TARRANT COUNTY WATER CONTROL
AND IMPROVEMENT DISTRICT NO. 1

Report to the
Texas Water Development Board

REGIONAL WASTEWATER FACILITY PLAN FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

TWDB CONTRACT NO. 9-483-737

Final Report
April 1990

Prepared by

Alan Plummer and Associates, Inc.
CIVIL/ENVIRONMENTAL ENGINEERS · ARLINGTON-AUSTIN-FORT WORTH, TEXAS

In Association with

Rady and Associates, Inc.
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ENVIRONMENTAL/CIVIL ENGINEERS

307-0603/2

April 27, 1990

Mr. David H. Marshall, P.E.
Tarrant County Water Control and Improvement
District Number One
6506 Wells Burnett
Fort Worth, Texas 76136

Re: Regional Wastewater Facility Planning Study for a Portion of the Eagle Mountain Lake and Lake Worth Watersheds - Final Report

Dear Mr. Marshall:

Fifty copies of the final report for the referenced project are enclosed for distribution to study participants and to the Texas Water Development Board. Comments received from the study participants and from the Texas Water Development Board have been addressed in this document.

This report identifies Alternative 2b (serving Azle and Pelican Bay through a single "regional" plant in the Azle area, with service to the Silver Creek and Live Oak Creek watersheds via the City of Fort Worth collection system) as the most cost-effective of the five primary alternatives evaluated. Project costs associated with the remaining alternatives are also presented in this report for comparison purposes.

We appreciate the opportunity to serve the District on this project. If you have any questions, please call.

Sincerely,

ALAN PLUMMER AND ASSOCIATES, INC.

Richard H. Smith

Richard H. Smith, P.E.

Sincerely,

ALAN PLUMMER AND ASSOCIATES, INC.

Mark A. Perkins

Mark A. Perkins, P.E.

RHS:MAP:rmb
Enclosures

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

CHAPTER I
EXECUTIVE SUMMARY

BACKGROUND

1. In 1988, the Tarrant County Water Control and Improvement District No. 1 (District), in cooperation with the Texas Water Development Board (TWDB) completed a comprehensive water quality management and facility planning study for the upper West Fork and Clear Fork of the Trinity River basin, including the Eagle Mountain Lake and Lake Worth watersheds.

   The 1988 study projected that both point and nonpoint source pollutant loadings would increase with future development in the areas west of Eagle Mountain Lake and Lake Worth. At the time of the 1988 study, the Texas Water Commission had initiated an intensive water quality survey of Eagle Mountain Lake, to be followed by a modeling effort to evaluate the assimilative capacity of Eagle Mountain Lake. This modeling effort has yet to be finalized. The 1988 study indicated, however, that results of the modeling could lead communities currently discharging to Eagle Mountain Lake to consider either diverting their treated effluent flows out of the Lake's watershed or upgrading existing treatment facilities in a manner that would ultimately facilitate phosphorus removal and nitrification capability.

2. The City of Azle currently operates separate wastewater collection and treatment facilities in both the Ash Creek and Walnut Creek watersheds. Both facilities discharge treated effluent to Eagle Mountain Lake. Both of the existing plants currently have permits which allow effluent BOD and TSS concentrations of 10 and 15 mg/l, respectively. Neither has limitations on ammonia or phosphorous at present. Both plants are currently in compliance with the effluent quality restrictions set forth in their current permits.

3. The City of Azle has submitted an application for amendment of the Texas Water Commission permit for its Ash Creek Wastewater treatment facility. The Texas Water Commission has withheld action on the City's application until completion of this study, which evaluates the economic feasibility of several conceptual alternatives for providing future wastewater service to the City of Azle. Two of the conceptual alternatives evaluated in this study involve transfer of Azle's wastewater out of the Eagle Mountain Lake watershed.

4. Save Eagle Mountain Lake, Inc., a local citizen's organization, advocates elimination of all wastewater discharges to Eagle Mountain Lake.

5. The City of Fort Worth owns and operates a large regional wastewater collection and treatment system which currently extends to areas immediately south and east of the planning area. The City of Fort Worth's recently-adopted Wastewater System Plan proposes future extension of the system to serve the Silver Creek and Live Oak Creek watersheds, as well as the City of Azle, by the year 2010. The proposed extension of service to these areas is predicated largely on a goal of protecting water supply resources in Eagle Mountain Lake and Lake Worth. The North Central Texas Council of Governments, in its Draft 1990 Annual Water Quality Management Plan, has indicated that service to this area may ultimately be provided by the City of Fort Worth.

6. The City of Pelican Bay, located north of Azle along the shores of Eagle Mountain Lake, has no existing wastewater collection or treatment facilities at present. Concerns about water pollution resulting from malfunctioning septic tanks in the Pelican Bay area have been recorded.

7. The primary objective of this study is to assess the relative economic feasibility of a number of conceptual alternatives for providing future wastewater service in the study area. Environmental impacts associated with each alternative have not been evaluated in detail as part of this study. Although the potential costs of complying with several different effluent limit scenarios has been evaluated, no recommendations with regard to these limits are made as part of this study.

Texas Water Development Board Contract No. 9-483-737 between the Texas Water Development Board and the Tarrant County Water Control and Improvement District No. 1 establishes the general scope of this study and defines the specific wastewater facility alternatives that are to be evaluated as a part of the study. The alternatives identified in this contract are as follows:

Alternative 1

Establish a new wastewater treatment plant in the Silver Creek and Live Oak Creek drainage basins in conjunction with continued operation (with upgrade and/or expansion) of the existing Ash Creek and Walnut Creek Wastewater Treatment Plants in the City of Azle.

Alternative 2A

Construct collection facilities to transport all future wastewater flows from the planning area to the City of Fort Worth Wastewater Collection System for treatment at the existing Village Creek Wastewater Treatment Plant. This alternative would result in elimination of the City of Azle's discharges from the Eagle Mountain Lake Watershed as is advocated by Save Eagle Mountain Lake, Incorporated.

Alternative 2B

Collect all future wastewater flows from the Fort Worth portion of the planning area (Silver Creek and Live Oak Creek watersheds) and transport these flows through the Fort Worth Collection System to the Village Creek Wastewater Treatment Plant. All flows from the remaining portions of the planning area will be collected for treatment at a single new wastewater treatment plant in the Azle area which will discharge to Eagle Mountain Lake.

Alternative 3

Collect all future wastewater flows from the planning area and transport these flows to a single new "satellite plant" designed to discharge a high quality effluent to Eagle Mountain Lake.

Alternative 4

Collect all future wastewater flows from the planning area and transport these flows to a single new "satellite plant" designed to discharge a high quality effluent to Lake Worth. This alternative would result in elimination of the City of Azle's discharges from the Eagle Mountain Lake Watershed as is advocated by Save Eagle Mountain Lake, Incorporated.

In addition to these alternatives, this study has evaluated the relative impacts on feasibility of participation by the cities of Pelican Bay and Lakeside in various systems. The financial advantages and disadvantages of participation in a regional system by the City of Azle have also been reviewed.

FINDINGS AND RECOMMENDATIONS

1. Populations within the lower Ash Creek, Walnut Creek, Silver Creek, and Live Oak Creek watersheds on the west sides of Eagle Mountain Lake and Lake Worth are projected to increase steadily during the next 20 years. The total population of the planning area covered by this study is expected to increase from 18,404 persons in 1990 to 26,358 persons in 2010. The Walnut Creek watershed, including portions of the City of Azle, is projected to be the location for the most notable increases.

2. Due to very low population densities in the upper reaches of these watersheds, it is anticipated that many of the residents of the study area will not be able to receive cost-effective organized sewerage service within the 20-year planning horizon. It is projected that the "sewered" population of the planning area will increase from 8,374 persons in 1990 (all of which will reside in or near the City of Azle) to 20,619 persons in year 2010.

3. Based on a direct comparison of projected long-term capital and operating costs associated with each alternative, it appears that alternative 2B (development of single "regional" plant to serve Azle and Pelican Bay, with the remaining portions of the study area being served through the existing City of Fort Worth system) will be the most cost-effective of the five primary alternatives evaluated in this study.

4. It is noted that Alternative 2B, while projected to be the most cost-effective of the five primary alternatives evaluated, is inconsistent with improvements proposed for this area through year 2010 by the City of Fort Worth's Wastewater System Plan, and is consequently inconsistent with the NCTCOG Draft 1990 Annual Water Quality Management Plan. For the 20-year planning horizon investigated, wastewater service for the Ash Creek and Walnut Creek watersheds, as well as for areas north such as Pelican Bay, would

be served through a "regional" plant in the Azle area under Alternative 2B. The City of Fort Worth's Wastewater System Plan proposes future service to these areas through the Fort Worth collection system. It is emphasized, however, that implementation of Alternative 2B would not necessarily preclude ultimate wastewater service to the Azle area through the City of Fort Worth's system.

5. It does not appear that consolidation of all study area flows into a single wastewater system will be the most cost-effective alternative during the 20-year planning horizon examined. If population growth or permit requirements change substantially from projected trends used for this study, the feasibility of consolidating service should be reevaluated at that time.

6. Population densities projected for the Silver Creek and Live Oak Creek watersheds will probably make wastewater service to their upper reaches prohibitively expensive during the 20-year planning horizon. During this period, service through the existing City of Fort Worth collection system appears to be the most cost-effective means of providing wastewater service within the Silver Creek and Live Oak Creek watersheds. It is suggested that the City of Fort Worth give consideration to land acquisition for a satellite plant that may prove feasible in the Silver Creek/Live Oak Creek watersheds at some time beyond the 20-year planning horizon considered in this study.

7. The cost analyses conducted for this study suggest that, for economic reasons, the City of Azle should give consideration to expanding and upgrading its existing Ash Creek wastewater treatment plant, abandoning its Walnut Creek plant, and consolidating all of its wastewater treatment services at the Ash Creek site. It is noted, however, for purposes of planning beyond the 20-year planning horizon considered in this study, that the Walnut Creek

watershed may ultimately contribute the majority of the Azle area's flows.

8. The projected probable costs of capital improvements associated with each alternative evaluated are presented in detail in Chapters VII and VIII.

9. These analyses suggest that participation by the City of Lakeside would contribute to the economic feasibility of any sewerage system to be developed within the Silver Creek and Live Oak Creek watersheds.

10. It appears that the following entities would be the most appropriate management agencies for the proposed facilities:

    - Azle Area Wastewater Treatment Plant: City of Azle or "regional entity" such as the Trinity River Authority of Texas.

    - Collection System Facilities within City of Azle: City of Azle.

    - Interceptor System Facilities in Silver Creek and Live Oak Creek Watersheds: City of Fort Worth or other "regional entity."

    - Interceptor Facilities Connecting Pelican Bay to Azle System: Pelican Bay or "regional entity" such as Trinity River Authority.

11. It is noted that specific recommendations with regard to effluent quality standards for each alternative evaluated are beyond the scope of this study, but could influence selection of an alternative for further development. Additional evaluations with respect to the potential water quality impacts associated with expanding and upgrading the Ash Creek plant are recommended.

CHAPTER II
INTRODUCTION

BACKGROUND

In 1988, the Tarrant County Water Control and Improvement District No. 1 (District), in cooperation with the Texas Water Development Board (TWDB), completed a comprehensive study to identify wastewater facilities needed to accommodate future population growth and to protect water quality in a 2,725 square mile planning area that includes the upper West Fork and Clear Fork of the Trinity River Basin in north Texas. The study area includes the watersheds of six reservoirs, among which were Lake Worth and Eagle Mountain Lake. These reservoirs are currently, and will continue to be, the sources of water supply for a large number of people in the North Texas area, including residents of Fort Worth and Arlington.

The 1988 study projected that both point and nonpoint source pollutant loadings would increase with future development in the areas west of Eagle Mountain Lake and Lake Worth. At the time of the 1988 study, the Texas Water Commission had initiated an intensive water quality survey of Eagle Mountain Lake, to be followed by a modeling effort to evaluate the assimilative capacity of Eagle Mountain Lake. this modeling effort has yet to be finalized. The 1988 study indicated, however, that results of the modeling could lead communities currently discharging to Eagle Mountain Lake to consider either diverting their treatment effluent flows out of the Lake's watershed or upgrading existing treatment facilities in a manner that would ultimately facilitate phosphorus removal and nitrification capability. As an additional consideration, one local citizen's group, Save Eagle Mountain Lake, Inc., has advocated elimination of all wastewater discharges to Eagle Mountain lake.

The City of Azle operates two existing municipal wastewater treatment facilities that discharge to Eagle Mountain Lake. On January 5, 1989, the Texas Water Commission issued new wastewater discharge permits for each of

the City of Azle's existing plants. As a result of a public hearing held in November of 1988, the City of Azle submitted an application for further amendment to its permit for the Ash Creek wastewater treatment plant. This application was submitted by the City to the Texas Water Commission on May 21, 1989, and has been determined to be administratively complete by the Water Commission.

As the study presented herein was being initiated in order to assess the feasibility and cost-effectiveness of several alternative means for providing wastewater treatment service for the affected area, the Texas Water Commission has delayed action of the City's permit application. The delayed action on behalf of the Water Commission, is intended to allow the City time to evaluate its alternatives for future wastewater treatment and to facilitate the Water Commission in giving consideration to the City's future plans when developing and amended permit.

OBJECTIVES OF STUDY

It has been frequently suggested by representatives of Save Eagle Mountain Lake, Inc. that the City of Azle should divert its wastewater treatment plant effluent out of the Eagle Mountain Lake watershed.

One of the objectives of this study is to assess the relative economic feasibility of diverting wastewater from the Azle area out of the Eagle Mountain Lake watershed, downstream to the City of Fort Worth's wastewater system or to a new "Satellite" plant discharging to Lake Worth.

As the City of Fort Worth's Wastewater System Plan indicates a need for sewerage service within the Silver Creek and Live Oak Creek watersheds in the near future, another objective of this study is to assess the relative economic feasibility of several conceptual alternatives for development of sewerage systems in these areas.

In recognition of these primary objectives, five primary conceptual alternatives for providing wastewater service to the west side of Eagle Mountain Lake and Lake Worth were identified. TWDB Contract No. 9-483-737 between the TWDB and the District establishes the general scope of this study and defines the specific wastewater facility alternatives that are to be evaluated as a part of the study. The alternatives identified in this contract are as follows:

Alternative 1

Establish a new wastewater treatment plant in the Silver Creek and Live Oak Creek drainage basins in conjunction with continued operation (with upgrade and/or expansion) of the existing Ash Creek and Walnut Creek Wastewater Treatment Plants in the City of Azle. (Under this alternative, the City of Pelican Bay would be served through Azle's Walnut Creek plant.)

Alternative 2A

Construct interceptor facilities to transport all future wastewater flows from the entire planning area to the City of Fort Worth Wastewater Collection System for treatment at the existing Village Creek Wastewater Treatment Plant. This alternative would result in elimination of the City of Azle's discharges from the Eagle Mountain Lake Watershed as is advocated by Save Eagle Mountain Lake, Incorporated.

Alternative 2B

Collect all future wastewater flows from the Fort Worth portion of the planning area (Silver Creek and Live Oak Creek watersheds) and transport these flows through the Fort Worth Collection System to the Village Creek Wastewater Treatment Plant. All flows from the remaining portions of the planning area will be collected for treatment at a single new

wastewater treatment plant in the Azle area which will discharge to Eagle Mountain Lake.

Alternative 3

Collect all future wastewater flows from the planning area and transport these flows to a single new "satellite plant" designed to discharge a high quality effluent to Eagle Mountain Lake.

Alternative 4

Collect all future wastewater flows from the planning area and transport these flows to a single new "satellite plant" designed to discharge a high quality effluent to Lake Worth. This alternative would result in elimination of the City of Azle's discharges from the Eagle Mountain Lake Watershed as is advocated by Save Eagle Mountain Lake, Incorporated.

As it is presently unknown what effluent quality criteria will be required for discharges to Eagle Mountain Lake or for any future discharges to Lake Worth, costs for Alternatives 1, 2B, 3 and 4 were each developed for three possible effluent scenarios. It is emphasized that no specific recommendations with regard to effluent quality limitations are made as part of this study. Results of these analyses allow an economic comparison of the five primary alternatives listed above, and demonstrate relative differences in cost of service that may be expected to result from varying permit limits being imposed.

LOCATION OF PLANNING AREA

A map showing the location of the planning area and the layout of each of the major watersheds within the planning area is presented in Figure II-1. The

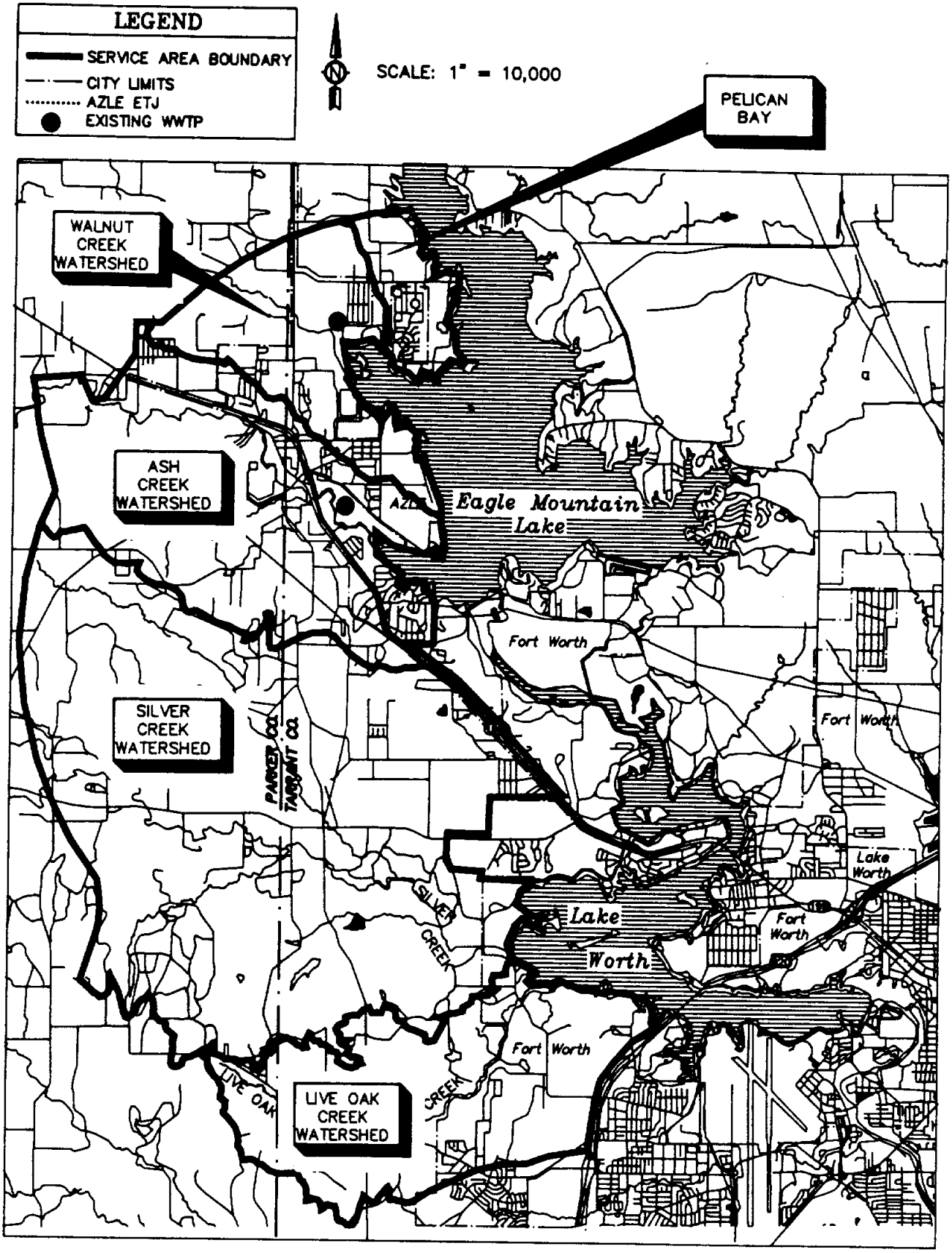


FIGURE II – 1
PLANNING AREA MAP

planning area generally includes the watersheds of Live Oak Creek, Silver Creek, Ash Creek and Walnut Creek, along with the cities of Pelican Bay and Lakeside that lie within an area generally bounded on the east by Eagle Mountain Lake and Lake Worth and on the west by the extraterritorial jurisdiction boundaries of the cities of Fort Worth and Azle. The study area is generally located northwest of the City of Fort Worth, Texas.

LOCAL PARTICIPATION IN STUDY

This study was initiated by the District in cooperation with the TWDB. Funding assistance for this study has been provided by the cities of Azle and Fort Worth. Personnel from the District, the cities of Azle and Fort Worth, and from the Trinity River Authority have participated actively in project meetings and have provided much of the information used in evaluating and developing the Alternatives. The following other entities that may be affected by this study have been informed of developments in the study and have been given opportunities to participate:

Parker County
Tarrant County
City of Pelican Bay
Central Texas Utilities
Community Water Supply Corporation
North Central Texas Council of Governments
Tarrant County Municipal Utility District No. 1

STATE PARTICIPATION

Fifty percent of the funding for this study was provided by the TWDB through the State's Research and Planning fund. The remaining fifty percent of the project funding was provided jointly by the District and by the cities of Fort Worth and Azle. Work performed for this study has been pursued in accordance with provisions of the TWDB's contract with the District.

CHAPTER III
PLANNING AREA DESCRIPTION

This chapter describes the location boundaries and general land use patterns within the project planning area.

STUDY AREA BOUNDARY

The area included within this study was shown in Figure II-1. In general, the study area is bounded on the east side by Eagle Mountain Lake, State Highway 199, and Lake Worth. The study area is bounded on the north and west sides by the extraterritorial jurisdiction limits of the cities of Azle and Fort Worth. The southern boundary of the study generally follows the southern boundary of the Live Oak Creek watershed. In general, the western shores of both Eagle Mountain Lake and Lake Worth are included in the study area.

The City of Azle, located within the Ash Creek and Walnut Creek watersheds, west of Eagle Mountain Lake, is the largest incorporated municipality located within the study area. The City of Pelican Bay, located on the western shore of Eagle Mountain Lake, northeast of the City of Azle, also lies within the study area. Identification of potential means of providing wastewater service to Pelican Bay is a key objective of this study. The City of Lakeside, located on the western shore of Lake Worth, near Highway 199, is not a study participant. This study does, however, recognize Lakeside as a potential future participant in any organized wastewater system that might be constructed along the western shores of Lake Worth.

DESCRIPTION OF INDIVIDUAL SERVICE AREA BOUNDARIES

Alternative 1

Alternative 1 would result in the development of three individual wastewater systems within the study area. The City of Azle's existing Walnut Creek

Wastewater Treatment Plant, upgraded and expanded as necessary, would provide wastewater treatment service to the portions of Pelican Bay and the Walnut Creek watershed that lie within the study area. The City of Azle's existing Ash Creek Wastewater Treatment Plant would continue to provide service to the Ash Creek watershed area, while a new "regional" wastewater system would be developed within the Silver Creek and Live Oak Creek watersheds. This regional plant could potentially provide service to the City of Lakeside. Service area boundaries for each of these systems are depicted in Figure III-1.

Alternative 2A

Under Alternative 2A, all wastewater flows generated within the entire study area would be transported across Lake Worth and to the existing City of Fort Worth Wastewater Collection System. A regional interceptor system would be constructed along State Highway 199 and along the western shores of Lake Worth and Eagle Mountain Lake to provide service to all municipalities and watersheds within the study area. The approximate service area boundaries for this system are depicted in Figure III-2. Both of the existing plant currently operated by the City of Azle would be abandoned under this alternative.

Alternative 2B

Under this alternative, flows generated within the Silver Creek and the Live Oak Creek watersheds (possibly including flows generated by the City of Lakeside) would be transferred to the existing City of Fort Worth Wastewater Collection System. Wastewater flows generated within the remaining portions of the study area would be served through a single "regional" plant discharging to Eagle Mountain Lake. The service area boundaries for the wastewater systems included in this alternative are depicted in Figure III-3. Under this alternative, it is most likely that the existing Ash Creek plant would be expanded to form the new regional plant, and that Azle's existing Walnut Creek Plant would be abandoned.

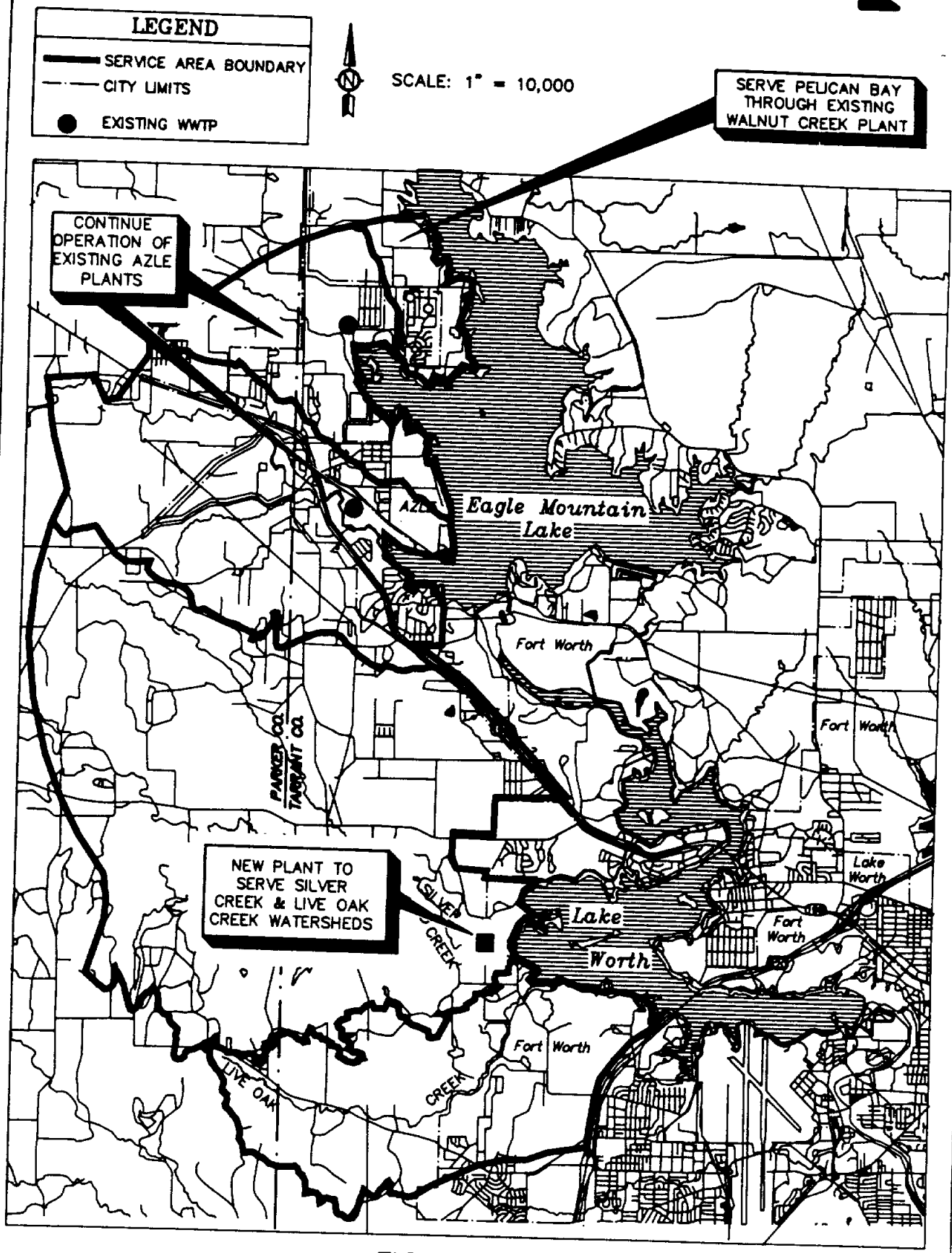


FIGURE III–1
ALTERNATIVE 1
SERVICE AREA BOUNDARIES

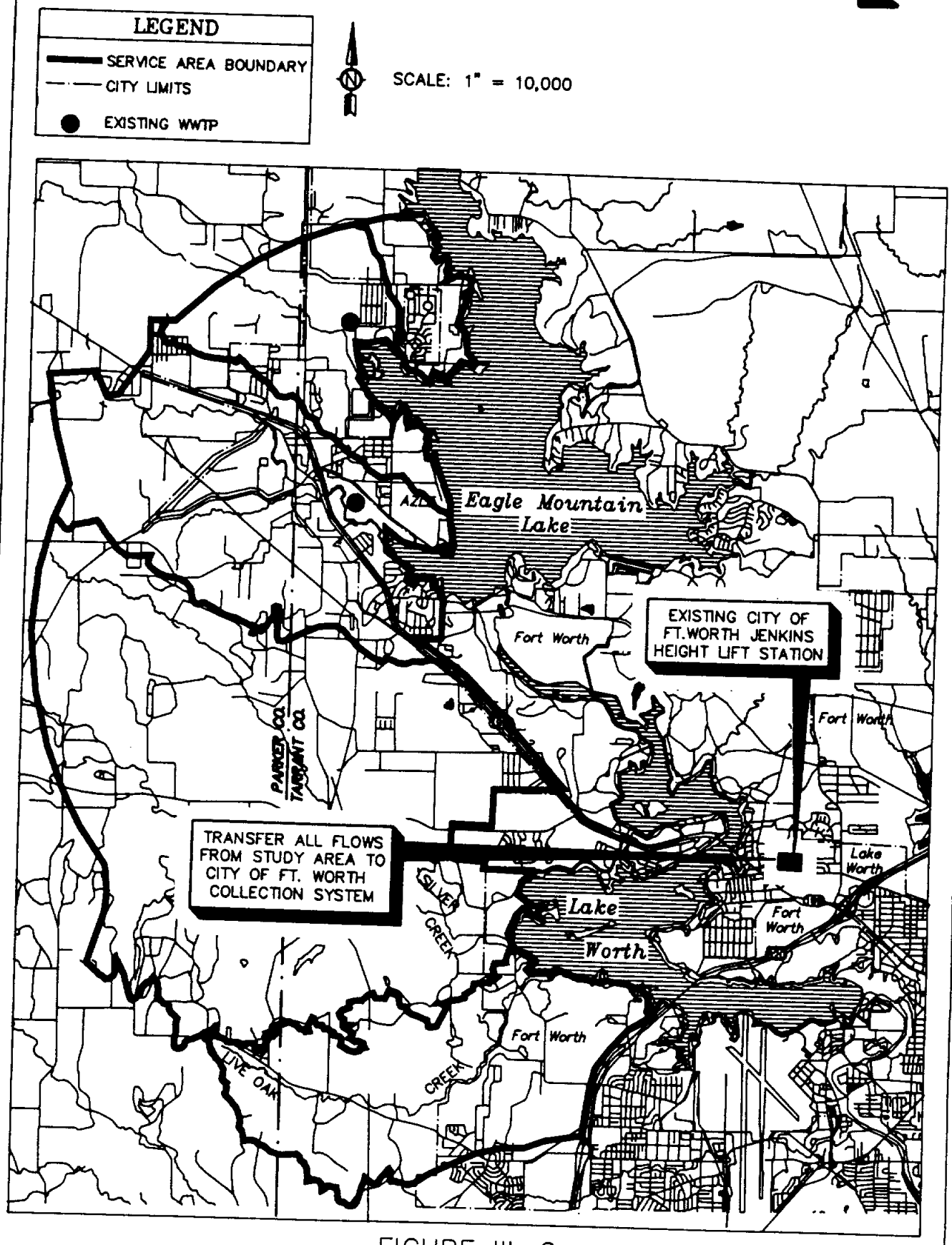


FIGURE III-2
ALTERNATIVE 2A
SERVICE AREA BOUNDARIES

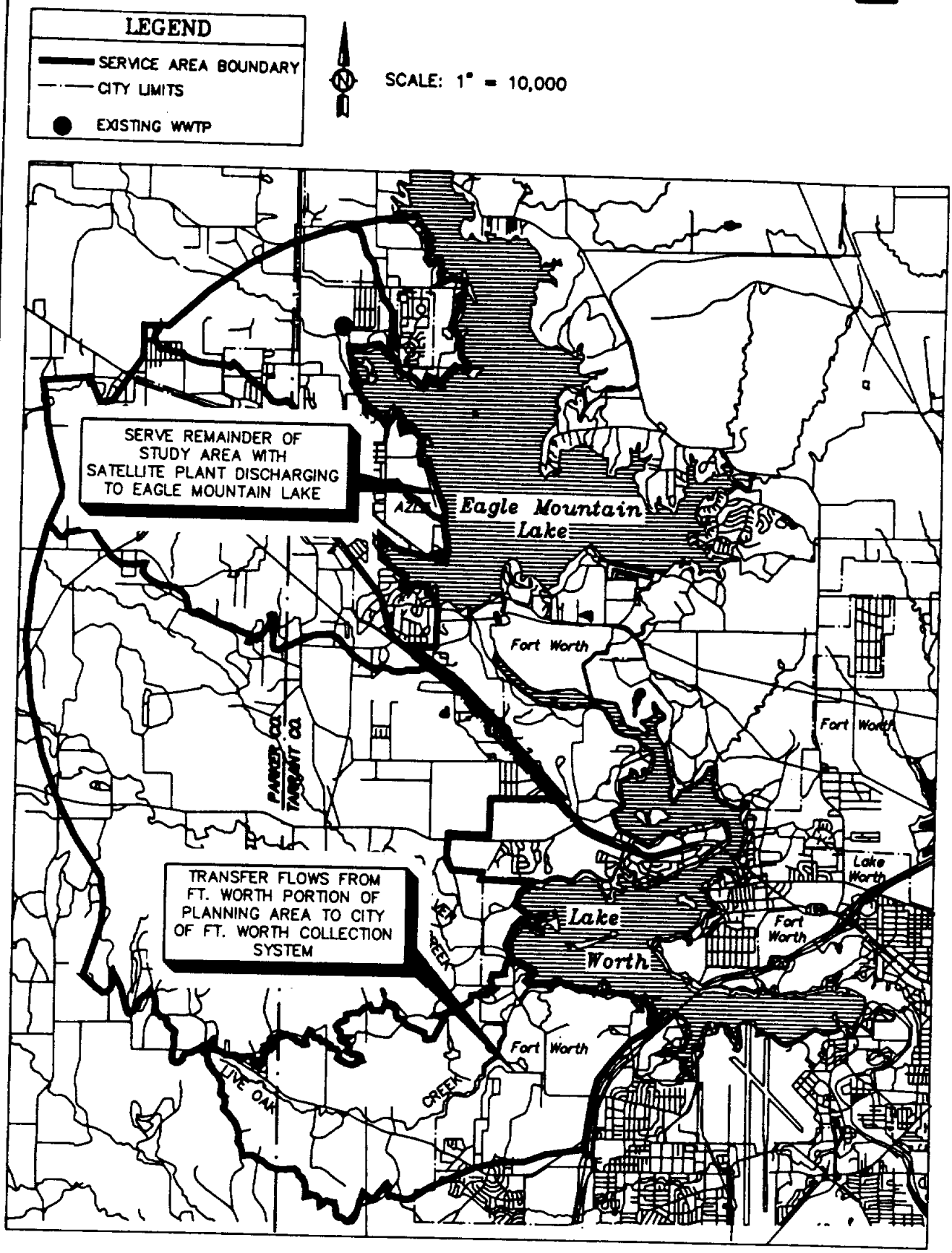


FIGURE III-3
ALTERNATIVE 2B
SERVICE AREA BOUNDARIES

Alternative 3

The alternative involves a regional collection system that would transport all flows generated within the entire study area to a regional wastewater treatment plant discharging to Eagle Mountain Lake. The service area boundaries for this plant are depicted in Figure III-4. Under this alternative, Azle's existing Ash Creek plant site would be the most likely location for a regional plant. Azle's existing Walnut Creek plant would be abandoned.

Alternative 4

The alternative involves a regional collection system that would transport all flows generated within the entire study area to a regional wastewater treatment plant discharging to Lake Worth. The service area boundaries for this plant are depicted in Figure III-5.

LAND USE

The study area consists of approximately 69 square miles lying within Tarrant and Parker Counties. This study area is generally divided among six individual "subareas" as is described in Table III-1.

Approximately 10 percent of the land in the study area is currently developed. The majority of this developed land is residential with fairly low population densities. With the exception of some areas within the City of Azle, the majority of the study area shows both existing and projected population densities of less than two persons per acre. The more heavily developed areas generally lie within the City of Azle, the City of Pelican Bay, the City of Lakeside, along Highway 199, the lake shores, and in certain areas of the Live Oak Creek watershed that include portions of the City of Fort Worth.

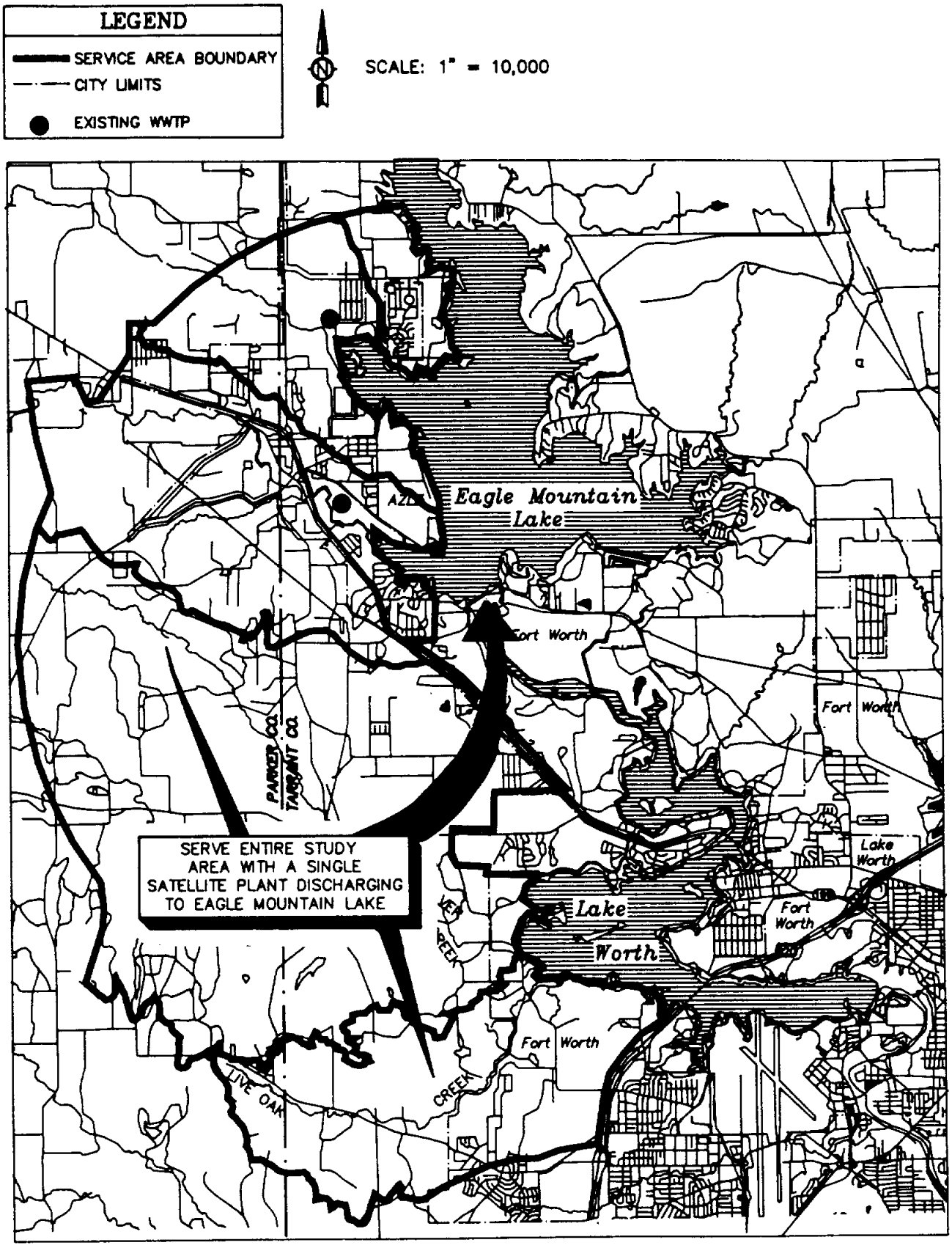


FIGURE III–4
ALTERNATIVE 3
SERVICE AREA BOUNDARIES

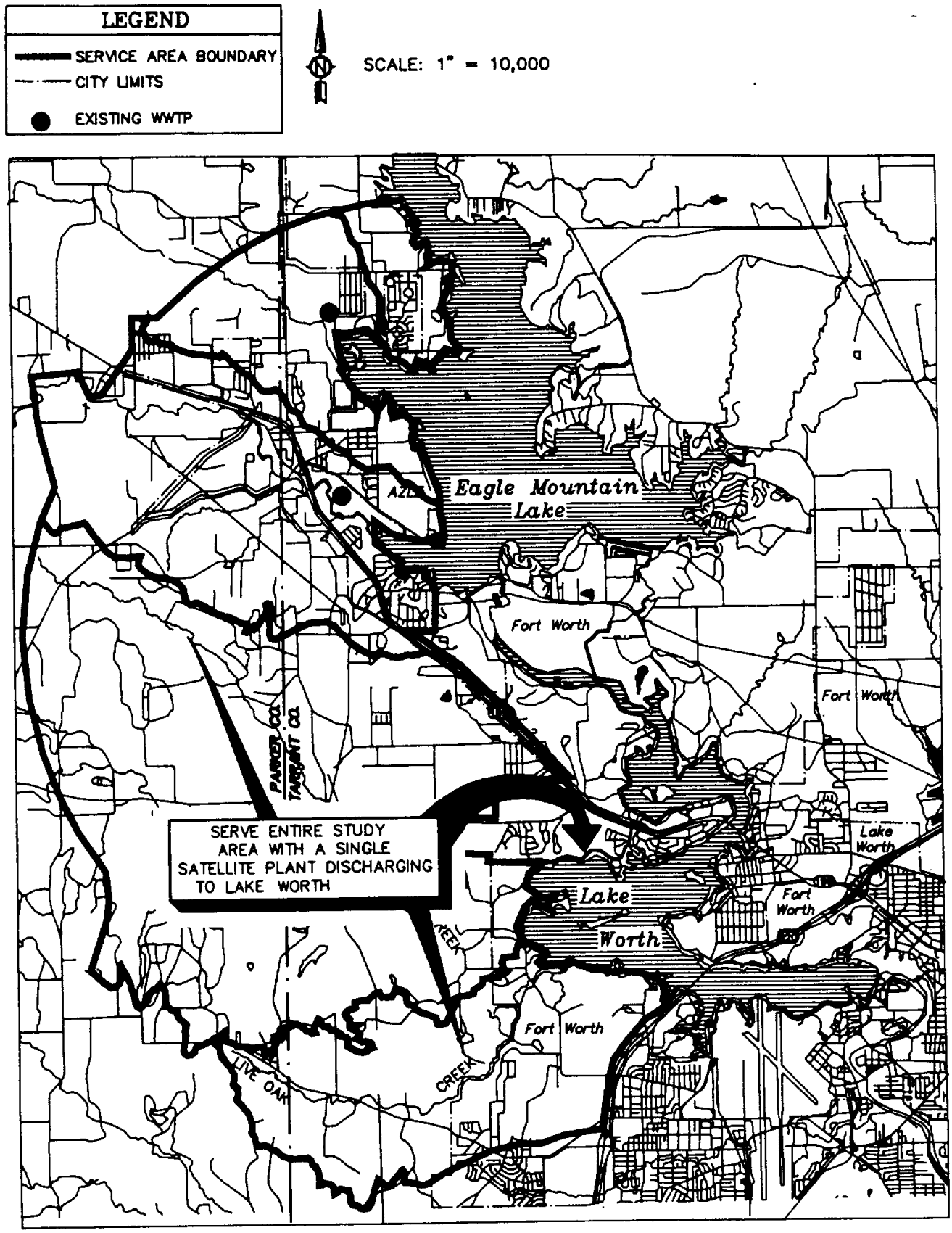


FIGURE III-5
ALTERNATIVE 4
SERVICE AREA BOUNDARIES

TABLE III-1

LAND AREA SUMMARY

Sub-area Description	Square Miles of Watershed Lying Within Planning Area Boundary
Pelican Bay	2.1
Walnut Creek	6.2
Ash Creek	14.3
Silver Creek	32.7
Lakeside	2.3
Live Oak Creek	11.4
TOTAL PLANNING AREA	69.0

The topography of the study area, in general, is gently rolling, ranging in elevation from 650 feet above mean sea level to 1,000 feet. Soils in the area are mostly clay, but sandy loams are present and many of the hills consist of rock. The majority of the study area has been shown by the Soil Conservation Service to have severe limitations for septic tank use due to low percolation rates, shallow rock, or flooding. Problems with existing septic tank system failures have been documented in several portions of the study area.

CHAPTER IV
POPULATION PROJECTIONS

This chapter outlines the methodology and sources of data used to project future study area populations. Population projections have been evaluated for the entire study area and for each of the individual "subareas."

DESIGN YEAR

A 20-year planning horizon has been selected for this study as described in the Planning Grant application. In general, all alternatives have been compared based on initial construction and operation of facilities needed to serve the projected year 2010 populations. In reviewing the total study area populations and the number of persons projected to be served by organized wastewater systems, it is apparent that cost savings associated with gradual phasing-in of collection and treatment facilities will be minor. As will be shown later in this chapter, the projected "sewered population" of the entire study area in 1995 is approximately 73 percent of the year 2010 sewered population.

METHODOLOGY

Traffic Survey Zone (TSZ) population projections provided by the North Central Texas Council of Governments (NCTCOG) were used as a primary basis for population projections for this study. These TSZs generally consist of areas bounded by major roads, highways, or political boundaries and include areas with fairly uniform land use patterns. This source of population projections is generally accepted by the Texas Water Development Board and by other state agencies for planning work in the North Texas area. Projected populations for each of these TSZs have been provided by NCTCOG for years 1990, 2000 and 2010. Intermediate year populations have been determined by linear interpolation.

Total Population

In order to project watershed populations for the study area, the geographical boundaries of each watershed or "subarea" were superimposed over a map showing the boundaries of the TSZs. Populations of each TSZ lying completely within a watershed area were assigned to that watershed. Populations of TSZs lying partially within a watershed area were assigned to the watershed area in accordance with the percentage of the area of the TSZ lying within the watershed area.

Sewered Population

As has been previously discussed, the projected population densities for the majority of this study area are very low, even through year 2010. This is particularly true within the Silver Creek and Live Oak Creek watersheds and the upper reaches of the Ash Creek and the Walnut Creek watersheds. In order to project a volume of wastewater that might be expected within the study areas during the planning period, it was necessary to estimate the number of persons within each of these watersheds that could reasonably be expected to be served by an organized wastewater system. In order to make these projections, population densities projected for each of the subareas were reviewed, and projected sewered populations provided by the City of Azle were also reviewed. For purposes of this study, the sewered population projections provided by the City of Azle were used for the Ash Creek and Walnut Creek watershed areas. For the Pelican Bay watershed area, it was assumed that the population residing within the Pelican Bay city limits would be served by an organized wastewater system beginning in 1995. Because projected population densities for the northern end of the Pelican Bay subarea (between the City's northern boundary and the northern boundary of the study area) are low, even through year 2010, it was assumed that no wastewater service would be provided to this area during the planning period.

Projected population densities for the Silver Creek watershed are quite low throughout the study area. For the Silver Creek watershed, it has been assumed that residents of all TSZs within the City of Lakeside, abutting State Highway 199, and abutting Lake Worth, would be served by an organized wastewater system beginning in year 1995. Population densities projected for the middle and upper reaches of the Silver Creek watershed area appear too low to support a fully developed wastewater system in this area during the 20-year planning period.

Near its southern boundary, the Live Oak Creek watershed includes one fairly heavily-developed area that lies within the Fort Worth city limits. For purposes of calculating a sewered population for the Live Oak Creek watershed, it has been assumed that sewer lines would be extended along Live Oak Creek to this development and that all TSZs within the watershed that adjoin this sewer line route or that abut Lake Worth would be served by the sewer system beginning in year 1995. As with the Silver Creek watershed, organized sewer service in the upper reaches of the Live Oak Creek watershed does not appear reasonable within the 20-year planning period due to very low projected population densities.

TWDB Population Projections

The contract between the District and the Texas Water Development Board for this study requires that if the TWDB's population projections are not used, justification for the selected populations be provided and that the TWDB's populations be included in all reports for comparison purposes.

The City of Azle is the only incorporated municipality lying entirely within the study area for which population projections have been prepared by the TWDB. Population projections prepared for the City of Azle by the TWDB, the City, and by the NCTCOG are presented in Table IV-1. As has been previously discussed, future flow rates projected for this study are based on "sewered" populations projected in the City of Azle's comprehensive plan. These

TABLE IV-1

CITY OF AZLE, TEXAS

COMPARISON OF PROJECTED POPULATIONS

	Source of Population Projections					
	Projected Population Within City Limits				Study Area[D] Watershed Population from NCTCOG TSZ Analysis	Projected[E] Sewered Population
Year	TWDB[A] Low Series	TWDB[A] High Series	Azle[B] Master Plan	NCTCOG[C] City Total		
1990	9272	9335	9304	9240	10978	8374
1995	10286[F]	10357[F]	9800	9910[F]	12190	9310
2000	11300	11379	10750	10580	13394	10213
2005	11733[F]	11878[F]	12000	11325[F]	14590	11400
2010	12165	12376	14000	12070	15779	13300

[A]Texas Water Development Board

[B]City of Azle, Texas - 1988 Master Plan Update

[C]North Central Texas Council of Governments

[D]Total projected population of portions of Ash Creek and Walnut Creek watersheds lying within study boundary, based on analysis of NCTCOG projections for traffic survey zones

[E]City of Azle, Texas - Total of projected sewered population of Ash Creek and Walnut Creek Watersheds.

[F]Value calculated by linear interpolation between published values

figures reflect populations projected to actually be served by the existing Ash Creek and Walnut Creek wastewater systems within the City of Azle, and are reasonably consistent with projections developed by other agencies. Although consideration was given to each of the projected populations presented in Table IV-1, the City's projected "sewered" population was selected, as use of these figures recognizes and establishes consistency with previous planning work done by the City of Azle. These figures also account for the fact that the City's service area boundaries may not coincide with the political boundaries used for the TWDB and NCTCOG projections.

PROJECTIONS

Table IV-2 presents a summary of the total populations and "sewered populations" projected for each of the wastewater service areas within the study area. These projections reflect that by year 2010, just over 90 percent of both the Pelican Bay and Lakeside populations will potentially be served by an organized wastewater system. As would be expected due to lower projected densities, only about half of the populations of the Silver Creek and Live Oak Creek watersheds are projected to be served by year 2010. The sewered populations projected for the Ash Creek and Walnut Creek watersheds have been provided by the City of Azle and indicate that 73 percent of the population within the Walnut Creek subarea will be served by year 2010, whereas 92 percent of the population within the Ash Creek subarea will be served.

These projections show a total study area population of 18,404 in 1990, increasing to 26,358 in year 2010. Projections also show that the sewered population will begin at approximately 8,374 persons in 1990 (all within the City of Azle's service area). This sewered population would be expected to increase dramatically as service became extended to Pelican Bay, Silver Creek, Lakeside and Live Oak Creek. Assuming each of these areas would be served by 1995, a sewered population of 15,091 is projected for that year.

TABLE IV- 2
POPULATION PROJECTION SUMMARY

WASTEWATER SERVICE AREA		1990	1995	2000	2005	2010
PELICAN BAY	TOTAL POPULATION	1513	1886	2141	2549	2958
	SEWERED POPULATION	0	1583	1895	2300	2705
WALNUT CREEK	TOTAL POPULATION	3859	4412	4962	5579	6194
	SEWERED POPULATION	2847	3165	3473	3876	4522
ASH CREEK	TOTAL POPULATION	7119	7778	8432	9011	9585
	SEWERED POPULATION	5527	6145	6740	7524	8778
SILVER CREEK	TOTAL POPULATION	2812	2980	3148	3351	3552
	SEWERED POPULATION	0	1634	1662	1731	1801
LAKESIDE	TOTAL POPULATION	1640	1659	1675	1688	1698
	SEWERED POPULATION	0	1534	1548	1553	1555
LIVE OAK CREEK	TOTAL POPULATION	1461	1742	2024	2198	2371
	SEWERED POPULATION	0	1030	1123	1191	1258
TOTAL STUDY AREA	TOTAL POPULATION	18404	20457	22382	24376	26358
	SEWERED POPULATION	8374	15091	16441	18175	20619

SEE NOTES ON FOLLOWING PAGE.

TABLE IV-2

NOTES

1. "Total Population" represents total projected population within each watershed area. The populations listed in this table are derived from an analysis of NCTCOG Traffic Survey Zone (TSZ) Population Projections.

2. "Sewered Population" represents the estimated number of residents to be served by a wastewater system within each watershed. The following sources and assumptions have been used in developing these projections:

   a. Pelican Bay: Assumes service to all residents of TSZ 8783 beginning in 1995.

   b. Walnut Creek and Ash Creek: Based on wastewater service area populations projected in City's comprehensive plan as provided by Rady and Associates, Inc.

   c: Silver Creek: Assumes wastewater service to residents of TSZ's abutting Highway 199 and Lake Worth beginning in 1995.

   d. Lakeside: Assumes regional system service to TSZ's 5109, 8840 and 8841 beginning in 1995.

   e. Live Oak Creek: Assumes service to TSZ's 5110, 5111, 7084, 8813, 8814, 8815, 8816, and one-third of TSZ 7541 beginning in 1995.

This sewered population for the entire study area is then projected to increase gradually to 20,619 in year 2010.

The projected year 2010 population will result in an average population density of 0.6 persons per acre over the entire study area. This illustrates the relatively low density projected during the 20-year planning period. If an ultimate population density of 2.5 persons per acre is assumed for the entire study area (1-acre average lot sizes), an ultimate total study area population of 110,000 can be computed. By contrast, an average systemwide population density of 5.4 persons per acre is currently estimated for the City of Fort Worth's wastewater service area.

In general, it can be concluded that the study area is projected to experience moderate, steady growth rates throughout the 20-year planning horizon. The Walnut Creek and Pelican Bay areas are projected to show the most dramatic increases during the planning period, while the projected population increases are more moderate in other areas.

CHAPTER V
FLOW AND WASTELOAD PROJECTIONS

This chapter presents the projected wastewater flows and wasteloads associated with each of the alternatives being evaluated. A discussion of the basis for each of the major assumptions being used is also presented in this chapter.

METHODOLOGY

This section presents the major assumptions and methods of calculation used in projecting flows and wasteloads associated with each alternative.

Per Capita Flows

In order to compute per capita flows for the study area, an analysis of historical per capita flows within the existing wastewater systems in the study area was conducted. Table V-1 summarizes the per capita wastewater flows estimated for each of the City of Azle wastewater systems for the past five years. As is indicated in the table, a 5-year average flow of 91 gpcd has been experienced at the Ash Creek plant, while a 5-year average flow of 76 gpcd has been experienced at the Walnut Creek plant. For the combined Azle system, a 5-year average flow of 87 gpcd has been experienced. Some variation is apparent in these figures. It has been concluded that these figures do not indicate the need for a more conservative per capita flow value, for the City of Azle and for the entire study area, than the 100 gpcd average listed in the current Texas Water Commission design criteria.

Recently-proposed revisions to the Texas Water Commission's Design Criteria for Sewerage Systems define "design flow" as a maximum 30-day average flow. Sizing of several key treatment units in any plant constructed in Texas must take this flow into account. Sizing of other key units in accordance with the recently-proposed revisions to the design criteria is dependent on maximum daily flows and/or

TABLE V-1
PER CAPITA FLOW ANALYSIS FOR
CITY OF AZLE WASTEWATER SYSTEM

SERVICE AREA	1985	1986	1987	1988	1989*	AVERAGE GPCD
ASH CREEK						
Estimated Population	4917	4997	5077	5156	5236	
Avg. Daily Flow (mgd)	0.366	0.478	0.605	0.471	0.399	
Per Capita Flow (gpcd)	74	96	119	91	76	91
WALNUT CREEK						
Estimated Population	1788	2015	2242	2469	2696	
Avg. Daily Flow (mgd)	0.132	0.166	0.161	0.204	0.192	
Per Capita Flow (gpcd)	74	82	72	83	71	76
COMBINED SYSTEM						
Estimated Population	6705	7012	7319	7625	7932	
Avg. Daily Flow (mgd)	0.498	0.644	0.766	0.675	0.591	
Per Capita Flow (gpcd)	74	92	105	89	75	87

*INCLUDES DATA FOR JANUARY THROUGH SEPTEMBER, 1989

2-hour peak flows. Table V-2 presents an analysis of historical monthly maximum and daily maximum flow ratios for the last five years at both of the City of Azle plants. In evaluating this data, it should be pointed out that uncharacteristically high flows were received during the spring of 1989 at both of the Azle plants, as well as many other plants around North Texas, due to extraordinary high rainfall.

It is suggested from this analysis that a maximum 30-day average flow/average daily flow ratio of 1.5 is appropriate for design of improvements to the Azle wastewater system and for the remainder of this study area. This ratio is generally consistent with ratios compiled for other small municipal wastewater systems in the North Texas area.

Table V-2 also indicates that a maximum daily flow/average daily flow ratio of 1.91 has typically been experienced at the Ash Creek plant and that a ratio of 1.80 has typically been experienced at the Walnut Creek plant. A 5-year average for this ratio for both of the Azle systems is 1.88. For the remainder of this study, it will be assumed that a maximum daily flow/average daily flow ratio of 2.0 is appropriate for the City of Azle and for any other municipal wastewater systems developed within the study area.

At present, insufficient data are available to establish actual 2-hour peak flow ratios for either of the Azle systems. In accordance with recently-proposed Texas Water Commission design criteria, and in consideration of peaking factors encountered at other similar-sized communities in North Texas, a ratio of 4 has been assumed for this value.

In summary, for development and evaluation of these alternatives, the following per capita flows are used:

Average Daily Flow	100 gpcd
Maximum Monthly Flow	150 gpcd
Peak Daily Flow	200 gpcd
2-hour Peak Flow	400 gpcd

TABLE V-2
PEAKING FACTOR ANALYSIS
FOR CITY OF AZLE WASTEWATER SYSTEM

SERVICE AREA	1985	1986	1987	1988	1989	AVERAGE
ASH CREEK						
Avg. Daily Flow (mgd)	0.366	0.478	0.605	0.471	0.399	
Max Month Flow (mgd)	0.513	0.610	0.739	0.717	0.715	
Max Daily Flow (mgd)	0.930	1.000	1.124	0.975	2.315	
Max Mo/Avg Day Ratio	1.40	1.28	1.22	1.52	1.79	1.44
Max Day/Avg Day Ratio	1.81	1.64	1.52	1.36	3.24	1.91
WALNUT CREEK						
Avg. Daily Flow (mgd)	0.132	0.166	0.161	0.204	0.192	
Max Month Flow (mgd)	0.165	0.234	0.202	0.246	0.316	
Max Daily Flow (mgd)	0.29	0.39	0.264	0.407	0.824	
Max Mo/Avg Day Ratio	1.25	1.41	1.25	1.21	1.65	1.35
Max Day/Avg Day Ratio	1.76	1.67	1.31	1.65	2.61	1.80
COMBINED SYSTEM						
Avg. Daily Flow (mgd)	0.498	0.644	0.766	0.675	0.591	
Max Month Flow (mgd)	0.678	0.844	0.941	0.963	1.031	
Max Daily Flow (mgd)	1.22	1.39	1.388	1.382	3.139	
Max Mo/Avg Day Ratio	1.36	1.31	1.23	1.43	1.74	1.41
Max Day/Avg Day Ratio	1.80	1.65	1.48	1.44	3.04	1.88

FLOW PROJECTIONS

Table V-3 presents projected average daily flows and maximum 30-day average flows to be generated within each of the subareas within the planning area. As is indicated in this table, an average daily flow of approximately 0.84 MGD, resulting entirely from service to the Walnut Creek and Ash Creek watershed areas, is anticipated in 1990. This flow would be anticipated to increase substantially when wastewater service is provided to Pelican Bay, Silver Creek, Lakeside and Live Oak Creek and would increase gradually thereafter to an average daily flow of 2.06 MGD for the entire study area in year 2010. This corresponds to a maximum 30-day average flow of 3.09 MGD in year 2010.

WASTELOAD PROJECTIONS

Wasteload projections have been computed for each 5-year increment in the planning period and are presented in Appendix A. These wasteload projections are computed for the individual receiving waters for each permit condition under each of the major alternatives evaluated.

The year 2010 average daily flows for the Ash Creek, Walnut Creek and Pelican Bay service areas presented in Table V-1 total 1.6 MGD. This is slightly lower than the year 2010 Base Wastewater Flow of 1.84 MGD projected for this area in the City of Fort Worth's Wastewater System Plan. This difference can be explained by the fact that average flows developed for this study are based on "sewered" populations only in the more densely-populated portions of the study area, and by the fact that average per capita flow rates used for this study were derived from a historical analysis of Azle-area flows rather than using flo characteristics typical for the Fort Worth collection system.

TABLE V-3
POPULATION AND FLOW PROJECTION SUMMARY

PER CAPITA FLOWS: AVERAGE DAILY (GPCD): 100
MAXIMUM MONTH (GPCD): 150

WASTEWATER SERVICE AREA		1990	1995	2000	2005	2010
PELICAN BAY	TOTAL POPULATION	1513	1886	2141	2549	2958
	SEWERED POPULATION	0	1583	1895	2300	2705
	AVG DAILY FLOW MGD	0.00	0.16	0.19	0.23	0.27
	MAX MONTH FLOW MGD	0.00	0.24	0.28	0.35	0.41
WALNUT CREEK	TOTAL POPULATION	3859	4412	4962	5579	6194
	SEWERED POPULATION	2847	3165	3473	3876	4522
	AVG DAILY FLOW MGD	0.28	0.32	0.35	0.39	0.45
	MAX MONTH FLOW MGD	0.43	0.47	0.52	0.58	0.68
ASH CREEK	TOTAL POPULATION	7119	7778	8432	9011	9585
	SEWERED POPULATION	5527	6145	6740	7524	8778
	AVG DAILY FLOW MGD	0.55	0.61	0.67	0.75	0.88
	MAX MONTH FLOW MGD	0.83	0.92	1.01	1.13	1.32
SILVER CREEK	TOTAL POPULATION	2812	2980	3148	3351	3552
	SEWERED POPULATION	0	1634	1662	1731	1801
	AVG DAILY FLOW MGD	0.00	0.16	0.17	0.17	0.18
	MAX MONTH FLOW MGD	0.00	0.25	0.25	0.26	0.27
LAKESIDE	TOTAL POPULATION	1640	1659	1675	1688	1698
	SEWERED POPULATION	0	1534	1548	1553	1555
	AVG DAILY FLOW MGD	0.00	0.15	0.15	0.16	0.16
	MAX MONTH FLOW MGD	0.00	0.23	0.23	0.23	0.23
LIVE OAK CREEK	TOTAL POPULATION	1461	1742	2024	2198	2371
	SEWERED POPULATION	0	1030	1123	1191	1258
	AVG DAILY FLOW MGD	0.00	0.10	0.11	0.12	0.13
	MAX MONTH FLOW MGD	0.00	0.15	0.17	0.18	0.19
TOTAL STUDY AREA	TOTAL POPULATION	18404	20457	22382	24376	26358
	SEWERED POPULATION	8374	15091	16441	18175	20619
	AVG DAILY FLOW MGD	0.84	1.51	1.64	1.82	2.06
	MAX MONTH FLOW MGD	1.26	2.26	2.47	2.73	3.09

SEE NOTES ON FOLLOWING PAGE.

TABLE V-3

NOTES

1. "Total Population" represents total projected population within each watershed area. The populations listed in this table are derived from an analysis of NCTCOG Traffic Survey Zone (TSZ) Population Projections.

2. "Sewered Population" represents the estimated number of residents to be served by a wastewater system within each watershed. The following sources and assumptions have been used in developing these projections:

   a. Pelican Bay: Assumes service to all residents of TSZ 8783 beginning in 1995.

   b. Walnut Creek and Ash Creek: Based on wastewater service area populations projected in City's comprehensive plan as provided by Rady and Associates, Inc.

   c: Silver Creek: Assumes wastewater service to residents of TSZ's abutting Highway 199 and Lake Worth beginning in 1995.

   d. Lakeside: Assumes regional system service to TSZ's 5109, 8840 and 8841 beginning in 1995.

   e. Live Oak Creek: Assumes service to TSZ's 5110, 5111, 7084, 8813, 8814, 8815, 8816, and one-third of TSZ 7541 beginning in 1995.

3. "Average Daily Flow" represents projected annual average wastewater flow based on projected sewered populations and 100 gpcd average per-capita flow.

4. "Max Month" flow represents projected maximum 30-day average flows based on projected "sewered" populations and 150 gpcd per-capita flow. This is the "design flow" that would be required for any treatment facilities.

The corresponding peak flow used in this study is 6.4 MGD. As has been previously discussed, this has been based on a peaking factor of 4, which is consistent both with Texas Water Commission design criteria and with peaking factors commonly encountered in similar-sized communities in the North Texas area. Insufficient data are available to accurately characterize historical peaking factors for the City of Azle's system.

CHAPTER VI
WASTEWATER FACILITY NEEDS

This chapter summarizes the specific wastewater facilities that would be needed under each of the alternatives evaluated, and presents a discussion of the methodologies used to establish the sizes and locations of these facilities.

METHODOLOGY

As has been previously discussed, the population projections for this study area indicate that between 1995 (the year assumed to be the initial year of service for the currently-unserved subareas) and year 2010, a thirty-six percent increase in sewered population and flow rates is anticipated. Because of this comparatively moderate projected increase, it has been assumed that all collection and treatment facilities associated with each of the alternatives being evaluated would be designed and initially constructed to provide service through year 2010. Wastewater treatment plants under each of the alternatives have therefore been sized for the year 2010 design flows and collection system facilities used in this evaluation have been sized for year 2010 peak flows.

Treatment Facility Needs

New wastewater treatment facilities associates with the various alternatives have been sized based on the projected year 2010 sewered population and the maximum 30-day average per capita flow of 150 GPCD. The treatment facility sizes thus established for each of the primary alternatives examined are listed in Table VI-1. For each of the alternatives (with the cities of Pelican Bay and Lakeside included) a total year 2010 treatment capacity of 3.09 MGD is needed.

TABLE VI-1

WASTEWATER TREATMENT FACILITY NEEDS SUMMARY

Alternative	Treatment Plant Name	Year 2000 Design Flow (MGD)
1	Walnut Creek WWTP	1.1
	Ash Creek WWTP	1.32
	Silver Creek/Live Oak Creek regional system	0.69
2A	All flows transported to City of Fort Worth system	3.09
2B	Azle Area Satellite Plant	2.41
	Silver Creek and Live Oak Creek flows to City of Fort Worth	0.69
3	Satellite Plant with Eagle Mountain discharge	3.09
4	Satellite Plant with Lake Worth discharge	3.09

Collection System Needs

A key focus of this study is to select, from among several conceptual alternatives, a concept for wastewater system development that will be most cost-effective for all parties involved. Certain costs which will be incurred by each of the system participants, regardless of the alternative selected, have not been included or evaluated in this study. The cost of constructing an internal collection system within the City of Pelican Bay, for instance, will be incurred under any alternative that involves extension of wastewater service to Pelican Bay. Facility needs and costs associated with internal collection systems within Pelican Bay, Azle, Lakeside, and other areas to be served will be the same for each alternative and will thus have no effect on the economic ranking of the alternatives. Layouts and costs for these facilities have not been developed in this study.

Regional interceptor facilities have been sized based on projected year 2010 peak flows and based on the general topography of the area. It should be pointed out that the City of Fort Worth's Wastewater System Plan, published in June 1989, indicates that the City of Fort Worth's collection system would be extended northward to Azle by year 2010. Collection system facilities developed for this study, however, differ somewhat from those shown in the City of Fort Worth Wastewater System Plan. An assessment of terrain conditions in the area west of Eagle Mountain Lake and Lake Worth indicates that a system of small pump stations and pipelines in this area will likely be more cost-effective than a gravity interceptor system. For the gravity interceptor system, proposed in the Fort Worth Wastewater System Plan, extremely deep excavations would be required in several areas and ground water problems would be encountered along most of the pipeline route.

FACILITY NEEDS

Design flows associated with wastewater treatment facilities required under each alternative are summarized in Table VI-1. Collection and treatment facilities that are unique to each Alternatives 1, 2A, 2B, 3 and 4 are listed in Tables VI-2 through VI-6, respectively. Conceptual layouts of the facilities required for each of these alternatives are shown on Figures VI-1 through VI-5 in Appendix F at the back of this document.

Current process capacity analyses for each of the existing Azle plants are presented in Appendix B. These process analyses consider recently-proposed Texas Water Commission design criteria and each of the potential effluent sets being evaluated. As is indicated by these tables, the existing Walnut Creek plant may be downrated somewhat, due primarily to aeration capacity, if more stringent effluent limitations are imposed. The existing Walnut Creek plant, at present, appears to be limited primarily by its aeration capability. The Walnut Creek plant currently employs a contact stabilization process, which is not allowed by the recently-proposed TWC design criteria when nitrification is required. No significant capacity derating is anticipated for the existing Ash Creek plant.

MANAGEMENT AGENCY/IMPLEMENTATION CONSIDERATIONS

Implementation of any of the major alternatives considered in this study would require execution of interagency agreements to address responsibility for permitting, design, construction, and operation of wastewater system facilities. Table VI-7 presents a list of potential management agencies for the various wastewater systems required under each alternative.

TABLE VI-2

FACILITY NEEDS SUMMARY

ALTERNATIVE 1

1. Construct expansion/upgrade to City of Azle Walnut Creek WWTP to bring design capacity to 1.1 MGD.

2. Construct expansion/upgrade to City of Azle Ash Creek WWTP to bring design capacity to 1.32 MGD.

3. Construct a new 0.7 MGD "satellite" wastewater treatment plant in the Silver Creek watershed.

4. Construct pump stations and interceptor system facilities as shown in Figure VI-1. (See Appendix F.)

TABLE VI-3

FACILITY NEEDS SUMMARY

ALTERNATIVE 2A

1. Construct pump stations and interceptor system facilities as shown in Figure VI-2. (See Appendix F.)

2. Construct improvements to existing City of Fort Worth interceptor system as required to accommodate increased flows.

3. Abandon existing City of Azle Ash Creek and Walnut Creek Wastewater Treatment Plants.

TABLE VI-4

FACILITY NEEDS SUMMARY

ALTERNATIVE 2B

1. Expand existing City of Azle Ash Creek WWTP to 2.41 MGD design capacity to accommodate future flows from Ash Creek, Walnut Creek, and Pelican Bay.

2. Construct pump stations and interceptor system facilities as shown in Figure VI-3 (see Appendix F) to provide service to Silver Creek and Live Oak Creek study areas through existing City of Fort Worth wastewater system.

3. Construct improvements to existing City of Fort Worth interceptor system as required to accommodate increased flows.

TABLE VI-5

FACILITY NEEDS SUMMARY

ALTERNATIVE 3

1. Expand existing Ash Creek WWTP to 3.09 MGD capacity to serve entire study area with a discharge to Eagle Mountain Lake.

2. Construct pump stations and interceptor system facilities as shown in Figure /I-4 (see Appendix F) to transport all wastewater flows to new plant.

TABLE VI-6

FACILITY NEEDS SUMMARY

ALTERNATIVE 4

1. Construct new 3.09 MGD "regional" wastewater treatment plant with discharge to Lake Worth to serve entire study area.

2. Construct pump stations and interceptor system facilities as shown in Figure VI-4 (see Appendix F) to transport all wastewater flows to new plant.

TABLE VI-7

SUMMARY OF POTENTIAL MANAGEMENT AGENCIES

Alternative	Treatment Plant Name	Year 2010 Design Flow (MGD)	Discharge To	Potential Mgmt. Agencies for Treatment Plant	Potential Mgmt. Agencies for Regional Interceptor System
1	Walnut Creek WWTP	1.1	Eagle Mountain	1. City of Azle 2. Regional Entity 3. Other	1. City of Azle 2. Regional Entity
	Ash Creek WWTP	1.32	Eagle Mountain	1. City of Azle 2. Regional Entity 3. Other	1. City of Azle 2. Regional Entity
	Silver Creek/Live Oak Creek Regional System	0.69	Lake Worth	1. City of Fort Worth 2. Regional Entity 3. Other	1. City of Fort Worth 2. Regional Entity
2A	All flows transported to City of Fort Worth system	3.09	N/A	1. City of Fort Worth	1. City of Fort Worth 2. Regional Entity
2B	Azle Area Satellite Plant	2.41	Eagle Mountain	1. City of Azle 2. Regional Entity 3. Other	1. City of Azle 2. Regional Entity
	Silver Creek/Live Oak Creek flows to City of Fort Worth	0.69	N/A	1. City of Fort Worth	1. City of Fort Worth 2. Regional Entity
3	Satellite Plant with Eagle Mountain discharge (at Ash Creek WWTP site)	3.09	Eagle Mountain	1. City of Azle 2. Regional Entity 3. Other	1. City of Azle 2. Regional Entity
4	Satellite Plant with Lake Worth Discharge	3.09	Lake Worth	1. City of Fort Worth 2. Regional Entity 3. Other	1. City of Fort Worth 2. Regional Entity

Wastewater Treatment

Alternative 1 would require permitting and construction, as well as continued operation, for two wastewater treatment plants in the City of Azle. A major permit amendment would be required for each plant. The City of Azle would be a likely management agency for operation of each of these plants. The City could also, however, contract with a "regional entity" such as the Trinity River Authority of Texas for construction and operation of the plant facilities. The plant to be constructed in the Silver Creek/Live Oak Creek area under this alternative could be operated either by the City of Fort Worth or by another "regional" entity.

Under Alternative 2A, the City of Fort Worth would be responsible for treatment of all wastewater generated in the study area through its existing Village Creek plant.

Alternative 2B would involve operation of a single "regional" plant near the location of the existing City of Azle Ash Creek plant, and would involve treatment of flows from the Silver Creek and Live Oak Creek basins at the City of Fort Worth's Village Creek plant. The Azle-area plant, under this alternative, could be operated by the City of Azle, or could be operated by another regional entity such as the Trinity River Authority of Texas. If operated by a regional entity, interagency agreements between the regional entity and both Azle and Pelican Bay would be required. These agreements would involve certain commitments on behalf of Azle, Pelican Bay, and any other participating entity to reimburse the regional entity for its costs incurred in building and operating the treatment facilities.

Alternatives 3 and 4 present similar opportunities for operation by a regional entity under such agreements. Plants required under Alternatives 3 and 4 could be operated by the cities of Azle or Fort Worth, respectively, or by a regional entity under either alternative.

It should be pointed out that implementation of Alternative 1 will involve obtaining a total of three wastewater discharge permits, two of which will allow discharge of treated effluent to Eagle Mountain Lake. Alternative 2A will eliminate all wastewater discharges into both Eagle Mountain Lake and Lake Worth. Alternative 2B will result in a single discharge to Eagle Mountain Lake, with the southern end of the study area having its wastewater transported beyond the Lake Worth watershed. Alternatives 3 and 4 will involve single plants discharging to Eagle Mountain Lake and Lake Worth, respectively.

Collection Systems

For each of the alternative evaluated, it is anticipated that "internal" collection systems within the boundaries of a given city will be owned and operated by that city. "Regional" interceptor systems, or those components of the collection system that facilitate transportation of one entity's wastewater from a central collection point to or through the jurisdiction of another entity, could be implemented either by a regional entity (such as the Trinity River Authority) or by a contractual agreement between cities. Where one city's personnel for any reason would be restricted from working on a regular basis with another city's jurisdiction, a regional entity would be the most likely managing agency for the collection system.

Under regional system agreements typically encountered, the costs of treatment facilities and the "regional" components of collection systems would be allocated among system participants in accordance with their relative flow and wasteload contributions. The costs associated with internal collection would be borne by the residents of the city where the collection system was constructed.

In areas such as Pelican Bay, where needs exist for internal collection system facilities, special financing assistance may be available through the Texas Department of Commerce or through other State agencies to help implement these systems.

CHAPTER VII
FACILITY COSTS

This chapter outlines the methodologies used to project the capital and operating costs associated with each of the alternatives evaluated. The chapter also presents a comparison of various costs associated with each alternative and presents the results of a detailed economic analysis.

It is emphasized that the costs presented in this report are intended to be used for comparison purposes only. Actual costs associated with wastewater system facilities may be expected to vary to reflect conditions unique to individual sites, processes, permit requirements, and operating policies.

METHODOLOGY

This section discusses the methodologies used to compute treatment plant capital costs, collection system capital costs, pump station capital costs, and annual operation and maintenance costs associated with each alternative. This section also includes a discussion of various economic parameters assumed for the analysis.

Treatment Facility Capital Costs

Capital costs for treatment facilities are projected for all alternatives except for Alternative 2A. For Alternative 2A, the capital cost associated with the existing City of Fort Worth system is included in the wastewater service fees provided by the City of Fort Worth. The costs of treatment facilities can vary considerably, depending on the specific processes, site conditions, and permit restrictions finally established for each plant. Projection of these construction costs to a high degree of accuracy is therefore difficult until many of these parameters are firmly established. In order to provide a consistent basis for projecting an opinion of probable construction cost for each treatment scenario, however, the costs of several

new wastewater treatment facilities, recently constructed in the North Texas area, were compiled and tabulated.

Figure VII-1 presents a plot of the average construction costs (dollars per gallon of treatment capacity) for these projects. Curve A on Figure VII-1 is a visually-fit line indicating an apparent trend for construction costs only. This curve represents new treatment plants constructed in the North Texas area without effluent filters. Curve B has been plotted by adding 30-percent for land acquisition, administrative, engineering, permitting and contingency costs to curve A. Each of the plants used in the analysis for which curves A and B have been developed were designed to meet 10/15/3 permit conditions. Curve B is used in the remainder of this chapter as a basis for projecting capital costs associated with treatment plants under each alternative.

The cost of effluent filters has been added to all scenarios evaluated in this study for plants discharging to Eagle Mountain Lake and Lake Worth. Capital costs associated with effluent filters were taken from Figure VII-2. This figure was compiled from recent construction projects in the North Texas area where effluent filters were added to small wastewater treatment plants. Again, a 30-percent figure to reflect administrative, engineering, land and contingency costs was added to construction costs to obtain total capital cost figures.

In order to project additional capital costs associated with compliance with a 5/5/2/1 permit, it has been assumed that the following additional process units would be added:

- Alum feed
- Sodium hydroxide feed
- Polymer feed

FIGURE VII - 1
TREATMENT PLANT CAPITAL COSTS

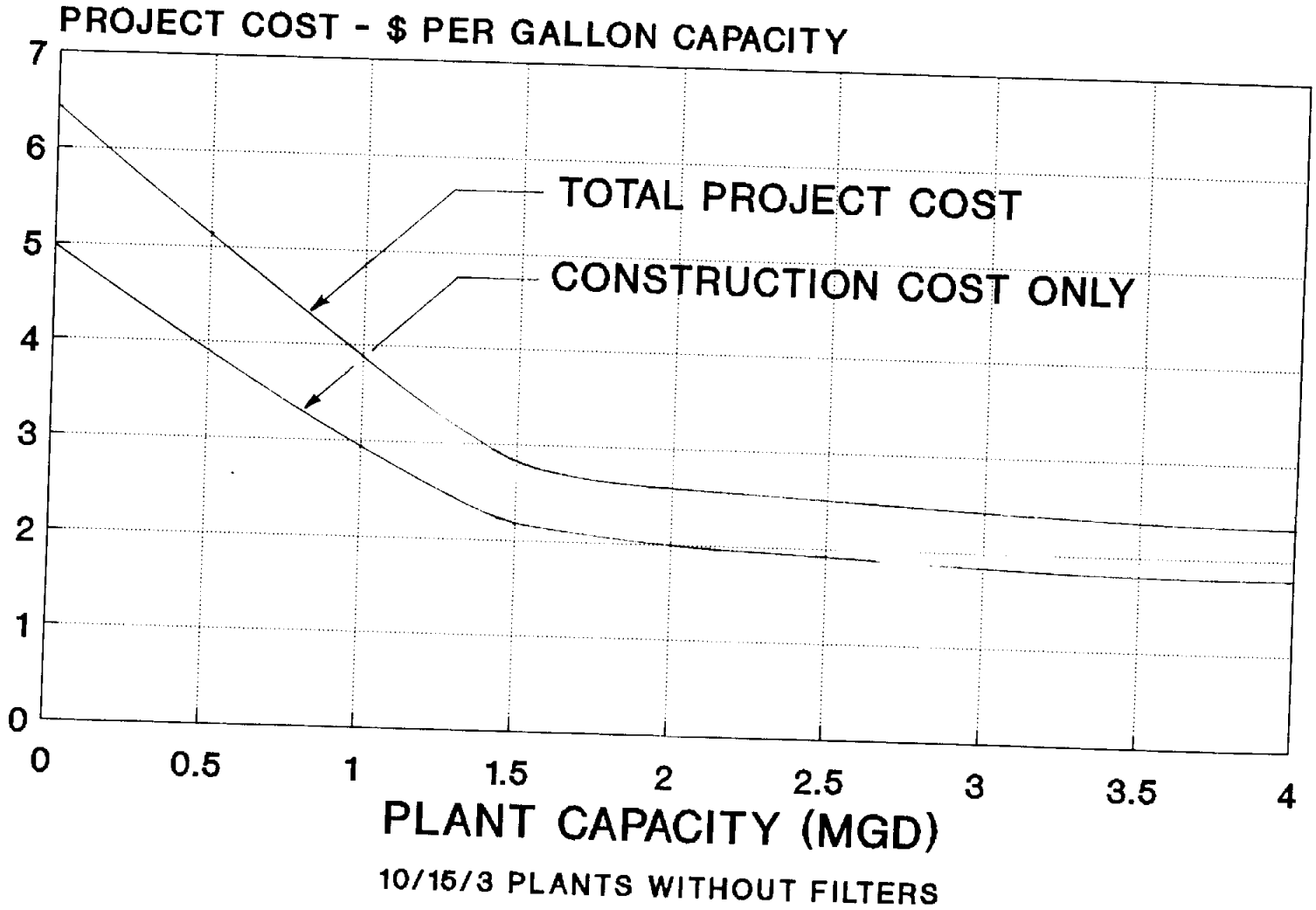
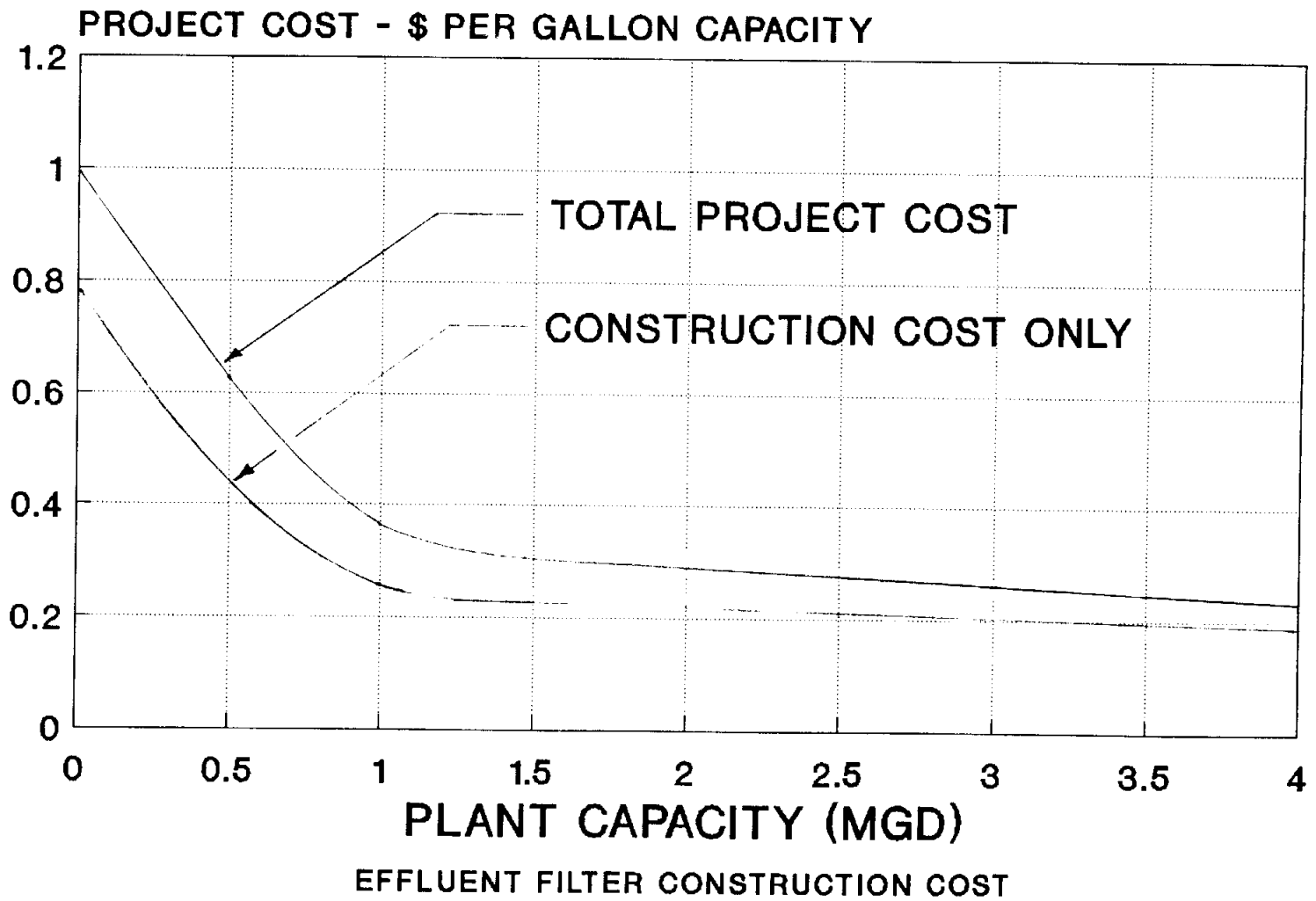


FIGURE VII-2
CAPITAL COST - EFFLUENT FILTERS



EFFLUENT FILTER CONSTRUCTION COST

Capital costs associated with adding chemical feed facilities have been extracted from applicable curves in the EPA Innovative and Alternative Technology Assessment Manual.

As would be expected, these curves indicate lower unit costs as plant size increases. These curves indicate that for a 10/15/3 permit, treatment plants may be expected to cost over six dollars per gallon of treatment capacity for small package plants, and as low as two dollars or less per gallon of treatment capacity for plant sizes 3 MGD and larger. Again, these costs represent recent construction cost trends in the North Texas area and are intended for comparison purposes only. Actual construction costs can and do vary considerably.

Interceptor System Capital Costs

Anticipated capital costs associated with "regional" interceptor lines needed for each alternative were evaluated. Table VII-1 presents a breakdown of the unit costs assumed for each size of gravity interceptor evaluated in this study. These costs were derived from the City of Fort Worth's Wastewater System Plan, Chapter 6, and have been slightly adjusted upward to reflect an assumed 10-foot trench depth, rather than an eight foot depth assumed in Fort Worth's planning document. Table VII-2 presents a breakdown of the unit costs used for force mains. A 30-percent figure has been added to all of these costs to reflect administrative, engineering, contingencies, and other such costs. Because of the highly variable nature of land rights costs associated with regional interceptor work, the costs of obtaining land rights has not been included in the evaluation of any of the alternatives.

These costs provide a reasonably-consistent basis for evaluation and comparison of each of the alternatives. It is pointed out again, however, that unit costs associated with a specific pipeline may vary considerably. The costs presented in Table VII-1 and VII-2 do not include such "special" features as protective linings, siphons, exposed stream crossings, and other

TABLE VII-1

BASE UNIT CONSTRUCTION COSTS FOR SEWERS

Diameter (in)	Unit Cost ($/ft)
10	34
12	40
15	46
18	51
27 (10-ft. depth)	70
27 (12-ft. depth)	76
30	80

See discussion in text.

TABLE VII-2

BASE UNIT CONSTRUCTION COSTS FOR FORCE MAINS

Force Main Diameter (in)	Unit Cost ($/ft)
6	24
8	26
10	28
12	30
18	40
21	47

See discussion in text.

such "unusual" work, but are intended to include normally-encountered "incidental" items such as manholes, street crossings, trench safety systems, and fittings.

Pump Station Capital Costs

The costs of all collection system pump stations have been projected based on the following formula:

New Pumping Station Construction Costs:

$$C_{ps} = 120{,}000\ Q^{0.657}$$

where C_{ps} = pumping station construction costs

Q = design peak flow (mgd)

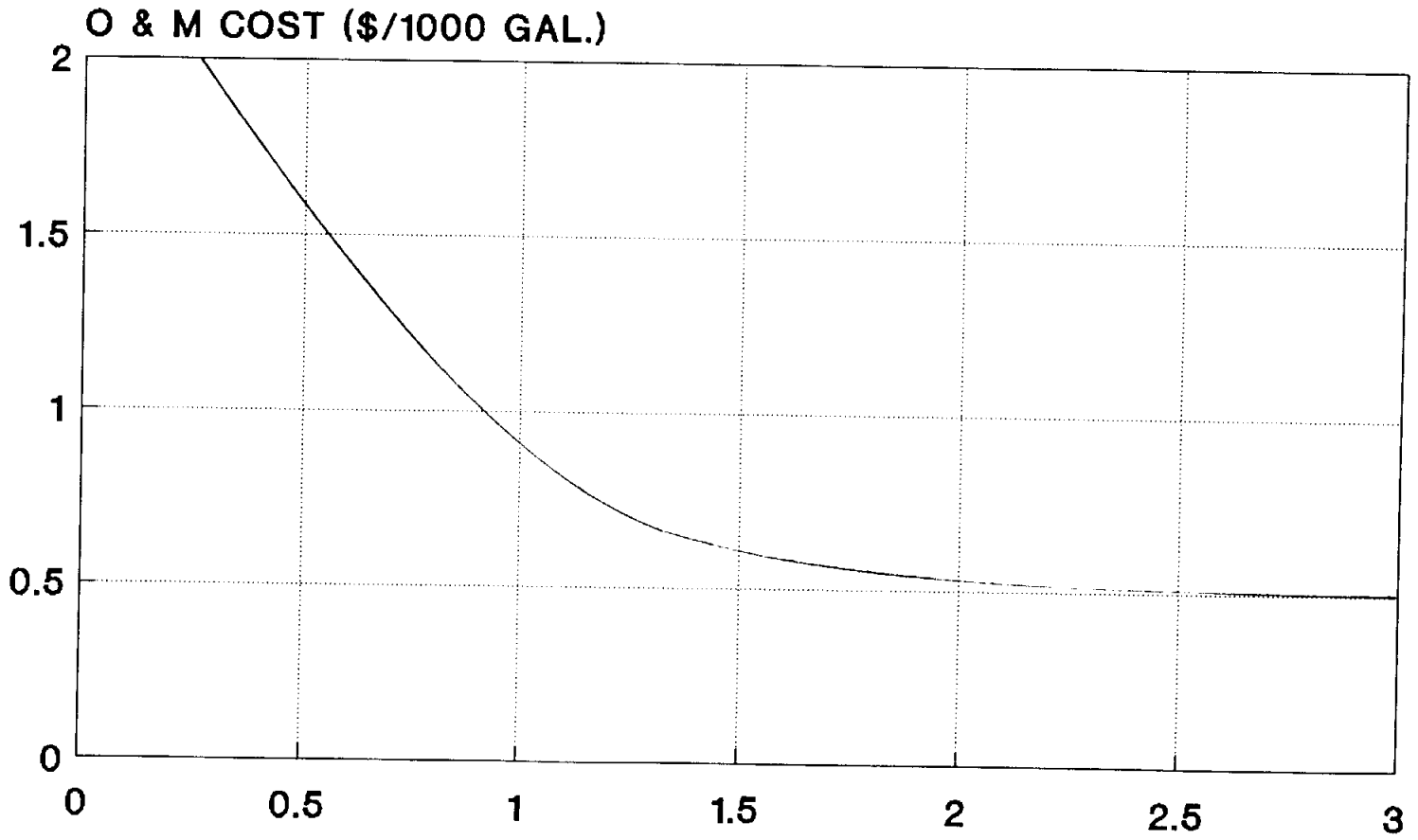
This formula is presented in the City of Fort Worth's Wastewater System Plan and is used by the City of Fort Worth in long-range planning work for its wastewater system. Although specific project costs may vary considerably, this method, again, provides a consistent basis for evaluation and comparison of the alternatives.

Operation and Maintenance Costs

Figure VII-3 presents a curve derived from an evaluation of operation and maintenance costs at several small wastewater treatment plants around the North Texas area. The costs thus derived generally reflect plants with a 10/15 permit without nitrification requirements. This curve was used for projection of operation and maintenance costs for all alternatives involving a 10/15 permit condition.

For alternatives involving a nitrification requirement, the unit cost per thousand gallons from the curve on Figure VII-3 was increased by 11 percent to reflect operational costs associated with additional aeration facilities. In order to establish an appropriate cost for operation of facilities to meet

FIGURE VII-3
OPERATION AND MAINTENANCE COST



FOR PLANTS WITH 10/16 PERMIT

a 5/5/2/1 permit, an additional amount was added to reflect operation of a polymer feed system, an alum feed system, and a sodium hydroxide feed system. As these additional costs have traditionally not been incurred by most small wastewater treatment plants in the North Texas area, local operating cost information is not available. The EPA's Innovative and Alternative Technology Assessment Manual was used to project annual operating costs for these unit processes based on the anticipated annual flow rate.

ECONOMIC ADJUSTMENTS

Table VII-3 presents a list of assumptions that were made with regard to major economic parameters. A 4-percent inflation rate has been assumed to apply to both the unit operation and maintenance costs and to capital costs for all alternatives.

The City of Fort Worth is currently reviewing its rate structure and will be projecting future wastewater rates within the near future. As this information is currently unavailable, current City of Fort Worth wastewater rates and system access fees, have been used for all alternatives involving connection to the City of Fort Worth's system. A 4-percent annual inflation rate has been applied to these costs.

For initial comparison of the alternatives, an 8-percent interest rate on borrowed money has been assumed with a 20-year loan term. Capital costs have thus been converted to equivalent annual payments during the life of the project. These annual payments have been added to projected annual operation and maintenance costs to calculate total annual costs associated with each alternative. These total annual costs have been divided by the anticipated number of households served (assuming 2.54 persons per household) and divided by twelve to obtain an estimated monthly cost per household associated with each alternative.

TABLE VII-3

BASIC DATA REQUIRED FOR ECONOMIC ANALYSES

Parameter	Value Proposed for Use in Ecomonic Analysis
Annual Inflation Rate	4.00% (to be applied to capital and O&M costs)
Average Per Capita Flow (GPCD)	100
Design Per Capita Flow (GPCD)	150
Loan Terms:	
Interest Rate	8.00%
Duration (years)	20
Average Number of Persons per Household	2.54
Fort Worth Customer City Charges[1]	$0.3779 per thousand gallons+ $0.0841 per pound of BOD+ $0.1482 per pound of TSS
City of Fort Worth System Access Fee[1]	$144 per new connection added after 1992

[1]Basis of charges by City of Fort Worth established in customer contracts in 1989.

[2]Based on System Facility Access Fees for residential connections with 1600-1800 sq. ft. living area as established in City of Fort Worth Ordinance No. 9853.

These costs are intended to reflect the costs of constructing and operating the "regional" components of the collection system and treatment facilities associated with each alternative. As has been pointed out previously, these costs do not reflect costs that will be associated with constructing and operating internal collection system components within each community to be served. Currently-unsewered areas may therefore be expected to incur considerably higher costs than those indicated in the economic analysis. The economic analysis further makes no distinction between industrial, commercial or residential customers, or between varying rates of water usage. The average monthly cost per household figures have been calculated as a consistent basis for comparison of alternatives. It should be recognized that actual residential wastewater rates can vary considerably from the values presented.

For alternatives involving wastewater transportation and treatment through the existing City of Fort Worth wastewater system, current customer City rates have been applied as operation and maintenance costs. An influent concentration of 200 ml/l BOD and 200 ml/l TSS has been entered into the City of Fort Worth's rate calculation, along with projected annual average flow rates, in order to project the Fort Worth customer charges.

CAPITAL COST PROJECTIONS

Table VII-4 presents a comparison of projected capital costs necessary for implementation of each of the major alternatives evaluated. As is evident from this table, Alternative 4 requires the highest initial commitment to capital expenditures for treatment and regional interceptor facilities. The other alternatives, all of which make some use of existing treatment plant capacity in either the Azle or Fort Worth systems, show considerably lower initial capital expenditures. As was previously discussed, the comparatively moderate growth rates projected for this region do not suggest that there will be significant advantages to a phased approach to implementing any of these improvements.

TABLE VII-4

COMPARISON OF PROBABLE CAPITAL COSTS

Alternative	Probable Capital Costs (Millions)[1] Treatment Facilities[2]	Collection System	Total
1	$8.8-10.2	$2.3	$11.1-12.5
2A	NA	$9.6	NA
2B	$5.5-5.8	$4.8	$10.3-10.6
3	$6.6-7.0	$5.9	$12.5-12.9
4	$8.3-8.7	$8.5	$16.8-17.2

[1]Costs presented in this table are intended for comparison purposes only.

[2]Cost range shown is projected range of costs from 10/15 permit conditions to 5/5/2/1 permit conditions.

It has been assumed in this analysis that for alternatives involving transfer of flows to the City of Fort Worth's wastewater system, planning area residents will bear the capital costs associated with constructing pipelines to connect to Fort Worth's system. It is assumed that if and when downstream improvements to the Fort Worth collection system are needed, these costs will be considered a "system cost" to be borne jointly by all customers served throughout the Village Creek system.

OPERATION AND MAINTENANCE COST PROJECTIONS

Table VII-5 presents a comparison of operation and maintenance costs associated with each of the major alternatives evaluated. As is indicated in this table, unit O&M costs are generally projected to be lower as the size of a wastewater system increases. Alternatives 2A and 2B thus exhibit the lowest unit O&M costs, as they take advantage of the economies of scale inherent in the existing Fort Worth system. Where applicable, these costs reflect both service charges and system access fees to be incurred by new customers of the Fort Worth system. The costs presented do not include the cost of operating internal collection systems within Pelican Bay, Lakeside, or any other "non-regional" system components.

TOTAL ANNUAL COST

Table VII-6 presents a comparison of projected total annual costs in key years for each of the major alternatives evaluated. These costs include projected annualized capital and operating costs associated with the "regional" components of all new facilities. As is indicated by these figures, Alternative 2B exhibits the lowest annual costs of the five alternatives in each of the three planning years listed. This is largely because this alternative takes advantage of existing treatment capacity in the City of Azle and it does not require construction of extensive collection facilities between Azle and Fort Worth. Projected total annual costs for Alternatives 2A and 2B are subject to change when Fort Worth's projected future rate structure is firmly established.

TABLE VII-5

O&M COST COMPARISON

Alternative	Projected Average Plant and Regional Collection System O&M Cost[1] ($/1,000 gallons)
1	$1.51-2.02
2A	Based on City of Fort Worth rate structure with system access fees applied to new connections after 1992.
2B	$1.04-1.26 for Azle area plant; Fort Worth area charges based on City of Fort Worth rate structure with system access fees applied to new connections after 1992.
3	$0.84-0.91
4	$0.88-1.10

[1]Low cost shown reflects compliance with 10/15 permit; high cost shown reflects compliance with 5/5/2/1 permit. All costs shown include projected regional interceptor system operation and maintenance costs, and are expressed in 1990 dollars. Costs presented are for comparison purposes only.

TABLE VII-6

TOTAL ANNUAL COST COMPARISON

Alternative	Total Annual Cost (millions) 1995	2000	2010
1	$2.5	$2.9	$4.2
2A	$2.1	$2.3	$3.4
2B	$1.9	$2.0	$2.9
3	$2.0	$2.2	$2.9
4	$2.5	$2.7	$3.4

All costs are presented in "inflated" dollars assuming 4% annual inflation for all capital and O&M costs. All costs reflect compliance with nitrification requirements at new facilities and are presented for comparison purposes only.

PRESENT VALUE COMPARISON

Table VII-7 presents a comparison of the estimated present values of all capital and O&M expenditures associated with each of the major alternatives during the 20-year planning horizon. These figures indicate that for any of the anticipated permit conditions, Alternative 2B will result in the lowest effective total cost to the citizens of the study area.

LONG-TERM COST ANALYSES SUMMARY

Computer printouts prepared for long-term costs analysis of each of the alternatives evaluated are presented in Appendix D at the back of this report. These printouts include capital and O&M cost summaries, as well as projected costs per household for each alternative.

PER-CONNECTION COSTS

Figures VII-4 through VII-6 present a comparison of the anticipated monthly costs per household associated with the regional system components of each alternative under each permit scenario. These curves indicate that Alternative 2B will yield the lowest total cost per connection over most of the 20-year planning horizon, regardless of permit requirements. These data indicate that residents of the Ash Creek, Walnut Creek, and Pelican Bay areas will be most cost-effectively served by treatment facilities located in that area rather than through larger regional facilities or through the City of Fort Worth's system. The average monthly cost of constructing and operating Alternative 2B under 10/15/3 permit conditions is expected to range from a low of about $25 per connection in 1996 to a high of $29 per connection in 2010. These costs assume a 4-percent annual rate of inflation throughout the duration of the planning period.

TABLE VII-7

PRESENT VALUE COMPARISON

Alternative	Present Value[1] of Projected Capital and Operating Costs through 2010		
	10/15	10/15/3	5/5/2/1
1	22.2	24.8	27.5
2A[2]	20.5	20.5	20.5
2B	17.6	18.1	19.1
3	18.6	19.2	20.6
4	23.1	23.7	25.1

[1]All present values are expressed in 1990 dollars and are presented for comparison purposes only.

[2]Costs presented for Alternative 2A do not include costs of upgrading the Fort Worth Village Creek plant beyond its current treatment level.

FIGURE VII-4
COST COMPARISON - 10/15

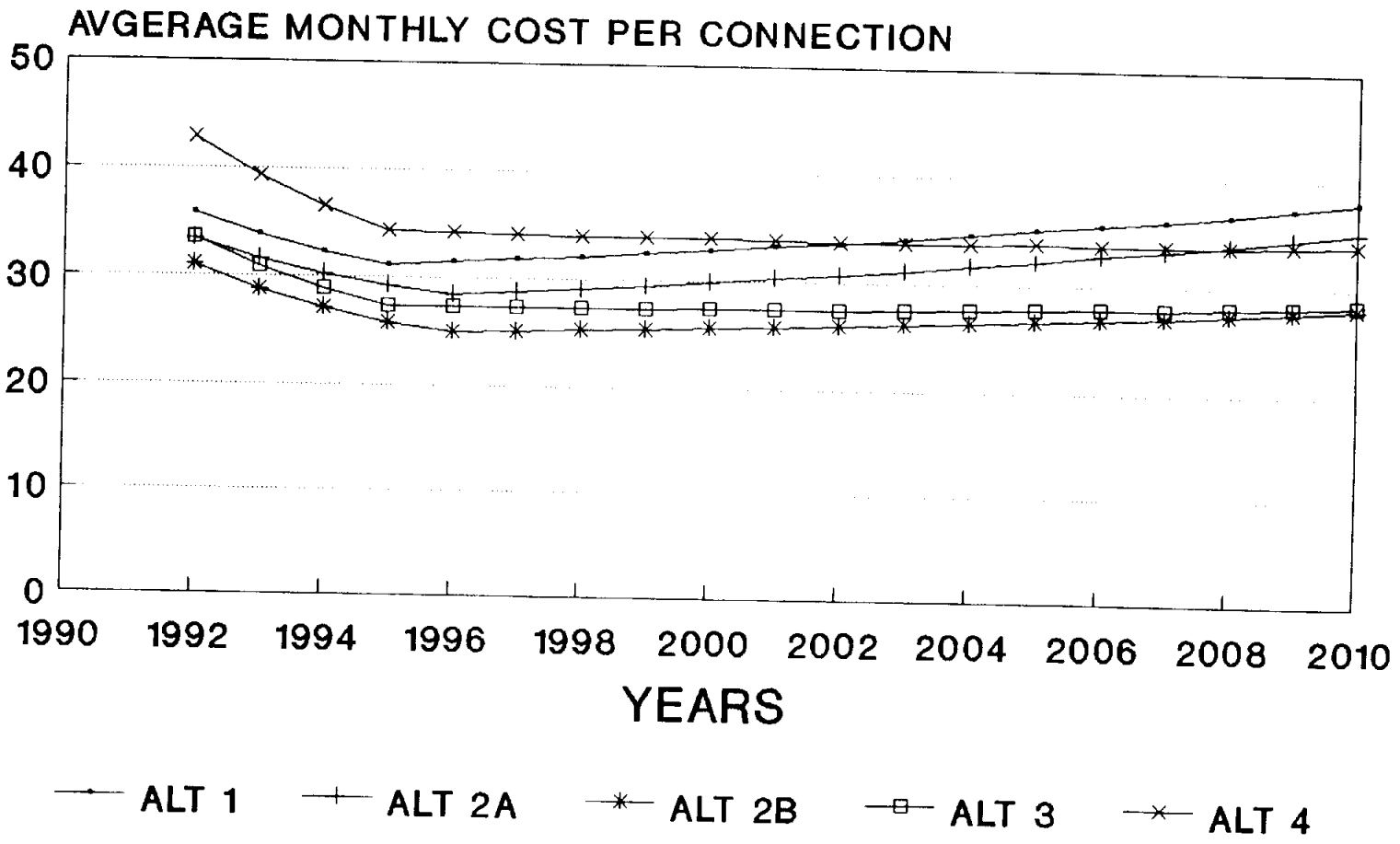


FIGURE VII-5
COST COMPARISON - 10/15/3

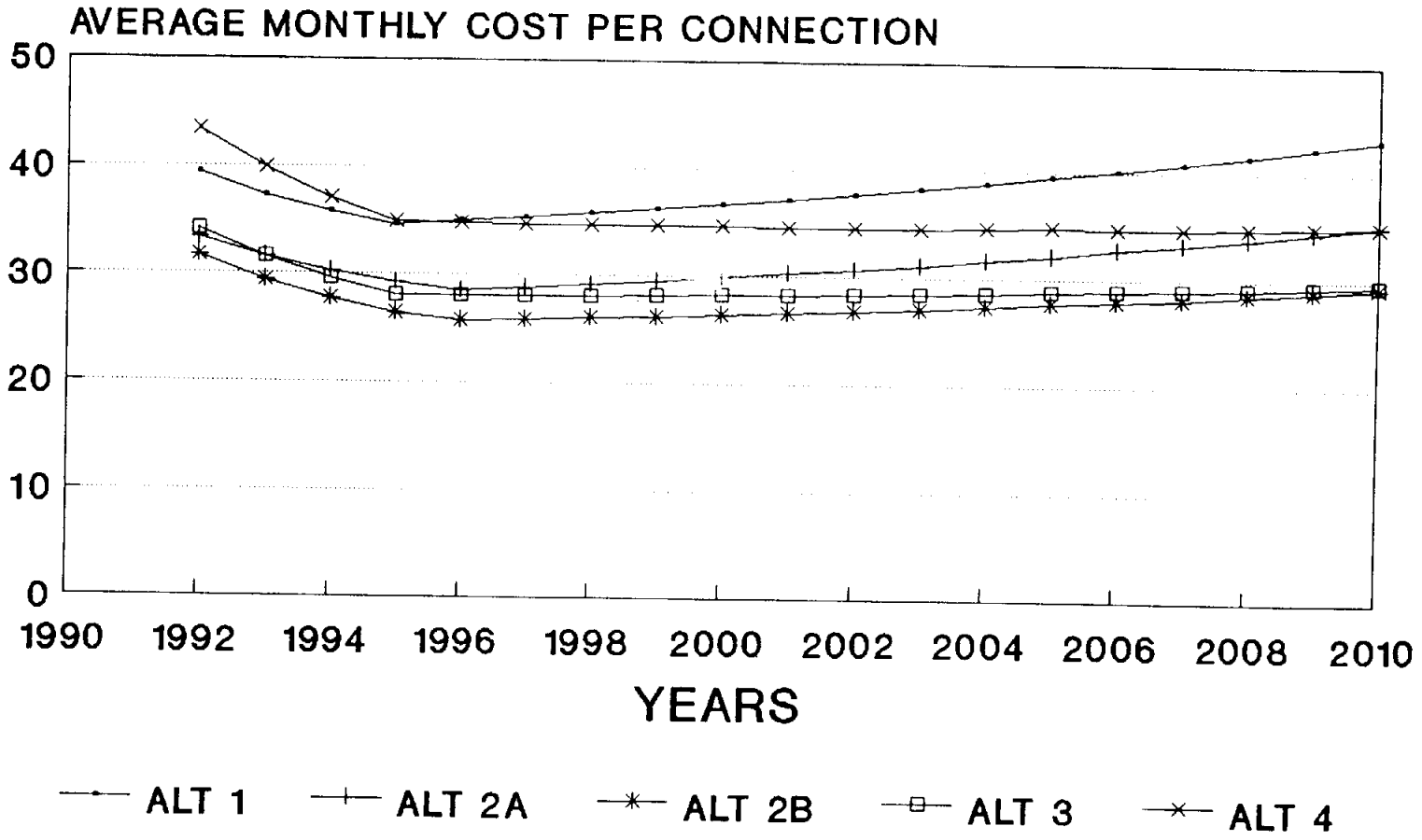
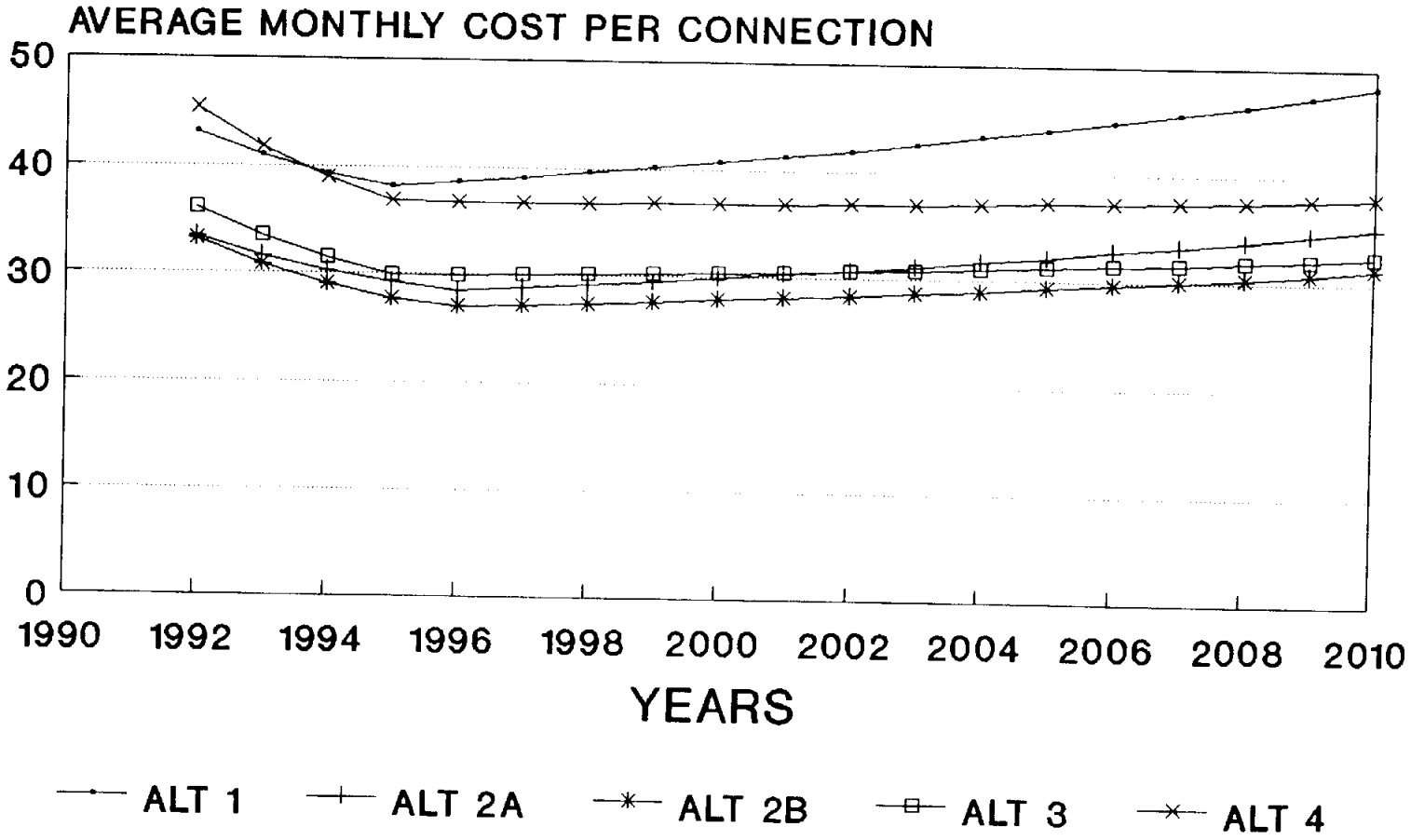


FIGURE VII-6
COST COMPARISON - 5/5/2/1



CONSOLIDATION OF TREATMENT FACILITIES IN AZLE

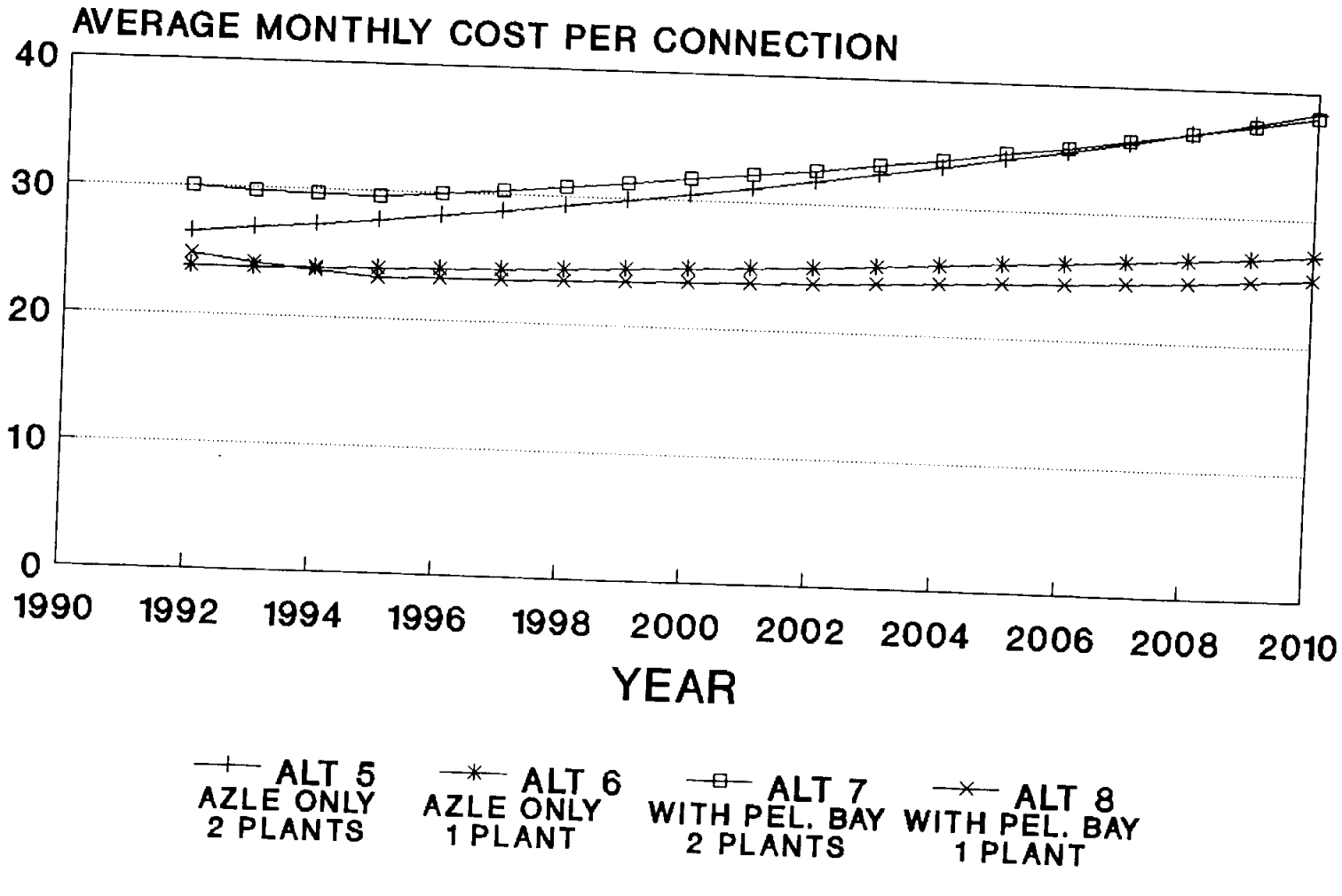
Tables included in Appendix D as "Alternate 7" and "Alternate 8" were prepared to assess the potential costs of consolidating wastewater treatment facilities in the Azle area into a single plant (assumed to be located at the existing Ash Creek site) vs. upgrading and expanding both of Azle's existing plants to handle projected year 2010 flows and to meet nitrification requirements. These analyses indicate that the City of Azle may benefit from consolidating its wastewater treatment operations at a single plant site if more stringent permit limitations are imposed.

PARTICIPATION BY PELICAN BAY

Tables included in Appendix D as "Alternative 5" and "Alternative 6, along with the previously-discussed tables for Alternatives "7" and "8", may be used to assess the potential impact of inclusion of the City of Pelican Bay within the City of Azle's wastewater system. These figures indicate that if the City of Azle's wastewater treatment functions are combined at a single plant, it may be to the advantages of both Azle and Pelican Bay residents for the City of Azle to accept Pelican Bay's wastewater under a contractual agreement for treatment at its Ash Creek plant.

The advantages of combining Azle and Pelican Bay wastewaters would not be realized if Pelican Bay were served through the existing Walnut Creek plant, primarily because of the higher unit costs of upgrading, expanding, and operating the smaller plant. Figure VII-7 presents a plot of the projected monthly costs per connection to be incurred by Azle-area residents under each of these scenarios.

FIGURE VII-7
COST COMPARISON - 10/15/3



PARTICIPATION BY LAKESIDE

An economic sensitivity analysis for facilities for the Silver Creek and Live Oak Creek watersheds under Alternative 2B indicates that participation by the City of Lakeside would significantly enhance the economic feasibility of providing regional wastewater service in this area. This is due primarily to the economies of scale that could be made available to other area residents by including Lakeside in a regional system.

WATER REUSE/RECLAMATION

Water reclamation programs are receiving attention and encouragement on a national basis. Under any of the alternatives evaluated, some potential exists for recovery of costs through either direct or indirect water reuse. Due to the relatively low flows projected for most of the alternatives considered, it is not anticipated that water reuse possibilities will be the governing factor in determining the alternative's feasibility. It is noted, however, that plans for golf courses and parks have been proposed in the Azle area and in the Lake Worth watershed area, and that water reuse by irrigation of these lands may prove attractive for these projects.

EXISTING BONDED INDEBTEDNESS

Although the City of Azle does not have its debt service payments specifically broken out for wastewater treatment facilities, it is estimated that the City currently has an outstanding debt of approximately $1.5 to $2 million due specifically to wastewater treatment facility upgrades in recent years. If these existing debts were taken over by a regional entity under an agreement that would distribute the existing debt service costs over a larger population base, unit costs to Azle-area residents would decrease, while costs to the remaining study area residents would increase to a lesser extent.

Under alternative 2B, for instance, if an agreement were reached to distribute these existing debt service payments among customers in both Azle and Pelican Bay, the average customer in the City of Azle would be expected to realize cost savings on the order of $.50 to $1.00 per connection per month. Costs to other system participants would rise from those values previously shown to reflect this additional cost. More substantial cost savings to Azle residents might be realized if an agreement could be negotiated whereby a regional entity such as the City of Fort Worth would absorb these existing debt service payments and distribute them over a substantially larger population base. It is estimated that Azle's existing debt service for its recent wastewater treatment plant improvements result in an average cost of approximately $5.00 per connection per month when divided strictly over the number of residential connections.

CHAPTER VIII
RECOMMENDATIONS

This chapter summarizes the recommendations for wastewater facility improvements that have been developed through this study.

RECOMMENDED PLAN

It appears that a wastewater system similar to that described under Alternative 2B will be the most cost-effective scenario for wastewater service to the study area within the next 20 years.

Under this scenario, the existing City of Azle Ash Creek Wastewater Treatment Plant would be expanded as necessary to accommodate future flows from the Walnut Creek and Pelican Bay service areas, as well as from its own watershed. The Silver Creek and Live Oak Creek watersheds would be served by the City of Fort Worth through its existing collection system. It does not appear that consolidation of all wastewater collection and treatment functions into a single system for the study area will be the most cost-effective alternative within the 20-year planning horizon.

These recommendations are based primarily on a comparison of projected long-term capital and operating costs associated with each alternative. It is noted that the following considerations could also have an effect on the specific alternative selected:

1. Specific recommendations with regard to effluent quality standards for each alternative evaluated are beyond the scope of this study, but could be a factor in selecting an alternative for further development. In reviewing this draft report, the Texas Water Commission (TWC) staff has recommended that further studies be done to determine the impacts of the discharge from an expanded Ash Creek wastewater treatment plant on the Lake and cove areas. It was also suggested by the TWC staff that an evaluation with respect to relocation of the Ash Creek plant's outfall may be warranted.

2. Water reuse does not appear to be a major factor influencing costs of wastewater service during the planning period. It could, however, somewhat influence the projected annual costs of any of the alternatives selected if suitable customers for treated wastewater are identified.

3. A limitation on the available site capacity at the City of Fort Worth's existing Village Creek Wastewater Treatment Plant may require the City to consider building future treatment capacity at remote or "satellite" locations within its collection system. Although construction of a "satellite plant" to serve the entire planning area does not appear to be the most cost-effective alternative during this planning period, this situation may change at some time in the future. It is suggested that the City of Fort Worth consider early planning, possibly including site acquisition, for a future satellite plant in or near this project's study area.

4. Projected future wholesale wastewater rate structures were not available from the City of Fort Worth at the time of this printing. The relative rankings of the alternatives involving service through Fort Worth's system could change somewhat when these figures are made available.

5. It is noted that for purposes of planning beyond year 2010, the Walnut Creek watershed may ultimately contribute the majority of the wastewater flows to be generated in the Azle area.

Table VIII-1 presents a summary of the sizes, costs, and suggested timing of the improvements recommended in this plan.

TABLE VIII-1

SUMMARY OF RECOMMENDED IMPROVEMENTS

Description	Begin	End	Opinion of Probable Cost (millions)
1. Obtain permit amendment, design, and construct improvements to expand and upgrade existing Ash Creek WWTP to 2.41 MGD design flow.	6/90	12/92	5.5
2. Design and construct collection system improvements necessary to transport Pelican Bay and Azle area flows to Ash Creek watershed and to serve Silver Creek and Live Oak Creek watersheds through existing City of Fort Worth system (sizes of collection system facilities are detailed in Chapter VI).	9/90	6/93	4.8
3. Abandon existing Azle Walnut Creek WWTP.	-	12/92	N/A
4. Obtain funding, design and construct internal collection systems in areas that do not currently have sewerage service.	6/90	12/93	-

Notes: All costs are expressed in 1990 dollars. Land rights costs for pipelines are not included. Costs shown in this table are intended to reflect compliance with nitrification and filtration requirements at the Azle-area Wastewater Treatment Plant (10/15/3 permit). Costs will be higher if more stringent permit limitations are imposed.

APPENDIX A

WASTELOAD PROJECTIONS

APPENDIX A

WASTELOAD PROJECTIONS

INDEX

ALTERNATE 1

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 1 *
* 10/15 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK
LAKE WORTH: SILVER CREEK, LIVE OAK CREEK, LAKESIDE
CITY OF FT. WORTH: NONE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	16	8

PROJECTED WASTELOADS (lb/day):
****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.83	1.09	1.21	1.37	1.60
	max month	1.25	1.64	1.82	2.06	2.40
BOD	avg day	69	91	101	114	69
	max month	104	136	151	171	104
TSS	avg day	104	136	151	171	104
	max month	156	205	227	257	156
AMMONIA	avg day	111	145	161	183	214
	max month	166	218	242	274	320
PHOS	avg day	55	73	81	91	107
	max month	83	109	121	137	160
DISCHARGES TO LAKE WORTH						
FLOW	avg day	0.00	0.41	0.43	0.45	0.47
	max month	0	0.62	0.65	0.68	0.71
BOD	avg day	0	34	36	38	39
	max month	0	51	54	56	59
TSS	avg day	0	51	54	56	59
	max month	0	77	81	84	88
AMMONIA	avg day	0	55	57	60	63
	max month	0	82	86	90	94
PHOS	avg day	0	27	29	30	31
	max month	0	41	43	45	47

ALTERNATE 1

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: *
* 10/15/3 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE:	PELICAN BAY, ASH CREEK, WALNUT CREEK
LAKE WORTH:	SILVER CREEK, LIVE OAK CREEK, LAKESIDE
CITY OF FT. WORTH:	NONE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	3	8

PROJECTED WASTELOADS (lb/day):
****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.83	1.09	1.21	1.37	1.60
	max month	1.25	1.64	1.82	2.06	2.40
BOD	avg day	69	91	101	114	133
	max month	104	136	151	171	200
TSS	avg day	104	136	151	171	200
	max month	156	205	227	257	300
AMMONIA	avg day	21	27	30	34	40
	max month	31	41	45	51	60
PHOS	avg day	55	73	81	91	107
	max month	83	109	121	137	160
DISCHARGES TO LAKE WORTH						
FLOW	avg day	0.00	0.41	0.43	0.45	0.47
	max month	0	0.62	0.65	0.68	0.71
BOD	avg day	0	34	36	38	39
	max month	0	51	54	56	59
TSS	avg day	0	51	54	56	59
	max month	0	77	81	84	88
AMMONIA	avg day	0	10	11	11	12
	max month	0	15	16	17	18
PHOS	avg day	0	27	29	30	31
	max month	0	41	43	45	47

ALTERNATE 1

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 1 *
* 5/5/2/1 *
****

CONTRIBUTING WATERSHEDS:
EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK
LAKE WORTH: SILVER CREEK, LIVE OAK CREEK, LAKESIDE
CITY OF FT. WORTH: NONE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	5	5	2	1

PROJECTED WASTELOADS (lb/day):
********** *****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.83	1.09	1.21	1.37	1.60
	max month	1.25	1.64	1.82	2.06	2.40
BOD	avg day	35	45	50	57	67
	max month	52	68	76	86	100
TSS	avg day	35	45	50	57	67
	max month	52	68	76	86	100
AMMONIA	avg day	14	18	20	23	27
	max month	21	27	30	34	40
PHOS	avg day	7	9	10	11	13
	max month	10	14	15	17	20
DISCHARGES TO LAKE WORTH						
FLOW	avg day	0.00	0.41	0.43	0.45	0.47
	max month	0.00	0.62	0.65	0.68	0.71
BOD	avg day	0	17	18	19	20
	max month	0	26	27	28	29
TSS	avg day	0	17	18	19	0
	max month	0	26	27	28	0
AMMONIA	avg day	0	7	7	8	8
	max month	0	10	11	11	12
PHOS	avg day	0	3	4	4	4
	max month	0	5	5	6	6

ALTERNATE 2A

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 2A *
* 200/200 *
****

CONTRIBUTING WATERSHEDS:
CITY OF FT. WORTH: PELICAN BAY, ASH CREEK, WALNUT CREEK SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS
INFLUENT:	200	200

PROJECTED WASTELOADS (lb/day):
****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO CITY OF FORT WORTH						
FLOW	avg day	0.83	1.50	1.64	1.82	2.07
	max month	1.25	2.25	2.46	2.73	3.11
BOD	avg day	1384	2502	2736	3036	1384
	max month	2077	3753	4103	4554	2077
TSS	avg day	1384	2502	2736	3036	1384
	max month	2077	3753	4103	4554	2077

ALTERNATE 2B

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 2B *
* 10/15 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK

CITY OF FT. WORTH: SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	16	8

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.83	1.09	1.21	1.37	1.60
	max month	1.25	1.64	1.82	2.06	2.40
BOD	avg day	69	91	101	114	69
	max month	104	136	151	171	104
TSS	avg day	104	136	151	171	104
	max month	156	205	227	257	156
AMMONIA	avg day	111	145	161	183	214
	max month	166	218	242	274	320
PHOS	avg day	55	73	81	91	107
	max month	83	109	121	137	160
DISCHARGES TO CITY OF FORT WORTH						
FLOW	avg day	0.00	0.41	0.43	0.45	0.47
	max month	0	0.62	0.65	0.68	0.71
BOD	avg day	0	34	36	38	39
	max month	0	51	54	56	59
TSS	avg day	0	51	54	56	59
	max month	0	77	81	84	88
AMMONIA	avg day	0	55	57	60	63
	max month	0	82	86	90	94
PHOS	avg day	0	27	29	30	31
	max month	0	41	43	45	47

ALTERNATE 2B

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PL NING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 2B *
* 10/15/3 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK

CITY OF FT. WORTH: SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	3	8

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.83	1.09	1.21	1.37	1.60
	max month	1.25	1.64	1.82	2.06	2.40
BOD	avg day	69	91	101	114	133
	max month	104	136	151	171	200
TSS	avg day	104	136	151	171	200
	max month	156	205	227	257	300
AMMONIA	avg day	21	27	30	34	40
	max month	31	41	45	51	60
PHOS	avg day	55	73	81	91	107
	max month	83	109	121	137	160
DISCHARGES TO CITY OF FORT WORTH						
FLOW	avg day	0.00	0.41	0.43	0.45	0.47
	max month	0	0.62	0.65	0.68	0.71
BOD	avg day	0	[illegible]	36	38	39
	max month	0	51	54	56	59
TSS	avg day	0	51	54	56	59
	max month	0	77	81	84	88
AMMONIA	avg day	0	10	11	11	12
	max month	0	15	16	17	18
PHOS	avg day	0	27	29	30	31
	max month	0	41	43	45	47

ALTERNATE 3

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 3 *
* 10/15 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	16	8

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.84	1.51	1.64	1.82	2.06
	max month	1.26	2.27	2.46	2.73	3.09
BOD	avg day	70	126	137	152	172
	max month	105	189	205	228	258
TSS	avg day	105	189	205	228	258
	max month	158	283	308	342	387
AMMONIA	avg day	112	201	219	243	275
	max month	168	302	328	364	412
PHOS	avg day	56	101	109	121	137
	max month	84	151	164	182	206

ALTERNATE 3

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 3 *
* 10/15/3 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	3	8

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.84	1.51	1.64	1.82	2.06
	max month	1.26	2.27	2.46	2.73	3.09
BOD	avg day	70	126	137	152	172
	max month	105	189	205	228	258
TSS	avg day	105	189	205	228	258
	max month	158	283	308	342	387
AMMONIA	avg day	21	38	41	46	52
	max month	32	57	62	68	77
PHOS	avg day	56	101	109	121	137
	max month	84	151	164	182	206

ALTERNATE 3

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 3 *
* 5/5/2/1 *
****

CONTRIBUTING WATERSHEDS:

EAGLE MOUNTAIN LAKE: PELICAN BAY, ASH CREEK, WALNUT CREEK SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	5	5	2	1

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO EAGLE MOUNTAIN LAKE						
FLOW	avg day	0.84	1.51	1.64	1.82	2.06
	max month	1.26	2.27	2.46	2.73	3.09
BOD	avg day	35	63	68	76	86
	max month	53	94	103	114	129
TSS	avg day	35	63	68	76	86
	max month	53	94	103	114	129
AMMONIA	avg day	14	25	27	30	34
	max month	21	38	41	46	52
PHOS	avg day	7	13	14	15	17
	max month	11	19	21	23	26

ALTERNATE 4

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE
EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 4 *
* 10/15 *
****

CONTRIBUTING WATERSHEDS:

LAKE WORTH: PELICAN BAY, ASH CREEK, WALNUT CREEK
SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
.UENT:	200	200		
EFFLUENT:	10	15	16	8

PROJECTED WASTELOADS (lb/day):
****

RECEIVING WATER & PARAMETER		Y E A R 1990	1995	2000	2005	2010
DISCHARGES TO LAKE WORTH						
FLOW	avg day	0.84	1.51	1.64	1.82	2.06
	max month	1.26	2.27	2.46	2.73	3.09
BOD	avg day	70	126	137	152	172
	max month	105	189	205	228	258
TSS	avg day	105	189	205	228	258
	max month	158	283	308	342	387
AMMONIA	avg day	112	201	219	243	275
	max month	168	302	328	364	412
PHOS	avg day	56	101	109	121	137
	max month	84	151	164	182	206

ALTERNATE 4

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 4 *
* 10/15/3 *
****

CONTRIBUTING WATERSHEDS:

LAKE WORTH: PELICAN BAY, ASH CREEK, WALNUT CREEK SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	10	15	3	8

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO LAKE WORTH						
FLOW	avg day	0.84	1.51	1.64	1.82	2.06
	max month	1.26	2.27	2.46	2.73	3.09
BOD	avg day	70	126	137	152	172
	max month	105	189	205	228	258
TSS	avg day	105	189	205	228	258
	max month	158	283	308	342	387
AMMONIA	avg day	21	38	41	46	52
	max month	32	57	62	68	77
PHOS	avg day	56	101	109	121	137
	max month	84	151	164	182	206

ALTERNATE 4

TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 1

REGIONAL WASTEWATER FACILITY PLANNING STUDY FOR A PORTION OF THE EAGLE MOUNTAIN LAKE AND LAKE WORTH WATERSHEDS

WASTELOAD PROJECTIONS

****
* ALTERNATIVE: 4 *
* 5/5/2/1 *
****

CONTRIBUTING WATERSHEDS:

LAKE WORTH: PELICAN BAY, ASH CREEK, WALNUT CREEK SILVER CREEK, LIVE OAK CREEK, LAKESIDE

POLLUTANT CONCENTRATIONS: (mg/l)

	BOD	TSS	NH3	PHOS
INFLUENT:	200	200		
EFFLUENT:	5	5	2	1

PROJECTED WASTELOADS (lb/day):

****

RECEIVING WATER & PARAMETER		YEAR 1990	1995	2000	2005	2010
DISCHARGES TO LAKE WORTH						
FLOW	avg day	0.84	1.51	1.64	1.82	2.06
	max month	1.26	2.27	2.46	2.73	3.09
BOD	avg day	35	63	68	76	86
	max month	53	94	103	114	129
TSS	avg day	35	63	68	76	86
	max month	53	94	103	114	129
AMMONIA	avg day	14	25	27	30	34
	max month	21	38	41	46	52
PHOS	avg day	7	13	14	15	17
	max month	11	19	21	23	26

APPENDIX B

PROCESS CAPACITY SUMMARIES

FOR

EXISTING CITY OF AZLE

WASTEWATER TREATMENT PLANTS

APPENDIX B

PROCESS CAPACITY SUMMARIES FOR EXISTING CITY OF AZLE WASTEWATER TREATMENT PLANTS

INDEX

ASH CREEK CAPACITY ANALYSIS
EFFLUENT SET: 10/15
AVG INFLUENT CONCS 200 MG/L BOD 200 MG/L TSS
DESIGN CONCS 250 MG/L BOD 250 MG/L TSS

TREATMENT UNIT	DIMENSIONS	CAPACITY DESIGN MGD	CAPACITY PEAK 2HR MGD	CRITERIA
PRELIMINARY TREATMENT UNITS				
COMMINUTOR	---	---	3.5	DESIGN CAPACITY
BAR SCREEN	---	---	3.5	DESIGN CAPACITY
PARSHALL FLUME	---	---	3.5	DESIGN CAPACITY
OXIDATION DITCH	102715 CU FT	3.28	---	15 LB/1000 CU FT
ROTORS (4 @ 20 HP)	80 HP	1.15	---	1.5 LB O2/HP HR, 1.6 LB O2/ LB BOD
FINAL CLARIFIER	4580 SQ FT	2.29	4.58	500 GPD/SQ FT Qd, 1000 GPD/SQ FT Qp2hr
	8 FT			
	36642 CU FT	1.83	3.65	3.6 HR Qd, 1.8 HR Qp2hr
EFFLUENT FILTERS (2 @ 200 SQ FT)	400 SQ FT	1.15	---	4 GPM/SQ FT, 1 FILTER OUT
CHLORINE CONTACT BASINS (2 @ 2545 CU FT)	5090 CU FT	---	2.74	20 MIN DT @ Qp2hr
SLUDGE DRYING BEDS (4 @ 4000 SQ FT)	16000 SQ FT	1.20	---	8 SQ FT/LB BOD INF

ASH CREEK CAPACITY ANALYSIS
EFFLUENT SET: 10/15/3
AVG INFLUENT CONCS 200 MG/L BOD 200 MG/L TSS
DESIGN CONCS 250 MG/L BOD 250 MG/L TSS

TREATMENT UNIT	DIMENSIONS	CAPACITY DESIGN MGD	CAPACITY PEAK 2HR MGD	CRITERIA
PRELIMINARY TREATMENT UNITS				
COMMINUTOR	---	---	3.5	DESIGN CAPACITY
BAR SCREEN	---	---	3.5	DESIGN CAPACITY
PARSHALL FLUME	---	---	3.5	DESIGN CAPACITY
OXIDATION DITCH	102715 CU FT	3.28	---	15 LB/1000 CU FT
ROTORS (4 @ 20 HP)	80 HP	0.84	---	1.5 LB O2/HP HR, 2.2 LB O2/ LB BOD
FINAL CLARIFIER	4580 SQ FT 8 FT	1.83	3.66	400 GPD/SQ FT Qd, 800 GPD/SQ FT Qp2hr
	36642 CU FT	1.46	2.99	4.5 HR Qd, 2.2 HR Qp2hr
EFFLUENT FILTERS (2 @ 200 SQ FT)	400 SQ FT	1.15	---	4 GPM/SQ FT, 1 FILTER OUT
CHLORINE CONTACT BASINS (2 @ 2545 CU FT)	5090 CU FT	---	2.74	20 MIN DT @ Qp2hr
SLUDGE DRYING BEDS (4 @ 4000 SQ FT)	16000 SQ FT	1.20	---	8 SQ FT/LB BOD INF

ASH CREEK CAPACITY ANALYSIS
EFFLUENT SET: 5/5/2/1
AVG INFLUENT CONCS 200 MG/L BOD 200 MG/L TSS
DESIGN CONCS 250 MG/L BOD 250 MG/L TSS

TREATMENT UNIT	DIMENSIONS	CAPACITY DESIGN MGD	CAPACITY PEAK 2HR MGD	CRITERIA
PRELIMINARY TREATMENT UNITS				
COMMINUTOR	---	---	3.5	DESIGN CAPACITY
BAR SCREEN	---	---	3.5	DESIGN CAPACITY
PARSHALL FLUME	---	---	3.5	DESIGN CAPACITY
OXIDATION DITCH	102715 CU FT	3.28	---	15 LB/1000 CU FT
ROTORS (4 @ 20 HP)	80 HP	0.84	---	1.5 LB O2/HP HR, 2.2 LB O2/ LB BOD
FINAL CLARIFIER	4580 SQ FT	1.83	3.66	400 GPD/SQ FT Qd, 800 GPD/SQ FT Qp2hr
	8 FT			
	36642 CU FT	1.46	2.99	4.5 HR Qd, 2.2 HR Qp2hr
EFFLUENT FILTERS (2 @ 200 SQ FT)	400 SQ FT	0.58	---	2 GPM/SQ FT, 1 FILTER OUT
CHLORINE CONTACT BASINS (2 @ 2545 CU FT)	5090 CU FT	---	2.74	20 MIN DT @ Qp2hr
SLUDGE DRYING BEDS (4 @ 4000 SQ FT)	16000 SQ FT	1.20	---	8 SQ FT/LB BOD INF

WALNUT CREEK CAPACITY ANALYSIS
EFFLUENT SET: 10/15
AVG INFLUENT CONCS 220 MG/L BOD 230 MG/L TSS
DESIGN CONCS 250 MG/L BOD 250 MG/L TSS

TREATMENT UNIT	DIMENSIONS	CAPACITY DESIGN MGD	CAPACITY PEAK 2HR MGD	CRITERIA
PRELIMINARY TREATMENT UNITS				
COMMINUTOR	---	0.03	0.5	DESIGN CAPACITY
BAR SCREEN	---	0.03	0.5	DESIGN CAPACITY
PARSHALL FLUME	---	0.03	0.5	DESIGN CAPACITY
BIOLOGICAL TREATMENT UNITS				
AERATION 1	2888 CU FT			
REAERATION 1	5659 CUFT	0.20	---	50 LB/1000 CU FT
FINAL CLARIFIER 1	418 SQ FT	0.29	0.59	700 GPD/SQ FT Qd, 1400 GPD/SQ FT Qp2hr
	15 FT			
	6270 CU FT	0.43	0.87	2.6 HR Qd, 1.3 HR Qp2hr
AEROBIC DIGESTER 1	3016 CU FT	0.08	---	20 CU FT/LB BODin
BLOWERS (2, COMB'D TOTAL)	950 SCFM	0.75	---	30 SCFM/1000 CU FT (DIG)
				1.21 LB O2/LB BOD, 8% OTE
AERATION 2	3548 CU FT			
REAERATION 2	7096 CUFT	0.26	---	50 LB/1000 CU FT
FINAL CLARIFIER 2	899 SQ FT	0.63	1.26	700 GPD/SQ FT Qd, 1400 GPD/SQ FT Qp2hr
	15 FT			
	13485 CU FT	0.93	1.86	2.6 HR Qd, 1.3 HR Qp2hr
AEROBIC DIGESTER 2	5322 CU FT	0.14	---	20 CU FT/LB BODin
BLOWER (1, TOTAL)	500 SCFM	0.28	---	30 SCFM/1000 CU FT (DIG)
				1.21 LB O2/LB BOD, 8% OTE
EFFLUENT FILTERS (4 @ 36 SQ FT)	144 SQ FT	0.47	---	3 GPM/SQ FT
CHLORINE CONTACT BASINS (2 @ 504 CU FT, 2 @ 630)	2268 CU FT	---	1.22	20 MIN DT @ Qp2hr
SLUDGE DRYING BEDS (6 @ 700 SQ FT, 1 @ 1000 SQ FT)	5200 SQ FT	0.35	---	8 SQ FT/LB BOD INF

WALNUT CREEK CAPACITY ANALYSIS
EFFLUENT SET: 10/15/3
AVG INFLUENT CONCS 220 MG/L BOD 230 MG/L TSS
DESIGN CONCS 250 MG/L BOD 250 MG/L TSS

TREATMENT UNIT	DIMENSIONS	CAPACITY DESIGN MGD	CAPACITY PEAK 2HR MGD	CRITERIA
PRELIMINARY TREATMENT UNITS				
COMMINUTOR	---	0.03	0.5	DESIGN CAPACITY
BAR SCREEN	---	0.03	0.5	DESIGN CAPACITY
PARSHALL FLUME	---	0.03	0.5	DESIGN CAPACITY
BIOLOGICAL TREATMENT UNITS				
AERATION 1	2888 CU FT			
REAERATION 1	5659 CUFT	0.20	---	50 LB/1000 CU FT
FINAL CLARIFIER 1	418 SQ FT	0.17	0.33	400 GPD/SQ FT Qd, 800 GPD/SQ FT Qp2hr
	15 FT			
AEROBIC DIGESTER 1	6270 CU FT	0.25	0.51	4.5 HR Qd, 2.2 HR Qp2hr
BLOWERS (2, COMB'D TOTAL)	3016 CU FT	0.08	---	20 CU FT/LB BODin
	950 SCFM	0.36	---	30 SCFM/1000 CU FT (DIG)
				2.2 LB O2/LB BOD, 8% OTE
AERATION 2	3548 CU FT			
REAERATION 2	7096 CUFT	0.26	---	50 LB/1000 CU FT
FINAL CLARIFIER 2	899 SQ FT	0.36	0.72	400 GPD/SQ FT Qd, 800 GPD/SQ FT Qp2hr
	15 FT			
AEROBIC DIGESTER 2	13485 CU FT	0.54	1.10	4.5 HR Qd, 2.2 HR Qp2hr
BLOWER (1, TOTAL)	5322 CU FT	0.15	---	20 CU FT/LB BODin
	500 SCFM	0.14	---	30 SCFM/1000 CU FT (DIG)
				2.2 LB O2/LB BOD, 8% OTE
EFFLUENT FILTERS (4 @ 36 SQ FT)	144 SQ FT	0.47	---	3 GPM/SQ FT
CHLORINE CONTACT BASINS (2 @ 504 CU FT, 2 @ 630)	2268 CU FT	---	1.22	20 MIN DT @ Qp2hr
SLUDGE DRYING BEDS (6 @ 700 SQ FT, 1 @ 1000 SQ FT)	5200 SQ FT	0.35	---	8 SQ FT/LB BOD INF

WALNUT CREEK CAPACITY ANALYSIS
EFFLUENT SET: 5/5/2/1
AVG INFLUENT CONCS 220 MG/L BOD 230 MG/L TSS
DESIGN CONCS 250 MG/L BOD 250 MG/L TSS

TREATMENT UNIT	DIMENSIONS	CAPACITY DESIGN MGD	CAPACITY PEAK 2HR MGD	CRITERIA
PRELIMINARY TREATMENT UNITS				
COMMINUTOR	---	0.03	0.5	DESIGN CAPACITY
BAR SCREEN	---	0.03	0.5	DESIGN CAPACITY
PARSHALL FLUME	---	0.03	0.5	DESIGN CAPACITY
BIOLOGICAL TREATMENT UNITS				
AERATION 1	2888 CU FT			
REAERATION 1	5659 CUFT	0.20	---	50 LB/1000 CU FT
FINAL CLARIFIER 1	418 SQ FT	0.17	0.33	400 GPD/SQ FT Qd, 800 GPD/SQ FT Qp2hr
	15 FT			
	6270 CU FT	0.25	0.51	4.5 HR Qd, 2.2 HR Qp2hr
AEROBIC DIGESTER 1	3016 CU FT	0.08	---	20 CU FT/LB BODin
BLOWERS (2, COMB'D TOTAL)	950 SCFM	0.36	---	30 SCFM/1000 CU FT (DIG) 2.2 LB O2/LB BOD, 8% OTE
AERATION 2	3548 CU FT			
REAERATION 2	7096 CUFT	0.26	---	50 LB/1000 CU FT
FINAL CLARIFIER 2	899 SQ FT	0.36	0.72	400 GPD/SQ FT Qd, 800 GPD/SQ FT Qp2hr
	15 FT			
	13485 CU FT	0.54	1.10	4.5 HR Qd, 2.2 HR Qp2hr
AEROBIC DIGESTER 2	5322 CU FT	0.15	---	20 CU FT/LB BODin
BLOWER (1, TOTAL)	500 SCFM	0.14	---	30 SCFM/1000 CU FT (DIG) 2.2 LB O2/LB BOD, 8% OTE
EFFLUENT FILTERS (4 @ 36 SQ FT)	144 SQ FT	0.23	---	1.5 GPM/SQ FT
CHLORINE CONTACT BASINS (2 @ 504 CU FT, 2 @ 630)	2268 CU FT	---	1.22	20 MIN DT @ Qp2hr
SLUDGE DRYING BEDS (6 @ 700 SQ FT, 1 @ 1000 SQ FT)	5200 SQ FT	0.35	---	8 SQ FT/LB BOD INF

APPENDIX C

CAPITAL COST PROJECTIONS

FOR

REGIONAL INTERCEPTOR SYSTEM COMPONENTS

APPENDIX C

CAPITAL COST PROJECTIONS FOR REGIONAL INTERCEPTOR SYSTEM COMPONENTS

INDEX

RADY AND ASSOCIATES, INC.
Engineers·Architects·Planners
910 Collier Street
Fort Worth, Texas 76102
817/335-6511

COST PROJECTION

Date November 26, 1989 Job No. 89024

PREPARED FOR APAI REGIONAL WW STUDY

PROJECT DESCRIPTION ALTERNATIVE 1 - COLLECTION SYSTEM

Item No.	Description of item	Total Quantity	Unit	Unit Price	Cost
1.	10" Sewer (PVC, 10' Aver. Depth)	6,500	L.F.	$34.00	$221,000.00
2.	12" Sewer (PVC, 10' Aver. Depth)	5,000	L.F.	40.00	200,000.00
3.	6" Force Main (DIP, Cl. 51)	7,500	L.F.	24.00	180,000.00
4.	8" Force Main (DIP, Cl. 51)	5,000	L.F.	26.00	130,000.00
5.	Lift Station No. 1 (1250 gpm)	1	L.S.	130,000.00	130,000.00
6.	Lift Station No. 2 (2000 gpm)	1	L.S.	240,000.00	240,000.00
7.	Lift Station No. 3 (360 gpm)	1	L.S.	80,000.00	80,000.00
8.	Lift Station No. 4 (444 gpm)	1	L.S.	90,000.00	90,000.00
9.	Lift Station No. 5 (1305 gpm)	1	L.S.	180,000.00	180,000.00
10.	Lift Station No. 6 (2445 gpm)	1	L.S.	280,000.00	280,000.00
	Subtotal				$1,731,000.00
	Contingencies (30%) Administration, Engineering, Survey & Legal				519,300.00
	TOTAL				$2,250,300.00

Prpd.by WGP
Chkd.by

RADY AND ASSOCIATES, INC.
Engineers·Architects·Planners
910 Collier Street
Fort Worth, Texas 76102
817/335-6511

COST PROJECTION

Date November 26, 1989 Job No. 89024

PREPARED FOR APAI REGIONAL WW STUDY

PROJECT DESCRIPTION ALTERNATIVE 2A - COLLECTION SYSTEM

Item No.	Description of item	Total Quantity	Unit	Unit Price	Cost
1.	10" Sewer (PVC, 10' Aver. Depth)	4,300	L.F.	$34.00	$146,200.00
2.	12" Sewer (PVC, 10' Aver. Depth)	5,000	L.F.	40.00	200,000.00
3.	18" Sewer (PVC, 10' Aver. Depth)	11,000	L.F.	51.00	561,000.00
4.	27" Sewer (RCP, 10' Aver. Depth)	6,000	L.F.	72.00	432,000.00
5.	27" Sewer (RCP, 12' Aver. Depth)	8,000	L.F.	76.00	608,000.00
6.	30" Sewer (RCP, 10' Aver. Depth)	10,000	L.F.	80.00	800,000.00
7.	6" Force Main (DIP, Cl. 51)	7,000	L.F.	24.00	168,000.00
8.	8" Force Main (DIP, Cl. 51)	17,000	L.F.	26.00	442,000.00
9.	12" Force Main (DIP, Cl. 51)	5,000	L.F.	30.00	150,000.00
10.	18" Force Main (DIP, Cl. 51)	15,800	L.F.	40.00	632,000.00
11.	21" Force Main (DIP, Cl. 51)	9,500	L.F.	47.00	446,500.00
12.	Lift Station No. 1 (1250 gpm)	1	L.S.	130,000.00	130,000.00
13.	Lift Station No. 2 (2000 gpm)	1	L.S.	240,000.00	240,000.00
14.	Lift Station No. 3 (360 gpm)	1	L.S.	80,000.00	80,000.00
15.	Lift Station No. 4 (445 gpm)	1	L.S.	90,000.00	90,000.00
16.	Lift Station No. 5 (860 gpm)	1	L.S.	140,000.00	140,000.00
17.	Lift Station No. 6 (4445 gpm)	1	L.S.	410,000.00	410,000.00
18.	Lift Station No. 7 (5720 gpm)	1	L.S.	480,000.00	480,000.00
19.	Lift Station No. 8 (4445 gpm)	1	L.S.	410,000.00	410,000.00
20.	Lift Station No. 9 (4445 gpm)	1	L.S.	410,000.00	410,000.00
21.	Lift Station No. 10 (4445 gpm)	1	L.S.	410,000.00	410,000.00
	Subtotal				$7,385,700.00
	Contingencies (30%)				
	Administration, Engineering, Survey & Legal				2,215,700.00
	TOTAL				$9,601,400.00

Prpd.by WGP
Chkd.by

RADY AND ASSOCIATES, INC.
Engineers·Architects·Planners
910 Collier Street
Fort Worth, Texas 76102
817/335-6511

COST PROJECTION

Date November 26, 1989 Job No. 89024

PREPARED FOR APAI REGIONAL WW STUDY

PROJECT DESCRIPTION ALTERNATIVE 2B - COLLECTION SYSTEM

Item No.	Description of item	Total Quantity	Unit	Unit Price	Cost
1.	10" Sewer (PVC, 10' Aver. Depth)	4,300	L.F.	$34.00	$146,200.00
2.	12" Sewer (PVC, 10' Aver. Depth)	5,000	L.F.	40.00	200,000.00
3.	15" Sewer (PVC, 10' Aver. Depth)	10,000	L.F.	46.00	460,000.00
4.	18" Sewer (PVC, 10' Aver. Depth)	11,000	L.F.	51.00	561,000.00
5.	6" Force Main (DIP, Cl. 51)	7,000	L.F.	24.00	168,000.00
6.	8" Force Main (DIP, Cl. 51)	17,000	L.F.	26.00	442,000.00
7.	10" Force Main (DIP, Cl. 51)	9,500	L.F.	28.00	266,000.00
8.	12" Force Main (DIP, Cl. 51)	5,000	L.F.	30.00	150,000.00
9.	Lift Station No. 1 (1250 gpm)	1	L.S.	130,000.00	130,000.00
10.	Lift Station No. 2 (2000 gpm)	1	L.S.	240,000.00	240,000.00
11.	Lift Station No. 3 (360 gpm)	1	L.S.	80,000.00	80,000.00
12.	Lift Station No. 4 (445 gpm)	1	L.S.	90,000.00	90,000.00
13.	Lift Station No. 5 (860 gpm)	1	L.S.	140,000.00	140,000.00
14.	Lift Station No. 6 (4445 gpm)	1	L.S.	410,000.00	410,000.00
15.	Lift Station No. 7 (1305 gpm)	1	L.S.	180,000.00	180,000.00
	Subtotal				$3,663,200.00
	Contingencies (30%)				
	Administration, Engineering, Survey & Legal				1,099,000.00
	TOTAL				$4,762,200.00

Prpd.by WGP
Chkd.by

RADY AND ASSOCIATES, INC.
Engineers·Architects·Planners
910 Collier Street
Fort Worth, Texas 76102
817/335-6511

COST PROJECTION

Date November 26, 1989 Job No. 89024

PREPARED FOR APAI REGIONAL WW STUDY

PROJECT DESCRIPTION ALTERNATIVE 3 - COLLECTION SYSTEM

Item No.	Description of item	Total Quantity	Unit	Unit Price	Cost
1.	10" Sewer (PVC, 10' Aver. Depth)	4,300	L.F.	$34.00	$146,200.00
2.	12" Sewer (PVC, 10' Aver. Depth)	8,500	L.F.	40.00	340,000.00
3.	15" Sewer (PVC, 10' Aver. Depth)	19,300	L.F.	46.00	887,800.00
4.	18" Sewer (PVC, 10' Aver. Depth)	11,000	L.F.	51.00	561,000.00
5.	6" Force Main (DIP, Cl. 51)	7,000	L.F.	24.00	168,000.00
6.	8" Force Main (DIP, Cl. 51)	17,000	L.F.	26.00	442,000.00
7.	10" Force Main (DIP, Cl. 51)	6,000	L.F.	28.00	168,000.00
8.	12" Force Main (DIP, Cl. 51)	5,000	L.F.	30.00	150,000.00
9.	Lift Station No. 1 (1250 gpm)	1	L.S.	130,000.00	130,000.00
10.	Lift Station No. 2 (2000 gpm)	1	L.S.	240,000.00	240,000.00
11.	Lift Station No. 3 (360 gpm)	1	L.S.	80,000.00	80,000.00
12.	Lift Station No. 4 (445 gpm)	1	L.S.	90,000.00	90,000.00
13.	Lift Station No. 5 (860 gpm)	1	L.S.	140,000.00	140,000.00
14.	Lift Station No. 6 (5720 gpm)	1	L.S.	480,000.00	480,000.00
15.	Lift Station No. 8 (1310 gpm)	1	L.S.	180,000.00	180,000.00
16.	Lift Station No. 9 (1310 gpm)	1	L.S.	180,000.00	180,000.00
17.	Lift Station No. 10 (1310 gpm)	1	L.S.	180,000.00	180,000.00
	Subtotal				$4,563,000.00
	Contingencies (30%)				
	Administration, Engineering, Survey & Legal				1,368,900.00
	TOTAL				$5,931,900.00

Prpd.by WGP
Chkd.by

RADY AND ASSOCIATES, INC.
Engineers·Architects·Planners
910 Collier Street
Fort Worth, Texas 76102
817/335-6511

COST PROJECTION

Date November 26, 1989 Job No. 89024

PREPARED FOR APAI REGIONAL WW STUDY

PROJECT DESCRIPTION ALTERNATIVE 4 - COLLECTION SYSTEM

Item No.	Description of item	Total Quantity	Unit	Unit Price	Cost
1.	10" Sewer (PVC, 10' Aver. Depth)	6,500	L.F.	$34.00	$221,000.00
2.	12" Sewer (PVC, 10' Aver. Depth)	5,000	L.F.	40.00	200,000.00
3.	18" Sewer (PVC, 10' Aver. Depth)	11,000	L.F.	51.00	561,000.00
4.	27" Sewer (RCP, 10' Aver. Depth)	11,500	L.F.	72.00	828,000.00
5.	27" Sewer (RCP, 12' Aver. Depth)	8,000	L.F.	74.00	592,000.00
6.	30" Sewer (RCP, 10' Aver. Depth)	3,000	L.F.	80.00	240,000.00
7.	6" Force Main (DIP, Cl. 51)	7,500	L.F.	24.00	180,000.00
8.	8" Force Main (DIP, Cl. 51)	5,000	L.F.	26.00	130,000.00
9.	12" Force Main (DIP, Cl. 51)	5,000	L.F.	28.00	140,000.00
10.	18" Force Main (DIP, Cl. 51)	18,800	L.F.	40.00	752,000.00
11.	Lift Station No. 1 (1250 gpm)	1	L.S.	130,000.00	130,000.00
12.	Lift Station No. 2 (2000 gpm)	1	L.S.	240,000.00	240,000.00
13.	Lift Station No. 3 (360 gpm)	1	L.S.	80,000.00	80,000.00
14.	Lift Station No. 4 (445 gpm)	1	L.S.	90,000.00	90,000.00
15.	Lift Station No. 5 (5720 gpm)	1	L.S.	480,000.00	480,000.00
16.	Lift Station No. 6 (4445 gpm)	1	L.S.	410,000.00	410,000.00
17.	Lift Station No. 8 (4445 gpm)	1	L.S.	410,000.00	410,000.00
18.	Lift Station No. 9 (4445 gpm)	1	L.S.	410,000.00	410,000.00
19.	Lift Station No. 10 (4445 gpm)	1	L.S.	410,000.00	410,000.00
	Subtotal				$6,504,000.00
	Contingencies (30%)				
	Administration, Engineering, Survey & Legal				1,951,200.00
	TOTAL				$8,455,200.00

Prpd.by WGP
Chkd.by

APPENDIX D

LONG-TERM COST ANALYSES

APPENDIX D

LONG-TERM COST ANALYSES

INDEX

COST11
12/12/89

ALTERNATIVE 1
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.51		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256			0	0	0	*****		*****	*****
1991	9717	0.972	1.458			0	0	0	*****		*****	*****
1992	11061	1.106	1.659	8760000	2250300	11010300	11908740	1212932	659361		1872292	$35.83
1993	12404	1.240	1.861			0	0	1212932	769022		1981953	$33.82
1994	13748	1.375	2.062			0	0	1212932	886401		2099332	$32.32
1995	15091	1.509	2.264			0	0	1212932	1011939		2224871	$31.21
1996	15361	1.536	2.304			0	0	1212932	1071246		2284178	$31.47
1997	15631	1.563	2.345			0	0	1212932	1133679		2346610	$31.78
1998	15901	1.590	2.385			0	0	1212932	1199391		2412323	$32.11
1999	16171	1.617	2.426			0	0	1212932	1268548		2481479	$32.48
2000	16441	1.644	2.466			0	0	1212932	1341317		2554249	$32.88
2001	16788	1.679	2.518			0	0	1212932	1424395		2637326	$33.25
2002	17135	1.713	2.570			0	0	1212932	1511972		2724904	$33.66
2003	17481	1.748	2.622			0	0	1212932	1604277		2817209	$34.11
2004	17828	1.783	2.674			0	0	1212932	1701547		2914479	$34.60
2005	18175	1.818	2.726			0	0	1212932	1804032		3016964	$35.14
2006	18664	1.866	2.800			0	0	1212932	1926652		3139584	$35.61
2007	19153	1.915	2.873			0	0	1212932	2056195		3269127	$36.13
2008	19641	1.964	2.946			0	0	1212932	2193019		3405950	$36.70
2009	20130	2.013	3.020			0	0	1212932	2337499		3550430	$37.33
2010	20619	2.062	3.093			0	0	1212932	2490028		3702959	$38.01
TOTAL:				8760000	2250300	11010300	11908740					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $22234081

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST12
12/12/89

ALTERNATIVE 1
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.76		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY COST PER HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		*****	*****
1991	9717	0.972	1.458			0	0	0	*****		*****	*****
1992	11061	1.106	1.659	9490000	2250300	11740300	12698308	1293351	768526		2061877	$39.46
1993	12404	1.240	1.861			0	0	1293351	896343		2189694	$37.37
1994	13748	1.375	2.062			0	0	1293351	1033156		2326506	$35.82
1995	15091	1.509	2.264			0	0	1293351	1179479		2472830	$34.68
1996	15361	1.536	2.304			0	0	1293351	1248605		2541956	$35.03
1997	15631	1.563	2.345			0	0	1293351	1321374		2614725	$35.41
1998	15901	1.590	2.385			0	0	1293351	1397966		2691317	$35.83
1999	16171	1.617	2.426			0	0	1293351	1478572		2771923	$36.28
2000	16441	1.644	2.466			0	0	1293351	1563389		2856740	$36.78
2001	16788	1.679	2.518			0	0	1293351	1660222		2953572	$37.24
2002	17135	1.713	2.570			0	0	1293351	1762299		3055650	$37.75
2003	17481	1.748	2.622			0	0	1293351	1869886		3163237	$38.30
2004	17828	1.783	2.674			0	0	1293351	1983261		3276611	$38.90
2005	18175	1.818	2.726			0	0	1293351	2102713		3396064	$39.55
2006	18664	1.866	2.800			0	0	1293351	2245634		3538985	$40.14
2007	19153	1.915	2.873			0	0	1293351	2396625		3689976	$40.78
2008	19641	1.964	2.946			0	0	1293351	2556101		3849452	$41.48
2009	20130	2.013	3.020			0	0	1293351	2724502		4017852	$42.25
2010	20619	2.062	3.093			0	0	1293351	2902284		4195635	$43.07
TOTAL:				9490000	2250300	11740300	12698308					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $24844621

NOTE:COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST13
12/12/89

ALTERNATIVE 1
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	5/5/2/1	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$2.02		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY * *COST PER * *HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256				0	0	0	*****	*****	***** *
1991	9717	0.972	1.458				0	0	0	*****	*****	***** *
1992	11061	1.106	1.659	10200000	2250300	12450300	13466244	1371567	882059		2253625	$43.13 *
1993	12404	1.240	1.861				0	0	1371567	1028757	2400324	$40.96 *
1994	13748	1.375	2.062				0	0	1371567	1185781	2557348	$39.37 *
1995	15091	1.509	2.264				0	0	1371567	1353720	2725287	$38.22 *
1996	15361	1.536	2.304				0	0	1371567	1433058	2804625	$38.65 *
1997	15631	1.563	2.345				0	0	1371567	1516577	2888143	$39.11 *
1998	15901	1.590	2.385				0	0	1371567	1604484	2976051	$39.62 *
1999	16171	1.617	2.426				0	0	1371567	1696997	3068564	$40.17 *
2000	16441	1.644	2.466				0	0	1371567	1794345	3165911	$40.76 *
2001	16788	1.679	2.518				0	0	1371567	1905482	3277048	$41.32 *
2002	17135	1.713	2.570				0	0	1371567	2022639	3394205	$41.93 *
2003	17481	1.748	2.622				0	0	1371567	2146119	3517686	$42.59 *
2004	17828	1.783	2.674				0	0	1371567	2276242	3647809	$43.31 *
2005	18175	1.818	2.726				0	0	1371567	2413341	3784908	$44.08 *
2006	18664	1.866	2.800				0	0	1371567	2577376	3948942	$44.79 *
2007	19153	1.915	2.873				0	0	1371567	2750672	4122238	$45.56 *
2008	19641	1.964	2.946				0	0	1371567	2933707	4305274	$46.40 *
2009	20130	2.013	3.020				0	0	1371567	3126985	4498552	$47.30 *
2010	20619	2.062	3.093				0	0	1371567	3331031	4702597	$48.28 *
TOTAL:				10200000	2250300	12450300	13466244					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $27511387

NOTE: COSTS DO NOT INCLUDE SERVICE DEBT ON EXISTING FACILITIES

COST2A
01/22/90

ALTERNATIVE 2a
LONG-TERM COST ANALYSIS

PERMIT LIMITS: N/A
INFLATION RATE(%): 4.000
AVG FLOW(GPCD): 100
INTEREST RATE: 8.00
LOAN TERM(YRS): 20
O&M COST ($/1000):CITY OF FT. WORTH RATES
PERSONS/HOUSEHOLD: 2.54

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	FT. WORTH WASTEWATER RATES (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****	*****	***** *
1991	9717	0.972	1.458			0	0	0	*****	*****	***** *
1992	11061	1.106	1.659		9601400	9601400	10384874	1057722	690274	1747996	$33.45 *
1993	12404	1.240	1.861			0	0	1057722	795071	1852793	$31.62 *
1994	13748	1.375	2.062			0	0	1057722	907147	1964870	$30.25 *
1995	15091	1.509	2.264			0	0	1057722	1026918	2084640	$29.24 *
1996	15361	1.536	2.304			0	0	1057722	1011407	2069129	$28.51 *
1997	15631	1.563	2.345			0	0	1057722	1070011	2127733	$28.81 *
1998	15901	1.590	2.385			0	0	1057722	1131685	2189408	$29.14 *
1999	16171	1.617	2.426			0	0	1057722	1196582	2254304	$29.51 *
2000	16441	1.644	2.466			0	0	1057722	1264859	2322582	$29.90 *
2001	16788	1.679	2.518			0	0	1057722	1349168	2406891	$30.35 *
2002	17135	1.713	2.570			0	0	1057722	1431496	2489218	$30.75 *
2003	17481	1.748	2.622			0	0	1057722	1518250	2575973	$31.19 *
2004	17828	1.783	2.674			0	0	1057722	1609655	2667378	$31.67 *
2005	18175	1.818	2.726			0	0	1057722	1705943	2763665	$32.19 *
2006	18664	1.866	2.800			0	0	1057722	1835442	2893164	$32.81 *
2007	19153	1.915	2.873			0	0	1057722	1957493	3015215	$33.32 *
2008	19641	1.964	2.946			0	0	1057722	2086371	3144093	$33.88 *
2009	20130	2.013	3.020			0	0	1057722	2222427	3280150	$34.49 *
2010	20619	2.062	3.093			0	0	1057722	2366030	3423753	$35.15 *
TOTAL:					0	9601400	9601400	10384874			

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): 20452382

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST2B1
01/22/90

ALTERNATIVE 2B
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10/15	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.04		

YEAR	POPULATION SERVED (AZLE)	AZLE AVG FLOW (MGD)	AZLE DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	FT WORTH SERVICE CHARGES (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****	0	*****	***** *
1991	8878	0.888	1.332			0	0	0	*****	0	*****	***** *
1992	9382	0.938	1.407	5550000	4762200	10312200	11153676	1136026	385185	100270	1621482	$31.03 *
1993	9885	0.989	1.483			0	0	1136026	422105	129650	1687781	$28.80 *
1994	10389	1.039	1.558			0	0	1136026	461362	161220	1758608	$27.08 *
1995	10893	1.089	1.634			0	0	1136026	503084	195109	1834219	$25.73 *
1996	11136	1.114	1.670			0	0	1136026	534879	145539	1816444	$25.03 *
1997	11379	1.138	1.707			0	0	1136026	568413	152315	1856754	$25.14 *
1998	11622	1.162	1.743			0	0	1136026	603773	159400	1899200	$25.28 *
1999	11865	1.187	1.780			0	0	1136026	641053	166809	1943889	$25.44 *
2000	12108	1.211	1.816			0	0	1136026	680349	174554	1990930	$25.63 *
2001	12426	1.243	1.864			0	0	1136026	726170	182833	2045029	$25.78 *
2002	12745	1.274	1.912			0	0	1136026	774568	191368	2101962	$25.97 *
2003	13063	1.306	1.959			0	0	1136026	825675	200293	2161995	$26.18 *
2004	13382	1.338	2.007			0	0	1136026	879632	209626	2225284	$26.42 *
2005	13700	1.370	2.055			0	0	1136026	936584	219385	2291996	$26.69 *
2006	14161	1.416	2.124			0	0	1136026	1006824	229495	2372345	$26.90 *
2007	14622	1.462	2.193			0	0	1136026	1081184	240129	2457340	$27.16 *
2008	15083	1.508	2.262			0	0	1136026	1159883	251247	2547156	$27.45 *
2009	15544	1.554	2.332			0	0	1136026	1243147	262871	2642044	$27.78 *
2010	16005	1.601	2.401			0	0	1136026	1331216	275022	2742265	$28.15 *
TOTAL:				5550000	4762200	10312200	11153676					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $17601187

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST2B2
01/22/90

ALTERNATIVE 2B
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.13		

YEAR	POPULATION SERVED (AZLE)	AZLE AVG FLOW (MGD)	AZLE DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	FT WORTH SERVICE CHARGES (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY COST PER HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256			0	0	0	*****	0	*****	*****
1991	8878	0.888	1.332			0	0	0	*****	0	*****	*****
1992	9382	0.938	1.407	5550000	4762200	10312200	11153676	1136026	418519	100270	1654815	$31.67
1993	9885	0.989	1.483			0	0	1136026	458633	129650	1724310	$29.42
1994	10389	1.039	1.558			0	0	1136026	501287	161220	1798534	$27.69
1995	10893	1.089	1.634			0	0	1136026	546620	195109	1877755	$26.34
1996	11136	1.114	1.670			0	0	1136026	581166	145539	1862732	$25.67
1997	11379	1.138	1.707			0	0	1136026	617602	152315	1905944	$25.81
1998	11622	1.162	1.743			0	0	1136026	656023	159400	1951449	$25.98
1999	11865	1.187	1.780			0	0	1136026	696529	166809	1999364	$26.17
2000	12108	1.211	1.816			0	0	1136026	739226	174554	2049806	$26.39
2001	12426	1.243	1.864			0	0	1136026	789012	182833	2107871	$26.58
2002	12745	1.274	1.912			0	0	1136026	841597	191368	2168992	$26.79
2003	13063	1.306	1.959			0	0	1136026	897128	200293	2233447	$27.04
2004	13382	1.338	2.007			0	0	1136026	955754	209626	2301406	$27.32
2005	13700	1.370	2.055			0	0	1136026	1017635	219385	2373046	$27.64
2006	14161	1.416	2.124			0	0	1136026	1093953	229495	2459474	$27.89
2007	14622	1.462	2.193			0	0	1136026	1174748	240129	2550904	$28.19
2008	15083	1.508	2.262			0	0	1136026	1260257	251247	2647531	$28.53
2009	15544	1.554	2.332			0	0	1136026	1350727	262871	2749624	$28.91
2010	16005	1.601	2.401			0	0	1136026	1446418	275022	2857466	$29.33
TOTAL:				5550000	4762200	10312200	11153676					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $18115653

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST2B3
01/22/90

ALTERNATIVE 2B
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	5/5/2/1	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.26		

YEAR	POPULATION SERVED (AZLE)	AZLE AVG FLOW (MGD)	AZLE DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	FT WORTH SERVICE CHARGES (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****	0	*****	***** *
1991	8878	0.888	1.332			0	0	0	*****	0	*****	***** *
1992	9382	0.938	1.407	5820000	4762200	10582200	11445708	1165771	466667	100270	1732707	$33.16 *
1993	9885	0.989	1.483			0	0	1165771	511396	129650	1806817	$30.83 *
1994	10389	1.039	1.558			0	0	1165771	558958	161220	1885948	$29.04 *
1995	10893	1.089	1.634			0	0	1165771	609505	195109	1970385	$27.64 *
1996	11136	1.114	1.670			0	0	1165771	648026	145539	1959336	$27.00 *
1997	11379	1.138	1.707			0	0	1165771	688654	152315	2006739	$27.17 *
1998	11622	1.162	1.743			0	0	1165771	731494	159400	2056665	$27.38 *
1999	11865	1.187	1.780			0	0	1165771	776660	166809	2109240	$27.61 *
2000	12108	1.211	1.816			0	0	1165771	824269	174554	2164594	$27.87 *
2001	12426	1.243	1.864			0	0	1165771	879783	182833	2228386	$28.10 *
2002	12745	1.274	1.912			0	0	1165771	938418	191368	2295557	$28.36 *
2003	13063	1.306	1.959			0	0	1165771	1000337	200293	2366401	$28.65 *
2004	13382	1.338	2.007			0	0	1165771	1065708	209626	2441105	$28.98 *
2005	13700	1.370	2.055			0	0	1165771	1134708	219385	2519863	$29.35 *
2006	14161	1.416	2.124			0	0	1165771	1219806	229495	2615072	$29.66 *
2007	14622	1.462	2.193			0	0	1165771	1309896	240129	2715796	$30.01 *
2008	15083	1.508	2.262			0	0	1165771	1405242	251247	2822260	$30.41 *
2009	15544	1.554	2.332			0	0	1165771	1506120	262871	2934762	$30.86 *
2010	16005	1.601	2.401			0	0	1165771	1612820	275022	3053612	$31.35 *
TOTAL:				5820000	4762200	10582200	11445708					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $19123263

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST31
12/12/89

ALTERNATIVE 3
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$0.84		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256			0	0	0	*****		*****	*****
1991	9717	0.972	1.458			0	0	0	*****		*****	*****
1992	11061	1.106	1.659	6650000	5931900	12581900	13608583	1386064	366797		1752861	$33.54
1993	12404	1.240	1.861			0	0	1386064	427800		1813864	$30.95
1994	13748	1.375	2.062			0	0	1386064	493097		1879161	$28.93
1995	15091	1.509	2.264			0	0	1386064	562933		1948997	$27.34
1996	15361	1.536	2.304			0	0	1386064	595925		1981989	$27.31
1997	15631	1.563	2.345			0	0	1386064	630656		2016720	$27.31
1998	15901	1.590	2.385			0	0	1386064	667211		2053275	$27.33
1999	16171	1.617	2.426			0	0	1386064	705682		2091746	$27.38
2000	16441	1.644	2.466			0	0	1386064	746163		2132227	$27.45
2001	16788	1.679	2.518			0	0	1386064	792378		2178443	$27.47
2002	17135	1.713	2.570			0	0	1386064	841097		2227161	$27.51
2003	17481	1.748	2.622			0	0	1386064	892446		2278510	$27.59
2004	17828	1.783	2.674			0	0	1386064	946556		2332620	$27.69
2005	18175	1.818	2.726			0	0	1386064	1003568		2389632	$27.83
2006	18664	1.866	2.800			0	0	1386064	1071780		2457844	$27.87
2007	19153	1.915	2.873			0	0	1386064	1143844		2529908	$27.96
2008	19641	1.964	2.946			0	0	1386064	1219957		2606022	$28.08
2009	20130	2.013	3.020			0	0	1386064	1300330		2686395	$28.25
2010	20619	2.062	3.093			0	0	1386064	1385181		2771245	$28.45
TOTAL:				6650000	5931900	12581900	13608583					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $18693851

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST32
12/12/89

ALTERNATIVE 3
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$0.91		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256			0	0	0	*****		***** *	***** *
1991	9717	0.972	1.458			0	0	0	*****		***** *	***** *
1992	11061	1.106	1.659	6650000	5931900	12581900	13608583	1386064	397363		1783427 *	$34.13 *
1993	12404	1.240	1.861			0	0	1386064	463450		1849514 *	$31.56 *
1994	13748	1.375	2.062			0	0	1386064	534188		1920253 *	$29.57 *
1995	15091	1.509	2.264			0	0	1386064	609844		1995909 *	$27.99 *
1996	15361	1.536	2.304			0	0	1386064	645586		2031650 *	$28.00 *
1997	15631	1.563	2.345			0	0	1386064	683210		2069275 *	$28.02 *
1998	15901	1.590	2.385			0	0	1386064	722812		2108876 *	$28.07 *
1999	16171	1.617	2.426			0	0	1386064	764489		2150553 *	$28.15 *
2000	16441	1.644	2.466			0	0	1386064	808343		2194408 *	$28.25 *
2001	16788	1.679	2.518			0	0	1386064	858410		2244474 *	$28.30 *
2002	17135	1.713	2.570			0	0	1386064	911189		2297253 *	$28.38 *
2003	17481	1.748	2.622			0	0	1386064	966816		2352880 *	$28.49 *
2004	17828	1.783	2.674			0	0	1386064	1025436		2411500 *	$28.63 *
2005	18175	1.818	2.726			0	0	1386064	1087198		2473263 *	$28.80 *
2006	18664	1.866	2.800			0	0	1386064	1161095		2547159 *	$28.89 *
2007	19153	1.915	2.873			0	0	1386064	1239164		2625228 *	$29.01 *
2008	19641	1.964	2.946			0	0	1386064	1321621		2707685 *	$29.18 *
2009	20130	2.013	3.020			0	0	1386064	1408691		2794755 *	$29.39 *
2010	20619	2.062	3.093			0	0	1386064	1500613		2886677 *	$29.63 *
TOTAL:				6650000	5931900	12581900	13608583					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $19224572

NOTE: COSTS DO NOT INCLUDE DEBT SERIVCE ON EXISTING FACILITIES

COST33
12/12/89

ALTERNATIVE 3
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	5/5/2/1	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.06		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		*****	*****
1991	9717	0.972	1.458			0	0	0	*****		*****	*****
1992	11061	1.106	1.659	6970000	5931900	12901900	13954695	1421317	462862		1884179	$36.06
1993	12404	1.240	1.861			0	0	1421317	539843		1961160	$33.47
1994	13748	1.375	2.062			0	0	1421317	622242		2043558	$31.46
1995	15091	1.509	2.264			0	0	1421317	710368		2131685	$29.90
1996	15361	1.536	2.304			0	0	1421317	752001		2173317	$29.95
1997	15631	1.563	2.345			0	0	1421317	795827		2217144	$30.02
1998	15901	1.590	2.385			0	0	1421317	841957		2263273	$30.13
1999	16171	1.617	2.426			0	0	1421317	890504		2311820	$30.26
2000	16441	1.644	2.466			0	0	1421317	941587		2362903	$30.42
2001	16788	1.679	2.518			0	0	1421317	999906		2421223	$30.53
2002	17135	1.713	2.570			0	0	1421317	1061385		2482701	$30.67
2003	17481	1.748	2.622			0	0	1421317	1126181		2547498	$30.85
2004	17828	1.783	2.674			0	0	1421317	1194464		2615780	$31.06
2005	18175	1.818	2.726			0	0	1421317	1266407		2687723	$31.30
2006	18664	1.866	2.800			0	0	1421317	1352484		2773801	$31.46
2007	19153	1.915	2.873			0	0	1421317	1443422		2864738	$31.66
2008	19641	1.964	2.946			0	0	1421317	1539470		2960787	$31.91
2009	20130	2.013	3.020			0	0	1421317	1640893		3062210	$32.20
2010	20619	2.062	3.093			0	0	1421317	1747967		3169283	$32.53
TOTAL:				6970000	5931900	12901900	13954695					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $20675304

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST41
12/12/89

ALTERNATIVE 4
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$0.88		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY * *COST PER * *HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256			0	0	0	*****		*****	*****
1991	9717	0.972	1.458			0	0	0	*****		*****	*****
1992	11061	1.106	1.659	8370000	8455200	16825200	18198136	1853520	384263		2237784	$42.82
1993	12404	1.240	1.861			0	0	1853520	448172		2301692	$39.28
1994	13748	1.375	2.062			0	0	1853520	516578		2370098	$36.49
1995	15091	1.509	2.264			0	0	1853520	589740		2443260	$34.27
1996	15361	1.536	2.304			0	0	1853520	624302		2477823	$34.14
1997	15631	1.563	2.345			0	0	1853520	660687		2514207	$34.05
1998	15901	1.590	2.385			0	0	1853520	698983		2552504	$33.98
1999	16171	1.617	2.426			0	0	1853520	739286		2592806	$33.94
2000	16441	1.644	2.466			0	0	1853520	781695		2635215	$33.93
2001	16788	1.679	2.518			0	0	1853520	830111		2683631	$33.84
2002	17135	1.713	2.570			0	0	1853520	881149		2734670	$33.78
2003	17481	1.748	2.622			0	0	1853520	934943		2788463	$33.76
2004	17828	1.783	2.674			0	0	1853520	991630		2845151	$33.78
2005	18175	1.818	2.726			0	0	1853520	1051357		2904877	$33.83
2006	18664	1.866	2.800			0	0	1853520	1122817		2976338	$33.75
2007	19153	1.915	2.873			0	0	1853520	1198312		3051833	$33.73
2008	19641	1.964	2.946			0	0	1853520	1278051		3131571	$33.75
2009	20130	2.013	3.020			0	0	1853520	1362251		3215771	$33.81
2010	20619	2.062	3.093			0	0	1853520	1451142		3304662	$33.92
TOTAL:				8370000	8455200	16825200	18198136					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $23153844

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST42
12/12/89

ALTERNATIVE 4
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	10,15.3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$0.95		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY * *COST PER * *HOUSEHOLD* *(INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		*****	* ***** *
1991	9717	0.972	1.458			0	0	0	*****		*****	* ***** *
1992	11061	1.106	1.659	8370000	8455200	16825200	18198136	1853520	414830		2268350	* $43.41 *
1993	12404	1.240	1.861			0	0	1853520	483822		2337342	* $39.88 *
1994	13748	1.375	2.062			0	0	1853520	557669		2411190	* $37.12 *
1995	15091	1.509	2.264			0	0	1853520	636651		2490171	* $34.93 *
1996	15361	1.536	2.304			0	0	1853520	673963		2527483	* $34.83 *
1997	15631	1.563	2.345			0	0	1853520	713242		2566762	* $34.76 *
1998	15901	1.590	2.385			0	0	1853520	754584		2608104	* $34.72 *
1999	16171	1.617	2.426			0	0	1853520	798093		2651613	* $34.71 *
2000	16441	1.644	2.466			0	0	1853520	843875		2697395	* $34.73 *
2001	16788	1.679	2.518			0	0	1853520	896142		2749663	* $34.67 *
2002	17135	1.713	2.570			0	0	1853520	951241		2804761	* $34.65 *
2003	17481	1.748	2.622			0	0	1853520	1009314		2862834	* $34.66 *
2004	17828	1.783	2.674			0	0	1853520	1070510		2924030	* $34.72 *
2005	18175	1.818	2.726			0	0	1853520	1134987		2988508	* $34.80 *
2006	18664	1.866	2.800			0	0	1853520	1212132		3065653	* $34.77 *
2007	19153	1.915	2.873			0	0	1853520	1293633		3147153	* $34.78 *
2008	19641	1.964	2.946			0	0	1853520	1379714		3233234	* $34.84 *
2009	20130	2.013	3.020			0	0	1853520	1470612		3324132	* $34.95 *
2010	20619	2.062	3.093			0	0	1853520	1566574		3420094	* $35.11 *
TOTAL:				8370000	8455200	16825200	18198136					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $23684565

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST43
12/12/89

ALTERNATIVE 4
LONG-TERM COST ANALYSIS

PERMIT LIMITS:	5/5/2/1	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.10		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY * *COST PER * *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		***** *	***** *
1991	9717	0.972	1.458			0	0	0	*****		***** *	***** *
1992	11061	1.106	1.659	8690000	8455200	17145200	18544248	1888773	480329		2369102 *	$45.34 *
1993	12404	1.240	1.861			0	0	1888773	560214		2448987 *	$41.79 *
1994	13748	1.375	2.062			0	0	1888773	645722		2534495 *	$39.02 *
1995	15091	1.509	2.264			0	0	1888773	737174		2625947 *	$36.83 *
1996	15361	1.536	2.304			0	0	1888773	780378		2669151 *	$36.78 *
1997	15631	1.563	2.345			0	0	1888773	825859		2714631 *	$36.76 *
1998	15901	1.590	2.385			0	0	1888773	873729		2762502 *	$36.77 *
1999	16171	1.617	2.426			0	0	1888773	924107		2812880 *	$36.82 *
2000	16441	1.644	2.466			0	0	1888773	977118		2865891 *	$36.90 *
2001	16788	1.679	2.518			0	0	1888773	1037638		2926411 *	$36.90 *
2002	17135	1.713	2.570			0	0	1888773	1101437		2990209 *	$36.94 *
2003	17481	1.748	2.622			0	0	1888773	1168679		3057451 *	$37.02 *
2004	17828	1.783	2.674			0	0	1888773	1239538		3128311 *	$37.14 *
2005	18175	1.818	2.726			0	0	1888773	1314196		3202968 *	$37.30 *
2006	18664	1.866	2.800			0	0	1888773	1403521		3292294 *	$37.34 *
2007	19153	1.915	2.873			0	0	1888773	1497890		3386663 *	$37.43 *
2008	19641	1.964	2.946			0	0	1888773	1597563		3486336 *	$37.57 *
2009	20130	2.013	3.020			0	0	1888773	1702814		3591586 *	$37.77 *
2010	20619	2.062	3.093			0	0	1888773	1813928		3702700 *	$38.01 *
TOTAL:				8690000	8455200	17145200	18544248					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $25135297

NOTE: COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST52
12/12/89

ALTERNATIVE 5
LONG-TERM COST ANALYSIS
FOR CITY OF AZLE ONLY (UPGRADE BOTH PLANTS) (NO SERVICE TO PELICAN BAY)

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.83		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY * *COST PER * *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		***** *	***** *
1991	8561	0.856	1.284			0	0	0	*****		***** *	***** *
1992	8748	0.875	1.312	4200000		4200000	4542720	462686	632032		1094718 *	$26.49 *
1993	8936	0.894	1.340			0	0	462686	671379		1134065 *	$26.86 *
1994	9123	0.912	1.368			0	0	462686	712862		1175548 *	$27.27 *
1995	9310	0.931	1.397			0	0	462686	756590		1219276 *	$27.72 *
1996	9491	0.949	1.424			0	0	462686	802117		1264803 *	$28.21 *
1997	9671	0.967	1.451			0	0	462686	850076		1312762 *	$28.73 *
1998	9852	0.985	1.478			0	0	462686	900588		1363274 *	$29.29 *
1999	10032	1.003	1.505			0	0	462686	953781		1416467 *	$29.89 *
2000	10213	1.021	1.532			0	0	462686	1009789		1472475 *	$30.52 *
2001	10450	1.045	1.568			0	0	462686	1074592		1537278 *	$31.14 *
2002	10688	1.069	1.603			0	0	462686	1142963		1605650 *	$31.80 *
2003	10925	1.093	1.639			0	0	462686	1215085		1677771 *	$32.51 *
2004	11163	1.116	1.674			0	0	462686	1291148		1753834 *	$33.26 *
2005	11400	1.140	1.710			0	0	462686	1371352		1834038 *	$34.05 *
2006	11780	1.178	1.767			0	0	462686	1473746		1936432 *	$34.79 *
2007	12160	1.216	1.824			0	0	462686	1582138		2044824 *	$35.59 *
2008	12540	1.254	1.881			0	0	462686	1696843		2159529 *	$36.45 *
2009	12920	1.292	1.938			0	0	462686	1818193		2280879 *	$37.37 *
2010	13300	1.330	1.995			0	0	462686	1946536		2409222 *	$38.34 *
TOTAL:				4200000	0	4200000	4542720					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $13015698

NOTE:COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST62
12/12/89

ALTERNATIVE 6
LONG-TERM COST ANALYSIS
FOR CITY OF AZLE ONLY (SINGLE PLANT @ ASH CREEK SITE) (NO SERVICE TO PELICAN BAY)

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.01		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		*****	***** *
1991	8561	0.856	1.284			0	0	0	*****		*****	***** *
1992	8748	0.875	1.312	4800000	950000	5750000	6219200	633439	348827		982266	$23.77 *
1993	8936	0.894	1.340			0	0	633439	370542		1003982	$23.78 *
1994	9123	0.912	1.368			0	0	633439	393437		1026877	$23.83 *
1995	9310	0.931	1.397			0	0	633439	417571		1051011	$23.90 *
1996	9491	0.949	1.424			0	0	633439	442698		1076138	$24.00 *
1997	9671	0.967	1.451			0	0	633439	469168		1102607	$24.13 *
1998	9852	0.985	1.478			0	0	633439	497046		1130485	$24.29 *
1999	10032	1.003	1.505			0	0	633439	526404		1159843	$24.47 *
2000	10213	1.021	1.532			0	0	633439	557315		1190755	$24.68 *
2001	10450	1.045	1.568			0	0	633439	593081		1226520	$24.84 *
2002	10688	1.069	1.603			0	0	633439	630816		1264255	$25.04 *
2003	10925	1.093	1.639			0	0	633439	670621		1304060	$25.27 *
2004	11163	1.116	1.674			0	0	633439	712601		1346040	$25.52 *
2005	11400	1.140	1.710			0	0	633439	756866		1390306	$25.81 *
2006	11780	1.178	1.767			0	0	633439	813379		1446818	$26.00 *
2007	12160	1.216	1.824			0	0	633439	873202		1506641	$26.23 *
2008	12540	1.254	1.881			0	0	633439	936509		1569948	$26.50 *
2009	12920	1.292	1.938			0	0	633439	1003483		1636923	$26.82 *
2010	13300	1.330	1.995			0	0	633439	1074318		1707757	$27.18 *
TOTAL:				4800000	950000	5750000	6219200					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $10545472

NOTE:COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST72
12/12/89

ALTERNATIVE 7
LONG-TERM COST ANALYSIS
AZLE & PELICAN BAY SERVICE
THROUGH BOTH EXISTING AZLE PLANTS (PELICAN BAY SERVICE THROUGH WALNUT CREEK PLANT)

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$1.70		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)*
1990	8374	0.837	1.256			0	0	0	*****		***** *	***** *
1991	8878	0.888	1.332			0	0	0	*****		***** *	***** *
1992	9382	0.938	1.407	5940000	420000	6360000	6878976	700639	629630		1330269 *	$30.01 *
1993	9885	0.989	1.483			0	0	700639	689979		1390618 *	$29.78 *
1994	10389	1.039	1.558			0	0	700639	754149		1454788 *	$29.64 *
1995	10893	1.089	1.634			0	0	700639	822349		1522988 *	$29.59 *
1996	11136	1.114	1.670			0	0	700639	874321		1574960 *	$29.94 *
1997	11379	1.138	1.707			0	0	700639	929136		1629775 *	$30.32 *
1998	11622	1.162	1.743			0	0	700639	986937		1687576 *	$30.74 *
1999	11865	1.187	1.780			0	0	700639	1047875		1748514 *	$31.19 *
2000	12108	1.211	1.816			0	0	700639	1112110		1812749 *	$31.69 *
2001	12426	1.243	1.864			0	0	700639	1187009		1887647 *	$32.15 *
2002	12745	1.274	1.912			0	0	700639	1266120		1966759 *	$32.66 *
2003	13063	1.306	1.959			0	0	700639	1349661		2050300 *	$33.22 *
2004	13382	1.338	2.007			0	0	700639	1437860		2138499 *	$33.83 *
2005	13700	1.370	2.055			0	0	700639	1530955		2231594 *	$34.48 *
2006	14161	1.416	2.124			0	0	700639	1645770		2346409 *	$35.07 *
2007	14622	1.462	2.193			0	0	700639	1767321		2467959 *	$35.73 *
2008	15083	1.508	2.262			0	0	700639	1895962		2596601 *	$36.44 *
2009	15544	1.554	2.332			0	0	700639	2032067		2732706 *	$37.21 *
2010	16005	1.601	2.401			0	0	700639	2176027		2876666 *	$38.04 *
TOTAL:				5940000	420000	6360000	6878976					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $15947935

NOTE:COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

COST82
12/12/89

ALTERNATIVE 8
LONG-TERM COST ANALYSIS
AZLE AND PELICAN BAY SERVICE THROUGH A SINGLE PLANT
(UPGRADE ASH CREEK PLANT TO SERVE BOTH AZLE AND PELICAN BAY)

PERMIT LIMITS:	10,15,3	INTEREST RATE:	8.00	PERSONS/HOUSEHOLD:	2.54
INFLATION RATE(%):	4.000	LOAN TERM(YRS):	20		
AVG FLOW(GPCD):	100	O&M COST ($/1000):	$0.90		

YEAR	POPULATION SERVED	AVERAGE ANNUAL FLOW (MGD)	DESIGN FLOW (MGD)	PLANT CAPTL COST (1990 $)	COLL SYST CAPITAL COST (1990 $)	TOTAL CAPTL COST (1990 $)	TOTAL CAPTL COST (INFLA $)	ANN'LIZED CAPTL COST (INFLA $)	ANNUAL O&M COST (INFLA $)	OTHER COSTS (INFLA $)	TOTAL ANNUAL COST (INFLA $)	*MONTHLY *COST PER *HOUSEHOLD* (INFLA $)
1990	8374	0.837	1.256			0	0	0	*****		*****	*****
1991	8878	0.888	1.332			0	0	0	*****		*****	*****
1992	9382	0.938	1.407	5550000	1370000	6920000	7484672	762330	333334		1095664	$24.72
1993	9885	0.989	1.483			0	0	762330	365283		1127614	$24.14
1994	10389	1.039	1.558			0	0	762330	399255		1161586	$23.67
1995	10893	1.089	1.634			0	0	762330	435361		1197691	$23.27
1996	11136	1.114	1.670			0	0	762330	462876		1225206	$23.29
1997	11379	1.138	1.707			0	0	762330	491895		1254226	$23.33
1998	11622	1.162	1.743			0	0	762330	522496		1284826	$23.40
1999	11865	1.187	1.780			0	0	762330	554757		1317088	$23.50
2000	12108	1.211	1.816			0	0	762330	588764		1351094	$23.62
2001	12426	1.243	1.864			0	0	762330	628416		1390747	$23.69
2002	12745	1.274	1.912			0	0	762330	670299		1432629	$23.79
2003	13063	1.306	1.959			0	0	762330	714527		1476857	$23.93
2004	13382	1.338	2.007			0	0	762330	761220		1523550	$24.10
2005	13700	1.370	2.055			0	0	762330	810506		1572836	$24.30
2006	14161	1.416	2.124			0	0	762330	871290		1633620	$24.42
2007	14622	1.462	2.193			0	0	762330	935640		1697971	$24.58
2008	15083	1.508	2.262			0	0	762330	1003745		1766075	$24.78
2009	15544	1.554	2.332			0	0	762330	1075800		1838131	$25.03
2010	16005	1.601	2.401			0	0	762330	1152014		1914345	$25.32
TOTAL:				5550000	1370000	6920000	7484672					

PRESENT WORTH OF ALL COSTS (1990 DOLLARS): $11923474

NOTE:COSTS DO NOT INCLUDE DEBT SERVICE ON EXISTING FACILITIES

APPENDIX E

TEXAS WATER DEVELOPMENT BOARD

COMMENTS ON DRAFT REPORT

FILE COPY

PROJECT/PROPOSAL NO. 307-0603

DATE RECEIVED APR 2 1990

TEXAS WATER DEVELOPMENT BOARD

RECEIVED
MAR 23 1990

March 22, 1990

Mr. James Oliver
Tarrant County Water Control and
Improvement District No. 1
P. O. Box 4508
Fort Worth, Texas 76106-0508

Dear Mr. Oliver:

Re: Draft Final Report for Regional Wastewater Facility Plan for a Portion of Eagle Mountain Lake and Lake Worth Watersheds

Staff members of the Texas Water Development Board and the Texas Water Commission's Water Quality Standards and Evaluation Section have completed a review of the referenced document under TWDB Contract No. 9-483-737 with Tarrant County Water Control and Improvement District No. 1. The following comments should be considered before the report is finalized.

The TWC staff indicated that the report's proposal to abandon the City of Azel Walnut Creek WWTP and to expand the Ash Creek WWTP to 2.41 MGD with a discharge into Eagle Mountain Lake is inconsistent with the 1988 study on the Upper West Fork and Clear Fork of the Trinity River Basin. The 1988 study concluded that the City of Azle should divert its discharge from Eagle Mountain Lake or upgrade its treatment facilities to include nitrification and phosphorus removal. In order to be consistent with the 1988 study, consideration should be given to incorporating nitrification and phosphorus removal at the upgraded and expanded Ash Creek WWTP. In addition, the TWC staff recommends that further studies be done to determine the impacts of the 2.41 MGD Ash Creek facility on the lake and backwater cove areas, and TWC also indicated that a water quality impact study and an evaluation are needed with respect to the relocation and submergence of the discharge to the main body of Eagle Mountain Lake.

As stated in my January 22, 1990, letter to Mr. David Marshall, the Board's staff recommends that the NCTCOG projections be considered in projecting the sewered populations for all six service areas considered in this study.

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MAR 27 1990

P. O. Box 13231 Capitol Station • 1700 N. Congress Avenue • Austin, Texas 78711-3231
Telephone 512 463-7847 • Telefax 512 475-2053

In order for this project to be eligible for funding through the TWDB, a detailed engineering report would be required, as well as consistency with the NCTCOG Water Quality Management Plan. If financial assistance were requested, an environmental assessment would need to be prepared, and approved water conservation and drought contingency plans would need to be formally adopted by all users.

The Board looks forward to receiving the Final Report on the planning project and to processing the billings for this project. If you have any questions regarding the review comments, please contact Ms. Carolyn Brittin, the Board's Contract Manager, at (512) 475-2056.

Sincerely,

Tommy Knowles
Director of Planning

APPENDIX F

MAPS

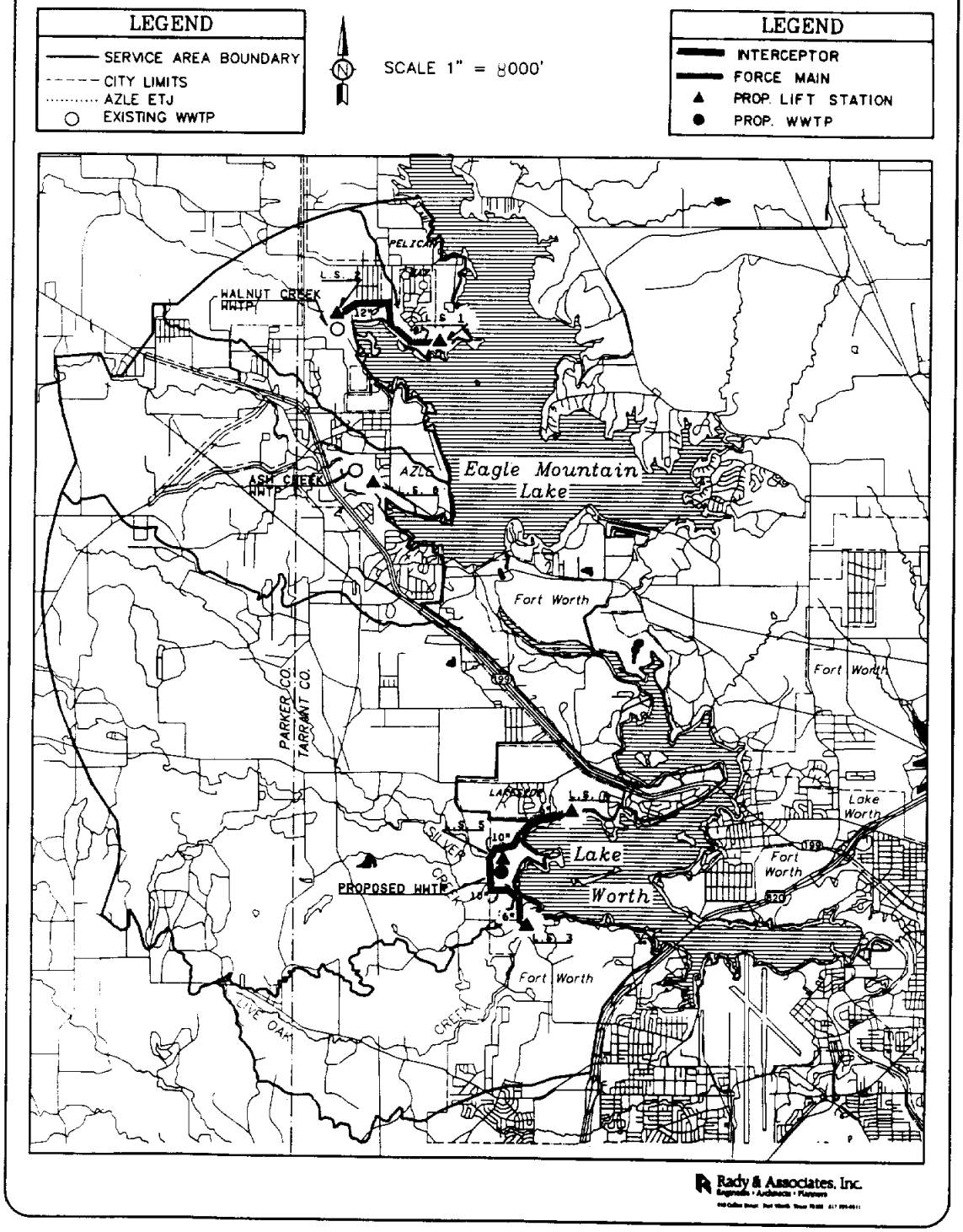

FIGURE VI - 1
ALTERNATIVE 1
COLLECTION SYSTEM

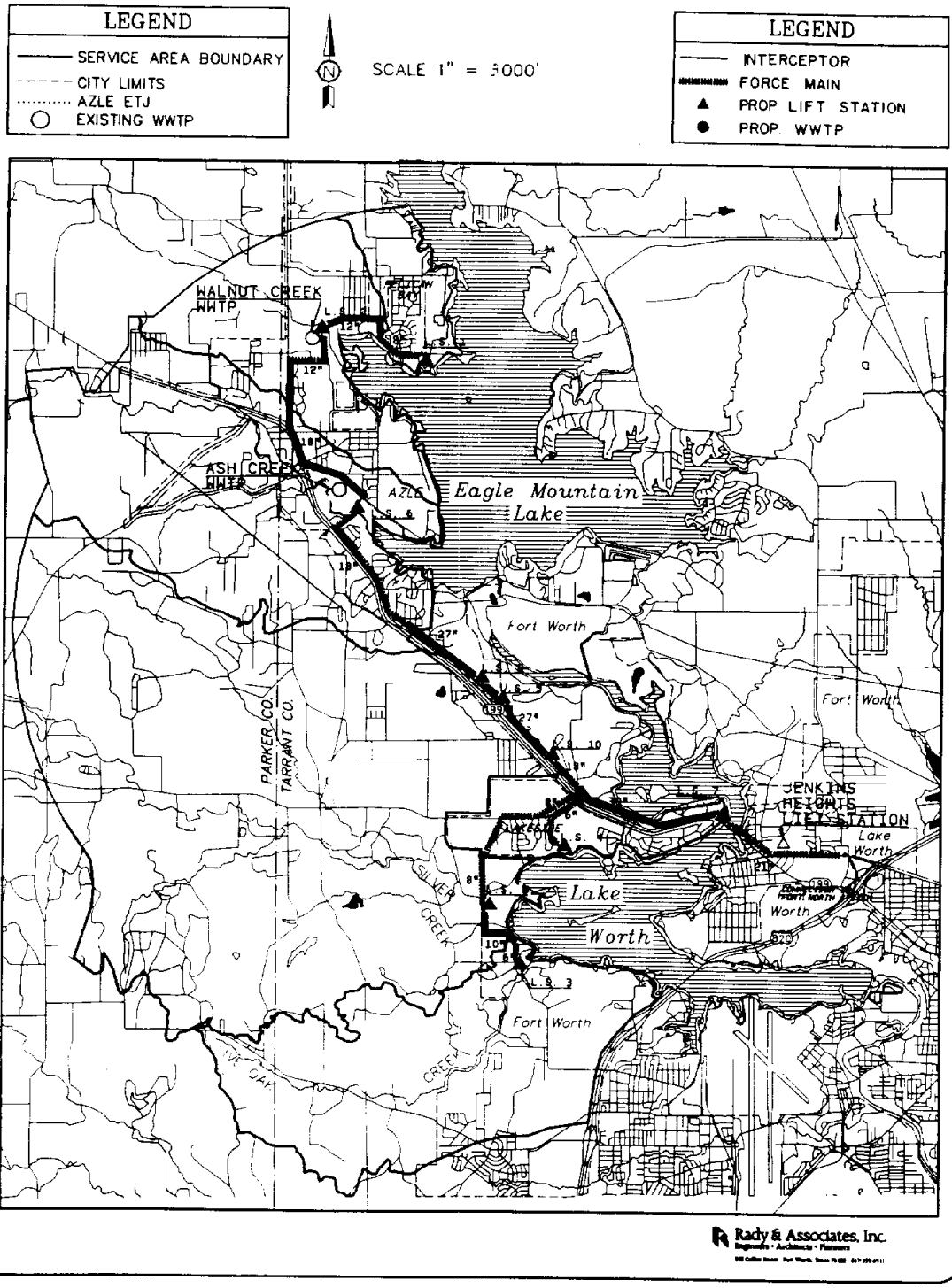

FIGURE VI - 2
ALTERNATIVE 2A
COLLECTION SYSTEM

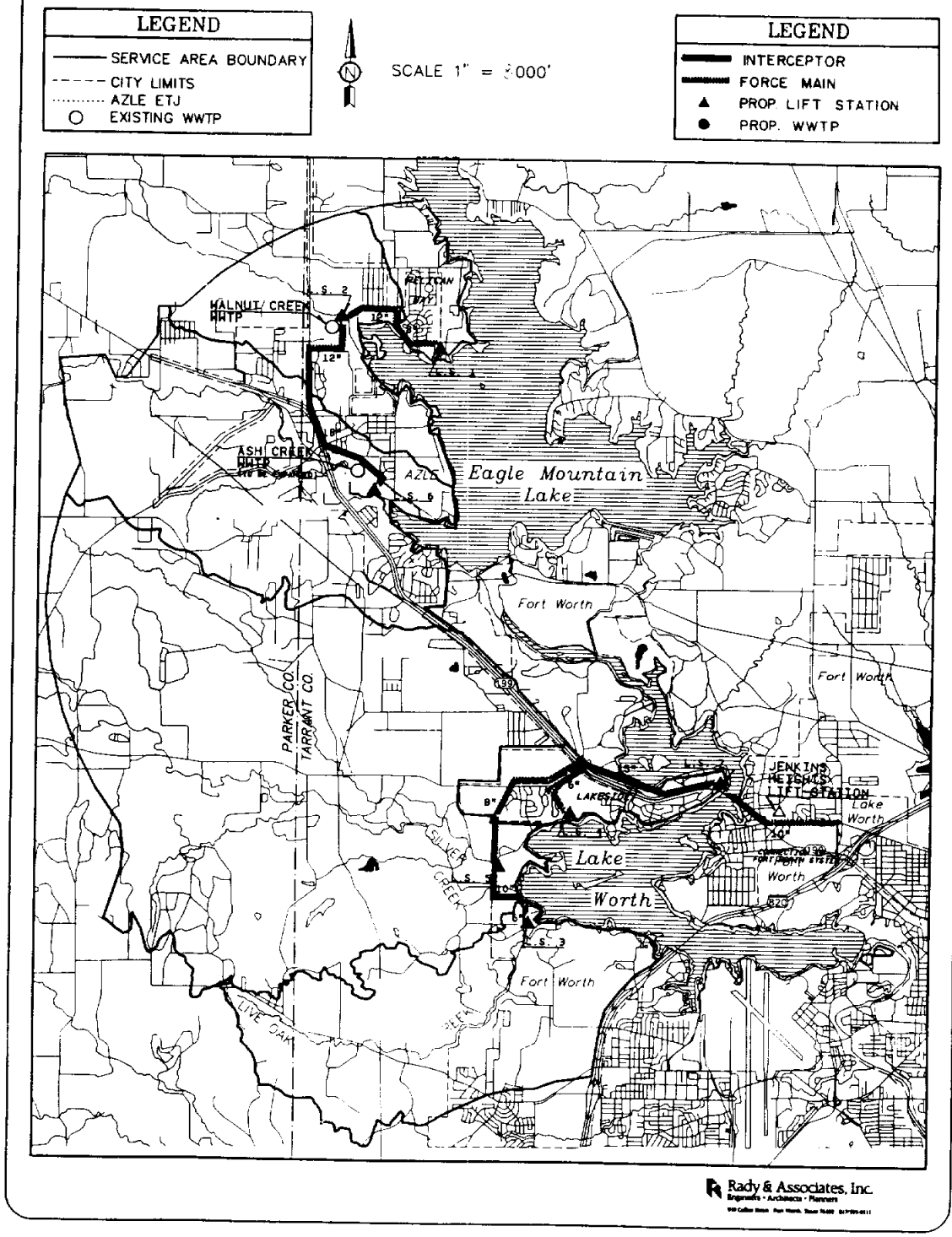

FIGURE VI - 3
ALTERNATIVE 2B
COLLECTION SYSTEM

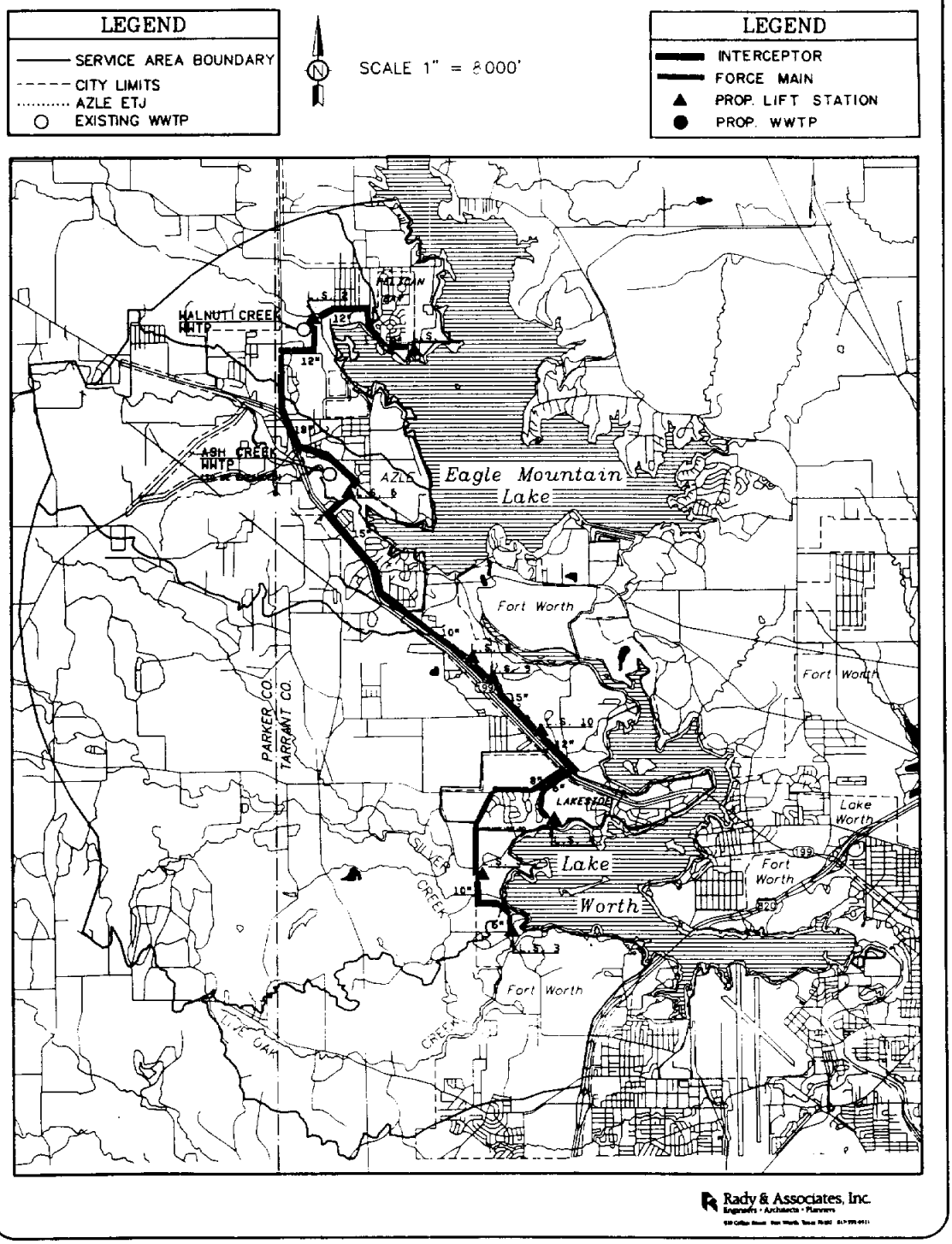

FIGURE VI - 4
ALTERNATIVE 3
COLLECTION SYSTEM

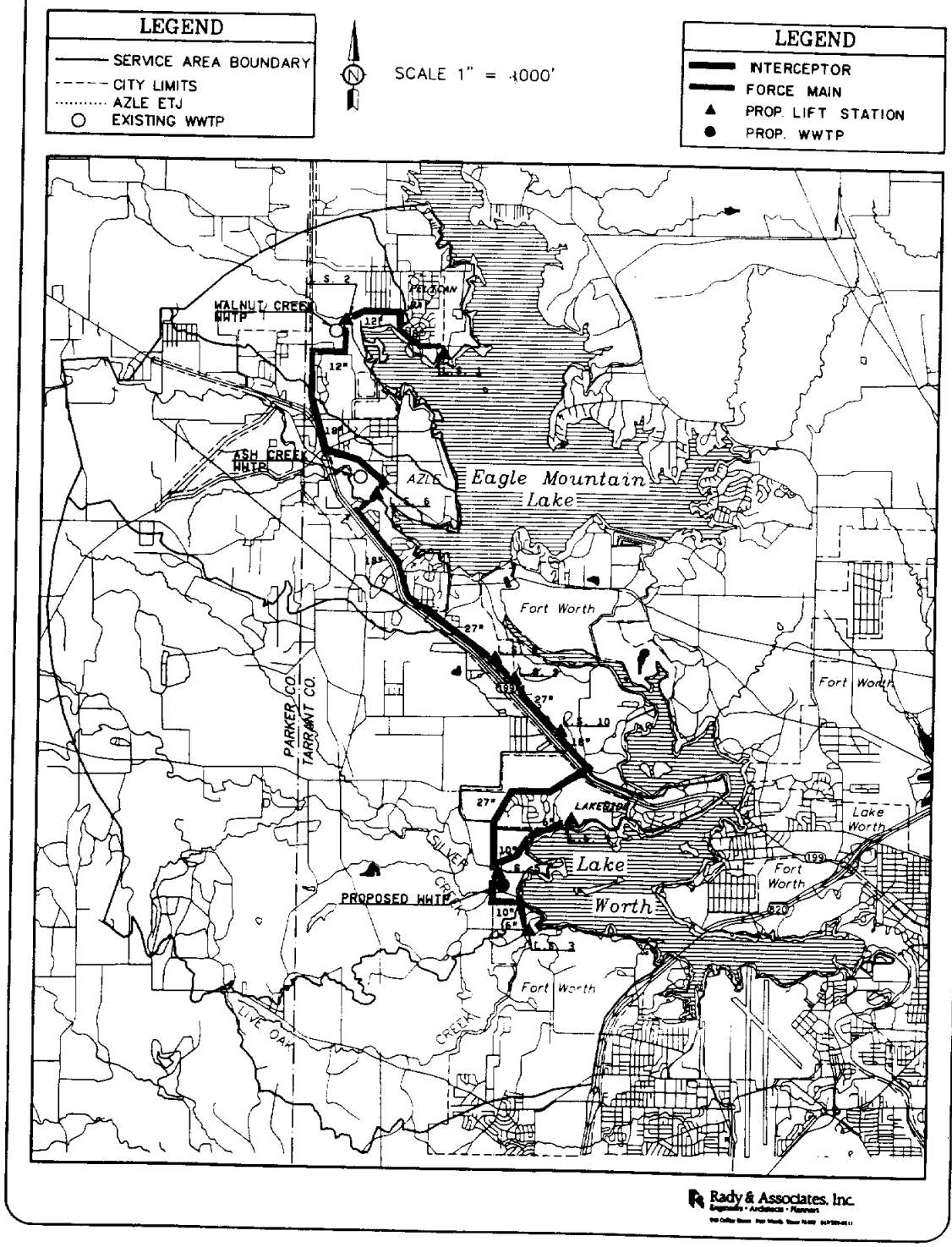

FIGURE VI - 5
ALTERNATIVE 4
COLLECTION SYSTEM