CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITIES STUDY

Prepared For

City of Granite Shoals, Texas

AUGUST 2008

GSH07265

STATE OF TEXAS
Jonathan Birdette Howard
89744
LICENSED
PROFESSIONAL ENGINEER

8/29/2008

Prepared by

Freese and Nichols

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Building 4, Suite 100
Austin, TX 78759

Freese and Nichols, Inc. Engineers Environmental Scientists Architects
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August 29, 2008

Ms. Kathleen Ligon
Project Manager, Water Resources Planning Division
1700 North Congress Avenue
P.O. Box 13231
Austin TX 78711-3231

RE: Regional Wastewater Facilities Planning

Dear Ms. Ligon:

On behalf of the City of Granite Shoals (City), and in accordance with the Agreement between the City and the Texas Water Development Board (Board) dated July 23, 2007, Freese and Nichols, Inc. is pleased to submit nine copies of the draft report titled "City of Granite Shoals Regional Wastewater Facilities Study." In accordance with the Board's Agreement with Granite Shoals, we are also submitting one unbound camera-ready copy, and one electronic copy in PDF format.

The Draft Report recommends implementation of a low pressure collection/transmission system, new wastewater treatment plant, and effluent disposal facilities. The opinion of probable capital cost for the first phase of the project is:

- Collection/Transmission System: $ 2.26 million
- Wastewater Treatment Plant: $ 4.31 million
- Effluent Disposal System: $ 7.50 million

Total: $14.07 million

We are available to discuss these recommendations with you at your convenience. Please contact us if you have questions or need additional information.

Sincerely,

FREESE AND NICHOLS, INC.

Jonathan B. Howard, P.E.
Project Manager

cc: Hon. Frank Reilly, Mayor of Granite Shoals
Mr. John Gayle, City Manager

Attachments

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

This report summarizes the findings of the Regional Wastewater Facilities Study conducted by Freese and Nichols, Inc. on behalf of the City of Granite Shoals, Texas (City), in cooperation with the Texas Water Development Board (TWDB).

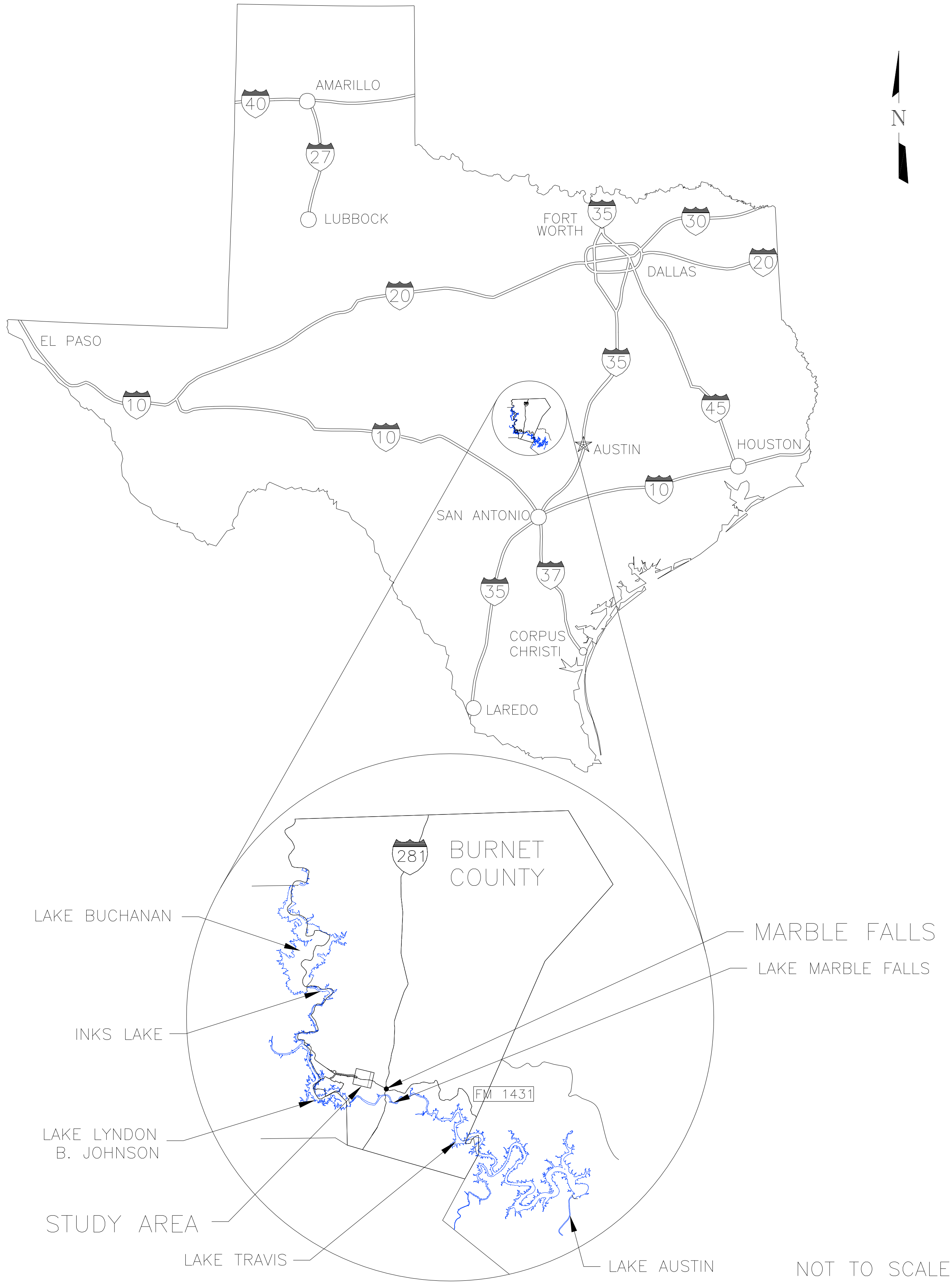
The City is experiencing growth due to the expanding Austin suburban area, and the benefit of replacing the existing septic systems with a wastewater collection and treatment system are becoming increasingly evident. These benefits include a reduced reliance on septic systems for wastewater treatment and protection of water quality in the Highland Lakes as population increases.

The purpose of the Regional Wastewater Facilities Study is to determine how best to implement a wastewater system for the City and residents in the remainder of the study area who currently rely on septic systems to treat wastewater.

The City anticipates taking the lead role in implementing the recommendations presented in this report.

2.0 PROJECT BACKGROUND

The study area is located approximately 50 miles west of Austin on Lake Lyndon B. Johnson (Lake LBJ) in Burnet County, Texas, as shown in Figures ES.1 and ES.2. The City's location has historically made it an attractive area for second homes, and retirement residences. However, the study area is under intense growth pressure from the expanding Austin suburban area.



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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE ES.1: PLANNING AREA LOCATION MAP

F&N JOB NO. GSH07265
DATE MAY. 2008
SCALE AS SHOWN
DESIGNED JBH
DRAFTED CJE
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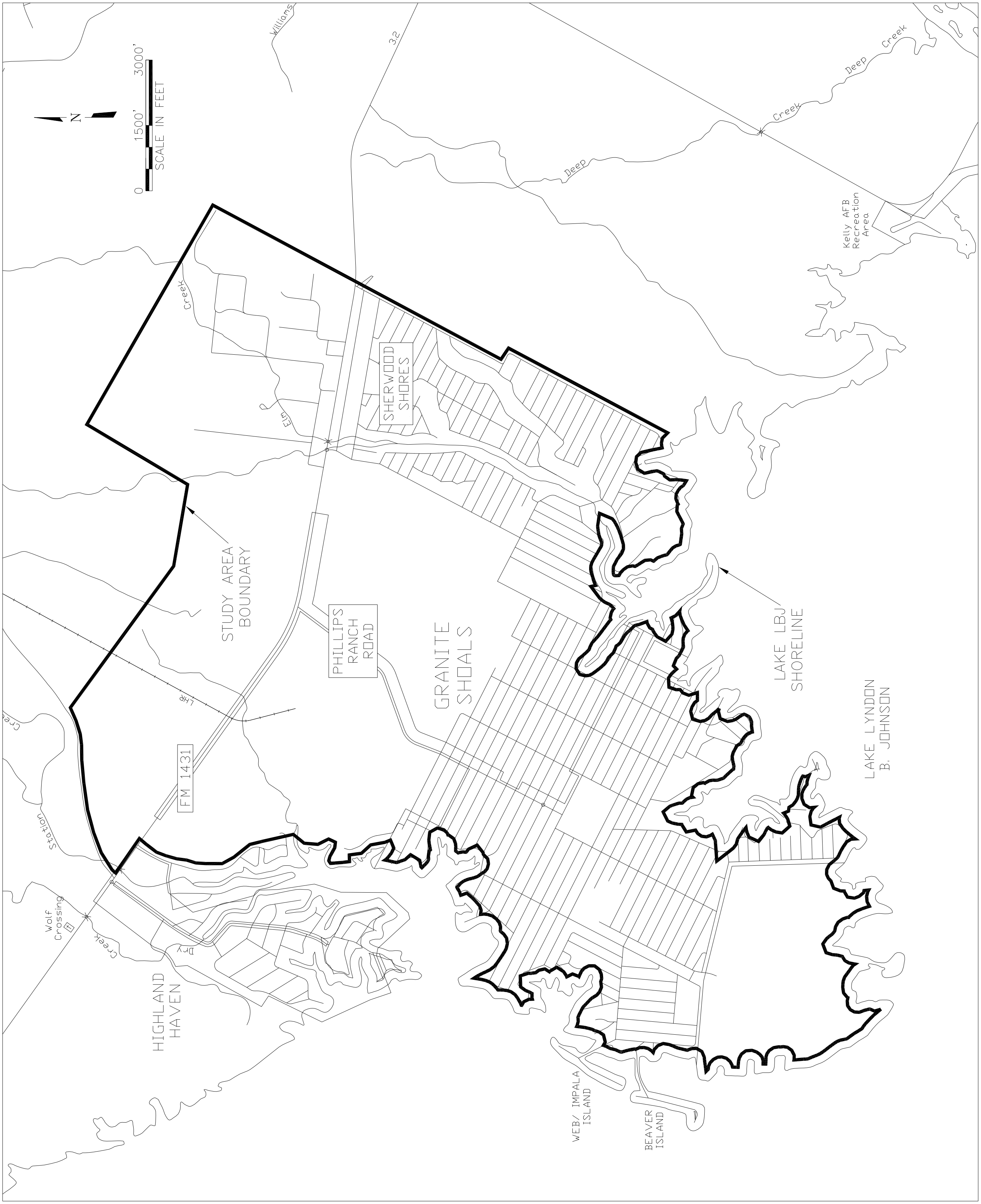
ES.1
FIGURE



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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE ES.2: STUDY AREA

F&N JOB NO.	GSH07265
DATE	MAY 2008
SCALE	AS SHOWN
DESIGNED	JBH
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ES.2
FIGURE

Date: Aug 28, 2008 – 7:18am User: cje File: N:\wr\Report\FIGURE-ES.2.dwg

Within the study area, only a few residents are served by a wastewater collection and treatment system. These residents include those located on Beaver Isle Drive, Web Isle and Impala Isle Drives, and several homes located on the Lake LBJ shoreline. This area is served by a small wastewater treatment facility owned and operated by Aqua Texas, Inc. (Aqua Texas). The remaining residents within the study area currently operate individual septic systems to treat wastewater.

With an increasing population, combined with the rocky soils in the area, septic systems are becoming a less attractive option for wastewater treatment. In particular, the study area is underlain by a shallow, granite/gravel aquifer and shallow granite bedrock. Discharges from septic tank leach fields tend to rapidly infiltrate through the shallow aquifer and fractures in the underlying bedrock, which reduces the effectiveness of treatment normally provided by percolation through a soil column. This combination of rapid infiltration and reduced treatment creates potential impacts to the groundwater in the area. Further, the proximity of Lake LBJ increases the possibility of water quality impacts from the septic tank systems. A centralized wastewater system will better support the increasing population pressure in the area, reduce the reliance on septic systems for wastewater treatment, and provide for continued protection of the water quality in the Highland Lakes as study area population increases.

3.0 AUTHORIZATION

The City and TWDB entered into an Agreement dated July 23, 2007 to develop a regional facilities plan for wastewater collection and treatment within the City and the surrounding area. The City, via Council action in July 2007, authorized FNI to proceed with a study to evaluate alternatives for a collection, transmission and treatment system for the City and Sherwood Shores, and to provide the City with a report documenting the findings and recommendations associated with the study in fulfillment of the City's agreement with TWDB. This study is funded by the City and by the TWDB through a regional planning grant.

4.0 PROJECTED POPULATION AND WASTEWATER FLOWS

Planning-level population, wastewater flow, and wastewater loading projections were developed through the year 2030 based on prior studies, data from nearby wastewater treatment facilities, and current State of Texas design criteria. These analyses result in a year 2030 planning population of 5,109 and a projected average annual wastewater flow of about 511,000 gallons per day.

5.0 RECOMMENDED PROJECT

Prior studies considered other types of treatment, such as oxidation ditches, aerated lagoons, fixed film reactors, and stabilization ponds. Wastewater treatment alternatives considered as part of this study included conventional activated sludge and sequencing batch reactors (SBR). A SBR is the preferred treatment process, as it will provide the appropriate level of treatment for land disposal of the effluent, is comparable in cost to other treatment alternatives, and appears to offer more flexibility with respect to capacity increases in the future. The City has recently purchased approximately 131 acres southwest of the intersection of Phillips Ranch Road and FM 1431; the new treatment facility and effluent storage ponds will be sited in the south and southwestern portion of this parcel.

Collection system alternatives considered included conventional gravity systems, low pressure systems, and septic tank effluent pumping (STEP) systems. The topography and geology of the study area make conventional gravity systems potentially cost-prohibitive. STEP systems are a subset of low pressure collection systems, and in concept would offer some cost savings through reuse of existing septic tanks and potentially lowering the organic loadings at the proposed wastewater treatment plant. Unfortunately, the ability to reuse existing septic tanks has not been proven in practice, and implementation of STEP systems often requires replacement of existing septic tanks in order to properly implement the system. A low pressure collection system utilizing small grinder pumps at each service connection is the recommended alternative for the study area.

The recommended project is shown on Figure ES.3. The opinion of probable capital cost for the recommended project is presented in Table ES.1. Opinions of probable annual and unit costs are not presented for the overall project because the timing of subsequent phases cannot be defined at this time.

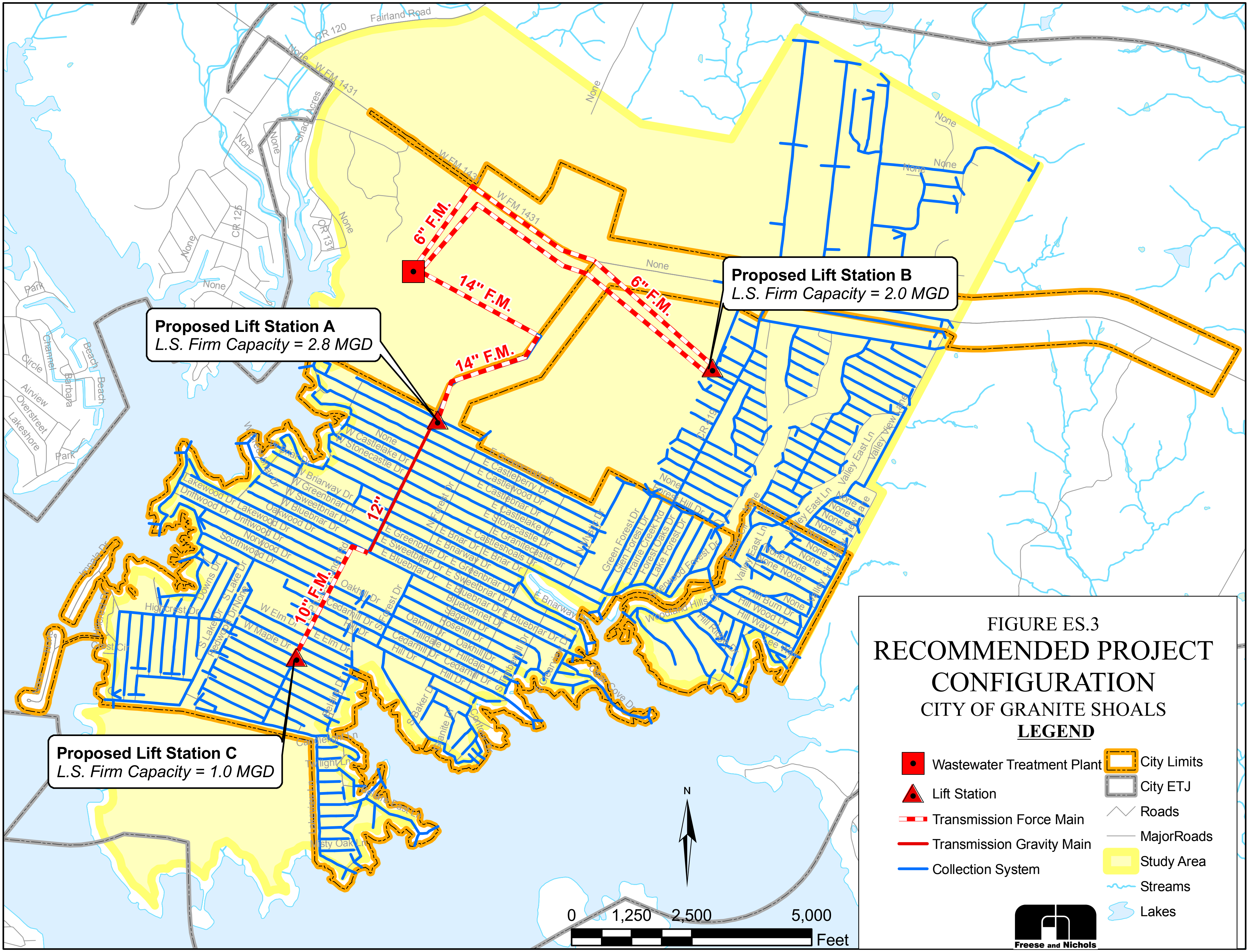


FIGURE ES.3
RECOMMENDED PROJECT CONFIGURATION
CITY OF GRANITE SHOALS

Table ES.1
Granite Shoals
Wastewater System
Opinions Of Probable Project Cost

Phase	Project Description	Construction Items	Quantity	Units	Unit Price	Costs
1	**Phase 1 Collection System**	Grinder Pump System for Existing Houses	28	LS	$5,500	$154,000
		Collection System 1.25"	524	LF	$7	$3,605
		Collection System 1.5"	1,259	LF	$8	$10,389
		Collection System 8"	1,525	LF	$44	$67,096
		4" and less Pavement Repair	1,784	LF	$12	$21,404
		8" Pavement Repair	1,525	LF	$16	$24,398
					Subtotal	$280,892
					Contingency @ 25%	$70,223
					Total Construction Cost	$351,115
					Engineering, Surveying & Geotech @ 15%	$52,667
					Total Project Cost	$403,782
1	**Phase 1 Transmission System**	Lift Station - New 2 MGD	1	LS	$700,000	$700,000
		6" Force Main	9,765	LF	$33	$322,233
		Easement Acquisition along 1431	7,130	LF	$10	$71,300
		Easement Acquisition	2,635	LF	$5	$13,173
		12" Boring and Casing	400	LF	$120	$48,000
		6" Pavement Repair	9,765	LF	$14	$136,705
					Subtotal	$1,291,412
					Contingency @ 25%	$322,853
					Total Construction Cost	$1,614,265
					Engineering, Surveying & Geotech @ 15%	$242,140
					Total Project Cost	$1,856,404
1	**Phase 1 Wastewater Treatment Plant**	Wastewater Treatment Plant	1	LS	$3,000,000	$3,000,000
					Subtotal	$3,000,000
					Contingency @ 25%	$750,000
					Total Construction Cost	$3,750,000
					Engineering, Surveying & Geotech @ 15%	$562,500
					Total Project Cost	$4,312,500
1	**Phase 1 Effluent Disposal**	Land	55	Acres	$10,000	$550,000
		Irrigation System	1	LS	$880,428	$880,428
		Storage Ponds	1	LS	$3,788,328	$3,788,328
					Subtotal	$5,218,755
					Contingency @ 25%	$1,304,689
					Total Construction Cost	$6,523,444
					Engineering, Surveying & Geotech @ 15%	$978,517
					Total Project Cost	$7,501,961
	TOTAL PHASE 1 TRANSMISSION/COLLECTION/TREATMENT SYSTEM					**$14,074,648**

Notes:
1. All costs are in June 2008 dollars.
2. Phase 1 transmission system is assumed to require acquisition of a minimum 20-foot wide easement along either alternative pipeline alignment
3. Cost for easement acquisition along FM 1431 is assumed to be approximately $20,000 per acre, or approximately $10/running foot of easement for Phase 1 Transmission system.
4. Cost for easement acquisition along LCRA power line is assumed to be approximately $10,000 per acre, or approximately $5/running foot of easement for Phase 1 Transmission system.
5. Costs for easement and right-of-way acquisition are not included for remaining elements of the work

Table ES.1
Granite Shoals
Wastewater System
Opinions Of Probable Project Cost

Phase	Project Description	Construction Items	Quantity	Units	Unit Price	Costs
2	**Subsequent Collection System Phasing**	Grinder Pump System for Existing Houses*	2,430	LS	$5,500	$13,365,000
		Collection System 1.25"	187,376	LF	$7	$1,288,207
		Collection System 1.5"	120,387	LF	$8	$993,191
		Collection System 2"	132,645	LF	$11	$1,459,095
		Collection System 3"	72,113	LF	$17	$1,189,865
		Collection System 4"	29,288	LF	$22	$644,336
		Collection System 6"	9,225	LF	$33	$304,425
		Collection System 8"	5,200	LF	$44	$228,804
		Collection System 10"	9,772	LF	$55	$537,460
		Collection System 12"	1,220	LF	$66	$80,520
		Collection System 14"	4,409	LF	$77	$339,493
		4" and less Pavement Repair	541,808	LF	$12	$6,501,700
		6" Pavement Repair	9,225	LF	$14	$129,150
		8" Pavement Repair	5,200	LF	$16	$83,202
		10" and larger Pavement Repair	15,401	LF	$20	$308,020
					Subtotal	$27,452,468
					Contingency @ 25%	$6,863,117
					Total Construction Cost	$34,315,585
					Engineering, Surveying & Geotech @ 15%	$5,147,338
					Total Project Cost	$39,462,922
2	**Subsequent Transmission System Phasing**	Lift Station - New 2.8 MGD	1	LS	$750,000	$750,000
		Lift Station - New 1 MGD	1	LS	$550,000	$550,000
		10" Force Main	12,750	LF	$55	$701,253
		14" Force Main	6,671	LF	$77	$513,679
		12" Sanitary Sewer	3,554	LF	$66	$234,531
		48" Diameter Manhole	9	EA	$4,000	$35,535
		20" Boring and Casing	200	LF	$200	$40,000
		10" and larger Pavement Repair	22,975	LF	$20	$459,494
					Subtotal	$3,284,491
					Contingency @ 25%	$821,123
					Total Construction Cost	$4,105,614
					Engineering, Surveying & Geotech @ 15%	$615,842
					Total Project Cost	$4,721,456
2	**Subsequent Wastewater Treatment Plant Phasing** (two phases of 150,000 gpd each)	Wastewater Treatment Plant Expans 1	1	LS	$1,500,000	$1,500,000
		Wastewater Treatment Plant Expans 2	1	LS	$1,500,000	$1,500,000
					Subtotal	$3,000,000
					Contingency @ 25%	$750,000
					Total Construction Cost	$3,750,000
					Engineering, Surveying & Geotech @ 15%	$562,500
					Total Project Cost	$4,312,500
2	**Subsequent Effluent Disposal** (360,000 gpd capacity expansion, mulitple phases)	Land	132	Acres	$10,000	$1,320,000
		Irrigation System	1	LS	$2,113,027	$2,113,027
		Storage Ponds	1	LS	$9,091,986	$9,091,986
					Subtotal	$12,525,013
					Contingency @ 25%	$3,131,253
					Total Construction Cost	$15,656,266
					Engineering, Surveying & Geotech @ 15%	$2,348,440
					Total Project Cost	$18,004,706
	TOTAL SUBSEQUENT PHASES TRANSMISSION/COLLECTION/TREATMENT					**$66,501,585**
	Granite Shoals TOTAL SYSTEM COSTS					**$80,576,232**

*The number of future connections is estimated solely for purposes of estimating total project cost and was not used for projecting wastewater flows. The indicated number of connections is based on projected number of connections in the year 2030 from the City's WTP pre-design report, after adjustments for differences in overall population projections. Estimated capita per connection is about 2.08 capita per connection.

6.0 PUBLIC MEETINGS

In accordance with the City's Agreement with TWDB, three public meetings were conducted to discuss the status of the project and solicit input and comments from the affected public. These public meetings were held on September 6, 2007, June 27, 2008, and August 5, 2008. Meeting minutes from these meetings are included in Appendix C. A brief summary of each meeting follows:

6.1.1 September 6, 2007 Public Meeting

The September 6, 2007 public meeting served as a project introduction and kickoff meeting. The project team and meeting attendees discussed the project approach in detail, and answered related questions. Of particular note were discussions related to population projections, peaking factors, and other factors that would impact population projections and wastewater flow projections.

6.1.2 June 27, 2008 Public Meeting

The June 27, 2008 public meeting focused on discussion of the results and recommendations contained in the Draft Report. Significant discussions took place with respect to estimated project cost. Meeting participants provided significant input regarding possible ways to reduce overall project cost by modifying the project configuration, revising project cost assumptions, etc.

6.1.3 August 5, 2008 Public Meeting

The August 5, 2008 public meeting focused on revisions to the project configuration and costs, in accordance with the suggestions made at the June 27, 2008 public meeting, and discussion of TWDB comments on the draft report. Suggested revisions from the June 27, 2008 public meeting resulted in Phase 1 costs reduced from approximately $32 million to approximately $14 million, and overall project costs reduced from over $230 million to approximately $80 million.

7.0 INITIAL PHASE AND IMPLEMENTATION SCHEDULE

The recommended initial phase of the project is shown in Figure ES.4. This phase will consist of construction of: a new 300,000 gallon per day wastewater treatment facility; a lift station near Jackson Drive and Prairie Creek Road; forcemains in FM 1431, Phillips Ranch Road, and crossing a City-owned parcel; and grinder pump and low pressure system pipes along FM 1431. Opinions of probable capital cost, annual cost, and unit cost for the recommended initial phase are presented in Table ES.2. A proposed implementation schedule for the initial phase is shown in Figure ES.5.

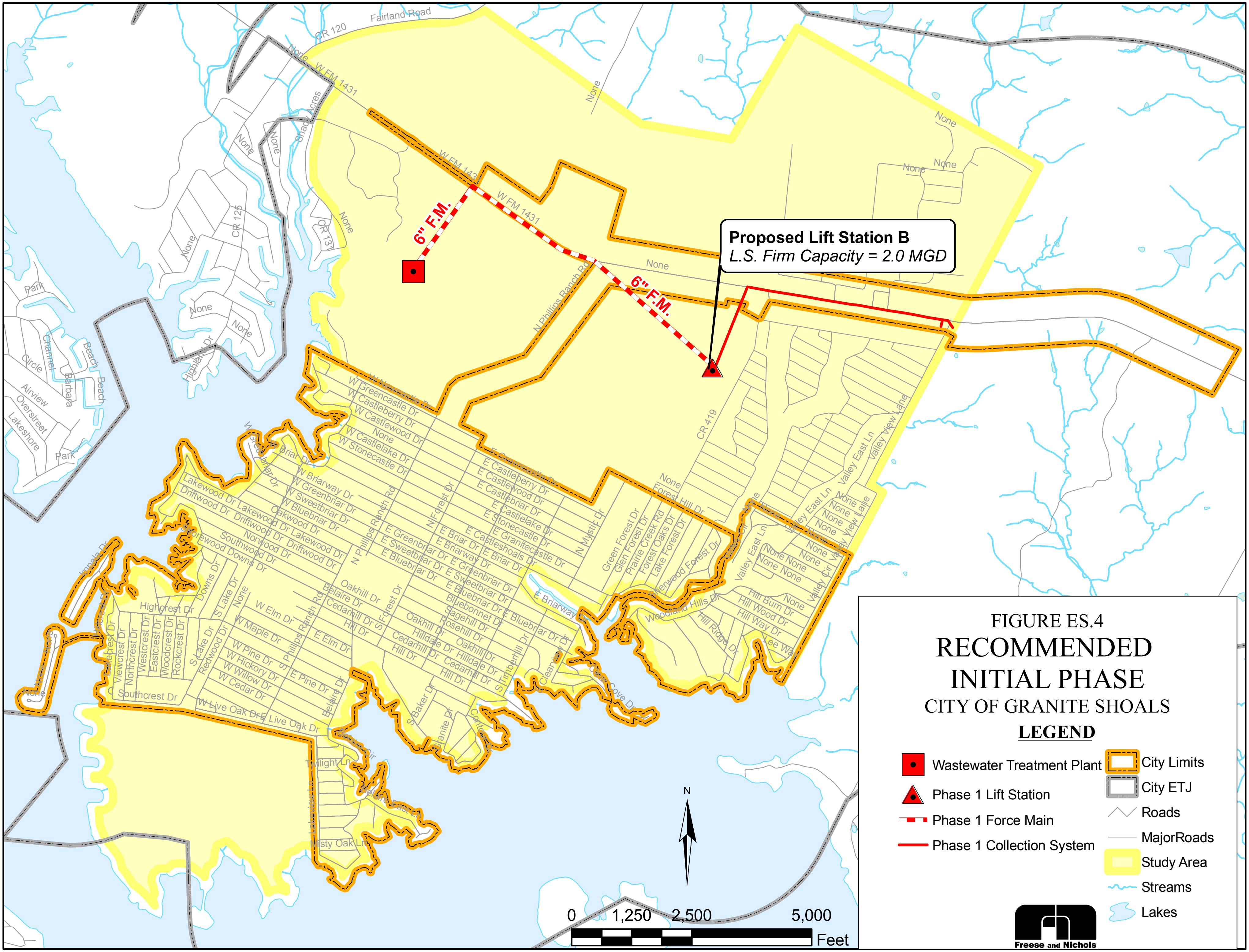
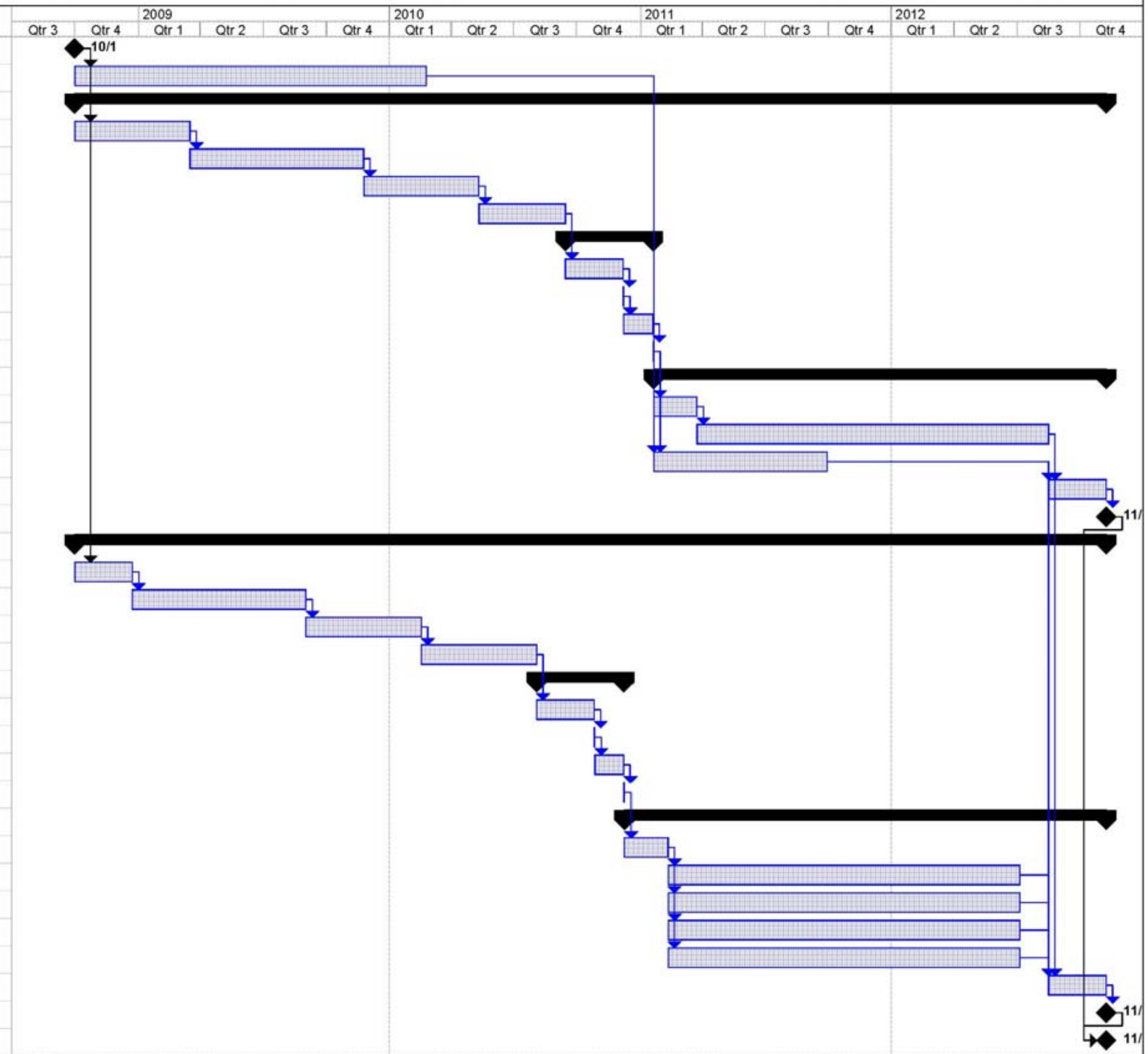

Proposed Lift Station B
L.S. Firm Capacity = 2.0 MGD
6" F.M.
6" F.M.
Fairland Road
CR 120
W FM 1431
CR 125
CR 131
CR 419
N Phillips Ranch Rd
FIGURE ES.4
RECOMMENDED
INITIAL PHASE
CITY OF GRANITE SHOALS
LEGEND
Wastewater Treatment Plant
Phase 1 Lift Station
Phase 1 Force Main
Phase 1 Collection System
City Limits
City ETJ
Roads
MajorRoads
Study Area
Streams
Lakes
N
0
1,250
2,500
5,000
Feet
Freese and Nichols

Table ES.2 Opinion of Probable Cost Annual Cost Analysis		
Interest Rate	6%	
Amoritization Period	20 years	
Phase 1 Capacity	150,000	gpd
Phase 1 Capital Costs		
Collection System	$403,782	
Transmission System	$1,856,404	
WWTP	$4,312,500	
Eff. Disposal Sys.	$7,501,961	
Total Capital Costs	$14,074,648	
Phase 1 Annual costs		
Debt Service by Project Element		
Collection System	$35,204	
Transmission System	$161,850	
WWTP	$375,983	
Eff. Disposal Sys.	$654,055	
Total Debt Service	$1,227,092	
O&M Costs by Project Element		
Pipeline O&M	$45,204	
Lift station energy Costs	$17,038	
WWTP O&M costs	$311,000	
Eff. Disposal Sys.	$229,056	
Total O&M	$602,298	
Total Estimated Annual Costs	**$1,829,389**	
Unit cost ($/gpd)	**$12**	

Figure ES.5: Phase 1 Proposed Implementation Schedule
Granite Shoals Regional Wastewater Facilities

ID	Task Name	Duration	Start	Finish	Predecessors
1	Notice to Proceed	0 days	Wed 10/1/08	Wed 10/1/08	
2	Acquire Land Disposal Area	365 days	Wed 10/1/08	Tue 2/23/10	1
3	**Wastewater Treatment Plant**	**1072 days**	**Wed 10/1/08**	**Thu 11/8/12**	
4	Preliminary Engineering Report	120 days	Wed 10/1/08	Tue 3/17/09	1
5	Permitting	180 days	Wed 3/18/09	Tue 11/24/09	4
6	Final Design	120 days	Wed 11/25/09	Tue 5/11/10	5
7	TCEQ Design Review	90 days	Wed 5/12/10	Tue 9/14/10	6
8	**Bid Period**	**91 days**	**Wed 9/15/10**	**Wed 1/19/11**	
9	Advertisement Period	60 days	Wed 9/15/10	Tue 12/7/10	7
10	Bid Opening	1 day	Wed 12/8/10	Wed 12/8/10	9
11	Bid Evaluation	30 days	Thu 12/9/10	Wed 1/19/11	10
12	Construction Contract Award	1 day	Thu 1/20/11	Thu 1/20/11	11
13	**WWTP Construction**	**470 days**	**Fri 1/21/11**	**Thu 11/8/12**	
14	Mobilization	45 days	Fri 1/21/11	Thu 3/24/11	12
15	Construction	365 days	Fri 3/25/11	Thu 8/16/12	14
16	Construct land disposal system	180 days	Fri 1/21/11	Thu 9/29/11	12,2
17	Startup and Commissioning	60 days	Fri 8/17/12	Thu 11/8/12	16,15
18	WWTP in service	0 days	Thu 11/8/12	Thu 11/8/12	17
19	**Transmission/Collection System**	**1072 days**	**Wed 10/1/08**	**Thu 11/8/12**	
20	Preliminary Engineering Report	60 days	Wed 10/1/08	Tue 12/23/08	1
21	Permitting	180 days	Wed 12/24/08	Tue 9/1/09	20
22	Final Design	120 days	Wed 9/2/09	Tue 2/16/10	21
23	TCEQ Design Review	120 days	Wed 2/17/10	Tue 8/3/10	22
24	**Bid Period**	**91 days**	**Wed 8/4/10**	**Wed 12/8/10**	
25	Advertisement Period	60 days	Wed 8/4/10	Tue 10/26/10	23
26	Bid Evaluation	1 day	Wed 10/27/10	Wed 10/27/10	25
27	Contract Award	30 days	Thu 10/28/10	Wed 12/8/10	26
28	Construction Contract Award	1 day	Thu 12/9/10	Thu 12/9/10	27
29	**Transmission/Collection System Constru**	**500 days**	**Fri 12/10/10**	**Thu 11/8/12**	
30	Mobilization	45 days	Fri 12/10/10	Thu 2/10/11	28
31	Lift Station Construction	365 days	Fri 2/11/11	Thu 7/5/12	30
32	Large Diameter Forcemain Constructi	365 days	Fri 2/11/11	Thu 7/5/12	30
33	Grinder Pump Construction	365 days	Fri 2/11/11	Thu 7/5/12	30
34	Small Diameter Pipeline Construction	365 days	Fri 2/11/11	Thu 7/5/12	30
35	Transmission/Collection System Testi	60 days	Fri 8/17/12	Thu 11/8/12	32,33,34,15,16,31
36	Transmission/Collection System in ser	0 days	Thu 11/8/12	Thu 11/8/12	35
37	Phase 1 Complete	0 days	Thu 11/8/12	Thu 11/8/12	36,18



Project: Phase 1 Project Schedule
Date: Tue 5/27/08

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

CHAPTER ONE
INTRODUCTION

1.0 INTRODUCTION

This report summarizes the findings of the Regional Wastewater Facilities Study conducted by Freese and Nichols, Inc. on behalf of the City of Granite Shoals, Texas (City), in cooperation with the Texas Water Development Board (TWDB).

The purpose of the Regional Wastewater Facilities Study is to determine how best to implement a wastewater system for the City of Granite Shoals and residents in the remainder of the study area who currently rely on septic systems to treat wastewater.

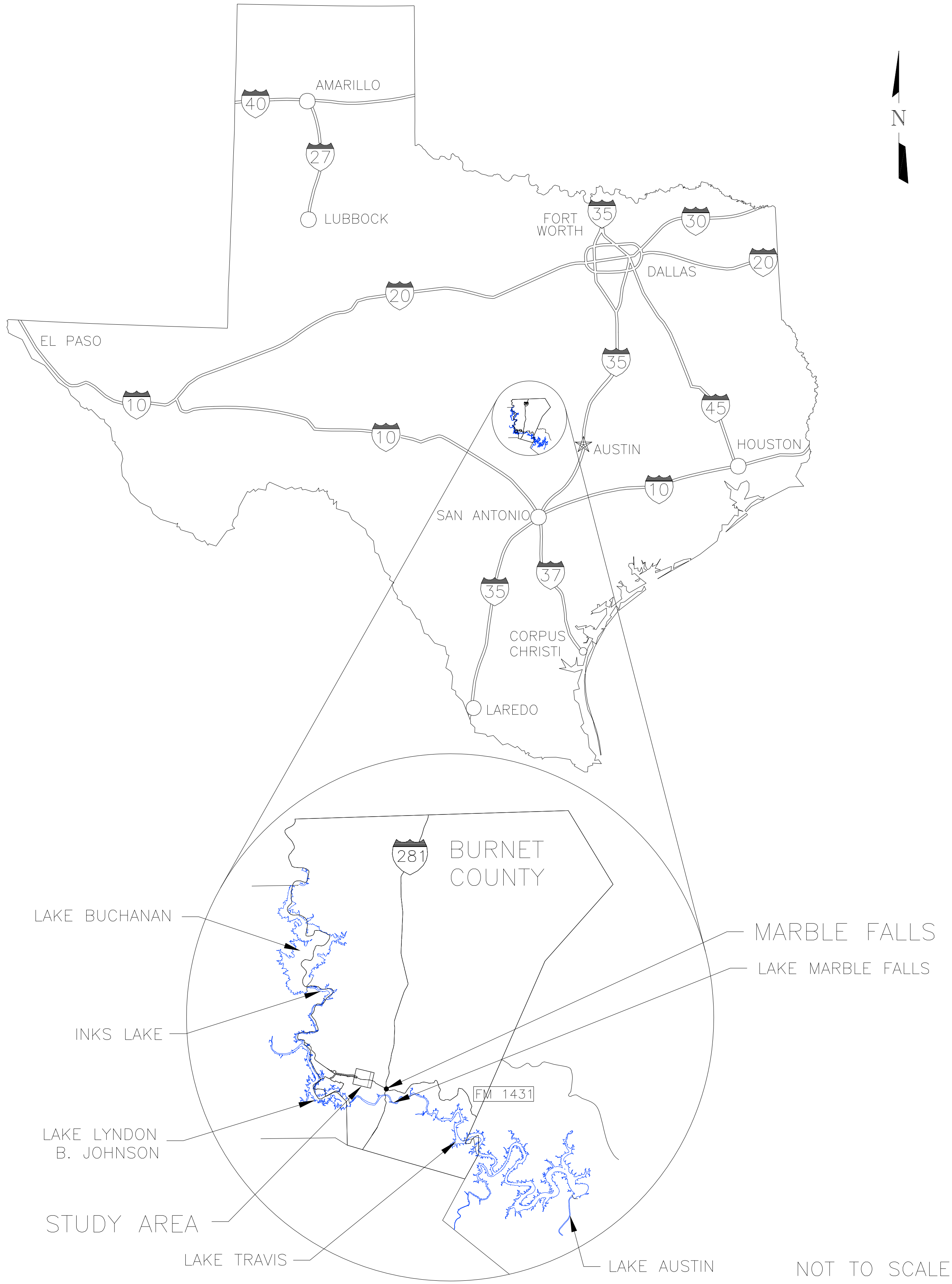
1.1 Project Background

The study area is located approximately 50 miles west of Austin on Lake Lyndon B. Johnson in Burnet County, Texas, as shown in Figure 1.1. Within the study area, only a few residents are served by a wastewater collection and treatment system. These residents include those located on Beaver Isle Drive, Web Isle and Impala Isle Drives, and several homes located on the Lake LBJ shoreline. This area is served by a small wastewater treatment facility owned and operated by Aqua Texas, Inc. (Aqua Texas). The remaining residents within the study area currently operate individual septic systems to treat wastewater.

The City is experiencing growth due to the expanding Austin suburban area, and the benefits of replacing the existing septic systems with a wastewater collection and treatment system are becoming increasingly evident. These benefits include a reduced reliance on septic systems for wastewater treatment and protection of water quality in the Highland Lakes and underlying groundwater as population increases.

1.2 Authorization

The City and TWDB entered into an Agreement dated July 23, 2007 to develop a regional facilities plan for wastewater collection and treatment within the City and the surrounding area. The City, via Council action in July 2007, authorized FNI to proceed with a study to evaluate alternatives for a collection, transmission and treatment system



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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE 1.1: PLANNING AREA LOCATION MAP

F&N JOB NO.	GSH07265
DATE	MAY. 2008
SCALE	AS SHOWN
DESIGNED	JBH
DRAFTED	CJE
FILE	FIGURE1.1.dwg

1.1
FIGURE

ACAD Rel 17.1s (LMS Tech) User: MV
[GSH07265][NOT ON NETWORK]N:\WR\REPORT\FIGURE1.1.DWG LAYOUT: Layout1
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Date: Aug 28, 2008 – 7:18am User: cje File: N:\wr\Report\FIGURE1.1.dwg

for the City and Sherwood Shores, and to provide the City with a report documenting the findings and recommendations associated with the study in fulfillment of the City's agreement with TWDB.

This study is funded by the City and by the TWDB through a regional planning grant.

1.3 Scope of Work

The scope of work, as defined in the City's contracts with TWDB and FNI is comprised of the following tasks:

Task A – Project Definition and Funding Acquisition

This task includes definition of the project phases, requirements, and objectives and development of the approach and schedule intended to meet these objectives.

Task B – Project Management

This task includes monitoring of the project budget and schedule during the total life of the defined project scope as well as miscellaneous efforts in review of billings and other financial submittals related to the project.

Task C – Changing Project Conditions

During the course of performance of the project tasks, project demands and needs may require the City of Granite Shoals to modify the project. As these changing project demands are detected by the City, the appropriate steps will be identified to accommodate them.

Task D – Population and Flow Projections

Population and flow projections will be calculated using historical data obtained from the Texas Commission on Environmental Quality, Burnet County, Sherwood Shores Trust and the City of Granite Shoals. These projections will be used to determine system needs and sizing of a potential city-wide system.

Task E – Identify Transmission, Treatment, and Collection System Alternatives

The study will begin by determining potential locations of a wastewater treatment plant. This task will evaluate alternatives available for transmission facilities, treatment facilities, and a collection system.

Task F – Develop Recommendations

Based on the information acquired, research conducted and the examination of alternatives, recommendations will be developed. These recommendations will be grouped in suggested phases for implementation and timing.

Task G – Draft and Final Report

A final report will be presented at the end of the study. This report will contain population and flow projections, all wastewater system options, and recommendations developed in Task F.

Task H – Public Advisory Committee Coordination

At the onset of the project criteria for establishment of a Public Advisory Committee (PAC) will be established and an initial meeting with invited committee members will be conducted. At this time, a preliminary meeting schedule and coordination procedures will be established. The Engineer will also develop a detailed summary of this meeting as well as subsequent PAC meetings. During these meetings, the Technical Memorandums developed for the project will be reviewed and comments solicited. A summary of the public meetings is provided in Chapter 6. Minutes from each meeting are provided in Appendix C.

CHAPTER TWO

PROJECT PLANNING AREA

2.0 PROJECT PLANNING AREA

This chapter presents an overview of the project planning area location, physiographic setting, political subdivisions, endangered species, existing wastewater treatment facilities, previous planning studies, and need for the project.

2.1 Location

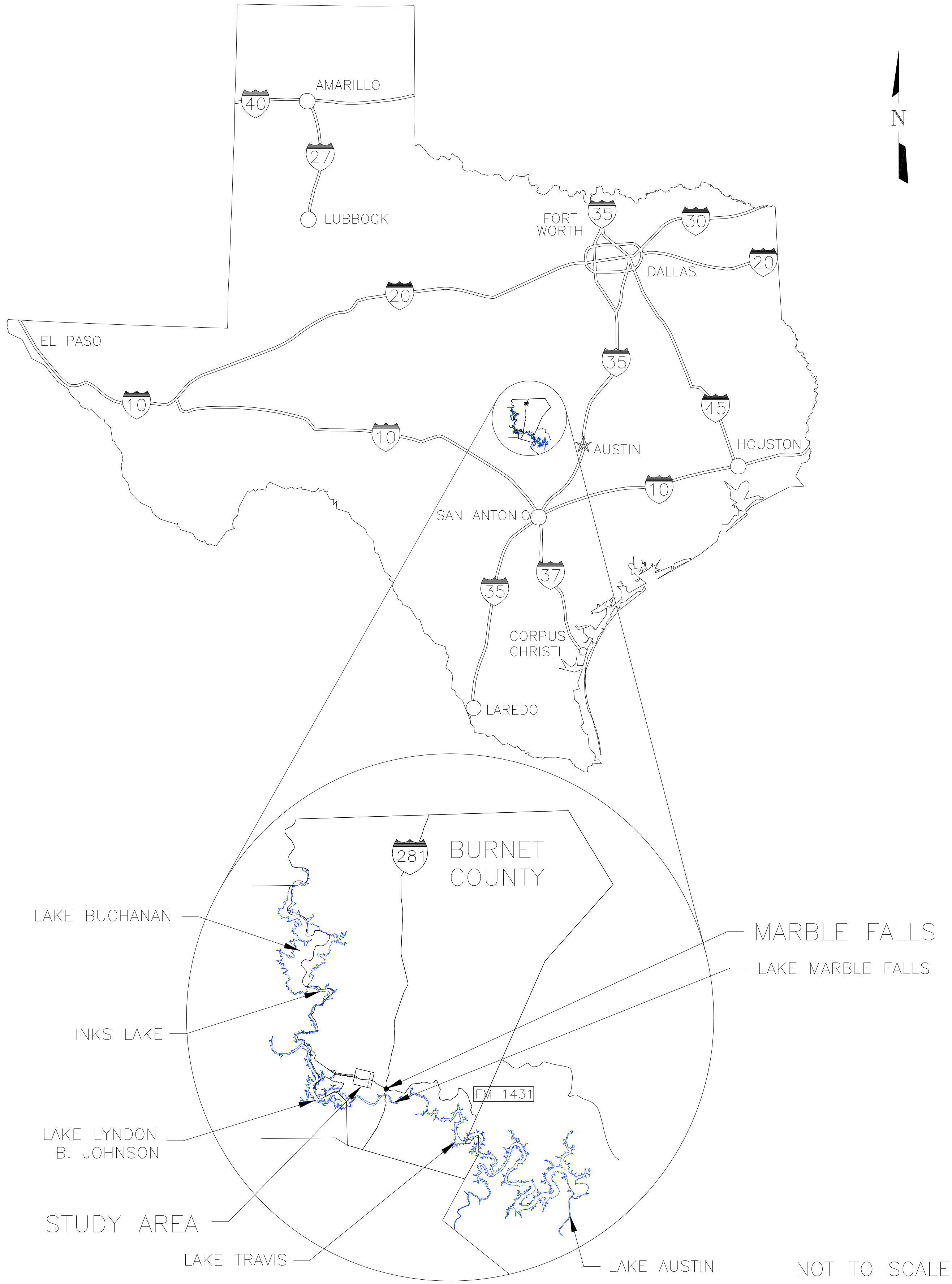
The study area is located in Burnet County, Texas, as shown in Figure 2.1. The study area is generally bounded on the north by FM 1431 and on the south by Lake Lyndon B. Johnson (Lake LBJ). It includes the City of Granite Shoals and portions of the Sherwood Shores Trust, as shown in Figure 2.2.

Land use within the study area is predominantly low density residential, with some commercial land use adjacent to major roads. Current zoning within the study area is shown on Figure 2.3. Residential properties range from lakefront homes to mobile homes. A substantial portion of the study area is a weekend and holiday community.

2.2 Physiographic Setting

Granite Shoals lies within the Llano uplift eco-region of the Edwards Plateau in central Texas. The Llano Uplift is an oval topographic basin of approximately 4,000 square miles, rimmed by the Edwards Plateau on the west, south, and east, and by the Osage Plain to the north. Geologically, the area is classified as a structural dome or uplift, in which the Precambrian and early paleozoic rocks have been exposed by erosion and removal of formerly overlying upper Paleozoic and Cretaceous rocks. *(Soil Survey of Blanco and Burnet Counties, Texas, United States Department of Agriculture, 1979; Soil Survey of Llano County, Texas, United States Department of Agriculture, 2000)*

The primary surficial deposits in the project area are Precambrian-aged, course-grained, pink granite of the Town Mountain Granite Formation. Exposed granite within the area has been dated at one billion years old. However, in some places alongside the Llano River, Quaternary alluvium is visible at the surface. These Quaternary deposits mainly consist of gravel, sand, silt, clay, and organic matter up to 35 feet thick in low



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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE 2.1: PLANNING AREA LOCATION MAP

F&N JOB NO.	GSH07265
DATE	MAY. 2008
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2.1

FIGURE

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[GSH07265][NOT ON NETWORK]N:\WR\REPORT\FIGURE1.1.DWG LAYOUT: Layout1
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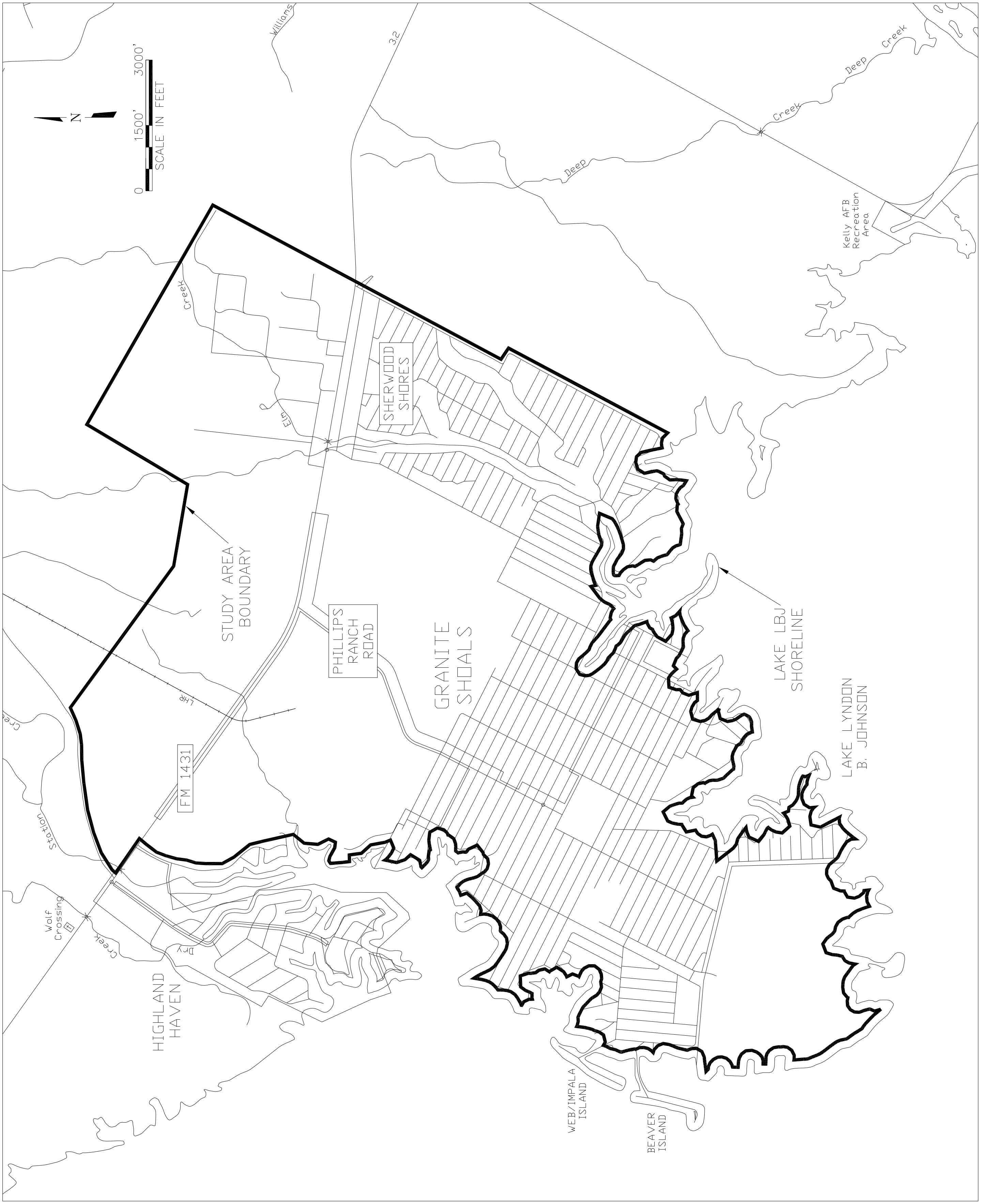

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CITY OF GRANITE SHOALS

STUDY AREA MAP

APPROXIMATE STUDY AREA BOUNDARY

F&N JOB NO.	GSH07265
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FIGURE 2.2

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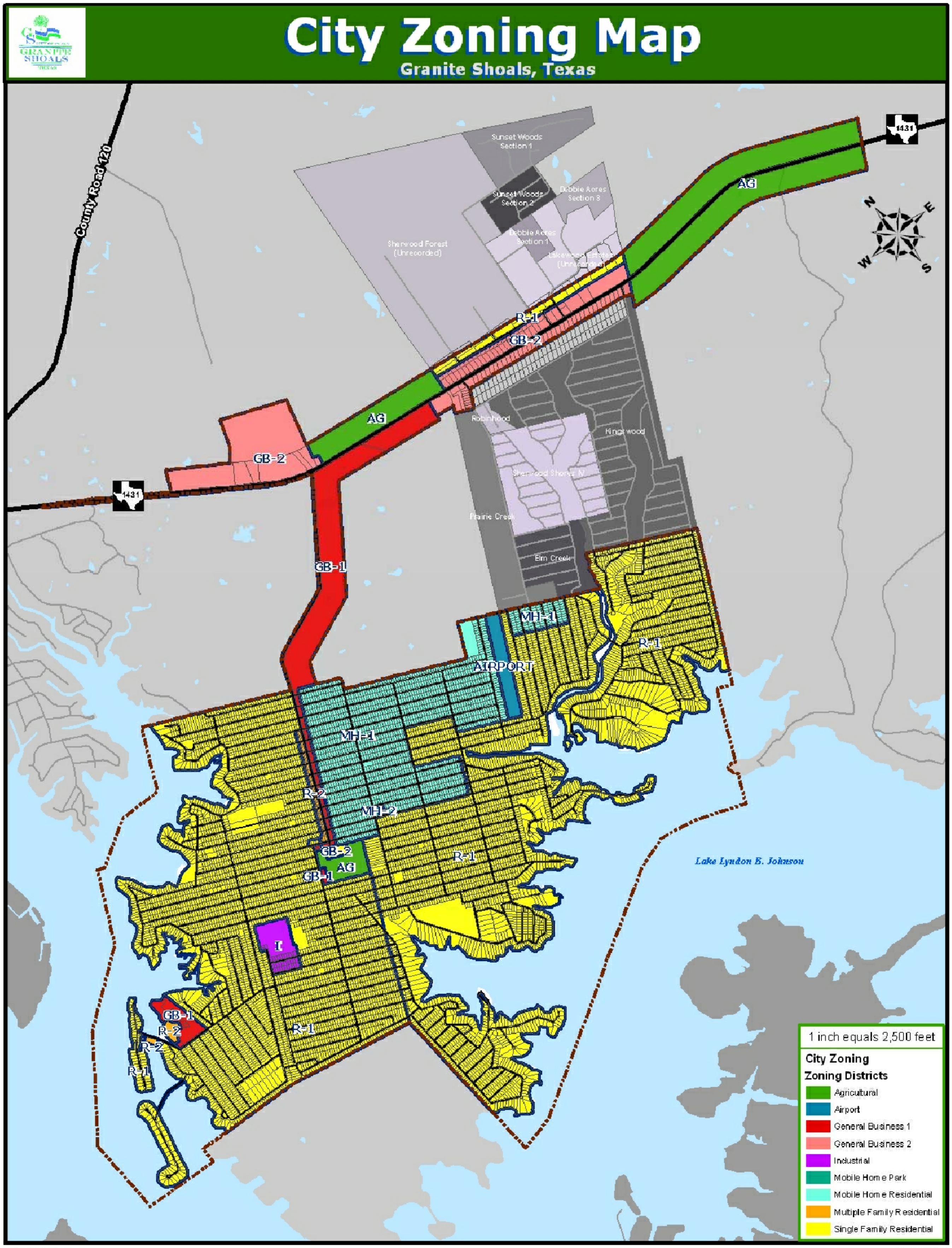

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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

STUDY AREA ZONING

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FIGURE 2.3

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[GSH07265][AUSTIN1]N:\WR\REPORT\FIGURE 2.3.DWG LAYOUT: Layout1
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Date: May 30, 2008 – 2:51pm User: gal File: N:\wr\Report\FIGURE 2.3.dwg floodplain terraces. Upland soils are shallow, reddish brown, stony, sandy loams over granite, gneiss, and schist with deeper sandy loam in the valleys.

The study area is underlain by a gravel/granite aquifer. Based on information from the Central Texas Groundwater Conservation District, this aquifer recharges quickly from the top. The extent of this aquifer is shown in Figure 2.4

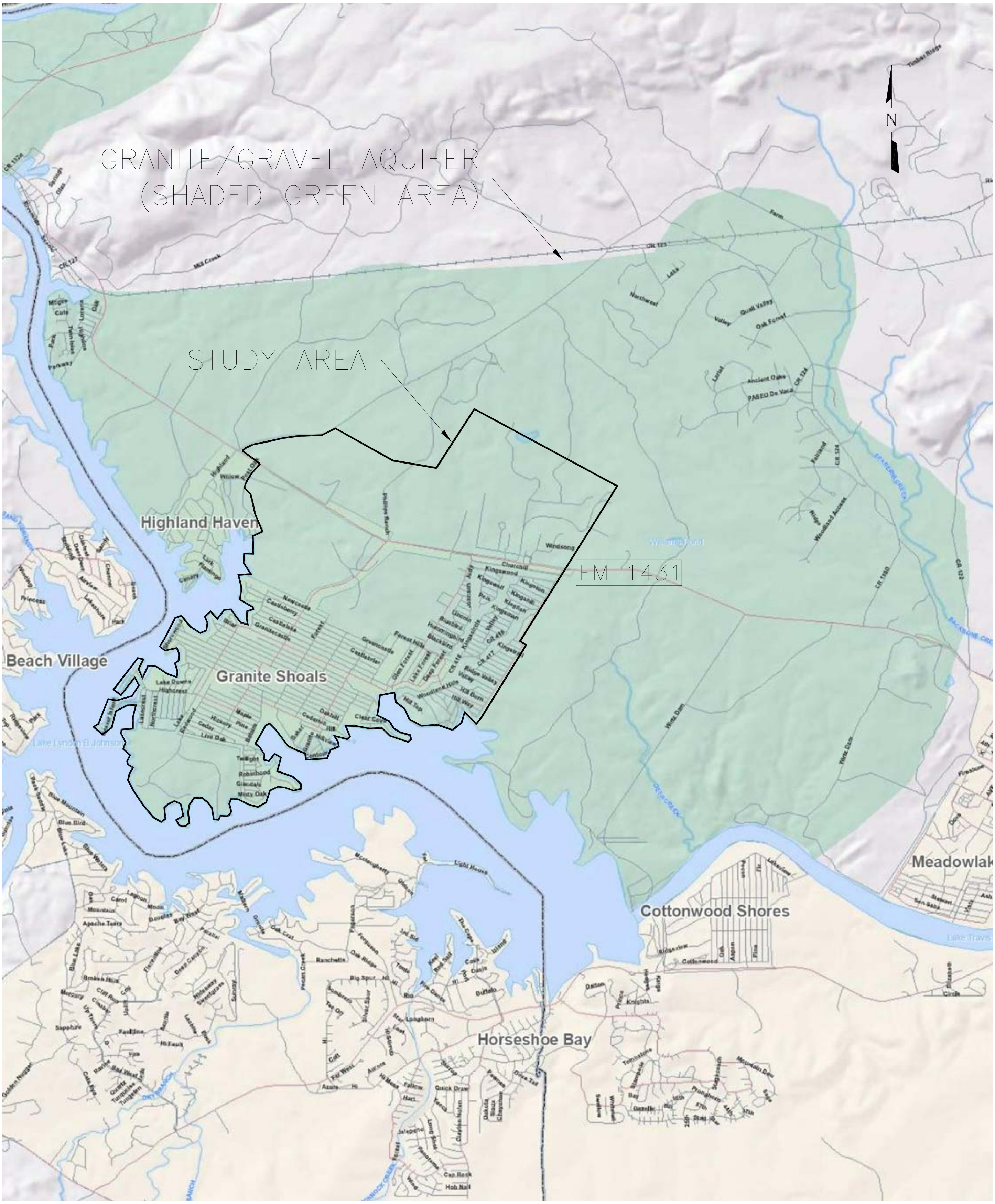
Woody vegetation consists of plateau live oak (*Quercus fusiformus*), honey mesquite (*Prosopis glandulosa*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), and cedar elm (*Ulmus crassifolia*). Flora normally found in arid west Texas, such as catclaw mimosa (*Mimosa aculeaticarpa*) and soaptree yucca (*Yucca elata*) also occur on dry sites of the Llano uplift. Ashe juniper (*Juniperus ashei*) and Texas oak (*Quercus buckleyi*) are generally absent except for limestone inclusions within the uplift. Grasses include little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), yellow Indiangrass (*Sorghastrum nutans*), and silver bluestem (*Bothriochloa laguroides*). Dome-like granite hills and outcrops contain unusual plant communities. Ranching is the major land use; however, level areas of sandy loam are farmed to produce wheat, sorghum, and peaches.

2.3 Political Subdivisions

The political subdivisions participating in this study are the City of Granite Shoals and Sherwood Shores Trust. The extraterritorial jurisdictions of the City and surrounding political subdivisions are shown in Figure 2.5 and include the City of Marble Falls, and the communities of Kingsland, Highland Haven, Sandy Acres, Lakewood Estates, and Horseshoe Bay.

2.4 Endangered Species

- Information regarding the occurrence of protected (federally-listed threatened or endangered species) with the project area is required in order to identify and evaluate potential impacts to protected species, and comply with applicable state and federal laws.



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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

GRANITE/GRAVEL AQUIFER
WITHIN THE STUDY AREA

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FIGURE 2.4

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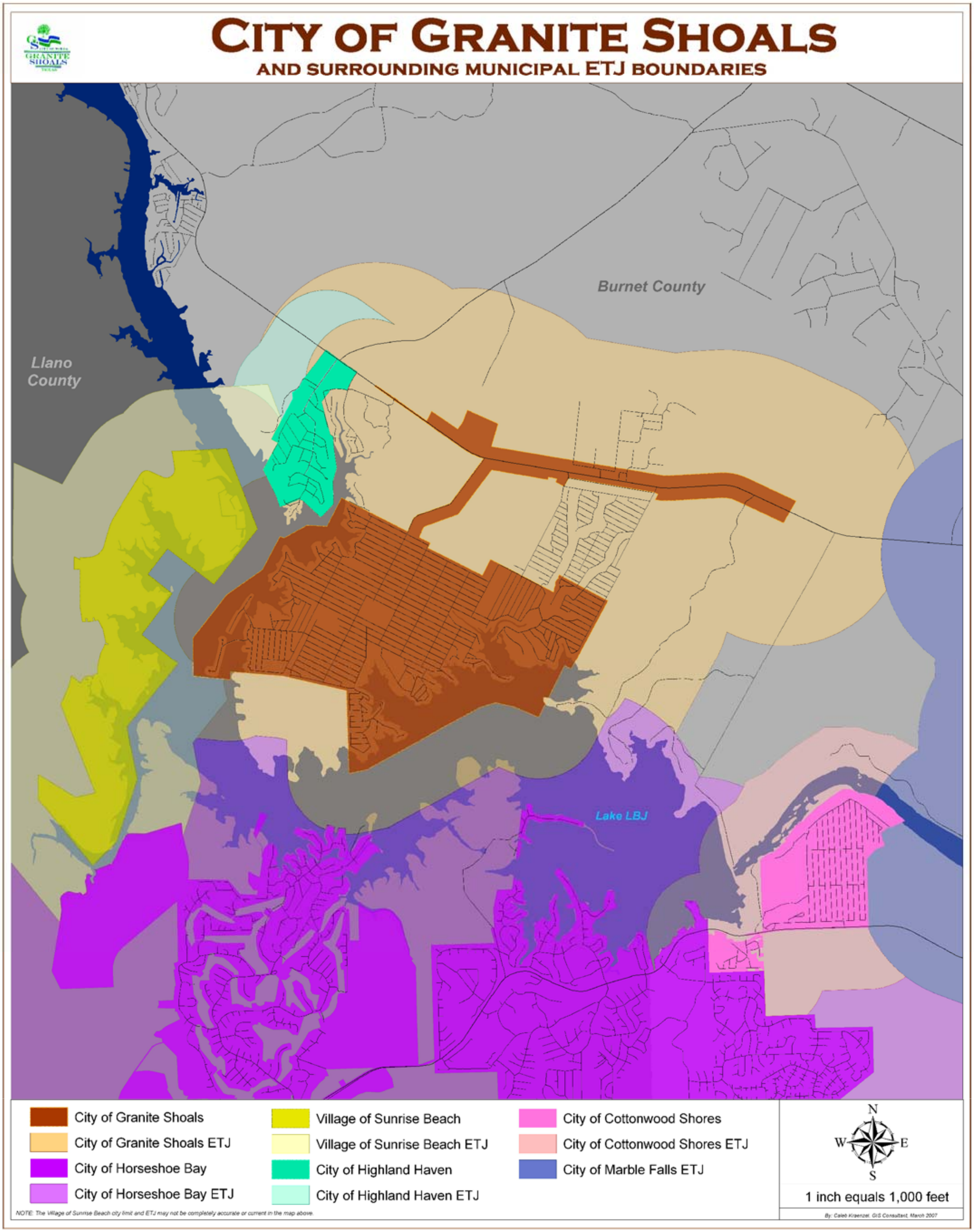

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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

POLITICAL SUBDIVISIONS AND ETJS

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2.5
FIGURE

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The following federal and state laws mandate assessment of potential habitat for threatened and endangered species:

- National Environmental Policy Act (NEPA) (Public Law [PL] 91-190, 42 United States Code (U.S.C.), 4321 et seq.)
- Endangered Species Act of 1973 (PL 93-205) and amendments of 1988 (PL 100-478)
- Chapters 67 and 68 of the Texas Parks and Wildlife Code, and Section 65.171-65.184 of Title 31 of the Texas Administrative Code.

The August 8, 2007 Texas Parks and Wildlife Department "Annotated County List of Rare Species" for Burnet County, and the United States Fish and Wildlife Service (USFWS) Southwest Region County-by-County list on the Southwest Region Ecological Services web site (viewed on February 20, 2008) were reviewed to identify protected species listed for Burnet County, and potentially located within the project area. Table 2.1 presents the results of the review. Each of the species listed in Table 2.1 has the potential to occur in Burnet County. A species that is listed for a county means that there is the potential for it to occur if its suitable habitat is present. Within a given area in a county that species habitat may or may not be present. If the habitat is present, then the species may occur. If the habitat is not there then it is unlikely that the species will be present. The potential for these species' habitat to exist in the project area is also summarized in Table 2.1.

Table 2.1: Federally- Listed Threatened and Endangered Species in Burnet County

Common Name	Scientific Name	USFWS*	Potential Habitat Present
Bee Creek Cave/ Reddell Harvestman	*Texella reddelli*	E	unlikely
Bald Eagle	*Haliaeetus leucocephalus*	DL	potentially
Black-capped Vireo	*Vireo atricapilla*	E	potentially
Golden-cheeked Warbler	*Dendroica chrysoparia*	E	potentially
Whooping Crane	*Grus americana*	E, EXPN	unlikely

* U. S. Fish and Wildlife Service (E= endangered, EXPN= non-essential experimental population, DL = delisted, C = candidate)

The following provides a brief description of each protected species:

The Bee Creek Cave harvestman is a cave-dwelling arachnid. This subterranean species has adapted to areas with consistent humidity and temperature levels and a continual influx of nutrients from the surface. The known range for the Bee Creek Cave harvestman is limited to a few caves in Travis and Williamson counties.

Bald eagles are found primarily near seacoasts, rivers, and large lakes where food resources such as fish and waterfowl are readily available. Eagles usually build their nests in 40 to 120-foot tall trees or on cliffs. The bald eagle is known to nest along the Colorado River in Bastrop County and on the Llano River in Llano County. The bald eagle is known to winter from early November to late March along major river systems of the eastern and central Edwards Plateau. The Colorado River drainage, especially Lake Buchanan in Llano and Burnet counties, is the area most likely to have wintering bald eagles in the project vicinity.

The Black-capped vireo is a migratory songbird present in Texas during the breeding season of late March through September. The breeding habitat normally has a distinctive patchy, two-layered aspect that includes a deciduous, broad-leaved shrub and tree layer with open, grassy spaces. Foliage reaching to ground level is used for nesting cover and the birds return to the same territory, or one nearby, year after year. The species composition of the vegetation is less important than the presence of adequate broad-leaved shrubs, foliage to ground level, and the required structure. Upper canopy within vireo habitat is relatively open.

The golden-cheeked warbler is a migratory songbird present in Texas during the breeding season of early March through early August. The songbirds prefer an oak-juniper wood that possesses a high percentage of tree canopy. In the study "The Interactions Between Avian Predators and Golden-cheeked Warblers in Travis County, Texas," by K. A. Arnold et al, 1996, it was determined that the warblers normally inhabit areas with a dense tree canopy contiguous within blocks of 56 acres or more. Ashe juniper within the oak-juniper woods normally occupied by the warbler is not predominately second growth or multi-trunked. The warbler collects the strips of bark shedding from Ashe juniper to construct their nests.

The whooping crane breeds in Canada and winters on the Texas coast. During migration the crane typically stops to rest and feed in open bottomlands of large rivers, marshes, and in agricultural areas.

In addition to the species listed in Table 2.1, several other species have the potential to be present in the project area during migratory periods. These species include the American Peregrine Falcon, the Arctic Peregrine Falcon, and the Interior Least Tern. Discussion of each of these species follow.

The American peregrine falcon is a year-round resident and local breeder in west Texas and nests in tall cliffs. The falcon is considered a migrant across Texas from northern breeding areas in the US and Canada to wintering grounds along the Texas coast and further south. During migration, the birds may rest or feed in urban areas, lake shores, coastlines and barrier islands.

The arctic peregrine falcon is considered to be a potential migrant in central Texas. This sub-species nests in the Arctic island and tundra regions of Alaska, Canada, and Greenland, and winters along the Texas coast south into South America. There is the potential for the falcons to migrate through central Texas in the spring and fall in route from breeding to wintering grounds. Peregrine falcons prefer open areas and often occur near water or wherever smaller birds concentrate.

The interior least tern is a shorebird that breeds in Texas along portions of the Rio Grande River, Canadian River, and Prairie Dog Town Fork of the Red River. Nesting habitat includes large areas of bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats near large rivers and reservoirs. This species winters along the coasts of Central and South America and feeds in shallow water where there is an abundance of fish.

The opportunity to avoid and minimize impacts to threatened and endangered species can be discussed as further decisions have been made regarding pipeline location, plant location, and additional planning strategies evolve. Qualified environmental personnel would need to conduct a pedestrian survey the project area to identify any potential habitat of the listed threatened or endangered species. An environmental assessment (EA) could be required if protected species were found on the project site.

2.5 Existing Wastewater Facilities

This section provides a description of existing wastewater facilities serving the project area.

2.5.1 Treatment Plants

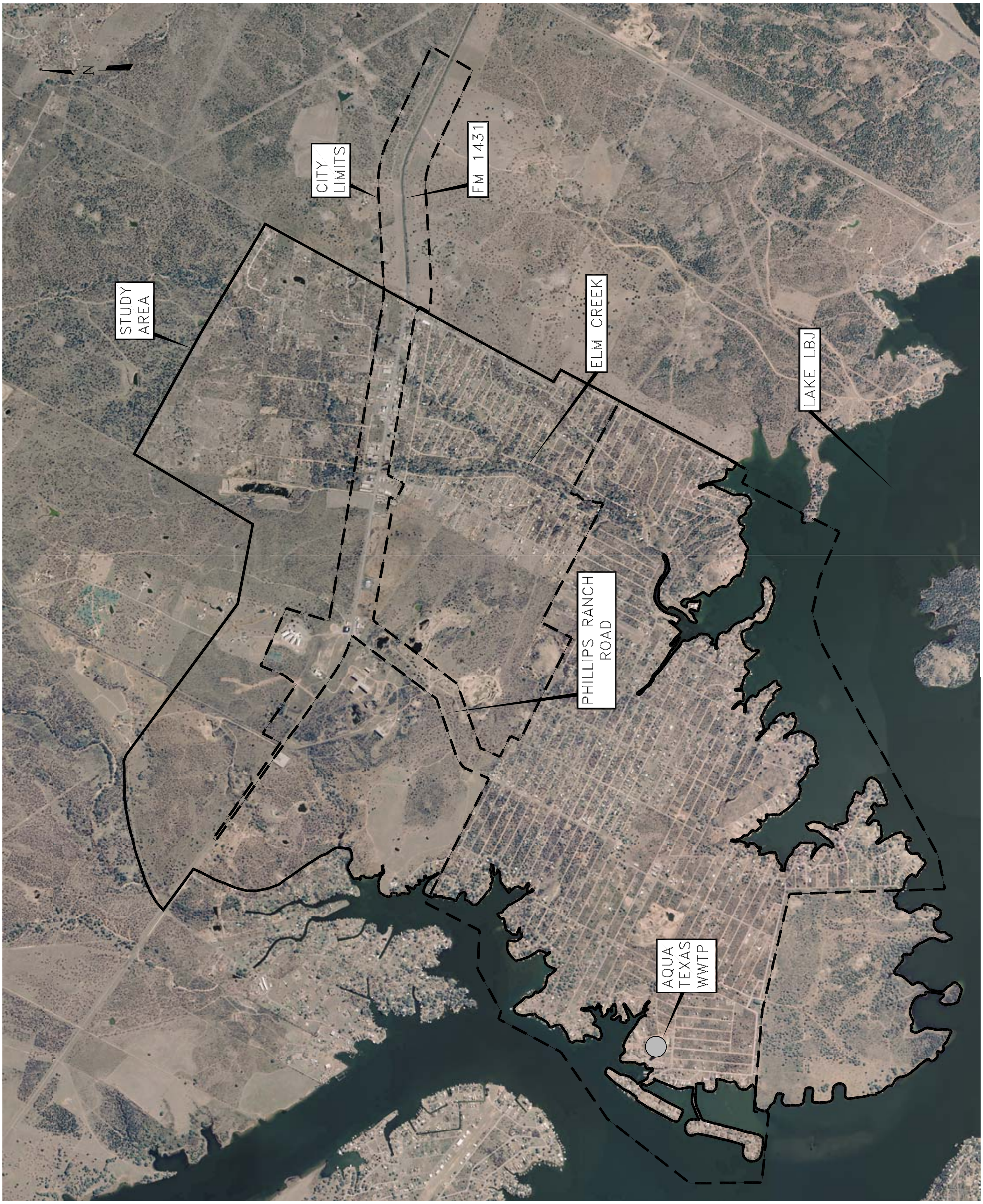
A portion of the City, which includes Beaver Isle Drive, Web Isle and Impala Isle Drives, and some shoreline residences are served by a small WWTP that is owned and operated by Aqua Texas. This facility discharges its effluent into Lake LBJ. The WWTP is permitted for an interim flow limit of 30,000 gallons per day and an ultimate limit of 50,000 gallons per day. Figure 2.6 shows the location of the Aqua Texas facility.

2.5.2 Septage Systems

The Highland Lakes Ordinance (311 TAC Subchapter F) currently prohibits discharge of wastewater effluent into the Highland Lakes. As a result, the remainder of the study area not served by the Aqua Texas WWTP relies on septic tanks for wastewater disposal. As of the year 2000, approximately 2,042 septic tank permits had been issued for the study area.

2.6 Previous Planning Efforts

The Lower Colorado River Authority (LCRA) previously contracted with Parsons Engineering Science Inc. to conduct a study to evaluate options for a centralized wastewater collection, transmission and treatment system. The report summarizing the



[GSH07265][AUSTIN1]N:\WR\REPORT\FIGURE 2.6.DWG LAYOUT: Layout1
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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE 2.6: LOCATION OF AQUA TEXAS WWTP

F&N JOB NO.	GSH07265
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2.6
FIGURE

Date: Jun 26, 2008 – 11:11am User: gal File: N:\wr\Report\FIGURE 2.6.dwg findings of this study is titled "Granite Shoals Area Wastewater Treatment Plant Alternatives Evaluation", August 2001 (Parsons Report).

The Parsons Report evaluated alternatives for the location of the WWTP, treatment process and transmission system. The recommendations of the Parsons study were:

- Constructing a new WWTP in Granite Shoals
- Oxidation ditch treatment process
- Low pressure collection system

2.7 Need for the Project

The City's location has historically made it an attractive area for second homes, and retirement residences. However, the study area is under intense growth pressure from the expanding Austin suburban area.

As a result of the study area's general reliance on septic systems for wastewater treatment, residents of the area have historically purchased multiple lots to accommodate a residence and provide the necessary area for a septic system leach field. With an increasing population, combined with the rocky soils and rapidly recharging granite/gravel aquifer underlying the area, septic systems are becoming a less attractive option for wastewater treatment. Discharges from septic tank leach fields tend to rapidly infiltrate through the gravel/granite aquifer and fractures in the underlying bedrock, which reduces the effectiveness of treatment normally provided by percolation through a soil column. This combination of rapid infiltration and reduced treatment creates potential impacts to the groundwater in the area. Further, the proximity of Lake LBJ increases the possibility of water quality impacts from the septic tank systems.

The City currently contracts with LCRA for septic tank permitting and monitoring. Although there are no documented cases of water quality issues caused by septic tanks in the study area, the City, LCRA, and community leaders recognize that the risks to water quality are much greater with the current wastewater disposal system via septic tanks than would be the risk using an engineered wastewater collection, treatment, and disposal system. Further, a centralized wastewater system will better support the increasing population pressure in the area, reduce the reliance on septic systems for wastewater treatment, and provide for continued protection of the water quality in the Highland Lakes and underlying groundwater as the study area population increases.

CHAPTER THREE

PROJECTED POPULATION, LAND USE, WASTEWATER FLOWS AND LOADINGS

3.0 PROJECTED POPULATION, LAND USE, WASTEWATER FLOWS AND LOADINGS

This chapter provides summaries of analyses related to projected population, wastewater flows, and wastewater loadings.

3.1 Projected Population

The objectives of this study require a projection of the quantities of future wastewater flow. Planning-level wastewater flow projections are generally developed either by applying a per capita flow rate to population or connection projections, or by applying unit area flow generation rates specific to land use type to land use projections.

Flow rates are generally developed either using historic data or generalized flow rates from text books, comparable communities, or state regulatory agencies. The Texas Commission on Environmental Quality (TCEQ) prescribes the use of specific per capita flow rates in circumstances where historic data is not available. Unit area flow generation rates are typically developed based on historic wastewater collection system flow measurements.

Since the study area has very limited to no collection and treatment system data, it is not possible to develop specific per capita flow rates or unit area flow generation data. Under these circumstances, wastewater flow rates will be developed using population projections and per capita flows rates.

The planning period for this study extends through 2030.

3.1.1 Study Area Historical and Projected Population

Historical and projected population data was gathered from several sources, including:

1) Engineering Study, Granite Shoals Area, Wastewater Treatment Plant Alternatives Evaluation, prepared for the Lower Colorado River Authority by Parsons Engineering Science, August 2001.(Parsons Report).

2) Texas Water Development Board (TWDB) Region K approved population

projections, January 2006.

3) City of Granite Shoals Comprehensive Plan, approved November 2003.
    a. 50 percent of growth rate from 1990-2000
    b. 100 percent of growth rate from 1990-2000

4) Preliminary Design Report for New Surface Water Treatment Plant, Carter & Burgess, May 2005.
    a. TWDB growth rate.
    b. 100 percent growth rate scenario from City's comprehensive plan.

The 2005 Carter & Burgess report provided information on population growth rates, which were then applied to the year 2000 census data to estimate population in subsequent years.

The Parsons Report provided population estimates through 2020. Population projections through 2030 were extrapolated using the growth rate for the number of connections and population per connection assumed in the Parsons Report.

The remainder of the sources provided population projection through 2030. Table 3.1 presents a comparison of historical and projected populations from the sources described above. Figure 3.1 presents this information graphically.

Projections from each of these sources were compared for use in development of future population projections for the study area.

A review of the data presented in Table 3.1 and Figure 3.1 shows that the population projections from the Parsons Report are substantially larger than the projections from the other sources. For example, the year 2000 population estimate was more than two times the Census data for that year. Therefore, for the purposes of this study, the projected population used by FNI is the average population for all scenarios excluding the Parsons Report. The "Design" population projection is presented in Table 3.2 and shown as the line labeled "Design" in Figure 3.1.

Figure 3.1: Comparison of Population Projections

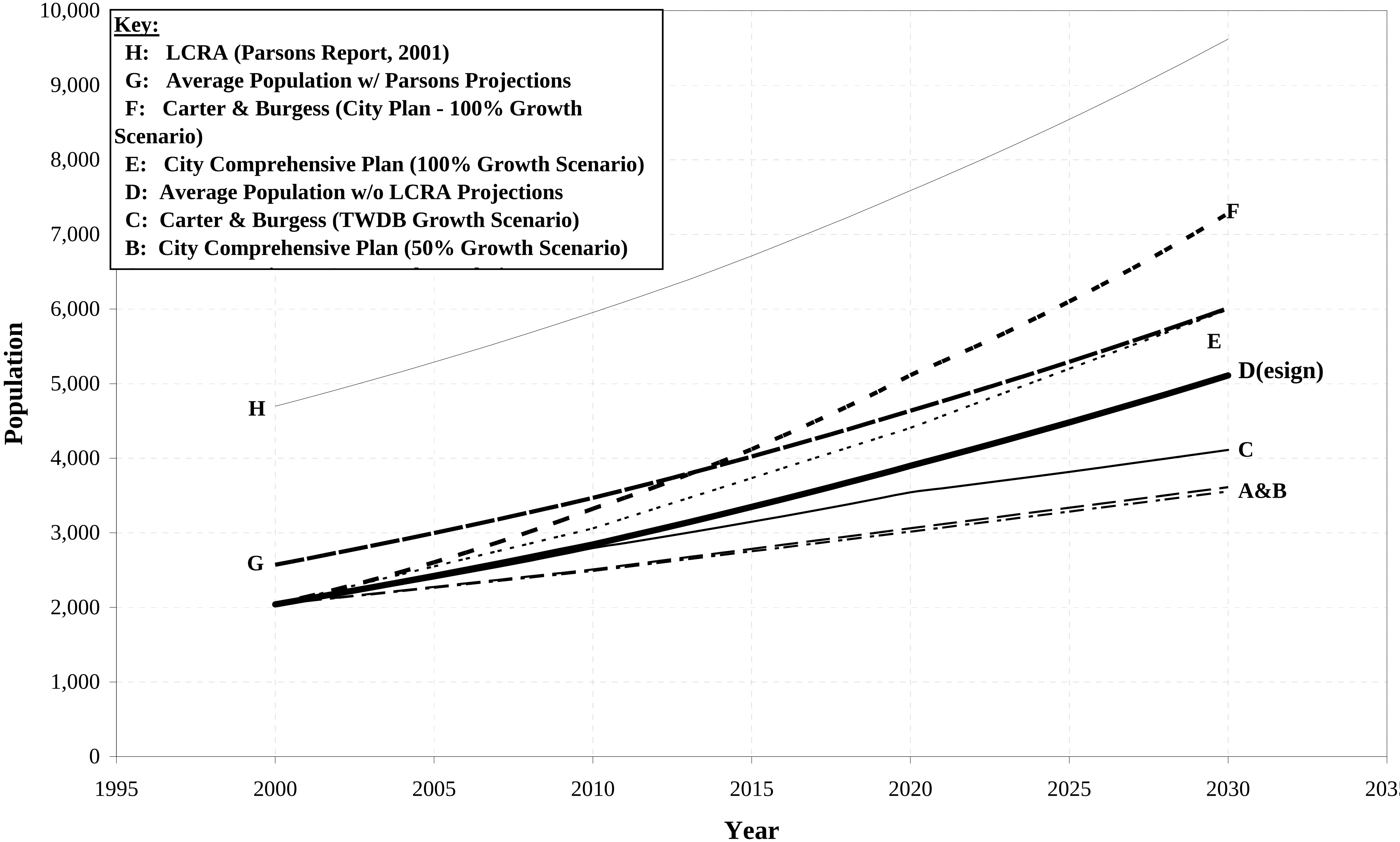


Table 3.1: Comparison of Historic and Projected Population for the Study Area

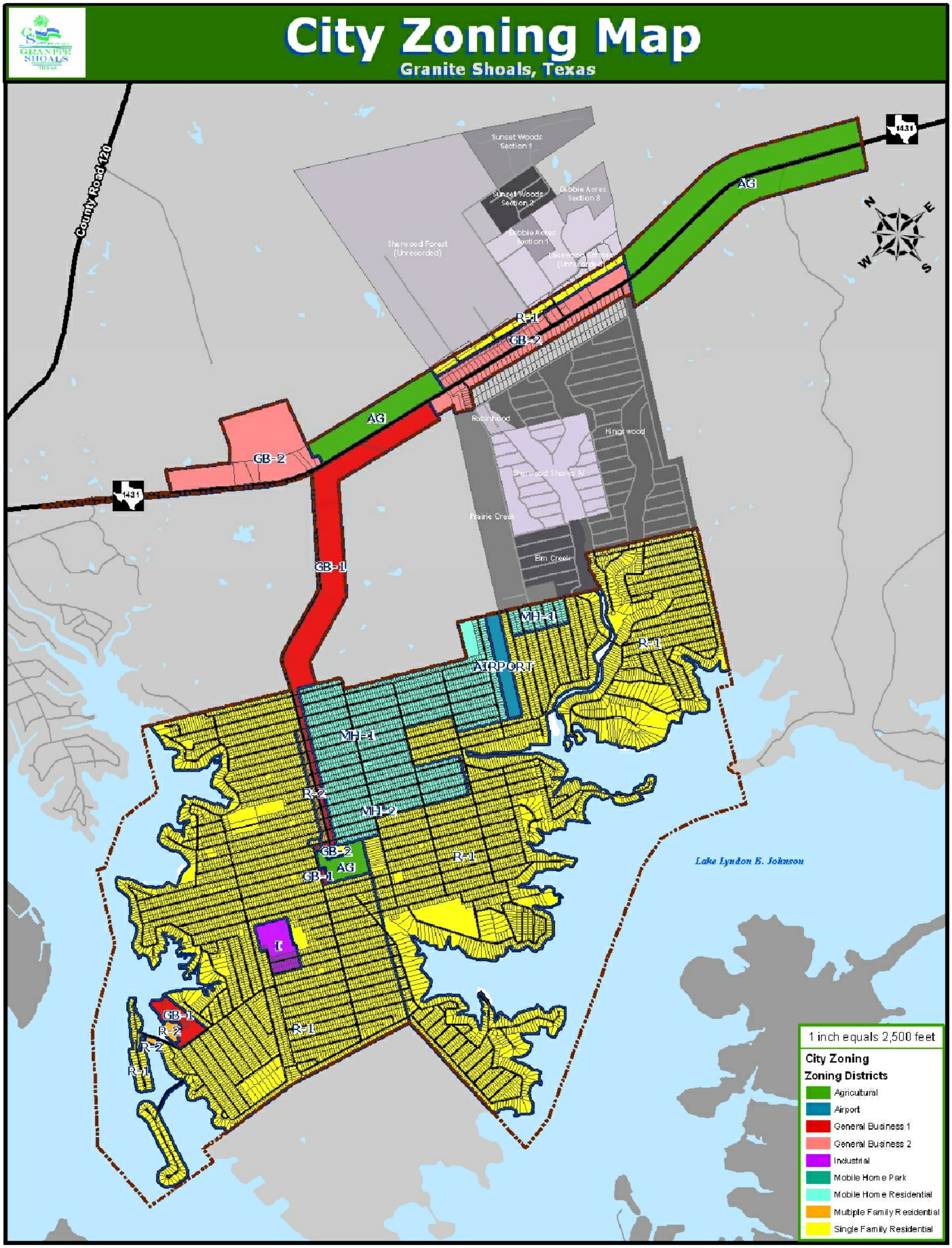
			City Comprehensive Plan Projections		2005 C&B WTP Report		Average Population	
Year	LCRA (Parsons, 2001)(1)	TWDB (Region K, 2006)	50% growth rate scenario(2)	100% growth rate scenario(3)	TWDB growth scenario(4)	City's Comprehensive Plan growth scenario(4)	With Parsons projections	Design (Without Parsons Projections)
2000	4,697	2,040	2,040	2,040	2,040	2,040	2,571	2,040
2001	4,809	2,085	2,087	2,142	2,105	2,142	2,653	2,114
2002	4,925	2,130	2,134	2,244	2,173	2,249	2,736	2,189
2003	5,043	2,175	2,181	2,346	2,242	2,362	2,821	2,266
2004	5,164	2,220	2,228	2,448	2,314	2,480	2,908	2,344
2005	5,288	2,265	2,275	2,550	2,388	2,604	2,996	2,423
2006	5,415	2,309	2,321	2,652	2,464	2,734	3,086	2,504
2007	5,545	2,354	2,368	2,754	2,543	2,870	3,178	2,587
2008	5,678	2,399	2,415	2,856	2,625	3,014	3,272	2,671
2009	5,814	2,444	2,462	2,958	2,709	3,165	3,369	2,757
2010	5,954	2,489	2,509	3,060	2,795	3,323	3,467	2,845
2011	6,097	2,542	2,564	3,195	2,862	3,469	3,573	2,942
2012	6,243	2,594	2,619	3,329	2,931	3,622	3,682	3,041
2013	6,392	2,647	2,675	3,464	3,001	3,781	3,792	3,142
2014	6,551	2,699	2,730	3,598	3,073	3,948	3,905	3,244
2015	6,713	2,752	2,785	3,733	3,147	4,121	4,021	3,348
2016	6,880	2,805	2,840	3,868	3,223	4,303	4,139	3,454
2017	7,051	2,857	2,895	4,002	3,300	4,492	4,260	3,562
2018	7,225	2,910	2,951	4,137	3,379	4,690	4,382	3,672
2019	7,404	2,962	3,006	4,271	3,460	4,896	4,508	3,784
2020	7,588	3,015	3,061	4,406	3,543	5,111	4,636	3,898
2021	7,770	3,069	3,116	4,565	3,597	5,295	4,763	4,011
2022	7,956	3,123	3,171	4,723	3,651	5,486	4,892	4,126
2023	8,147	3,177	3,226	4,882	3,705	5,683	5,023	4,242
2024	8,343	3,231	3,281	5,040	3,761	5,888	5,157	4,360
2025	8,543	3,285	3,337	5,199	3,817	6,100	5,293	4,480
2026	8,748	3,338	3,392	5,358	3,875	6,320	5,431	4,602
2027	8,958	3,392	3,447	5,516	3,933	6,547	5,572	4,726
2028	9,173	3,446	3,502	5,675	3,992	6,783	5,716	4,851
2029	9,393	3,500	3,557	5,833	4,052	7,027	5,862	4,979
2030	9,619	3,554	3,612	5,992	4,112	7,280	6,011	5,109

(1) 2021-2030 values have been extrapolated.
(2) 50% of the growth rate from 1990-2000 was used.
(3) 100% of the growth rate from 1990-2000 was used.
(4) Year 2000 population from Census.
Note: Parsons Report used growth rate of 2.4 % and 2.3 people per connection

Table 3.2: Design Population Projections	
Year	**Design Population**
2000	2,040
2001	2,114
2002	2,189
2003	2,266
2004	2,344
2005	2,423
2006	2,504
2007	2,587
2008	2,671
2009	2,757
2010	2,845
2011	2,942
2012	3,041
2013	3,142
2014	3,244
2015	3,348
2016	3,454
2017	3,562
2018	3,672
2019	3,784
2020	3,898
2021	4,011
2022	4,126
2023	4,242
2024	4,360
2025	4,480
2026	4,602
2027	4,726
2028	4,851
2029	4,979
2030	5,109

3.2 Land Use

As indicated in Chapter 2, land use within the study area is predominantly low density residential, with some commercial land use adjacent to major roads. Current zoning within the study area is shown on Figure 3.2. There is currently insufficient data to project wastewater flows based on land use or zoning.



ACAD Rel 17.1s (LMS Tech) User: GAL
[GSH07265][AUSTIN1]N:\WR\REPORT\FIGURE 3.2.DWG LAYOUT: Layout1
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CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

STUDY AREA ZONING

F&N JOB NO.	GSH07265
DATE	FEB. 2008
SCALE	AS SHOWN
DESIGNED	JBH
DRAFTED	CJE
FILE	FIGURE 3.2.dwg

3.2
FIGURE

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3.3 Per Capita Wastewater Flows

Historical flow records were solicited from two entities near the study area: the Aqua Texas wastewater plant which currently serves a small portion of the study area; and Lake LBJ Municipal Utility District (MUD), which operates the Horseshoe Bay Wastewater Treatment facility. These entities were chosen based on their proximity to the study area, and the similarities in land use to that of the study area. Lake LBJ MUD was unresponsive to the request for data.

Historic flow data for January 2002 through October 2007 was obtained for the Aqua Texas facility. This flow data is summarized in Appendix A. Estimates of population within the area currently served by the Aqua Texas facility were developed based on analysis of year 2000 census data for the service area, and extrapolated using the same percentage growth by year as reflected in the Design Population presented in Table 3.2. Population and per capita flow estimates by year for the Aqua Texas service area are presented in Table 3.3

Table 3.3: Estimated Population and Per Capita Wastewater Flow Estimates for Aqua Texas Service Area

Year	Study Area Population	Rate of Population Growth	Estimated Service Area Population	Estimated Per Capita Wastewater Flows
2000	2040		108	
2002	2189	7.31%	116	85.46
2003	2266	3.50%	120	87.26
2004	2344	3.44%	124	98.50
2005	2423	3.39%	128	103.37
2006	2504	3.34%	133	102.56
2007	2587	3.30%	137	119.84
			Average	99.50

Based on the analysis of the Aqua Texas facility flows, a per capita wastewater flow rate of 100 gallons per capita per day will be used for this study.

3.4 Design Wastewater Loadings

Wastewater influent parameters, including biochemical oxygen demand (BOD), total suspended solids (TSS), Total Kjeldahl Nitrogen (TKN), and phosphorous (P) data was requested from the Aqua Texas facility and Lake LBJ MUD. Lake LBJ MUD was unresponsive to the request for data, and the Aqua Texas facility is not required to monitor wastewater influent. As a result, wastewater influent parameters were assumed based on prior experience with similar communities. Table 3.4 presents the wastewater parameters assumed for this study.

Table 3.4: Design Wastewater Loadings

Parameter	Design Value (mg/l)
Biochemical Oxygen Demand (BOD5)	225
Total Suspended Solids (TSS)	225
Total Nitrogen (N)	40
Total Kjeldahl Nitrogen (TKN)	15
Ammonia Nitrogen (NH3-N)	25
Total Phosphorous (P)	8

These parameters should be revisited during preliminary design of the recommended project. Following construction of the first phase of the project, the City should monitor wastewater influent parameters to develop a historical database to use as part of future system expansions.

3.5 Projected Wastewater Flows and Loadings

3.5.1 Projected Wastewater Flows

Table 3.5 presents projected wastewater flows based on the design population presented in Table 3.2 and a per capita wastewater flow of 100 gpcd. In accordance with TCEQ draft criteria Chapter 217 §217.32, for a facility with a capacity less than 1 MGD, the permitted flow is the maximum 30-day average flow estimated by multiplying the average annual flow by a factor of at least 1.5. Based on the flow information collected from Aqua Texas, the ratio of maximum month to average flow was approximately 1.3, so the minimum TCEQ factor of 1.5 was applied to the estimated average annual flow to calculate the maximum month/permitted flow. In accordance with TCEQ draft criteria Chapter 217 §217, two-hour peak flows were calculated by multiplying the maximum month flow by four. Projected wastewater flows are presented graphically in Figure 3.3.

Table 3.5: Projected Wastewater Flows

		Projected Flows		
Year	**Design Population**	**Average Annual Flow (gpd)**	**Maximum Month/ Permitted (gpd)**	**2-hour Peak Flow (mgd)**
2008	2,671	267,110	400,665	1.60
2009	2,757	275,723	413,584	1.65
2010	2,845	284,524	426,785	1.71
2011	2,942	294,239	441,358	1.77
2012	3,041	304,115	456,172	1.82
2013	3,142	314,159	471,238	1.88
2014	3,244	324,378	486,567	1.95
2015	3,348	334,780	502,171	2.01
2016	3,454	345,374	518,061	2.07
2017	3,562	356,167	534,250	2.14
2018	3,672	367,168	550,751	2.20
2019	3,784	378,386	567,579	2.27
2020	3,898	389,832	584,747	2.34
2021	4,011	401,122	601,683	2.41
2022	4,126	412,577	618,866	2.48
2023	4,242	424,205	636,307	2.55
2024	4,360	436,010	654,015	2.62
2025	4,480	447,999	671,998	2.69
2026	4,602	460,179	690,268	2.76
2027	4,726	472,557	708,835	2.84
2028	4,851	485,139	727,708	2.91
2029	4,979	497,933	746,900	2.99
2030	5,109	510,948	766,421	3.07

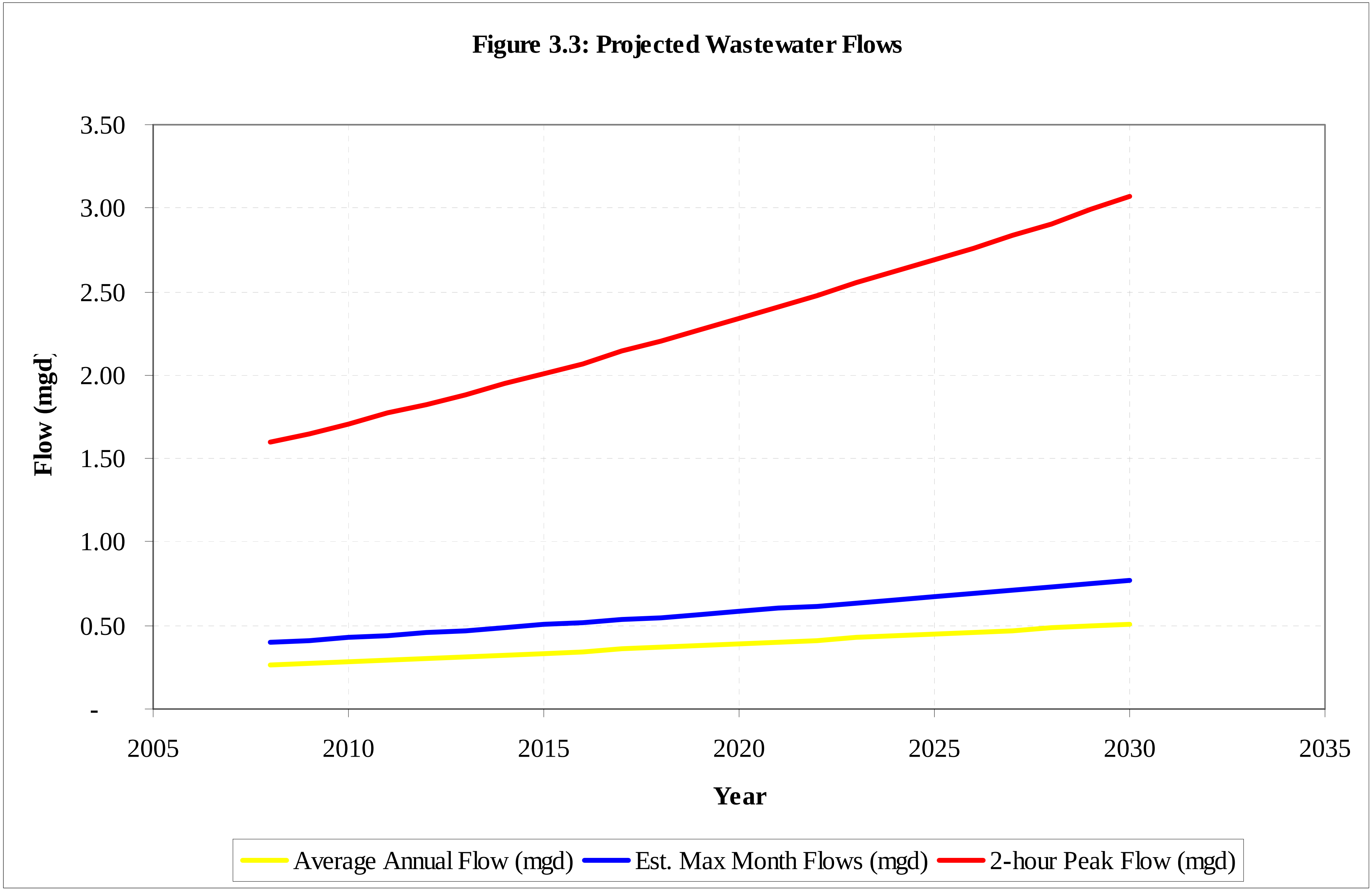


Figure 3.3: Projected Wastewater Flows
3.50
3.00
2.50
2.00
1.50
1.00
0.50
-
Flow (mgd)
2005
2010
2015
2020
2025
2030
2035
Year
Average Annual Flow (mgd)
Est. Max Month Flows (mgd)
2-hour Peak Flow (mgd)

3.5.2 Projected Wastewater Loadings

Projected wastewater loadings were developed based on design wastewater influent parameters presented in Table 3.4, and projected wastewater flows presented in Table 3.5. Table 3.6 presents projected wastewater loadings over the project planning horizon. Figures 3.4 and 3.5 shows projected BOD_5 and TSS respectively. Figure 3.6 shows projected loadings for total nitrogen, TKN, Ammonia-N, and Phosphorous.

3.5.3 Target Wastewater Effluent Quality

Due to the current ban on wastewater discharges to the Highland Lakes system (the "Highland Lakes Ban"), disposal of treated wastewater effluent will be via land application. The City is also planning on the implementation of a treated effluent reuse program. This reuse program is intended to supplement the City's existing water supply, but is not necessarily intended as a substitute for land application of the treated effluent. Target wastewater effluent quality parameters for land disposal and for Type 1 reuse are presented in Table 3.7.

The City intends to configure and permit the proposed wastewater treatment facilities to meet the minimum requirements for land application of the effluent. In the future, as reuse opportunities are identified, the City will apply for a Chapter 210 (Texas Administrative Code Chapter 210) authorization for Type 1 effluent.

The more stringent Type 1 effluent requirements can be accommodated in several ways, including adjusting the entire plant process to produce a higher quality effluent, or by providing add itional treatment processes to treat the reuse portion of the effluent to the required standards. Specific process options to accommodate both land application and Type 1 reuse will be identified and evaluated during the preliminary design phase of the project.

Table 3.6: Projected Wastewater Loadings

			BOD		TSS		total N		TKN		Ammonia - N		P	
Year	Average Annual Flow (gpd)	Estimated Maximum Month Flows (gpd)	Annual Average (lbs/day)	Max Month (lbs/day)	Annual Average (lbs/day)	Max Month (lbs/day)	Annual Average (lbs/day)	Max Month (lbs/day)	Annual Average (lbs/day)	Max Month (lbs/day)	Annual Average (lbs/day)	Max Month (lbs/day)	Annual Average (lbs/day)	Max Month (lbs/day)
2008	267110	400665	501	752	501	752	89	134	33	50	56	84	18	27
2009	275723	413584	517	776	517	776	92	138	34	52	57	86	18	28
2010	284524	426785	534	801	534	801	95	142	36	53	59	89	19	28
2011	294239	441358	552	828	552	828	98	147	37	55	61	92	20	29
2012	304115	456172	571	856	571	856	101	152	38	57	63	95	20	30
2013	314159	471238	590	884	590	884	105	157	39	59	66	98	21	31
2014	324378	486567	609	913	609	913	108	162	41	61	68	101	22	32
2015	334780	502171	628	942	628	942	112	168	42	63	70	105	22	34
2016	345374	518061	648	972	648	972	115	173	43	65	72	108	23	35
2017	356167	534250	668	1003	668	1003	119	178	45	67	74	111	24	36
2018	367168	550751	689	1033	689	1033	122	184	46	69	77	115	24	37
2019	378386	567579	710	1065	710	1065	126	189	47	71	79	118	25	38
2020	389832	584747	732	1097	732	1097	130	195	49	73	81	122	26	39
2021	401122	601683	753	1129	753	1129	134	201	50	75	84	125	27	40
2022	412577	618866	774	1161	774	1161	138	206	52	77	86	129	28	41
2023	424205	636307	796	1194	796	1194	142	212	53	80	88	133	28	42
2024	436010	654015	818	1227	818	1227	145	218	55	82	91	136	29	44
2025	447999	671998	841	1261	841	1261	149	224	56	84	93	140	30	45
2026	460179	690268	864	1295	864	1295	154	230	58	86	96	144	31	46
2027	472557	708835	887	1330	887	1330	158	236	59	89	99	148	32	47
2028	485139	727708	910	1366	910	1366	162	243	61	91	101	152	32	49
2029	497933	746900	934	1402	934	1402	166	249	62	93	104	156	33	50
2030	510948	766421	959	1438	959	1438	170	256	64	96	107	160	34	51

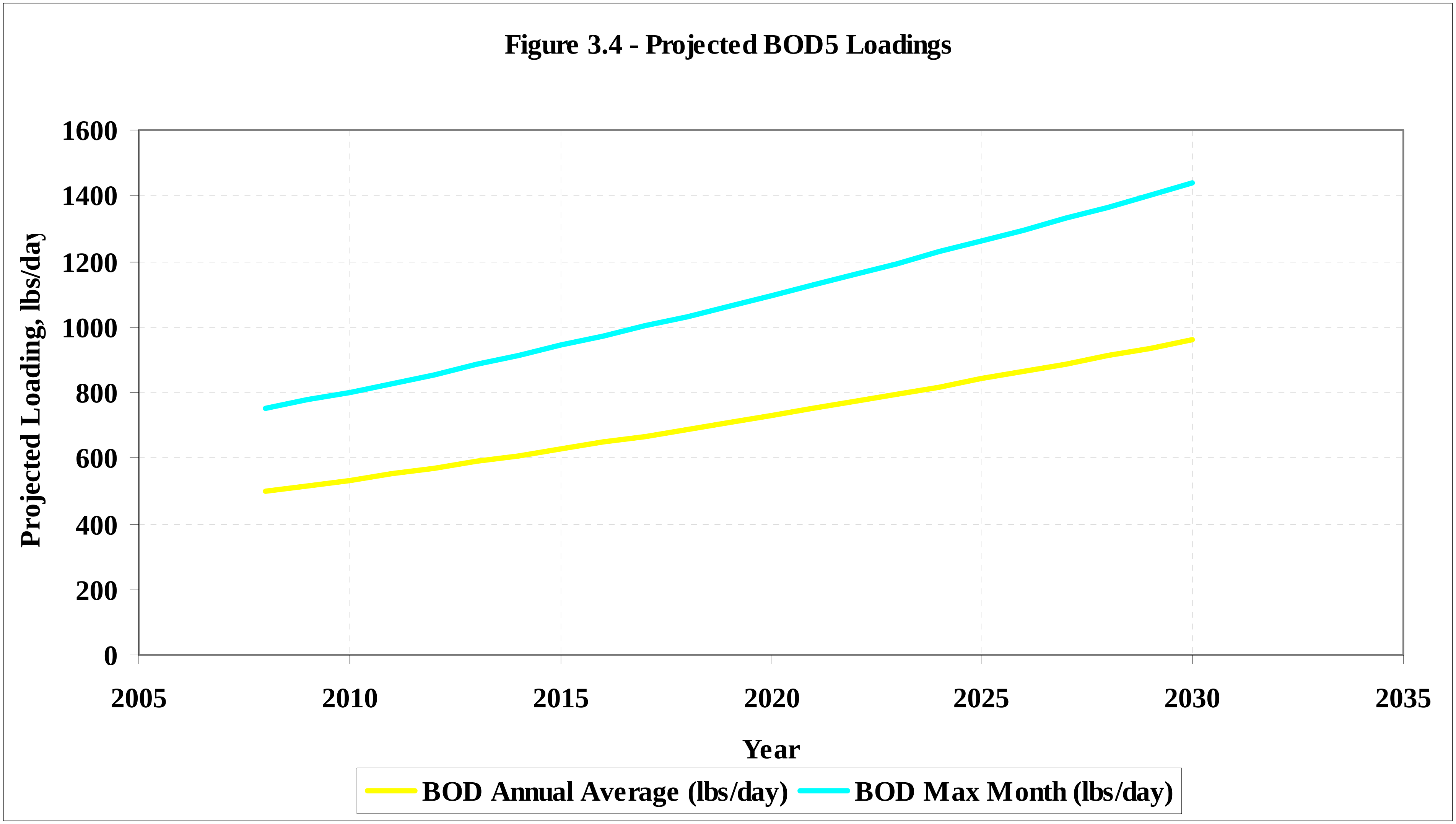


Figure 3.4 - Projected BOD5 Loadings
1600
1400
1200
1000
800
600
400
200
0
Projected Loading, lbs/day
2005
2010
2015
2020
2025
2030
2035
Year
BOD Annual Average (lbs/day)
BOD Max Month (lbs/day)

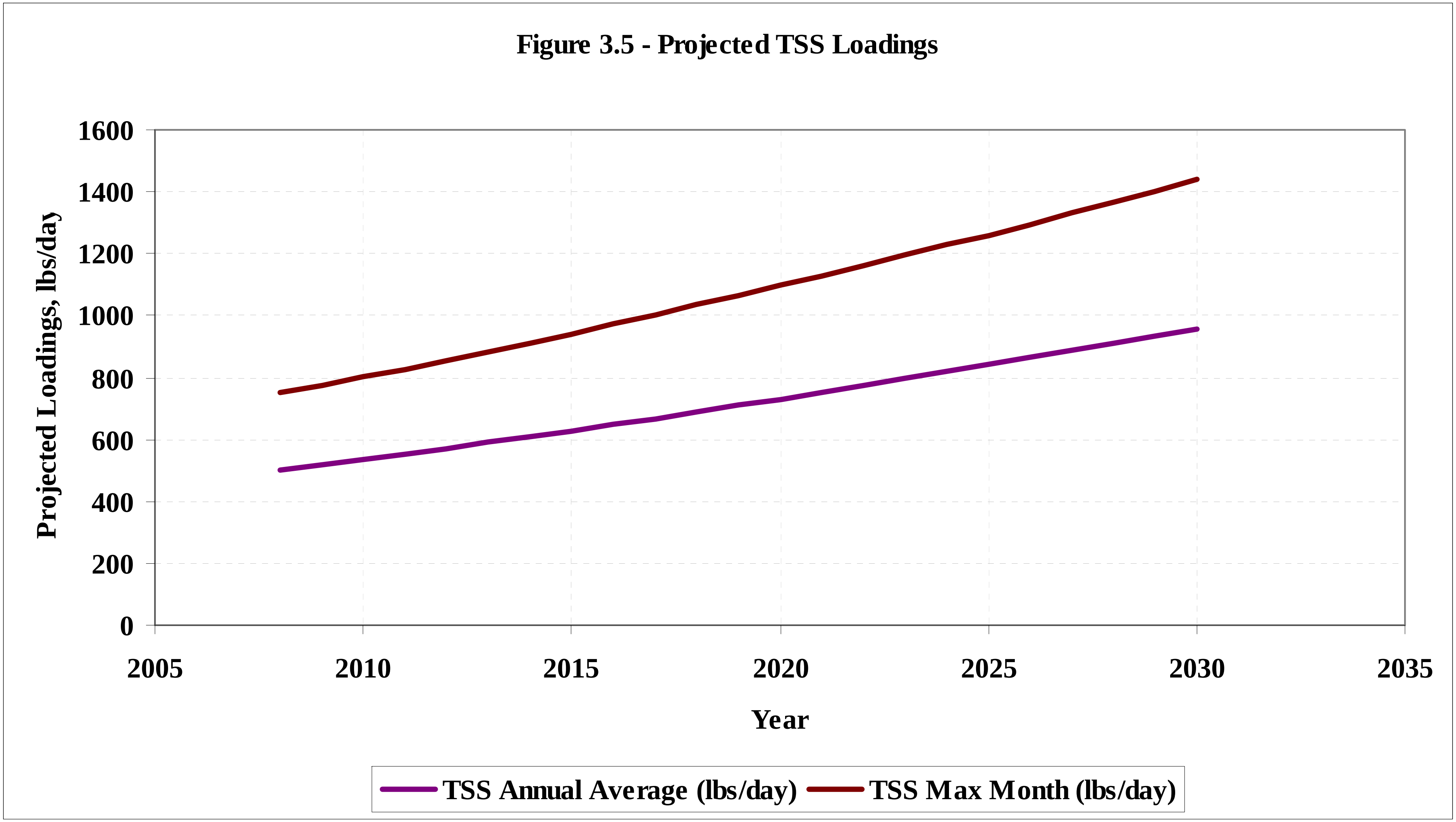


Figure 3.5 - Projected TSS Loadings
Projected Loadings, lbs/day
1600
1400
1200
1000
800
600
400
200
0
2005
2010
2015
2020
2025
2030
2035
Year
TSS Annual Average (lbs/day)
TSS Max Month (lbs/day)

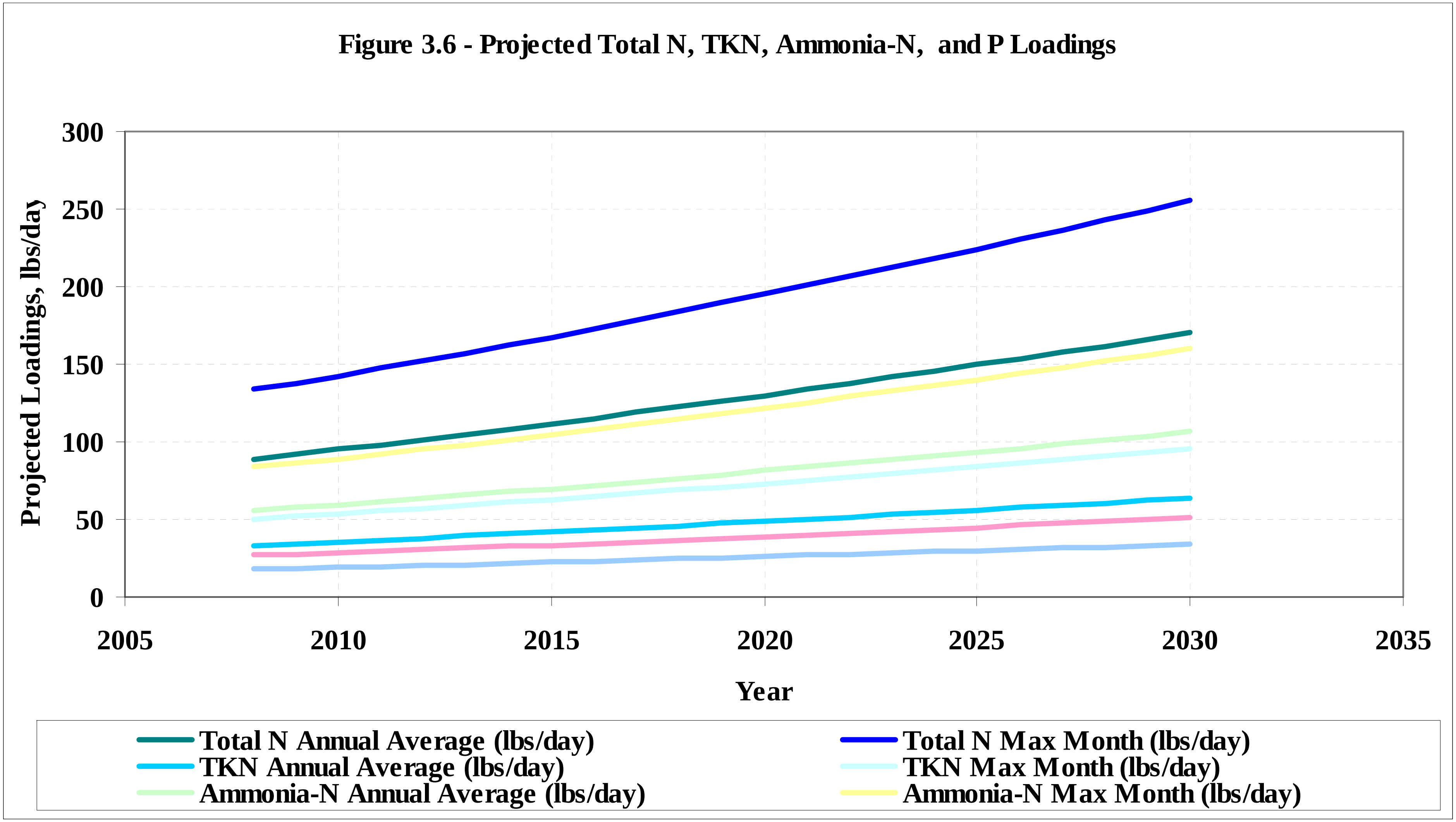


Figure 3.6 - Projected Total N, TKN, Ammonia-N, and P Loadings
Projected Loadings, lbs/day
300
250
200
150
100
50
0
2005
2010
2015
2020
2025
2030
2035
Year
Total N Annual Average (lbs/day)
Total N Max Month (lbs/day)
TKN Annual Average (lbs/day)
TKN Max Month (lbs/day)
Ammonia-N Annual Average (lbs/day)
Ammonia-N Max Month (lbs/day)

Table 3.7: Target Wastewater Effluent Quality Parameters	
Parameter	**Limit**
Effluent Quality for Land Disposal	
BOD_5 or $CBOD_5$	20 mg/l
Total Suspended Solids (TSS)	20 mg/l
Effluent Quality for Type 1 Reuse	
BOD_5 or $CBOD_5$	5 mg/l
Turbidity	3 NTU
Fecal Coliform	20 CFU/100 ml*
Fecal Coliform	(not to exceed) 75 CFU/100 ml**
Notes: * geometric mean ** single grab sample	

3.5.4 Recommended Initial Wastewater Facility Capacity

The projected wastewater flows and loadings described above assume that the entire study area will immediately contribute flows to the wastewater facility. This is not realistic, since the City of Granite Shoals will need to construct the collection and transmission system in phases. This also means that the City can exercise considerable control over wastewater facility influent flows by careful phasing of the collection and transmission systems. The City will need to monitor influent flows and adjust the timing of collection system and plant capacity expansions as appropriate to keep influent flows at or below treatment facility capacity.

For treatment plants with capacities less than 1.0 million gallons per day (mgd), TAC Chapter 217 uses the term “Design Flow” or “Permitted Flow” to refer to the average annual flow multiplied by the ratio of the maximum month flow to the average annual flow, or by a factor of 1.5, whichever is larger. Throughout this report, the project wastewater treatment capacity is presented in terms of average annual flow. The treatment capacity stated in terms of “annual average flow” or “average dry weather flow" (ADWF) includes process capacity to accommodate TAC 217 "Design Flow" or "Permitted Flow" requirements.

The recommended initial average annual treatment capacity will be 300,000 gallons per day (gpd) (450,000 gpd "Design Flow" per TAC 217). Subsequent expansions can be configured as a single 300,000 gpd expansion, or two 150,000 gpd expansions, as the wastewater collection system is expanded. Figure 3.7 shows an example phasing comprised of an initial 300,000 gpd capacity wastewater facility, with two later 150,000 gpd expansions.

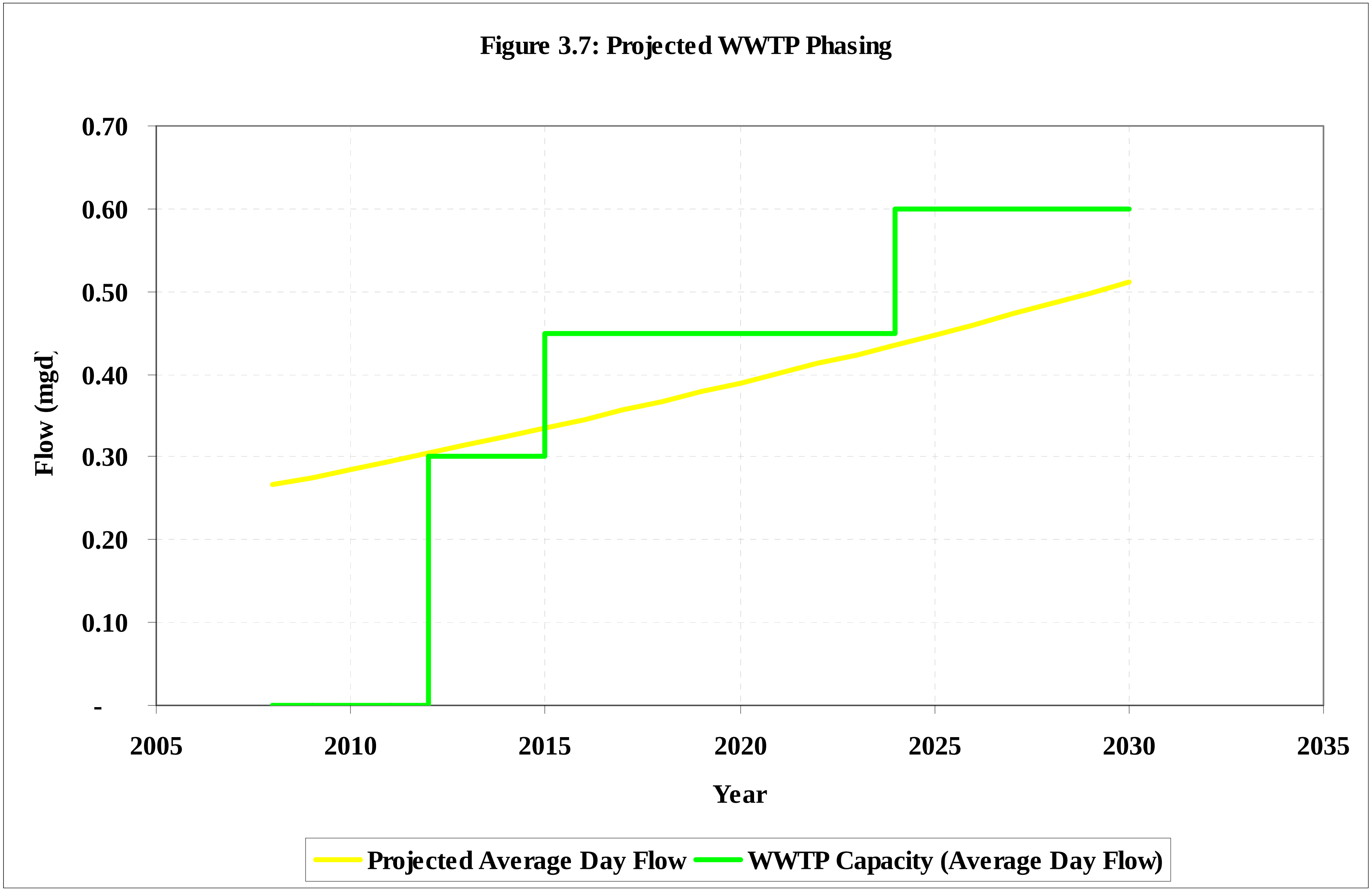


Figure 3.7: Projected WWTP Phasing
Flow (mgd)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
-
2005
2010
2015
2020
2025
2030
2035
Year
Projected Average Day Flow
WWTP Capacity (Average Day Flow)

CHAPTER FOUR

WASTEWATER TREATMENT ALTERNATIVES

4.0 WASTEWATER TREATMENT ALTERNATIVES

The number of treatment alternatives for the Granite Shoals region is almost limitless, but any alternative must meet two broad sets of criteria:

- Regulatory: The Texas Commission on Environmental Quality (TCEQ) has regulations that govern the design of wastewater treatment plants, the discharge limits for the plant's effluent, the manner in which effluent may be land applied and/or reused, and the methods by which solid residuals ("sludge") from the plant may be processed and disposed.

- Non-Regulatory: Land area within the study area is limited and development along Lake LBJ is increasing; therefore, a wastewater plant constructed within the study area ideally will have a small footprint and produces limited odors. Additionally, the plant needs to have flexibility for phased expansion, and the City would like to use some of the plant's effluent to irrigate city parks, athletic fields, and/or greenbelts.

4.1 Projected Effluent Water Quality Requirements

Several treatment plants, including Aqua Texas, have permits that allow them to discharge relatively minor quantities of highly treated wastewater directly into Lake LBJ, but the TCEQ's Highland Lakes ban precludes new permits for direct discharge into the lake. Therefore, land application (irrigation) of the effluent is currently the only option available for the disposal of treated effluent. This will require that owned or leased land be available in sufficient quantities to store and dispose of the treated effluent, similar to disposal practices used by the cities of Marble Falls and Kingsland, or Lake LBJ MUD.

It is conceivable that increasing water demands in the Colorado River basin will prompt a re-examination of the Highland Lakes ban and ultimately allow discharge of the Granite Shoals treatment plant effluent into the Lake LBJ. This would require a much higher level of treatment than is necessary for land application, and would probably include advanced treatment for removal of nutrients (phosphorus and nitrogen).

4.2 Required Treatment Capacity

As shown in Table 3.6, the wastewater flows for Granite Shoals are projected to reach nearly 285,000 gpd by 2010 and nearly 511,000 gpd by 2030. These projections assume that the entire collection system is in place and that all potential customers switch from septic systems as soon as the collection system is available. In reality, the process of extending the collection system and switching from septic systems to the collection system will be gradual, possibly taking as long as ten years from the plant's startup. Therefore, the plant will be constructed in phases, with an initial annual average flow capacity of 300,000 gpd, or 0.3 MGD. For purposes of comparison, the Lake LBJ MUD plant currently has a capacity of 0.4 MGD.

4.3 Process Alternatives

Treatment of municipal wastewater generally requires several steps to achieve the following goals:

- Removal of suspended solids by screening, settling, or filtering them from the wastewater.
- Conversion of dissolved organics to bacterial cells that can be removed by settling and/or filtration.
- Disinfection to kill or inactivate disease causing organisms ("pathogens") that could be present in the wastewater.
- Stabilization of the residual solids from treatment of the wastewater, either on site or off site.

While the City currently controls about 131 acres of land that would be suitable for several different wastewater treatment processes, the City's land has higher and better uses than being devoted to low-rate, large footprint treatment processes. In addition, conceptual planning for adjacent private parcels has identified high value residential as the likely land use for these adjacent properties.

Future land uses of both the City property and adjacent private properties will tend to favor wastewater facilities that minimize footprint and odor potential. This generally rules out low rate systems such as lagoons or fixed-film processes such as trickling filters. The most attractive treatment alternatives are variations of the activated sludge process, in which the wastewater is mixed with bacteria and aerated to allow the bacteria to oxidize the organics. Following aeration, the treatment bacteria are removed from the treated wastewater by gravity settling. The two treatment alternatives chosen for comparison are:

- Conventional Activated Sludge, with the wastewater flowing through separate aeration basins and settling tanks ("clarifiers"), and

- Sequencing Batch Reactors ("SBRs"), in which each parallel tank sequences through the functions of aeration and settling.

Generally, the cost for an SBR system is comparable to, or slightly less, than a similar conventional activated sludge plant, but there are significant pros and cons for each alternative. In the area around Granite Shoals, Marble Falls has a conventional activated sludge system with an oxidation ditch aeration basin; Lake LBJ MUD has an SBR system, and Kingsland has a conventional activated sludge plant but will be switching to an SBR for its new wastewater treatment plant. Implementation of either activated sludge alternative would have many common elements:

- Treatment of the raw wastewater through a 1/4 inch fine screen to remove large solids, with washing, compaction, and disposal of the screenings in a landfill.

- No primary clarifiers, which are not cost effective for small plants. Also, primary clarifiers have a significant potential to create objectionable odors.

- Effluent disinfection with gaseous chlorine from 150 pound cylinders. When the plant is expanded to a capacity of 0.6 to 0.8 MGD, convert to ultraviolet (UV) disinfection and retain the chlorination system for providing a chlorine residual in the reuse distribution lines.

- Disk filtration of the effluent to enable Type 1 effluent reuse at parks and recreational facilities within the study area. Potential reuse is distinct from land disposal in this case, with potential reuse being used to supplement the area's existing surface water supplies.

- A small building for electrical equipment, blowers, and a rudimentary office and operations laboratory.

- Short-term aerated storage of sludge, with minimal digestion, and batch dewatering on a small belt press for transport to the centralized composting facility in Burnet.

4.3.1 Conventional Activated Sludge Alternative

In this alternative, screened wastewater would flow by gravity to a splitter box, which would divide the flow between two parallel concrete aeration basins. Air would be supplied to the aeration basins by blowers and diffusers at the bottom of the basins. The mixture of treated wastewater and bacteria from both basins would flow to another splitter box for division between two final clarifiers. Most of the sludge from the bottom of the clarifiers ("return activated sludge") would be pumped back to the head of the aeration basins and a small portion would be wasted to the sludge storage tank.

The clarified effluent would flow to a cloth disk filter for further reduction of suspended solids in order to meet Type 1 reuse requirements. The filtered effluent would then flow through a chlorine contact basin for disinfection. After disinfection the effluent would flow to the effluent storage lagoons and the reuse pump station would pump the treated effluent for land application and to other reuse systems. Figure 4.1 shows the process flow diagram of the conventional activated sludge process.

4.3.2 Sequencing Batch Reactor (SBR) Alternative

In this alternative, influent valves would feed screened wastewater to one of two parallel concrete SBR basins. In a SBR system, while one tank is fed and mixed or aerated, the other SBR is quiescent to allow settling and decanting of the treated effluent. Since the SBR system does not have a separate clarifier, there is no return activated sludge system and excess sludge would simply be wasted from the SBR at the end of the decant phase. A Programmable Logic Controller (PLC) would control the opening and closing of the influent and decant valves and adjust their open/close sequence depending on the influent flow rate. Air would be supplied by blowers and diffusers, just like the conventional alternative.

The SBR effluent would flow to a post equalization basin with a low-horsepower aspirating mixer. Post-SBR equalization is desirable to provide a more uniform flow to the effluent disk filter and the disinfection basin. After disinfection the effluent would

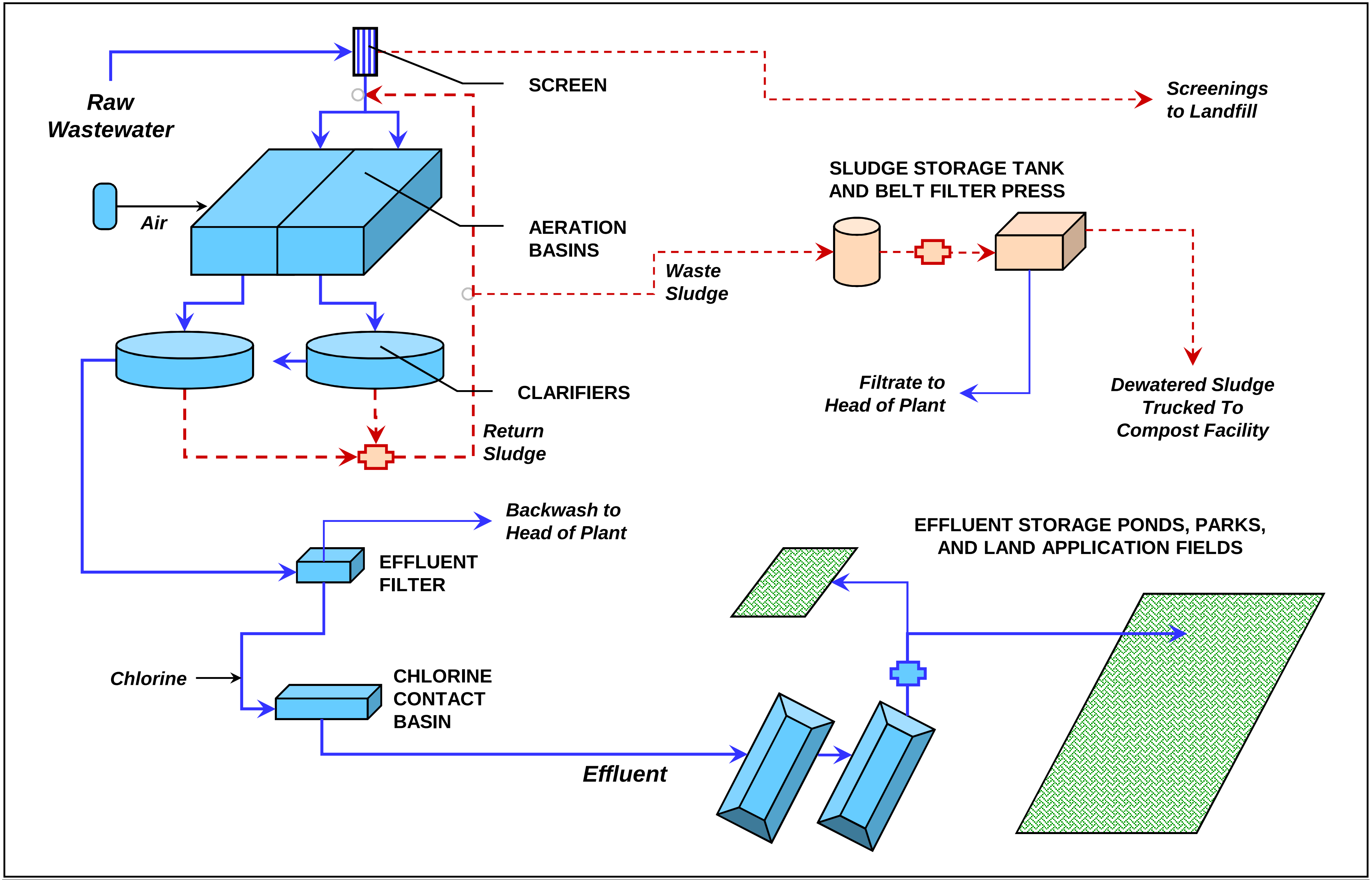


FIGURE 4.1 -- PROCESS FLOW DIAGRAM FOR CONVENTIONAL ACTIVATED SLUDGE ALTERNATIVE

flow to the effluent storage lagoons and the reuse pump station would pump the treated effluent for land application and to other reuse systems. Figure 4.2 shows the process flow diagram of the SBR process.

4.3.3 Comparison of Treatment Alternatives

Table 4.1 lists advantages and disadvantages of the two treatment alternatives. None of the comparison criteria is in itself strong enough to tip the choice one way or the other. Neither alternative will require a much larger footprint, create more odors, or produce a significantly different effluent quality than the other. The key factor in deciding between the two alternatives is flexibility and the ability to expand the plant in small increments as the study area its collections system grows. Expansion and/or merging of aeration basins in a conventional activated sludge system can be straightforward, but expansion of clarifiers is not possible. For plants that are built in multiple small increments, this necessitates choosing between several poor options: construction of multiple tiny clarifiers and complicated yard piping, construction of oversized clarifiers in the first phase, abandonment of the initial small clarifiers with replacement by larger clarifiers in later phases, or construction of different sized clarifiers – an operating nightmare. On the other hand, small SBR basins can be merged into larger basins and the basins can be easily mirror imaged. As an example, two small basins can be constructed with an initial flow capacity of "Q." The basins can be expanded to provide a capacity of 2Q, then mirror imaged to provide a capacity of 3Q or 4Q. If the first two basins are merged into one basin with a combined capacity of 2Q, the plant can be mirror-imaged to 4Q, 6Q, or even 8Q without sacrificing basins. One other important advantage of the SBR is its flexibility to operate in different process modes (denitrification and/or biological phosphorus removal) simply by changing the cycle sequencing in the PLC.

SBRs do have drawbacks. The first disadvantage is somewhat more complicated piping and controls than a conventional flow-through system, although much less complicated than the City's new membrane water treatment plant. Also, SBR components are proprietary and it is difficult to prepare a generic design that allows head-to-head bidding by different SBR suppliers. This requires designing the system around

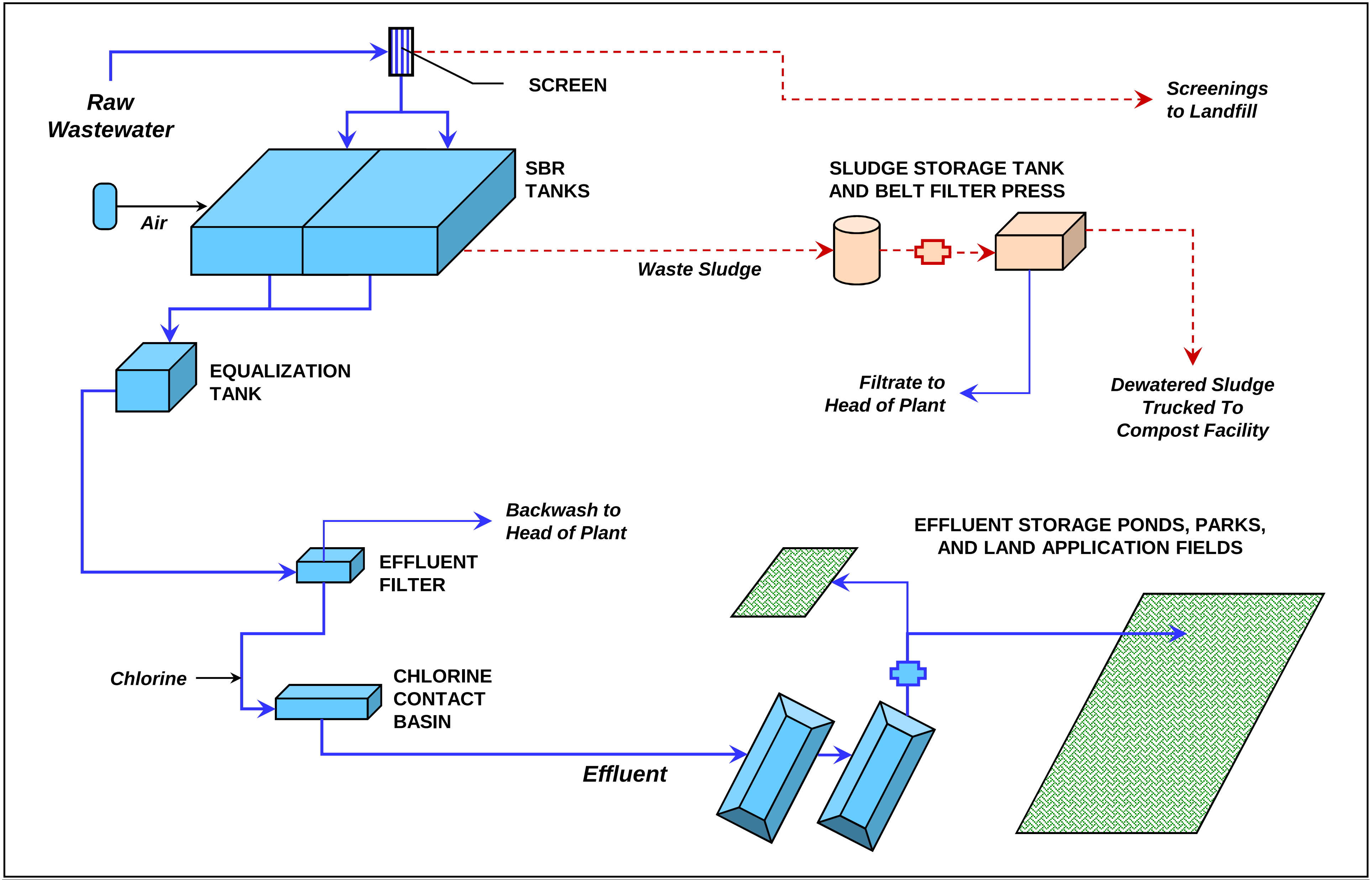


FIGURE 4.2 -- PROCESS FLOW DIAGRAM FOR SEQUENCING BATCH REACTOR ALTERNATIVE

Table 4.1 Comparison of Process Alternatives

CRITERION		CONVENTIONAL ACTIVATED SLUDGE	SBR	COMMENTS
Process Flexibility				
	Step-Feed for routing stormwater	+	–	Storm flows can be routed to end of flow-through system. Not as important for low pressure collection system
	Anoxic zone for energy savings & N removal	++	++	SBR replaces anoxic zone with anoxic phase
	Anaerobic zone for phosphorus removal	++	++	SBR replaces anaerobic zone with anaerobic phase
Ease of automation		–	++	SBR uses PLC for operation; can be remotely monitored
Modification through programming		–	++	SBR phases can be modified without structural changes by modifying cycle times.
Ability to meet more stringent permit limits		++	+	Flow-through system has more capability for “tweaking” to maximize BNR efficiency
Solids Processing				
	Quantity produced	+	+	Both provide extended aeration stabilization
	Ease of dewatering	-	-	Long-SRT waste sludge harder to dewater
Phased Construction		-	++	Easy to add additional basins
Footprint Required		+	++	For a new system SBR is very compact
Simplicity of operation		–	+	Simple SBR operation; no clarifiers or sludge pumping
Operational familiarity		+	++	Increasingly common in central Texas
Sole source procurement		++	–	Design is specific to SBR supplier
Downstream hydraulics		+	–	Pulsed SBR discharge difficult for filters or UV

the equipment and hydraulic peculiarities of a particular supplier, again, like the City's water treatment plant.

For the study area, the ability to easily expand an SBR treatment plant in small increments outweighs the drawbacks of the SBR; therefore, the SBR is the recommended treatment alternative.

4.4 Effluent Disposal

Treated effluent will be disposed of via land application. Land application will be in the form of spray irrigation of an appropriate area of land near the study area. Land application typical involves heavily irrigated summer crops of coastal Bermuda grass, and winter crops of winter wheat or rye. Irrigation practices are focused primarily on applying the maximum volume of effluent consistent with state regulations. These irrigation practices will generally produce large volumes of somewhat lower quality, but marketable, hay. Irrigation is stopped on portions of the disposal area for a length of time sufficient to allow the area to dry and the hay to be harvested. Effluent disposal irrigation and cropping practices are incompatible with livestock grazing.

Several potential sites have been identified with in the study area, as described in the following section. Major components of the effluent disposal system include:

- Land for disposal (irrigation) of treated effluent.
- A spray irrigation system
- Effluent equalization storage, tentatively located on the City's 131 acre parcel.
- Effluent pumping station

The total area required for effluent disposal based on projected flows is between 180 and 300 acres. More specific water balance analyses will be conducted once specific disposal sites are identified. The total required area will depend to some degree on specific soil types and proposed crops at prospective disposal areas. For conceptual estimating purposes, disposal of 300,000 gpd is assumed to require the following:

- 110 acres for effluent disposal, based on Burnet County's application rate of

0.062 gallons per day per square foot.

- Equalization storage totaling about 191 acre-feet, in the form of lined effluent storage ponds, including a 3,000 gpm effluent pumping station
- Spray irrigation system.

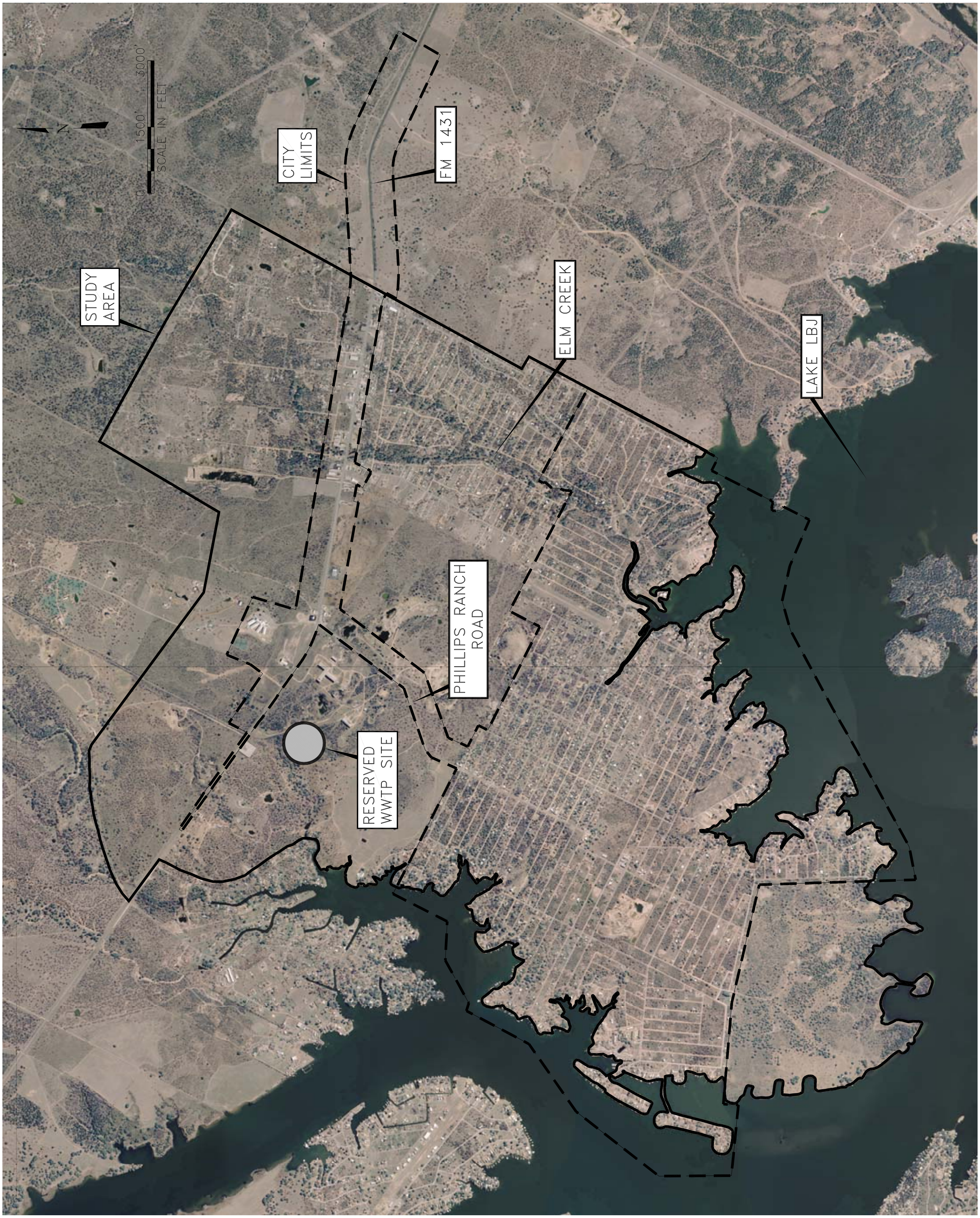
Estimated capital cost of an effluent disposal system with 300,000 gpd capcity, including purchase of the land for disposal, is approximately $15,000,000. The City may be able to reduce initial costs of these facilities by permitting the wastewater treatment plan for an interim flow of 150,000 gpd, which would proportionately reduce the cost of the first phase of the effluent disposal system.

4.5 Implementation of Recommended Treatment Alternative

4.5.1 Siting and Layout

The City recently purchased approximately a 136-acre parcel located on the southwest corner of FM 1431 and Phillips Ranch Rd. This parcel was part of a former granite quarry operation. A local church has recently purchased five acres located at the southeast corner of the 136-acre parcel, leaving approximately 131 acres available for the City's use.. The land use planning for development of this property has just started, but the City intends to reserve the south and southwest areas of the property for a wastewater treatment plant and effluent storage ponds, as shown in Figure 4.3. Area required for the treatment plant is initially estimated at approximately five acres, with an additional 34 acres total required for full buildout of the effluent storage ponds. The quarry's old administration building sits on a hill in the center of the property and it will become the new city hall. The City intends to develop the balance of the property for recreational facilities and reuse plant effluent to water athletic fields and green spaces.

The City acquired this parcel during the initial phases of the study and directed Freese and Nichols, Inc. to site the wastewater treatment facility and effluent storage ponds on this site. As a result, other sites were not evaluated as part of this study.



Freese and Nichols
10814 Jollyville Road Building IV, Suite 100
Austin, Texas 78759
Phone – (512) 617–3100
Fax – (512) 617–3101

CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE 4.3: RESERVED WASTEWATER TREATMENT SITE

F&N JOB NO.	GSH07265
DATE	MAY 2008
SCALE	AS SHOWN
DESIGNED	JBH
DRAFTED	CJE
FILE	FIGURE4.3.dwg

4.3

FIGURE

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[GSH07265][]N:\WR\REPORT\FIGURE4.3.DWG LAYOUT: Layout1
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Date: Aug 28, 2008 – 7:15am User: cje File: N:\wr\Report\FIGURE4.3.dwg

Although the City currently owns sufficient land to accommodate expected effluent disposal needs for the first phase of the project, effluent disposal is not viewed as a compatible use given the preliminary land use planning for the City's parcel and adjacent private property. Therefore, land for effluent disposal will need to be leased or purchased, sufficient to dispose of effluent not applied by the City to its municipal facilities. The Parsons regional study identified an area north of FM 1431; other options include: the area southwest of the treatment plant, the area southeast of FM 1431 and Phillips Ranch Rd., and property south of FM 1431 and east of the City.

4.5.2 Phasing

The SBR process will enable incremental construction at a pace to match the growth of the study area, which will accelerate as sewer service attracts new businesses and residents. Phase 1 of the treatment facility will have an annual average capacity of 0.3 MGD and will include a headworks with a fine screen, a 2-basin SBR with fine bubble diffusers and three blowers, effluent equalization, cloth media disk filtration, and disinfection using gaseous chlorine. Waste solids will be accumulated in an aerated sludge holding tank, then dewatered on a belt press and trucked to Lower Colorado River Authority's Highland Lakes biosolids facility in Burnet. The composted sludge will be brought back to the facility for use by citizens in the city. LCRA has been contacted concerning the delivery of biosolids to their facility. LCRA has requested that the City coordinate with them as the project moves forward.

Depending on the rate of growth, Phase 2 could involve either a 0.15 or a 0.3 MGD expansion. The 0.15 MGD expansion would require adding a third SBR, adding a blower, and installing an additional disk on the effluent filter. The 0.3 MGD expansion would require expanding the two SBR basins to double their initial size, adding two blowers, and installing additional disks on the effluent filter. At the outset of Phase 2, installation of UV disinfection modules in the chlorine contact channels should be considered; the chlorination system being retained to provide disinfection residual for reuse water.

The initial phase of the effluent disposal system will likely be constructed for an initial disposal capacity of 150,000 gpd. Additional disposal area, effluent storage ponds, etc. will be acquired/constructed as warranted by increases in wastewater influent flows to the facilities.

4.5.3 Opinion of Probable Cost

For a planning-level study, it is appropriate to estimate the cost of the treatment plant by using a unit cost multiplied by the plant's capacity. Typical unit costs for construction of large wastewater treatment plants are $4-5/(gal/day), or $40-50 million for a 10 MGD plant. The unit costs for smaller plants are roughly double that amount because the costs of the headworks, roads, administration building, and sludge dewatering do not decrease proportionally to the plant's flow rate. For an above-grade 0.3 MGD plant with mechanical sludge dewatering, the unit cost will be approximately $10/(gal/day), for a construction cost of $3 million. The land effluent storage lagoons, pump station and piping will cost up to an additional $7 million to $15 million, depending on the size of the first phase effluent disposal facility, and where the effluent is applied.

CHAPTER FIVE

TRANSMISSION AND COLLECTION SYSTEMS ALTERNATIVES

5.0 TRANSMISSION AND COLLECTION SYSTEM ALTERNATIVES

This Chapter summarizes the alternatives related to transmission and collection system alternatives and presents the recommended transmission system and collection system configuration.

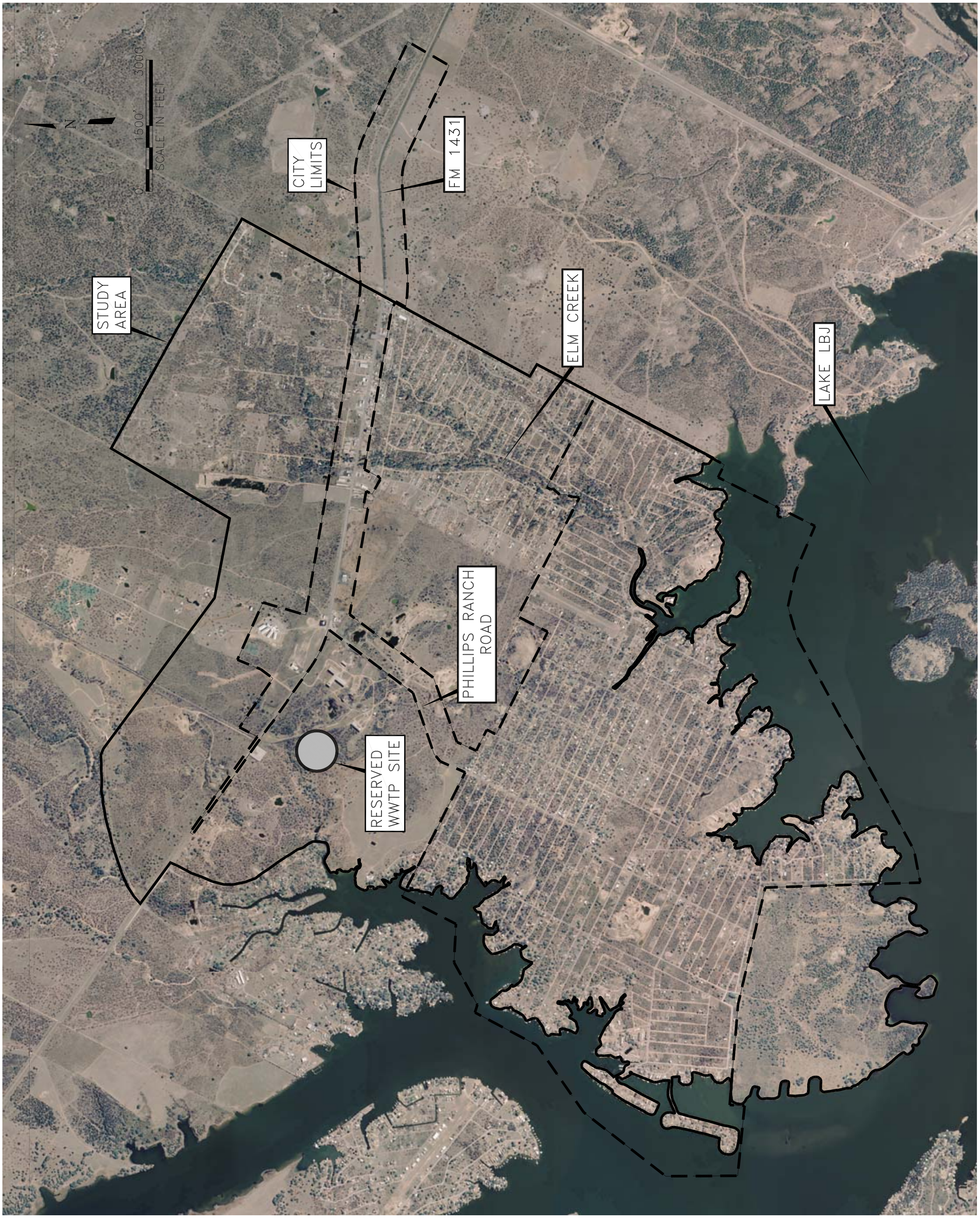
5.1 Transmission System Alternatives

The transmission system is defined as that portion of the project that aggregates flows from the collection system into major centralized lift stations and larger-diameter forcemains and transports wastewater to the treatment facility. The location of the treatment facility obviously impacts the configuration of the transmission system.

The Parsons Report evaluated two transmission/treatment alternatives. The first alternative included a wastewater treatment facility located within the City of Granite Shoals, generally near the intersection of FM 1431 and Philips Ranch Road. The second alternative envisioned a transmission system extending along FM 1431 to the Marble Falls wastewater treatment facility. The Parsons report concluded that the first alternative was preferable due to lower costs and ease of operation.

The current opinion of probable cost for a forcemain to transport wastewater from the study area to the City of Marble Falls wastewater treatment facility is in excess of $47 million. This estimate does not include probable expansion of the Marble Falls treatment facility, expansion of the treated effluent pipeline between the Marble Falls treatment facility and their existing land disposal site, nor expansion of effluent storage facilities, effluent disposal area, etc. Based on this analysis, it appears that transporting wastewater to Marble Falls for treatment and disposal is a more costly option than local treatment and disposal.

As described in Chapter 4, the City has purchased approximately 131 acres in the southwest corner of the FM 1431/Phillips Ranch Road intersection. The City has allocated an area in the south and southwestern portion of this parcel for construction of its wastewater treatment facility and effluent storage ponds, as indicated on Figure 5.1.



CITY OF GRANITE SHOALS

REGIONAL WASTEWATER FACILITY PLANNING

FIGURE 5.1: RESERVED WASTEWATER TREATMENT SITE

Freese and Nichols
10814 Jollyville Road Building IV, Suite 100
Austin, Texas 78759
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Fax – (512) 617-3101

F&N JOB NO.	GSH07265
DATE	MAY 2008
SCALE	AS SHOWN
DESIGNED	JBH
DRAFTED	CJE
FILE	FIGURE 5.1.dwg

FIGURE 5.1

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[GSH07265][AUSTIN1]N:\WR\REPORT\FIGURE 5.1.DWG LAYOUT: Layout1
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Since the treatment facility location has already been identified, there are limited alternative transmission system configurations to consider on a conceptual level. The proposed transmission system configuration is shown on Figure 5.2.

5.2 Collection System Alternatives

This section describes collection system alternatives and presents the recommended collection system configuration.

5.2.1 Study Area Topography and Geology, and Impacts on Collection System

The study area is comprised of the City of Granite Shoals (City) and portions of the Sherwood Shores trust. The study area is located predominantly on a peninsula bounded by Lake LBJ on its east, south, and west. The central portion of the peninsula is a topographic ridge. The perimeter of the peninsula bounding Lake LBJ is topographically lower than the center portion of the peninsula. Figure 5.3 shows the general topography of the study area.

The Sherwood Shores area has developed generally along Elm Creek and its tributaries. The topographic low point within Sherwood Shores is at the confluence of Elm Creek and Lake LBJ. This topographic low point is some distance from the recommended treatment plant location and would require construction of one or more lift stations and forcemains to transport wastewater from the Sherwood Shores area to the proposed wastewater treatment facility.

As described in Chapter 2, the study area is generally underlain by a shallow granite gravel aquifer and surficial deposits of Precambrian-aged, course-grained, pink granite of the Town Mountain Granite Formation. These materials differ in their ease of excavation, with the granite gravel aquifer material generally being comparatively easy to excavate, and the Town Mountain formation materials being very difficult to excavate, with excavation generally requiring blasting, saw cutting, or some other type of non-conventional construction methods. No formal geotechnical information exists to define

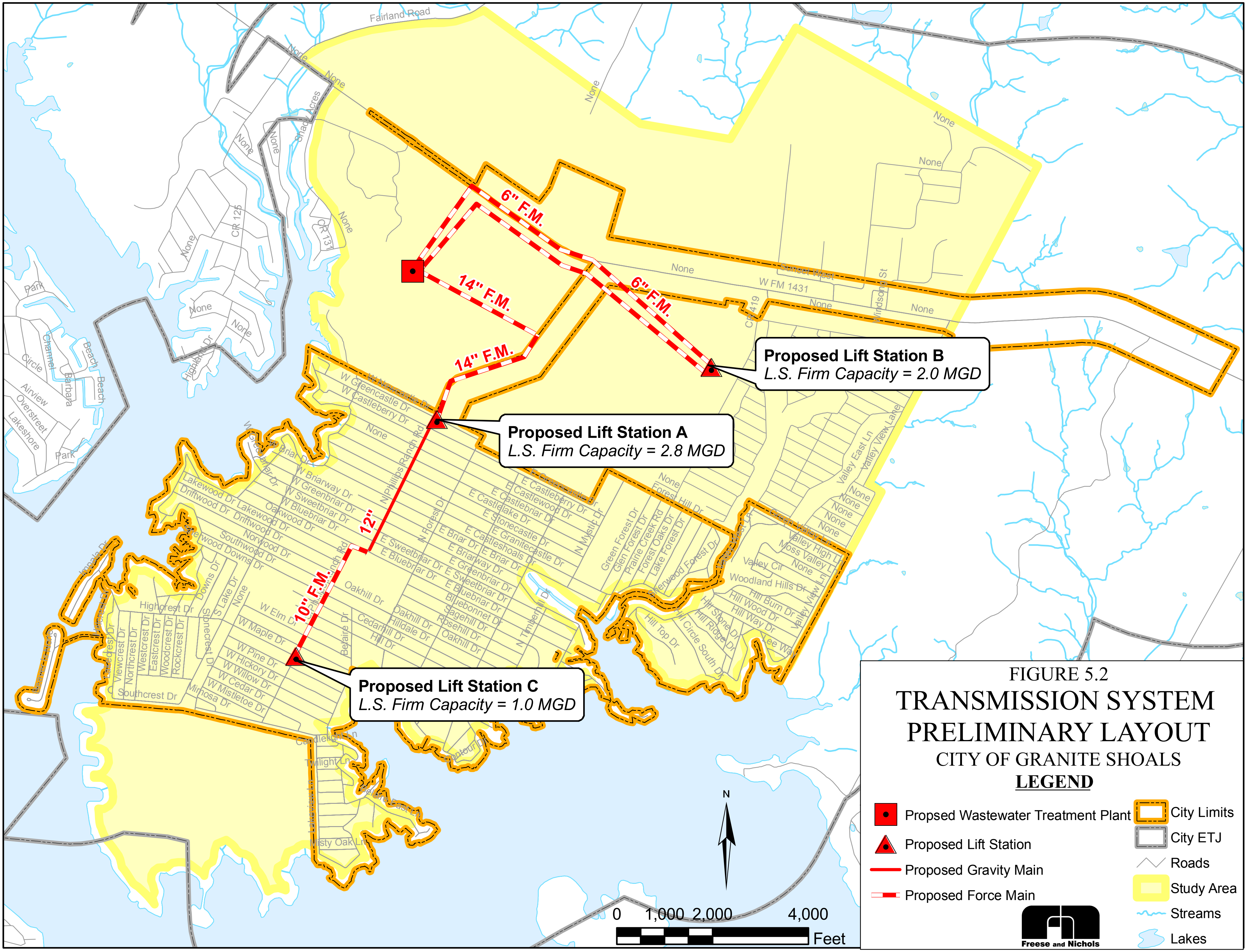
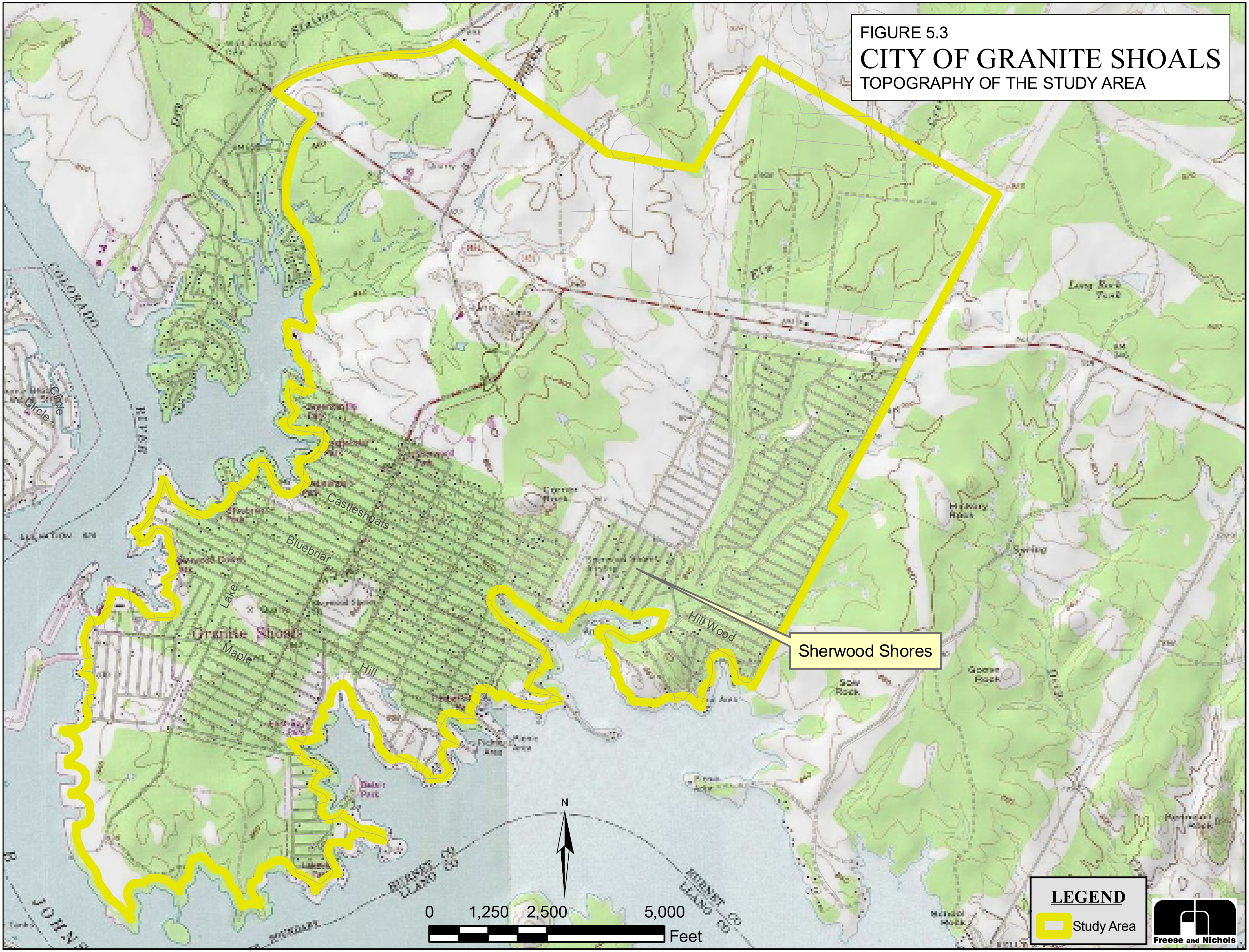


FIGURE 5.2
TRANSMISSION SYSTEM
PRELIMINARY LAYOUT
CITY OF GRANITE SHOALS
LEGEND
Propsed Wastewater Treatment Plant
Proposed Lift Station
Proposed Gravity Main
Proposed Force Main
City Limits
City ETJ
Roads
Study Area
Streams
Lakes
Proposed Lift Station A
L.S. Firm Capacity = 2.8 MGD
Proposed Lift Station B
L.S. Firm Capacity = 2.0 MGD
Proposed Lift Station C
L.S. Firm Capacity = 1.0 MGD
6" F.M.
6" F.M.
14" F.M.
14" F.M.
12"
10" F.M.
Fairland Road
W FM 1431
N
0 1,000 2,000 4,000
Feet
Freese and Nichols

FIGURE 5.3

CITY OF GRANITE SHOALS

TOPOGRAPHY OF THE STUDY AREA



the limits of Town Mountain formation outcrop, and the extent and depth of the granite gravel aquifer.

City staff has indicated that, based on some recent pipeline construction, the granite gravel aquifer is deep enough within the street rights-of-way within the study area to accommodate pipeline cover depths of up to about three feet. Cover depths larger than about three feet may require excavation in the Town Mountain formation, at significantly greater costs.

The combination of topography and geology may not be advantageous to construction of large diameter, deep pipelines and other relatively large, below-grade structures. Lacking more detailed geotechnical information, the existing topography and geology appears to favor construction of smaller diameter, shallow pipelines and structures.

5.2.2 System Alternatives

Three alternative types of collection systems were identified for consideration: a gravity system; low pressure system; and a STEP system. A discussion of each alternative follows.

5.2.2.1 Conventional Gravity System

A conventional gravity collection system typically consists of a series of pipelines connected in a dendritic pattern flowing to a common low point. The pipelines are constructed so that all pipes slope in the direction of desired flow, towards the common low point. Conventional gravity systems consume no power and are usually reliable.

In more complex gravity systems, smaller, topographically isolated dendritic systems may drain to lift stations, which then pump collected wastewater to other portions of the system, which then ultimately flow (or are pumped) to the treatment facility.

In a gravity system, the pipes are typically installed with a minimum of three to six feet of cover over the top of the pipe. For service areas with residences containing basements, the pipelines are typically installed at greater depths. Manholes are typically added at 200- to 400-foot intervals and at vertical and horizontal changes of direction.

The cost of installing a gravity system within the shallow granite gravel aquifer would approximate installation costs in other non-rock conditions. However, the cost of installing gravity pipelines in the Town Mountain formation would be about $300 per linear foot for three to six foot installation depths, excluding the cost of manholes and other appurtenances. This cost is approximately three times the cost of more typical, non-rock gravity wastewater pipeline installations, and about 30 times the unit cost of equivalent low pressure sewer collector lines. While there may be locations within the study area where a conventional gravity collection system may be feasible, the lack of geotechnical information, specifically the extent and depth of the granite gravel aquifer, prevents development of a valid conceptual cost for a conventional gravity collection system at this time. As a result, this alternative was not developed further.

The City has expressed a preference for conventional gravity collection systems where geotechnical conditions are favorable. The City is particularly interested in exploring the feasibility of a gravity collection system for the eastern portions of the study area, particularly in the Sherwood Shores area and the southeastern portions of Granite Shoals. When properly configured, it is possible to develop a collection system that contains both conventional and low pressure systems.

We recommend that, as the collection system is expanded within the study area, the City collect additional information via appropriate geotechnical investigations. Once this geotechnical information is available, a meaningful comparison of conventional gravity sewer costs versus low pressure system costs can be developed.

5.2.2.2 Low Pressure Systems

A low pressure collection system utilizes a small wet well and pump located at each service connection. Wastewater flows into the wet well and then pumped via a grinder-type pump into a small diameter (generally less than 2-inch diameter) forcemain. The forcemains can be installed in shallow trenches, which is advantageous considering the geology of the study area.

The Parsons report recommendations included a low pressure collection system. The Parsons recommendations were reviewed internally and verified independently by soliciting preliminary system designs from low pressure system companies. The independent designs developed by low pressure system manufacturers are not significantly different from the recommendations developed by Parsons.

5.2.2.3 STEP system

Septic tank effluent pump (STEP) systems are a subset of low pressure collection systems. STEP systems differ from other low pressure systems in that instead of wastewater being pumped directly into the collection system, effluent first flows into a septic tank and received partial treatment (generally solids removal only) before being pumped into the low pressure collection system. The solids remain in the septic tank where natural processes reduce their volume over time. However, as with other septic tank based disposal technologies, the solids must be removed from the septic tank on a regular basis. Since most solids are removed by the septic tank, pipelines can be smaller than those of conventional gravity systems.

Retrofitting existing septic tanks in the study area would appear to present an opportunity for cost savings. However, based on other conversion attempts, it appears that a large number of existing septic tanks cannot be retrofitted and must be replaced, often due to insufficient capacity, deterioration, leaks, or incompatibility with the pumping system. This typically negates any cost savings opportunities.

Based on the above analyses, the STEP system alternative was not developed further.

5.2.3 Recommended Collection System Alternative

Considering the collection system alternatives available, it appears that a low pressure system is the preferred collection system alternative. Figure 5.4 shows the proposed low pressure collection system configuration.

5.3 Recommended Transmission/Collection System

The proposed transmission/collection system configuration is shown in Figure 5.5. Details related specific pipe size, alignment, lift station location, services area etc. are subject to change as the project is implemented.

The initial phase of the transmission and collection system will include construction of the collection system along FM 1431 to service commercial and educational facilities in this area. The initial phase of the transmission system will aggregate flows along FM 1431 and transport the flows to the proposed wastewater treatment facility. A lift station with a firm capacity of two MGD will be constructed near Prairie Creek Road and Jackson Drive. The recommended initial phase of the transmission and collection system is shown in Figure 5.6.

Subsequent phases of the transmission and collection system will be constructed from north to south along Phillips Ranch Road, and extending east and west from Phillips Ranch Road. Similar phasing is anticipated for those portions of Sherwood Shores within the study area, with subsequent phases of the collection and transmission system proceeding north and south of FM 1431. Figure 5.7 shows a schematic of anticipated phasing.

Opinions of probable capital cost for the overall project and for the initial phase are provided in Table 5.1. Table 5.1 includes estimates of the annualized and unit costs for the overall project and the initial phase.

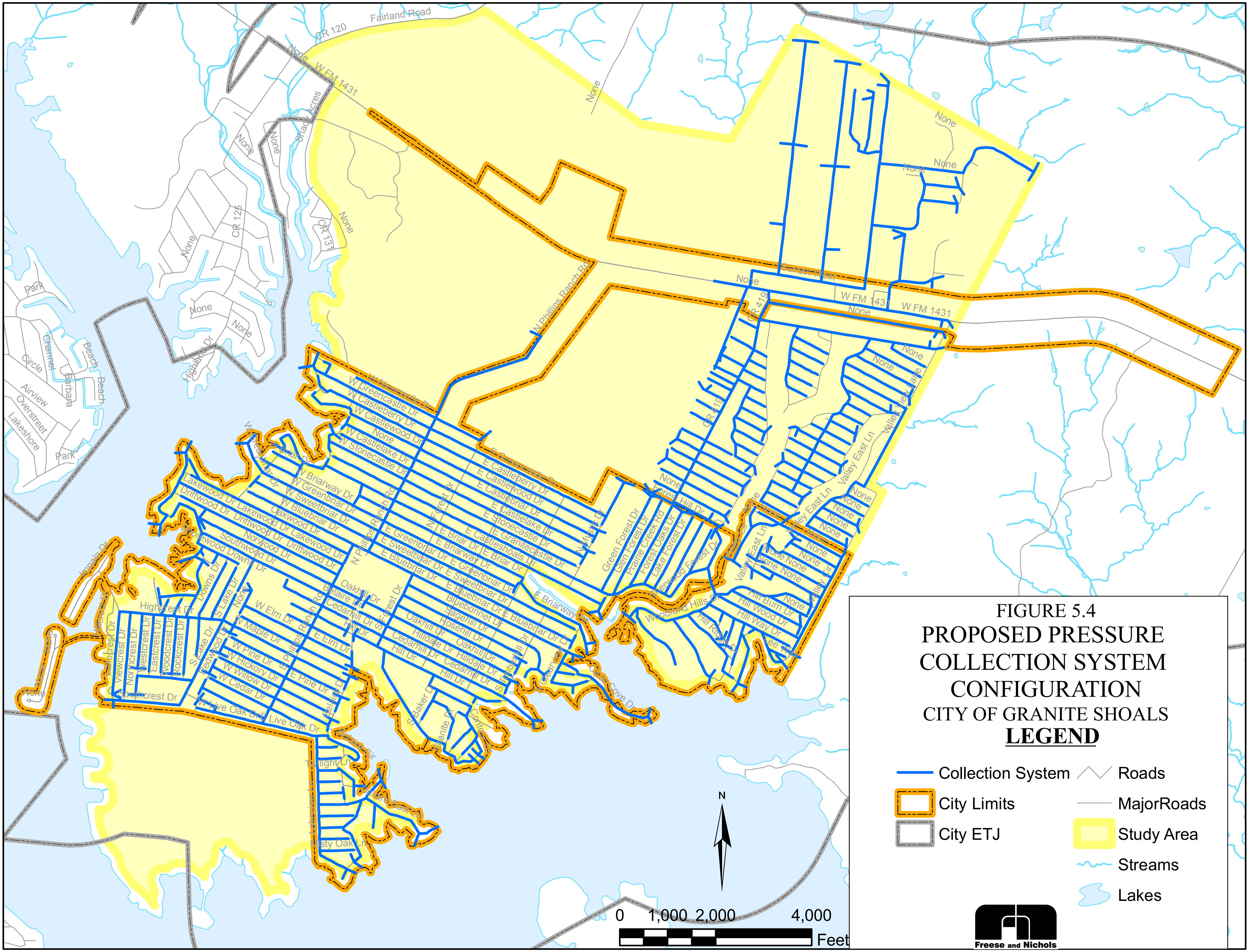


FIGURE 5.4
PROPOSED PRESSURE COLLECTION SYSTEM CONFIGURATION
CITY OF GRANITE SHOALS

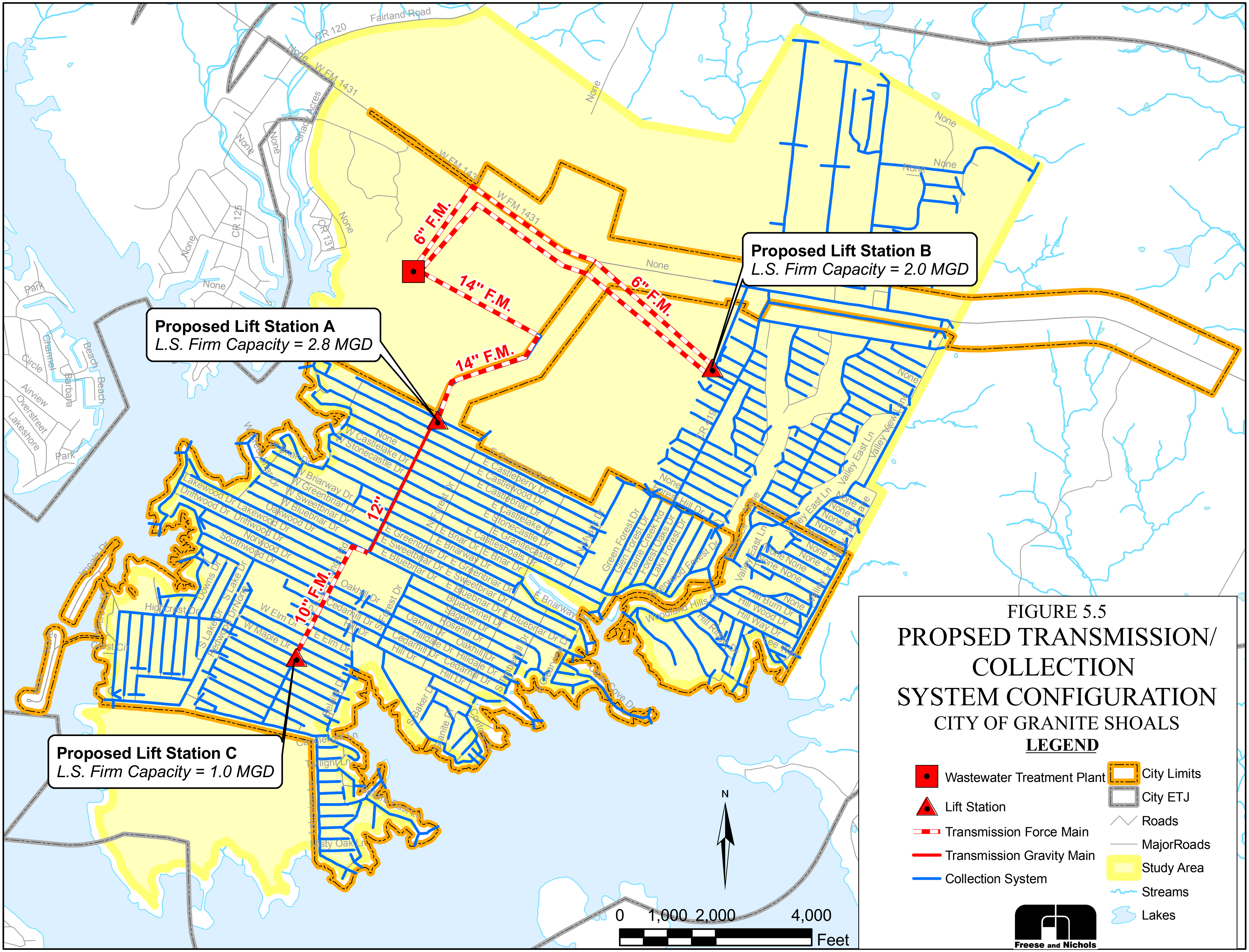


FIGURE 5.5
PROPSED TRANSMISSION/ COLLECTION SYSTEM CONFIGURATION
CITY OF GRANITE SHOALS

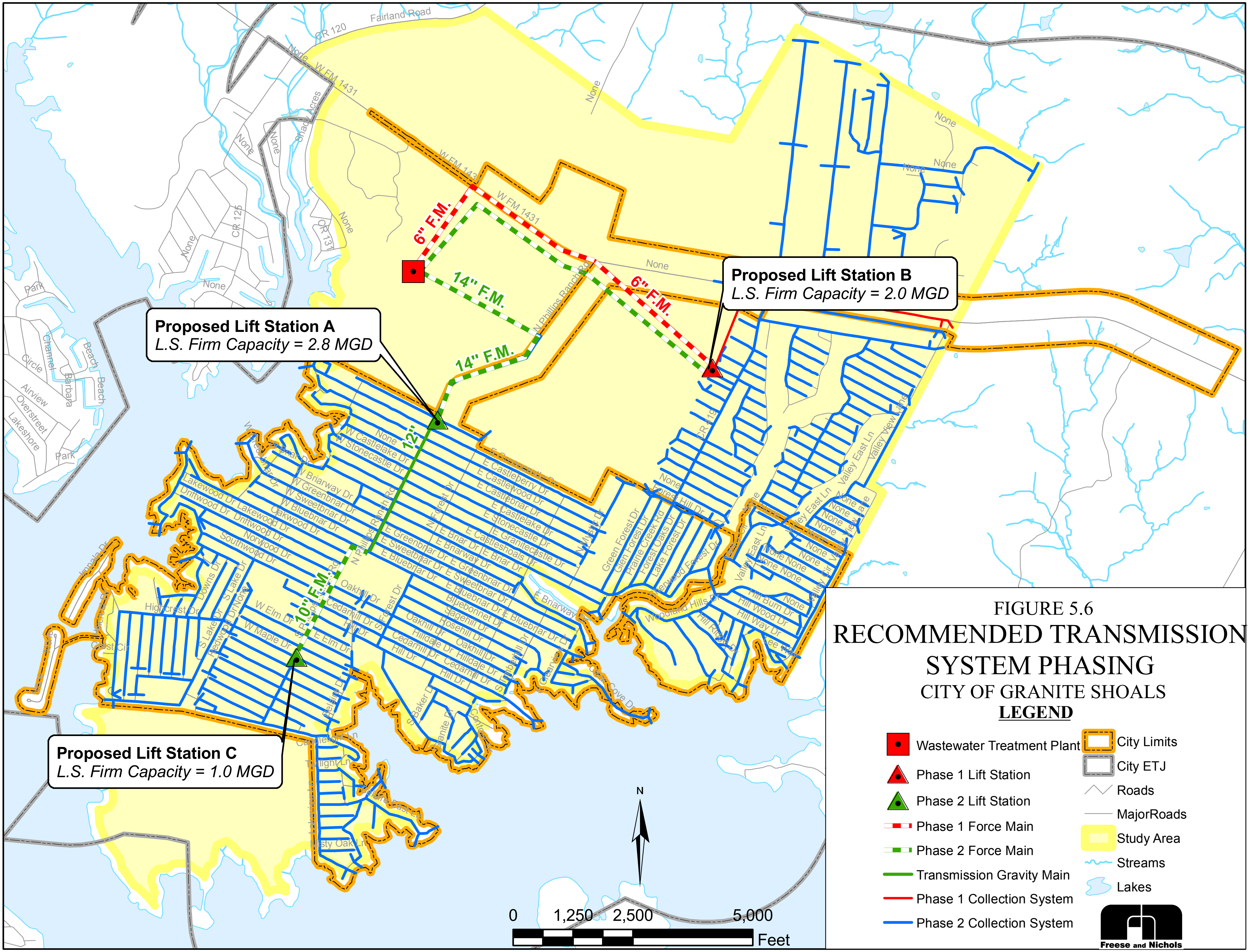


FIGURE 5.6
RECOMMENDED TRANSMISSION SYSTEM PHASING
CITY OF GRANITE SHOALS

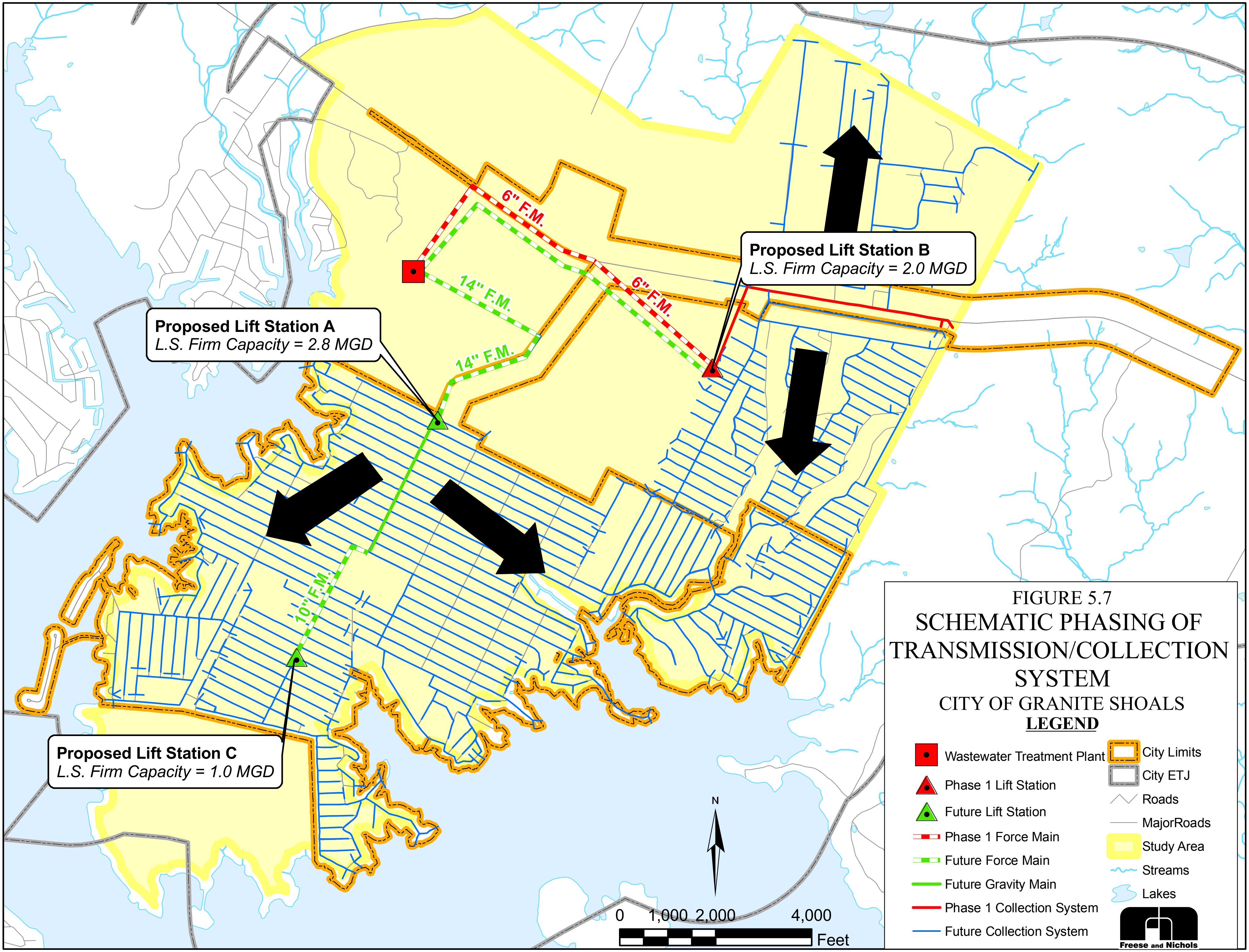

6" F.M.
6" F.M.
14" F.M.
14" F.M.
10" F.M.
Proposed Lift Station A
L.S. Firm Capacity = 2.8 MGD
Proposed Lift Station B
L.S. Firm Capacity = 2.0 MGD
Proposed Lift Station C
L.S. Firm Capacity = 1.0 MGD
FIGURE 5.7
SCHEMATIC PHASING OF TRANSMISSION/COLLECTION SYSTEM
CITY OF GRANITE SHOALS
LEGEND
Wastewater Treatment Plant
Phase 1 Lift Station
Future Lift Station
Phase 1 Force Main
Future Force Main
Future Gravity Main
Phase 1 Collection System
Future Collection System
City Limits
City ETJ
Roads
MajorRoads
Study Area
Streams
Lakes
N
0
1,000
2,000
4,000
Feet
Freese and Nichols

Table 5.1
Granite Shoals
Wastewater System
Opinions Of Probable Project Cost

Phase	Project Description	Construction Items	Quantity	Units	Unit Price	Costs
1	**Phase 1 Collection System**	Grinder Pump System for Existing Houses	28	LS	$5,500	$154,000
		Collection System 1.25"	524	LF	$7	$3,605
		Collection System 1.5"	1,259	LF	$8	$10,389
		Collection System 8"	1,525	LF	$44	$67,096
		4" and less Pavement Repair	1,784	LF	$12	$21,404
		8" Pavement Repair	1,525	LF	$16	$24,398
					Subtotal	$280,892
					Contingency @ 25%	$70,223
					Total Construction Cost	$351,115
					Engineering, Surveying & Geotech @ 15%	$52,667
					Total Project Cost	$403,782
1	**Phase 1 Transmission System**	Lift Station - New 2 MGD	1	LS	$700,000	$700,000
		6" Force Main	9,765	LF	$33	$322,233
		Easement Acquisition along 1431	7,130	LF	$10	$71,300
		Easement Acquisition	2,635	LF	$5	$13,173
		12" Boring and Casing	400	LF	$120	$48,000
		6" Pavement Repair	9,765	LF	$14	$136,705
					Subtotal	$1,291,412
					Contingency @ 25%	$322,853
					Total Construction Cost	$1,614,265
					Engineering, Surveying & Geotech @ 15%	$242,140
					Total Project Cost	$1,856,404
	TOTAL PHASE 1 TRANSMISSION/COLLECTION SYSTEM					**$2,260,187**
2	**Subsequent Collection System Phasing**	Grinder Pump System for Existing Houses*	2,430	LS	$5,500	$13,365,000
		Collection System 1.25"	187,376	LF	$7	$1,288,207
		Collection System 1.5"	120,387	LF	$8	$993,191
		Collection System 2"	132,645	LF	$11	$1,459,095
		Collection System 3"	72,113	LF	$17	$1,189,865
		Collection System 4"	29,288	LF	$22	$644,336
		Collection System 6"	9,225	LF	$33	$304,425
		Collection System 8"	5,200	LF	$44	$228,804
		Collection System 10"	9,772	LF	$55	$537,460
		Collection System 12"	1,220	LF	$66	$80,520
		Collection System 14"	4,409	LF	$77	$339,493
		4" and less Pavement Repair	541,808	LF	$12	$6,501,700
		6" Pavement Repair	9,225	LF	$14	$129,150
		8" Pavement Repair	5,200	LF	$16	$83,202
		10" and larger Pavement Repair	15,401	LF	$20	$308,020
					Subtotal	$27,452,468
					Contingency @ 25%	$6,863,117
					Total Construction Cost	$34,315,585
					Engineering, Surveying & Geotech @ 15%	$5,147,338
					Total Project Cost	$39,462,922
2	**Subsequent Transmission System Phasing**	Lift Station - New 2.8 MGD	1	LS	$750,000	$750,000
		Lift Station - New 1 MGD	1	LS	$550,000	$550,000
		10" Force Main	12,750	LF	$55	$701,253
		14" Force Main	6,671	LF	$77	$513,679
		12" Sanitary Sewer	3,554	LF	$66	$234,531
		48" Diameter Manhole	9	EA	$4,000	$35,535
		20" Boring and Casing	200	LF	$200	$40,000
		10" and larger Pavement Repair	22,975	LF	$20	$459,494
					Subtotal	$3,284,491
					Contingency @ 25%	$821,123
					Total Construction Cost	$4,105,614
					Engineering, Surveying & Geotech @ 15%	$615,842
					Total Project Cost	$4,721,456
	Granite Shoals TOTAL SUBSEQUENT PHASE COSTS					**$44,184,378**
	TOTAL SYSTEM COSTS					**$46,444,565**

Notes:
1. All costs are in June 2008 dollars.
2. Phase 1 transmission system is assumed to require acquisition of a minimum 20-foot wide easement along either alternative pipeline alignmen
3. Cost for easement acquisition along FM 1431 is assumed to be approximately $20,000 per acre, or approximately $10/running foot of easement for Phase 1 Transmission system.
4. Cost for easement acquisition along LCRA power line is assumed to be approximately $10,000 per acre, or approximately $5/running foot of easement for Phase 1 Transmission system.
5. Costs for easement and right-of-way acquisition are not included for remaining elements of the work

*The number of future connections is estimated solely for purposes of estimating total project cost and was not used for projecting wastewater flows. The indicated number of connections is based on projected number of connections in the year 2030 from the City's WTP pre-design report, after adjustments for differences in overall population projections. Estimated capita per connection is about 2.08 capita per connection.

CHAPTER SIX
RECOMMENDED PROJECT AND IMPLEMENTATION PLAN

6.0 RECOMMENDED PROJECT AND IMPLEMENTATION PLAN

This chapter presents a summary of the recommended project, project phasing, opinions of probable cost, and a discussion of project financing.

6.1 Recommended Project

The recommended project consists of a new wastewater treatment plant located within the City of Granite Shoals, a low pressure collection system, and appropriate lift stations and forcemains to convey the wastewater flows from the collection system to the wastewater treatment facility. The recommended project is shown in Figure 6.1.

6.1.1 Recommended Treatment Process and Location

The recommended treatment process is a sequencing batch reactor (SBR). This treatment process better lends itself to small capacity initial phases. Compared to other process alternatives evaluated, an SBR process is considered to provide better utilization of existing process units as capacity is expanded to accommodate future wastewater flows. The recommended initial capacity of the wastewater treatment facility is 300,000 gallons per day.

The preferred location of the wastewater treatment facility is approximately 2,500 feet southwest of the intersection of FM 1431 and Phillips Ranch Road, as shown in Figure 6.1

6.1.2 Recommended Transmission/Collection System and Configuration

The recommended transmission/collection system configuration is shown on Figure 6.1. The transmission system will consist of 12-, 14-, and 16-inch inch diameter forcemains in FM 1431, Phillips Ranch Road, and across the City-acquired parcel to the proposed wastewater treatment plant location. Lift stations will be located near Jackson Drive and Prairie Creek Road; Phillips Ranch Road and Newcastle Drive; and Phillips Ranch Road and Maple Drive. Pipeline size and alignment and lift station locations may change as detailed analyses are conducted as the design progresses.

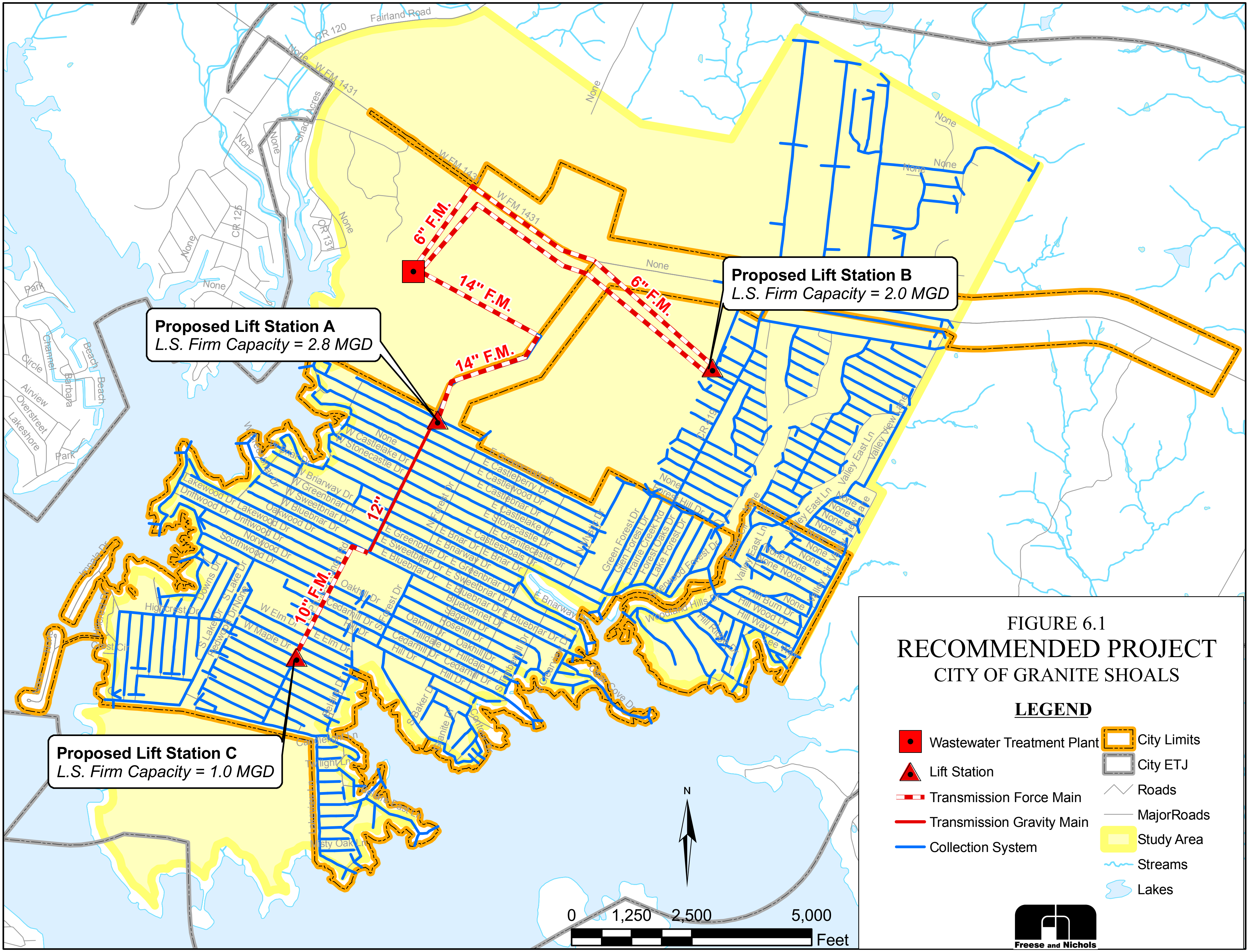


FIGURE 6.1
RECOMMENDED PROJECT
CITY OF GRANITE SHOALS

The recommended collection system will consist of low pressure grinder pump installations at each residence/service connection. Small-diameter, low pressure forcemains will convey wastewater from each service connection to the major lift stations included in the transmission system.

There is a possibility that the Highland Lakes ban may be modified or rescinded in the future. Under this circumstance, discharges to Lake LBJ may be permissible, but effluent standards are expected to be very stringent, particularly with respect to nutrients. The recommended process configuration can accommodate reasonably stringent nutrient limits. It may be possible to utilize constructed wetlands to improve effluent water quality beyond that achievable using the recommended process. Other impacts to the project configuration will include elimination of land application for effluent disposal, and concomitant reduction or elimination of effluent storage ponds.

6.2 Project Phasing

The recommended initial phase of the project will consist of the following major elements:

- Construction of transmission system forcemains within the study area's commercial corridors along FM 1431 and Phillips Ranch Road.
- Construction of a lift station near Jackson Drive and Prairie Creek Road.
- Installation of grinder pump stations at service connections within the City's commercial corridors along FM 1431
- Construction of low pressure collection system pipelines as needed to convey wastewater from the grinder pumps at each service connection to the transmission system
- Construction of a 300,000 gallon per day wastewater treatment facility with an interim permitted discharge of 150,000 gallons per day.
- Construction of effluent disposal irrigation system with a 150,000 gallon per day capacity.

Figure 6.2 shows the recommended initial phase of the transmission/collection system and the wastewater treatment plant. Figure 6.3 presents a preliminary schedule for implementation of the recommended initial phase of the project.

Future phases will include extension of the transmission and collection systems south of Newcastle Drive in the Granite Shoals area, and north and south of FM 1431 in the Sherwood Shores area. The City has expressed a preference for conventional gravity collection systems where geotechnical conditions are favorable. The City is particularly interested in exploring the feasibility of a gravity collection system for the eastern portions of the study area, particularly in the Sherwood Shores area and the southeastern portions of Granite Shoals. We recommend that, as the collection system is expanded within the study area, the City collect additional information via appropriate geotechnical investigations. Once this geotechnical information is available, a meaningful comparison of conventional gravity sewer costs versus low pressure system costs can be developed.

Since the study area is currently unsewered, influent flows into the treatment plant are highly dependent on construction of subsequent phases of the transmission and collection systems. In other words, the quantity of wastewater influent flowing into the treatment plant can be managed by managing the timing and extent of expansions of the transmission and collection systems.

The City will monitor wastewater flows and loadings following construction of the initial phase of the project. This will provide the City with the information needed to better define subsequent expansion of the transmission/collection system and the wastewater plant.

6.3 Project Implementation

Figure 6.3 presents an overall implementation plan for the recommended first phase of the project. The activities to be completed once the City elects to move forward the with project include the following:

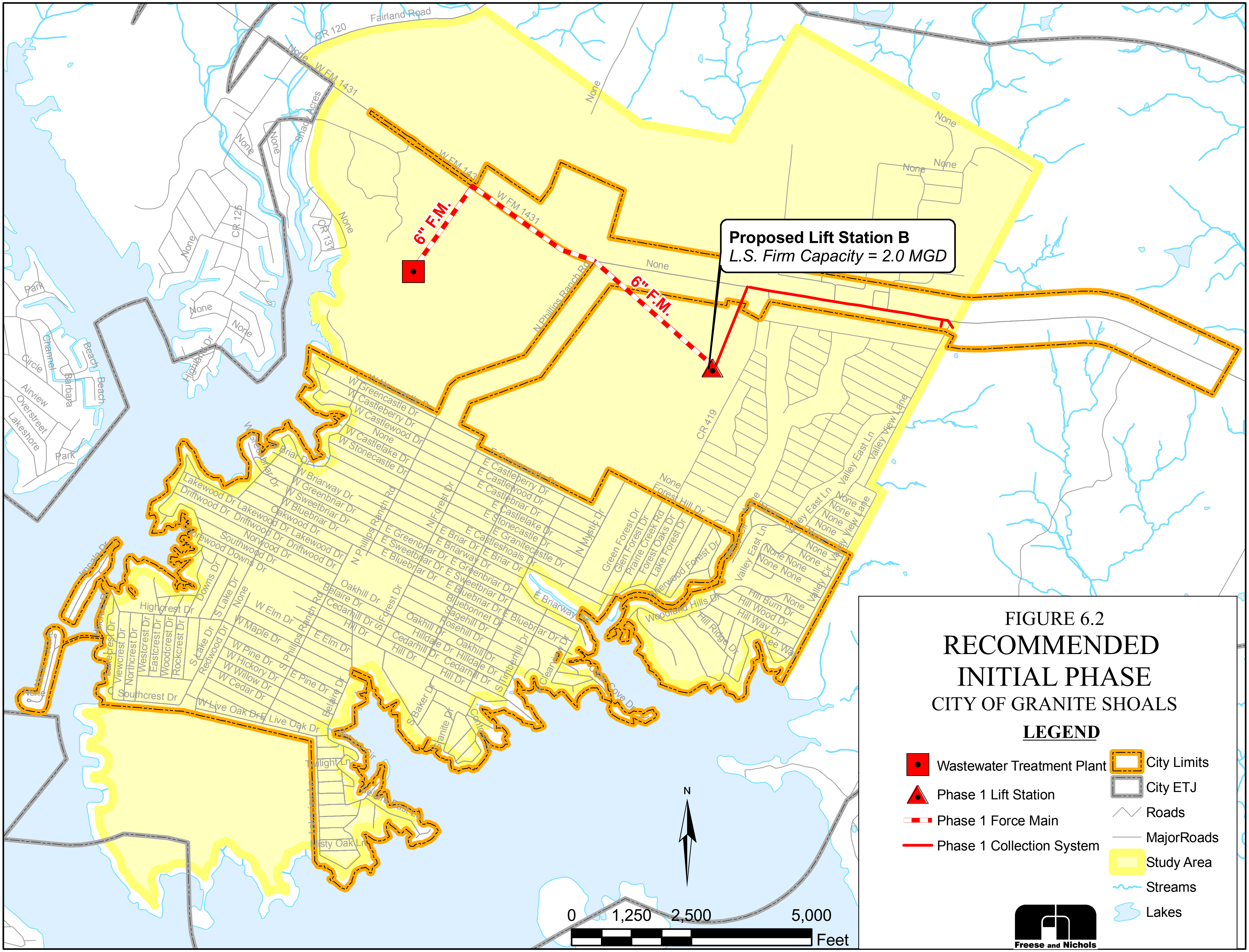
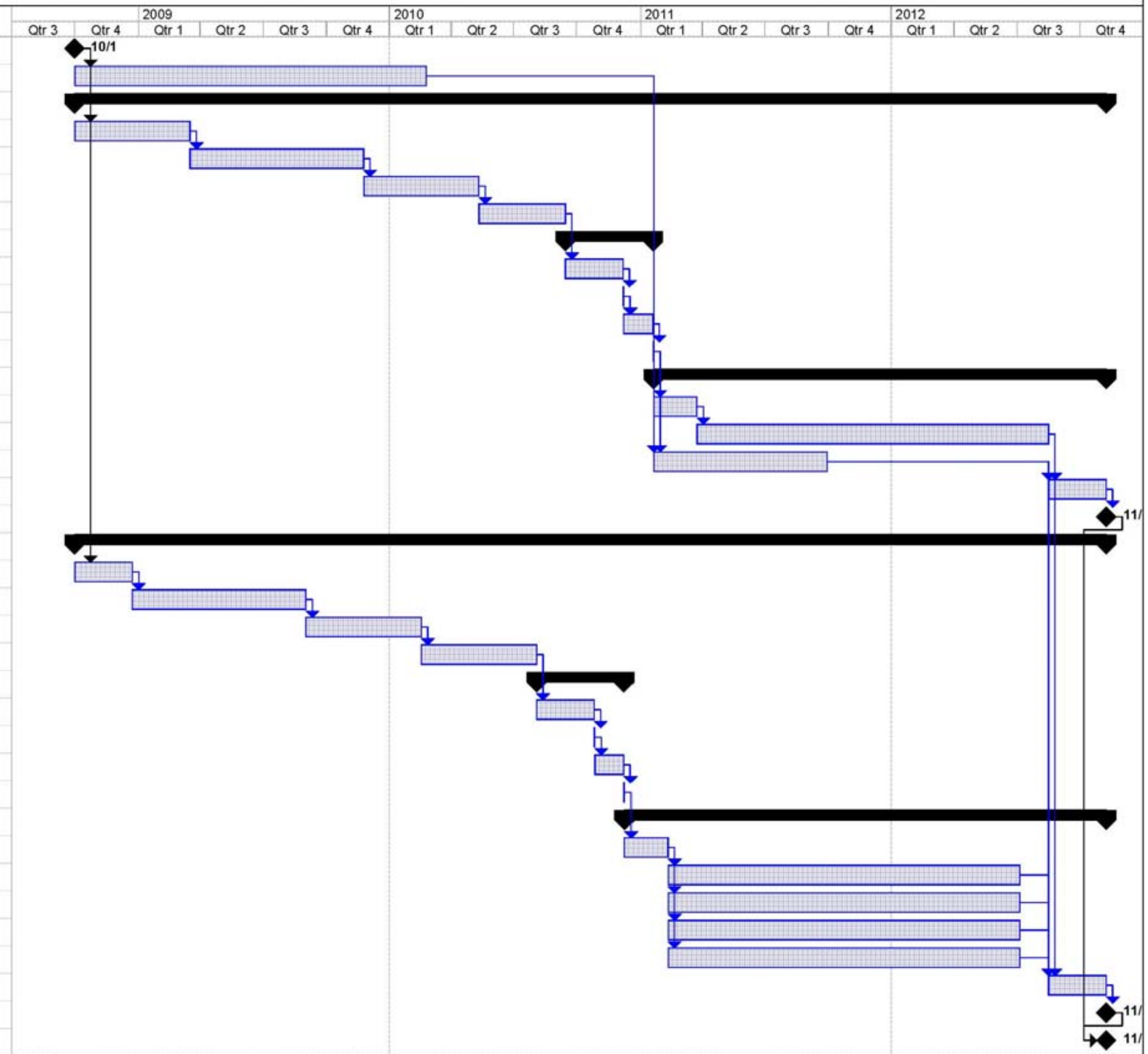


FIGURE 6.2
RECOMMENDED INITIAL PHASE
CITY OF GRANITE SHOALS
LEGEND
Wastewater Treatment Plant
Phase 1 Lift Station
Phase 1 Force Main
Phase 1 Collection System
City Limits
City ETJ
Roads
MajorRoads
Study Area
Streams
Lakes
Proposed Lift Station B
L.S. Firm Capacity = 2.0 MGD
6" F.M.
6" F.M.
N
0
1,250
2,500
5,000
Feet
Freese and Nichols

Figure 6.3: Phase 1 Proposed Implementation Schedule
Granite Shoals Regional Wastewater Facilities

ID	Task Name	Duration	Start	Finish	Predecessors
1	Notice to Proceed	0 days	Wed 10/1/08	Wed 10/1/08	
2	Acquire Land Disposal Area	365 days	Wed 10/1/08	Tue 2/23/10	1
3	**Wastewater Treatment Plant**	**1072 days**	**Wed 10/1/08**	**Thu 11/8/12**	
4	Preliminary Engineering Report	120 days	Wed 10/1/08	Tue 3/17/09	1
5	Permitting	180 days	Wed 3/18/09	Tue 11/24/09	4
6	Final Design	120 days	Wed 11/25/09	Tue 5/11/10	5
7	TCEQ Design Review	90 days	Wed 5/12/10	Tue 9/14/10	6
8	**Bid Period**	**91 days**	**Wed 9/15/10**	**Wed 1/19/11**	
9	Advertisement Period	60 days	Wed 9/15/10	Tue 12/7/10	7
10	Bid Opening	1 day	Wed 12/8/10	Wed 12/8/10	9
11	Bid Evaluation	30 days	Thu 12/9/10	Wed 1/19/11	10
12	Construction Contract Award	1 day	Thu 1/20/11	Thu 1/20/11	11
13	**WWTP Construction**	**470 days**	**Fri 1/21/11**	**Thu 11/8/12**	
14	Mobilization	45 days	Fri 1/21/11	Thu 3/24/11	12
15	Construction	365 days	Fri 3/25/11	Thu 8/16/12	14
16	Construct land disposal system	180 days	Fri 1/21/11	Thu 9/29/11	12,2
17	Startup and Commissioning	60 days	Fri 8/17/12	Thu 11/8/12	16,15
18	WWTP in service	0 days	Thu 11/8/12	Thu 11/8/12	17
19	**Transmission/Collection System**	**1072 days**	**Wed 10/1/08**	**Thu 11/8/12**	
20	Preliminary Engineering Report	60 days	Wed 10/1/08	Tue 12/23/08	1
21	Permitting	180 days	Wed 12/24/08	Tue 9/1/09	20
22	Final Design	120 days	Wed 9/2/09	Tue 2/16/10	21
23	TCEQ Design Review	120 days	Wed 2/17/10	Tue 8/3/10	22
24	**Bid Period**	**91 days**	**Wed 8/4/10**	**Wed 12/8/10**	
25	Advertisement Period	60 days	Wed 8/4/10	Tue 10/26/10	23
26	Bid Evaluation	1 day	Wed 10/27/10	Wed 10/27/10	25
27	Contract Award	30 days	Thu 10/28/10	Wed 12/8/10	26
28	Construction Contract Award	1 day	Thu 12/9/10	Thu 12/9/10	27
29	**Transmission/Collection System Constru**	**500 days**	**Fri 12/10/10**	**Thu 11/8/12**	
30	Mobilization	45 days	Fri 12/10/10	Thu 2/10/11	28
31	Lift Station Construction	365 days	Fri 2/11/11	Thu 7/5/12	30
32	Large Diameter Forcemain Constructi	365 days	Fri 2/11/11	Thu 7/5/12	30
33	Grinder Pump Construction	365 days	Fri 2/11/11	Thu 7/5/12	30
34	Small Diameter Pipeline Construction	365 days	Fri 2/11/11	Thu 7/5/12	30
35	Transmission/Collection System Testi	60 days	Fri 8/17/12	Thu 11/8/12	32,33,34,15,16,31
36	Transmission/Collection System in ser	0 days	Thu 11/8/12	Thu 11/8/12	35
37	Phase 1 Complete	0 days	Thu 11/8/12	Thu 11/8/12	36,18



Project: Phase 1 Project Schedule Date: Wed 5/28/08	Task		Progress		Summary		External Tasks	Deadline
	Split		Milestone		Project Summary		External Milestone	

- Identify and pursue project funding.
- Land acquisition for effluent disposal area(s).
- Easement acquisition for pipelines as appropriate.
- State-mandated environmental, historical, and archeological investigations.
- Preliminary design of Phase 1 facilities, including geotechnical investigations.
- Finalize Phase 1 configuration based on results of preliminary engineering.
- Final design of Phase 1 project.
- Phase 1 permitting through TCEQ
- Advertise for Bids and award construction contract.
- Construct Phase 1.

Certain additional environmental investigations and/or assessments may be required depending on the source of project funding. These activities, if necessary, would generally be conducted prior to or in conjunction with preliminary design.

6.4 Opinion of Probable Cost

Opinions of probable capital, annual, and unit costs for the overall project are included in Table 6.1. Opinions of probable capital, annual, and unit costs for Phase 1 of the project are included in Table 6.2.

6.5 Project Financing

The City of Granite Shoals currently plans to fund the recommended project using a combination of bond sales, State Revolving Fund loans, assessed service fees, and grants. Grant funding is targeted specifically for the Sherwood Shores area due to its status as an economically-disadvantaged area. Specific funding methods will be identified as the project progresses. Additional details of potential funding sources is included in Appendix B.

Table 6.1
Granite Shoals
Wastewater System
Opinions Of Probable Project Cost

Phase	Project Description	Construction Items	Quantity	Units	Unit Price	Costs
1	**Phase 1 Collection System**	Grinder Pump System for Existing Houses	28	LS	$5,500	$154,000
		Collection System 1.25"	524	LF	$7	$3,605
		Collection System 1.5"	1,259	LF	$8	$10,389
		Collection System 8"	1,525	LF	$44	$67,096
		4" and less Pavement Repair	1,784	LF	$12	$21,404
		8" Pavement Repair	1,525	LF	$16	$24,398
					Subtotal	$280,892
					Contingency @ 25%	$70,223
					Total Construction Cost	$351,115
					Engineering, Surveying & Geotech @ 15%	$52,667
					Total Project Cost	$403,782
1	**Phase 1 Transmission System**	Lift Station - New 2 MGD	1	LS	$700,000	$700,000
		6" Force Main	9,765	LF	$33	$322,233
		Easement Acquisition along 1431	7,130	LF	$10	$71,300
		Easement Acquisition	2,635	LF	$5	$13,173
		12" Boring and Casing	400	LF	$120	$48,000
		6" Pavement Repair	9,765	LF	$14	$136,705
					Subtotal	$1,291,412
					Contingency @ 25%	$322,853
					Total Construction Cost	$1,614,265
					Engineering, Surveying & Geotech @ 15%	$242,140
					Total Project Cost	$1,856,404
1	**Phase 1 Wastewater Treatment Plant**	Wastewater Treatment Plant	1	LS	$3,000,000	$3,000,000
					Subtotal	$3,000,000
					Contingency @ 25%	$750,000
					Total Construction Cost	$3,750,000
					Engineering, Surveying & Geotech @ 15%	$562,500
					Total Project Cost	$4,312,500
1	**Phase 1 Effluent Disposal**	Land	55	Acres	$10,000	$550,000
		Irrigation System	1	LS	$880,428	$880,428
		Storage Ponds	1	LS	$3,788,328	$3,788,328
					Subtotal	$5,218,755
					Contingency @ 25%	$1,304,689
					Total Construction Cost	$6,523,444
					Engineering, Surveying & Geotech @ 15%	$978,517
					Total Project Cost	$7,501,961
	TOTAL PHASE 1 TRANSMISSION/COLLECTION/TREATMENT SYSTEM					**$14,074,648**

Notes:
1. All costs are in June 2008 dollars.
2. Phase 1 transmission system is assumed to require acquisition of a minimum 20-foot wide easement along either alternative pipeline alignmen
3. Cost for easement acquisition along FM 1431 is assumed to be approximately $20,000 per acre, or approximately $10/running foot of easement for Phase 1 Transmission system.
4. Cost for easement acquisition along LCRA power line is assumed to be approximately $10,000 per acre, or approximately $5/running foot of easement fo Phase 1 Transmission system.
5. Costs for easement and right-of-way acquisition are not included for remaining elements of the work

Table 6.1
Granite Shoals
Wastewater System
Opinions Of Probable Project Cost

Phase	Project Description	Construction Items	Quantity	Units	Unit Price	Costs
2	**Subsequent Collection System Phasing**	Grinder Pump System for Existing Houses	2,430	LS	$5,500	$13,365,000
		Collection System 1.25"	187,376	LF	$7	$1,288,207
		Collection System 1.5"	120,387	LF	$8	$993,191
		Collection System 2"	132,645	LF	$11	$1,459,095
		Collection System 3"	72,113	LF	$17	$1,189,865
		Collection System 4"	29,288	LF	$22	$644,336
		Collection System 6"	9,225	LF	$33	$304,425
		Collection System 8"	5,200	LF	$44	$228,804
		Collection System 10"	9,772	LF	$55	$537,460
		Collection System 12"	1,220	LF	$66	$80,520
		Collection System 14"	4,409	LF	$77	$339,493
		4" and less Pavement Repair	541,808	LF	$12	$6,501,700
		6" Pavement Repair	9,225	LF	$14	$129,150
		8" Pavement Repair	5,200	LF	$16	$83,202
		10" and larger Pavement Repair	15,401	LF	$20	$308,020
					Subtotal	$27,452,468
					Contingency @ 25%	$6,863,117
					Total Construction Cost	$34,315,585
					Engineering, Surveying & Geotech @ 15%	$5,147,338
					Total Project Cost	$39,462,922
2	**Subsequent Transmission System Phasing**	Lift Station - New 2.8 MGD	1	LS	$750,000	$750,000
		Lift Station - New 1 MGD	1	LS	$550,000	$550,000
		10" Force Main	12,750	LF	$55	$701,253
		14" Force Main	6,671	LF	$77	$513,679
		12" Sanitary Sewer	3,554	LF	$66	$234,531
		48" Diameter Manhole	9	EA	$4,000	$35,535
		20" Boring and Casing	200	LF	$200	$40,000
		10" and larger Pavement Repair	22,975	LF	$20	$459,494
					Subtotal	$3,284,491
					Contingency @ 25%	$821,123
					Total Construction Cost	$4,105,614
					Engineering, Surveying & Geotech @ 15%	$615,842
					Total Project Cost	$4,721,456
2	**Subsequent Wastewater Treatment Plant Phasing** (two phases of 150,000 gpd each)	Wastewater Treatment Plant Expans 1	1	LS	$1,500,000	$1,500,000
		Wastewater Treatment Plant Expans 2	1	LS	$1,500,000	$1,500,000
					Subtotal	$3,000,000
					Contingency @ 25%	$750,000
					Total Construction Cost	$3,750,000
					Engineering, Surveying & Geotech @ 15%	$562,500
					Total Project Cost	$4,312,500
2	**Subsequent Effluent Disposal** (360,000 gpd capacity expansion,	Land	132	Acres	$10,000	$1,320,000
		Irrigation System	1	LS	$2,113,027	$2,113,027
		Storage Ponds	1	LS	$9,091,986	$9,091,986
					Subtotal	$12,525,013
					Contingency @ 25%	$3,131,253
					Total Construction Cost	$15,656,266
					Engineering, Surveying & Geotech @ 15%	$2,348,440
					Total Project Cost	$18,004,706
	TOTAL SUBSEQUENT PHASES TRANSMISSION/COLLECTION/TREATMENT					**$66,501,585**
	Granite Shoals TOTAL SYSTEM COSTS					**$80,576,232**

*The number of future connections is estimated solely for purposes of estimating total project cost and was not used for projecting wastewater flows. The indicated number of connections is based on projected number of connections in the year 2030 from the City's WTP pre-design report, after adjustments for differences in overall population projections. Estimated capita per connection is about 2.08 capita per connection.report, after adjustments for differences in population projections. Estimated capita per connection is about 2.08 capita per connection.

Table 6.2 Opinion of Probable Cost Annual Cost Analysis		
Interest Rate	6%	
Amoritization Period	20 years	
Phase 1 Capacity	150,000	gpd
Phase 1 Capital Costs		
Collection System	$403,782	
Transmission System	$1,856,404	
WWTP	$4,312,500	
Eff. Disposal Sys.	$7,501,961	
Total Capital Costs	$14,074,648	
Phase 1 Annual costs		
Debt Service by Project Element		
Collection System	$35,204	
Transmission System	$161,850	
WWTP	$375,983	
Eff. Disposal Sys.	$654,055	
Total Debt Service	$1,227,092	
O&M Costs by Project Element		
Pipeline O&M	$45,204	
Lift station energy Costs	$17,038	
WWTP O&M costs	$311,000	
Eff. Disposal Sys.	$229,056	
Total O&M	$602,298	
Total Estimated Annual Costs	**$1,829,389**	
Unit cost ($/gpd)	**$12**	

Public Meetings

In accordance with the City's Agreement with TWDB, three public meetings were conducted to discuss the status of the project and solicit input and comments from the affected public. These public meetings were held on September 6, 2007, June 27, 2008, and August 5, 2008. Meeting minutes from these meetings are included in Appendix C. A brief summary of each meeting follows:

6.5.1 September 6, 2007 Public Meeting

The September 6, 2007 public meeting served as a project introduction and kickoff meeting. The project team and meeting attendees discussed the project approach in detail, and answered related questions. Of particular note were discussions related to population projections, peaking factors, and other factors that would impact population projections and wastewater flow projections.

6.5.2 June 27, 2008 Public Meeting

The June 27, 2008 public meeting focused on discussion of the results and recommendations contained in the Draft Report. Significant discussions took place with respect to estimated project cost. Meeting participants provided significant input regarding possible ways to reduce overall project cost by modifying the project configuration, revising project cost assumptions, etc.

6.5.3 August 5, 2008 Public Meeting

The August 5, 2008 public meeting focused on revisions to the project configuration and costs, in accordance with the suggestions made at the June 27, 2008 public meeting, and discussion of TWDB comments on the draft report. Suggested revisions from the June 27, 2008 public meeting resulted in Phase 1 costs reduced from approximately $32 million to approximately $14 million, and overall project costs reduced from over $230 million to approximately $88 million.

APPENDIX A

Appendix A: Monthly Effluent Flow Data					
Aqua Texas WWTP, Granite Shoals, Texas					
	AVERAGE FLOWS			MAX FLOWS	
Month	Q_{month} (mgd)	Q_{month} (gpd)	Q_{month}/ Q_{avg}	$Q_{max\ day}$ (mgd)	$Q_{max\ day}$/ Q_{avg}
Jan-02	0.008716	8,716	0.880	0.011	0.873
Feb-02	0.010360	10,360	1.046	0.015	1.180
Mar-02	0.011132	11,132	1.124	0.072	5.735
Apr-02	0.009755	9,755	0.985	0.013	1.015
May-02	0.010600	10,600	1.070	0.022	1.765
Jun-02	0.009722	9,722	0.982	0.013	1.013
Jul-02	0.011555	11,555	1.167	0.038	3.048
Aug-02	0.010211	10,211	1.031	0.020	1.560
Sep-02	0.009200	9,200	0.929	0.012	0.929
Oct-02	0.009424	9,424	0.951	0.012	0.929
Nov-02	0.008388	8,388	0.847	0.011	0.846
Dec-02	0.009799	9,799	0.989	0.014	1.077
Jan-03	0.010211	10,211	0.976	0.020	1.560
Feb-03	0.008966	8,966	0.857	0.018	1.424
Mar-03	0.008175	8,175	0.781	0.010	0.790
Apr-03	0.007765	7,765	0.742	0.010	0.794
May-03	0.010211	10,211	0.976	0.020	1.560
Jun-03	0.013891	13,891	1.327	0.026	2.109
Jul-03	0.013666	13,666	1.306	0.029	2.291
Aug-03	0.012101	12,101	1.156	0.030	2.389
Sep-03	0.010034	10,034	0.959	0.016	1.256
Oct-03	0.009621	9,621	0.919	0.017	1.356
Nov-03	0.008889	8,889	0.849	0.011	0.866
Dec-03	0.012071	12,071	1.153	0.018	1.448
Jan-04	0.011142	11,142	0.912	0.018	1.408
Feb-04	0.009582	9,582	0.784	0.011	0.865
Mar-04	0.009436	9,436	0.772	0.017	1.372
Apr-04	0.012411	12,411	1.015	0.017	1.372
May-04	0.013992	13,992	1.145	0.021	1.664
Jun-04	0.012813	12,813	1.048	0.019	1.495
Jul-04	0.013250	13,250	1.084	0.018	1.454
Aug-04	0.013447	13,447	1.100	0.020	1.560
Sep-04	0.010320	10,320	0.844	0.017	1.358
Oct-04	0.012739	12,739	1.042	0.018	1.437
Nov-04	0.015130	15,130	1.238	0.030	2.412
Dec-04	0.012405	12,405	1.015	0.018	1.437
Jan-05	0.012874	12,874	0.971	0.020	1.575
Feb-05	0.014530	14,530	1.096	0.027	2.155
Mar-05	0.015725	15,725	1.186	0.029	2.325
Apr-05	0.013542	13,542	1.021	0.023	1.828
May-05	0.014505	14,505	1.094	0.030	2.363
Jun-05	0.015764	15,764	1.189	0.026	2.100
Jul-05	0.013267	13,267	1.001	0.027	2.175
Aug-05	0.010938	10,938	0.825	0.017	1.378

Appendix A: Monthly Effluent Flow Data					
Aqua Texas WWTP, Granite Shoals, Texas					
	AVERAGE FLOWS			MAX FLOWS	
Month	Q_{month} (mgd)	Q_{month} (gpd)	Q_{month}/ Q_{avg}	$Q_{max\ day}$ (mgd)	$Q_{max\ day}$/ Q_{avg}
Sep-05	0.012047	12,047	0.909	0.016	1.268
Oct-05	0.011569	11,569	0.872	0.021	1.636
Nov-05	0.012105	12,105	0.913	0.029	2.333
Dec-05	0.012257	12,257	0.924	0.026	2.060
Jan-06	0.012269	12,269	0.902	0.019	1.486
Feb-06	0.012899	12,899	0.949	0.019	1.500
Mar-06	0.013534	13,534	0.995	0.018	1.399
Apr-06	0.013894	13,894	1.022	0.020	1.616
May-06	0.013659	13,659	1.005	0.032	2.532
Jun-06	0.014655	14,655	1.078	0.024	1.876
Jul-06	0.017680	17,680	1.300	0.029	2.310
Aug-06	0.012965	12,965	0.954	0.019	1.548
Sep-06	0.013895	13,895	1.022	0.018	1.458
Oct-06	0.012066	12,066	0.887	0.019	1.548
Nov-06	0.012958	12,958	0.953	0.019	1.502
Dec-06	0.012679	12,679	0.933	0.022	1.755
Jan-07	0.014099	14,099	0.859	0.019	1.516
Feb-07	0.014914	14,914	0.909	0.023	1.832
Mar-07	0.018962	18,962	1.155	0.036	2.861
Apr-07	0.017319	17,319	1.055	0.024	1.939
May-07	0.016095	16,095	0.981	0.024	1.941
Jun-07	0.020311	20,311	1.238	0.034	2.723
Jul-07	0.017925	17,925	1.092	0.024	1.947
Aug-07	0.014735	14,735	0.898	0.021	1.644
Sep-07	0.016195	16,195	0.987	0.021	1.698
Oct-07	0.013559	13,559	0.826	0.021	1.696

APPENDIX B

Appendix B – Financing Mechanisms

This appendix provides an overview of funding programs potentially available to the City of Granite Shoals for implementing the recommended project.

For each program discussed below, the purpose of the program, eligible applicants, restrictions on the use of funds, the loan maturity, the interest rate, and the total available funding are reported where available. Additional information on each program is included at the end of this appendix.

The City should contact the respective program manager for each funding source to determine the eligibility of the project and whether additional restrictions apply.

1.0 MARKET FINANCING

Market financing through local bank loans and municipal bonds that are repaid through increased fees and revenues are the primary mechanisms for funding municipal infrastructure projects. This funding mechanism places the burden of paying for the capital improvements on the beneficiaries of the project. It also provides for local control in the implementation and timing of the needed improvements.

2.0 TEXAS WATER DEVELOPMENT BOARD PROGRAMS

Texas Water Development Board (TWDB) programs are targeted towards political subdivisions and non-profit water supply corporations and districts. Three programs benefit *colonias* and state-designated economically distressed areas. The Sherwood Shores area may qualify as an economically distressed area, but the City should verify this prior to pursuing such funding.

Other programs specific to municipalities include the Drinking Water State Revolving Loan Fund, Clean Water State Revolving Fund Program (CWSRF), Development Fund II Water and Wastewater Loan Program, State Participation Program (SPP), and the Water Infrastructure Fund.

Each of these TWDB programs is discussed below.

Clean Water State Revolving Fund Program

The Clean Water State Revolving Fund Program (CWSRF) provides low-interest loans for planning, design, and construction of wastewater recycling and reuse facilities[1]. The applicant for assistance from the CWSRF program must be a political subdivision.

Applicants to the CSWRF program must submit an information form to the TWDB each year for inclusion in the TWDB's intended use plan for the year. The TWDB identifies priority projects and requests funding applications for these projects. Depending on the source of funds, interest rates vary from 0.7 percent to 1.7 percent below market interest rates. The maximum repayment period is 20 years after completion of construction. The CWSRF program has a budget of approximately $400 million in 2002.

Texas Water Development Fund

Loans for planning, design and construction of water supply, wastewater and flood control projects may be obtained from the TWDF. To apply for state financial assistance for water supply, water and wastewater treatment, and flood control projects, the applicant must be a political subdivision of the state or a nonprofit water supply corporation.

The interest rate on a TWDF loan varies depending on market conditions. The lending rate scales are set 0.35 percent above the Texas Water Development Board's borrowing cost. Repayment periods generally range from 20 to 25 years.[2]"

State Participation Program

Deferred interest loans from the TWDB's State Participation Program may be used for regional systems where the project sponsors are unable to assume debt for an optimally sized facility[3]. In return for state participation, the TWDB may acquire ownership interest in the project. The benefits of assistance from the State Participation Program include deferred payments until the customer base grows into the project capacity and no interest on the deferred payments. TWDB participation is limited to the maximum of the excess project capacity or 50 percent of the project. Remaining costs may be eligible for funding from other TWDB programs.

The maximum repayment term for assistance from the State Participation Program is 34 years. The repayment schedule may be obtained from the TWDB. State Participation Program funding will vary depending on funds received from ongoing participation projects.

Rural Water Assistance Fund

Using the Rural Water Assistance Fund, the TWDB will provide low-interest loans for development of rural water supplies or for regionalization of rural water supplies. Eligible applicants are rural political subdivisions, defined as a "nonprofit water supply or sewer service corporation, district, or municipality with a service area of 10,000 or less in population or that otherwise qualifies for financing from a federal agency or a county in which no urban area exceeds 50,000 in population.[4]"

Economically Distressed Areas Program

"The program provides financial assistance in the form of a grant, or a combination grant/loan to provide water and wastewater services to economically distressed areas to meet the minimal needs of residents. The EDAP can fund planning, land acquisition, design, construction for new service or improvements to water supply and wastewater collection and treatment works, including all necessary engineering work. The program will not fund on going operation and maintenance expenses.

Applicants must be an area in which the water supply or sewer services are inadequate to meet minimal needs to residential users; the financial resources are inadequate to provide water supply or sewer services to satisfy those needs; and were established residential subdivision as of June 1, 2005. In addition, the area to be served by the proposed project must have a median income that is not greater than 75% of the median state household income for the most recent year for which statistics are available.[5]"

[1] *"Clean Water State Revolving Fund Program," Texas Water Development Board, available online at http://www.twdb.state.tx.us/assistance/financial/fin_infrastructure/cwsrffund.htm, Austin, March 2002.*

[2] *"Texas Water Development Fund" Texas Water Development Board, available online at http://www.twdb.state.tx.us/publications/shells/TWDF_0307.pdf, Austin, August 2008.*

[3] *"State Participation Program," Texas Water Development Board, available online at http://www.twdb.state.tx.us/assistance/financial/fin_infrastructure/StateParticipation.htm, Austin, March 2002.*

[4] *Federal Funding Sources for Watershed Protection, Second Edition, Office of Water, U.S. Environmental Protection Agency, Publication EPA 841-B-99-003, Washington, D.C., December 1999. Available online at http://www.epa.gov/owow/watershed/wacademy/fund/wfund.pdf, March 2002.*

[5] *"Economically Distressed Areas Program" Texas Water Development Board, available online at http://www.twdb.state.tx.us/publications/shells/EDAP.pdf, Austin, August 2008.*

TEXAS WATER DEVELOPMENT BOARD

FINANCIAL ASSISTANCE PROGRAMS

Federally Subsidized Programs:

Clean Water State Revolving Fund (CWSRF) provides loans for wastewater related projects at interest rates lower than the commercial markets offer. The CWSRF also includes disadvantaged community funds that provide even lower interest rates for applicants meeting the respective criteria.

Drinking Water State Revolving Fund (DWSRF) provides loans at interest rates lower than the commercial markets offer to finance projects for public drinking water systems that facilitate compliance with primary drinking water regulations, or otherwise significantly further the health protection objectives of the Federal Safe Drinking Water Act. The DWSRF also has disadvantaged community funds that provide partial loan forgiveness and even lower interest rates for applicants meeting the respective criteria.

State Programs:

Texas Water Development Fund (TWDF) is a state loan program that does not receive federal subsidies, and is a very streamlined program. The program includes loans for water supply, water quality enhancement, flood control and municipal solid waste. The TWDF enables the Texas Water Development Board (TWDB) to fund multiple eligible components in one loan.

State Participation enables the State to assume a temporary ownership interest in a regional project when the local sponsors are unable to assume debt for the optimally sized facility. The loan repayments that would have been required, if the assistance had been from a conventional loan, are deferred. The cost of the funding is repaid to the TWDB based upon purchase payments, which allows the TWDB to recover its principal, interest costs, issuance and related expenses; however, repayment is on a deferred timetable.

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Texas Water Information Network (TxWIN)
http://www.txwin.net

Rural Area Assistance:

Rural Water Assistance Fund (RWAF) small rural water utilities with low cost financing for water and wastewater construction projects. The TWDB offers attractive interest rate loans with short and long-term finance options at tax exempt rates. Funding through this program gives an added benefit to Nonprofit Water Supply Corporations, as construction costs qualify for sales tax exemption.

Financial Assistance For Special Needs:

Agricultural Water Conservation Loan, Grant and Linked Deposit Program

Colonia and Community Self-Help Program

Economically Distressed Areas Program

Federal Emergency Management Agency Flood Mitigation Assistance

Groundwater District Loan Program

Nonpoint Source Pollution Loan and Estuary Management Program (of the CWSRF)

Regional Water Planning/Grants

Water Research Grant Program

WHERE MAY I GET MORE INFORMATION?

For more information, contact the Texas Water Development Board at 512/463-0991. Additional information on other agency financial programs is also available on the TWDB web site: www.twdb.state.tx.us/assistance/financial/financial_main.asp.

Other funding information links:

Financial Assistance Programs from Other Agencies www.twdb.state.tx.us/assistance/financial/fin_infrastructure/fin_links/infrastructure_links.asp

Governor's Office Grants Team - www.governor.state.tx.us/divisions/stategrants

Grant Resources by area - www.governor.state.tx.us/divisions/stategrants/resourcesbyarea

Federal Funding Opportunities - www.grants.gov

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Clean Water State Revolving Fund

What is the CWSRF Program and Who Can Apply?

The Clean Water State Revolving Fund (CWSRF) provides loans at interest rates lower than the market to political subdivisions with the authority to own or operate a wastewater system in Texas. The CWSRF also includes Tier III (federal) and Disadvantaged Communities funds that provide even lower interest rates for those meeting the respective criteria.

Although nonprofit water supply corporations are considered political subdivisions for various other TWDB programs, they are not eligible to receive assistance from the CWSRF.

How Can CWSRF Loans be Used?

Loans can be used for the planning, design and construction of wastewater treatment facilities, wastewater recycling and reuse facilities, collection systems, stormwater pollution control, nonpoint source pollution control, and estuary management projects.

What Loan Terms are Offered through the CWSRF?

The CWSRF offers fixed and variable rate loans at subsidized interest rates. The maximum repayment period for a CWSRF loan is 30 years from the completion of project construction. A cost-recovery loan origination fee of 1.85% is imposed to cover administrative costs of operating the CWSRF. Applicants have the option to finance the origination fee in their loan or to pay it at closing. An additional interest rate subsidy is offered to those financing the origination fee. Total loan amounts are limited to $75,000,000 for the first nine months of the fiscal year.

Interest rates vary according to the type of financing selected and are locked in at closing:

- Tier II (state) funds offer a net long-term fixed interest rate of 0.95% below the market rate for those applicants financing the origination fee. For applicants who pay the origination fee from other sources, the interest rate is 0.70% below the market rate.
- Short-term, variable rates are also available. Variable rates are available during the construction period but must convert to a long-term, fixed rate loan within 90 days of the completion of project construction. The variable interest rates are generally about 2% below the above-described fixed rates, or up to 2.95% below the market rate. Borrowers have the option to convert to long-term, fixed rate financing at any time prior to project completion.
- Tier III (federal) funds offer a net long-term fixed interest rate of 1.95% below the market rate.
- Disadvantaged Communities funds offer an interest rate of 0% or 1% to eligible communities with populations up to 25,000.

A limited amount of funding is available each year to applicants who qualify as disadvantaged communities.

What is the Application and Approval Process?

Pre-application

Each year, the TWDB notifies all known potential entities of the availability of funding and timelines for the upcoming cycle. Prospective loan applicants are asked to submit project information that describes the applicant's existing wastewater facilities, facility needs, the nature of the project being considered, and project cost estimates. This information is used to rate each proposed project and place them in priority order in the Intended Use Plan (IUP). Projects are ranked in priority order in one of seven different categories: six population categories and one nonpoint source estuaries management category. Available funds are distributed among these categories and funding lines are drawn. Entities above the funding lines are invited to submit applications. All applicants are encouraged to schedule a pre-application conference that will guide them through the CWSRF application process. Funding lines are redrawn as necessary and subsequent invitations are sent to prospective applicants.

Application and Commitment

Applications consist of an engineering feasibility report and environmental information and contain certain general, fiscal and legal information. The timeframe for submittal of an application is the first business day of the month preceding the month during which the applicant desires TWDB Board consideration (e.g., due November 1 for Board consideration in December). Applications for loans are considered for approval by the TWDB Board at its monthly public meetings.

Loan Closing Option

The CWSRF offers a pre-design funding option, whereby an eligible applicant may receive a loan commitment based on preliminary engineering, environmental, economic, and social information. Pre-design funding allows for the release of funds for completion of detailed planning and environmental studies at closing. Funds for design, preparation of final plans and specifications, and construction are placed in escrow at closing to be released when needed.

If the pre-design funding option is not used, prior to closing the applicant must develop plans and specifications, obtain all necessary permits, and bid the project in order to determine the exact amount needed for funding.

Applicants generally receive a two-year loan commitment. All TWDB loans are monitored for the life of the outstanding debt to ensure compliance with all requirements and to maintain the funds sound financial condition.

Are There Any Special Requirements?

- Applicants for loans greater than $500,000 must adopt a water conservation and drought contingency plan (a statutory requirement).
- Tier III (federal) loans require compliance with various federal requirements. Included in these requirements: a National Environmental Policy Act-type environmental review, and compliance with the TWDB's Disadvantaged Business Enterprise (DBE) program. The DBE program requires applicants and prime contractors to follow six affirmative steps in procurement: (1) include qualified SMWBE's on solicitation lists; (2) solicit potential DBE's, whenever they are potential sources; (3) reduce contract size/quantities, when economically feasible, to permit maximum participation of DBE's; (4) establish delivery schedules to encourage participation by DBE's; (5) use the services and assistance of the Small Business Administration, Minority Business Development Agency, and the U.S. Department of Commerce, as appropriate; and (6) require all prime contractors to follow steps 1-5 when awarding subcontracts or sub-agreements.
- The document entitled "DBE State Revolving Fund Program Guidance Document for the Utilization of Small, Minority, and Women-Owned Business Enterprises in Procurement" describes the program in detail and is available online at: http://www.twdb.state.tx.us/publications/forms_manuals/SRF052_SMWBEGuidance.pdf. If you don't have access to the Internet or for specific questions regarding the required procurement steps, please contact Otis Williams at (512) 463-1878. TWDB staff is available to assist applicants in determining the scope of investigation required, preparing reports, and coordinating with environmental regulatory agencies.

Where May I Get More Information?

For more information, contact the Texas Water Development Board at (512) 463-0991. Additional information on the CWSRF and other agency programs is also available on the TWDB web site:
www.twdb.state.tx.us/assistance/financial/financial_main.asp.

CWSRF 0408L

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TEXAS WATER DEVELOPMENT FUND - STATE FINANCING FOR WATER SUPPLY, WASTEWATER AND FLOOD CONTROL PROJECTS

WHAT STATE FINANCIAL ASSISTANCE CAN THE TEXAS WATER DEVELOPMENT BOARD PROVIDE FOR WATER SUPPLY, WASTEWATER AND FLOOD CONTROL PROJECTS AND WHO CAN APPLY?

Loans for the planning, design and construction of water supply, wastewater and flood control projects may be obtained from the Texas Water Development Fund (TWDF).

To apply for state financial assistance for water supply, water and wastewater treatment, and flood control projects, the applicant must be a political subdivision of the state or a nonprofit water supply corporation. Political subdivisions include cities, counties, districts and river authorities. Water supply projects must be consistent with the 2007 State Water Plan.

HOW CAN TWDF LOANS BE USED?

The TWDF provides financing for the acquisition, improvement or construction of such water-related projects as water wells, retail distribution and wholesale transmission lines, pumping facilities, storage reservoirs and tanks, and water treatment plants. It also provides financing for the purchase of water rights. The TWDF also provides financing for wastewater collection and treatment projects and flood control projects.

WHAT LOAN TERMS ARE OFFERED THROUGH THE TWDF?

The interest rate on a TWDF loan varies depending on market conditions. The lending rate scales are set 0.35 percent above the Texas Water Development Board's (TWDB) borrowing cost. The lending rates are intended to provide reasonable rates for its customers while covering the TWDB's cost of funds and risk exposures. Current interest rates are available at www.twdb.state.tx.us. Repayment periods generally range from 20 to 25 years.

DOES THE TWDB LOAN MONEY TO COMPLETE PLANNING, PRELIMINARY DESIGN AND OTHER PRE-CONSTRUCTION COSTS?

Using the TWDB's pre-design funding option, an eligible applicant may receive a loan commitment based on preliminary engineering, environmental, economic and social information. Funds for completing detailed planning, including environmental studies, are provided at closing, while funds for design, preparation of final plans and specifications, and construction are placed in escrow until needed. The interest rate is locked in at closing.

The pre-design funding option is available for most water supply and treatment, and wastewater projects. As with other TWDB loan programs, the applicant's ability to repay the loan is the major determining factor in the approval for using the pre-design funding option.

If the pre-design funding option is not used, the applicant must develop plans and specifications and have them approved, obtain all necessary permits and open bids prior to closing the loan.

WHAT REVENUE SOURCE(S) CAN A BORROWER USE TO REPAY A TWDB LOAN?

The TWDB accepts general obligation bonds, revenue bonds and tax and revenue certificates of obligation.

WHAT IS THE APPLICATION AND APPROVAL PROCESS?

(1) Schedule a pre-application conference to discuss the project's eligibility. For tax-exempt borrowers, the applicant, the applicant's financial advisor and the applicant's consulting engineer must attend this conference.
(2) Submit an application for staff review. An application consists of general, fiscal, legal, engineering and environmental information; a water conservation and drought contingency plan will be required for financial assistance greater than $500,000 (a statutory requirement). A complete application is due on the first business day of the month preceding the month during which the application is to be considered by the TWDB.
(3) The TWDB meets in Austin each month to consider applications for financial assistance. If the application is approved, the TWDB will extend a two-year loan commitment.
(4) If using the pre-design funding option, the applicant must submit the following documents prior to the loan commitment:
- Complete general, legal, and fiscal information described above (same as required by present rules);
- A preliminary engineering feasibility report including a description of the problem and/or need, a description of the proposed project, alternatives considered, population and flow projections, a proposed work plan and schedule, area maps, and estimated project costs;
- If the loan is for more than $500,000, provide a draft Water Conservation Plan;
- A discussion of known permitting, social, or environmental issues that may become involved in the evaluation of project alternatives and in the implementation of the proposed project;
- Contracts for engineering services; and
- Additional information as may be required by the Executive Administrator.

(5) TWDB staff monitors the project during the construction process.
(6) Loans are monitored by TWDB staff for the life of the outstanding debt to ensure compliance with the bond indenture requirements and the maintenance of a sound financial condition.

WHERE MAY I GET MORE INFORMATION?

For more information, contact the Texas Water Development Board at 512/463-0991 or visit the Assistance Section of the TWDB website at www.twdb.state.tx.us

TWDF 0307

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STATE PARTICIPATION

WHAT IS STATE PARTICIPATION?

The State Participation Program enables the Texas Water Development Board (TWDB) to assume a temporary ownership interest in a regional project when the local sponsors are unable to assume debt for the optimally sized facility. The TWDB may acquire ownership interest in the water rights or a co-ownership interest of the property and treatment works. The loan repayments that would have been required, if the assistance had been from a loan, are deferred. Ultimately, the cost of the funding is repaid to the TWDB based upon purchase payments, which allow the TWDB to recover its principal and interest costs and issuance expenses, etc., but on a deferred timetable.

The program is intended to allow for optimization of regional projects through limited State participation where the benefits can be documented, and such development is unaffordable without State participation. The goal is to allow for the “Right Sizing” of projects in consideration of future growth. On new water supply projects the TWDB can fund up to 80% of costs, provided the applicant will finance at least 20% of the total project cost from sources other than the State Participation Account, and at least 20% of the total capacity of the proposed project will serve existing needs. On other State Participation projects the TWDB can fund up to 50% of costs, provided the applicant will finance at least 50% of the total project cost from sources other than the State Participation Account, and at least 50% of the total capacity of the proposed project will serve existing needs.

WHO CAN APPLY FOR THE FUNDS?

Any political subdivision of the State and water supply corporations which may sponsor construction of a regional water or wastewater project can apply to the TWDB for participation in the project. Although it is not required, the applicant usually acquires a loan from the TWDB for the community’s immediate needs.

HOW DO I APPLY FOR STATE PARTICIPATION FUNDING?

The applicant is encouraged to meet with TWDB staff for assistance in preparing the application and to discuss the terms of the loan. The applicant must submit an engineering feasibility report and environmental information, as well as general, fiscal and legal application information to the TWDB's Office of Project Finance and Construction Assistance.

HOW DOES TWDB GET FUNDS FOR THE PROGRAM?

The State Legislature, recognizing the value in optimizing and “Right Sizing” systems, has appropriated funds to assist local governments in regional optimization projects. To offset some of the initial cost of processing these projects, the TWDB charges an administrative cost recovery fee of 0.77%. As the earlier projects repurchase the TWDB’s interest, there will be additional funds available for future projects.

WHAT SAVINGS DOES STATE PARTICIPATION PROVIDE?

The benefits to the participant are threefold: 1) payments are deferred until the customer base grows into the added capacity facilitated, which will augment the applicant’s ability to make the payments to the TWDB; 2) the TWDB does not accrue interest on the deferred interest portion thereby reducing the overall carrying cost of the facility for the applicant; 3) optimizing regional projects reduces the necessity and added expense to local

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governments of building new structures or replacing undersized structures in the future. These funds are limited in availability both as to the total amount approved by the Legislature each biennium and by limitations to participation in individual projects. The TWDB's participation from this program is limited to a maximum of 80% of costs for projects creating a new water supply, and to 50% of costs for other types of projects. In both cases, State participation is limited to the portion of the project designated as excess capacity. The remaining costs of the project may be funded through other TWDB programs. There is also a requirement that the project cannot be reasonably financed without State participation assistance, and that the optimum regional development of the project cannot be reasonably financed without the State participation. Other findings must also be made.

What are the Terms of Financial Assistance?

Security Instrument: A Master Agreement will be developed to establish responsibilities, duties and liabilities of each party, and to govern the funding arrangements, including provisions for a defined source of revenue which will be used to purchase the State's portion of the facility.

Pledge: System revenues and/or tax pledges are typically required. Contract revenue pledges for river authorities and others are possible. The TWDB may subordinate this obligation relative to debt issuance.

Length of TWDB Participation and Repurchase Payments: Period of useful life of the project facilities being constructed with a maximum financing life of 34 years. Contracts between the TWDB and the applicant include a repurchase payment schedule which approximates the following:

- 1st & 2nd Years $0 interest payable/$0 principal (interest accrues but deferred as to payment)
- 3rd & 4th Years @ 20% of accrued interest/$0 principal (80% of accrued interest deferred)
- 5th Year @ 30% of accrued interest/$0 principal (70% of accrued interest deferred)
- 6th Year @ 40% of accrued interest/$0 principal (60% of accrued interest deferred)
- 7th Year @ 55% of accrued interest/$0 principal (45% of accrued interest deferred)
- 8th Year @ 70% of accrued interest/$0 principal (30% of accrued interest deferred)
- 9th Year @ 85% of accrued interest/$0 principal (15% of accrued interest deferred)
- 10th - 12th Years @ 100% of accrued interest/$0 principal (No accrued interest deferred)
- 13th - 19th Years @ all annual accruing interest plus recovery of equal portions of the previously deferred interest each year
- 20th - 34th Years @ all annual accruing interest plus principal

A portion of the TWDB's ownership is transferred only when the principal portion of the payment begins.

THE INTENT IN THE SCHEDULE IS TO PRODUCE APPROXIMATELY LEVEL DEBT SERVICE BEGINNING IN THE 13TH YEAR, BUT THE DEFERRED INTEREST COMPONENT IS RECOVERED PRIOR TO THE APPLICATION OF PAYMENTS TO PRINCIPAL.

Interest Rates: While the assistance is not a loan, the purchase requirement is certain as to terms of payment and includes a component of the repurchase cost that includes the interest costs of the TWDB's funds in financing the project. These rates are based upon the TWDB's cost of funds for loans at such time as the TWDB's acquisition payment is made to establish its participation in the project. Rates are established by maturity date for each installment closed. The rates are set approximately 45 days prior to installment closing, and are based upon the TWDB's TIC composite lending rate scale for State Participation bonds. The rate is set in accordance with the TWDB Rules 31 TAC 363.33(a).

Fees: There is an Administrative cost recovery fee relating to State Participation Commitments of $0.77 per $100 of Participation funds provided. The fee will be paid at closing, either in full, or a minimum of 1/3. If the applicant chooses to pay 1/3 of the fee at closing, the remaining 2/3 may be arranged in two subsequent installments in the first, second or third years based upon terms agreed upon in the individual contracts.

Conditions to Close: Environmental Review and Water Conservation Plans in addition to financial conditions. Upon TWDB commitment, a letter is provided detailing all special conditions.

Applicable Rules: 31 TAC 363 Subchapter A and F.

WHERE MAY I GET MORE INFORMATION?

For more information, contact the Texas Water Development Board at 512/463-0991 or visit the Assistance Section of the TWDB web site at www.twdb.state.tx.us.

SP0108

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RURAL WATER ASSISTANCE FUND

WHAT IS THE RWAF PROGRAM AND WHO CAN APPLY?

The Texas Water Development Board (TWDB) administers the Rural Water Assistance Fund (RWAF), created in 2001 by the 77th Texas Legislature. The RWAF program is designed to assist small rural utilities to obtain low cost financing for water and wastewater projects. The TWDB offers tax exempt, attractive interest rate loans with short and long-term finance options. Eligible borrowers are defined as Rural Political Subdivisions which include nonprofit water supply corporations, water districts, or municipalities serving a population of up to 10,000, or that otherwise qualify for federal financing, or counties in which no urban area has a population exceeding 50,000.

HOW CAN RWAF LOANS BE USED?

The RWAF loans may be used to fund water-related capital construction projects including, but not limited to, line extensions, overhead storage, the purchase of well fields, and the purchase or lease of rights to produce groundwater. Water quality enhancement projects such as wastewater collection and treatment projects are also eligible projects in addition to interim financing of construction projects. Costs of planning, design, and construction are all eligible for funding. The RWAF may also be used to enable a rural utility to obtain water or wastewater service supplied by a larger utility or to finance the consolidation or regionalization of a neighboring utility.

WHAT LOAN TERMS ARE OFFERED THROUGH THE RWAF?

This flexible term finance program provides borrowers with tax exempt loans with attractive interest rates, up to a 40-year maturity on loans (consistent with the useful life of the project), and quick turn-around

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time on loan applications. In addition, non-profit water supply corporations are exempt from paying sales tax incurred on any project financed by the program. A rural utility may also enter into an agreement with a federal or state agency to submit a joint application for financial assistance.

WHAT ARE THE APPLICATION REQUIREMENTS?

Applicants should schedule a pre-application conference with the TWDB and obtain guidance on completing a funding application. The application materials must include general system information such as rates and customer base, operating budgets, financial statements, preliminary engineering planning and environmental information, and project information. In approving a loan application, the TWDB considers: (1) the needs of the area to be served by the project; (2) the benefit of the project to the area; (3) the relationship of the project to the overall state water needs; (4) the relationship of the project to the State Water Plan; and (5) the availability of all sources of revenue to the rural utility for the ultimate repayment of the project cost. An application is due on the first business day of the month preceding the month during which the application is to be considered by the TWDB Board. The Board usually meets in Austin once every month to consider financial assistance applications.

COMMITMENT AND FUNDING

Upon approval of the application, the TWDB extends the applicant a loan commitment, provides an acknowledgement letter and other necessary loan and authorizing documents. The applicant approves and authorizes the project financing package at a public meeting. The project loan is closed and funds are then released for planning, with subsequent releases from escrow based on rules-determined milestones.

OTHER REQUIREMENTS

The applicant must complete the remaining engineering and other regulatory requirements as outlined in the application guidance materials. The applicant is required to solicit bids for the project prior to commencement of construction. Terms for loan repayment are flexible, depending on the applicant's needs.

WHERE MAY I GET MORE INFORMATION?

To receive additional information or to request a pre-loan meeting, please contact the Texas Water Development Board at 512/463-0991. Information is also available in the Assistance Section of the TWDB web site at www.twdb.state.tx.us.

RWAF 03/07

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ECONOMICALLY DISTRESSED AREAS PROGRAM

What Is the Economically Distressed Areas Program?

The 71st Texas Legislature (1989) passed comprehensive legislation that established the Economically Distressed Areas Program (EDAP) to be administered by the Texas Water Development Board (TWDB). The program provides financial assistance in the form of a grant, or a combination grant/loan to provide water and wastewater services to economically distressed areas to meet the minimal needs of residents. The program includes measures to prevent future substandard development. Subsequently, the 79th Texas legislature (2005) passed legislation that changed the definition of an economically distressed area, essentially expanding the program statewide. On November 6, 2007, the Texas voters approved Proposition 16, which authorized the TWDB to issue up to $250 million in additional general obligation bonds for the EDAP. The TWDB will use bond proceeds to issue approximately $87 million dollars during the next two years in grants and loans for water and wastewater projects in economically distressed communities all across Texas.

What Is an Economically Distressed Area?

An area in which:

- the water supply or sewer services are inadequate to meet minimal needs of residential users;
- the financial resources are inadequate to provide water supply or sewer services to satisfy those needs; and
- was an established residential subdivision as of June 1, 2005.

What Areas Are Eligible to Receive the Financial Assistance?

Projects must be located in an Economically Distressed Area as defined above. In addition, the area to be served by the proposed project must have a median income that is not greater than 75% of the median state household income for the most recent year for which statistics are available.

What Can Be Funded?

The EDAP can fund planning, land acquisition, design, construction for new service or improvements to water supply and wastewater collection and treatment works, including all necessary engineering work. The program will not fund ongoing operation and maintenance expenses. The EDAP applicant is responsible for operation and maintenance of the system.

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EDAP statutes prohibit EDAP funds from being used to pay for lines on private property to connect colonia residents to water mains. Additional grants from the Office of Rural Community Affairs, the Texas Department of Housing and Community Affairs, the U.S. Department of Agriculture-Rural Development and the North American Development Bank may pay for residential service connections.

The TWDB will work with an applicant to establish a financial assistance plan for planning, design, acquisition, and construction. TWDB staff will also work with the applicant to assist in providing joint funding by the EDAP and other available TWDB financial assistance programs and other state and federal agencies.

Who Can Apply?

All political subdivisions, including cities, counties, water districts and nonprofit water supply corporations are eligible to apply for funds. The applicant, or its designee, must be capable of maintaining and operating the completed system. The applicant is responsible for securing any necessary water permits or rights, wastewater discharge permits and any other required licenses.

The applicant must provide a citation as to its legal authority to provide service in the area (authorization under Texas Constitution and Statues). If an applicant is required under Chapter 13 of the Water Code to have a Certificate of Convenience and Necessity (CCN) in order to provide service to the proposed project area to be considered for EDAP financing, the applicant must have or be applying for the CCN.

How Do I Apply?

The first step in the application process is to schedule a pre-application conference with TWDB staff. The purpose of the conference is to discuss the proposed project and provide any needed guidance and assistance to potential applicants. Requesting a pre-application conference does not in any way obligate an applicant to continue the process.

Secondly, the applicant will complete a financial assistance application for planning, acquisition and design for the proposed EDAP project. Once the planning, acquisition and design portion of the project is complete, the applicant may seek funding for the construction portion of the project from the Texas Water Development Board.

An application for financial assistance for project construction requires all planning, acquisition, and design to be complete and approved by Board staff.

Are There Any Other Special Requirements?

- The EDAP includes measures to prevent future substandard development. The county where the project is located must adopt rules for the regulation of subdivisions, prior to application for financial assistance. If the applicant is a city or if any part of the project is located within the extended territorial jurisdiction of a municipality, the city must also adopt model subdivision regulations.
- The applicant must apply for and maintain a designation by the Texas Commission on Environmental Quality (TCEQ) as an Authorized Agent for the regulation of on-site waste disposal facilities, if applicable.
- The county must also prepare a map that shows where different types of on-site sewage disposal systems are appropriate.

Where May I Get More Information?

For more information, contact the Texas Water Development Board at 512/463-0991, or visit the Assistance Section of the TWDB website at www.twdb.state.tx.us.

EDAP 0108

APPENDIX C

Freese and Nichols

INNOVATIVE APPROACHES...PRACTICAL RESULTS

MEETING MINUTES

Project:	City of Granite Shoals Regional Wastewater Study (GSH07265)	**Meeting Minutes No.**	1
Subject:	Kickoff Meeting with City of Granite Shoals (First TWDB required public meeting)		
Recorded By:	Tejashri Kyle		
Date:	September 6, 2007		
Location:	Granite Shoals City Hall		
Attendees:	List of attendees is included on attached sign-in sheet.		

The following reflects our understanding of the items discussed during the subject meeting. If you do not notify us within five working days, we will assume that you are in agreement with our understanding.

Item	Description	Action By
1.01	Leonard Ripley commenced the meeting with introductions and a recap of how the process began for the wastewater study to begin.	None
1.02	Mike Morrison introduced the Freese and Nichols, Inc. (FNI) team for the project.	None
1.03	Jonathan Howard asked Council members and other attendees to introduce themselves. Jonathan began by reiterating that the goal of the project is to provide wastewater service to the cities of Granite Shoals and Sherwood Shores.	None
1.04	Jonathan then covered the project handbook and its contents. He referred the group to the project directory and copies of contracts the City has with Texas Water Development Board (TWDB) and FNI.	None
1.05	Jonathan mentioned that FNI will be providing monthly invoices and monthly one-page reports to the City.	FNI
1.06	Jonathan covered the study plan (memo) in greater detail. First task will be to arrive at estimates of projected population and wastewater flows. Jonathan cautioned that the population projections may not match those published by TWDB.	FNI
1.07	Dennis Maier mentioned that during the water treatment plant (WTP) study, the City received four differing population projections. He suggested that City would like to see the wastewater treatment plant (WWTP) sized for all projected populations and that a group decision would have to be made as to which of the projected populations would be used in the study. Jonathan added that FNI would like to see the projections from the WTP study.	FNI/City
1.08	Kathleen Ligon (TWDB Contract Administrator/Project Manager) clarified	FNI/City

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	that she has previously experienced population projections differing from TWDB and that would be fine as long as FNI/City can justify the difference.	
1.09	Leonard added that phasing in this project is very important and allows for flexibility in bringing the additional population on the wastewater system.	FNI
1.10	Bessie Jackson asked how many years the projections will be carried, to which Jonathan responded that typically such studies use a timeframe of 20-30 years in 5-year increments. Mike concurred and added that TWDB projects till 2050 in 10-year increments.	FNI
1.11	Jonathan mentioned that there are a couple of different ways or arriving at population projections, one of which is based on planning and zoning maps, but projections are harder to predict using this approach.	FNI
1.12	Jonathan clarified that the wastewater treatment process will be based on estimates of wastewater loadings. He added that FNI plans to look at the previous LCRA study and that Leonard would provide additional input on the most cost-effective treatment option for the City.	FNI
1.13	Jonathan provided the definitions of treatment system, collection system and transmission system.	None
1.14	Jonathan mentioned that since the Highland Lakes ban does not allow the City to discharge treated effluent to Lake LBJ, the effluent will have to disposed off by irrigation. Treated effluent could be applied to places such as parks, but additional area will have to be set aside for irrigation.	City
1.15	Leonard added that the City will need to have enough land set aside as though all of the treated effluent was being disposed via irrigation, even though the City may not use the entire area for irrigation purposes. He added that it would be better if the City could sell the treated effluent as reuse water to one or two landowners.	City
1.16	Frank Reilly asked about the possibility of irrigating the airfield grass strip. The approximate area is 15 acres. The group agreed that would be a good place to start for irrigation.	City
1.17	Jonathan mentioned that the LCRA report had recommended small grinder pumps that would serve one or two homes, and small diameter collection lines that would carry wastewater to the intermediate lift stations and finally to the WWTP. He suggested that the STEP system may provide a good solution during the transition from septic systems to a centralized WWTP because it uses septic systems as pre-treatment.	FNI/City
1.18	Jonathan stated that the transmission system may consist of 2 to 3 intermediate lift stations. He concluded the alternatives portion of the discussion by saying that once FNI has a list of alternatives with input from the City, a recommended option can be chosen and cost estimates developed.	FNI/City
1.19	Jonathan added that FNI will develop capital costs, annualized costs and unit costs for the recommended collection, transmission and treatment system alternatives for each phase that is proposed.	FNI

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1.20	Dennis asked if FNI will be estimating City's wastewater revenue and how long it will take to recover the debt for the WWTP. Jonathan responded that FNI will study the wastewater rate structure. Mike added that FNI will advise the City on the available funding mechanisms, e.g. TWDB has up to 20-year funding opportunities. Mike concluded that FNI will study rate structure and assess impacts of phasing on the rates.	FNI
1.21	Kathleen informed the group about some TWDB loan programs and provided handouts describing these programs. She added that the City can request TWDB staff to make a presentation and answer questions about the funding options.	City/ TWDB
1.22	Jonathan discussed the schedule and mentioned that the draft report is due to TWDB on February 29, 2008. The City and TWDB have until March 31, 2008 to provide their comments to FNI. The final report is due to TWDB on May 23, 2008.	FNI/City/ TWDB
1.23	Jonathan stated that according to their contract with the TWDB, City is required to form a Public Advisory Committee (PAC). The group discussed the PAC make-up and concluded that the participants should include the City, Marble Falls, Burnet County, LCRA, Highland Haven, and Aqua Texas. Merilyn Nations suggested to Bessie that the entire wastewater committee be present at the PAC meetings.	City
1.24	Frank asked if it would be alright to form the PAC by the end of September, to which Jonathan responded in the affirmative.	City
1.25	Kathleen stated that the TWDB contract requires the City to hold three (3) public meetings, and that the kickoff meeting would count as the first one since notice was posted to the public.	City
1.26	Several Council members posed the question as to why the public meetings were needed and whether the City would have to take suggestions made during these meetings. Leonard responded that the meetings are for informational purposes and to offer the public a chance to provide input in the process of development of the study.	City
1.27	The group agreed that openness and involvement of the public in the early stages of the project would be beneficial.	City
1.28	Jonathan referred the group to Article II section 5 (public meeting requirements) of the TWDB's contract with the City and stressed that the City is only required to consider public input, but that the Council would ultimately make the decisions.	City
1.29	Jonathan stated that FNI would contact Ronda and provide some possible dates to schedule the public meeting at the 50% stage. The group agreed that a representative from TCEQ should be invited to the public meetings. Leonard and Kathleen noted that TCEQ's involvement in the public meetings is not typical.	FNI/City
1.30	Jonathan noted that the third and last public meeting will need to be held between March 31 and May 31, 2008.	FNI/City
1.31	Dennis asked what the outcome of the public meetings would be, to which	City

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	Jonathan responded that the meetings would give the City a better understanding public's view of the project, and give the City an opportunity to identify potential roadblocks. Kathleen added that the public meetings would keep the public informed of the possible alternatives being considered and provide them the chance to express their views on the alternatives.	
1.32	The group discussed that the Council meeting near the project completion date is scheduled for May 13, 2008. This would be a good date to present the study findings to the City since the media and public would be present.	FNI
1.33	Jonathan explained that FNI's monthly invoices will be sent to the City (John Gayle) with a copy to Ronda Reichle. The City will forward the invoice to TWDB for reimbursement.	FNI/City
1.34	Ronda asked who the City needed to contact for invoice related questions, to which Kathleen replied that correspondence should be addressed to Phyllis Thomas, with a copy to Kathleen.	City
1.35	Jonathan referred the group to the report outline and mentioned that the outline provides an idea of report contents.	FNI
1.36	Ronda asked whether City will receive the report in parts (such as memoranda) or as one document. Jonathan responded that the plan is to provide one document. Leonard added that FNI will seek City's approval of population and wastewater flow projections, since that is the basis of recommendations in the study.	FNI/City
1.37	Jonathan stated that the key decision points in the project are: population projections, per capita wastewater flow, WWTP site, and disposal site.	FNI/City
1.38	The group discussed peaking factors on wastewater flow. Leonard stated that the 2006 monthly flow data from Aqua Texas indicates a peaking factor of approximately 2.3, which is on the low side. Jonathan added that the textbook value for similar plants is 4.0. Leonard replied that the 4.0 is with infiltration/inflow, which does not occur in the case of the Granite Shoals Aqua Texas plant.	None
1.39	Dennis added that the City is a weekend and holiday community. The group agreed that because of the special case that the City has a large transient population, the population and wastewater flow projections will have to be carefully derived.	FNI/City
1.40	John mentioned that he, along with Leonard and Jonathan met with four representatives from Aqua Texas on August 7, 2007. They discussed how Aqua Texas could help with the wastewater study. John stated that the August 7th meeting laid the groundwork for FNI to collect additional data from Aqua.	FNI
1.41	Jonathan added that the report outline will be updated with a chapter on financial information and funding sources.	FNI
1.42	Ronda and John agreed that they will coordinate with FNI to provide the requested data, and that FNI should contact LCRA for data on number of septage permits.	FNI/City

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1.43	Jonathan asked if the City has an approved comprehensive master plan, to which Dennis replied that the City does have one, but it is out of date and they are working on a new one.	None
1.44	Jonathan stated that a water conservation plan is required to satisfy TWDB funding requirements. Council members responded that the City does have an approved water conservation plan.	None
1.45	Jonathan provided copies of the survey to all attendees and clarified that it will be sent to all Aqua Texas customers. Leonard added the survey will help FNI collect better data on wastewater flow rates.	FNI
1.46	Frank asked how crucial it is to send out the survey since the City is currently involved in litigation with residents of Beaver Island, which is served by the Aqua Texas plant.	None
1.47	The group agreed that the Council needed to discuss the survey and how it should be sent out and inform FNI of their decision.	City
1.48	Mike asked how many wastewater connections exist in the Aqua Texas service area, to which Ricky Rowe replied about 180.	None
1.49	Dennis suggested that Aqua Texas could conduct the survey. Merilyn seconded Dennis by saying that the residents would be more willing to answer to Aqua Texas than they would to the City.	City
1.50	Jonathan conducted a wrap-up of the meeting by summarizing that the last required public meeting would be held on May 13, 2008, that FNI would coordinate with Ronda to setup a date for the 50% public meeting and that FNI will need to discuss the four key points mentioned earlier with the City.	FNI/City
1.51	Jonathan added that it may be a good idea to present the key points to the PAC. FNI would propose dates/topics for the PAC meetings.	FNI/City
1.52	Merilyn asked Kathleen which of the funding sources would be best for the City. Kathleen responded that the Rural Water Assistance Fund and CWSRF are options the City should consider.	City
1.53	Leonard added that grants for collection system piping in smaller areas could also be utilized.	City
1.54	Kathleen added that if the City is classified as socially/economically depressed area in the 2000 census, they could qualify for USDA grants. Bessie mentioned that the City did receive such a status in the 2000 census. Mike added that the City may qualify for community development block grants.	City
1.55	Kathleen mentioned it would be best for the City to consult with TWDB staff regarding funding options. Jonathan suggested that the TWDB funding staff could be invited to a PAC meeting. Leonard offered that it would be better to involve TWDB funding staff towards the end of the study.	City
1.56	The meeting was duly posted in accordance with Public Notification requirements. A majority of the City Council was present, and this meeting served as the first public meeting in accordance with the TWDB planning	None

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	grant requirements.	

Adjourn: Meeting was adjourned at approximately 5:00 pm.

Copies to: Kathleen Ligon, Frank Reilly, John Gayle, Ronda Reichle, Leonard Ripley, File

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TEXAS WATER DEVELOPMENT BOARD
PLANNING PROJECT

KICK-OFF MEETING

City Hall
Council Chambers
410 N. Phillips Ranch Rd.
Granite Shoals, Texas

Thursday, September 6, 2007

3:00 p.m.

Sign in Sheet

	Name	Phone Number	e-mail
1.	Tejashri Kyle, Freese + Nichols	(512) 617-3154	tjk@freese.com
2.	Kathleen Ligon TWDB	(512) 463-8294	Kathleen.ligon@twdb.state.tx.us
3.	Mike Morrison FNI	(512) 617-3150	mgm@freese.com
4.	Jonathan Howard FNI	(512) 617-3144	jbh@freese.com
5.	Ronda Reichle city secretary	830-598-2424 x101	citysecretary@graniteshoals.org
6.	Pat Zeller Granite Shoals (Treasurer)	830 598 2424 x 102	gs treas@tstar.net
7.	Ricky Rowe Granite Shoals (water dept supervisor)	830-613-8696	gswater@tstar.net
8.	Ken Francis (Bld. Inspector)	830-2424 X 3	gssec@tstar.net
9.	Bessie Jackson (Council)	830-598-1940	hjackson@moment.net
10.	David N. Dittmar (Council)	(512) 6636971	NAVLINK@VERIZON.NET
11.	Dennis Maier (council)	830 598 2614	optics@nctv.com
12.	Merilyn Nations (council)	(830) 598-1321	mamamer@tstar.net
13.	Shirley King (council)	830 598-5102	shirleyking08@aol.com
14.	John Gayle City Mgr	830-598-2424	citymanager@graniteshoals.org
15.	Frank Reilly, Mayor	512-970-3811	mayor@graniteshoals.org

	Name	Phone #	Email
16.			
17.	Austin Stanphill	(830)613-9110	fire@graniteshoals.org
18.	Leonard Ripley, FNI	(817) 735-7347	ler@freese.com
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The City of Granite Shoals

410 N. Phillips Ranch Road
Granite Shoals, Texas 78654

phone (830) 598-2424
fax (830) 598-6538

I, Ronda Reichle, City Secretary for the City of Granite Shoals, Texas, certify that the attached are true and correct Minutes taken from the tapes and notes of the City Council Special meeting held on September 6, 2007.

Ronda Reichle, City Secretary

The City of Granite Shoals

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MINUTES

FOR A SPECIAL MEETING

OF THE CITY COUNCIL
OF THE CITY OF GRANITE SHOALS

FRIDAY, JUNE 27, 2008
6:00 p.m.

1. Mayor Frank Reilly called to order the Special meeting of the City Council of the City of Granite Shoals at 6:19 p.m., City Hall, Council Chambers, 410 N. Phillips Ranch Road, Granite Shoals, Texas. In attendance: Peggy Edwards, Bessie Jackson, Shirley King, Dennis Maier and Merilyn Nations.

2. Public comment and announcements. No public comments or announcements were made.

3. Receive presentation from Jonathan Howard, P.E., Freese and Nichols, Inc. and review of draft Regional Wastewater Facilities Study. Jonathan Howard and Leonard Ripley provided information related to the wastewater study. Kathleen Ligon, Texas Water Development Board was available for question and comment. A meeting for the first week in August was requested, at which time there will be review of the final draft before it is submitted to Texas Water Development Board.

4. Discussion and possible regarding draft Regional Wastewater Facilities Study. No action was taken on this item.

5. Discussion regarding future agenda items. No items were requested.

6. Adjournment 8:23 p.m.

I, Ronda Reichle, City Secretary for the City of Granite Shoals, Texas, certify that the attached are true and correct Minutes taken from the tapes and notes of the City Council Special meeting held on June 27, 2008.

Ronda Reichle
Ronda Reichle, City Secretary

The City of Granite Shoals

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Granite Shoals, Texas 78654

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MINUTES

FOR A SPECIAL MEETING

OF THE CITY COUNCIL
OF THE CITY OF GRANITE SHOALS

FRIDAY, AUGUST 8, 2008
6:00 p.m.

1. Mayor Pro Tem Dennis Maier called to order the Special meeting of the City Council of the City of Granite Shoals at 6:22 p.m., City Hall, Council Chambers, 410 N. Phillips Ranch Road, Granite Shoals, Texas. In attendance: David Dittmer, Peggy Edwards, Bessie Jackson, Shirley King, Merilyn Nations (arrived at 7:20 p.m, was excused at 7:50 p.m.).

2. Public comment and announcements. No public comments or announcements were made.

3. Receive presentation from Leonard Ripley, Ph.D., P.E. and Jonathan Howard, P.E., Freese and Nichols, Inc. providing an update, including but not limited to, Regional Wastewater Study and application to Texas Water Development Board. Jonathan Howard and Leonard Ripley provided information related to the wastewater study. Connie Townsend, P.E., Texas Water Development Board was available for question and comment. Dr. Ripley requested an written comment from the city be submitted by August 22nd. Freese and Nichols will submit the Regional Wastewater Facilities Study to the Texas Water Development Board on or before August 31, 2008.

4. Discussion and possible regarding draft Regional Wastewater Facilities Study and application to Texas Water Development Board. Motion was made by Bessie Jackson to accept the report as presented. Seconded by Shirley King. Motion passed unanimously.

5. Discussion regarding future agenda items. No items were requested.

6. Adjournment 8:37 p.m.

I, Ronda Reichle, City Secretary for the City of Granite Shoals, Texas, certify that the attached are true and correct Minutes taken from the tapes and notes of the City Council Special meeting held on August 8, 2008.

Ronda Reichle
Ronda Reichle, City Secretary

APPENDIX D

City of Granite Shoals Regional Wastewater Facilities Study

A) **Executive Summary**

1) Chapter 1:Introduction

2) Chapter 2: Project Planning Area

3) Chapter 3: Projected Populations, Land Use, Wastewater Flows and Loadings

Chapter 3 of the report states that the planning period for this study extends thru 2030.

a) Wastewater Effluent Quality
Please address the wastewater effluent quality standards that will be used for the proposed Wastewater Treatment Plant (WWTP). This issue will affect the discussions below

b) Wastewater Flows:
The official addendum dated 7/25/2008 revised the number of connections from 14,682 connections (or 44,406 capita based an average of 2.5 to 3 capita/connection) to a 4,160 connections (or ***12,480 capita***)

At an average of 100 gallons per day/capita wastewater generation, this translates to a reduction in expected wastewater flows from 4.4 Million Gallons per Day (MGD) to ***1.25 MGD***.

The report states that based on several studies, including the Board's own, the design population projection for the project area is projected at ***5,109 capita*** (Table 3.2 of the Report) in 2030; and that the projected wastewater flows would remain at about 100 gallons pre capita per day.
This implies that the average wastewater flow in 2030 would be 0.5 MGD; the design wastewater flow would be ***0.76 MGD*** and the peak wastewater flow would be 3.0 MGD (Table 3.5 of the report). WWTP are sized on the basis of design flow.
Based on the flow calculations, that is no consistency between the Board's population projection and the City's projection (via amended report). This will have an effect on the sizing of the Wastewater Facilities

c) Recommended Wastewater Treatment Plant Sizing
Original Draft Report:
Section 3.5.3 of the report (Titled: Recommended Initial Wastewater Facility Capacity) states that the Phase 1 facility capacity should be 0.3 MGD, and an additional facility capacity of 0.3 MGD would be added during Phase 2 for a 2030 facility capacity of ***0.6 MGD***.
Addendum to Draft Report:

The July 2008 amended report suggests that 0.3 MGD WWTP should be constructed during Phase I with an expansion to ***0.6 MGD*** during Phase 2

Please discuss if the year 2030 design capacity of the WWTP should be ***1.25 MGD*** *based on the number of connections, or should it be* ***0.76 MGD*** *based on flow and population projections.*
What would be the financial impact on the Project if the WWTP would have to be sized on the basis of the number of connections?

4) Chapter 4: Wastewater Treatment Process Alternatives
a) Effluent Quality:
As mentioned above, the final effluent quality required will affect the discussion below.

b) Process Alternatives:
The report mentions in Chapter 2.6 that in August , 2001, the LCRA funded Parson's report evaluated alternatives for the location of the WWTP, treatment process and transmission system. The current report essentially mirrors the Parsons report except that the current report recommends the use of a Sequential Batch Reactor (SBR) process whilst the Parson's report recommended an Oxidation Ditch Process.

In Chapter 4.3 (Process Alternatives) the report states "…The need to limit the plant's footprint and minimize odors rule out low-rate systems such as lagoons or fixed –film processes such as tricking filters."

Which other processes were evaluated other than the Activated Sludge process? Given that the City owns 134 acres on which it is proposing to site the WWTP and effluent holding ponds (see discussion below), will the plant's footprint be a limitation to a proper evaluation? (Chapter 1, Task E). Please discuss the evaluation parameters (e.g. land required, cost of construction, reliability, ease of operation, Operations and Maintenance (O&M) costs and effluent quality issues) as a minimum, between the Parsons report's recommendation of the Oxidation Ditches and the current report's recommendations.
What effect will the constraints with respect to SBRs (as discussed in Chapter 4.3 Page 4.8) have on the Net Present Value of O&M costs for the recommended treatment process?

(Note that the current rates of escalations in the costs of electricity, among others things, will have a large impact on the NPV of the treatment processes evaluated/recommended.)

c) Wastewater Treatment Plant Location
The proposed WWTP is proposed for location on a 134 acre quarry that is now City owned.

Figure 4.3 refers to Potential Wastewater Treatment Sites. However, only one site is shown.

Which other sites were evaluated for the treatment facilities.
Were long term pumping costs considered in the site evaluations?

d) Effluent Disposal Alternatives

i) Land Disposal
The report indicates that the effluent will be disposed of by land application.

ii) Effluent Storage
Section 4.5.1 states that "…the City intends to reserve that site's south and southwest areas of the property (pertaining to the 134 acres mentioned above) for a WWTP and effluent storage ponds as shown Figure 4.3." The revised cost estimate calls for the purchase of land for effluent storage ponds at an estimated cost of $3,927,216.

Please explain the purchase of land for effluent ponds
If land for the effluent ponds is to be purchased, which other sites were evaluated for the effluent ponds? (Relating to long term energy cost escalations for pumping)

iii) Effluent Disposal
The revised project (150,000 GPD) estimate requires approximately 55 acres for effluent disposal. Chapter 4.5.1 states that "…The City intends to develop the balance of the property for recreational facilities and reuse plant effluent to water athletic fields and green spaces"

Can the 134 acre quarry site provide the 55 acres required for effluent disposal, at a potential cost savings of $500,000?

<u>5) Chapter 5: Transmission and Collection System Alternatives</u>

a) Low Pressure System
The estimated cost of the low pressure collection system and transmission system recommended by the report was compared with the costs of a similar type and size of project (Board funded) that was recently bid out. The estimated costs for the systems recommended by this report compare favorably with the bid prices.

<u>6) Chapter 6: Recommended Project and Implementation Plan</u>

a) Operation, Maintenance & Personnel Costs
The addendum to the report does not provide any estimated of Operation, Maintenance and Personnel costs for the Collection and Transmission System and for the WWTP. As shown below

"Chapter 317.2 (d)(1) of Chapter 317 : Design Criteria for Sewerage Systems stipulates that for Alternative Sewer Systems:

(1) Management. A responsible management structure under the regulatory jurisdiction of the TNRCC shall be established, to the satisfaction of the Executive Director, to be in charge of the operation and maintenance of an alternative wastewater collection system. A legally binding service agreement shall be required to insure the alternative wastewater collection system is properly constructed and maintained. The required elements of the service agreement are as follows:

(A) The document must be legally binding.

(E) The utility must be responsible for the operation and maintenance of the system including any interceptor tank, pressure sewer pump tank or vacuum system appurtenances incorporated.

(F) The utility must be able to stop any discharges from any collection system appurtenances in order to prevent contamination of State waters.

(G) The utility shall submit a maintenance schedule to the Executive Director which outlines routine service inspections and maintenance for all types of pressure sewers, small diameter gravity sewers, and vacuum sewer system components.

(H) Pumping units, grinder pumps, vacuum sewer appurtenances, interceptor tanks, shall be regarded as integral components of the system and not as a part of the home plumbing.

(I) Provision to ensure collection system integrity during a power outage (twoyear event) shall be incorporated into the design. Power outage duration will be determined as described in §317.3(e)(1) of this title (relating to Lift Stations).

These requirements of Chapter 317 will add to the operations cost of the recommended system; thus their costs should be quantified to the extent possible to allow for a proper evaluation of alternatives proposed.

7) Appendix A – Flow Data

No Comments

8) Appendix B – Financing Mechanisms

No financing mechanism, based on the City' economic and or financial status has been recommended – Please clarify.

TWDB Contract No. 0704830730
DRAFT
CITY OF GRANITE SHOALS
REGIONAL WASTEWATER FACILITIES STUDY
June 2008

REPORT COMMENTS

TOC – the convention of using the same labeling for Figure, Table, and Page numbers is confusing. For example, Figure ES.1 on page ES.2 and Table 3.1 on page 3.3. Suggest changing notation to Figure 3-1 and Table 3-1 etc.

Page ES.1 2.0 Project Background
Suggest labeling Beaver Island and Web Impala Island in figures.

Also suggest including the Highland Lakes System on Figure ES.1 and labeling Lake LBJ in Figure ES.2. Also on Figures 2.1 and 2.2.

Page 2.1 "The Llano uplift is someone of a basin…" This statement is confusing. Basins typically refer to watersheds.

Page 2.8 Table 2.1 the report states that "Each of the species listed in Table 2.1 has the potential to occur in Burnet County", yet under the column 'Potential Habitat Present" lists two species as unlikely. These appear contradictory.

Page 2.13 In order to demonstrate a need for the project, the report states that the septic systems may potentially threaten groundwater quality and nearby Lake LBJ. Are there any documented reports that this study could reference to show that this impact has happened nearby or is a current impact? Suggest including this reference to support the need for the project.

Figure 3.2 The study area boundary should be included in the legend of the figure or at least labeled.

Page 4.3 There is a mention of reuse in this section – does this pertain to effluent disposal other than the land application fields previously described?

Page 4.9 What is the application rate anticipated for the 135 acres of land for treated effluent disposal?

Section 5.0 It would be useful to see a topographic map of the service area to demonstrate need for a pressure system rather than a gravity system.

Page 5.3 Please indicate the Sherwood Shores area in one of the figures.

Many of my comments were addressed with the revised cost estimate addendum, including ‘real world’ construction costs and using projected growth to the estimate needs rather than full build-out.

Suggest including the ultimate capacity of the WWTP in the final cost estimate.

In General: suggest that the plans for phasing be included in all relevant figures, including differentiating between Phase 1 and future phase facilities.

(1) I had to work pretty hard to discern what the figures/tables were trying to show. It would help to have more clearly labeled figures and tables; from more descriptive titles; would be nice to show study area in most figures for reference and service areas for the different phases where appropriate; making sure figure legends are complete (example figure 2.3 has an unlabeled city boundary line and unknown zone areas in ETJ) and giving phase 2 subtotals in cost tables.

(2) Put page #s on all pages

(3) Fig.3.7 what does ADWF stand for?

(4) Several places in report refer to the city-owned tract of land to be used for WWTP facilities. Need to clarify the tract is not 136 acres, but 131 acres and the church owns the other 5 acres.

(5) Section 4.4 - give discussion as in meeting of a brief example crop scenario summer bermuda, winter wheat/rye, heavily irrigated to almost marshy conditions (different than conventional farming practices and will produce a lower quality hay, but still be marketable to sell). How to prep land for harvesting hay and that the land would need to be exclusively for crop production not cattle grazing. Another question I have on this would be the sectioning of the 131-acre tract. Within the 131 acres, please clarify estimated acreage assigned for WWTP facilities (assuming recommended SBR), acreage assigned for land application of effluent (I may have missed this, but I did not see this in report), acreage assigned for city's recreational facilities and city hall, and how the heavily irrigated effluent disposal area (marshy conditions) will affect these other land uses. What other types of acreages (ie what land uses) are being considered for remainder of land needed for land application - golf course and park irrigation or just more heavily irrigated crop land? Helpful to state that the more specific water balance calculations will be part of the next phase of this project that will be needed to determine the exact acreage needed for the project .

(6) Would also be nice to have a list somewhere near the end that summarizes all of the next steps to take on this project such as geotechnical survey, water balance calculations, determination of acreage needed for effluent disposal for different land uses, etc.

(7) update the improved possibility of using gravity flow collection for a portion of the eastern side of the city - discussion at meeting.

(8) What kind of flows are anticipated from the revised phase 1 area of just 28 commercial properties? Estimated timetable for adding residential neighborhoods to phase 1 collection/transmission system?

(9) It sounded like at the meeting that the study is relying heavily on the hopes that the LCRA will lift its ban on treated effluent discharge into the lake instead of additional land application of effluent. I think it would be helpful to discuss pros/cons of this a bit and also, include the possibilities of utilizing constructed wetlands for part of the effluent treatment discharge as was discussed in meeting.

Page 5.5: There appears to be a typo in the first line ("militate").

Page 4.3: The last bullet refers to the sludge composting facility in Burnet. Is it still in operation? If not, please amend the report.

Appendix B contains several inappropriate references to Region C (Granite Shoals is located in the Region K regional water planning area).

Appendix B should discuss financing programs that are appropriate for the project (e.g. Water Infrastructure Fund, Drinking Water State Revolving Fund, and Agriculture Water Conservation Loans do not provide assistance for wastewater projects, and should not be included). Why is it assumed that the project would not be eligible for funding through the Rural Water Assistance Fund? More discussion on eligibility for disadvantaged programs may be useful for the community. The Clean Water SRF budget information is out of date.

Documentation of public meetings should be provided in an appendix, with a brief discussion on the outcome of the meetings in the report.

While the design population projections in the report are slightly higher than TWDB projections from the Region K Regional Water Plan, it was determined that the projections are reasonable given more recent Texas State Data Center estimates and other considerations.