BIG FOSSIL CREEK RELIEF SEWER PLANNING REPORT

TWDB CONTRACT NO. 99-483-308 BIG FOSSIL CREEK REGIONAL WASTEWATER PLANNING GRANT

Prepared for the

CITY OF NORTH RICHLAND HILLS
PUBLIC WORKS DEPARTMENT
7301 N.E. LOOP 820
NORTH RICHLAND HILLS, TEXAS
76180 (817) 581-5521

and

The City of Fort Worth
The City of Richland Hills
The City of Haltom City

Prepared by

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Bedford, Texas 76021
(817) 283-6211

December, 1999
Revised March, 2000

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

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December 31, 1999

Mr. Gregory W. Dickens, P.E.
Public Works Director
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Re: ***3-436, CITY OF NORTH RICHLAND HILLS, TWDB CONTRACT NO. 99-483-308, BIG FOSSIL CREEK REGIONAL WASTEWATER PLANNING GRANT, TRANSMITTAL OF PRELIMINARY REPORT***

In accordance with the provisions of our Authorization for Professional Engineering Services agreement dated July 15, 1997, we are furnishing you with copies of the Preliminary Report for the "North Richland Hills Big Fossil Relief Sewer Planning" study, for your review and transmittal to the primary funding agency, the Texas Water Development Board. Copies of the report are also provided for the other city participants which include the City of Fort Worth, Haltom City, and Richland Hills.

We would like to thank the Texas Water Development Board for providing the grant funds for half of this project, along with the other funding participants with include administrative and public works staffs of the participating cities who furnished us with the engineering data and other planning materials required to conduct this study, whose names are included in the list below. We would also like to thank our sub-consultants, Shaun Spooner, of Spooner & Associates, Inc., Surveyors, and Mark Bradley, R.O.W. Agent with Universal Field Services, Inc., for their help with this assignment.

Please call if you have any questions or require any additional information concerning this study.

Richard W. Albin

RICHARD W. ALBIN, P.E., Vice President

RWA/ra/Report Transmittal.doc

CC: Mr. Steve Norwood, Assistant City Manager
Mr. Kevin B. Miller, P.E., C.F.M., Assistant Director of Public Works/Utilities
Mr. Frank Crumb, P.E., Fort Worth Engineering Services Coordinator
Mr. Peter Fu, P.E., Fort Worth Wastewater Facilities Engineer
Mr. Greg Van Nieuwenhuize, P.E., Haltom City Engineer
Mr. John Cherry, P.E., Richland Hills Director of Public Works
Mr. Shaun Spooner, R.P.L.S., Spooner & Associates.
Mr. Mark Bradley, R.O.W. Agent, Universal Field Services

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TWDB CONTRACT NO. 99-483-308
BIG FOSSIL CREEK
REGIONAL WASTEWATER PLANNING GRANT STUDY
December, 1999

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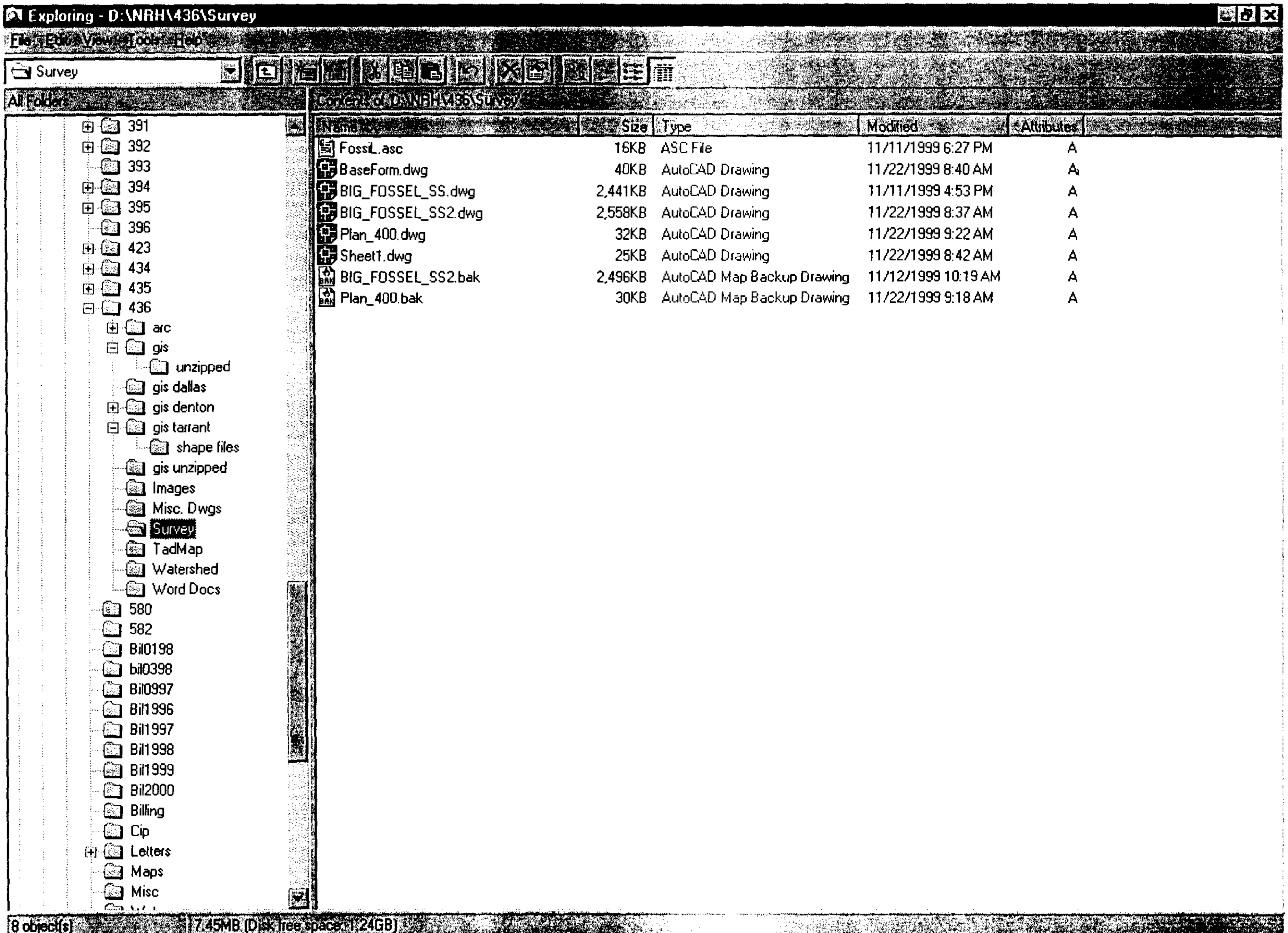
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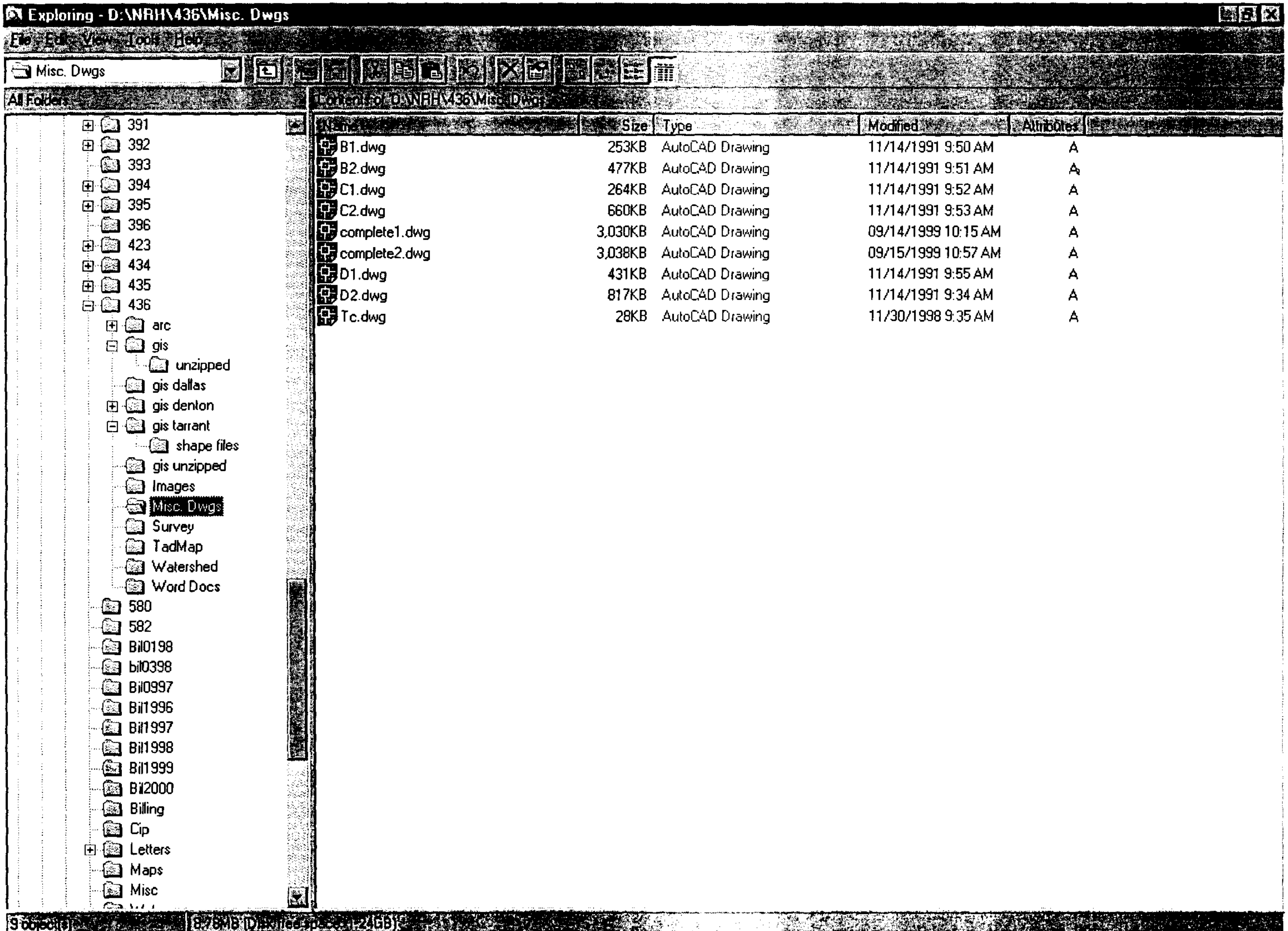
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TAB 1

BIG FOSSIL SEWER STUDY

REPORT TEXT

Executive Summary

The Big Fossil Creek Wastewater Outfall System affects four main communities which include Fort Worth, Haltom City, North Richland Hills and Richland Hills. The City of Richland Hills has a 36-inch Wastewater Outfall that was installed in the 1950's by the Tarrant County Water Supply Corporation, which was the previous owner of the systems which serve Richland Hills and North Richland Hills. This sewer line is designated as the T.C.W.S.C. Outfall Main, and transports wastewater from portions of both cities of Richand Hills and North Richland Hills to the City of Fort Worth 96-inch West Fork Outfall Sewer. The City of Fort Worth has a 48-inch wastewater Outfall main which is located in close proximity to the T.C.W.S.C. line and runs along the same creek bottom. This line is designated as the C.O.F.W. Outfall Main and serves a large watershed area which includes customers in Haltom City, Fort Worth, and portions of other smaller communities such as Watauga, Saginaw, and Haslet, plus some unincorporated Tarrant County areas. TAB 2 includes maps which show the Big Fossil watershed area and the location of the C.O.F.W. and T.C.W.S.C. Outfall mains. The recommendations included in this study for improvements to the Big Fossil Outfall System include only the portion from the Fort Worth West Fork Outfall to Broadway Drive. See Exhibit 1, at the end of this section, which is a map showing the location of the Outfall Sewers studied in detail in this report.

All four of the cities participating in this study, which include North Richland Hills, Richland Hills, Haltom City, and Fort Worth, have received Administrative Orders (AO) from the United States Environmental Protection Agency (EPA) with this Big Fossil Creek Wastewater Outfall System being recognized as needing to be studied in detail to determine the best plan for increasing the capacity to meet future demands. The Big Fossil Creek area is currently only partially developed, with full service of the watershed area expected to occur by the year 2020. The Big Fossil Creek system is also expected to provide service to the Marine Creek Watershed area which is located west of the natural Big Fossil Creek watershed area. Wastewater from the Marine Creek area is currently planned to be pumped by lift station to the Big Fossil area. The Big Fossil wastewater system is also expected to serve an Intel Facilities Plant located north of Big Fossil in the TRA Denton Creek Watershed area. A constant flow of 6.0 MGD was assumed for this facility based on a report prepared by Carter & Burgess, Inc.

Three primary alternatives have been identified for providing increased capacity to the Big Fossil Outfall System. These three alternatives are evaluated in this study. Several combinations of flow capacity sharing "Options" were modeled as required for the selection of the best alternative for each of the participating cities. A ranking matrix was developed for determining the best alternative, and a detailed discussion of the ranking procedure is presented at the end of this section of the report.

1. The first alternative includes construction of a single parallel Outfall Line in the vicinity of the existing City of Fort Worth Outfall Sewer which would increase the capacity of the Big Fossil system as required to serve all of the communities including Haltom City, North Richland Hills, Richland Hills, and the City of Fort Worth, and its other customer cities which are served by the Big Fossil system. The T.C.W.S.C. line would be abandoned as a major Outfall Line under this scenario, although a portion of it could be used by Richland Hills as a minor collector.

2. The second alternative includes construction of a parallel Big Fossil Outfall Sewer which would have sufficient capacity to serve all of the communities except for Richland Hills, which would continue to be served by the TCWSC line alone. The TCWSC line has sufficient capacity to serve Richland Hills for the foreseeable future, without future paralleling, but it will require extensive rehabilitation or replacement.

3. The third alternative includes separate parallel pipes for both the C.O.F.W. Outfall sewer, and the T.C.W.S.C. Outfall Sewer as proposed in the City of Fort Worth Sanitary Sewer Master Plan. This alternative assumes that North Richland Hills and Richland Hills will both continue to be served jointly by the T.C.W.S.C. Outfall System, and that the C.O.F.W. line will be paralleled as required to provide capacity for Haltom City, Fort Worth and the remainder of the Big Fossil service area, including the designated Marine Creek area and the Intel Facility.

The results of this comprehensive study indicate that the best interests of each of the four participating cities is served by a single parallel Outfall Sewer line which should be designed to have sufficient capacity to provide joint service for the entire Big Fossil service area. Cost comparisons of all the scenarios considered are discussed in detail in this report along with the methodology used in the evaluations and recommendations.

The table on the following page is a summary of the total preliminary estimated project cost allocations for each city for the design year of 2070 required to construct the Big Fossil Parallel Sanitary sewer line which has sufficient capacity to provide service for North Richland Hills, Richland Hills, the Haltom City Big Fossil watershed area plus a portion of the Little Fossil area, and for the City of Fort Worth and other customer cities in the Big Fossil watershed plus a portion of the Marine Creek watershed, and the Intel Facility Plant located in the TRA Denton Creek Watershed area.

The following sections include discussions regarding the methodology used in this study to develop the peak discharges, size the relief Outfall Lines, and develop the preliminary cost estimates for evaluating various alternatives and flow scenarios.

PARTICIPATING COMMUNITY	PEAK FLOW (MGD)	% COST SHARE	TOTAL ESTIM. COST
FORT WORTH	125.69	83.98%	$13,461,687
HALTOM CITY	15.38	10.28%	$1,647,233
NORTH RICHLAND HILLS	7.36	4.92%	$788,273
RICHLAND HILLS	1.24	0.83%	$132,807
TOTAL	149.67	100.00%	$16,030,000
NOTE: Cost Participation Share based on estimated peak flows calculated using a calibration formula developed from the City of Fort WorthHydroworks computer model of the Big Fossil watershed area which relates future estimated Equivalent Populations and Sewered Areas for each community.			

Service Area

The Big Fossil Creek Watershed area is shown on the exhibit titled "Watershed Areas" under TAB 2. The total natural watershed area includes 34,989 acres. Currently, service is provided to 21,851 acres. The limits of the current service area are shown on the Watershed Area map and is labeled "Year 2000 Service Area". This area within the natural Big Fossil Creek watershed, but outside the current service area limits is referred to as area "BFX" throughout this report.

The City of Fort Worth Master Plan proposes to serve a portion of an additional area outside the Big Fossil Creek Watershed designated as the "Marine Creek Watershed" area. This area will be served by pumping wastewater by lift station to the Big Fossil System. The Marine Creek area to be served by the Big Fossil Creek System totals 23,717 acres.

A plant designated as the "Intel Facility" is shown on the Watershed Area map, and is located in the TRA Denton Creek Watershed area north of the Big Fossil Watershed. A lift station and force main are proposed which would provide service to this facility by the Big Fossil system. A constant flow of 6.0 MGD is assumed in the flow models included in this report as proposed in a "Hydraulic Analysis Intel Wastewater Project" report prepared by Carter and Burgess, Inc., dated November, 1997. Flow option calculations are provided which show the effect of the 6.0 MGD Intel flow on the capacity requirements of the Big Fossil Creek Outfall Sewer, and with the flow omitted from the model for comparison.

Three additional detailed watershed area exhibits are included under TAB 2 which show the "Lower Big Fossil Watershed" area, the "Upper Big Fossil Watershed" area, and the "Marine Creek Watershed" areas. Sub-areas are shown on each of these exhibits which are included in the tables and computer models used for population projections and sewer discharge calculations throughout this report. These sub-areas correspond to the area designations included in thẽ City of Fort Worth Land Use Plan and Sanitary Sewer Master Plan. The size in acres of each sub-area, along with the land use characteristics and population projections is presented in the table labeled "Base Table Query, Dec.99.xls", which is included under TAB 5. Additional population projections are shown for each sub-area and grouped into the basin areas included in this study, and this data is also included under TAB 5. The data included in these tables was provided by the City of Fort Worth Water Department for our use in this study. Areas discharging into the Big Fossil system were extracted from the database and grouped by categories used in the flow "Options" scenarios considered in this study.

An additional area is included in this study located within Haltom City which could also be served by the proposed Big Fossil Outfall Sewer. This extra area includes portions of the Little Fossil Creek and West Fork watershed areas. The existing sewer line which currently serves this area is labeled "Existing Haltom City West Fork Outfall Sanitary Sewer". The area served is designated as the "Little Fossil Creek" watershed area as shown on Exhibit 1, and sheet 2 of 4, "Lower Big Fossil Watershed" in the TAB 2 section.

Population Projections

Detailed population projections and methodologies used for this study are presented under TAB 5 for each of the participating communities and other cities located within the Big Fossil watershed area. These projections were performed to provide a check against the population data and projections provided by the City of Fort Worth. The results of our population projections agree favorably with the projections provided by the City of Fort Worth. A detailed discussion of the population projection methods used in this study, along with exhibits showing the North Central Texas Council of Governments (N.C.T.C.O.G.) Census Tracts and Forecast Districts used in the projections, are presented in this section of the report for reference.

Sanitary Sewer Plans and Right-Of-Way Documents

As-built construction plans of the City of Fort Worth (C.O.F.W.) Big Fossil Creek Outfall Sewer Line and the Tarrant County Water Supply Corporation (T.C.W.S.C.) Outfall Sewer Line were provided by the City of Fort Worth Water Department. A detailed on-the-ground field survey was conducted to verify the location of the existing sewer lines and confirm the stations and elevations of the manholes and manhole rims. The field survey data agree favorably with the as-built construction plans, and the as-built plan data is sufficiently accurate for the planning purposes included in this study.

The plan location and alignment of the C.O.F.W. and T.C.W.S.C. lines are shown on the plan sheets included under TAB 3 of this report. A proposed route for the Big Fossil Creek Parallel Outfall Line is shown on these drawings. An alternate route proposed by the City of Fort Worth Water Department is also shown in this section of the report for reference. The preliminary location of the proposed Haltom City West Fork Parallel Sanitary Sewer line which would serve the extra Little Fossil Creek area is also shown on this drawing.

The location and number of each sanitary sewer easement parcel are noted on the plan sheets. Spreadsheets are also included in this section of the report which list the available easement parcel ownership data associated with the C.O.F. W. and T.C.W.S.C. sewer mains. Profile sheets are also provided in this section of the report, and the beginning and ending locations of each right-of-way or easement parcel are shown in the profile drawings. Hydraulic information and other data is provided in the profile sheets as well. Profile data sheets are included under TAB 4 of this report.

A tabulation of the ownership data for the easements and properties on which the sewer lines are located is presented under TAB 3, as noted above. Not all of the ownership records for the sewer mains have been located. We are continuing to research the records to determine if any additional easement ownership data is available. All known property ownership information will be included in the final report.

Calculation of Flow Data

The basis for the preliminary sizing of the proposed Big Fossil Creek and TCWSC Outfall Relief Sewer Lines is discharge flow rate plus other hydraulic flow parameters used to determine pipe capacity. The sanitary sewer discharge consists of three basic components. The first is the *base flow*, which is a function of the equivalent population. The equivalent population is equal to the residential population plus one-half the employment population. Projections of these data are presented for each sub-area in TAB 5 of the report. The Fort Worth Master Plan recommends using a base flow rate of 80 gallons per capita per day (gpcd) for the design base flow rate. The second component of the flow is *ground water infiltration* (GWI). The Fort Worth Master Plan recommends 14 gpcd times the equivalent population as an approximation of this flow. The third component of the discharge is *rain-dependent infiltration/inflow* (RDII). This quantity of flow is determined by correlating rainfall events to excesses in sewer system flow rates though a comprehensive flow metering and monitoring program. RDII flows are a function of the size and runoff characteristics of the portion of the watershed area which is sewered. Hydrographs showing the shapes of various land use types are presented under TAB 6 of this report. Existing and projected sewered areas in acres are presented in the Population Projections table under TAB 5.

For purposes of this preliminary planning report, approximations in peak flow rates have been calculated by developing formulas which "calibrate" the discharges to the Fort Worth "*HydroWorks*" sanitary sewer model. Design discharges for the years 2000 and 2020 from the Master Plan data for the Big Fossil Watershed were used to develop these formulas. An outline of the procedure used to develop these flow calibration formulas is presented under TAB 6 in Table "CALIB-1" of the report. Peak discharge flow rates for various flow "scenarios" are tabulated under TAB 7 also. We would caution that these approximate peak flows should only be used for purposes of comparing various sizing alternatives, and not used for final design. We would recommend that a *HydroWorks* model update be performed by the City of Fort Worth, based on the parameters presented in this report, for the best design scenario selected in order to determine the final pipe design and hydraulic gradients.

Pipe Sizing and Cost Estimates

After development of flow data tables (TAB 7) for various flow "scenarios" for the design years of 2000, 2005, 2010, 2015, 2020, 2050, and 2070, the proposed C.O.F.W. and T.C.W.S.C. parallel sewers were sized based on hydraulic calculations calibrated to the City of Fort Worth hydraulic tables from the Master Plan CIP project spreadsheets. Peak discharges for each line segment for various conditions of equivalent population, sewered acreages, and design year were calculated based on calibration formulas developed from the Master Plan year 2000 and 2020 HydroWorks computer models. These formulas were used to develop discharge estimates for design years other than 2000 and 2020 by interpolation and extrapolation of the data based on these two design periods. Baseline calibration tables showing the existing year 2000 conditions and projected year 2020 conditions for the C.O.F.W. Line, along with a discussion of the methodology used are included under TAB 7.

Flow scenario calculations for each of the design years noted were performed for the following conditions:

1. City of Fort Worth Outfall flows based on the Master Plan conditions for the Big Fossil Creek watershed, not including Intel Flows, the BFX or Marine Creek areas until design year 2020.

2. City of Fort Worth Outfall flows, including BFX flows, but not Marine Creek or Intel.

3. City of Fort worth Outfall flows, including BFX area, and Marine Creek areas, but not Intel.

4. Same as Scenario 3 plus Intel flows.

5. Tarrant County Water Supply Corporation Outfall flows, based on the City of Fort Worth Master Plan, including flows from Richland Hills and North Richland Hills.

6. Tarrant County Water Supply Corporation Outfall flows revised to account for additional area in North Richland Hills which is served by the T.C.W.S.C. line, but not included in the Fort Worth Model.

7. North Richland Hills total flows to the Big Fossil Creek system based on calibration with the T.C.W.S.C. Fort Worth Master Plan model. These flow rates are higher than the C.O.F.W. model flows because the time to peak is shorter. These peak rates are used to determine the proposed cost split between NRH and Richland Hills for improvements to the T.C.W.S.C. system.

8. Richland Hills total flows to the Big Fossil Creek system based on calibration with the T.C.W.S.C. Fort Worth Master Plan model. These flow rates are higher than then C.O.F.W. model flows because the time to peak is shorter. These peak rates are used to determine the proposed cost split between NRH and Richland Hills for improvements to the T.C.W.S.C. system.

9. North Richland Hills flows to the Big Fossil Creek system based on calibration with the C.O.F.W. Master Plan model. These flows are used for determining the cost split with the other cities for improvements to the C.O.F.W. Big Fossil Outfall Sewer. These peak flows are less than the T.C.W.S.C. model flows due to the longer time to peak for the Big Fossil watershed.

10. Richland Hills flows to the Big Fossil Creek system based on calibration with the C.O.F.W. Master Plan model. These flows are used for determining the cost split with the other cities for improvements to the C.O.F.W. Big Fossil Outfall Sewer. These peak flows are less than the T.C.W.S.C. model flows due to the longer time to peak for the Big Fossil Creek watershed.

11. Haltom City total flows from the area of the city within the Big Fossil Creek watershed which sewer to the C.O.F.W. Outfall, based on calibration with the C.O.F.W. Outfall Master Plan.

12. Haltom City total flows from the area of the city within the "Little" Fossil Creek watershed which sewer to the C.O.F.W. Outfall, based on calibration with the C.O.F.W. Outfall Master Plan. This area is designated as "LF000570" as shown on the "Lower Big Fossil Creek Watershed" area

map under TAB 1. This additional area is being considered for service to the C.O.F.W. line because the current Little Fossil Creek Outfall Main requires extensive rehabilitation, and diversion of the Little Fossil area to the Big Fossil line is an alternative which would eliminate the need for rehabilitation or reconstruction of a major portion of the Little Fossil Creek Outfall.

13. Combined Haltom City flows from the Big Fossil area and the Little Fossil area into the C.O.F.W. Outfall Sewer, (11.+12.).

A tabulation titled "Flow Scenario Calculations" of the 13 flow scenarios listed above is presented under TAB 6 of the report. Included in the table are the calculated flow model calibration coefficients "A" and "B" used to develop the peak flow rates, along with the equivalent populations, sewered acres, base flow calculations, *Harmon's Peaking Factor*, Peak *Base Flow* calculations, GWI and RDII flows, total Flows and *Base Flow* peaking factor check. These parameters are provided for the design years 2000, 2005, 2010, 2015, 2020, 2050, and 2070. For purposes of this study, projections to the year 2070 are considered to represent ultimate development of the watershed areas served by the Big Fossil Creek Outfall System. A summary of the calculated peak discharges for each of these 13 scenarios is listed in Table "PEAKS-1" titled "Peak discharge Summary" included under TAB 6.

Hydraulic calculation tables were developed based on the City of Fort Worth *HydroWorks* calibrated model which are used for sizing the proposed replacement pipes and parallel pipes for each flow scenario and design option considered. Cost estimates of replacement and parallel sanitary sewer lines are based on pipeline costs developed from the City of Fort Worth Master Plan, dated December, 1997, and increased by a factor of about 1.06 times 1997 values based on the Engineering News Record (ENR) cost index increase since 1997. Estimated construction costs are increased by a factor of 1.5 to include engineering, financing, right-of-way acquisition costs, and contingencies. Table "COST-1" showing these unit prices is included at the end of TAB 7 of the report. These preliminary costs should not be used for final design estimates, but rather for purposes of comparing various alternative designs and preliminary planning only. Hydraulic tables for each design option are presented under TAB 7 of the report.

Using the various flow scenarios listed above, three main design "Options" are considered, including several "sub-options" in order to determine the sewer system improvement that is most advantageous from an economic standpoint to each participating city. Summary tables of the results of these comparisons follow this section. The following is a brief summary of each main Option and the associated "sub-options". A detailed discussion of the results of each Option is included herein.

Option 1 -- Construct a single parallel relief line to serve all Cities

Option 1a -- All areas considered in the service area including Haltom City Little Fossil, BFX area, Marine Creek and Intel site.

Option 1b -- Same as Option 1a less the Marine Creek area

Option 1c -- Same as Option 1b less the Intel Site flow

Option 1d -- Same as Option 1c less the Haltom City Little Fossil area

Option 2 -- Construct a single parallel relief line to serve all Cities except Richland Hills

Option 2a -- C.O.F.W. parallel line to serve only Fort Worth, Haltom City (with Little Fossil), and North Richland Hills, including BFX, Marine Creek and Intel site

Option 2b -- T.C.W.S.C. existing line with rehab serving Richland Hills only

Option 3 -- Construct two parallel lines, one adjacent to existing C.O.F.W. line and another adjacent to existing T.C.W.S.C. line.

Option 3a -- C.O.F.W. parallel line to serve only Fort Worth and Haltom City (with Little Fossil), including BFX, Marine Creek and Intel site

Option 3b -- New parallel T.C.W.S.C. line constructed to serve both NRH and Richland Hills

Option 1a -- All Cities Served by Proposed C.O.F.W. Parallel Outfall

This option includes flows from each city to the Big Fossil Creek Outfall including Fort Worth Big Fossil watershed area, North Richland Hills, Richland Hills, Haltom City (Big Fossil and Little Fossil Areas), plus areas outside the Big Fossil Creek watershed including the Marine Creek watershed area and the Intel Facility site.

Table FWOPT-1 shows an estimate of Fort Worth's share of the costs for this option for the design years 2000 through 2070. Fort Worth's share of the estimated cost for the proposed C.O.F.W. parallel Outfall sized to meet the demands of the year 2020 is about $12.16 million. The cost to construct this parallel line to meet projected 2070 demands is $13.46. Haltom City's share of the costs for capacity in this line based on calculated peak flows is $1.59 million in 2020 or $1.65 million in 2070. Haltom City's share includes capacity for both the Big and Little Fossil Creek service areas.

North Richland Hills' share of the estimated cost of this Option is $0.96 for the 2020 design, or $0.79 for the 2070 design year. NRH costs are less in 2070 because NRH's proportion of the peak flow in 2020 is higher than its portion in 2070 relative to the demands of Fort Worth. Therefore, it is more advantageous for NRH to have the C.O.F.W. Outfall design based on 2070 demand conditions rather than the year 2020 conditions.

Richland Hills' share of the estimated cost of this Option is $0.18 for the 2020 design, or $0.13 for the 2070 design year. Richland Hills' costs are less in 2070 because RH's proportion of the peak flow in 2020 is higher than its portion in 2070 relative to the demands of Fort Worth. Therefore, like NRH, it is more advantageous for RH to have the C.O.F.W. Outfall design based on 2070 demand conditions rather than the year 2020 conditions.

Option 1b -- All Cities Served by Proposed C.O.F.W. Parallel Outfall (less the Marine Creek Area)

This option is similar to Option 1a, and includes flows from each city to the Big Fossil Outfall including Fort Worth Big Fossil watershed area, North Richland Hills, Richland Hills, Haltom City (Big Fossil and Little Fossil Areas), plus the Intel Facility site. However, the Marine Creek area is omitted from the model to help Fort Worth determine what the cost difference would be to provide sewer service for the Marine Creek area to some other watershed area or system.

Fort Worth's share of the estimated cost for the proposed C.O.F.W. parallel Outfall sized to meet the demands of the year 2020 is about $12.16 million with the Marine Creek area included, and $11.04 million with Marine Creek not included in the capacity of the parallel Outfall sewer. This is a cost difference of about $1.12 million. The cost to construct this parallel line to meet projected 2070 demands is $13.2146 including Marine Creek, and $11.95 with Marine Creek not included. This is a cost difference of about $1.51 million. Therefore, if Marine Creek is to be served by the Big Fossil parallel Outfall, it is more cost effective to base the design on Year 2070 conditions than 2020 conditions. These cost differences should be compared with the cost to provide sewer service to the Marine Creek area to some other watershed other than Big Fossil before a final decision can be made in this regard.

Haltom City's share of the costs for capacity in this line based on calculated peak flows is $1.59 million in 2020 with the Marine Creek area included, and $1.68 with Marine Creek not included. Haltom City's 2070 costs are $1.65 million with the Marine Creek area included, and $1.76 million with Marine Creek not included. Therefore, it is more advantageous to have the Marine Creek area served by Big Fossil if that Option is selected for the design. We would note that Haltom City's share includes capacity for both the Big and Little Fossil Creek service areas in this design Option.

North Richland Hills' share of the estimated cost of this Option is $0.96 with Marine Creek included, and $1.01 with Marine Creek not included for the 2020 design; or $0.79 with Marine Creek in the 2070 design year, and $0.84 without Marine Creek. Therefore, it is more advantageous for NRH to have the C.O.F.W. Outfall design based on Marine Creek included in the capacity design for either the 2020 or the 2070 demand conditions.

Richland Hills' share of the estimated cost of this Option is $0.18 for the 2020 design with Marine Creek included, and $0.16 with Marine Creek not included; or $0.13 for the 2070 design year with Marine Creek, and $0.14 without Marine Creek. Therefore, like NRH, it is more advantageous for RH to have the C.O.F.W. Outfall design based on Marine Creek included in the capacity design for either the 2020 or the 2070 demand conditions.

Option 1c -- All Cities Served by Proposed C.O.F.W. Parallel Outfall (less the Marine Creek Area and the Intel Flow)

This option is similar to Option 1b, and includes flows from each city to the Big Fossil Creek Outfall including Fort Worth Big Fossil Creek watershed area, North Richland Hills, Richland Hills, Haltom City (Big Fossil and Little Fossil Areas). However, the Marine Creek area and the Intel Facility flow are omitted from the model to help Fort Worth determine what the cost differences would be to provide sewer service for the Marine Creek area and the Intel site to some other watershed or system.

The 2020 design year cost difference for Fort Worth between Options 1b and 1c with the 6.0 MGD Intel site flow omitted from the C.O.F.W. parallel line capacity sizing is $11.04 - $9.45 = $1.59 million. The year 2070 design cost difference is $11.95 - 10.67 = $1.28 million. Therefore, it is more advantageous to Fort Worth for the C.O.F.W. parallel line to be designed to the 2070 conditions if the Intel site is served by the Big Fossil system.

For the 2020 design year, the cost savings to Haltom City is $1.68 - $1.55 = $130,000 without the Intel Flow capacity, and $1.76 - $1.66 = $100,000 less for the 2070 design year. It is more advantageous to Haltom City if capacity for the Intel site is not included in the C.O.F.W. sewer design.

For the 2020 design year, the cost savings to NRH is $1.01 - $0.94 = $70,000 without the Intel Flow capacity, and $0.84 - $0.80 = $40,000 less for the 2070 design year. It is more advantageous to NRH if capacity for the Intel site is not included in the C.O.F.W. sewer design.

For the 2020 design year, the cost savings to RH is \$0.16 - \$0.14 = \$20,000 without the Intel Flow capacity, and \$0.14 - \$0.12 = \$20,000 less for the 2070 design year. It is more advantageous to RH if capacity for the Intel site is not included in the C.O.F.W. sewer design.

If the Intel Site is added to the capacity requirements of the Big Fossil Creek Sewer, then we would recommend that the extra costs to Haltom City, NRH, and Richland Hills be borne by Intel and/or the City of Fort Worth. For the 2020 Design year, this total extra cost would be \$1.59 + \$0.13 + \$0.07 + \$0.02 = \$1.81 million to provide the additional 6.0 MGD capacity to serve the Intel site. The cost shares for Haltom City, NRH, and Richland Hills should be reduced accordingly. The extra year 2070 costs would be \$1.28 + \$0.10 + \$0.04 + \$0.02 = \$1.44 million.

Option 1d -- All Cities Served by Proposed C.O.F.W. Parallel Outfall (less Haltom City Little Fossil watershed area)

This option includes flows from each city to the Big Fossil Creek Outfall including Fort Worth Big Fossil Creek watershed area, North Richland Hills, Richland Hills, Haltom City (Big Fossil area only), plus areas outside the Big Fossil watershed including Marine Creek and the Intel Facility site. The Haltom City Little Fossil Creek watershed area is not included.

Fort Worth's share of the C.O.F.W. parallel Outfall cost, for design year 2020, would increase from \$12.16 million to \$12.81 million if the Little Fossil area is omitted from the capacity design, because Haltom City's total share would go down. For design year 2070, Fort Worth's share of the cost would go up from \$13.46 million to \$14.02 without Little Fossil included. Therefore, it is more advantageous for Fort Worth to have the Little Fossil area included in the design capacity.

Haltom City's share of the cost would go down from \$1.59 million to \$0.85 million, in design year 2020, if the Little Fossil area is not included in the capacity calculations. However, Haltom City should compare the cost difference of \$740,000 for the Little Fossil capacity in the Big Fossil parallel Outfall, versus the cost to rehabilitate or reconstruct a new Little Fossil Outfall line. Assuming that the required capacity of the Little Fossil Outfall is about 7.5 MGD, and the grade of the line is the same as the C.O.F.W. Outfall, which is 0.08%, then the approximate size of the Little Fossil line would be about 36" in diameter, based on a Manning's n factor of 0.0145. Assuming the length of the Little Fossil Line is about 5,200 feet, and the cost of the 36 inch line is about \$230 per foot, then the total estimated cost of the Little Fossil line would be about \$1.20 million. Therefore, Haltom City would save \$1.20 - \$0.74 = \$460,000 by purchasing capacity in the proposed C.O.F.W. parallel Outfall sewer rather than building a new Little Fossil line.

North Richland Hills' share of the 2020 project cost would increase from $0.96 to $1.04 if the Little Fossil capacity is not included in the design. For the 2070 design year, NRH costs would increase from $0.79 to $0.84 without the Little Fossil capacity. Therefore, it is more advantageous to NRH for Haltom City to include the Little Fossil Creek area in its share of the C.O.F.W. parallel line capacity purchase.

Similarly, Richland Hills' share of the 2020 project cost would increase from $0.18 to $0.20 if the Little Fossil capacity is not included in the design. For the 2070 design year, RH costs would increase from $0.13 to $0.14 without the Little Fossil capacity. Therefore, it is more advantageous to RH for Haltom City to include the Little Fossil area in its share of the C.O.F.W. parallel line capacity purchase.

Options 2a and 2b -- All Cities Served by Proposed C.O.F.W. Parallel Outfall except Richland Hills which would be served by the TCWSC line

This option includes flows from each city to the Big Fossil Outfall including Fort Worth Big Fossil Creek watershed area, North Richland Hills, and Haltom City (Big Fossil and Little Fossil Creek Areas), plus areas outside the Big Fossil watershed including Marine Creek and the Intel Facility site. Richland Hills would continue to be served by the existing Tarrant County Water Supply Corporation Outfall Line, but NRH would transfer service to the proposed new C.O.F.W. parallel Outfall.

For this Option, Fort Worth's share of the costs would increase from $12.16 million to $12.40 million, in the 2020 design year, without Richland Hills participation. In the 2070 design year, Fort Worth's cost would increase from $13.46 to $13.53 without Richland Hills' participation.

For this Option, Haltom City's share of the costs would increase from $1.59 million to $1.65 million, in the 2020 design year, without Richland Hills participation. In the 2070 design year, Haltom City's cost would increase from $1.65 to $1.69 without Richland Hills' participation.

For this Option, North Richland Hills' share of the costs would increase from $0.96 million to $1.00 million, in the 2020 design year, without Richland Hills participation. In the 2070 design year, NRH's cost would increase from $0.79 to $0.81 without Richland Hills' participation.

Assuming that Richland Hills rehabilitation costs of the existing Tarrant County Water Supply Corporation are about 1/3 of the costs to replace that existing line, then the estimated rehabilitation costs to Richland Hills would be about $720,000. This cost is higher for Richland Hills than all the other Option costs which include Richland Hills purchasing capacity in the proposed C.O.F.W. parallel Outfall sewer. Therefore, based on this scenario, it is more advantageous for Richland Hills to participate in the cost of a new C.O.F.W. parallel Outfall sewer than it would be to assume maintenance responsibility for the T.C.W.S.C. line and pay for the rehab costs. This also assumes that someone will pay for the connections.

Options 3a and 3b -- Cities Served by Proposed C.O.F.W. Parallel Outfall include only Fort Worth and Haltom City, with NRH and Richland Hills being served by the T.C.W.S.C. line

This option includes flows from Fort Worth and Haltom City (with Little Fossil Creek area) to the Big Fossil Creek Outfall including Marine Creek and the Intel Facility site. Richland Hills and North Richland Hills would continue to be served by the Tarrant County Water Supply Corporation line, and Richland Hills and NRH would share in the cost of a new parallel T.C.W.S.C. line as required to meet future demands.

This is the least advantageous scenario for the City of Fort Worth. It's share of the 2020 design year cost would be $14.48 million compared with $12.16 million for Option 1a. Fort Worth's 2070 design year cost would be $14.48 compared with $13.46 for Option 1a.

This is also the least advantageous scenario for Haltom City. It's share of the 2020 design year cost would be $1.80 million compared with $1.59 million for Option 1a. Haltom City's 2070 design year cost would be $1.88 million compared with $1.65 million for Option 1a.

This Option is by far the worst scenario for North Richland Hills. It's share of the cost with Richland Hills for construction of a new T.C.W.S.C. parallel line would be about $5.24 million for the 2020 design year, as compared with only $0.96 million for its share of the C.O.F.W. parallel Outfall in Option 1a.

This Option is also by far the worst scenario for Richland Hills. It's share of the cost with North Richland Hills for construction of a new T.C.W.S.C. parallel line would be about $1.88 million for the 2020 design year, as compared with only $0.18 million for its share of the C.O.F.W. parallel Outfall in Option 1a.

Summary of Options and Recommendations

The following table is a matrix based on the relative cost of each Option considered on a scale of 1 to 6, for the 2070 design year, with 1 being the least expensive alternative.

PARTICIPATING CITY	EVALUATION OPTION NUMBER					
	1a	1b	1c	1d	2	3
FORT WORTH	3	2	1	5	4	6
HALTOM CITY	2	5	3	1	4	6
NRH	1	4	2	5	3	6
RICHLAND HILLS	1	3	2	4	5	6
TOTAL SCORE	7	14	8	15	16	24

Based on this evaluation, Option 1a is the best alternative for all participating cities.

OPTION 1a - All Cities Served by C.O.F.W. Big Fossil Outfall, Including NRH, Haltom city, R.H., Marine Creek Are, BFX Area, and 6.0 MGD Intel Flow. Also includes Haltom City Little Fossil Area.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	63.93	77.06%	$9.01	69.31	77.76%	$9.52	74.15	78.53%	$9.71	86.92	80.70%	$11.90	94.40	81.69%	$12.16	114.63	83.42%	$13.37	125.69	83.98%	$13.46
HALTOM CITY	10.99	13.25%	$1.55	11.3	12.68%	$1.55	11.6	12.28%	$1.52	11.96	11.10%	$1.64	12.31	10.65%	$1.59	14.19	10.33%	$1.66	15.38	10.28%	$1.65
NRH	6.81	8.21%	$0.96	7.2	8.08%	$0.99	7.35	7.78%	$0.96	7.39	6.86%	$1.01	7.44	6.44%	$0.96	7.36	5.36%	$0.86	7.36	4.92%	$0.79
RICHLAND HILLS	1.23	1.49%	$0.17	1.32	1.48%	$0.18	1.32	1.40%	$0.17	1.43	1.33%	$0.20	1.41	1.22%	$0.18	1.24	0.90%	$0.14	1.24	0.83%	$0.13
TOTAL	82.96	100.00%	$11.69	89.13	100.00%	$12.24	94.42	100.00%	$12.37	107.70	100.00%	$14.75	115.56	100.00%	$14.89	137.42	100.00%	$16.03	149.67	100.00%	$16.03

OPTION 1b - All cities Served by C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City (with Little Fossil), Richland Hills, BFX Area, and Constant 6.0 MGD Intel Flow. Marine Creek Area is Not Included.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	55.06	74.48%	$6.29	60.20	75.27%	$6.83	64.79	76.42%	$8.60	75.64	78.51%	$10.18	81.15	79.51%	$11.04	96.60	80.94%	$11.89	104.65	81.38%	$11.95
HALTOM CITY	10.99	14.87%	$1.26	11.3	14.13%	$1.28	11.6	13.68%	$1.54	11.96	12.41%	$1.61	12.31	12.06%	$1.68	14.19	11.89%	$1.75	15.38	11.96%	$1.76
NRH	6.81	9.21%	$0.78	7.2	9.00%	$0.82	7.35	8.67%	$0.98	7.39	7.67%	$0.99	7.44	7.29%	$1.01	7.36	6.17%	$0.91	7.36	5.72%	$0.84
RICHLAND HILLS	1.07	1.45%	$0.12	1.28	1.60%	$0.14	1.04	1.23%	$0.14	1.36	1.41%	$0.18	1.16	1.14%	$0.16	1.20	1.01%	$0.15	1.20	0.94%	$0.14
TOTAL	73.93	100.00%	$8.45	79.98	100.00%	$9.07	84.78	100.00%	$11.25	96.35	100.00%	$12.97	102.06	100.00%	$13.89	119.35	100.00%	$14.69	128.59	100.00%	$14.69

OPTION 1c - All Cities Served by C.O.F.W. Big Fossil Outfall, Including NRH, Haltom city (with Little Fossil), Richland Hills, BFX Area, and Marine Creek Area. Intel 6.0 MGD Flow is Not Included.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	49.06	72.49%	$4.80	54.20	73.44%	$6.01	58.79	74.57%	$6.58	69.64	77.14%	$8.97	75.15	78.25%	$9.45	90.60	79.97%	$9.88	98.65	80.50%	$10.67
HALTOM CITY	10.99	16.24%	$1.08	11.3	15.31%	$1.25	11.6	14.71%	$1.30	11.96	13.25%	$1.54	12.31	12.82%	$1.55	14.19	12.52%	$1.55	15.38	12.55%	$1.66
NRH	6.81	10.06%	$0.67	7.2	9.76%	$0.80	7.35	9.32%	$0.82	7.39	8.19%	$0.95	7.44	7.75%	$0.94	7.36	6.50%	$0.80	7.36	6.01%	$0.80
RICHLAND HILLS	0.82	1.21%	$0.08	1.11	1.50%	$0.12	1.10	1.39%	$0.12	1.29	1.43%	$0.17	1.14	1.19%	$0.14	1.14	1.01%	$0.12	1.15	0.94%	$0.12
TOTAL	67.68	100.00%	$6.62	73.81	100.00%	$8.19	78.84	100.00%	$8.83	90.28	100.00%	$11.63	96.04	100.00%	$12.08	113.29	100.00%	$12.36	122.54	100.00%	$13.25

OPTION 1d - All Cities Served by C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, BFX Area, and Intel Flow. Little Fossil Area Not Included.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	61.42	82.55%	$8.05	66.82	83.14%	$9.94	71.69	83.50%	$10.62	84.36	85.31%	$12.70	91.94	86.04%	$12.81	112.25	87.17%	$13.97	123.36	87.46%	$14.02
HALTOM CITY	4.77	6.41%	$0.63	5.07	6.31%	$0.75	5.36	6.24%	$0.79	5.72	5.78%	$0.86	6.07	5.68%	$0.85	7.92	6.15%	$0.99	9.09	6.44%	$1.03
NRH	6.81	9.15%	$0.89	7.2	8.96%	$1.07	7.35	8.56%	$1.09	7.39	7.47%	$1.11	7.44	6.96%	$1.04	7.36	5.72%	$0.92	7.36	5.22%	$0.84
RICHLAND HILLS	1.41	1.89%	$0.18	1.28	1.59%	$0.19	1.45	1.69%	$0.22	1.42	1.43%	$0.21	1.41	1.32%	$0.20	1.24	0.96%	$0.15	1.24	0.88%	$0.14
TOTAL	74.41	100.00%	$9.75	80.37	100.00%	$11.96	85.85	100.00%	$12.72	98.89	100.00%	$14.89	106.86	100.00%	$14.89	128.77	100.00%	$16.03	141.05	100.00%	$16.03

OPTION 2a - All Cities Served by C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City (with Little Fossil), Marine Creek Area, BFX Area, Intel Flow, but Excluding Richland Hills.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	62.46	77.82%	$9.13	67.75	78.55%	$9.21	72.45	79.27%	$10.12	85.14	81.48%	$12.06	92.54	82.41%	$12.40	112.14	83.88%	$13.45	123.20	84.42%	$13.53
HALTOM CITY	10.99	13.69%	$1.61	11.3	13.10%	$1.54	11.6	12.69%	$1.62	11.96	11.45%	$1.69	12.31	10.96%	$1.65	14.19	10.61%	$1.70	15.38	10.54%	$1.69
NRH	6.81	8.48%	$1.00	7.2	8.35%	$0.98	7.35	8.04%	$1.03	7.39	7.07%	$1.05	7.44	6.63%	$1.00	7.36	5.51%	$0.88	7.36	5.04%	$0.81
RICHLAND HILLS	0.00	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00
TOTAL	80.26	100.00%	$11.73	86.25	100.00%	$11.73	91.4	100.00%	$12.77	104.49	100.00%	$14.80	112.29	100.00%	$15.05	133.69	100.00%	$16.03	145.94	100.00%	$16.03

OPTION 2b - Richland Hills Served by Tarrant County Water Supply Corporation Line (TCWSC) only, and not included in C.O.F.W. Big Fossil Outfall.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00
HALTOM CITY	0.00	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00
NRH	0.00	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00
RICHLAND HILLS	5.17	100.00%	$0.72	5.49	100.00%	$0.72	6.9	100.00%	$0.72	7.85	100.00%	$0.72	8.81	100.00%	$0.72	13.26	100.00%	$0.72	13.26	100.00%	$0.72
TOTAL	5.17	100.00%	$0.72	5.49	100.00%	$0.72	6.9	100.00%	$0.72	7.85	100.00%	$0.72	8.81	100.00%	$0.72	13.26	100.00%	$0.72	13.26	100.00%	$0.72

OPTION 3a - Areas Served by C.O.F.W. Big Fossil Outfall Include Haltom City (with Little Fossil), Marine Creek Area, BFX Area, Intel Flow, but Excluding Richland Hills and NRH.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	59.15	84.33%	$8.26	64.26	85.04%	$9.94	68.74	85.56%	$10.88	81.26	87.17%	$12.86	88.50	87.79%	$12.95	107.39	88.33%	$14.16	118.45	88.51%	$14.48
HALTOM CITY	10.99	15.67%	$1.54	11.3	14.96%	$1.75	11.6	14.44%	$1.84	11.96	12.83%	$1.89	12.31	12.21%	$1.80	14.19	11.67%	$1.87	15.38	11.49%	$1.88
NRH	0.00	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00
RICHLAND HILLS	0.00	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00
TOTAL	70.14	100.00%	$9.80	75.56	100.00%	$11.69	80.34	100.00%	$12.72	93.22	100.00%	$14.75	100.81	100.00%	$14.75	121.58	100.00%	$16.03	133.83	100.00%	$16.36

OPTION 3b - Richland Hills and NRH Served by Tarrant County Water Supply Corporation Line (TCWSC) only, and not included in C.O.F.W. Big Fossil Outfall.

PARTICIPATING CITY	YEAR 2000			YEAR 2005			YEAR 2010			YEAR 2015			YEAR 2020			YEAR 2050			YEAR 2070		
	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST	PEAK FLOW	% SHARE	PROJECT COST
FORT WORTH	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00	0.00%	$0.00
HALTOM CITY	0.00	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00	0	0.00%	$0.00
NRH	18.01	77.70%	$4.55	18.93	77.52%	$4.54	21.16	75.41%	$5.21	22.81	74.40%	$5.30	24.47	73.53%	$5.24	24.98	73.54%	$5.24	24.98	73.54%	$5.24
RICHLAND HILLS	5.17	22.30%	$1.31	5.49	22.48%	$1.32	6.9	24.59%	$1.70	7.85	25.60%	$1.82	8.81	26.47%	$1.88	8.99	26.46%	$1.88	8.99	26.46%	$1.88
TOTAL	23.18	100.00%	$5.86	24.42	100.00%	$5.86	28.06	100.00%	$6.91	30.66	100.00%	$7.12	33.28	100.00%	$7.12	33.97	100.00%	$7.12	33.97	100.00%	$7.12

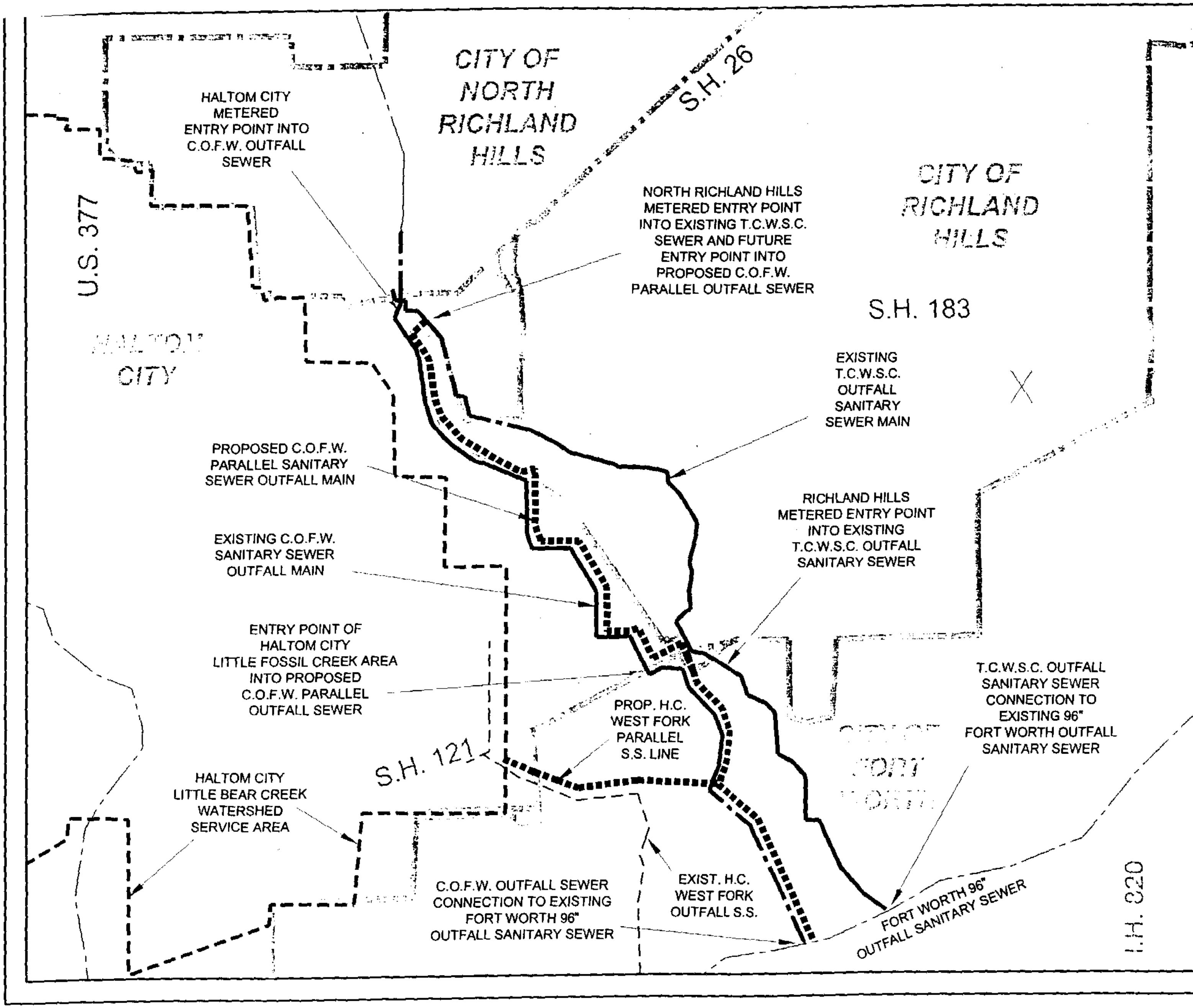
CITY OF FORT WORTH ESTIMATED SHARE OF PROJECT COSTS								
OPTION NO.	OPTION DESCRIPTION	CIP DESIGN YEAR						
		2000	2005	2010	2015	2020	2050	2070
1a	All Cities Served By C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, Year 2020 BFX Area, and 6.0 MGD Intel Flow, Plus Haltom City Little Fossil Area Extra	$9.01	$9.52	$9.71	$11.90	$12.16	$13.37	$13.46
1b	Same as Option 1a above, but less Marine Creek Area	$6.29	$6.83	$8.60	$10.18	$11.04	$11.89	$11.95
1c	Same As Option 1b, but also less Intel Facility Flow	$4.80	$6.01	$6.58	$8.97	$9.45	$9.88	$10.67
1d	Same As Option 1a, but less Haltom City Little Fossil Area	$8.05	$9.94	$10.62	$12.70	$12.81	$13.97	$14.02
2	All Cities Served by C.O.F.W. Big Fossil Outfall except Richland Hills Which will be served by the TCWSC Line. (Includes L.F.)							
2a	Big Fossil Data (H.C + NRH + F.W.)	$9.13	$9.21	$10.12	$12.06	$12.40	$13.45	$13.53
2b	TCWSC Data (Richland Hills Only)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3	Only Fort Worth and Haltom City served by the Big Fossil Line, with Richland Hills and NRH served by the TCWSC Line							
3a	Big Fossil Data (H.C. + F.W.)	$8.26	$9.94	$10.88	$12.86	$12.95	$14.16	$14.48
3b	TCWSC Data (R.Hills + NRH)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

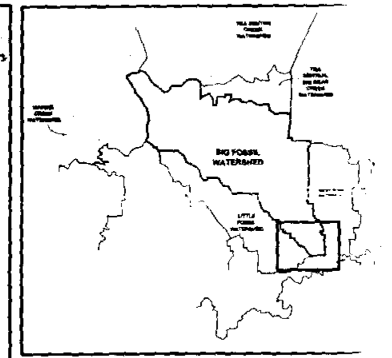
HALTOM CITY ESTIMATED SHARE OF PROJECT COSTS

OPTION NO.	OPTION DESCRIPTION	CIP DESIGN YEAR						
		2000	2005	2010	2015	2020	2050	2070
1a	All Cities Served By C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, Year 2020 BFX Area, and 6.0 MGD Intel Flow, Plus Haltom City Little Fossil Area Extra	$1.55	$1.55	$1.52	$1.64	$1.59	$1.66	$1.65
1b	Same as Option 1a above, but less Marine Creek Area	$1.26	$1.28	$1.54	$1.61	$1.68	$1.75	$1.76
1c	Same As Option 1b, but also less Intel Facility Flow	$1.08	$1.25	$1.30	$1.54	$1.55	$1.55	$1.66
1d	Same As Option 1a, but less Haltom City Little Fossil Area	$0.63	$0.75	$0.79	$0.86	$0.85	$0.99	$1.03
2	All Cities Served by C.O.F.W. Big Fossil Outfall except Richland Hills Which will be served by the TCWSC Line. (Includes L.F.)							
2a	Big Fossil Data (H.C + NRH + F.W.)	$1.00	$1.54	$1.62	$1.69	$1.65	$1.70	$1.69
2b	TCWSC Data (Richland Hills Only)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3	Only Fort Worth and Haltom City served by the Big Fossil Line, with Richland Hills and NRH served by the TCWSC Line							
3a	Big Fossil Data (H.C./L.F. + F.W.)	$1.54	$1.75	$1.84	$1.89	$1.80	$1.87	$1.88
3b	TCWSC Data (R.Hills + NRH)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

NORTH RICHLAND HILLS ESTIMATED SHARE OF PROJECT COSTS								
OPTION NO.	OPTION DESCRIPTION	CIP DESIGN YEAR						
		2000	2005	2010	2015	2020	2050	2070
1a	All Cities Served By C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, Year 2020 BFX Area, and 6.0 MGD Intel Flow, Plus Haltom City Little Fossil Area Extra	$0.96	$0.99	$0.96	$1.01	$0.96	$0.86	$0.79
1b	Same as Option 1a above, but less Marine Creek Area	$0.78	$0.82	$0.98	$0.99	$1.01	$0.91	$0.84
1c	Same As Option 1b, but also less Intel Facility Flow	$0.67	$0.80	$0.82	$0.95	$0.94	$0.80	$0.80
1d	Same As Option 1a, but less Haltom City Little Fossil Area	$0.89	$1.07	$1.09	$1.11	$1.04	$0.92	$0.84
2	All Cities Served by C.O.F.W. Big Fossil Outfall except Richland Hills Which will be served by the TCWSC Line. (Includes L.F.)							
2a	Big Fossil Data (H.C + NRH + F.W.)	$1.00	$0.98	$1.03	$1.05	$1.00	$0.88	$0.81
2b	TCWSC Data (Richland Hills Only)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3	Only Fort Worth and Haltom City served by the Big Fossil Line, with Richland Hills and NRH served by the TCWSC Line							
3a	Big Fossil Data (H.C. + F.W.)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3b	TCWSC Data (R.Hills + NRH)	$4.55	$4.54	$5.21	$5.30	$5.24	$5.24	$5.24

RICHLAND HILLS ESTIMATED SHARE OF PROJECT COSTS								
OPTION NO.	OPTION DESCRIPTION	CIP DESIGN YEAR						
		2000	2005	2010	2015	2020	2050	2070
1a	All Cities Served By C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, Year 2020 BFX Area, and 6.0 MGD Intel Flow, Plus Haltom City Little Fossil Area Extra	$0.17	$0.18	$0.17	$0.20	$0.18	$0.14	$0.13
1b	Same as Option 1a above, but less Marine Creek Area	$0.12	$0.14	$0.14	$0.18	$0.16	$0.15	$0.14
1c	Same As Option 1b, but also less Intel Facility Flow	$0.08	$0.12	$0.12	$0.17	$0.14	$0.12	$0.12
1d	Same As Option 1a, but less Haltom City Little Fossil Area	$0.18	$0.19	$0.22	$0.21	$0.20	$0.15	$0.14
2	All Cities Served by C.O.F.W. Big Fossil Outfall except Richland Hills Which will be served by the TCWSC Line. (Includes L.F.)							
2a	Big Fossil Data (H.C + NRH + F.W.)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2b	TCWSC Data (Richland Hills Only)	$0.72	$0.72	$0.72	$0.72	$0.72	$0.72	$0.72
3	Only Fort Worth and Haltom City served by the Big Fossil Line, with Richland Hills and NRH served by the TCWSC Line							
3a	Big Fossil Data (H.C. + F.W.)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3b	TCWSC Data (R.Hills + NRH)	$1.31	$1.32	$1.70	$1.82	$1.88	$1.88	$1.88





NRH

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Notes:

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2. Watershed areas shown are based on watershed and drainage area maps included in the City of Fort Worth Sanitary Sewer Masterplan dated September, 1998, prepared by Freese and Nichols, Inc., Montgomery Watson, and Brown & Root, Inc. Data furnished to KEF for this study by the City of Fort Worth Water Dept.

BIG FOSSIL SEWER STUDY

C.O.F.W. AND T.C.W.S.C.O. MAINS

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

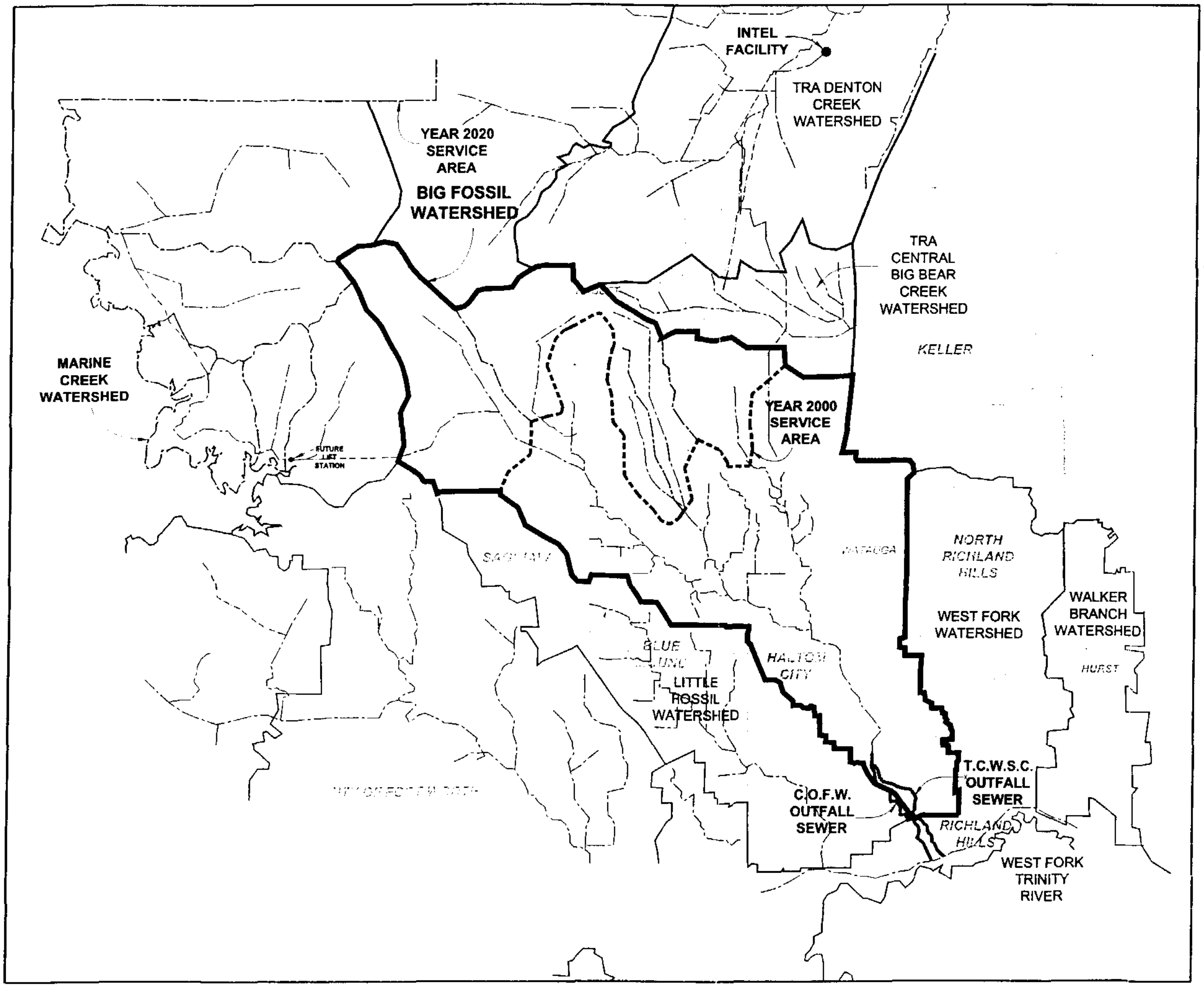
DESIGNED BY RWA	REV. BY DATE SYMBOL	DATE DECEMBER, 1999
DRAWN BY RWA	EXHIBIT 1	JOB NO. 3-416
CHECKED BY KEE		SHEET NO. 1 OF 1

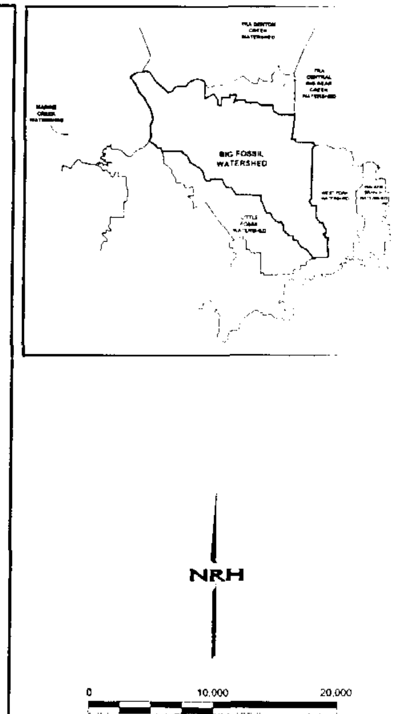
TAB 2

BIG FOSSIL SEWER STUDY

WATERSHED AREA MAPS

(See Revised Maps TAB 9)





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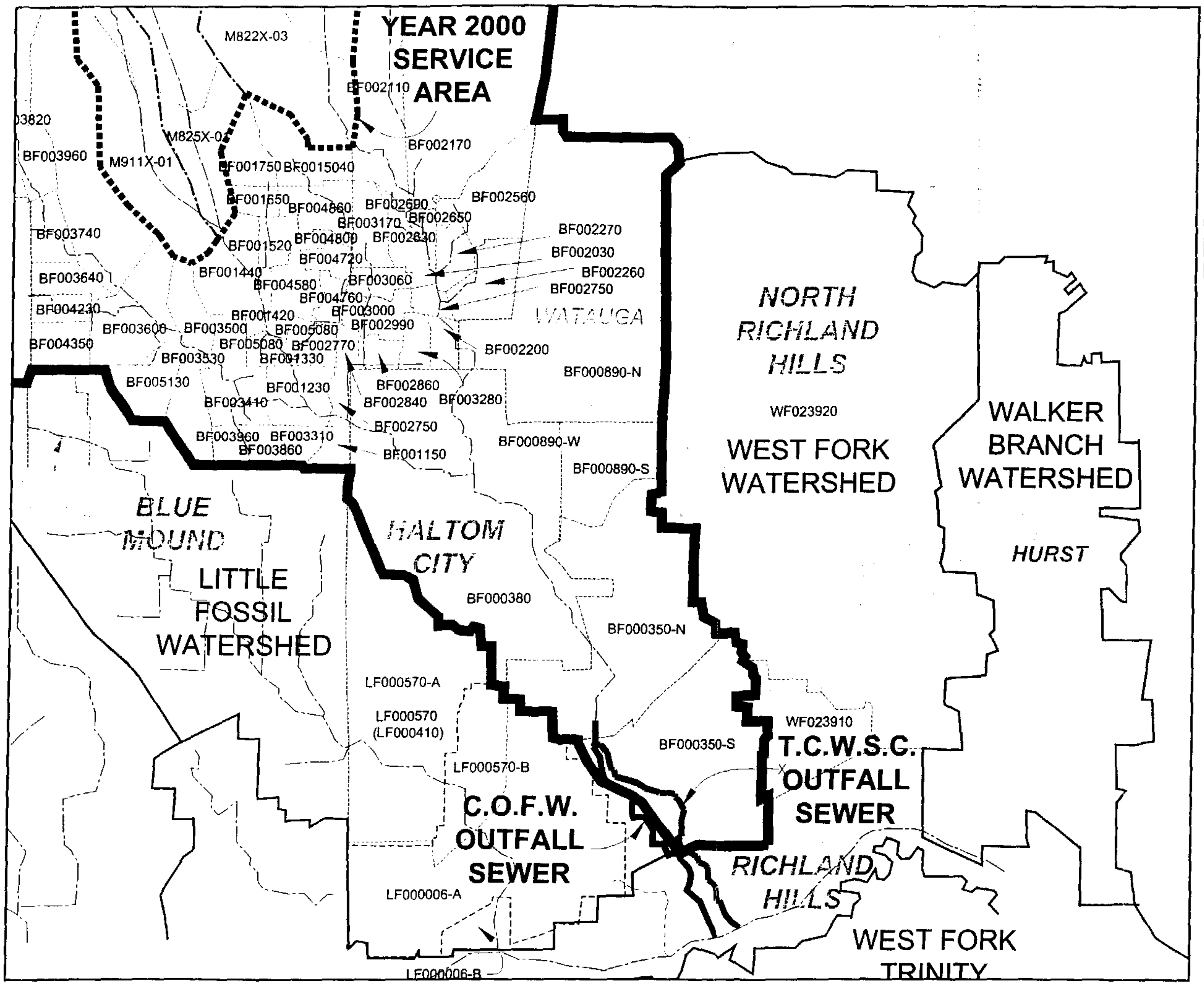
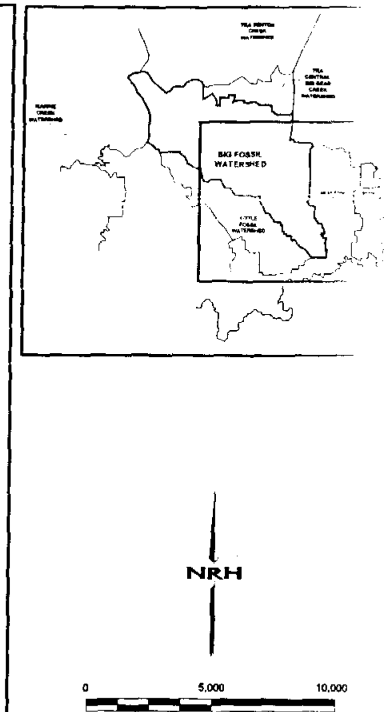
BIG FOSSIL SEWER STUDY

WATERSHED AREAS

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas





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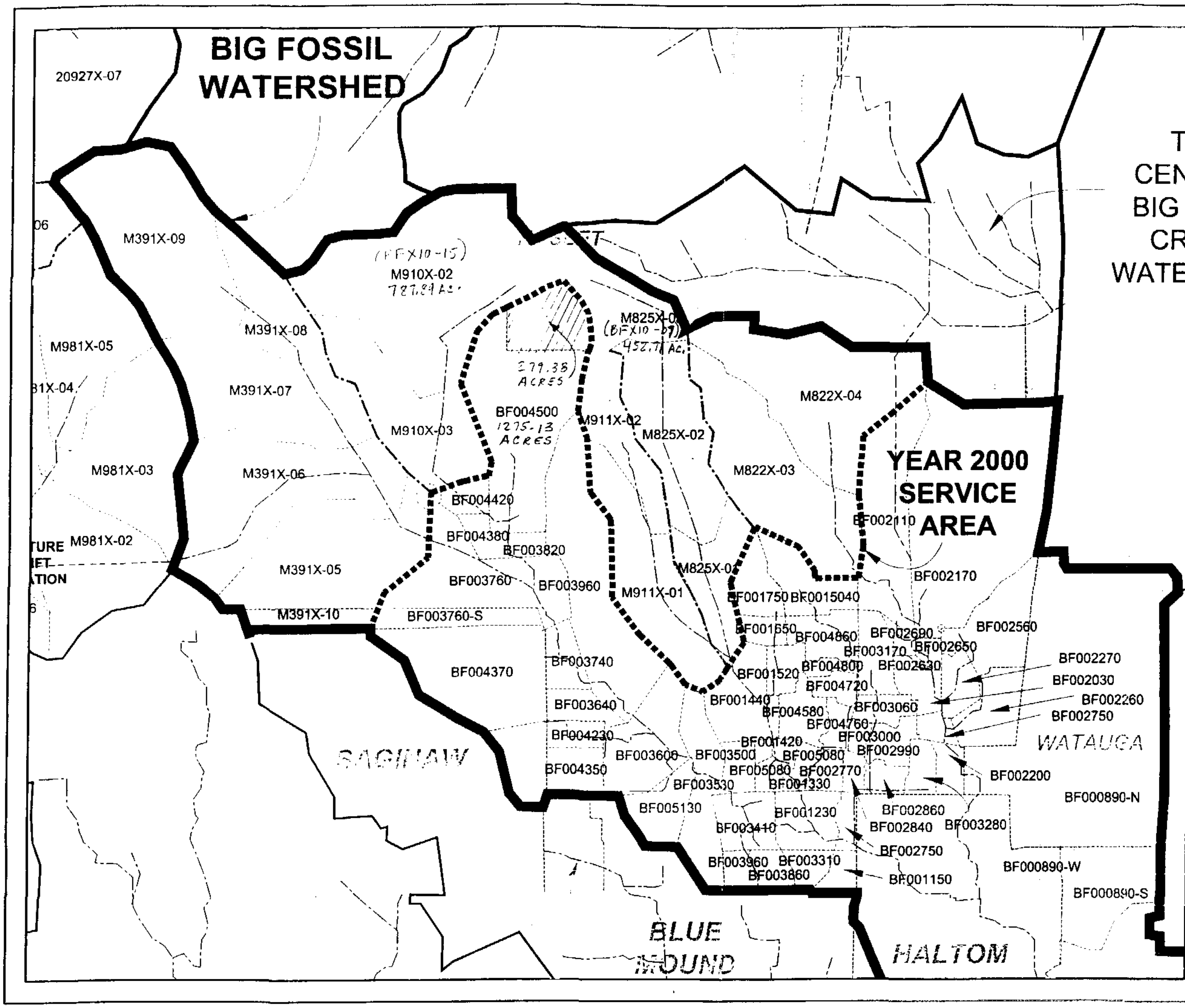
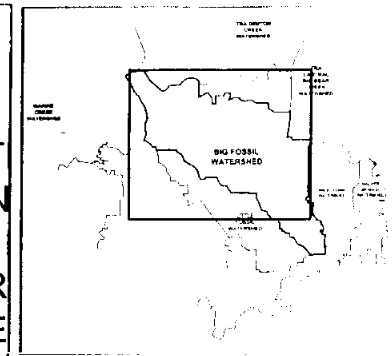
BIG FOSSIL SEWER STUDY

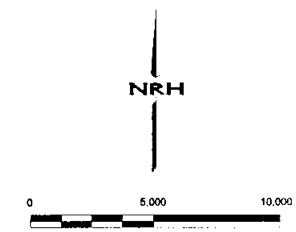
LOWER BIG FOSSIL WATERSHED

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas







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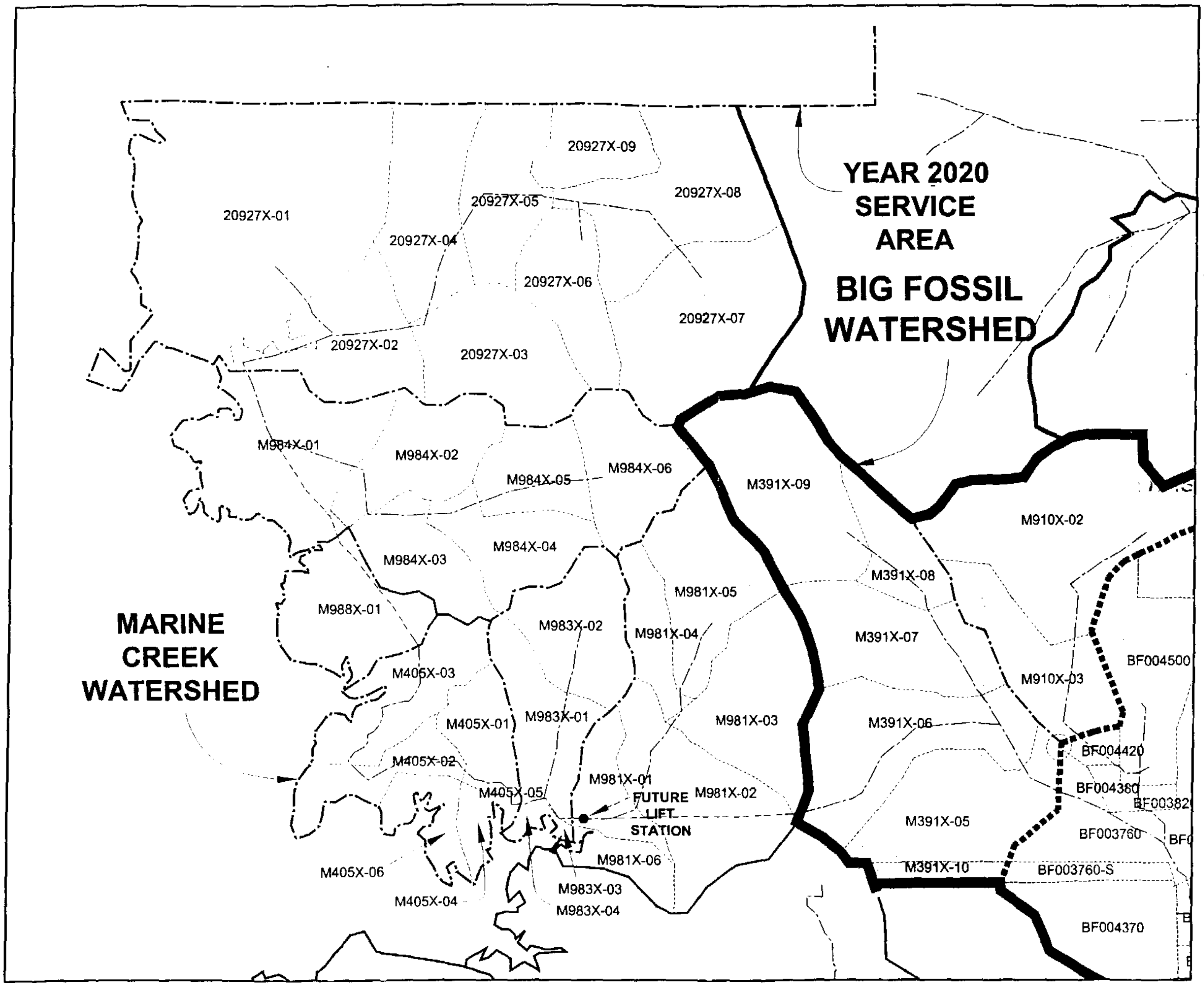
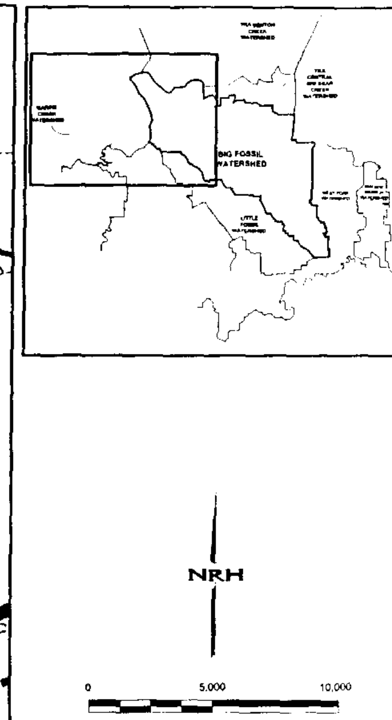
BIG FOSSIL SEWER STUDY

UPPER BIG FOSSIL WATERSHED

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas





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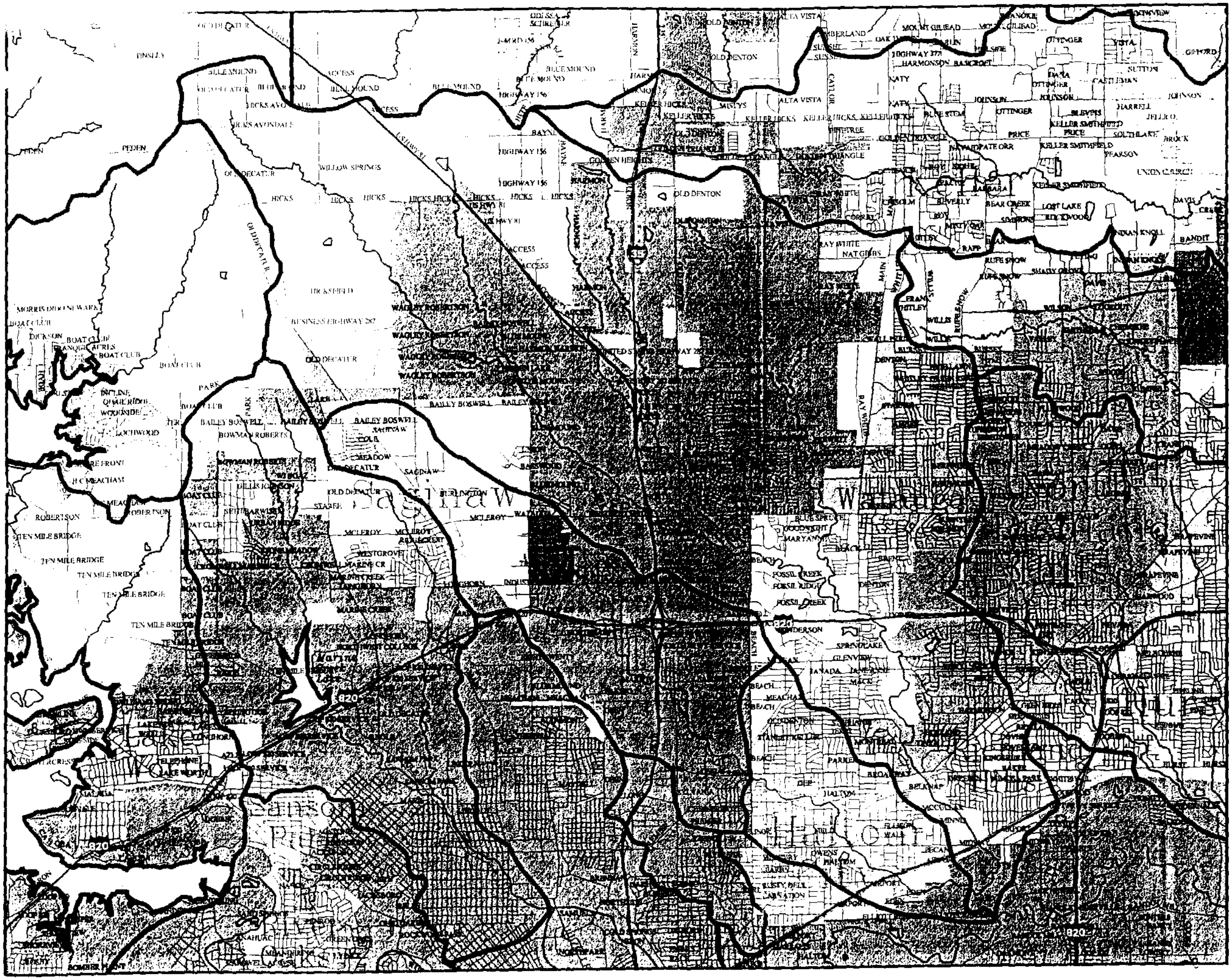
BIG FOSSIL SEWER STUDY

MARINE CREEK WATERSHED AREA

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas



Big Fossil Creek Watershed

LEGEND

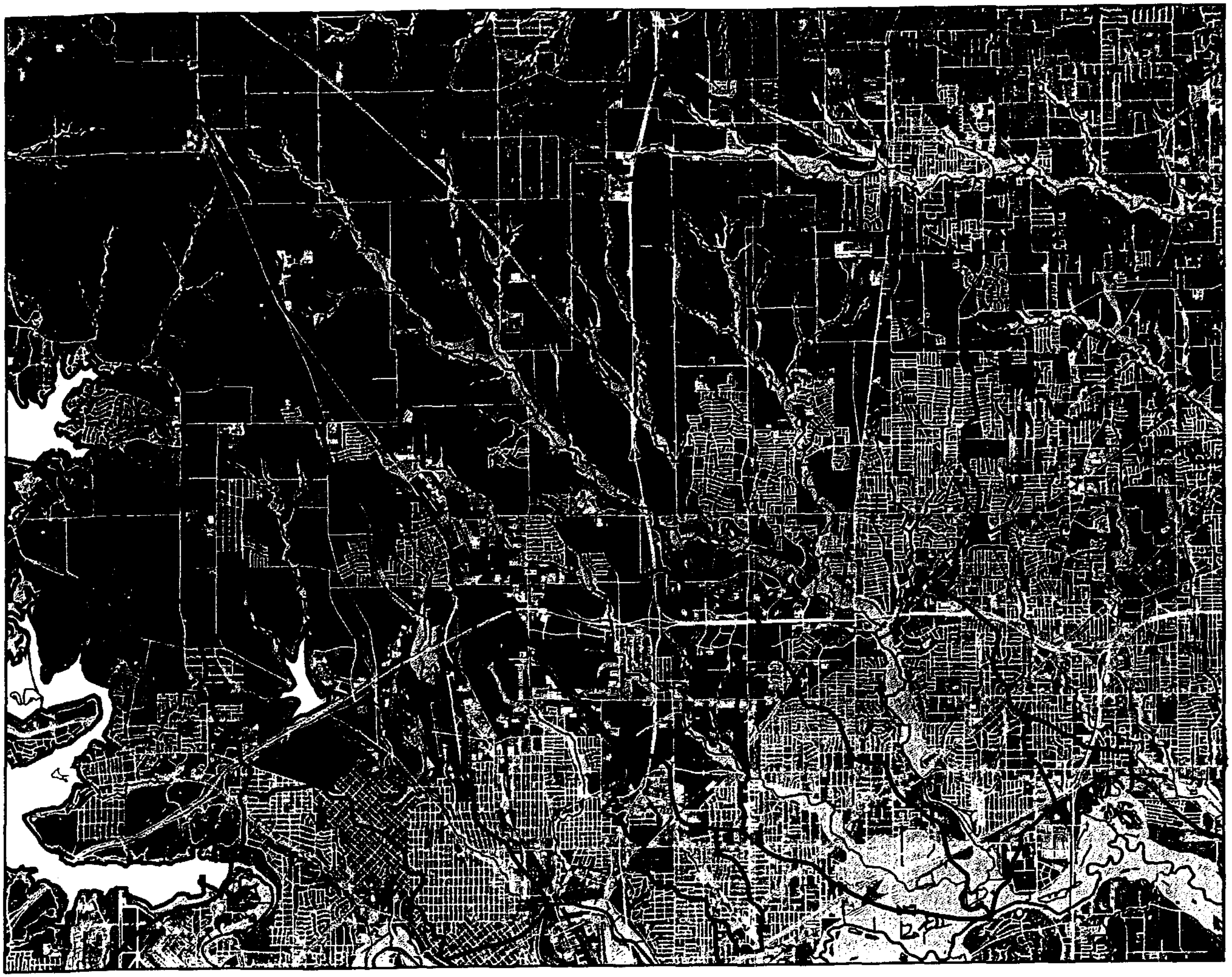
- County Boundaries
- Other Roads
- Major Roads
- DLG Streams
- Watershed Boundaries

ENVIRONMENTAL RESOURCES PROJECTS
NORTH CENTRAL TEXAS

North Central Texas Council of Governments Environmental Resources

Scale: 1 inch = 1 Miles

12/09/97	Custom Area



Big Fossil Creek Watershed 12 meter resolution

(Consortium Data)

LEGEND

Fema Q3 100 Year Flood Boundary

Fema Q3 500 Year Flood Boundary

Road Centerlines

Streams

County Boundaries

Watershed Boundaries

ENVIRONMENTAL RESOURCES PROJECTS
NORTH CENTRAL TEXAS

Miles

/97 | stom Area

TAB 3

BIG FOSSIL SEWER STUDY

CITY OF FORT WORTH

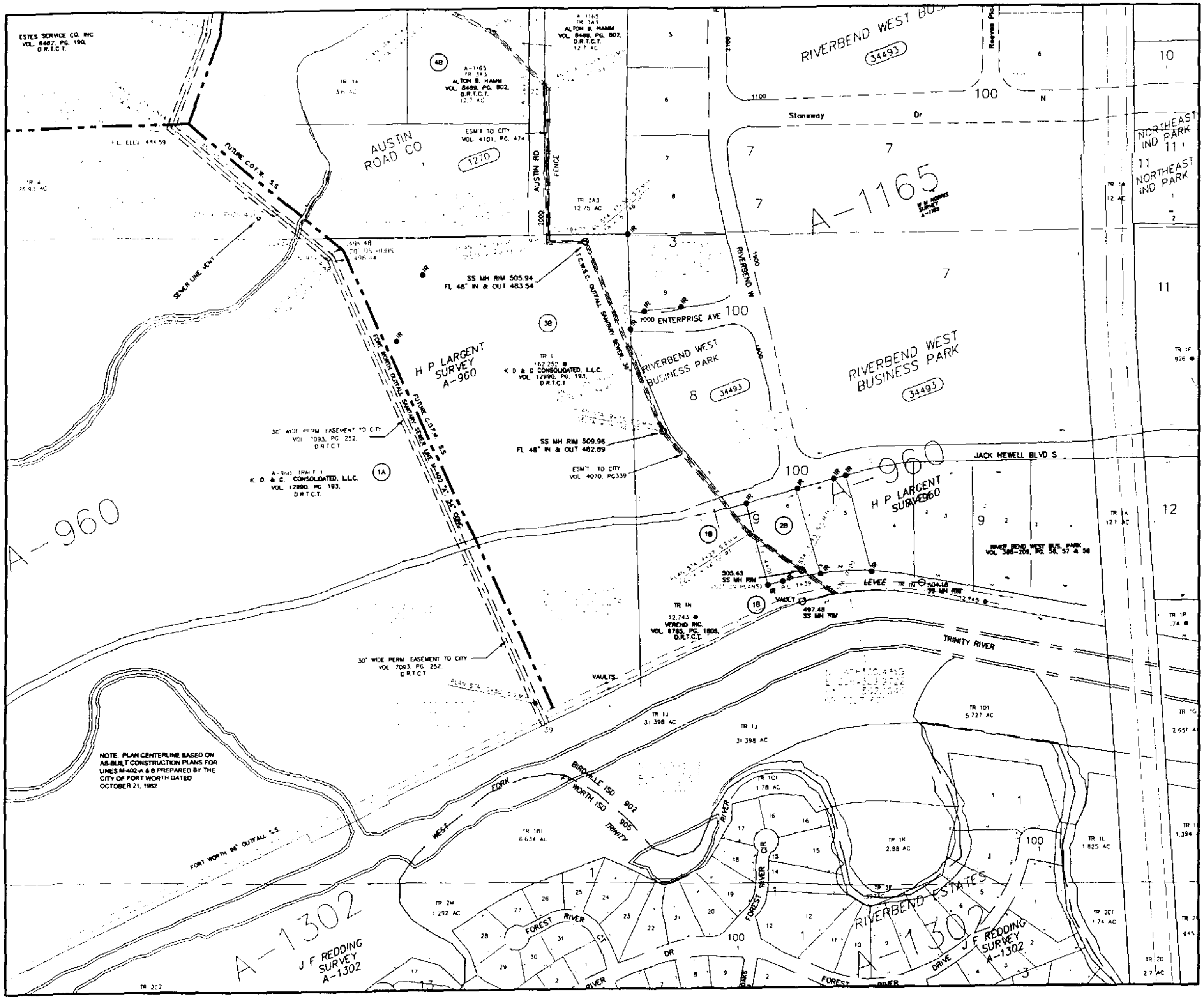
AND

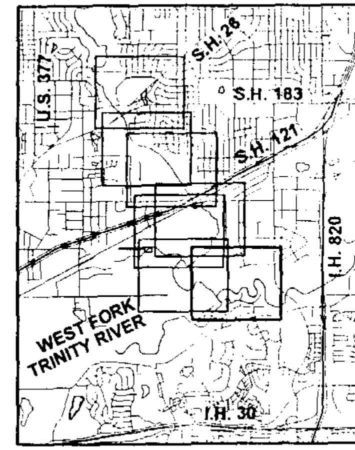
TARRANT COUNTY WATER SUPPLY CORP.

SANITARY SEWER OUTFALLS

RIGHT-OF-WAY PLAN SHEETS

(See Revised Sheets TAB 9)





NRH

0 400 800

SCALE: 1" = 400'

Notes:

1. This document is prepared in accordance with the provisions of Regional Facility Planning Contract No. 99-483-308, dated 5/18/99, between the City of North Richland Hills and the TWDB, with funding participation by the City of Fort Worth, Haltom City and Richland Hills.

2. This drawing is based on a field survey prepared by Spooner & Associates, Inc., Land Surveyors, (817-282-6981), dated 11/11/99, with R.O.W. document research by Universal Field Services, Inc. (918-494-7600), and KEF, Inc., (817-283-6211), with data plotted on property maps furnished by the Tarrant County Appraisal District.

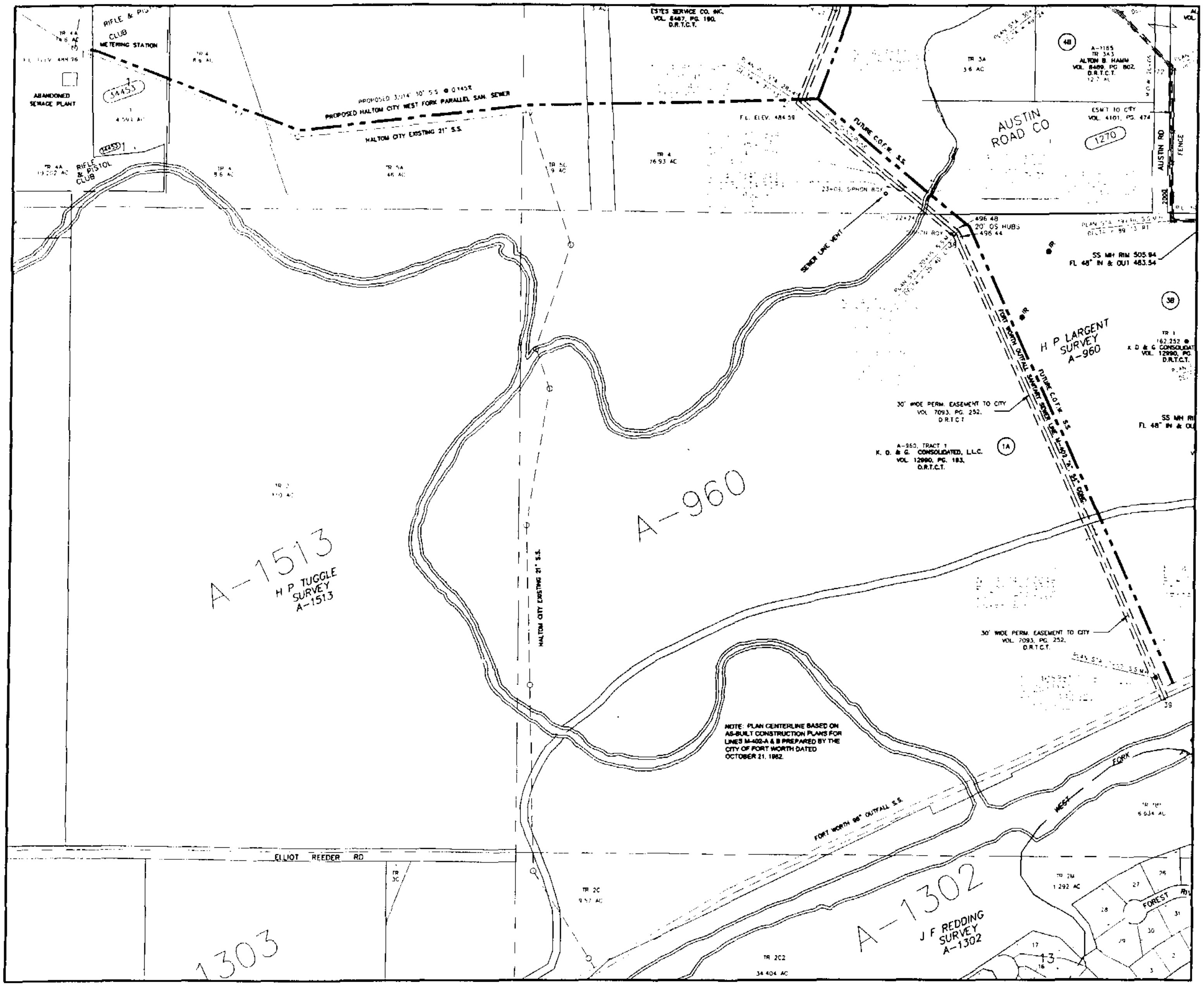
BIG FOSSIL SEWER STUDY

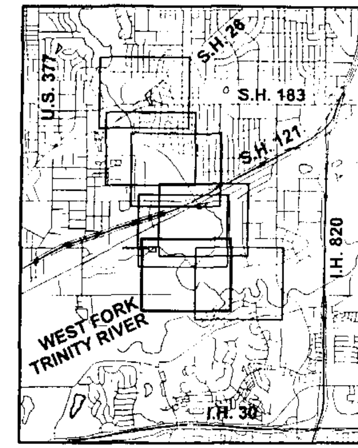
R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY RWA	REV BY DATE SYMBOL	DATE DECEMBER 1999
DRAWN BY RWA		JOB NO 3-436
CHECKED BY AFE		SHEET NO 1 OF 5





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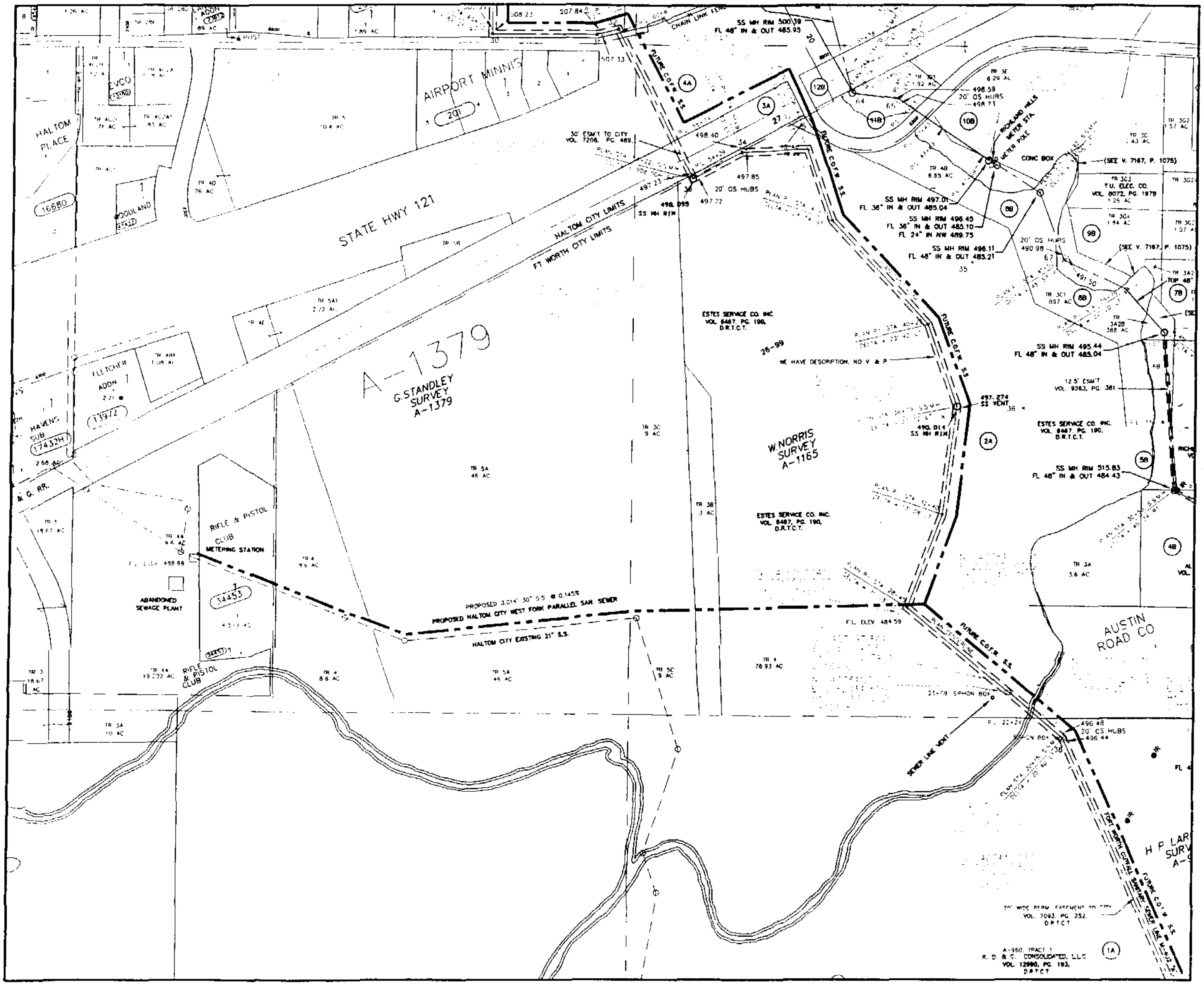
BIG FOSSIL SEWER STUDY

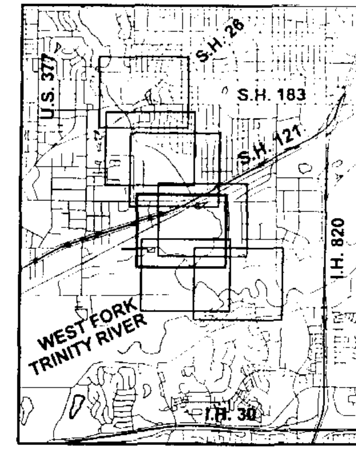
R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY RWA	REV. BY DATE SYMBOL	DATE [illegible]
DRAWN BY RWA		JOB NO. [illegible]
CHECKED BY KEE		SHEET NO. [illegible]





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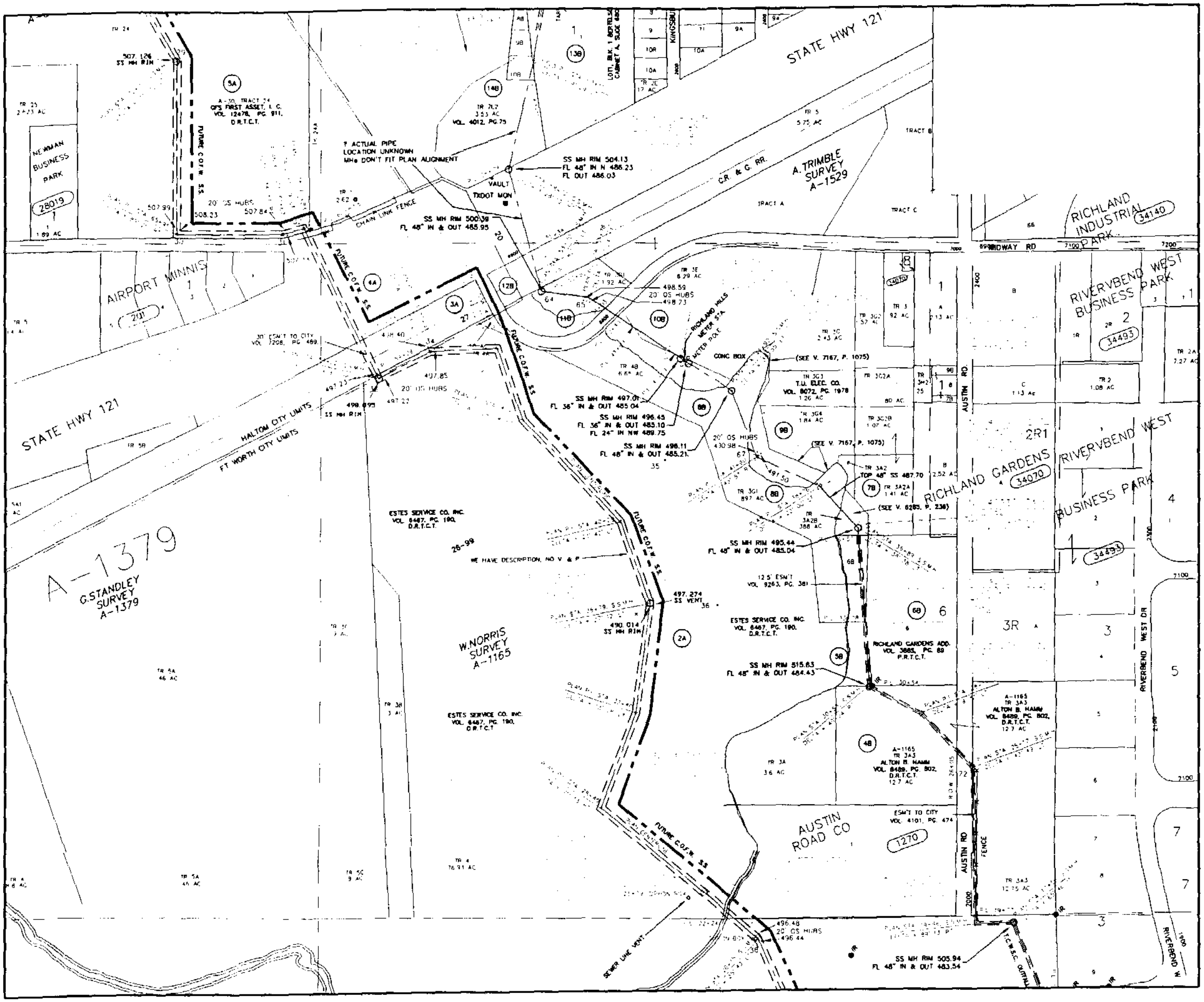
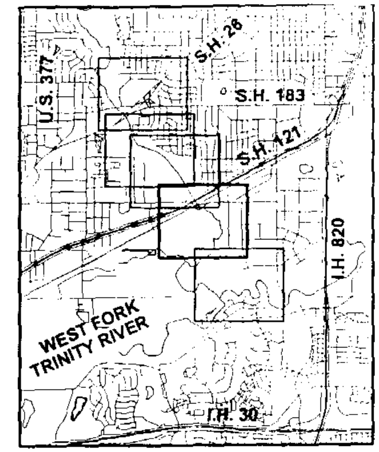
R.O.W. STRIP MAP

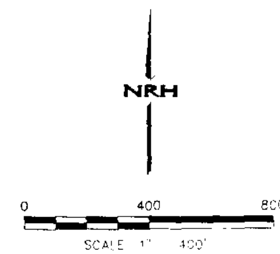
CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: RWA
DRAWN BY: RWA
CHECKED BY: KEE







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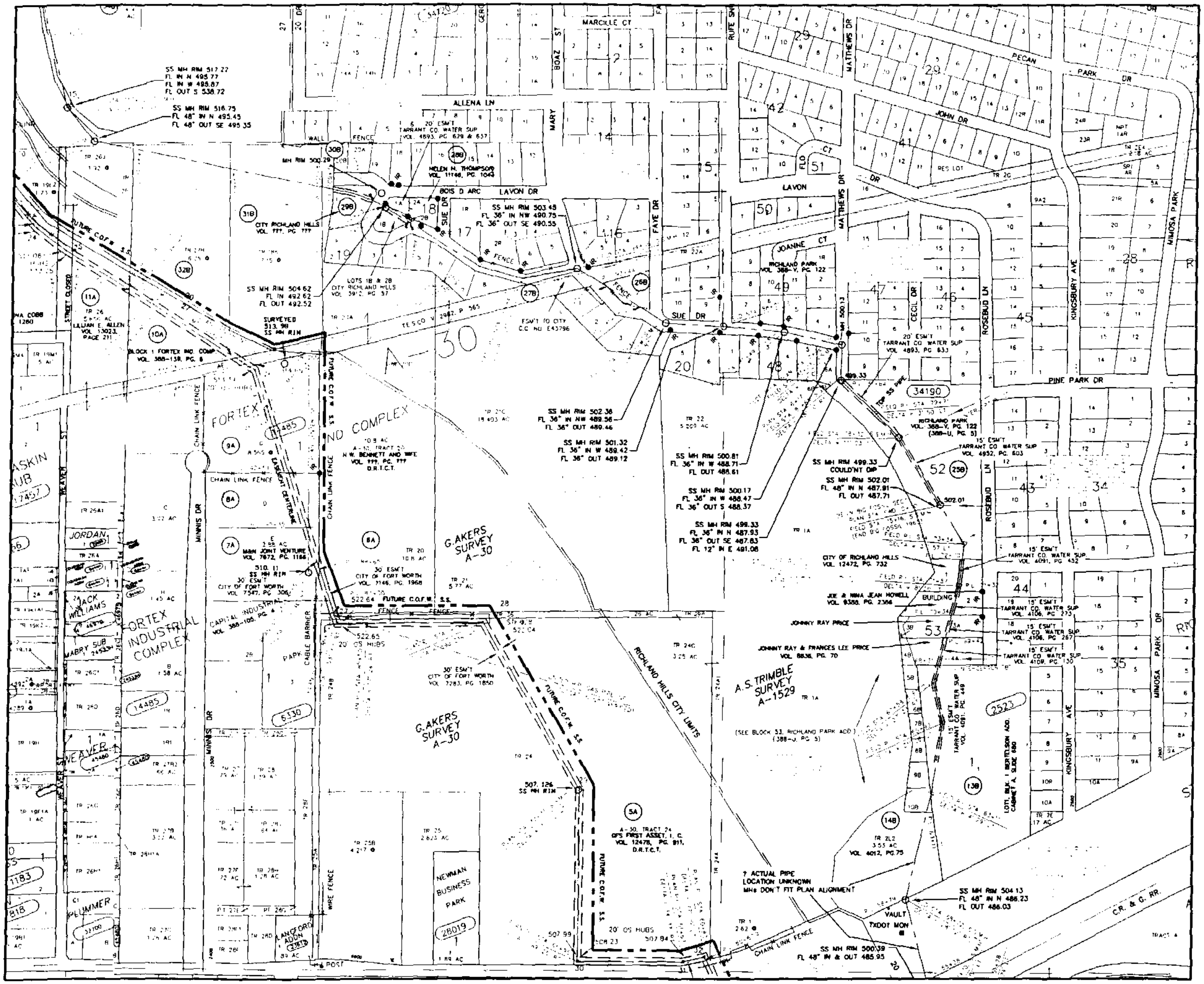
BIG FOSSIL SEWER STUDY

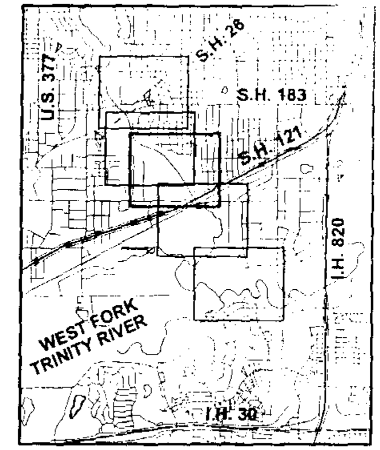
R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY RWA
DRAWN BY RWA
CHECKED BY KEF





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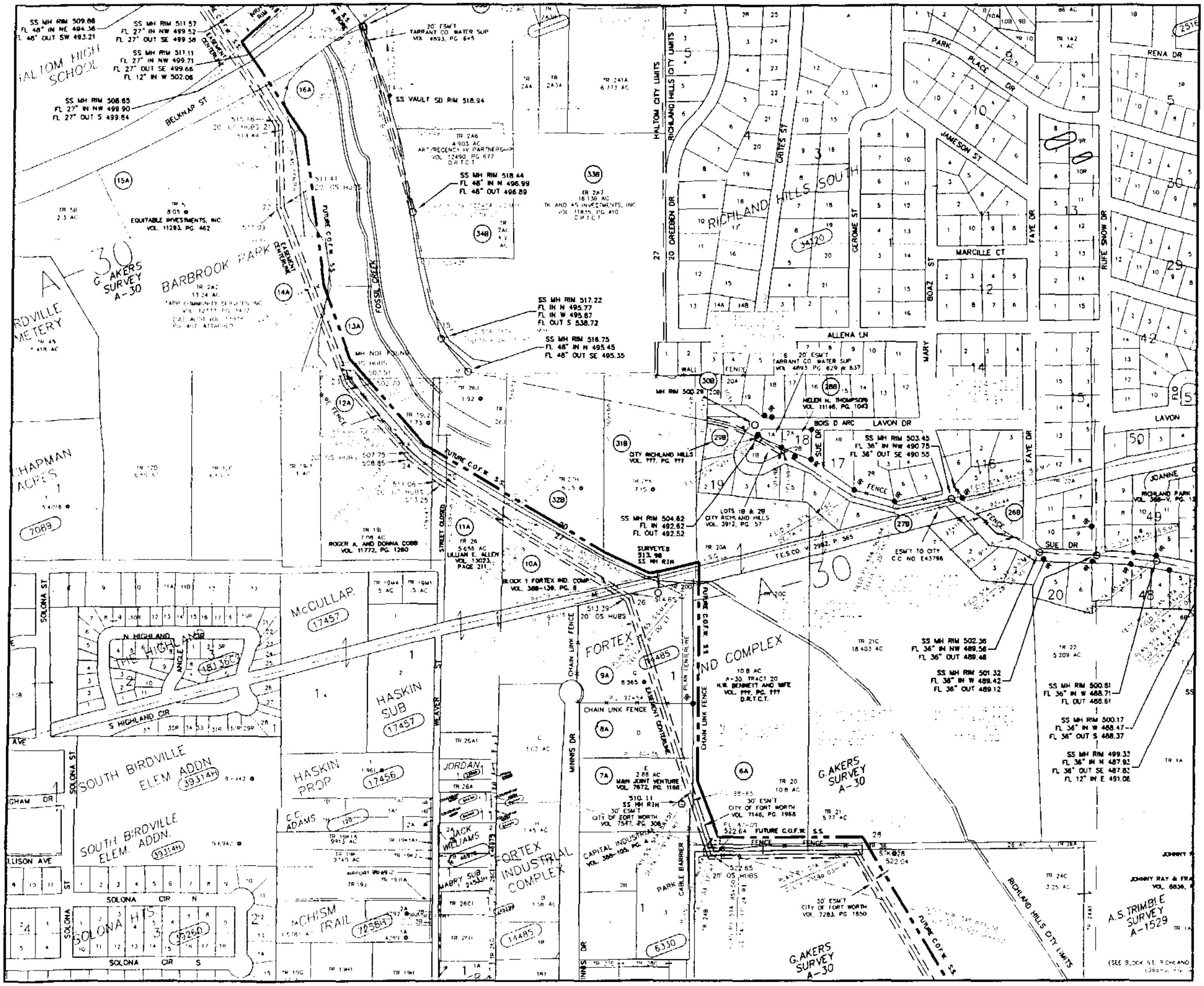
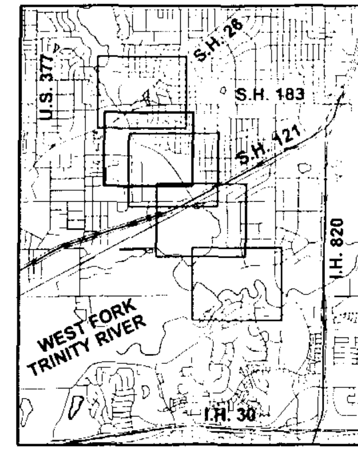
R.O.W. STRIP MAP

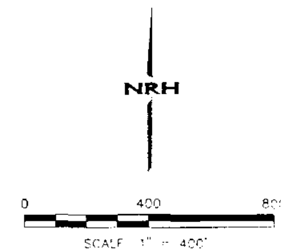
CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY RWA	REV. BY DATE SYMBOL	DATE DECEMBER, 1999
DRAWN BY RWA		JOB NO. 3-436
CHECKED BY		SHEET NO.







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BIG FOSSIL SEWER STUDY

R.O.W. STRIP MAP

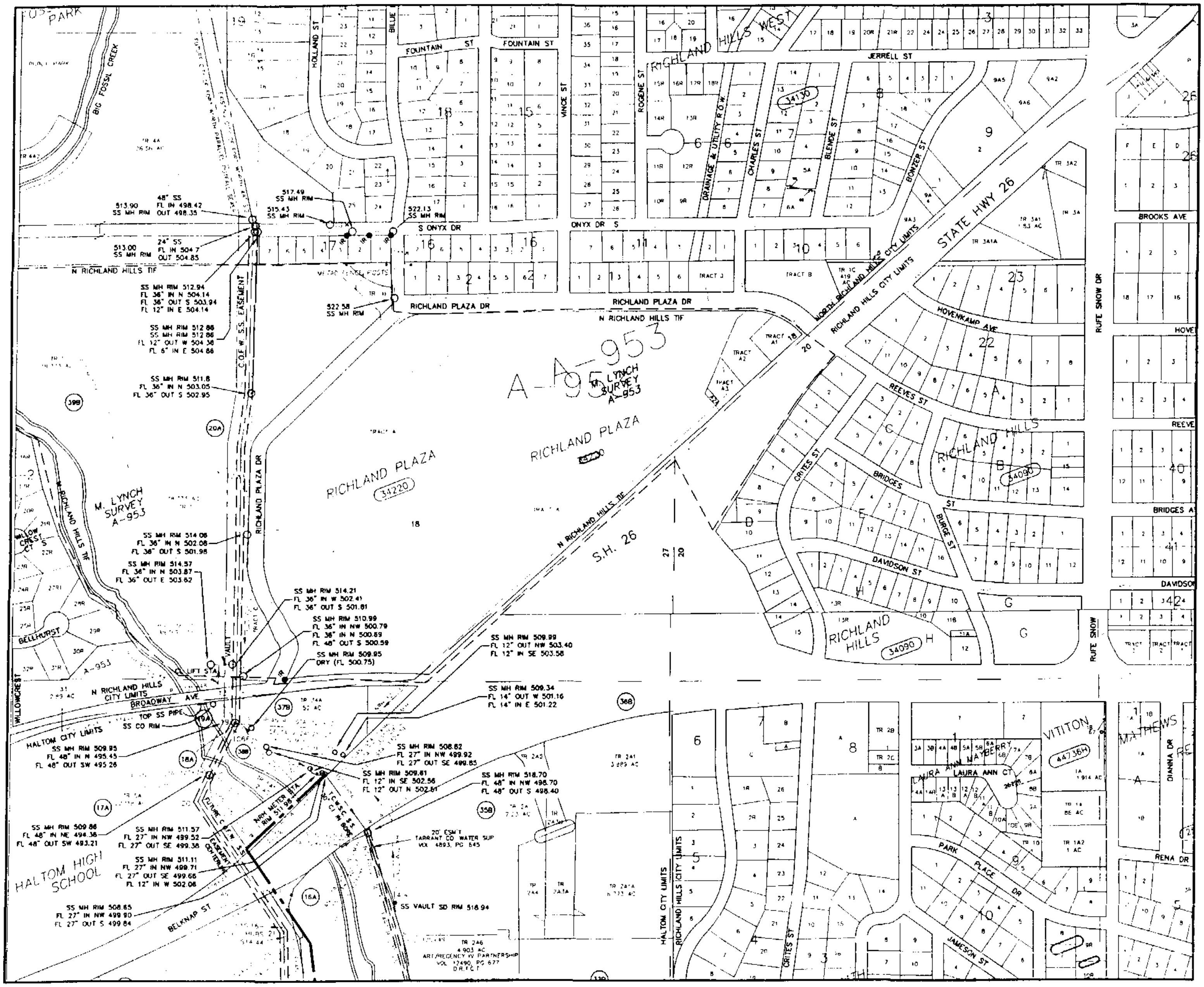
CITY OF NORTH RICHLAND HILLS

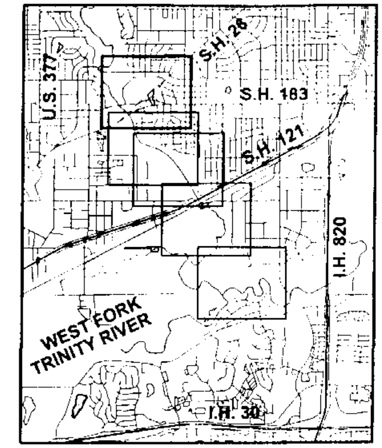
KNOWLTON-ENGLISH-FLOWERS, INC.

CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY RWA

DRAWN BY RWA





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BIG FOSSIL SEWER STUDY

R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: RWA
DRAWN BY: RWA
CHECKED BY: HEE

Big Fossil Sewer (City of Fort Worth Outfall -- Currently Serves Fort Worth, Haltom City, Watauga, Saginaw, Haslet, and Other Unincorporated Areas)																	
			Address													Easement	
Parcel	Location	Owner	Address	City	ST.	Zip	Survey	Abstract	Tract	Subdivision	Lot	Block	Date	Volume	Page	Volume	Page
1A	Fort Worth	KD&G Consolidated LLC	PO BOX 185219	Ft. Worth	TX	76181	Largent	960	1				11/19/1997	12990	193	7093	252
2A	Fort Worth	SCA Services of FW Inc.	669 Airport Fwy. #500	Hurst	TX	76053	Norris	1165	4								
3A	Haltom City	Railroad					Norris	1165									
4A	Haltom City	State Hwy. 121					Norris	1165									
	Haltom City	State Hwy. 121					Stanley	1379									
	Haltom City	State Hwy. 121					Trimble	529									
	Haltom City	State Hwy. 121					Akers	30									
5A	Haltom City	50% GFS First Asset LC Et Al	8441 E. 32nd St. N. #200	Wichita	KS	67226	Akers	30	24	(Condemnation Hearing)			08/14/1996	12478	911	7283	1850
		50% Patterson A.B. , & [2]	5942 Abrams Rd. #113	Dallas	TX	75231							05/20/1979	6741	2479		
		Bennet H.W. Mrs., Est. [3]	3400 W. Park Blvd. Apt 1031	Plano	TX	75075	Akers	30	36	(Small Strip)							
6A	Haltom City	Bennet H.W. Mrs., Est. [3]	3401 W. Park Blvd. Apt 1031	Plano	TX	75076	Akers	30	20				05/10/1945	1745	413	7146	1967
7A	Haltom City	M&N /JV	PO BOX 100206	Ft. Worth	TX	76117	Akers	30		Fortex Ind. Complex	E	1	11/16/1983	7672	1166	7547	306
8A	Haltom City	[1] Gunn Investmests, L.P.	3909 Ann Arbor Ct.	Ft. Worth	TX	76109	Akers	30		Fortex Ind. Complex	D	1	07/20/1999	13931	70	7547	306
9A	Haltom City	Klabzuba Properties II	930 W. 1st St.	Ft. Worth	TX	76102	Akers	30		Fortex Ind. Complex	G	1	04/01/1996	12621	1460	7547	306
10A	Haltom City						Akers	30								7547	306
11A	Haltom City	Allen Lillian E.	2140 San Fernando St.	Bedford	TX	76021	Akers	30	26				10/22/1997	13023	211		
12A	Haltom City	Cobb Roger A & Donna	3220 Haltom Rd.	Ft. Worth	TX	76117	Akers	30	19L				10/24/1994	11772	1260	7084	2284
13A	Richland Hills						Akers	30	19L2								
14A	Haltom City	Tapp Community Services	2404 Yeager St.	Ft. Worth	TX	76112	Akers	30	2A2				02/11/1998	13078	407	7175	416
15A	Haltom City	Equitable Investments Inc.	7600 Scott St.	White Settlement	TX	76108	Akers	30	5				10/22/1993	11293	462	7146	1948
16A	Haltom City	Grapevine Hwy.					Akers	30									
17A	Haltom City	Birdville I.S.D.	E. Belnap St.	Ft. Worth	TX	76117	Akers	30	5A	Haltom Hills			03/12/1956	2969	383	4922	448
18A	Haltom City	City Of Richland Hills	E. Belnap St.	Ft. Worth	TX	76118	Akers	30	5A1				03/05/1964	3906	355	7146	1946
19A	Haltom City	Same As 17 ?					Akers	30	5A	Haltom Hills			03/12/1956	2969	383	4922	448
20A	North Richland Hills	Birdville I.S.D.	Broadway Ave.	NRH			Lynch	953	1								
NOTES:																	
[1]	Previous Owner:	Terry Fricks	2524 Minnis Drive	Ft. Worth	TX	76117							02/20/1996	12269	1041	7547	306
[2]		& General Financial Services															
[3]		Attn: Patsy Brown															

T.C.W.S.C. (Tarrant County Water Supply Corporation Outfall Sewer -- Currently Serves Richland Hills and North Richland Hills)

			Address															Easement	
Parcel	Location	Owner	Address	City	ST.	Zip	Survey	Abstract	Tract	Area	Addition	Lot	Block	Date	Volume	Page		Volume	Page
1B	Fort Worth	LRB Holdings Inc	7101 Atco Drive	Ft. Worth	TX	76118	H.P. Largent	960	1N	12.734				09/15/1997	12914	141	TAD	4070	339
2B	Fort Worth	LRB Holdings Inc.	7101 Atco Drive	Ft. Worth	TX	76118	H.P. Largent	960			RiverBend West Addn	6	9	09/15/1997	12914	141	TAD	4070	339
3B	Fort Worth	KD&G Consolidated LLC	PO BOX 185219	Ft. Worth	TX	76181	H.P. Largent	960	1	162.25				11/19/1997	12990	193	TAD	4070	339
4B	Fort Worth	Austin International Ventures	3525 Travis, #300	Dallas	TX	75204	W.M. Norris	1165	3A3					04/09/1999	13761	193	TAD	4101	474
5B	Fort Worth	A.E. Jones & Buanita Etux	2405 Austin Road	Ft. Worth	TX	76118	W.M. Norris	1165			Richland Gardens	6	6	07/13/1956	3022	508	ABS	4058	335
6B	Fort Worth	City of Richland Hills	3201 Diana Drive	Ft. Worth	TX	76180	W.M. Norris	1165			Richland Gardens	6B	6	12/23/1964	4012	675			
7B	Fort Worth	City of Richland Hills	3201 Diana Drive	Ft. Worth	TX	76180	W.M. Norris	1165	3A2B					12/23/1964	4012	675			
8B	Fort Worth	City of Richland Hills	3201 Diana Drive	Ft. Worth	TX	76180	W.M. Norris	1165	4B										
9B	Fort Worth	City of Richland Hills	3201 Diana Drive	Ft. Worth	TX	76180	W.M. Norris	1165	3G1										
10B	Fort Worth	City of Richland Hills	3201 Diana Drive	Ft. Worth	TX	76180	W.M. Norris	1165	3E									8042	493
11B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	W.M. Norris	1165	3D1					03/10/1964	3915	353			
12B	Richland Hills	Railroad					W.M. Norris	1165	RR										
13B	Richland Hills	State Hwy. 121					A. Trimble	1529	121										
14B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	A. Trimble	1529	2L2					12/23/1964	4012	675	TAD		
									IA						3915	355		2937	329
15B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	A. Trimble	1529			Richland Park Addition	10	53	12/23/1964	4012	675			
16B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	A. Trimble	1529			Richland Park Addition	9	53	12/23/1964	4012	675			
17B	Richland Hills	Bertelsen Keith	2600 Rosebud Lane	Ft. Worth	TX	76118	A. Trimble	1529			Bertelsen Addition	1	1		7822	801		4091	449
21B	Richland Hills	Price Johnny R. & Frances ETUX	2653 Rosebud Ln.	Ft. Worth	TX	76118	A. Trimble	1529			Richland Park Addition	4A1	53	02/04/1987	8836	70	TAD	4107	130
22B	Richland Hills	Price Johnny R. & Frances ETUX	2654 Rosebud Ln.	Ft. Worth	TX	76119	A. Trimble	1529			Richland Park Addition	3A	53		6910	161		4106	267
23B	Richland Hills	Howell Joe & Nina Jean ETUX	2659 Rosebud Ln.	Ft. Worth	TX	76118	A. Trimble	1529			Richland Park Addition	2	53	09/15/1988	9388	2366	TAD	4106	273
24B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	A. Trimble	1529			Richland Park Addition	1	53	08/12/1996	12472	732		4091	452
25B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	A. Trimble	1529			Richland Park Addition		52	08/05/1953	2603	392	ABS	4952	601
26B	Richland Hills	Harvey Thomas E.	6600 Sue Drive	Ft. Worth	TX	76118	G. Akers	30			Richland Hills South	1	20	05/04/1976	6008	956			
27B	Richland Hills	Texas Electric Service Company					G. Akers	30			Texas Electric Service Co.				2982	565			
28B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	G. Akers	30			Richland Hills South	2B, 1B	18	03/20/1964	3912	57		4893	629
29B	Richland Hills	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	G. Akers	30			Richland Hills South	1	19					4893	637
30B	Richland Hills	City of Richland Hills	3203 Diana Drive	Ft. Worth	TX	76182	G. Akers	30	20C									4893	637
31B	Richland Hills	City of Richland Hills					G. Akers	30	28K									4893	637
32B	Richland Hills	City of Richland Hills					G. Akers	30	27H									4893	637
33B	Haltom City	TK & AS Investments Inc.	P.O. Box 498042	Garland	TX	75049	G. Akers	30	2A7					12/13/1994	11835	410	TAD	4893	637
34B	Haltom City	ART/REGENCY IV Prtnshp.	21616 Cezanne Pl	Woodland Hills	CA	91364	G. Akers	30	2A6					07/23/1996	12490	677	TAD		
35B	Haltom City	TK & AS Investments Inc	P.O. Box 498042	Garland	TX	75049	G. Akers	30	2A					12/13/1994	11835	410	TAD	7146	195
36B	Haltom City	S.H. 26					G. Akers	30											
37B	Haltom City	Birdville I.S.D.					G. Akers	30	5A					03/12/1956	2969	383		4922	448
38B	Haltom City	City of Richland Hills	3202 Diana Drive	Ft. Worth	TX	76181	G. Akers	30	5A1					03/05/1964	3906	355		7146	194
39B	NRH	Birdville I.S.D.					M. Lynch	953	1										
NOTES:																			

TAD Tad Microfilm Data
ABS Abstract Data

PROPOSED ALTERNATE ROUTE

FOR THE BIG FOSSIL PARALLEL OUTFALL LINE

BY

CITY OF FORT WORTH

WATER DEPARTMENT

(See Revised Map TAB 9)

DEC-29-99 WED 10:22 FT. WORTH WATER DEPT FAX NO. 817 871 8195 P. 01

FORT WORTH WATER DEPARTMENT

City of Fort Worth Water Department
Administration Division
P.O. Box 870 - 1000 Throckmorton Street
Fort Worth, TX 76101-0870
Phone 817/871-8220
Fax 817/871-8195

FAX

Date: 12-29-99

Number of pages including cover sheet: 3

To: Richard Albin
Knowlton-English-Flowers

Phone 283-6211
Fax 354-4389

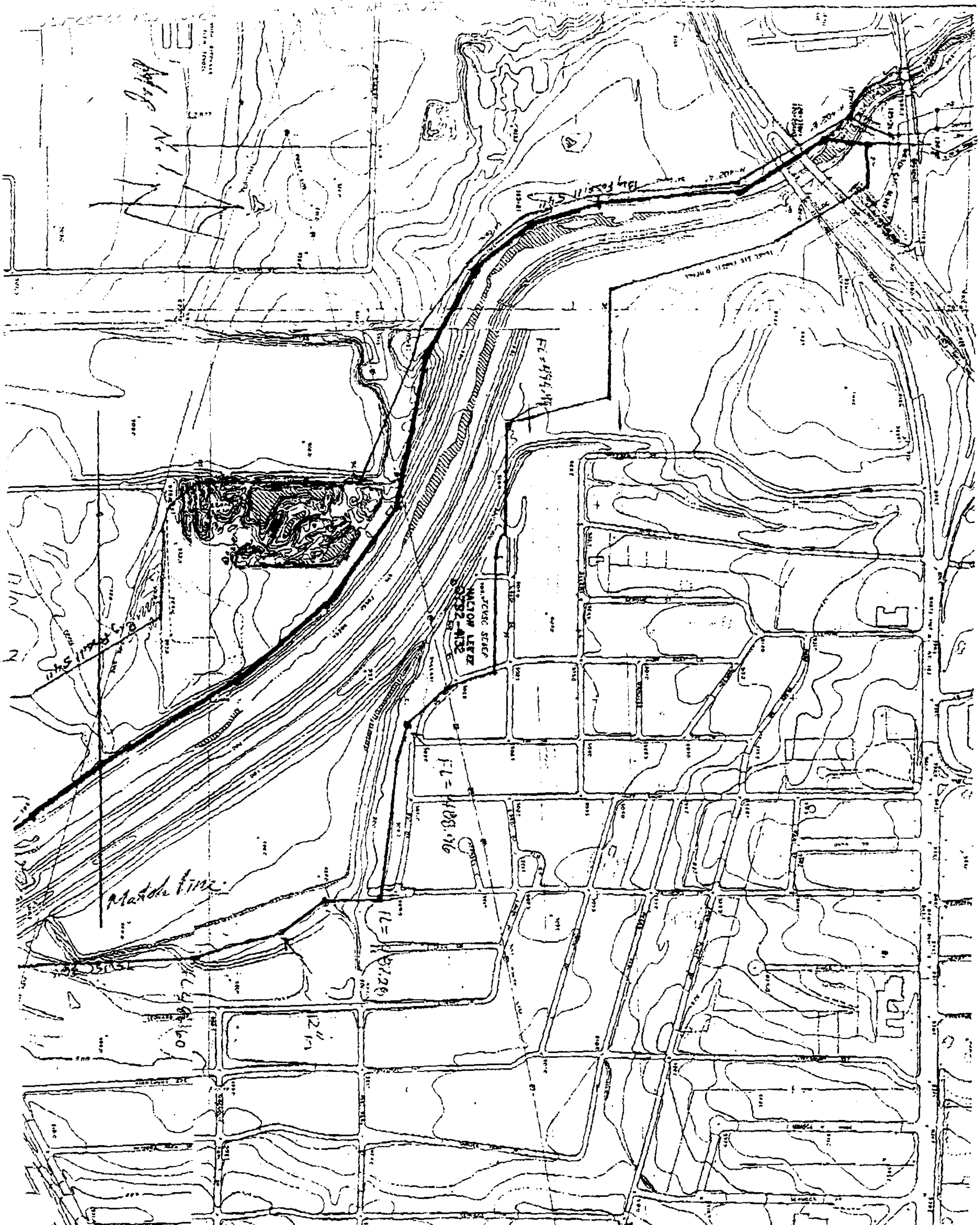
From:

FORT WORTH
KUO-CHING "PETER" FU
WASTEWATER FACILITIES ENGINEER
WATER DEPARTMENT
ENGINEERING SERVICES DIVISION
CITY OF FORT WORTH
1000 THROCKMORTON STREET • FORT WORTH, TEXAS 76102
(817) 871-8438 • FAX (817) 871-8195

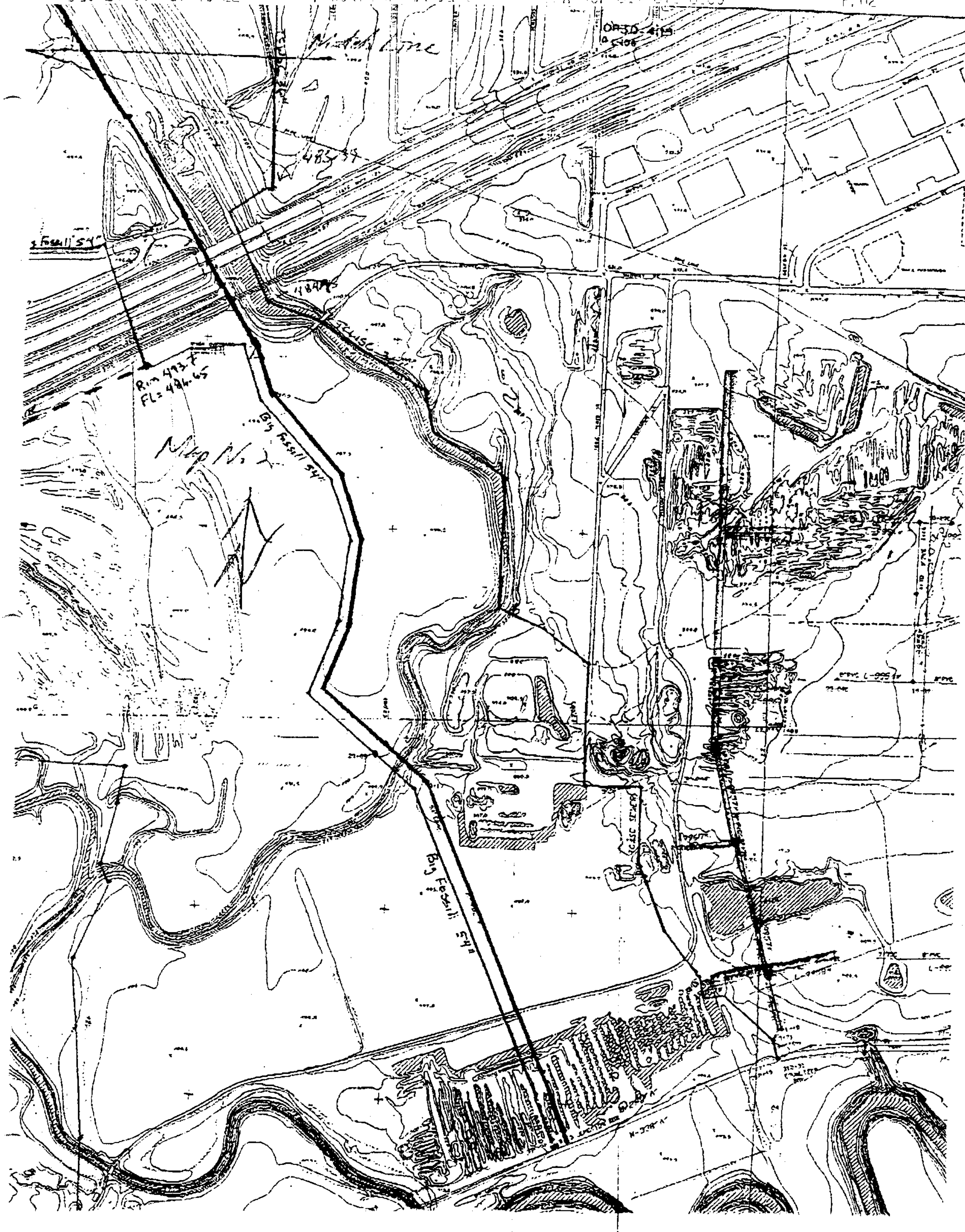
Remarks: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please comment ☑ FYI

Richard, per our previous discussion as shown on the attached map is an alternative alignment selected, based on accessibility and maintainability in mind. If you have any questions please let me know. Thanks

Peter



Match line


Match Line
Rim 493.7
FL= 486.65
Big Fossil 54"
Fossil 54"
Big Fossil 54"

TAB 4

BIG FOSSIL SEWER STUDY

CITY OF FORT WORTH

AND

TARRANT COUNTY WATER SUPPLY CORP.

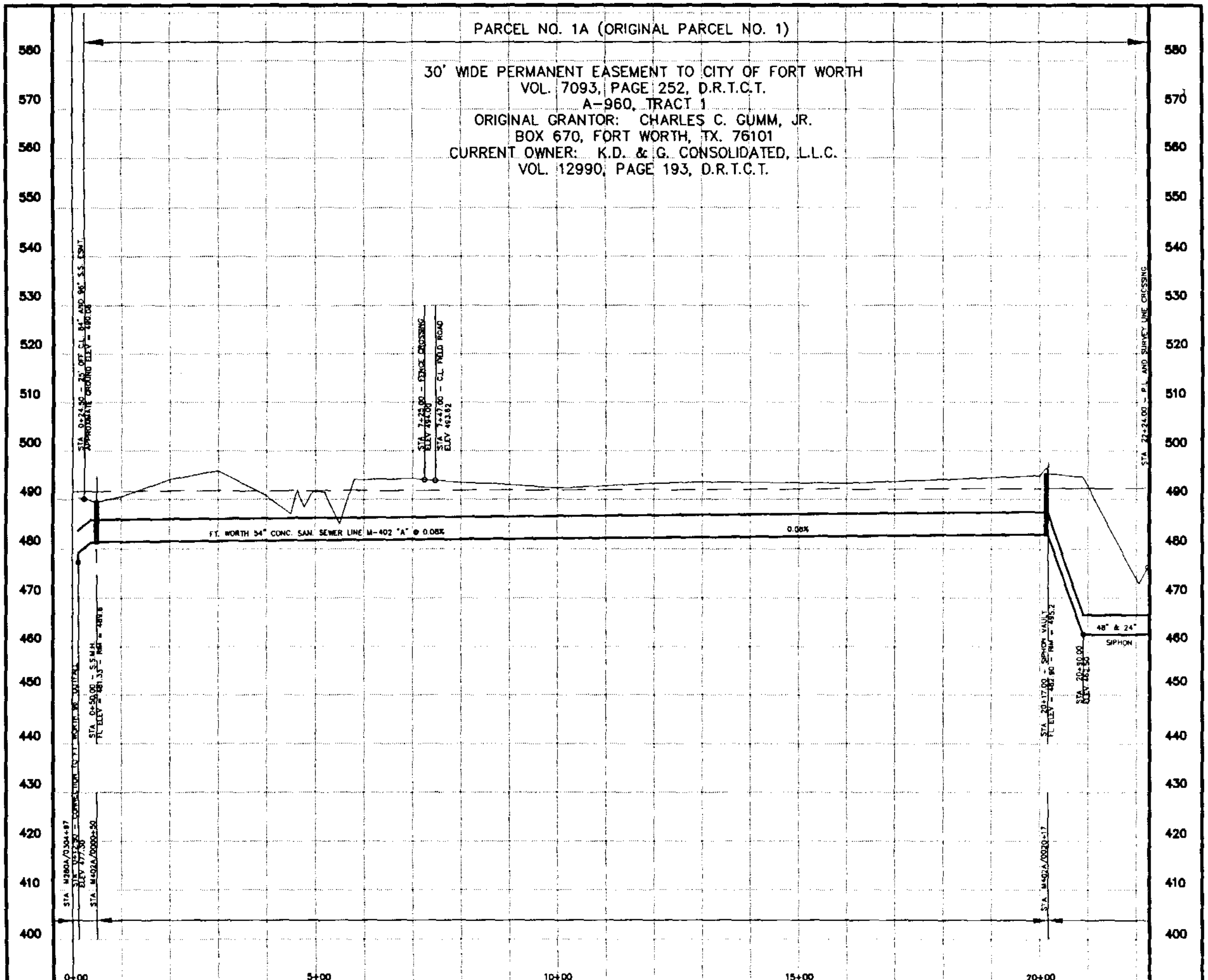
SANITARY SEWER OUTFALLS

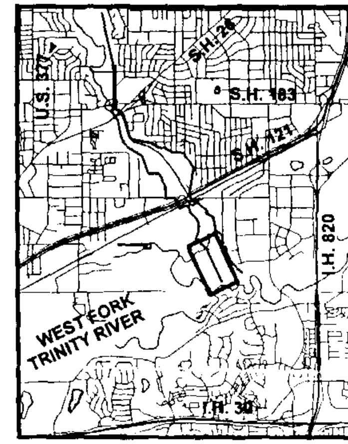
PROFILE SHEETS

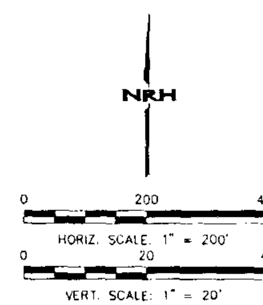
CITY OF FORT WORTH

OUTFALL SEWER

PROFILES







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BIG FOSSIL SEWER STUDY

FORT WORTH OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.

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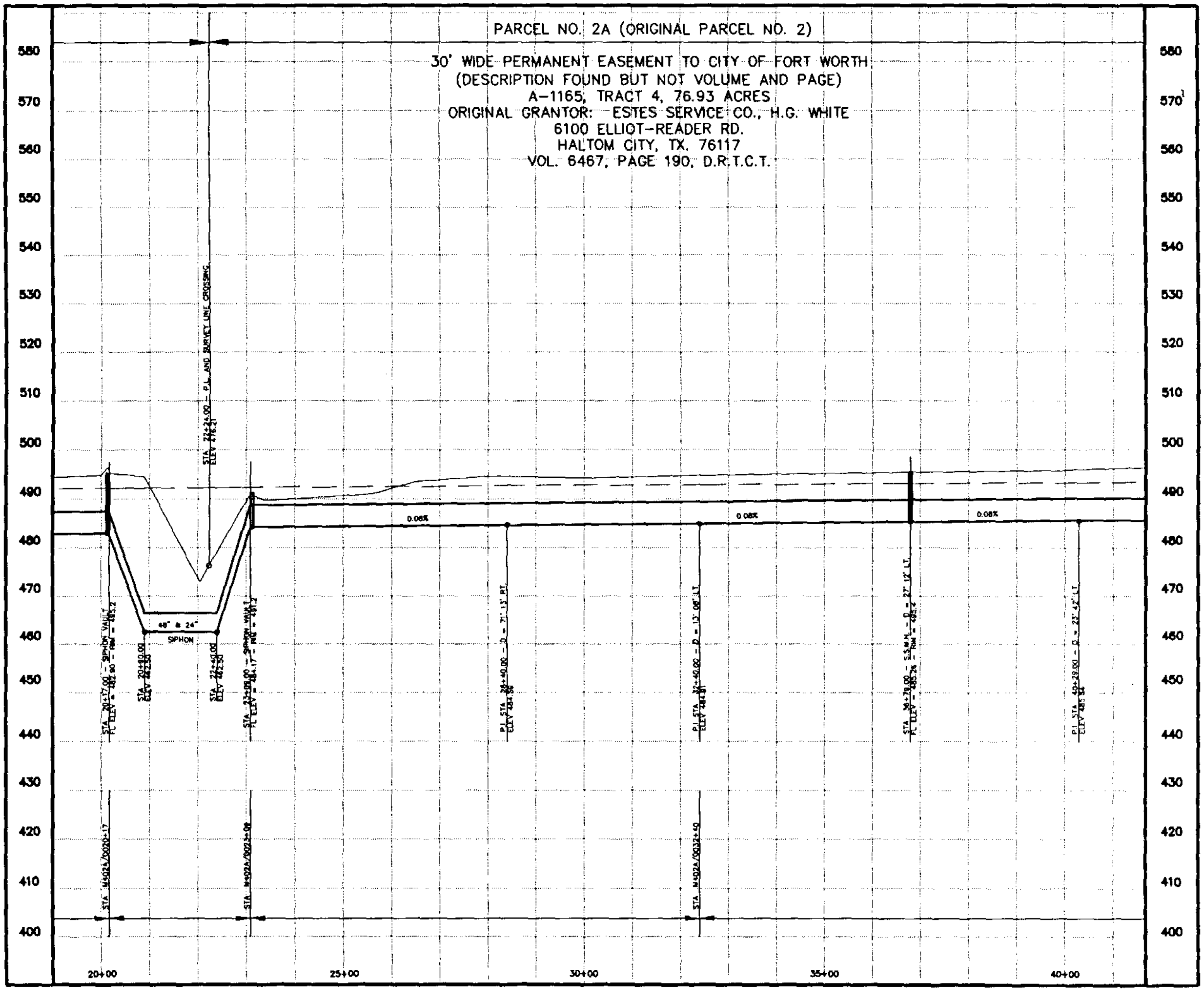

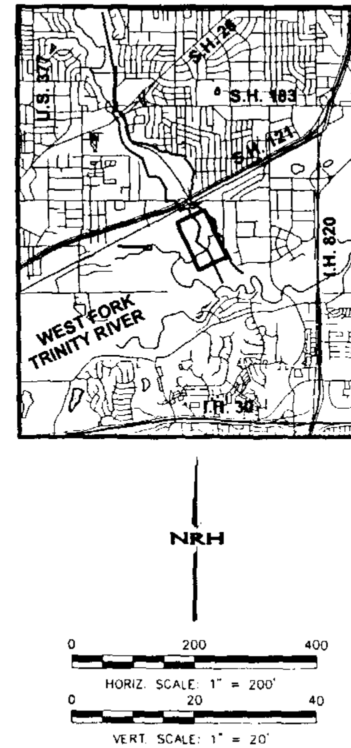

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BIG FOSSIL SEWER STUDY

FORT WORTH OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.

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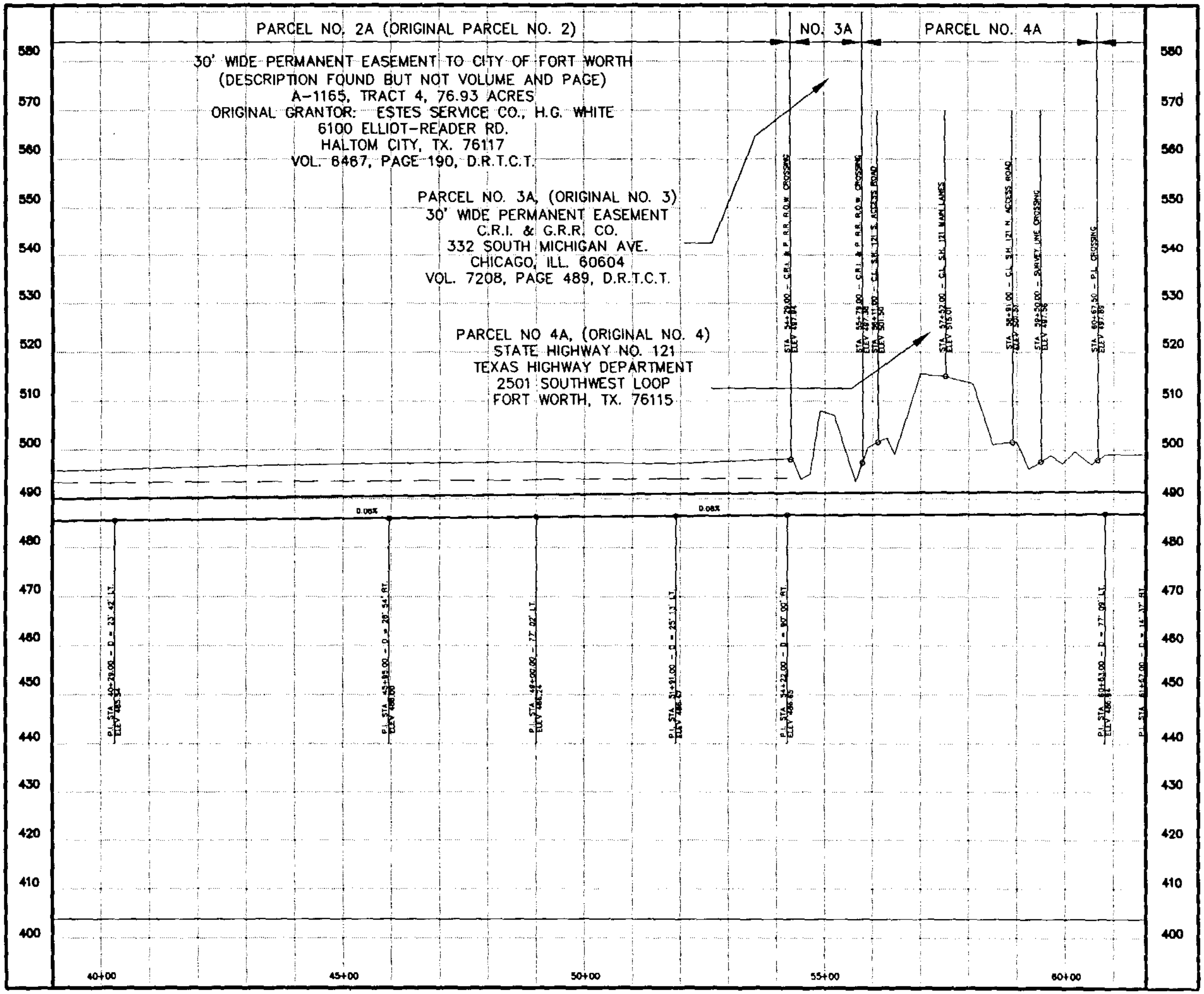

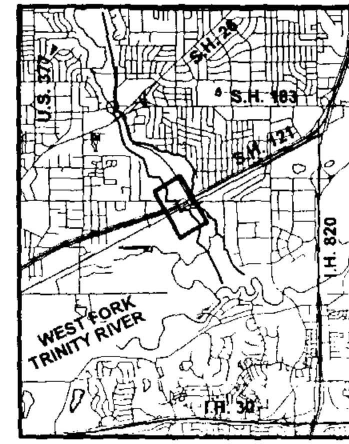

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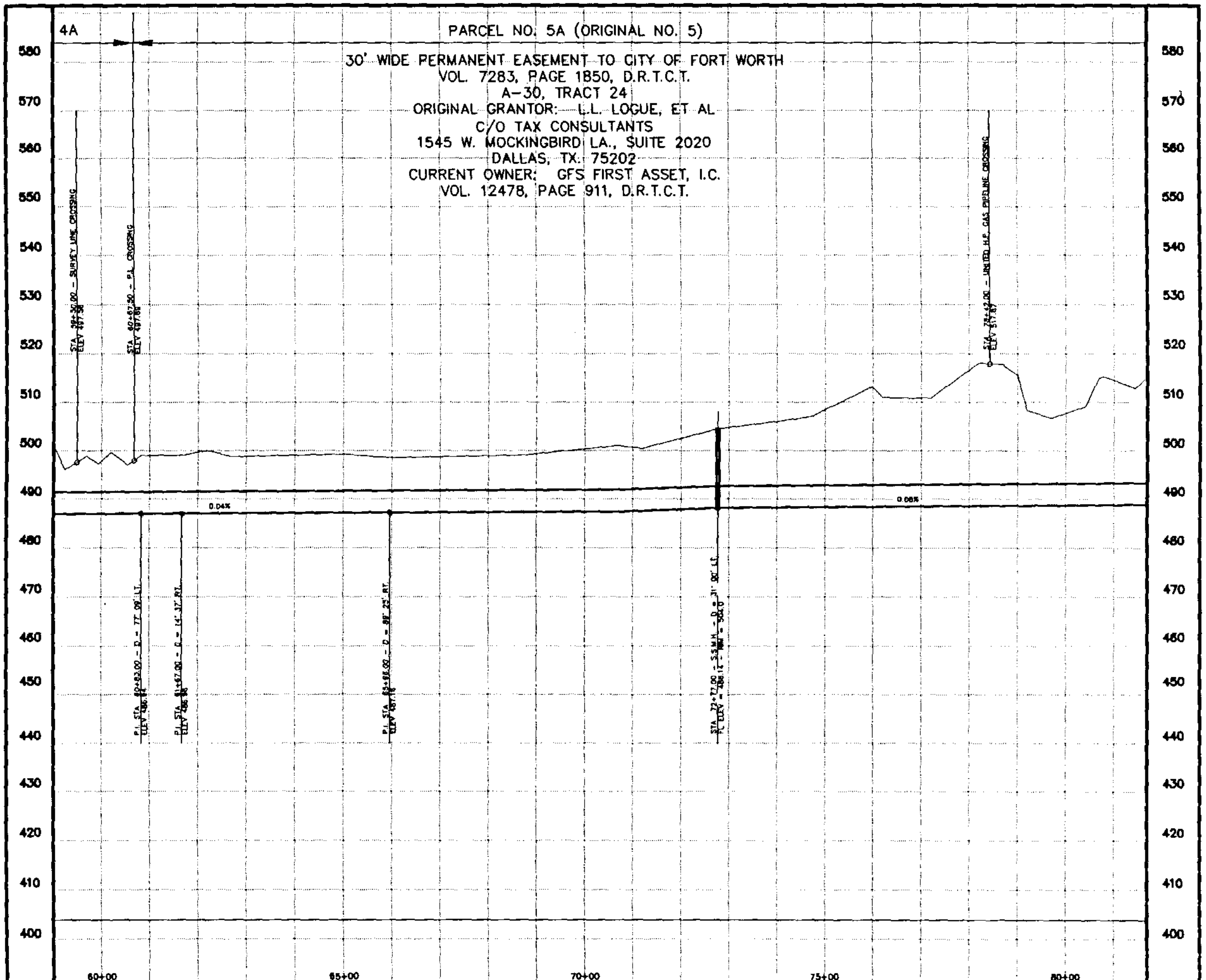
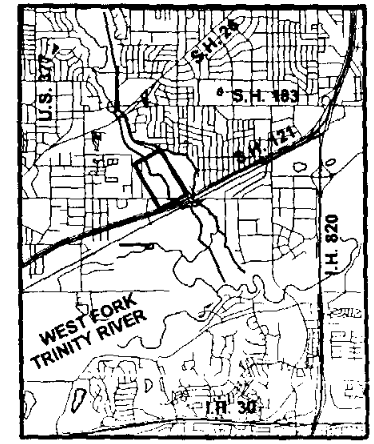
BIG FOSSIL SEWER STUDY

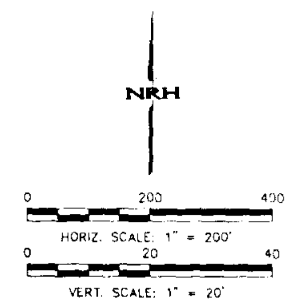
FORT WORTH OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.







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BIG FOSSIL SEWER STUDY

FORT WORTH OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

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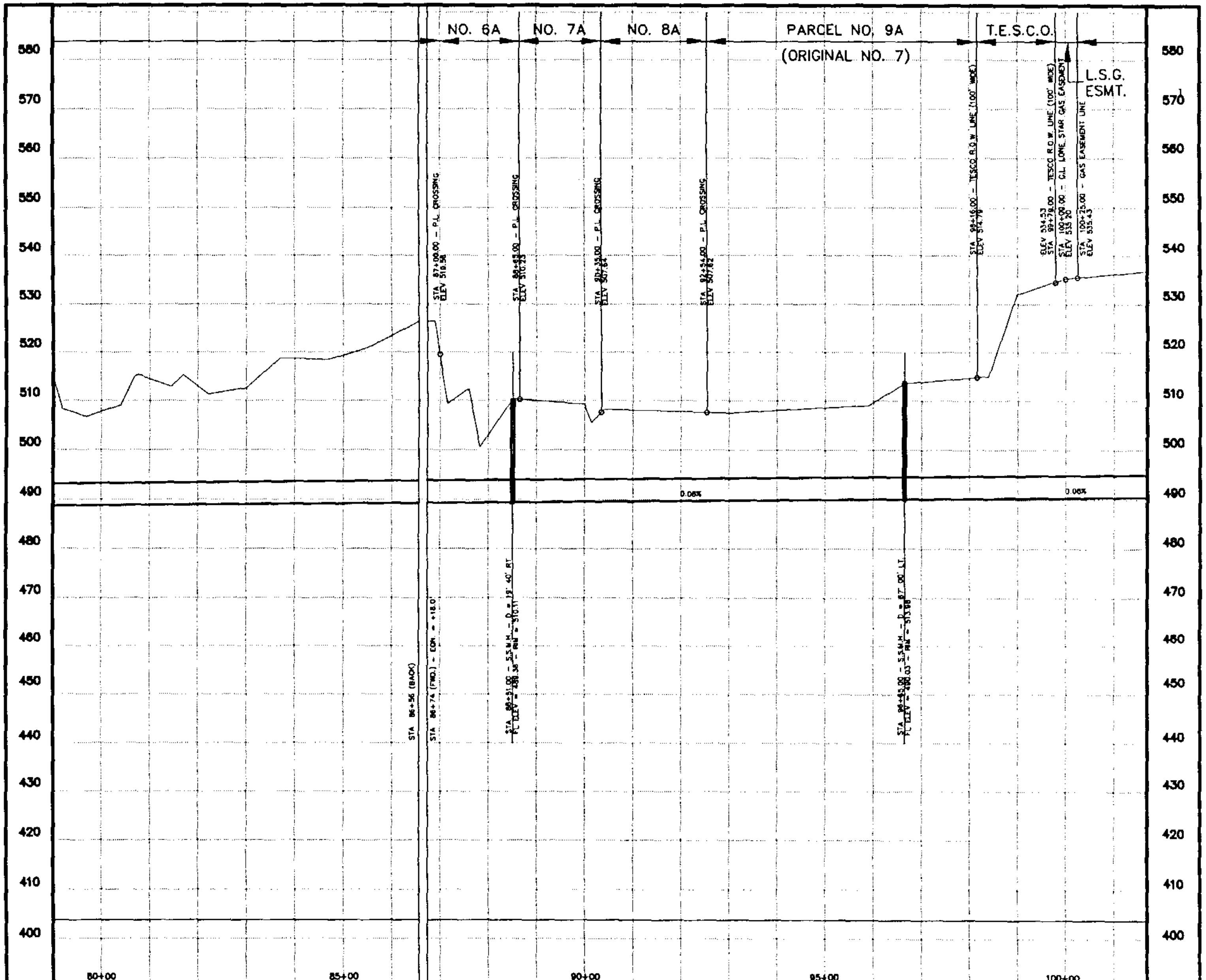

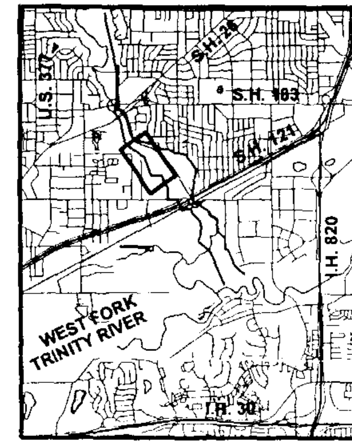

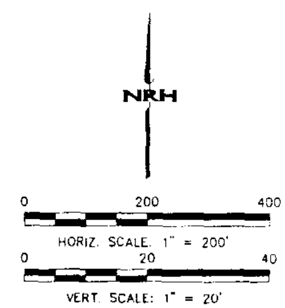

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BIG FOSSIL SEWER STUDY

FORT WORTH OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.

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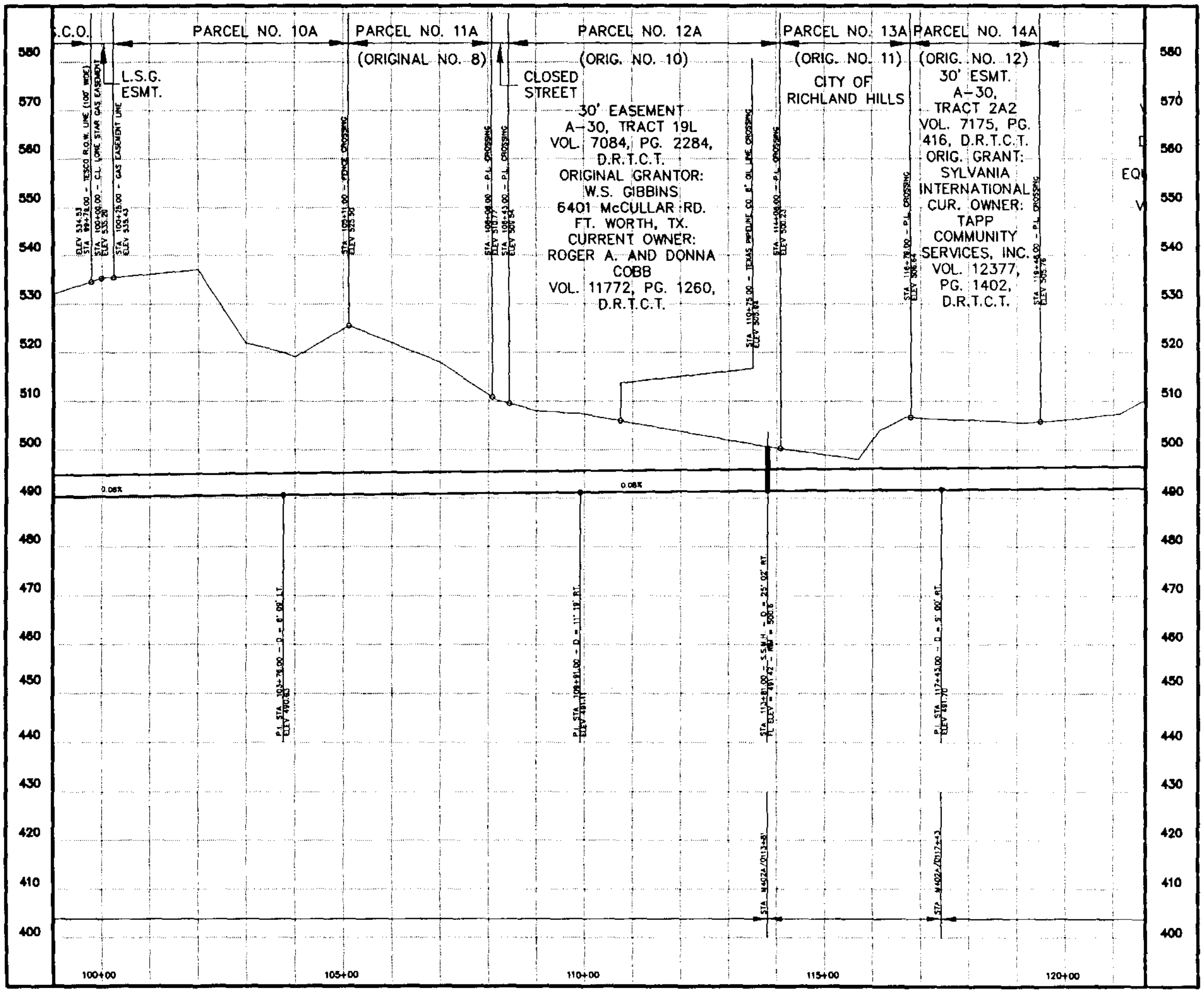

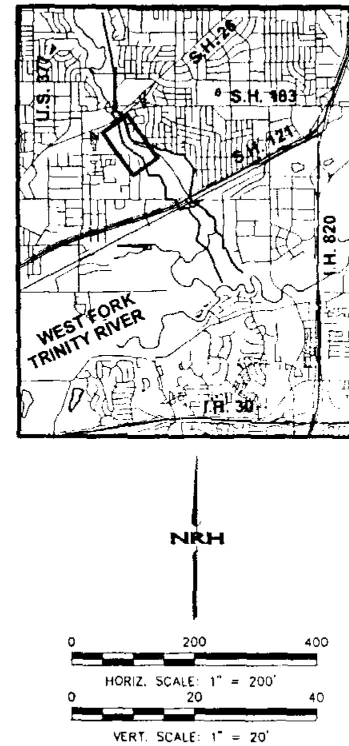

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BIG FOSSIL SEWER STUDY

FORT WORTH OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.

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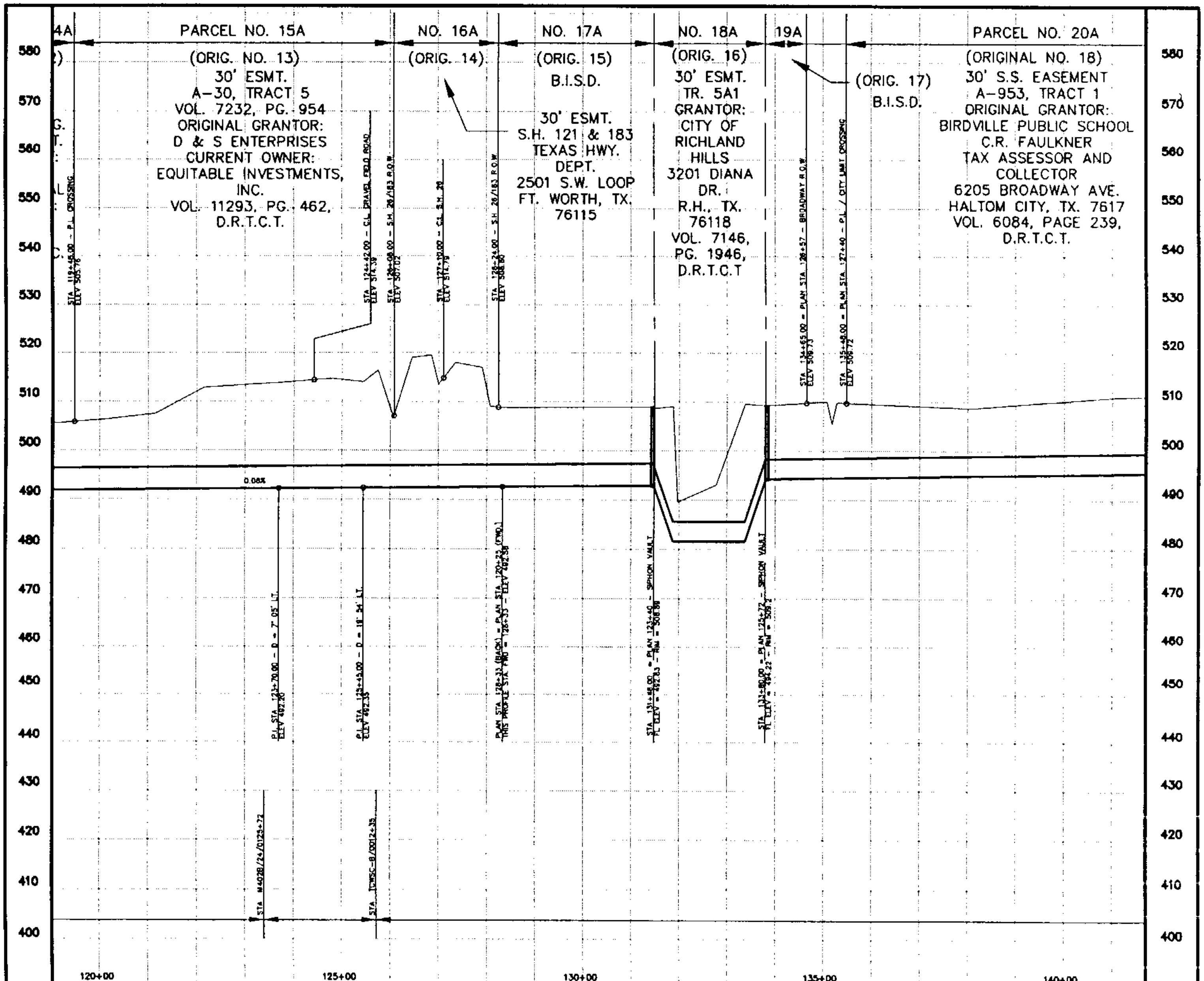

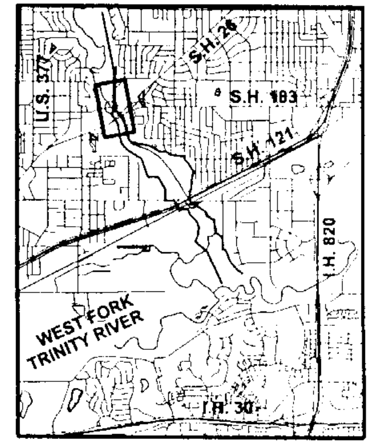

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BIG FOSSIL SEWER STUDY

FORT WORTH OUTFALL PROFILE

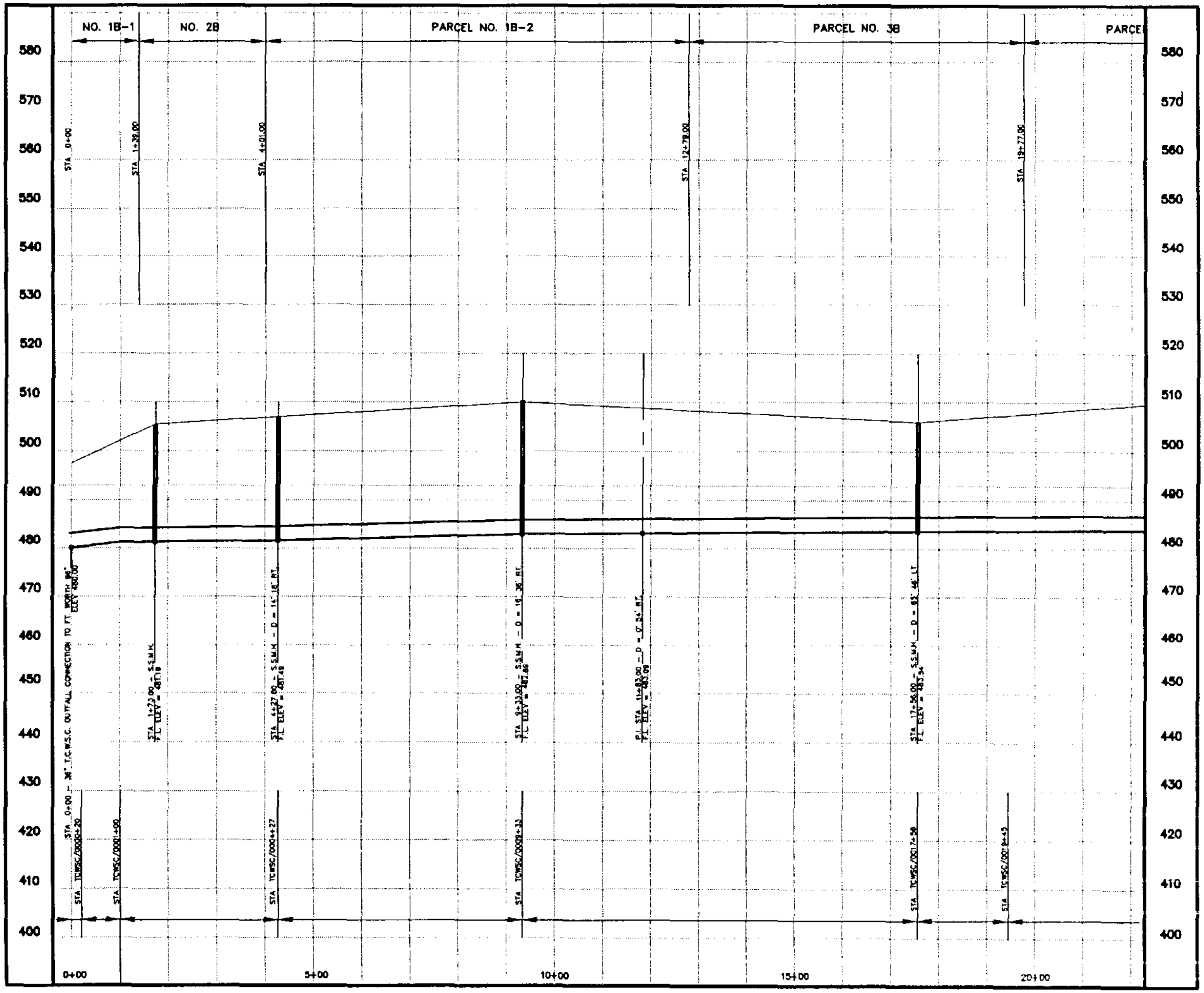
CITY OF NORTH RICHLAND HILLS

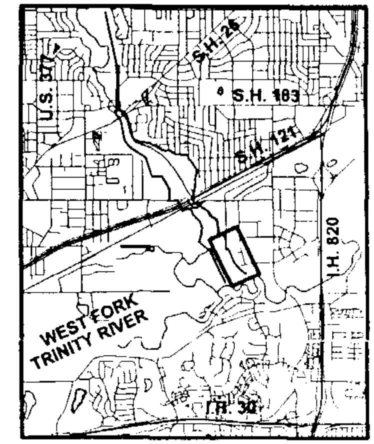
KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

TARRANT COUNTY WATER SUPPLY CORP.

OUTFALL SEWER

PROFILES





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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

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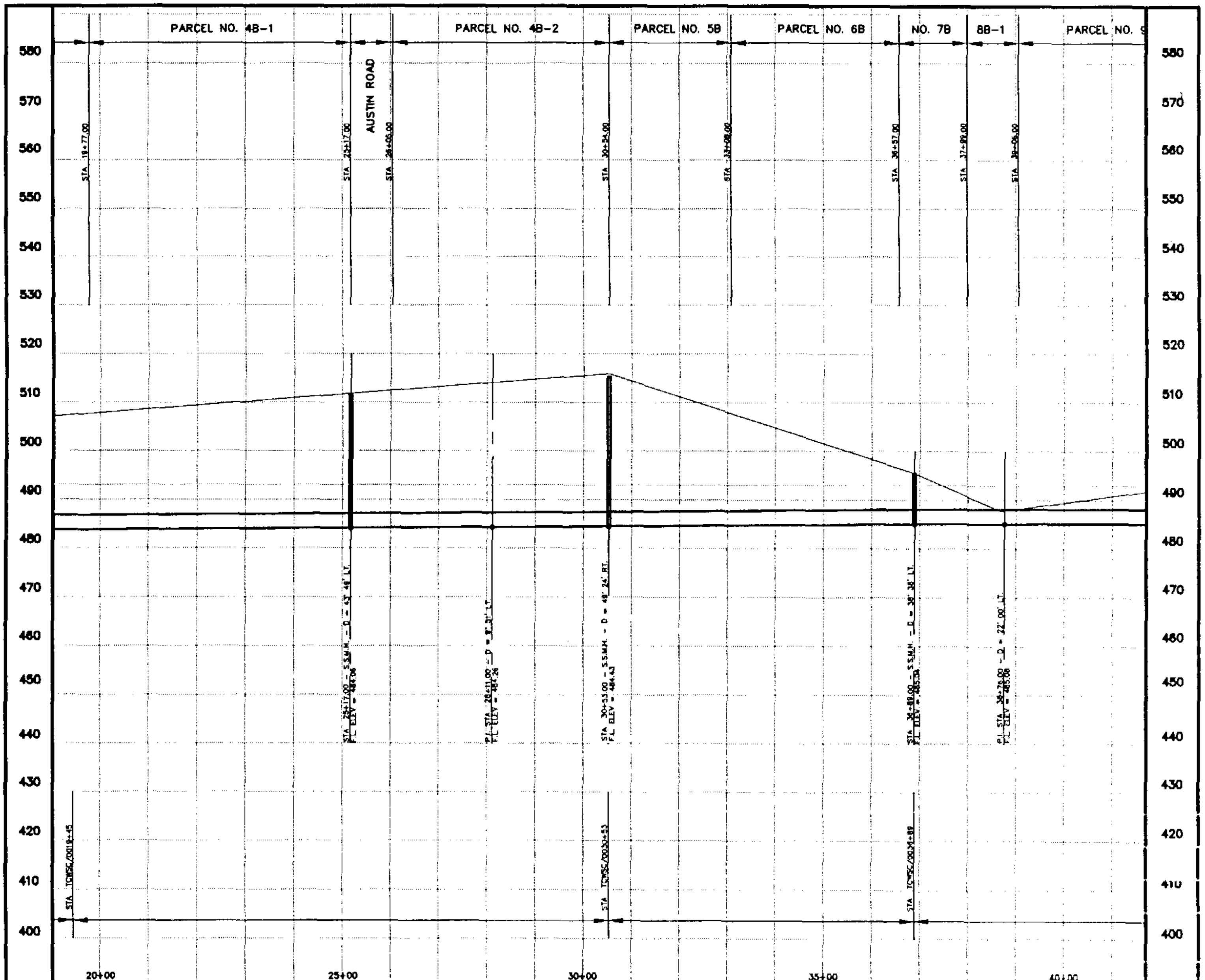

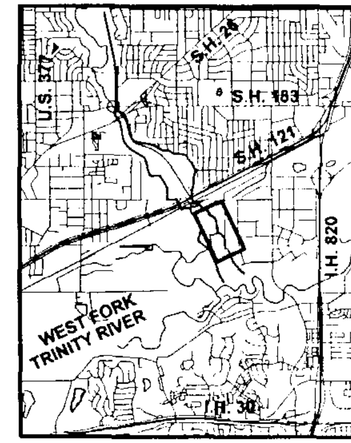

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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.

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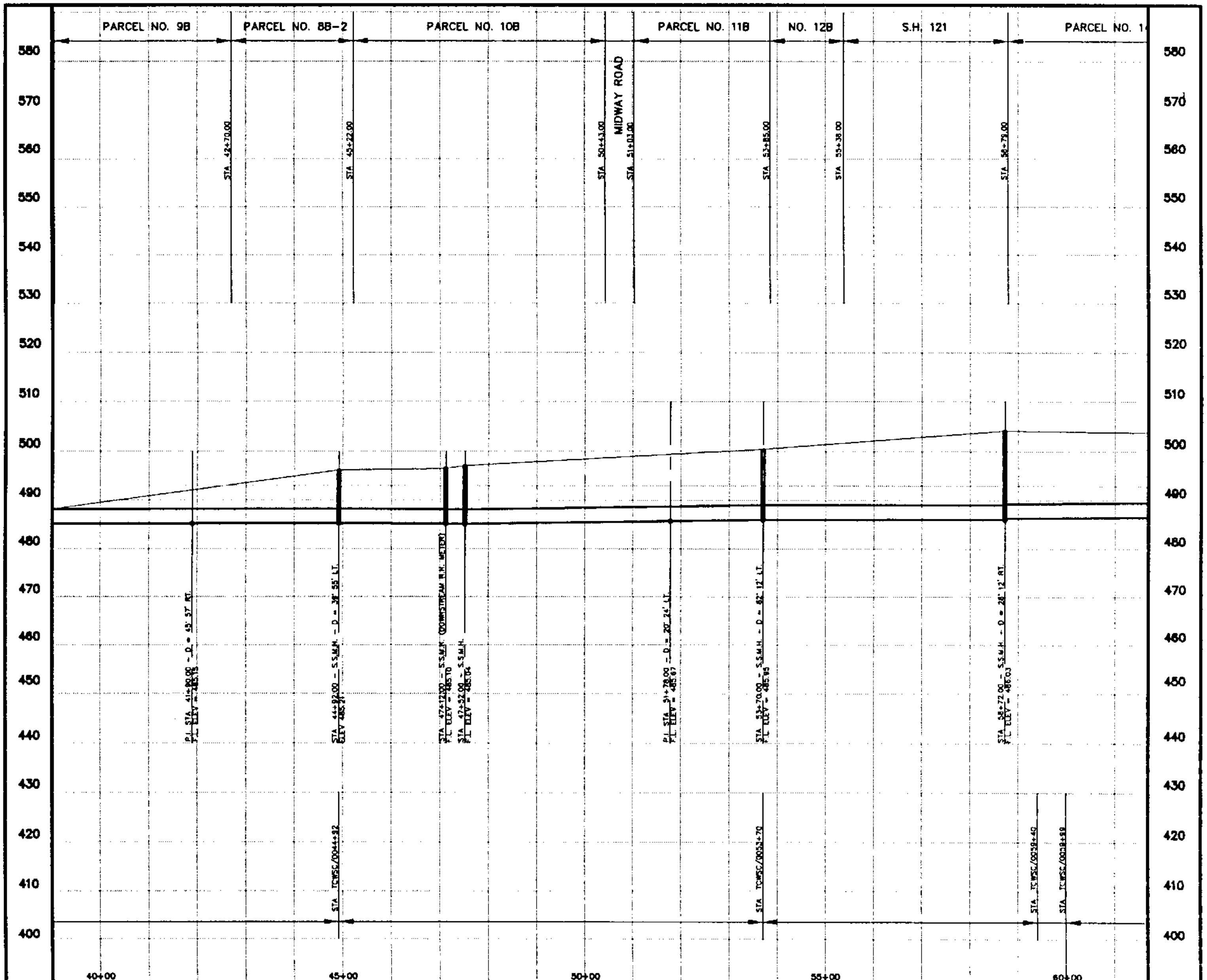

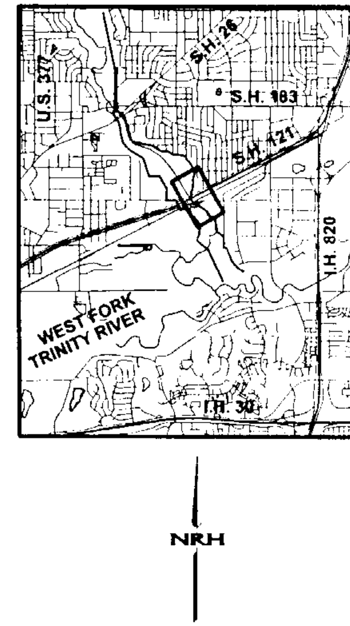

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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

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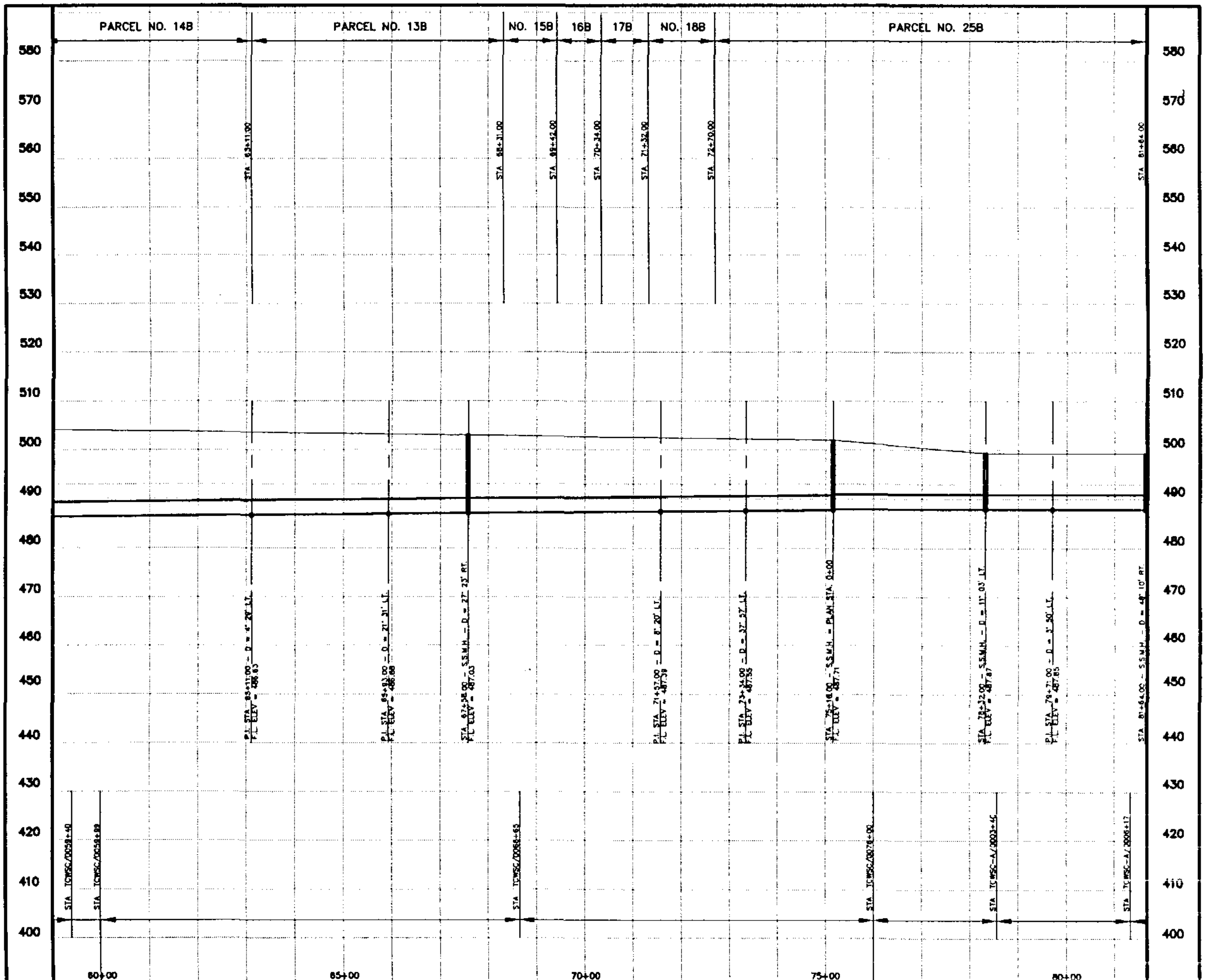

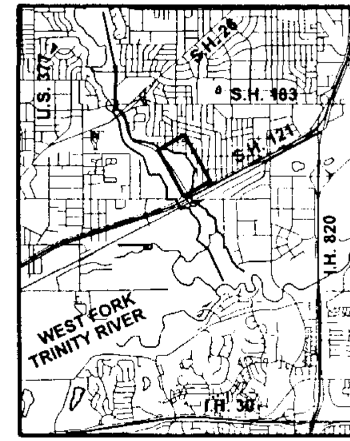

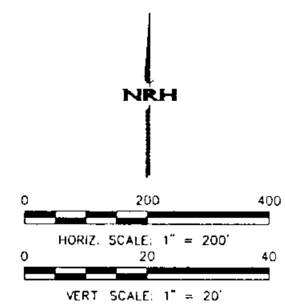

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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

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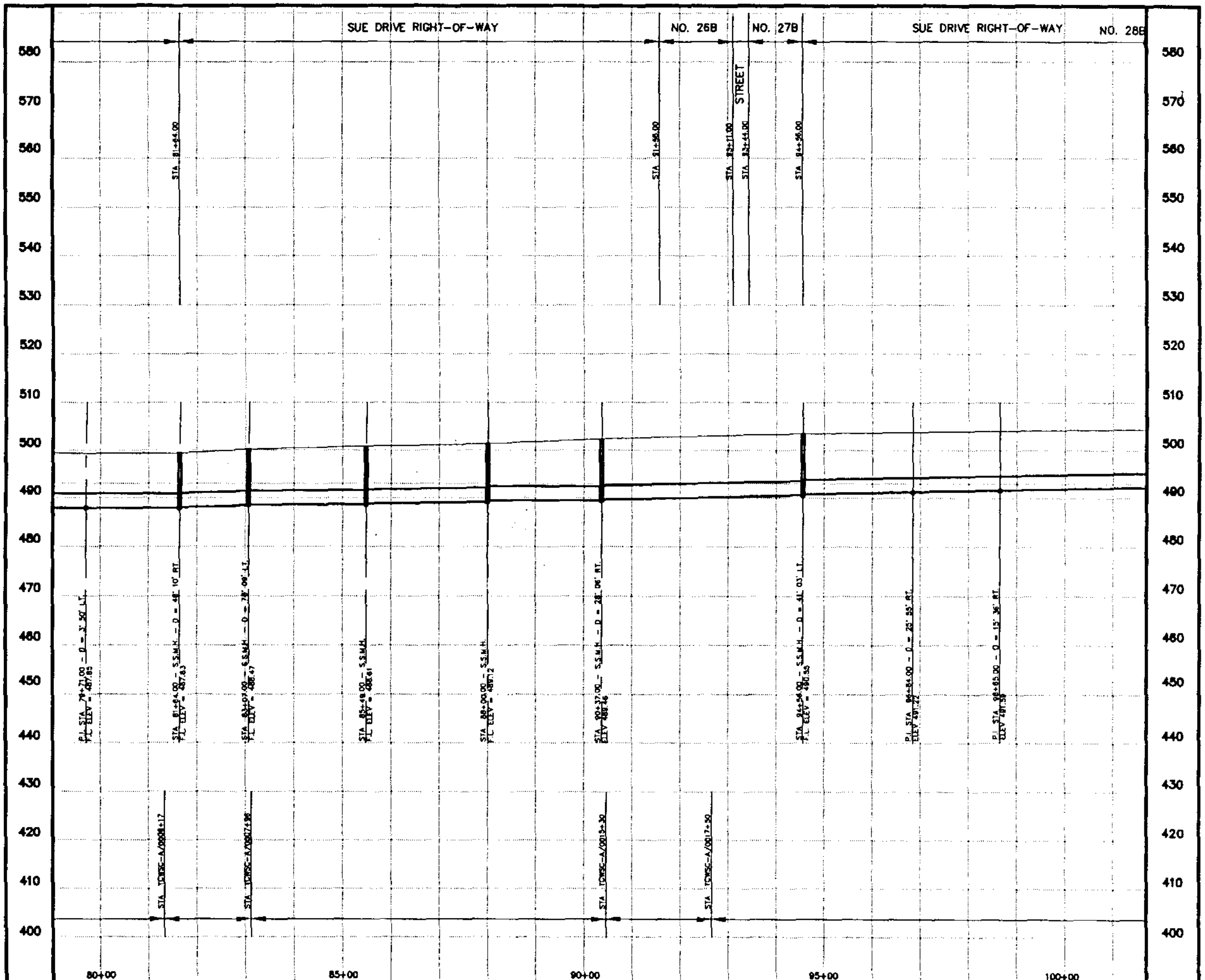

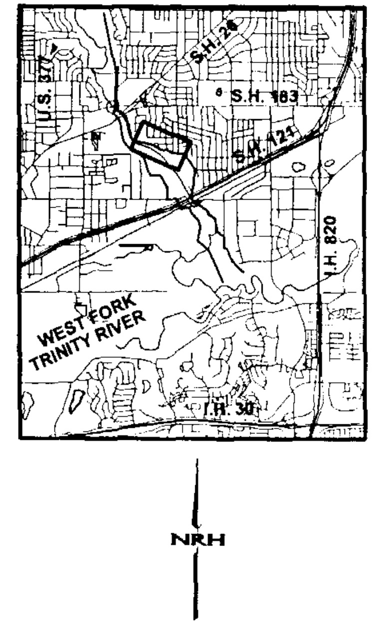

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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

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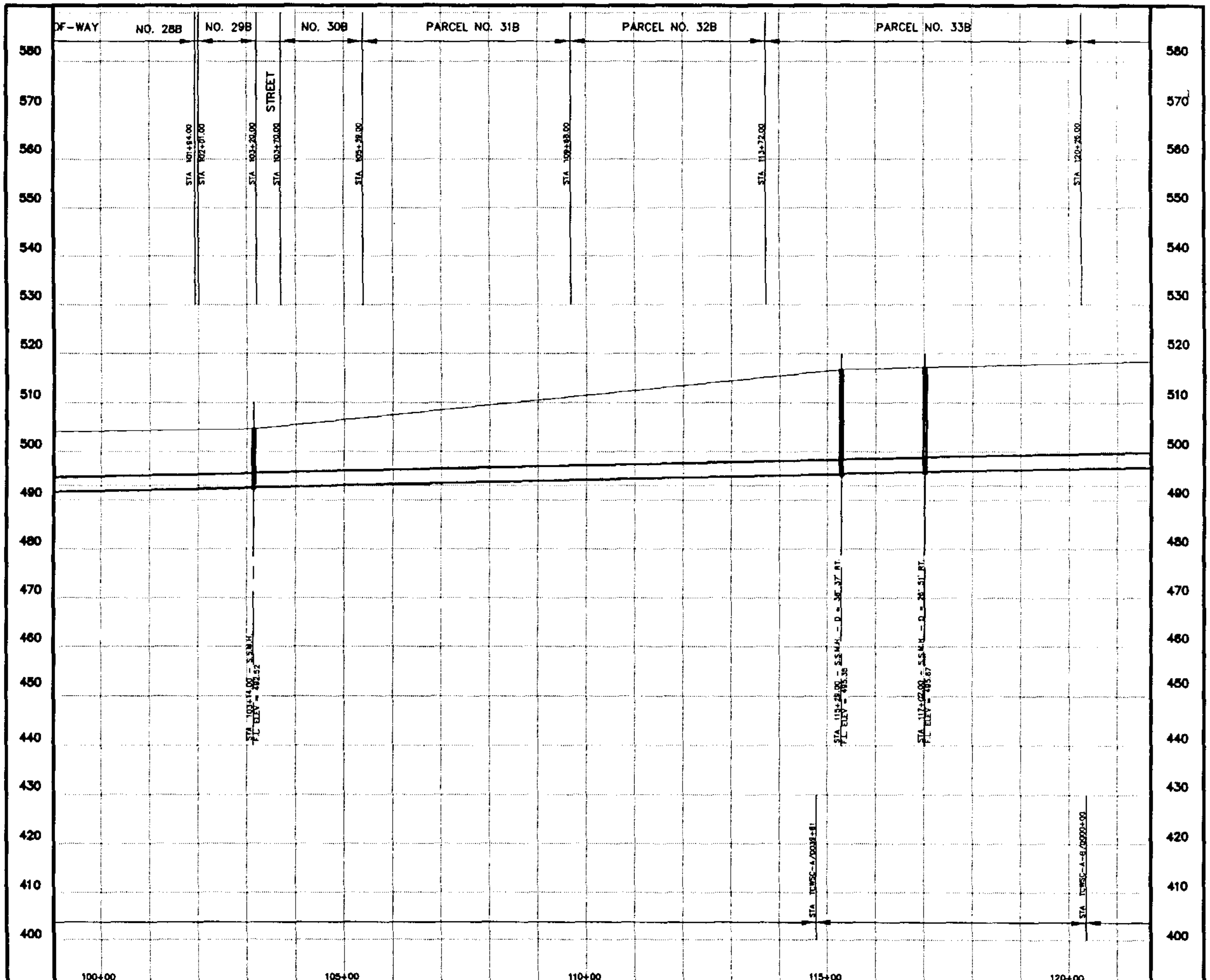

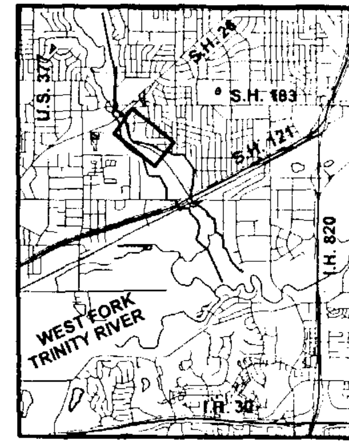

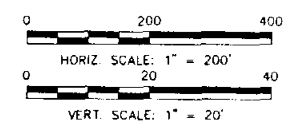

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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
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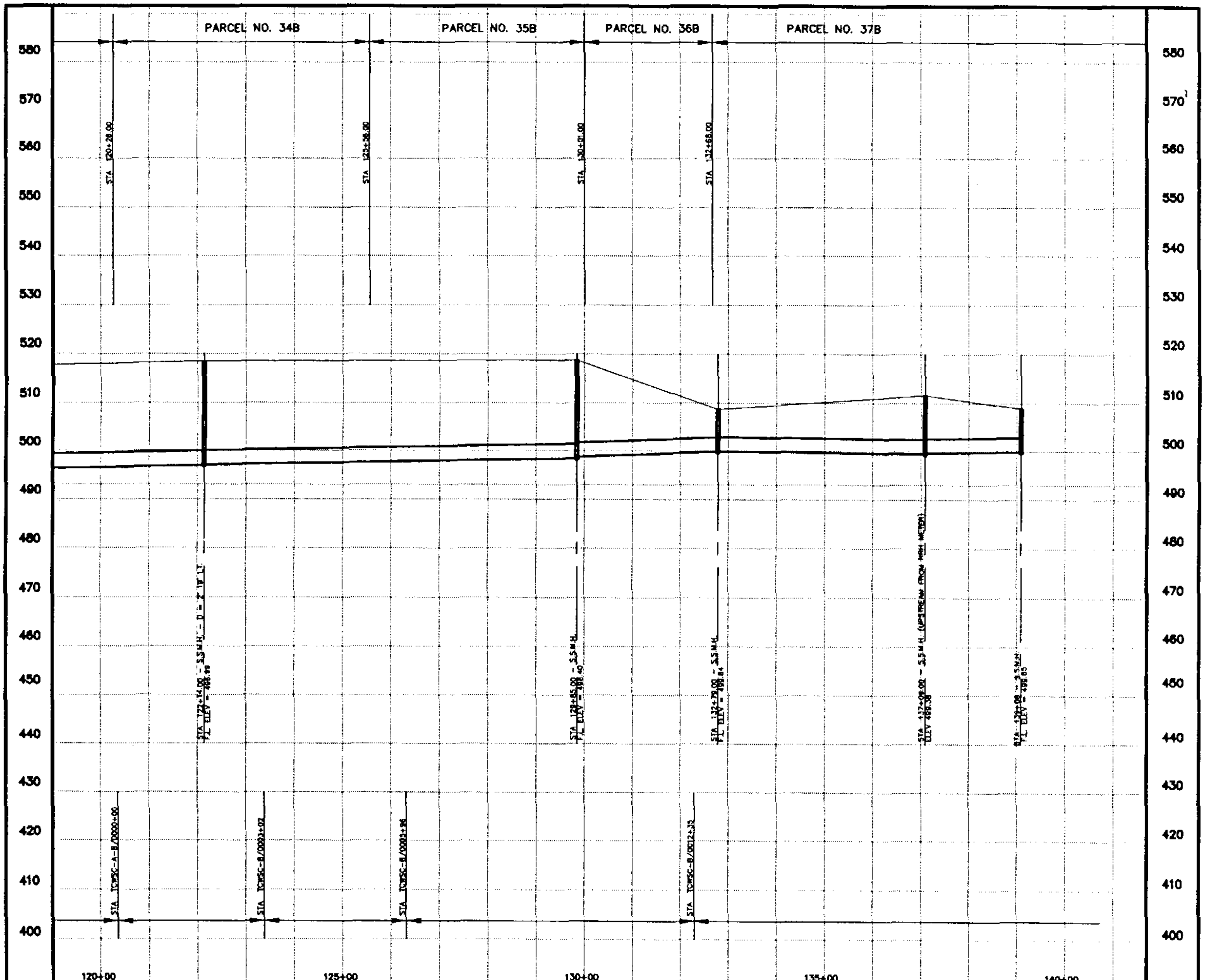

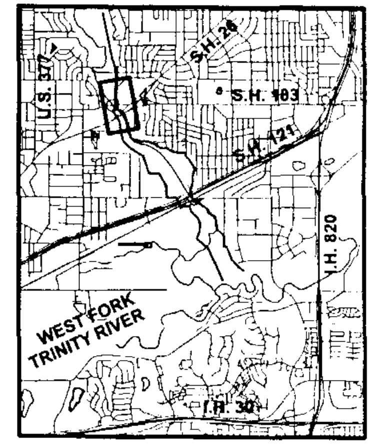

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BIG FOSSIL SEWER STUDY

T.C.W.S.C. OUTFALL PROFILE

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

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CHECKED BY AEE		SHEET NO. 7 OF 7

TAB 5

BIG FOSSIL SEWER STUDY

POPULATION PROJECTIONS

(See Further Discussion TAB 9)

INTRODUCTION

Evaluate Big Fossil drainage area by determining the existing flows for 1995 and potential flows for the years 2005 & 2025. Determine what percentages of the flows are contributed by each city contained within the Big Fossil boundary.

The Big Fossil wastewater service area receives flow from seven cities and a select area of Tarrant County.

LAND USE AND POPULATION PROJECTIONS

Land use and population data provide information necessary to establish wastewater flow patterns for different land use types and wastewater quantities based on employment and population distributions. This information is used in calculating present and future wastewater flow requirements for each city's service area. The population and land use projections can also provide a basis for the selection and staging of identified capital improvements to the wastewater system.

Land use and population data were compiled using data from the North Central Texas Council of Governments' (NCTCOG) databases. The NCTCOG maintains population and land use data based on the latest census data.

For this assignment, the land use data compiled by NCTCOG was grouped into categories based on developed and undeveloped areas for each city contained in the defined study area. The developed area was further broken down into sewered and unsewered categories. The sewered groups of the NCTCOG land uses were defined as: single family & high-density residential, industrial, institutional, and commercial. The non-sewered group includes the NCTCOG categories: infrastructure, parks & flood plain, and water. The following table summarizes 1995 NCTCOG population and land use data for the cities which contribute to the Big Fossil wastewater service area.

Table 1.
1995 Summary of Cities in Big Fossil Study

			DEVELOPED				UNDEVELOPED	
			Sewered		UnSewered			
CITY	1995 Population	1995 Employment	Total(1) Residential (acres)	Total(2) Employment (acres)	Total(3) UnSewered (acres)	**Total Developed (acres)**	**Total(4) Undeveloped (acres)**	***TOTAL CITY (acres)***
Haslet	1000	353	1046	79	85	**1210**	**1995**	***3205***
Haltom City	33500	11476	3506	1502	642	**5650**	**2285**	***7935***
Watauga	21100	1515	1756	202	29	**1987**	**613**	***2600***
North Richland Hills	50650	13567	5495	1426	684	**7605**	**4070**	***11675***
Richland Hills	8150	5199	1170	374	155	**1699**	**308**	***2007***
Saginaw	9400	3452	773	811	503	**2087**	**2691**	***4778***
Fort Worth	473600	339778	47223	22958	29789	**99970**	**83826**	***183796***

(1) single family, multi-family, mobile homes, and group quarters
(2) industrial, commercial, and institutional
(3) infrastructure, parks, water, and flood plain
(4) under construction and vacant

In order to determine future population and employment data, a systematic method was developed incorporating census tracts, forecast districts, and city boundaries. Each city lies within the boundary of several forecast districts and census tracts. A map was developed of each city showing the corresponding census tracts and forecast districts for that certain city. From this map the population per house density of each of the contributing forecast districts was computed by defining the census tracts contained in each forecast district. These forecast district densities were then used to figure population data for the years: 1995, 2005, & 2025. A similar method was then used to determine population and employment data for areas in each city, which contribute to the Big Fossil watershed. The employment and population numbers were factored for each census tract and forecast district in order to determine the population and employment data for the study. This preliminary analysis was used for comparison purposes only.

The following table shows population and employment data for the cities located in the Big Fossil watershed area which were developed from the City of Fort Worth Sanitary Sewer Master Plan and Land Use Assumptions Plan furnished by the City of Fort Worth Water Department for use in this study.

EXHIBIT "F"
Table 2.
(Revised)
Population and Employment Summaries of Cities in the Big Fossil Study

CITY	Service Area (Ac.)	POPULATION			EMPLOYMENT		
		1995	2005	2025	1995	2005	2025
Fort Worth	48,363	19,074	24,305	38,741	5,162	7,216	21,374
Haltom City	3,227	12,151	13,151	15,271	1,870	3,339	6,805
Haslet	453	130	258	583	47	88	223
North Richland Hills	2,465	13,371	14,809	16,887	3,565	4,244	5,696
Richland Hills	1,365	6,164	6,897	7,745	2,508	3,011	4,075
Saginaw	763	255	695	1,625	141	196	443
Watauga	2,600	18,834	20,591	23,934	1,730	1,958	2,504
TOTAL	**59,236**	**69,979**	**80,706**	**104,786**	**15,023**	**20,052**	**41,120**

Note: Source of Population Data: City of Fort Worth Sanitary Sewer Master Plan
See Database Tables "LUAPOP-1" and "LUAPOP-2", under TAB 5.
City of Fort Worth area also includes unincorporated Tarrant County Areas in Watershed

EXHIBIT "B"
COMPARISON OF PROJECTED GROWTH IN SELECTED CITIES BETWEEN 2005 AND 2025
FROM 2002 SWP AND CHAPTER 5, TABLE 2 (CORRECTED), BIG FOSSIL SEWER STUDY

CITY	1990	2000	2005	P2005	2010	2020	2025	P2025	2002 SWP % INCREASE	BIG FOSSIL STUDY % INCREASE
HASLET	795	1,260	1,352	258	1,443	1,899	2,113	583	56.29%	125.97%
HALTOM CITY	32,856	38,845	40,275	13,151	41,704	43,272	43,628	15,271	8.33%	16.12%
WATAUGA	20,009	22,233	23,254	20,591	24,274	26,157	27,063	23,934	16.38%	16.24%
N. RICHLAND HILLS	45,895	55,884	61,624	14,809	67,363	81,200	85,804	16,887	39.24%	14.03%
RICHLAND HILLS	7,978	8,886	9,633	6,897	10,379	12,109	12,864	7,745	33.54%	12.30%
SAGINAW	8,551	12,172	13,047	695	13,922	15,878	16,481	1,625	26.32%	133.81%
FORT WORTH	447,619	496,622	514,670	24,305	532,717	580,375	588,244	38,741	14.30%	59.40%
TOTALS	563,703	635,902	663,855	80,706	691,802	760,890	776,197	104,786	16.92%	29.84%

NOTES: P2005 AND P2025 POPULATION PROJECTIONS INCLUDE ONLY BIG FOSSIL WATERSHED AREAS
SEE EXHIBIT "C" FOR SUMMARY OF POPULATION PROJECTIONS FOR YEARS 1990 THROUGH 2070
PERCENT INCREASES BASED ON COMPARISON OF YEARS 2005 AND 2025

EXHIBIT "C"
"POPULATION" PROJECTIONS USED IN THE BIG FOSSIL SEWER STUDY BASED ON DATA FROM THE CITY OF FORT WORTH SANITARY SEWER MASTER PLAN REPORT

CITY	TOTAL CITY AREA (AC.)	TOTAL BIG FOS. SERV. AR. (AC.)	TAB. LUAPOP-1 PAGE 8 OF 12				TABL. LUAPOP-1 PAGE 12 OF 12			INTERP.	TAB. LUAPOP-2 PAGE 10 OF 20	
			1990	1995	2000	2005	2010	2015	2020	2025	2050	2070
Haslet	3,205	453	66	130	194	258	322	416	509	583	952	1,247
Haltom City	7,935	3,227	11,650	12,151	12,651	13,151	13,651	14,203	14,754	15,271	17,858	19,928
Watauga	2,600	2,600	17,955	18,834	19,712	20,591	21,469	22,275	23,080	23,934	28,205	31,622
N. Richland Hills	11,675	2,465	12,652	13,371	14,091	14,809	15,528	15,906	16,282	16,887	19,912	22,332
Richland Hills	2,007	1,365	5,797	6,164	6,530	6,897	7,264	7,365	7,467	7,745	9,137	10,250
Saginaw	4,778	763	35	255	475	695	915	1,157	1,398	1,625	2,761	3,670
Fort Worth	183,796	48,363	16,459	19,074	21,690	24,305	26,921	31,239	35,558	38,741	54,657	67,389
TOTALS	215,996	59,236	64,614	69,979	75,343	80,706	86,070	92,561	99,048	104,787	133,482	156,438

NOTES:
Big Fossil Service Area Includes Marine Creek Watershed Area, but not Little Fossil Creek Watershed Area
Source of Data: City of Fort Worth Database Tables "LUAPOP-1" and "LUAPOP-2"
Population Estimates for Year 2025 Interpolated between Years 2020 and 2050

EXHIBIT "D"
"EMPLOYMENT" PROJECTIONS USED IN THE BIG FOSSIL SEWER STUDY BASED ON DATA FROM THE CITY OF FORT WORTH SANITARY SEWER MASTER PLAN REPORT

CITY	TOTAL CITY AREA (AC.)	TOTAL BIG FOS. SERV. AR. (AC.)	TAB. LUAPOP-1 PAGE 4 OF 12							INTERP.	TAB. LUAPOP-2 PAGE 10 OF 20	
			1990	1995	2000	2005	2010	2015	2020	2025	2050	2070
Haslet	3,205	453	27	47	68	88	108	152	195	223	363	475
Haltom City	7,935	3,227	1,136	1,870	2,605	3,339	4,074	5,035	5,995	6,805	10,855	14,095
Watauga	2,600	2,600	1,615	1,730	1,844	1,958	2,072	2,225	2,377	2,504	3,139	3,647
N. Richland Hills	11,675	2,465	3,226	3,565	3,904	4,244	4,583	4,963	5,343	5,696	7,461	8,873
Richland Hills	2,007	1,365	2,256	2,508	2,760	3,011	3,263	3,539	3,815	4,075	5,374	6,414
Saginaw	4,778	763	113	141	169	196	224	310	396	443	679	868
Fort Worth	183,796	48,363	4,135	5,162	6,189	7,216	8,243	13,577	18,911	21,374	33,687	43,538
TOTALS	215,996	59,236	12,508	15,023	17,539	20,052	22,567	29,801	37,032	41,120	61,558	77,910

NOTES: Big Fossil Service Area Includes Marine Creek Watershed Area, but not Little Fossil Creek Watershed Area
Source of Data: City of Fort Worth Database Tables "LUAPOP-1" and "LUAPOP-2"
Employment Estimates for Year 2025 Interpolated between Years 2020 and 2050

EXHIBIT "E"
"EQUIVALENT" POPULATION PROJECTIONS USED IN THE BIG FOSSIL SEWER STUDY BASED ON DATA FROM THE CITY OF FORT WORTH SANITARY SEWER MASTER PLAN REPORT

CITY	TOTAL CITY AREA (AC.)	TOTAL BIG FOS. SERV. AR. (AC.)	TAB. LUAPOP-1 PAGE 8 OF 12				TABL. LUAPOP-1 PAGE 12 OF 12			INTERP.	TAB. LUAPOP-2 PAGE 10 OF 20	
			1990	1995	2000	2005	2010	2015	2020	2025	2050	2070
Haslet	3,205	453	80	154	228	302	376	492	607	694	1,134	1,485
Haltom City	7,935	3,227	12,218	13,086	13,954	14,821	15,688	16,721	17,752	18,674	23,286	26,976
Watauga	2,600	2,600	18,763	19,699	20,634	21,570	22,505	23,388	24,269	25,186	29,775	33,446
N. Richland Hills	11,675	2,465	14,265	15,154	16,043	16,931	17,820	18,388	18,954	19,735	23,643	26,769
Richland Hills	2,007	1,365	6,925	7,418	7,910	8,403	8,896	9,135	9,375	9,783	11,824	13,457
Saginaw	4,778	763	92	326	560	793	1,027	1,312	1,596	1,847	3,101	4,104
Fort Worth	183,796	48,363	18,527	21,655	24,785	27,913	31,043	38,028	45,014	49,428	71,501	89,158
TOTALS	215,996	59,236	70,868	77,491	84,113	90,732	97,354	107,462	117,564	125,347	164,261	195,393

NOTES:
Big Fossil Service Area Includes Marine Creek Watershed Area, but not Little Fossil Creek Watershed Area
Source of Data: City of Fort Worth Database Tables "LUAPOP-1" and "LUAPOP-2"
Equivalent Population Estimate for Year 2025 Interpolated between Years 2020 and 2050
Equivalent Population = Population (Exhibit "B") + 0.5 x Employment (Exhibit "C")

Population Projection Methodology

1. One of the initial steps required Internet research to compile COG data for Tarrant County.

2. It was discovered that two forms of data existed.

3. Census Tract (CT) data gave detailed land use information for each tract, which was used to compute population and employment densities.

4. Forecast District (FD) data contained information governing household and employment numbers for the years 1995, 2025, & 2025.

5. Since the Forecast District & Census Tract boundaries did not necessarily fall on city limit lines, it was necessary to calculate what percentage of each Forecast District & Census Tract fell within each city's limits.

6. Once this was determined, we used this data to calculate the population for each city for the years 1995, 2005, & 2025.

7. These population numbers were then used to figure future population and employment land use areas.

8. These data were compared with population and employment projections by the City of Fort Worth in their Land Use Assumptions Plan and Sanitary Sewer Master Plan, and the results compared favorably. Therefore, the Fort Worth Population Database Information is used for this Big Fossil study. A table of population projections by the Texas Water Development Board is included in this section for reference.

EXHIBIT "A"

Big Fossil Sewer Study, Table No. TWDB-1

TEXAS WATER DEVELOPMENT BOARD POPULATION AND WATER USE PROJECTIONS

CITY	TOTAL LAND AREA	YEAR 1990				YEAR 2000				YEAR 2010			
		POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.
Fort Worth	183,796	447,619	105,420	210.24	2.44	496,622	127,946	229.98	2.70	532,717	134,262	224.98	2.90
North Richland Hills	11,675	45,895	6,331	123.14	3.93	55,884	9,640	153.99	4.79	67,363	11,394	150.99	5.77
Haltom City	7,935	32,856	4,575	124.30	4.14	38,845	6,309	144.98	4.90	41,704	6,633	141.98	5.26
Richland Hills	2,007	7,978	1,301	145.57	3.98	8,886	1,334	134.01	4.43	10,379	1,523	130.99	5.17
Watauga	2,600	20,009	2,761	123.18	7.70	22,233	3,835	153.98	8.55	24,274	4,106	151.00	9.34
Haslet	3,205	795	108	121.27	0.25	1,260	229	162.24	0.39	1,443	267	165.17	0.45
Saginaw	4,778	8,551	1,238	129.24	1.79	12,172	2,059	151.00	2.55	13,922	2,495	159.98	2.91
Tarrant County	574,450	1,170,247	226,690	172.92	2.04	1,415,759	308,195	194.33	2.46	1,594,218	341,530	191.24	2.78

CITY	TOTAL LAND AREA	YEAR 2020				YEAR 2030				YEAR 2040			
		POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.
Fort Worth	183,796	580,375	143,673	220.99	3.16	596,112	144,230	215.99	3.24	632,480	150,195	211.99	3.44
North Richland Hills	11,675	81,200	13,461	147.99	6.96	90,408	14,684	144.99	7.74	100,661	16,011	141.99	8.62
Haltom City	7,935	43,272	6,737	138.98	5.45	43,983	6,700	135.98	5.54	44,197	6,584	132.98	5.57
Richland Hills	2,007	12,109	1,750	129.01	6.03	13,618	1,922	125.99	6.79	16,497	2,273	123.00	8.22
Watauga	2,600	26,157	4,336	147.98	10.06	27,969	4,543	145.00	10.76	29,906	4,757	141.99	11.50
Haslet	3,205	1,899	372	174.87	0.59	2,327	456	174.93	0.73	2,587	478	164.94	0.81
Saginaw	4,778	15,878	2,970	166.98	3.32	17,084	3,062	160.00	3.58	18,915	3,284	154.99	3.96
Tarrant County	574,450	1,798,894	377,333	187.25	3.13	1,915,375	391,338	182.39	3.33	2,111,193	416,854	176.26	3.68

CITY	TOTAL LAND AREA	YEAR 2050			
		POP.	AC-FT	GPCD	POP/AC.
Fort Worth	183,796	671,067	155,600	206.99	3.65
North Richland Hills	11,675	112,232	17,475	138.99	9.61
Haltom City	7,935	44,412	6,517	130.99	5.60
Richland Hills	2,007	19,985	2,709	121.00	9.96
Watauga	2,600	29,906	4,656	138.98	11.50
Haslet	3,205	2,808	503	159.91	0.88
Saginaw	4,778	20,942	3,519	150.00	4.38
Tarrant County	574,450	2,205,610	430,303	174.16	3.84

Notes:

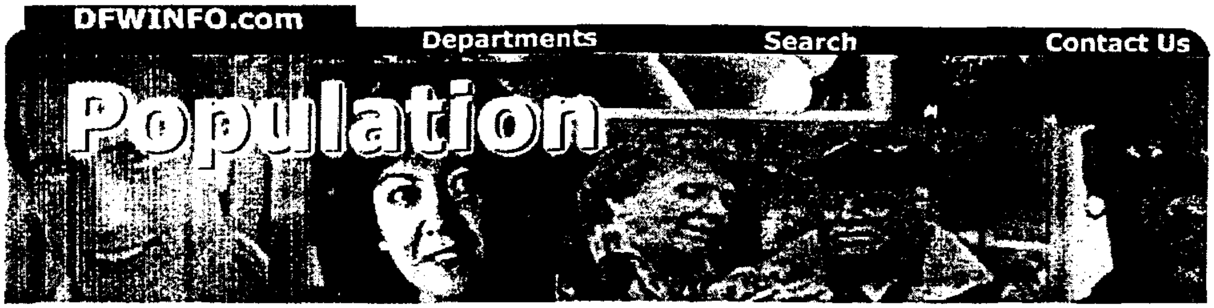
Popluation Projections Web Site:
http://www.twdb.state.tx.us/popwuse/PopulationC.htm

Water Use Web Site:
http://www.twdb.state.tx.us/popwuse/MunicipalC.htm

GPCD = AC-FT x 43,560 c.f./acre-ft x 7.48 gal/c.f. / 365 days/year / Popluation

N.C.T.C.O.G.

REGIONAL POPULATION DATA



1999 Population Estimates

1999 Population Estimates By City

April 22, 1999 Population Estimates
Presentation to the NCTCOG Executive Board

Dallas Morning News article, April 23, 1999

Fort Worth Star Telegram article, April 23, 1999

Fort Worth Star Telegram article- NE Tarrant, April 23, 1999

Fort Worth Star Telegram article- Arlington, April 23, 1999

Fort Worth Star Telegram article- Arlington, April 26, 1999

1998 Population Estimates By Census Tract

Interactive query of Population Estimates Data

**For additional assistance please call (817) 695-9150 or email us.

Downloadable Data

1999 Population Estimates by City
Excel , Text File , Dbf File , README

1998 Population Estimates by Census Tract
Text File , Dbf File , README

1970, 1980, 1990 Census Popluation Data

Text File

1990 U.S. Census Reports Population & Housing Profile for North Central Texas
Cities and Counties

Geographic Information Systems(GIS) Data - City Boundaries, Census Tracts, etc...

Other Related Links

County Population Data - 1970 to present, US States, MSA and Counties. Texas A&M Real Estate Center

1990 and 1996 Estimates of Cities with Populations over 100,000 - Ranks Cities Nationally

Historical Population and Projections, Texas State Data Center

Population Projections by race/ethnicity for counties in Texas, Texas Comptroller of Public Accounts

Population and Economic Detail - .XLS files for Cities, Counties, MSA's and States, Texas Comptroller of Public Accounts.

Counties and Places Population Projections in Texas - Texas Water Development Board

Fastest Growing Cities in D/FW Metroplex, 1997

1997 Total Population Growth: Top 10 Cities in D/FW Metroplex

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April 1999

North Central Texas Council of Governments
Research and Information Services

Summary of Regional Population Estimates

North Central Texas added 136,847 new residents last year for a total population of 4,963,064. This marks the third consecutive year that the region boasts a population growth of 100,000 or more persons and pushes the average annual growth in the 1990s above 90,000. Last year's growth, also, virtually guarantees a Census 2000 count in North Central Texas exceeding 5,000,000 persons.

Five cities captured 30% of all the growth in North Central Texas last year. Plano retained its lead, adding 14,550 new residents in 1998 for a total population of 220,200. This one-year growth represents an all time high for Plano. The city of Fort Worth added 10,200 persons, going over the half million threshold in 1998 with 504,350 residents. Lewisville (74,700), McKinney (43,500) and Flower Mound (47,300) round out the top five, adding about 5,000 new residents each.

Eighty-one percent (81%) of the region's population growth in 1998, or more than 100,000 persons, occurred within the boundaries of four core counties. Collin again led all counties with 35,730 new residents added. This yields an average increase of more than eight percent (8%) per year throughout the decade in Collin County. Tarrant County was second in absolute growth in 1998, with 31,142 new persons, and has now added more than 200,000 persons since 1990. For the first time, Denton County jumped to third with 24,925 persons added and Dallas County followed with 19,208 new residents.

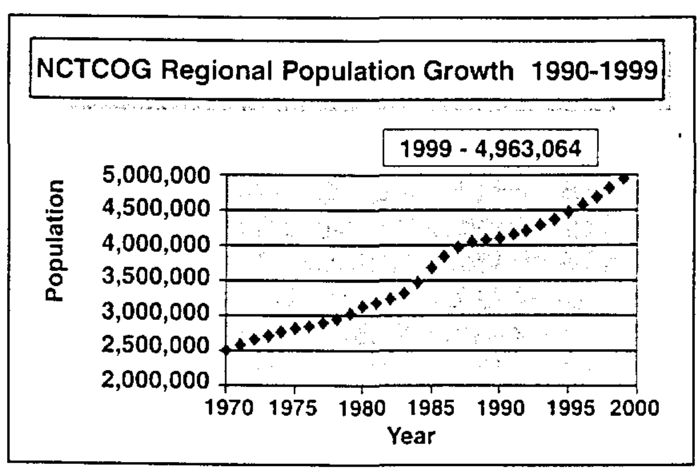
The counties beyond the urban core continue to gain in share of growth. These 12 ex-urban and rural counties added over 25,000 persons last year, with unincorporated areas accounting for 70% of this growth, or 17,500 persons. Johnson led these 12 counties in absolute growth with 4,831 new residents for a total county population of 118,677.

State Highway 121 Corridor cities continue to have the fastest growth rates in the region. The city of Frisco, which added 4,350 new residents in 1998, pushed their population 327 percent above the 1990 census count to 26,200 persons. Similarly, Flower Mound and Southlake tripled their 1990 totals. Four other cities doubled their 1990 population and all fall within the Corridor: Allen (39,000), Coppell (33,050), Corinth (9,150) and McKinney (43,500).

Construction in North Central Texas was up by more than 18 percent last year with 45,000 new homes added. More than 2,400 single-family homes were built in each month of 1998 and the multi-family industry rebounded by adding 16,100 new units, an increase of almost 50% over 1997. Further, the current inventory of multi-family units permitted or under construction exceeds 30,000 units.

Employment growth in North Central Texas has been the driving force behind the incredible population growth in the last part of this decade. Jobs were created at unprecedented rates in the last few years, peaking with more than 100,000 new jobs in 1997. However, in 1998, job growth slowed by nearly ten percent (10%) in the region. Yet, the multi-family industry is constructing units at a record pace in an attempt to keep up with the all of the migrants moving to North Texas.

Local analysts are watching these three interrelated trends of job, population and construction growth closely in 1999 to see where the next blip on the radar screen surfaces. Without a doubt, this region will reach five million by 2000. But, what else will the millennium bring?



	Final Census 4/1/70	Final Census 4/1/80	Final Census 4/1/90	Estimated Population 1/1/95	Revised Population 1/1/98	Estimated Population 1/1/99	Percent Growth 1998-99
Collin County	**66,920**	**144,576**	**264,036**	**348,400**	**426,312**	**462,042**	**8.38%**
Allen*	1,940	8,314	19,315	26,900	34,800	39,000	12.07%
Celina	1,272	1,520	1,737	1,750	1,900	1,900	0.00%
Fairview	463	893	1,554	2,000	2,700	2,850	5.56%
Farmersville	2,311	2,360	2,640	2,650	2,750	2,800	1.82%
Frisco*	1,845	3,499	6,138	13,850	21,850	26,200	19.91%
Lucas	540	1,370	2,205	2,400	2,900	3,050	5.17%
McKinney	15,193	16,256	21,283	28,400	38,150	43,500	14.02%
Murphy	261	1,150	1,547	1,650	2,250	2,600	15.56%
Parker*	367	1,098	1,213	1,450	1,700	1,750	2.94%
Plano*	17,872	72,331	127,885	169,900	205,650	220,200	7.08%
Princeton*	1,105	3,408	2,448	2,500	2,750	2,900	5.45%
Prosper	501	675	1,018	1,200	1,550	1,650	6.45%
Wylie	2,675	3,152	8,716	9,650	11,600	12,400	6.90%
Remainder of Collin County	17,785	20,109	30,019	33,100	37,450	39,250	4.81%
Split Cities	2,790	8,441	36,318	51,000	58,312	61,992	6.31%
Dallas County	**1,327,696**	**1,556,419**	**1,852,810**	**1,931,150**	**2,023,736**	**2,042,944**	**0.95%**
Addison	593	5,553	8,783	10,200	12,300	12,400	0.81%
Balch Springs	10,464	13,746	17,406	18,300	18,700	18,750	0.27%
Cedar Hill*	2,610	6,849	19,988	24,450	27,650	29,600	7.05%
Cockrell Hill	3,515	3,262	3,746	3,800	3,800	3,800	0.00%
Coppell	1,728	3,826	16,881	24,050	29,850	33,050	10.72%
Dallas*	844,401	904,078	1,007,618	1,034,400	1,065,200	1,068,800	0.34%
DeSoto	6,617	15,538	30,544	33,950	36,050	36,850	2.22%
Duncanville*	14,105	27,781	35,008	35,300	36,150	36,300	0.41%
Farmers Branch	27,492	24,863	24,250	24,500	26,100	26,900	3.07%
Garland*	81,437	138,857	180,635	193,200	201,200	204,000	1.39%
Glenn Heights	257	1,033	4,564	4,650	5,900	6,400	8.47%
Grand Prairie*	50,904	71,462	99,606	104,350	112,400	115,150	2.45%
Highland Park	10,133	8,909	8,739	9,050	9,400	9,400	0.00%
Hutchins	1,715	2,837	2,719	2,750	2,750	2,750	0.00%
Irving	97,260	109,943	155,037	166,350	182,500	183,350	0.47%
Lancaster	10,522	14,807	22,117	22,750	23,300	24,250	4.08%
Mesquite	55,131	67,053	101,484	109,850	117,950	119,600	1.40%
Richardson	48,405	72,496	74,840	78,750	86,700	89,200	2.88%
Rowlett	2,243	7,522	23,260	32,350	39,250	41,250	5.10%
Sachse	777	1,640	5,346	6,700	7,350	8,300	12.93%
Seagoville	4,390	7,304	8,969	9,500	10,350	10,400	0.48%
Sunnyvale	995	1,404	2,228	2,300	2,450	2,650	8.16%
University Park	23,498	22,254	22,259	23,000	23,850	23,900	0.21%
Wilmer	1,922	2,367	2,479	2,500	2,650	2,650	0.00%
Remainder of Dallas County	18,941	9,181	6,197	6,250	6,400	6,450	0.78%
Split Cities	7,641	11,854	(31,893)	(52,100)	(66,464)	(73,206)	10.14%
Denton County	**75,633**	**143,126**	**273,525**	**320,400**	**375,990**	**400,915**	**6.63%**
Argyle	443	1,111	1,575	1,950	2,050	2,150	4.88%
Aubrey	731	948	1,138	1,100	1,150	1,200	4.35%
Carrollton	13,855	40,595	82,169	90,950	97,950	102,350	4.49%
Copper Canyon	NI	465	978	1,150	1,250	1,300	4.00%
Corinth	461	1,264	3,944	4,900	7,300	9,150	25.34%
Denton	39,874	48,063	66,270	69,800	73,200	75,300	2.87%
Double Oak	NI	836	1,664	1,800	2,150	2,250	4.65%
Flower Mound	1,685	4,402	15,527	29,600	42,500	47,300	11.29%
Hickory Creek	218	1,422	1,893	2,000	2,050	2,050	0.00%
Highland Village	516	3,246	7,027	10,350	11,700	12,150	3.85%
Justin	741	920	1,234	1,300	1,450	1,550	6.90%
Krum	454	917	1,542	1,650	1,800	1,900	5.56%
Lake Dallas	1,431	3,177	3,656	4,150	5,550	5,900	6.31%
Lewisville	9,264	24,273	46,521	53,350	69,200	74,700	7.95%
Little Elm	363	926	1,255	1,150	2,050	2,200	7.32%
Pilot Point	1,663	2,211	2,538	2,800	3,100	3,250	4.84%
Roanoke	817	910	1,616	1,900	2,100	2,150	2.38%
Sanger*	1,603	2,754	3,514	4,100	5,050	5,200	2.97%
Shady Shores	543	813	1,045	1,350	1,550	1,650	6.45%
The Colony	NI	11,586	22,113	23,150	24,400	25,750	5.53%
Trophy Club	NI	NI	3,922	4,400	5,850	6,200	5.98%
Remainder of Denton County	12,826	19,870	28,072	31,800	36,400	38,400	5.49%
Split Cities	(11,855)	(27,583)	(25,688)	(24,300)	(23,810)	(23,135)	-2.83%
Ellis County	**46,638**	**59,743**	**85,167**	**91,700**	**103,718**	**107,858**	**3.99%**
Ennis*	11,046	12,110	13,869	14,450	15,200	15,550	2.30%
Ferris	2,180	2,228	2,212	2,200	2,200	2,200	0.00%
Italy	1,309	1,306	1,699	1,750	1,800	1,800	0.00%
Midlothian*	2,322	3,219	5,040	5,800	6,900	7,250	5.07%
Oak Leaf	NI	NI	984	1,000	1,050	1,200	14.29%
Ovilla	339	1,067	2,027	2,550	2,900	3,050	5.17%
Palmer	601	1,187	1,659	1,650	1,800	1,800	0.00%
Red Oak	767	1,882	3,124	3,600	5,000	5,100	2.00%
Waxahachie*	13,452	14,624	17,984	19,100	20,300	20,700	1.97%
Remainder of Ellis County	14,431	21,926	35,857	38,900	45,500	47,850	5.16%
Split Cities	191	194	712	700	1,068	1,358	27.15%

	Final Census 4/1/70	Final Census 4/1/80	Final Census 4/1/90	Estimated Population 1/1/95	Revised Population 1/1/98	Estimated Population 1/1/99	Percent Growth 1998-99
Erath County	**18,141**	**22,560**	**27,991**	**29,050**	**31,250**	**31,850**	**1.92%**
Dublin	2,810	2,723	3,190	3,250	3,300	3,400	3.03%
Stephenville	9,277	11,881	13,502	13,700	14,600	14,650	0.34%
Remainder of Erath County	6,054	7,956	11,299	12,100	13,350	13,800	3.37%
Hood County	**6,368**	**17,714**	**28,981**	**32,350**	**37,800**	**39,450**	**4.37%**
Granbury	2,473	3,332	4,045	4,250	6,050	6,500	7.44%
Remainder of Hood County	3,895	14,382	24,936	28,100	31,750	32,950	3.78%
Hunt County	**47,948**	**55,248**	**64,343**	**65,400**	**69,700**	**71,500**	**2.58%**
Caddo Mills	935	1,060	1,068	1,100	1,100	1,150	4.55%
Commerce	9,534	8,136	6,825	7,000	7,650	7,750	1.31%
Greenville	22,043	22,161	23,071	23,250	24,400	24,600	0.82%
Quinlan	844	1,002	1,360	1,450	1,550	1,550	0.00%
Wolfe City	1,433	1,594	1,505	1,550	1,600	1,600	0.00%
Remainder of Hunt County	13,159	21,295	30,514	31,050	33,400	34,850	4.34%
Johnson County	**45,769**	**67,649**	**97,165**	**103,750**	**113,846**	**118,677**	**4.24%**
Alvarado	2,129	2,701	2,918	3,000	3,200	3,250	1.56%
Burleson	7,713	11,734	16,113	17,950	19,450	20,400	4.88%
Cleburne	16,015	19,218	22,205	22,700	24,700	25,000	1.21%
Grandview	935	1,205	1,245	1,250	1,300	1,300	0.00%
Joshua*	924	1,470	3,821	4,300	5,400	5,450	0.93%
Keene	2,440	3,013	3,944	4,450	4,500	4,550	1.11%
Venus	414	518	977	1,600	1,700	1,800	5.88%
Remainder of Johnson County	16,133	28,891	47,285	50,950	56,450	59,900	6.11%
Split Cities	(934)	(1,101)	(1,343)	(2,450)	(2,854)	(2,973)	4.17%
Kaufman County	**32,392**	**39,015**	**52,220**	**56,750**	**62,779**	**65,880**	**4.94%**
Combine	249	698	1,329	1,450	1,550	1,550	0.00%
Crandall	774	831	1,652	2,100	2,350	2,350	0.00%
Forney	1,745	2,483	4,070	4,450	4,950	5,200	5.05%
Kaufman*	4,012	4,658	5,251	5,500	5,700	5,850	2.63%
Kemp	999	1,035	1,184	1,200	1,200	1,200	0.00%
Mabank	1,239	1,443	1,458	1,550	1,750	1,750	0.00%
Terrell	14,182	13,225	12,490	12,650	12,950	13,200	1.93%
Remainder of Kaufman County	9,320	14,779	25,494	28,300	32,800	35,250	7.47%
Split Cities	(128)	(137)	(708)	(450)	(471)	(470)	-0.21%
Navarro County	**31,150**	**35,323**	**39,926**	**40,300**	**40,650**	**41,100**	**1.11%**
Corsicana	19,972	21,712	22,911	23,000	23,050	23,300	1.08%
Kerens	1,446	1,582	1,702	1,700	1,700	1,750	2.94%
Remainder of Navarro County	9,732	12,029	15,313	15,600	15,900	16,050	0.94%
Palo Pinto County	**28,962**	**24,062**	**25,055**	**25,550**	**25,731**	**25,980**	**0.97%**
Mineral Wells*	18,411	14,468	14,935	14,850	15,650	15,700	0.32%
Remainder of Palo Pinto County	10,586	9,631	10,602	10,750	11,250	11,450	1.78%
Split Cities	(35)	(37)	(482)	(50)	(1,169)	(1,170)	0.09%
Parker County	**33,888**	**44,609**	**64,785**	**73,550**	**84,911**	**89,047**	**4.87%**
Aledo	620	1,027	1,169	1,200	1,450	1,500	3.45%
Hudson Oaks	NI	309	711	1,150	1,250	1,250	0.00%
Reno	688	1,174	2,322	2,450	2,700	2,800	3.70%
Springtown	1,194	1,658	1,740	1,800	2,050	2,100	2.44%
Weatherford	11,750	12,049	14,804	16,550	18,900	19,500	3.17%
Willow Park	230	1,113	2,328	3,050	3,400	3,550	4.41%
Remainder of Parker County	18,617	26,349	40,026	46,100	52,750	55,950	6.07%
Split Cities	789	930	1,685	1,250	2,411	2,397	-0.58%
Rockwall County	**7,046**	**14,528**	**25,604**	**31,050**	**36,781**	**39,316**	**6.89%**
Heath	520	1,459	2,108	2,750	3,350	3,650	8.96%
Rockwall	3,121	5,939	10,486	12,200	14,600	15,850	8.56%
Royse City	1,535	1,566	2,206	2,650	2,900	2,950	1.72%
Remainder of Rockwall County	1,605	4,567	7,525	8,700	9,900	10,450	5.56%
Split Cities	265	997	3,279	4,750	6,031	6,416	6.38%
Somervell County	**2,793**	**4,154**	**5,360**	**5,600**	**6,200**	**6,350**	**2.42%**
Glen Rose	1,554	2,075	1,949	1,950	2,000	2,000	0.00%
Remainder of Somervell County	1,239	2,079	3,411	3,650	4,200	4,350	3.57%
Tarrant County	**715,587**	**860,880**	**1,170,103**	**1,258,450**	**1,345,413**	**1,376,555**	**2.31%**
Arlington*	90,229	160,113	261,717	281,150	304,950	309,250	1.41%
Azle	4,493	5,822	8,868	9,300	9,500	9,600	1.05%
Bedford	10,049	20,821	43,762	45,900	48,450	48,900	0.93%
Benbrook	8,169	13,579	19,564	20,250	21,500	21,600	0.47%
Blue Mound	1,283	2,169	2,133	2,400	2,450	2,450	0.00%
Colleyville	3,342	6,700	12,724	16,200	18,600	19,250	3.49%
Crowley	2,662	5,852	6,974	7,150	7,450	7,650	2.68%
Dalworthington Grdns	757	1,100	1,758	2,050	2,150	2,200	2.33%
Edgecliff Village	1,143	2,695	2,715	2,750	2,750	2,750	0.00%
Euless	19,316	24,002	38,149	39,900	42,800	44,700	4.44%
Everman	4,570	5,387	5,672	5,750	5,700	5,700	0.00%
Forest Hill	8,236	11,684	11,482	11,550	11,550	11,550	0.00%
Fort Worth	393,455	385,164	447,619	473,600	494,150	504,350	2.06%

	Final Census 4/1/70	Final Census 4/1/80	Final Census 4/1/90	Estimated Population 1/1/95	Revised Population 1/1/98	Estimated Population 1/1/99	Percent Growth 1998-99
Grapevine*	7,049	11,801	29,198	33,100	37,150	38,750	4.31%
Haltom City	28,127	29,014	32,856	33,500	35,350	36,200	2.40%
Haslet	276	262	795	1,000	1,050	1,150	9.52%
Hurst	27,215	31,420	33,574	35,650	36,300	36,550	0.69%
Keller	1,474	4,156	13,683	18,250	22,650	24,350	7.51%
Kennedale	3,076	2,594	4,096	4,850	5,400	5,700	5.56%
Lake Worth	4,958	4,394	4,591	4,650	4,600	4,600	0.00%
Mansfield*	3,658	8,102	15,615	19,850	23,800	25,600	7.56%
N. Richland Hills	16,514	30,592	45,895	50,650	53,100	54,850	3.30%
Pantego	1,779	2,431	2,371	2,400	2,400	2,400	0.00%
Pelican Bay	NI	NI	1,271	1,300	1,500	1,500	0.00%
Richland Hills	8,865	7,977	7,978	8,150	8,500	8,750	2.94%
River Oaks	8,193	6,890	6,580	6,600	6,600	6,600	0.00%
Saginaw	2,382	5,736	8,551	9,400	11,000	11,750	6.82%
Sansom Park	4,771	3,921	3,928	3,900	3,950	3,950	0.00%
Southlake*	2,031	2,808	7,082	13,350	19,250	21,050	9.35%
Watauga	3,778	10,284	20,009	21,100	22,000	22,000	0.00%
Westworth Village	4,578	3,651	2,350	1,850	1,900	1,950	2.63%
White Settlement	13,449	13,508	15,472	15,400	15,500	15,500	0.00%
Remainder of Tarrant County	24,110	29,854	33,232	34,050	34,500	34,650	0.43%
Split Cities	1,600	6,397	17,839	21,500	26,913	28,755	6.84%
Wise County	**19,687**	**26,575**	**34,679**	**36,850**	**41,400**	**43,600**	**5.31%**
Boyd	695	889	1,041	1,100	1,100	1,150	4.55%
Bridgeport	3,614	3,737	3,581	3,600	3,700	3,700	0.00%
Decatur*	3,240	4,104	4,245	4,400	4,550	4,800	5.49%
Remainder of Wise County	12,138	17,845	25,812	27,750	32,050	33,950	5.93%
Nine County Urban Area (Collin, Dallas, Denton, Ellis Johnson, Kaufman, Parker, Rockwall, Tarrant	2,351,569	2,930,545	3,885,415	4,215,200	4,573,486	4,703,234	2.84%
NCTCOG Region (16 counties)	2,508,442	3,119,806	4,111,750	4,450,300	4,826,217	4,963,064	2.84%

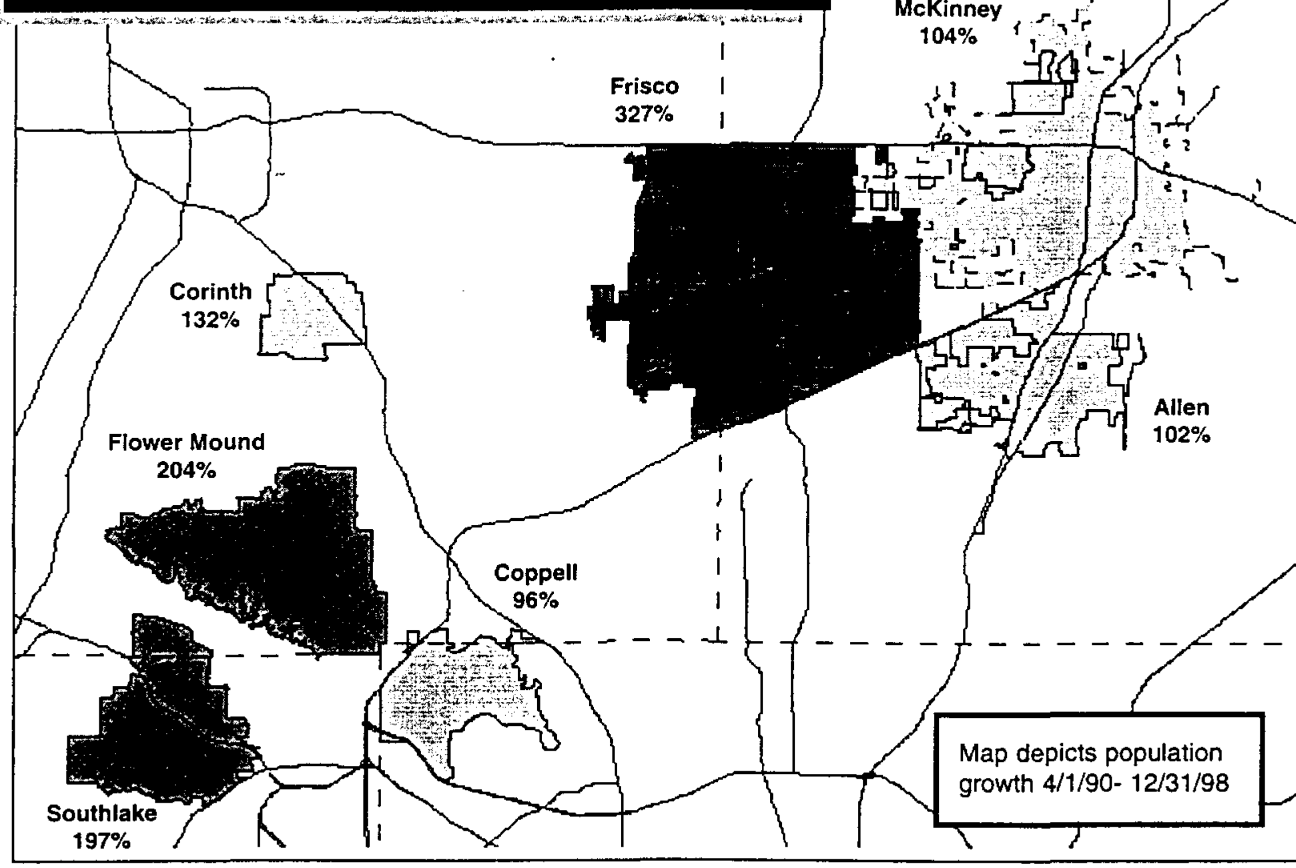
* *1990 population totals have been officially changed by the Census Bureau.*

SPLIT CITY TOTALS

Added to	Split Cities	Population	Added to	Split Cities	Population
Collin County	**Dallas**	**45,533**	**Ellis County**	**Cedar Hill**	**222**
	Garland	**15**		**Glenn Heights**	**1,277**
	Richardson	**19,246**		**Grand Prairie**	**4**
	Royse City	**198**		**Mansfield**	**158**
	Sachse	**1,288**			
			Johnson County	**Mansfield**	**390**
Dallas County	**Carrollton**	**46,541**			
	Combine	**449**	**Kaufman County**	**Dallas**	**8**
	Grapevine	**6**		**Seagoville**	**6**
	Lewisville	**1,711**			
	Ovilla	**303**	**Parker County**	**Azle**	**1,228**
	Wylie	**171**		**Mineral Wells**	**1,170**
Denton County	**Dallas**	**20,765**	**Rockwall County**	**Dallas**	**77**
	Coppell	**6**		**Garland**	**0**
	Fort Worth	**3**		**Rowlett**	**6,336**
	Frisco	**1,646**		**Wylie**	**201**
	Plano	**2,269**			
	Southlake	**428**	**Tarrant County**	**Burleson**	**3,363**
				Grand Prairie	**27,605**

For technical questions, contact *Angi Young,* Research and Information Services, NCTCOG. To order copies of this and other COG publications, contact *Alice Tate,* Regional Information Center, NCTCOG, 616 Six Flags Drive, Suite 200, P. O. Box 5888, Arlington, Texas 76005-5888, (817) 640-3300.

Fastest Growing Cities in the '90s



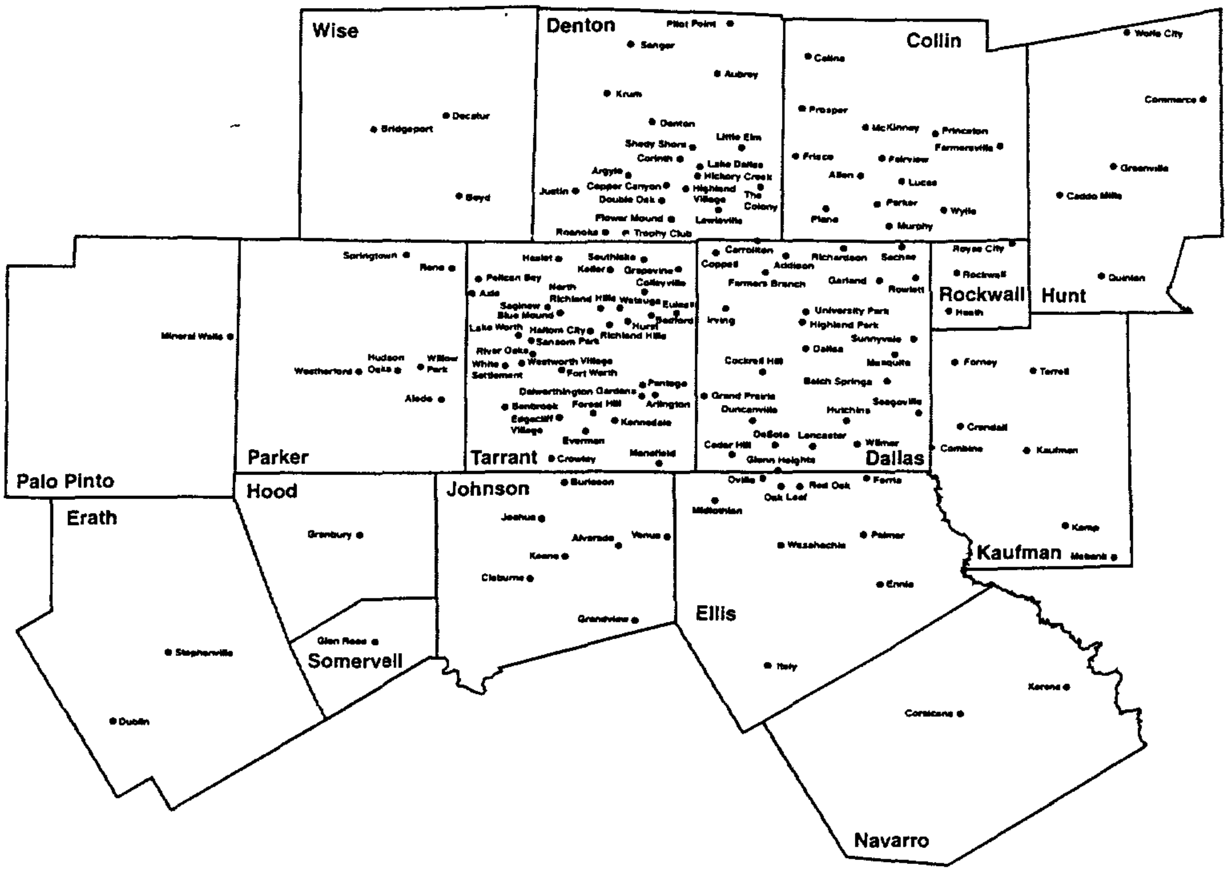
Population Estimates Methodology:

NCTCOG's population estimates are based on current housing inventories for each city in the NCTCOG region with a population of 1,000 or more. The figures are reviewed at the regional level for consistency with other indicators of regional population such as labor force estimates and vital statistics.

Cities complete a building permit form that provides NCTCOG with information on building completions, demolitions, annexations and other changes in housing stock that occurred throughout the prior year. The reported housing units by type (single family, multi family, other) are added to the 1990 Census housing stock figures to develop estimates of current year housing stock. Persons per household figures and occupancy rates were adjusted slightly in order to account for national trends as well as regional and local rates observed from secondary data sources and surveys. These rates were used in conjunction with building permit data to produce city level population estimates. Final population for January 1, 1999 also includes estimates of persons living in group quarters (nursing homes, dormitories, etc.). All figures are reviewed by each city prior to publication. County level estimates are adjusted for cities that are in more than one county. Remainder of county totals are estimated based upon secondary resources and have been adjusted to reflect annexations.

Revised population estimates require prior year adjustments through methodological changes to ensure consistency. The percent growth column provides a convenient indicator of the annual growth for each city and county.

Map of the North Central Texas Region
(All Cities over 1,000)



North Central Texas Council of Governments
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North Central Texas Council of Governments • Research and Information Services

The North Central Texas Council of Governments (NCTCOG) 1998 Population by Census Tract is part of the Research and Information Services Department's Annual Population Estimates program. The tract estimates cover 810 census tracts that are located completely within the Metropolitan Planning Area (MPA). The MPA is designated for regional transportation planning and includes all of Collin, Dallas, Denton, Rockwall and Tarrant counties as well as portions of Ellis, Johnson, Kaufman and Parker.

The MPA is now home to 4,403,750 persons, growing by almost as much in the last three years (314,150), as it did in the first five years of the decade (321,350). The average annual growth of nearly 105,000 per year since 1995 exceeds the totals achieved in the 1980s and is driven by unprecedented economic expansion in North Central Texas.

Census tract data allows us to look beyond city and county boundaries to market-defined areas of development. At this level of analysis, the State Highway (SH) 121 corridor reigns as the dominant residential growth market throughout the 1990s. This corridor, which crosses four counties and 14 cities, emerged as the fastest growing sector in our region in the first half of this decade with 103,010 new residents. In the last three years, another 113,618 persons were added to this area, for a total 1990s increase of 216,628 or 58% of the MPA total.

The power of the SH 121 Corridor has contributed to the emergence of the SH 114 Corridor in the last three years. Jutting northwest from 121 and sitting strategically between DFW and Alliance Airports, the 114 corridor combines with 121 to capture almost 40% of all the growth in the MPA from 1995 through 1997 (119,791 persons). Not surprisingly, then, eight of the top ten census tracts in absolute growth are included in the new SH 121/114 Corridor that now boasts 639,231 residents.

The location of the 114 Corridor and portions of 121 in Denton explains this county's increase in share of population growth to 17 percent of the MPA total in the last three years. This is a three percent jump over its' share the first half of the 1990s, taken fairly evenly from the surrounding counties.

The NCTCOG tract analysis also gives us an opportunity to look at interesting growth areas within the region that are sometimes lost, such as the neighborhood in and around the Dallas Central Business District (CBD). Central Dallas population is so dense that the census tracts in this area are very small in comparison to the rest of the region. However, when central area tracts are combined to achieve a more normal land mass, they take on the character of some of the region's highest growth tracts.

The expanded Dallas CBD includes 12 census tracts and is home to 11,500 persons on 2,265 acres of land. This is an area that is less than half the size of an average census tract in the MPA and one-fourth the average size of the top ten growth tracts. However, despite this smaller size, the expanded CBD has grown at a ratio equal to that of the top ten tracts. Average tracts in this region have grown by one person per 10 acres since 1990. The ten fastest growing tracts and the expanded CBD area have each grown by more than ten times that rate or one person per one acre. In absolute growth, the CBD tract ranks 28th in the MPA.

The "Downtown" Census Tract

	Avg. MPA Tract	Avg. Top 10Tract	"Downtown" Tract
Acres	5,447	9,518	2,265
95-97 Pop.	393	5,581	2,333
Total 1998	5,398	17,193	11,500
Density	1	1.8	5

1990 Tract	1990 Population	1995 Population	1998 Population
1.00	3,274	3,287	3,537
2.01	2,486	2,492	2,490
2.02	3,291	3,305	3,308
3.00	3,183	3,202	3,210
4.01	3,744	3,775	3,813
4.03	5,415	5,433	5,442
4.04	4,109	4,147	4,163
4.05	2,312	2,337	2,418
5.00	4,911	4,963	5,005
6.01	6,499	6,812	6,849
6.03	3,903	3,943	3,993
6.04	3,962	3,998	4,052
7.01	2,086	2,110	2,621
7.02	2,909	3,206	3,386
8.00	4,616	4,655	4,698
9.00	5,248	5,301	5,306
10.01	1,817	1,827	1,830
10.02	2,747	2,763	2,775
11.01	3,652	3,677	3,691
11.02	2,014	2,029	2,028
12.01	3,842	3,855	3,864
12.02	3,105	3,132	3,142
13.01	2,522	2,561	2,569
13.02	3,215	3,244	3,258
14.00	4,132	4,191	4,205
15.02	3,849	3,888	3,896
15.03	3,982	4,026	4,058
15.04	3,027	3,058	3,082
16.00	2,716	2,816	2,828
17.01	1	1	38
17.02	433	794	1,353
18.00	1,460	1,533	1,577
19.00	830	833	1,284
20.00	6,246	6,310	6,347
21.00	0	0	0
22.01	915	917	918
22.02	398	402	1,177
24.00	3,803	3,821	3,827
25.00	5,883	5,909	5,933
27.01	4,683	4,722	4,734
27.02	2,168	2,176	2,187
28.00	418	421	422
29.00	1,051	1,062	1,063
31.01	2,841	2,843	2,846
31.02	92	92	92
32.01	602	601	602
33.00	1,570	1,577	1,579
34.00	1,665	1,681	1,683
35.00	1,883	1,901	1,906
36.00	1,010	1,015	1,022
37.00	4,194	4,210	4,211
38.00	3,018	3,085	3,093
39.01	2,170	2,185	2,203
39.02	2,423	2,436	2,435
40.00	1,709	1,719	1,720
41.00	1,538	1,545	1,540
42.00	8,050	8,107	8,133
43.00	4,829	4,869	4,875
44.00	3,248	3,261	3,273
45.00	5,041	5,065	5,109
46.00	2,307	2,321	2,326
47.00	3,358	3,381	3,400
48.00	3,756	3,791	3,833
49.00	4,152	4,164	4,155
50.00	4,023	4,031	4,045
51.00	2,775	2,780	2,788
52.00	4,153	4,170	4,181
53.00	6,205	6,221	6,237
54.00	5,401	5,414	5,407

1990 Tract	1990 Population	1995 Population	1998 Population
55.00	4,295	4,308	4,306
56.00	6,139	6,156	6,162
57.00	4,913	4,921	4,916
59.01	6,173	6,184	6,186
59.02	4,445	4,462	4,463
60.01	3,197	3,213	3,220
60.02	4,027	4,065	4,070
61.00	4,248	4,276	4,291
62.00	4,464	4,483	4,489
63.01	4,569	4,580	4,595
63.02	3,300	3,306	3,308
64.00	6,938	6,967	6,974
65.01	3,281	3,291	3,303
65.02	3,159	3,164	3,190
67.00	6,101	6,130	6,146
68.00	5,251	5,295	5,288
69.00	2,612	2,634	2,637
71.01	1,996	2,010	2,014
71.02	5,773	5,796	5,797
72.01	4,935	4,988	5,020
72.02	4,930	4,983	5,012
73.01	1,985	1,990	1,994
73.02	3,606	3,621	3,747
74.00	1,395	1,406	1,436
75.01	622	627	6,48
75.02	381	388	389
76.01	1,987	1,996	2,002
76.02	814	816	817
76.03	917	919	924
76.04	2,858	2,902	3,004
77.00	4,961	5,049	5,191
78.01	1,996	2,003	2,046
78.04	4,343	4,372	4,887
78.05	3,029	3,100	3,136
78.06	5,313	5,370	5,415
78.09	2,202	2,215	2,226
78.10	4,910	4,941	4,967
78.11	4,048	4,094	4,125
78.12	3,533	3,545	3,543
78.13	6,774	6,811	6,879
78.14	4,491	4,543	4,762
78.15	3,897	3,941	3,977
78.16	6,038	6,109	6,152
78.17	7,133	7,217	7,264
79.02	5,488	5,507	5,521
79.03	2,574	2,590	2,602
79.05	4,094	4,267	4,330
79.06	1,460	1,489	1,506
79.07	3,791	3,836	3,840
79.08	5,447	5,512	5,528
80.00	6,015	6,026	6,029
81.00	5,260	5,461	5,541
82.00	3,797	3,816	3,874
83.00	1,333	1,336	1,333
84.00	5,470	5,488	5,488
85.00	3,356	3,383	3,410
86.01	1,107	1,117	1,122
86.02	2,588	2,608	2,601
87.01	5,189	5,222	5,764
87.03	2,993	2,999	3,012
87.04	5,153	5,191	5,213
87.05	1,924	1,925	1,934
88.01	2,862	2,869	2,869
88.02	6,071	6,094	6,096
89.00	4,696	4,725	4,734
90.01	1,169	1,177	1,177
90.02	4,343	4,359	4,373
91.01	5,058	5,094	5,108
91.02	7,832	7,856	7,866

1990 Tract	1990 Population	1995 Population	1998 Population
92.01	4,830	4,838	4,830
92.02	4,397	4,429	4,434
93.01	3,194	3,200	3,206
93.03	4,317	4,324	4,331
93.04	5,110	5,145	5,153
94.01	3,161	3,170	3,164
94.02	2,209	2,215	2,248
95.00	2,274	2,278	2,279
96.03	4,744	4,762	4,768
96.04	4,045	4,087	4,101
96.05	2,774	2,791	2,799
96.06	5,843	5,893	5,942
96.07	3,114	3,122	3,129
96.08	4,752	4,781	4,803
96.09	2,982	2,988	2,985
97.01	3,564	3,576	3,575
97.02	2,994	3,003	3,003
98.01	7,961	8,042	8,058
98.02	4,600	4,629	4,680
99.00	1,451	1,450	1,453
100.00	3,265	3,269	3,314
101.01	4,242	4,247	4,269
101.02	3,649	3,653	3,737
102.00	1,756	1,769	1,772
103.00	433	437	438
104.00	2,122	2,150	2,156
105.00	2,575	2,598	2,602
106.00	7,743	7,796	7,996
107.01	2,901	2,908	2,897
107.02	5,394	5,425	5,691
108.01	5,816	5,851	5,850
108.02	5,806	5,851	5,862
108.03	6,529	6,566	6,587
109.00	8,385	8,472	9,126
110.01	6,887	6,954	6,963
110.02	3,216	3,225	3,226
111.01	4,153	4,171	4224
111.03	3,518	3,526	3526
111.04	3,958	3,975	3,994
111.05	4,587	4,621	4,632
112.00	3,465	3,476	3,475
113.00	5,187	5,202	5,201
114.01	3,822	3,845	3,862
114.02	917	953	955
115.00	4,967	5,015	5,018
116.01	4,310	4,327	4,339
116.02	3,440	3,447	3,454
117.00	8,640	8,676	8,689
118.00	6,836	6,910	7,153
119.00	7,319	7,361	7,488
120.00	5,395	5,432	5,447
121.00	2,928	2,955	3,156
122.02	8,875	8,932	9,031
122.03	4,589	4,630	4,652
122.04	5,143	5,168	5,174
122.05	7,313	7,382	7,416
123.00	8,002	8,076	8,128
124.00	4,847	4,868	4,876
125.00	6,299	6,315	6,318
126.01	4,577	4,748	4,744
126.02	6,216	6,262	6,292
127.00	7,291	7,319	7,320
128.00	6,948	6,968	6,984
129.00	4,436	4,451	4,467
130.04	5,705	5,721	5,733
130.05	5,138	5,199	5,215
130.06	6,404	6,475	6,517
130.07	2,946	2,962	2,962
130.08	3,101	3,114	3,113

1990 Tract	1990 Population	1995 Population	1998 Population
201.98	94	95	96
202.00	10,653	12,116	13,361
202.98	130	130	130
203.01	4,866	5,310	6,063
203.02	12,835	14,456	16,931
203.98	0	0	0
204.01	2,545	2,707	2,849
204.02	4,005	4,320	4,416
204.03	3,622	3,641	3,693
205.01	6,175	6,487	7,478
205.02	7,215	7,701	8,252
206.01	4,108	4,250	4,335
206.02	6,073	6,433	6,753
207.00	3,357	3,481	3,506
208.00	3,157	3,217	3,601
209.00	3,296	3,453	3,456
210.00	5,739	5,944	5,975
211.00	2,591	2,700	2,773
212.00	4,818	5,522	5,866
213.01	2,077	2,191	2,192
213.02	7,643	8,215	8,747
214.01	5,547	6,047	6,871
214.02	4,332	5,295	7,860
214.03	5,645	6,221	7,585
215.02	3,479	3,590	3,861
215.04	7,012	9,370	10,546
215.05	3,323	4,049	5,365
215.06	6,888	7,056	7,556
215.07	16,665	18,282	19,863
216.01	4,564	4,696	5,849
216.03	4,757	6,984	7,896
216.04	5,247	6,709	8,959
216.05	4,274	4,871	6,129
216.06	7,328	7,917	8,241
216.07	8,066	8,527	9,067
216.08	8,508	8,322	8,603
216.09	9,506	11,595	12,717
216.10	6,870	8,774	9,394
216.11	3,998	4,950	5,200
217.03	7,084	7,880	10,053
217.05	1,926	3,235	3,740
217.06	5,428	8,398	10,506
217.07	5,625	7,294	10,319
217.08	1,302	2,494	6,512
217.09	2,955	11,251	14,504
217.10	6,253	9,251	15,600
217.11	6,082	6,289	7,250
217.12	6,529	7,643	10,478
217.13	7,961	8,072	9,004
301.00	3,806	4,190	4,702
302.00	5,697	6,272	7,035
303.00	4,798	5,221	5,926
304.00	5,541	9,051	12,030
305.00	2,683	8,691	17,897
306.00	3,703	7,782	11,647
307.00	7,148	7,401	8,124
308.00	4,101	4,584	6,381
309.00	5,285	5,202	5,825
310.00	8,546	9,275	10,337
311.00	5,613	5,913	6,434
312.00	3,238	3,565	3,982
313.02	9,014	10,890	13,680
313.03	3,619	4,591	5,249
313.04	6,429	6,689	7,804
314.01	3,664	4,606	7,436
314.02	5,968	10,813	14,422
315.01	7,380	9,949	11,044
315.02	7,052	8,119	10,935
316.01	7,934	9,210	10,752
316.03	0	0	0
316.05	0	0	0
316.08	8,116	8,508	8,974
316.09	7,574	7,971	8,277
316.10	7,698	7,800	7,996
316.11	3,225	3,767	3,876
316.12	6,135	6,753	6,922
316.13	6,583	6,659	6,974
316.14	6,505	10,823	13,927
316.15	8,532	11,591	12,445
316.16	6,373	9,907	15,602
316.17	4,567	7,334	9,881
316.18	4,223	12,197	19,852
316.19	4,013	13,173	19,776
316.20	3,039	8,295	7,585
316.21	4,684	5,564	6,409
317.02	6,120	8,604	9,682
317.98	20,109	30,767	34,314
318.02	4,571	4,652	6,238
318.03	4,897	5,242	6,406
318.98	7,160	7,830	8,117
319.00	3,202	3,405	3,650
320.03	4,832	4,948	5,172
320.04	6,204	6,305	6,516
320.05	3,015	3,194	3,688
320.07	5,032	5,097	6,254
320.08	3,942	4,355	4,445
320.98	2,466	3,945	5,000
401.00	3,073	3,701	4,746
402.00	2,140	2,498	3,001
403.01	3,287	4,621	5,815
403.02	5,445	6,278	7,420
404.00	4,318	4,989	5,614
405.00	7,341	8,584	10,253
502.00	6,803	8,415	9,567
508.00	4,893	6,303	7,130
601.00	9,498	9,848	10,988
602.01	7,658	8,600	10,252
602.02	7,064	7,781	9,583
602.03	5,874	6,356	7,300
603.00	2,976	3,111	3,272
604.00	3,473	3,632	3,790
605.00	2,552	2,673	2,789
606.00	6,125	6,509	7,107
607.00	4,747	5,242	6,143
608.00	5,434	5,990	7,084
614.00	5,855	6,131	6,610
615.00	4,169	4,363	4,578
616.00	4,682	4,921	5,192
1001.01	4,718	4,852	4,905
1001.02	4,275	4,375	4,405
1002.01	3,461	3,620	3,652
1002.02	5,192	5,324	5,384
1003.00	4,097	4,276	4,309
1004.00	6,652	6,856	6,915
1005.01	5,981	6,219	6,257
1005.02	6,346	6,517	6,572
1006.01	1,810	1,872	1,889
1006.02	2,877	2,967	3,034
1007.00	3,959	4,065	4,093
1008.00	5,717	5,926	5,960
1009.00	2,309	2,364	2,377
1010.00	3,617	3,665	3,824
1011.00	1,757	1,782	1,867
1012.01	1,261	1,296	1,306
1012.02	3,701	3,803	3,833
1013.01	4,477	4,625	4,659
1013.02	3,169	3,242	3,275
1014.01	4,207	4,361	4,400
1014.02	2,583	2,625	2,648
1014.03	4,036	4,198	4,244
1015.00	3,641	3,730	3,777
1016.00	1,340	1,372	1,451
1017.00	2,796	2,840	2,900
1018.00	489	820	1,067
1019.00	574	596	608
1020.00	1,151	1,201	1,216
1021.00	5,356	5,576	5,619
1022.01	3,533	3,627	3,668
1022.02	3,017	3,148	3,180
1023.01	3,128	3,249	3,274
1023.02	4,996	5,094	5,135
1024.01	3,870	4,021	4,079
1024.02	3,986	4,091	4,119
1025.00	3,931	4,084	4,114
1026.00	6,254	6,437	6,503
1027.00	3,706	3,838	3,875
1028.00	1,322	1,363	1,376
1029.00	1,497	1,539	1,606
1030.00	1,655	1,751	1,813
1031.00	870	892	1,218
1032.00	464	482	483
1033.00	1,402	1,432	1,447
1034.00	1,005	1,024	1,032
1035.00	5,476	5,640	5,724
1036.01	2,791	3,035	3,067
1036.02	2,067	2,127	2,155
1037.01	3,622	3,878	3,939
1037.02	2,583	2,623	2,641
1038.00	3,599	3,755	3,783
1039.00	2,435	2,509	2,532
1040.00	1,961	2,012	2,050
1041.00	4,323	4,465	4,502
1042.01	5,663	5,834	6,093
1042.02	3,233	3,311	3,338
1043.00	5,045	5,219	5,262
1044.00	5,192	5,300	5,353
1045.01	7,376	7,623	7,678
1045.02	2,768	2,844	2,865
1045.03	2,863	2,950	2,979
1046.01	3,356	3,575	3,602
1046.02	3,841	3,906	3,942
1046.03	2,940	3,052	3,079
1046.04	2,323	2,356	2,387
1046.05	4,336	4,460	4,501
1047.00	5,980	6,093	6,144
1048.01	6,728	6,911	6,993
1048.02	4,704	4,824	4,887
1049.00	2,224	2,270	2,295
1050.01	5,057	5,178	5,232
1050.05	1,521	1,884	2,269
1050.06	1,177	1,189	1,226
1051.00	4,010	4,196	4,230
1052.01	4,196	4,389	4,425
1052.02	7,937	8,387	8,448
1052.03	2,054	2,104	2,125
1053.00	782	815	819
1054.03	3,390	3,494	4,146
1054.04	3,523	3,606	3,924
1054.05	3,421	3,585	4,308
1054.06	1,906	2,141	2,314
1055.02	5,730	5,873	5,918
1055.03	5,564	5,653	5,734
1055.05	4,379	4,533	4,572
1055.06	4,137	4,453	4,473
1055.07	1,001	1,790	2,383
1055.08	2,479	2,859	3,036
1055.09	10,535	10,853	10,962

1990 Tract	1990 Population	1995 Population	1998 Population
130.09	4,756	4,789	4,798
131.01	2,648	2,654	2,652
131.02	1,793	1,799	1,796
131.03	6,570	6,638	6,652
132.00	2,464	2,479	2,644
133.00	1,826	1,828	1,827
134.01	891	893	903
134.02	1,006	1,009	1,006
135.00	2,377	2,384	2,384
136.05	5,803	5,819	5,825
136.06	5,137	5,166	5,166
136.07	3,544	3,555	3,564
136.08	2,547	2,580	2,611
136.09	3,959	3,987	4,011
136.10	4,409	4,443	4,451
136.11	1,307	1,626	1,632
136.12	5,119	5,612	5,637
136.13	5,367	5,595	6,364
136.14	4,610	5,087	6,328
136.15	5,024	5,083	5,097
136.16	2,022	2,061	2,067
136.17	3,216	3,226	3,217
136.18	2,412	2,419	2,428
136.19	5,851	5,858	5,858
137.01	5,024	5,077	5,147
137.02	8,191	8,469	8,733
137.04	2,812	4,121	5,656
137.05	1	1	1
137.07	9,620	11,333	11,691
137.08	7,440	7,712	8,038
137.09	7,147	8,145	8,947
137.10	7,449	7,657	8,506
138.01	4,530	4,627	6,198
138.02	8,480	8,646	8,673
139.00	6,845	6,857	6,827
140.01	3,561	3579	3,601
140.02	325	345	275
141.01	690	1,499	1,727
141.03	2,587	2,667	3,151
141.05	582	752	1,454
141.07	6,448	9,718	11,884
141.08	5,055	9,393	10,990
141.09	3,486	5,508	7,888
141.10	2,579	3,112	5,554
141.11	3,491	7,290	9,504
141.12	4,154	4,267	4,542
141.13	3,962	4,066	4,328
141.14	2,291	2,362	2,522
141.15	6,362	6,429	6,538
141.16	4,048	4,155	4,413
141.97	9	9	9
141.98	2,645	4,101	4,556
142.01	1,714	1,736	1,795
142.02	5,593	5,672	5,855
143.02	6,390	6,459	6,599
143.03	7,960	8,117	8,481
143.04	4,573	6,568	7,598
143.05	6,520	6,672	7,034
143.06	4,792	4,835	4,900
144.02	7,229	7,340	7,588
144.03	3,676	3,774	4,014
144.04	6,763	7,186	7,608
145.00	7,004	7,091	7,307
146.00	8,100	8,235	8,549
147.00	8,248	8,457	8,801
148.01	1,141	1,143	1,162
148.02	1,308	1,346	1,383
149.00	4,229	4,311	4,495
150.00	6,656	6,789	6,979

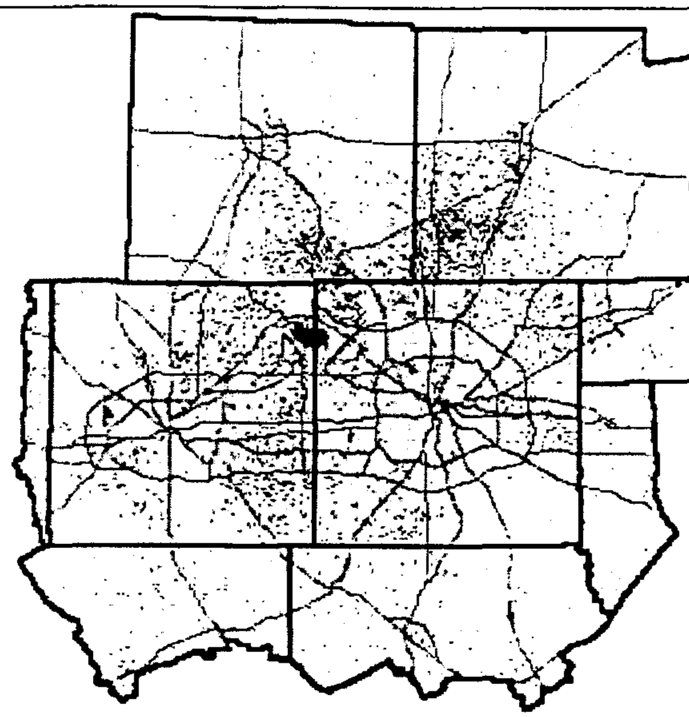
1990 Tract	1990 Population	1995 Population	1998 Population
151.00	6,309	6,376	6,542
152.02	2,929	2,977	3,076
152.03	7,100	7,202	7,431
152.04	6,528	6,808	6,884
153.01	4,036	4,035	3,417
153.02	7,317	7,384	7,539
154.01	4,701	4,678	4,752
154.02	6,187	6,238	6,184
155.00	3,358	3,353	3,387
156.00	4,067	4,071	4,108
157.00	2,429	2,432	2,432
158.00	2,313	2,315	2,286
159.00	2,757	2,784	2,782
160.00	6,116	6,241	6,247
161.00	2,362	2,350	2,363
162.00	8,101	8,148	8,127
163.00	5,605	5,665	5,719
164.01	3,247	3,610	3,818
164.02	9,724	9,681	9,721
164.03	7,944	8,956	9,468
164.04	2394	3,021	4,058
164.05	7,013	7,075	7,484
165.01	4,953	5,177	5,294
165.02	5,938	5,960	6,056
165.05	7,729	9,789	11,230
165.08	8,635	8,595	8,761
165.09	4,852	4,851	4,922
165.10	5,144	5,307	5,325
165.11	3,596	3,606	3,701
165.12	7,255	7,221	7,356
165.13	4,564	4,893	5,039
166.04	11,237	13,417	15,341
166.05	2,290	2,315	2,334
166.06	5,334	5,616	6,054
166.07	3,276	3,316	3,345
166.08	6,808	7,354	7,776
166.09	7,533	7,850	8,305
166.10	4,493	4,536	4,794
166.11	3,472	4,074	4,513
166.12	5,083	6,897	7,429
166.13	6,130	6,273	7,854
167.01	6,104	6,117	6,135
167.02	11,870	12,183	12,286
168.01	8,479	8,720	9,439
168.02	2,154	2,215	2,231
169.01	4,209	4,223	4,220
169.02	2,854	2,886	2,893
169.03	3,568	3,590	3,761
169.04	395	401	406
170.01	6,066	6,182	6,739
170.02	10,260	10,762	10,990
171.00	6,266	6,322	6,564
172.01	4,789	4,866	5,057
172.02	5,489	6,160	6,354
173.01	4,662	4,704	4,789
173.02	10,405	15,832	18,839
174.00	5,580	5,860	5,949
175.00	2,659	2,757	2,812
176.01	9,231	9,491	9,939
176.02	3,262	3,276	3,320
177.01	8,994	9,141	9,391
177.02	5,544	6,112	6,520
178.04	5,358	5,406	5,593
178.05	5,582	5,637	6,281
178.06	4,493	4,528	4,712
178.07	5,132	5,185	5,361
178.08	3,529	3,729	3,799
178.09	7,144	7,473	7,577
178.10	9,026	9,664	9,990

1990 Tract	1990 Population	1995 Population	1998 Population
179.00	4,696	4,716	4,790
180.00	9,104	9,220	9,406
181.04	3,467	3,634	3,877
181.05	5,297	5,348	5,410
181.06	6,418	7,379	7,747
181.07	9,298	11,269	12,007
181.08	8,722	13,415	16,210
181.10	4,857	4,999	5,118
181.11	5,193	5,241	5,322
181.12	8,982	9,110	9,247
181.13	11,568	11,922	12,186
181.15	10,358	11,102	11,420
181.16	5,940	7,864	8,889
181.17	6,000	7,114	8,448
181.18	4,729	5,166	5,503
181.19	4,219	5,069	5,536
182.01	7,854	8,478	9,226
182.02	6,848	7,074	7,174
183.00	5,726	5,859	5,933
184.01	4,220	4,456	4,524
184.02	3,814	3,867	3,918
184.03	2,478	2,859	2,916
185.01	3,021	3,086	3,123
185.03	3,846	3,890	3,884
185.04	3,955	4,002	4,033
186.00	3,345	3,370	3,407
187.00	5,339	5,550	5,635
188.01	3,818	3,835	3,872
188.02	767	801	808
189.00	4,784	4,896	4,982
190.04	5,849	5,966	6,038
190.07	9,900	10,267	10,391
190.08	11,482	12,627	12,962
190.09	10,675	13,124	15,413
190.10	6,643	6,739	6,870
190.12	4,787	4,982	6,457
190.13	4,501	5,179	5,321
190.14	6,217	6,366	6,439
190.15	6,895	7,151	7,256
190.16	2,559	2,582	2,587
190.17	7,157	7,221	7,569
190.18	4,597	4,627	4,644
190.19	5,989	6,062	6,116
190.20	4,555	4,995	5,073
190.21	6,689	6,914	7,011
190.22	7,124	7,151	7,193
190.23	4,942	4,990	5,050
190.24	4,403	4,434	4,479
191.00	5,021	5,082	5,197
192.02	4,209	4,312	4,478
192.03	4,045	4,086	4,139
192.04	6,757	6,962	7,295
192.05	3,428	3,439	3,448
192.06	4,411	4,450	4,490
192.08	5,389	5,440	5,473
192.09	5,750	5,818	5,897
192.10	4,027	4,192	4,197
192.11	4,666	4,758	5,456
193.01	2,463	2,546	2,801
193.02	5,991	6,161	6,079
194.00	3,578	3,715	3,829
195.01	6,002	6,218	6,659
195.02	4,231	4,368	4,511
196.00	2,304	2,429	2,561
197.00	2,146	2,216	2,317
198.00	4,236	4,363	4,480
199.00	3,746	3,798	3,788
201.01	7,502	8,313	9,284
201.02	4,094	4,394	4,968

1990 Tract	1990 Population	1995 Population	1998 Population
1055.10	3,083	3,349	3,450
1056.00	4,640	4,710	4,747
1057.01	3,479	3,557	3,588
1057.03	3,613	3,741	3,767
1057.04	5,865	6,414	6,476
1058.00	3,818	3,894	3,929
1059.00	6,724	6,922	7,050
1060.01	6,766	6,980	7,038
1060.02	3,631	3,701	3,738
1060.04	2,136	2,183	2,206
1060.05	515	527	556
1061.01	1,473	1,510	1,528
1061.02	1,887	1,959	1,979
1062.01	4,056	4,114	4,151
1062.02	4,250	4,371	4,422
1063.00	2,601	2,709	2,764
1064.00	1,637	1,672	1,684
1065.02	2,658	2,759	2,783
1065.03	4,901	5,025	5,066
1065.06	8,464	8,914	8,986
1065.07	2,002	2,100	2,115
1065.08	4,301	4,537	5,326
1065.09	2,258	2,417	2,473
1065.10	1,320	1,975	2,766
1065.11	3,588	3,860	4,009
1065.12	3,126	3,426	3,507
1065.13	2,789	2,898	2,913
1065.14	3,020	3,363	3,399
1066.00	646	966	1,662
1067.00	1,383	1,557	1,619
1101.01	5,122	5,261	5,447
1101.02	4,093	4,174	4,160
1102.01	7,985	8,277	9,600
1102.02	3,302	3,293	3,412
1103.00	8,433	8,532	8,597
1104.01	4,926	4,986	5,004
1104.02	3,911	3,906	3,929
1105.00	6,650	6,649	6,649
1106.01	2,350	1,849	1,923
1106.02	678	710	720
1107.01	7,036	7,001	7,035
1107.02	8,446	8,433	8,487
1108.01	4,559	5,599	5,962
1108.04	2,369	2,575	3,123
1109.01	3,416	3,528	3,769
1109.03	1,539	1,671	1,748
1109.04	607	618	645
1109.05	4,022	4,215	4,458
1109.06	4,627	4,743	5,049
1109.07	3,194	3,298	3,531
1110.03	2,602	2,634	2,636
1110.05	3,753	4,177	4,381
1110.06	5,242	6,306	7,163
1110.07	6,080	7,002	7,624
1110.08	2,732	2,793	2,824
1110.09	1,547	1,895	2,085
1110.10	1,217	1,265	1,282
1111.01	6,563	6,579	6,595
1111.02	5,121	5,163	5,162
1112.01	4,873	5,085	5,173
1112.02	5,653	5,727	5,693
1113.01	4,949	5,119	5,222
1113.03	1,788	3,562	5,300
1113.04	3,570	4,671	5,165
1113.05	5,634	6,506	7,167
1113.06	2,587	3,121	3,301
1114.01	3,637	5,595	6,490
1114.02	4,228	4,938	5,254
1114.03	7,848	8,408	8,896
1115.05	4,207	4,245	4,454
1115.06	6,051	6,103	6,354
1115.11	3,406	4,344	5,147
1115.12	6,443	7,556	9,529
1115.13	2,077	2,797	2,899
1115.14	4,861	5,634	5,914
1115.15	6,812	8,561	9,648
1115.16	3,655	5,658	6,359
1115.17	5,362	7,284	8,453
1115.18	1,475	2,154	3,878
1115.19	1,078	1,090	1,326
1115.21	6,555	6,599	6,926
1115.22	6,918	6,948	7,218
1115.23	4,693	4,759	5,291
1115.24	5,893	6,010	6,317
1115.25	5,495	5,701	5,969
1115.26	4,525	4,570	4,752
1115.27	6,733	6,821	7,201
1115.28	7,004	8,203	8,669
1115.29	3,829	3,847	3,983
1115.30	5,782	6,399	6,847
1115.31	4,636	4,920	5,218
1115.32	3,408	3,656	3,987
1115.33	4,192	4,632	4,914
1115.34	5,507	5,682	5,969
1115.35	478	813	1,179
1130.01	3,098	3,272	3,630
1130.02	4,671	4,944	5,239
1131.01	2,368	2,653	5,235
1131.02	4,730	4,816	5,147
1131.03	5,499	5,685	6,023
1131.04	2,504	2,934	3,221
1131.05	7,111	7,657	8,209
1131.06	8,176	8,314	8,926
1131.07	2,685	2,734	2,833
1131.08	4,308	4,517	4,689
1132.05	7,307	7,561	7,923
1132.06	4,474	4,495	4,569
1132.07	3,285	4,282	4,439
1132.08	8,338	9,030	9,239
1132.09	9,189	9,364	9,557
1132.10	3,842	5,047	5,511
1132.11	8,421	8,859	9,398
1133.01	4,384	4,456	4,529
1133.02	4,002	4,073	4,342
1134.03	3,003	3,038	3,047
1134.04	5,455	5,590	5,615
1134.05	4,538	4,800	4,892
1134.07	3,641	4,053	4,079
1134.08	5,567	5,619	5,624
1135.04	7,276	7,499	7,818
1135.05	6,803	7,456	7,766
1135.06	8,765	8,966	8,996
1135.07	6,210	6,640	7,413
1135.08	8,923	9,114	10,655
1136.07	4,233	4,303	4,344
1136.09	18,320	20,391	22,680
1136.10	4,811	5,708	6,417
1136.11	3,303	3,897	4,266
1136.12	4,305	4,398	4,569
1136.13	4,727	4,849	4,907
1136.14	7,828	8,453	9,023
1136.15	7,697	8,109	8,277
1136.16	6,542	7,021	7,926
1136.17	7,486	7,720	7,870
1136.18	6,263	6,489	6,969
1136.19	4,672	4,891	5,028
1137.02	7,018	8,376	9,419
1137.03	4,567	4,880	5,119
1137.04	9,335	10,609	11,618
1138.01	4,684	8,394	11,507
1138.03	4,563	4,921	5,361
1138.04	10,896	11,922	12,193
1138.05	8,091	8,138	8,317
1139.01	5,380	11,048	16,313
1139.02	9,839	11,648	13,510
1139.03	6,038	8,283	9,418
1139.04	4,078	5,509	7,632
1139.05	7,471	8,494	9,512
1140.01	3,112	3,315	3,523
1140.03	2,221	2,852	3,599
1140.04	8,430	8,888	9,841
1141.01	1,526	1,754	1,829
1141.02	4,701	4,841	4,908
1142.02	5,402	5,612	5,695
1142.03	4,868	5,045	5,261
1142.04	3,934	4,159	4,359
1142.05	3,477	3,597	3,672
1216.01	6,435	7,285	7,606
1216.04	5,803	5,853	6,106
1216.05	2,981	3,004	3,116
1216.06	2,577	2,617	2,764
1216.08	5,566	5,972	6,219
1216.09	5,369	5,647	5,863
1216.10	2,566	2,646	2,820
1216.11	3,785	4,652	4,863
1217.01	7,717	7,782	8,235
1217.02	4,112	4,153	4,395
1218.00	215	216	225
1219.01	6,572	6,646	7,112
1219.02	6,671	6,691	7,117
1220.00	6,967	7,013	7,349
1221.00	5,423	5,446	5,651
1222.00	1,671	1,690	1,782
1223.00	3,347	3,375	3,577
1224.00	5,555	6,097	6,761
1225.00	3,650	3,736	3,921
1226.00	4,127	4,159	4,340
1227.00	4,712	4,848	5,107
1228.00	6,671	6,732	7,132
1229.00	6,213	6,255	6,533
1302.01	4,231	4,380	4,872
1302.02	12,747	13,795	15,030
1302.03	14,496	15,629	17,375
1304.01	8,334	8,917	9,867
1307.00	3,857	3,908	4,113
1308.00	3,148	3,248	3,411
1309.00	2,771	2,830	2,972
1310.00	4,452	4,523	4,744
1311.00	4,635	4,762	5,019

Research and compilation of the 1998 population by tract database was conducted by NCTCOG Research and Information Services (RIS) Senior Associate **Rocky Gardiner**. If you have any questions or require further information on this or any other RIS product, please call **(817) 695-9150.**

Population Growth
1995-1998



• = 100 persons

North Central Texas Council of
Governments
Centerpoint Two, 616 Six Flags Drive
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Arlington, TX 76005-5888

North Central Texas Council of Governments • Research and Information Services

The North Central Texas Council of Governments (NCTCOG) Land Use Inventory is part of the NCTCOG's mid-decade update program, providing small area demographic and land use information for 1995 in the North Central Texas region. The Land Use Inventory covers the Metropolitan Planning Area (MPA), as designated for regional transportation planning, which encompasses more than three million acres of land including all of Collin, Dallas, Denton, Tarrant and Rockwall counties as well as portions of Ellis, Johnson, Kaufman and Parker. Approximately 90% of all residential and commercial activities in North Central Texas are located within this planning area as shown on page 4.

This publication reports the 1995 land uses for 141 cities in the MPA with total land areas of 300 acres or more. The listing for each city reports the total acres of land in 11 land use categories as well as the total acreage and percent of land that is vacant. Descriptions of the land use categories follow the city listings.

Within the MPA, vacant land accounts for nearly 70% of the 3.17 million acres. Another 129,388 acres or 4% of the total MPA land area is devoted to lakes and other water resources. Of the remaining 26% or 826,241 acres in development, 58% is in residential uses, 20% is in employment uses and another 21% is devoted to infrastructure and dedicated land. Employment land includes all commercial, industrial and institutional land. Only one percent of the MPA's land area was under construction in 1995, nearly all of which was located in the suburban communities.

The top ten cities in total residential land within the MPA, listed on page five of this publication, are also the ten most populous cities in North Central Texas. Nine of these ten cities also rank within the top ten for employment land. The City of Denton finishes out the employment top ten. Denton ranks unexpectedly high in total employment land because it serves as a central city for Denton County rather than as a suburb to Dallas and Fort Worth. As such, it has a higher ratio of commercial to residential activity than the surrounding suburban communities.

The NCTCOG Land Use Inventory was used to calculate typical land use requirements per one hundred residents for large and small suburban cities within the MPA, as presented in the Suburban Land Uses section of this publication. The smaller communities range in size from 20,000 to 40,000 residents and larger cities range from 40,000 to 100,000 persons.

The smaller cities are relatively dispersed settlements, reporting an average total land area of 43 acres and developed land area of 20 acres per 100 residents. This yields an average residential density 2.3 persons per total and 5 persons per developed acre of land. Developed land area is the total land area less vacant land and water.

The larger communities, on the other hand, require less than 31 total acres and 16 developed acres per 100 residents. These figures yield average densities for the larger communities of 3.3 persons per total and 6.2 persons per developed acre. The most notable differences between the developed land uses required to support 100 residents in large and small communities are in the single family and parks/open space categories. Smaller cities in the region are less densely populated and have designated a larger amount of their land area to parks and open space. And in total area, small communities have a much higher share of land that is vacant than do the larger communities.

City	Single Family	Multi-Family	Other Res.	Industrial	Comm.	Inst.	Infra.	Dedicated	Water	Under Const.	Vacant	Total Acres	Percent Vacant
Addison	306	243	0	556	618	137	305	4	2	58	585	2,812	20.8%
Aledo	137	0	29	11	13	36	3	0	0	0	896	1,124	79.7%
Allen	2646	31	0	72	235	197	259	733	0	24	7,929	12,124	65.4%
Alvarado	443	14	26	49	113	36	205	28	10	0	1,888	2,813	67.1%
Anna	219	0	16	14	18	7	0	5	0	0	723	1,003	72.1%
Argyle	786	0	36	6	9	25	90	0	0	0	5,603	6,555	85.5%
Arlington	21,410	2,243	610	2,645	4,240	2,313	3,061	3,336	1,971	344	19,262	61,434	31.4%
Aubrey	192	0	12	5	28	38	6	0	0	0	312	593	52.6%
Aurora	75	0	44	4	5	4	11	8	0	0	1,915	2,065	92.7%
Azle	1,527	29	24	45	202	98	164	106	65	0	2,328	4,587	50.8%
Balch Springs	1,925	83	15	191	251	74	362	69	0	41	2,161	5,172	41.8%
Bartonville	598	0	30	126	9	0	32	0	8	0	3,059	3,861	79.2%
Bedford	3,444	420	4	54	506	357	354	89	5	24	1,143	6,400	17.9%
Benbrook	2,265	125	3	99	184	96	364	1,209	394	80	2,696	7,515	35.9%
Blue Mound	197	0	0	49	6	13	0	5	0	0	72	342	21.1%
Blue Ridge	130	0	3	4	14	13	0	0	0	0	216	380	56.8%
Boyd	177	1	4	61	20	39	15	0	0	0	1,522	1,839	82.8%
Briar Oaks	226	0	0	0	0	0	0	0	0	0	424	650	65.2%
Burleson	2,013	32	86	195	314	193	377	204	13	0	7,320	10,746	68.1%
Carrollton	6,728	630	45	2,117	899	471	909	2,079	394	181	7,964	22,418	35.5%
Cedar Hill	3,246	49	6	206	162	311	960	1,897	21	54	14,697	21,608	68.0%
Celina	320	0	0	11	53	37	0	0	1	0	831	1,253	66.3%
Cleburne	3,096	10	49	353	962	184	678	501	1,654	0	6,656	14,142	47.1%
Cockrell Hill	297	9	0	8	30	12	0	0	0	0	14	370	3.8%
Colleyville	3,917	13	2	73	186	185	4	85	28	433	3,478	8,403	41.4%
Combine	649	0	169	6	17	0	84	5	80	0	3,569	4,579	77.9%
Coppell	2,561	56	40	272	133	537	302	266	70	144	5,031	9,412	53.5%
Copper Canyon	493	0	0	0	0	0	83	0	0	0	1,863	2,438	76.4%
Corinth	595	0	71	72	79	1	164	171	21	20	3,733	4,929	75.7%
Crandall	317	0	3	10	18	54	141	8	10	0	952	1,513	62.9%
Crossroads	122	0	0	67	5	8	75	0	5	0	3,755	4,035	93.1%
Crowley	650	6	44	113	51	129	50	79	0	31	2,911	4,063	71.6%
Dallas	76,570	10,741	1,060	15,975	13,822	8,227	13,247	18,194	27,449	587	60,045	245,917	24.4%
Dalworthington Gardens	536	12	0	11	59	16	5	26	17	0	479	1,161	41.3%
DeSoto	4,363	133	88	190	364	293	225	282	0	51	7,615	13,603	56.0%
Denton	5,504	547	628	1,167	1,235	1,062	1,838	1,060	126	17	20,818	34,002	61.2%
Double Oak	631	0	0	0	0	0	0	0	4	50	695	1,380	50.4%
Duncanville	4,259	157	3	250	443	378	350	266	11	14	1,087	7,219	15.1%
Edgecliff Village (1110.03)	465	0	0	27	4	6	1	4	0	0	256	764	33.5%
Ennis	1,812	36	23	473	347	186	545	119	240	0	7,139	10,919	65.4%
Euless	2,647	486	17	186	462	343	3,208	461	40	35	2,377	10,261	23.2%
Everman	514	15	0	65	31	63	36	49	0	0	328	1,100	29.8%
Fairview (Collin)	1,232	0	4	19	13	16	43	54	0	37	2,634	4,051	65.0%
Farmers Branch	2,411	135	8	1,134	860	462	326	580	100	1	1,662	7,677	21.6%
Farmersville	550	0	0	117	78	57	19	115	102	0	1,080	2,117	51.0%
Fate	111	0	1	49	0	0	169	0	0	0	2,372	2,701	87.8%
Ferris	291	6	0	57	36	62	127	10	0	0	825	1,412	58.4%
Flower Mound	4,489	18	98	112	113	203	80	921	175	343	13,892	20,443	68.0%
Forest Hill	1,307	0	32	78	240	48	109	33	0	19	853	2,718	31.4%
Forney	544	7	25	103	78	86	179	46	0	143	3,571	4,782	74.7%
Fort Worth	43,024	2,838	1,361	10,267	6,625	6,066	11,936	13,584	4,269	786	83,038	183,796	45.2%
Frisco	1,667	21	53	150	90	75	441	355	12	270	18,801	21,935	85.7%
Garland	15,213	1,336	39	2,634	1,771	1,155	1,064	2,139	80	53	11,163	36,647	30.5%
Glenn Heights	625	0	122	16	28	20	78	35	0	0	3,461	4,385	78.9%
Godley	168	0	2	1	21	20	0	0	0	0	239	451	53.0%
Grand Prairie	8,423	575	316	2,919	1,361	698	2,059	4,862	5,209	253	23,390	50,065	46.7%
Grapevine	3,352	182	81	460	533	1,921	6,270	2,655	2,349	215	4,230	22,248	19.0%
Haltom City	3,229	152	126	690	490	322	277	339	26	50	2,235	7,935	28.2%
Haslet	1,046	0	0	2	5	72	85	0	0	0	1,995	3,205	62.2%
Heath	756	4	0	0	12	0	0	20	112	147	3,198	4,248	75.3%
Hebron	79	1	4	13	0	16	150	46	22	5	4,178	4,515	92.5%
Hickory Creek	313	0	47	13	1	0	58	1,095	134	0	1,252	2,912	43.0%
Highland Park	1,111	32	0	0	31	31	19	185	15	0	3	1,426	0.2%
Highland Village	1,415	0	0	33	49	16	79	173	595	22	805	3,188	25.3%
Hurst	3,179	272	23	177	737	340	276	221	0	14	1,109	6,347	17.5%
Hutchins	300	0	73	250	67	15	259	76	76	64	4,339	5,519	78.6%
Irving	9,728	2,001	213	2,462	2,946	1,615	7,484	2,142	613	815	13,525	43,544	31.1%

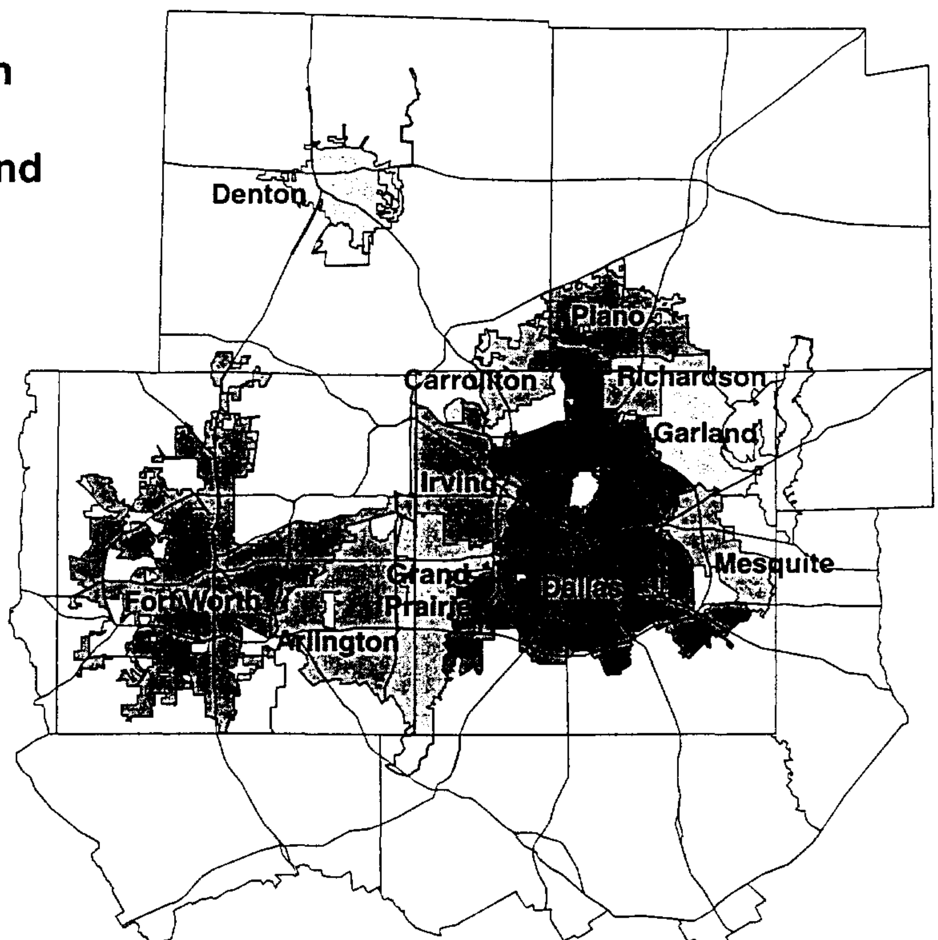
City	Single Family	Multi-Family	Other Res.	Industrial	Comm.	Inst.	Infra.	Dedicated	Water	Under Const.	Vacant	Total Acres	Percent Vacant
Joshua	751	9	98	29	86	78	106	96	12	0	2,307	3,571	64.6%
Justin	197	9	0	56	30	12	21	4	3	57	1,095	1,484	73.8%
Keene	450	26	84	16	61	115	0	48	0	0	710	1,510	47.0%
Keller	3,998	1	43	138	92	188	57	94	20	77	6,947	11,653	59.6%
Kennedale	644	7	24	217	74	48	60	60	0	18	1,443	2,595	55.6%
Krugerville	222	0	0	0	12	0	7	0	0	0	202	443	45.6%
Krum	290	0	0	4	9	26	3	3	0	0	527	861	61.2%
Lake Dallas	344	20	62	43	40	67	66	153	218	0	651	1,665	39.1%
Lake Worth	732	1	8	7	156	95	74	61	1	0	460	1,593	28.9%
Lakeside	197	0	2	9	19	7	15	5	0	0	736	990	74.3%
Lakewood Village	52	0	0	0	0	0	0	0	8	0	486	545	89.2%
Lancaster	3,243	95	47	420	324	268	488	315	0	0	13,476	18,675	72.2%
Lavon	101	0	0	0	0	0	16	0	6	0	563	685	82.2%
Lewisville	3,455	354	293	950	1,024	409	1,160	2,095	3,804	166	12,806	26,515	48.3%
Little Elm	179	0	52	0	24	25	0	0	24	0	1,788	2,090	85.6%
Lowrey Crossing	592	0	0	1	14	3	0	10	11	0	1,197	1,828	65.5%
Lucas	1,866	0	0	3	0	9	3	20	21	0	3,047	4,970	61.3%
Mansfield	3,050	23	165	682	271	220	525	405	107	56	19,329	24,832	77.8%
Maypearl	120	0	0	8	16	0	0	0	0	0	158	302	52.3%
McKinney	3,039	130	84	564	573	371	576	1,077	312	143	21,953	28,822	76.2%
McLendon-Chisholm	664	0	0	0	0	0	0	0	46	0	7,224	7,935	91.0%
Melissa	224	0	0	20	19	16	21	0	0	0	732	1,032	70.9%
Mesquite	8,582	578	37	826	1,452	1,032	1,425	1,104	37	92	12,279	27,443	44.7%
Midlothian	619	17	56	1,505	114	88	283	47	185	187	12,511	15,611	80.1%
Murphy	550	0	1	8	10	1	18	0	0	49	1,798	2,435	73.8%
N. Richland Hills	5,167	264	64	192	800	434	261	408	15	123	3,946	11,675	33.8%
Nevada	121	0	0	0	9	16	0	5	0	0	397	547	72.6%
New Hope	335	0	0	4	0	0	0	0	1	0	590	930	63.4%
North Lake	13	0	34	354	0	0	200	1	0	0	7,288	7,889	92.4%
Oak Leaf	400	0	0	0	0	0	0	0	0	0	440	840	52.4%
Oak Point	403	0	0	0	0	0	0	0	199	0	3,113	3,716	83.8%
Ovilla	1,185	0	0	0	3	14	0	7	0	40	2,210	3,459	63.9%
Palmer	523	0	0	20	52	59	86	0	0	0	1,001	1,740	57.5%
Pantego	274	31	0	21	198	3	1	0	0	4	95	627	15.2%
Parker	1,031	0	3	0	0	2	0	25	0	0	2,827	3,888	72.7%
Pecan Hill	98	0	22	0	0	0	0	0	0	0	1,144	1,264	90.5%
Pelican Bay	7	1	291	0	8	0	0	2	1	20	91	420	21.7%
Pilot Point	570	5	9	43	132	44	0	25	0	0	1,051	1,879	55.9%
Plano	15,182	898	76	939	2,850	1,049	1,259	2,582	14	593	17,072	42,513	40.2%
Ponder	100	0	0	8	6	14	0	0	0	0	1,667	1,795	92.9%
Princeton	315	9	66	15	55	72	50	41	17	0	1,884	2,523	74.7%
Prosper	321	0	3	29	16	36	17	0	0	7	500	929	53.8%
Red Oak	499	20	33	1	74	68	33	0	0	32	934	1,693	55.2%
Richardson	7,541	355	22	1,146	1,473	1,168	611	1,389	0	747	3,594	18,045	19.9%
Richland Hills	1,143	24	3	143	153	78	127	30	0	0	308	2,007	15.3%
River Oaks	940	5	0	0	72	72	2	165	0	0	13	1,268	1.0%
Roanoke	282	3	20	177	41	14	75	0	0	0	1,452	2,064	70.3%
Rockwall	1,347	100	12	214	219	187	249	369	206	385	6,173	9,458	65.3%
Rosser	109	0	0	20	12	12	0	0	11	0	1,396	1,560	89.5%
Rowlett	3,882	24	26	148	189	93	17	187	111	89	7,184	11,949	60.1%
Royse City	316	11	53	23	84	29	286	18	0	0	5,422	6,244	86.8%
Sachse	1,302	3	4	21	53	33	43	155	91	4	4,149	5,856	70.9%
Saginaw	727	43	3	666	78	67	325	178	0	0	2,691	4,778	56.3%
Saint Paul	284	0	0	5	0	0	2	0	3	0	591	884	66.9%
Sanger	390	10	51	35	81	36	147	3	0	0	883	1,635	54.0%
Sansom Park	567	0	2	27	70	15	0	56	0	0	47	784	6.0%
Seagoville	1,138	29	284	297	181	54	306	227	84	8	7,727	10,333	74.8%
Shady Shore	299	0	7	0	0	0	17	17	12	0	1,425	1,776	80.2%
Southlake	3,644	0	67	312	157	171	220	421	183	528	8,262	13,964	59.2%
Sunnyvale	967	28	0	247	54	14	401	142	40	0	8,797	10,689	82.3%
The Colony	1,917	0	7	1	115	233	235	962	219	40	3,864	7,592	50.9%
Trophy Club	586	11	3	0	6	25	30	352	10	0	1,347	2,370	56.8%
University Park	1,859	114	31	4	71	224	21	62	0	0	1	2,387	0.0%
Venus	117	6	18	38	13	37	36	11	0	0	956	1,232	77.6%
Watauga	1,756	0	0	19	104	79	16	13	0	0	613	2,600	23.6%
Waxahachie	2,498	51	88	453	605	199	1,430	224	774	0	14,313	20,632	69.4%
Westlake	19	1	0	0	74	1	169	5	72	3	3,623	3,967	91.3%

City	Single Family	Multi-Family	Other Res.	Industrial	Comm.	Inst.	Infra.	Dedicated	Water	Under Const.	Vacant	Total Acres	Percent Vacant
Westminster	132	0	21	3	1	0	0	0	0	0	1,115	1,271	87.7%
Weston	147	0	0	0	0	0	16	0	0	0	2,601	2,763	94.1%
Westover Hills	391	4	0	0	0	0	0	54	0	0	6	455	1.3%
Westworth Village	309	0	0	0	3	406	19	285	0	0	237	1,259	18.8%
White Settlement	1,397	67	31	98	238	399	108	63	0	0	815	3,215	25.3%
Wilmer	332	7	55	13	19	35	155	4	0	0	3,124	3,744	83.4%
Wylie	949	11	168	206	118	148	261	453	9,722	252	7,609	19,896	38.2%

MPA TOTAL

Year	Single Family	Multi-Family	Other Res.	Industrial	Comm.	Inst.	Infra.	Dedicated	Water	Under Const.	Vacant	Total Acres
1995	423,568	27,162	24,270	67,390	57,580	39,144	85,731	91,205	129,388	10,190	2,218,935	3,174,563
percentage	13.3%	0.9%	0.8%	2.1%	0	1.8%	2.7%	2.9%	4.1%	0.3%	69.9%	

Top Ten Cities in Residential and Employment Land



The research and compilation of the 1995 land use database was conducted by NCTCOG Research and Information Services (RIS) Associate **Rocky Gardiner**, assisted by RIS Intern **Ekong Peters**. If you have any questions or require further information on this or any other RIS products, please call **(817) 695-9150**.

Top Ten Cities in Residential/Employment Land by City Size

No.	City	Total Acres	Res. Acres	Percent Res.	No.	City	Total Acres	Emp. Acres	Percent Emp.
1	Dallas	245,918	88,371	35.9%	1	Dallas	245,918	38,025	15.5%
2	Fort Worth	183,796	47,224	25.7%	2	Fort Worth	183,796	22,958	12.5%
3	Arlington	61,434	9,198	15.0%	3	Arlington	61,434	9,198	15.0%
4	Garland	36,647	16,588	45.3%	4	Irving	43,544	7,024	16.1%
5	Plano	42,513	16,156	38.0%	5	Garland	36,647	5,559	15.2%
6	Irving	43,544	11,942	27.4%	6	Grand Prairie	50,065	4,978	9.9%
7	Grand Prairie	50,065	9,314	18.6%	7	Plano	42,513	4,838	11.4%
8	Mesquite	27,443	9,196	33.5%	8	Richardson	18,045	3,786	21.0%
9	Richardson	18,045	7,918	43.9%	9	Carrollton	22,418	3,487	15.6%
10	Carrollton	22,418	7,403	33.0%	10	Denton	34,003	3,464	10.2%

Definitions

Single Family	One family detached unit and duplexes.
Multi-Family	Structures with three or more separate units such as apartments, townhouses and condominiums.
Other Residential	Includes both mobile homes inside mobile home parks and free standing units outside parks. Also includes group quarters or nursing homes, orphanages, college dormitories, jail, military base personnel quarters.
Industrial	Manufacturing plants, warehouses, office showrooms, etc.
Commercial	Includes all office structures and retail buildings, such as department stores, repair shops, supermarkets and restaurants, as well as hotels and motels.
Institutional	Churches, governmental facilities, museums, schools, hospitals, medical clinics, libraries, military bases, are among those uses included.
Infrastructure	All roads, airports (including terminals and runways), railroads, radio and television communication stations, truck terminals, sewage treatment and power plants, power line easements, pump stations, water treatment plants, and water systems etc.
Dedicated Land	Includes all public and private parks, golf courses, cemeteries, tennis courts, swimming pools, amusement parks, sanitary landfills, land applications, and similar waste management facilities. Also includes major flood control structures, levies and flood channels.
Under Construction	Land that has undergone site preparation and construction has begun.
Water	All water bodies.
Vacant	Undeveloped land.
Total acres	All land and water acreage within the city.

Suburban Land Uses

Cities of 40,000 to 100,000 Persons

Land Use Category	Avg. # of Acres	Acres per 100 persons
Single-Family Residential	5,307	8.18
Multi-Family Residential	428	0.66
Mobile Homes	137	0.21
Commercial	989	1.52
Industrial	937	1.44
Institutional	650	1.00
Parks & Open Space	870	1.34
All other Catagories	10,523	16.22
Total Land Area	**19,841**	**30.58**

Cities of 20,000 to 40,000 Persons

Land Use Category	Avg. # of Acres	Acres per 100 persons
Single-Family Residential	3,023	10.75
Multi-Family Residential	114	0.41
Mobile Homes	31	0.11
Commercial	371	1.32
Industrial	282	1.00
Institutional	361	1.28
Parks & Open Space	662	2.35
All other Catagories	7,396	26.29
Total Land Area	**12,240**	**43.51**

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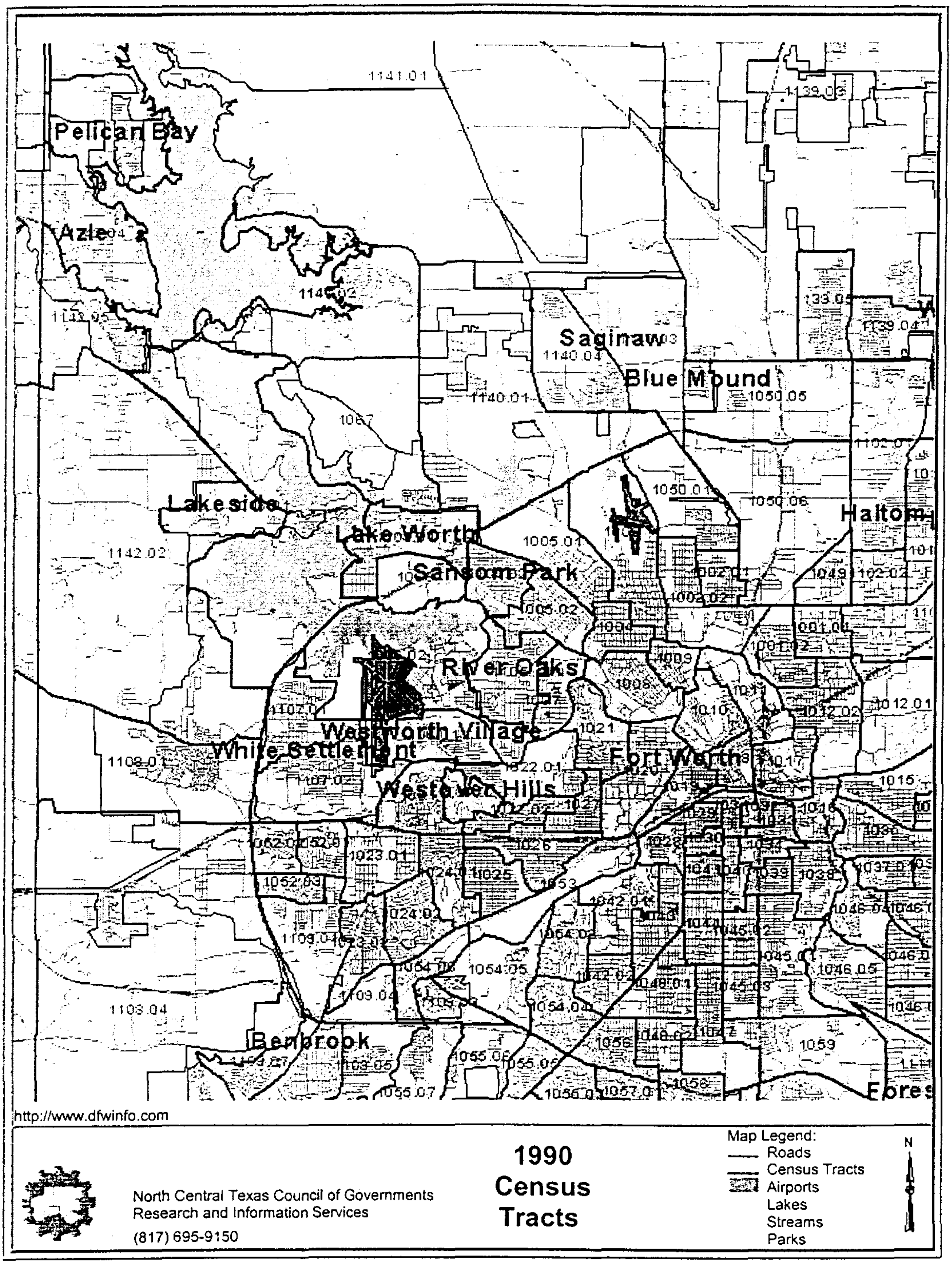
CITY OF FORT WORTH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Lake Worth
Sansom Park
Saginaw
Blue Mound
Haltom
River Oaks
Westworth Village
White Settlement
Westover Hills
Fort Worth
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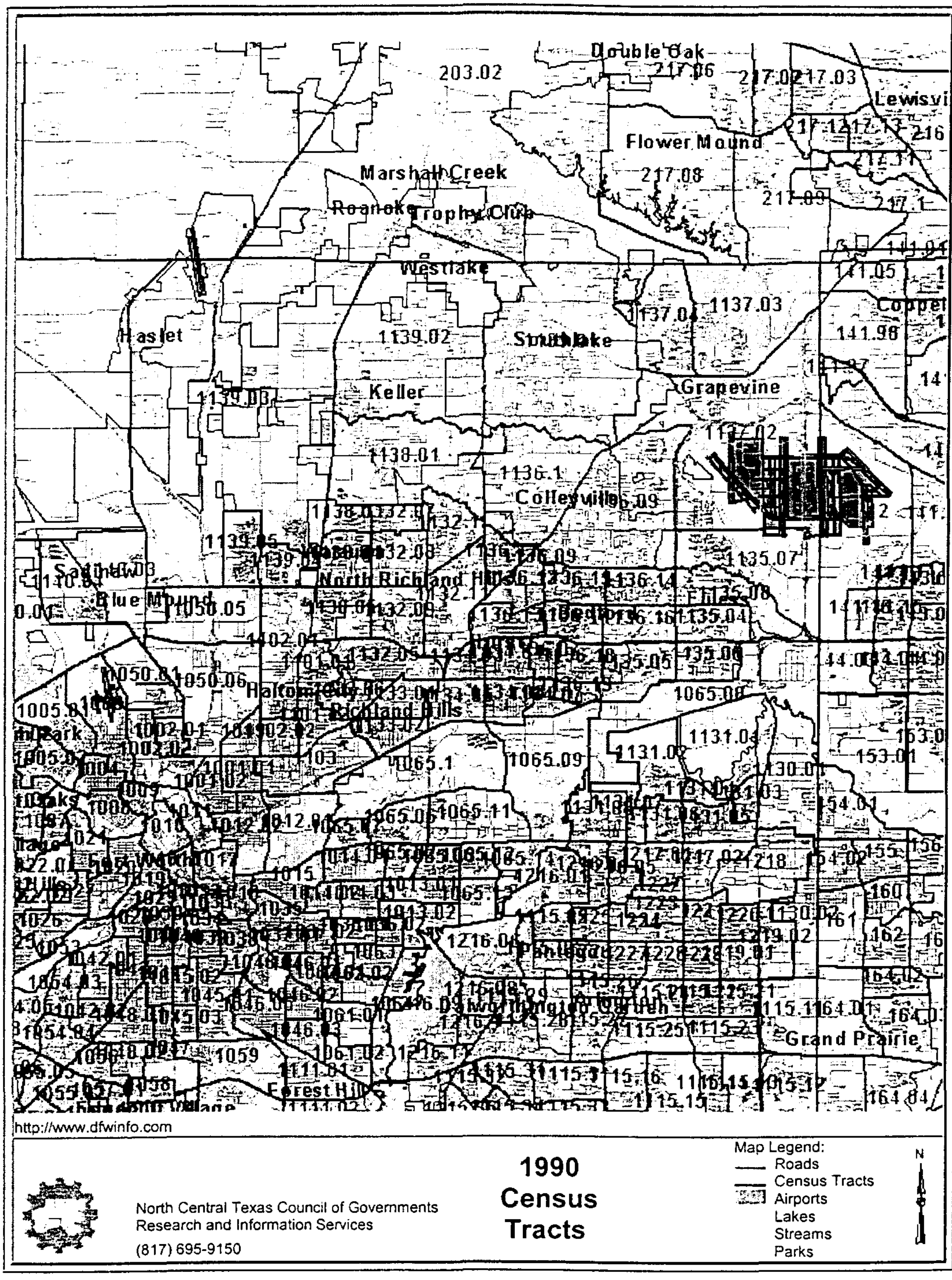
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Roanoke
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Grapevine
Colleyville
North Richland Hills
Blue Mound
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Forest Hill
Grand Prairie
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Census
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Roads
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Parks
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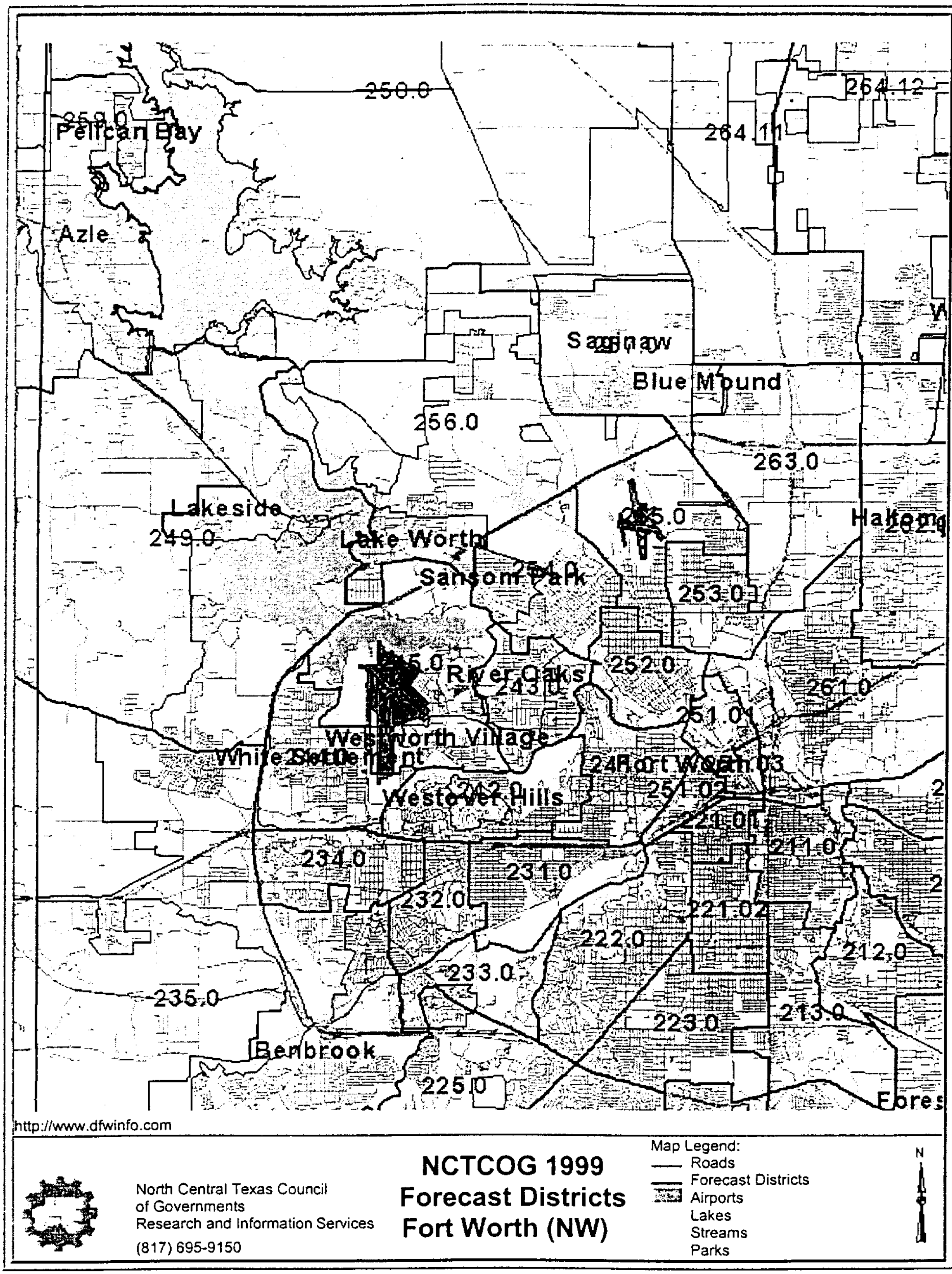
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Forecast Districts
Fort Worth (NW)
Map Legend:
Roads
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Lakes
Streams
Parks
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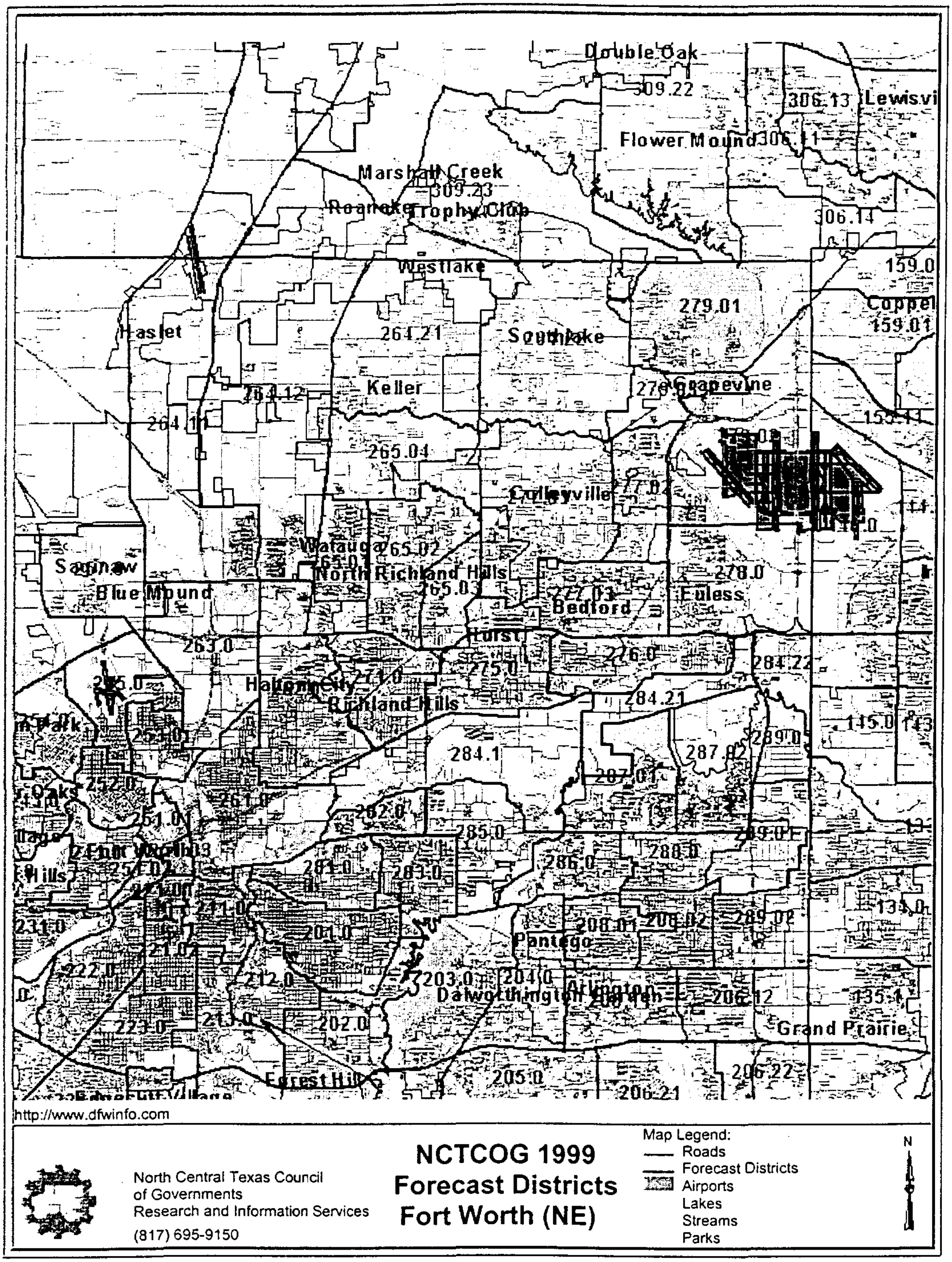
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Forecast Districts
Fort Worth (NE)
Map Legend:
Roads
Forecast Districts
Airports
Lakes
Streams
Parks
N

Fort Worth

(1) Census Tracts	(2) Total Area	(3) Area in Watershed	(4) % Area In Wshed	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In Wshed	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1050.05	2524	1191	47.19%	1884	0.75	889	763	2.47	2619
1065.1	4618	279	6.04%	1975	0.43	119	693	2.85	5194
1139.03	27591	11629	42.15%	8283	0.30	3491	2710	3.06	4672
1139.04	1036	901	86.97%	5509	5.32	4791	1951	2.82	248
1139.05	1276	1276	100.00%	8494	6.66	8494	2557	3.32	475
1141.01	47204	8882	18.82%	1754	0.04	330	648	2.71	1510
		24158		27899	13.49	18115	9322	17.23	14719

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in Watershed	(14) % Area In Wshed	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
258	50461	8882	17.60%	2484	2662	5046	2.71	6731.64	0.13	7214.02	0.14	13674.66	0.27
264.11	12661	7022	55.46%	2901	4509	13517	3.09	8964.09	0.71	13932.81	1.10	41767.53	3.30
264.12	17248	6785	39.34%	4317	6885	21562	2.82	12173.94	0.71	19415.7	1.13	60804.84	3.53
263	6542	1191	18.21%	1006	1533	6500	3.95	3973.7	0.61	6055.35	0.93	25675	3.92
284.1	8739	278	3.18%	1979	2790	4700	2.85	5640.15	0.65	7951.5	0.91	13395	1.53
	95651	24158		12687	18379	51325	3.08	37483.52	2.80	54569.38	4.20	155317.03	12.55

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in Watershed	(28) % Area In Wshed	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
258	50461	8882	17.60%	2224	0.04	2616	0.05	6640	0.13
264.11	12661	7022	55.46%	2679	0.21	8447	0.67	16635	1.31
264.12	17248	6785	39.34%	2717	0.16	11078	0.64	19948	1.16
263	6542	1191	18.21%	10302	1.57	13121	2.01	21305	3.26
284.1	8739	278	3.18%	12361	1.41	13944	1.60	20165	2.31
		24158		30283	3.40	49206	4.96	84693	8.17

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
258	1141.01	47204	47204	2.71	127922.84
	1138.04	3195	3195	2.64	8434.80
		50399	50399		136357.64
					[redacted]
264.11	1139.03	27591	11384	3.06	34835.04
	1139.05	1276	1276	3.32	4236.32
			12660		39071.36
					[redacted]
264.12	1139.04	1036	138	2.82	389.16
					[redacted]
263	1050.05	2524	2524	2.47	6234.28
	1050.06	3973	3973	4.89	19427.97
		6497	6497		25662.25
					[redacted]
284.1	1065.1	4618	4618	2.85	13161.30
		4618	4618		13161.3
					[redacted]

Population for area in Watershed for Fort Worth & Tarrant County

(41) Forecast Districts	(42) Population 1995	(43) Population 2005	(44) Population 2025	(45) Employment 1995	(46) Employment 2005	(47) Employment 2025
258	1185	1270	2407	391	460	1169
264.11	4972	7727	23165	1486	4685	9226
264.12	4789	7638	23919	1069	4358	7847
263	723	1102	4674	1876	2389	3879
284.1	179	253	426	393	444	641
TOTAL	11848	17990	54592	5215	12335	22762

FUTURE POP. & EMP. LAND USE AREAS

1995 Population	11848	1995 Employment	5215
1995 Residential Area	6207	1995 Employment Area	3017
1995 Density	1.91	1995 Density	1.73
2005 Residential Area	9425	2005 Employment Area	7137
2025 Residential Area	28599	2025 Employment Area	13169

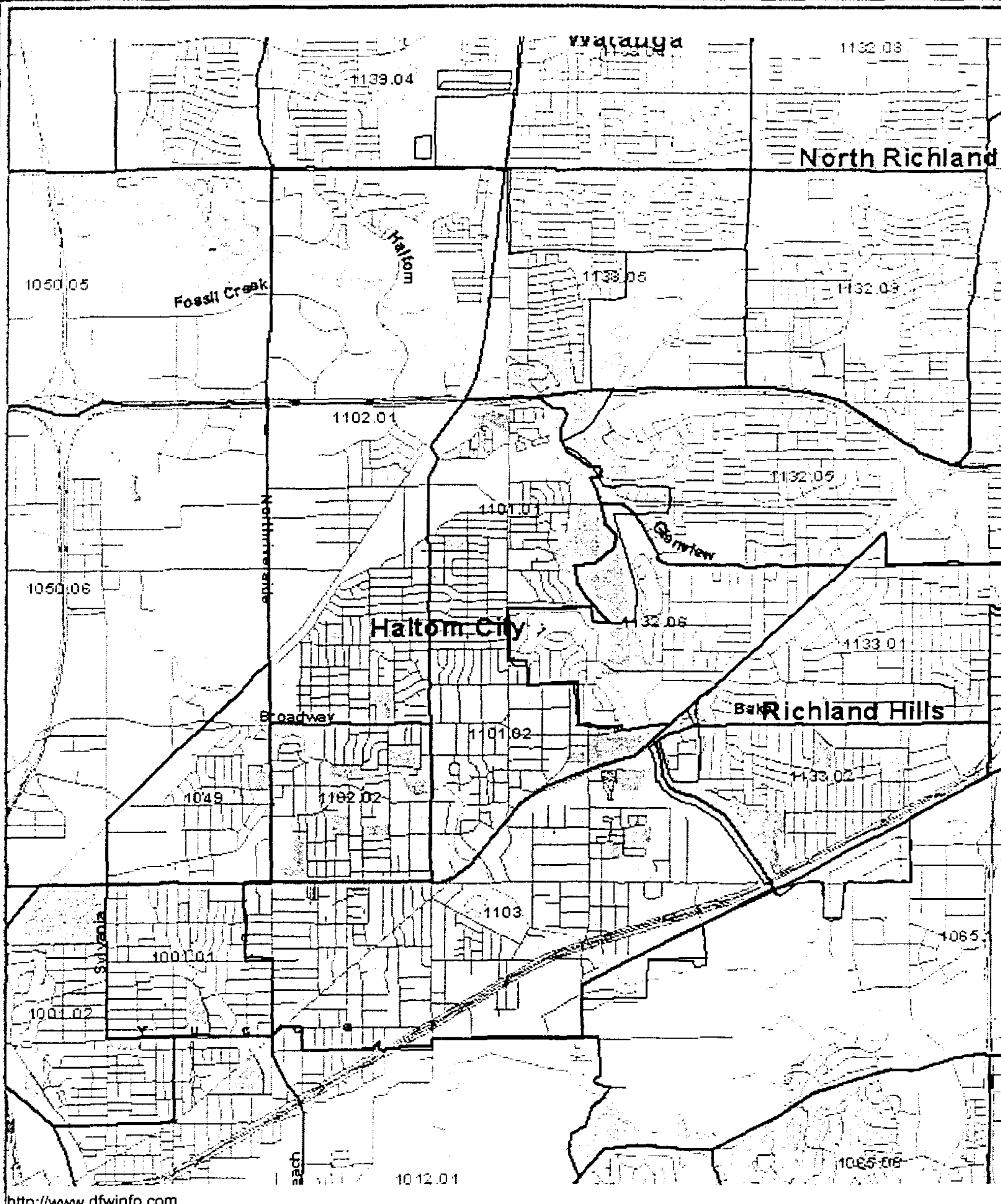
	1995	**2005**	**2025**
Residential Area	6207	9425	28599
Employment Area	3017	7137	13169
SEWERED AREA	**9224**	**16561**	**41768**
Total Unsewered	3915	5272	9972
Vacant & Under Constr.	11018	2325	0
REMINADER	**14933**	**7597**	**9972**
	24157	24158	51740
TOTAL AREA	**24158**	**24158**	**24158**

NOTES: Census Tracts from NCTCOG Population Database

Total Census Tract Area (Acres)

(1) Total Area in City (Acres)
(2) Percent of Census Tract Area within City
(3) Total 1995 Population in Census Tract from NCTCOG data
(4) Average Population Density in People/Acre = (5) / (2)
(5) 1995 Population within City = (5) x (4)
(6) 1995 Total Households from NCTCOG Database
(7) 1995 Population per House = (5) / (8)
(8) 1995 Total Employment from NCTCOG Database
(9) Population Forecast Districts from NCTCOG Database
(10) Total Computed Area within Forecast District from AutoCAD map (Acres)
(11) Area of Forecast District within City (Acres)
(12) Percent of Forecast District Total Area within City
(13) 1995 Total Households in Forecast District
(14) 2005 Total Households in Forecast District (Projected by NCTCOG)
(15) 2025 Total Households in Forecast District (Projected by NCTCOG)
(16) Computed Weighted Average Population per House Density from Col. (40)
(17) Computed 1995 Forecast District Population = (18) x (15)
(18) Average 1995 Population Density of Forecast District in People / Acre = (19) / (12)
(19) Computed 2005 Forecast District Population = (18) x (16)
(20) Average 2005 Population Density of Forecast District in People / Acre = (21) / (12)
(21) Computed 2025 Forecast District Population = (18) x (17)
(22) Average 2025 Population Density of Forecast District in People / Acre = (23) / (12)
(23) Population Forecast Districts from NCTCOG Database
(24) Total Computed Area within Forecast District from AutoCAD map (Acres)
(25) Area of Forecast District within City (Acres)
(26) Percent of Forecast District Total Area within City
(27) 1995 Total Employment in Forecast District
(28) Average 1995 Employment Density of Forecast District in Employees / Acre = (29) / (26)
(29) 2005 Total Employment in Forecast District
(30) Average 2005 Employment Density of Forecast District in Employees / Acre = (31) / (26)
(31) 2025 Total Employment in Forecast District
(32) Average 2025 Employment Density of Forecast District in Employees / Acre = (33) / (26)
(33) Population Forecast Districts from NCTCOG Database
(34) Census Tracts from NCTCOG Population Database
(35) Total Census Tract Area (Acres)
(36) Portion of Census Tract Area in Forecast District (Acres)
(37) Population per House Density from Col. (9)
(38) (38) x (39), Sum Col (40) / (37) = Weighted Average Population per House in Forecast District
(39) Population Forecast Districts from NCTCOG Database
(40) Computed 1995 Forecast District Population in City Limits = (19) x (14)
(41) Computed 2005 Forecast District Population in City Limits = (19) x (14)
(42) Computed 2025 Forecast District Population in City Limits = (19) x (14)
(43) 1995 Total Employment in Forecast District for City Limits = (29) x (28)
(44) 2005 Total Employment in Forecast District for City Limits = (29) x (28)
(45) 2025 Total Employment in Forecast District for City Limits = (29) x (28)

HALTOM CITY



North Central Texas Council of Governments
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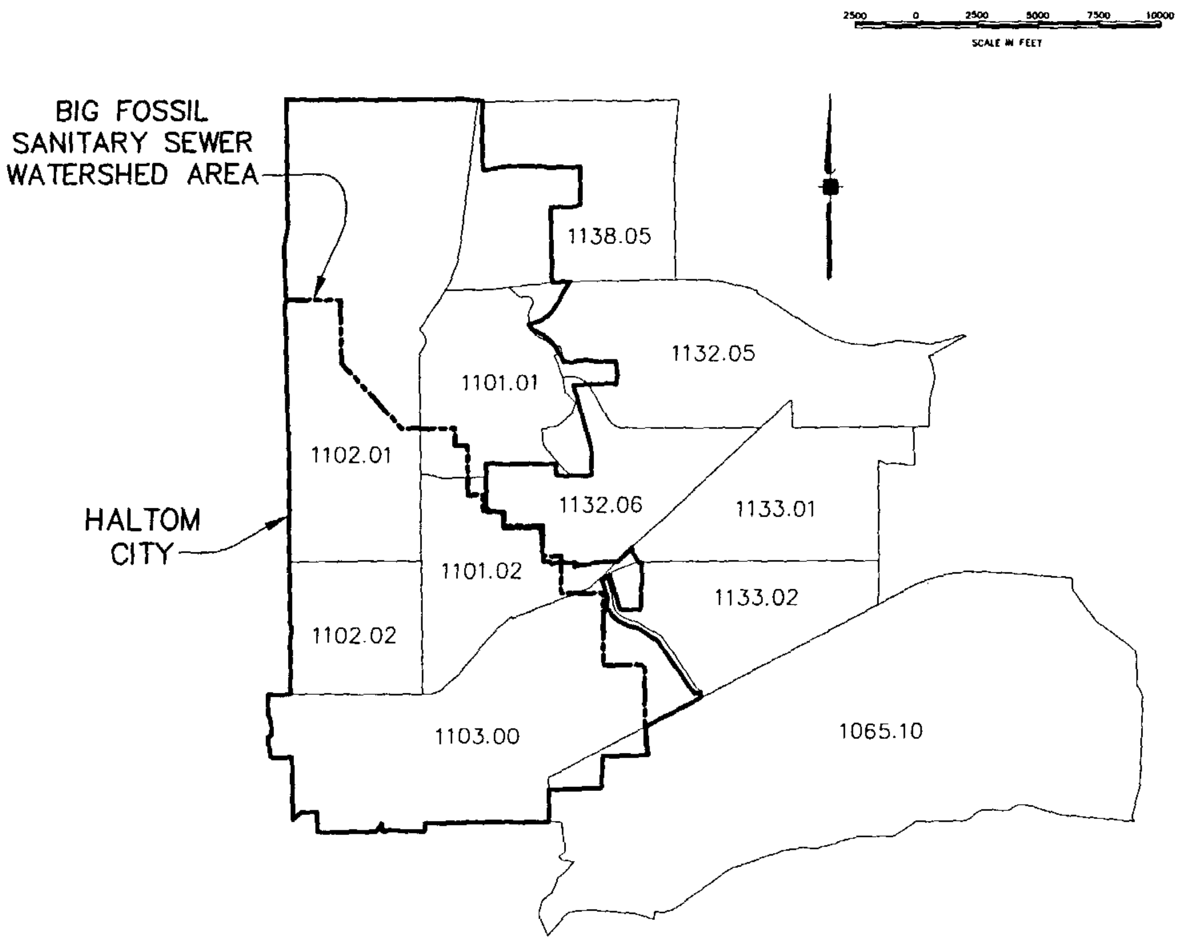
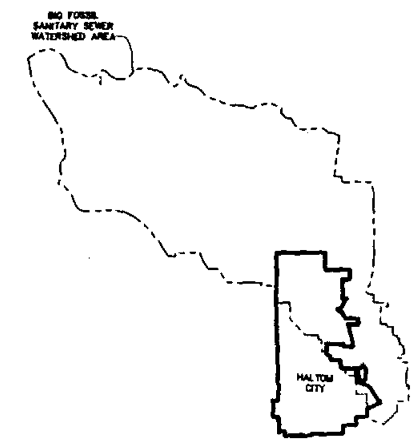
1990 Census Tracts

Map Legend:
Roads
Census Tracts
Airports
Lakes
Streams
Parks

N





BIG FOSSIL INDEX

Haltom City Census Tract Data

Tract	Total Area	Area in watershed	Percentage	Population Data 1990	1995	1998	1995 RESIDENTIAL ACRES	1995 POPULATION DENSITY
1101 01	868	791 7	91 2%	5122	5261	5447	337	15 6[illegible]
1101 02	758	57	7 5%	4275	4375	4405	781	5 60
1102 01	2666	1668 6	62 6%	7985	8277	9600	523	15 83
1103	2235	214	9 6%	4097	4276	4309	1793	2 38
1132 05	1711	878 43	51 3%	7307	7561	7923	599	12 62
1132 06	913	906 3	99 3%	4474	4495	4569	407	11 04
1133 01	1023	517 1	50 5%	4384	4465	4529	542	8 24
1133 02	866	686 22	79 2%	4002	4073	4342	571	7 13
1138 05	1455	1411 44	97 0%	8091	8138	8317	342	23 80
1065 1	4618	407 5	8 8%	1320	1975	2766	438	4 51

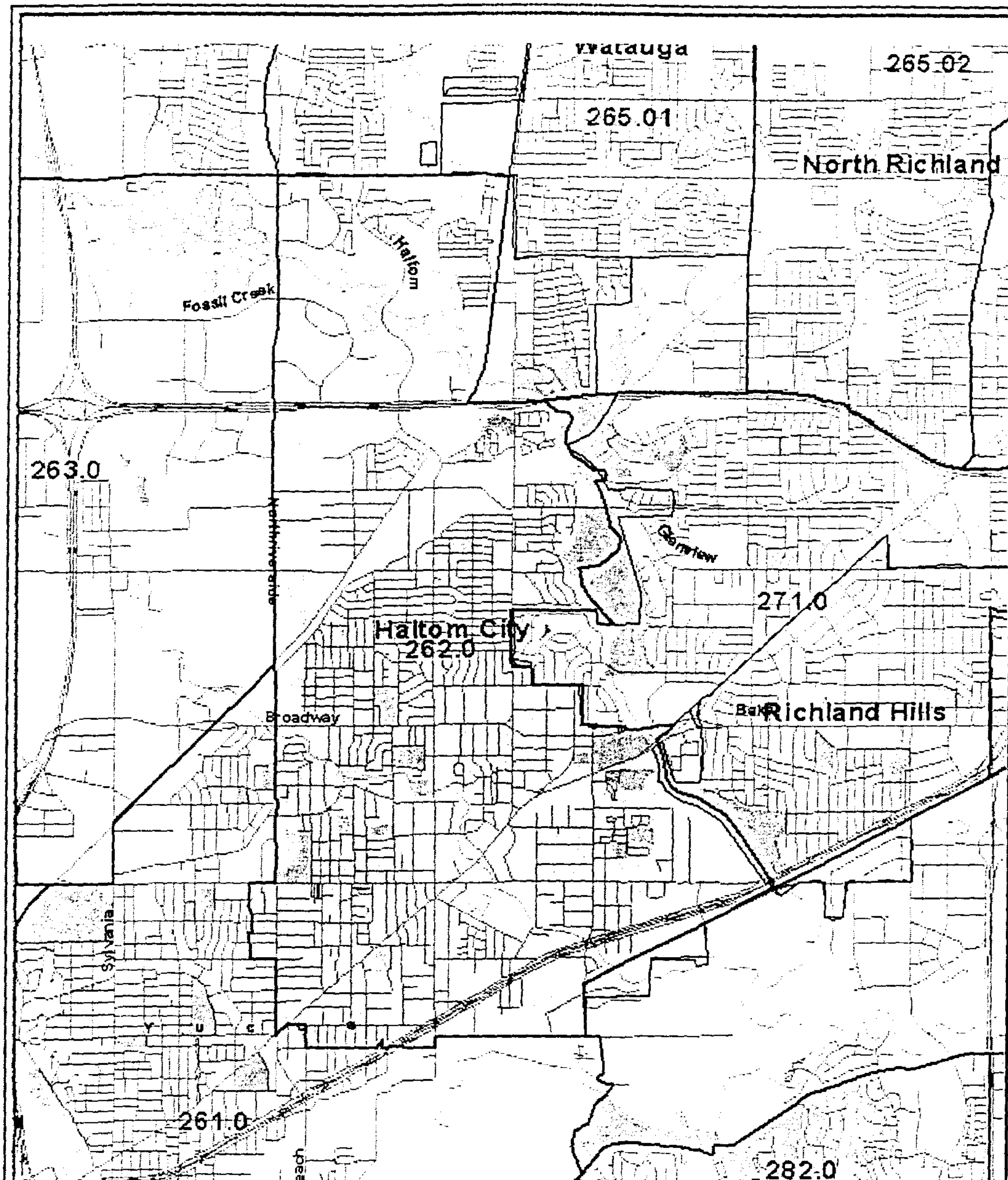
BIG FOSSIL SEWER STUDY

HALTOM CITY CENSUS TRACTS

City of
NORTH RICHLAND HILLS
Texas

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: CLS	REV. BY DATE SYMBOL	DATE NOVEMBER 1999
DRAWN BY: CLS		JOB NO. 03-436
CHECKED BY		SHEET



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Research and Information Services
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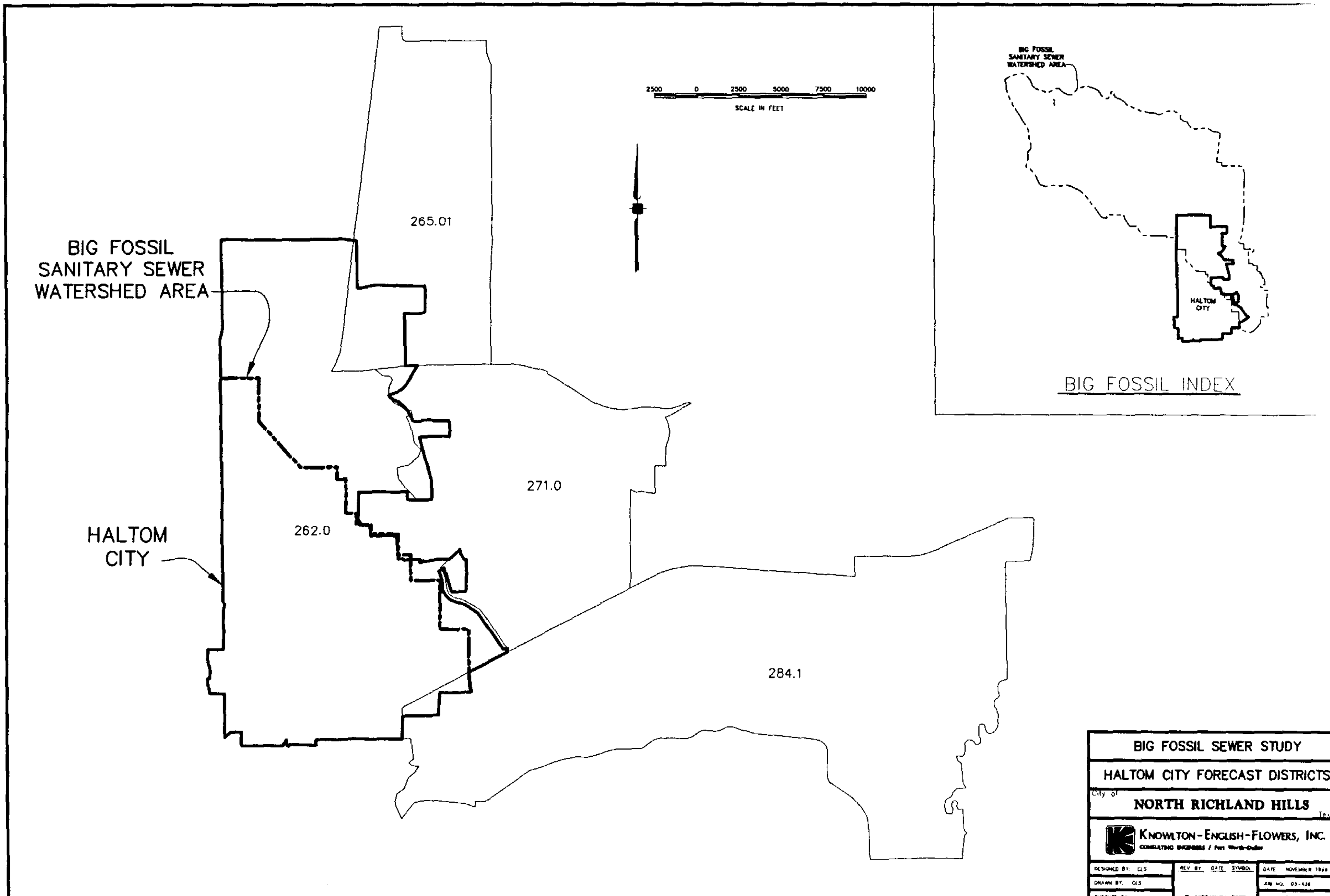
NCTCOG 1999 Forecast Districts Haltom City

Map Legend:
Roads
Forecast Districts
Airports
Lakes
Streams
Parks

N



BIG FOSSIL INDEX

BIG FOSSIL SEWER STUDY
HALTOM CITY FORECAST DISTRICTS
City of NORTH RICHLAND HILLS Texas
KNOWLTON-ENGLISH-FLOWERS, INC.

DESIGNED BY: CLS	REV BY DATE SYMBOL	DATE NOVEMBER
DRAWN BY: CLS		JOB NO. 03-436
CHECKED BY		SHEET NO. K OF

HALTOM CITY

(1) Census Tracts	(2) Total Area	(3) Area in City	(4) % Area In City	(5) Total 1995 Pop	(6) Avg. Pop. Density	(7) 1995 Pop. In City	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1065.1	4618	81	1.75%	1975	0.43	35	693	2.85	5194
1101.01	868	868	100.00%	5261	6.06	5261	2297	2.29	720
1101.02	758	758	100.00%	4174	5.51	4174	1732	2.41	1083
1102.01	2666	2666	100.00%	8277	3.10	8277	3109	2.66	2677
1102.02	655	655	100.00%	3293	5.03	3293	1228	2.68	782
1103	2235	2196	98.26%	8532	3.82	8383	3222	2.65	5725
1132.05	1711	90	5.28%	7561	4.42	399	2941	2.57	3591
1132.06	913	93	10.19%	4495	4.92	458	1754	2.56	1206
1133.01	1023	11	1.09%	4456	4.36	48	1803	2.47	1279
1133.02	866	42	4.85%	4073	4.70	198	1497	2.72	2545
1138.05	1455	475	32.65%	8138	5.59	2657	2775	2.93	2338
		7935		60235	47.94	33183	23051	28.80	27140

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in City	(14) % Area In City	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
262	7139.37	7128	99.84%	11588	13259	14059	2.58	29897.04	4.19	34208.22	4.79	36272.22	5.08
265.01	3397.7	479	14.10%	8012	8862	11662	2.37	18988.44	5.59	21002.94	6.18	27638.94	8.13
271	4540.6	247	5.44%	7995	8840	10330	2.15	17189.25	3.79	19006	4.19	22209.5	4.89
284.1	8738.65	81	0.93%	1979	2790	4700	2.15	4254.85	0.49	5998.5	0.69	10105	1.16
	23816.32	7935	33.32%	29574	33751	40751	2.31	70329.58	14.05	80215.66	15.85	96225.66	19.26

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in City	(28) % Area In City	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
262	7139.37	7128	99.84%	10987	1.54	13469	1.89	15948	2.23
265.01	3397.7	479	14.10%	3290	0.97	4197	1.24	6074	1.79
271	4540.6	247	5.44%	8621	1.90	9769	2.15	12762	2.81
284.1	8738.65	81	0.93%	12361	1.41	13944.00	1.60	20165	2.31
		7935		35259	5.82	41379	6.87	54949	9.14

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
262	1101.01	868	868	2.29	1988.05
	1101.02	758	758	2.41	1826.73
	1102.01	2666	2666	2.66	7097.61
	1102.02	655	655	2.68	1756.45
	1103	2235	2235	2.65	5918.38
		7182	7182		18587.22
					[illegible]
265.01	1138.05	1455	1455	2.93	4266.95
					[illegible]
271	1132.05	1711	1711	2.57	4398.80
	1132.06	913	913	2.56	2339.76
	1133.01	1023	1023	2.47	2528.28
	1133.02	866	866	2.72	2356.19
		4513	4513		11623.03
					[illegible]
284.1	1065.1	4618	4618	2.85	13160.97
					[illegible]

(41)	(42)	(43)	(44)	(45)	(46)	(47)
CITY ONLY						
Forecast	Population			Employment		
Districts	1995	2005	2025	1995	2005	2025
262	29849	34154	36214	10970	13448	15923
265.01	2677	2961	3896	464	592	856
271	935	1034	1208	469	531	694
284.1	39	56	94	115	129	187
TOTAL	33501	38204	41413	12017	14700	17660

Haltom City Ultimate Population 47408

	1995	1998	1999	2000	2005	2010	2020
Haltom City #	33500	35350	36200	37450	38982	40514	42986

FUTURE POP. & EMP. LAND USE AREAS

1995 Population	33501	1995 Employment	12017
1995 Residential Area	3507	1995 Employment Area	1502
1995 Density	9.55	1995 Density	8.00
2005 Residential Area	3999	2005 Residential Area	1837
2025 Residential Area	4335	2025 Residential Area	2207

	1995	**2005**	**2025**
Residential Area	3507	3999	4335
Employment Area	1502	1837	2207
SEWERED AREA	**5009**	**5837**	**6543**
Infrastructure	641	747	837
Vacant	2285	1354	539
REMINADER	**2926**	**2101**	**1376**
	7935	7938	7919
TOTAL AREA	**7935**	**7935**	**7935**

NOTES:

(1) Census Tracts from NCTCOG Population Database
(2) Total Census Tract Area (Acres)
(3) Total Area in City (Acres)
(4) Percent of Census Tract Area within City
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City (Acres)
(14) Percent of Forecast District Total Area within City
(15) 1995 Total Households in Forecast District
(16) 2005 Total Households in Forecast District (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density from Col. (40)
(19) Computed 1995 Forecast District Population = (18) x (15)
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(22) Average 2005 Population Density of Forecast District in People / Acre = (21) / (12)
(23) Computed 2025 Forecast District Population = (18) x (17)
(24) Average 2025 Population Density of Forecast District in People / Acre = (23) / (12)
(25) Population Forecast Districts from NCTCOG Database
(26) Total Computed Area within Forecast District from AutoCAD map (Acres)
(27) Area of Forecast District within City (Acres)
(28) Percent of Forecast District Total Area within City
(29) 1995 Total Employment in Forecast District
(30) Average 1995 Employment Density of Forecast District in Employees / Acre = (29) / (26)
(31) 2005 Total Employment in Forecast District
(32) Average 2005 Employment Density of Forecast District in Employees / Acre = (31) / (26)
(33) 2025 Total Employment in Forecast District
(34) Average 2025 Employment Density of Forecast District in Employees / Acre = (33) / (26)
(35) Population Forecast Districts from NCTCOG Database
(36) Census Tracts from NCTCOG Population Database
(37) Total Census Tract Area (Acres)
(38) Portion of Census Tract Area in Forecast District (Acres)
(39) Population per House Density from Col. (9)
(40) (38) x (39). Sum Col (40) / (37) = Weighted Average Population per House in Forecast District
(41) Population Forecast Districts from NCTCOG Database
(42) Computed 1995 Forecast District Population in City Limits = (19) x (14)
(43) Computed 2005 Forecast District Population in City Limits = (19) x (14)
(44) Computed 2025 Forecast District Population in City Limits = (19) x (14)
(45) 1995 Total Employment in Forecast District for City Limits = (29) x (28)
(46) 2005 Total Employment in Forecast District for City Limits = (29) x (28)
(47) 2025 Total Employment in Forecast District for City Limits = (29) x (28)

HALTOM CITY (BIG FOSSIL)

(1) Census Tracts	(2) Total Area	(3) Area in Watershed	(4) % Area Watershed	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In Wshed	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1101.01	868	790	91.01%	5261	6.06	4788	2297	2.29	720
1101.02	758	58	7.65%	4174	5.51	319	1732	2.41	1083
1102.01	2666	1675	62.83%	8277	3.10	5200	3109	2.66	2677
1103	2235	183	8.19%	8532	3.82	699	3222	2.65	5725
1132.05	1711	90	5.28%	7561	4.42	399	2941	2.57	3591
1132.06	913	93	10.19%	4495	4.92	458	1754	2.56	1206
1133.01	1023	11	1.09%	4456	4.36	48	1803	2.47	1279
1133.02	866	42	4.85%	4073	4.70	198	1497	2.72	2545
1138.05	1455	475	32.65%	8138	5.59	2657	2775	2.93	2338
		3418		54967	42.48	14766	21130	23.27	21164

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in Watershed	(14) % Area Watershed	(15) Total 1995 Households In Wshed	(16) Total 2005 Households In Wshed	(17) Total 2025 Households In Wshed	(18) Population /House	(19) 1995 Population in Wshed	(20) 2005 Population In Wshed	(21) 2025 Population In Wshed
262	7139.37	2701	37.83%	4384	5016	5319	2.59	11355	12992	13776
265.01	3397.7	479	14.10%	1130	1249	1644	2.93	3309	3661	4817
271	4540.6	238	5.24%	419	463	541	2.58	1081	1195	1397
		3418		**5933**	**6729**	**7504**	**2.70**	**15745.3**	**17848.018**	**19990**

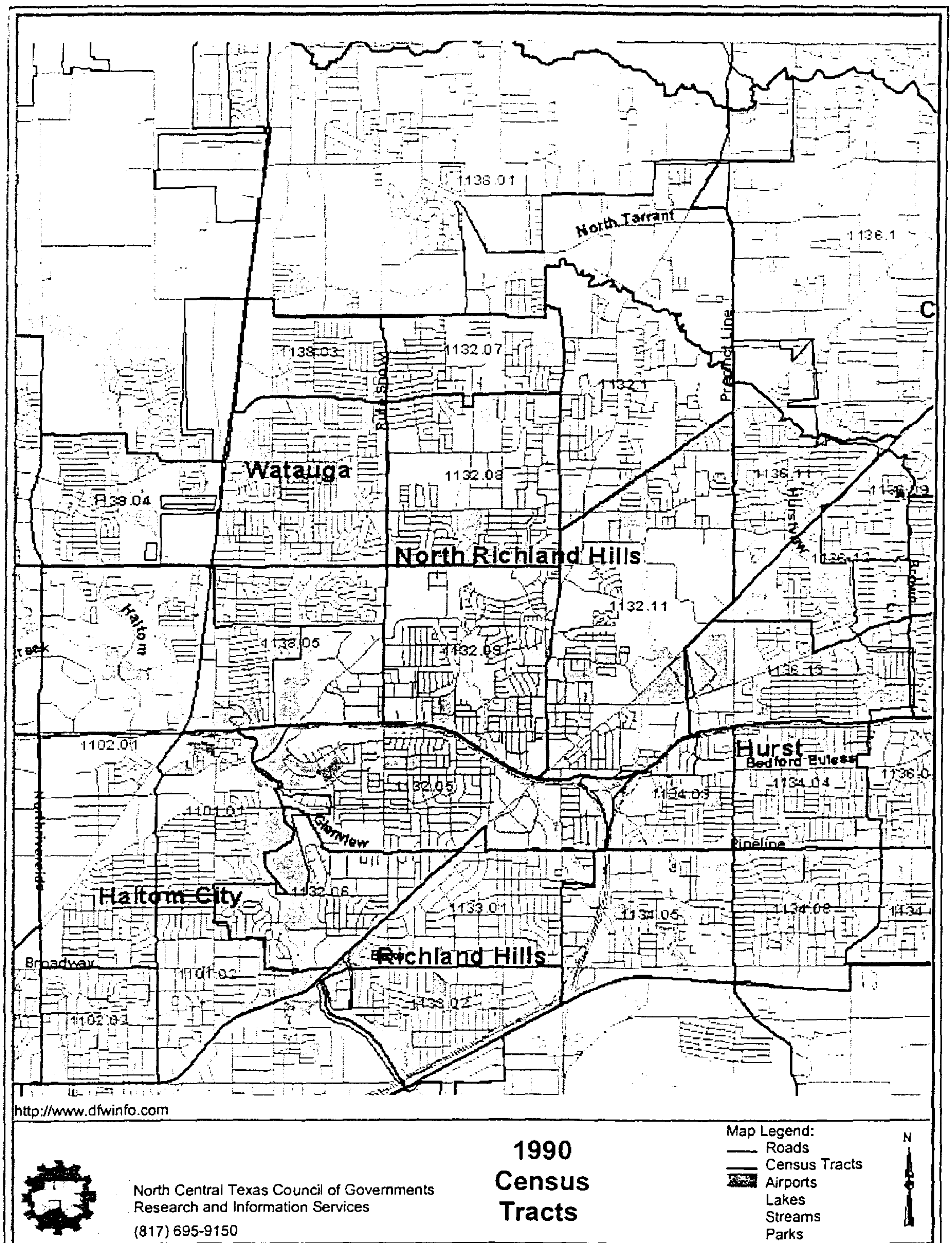
EMPLOYMENT

(22) Forecast Districts	(23) Total Area	(24) Area in Watershed	(25) % Area Watershed	(26) Total 1995 Employment In Wshed	(27) Total 2005 Employment In Wshed	(28) Total 2025 Employment In Wshed
262	7139.37	2701	37.83%	4157	5096	6034
265.01	3397.7	479	14.10%	464	592	856
271	4540.6	238	5.24%	452	512	669
		3418		**5072**	**6199**	**7559**

NOTES:

(1) Census Tracts from NCTCOG Population Database that are contained by the Haltom City limits and contribute to the Big Fossil Watershed
(2) Total Census Tract Area (Acres)
(3) Total Area in Haltom City limits that contribute to the Big Fossil Watershed (Acres)
(4) Percent of Census Tract Area within City Limits that contribute to the Big Fossil Watershed
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City that contributes to the Big Fossil Watershed = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(14) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(15) 1995 Total Households in Forecast District that contributes to Big Fossil Watershed
(16) 2005 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density (previously computed for entire Forecast Districts
(19) Computed 1995 Forecast District Population in city which contributes to Big Fossil WAtershed = (18) x (15)
(20) Computed 2005 Forecast District Population in city which contributes to Big Fossil Watershed = (18) x (16)
(21) Computed 2025 Forecast District Population in city which contributes to Big Fossil Watershed = (18) x (17)
(22) Population Forecast Districts from NCTCOG Database
(23) Total Computed Area within Forecast District from AutoCAD map (Acres)
(24) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(25) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(26) 1995 Employment in Forecast District in city which contributes to Big Fossil Watershed
(27) 2005 Employment in Forecast District in city which contributes to Big Fossil Watershed
(28) 2025 Employment in Forecast District in city which contributes to Big Fossil Watershed

NORTH RICHLAND HILLS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1136.11
Hurstview
North Richland Hills
1132.11
Haltom
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1102.01
Hurst
Bedford Euless
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1134.04
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Glenview
Pipeline
Haltom City
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1134.06
Broadway
Richland Hills
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1990
Census
Tracts
Map Legend:
Roads
Census Tracts
Airports
Lakes
Streams
Parks
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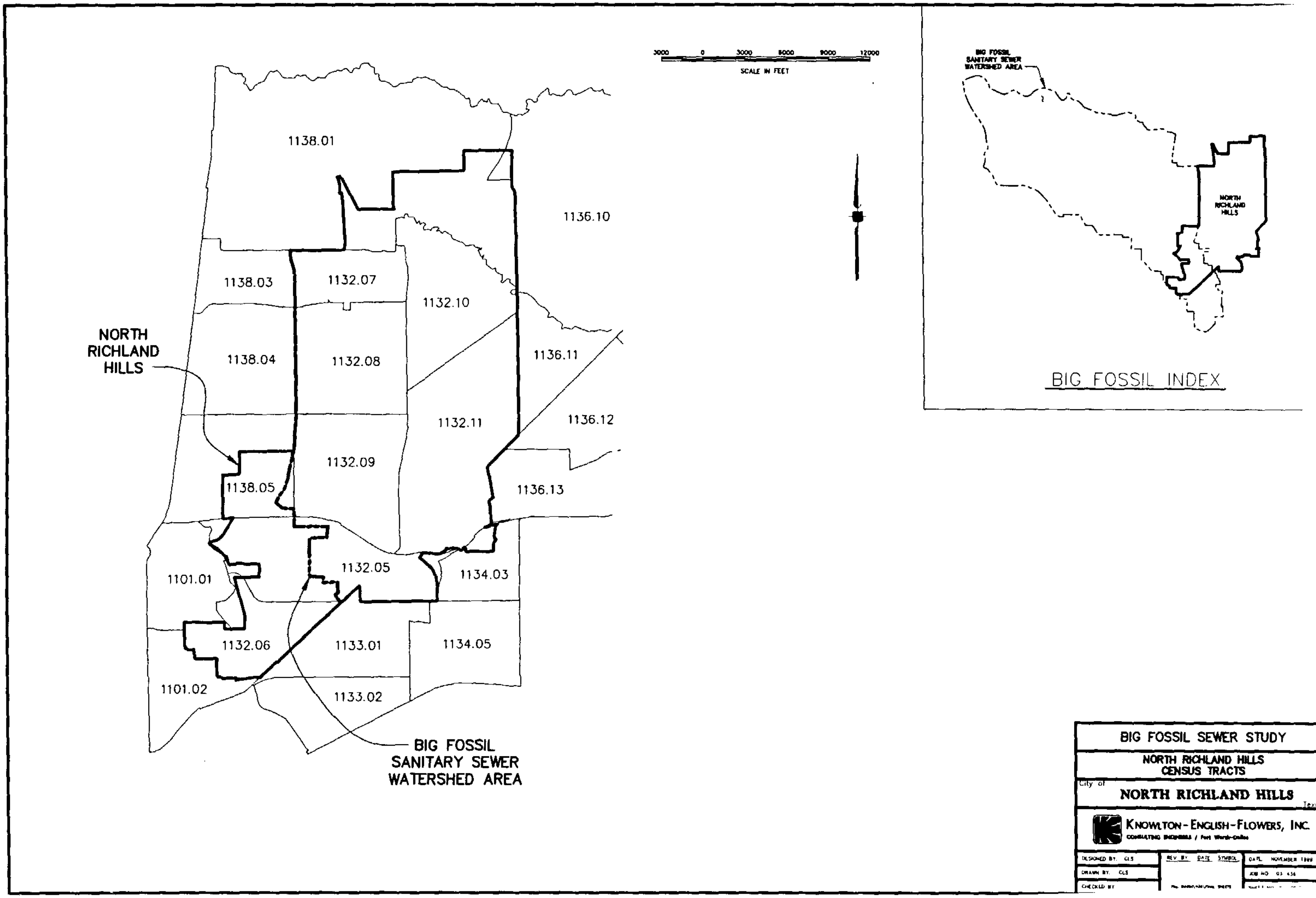
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1132.05
1134.03
1132.06
1133.01
1134.05
1101.02
1133.02
NORTH RICHLAND HILLS
BIG FOSSIL SANITARY SEWER WATERSHED AREA
BIG FOSSIL SANITARY SEWER WATERSHED AREA
NORTH RICHLAND HILLS
BIG FOSSIL INDEX
BIG FOSSIL SEWER STUDY
NORTH RICHLAND HILLS CENSUS TRACTS
City of
NORTH RICHLAND HILLS
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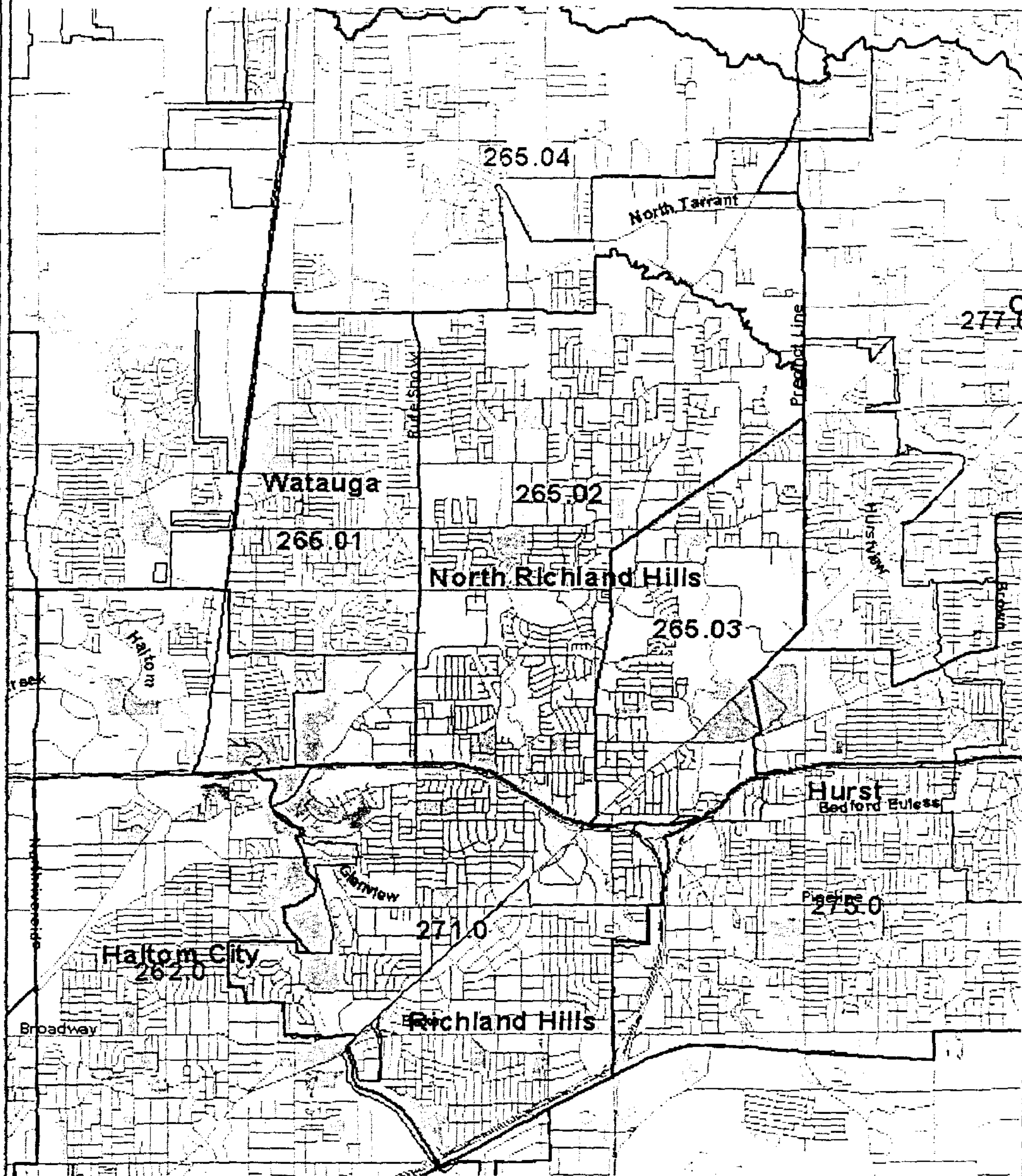

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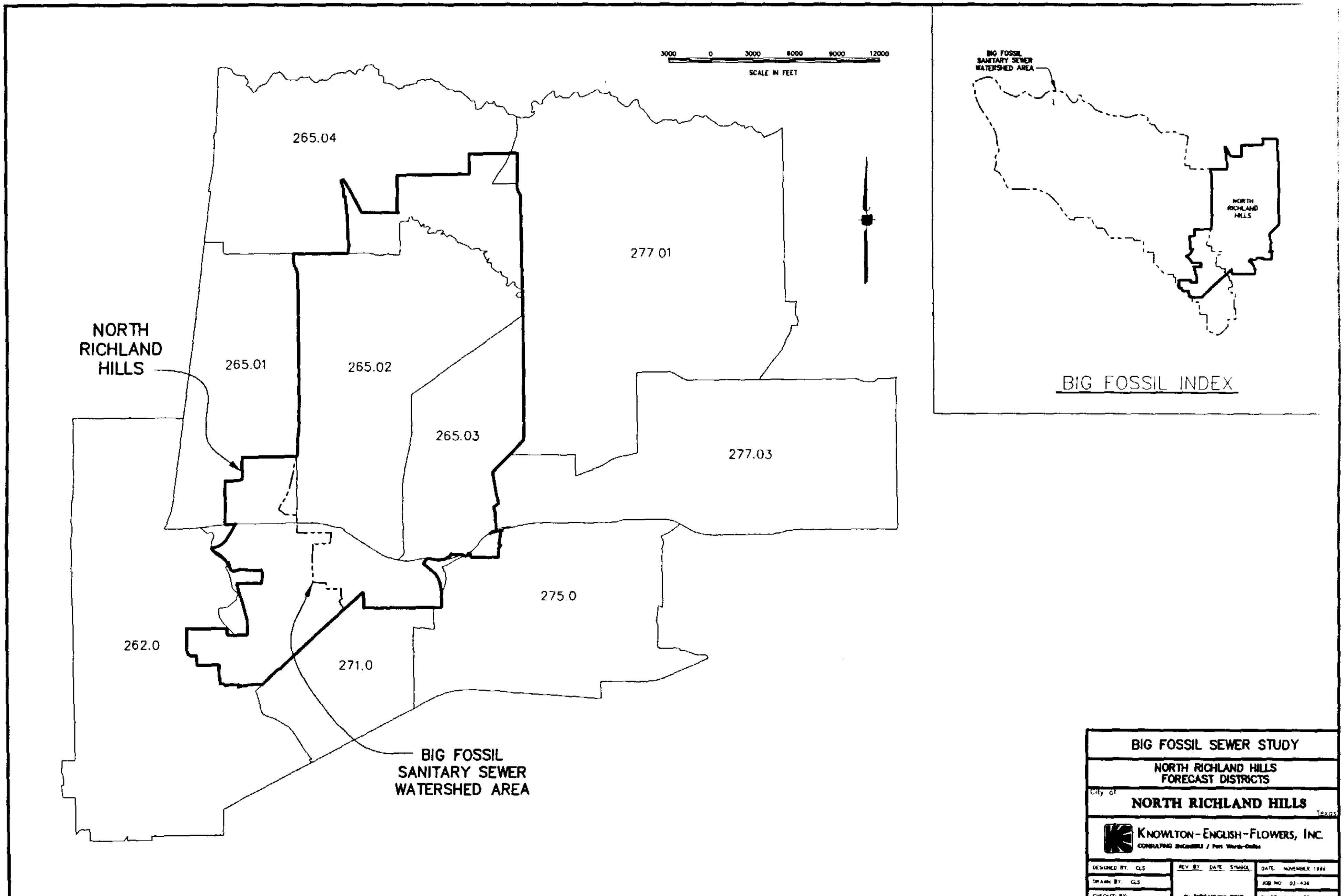
NCTCOG 1999
Forecast Districts
North Richland H

Map Legend:
- Roads
- Forecast Districts
- Airports
- Lakes
- Streams
- Parks

N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277.01
265.01
265.02
265.03
277.03
NORTH RICHLAND HILLS
262.0
271.0
275.0
BIG FOSSIL SANITARY SEWER WATERSHED AREA
BIG FOSSIL SANITARY SEWER WATERSHED AREA
NORTH RICHLAND HILLS
BIG FOSSIL INDEX
BIG FOSSIL SEWER STUDY
NORTH RICHLAND HILLS FORECAST DISTRICTS
City of
NORTH RICHLAND HILLS
Texas
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DRAWN BY: CLS
CHECKED BY:
REV BY DATE SYMBOL
DATE NOVEMBER 1999
JOB NO 03-436
SHEET NO X OF XX

North Richland Hills

(1) Census Tracts	(2) Total Area	(3) Area in City	(4) % Area In City	(5) Total 1995 Pop.	(6) Avg. Pop Density	(7) 1995 Pop In City	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1132.05	1711	1572	91.88%	7561	4.42	6947	2941	2.57	3591
1132.06	913	822	90.03%	4495	4.92	4047	1754	2.56	1206
1132.07	699	699	100.00%	4282	6.13	4282	1394	3.07	95
1132.08	1440	1440	100.00%	9030	6.27	9030	2939	3.07	544
1132.09	1462	1462	100.00%	9364	6.40	9364	3588	2.61	2866
1132.1	1394	1394	100.00%	5047	3.62	5047	1652	3.06	338
1132.11	2308	2308	100.00%	8859	3.84	8859	3510	2.52	2958
1134.03	603	63	10.43%	3038	5.04	317	1176	2.58	3681
1136.1	4583	55	1.20%	5708	1.25	69	1935	2.95	773
1138.01	5800	1365	23.53%	8394	1.45	1975	2780	3.02	253
1138.05	1455	495	34.02%	8138	5.59	2769	2775	2.93	2338
		11675		73916	48.93	52705	26444	30.95	18643

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in City	(14) % Area In City	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
265.01	3446	495	14.36%	8012	8862	11662	3.09	24757.08	7.18	27383.58	7.95	36035.58	10.46
265.02	4995	4995	100.00%	9573	10827	14603	2.93	28048.89	5.62	31723.11	6.35	42786.79	8.57
265.03	2308	2308	100.00%	3510	4004	6726	2.52	8845.2	3.83	10090.08	4.37	16949.52	7.34
265.04	5813	1365	23.48%	2780	5592	13146	3.02	8395.6	1.44	16887.84	2.91	39700.92	6.83
271	4540.6	2394	52.72%	7995	8840	10330	2.57	20547.15	4.53	22718.8	5.00	26548.1	5.85
275	4405.4	63	1.43%	10757	11110	11811	2.55	27430.35	6.23	28330.5	6.43	30118.05	6.84
277.01	9187	55	0.60%	6700	8631	14146	2.96	19832	2.16	25547.76	2.78	41872.16	4.56
	34695	11675		49327	57866	82424	2.81	137856.27	30.99	162681.67	35.79	234011.12	50.44

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in City	(28) % Area In City	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
265.01	3446	495	14.36%	3290	0.95	4197	1.22	6704	1.95
265.02	4995	4995	100.00%	3843	0.77	5556	1.11	5518	1.10
265.03	2308	2308	100.00%	2958	1.28	4955	2.15	4925	2.13
265.04	5813	1365	23.48%	253	0.04	2472	0.43	5971	1.03
271	4540.6	2394	52.72%	8621	1.90	9769	2.15	12762	2.81
275	4405.4	63	1.43%	13242	3.01	15646	3.55	22022	5.00
277.01	9187	55	0.60%	5386	0.59	6625	0.72	9939	1.08
		11675		37593	8.54	49220	11.33	67841	15.10

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
265.01	1138.03	638	638	3.18	2028.84
	1138.04	1365	1365	3.23	4408.95
	1138.05	1455	1455	2.93	4263.15
		3458	3458		10700.94
					[illegible]
265.02	1132.07	699	699	3.07	2145.93
	1132.08	1440	1440	3.07	4420.80
	1132.09	1462	1462	2.61	3815.82
	1132.1	1394	1394	3.06	4265.64
		4995	4995		14648.19
					[illegible]
265.03	1132.11	2308	2308	2.52	5815.16
					[illegible]
265.04	1138.01	5800	1365	3.02	4122.30
					[illegible]
271	1132.05	1711	1711	2.57	4397.27
	1132.06	913	913	2.56	2337.28
	1133.01	1023	1023	2.47	2526.81
	1133.02	866	866	2.72	2355.52
		4513	4513		11616.08
					[illegible]
275	1134.03	603	603	2.58	1555.74
	1134.04	843	843	2.61	2200.23
	1134.05	1059	1059	2.42	2562.78
	1134.07	482	482	2.60	1253.20
	1134.08	903	903	2.65	2392.95
	1136.07	509	509	2.43	1236.87
		4399	4399		11201.77
					[illegible]
277.01	1136.09	6389	2832	2.94	8326.08
	1136.1	4583	4583	2.95	13519.85
	1136.11	783	783	3.12	2442.96
	1136.12	978	978	2.93	2865.54
		12732	9178		27154.43
					[illegible]

(41)	(42)	(43)	(44)	(45)	(46)	(47)
CITY ONLY						
Forecast Districts	Population 1995	2005	2025	Employment 1995	2005	2025
265.01	3556	3934	5176	473	603	963
265.02	28049	31723	42787	3843	5556	5518
265.03	8845	10090	16950	2958	4955	4925
265.04	1971	3966	9323	59	580	1402
271	10833	11978	13997	4545	5151	6729
275	392	405	431	189	224	315
277.01	119	153	251	32	40	60
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	Pop	Year
North Richalnd Hills Ultimate Population	77757	
Fort Worth Impact Fee Study	[illegible]	[illegible]

FUTURE POP. & EMP. LAND USE AREAS

1995 Population	53766	1995 Employment	12100
1995 Residential Area	5495	1995 Employment Area	1426
1995 Density	9.78	1995 Density	8.49
2005 Residential Area	6362	2005 Residential Area	2016
2025 Residential Area	9087	2025 Residential Area	2347

	1995	2005	2015	2025	
Residential Area	5495	6362	7725	9087	2725
Employment Area	1426	2016	2181	2347	330
SEWERED AREA	**6921**	**8378**	**9906**	**11434**	3056
Total Unsewered	684	829	929	1029	201
Vacant & Under Constr.	4070	2469	841	0	-2469
REMINADER	**4754**	**3297**	**1770**	1029	-2268
	11675	11675	11675	12463	
TOTAL AREA	11675	11675	11675	11675	

NOTES Census Tracts from NCTCOG Population Database
Total Census Tract Area (Acres)
(1) Total Area in City (Acres)
(2) Percent of Census Tract Area within City
(3) Total 1995 Population in Census Tract from NCTCOG data
(4) Average Population Density in People/Acre = (5) / (2)
(5) 1995 Population within City = (5) x (4)
(6) 1995 Total Households from NCTCOG Database
(7) 1995 Population per House = (5) / (8)
(8) 1995 Total Employment from NCTCOG Database
(9) Population Forecast Districts from NCTCOG Database
(10) Total Computed Area within Forecast District from AutoCAD map (Acres)
(11) Area of Forecast District within City (Acres)
(12) Percent of Forecast District Total Area within City
(13) 1995 Total Households in Forecast District
(14) 2005 Total Households in Forecast District (Projected by NCTCOG)
(15) 2025 Total Households in Forecast District (Projected by NCTCOG)
(16) Computed Weighted Average Population per House Density from Col (40)
(17) Computed 1995 Forecast District Population = (18) x (15)
(18) Average 1995 Population Density of Forecast District in People / Acre = (19) / (12)
(19) Computed 2005 Forecast District Population = (18) x (16)
(20) Average 2005 Population Density of Forecast District in People / Acre = (21) / (12)
(21) Computed 2025 Forecast District Population = (18) x (17)
(22) Average 2025 Population Density of Forecast District in People / Acre = (23) / (12)
(23) Population Forecast Districts from NCTCOG Database
(24) Total Computed Area within Forecast District from AutoCAD map (Acres)
(25) Area of Forecast District within City (Acres)
(26) Percent of Forecast District Total Area within City
(27) 1995 Total Employment in Forecast District
(28) Average 1995 Employment Density of Forecast District in Employees / Acre = (29) / (26)
(29) 2005 Total Employment in Forecast District
(30) Average 2005 Employment Density of Forecast District in Employees / Acre = (31) / (26)
(31) 2025 Total Employment in Forecast District
(32) Average 2025 Employment Density of Forecast District in Employees / Acre = (33) / (26)
(33) Population Forecast Districts from NCTCOG Database
(34) Census Tracts from NCTCOG Population Database
(35) Total Census Tract Area (Acres)
(36) Portion of Census Tract Area in Forecast District (Acres)
(37) Population per House Density from Col (9)
(38) (38) x (39). Sum Col (40) / (37) = Weighted Average Population per House in Forecast District
(39) Population Forecast Districts from NCTCOG Database
(40) Computed 1995 Forecast District Population in City Limits = (19) x (14)
(41) Computed 2005 Forecast District Population in City Limits = (19) x (14)
(42) Computed 2025 Forecast District Population in City Limits = (19) x (14)
(43) 1995 Total Employment in Forecast District for City Limits = (29) x (28)
(44) 2005 Total Employment in Forecast District for City Limits = (29) x (28)

NORTH RICHLAND HILLS (BIG FOSSIL)

(1) Census Tracts	(2) Total Area	(3) Area in Watershed	(4) % Area Watershed	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In Wshed	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1132.05	1711	784	45.82%	7561	4.42	3465	2941	2.57	3591
1132.06	913	822	90.03%	4495	4.92	4047	1754	2.56	1208
1138.05	1455	446	30.65%	8138	5.59	2495	2775	2.93	2338
		2052		20194	14.94	10006	7470	8.07	7135

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in Watershed	(14) % Area Watershed	(15) Total 1995 Households In Wshed	(16) Total 2005 Households In Wshed	(17) Total 2025 Households In Wshed	(18) Population /House	(19) 1995 Population in Wshed	(20) 2005 Population In Wshed	(21) 2025 Population In Wshed
265.01	3446	446	12.94%	8012	8862	11662	3.09	3204	3544	4664
271	4540.6	1606	35.37%	7995	8840	10330	2.57	7267	8036	9390
		2052		16007	17702	21992	2.83	10472	11580	14054

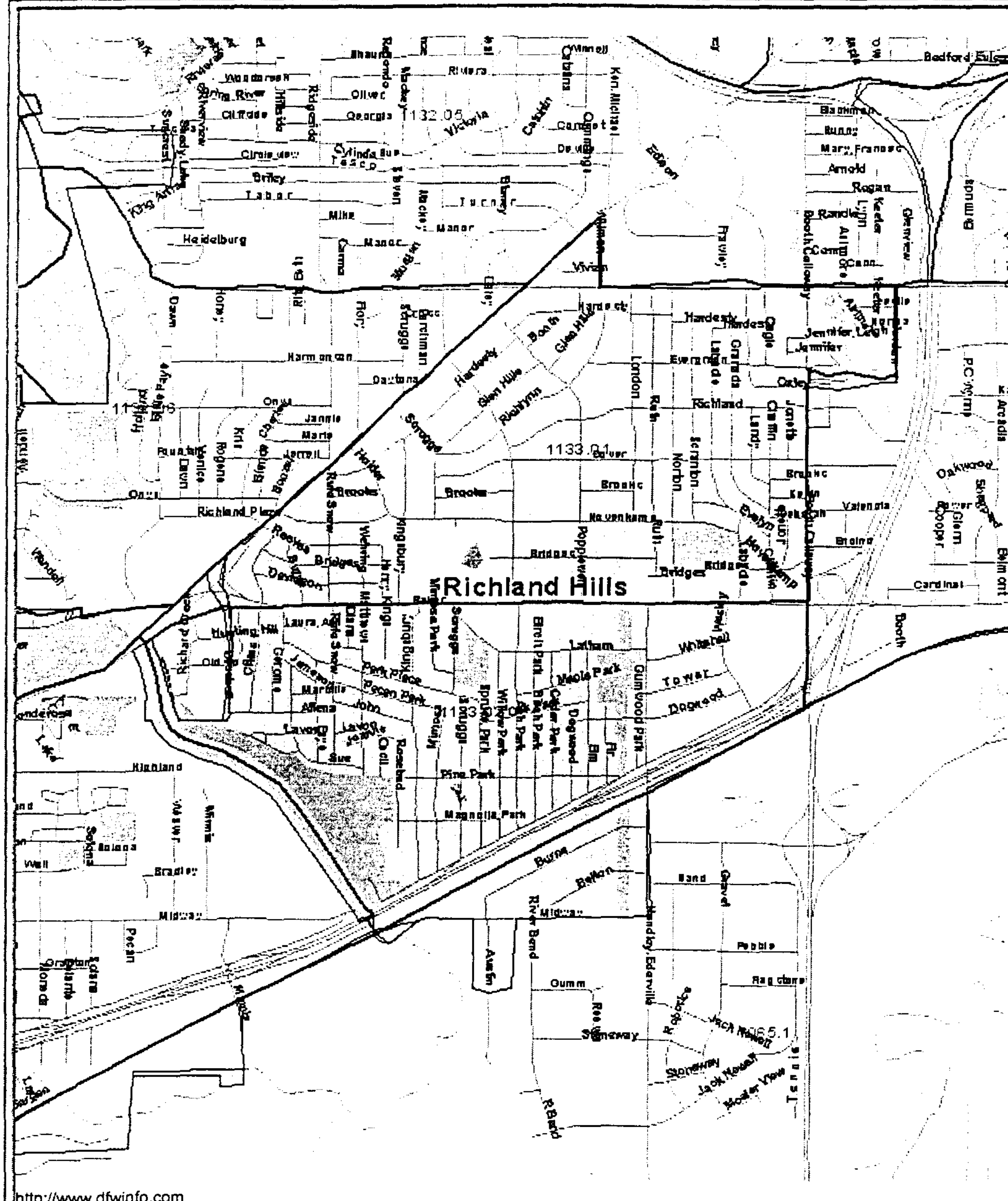
EMPLOYMENT

(22) Forecast Districts	(23) Total Area	(24) Area in Watershed	(25) % Area Watershed	(26) Total 1995 Employment In Wshed	(27) Total 2005 Employment In Wshed	(28) Total 2025 Employment In Wshed
265.01	3446	446	12.94%	426	543	868
271	4540.6	1606	35.37%	3049	3455	4514
		2052		3475	3998	5382

NOTES:

(1) Census Tracts from NCTCOG Population Database that are contained by the Haltom City limits and contribute to the Big Fossil Watershed
(2) Total Census Tract Area (Acres)
(3) Total Area in Haltom City limits that contribute to the Big Fossil Watershed (Acres)
(4) Percent of Census Tract Area within City Limits that contribute to the Big Fossil Watershed
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City that contributes to the Big Fossil Watershed = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(14) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(15) 1995 Total Households in Forecast District that contributes to Big Fossil Watershed
(16) 2005 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density (previously computed for entire Forecast Districts
(19) Computed 1995 Forecast District Population in city which contributes to Big Fossil WAtershed = (18) x (15)
(20) Computed 2005 Forecast District Population in city which contributes to Big Fossil Watershed = (18) x (16)
(21) Computed 2025 Forecast District Population in city which contributes to Big Fossil Watershed = (18) x (17)
(22) Population Forecast Districts from NCTCOG Database
(23) Total Computed Area within Forecast District from AutoCAD map (Acres)
(24) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(25) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(26) 1995 Employment in Forecast District in city which contributes to Big Fossil Watershed
(27) 2005 Employment in Forecast District in city which contributes to Big Fossil Watershed
(28) 2025 Employment in Forecast District in city which contributes to Big Fossil Watershed

RICHLAND HILLS



North Central Texas Council of Governments
Research and Information Services
(817) 695-9150

1990 Census Tracts

Map Legend:
- Roads
- Census Tracts
- Airports
- Lakes
- Streams
- Parks

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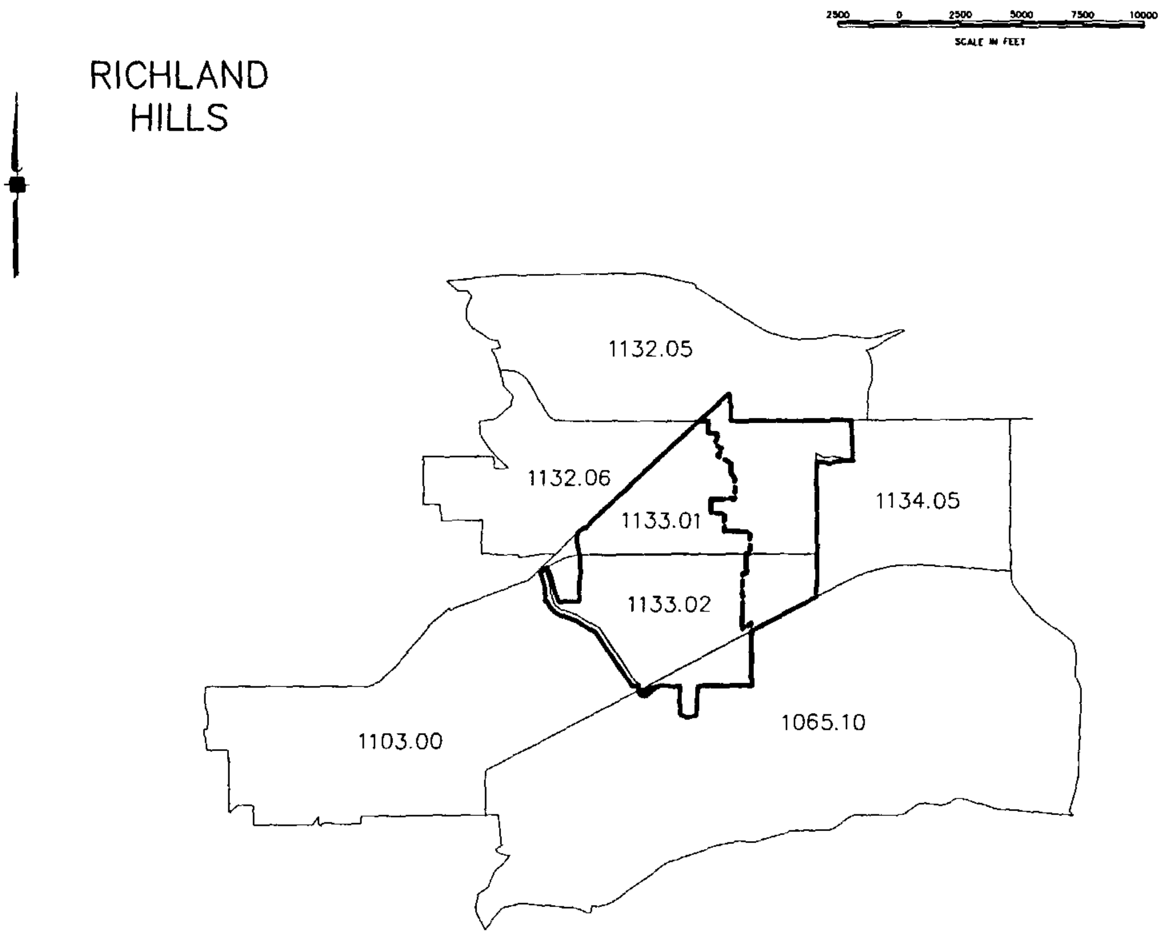

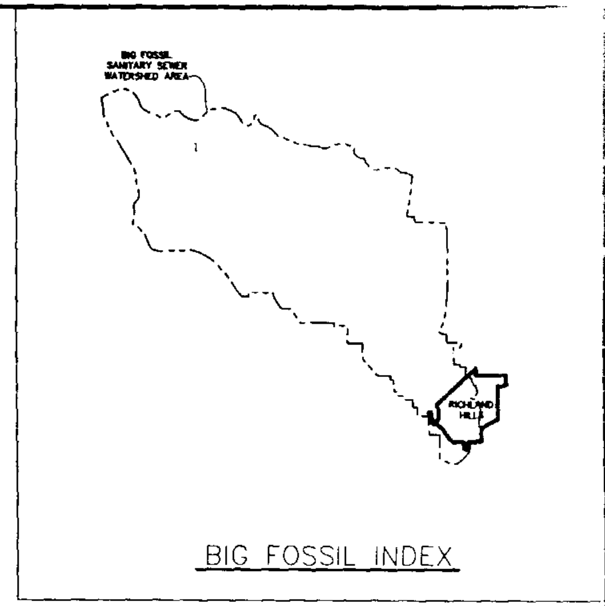

BIG FOSSIL SEWER STUDY

RICHLAND HILLS CENSUS TRACTS

City of

NORTH RICHLAND HILLS

Texas

KNOWLTON-ENGLISH-FLOWERS, INC.

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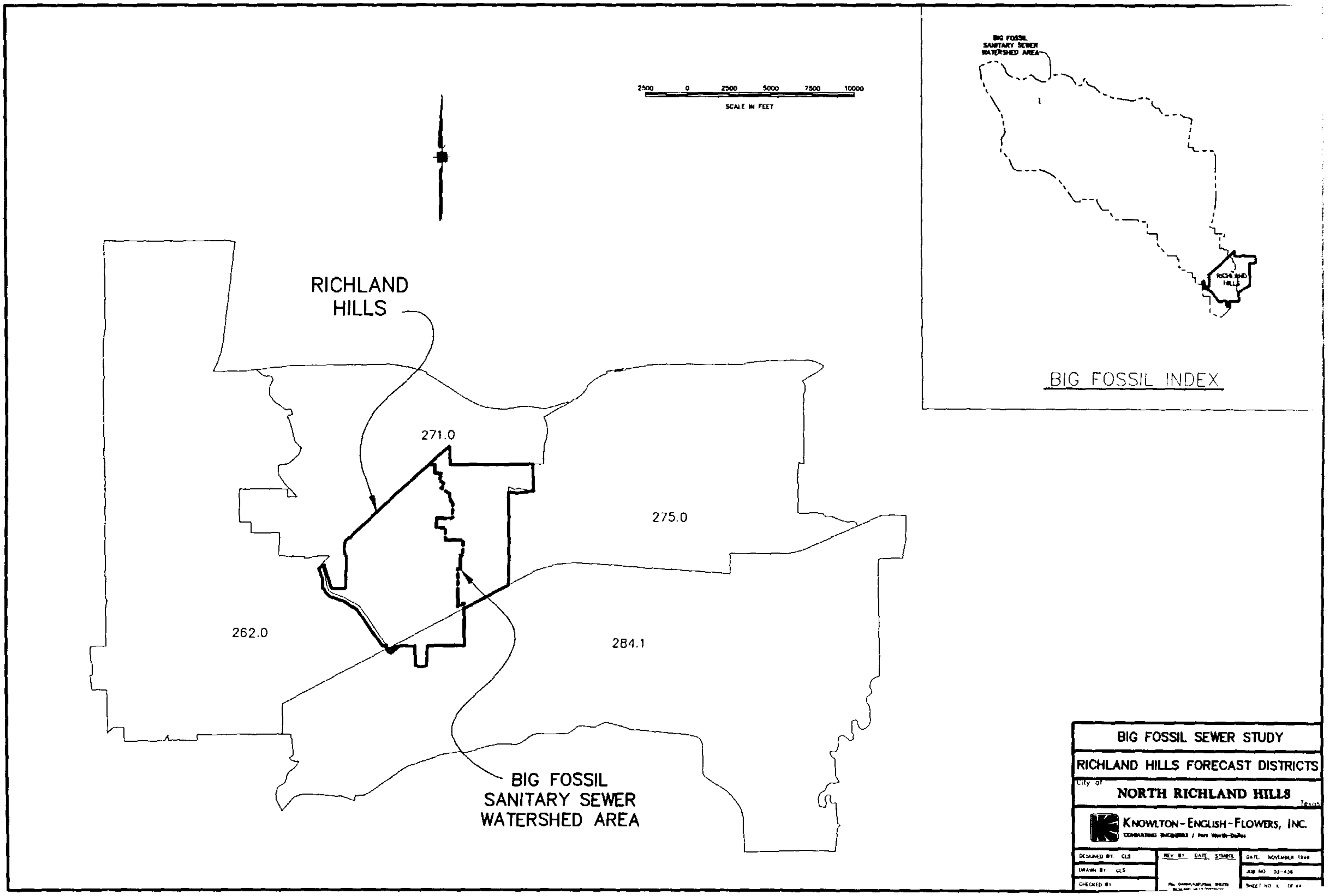
DRAWN BY: CLS		JOB NO. [illegible]
CHECKED BY:		SHEET NO. [illegible]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SCALE IN FEET
RICHLAND HILLS
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275.0
262.0
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BIG FOSSIL SANITARY SEWER WATERSHED AREA
BIG FOSSIL SANITARY SEWER WATERSHED AREA
RICHLAND HILLS
BIG FOSSIL INDEX
BIG FOSSIL SEWER STUDY
RICHLAND HILLS FORECAST DISTRICTS
City of
NORTH RICHLAND HILLS
Texas
KNOWLTON-ENGLISH-FLOWERS, INC.
DESIGNED BY: CLS
DRAWN BY: CLS
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REV BY DATE SYMBOL
JOB NO. 03-436

Richland Hills

(1) Census Tracts	(2) Total Area	(3) Area in City	(4) % Area In City	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In City	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1065.1	4618	127	2.75%	1975	0.43	54	693	2.85	5194
1103	2235	33	1.48%	8532	3.82	126	3222	2.65	5725
1133.01	1023	1016	99.32%	4456	4.36	4426	1803	2.47	1279
1133.02	866	825	95.27%	4073	4.70	3880	1497	2.72	2545
1134.05	1059	6	0.59%	4800	4.53	28	1986	2.42	2337
		2007		23836	17.84	8514	9201	13.11	17080

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in City	(14) % Area In City	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
262	7139.37	33	0.46%	11588	13259	14059	2.65	30708.2	4.30	35136.35	4.92	37256.35	5.22
271	4540.6	1838	40.48%	7995	8840	10330	2.57	20547.15	4.53	22718.8	5.00	26548.1	5.85
275	4405.4	6	0.14%	10757	11110	11811	2.42	26031.94	5.91	26886.2	6.10	28582.62	6.49
284.1	8738.65	130	1.49%	1979	2790	4700	2.85	5640.15	0.65	7951.5	0.91	13395	1.53
	24824.02	2007		32319	35999	40900	2.62	82927.44	15.38	92692.85	16.94	105782.07	19.09

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in City	(28) % Area In City	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
262	7139.37	33	0.46%	10987	1.54	13469	1.89	15948	2.23
271	4540.6	1838	40.48%	8621	1.90	9769	2.15	12762	2.81
275	4405.4	6	0.14%	13242	3.01	15646	3.55	22022	5.00
284.1	8738.65	130	1.49%	12361	1.41	13944	1.60	20165	2.31
		2007		45211	7.86	52828	9.19	70897	12.35

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
262	1103	2235	2235	2.65	5918.38
					2.65
271	1132.05	1711	1711	2.57	4397.27
	1132.06	913	913	2.56	2337.28
	1133.01	2235	1023	2.65	2708.95
	1133.02	1023	866	2.47	2140.26
		5882	4513		11583.76
					2.57
275	1134.05	1059	1059	2.42	2562.78
					2.42
284.1	1065.1	4618	4618	2.85	13161.30
					2.85

(41)	(42)	(43)	(44)	(45)	(46)	(47)
CITY ONLY						
Forecast Districts	Population 1995	2005	2025	Employment 1995	2005	2025
262	142	162	172	51	62	74
265.01	8317	9196	10746	3490	3954	5166
271	35	37	39	18	21	30
284.1	84	118	199	184	207	300
TOTAL	8579	9514	11157	3742	4245	5570

	Pop	Year
Richalnd Hills Ultimate Population	9627	
Fort Worth Impact Fee Study	10175	2019

FUTURE POP. & EMP. LAND USE AREAS

1995 Population	8579	1995 Employment	3742
1995 Residential Area	1170	1995 Employment Area	374
1995 Density	7.33	1995 Density	10.01
2005 Residential Area	1298	2005 Residential Area	424
2025 Residential Area	1522	2025 Residential Area	557

	1995	2005	2025
Residential Area	1170	1298	1522
Employment Area	374	424	557
SEWERED AREA	**1544**	**1722**	**2078**
Infrastructure	155	173	0
Vacant	308	112	0
REMINADER	**463**	**285**	**0**
	2007	2007	2078
TOTAL AREA	**2007**	**2007**	**2007**

NOTES:

(1) Census Tracts from NCTCOG Population Database
(2) Total Census Tract Area (Acres)
(3) Total Area in City (Acres)
(4) Percent of Census Tract Area within City
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City (Acres)
(14) Percent of Forecast District Total Area within City
(15) 1995 Total Households in Forecast District
(16) 2005 Total Households in Forecast District (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density from Col. (40)
(19) Computed 1995 Forecast District Population = (18) x (15)
(20) Average 1995 Population Density of Forecast District in People / Acre = (19) / (12)
(21) Computed 2005 Forecast District Population = (18) x (16)
(22) Average 2005 Population Density of Forecast District in People / Acre = (21) / (12)
(23) Computed 2025 Forecast District Population = (18) x (17)
(24) Average 2025 Population Density of Forecast District in People / Acre = (23) / (12)
(25) Population Forecast Districts from NCTCOG Database
(26) Total Computed Area within Forecast District from AutoCAD map (Acres)
(27) Area of Forecast District within City (Acres)
(28) Percent of Forecast District Total Area within City
(29) 1995 Total Employment in Forecast District
(30) Average 1995 Employment Density of Forecast District in Employees / Acre = (29) / (26)
(31) 2005 Total Employment in Forecast District
(32) Average 2005 Employment Density of Forecast District in Employees / Acre = (31) / (26)
(33) 2025 Total Employment in Forecast District
(34) Average 2025 Employment Density of Forecast District in Employees / Acre = (33) / (26)
(35) Population Forecast Districts from NCTCOG Database
(36) Census Tracts from NCTCOG Population Database
(37) Total Census Tract Area (Acres)
(38) Portion of Census Tract Area in Forecast District (Acres)
(39) Population per House Density from Col. (9)
(40) (38) x (39). Sum Col (40) / (37) = Weighted Average Population per House in Forecast District
(41) Population Forecast Districts from NCTCOG Database
(42) Computed 1995 Forecast District Population in City Limits = (19) x (14)
(43) Computed 2005 Forecast District Population in City Limits = (19) x (14)
(44) Computed 2025 Forecast District Population in City Limits = (19) x (14)
(45) 1995 Total Employment in Forecast District for City Limits = (29) x (28)
(46) 2005 Total Employment in Forecast District for City Limits = (29) x (28)
(47) 2025 Total Employment in Forecast District for City Limits = (29) x (28)

RICHLAND HILLS (BIG FOSSIL)

(1) Census Tracts	(2) Total Area	(3) Area in Watershed	(4) % Area Watershed	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In Wshed	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1065.1	4618	127	2.75%	1975	0.43	54	693	2.85	5194
1103	2235	33	1.48%	8532	3.82	126	3222	2.65	5725
1133.01	1023	489	47.83%	4456	4.36	2131	1803	2.47	1279
1133.02	866	651	75.17%	4073	4.70	3062	1497	2.72	2545
1134.05	1059	6	0.59%	4800	4.53	28	1986	2.42	2337
		1307		23836	17.84	5401	9201	13.11	17080

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in Watershed	(14) % Area Watershed	(15) Total 1995 Households In Wshed	(16) Total 2005 Households In Wshed	(17) Total 2025 Households In Wshed	(18) Population /House	(19) 1995 Population in Wshed	(20) 2005 Population In Wshed	(21) 2025 Population In Wshed
262	7139.37	33	0.46%	54	61	65	2.59	139	159	168
271	4540.6	1141	25.13%	2912	3332	3533	2.58	7513	8596	9115
275	4405.4	6	0.14%	11	12	14	2.42	26	29	34
284.1	8738.7	127	1.45%	156	161	172	2.85	446	460	489
		1307		3133	3567	3784	2.61	8123.4	9244.1637	9806

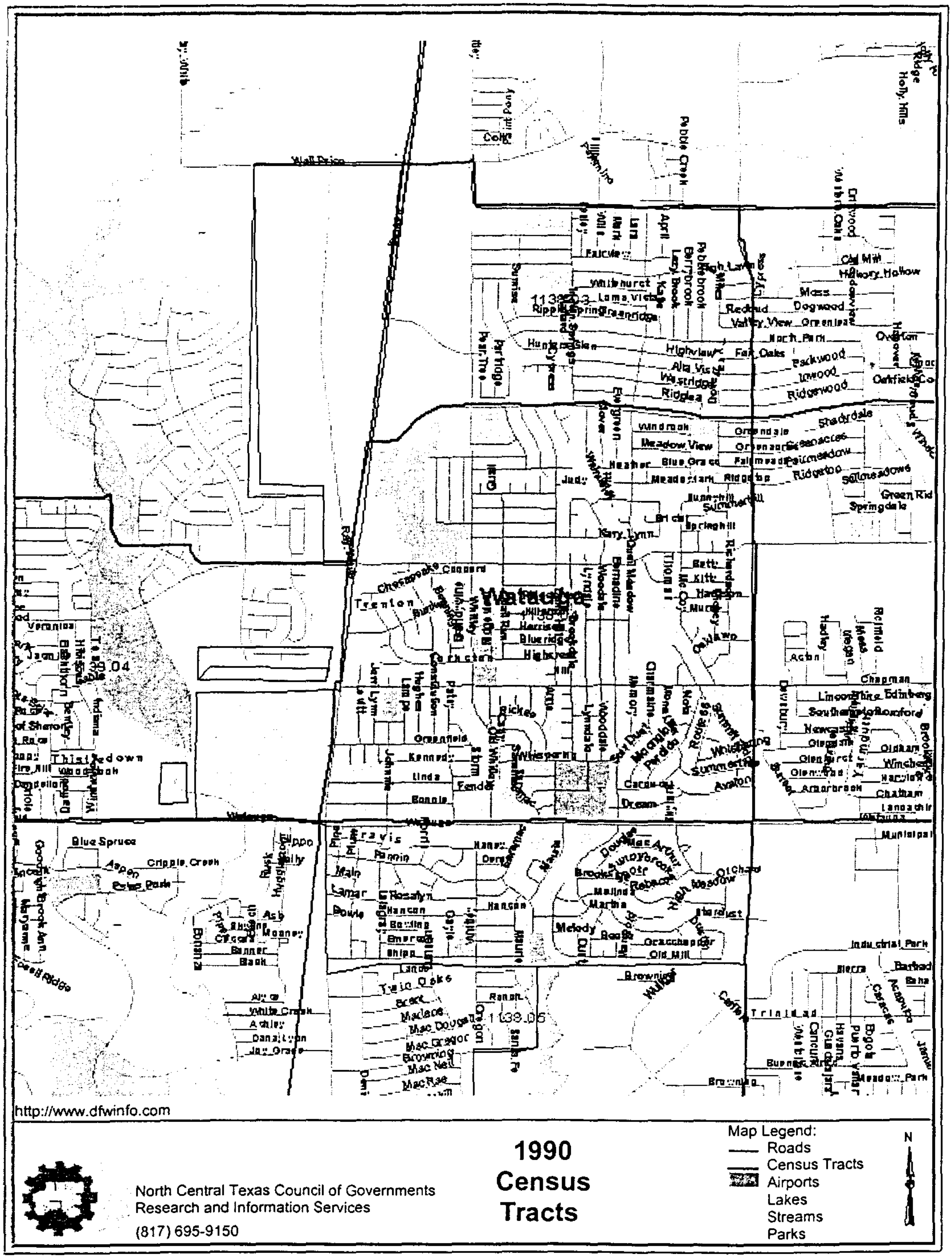
EMPLOYMENT

(22) Forecast Districts	(23) Total Area	(24) Area in Watershed	(25) % Area Watershed	(26) Total 1995 Employment In Wshed	(27) Total 2005 Employment In Wshed	(28) Total 2025 Employment In Wshed
262	7139.37	33	0.46%	51	62	74
271	4540.6	1141	25.13%	2761	3385	4008
275	4405.4	6	0.14%	12	13	17
284.1	8738.7	127	1.45%	192	227	320
		1307		3016	3688	4419

NOTES:

(1) Census Tracts from NCTCOG Population Database that are contained by the Haltom City limits and contribute to the Big Fossil Watershed
(2) Total Census Tract Area (Acres)
(3) Total Area in Haltom City limits that contribute to the Big Fossil Watershed (Acres)
(4) Percent of Census Tract Area within City Limits that contribute to the Big Fossil Watershed
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City that contributes to the Big Fossil Watershed = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(14) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(15) 1995 Total Households in Forecast District that contributes to Big Fossil Watershed
(16) 2005 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density (previously computed for entire Forecast Districts
(19) Computed 1995 Forecast District Population in city which contributes to Big Fossil WAtershed = (18) x (15)
(20) Computed 2005 Forecast District Population in city which contributes to Big Fossil Watershed = (18) x (16)
(21) Computed 2025 Forecast District Population in city which contributes to Big Fossil Watershed = (18) x (17)
(22) Population Forecast Districts from NCTCOG Database
(23) Total Computed Area within Forecast District from AutoCAD map (Acres)
(24) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(25) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(26) 1995 Employment in Forecast District in city which contributes to Big Fossil Watershed
(27) 2005 Employment in Forecast District in city which contributes to Big Fossil Watershed
(28) 2025 Employment in Forecast District in city which contributes to Big Fossil Watershed

WATAUGA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Harrison
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Ridgetop
Springdale
Green Ridge
Chapman
Edinburg
Newcastle
Winchester
Chatham
Thistledown
Blue Spruce
Cripple Creek
Aspen
Watauga
Melody
Old Mill
Industrial Park
Trinidad
Twin Oaks
Mac Gregor
Browning
Mac Rae
Hickory Hollow
Dogwood
Packwood
Inwood
Ridgewood
Oakfield
Overton
Dream
Avalon
Summertree
Kennedy
Linda
Bonnie
Fender
Greenfield
Lamar
Bowie
Hancon
Oregon
Santa Fe
High Meadow
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Tracts
Map Legend:
Roads
Census Tracts
Airports
Lakes
Streams
Parks
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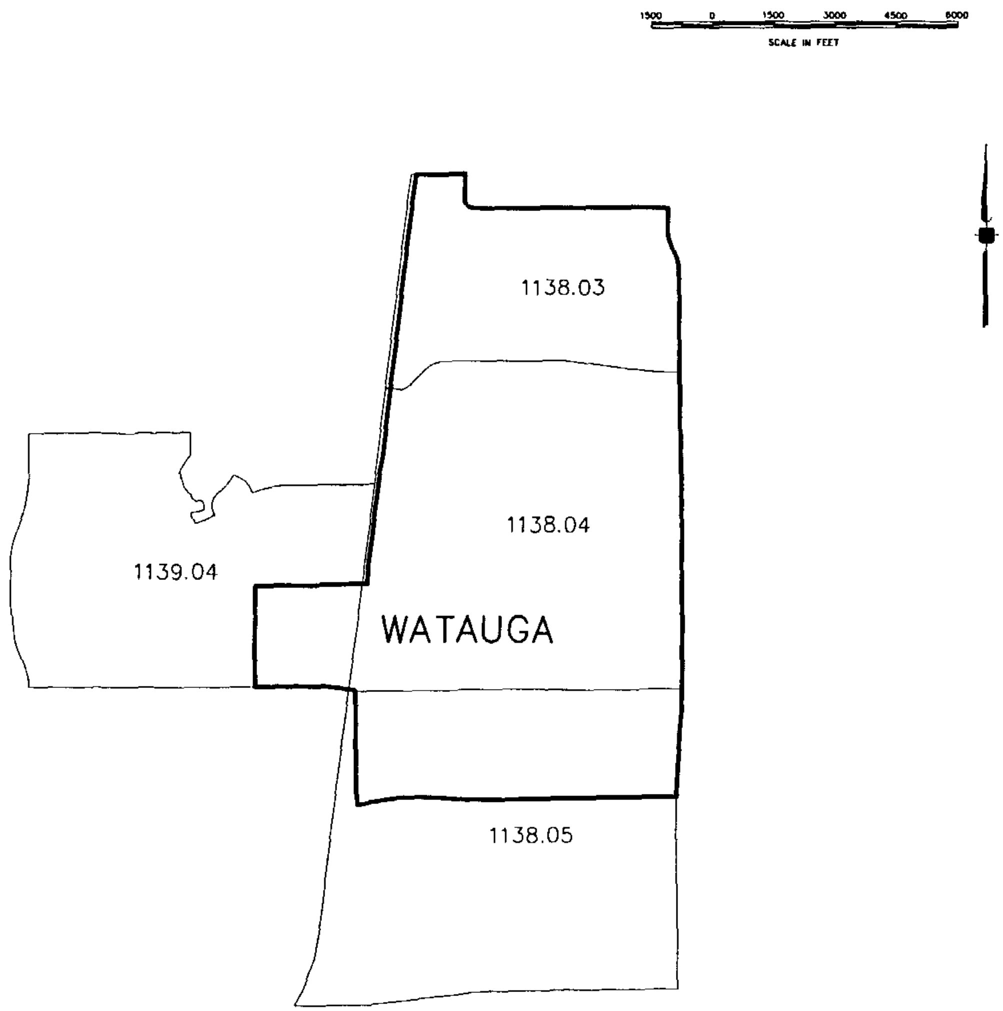
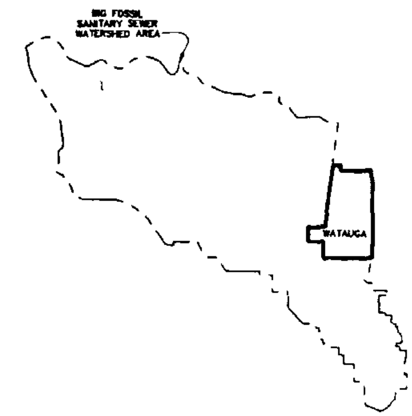




BIG FOSSIL INDEX

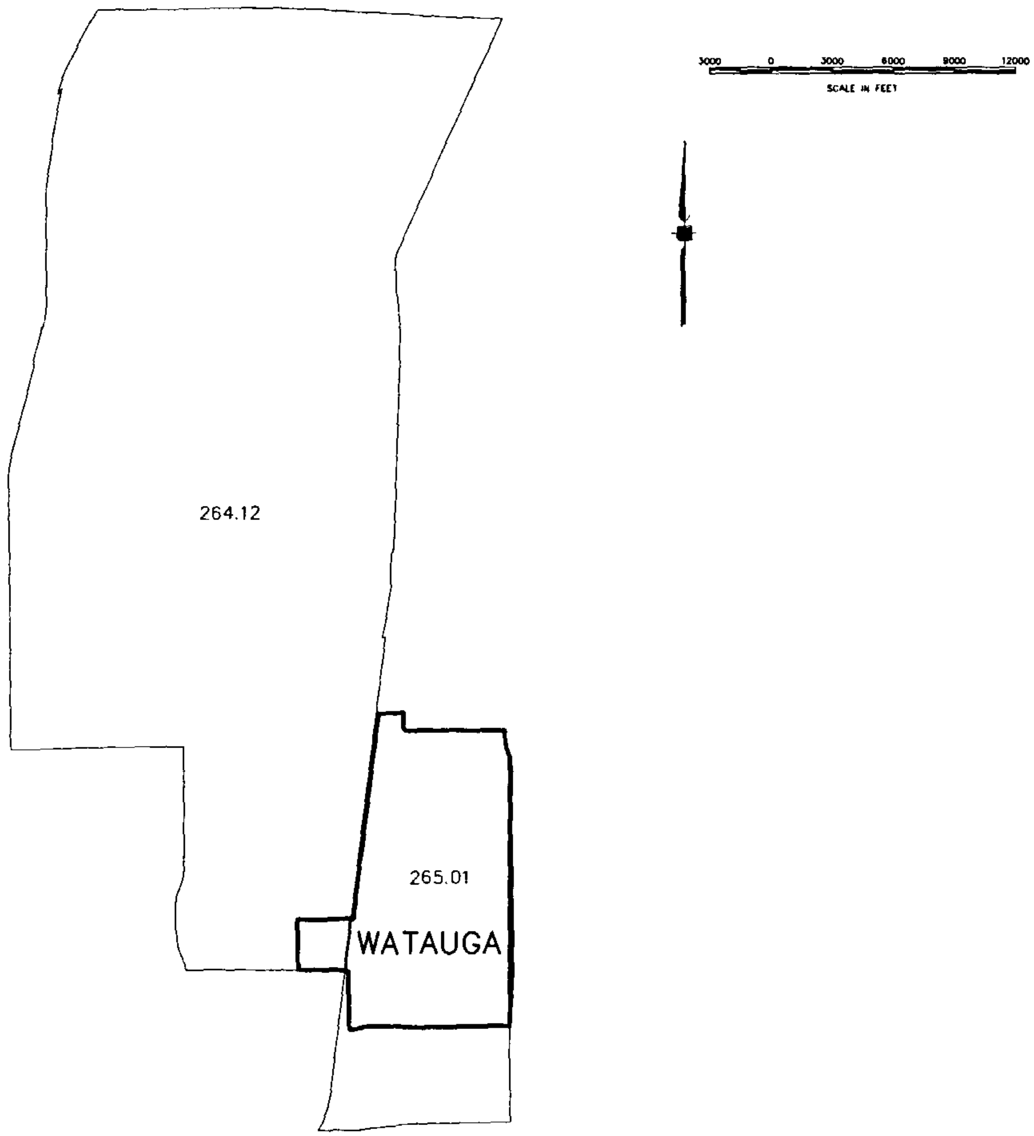
BIG FOSSIL SEWER STUDY

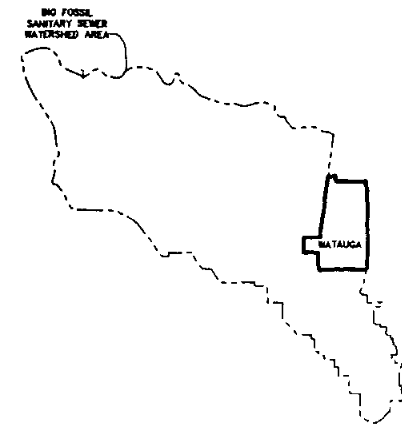
WATAUGA CENSUS TRACTS

City of **NORTH RICHLAND HILLS** Texas

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: CLS	REV BY DATE SYMBOL	DATE: NOVEMBER 1989
DRAWN BY: CLS		JOB NO. 03-436
CHECKED BY		SHEET NO. K OF KK





BIG FOSSIL INDEX

BIG FOSSIL SEWER STUDY
WATAUGA FORECAST DISTRICTS
City of NORTH RICHLAND HILLS Texas
KNOWLTON-ENGLISH-FLOWERS, INC.

DESIGNED BY: CLS	REV. BY DATE SYMBOL	DATE: NOVEMBER
DRAWN BY: CLS		JOB NO. 03-436
CHECKED BY:		

Watauga

(1) Census Tracts	(2) Total Area	(3) Area in City	(4) % Area In City	(5) Total 1995 Pop	(6) Avg. Pop. Density	(7) 1995 Pop. In City	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1138.03	638	626	98.12%	4921	7.71	4828	1548	3.18	120
1138.04	1365	1353	99.12%	11922	8.73	11817	3689	3.23	832
1138.05	1455	483	33.20%	8138	5.59	2701	2775	2.93	2338
1139.04	1036	138	13.32%	5509	5.32	734	1951	2.82	248
		2600		30490	27.36	20081	9963	12.17	3538

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in City	(14) % Area In City	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
264.12	17248	138	0.80%	4317	6885	21562	2.82	12173.94	0.71	19415.7	1.13	60804.84	3.53
265.01	3432	2462	71.74%	8012	8862	11662	3.18	25478.16	7.42	28181.16	8.21	37085.16	10.81
	20680	2600		12329	15747	33224	3.00	37652.1	8.13	47596.86	9.34	97890.00	14.33

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in City	(28) % Area In City	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
264.12	17248	138	0.80%	2717	0.16	11078	0.64	19948	1.16
265.01	3432	2462	71.74%	3290	0.96	4197	1.22	6074	1.77
		2600		6007	1.12	15275	1.87	26022	2.93

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
264.12	1139.04	1036	138	2.82	389.16
					[illegible]
265.01	1138.03	638	626	3.18	1990.66
	1138.04	1365	1353	3.23	4370.19
	1138.05	1455	483	2.93	1415.19
					[illegible]

(41)	(42)	(43)	(44)	(45)	(46)	(47)
CITY ONLY						
Forecast	Population			Employment		
Districts	1995	2005	2025	1995	2005	2025
264.12	97	155	486	22	89	160
265.01	18277	20216	26604	2360	3011	4357
TOTAL	18375	20372	27090	2382	3099	4517

Watauga Ultimate Population 27609

FUTURE POP. & EMP. LAND USE AREAS

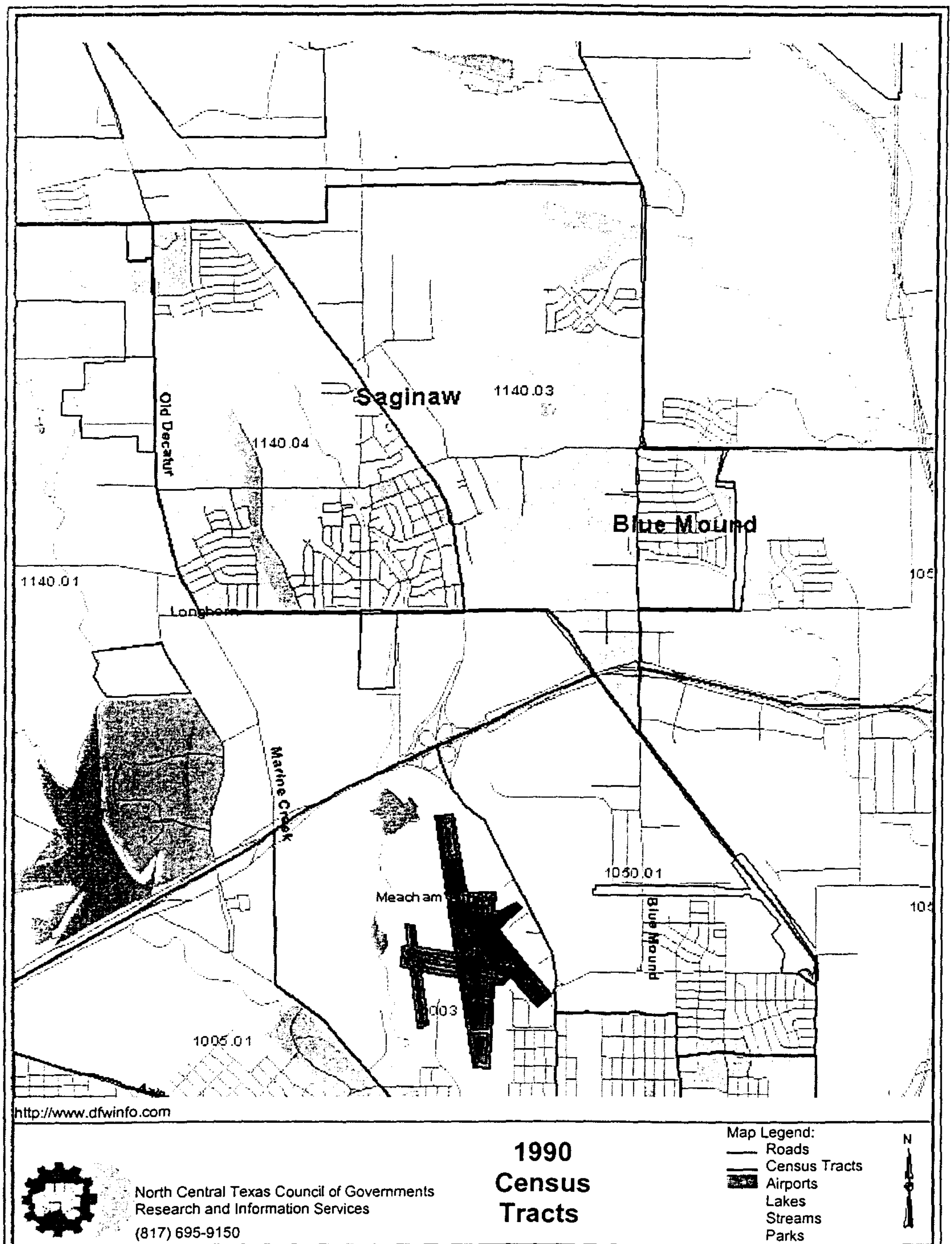
1995 Population	18375	1995 Employment	2382
1995 Residential Area	1756	1995 Employment Area	202
1995 Density	10.46	1995 Density	11.79
2005 Residential Area	1947	**2005 Residential Area**	263
2025 Residential Area	2569	**2025 Residential Area**	383

	1995	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential Area	1756	1947	1979	2011	2043	2075	2107	2139	2172	2204	2236	2268	2300	2332	2364	2396	2428	2460	2493	2525	2557	[illegible]
Employment Area	202	263	269	275	281	287	293	299	305	311	317	323	329	335	341	347	353	359	365	371	377	[illegible]
SEWERED AREA	**1958**	**2210**	**2248**	**2286**	**2324**	**2362**	**2400**	**2438**	**2476**	**2514**	**2553**	**2591**	**2629**	**2667**	**2705**	**2743**	**2781**	**2819**	**2857**	**2895**	**2934**	2972
Total Unsewered	29	33	33	34	34	35	35	36	37	37	38	38	39	39	40	40	41	42	42	43	43	44
Vacant & Under Constr.	613	358	333	308	283	258	233	208	183	158	133	108	83	58	33	8	-17	-42	-67	-92	-117	0
REMINADER	**642**	**391**	**366**	**342**	**317**	**293**	**268**	**244**	**220**	**195**	**171**	**146**	**122**	**97**	**73**	**48**	**24**	**0**	**-25**	**-49**	**-74**	**44**
	2600	2600	2614	2628	2641	2655	2669	2682	2696	2710	2723	2737	2751	2764	2778	2792	2805	2819	2832	2846	2860	3016
TOTAL AREA	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	**2600**	2600

NOTES:

(1) Census Tracts from NCTCOG Population Database
(2) Total Census Tract Area (Acres)
(3) Total Area in City (Acres)
(4) Percent of Census Tract Area within City
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City (Acres)
(14) Percent of Forecast District Total Area within City
(15) 1995 Total Households in Forecast District
(16) 2005 Total Households in Forecast District (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density from Col. (40)
(19) Computed 1995 Forecast District Population = (18) x (15)
(20) Average 1995 Population Density of Forecast District in People / Acre = (19) / (12)
(21) Computed 2005 Forecast District Population = (18) x (16)
(22) Average 2005 Population Density of Forecast District in People / Acre = (21) / (12)
(23) Computed 2025 Forecast District Population = (18) x (17)
(24) Average 2025 Population Density of Forecast District in People / Acre = (23) / (12)
(25) Population Forecast Districts from NCTCOG Database
(26) Total Computed Area within Forecast District from AutoCAD map (Acres)
(27) Area of Forecast District within City (Acres)
(28) Percent of Forecast District Total Area within City
(29) 1995 Total Employment in Forecast District
(30) Average 1995 Employment Density of Forecast District in Employees / Acre = (29) / (26)
(31) 2005 Total Employment in Forecast District
(32) Average 2005 Employment Density of Forecast District in Employees / Acre = (31) / (26)
(33) 2025 Total Employment in Forecast District
(34) Average 2025 Employment Density of Forecast District in Employees / Acre = (33) / (26)
(35) Population Forecast Districts from NCTCOG Database
(36) Census Tracts from NCTCOG Population Database
(37) Total Census Tract Area (Acres)
(38) Portion of Census Tract Area in Forecast District (Acres)
(39) Population per House Density from Col. (9)
(40) (38) x (39). Sum Col (40) / (37) = Weighted Average Population per House in Forecast District
(41) Population Forecast Districts from NCTCOG Database
(42) Computed 1995 Forecast District Population in City Limits = (19) x (14)
(43) Computed 2005 Forecast District Population in City Limits = (19) x (14)
(44) Computed 2025 Forecast District Population in City Limits = (19) x (14)
(45) 1995 Total Employment in Forecast District for City Limits = (29) x (28)
(46) 2005 Total Employment in Forecast District for City Limits = (29) x (28)
(47) 2025 Total Employment in Forecast District for City Limits = (29) x (28)

SAGINAW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Blue Mound
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Longhorn
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Meacham
Blue Mound
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North Central Texas Council of Governments
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(817) 695-9150
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Streams
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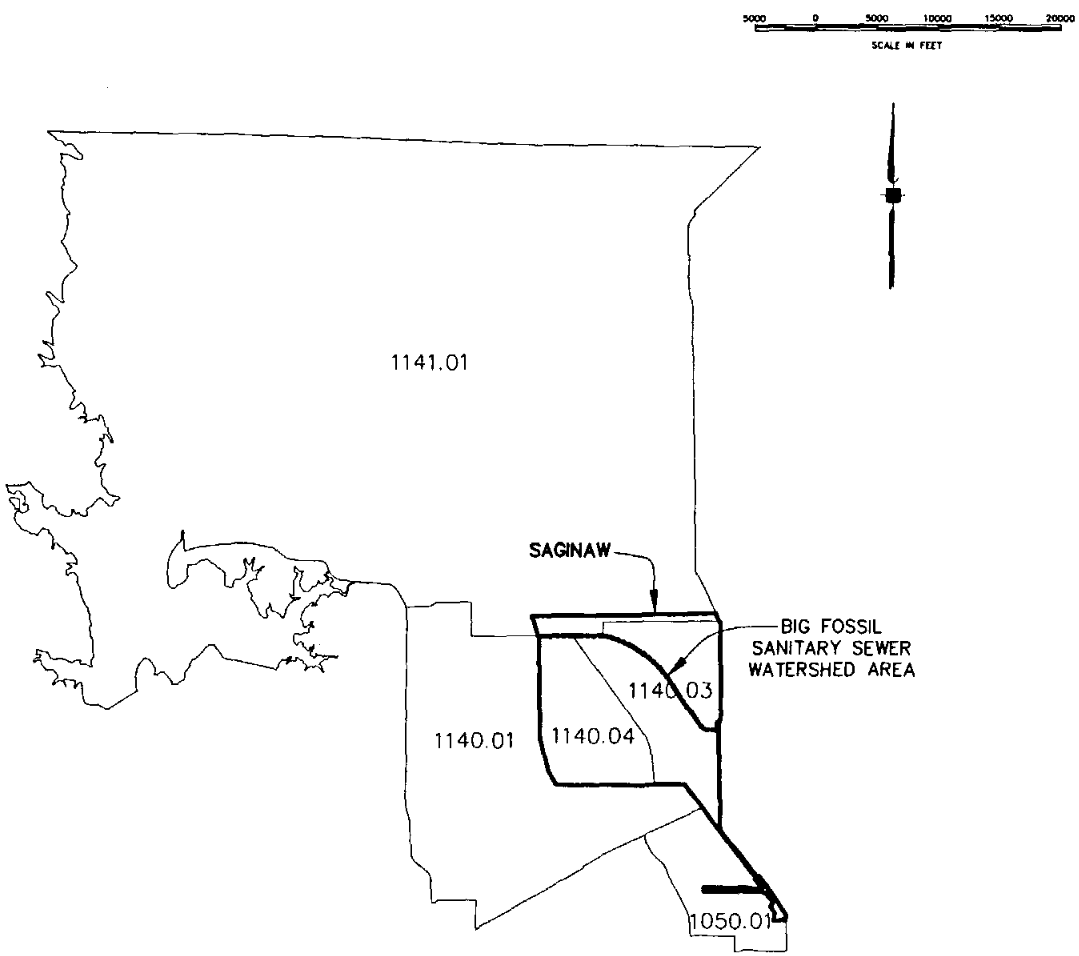

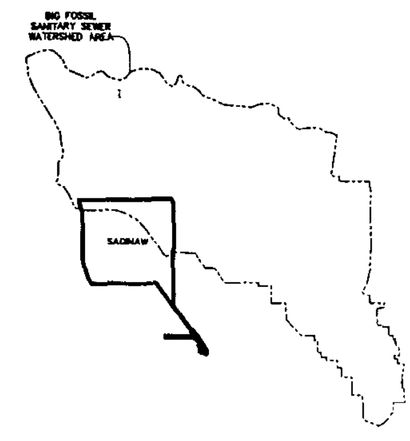

BIG FOSSIL INDEX

BIG FOSSIL SEWER STUDY

SAGINAW CENSUS TRACTS

City of
NORTH RICHLAND HILLS
Texas

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

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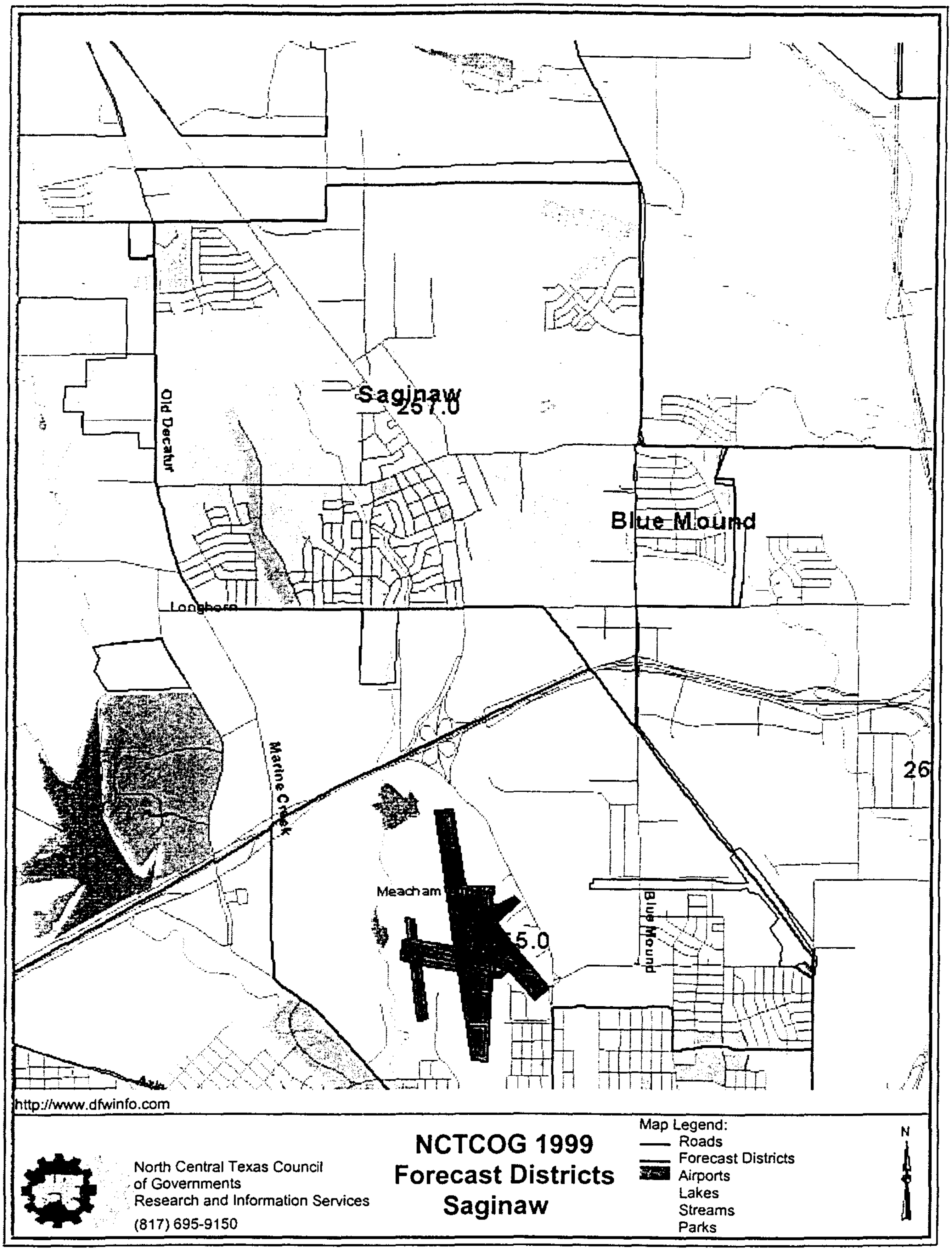
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Blue Mound
Longhorn
Marine Creek
26
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Blue Mound
http://www.dfwinfo.com
North Central Texas Council of Governments
Research and Information Services
(817) 695-9150
NCTCOG 1999
Forecast Districts
Saginaw
Map Legend:
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Airports
Lakes
Streams
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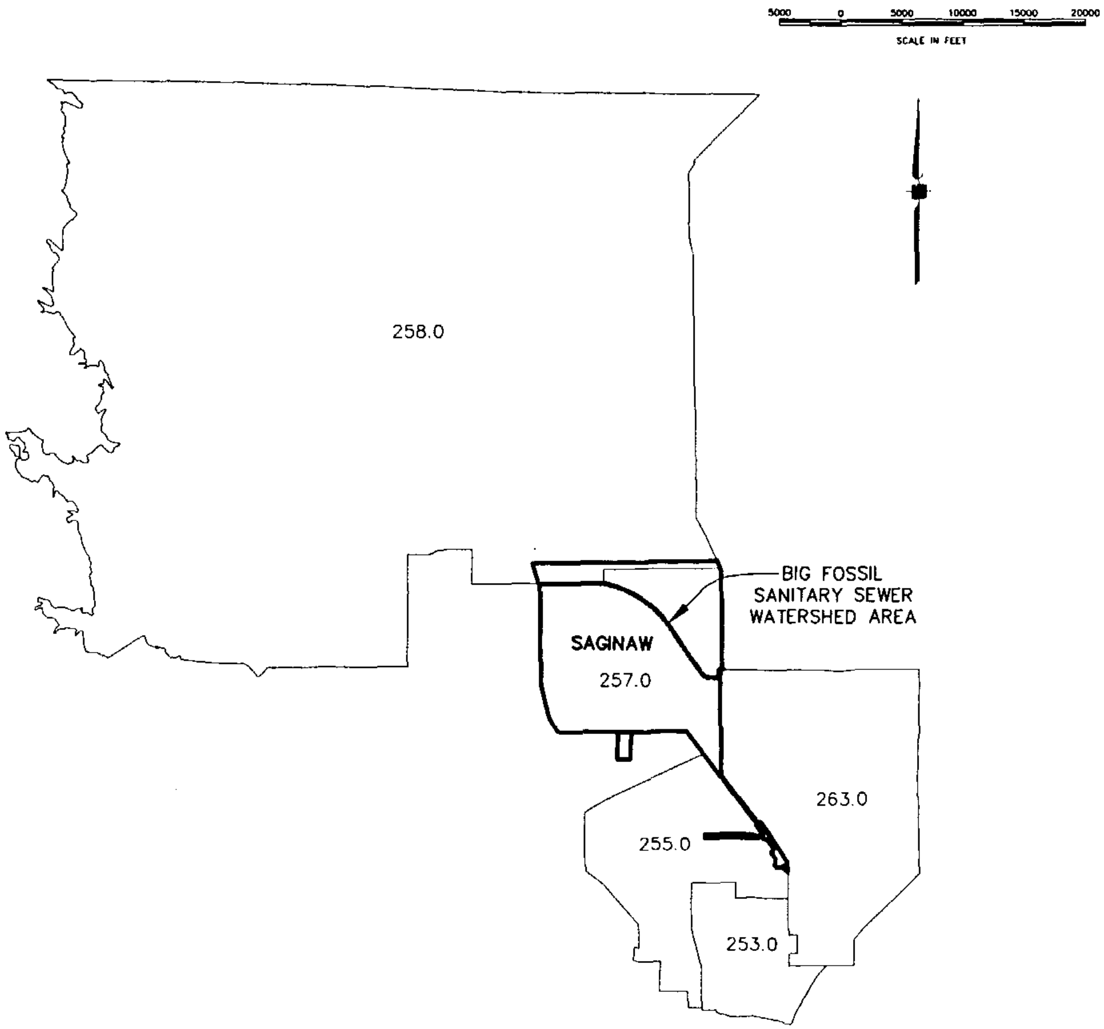

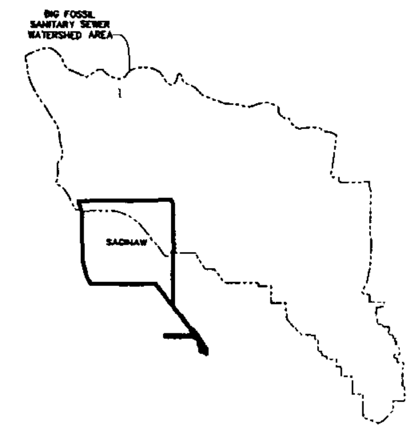

BIG FOSSIL INDEX

BIG FOSSIL SEWER STUDY
SAGINAW FORECAST DISTRICTS
City of NORTH RICHLAND HILLS Texas
KNOWLTON-ENGLISH-FLOWERS, INC. CONSULTING ENGINEERS / Fort Worth-Dallas

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CHECKED BY		SHEET NO. OF

Saginaw

(1) Census Tracts	(2) Total Area	(3) Area in City	(4) % Area In City	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In City	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1050.01	1654	69	4.17%	5178	3.13	216	1482	3.49	6213
1050.06	3973	31	0.77%	1189	0.30	9	243	4.89	7683
1140.03	2863	2505	87.50%	2852	1.00	2495	894	3.19	2056
1140.04	1831	1831	100.00%	8888	4.85	8888	2981	2.98	1051
1141.01	47204	342	0.72%	1754	0.04	13	648	2.71	1510
		4778		19861	9.32	11621	6248	17.27	18513

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in City	(14) % Area In City	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
255	3829	69	1.80%	2779	2872	3061	3.38	9393.02	2.45	9707.36	2.54	10346.18	2.70
257	4694	4336	92.37%	3875	6903	8719	3.11	12051.25	2.57	21468.33	4.57	27116.09	5.78
258	50461	342	0.68%	2484	2662	5046	2.71	6731.64	0.13	7214.02	0.14	13674.66	0.27
263	6523	31	0.48%	1006	1533	6500	3.95	3973.7	0.61	6055.35	0.93	25675	3.94
	65507	4778		10144	13970	23326	3.29	32149.61	5.76	44445.06	8.18	76811.93	12.69

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in City	(28) % Area In City	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
255	3829	69	1.80%	9072	2.37	11993	3.13	12837	3.35
257	4694	4336	92.37%	3107	0.66	3386	0.72	5502	1.17
258	50461	342	0.68%	2224	0.04	2616	0.05	6640	0.13
263	6523	31	0.48%	10302	1.58	13121	2.01	21305	3.27
		4778		24705	4.65	31116	5.92	46284	7.92

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
255	1003	2198	2198	3.30	7253.40
	1050.01	1654	1654	3.49	5772.46
			3852		13025.86
					3.38
257	1140.03	2863	2863	3.19	9132.97
	1140.04	1831	1831	2.98	5456.38
			4694		14589.35
					3.11
258	1141.01	47204	47204	2.71	127922.64
	1141.02	3195	3195	2.64	8434.80
			50399		136357.64
					2.71
263	1050.05	2524	2524	2.47	6234.28
	1050.06	3973	3973	4.89	19427.97
			6497		25662.25
					3.95

(41)	(42)	(43)	(44)	(45)	(46)	(47)
CITY ONLY						
Forecast	Population			Employment		
Districts	1995	2005	2025	1995	2005	2025
264.12	169	175	186	163	216	231
265.12	11132	19831	25048	2870	3128	5082
266.12	46	49	93	15	18	45
265.01	19	29	122	49	62	101
TOTAL	11366	20084	25449	3098	3424	5460

Saginaw Ultimate Population 21520

FUTURE POP. & EMP. LAND USE AREAS

1995 Population	11366	1995 Employment	3098
1995 Residential Area	773	1995 Employment Area	811
1995 Density	14.70	1995 Density	3.82
2005 Residential Area	1366	2005 Residential Area	896
2025 Residential Area	1731	2025 Residential Area	1430

	1995	**2005**	**2025**
Residential Area	773	1366	1731
Employment Area	811	896	1430
SEWERED AREA	**1584**	**2262**	**3160**
Total Unsewered	503	718	1004
Vacant & Under Constr.	2691	1798	614
REMINADER	**3194**	**2516**	**1618**
	4778	4779	4778
TOTAL AREA	**4778**	**4778**	**4778**

NOTES:

(1) Census Tracts from NCTCOG Population Database
(2) Total Census Tract Area (Acres)
(3) Total Area in City (Acres)
(4) Percent of Census Tract Area within City
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
(12) Total Computed Area within Forecast District from AutoCAD map (Acres)
(13) Area of Forecast District within City (Acres)
(14) Percent of Forecast District Total Area within City
(15) 1995 Total Households in Forecast District
(16) 2005 Total Households in Forecast District (Projected by NCTCOG)
(17) 2025 Total Households in Forecast District (Projected by NCTCOG)
(18) Computed Weighted Average Population per House Density from Col. (40)
(19) Computed 1995 Forecast District Population = (18) x (15)
(20) Average 1995 Population Density of Forecast District in People / Acre = (19) / (12)
(21) Computed 2005 Forecast District Population = (18) x (16)
(22) Average 2005 Population Density of Forecast District in People / Acre = (21) / (12)
(23) Computed 2025 Forecast District Population = (18) x (17)
(24) Average 2025 Population Density of Forecast District in People / Acre = (23) / (12)
(25) Population Forecast Districts from NCTCOG Database
(26) Total Computed Area within Forecast District from AutoCAD map (Acres)
(27) Area of Forecast District within City (Acres)
(28) Percent of Forecast District Total Area within City
(29) 1995 Total Employment in Forecast District
(30) Average 1995 Employment Density of Forecast District in Employees / Acre = (29) / (26)
(31) 2005 Total Employment in Forecast District
(32) Average 2005 Employment Density of Forecast District in Employees / Acre = (31) / (26)
(33) 2025 Total Employment in Forecast District
(34) Average 2025 Employment Density of Forecast District in Employees / Acre = (33) / (26)
(35) Population Forecast Districts from NCTCOG Database
(36) Census Tracts from NCTCOG Population Database
(37) Total Census Tract Area (Acres)
(38) Portion of Census Tract Area in Forecast District (Acres)
(39) Population per House Density from Col. (9)
(40) (38) x (39), Sum Col (40) / (37) = Weighted Average Population per House in Forecast District
(41) Population Forecast Districts from NCTCOG Database
(42) Computed 1995 Forecast District Population in City Limits = (19) x (14)
(43) Computed 2005 Forecast District Population in City Limits = (19) x (14)
(44) Computed 2025 Forecast District Population in City Limits = (19) x (14)
(45) 1995 Total Employment in Forecast District for City Limits = (29) x (28)
(46) 2005 Total Employment in Forecast District for City Limits = (29) x (28)

Saginaw (BIG FOSSIL)

(1) Census Tracts	(2) Total Area	(3) Area in Watershed	(4) % Area Watershed	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In Wshed	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1140.03	2863	1004	35.07%	2852	1.00	1000	894	3.19	2056
1141.01	47204	327	0.69%	1754	0.04	12	648	2.71	1510
		1331		4606	1.03	1012	1542	5.90	3566

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in Watershed	(14) % Area Watershed	(15) Total 1995 Households In Wshed	(16) Total 2005 Households In Wshed	(17) Total 2025 Households In Wshed	(18) Population /House	(19) 1995 Population in Wshed	(20) 2005 Population In Wshed	(21) 2025 Population In Wshed
257	4694	1004	21.39%	829	1476	1865	3.11	2578	4592	5800
258	50461	327	0.65%	16	17	33	2.71	44	47	89
		1331		845	1494	1898	2.91	2621	4639	5888

EMPLOYMENT

(22) Forecast Districts	(23) Total Area	(24) Area in Watershed	(25) % Area Watershed	(26) Total 1995 Employment In Wshed	(27) Total 2005 Employment In Wshed	(28) Total 2025 Employment In Wshed
257	4694	1004	21.39%	1940	2565	2746
258	50461	327	0.65%	20	22	36
		1331		1961	2587	2781

NOTES:

(1) Census Tracts from NCTCOG Population Database that are contained by the Haltom City limits and contribute to the Big Fossil Watershed
(2) Total Census Tract Area (Acres)
(3) Total Area in Haltom City limits that contribute to the Big Fossil Watershed (Acres)
(4) Percent of Census Tract Area within City Limits that contribute to the Big Fossil Watershed
(5) Total 1995 Population in Census Tract from NCTCOG data
(6) Average Population Density in People/Acre = (5) / (2)
(7) 1995 Population within City that contributes to the Big Fossil Watershed = (5) x (4)
(8) 1995 Total Households from NCTCOG Database
(9) 1995 Population per House = (5) / (8)
(10) 1995 Total Employment from NCTCOG Database
(11) Population Forecast Districts from NCTCOG Database
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(14) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
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(16) 2005 Total Households in Forecast District that contributes to Big Fossil Watershed (Projected by NCTCOG)
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(18) Computed Weighted Average Population per House Density (previously computed for entire Forecast Districts
(19) Computed 1995 Forecast District Population in city which contributes to Big Fossil WAtershed = (18) x (15)
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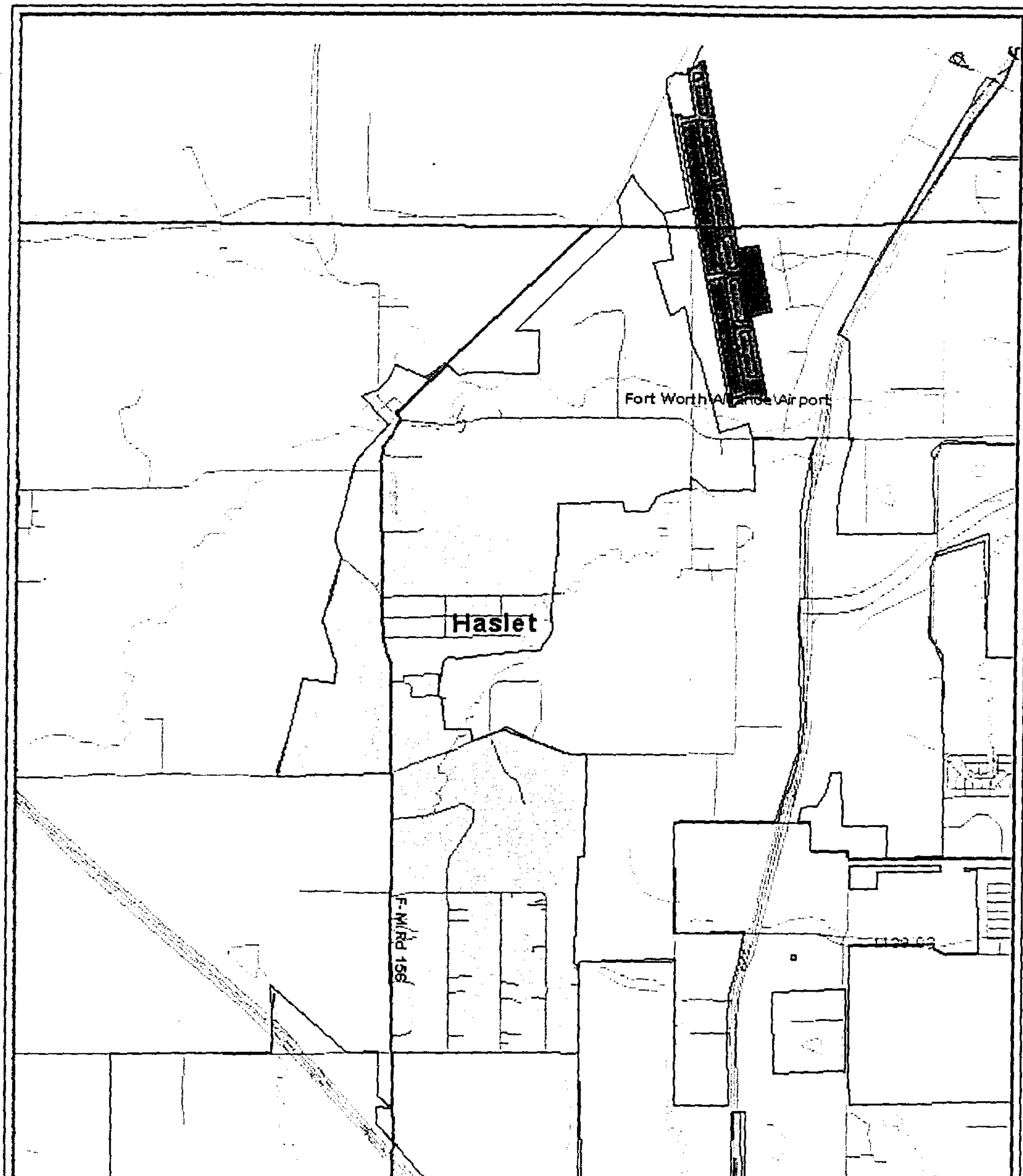
(22) Population Forecast Districts from NCTCOG Database
(23) Total Computed Area within Forecast District from AutoCAD map (Acres)
(24) Area of Forecast District within City that contributes to Big Fossil Watershed (Acres)
(25) Percent of Forecast District Total Area within City that contributes to Big Fossil Watershed
(26) 1995 Employment in Forecast District in city which contributes to Big Fossil Watershed
(27) 2005 Employment in Forecast District in city which contributes to Big Fossil Watershed
(28) 2025 Employment in Forecast District in city which contributes to Big Fossil Watershed

HASLET

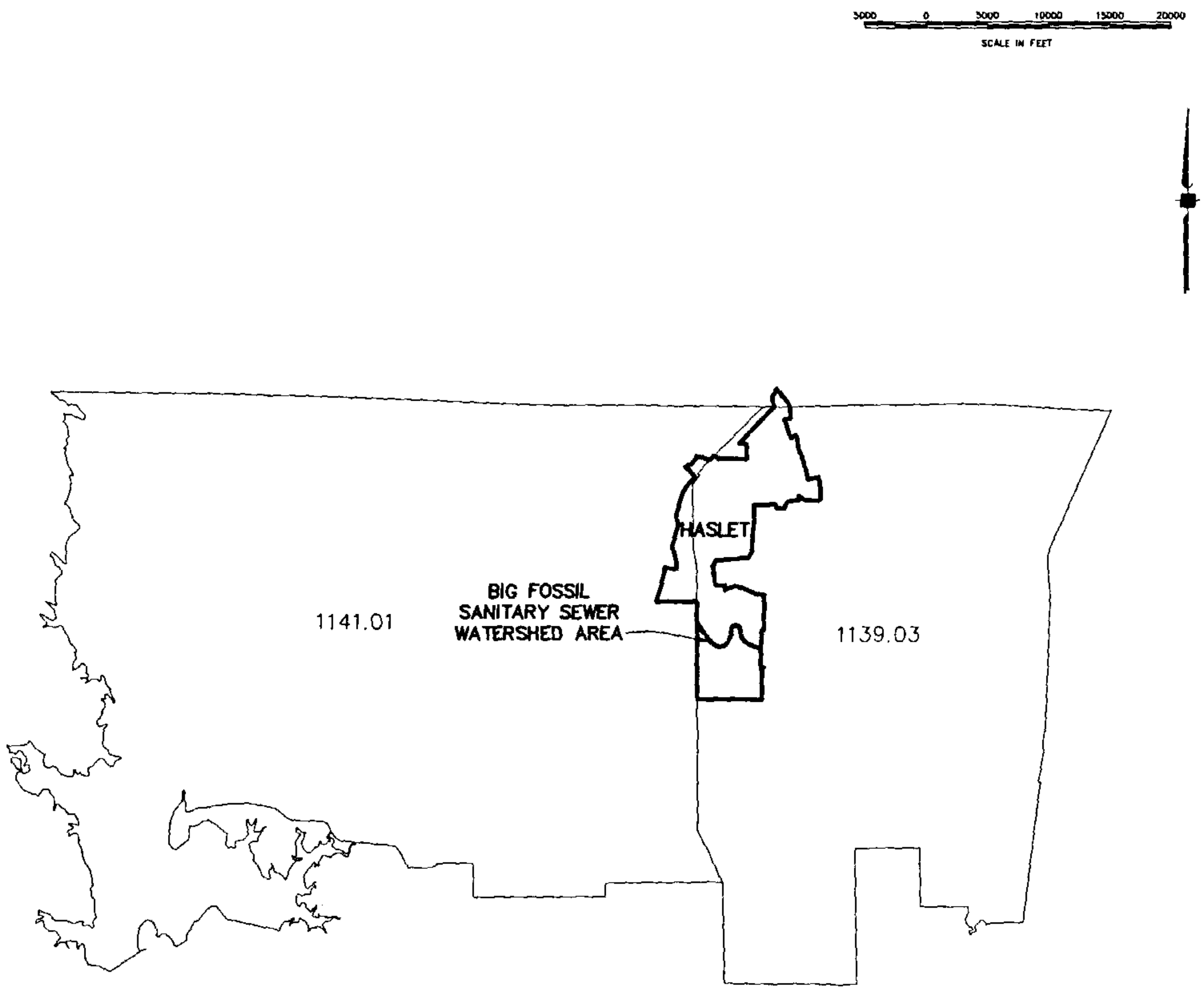


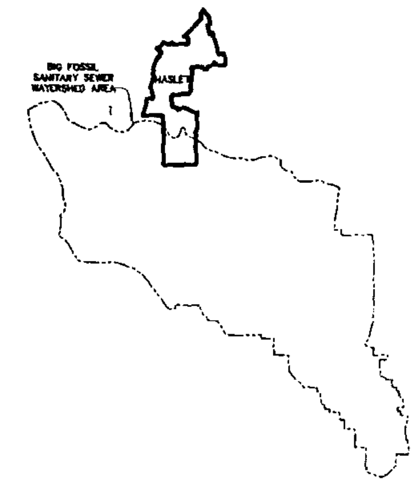
North Central Texas Council of Governments
Research and Information Services
(817) 695-9150

1990 Census Tracts

Map Legend:
Roads
Census Tracts
Airports
Lakes
Streams
Parks

N





BIG FOSSIL INDEX

BIG FOSSIL SEWER STUDY
HASLET CENSUS TRACTS
City of NORTH RICHLAND HILLS Texas
KNOWLTON-ENGLISH-FLOWERS, INC.

DESIGNED BY: CLS	REV BY DATE SYMBOL	DATE: NOVEMBER 1999
DRAWN BY: CLS		JOB NO. 03-636
CHECKED BY		

Haslet

(1) Census Tracts	(2) Total Area	(3) Area in City	(4) % Area In City	(5) Total 1995 Pop.	(6) Avg. Pop. Density	(7) 1995 Pop. In City	(8) 1995 Total Households	(9) 1995 Population /House	(10) 1995 Total Employment
1139.03	27591	2755	9.99%	8283	0.30	827	1995	4.15	4672
1141.01	47204	422	0.89%	1754	0.04	16	648	2.71	1510
		3177		10037	0.34	843	2643	6.86	6182

POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in City	(14) % Area In City	(15) Thh95	(16) Thh05	(17) Thh25	(18) Population /House	(19) 1995 Population	(20) 1995 Density	(21) 2005 Population	(22) 2005 Density	(23) 2025 Population	(24) 2025 Density
264.11	12661	2755	21.76%	2901	4509	13517	3.09	8964.09	0.71	13932.81	1.10	41767.53	3.30
258	50461	422	0.84%	2484	2662	5046	2.71	6731.64	0.13	7214.02	0.14	13674.66	0.27
Denton Co.	28	28	100.00%	0	0	0	0	0	0.00	0	0.00	0	0.00
	63150	3205		5385	7171	18563	1.93	15695.73	0.84	21146.83	1.24	55442.19	3.57

EMPLOYMENT

(25) Forecast Districts	(26) Total Area	(27) Area in City	(28) % Area In City	(29) Tot95	(30) 1995 Density	(31) Tot05	(32) 2005 Density	(33) Tot25	(34) 2,025.00 Density
264.11	12661	2755	21.76%	2679	0.21	8447	0.67	16635	1.31
258	50461	422	0.84%	2224	0.04	2616	0.05	6640	0.13
Denton Co.	28	28	100.00%	0	0.00	0	0.00	0	0.00
		3205		4903	0.26	11063	0.72	23275	1.45

(35) Forecast District	(36) Census Tracts	(37) Total Tr. Area	(38) Area in FD	(39) 1995 Population /House	(40)
264.11	1139.03	27591	11384	3.06	34835.04
	1139.05	1276	1276	3.32	4236.32
			12660		39071.36
					3.09
258	1141.01	47204	47204	2.71	127922.84
	1141.02	3195	3195	2.64	8434.80
			50399		136357.64
					2.71

(41)	(42)	(43)	(44)	(45)	(46)	(47)
CITY ONLY						
Forecast	Population			Employment		
Districts	1995	2005	2025	1995	2005	2025
264.11	1951	3032	9089	583	1838	3620
258	56	60	114	19	22	56
Denton Co.	0	0	0	0	0	0
TOTAL	2007	3092	9203	602	1860	3675

Haslet Ultimate Population 2649

FUTURE POP. & EMP. LAND USE AREAS

1995 Population	2007	1995 Employment	602
1995 Residential Area	1046	1995 Employment Area	79
1995 Density	1.92	1995 Density	7.61
2005 Residential Area	1612	2005 Residential Area	244
2025 Residential Area	4797	2025 Residential Area	483

	1995	**2005**	**2025**
Residential Area	1046	1612	4797
Employment Area	79	244	483
SEWERED AREA	**1125**	**1856**	**5279**
Total Unsewered	85	140	399
Vacant & Under Constr.	1995	1209	0
REMINADER	**2080**	**1349**	**399**
	3205	3205	5678
TOTAL AREA	**3205**	**3205**	**3205** ✓

NOTES:

(1) Census Tracts from NCTCOG Population Database
(2) Total Census Tract Area (Acres)
(3) Total Area in City (Acres)
(4) Percent of Census Tract Area within City
(5) Total 1995 Population in Census Tract from NCTCOG data

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Haslet (BIG FOSSIL)

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POPULATION

(11) Forecast Districts	(12) Total Area	(13) Area in Watershed	(14) % Area Watershed	(15) Total 1995 Households In Wshed	(16) Total 2005 Households In Wshed	(17) Total 2025 Households In Wshed	(18) Population /House	(19) 1995 Population in Wshed	(20) 2005 Population In Wshed	(21) 2025 Population In Wshed
257	4694	1004	21.39%	#REF!	#REF!	#REF!	3.11	#REF!	#REF!	#REF!
258	50461	327	0.65%	16	17	33	2.71	44	47	89
		1331		#REF!	#REF!	#REF!	2.91	#REF!	#REF!	#REF!

EMPLOYMENT

(22) Forecast Districts	(23) Total Area	(24) Area in Watershed	(25) % Area Watershed	(26) Total 1995 Employment In Wshed	(27) Total 2005 Employment In Wshed	(28) Total 2025 Employment In Wshed
257	4694	1004	21.39%	573	1807	3558
258	50461	327	0.65%	#REF!	#REF!	#REF!
		1331		#REF!	#REF!	#REF!

NOTES:

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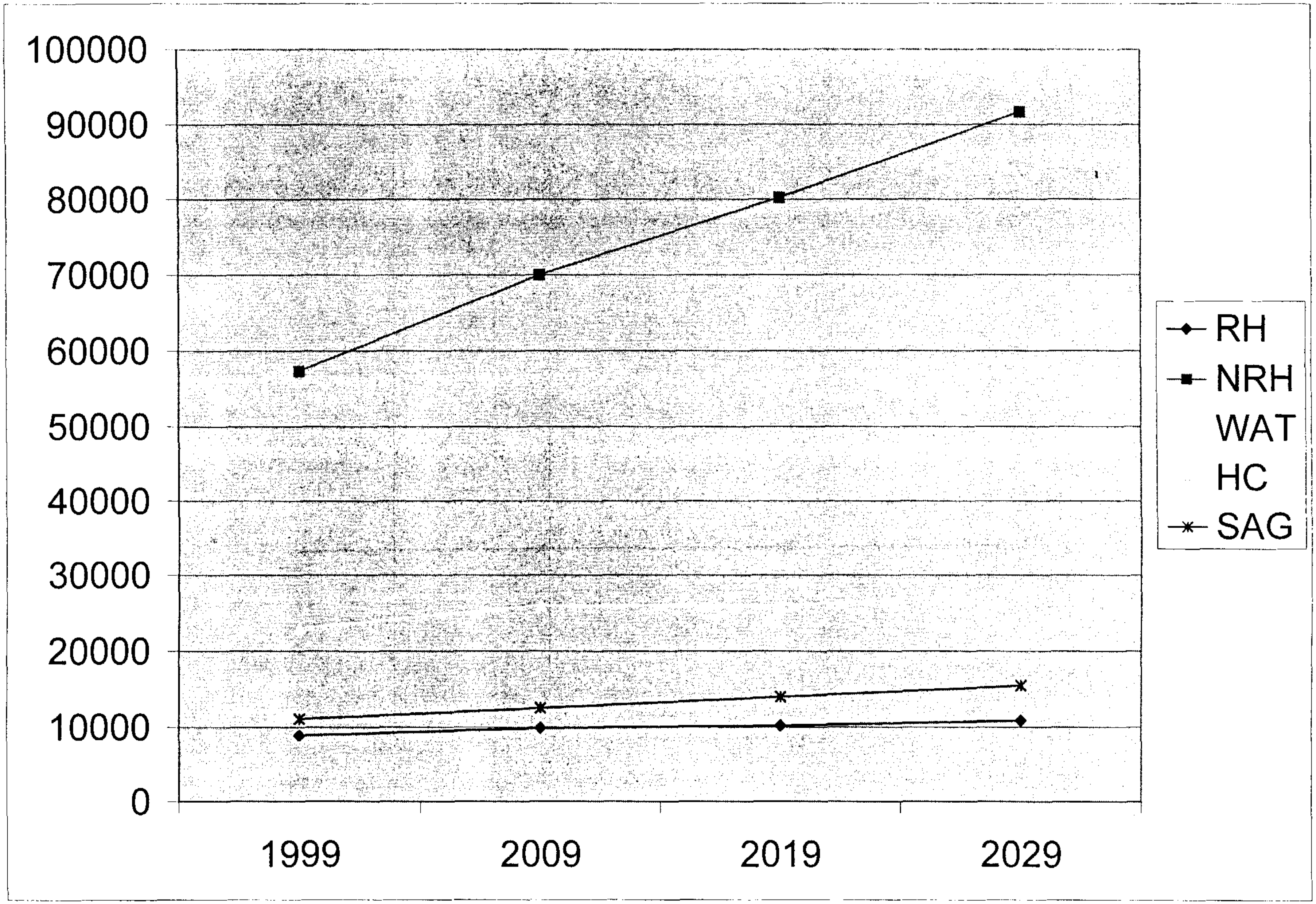
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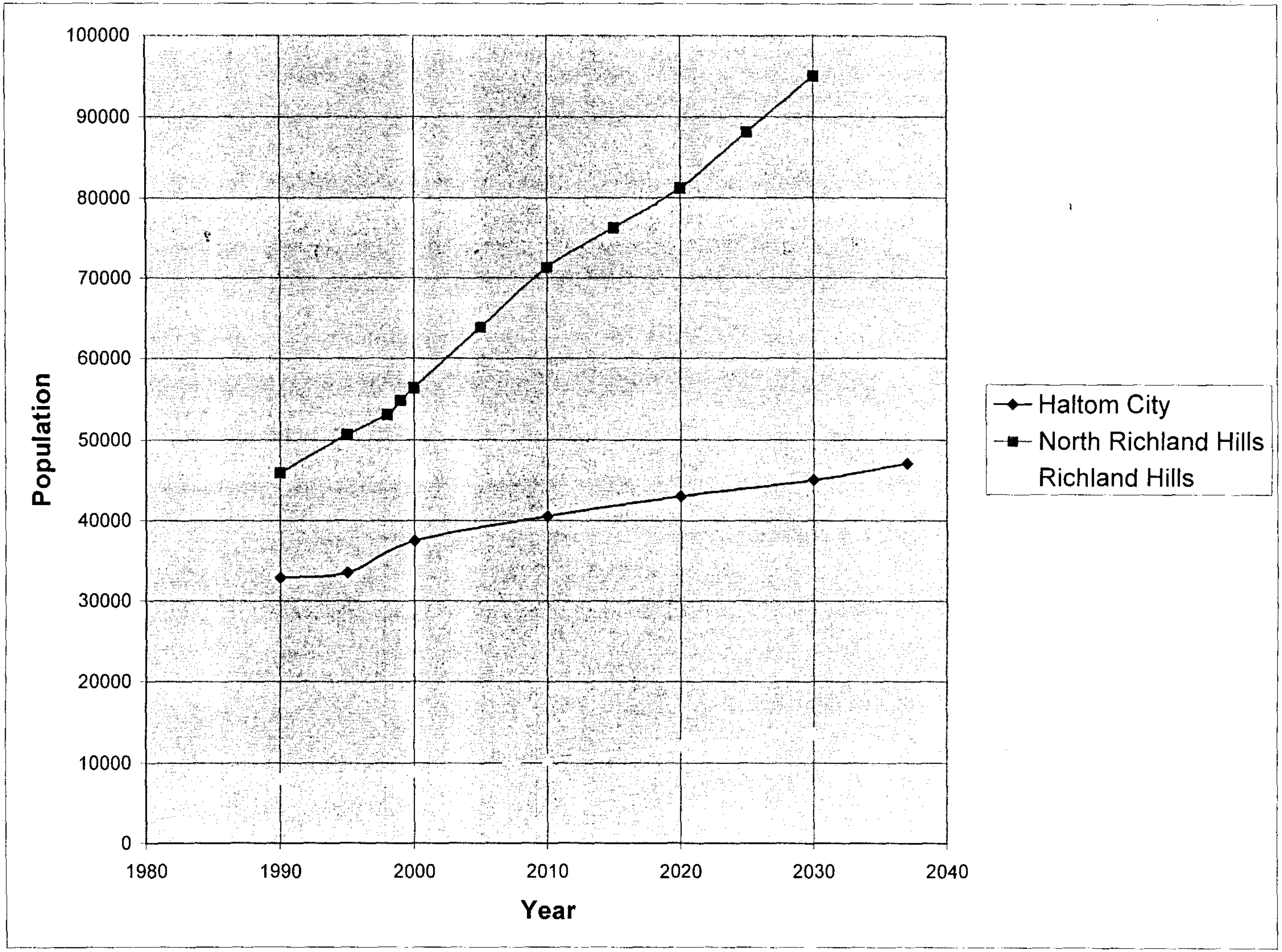
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80000
70000
60000
50000
40000
30000
20000
10000
0
Population
1980
1990
2000
2010
2020
2030
2040
Year
Haltom City
North Richland Hills
Richland Hills

PART 1
CITY OF FORT WORTH
LAND USE ASSUMPTIONS DATABASE
PROPULATION PROJECTIONS
AND LAND USE AREAS
EXTRACTED FOR BIG FOSSIL CREEK AREA

FORT WORTH POPULATION PROJECTIONS

TABLE "LUAPOP-1"

(See TAB 9)

FORT WORTH POPULATION PROJECTIONS

TABLE "LUAPOP-2"

(See TAB 9)

TAB 6

BIG FOSSIL SEWER STUDY

FLOW DISCHARGE CALCULATIONS

FORMULA FOR CALIBRATION OF WATERSHED FLOW MODEL
BASED ON EQUIVALENT POPULATION AND SEWERED AREAS
USING RESULTS OF FORT WORTH MASTER PLAN HYDROWORKS MODEL

Year 2000 Model: A x (2000 Equiv. Pop.) + B x (2000 Sewered Area) = 2000 Peak Modeled Flow

Year 2020 Model: A x (2020 Equiv. Pop.) + B x (2020 Sewered Area) = 2020 Peak Modeled Flow

City of Fort Worth Outfall Line:

	Year 2000	Year 2020
Equiv. Population:	57207.5	93287.5
Total Sewered Acres:	9004.81	20981.33
Peak Flow (MGD):	32.22	80.17

NOTE: 10 MGD Intel Q Subtracted from Year 2020 Peak Flow. Marine Creek area included in 2020 Flows.

A EP2000 + B SA2000 = PF2000
A EP2020 + B SA2020 = PF2020

A = [(PF2020/SA2020) - (PF2000/SA2000)] / [(EP2020/SA20200 - (EP2000/SA2000)]

B = (PF2000 - A EP2000) / SA 2000

A = -0.000127 B = 0.0043875

CHECK:

PF2000 = A x EP2000 + B x SA2000 PF2020 = A x EP2020 + B x SA2020

PF2000 = 32.22 PF 2020 = 80.17

T.C.W.S.C. Outfall Line:

	Year 2000	Year 2020
Equiv. Population:	17,430.50	20,657.50
Total Sewered Acres:	2,550.82	2,764.11
Peak Flow (MGD):	11.39	19.42

A EP2000 + B SA2000 = PF2000
A EP2020 + B SA2020 = PF2020

A = [(PF2020/SA2020) - (PF2000/SA2000)] / [(EP2020/SA20200 - (EP2000/SA2000)]

B = (PF2000 - A EP2000) / SA 2000

A = 0.004 B = -0.022866

CHECK:

PF2000 = A x EP2000 + B x SA2000 PF2020 = A x EP2020 + B x SA2020

PF2000 = 11.39 PF 2020 = 19.42

Flow Scenario	Scenario Description	Peak Flow Rates Based on Ft. Worth Master Plan Model (MGD)						
		2000	2005	2010	2015	2020	2050	2070
1	C.O.F.W. Outfall, Master Plan Not including Intel flows, BFX or Marine Creek Areas until 2020	32.22	34.66	36.62	40.64	80.17	95.20	103.56
2	C.O.F.W. Outfall, Including BFX but not MC and Intel	41.17	45.96	49.93	60.76	64.67	73.77	78.39
3	C.O.F.W. Outfall, Including BFX and MC Areas, but Not Intel	51.32	56.43	60.71	73.86	80.17	95.20	103.56
4	Scenario 3 + 6.0 MGD Intel	57.32	62.43	66.71	79.86	86.17	101.20	109.56
5	T.C.W.S.C. Outfall, Master Plan Includes Richland Hills & NRH	11.39	12.10	15.20	17.31	19.42	23.38	23.38
6	T.C.W.S.C. Outfall, Revised to Include Additional NRH Area	23.18	24.42	28.05	30.67	33.28	33.97	33.97
7	North Richland Hills Total Flows based on TCWSC Calibrated Model	18.01	18.93	21.16	22.81	24.47	24.98	24.98
8	Richland Hills Total Flows based on TCWSC Calibrated Model	5.17	5.49	6.90	7.85	8.81	8.99	8.99
9	North Richland Hills Total Flows based on COFW Calibrated Model	6.81	7.20	7.35	7.39	7.44	7.36	7.36
10	Richland Hills Total Flows based on COFW Calibrated Model	4.07	4.32	4.37	4.34	4.31	4.07	4.07
11	Haltom City Total Flows in BF based on COFW Calibrated Model	4.77	5.07	5.36	5.72	6.07	7.92	9.09
12	Haltom City Flows in Little Fossil Area which can be served by BF	6.92	6.93	6.93	6.94	6.94	6.97	7.00
13	Combined Haltom City BF Flows and Little Fossil Flows	11.69	11.99	12.30	12.66	13.01	14.89	16.08

Flow Scenario	Scenario Description	Coef. A	Coef. B	Year 2000									Year 2005								
				Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.	Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.
1	C.O.F.W. Outfall, Master Plan Not including Intel flows, BFX or Marine Creek Areas until 2020	-0.00013	0.00439	57,207.50	9,004.81	4.58	2.21	10.12	0.80	21.30	32.22	5.99	61,604.75	9,689.21	4.93	2.18	10.75	0.86	23.05	34.66	5.99
2	C.O.F.W. Outfall, Including BFX but not MC and Intel	-0.00013	0.00439	60,118.25	11,128.39	4.81	2.19	10.54	0.84	29.79	41.17	7.28	65,522.63	12,377.97	5.24	2.16	11.31	0.92	33.73	45.96	7.46
3	C.O.F.W. Outfall, Including BFX and MC Areas, but Not Intel	-0.00013	0.00439	63,500.75	13,540.54	5.08	2.17	11.02	0.89	39.41	51.32	8.60	68,915.63	14,861.78	5.51	2.14	11.79	0.96	43.67	56.43	8.71
4	Scenario 3 + 6.0 MGD Intel	-0.00013	0.00439	63,500.75	13,540.54	11.08	2.17	24.04	0.89	32.39	57.32	4.79	68,915.63	14,861.78	11.51	2.14	24.62	0.96	36.84	62.43	5.00
5	T.C.W.S.C. Outfall, Master Plan Includes Richland Hills & NRH	0.00400	-0.02287	17,430.50	2,550.82	1.39	2.71	3.78	0.24	7.36	11.39	6.95	18,516.00	2,709.67	1.48	2.69	3.98	0.26	7.86	12.10	6.95
6	T.C.W.S.C. Outfall, Revised to Include Additional NRH Area	0.00400	-0.02287	23,952.45	3,176.17	1.92	2.57	4.93	0.34	17.91	23.18	10.29	25,333.66	3,363.38	2.03	2.55	5.17	0.35	18.90	24.42	10.25
7	North Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	16,042.49	2,018.61	1.28	2.75	3.53	0.22	14.26	18.01	11.94	16,931.10	2,133.73	1.35	2.73	3.69	0.24	15.00	18.93	11.89
8	Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	7,909.96	1,157.56	0.63	3.06	1.93	0.11	3.12	5.17	6.95	8,402.56	1,229.65	0.67	3.03	2.04	0.12	3.34	5.49	6.95
9	North Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	16,042.49	2,018.61	1.28	2.75	3.53	0.22	3.06	6.81	4.52	16,931.10	2,133.73	1.35	2.73	3.69	0.24	3.28	7.20	4.53
10	Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	7,909.96	1,157.56	0.63	3.06	1.93	0.11	2.03	4.07	5.48	8,402.56	1,229.65	0.67	3.03	2.04	0.12	2.17	4.32	5.48
11	Haltom City Total Flows in BF based on COFW Calibrated Model	-0.00013	0.00439	13,953.23	1,492.22	1.12	2.81	3.14	0.20	1.44	4.77	3.64	14,820.75	1,585.27	1.19	2.78	3.30	0.21	1.56	5.07	3.64
12	Haltom City Flows in Little Fossil Area which can be served by BF	-0.00013	0.00439	14,419.88	1,995.25	1.15	2.80	3.22	0.20	3.49	6.92	5.10	14,351.78	1,995.25	1.15	2.80	3.21	0.20	3.51	6.93	5.13
13	Combined Haltom City BF Flows and Little Fossil Flows	-0.00013	0.00439	28,373.11	3,487.46	2.27	2.50	5.68	0.40	5.61	11.69	4.38	29,172.53	3,580.52	2.33	2.49	5.81	0.41	5.78	11.99	4.37

NOTES: Coef. A and B are derived from a calibration of the City of Fort Worth HydroWorks Flow Model based on Peak Discharges in Yesrs 2000 and 2020
Eq. Pop. = Equivalent Population = Residential Population + 0.5 x Employment Population
Sew. Ac. = Sewered Acres
Base Q = Base Flow = 80 gpcd x Eq. Pop.
H.P.F. = Harmon's Peaking Factor = 1 + 14 / (4 + (Pop./1000)^0.5)
Pk. Q = Peak Base Flow = Base Q x H.P.F.
GWI = Ground Water Inflow = 14 gpcd x Eq. Pop.
RDII = Rain Depend Infiltration/Inflow = Total Discharge - Peak Q - GWI
Total = Peak Discharge Computed from Calibration Formula = A x Eq. Pop. + B x Sew. Ac.
P.F. = Peaking Factor Check = Total / (Pk. Q + GWI)

Flow Scenario	Scenario Description	Coef. A	Coef. B	Year 2010									Year 2015								
				Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.	Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.
1	C.O.F.W. Outfall, Master Plan Not including Intel flows, BFX or Marine Creek Areas until 2020	-0.00013	0.00439	66,002.00	10,262.30	5.28	2.15	11.38	0.92	24.32	36.62	5.90	72,946.25	11,382.01	5.84	2.12	12.35	1.02	27.27	40.64	5.93
2	C.O.F.W. Outfall, Including BFX but not MC and Intel	-0.00013	0.00439	70,927.00	13,439.85	5.67	2.13	12.07	0.99	36.87	49.93	7.49	80,011.75	16,171.40	6.40	2.08	13.32	1.12	46.31	60.76	8.08
3	C.O.F.W. Outfall, Including BFX and MC Areas, but Not Intel	-0.00013	0.00439	74,330.50	15,995.33	5.95	2.11	12.54	1.04	47.13	60.71	8.69	83,809.00	19,268.02	6.70	2.06	13.84	1.17	58.85	73.86	9.38
4	Scenario 3 + 6.0 MGD Intel	-0.00013	0.00439	74,330.50	15,995.33	11.95	2.11	25.20	1.04	40.47	66.71	5.14	83,809.00	19,268.02	12.70	2.06	26.23	1.17	52.46	79.86	5.75
5	T.C.W.S.C. Outfall, Master Plan Includes Richland Hills & NRH	0.00400	-0.02287	19,601.50	2,764.11	1.57	2.66	4.17	0.27	10.75	15.20	8.25	20,129.50	2,764.11	1.61	2.65	4.27	0.28	12.76	17.31	9.15
6	T.C.W.S.C. Outfall, Revised to Include Additional NRH Area	0.00400	-0.02287	26,714.86	3,446.17	2.14	2.53	5.40	0.37	22.28	28.05	11.17	27,521.61	3,472.90	2.20	2.51	5.54	0.39	24.75	30.67	11.85
7	North Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	17,819.70	2,191.82	1.43	2.70	3.85	0.25	17.05	21.16	12.63	18,386.85	2,218.54	1.47	2.69	3.96	0.26	18.60	22.81	13.20
8	Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	8,895.16	1,254.35	0.71	3.01	2.14	0.12	4.63	6.90	8.25	9,134.77	1,254.35	0.73	2.99	2.19	0.13	5.54	7.85	9.15
9	North Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	17,819.70	2,191.82	1.43	2.70	3.85	0.25	3.24	7.35	4.39	18,386.85	2,218.54	1.47	2.69	3.96	0.26	3.18	7.39	4.28
10	Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	8,895.16	1,254.35	0.71	3.01	2.14	0.12	2.11	4.37	5.23	9,134.77	1,254.35	0.73	2.99	2.19	0.13	2.02	4.34	5.05
11	Haltom City Total Flows in BF based on COFW Calibrated Model	-0.00013	0.00439	15,688.26	1,678.32	1.26	2.76	3.46	0.22	1.68	5.36	3.64	16,720.04	1,789.18	1.34	2.73	3.65	0.23	1.83	5.72	3.64
12	Haltom City Flows in Little Fossil Area which can be served by BF	-0.00013	0.00439	14,283.68	1,995.25	1.14	2.80	3.20	0.20	3.54	6.93	5.16	14,275.34	1,995.25	1.14	2.80	3.20	0.20	3.54	6.94	5.17
13	Combined Haltom City BF Flows and Little Fossil Flows	-0.00013	0.00439	29,971.94	3,673.57	2.40	2.48	5.94	0.42	5.94	12.30	4.37	30,995.39	3,784.42	2.48	2.46	6.11	0.43	6.11	12.66	4.34

NOTES: Coef. A and B are derived from a calibration of the City of Fc
Flow Model based on Peak Discharges in Yesrs 2000 and :
Eq. Pop. = Equivalent Population = Residential Population +
Sew. Ac. = Sewered Acres
Base Q = Base Flow = 80 gpcd x Eq. Pop.
H.P.F. = Harmon's Peaking Factor = 1 + 14 / (4 + (Pop./100(
Pk. Q = Peak Base Flow = Base Q x H.P.F.
GWI = Ground Water Inflow = 14 gpcd x Eq. Pop.
RDII = Rain Depend Infiltration/Inflow = Total Discharge - Pe
Total = Peak Discharge Computed from Calibration Formula
P.F. = Peaking Factor Check = Total / (Pk. Q + GWI)

Flow Scenario	Scenario Description	Coef. A	Coef. B	Year 2020 Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.
1	C.O.F.W. Outfall, Master Plan Not including Intel flows, BFX or Marine Creek Areas until 2020	-0.00013	0.00439	93,287.50	20,981.33	7.46	2.02	15.11	1.31	63.75	80.17	9.14
2	C.O.F.W. Outfall, Including BFX but not MC and Intel	-0.00013	0.00439	89,096.50	17,325.75	7.13	2.04	14.55	1.25	48.86	64.67	7.72
3	C.O.F.W. Outfall, Including BFX and MC Areas, but Not Intel	-0.00013	0.00439	93,287.50	20,981.33	7.46	2.02	15.11	1.31	63.75	80.17	9.14
4	Scenario 3 + 6.0 MGD Intel	-0.00013	0.00439	93,287.50	20,981.33	13.46	2.02	27.26	1.31	57.60	86.17	5.83
5	T.C.W.S.C. Outfall, Master Plan Includes Richland Hills & NRH	0.00400	-0.02287	20,657.50	2,764.11	1.65	2.64	4.36	0.29	14.77	19.42	10.00
6	T.C.W.S.C. Outfall, Revised to Include Additional NRH Area	0.00400	-0.02287	28,328.36	3,499.63	2.27	2.50	5.67	0.40	27.22	33.28	12.50
7	North Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	18,953.99	2,245.27	1.52	2.68	4.06	0.27	20.15	24.47	13.73
8	Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	9,374.37	1,254.35	0.75	2.98	2.24	0.13	6.44	8.81	10.00
9	North Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	18,953.99	2,245.27	1.52	2.68	4.06	0.27	3.11	7.44	4.17
10	Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	9,374.37	1,254.35	0.75	2.98	2.24	0.13	1.94	4.31	4.89
11	Haltom City Total Flows in BF based on COFW Calibrated Model	-0.00013	0.00439	17,751.83	1,900.03	1.42	2.70	3.84	0.25	1.99	6.07	3.64
12	Haltom City Flows in Little Fossil Area which can be served by BF	-0.00013	0.00439	14,267.00	1,995.25	1.14	2.80	3.20	0.20	3.54	6.94	5.17
13	Combined Haltom City BF Flows and Little Fossil Flows	-0.00013	0.00439	32,018.83	3,895.28	2.56	2.45	6.27	0.45	6.29	13.01	4.32

Flow Scenario	Year 2050 Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.
1	124,280.00	25,306.50	9.94	1.92	19.13	1.74	74.33	95.20	8.15
2	119,259.50	20,276.73	9.54	1.94	18.49	1.67	53.61	73.77	6.58
3	124,280.00	25,306.50	9.94	1.92	19.13	1.74	74.33	95.20	8.15
4	124,280.00	25,306.50	15.94	1.92	30.68	1.74	68.78	101.20	5.72
5	24,876.99	2,764.11	1.99	2.56	5.09	0.35	17.95	23.38	10.00
6	32,547.85	3,549.06	2.60	2.44	6.36	0.46	27.15	33.97	11.10
7	21,258.67	2,294.71	1.70	2.63	4.47	0.30	20.22	24.98	12.50
8	11,289.18	1,254.35	0.90	2.90	2.62	0.16	6.21	8.99	8.47
9	21,258.67	2,294.71	1.70	2.63	4.47	0.30	2.60	7.36	3.68
10	11,289.18	1,254.35	0.90	2.90	2.62	0.16	1.29	4.07	3.83
11	22,927.83	2,469.82	1.83	2.59	4.76	0.32	2.84	7.92	3.67
12	13,977.93	1,995.25	1.12	2.81	3.14	0.20	3.64	6.97	5.31
13	36,905.75	4,465.06	2.95	2.39	7.06	0.52	7.32	14.89	4.29

NOTES: Coef. A and B are derived from a calibration of the City of Fc
Flow Model based on Peak Discharges in Yesrs 2000 and :
Eq. Pop. = Equivalent Population = Residential Population +
Sew. Ac. = Sewered Acres
Base Q = Base Flow = 80 gpcd x Eq. Pop.
H.P.F. = Harmon's Peaking Factor = 1 + 14 / (4 + (Pop./100(
Pk. Q = Peak Base Flow = Base Q x H.P.F.
GWI = Ground Water Inflow = 14 gpcd x Eq. Pop.
RDII = Rain Depend Infiltration/Inflow = Total Discharge - Pe
Total = Peak Discharge Computed from Calibration Formula
P.F. = Peaking Factor Check = Total / (Pk. Q + GWI)

Flow Scenario	Scenario Description	Coef. A	Coef. B	Year 2070								
				Eq. Pop.	Sew. Ac.	Base Q	H.P.F.	Pk. Q	GWI	RDII	Total	P.F.
1	C.O.F.W. Outfall, Master Plan Not including Intel flows, BFX or Marine Creek Areas until 2020	-0.00013	0.00439	143,526.11	27,771.31	11.48	1.88	21.54	2.01	80.01	103.56	7.68
2	C.O.F.W. Outfall, Including BFX but not MC and Intel	-0.00013	0.00439	137,952.61	21,873.32	11.04	1.89	20.85	1.93	55.61	78.39	6.05
3	C.O.F.W. Outfall, Including BFX and MC Areas, but Not Intel	-0.00013	0.00439	143,526.11	27,771.31	11.48	1.88	21.54	2.01	80.01	103.56	7.68
4	Scenario 3 + 6.0 MGD Intel	-0.00013	0.00439	143,526.11	27,771.31	17.48	1.88	32.80	2.01	74.75	109.56	5.62
5	T.C.W.S.C. Outfall, Master Plan Includes Richland Hills & NRH	0.00400	-0.02287	24,876.99	2,764.11	1.99	2.56	5.09	0.35	17.95	23.38	10.00
6	T.C.W.S.C. Outfall, Revised to Include Additional NRH Area	0.00400	-0.02287	32,547.85	3,549.06	2.60	2.44	6.36	0.46	27.15	33.97	11.10
7	North Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	21,258.67	2,294.71	1.70	2.63	4.47	0.30	20.22	24.98	12.50
8	Richland Hills Total Flows based on TCWSC Calibrated Model	0.00400	-0.02287	11,289.18	1,254.35	0.90	2.90	2.62	0.16	6.21	8.99	8.47
9	North Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	21,258.67	2,294.71	1.70	2.63	4.47	0.30	2.60	7.36	3.68
10	Richland Hills Total Flows based on COFW Calibrated Model	-0.00013	0.00439	11,289.18	1,254.35	0.90	2.90	2.62	0.16	1.29	4.07	3.83
11	Haltom City Total Flows in BF based on COFW Calibrated Model	-0.00013	0.00439	26,378.49	2,836.78	2.11	2.53	5.34	0.37	3.37	9.09	3.66
12	Haltom City Flows in Little Fossil Area which can be served by BF	-0.00013	0.00439	13,785.21	1,995.25	1.10	2.82	3.10	0.19	3.70	7.00	5.40
13	Combined Haltom City BF Flows and Little Fossil Flows	-0.00013	0.00439	40,163.70	4,832.03	3.21	2.35	7.56	0.56	7.96	16.08	4.26

NOTES: Coef. A and B are derived from a calibration of the City of Fc
Flow Model based on Peak Discharges in Yesrs 2000 and :
Eq. Pop. = Equivalent Population = Residential Population +
Sew. Ac. = Sewered Acres
Base Q = Base Flow = 80 gpcd x Eq. Pop.
H.P.F. = Harmon's Peaking Factor = 1 + 14 / (4 + (Pop./100(
Pk. Q = Peak Base Flow = Base Q x H.P.F.
GWI = Ground Water Inflow = 14 gpcd x Eq. Pop.
RDII = Rain Depend Infiltration/Inflow = Total Discharge - Pe
Total = Peak Discharge Computed from Calibration Formula
P.F. = Peaking Factor Check = Total / (Pk. Q + GWI)

Landuse Code	Matrix ID	Index Number	Area	Dry GWI	2 Year GWI	5 Year GWI	10 Year GWI	Zero Index	One Index	Wastewater Inde	Rainfall Index	Runoff Index
10	IN-1	1	Large	0	150	220	260	0	1	1	1	
20	IS-1	2	Large	0	150	230	260	0	1	2	2	
30	OR-1	3	Large	0	140	220	270	0	1	3	3	
40	HD-1	4	Large	0	150	210	250	0	1	7	4	
50	MX-1	5	Large	0	170	240	280	0	1	7	5	
60	SF-1A	6	Large	0	280	360	400	0	1	7	6	
70	SF-1B	7	Large	0	220	320	360	0	1	7	7	
80	IN-2	8	Large	0	160	230	270	0	1	7	8	
90	IS-2	9	Large	0	160	240	270	0	1	7	9	
100	OR-2	10	Large	0	160	240	290	0	1	7	10	
110	HD-2	11	Large	0	160	220	260	0	1	7	11	
120	MX-2	12	Large	0	180	260	300	0	1	7	12	
130	IN-3	13	Large	0	170	240	290	0	1	7	13	
140	IS-3	14	Large	0	190	250	300	0	1	7	14	
150	OR-3	15	Large	0	180	260	310	0	1	7	15	
160	HD-3	16	Large	0	170	230	290	0	1	7	16	
170	MX-3	17	Large	0	200	280	320	0	1	7	17	
180	IN-1	18	Small	0	150	220	260	0	1	18	18	
190	IS-1	19	Small	0	150	230	260	0	1	19	19	
200	OR-1	20	Small	0	140	220	270	0	1	20	20	
210	HD-1	21	Small	0	150	210	250	0	1	7	21	
220	MX-1	22	Small	0	170	240	280	0	1	7	22	
230	SF-1A	23	Small	0	280	360	400	0	1	7	23	
240	SF-1B	24	Small	0	220	320	360	0	1	7	24	
250	IN-2	25	Small	0	160	230	270	0	1	7	25	
260	IS-2	26	Small	0	160	240	270	0	1	7	26	
270	OR-2	27	Small	0	160	240	290	0	1	7	27	
280	HD-2	28	Small	0	160	220	260	0	1	7	28	
290	MX-2	29	Small	0	180	260	300	0	1	7	29	
300	IN-3	30	Small	0	170	240	290	0	1	7	30	
310	IS-3	31	Small	0	190	250	300	0	1	7	31	
320	OR-3	32	Small	0	180	260	310	0	1	7	32	
330	HD-3	33	Small	0	170	230	290	0	1	7	33	
340	MX-3	34	Small	0	200	280	320	0	1	7	34	
350	High GPCD	99	NA	0	180	280	320	0	1	35	7	
360	High I/I	98	NA	0	220	360	400	0	1	35	35	

2 Year GWI

280 GPAD - 100 GPAD DRY = 180 GPAD ADDITIONAL

Matrix ID	GPAD	Sum of Acres	% of Total Acres	Sum of GWI
HD-1	150	1849.32	1.20%	1.805423769
HD-2	160	9837.11	6.40%	10.24385307
HD-3	170	1287.23	0.84%	1.424232541
IN-1	150	18065.29	11.76%	17.63648474
IN-2	160	8802.42	5.73%	9.166380893
IN-3	170	4928.7	3.21%	5.453271697
IS-1	150	6164.61	4.01%	6.018284245
IS-2	160	2318.27	1.51%	2.414125415
IS-3	190	4940.98	3.22%	6.110018528
MX-1	170	10253.05	6.67%	11.34430324
MX-2	180	18522.96	12.06%	21.69994955
MX-3	200	17221.82	11.21%	22.41738093
OR-1	140	2939.5	1.91%	2.678411682
OR-2	160	15924.48	10.36%	16.58292256
OR-3	180	5179.33	3.37%	6.067669515
SF-1A	280	6800.7	4.43%	12.39331473
SF-1B	220	18611.26	12.11%	26.64859321
SUMS		153647.03	100.00%	180.1046203

5 Year GWI

358 GPAD - 100 GPAD DRY = 258 GPAD ADDITIONAL

Matrix ID	GPAD	Sum of Acres	% of Total Acres	Sum of GWI
HD-1	210	1849.32	1.20%	2.527593277
HD-2	220	9837.11	6.40%	14.08529797
HD-3	230	1287.23	0.84%	1.92690285
IN-1	220	18065.29	11.76%	25.86684429
IN-2	230	8802.42	5.73%	13.17667253
IN-3	240	4928.7	3.21%	7.698736513
IS-1	230	6164.61	4.01%	9.228035843
IS-2	240	2318.27	1.51%	3.621188122
IS-3	250	4940.98	3.22%	8.039498063
MX-1	240	10253.05	6.67%	16.01548692
MX-2	260	18522.96	12.06%	31.34437158
MX-3	280	17221.82	11.21%	31.3843333
OR-1	220	2939.5	1.91%	4.208932643
OR-2	240	15924.48	10.36%	24.87438384
OR-3	260	5179.33	3.37%	8.764411522
SF-1A	360	6800.7	4.43%	15.93426179
SF-1B	320	18611.26	12.11%	38.76159012
SUMS		153647.03	100.00%	257.4585412

10 Year GWI

400 GPAD - 100 GPAD DRY = 300 GPAD ADDITIONAL

Matrix ID	GPAD	Sum of Acres	% of Total Acres	Sum of GWI
HD-1	250	1849.32	1.20%	3.009039615
HD-2	260	9837.11	6.40%	16.64626124
HD-3	290	1287.23	0.84%	2.429573159
IN-1	260	18065.29	11.76%	30.56990688
IN-2	270	8802.42	5.73%	15.46826776
IN-3	290	4928.7	3.21%	9.302639953
IS-1	260	6164.61	4.01%	10.43169269
IS-2	270	2318.27	1.51%	4.073836637
IS-3	300	4940.98	3.22%	9.647397675
MX-1	280	10253.05	6.67%	18.68473475
MX-2	300	18522.96	12.06%	36.16658259
MX-3	320	17221.82	11.21%	35.86780949
OR-1	270	2939.5	1.91%	5.165508243
OR-2	290	15924.48	10.36%	30.05654714
OR-3	310	5179.33	3.37%	10.44987528
SF-1A	400	6800.7	4.43%	17.70473533
SF-1B	360	18611.26	12.11%	43.60678888
SUMS		153647.03	100.00%	299.2811973

25 Year GWI

455 GPAD - 100 GPAD DRY = 355 GPAD ADDITIONAL

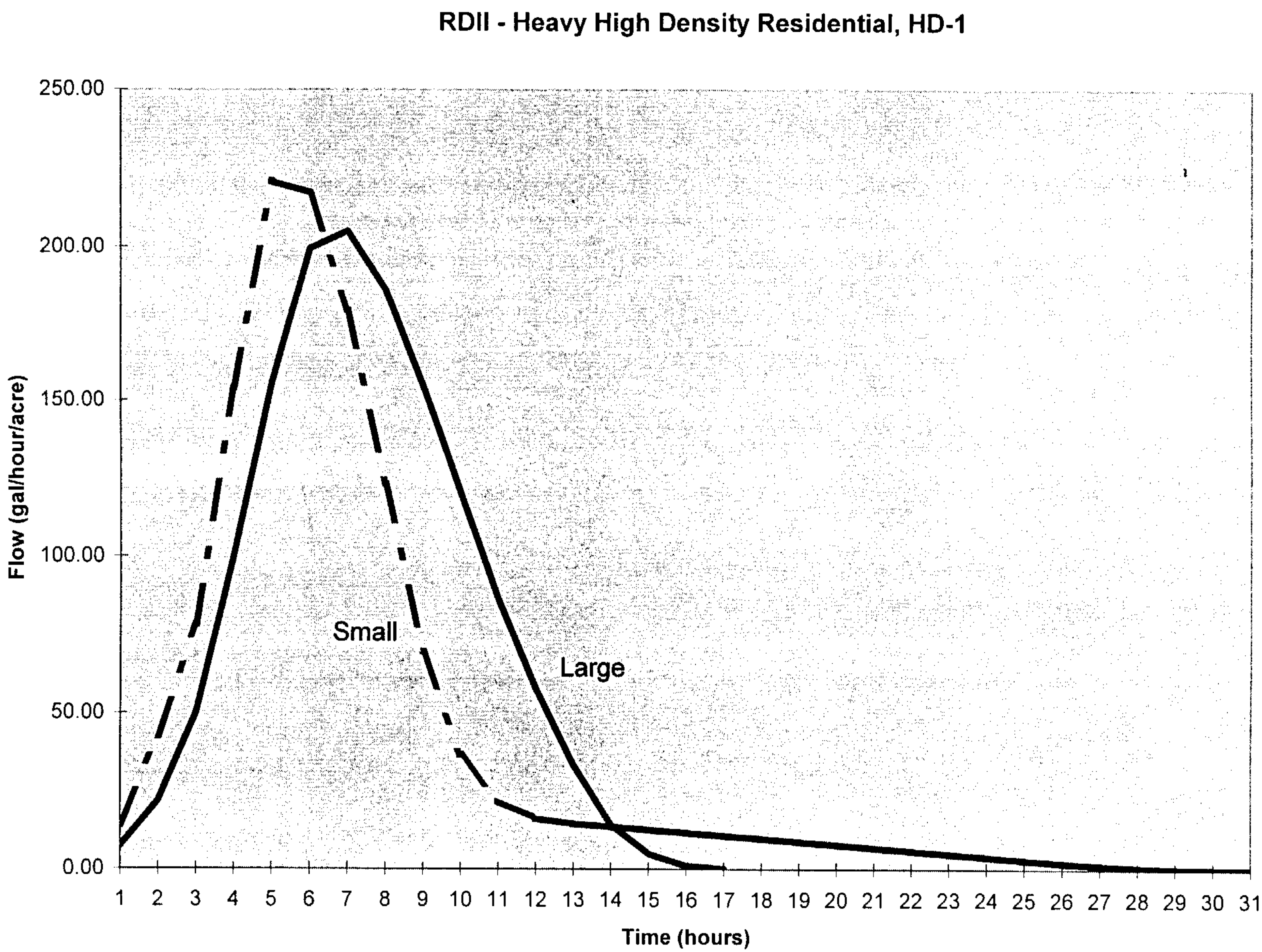
Matrix ID	GPAD	Sum of Acres	% of Total Acres	Sum of GWI
HD-1	290	1849.32	1.20%	3.490485953
HD-2	300	9837.11	6.40%	19.20722451
HD-3	340	1287.23	0.84%	2.848465083
IN-1	290	18065.29	11.76%	34.09720383
IN-2	310	8802.42	5.73%	17.75986298
IN-3	340	4928.7	3.21%	10.90654339
IS-1	290	6164.61	4.01%	11.63534954
IS-2	310	2318.27	1.51%	4.677367991
IS-3	340	4940.98	3.22%	10.93371737
MX-1	330	10253.05	6.67%	22.02129452
MX-2	360	18522.96	12.06%	43.39989911
MX-3	390	17221.82	11.21%	43.71389281
OR-1	320	2939.5	1.91%	6.122083844
OR-2	350	15924.48	10.36%	36.2751431
OR-3	380	5179.33	3.37%	12.80952453
SF-1A	470	6800.7	4.43%	20.80306401
SF-1B	440	18611.26	12.11%	53.29718641
SUMS		153647.03	100.00%	353.998309

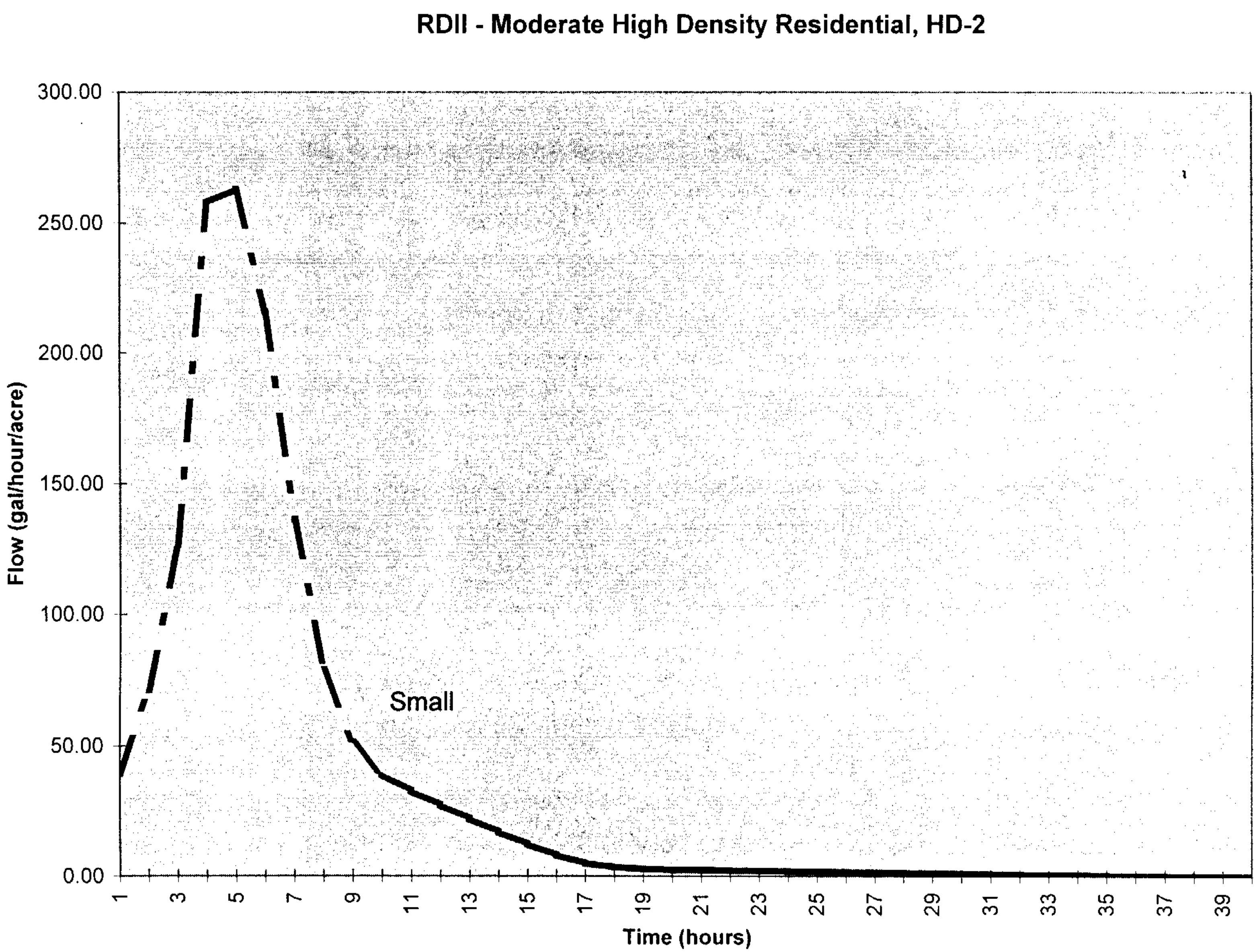
Gallons/Hour of Inflow (RATE)

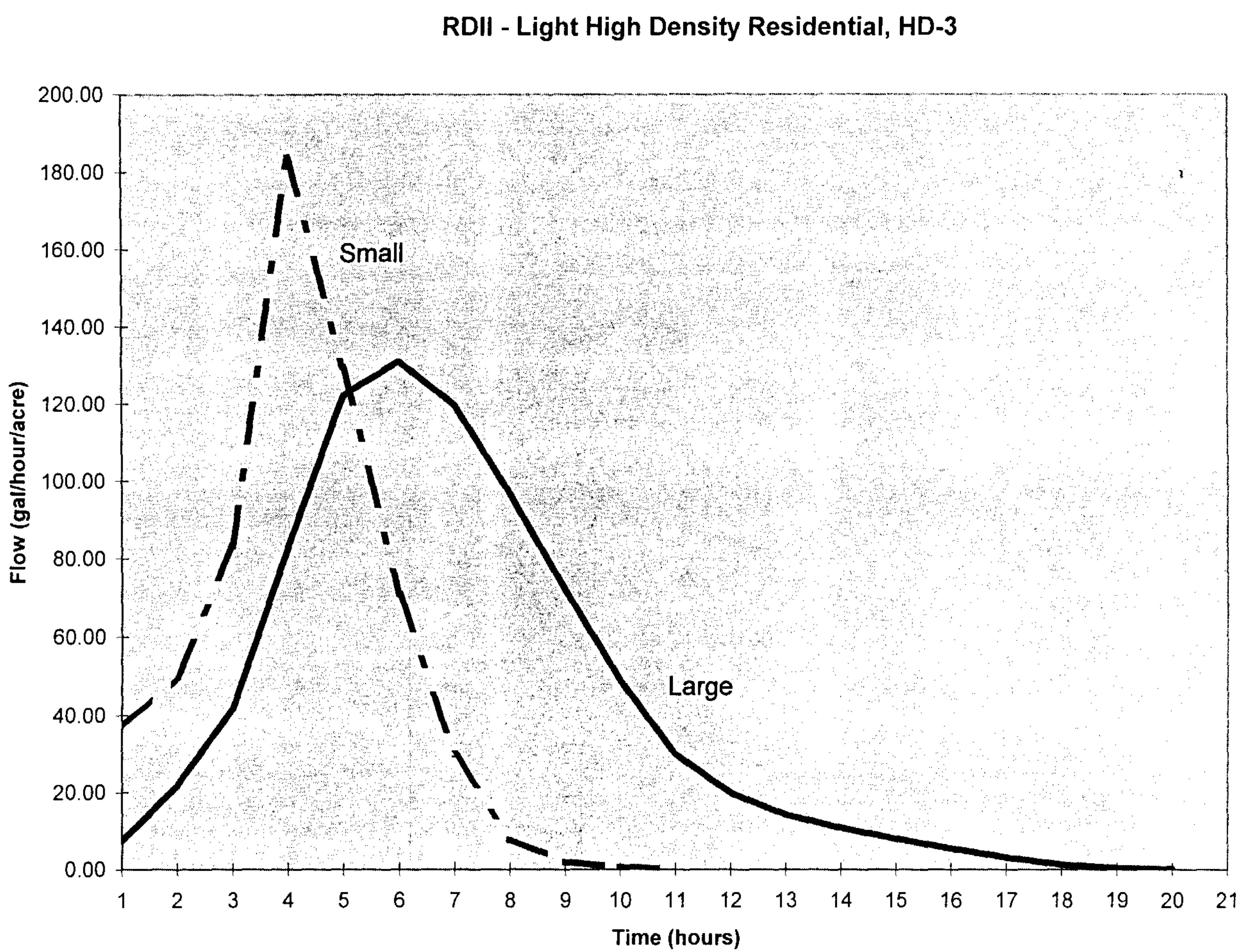
Matrix ID	HD-1	HD-1	HD-2	HD-3	HD-3	IN-1	IN-1	IN-2	IN-3	IN-3
	large	small	small	small	large	small	large	large	small	large
ACRES	1,849.00	164.00	1,327.00	240.00	472.00	192.00	1,095.00	995.00	620.00	620.00
Hour	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre
0										
1	7.09	13.92	39.46	36.80	7.11	38.40	11.38	9.72	16.00	16.00
2	21.68	42.54	71.26	49.99	21.73	71.52	34.76	29.70	48.90	48.90
3	49.86	78.22	126.64	83.40	41.75	129.87	68.01	54.66	93.25	93.25
4	100.26	153.90	257.61	183.76	82.91	265.69	137.16	107.59	187.11	187.11
5	154.97	220.84	262.77	129.53	122.09	280.45	206.29	154.26	276.46	276.46
6	199.31	217.11	215.78	70.99	131.03	246.14	233.88	151.53	298.24	298.24
7	205.00	178.90	136.31	29.83	119.64	172.80	234.91	126.16	281.57	281.57
8	185.88	123.00	79.09	7.76	96.64	98.43	220.31	87.62	237.27	237.27
9	154.70	69.67	51.46	1.92	71.87	61.59	200.76	52.05	184.95	184.95
10	120.01	36.52	39.10	0.63	48.91	43.43	167.83	34.97	135.45	135.45
11	86.27	21.70	32.86	0.11	29.90	35.46	134.94	27.00	90.87	90.87
12	57.86	16.14	27.59		19.85	30.28	102.01	23.91	56.80	56.80
13	33.48	14.43	22.30		14.15	25.10	69.06	22.16	39.83	39.83
14	14.22	13.47	17.10		10.73	19.93	36.19	20.42	31.20	31.20
15	4.89	12.51	12.34		7.95	14.75	2.55	18.67	26.73	26.73
16	1.05	11.55	8.11		5.39	10.01	0.97	16.92	23.33	23.33
17	0.07	10.59	4.92		3.09	5.73	0.81	15.17	19.92	19.92
18		9.64	3.43		1.23	2.29	0.55	13.43	16.52	16.52
19		8.68	2.76		0.40	0.75		11.68	13.11	13.11
20		7.72	2.51		0.07	0.13		9.93	9.71	9.71
21		6.76	2.36					8.31	6.59	6.59
22		5.80	2.21					6.81	3.77	3.77
23		4.84	2.07					5.54	1.51	1.51
24		3.88	1.92					4.81	0.49	0.49
25		2.92	1.77					4.33	0.09	0.09
26		2.03	1.63					3.98		
27		1.22	1.48					3.67		
28		0.55	1.33					3.36		
29		0.20	1.18					3.05		
30		0.05	1.04					2.74		
31		0.00	0.89					2.43		
32			0.74					2.12		
33			0.60					1.81		
34			0.45					1.50		
35			0.31					1.19		
36			0.19					0.88		
37			0.08					0.60		
38			0.03					0.34		
39			0.01					0.14		
40			0.00					0.04		
41								0.01		
42										
43										
44										
45										
46										
47										
48										

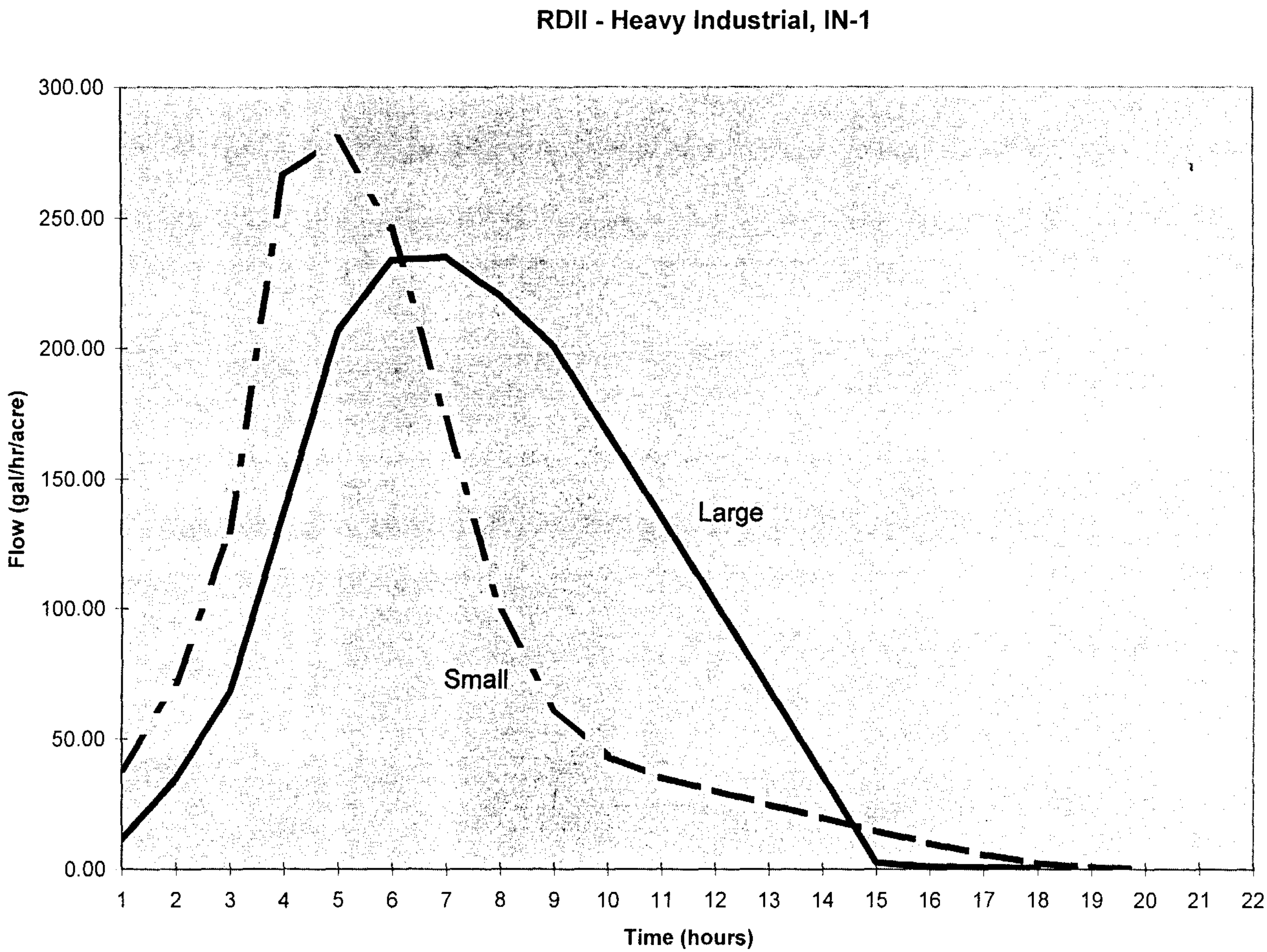
Matrix ID	IS-1	IS-1	IS-2	IS-3	MX-1	MX-2	MX-3	MX-3	OR-1
	small	large	large	small	large	large	small	large	small
ACRES	208.00	1,266.00	1,650.00	229.00	5,728.00	399.00	77.00	840.00	169.00
Hour	Gal/hr/acre	Gal/hr/acre	gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre
0									
1	7.12	8.24	16.67	52.57	5.99	35.39	61.02	15.78	29.13
2	21.75	25.19	50.92	95.54	18.31	69.05	108.79	48.23	55.84
3	39.33	48.07	96.67	170.57	42.12	129.28	191.55	92.11	103.37
4	73.42	94.31	189.47	350.11	84.44	263.75	387.87	184.95	211.46
5	103.95	136.44	273.98	369.98	130.16	297.76	389.82	275.05	233.29
6	95.16	140.23	280.07	322.85	166.66	286.64	309.02	300.62	216.26
7	62.66	118.90	237.27	242.75	169.44	229.39	181.66	291.27	165.08
8	36.26	84.26	170.41	196.67	150.82	166.48	107.43	261.02	108.00
9	16.35	49.89	105.88	169.99	121.15	130.80	70.09	225.02	70.40
10	5.66	29.62	69.85	153.88	90.33	109.59	53.19	189.02	49.35
11	1.70	16.99	48.21	139.64	61.82	96.61	42.22	153.01	37.14
12	0.27	9.40	34.15	124.80	38.17	85.81	31.26	117.01	28.35
13		6.01	23.17	109.96	25.59	75.02	21.21	82.83	20.41
14		4.16	13.27	95.13	18.37	64.22	12.15	51.79	13.18
15		3.13	5.30	80.29	13.97	53.43	4.85	25.51	6.92
16		2.32	1.74	65.45	10.34	42.64	1.59	9.51	2.66
17		1.57	0.31	51.38	7.02	31.84	0.28	2.65	0.80
18		0.90		38.11	4.02	21.87		0.37	0.13
19		0.36		26.30	1.61	12.85			
20		0.12		17.82	0.53	5.50			
21		0.02		11.43	0.09	1.89			
22				6.41		0.41			
23				2.56		0.03			
24				0.84					
25				0.15					
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									

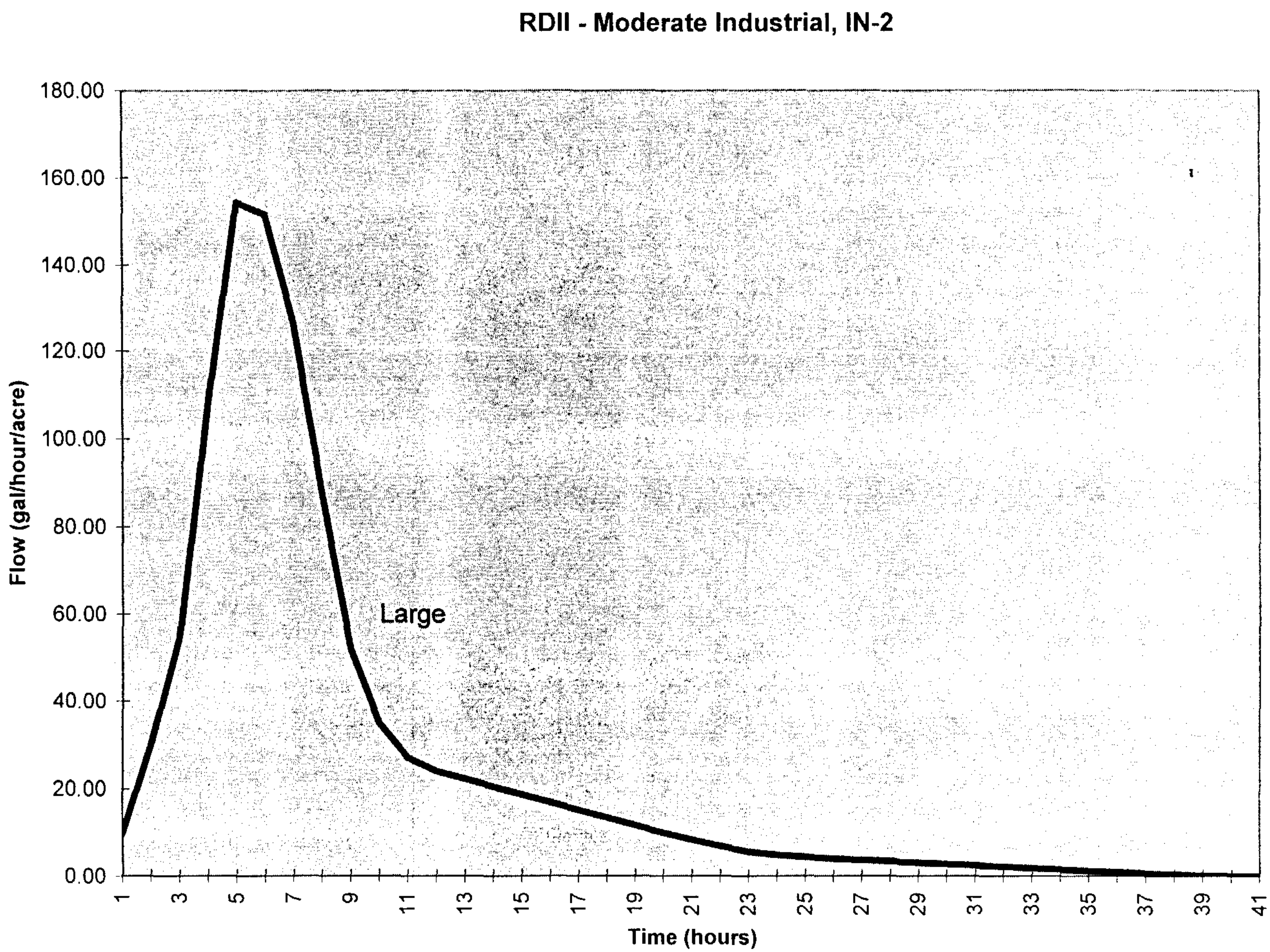
Matrix ID	OR-1	OR-2	OR-2	OR-3	SF-1A	SF-1A	SF-1B	SF-1B
	large	small	large	small	small	large	small	large
ACRES	417.00	1,869.00	1,869.00	287.00	180.00	390.00	180.00	335.00
Hour	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre	Gal/hr/acre
0								
1	7.32	27.19	27.19	39.83	24.99	20.92	20.46	40.44
2	22.37	48.35	48.35	64.49	76.35	63.91	62.53	74.02
3	43.81	84.95	84.95	103.50	139.81	120.85	114.49	132.83
4	86.74	173.56	173.56	222.61	274.44	241.41	224.75	271.79
5	127.99	174.72	174.72	191.93	391.72	354.38	320.79	279.80
6	139.51	140.59	140.59	112.00	379.04	374.84	310.41	235.95
7	126.81	89.61	89.61	55.97	307.48	343.37	251.81	155.51
8	101.86	58.34	58.34	19.68	202.23	275.72	165.62	79.15
9	74.07	44.44	44.44	5.60	105.77	203.16	86.62	43.21
10	48.80	39.00	39.00	1.77	59.70	135.69	48.89	27.22
11	30.52	36.20	36.20		38.37	80.25	31.42	21.64
12	18.82	33.48	33.48		30.30	53.32	24.82	18.85
13	10.90	30.71	30.71		25.88	40.18	21.19	16.06
14	5.24	27.94	27.94		21.46	34.31	17.57	13.27
15	1.95	25.17	25.17		17.03	30.43	13.95	10.47
16	0.54	22.40	22.40		12.61	26.55	10.33	7.70
17	0.08	19.63	19.63		8.56	22.68	7.01	5.17
18		16.86	16.86		4.90	18.80	4.01	2.91
19		14.09	14.09		1.96	14.92	1.60	1.15
20		11.41	11.41		0.64	11.05	0.53	0.37
21		8.93	8.93		0.11	7.50	0.09	0.06
22		6.74	6.74			4.29		
23		5.14	5.14			1.72		
24		4.25	4.25			0.56		
25		3.71	3.71			0.10		
26		3.34	3.34					
27		3.00	3.00					
28		2.66	2.66					
29		2.32	2.32					
30		1.98	1.98					
31		1.64	1.64					
32		1.30	1.30					
33		0.97	0.97					
34		0.66	0.66					
35		0.38	0.38					
36		0.15	0.15					
37		0.05	0.05					
38		0.01	0.01					
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								


RDII - Heavy High Density Residential, HD-1
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hour/acre)
Small
Large
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Time (hours)

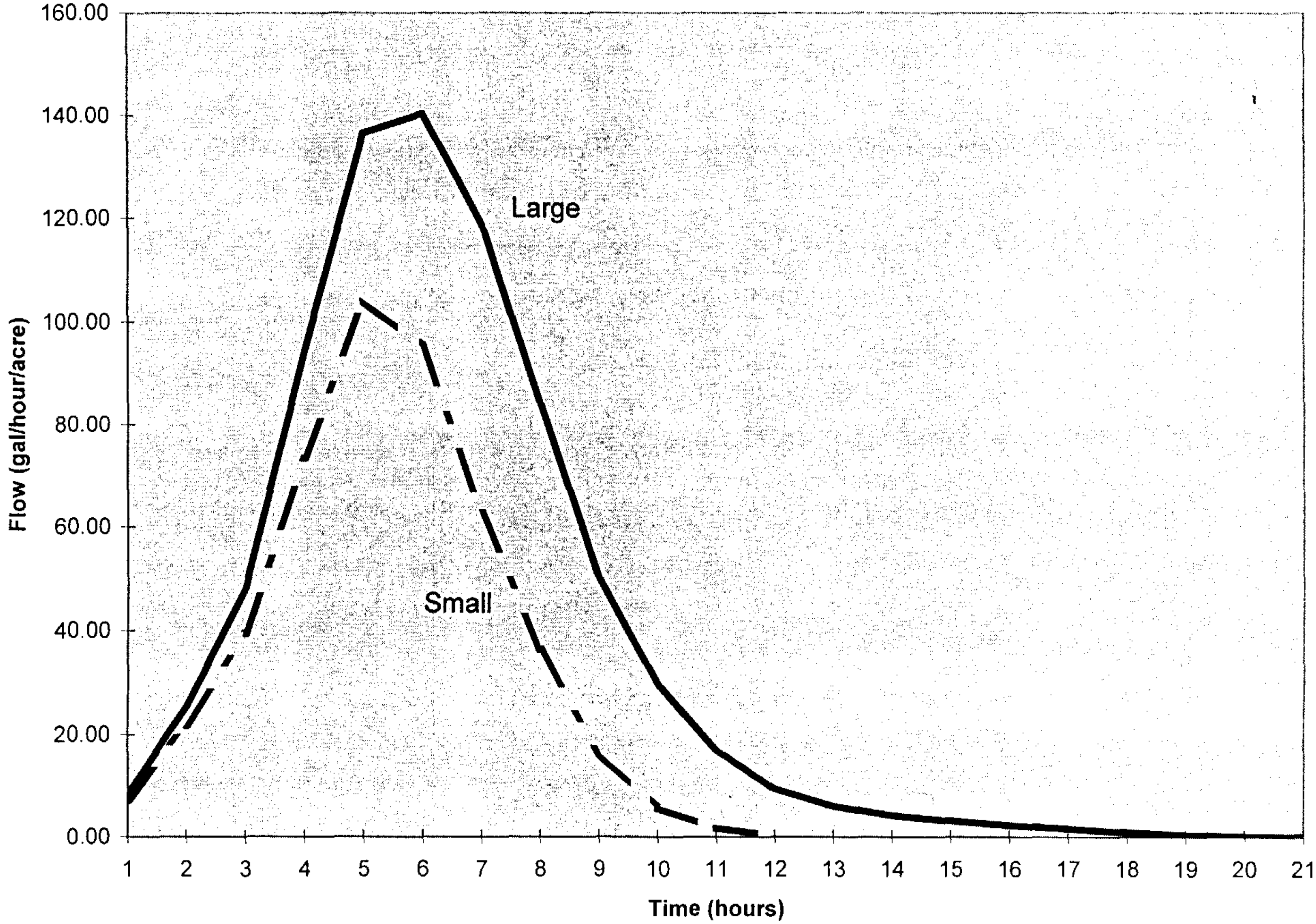

RDII - Moderate High Density Residential, HD-2
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hour/acre)
Small
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
Time (hours)

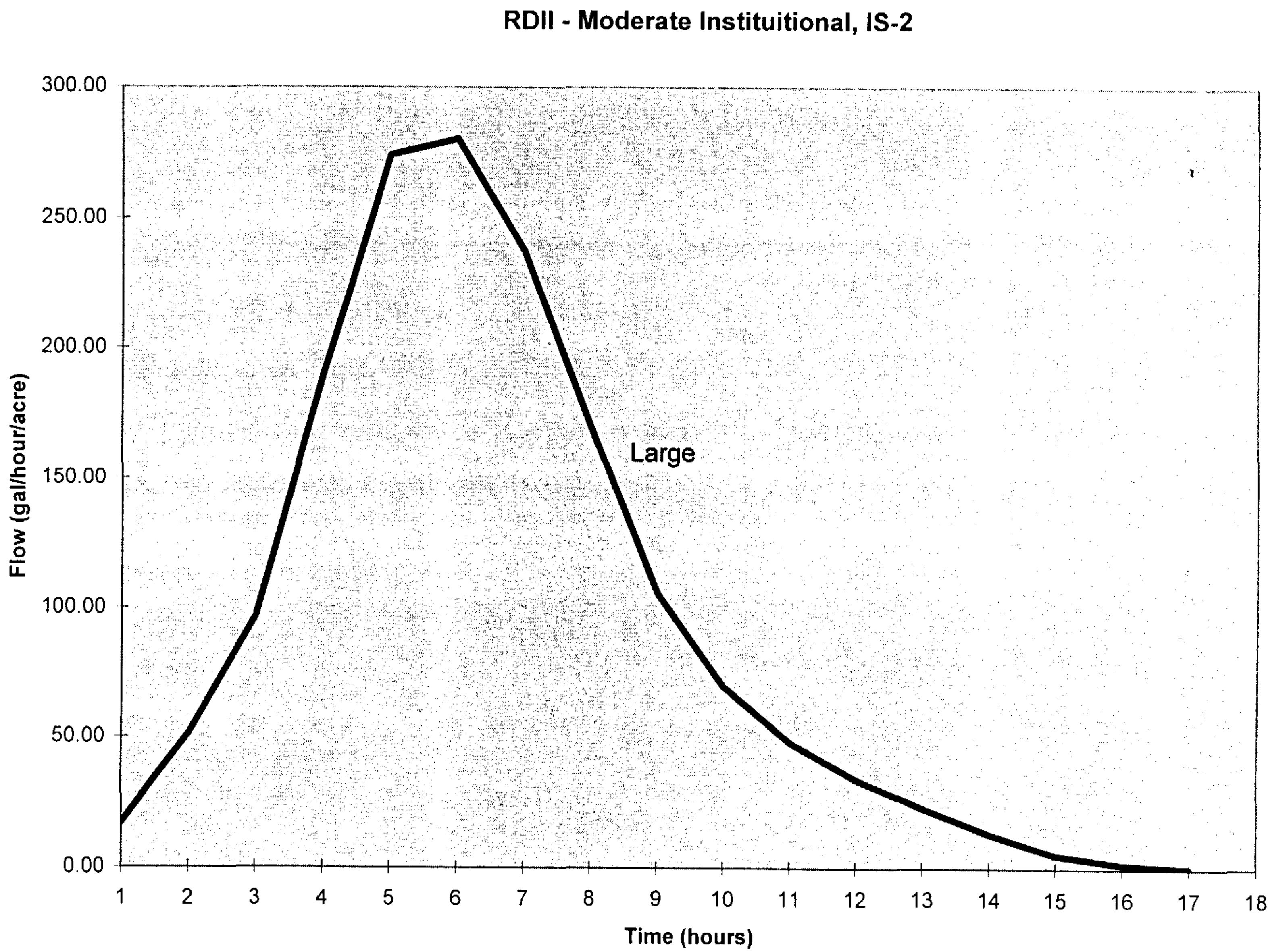

RDII - Light High Density Residential, HD-3
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Flow (gal/hour/acre)
Small
Large
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Time (hours)


RDII - Heavy Industrial, IN-1
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hr/acre)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Time (hours)
Large
Small

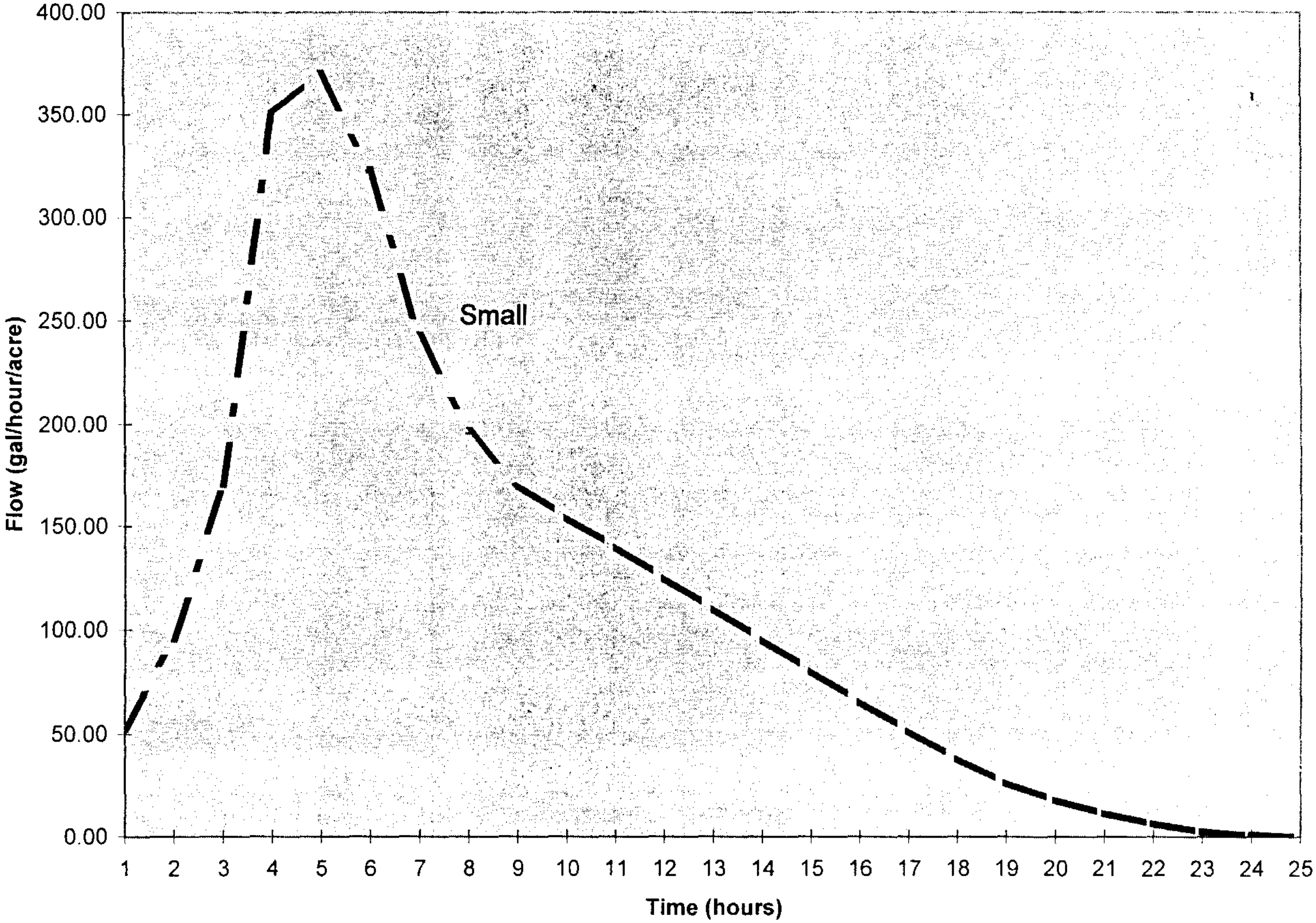

RDII - Moderate Industrial, IN-2
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Flow (gal/hour/acre)
Large
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
39
41
Time (hours)

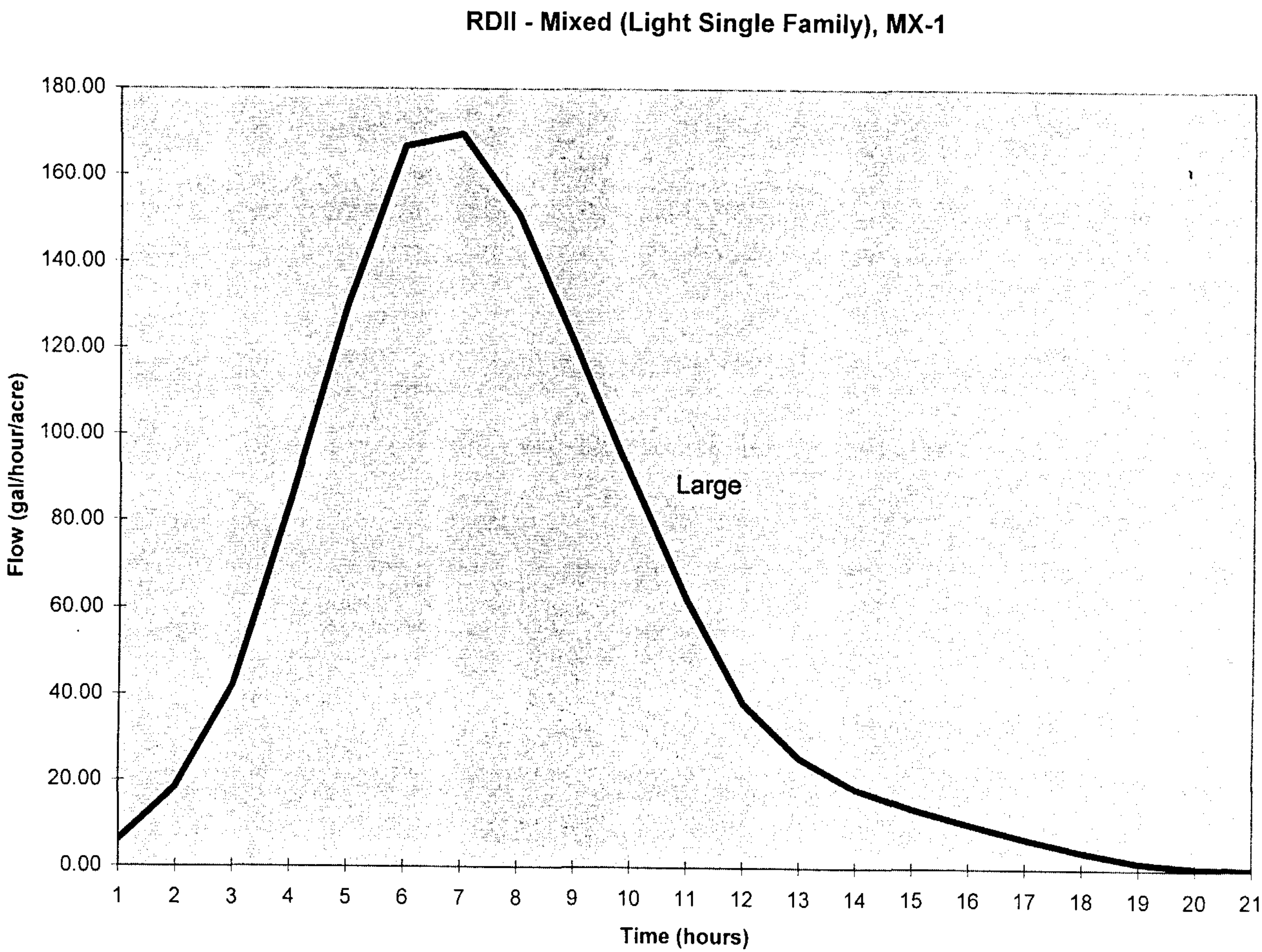
RDII - Heavy Instituitional, IS-1



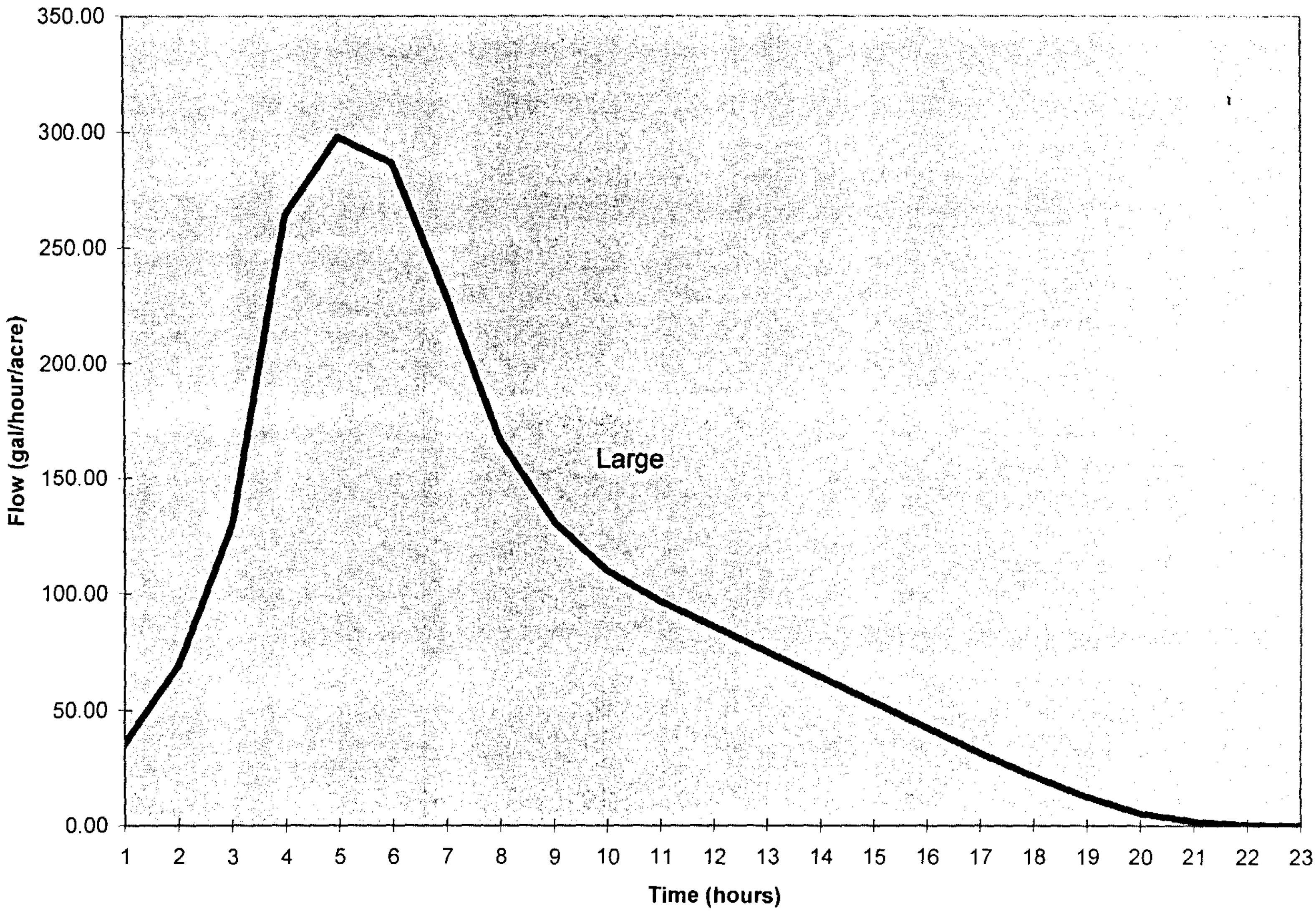

RDII - Moderate Instituitional, IS-2
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hour/acre)
Large
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Time (hours)

RDII - Light Instituitional, IS-3

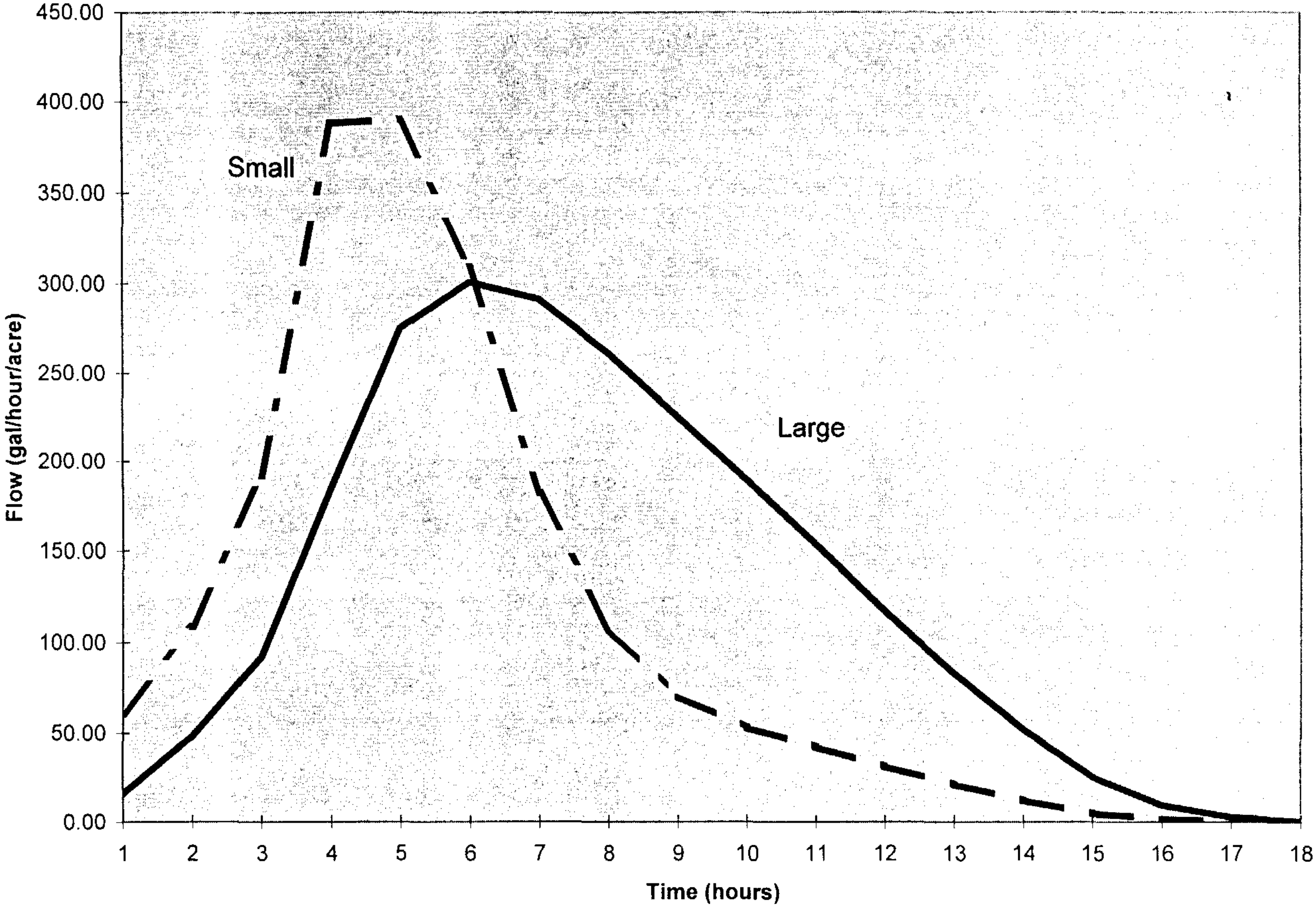


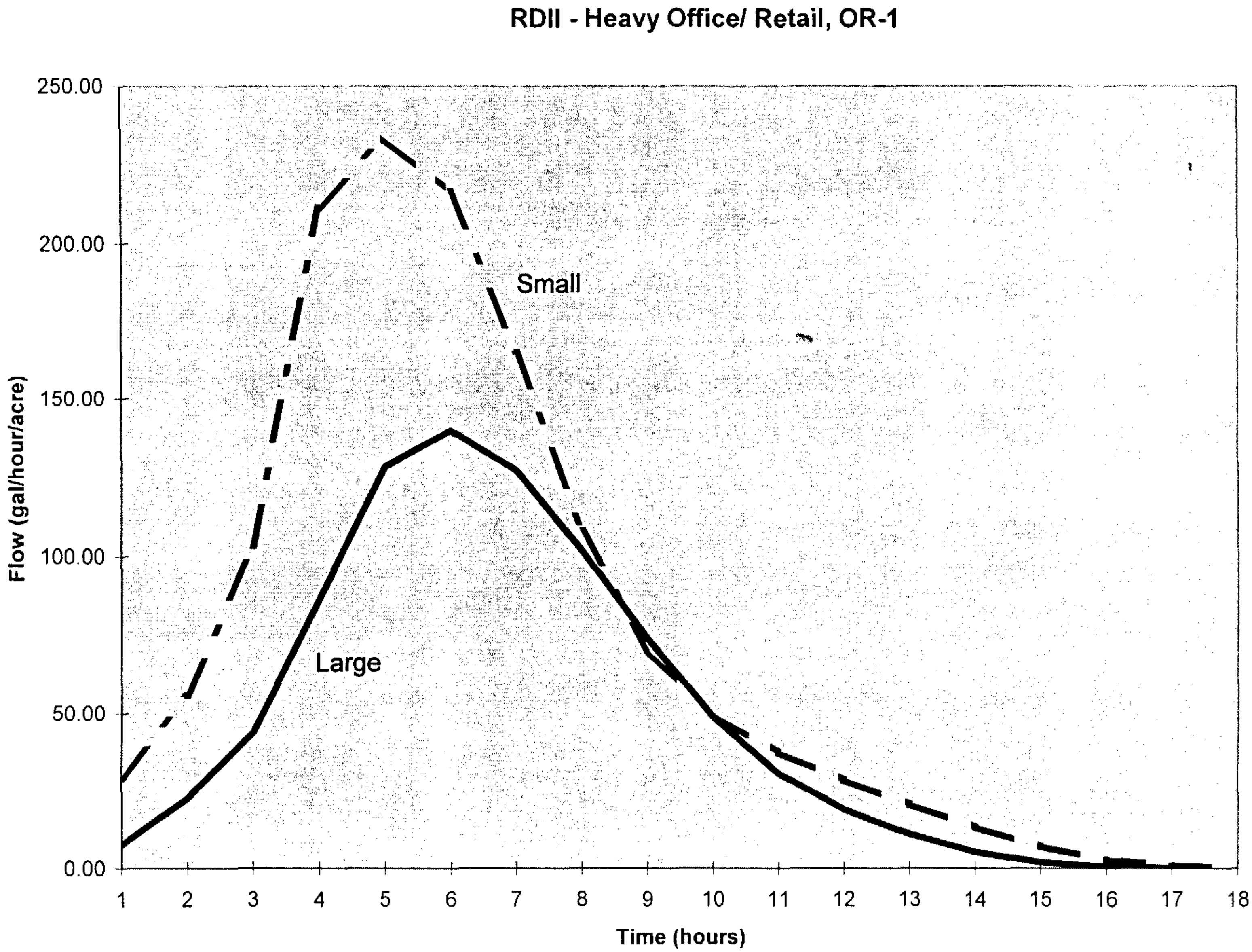

RDII - Mixed (Light Single Family), MX-1
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Flow (gal/hour/acre)
Large
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Time (hours)

RDII - Mixed (Moderate Single Family), MX-2

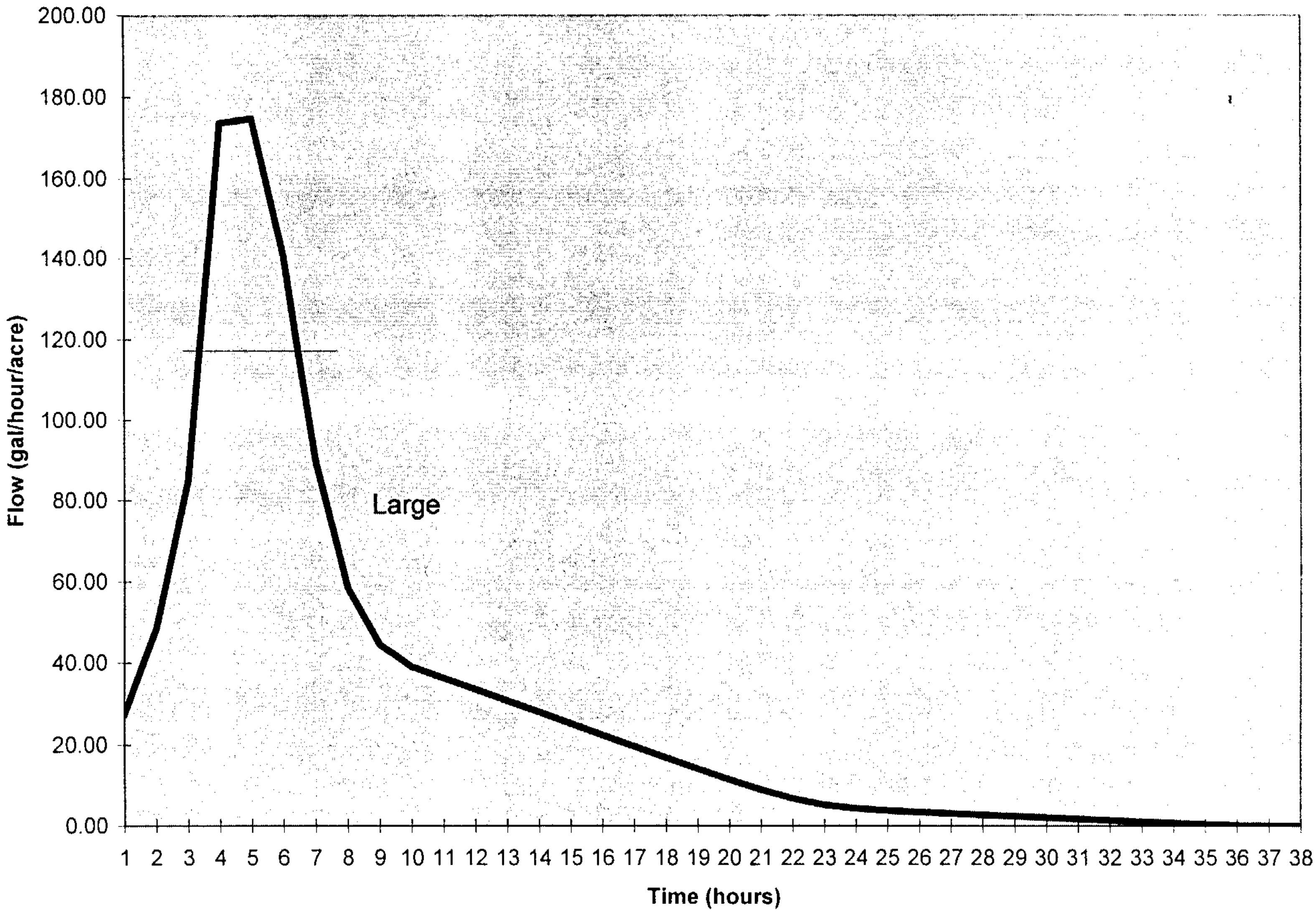


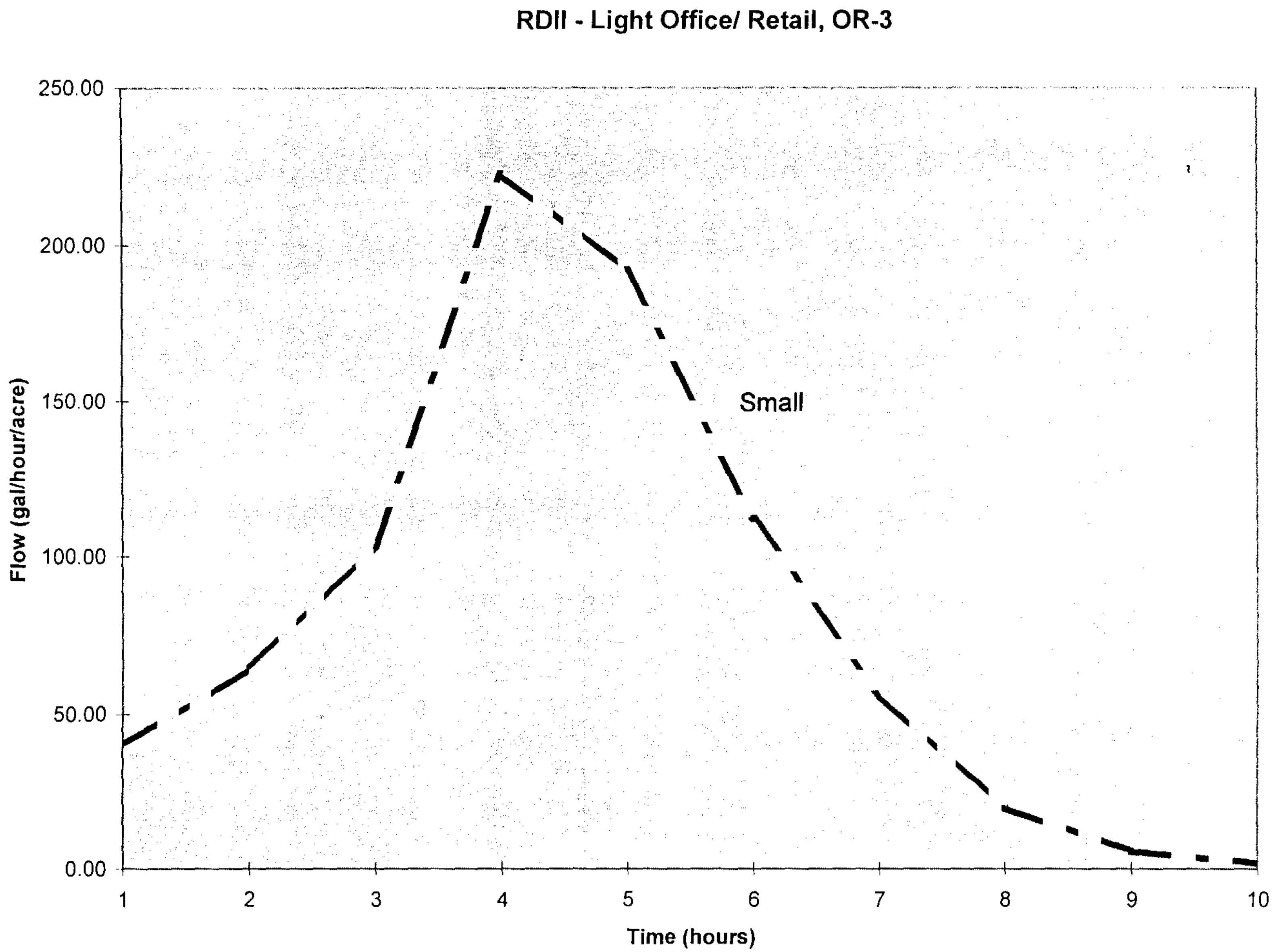
RDII - Mixed (Heavy Single Family), MX-3

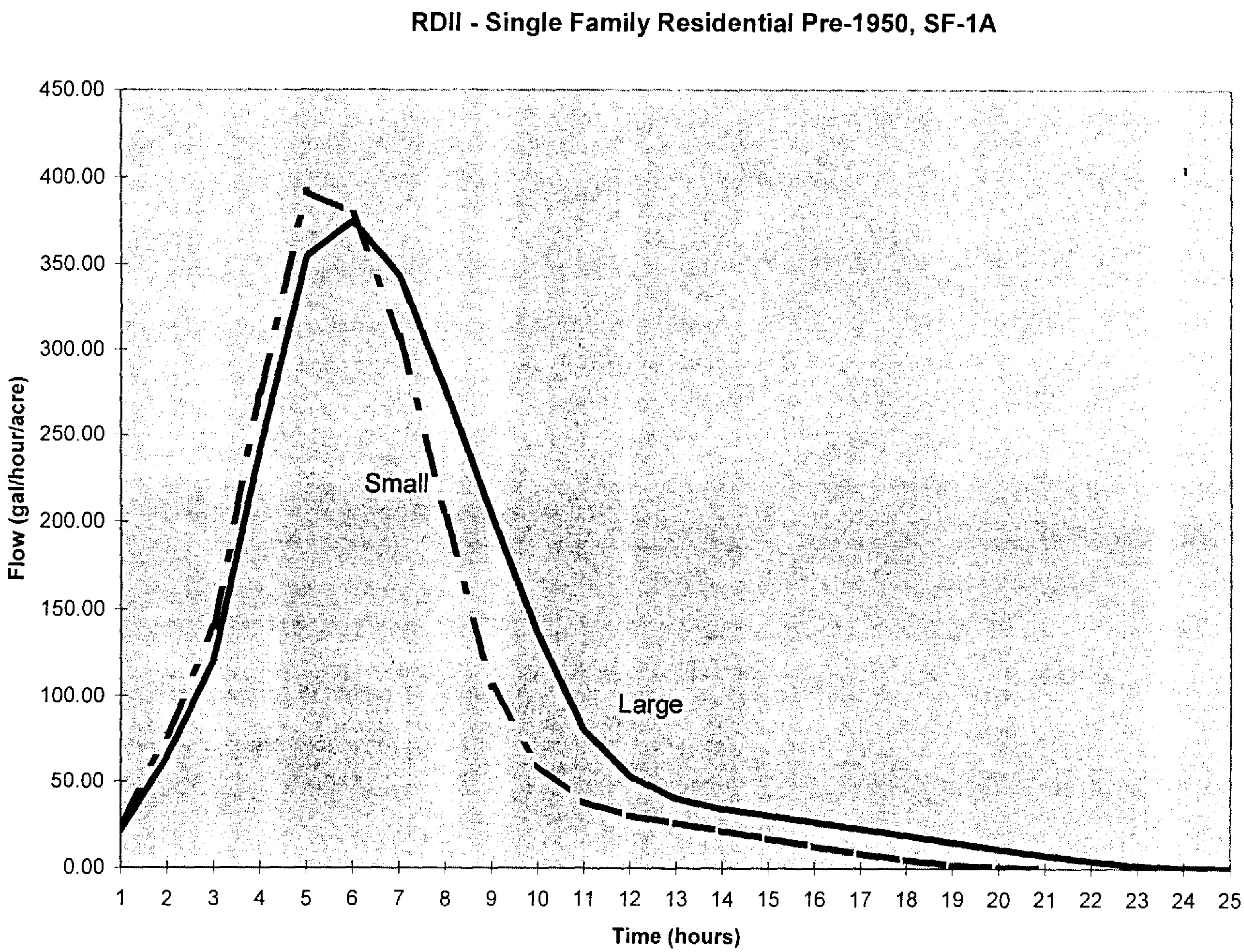


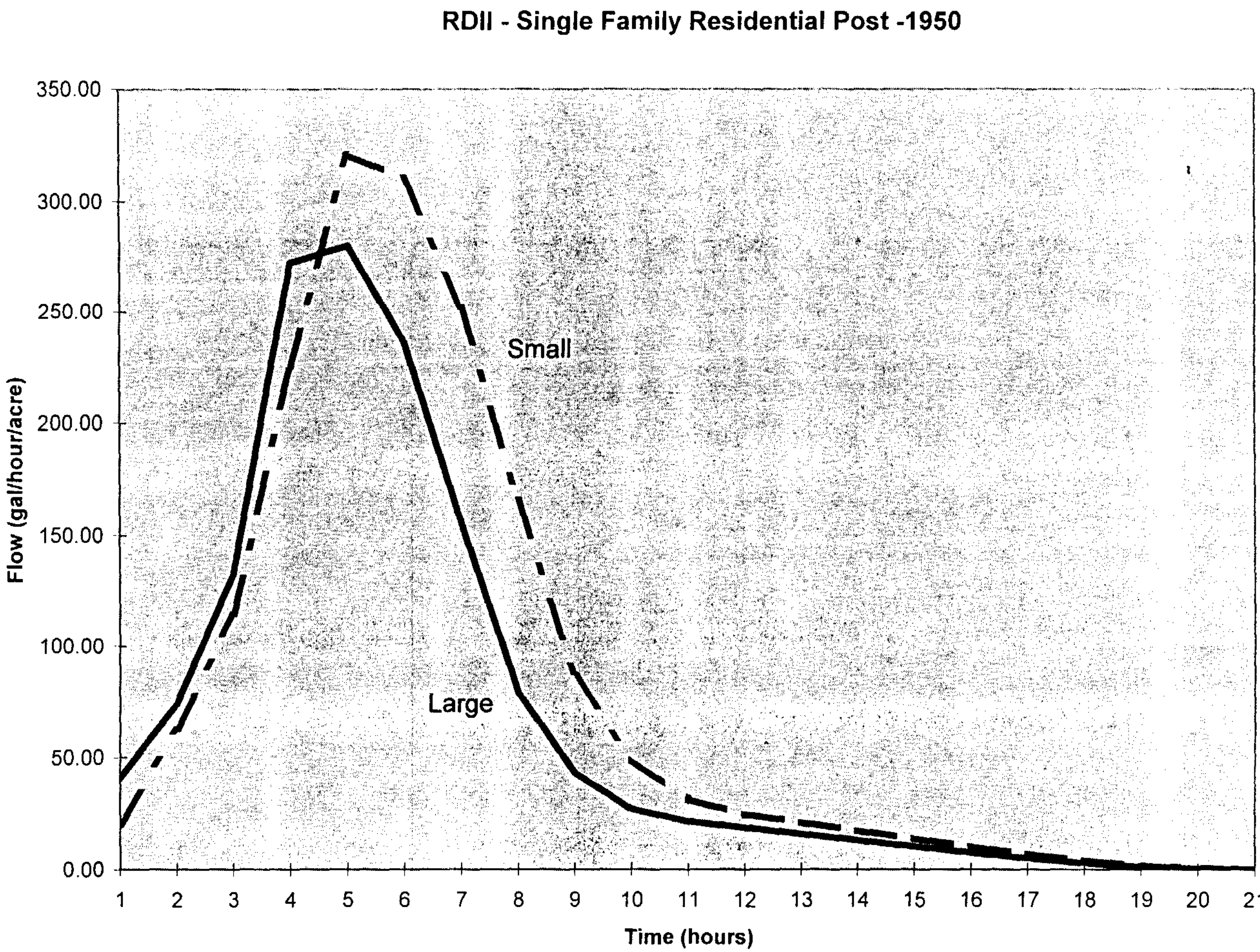

RDII - Heavy Office/ Retail, OR-1
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hour/acre)
Small
Large
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Time (hours)

RDII - Moderate Office/ Retail, OR-2




RDII - Light Office/ Retail, OR-3
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hour/acre)
Small
1
2
3
4
5
6
7
8
9
10
Time (hours)


RDII - Single Family Residential Pre-1950, SF-1A
Flow (gal/hour/acre)
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Time (hours)
Small
Large


RDII - Single Family Residential Post -1950
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Flow (gal/hour/acre)
Small
Large
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Time (hours)

TAB 7

BIG FOSSIL SEWER STUDY

PROPOSED SEWER PIPE SIZES,

HYDRAULIC TABLES, AND

PRELIMINARY COST ESTIMATES

Flow Calibration Methodology:

Table "CALIB-1", which follows this page, shows the equations used for calibrating the flow discharge projections for the years 2000, 2005, 2010, 2015, 2020, 2050, and 2070 to the Fort Worth Sanitary Sewer Master Plan based on existing year 2000 conditions, and projected year 2020 conditions.

The equivalent populations and sewered areas are presented in the "Fort Worth Sub-Area Projections" table under TAB 5 of the report. The equivalent population used for year 2000 is 57,207.5, and the sewered area is 9,004.81 acres. These population and area values are associated with only the existing Big Fossil Watershed area which the City of Fort Worth Outfall Sewer line currently serves. This area included Fort Worth and Haltom City, but does not include North Richland Hills or Richland Hills which are currently served by the T.C.W.S.C. Outfall Line.

The year 2000 peak flow rate of 32.22 used in the calibration model is based on a peak flow of 42.22 MGD, (less 10 MGD for the Intel Site), shown in the Fort Worth Master Plan hydraulics table labeled "Appendix D, 2020 Model Results, 5 Year Storm, 5 Year Gwi", pages 192 and 193, under the column labeled "Existing Piping 2000 Maxflow (MGD)". A copy of this table is attached.

The equivalent population used for the year 2020 is 93,287.50, and the associated sewered area is 20,881.33. These population and area values are based on the entire Big Fossil Watershed area, less the NRH and Richland Hills areas, plus the Marine Creek area.

The year 2020 peak flow rate of 80.17 used in the calibration model is based on a peak flow of 90.17, (less 10 MGD for the Intel Site), shown in the attached Master Plan hydraulics table.

The calibration equations developed using the methods discussed herein are used for all the other hydraulic tables included in the Big Fossil Sanitary Sewer System report for design conditions which differ from the baseline conditions shown.

Population and area values for the T.C.W.S.C. line are also shown on Table "CALIB-1". Following this table, a detailed discussion of Tables "7-0" and "7-0a" is presented.

FORMULA FOR CALIBRATION OF WATERSHED FLOW MODEL
BASED ON EQUIVALENT POPULATION AND SEWERED AREAS
USING RESULTS OF FORT WORTH MASTER PLAN HYDROWORKS MODEL

Year 2000 Model: A x (2000 Equiv. Pop.) + B x (2000 Sewered Area) = 2000 Peak Modeled Flow

Year 2020 Model: A x (2020 Equiv. Pop.) + B x (2020 Sewered Area) = 2020 Peak Modeled Flow

City of Fort Worth Outfall Line:

	Year 2000	Year 2020	
Equiv. Population:	57207.5	93287.5	
Total Sewered Acres:	9004.81	20981.33	
Peak Flow (MGD):	32.22	80.17	NOTE: 10 MGD Intel Q Subtracted from Year 2020 Peak Flow. Marine Creek area included in 2020 Flows.

A EP2000 + B SA2000 = PF2000
A EP2020 + B SA2020 = PF2020

A = [(PF2020/SA2020) - (PF2000/SA2000)] / [(EP2020/SA20200 - (EP2000/SA2000)]

B = (PF2000 - A EP2000) / SA 2000

A = -0.000127 B = 0.0043875

CHECK:

PF2000 = A x EP2000 + B x SA2000 PF2020 = A x EP2020 + B x SA2020

PF2000 = 32.22 PF 2020 = 80.17

T.C.W.S.C. Outfall Line:

	Year 2000	Year 2020
Equiv. Population:	17,430.50	20,657.50
Total Sewered Acres:	2,550.82	2,764.11
Peak Flow (MGD):	11.39	19.42

A EP2000 + B SA2000 = PF2000
A EP2020 + B SA2020 = PF2020

A = [(PF2020/SA2020) - (PF2000/SA2000)] / [(EP2020/SA20200 - (EP2000/SA2000)]

B = (PF2000 - A EP2000) / SA 2000

A = 0.004 B = -0.022866

CHECK:

PF2000 = A x EP2000 + B x SA2000 PF2020 = A x EP2020 + B x SA2020

PF2000 = 11.39 PF 2020 = 19.42

Discussion of the year 2000 baseline calibration table, "7-0":

Upstream and Downstream Stations -- these stations correspond to the same station numbers used in the Fort Worth Master Plan report and are shown on the attached Appendix "D" table on pages 192, and 193, for the line segment between the Forth Worth West Fork 96" S.S. and Broadway Blvd. The Richland Hills meter is located below Station M402A/0040+28, which is delineated with a horizontal line.

Length (ft.) -- The length of each line segment is shown, and corresponds to the Master Plan length. It is assumed that the proposed parallel line will be roughly equivalent in length to the existing line.

Existing Diameter (in) -- The existing pipe diameter is noted. The siphon section has been changed to show the revised pipe diameter of 50.71-inches which is equivalent to the existing parallel 24-inch and 48-inch diameter siphon pipes. The Fort Worth Master Plan table only shows the 24-inch pipe.

Existing Pipe Capacity (MGD) -- This is the computed capacity of the existing pipe based on the Colbrook-White equations. Capacities of the proposed replacement and parallel pipes are based on the Mannings Equation, and compare favorably with the results of the Colbrook-White equation when using existing pipe flowline grades for the hydraulic slope and a Mannings "n" factor of 0.0145.

2000 Model Flow (MGD) -- This column shows the flow rates presented in the Fort Worth Master Plan for the year 2000. These flows include a uniform 10 MGD rate for the Intel Plant Site. The 10 MGD is subtracted from each flow value before computing the calibration coefficients "A" and "B", which are based only on equivalent population and sewered areas. The equivalent population of 57,207.5 and sewered area of 9,004.81 are shown at the bottom of this column.

2020 Model Flow (MGD) -- These flow rates correspond to the projected flows in the year 2020 from the Fort Worth Master Plan. The equivalent population of 93,287.50 and sewered area of 20,981.33 are shown at the bottom of this column. The flow rates vary from a minimum of 18.71 MGD to a maximum flow of **42.22 MGD**. The value of **42.22 MGD** was the basis for the calibration equation.

2000 Coefficient "A" -- This is the first coefficient in the calibration equation and is computed for each line segment based on the year 2000 Master Plan modeled flow using the formula presented in Table "CALIB-1".

2000 Coefficient "B" -- This is the second coefficient in the calibration equation and is computed for each line segment based on the year 2000 Master Plan modeled flow using the formula presented in Table "CALIB-1".

Model Proposed Diameter (In.) -- This is the proposed replacement pipe diameter for the year 2020 condition as presented in the Fort Worth Master Plan Appendix "D" table.

Design Hydraulic Gradient Slope (Ft./Foot) -- This is the average flowline grade of the existing pipe between major line segments. It is assumed that the proposed replacement and parallel pipes will follow the approximate grade of the existing line. This grade is based on pipe flowline elevations and line segment lengths presented in the Fort Worth Master Plan Appendix "D" table.

2000 Design Flow (MGD) -- The year 2000 design flow values are computed using the calibration equations discussed above, and are equivalent to the existing year 2000 flows listed in the column "2000 Model Flow". The value used for equivalent population of 57,207.50 and sewered area of 9,004.81 acres is the same as the model 2000 flow values, and the results of the flow rate calculations confirms that the calibration equations are correct. The flow rates vary from a minimum of 18.71 MGD to a maximum flow of **42.22 MGD**, which agree with the year 2000 model flows.

Proposed Replacement Pipe Diameter (In.) -- The proposed replacement pipe diameters shown are set equal to the existing pipe diameters for purposes of comparing the existing pipe capacities shown in the Master Plan versus the computed capacities calculated using the Mannings Equation and existing pipe flowline slopes.

Replacement Pipe Capacity (MGD) -- This column shows the computed replacement pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. Note that these capacities compare favorably with the existing pipe capacities shown in the Master Plan using the Colbrook-White equations, except for the very downstream end and the siphon section. Average grades through these two line segments are used for calculations in this column.

Proposed Parallel Pipe Diameter (In.) -- No proposed parallel pipe is recommended for the existing year 2000 conditions since the existing pipe has sufficient capacity to handle existing flow rates based on the Fort Worth year 2000 model flows shown.

Parallel Pipe Capacity (MGD) -- This column shows the computed parallel pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. See the year 2020 table for capacity calculations for the 2020 design conditions.

Combined Capacity of Both Pipes (MGD) -- This is the sum of the existing pipe capacity, from the Master Plan, plus the proposed replacement pipe capacity. This value should generally exceed the Design Flow rate, which it does for most line segments within the study limits.

Estimated Replacement Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

Estimated Parallel Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	DESIGN H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0013	0.0094	90	0.000800	18.94	54	32.38	0	0.00	222.11	$29,200.29	$0.00
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0014	0.0099	90	0.000800	18.71	54	32.38	0	0.00	34.03	494,114.77	0.00
M402A/0020+90 (24+48)	M402A/0020+17	73	50.71	-70.57	18.71	86.61	-0.0014	0.0099	90	0.000800	18.71	50.71	27.38	0	0.00	-70.57	18,429.33	0.00
M402A/0022+40 (24+48)	M402A/0020+90	150	50.71	0.00	18.71	86.61	-0.0014	0.0099	90	0.000800	18.71	50.71	27.38	0	0.00	0.00	37,868.49	0.00
M402A/0023+09 (24+48)	M402A/0022+40	69	50.71	74.31	18.71	86.64	-0.0014	0.0099	90	0.000800	18.71	50.71	27.38	0	0.00	74.31	17,419.51	0.00
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0014	0.0100	90	0.000800	18.78	54	32.38	0	0.00	25.04	249,061.33	0.00
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0014	0.0101	90	0.000800	18.81	54	32.38	0	0.00	35.67	114,224.68	0.00
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0014	0.0101	84	0.000831	18.87	54	33.01	0	0.00	32.39	123,958.11	0.00
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0014	0.0101	84	0.000665	18.92	54	29.52	0	0.00	29.03	103,346.14	0.00
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0014	0.0101	84	0.000894	18.97	54	34.24	0	0.00	33.82	160,029.06	0.00
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0014	0.0101	84	0.000651	18.99	54	29.22	0	0.00	28.71	87,887.16	0.00
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0014	0.0101	84	0.000794	18.99	54	32.25	0	0.00	31.72	72,141.90	0.00
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0014	0.0101	84	0.000980	19.06	54	35.85	0	0.00	35.19	73,000.73	0.00
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0007	0.0068	84	0.000698	31.63	54	30.24	0	0.00	29.72	184,648.92	0.00
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0007	0.0068	84	0.000808	31.61	54	32.54	0	0.00	31.88	28,341.46	0.00
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0007	0.0069	84	0.000824	31.54	54	32.85	0	0.00	32.39	146,001.47	0.00
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0007	0.0069	84	0.000781	31.50	54	32.00	0	0.00	31.52	197,817.68	0.00
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0007	0.0070	84	0.000817	31.45	54	32.72	0	0.00	32.23	231,312.13	0.00
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0007	0.0070	84	0.000800	31.43	54	32.38	0	0.00	35.67	114,510.96	0.00
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0007	0.0070	84	0.000800	31.43	54	32.38	0	0.00	29.26	43,227.89	0.00
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0007	0.0070	84	0.000476	31.45	54	24.98	0	0.00	24.42	48,094.60	0.00
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0007	0.0070	84	0.000793	31.56	54	32.23	0	0.00	31.72	234,747.46	0.00
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0007	0.0070	84	0.000380	31.63	54	22.31	0	0.00	21.89	203,543.22	0.00
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0007	0.0070	84	0.001360	31.66	54	42.22	0	0.00	53.47	38,647.45	0.00
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0007	0.0070	84	0.001360	31.70	54	42.22	0	0.00	25.08	231,025.85	0.00
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0007	0.0070	84	0.001217	31.77	54	39.94	0	0.00	39.39	98,765.70	0.00
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	-0.0001	0.0044	84	0.001309	42.22	54	41.43	0	0.00	40.78	198,962.79	0.00
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	-0.0001	0.0044	84	0.001349	42.22	54	42.05	0	0.00	41.74	36,070.95	0.00
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	-0.0001	0.0044	84	0.001071	42.20	54	37.47	0	0.00	36.97	88,173.44	0.00
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0005	0.0055	66	0.002647	33.78	48	43.02	0	0.00	31.40	262,385.60	0.00
		14135																

DESIGN CONDITION: **OPTION NO. 0**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. =	57,207.50	93,287.50
F.W. Model Sew. Ac. =	9,004.81	20,981.33
Constant Intel Flow =	10.00	10.00

2000 Eq. Pop. =	57,207.50
2000 Sew. Ac. =	9,004.81
Constant Intel Flow =	10.00

TOTAL ESTIM. CONST. COST =	$3,966,959.05	$0.00
+ Engr., ROW, Financ., Conting. (1.5x) =	$5,950,438.57	$0.00
Avg. Estimated Per Foot Cost =	$420.97	$0.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
DESIGN H.G. SLOPE	Design Hydraulic Gradient Slope = Approximate Flowline Slope of Existing Pipe (Average through siphon area used)
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 0

Exist. 2000 Conditions. Big Fossil C.O.F.W. Line Serving Fort Worth, Haltom City (not including Little Fossil), and estimated 10.0 MGD flow from the Intel Facility Plant. Future BFX area and Marine Creek areas not included in this scenario. This is baseline 2000 Condition from the Fort Worth Sanitary Sewer Master Plan.

Estim. Cost Above R.H. Meter =	$2,779,336.40	$0.00
Estim. Cost Below R.H. Meter =	$1,187,622.65	$0.00
Percent R.H. Cost of Total Line =	29.94%	
Estim. Richland Hills Cost Share =	$1,781,433.98	

Discussion of the year 2020 baseline calibration table, "7-0a":

Upstream and Downstream Stations -- these stations correspond to the same station numbers used in the Fort Worth Master Plan report and are shown on the attached Appendix "D" table on pages 192, and 193, for the line segment between the Forth Worth West Fork 96" S.S. and Broadway Blvd. The Richland Hills meter is located below Station M402A/0040+28, which is delineated with a horizontal line.

Length (ft.) -- The length of each line segment is shown, and corresponds to the Master Plan length. It is assumed that the proposed parallel line will be roughly equivalent in length to the existing line.

Existing Diameter (in) -- The existing pipe diameter is noted. The siphon section has been changed to show the revised pipe diameter of 50.71-inches which is equivalent to the existing parallel 24-inch and 48-inch diameter siphon pipes. The Fort Worth Master Plan table only shows the 24-inch pipe.

Existing Pipe Capacity (MGD) -- This is the computed capacity of the existing pipe based on the Colbrook-White equations. Capacities of the proposed replacement and parallel pipes are based on the Mannings Equation, and compare favorably with the results of the Colbrook-White equation when using existing pipe flowline grades for the hydraulic slope and a Mannings "n" factor of 0.0145.

2000 Model Flow (MGD) -- This column shows the flow rates presented in the Fort Worth Master Plan for the year 2000. These flows include a uniform 10 MGD rate for the Intel Plant Site. The 10 MGD is subtracted from each flow value before computing the calibration coefficients "A" and "B", which are based only on equivalent population and sewered areas. The equivalent population of 57,207.5 and sewered area of 9,004.81 are shown at the bottom of this column.

2020 Model Flow (MGD) -- These flow rates correspond to the projected flows in the year 2020 from the Fort Worth Master Plan. The equivalent population of 93,287.50 and sewered area of 20,981.33 are shown at the bottom of this column. The flow rates vary from a minimum of 18.71 MGD to a maximum flow of **42.22 MGD**. The value of **42.22 MGD** was the basis for the calibration equation.

2020 Coefficient "A" -- This is the first coefficient in the calibration equation and is computed for each line segment based on the year 2020 Master Plan modeled flow using the formula presented in Table "CALIB-1".

2020 Coefficient "B" -- This is the second coefficient in the calibration equation and is computed for each line segment based on the year 2020 Master Plan modeled flow using the formula presented in Table "CALIB-1".

Model Proposed Diameter (In.) -- This is the proposed replacement pipe diameter for the year 2020 condition as presented in the Fort Worth Master Plan Appendix "D" table.

Design Hydraulic Gradient Slope (Ft./Foot) -- This is the average flowline grade of the existing pipe between major line segments. It is assumed that the proposed replacement and parallel pipes will follow the approximate grade of the existing line. This grade is based on pipe flowline elevations and line segment lengths presented in the Fort Worth Master Plan Appendix "D" table.

2020 Design Flow (MGD) -- The year 2020 design flow values are computed using the calibration equations discussed above, and are equivalent to the year 2020 flows listed in the column "2020 Maxflow (MGD)". The value used for equivalent population of 93,287.50 and sewered area of 20,981.33 acres is the same as the model 2020 flow values, and the results of the flow rate calculations confirms that the calibration equations are correct. The flow rates vary from a minimum of 83.61 MGD to a maximum flow of **90.17 MGD**, which agree with the year 2020 model flows.

Proposed Replacement Pipe Diameter (In.) -- The proposed replacement pipe diameters shown are set equal to the proposed Master Plan pipe diameters for purposes of comparing the design pipe capacities shown in the Master Plan versus the computed capacities calculated using the Mannings Equation and existing pipe flowline slopes.

Replacement Pipe Capacity (MGD) -- This column shows the computed replacement pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. Note that these capacities compare favorably with the design pipe capacities shown in the Master Plan using the Colbrook-White equations, except for the very downstream end and the siphon section. Average grades through these two line segments are used for calculations in this column.

Proposed Parallel Pipe Diameter (In.) -- The proposed parallel pipe diameters recommended for the year 2020 design conditions are the same as those shown in the Master Plan for purposes of comparison.

Parallel Pipe Capacity (MGD) -- This column shows the computed parallel pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. These values compare favorably with the values shown in the Fort Worth Master plan Appendix "D" table.

Combined Capacity of Both Pipes (MGD) -- This is the sum of the existing pipe capacity, from the Master Plan, plus the proposed replacement pipe capacity. This value should generally exceed the Design Flow rate, which it does for most line segments within the study limits.

Estimated Replacement Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

Estimated Parallel Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	DESIGN H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0013	0.0094	90	0.000800	83.62	90	126.44	78	86.33	308.44	$81,111.93	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0014	0.0099	90	0.000800	86.59	90	126.44	78	86.33	120.36	1,372,541.04	1,030,930.82
M402A/0020+90 (24+48)	M402A/0020+17	73	50.71	-70.57	18.71	86.61	-0.0014	0.0099	90	0.000800	86.61	90	126.44	90	126.44	55.87	58,050.69	58,050.69
M402A/0022+40 (24+48)	M402A/0020+90	150	50.71	0.00	18.71	86.61	-0.0014	0.0099	90	0.000800	86.61	90	126.44	90	126.44	126.44	119,282.25	119,282.25
M402A/0023+09 (24+48)	M402A/0022+40	69	50.71	74.31	18.71	86.64	-0.0014	0.0099	90	0.000800	86.64	90	126.44	90	126.44	200.75	54,869.83	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0014	0.0100	90	0.000800	87.43	90	126.44	78	86.33	111.37	691,837.02	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0014	0.0101	90	0.000800	87.66	90	126.44	78	86.33	122.00	317,290.77	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0014	0.0101	84	0.000831	87.84	84	107.24	66	56.37	88.76	299,948.02	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0014	0.0101	84	0.000665	87.96	84	95.89	66	50.41	79.44	250,072.13	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0014	0.0101	84	0.000894	88.07	84	111.23	66	58.47	92.29	387,230.81	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0014	0.0101	84	0.000651	88.14	84	94.93	66	49.90	78.61	212,665.22	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0014	0.0101	84	0.000794	88.19	84	104.77	66	55.08	86.80	174,565.59	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0014	0.0101	84	0.000980	88.23	84	116.45	66	61.21	96.40	176,643.75	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0007	0.0068	84	0.000698	88.35	84	98.24	66	51.64	81.36	446,804.78	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0007	0.0068	84	0.000808	88.37	84	105.72	66	55.57	87.45	68,579.34	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0007	0.0069	84	0.000824	88.46	84	106.73	66	56.10	88.49	353,287.50	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0007	0.0069	84	0.000781	88.60	84	103.97	66	54.65	86.17	478,669.93	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0007	0.0070	84	0.000817	88.80	84	106.29	66	55.87	88.10	559,718.24	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0007	0.0070	84	0.000800	88.89	84	105.19	66	55.30	90.97	277,088.24	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0007	0.0070	84	0.000800	88.94	84	105.19	66	55.30	84.56	104,600.81	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0007	0.0070	84	0.000476	88.99	84	81.16	66	42.66	67.08	116,377.06	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0007	0.0070	84	0.000793	89.19	84	104.71	66	55.04	86.76	568,030.89	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0007	0.0070	84	0.000380	89.37	84	72.48	66	38.10	59.99	492,524.34	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0007	0.0070	84	0.001360	89.42	84	137.15	66	72.10	125.57	93,517.28	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0007	0.0070	84	0.001360	89.67	84	137.15	66	72.10	97.18	559,025.52	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0007	0.0070	84	0.001217	89.76	84	129.76	66	68.21	107.60	238,988.61	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	-0.0001	0.0044	84	0.001309	90.01	84	134.58	66	70.74	111.52	481,440.81	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	-0.0001	0.0044	84	0.001349	90.06	84	136.61	66	71.81	113.55	87,282.79	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	-0.0001	0.0044	84	0.001071	90.17	84	121.74	66	63.99	100.96	213,357.94	131,715.87
M402B/0136+74	M402B/0125+72	1160	48	31.40	33.78	83.60	-0.0005	0.0055	66	0.002647	83.60	66	100.57	48	43.02	74.42	496,072.77	262,385.60
		14135																

DESIGN CONDITION: OPTION NO. 0a
DESIGN YEAR: 2020

F.W. Model Eq. Pop. =	57,207.50	93,287.50
F.W. Model Sew. Ac. =	9,004.81	20,981.33
Constant Intel Flow =	10.00	10.00

2020 Eq. Pop. =	93,287.50
2020 Sew. Ac. =	20,981.33
Constant Intel Flow =	10.00

TOTAL ESTIM. CONST. COST =	$9,831,475.92	$6,443,853.09
+ Engr., ROW, Financ., Conting (1.5x) =	$14,747,213.88	$9,665,779.63
Avg. Estimated Per Foot Cost =	$1,043.31	$683.82

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
DESIGN H.G. SLOPE	Design Hydraulic Gradient Slope = Approximate Flowline Slope of Existing Pipe (Average through siphon area used)
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 0a

Projected 2020 Conditions. Big Fossil C.O.F.W. Line Serving Fort Worth, Haltom City (not including Little Fossil), BFX Area, Marine Creek, and with BFX Area, and estimated constant 10.0 MGD flow from the Intel Facility Plant.
This is baseline 2020 Condition from the Fort Worth Sanitary Sewer Master Plan.

Estim. Cost Above R.H. Meter =	$6,586,472.24	$4,022,275.07
Estim. Cost Below R.H. Meter =	$3,245,003.68	$2,421,578.02
Percent R.H. Cost of Total Line =	33.01%	37.58%
Estim. Richland Hills Cost Share =	$4,867,505.52	$3,632,367.03

Upstream Main/Station	Downstream Main/Station	Length (feet)	Proposed Diameter (in)	Existing Pipe Diameter (in)	2020 Proposed Piping Gravity Flow Capacity (MGD)	2020 Maxflow (MGD)	Existing Piping Gravity Flow Capacity (MGD)	Existing Piping 2000 Maxflow (MGD)	Up Pipe Invert (Ft)	US Max Depth (ft)	US Max Level (El)	US Ground Level (El)	US Max Vel (ft/sec)	DS Pipe Invert (El)	DS Max Depth (ft)	DS Ground Level	US Sur Ind	DS Sur Ind	Subbasin	Model Link Ref
M394E/0037+35	M394E/0032+50	485	10	10	0.96	1.10	0.96	0.98	517.15	6.39	523.54	528.53	3.03	514.43	5.79	526.98	+	+	TRA	TR001390.1
M394E/0041+10	M394E/0037+35	375	10	10	0.96	1.10	0.96	0.98	519.25	6.89	526.14	530.7	3.08	517.15	6.42	528.53	+	+	TRA	TR001400.1
M394E/0044+73	M394E/0041+10	363	10	10	0.96	1.10	0.96	0.98	521.28	7.41	528.69	531.51	3.08	519.25	6.92	530.7	+	+	TRA	TR001410.1
M394E/0048+50	M394E/0044+73	377	8	8	0.96	0.46	0.96	0.34	528.24	1.62	529.87	537.23	4.09	521.28	7.43	531.51	x	x	TRA	TR001420.1
M394E/0051+77	M394E/0048+50	327	8	8	0.43	0.46	0.43	0.34	529.54	1.44	530.98	543.85	2.21	528.24	1.63	537.23	+	+	TRA	TR001430.1
M394E/0056+50	M394E/0051+77	473	8	8	0.46	0.46	0.46	0.34	531.44	1.22	532.66	545.88	2.22	529.54	1.50	543.85	+	+	TRA	TR001440.1
M394E/0061+20	M394E/0056+50	470	8	8	0.46	0.46	0.46	0.34	533.32	1.20	534.52	546.26	2.22	531.44	1.23	545.88	+	+	TRA	TR001450.1
M394E/0065+50	M394E/0061+20	430	8	8	0.37	0.46	0.37	0.34	534.50	1.95	536.45	546.8	1.90	533.32	1.22	546.26	+	+	TRA	TR001460.1
M394E/0070+11	M394E/0065+50	461	8	8	0.50	0.46	0.50	0.37	536.88	1.65	538.53	547.14	2.50	534.50	1.96	546.8	x	x	TRA	TR001470.1
M394E/0071+86	M394E/0070+11	175	8	8	0.46	0.48	0.46	0.37	537.58	1.80	539.38	548.8	2.24	536.88	1.72	547.14	+	+	TRA	TR001480.1
M395/0005+20	M340/0082+74	520	21	21	4.93	1.32	4.93	0.80	617.14	0.63	617.77	626.66	2.67	615.67	0.52	621			M340	LF002230.1
M396/0007+17	M395/0005+20	717	21	21	6.50	1.32	6.50	0.80	620.68	0.54	621.22	633.9	3.24	617.14	0.63	626.66			M340	LF002240.1
M397/0002+00	M396/0007+17	200	21	21	5.23	1.32	5.23	0.80	621.32	0.61	621.93	634.5	2.79	620.68	0.54	633.9			M340	LF002250.1
M397/0005+35	M397/0002+00	335	21	21	6.46	1.32	6.46	0.80	622.94	0.54	623.48	636.2	3.23	621.32	0.61	634.5			M340	LF002260.1
M398/0006+50	M341/0054+49=	630	18	18	3.26	3.97	3.26	3.40	449.03	3.02	452.04	454.8	3.28	447.21	2.16	453.6	+	+	TRA	TR000860.1
M398/0011+57	M398/0006+50	507	18	18	3.24	3.97	3.24	3.40	450.45	3.89	454.34	457	3.24	449.03	3.20	454.8	+	+	TRA	TR000870.1
M398/0017+77	M398/0011+57	620	18	18	3.13	3.97	3.13	3.40	452.06	4.97	457.03	461.9	3.18	450.45	3.99	457	+	+	TRA	TR000880.1
M398/0021+70	M398/0017+77	393	18	15	5.25	3.97	3.24	3.40	454.93	3.90	458.84	466.3	5.38	452.06	5.12	461.9	x	x	TRA	TR000890.1
M398/0023+92	M398/0021+70	222	18	15	5.00	3.97	3.08	3.40	456.40	3.53	459.93	475.3	4.73	454.93	4.06	466.3	x	x	TRA	TR000900.1
M398/0025+15	M398/0023+92	123	18	15	5.41	3.97	3.33	3.40	457.34	3.13	460.47	475.7	5.01	456.40	3.56	475.3	x	x	TRA	TR000910.1
M398/0028+67	M398/0025+15	352	15	15	3.20	2.97	3.20	2.74	459.81	2.67	462.48	471.6	4.52	457.34	3.16	475.7	x	x	TRA	TR000920.1
M398/0033+52	M398/0028+67	485	15	15	3.22	3.01	3.22	2.76	463.31	2.09	465.40	478.4	4.59	459.81	2.78	471.6	x	x	TRA	TR000930.1
M398/0036+43	M398/0033+52	291	12	12	2.81	3.01	2.81	2.78	468.57	2.78	471.35	474.1	6.17	463.31	2.14	478.4	+	+	TRA	TR000940.1
M398/0037+92	M398/0036+43	149	12	12	2.05	3.01	2.05	2.78	469.99	4.74	474.73	490	5.32	468.57	3.21	474.1	+	+	TRA	TR000950.1
M398/0041+48	M398/0037+92	356	12	12	2.10	2.83	2.10	2.67	473.57	7.67	481.24	494.1	4.67	469.99	4.82	490	+	+	TRA	TR000960.1
M398/0044+56	M398/0041+48	308	12	12	2.10	2.83	2.10	2.69	476.69	10.17	486.86	492.3	4.63	473.57	7.75	494.1	+	+	TRA	TR000970.1
M398/0046+27	M398/0044+56	171	12	12	4.06	2.83	4.06	2.72	483.06	7.03	490.09	494	10.01	476.65	10.29	492.3	x	x	TRA	TR000980.1
M399/0000+40	L4397/0016+00=	52	10	10	3.70	0.46	3.70	0.43	670.00	0.21	670.21	675.8	6.32	665.70	0.38	676.8			M207R	WF021590.1
M399/0001+01	M399/0000+40	61	10	10	3.01	0.46	3.01	0.43	673.43	0.23	673.66	674.7	5.59	670.00	0.23	675.8			M207R	WF021600.1
M399/0004+36	M399/0001+01	335	10	10	1.80	0.46	1.80	0.43	679.94	0.30	680.24	681.6	4.00	673.43	0.30	674.7			M207R	WF021610.1
M399/0007+67	M399/0004+36	331	10	10	1.80	0.46	1.80	0.43	686.37	0.30	686.67	690.1	3.99	679.94	0.30	681.6			M207R	WF021620.1
M399/0011+79	M399/0007+67	412	10	10	0.68	0.46	0.68	0.43	687.52	0.50	688.02	717.1	2.02	686.37	0.37	690.1			M207R	WF021630.1
M402A/0000+50	*M230A/0304+97*	*102*	*90*	*54*	*850.72*	*83.62*	*222.11*	*18.94*	*481.33*	*10.27*	*491.59*	*489.6*	*8.91*	*477.40*	*14.15*	*495*	*x*	*x*	*CDUAL*	*BF000390.1*
M402A/0020+17	M402A/0000+50	1,726	90	54	130.41	86.59	34.03	18.71	482.90	9.26	492.16	495.2	4.86	481.33	10.30	489.6	x	x	CDUAL	BF000400.1
M402A/0020+90	M402A/0020+17	73	90	24	0.00	86.61	70.57	18.71	462.50	29.70	492.20	474	2.77	482.88	9.32	495.2	x	x	CDUAL	BF000404.1
M402A/0022+40	M402A/0020+90	150	90	24	0.00	86.61	0.00	18.71	462.50	29.77	492.27	475	2.77	462.50	29.72	474	+	+	CDUAL	BF000406.1
M402A/0023+09	M402A/0022+40	69	90	24	140.73	86.64	74.31	18.71	484.07	8.28	492.35	491.2	7.00	462.50	29.79	475	x	x	CDUAL	BF000410.1
M402A/0028+40	M402A/0023+09	870	90	54	96.02	87.43	25.04	18.78	484.50	8.13	492.63	494.6	4.96	484.07	8.29	491.2	x	x	CDUAL	BF000420.1
M402A/0032+40	M402A/0028+40	399	90	54	136.66	87.66	35.67	18.81	484.90	7.97	492.87	495.3	4.97	484.50	8.24	494.6	x	x	CDUAL	BF000430.1
M402A/0036+79	M402A/0032+40	433	84	54	103.62	87.84	32.39	18.87	485.26	7.83	493.09	495.4	5.08	484.90	7.99	495.3	x	x	CDUAL	BF000440.1
M402A/0040+28	M402A/0036+79	361	84	54	92.87	87.96	29.03	18.92	485.50	7.79	493.29	496.2	4.91	485.26	7.86	495.4	x	x	CDUAL	BF000450.1
M402A/0045+95	M402A/0040+28	559	84	54	103.20	88.07	33.82	18.97	486.00	7.57	493.57	497.2	4.88	485.50	7.82	496.2	x	x	CDUAL	BF000460.1
M402A/0049+00	M402A/0045+95	307	84	54	91.84	88.14	28.71	18.99	486.20	7.58	493.78	497.4	4.76	486.00	7.64	497.2	x	x	CDUAL	BF000470.1
M402A/0051+91	M402A/0049+00	252	84	54	101.49	88.19	31.72	18.99	486.40	7.65	494.05	494.8	4.69	486.20	7.73	497.4	x	x	CDUAL	BF000480.1
M402A/0054+21	M402A/0051+91	255	84	54	112.59	88.23	35.19	19.06	486.65	7.55	494.20	493.7	4.71	486.40	7.68	494.8	x	x	CDUAL	BF000490.1
M402A/0060+63	M402A/0054+21	645	84	54	95.08	88.35	29.72	31.63	487.10	7.54	494.64	498.3	4.58	486.65	7.69	493.7	x	x	CDUAL	BF000500.1
M402A/0061+67	M402A/0060+68	99	84	54	102.00	88.37	31.88	31.61	487.18	7.65	494.83	498.4	4.53	487.10	7.69	498.3	x	x	CDUAL	BF000510.1
M402A/0065+95	M402A/0061+67	510	84	54	103.62	88.46	32.39	31.54	487.60	7.50	495.10	498.5	4.55	487.18	7.69	498.4	x	x	CDUAL	BF000520.1
M402A/0072+77	M402A/0065+95	691	84	54	100.83	88.60	31.52	31.50	488.14	7.42	495.56	503.8	4.52	487.60	7.64	498.5	x	x	CDUAL	BF000530.1

* X= Surcharged by depth
+= Surcharged by capacity
Shaded = Siphons
Italicized Text--Sized for Continuity of Pipe Diameters

Upstream Main/Station	Downstream Main/Station	Length (feet)	Proposed Diameter (in)	Existing Pipe Diameter (in)	2020 Proposed Piping Gravity Flow Capacity (MGD)	2020 Maxflow (MGD)	Existing Piping Gravity Flows Capacity (MGD)	Existing Piping 2000 Maxflow (MGD)	Up Pipe Invert (Ft)	US Max Depth (ft)	US Max Level (El)	US Ground Level (El)	US Max Vel (ft/sec)	DS Pipe Invert (El)	DS Max Depth (ft)	DS Ground Level	US Sur Ind	DS Sur Ind	Subbasin	Model Link Ref.
M402A/0080+78	M402A/0072+77	808	84	54	103.07	88.80	32.23	31.45	488.80	7.23	496.03	510	4.54	488.14	7.52	503.8	x	x	CDUAL	BF000540.1
M402A/0085+50	M402A/0080+78	400	84	54	114.07	88.89	35.67	31.43	489.20	7.13	496.33	531.8	4.60	488.80	7.35	510	x	x	CDUAL	BF000550.1
M402A/0086+56=	M402A/0085+50	151	84	54	93.60	88.94	29.26	31.43	489.30	7.13	496.43	534	4.57	489.20	7.16	531.8	x	x	CDUAL	BF000560.1
M402A/0088+51	M402A/0086+56=	163	84	54	78.15	88.99	24.42	31.45	489.38	7.22	496.60	510.2	4.48	489.30	7.22	534	+	+	CDUAL	BF000570.1
M402A/0096+65	M402A/0088+51	820	84	54	101.47	89.19	31.72	31.56	490.03	7.00	497.03	510.5	4.51	489.38	7.28	510.2	x	x	CDUAL	BF000580.1
M402A/0103+76	M402A/0096+65	711	84	54	70.02	89.37	21.89	31.63	490.30	7.08	497.38	515	4.28	490.03	7.02	510.5	+	+	CDUAL	BF000590.1
M402A/0105+11	M402A/0103+76	135	84	54	170.99	89.42	53.47	31.66	490.60	6.94	497.54	519.8	4.44	490.30	7.18	515		x	CDUAL	BF000600.1
M402A/0109+91	M402A/0105+11	807	84	54	80.25	89.67	25.08	31.70	491.00	7.01	498.01	507.6	4.27	490.60	7.03	519.8	+	+	CDUAL	BF000610.1
M402A/0113+81	M402A/0109+91	345	84	54	125.96	89.76	39.39	31.77	491.42	6.84	498.26	500.6	4.41	491.00	7.11	507.6		x	CDUAL	BF000620.1
M402A/0117+43	M402A/0113+81	695	84	54	130.41	90.01	40.78	42.22	492.33	6.31	498.64	506.6	4.81	491.42	6.90	500.6			CDUAL	BF000630.1
M402A/0120+25	M402A/0117+43	126	84	54	133.47	90.06	41.74	42.22	492.50	6.21	498.71	508.7	4.88	492.33	6.32	506.6			CDUAL	BF000640.1
M402B/0123+40	M402A/0120+25	308	84	54	118.25	90.17	36.97	42.20	492.83	6.07	498.90	508.8	4.93	492.50	6.25	508.7			CDUAL	BF000650.1
M402B/0136+74	M402B/24/0125+72	1,160	66	48	72.69	83.60	31.40	33.78	495.90	5.19	501.09	511	5.92	494.22	4.89	509.2			CDUAL	BF000670.1
M402B/0138+97	M402B/0136+74	214	66	48	71.91	83.60	31.08	33.78	496.20	5.50	501.70	511.2	5.65	495.90	5.43	511	+		CDUAL	BF000680.1
M402B/0145+84	M402B/0138+97	630	66	48	84.83	83.60	36.65	33.78	497.44	5.67	503.11	513.3	5.86	496.20	5.81	511.2	x	x	CDUAL	BF000690.1
M402B/0151+18	M402B/0145+84	1,469	66	48	43.34	83.62	18.71	33.76	498.20	7.62	505.82	516.3	5.22	497.44	5.73	513.3	+	+	CDUAL	BF000700.1
M402B/0157+28	M402B/0151+18	725	66	48	71.00	83.62	30.67	33.73	499.20	8.75	507.95	519.3	5.19	498.20	8.35	516.3	+	+	CDUAL	BF000710.1
M402B/0162+84	M402B/0157+28	555	66	48	77.53	83.62	33.50	33.73	500.11	9.57	509.68	516.2	5.17	499.20	9.41	519.3	+	+	CDUAL	BF000720.1
M402B/0187+42	M402B/0162+84	2,364	66	48	78.81	83.62	34.05	33.73	504.13	10.24	514.37	527.8	5.69	500.11	9.69	516.2	+	+	HALTOM CITY-A	BF000730.1
M402B/0191+73	M402B/0187+42	436	66	48	69.13	83.62	29.83	33.71	504.70	11.08	515.78	527.9	5.43	504.13	10.81	527.8	+	+	HALTOM CITY-A	BF000740.1
M402B/0193+88	M402B/0191+73	215	66	48	81.87	83.62	35.33	33.71	505.10	11.61	516.71	525.4	5.44	504.70	11.59	527.9	+	+	HALTOM CITY-A	BF000750.1
M402B/0197+14	M402B/0193+88	312	66	48	76.71	83.62	33.16	33.71	505.60	12.16	517.76	528.7	5.42	505.10	12.06	525.4	+	+	HALTOM CITY-A	BF000760.1
M402B/0198+05	M402B/0197+14	91	66	48	44.19	83.62	19.08	33.71	505.65	12.54	518.19	525.8	5.23	505.60	12.41	528.7	+	+	HALTOM CITY-A	BF000770.1
M402B/0199+99	M402B/0198+05	197	66	48	80.75	83.62	34.90	33.71	506.00	12.82	518.82	526.7	5.29	505.65	12.79	525.8	+	+	HALTOM CITY-A	BF000780.1
M402B/0201+77	M402B/0199+99	191	66	48	87.69	83.62	37.91	33.71	506.40	13.24	519.65	527	5.43	506.00	13.28	526.7	x	x	HALTOM CITY-A	BF000790.1
M402B/0211+90	M402B/0201+77	1,018	66	48	75.77	83.62	32.75	33.73	508.00	14.07	522.07	529.6	5.50	506.40	13.70	527	+	+	HALTOM CITY-A	BF000800.1
M402B/0220+83	M402B/0211+90	877	66	48	76.43	83.62	33.05	33.73	509.40	14.44	523.84	530.6	5.60	508.00	14.15	529.6	+	+	HALTOM CITY-A	BF000810.1
M402B/0223+26	M402B/0220+83	242	66	48	80.43	83.62	34.76	33.73	509.83	14.98	524.81	532	5.55	509.40	14.94	530.6	+	+	HALTOM CITY-A	BF000820.1
M402B/0227+34	*M402B/0223+26*	*417*	*66*	*48*	*309.20*	*83.62*	*133.67*	*33.73*	*520.70*	*5.54*	*526.24*	*532.6*	*15.73*	*509.83*	*15.48*	*532*	*x*	*x*	*HALTOM CITY-A*	*BF000830.1*
M402B/0230+48	M402B/0227+34	316	66	48	76.32	83.62	32.98	33.82	521.20	5.70	526.90	534.4	7.26	520.70	5.59	532.6	+	+	HALTOM CITY-A	BF000840.1
M402B/0232+94	M402B/0230+48	241	66	48	104.76	83.62	45.28	34.23	521.92	5.53	527.45	534.9	7.32	521.20	5.80	534.4	x	x	HALTOM CITY-A	BF000850.1
M402B/0233+10	M402B/0232+94	16	66	24	1458.82	83.62	101.17	34.26	512.40	15.11	527.51	524	5.05	521.92	5.58	534.9	x	x	HALTOM CITY-A	BF000854.1
M402B/0233+50	M402B/0233+10	40	66	24	0.00	83.62	0.00	34.26	512.40	15.27	527.67	524	5.05	512.40	15.19	524	+	+	HALTOM CITY-A	BF000856.1
M402B/0233+77	M402B/0233+50	27	66	48	1193.13	83.62	515.84	34.28	522.59	5.25	527.83	534.8	8.30	512.40	15.35	524		x	HALTOM CITY-A	BF000860.1
M402B/0238+19	M402B/0233+77	437	66	48	92.02	83.78	39.78	34.33	523.60	5.42	529.02	533	7.14	522.59	5.60	534.8		x	HALTOM CITY-A	BF000870.1
M402B/0248+66=	M402B/0238+19	903	66	48	80.54	84.06	34.80	46.81	525.20	5.97	531.17	535.6	6.24	523.60	5.83	533	+	+	HALTOM CITY-A	BF000880.1
M402B/24/0123+80	M402B/0123+40	47	72	48	1196.95	45.10	411.25	35.83	481.50	17.47	498.97	500.4	2.29	492.83	6.14	508.8	x	x	CDUAL	BF005270.1
M402B/24/0125	M402B/48/0125+30	41	72	24	1353.05	45.10	74.56	6.37	493.91	5.16	499.07	509.2	4.31	481.50	17.54	500.4		x	CDUAL	BF000660.2
M402B/24/0125+30	M402B/24/0123+80	150	72	48	0.00	45.10	0.00	35.83	481.50	17.53	499.03	500.4	2.29	481.50	17.48	500.4	+	+	CDUAL	BF005290.1
M402B/24/0125+72	M402B/24/0125+30	41	72	48	1353.05	45.10	464.88	35.83	493.91	5.16	499.07	509.2	4.31	481.50	17.54	500.4		x	CDUAL	BF000660.1
M402B/48/0123+80	M402B/0123+40	47	72	24	1196.95	45.10	65.96	6.37	481.50	17.47	498.97	500.4	2.29	492.83	6.14	508.8	x	x	CDUAL	BF005250.1
M402B/48/0125+30	M402B/48/0123+80	150	72	24	0.00	45.10	0.00	6.37	481.50	17.53	499.03	500.4	2.29	481.50	17.48	500.4	+	+	CDUAL	BF005260.1
M402C/0247+43	M402B/0248+66=	14	66	48	157.23	84.06	67.97	46.81	525.29	6.02	531.31	536.3	6.27	525.20	6.08	535.6	x	x	HALTOM CITY-A	BF000890.1
M402C/0251+09	M402C/0247+43	371	66	48	77.55	66.57	33.53	28.46	525.90	5.92	531.82	537.7	4.97	525.29	6.09	536.3	x	x	HALTOM CITY-A	BF000900.1
M402C/0259+83	M402C/0251+09	868	66	48	73.99	66.62	31.97	28.46	527.20	5.94	533.15	540.5	5.14	525.90	6.20	537.7	x	x	HALTOM CITY-A	BF000910.1
M402C/0270+08	M402C/0259+83	1,019	60	48	71.73	66.89	39.83	28.46	529.57	5.68	535.25	542.4	6.17	527.20	6.01	540.5	x	x	HALTOM CITY-A	BF000920.1
M402C/0274+88	*M402C/0270+08*	*480*	*60*	*48*	*-59.70*	*66.94*	*-33.14*	*28.46*	*528.80*	*7.48*	*536.28*	*541*	*5.05*	*529.57*	*5.75*	*542.4*	*x*	*x*	*HALTOM CITY-A*	*BF000930.1*
M402C/0280+48	M402C/0274+88	560	60	48	65.98	66.96	36.63	28.46	529.90	7.62	537.52	540.8	5.05	528.80	7.60	541	+	+	HALTOM CITY-A	BF000935.1
M402C/0282+44	M402C/0280+48	184	60	48	84.90	66.96	47.13	28.46	530.50	7.57	538.07	545	5.05	529.90	7.80	540.8	x	x	HALTOM CITY-A	BF000940.1

* X= Surcharged by depth
+= Surcharged by capacity
Shaded = Siphons
Italicized Text=Sized for Continuity of Pipe Diameters

BROADWAY

$8,103,460 $5,543,782

Project	Model Link	Main/UpStation	Main/DownStation	Existing	2000	2020	Parallel	Length	2000 Cost	2020 Cost	Parallel Cost	Subbasin	Group	Note
bf_cm_1	BF000390.1	M402A/0000+50	M280A/0304+97	54	72	90	78	102	$46,713	$67,568	$51,645	CDUAL		
bf_cm_1	BF000400.1	M402A/0020+17	M402A/0000+50	54	72	90	78	1726	$790,456	$1,143,354	$873,908	CDUAL		
bf_cm_1	BF000404.1	M402A/0020+90	M468/0020+17	24	72	90	90	73	$33,432	$48,357	$48,357	CDUAL		
bf_cm_1	BF000406.1	M402A/0022+40	M402A/0020+90	24	72	90	90	150	$68,696	$99,365	$99,365	CDUAL		
bf_cm_1	BF000410.1	M402A/0023+09	M402A/0020+17	24	72	90	90	69	$31,600	$45,708	$45,708	CDUAL		
bf_cm_1	BF000420.1	M402A/0028+40	M402A/0023+09	54	72	90	78	870	$398,434	$576,314	$440,498	CDUAL		
bf_cm_1	BF000430.1	M402A/0032+40	M402A/0028+40	54	72	90	78	399	$182,730	$264,310	$202,022	CDUAL		
bf_cm_1	BF000440.1	M402A/0036+79	M402A/0032+40	54	72	84	66	433	$198,301	$245,411	$158,803	CDUAL		
bf_cm_1	BF000450.1	M402A/0040+28	M402A/0036+79	54	72	84	66	361	$165,327	$204,604	$132,397	CDUAL		
bf_cm_1	BF000460.1	M402A/0045+95	M402A/0040+28	54	72	84	66	559	$256,005	$316,824	$205,013	CDUAL		
bf_cm_1	BF000470.1	M402A/0049+00	M402A/0045+95	54	72	84	66	307	$140,597	$173,998	$112,592	CDUAL		
bf_cm_1	BF000480.1	M402A/0051+91	M402A/0049+00	54	72	84	66	252	$115,408	$142,826	$92,421	CDUAL		
bf_cm_1	BF000490.1	M402A/0054+21	M402A/0051+91	54	72	84	66	255	$116,782	$144,526	$93,521	CDUAL		
bf_cm_1	BF000500.1	M402A/0060+68	M402A/0054+21	54	72	84	66	645	$295,391	$365,567	$236,554	CDUAL		
bf_cm_1	BF000510.1	M402A/0061+67	M402A/0060+68	54	72	84	66	99	$45,339	$56,110	$36,308	CDUAL		
bf_cm_1	BF000520.1	M402A/0065+95	M402A/0060+68	54	72	84	66	510	$233,565	$289,053	$187,043	CDUAL		
bf_cm_1	BF000530.1	M402A/0072+77	M402A/0065+95	54	72	84	66	691	$316,457	$391,638	$253,424	CDUAL		
bf_cm_1	BF000540.1	M402A/0080+78	M402A/0072+77	54	72	84	66	808	$370,040	$457,950	$296,334	CDUAL		
bf_cm_1	BF000550.1	M402A/0085+50	M402A/0080+78	54	72	84	66	400	$183,188	$226,708	$146,700	CDUAL		
bf_cm_1	BF000560.1	M402A/0086+56=	M402A/0085+50	54	72	84	66	151	$69,153	$85,582	$55,379	CDUAL		
bf_cm_1	BF000570.1	M402A/0088+51	M402A/0086+56=	54	72	84	66	168	$76,939	$95,217	$61,614	CDUAL		
bf_cm_1	BF000580.1	M402A/0096+65	M402A/0088+51	54	72	84	66	820	$375,535	$464,751	$300,735	CDUAL		
bf_cm_1	BF000590.1	M402A/0103+76	M402A/0096+95	54	72	84	66	711	$325,617	$402,973	$260,759	CDUAL		
bf_cm_1	BF000600.1	M402A/0105+11	M402A/0103+76	54	72	84	66	135	$61,826	$76,514	$49,511	CDUAL		
bf_cm_1	BF000610.1	M402A/0109+91	M402A/0105+11	54	72	84	66	807	$369,582	$457,383	$295,967	CDUAL		
bf_cm_1	BF000620.1	M402A/0113+81	M402A/0109+91	54	72	84	66	345	$158,000	$195,536	$126,529	CDUAL		
bf_cm_1	BF000630.1	M402A/0117+43	M402A/0113+81	54	66	84	66	695	$254,891	$393,905	$254,891	CDUAL		
bf_cm_1	BF000640.1	M402A/0120+25	M402A/0117+43	54	66	84	66	126	$46,211	$71,413	$46,211	CDUAL		
bf_cm_1	BF000650.1	M402B/0123+40	M402A/0120+25	54	66	84	66	308	$112,959	$174,565	$112,959	CDUAL		
~~bf_cm_1~~	~~BF000670.1~~	~~M402B/0136+74~~	~~M402B/0125+71~~	~~48~~	~~60~~	~~66~~	~~48~~	~~1160~~	~~$377,151~~	~~$425,430~~	~~$266,614~~	~~CDUAL~~		
bf_cm_1	BF000680.1	M402B/0138+97	M402B/0136+74	48	60	66	48	214	$69,578	$78,485	$49,186	CDUAL		
bf_cm_1	BF000690.1	M402B/0145+84	M402B/0138+97	48	60	66	48	630	$204,832	$231,053	$144,799	CDUAL		
bf_cm_1	BF000700.1	M402B/0151+18	M402B/0145+84	48	60	66	48	1469	$477,616	$538,756	$337,635	CDUAL		
bf_cm_1	BF000710.1	M402B/0157+28	M402B/0151+18	48	60	66	48	725	$235,719	$265,894	$166,634	CDUAL		
bf_cm_1	BF000720.1	M402B/0162+84	M402B/0157+28	48	60	66	48	553	$179,797	$202,813	$127,102	CDUAL		
bf_cm_1	BF000730.1	M402B/0187+42	M402B/0162+84	48	60	66	48	2364	$768,607	$866,997	$543,342	Haltom City -A		
bf_cm_1	BF000740.1	M402B/0191+73	M402B/0187+42	48	60	66	48	436	$141,757	$159,903	$100,210	Haltom City -A		
bf_cm_1	BF000750.1	M402B/0193+88	M402B/0191+73	48	60	66	48	215	$69,903	$78,851	$49,416	Haltom City -A		
bf_cm_1	BF000760.1	M402B/0197+14	M402B/0193+88	48	60	66	48	312	$101,441	$114,426	$71,710	Haltom City -A		
bf_cm_1	BF000770.1	M402B/0198+05	M402B/0197+14	48	60	66	48	91	$29,587	$33,374	$20,915	Haltom City -A		
bf_cm_1	BF000780.1	M402B/0199+99	M402B/0198+05	48	60	66	48	197	$64,051	$72,250	$45,278	Haltom City -A		
bf_cm_1	BF000790.1	M402B/0201+77	M402B/0199+99	48	60	66	48	191	$62,100	$70,049	$43,899	Haltom City -A		
bf_cm_1	BF000800.1	M402B/0211+90	M402B/0201+77	48	60	66	48	1018	$330,982	$373,352	$233,977	Haltom City -A		
bf_cm_1	BF000810.1	M402B/0220+83	M402B/0211+90	48	60	66	48	877	$285,139	$321,640	$201,570	Haltom City -A		
bf_cm_1	BF000820.1	M402B/0223+26	M402B/0220+83	48	60	66	48	242	$78,681	$88,754	$55,621	Haltom City -A		
bf_cm_1	BF000830.1	M402B/0227+34	M402B/0223+26	48	60	66	48	417	$135,579	$152,935	$95,843	Haltom City -A		

Parallel pipes were calculated based on equivalent area for 2020 pipe sizes. Minimum velocity and grade were not reviewed.
Replacement or parallel pipe decisions and final pipe sizes must be determined during design.

OPTION NO.	OPTION DESCRIPTION	YEAR 2000		YEAR 2005		YEAR 2010		YEAR 2015		YEAR 2020		YEAR 2050		YEAR 2070	
		EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.
1	All Cities Served By C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, Year 2020 BFX Area, and 6.0 MGD Intel Flow, Plus Haltom City Little Fossil Area Extra	93,900.75	17,885.92	100,339.88	19,366.02	106,779.00	20,554.00	116,778.00	23,826.69	126,777.00	25,540.00	161,728.99	29,865.17	180,801.77	32,329.98
2	Same as Option 1 above, but less Marine Creek Area	90,518.25	15,473.77	96,946.88	16,882.20	103,375.50	17,998.52	112,980.75	20,730.07	122,586.00	21,884.42	156,708.49	24,835.40	175,228.27	26,431.99
3	Same As Option 2, but also less Intel Facility Flow	90,518.25	15,473.77	96,946.88	16,882.20	103,375.50	17,998.52	112,980.75	20,730.07	122,586.00	21,884.42	156,708.49	24,835.40	175,228.27	26,431.99
4	Same As Option 1, but less Haltom City Little Fossil Area	80,931.25	16,091.36	87,431.63	17,571.46	93,932.00	18,759.44	103,938.50	22,032.13	113,945.00	23,745.44	149,156.99	28,070.61	168,403.10	30,535.42
5	All Cities Served by C.O.F.W. Big Fossil Outfall except Richland Hills Which will be served by the TCWSC Line. (Includes L.F.)														
5a	Big Fossil Data (H.C + NRH + F.W.)	85,990.79	16,728.36	91,937.31	18,136.37	97,883.84	19,299.64	107,643.23	22,572.33	117,402.63	24,285.65	150,439.81	28,610.82	169,512.59	31,075.63
5b	TCWSC Data (Richland Hills Only)	7,909.96	1,157.56	8,402.56	1,229.65	8,895.16	1,254.35	9,134.77	1,254.35	9,374.37	1,254.35	11,289.18	1,254.35	11,289.18	1,254.35
6	Only Fort Worth and Haltom City served by the Big Fossil Line, with Richland Hills and NRH served by the TCWSC Line														
6a	Big Fossil Data (H.C. + F.W.)	69,948.30	14,709.75	75,006.22	16,002.64	80,064.14	17,107.83	89,256.39	20,353.79	98,448.64	22,040.38	129,181.14	26,316.11	148,253.92	28,780.92
6b	TCWSC Data (R.Hills + NRH)	23,952.45	3,176.17	25,333.66	3,363.38	26,714.86	3,446.17	27,521.61	3,472.90	28,328.36	3,499.63	32,547.85	3,549.06	32,547.85	3,549.06

OPTION NUMBERING REVISIONS:

OPTION 1 = OPTION 1a

OPTION 2 = OPTION 1b

OPTION 3 = OPTION 1c

OPTION 4 = OPTION 1d

OPTION 5a = OPTION 2a

OPTION 5b = OPTION 2b

OPTION 6a = OPTION 3a

OPTION 6b = OPTION 3b

OPTION 1

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	63.09	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	64.37	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	64.38	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	64.38	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	64.39	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	64.84	84	72.74	78	159.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	64.98	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	65.12	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	65.22	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	65.31	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	65.36	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	65.39	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	65.47	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	76.05	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	76.04	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	76.03	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	76.07	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	76.12	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	76.15	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	76.17	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	76.22	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	76.41	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	76.55	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	76.60	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	76.76	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	76.86	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	85.74	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	85.76	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	85.80	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	75.51	66	83.60	60	64.84	96.24	496,072.77	409,977.50
		14135																

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2000

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 93,900.75
2000 Sew. Ac. = 17,885.92
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST =	$9,277,334.79	$7,792,254.93
+ Engr., ROW, Financ., Conting. (1.5x) =	$13,916,002.18	$11,688,382.40
Avg. Estimated Per Foot Cost =	$984.51	$826.91

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$6,455,452.62	$5,428,469.60
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,363,785.33
Percent R.H. Cost of Total Line =	30.42%	30.34%
Estim. Richland Hills Cost Share =	$4,232,823.25	$3,545,678.00

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (n)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	69.13	86	74.07	78	57.09	279.20	$74,062.20	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	70.63	86	76.70	78	59.12	93.15	1,253,248.58	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	70.64	86	76.72	78	59.13	-11.44	53,005.30	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	70.64	86	76.72	78	59.13	59.13	108,915.00	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	70.65	86	76.75	78	59.15	133.46	50,100.90	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	71.16	86	77.45	78	59.69	84.73	631,706.99	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	71.32	86	77.65	78	59.85	95.52	289,713.90	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	71.47	86	93.53	78	72.09	104.48	314,401.30	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	71.58	86	93.66	78	72.19	101.22	262,122.10	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	71.68	86	93.77	78	72.28	106.10	405,889.89	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	71.74	86	93.85	78	72.33	101.04	222,912.70	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	71.77	86	93.90	78	72.38	104.10	182,977.20	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	71.85	86	93.94	78	72.41	107.60	185,155.50	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	82.34	86	94.07	78	72.51	102.23	468,334.49	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	82.33	86	94.09	78	72.52	104.40	71,883.90	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	82.32	86	94.19	78	72.60	104.99	370,310.99	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	82.37	86	94.34	78	72.71	104.23	501,735.09	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	82.44	86	94.55	78	72.88	105.11	586,688.79	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	82.48	86	94.65	78	72.95	108.62	290,440.00	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	82.50	86	94.70	78	72.99	102.25	109,641.10	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	82.55	86	94.75	78	73.03	97.45	121,984.80	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	82.75	86	94.97	78	73.20	104.92	595,401.99	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	82.91	86	95.16	78	73.34	95.23	516,257.09	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	82.97	86	95.21	78	73.39	126.86	98,023.50	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	83.14	86	95.48	78	73.59	98.67	585,962.69	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	83.25	86	95.57	78	73.66	113.05	250,504.50	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	92.06	86	95.84	78	73.87	114.65	504,639.49	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	92.08	86	95.89	78	73.91	115.65	91,488.60	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	92.13	86	96.01	78	74.00	110.97	223,638.80	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	81.42	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 100,339.88
2005 Sew. Ac. = 19,366.02
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,917,220.12 $8,159,877.51
+ Engr., ROW, Financ., Conting. (1.5x) = $14,875,830.18 $12,239,816.26

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$6,879,943.87	$5,661,393.37
Estim. Cost Below R.H. Meter =	$3,037,276.25	$2,498,484.14
Percent R.H. Cost of Total Line =	30.63%	30.62%
Estim. Richland Hills Cost Share =	$4,555,914.38	$3,747,726.21

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	72.72	86	74.07	78	57.09	279.20	$74,062.20	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	74.29	86	76.70	78	59.12	93.15	1,253,248.58	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	74.30	86	76.72	78	59.13	-11.44	53,005.30	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	74.30	86	76.72	78	59.13	59.13	108,915.00	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	74.31	86	76.75	78	59.15	133.46	50,100.90	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	74.85	86	77.45	78	59.69	84.73	631,706.99	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	75.01	86	77.65	78	59.85	95.52	289,713.90	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	75.17	86	93.53	78	72.09	104.48	314,401.30	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	75.29	86	93.66	78	72.19	101.22	262,122.10	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	75.40	86	93.77	78	72.28	106.10	405,889.89	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	75.46	86	93.85	78	72.33	101.04	222,912.70	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	75.49	86	93.90	78	72.38	104.10	182,977.20	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	75.57	86	93.94	78	72.41	107.60	185,155.50	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	86.91	86	94.07	78	72.51	102.23	468,334.49	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	86.91	86	94.09	78	72.52	104.40	71,883.90	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	86.90	86	94.19	78	72.60	104.99	370,310.99	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	86.95	86	94.34	78	72.71	104.23	501,735.09	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	87.02	86	94.55	78	72.88	105.11	586,688.79	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	87.06	86	94.65	78	72.95	108.62	290,440.00	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	87.09	86	94.70	78	72.99	102.25	109,641.10	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	87.13	86	94.75	78	73.03	97.45	121,984.80	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	87.35	86	94.97	78	73.20	104.92	595,401.99	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	87.52	86	95.16	78	73.34	95.23	516,257.09	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	87.58	86	95.21	78	73.39	126.86	98,023.50	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	87.76	86	95.48	78	73.59	98.67	585,962.69	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	87.88	86	95.57	78	73.66	113.05	250,504.50	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	97.39	86	95.84	78	73.87	114.65	504,639.49	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	97.42	86	95.89	78	73.91	115.65	91,488.60	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	97.47	86	96.01	78	74.00	110.97	223,638.80	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	86.02	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2010

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 106,779.00
2010 Sew. Ac. = 20,554.00
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $10,011,514.95 $8,245,972.78
+ Engr., ROW, Financ., Conting. (1.5x) = $15,017,272.42 $12,368,959.17

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$6,974,238.69	$5,747,488.64
Estim. Cost Below R.H. Meter =	$3,037,276.25	$2,498,484.14
Percent R.H. Cost of Total Line =	30.34%	30.30%
Estim. Richland Hills Cost Share =	$4,555,914.38	$3,747,726.21

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	90.26	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	92.68	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	92.70	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	92.70	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	92.73	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	93.45	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	93.67	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	93.87	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	94.00	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	94.13	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	94.20	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	94.24	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	94.32	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	102.36	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	102.37	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	102.40	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	102.50	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	102.64	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	102.70	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	102.75	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	102.80	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	103.04	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	103.24	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	103.31	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	103.55	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	103.67	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	110.48	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	110.53	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	110.61	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	99.61	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2015

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 116,778.00
2015 Sew. Ac. = 23,826.69
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,279,590.65 $9,831,475.92
+ Engr., ROW, Financ., Conting. (1.5x) = $16,919,385.98 $14,747,213.88

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$7,581,897.60	$6,586,472.24
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	32.78%	33.01%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	94.74	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	97.20	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	97.21	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	97.21	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	97.24	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	97.99	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	98.22	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	98.43	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	98.57	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	98.71	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	98.79	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	98.83	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	98.92	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	108.70	96	126.14	84	88.35	118.07	583,581.76	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	108.71	96	126.17	84	88.37	120.25	89,573.01	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	108.73	96	126.30	84	88.46	120.85	461,436.74	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	108.83	96	126.50	84	88.60	120.12	625,201.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	108.96	96	126.78	84	88.80	121.03	731,060.56	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	109.03	96	126.91	84	88.89	124.56	361,911.17	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	109.07	96	126.98	84	88.94	118.20	136,621.47	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	109.13	96	127.05	84	88.99	113.41	152,002.69	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	109.40	96	127.34	84	89.19	120.91	741,917.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	109.61	96	127.60	84	89.37	111.26	643,297.10	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	109.68	96	127.67	84	89.42	142.89	122,145.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	109.93	96	128.02	84	89.67	114.75	730,155.78	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	110.06	96	128.15	84	89.76	129.15	312,148.38	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	118.33	96	128.51	84	90.01	130.79	628,820.65	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	118.37	96	128.58	84	90.06	131.80	114,002.02	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	118.46	96	128.74	84	90.17	127.14	278,671.60	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	106.15	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2020

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 126,777.00
2020 Sew. Ac. = 25,540.00
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $9,925,770.75
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $14,888,656.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$6,680,767.06
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	32.69%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	96.46	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	98.15	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	98.16	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	98.16	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	98.18	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	98.86	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	99.07	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	99.29	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	99.46	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	99.62	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	99.71	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	99.74	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	99.89	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	121.16	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	121.14	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	121.08	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	121.12	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	121.17	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	121.20	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	121.24	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	121.30	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	121.63	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	121.87	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	121.96	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	122.20	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	122.38	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	140.17	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	140.21	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	140.25	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	121.46	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2050

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 161,728.99
2050 Sew. Ac. = 29,865.17
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PAR.. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	98.27	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	99.60	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	99.61	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	99.61	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	99.63	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	100.27	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	100.48	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	100.72	90	105.58	94	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	100.90	90	105.73	34	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	101.07	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	101.16	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	101.19	90	106.00	04	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	101.37	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	128.57	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	128.54	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	128.44	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	128.44	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	128.46	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	128.47	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	128.50	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	128.57	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	128.93	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	129.19	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	129.29	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	129.53	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	129.74	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	152.44	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	152.47	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	152.50	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	130.29	78	130.52	72	105.43	136.83	692,861.97	590,367.59
		14135																

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 180,801.77
2070 Sew. Ac. = 32,329.98
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76
Avg. Estimated Per Foot Cost = $1,294.12 $1,134.01

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter = $8,497,239.51 $7,441,172.82
Estim. Cost Below R.H. Meter = $3,697,693.06 $3,245,003.68
Percent R.H. Cost of Total Line = 30.32% 30.37%
Estim. Richland Hills Cost Share = $5,546,539.58 $4,867,505.52

OPTION 2

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	46.23	72	46.12	60	28.36	250.47	$51,911.63	$36,049.75
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	46.52	72	47.76	60	29.37	63.40	878,426.26	610,018.24
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	46.52	72	47.77	60	29.38	-41.19	37,152.44	25,800.31
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	46.52	72	47.77	60	29.38	29.38	76,340.64	53,014.33
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	46.53	72	47.79	60	29.39	103.70	35,116.69	24,386.59
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	46.77	72	48.22	60	29.65	54.69	442,775.69	307,483.12
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	46.85	72	48.35	60	29.73	65.40	203,066.09	141,018.12
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	46.96	72	58.23	60	35.81	68.20	220,369.97	153,034.70
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	47.05	72	58.31	60	35.86	64.89	183,726.47	127,587.82
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	47.14	72	58.39	60	35.90	69.72	284,496.11	197,566.74
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	47.18	72	58.43	60	35.93	64.64	156,243.84	108,502.66
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	47.18	72	58.46	60	35.95	67.67	128,252.27	89,064.08
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	47.28	72	58.49	60	35.97	71.16	129,779.08	90,124.36
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	63.20	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	63.18	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	63.11	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	63.09	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	63.06	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	63.06	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	63.07	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	63.10	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	63.28	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	63.40	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	63.45	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	63.55	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	63.66	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	76.92	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	76.93	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	76.93	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	65.00	78	130.52	66	83.60	115.00	692,861.97	496,072.77

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 90,518.25
2000 Sew. Ac. = 15,473.77
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $7,951,849.27 $5,632,451.08
+ Engr., RCW, Financ., Conting. (1.5x) = $11,927,773.91 $8,448,676.61

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$5,822,963.38	$4,154,058.09
Estim. Cost Below R.H. Meter =	$2,128,885.90	$1,478,392.98
Percent R.H. Cost of Total Line =	26.77%	26.25%
Estim. Richland Hills Cost Share =	$3,193,328.85	$2,217,589.48

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	51.68	78	57.09	66	36.57	258.68	$60,924.07	$43,620.19
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	52.15	78	59.12	66	37.87	71.90	1,030,930.82	738,122.07
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	52.16	78	59.13	66	37.88	-32.69	43,602.52	31,218.37
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	52.16	78	59.13	66	37.88	37.88	89,594.22	64,147.34
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	52.17	78	59.15	66	37.89	112.20	41,213.34	29,507.78
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	52.46	78	59.69	66	38.24	63.28	519,646.47	372,054.58
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	52.56	78	59.85	66	38.34	74.01	238,320.62	170,631.93
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	52.68	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	52.77	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	52.87	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	52.91	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	52.92	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	53.02	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	69.07	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	69.05	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	68.99	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	68.97	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	68.96	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	68.96	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	68.97	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	69.01	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	69.20	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	69.34	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	69.39	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	69.50	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	69.62	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	83.00	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	83.01	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	83.02	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	70.59	78	130.52	66	83.60	115.00	692,861.97	496,072.77

DESIGN CONDITION: OPTION NO. 2
DESIGN YEAR: 2005

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 96,946.88
2005 Sew. Ac. = 16,882.20
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,442,761.98 $6,044,817.75
+ Engr., ROW, Financ., Conting. (1.5x) = $12,664,142.97 $9,067,226.62

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$5,944,277.84	$4,255,962.24
Estim. Cost Below R.H. Meter =	$2,498,484.14	$1,788,855.51
Percent R.H. Cost of Total Line =	29.59%	29.59%
Estim. Richland Hills Cost Share =	$3,747,726.21	$2,683,283.27

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	54.68	78	57.09	66	36.57	258.68	$60,924.07	$43,620.19
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	55.19	78	59.12	66	37.87	71.90	1,030,930.82	738,122.07
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	55.19	78	59.13	66	37.88	-32.69	43,602.52	31,218.37
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	55.19	78	59.13	66	37.88	37.88	89,594.22	64,147.34
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	55.20	78	59.15	66	37.89	112.20	41,213.34	29,507.78
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	55.51	78	59.69	66	38.24	63.28	519,646.47	372,054.58
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	55.61	78	59.85	66	38.34	74.01	238,320.62	170,631.93
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	55.75	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	55.85	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	55.94	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	55.99	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	56.00	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	56.11	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	73.24	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	73.22	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	73.15	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	73.13	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	73.12	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	73.11	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	73.13	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	73.17	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	73.37	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	73.52	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	73.57	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	73.70	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	73.82	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	88.09	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	88.11	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	88.11	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	74.86	64	77.01	78	130.52	161.92	466,463.28	692,861.97

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 103,375.50
2010 Sew. Ac. = 17,998.52
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,924,327.28 $7,500,209.58
+ Engr., ROW, Financ., Conting. (1.5x) = $13,386,490.92 $11,250,314.37

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$6,425,843.14	$5,711,354.07
Estim. Cost Below R.H. Meter =	$2,498,484.14	$1,788,855.51
Percent R.H. Cost of Total Line =	28.00%	23.85%
Estim. Richland Hills Cost Share =	$3,747,726.21	$2,683,283.27

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	68.08	84	69.57	84	69.57	291.68	$70,657.50	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	69.19	84	72.04	84	72.04	106.07	1,195,635.75	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	69.20	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	69.20	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	69.21	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.67	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.81	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.97	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	70.08	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	70.20	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	70.25	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	70.28	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	70.38	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	85.67	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	85.66	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	85.61	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	85.63	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	85.66	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	85.68	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M4)2A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	85.70	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	85.75	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	85.98	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	86.15	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	86.21	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	86.37	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	86.50	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	99.28	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M4C2A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	99.31	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	99.33	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	86.05	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 112,980.75
2015 Sew. Ac. = 20,730.07
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,791,605.61 $8,645,064.67
+ Engr., ROW, Financ., Conting. (1.5x) = $14,687,408.42 $12,967,597.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$6,893,955.36	$5,944,277.84
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,700,786.83
Percent R.H. Cost of Total Line =	29.59%	31.24%
Estim. Richland Hills Cost Share =	$4,346,475.37	$4,051,180.25

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	68.26	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	69.15	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	69.15	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	69.15	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	69.17	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.59	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.73	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.89	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	70.02	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	70.14	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	70.19	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	70.22	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	70.33	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	88.89	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	88.87	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	88.81	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	88.80	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	88.81	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	88.82	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	88.84	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	88.89	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	89.14	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	89.31	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	89.38	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	89.54	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	89.68	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	105.17	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	105.19	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	105.21	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	90.11	90	191.16	84	159.04	190.44	922,449.36	803,555.89

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2020**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 122,586.00
2020 Sew. Ac. = 21,884.42
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $10,670,904.84 $9,261,419.89
+ Engr., ROW, Financ., Conting. (1.5x) = $16,006,357.26 $13,892,129.83

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$7,773,254.59	$6,762,935.74
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,498,484.14
Percent R.H. Cost of Total Line =	27.15%	26.98%
Estim. Richland Hills Cost Share :	$4,346,475.37	$3,747,726.21

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	59.29	84	69.57	84	69.57	291.68	$70,657.50	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	58.75	84	72.04	84	72.04	106.07	1,195,635.75	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	58.75	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	58.75	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	58.75	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	58.96	84	72.74	84	72.74	97.78	602,666.92	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	59.05	84	72.93	84	72.93	108.60	276,395.52	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	59.22	84	87.84	84	87.84	120.23	299,948.02	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	59.36	84	87.96	84	87.96	116.99	250,072.13	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	59.49	84	88.07	84	88.07	121.89	387,230.81	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	59.55	84	88.14	84	88.14	116.85	212,665.22	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	59.55	84	88.19	84	88.19	119.91	174,565.59	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	59.74	84	88.23	84	88.23	123.42	176,643.75	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	93.63	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	93.57	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	93.39	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	93.28	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	93.15	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	93.10	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	93.10	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	93.16	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	93.46	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	93.66	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	93.74	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	93.85	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	94.04	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	122.22	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	122.22	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	122.17	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	99.30	90	191.16	84	159.04	190.44	922,449.36	803,555.89

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 156,708.49
2050 Sew. Ac. = 24,835.40
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $10,670,904.84 $9,791,605.61
+ Engr., ROW, Financ., Conting. (1.5x) = $16,006,357.26 $14,687,408.42

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$7,773,254.59	$6,893,955.36
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,897,650.25
Percent R.H. Cost of Total Line =	27.15%	29.59%
Estim. Richland Hills Cost Share =	$4,346,475.37	$4,346,475.37

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	54.38	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	53.07	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	53.06	90	86.61	84	72.06	1.49	58,050.69	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	53.06	90	86.61	84	72.06	72.06	119,282.25	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	53.06	90	86.64	84	72.08	146.39	54,869.83	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	53.15	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	53.21	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	53.38	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	53.52	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	53.67	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	53.73	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	53.72	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	53.94	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	96.17	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	96.10	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	95.85	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	95.69	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	95.48	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	95.40	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	95.39	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	95.45	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	95.78	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	95.98	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	96.07	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	96.16	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	96.38	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	131.46	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	131.45	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	131.36	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	104.26	90	191.16	84	159.04	190.44	922,449.36	803,555.89

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 175,228.27
2070 Sew. Ac. = 26,431.99
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,240,363.58 $9,791,605.61
+ Engr., ROW, Financ., Conting. (1.5x) = $16,860,545.37 $14,687,408.42

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$7,913,979.37	$6,893,955.36
Estim. Cost Below R.H. Meter =	$3,326,384.21	$2,897,650.25
Percent R.H. Cost of Total Line =	29.59%	29.59%
Estim. Richland Hills Cost Share =	$4,989,576.32	$4,346,475.37

OPTION 3

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	40.23	72	46.12	54	21.41	243.52	$51,911.63	$29,200.29
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	40.52	72	47.76	54	22.18	56.21	878,426.26	494,114.77
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	40.52	72	47.77	54	22.18	-48.39	37,152.44	20,898.25
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	40.52	72	47.77	54	22.18	22.18	76,340.64	42,941.61
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	40.53	72	47.79	54	22.19	96.50	35,116.69	19,753.14
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	40.77	72	48.22	54	22.39	47.43	442,775.69	249,061.33
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	40.85	72	48.35	54	22.45	58.12	203,066.09	114,224.68
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	40.96	66	46.17	54	27.04	59.43	185,171.99	123,958.11
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	41.05	66	46.24	54	27.08	56.11	154,381.27	103,346.14
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	41.14	66	46.29	54	27.11	60.93	239,055.76	160,029.06
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	41.18	66	46.33	54	27.13	55.84	131,288.22	87,887.16
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	41.18	66	46.36	54	27.15	58.87	107,767.53	72,141.90
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	41.28	66	46.38	54	27.16	62.35	109,050.48	73,000.73
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	57.20	72	58.57	54	27.20	56.92	328,264.74	184,648.92
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	57.18	72	58.58	54	27.20	59.08	50,384.82	28,341.46
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	57.11	72	58.64	54	27.23	59.62	259,558.17	146,001.47
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	57.09	72	58.74	54	27.27	58.79	351,675.87	197,817.68
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	57.06	72	58.87	54	27.33	59.56	411,221.56	231,312.13
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	57.06	72	58.93	54	27.36	63.03	203,575.03	114,510.96
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	57.07	72	58.96	60	36.26	65.52	76,849.57	53,367.76
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	57.10	72	59.00	60	36.28	60.70	85,501.51	59,376.05
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	57.28	72	59.13	60	36.36	68.08	417,328.82	289,811.68
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	57.40	72	59.25	60	36.43	58.32	361,854.62	251,287.93
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	57.45	72	59.28	60	36.46	89.93	68,706.57	47,712.90
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	57.55	72	59.45	60	36.56	61.64	410,712.63	285,217.10
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	57.66	72	59.51	60	36.59	75.98	175,583.47	121,932.96
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	70.92	78	73.87	60	36.70	77.48	415,119.89	245,633.07
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	70.93	78	73.91	60	36.72	78.46	75,259.14	44,532.04
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	70.93	78	74.00	60	36.76	73.73	183,966.80	108,856.09
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	59.00	78	130.52	60	64.84	96.24	692,861.97	409,977.50

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 90,518.25
2000 Sew. Ac. = 15,473.77
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $7,219,929.88 $4,410,894.85
+ Engr., RO V, Financ., Conting. (1.5x) = $10,829,894.82 $6,616,342.28

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$4,916,531.41	$3,053,367.48
Estim. Cost Below R.H. Meter =	$2,251,486.84	$1,328,327.08
Percent R.H. Cost of Total Line =	20.79%	20.08%
Estim. Richland Hills Cost Share =	$0.00	$0.00

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	45.68	72	46.12	60	28.36	250.47	$51,911.63	$36,049.75
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	46.15	72	47.76	60	29.37	63.40	878,426.26	610,018.24
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	46.16	72	47.77	60	29.38	-41.19	37,152.44	25,800.31
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	46.16	72	47.77	60	29.38	29.38	76,340.64	53,014.33
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	46.17	72	47.79	60	29.39	103.70	35,116.69	24,386.59
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	46.46	72	48.22	60	29.65	54.69	442,775.69	307,483.12
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	46.56	72	48.35	54	22.45	58.12	203,066.09	114,224.68
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	46.68	72	58.23	54	27.04	59.43	220,369.97	123,958.11
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	46.77	72	58.31	54	27.08	56.11	183,726.47	103,346.14
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	46.87	72	58.39	54	27.11	60.93	284,496.11	160,029.06
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	46.91	72	58.43	54	27.13	55.84	156,243.84	87,887.16
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	46.92	72	58.46	54	27.15	58.87	128,252.27	72,141.90
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	47.02	72	58.49	54	27.16	62.35	129,779.08	73,000.73
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	63.07	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	63.05	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	62.99	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	62.97	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	62.96	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	62.96	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	62.97	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	63.01	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	63.20	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	63.34	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	63.39	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	63.50	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	63.62	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	77.00	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	77.01	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	77.02	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	64.59	78	130.52	66	83.60	115.00	692,861.97	496,072.77

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 96,946.88
2005 Sew. Ac. = 16,882.20
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $7,951,849.27 $5,460,140.36
+ Engr., ROW, Financ., Conting. (1.5x) = $11,927,773.91 $8,190,210.54

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$5,822,963.38	$4,061,859.10
Estim. Cost Below R.H. Meter =	$2,128,885.90	$1,398,281.26
Percent R.H. Cost of Total Line =	26.77%	25.61%
Estim. Richland Hills Cost Share =	$3,193,328.85	$2,097,421.89

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	48.68	78	57.09	60	28.36	250.47	$60,924.07	$36,049.75
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	49.19	78	59.12	60	29.37	63.40	1,030,930.82	610,018.24
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	49.19	78	59.13	60	29.38	-41.19	43,602.52	25,800.31
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	49.19	78	59.13	60	29.38	29.38	89,594.22	53,014.33
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	49.20	78	59.15	60	29.39	103.70	41,213.34	24,386.59
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	49.51	78	59.69	60	29.65	54.69	519,646.47	307,483.12
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	49.61	78	59.85	60	29.73	65.40	238,320.62	141,018.12
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	49.75	72	58.23	60	35.81	68.20	220,369.97	153,034.70
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	49.85	72	58.31	60	35.86	64.89	183,726.47	127,587.82
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	49.94	72	58.39	60	35.90	69.72	284,496.11	197,566.74
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	49.99	72	58.43	60	35.93	64.64	156,243.84	108,502.66
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	50.00	72	58.46	60	35.95	67.67	128,252.27	89,064.08
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	50.11	72	58.49	60	35.97	71.16	129,779.08	90,124.36
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	67.24	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	67.22	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	67.15	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	67.13	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	67.12	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	67.11	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	67.13	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	67.17	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	67.37	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	67.52	78	73.34	72	59.25	81.14	424,676.60	361,854.62
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	67.57	78	73.39	72	59.28	112.75	80,634.80	68,706.57
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	67.70	78	73.59	72	59.45	84.53	482,016.90	410,712.63
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	67.82	78	73.66	72	59.51	98.90	206,066.71	175,583.47
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	82.09	84	90.01	72	59.67	100.45	481,440.81	353,711.62
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	82.11	84	90.06	72	59.70	101.44	87,282.79	64,126.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	82.11	84	90.17	72	59.78	96.75	213,357.94	156,752.77
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	68.86	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 103,375.50
2010 Sew. Ac. = 17,998.52
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $8,256,533.24 $5,886,640.66
+ Engr., ROW, Financ., Conting. (1.5x) = $12,384,799.86 $8,829,960.98

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD^1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$5,828,204.73	$4,408,247.67
Estim. Cost Below R.H. Meter =	$2,428,328.51	$1,478,392.98
Percent R.H. Cost of Total Line =	29.41%	25.11%
Estim. Richland Hills Cost Share =	$3,642,492.77	$2,217,589.48

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	62.08	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	63.19	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	63.20	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	63.20	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	63.21	84	72.08	72	47.79	122.10	47,797.72	35,116.69
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	63.67	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	63.81	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.97	78	72.09	72	58.23	90.62	258,628.65	220,369.97
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	64.08	78	72.19	72	58.31	87.34	215,623.42	183,726.47
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	64.20	78	72.28	72	58.39	92.21	333,887.79	284,496.11
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	64.25	78	72.33	72	58.43	87.14	183,369.50	156,243.84
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	64.28	78	72.38	72	58.46	90.18	150,518.29	128,252.27
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	64.38	78	72.41	72	58.49	93.68	152,310.17	129,779.08
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	79.67	84	88.35	72	58.57	88.29	446,804.78	328,264.74
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	79.66	84	88.37	72	58.58	90.46	68,579.34	50,384.82
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	79.61	84	88.46	72	58.64	91.03	353,287.50	259,558.17
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	79.63	84	88.60	72	58.74	90.26	478,669.93	351,675.87
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	79.66	84	88.80	72	58.87	91.10	559,718.24	411,221.56
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	79.68	84	88.89	72	58.93	94.60	277,088.24	203,575.03
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	79.70	84	88.94	72	58.96	88.22	104,600.81	76,849.57
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	79.75	84	88.99	72	59.00	83.42	116,377.06	85,501.51
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	79.98	84	89.19	72	59.13	90.85	568,030.89	417,328.82
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	80.15	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	80.21	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	80.37	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	80.50	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	93.28	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	93.31	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	93.33	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	80.05	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 112,980.75
2015 Sew. Ac. = 20,730.07
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $9,584,817.91 $7,753,840.75
+ Engr., ROW, Financ., Conting. (1.5x) = $14,377,226.86 $11,630,761.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$6,762,935.74	$5,443,734.19
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,310,106.55
Percent R.H. Cost of Total Line =	29.44%	29.79%
Estim. Richland Hills Cost Share =	$4,232,823.25	$3,465,159.83

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	62.26	84	69.57	72	46.12	268.23	$70,657.50	$51,911.63
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	63.15	84	72.04	72	47.76	81.79	1,195,635.75	878,426.26
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	63.15	84	72.06	72	47.77	-22.80	50,568.60	37,152.44
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	63.15	84	72.06	72	47.77	47.77	103,908.09	76,340.64
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	63.17	84	72.08	72	47.79	122.10	47,797.72	35,116.69
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	63.59	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	63.73	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.89	84	87.84	72	58.23	90.62	299,948.02	220,369.97
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	64.02	84	87.96	72	58.31	87.34	250,072.13	183,726.47
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	64.14	84	88.07	72	58.39	92.21	387,230.81	284,496.11
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	64.19	84	88.14	72	58.43	87.14	212,665.22	156,243.84
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	64.22	84	88.19	72	58.46	90.18	174,565.59	128,252.27
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	64.33	84	88.23	72	58.49	93.68	176,643.75	129,779.08
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	82.89	84	88.35	72	58.57	88.29	446,804.78	328,264.74
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	82.87	84	88.37	72	58.58	90.46	68,579.34	50,384.82
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	82.81	84	88.46	72	58.64	91.03	353,287.50	259,558.17
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	82.80	84	88.60	72	58.74	90.26	478,669.93	351,675.87
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	82.81	84	88.80	72	58.87	91.10	559,718.24	411,221.56
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	82.82	84	88.89	72	58.93	94.60	277,088.24	203,575.03
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	82.84	84	88.94	72	58.96	88.22	104,600.81	76,849.57
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	82.89	84	88.99	34	88.99	113.41	116,377.06	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	83.14	84	89.19	84	89.19	120.91	568,030.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	83.31	84	89.37	84	89.37	111.26	492,524.34	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	83.38	84	89.42	84	89.42	142.89	93,517.28	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	83.54	84	89.67	84	89.67	114.75	559,025.52	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	83.68	84	89.76	84	89.76	129.15	238,988.61	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	99.17	84	90.01	84	90.01	130.79	481,440.81	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	99.19	84	90.06	84	90.06	131.80	87,282.79	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	99.21	84	90.17	84	90.17	127.14	213,357.94	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	84.11	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2020**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 122,586.00
2020 Sew. Ac. = 21,884.42
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $9,791,605.61 $8,052,594.17
+ Engr., ROW, Financ., Conting. (1.5x) = $14,687,408.42 $12,078,891.26

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$6,893,955.36	$5,923,708.28
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,128,885.90
Percen R.H. Cost of Total Line =	29.59%	26.44%
Estim. Richland Hills Cost Share :	$4,346,475.37	$3,193,328.85

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	53.29	90	83.62	78	57.09	279.20	$81,111.93	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	52.75	90	86.59	78	59.12	93.15	1,372,541.04	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	52.75	90	86.61	78	59.13	-11.44	58,050.69	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	52.75	90	86.61	78	59.13	59.13	119,282.25	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	52.75	90	86.64	78	59.15	133.46	54,869.83	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	52.96	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	53.05	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	53.22	84	87.84	72	58.23	90.62	299,948.02	220,369.97
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	53.36	84	87.96	72	58.31	87.34	250,072.13	183,726.47
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	53.49	84	88.07	72	58.39	92.21	387,230.81	284,496.11
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	53.55	84	88.14	72	58.43	87.14	212,665.22	156,243.84
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	53.55	84	88.19	72	58.46	90.18	174,565.59	128,252.27
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	53.74	84	88.23	72	58.49	93.68	176,643.75	129,779.08
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	87.63	84	88.35	72	58.57	88.29	446,804.78	328,264.74
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	87.57	84	88.37	72	58.58	90.46	68,579.34	50,384.82
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	87.39	84	88.46	72	58.64	91.03	353,287.50	259,558.17
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	87.28	84	88.60	72	58.74	90.26	478,669.93	351,675.87
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	87.15	84	88.80	72	58.87	91.10	559,718.24	411,221.56
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	87.10	84	88.89	72	58.93	94.60	277,088.24	203,575.03
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	87.10	84	88.94	72	58.96	88.22	104,600.81	76,849.57
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	87.16	84	88.99	84	88.99	113.41	116,377.06	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	87.46	84	89.19	84	89.19	120.91	568,030.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	87.66	84	89.37	84	89.37	111.26	492,524.34	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	87.74	84	89.42	84	89.42	142.89	93,517.28	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	87.85	84	89.67	84	89.67	114.75	559,025.52	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	88.04	84	89.76	84	89.76	129.15	238,988.61	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	116.22	84	90.01	84	90.01	130.79	481,440.81	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	116.22	84	90.06	84	90.06	131.80	87,282.79	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	116.17	84	90.17	84	90.17	127.14	213,357.94	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	93.30	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 156,708.49
2050 Sew. Ac. = 24,835.40
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $10,008,893.68 $8,239,911.48
+ Engr., ROW, Financ., Conting. (1.5x) = $15,013,340.52 $12,359,867.22

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$6,893,955.36	$5,923,708.28
Estim. Cost Below R.H. Meter =	$3,114,938.32	$2,316,203.20
Percent R.H. Cost of Total Line =	31.12%	28.11%
Estim. Richland Hills Cost Share =	$4,672,407.48	$3,474,304.80

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	48.38	90	83.62	78	57.09	279.20	$81,111.93	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	47.07	90	86.59	78	59.12	93.15	1,372,541.04	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	47.06	90	86.61	78	59.13	-11.44	58,050.69	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	47.06	90	86.61	78	59.13	59.13	119,282.25	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	47.06	90	86.64	78	59.15	133.46	54,869.83	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	47.15	90	87.43	78	59.69	84.73	691,837.02	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	47.21	90	87.66	78	59.85	95.52	317,290.77	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	47.38	90	105.58	78	72.09	104.48	344,328.08	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	47.52	90	105.73	78	72.19	101.22	287,072.60	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	47.67	90	105.86	78	72.28	106.10	444,525.17	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	47.73	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	47.72	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	47.94	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	90.17	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	90.10	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	89.85	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	89.69	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	89.48	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	89.40	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	89.39	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	89.45	84	88.99	84	88.99	113.41	116,377.06	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	89.78	84	89.19	84	89.19	120.91	568,030.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	89.98	84	89.37	34	89.37	111.26	492,524.34	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	90.07	84	89.42	34	89.42	142.89	93,517.28	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	90.16	84	89.67	34	89.67	114.75	559,025.52	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	90.38	84	89.76	84	89.76	129.15	238,988.61	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	125.46	84	90.01	84	90.01	130.79	481,440.81	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	125.45	84	90.06	84	90.06	131.80	87,282.79	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	125.36	84	90.17	84	90.17	127.14	213,357.94	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	98.26	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 175,228.27
2070 Sew. Ac. = 26,431.99
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $10,277,633.93 $8,835,439.13
+ Engr., ROW, Financ., Conting. (1.5x) = $15,416,450.90 $13,253,158.70

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$6,951,249.72	$6,336,954.99
Estim. Cost Below R.H. Meter =	$3,326,384.21	$2,498,484.14
Percent R.H. Cost of Total Line =	32.37%	28.28%
Estim. Richland Hills Cost Share =	$4,989,576.32	$3,747,726.21

OPTION 4

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	60.87	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	62.32	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	62.33	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	62.33	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	62.35	84	72.08	72	47.79	122.10	47,797.72	35,116.69
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	62.81	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	62.95	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.08	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	63.17	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	63.25	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	63.30	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	63.33	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	63.39	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	70.32	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	70.32	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	70.33	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	70.38	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	70.46	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	70.50	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	70.53	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	70.56	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	70.73	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	70.86	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	70.91	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	71.06	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	71.15	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	76.99	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	77.02	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	77.07	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	68.97	66	83.60	66	83.60	115.00	496,072.77	496,072.77

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 80,931.25
2000 Sew. Ac. = 16,091.36
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,569,370.81 $6,501,525.61
+ Engr., ROW, Financ., Conting. (1.5x) = $12,854,056.21 $9,752,288.42

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth Big Fossil Outfall, including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$5,747,488.64	$4,255,962.24
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,245,563.37
Percent R.H. Cost of Total Line =	32.93%	34.54%
Estim. Richland Hills Cost Share :	$4,232,823.25	$3,368,345.06

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	66.85	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	68.52	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	68.53	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	68.53	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	68.55	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.06	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.22	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.36	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	69.46	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	69.55	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	69.61	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	69.64	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	69.70	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	76.58	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	76.58	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	76.60	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	76.66	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	76.76	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	76.80	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	76.83	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	76.87	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	77.05	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	77.20	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	77.25	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	77.42	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	77.51	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	83.33	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	83.36	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	83.41	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	74.88	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 87,431.63
2005 Sew. Ac. = 17,571.46
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,474,123.99 $7,972,645.03
+ Engr., ROW, Financ., Conting. (1.5x) = $14,211,185.98 $11,958,967.54

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$6,652,241.82	$5,608,859.70
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,363,785.33
Percent R.H. Cost of Total Line =	29.79%	29.65%
Estim. Richland Hills Cost Share =	$4,232,823.25	$3,545,678.00

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	70.38	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	72.11	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	72.12	90	86.61	84	72.06	1.49	58,050.69	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	72.12	90	86.61	84	72.06	72.06	119,282.25	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	72.14	90	86.64	84	72.08	146.39	54,869.83	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	72.68	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	72.85	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	73.00	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	73.10	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	73.20	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	73.26	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	73.29	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	73.36	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	81.14	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	81.14	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	81.15	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	81.22	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	81.31	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	81.36	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	81.39	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	81.43	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	81.63	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	81.78	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	81.83	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	82.02	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	82.12	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	88.68	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	88.71	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	88.77	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	79.46	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: OPTION NO. 4 F.W. Model Eq. Pop. = 57,207.50 93,287.50 2010 Eq. Pop. = 93,932.00 TOTAL ESTIM. CONST. COST = $9,831,475.92 $8,483,275.53

DESIGN YEAR: 2010 F.W. Model Sew. Ac. = 9,004.81 20,981.33 2010 Sew. Ac. = 18,759.44 + Engr., ROW, Financ., Conting. (1.5x) = $14,747,213.88 $12,724,913.30

Constant Intel Flow = 6.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option does not include diversion
of Little Fossil Creek Area in Haltom City
to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$6,586,472.24	$5,661,393.37
Estim. Cost Below R.H. Meter =	$3,245,003.68	$2,821,882.17
Percent R.H. Cost of Total Line =	33.01%	33.26%
Estim. Richland Hills Cost Share =	$4,867,505.52	$4,232,823.25

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	87.91	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	90.50	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	90.52	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	90.52	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	90.55	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	91.28	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	91.50	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	91.68	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	91.81	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	91.92	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	91.99	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	92.04	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	92.10	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	96.59	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	96.60	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	96.65	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	96.77	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	96.93	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	97.00	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	97.05	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	97.10	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	97.32	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	97.50	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	97.56	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	97.80	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	97.90	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	101.77	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	101.81	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	101.90	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	93.06	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 103,938.50
2015 Sew. Ac. = 22,032.13
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,382,085.03 $9,925,770.75
+ Engr., ROW, Financ., Conting. (1.5x) = $17,073,127.54 $14,888,656.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$7,684,391.97	$6,680,767.06
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	32.49%	32.69%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	92.38	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	95.00	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	95.02	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	95.02	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	95.05	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	95.81	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	96.04	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	96.24	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	96.37	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	96.50	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	96.57	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	96.62	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	96.69	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	102.92	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	102.93	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	102.98	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	103.09	90	106.50	64	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	103.25	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	103.33	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	103.37	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	103.43	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	103.67	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	103.87	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	103.93	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	104.18	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	104.29	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	109.62	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	109.66	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	109.76	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	99.59	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2020**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 113,945.00
2020 Sew. Ac. = 23,745.44
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,382,085.03 $9,925,770.75
+ Engr., ROW, Financ., Conting. (1.5x) = $17,073,127.54 $14,888,656.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$7,684,391.97	$6,680,767.06
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	32.49%	32.69%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	93.84	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	95.68	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	95.69	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	95.69	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	95.72	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	96.39	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	96.60	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	96.82	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	96.98	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	97.13	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	97.21	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	97.24	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	97.37	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	115.28	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	115.27	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	115.24	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	115.28	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	115.36	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	115.39	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	115.43	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	115.50	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	115.80	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	116.03	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	116.11	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	116.35	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	116.51	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	131.51	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	131.55	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	131.60	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	114.87	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 149,156.99
2050 Sew. Ac. = 28,070.61
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option does not include diversion
of Little Fossil Creek Area in Haltom City
to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	95.48	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	96.95	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	96.96	96	102.88	30	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	96.96	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	96.98	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	97.62	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	97.82	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	98.05	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	98.22	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	98.39	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	98.47	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	98.50	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	98.66	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	122.63	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	122.60	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	122.53	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	122.54	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	122.57	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	122.59	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	122.63	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	122.70	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	123.03	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	123.28	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	123.37	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	123.61	96	128.02	:)0	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	123.80	96	128.15	)0	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	143.82	96	128.51	:)0	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	143.85	96	128.58	)0	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	143.88	96	128.74	.)0	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	123.68	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: OPTION NO. 4
DESIGN YEAR: 2070

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 168,403.10
2070 Sew. Ac. = 30,535.42
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option does not include diversion
of Little Fossil Creek Area in Haltom City
to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

OPTION 5a

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	61.21	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	62.56	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	62.57	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	62.57	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	62.58	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	63.03	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	63.17	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.30	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	63.39	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	63.48	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	63.53	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	63.56	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	63.63	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	72.19	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	72.18	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	72.18	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	72.23	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	72.29	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	72.33	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	72.35	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	72.39	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	72.57	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	72.71	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	72.75	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	72.90	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	73.00	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	80.19	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	80.22	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	80.26	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	71.23	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 85,990.79
2000 Sew. Ac. = 16,728.36
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,277,334.79 $7,820,119.26
+ Engr., ROW, Financ., Conting. (1.5x) = $13,916,002.18 $11,730,178.89

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD^1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth Big Fossil Outfall, except Richland Hills, but including NRH, Haltom City, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	67.13	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	68.71	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	68.72	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	68.72	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	68.73	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.24	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.39	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.54	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	69.64	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	69.74	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	69.79	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	69.82	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	69.89	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	78.23	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	78.23	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	78.24	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	78.29	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	78.38	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	78.41	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	78.44	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	78.49	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	78.67	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	78.83	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	78.87	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	79.05	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	79.14	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	86.17	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	86.20	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	86.25	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	76.88	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 91,937.31
2005 Sew. Ac. = 18,136.37
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,277,334.79 $7,820,119.26
+ Engr., ROW, Financ., Conting. (1.5x) = $13,916,002.18 $11,730,178.89

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	71.00	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	72.67	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	72.69	90	86.61	90	86.61	16.04	58,050.69	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	72.69	90	86.61	90	86.61	86.61	119,282.25	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	72.71	90	86.64	90	86.64	160.95	54,869.83	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	73.24	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	73.41	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	73.56	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	73.67	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	73.77	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	73.83	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	73.86	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	73.93	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	82.85	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	82.85	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	82.85	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	82.91	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	83.00	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	83.04	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	83.07	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	83.12	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	83.32	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	83.48	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	83.53	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	83.71	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	83.82	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	91.32	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	91.35	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	91.40	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	81.42	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 5a** F.W. Model Eq. Pop. = 57,207.50 93,287.50 2010 Eq. Pop. = 97,883.84 TOTAL ESTIM. CONST. COST = $9,831,475.92 $8,513,203.89

DESIGN YEAR: **2010** F.W. Model Sew. Ac. = 9,004.81 20,981.33 2010 Sew. Ac. = 19,299.64 + Engr., ROW, Financ., Conting. (1.5x) = $14,747,213.88 $12,769,805.83

Constant Intel Flow = 6.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	88.77	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	91.33	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	96	102.88	32.31	66,048.79	66,048.79
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	96	102.88	102.88	135,716.69	135,716.69
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	91.37	96	102.91	96	102.91	177.22	62,429.68	62,429.68
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	92.11	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	92.33	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	92.52	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	92.64	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	92.76	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	92.83	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	92.88	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	92.94	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	98.38	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	98.39	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	98.44	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	98.55	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	98.71	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	98.78	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	98.83	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	98.88	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	99.10	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	99.29	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	99.35	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	99.59	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	99.70	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	104.36	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	104.40	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	104.49	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	95.05	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 107,643.23
2015 Sew. Ac. = 22,572.33
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,279,590.65 $9,863,468.30
+ Engr., ROW, Financ., Conting. (1.5x) = $16,919,385.98 $14,795,202.46

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, <u>except Richland Hills</u>, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	93.49	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	96.10	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	96.12	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	96.12	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	96.15	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	96.91	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	97.14	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	97.34	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	97.48	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	97.61	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	97.68	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	97.73	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	97.80	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	104.81	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	104.82	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	104.87	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	104.97	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	105.13	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	105.20	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	105.25	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	105.30	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	105.55	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	105.75	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	105.82	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	106.07	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	106.19	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	112.16	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	112.20	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	112.29	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	101.61	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: .2020

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 117,402.63
2020 Sew. Ac. = 24,285.65
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,492,690.59 $10,030,827.48
+ Engr., ROW, Financ., Conting. (1.5x) = $17,239,035.89 $15,046,241.22

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth Big Fossil Outfall, except Richland Hills, but including NRH, Haltom City, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	97.10	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	99.11	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	99.13	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	99.13	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	99.15	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	99.86	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	100.08	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	100.31	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	100.47	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	100.62	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	100.70	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	100.74	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	100.87	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	117.97	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	117.96	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	117.93	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	117.99	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	118.08	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	118.12	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	118.16	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	118.23	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	118.53	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	118.77	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	118.85	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	119.10	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	119.26	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	133.60	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	133.64	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	133.69	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	117.16	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 150,439.81
2050 Sew. Ac. = 28,610.82
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	98.91	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	100.56	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	100.58	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	100.58	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	100.60	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	101.28	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	101.49	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	101.73	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	101.90	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	102.07	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	102.16	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	102.19	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	102.35	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	125.38	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	125.35	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	125.29	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	125.31	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	125.36	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	125.39	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	125.42	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	125.49	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	125.84	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	126.09	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	126.18	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	126.43	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	126.62	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	145.87	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	145.90	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	145.94	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	125.99	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 169,512.59
2070 Sew. Ac. = 31,075.63
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

OPTION 5b

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	4.92	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	4.93	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	4.95	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	4.97	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	4.98	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	4.98	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	4.99	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	4.99	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	4.99	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	5.00	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	5.00	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	5.01	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	5.02	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	5.03	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	5.04	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	5.15	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	5.06	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	5.07	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	5.07	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	5.09	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	5.10	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	5.14	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.10	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.10	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.10	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	0.10	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	0.10	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	5.16	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	5.17	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	-0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.19	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.21	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2000

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2000 Eq. Pop. = 7,909.96
2000 Sew. Ac. = 1,157.56

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	5.23	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	5.24	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	5.26	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	5.28	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	5.29	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	5.29	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	5.30	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	5.30	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	5.30	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	5.31	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	5.31	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	5.33	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	5.34	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	5.35	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	5.36	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	5.47	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	5.38	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	5.39	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	5.39	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	5.40	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	5.41	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	5.46	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.11	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.11	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.11	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	0.10	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	0.10	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	5.48	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	5.49	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	-0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.45	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.47	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2005

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2005 Eq. Pop. = 8,402.56
2005 Sew. Ac. = 1,229.65

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	6.27	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	6.29	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	6.37	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	6.46	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	6.56	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	6.58	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	6.63	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	6.67	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	6.70	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	6.74	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	6.76	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	6.78	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	6.79	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	6.80	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	6.81	36	10 04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	6.88	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	6.82	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	6.83	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	6.83	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	6.84	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	6.85	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	6.87	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.04	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.04	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.04	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	0.03	16	0.00	0	0.00	0.00	301.59	0 00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	0.04	16	11.50	0	0.00	11.50	628.32	0 00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	6.89	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	6.90	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	-0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.96	27	25.47	0	0.00	25.47	25,764.96	0 00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.97	27	24.49	0	0 00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2010

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2010 Eq. Pop. = 8,895.16
2010 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	6.96	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	6.99	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.11	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	7.26	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	7.43	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	7.45	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	7.53	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	7.60	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	7.66	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	7.72	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	7.76	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	7.78	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	7.78	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	7.79	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	7.80	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	7.85	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	7.81	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	7.82	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	7.82	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	7.82	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	7.82	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	7.84	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.02	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.02	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.02	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.02	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.01	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	7.85	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	7.85	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	5.27	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	5.28	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2015

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2015 Eq. Pop. = 9,134.77
2015 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	7.66	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	7.70	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.85	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	8.06	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	8.29	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	8.33	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	8.43	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	8.54	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	8.62	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	8.70	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	8.75	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	8.77	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	8.77	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	8.78	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	8.79	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	8.81	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	8.80	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	8.80	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	8.80	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	8.80	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	8.80	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	8.80	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.07	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.07	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.07	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.07	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.06	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	8.81	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	8.81	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	5.58	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	5.58	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2020

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2020 Eq. Pop. = 9,374.37
2020 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	7.09	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	7.16	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.40	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	7.76	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	8.15	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	8.23	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	8.40	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	8.59	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	8.74	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	8.88	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	8.98	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	8.99	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	8.98	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	8.98	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	9.00	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	8.88	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	8.98	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	8.97	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	8.97	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	8.95	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	8.94	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	8.88	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.26	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.25	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	8.87	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	8.85	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.33	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.31	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b** **2050**

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2050 Eq. Pop. = 11,289.18
2050 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	7.09	36	142.07	0	3.52	145.59	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	7.16	36	44.89	0	3.54	48.43	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.40	36	13.97	0	3.61	17.58	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	7.76	36	10.16	0	3.70	13.86	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	8.15	36	10.25	0	3.81	14.06	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	8.23	36	10.00	0	3.83	13.83	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	8.40	36	10.20	0	3.88	14.08	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	8.59	36	10.29	0	3.92	14.21	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	8.74	36	10.13	0	3.96	14.09	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	8.88	36	10.18	0	4.00	14.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	8.98	36	10.25	0	4.02	14.27	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	8.99	36	10.20	0	5.52	15.72	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	8.98	36	9.95	0	5.52	15.47	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	8.98	36	10.22	0	5.53	15.75	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	9.00	36	10.04	0	5.53	15.57	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	8.88	27	12.53	0	4.37	16.90	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	8.98	36	10.22	0	3.06	13.28	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	8.97	36	10.13	0	3.06	13.19	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	8.97	30	8.88	0	4.36	13.24	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	8.95	30	10.86	0	4.36	15.22	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	8.94	27	21.09	0	2.03	23.12	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	8.88	27	6.66	0	2.03	8.69	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	27	8.08	0	0.04	8.12	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	-16.02	0	0.04	-15.98	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	0.00	0	0.04	0.04	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.26	16	0.00	0	0.04	0.04	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.25	16	11.50	0	0.04	11.54	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	8.87	27	8.97	0	2.03	11.00	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	8.85	30	11.53	0	2.03	13.56	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.33	27	25.47	0	3.15	28.62	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.31	27	24.49	0	4.17	28.66	6,083.39	0.00

DESIGN CONDITION: **OPTION 5b**
2070

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2070 Eq. Pop. = 11,289.18
2070 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

OPTION 6a

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	60.14	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	61.82	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	61.83	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	61.83	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	61.85	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	62.33	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	62.48	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	62.60	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	62.68	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	62.76	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	62.81	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	62.84	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	62.88	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	66.28	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	66.28	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	66.32	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	66.39	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	66.49	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	66.54	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	66.57	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	66.60	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	66.75	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	66.88	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	66.91	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	67.07	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	67.14	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	70.06	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	70.08	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	70.14	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	64.06	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 69,948.30
2000 Sew. Ac. = 14,709.75
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,569,370.81 $6,533,652.29
+ Engr., ROW, Financ., Conting. (1.5x) = $12,854,056.21 $9,800,478.44

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	65.97	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	67.90	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	67.91	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	67.91	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	67.93	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	68.48	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	68.64	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	68.77	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	68.86	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	68.94	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	69.00	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	69.03	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	69.07	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	71.97	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	71.98	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	72.03	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	72.11	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	72.23	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	72.29	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	72.32	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	72.36	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	72.52	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	72.65	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	72.69	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	72.87	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	72.94	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	75.46	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	75.49	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	75.56	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	69.29	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 75,006.22
2005 Sew. Ac. = 16,002.64
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,277,334.79 $7,792,254.93
+ Engr., ROW, Financ., Conting. (1.5x) = $13,916,002.18 $11,688,382.40

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	70.24	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	72.31	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	72.32	90	86.61	84	72.06	1.49	58,050.69	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	72.32	90	86.61	84	72.06	72.06	119,282.25	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	72.34	90	86.64	84	72.08	146.39	54,869.83	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	72.92	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	73.10	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	73.24	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	73.34	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	73.43	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	73.48	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	73.52	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	73.56	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	76.57	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	76.58	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	76.63	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	76.72	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	76.85	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	76.91	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	76.95	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	76.99	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	77.16	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	77.30	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	77.35	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	77.54	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	77.62	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	80.23	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	80.26	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	80.34	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	73.68	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 80,064.14
2010 Sew. Ac. = 17,107.83
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,831,475.92 $8,483,275.53
+ Engr., ROW, Financ., Conting. (1.5x) = $14,747,213.88 $12,724,913.30

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	88.34	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	91.33	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	91.38	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	92.17	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	92.40	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	92.57	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	92.69	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	92.80	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	92.87	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	92.92	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	92.95	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	92.16	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	92.18	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	92.28	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	92.42	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	92.63	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	92.72	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	92.77	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	92.82	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	93.01	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	93.18	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	93.23	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	93.48	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	93.56	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	93.06	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	93.11	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	93.22	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	87.25	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 6a** F.W. Model Eq. Pop. = 57,207.50 93,287.50 2015 Eq. Pop. = 89,256.39 TOTAL ESTIM. CONST. COST = $11,279,590.65 $9,831,475.92
DESIGN YEAR: **2015** F.W. Model Sew. Ac. = 9,004.81 20,981.33 2015 Sew. Ac. = 20,353.79 + Engr., ROW, Financ., Conting. (1.5x) = $16,919,385.98 $14,747,213.88
Constant Intel Flow = 6.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST. DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	98.86	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	101.52	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	101.54	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	101.54	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	101.57	96	102.91	90	86164	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	102.37	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	102.61	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	102.82	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	102.97	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	103.11	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	103.19	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	103.24	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	103.33	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	112.36	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	112.36	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	112.40	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	112.50	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	112.66	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	112.73	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	112.77	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	112.84	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	113.10	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	113.32	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	113.39	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	113.66	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	113.79	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	121.44	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	121.49	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	121.58	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	109.37	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 129,181.14
2050 Sew. Ac. = 26,316.11
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	100.68	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	102.98	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	102.99	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	102.99	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	103.02	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	103.78	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	104.02	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	104.25	96	125.41	90	105.58	137.97	391,768.84	344,328.08
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	104.41	96	125.58	90	105.73	134.76	326,624.83	287,072.60
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	104.56	96	125.74	90	105.86	139.68	505,770.86	444,525.17
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	104.65	96	125.84	90	105.94	134.65	277,766.82	244,131.00
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	104.69	96	125.91	90	106.00	137.72	228,004.04	200,394.17
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	104.81	96	125.97	90	106.05	141.24	230,718.37	202,779.82
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	119.76	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	119.76	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	119.75	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	119.83	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	119.94	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	119.99	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	120.04	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	120.10	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	120.41	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	120.65	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	120.72	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	120.99	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	121.15	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	133.71	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	133.75	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	133.83	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	118.20	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 148,253.92
2070 Sew. Ac. = 28,780.92
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,432,355.48 $10,908,281.81
+ Engr., ROW, Financ., Conting. (1.5x) = $18,648,533.22 $16,362,422.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

OPTION 6b

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	20.01	60	22.34	54	16.87	158.94	$7,068.58	$5,725.55
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	20.12	60	22.46	54	16.96	61.85	28,274.31	22,902.19
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	20.55	60	22.91	54	17.30	31.27	115,571.24	93,612.71
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	21.13	60	23.52	54	17.76	27.92	178,835.01	144,856.36
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	21.76	60	24.18	54	18.26	28.51	290,871.96	235,606.29
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	21.87	60	24.30	54	18.35	28.35	66,798.06	54,106.43
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	22.16	60	24.61	54	18.58	28.78	202,161.32	163,750.67
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	22.45	60	24.91	54	18.81	29.10	189,437.88	153,444.68
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	22.68	60	25.15	54	18.99	29.12	224,780.76	182,072.42
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	22.91	60	25.39	54	19.17	29.35	283,803.39	229,880.74
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	23.06	60	25.55	54	19.29	29.54	310,310.55	251,351.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	23.11	54	26.46	48	19.33	29.53	163,178.11	128,930.85
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	23.10	54	26.46	48	19.33	29.28	16,890.37	13,345.47
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	23.13	54	26.49	48	19.35	29.57	247,916.22	195,884.42
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	23.16	54	26.53	48	19.38	29.42	210,413.88	166,252.94
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	23.18	54	37.96	48	27.73	40.26	214,708.04	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	23.18	54	26.56	48	19.40	29.62	97,334.31	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	23.18	54	26.56	48	19.40	29.53	79,298.84	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	23.18	48	27.70	42	19.40	28.28	40,488.81	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	23.18	48	27.70	42	19.40	30.26	166,026.75	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	23.17	48	27.70	42	19.40	40.49	49,762.79	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	23.16	48	27.70	42	19.40	26.06	500,116.00	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.23	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.23	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.23	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.23	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.21	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	23.18	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	23.18	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	14.41	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	14.41	30	16.29	18	4.17	28.66	7,510.36	2,703.73

DESIGN CONDITION: **OPTION 6b**
2000

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2000 Eq. Pop. = 23,952.45
2000 Sew. Ac. = 3,176.17

TOTAL ESTIM. CONST. COST = $3,906,414.01 $3,092,629.89
+ Engr., ROW, Financ., Conting. (1.5x) = $5,859,621.02 $4,638,944.84

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	21.10	60	22.34	54	16.87	158.94	$7,068.58	$5,725.55
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	21.22	60	22.46	54	16.96	61.85	28,274.31	22,902.19
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	21.66	60	22.91	54	17.30	31.27	115,571.24	93,612.71
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	22.27	60	23.52	54	17.76	27.92	178,835.01	144,856.36
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	22.93	60	24.18	54	18.26	28.51	290,871.96	235,606.29
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	23.05	60	24.30	54	18.35	28.35	66,798.06	54,106.43
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	23.35	60	24.61	54	18.58	28.78	202,161.32	163,750.67
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	23.66	60	24.91	54	18.81	29.10	189,437.88	153,444.68
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	23.90	60	25.15	54	18.99	29.12	224,780.76	182,072.42
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	24.13	60	25.39	54	19.17	29.35	283,803.39	229,880.74
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	24.29	60	25.55	54	19.29	29.54	310,310.55	251,351.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	24.34	54	26.46	48	19.33	29.53	163,178.11	128,930.85
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	24.34	54	26.46	48	19.33	29.28	16,890.37	13,345.47
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	24.36	54	26.49	48	19.35	29.57	247,916.22	195,884.42
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	24.40	54	26.53	48	19.38	29.42	210,413.88	166,252.94
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	24.43	54	37.96	48	27.73	40.26	214,708.04	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	24.42	54	26.56	48	19.40	29.62	97,334.31	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	24.42	54	26.56	48	19.40	29.53	79,298.84	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	24.42	48	27.70	42	19.40	28.28	40,488.81	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	24.42	48	27.70	42	19.40	30.26	166,026.75	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	24.41	48	27.70	42	19.40	40.49	49,762.79	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	24.40	48	27.70	42	19.40	26.06	500,116.00	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.24	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.24	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.24	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.24	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.21	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	24.42	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	24.42	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	15.22	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	15.22	30	16.29	18	4.17	28.66	7,510.36	2,703.73

DESIGN CONDITION: **OPTION 6b**
2005

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2005 Eq. Pop. = 25,333.66
2005 Sew. Ac. = 3,363.38

TOTAL ESTIM. CONST. COST = $3,906,414.01 $3,092,629.89
+ Engr., ROW, Financ., Conting. (1.5x) = $5,859,621.02 $4,638,944.84

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	23.81	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	23.96	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	24.54	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	25.34	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	26.22	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	26.38	66	31.34	54	18.35	28.35	80,825.65	54,106.43
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	26.78	66	31.73	54	18.58	28.78	244,615.19	163,750.67
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	27.19	66	32.12	54	18.81	29.10	229,219.83	153,444.68
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	27.51	60	25.15	54	18.99	29.12	224,780.76	182,072.42
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	27.82	66	32.74	54	19.17	29.35	343,402.10	229,880.74
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	28.04	66	32.94	54	19.29	29.54	375,475.77	251,351.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	28.09	60	35.05	48	19.33	29.53	201,454.46	128,930.85
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	28.08	60	35.05	48	19.33	29.28	20,852.30	13,345.47
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	28.10	60	35.08	48	19.35	29.57	306,069.41	195,884.42
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	28.14	60	35.14	48	19.38	29.42	259,770.22	166,252.94
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	28.08	54	37.96	48	27.73	40.26	214,708.04	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	28.15	54	26.56	48	19.40	29.62	97,334.31	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	28.14	54	26.56	48	19.40	29.53	79,298.84	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	28.14	54	37.92	42	19.40	28.28	51,243.65	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	28.12	54	37.92	42	19.40	30.26	210,127.60	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	28.11	54	37.92	42	19.40	40.49	62,981.03	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	28.06	54	37.92	42	19.40	26.06	632,959.31	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.42	48	0.56	30	0.16	8.24	2,261.94	883.57
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.42	48	0.56	30	0.16	-15.86	2,940.53	1,148.64
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.42	48	0.56	30	0.16	0.16	1,357.17	530.14
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.41	48	0.56	30	0.16	0.16	2,714.33	1,060.29
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.37	48	0.49	30	0.14	11.64	5,654.86	2,208.93
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	28.06	48	27.73	30	7.92	16.89	68,310.73	26,683.88
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	28.05	48	27.73	30	7.92	19.45	66,727.37	26,065.38
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.01	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	16.58	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	16.56	30	16.29	27	12.30	36.79	7,510.36	6,083.39

DESIGN CONDITION: **OPTION 6b**
2010

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2010 Eq. Pop. = 26,714.86
2010 Sew. Ac. = 3,446.17

TOTAL ESTIM. CONST. COST = $4,608,436.86 $3,157,689.96
+ Engr., ROW, Financ., Conting. (1.5x) = $6,912,655.28 $4,736,534.94

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	25.73	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	25.91	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	26.59	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	27.53	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	28.58	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	28.77	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	29.24	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	29.73	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	30.12	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	30.49	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	30.74	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	30.80	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	30.78	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	30.81	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	30.85	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	30.72	60	50.27	48	27.73	40.26	265,071.66	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	30.85	60	35.17	48	19.40	29.62	120,165.82	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	30.83	60	35.17	48	19.40	29.53	97,899.80	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	30.83	54	37.92	42	19.40	28.28	51,243.65	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	30.80	54	37.92	42	19.40	30.26	210,127.60	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	30.78	54	37.92	42	19.40	40.49	62,981.03	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	30.69	54	37.92	42	19.40	26.06	632,959.31	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.56	48	0.56	30	0.16	8.24	2,261.94	883.57
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.56	48	0.56	30	0.16	-15.86	2,940.53	1,148.64
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.56	48	0.56	30	0.16	0.16	1,357.17	530.14
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.54	48	0.56	30	0.16	0.16	2,714.33	1,060.29
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.50	48	0.49	30	0.14	11.64	5,654.86	2,208.93
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	30.69	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	30.67	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.02	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	17.48	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	17.45	30	16.29	27	12.30	36.79	7,510.36	6,083.39

DESIGN CONDITION: **OPTION 6b** **2015**

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2015 Eq. Pop. = 27,521.61
2015 Sew. Ac. = 3,472.90

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,584,999.61
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 5,377,499.41

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	27.65	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	27.85	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	28.63	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	29.73	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	30.93	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	31.16	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	31.71	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	32.28	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	32.73	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	33.15	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	33.45	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	33.51	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	33.48	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	33.51	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	33.56	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	33.35	60	50.27	54	37.96	50.49	265,071.66	214,708.04
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	33.54	60	35.17	54	26.56	36.78	120,165.82	97,334.31
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	33.51	60	35.17	54	26.56	36.69	97,899.80	79,298.84
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	33.51	54	37.92	48	27.70	36.58	51,243.65	40,488.81
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	33.47	54	37.92	48	27.70	38.56	210,127.60	166,026.75
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	33.45	54	37.92	48	27.70	48.79	62,981.03	49,762.79
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	33.33	54	37.92	48	27.70	34.36	632,959.31	500,116.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.71	48	0.56	48	0.56	8.64	2,261.94	2,261.94
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.71	48	0.56	48	0.56	-15.46	2,940.53	2,940.53
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.71	48	0.56	48	0.56	0.56	1,357.17	1,357.17
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.68	48	0.56	48	0.56	0.56	2,714.33	2,714.33
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.63	48	0.49	48	0.49	11.99	5,654.86	5,654.86
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	33.31	48	27.73	48	27.73	36.70	68,310.73	68,310.73
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	33.28	48	27.73	48	27.73	39.26	66,727.37	66,727.37
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.03	36	0.00	36	0.00	9.86	19,085.16	19,085.16
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	18.38	36	20.00	36	20.00	45.47	45,804.38	45,804.38
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	18.34	30	16.29	30	16.29	40.78	7,510.36	7,510.36

DESIGN CONDITION: **OPTION 6b**
2020

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2020 Eq. Pop. = 28,328.36
2020 Sew. Ac. = 3,499.63

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,906,414.01
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 $5,859,621.02

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	26.09	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	26.33	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	27.27	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	28.61	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	30.10	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	30.38	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	31.05	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	31.77	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	32.33	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	32.85	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	33.22	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	33.27	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	33.22	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	33.24	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	33.28	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	32.84	60	50.27	54	37.96	50.49	265,071.66	214,708.04
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	33.22	60	35.17	54	26.56	36.78	120,165.82	97,334.31
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	33.17	60	35.17	54	26.56	36.69	97,899.80	79,298.84
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	33.17	54	37.92	48	27.70	36.58	51,243.65	40,488.81
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	33.10	54	37.92	48	27.70	38.56	210,127.60	166,026.75
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	33.05	54	37.92	48	27.70	48.79	62,981.03	49,762.79
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	32.83	54	37.92	48	27.70	34.36	632,959.31	500,116.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-1.02	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.95	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	32.77	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	32.72	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.05	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	15.73	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	15.66	30	16.29	24	8.98	33.47	7,510.36	4,806.63

DESIGN CONDITION: **OPTION 6b**
2050

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2050 Eq. Pop. = 32,547.85
2050 Sew. Ac. = 3,549.06

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,848,734.42
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 $5,773,101.63

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	26.09	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	26.33	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	27.27	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	28.61	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	30.10	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	30.38	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	31.05	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	31.77	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	32.33	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	32.85	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	33.22	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	33.27	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	33.22	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	33.24	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	33.28	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	32.84	60	50.27	54	37.96	50.49	265,071.66	214,708.04
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	33.22	60	35.17	54	26.56	36.78	120,165.82	97,334.31
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	33.17	60	35.17	54	26.56	36.69	97,899.80	79,298.84
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	33.17	54	37.92	48	27.70	36.58	51,243.65	40,488.81
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	33.10	54	37.92	48	27.70	38.56	210,127.60	166,026.75
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	33.05	54	37.92	48	27.70	48.79	62,981.03	49,762.79
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	32.83	54	37.92	48	27.70	34.36	632,959.31	500,116.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-1.02	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.95	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	32.77	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	32.72	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.05	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	15.73	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	15.66	30	16.29	24	8.98	33.47	7,510.36	4,806.63

DESIGN CONDITION: **OPTION 6b** **2070**

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2070 Eq. Pop. = 32,547.85
2070 Sew. Ac. = 3,549.06

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,848,734.42
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 $5,773,101.63

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

PIPE DIA.	1997 F.W.M.P. CONST. COST. (Per Ft.)	2000 ESTIM. CONST. COST (Per Ft.)	ESTIM. CONST. COST (Per In.)	PIPE AREA (sq. in.)	ESTIM. CONST. COST (Per S.I.)
4	32.31	34.41	8.60	12.57	2.7383
6	83.04	88.44	14.74	28.27	3.1279
8	87.32	93.00	11.62	50.27	1.8501
10	95.88	102.11	10.21	78.54	1.3001
12	99.03	105.47	8.79	113.10	0.9325
15	102.18	108.82	7.25	176.71	0.6158
18	105.33	112.18	6.23	254.47	0.4408
24	108.47	115.52	4.81	452.39	0.2554
30	122.64	130.61	4.35	706.86	0.1848
36	142.45	151.71	4.21	1,017.87	0.1490
42	195.22	207.91	4.95	1,385.44	0.1501
48	229.84	244.78	5.10	1,809.55	0.1353
54	276.31	294.27	5.45	2,290.21	0.1285
60	325.13	346.26	5.77	2,827.42	0.1225
66	366.75	390.59	5.92	3,421.18	0.1142
72	457.97	487.74	6.77	4,071.49	0.1198
78	506.32	539.23	6.91	4,778.34	0.1128
84	566.77	603.61	7.19	5,541.75	0.1089
90	662.43	705.49	7.84	6,361.70	0.1109
96	743.15	791.45	8.24	7,238.20	0.1093
108	990.71	1,055.11	9.77	9,160.85	0.1152
120	1,429.60	1,522.52	12.69	11,309.69	0.1346
				Avg = (Above 30")	0.1239

TAB 8

TEXAS WATER DEVELOPMENT BOARD

CONTRACT

ENGINEERING SERVICES AGREEMENT

AND

MISCELLANEOUS CORRESPONDENCE

COPY

CITY OF
NORTH RICHLAND HILLS

Department: Public Works Department Council Meeting Date: 6/14/99

Subject: Approve Regional Facility Planning Contract with the Texas Water Development Board for the Big Fossil Creek Wastewater System – Resolution No. 99-38

Agenda Number:

The Big Fossil Creek Wastewater Outfall System affects four separate entities. Richland Hills has a 36-inch wastewater outfall that was installed in the 1950's by the previous owner of Richland Hills and North Richland Hills water and sewer systems. North Richland Hills has a large amount of wastewater that flows down this outfall. The city of Fort Worth has a 48-inch wastewater outfall down this same creek bottom that carries flows from the city of Fort Worth customers as well as Haltom City's wastewater flows.

All four cities have received Administrative Orders (AO) from the United States Environmental Protection Agency (EPA) with this Big Fossil Creek Wastewater Outfall System being recognized as needing to be studied in detail to decide the best plan for increasing the capacity to meet ultimate needs. Only a portion of the Big Fossil Creek service area has been developed.

Previously, the planning grant application was submitted to the Texas Water Development Board (TWDB) by the city of Fort Worth, but was not approved. The TWDB staff gave indications that it would be better received if one of the other three cities (North Richland Hills, Richland Hills, or Haltom City) involved be the one submitting for the grant. North Richland Hills offered to be the lead city on this grant. When we resubmitted the application early this year, it was approved.

The TWDB has sent a revised contract for North Richland Hills to execute and return. Staff previously reviewed the contract and made comments. The main items covered by the contract are listed below.

1. Contract execution deadline is July 8, 1999.
2. Study completion date is August 31, 1999 with the final report deadline being October 31, 1999.
3. The study will identify three cost-effective alternatives for providing wastewater system capacity for the four cities.
4. Total study costs are $59,950 with the TWDB paying $29,975 of the total.
5. The City of North Richland Hills is responsible for $29,975. This cost will be split evenly between Richland Hills, Fort Worth, Haltom City, and North Richland Hills.

Finance Review

Source of Funds:
Bonds (GO/Rev.) ____
Operating Budget ____
Other ____

Account Number
Sufficient Funds Available

Larry Koonce Finance Director

Gregory A. Dickens
Department Head Signature

City Manager Signature

The other three cities have obligated themselves for one-fourth of the study costs, up to $7,500 each. North Richland Hills has sufficient money in the Unspecified Utility CIP Fund for paying it's share (approximately $7,500).

Recommendation: To approve Resolution No. 99-38.

RESOLUTION NO. 99-38

BE IT RESOLVED by the City Council of the City of North Richland Hills, Texas, that:

1.

The City Manager be, and is hereby authorized to execute the attached Agreement with the Texas Water Development Board concerning the Regional Facility Planning Grant for a study on the Big Fossil Creek Wastewater Outfall System serving North Richland Hills, Richland Hills, Fort Worth, and Haltom City, as an act and deed of the City.

PASSED AND APPROVED this the 14th day June, 1999.

____
Charles Scoma, Mayor

ATTEST:

____
Patricia Hutson, City Secretary

APPROVED AS TO LEGALITY:

____
Rex McEntire, Attorney for the City

APPROVED AS TO CONTENT:

Gregory W. Dickens

Gregory W. Dickens, Public Works Director

(CM) file

TEXAS WATER DEVELOPMENT BOARD

RECEIVED MAY 24 1999

May 14, 1999

Mr. Larry J. Cunningham
City Manager
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Re: Regional Facility Planning Contract Between the City of North Richland Hills (City) and the Texas Water Development Board (Board)

Dear Mr. Cunningham:

Enclosed are three copies of a regional facility planning contract between the Board and the City. The deadline for execution of this contract is July 8, 1999.

The Board's share of the $59,950.00 facility plan is $29,975.00 or 50 percent to be provided from the Research and Planning Fund. The local share of the plan will be provided by the City in the amount of $29,975.00 in cash and $0.00 in in-kind services.

Please sign and date all three copies of the contract by July 8, 1999, retain a copy for your files and return the remaining two executed copies, along with the City's federal or state vendor identification number, to the attention of the Board's Research and Planning Fund Grants Management Division.

A Payment Request Checklist and return address labels are enclosed for your information and use. If you have any questions concerning this contract, please contact Mr. Ralph Boeker, the Board's designated Contract Manager for this study, at (512) 936-0851.

Sincerely,

Tommy Knowles

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

Enclosures

Cc: Gregory W. Dickens, P.E.
Ralph Boeker, TWDB

:STATE OF TEXAS TWDB Contract No. 99-483-308

COUNTY OF TRAVIS Research and Planning Fund

Regional Facility Planning

THIS Contract, (hereinafter "CONTRACT"), between the Texas Water Development Board (hereinafter "BOARD") and the City of North Richland Hills (hereinafter "CONTRACTOR (S)"), is composed of two parts: Section I. Specific Conditions and Exceptions to the Standard Agreement and Section II. Standard Agreement. The terms and conditions set forth in Section I will take precedence over terms and conditions in Section II.

SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT

ARTICLE I. DEFINITIONS: For the purposes of this Contract, the following terms or phrases shall have the meaning ascribed therewith:

A. BOARD - The Texas Water Development Board, or its designated representative

B. CONTRACTOR (S) - City of North Richland Hills

C. EXECUTIVE ADMINISTRATOR - The Executive Administrator of the Board or his designated representative

D. PARTICIPANT (S) - City of North Richland Hills, City of Fort Worth, City of Richland Hills, and City of Haltom City

E. REQUIRED INTERLOCAL AGREEMENT (S) -Not applicable

F. REGIONAL PLAN - Regional wastewater facility

G. BOARD APPROVAL DATE - April 8, 1999

H. PLANNING AREA - The planning area is the Fossil Creek Basin of the Trinity River. The project area is more specifically defined in Exhibit A (the original grant application).

I. DEADLINE FOR CONTRACT EXECUTION - July 8, 1999

J. CONTRACT INITIATION DATE - April 8, 1999

K. STUDY COMPLETION DATE - August 31, 1999

SECTION II. STANDARD AGREEMENT

ARTICLE I. RECITALS

Whereas, the CONTRACTOR (S) applied to the BOARD, Austin, Texas for a planning grant to develop a REGIONAL FACILITY PLAN;

Whereas, the CONTRACTOR (S) and PARTICIPANT (S) will commit cash and/or in-kind services to pay for the local share of this planning project;

Whereas, the CONTRACTOR (S) is the entity who will act as administrator of the BOARD's planning grant and will be responsible for the execution of this contract;

Whereas, on the BOARD APPROVAL DATE, the BOARD approved the CONTRACTOR (S)'s application for financial assistance;

Now, therefore, the BOARD and the CONTRACTOR (S), agree as follows:

ARTICLE II. PROJECT DESCRIPTION AND SERVICES TO BE PERFORMED

1. Services and activities provided under this Contract shall be in strict accordance with requirements of the Texas Water Code, Chapter 15; associated rules of the Texas Administrative Code, Chapter 355, Sections 355.1-355.11, Subchapter A; Exhibit A, the original grant application, which is incorporated herein and made a permanent part of this Contract; and this Contract.

2. The CONTRACTOR (S) will prepare a REGIONAL FACILITY PLAN for the PLANNING AREA, as delineated and described in Exhibit A, according to the Scope of Work contained in Exhibit B. The CONTRACTOR (S) will consider BOARD population and water use projections, and if not used in the REGIONAL FACILITY PLAN, provide an explanation of why not used. Where applicable, the CONTRACTOR (S) will develop water conservation plans according to Texas Administrative Code, Chapters 363.15, 363.71, 375.37, and 375.101.

3. The CONTRACTOR (S) will establish formal, direct, and continuous liaisons with all cities, counties, councils of governments, river authorities, regional water planning groups designated under Texas Water Code §16.053 and 31 Texas Administrative Code §357.4, and all applicable state agencies, federal agencies, and other governmental entities in the PLANNING AREA, and all entities providing water and/or wastewater service in the PLANNING AREA for the purpose of coordinating the scope of work and REGIONAL FACILITY PLAN with all existing studies, plans, or activities for the purpose of providing information and obtaining available data for the development of the REGIONAL FACILITY PLAN.

ready original, and nine (9) bound double-sided copies of the final report to the EXECUTIVE ADMINISTRATOR no later than the FINAL REPORT DEADLINE. The CONTRACTOR (S) will submit one (1) electronic copy of any computer programs, maps, or models and an operations manual developed under the terms of this Contract.

5. The CONTRACTOR (S) will submit progress reports with submittal of vouchers according to the VOUCHER SUBMISSION SCHEDULE. Progress reports shall be in written form and shall include a brief statement of the overall progress made since the last status report; a brief description of any problems that have been encountered during the previous reporting period that will affect the study, delay the timely completion of any portion of this Contract, inhibit the completion of or cause a change in any of the study's products or objectives; and a description of any action the CONTRACTOR (S) plans to take to correct any problems that have been encountered.

6. The EXECUTIVE ADMINISTRATOR can extend the COMPLETION DATE and the FINAL REPORT DEADLINE upon written approval. The CONTRACTOR (S) should submit a written request to the EXECUTIVE ADMINISTRATOR at least thirty (30) working days prior to the COMPLETION DATE or thirty (30) days prior to the FINAL REPORT DEADLINE for an extension to the respective dates and explanation of why the deadlines have not been met.

ARTICLE IV. COMPENSATION AND REIMBURSEMENT

1. The BOARD agrees to compensate and reimburse the CONTRACTOR (S) in a total amount not to exceed the BOARD'S SHARE OF THE TOTAL STUDY COSTS for costs incurred and paid by the CONTRACTOR (S) pursuant to performance of this Contract. The CONTRACTOR (S) will contribute local matching funds in sources and amounts defined as the LOCAL SHARE OF THE TOTAL STUDY COSTS. The BOARD shall reimburse the CONTRACTOR (S) for ninety percent (90%) of the BOARD's share of each invoice pending the CONTRACTOR (S)'s performance, completion of a Final Report, and written acceptance of said Final Report by the EXECUTIVE ADMINISTRATOR, at which time the BOARD shall pay the retained ten percent (10%) to the CONTRACTOR (S).

2. The CONTRACTOR (S) shall submit vouchers and documentation for reimbursement billing according to the VOUCHER SUBMISSION SCHEDULE and in accordance with the approved task and expense budgets contained in Exhibit C to this Contract. At the discretion of the EXECUTIVE ADMINISTRATOR and upon written memorandum to the contract file, the CONTRACTOR (S) has budget flexibility within task and expense budget categories to the extent that the resulting change in amount in any one task or

C. For travel and subsistence expenses, including such expenses for subcontractors --

(1) names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Law Regular Session, 1997, Art. IX, Sec. 13 through 21, at IX-54 or as amended or superseded;

(2) other transportation costs -- copies of invoices covering tickets for transportation or, if not available, names, dates, and points of travel of individuals; and

(3) all other reimbursable expenses -- invoices or purchase vouchers showing reason for expense with receipts to evidence the amount incurred.

ARTICLE V. OWNERSHIP, PUBLICATION, AND SUBCONTRACTING

1. The BOARD shall have unlimited rights to technical or other data resulting directly from the performance of services under this Contract. It is agreed that all reports, drafts of reports, or other material, data, drawings, computer programs and codes associated with this Contract and developed by the CONTRACTOR(S) or its subcontractors pursuant to this Contract shall become the joint property of the CONTRACTOR(S) and the BOARD. These materials shall not be copyrighted or patented by the CONTRACTOR (S) or by any consultants involved in this Contract unless the EXECUTIVE ADMINISTRATOR approves in writing the right to establish copyright or patent; provided, however, that copyrighting or patenting by the CONTRACTOR (S) or its subcontractors will in no way limit the BOARD's access to or right to request and receive or distribute data and information obtained or developed pursuant to this Contract. Any material subject to a BOARD copyright and produced by the CONTRACTOR (S) or BOARD pursuant to this Contract may be printed by the CONTRACTOR (S) or the BOARD at their own cost and distributed by either at their discretion. The CONTRACTOR (S) may otherwise utilize such material provided under this Contract as it deems necessary and appropriate, including the right to publish and distribute the materials or any parts thereof under its own name, provided that any BOARD copyright is appropriately noted on the printed materials.

2. The CONTRACTOR (S) agrees to acknowledge the BOARD in any news releases or other publications relating to the work performed under this Contract.

3. No work herein called for by the CONTRACTOR (S) shall be reimbursed for expenses by the BOARD to the CONTRACTOR (S) without prior written approval

ARTICLE VIII. LICENSES, PERMIT, AND INSURANCE

1. For the purpose of this Contract. the CONTRACTOR (S) will be considered an independent contractor and therefore solely responsible for liability resulting from negligent acts or omissions. The CONTRACTOR (S) shall obtain all necessary insurance, in the judgement of the CONTRACTOR (S), to protect themselves, the BOARD, and employees and officials of the BOARD from liability arising out of this Contract. The CONTRACTOR (S) shall indemnify and hold the BOARD and the State of Texas harmless, to the extent the CONTRACTOR (S) may do so in accordance with state law, from any and all loses, damages, liability, or claims therefore, on account of personal injury, death, or property damage of any nature whatsoever caused by the CONTRACTOR (S), arising out of the activities under this Contract.

2. The CONTRACTOR (S) shall be solely and entirely responsible for procuring all appropriate licenses and permits, which may be required by any competent authority for the CONTRACTOR (S) to perform the subject, work.

ARTICLE IX. SEVERANCE PROVISION

1. Should any one or more provisions of this Contract be held to be null, void, voidable, or for any reason whatsoever, of no force and effect, such provision(s) shall be construed as severable from the remainder of this Contract and shall not affect the validity of all other provisions of this Contract which shall remain of full force and effect.

ARTICLE X. CORRESPONDENCE

All correspondence between the parties shall be made to the following addresses:

For the **BOARD**:
Mr. Craig D. Pedersen
Executive Administrator
Texas Water Development Board
P.O. Box 13231, Capitol Station
Austin, Texas 78711-3231

For the **CONTRACTOR(S)**:
Mr. Gregory W. Dickens, P.E.
Public Works Director
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Attention: Research and Planning Fund
Grants Management Division

EXHIBIT A

ORIGINAL GRANT APPLICATION

EXHIBIT B

SCOPE OF WORK

Discussion of the year 2000 baseline calibration table, "7-0":

Upstream and Downstream Stations -- these stations correspond to the same station numbers used in the Fort Worth Master Plan report and are shown on the attached Appendix "D" table on pages 192, and 193, for the line segment between the Forth Worth West Fork 96" S.S. and Broadway Blvd. The Richland Hills meter is located below Station M402A/0040+28, which is delineated with a horizontal line.

Length (ft.) -- The length of each line segment is shown, and corresponds to the Master Plan length. It is assumed that the proposed parallel line will be roughly equivalent in length to the existing line.

Existing Diameter (in) -- The existing pipe diameter is noted. The siphon section has been changed to show the revised pipe diameter of 50.71-inches which is equivalent to the existing parallel 24-inch and 48-inch diameter siphon pipes. The Fort Worth Master Plan table only shows the 24-inch pipe.

Existing Pipe Capacity (MGD) -- This is the computed capacity of the existing pipe based on the Colbrook-White equations. Capacities of the proposed replacement and parallel pipes are based on the Mannings Equation, and compare favorably with the results of the Colbrook-White equation when using existing pipe flowline grades for the hydraulic slope and a Mannings "n" factor of 0.0145.

2000 Model Flow (MGD) -- This column shows the flow rates presented in the Fort Worth Master Plan for the year 2000. These flows include a uniform 10 MGD rate for the Intel Plant Site. The 10 MGD is subtracted from each flow value before computing the calibration coefficients "A" and "B", which are based only on equivalent population and sewered areas. The equivalent population of 57,207.5 and sewered area of 9,004.81 are shown at the bottom of this column.

2020 Model Flow (MGD) -- These flow rates correspond to the projected flows in the year 2020 from the Fort Worth Master Plan. The equivalent population of 93,287.50 and sewered area of 20,981.33 are shown at the bottom of this column. The flow rates vary from a minimum of 18.71 MGD to a maximum flow of **42.22 MGD**. The value of **42.22 MGD** was the basis for the calibration equation.

2000 Coefficient "A" -- This is the first coefficient in the calibration equation and is computed for each line segment based on the year 2000 Master Plan modeled flow using the formula presented in Table "CALIB-1".

2000 Coefficient "B" -- This is the second coefficient in the calibration equation and is computed for each line segment based on the year 2000 Master Plan modeled flow using the formula presented in Table "CALIB-1".

Model Proposed Diameter (In.) -- This is the proposed replacement pipe diameter for the year 2020 condition as presented in the Fort Worth Master Plan Appendix "D" table.

Design Hydraulic Gradient Slope (Ft./Foot) -- This is the average flowline grade of the existing pipe between major line segments. It is assumed that the proposed replacement and parallel pipes will follow the approximate grade of the existing line. This grade is based on pipe flowline elevations and line segment lengths presented in the Fort Worth Master Plan Appendix "D" table.

2000 Design Flow (MGD) -- The year 2000 design flow values are computed using the calibration equations discussed above, and are equivalent to the existing year 2000 flows listed in the column "2000 Model Flow". The value used for equivalent population of 57,207.50 and sewered area of 9,004.81 acres is the same as the model 2000 flow values, and the results of the flow rate calculations confirms that the calibration equations are correct. The flow rates vary from a minimum of 18.71 MGD to a maximum flow of **42.22 MGD**, which agree with the year 2000 model flows.

Proposed Replacement Pipe Diameter (In.) -- The proposed replacement pipe diameters shown are set equal to the existing pipe diameters for purposes of comparing the existing pipe capacities shown in the Master Plan versus the computed capacities calculated using the Mannings Equation and existing pipe flowline slopes.

Replacement Pipe Capacity (MGD) -- This column shows the computed replacement pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. Note that these capacities compare favorably with the existing pipe capacities shown in the Master Plan using the Colbrook-White equations, except for the very downstream end and the siphon section. Average grades through these two line segments are used for calculations in this column.

Proposed Parallel Pipe Diameter (In.) -- No proposed parallel pipe is recommended for the existing year 2000 conditions since the existing pipe has sufficient capacity to handle existing flow rates based on the Fort Worth year 2000 model flows shown.

Parallel Pipe Capacity (MGD) -- This column shows the computed parallel pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. See the year 2020 table for capacity calculations for the 2020 design conditions.

Combined Capacity of Both Pipes (MGD) -- This is the sum of the existing pipe capacity, from the Master Plan, plus the proposed replacement pipe capacity. This value should generally exceed the Design Flow rate, which it does for most line segments within the study limits.

Estimated Replacement Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

Estimated Parallel Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	DESIGN H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0013	0.0094	90	0.000800	18.94	54	32.38	0	0.00	222.11	$29,200.29	$0.00
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0014	0.0099	90	0.000800	18.71	54	32.38	0	0.00	34.03	494,114.77	0.00
M402A/0020+90 (24+48)	M402A/0020+17	73	50.71	-70.57	18.71	86.61	-0.0014	0.0099	90	0.000800	18.71	50.71	27.38	0	0.00	-70.57	18,429.33	0.00
M402A/0022+40 (24+48)	M402A/0020+90	150	50.71	0.00	18.71	86.61	-0.0014	0.0099	90	0.000800	18.71	50.71	27.38	0	0.00	0.00	37,868.49	0.00
M402A/0023+09 (24+48)	M402A/0022+40	69	50.71	74.31	18.71	86.64	-0.0014	0.0099	90	0.000800	18.71	50.71	27.38	0	0.00	74.31	17,419.51	0.00
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0014	0.0100	90	0.000800	18.78	54	32.38	0	10.00	25.04	249,061.33	0.00
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0014	0.0101	90	0.000800	18.81	54	32.38	0	0.00	35.67	114,224.68	0.00
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0014	0.0101	84	0.000831	18.87	54	33.01	0	0.00	32.39	123,958.11	0.00
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0014	0.0101	84	0.000665	18.92	54	29.52	0	0.00	29.03	103,346.14	0.00
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0014	0.0101	84	0.000894	18.97	54	34.24	0	0.00	33.82	160,029.06	0.00
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0014	0.0101	84	0.000651	18.99	54	29.22	0	0.00	28.71	87,887.16	0.00
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0014	0.0101	84	0.000794	18.99	54	32.25	0	0.00	31.72	72,141.90	0.00
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0014	0.0101	84	0.000980	19.06	54	35.85	0	0.00	35.19	73,000.73	0.00
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0007	0.0068	84	0.000698	31.63	54	30.24	0	0.00	29.72	184,648.92	0.00
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0007	0.0068	84	0.000808	31.61	54	32.54	0	0.00	31.88	28,341.46	0.00
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0007	0.0069	84	0.000824	31.54	54	32.85	0	0.00	32.39	146,001.47	0.00
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0007	0.0069	84	0.000781	31.50	54	32.00	0	0.00	31.52	197,817.68	0.00
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0007	0.0070	84	0.000817	31.45	54	32.72	0	0.00	32.23	231,312.13	0.00
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0007	0.0070	84	0.000800	31.43	54	32.38	0	0.00	35.67	114,510.96	0.00
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0007	0.0070	84	0.000800	31.43	54	32.38	0	0.00	29.26	43,227.89	0.00
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0007	0.0070	84	0.000476	31.45	54	24.98	0	0.00	24.42	48,094.60	0.00
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0007	0.0070	84	0.000793	31.56	54	32.23	0	0.00	31.72	234,747.46	0.00
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0007	0.0070	84	0.000380	31.63	54	22.31	0	0.00	21.89	203,543.22	0.00
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0007	0.0070	84	0.001360	31.66	54	42.22	0	0.00	53.47	38,647.45	0.00
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0007	0.0070	84	0.001360	31.70	54	42.22	0	0.00	25.08	231,025.85	0.00
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0007	0.0070	84	0.001217	31.77	54	39.94	0	0.00	39.39	98,765.70	0.00
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	-0.0001	0.0044	84	0.001309	42.22	54	41.43	0	0.00	40.78	198,962.79	0.00
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	-0.0001	0.0044	84	0.001349	42.22	54	42.05	0	0.00	41.74	36,070.95	0.00
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	-0.0001	0.0044	84	0.001071	42.20	54	37.47	0	0.00	36.97	88,173.44	0.00
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0005	0.0055	66	0.002647	33.78	48	43.02	0	0.00	31.40	262,385.60	0.00
		14135																

DESIGN CONDITION: **OPTION NO. 0**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33
Constant Intel Flow = 10.00 10.00

2000 Eq. Pop. = 57,207.50
2000 Sew. Ac. = 9,004.81
Constant Intel Flow = 10.00

TOTAL ESTIM. CONST. COST =	$3,966,959.05	$0.00
+ Engr., ROW, Financ., Conting. (1.5x) =	$5,950,438.57	$0.00
Avg. Estimated Per Foot Cost =	$420.97	$0.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
DESIGN H.G. SLOPE	Design Hydraulic Gradient Slope = Approximate Flowline Slope of Existing Pipe (Average through siphon area used)
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 0

Exist. 2000 Conditions. Big Fossil C.O.F.W. Line Serving Fort Worth, Haltom City (not including Little Fossil), and estimated 10.0 MGD flow from the Intel Facility Plant. Future BFX area and Marine Creek areas not included in this scenario. This is baseline 2000 Condition from the Fort Worth Sanitary Sewer Master Plan.

Estim. Cost Above R.H. Meter =	$2,779,336.40	$0.00
Estim. Cost Below R.H. Meter =	$1,187,622.65	$0.00
Percent R.H. Cost of Total Line =	29.94%	
Estim. Richland Hills Cost Share =	$1,781,433.98	

Discussion of the year 2020 baseline calibration table, "7-0a":

Upstream and Downstream Stations -- these stations correspond to the same station numbers used in the Fort Worth Master Plan report and are shown on the attached Appendix "D" table on pages 192, and 193, for the line segment between the Forth Worth West Fork 96" S.S. and Broadway Blvd. The Richland Hills meter is located below Station M402A/0040+28, which is delineated with a horizontal line.

Length (ft.) -- The length of each line segment is shown, and corresponds to the Master Plan length. It is assumed that the proposed parallel line will be roughly equivalent in length to the existing line.

Existing Diameter (in) -- The existing pipe diameter is noted. The siphon section has been changed to show the revised pipe diameter of 50.71-inches which is equivalent to the existing parallel 24-inch and 48-inch diameter siphon pipes. The Fort Worth Master Plan table only shows the 24-inch pipe.

Existing Pipe Capacity (MGD) -- This is the computed capacity of the existing pipe based on the Colbrook-White equations. Capacities of the proposed replacement and parallel pipes are based on the Mannings Equation, and compare favorably with the results of the Colbrook-White equation when using existing pipe flowline grades for the hydraulic slope and a Mannings "n" factor of 0.0145.

2000 Model Flow (MGD) -- This column shows the flow rates presented in the Fort Worth Master Plan for the year 2000. These flows include a uniform 10 MGD rate for the Intel Plant Site. The 10 MGD is subtracted from each flow value before computing the calibration coefficients "A" and "B", which are based only on equivalent population and sewered areas. The equivalent population of 57,207.5 and sewered area of 9,004.81 are shown at the bottom of this column.

2020 Model Flow (MGD) -- These flow rates correspond to the projected flows in the year 2020 from the Fort Worth Master Plan. The equivalent population of 93,287.50 and sewered area of 20,981.33 are shown at the bottom of this column. The flow rates vary from a minimum of 18.71 MGD to a maximum flow of **42.22 MGD**. The value of **42.22 MGD** was the basis for the calibration equation.

2020 Coefficient "A" -- This is the first coefficient in the calibration equation and is computed for each line segment based on the year 2020 Master Plan modeled flow using the formula presented in Table "CALIB-1".

2020 Coefficient "B" -- This is the second coefficient in the calibration equation and is computed for each line segment based on the year 2020 Master Plan modeled flow using the formula presented in Table "CALIB-1".

Model Proposed Diameter (In.) -- This is the proposed replacement pipe diameter for the year 2020 condition as presented in the Fort Worth Master Plan Appendix "D" table.

Design Hydraulic Gradient Slope (Ft./Foot) -- This is the average flowline grade of the existing pipe between major line segments. It is assumed that the proposed replacement and parallel pipes will follow the approximate grade of the existing line. This grade is based on pipe flowline elevations and line segment lengths presented in the Fort Worth Master Plan Appendix "D" table.

2020 Design Flow (MGD) -- The year 2020 design flow values are computed using the calibration equations discussed above, and are equivalent to the year 2020 flows listed in the column "2020 Maxflow (MGD)". The value used for equivalent population of 93,287.50 and sewered area of 20,981.33 acres is the same as the model 2020 flow values, and the results of the flow rate calculations confirms that the calibration equations are correct. The flow rates vary from a minimum of 83.61 MGD to a maximum flow of **90.17 MGD**, which agree with the year 2020 model flows.

Proposed Replacement Pipe Diameter (In.) -- The proposed replacement pipe diameters shown are set equal to the proposed Master Plan pipe diameters for purposes of comparing the design pipe capacities shown in the Master Plan versus the computed capacities calculated using the Mannings Equation and existing pipe flowline slopes.

Replacement Pipe Capacity (MGD) -- This column shows the computed replacement pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. Note that these capacities compare favorably with the design pipe capacities shown in the Master Plan using the Colbrook-White equations, except for the very downstream end and the siphon section. Average grades through these two line segments are used for calculations in this column.

Proposed Parallel Pipe Diameter (In.) -- The proposed parallel pipe diameters recommended for the year 2020 design conditions are the same as those shown in the Master Plan for purposes of comparison.

Parallel Pipe Capacity (MGD) -- This column shows the computed parallel pipe capacity using the existing pipe flowline grade and a Mannings Equation "n" factor of 0.0145. These values compare favorably with the values shown in the Fort Worth Master plan Appendix "D" table.

Combined Capacity of Both Pipes (MGD) -- This is the sum of the existing pipe capacity, from the Master Plan, plus the proposed replacement pipe capacity. This value should generally exceed the Design Flow rate, which it does for most line segments within the study limits.

Estimated Replacement Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

Estimated Parallel Pipe Costs -- This is the estimated pipe replacement costs in current year 2000 dollars based on an average estimated unit price of $0.125 per square inch of pipe diameter.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	DESIGN H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0013	0.0094	90	0.000800	83.62	90	126.44	78	86.33	308.44	$81,111.93	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0014	0.0099	90	0.000800	86.59	90	126.44	78	86.33	120.36	1,372,541.04	1,030,930.82
M402A/0020+90 (24+48)	M402A/0020+17	73	50.71	-70.57	18.71	86.61	-0.0014	0.0099	90	0.000800	86.61	90	126.44	90	126.44	55.87	58,050.69	58,050.69
M402A/0022+40 (24+48)	M402A/0020+90	150	50.71	0.00	18.71	86.61	-0.0014	0.0099	90	0.000800	86.61	90	126.44	90	126.44	126.44	119,282.25	119,282.25
M402A/0023+09 (24+48)	M402A/0022+40	69	50.71	74.31	18.71	86.64	-0.0014	0.0099	90	0.000800	86.64	90	126.44	90	126.44	200.75	54,869.83	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0014	0.0100	90	0.000800	87.43	90	126.44	78	86.33	111.37	691,837.02	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0014	0.0101	90	0.000800	87.66	90	126.44	78	86.33	122.00	317,290.77	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0014	0.0101	84	0.000831	87.84	84	107.24	66	56.37	88.76	299,948.02	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0014	0.0101	84	0.000665	87.96	84	95.89	66	50.41	79.44	250,072.13	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0014	0.0101	84	0.000894	88.07	84	111.23	66	58.47	92.29	387,230.81	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0014	0.0101	84	0.000651	88.14	84	94.93	66	49.90	78.61	212,665.22	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0014	0.0101	84	0.000794	88.19	84	104.77	66	55.08	86.80	174,565.59	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0014	0.0101	84	0.000980	88.23	84	116.45	66	61.21	96.40	176,643.75	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0007	0.0068	84	0.000698	88.35	84	98.24	66	51.64	81.36	446,804.78	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0007	0.0068	84	0.000808	88.37	84	105.72	66	55.57	87.45	68,579.34	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0007	0.0069	84	0.000824	88.46	84	106.73	66	56.10	88.49	353,287.50	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0007	0.0069	84	0.000781	88.60	84	103.97	66	54.65	86.17	478,669.93	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0007	0.0070	84	0.000817	88.80	84	106.29	66	55.87	88.10	559,718.24	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0007	0.0070	84	0.000800	88.89	84	105.19	66	55.30	90.97	277,088.24	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0007	0.0070	84	0.000800	88.94	84	105.19	66	55.30	84.56	104,600.81	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0007	0.0070	84	0.000476	88.99	84	81.16	66	42.66	67.08	116,377.06	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0007	0.0070	84	0.000793	89.19	84	104.71	66	55.04	86.76	568,030.89	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0007	0.0070	84	0.000380	89.37	84	72.48	66	38.10	59.99	492,524.34	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0007	0.0070	84	0.001360	89.42	84	137.15	66	72.10	125.57	93,517.28	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0007	0.0070	84	0.001360	89.67	84	137.15	66	72.10	97.18	559,025.52	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0007	0.0070	84	0.001217	89.76	84	129.76	66	68.21	107.60	238,988.61	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	-0.0001	0.0044	84	0.001309	90.01	84	134.58	66	70.74	111.52	481,440.81	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	-0.0001	0.0044	84	0.001349	90.06	84	136.61	66	71.81	113.55	87,282.79	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	-0.0001	0.0044	84	0.001071	90.17	84	121.74	66	63.99	100.96	213,357.94	131,715.87
M402B/0136+74	M402B/0125+72	1160	48	31.40	33.78	83.60	-0.0005	0.0055	66	0.002647	83.60	66	100.57	48	43.02	74.42	496,072.77	262,385.60
		14135																

DESIGN CONDITION: OPTION NO. 0a
DESIGN YEAR: 2020

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33
Constant Intel Flow = 10.00 10.00

2020 Eq. Pop. = 93,287.50
2020 Sew. Ac. = 20,981.33
Constant Intel Flow = 10.00

TOTAL ESTIM. CONST. COST = $9,831,475.92 $6,443,853.09
+ Engr., ROW, Financ., Conting (1.5x) = $14,747,213.88 $9,665,779.63
Avg. Estimated Per Foot Cost = $1,043.31 $683.82

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
DESIGN H.G. SLOPE	Design Hydraulic Gradient Slope = Approximate Flowline Slope of Existing Pipe (Average through siphon area used)
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 0a

Projected 2020 Conditions. Big Fossil C.O.F.W. Line Serving Fort Worth, Haltom City (not including Little Fossil), BFX Area, Marine Creek, and with BFX Area, and estimated constant 10.0 MGD flow from the Intel Facility Plant.
This is baseline 2020 Condition from the Fort Worth Sanitary Sewer Master Plan.

Estim. Cost Above R.H. Meter =	$6,586,472.24	$4,022,275.07
Estim. Cost Below R.H. Meter =	$3,245,003.68	$2,421,578.02
Percent R.H. Cost of Total Line =	33.01%	37.58%
Estim. Richland Hills Cost Share =	$4,867,505.52	$3,632,367.03

Upstream Main/Station	Downstream Main/Station	Length (feet)	Proposed Diameter (in)	Existing Pipe Diameter (in)	2020 Proposed Piping Gravity Flow Capacity (MGD)	2020 Maxflow (MGD)	Existing Piping Gravity Flow Capacity (MGD)	Existing Piping 2000 Maxflow (MGD)	Up Pipe Invert (Ft)	US Max Depth (ft)	US Max Level (El)	US Ground Level (El)	US Max Vel (ft/sec)	DS Pipe Invert (El)	DS Max Depth (ft)	DS Ground Level	US Sur Ind	DS Sur Ind	Subbasin	Model Link Ref
M394E/0037+35	M394E/0032+50	485	10	10	0.96	1.10	0.96	0.98	517.15	6.39	523.54	528.53	3.03	514.43	5.79	526.98	+	+	TRA	TR001390.1
M394E/0041+10	M394E/0037+35	375	10	10	0.96	1.10	0.96	0.98	519.25	6.89	526.14	530.7	3.08	517.15	6.42	528.53	+	+	TRA	TR001400.1
M394E/0044+73	M394E/0041+10	363	10	10	0.96	1.10	0.96	0.98	521.28	7.41	528.69	531.51	3.08	519.25	6.92	530.7	+	+	TRA	TR001410.1
M394E/0048+50	M394E/0044+73	377	8	8	0.96	0.46	0.96	0.34	528.24	1.62	529.87	537.23	4.09	521.28	7.43	531.51	x	x	TRA	TR001420.1
M394E/0051+77	M394E/0048+50	327	8	8	0.43	0.46	0.43	0.34	529.54	1.44	530.98	543.85	2.21	528.24	1.63	537.23	+	+	TRA	TR001430.1
M394E/0056+50	M394E/0051+77	473	8	8	0.46	0.46	0.46	0.34	531.44	1.22	532.66	545.88	2.22	529.54	1.50	543.85	+	+	TRA	TR001440.1
M394E/0061+20	M394E/0056+50	470	8	8	0.46	0.46	0.46	0.34	533.32	1.20	534.52	546.26	2.22	531.44	1.23	545.88	+	+	TRA	TR001450.1
M394E/0065+50	M394E/0061+20	430	8	8	0.37	0.46	0.37	0.34	534.50	1.95	536.45	546.8	1.90	533.32	1.22	546.26	+	+	TRA	TR001460.1
M394E/0070+11	M394E/0065+50	461	8	8	0.50	0.46	0.50	0.37	536.88	1.65	538.53	547.14	2.50	534.50	1.96	546.8	x	x	TRA	TR001470.1
M394E/0071+86	M394E/0070+11	175	8	8	0.46	0.48	0.46	0.37	537.58	1.80	539.38	548.8	2.24	536.88	1.72	547.14	+	+	TRA	TR001480.1
M395/0005+20	M340/0082+74	520	21	21	4.93	1.32	4.93	0.80	617.14	0.63	617.77	626.66	2.67	615.67	0.52	621			M340	LF002230.1
M396/0007+17	M395/0005+20	717	21	21	6.50	1.32	6.50	0.80	620.68	0.54	621.22	633.9	3.24	617.14	0.63	626.66			M340	LF002240.1
M397/0002+00	M396/0007+17	200	21	21	5.23	1.32	5.23	0.80	621.32	0.61	621.93	634.5	2.79	620.68	0.54	633.9			M340	LF002250.1
M397/0005+35	M397/0002+00	335	21	21	6.46	1.32	6.46	0.80	622.94	0.54	623.48	636.2	3.23	621.32	0.61	634.5			M340	LF002260.1
M398/0006+50	M341/0054+49=	630	18	18	3.26	3.97	3.26	3.40	449.03	3.02	452.04	454.8	3.28	447.21	2.16	453.6	+	+	TRA	TR000860.1
M398/0011+57	M398/0006+50	507	18	18	3.24	3.97	3.24	3.40	450.45	3.89	454.34	457	3.24	449.03	3.20	454.8	+	+	TRA	TR000870.1
M398/0017+77	M398/0011+57	620	18	18	3.13	3.97	3.13	3.40	452.06	4.97	457.03	461.9	3.18	450.45	3.99	457	+	+	TRA	TR000880.1
M398/0021+70	M398/0017+77	393	18	15	5.25	3.97	3.24	3.40	454.93	3.90	458.84	466.3	5.38	452.06	5.12	461.9	x	x	TRA	TR000890.1
M398/0023+92	M398/0021+70	222	18	15	5.00	3.97	3.08	3.40	456.40	3.53	459.93	475.3	4.73	454.93	4.06	466.3	x	x	TRA	TR000900.1
M398/0025+15	M398/0023+92	123	18	15	5.41	3.97	3.33	3.40	457.34	3.13	460.47	475.7	5.01	456.40	3.56	475.3	x	x	TRA	TR000910.1
M398/0028+67	M398/0025+15	352	15	15	3.20	2.97	3.20	2.74	459.81	2.67	462.48	471.6	4.52	457.34	3.16	475.7	x	x	TRA	TR000920.1
M398/0033+52	M398/0028+67	485	15	15	3.22	3.01	3.22	2.76	463.31	2.09	465.40	478.4	4.59	459.81	2.78	471.6	x	x	TRA	TR000930.1
M398/0036+43	M398/0033+52	291	12	12	2.81	3.01	2.81	2.78	468.57	2.78	471.35	474.1	6.17	463.31	2.14	478.4	+	+	TRA	TR000940.1
M398/0037+92	M398/0036+43	149	12	12	2.05	3.01	2.05	2.78	469.99	4.74	474.73	490	5.32	468.57	3.21	474.1	+	+	TRA	TR000950.1
M398/0041+48	M398/0037+92	356	12	12	2.10	2.83	2.10	2.67	473.57	7.67	481.24	494.1	4.67	469.99	4.82	490	+	+	TRA	TR000960.1
M398/0044+56	M398/0041+48	308	12	12	2.10	2.83	2.10	2.69	476.69	10.17	486.86	492.3	4.63	473.57	7.75	494.1	+	+	TRA	TR000970.1
M398/0046+27	M398/0044+56	171	12	12	4.06	2.83	4.06	2.72	483.06	7.03	490.09	494	10.01	476.65	10.29	492.3	x	x	TRA	TR000980.1
M399/0000+40	L4397/0016+00=	52	10	10	3.70	0.46	3.70	0.43	670.00	0.21	670.21	675.8	6.32	665.70	0.38	676.8			M207R	WF021590.1
M399/0001+01	M399/0000+40	61	10	10	3.01	0.46	3.01	0.43	673.43	0.23	673.66	674.7	5.59	670.00	0.23	675.8			M207R	WF021600.1
M399/0004+36	M399/0001+01	335	10	10	1.80	0.46	1.80	0.43	679.94	0.30	680.24	681.6	4.00	673.43	0.30	674.7			M207R	WF021610.1
M399/0007+67	M399/0004+36	331	10	10	1.80	0.46	1.80	0.43	686.37	0.30	686.67	690.1	3.99	679.94	0.30	681.6			M207R	WF021620.1
M399/0011+79	M399/0007+67	412	10	10	0.68	0.46	0.68	0.43	687.52	0.50	688.02	717.1	2.02	686.37	0.37	690.1			M207R	WF021630.1
M402A/0000+50	*M230A/0304+97*	*102*	*90*	*54*	*850.72*	*83.62*	*222.11*	*18.94*	*481.33*	*10.27*	*491.59*	*489.6*	*8.91*	*477.40*	*14.15*	*495*	*x*	*x*	*CDUAL*	*BF000390.1*
M402A/0020+17	M402A/0000+50	1,726	90	54	130.41	86.59	34.03	18.71	482.90	9.26	492.16	495.2	4.86	481.33	10.30	489.6	x	x	CDUAL	BF000400.1
M402A/0020+90	M402A/0020+17	73	90	24	0.00	86.61	-70.57	18.71	462.50	29.70	492.20	474	2.77	482.88	9.32	495.2	x	x	CDUAL	BF000404.1
M402A/0022+40	M402A/0020+90	150	90	24	0.00	86.61	0.00	18.71	462.50	29.77	492.27	475	2.77	462.50	29.72	474	+	+	CDUAL	BF000406.1
M402A/0023+09	M402A/0022+40	69	90	24	140.73	86.64	74.31	18.71	484.07	8.28	492.35	491.2	7.00	462.50	29.79	475	x	x	CDUAL	BF000410.1
M402A/0028+40	M402A/0023+09	870	90	54	96.02	87.43	25.04	18.78	484.50	8.13	492.63	494.6	4.96	484.07	8.29	491.2	x	x	CDUAL	BF000420.1
M402A/0032+40	M402A/0028+40	399	90	54	136.66	87.66	35.67	18.81	484.90	7.97	492.87	495.3	4.97	484.50	8.24	494.6	x	x	CDUAL	BF000430.1
M402A/0036+79	M402A/0032+40	433	84	54	103.62	87.84	32.39	18.87	485.26	7.83	493.09	495.4	5.08	484.90	7.99	495.3	x	x	CDUAL	BF000440.1
M402A/0040+28	M402A/0036+79	361	84	54	92.87	87.96	29.03	18.92	485.50	7.79	493.29	496.2	4.91	485.26	7.86	495.4	x	x	CDUAL	BF000450.1
M402A/0045+95	M402A/0040+28	559	84	54	103.20	88.07	33.82	18.97	486.00	7.57	493.57	497.2	4.88	485.50	7.82	496.2	x	x	CDUAL	BF000460.1
M402A/0049+00	M402A/0045+95	307	84	54	91.84	88.14	28.71	18.99	486.20	7.58	493.78	497.4	4.76	486.00	7.64	497.2	x	x	CDUAL	BF000470.1
M402A/0051+91	M402A/0049+00	252	84	54	101.49	88.19	31.72	18.99	486.40	7.65	494.05	494.8	4.69	486.20	7.73	497.4	x	x	CDUAL	BF000480.1
M402A/0054+21	M402A/0051+91	255	84	54	112.59	88.23	35.19	19.06	486.65	7.55	494.20	493.7	4.71	486.40	7.68	494.8	x	x	CDUAL	BF000490.1
M402A/0060+63	M402A/0054+21	645	84	54	95.08	88.35	29.72	31.63	487.10	7.54	494.64	498.3	4.58	486.65	7.69	493.7	x	x	CDUAL	BF000500.1
M402A/0061+67	M402A/0060+68	99	84	54	102.00	88.37	31.88	31.61	487.18	7.65	494.83	498.4	4.53	487.10	7.69	498.3	x	x	CDUAL	BF000510.1
M402A/0065+95	M402A/0061+67	510	84	54	103.62	88.46	32.39	31.54	487.60	7.50	495.10	498.5	4.55	487.18	7.69	498.4	x	x	CDUAL	BF000520.1
M402A/0072+77	M402A/0065+95	691	84	54	100.83	88.60	31.52	31.50	488.14	7.42	495.56	503.8	4.52	487.60	7.64	498.5	x	x	CDUAL	BF000530.1

* X= Surcharged by depth
+= Surcharged by capacity
Shaded = Siphons
Italicized Text--Sized for Continuity of Pipe Diameters

Upstream Main/Station	Downstream Main/Station	Length (feet)	Proposed Diameter (in)	Existing Pipe Diameter (in)	2020 Proposed Piping Gravity Flow Capacity (MGD)	2020 Maxflow (MGD)	Existing Piping Gravity Flow Capacity (MGD)	Existing Piping 2000 Maxflow (MGD)	Up Pipe Invert (Ft)	US Max Depth (ft)	US Max Level (El)	US Ground Level (El)	US Max Vel (ft/sec)	DS Pipe Invert (El)	DS Max Depth (ft)	DS Ground Level	US Sur Ind	DS Sur Ind	Subbasin	Model Link Ref.
M402A/0080+78	M402A/0072+77	808	84	54	103.07	88.80	32.23	31.45	488.30	7.23	496.03	510	4.54	488.14	7.52	503.8	x	x	CDUAL	BF000540.1
M402A/0085+50	M402A/0080+78	400	84	54	114.07	88.89	35.67	31.43	489.20	7.13	496.33	531.8	4.60	488.80	7.35	510	x	x	CDUAL	BF000550.1
M402A/0086+56=	M402A/0085+50	151	84	54	93.60	88.94	29.26	31.43	489.30	7.13	496.43	534	4.57	489.20	7.16	531.8	x	x	CDUAL	BF000560.1
M402A/0088+51	M402A/0086+56=	163	84	54	78.15	88.99	24.42	31.45	489.38	7.22	496.60	510.2	4.48	489.30	7.22	534	+	+	CDUAL	BF000570.1
M402A/0096+65	M402A/0088+51	820	84	54	101.47	89.19	31.72	31.56	490.03	7.00	497.03	510.5	4.51	489.38	7.28	510.2	x	x	CDUAL	BF000580.1
M402A/0103+76	M402A/0096+65	711	84	54	70.02	89.37	21.89	31.63	490.30	7.08	497.38	515	4.28	490.03	7.02	510.5	+	+	CDUAL	BF000590.1
M402A/0105+11	M402A/0103+76	135	84	54	170.99	89.42	53.47	31.66	490.60	6.94	497.54	519.8	4.44	490.30	7.18	515		x	CDUAL	BF000600.1
M402A/0109+91	M402A/0105+11	807	84	54	80.25	89.67	25.08	31.70	491.00	7.01	498.01	507.6	4.27	490.60	7.03	519.8	+	+	CDUAL	BF000610.1
M402A/0113+81	M402A/0109+91	345	84	54	125.96	89.76	39.39	31.77	491.42	6.84	498.26	500.6	4.41	491.00	7.11	507.6		x	CDUAL	BF000620.1
M402A/0117+43	M402A/0113+81	695	84	54	130.41	90.01	40.78	42.22	492.33	6.31	498.64	506.6	4.81	491.42	6.90	500.6			CDUAL	BF000630.1
M402A/0120+25	M402A/0117+43	126	84	54	133.47	90.06	41.74	42.22	492.50	6.21	498.71	508.7	4.88	492.33	6.32	506.6			CDUAL	BF000640.1
M402B/0123+40	M402A/0120+25	308	84	54	118.25	90.17	36.97	42.20	492.83	6.07	498.90	508.8	4.93	492.50	6.25	508.7			CDUAL	BF000650.1
M402B/0136+74	M402B/24/0125+72	1,160	66	48	72.69	83.60	31.40	33.78	495.90	5.19	501.09	511	5.92	494.22	4.89	509.2			CDUAL	BF000670.1
M402B/0138+97	M402B/0136+74	214	66	48	71.91	83.60	31.08	33.78	496.20	5.50	501.70	511.2	5.65	495.90	5.43	511	+		CDUAL	BF000680.1
M402B/0145+84	M402B/0138+97	630	66	48	84.83	83.60	36.65	33.78	497.44	5.67	503.11	513.3	5.86	496.20	5.31	511.2	x	x	CDUAL	BF000690.1
M402B/0151+18	M402B/0145+84	1,469	66	48	43.34	83.62	18.71	33.76	498.20	7.62	505.82	516.3	5.22	497.44	5.73	513.3	+	+	CDUAL	BF000700.1
M402B/0157+28	M402B/0151+18	725	66	48	71.00	83.62	30.67	33.73	499.20	8.75	507.95	519.3	5.19	498.20	8.35	516.3	+	+	CDUAL	BF000710.1
M402B/0162+84	M402B/0157+28	555	66	48	77.53	83.62	33.50	33.73	500.11	9.57	509.68	516.2	5.17	499.20	9.41	519.3	+	+	CDUAL	BF000720.1
M402B/0187+42	M402B/0162+84	2,364	66	48	78.81	83.62	34.05	33.73	504.13	10.24	514.37	527.8	5.69	500.11	9.69	516.2	+	+	HALTOM CITY-A	BF000730.1
M402B/0191+73	M402B/0187+42	436	66	48	69.13	83.62	29.88	33.71	504.70	11.08	515.78	527.9	5.43	504.13	10.81	527.8	+	+	HALTOM CITY-A	BF000740.1
M402B/0193+88	M402B/0191+73	215	66	48	81.87	83.62	35.38	33.71	505.10	11.61	516.71	525.4	5.44	504.70	11.59	527.9	+	+	HALTOM CITY-A	BF000750.1
M402B/0197+14	M402B/0193+88	312	66	48	76.71	83.62	33.16	33.71	505.60	12.16	517.76	528.7	5.42	505.10	12.06	525.4	+	+	HALTOM CITY-A	BF000760.1
M402B/0198+05	M402B/0197+14	91	66	48	44.19	83.62	19.08	33.71	505.65	12.54	518.19	525.8	5.23	505.60	12.41	528.7	+	+	HALTOM CITY-A	BF000770.1
M402B/0199+99	M402B/0198+05	197	66	48	80.75	83.62	34.90	33.71	506.00	12.82	518.82	526.7	5.29	505.65	12.79	525.8	+	+	HALTOM CITY-A	BF000780.1
M402B/0201+77	M402B/0199+99	191	66	48	87.69	83.62	37.91	33.71	506.40	13.24	519.65	527	5.43	506.00	13.28	526.7	x	x	HALTOM CITY-A	BF000790.1
M402B/0211+90	M402B/0201+77	1,018	66	48	75.77	83.62	32.75	33.73	508.00	14.07	522.07	529.6	5.50	506.40	13.70	527	+	+	HALTOM CITY-A	BF000800.1
M402B/0220+83	M402B/0211+90	877	66	48	76.43	83.62	33.05	33.73	509.40	14.44	523.84	530.6	5.60	508.00	14.15	529.6	+	+	HALTOM CITY-A	BF000810.1
M402B/0223+26	M402B/0220+83	242	66	48	80.43	83.62	34.76	33.73	509.83	14.98	524.81	532	5.55	509.40	14.94	530.6	+	+	HALTOM CITY-A	BF000820.1
M402B/0227+34	*M402B/0223+26*	*417*	*66*	*48*	*309.20*	*83.62*	*133.67*	*33.73*	*520.70*	*5.54*	*526.24*	*532.6*	*15.73*	*509.83*	*15.48*	*532*	*x*	*x*	*HALTOM CITY-A*	*BF000830.1*
M402B/0230+48	M402B/0227+34	316	66	48	76.32	83.62	32.98	33.82	521.20	5.70	526.90	534.4	7.26	520.70	5.59	532.6	+	+	HALTOM CITY-A	BF000840.1
M402B/0232+94	M402B/0230+48	241	66	48	104.76	83.62	45.28	34.23	521.92	5.53	527.45	534.9	7.32	521.20	5.80	534.4	x	x	HALTOM CITY-A	BF000850.1
M402B/0233+10	M402B/0232+94	16	66	24	1458.82	83.62	101.17	34.26	512.40	15.11	527.51	524	5.05	521.92	5.58	534.9	x	x	HALTOM CITY-A	BF000854.1
M402B/0233+50	M402B/0233+10	40	66	24	0.00	83.62	0.00	34.26	512.40	15.27	527.67	524	5.05	512.40	15.19	524	+	+	HALTOM CITY-A	BF000856.1
M402B/0233+77	M402B/0233+50	27	66	48	1193.13	83.62	515.84	34.28	522.59	5.25	527.83	534.8	8.30	512.40	15.35	524		x	HALTOM CITY-A	BF000860.1
M402B/0238+19	M402B/0233+77	437	66	48	92.02	83.78	39.78	34.33	523.60	5.42	529.02	533	7.14	522.59	5.60	534.8		x	HALTOM CITY-A	BF000870.1
M402B/0248+66=	M402B/0238+19	903	66	48	80.54	84.06	34.80	46.81	525.20	5.97	531.17	535.6	6.24	523.60	5.83	533	+	+	HALTOM CITY-A	BF000880.1
M402B/24/0123+80	M402B/0123+40	47	72	48	1196.95	45.10	411.25	35.83	481.50	17.47	498.97	500.4	2.29	492.83	6.14	508.8	x	x	CDUAL	BF005270.1
M402B/24/0125	M402B/48/0125+30	41	72	24	1353.05	45.10	74.56	6.37	493.91	5.16	499.07	509.2	4.31	481.50	17.54	500.4		x	CDUAL	BF000660.2
M402B/24/0125+30	M402B/24/0123+80	150	72	48	0.00	45.10	0.00	35.83	481.50	17.53	499.03	500.4	2.29	481.50	17.48	500.4	+	+	CDUAL	BF005290.1
M402B/24/0125+72	M402B/24/0125+30	41	72	48	1353.05	45.10	464.88	35.83	493.91	5.16	499.07	509.2	4.31	481.50	17.54	500.4		x	CDUAL	BF000660.1
M402B/48/0123+80	M402B/0123+40	47	72	24	1196.95	45.10	65.96	6.37	481.50	17.47	498.97	500.4	2.29	492.83	6.14	508.8	x	x	CDUAL	BF005250.1
M402B/48/0125+30	M402B/48/0123+80	150	72	24	0.00	45.10	0.00	6.37	481.50	17.53	499.03	500.4	2.29	481.50	17.48	500.4	+	+	CDUAL	BF005260.1
M402C/0247+43	M402B/0248+66=	14	66	48	157.23	84.06	67.97	46.81	525.29	6.02	531.31	536.3	6.27	525.20	6.08	535.6	x	x	HALTOM CITY-A	BF000890.1
M402C/0251+09	M402C/0247+43	371	66	48	77.55	66.57	33.53	28.46	525.90	5.92	531.82	537.7	4.97	525.29	6.09	536.3	x	x	HALTOM CITY-A	BF000900.1
M402C/0259+83	M402C/0251+09	868	66	48	73.99	66.62	31.97	28.46	527.20	5.94	533.15	540.5	5.14	525.90	6.20	537.7	x	x	HALTOM CITY-A	BF000910.1
M402C/0270+08	M402C/0259+83	1,019	60	48	71.73	66.89	39.83	28.46	529.57	5.68	535.25	542.4	6.17	527.20	6.01	540.5	x	x	HALTOM CITY-A	BF000920.1
M402C/0274+88	*M402C/0270+08*	*480*	*60*	*48*	*-59.70*	*66.94*	*-33.14*	*28.46*	*528.80*	*7.48*	*536.28*	*541*	*5.05*	*529.57*	*5.75*	*542.4*	*x*	*x*	*HALTOM CITY-A*	*BF000930.1*
M402C/0280+48	M402C/0274+88	560	60	48	65.98	66.96	36.63	28.46	529.90	7.62	537.52	540.8	5.05	528.80	7.60	541	+	+	HALTOM CITY-A	BF000935.1
M402C/0282+44	M402C/0280+48	184	60	48	84.90	66.96	47.13	28.46	530.50	7.57	538.07	545	5.05	529.90	7.80	540.8	x	x	HALTOM CITY-A	BF000940.1

* X= Surcharged by depth
+= Surcharged by capacity
Shaded = Siphons
Italicized Text=Sized for Continuity of Pipe Diameters

BROADWAY

$8,103,460 $5,543,782

Project	Model Link	Main/UpStation	Main/DownStation	Existing	2000	2020	Parallel	Length	2000 Cost	2020 Cost	Parallel Cost	Subbasin	Group	Note
bf_cm_1	BF000390.1	M402A/0000+50	M280A/0304+97	54	72	90	78	102	$46,713	$67,568	$51,645	CDUAL		
bf_cm_1	BF000400.1	M402A/0020+17	M402A/0000+50	54	72	90	78	1726	$790,456	$1,143,354	$873,908	CDUAL		
bf_cm_1	BF000404.1	M402A/0020+90	M468/0020+17	24	72	90	90	73	$33,432	$48,357	$48,357	CDUAL		
bf_cm_1	BF000406.1	M402A/0022+40	M402A/0020+90	24	72	90	90	150	$68,696	$99,365	$99,365	CDUAL		
bf_cm_1	BF000410.1	M402A/0023+09	M402A/0020+17	24	72	90	90	69	$31,600	$45,708	$45,708	CDUAL		
bf_cm_1	BF000420.1	M402A/0028+40	M402A/0023+09	54	72	90	78	870	$398,434	$576,314	$440,498	CDUAL		
bf_cm_1	BF000430.1	M402A/0032+40	M402A/0028+40	54	72	90	78	399	$182,730	$264,310	$202,022	CDUAL		
bf_cm_1	BF000440.1	M402A/0036+79	M402A/0032+40	54	72	84	66	433	$198,301	$245,411	$158,803	CDUAL		
bf_cm_1	BF000450.1	M402A/0040+28	M402A/0036+79	54	72	84	66	361	$165,327	$204,604	$132,397	CDUAL		
bf_cm_1	BF000460.1	M402A/0045+95	M402A/0040+28	54	72	84	66	559	$256,005	$316,824	$205,013	CDUAL		
bf_cm_1	BF000470.1	M402A/0049+00	M402A/0045+95	54	72	84	66	307	$140,597	$173,998	$112,592	CDUAL		
bf_cm_1	BF000480.1	M402A/0051+91	M402A/0049+00	54	72	84	66	252	$115,408	$142,826	$92,421	CDUAL		
bf_cm_1	BF000490.1	M402A/0054+21	M402A/0051+91	54	72	84	66	255	$116,782	$144,526	$93,521	CDUAL		
bf_cm_1	BF000500.1	M402A/0060+68	M402A/0054+21	54	72	84	66	645	$295,391	$365,567	$236,554	CDUAL		
bf_cm_1	BF000510.1	M402A/0061+67	M402A/0060+68	54	72	84	66	99	$45,339	$56,110	$36,308	CDUAL		
bf_cm_1	BF000520.1	M402A/0065+95	M402A/0060+68	54	72	84	66	510	$233,565	$289,053	$187,043	CDUAL		
bf_cm_1	BF000530.1	M402A/0072+77	M402A/0065+95	54	72	84	66	691	$316,457	$391,638	$253,424	CDUAL		
bf_cm_1	BF000540.1	M402A/0080+78	M402A/0072+77	54	72	84	66	808	$370,040	$457,950	$296,334	CDUAL		
bf_cm_1	BF000550.1	M402A/0085+50	M402A/0080+78	54	72	84	66	400	$183,188	$226,708	$146,700	CDUAL		
bf_cm_1	BF000560.1	M402A/0086+56=	M402A/0085+50	54	72	84	66	151	$69,153	$85,582	$55,379	CDUAL		
bf_cm_1	BF000570.1	M402A/0088+51	M402A/0086+56=	54	72	84	66	168	$76,939	$95,217	$61,614	CDUAL		
bf_cm_1	BF000580.1	M402A/0096+65	M402A/0088+51	54	72	84	66	820	$375,535	$464,751	$300,735	CDUAL		
bf_cm_1	BF000590.1	M402A/0103+76	M402A/0096+95	54	72	84	66	711	$325,617	$402,973	$260,759	CDUAL		
bf_cm_1	BF000600.1	M402A/0105+11	M402A/0103+76	54	72	84	66	135	$61,826	$76,514	$49,511	CDUAL		
bf_cm_1	BF000610.1	M402A/0109+91	M402A/0105+11	54	72	84	66	807	$369,582	$457,383	$295,967	CDUAL		
bf_cm_1	BF000620.1	M402A/0113+81	M402A/0109+91	54	72	84	66	345	$158,000	$195,536	$126,529	CDUAL		
bf_cm_1	BF000630.1	M402A/0117+43	M402A/0113+81	54	66	84	66	695	$254,891	$393,905	$254,891	CDUAL		
bf_cm_1	BF000640.1	M402A/0120+25	M402A/0117+43	54	66	84	66	126	$46,211	$71,413	$46,211	CDUAL		
bf_cm_1	BF000650.1	M402B/0123+40	M402A/0120+25	54	66	84	66	308	$112,959	$174,565	$112,959	CDUAL		
bf_cm_1	BF000670.1	M402B/0136+74	M402B/0125+71	48	60	66	48	1160	$377,151	$425,430	$266,614	CDUAL		
bf_cm_1	BF000680.1	M402B/0138+97	M402B/0136+74	48	60	66	48	214	$69,578	$78,485	$49,186	CDUAL		
bf_cm_1	BF000690.1	M402B/0145+84	M402B/0138+97	48	60	66	48	630	$204,832	$231,053	$144,799	CDUAL		
bf_cm_1	BF000700.1	M402B/0151+18	M402B/0145+84	48	60	66	48	1469	$477,616	$538,756	$337,635	CDUAL		
bf_cm_1	BF000710.1	M402B/0157+28	M402B/0151+18	48	60	66	48	725	$235,719	$265,894	$166,634	CDUAL		
bf_cm_1	BF000720.1	M402B/0162+84	M402B/0157+28	48	60	66	48	553	$179,797	$202,813	$127,102	CDUAL		
bf_cm_1	BF000730.1	M402B/0187+42	M402B/0162+84	48	60	66	48	2364	$768,607	$866,997	$543,342	Haltom City -A		
bf_cm_1	BF000740.1	M402B/0191+73	M402B/0187+42	48	60	66	48	436	$141,757	$159,903	$100,210	Haltom City -A		
bf_cm_1	BF000750.1	M402B/0193+88	M402B/0191+73	48	60	66	48	215	$69,903	$78,851	$49,416	Haltom City -A		
bf_cm_1	BF000760.1	M402B/0197+14	M402B/0193+88	48	60	66	48	312	$101,441	$114,426	$71,710	Haltom City -A		
bf_cm_1	BF000770.1	M402B/0198+05	M402B/0197+14	48	60	66	48	91	$29,587	$33,374	$20,915	Haltom City -A		
bf_cm_1	BF000780.1	M402B/0199+99	M402B/0198+05	48	60	66	48	197	$64,051	$72,250	$45,278	Haltom City -A		
bf_cm_1	BF000790.1	M402B/0201+77	M402B/0199+99	48	60	66	48	191	$62,100	$70,049	$43,899	Haltom City -A		
bf_cm_1	BF000800.1	M402B/0211+90	M402B/0201+77	48	60	66	48	1018	$330,982	$373,352	$233,977	Haltom City -A		
bf_cm_1	BF000810.1	M402B/0220+83	M402B/0211+90	48	60	66	48	877	$285,139	$321,640	$201,570	Haltom City -A		
bf_cm_1	BF000820.1	M402B/0223+26	M402B/0220+83	48	60	66	48	242	$78,681	$88,754	$55,621	Haltom City -A		
bf_cm_1	BF000830.1	M402B/0227+34	M402B/0223+26	48	60	66	48	417	$135,579	$152,935	$95,843	Haltom City -A		

Parallel pipes were calculated based on equivalent area for 2020 pipe sizes. Minimum velocity and grade were not reviewed.
Replacement or parallel pipe decisions and final pipe sizes must be determined during design.

OPTION NO.	OPTION DESCRIPTION	YEAR 2000		YEAR 2005		YEAR 2010		YEAR 2015		YEAR 2020		YEAR 2050		YEAR 2070	
		EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.	EQ. POP.	SEW. AC.
1	All Cities Served By C.O.F.W. Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, Year 2020 BFX Area, and 6.0 MGD Intel Flow, Plus Haltom City Little Fossil Area Extra	93,900.75	17,885.92	100,339.88	19,366.02	106,779.00	20,554.00	116,778.00	23,826.69	126,777.00	25,540.00	161,728.99	29,865.17	180,801.77	32,329.98
2	Same as Option 1 above, but less Marine Creek Area	90,518.25	15,473.77	96,946.88	16,882.20	103,375.50	17,998.52	112,980.75	20,730.07	122,586.00	21,884.42	156,708.49	24,835.40	175,228.27	26,431.99
3	Same As Option 2, but also less Intel Facility Flow	90,518.25	15,473.77	96,946.88	16,882.20	103,375.50	17,998.52	112,980.75	20,730.07	122,586.00	21,884.42	156,708.49	24,835.40	175,228.27	26,431.99
4	Same As Option 1, but less Haltom City Little Fossil Area	80,931.25	16,091.36	87,431.63	17,571.46	93,932.00	18,759.44	103,938.50	22,032.13	113,945.00	23,745.44	149,156.99	28,070.61	168,403.10	30,535.42
5	All Cities Served by C.O.F.W. Big Fossil Outfall except Richland Hills Which will be served by the TCWSC Line. (Includes L.F.)														
5a	Big Fossil Data (H.C + NRH + F.W.)	85,990.79	16,728.36	91,937.31	18,136.37	97,883.84	19,299.64	107,643.23	22,572.33	117,402.63	24,285.65	150,439.81	28,610.82	169,512.59	31,075.63
5b	TCWSC Data (Richland Hills Only)	7,909.96	1,157.56	8,402.56	1,229.65	8,895.16	1,254.35	9,134.77	1,254.35	9,374.37	1,254.35	11,289.18	1,254.35	11,289.18	1,254.35
6	Only Fort Worth and Haltom City served by the Big Fossil Line, with Richland Hills and NRH served by the TCWSC Line														
6a	Big Fossil Data (H.C. + F.W.)	69,948.30	14,709.75	75,006.22	16,002.64	80,064.14	17,107.83	89,256.39	20,353.79	98,448.64	22,040.38	129,181.14	26,316.11	148,253.92	28,780.92
6b	TCWSC Data (R.Hills + NRH)	23,952.45	3,176.17	25,333.66	3,363.38	26,714.86	3,446.17	27,521.61	3,472.90	28,328.36	3,499.63	32,547.85	3,549.06	32,547.85	3,549.06

OPTION NUMBERING REVISIONS:

OPTION 1 = OPTION 1a

OPTION 2 = OPTION 1b

OPTION 3 = OPTION 1c

OPTION 4 = OPTION 1d

OPTION 5a = OPTION 2a

OPTION 5b = OPTION 2b

OPTION 6a = OPTION 3a

OPTION 6b = OPTION 3b

OPTION 1

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	63.09	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	64.37	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	64.38	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	64.38	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	64.39	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	64.84	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	64.98	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	65.12	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	65.22	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	65.31	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	65.36	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	65.39	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	65.47	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	76.05	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	76.04	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	76.03	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	76.07	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	76.12	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	76.15	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	76.17	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	76.22	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	76.41	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	76.55	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	76.60	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	76.76	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	76.86	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	85.74	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	85.76	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	85.80	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	75.51	66	83.60	60	64.84	96.24	496,072.77	409,977.50
		14135																

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2000

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 93,900.75
2000 Sew. Ac. = 17,885.92
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST =	$9,277,334.79	$7,792,254.93
+ Engr., ROW, Financ., Conting. (1.5x) =	$13,916,002.18	$11,688,382.40
Avg. Estimated Per Foot Cost =	$984.51	$826.91

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line.

Estim. Cost Above R.H. Meter =	$6,455,452.62	$5,428,469.60
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,363,785.33
Percent R.H. Cost of Total Line =	30.42%	30.34%
Estim. Richland Hills Cost Share =	$4,232,823.25	$3,545,678.00

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (n)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	69.13	86	74.07	78	57.09	279.20	$74,062.20	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	70.63	86	76.70	78	59.12	93.15	1,253,248.58	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	70.64	86	76.72	78	59.13	-11.44	53,005.30	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	70.64	86	76.72	78	59.13	59.13	108,915.00	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	70.65	86	76.75	78	59.15	133.46	50,100.90	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	71.16	86	77.45	78	59.69	84.73	631,706.99	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	71.32	86	77.65	78	59.85	95.52	289,713.90	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	71.47	86	93.53	78	72.09	104.48	314,401.30	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	71.58	86	93.66	78	72.19	101.22	262,122.10	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	71.68	86	93.77	78	72.28	106.10	405,889.89	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	71.74	86	93.85	78	72.33	101.04	222,912.70	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	71.77	86	93.90	78	72.38	104.10	182,977.20	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	71.85	86	93.94	78	72.41	107.60	185,155.50	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	82.34	86	94.07	78	72.51	102.23	468,334.49	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	82.33	86	94.09	78	72.52	104.40	71,883.90	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	82.32	86	94.19	78	72.60	104.99	370,310.99	304,620 35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	82.37	86	94.34	78	72.71	104.23	501,735.09	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	82.44	86	94.55	78	72.88	105.11	586,688.79	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	82.48	86	94.65	78	72.95	108.62	290,440.00	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	82.50	86	94.70	78	72.99	102.25	109,641.10	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	82.55	86	94.75	78	73.03	97.45	121,984.80	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	82.75	86	94.97	78	73.20	104.92	595,401.99	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	82.91	86	95.16	78	73.34	95.23	516,257.09	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	82.97	86	95.21	78	73.39	126.86	98,023.50	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	83.14	86	95.48	78	73.59	98.67	585,962.69	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	83.25	86	95.57	78	73.66	113.05	250,504.50	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	92.06	86	95.84	78	73.87	114.65	504,639.49	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	92.08	86	95.89	78	73.91	115.65	91,488.60	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	92.13	86	96.01	78	74.00	110.97	223,638.80	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	81.42	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 100,339.88
2005 Sew. Ac. = 19,366.02
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,917,220.12 $8,159,877.51
+ Engr., ROW, Financ., Conting. (1.5x) = $14,875,830.18 $12,239,816.26

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6 0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$6,879,943.87	$5,661,393.37
Estim. Cost Below R.H. Meter =	$3,037,276.25	$2,498,484.14
Percent R.H. Cost of Total Line =	30.63%	30.62%
Estim. Richland Hills Cost Share =	$4,555,914.38	$3,747,726.21

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIFE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	72.72	86	74.07	78	57.09	279.20	$74,062.20	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	74.29	86	76.70	78	59.12	93.15	1,253,248.58	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	74.30	86	76.72	78	59.13	-11.44	53,005.30	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	74.30	86	76.72	78	59.13	59.13	108,915.00	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	74.31	86	76.75	78	59.15	133.46	50,100.90	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	74.85	86	77.45	78	59.69	84.73	631,706.99	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	75.01	86	77.65	78	59.85	95.52	289,713.90	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	75.17	86	93.53	78	72.09	104.48	314,401.30	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	75.29	86	93.66	78	72.19	101.22	262,122.10	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	75.40	86	93.77	78	72.28	106.10	405,889.89	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	75.46	86	93.85	78	72.33	101.04	222,912.70	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	75.49	86	93.90	78	72.38	104.10	182,977.20	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	75.57	86	93.94	78	72.41	107.60	185,155.50	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	86.91	86	94.07	78	72.51	102.23	468,334.49	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	86.91	86	94.09	78	72.52	104.40	71,883.90	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	86.90	86	94.19	78	72.60	104.99	370,310.99	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	86.95	86	94.34	78	72.71	104.23	501,735.09	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	87.02	86	94.55	78	72.88	105.11	586,688.79	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	87.06	86	94.65	78	72.95	108.62	290,440.00	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	87.09	86	94.70	78	72.99	102.25	109,641.10	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	87.13	86	94.75	78	73.03	97.45	121,984.80	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	87.35	86	94.97	78	73.20	104.92	595,401.99	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	87.52	86	95.16	78	73.34	95.23	516,257.09	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	87.58	86	95.21	78	73.39	126.86	98,023.50	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	87.76	86	95.48	78	73.59	98.67	585,962.69	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	87.88	86	95.57	78	73.66	113.05	250,504.50	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	97.39	86	95.84	78	73.87	114.65	504,639.49	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	97.42	86	95.89	78	73.91	115.65	91,488.60	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	97.47	86	96.01	78	74.00	110.97	223,638.80	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	86.02	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 106,779.00
2010 Sew. Ac. = 20,554.00
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $10,011,514.95 $8,245,972.78
+ Engr., ROW, Financ., Conting. (1.5x) = $15,017,272.42 $12,368,959.17

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line.

Estim. Cost Above R.H. Meter =	$6,974,238.69	$5,747,488.64
Estim. Cost Below R.H. Meter =	$3,037,276.25	$2,498,484.14
Percent R.H. Cost of Total Line =	30.34%	30.30%
Estim. Richland Hills Cost Share =	$4,555,914.38	$3,747,726.21

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	90.26	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	92.68	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	92.70	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	92.70	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	92.73	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	93.45	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	93.67	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	93.87	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	94.00	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	94.13	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	94.20	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	94.24	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	94.32	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	102.36	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	102.37	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	102.40	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	102.50	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	102.64	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	102.70	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	102.75	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	102.80	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	103.04	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	103.24	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	103.31	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	103.55	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	103.67	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	110.48	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	110.53	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	110.61	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	99.61	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 116,778.00
2015 Sew. Ac. = 23,826.69
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,279,590.65 $9,831,475.92
+ Engr., ROW, Financ., Conting. (1.5x) = $16,919,385.98 $14,747,213.88

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter = $7,581,897.60 $6,586,472.24
Estim. Cost Below R.H. Meter = $3,697,693.06 $3,245,003.68
Percent R.H. Cost of Total Line = 32.78% 33.01%
Estim. Richland Hills Cost Share = $5,546,539.58 $4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	94.74	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	97.20	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	97.21	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	97.21	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	97.24	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	97.99	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	98.22	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	98.43	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	98.57	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	98.71	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	98.79	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	98.83	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	98.92	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	108.70	96	126.14	84	88.35	118.07	583,581.76	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	108.71	96	126.17	84	88.37	120.25	89,573.01	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	108.73	96	126.30	84	88.46	120.85	461,436.74	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	108.83	96	126.50	84	88.60	120.12	625,201.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	108.96	96	126.78	84	88.80	121.03	731,060.56	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	109.03	96	126.91	84	88.89	124.56	361,911.17	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	109.07	96	126.98	84	88.94	118.20	136,621.47	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	109.13	96	127.05	84	88.99	113.41	152,002.69	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	109.40	96	127.34	84	89.19	120.91	741,917.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	109.61	96	127.60	84	89.37	111.26	643,297.10	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	109.68	96	127.67	84	89.42	142.89	122,145.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	109.93	96	128.02	84	89.67	114.75	730,155.78	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	110.06	96	128.15	84	89.76	129.15	312,148.38	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	118.33	96	128.51	84	90.01	130.79	628,820.65	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	118.37	96	128.58	84	90.06	131.80	114,002.02	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	118.46	96	128.74	84	90.17	127.14	278,671.60	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	106.15	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: OPTION NO. 1
DESIGN YEAR: 2020

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 126,777.00
2020 Sew. Ac. = 25,540.00
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $9,925,770.75
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $14,888,656.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$6,680,767.06
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	32.69%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	96.46	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	98.15	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	98.16	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	98.16	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	98.18	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	98.86	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	99.07	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	99.29	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	99.46	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	99.62	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	99.71	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	99.74	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	99.89	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	121.16	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	121.14	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	121.08	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	121.12	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	121.17	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	121.20	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	121.24	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	121.30	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	121.63	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	121.87	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	121.96	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	122.20	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	122.38	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	140.17	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	140.21	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	140.25	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	121.46	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 161,728.99
2050 Sew. Ac. = 29,865.17
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PAR. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	98.27	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	99.60	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	99.61	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	99.61	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	99.63	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	100.27	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	100.48	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	100.72	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	100.90	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	101.07	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	101.16	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	101.19	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	101.37	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	128.57	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	128.54	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	128.44	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	128.44	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	128.46	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	128.47	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	128.50	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	128.57	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	128.93	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	129.19	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	129.29	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	129.53	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	129.74	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	152.44	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	152.47	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	152.50	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	130.29	78	130.52	72	105.43	136.83	692,861.97	590,367.59
		14135																

DESIGN CONDITION: **OPTION NO. 1**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 180,801.77
2070 Sew. Ac. = 32,329.98
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76
Avg. Estimated Per Foot Cost = $1,294.12 $1,134.01

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 1

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

OPTION 2

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	46.23	72	46.12	60	28.36	250.47	$51,911.63	$36,049.75
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	46.52	72	47.76	60	29.37	63.40	878,426.26	610,018.24
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	46.52	72	47.77	60	29.38	-41.19	37,152.44	25,800.31
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	46.52	72	47.77	60	29.38	29.38	76,340.64	53,014.33
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	46.53	72	47.79	60	29.39	103.70	35,116.69	24,386.59
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	46.77	72	48.22	60	29.65	54.69	442,775.69	307,483.12
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	46.85	72	48.35	60	29.73	65.40	203,066.09	141,018.12
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	46.96	72	58.23	60	35.81	68.20	220,369.97	153,034.70
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	47.05	72	58.31	60	35.86	64.89	183,726.47	127,587.82
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	47.14	72	58.39	60	35.90	69.72	284,496.11	197,566.74
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	47.18	72	58.43	60	35.93	64.64	156,243.84	108,502.66
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	47.18	72	58.46	60	35.95	67.67	128,252.27	89,064.08
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	47.28	72	58.49	60	35.97	71.16	129,779.08	90,124.36
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	63.20	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	63.18	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	63.11	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	63.09	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	63.06	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	63.06	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	63.07	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	63.10	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	63.28	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	63.40	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	63.45	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	63.55	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	63.66	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	76.92	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	76.93	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	76.93	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	65.00	78	130.52	66	83.60	115.00	692,861.97	496,072.77

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 90,518.25
2000 Sew. Ac. = 15,473.77
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $7,951,849.27 $5,632,451.08
+ Engr., RCW, Financ., Conting. (1.5x) = $11,927,773.91 $8,448,676.61

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$5,822,963.38	$4,154,058.09
Estim. Cost Below R.H. Meter =	$2,128,885.90	$1,478,392.98
Percent R.H. Cost of Total Line =	26.77%	26.25%
Estim. Richland Hills Cost Share =	$3,193,328.85	$2,217,589.48

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	51.68	78	57.09	66	36.57	258.68	$60,924.07	$43,620.19
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	52.15	78	59.12	66	37.87	71.90	1,030,930.82	738,122.07
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	52.16	78	59.13	66	37.88	-32.69	43,602.52	31,218.37
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	52.16	78	59.13	66	37.88	37.88	89,594.22	64,147.34
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	52.17	78	59.15	66	37.89	112.20	41,213.34	29,507.78
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	52.46	78	59.69	66	38.24	63.28	519,646.47	372,054.58
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	52.56	78	59.85	66	38.34	74.01	238,320.62	170,631.93
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	52.68	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	52.77	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	52.87	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	52.91	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	52.92	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	53.02	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	69.07	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	69.05	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	68.99	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	68.97	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	68.96	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	68.96	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	68.97	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	69.01	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	69.20	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	69.34	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	69.39	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	69.50	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	69.62	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	83.00	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	83.01	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	83.02	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	70.59	78	130.52	66	83.60	115.00	692,861.97	496,072.77

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 96,946.88
2005 Sew. Ac. = 16,882.20
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,442,761.98 $6,044,817.75
+ Engr., ROW, Financ., Conting. (1.5x) = $12,664,142.97 $9,067,226.62

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$5,944,277.84	$4,255,962.24
Estim. Cost Below R.H. Meter =	$2,498,484.14	$1,788,855.51
Percent R.H. Cost of Total Line =	29.59%	29.59%
Estim. Richland Hills Cost Share :	$3,747,726.21	$2,683,283.27

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	54.68	78	57.09	66	36.57	258.68	$60,924.07	$43,620.19
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	55.19	78	59.12	66	37.87	71.90	1,030,930.82	738,122.07
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	55.19	78	59.13	66	37.88	-32.69	43,602.52	31,218.37
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	55.19	78	59.13	66	37.88	37.88	89,594.22	64,147.34
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	55.20	78	59.15	66	37.89	112.20	41,213.34	29,507.78
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	55.51	78	59.69	66	38.24	63.28	519,646.47	372,054.58
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	55.61	78	59.85	66	38.34	74.01	238,320.62	170,631.93
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	55.75	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	55.85	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	55.94	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	55.99	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	56.00	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	56.11	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	73.24	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	73.22	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	73.15	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	73.13	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	73.12	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	73.11	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	73.13	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	73.17	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	73.37	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	73.52	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	73.57	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	73.70	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	73.82	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	88.09	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	88.11	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	88.11	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	74.86	64	77.01	78	130.52	161.92	466,463.28	692,861.97

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 103,375.50
2010 Sew. Ac. = 17,998.52
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,924,327.28 $7,500,209.58
+ Engr., ROW, Financ., Conting. (1.5x) = $13,386,490.92 $11,250,314.37

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$6,425,843.14	$5,711,354.07
Estim. Cost Below R.H. Meter =	$2,498,484.14	$1,788,855.51
Percent R.H. Cost of Total Line =	28.00%	23.85%
Estim. Richland Hills Cost Share =	$3,747,726.21	$2,683,283.27

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	68.08	84	69.57	84	69.57	291.68	$70,657.50	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	69.19	84	72.04	84	72.04	106.07	1,195,635.75	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	69.20	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	69.20	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	69.21	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.67	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.81	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.97	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	70.08	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	70.20	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	70.25	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	70.28	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	70.38	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	85.67	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	85.66	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	85.61	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	85.63	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	85.66	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	85.68	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M4?2A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	85.70	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	85.75	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	85.98	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	86.15	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	86.21	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	86.37	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	86.50	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	99.28	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M4?2A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	99.31	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	99.33	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	86.05	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 112,980.75
2015 Sew. Ac. = 20,730.07
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,791,605.61 $8,645,064.67
+ Engr., ROW, Financ., Conting. (1.5x) = $14,687,408.42 $12,967,597.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$6,893,955.36	$5,944,277.84
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,700,786.83
Percent R.H. Cost of Total Line =	29.59%	31.24%
Estim. Richland Hills Cost Share =	$4,346,475.37	$4,051,180.25

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	68.26	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	69.15	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	69.15	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	69.15	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	69.17	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.59	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.73	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.89	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	70.02	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	70.14	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	70.19	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	70.22	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	70.33	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	88.89	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	88.87	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	88.81	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	88.80	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	88.81	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	88.82	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	88.84	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	88.89	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	89.14	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	89.31	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	89.38	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	89.54	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	89.68	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	105.17	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	105.19	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	105.21	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	90.11	90	191.16	84	159.04	190.44	922,449.36	803,555.89

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2020**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 122,586.00
2020 Sew. Ac. = 21,884.42
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $10,670,904.84 $9,261,419.89
+ Engr., ROW, Financ., Conting. (1.5x) = $16,006,357.26 $13,892,129.83

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$7,773,254.59	$6,762,935.74
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,498,484.14
Percent R.H. Cost of Total Line =	27.15%	26.98%
Estim. Richland Hills Cost Share =	$4,346,475.37	$3,747,726.21

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	59.29	84	69.57	84	69.57	291.68	$70,657.50	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	58.75	84	72.04	84	72.04	106.07	1,195,635.75	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	58.75	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	58.75	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	58.75	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	58.96	84	72.74	84	72.74	97.78	602,666.92	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	59.05	84	72.93	84	72.93	108.60	276,395.52	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	59.22	84	87.84	84	87.84	120.23	299,948.02	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	59.36	84	87.96	84	87.96	116.99	250,072.13	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	59.49	84	88.07	84	88.07	121.89	387,230.81	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	59.55	84	88.14	84	88.14	116.85	212,665.22	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	59.55	84	88.19	84	88.19	119.91	174,565.59	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	59.74	84	88.23	84	88.23	123.42	176,643.75	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	93.63	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	93.57	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	93.39	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	93.28	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	93.15	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	93.10	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	93.10	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	93.16	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	93.46	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	93.66	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	93.74	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	93.85	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	94.04	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	122.22	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	122.22	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	122.17	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	99.30	90	191.16	84	159.04	190.44	922,449.36	803,555.89

DESIGN CONDITION: **OPTION NO. 2**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 156,708.49
2050 Sew. Ac. = 24,835.40
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $10,670,904.84 $9,791,605.61
+ Engr., ROW, Financ., Conting. (1.5x) = $16,006,357.26 $14,687,408.42

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$7,773,254.59	$6,893,955.36
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,897,650.25
Percent R.H. Cost of Total Line =	27.15%	29.59%
Estim. Richland Hills Cost Share =	$4,346,475.37	$4,346,475.37

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	54.38	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	53.07	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	53.06	90	86.61	84	72.06	1.49	58,050.69	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	53.06	90	86.61	84	72.06	72.06	119,282.25	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	53.06	90	86.64	84	72.08	146.39	54,869.83	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	53.15	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	53.21	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	53.38	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	53.52	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	53.67	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	53.73	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	53.72	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	53.94	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	96.17	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	96.10	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	95.85	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	95.69	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	95.48	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	95.40	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	95.39	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	95.45	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	95.78	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	95.98	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	96.07	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	96.16	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	96.38	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	131.46	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	131.45	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	131.36	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	104.26	90	191.16	84	159.04	190.44	922,449.36	803,555.89

DESIGN CONDITION: OPTION NO. 2
DESIGN YEAR: 2070

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 175,228.27
2070 Sew. Ac. = 26,431.99
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,240,363.58 $9,791,605.61
+ Engr., ROW, Finance, Conting. (1.5x) = $16,860,545.37 $14,687,408.42

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 2

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. The Marine Creek Area is not included in this model.

Estim. Cost Above R.H. Meter =	$7,913,979.37	$6,893,955.36
Estim. Cost Below R.H. Meter =	$3,326,384.21	$2,897,650.25
Percent R.H. Cost of Total Line =	29.59%	29.59%
Estim. Richland Hills Cost Share =	$4,989,576.32	$4,346,475.37

OPTION 3

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	40.23	72	46.12	54	21.41	243.52	$51,911.63	$29,200.29
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	40.52	72	47.76	54	22.18	56.21	878,426.26	494,114.77
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	40.52	72	47.77	54	22.18	-48.39	37,152.44	20,898.25
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	40.52	72	47.77	54	22.18	22.18	76,340.64	42,941.61
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	40.53	72	47.79	54	22.19	96.50	35,116.69	19,753.14
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	40.77	72	48.22	54	22.39	47.43	442,775.69	249,061.33
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	40.85	72	48.35	54	22.45	58.12	203,066.09	114,224.68
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	40.96	66	46.17	54	27.04	59.43	185,171.99	123,958.11
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	41.05	66	46.24	54	27.08	56.11	154,381.27	103,346.14
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	41.14	66	46.29	54	27.11	60.93	239,055.76	160,029.06
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	41.18	66	46.33	54	27.13	55.84	131,288.22	87,887.16
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	41.18	66	46.36	54	27.15	58.87	107,767.53	72,141.90
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	41.28	66	46.38	54	27.16	62.35	109,050.48	73,000.73
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	57.20	72	58.57	54	27.20	56.92	328,264.74	184,648.92
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	57.18	72	58.58	54	27.20	59.08	50,384.82	28,341.46
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	57.11	72	58.64	54	27.23	59.62	259,558.17	146,001.47
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	57.09	72	58.74	54	27.27	58.79	351,675.87	197,817.68
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	57.06	72	58.87	54	27.33	59.56	411,221.56	231,312.13
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	57.06	72	58.93	54	27.36	63.03	203,575.03	114,510.96
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	57.07	72	58.96	60	36.26	65.52	76,849.57	53,367.76
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	57.10	72	59.00	60	36.28	60.70	85,501.51	59,376.05
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	57.28	72	59.13	60	36.36	68.08	417,328.82	289,811.68
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	57.40	72	59.25	60	36.43	58.32	361,854.62	251,287.93
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	57.45	72	59.28	60	36.46	89.93	68,706.57	47,712.90
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	57.55	72	59.45	60	36.56	61.64	410,712.63	285,217.10
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	57.66	72	59.51	60	36.59	75.98	175,583.47	121,932.96
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	70.92	78	73.87	60	36.70	77.48	415,119.89	245,633.07
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	70.93	78	73.91	60	36.72	78.46	75,259.14	44,532.04
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	70.93	78	74.00	60	36.76	73.73	183,966.80	108,856.09
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	59.00	78	130.52	60	64.84	96.24	692,861.97	409,977.50

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 90,518.25
2000 Sew. Ac. = 15,473.77
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $7,219,929.88 $4,410,894.85
+ Engr., RO V, Financ., Conting. (1.5x) = $10,829,894.82 $6,616,342.28

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$4,916,531.41	$3,053,367.48
Estim. Cost Below R.H. Meter =	$2,251,486.84	$1,328,327.08
Percent R.H. Cost of Total Line =	20.79%	20.08%
Estim. Richland Hills Cost Share =	$0.00	$0.00

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	45.68	72	46.12	60	28.36	250.47	$51,911.63	$36,049.75
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	46.15	72	47.76	60	29.37	63.40	878,426.26	610,018.24
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	46.16	72	47.77	60	29.38	-41.19	37,152.44	25,800.31
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	46.16	72	47.77	60	29.38	29.38	76,340.64	53,014.33
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	46.17	72	47.79	60	29.39	103.70	35,116.69	24,386.59
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	46.46	72	48.22	60	29.65	54.69	442,775.69	307,483.12
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	46.56	72	48.35	54	22.45	58.12	203,066.09	114,224.68
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	46.68	72	58.23	54	27.04	59.43	220,369.97	123,958.11
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	46.77	72	58.31	54	27.08	56.11	183,726.47	103,346.14
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	46.87	72	58.39	54	27.11	60.93	284,496.11	160,029.06
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	46.91	72	58.43	54	27.13	55.84	156,243.84	87,887.16
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	46.92	72	58.46	54	27.15	58.87	128,252.27	72,141.90
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	47.02	72	58.49	54	27.16	62.35	129,779.08	73,000.73
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	63.07	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	63.05	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	62.99	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	62.97	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	62.96	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	62.96	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	62.97	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	63.01	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	63.20	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	63.34	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	63.39	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	63.50	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	63.62	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	77.00	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	77.01	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	77.02	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	64.59	78	130.52	66	83.60	115.00	692,861.97	496,072.77

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 96,946.88
2005 Sew. Ac. = 16,882.20
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $7,951,849.27 $5,460,140.36
+ Engr., ROW, Financ., Conting. (1.5x) = $11,927,773.91 $8,190,210.54

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$5,822,963.38	$4,061,859.10
Estim. Cost Below R.H. Meter =	$2,128,885.90	$1,398,281.26
Percent R.H. Cost of Total Line =	26.77%	25.61%
Estim. Richland Hills Cost Share =	$3,193,328.85	$2,097,421.89

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	48.68	78	57.09	60	28.36	250.47	$60,924.07	$36,049.75
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	49.19	78	59.12	60	29.37	63.40	1,030,930.82	610,018.24
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	49.19	78	59.13	60	29.38	-41.19	43,602.52	25,800.31
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	49.19	78	59.13	60	29.38	29.38	89,594.22	53,014.33
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	49.20	78	59.15	60	29.39	103.70	41,213.34	24,386.59
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	49.51	78	59.69	60	29.65	54.69	519,646.47	307,483.12
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	49.61	78	59.85	60	29.73	65.40	238,320.62	141,018.12
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	49.75	72	58.23	60	35.81	68.20	220,369.97	153,034.70
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	49.85	72	58.31	60	35.86	64.89	183,726.47	127,587.82
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	49.94	72	58.39	60	35.90	69.72	284,496.11	197,566.74
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	49.99	72	58.43	60	35.93	64.64	156,243.84	108,502.66
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	50.00	72	58.46	60	35.95	67.67	128,252.27	89,064.08
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	50.11	72	58.49	60	35.97	71.16	129,779.08	90,124.36
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	67.24	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	67.22	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	67.15	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	67.13	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	67.12	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	67.11	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	67.13	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	67.17	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	67.37	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	67.52	78	73.34	72	59.25	81.14	424,676.60	361,854.62
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	67.57	78	73.39	72	59.28	112.75	80,634.80	68,706.57
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	67.70	78	73.59	72	59.45	84.53	482,016.90	410,712.63
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	67.82	78	73.66	72	59.51	98.90	206,066.71	175,583.47
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	82.09	84	90.01	72	59.67	100.45	481,440.81	353,711.62
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	82.11	84	90.06	72	59.70	101.44	87,282.79	64,126.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	82.11	84	90.17	72	59.78	96.75	213,357.94	156,752.77
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	68.86	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 103,375.50
2010 Sew. Ac. = 17,998.52
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $8,256,533.24 $5,886,640.66
+ Engr., ROW, Financ., Conting. (1.5x) = $12,384,799.86 $8,829,960.98

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD^1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$5,828,204.73	$4,408,247.67
Estim. Cost Below R.H. Meter =	$2,428,328.51	$1,478,392.98
Percent R.H. Cost of Total Line =	29.41%	25.11%
Estim. Richland Hills Cost Share =	$3,642,492.77	$2,217,589.48

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	62.08	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	63.19	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	63.20	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	63.20	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	63.21	84	72.08	72	47.79	122.10	47,797.72	35,116.69
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	63.67	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	63.81	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.97	78	72.09	72	58.23	90.62	258,628.65	220,369.97
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	64.08	78	72.19	72	58.31	87.34	215,623.42	183,726.47
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	64.20	78	72.28	72	58.39	92.21	333,887.79	284,496.11
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	64.25	78	72.33	72	58.43	87.14	183,369.50	156,243.84
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	64.28	78	72.38	72	58.46	90.18	150,518.29	128,252.27
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	64.38	78	72.41	72	58.49	93.68	152,310.17	129,779.08
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	79.67	84	88.35	72	58.57	88.29	446,804.78	328,264.74
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	79.66	84	88.37	72	58.58	90.46	68,579.34	50,384.82
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	79.61	84	88.46	72	58.64	91.03	353,287.50	259,558.17
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	79.63	84	88.60	72	58.74	90.26	478,669.93	351,675.87
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	79.66	84	88.80	72	58.87	91.10	559,718.24	411,221.56
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	79.68	84	88.89	72	58.93	94.60	277,088.24	203,575.03
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	79.70	84	88.94	72	58.96	88.22	104,600.81	76,849.57
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	79.75	84	88.99	72	59.00	83.42	116,377.06	85,501.51
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	79.98	84	89.19	72	59.13	90.85	568,030.89	417,328.82
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	80.15	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	80.21	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	80.37	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	80.50	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	93.28	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	93.31	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	93.33	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	80.05	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 112,980.75
2015 Sew. Ac. = 20,730.07
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $9,584,817.91 $7,753,840.75
+ Engr., ROW, Financ., Conting. (1.5x) = $14,377,226.86 $11,630,761.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$6,762,935.74	$5,443,734.19
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,310,106.55
Percent R.H. Cost of Total Line =	29.44%	29.79%
Estim. Richland Hills Cost Share =	$4,232,823.25	$3,465,159.83

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	62.26	84	69.57	72	46.12	268.23	$70,657.50	$51,911.63
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	63.15	84	72.04	72	47.76	81.79	1,195,635.75	878,426.26
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	63.15	84	72.06	72	47.77	-22.80	50,568.60	37,152.44
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	63.15	84	72.06	72	47.77	47.77	103,908.09	76,340.64
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	63.17	84	72.08	72	47.79	122.10	47,797.72	35,116.69
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	63.59	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	63.73	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.89	84	87.84	72	58.23	90.62	299,948.02	220,369.97
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	64.02	84	87.96	72	58.31	87.34	250,072.13	183,726.47
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	64.14	84	88.07	72	58.39	92.21	387,230.81	284,496.11
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	64.19	84	88.14	72	58.43	87.14	212,665.22	156,243.84
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	64.22	84	88.19	72	58.46	90.18	174,565.59	128,252.27
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	64.33	84	88.23	72	58.49	93.68	176,643.75	129,779.08
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	82.89	84	88.35	72	58.57	88.29	446,804.78	328,264.74
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	82.87	84	88.37	72	58.58	90.46	68,579.34	50,384.82
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	82.81	84	88.46	72	58.64	91.03	353,287.50	259,558.17
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	82.80	84	88.60	72	58.74	90.26	478,669.93	351,675.87
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	82.81	84	88.80	72	58.87	91.10	559,718.24	411,221.56
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	82.82	84	88.89	72	58.93	94.60	277,088.24	203,575.03
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	82.84	84	88.94	72	58.96	88.22	104,600.81	76,849.57
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	82.89	84	88.99	34	88.99	113.41	116,377.06	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	83.14	84	89.19	84	89.19	120.91	568,030.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	83.31	84	89.37	84	89.37	111.26	492,524.34	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	83.38	84	89.42	84	89.42	142.89	93,517.28	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	83.54	84	89.67	84	89.67	114.75	559,025.52	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	83.68	84	89.76	84	89.76	129.15	238,988.61	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	99.17	84	90.01	84	90.01	130.79	481,440.81	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	99.19	84	90.06	84	90.06	131.80	87,282.79	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	99.21	84	90.17	84	90.17	127.14	213,357.94	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	84.11	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2020**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 122,586.00
2020 Sew. Ac. = 21,884.42
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $9,791,605.61 $8,052,594.17
+ Engr., ROW, Financ., Conting. (1.5x) = $14,687,408.42 $12,078,891.26

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is <u>not</u> included in this model.

Estim. Cost Above R.H. Meter =	$6,893,955.36	$5,923,708.28
Estim. Cost Below R.H. Meter =	$2,897,650.25	$2,128,885.90
Percen R.H. Cost of Total Line =	29.59%	26.44%
Estim. Richland Hills Cost Share =	$4,346,475.37	$3,193,328.85

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	53.29	90	83.62	78	57.09	279.20	$81,111.93	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	52.75	90	86.59	78	59.12	93.15	1,372,541.04	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	52.75	90	86.61	78	59.13	-11.44	58,050.69	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	52.75	90	86.61	78	59.13	59.13	119,282.25	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	52.75	90	86.64	78	59.15	133.46	54,869.83	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	52.96	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	53.05	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	53.22	84	87.84	72	58.23	90.62	299,948.02	220,369.97
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	53.36	84	87.96	72	58.31	87.34	250,072.13	183,726.47
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	53.49	84	88.07	72	58.39	92.21	387,230.81	284,496.11
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	53.55	84	88.14	72	58.43	87.14	212,665.22	156,243.84
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	53.55	84	88.19	72	58.46	90.18	174,565.59	128,252 27
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	53.74	84	88.23	72	58.49	93.68	176,643.75	129,779.08
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	87.63	84	88.35	72	58.57	88.29	446,804.78	328,264.74
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	87.57	84	88.37	72	58.58	90.46	68,579.34	50,384.82
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	87.39	84	88.46	72	58.64	91.03	353,287.50	259,558.17
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	87.28	84	88.60	72	58.74	90.26	478,669.93	351,675.87
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	87.15	84	88.80	72	58.87	91.10	559,718.24	411,221.56
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	87.10	84	88.89	72	58.93	94.60	277,088.24	203,575.03
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	87.10	84	88.94	72	58.96	88.22	104,600.81	76,849.57
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	87.16	84	88.99	84	88.99	113.41	116,377.06	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	87.46	84	89.19	84	89.19	120.91	568,030.89	568,030 89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	87 66	84	89.37	84	89.37	111.26	492,524.34	492,524 34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	87.74	84	89 42	84	89.42	142.89	93,517.28	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	87.85	84	89.67	84	89.67	114.75	559,025.52	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	88 04	84	89.76	84	89 76	129.15	238,988 61	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	116.22	84	90.01	84	90.01	130.79	481,440.81	481,440 81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	116.22	84	90.06	84	90.06	131.80	87,282.79	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	116.17	84	90.17	84	90.17	127.14	213,357.94	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	93.30	84	159.04	78	130 52	161.92	803,555.89	692,861.97

DESIGN CONDITION: **OPTION NO. 3**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 156,708.49
2050 Sew. Ac. = 24,835.40
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $10,008,893.68 $8,239,911 48
+ Engr., ROW, Financ., Conting. (1.5x) = $15,013,340.52 $12,359,867.22

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R H. Meter =	$6,893,955.36	$5,923,708 28
Estim. Cost Below R H. Meter =	$3,114,938.32	$2,316,203 20
Percent R.H. Cost of Total Line =	31.12%	28.11%
Estim. Richland Hills Cost Share =	$4,672,407 48	$3,474,304 80

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	48.38	90	83.62	78	57.09	279.20	$81,111.93	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	47.07	90	86.59	78	59.12	93.15	1,372,541.04	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	47.06	90	86.61	78	59.13	-11.44	58,050.69	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	47.06	90	86.61	78	59.13	59.13	119,282.25	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	47.06	90	86.64	78	59.15	133.46	54,869.83	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	47.15	90	87.43	78	59.69	84.73	691,837.02	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	47.21	90	87.66	78	59.85	95.52	317,290.77	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	47.38	90	105.58	78	72.09	104.48	344,328.08	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	47.52	90	105.73	78	72.19	101.22	287,072.60	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	47.67	90	105.86	78	72.28	106.10	444,525.17	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	47.73	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	47.72	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	47.94	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	90.17	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	90.10	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	89.85	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	89.69	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	89.48	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	89.40	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	89.39	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	89.45	84	88.99	84	88.99	113.41	116,377.06	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	89.78	84	89.19	84	89.19	120.91	568,030.89	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	89.98	84	89.37	34	89.37	111.26	492,524.34	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	90.07	84	89.42	34	89.42	142.89	93,517.28	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	90.16	84	89.67	34	89.67	114.75	559,025.52	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	90.38	84	89.76	84	89.76	129.15	238,988.61	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	125.46	84	90.01	84	90.01	130.79	481,440.81	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	125.45	84	90.06	84	90.06	131.80	87,282.79	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	125.36	84	90.17	84	90.17	127.14	213,357.94	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	98.26	84	159.04	78	130.52	161.92	803,555.89	692,861.97

DESIGN CONDITION: OPTION NO. 3
DESIGN YEAR: 2070

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 175,228.27
2070 Sew. Ac. = 26,431.99
Constant Intel Flow = 0.00

TOTAL ESTIM. CONST. COST = $10,277,633.93 $8,835,439.13
+ Engr., ROW, Financ., Conting. (1.5x) = $15,416,450.90 $13,253,158.70

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 3

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, year 2020 BFX Area. This option also includes diversion of Little Fossil Creek Area in Haltom City. The Marine Creek Area is included, but the 6.0 MGD Intel Facility flow is not included in this model.

Estim. Cost Above R.H. Meter =	$6,951,249.72	$6,336,954.99
Estim. Cost Below R.H. Meter =	$3,326,384.21	$2,498,484.14
Percent R.H. Cost of Total Line =	32.37%	28.28%
Estim. Richland Hills Cost Share =	$4,989,576.32	$3,747,726.21

OPTION 4

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	60.87	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	62.32	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	62.33	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	62.33	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	62.35	84	72.08	72	47.79	122.10	47,797.72	35,116.69
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	62.81	84	72.74	72	48.22	73.26	602,666.92	442,775.69
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	62.95	84	72.93	72	48.35	84.02	276,395.52	203,066.09
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.08	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	63.17	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	63.25	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	63.30	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	63.33	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	63.39	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	70.32	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	70.32	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	70.33	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	70.38	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	70.46	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	70.50	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	70.53	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	70.56	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	70.73	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	70.86	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	70.91	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	71.06	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	71.15	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	76.99	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	77.02	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	77.07	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	68.97	66	83.60	66	83.60	115.00	496,072.77	496,072.77

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 80,931.25
2000 Sew. Ac. = 16,091.36
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,569,370.81 $6,501,525.61
+ Engr., ROW, Financ., Conting. (1.5x) = $12,854,056.21 $9,752,288.42

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth Big Fossil Outfall, including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$5,747,488.64	$4,255,962.24
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,245,563.37
Percent R.H. Cost of Total Line =	32.93%	34.54%
Estim. Richland Hills Cost Share :	$4,232,823.25	$3,368,345.06

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	66.85	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	68.52	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	68.53	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	68.53	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	68.55	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.06	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.22	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.36	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	69.46	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	69.55	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	69.61	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	69.64	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	69.70	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	76.58	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	76.58	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	76.60	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	76.66	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	76.76	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	76.80	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	76.83	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	76.87	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	77.05	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	77.20	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	77.25	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	77.42	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	77.51	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	83.33	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	83.36	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	83.41	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	74.88	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 87,431.63
2005 Sew. Ac. = 17,571.46
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,474,123.99 $7,972,645.03
+ Engr., ROW, Financ., Conting. (1.5x) = $14,211,185.98 $11,958,967.54

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$6,652,241.82	$5,608,859.70
Estim. Cost Below R.H. Meter =	$2,821,882.17	$2,363,785.33
Percent R.H. Cost of Total Line =	29.79%	29.65%
Estim. Richland Hills Cost Share =	$4,232,823.25	$3,545,678.00

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	70.38	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	72.11	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	72.12	90	86.61	84	72.06	1.49	58,050.69	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	72.12	90	86.61	84	72.06	72.06	119,282.25	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	72.14	90	86.64	84	72.08	146.39	54,869.83	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	72.68	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	72.85	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	73.00	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	73.10	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	73.20	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	73.26	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	73.29	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	73.36	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	81.14	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	81.14	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	81.15	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	81.22	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	81.31	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	81.36	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	81.39	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	81.43	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	81.63	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	81.78	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	81.83	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	82.02	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	82.12	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	88.68	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	88.71	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	88.77	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	79.46	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: OPTION NO. 4 F.W. Model Eq. Pop. = 57,207.50 93,287.50 2010 Eq. Pop. = 93,932.00 TOTAL ESTIM. CONST. COST = $9,831,475.92 $8,483,275.53

DESIGN YEAR: 2010 F.W. Model Sew. Ac. = 9,004.81 20,981.33 2010 Sew. Ac. = 18,759.44 + Engr., ROW, Financ., Conting. (1.5x) = $14,747,213.88 $12,724,913.30

Constant Intel Flow = 6.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option does not include diversion
of Little Fossil Creek Area in Haltom City
to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$6,586,472.24	$5,661,393.37
Estim. Cost Below R.H. Meter =	$3,245,003.68	$2,821,882.17
Percent R.H. Cost of Total Line =	33.01%	33.26%
Estim. Richland Hills Cost Share =	$4,867,505.52	$4,232,823.25

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	87.91	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	90.50	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	90.52	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	90.52	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	90.55	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	91.28	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	91.50	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	91.68	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	91.81	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	91.92	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	91.99	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	92.04	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	92.10	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	96.59	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	96.60	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	96.65	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	96.77	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	96.93	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	97.00	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	97.05	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	97.10	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	97.32	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	97.50	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	97.56	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	97.80	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	97.90	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	101.77	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	101.81	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	101.90	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	93.06	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 103,938.50
2015 Sew. Ac. = 22,032.13
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,382,085.03 $9,925,770.75
+ Engr., ROW, Financ., Conting. (1.5x) = $17,073,127.54 $14,888,656.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$7,684,391.97	$6,680,767.06
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	32.49%	32.69%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	92.38	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	95.00	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	95.02	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	95.02	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	95.05	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	95.81	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	96.04	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	96.24	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	96.37	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	96.50	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	96.57	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	96.62	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	96.69	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	102.92	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	102.93	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	102.98	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	103.09	90	106.50	64	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	103.25	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	103.33	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	103.37	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	103.43	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	103.67	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	103.87	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	103.93	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	104.18	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	104.29	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	109.62	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	109.66	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	109.76	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	99.59	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2020**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 113,945.00
2020 Sew. Ac. = 23,745.44
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,382,085.03 $9,925,770.75
+ Engr., ROW, Financ., Conting. (1.5x) = $17,073,127.54 $14,888,656.12

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$7,684,391.97	$6,680,767.06
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	32.49%	32.69%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	93.84	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	95.68	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	95.69	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	95.69	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	95.72	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	96.39	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	96.60	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	96.82	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	96.98	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	97.13	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	97.21	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	97.24	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	97.37	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	115.28	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	115.27	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	115.24	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	115.28	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	115.36	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	115.39	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	115.43	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	115.50	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	115.80	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	116.03	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	116.11	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	116.35	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	116.51	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	131.51	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	131.55	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	131.60	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	114.87	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 4**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 149,156.99
2050 Sew. Ac. = 28,070.61
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City, Richland Hills, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option does not include diversion of Little Fossil Creek Area in Haltom City to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	95.48	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	96.95	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	96.96	96	102.88	30	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	96.96	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	96.98	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	97.62	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	97.82	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	98.05	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	98.22	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	98.39	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	98.47	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	98.50	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	98.66	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	122.63	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	122.60	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	122.53	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	122.54	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	122.57	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	122.59	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	122.63	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	122.70	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	123.03	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	123.28	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	123.37	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	123.61	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	123.80	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	143.82	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	143.85	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	143.88	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	123.68	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: OPTION NO. 4
DESIGN YEAR: 2070

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 168,403.10
2070 Sew. Ac. = 30,535.42
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 4

All Cities Served by City of Fort Worth
Big Fossil Outfall, Including NRH, Haltom City,
Richland Hills, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option does not include diversion
of Little Fossil Creek Area in Haltom City
to this line -- this area is omitted.

Estim. Cost Above R.H. Meter =	$8,497,239.51	$7,441,172.82
Estim. Cost Below R.H. Meter =	$3,697,693.06	$3,245,003.68
Percent R.H. Cost of Total Line =	30.32%	30.37%
Estim. Richland Hills Cost Share =	$5,546,539.58	$4,867,505.52

OPTION 5a

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	61.21	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	62.56	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	62.57	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	62.57	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	62.58	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	63.03	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	63.17	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	63.30	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	63.39	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	63.48	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	63.53	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	63.56	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	63.63	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	72.19	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	72.18	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	72.18	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	72.23	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	72.29	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	72.33	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	72.35	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	72.39	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	72.57	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	72.71	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	72.75	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	72.90	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	73.00	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	80.19	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	80.22	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	80.26	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	71.23	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 85,990.79
2000 Sew. Ac. = 16,728.36
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,277,334.79 $7,820,119.26
+ Engr., ROW, Financ., Conting. (1.5x) = $13,916,002.18 $11,730,178.89

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth Big Fossil Outfall, except Richland Hills, but including NRH, Haltom City, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	67.13	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	68.71	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	68.72	84	72.06	84	72.06	1.49	50,568.60	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	68.72	84	72.06	84	72.06	72.06	103,908.09	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	68.73	84	72.08	84	72.08	146.39	47,797.72	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	69.24	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	69.39	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	69.54	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	69.64	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	69.74	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	69.79	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	69.82	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	69.89	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	78.23	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	78.23	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	78.24	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	78.29	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	78.38	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	78.41	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	78.44	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	78.49	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	78.67	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	78.83	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	78.87	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	79.05	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	79.14	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	86.17	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	86.20	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	86.25	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	76.88	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 91,937.31
2005 Sew. Ac. = 18,136.37
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,277,334.79 $7,820,119.26
+ Engr., ROW, Financ., Conting. (1.5x) = $13,916,002.18 $11,730,178.89

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	71.00	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	72.67	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	72.69	90	86.61	90	86.61	16.04	58,050.69	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	72.69	90	86.61	90	86.61	86.61	119,282.25	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	72.71	90	86.64	90	86.64	160.95	54,869.83	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	73.24	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	73.41	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	73.56	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	73.67	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	73.77	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	73.83	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	73.86	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	73.93	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	82.85	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	82.85	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	82.85	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	82.91	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	83.00	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	83.04	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	83.07	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	83.12	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	83.32	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	83.48	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	83.53	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	83.71	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	83.82	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	91.32	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	91.35	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	91.40	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	81.42	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 97,883.84
2010 Sew. Ac. = 19,299.64
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,831,475.92 $8,513,203.89
+ Engr., ROW, Financ., Conting. (1.5x) = $14,747,213.88 $12,769,805.83

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	88.77	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	91.33	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	96	102.88	32.31	66,048.79	66,048.79
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	96	102.88	102.88	135,716.69	135,716.69
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	91.37	96	102.91	96	102.91	177.22	62,429.68	62,429.68
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	92.11	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	92.33	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	92.52	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	92.64	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	92.76	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	92.83	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	92.88	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	92.94	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	98.38	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	98.39	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	98.44	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	98.55	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	98.71	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	98.78	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	98.83	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	98.88	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	99.10	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	99.29	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	99.35	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	99.59	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	99.70	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	104.36	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	104.40	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	104.49	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	95.05	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2015**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2015 Eq. Pop. = 107,643.23
2015 Sew. Ac. = 22,572.33
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,279,590.65 $9,863,468.30
+ Engr., ROW, Financ., Conting. (1.5x) = $16,919,385.98 $14,795,202.46

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2020 COEF. "A"	2020 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	93.49	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	96.10	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	96.12	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	96.12	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	96.15	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	96.91	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	97.14	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	97.34	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	97.48	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	97.61	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	97.68	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	97.73	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	97.80	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	104.81	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	104.82	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	104.87	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	104.97	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	105.13	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	105.20	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	105.25	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	105.30	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	105.55	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	105.75	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	105.82	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	106.07	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	106.19	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	112.16	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	112.20	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	112.29	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	101.61	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: .2020

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2020 Eq. Pop. = 117,402.63
2020 Sew. Ac. = 24,285.65
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $11,492,690.59 $10,030,827.48
+ Engr., ROW, Financ., Conting. (1.5x) = $17,239,035.89 $15,046,241.22

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth Big Fossil Outfall, except Richland Hills, but including NRH, Haltom City, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	97.10	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	99.11	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	99.13	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	99.13	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	99.15	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	99.86	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	100.08	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	100.31	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	100.47	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	100.62	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	100.70	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	100.74	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	100.87	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	117.97	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	117.96	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	117.93	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	117.99	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	118.08	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	118.12	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	118.16	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	118.23	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	118.53	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	118.77	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	118.85	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	119.10	96	128.02	90	107.78	132.86	730,155.78	641,738.46
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	119.26	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	133.60	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	133.64	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	133.69	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	117.16	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2050**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2050 Eq. Pop. = 150,439.81
2050 Sew. Ac. = 28,610.82
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including NRH, Haltom City, Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow. This Option also includes diversion of Little Fossil Creek Area in Haltom City to this line. Richland Hills omitted from this model.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	98.91	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	100.56	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	100.58	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	100.58	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	100.60	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	101.28	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	101.49	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	101.73	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	101.90	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	102.07	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	102.16	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	102.19	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	102.35	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	125.38	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	125.35	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	125.29	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	125.31	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	125.36	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	125.39	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	125.42	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	125.49	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	125.84	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	126.09	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	126.18	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	126.43	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	126.62	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	145.87	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	145.90	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	145.94	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	125.99	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 5a**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 169,512.59
2070 Sew. Ac. = 31,075.63
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50
+ Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5a

All Cities Served by City of Fort Worth
Big Fossil Outfall, except Richland Hills, but including
NRH, Haltom City, Marine Creek Area, year 2020
BFX Area, and Constant 6.0 MGD Intel Facility
Flow. This Option also includes diversion
of Little Fossil Creek Area in Haltom City
to this line. Richland Hills omitted from this model.

OPTION 5b

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	4.92	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	4.93	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	4.95	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	4.97	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	4.98	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	4.98	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	4.99	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	4.99	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	4.99	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	5.00	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	5.00	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	5.01	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	5.02	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	5.03	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	5.04	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	5.15	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	5.06	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	5.07	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	5.07	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	5.09	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	5.10	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	5.14	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.10	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.10	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.10	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	0.10	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	0.10	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	5.16	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	5.17	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	-0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.19	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.21	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2000

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2000 Eq. Pop. = 7,909.96
2000 Sew. Ac. = 1,157.56

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	5.23	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	5.24	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	5.26	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	5.28	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	5.29	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	5.29	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	5.30	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	5.30	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	5.30	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	5.31	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	5.31	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	5.33	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	5.34	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	5.35	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	5.36	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	5.47	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	5.38	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	5.39	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	5.39	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	5.40	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	5.41	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	5.46	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.11	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.11	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.11	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	0.10	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	0.10	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	5.48	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	5.49	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	-0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.45	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.47	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b** **2005**

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2005 Eq. Pop. = 8,402.56
2005 Sew. Ac. = 1,229.65

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	6.27	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	6.29	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	6.37	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	6.46	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	6.56	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	6.58	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	6.63	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	6.67	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	6.70	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	6.74	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	6.76	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	6.78	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	6.79	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	6.80	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	6.81	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	6.88	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	6.82	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	6.83	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	6.83	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	6.84	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	6.85	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	6.87	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.04	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.04	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	0.04	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	0.03	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	0.04	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	6.89	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	6.90	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	-0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.96	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.97	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b** **2010**

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2010 Eq. Pop. = 8,895.16
2010 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	6.96	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	6.99	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.11	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	7.26	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	7.43	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	7.45	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	7.53	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	7.60	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	7.66	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	7.72	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	7.76	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	7.78	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	7.78	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	7.79	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	7.80	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	7.85	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	7.81	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	7.82	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	7.82	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	7.82	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	7.82	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	7.84	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.02	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.02	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.02	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.02	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.01	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	7.85	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	7.85	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	5.27	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	5.28	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2015

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2015 Eq. Pop. = 9,134.77
2015 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	7.66	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	7.70	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.85	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	8.06	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	8.29	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	8.33	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	8.43	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	8.54	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	8.62	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	8.70	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	8.75	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	8.77	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	8.77	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	8.78	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	8.79	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	8.81	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	8.80	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	8.80	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	8.80	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	8.80	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	8.80	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	8.80	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.07	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.07	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.07	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.07	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.06	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	8.81	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	8.81	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	5.58	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	5.58	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2020

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2020 Eq. Pop. = 9,374.37
2020 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	7.09	36	142.07	0	0.00	142.07	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	7.16	36	44.89	0	0.00	44.89	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.40	36	13.97	0	0.00	13.97	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	7.76	36	10.16	0	0.00	10.16	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	8.15	36	10.25	0	0.00	10.25	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	8.23	36	10.00	0	0.00	10.00	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	8.40	36	10.20	0	0.00	10.20	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	8.59	36	10.29	0	0.00	10.29	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	8.74	36	10.13	0	0.00	10.13	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	8.88	36	10.18	0	0.00	10.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	8.98	36	10.25	0	0.00	10.25	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	8.99	36	10.20	0	0.00	10.20	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	8.98	36	9.95	0	0.00	9.95	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	8.98	36	10.22	0	0.00	10.22	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	9.00	36	10.04	0	0.00	10.04	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	8.88	27	12.53	0	0.00	12.53	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	8.98	36	10.22	0	0.00	10.22	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	8.97	36	10.13	0	0.00	10.13	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	8.97	30	8.88	0	0.00	8.88	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	8.95	30	10.86	0	0.00	10.86	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	8.94	27	21.09	0	0.00	21.09	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	8.88	27	6.66	0	0.00	6.66	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	27	8.08	0	0.00	8.08	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	-16.02	0	0.00	-16.02	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	0.00	0	0.00	0.00	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.26	16	0.00	0	0.00	0.00	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.25	16	11.50	0	0.00	11.50	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	8.87	27	8.97	0	0.00	8.97	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	8.85	30	11.53	0	0.00	11.53	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.33	27	25.47	0	0.00	25.47	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.31	27	24.49	0	0.00	24.49	6,083.39	0.00

DESIGN CONDITION: **OPTION NO. 5b**
2050

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2050 Eq. Pop. = 11,289.18
2050 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	7.09	36	142.07	0	3.52	145.59	$2,544.69	$0.00
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	7.16	36	44.89	0	3.54	48.43	10,178.75	0.00
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	7.40	36	13.97	0	3.61	17.58	41,605.65	0.00
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	7.76	36	10.16	0	3.70	13.86	64,380.60	0.00
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	8.15	36	10.25	0	3.81	14.06	104,713.91	0.00
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	8.23	36	10.00	0	3.83	13.83	24,047.30	0.00
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	8.40	36	10.20	0	3.88	14.08	72,778.07	0.00
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	8.59	36	10.29	0	3.92	14.21	68,197.64	0.00
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	8.74	36	10.13	0	3.96	14.09	80,921.08	0.00
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	8.88	36	10.18	0	4.00	14.18	102,169.22	0.00
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	8.98	36	10.25	0	4.02	14.27	111,711.80	0.00
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	8.99	36	10.20	0	5.52	15.72	72,523.61	0.00
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	8.98	36	9.95	0	5.52	15.47	7,506.83	0.00
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	8.98	36	10.22	0	5.53	15.75	110,184.99	0.00
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	9.00	36	10.04	0	5.53	15.57	93,517.28	0.00
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	8.88	27	12.53	0	4.37	16.90	53,677.01	0.00
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	8.98	36	10.22	0	3.06	13.28	43,259.69	0.00
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	8.97	36	10.13	0	3.06	13.19	35,243.93	0.00
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	8.97	30	8.88	0	4.36	13.24	15,815.94	0.00
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	8.95	30	10.86	0	4.36	15.22	64,854.20	0.00
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	8.94	27	21.09	0	2.03	23.12	15,745.26	0.00
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	8.88	27	6.66	0	2.03	8.69	158,239.83	0.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	27	8.08	0	0.04	8.12	715.69	0.00
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	-16.02	0	0.04	-15.98	326.73	0.00
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.28	16	0.00	0	0.04	0.04	150.80	0.00
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.26	16	0.00	0	0.04	0.04	301.59	0.00
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.25	16	11.50	0	0.04	11.54	628.32	0.00
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	8.87	27	8.97	0	2.03	11.00	21,613.94	0.00
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	8.85	30	11.53	0	2.03	13.56	26,065.38	0.00
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.01	27	9.86	0	0.00	9.86	10,735.40	0.00
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	4.33	27	25.47	0	3.15	28.62	25,764.96	0.00
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	4.31	27	24.49	0	4.17	28.66	6,083.39	0.00

DESIGN CONDITION: **OPTION 5b**
2070

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2070 Eq. Pop. = 11,289.18
2070 Sew. Ac. = 1,254.35

TOTAL ESTIM. CONST. COST = $1,446,203.47 $0.00
+ Engr., ROW, Financ., Conting. (1.5x) = $2,169,305.20 $0.00
Assume Rehab. Cost = 0.33 x Repl. Cost = $715,870.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Capacity of Replacement Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 5b

Includes Flow only from Richland Hills. North Richland Hills flow is assumed to be diverted to the proposed City of Fort Worth Outfall Sewer.

OPTION 6a

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2000 COEF. "A"	2000 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	60.14	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	61.82	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	61.83	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	61.83	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	61.85	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	62.33	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	62.48	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	62.60	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	62.68	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	62.76	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	62.81	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	62.84	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	62.88	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	66.28	78	72.51	66	46.44	76.16	385,255.15	275,833.57
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	66.28	78	72.52	66	46.45	78.33	59,132.19	42,337.24
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	66.32	78	72.60	66	46.50	78.89	304,620.35	218,100.96
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	66.39	78	72.71	66	46.57	78.09	412,730.71	295,505.42
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	66.49	78	72.88	66	46.68	78.91	482,614.20	345,540.34
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	66.54	78	72.95	66	46.73	82.40	238,917.92	171,059.58
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	66.57	78	72.99	66	46.75	76.01	90,191.51	64,574.99
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	66.60	78	73.03	66	46.78	71.20	100,345.53	71,845.02
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	66.75	78	73.20	66	46.88	78.60	489,781.73	350,672.13
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	66.88	78	73.34	66	46.98	68.87	424,676.60	304,058.40
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	66.91	78	73.39	66	47.00	100.47	80,634.80	57,732.61
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	67.07	78	73.59	66	47.14	72.22	482,016.90	345,112.69
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	67.14	78	73.66	66	47.18	86.57	206,066.71	147,538.88
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	70.06	78	73.87	66	47.31	88.09	415,119.89	297,216.01
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	70.08	78	73.91	66	47.34	89.08	75,259.14	53,883.77
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	70.14	78	74.00	66	47.40	84.37	183,966.80	131,715.87
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	64.06	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2000**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2000 Eq. Pop. = 69,948.30
2000 Sew. Ac. = 14,709.75
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $8,569,370.81 $6,533,652.29
+ Engr., ROW, Financ., Conting. (1.5x) = $12,854,056.21 $9,800,478.44

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2005 COEF. "A"	2005 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	65.97	84	69.57	78	57.09	279.20	$70,657.50	$60,924.07
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	67.90	84	72.04	78	59.12	93.15	1,195,635.75	1,030,930.82
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	67.91	84	72.06	78	59.13	-11.44	50,568.60	43,602.52
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	67.91	84	72.06	78	59.13	59.13	103,908.09	89,594.22
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	67.93	84	72.08	78	59.15	133.46	47,797.72	41,213.34
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	68.48	84	72.74	78	59.69	84.73	602,666.92	519,646.47
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	68.64	84	72.93	78	59.85	95.52	276,395.52	238,320.62
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	68.77	78	72.09	66	46.17	78.56	258,628.65	185,171.99
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	68.86	78	72.19	66	46.24	75.27	215,623.42	154,381.27
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	68.94	78	72.28	66	46.29	80.11	333,887.79	239,055.76
M402A/0049+00	M402A/0045+95	307	54	28.71	-18.99	88.14	-0.0011	0.0091	84	0.000562	69.00	78	72.33	66	46.33	75.04	183,369.50	131,288.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	69.03	78	72.38	66	46.36	78.08	150,518.29	107,767.53
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	69.07	78	72.41	66	46.38	81.57	152,310.17	109,050.48
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	71.97	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	71.98	84	88.37	78	72.52	104 40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	72.03	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	72.11	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	72.23	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	72.29	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	72.32	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	72.36	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	72.52	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	72.65	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	72.69	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	72.87	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	72.94	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	75.46	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	75.49	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	75.56	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	69.29	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2005**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2005 Eq. Pop. = 75,006.22
2005 Sew. Ac. = 16,002.64
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,277,334.79 $7,792,254.93
+ Engr., ROW, Financ., Conting. (1.5x) = $13,916,002.18 $11,688,382.40

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2010 COEF. "A"	2010 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	70.24	90	83.62	84	69.57	291.68	$81,111.93	$70,657.50
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	72.31	90	86.59	84	72.04	106.07	1,372,541.04	1,195,635.75
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	72.32	90	86.61	84	72.06	1.49	58,050.69	50,568.60
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	72.32	90	86.61	84	72.06	72.06	119,282.25	103,908.09
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	72.34	90	86.64	84	72.08	146.39	54,869.83	47,797.72
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	72.92	90	87.43	84	72.74	97.78	691,837.02	602,666.92
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	73.10	90	87.66	84	72.93	108.60	317,290.77	276,395.52
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	73.24	84	87.84	78	72.09	104.48	299,948.02	258,628.65
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	73.34	84	87.96	78	72.19	101.22	250,072.13	215,623.42
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	73.43	84	88.07	78	72.28	106.10	387,230.81	333,887.79
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	73.48	84	88.14	78	72.33	101.04	212,665.22	183,369.50
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	73.52	84	88.19	78	72.38	104.10	174,565.59	150,518.29
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	73.56	84	88.23	78	72.41	107.60	176,643.75	152,310.17
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	76.57	84	88.35	78	72.51	102.23	446,804.78	385,255.15
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	76.58	84	88.37	78	72.52	104.40	68,579.34	59,132.19
M402A/0065+95	M402A/0061+67	510	54	32 39	31 54	88.46	-0.0004	0.0059	84	0.000566	76.63	84	88.46	78	72.60	104.99	353,287.50	304,620.35
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	76.72	84	88.60	78	72.71	104.23	478,669.93	412,730.71
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	76.85	84	88.80	78	72.88	105.11	559,718.24	482,614.20
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	76.91	84	88.89	78	72.95	108.62	277,088.24	238,917.92
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	76.95	84	88.94	78	72.99	102.25	104,600.81	90,191.51
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	76.99	84	88.99	78	73.03	97.45	116,377.06	100,345.53
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	77.16	84	89.19	78	73.20	104.92	568,030.89	489,781.73
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	77.30	84	89.37	78	73.34	95.23	492,524.34	424,676.60
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	77.35	84	89.42	78	73.39	126.86	93,517.28	80,634.80
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	77.54	84	89.67	78	73.59	98.67	559,025.52	482,016.90
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	77.62	84	89.76	78	73.66	113.05	238,988.61	206,066.71
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	80.23	84	90.01	78	73.87	114.65	481,440.81	415,119.89
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	80.26	84	90.06	78	73.91	115.65	87,282.79	75,259.14
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	80.34	84	90.17	78	74.00	110.97	213,357.94	183,966.80
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	73.68	66	83.60	60	64.84	96.24	496,072.77	409,977.50

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2010**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2010 Eq. Pop. = 80,064.14
2010 Sew. Ac. = 17,107.83
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $9,831,475.92 $8,483,275.53
+ Engr., ROW, Financ., Conting. (1.5x) = $14,747,213.88 $12,724,913.30

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2015 COEF. "A"	2015 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	88.34	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	91.33	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	91.35	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	91.38	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	92.17	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	92.40	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	92.57	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	92.69	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	92.80	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	92.87	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	92.92	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	92.95	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	92.16	90	106.20	84	88.35	118.07	512,913.65	446,804.78
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	92.18	90	106.22	84	88.37	120.25	78,726.28	68,579.34
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	92.28	90	106.33	84	88.46	120.85	405,559.63	353,287.50
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	92.42	90	106.50	84	88.60	120.12	549,493.54	478,669.93
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	92.63	90	106.74	84	88.80	121.03	642,533.69	559,718.24
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	92.72	90	106.85	84	88.89	124.56	318,085.99	277,088.24
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	92.77	90	106.91	84	88.94	118.20	120,077.46	104,600.81
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	92.82	90	106.97	84	88.99	113.41	133,596.11	116,377.06
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	93.01	90	107.21	84	89.19	120.91	652,076.27	568,030.89
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	93.18	90	107.42	84	89.37	111.26	565,397.84	492,524.34
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	93.23	90	107.48	84	89.42	142.89	107,354.02	93,517.28
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	93.48	90	107.78	84	89.67	114.75	641,738.48	559,025.52
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	93.56	90	107.89	84	89.76	129.15	274,349.16	238,988.61
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	93.06	90	108.19	84	90.01	130.79	552,674.40	481,440.81
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	93.11	90	108.25	84	90.06	131.80	100,197.09	87,282.79
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	93.22	90	108.38	84	90.17	127.14	244,926.21	213,357.94
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	87.25	72	105.43	66	83.60	115.00	590,367.59	496,072.77

DESIGN CONDITION: **OPTION NO. 6a** F.W. Model Eq. Pop. = 57,207.50 93,287.50 2015 Eq. Pop. = 89,256.39 TOTAL ESTIM. CONST. COST = $11,279,590.65 $9,831,475.92

DESIGN YEAR: **2015** F.W. Model Sew. Ac. = 9,004.81 20,981.33 2015 Sew. Ac. = 20,353.79 + Engr., ROW, Financ., Conting. (1.5x) = $16,919,385.98 $14,747,213.88

Constant Intel Flow = 6.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST. DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2050 COEF. "A"	2050 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	98.86	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	101.52	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	101.54	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	101.54	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	101.57	96	102.91	90	86164	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	102.37	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	102.61	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	102.82	90	105.58	84	87.84	120.23	344,328.08	299,948.02
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	102.97	90	105.73	84	87.96	116.99	287,072.60	250,072.13
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	103.11	90	105.86	84	88.07	121.89	444,525.17	387,230.81
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	103.19	90	105.94	84	88.14	116.85	244,131.00	212,665.22
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	103.24	90	106.00	84	88.19	119.91	200,394.17	174,565.59
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	103.33	90	106.05	84	88.23	123.42	202,779.82	176,643.75
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	112.36	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	112.36	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	112.40	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	112.50	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	112.66	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	112.73	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	112.77	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	112.84	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	113.10	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	113.32	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	113.39	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	113.66	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	113.79	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	121.44	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	121.49	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	121.58	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	109.37	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 6a** F.W. Model Eq. Pop. = 57,207.50 93,287.50 2050 Eq. Pop. = 129,181.14 TOTAL ESTIM. CONST. COST = $12,194,932.56 $10,686,176.50

DESIGN YEAR: **2050** F.W. Model Sew. Ac. = 9,004.81 20,981.33 2050 Sew. Ac. = 26,316.11 + Engr., ROW, Financ., Conting. (1.5x) = $18,292,398.84 $16,029,264.76

Constant Intel Flow = 6.00

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	2070 COEF. "A"	2070 COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
M402A/0000+50	M280A/0304+97	102	54	222.11	18.94	83.62	-0.0010	0.0084	90	0.000350	100.68	96	99.32	90	83.62	305.73	$92,287.35	$81,111.93
M402A/0020+17	M402A/0000+50	1726	54	34.03	18.71	86.59	-0.0011	0.0089	90	0.000375	102.98	96	102.85	90	86.59	120.62	1,561,646.69	1,372,541.04
M402A/0020+90	M402A/0020+17	73	24	-70.57	18.71	86.61	-0.0011	0.0089	90	0.000375	102.99	96	102.88	90	86.61	16.04	66,048.79	58,050.69
M402A/0022+40	M402A/0020+90	150	24	0.00	18.71	86.61	-0.0011	0.0089	90	0.000375	102.99	96	102.88	90	86.61	86.61	135,716.69	119,282.25
M402A/0023+09	M402A/0022+40	69	24	74.31	18.71	86.64	-0.0011	0.0089	90	0.000376	103.02	96	102.91	90	86.64	160.95	62,429.68	54,869.83
M402A/0028+40	M402A/0023+09	870	54	25.04	18.78	87.43	-0.0011	0.0090	90	0.000383	103.78	96	103.85	90	87.43	112.47	787,156.79	691,837.02
M402A/0032+40	M402A/0028+40	399	54	35.67	18.81	87.66	-0.0011	0.0090	90	0.000385	104.02	96	104.12	90	87.66	123.33	361,006.39	317,290.77
M402A/0036+79	M402A/0032+40	433	54	32.39	18.87	87.84	-0.0011	0.0091	84	0.000558	104.25	96	125.41	90	105.58	137.97	391,768.84	344,328.08
M402A/0040+28	M402A/0036+79	361	54	29.03	18.92	87.96	-0.0011	0.0091	84	0.000559	104.41	96	125.58	90	105.73	134.76	326,624.83	287,072.60
M402A/0045+95	M402A/0040+28	559	54	33.82	18.97	88.07	-0.0011	0.0091	84	0.000561	104.56	96	125.74	90	105.86	139.68	505,770.86	444,525.17
M402A/0049+00	M402A/0045+95	307	54	28.71	18.99	88.14	-0.0011	0.0091	84	0.000562	104.65	96	125.84	90	105.94	134.65	277,766.82	244,131.00
M402A/0051+91	M402A/0049+00	252	54	31.72	18.99	88.19	-0.0011	0.0091	84	0.000562	104.69	96	125.91	90	106.00	137.72	228,004.04	200,394.17
M402A/0054+21	M402A/0051+91	255	54	35.19	19.06	88.23	-0.0011	0.0091	84	0.000563	104.81	96	125.97	90	106.05	141.24	230,718.37	202,779.82
M402A/0060+68	M402A/0054+21	645	54	29.72	31.63	88.35	-0.0004	0.0058	84	0.000564	119.76	96	126.14	90	106.20	135.92	583,581.76	512,913.65
M402A/0061+67	M402A/0060+68	99	54	31.88	31.61	88.37	-0.0004	0.0058	84	0.000565	119.76	96	126.17	90	106.22	138.10	89,573.01	78,726.28
M402A/0065+95	M402A/0061+67	510	54	32.39	31.54	88.46	-0.0004	0.0059	84	0.000566	119.75	96	126.30	90	106.33	138.72	461,436.74	405,559.63
M402A/0072+77	M402A/0065+95	691	54	31.52	31.50	88.60	-0.0004	0.0059	84	0.000568	119.83	96	126.50	90	106.50	138.02	625,201.54	549,493.54
M402A/0080+78	M402A/0072+77	808	54	32.23	31.45	88.80	-0.0004	0.0060	84	0.000570	119.94	96	126.78	90	106.74	138.97	731,060.56	642,533.69
M402A/0085+50	M402A/0080+78	400	54	35.67	31.43	88.89	-0.0004	0.0060	84	0.000571	119.99	96	126.91	90	106.85	142.52	361,911.17	318,085.99
M402A/0086+56	M402A/0085+50	151	54	29.26	31.43	88.94	-0.0004	0.0060	84	0.000572	120.04	96	126.98	90	106.91	136.17	136,621.47	120,077.46
M402A/0088+51	M402A/0086+56	168	54	24.42	31.45	88.99	-0.0004	0.0060	84	0.000573	120.10	96	127.05	90	106.97	131.39	152,002.69	133,596.11
M402A/0096+65	M402A/0088+51	820	54	31.72	31.56	89.19	-0.0004	0.0060	84	0.000575	120.41	96	127.34	90	107.21	138.93	741,917.89	652,076.27
M402A/0103+76	M402A/0096+65	711	54	21.89	31.63	89.37	-0.0004	0.0060	84	0.000577	120.65	96	127.60	90	107.42	129.31	643,297.10	565,397.84
M402A/0105+11	M402A/0103+76	135	54	53.47	31.66	89.42	-0.0004	0.0060	84	0.000578	120.72	96	127.67	90	107.48	160.95	122,145.02	107,354.02
M402A/0109+91	M402A/0105+11	807	54	25.08	31.70	89.67	-0.0004	0.0060	84	0.000581	120.99	96	128.02	90	107.78	132.86	730,155.78	641,738.48
M402A/0113+81	M402A/0109+91	345	54	39.39	31.77	89.76	-0.0004	0.0060	84	0.000582	121.15	96	128.15	90	107.89	147.28	312,148.38	274,349.16
M402A/0117+43	M402A/0113+81	695	54	40.78	42.22	90.01	0.0002	0.0034	84	0.000586	133.71	96	128.51	90	108.19	148.97	628,820.65	552,674.40
M402A/0120+25	M402A/0117+43	126	54	41.74	42.22	90.06	0.0002	0.0034	84	0.000586	133.75	96	128.58	90	108.25	149.99	114,002.02	100,197.09
M402B/0123+40	M402A/0120+25	308	54	36.97	42.20	90.17	0.0002	0.0034	84	0.000588	133.83	96	128.74	90	108.38	145.35	278,671.60	244,926.21
M402B/0136+74	M402B/0123+40	1160	48	31.40	33.78	83.60	-0.0001	0.0045	66	0.001829	118.20	78	130.52	72	105.43	136.83	692,861.97	590,367.59

DESIGN CONDITION: **OPTION NO. 6a**
DESIGN YEAR: **2070**

F.W. Model Eq. Pop. = 57,207.50 93,287.50
F.W. Model Sew. Ac. = 9,004.81 20,981.33

2070 Eq. Pop. = 148,253.92
2070 Sew. Ac. = 28,780.92
Constant Intel Flow = 6.00

TOTAL ESTIM. CONST. COST = $12,432,355.48 $10,908,281.81
+ Engr., ROW, Financ., Conting. (1.5x) = $18,648,533.22 $16,362,422.72

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6a

Cities Served by City of Fort Worth Big Fossil Outfall including only Haltom City and Haltom City Little Fossil, plus Marine Creek Area, year 2020 BFX Area, and Constant 6.0 MGD Intel Facility Flow.
The Cities of NRH and Richland Hills are not included in this model. Those cities are served by the TCWSC line.

OPTION 6b

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2000 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	20.01	60	22.34	54	16.87	158.94	$7,068.58	$5,725.55
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	20.12	60	22.46	54	16.96	61.85	28,274.31	22,902.19
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	20.55	60	22.91	54	17.30	31.27	115,571.24	93,612.71
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	21.13	60	23.52	54	17.76	27.92	178,835.01	144,856.36
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	21.76	60	24.18	54	18.26	28.51	290,871.96	235,606.29
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	21.87	60	24.30	54	18.35	28.35	66,798.06	54,106.43
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	22.16	60	24.61	54	18.58	28.78	202,161.32	163,750.67
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	22.45	60	24.91	54	18.81	29.10	189,437.88	153,444.68
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	22.68	60	25.15	54	18.99	29.12	224,780.76	182,072.42
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	22.91	60	25.39	54	19.17	29.35	283,803.39	229,880.74
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	23.06	60	25.55	54	19.29	29.54	310,310.55	251,351.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	23.11	54	26.46	48	19.33	29.53	163,178.11	128,930.85
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	23.10	54	26.46	48	19.33	29.28	16,890.37	13,345.47
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	23.13	54	26.49	48	19.35	29.57	247,916.22	195,884.42
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	23.16	54	26.53	48	19.38	29.42	210,413.88	166,252.94
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	23.18	54	37.96	48	27.73	40.26	214,708.04	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	23.18	54	26.56	48	19.40	29.62	97,334.31	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	23.18	54	26.56	48	19.40	29.53	79,298.84	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	23.18	48	27.70	42	19.40	28.28	40,488.81	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	23.18	48	27.70	42	19.40	30.26	166,026.75	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	23.17	48	27.70	42	19.40	40.49	49,762.79	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	23.16	48	27.70	42	19.40	26.06	500,116.00	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.23	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.23	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.23	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.23	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.21	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	23.18	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	23.18	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	14.41	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	14.41	30	16.29	18	4.17	28.66	7,510.36	2,703.73

DESIGN CONDITION: **OPTION 6b**
2000

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2000 Eq. Pop. = 23,952.45
2000 Sew. Ac. = 3,176.17

TOTAL ESTIM. CONST. COST = $3,906,414.01 $3,092,629.89
+ Engr., ROW, Financ., Conting. (1.5x) = $5,859,621.02 $4,638,944.84

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2005 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	21.10	60	22.34	54	16.87	158.94	$7,068.58	$5,725.55
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	21.22	60	22.46	54	16.96	61.85	28,274.31	22,902.19
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	21.66	60	22.91	54	17.30	31.27	115,571.24	93,612.71
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	22.27	60	23.52	54	17.76	27.92	178,835.01	144,856.36
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	22.93	60	24.18	54	18.26	28.51	290,871.96	235,606.29
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	23.05	60	24.30	54	18.35	28.35	66,798.06	54,106.43
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	23.35	60	24.61	54	18.58	28.78	202,161.32	163,750.67
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	23.66	60	24.91	54	18.81	29.10	189,437.88	153,444.68
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	23.90	60	25.15	54	18.99	29.12	224,780.76	182,072.42
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	24.13	60	25.39	54	19.17	29.35	283,803.39	229,880.74
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	24.29	60	25.55	54	19.29	29.54	310,310.55	251,351.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	24.34	54	26.46	48	19.33	29.53	163,178.11	128,930.85
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	24.34	54	26.46	48	19.33	29.28	16,890.37	13,345.47
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	24.36	54	26.49	48	19.35	29.57	247,916.22	195,884.42
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	24.40	54	26.53	48	19.38	29.42	210,413.88	166,252.94
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	24.43	54	37.96	48	27.73	40.26	214,708.04	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	24.42	54	26.56	48	19.40	29.62	97,334.31	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	24.42	54	26.56	48	19.40	29.53	79,298.84	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	24.42	48	27.70	42	19.40	28.28	40,488.81	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	24.42	48	27.70	42	19.40	30.26	166,026.75	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	24.41	48	27.70	42	19.40	40.49	49,762.79	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	24.40	48	27.70	42	19.40	26.06	500,116.00	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.24	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.24	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.24	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.24	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.21	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	24.42	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	24.42	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.00	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	15.22	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	15.22	30	16.29	18	4.17	28.66	7,510.36	2,703.73

DESIGN CONDITION: **OPTION 6b**
2005

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2005 Eq. Pop. = 25,333.66
2005 Sew. Ac. = 3,363.38

TOTAL ESTIM. CONST. COST = $3,906,414.01 $3,092,629.89
+ Engr., ROW, Financ., Conting. (1.5x) = $5,859,621.02 $4,638,944.84

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2010 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	23.81	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	23.96	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	24.54	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	25.34	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	26.22	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	26.38	66	31.34	54	18.35	28.35	80,825.65	54,106.43
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	26.78	66	31.73	54	18.58	28.78	244,615.19	163,750.67
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	27.19	66	32.12	54	18.81	29.10	229,219.83	153,444.68
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	27.51	60	25.15	54	18.99	29.12	224,780.76	182,072.42
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	27.82	66	32.74	54	19.17	29.35	343,402.10	229,880.74
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	28.04	66	32.94	54	19.29	29.54	375,475.77	251,351.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	28.09	60	35.05	48	19.33	29.53	201,454.46	128,930.85
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	28.08	60	35.05	48	19.33	29.28	20,852.30	13,345.47
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	28.10	60	35.08	48	19.35	29.57	306,069.41	195,884.42
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	28.14	60	35.14	48	19.38	29.42	259,770.22	166,252.94
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	28.08	54	37.96	48	27.73	40.26	214,708.04	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	28.15	54	26.56	48	19.40	29.62	97,334.31	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	28.14	54	26.56	48	19.40	29.53	79,298.84	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	28.14	54	37.92	42	19.40	28.28	51,243.65	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	28.12	54	37.92	42	19.40	30.26	210,127.60	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	28.11	54	37.92	42	19.40	40.49	62,981.03	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	28.06	54	37.92	42	19.40	26.06	632,959.31	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.42	48	0.56	30	0.16	8.24	2,261.94	883.57
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.42	48	0.56	30	0.16	-15.86	2,940.53	1,148.64
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.42	48	0.56	30	0.16	0.16	1,357.17	530.14
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.41	48	0.56	30	0.16	0.16	2,714.33	1,060.29
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.37	48	0.49	30	0.14	11.64	5,654.86	2,208.93
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	28.06	48	27.73	30	7.92	16.89	68,310.73	26,683.88
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	28.05	48	27.73	30	7.92	19.45	66,727.37	26,065.38
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.01	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	16.58	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	16.56	30	16.29	27	12.30	36.79	7,510.36	6,083.39

DESIGN CONDITION: **OPTION 6b**
2010

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2010 Eq. Pop. = 26,714.86
2010 Sew. Ac. = 3,446.17

TOTAL ESTIM. CONST. COST = $4,608,436.86 $3,157,689.96
+ Engr., ROW, Financ., Conting. (1.5x) = $6,912,655.28 $4,736,534.94

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2015 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	25.73	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	25.91	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	26.59	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	27.53	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	28.58	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	28.77	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	29.24	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	29.73	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	30.12	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	30.49	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	30.74	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	30.80	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	30.78	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	30.81	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	30.85	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	30.72	60	50.27	48	27.73	40.26	265,071.66	169,645.86
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	30.85	60	35.17	48	19.40	29.62	120,165.82	76,906.12
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	30.83	60	35.17	48	19.40	29.53	97,899.80	62,655.87
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	30.83	54	37.92	42	19.40	28.28	51,243.65	30,999.25
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	30.80	54	37.92	42	19.40	30.26	210,127.60	127,114.23
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	30.78	54	37.92	42	19.40	40.49	62,981.03	38,099.63
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	30.69	54	37.92	42	19.40	26.06	632,959.31	382,901.31
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.56	48	0.56	30	0.16	8.24	2,261.94	883.57
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.56	48	0.56	30	0.16	-15.86	2,940.53	1,148.64
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.56	48	0.56	30	0.16	0.16	1,357.17	530.14
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.54	48	0.56	30	0.16	0.16	2,714.33	1,060.29
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.50	48	0.49	30	0.14	11.64	5,654.86	2,208.93
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	30.69	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	30.67	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.02	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	17.48	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	17.45	30	16.29	27	12.30	36.79	7,510.36	6,083.39

DESIGN CONDITION: **OPTION 6b**
2015

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2015 Eq. Pop. = 27,521.61
2015 Sew. Ac. = 3,472.90

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,584,999.61
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 5,377,499.41

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2020 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	27.65	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	27.85	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	28.63	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	29.73	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	30.93	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	31.16	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	31.71	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	32.28	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	32.73	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	33.15	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	33.45	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	33.51	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	33.48	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	33.51	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	33.56	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	33.35	60	50.27	54	37.96	50.49	265,071.66	214,708.04
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	33.54	60	35.17	54	26.56	36.78	120,165.82	97,334.31
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	33.51	60	35.17	54	26.56	36.69	97,899.80	79,298.84
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	33.51	54	37.92	48	27.70	36.58	51,243.65	40,488.81
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	33.47	54	37.92	48	27.70	38.56	210,127.60	166,026.75
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	33.45	54	37.92	48	27.70	48.79	62,981.03	49,762.79
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	33.33	54	37.92	48	27.70	34.36	632,959.31	500,116.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.71	48	0.56	48	0.56	8.64	2,261.94	2,261.94
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.71	48	0.56	48	0.56	-15.46	2,940.53	2,940.53
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-0.71	48	0.56	48	0.56	0.56	1,357.17	1,357.17
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-0.68	48	0.56	48	0.56	0.56	2,714.33	2,714.33
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.63	48	0.49	48	0.49	11.99	5,654.86	5,654.86
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	33.31	48	27.73	48	27.73	36.70	68,310.73	68,310.73
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	33.28	48	27.73	48	27.73	39.26	66,727.37	66,727.37
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.03	36	0.00	36	0.00	9.86	19,085.16	19,085.16
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	18.38	36	20.00	36	20.00	45.47	45,804.38	45,804.38
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	18.34	30	16.29	30	16.29	40.78	7,510.36	7,510.36

DESIGN CONDITION: **OPTION 6b**
2020

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2020 Eq. Pop. = 28,328.36
2020 Sew. Ac. = 3,499.63

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,906,414.01
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 $5,859,621.02

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2050 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	26.09	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	26.33	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	27.27	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	28.61	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	30.10	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	30.38	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	31.05	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	31.77	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	32.33	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	32.85	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	33.22	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	33.27	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	33.22	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	33.24	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	33.28	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	32.84	60	50.27	54	37.96	50.49	265,071.66	214,708.04
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	33.22	60	35.17	54	26.56	36.78	120,165.82	97,334.31
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	33.17	60	35.17	54	26.56	36.69	97,899.80	79,298.84
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	33.17	54	37.92	48	27.70	36.58	51,243.65	40,488.81
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	33.10	54	37.92	48	27.70	38.56	210,127.60	166,026.75
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	33.05	54	37.92	48	27.70	48.79	62,981.03	49,762.79
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	32.83	54	37.92	48	27.70	34.36	632,959.31	500,116.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-1.02	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.95	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	32.77	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	32.72	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.05	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	15.73	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	15.66	30	16.29	24	8.98	33.47	7,510.36	4,806.63

DESIGN CONDITION: **OPTION 6b**
2050

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2050 Eq. Pop. = 32,547.85
2050 Sew. Ac. = 3,549.06

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,848,734.42
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 $5,773,101.63

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

UPSTREAM MAIN/STATION	DOWNSTREAM MAIN/STATION	LENGTH (feet)	EXIST. DIA. (in)	EXIST. PIPE CAP. (MGD)	2000 MODEL FLOW (MGD)	2020 MODEL FLOW (MGD)	COEF. "A"	COEF. "B"	MODEL PROP. DIA. (in)	MODEL H.G. SLOPE (ft/foot)	2070 DESIGN FLOW (MGD)	PROP. REPL. PIPE (in)	REPL. PIPE CAP. (MGD)	PROP. PARL. PIPE (in)	PARL. PIPE CAP. (MGD)	BOTH CAP. (MGD)	ESTIM. REPL. PIPE COST	ESTIM. PARAL. PIPE COST
TCWSC/0000+20	L9957/0001+32	20	36	142.07	10.84	16.87	0.0029	-0.0155	54	0.000217	26.09	66	28.81	60	22.34	164.41	$8,552.98	$7,068.58
TCWSC/0001+00	TCWSC/0000+20	80	36	44.89	10.86	16.96	0.0029	-0.0158	54	0.000219	26.33	66	28.96	60	22.46	67.35	34,211.92	28,274.31
TCWSC/0004+27	TCWSC/0001+00	327	36	13.97	10.91	17.30	0.0031	-0.0169	54	0.000228	27.27	66	29.54	60	22.91	36.88	139,841.20	115,571.24
TCWSC/0009+33	TCWSC/0004+27	506	36	10.16	10.95	17.76	0.0033	-0.0185	54	0.000241	28.61	66	30.33	60	23.52	33.68	216,390.36	178,835.01
TCWSC/0017+56	TCWSC/0009+33	823	36	10.25	10.98	18.26	0.0036	-0.0203	54	0.000254	30.10	66	31.18	60	24.18	34.43	351,955.08	290,871.96
TCWSC/0019+45	TCWSC/0017+56	189	36	10.00	10.98	18.35	0.0036	-0.0206	54	0.000257	30.38	66	31.34	60	24.30	34.30	80,825.65	66,798.06
TCWSC/0025+17	TCWSC/0019+45	572	36	10.20	11.00	18.58	0.0038	-0.0214	54	0.000263	31.05	66	31.73	60	24.61	34.81	244,615.19	202,161.32
TCWSC/0030+53	TCWSC/0025+17	536	36	10.29	11.00	18.81	0.0039	-0.0223	54	0.000270	31.77	66	32.12	60	24.91	35.20	229,219.83	189,437.88
TCWSC/0036+89	TCWSC/0030+53	636	36	10.13	11.00	18.99	0.0040	-0.0230	54	0.000275	32.33	66	32.43	60	25.15	35.28	271,984.73	224,780.76
TCWSC/0044+92	TCWSC/0036+89	803	36	10.18	11.02	19.17	0.0041	-0.0236	54	0.000280	32.85	66	32.74	60	25.39	35.57	343,402.10	283,803.39
TCWSC/0053+70	TCWSC/0044+92	878	36	10.25	11.02	19.29	0.0042	-0.0241	54	0.000284	33.22	66	32.94	60	25.55	35.80	375,475.77	310,310.55
TCWSC/0059+40	TCWSC/0053+70	570	36	10.20	11.05	19.33	0.0042	-0.0241	48	0.000534	33.27	60	35.05	54	26.46	36.66	201,454.46	163,178.11
TCWSC/0059+99	TCWSC/0059+40	59	36	9.95	11.07	19.33	0.0041	-0.0240	48	0.000534	33.22	60	35.05	54	26.46	36.41	20,852.30	16,890.37
TCWSC/0068+65	TCWSC/0059+99	866	36	10.22	11.09	19.35	0.0041	-0.0240	48	0.000535	33.24	60	35.08	54	26.49	36.71	306,069.41	247,916.22
TCWSC/0076+00	TCWSC/0068+65	735	36	10.04	11.11	19.38	0.0041	-0.0240	48	0.000537	33.28	60	35.14	54	26.53	36.57	259,770.22	210,413.88
TCWSC/A-B/0000+00	TCWSC/0076+00	750	27	12.53	11.34	19.42	0.0040	-0.0231	42	0.001099	32.84	60	50.27	54	37.96	50.49	265,071.66	214,708.04
TCWSC-A/0003+40	TCWSC/A-B/0000+00	340	36	10.22	11.16	19.40	0.0041	-0.0238	48	0.000538	33.22	60	35.17	54	26.56	36.78	120,165.82	97,334.31
TCWSC-A/0006+17	TCWSC-A/0003+40	277	36	10.13	11.18	19.40	0.0041	-0.0237	48	0.000538	33.17	60	35.17	54	26.56	36.69	97,899.80	79,298.84
TCWSC-A/0007+96	TCWSC-A/0006+17	179	30	8.88	11.18	19.40	0.0041	-0.0237	42	0.001097	33.17	54	37.92	48	27.70	36.58	51,243.65	40,488.81
TCWSC-A/0015+30	TCWSC-A/0007+96	734	30	10.86	11.21	19.40	0.0041	-0.0236	42	0.001097	33.10	54	37.92	48	27.70	38.56	210,127.60	166,026.75
TCWSC-A/0017+50	TCWSC-A/0015+30	220	27	21.09	11.23	19.40	0.0041	-0.0235	42	0.001097	33.05	54	37.92	48	27.70	48.79	62,981.03	49,762.79
TCWSC-A/0039+61	TCWSC-A/0017+50	2211	27	6.66	11.32	19.40	0.0040	-0.0231	42	0.001097	32.83	54	37.92	48	27.70	34.36	632,959.31	500,116.00
TCWSC-B/0001+14.8	TCWSC-A/0039+61	10	27	8.08	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	8.47	2,261.94	1,731.80
TCWSC-B/0001+28.94	TCWSC-B/0001+14.8	13	16	-16.02	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	-15.63	2,940.53	2,251.34
TCWSC-B/0001+34.94	TCWSC-B/0001+28.94	6	16	0.00	0.23	-0.16	-0.0002	0.0017	30	0.000000	-1.07	48	0.56	42	0.39	0.39	1,357.17	1,039.08
TCWSC-B/0001+46.94	TCWSC-B/0001+34.94	12	16	0.00	0.21	-0.16	-0.0002	0.0016	30	0.000000	-1.02	48	0.56	42	0.39	0.39	2,714.33	2,078.16
TCWSC-B/0001+73.07	TCWSC-B/0001+46.94	25	16	11.50	0.21	-0.14	-0.0002	0.0015	30	0.000000	-0.95	48	0.49	42	0.34	11.84	5,654.86	4,329.50
TCWSC-B/0003+02	TCWSC-B/0001+73.07	302	27	8.97	11.37	19.42	0.0040	-0.0230	42	0.001099	32.77	48	27.73	42	19.42	28.39	68,310.73	52,300.40
TCWSC-B/0005+96	TCWSC-B/0003+02	295	30	11.53	11.39	19.42	0.0040	-0.0229	42	0.001099	32.72	48	27.73	42	19.42	30.95	66,727.37	51,088.14
TCWSC-B/0008+15	TCWSC-B/0005+96	150	27	9.86	-0.02	0.00	0.0000	-0.0001	30	0.000000	0.05	36	0.00	30	0.00	9.86	19,085.16	13,253.58
TCWSC-B/0011+93	TCWSC-B/0008+15	360	27	25.47	9.24	12.30	0.0013	-0.0052	30	0.002653	15.73	36	20.00	30	12.30	37.77	45,804.38	31,808.60
TCWSC-B/0012+35	TCWSC-B/0011+93	85	27	24.49	9.27	12.30	0.0013	-0.0051	27	0.004654	15.66	30	16.29	24	8.98	33.47	7,510.36	4,806.63

DESIGN CONDITION: **OPTION 6b** **2070**

F.W. Model Eq. Pop. = 17,430.50 20,657.50
F.W. Model Sew. Ac. = 2,550.82 2,764.11

2070 Eq. Pop. = 32,547.85
2070 Sew. Ac. = 3,549.06

TOTAL ESTIM. CONST. COST = $4,747,436.90 $3,848,734.42
+ Engr., ROW, Financ., Conting. (1.5x) = $7,121,155.35 $5,773,101.63

NOTES:

UPSTREAM MAIN/STATION	Upstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
UPSTREAM MAIN/STATION	Downstream Sta. of Pipe Based on City of Fort Worth Master Plan Designations. Stations confirmed by Field Survey
LENGTH	Length of Pipe Segment in Feet
EXIST DIA.	Existing Pipe Diameter in Inches
EXIST PIPE CAP	Existing Gravity Flow Capacity of Pipe in MGD based on Ft. Worth Master Plan Data using Colbrook-White equations
2000 MODEL FLOW	Year 2000 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
2020 MODEL FLOW	Year 2020 Flow Rate in Ft. Worth Master Plan based on HydroWorks Calculations
COEF. "A", COEF. "B"	Calibration Coeficients used to Compute Design Flows based on Model Flows: Flow = A x Eq. Pop. + B x Sewered Acres
MODEL PROP DIA.	Proposed Diameter Pipe shown in Ft. Worth Master Plan for the Year 2020 Design
MODEL H.G. SLOPE	Computed Hydraulic Gradient Slope of Model Pipe Using Mannings Eqn.: s = [1629.6 x n x MGD*1.54 / D^(8/3)]^2, n = 0.0145
DESIGN FLOW	Calculated Design Flow in MGD Based on Computed Coef. "A" and "B" and Design Period Equivalent Population and Sewered Acres
PROP. REPL. PIPE	Proposed Replacement Pipe in Inches
REPL. PIPE CAP.	Proposed Replacement Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
PROP. PARL. PIPE	Proposed Parallel Pipe in Inches
PARL. PIPE CAP.	Proposed Parallel Pipe Capacity in MGD = [D^(8/3) x s^(1/2) / 1629.6 x n] / 1.54
BOTH CAP.	Combined Capacity of Existing Pipe and Proposed Parallel Pipe in MGD
ESTIM. REPL. PIPE COST	Estimated Construction Cost of Proposed Replacement Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)
ESTIM. PARL. PIPE COST	Estimated Construction Cost of Proposed Parallel Pipe = Area of Pipe (Sq. In.) x $0.125/sq. in. x Length (Ft.)

OPTION 6b

Includes Flows from Richland Hills and North Richland Hills, which is the current condition.
Assumes R. Hills and NRH will not be connected to the COFW Big Fossil line.

PIPE DIA.	1997 F.W.M.P. CONST. COST. (Per Ft.)	2000 ESTIM. CONST. COST (Per Ft.)	ESTIM. CONST. COST (Per In.)	PIPE AREA (sq. in.)	ESTIM. CONST. COST (Per S.I.)
4	32.31	34.41	8.60	12.57	2.7383
6	83.04	88.44	14.74	28.27	3.1279
8	87.32	93.00	11.62	50.27	1.8501
10	95.88	102.11	10.21	78.54	1.3001
12	99.03	105.47	8.79	113.10	0.9325
15	102.18	108.82	7.25	176.71	0.6158
18	105.33	112.18	6.23	254.47	0.4408
24	108.47	115.52	4.81	452.39	0.2554
30	122.64	130.61	4.35	706.86	0.1848
36	142.45	151.71	4.21	1,017.87	0.1490
42	195.22	207.91	4.95	1,385.44	0.1501
48	229.84	244.78	5.10	1,809.55	0.1353
54	276.31	294.27	5.45	2,290.21	0.1285
60	325.13	346.26	5.77	2,827.42	0.1225
66	366.75	390.59	5.92	3,421.18	0.1142
72	457.97	487.74	6.77	4,071.49	0.1198
78	506.32	539.23	6.91	4,778.34	0.1128
84	566.77	603.61	7.19	5,541.75	0.1089
90	662.43	705.49	7.84	6,361.70	0.1109
96	743.15	791.45	8.24	7,238.20	0.1093
108	990.71	1,055.11	9.77	9,160.85	0.1152
120	1,429.60	1,522.52	12.69	11,309.69	0.1346
				Avg = (Above 30")	0.1239

TAB 8

TEXAS WATER DEVELOPMENT BOARD

CONTRACT

ENGINEERING SERVICES AGREEMENT

AND

MISCELLANEOUS CORRESPONDENCE

COPY

CITY OF
NORTH RICHLAND HILLS

Department: Public Works Department Council Meeting Date: 6/14/99

Subject: Approve Regional Facility Planning Contract with the Texas Water Development Board for the Big Fossil Creek Wastewater System – Resolution No. 99-38

Agenda Number: ________

The Big Fossil Creek Wastewater Outfall System affects four separate entities. Richland Hills has a 36-inch wastewater outfall that was installed in the 1950's by the previous owner of Richland Hills and North Richland Hills water and sewer systems. North Richland Hills has a large amount of wastewater that flows down this outfall. The city of Fort Worth has a 48-inch wastewater outfall down this same creek bottom that carries flows from the city of Fort Worth customers as well as Haltom City's wastewater flows.

All four cities have received Administrative Orders (AO) from the United States Environmental Protection Agency (EPA) with this Big Fossil Creek Wastewater Outfall System being recognized as needing to be studied in detail to decide the best plan for increasing the capacity to meet ultimate needs. Only a portion of the Big Fossil Creek service area has been developed.

Previously, the planning grant application was submitted to the Texas Water Development Board (TWDB) by the city of Fort Worth, but was not approved. The TWDB staff gave indications that it would be better received if one of the other three cities (North Richland Hills, Richland Hills, or Haltom City) involved be the one submitting for the grant. North Richland Hills offered to be the lead city on this grant. When we resubmitted the application early this year, it was approved.

The TWDB has sent a revised contract for North Richland Hills to execute and return. Staff previously reviewed the contract and made comments. The main items covered by the contract are listed below.

1. Contract execution deadline is July 8, 1999.
2. Study completion date is August 31, 1999 with the final report deadline being October 31, 1999.
3. The study will identify three cost-effective alternatives for providing wastewater system capacity for the four cities.
4. Total study costs are $59,950 with the TWDB paying $29,975 of the total.
5. The City of North Richland Hills is responsible for $29,975. This cost will be split evenly between Richland Hills, Fort Worth, Haltom City, and North Richland Hills.

Finance Review

Source of Funds:
Bonds (GO/Rev.) ____
Operating Budget ____
Other ____

Account Number
Sufficient Funds Available

Larry Koonce
Finance Director

Gregory A. Dickens
Department Head Signature

City Manager Signature

The other three cities have obligated themselves for one-fourth of the study costs, up to $7,500 each. North Richland Hills has sufficient money in the Unspecified Utility CIP Fund for paying it's share (approximately $7,500).

Recommendation: To approve Resolution No. 99-38.

RESOLUTION NO. 99-38

BE IT RESOLVED by the City Council of the City of North Richland Hills, Texas, that:

1.

The City Manager be, and is hereby authorized to execute the attached Agreement with the Texas Water Development Board concerning the Regional Facility Planning Grant for a study on the Big Fossil Creek Wastewater Outfall System serving North Richland Hills, Richland Hills, Fort Worth, and Haltom City, as an act and deed of the City.

PASSED AND APPROVED this the 14th day June, 1999.

Charles Scoma, Mayor

ATTEST:

Patricia Hutson, City Secretary

APPROVED AS TO LEGALITY:

Rex McEntire, Attorney for the City

APPROVED AS TO CONTENT:

Gregory W. Dickens

Gregory W. Dickens, Public Works Director

(OM) file

TEXAS WATER DEVELOPMENT BOARD

RECEIVED MAY 24 1999

May 14, 1999

Mr. Larry J. Cunningham
City Manager
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Re: Regional Facility Planning Contract Between the City of North Richland Hills (City) and the Texas Water Development Board (Board)

Dear Mr. Cunningham:

Enclosed are three copies of a regional facility planning contract between the Board and the City. The deadline for execution of this contract is July 8, 1999.

The Board's share of the $59,950.00 facility plan is $29,975.00 or 50 percent to be provided from the Research and Planning Fund. The local share of the plan will be provided by the City in the amount of $29,975.00 in cash and $0.00 in in-kind services.

Please sign and date all three copies of the contract by July 8, 1999, retain a copy for your files and return the remaining two executed copies, along with the City's federal or state vendor identification number, to the attention of the Board's Research and Planning Fund Grants Management Division.

A Payment Request Checklist and return address labels are enclosed for your information and use. If you have any questions concerning this contract, please contact Mr. Ralph Boeker, the Board's designated Contract Manager for this study, at (512) 936-0851.

Sincerely,

Tommy Knowles

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

Enclosures

Cc: Gregory W. Dickens, P.E.
Ralph Boeker, TWDB

Our Mission
Provide leadership, technical services and financial assistance to support planning, conservation, and responsible development of water for Texas.

P.O. Box 13231 • 1700 N. Congress Avenue • Austin, Texas 78711-3231
Telephone (512) 463-7847 • Telefax (512) 475-2053 • 1-800-RELAY TX (for the hearing impaired)
URL Address: http://www.twdb.state.tx.us • E-Mail Address: info@twdb.state.tx.us

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:STATE OF TEXAS

COUNTY OF TRAVIS

TWDB Contract No. 99-483-308

Research and Planning Fund

Regional Facility Planning

THIS Contract, (hereinafter "CONTRACT"). between the Texas Water Development Board (hereinafter "BOARD") and the City of North Richland Hills (hereinafter "CONTRACTOR (S)"), is composed of two parts: Section I. Specific Conditions and Exceptions to the Standard Agreement and Section II. Standard Agreement. The terms and conditions set forth in Section I will take precedence over terms and conditions in Section II.

SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT

ARTICLE I. DEFINITIONS: For the purposes of this Contract, the following terms or phrases shall have the meaning ascribed therewith:

A. BOARD - The Texas Water Development Board, or its designated representative

B. CONTRACTOR (S) - City of North Richland Hills

C. EXECUTIVE ADMINISTRATOR - The Executive Administrator of the Board or his designated representative

D. PARTICIPANT (S) - City of North Richland Hills, City of Fort Worth, City of Richland Hills, and City of Haltom City

E. REQUIRED INTERLOCAL AGREEMENT (S) -Not applicable

F. REGIONAL PLAN - Regional wastewater facility

G. BOARD APPROVAL DATE - April 8, 1999

H. PLANNING AREA - The planning area is the Fossil Creek Basin of the Trinity River. The project area is more specifically defined in Exhibit A (the original grant application).

I. DEADLINE FOR CONTRACT EXECUTION - July 8, 1999

J. CONTRACT INITIATION DATE - April 8, 1999

K. STUDY COMPLETION DATE - August 31, 1999

SECTION II. STANDARD AGREEMENT

ARTICLE I. RECITALS

Whereas, the CONTRACTOR (S) applied to the BOARD, Austin, Texas for a planning grant to develop a REGIONAL FACILITY PLAN;

Whereas, the CONTRACTOR (S) and PARTICIPANT (S) will commit cash and/or in-kind services to pay for the local share of this planning project;

Whereas, the CONTRACTOR (S) is the entity who will act as administrator of the BOARD's planning grant and will be responsible for the execution of this contract;

Whereas, on the BOARD APPROVAL DATE, the BOARD approved the CONTRACTOR (S)'s application for financial assistance;

Now, therefore, the BOARD and the CONTRACTOR (S), agree as follows:

ARTICLE II. PROJECT DESCRIPTION AND SERVICES TO BE PERFORMED

1. Services and activities provided under this Contract shall be in strict accordance with requirements of the Texas Water Code, Chapter 15; associated rules of the Texas Administrative Code, Chapter 355, Sections 355.1-355.11, Subchapter A; Exhibit A, the original grant application, which is incorporated herein and made a permanent part of this Contract; and this Contract.

2. The CONTRACTOR (S) will prepare a REGIONAL FACILITY PLAN for the PLANNING AREA, as delineated and described in Exhibit A, according to the Scope of Work contained in Exhibit B. The CONTRACTOR (S) will consider BOARD population and water use projections, and if not used in the REGIONAL FACILITY PLAN, provide an explanation of why not used. Where applicable, the CONTRACTOR (S) will develop water conservation plans according to Texas Administrative Code, Chapters 363.15, 363.71, 375.37, and 375.101.

3. The CONTRACTOR (S) will establish formal, direct, and continuous liaisons with all cities, counties, councils of governments, river authorities, regional water planning groups designated under Texas Water Code §16.053 and 31 Texas Administrative Code §357.4, and all applicable state agencies, federal agencies, and other governmental entities in the PLANNING AREA, and all entities providing water and/or wastewater service in the PLANNING AREA for the purpose of coordinating the scope of work and REGIONAL FACILITY PLAN with all existing studies, plans, or activities for the purpose of providing information and obtaining available data for the development of the REGIONAL FACILITY PLAN.

ready original, and nine (9) bound double-sided copies of the final report to the EXECUTIVE ADMINISTRATOR no later than the FINAL REPORT DEADLINE. The CONTRACTOR (S) will submit one (1) electronic copy of any computer programs, maps, or models and an operations manual developed under the terms of this Contract.

5. The CONTRACTOR (S) will submit progress reports with submittal of vouchers according to the VOUCHER SUBMISSION SCHEDULE. Progress reports shall be in written form and shall include a brief statement of the overall progress made since the last status report; a brief description of any problems that have been encountered during the previous reporting period that will affect the study, delay the timely completion of any portion of this Contract, inhibit the completion of or cause a change in any of the study's products or objectives; and a description of any action the CONTRACTOR (S) plans to take to correct any problems that have been encountered.

6. The EXECUTIVE ADMINISTRATOR can extend the COMPLETION DATE and the FINAL REPORT DEADLINE upon written approval. The CONTRACTOR (S) should submit a written request to the EXECUTIVE ADMINISTRATOR at least thirty (30) working days prior to the COMPLETION DATE or thirty (30) days prior to the FINAL REPORT DEADLINE for an extension to the respective dates and explanation of why the deadlines have not been met.

ARTICLE IV. COMPENSATION AND REIMBURSEMENT

1. The BOARD agrees to compensate and reimburse the CONTRACTOR (S) in a total amount not to exceed the BOARD'S SHARE OF THE TOTAL STUDY COSTS for costs incurred and paid by the CONTRACTOR (S) pursuant to performance of this Contract. The CONTRACTOR (S) will contribute local matching funds in sources and amounts defined as the LOCAL SHARE OF THE TOTAL STUDY COSTS. The BOARD shall reimburse the CONTRACTOR (S) for ninety percent (90%) of the BOARD's share of each invoice pending the CONTRACTOR (S)'s performance, completion of a Final Report, and written acceptance of said Final Report by the EXECUTIVE ADMINISTRATOR, at which time the BOARD shall pay the retained ten percent (10%) to the CONTRACTOR (S).

2. The CONTRACTOR (S) shall submit vouchers and documentation for reimbursement billing according to the VOUCHER SUBMISSION SCHEDULE and in accordance with the approved task and expense budgets contained in Exhibit C to this Contract. At the discretion of the EXECUTIVE ADMINISTRATOR and upon written memorandum to the contract file, the CONTRACTOR (S) has budget flexibility within task and expense budget categories to the extent that the resulting change in amount in any one task or

C. For travel and subsistence expenses, including such expenses for subcontractors --

(1) names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Law Regular Session, 1997, Art. IX, Sec. 13 through 21, at IX-54 or as amended or superseded;

(2) other transportation costs -- copies of invoices covering tickets for transportation or, if not available, names, dates, and points of travel of individuals; and

(3) all other reimbursable expenses -- invoices or purchase vouchers showing reason for expense with receipts to evidence the amount incurred.

ARTICLE V. OWNERSHIP, PUBLICATION, AND SUBCONTRACTING

1. The BOARD shall have unlimited rights to technical or other data resulting directly from the performance of services under this Contract. It is agreed that all reports, drafts of reports, or other material, data, drawings, computer programs and codes associated with this Contract and developed by the CONTRACTOR(S) or its subcontractors pursuant to this Contract shall become the joint property of the CONTRACTOR(S) and the BOARD. These materials shall not be copyrighted or patented by the CONTRACTOR (S) or by any consultants involved in this Contract unless the EXECUTIVE ADMINISTRATOR approves in writing the right to establish copyright or patent; provided, however, that copyrighting or patenting by the CONTRACTOR (S) or its subcontractors will in no way limit the BOARD's access to or right to request and receive or distribute data and information obtained or developed pursuant to this Contract. Any material subject to a BOARD copyright and produced by the CONTRACTOR (S) or BOARD pursuant to this Contract may be printed by the CONTRACTOR (S) or the BOARD at their own cost and distributed by either at their discretion. The CONTRACTOR (S) may otherwise utilize such material provided under this Contract as it deems necessary and appropriate, including the right to publish and distribute the materials or any parts thereof under its own name, provided that any BOARD copyright is appropriately noted on the printed materials.

2. The CONTRACTOR (S) agrees to acknowledge the BOARD in any news releases or other publications relating to the work performed under this Contract.

3. No work herein called for by the CONTRACTOR (S) shall be reimbursed for expenses by the BOARD to the CONTRACTOR (S) without prior written approval

ARTICLE VIII. LICENSES, PERMIT, AND INSURANCE

1. For the purpose of this Contract. the CONTRACTOR (S) will be considered an independent contractor and therefore solely responsible for liability resulting from negligent acts or omissions. The CONTRACTOR (S) shall obtain all necessary insurance, in the judgement of the CONTRACTOR (S), to protect themselves, the BOARD, and employees and officials of the BOARD from liability arising out of this Contract. The CONTRACTOR (S) shall indemnify and hold the BOARD and the State of Texas harmless, to the extent the CONTRACTOR (S) may do so in accordance with state law, from any and all loses, damages, liability, or claims therefore, on account of personal injury, death, or property damage of any nature whatsoever caused by the CONTRACTOR (S), arising out of the activities under this Contract.

2. The CONTRACTOR (S) shall be solely and entirely responsible for procuring all appropriate licenses and permits, which may be required by any competent authority for the CONTRACTOR (S) to perform the subject, work.

ARTICLE IX. SEVERANCE PROVISION

1. Should any one or more provisions of this Contract be held to be null, void, voidable, or for any reason whatsoever, of no force and effect, such provision(s) shall be construed as severable from the remainder of this Contract and shall not affect the validity of all other provisions of this Contract which shall remain of full force and effect.

ARTICLE X. CORRESPONDENCE

All correspondence between the parties shall be made to the following addresses:

For the **BOARD**:	For the **CONTRACTOR(S)**:
Mr. Craig D. Pedersen	Mr. Gregory W. Dickens, P.E.
Executive Administrator	Public Works Director
Texas Water Development Board	City of North Richland Hills
P.O. Box 13231, Capitol Station	7301 N.E. Loop 820
Austin, Texas 78711-3231	North Richland Hills, Texas 76180

Attention: Research and Planning Fund
Grants Management Division

EXHIBIT A

ORIGINAL GRANT APPLICATION

EXHIBIT B

SCOPE OF WORK

27. A detailed scope of work for proposed planning. (Not to exceed 6 pages.)

The City of North Richland Hills in cooperation with the cities of Richland Hills, Haltom City, and Fort Worth for the Big Fossil Relief Sewer Planning Study proposes the following scope of work.

Task 1: Obtain and review available existing sanitary sewer design data (drawings and specifications) for COFW Big Fossil Sewer and TCWSC Big Fossil Sewer.

Task 2: Conduct preliminary easement ownership research. Provide services of a right-of-way consultant.

Task 3: Prepare parcel map for the lower section of the COFW Big Fossil Sewer and the TCWSC Big Fossil Sewer. Provide surveying services.

Task 4: Determine if any additional right-of-way is required for the TCWSC Big Fossil Sewer.

Task 5: Determine capacity requirements in gallons per minute for the proposed relief sanitary sewer utilizing data from the Fort Worth Wet Weather Program and available Sanitary Sewer Evaluation Studies that were recently completed by the cities of North Richland Hills, Haltom City and Richland Hills. Determine required sanitary sewer sizes (diameter).

Task 6: Identify three cost effective alternative routes for the proposed relief sewer.

Task 7: Determine easement requirements for each alternative route for the proposed relief sanitary sewer.

Task 8: Develop evaluation matrix to select the optimum route for the proposed relief sanitary sewer. The matrix will include the following criteria:

- capital cost
- additional easement required
- impact on participating communities
- design considerations (creek and road crossings, topography)
- construction impacts
- sanitary sewer maintenance requirements

EXHIBIT C

TASK AND EXPENSE CATEGORY BUDGET

TASK BUDGET

TASK	DESCRIPTION	AMOUNT
Task 1		$690.00
Task 2		9,880.00
Task 3		10,580.00
Task 4		1,900.00
Task 5		4,060.00
Task 6		2,760.00
Task 7		2,760.00
Task 8		4,880.00
Task 9		11,760.00
Task 10		5,000.00
Task 11		810.00
Task 12		4,870.00
Total		$59,950.00

EXPENSE BUDGET

CATEGORY	TOTAL AMOUNT	SUBCONTRACT
A. Salaries and Wages[1]	$12,204.00	
B. Fringe[2]	4,515.00	
C. Travel	50.00	
D. Surveying	6,000.00	
E. Subcontract	15,000.00	
F. Employee Mileage	100.00	
G. communications (phone, fax, mail, delivery)	100.00	
H. Reproduction	250.00	
I. Overhead[3]	15,621.00	
J. Profit	6,110.00	
Total	$59,950.00	$15,000.00

[1] Salaries and Wages is defined as the cost of salaries of engineers, draftsmen, stenographers, surveymen, clerks, laborers, etc., for time directly chargeable to this contract.

[2] Fringe is defined as the cost of social security contributions, unemployment, excise, and payroll taxes, employment compensation insurance, retirement benefits, medical and insurance benefits, sick leave, vacation, and holiday pay applicable thereto.

[3] Other Expenses is defined to include expendable supplies, communications, reproduction, postage, and costs of public meetings directly chargeable to this CONTRACT.

TEXAS WATER DEVELOPMENT BOARD
RESEARCH AND PLANNING FUND

APPLICATION CHECKLIST

I. GENERAL INFORMATION

1. **Legal name of applicant(s).**

   City of North Richland Hills, Texas
   City of Fort Worth, Texas
   City of Richland Hills, Texas
   City of Haltom City, Texas

2. **Participating political subdivision(s).**

   Same as above.

3. **Authority of law under which the applicant was created.**

   All four of the applicants are municipalities operating under the authority of the laws of the State of Texas.

4. **Applicant's official representative, name, title, mailing address, phone number, fax number and if available, e-mail address and vendor I.D. number.**

   Gregory W. Dickens, P.E.
   Public Works Director
   City of North Richland Hills
   7301 N.E. Loop 820
   North Richland Hills, Texas 76180
   Telephone number: (817) 581-5521
   Fax number: (817) 656-7538
   E-mail: www.nrhowadm@airmail.net

5. **Citations of applicant's legal authority to plan, develop, and operate a regional facility for the planning area or if authority to plan is by interlocal agreement, attach agreement to application.**

   The cities of Richland Hills, Haltom City and North Richland Hills discharge their wastewater into the City of Fort Worth's sanitary sewer collection system.

13. **Total grant funds requested from the Texas Water Development Board.**

$30,000

14. **Detailed description of why proposed planning is needed. (Not to exceed 1 page.)**

Each of the four applicants have experienced wet-weather overflows from their sanitary sewer systems. These sanitary sewer overflows (SSOs) have recurred with sufficient frequency to result in the issuance of Administrative Orders (AO's) from the United States Environmental Protection Agency (EPA) Region 6 for field studies, evaluations of the collection system, and ultimately the correction/elimination of these SSOs.

All four applicants have completed their sanitary sewer evaluation studies (SSES). All studies confirmed that a parallel relief sewer is required for each of the four municipalities. Preliminary planning conferences have been held which identified the mutual benefit of a joint project involving the City of North Richland Hills, City of Richland Hills, City of Haltom City, and City of Fort Worth in extending, replacing, and/or renovating the Big Fossil Creek Sewer System.

At the present time there are two parallel sanitary sewer lines in the Big Fossil Creek Sewer System that were constructed in the 1950s. These lines will need to be rehabilitated and have capacity increased with a potential parallel sanitary sewer line. Alternately, a single relief interceptor may be cost-effective when compared to rehabilitation and capacity increases by parallel facilities.

15. **Detailed description of why state funding assistance is needed. (Not to exceed 1 page.)**

All four communities are faced with significant funding requirements to rehabilitate the collection systems that are internal to each cities' facilities. The main outfall sewers that convey sanitary flow from portions of each of the four systems to the Village Creek outfall sewer system is an area for which the ownership and operation and maintenance responsibility is unclear. Accordingly, no funds have been planned for studying or replacing this aging system. In order to avoid excessive cost burdens that none of the four participating municipalities are willing to undertake individually, the assistance from the Texas Water Development Board (TWDB) is requested.

23. **Average population growth rate in proposed planning area for the past 10 years.**

2.11 percent

24. **List date(s) and description(s) of most recent water supply and/or wastewater facility planning in proposed planning area.**

City of North Richland Hills – "Final Water and Wastewater Impact Fee Update Report", July 1997

City of Haltom City – "Summary of Impact Fee Effort pertaining to City of Fort Worth (Pass-through 1996 Impact Fees for City of Haltom City), January 1997

City of Richland Hills – Wastewater Master Plan completed in 1983 and Impact Fee Analysis completed in 1995

City of Fort Worth – "Water and Wastewater System Master Plan," June 1989

25. **List of political subdivisions, as defined earlier, in proposed planning area.**

Political subdivisions in the Big Fossil Creek Drainage Basin are the City of Fort Worth, City of Richland Hills, City of Haltom City, City of North Richland Hills, City of Blue Mound, City of Saginaw, City of Watauga, and Tarrant County.

26. **Percentage of political subdivisions in proposed planning area that are participating.**

92.45 percent

27. **A detailed scope of work for proposed planning. (Not to exceed 6 pages.)**

The City of North Richland Hills in cooperation with the cities of Richland Hills, Haltom City, and Fort Worth for the Big Fossil Relief Sewer Planning Study proposes the following scope of work.

Task 1: Obtain and review available existing sanitary sewer design data (drawings and specifications) for COFW Big Fossil Sewer and TCWSC Big Fossil Sewer.

Task 12: Manage the progress of the project, including schedule, budget and coordination with the Texas Water Development Board.

28. A task budget for detailed scope of work by task.

Please see Table 1.

29. An expense budget for detailed scope of work by expense category.

Please see Table 1.

30. A time schedule for completing detailed scope of work by task.

EVENT	TIME FROM AUTHORIZATION TO PROCEED
Complete Tasks 1 through 4 and Conduct Project Workshop No. 1	4 Weeks
Complete Tasks 5 through 8 and Conduct Project Workshop No. 2	8 Weeks
Submit Draft Report to TWDB for Review	9 Weeks
Complete Task 9 and Submit Final Report to TWDB	12 Weeks
TOTAL PROJECT TIME	90 Days

31. **Method of monitoring study progress.**

Monthly progress meetings will be scheduled to take place in the City of North Richland Hills City Hall, which is the lead City and is a convenient, central location to all four cities that are involved in the planning process.

32. **Qualifications and direct experience of proposed project staff.**

This project will be administered under the direction of Mr. Gregory Dickens, P.E. who has extensive experience in administering and coordinating multi-million dollar wastewater collection system and planning and development projects of this magnitude.

III. EXISTING SYSTEM INFORMATION

If proposed planning includes regional water supply planning, include the following information for each entity participating in this study:

Items 33 through 39 as listed in the Texas Water Development Board "Application Checklist" are not applicable to this project.

If proposed planning includes regional wastewater planning, include the following information for each entity participating in this study:

40. **Number of permit violations in past 12 months for fecal coliform, D.O. or nutrients, metals/organics, and other.**

There have been no permit violations at the Village Creek Wastewater Treatment Plant (WWTP). EPA alleges each sanitary sewer overflow (SSO) in the applicants or participating cities collection systems are permit violations and must only be reported.

41. **Number of enforcement actions in past 12 months.**

EPA has previously issued Administrative Orders (AO's) as an enforcement action to all four of the participating cities in this planning effort. Additionally, the EPA has also issued AO's to the cities of North Richland Hills, Richland Hills, and Haltom City requiring these cities to correct/eliminate their SSO's within 5 years, 3 years and 5 years, respectively.

42. **Percent of facility capacity used at present.**

The Fossil Creek Sanitary Sewer System has adequate capacity for dry weather flows, however, at the present time adequate peak wet weather capacity is not provided. This lack of capacity for wet weather events has

Implementation of viable solutions identified through the proposed planning will be diligently pursued and identification of potential sources of funding for implementation of viable solutions.

EPA Region 6 will include in their AO's as part of enforcement, a schedule to remedy wet weather SSOs in the Fossil Creek Drainage Basin. Failure to pursue solutions to the SSOs will result in further enforcement activities by the EPA.

If proposed planning includes regional wastewater planning, the proposal will conform to the approved state water quality management plan or that an amendment to the water quality management plan which will bring the proposed planning into compliance with the water quality plan is being processed for the proposed planning area.

The City of Fort Worth monitors compliance of its wastewater collection and treatment facilities for its residents and the residents of each of the other three participating municipalities as well as more than 18 additional municipalities in the Village Creek Wastewater system service area. The three participating municipalities are customers of the Fort Worth Village Creek Wastewater Treatment System in the North Central Texas Council of Government's Water Quality Management Plan.

If a grant is awarded, written evidence that local matching funds and in-kind services are available for the proposed planning must be provided when the contract is executed.

Local matching funds will be available for this effort on receipt of a proposed contract with the TWDB. These funds can be committed by the Utility Directors and City Managers of each of the respective cities. if necessary, City Council resolutions can be enacted, if required by the TWDB.

An approved water conservation plan has been implemented in the proposed planning area or will be developed as part of the overall planning project.

The cities of North Richland Hills, Haltom City, Richland Hills, and Fort Worth all have water conservation plans in place.

City of Watauga – Mr. Dale Cheatham, City Manager
7101 Whitley Road, Watauga, Texas 76148

Tarrant County – Ms. Suzanne Henderson, County Clerk
100 East Weatherford, Fort Worth, Texas 76196

VI. RESOLUTION

A resolution from the governing body of each applicant and/or participant:

- **stating the entity's representative is authorized to apply for a grant from the Texas Water Development Board;**
- **granting authority for the entity to enter into a contract with the Texas Water Development Board; and**
- **stating the intent to commit local matching funds in cash and/or in kind services.**

Resolutions from the City Managers of each of the applicants are included at the end of this submittal.

CITY OF HALTOM CITY

September 30, 1997

Texas Water Development Board
1700 North Congress Avenue
P.O. Box 13231
Austin, TX 78711 - 3231

RE: **MULTI-JURISDICTIONAL GRANT APPLICATION**
SANITARY SEWER STUDY

Dear Madam or Sir:

Haltom City was recently made aware of a potential grant from the Texas Water Development Board (TWDB) for multi-jurisdictional sanitary sewer studies.

The grant application process was discussed during a Special-Called Meeting of the Haltom City Council yesterday evening. At that time, the City Council unanimously directed staff to apply for this grant and to appropriate Haltom City's necessary share of funds. It is our understanding that if the grant application is approved, fifty percent (50%) of the funding for this type of sanitary sewer study would be provided by the TWDB and the remaining 50% of funding, in cash, would be shared on an equitable basis between the applicant cities of Fort Worth, Haltom City, North Richland Hills and Richland Hills. Additionally, the City Council will formally adopt a Resolution to this effect upon receipt of notice of approval of the grant application from the TWDB.

If I can provide you with any additional information, please do not hesitate to contact me.

Sincerely,

Bill Eisen

Bill Eisen
City Manager

MINUTES OF THE RICHLAND HILLS CITY COUNCIL

REGULAR MEETING

NOVEMBER 11, 1997

1. CALL TO ORDER

Mayor Kelley called the meeting to order at 7:30 p.m. in the Council Chambers of the Richland Hills City Hall, 3200 Diana Drive, Richland Hills, Texas.

Councilmembers Present: Pat Watkins, Jim McKnight, Horace Hamilton, Phil Heinze, and Wayne Erickson.

City Staff Present: City Manager James W. Quin, City Secretary Terri Willis and City Attorney Paul Wieneskie.

2. INVOCATION AND PLEDGES OF ALLEGIANCE

The invocation was given by Mayor Pro Tem Watkins.

Councilmember McKnight led the Pledge of Allegiance to the United States and Texas flags.

3. COUNCIL-APPOINTED BOARDS

At this time, the City Council considered resignations and appointments to the City's boards, commissions, and committees.

MOTION: A motion was made by Councilmember Hamilton, and seconded by Mayor Pro Tem Watkins, to appoint Gabriella Bendslev to Place 3A on the Teen Court Advisory Board.

Mayor Kelley advised there being no objection, Ms. Bendslev was duly appointed.

4. PRESENTATIONS/RECOGNITIONS - RECOGNITION OF MR. MARK STRUHS

City Manager Quin advised that Mr. Mark Struhs, Vice-President of Dynamo Ltd., was being recognized for being 1 of 12 executives selected to meet with President Clinton regarding NAFTA and the President's Fast Track Authority.

Mayor Kelley advised that Mr. Struhs was unable to attend the meeting, and explained that Dynamo Ltd. was one of the larger exporters in the world of game tables. This same company was previously recognized as being named "Exporter of the Year" in 1996.

14. DISCUSSION OF BIG FOSSIL RELIEF SEWER PLANNING STUDY (cont'd.)

MOTION: A motion was made by Mayor Pro Tem Watkins, and seconded by Councilmember Heinze, to approve participation in the Big Fossil Relief Sewer Planning Study in the amount of $7,500. The motion unanimously carried.

15. WATER SYSTEM REVENUE REQUIREMENTS WORKSHOP

City Manager Quin advised that this item was for consideration of scheduling a workshop for Thursday, December 11, 1997 at 7:00 p.m. to review the water system revenue requirements study completed by the engineering firm of Carter and Burgess, Inc. This study was approved by the City Council in August of this year. The study was needed in order to determine the rate increase needed to fund $200,000 in capital improvements in next year's budget.

MOTION: A motion was made by Councilmember Heinze, and seconded by Councilmember Hamilton, to schedule a workshop for 7:00 p.m. on Thursday, December 11, 1997 to review the water system revenue requirements study. The motion unanimously carried.

16. REMOVAL OF CONSENT AGENDA ITEMS

There were no items removed from the Consent Agenda for individual consideration.

17. CONSENT AGENDA

City Manager Quin reviewed the Consent Agenda as follows:

Approval of the Minutes of the October 28, 1997 Regular City Council Meeting

MOTION: A motion was made by Councilmember Heinze, and seconded by Mayor Pro Tem Watkins, to approve the Consent Agenda as presented. The motion unanimously carried.

COPY TO BILLING FILE

KNOWLTON-ENGLISH-FLOWERS, INC.

CONSULTING ENGINEERS / Fort Worth-Dallas

ROUTING
JOB NO. 3-436
FILING Core.
KEE __ TEN __
BPF __ GWF __
RWA __ JVS __
DHC __ JFP __
MER __ RMW __
GRP __ LDR __
SAG __ JEH __
JOH __ CLS __
7-20-99

AUTHORIZATION FOR PROFESSIONAL ENGINEERING SERVICES

PROJECT NO.: 3-436

PROJECT NAME: North Richland Hills Big Fossil Relief Sewer Planning

CLIENT: The City of North Richland Hills, Texas

ADDRESS: City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, TX 76180

Hereby requests and authorizes Knowlton-English-Flowers, Inc., Consulting Engineers to perform the following services:

SCOPE: See Attached Scope of Work

COMPENSATION: Compensation to Knowlton-English-Flowers, Inc., shall be on a Lump Sum basis in the Total Amount of Fifty Nine Thousand Nine Hundred Fifty Dollars and no/100, ($59,950.00)

Approved for
The City of North Richland Hills

By: [signature]

Title: CITY MANAGER

Date: 7-15-99

Accepted for
Knowlton-English-Flowers, Inc.

By: [signature]
Richard W. Albin, P.E.

Title: Vice President

Date: July 5, 1999

NORTH RICHLAND HILLS BIG FOSSIL RELIEF SEWER PLANNING

SCOPE OF WORK

The City of North Richland Hills, in cooperation with the cities of Richland Hills, Haltom City and Fort Worth for the Big Fossil Relief Sewer Planning Study proposes the following Scope of Work:

Task 1: Obtain and review available existing sanitary sewer design data (drawings and specifications) for COFW Big Fossil Sewer and TCWSC Big Fossil Sewer.

Task 2: Conduct preliminary easement ownership research. Provide services of a right-of-way consultant.

Task 3: Prepare parcel map for the lower section of the COFW Big Fossil Sewer and the TCWSC Big Fossil Sewer. Provide surveying services.

Task 4: Determine if any additional right-of-way is required for the TCWSC Big Fossil Sewer.

Task 5: Determine capacity requirements in gallons per minute for the proposed relief sanitary sewer utilizing data from the Fort Worth Wet Weather Program and available Sanitary Sewer Evaluation Studies that were recently completed by the cities of North Richland Hills, Haltom City and Richland Hills. Determine required sanitary sewer sizes (diameter).

Task 6: Identify three cost effective alternative routes for the proposed relief sewer.

Task 7: Determine easement requirement for each alternative route for the proposed relief sanitary sewer.

Task 8: Develop evaluation matrix to select the optimum route for the proposed relief sanitary sewer. The matrix will include the following criteria:

- capital cost
- additional easement required
- impact on participating communities
- design considerations (creek and road crossings, topography)
- construction impacts
- sanitary sewer maintenance requirements

Task 9: Prepare study report document Tasks 1 through 8. Report will recommend proposed relief sanitary sewer sizes and route(s). Provide services of a technical editor.

Task 10: Conduct two project workshops for quality control, discussion of project issues, and consensus on proposed relief sanitary sewer. Conduct monthly progress meetings with the applicants.

Task 11: Provide word processing support.

Task 12: Manage the progress of the project, including schedule, budget and coordination with the Texas Water Development Board.

CITY OF NORTH RICHLAND HILLS

Department: Public Works Department Council Meeting Date: 7/12/99

Subject: Approve Agreement for Engineering Services with Knowlton, English & Flowers, Inc. for the Big Fossil Creek Wastewater Outfall System Planning Study – Resolution No. 99-43 Agenda Number: PW 99-14

The cities of North Richland Hills, Fort Worth, Richland Hills and Haltom City received administrative orders from the Environmental Protection Agency requiring correction of sanitary sewer collection system problems to eliminate overflows. A study is necessary to determine the feasibility of extending, replacing or renovating the existing sanitary sewer pipelines within the Big Fossil Creek wastewater outfall system.

The city of North Richland Hills submitted a grant application to the Texas Water Development Board (TWDB) for grant funds, with the cities of Richland Hills, Haltom City and Fort Worth to perform a multi-jurisdictional wastewater planning study for the section of the outfall system between Broadway Avenue south to the existing Fort Worth 90" and 96" Village Creek Treatment Plant outfall lines. The grant was approved by the TWDB and approved by Council at the June 28, 1999 meeting.

Staff has requested and received an agreement from Knowlton-English-Flowers, Inc. (KEF) to conduct this regional planning study in accordance with the scope of work as outlined in the TWDB contract.

The study will entail reviewing existing sewer design data, researching existing sewer easements and property ownership, preparing parcel map, identifying three alternative solutions, and providing all information in a report.

KEF has agreed to perform the study for $59,950 within the proposed 90-day schedule. The proposed agreement is attached.

The TWDB grant is for half of the total study cost of $59,950. The other half is to be paid for by the four cities. The other three cities have appropriated their quarter share to be paid to us. The TWDB will reimburse their $29,975 on a monthly basis as we expend the funds. Sufficient funds are available in the Unspecified Utility CIP fund to pay our share, which totals $7,493.75.

Recommendation: To approve Resolution No. 99-43

Finance Review

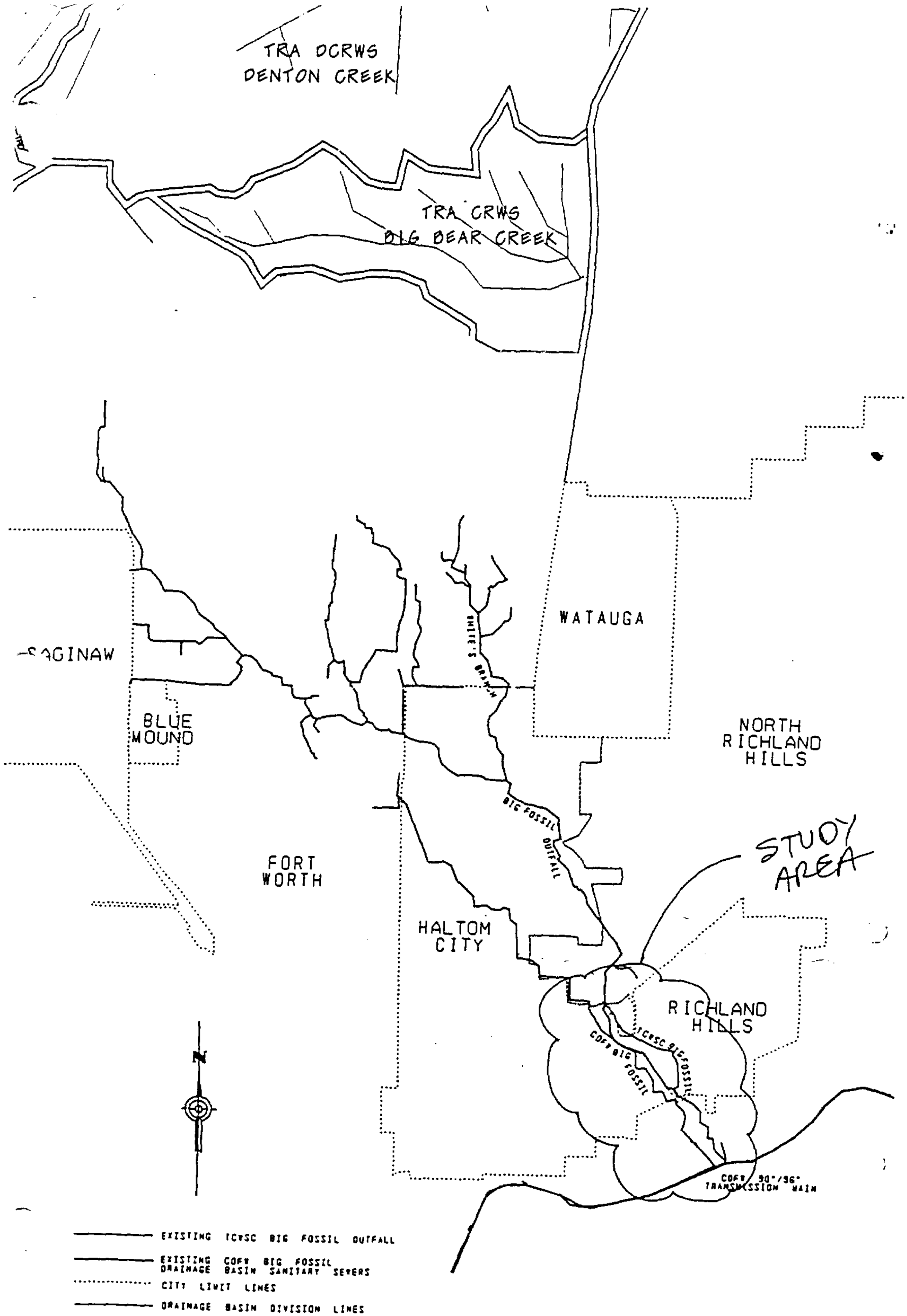
Source of Funds:
Bonds (GO/Rev.) ____
Operating Budget ____
Other

Account Number 02-23-17-6000;99-02-23-017
Sufficient Funds Available

Larry Koonce Finance Director

Gregory W. Dickens
Department Head Signature

Larry J. Cunningham
City Manager Signature


TRA DCRWS
DENTON CREEK
TRA CRWS
BIG BEAR CREEK
WATAUGA
SAGINAW
BLUE MOUND
NORTH RICHLAND HILLS
FORT WORTH
BIG FOSSIL OUTFALL
STUDY AREA
HALTOM CITY
RICHLAND HILLS
TCWSC BIG FOSSIL
COFW BIG FOSSIL
N
COFW 90"/96" TRANSMISSION MAIN
EXISTING TCWSC BIG FOSSIL OUTFALL
EXISTING COFW BIG FOSSIL DRAINAGE BASIN SANITARY SEWERS
CITY LIMIT LINES
DRAINAGE BASIN DIVISION LINES

CITY OF NORTH RICHLAND HILLS

Public Works

CERTIFIED MAIL Z 187 017 102

July 15, 1999

Texas Water Development Board
P. O. Box 13231
1700 N. Congress Avenue
Austin, Texas 78711-3231
(512) 463-3154

ROUTING
JOB NO. 3-436
FILING
KEF
BPF
RWA
DHC
MER
GRP
SAG

Attention: Ms. Phyllis Thomas, Research and Planning Fund
Grants Management Division

RE: TWDB CONTRACT NO. 99-483-308; BIG FOSSIL CREEK REGIONAL WASTEWATER PLANNING GRANT

Ms. Thomas:

The City has had to hire an engineering firm other than the one which helped put the application together and had a lot of the background data on the project. Circumstances arose with the first engineering consultant which did not allow us to enter into a contract for their services. This will cause at least a 90-day delay in the project schedule.

The City would appreciate your consideration in extending the "Study Completion Date" from August 31, 1999 to November 31, 1999 and moving the "Final Report Deadline" from October 31, 1999 to January 31, 2000. These are items "K" and "L" on pages 1 and 2 of the contract. No other changes to the contract are requested.

If you have any questions, please contact me. I will await notice of your determination.

Respectfully,

Gregory W. Dickens, P.E.
Public Works Director

GWD/mfs/pwl99251

cc: Steve Norwood, Assistant City Manager
Frank Crumb, City of Fort Worth
Greg Van Nieuvenhuize, City of Haltom City
John Cherry, City of Richland Hills
Richard Albin, Knowlton-English-Flowers, Inc.

P.O. Box 820609 • North Richland Hills, Texas • 76182-0609
7301 Northeast Loop 820 • 817-581-5521 • FAX 817-656-7538

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

August 13, 1999

Mr. S. Frank Crumb, P.E.,
Engineering Coordinator
Engineering Services
City of Fort Worth
P.O. Box 870
Fort Worth, Texas 76101-0870

Re: ***3-436, CITY OF NORTH RICHLAND HILLS***
BIG FOSSIL RELIEF SEWER PLANNING
RETURN OF FORT WORTH SEWER MASTER PLAN DOCUMENTS

We are returning to you under separate cover Volumes 1, 2, and 3 of the Fort Worth *Wastewater Collection System Master Plan, 2000-2020*, documents which you loaned to us for use in data gathering associated with the referenced project. The documents were hand-delivered to Mr. Nowzar Dinyarian today.

We made Xerox copies of portions of these documents which were related to the Big Fossil sewer area. We would note that in our review of Volume II - Model Results, of the Master Plan documents, we could not find a printout of Hydroworks model results for the Tarrant County Water Supply Corporation line BF_CM_2, which is identified by nodes TCWSC/0000+20 through TCWSC-B/0012+35. We wish to thank Mr. Jim Baddaker, with Freese and Nichols, Inc., consultants for the Master Plan, who furnished us an Excel spreadsheet copy of the model results for line BF_CM_2 which was transmitted to our office by email. Attached is a printed copy of this spreadsheet for your files.

Thank you for the data you provided us and for your assistance with this project.

Richard W. Albin

RICHARD W. ALBIN, P.E., Vice-President

RWA/ra/Fwdata.doc

Attachment

Cc: Mr. Steve Norwood, NRH Assistant City Manager
Mr. Gregory W. Dickens, P.E., NRH Director of Public Works
Mr. J.R. Baddaker, P.E., Freese and Nichols, Inc.
Mr. Nowzar Dinyarian, Fort Worth Water Department

1901 CENTRAL DR., SUITE 550 • BEDFORD, TEXAS 76021-5826 • 817/283-6211 • METRO 817/267-3367 • FAX 817/354-4389

CITY OF NORTH RICHLAND HILLS

Public Works

ROUTING
JOB NO. 3-436
FILING CORR.
KEE ___ TEN ___
BPF ___ GWF ___
RWA ___ JVS ___
DHC ___ JFP ___
MER ___ RMW ___
GRP ___ LDR ___
SAG ___ JEH ___
JCH ___ CLS ___
12-3-99

November 29, 1999

CERTIFIED MAIL #Z187017138

Texas Water Development Board
P.O. Box 13231
1700 N. Congress Avenue
Austin, Texas 78711-3231
(512) 463-3154

Attention: Ms. Phyllis Thomas, Research and Planning Fund
Grants Management Division

RE: TWDB CONTRACT NO. 99-483-308; BIG FOSSIL CREEK REGIONAL WASTEWATER PLANNING GRANT

Ms. Thomas:

There have been some unique issues we have had to address in collecting the field data and verifying location of existing wastewater lines. This will cause the study completion to be delayed by one month.

The City would appreciate your consideration in extending the "Study Completion Date" from November 30, 1999 to December 31, 1999 and moving the "Final Report Deadline" from January 31, 2000 to February 29, 2000. These are items "K" and "L" on pages 1 and 2 of the contract. No other changes to the contract are requested.

Please send me the amendment to the contract for my execution in behalf of the City. If you have any questions, please contact me. I will await notice of your determination.

Respectfully,

Gregory W. Dickens

Gregory W. Dickens, P.E.
Public Works Director

GWD/smm/pwl99404

cc: Steve Norwood, Assistant City Manager
Frank Crumb, City of Fort Worth
Peter Fu, City of Fort Worth
Greg Van Nieuvenhuize, City of Haltom City
John Cherry, City of Richland Hills
Richard Albin, Knowtlon-English-Flowers, Inc.

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

RECEIVED
JAN 12 2000
NRH Public Works

January 10, 2000

Mr. Gregory W. Dickens, P.E.
Public Works Director
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Re: ***3-436, CITY OF NORTH RICHLAND HILLS, TWDB CONTRACT NO. 99-483-308, BIG FOSSIL CREEK REGIONAL WASTEWATER PLANNING GRANT, MINUTES OF PRELIMINARY REPORT PRESENTATION MEETING, 1/07/00***

Attached are minutes of the meeting conducted for the referenced project on January 7, 2000, during which the preliminary report was presented. A list of attendees and a summary of the topics discussed are included. Also enclosed is an exhibit, which will be added to the report, showing the location of the existing and proposed sewer lines. By copy of this letter, we are also transmitting these minutes to the other meeting attendees for their review.

The next meeting is currently scheduled for Friday, January 14, 2000, at 9:30 am, at the NRH City Hall. Please advise if anyone has a conflict with this proposed meeting date. In the meantime, please call if you have any questions or require any additional information concerning this study.

RICHARD W. ALBIN, P.E., Vice President

RWA/ra/Minutes 1/07/00.doc

CC: Mr. Kevin B. Miller, P.E., C.F.M., Assistant Director of Public Works/Utilities
Mr. Frank Crumb, P.E., Fort Worth Engineering Services Coordinator
Mr. Peter Fu, P.E., Fort Worth Wastewater Facilities Engineer
Mr. Greg Van Nieuwenhuize, P.E., Haltom City Engineer
Mr. John Cherry, P.E., Richland Hills Director of Public Works

Addresses and Phone Numbers of City Representatives:

Mr. Gregory W. Dickens, P.E.
Public Works Director
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180
(817) 427-6405, (817) 427-6404 Fax.

Mr. Kevin B. Miller, P.E., (817) 427-6406

Mr. S. Frank Crumb, P.E., Engineering Services Coordinator
City of Fort Worth
P.O. Box 870
Fort Worth, Texas 76101-0870
(817) 871-8243, (817) 871-8195 Fax.

Mr. Peter Fu, P.E., (817) 871-8438

Mr. Gregory Van Nieuwenhuize, P.E., City Engineer
City of Haltom City
P.O. Box 14246
Haltom City, Texas 76117
(817) 222-7750, (817) 834-7237 Fax.

Mr. John Cherry, P.E., Director of Public Works
City of Richland Hills
3200 Diana Drive
Richland Hills, Texas 76118
(817) 595-6629, (817) 595-6644 Fax.

Minutes of Big Fossil Sewer Study Status Report Meeting, Fri. 1/07/00, 10:00 am.

Attending:

INDIVIDUAL	TITLE	REPRESENTING
Richard Albin, P.E.	Consultant	KEF
Frank Crumb, P.E.	Eng. Serv. Coordinator	Fort Worth
Greg Van Nieuwenhuize, P.E.	City Engineer	Haltom City
Chuck Kendrick	Public Works Director	Haltom City
Ty Hilton, P.E.	Engineer	TNP
John Cherry, P.E.	P.W. Director	Richland Hills

This meeting was conducted to present the results of the preliminary "Big Fossil Sewer Study" report prepared by KEF with assistance from staff members from the cities of Fort Worth, Haltom City, North Richland Hills and Richland Hills.

The three main "alternatives" were discussed including the various "options" associated with each alternative. The decision was made to change the order and numbering of the alternatives and include the options as sub-alternatives as follows:

Option 1 -- Construct a single parallel relief line to serve all Cities

- Option 1a -- All areas considered in the service area including Haltom City Little Fossil, BFX area, Marine Creek and Intel site.
- Option 1b -- Same as Option 1a less the Marine Creek area
- Option 1c -- Same as Option 1b less the Intel Site flow
- Option 1d -- Same as Option 1c less the Haltom City Little Fossil area

Option 2 -- Construct a single parallel relief line to serve all Cities except Richland Hills

- Option 2a -- C.O.F.W. parallel line to serve only Fort Worth, Haltom City (with Little Fossil), and North Richland Hills, including BFX, Marine Creek and Intel site
- Option 2b -- T.C.W.S.C. existing line with rehab serving Richland Hills only

Option 3 -- Construct two parallel lines, one adjacent to existing C.O.F.W. line and another adjacent to existing T.C.W.S.C. line.

- Option 3a -- C.O.F.W. parallel line to serve only Fort Worth and Haltom City (with Little Fossil), including BFX, Marine Creek and Intel site
- Option 3b -- New parallel T.C.W.S.C. line constructed to serve both NRH and Richland Hills

The additional Haltom City Little Fossil Creek area included in the study, as requested by Peter Fu, was not shown correctly. It was based on the assumption that area LF000570 was the correct area, (see Watershed Area Map 2 of 4, TAB 2). The portion of the correct Little Fossil Creek area is south of the LF000570 area, according to Haltom City representatives. Haltom City will provide a map showing the exact limits of the actual Little Fossil area to be considered for including in the capacity calculations for the C.O.F.W. parallel line. Also, the exact location of the proposed Little Fossil line, which would be replaced by providing capacity in the proposed C.O.F.W. parallel line, will be shown on a map as provided by Haltom City. However, it was determined that the area in acres of the Little Fossil area shown in the study is about the same approximate size as the correct Little Fossil area, so the order of magnitude of the peak flows and cost estimate sharing splits is about the same. Haltom City representatives indicated that cost estimates for the proposed Little Fossil line should be based on a proposed 30-inch line which measures about 5,000 feet in length. We assumed a 5,200 foot length in the preliminary report.

It was agreed that an additional exhibit should be included in the report which shows on one sheet the full length of the existing Big Fossil and T.C.W.S.C. lines from the Fort Worth 96-inch outfall to Broadway Blvd, (which represents the limits of the lines studied in this report). This exhibit will be added to TAB 1 and will also show the approximate location of the proposed C.O.F.W. parallel outfall sewer.

All representatives at the meeting were in general agreement, in principle, with the cost sharing methodology used in the report, which is based on the relative magnitude of approximate peak flows computed from equivalent population and sewered area projections for each participating city included in the City of Fort Worth Sanitary Sewer System Master Plan Report. However, the Richland Hills representative, John Cherry, indicated that participation from Richland Hills should be based only on the portion of the proposed parallel outfall line south of the Richland Hills meter. The cost estimate splits for Richland Hills will be modified to reflect their share of the C.O.F.W. outfall line which would extend from the 96-inch outfall northward to just south of S.H. 121. This modification would also increase the share of estimated costs for the other city participants proportionately. John Cherry also mentioned that the rehab costs for the existing T.C.W.S.C. line would be about $700,000, which is close to the estimated rehab costs assumed in the study, (see Tables in TAB 7 for Option 5b which show estimated RH costs). Also, see attached letter from John Cherry dated January 6, 2000.

Haltom City representative, Greg Van Nieuwenhuize, was also in general agreement with the cost split methodology presented in the report, assuming that all cities are required by contract to participate in the proposed Big Fossil outfall sewer. However, Greg expressed his view that the issue remains unresolved regarding whether or not Fort Worth should be required by contract to upgrade the Big Fossil line at City of Fort Worth's expense alone, since the C.O.F.W. line may be considered by Haltom City to be a "system" line. Fort Worth would then be "fronting" the improvement costs, and based on this scenario, customer cities would then later pay for their fair share of the improvements through rate increases, if appropriate.

Frank Crumb took the position that it is reasonable and fair for the cities of Haltom City, North Richland Hills and Richland Hills to contribute their fair-share of the engineering and construction costs of the proposed improvements to the system line which serves all of these cities, since Fort Worth will be required to upsize and/or parallel the remaining portion of the Big Fossil ourfall system lines north of Broadway Blvd. at its own considerable expense.

Most of the meeting representatives also agreed that it might be premature, at this time, to send the report to the Texas Water Development Board until the participating cities have had more time to consider the report and come to an agreement on what manner of cost participation is acceptable for each party. However, John Cherry expressed that he was comfortable with sending the preliminary report to the T.W.D.B. just as it is, along with his letter. It was further recommended by the meeting participants that Greg Dickens should contact the T.W.D.B. representative as soon as possible to determine if the preliminary report should be submitted anyway, without full consensus of all participating cities at this time, since the T.W.D.B. is funding half of the report costs.

If there are any additions or corrections to these minutes which need to be made prior to the proposed meeting on Friday, January 14, 2000, at 9:30 am, then please advise.

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

March 12, 2000

Mr. Gregory W. Dickens, P.E.,
Director of Public Works
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Re: ***3-436, CITY OF NORTH RICHLAND HILLS***
BIG FOSSIL SEWER STUDY REPORT
REGIONAL FACILITY PLANNING CONTRACT BETWEEN THE CITY OF NRH AND THE TWDB, CONTRACT NO. 99-483-308
REPORT REVISIONS

We have received review comments for the referenced project by letter from the Texas Water Development Board, dated February 28, 2000, which we received by FAX from your office dated March 10, 2000. A copy of the transmittal letter and review comments is attached, (See Section "1").

The two main comments made by the TWDB concerned (a) justification of population projections, and (b) an evaluation matrix to determine the optimum route of the proposed parallel sanitary sewer. Both of those issues are addressed herein, (See Section "2").

An additional comment by the TWDB concerns "the level of agreement of participants regarding proposed cost participation". We understand that you will address this issue separately since you have been in contact with the participants concerning the recommendations in the Report.

After further review and approval by the TWDB, we will incorporate the revisions in the Final Report. In the meantime, please call if you have any questions.

Richard W. Albin

RICHARD W. ALBIN, P.E., Vice President

RWA/ra/Review1.doc

1901 CENTRAL DR., SUITE 550 • BEDFORD, TEXAS 76021-5826 • 817/283-6211 • METRO 817/267-3367 • FAX 817/354-4389

SECTION 1

REVIEW COMMENTS BY TWDB

City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180
(817) 427-6400; Fax (817) 427-6404

Public Works Administration

Fax

To:	Richard Albin	**From:**	Greg Dickens, Public Works Director
Fax:	354-4389	**Pages:**	4 (including cover sheet)
Phone:		**Date:**	03/10/00
Re:	TWDB	**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

● **Comments:**

Please call me when you receive this.

Thanks,
Greg

TEXAS WATER DEVELOPMENT BOARD

February 28, 2000

Mr. Gregory W. Dickens, P.E.
Public Works Director
City of North Richland Hills
7301 N.E. Loop 820
North Richland Hills, Texas 76180

Re: Regional Facility Planning Contract Between the City of North Richland Hills (City) and the Texas Water Development Board (Board), TWDB Contract No. 99-483-308

Dear Mr. Dickens:

Staff members of the Texas Water Development Board have completed a review of the draft report under TWDB Contract No. 99-483-308 and offer comments shown in Attachment 1.

However, Item 5 in Attachment 1 was not included or addressed in the Draft Final Report and as submitted does not meet contractual requirements. Therefore, please submit this section for review prior to delivery of the Final Report.

After review comments have been transmitted to the City regarding the above referenced item, the City will consider incorporating all comments from the EXECUTIVE ADMINISTRATOR and other commentors on the draft final report into the Final Report.

Please contact Mr. Ralph Boeker, the Board's designated Contract Manager, at (512) 936-0851, if you have any questions about the Board's comments.

Sincerely,

Tommy Knowles

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

cc: Ralph Boeker, TWDB

RECEIVED
MAR 9 2000
NRH Public Works

Our Mission
Provide leadership, technical services and financial assistance to support planning, conservation, and responsible development of water for Texas.

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URL Address: http://www.twdb.state.tx.us • E-Mail Address: info@twdb.state.tx.us
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ATTACHMENT 1

TEXAS WATER DEVELOPMENT BOARD
Review Comments: "Big Fossil Creek Relief Sewer Planning Report"
Contract No. 99-483-308

1. The engineering report includes a table titled Big Fossil Sewer Study, Table No. 1 TWDB-1. That table contains out-of-date information from an older version of the TWDB web site. Note the date printed on bottom left corner of the page "12/31/1999". The new 2002 State Water Plan planning data for Region C is posted on TWDB web site as of 2/4/2000.

2. Attachment 2 shows a comparison of growth in the selected cities within the drainage area of the study. The only comparison made is of growth rates since entire cities (total populations) are not contained within the drainage area; however, growth rates in the drainage area may not reflect growth rates for these cities on the whole.

3. According to the report, the cities involved (in the basin) other than Fort Worth has a total population increase of less than 20,000 during the study period. Fort Worth has a total increase in excess of 36,000 (203%) for that part of the City in the drainage area. The TWDB projected growth for all of Fort Worth during the same period is 14%. Perhaps a double check of that particular area of the City could verify the much higher population growth in the Big Fossil drainage area. The report should include additional information supporting this growth rate.

4. Generally, the report's presentation of the projections is acceptable.

5. Task 8 in the Scope of Work has not been addressed. Please show how the objectives of Task 8 were met: "Develop evaluation matrix to select the optimum route for the proposed relief sanitary sewer."

6. Please provide a status of the level of agreement of proposed participants regarding cost participation.

ATTACHMENT 2

Comparison of projected growth in selected cities between 2005 and 2025. From 2002 SWP and Chapter 5, Table 2.
Big Fossil Study

COMPARISON OF STUDY POPULATION WITH MOST RECENT
PROJECTONS FOR THE 2002 WATER PLAN, PREPARED BY REGION C PLANNING GROUP

City	1990	2000	2005	p2005	2010	2020	2025	p2025	2002 SWP % increase	Big Fossil Study % increase
HASLET	795	1,260	1,352	3,092	1,443	1,899	2,113	9,203	56.34%	197.64%
HALTOM CITY	32,856	38,845	40,275	17,848	41,704	43,272	43,628	19,990	8.33%	12.00%
WATAUGA	20,009	22,233	23,254	20,372	24,274	26,157	27,063	27,090	16.38%	32.98%
NORTH RICHLAND	45,895	55,884	61,624	11,580	67,363	81,200	85,804	14,054	39.24%	21.36%
RICHLAND HILLS	7,978	8,886	9,633	9,244	10,379	12,109	12,864	9,806	33.54%	6.08%
SAGINAW	8,551	12,172	13,047	4,639	13,922	15,878	16,481	5,888	26.32%	26.92%
FORT WORTH	447,619	496,622	514,670	17,990	532,717	580,375	588,244	54,592	14.30%	203.46%

p2005 and p2025 population projections provided by consultant. 2005 and 2025 population projections are interpolations of the 2002 State Water Plan.

Percentage increase for projections are compared in columns "% incr" and "p%incr"

SECTION 2

REPLY TO REVIEW COMMENTS

AND REPORT REVISIONS

REPLY TO TWDB REVIEW COMMENTS

1. *The engineering report includes a table titled Big Fossil Sewer Study, Table No. 1, TWDB-1. That table contains out-of-date information from an older version of the TWDB web site. Note the date printed on bottom left corner of the page "12/31/1999". The new 2002 State Water planning data for Region C is posted on TWDB web site as of 2/4/2000.*

Table No. 1, TWDB-1, has been updated based on the new population and water demand data provided at the TWDB web site, (See attached Exhibit "A"). The population projections in this table have not been adopted by the participating cities, as far as we know, but are used as a comparison of the growth projection rates included in this report.

2. *Attachment 2 shows a comparison of growth in the selected cities within the drainage area of the study. The only comparison made is of growth rates since entire cities (total populations) are not contained within the drainage area; however, growth rates in the drainage area may not reflect growth rates for these cities on the whole.*

Exhibit "B" is attached which includes a copy of the population projection data provided by the TWDB in Attachment 2. The population projections for years p2005 and p2025 reflect that actual population values used in the Report discharge calculations. The population projections shown in Table 2, "Population and Employment Summaries of cities in the Big Fossil Study", under TAB 5, have been corrected to show the actual populations used in the study, (See Exhibit "F"). Exhibit "C" is a summary table which shows the actual population projections used in this study from the Fort Worth Land Use databases for the years 1990 through 2070. Exhibit "D" shows the employment values used, and Exhibit "E" shows the "equivalent" population values used.

We would note that the population values used in the discharge calculations are based on the "Equivalent Populations" which are equal to the Population Values plus one-half the Employment Values. These Equivalent Population values are the same values used in the approved City of Fort Worth Sanitary Sewer Master Plan. (See further discussion of population projections below).

3. *According to the report, the cities involved (in the basis) other than Fort Worth, has a total population increase of less than 20,000 during the study period. fort Worth has a total increase in excess of 36,000 (203%) for that part of the City in the drainage area. The TWDB projected growth for all of Fort Worth during the same period is 14%. Perhaps a double check of that particular area of the City could verify the much higher population growth in the Big Fossil drainage area. The report should include additional information supporting this growth rate.*

As noted in item 2 above, the population values shown in Table 2, TAB 5, were not correct. They were based on preliminary population projection calculations using North Central Texas Council of Governments forecast district data which do not reflect the final actual population data used in the study. It was determined that the best and most reliable source of population projection data within the Big Fossil Creek service area, for purposes of this study, was the City of Fort Worth Sanitary Sewer Master Plan Data which was prepared by their Land Use Planning consultants and approved by the City of Fort Worth as part of their Land Use Assumptions Plan. This data was determined to be better suited to this study because it is broken down into small sub-areas as shown under TAB 2, Sheets 1, 2, and 3 of 4. (The NCTCOG Forecast District areas proved to be too large for this particular study for the level of precision required).

The population projection database, which also shows these individual watershed basin sub-areas, was furnished to us by the City of Fort Worth Water Department for use in this study. This population database is broken into two separate tables of the Report under TAB 5 listed as Table "LUAPOP-1" and Table "LUAPOP-2". Those tables are reproduced herein under Exhibits "G" and "H" respectively. Summary line items are added in these tables which show the population projection totals for each of the selected cities included in the study based on the sub-area basin totals.

The following is a brief discussion of the population projections for each city included in Exhibit "B" in the order listed:

<u>Haslet (Not a Participating City)</u>

Copies of the Sub-basin Area maps are enclosed for reference under Exhibit "I". The portion of the Haslet area in the Big Fossil service area is colored in yellow on Sheet 3 of 4. This exhibit shows the basis for the Haslet population projections within the Big Fossil Service area. Also, please refer to Exhibit "B" which presents the TWDB population projections and the correct year p2005 and p2025 projections for populations within the Big Fossil Service area.

Note that the total city land area of Haslet is 3,205 acres, but only 453 acres of the city are included in the Big Fossil service area. Based on the TWDB projections, the total city population is expected to grow from 1,352 people in 2005 to 2,113 people in 2025, which is a 56.29% increase of 761 people. However, the Big Fossil service area population increase is expected to be from 258 people to 583 people, which is a 125.97% increase of 325 people, based on the Fort Worth Land Use Assumptions plan forecast for sub-basin area no. BFX10-07. This is a reasonable assumption, in our opinion, since the south portion of Haslet is expected to grow faster than the north part of the city due to the availablity of sanitary sewer service lines to that portion of the city and the close proximity of a major roadway arterial, U.S. Highway 81.

We would note that since Haslet is not a participating city in this study, and since the City of Fort Worth provides service to this city, the population for Haslet is included with the City of Fort Worth in the cost participation portion of the study. This also applies to the cities of Watauga and Saginaw, which are not participating cities. Their populations are added in with Fort Worth for purposes of calculating Fort Worth's portion of the cost participation.

Haltom City (Participating City)

The TWDB projected growth of the whole city from 2005 to 2025 is 3,353 people, or 8.33%. The projected growth in the Big Fossil watershed area based on the City of Fort Worth Land Use Assumptions database, which is used in this report, is 2,120 people, or 16.12%. The Haltom City area included in the Big Fossil watershed is shaded purple and shown on Sheet No. 2 of 4 in Exhibit "I". It is reasonable to project a higher growth rate in the Big Fossil area because most of the future growth will be in the north part of the City, or the Big Fossil watershed area, since the southern part of the city, which lies outside the Big Fossil watershed area, is already more fully developed as the street map indicates.

Watauga (Not a Participating City)

The TWDB projected growth of Watauga from 2005 to 2025 is 3,809 people, or 16.38%. The projected growth used in the report is 3,343, or 16.24%, which agrees favorably with the TWDB projection rate. Although the projected population totals differ in the year 2025, the protected totals for the year 2050 are in close agreement of about 29,000 people. The Watauga area is shaded blue on Sheet No. 3 of 4 in Exhibit "I".

North Richland Hills (Participating City)

The TWDB projected growth of the whole city from 2005 to 2025 is 24,180 people, or 39.24%. The projected growth in the Big Fossil Watershed area based on the City of Fort Worth Land Use Assumptions database, which is used in this report, is only 2,078 people, or 14.03%. The NRH City area included in the Big Fossil watershed is shaded brown and shown on Sheet No. 2 of 4 in Exhibit "I". This situation is reversed from Haltom City. It is reasonable to project a much lower growth rate in the Big Fossil area because most of the future growth in NRH will be in the north part of the City, which is outside the Big Fossil watershed area. Most of the southern part of the city, which lies within the Big Fossil watershed area, is already almost completely developed.

Richland Hills (Participating City)

This situation is very similar to NRH. The TWDB projected growth of the whole city of Richland Hills from 2005 to 2025 is 3,231 people, or 33.54%. The projected growth in the Big Fossil Watershed area based on the City of Fort Worth Land Use Assumptions database, which is used in this report, is only 848 people, or 12.30%. The Richland Hills City area included in the Big Fossil watershed is shaded green and shown on Sheet No. 2 of 4 in Exhibit "I". This situation is also reversed from Haltom City. It is reasonable to project a much lower growth rate in the Big Fossil area because most of the future growth in Richland Hills will be in the east part of the City, which is outside the Big Fossil watershed area. Most of the western part of the city, which lies within the Big Fossil watershed area, is already almost completely developed.

Saginaw (Not a Participating City)

The projected growth in Saginaw is similar to Haslet, in that most of the anticipated growth is in the northeast part of the City where service lines are available for extension. Based on the TWDB projections, the growth from 2005 to 2025 for the whole city is expected to be 3,434 people, or 26.32%. The Fort Worth Land Use Assumptions projected growth in the Big Fossil area of the city is expected to be 930 people, or an increase of 133.81% since that area is expected to jump from 695 people in 2005 to 1,625 people by 2025. The Big Fossil area of Saginaw is shaded orange on Sheet 3 of 4 in Exhibit "I".

Fort Worth (Participating City)

Projected TWDB population growth for the whole city of Fort Worth from 2005 to 2025 is 73,574 people or 14.30%. The projected growth in the Big Fossil service area (which includes a portion of Marine Creek) during this period is 14,436 people or 59.40%, based on the Fort Worth Land Use Assumptions Plan database used in this report. Most of the northwesterly portion of the Big Fossil Watershed and the Marine Creek areas are sparsely developed currently, and it is reasonable to assume that the growth rate in this area will be higher than the overall growth rate of the city as a whole.

Based on the population projections used in this report as discussed above, the following table lists the population percentage of each participating city in the year 2025, (not including employment population), with the Fort Worth population including customer cities Haslet, Watauga, and Saginaw (*), and Haltom City not including the Little Fossil area:

Haltom City	15,271	14.57%
North Richland Hills	16,887	16.12%
Richland Hills	7,745	7.39%
Fort Worth (*)	64,883	61.92%
TOTALS	104,786	100.00%

5. *Task 8 in the Scope of Work has not been addressed. Please show how the objectives of Task 8 were met: "Develop evaluation matrix to select the optimum route for the proposed relief sanitary sewer."*

Revised Plan Sheets 1, 2, 3, 4, and 5 of 5 are included herewith under Exhibit "J". These sheets show 3 possible routes for the proposed relief sanitary sewer labeled Alternates 1, 2 and 3. Alternate 1 follows closely the route of the existing Big Fossil Outfall sanitary sewer and was presented in the preliminary report. Alternate 2 also follows the existing Big Fossil outfall route except for the section between the C.R.& G. Railroad (see sheet no. 2) and the TESCO R.O.W. (see sheet no. 4). The third alternate follows closely the alignment of the existing T.C.W.S.C. line. The following is a discussion of the features of each alternate which will be used to develop a matrix required to identify the optimum route.

Capital Cost

The following is an estimate of project cost based on an estimate of $1,134 per linear foot for Option 1a for the 2070 design year:

1. Alternate 2 - 12,227 linear feet x $1,134/ft. = $13.87 million
2. Alternate 3 - 13,302 linear feet x $1,134/ft. = $15.08 million
3. Alternate 1 - 13,382 linear feet x $1,134/ft. = $15.18 million

Additional Easements Required

The following is a ranking of each alternative based on the estimated total number of easements required:

1. Alternate 1 - 18 Easements
2. Alternate 2 - 18 Easements
3. Alternate 3 - 28 Easements

Construction Impact on Participating Communities

Construction and Community impacts are combined into this single category. This criteria will be based on close proximity to existing homes or businesses which is a measure of the effect dust and noise pollution on each community during construction, and nuisance effects after construction. Ranking is determined based on total number of homes or businesses in close proximity to each alternate route:

1. Alternate 2 - 10 buildings
2. Alternate 1 - 15 buildings
3. Alternate 3 - 54 buildings

Design Considerations (Creek and Road Crossing, Topography)

This criteria will be ranked based on the total number of Creek and Road crossings for each alternative:

1. Alternate 2 - 8 crossings
2. Alternate 1 - 8 crosssings
3. Alternate 3 - 13 crossings

Sanitary Sewer Maintenance Requirements

This criteria is generally a function of the total number of manholes or bends on each alternate line which will require periodic cleaning and maintenance. The following ranking is based on total number of bends and/or manholes on each line:

1. Alternate 2 - 25 manholes and/or bends
2. Alternate 1 - 30 manholes and/or bends
3. Alternate 3 - 33 manholes and/or bends

The following is a Ranking Matrix Based on the Criteria Listed above:

	Alt. 1	Alt 2	Alt. 3
Capital Cost	3	1	2
Additional Easements Req'd	1	1	2
Construction/Community Impacts	2	1	3
Design Considerations	1	1	2
Maintenance Requirements	2	1	3
TOTALS	9	5	12

Based on the above ranking matrix, the optimum alignment is Alternate No. 2, which is the route recommended by the City of Fort Worth Water Department.

EXHIBIT "A"

Big Fossil Sewer Study, Table No. TWDB-1

TEXAS WATER DEVELOPMENT BOARD POPULATION AND WATER USE PROJECTIONS

CITY	TOTAL LAND AREA	YEAR 1990				YEAR 2000				YEAR 2010			
		POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.
Fort Worth	183,796	447,619	105,420	210.24	2.44	496,622	127,946	229.98	2.70	532,717	134,262	224.98	2.90
North Richland Hills	11,675	45,895	6,331	123.14	3.93	55,884	9,640	153.99	4.79	67,363	11,394	150.99	5.77
Haltom City	7,935	32,856	4,575	124.30	4.14	38,845	6,309	144.98	4.90	41,704	6,633	141.98	5.26
Richland Hills	2,007	7,978	1,301	145.57	3.98	8,886	1,334	134.01	4.43	10,379	1,523	130.99	5.17
Watauga	2,600	20,009	2,761	123.18	7.70	22,233	3,835	153.98	8.55	24,274	4,106	151.00	9.34
Haslet	3,205	795	108	121.27	0.25	1,260	229	162.24	0.39	1,443	267	165.17	0.45
Saginaw	4,778	8,551	1,238	129.24	1.79	12,172	2,059	151.00	2.55	13,922	2,495	159.98	2.91
Tarrant County	574,450	1,170,247	226,690	172.92	2.04	1,415,759	308,195	194.33	2.46	1,594,218	341,530	191.24	2.78

CITY	TOTAL LAND AREA	YEAR 2020				YEAR 2030				YEAR 2040			
		POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.	POP.	AC-FT	GPCD	POP/AC.
Fort Worth	183,796	580,375	143,673	220.99	3.16	596,112	144,230	215.99	3.24	632,480	150,195	211.99	3.44
North Richland Hills	11,675	81,200	13,461	147.99	6.96	90,408	14,684	144.99	7.74	100,661	16,011	141.99	8.62
Haltom City	7,935	43,272	6,737	138.98	5.45	43,983	6,700	135.98	5.54	44,197	6,584	132.98	5.57
Richland Hills	2,007	12,109	1,750	129.01	6.03	13,618	1,922	125.99	6.79	16,497	2,273	123.00	8.22
Watauga	2,600	26,157	4,336	147.98	10.06	27,969	4,543	145.00	10.76	29,906	4,757	141.99	11.50
Haslet	3,205	1,899	372	174.87	0.59	2,327	456	174.93	0.73	2,587	478	164.94	0.81
Saginaw	4,778	15,878	2,970	166.98	3.32	17,084	3,062	160.00	3.58	18,915	3,284	154.99	3.96
Tarrant County	574,450	1,798,894	377,333	187.25	3.13	1,915,375	391,338	182.39	3.33	2,111,193	416,854	176.26	3.68

CITY	TOTAL LAND AREA	YEAR 2050			
		POP.	AC-FT	GPCD	POP/AC.
Fort Worth	183,796	671,067	155,600	206.99	3.65
North Richland Hills	11,675	112,232	17,475	138.99	9.61
Haltom City	7,935	44,412	6,517	130.99	5.60
Richland Hills	2,007	19,985	2,709	121.00	9.96
Watauga	2,600	29,906	4,656	138.98	11.50
Haslet	3,205	2,808	503	159.91	0.88
Saginaw	4,778	20,942	3,519	150.00	4.38
Tarrant County	574,450	2,205,610	430,303	174.16	3.84

Notes:

Popluation Projections Web Site:
http://www.twdb.state.tx.us/popwuse/PopulationC.htm

Water Use Web Site:
http://www.twdb.state.tx.us/popwuse/MunicipalC.htm

GPCD = AC-FT x 43,560 c.f./acre-ft x 7.48 gal/c.f. / 365 days/year / Popluation

EXHIBIT "B"
COMPARISON OF PROJECTED GROWTH IN SELECTED CITIES BETWEEN 2005 AND 2025
FROM 2002 SWP AND CHAPTER 5, TABLE 2 (CORRECTED), BIG FOSSIL SEWER STUDY

CITY	1990	2000	2005	P2005	2010	2020	2025	P2025	2002 SWP % INCREASE	BIG FOSSIL STUDY % INCREASE
HASLET	795	1,260	1,352	258	1,443	1,899	2,113	583	56.29%	125.97%
HALTOM CITY	32,856	38,845	40,275	13,151	41,704	43,272	43,628	15,271	8.33%	16.12%
WATAUGA	20,009	22,233	23,254	20,591	24,274	26,157	27,063	23,934	16.38%	16.24%
N. RICHLAND HILLS	45,895	55,884	61,624	14,809	67,363	81,200	85,804	16,887	39.24%	14.03%
RICHLAND HILLS	7,978	8,886	9,633	6,897	10,379	12,109	12,864	7,745	33.54%	12.30%
SAGINAW	8,551	12,172	13,047	695	13,922	15,878	16,481	1,625	26.32%	133.81%
FORT WORTH	447,619	496,622	514,670	24,305	532,717	580,375	588,244	38,741	14.30%	59.40%
TOTALS	563,703	635,902	663,855	80,706	691,802	760,890	776,197	104,786	16.92%	29.84%

NOTES: P2005 AND P2025 POPULATION PROJECTIONS INCLUDE ONLY BIG FOSSIL WATERSHED AREAS
SEE EXHIBIT "C" FOR SUMMARY OF POPULATION PROJECTIONS FOR YEARS 1990 THROUGH 2070
PERCENT INCREASES BASED ON COMPARISON OF YEARS 2005 AND 2025

EXHIBIT "C"
"POPULATION" PROJECTIONS USED IN THE BIG FOSSIL SEWER STUDY BASED ON DATA FROM THE CITY OF FORT WORTH SANITARY SEWER MASTER PLAN REPORT

CITY	TOTAL CITY AREA (AC.)	TOTAL BIG FOS. SERV. AR. (AC.)	TAB. LUAPOP-1 PAGE 8 OF 12				TABL. LUAPOP-1 PAGE 12 OF 12			INTERP.	TAB. LUAPOP-2 PAGE 10 OF 20	
			1990	1995	2000	2005	2010	2015	2020	2025	2050	2070
Haslet	3,205	453	66	130	194	258	322	416	509	583	952	1,247
Haltom City	7,935	3,227	11,650	12,151	12,651	13,151	13,651	14,203	14,754	15,271	17,858	19,928
Watauga	2,600	2,600	17,955	18,834	19,712	20,591	21,469	22,275	23,080	23,934	28,205	31,622
N. Richland Hills	11,675	2,465	12,652	13,371	14,091	14,809	15,528	15,906	16,282	16,887	19,912	22,332
Richland Hills	2,007	1,365	5,797	6,164	6,530	6,897	7,264	7,365	7,467	7,745	9,137	10,250
Saginaw	4,778	763	35	255	475	695	915	1,157	1,398	1,625	2,761	3,670
Fort Worth	183,796	48,363	16,459	19,074	21,690	24,305	26,921	31,239	35,558	38,741	54,657	67,389
TOTALS	215,996	59,236	64,614	69,979	75,343	80,706	86,070	92,561	99,048	104,787	133,482	156,438

NOTES:
Big Fossil Service Area Includes Marine Creek Watershed Area, but not Little Fossil Creek Watershed Area
Source of Data: City of Fort Worth Database Tables "LUAPOP-1" and "LUAPOP-2"
Population Estimates for Year 2025 Interpolated between Years 2020 and 2050

EXHIBIT "D"
"EMPLOYMENT" PROJECTIONS USED IN THE BIG FOSSIL SEWER STUDY BASED ON DATA FROM THE CITY OF FORT WORTH SANITARY SEWER MASTER PLAN REPORT

CITY	TOTAL CITY AREA (AC.)	TOTAL BIG FOS. SERV. AR. (AC.)	TAB. LUAPOP-1 PAGE 4 OF 12							INTERP.	TAB. LUAPOP-2 PAGE 10 OF 20	
			1990	1995	2000	2005	2010	2015	2020	2025	2050	2070
Haslet	3,205	453	27	47	68	88	108	152	195	223	363	475
Haltom City	7,935	3,227	1,136	1,870	2,605	3,339	4,074	5,035	5,995	6,805	10,855	14,095
Watauga	2,600	2,600	1,615	1,730	1,844	1,958	2,072	2,225	2,377	2,504	3,139	3,647
N. Richland Hills	11,675	2,465	3,226	3,565	3,904	4,244	4,583	4,963	5,343	5,696	7,461	8,873
Richland Hills	2,007	1,365	2,256	2,508	2,760	3,011	3,263	3,539	3,815	4,075	5,374	6,414
Saginaw	4,778	763	113	141	169	196	224	310	396	443	679	868
Fort Worth	183,796	48,363	4,135	5,162	6,189	7,216	8,243	13,577	18,911	21,374	33,687	43,538
TOTALS	215,996	59,236	12,508	15,023	17,539	20,052	22,567	29,801	37,032	41,120	61,558	77,910

NOTES:
Big Fossil Service Area Includes Marine Creek Watershed Area, but not Little Fossil Creek Watershed Area
Source of Data: City of Fort Worth Database Tables "LUAPOP-1" and "LUAPOP-2"
Employment Estimates for Year 2025 Interpolated between Years 2020 and 2050

EXHIBIT "E"
"EQUIVALENT" POPULATION PROJECTIONS USED IN THE BIG FOSSIL SEWER STUDY BASED ON DATA FROM THE CITY OF FORT WORTH SANITARY SEWER MASTER PLAN REPORT

CITY	TOTAL CITY AREA (AC.)	TOTAL BIG FOS. SERV. AR. (AC.)	TAB. LUAPOP-1 PAGE 8 OF 12				TABL. LUAPOP-1 PAGE 12 OF 12			INTERP.	TAB. LUAPOP-2 PAGE 10 OF 20	
			1990	1995	2000	2005	2010	2015	2020	2025	2050	2070
Haslet	3,205	453	80	154	228	302	376	492	607	694	1,134	1,485
Haltom City	7,935	3,227	12,218	13,086	13,954	14,821	15,688	16,721	17,752	18,674	23,286	26,976
Watauga	2,600	2,600	18,763	19,699	20,634	21,570	22,505	23,388	24,269	25,186	29,775	33,446
N. Richland Hills	11,675	2,465	14,265	15,154	16,043	16,931	17,820	18,388	18,954	19,735	23,643	26,769
Richland Hills	2,007	1,365	6,925	7,418	7,910	8,403	8,896	9,135	9,375	9,783	11,824	13,457
Saginaw	4,778	763	92	326	560	793	1,027	1,312	1,596	1,847	3,101	4,104
Fort Worth	183,796	48,363	18,527	21,655	24,785	27,913	31,043	38,028	45,014	49,428	71,501	89,158
TOTALS	215,996	59,236	70,868	77,491	84,113	90,732	97,354	107,462	117,564	125,347	164,261	195,393

NOTES:
Big Fossil Service Area Includes Marine Creek Watershed Area, but not Little Fossil Creek Watershed Area
Source of Data: City of Fort Worth Database Tables "LUAPOP-1" and "LUAPOP-2"
Equivalent Population Estimate for Year 2025 Interpolated between Years 2020 and 2050
Equivalent Population = Population (Exhibit "B") + 0.5 x Employment (Exhibit "C")

In order to determine future population and employment data, a systematic method was developed incorporating census tracts, forecast districts, and city boundaries. Each city lies within the boundary of several forecast districts and census tracts. A map was developed of each city showing the corresponding census tracts and forecast districts for that certain city. From this map the population per house density of each of the contributing forecast districts was computed by defining the census tracts contained in each forecast district. These forecast district densities were then used to figure population data for the years: 1995, 2005, & 2025. A similar method was then used to determine population and employment data for areas in each city, which contribute to the Big Fossil watershed. The employment and population numbers were factored for each census tract and forecast district in order to determine the population and employment data for the study. This preliminary analysis was used for comparison purposes only.

The following table shows population and employment data for the cities located in the Big Fossil watershed area which were developed from the City of Fort Worth Sanitary Sewer Master Plan and Land Use Assumptions Plan furnished by the City of Fort Worth Water Department for use in this study.

EXHIBIT "F"
Table 2.
(Revised)
Population and Employment Summaries of Cities in the Big Fossil Study

CITY	Service Area (Ac.)	POPULATION			EMPLOYMENT		
		1995	2005	2025	1995	2005	2025
Fort Worth	48,363	19,074	24,305	38,741	5,162	7,216	21,374
Haltom City	3,227	12,151	13,151	15,271	1,870	3,339	6,805
Haslet	453	130	258	583	47	88	223
North Richland Hills	2,465	13,371	14,809	16,887	3,565	4,244	5,696
Richland Hills	1,365	6,164	6,897	7,745	2,508	3,011	4,075
Saginaw	763	255	695	1,625	141	196	443
Watauga	2,600	18,834	20,591	23,934	1,730	1,958	2,504
TOTAL	**59,236**	**69,979**	**80,706**	**104,786**	**15,023**	**20,052**	**41,120**

Note: Source of Population Data: City of Fort Worth Sanitary Sewer Master Plan
See Database Tables "LUAPOP-1" and "LUAPOP-2", under TAB 5.
City of Fort Worth area also includes unincorporated Tarrant County Areas in Watershed

EXHIBIT "G"

FORT WORTH POPULATION PROJECTIONS

TABLE "LUAPOP-1"

SUBAREA	AREA_AC	Easting	EMP_1990	EMP_1995	EMP_2000	EMP_2005	EMP_2010	EMP_2015	EMP_2020	Flood Cont.0	HD Resid.0	Industrial0
	BIG FOSSIL CURRENT SERVICE AREA											
BF000350-S	1,365.37	2,355,216.25	2,256.00	2,508.00	2,760.00	3,011.00	3,263.00	3,539.00	3,815.00	0.00	34.96	81.82
BF000350-N	1,643.38	2,355,216.25	2,715.00	3,018.00	3,321.00	3,625.00	3,928.00	4,260.00	4,592.00	0.00	42.07	98.47
BF000380	3,058.33	2,346,512.75	1,031.00	1,758.00	2,485.00	3,212.00	3,939.00	4,890.00	5,841.00	0.00	166.71	125.33
BF000890-N	2,600.04	2,350,886.25	1,615.43	1,729.67	1,843.93	1,958.18	2,072.43	2,224.89	2,377.36	0.00	6.93	64.29
BF000890-S	821.81	2,350,886.25	510.60	546.71	582.82	618.93	655.04	703.24	751.43	0.00	2.60	24.13
BF000890-W	168.88	2,350,886.25	104.93	112.35	119.77	127.19	134.61	144.51	154.41	0.00	0.53	4.96
BF001150	86.85	2,339,210.75	92.00	114.00	136.00	158.00	180.00	265.50	351.00	0.00	0.00	5.51
BF001230	211.03	2,336,926.75	86.00	110.25	134.50	158.75	183.00	278.00	373.00	0.00	0.00	0.00
BF001330	71.91	2,337,067.00	8.00	8.75	9.50	10.25	11.00	11.50	12.00	0.00	0.00	0.00
BF001380	33.88	2,336,149.50	4.00	4.25	4.50	4.75	5.00	5.50	6.00	0.00	0.00	0.00
BF001420	22.35	2,335,175.50	2.00	2.25	2.50	2.75	3.00	3.50	4.00	0.00	0.00	0.00
BF001440	343.58	2,334,048.25	4.00	17.50	31.00	44.50	58.00	111.50	165.00	0.00	0.00	7.99
BF001520	98.70	2,336,266.75	4.00	6.00	8.00	10.00	12.00	16.00	20.00	0.00	0.00	0.00
BF001650	80.52	2,335,319.00	2.00	4.00	6.00	8.00	10.00	18.00	26.00	0.00	0.00	0.00
BF001750	175.51	2,335,061.00	2.00	12.25	22.50	32.75	43.00	71.00	99.00	0.00	0.00	0.00
BF001970	75.55	2,344,510.25	4.00	5.50	7.00	8.50	10.00	14.00	18.00	0.00	0.00	4.11
BF002000	55.13	2,344,042.75	3.00	4.25	5.50	6.75	8.00	11.00	14.00	0.00	0.00	0.00
BF002030	98.50	2,343,247.50	5.00	7.00	9.00	11.00	13.00	17.50	22.00	0.00	0.00	0.00
BF002110	655.15	2,341,326.25	0.00	21.25	42.50	63.75	85.00	132.00	179.00	0.00	0.00	0.00
BF002170	1,808.64	2,346,034.50	1,067.00	1,139.75	1,212.50	1,285.25	1,358.00	1,507.50	1,657.00	0.00	0.00	106.10
BF002260	203.84	2,346,618.75	23.00	32.75	42.50	52.25	62.00	83.50	105.00	0.00	0.00	0.00
BF002270	124.51	2,345,136.00	7.00	13.00	19.00	25.00	31.00	44.00	57.00	0.00	0.00	0.00
BF002560	285.98	2,347,455.00	0.00	13.90	27.79	41.69	55.58	85.90	116.22	0.00	0.00	0.00
BF002630	25.83	2,342,396.25	0.00	1.00	2.00	3.00	4.00	6.00	8.00	0.00	0.00	0.00
BF002650	43.15	2,343,705.00	0.00	2.00	4.00	6.00	8.00	12.50	17.00	0.00	0.00	0.00
BF002690	38.32	2,342,377.25	0.00	1.25	2.50	3.75	5.00	8.00	11.00	0.00	0.00	0.00
BF002750	75.12	2,339,397.00	14.00	19.00	24.00	29.00	34.00	55.00	76.00	0.00	0.00	0.00
BF002770	69.73	2,338,738.00	8.00	8.50	9.00	9.50	10.00	11.00	12.00	0.00	0.00	0.00
BF002840	49.22	2,339,896.75	3.00	3.50	4.00	4.50	5.00	6.00	7.00	0.00	0.00	0.00
BF002860	67.40	2,341,704.50	2.00	3.25	4.50	5.75	7.00	9.50	12.00	0.00	0.00	0.00
BF002990	118.57	2,341,817.25	4.00	6.00	8.00	10.00	12.00	16.50	21.00	0.00	0.00	0.00
BF003000	32.30	2,340,122.75	1.00	1.50	2.00	2.50	3.00	4.00	5.00	0.00	0.00	0.00
BF003060	97.71	2,341,543.25	4.00	5.50	7.00	8.50	10.00	13.50	17.00	0.00	0.00	0.00
BF003170	166.69	2,340,764.75	2.00	6.75	11.50	16.25	21.00	32.00	43.00	0.00	0.00	0.00
BF003280	82.67	2,343,341.50	3.00	4.25	5.50	6.75	8.00	11.00	14.00	0.00	0.00	0.00
BF003310	84.18	2,337,519.25	90.00	111.25	132.50	153.75	175.00	257.50	340.00	0.00	0.00	0.05
BF003410	207.26	2,335,414.25	159.00	198.00	237.00	276.00	315.00	467.00	619.00	0.00	0.00	0.00
BF003500	105.61	2,334,097.75	0.00	5.00	10.00	15.00	20.00	41.00	62.00	0.00	0.00	0.00
BF003530	382.87	2,331,868.00	163.00	201.75	240.50	279.25	318.00	492.50	667.00	0.00	0.00	1.37
BF003600	399.14	2,329,002.50	108.00	140.50	173.00	205.50	238.00	389.50	541.00	0.00	0.00	68.38
BF003640	123.27	2,324,675.75	55.00	67.75	80.50	93.25	106.00	157.00	208.00	0.00	0.00	6.67
BF003660	923.79	2,325,880.25	67.00	103.75	140.50	177.25	214.00	524.00	834.00	0.00	0.00	13.97
BF003740	140.57	2,324,677.75	27.00	37.00	47.00	57.00	67.00	117.00	167.00	0.00	0.00	0.00

SUBAREA	AREA_AC	Easting	EMP_1990	EMP_1995	EMP_2000	EMP_2005	EMP_2010	EMP_2015	EMP_2020	Flood Cont.0	HD Resid.0	Industrial0
BF003760	897.71	2,319,783.00	0.00	14.75	29.50	44.25	59.00	196.50	334.00	0.00	0.00	14.83
BF003820	53.66	2,322,882.00	9.00	10.00	11.00	12.00	13.00	35.50	58.00	0.00	0.00	18.25
BF003860	86.37	2,335,858.75	92.00	113.75	135.50	157.25	179.00	264.00	349.00	0.00	0.00	0.00
BF003960	81.36	2,333,815.50	85.00	105.50	126.00	146.50	167.00	247.00	327.00	0.00	12.69	0.00
BF004230	87.30	2,325,657.00	39.00	48.25	57.50	66.75	76.00	112.00	148.00	0.00	0.00	0.00
BF004330	223.60	2,322,394.50	43.00	49.75	56.50	63.25	70.00	94.00	118.00	0.00	0.00	23.59
BF004350	150.02	2,325,431.00	67.00	82.75	98.50	114.25	130.00	192.00	254.00	0.00	0.00	0.00
BF004370	763.78	2,321,593.25	113.00	140.75	168.50	196.25	224.00	310.00	396.00	0.00	0.00	26.95
BF004380	83.77	2,320,687.50	0.00	3.00	6.00	9.00	12.00	48.50	85.00	0.00	0.00	0.39
BF004420	94.65	2,319,701.25	0.00	3.25	6.50	9.75	13.00	54.50	96.00	0.00	0.00	0.00
BF004500	1,275.13	2,322,494.75	93.00	128.75	164.50	200.25	236.00	580.50	925.00	0.00	0.00	110.08
BF004590	151.50	2,337,446.75	6.00	9.00	12.00	15.00	18.00	24.50	31.00	0.00	0.00	0.00
BF004720	76.32	2,339,430.00	3.00	4.50	6.00	7.50	9.00	12.00	15.00	0.00	0.00	0.00
BF004760	71.71	2,339,084.00	3.00	4.25	5.50	6.75	8.00	11.00	14.00	0.00	0.00	0.00
BF004800	49.57	2,338,556.00	2.00	3.00	4.00	5.00	6.00	8.00	10.00	0.00	0.00	0.00
BF004860	181.38	2,338,246.75	8.00	11.50	15.00	18.50	22.00	30.00	38.00	0.00	0.00	1.43
BF005040	267.34	2,336,680.25	7.00	11.50	16.00	20.50	25.00	35.00	45.00	0.00	0.00	0.00
BF005080	54.53	2,335,422.50	6.00	6.25	6.50	6.75	7.00	8.50	10.00	0.00	0.00	0.00
BF005130	235.46	2,329,502.00	172.00	204.50	237.00	269.50	302.00	436.00	570.00	0.00	0.00	38.22
SUB-TOTAL	22,208.01		11,003.96	13,071.88	15,139.81	17,207.73	19,275.66	23,767.54	28,259.43	0.00	266.49	846.89
	BIG FOSSIL EXTRA 2020 SERVICE AREA											
BFX10-01	417.04	2,057,143.32	10.00	51.75	93.50	135.25	177.00	285.00	393.00	0.00	0.00	0.00
BFX10-02	802.86	2,054,539.54	39.00	86.75	134.50	182.25	230.00	440.50	651.00	0.00	0.00	30.33
BFX10-03	1,389.38	2,063,399.64	1.00	51.50	102.00	152.50	203.00	313.50	424.00	0.00	0.00	5.27
BFX10-04	1,068.25	2,060,892.43	3.00	77.25	151.50	225.75	300.00	462.00	624.00	0.00	0.00	2.71
BFX10-05	775.34	2,056,421.39	86.00	166.50	247.00	327.50	408.00	582.50	757.00	0.00	0.00	21.29
BFX10-06	459.88	2,051,691.20	54.00	84.75	115.50	146.25	177.00	259.50	342.00	0.00	0.00	13.80
BFX10-07	452.71	2,053,953.18	27.00	47.25	67.50	87.75	108.00	151.50	195.00	0.00	0.00	30.56
BFX10-10	1,256.81	2,037,756.83	45.00	49.25	53.50	57.75	62.00	124.50	187.00	0.00	0.00	18.51
BFX10-11	1,734.47	2,042,783.05	13.00	36.25	59.50	82.75	106.00	575.50	1,045.00	0.00	0.00	19.05
BFX10-12	1,234.82	2,034,732.29	78.00	83.50	89.00	94.50	100.00	174.50	249.00	0.00	0.00	92.63
BFX10-13	1,000.10	2,034,063.37	92.00	94.50	97.00	99.50	102.00	137.50	173.00	0.00	0.00	47.44
BFX10-15	787.89	2,042,040.00	4.00	27.75	51.50	75.25	99.00	408.00	717.00	0.00	0.00	17.74
BFX10-16	440.21	2,035,050.89	7.00	7.75	8.50	9.25	10.00	85.50	161.00	0.00	0.00	0.00
BFX10-17	1,318.38	2,029,294.17	48.00	49.00	50.00	51.00	52.00	102.00	152.00	0.00	0.00	28.35
SUB-TOTAL	13,138.13		507.00	913.75	1,320.50	1,727.25	2,134.00	4,102.00	6,070.00	0.00	0.00	327.68
TOTAL B.F.	35,346.13		11,510.96	13,985.63	16,460.31	18,934.98	21,409.66	27,869.54	34,329.43	0.00	266.49	1,174.57

SUBAREA	AREA_AC	Easting	EMP_1990	EMP_1995	EMP_2000	EMP_2005	EMP_2010	EMP_2015	EMP_2020	Flood Cont.0	HD Resid.0	Industrial0
	MARINE CREEK AREA TO BE PUMPED TO BIG FOSSIL AREA											
MCX20-01	271.29	2,020,647.80	120.00	124.00	128.00	132.00	136.00	208.50	281.00	0.00	0.00	5.15
MCX10-03	21.77	2,017,711.01	1.00	1.25	1.50	1.75	2.00	10.50	19.00	0.00	0.00	0.00
MCX10-04	61.40	2,016,014.58	3.00	4.25	5.50	6.75	8.00	33.00	58.00	0.00	0.00	0.00
MCX10-05	32.56	2,015,014.88	1.00	1.75	2.50	3.25	4.00	17.00	30.00	0.00	0.00	0.00
MCX10-06	145.58	2,013,328.79	8.00	11.25	14.50	17.75	21.00	82.00	143.00	0.00	0.00	5.88
MCX10-07	300.25	2,010,763.18	39.00	44.75	50.50	56.25	62.00	171.50	281.00	0.00	0.00	0.00
MCX10-08	415.46	2,007,321.71	134.00	138.50	143.00	147.50	152.00	240.00	328.00	0.65	9.78	44.56
MCX10-09	1,122.80	2,024,973.99	0.00	1.25	2.50	3.75	5.00	26.50	48.00	0.00	0.00	82.20
MCX10-10	372.16	2,019,653.64	13.00	14.00	15.00	16.00	17.00	34.00	51.00	0.00	0.00	11.97
MCX10-11	623.92	2,017,114.30	0.00	0.75	1.50	2.25	3.00	20.00	37.00	0.00	0.00	54.44
MCX10-12	415.80	2,014,066.40	35.00	35.50	36.00	36.50	37.00	50.00	63.00	0.00	0.00	55.97
MCX10-13	739.89	2,010,622.90	175.00	175.75	176.50	177.25	178.00	197.50	217.00	11.47	0.00	232.66
MCX10-14	1,035.04	2,027,719.48	2.00	2.75	3.50	4.25	5.00	27.50	50.00	0.00	0.00	54.87
MCX10-15	942.90	2,025,280.83	9.00	10.00	11.00	12.00	13.00	33.00	53.00	0.00	0.00	126.68
MCX10-16	383.73	2,022,120.51	0.00	0.25	0.50	0.75	1.00	9.00	17.00	0.00	0.00	0.00
MCX10-17	758.58	2,018,409.48	0.00	0.75	1.50	2.25	3.00	19.00	35.00	0.00	0.00	0.00
MCX10-18	754.09	2,022,612.78	48.00	48.75	49.50	50.25	51.00	58.50	66.00	0.00	0.00	2.92
MCX10-19	527.57	2,017,207.11	39.00	39.50	40.00	40.50	41.00	46.00	51.00	0.00	0.00	7.67
MCX10-20	616.82	2,016,230.95	9.00	9.50	10.00	10.50	11.00	21.00	31.00	0.00	0.00	11.60
MCX10-21	599.73	2,011,594.53	6.00	6.25	6.50	6.75	7.00	17.00	27.00	0.00	0.00	1.32
MCX10-22	812.15	2,008,200.96	0.00	0.50	1.00	1.50	2.00	32.00	62.00	0.00	0.00	0.00
MCX10-23	750.41	2,011,401.29	55.00	55.75	56.50	57.25	58.00	65.00	72.00	0.00	0.00	4.76
MCX10-24	1,382.77	2,004,626.95	26.00	27.00	28.00	29.00	30.00	53.00	76.00	0.00	0.00	206.75
MCX20-01a	1,503.44	2,024,698.49	23.00	24.25	25.50	26.75	28.00	58.50	89.00	0.00	23.48	3.11
MCX20-02	635.28	2,017,453.04	9.00	9.75	10.50	11.25	12.00	24.00	36.00	0.00	0.00	0.00
MCX20-03	978.26	2,013,547.69	68.00	69.00	70.00	71.00	72.00	81.00	90.00	0.00	0.00	13.13
MCX20-04	881.55	2,006,888.77	26.00	26.75	27.50	28.25	29.00	41.50	54.00	0.00	0.00	124.47
MCX20-05	3,226.10	2,001,238.29	84.00	86.50	89.00	91.50	94.00	125.50	157.00	0.00	0.00	159.42
MCX20-06	1,278.94	2,023,876.31	16.00	16.75	17.50	18.25	19.00	37.00	55.00	0.00	169.72	0.00
MCX20-07	455.17	2,019,046.01	16.00	16.50	17.00	17.50	18.00	24.50	31.00	0.00	28.73	0.00
MCX20-08	712.98	2,014,215.71	22.00	22.50	23.00	23.50	24.00	35.00	46.00	0.00	0.00	18.23
MCX20-09	959.06	2,010,207.58	10.00	11.00	12.00	13.00	14.00	32.00	50.00	0.00	0.00	0.00
SUB-TOTAL	23,717.45		997.00	1,037.00	1,077.00	1,117.00	1,157.00	1,930.50	2,704.00	12.12	231.71	1,227.76
B.F. CUR. + MC	45,925.46		12,000.96	14,108.88	16,216.81	18,324.73	20,432.66	25,698.04	30,963.43	12.12	498.20	2,074.65
B.F. TOT. + MC	59,063.58		12,507.96	15,022.63	17,537.31	20,051.98	22,566.66	29,800.04	37,033.43	12.12	498.20	2,402.33

SUBAREA	AREA_AC	Easting	EMP_1990	EMP_1995	EMP_2000	EMP_2005	EMP_2010	EMP_2015	EMP_2020	Flood Cont.0	HD Resid.0	Industrial0
TOTALS BY CITY												
(1) Haslet	452.71		27	47	68	88	108	152	195			
(2) Haltom City	3,227.21		1,136	1,870	2,605	3,339	4,074	5,035	5,995			
(3) Watauga	2,600.04		1,615	1,730	1,844	1,958	2,072	2,225	2,377			
(4) N. Richand Hills	2,465.19		3,226	3,565	3,904	4,244	4,583	4,963	5,343			
(5) Richland Hills	1,365.37		2,256	2,508	2,760	3,011	3,263	3,539	3,815			
(6) Saginaw	763.78		113	141	169	196	224	310	396			
(7) Fort Worth	48,189.29		4,135	5,162	6,189	7,216	8,243	13,577	18,911			

Notes:
(1) Haslet = BFX10-07 (M825X-03)
(2) Haltom City = BF000380 + BF000890-W
(3) Watauga = BF000890-N x 1.1874
(4) N. Richland Hills = BF000890-S + BF000350-N
(5) Richland Hills = BF000350-S
(6) Saginaw = BF004370
(7) Fort Worth = B.F. TOT. + MC - (1) - (2) - (3) - (4) - (5) - (6)

SUBAREA	Institutional0	MAPSCO	MBASIN	Non-Sew.0	Northing	Office/Retail0	Parks & Rec.0	POP_1990	POP_1995	POP_2000	POP_2005
BF000350-S	56.19	51T	Big Fossil	110.38	6,982,905.00	69.11	58.77	5,797.00	6,164.00	6,530.00	6,897.00
BF000350-N	67.64	51T	Big Fossil	132.86	6,982,905.00	83.18	70.74	6,977.00	7,418.00	7,860.00	8,301.00
BF000380	119.39	50B	Big Fossil	382.86	6,989,645.50	92.35	253.99	10,484.00	10,927.25	11,370.50	11,813.75
BF000890-N	57.83	37J	Big Fossil	116.59	4,819,244.57	78.43	102.69	17,955.30	18,833.73	19,712.16	20,590.60
BF000890-S	21.70	37J	Big Fossil	36.85	6,999,629.00	24.79	32.46	5,675.24	5,952.89	6,230.54	6,508.19
BF000890-W	4.46	37J	Big Fossil	7.57	6,999,629.00	5.09	6.67	1,166.24	1,223.29	1,280.35	1,337.40
BF001150	0.00	50A	Big Fossil	13.07	6,994,408.00	0.00	13.07	29.00	29.75	30.50	31.25
BF001230	0.00	49D	Big Fossil	117.60	6,997,353.50	0.53	109.06	29.00	32.25	35.50	38.75
BF001330	0.00	35Z	Big Fossil	0.00	6,999,272.00	0.00	0.00	418.00	470.25	522.50	574.75
BF001380	0.00	35V	Big Fossil	0.00	7,000,566.00	0.00	0.00	197.00	221.50	246.00	270.50
BF001420	0.00	35U	Big Fossil	0.00	7,000,324.50	0.00	0.00	118.00	132.50	147.00	161.50
BF001440	0.00	35U	Big Fossil	2.85	7,002,896.00	0.00	0.00	595.00	628.00	661.00	694.00
BF001520	14.99	35R	Big Fossil	1.97	7,004,707.00	0.00	0.00	590.00	616.50	643.00	669.50
BF001650	0.00	35L	Big Fossil	1.14	7,006,605.50	0.00	0.00	327.00	342.25	357.50	372.75
BF001750	1.98	35L	Big Fossil	0.00	7,008,340.00	0.00	0.00	332.00	360.00	388.00	416.00
BF001970	0.00	36Y	Big Fossil	0.00	6,999,396.50	0.00	0.00	377.00	363.75	350.50	337.25
BF002000	0.00	36T	Big Fossil	0.00	7,001,587.50	0.00	0.00	255.00	246.75	238.50	230.25
BF002030	0.00	36P	Big Fossil	0.00	7,003,814.50	0.00	0.00	466.00	453.75	441.50	429.25
BF002110	0.00	22X	Big Fossil	0.00	7,010,853.00	0.00	0.00	146.00	432.00	718.00	1,004.00
BF002170	0.00	22Y	Big Fossil	0.00	7,012,285.50	0.00	0.00	381.00	874.75	1,368.50	1,862.25
BF002260	1.21	36U	Big Fossil	0.00	7,002,121.00	0.00	0.00	37.00	93.50	150.00	206.50
BF002270	4.51	36Q	Big Fossil	0.00	7,003,735.50	0.00	0.00	37.00	83.00	129.00	175.00
BF002560	6.30	36M	Big Fossil	0.00	7,006,153.00	0.00	0.00	123.80	260.02	396.24	532.47
BF002630	0.00	36P	Big Fossil	0.00	7,004,819.50	0.00	0.00	2.00	15.75	29.50	43.25
BF002650	0.00	36P	Big Fossil	0.00	7,005,519.50	0.00	0.00	18.00	38.50	59.00	79.50
BF002690	0.00	36P	Big Fossil	0.00	7,005,555.50	0.00	0.00	1.00	21.75	42.50	63.25
BF002750	0.00	50A	Big Fossil	22.52	6,996,938.50	19.99	12.44	5.00	6.25	7.50	8.75
BF002770	10.39	36W	Big Fossil	9.78	6,999,656.00	0.00	9.78	406.00	456.75	507.50	558.25
BF002840	0.00	36W	Big Fossil	0.00	6,999,618.50	2.52	0.00	287.00	296.25	305.50	314.75
BF002860	0.00	36X	Big Fossil	0.00	6,998,827.00	0.00	0.00	397.00	381.25	365.50	349.75
BF002990	0.00	36T	Big Fossil	11.08	7,000,927.00	0.00	11.08	711.00	681.75	652.50	623.25
BF003000	0.72	36S	Big Fossil	0.00	7,001,354.00	0.00	0.00	193.00	185.00	177.00	169.00
BF003060	0.00	36T	Big Fossil	0.00	7,002,699.00	0.00	0.00	586.00	561.75	537.50	513.25
BF003170	0.00	36N	Big Fossil	0.00	7,004,906.50	0.00	0.00	328.00	376.75	425.50	474.25
BF003280	0.00	36X	Big Fossil	0.00	6,999,289.00	0.00	0.00	493.00	473.00	453.00	433.00
BF003310	0.00	49D	Big Fossil	33.45	6,994,705.50	0.02	33.45	28.00	28.75	29.50	30.25
BF003410	0.00	49C	Big Fossil	73.74	6,996,978.00	2.35	51.58	59.00	61.75	64.50	67.25
BF003500	0.00	35Y	Big Fossil	0.00	6,999,564.50	0.00	0.00	0.00	2.50	5.00	7.50
BF003530	19.62	49B	Big Fossil	61.45	6,997,074.00	0.00	0.00	247.00	263.25	279.50	295.75
BF003600	0.00	35S	Big Fossil	0.00	7,000,615.00	11.43	0.00	4.00	35.00	66.00	97.00
BF003640	0.00	34V	Big Fossil	0.00	7,002,797.50	0.00	0.00	2.00	15.50	29.00	42.50
BF003660	0.00	34H	Big Fossil	44.81	7,008,647.00	0.00	0.00	6.00	56.75	107.50	158.25
BF003740	0.00	34R	Big Fossil	0.00	7,004,542.50	0.00	0.00	1.00	11.00	21.00	31.00

SUBAREA	Institutional0	MAPSCO	MBASIN	Non-Sew.0	Northing	Office/Retail0	Parks & Rec.0	POP_1990	POP_1995	POP_2000	POP_2005
BF003760	0.00	34K	Big Fossil	21.22	7,008,704.00	0.00	0.00	3.00	17.00	31.00	45.00
BF003820	0.00	34G	Big Fossil	0.00	7,011,036.00	0.00	0.00	0.00	0.00	0.00	0.00
BF003860	0.00	49C	Big Fossil	14.09	6,994,433.50	0.00	14.09	29.00	29.75	30.50	31.25
BF003960	0.00	49C	Big Fossil	25.17	6,994,432.50	0.00	14.76	28.00	28.75	29.50	30.25
BF004230	0.00	34V	Big Fossil	0.00	7,001,173.00	0.00	0.00	1.00	10.75	20.50	30.25
BF004330	0.00	34Y	Big Fossil	0.00	7,000,511.00	0.12	0.00	16.00	82.25	148.50	214.75
BF004350	0.00	34Z	Big Fossil	0.00	6,999,622.00	0.00	0.00	2.00	18.75	35.50	52.25
BF004370	0.00	34P	Big Fossil	0.00	7,004,410.50	0.00	0.00	35.00	255.00	475.00	695.00
BF004380	0.00	34F	Big Fossil	0.00	7,011,244.00	0.00	0.00	1.00	2.25	3.50	4.75
BF004420	0.00	34B	Big Fossil	0.00	7,013,388.00	0.00	0.00	1.00	2.25	3.50	4.75
BF004500	0.00	20U	Big Fossil	55.70	7,017,572.50	9.59	0.00	79.00	225.00	371.00	517.00
BF004590	1.16	35V	Big Fossil	0.00	7,002,176.50	1.18	0.00	905.00	948.25	991.50	1,034.75
BF004720	0.00	36N	Big Fossil	0.00	7,003,217.00	0.00	0.00	456.00	475.75	495.50	515.25
BF004760	5.52	36S	Big Fossil	0.00	7,001,336.00	0.00	0.00	427.00	447.00	467.00	487.00
BF004800	1.34	36N	Big Fossil	4.02	7,004,688.00	0.00	4.02	292.00	305.25	318.50	331.75
BF004860	0.00	36N	Big Fossil	21.13	7,005,929.50	0.00	21.13	1,082.00	1,130.50	1,179.00	1,227.50
BF005040	10.60	35M	Big Fossil	0.00	7,009,453.00	0.00	0.00	924.00	977.50	1,031.00	1,084.50
BF005080	0.00	35Y	Big Fossil	0.00	6,999,666.50	0.00	0.00	299.00	336.25	373.50	410.75
BF005130	0.00	35W	Big Fossil	4.77	6,997,163.00	9.49	0.00	242.00	257.00	272.00	287.00
SUB-TOTAL	405.55			1,326.67		410.17	819.78	61,108.58	65,678.18	70,247.79	74,817.40
BFX10-01	0.00	35F	Big Fossil X10	33.93	446,121.47	0.00	0.00	3.00	55.00	107.00	159.00
BFX10-02	0.00	35E	Big Fossil X10	120.74	445,957.72	0.00	0.00	4.00	69.75	135.50	201.25
BFX10-03	0.00	21V	Big Fossil X10	20.84	454,648.67	0.20	0.00	241.00	463.00	685.00	907.00
BFX10-04	0.12	21Y	Big Fossil X10	26.36	451,091.89	0.00	0.00	154.00	315.75	477.50	639.25
BFX10-05	0.00	35B	Big Fossil X10	66.21	452,946.51	4.11	0.00	8.00	121.50	235.00	348.50
BFX10-06	0.00	35A	Big Fossil X10	0.00	454,157.45	0.00	0.00	14.00	100.50	187.00	273.50
BFX10-07	0.00	21N	Big Fossil X10	10.17	459,207.05	15.15	0.00	66.00	130.00	194.00	258.00
BFX10-10	0.00	33G	Big Fossil X10	15.03	446,683.36	0.00	0.00	24.00	25.75	27.50	29.25
BFX10-11	0.00	20K	Big Fossil X10	94.22	453,189.94	2.80	0.00	68.00	92.50	117.00	141.50
BFX10-12	0.00	33B	Big Fossil X10	10.33	450,642.85	0.00	0.00	18.00	19.75	21.50	23.25
BFX10-13	0.00	19S	Big Fossil X10	5.60	455,391.94	0.00	0.00	12.00	12.25	12.50	12.75
BFX10-15	0.00	20W	Big Fossil X10	0.00	460,292.32	0.00	0.00	11.00	20.25	29.50	38.75
BFX10-16	0.00	19P	Big Fossil X10	0.00	459,809.82	0.00	0.00	5.00	5.25	5.50	5.75
BFX10-17	0.00	18H	Big Fossil X10	0.00	463,341.07	20.22	0.00	15.00	15.50	16.00	16.50
SUB-TOTAL	0.12			403.43		42.48	0.00	643.00	1,446.75	2,250.50	3,054.25
TOTAL B.F.	405.67			1,730.10		452.65	819.78	61,751.58	67,124.93	72,498.29	77,871.65

SUBAREA	Institutional0	MAPSCO	MBASIN	Non-Sew.0	Northing	Office/Retail0	Parks & Rec.0	POP_1990	POP_1995	POP_2000	POP_2005
MCX20-01	11.28		Marine Creek X10	0.72	444,660.36	0.13	0.00	745.00	735.25	725.50	715.75
MCX10-03	0.00		Marine Creek X10	5.20	445,884.78	0.00	4.03	34.00	33.50	33.00	32.50
MCX10-04	0.00		Marine Creek X10	0.27	446,588.04	0.00	0.00	102.00	101.00	100.00	99.00
MCX10-05	0.00		Marine Creek X10	2.08	447,682.35	0.00	0.00	54.00	53.50	53.00	52.50
MCX10-06	0.00		Marine Creek X10	0.19	447,217.10	7.28	0.00	251.00	248.50	246.00	243.50
MCX10-07	0.00		Marine Creek X10	10.57	448,642.64	0.00	0.00	284.00	281.75	279.50	277.25
MCX10-08	6.76		Marine Creek X10	8.62	448,819.28	0.00	2.93	173.00	171.75	170.50	169.25
MCX10-09	0.00		Marine Creek X10	0.00	447,509.80	0.00	0.00	9.00	11.00	13.00	15.00
MCX10-10	0.00		Marine Creek X10	0.00	447,555.34	0.00	0.00	95.00	94.75	94.50	94.25
MCX10-11	0.00		Marine Creek X10	0.44	450,937.04	0.00	0.44	25.00	25.75	26.50	27.25
MCX10-12	12.17		Marine Creek X10	0.00	450,615.12	2.38	0.00	23.00	23.50	24.00	24.50
MCX10-13	0.00		Marine Creek X10	20.76	453,416.13	0.00	0.00	31.00	30.50	30.00	29.50
MCX10-14	0.00		Marine Creek X10	5.18	452,489.74	0.00	0.00	7.00	8.50	10.00	11.50
MCX10-15	0.00		Marine Creek X10	20.10	458,613.39	0.00	0.00	9.00	10.25	11.50	12.75
MCX10-16	0.00		Marine Creek X10	0.00	456,222.72	0.00	0.00	3.00	3.75	4.50	5.25
MCX10-17	0.00		Marine Creek X10	0.00	456,029.31	0.00	0.00	6.00	7.50	9.00	10.50
MCX10-18	0.00		Marine Creek X10	0.24	464,145.15	0.00	0.00	16.00	16.75	17.50	18.25
MCX10-19	0.00		Marine Creek X10	9.01	464,388.59	0.00	0.00	13.00	13.50	14.00	14.50
MCX10-20	0.00		Marine Creek X10	0.00	460,409.74	0.00	0.00	6.00	6.75	7.50	8.25
MCX10-21	0.00		Marine Creek X10	0.00	460,044.85	0.00	0.00	6.00	6.75	7.50	8.25
MCX10-22	0.00		Marine Creek X10	8.96	457,452.58	0.00	0.00	128.00	127.00	126.00	125.00
MCX10-23	0.00		Marine Creek X10	0.00	465,143.86	0.00	0.00	18.00	18.75	19.50	20.25
MCX10-24	1.17		Marine Creek X10	31.67	465,479.85	0.00	14.60	199.00	196.75	194.50	192.25
MCX20-01a	0.00		Marine Creek X20	96.28	471,283.90	15.61	0.00	96.00	95.00	94.00	93.00
MCX20-02	0.00		Marine Creek X20	0.00	473,649.71	0.00	0.00	4.00	5.00	6.00	7.00
MCX20-03	0.00		Marine Creek X20	15.74	470,049.56	0.00	0.00	22.00	23.00	24.00	25.00
MCX20-04	0.00		Marine Creek X20	5.67	470,947.90	0.00	0.00	32.00	32.50	33.00	33.50
MCX20-05	0.00		Marine Creek X20	1,342.75	476,603.28	19.55	0.00	70.00	72.25	74.50	76.75
MCX20-06	0.00		Marine Creek X20	57.50	477,661.31	2.12	0.00	269.00	265.25	261.50	257.75
MCX20-07	0.00		Marine Creek X20	1.03	480,232.85	0.00	0.00	94.00	93.00	92.00	91.00
MCX20-08	0.00		Marine Creek X20	0.00	477,867.04	0.00	0.00	21.00	21.75	22.50	23.25
MCX20-09	0.00		Marine Creek X20	0.00	477,404.16	0.00	0.00	18.00	18.75	19.50	20.25
SUB-TOTAL	31.38			1,642.98		47.07	22.00	2,863.00	2,853.50	2,844.00	2,834.50
B.F. CUR. + MC	436.93			2,969.65		457.24	841.78	63,971.58	68,531.68	73,091.79	77,651.90
B.F. TOT. + MC	437.05			3,373.08		499.72	841.78	64,614.58	69,978.43	75,342.29	80,706.15

SUBAREA	Institutional0	MAPSCO	MBASIN	Non-Sew.0	Northing	Office/Retail0	Parks & Rec.0	POP_1990	POP_1995	POP_2000	POP_2005
TOTALS BY CITY											
(1) Haslet								66	130	194	258
(2) Haltom City								11,650	12,151	12,651	13,151
(3) Watauga								17,955	18,834	19,712	20,591
(4) N. Richand Hills								12,652	13,371	14,091	14,809
(5) Richland Hills								5,797	6,164	6,530	6,897
(6) Saginaw								35	255	475	695
(7) Fort Worth								16,459	19,074	21,690	24,305

Notes:

SUBAREA	POP_2010	POP_2015	POP_2020	Roadway0	Single Fam.0	SNAP Subarea	SUBBASIN	Transp.0	Under Const.0	Vacant0	Water0
BF000350-S	7,264.00	7,365.00	7,467.00	40.94	771.00	BF000350-S	CDUAL	4.36	0.05	240.97	6.32
BF000350-N	8,742.00	8,865.00	8,987.00	49.27	928.55	BF000350-N	CDUAL	5.24	0.07	290.03	7.60
BF000380	12,257.00	12,756.00	13,255.00	71.12	685.48	BF000380	HALTOM CITY-A	39.47	0.00	1,486.22	18.28
BF000890-N	21,469.02	22,274.70	23,080.36	13.11	1,350.75	BF000890-N	WATAUGA	0.80	216.68	684.30	0.00
BF000890-S	6,785.84	7,040.50	7,295.15	4.14	426.94	BF000890-S	NRH	0.25	68.49	216.29	0.00
BF000890-W	1,394.46	1,446.79	1,499.12	0.85	87.73	BF00890-W	HALTOM CITY	0.05	14.07	44.45	0.00
BF001150	32.00	33.00	34.00	0.00	0.00	BF001150	M347	0.00	0.00	68.27	0.00
BF001230	42.00	45.50	49.00	0.00	4.14	BF001230	M347	0.00	0.00	88.76	8.54
BF001330	627.00	704.50	782.00	0.00	67.39	BF001330	M347	0.00	0.00	4.51	0.00
BF001380	295.00	332.00	369.00	0.00	26.59	BF001380	M347	0.00	0.00	7.29	0.00
BF001420	176.00	198.00	220.00	0.00	0.00	BF001420	M347	0.00	0.00	22.35	0.00
BF001440	727.00	807.00	887.00	1.75	0.68	BF001440	M347	0.00	0.89	331.15	1.10
BF001520	696.00	765.50	835.00	0.00	46.90	BF001520	M347	0.00	21.48	13.35	1.97
BF001650	388.00	427.50	467.00	0.00	0.00	BF001650	M347	0.00	0.38	79.00	1.14
BF001750	444.00	503.00	562.00	0.00	15.96	BF001750	M347	0.00	0.00	157.56	0.00
BF001970	324.00	327.50	331.00	0.00	0.02	BF001970	M473	0.00	2.59	68.83	0.00
BF002000	222.00	225.00	228.00	0.00	7.72	BF002000	M473	0.00	9.60	37.81	0.00
BF002030	417.00	425.50	434.00	0.00	10.35	BF002030	CM402A-A	0.00	0.00	88.16	0.00
BF002110	1,290.00	1,698.00	2,106.00	0.00	0.00	BF002110	NEWBF	0.00	0.00	655.15	0.00
BF002170	2,356.00	3,068.00	3,780.00	0.00	24.87	BF002170	NEWBF	0.00	7.68	1,669.99	0.00
BF002260	263.00	344.00	425.00	0.00	24.79	BF002260	M473	0.00	83.51	94.34	0.00
BF002270	221.00	287.50	354.00	0.00	47.64	BF002270	CM402A-A	0.00	40.18	32.17	0.00
BF002560	668.69	866.18	1,063.67	0.00	3.08	BF002560	CM402A-A	0.00	35.86	240.74	0.00
BF002630	57.00	77.00	97.00	0.00	0.00	BF002630	CM402A-A	0.00	0.00	25.83	0.00
BF002650	100.00	130.00	160.00	0.00	0.00	BF002650	CM402A-A	0.00	0.64	42.51	0.00
BF002690	84.00	114.00	144.00	0.00	0.00	BF002690	NEWBF	0.00	0.00	38.32	0.00
BF002750	10.00	12.00	14.00	0.00	0.07	BF002750	M347	0.00	0.00	32.56	10.08
BF002770	609.00	684.00	759.00	0.00	42.27	BF002770	M359	0.00	0.00	7.28	0.00
BF002840	324.00	347.00	370.00	0.00	0.00	BF002840	M359	0.00	0.00	46.70	0.00
BF002860	334.00	334.50	335.00	0.00	58.54	BF002860	M359	0.00	0.00	8.86	0.00
BF002990	594.00	593.00	592.00	0.00	99.90	BF002990	M359	0.00	0.00	7.60	0.00
BF003000	161.00	160.50	160.00	0.00	0.09	BF003000	M359	0.00	0.00	31.49	0.00
BF003060	489.00	488.50	488.00	0.00	70.07	BF003060	M359	0.00	0.00	27.63	0.00
BF003170	523.00	610.00	697.00	0.00	39.03	BF003170	M347	0.00	0.00	127.66	0.00
BF003280	413.00	412.50	412.00	0.00	53.39	BF003280	M359	0.00	16.68	12.59	0.00
BF003310	31.00	32.00	33.00	0.00	0.00	BF003310	M347	0.00	0.00	50.66	0.00
BF003410	70.00	73.50	77.00	22.16	0.00	BF003410	CM402A	0.00	0.00	131.17	0.00
BF003500	10.00	13.50	17.00	0.00	0.00	BF003500	CM402A	0.00	0.00	105.61	0.00
BF003530	312.00	337.00	362.00	61.45	2.14	BF003530	CM402A	0.00	0.00	298.29	0.00
BF003600	128.00	171.50	215.00	0.00	0.00	BF003600	CM402A	0.00	58.00	261.34	0.00
BF003640	56.00	75.50	95.00	0.00	0.00	BF003640	NEWBF	0.00	0.00	116.61	0.00
BF003660	209.00	281.50	354.00	44.81	0.00	BF003660	NEWBF	0.00	0.00	865.02	0.00
BF003740	41.00	56.00	71.00	0.00	0.00	BF003740	NEWBF	0.00	0.00	140.57	0.00

SUBAREA	POP_2010	POP_2015	POP_2020	Roadway0	Single Fam.0	SNAP Subarea	SUBBASIN	Transp.0	Under Const.0	Vacant0	Water0
BF003760	59.00	80.50	102.00	0.00	0.00	BF003760	NEWBF	0.00	0.00	861.66	21.22
BF003820	0.00	0.50	1.00	0.00	0.00	BF003820	NEWBF	0.00	0.00	35.41	0.00
BF003860	32.00	33.00	34.00	0.00	0.00	BF003860	M863	0.00	0.00	72.28	0.00
BF003960	31.00	32.00	33.00	10.41	0.00	BF003960	M863	0.00	0.00	43.49	0.00
BF004230	40.00	54.00	68.00	0.00	0.00	BF004230	M422	0.00	0.00	87.30	0.00
BF004330	281.00	354.00	427.00	0.00	0.00	BF004330	M422	0.00	10.04	189.84	0.00
BF004350	69.00	92.50	116.00	0.00	0.00	BF004350	M422	0.00	13.70	136.32	0.00
BF004370	915.00	1,156.50	1,398.00	0.00	12.04	BF004370	NEWBF	0.00	93.81	630.99	0.00
BF004380	6.00	7.50	9.00	0.00	0.00	BF004380	NEWBF	0.00	0.00	83.38	0.00
BF004420	6.00	8.00	10.00	0.00	0.00	BF004420	NEWBF	0.00	0.00	94.65	0.00
BF004500	663.00	873.50	1,084.00	55.70	237.02	BF004500	NEWBF	0.00	0.00	862.73	0.00
BF004590	1,078.00	1,187.00	1,296.00	0.00	130.81	BF004590	M347	0.00	0.00	18.37	0.00
BF004720	535.00	588.50	642.00	0.00	55.00	BF004720	M347	0.00	0.00	21.32	0.00
BF004760	507.00	558.50	610.00	0.00	45.30	BF004760	M347	0.00	0.00	20.89	0.00
BF004800	345.00	380.00	415.00	0.00	43.55	BF004800	M347	0.00	0.00	0.66	0.00
BF004860	1,276.00	1,404.50	1,533.00	0.00	105.50	BF004860	M347	0.00	34.64	18.69	0.00
BF005040	1,138.00	1,264.50	1,391.00	0.00	19.77	BF005040	M347	0.00	0.00	236.97	0.00
BF005080	448.00	503.50	559.00	0.00	0.00	BF005080	M347	0.00	0.00	54.53	0.00
BF005130	302.00	325.00	348.00	0.00	1.16	BF005130	M391A	0.00	0.66	181.17	4.77
SUB-TOTAL	79,387.01	84,712.67	90,038.30	375.71	5,546.23			50.17	729.70	12,650.63	81.02
BFX10-01	211.00	283.00	355.00	28.78	9.56	M825X-01	825X	0.00	0.00	373.55	5.15
BFX10-02	267.00	359.00	451.00	120.74	0.00	M911X-01	911X	0.00	0.00	651.79	0.00
BFX10-03	1,129.00	1,452.50	1,776.00	10.90	0.00	M822X-04	822X	0.00	0.00	1,363.08	9.94
BFX10-04	801.00	1,036.00	1,271.00	17.05	10.02	M822X-03	822X	0.00	0.00	1,029.03	9.31
BFX10-05	462.00	621.50	781.00	63.21	0.00	M825X-02	825X	0.00	0.00	683.73	3.00
BFX10-06	360.00	482.50	605.00	0.00	31.02	M911X-02	911X	0.00	0.00	415.06	0.00
BFX10-07	322.00	415.50	509.00	0.00	236.96	M825X-03	825X	0.00	0.00	159.87	10.17
BFX10-10	31.00	33.00	35.00	0.00	0.00	M391X-05	391X	13.60	0.00	1,223.26	1.43
BFX10-11	166.00	204.00	242.00	82.17	209.59	M910X-03	910X	0.00	0.00	1,408.81	12.05
BFX10-12	25.00	28.50	32.00	0.00	0.00	M391X-06	391X	10.33	0.00	1,131.85	0.00
BFX10-13	13.00	13.50	14.00	0.00	0.00	M391X-07	391X	0.00	0.00	947.06	5.60
BFX10-15	48.00	62.00	76.00	0.00	0.00	M910X-02	910X	0.00	0.00	770.15	0.00
BFX10-16	6.00	6.50	7.00	0.00	0.00	M391X-08	391X	0.00	0.00	440.21	0.00
BFX10-17	17.00	17.00	17.00	0.00	0.00	M391X-09	391X	0.00	0.00	1,269.81	0.00
SUB-TOTAL	3,858.00	5,014.50	6,171.00	322.85	497.15			23.93	0.00	11,867.26	56.65
TOTAL B.F.	83,245.01	89,727.17	96,209.30	698.56	6,043.38			74.10	729.70	24,517.89	137.67

SUBAREA	POP_2010	POP_2015	POP_2020	Roadway0	Single Fam.0	SNAP Subarea	SUBBASIN	Transp.0	Under Const.0	Vacant0	Water0
MCX20-01	706.00	698.50	691.00	0.00	9.39	M981X-06	981X	0.00	1.28	243.34	0.72
MCX10-03	32.00	32.00	32.00	0.00	13.66	M983X-03	983X	0.00	2.84	0.06	1.17
MCX10-04	98.00	97.00	96.00	0.00	32.49	M983X-04	983X	0.00	13.17	15.48	0.27
MCX10-05	52.00	51.50	51.00	0.00	0.02	M405X-05	405X	0.00	0.00	30.47	2.08
MCX10-06	241.00	239.50	238.00	0.00	61.73	M405X-04	405X	0.00	0.00	70.49	0.19
MCX10-07	275.00	274.00	273.00	0.00	147.11	M405X-06	405X	0.00	0.00	142.57	10.57
MCX10-08	168.00	168.00	168.00	0.00	63.46	M405X-02	405X	0.00	0.00	282.25	5.04
MCX10-09	17.00	20.00	23.00	0.00	0.00	M981X-02	981X	0.00	0.00	1,040.59	0.00
MCX10-10	94.00	93.00	92.00	0.00	0.10	M981X-01	981X	0.00	0.04	360.05	0.00
MCX10-11	28.00	29.50	31.00	0.00	1.15	M983X-01	983X	0.00	0.68	567.24	0.00
MCX10-12	25.00	26.00	27.00	0.00	1.16	M405X-01	405X	0.00	0.00	344.11	0.00
MCX10-13	29.00	29.50	30.00	0.00	0.00	M405X-03	405X	0.00	0.00	486.50	9.29
MCX10-14	13.00	15.00	17.00	0.00	0.00	M981X-03	981X	1.01	0.00	975.00	4.17
MCX10-15	14.00	15.50	17.00	0.00	0.00	M981X-05	981X	15.43	0.00	796.13	4.67
MCX10-16	6.00	7.00	8.00	0.00	0.00	M981X-04	981X	0.00	0.00	383.73	0.00
MCX10-17	12.00	14.00	16.00	0.00	0.00	M983X-02	983X	0.00	0.00	758.58	0.00
MCX10-18	19.00	20.00	21.00	0.00	0.00	M984X-06	984X	0.24	0.00	750.93	0.00
MCX10-19	15.00	15.50	16.00	0.00	0.00	M984X-05	984X	0.00	0.00	510.88	9.01
MCX10-20	9.00	10.50	12.00	0.00	0.00	M984X-04	984X	0.00	0.00	605.22	0.00
MCX10-21	9.00	9.50	10.00	0.00	0.00	M984X-03	981X	0.00	0.00	598.41	0.00
MCX10-22	124.00	123.00	122.00	0.00	0.00	M988X-01	988X	0.00	0.00	803.18	8.96
MCX10-23	21.00	22.00	23.00	0.00	0.00	M984X-02	984X	0.00	0.00	745.65	0.00
MCX10-24	190.00	189.00	188.00	0.00	168.61	M984X-01	984X	0.00	0.00	974.56	17.07
MCX20-01a	92.00	92.00	92.00	88.57	0.00	20927X-07	20297X	0.00	0.00	1,364.96	7.71
MCX20-02	8.00	10.00	12.00	0.00	0.00	20927X-06	20297X	0.00	0.00	635.29	0.00
MCX20-03	26.00	27.50	29.00	0.00	0.00	20927X-03	20297X	0.00	0.00	949.40	15.74
MCX20-04	34.00	35.00	36.00	0.00	50.39	20927X-02	20297X	0.00	0.00	701.03	5.67
MCX20-05	79.00	82.50	86.00	0.00	47.86	20927X-01	20297X	0.00	0.00	1,656.49	1,342.75
MCX20-06	254.00	251.50	249.00	57.50	22.12	20927X-08	20297X	0.00	0.00	1,072.22	0.00
MCX20-07	90.00	88.50	87.00	1.03	65.91	20927X-09	20297X	0.00	0.00	381.49	0.00
MCX20-08	24.00	23.50	23.00	0.00	0.00	20927X-05	20297X	0.00	0.00	703.99	0.00
MCX20-09	21.00	22.00	23.00	0.00	0.00	20927X-04	20297X	0.00	0.00	962.56	0.00
SUB-TOTAL	2,825.00	2,832.00	2,839.00	147.10	685.16			16.68	18.01	19,912.85	1,445.08
B.F. CUR. + MC	82,212.01	87,544.67	92,877.30	522.81	6,231.39			66.85	747.71	32,563.48	1,526.10
B.F. TOT. + MC	86,070.01	92,559.17	99,048.30	845.66	6,728.54			90.78	747.71	44,430.74	1,582.75

SUBAREA	POP_2010	POP_2015	POP_2020	Roadway0	Single Fam.0	SNAP Subarea	SUBBASIN	Transp.0	Under Const.0	Vacant0	Water0
TOTALS BY CITY											
(1) Haslet	322	416	509								
(2) Haltom City	13,651	14,203	14,754								
(3) Watauga	21,469	22,275	23,080								
(4) N. Richand Hills	15,528	15,906	16,282								
(5) Richland Hills	7,264	7,365	7,467								
(6) Saginaw	915	1,157	1,398								
(7) Fort Worth	26,921	31,239	35,558								

Notes:

EXHIBIT "H"

FORT WORTH POPULATION PROJECTIONS

TABLE "LUAPOP-2"

SUBAREA	90 Sewer Acres	95 Equiv Pop	1995 Sewer Acres	00 Equiv Pop	2000 Sewer Acres	05 Equiv Pop	2005 Sewer Acres	10 Equiv Pop	2010 Sewer Acres	15 Equiv Pop	2015 Sewer Acres
BIG FOSSIL CURRENT SERVICE AREA											
BF003960	12.69	81.50	14.67	92.50	16.65	103.50	18.63	114.50	20.61	155.50	27.99
BF000380	1,189.26	11,806.25	1,276.49	12,613.00	1,363.71	13,419.75	1,450.94	14,226.50	1,538.16	15,201.00	1,643.52
BF001150	5.51	86.75	6.37	98.50	7.24	110.25	8.10	122.00	8.96	165.75	12.18
BF001440	9.56	636.75	12.74	676.50	13.53	716.25	14.33	756.00	15.12	862.75	17.26
BF001970	6.72	366.50	7.33	354.00	7.33	341.50	7.33	329.00	7.33	334.50	7.33
BF002170	138.65	1,444.63	219.02	1,974.75	299.40	2,504.88	379.77	3,035.00	460.15	3,821.75	579.43
BF003310	0.07	84.38	1.69	95.75	1.92	107.13	2.14	118.50	2.37	160.75	3.22
BF003600	137.81	105.25	250.08	152.50	362.35	199.75	399.15	247.00	399.15	366.25	399.15
BF003640	6.67	49.38	11.16	69.25	15.66	89.13	20.15	109.00	24.65	154.00	34.82
BF003660	13.97	108.63	38.42	177.75	62.87	246.88	87.31	316.00	111.76	543.50	192.22
BF003760	14.83	24.38	120.49	45.75	226.16	67.13	331.82	88.50	437.49	178.75	876.49
BF003820	18.25	5.00	20.28	5.50	22.31	6.00	24.33	6.50	26.36	18.25	53.66
BF004330	33.75	107.13	96.41	176.75	159.08	246.38	221.74	316.00	223.59	401.00	223.59
BF004380	0.39	3.75	1.46	6.50	2.54	9.25	3.61	12.00	4.68	31.75	12.38
BF005130	49.53	359.25	54.25	390.50	58.97	421.75	63.69	453.00	68.41	543.00	82.00
BF004500	356.69	289.38	822.45	453.25	1,219.42	617.13	1,219.42	781.00	1,219.42	1,163.75	1,219.42
BF003000	0.81	185.75	3.72	178.00	3.72	170.25	3.72	162.50	3.72	162.50	3.72
BF003530	23.13	364.13	25.64	399.75	28.15	435.38	30.66	471.00	33.16	583.25	41.07
BF001520	83.37	619.50	87.24	647.00	91.12	674.50	94.99	702.00	96.72	773.50	96.72
BF005040	30.37	983.25	32.20	1,039.00	34.02	1,094.75	35.85	1,150.50	37.67	1,282.00	41.98
BF001750	17.94	366.13	19.72	399.25	21.51	432.38	23.29	465.50	25.08	538.50	29.01
BF002770	52.66	461.00	59.21	512.00	59.94	563.00	59.94	614.00	59.94	689.50	59.94
BF004760	50.82	449.13	53.27	469.75	55.71	490.38	58.16	511.00	60.60	564.00	66.89
BF001420	13.00	133.63	14.60	148.25	16.20	162.88	17.79	177.50	19.39	199.75	21.82
BF001650	0.38	344.25	6.89	360.50	7.21	376.75	7.54	393.00	7.86	436.50	8.73
BF002000	17.32	248.88	17.32	241.25	17.32	233.63	17.32	226.00	17.32	230.50	17.32
BF002110	15.00	442.63	45.48	739.25	75.95	1,035.88	106.43	1,332.50	136.90	1,764.00	181.23
BF002260	109.51	109.88	203.85	171.25	203.85	232.63	203.85	294.00	203.85	385.75	203.85
BF002560	45.24	266.97	97.56	410.14	149.88	553.31	202.20	696.48	254.52	909.13	285.98
BF002630	0.20	16.25	1.63	30.50	3.05	44.75	4.48	59.00	5.90	80.00	8.00
BF002650	0.64	39.50	1.40	61.00	2.17	82.50	2.93	104.00	3.70	136.25	4.84
BF002690	0.10	22.38	2.24	43.75	4.38	65.13	6.51	86.50	8.65	118.00	11.80
BF003500	0.10	5.00	0.63	10.00	1.25	15.00	1.88	20.00	2.50	34.00	4.25
BF003740	5.00	29.50	10.17	44.50	15.34	59.50	20.52	74.50	25.69	114.50	39.48
BF003860	10.00	86.63	11.55	98.25	13.10	109.88	14.65	121.50	16.20	165.00	22.00
BF004230	7.00	34.88	11.91	49.25	16.82	63.63	21.73	78.00	26.63	110.00	37.56
BF004350	13.70	60.13	23.20	84.75	32.71	109.38	42.21	134.00	51.71	188.50	72.75
BF004370	132.80	325.38	472.24	559.25	763.79	793.13	763.79	1,027.00	763.79	1,311.50	763.79
BF004420	0.10	3.88	0.39	6.75	0.68	9.63	0.96	12.50	1.25	35.25	3.53
BF005080	45.00	339.38	50.57	376.75	54.53	414.13	54.53	451.50	54.53	507.75	54.53
BF002270	92.33	89.50	124.50	138.50	124.50	187.50	124.50	236.50	124.50	309.50	124.50
BF004860	141.57	1,136.25	148.12	1,186.50	154.67	1,236.75	160.26	1,287.00	160.26	1,419.50	160.26
BF000350-S	1,013.39	7,417.36	1,085.47	7,909.96	1,157.56	8,402.56	1,229.65	8,895.16	1,254.35	9,134.77	1,254.35
BF000350-N	1,219.72	8,927.64	1,306.49	9,520.54	1,393.26	10,113.44	1,480.02	10,706.34	1,509.76	10,994.73	1,509.76
BF000890-N	1,799.08	19,698.57	1,888.78	20,634.12	1,978.49	21,569.68	2,068.19	22,505.23	2,157.90	23,387.14	2,242.46
BF000890-S	568.65	6,226.24	597.00	6,521.95	625.35	6,817.66	653.71	7,113.36	682.06	7,392.11	708.79
BF000890-W	116.85	1,279.46	122.68	1,340.23	128.51	1,401.00	134.33	1,461.76	140.16	1,519.04	145.65
BF003280	70.07	475.13	70.07	455.75	70.07	436.38	70.07	417.00	70.07	418.00	70.07
BF002750	20.06	15.75	26.33	19.50	32.60	23.25	38.87	27.00	45.14	39.50	52.62
BF002840	2.52	298.00	5.96	307.50	6.15	317.00	6.34	326.50	6.53	350.00	7.00
BF003410	2.35	160.75	3.22	183.00	3.66	205.25	4.11	227.50	4.55	307.00	6.14
BF001230	4.67	87.38	5.67	102.75	6.66	118.13	7.66	133.50	8.66	184.50	11.97
BF001330	67.39	474.63	71.90	527.25	71.90	579.88	71.90	632.50	71.90	710.25	71.90
BF001380	26.59	223.63	29.88	248.25	33.17	272.88	33.88	297.50	33.88	334.75	33.88

SUBAREA	90 Sewer Acres	95 Equiv Pop	1995 Sewer Acres	00 Equiv Pop	2000 Sewer Acres	05 Equiv Pop	2005 Sewer Acres	10 Equiv Pop	2010 Sewer Acres	15 Equiv Pop	2015 Sewer Acres
BF002030	10.35	457.25	10.35	446.00	10.35	434.75	10.35	423.50	10.35	434.25	10.35
BF002860	58.54	382.88	58.54	367.75	58.54	352.63	58.54	337.50	58.54	339.25	58.54
BF002990	99.90	684.75	99.90	656.50	99.90	628.25	99.90	600.00	99.90	601.25	99.90
BF003060	70.07	564.50	70.07	541.00	70.07	517.50	70.07	494.00	70.07	495.25	70.07
BF003170	39.03	380.13	45.10	431.25	51.16	482.38	57.23	533.50	63.29	626.00	74.26
BF004590	133.15	952.75	139.71	997.50	146.27	1,042.25	151.52	1,087.00	151.52	1,199.25	151.52
BF004720	55.00	478.00	57.46	498.50	59.93	519.00	62.39	539.50	64.86	594.50	71.47
BF004800	44.89	306.75	45.55	320.50	45.55	334.25	45.55	348.00	45.55	384.00	45.55
SUB-TOTAL 1	8,324.71	72,214.12	10,218.66	77,817.70	11,839.80	83,421.27	12,687.40	89,024.84	13,319.28	96,596.43	14,446.44
	BIG FOSSIL EXTRA 2020 SERVICE AREA										
BFX10-01	9.56	80.88	96.65	153.75	183.73	226.63	270.82	299.50	357.90	425.50	375.34
BFX10-02	30.33	113.13	146.00	202.75	261.68	292.38	377.35	382.00	493.02	579.25	722.57
BFX10-05	25.40	204.75	101.97	358.50	178.55	512.25	255.12	666.00	331.69	912.75	454.59
BFX10-06	44.82	142.88	156.19	244.75	267.55	346.63	378.92	448.50	413.89	612.25	413.89
BFX10-07	282.67	153.63	407.44	227.75	407.44	301.88	407.44	376.00	407.44	491.25	407.44
BFX10-03	5.47	488.75	11.07	736.00	16.67	983.25	22.27	1,230.50	27.87	1,609.25	36.45
BFX10-04	12.85	354.38	29.28	553.25	45.72	752.13	62.15	951.00	78.59	1,267.00	104.70
BFX10-15	17.74	34.13	46.57	55.25	75.40	76.38	104.22	97.50	133.05	266.00	362.99
BFX10-16	1.00	9.13	1.07	9.75	1.15	10.38	1.22	11.00	1.29	49.25	5.79
BFX10-10	18.51	50.38	20.05	54.25	21.60	58.13	23.14	62.00	24.68	95.25	37.92
BFX10-11	231.44	110.63	343.67	146.75	455.89	182.88	568.12	219.00	680.34	491.75	1,527.66
BFX10-12	92.63	61.50	99.94	66.00	107.26	70.50	114.57	75.00	121.88	115.75	188.10
BFX10-13	47.44	59.50	48.67	61.00	49.89	62.50	51.12	64.00	52.35	82.25	67.27
BFX10-17	48.57	40.00	49.82	41.00	51.06	42.00	52.31	43.00	53.55	68.00	84.69
SUB-TOTAL 2	868.43	1,903.63	1,558.39	2,910.75	2,123.57	3,917.88	2,688.76	4,925.00	3,177.56	7,065.50	4,789.40
TOTAL B.F.	9,193.14	74,117.75	11,777.05	80,728.45	13,963.37	87,339.14	15,376.16	93,949.84	16,496.83	103,661.93	19,235.84
	MARINE CREEK AREA TO BE PUMPED TO BIG FOSSIL AREA										
MCX20-01	42.20	107.13	42.20	106.75	42.20	106.38	42.20	106.00	42.20	121.25	47.60
MCX20-03	13.13	57.50	13.48	59.00	13.83	60.50	14.19	62.00	14.54	68.00	15.94
MCX20-04	174.86	45.88	178.26	46.75	181.66	47.63	185.06	48.50	188.46	55.75	216.63
MCX20-05	226.83	115.50	233.92	119.00	241.01	122.50	248.10	126.00	255.18	145.25	294.17
MCX20-06	193.96	273.63	193.96	270.25	193.96	266.88	193.96	263.50	193.96	270.00	193.96
MCX20-07	94.64	101.25	94.64	100.50	94.64	99.75	94.64	99.00	94.64	100.75	94.64
MCX20-08	18.23	33.00	18.80	34.00	19.37	35.00	19.94	36.00	20.51	41.00	23.36
MCX20-09	0.00	24.25	3.03	25.50	3.19	26.75	3.34	28.00	3.50	38.00	4.75
MCX10-10	12.11	101.75	12.14	102.00	12.17	102.25	12.20	102.50	12.23	110.00	13.12
MCX10-11	56.27	26.13	58.80	27.25	61.33	28.38	63.87	29.50	66.40	39.50	88.91
MCX10-12	71.68	41.25	73.01	42.00	74.33	42.75	75.66	43.50	76.99	51.00	90.26
MCX10-13	232.66	118.38	232.66	118.25	232.66	118.13	232.66	118.00	232.66	128.25	251.80
MCX10-16	0.00	3.88	0.48	4.75	0.59	5.63	0.70	6.50	0.81	11.50	1.44
MCX10-17	0.00	7.88	0.98	9.75	1.22	11.63	1.45	13.50	1.69	23.50	2.94
MCX10-19	7.67	33.25	7.85	34.00	8.02	34.75	8.20	35.50	8.38	38.50	9.09
MCX10-20	11.60	11.50	12.70	12.50	13.81	13.50	14.91	14.50	16.02	21.00	23.20
MCX10-21	1.32	9.88	1.45	10.75	1.58	11.63	1.71	12.50	1.83	18.00	2.64
MCX10-22	0.00	127.25	15.91	126.50	15.91	125.75	15.91	125.00	15.91	139.00	17.38
MCX10-23	4.76	46.63	4.88	47.75	5.00	48.88	5.11	50.00	5.23	54.50	5.70
MCX10-24	376.53	210.25	376.53	208.50	376.53	206.75	376.53	205.00	376.53	215.50	382.75
MCX10-02	27.23	797.25	27.23	789.50	27.23	781.75	27.23	774.00	27.23	802.75	27.23

SUBAREA	90 Sewer Acres	95 Equiv Pop	1995 Sewer Acres	00 Equiv Pop	2000 Sewer Acres	05 Equiv Pop	2005 Sewer Acres	10 Equiv Pop	2010 Sewer Acres	15 Equiv Pop	2015 Sewer Acres

NOTES:

Refer to Drain. Area Map titled "Lower Big Fossil Watershed" included in TAB 1 of the report.

BIG FOSSIL CURRENT SERVICE AREA = Year 2000 Watershed Area, Including Area Served by TCWSC Line, but not Including Marine Creek or BFX Areas

BIG FOSSIL EXTRA 2020 SERVICE AREA = Area within the Natural Big Fossil Watershed not currently served by the Big Fossil System but Expected to be Served by Year 2020

TOTAL B.F. = SUB-TOTAL 1 + SUB-TOTAL 2 = Big Fossil Current Service Area + Big Fossil Extra 2020 Service Area

MARINE CREEK AREA TO BE PUMPED TO BIG FOSSIL AREA = This is the portion of the Marine Creek Watershed currently proposed by the Ft. Worth Master Plan to be Served by the Big Fossil System

B.F. CUR. + MC = Current Big Fossil Service Area + Marine Creek Area (Does not Include BFX area)

B.F. TOT + MC = Cuttent Big Fossil Service Area + BFX Area + Marine Creek Area

TCWSC LINE = Areas served by the TSWSC Line as presented in the Fort Worth Master Plan. However, NRH Area BF000890-S is not included, but is included in TCWSC (REV.)

BF - TCWSC = Total Big Fossil Area less TCWSC Area

BF - M.C. = Total Big Fossil Area less Marine Creek Area

BF - MC - BFX = Total Big Fossil Area less Marine Creek and BFX Areas

TCWSC (REV.) = This is the corrected TCWSC area which serves Richland Hills and NRH

NRH (BF) = This is the total portion of NRH in the Big Fossil Watershed area currently served by the TCWSC Line

HALTOM (BF) = This is the total portion of Haltom City in the Big Fossil Watershed area currently served by the C.O.F.W. Line

HALTOM (BF+LF) = This is the total portion of Haltom City in the Big Fossil Watershed plus a portion of the Little Fossil watershed area which could be diverted to the Big Fossil Area and served by the proposed C.O.F.W. parallel line.

DESIGN OPTIONS:

1a TOTAL BIG FOSSIL	11,434.23	77,489.75	14,117.54	84,110.95	16,375.53	90,732.14	17,859.97	97,353.34	19,052.31	107,459.18	22,332.45
LITTLE FOSSIL	1,995.25	14,487.98	1,995.25	14,419.88	1,995.25	14,351.78	1,995.25	14,283.68	1,995.25	14,275.34	1,995.25
TOTAL	13,429.47	91,977.73	16,112.79	98,530.83	18,370.77	105,083.92	19,855.22	111,637.02	21,047.55	121,734.52	24,327.69
1b LESS MARINE CK.	11,188.38	88,605.73	13,772.29	95,148.33	15,958.62	101,690.92	17,371.40	108,233.52	18,492.08	117,937.27	21,231.08
1c LESS INTEL	11,188.38	88,605.73	13,772.29	95,148.33	15,958.62	101,690.92	17,371.40	108,233.52	18,492.08	117,937.27	21,231.08
1d LESS LITTLE FOS.	11,434.23	77,489.75	14,117.54	84,110.95	16,375.53	90,732.14	17,859.97	97,353.34	19,052.31	107,459.18	22,332.45
2a LESS R. HILLS	12,416.09	84,560.37	15,027.32	90,620.86	17,213.21	96,681.36	18,625.57	102,741.86	19,793.20	112,599.75	23,073.34
2b TCWSC (RH)	1,013.39	7,417.36	1,085.47	7,909.96	1,157.56	8,402.56	1,229.65	8,895.16	1,254.35	9,134.77	1,254.35
3a F.W. _ H.C. ONLY	10,627.72	69,406.48	13,123.83	74,578.37	15,194.60	79,750.27	16,491.84	84,922.16	17,601.38	94,212.90	20,854.79
3b TCWSC (NRH,RH)	2,801.76	22,571.24	2,988.96	23,952.45	3,176.17	25,333.66	3,363.38	26,714.86	3,446.17	27,521.61	3,472.90

NOTE: Options Which Include Intel Facility -- a constant Flow of 6.0 MGD is added to the model for each design year

SUBAREA	90 Sewer Acres	95 Equiv Pop	1995 Sewer Acres	00 Equiv Pop	2000 Sewer Acres	05 Equiv Pop	2005 Sewer Acres	10 Equiv Pop	2010 Sewer Acres	15 Equiv Pop	2015 Sewer Acres
TOTALS BY CITY											
(1) Haslet	283	154	407	228	407	302	407	376	407	491	407
(2) Haltom City	1,306	13,086	1,399	13,953	1,492	14,821	1,585	15,688	1,678	16,720	1,789
(3) Watauga	1,799	19,699	1,889	20,634	1,978	21,570	2,068	22,505	2,158	23,387	2,242
(4) N. Richand Hills	1,788	15,154	1,903	16,042	2,019	16,931	2,134	17,820	2,192	18,387	2,219
(5) Richland Hills	1,013	7,417	1,085	7,910	1,158	8,403	1,230	8,895	1,254	9,135	1,254
(6) Saginaw	133	325	472	559	764	793	764	1,027	764	1,312	764
(7) Fort Worth	5,112	21,655	6,961	24,784	8,557	27,913	9,672	31,042	10,599	38,028	13,657

Notes:

(1) Haslet = BFX10-07 (M825X-03)
(2) Haltom City = BF000380 + BF000890-W
(3) Watauga = BF000890-N x 1.1874
(4) N. Richland Hills = BF000890-S + BF000350-N
(5) Richland Hills = BF000350-S
(6) Saginaw = BF004370
(7) Fort Worth = B.F. TOT. + MC - (1) - (2) - (3) - (4) - (5) - (6)

SUBAREA	20 Equiv Pop	2020 Sewer Acres	POP_2050	EMP_2050	2050 Sewer Acres	2050 Equiv Pop	POP_2060	EMP_2060	2060 Sewer Acres	2060 Equiv Pop	POP_2070	EMP_2070
BF003960	196.50	35.37	38.00	569.00	56.18	322.50	39.67	649.67	56.18	364.50	41.33	730.33
BF000380	16,175.50	1,748.89	16,026.00	10,651.00	2,308.51	21,351.50	16,949.67	12,254.33	2,495.05	23,076.83	17,873.33	13,857.67
BF001150	209.50	15.39	39.00	610.00	25.27	344.00	40.67	696.33	28.57	388.83	42.33	782.67
BF001440	969.50	19.39	1,179.00	326.00	26.84	1,342.00	1,276.33	379.67	29.32	1,466.17	1,373.67	433.33
BF001970	340.00	7.33	285.00	32.00	7.33	301.00	269.67	36.67	7.33	288.00	254.33	41.33
BF002170	4,608.50	698.71	7,179.00	2,247.00	1,258.77	8,302.50	8,312.00	2,443.67	1,445.45	9,533.83	9,445.00	2,640.33
BF003310	203.00	4.06	38.00	590.00	6.66	333.00	39.67	673.33	7.53	376.33	41.33	756.67
BF003600	485.50	399.15	426.00	974.00	399.15	913.00	496.33	1,118.33	399.15	1,055.50	566.67	1,262.67
BF003640	199.00	44.99	188.00	361.00	83.32	368.50	219.00	412.00	96.09	425.00	250.00	463.00
BF003660	771.00	272.68	702.00	1,601.00	531.39	1,502.50	818.00	1,856.67	617.63	1,746.33	934.00	2,112.33
BF003760	269.00	876.49	201.00	668.00	876.49	535.00	234.00	779.33	876.49	623.67	267.00	890.67
BF003820	30.00	53.66	2.00	107.00	53.66	55.50	2.33	123.33	53.66	64.00	2.67	139.67
BF004330	486.00	223.59	838.00	193.00	223.59	934.50	975.00	218.00	223.59	1,084.00	1,112.00	243.00
BF004380	51.50	20.09	17.00	170.00	39.78	102.00	19.67	198.33	46.35	118.83	22.33	226.67
BF005130	633.00	95.59	454.00	968.00	141.64	938.00	489.33	1,100.67	157.00	1,039.67	524.67	1,233.33
BF004500	1,546.50	1,219.42	2,089.00	1,757.00	1,219.42	2,967.50	2,424.00	2,034.33	1,219.42	3,441.17	2,759.00	2,311.67
BF003000	162.50	3.72	127.00	9.00	3.72	131.50	116.00	10.33	3.72	121.17	105.00	11.67
BF003530	695.50	48.97	477.00	1,171.00	74.81	1,062.50	515.33	1,339.00	83.43	1,184.83	553.67	1,507.00
BF001520	845.00	96.72	1,080.00	36.00	96.72	845.00	1,161.67	41.33	96.72	845.00	1,243.33	46.67
BF005040	1,413.50	46.28	1,858.00	83.00	62.20	1,899.50	2,013.67	95.67	67.50	2,061.50	2,169.33	108.33
BF001750	611.50	32.94	792.00	196.00	47.95	890.00	868.67	228.33	52.95	982.83	945.33	260.67
BF002770	765.00	59.94	1,112.00	16.00	59.94	765.00	1,229.67	17.33	59.94	765.00	1,347.33	18.67
BF004760	617.00	71.71	793.00	25.00	71.71	617.00	854.00	28.67	71.71	617.00	915.00	32.33
BF001420	222.00	22.35	322.00	6.00	22.35	222.00	356.00	6.67	22.35	222.00	390.00	7.33
BF001650	480.00	9.60	607.00	50.00	12.64	632.00	653.67	58.00	13.65	635.04	700.33	66.00
BF002000	235.00	17.32	201.00	25.00	17.32	213.50	192.00	28.67	17.32	206.33	183.00	32.33
BF002110	2,195.50	225.57	4,066.00	358.00	436.13	4,245.00	4,719.33	417.67	506.32	4,928.17	5,372.67	477.33
BF002260	477.50	203.85	813.00	187.00	203.85	906.50	942.33	214.33	203.85	1,049.50	1,071.67	241.67
BF002560	1,121.78	285.98	2,003.54	232.44	285.98	2,119.76	2,316.83	271.18	285.98	2,287.82	2,630.12	309.92
BF002630	101.00	10.10	192.00	16.00	20.00	200.00	223.67	18.67	23.30	206.64	255.33	21.33
BF002650	168.50	5.99	302.00	34.00	11.34	319.00	349.33	39.67	13.13	345.20	396.67	45.33
BF002690	149.50	14.95	287.00	22.00	29.80	298.00	334.67	25.67	34.75	306.56	382.33	29.33
BF003500	48.00	6.00	34.00	124.00	12.00	96.00	39.67	144.67	14.00	112.00	45.33	165.33
BF003740	154.50	53.28	141.00	307.00	101.55	294.50	164.33	353.67	117.64	341.17	187.67	400.33
BF003860	208.50	27.80	39.00	606.00	45.60	342.00	40.67	691.67	51.53	386.50	42.33	777.33
BF004230	142.00	48.49	135.00	257.00	87.30	263.50	157.33	293.33	87.30	304.00	179.67	329.67
BF004350	243.00	93.78	230.00	441.00	150.02	450.50	268.00	503.33	150.02	519.67	306.00	565.67
BF004370	1,596.00	763.79	2,761.00	679.00	763.79	3,100.50	3,215.33	773.33	763.79	3,602.00	3,669.67	867.67
BF004420	58.00	5.80	19.00	192.00	11.50	115.00	22.00	224.00	13.40	134.00	25.00	256.00
BF005080	564.00	54.53	819.00	14.00	54.53	564.00	905.67	15.33	54.53	564.00	992.33	16.67
BF002270	382.50	124.50	671.00	107.00	124.50	724.50	776.67	123.67	124.50	838.50	882.33	140.33
BF004860	1,552.00	160.26	1,984.00	68.00	160.26	1,552.00	2,134.33	78.00	160.26	1,552.00	2,284.67	88.00
BF000350-S	9,374.37	1,254.35	9,136.81	5,374.35	1,254.35	11,289.18	9,693.47	5,894.11	1,254.35	11,289.18	10,250.13	6,413.86
BF000350-N	11,283.13	1,509.76	10,997.19	6,468.65	1,509.76	13,587.81	11,667.20	7,094.23	1,509.76	13,587.81	12,337.20	7,719.81
BF000890-N	24,269.04	2,327.02	28,205.43	3,139.30	2,483.44	24,269.04	29,913.78	3,393.27	2,483.44	24,269.04	31,622.14	3,647.25
BF000890-S	7,670.86	735.52	8,915.06	992.26	784.95	7,670.86	9,455.03	1,072.53	784.95	7,670.86	9,995.00	1,152.81
BF000890-W	1,576.33	151.14	1,832.00	203.90	161.30	1,576.33	1,942.96	220.40	161.30	1,576.33	2,053.93	236.90
BF003280	419.00	70.07	331.00	25.00	70.07	343.50	304.00	28.67	70.07	318.33	277.00	32.33
BF002750	52.00	52.62	23.00	138.00	52.62	92.00	26.00	158.67	52.62	105.33	29.00	179.33
BF002840	373.50	7.47	453.00	11.00	9.17	458.50	480.67	12.33	9.74	486.83	508.33	13.67
BF003410	386.50	7.73	95.00	1,079.00	12.69	634.50	101.00	1,232.33	14.34	717.17	107.00	1,385.67
BF001230	235.50	15.27	69.00	660.00	25.88	399.00	75.67	755.67	29.41	453.50	82.33	851.33
BF001330	788.00	71.90	1,146.00	16.00	71.90	788.00	1,267.33	17.33	71.90	788.00	1,388.67	18.67
BF001380	372.00	33.88	541.00	8.00	33.88	372.00	598.33	8.67	33.88	372.00	655.67	9.33

SUBAREA	20 Equiv Pop	2020 Sewer Acres	POP_2050	EMP_2050	2050 Sewer Acres	2050 Equiv Pop	POP_2060	EMP_2060	2060 Sewer Acres	2060 Equiv Pop	POP_2070	EMP_2070
BF002030	445.00	10.35	402.00	39.00	10.35	421.50	391.33	44.67	10.35	413.67	380.67	50.33
BF002860	341.00	58.54	273.00	22.00	58.54	284.00	252.33	25.33	58.54	265.00	231.67	28.67
BF002990	602.50	99.90	473.00	38.00	99.90	492.00	433.33	43.67	99.90	455.17	393.67	49.33
BF003060	496.50	70.07	390.00	30.00	70.07	405.00	357.33	34.33	70.07	374.50	324.67	38.67
BF003170	718.50	85.24	1,066.00	84.00	131.44	1,108.00	1,189.00	97.67	146.85	1,237.83	1,312.00	111.33
BF004590	1,311.50	151.52	1,687.00	56.00	151.52	1,311.50	1,817.33	64.33	151.52	1,311.50	1,947.67	72.67
BF004720	649.50	76.32	828.00	27.00	76.32	649.50	890.00	31.00	76.32	649.50	952.00	35.00
BF004800	420.00	45.55	538.00	18.00	45.55	420.00	579.00	20.67	45.55	420.00	620.00	23.33
SUB-TOTAL 1	104,168.01	15,063.22	118,968.03	45,514.90	17,339.22	130,053.98	128,611.27	51,266.72	17,987.25	136,972.65	138,254.51	57,018.54
BFX10-01	551.50	375.34	707.00	776.00	375.34	1,095.00	824.33	903.67	375.34	1,276.17	941.67	1,031.33
BFX10-02	776.50	722.57	898.00	1,263.00	722.57	1,529.50	1,047.00	1,467.00	722.57	1,780.50	1,196.00	1,671.00
BFX10-05	1,159.50	577.48	1,554.00	1,428.00	697.81	2,268.00	1,811.67	1,651.67	697.81	2,637.50	2,069.33	1,875.33
BFX10-06	776.00	413.89	1,196.00	630.00	413.89	1,511.00	1,393.00	726.00	413.89	1,756.00	1,590.00	822.00
BFX10-07	606.50	407.44	952.00	363.00	407.44	1,133.50	1,099.67	419.00	407.44	1,309.17	1,247.33	475.00
BFX10-03	1,988.00	45.03	3,311.00	847.00	84.59	3,734.50	3,822.67	988.00	97.77	4,316.67	4,334.33	1,129.00
BFX10-04	1,583.00	130.81	2,388.00	1,245.00	248.78	3,010.50	2,760.33	1,452.00	288.10	3,486.33	3,132.67	1,659.00
BFX10-15	434.50	592.93	141.00	1,430.00	709.10	856.00	162.67	1,667.67	709.10	996.50	184.33	1,905.33
BFX10-16	87.50	10.29	9.00	315.00	19.59	166.50	9.67	366.33	22.69	192.83	10.33	417.67
BFX10-10	128.50	51.15	46.00	329.00	83.79	210.50	49.67	376.33	94.67	237.83	53.33	423.67
BFX10-11	764.50	1,561.02	416.00	2,077.00	1,561.02	1,454.50	474.00	2,421.00	1,561.02	1,684.50	532.00	2,765.00
BFX10-12	156.50	254.33	46.00	420.00	416.02	256.00	50.67	477.00	469.92	289.17	55.33	534.00
BFX10-13	100.50	82.20	16.00	254.00	116.96	143.00	16.67	281.00	128.55	157.17	17.33	308.00
BFX10-17	93.00	115.82	19.00	256.00	183.07	147.00	19.67	290.67	205.49	165.00	20.33	325.33
SUB-TOTAL 2	9,206.00	5,340.30	11,699.00	11,633.00	6,039.97	17,515.50	13,541.67	13,487.33	6,194.36	20,285.33	15,384.33	15,341.67
TOTAL B.F.	113,374.01	20,403.52	130,667.03	57,147.90	23,379.19	147,569.48	142,152.93	64,754.05	24,181.62	157,257.99	153,638.84	72,360.21
MCX20-01	136.50	53.58	88.00	155.00	64.97	165.50	86.67	177.00	68.76	175.17	85.33	199.00
MCX20-03	74.00	17.35	36.00	112.00	21.57	92.00	38.33	119.33	22.98	98.00	40.67	126.67
MCX20-04	63.00	244.80	40.00	82.00	314.75	81.00	41.33	91.33	338.06	87.00	42.67	100.67
MCX20-05	164.50	333.16	102.00	230.00	439.48	217.00	107.33	254.33	474.93	234.50	112.67	278.67
MCX20-06	276.50	193.96	229.00	94.00	193.96	276.00	222.33	107.00	193.96	275.83	215.67	120.00
MCX20-07	102.50	95.10	80.00	46.00	95.57	103.00	77.67	51.00	95.72	103.17	75.33	56.00
MCX20-08	46.00	26.21	25.00	70.00	34.18	60.00	25.67	78.00	36.84	64.67	26.33	86.00
MCX20-09	48.00	6.00	28.00	90.00	9.13	73.00	29.67	103.33	10.17	81.33	31.33	116.67
MCX10-10	117.50	14.02	89.00	89.00	15.93	133.50	88.00	101.67	16.56	138.83	87.00	114.33
MCX10-11	49.50	111.41	37.00	74.00	166.56	74.00	39.00	86.33	184.94	82.17	41.00	98.67
MCX10-12	58.50	103.54	31.00	91.00	135.40	76.50	32.33	100.33	146.01	82.50	33.67	109.67
MCX10-13	138.50	271.93	29.00	259.00	311.20	158.50	28.67	273.00	324.28	165.17	28.33	287.00
MCX10-16	16.50	2.06	13.00	34.00	3.75	30.00	14.67	39.67	4.31	34.50	16.33	45.33
MCX10-17	33.50	4.19	26.00	70.00	7.63	61.00	29.33	81.67	8.77	70.17	32.67	93.33
MCX10-19	41.50	9.79	19.00	63.00	11.92	50.50	20.00	67.00	12.63	53.50	21.00	71.00
MCX10-20	27.50	30.38	18.00	53.00	49.16	44.50	20.00	60.33	55.42	50.17	22.00	67.67
MCX10-21	23.50	3.45	14.00	48.00	5.57	38.00	15.33	55.00	6.28	42.83	16.67	62.00
MCX10-22	153.00	19.13	116.00	124.00	22.25	178.00	114.00	144.67	23.29	186.33	112.00	165.33
MCX10-23	59.00	6.17	28.00	89.00	7.58	72.50	29.67	94.67	8.06	77.00	31.33	100.33
MCX10-24	226.00	401.40	177.00	126.00	426.26	240.00	173.33	142.67	434.55	244.67	169.67	159.33
MCX10-02	831.50	28.13	637.00	442.00	29.02	858.00	619.00	495.67	29.32	866.83	601.00	549.33

SUBAREA	20 Equiv Pop	2020 Sewer Acres	POP_2050	EMP_2050	2050 Sewer Acres	2050 Equiv Pop	POP_2060	EMP_2060	2060 Sewer Acres	2060 Equiv Pop	POP_2070	EMP_2070
MCX10-03	41.50	19.58	30.00	37.00	19.58	48.50	29.33	43.00	19.58	50.83	28.67	49.00
MCX10-04	125.00	55.14	90.00	113.00	55.27	146.50	88.00	131.33	55.27	153.67	86.00	149.67
MCX10-05	66.00	8.25	48.00	59.00	9.69	77.50	47.00	68.67	10.17	81.33	46.00	78.33
MCX10-06	309.50	90.90	225.00	278.00	106.90	364.00	220.67	323.00	112.24	382.17	216.33	368.00
MCX10-07	413.50	200.43	262.00	523.00	253.75	523.50	258.33	603.67	270.23	560.17	254.67	684.33
MCX10-08	332.00	172.31	163.00	522.00	220.06	424.00	161.33	586.67	235.97	454.67	159.67	651.33
MCX10-09	47.00	429.27	37.00	96.00	776.33	85.00	41.67	112.00	892.02	97.67	46.33	128.00
MCX10-14	42.00	288.07	27.00	98.00	521.27	76.00	30.33	114.00	599.00	87.33	33.67	130.00
MCX10-15	43.50	408.19	25.00	97.00	689.70	73.50	27.67	111.67	783.54	83.50	30.33	126.33
MCX10-18	54.00	3.94	26.00	84.00	4.96	68.00	27.67	90.00	5.30	72.67	29.33	96.00
MCX20-02	30.00	3.75	20.00	63.00	6.44	51.50	22.67	72.00	7.33	58.67	25.33	81.00
SUB-TOTALS	4,191.00	3,655.58	2,815.00	4,411.00	5,029.77	5,020.50	2,807.00	4,980.00	5,486.50	5,297.00	2,799.00	5,549.00
B.F. CUR. + MC	108,359.01	18,718.80	121,783.03	49,925.90	22,368.99	135,074.48	131,418.27	56,246.72	23,473.76	142,269.65	141,053.51	62,567.54
B.F. TOT + MC	117,565.01	24,059.11	133,482.03	61,558.90	28,408.97	152,589.98	144,959.93	69,734.05	29,668.12	162,554.99	156,437.84	77,909.21
BF000350-S	9,374.37	1,254.35	9,136.81	5,374.35	1,254.35	11,289.18	9,693.47	5,894.11	1,254.35	11,289.18	10,250.13	6,413.86
BF000350-N	11,283.13	1,509.76	10,997.19	6,468.65	1,509.76	13,587.81	11,667.20	7,094.23	1,509.76	13,587.81	12,337.20	7,719.81
TCWSC LINE	20,657.50	2,764.11	20,134.00	11,843.00	2,764.11	24,876.99	21,360.67	12,988.33	2,764.11	24,876.99	22,587.33	14,133.67
BF - TCWSC	96,907.51	21,295.00	113,348.03	49,715.90	25,644.86	127,712.99	123,599.27	56,745.72	26,904.01	137,678.00	133,850.51	63,775.54
BF - M.C.	92,716.51	17,639.41	110,533.03	45,304.90	20,615.08	122,692.49	120,792.27	51,765.72	21,417.51	132,381.00	131,051.51	58,226.54
BF - MC - BFX	83,510.51	12,299.11	98,834.03	33,671.90	14,575.11	105,176.99	107,250.60	38,278.39	15,223.14	112,095.66	115,667.18	42,884.88
BF000350-S	9,374.37	1,254.35	9,136.81	5,374.35	1,254.35	11,289.18	9,693.47	5,894.11	1,254.35	11,289.18	10,250.13	6,413.86
BF000350-N	11,283.13	1,509.76	10,997.19	6,468.65	1,509.76	13,587.81	11,667.20	7,094.23	1,509.76	13,587.81	12,337.20	7,719.81
BF000890-S	7,670.86	735.52	8,915.06	992.26	784.95	7,670.86	9,455.03	1,072.53	784.95	7,670.86	9,995.00	1,152.81
TCWSC (REV.)	28,328.36	3,499.63	29,049.06	12,835.26	3,549.06	32,547.85	30,815.69	14,060.87	3,549.06	32,547.85	32,582.33	15,286.48
BF000350-N	11,283.13	1,509.76	10,997.19	6,468.65	1,509.76	13,587.81	11,667.20	7,094.23	1,509.76	13,587.81	12,337.20	7,719.81
BF000890-S	7,670.86	735.52	8,915.06	992.26	784.95	7,670.86	9,455.03	1,072.53	784.95	7,670.86	9,995.00	1,152.81
NRH (BF)	18,953.99	2,245.27	19,912.25	7,460.90	2,294.71	21,258.67	21,122.22	8,166.76	2,294.71	21,258.67	22,332.20	8,872.62
BF000380	16,175.50	1,748.89	16,026.00	10,651.00	2,308.51	21,351.50	16,949.67	12,254.33	2,495.05	23,076.83	17,873.33	13,857.67
BF000890-W	1,576.33	151.14	1,832.00	203.90	161.30	1,576.33	1,942.96	220.40	161.30	1,576.33	2,053.93	236.90
HALTOM (BF)	17,751.83	1,900.03	17,858.00	10,854.90	2,469.82	22,927.83	18,892.63	12,474.73	2,656.36	24,653.16	19,927.26	14,094.56
LF000410	12,832.00	1,794.56	9,982.00	5,180.00	1,794.56	12,572.00	9,724.00	5,522.67	1,794.56	12,485.33	9,466.00	5,865.33
EXTRA LF AREA	14,267.00	1,995.25	11,098.29	5,759.28	1,995.25	13,977.93	10,811.43	6,140.27	1,995.25	13,881.57	10,524.58	6,521.25
HALTOM (BF+LF)	32,018.83	3,895.28	28,956.29	16,614.18	4,465.06	36,905.75	29,704.07	18,615.00	4,651.60	38,534.73	30,451.84	20,615.82

SUBAREA	20 Equiv Pop	2020 Sewer Acres	POP_2050	EMP_2050	2050 Sewer Acres	2050 Equiv Pop	POP_2060	EMP_2060	2060 Sewer Acres	2060 Equiv Pop	POP_2070	EMP_2070

NOTES:

Refer to Drain. Area Map titled "Lower Big Fossil Watershed" included in TAB 1 of the report.

DESIGN OPTIONS:

1a TOTAL BIG FOSSIL	117,565.01	24,059.11	133,482.03	61,558.90	28,408.97	152,589.98	144,959.93	69,734.05	29,668.12	162,554.99	156,437.84	77,909.21
LITTLE FOSSIL	14,267.00	1,995.25	11,098.29	5,759.28	1,995.25	13,977.93	10,811.43	6,140.27	1,995.25	13,881.57	10,524.58	6,521.25
TOTAL	131,832.01	26,054.35	144,580.31	67,318.18	30,404.21	166,567.91	155,771.37	75,874.32	31,663.37	176,436.55	166,962.43	84,430.46
1b LESS MARINE CK.	127,641.01	22,398.77	141,765.31	62,907.18	25,374.44	161,547.41	152,964.37	70,894.32	26,176.86	171,139.55	164,163.43	78,881.46
1c LESS INTEL	127,641.01	22,398.77	141,765.31	62,907.18	25,374.44	161,547.41	152,964.37	70,894.32	26,176.86	171,139.55	164,163.43	78,881.46
1d LESS LITTLE FOS.	117,565.01	24,059.11	133,482.03	61,558.90	28,408.97	152,589.98	144,959.93	69,734.05	29,668.12	162,554.99	156,437.84	77,909.21
2a LESS R. HILLS	122,457.64	24,800.00	135,443.50	61,943.82	29,149.86	155,278.73	146,077.90	69,980.21	30,409.01	165,147.38	156,712.29	78,016.61
2b TCWSC (RH)	9,374.37	1,254.35	9,136.81	5,374.35	1,254.35	11,289.18	9,693.47	5,894.11	1,254.35	11,289.18	10,250.13	6,413.86
3a F.W. _ H.C. ONLY	103,503.65	22,554.73	115,531.25	54,482.92	26,855.15	134,020.05	124,955.67	61,813.45	28,114.30	143,888.70	134,380.09	69,143.99
3b TCWSC (NRH,RH)	28,328.36	3,499.63	29,049.06	12,835.26	3,549.06	32,547.85	30,815.69	14,060.87	3,549.06	32,547.85	32,582.33	15,286.48

NOTE: Options Which Ir

SUBAREA	20 Equiv Pop	2020 Sewer Acres	POP_2050	EMP_2050	2050 Sewer Acres	2050 Equiv Pop	POP_2060	EMP_2060	2060 Sewer Acres	2060 Equiv Pop	POP_2070	EMP_2070
TOTALS BY CITY												
(1) Haslet	607	407	952	363	407	1,134	1,100	419	407	1,309	1,247	475
(2) Haltom City	17,752	1,900	17,858	10,855	2,470	22,928	18,893	12,475	2,656	24,653	19,927	14,095
(3) Watauga	24,269	2,327	28,205	3,139	2,483	24,269	29,914	3,393	2,483	24,269	31,622	3,647
(4) N. Richand Hills	18,954	2,245	19,912	7,461	2,295	21,259	21,122	8,167	2,295	21,259	22,332	8,873
(5) Richland Hills	9,374	1,254	9,137	5,374	1,254	11,289	9,693	5,894	1,254	11,289	10,250	6,414
(6) Saginaw	1,596	764	2,761	679	764	3,101	3,215	773	764	3,602	3,670	868
(7) Fort Worth	45,013	15,161	54,657	33,687	18,735	68,611	61,023	38,613	19,808	76,174	67,389	43,538

Notes:

SUBAREA	2070 Sewer Acres	2070 Equiv Pop	Dry GWI	2 Year GWI	5 Year GWI	10 Year GWI	Matrix ID	Area	Index Number	Wastewater Index	Rainfall Index	Runoff Index	Zero Index
BF002030	10.35	405.83	0.00	180.00	280.00	320.00	SF-1B	Small	24.00	35.00	7.00	60.00	0.00
BF002860	58.54	246.00	0.00	180.00	280.00	320.00	SF-1B	Large	7.00	35.00	7.00	1.00	0.00
BF002990	99.90	418.33	0.00	180.00	280.00	320.00	SF-1B	Large	7.00	35.00	7.00	1.00	0.00
BF003060	70.07	344.00	0.00	180.00	280.00	320.00	SF-1B	Large	7.00	35.00	7.00	1.00	0.00
BF003170	162.25	1,333.52	0.00	180.00	280.00	320.00	SF-1B	Small	24.00	35.00	7.00	1.00	0.00
BF004590	151.52	1,311.50	0.00	180.00	280.00	320.00	SF-1B	Large	7.00	35.00	7.00	75.00	0.00
BF004720	76.32	649.50	0.00	180.00	280.00	320.00	SF-1B	Large	7.00	35.00	7.00	75.00	0.00
BF004800	45.55	420.00	0.00	180.00	280.00	320.00	SF-1B	Small	24.00	35.00	7.00	75.00	0.00
SUB-TOTAL 1	18,627.03	143,175.93	0.00	10,739.07	16,368.28	18,859.46	0.00	0.00	1,070.40	1,699.79	662.08	3,418.72	0.00
BFX10-01	375.34	1,457.33	0.00	140.00	220.00	270.00	OR-1	Large	3.00	3.00	3.00	50.00	0.00
BFX10-02	722.57	2,031.50	0.00	140.00	220.00	270.00	OR-1	Large	3.00	3.00	3.00	50.00	0.00
BFX10-05	697.81	3,007.00	0.00	140.00	220.00	270.00	OR-1	Large	3.00	3.00	3.00	50.00	0.00
BFX10-06	413.89	2,001.00	0.00	140.00	220.00	270.00	OR-1	Large	3.00	3.00	3.00	50.00	0.00
BFX10-07	407.44	1,484.83	0.00	140.00	220.00	270.00	OR-1	Large	3.00	3.00	3.00	50.00	0.00
BFX10-03	110.96	4,898.83	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
BFX10-04	327.42	3,962.17	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
BFX10-15	709.10	1,137.00	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
BFX10-16	25.78	219.17	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
BFX10-10	105.55	265.17	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
BFX10-11	1,561.02	1,914.50	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
BFX10-12	523.82	322.33	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
BFX10-13	140.14	171.33	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
BFX10-17	227.91	183.00	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
SUB-TOTAL 2	6,348.75	23,055.17	0.00	2,170.00	3,320.00	3,930.00	0.00	0.00	68.00	48.00	68.00	700.00	0.00
TOTAL B.F.	24,975.78	166,231.10	0.00	12,909.07	19,688.28	22,789.46	0.00	0.00	1,138.40	1,747.79	730.08	4,118.72	0.00
MCX20-01	72.56	184.83	0.00	160.00	230.00	270.00	IN-2	Large	8.00	7.00	8.00	50.00	0.00
MCX20-03	24.38	104.00	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX20-04	361.38	93.00	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX20-05	510.37	252.00	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX20-06	193.96	275.67	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX20-07	95.88	103.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX20-08	39.50	69.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX20-09	11.21	89.67	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-10	17.20	144.17	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-11	203.32	90.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-12	156.63	88.50	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-13	337.37	171.83	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-16	4.88	39.00	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-17	9.92	79.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-19	13.33	56.50	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-20	61.68	55.83	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-21	6.99	47.67	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-22	24.33	194.67	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-23	8.53	81.50	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-24	442.84	249.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-02	29.62	875.67	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00

SUBAREA	2070 Sewer Acres	2070 Equiv Pop	Dry GWI	2 Year GWI	5 Year GWI	10 Year GWI	Matrix ID	Area	Index Number	Wastewater Index	Rainfall Index	Runoff Index	Zero Index
MCX10-03	19.58	53.17	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-04	55.27	160.83	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-05	10.65	85.17	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-06	117.57	400.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-07	270.23	596.83	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-08	251.89	485.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-09	1,007.71	110.33	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
MCX10-14	676.73	98.67	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
MCX10-15	848.62	93.50	0.00	150.00	220.00	260.00	IN-1	Large	1.00	1.00	1.00	50.00	0.00
MCX10-18	5.65	77.33	0.00	160.00	230.00	270.00	IN-2	Large	8.00	7.00	8.00	50.00	0.00
MCX20-02	8.23	65.83	0.00	180.00	280.00	320.00	High GPCD	Large	12.00	7.00	12.00	50.00	0.00
SUB-TOTALS	5,898.00	5,573.50	0.00	5,660.00	8,740.00	10,020.00	0.00	0.00	354.00	212.00	354.00	1,600.00	0.00
B.F. CUR. + MC	24,525.02	148,749.43	0.00	16,399.07	25,108.28	28,879.46	0.00	0.00	1,424.40	1,911.79	1,016.08	5,018.72	0.00
B.F. TOT + MC	30,873.77	171,804.60	0.00	18,569.07	28,428.28	32,809.46	0.00	0.00	1,492.40	1,959.79	1,084.08	5,718.72	0.00
BF000350-S	1,254.35	11,289.18	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
BF000350-N	1,509.76	13,587.81	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
TCWSC LINE	2,764.11	24,876.99	0.00	400.00	560.00	640.00	MX-3	Large	20.19	8.31	20.19	1.19	0.00
BF - TCWSC	28,109.66	146,927.61	0.00	18,169.07	27,868.28	32,169.46							
BF - M.C.	22,211.67	141,354.11	0.00	12,509.07	19,128.28	22,149.46							
BF - MC - BFX	15,862.92	118,298.94	0.00	10,339.07	15,808.28	18,219.46							
BF000350-S	1,254.35	11,289.18	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
BF000350-N	1,509.76	13,587.81	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
BF000890-S	784.95	7,670.86	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
TCWSC (REV.)	3,549.06	32,547.85	0.00	600.00	840.00	960.00							
BF000350-N	1,509.76	13,587.81	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
BF000890-S	784.95	7,670.86	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
NRH (BF)	2,294.71	21,258.67	0.00	400.00	560.00	640.00							
BF000380	2,675.48	24,802.17	0.00	160.00	220.00	260.00	HD-2	Large	11.00	7.00	11.00	1.00	0.00
BF000890-W	161.30	1,576.33	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
HALTOM (BF)	2,836.78	26,378.49											
LF000410	1,794.56	12,398.67	0.00	170.00	240.00	290.00	IN-3	Large	13.00	7.00	13.00	1.00	0.00
EXTRA LF AREA	1,995.25	13,785.21	0.00	170.00	240.00	290.00	IN-3	Large	13.00	7.00	13.00	1.00	0.00
HALTOM (BF+LF)	4,832.03	40,163.70											

NOTES:

Refer to Drain. Area Map titled "Lower Big Fossil Watershed" included in TAB 1 of the report.

DESIGN OPTIONS:

SUBAREA	2070 Sewer Acres	2070 Equiv Pop	Dry GWI	2 Year GWI	5 Year GWI	10 Year GWI	Matrix ID	Area	Index Number	Wastewater Index	Rainfall Index	Runoff Index	Zero Index
1a TOTAL BIG FOSSIL	30,873.77	171,804.60	0.00	18,569.07	28,428.28	32,809.46	0.00	0.00	1,492.40	1,959.79	1,084.08	5,718.72	0.00
LITTLE FOSSIL	1,995.25	13,785.21	0.00	170.00	240.00	290.00	IN-3	Large	13.00	7.00	13.00	1.00	0.00
TOTAL	32,869.02	185,589.81	0.00	18,739.07	28,668.28	33,099.46	#VALUE!	#VALUE!	1,505.40	1,966.79	1,097.08	5,719.72	0.00
1b LESS MARINE CK.	26,971.02	180,016.31	0.00	13,079.07	19,928.28	23,079.46	#VALUE!	#VALUE!	1,151.40	1,754.79	743.08	4,119.72	0.00
1c LESS INTEL	26,971.02	180,016.31	0.00	13,079.07	19,928.28	23,079.46	#VALUE!	#VALUE!	1,151.40	1,754.79	743.08	4,119.72	0.00
1d LESS LITTLE FOS.	30,873.77	171,804.60	0.00	18,569.07	28,428.28	32,809.46	0.00	0.00	1,492.40	1,959.79	1,084.08	5,718.72	0.00
2a LESS R. HILLS	31,614.67	174,300.63	0.00	18,539.07	28,388.28	32,779.46	#VALUE!	#VALUE!	1,488.40	1,959.79	1,080.08	5,718.72	0.00
2b TCWSC (RH)	1,254.35	11,289.18	0.00	200.00	280.00	320.00	MX-3	Large	17.00	7.00	17.00	1.00	0.00
3a F.W. _ H.C. ONLY	29,319.96	153,041.96	0.00	18,139.07	27,828.28	32,139.46	#VALUE!	#VALUE!	1,505.40	1,966.79	1,097.08	5,719.72	0.00
3b TCWSC (NRH,RH)	3,549.06	32,547.85	0.00	600.00	840.00	960.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NOTE: Options Which Ir

SUBAREA	2070 Sewer Acres	2070 Equiv Pop	Dry GWI	2 Year GWI	5 Year GWI	10 Year GWI	Matrix ID	Area	Index Number	Wastewater Index	Rainfall Index	Runoff Index	Zero Index
TOTALS BY CITY													
(1) Haslet	407	1,485	0	140	220	270	OR-1	Large	3	3	3	50	0
(2) Haltom City	2,837	26,378	0	360	500	580			28	14	28	2	0
(3) Watauga	2,483	24,269	0	237	332	380	MX-3	Large	20	8	20	1	0
(4) N. Richand Hills	2,295	21,259	0	400	560	640			34	14	34	2	0
(5) Richland Hills	1,254	11,289	0	200	280	320	MX-3	Large	17	7	17	1	0
(6) Saginaw	764	4,104	0	180	280	320	MX-1	Large	5	35	7	80	0
(7) Fort Worth	20,833	83,021	0	17,052	26,256	30,299	0	0	1,385	1,878	975	5,583	0

Notes:

SUBAREA	One Index	POP_1997	EMP_1997	97 Equiv Pop	1997 Sewer Acres
BF003960	1.00	29.05	113.70	85.90	15.46
BF000380	1.00	11,104.55	2,048.80	12,128.95	1,311.38
BF001150	1.00	30.05	122.80	91.45	6.72
BF001440	1.00	641.20	22.90	652.65	13.05
BF001970	1.00	358.45	6.10	361.50	7.33
BF002170	1.00	1,072.25	1,168.85	1,656.68	251.17
BF003310	1.00	29.05	119.75	88.93	1.78
BF003600	1.00	47.40	153.50	124.15	294.98
BF003640	1.00	20.90	72.85	57.33	12.96
BF003660	1.00	77.05	118.45	136.28	48.20
BF003760	1.00	22.60	20.65	32.93	162.76
BF003820	1.00	0.00	10.40	5.20	21.09
BF004330	1.00	108.75	52.45	134.98	121.48
BF004380	1.00	2.75	4.20	4.85	1.89
BF005130	1.00	263.00	217.50	371.75	56.14
BF004500	1.00	283.40	143.05	354.93	1,008.75
BF003000	1.00	181.80	1.70	182.65	3.72
BF003530	1.00	269.75	217.25	378.38	26.64
BF001520	1.00	627.10	6.80	630.50	88.79
BF005040	1.00	998.90	13.30	1,005.55	32.93
BF001750	1.00	371.20	16.35	379.38	20.44
BF002770	1.00	477.05	8.70	481.40	59.94
BF004760	1.00	455.00	4.75	457.38	54.24
BF001420	1.00	138.30	2.35	139.48	15.24
BF001650	1.00	348.35	4.80	350.75	7.02
BF002000	1.00	243.45	4.75	245.83	17.32
BF002110	1.00	546.40	29.75	561.28	57.67
BF002260	1.00	116.10	36.65	134.43	203.85
BF002560	0.84	314.51	19.45	324.24	118.49
BF002630	1.00	21.25	1.40	21.95	2.20
BF002650	1.00	46.70	2.80	48.10	1.71
BF002690	1.00	30.05	1.75	30.93	3.09
BF003500	1.00	3.50	7.00	7.00	0.88
BF003740	1.00	15.00	41.00	35.50	12.24
BF003860	1.00	30.05	122.45	91.28	12.17
BF004230	1.00	14.65	51.95	40.63	13.87
BF004350	1.00	25.45	89.05	69.98	27.00
BF004370	1.00	343.00	151.85	418.93	608.01
BF004420	1.00	2.75	4.55	5.03	0.50
BF005080	1.00	351.15	6.35	354.33	52.80
BF002270	1.00	101.40	15.40	109.10	124.50
BF004860	1.00	1,149.90	12.90	1,156.35	150.74
BF000350-S	1.00	6,310.18	2,608.44	7,614.40	1,114.31
BF000350-N	1.00	7,595.02	3,139.56	9,164.80	1,341.20
BF000890-N	1.19	19,185.10	1,775.38	20,072.79	1,924.67
BF000890-S	1.00	6,063.95	561.15	6,344.53	608.34
BF000890-W	1.00	1,246.11	115.31	1,303.77	125.01
BF003280	1.00	465.00	4.75	467.38	70.07
BF002750	1.00	6.75	21.00	17.25	28.84
BF002840	1.00	299.95	3.70	301.80	6.04
BF003410	1.00	62.85	213.60	169.65	3.39
BF001230	1.00	33.55	119.95	93.53	6.07
BF001330	1.00	491.15	9.05	495.68	71.90
BF001380	1.00	231.30	4.35	233.48	31.20

SUBAREA	One Index	POP_1997	EMP_1997	97 Equiv Pop	1997 Sewer Acres
BF002030	1.00	448.85	7.80	452.75	10.35
BF002860	1.00	374.95	3.75	376.83	58.54
BF002990	1.00	670.05	6.80	673.45	99.90
BF003060	1.00	552.05	6.10	555.10	70.07
BF003170	1.00	396.25	8.65	400.58	47.52
BF004590	1.00	965.55	10.20	970.65	142.34
BF004720	1.00	483.65	5.10	486.20	58.45
BF004800	1.00	310.55	3.40	312.25	45.55
SUB-TOTAL 1	62.03	67,506.03	13,899.05	74,455.55	10,914.87
BFX10-01	1.00	75.80	68.45	110.03	131.48
BFX10-02	1.00	96.05	105.85	148.98	192.27
BFX10-05	1.00	166.90	198.70	266.25	132.60
BFX10-06	1.00	135.10	97.05	183.63	200.73
BFX10-07	1.00	155.60	55.35	183.28	407.44
BFX10-03	1.00	551.80	71.70	587.65	13.31
BFX10-04	1.00	380.45	106.95	433.93	35.86
BFX10-15	1.00	23.95	37.25	42.58	58.10
BFX10-16	1.00	5.35	8.05	9.38	1.10
BFX10-10	1.00	26.45	50.95	51.93	20.67
BFX10-11	1.00	102.30	45.55	125.08	388.56
BFX10-12	1.00	20.45	85.70	63.30	102.87
BFX10-13	1.00	12.35	95.50	60.10	49.16
BFX10-17	1.00	15.70	49.40	40.40	50.31
SUB-TOTAL 2	14.00	1,768.25	1,076.45	2,306.48	1,784.46
TOTAL B.F.	76.03	69,274.28	14,975.50	76,762.03	12,699.33
MCX20-01	1.00	94.60	24.75	106.98	42.20
MCX20-03	1.00	23.40	69.40	58.10	13.62
MCX20-04	1.00	32.70	27.05	46.23	179.62
MCX20-05	1.00	73.15	87.50	116.90	236.75
MCX20-06	1.00	263.75	17.05	272.28	193.96
MCX20-07	1.00	92.60	16.70	100.95	94.64
MCX20-08	1.00	22.05	22.70	33.40	19.03
MCX20-09	1.00	19.05	11.40	24.75	3.09
MCX10-10	1.00	94.65	14.40	101.85	12.15
MCX10-11	1.00	26.05	1.05	26.58	59.82
MCX10-12	1.00	23.70	35.70	41.55	73.54
MCX10-13	1.00	30.30	176.05	118.33	232.66
MCX10-16	1.00	4.05	0.35	4.23	0.53
MCX10-17	1.00	8.10	1.05	8.63	1.08
MCX10-19	1.00	13.70	39.70	33.55	7.92
MCX10-20	1.00	7.05	9.70	11.90	13.15
MCX10-21	1.00	7.05	6.35	10.23	1.50
MCX10-22	1.00	126.60	0.70	126.95	15.91
MCX10-23	1.00	19.05	56.05	47.08	4.92
MCX10-24	1.00	195.85	27.40	209.55	376.53
MCX10-02	1.00	731.35	125.60	794.15	27.23

SUBAREA	One Index	POP_1997	EMP_1997	97 Equiv Pop	1997 Sewer Acres
MCX10-03	1.00	33.30	1.35	33.98	16.50
MCX10-04	1.00	100.60	4.75	102.98	45.66
MCX10-05	1.00	53.30	2.05	54.33	6.80
MCX10-06	1.00	247.50	12.55	253.78	74.89
MCX10-07	1.00	280.85	47.05	304.38	147.53
MCX10-08	1.00	171.25	140.30	241.40	125.29
MCX10-09	1.00	11.80	1.75	12.68	115.77
MCX10-14	1.00	9.10	3.05	10.63	72.87
MCX10-15	1.00	10.75	10.40	15.95	149.67
MCX10-18	1.00	17.05	49.05	41.58	3.03
MCX20-02	1.00	5.40	10.05	10.43	1.30
SUB-TOTALS	32.00	2,849.70	1,053.00	3,376.20	2,369.16
B.F. CUR. + MC	94.03	70,355.73	14,952.05	77,831.75	13,284.02
B.F. TOT + MC	108.03	72,123.98	16,028.50	80,138.23	15,068.49
BF000350-S	1.00	6,310.18	2,608.44	7,614.40	1,114.31
BF000350-N	1.00	7,595.02	3,139.56	9,164.80	1,341.20
TCWSC LINE	1.19	13,905.20	5,748.00	16,779.20	2,455.51
BF - TCWSC		58,218.78	10,280.50	63,359.03	12,612.98
BF - M.C.		55,369.08	9,227.50	59,982.83	10,243.82
BF - MC - BFX		53,600.83	8,151.05	57,676.35	8,459.36
BF000350-S	1.00	6,310.18	2,608.44	7,614.40	1,114.31
BF000350-N	1.00	7,595.02	3,139.56	9,164.80	1,341.20
BF000890-S	1.00	6,063.95	561.15	6,344.53	608.34
TCWSC (REV.)		19,969.15	6,309.15	23,123.73	3,063.85
BF000350-N	1.00	7,595.02	3,139.56	9,164.80	1,341.20
BF000890-S	1.00	6,063.95	561.15	6,344.53	608.34
NRH (BF)		13,658.97	3,700.71	15,509.33	1,949.54
BF000380	1.00	11,104.55	2,048.80	12,128.95	1,311.38
BF000890-W	1.00	1,246.11	115.31	1,303.77	125.01
HALTOM (BF)		12,350.66	2,164.11	13,432.72	1,436.39
LF000410	1.00	11,337.50	3,337.50	13,006.25	1,794.56
EXTRA LF AREA	1.00	12,605.37	3,710.73	14,460.74	1,995.25
HALTOM (BF+LF)		24,956.04	5,874.85	27,893.46	3,431.63

SUBAREA	One Index	POP_1997	EMP_1997	97 Equiv Pop	1997 Sewer Acres

NOTES:

Refer to Drain. Area Map titled "Lower Big Fossil Watershed" included in TAB 1 of the report.

DESIGN OPTIONS:

1a TOTAL BIG FOSSIL	108.03	72,123.98	16,028.50	80,138.23	15,068.49
LITTLE FOSSIL	1.00	12,605.37	3,710.73	14,460.74	1,995.25
TOTAL	109.03	84,729.35	19,739.23	94,598.97	17,063.73
1b LESS MARINE CK.	77.03	81,879.65	18,686.23	91,222.77	14,694.57
1c LESS INTEL	77.03	81,879.65	18,686.23	91,222.77	14,694.57
1d LESS LITTLE FOS.	108.03	72,123.98	16,028.50	80,138.23	15,068.49
2a LESS R. HILLS	108.03	78,419.17	17,130.79	86,984.57	15,949.42
2b TCWSC (RH)	1.00	6,310.18	2,608.44	7,614.40	1,114.31
3a F.W. _ H.C. ONLY	109.03	64,760.20	13,430.08	71,475.24	13,999.89
3b TCWSC (NRH,RH)	0.00	19,969.15	6,309.15	23,123.73	3,063.85

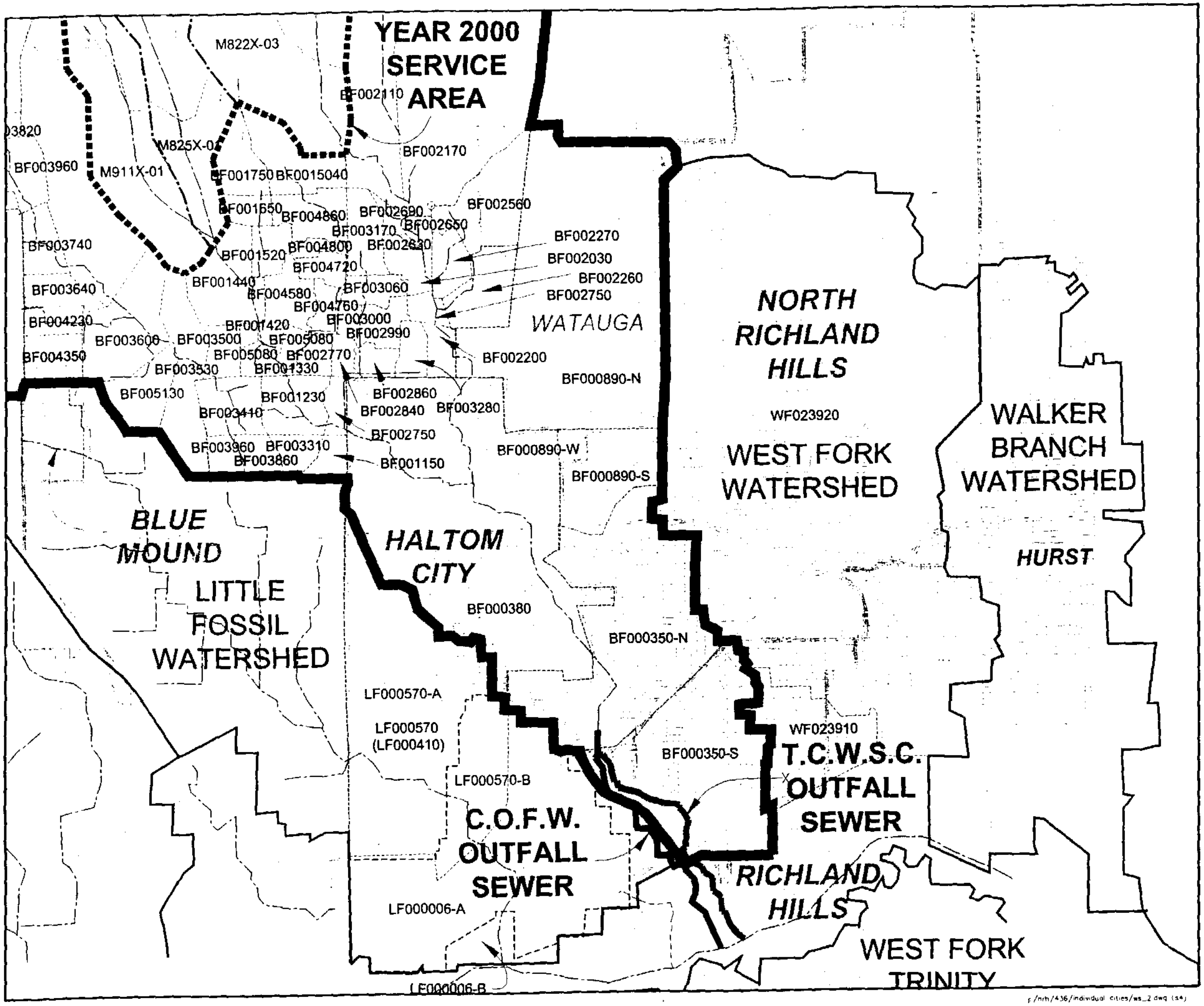
NOTE: Options Which Ir

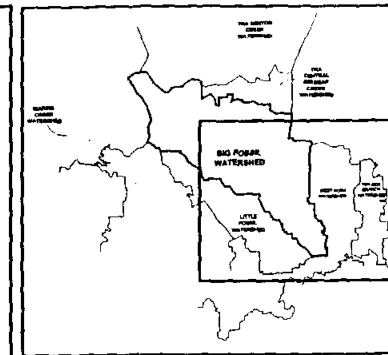
SUBAREA	One Index	POP_1997	EMP_1997	97 Equiv Pop	1997 Sewer Acres
TOTALS BY CITY					
(1) Haslet	1	156	55	183	407
(2) Haltom City	2	12,351	2,164	13,433	1,436
(3) Watauga	1	19,185	1,775	20,073	1,925
(4) N. Richand Hills	2	13,659	3,701	15,509	1,950
(5) Richland Hills	1	6,310	2,608	7,614	1,114
(6) Saginaw	1	343	152	419	608
(7) Fort Worth	100	20,120	5,573	22,907	7,628

Notes:

EXHIBIT "I"

WATERSHED SUB-AREA MAPS





Notes:

1. This document is prepared in accordance with the provisions of Regional Facility Planning Contract No. 99-483-308, dated 5/18/99, between the City of North Richland Hills and the TWDB, with funding participation by the City of Fort Worth, Haltom City and Richland Hills.

2. Watershed areas shown are based on watershed and drainage area maps included in the City of Fort Worth Sanitary Sewer Masterplan dated September, 1998, prepared by Freese and Nichols, Inc., Montgomery Watson, and Brown & Root, Inc. Data furnished to KEF for this study by the City of Fort Worth Water Dept.

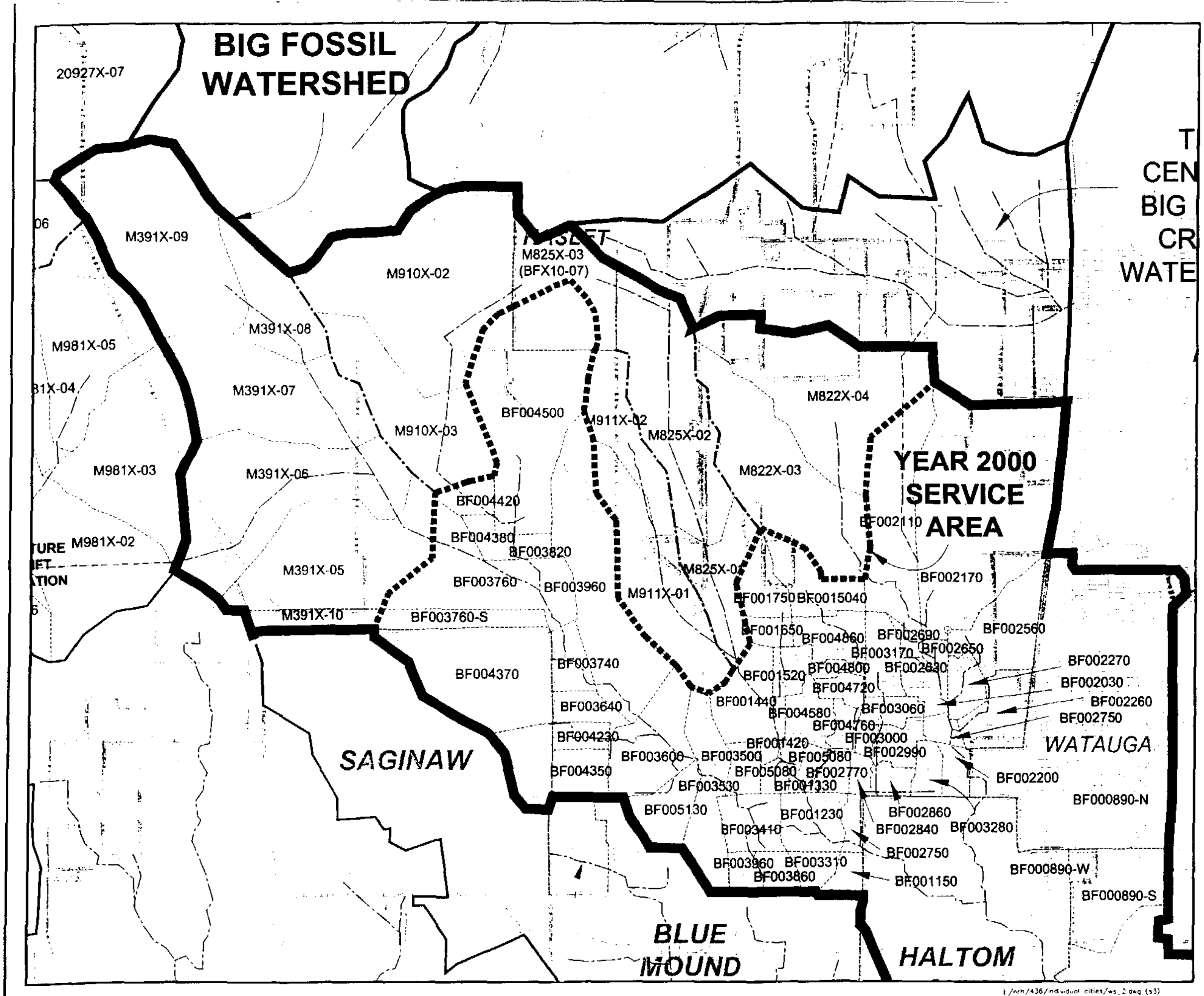
BIG FOSSIL SEWER STUDY

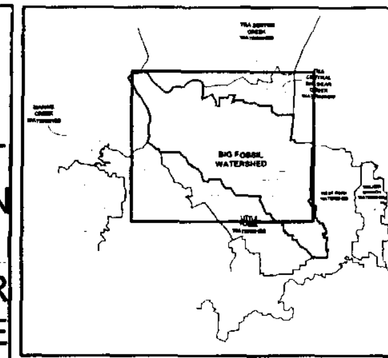
LOWER BIG FOSSIL WATERSHED

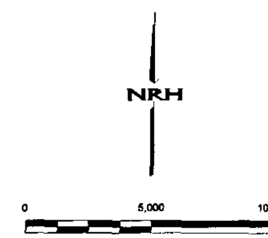
CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

f:/nrh/436/individual cities/ws_2.dwg (s4)







Notes:

1. This document is prepared in accordance with the provisions of Regional Facility Planning Contract No. 99-483-308, dated 5/18/99, between the City of North Richland Hills and the TWDB, with funding participation by the City of Fort Worth, Haltom City and Richland Hills.

2. Watershed areas shown are based on watershed and drainage area maps included in the City of Fort Worth Sanitary Sewer Masterplan dated September, 1998, prepared by Freese and Nichols, Inc., Montgomery Watson, and Brown & Root, Inc. Data furnished to KEF for this study by the City of Fort Worth Water Dept.

BIG FOSSIL SEWER STUDY

UPPER BIG FOSSIL WATERSHED

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: RWA	REV. BY DATE SYMB.	DATE: DECEMBER, 1999
DRAWN BY: RWA		JOB NO. 3-436
CHECKED BY: KEE		SHEET NO. 3 OF 4

i:/nrh/436/individual cities/ws_2.dwg (s3)

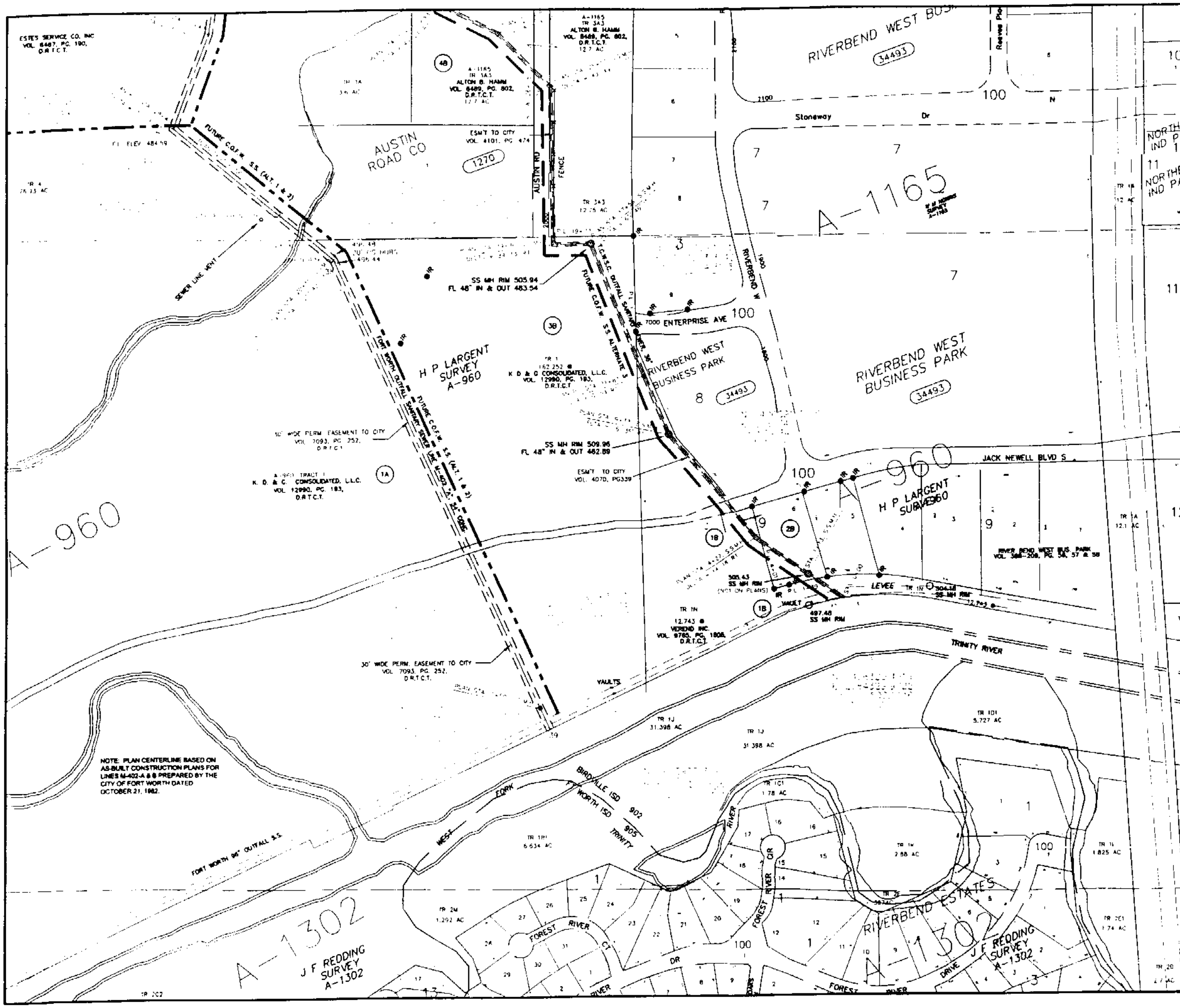
EXHIBIT "J"

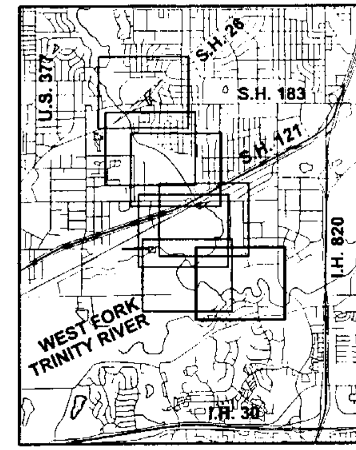
REVISED R.O.W. PLAN MAPS

SHOWING PROPOSED RELIEF SEWER

ALIGNMENT ALTERNATES

1, 2 AND 3





NRH

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SCALE: 1" = 400'

Notes:

1. This document is prepared in accordance with the provisions of Regional Facility Planning Contract No. 99-483-308, dated 5/18/99, between the City of North Richland Hills and the TWDB, with funding participation by the City of Fort Worth, Haltom City and Richland Hills.

2. This drawing is based on a field survey prepared by Spooner & Associates, Inc., Land Surveyors, (817-282-6981), dated 11/11/99, with R.O.W. document research by Universal Field Services, Inc. (918-494-7600), and KEF, Inc., (817-283-6211), with data plotted on property maps furnished by the Tarrant County Appraisal District.

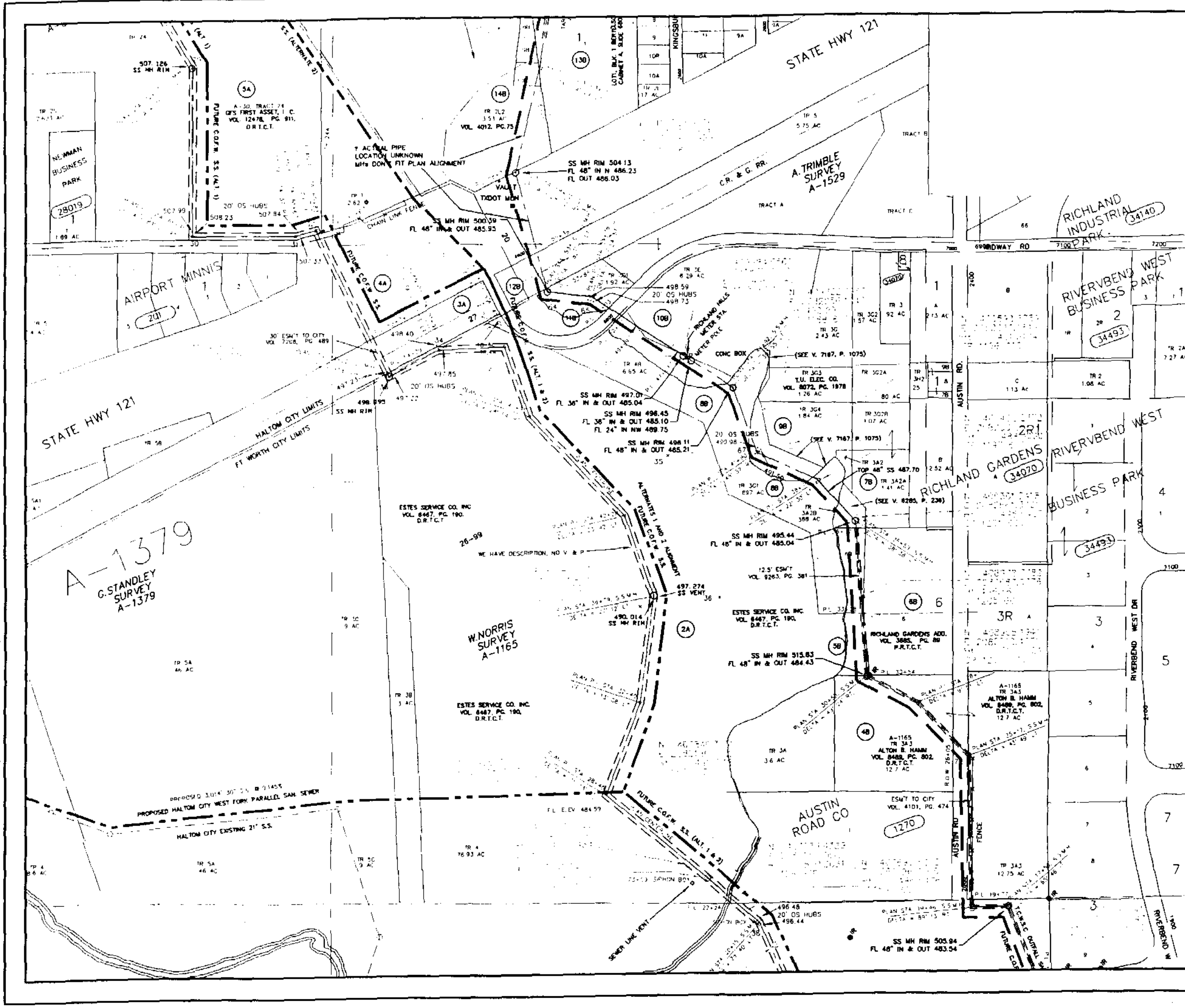
BIG FOSSIL SEWER STUDY

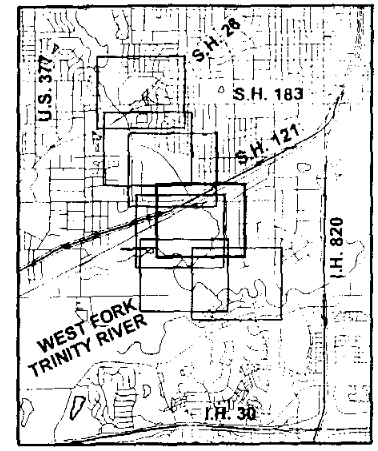
R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: RWA	REV. BY DATE SYMBOL	DATE: DECEMBER, 1999
DRAWN BY: RWA		JOB NO. 3-436
CHECKED BY: KEE		SHEET NO.





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BIG FOSSIL SEWER STUDY

R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

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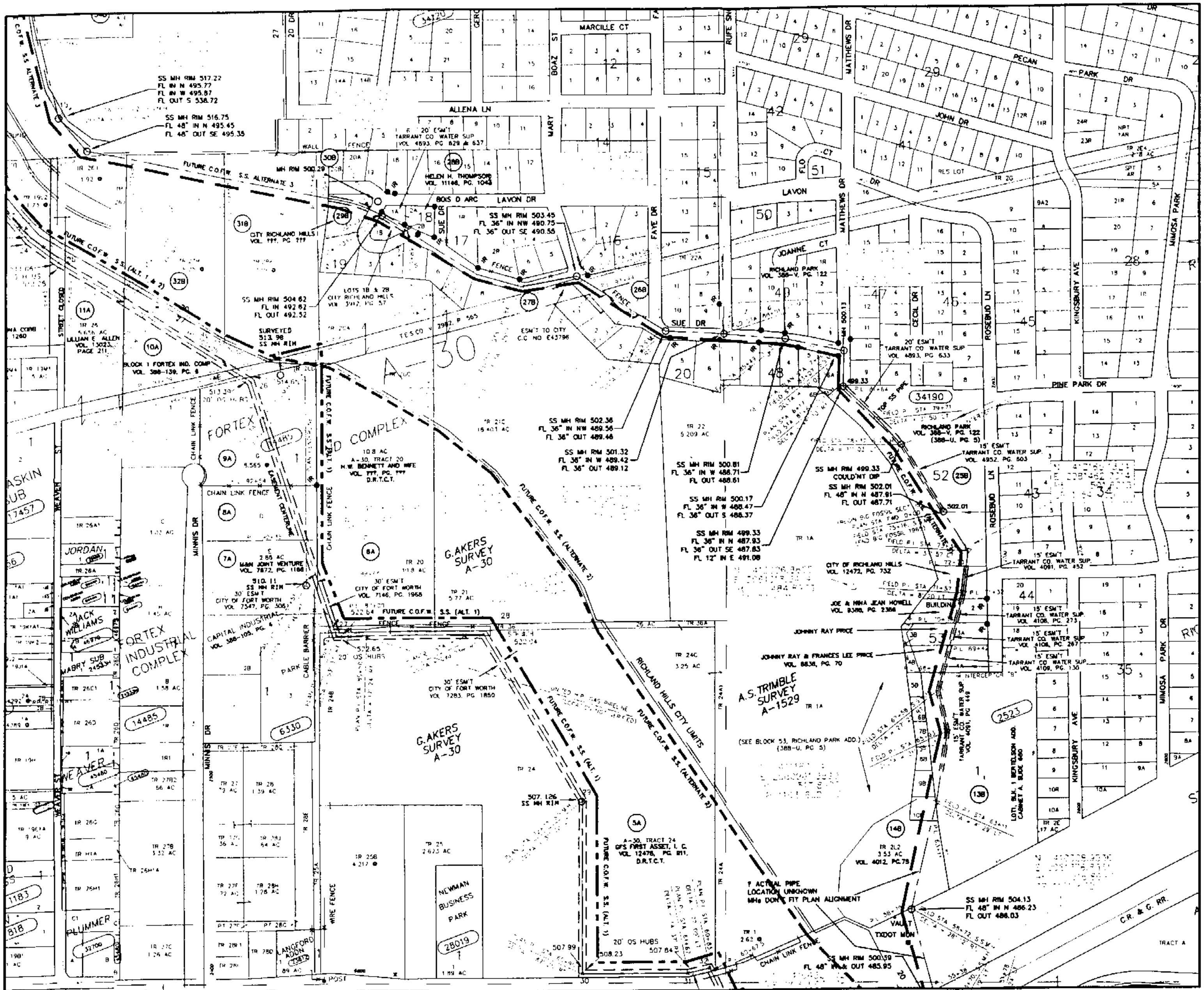

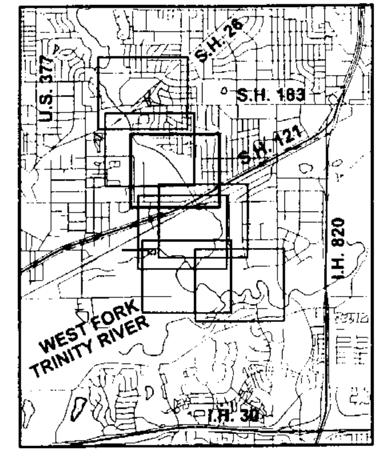

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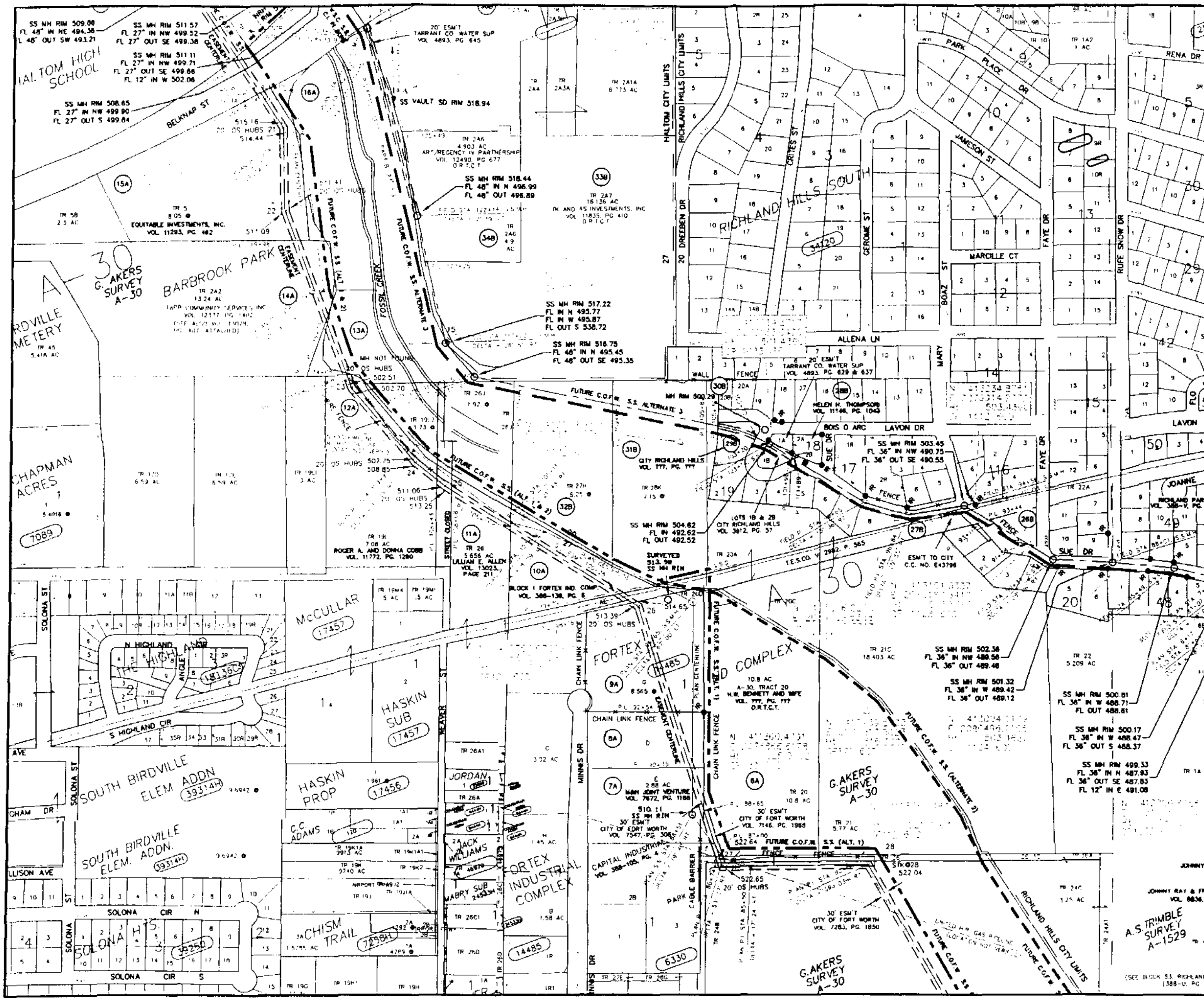
BIG FOSSIL SEWER STUDY

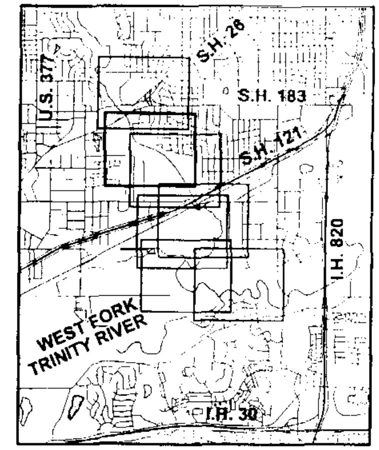
R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY RWA	REV. BY DATE SYMBOL	DATE DECEMBER, 1999
DRAWN BY RWA		JOB NO 3-436
CHECKED BY KLE		SHEET NO 3 OF 5





NRH

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SCALE: 1" = 400'

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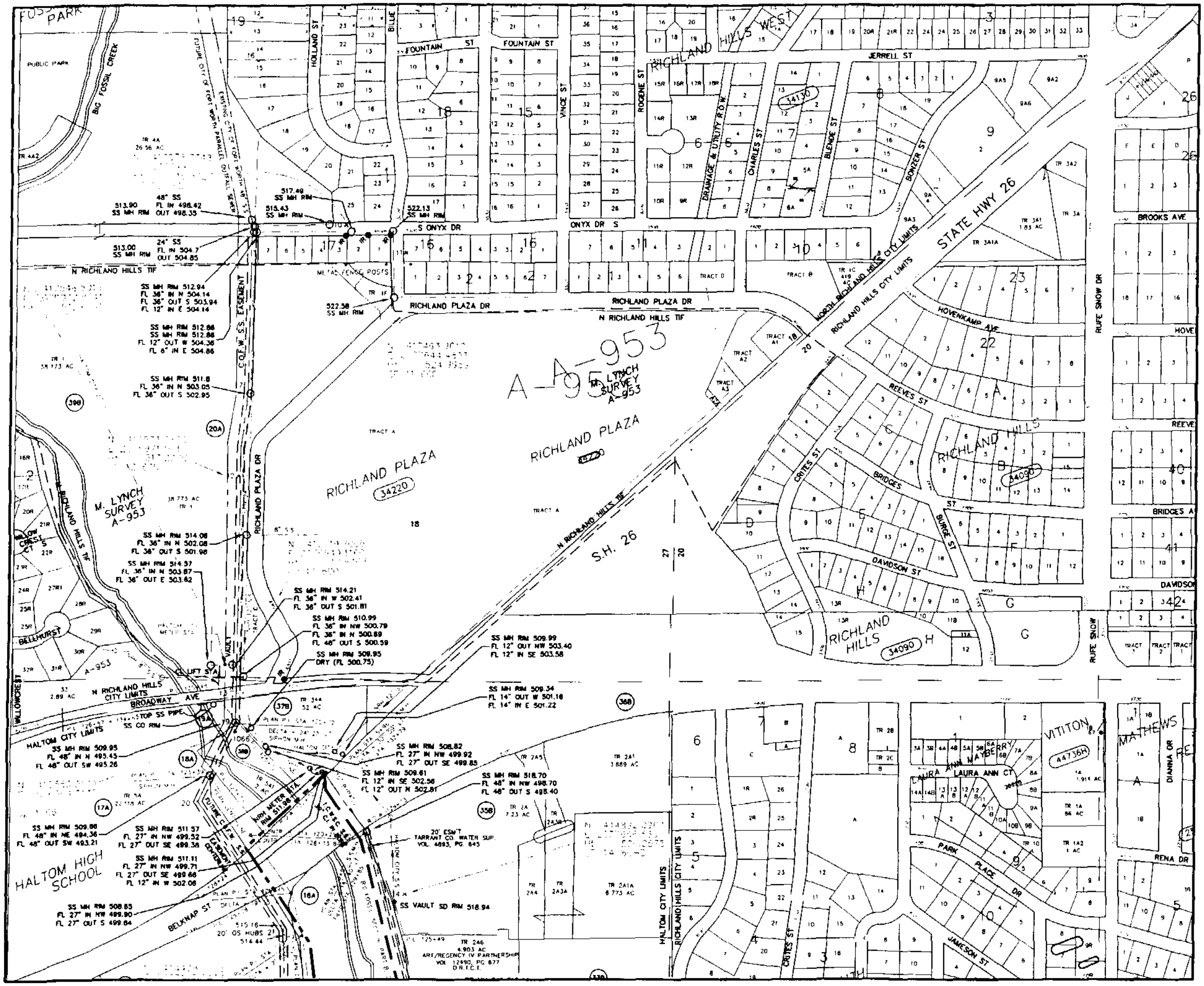
BIG FOSSIL SEWER STUDY

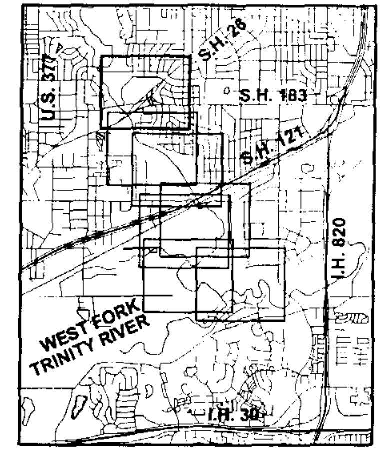
R.O.W. STRIP MAP

CITY OF NORTH RICHLAND HILLS

KNOWLTON-ENGLISH-FLOWERS, INC.
CONSULTING ENGINEERS / Fort Worth-Dallas

DESIGNED BY: RWA
DRAWN BY: RWA





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DESIGNED BY RWA	REV. BY DATE SYMBOL	DATE DECEMBER, 1999
DRAWN BY RWA		JOB NO. 3-436
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