

Final Report

**SOUTHEAST CAMERON COUNTY
Unserved Areas Study Report**

Espey Consultants, Inc.

Texas Water Development Board and Laguna Madre Water District

**In addition to the City of Los Fresnos, Port of Brownsville,
and East Rio Hondo Water Supply Corporation**

January 30, 2012

EC Project No. 10019.00

2012 JAN 31 PM 4:26

CONTACT ADMINISTRATION

1004831076_Final Report

EC

SOUTHEAST CAMERON COUNTY

Unserved Areas Study Report

Report

By:

Wayne K. Hunter, P.E.

Shrirang Golhar, P.E.

Sandeep Chaudhari, E.I.T., CFM

Espey Consultants, Inc.

Firm Registration F-293

2777 N. Stemmons Fwy., Suite 1102

Dallas, Texas 75207

January 2012



This page is intentionally blank.

Southeast Cameron County: Unserved Areas Study Report

By:
Wayne K. Hunter, P.E.
Shrirang Golhar, P.E.
Sandeep Chaudhari, E.I.T., CFM



January 2012

This project was funded in part by four local Cameron County entities (Laguna Madre Water District, the City of Los Fresnos, the Port of Brownsville, and the East Rio Hondo Water Supply Corporation) and by the Texas Water Development Board.

Table of Contents

1	Executive Summary	1
1.1	Introduction	1
1.2	Methodology	1
1.3	Service Area Delineation	1
1.4	Utility Service Demand Projection.....	5
1.5	Utility Service Options	5
1.6	Recommendations	8
2	Introduction	11
2.1	Objective	11
2.2	Methodology	11
3	Service Area Delineation	15
3.1	Study Area Description	15
3.2	Political Boundaries	15
3.3	Regulatory Considerations	16
3.4	Existing Utility Service	16
3.5	Utility Service Demand Projection.....	23
3.6	Population Projections.....	26
3.7	Water Demand.....	28
3.8	Utility Service Demand.....	29
4	Utility Service Options.....	33
4.1	Service Options from Laguna Madre Water District	64
4.2	Service Options – East Rio Hondo WSC	65
4.3	Service Options – City of Los Fresnos.....	65
4.4	Service Options – Brownsville Public Utilities Board.....	65
4.5	Service Options – Port of Brownsville / Brownsville Navigation District	66
5	Economic Analysis.....	67
5.1	Cost Estimation	67
6	Evaluation of Service Alternatives.....	77
6.1	Evaluation Criteria	77
6.2	Cost/Benefit Analysis.....	82
7	Implementation Considerations.....	85
7.1	Unique Factors of Proposed Service Providers.....	85
7.2	Recommendations for Implementation	87
8	Acknowledgments	101
9	References	103
10	Appendix A – Cost Estimate Tables.....	105
11	Appendix B – Scope	143
12	Appendix C – Public Meeting Documentation.....	149
13	Appendix D – TWDB Draft Report Comments and Responses	159

List of Figures

Figure ES-1	Water CCN boundaries.....	2
Figure ES-2	Wastewater CCN boundaries.....	3
Figure ES-3	Water pipeline and treatment facilities.....	4
Figure ES-4	Recommended water service options	9

Figure ES-5 Recommended wastewater service options	10
Figure 1 Southeast Cameron County unserved study area.....	13
Figure 2 Water CCN boundaries.....	17
Figure 3 Wastewater CCN boundaries.....	18
Figure 4 Wetlands delineation.....	19
Figure 5 Floodplain delineation.	20
Figure 6 Water pipeline and treatment facilities.	21
Figure 7 Wastewater pipeline and treatment facilities.	22
Figure 8 Overall potential development site map.	25
Figure 9 Region M planning area and unserved study area.	27
Figure 10 Parcel A1 North water service options.	38
Figure 11 Parcel A1 North wastewater service options.	39
Figure 12 Parcel A1 South water service options.	41
Figure 13 Parcel A1 South wastewater service options.	42
Figure 14 Parcel A2 North water service options.	44
Figure 15 Parcel A2 North wastewater service options.	45
Figure 16 Parcel A2 South water service options.	47
Figure 17 Parcel A2 South wastewater service options.	48
Figure 18 Parcel A3 water service options.....	50
Figure 19 Parcel A3 wastewater service options.....	51
Figure 20 Parcel A4 water service options.....	53
Figure 21 Parcel A4 wastewater service options.....	54
Figure 22 Parcel A1 Port water service options.	56
Figure 23 Parcel A1 Port wastewater service options.....	57
Figure 24 Parcel A5, A6, & A7 water service options.....	59
Figure 25 Parcel A5, A6, & A7 wastewater service options.....	60
Figure 26 Parcel A8 water service option.	62
Figure 27 Parcel A8 wastewater service options.....	63
Figure 28 Recommended water service options.....	90
Figure 29 Recommended wastewater service options.	91
Figure 30 Water service options by Laguna Madre Water District.	92
Figure 31 Wastewater service options by Laguna Madre Water District.	93
Figure 32 Water service options by Los Fresnos.	94
Figure 33 Wastewater service options by Los Fresnos.	95
Figure 34 Water service options by Brownsville Navigation District.	96
Figure 35 Wastewater service options by Brownsville Navigation District.	97
Figure 36 Water service options by East Rio Hondo Water Supply Corporation.....	98
Figure 37 Water service options by Brownsville Public Utilities Board.	99
Figure 38 Wastewater service options by Brownsville Public Utilities Board.	100

List of Tables

Table ES-1 Residential Service Alternatives	6
Table ES-2 Commercial Service Alternatives	7
Table ES-3 Recommended service options	8
Table 1 Potential development sites.	23
Table 2 Potential development site groups.....	24

Texas Water Development Board Report

Table 3	Population projections.....	26
Table 4	Population density projections.	28
Table 5	Region M year 2000 per capita water use.	29
Table 6	Per capita water use projections.	29
Table 7	Potential residential development sites and associated water and wastewater demands. ...	31
Table 8	Potential commercial development sites and associated water and wastewater demands. .	32
Table 9	Participating entities’ water and wastewater treatment plant capacities.	33
Table 10	Water and wastewater service options for residential development sites.	35
Table 11	Water and wastewater service options for commercial development sites.	36
Table 12	Residential development sites that can be served by LMWD.....	64
Table 13	Commercial development sites that can be served by LMWD.	64
Table 14	Residential development sites that can be served by East Rio Hondo WSC.	65
Table 15	Residential development sites that can be served by City of Los Fresnos.....	65
Table 16	Residential development sites that can be served by Brownsville PUB.	66
Table 17	Commercial development sites that can be served by Brownsville PUB.	66
Table 18	Residential development sites that can be served by Port of Brownsville/BND.	66
Table 19	Commercial development sites that can be served by Port of Brownsville/BND.....	66
Table 20	Monthly base rates for residential customers (water and wastewater).....	69
Table 21	Monthly base rates for commercial customers (water and wastewater).....	69
Table 22	Water service options cost summary for residential development sites.....	71
Table 23	Wastewater service options cost summary for residential development sites.....	73
Table 24	Water service options cost summary for commercial development sites.....	75
Table 25	Wastewater service options cost summary for commercial development sites.	75
Table 26	Situational parameters and criticality factor.....	77
Table 27	Situational parameters and criteria for criticality rating for residential development sites.....	78
Table 28	Situational parameters and criteria for criticality rating for commercial development sites. .	78
Table 29	Residential development sites evaluation matrix for water and wastewater service options..	79
Table 30	Commercial development sites evaluation matrix for water and wastewater service options.	80
Table 31	Evaluation matrix summary for water services.....	80
Table 32	Evaluation matrix summary for wastewater services.....	81
Table 33	Potential viable water service options for residential development sites.....	83
Table 34	Potential viable wastewater service options for residential development sites.....	83
Table 35	Potential viable water service options for commercial development sites.....	83
Table 36	Potential viable wastewater service options for commercial development sites.....	83
Table 37	Water and wastewater services by different providers considering CCNs and viability of providing both services.....	87
Table 38	Recommended service options.....	89

Tables CE-1 through CE-36 available in Appendix A

This page is intentionally blank.

1 Executive Summary

1.1 Introduction

Southeast Cameron County, Texas, encompasses a number of entities including cities, special purpose districts, and a water supply corporation which provide water and wastewater services to dedicated constituencies. Within this area are four entities whose jurisdictions encircle a vast 16,869 acre area that has little to no water or wastewater utility services. This currently undeveloped area is referenced as “unserved area.”

These four entities are:

1. Laguna Madre Water District (LMWD)
2. City of Los Fresnos
3. East Rio Hondo Water Supply Corporation (ERHWSC)
4. Port of Brownsville/Brownsville Navigation District (BND)

Each of these four entities provided representatives to form a group known as the Technical Advisory Committee (TAC) to provide local guidance to Espey Consultants during the course of the study.

The proximity of this unserved area to major highways, the Laguna Madre, major nearby recreational venues, and a navigation canal portends future development potential, a notion supported by periodic private sector land development proposals. This study is intended to define the potential demand for water and wastewater service within this unserved area, to evaluate alternative service options, and to recommend a plan for such service to meet future needs of this type in the study area. The results of the study can then be incorporated into the planning for local service providers.

The objective of this study is to identify various water and wastewater service alternatives to serve the identified unserved areas.

1.2 Methodology

In order to evaluate water and wastewater service options for the unserved areas of Southeast Cameron County, it was critical to understand the jurisdiction of boundaries of those entities which are presently providing water and wastewater services in the vicinity of the study area. Once the jurisdictions were known, unserved areas were confirmed, demands were developed, and water and wastewater options were then identified.

1.3 Service Area Delineation

The political jurisdiction and service boundaries of cities and special districts are defined as shown on **Figure ES-1** and **Figure ES-2**. Using the factors of political boundaries, wetlands and floodplains as described above, land with a potential for development within the study area was divided into parcels and assigned land uses based on input from the project participants. These developable parcels are shown on **Figure ES-3**.

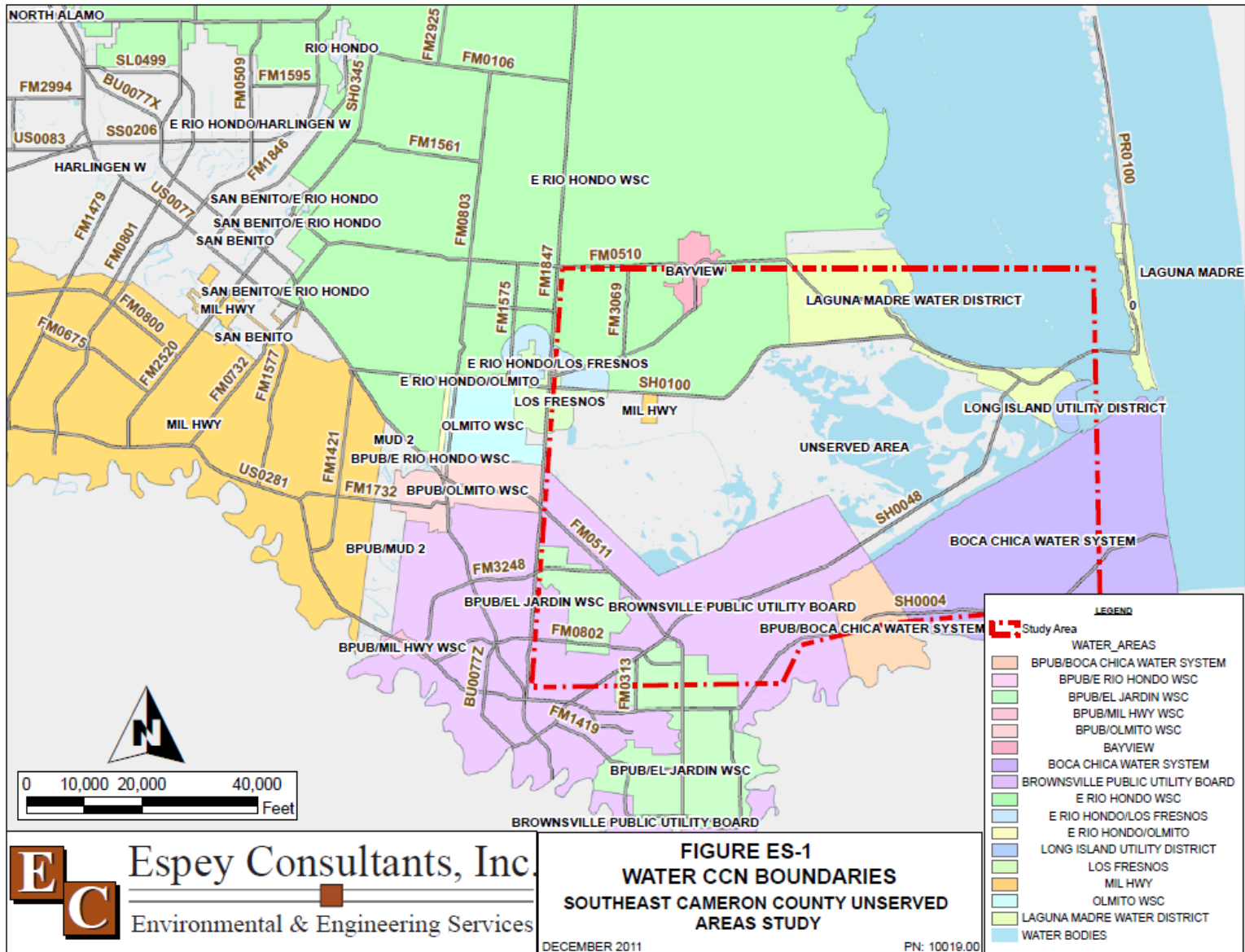


Figure ES-1 Water CCN boundaries.

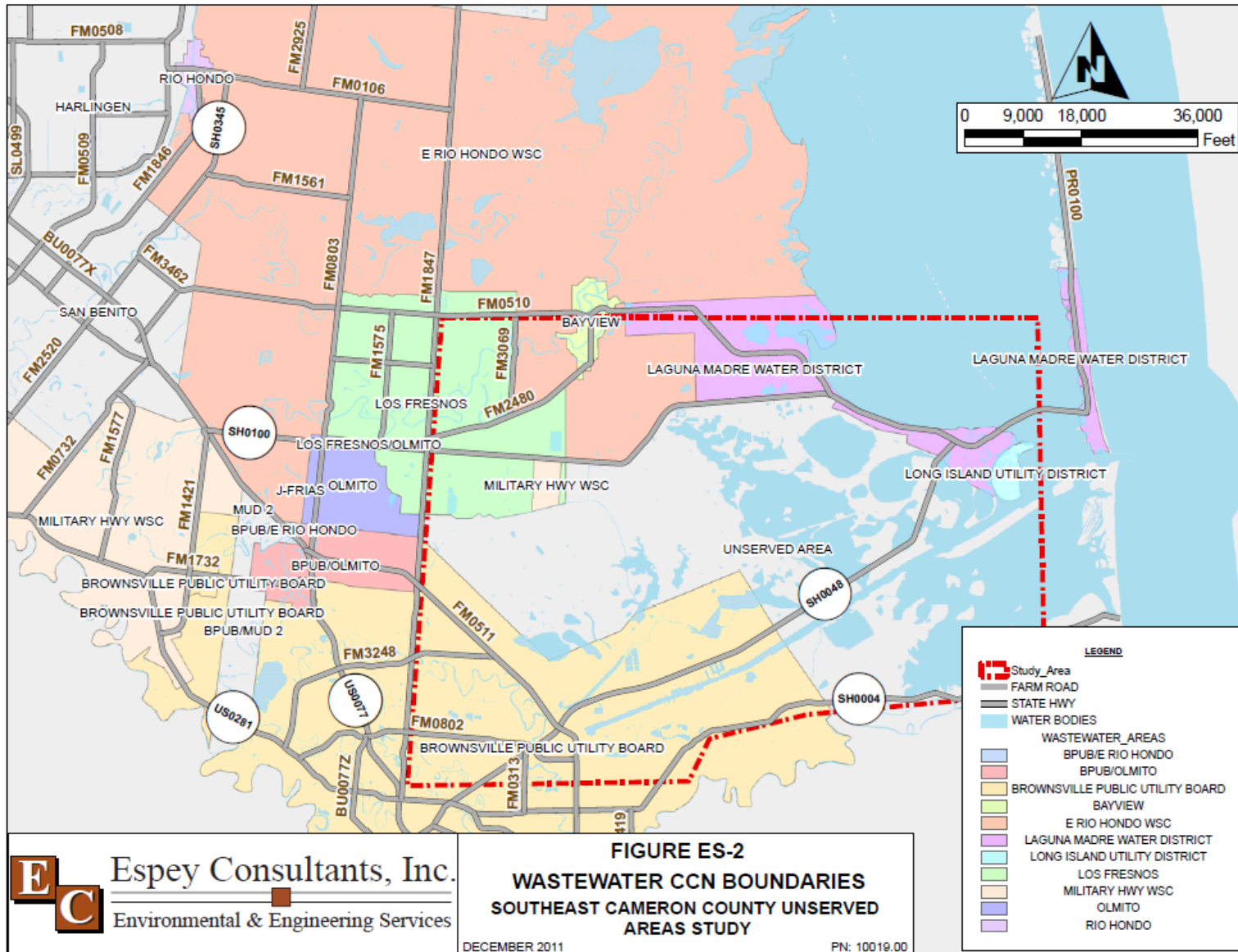


Figure ES-2 Wastewater CCN boundaries.

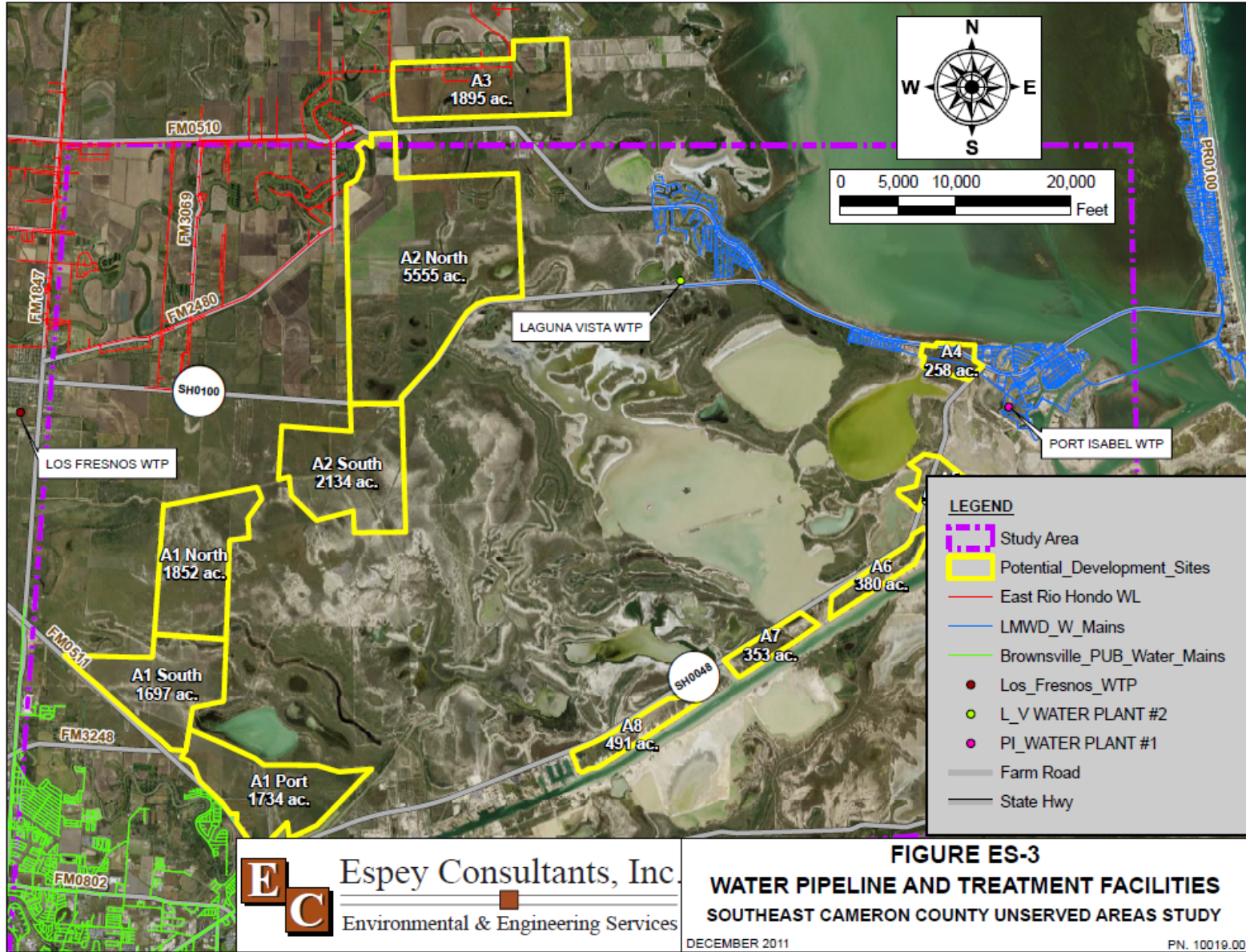


Figure ES-3 Water pipeline and treatment facilities.

1.4 Utility Service Demand Projection

Using the geo-referenced mapping developed for this project, it was determined that the study area encompasses a total of approximately 16,869 acres of developable land. After reviewing the constraints of political boundaries, wetlands, floodplains and distance from existing utility facilities, the total area of developable land was divided into nine development parcels. Using the local development regulations, zoning and land use criteria, the TAC determined that 13,391 acres in four of the parcels are suitable for residential development and the remaining 3,478 acres are suitable for industrial/commercial development.

The Technical Advisory Committee considered the projected water demands presented in the 2011 Region M Water Plan and applied the development ordinances of each of the project participants to arrive at a common set of criteria for projecting water demand and wastewater flows for parcels within the study area. The following assumptions were established for the demand projection process.

1. Absorption rate: The rate at which the acreage will be developed is projected to be approximately 515 acres/year. At this rate, approximately 50% of the developable acreage will be developed during the period of 2011-2020.
2. Residential density:
 - a. Parcel A1 North & South established as 2 units per acre.
 - b. Parcel A2 North & South established as 1.33 units per acre.
 - c. Parcel A3 & A4 established as 4 units per acre.
3. Residential occupancy: 3 persons/unit
4. Residential demand:
 - a. Parcels A1, A2, & A3 demands are assumed to be approximately 125 gallons per capita per day (gpcd), with 150 gpcd demand assigned for Parcel A4. TCEQ requires using 0.6 gpm/connection to develop water demand. The larger of these two demands were utilized in the calculation.
 - b. Residential wastewater flow: 100 gpcd (per TCEQ Chap. 217 Table B.1 Design Organic Loadings and Flows for a New Facility).
5. Industrial demand:
 - a. Industrial water demand established as 5,000 gallons per acre per day (Water demands observed in similar studies).
 - b. Industrial wastewater flow established as 3,500 per acre per day (Wastewater generation rates observed in similar studies).

1.5 Utility Service Options

Several options were identified to provide water and wastewater services to these potential development sites. Based upon the availability of existing water or wastewater service adjacent to the study area, each development parcel within the study area was subjected to consideration by existing utility service. When existing utility service was not available or when only one existing utility service option existed, a new service option was established by assuming the viability of a new water or wastewater treatment facility, to aid in the comparison of options for service. Those options for residential and commercial are summarized in **Table ES-1** and **Table ES-2**, respectively.

Table ES-1 Residential service alternatives.

Parcels	Water Demand (mgd)	Wastewater Generated (mgd)	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 North	0.80	0.278	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.
			Option 2	Treated water provided by East Rio Hondo WSC.	Option 2	Treated on-site.
			Option 3	Raw water from LMWD Cuates Pump Station and treated on-site.	-	-
A1 South	1.48	0.514	Option 1	Treated water from Brownsville PUB existing water distribution system.	Option 1	Wastewater collected, pumped, and treated at Brownsville PUB WWTP.
			Option 2	Treated water from Port of Brownsville existing water distribution system.	Option 2	Wastewater collected, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
					Option 3	Treated on-site.
A2 North	1.92	0.667	Option 1	Treated water provided by East Rio Hondo WSC.	Option 1	Wastewater collected, pumped, and treated at LMWD Laguna Vista WWTP.
			Option 2	Treated water from LMWD WTP No. 2.	Option 2	Treated on-site.
			Option 3	Raw water from LMWD and treated on-site.		
A2 South	0.74	0.256	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.
			Option 2	Supply raw water by tapping one of the two existing raw water lines conveying raw water from LMWD Cuates PS to WTP No.2 and treated on-site.	Option 2	Treated on-site.
			Option 3	Treated water supplied by ERH WSC by connecting to Ex. 12" WL	-	-
A3	1.96	0.682	Option 1	Treated water from East Rio Hondo WSC 12" waterline.	Option 1	Wastewater collected, pumped, and treated at LMWD Laguna Vista WWTP.
			Option 2	Treated water from LMWD WTP No. 2	Option 2	Wastewater collected and treated on-site.
A4	0.31	0.108	Option 1	Treated water from LMWD's existing water distribution system.	Option 1	Wastewater collected, connected, and treated at LMWD Port Isabel WWTP No. 1.

Table ES-2 Commercial service alternatives.

Parcels	Water Demand (mgd)	Wastewater Generated (mgd)	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 Port	3.035	2.124	Option 1	Connect to Port of Brownsville/BND existing water distribution line.	Option 1	Wastewater collected, pumped, and treated at BPUB’s Robindale WWTP.
			Option 2	Connect to Brownsville PUB’s existing water distribution line.	Option 2	Wastewater collected, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
A5	0.910	0.637	Option 1	Treated water from LMWD Ex. 24-inch Waterline.	Option 1	Wastewater collected, pumped, and treated at LMWD Port Isabel WWTP.
					Option 2	Send WW flow to an on-site wastewater treatment facility located on parcel A6 and designed for Parcel A5, A6, & A7.
A6	0.665	0.466	Option 1	Extend proposed water distribution of Parcel A5 up to Parcel A6 connecting to LMWD Ex. 24-inch Waterline.	Option 1	Wastewater collected along with Parcel A5, pumped, and treated at LMWD Port Isabel WWTP.
					Option 2	Operate an on-site wastewater treatment facility for all of the southern (commercial) development.
A7	0.618	0.432	Option 1	Extend proposed water distribution of Parcel A5 up to Parcel A7 connecting to LMWD Ex. 24-inch Waterline.	Option 1	Wastewater collected along with Parcel A5 & A6, pumped, and treated at LMWD Port Isabel WWTP.
					Option 2	Send WW flow to an on-site wastewater treatment facility located on parcel A6 and designed for Parcel A5, A6, & A7.
A8	0.859	0.601	Option 1	Connect to Port of Brownsville/BND existing water distribution line.	Option 1	Wastewater collected, pumped, and treated at Brownsville/BND Fishing Harbor WWTP.
					Option 2	Wastewater collected along with Parcel A8, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
					Option 3	Operate an on-site wastewater treatment facility for all of the southern (commercial) development.

1.6 Recommendations

This report has examined areas within Southeastern Cameron County which lack water and wastewater services for the purpose of identifying and evaluating alternatives to providing this service. The study was funded by the TWDB (50%) and the local cost share (50%) of the study was funded by four entities which have jurisdictions that surround the unserved areas and for the most part, have water and wastewater service available to portions of the service area. The analysis of the options has produced the most cost effective options for water and wastewater service and a risk analysis has augmented this cost analysis to better determine the most viable option for service. The following table, **Table ES-3**, lists all the recommended options for water and wastewater services. The recommended water and wastewater service options are presented in **Figures ES-4** and **ES-5**, respectively.

Table ES-3 Recommended service options.

Service Providing Agency	Parcels	Options	Area (acres)		Water Demand (mgd)	Wastewater Generated (mgd)
			Gross	Developed		
Laguna Madre Water District (LMWD)	A2 North	Wastewater	5,555	3,333	-	0.667
	A3	Wastewater	1,895	1,137	-	0.682
	A4	Water	258	180.6	0.31	-
		Wastewater			-	0.108
	A5, A6, & A7	Water	1,253	877	2.19	1.54
Wastewater						
City of Los Fresnos	A1 North	Water	1,852	926	0.80	0.278
		Wastewater				
	A2 South	Water	2,134	1,280	0.74	0.256
		Wastewater				
Brownsville Navigation District (BND)	A1 South	Water	1,697	849	0.73	-
	A1 Port	Water	1,734	1,214	3.035	-
	A8	Water	491	344	0.859	-
	A1 South	Wastewater	1,697	849	-	0.255
	A1 Port	Wastewater	1,734	1,214	-	2.124
	A8	Wastewater	491	344	-	0.601
East Rio Hondo Water Supply Corporation (ERH WSC)	A2 North	Water	5,555	3,333	1.92	-
	A3	Water	1,895	1,137	1.96	-
Brownsville Public Utilities Board (PUB)	A1 South	Water	1,697	849	0.73	0.255
		Wastewater				
	A1 Port	Water	1,734	1,214	3.035	2.124
		Wastewater				
A8	Wastewater	491	344	-	0.601	

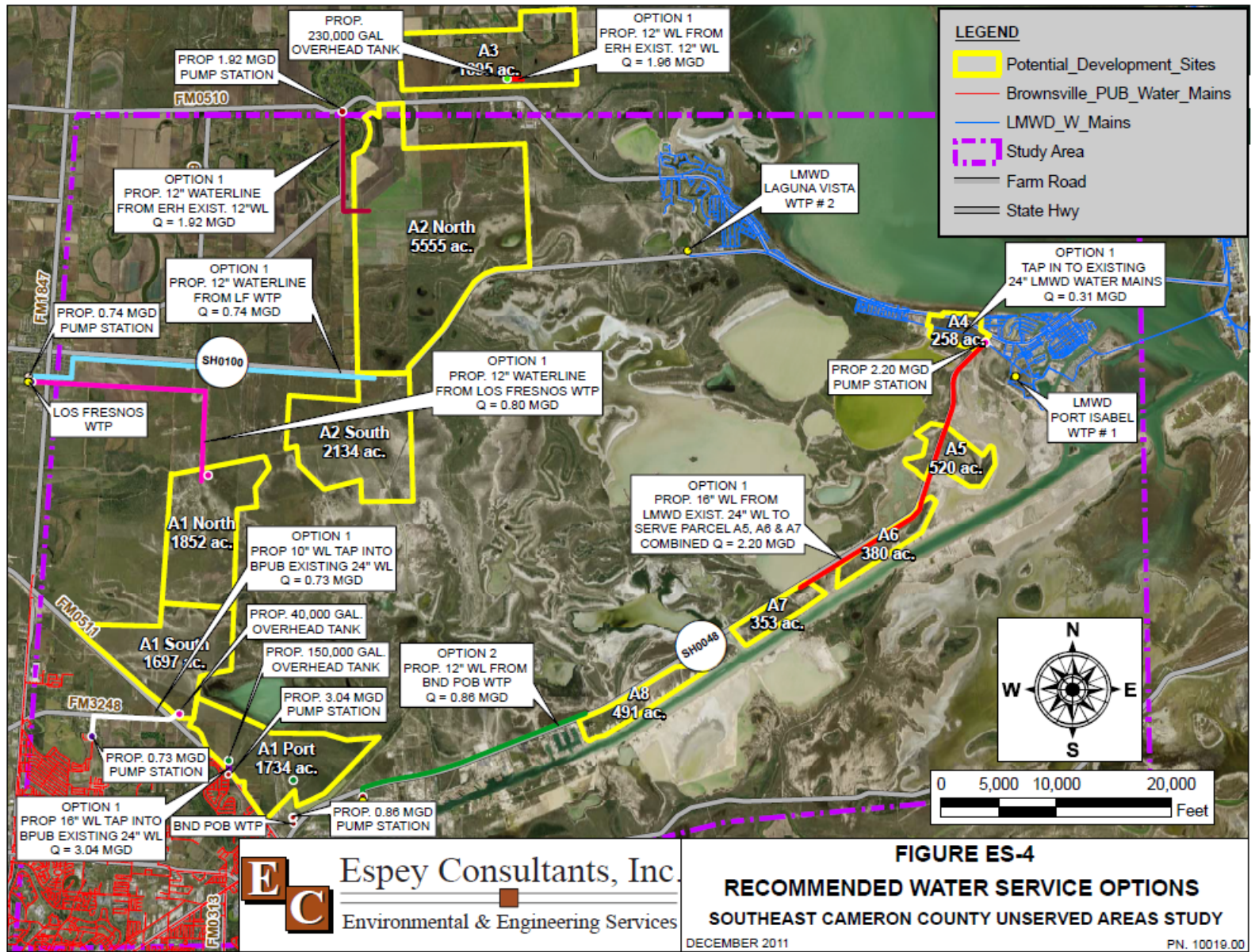


Figure ES-4 Recommended water service options.

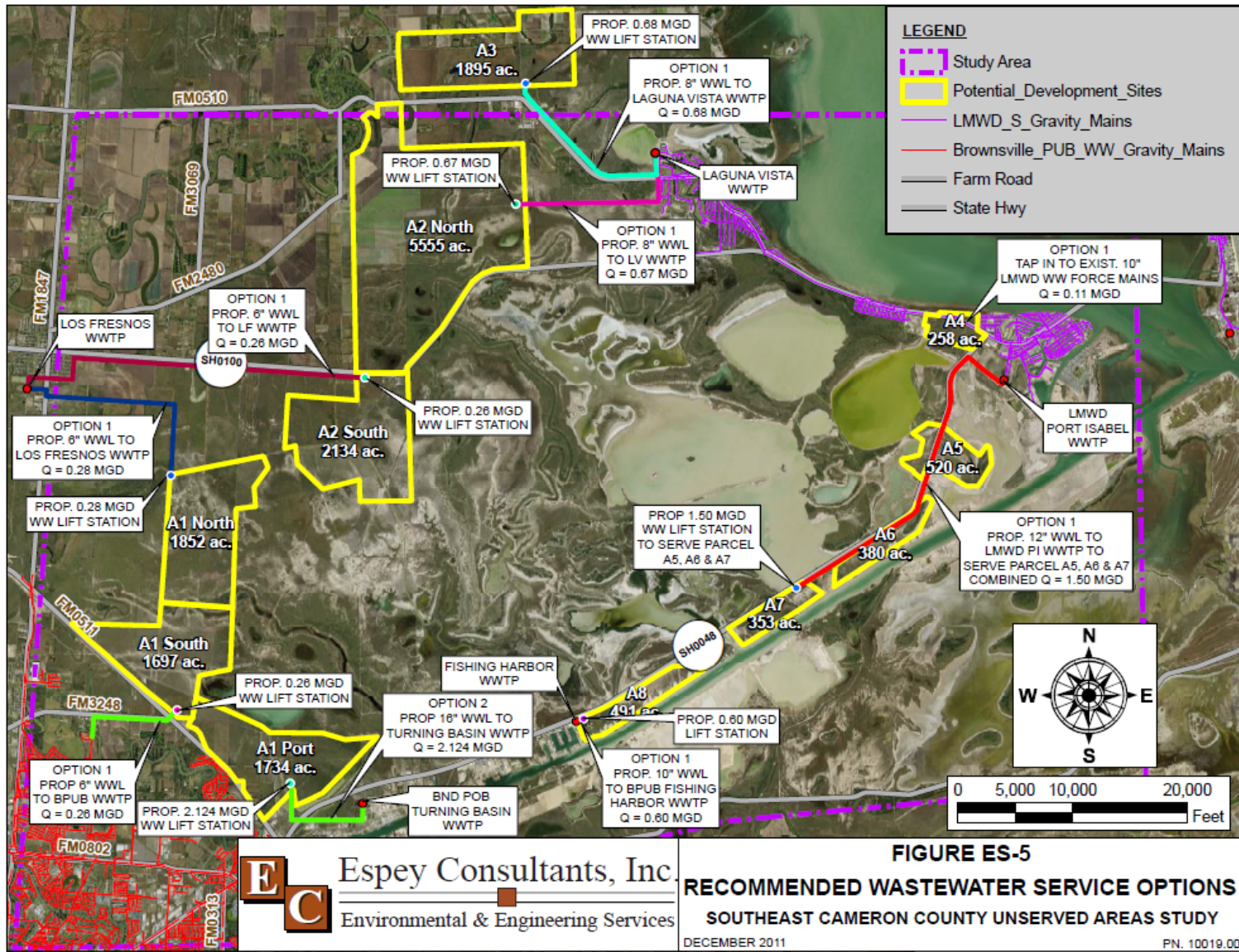


Figure ES-5 Recommended wastewater service options.

2 Introduction

Southeast Cameron County, Texas, encompasses a number of entities including cities, special purpose districts, and a water supply corporation which provide water and wastewater services to dedicated constituencies. Within this area are four entities whose jurisdictions encircle a vast 16,869 acre area that has little to no water or wastewater utility services. This currently undeveloped area is referred to as an “unserved area.”

These four entities are:

1. Laguna Madre Water District (LMWD)
2. City of Los Fresnos
3. East Rio Hondo Water Supply Corporation (ERH WSC)
4. Port of Brownsville/Brownsville Navigation District (BND)

Each of these four entities provided representatives to form a group known as the Technical Advisory Committee (TAC) to provide local guidance to Espey Consultants during the course of the study.

The proximity of this unserved area to major highways, the Laguna Madre, major nearby recreational venues, and a navigation canal portends future development potential, a notion supported by periodic private sector land development proposals. This study is intended to define the potential demand for water and wastewater service within this unserved area, to evaluate alternative service options, and to recommend a plan for such service to meet future needs of this type in the study area. The results of the study can then be incorporated into the planning for local service providers.

The scope of this study is presented in Appendix B.

2.1 Objective

The objective of this study is to identify various water and wastewater service alternatives to serve the identified unserved areas.

Figure 1 shows the general vicinity map of Southeast Cameron County identifying the cities and their boundaries in and around the unserved study area.

2.2 Methodology

In order to evaluate water and wastewater service options for the unserved areas of Southeast Cameron County, it is critical to understand the jurisdiction of boundaries of those entities which are presently providing water and wastewater services in the vicinity of the study area. Once the jurisdictions are known, unserved areas can be confirmed, demands can be developed, and water

and wastewater options can then be identified. This process will be carried forward using the following information:

To conduct this study, several pieces of information were collected and processed. The information required for this study is listed as follows:

- Service Area Delineation
 - Public Entity Maps that are in and around the proposed study area,
 - Existing Utilities Maps
 - Specific Service Region Maps
- Demand Development
 - Data Collection from Regional Databases
 - Individual Community Population Data
 - Local Water and Wastewater Utilization Rates
- Water and Wastewater Service Options
 - Data from area water system infrastructure
 - Data from area wastewater system infrastructure

Utilizing the above-referenced information, evaluation criteria was then developed to define the preliminary service requirements. The Technical Advisory Committee utilized the development ordinances from the surrounding water and wastewater service providing entities to establish criteria for use in developing demands for evaluating and comparing alternative service options. The methodology deployed as a consensus with the Technical Advisory Committee members was to utilize the following five steps:

1. Establishing the absorption rate of the unserved areas within the study area over the next ten years;
2. Distributing the determined absorption rate uniformly across the study area to define a percent developable by year 2020;
3. Assigning a proposed density per parcel in the study area based on its proximity to existing communities or developed areas;
4. Assigning an occupancy based on TCEQ criteria or criteria available from prior studies; and
5. Applying TCEQ criteria or local documented water demands for commercial and residential uses when adjacent to existing development.

Using these criteria, treatment and distribution/collection alternatives were proposed for specific service regions.

The alternatives for water and wastewater service were then subjected to evaluation, and a recommended set of alternatives for each portion of the study area was subjected to review and discussion through the Technical Advisory Committee.

The entire process for study execution was presented through a series of publicly advertised Public Meetings. Documentation regarding the timing and attendees of these meetings is included in Appendix C.

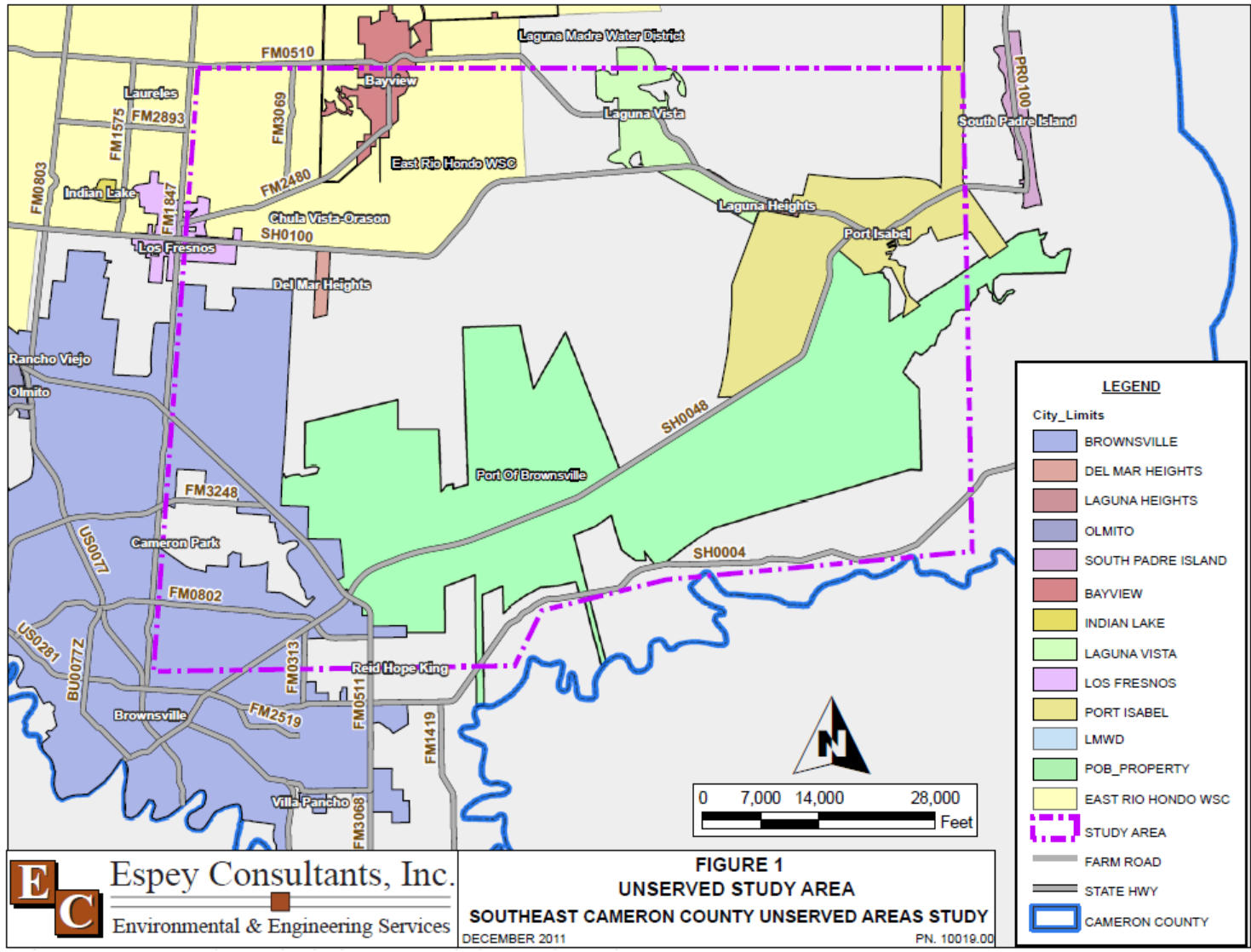


Figure 1 Southeast Cameron County unserved study area.

This page is intentionally blank.

3 Service Area Delineation

There are three key factors that influence the potential for water and sewer utility service within the study area. These factors are 1) the political boundaries of cities, districts, and service areas; 2) regulatory considerations; and 3) the location and features of developable tracts of land.

3.1 Study Area Description

Located in the Rio Grande River basin in southeastern Cameron County, the study area is characterized by gently sloping terrain that extends from west to east towards the Laguna Madre, a shallow bay lying between the mainland and South Padre Island. The southern portion of the study area drains south to the Brownsville Ship Channel. The low elevation and close proximity to the Laguna Madre combine to create natural shallow basins or resacas that capture low velocity surface flows.

3.2 Political Boundaries

The political jurisdiction and service boundaries of cities and special districts are defined as shown on **Figure 2** and **Figure 3**. By recognizing the established service jurisdiction of these entities, areas not served are more clearly defined.

1. The eastern side of the study area is formed by the corporate limits of Laguna Heights and the cities of Port Isabel and Laguna Vista, plus the Port of Brownsville/Brownsville Navigation District (BND). In addition to the Cities and Port of Brownsville, Water Certificate of Convenience and Necessities (CCNs) for Laguna Madre Water District, Long Island Utility District and Boca Chica Water System encompass areas in the eastern part of the study area.
2. The southern part of the study area is located within the City of Brownsville's Public Utilities Board (BPUB) water and sewer utility CCN. Areas of joint certification exist where the BPUB CCN overlaps with the Port of Brownsville/BND, Boca Chica Water System, and El Jardin WSC CCNs.
3. The western portion of the study area is formed by the corporate limits of Cameron Park, the City of Los Fresnos, and the BPUB CCN.
4. The northern boundary of the study area is formed by the East Rio Hondo Water Supply Corporation and Laguna Madre CCNs, and the corporate limits of the cities of Bayview, Del Mar Heights, and Chula Vista-Orason. In addition to that portion of the study area that is shown in **Figure 2** and **Figure 3** that are not presently served by any of the area's water or sewer utilities, a portion of the area within the BPUB CCN and within the Port of Brownsville Navigation District presently has no water or sewer utility service as the area is beyond the existing BPUB infrastructure.

3.3 Regulatory Considerations

There are two factors that are considered additionally in delineating the unserved area to be considered for future water and wastewater service: wetlands and regulatory floodplain.

The discharge of dredged or fills material into waters of the United States is regulated under Section 404 of the Clean Water Act. The Rivers and Harbors Act of 1899 defined navigable waters of the United States as “those waters that are subject to the ebb and flow of the tides and/or are presently used, or have been used in the past, or maybe susceptible to use to transport interstate or foreign commerce.” The Clean Water Act builds on this definition and defines waters of the United States to include tributaries to navigable waters, interstate wetlands, wetlands which could affect interstate or foreign commerce, and wetlands adjacent to other waters of the United States. The fundamental rationale of the program is that no discharge of dredged or fill material should be permitted if there is a practicable alternative that would be less damaging to our aquatic resources or if significant degradation would occur to the nation’s waters.

The area of potential wetlands (USFWS, 2010) is shown in **Figure 4**. The area of potential wetlands in the study area is a reflection of the proximity of the area to the Laguna Madre and represents areas in which development may be limited due to the cost of remediation for wetlands affected by construction.

As shown in **Figure 5**, the 100-year floodplain and areas determined to be within the 500-year floodplain, encompass the entire study area (FEMA, 1983; FEMA, 1991; FEMA, 1992; FEMA, 1999). Floodplain management is the operation of a community program of corrective and preventative measures for reducing flood damage. As participants in the National Flood Insurance Program (NFIP), Cameron County and the cities in the study area have adopted measures that generally include requirements for zoning, subdivision ordinances and building codes designed to meet the preventive and corrective aspects of floodplain management. Each community's agreement to adopt and enforce floodplain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Floodplain management ordinances typically allow construction within the floodplain provided the finished floor elevation is higher than the base flood elevation (BFE) as determined by FEMA. This elevation requirement can be in the construction of the building or in filling parcels in order to provide building sites that are higher than the BFE.

Using the factors of political boundaries, wetlands and floodplains as described above, land with a potential for development within the study area was divided into parcels and assigned land uses based on input from the project participants. These developable parcels are shown on **Figure 6**.

3.4 Existing Utility Service

In the vicinity of the unserved areas within the study area, all existing utility infrastructure was identified for water and wastewater services being provided adjacent to the unserved areas. These facilities were assumed to be candidates for providing service to the unserved areas. In those cases where treatment facilities were in place, existing capacities were defined for both water and wastewater facilities. Water and wastewater pipelines and treatment facilities identified adjacent to the service area are illustrated on **Figure 6** and **7**.

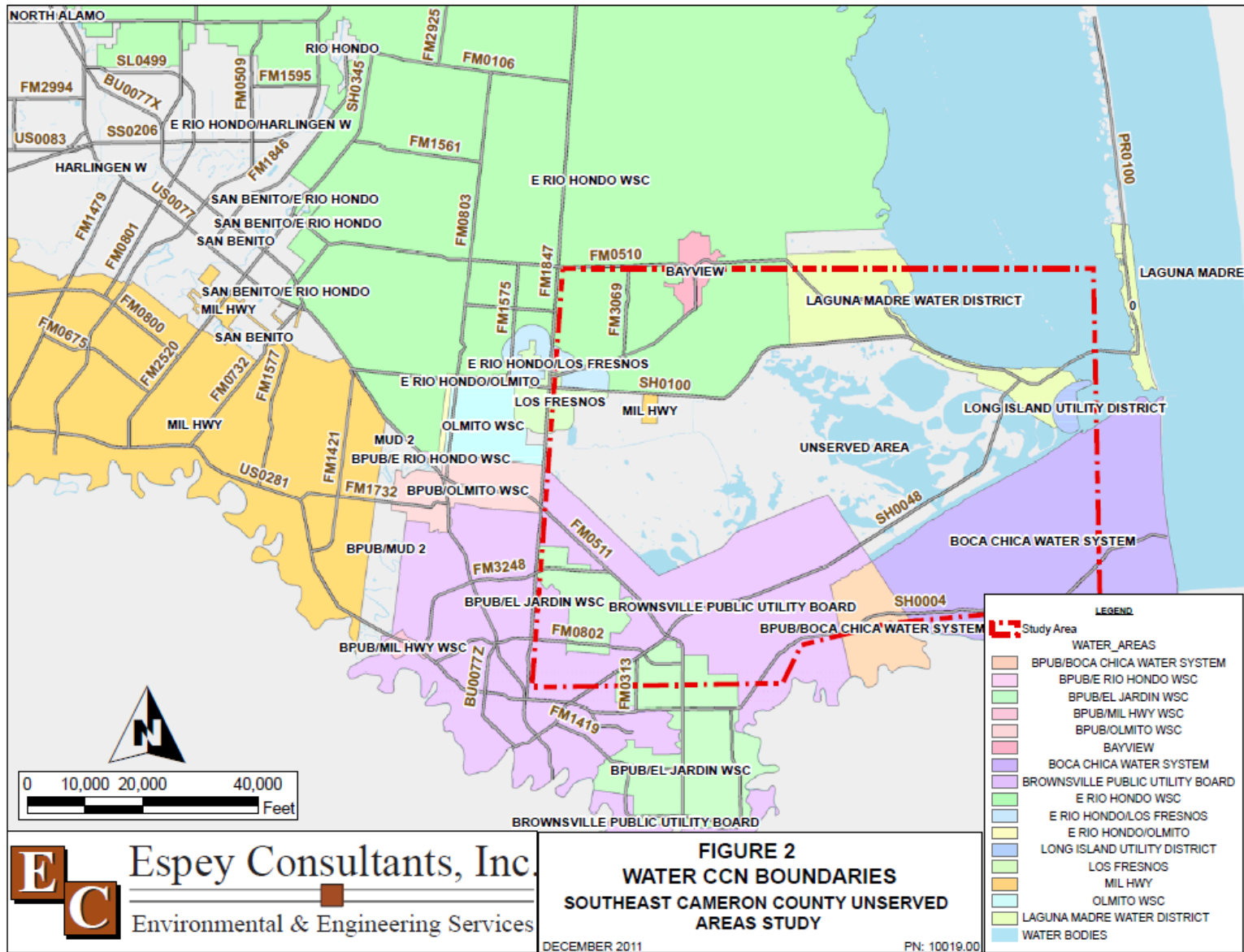


Figure 2 Water CCN boundaries.

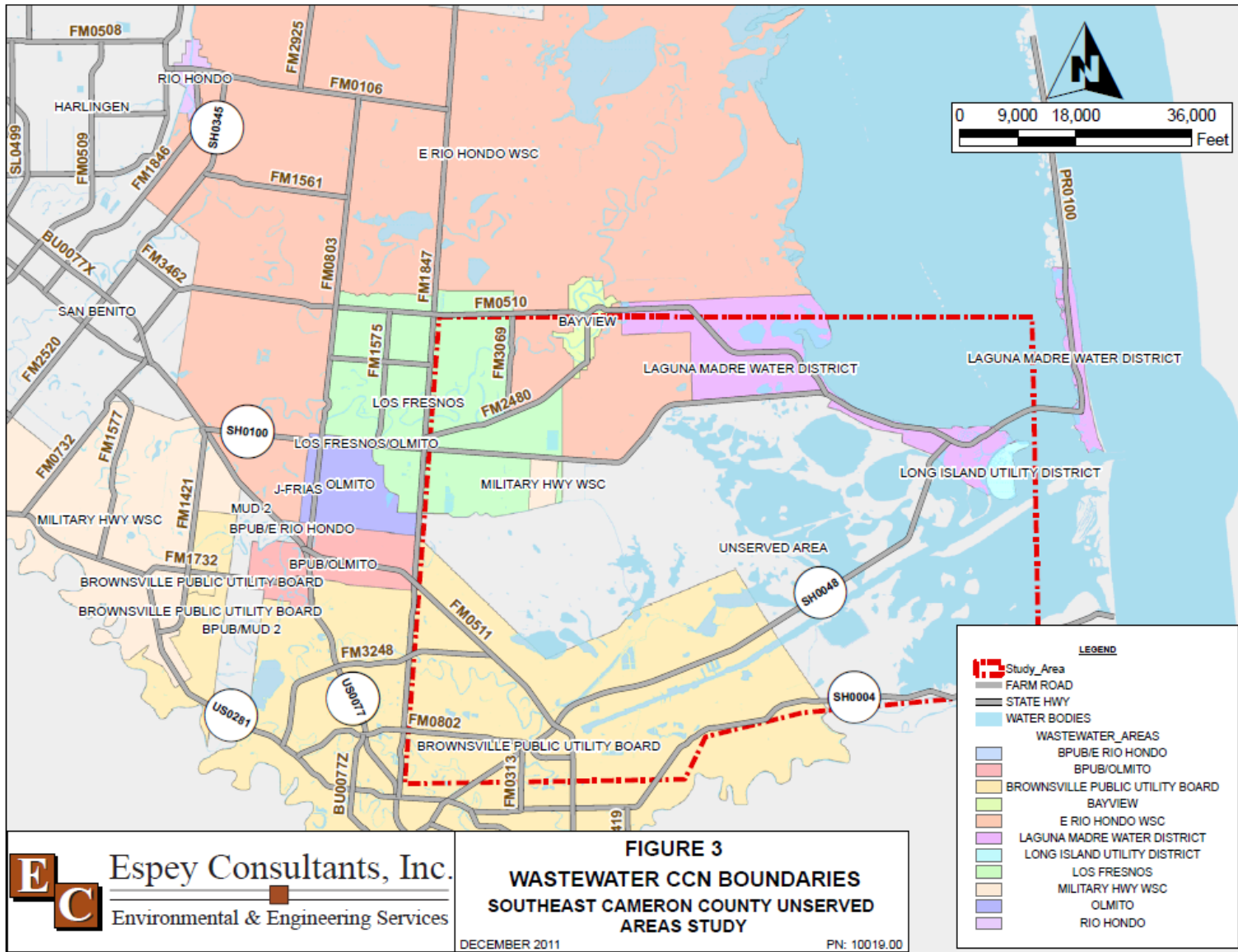


Figure 3 Wastewater CCN boundaries.

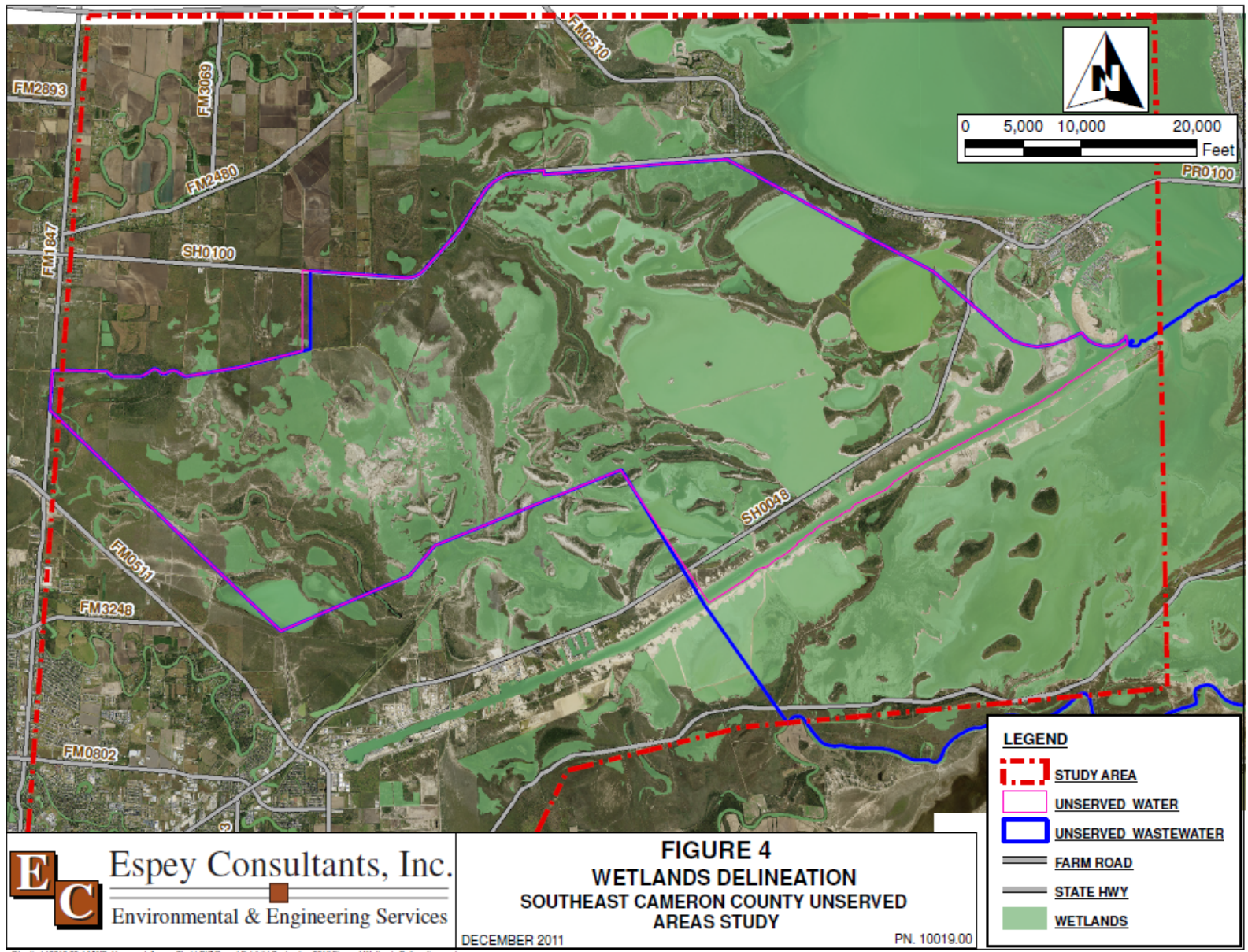


Figure 4 Wetlands delineation.

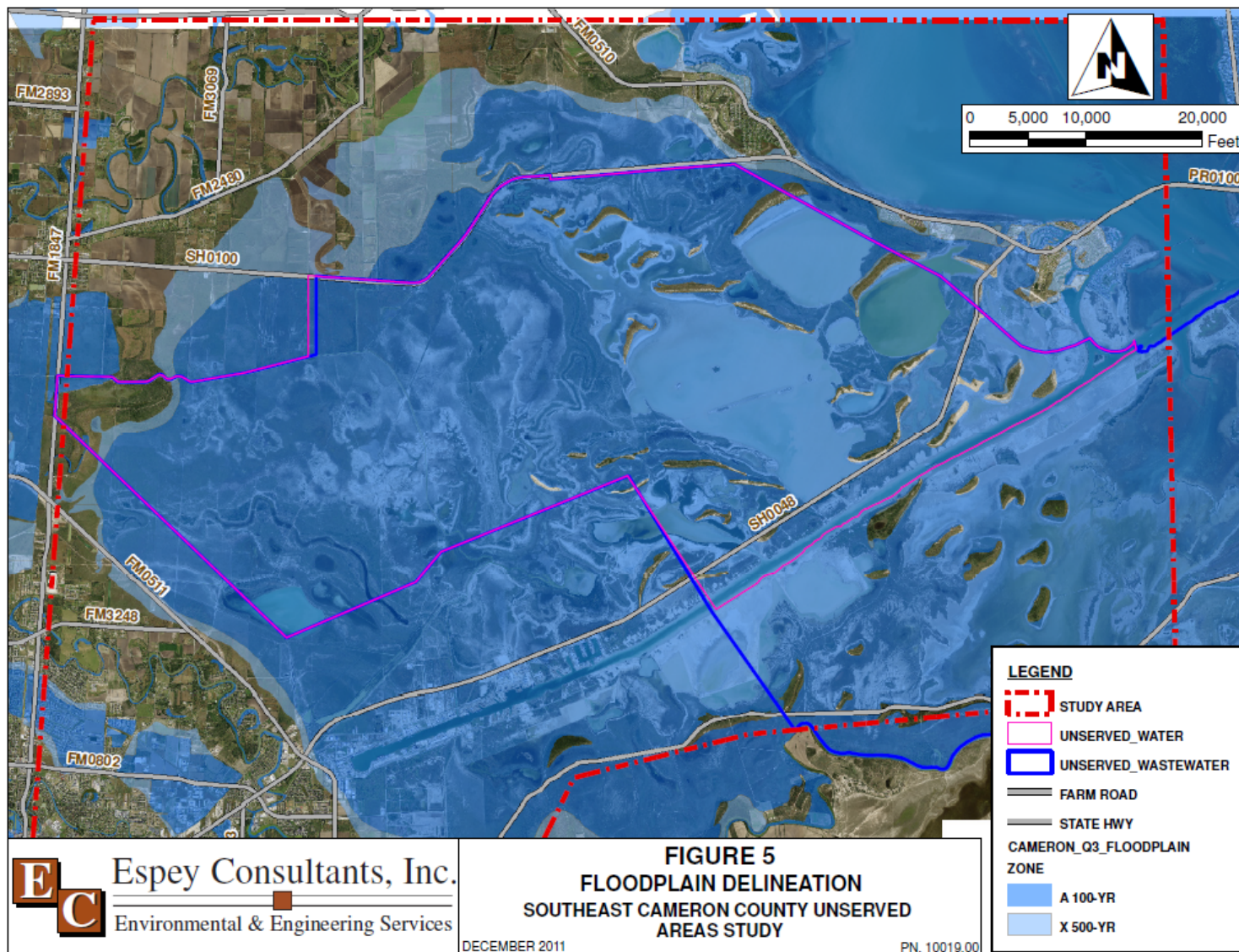


Figure 5 Floodplain delineation.

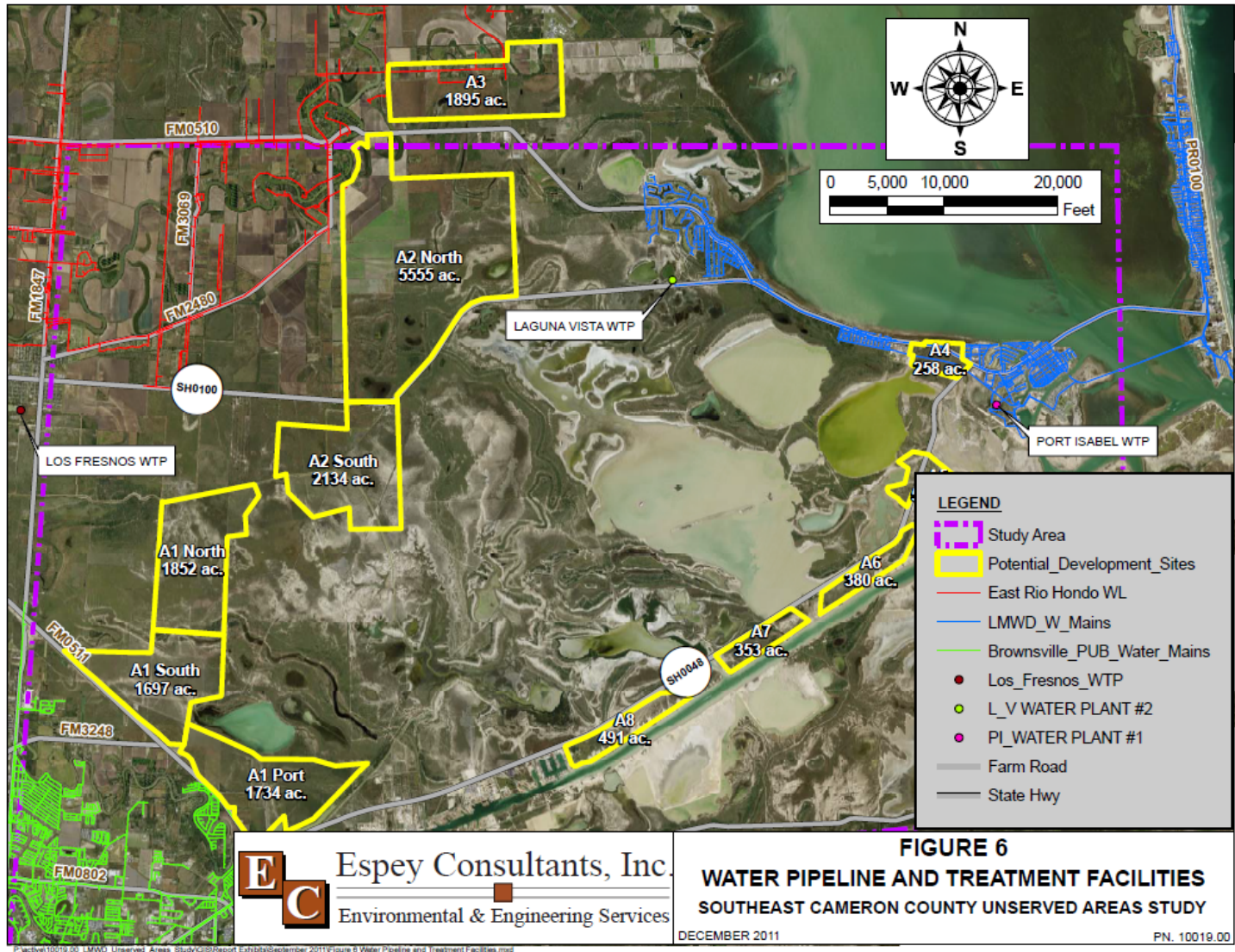


Figure 6 Water pipeline and treatment facilities.

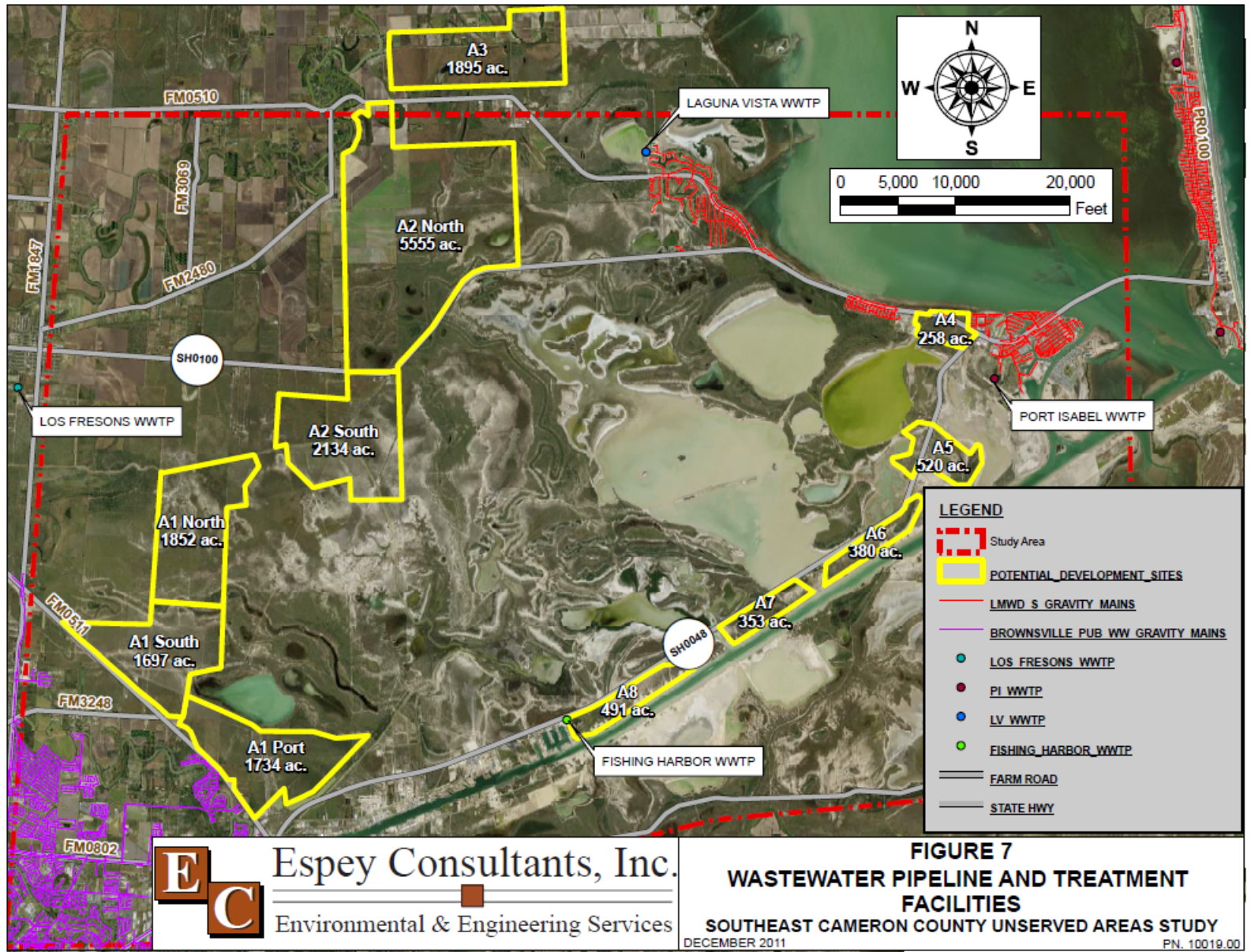


Figure 7 Wastewater pipeline and treatment facilities.

3.5 Utility Service Demand Projection

3.5.1 Service Area

Using the geo-referenced mapping developed for this project, it was determined that the study area encompasses a total of approximately 16,869 acres of developable land. After reviewing the constraints of political boundaries, wetlands, floodplains and distance from existing utility facilities, the total area of developable land was divided into eleven development parcels (**Figure 8**). Using the local development regulations, zoning and land use criteria, the Advisory Committee determined that 13,391 acres in four of the parcels are suitable for residential development and the remaining 3,478 acres are suitable for industrial/commercial development.

As shown in **Table 1**, the gross area of each parcel was then adjusted for site development features of roads, reclamation offsets by factors of 30% to 50% of the total parcel. The remaining acreage of each parcel was used to develop projected demands for water and wastewater utility service.

Table 1 Potential development sites.

Development Sites	Overall Area (acres)	Type	Area Reserved for Transportation and Reclamation (%)	Area Available for Development (acres)
A1-North	1,852	Residential	50%	926
A1-South	1,697	Residential	50%	849
A2-North	5,555	Residential	40%	3,333
A2-South	2,134	Residential	40%	1,280
A3	1,895	Residential	40%	1,137
A4	258	Residential	30%	181
A1 Port	1,734	Commercial	30%	1,214
A5	520	Commercial	30%	364
A6	380	Commercial	30%	266
A7	353	Commercial	30%	247
A8	491	Commercial	30%	344
Note: Approximately 30% to 50% of the development sites area is reserved for roads, parking, and reclamation areas such as parks, playing fields etc.				

These identified potential development sites are further grouped and listed in **Table 2**.

Table 2 Potential development site groups.

Group	Potential Development Areas
Port Area	Parcel A1 Port
	Parcel A5
	Parcel A6
	Parcel A7
	Parcel A8
Northern Area	Parcel A3
Laguna Vista West Area	Parcel A2 North
Remaining Unserved Area	Parcel A4
	Parcel A1 North
	Parcel A1 South
	Parcel A2 South

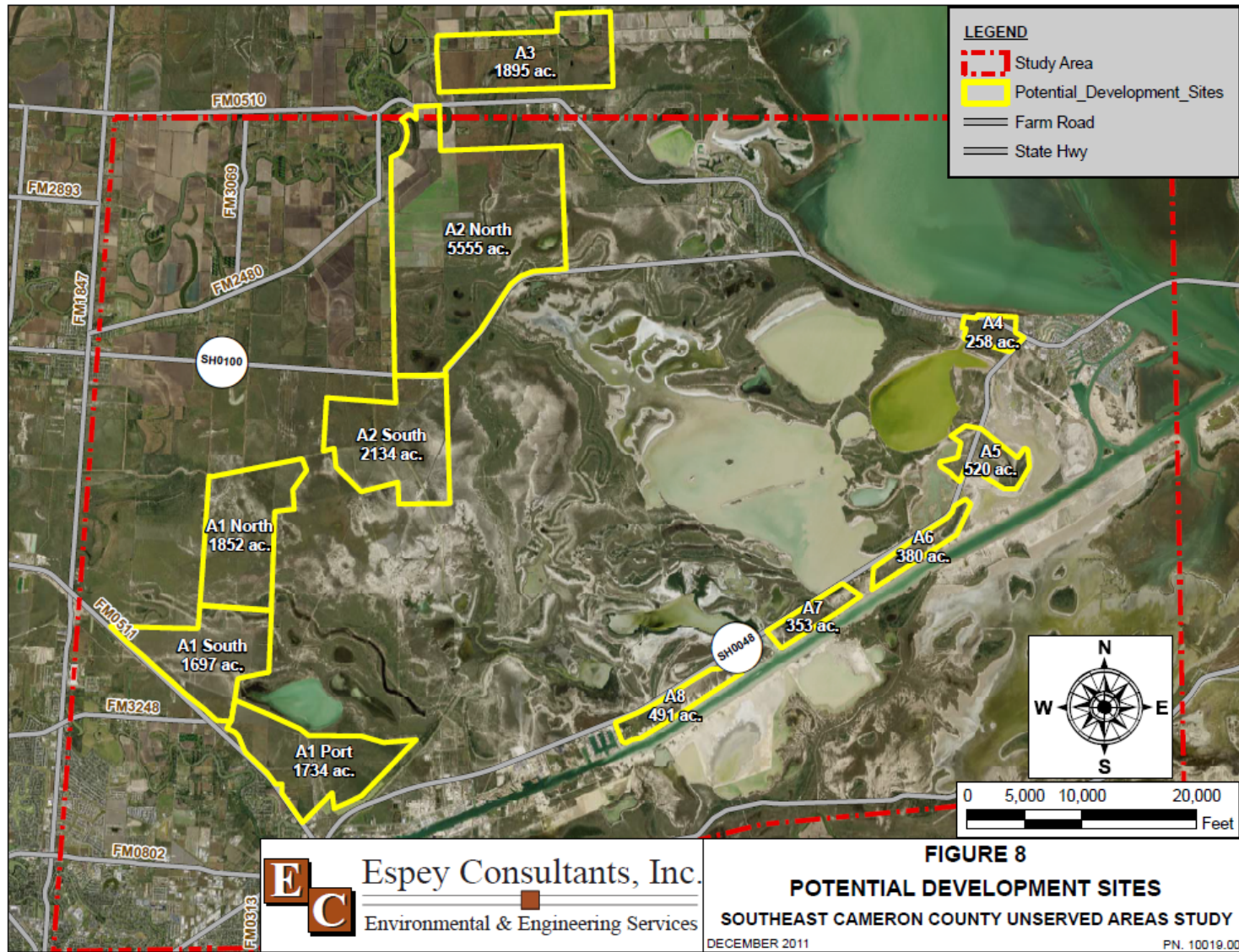


Figure 8 Overall potential development site map.

3.6 Population Projections

The intent of the study was to provide the best alternatives for water and wastewater service within the study area. The study area was established as areas which are not presently served for water or wastewater. Coincident to this feature of the study area is that without population, it was discovered during the study that these areas also do not have either existing population or projected population. This was proven through research of Regional Planning Group population projections and those of Cameron County and the surrounding cities. However, population projections were obtained for areas adjacent to the study area for equivalent consideration within the study area.

Projected population data was obtained from the Texas Water Development Board (TWDB) 2007 Region M Water Plan. The study area lies within the Region M planning area designated by the TWDB. This planning area is analyzed by the Rio Grande Regional Water Planning Group (Rio Grande RWPG), a local body created under Senate Bill 1 (est. 1997) to coordinate long-range water supply planning for the Region M planning area. **Figure 9** shows Region M and the unserved study area.

Based on TWDB guidelines, the Rio Grande RWPG implemented a cohort-component procedure for projecting populations. This procedure analyzed separate cohorts -age/sex/race/ethnic groups - within the planning area. There were four steps involved in projecting each cohort's population, with the last step being to combine the results from the first three steps - mortality, migration, and fertility modules.

The Rio Grande RWPG recognized the Texas State Data Center's identification of 23 cities within Region M that were growing faster than their anticipated growth rate established in the TWDB 2006 State Water Plan. The Rio Grande RWPG applied the TWDB recommendation of using a 3% population increase above the 2006 State Water Plan for each decade as guidance for updating their projected regional totals. By honoring the recommendation, the Rio Grande RWPG could not use the State Data Center's final projections for the 23 cities due to the overall regional increase of 5%. Instead, the Rio Grande RWPG used the entire TWDB recommended 3% regional population increase among the 23 cities identified by the State Data Center.

Each water user group is identified as user or group of users for which water demands and water supplies have been identified and analyzed and plans developed to meet water needs. Municipal water user groups include (a) incorporated cities and selected Census Designated Places with a population of 500 or more; (b) individual or groups of selected water utilities serving smaller municipalities or unincorporated areas; and (c) rural areas not included in a listed city or utility, aggregated for each county.

Table 3 lists the population projections for water user groups in the Region M plan adjacent to the study area.

Table 3 Population projections.

Rio Grande RWPG – 2011 Region M Water Plan – Population Projections						
Water User Group	2010	2020	2030	2040	2050	2060
Brownsville	180,444	218,268	257,460	296,637	335,947	373,453
East Rio Hondo WSC	19,904	26,420	33,155	39,869	46,585	52,973

El Jardin	10,859	13,521	16,274	19,017	21,761	24,371
Laguna Madre WD	7,725	11,408	15,215	19,010	22,806	26,416
Laguna Vista	2,651	3,314	4,008	4,705	5,413	6,094
Los Fresnos	6,649	8,908	11,243	13,571	15,899	18,114
Military Highway WSC	11,440	14,061	16,770	19,471	22,173	24,742
Olmito WSC	7,261	10,203	13,244	16,275	19,307	22,191
Port Isabel	5,282	5,723	6,179	6,633	7,088	7,520
South Padre Island	3,203	4,028	4,881	5,732	6,583	7,392

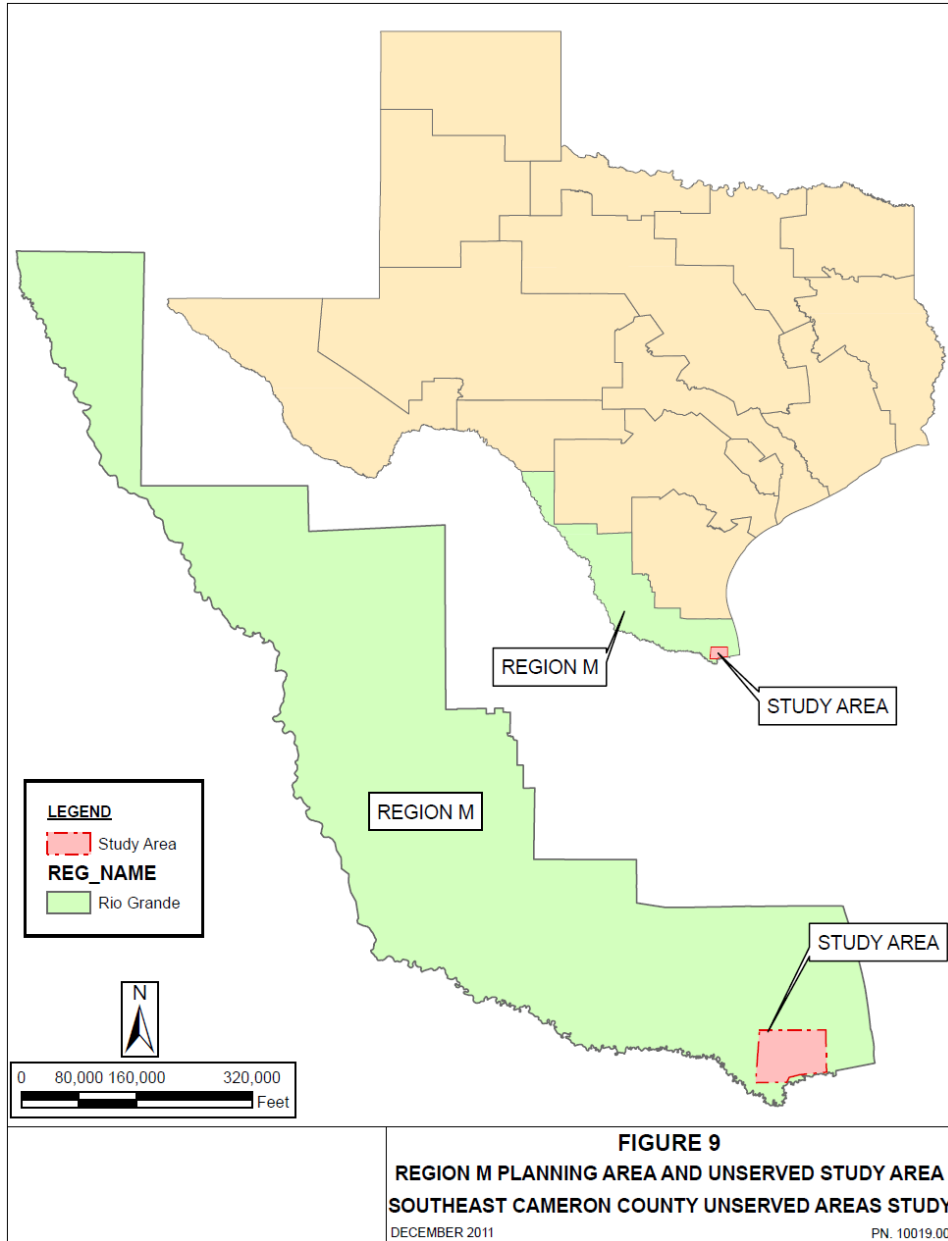


Figure 9 Region M planning area and unserved study area.

Table 4 lists each Water Users Group’s approximate density based on the Region M population projections.

Table 4 Population density projections.

WUG Density (capita/square mile)						
Water User Group	2010	2020	2030	2040	2050	2060
Brownsville	1,078	1,304	1,538	1,772	2,007	2,231
East Rio Hondo WSC	60	80	101	121	141	161
El Jardin	508	632	761	889	1,017	1,139
Laguna Madre WD	233	344	459	574	688	797
Laguna Vista	1,154	1,442	1,744	2,048	2,356	2,652
Los Fresnos	1,633	2,188	2,761	3,333	3,905	4,449
Military Highway WSC	97	120	143	166	189	211
Olmito WSC	1,148	1,613	2,094	2,573	3,053	3,509
Port Isabel	2,286	2,477	2,674	2,870	3,067	3,254
South Padre Island	1,800	2,264	2,743	3,221	3,700	4,154

3.7 Water Demand

The TWDB classifies water demand as the future amounts of water expected to be needed in dry-year conditions. They also distinguish municipal water use as comprising both residential and commercial water uses, but excluding industrial water use.

The Rio Grande RWPG’s water demand projections were determined using the following three variables:

1. Current and Projected Populations
2. Per Capita Water Use
3. Assumptions about the effects of certain Water Conservation Measures

The water demand projections stated in the 2011 Region M Water Plan use the year 2000 gpcd as the base Per Capita Water Use. This decision was made based on the following reasons:

1. Census2000 population figures will be more accurate than any single-year population estimate.
2. The Year 2000 was the driest year in the last decade for the majority of the regions and for the State as a whole, according to the Palmer Drought Severity Index.
3. Year 2000 water use data also takes into account the water use savings that have resulted to date from the 1991 State Water – Efficient Plumbing Act or conservation programs supported by the city or utility.

On the following page, **Table 5** lists the base per capita water use for the year 2000 per Water User Group.

Table 5 Region M year 2000 per capita water use.

Water User Group	2000 (gpcd)
Brownsville	229
East Rio Hondo WSC	113
El Jardin	162
Laguna Madre WD	271
Laguna Vista	115
Los Fresnos	107
Military Highway WSC	121
Olmito WSC	122
Port Isabel	451
South Padre Island	704

Table 6 lists these projected per capita water use figures with their respective Water User Groups.

Table 6 Per capita water use projections.

Water User Group	2010 (gpcd)	2020 (gpcd)	2030 (gpcd)	2040 (gpcd)	2050 (gpcd)	2060 (gpcd)
Brownsville	224	221	218	217	217	217
East Rio Hondo WSC	108	105	104	102	102	102
El Jardin	157	154	152	151	150	150
Laguna Madre WD	267	265	265	264	264	264
Laguna Vista	111	107	106	105	104	104
Los Fresnos	103	101	99	98	98	98
Military Highway WSC	116	113	110	109	108	108
Olmito WSC	117	115	114	113	113	113
Port Isabel	447	444	441	438	437	437
South Padre Island	698	695	693	692	691	691

Although, Table 6 shows the current and projected per capita water usage, the water use rate used in the calculation for the unserved areas study follows TCEQ recommendation of 0.6 gpm per connection. This water use rate translates into approximately 288 gpcd which coincides with the demands listed in Table 6.

3.8 Utility Service Demand

The Technical Advisory Committee considered the projected water demands presented in the 2011 Region M Water Plan and applied the development ordinances of each of the project participants to arrive at a common set of criteria for projecting water demand and wastewater

flows for parcels within the study area. The following assumptions were established for the demand projection process.

1. Absorption rate: The rate at which the acreage will be developed is projected to be approximately 515 acres/year. At this rate, approximately 50% of the developable acreage will be developed during the period of 2011-2020.
2. Residential density:
 - a. Parcel A1 North & South established as 2 units per acre.
 - b. Parcel A2 North & South established as 1.33 units per acre.
 - c. Parcel A3 & A4 established as 4 units per acre.
3. Residential occupancy: 3 persons/unit (Per TAC recommendation)
4. Residential demand:
 - a. Parcels A1, A2, & A3 water use rates are assumed to be approximately 125 gallons per capita per day (gpcd), with 150 gpcd demand assigned for Parcel A4 per TAC recommendation. TCEQ requires using 0.6 gpm/connection of water use rate to develop water demand. The larger of these two demands were utilized in the calculation.
 - b. Residential wastewater flow: 100 gpcd (per TCEQ Chap. 217 Table B.1 Design Organic Loadings and Flows for a New Facility).
5. Industrial demand:
 - a. Industrial water demand established as 5,000 gallons per acre per day (Water demands observed in *West Joe Pool Lake Service Plan Report*, Hunter, W., June 2011.).
 - b. Industrial wastewater flow established as 3,500 per acre per day (Wastewater generation rates observed in *West Joe Pool Lake Service Plan Report*, Hunter, W., June 2011.).

Table 7 lists the residential development sites and shows the calculation to develop the water and wastewater service demands. **Table 8** lists the industrial/commercial development sites and shows the calculation to develop the water and wastewater service demands.

Table 7 Potential residential development sites and associated water and wastewater demands.

Parcel	Area (ac)	Land Reserved for		Land for Development (%)	Lot Area (ac/lot)	No. of Lots	Persons per Household	Ultimate Population	Water Use Rate ¹ (gpcd)	Waste-water Generation Rate (gpcd)	Water Demand Using 125 gpcd for A1-A3 and 150 gpcd for A4	Water Demand (mgd) (using TCEQ Rule of 0.6 gpm/conn)		Wastewater Generated (mgd)	
		Transportation (%)	Reclamation (%)									2011-2020	2021-2030	2011-2020	2021-2030
A1-North	1,852	30%	20%	50%	0.50	1,852	3.0	5,556	125	100	0.35	0.80	0.80	0.278	0.278
A1-South	1,697	30%	20%	50%	0.50	1,697	3.0	5,091	125	100	0.32	0.73	0.73	0.255	0.255
A2-North	5,555	20%	20%	60%	0.75	4,444	3.0	13,332	125	100	0.83	1.92	1.92	0.667	0.667
A2-South	2,134	20%	20%	60%	0.75	1,707	3.0	5,122	125	100	0.32	0.74	0.74	0.256	0.256
A3	1,895	20%	20%	60%	0.25	4,548	3.0	13,644	125	100	0.85	1.96	1.96	0.682	0.682
A4	258	20%	10%	70%	0.25	722	3.0	2,167	150	100	0.16	0.31	0.31	0.108	0.108
Total Flow =												6.47	6.47	2.25	2.25
<p>1. Water demand was calculated using two criteria. a. Using 125 gpcd and 150 gpcd for Parcel A4 b. Using TCEQ rule of 0.6gpm/conn The water demand calculated using TCEQ rule was used to develop the infrastructure cost, and the water demand calculated using water use rate of 125 and 150 gpcd was used to calculate O&M cost.</p> <p>2. It is assumed in this calculation that the 50% ultimate population will be reached by year 2020 and rest of 50% development will occur by year 2030.</p>															

Table 8 Potential commercial development sites and associated water and wastewater demands.

Parcel	Area (ac)	Land Reserved for		Land for Development (%)	Ultimate Development	Water Use Rate (gpd/ac)	Wastewater Generation Rate (gpd/ac)	Water Demand (mgd)		Wastewater Generated (mgd)	
		Transportation (%)	Reclamation (%)					2011-2020	2021-2030	2011-2020	2021-2030
A1-Port	1,734	10%	20%	70%	1,214	5,000	3,500	3.035	3.035	2.124	2.124
A5	520	10%	20%	70%	364	5,000	3,500	0.910	0.910	0.637	0.637
A6	380	10%	20%	70%	266	5,000	3,500	0.665	0.665	0.466	0.466
A7	353	10%	20%	70%	247	5,000	3,500	0.618	0.618	0.432	0.432
A8	491	10%	20%	70%	344	5,000	3,500	0.859	0.859	0.601	0.601
Total Flow =								6.09	6.09	4.26	4.26
<p>1. Water demand was calculated using two criteria.</p> <ul style="list-style-type: none"> a. Using 125 gpcd and 150 gpcd for Parcel A4 b. Using TCEQ rule of 0.6gpm/conn <p>The water demand calculated using TCEQ rule was used to develop the infrastructure cost, and the water demand calculated using water use rate of 125 and 150 gpcd was used to calculate O&M cost.</p> <p>2. It is assumed in this calculation that the 50% ultimate population will be reached by year 2020 and rest of 50% development will occur by year 2030.</p>											

4 Utility Service Options

Water and wastewater service options were evaluated based upon the availability of existing infrastructure and economic feasibility.

The potential development sites (**Figure 6**) were categorized into residential and commercial development. Parcels included in these classifications are as follows:

- Residential Development:
 - Parcel A1-North,
 - Parcel A1-South,
 - Parcel A2-North,
 - Parcel A2-South,
 - Parcel A3, and
 - Parcel A4.
- Commercial Development:
 - A1-Port,
 - Parcel A5,
 - Parcel A6,
 - Parcel A7, and
 - Parcel A8.

Water and wastewater treatment capacity of the facilities operated by the project participants, was tabulated to define the available capacity adjacent to the study area (**Table 9**).

Table 9 Participating entities' water and wastewater treatment plant capacities.

Utility Service Provider	Utility Service	Treatment Facility Name	Treatment Capacity (mgd)
Laguna Madre Water District (LMWD)	Water	WTP No. 1	5.0
	Water	WTP No. 2	5.0
	Wastewater	Port Isabel WWTP No. 1	1.1
	Wastewater	Laguna Vista WWTP No. 2	0.65
City of Los Fresnos	Water	WTP	1.296
	Wastewater	WWTP	
Brownsville Public Utilities Board (BPUB)	Water	WTP # 1 & # 2	40
	Wastewater	WWTP # 1& #2	22.8
East Rio Hondo Water Supply Corporation (ERH WSC)	Water	WTP # 1	8.0
		WTP # 2	0.548
Port of Brownsville/Brownsville Navigation District	Wastewater	Fishing Harbor WWTP	0.25
		Turning Basin WWTP	0.25
		Amfels WWTP	0.098

Several options were identified to provide water and wastewater services to these potential development sites. Based upon the availability of existing water or wastewater service adjacent to the study area, each development parcel within the study area was subjected to consideration by existing utility service. When existing utility service was not available or when only one existing utility service option existed, a new service option was established by assuming the viability of a new water or wastewater treatment facility, to aid in the comparison of options for service. Those options for residential and commercial are summarized in **Table 10** and **Table 11**, respectively.

Table 10 Water and wastewater service options for residential development sites.

Parcels	Water Demand (mgd)	Wastewater Generated (mgd)	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 North	0.80	0.278	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.
			Option 2	Treated water provided by East Rio Hondo WSC.	Option 2	Treated on-site.
			Option 3	Raw water from LMWD Cuates Pump Station and treated on-site.	-	-
A1 South	0.73	0.255	Option 1	Treated water from Brownsville PUB existing water distribution system.	Option 1	Wastewater collected, pumped, and treated at Brownsville PUB WWTP.
			Option 2	Treated water from Port of Brownsville existing water distribution system.	Option 2	Wastewater collected, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
					Option 3	Treated on-site.
A2 North	1.92	0.667	Option 1	Treated water provided by East Rio Hondo WSC.	Option 1	Wastewater collected, pumped, and treated at LMWD Laguna Vista WWTP.
			Option 2	Treated water from LMWD WTP No. 2.	Option 2	Treated on-site.
			Option 3	Raw water from LMWD and treated on-site.		
A2 South	0.74	0.256	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.
			Option 2	Supply raw water by tapping one of the two existing raw water lines conveying raw water from LMWD Cuates PS to WTP No.2 and treated on-site.	Option 2	Treated on-site.
			Option 3	Treated water supplied by ERH WSC by connecting to Ex. 12" WL	-	-
A3	1.96	0.682	Option 1	Treated water from East Rio Hondo WSC 12" waterline.	Option 1	Wastewater collected, pumped, and treated at LMWD Laguna Vista WWTP.
			Option 2	Treated water from LMWD WTP No. 2	Option 2	Wastewater collected and treated on-site.
A4	0.31	0.108	Option 1	Treated water from LMWD's existing water distribution system.	Option 1	Wastewater collected, connected, and treated at LMWD Port Isabel WWTP No. 1.

Table 11 Water and wastewater service options for commercial development sites.

Parcels	Water Demand (mgd)	Wastewater Generated (mgd)	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 Port	3.035	2.124	Option 1	Connect to Port of Brownsville/BND existing water distribution line.	Option 1	Wastewater collected, pumped, and treated at BPUB’s Robindale WWTP.
			Option 2	Connect to Brownsville PUB’s existing water distribution line.	Option 2	Wastewater collected, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
A5	0.910	0.637	Option 1	Treated water from LMWD Ex. 24-inch waterline.	Option 1	Wastewater collected, pumped, and treated at LMWD Port Isabel WWTP.
					Option 2	Send WW flow to an on-site wastewater treatment facility located on parcel A6 and designed for Parcel A5, A6, & A7.
A6	0.665	0.466	Option 1	Extend proposed water distribution of Parcel A5 up to Parcel A6 connecting to LMWD Ex. 24-inch waterline.	Option 1	Wastewater collected along with Parcel A5, pumped, and treated at LMWD Port Isabel WWTP.
					Option 2	Operate an on-site wastewater treatment facility for all of the southern (commercial) development.
A7	0.618	0.432	Option 1	Extend proposed water distribution of Parcel A5 up to Parcel A7 connecting to LMWD Ex. 24-inch waterline.	Option 1	Wastewater collected along with Parcel A5 & A6, pumped, and treated at LMWD Port Isabel WWTP.
					Option 2	Send WW flow to an on-site wastewater treatment facility located on parcel A6 and designed for Parcel A5, A6, & A7.
A8	0.859	0.601	Option 1	Connect to Port of Brownsville/BND existing water distribution line.	Option 1	Wastewater collected, pumped, and treated at Port of Brownsville/BND Fishing Harbor WWTP.
					Option 2	Wastewater collected along with Parcel A8, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
					Option 3	Operate an on-site wastewater treatment facility for all of the southern (commercial) development.

1. Parcel A1 North:
 - a. Water Service Options: For Parcel A1 North water service options, refer to **Figure 10**. Three options were identified for water services and they are as follows:
 1. Option 1: A 12-inch proposed waterline from City of Los Fresnos' existing water treatment plant.
 2. Option 2: A 12-inch proposed waterline connected to an existing 12-inch waterline which is a part of ERH WSC's existing distribution infrastructure.
 3. Option 3: A 12-inch proposed raw water pipeline from LMWD's Cuates pump station up to the proposed onsite packaged water treatment plant.
 - b. Wastewater Service Options: For Parcel A1 North wastewater service options refer to **Figure 11**. Two options were identified for wastewater services and they are as follows:
 1. Option 1: Option 1 consists of a lift station and a proposed 6-inch line to convey wastewater to City of Los Fresnos' existing wastewater treatment plant.
 2. Option 2: This option includes a lift station and an onsite packaged wastewater treatment plant.

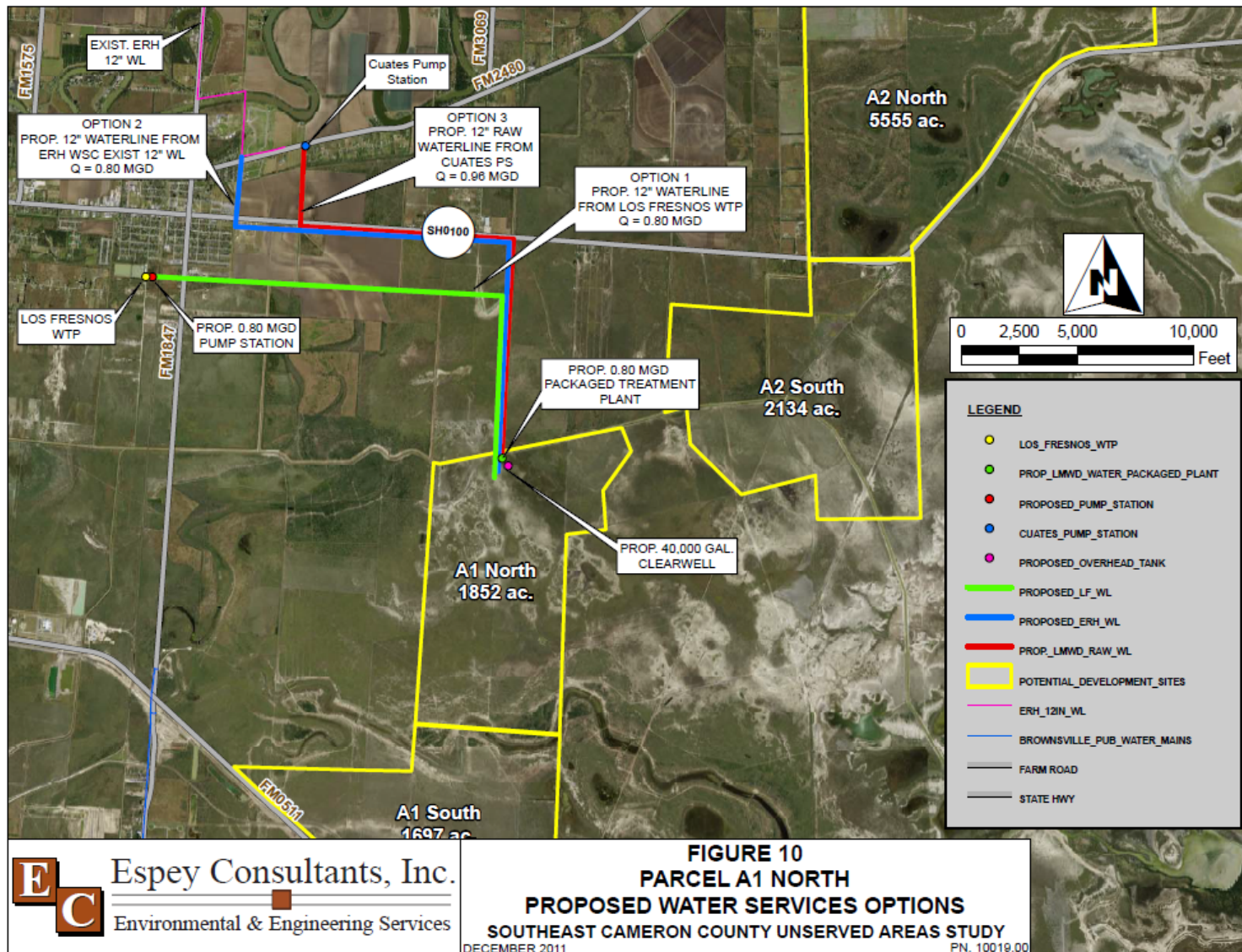


Figure 10 Parcel A1 North water service options.

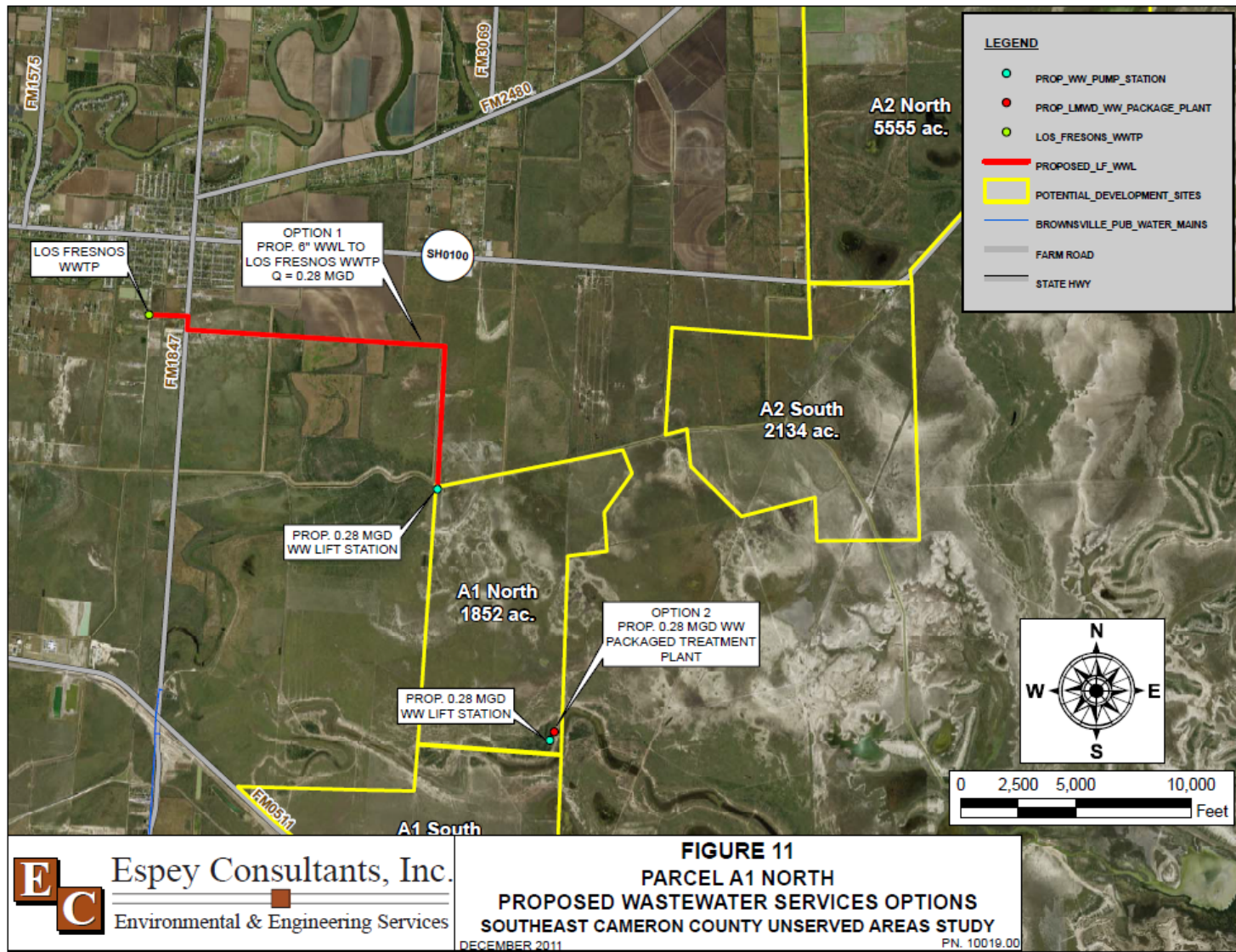


Figure 11 Parcel A1 North wastewater service options.

2. Parcel A1 South:
 - a. Water Service Options: For Parcel A1 South water service options, refer to **Figure 12**. Two options were identified for water services and they are as follows:
 1. Option 1: A 10-inch proposed waterline tapped into Brownsville Public Utilities Board (BPUB) existing infrastructure.
 2. Option 2: A 12-inch proposed waterline connected to Port of Brownsville/BND's existing water treatment plant.
 - b. Wastewater Service Options: For Parcel A1 South wastewater service options refer to **Figure 13**. Three options were identified for wastewater services and they are as follows:
 1. Option 1: Option 1 consists of a lift station and a proposed 6-inch line to convey wastewater to BPUB's existing wastewater collection system.
 2. Option 2: This option includes a lift station and a proposed 6-inch line to convey wastewater to Port of Brownsville/BND's Turning Basin wastewater treatment plant.
 3. Option 3: This option includes a lift station and an onsite packaged wastewater treatment plant.

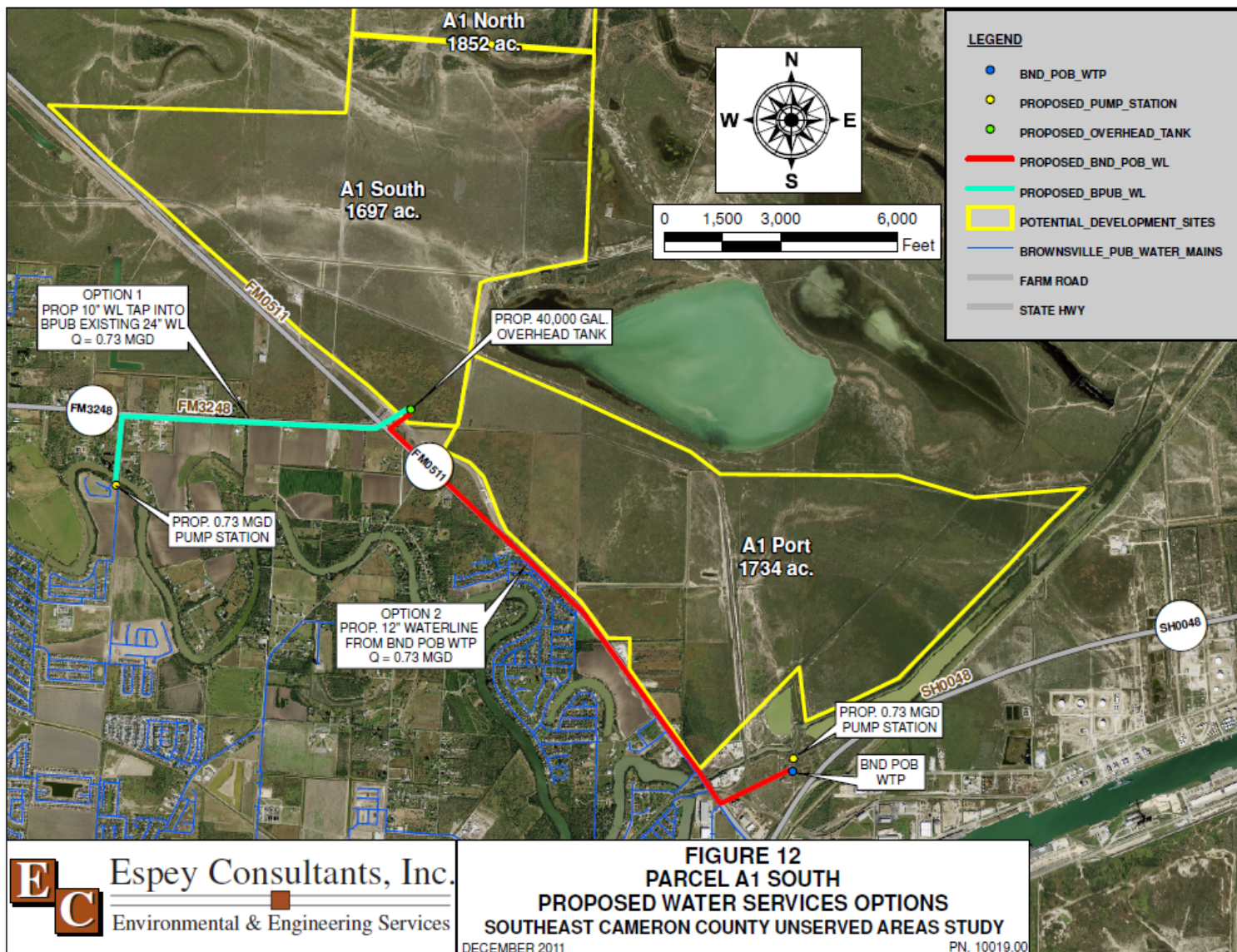


Figure 12 Parcel A1 South water service options.

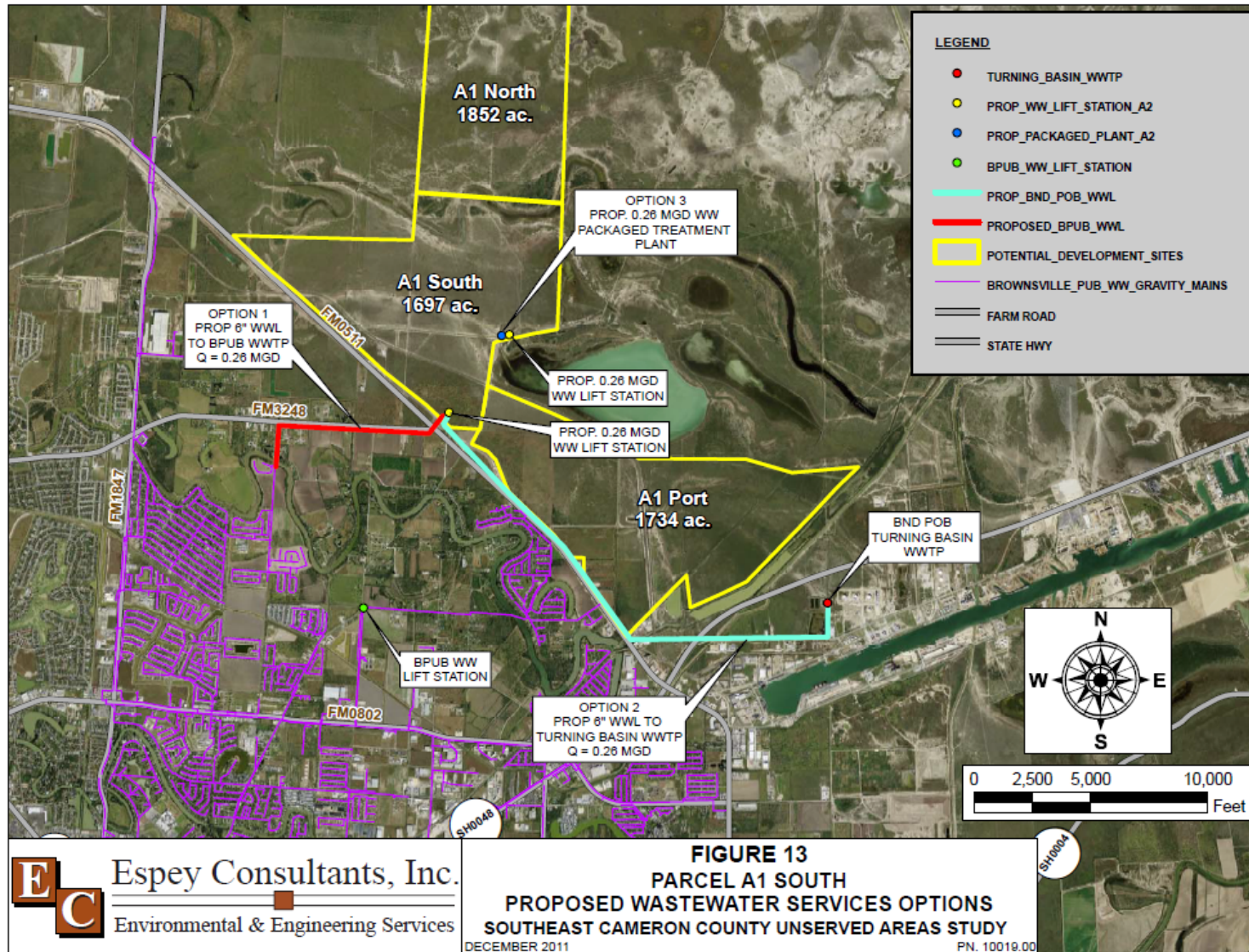


Figure 13 Parcel A1 South wastewater service options.

3. Parcel A2 North:
- a. Water Service Options: For Parcel A2 North water service options, refer to **Figure 14**. Three options were identified for water services and they are as follows:
 - 1. Option 1: A 12-inch proposed waterline connected to ERH WSC's existing distribution infrastructure.
 - 2. Option 2: A 12-inch proposed waterline from LMWD's existing Water Treatment Plant No. 2(WTP No.2).
 - 3. Option 3: A 12-inch proposed raw water pipeline tapping into LMWD's existing raw waterlines, conveying raw water to WTP No.2, to the proposed onsite packaged water treatment plant.

 - b. Wastewater Service Options: For Parcel A2 North wastewater service options refer to **Figure 15**. Two options were identified for wastewater services and they are as follows:
 - 1. Option 1: Option 1 consists of a lift station and a proposed 8-inch line to convey wastewater to LMWD's Laguna Vista wastewater treatment plant (LV WWTP).
 - 2. Option 2: This option includes a lift station and an onsite packaged wastewater treatment plant.

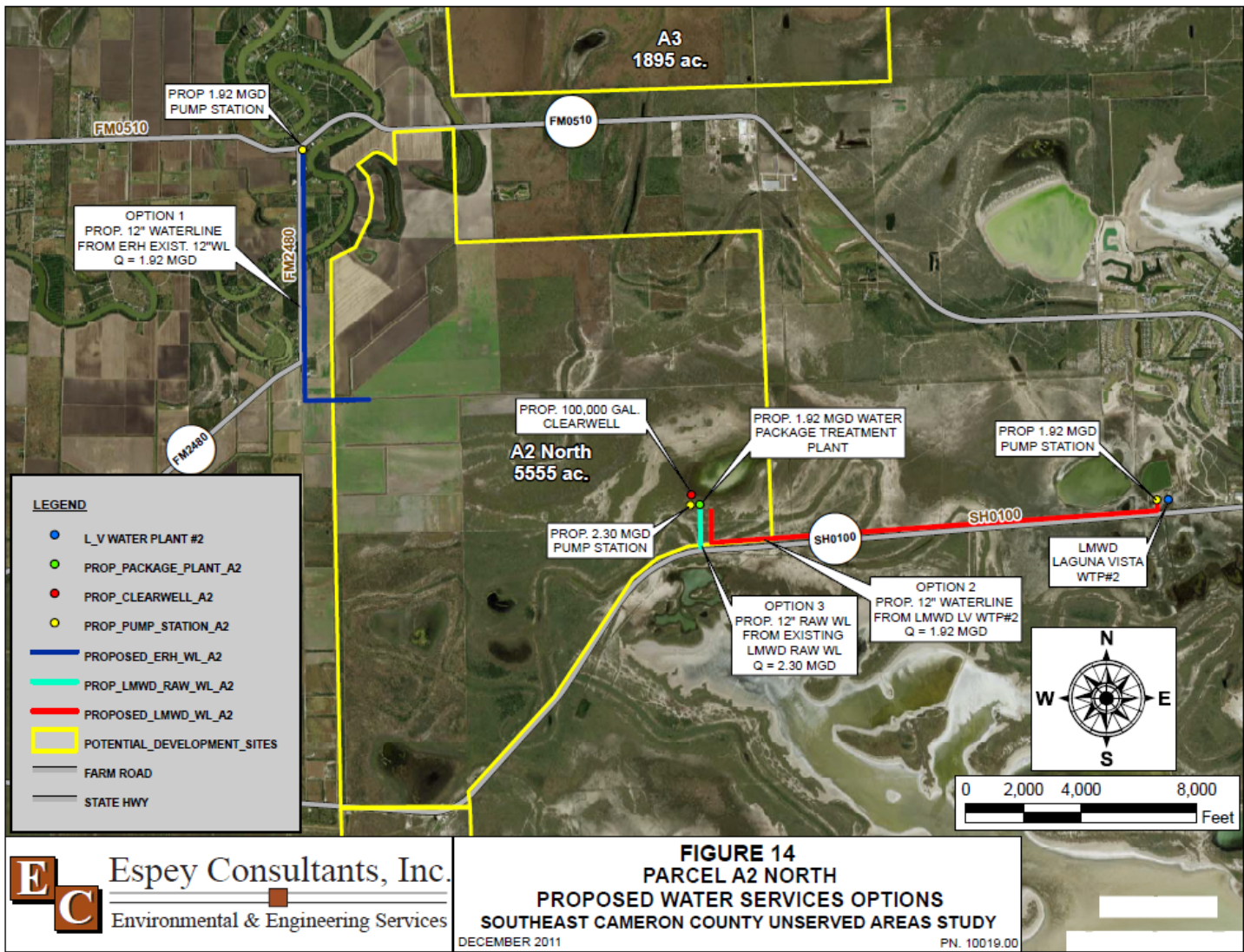


Figure 14 Parcel A2 North water service options.

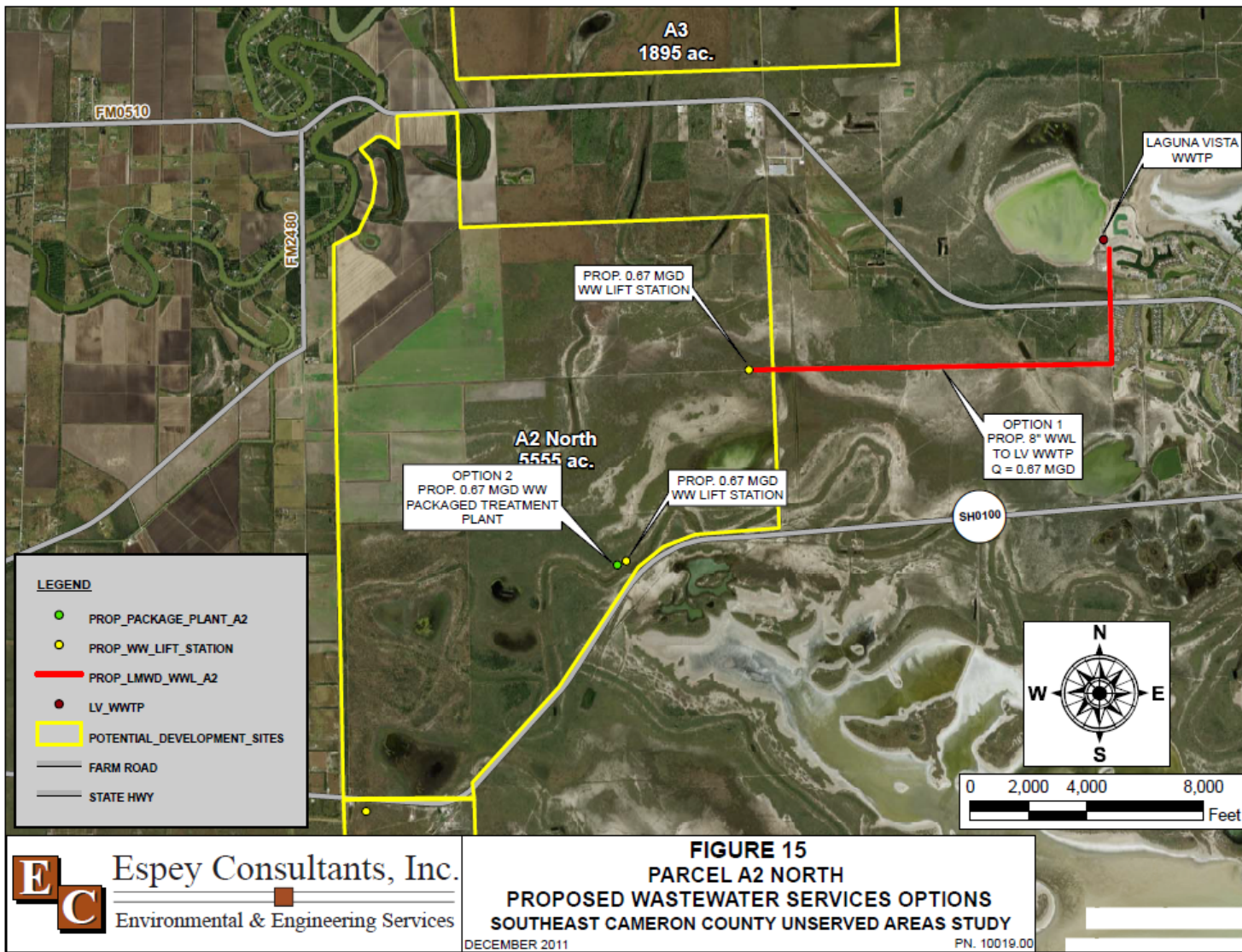


Figure 15 Parcel A2 North wastewater service options.

- 4. Parcel A2 South:
 - a. Water Service Options: For Parcel A2 South water service options, refer to **Figure 16**. Two options were identified for water services and they are as follows:
 - 1. Option 1: A 12-inch proposed waterline from City of Los Fresnos' existing water treatment plant.
 - 2. Option 2: A 10-inch proposed raw water pipeline tapping into LMWD's existing raw waterlines, conveying raw water to WTP No.2, to the proposed onsite packaged water treatment plant.
 - b. Wastewater Service Options: For Parcel A2 South wastewater service options refer to **Figure 17**. Two options were identified for wastewater services and they are as follows:
 - 1. Option 1: Option 1 consists of a lift station and a proposed 6-inch line to convey wastewater to City of Los Fresnos' existing wastewater treatment plant.
 - 2. Option 2: This option includes a lift station and an onsite packaged wastewater treatment plant.

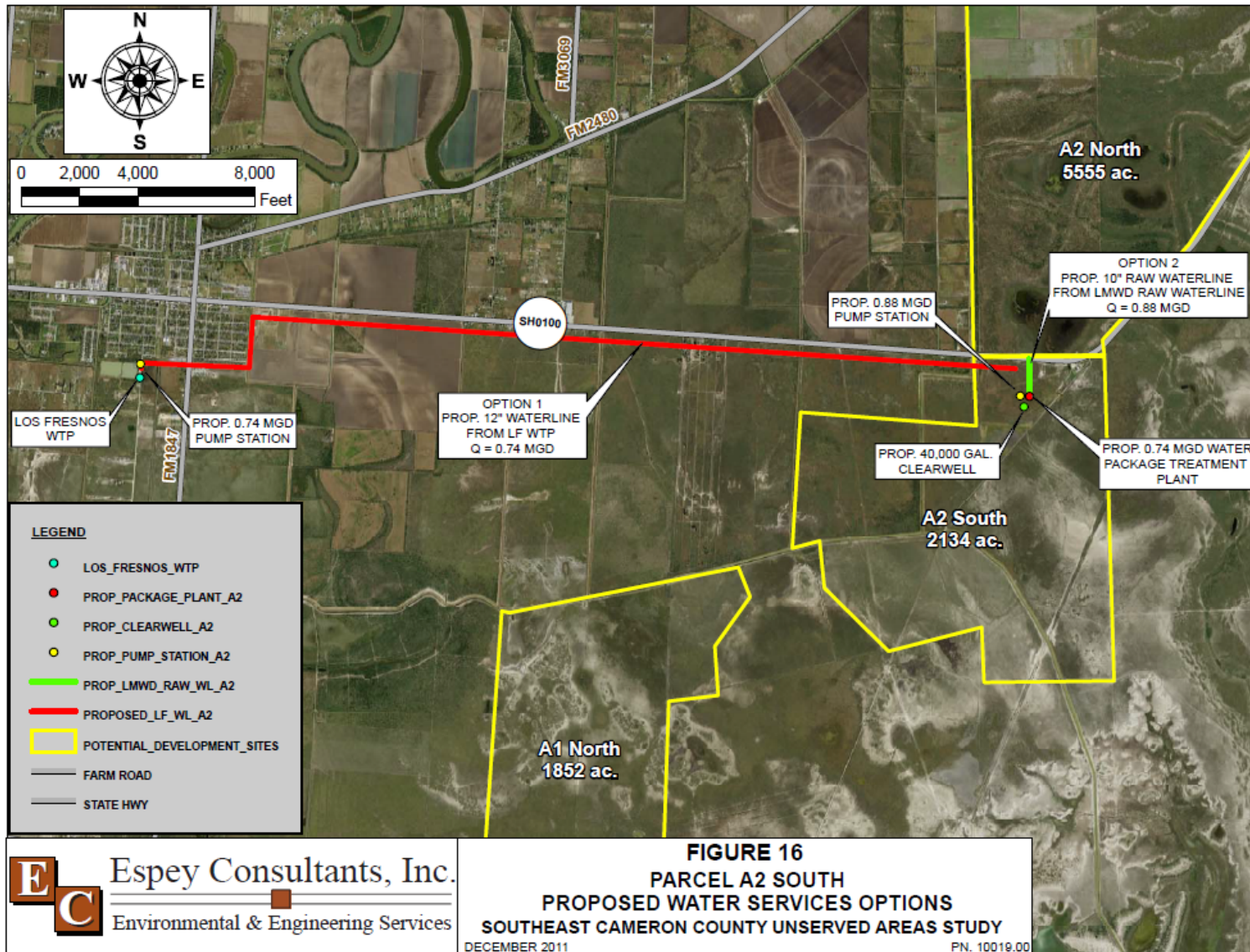


Figure 16 Parcel A2 South water service options.

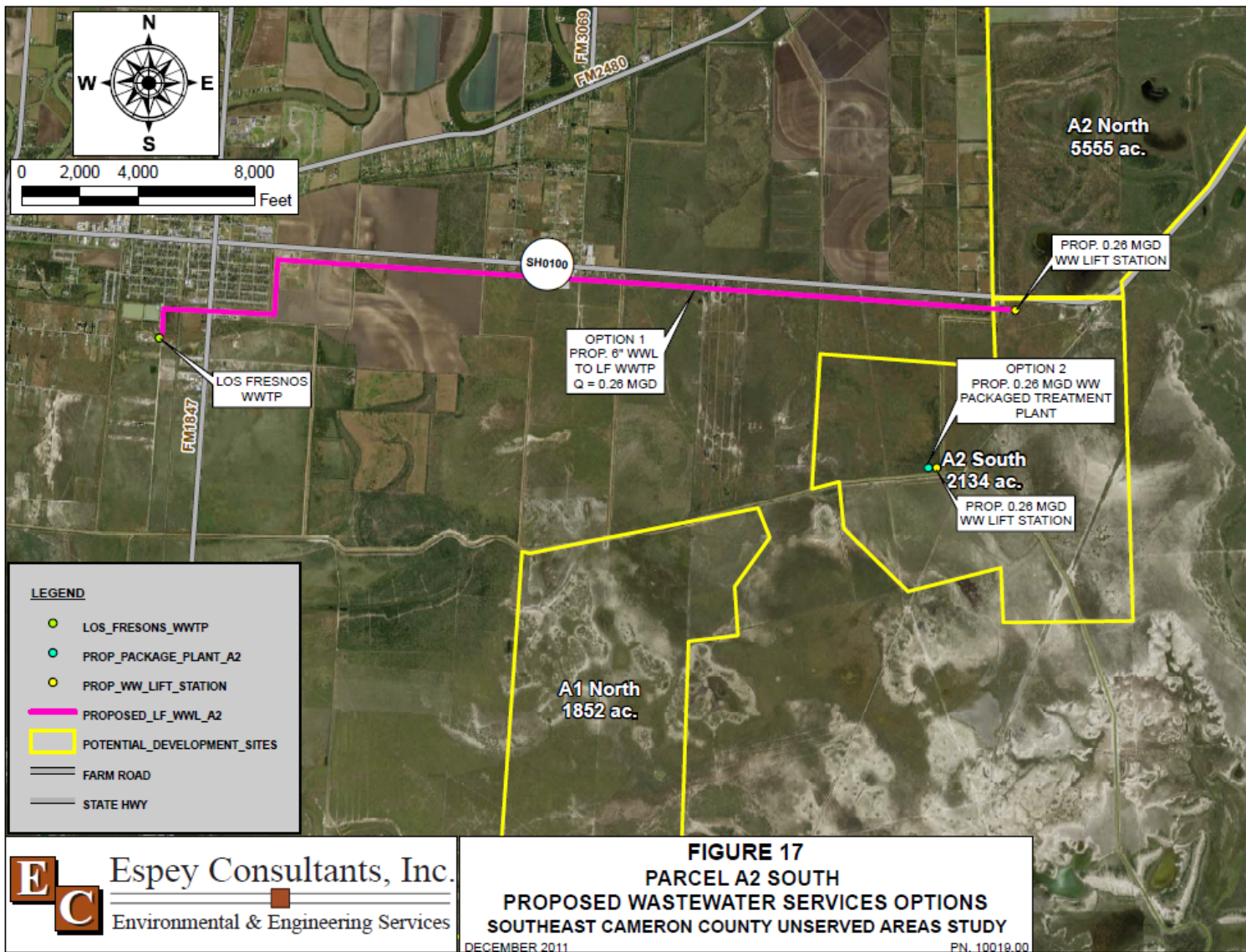


Figure 17 Parcel A2 South wastewater service options.

5. Parcel A3:

- a. Water Service Options: For Parcel A3 water service options, refer to **Figure 18**. Two options were identified for water services and they are as follows:
 1. Option 1: A 12-inch proposed waterline connected to ERH WSC's existing water distribution infrastructure.
 2. Option 2: A 16-inch proposed waterline from LMWD's existing WTP No. 2.

- b. Wastewater Service Options: For Parcel A3 wastewater service options refer to **Figure 19**. Two options were identified for wastewater services and they are as follows:
 1. Option 1: Option 1 consists of a lift station and a proposed 8-inch line to convey wastewater to LMWD Laguna Vista wastewater treatment plant.
 2. Option 2: This option includes a lift station and an onsite packaged wastewater treatment plant.

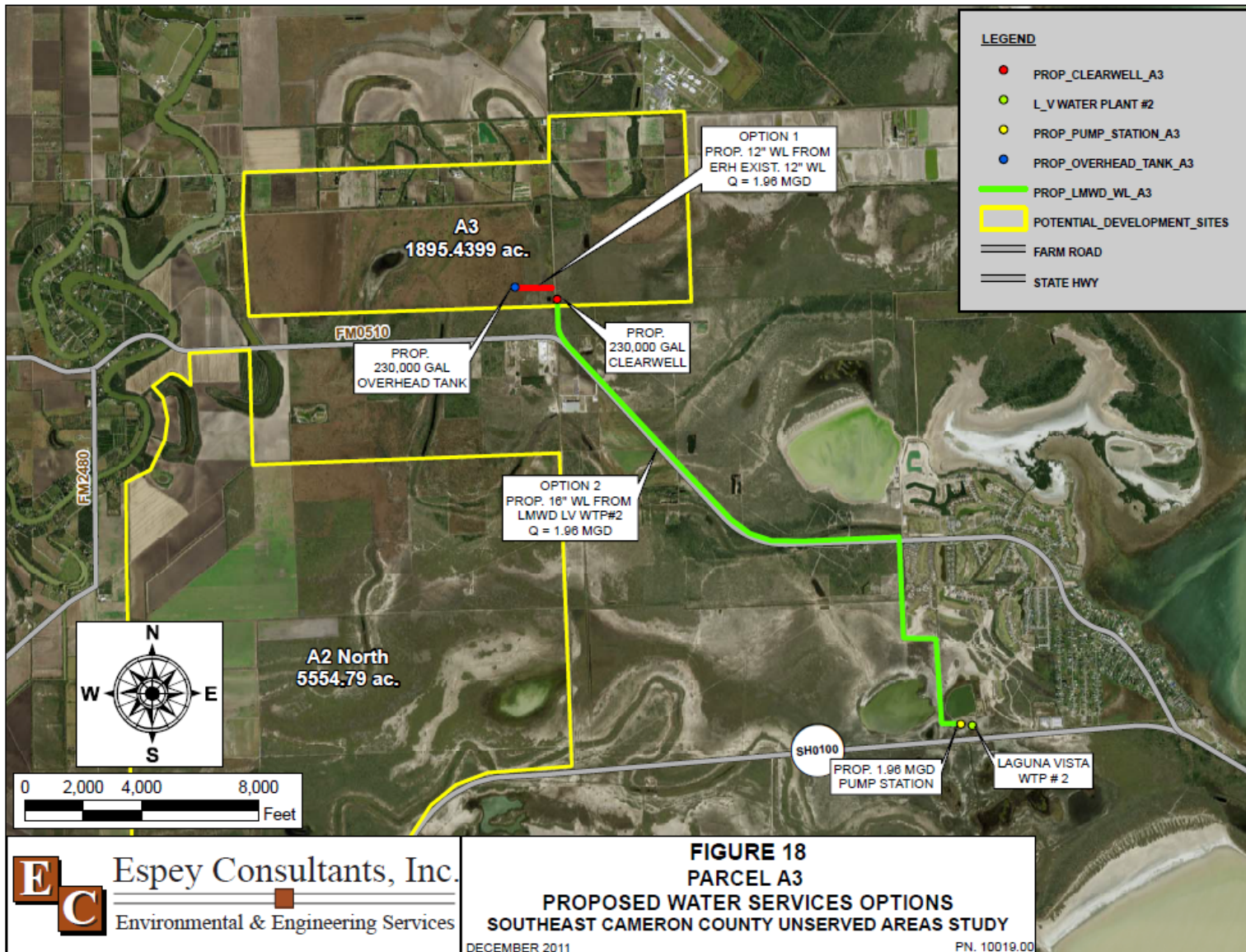


Figure 18 Parcel A3 water service options.

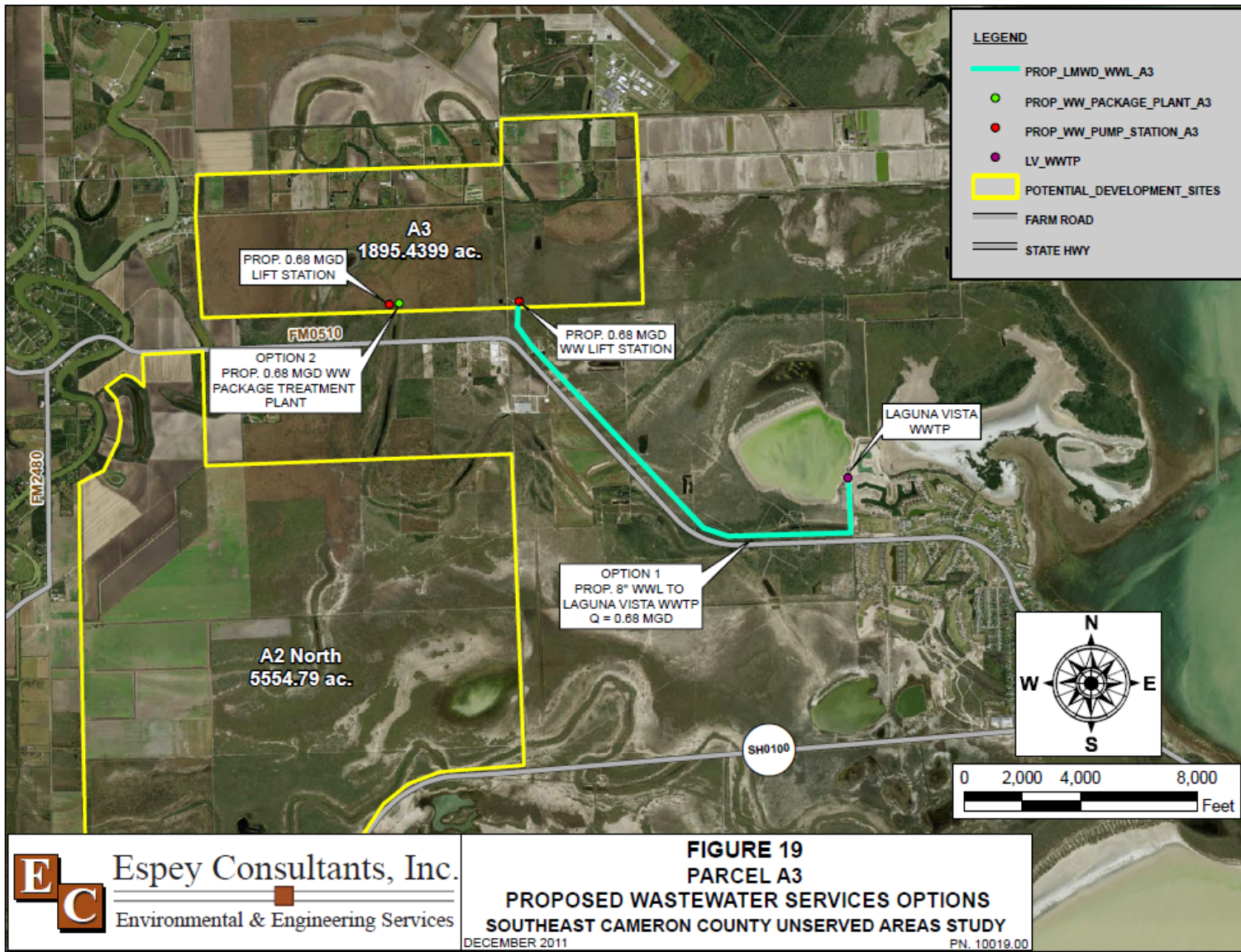


Figure 19 Parcel A3 wastewater service options.

6. Parcel A4: Parcel A4 is located within LMWD's current CCN boundary and existing water as well as wastewater infrastructure is available to serve Parcel A4. Water and wastewater services will be provided by tapping into existing water distribution and wastewater collection system. **Figure 20** and **Figure 21** show the existing water distribution and wastewater collection infrastructure, respectively.

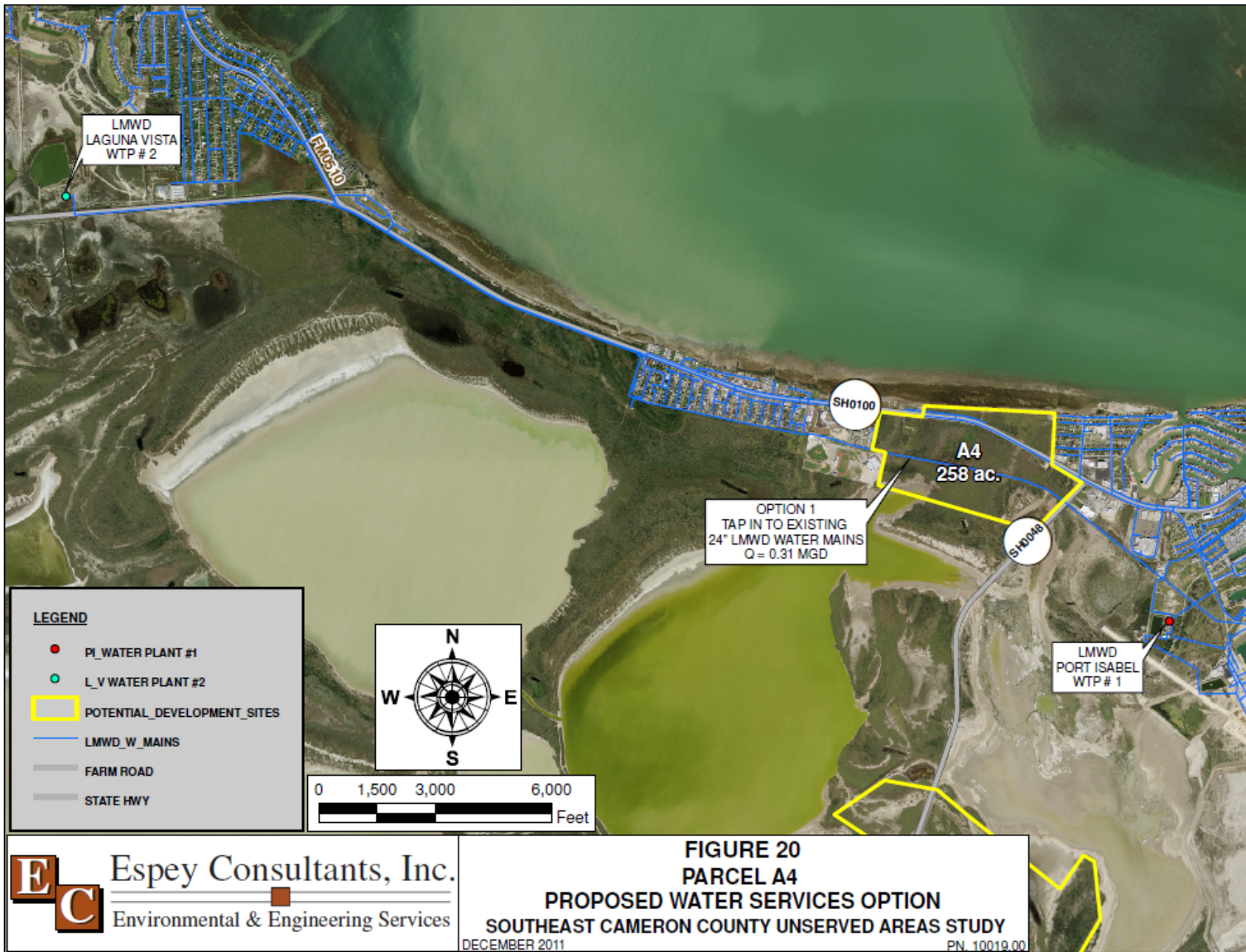


Figure 20 Parcel A4 water service options.

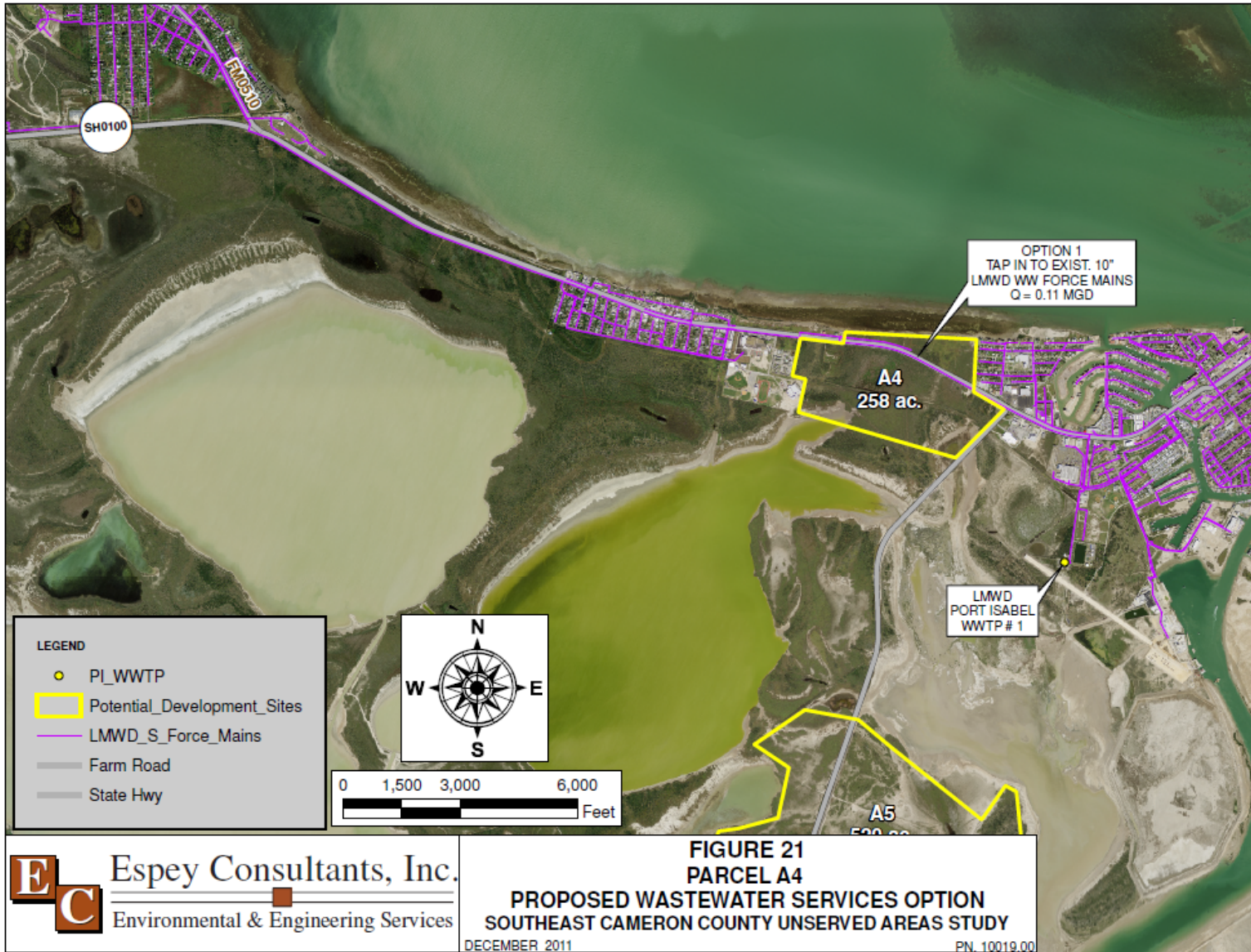


Figure 21 Parcel A4 wastewater service options.

7. Parcel A1 Port:
- a. Water Service Options: For Parcel A1 Port water service options, refer to **Figure 22**. Two options were identified for water services and they are as follows:
 - 1. Option 1: A 150,000 gallon overhead tank and a 16-inch proposed waterline connected to BPUB's existing water distribution infrastructure.
 - 2. Option 2: A 150,000 gallon overhead tank and a 16-inch proposed waterline from Port of Brownsville/BND's existing water storage facility.

 - b. Wastewater Service Options: For Parcel A1 Port wastewater service options refer to **Figure 23**. Two options were identified for wastewater services and they are as follows:
 - 1. Option 1: Option 1 consists of a lift station and a proposed 16-inch line to convey wastewater from Parcel A1 Port to BPUB's Robindale WWTP.
 - 2. Option 2: Option 2 consists of a lift station and a proposed 16-inch line to convey wastewater from Parcel A1 Port to Port of Brownsville/BND's Turning Basin wastewater treatment plant.

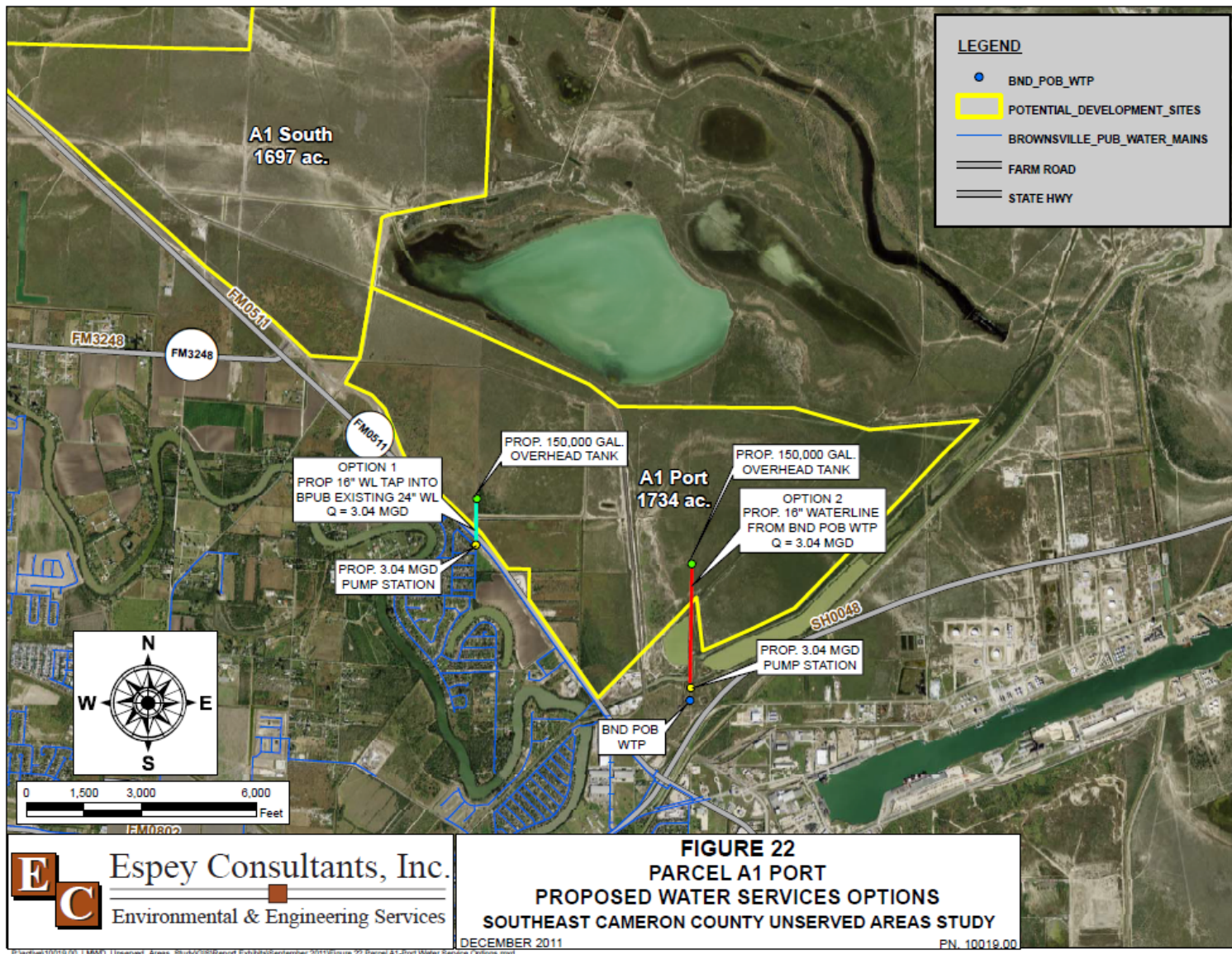


Figure 22 Parcel A1 Port water service options.

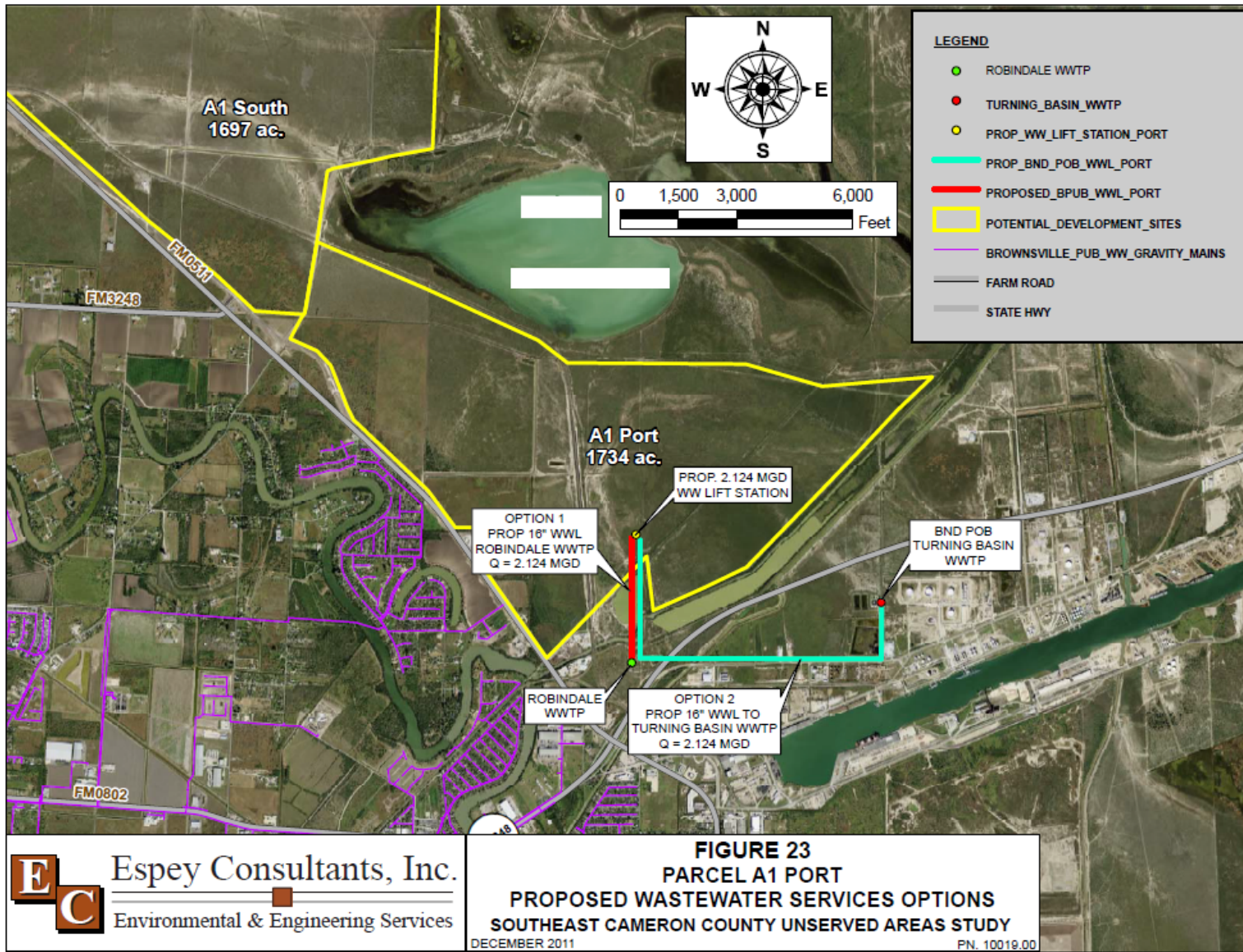


Figure 23 Parcel A1 Port wastewater service options.

8. Parcel A5, A6, and A7: For water and wastewater services, Parcel A5, Parcel A6, and Parcel A7 are combined due to their geographical locations.
 - a. Water Service Options: For water service options, refer to **Figure 24**. The only option identified for water services is as follows:
 1. Option 1: a 16-inch proposed waterline connected to LMWD's existing water treatment plant (WTP No.1).
 - b. Wastewater Service Options: For wastewater service options refer to **Figure 25**. Two options were identified for wastewater services and they are as follows:
 1. Option 1: Option 1 consists of a lift station and a proposed 12-inch line to convey wastewater from Parcel A5, A6, & A7 to LMWD's Port Isabel wastewater treatment plant.
 2. Option 2: This option includes a lift station and an onsite packaged wastewater treatment plant located on Parcel A7.

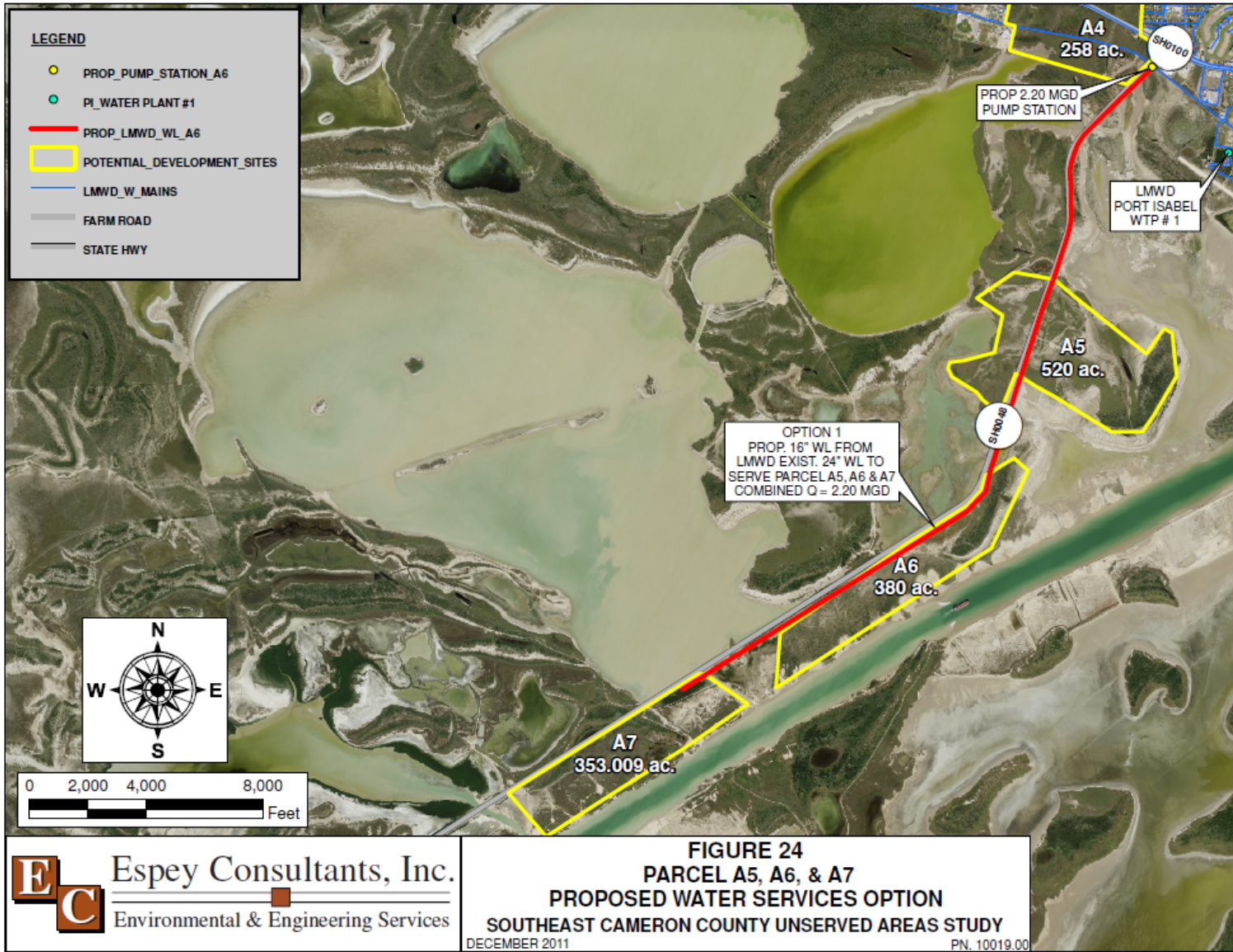


Figure 24 Parcel A5, A6, & A7 water service options.

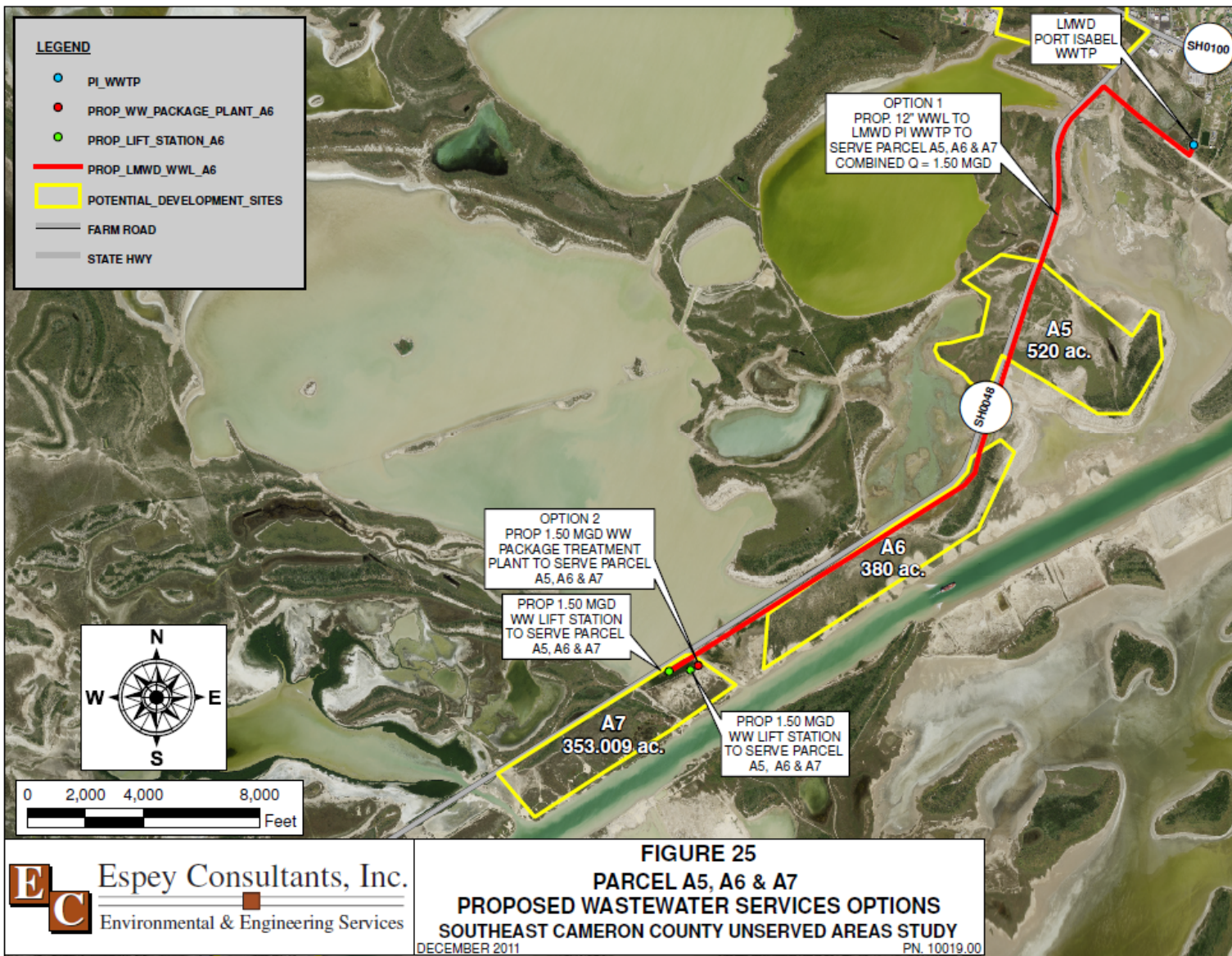


Figure 25 Parcel A5, A6, & A7 wastewater service options.

9. Parcel A8:

- a. Water Service Options: For water service options, refer to **Figure 26**. An option identified for water services is as follows:
 1. Option 1: A 12-inch proposed waterline connected to Port of Brownsville/BND's existing water storage facility.

- b. Wastewater Service Options: For wastewater service options refer to **Figure 27**. Two options were identified for wastewater services and they are as follows:
 1. Option 1: Option 1 consists of a lift station and a proposed 10-inch line to convey wastewater from Parcel A8 to BND's existing Fishing Harbor wastewater treatment plant.
 2. Option 2: Option 2 consists of a lift station and a proposed 10-inch line to convey wastewater from Parcel A8 to Port of Brownsville/BND's Turning Basin wastewater treatment plant.
 3. Option 3: This option includes a lift station and an onsite packaged wastewater treatment plant located.

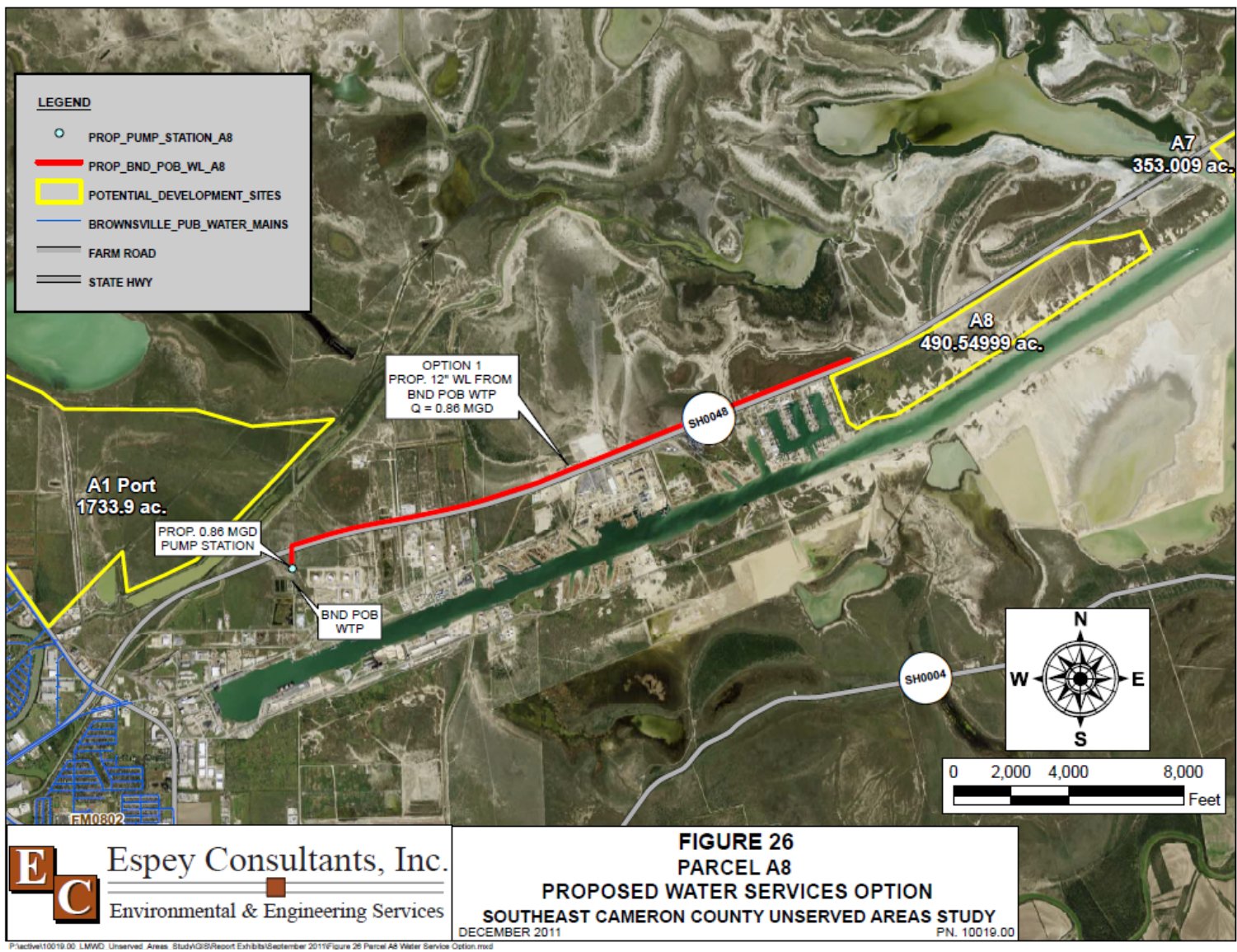


Figure 26 Parcel A8 water service option.

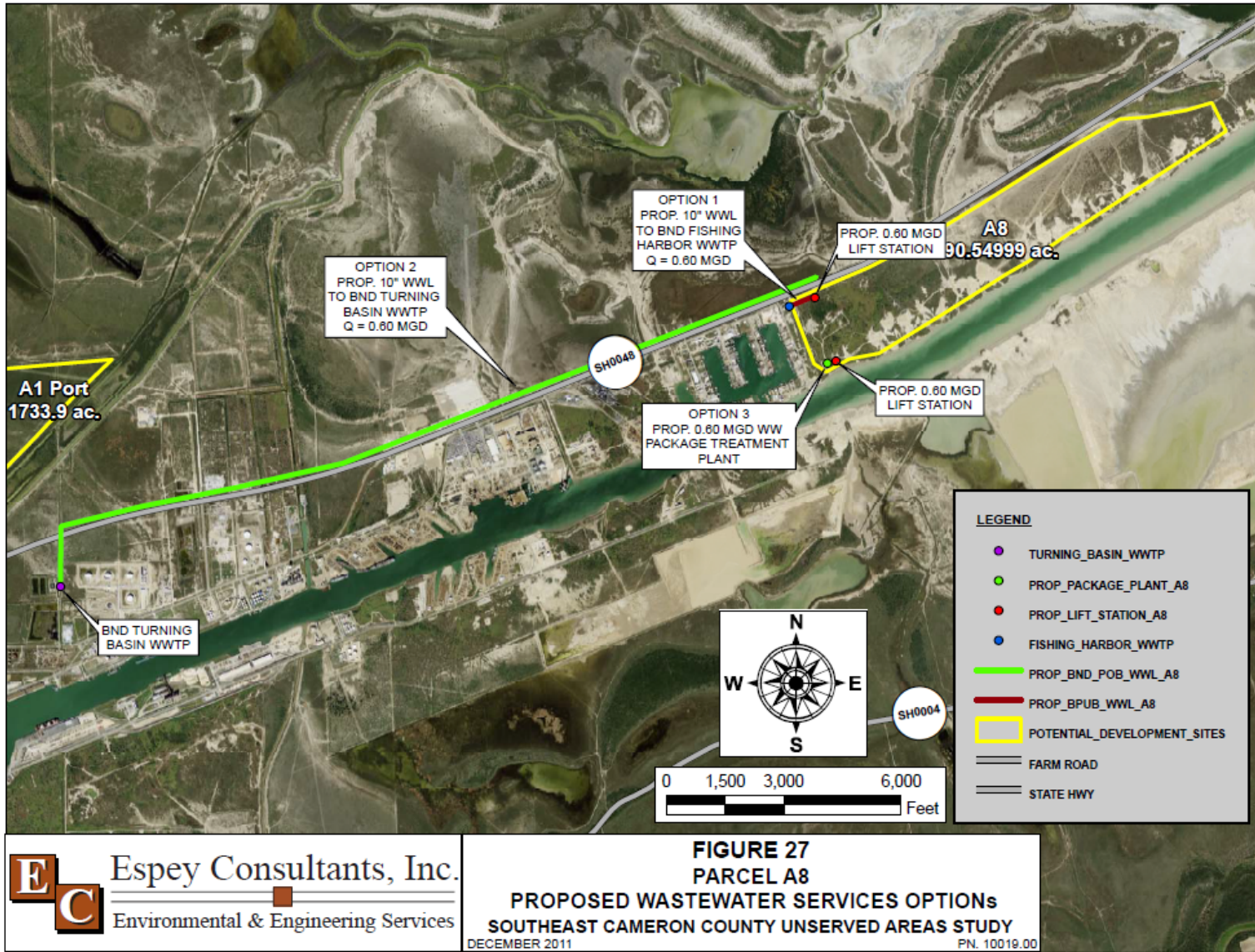


Figure 27 Parcel A8 wastewater service options.

4.1 Service Options from Laguna Madre Water District

Several water and wastewater service options considering the proximity to the existing infrastructure were identified for LMWD in this study. Following tables **Table 12** and **Table 13** lists those options for residential and commercial development respectively.

Table 12 Residential development sites that can be served by LMWD.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 North	Option 3	Raw water from LMWD Cuates Pump Station and treated on-site.	N/A	N/A
A1 South	N/A	N/A	N/A	N/A
A2 North	Option 2	Treated water from LMWD WTP No. 2.	Option 1	Wastewater collected, pumped, and treated at LMWD Laguna Vista WWTP.
	Option 3	Raw water from LMWD and treated on-site.		
A2 South	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.
	Option 2	Supply raw water by tapping one of the two existing raw water lines conveying raw water from LMWD Cuates PS to WTP No.2 and treated on-site.		
A3	Option 2	Treated water from LMWD WTP No. 2	Option 1	Wastewater collected, pumped, and treated at LMWD Laguna Vista WWTP.
A4	Option 1	Treated water from LMWD's existing water distribution system.	Option 1	Wastewater collected, connected, and treated at LMWD Port Isabel WWTP No. 1.

Table 13 Commercial development sites that can be served by LMWD.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 Port	N/A	N/A	N/A	N/A
A5	Option 1	Treated water from LMWD Ex. 24-inch Waterline.	Option 1	Wastewater collected, pumped, and treated at LMWD Port Isabel WWTP.
A6	Option 1	Extend proposed water distribution of Parcel A5 up to Parcel A6 connecting to LMWD Ex. 24-inch Waterline.	Option 1	Wastewater collected along with Parcel A5, pumped, and treated at LMWD Port Isabel WWTP.
A7	Option 1	Extend proposed water distribution of Parcel A5 up to Parcel A7 connecting to LMWD Ex. 24-inch Waterline.	N/A	Wastewater collected along with Parcel A5 & A6, pumped, and treated at LMWD Port Isabel WWTP.
A8	N/A	N/A	N/A	N/A

4.2 Service Options – East Rio Hondo WSC

Table 14 lists the water service options provided by East Rio Hondo WSC for the residential development sites. ERHWSC does not provide wastewater services.

Table 14 Residential development sites that can be served by East Rio Hondo WSC.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 North	Option 2	Treated water provided by East Rio Hondo WSC.	Option 2	N/A
A2 North	Option 1	Treated water provided by East Rio Hondo WSC.	Option 2	N/A
A2 South	Option 3	Treated water supplied by ERH WSC by connecting to Ex. 12” WL	Option 2	N/A
A3	Option 1	Treated water from East Rio Hondo WSC 12” WL.	Option 2	N/A

4.3 Service Options – City of Los Fresnos

Table 15 lists the water and wastewater service options provided by City of Los Fresnos for the residential development sites.

Table 15 Residential development sites that can be served by City of Los Fresnos.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 North	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.
A2 South	Option 1	Treated water provided by City of Los Fresnos.	Option 1	Wastewater collected, pumped, and treated at City of Los Fresnos WWTP.

4.4 Service Options – Brownsville Public Utilities Board

Table 16 and **Table 17** list the water and wastewater service options provided by Brownsville PUB for the residential and commercial development sites.

Table 16 Residential development sites that can be served by Brownsville PUB.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 South	Option 1	Treated water from Brownsville PUB existing water distribution system.	Option 1	N/A

Table 17 Commercial development sites that can be served by Brownsville PUB.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 Port	Option 1	Connect to Brownsville PUB’s existing water distribution line.	Option 1	Wastewater collected, pumped and treated at BPUB’s Robindale WWTP.
A8	Option 1	N/A	Option 1	N/A

4.5 Service Options – Port of Brownsville / Brownsville Navigation District

Following tables **Table 18** and **Table 19** list the service options provided by Port of Brownsville/BND for residential and commercial development sites respectively.

Table 18 Residential development sites that can be served by Port of Brownsville/BND.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 South	Option 2	Treated water from Port of Brownsville BND existing water distribution system.	Option 2	Wastewater collected, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.

Table 19 Commercial development sites that can be served by Port of Brownsville/BND.

Parcels	Options	Water Service Alternatives	Options	Wastewater Service Alternatives
A1 Port	Option 2	Connect to Port of Brownsville/BND existing water distribution line.	Option 2	Wastewater collected, pumped, and treated at Port of Brownsville/BND Turning Basin WWTP.
A8	Option 1	Connect to Port of Brownsville/BND existing water distribution line.	Option 1	Wastewater collected along with Parcel A8, pumped, and treated at Port of Brownsville/BND Fishing Harbor WWTP.

5 Economic Analysis

5.1 Cost Estimation

The alternatives identified in **Section 4** of this report for providing water and wastewater services were evaluated for each parcel utilizing existing infrastructure of all the participating agencies. For each alternative, capital costs, annualized capital costs (calculated using capital recovery factor), operation and maintenance (O&M) costs, and annual external costs were developed.

Developed costs for each alternative include:

1. Capital Cost
2. Annualized capital Cost
3. Annual O&M Cost
4. Annual External Cost

Capital Cost:

Capital cost is generally divided in to three categories:

1. Equipment/Material Cost: This cost comprises the equipment and/or material required as well as the associated installation cost. Under this category, a five-percent additional lump sum cost associated with electrical and instrumentation has been included for all electricity-intensive equipment/processes.
2. General Cost: General cost includes a five-percent of construction cost that is associated with general contractor's mobilization and de-mobilization. It also includes the cost of payment and performance bonds and the cost of insurance. General contractor's profit and general overhead (15% of construction costs) has been added to this category as a separate line item. A ten-percent of construction cost for contingency is included to this category to compensate for unknown expenses which occur during the project.
3. Engineering, Surveying, and Geotechnical Cost: A lump sum 20-percent of construction cost is has been included for the engineering, surveying, and geotechnical cost that will incur during the design phase of the project.

Capital cost detailed estimate for each service option of each potential development site has been calculated. Detailed cost tables (CE-1 through CE-36) have been attached to this report under **Appendix A**.

Annualized Capital Cost:

Annualized capital cost is calculated using project capital cost and the capital recovery factor (crf). Then the annualized capital cost is equally allocated to all the residential and/or commercial lots.

Capital recovery factor was calculated with the following assumptions:

- Annual Interest Rate (i) = 5%
- Loan Period (n) = 240 months (20 years)

Using the capital recovery formula of:

$$\text{crf} = \frac{i*(1+i)^n}{(1+i)^{n-1}}$$

$$\text{crf} = \frac{0.05*(1+0.05)^{240}}{(1+0.05)^{240}-1}$$

$$\text{crf} = 0.0802$$

Annual O&M Cost:

The annual operation and maintenance (O&M) costs per lot for water and wastewater treatment plants include the following items: general administration and overhead such as staff, insurance, etc., electricity, chemicals, fuel, maintenance, major repairs, sludge disposal, and permitting.

Annual External Cost:

The Annual External Costs per Lot for water treatment plants is based on the following:

1. Current water rates for each parcel from utility provider. The cost calculations include the base rates and the incremental rate based upon the usage.
2. For residential development in Parcels A1-A4, lot size varies from 0.25 acres to 0.75 acres and a single family house with 3 capita/lot is considered for calculations.
3. For commercial development in Parcels A1 Port and A5-A8, each lot is considered an acre lot for calculations.
4. The following water demands pertaining to each parcel are considered in the cost calculations:
 - a. 125 gpcd for Parcels A1-A3
 - b. 150 gpcd for Parcel A4
 - c. 5000 gpd/ac-lot for Parcels A5-A8

The Annual External Costs per Lot for wastewater treatment plants is based on the following:

1. Current wastewater rates for each parcels utility provider. The cost calculations include the base rates and the incremental rate based upon the usage.
2. For residential development in Parcels A1-A4, lot size varies from 0.25 acres to 0.75 acres and a single family house with 3 capita/lot is considered for calculations.
3. For commercial development in Parcels A1 Port and A5-A8, each lot is considered an acre lot for calculations.
4. The following wastewater generated flows each parcel are considered in the cost calculations:
 - a. 100 gpcd for Parcels A1-A4
 - b. 3500 gpd/ac-lot for Parcels A5-A8

Base Rates:

Table 20 lists all the monthly base rates for residential customers for the participating utilities that have been used in this analysis. Although the incremental rates for additional usage are not listed in the following tables, the incremental rates have been considered in the cost calculations.

Table 20 Monthly base rates for residential customers (water and wastewater).

Participating Agencies	Water Rates (\$/conn/month)	Wastewater Rates (\$/conn/month)
Laguna Madre Water District (LMWD)	\$11.90	\$12.35
East Rio Hondo Water Supply Corporation (ERH WSC)	\$34.00	-
City of Los Fresnos	\$22.74	\$22.34
Brownsville Public Utilities Board (BPUB)	\$9.47	\$6.84
Port of Brownsville / Brownsville Navigation District (BND)	\$9.47	\$30.00
Notes: 1. ERH WSC does not provide wastewater services.		

All residential customers are served using a 5/8-inch diameter connection with a 3/4-inch meter.

Table 21 lists all the monthly base rates for commercial customers for the participating utilities that have been used in this analysis.

Table 21 Monthly base rates for commercial customers (water and wastewater).

Participating Agencies	Water Rates (\$/conn/month)	Wastewater Rates (\$/conn/month)
Laguna Madre Water District (LMWD)	\$16.48	\$15.59
East Rio Hondo Water Supply Corporation (ERH WSC)	n/a	-
City of Los Fresnos	n/a	n/a
Brownsville Public Utilities Board (BPUB)	\$17.75	\$11.93
Port of Brownsville / Brownsville Navigation District (BND)	\$126.20	\$30.00
Notes: 1. ERH WSC does not provide wastewater services.		
2. No commercial development is anticipated in the potential development sites near City of Los Fresnos.		

All commercial customers are served using a 1-inch dia. meter for all the utilities except Port of Brownsville/Brownsville Navigation District (BND). The base water rate for BND is for a 2-inch diameter.

Water Demand:

As listed in **Table 7**, all the residential lots have an assumed average of 3 people per lot consuming approximately 125 gallon per capita per day (gpcd) water. All the commercial lots are one acre minimum lots and are assumed to be consuming 5,000 gallon per day (gpd).

Wastewater Generated:

Wastewater generated for residential lots is calculated assuming an average of 3 people per lot generating wastewater at the rate of 100 gpcd. For commercial development sites, wastewater generation rate is assumed to be 3,500 gpd per lot.

Annual Cost per Lot:

Annual costs per lot for water and wastewater services were determined by adding the annualized capital cost per lot using the capital recovery factor and annual O&M cost for each alternative at each potential development site.

Water and wastewater service option cost summary tables for residential development sites are presented in **Table 22** and **Table 23**, respectively. Water and wastewater service option cost summary tables for commercial development sites are presented in **Table 24** and **Table 25**, respectively.

Table 22 Water service options cost summary for residential development sites.

Parcels	Water Demand (mgd)	Lot Size (ac.)	No. of Lots	Options	Source of Water Service	Infrastructure Capital Cost ¹ (\$)	Annualized Capital Cost ² (\$)	Annual Capital Cost per Parcel (\$/parcel)	Annual Capital Cost per Lot (\$/lot)	Annual O&M Cost per Lot (\$/lot)	Annual External Cost per Lot ³ (\$/lot)	Total Annual Cost per Lot (\$/lot)
A1 North	0.8	0.50	926	Option 1	City of Los Fresnos.	\$2,062,000	\$165,460	\$165,460	\$179	\$18	\$795	\$991
				Option 2	East Rio Hondo WSC.	\$2,148,000	\$172,361	\$172,361	\$186	\$18	\$749	\$952
				Option 3	LMWD and On-site treatment	\$9,252,000	\$742,404	\$742,404	\$802	\$274	\$372	\$1,448
A1 South	0.73	0.50	1,713	Option 1	Brownsville PUB	\$1,675,000	\$134,406	\$134,406	\$78	\$15	\$350	\$443
				Option 2	Port of Brownsville	\$1,959,000	\$157,195	\$157,195	\$92	\$15	\$426	\$533
A2 North	1.92	0.75	2,222	Option 1	East Rio Hondo WSC	\$2,293,000	\$183,996	\$183,996	\$83	\$22	\$749	\$853
				Option 2	LMWD	\$2,634,000	\$211,359	\$211,359	\$95	\$29	\$372	\$497
				Option 3	LMWD and On-site treatment	\$13,576,000	\$1,089,373	\$1,089,373	\$490	\$225	\$372	\$1,088
A2 South	0.74	0.75	853	Option 1	City of Los Fresnos	\$2,275,000	\$182,552	\$182,552	\$214	\$23	\$795	\$1,031
				Option 2	LMWD and On-site treatment	\$7,882,000	\$632,472	\$632,472	\$741	\$233	\$372	\$1,347
A3	1.96	0.25	2,274	Option 1	East Rio Hondo WSC	\$1,713,000	\$137,456	\$137,456	\$60	\$14	\$749	\$823
				Option 2	LMWD	\$3,455,000	\$277,238	\$277,238	\$122	\$20	\$372	\$514

Texas Water Development Board Report

A4	0.31	0.25	361	Option 1	LMWD	-	-	-		-	\$372	\$372
<p>Note:</p> <ol style="list-style-type: none"> 1. Refer to Tables CE-1 thru CE-29 for all the capital cost estimates in Appendix A. 2. Annualized cost is calculated for 20 years and at 5% interest rate. 3. Annual External cost is based on 125 gpcd water demand and using the current water rates. 												

Table 23 Wastewater service options cost summary for residential development sites.

Parcels	Wastewater Generated (mgd)	Lot Size (ac.)	No of Lots	Options	Source of Wastewater Service	Infrastructure Capital Cost ¹ (\$)	Annualized Capital Cost ² (\$)	Annual Capital Cost per Parcel (\$/parcel)	Annual Capital Cost per Lot (\$/lot)	Annual O&M Cost per Lot (\$/lot)	Annual External Cost per Lot ³ (\$/lot)	Total Annual Cost per Lot (\$/lot)
A1 North	0.278	0.50	926	Option 1	City of Los Fresnos.	\$749,000	\$60,102	\$60,102	\$65	\$7	\$581	\$653
				Option 2	On-Site Treatment	\$2,973,000	\$238,561	\$238,561	\$258	\$73	\$471	\$801
A1 South	0.514	0.50	1,713	Option 1	Brownsville PUB	\$434,000	\$34,825	\$34,825	\$20	\$4	\$427	\$451
				Option 2	Port of Brownsville	\$818,000	\$65,638	\$65,638	\$38	\$4	\$576	\$618
				Option 3	On-Site Treatment	\$2,743,000	\$220,105	\$220,105	\$128	\$65	\$471	\$664
A2 North	0.667	0.75	2,222	Option 1	LMWD	\$916,000	\$73,502	\$73,502	\$33	\$7	\$298	\$339
				Option 2	On-Site Treatment	\$7,085,000	\$568,519	\$568,519	\$256	\$75	\$471	\$801
A2 South	0.256	0.75	853	Option 1	City of Los Fresnos.	\$1,125,000	\$90,273	\$90,273	\$106	\$8	\$581	\$695
				Option 2	On-Site Treatment	\$2,747,000	\$220,426	\$220,426	\$258	\$79	\$471	\$808
A3	0.682	0.25	2,274	Option 1	LMWD	\$912,000	\$73,181	\$73,181	\$32	\$9	\$298	\$339
				Option 2	On-Site Treatment	\$7,247,000	\$581,518	\$581,518	\$256	\$73	\$471	\$800
A4	0.108	0.25	361	Option 1	LMWD	-	-	-	-	-	\$298	\$298

Note:
 1. Refer to Tables CE-1 thru CE-29 for capital cost estimates in Appendix A.
 2. Annualized cost is calculated for 20 years and at 5% interest rate.

This page is intentionally blank.

Table 24 Water service options cost summary for commercial development sites.

Parcels	Water Demand (mgd)	No of Lots ¹	Options	Source of Water Service	Infrastructure Capital Cost ² (\$)	Annualized Capital Cost ³ (\$)	Annual Capital Cost per Parcel (\$/parcel)	Annual Capital Cost per Lot (\$/lot)	Annual O&M Cost per Lot (\$/lot)	Annual External Cost per Lot ⁴ (\$/lot)	Total Annual Cost per Lot (\$/lot)
A1 Port ⁵	3.035	607	Option 1	Port of Brownsville	\$1,612,000	\$129,351.05	\$129,351.05	\$213	\$35	\$5,686	\$5,934
			Option 2	Brownsville PUB	\$1,442,000	\$115,709.81	\$115,709.81	\$191	\$33	\$3,903	\$4,127
A5	0.91	182	Option 1	LMWD	\$1,508,399	\$121,038	\$121,038	\$665	\$110	\$8,551	\$9,326
A6	0.665	133	Option 1	LMWD	\$1,102,123	\$88,437	\$88,437	\$665	\$110	\$8,551	\$9,326
A7	0.618	124	Option 1	LMWD	\$1,024,442	\$82,204	\$82,204	\$666	\$110	\$8,563	\$9,338
A8	0.859	172	Option 1	Port of Brownsville	\$1,741,000	\$139,702	\$139,702	\$813	\$188	\$5,686	\$6,687

Table 25 Wastewater service options cost summary for commercial development sites.

Parcels	Wastewater Generated (mgd)	# of Lots ¹	Options	Source of Wastewater Service	Infrastructure Capital Cost ² (\$)	Annualized Capital Cost ³ (\$)	Annual Capital Cost per Parcel (\$/parcel)	Annual Capital Cost per Lot (\$/lot)	Annual O&M Cost per Lot (\$/lot)	Annual External Cost per Lot ⁴ (\$/lot)	Total Annual Cost per Lot (\$/lot)
A1 Port ⁵	2.124	607	Option 1	Brownsville PUB	\$628,000	\$50,392.34	\$50,392.34	\$83	\$15	\$2,880	\$2,978
			Option 2	Port of Brownsville	\$577,000	\$46,299.97	\$46,299.97	\$76	\$13	\$4,427	\$4,517
A5	0.637	182	Option 1	LMWD	\$875,525	\$70,254.41	\$70,254.41	\$386	\$91	\$6,403	\$6,880
			Option 2	On-Site Treatment	\$4,569,545	\$366,672.13	\$366,672.13	\$2,015	\$972	\$3,654	\$6,640
A6	0.466	133	Option 1	LMWD	\$640,457	\$51,391.94	\$51,391.94	\$386	\$91	\$6,403	\$6,881
			Option 2	On-Site Treatment	\$3,342,677	\$268,225.07	\$268,225.07	\$2,017	\$895	\$3,654	\$6,565
A7	0.432	124	Option 1	LMWD	\$593,856	\$47,652.54	\$47,652.54	\$386	\$90	\$6,403	\$6,880

Texas Water Development Board Report

			Option 2	On-Site Treatment	\$3,099,456	\$248,708.37	\$248,708.37	\$2,014	\$956	\$3,654	\$6,624
			Option 1	Port of Brownsville/BND	\$194,000	\$15,567.06	\$15,567.06	\$91	\$19	\$4,427	\$4,537
			Option 2	Port of Brownsville/BND	\$1,048,000	\$84,094.23	\$84,094.23	\$489	\$75	\$2,880	\$3,445
A8	0.601	172	Option 3	On-Site Treatment	\$6,496,000	\$521,255.85	\$521,255.85	\$3,034	\$952	\$3,654	\$7,640

Notes:

1. Parcels A5 thru A8 are reserved for commercial development and each lot is assumed to be one acre-lot.
2. Refer to Tables CE-6 thru CE-10 and CE-30 thru CE-36 for capital cost estimates in Appendix A.
3. Annualized cost is calculated for 20 years and at 5% interest rate.
4. Annual External cost is calculated using the 5000 gpcd/ac water demand.
5. Refer to Tables CE-6 thru CE-10 for capital cost estimates in Appendix A.
6. Water and wastewater infrastructure cost for parcels A5, A6, and A7 are approximately \$3.65 million & \$2.06 million respectively. The capital cost used in the calculation for each parcel is proportionate according to the water usage and wastewater generated.

6 Evaluation of Service Alternatives

6.1 Evaluation Criteria

To identify the most optimal and feasible service option for each parcel, a comparative analysis was carried out. This study required developing parameters that were critical or important for each participating agency, criteria to quantify these parameters in to risks, and a matrix ranking all service options against same set of criteria.

Parameters:

The following situational parameters were considered in this comparative analysis:

1. Connection Fees (including membership, installation, and impact fees)
2. Monthly Charge for Water and/or Sewer Services (including base charge and 2000 gallons of water)
3. Proximity of Service Area from Current CCN Boundary
4. Environmental Impact (water rights, discharges permits, wetland permits etc.)

In order to put emphasis on the importance of these situational parameters, weights were assigned to these parameters and are listed in **Table 26**. To obtain the overall score for an individual service option for each parcel, weighted average of the individual scores for various situational parameters using these weights is calculated.

Table 26 Situational parameters and criticality factor.

Situational Parameter	Criticality / Importance #
Connection Fees (including membership, installation, and impact fees)	0.5
Monthly Charge for Water and/or Sewer Services (including base charge and 2000 gallons of water)	0.6
Proximity of Service Area from Current CCN Boundary	0.6
Environmental Impact (water rights, discharges permits, wetland permits etc.)	0.4

Risk Factors:

A rating scale was developed to identify the impact of each of the service options on these situational parameters. This rating scale can be as simple as low, medium, or high risks. Each of these three risks can be assigned with a factor as shown in the following table.

Risk	Factor
Low	1
Medium	2
High	3

Criteria for each situational parameter were developed in order to quantify each service option in different risk groups. **Table 27** lists the situational parameters and the criteria categorizing parameters in low to high risk for residential development sites.

Table 27 Situational parameters and criteria for criticality rating for residential development sites.

Situational Parameter	Low	Medium	High
Connection Fees (including membership, installation, and impact fees)	<\$600	>\$600 <\$1000	>\$1000
Monthly Charge for Water and/or Sewer Services (including base charge and 2000 gallons of water)	<\$20	>\$20 <\$40	> \$40
Proximity of Service Area from Current CCN Boundary	Inside Current CCN	Outside Current CCN	Outside current CCN and Inside Other Agencies' CCN
Environmental Impact (water rights, discharges permits, wetland permits etc.)	No need to acquire additional rights or permits	Need to acquire at least one of three permits	Need to acquire all three permits

Similarly, **Table 28** lists the situational parameters and the criteria categorizing parameters in low to high risks for commercial development sites.

Table 28 Situational parameters and criteria for criticality rating for commercial development sites.

Situational Parameter	Low	Medium	High
Connection Fees (including membership, installation, and impact fees)	<\$800	>\$800 <\$1200	>\$1200
Monthly Charge for Water and/or Sewer Services (including base charge and 2000 gallons of water)	<\$60	>\$60 <\$100	> \$100
Proximity of Service Area from Current CCN Boundary	Inside Current CCN	Outside Current CCN	Outside current CCN and Inside Other Agencies' CCN
Environmental Impact (water rights, discharges permits, wetland permits etc.)	No need to acquire additional rights or permits	Need to acquire at least one of three permits	Need to acquire all three permits

With these situation parameters and the associated risk factors, an evaluation matrix was drawn by multiplying criticality of a situational parameter and the risk a service option pose to that parameter.

Evaluation Matrix:

An evaluation matrix was generated by calculating an overall rating. An overall rating for any service option is the sum of all ratings that can be calculated by multiplying the criticality number and the risk factor associated with that service option.

$$Rating = Criticality/Importance Number of situational parameter \times Risk Factor posed by a service option$$

Once an overall rating was calculated for all the service options, a ranking system was applied to all the service options for each parcel to identify the most optimum/feasible service option presented in **Tables 29** and **30** and summarized in **Tables 31** and **32**.

Table 29 Residential development sites evaluation matrix for water and wastewater service options.

Parcels	Water Service Options	Situational Parameters & Criticality Factor				Overall Ranking
		Conn. Fees	Water Rates	CCN Proximity	Env. Impact	
		0.5	0.6	0.6	0.4	
A1 North	Option 1	2	3	2	3	5.2
	Option 2	3	3	2	3	5.7
	Option 3	3	2	2	3	5.1
A1 South	Option 1	3	2	1	3	4.5
	Option 2	3	2	3	3	5.7
A2 North	Option 1	3	3	1	3	5.1
	Option 2	3	2	3	3	5.7
	Option 3	3	2	3	3	5.7
A2 South	Option 1	2	3	2	3	5.4
	Option 2	3	2	2	3	5.1
A3	Option 1	3	3	1	3	5.1
	Option 2	3	2	3	3	5.7
A4	Option 1	3	2	1	3	4.5
Parcels	Wastewater Service Options	Situational Parameters & Criticality Factor				Overall Ranking
		Conn. Fees	Water Rates	CCN Proximity	Env. Impact	
		0.5	0.6	0.6	0.4	
A1 North	Option 1	2	3	2	3	5.2
	Option 2	3	2	2	3	5.1
A1 South	Option 1	3	2	1	3	4.5
	Option 2	3	2	3	3	5.7
	Option 3	3	2	3	3	5.7
A2 North	Option 1	3	2	3	3	5.7
	Option 2	3	2	3	3	5.7
A2 South	Option 1	2	3	2	3	5.2
	Option 2	3	2	2	3	5.1
A3	Option 1	3	2	3	3	5.7
	Option 2	3	2	3	3	5.7
A4	Option 1	3	2	1	3	4.5

Table 30 Commercial development sites evaluation matrix for water and wastewater service options.

Parcels	Water Service Options	Situational Parameters & Criticality Factor				Overall Ranking
		Conn. Fees	Water Rates	CCN Proximity	Env. Impact	
		0.5	0.6	0.6	0.4	
A1 Port	Option 1	3	2	1	3	4.5
	Option 2	3	1	3	3	5.4
A5, A6, & A7	Option 1	3	3	3	3	6.3
A8	Option 1	3	1	3	3	5.1
	Option 2	3	2	1	3	4.5

Parcels	Wastewater Service Options	Situational Parameters & Criticality Factor				Overall Ranking
		Conn. Fees	Water Rates	CCN Proximity	Env. Impact	
		0.5	0.6	0.6	0.4	
A1 Port	Option 1	3	1	1	3	3.9
	Option 2	3	1	3	3	5.1
A5, A6, & A7	Option 1	2	2	3	3	5.0
	Option 2	2	1	3	3	4.6
A8	Option 1	3	1	1	3	3.9
	Option 2	3	1	1	3	3.9
	Option 3	2	1	1	3	3.4

Table 31 Evaluation matrix summary for water services.

Parcels	Water Demand (mgd)	Option Number	Option Service Provider	Total Infrastructure Cost	Total Annual Cost per Lot	Overall Ranking
A1 North	0.8	1	City of Los Fresnos	\$2,062,000	\$991	5.2
A1 South	0.73	1	BPUB	\$1,675,000	\$443	4.5
A2 North	1.92	1	ERH WSC	\$2,293,000	\$853	5.1
A2 South	0.74	1	City of Los Fresnos	\$2,275,000	\$1,031	5.4

A3	1.96	1	ERH WSC	\$1,713,000	\$823	5.1
A4	0.31	1	LMWD	-	-	4.5
A1- Port	3.035	2	BPUB	\$1,442,000	\$4,127	5.1
A5	0.91	1	LMWD	\$1,508,399	\$9,326	6.3
A6	0.665	1	LMWD	\$1,102,123	\$9,326	
A7	0.618	1	LMWD	\$1,024,442	\$9,338	
A8	0.859	2	BND	\$1,741,000	\$6,687	4.5

Table 32 Evaluation matrix summary for wastewater services.

Parcels	Wastewater Generated (mgd)	Option	Option Service Provider	Total Infrastructure Cost	Total Annual Cost per Lot	Overall Ranking
A1 North	0.278	1	City of Los Fresnos	\$749,000	\$653	5.2
A1 South	0.514	1	BPUB	\$434,000	\$451	4.5
A2 North	0.667	1	LMWD	\$916,000	\$339	5.7
A2 South	0.256	1	City of Los Fresnos	\$1,125,000	\$695	5.2
A3	0.682	1	LMWD	\$912,000	\$339	5.7
A4	0.108	1	LMWD	-	-	4.5
A1- Port	2.124	2	BPUB	\$577,000	\$4,517	5.1
A5	0.637	1	LMWD	\$875,525	\$6,880	5
A6	0.466	1	LMWD	\$640,457	\$6,881	5

A7	0.432	1	LMWD	\$593,856	\$6,880	5
A8	0.601	1	BPUB	\$194,000	\$4,537	3.9

6.2 Cost/Benefit Analysis

This study contemplated use of a cost/benefit analysis for the purpose of providing further analysis and evaluation of the alternatives. For a cost/benefit analysis to be completed, some differentiation is needed with the solution so that the benefit might be construed in evaluation to be greater or lesser in providing a benefit based on the solution comparison between alternatives. Through the course of this study, the Technical Advisory Committee established an intended development plan based upon the location of the unserved parcels within the study area. This designation established one intended development plan per parcel, appropriate given that the development potential was assumed to be viable but that the development type might vary depending upon the desires and market conditions present at the time of development. As a result, there are not multiple development scenarios for each parcel, thus there will be no more than one benefit per parcel and the actual benefit for the recommended alternative will be determined on the basis of least cost.

For the cost/benefit analysis, the cost as presented in Section 4 for each option is coupled with the overall ranking presented in this section.

The lowest “total annual cost per lot” with the lower “overall ranking” can be deemed as the most beneficial and viable for implementation. The following **Table 33** and **Table 34** list the water and wastewater service options with the lowest total annual cost per lot and the lowest overall ranking for residential development sites, respectively. **Table 35** and **Table 36** list the water and wastewater service options with the lowest total annual cost per lot and the lowest overall ranking for commercial development sites, respectively.

Table 33 Potential viable water service options for residential development sites.

Parcels	Water Service Options	Infrastructure Capital Cost [#] (\$)	Overall Ranking [#]
A1 North	Option 1 Los Fresnos	\$ 2,062,000	5.2
A1 South	Option 1 BPUB	\$ 1,675,000	4.5
A2 North	Option 1 ERHWSC	\$ 2,293,000	5.1
A2 South	Option 1 Los Fresnos	\$ 2,275,000	5.4
A3	Option 1 ERHWSC	\$ 1,713,000	5.1
A4*	Option 1 LMWD	-	4.5

[#]Refer to Tables CE-1 thru CE-36 in Appendix A.
^{*}Parcel A4 is located within the existing CCNs of LMWD and has existing water and wastewater infrastructure. Hence no separate capital cost was developed.

Table 34 Potential viable wastewater service options for residential development sites.

Parcels	Wastewater Service Options	Infrastructure Capital Cost [#] (\$)	Overall Ranking [#]
A1 North	Option 1 Los Fresnos	\$ 749,000	5.2
A1 South	Option 1 BPUB	\$ 434,000	4.5
A2 North	Option 1 LMWD	\$ 916,000	5.7
A2 South	Option 1 Los Fresnos	\$ 1,125,000	5.2
A3	Option 1 LMWD	\$ 912,000	5.7
A4*	Option 1 LMWD	-	4.5

[#]Refer to Tables CE-1 thru CE-36 in Appendix A.
^{*}Parcel A4 is located within the existing CCNs of LMWD and has existing water and wastewater infrastructure. Hence no separate capital cost was developed.

Table 35 Potential viable water service options for commercial development sites.

Parcels	Water Service Options	Infrastructure Capital Cost [#] (\$)	Overall Ranking [#]
A1 Port	Option 2 BPUB	\$ 1,442,000	5.4
A5, A6, & A7	Option 1 LMWD	\$ 3,634,964	6.3
A8	Option 2 BND	\$ 1,741,000	4.5

[#]Refer to Tables CE-1 thru CE-36 in Appendix A.

Table 36 Potential viable wastewater service options for commercial development sites.

Parcels	Wastewater Service Options	Infrastructure Capital Cost [#] (\$)	Overall Ranking [#]
A1 Port	Option 2 BND	\$ 577,000	5.1
A5, A6, & A7	Option 1 LMWD	\$ 2,109,838	5.0
A8	Option 1 BND	\$ 194,000	3.9

[#]Refer to Tables CE-1 thru CE-36 in Appendix A.

This page is intentionally blank.

7 Implementation Considerations

This report has examined areas within Southeastern Cameron County which lack water and wastewater services for the purpose of identifying and evaluating alternatives to providing this service. The study was funded by the TWDB (50%) and the local cost share (50%) of the study was funded by four entities which have jurisdictions that surround the unserved areas and for the most part, have water and wastewater service available to portions of the service area. The analysis of the options has produced the most cost effective options for water and wastewater service and a risk analysis has augmented this cost analysis to better determine the most viable option for service. The recommended water and wastewater service options are presented in **Figures 28** and **29**, respectively.

In reality, however, the implementation of development that will result in the need for water and wastewater service will be additionally affected by other factors uniquely characteristic of the local communities having the potential for adding new development. In addition to these unique factors, each of the potential service providers has institutional characteristics in terms of how they operate their utilities which will affect that utility's consideration as a candidate service provider. One such characteristic is Certificates of Convenience and Necessity (CCNs), which are utilized to establish dedicated service plans to a specific entity. The State of Texas utilizes CCNs as a method for establishing an area in which a utility can invest dependably in planning and providing facilities for future water and wastewater service to ensure that these investments are not undercut by alternative service options that may arise. Each of these features for consideration of water and wastewater service has been applied to the recommended service options from this study to identify added considerations that will affect implementation.

7.1 Unique Factors of Proposed Service Providers

Each of the four local sponsors for the study, Laguna Madre Water District (LMWD), City of Los Fresnos, Port of Brownsville, and East Rio Hondo Water Supply Corporation (ERHWSC) have water and wastewater infrastructure consisting of treatment facilities and conveyance facilities. This study has confirmed the locations and capacities of the existing infrastructure but has not determined the extent to which available capacity still exists in these facilities or if other restrictions exist which have obligated this capacity for other development. Accordingly, an assessment is needed by each of the candidate service providers to determine if the proposed facilities to be extended to the unserved areas have sufficient capacity to provide that service. In some cases, it is expected that the pipelines to which the proposed unserved area might connect will have capacity but that the utility may still lack the capability to provide the treatment for water or wastewater which ensures this connection is truly viable. Similarly, in the case of water service only, this study has not considered the effects of the additional water supply demands on the individual service providers recommended for each of the proposed service areas. This issue however is somewhat mitigated due to the nature of expected water supplies for the region. The study area lies within Region M which has determined that a water shortfall exists today which will increase through 2060, the current planning period for the region. One of the primary future sources of water is the conversion of irrigation water rights to municipal water rights, anticipated to occur naturally with increasing urbanization of the region. Much of the study area consists of

farming as the current land use; thus, it is assumed this can provide a means for setting aside water supply as a limitation to implementation. Other unique features of water and wastewater service providers that are anticipated to be issues that need to be considered for the recommended options presented herein:

1. Each of the proposed service providers operate their own systems and fund this operation through cost of service rate structures. The rates for each of these proposed service providers are structured to accommodate utility service within each provider's established service area or jurisdiction. The study area includes areas that by definition are not within the proposed service providers service areas; thus, it can be assumed that each service provider will require each new service area be added to the service provider's service area to take advantage of the rates in place today and used within this report. However, most of the service providers have defined provisions in their rate structure to also accommodate areas outside of their service area, but at a much higher rate structure. In addition to the consideration for being served within a service providers' service area or choosing to be served outside of the service provider's service area with a higher utility rate, in both cases, the costs for extending utility service to the service provider's service area will generally be born by the unserved area; and
2. Each of the recommended service providers operate some level of water and wastewater services. As a practical practice for managing retail water and wastewater service utilities, most utility service providers have provisions in place that authorize the service provider to terminate service if after some period of time, retail bills are not paid by the consumer. In the case of water service, water can be turned off as retail service includes a meter at every residence or business. This is not the case however for wastewater service for which the basis of retail billing cost for such services are established as a percentage of water usage. This study has identified the most cost effective options for water and wastewater service without regard for ensuring the service provider for either service must be the same. To do so would limit the cost effectiveness of the recommended options. Costs for all of the options have been developed which allow for calculation of this cost for each service provider. Cost estimates for all of the options are provided in **Appendix A**. So, if an area has been designed for receiving water service from one entity and wastewater service form another, if both entities currently provide water and wastewater service, then the costs for each entity can be calculated for providing both services as one option for comparison to develop the next most effective option for combined water and wastewater service. Additionally, as an alternative, one service provider, either water or wastewater, could conceivably contract with the other entity on a wholesale basis to provide the combined service to the consumer. The areas for which these combined water and wastewater services are recommended for different providers are shown in the following **Table 37**.

Table 37 Water and wastewater services by different providers considering CCNs and viability of providing both services.

Service Providing Agency	Parcels	Existing CCNs	Service Provided		
			Water	Wastewater	Both (Water and Wastewater)
Laguna Madre Water District (LMWD)	A2 North	No	-	Yes	-
	A3	No	-	Yes	-
	A4	Yes	Yes	Yes	Yes
	A5, A6, & A7	No	Yes	Yes	Yes
City of Los Fresnos	A1 North	No	Yes	Yes	Yes
	A2 South	No	Yes	Yes	Yes
Brownsville Navigation District (BND)	A1 South*	No	Yes	Yes	Yes
	A1 Port*	No	Yes	Yes	Yes
	A8	No	Yes	Yes	Yes
East Rio Hondo Water Supply Corporation (ERH WSC)	A2 North	No	Yes	No	-
	A3	No	Yes	No	-
Brownsville Public Utilities Board (PUB)	A1 South	No	Yes	Yes	Yes
	A1 Port	No	Yes	Yes	Yes
	A8	No	No	Yes	-

* BND can provide water and wastewater services to these areas as an alternate to Brownsville PUB.

7.2 Recommendations for Implementation

The recommended service plans have been developed using sound engineering analysis to arrive at least cost options. The following items apply to the implementation of the recommendations presented herein;

1. In preparing the study, a number of simplifying assumptions have been made that may have some effect on the projected costs for the facilities; thus, the assumptions identified in this report need to be assessed on a site specific basis. Assumptions made include development potential for land in areas in which wetlands are prevalent in the study area so assumed wetlands mitigation has been used to reduce the net effective available sites for development;
2. Jurisdictional requirements specific to the sites or to the service provider selected for an area may require additional set asides for public purposes such as easements, parklands, or road setbacks which may affect net available acreage for development;

3. Consideration needs to be given when two different service providers for water and wastewater service respectfully have been identified which can be secured through contacting each of the service providers; and
4. For planning purposes, there are currently CCNs identified in some of the study area which overlap or compete with the recommendations from this study. CCN designation for Brownsville Public Utilities Board (BPUB), for one, has an area of intended service which encompasses some of the planning areas addressed in this study; however, BPUB has reported to the stakeholders of the study that the utility has no intention of further extending its utilities to this service area. It is anticipated that similar CCN issues exist in the study area and may need to be resolved for implementation.

Considering the aforementioned conditions, the service options recommended for each potential development sites for each service providing agency are listed in **Table 38**.

Figures 30 and 31 show the water and wastewater service options proposed to be served by LMWD, respectively. **Figures 32 and 33** show the water and wastewater service options proposed to be served by the City of Los Fresnos, respectively. **Figures 34 and 35** show the water and wastewater service options proposed to be served by BND, respectively. **Figure 36** shows the water service options proposed to be served by ERHWSC. **Figures 37 and 38** show the water and wastewater service options proposed to be served by BPUB, respectively.

Table 38 Recommended service options.

Service Providing Agency	Parcels	Options	Area (acres)		Water Demand (mgd)	Wastewater Generated (mgd)
			Gross	Developed		
Laguna Madre Water District (LMWD)	A2 North	Wastewater	5,555	3,333	-	0.667
	A3	Wastewater	1,895	1,137	-	0.682
	A4	Water	258	180.6	0.31	-
		Wastewater			-	0.108
A5, A6, & A7	Water	1,253	877	2.19	1.54	
	Wastewater					
City of Los Fresnos	A1 North	Water	1,852	926	0.80	0.278
		Wastewater				
	A2 South	Water	2,134	1,280	0.74	0.256
		Wastewater				
Brownsville Navigation District (BND)	A1 South	Water	1,697	849	0.73	-
	A1 Port	Water	1,734	1,214	3.035	-
	A8	Water	491	344	0.859	-
	A1 South	Wastewater	1,697	849	-	0.255
	A1 Port	Wastewater	1,734	1,214	-	2.124
	A8	Wastewater	491	344	-	0.601
East Rio Hondo Water Supply Corporation (ERH WSC)	A2 North	Water	5,555	3,333	1.92	-
	A3	Water	1,895	1,137	1.96	-
Brownsville Public Utilities Board (PUB)	A1 South	Water	1,697	849	0.73	0.255
		Wastewater				
	A1 Port	Water	1,734	1,214	3.035	2.124
		Wastewater				
A8	Wastewater	491	344	-	0.601	

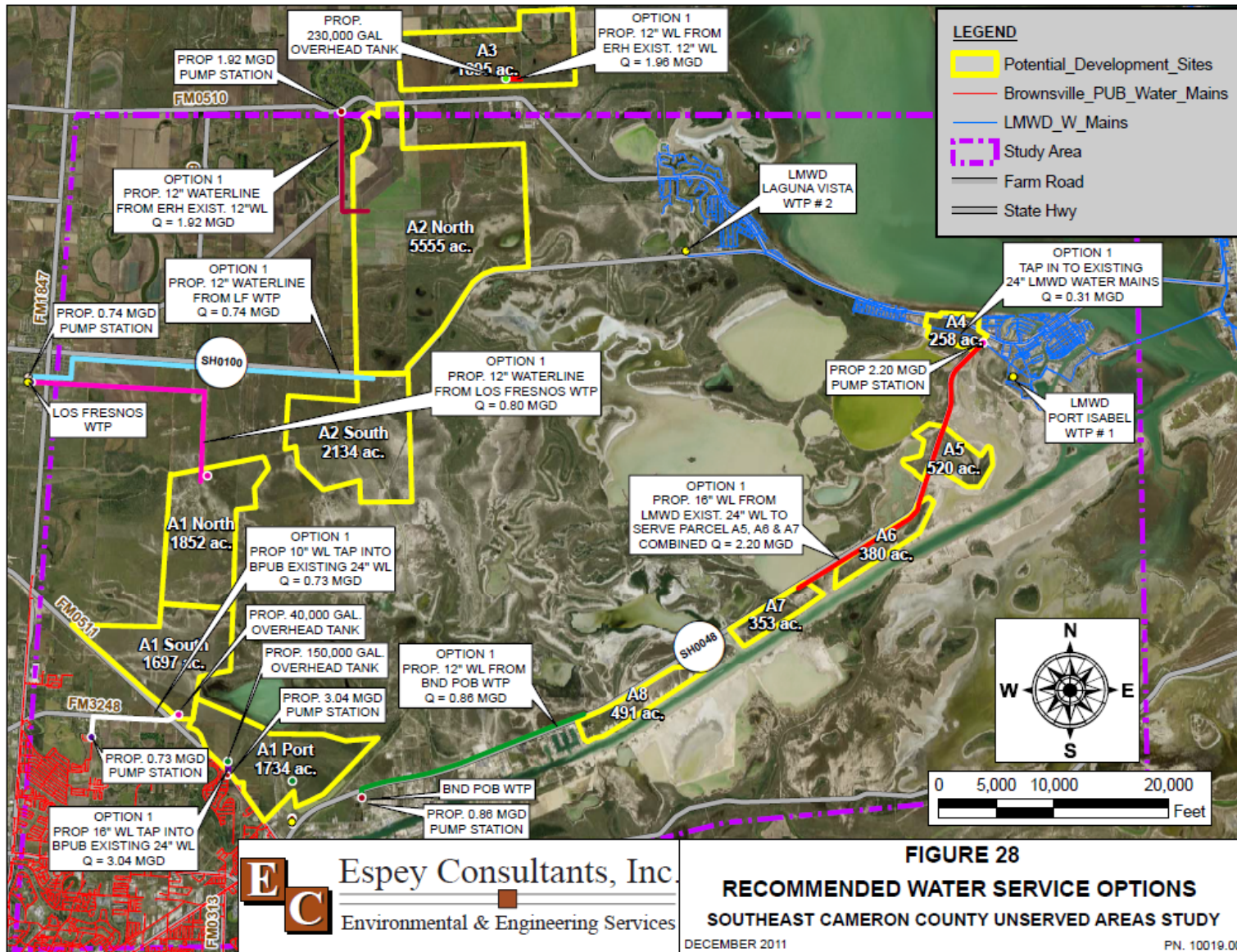


Figure 28 Recommended water service options.

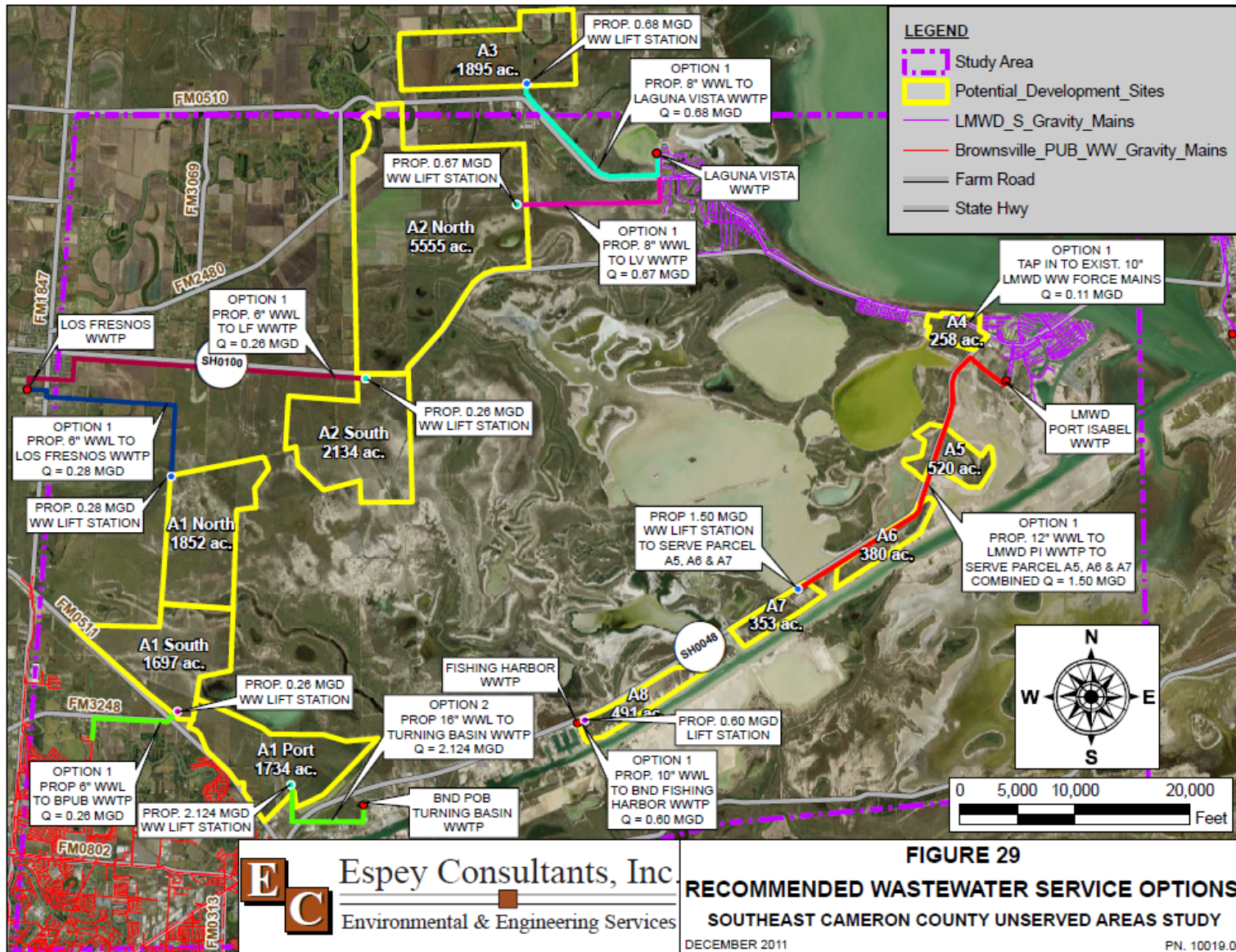


Figure 29 Recommended wastewater service options.

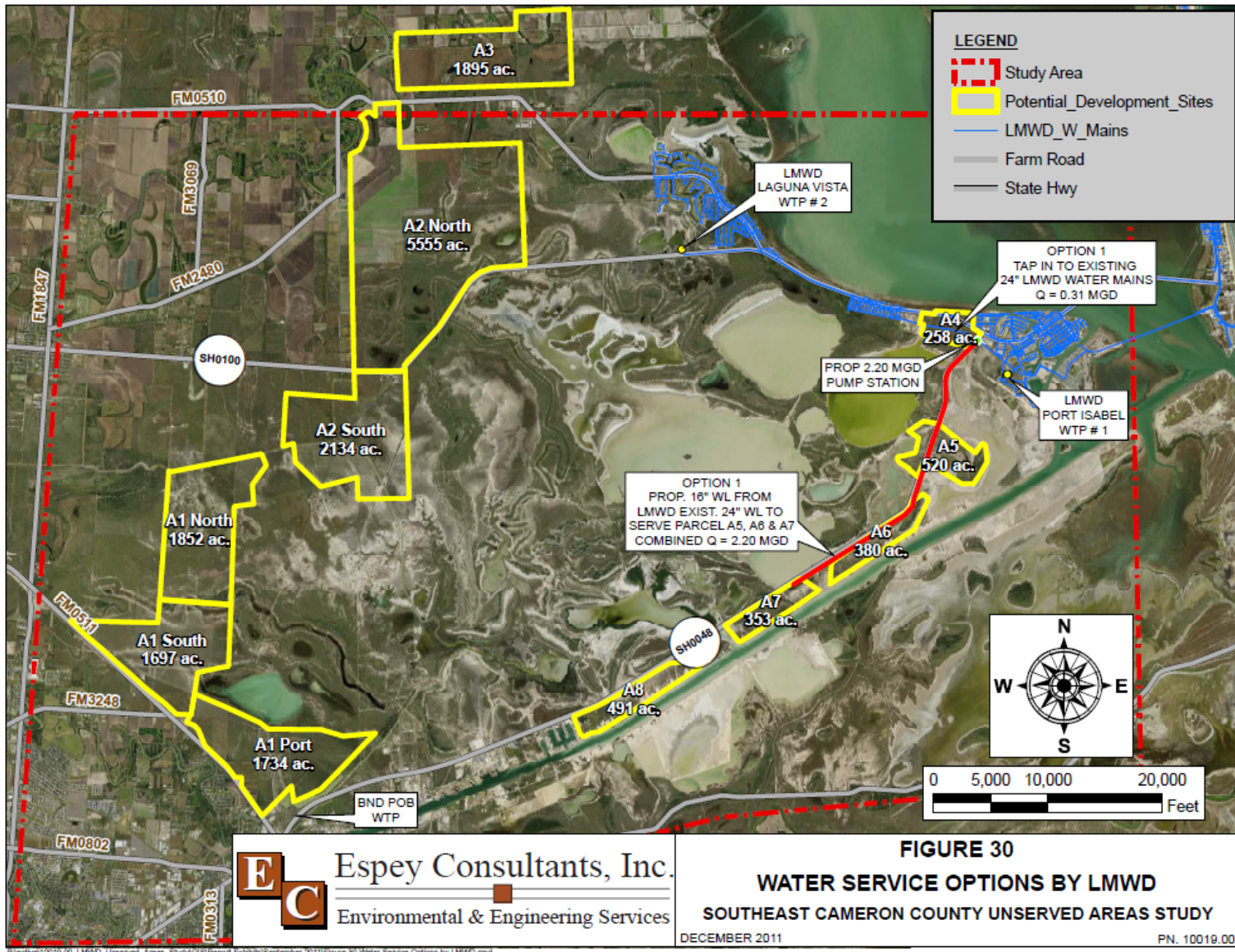


Figure 30 Water service options by Laguna Madre Water District.

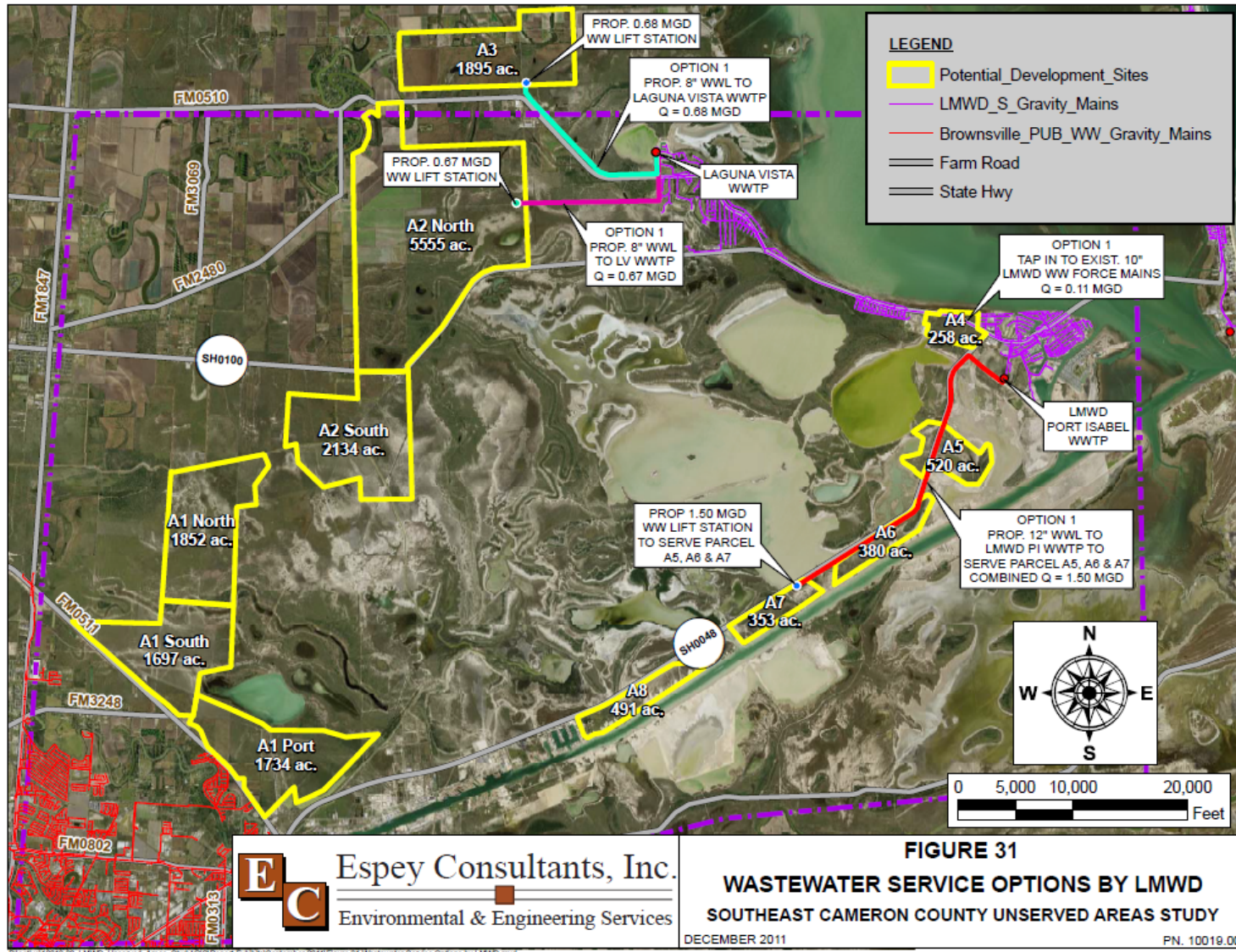


Figure 31 Wastewater service options by Laguna Madre Water District.

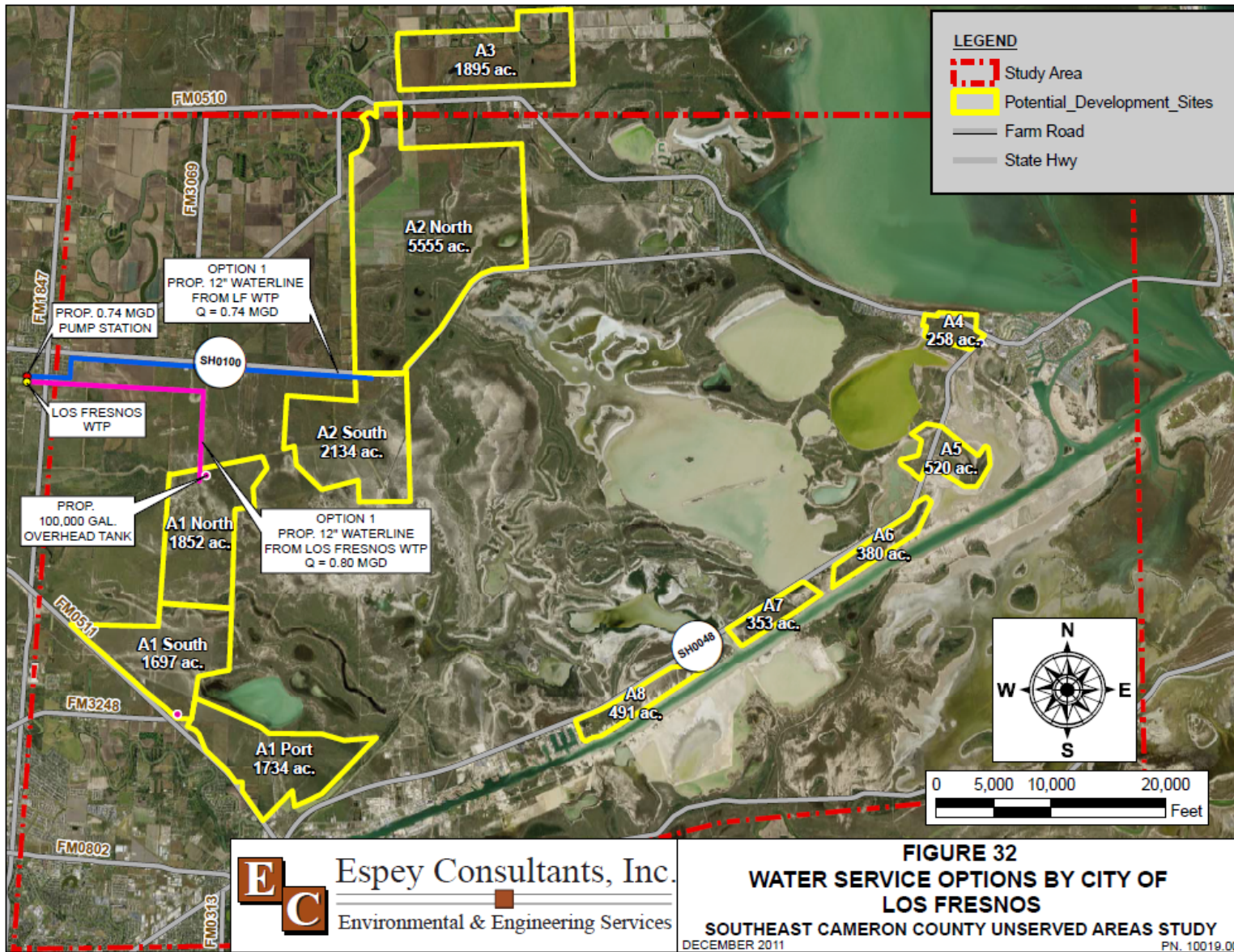


Figure 32 Water service options by Los Fresnos.

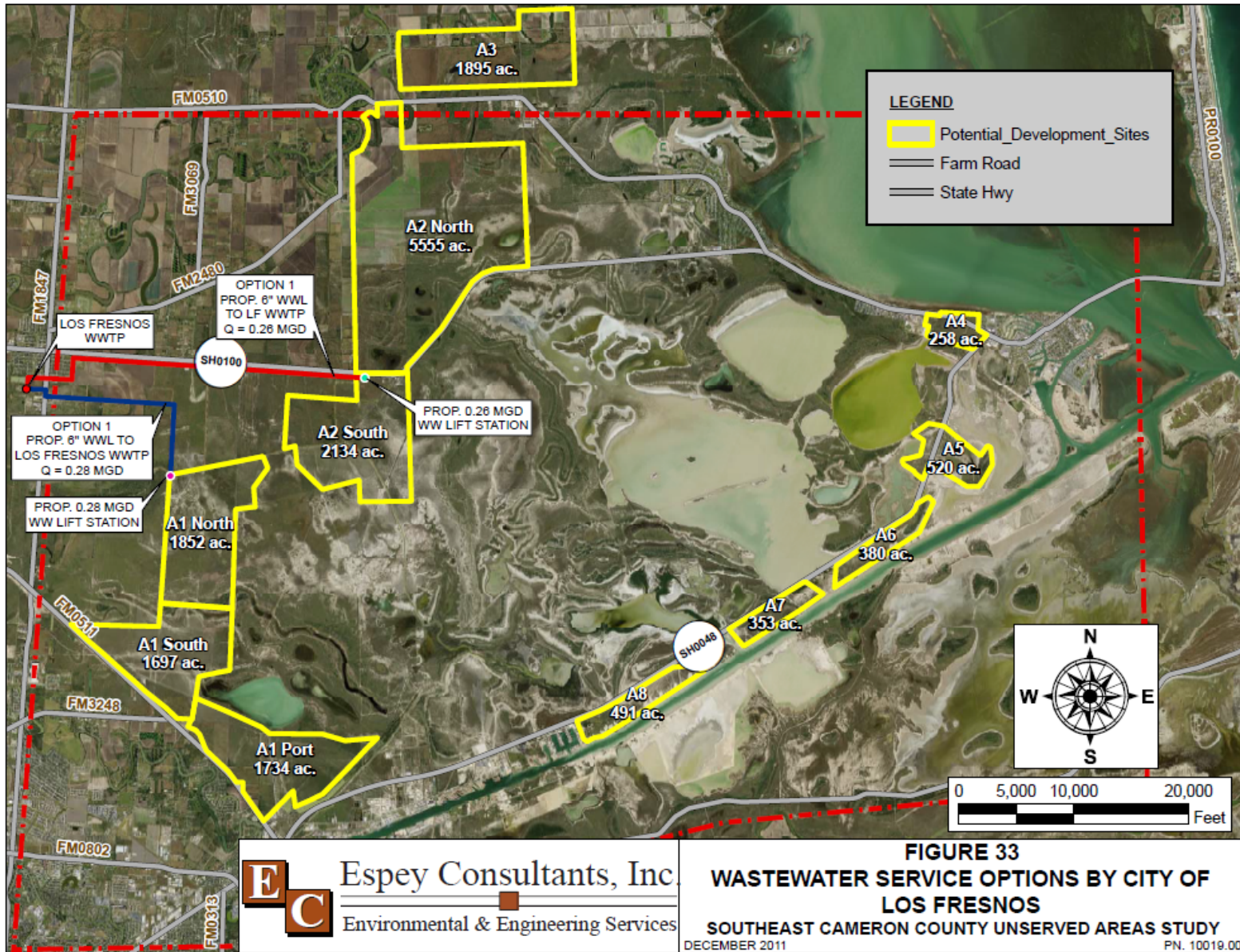


Figure 33 Wastewater service options by Los Fresnos.

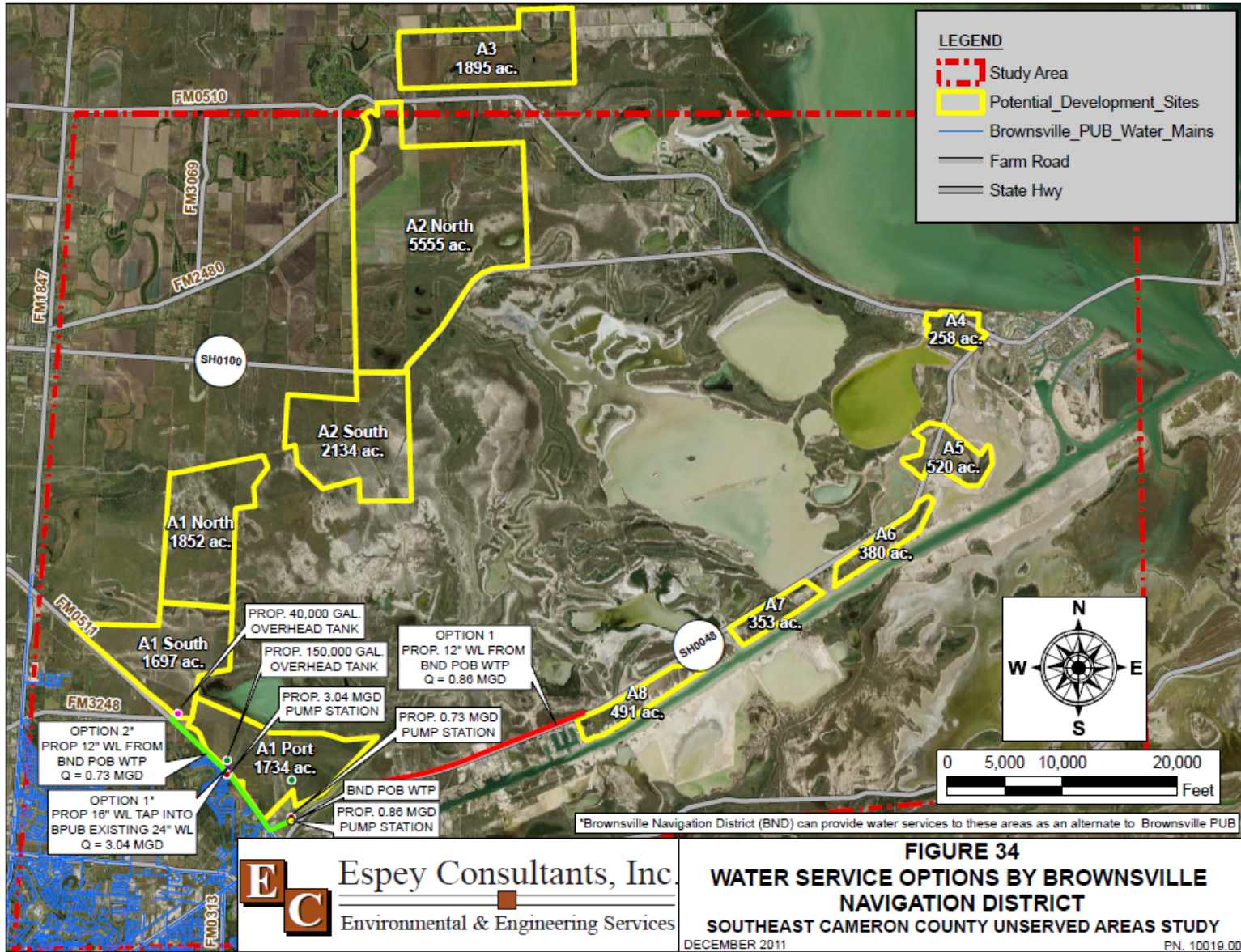


Figure 34 Water service options by Brownsville Navigation District.

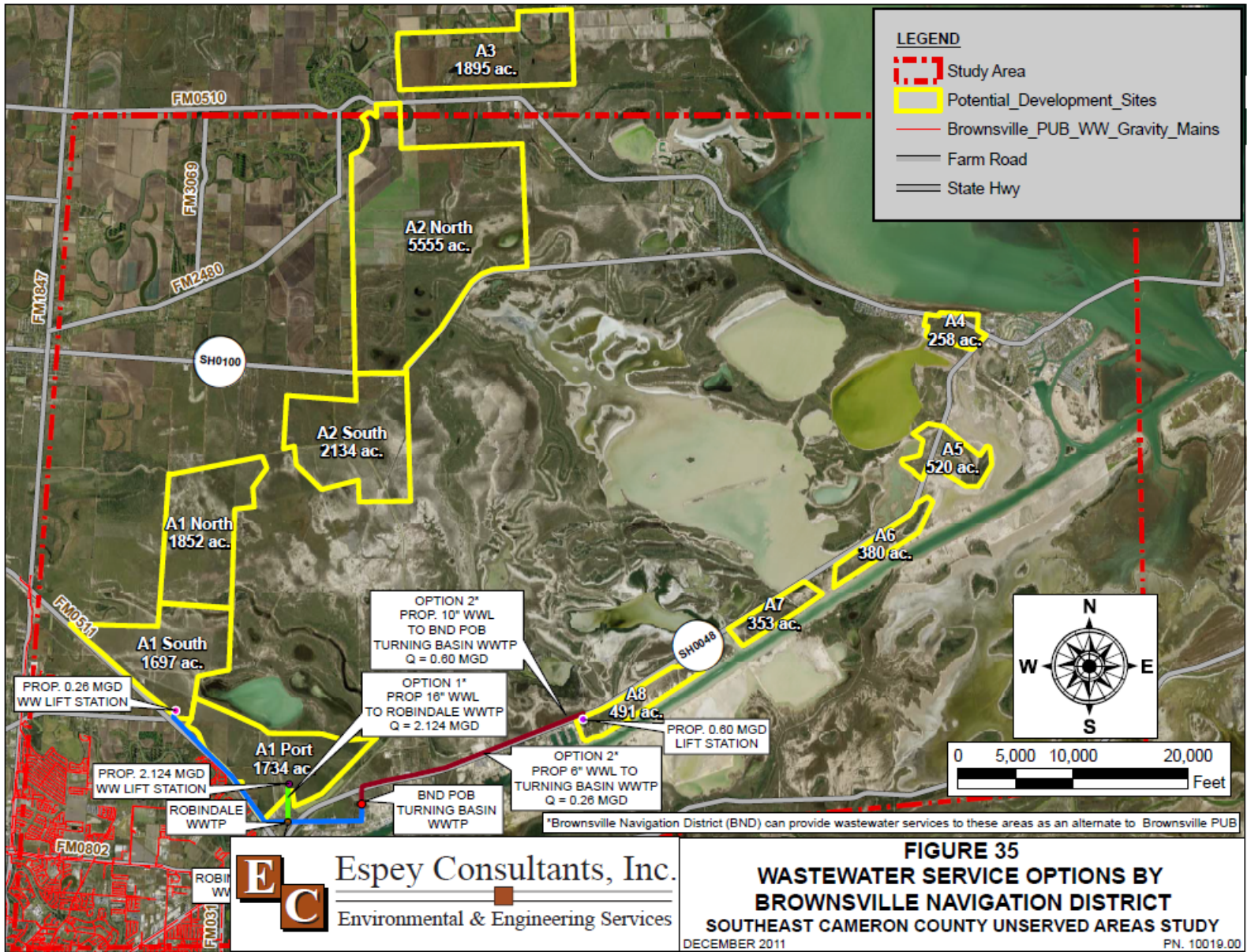


Figure 35 Wastewater service options by Brownsville Navigation District.

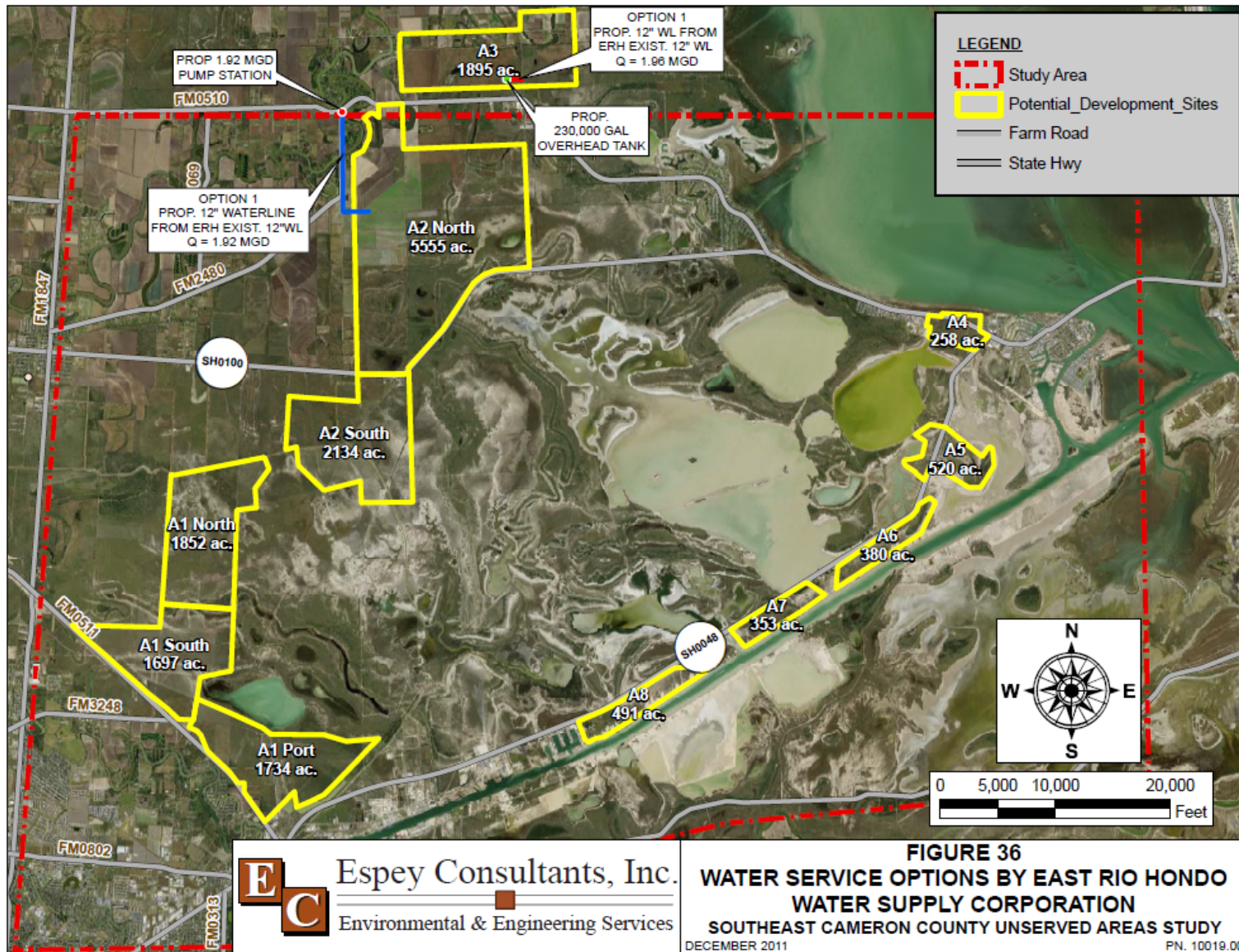


Figure 36 Water service options by East Rio Hondo Water Supply Corporation.

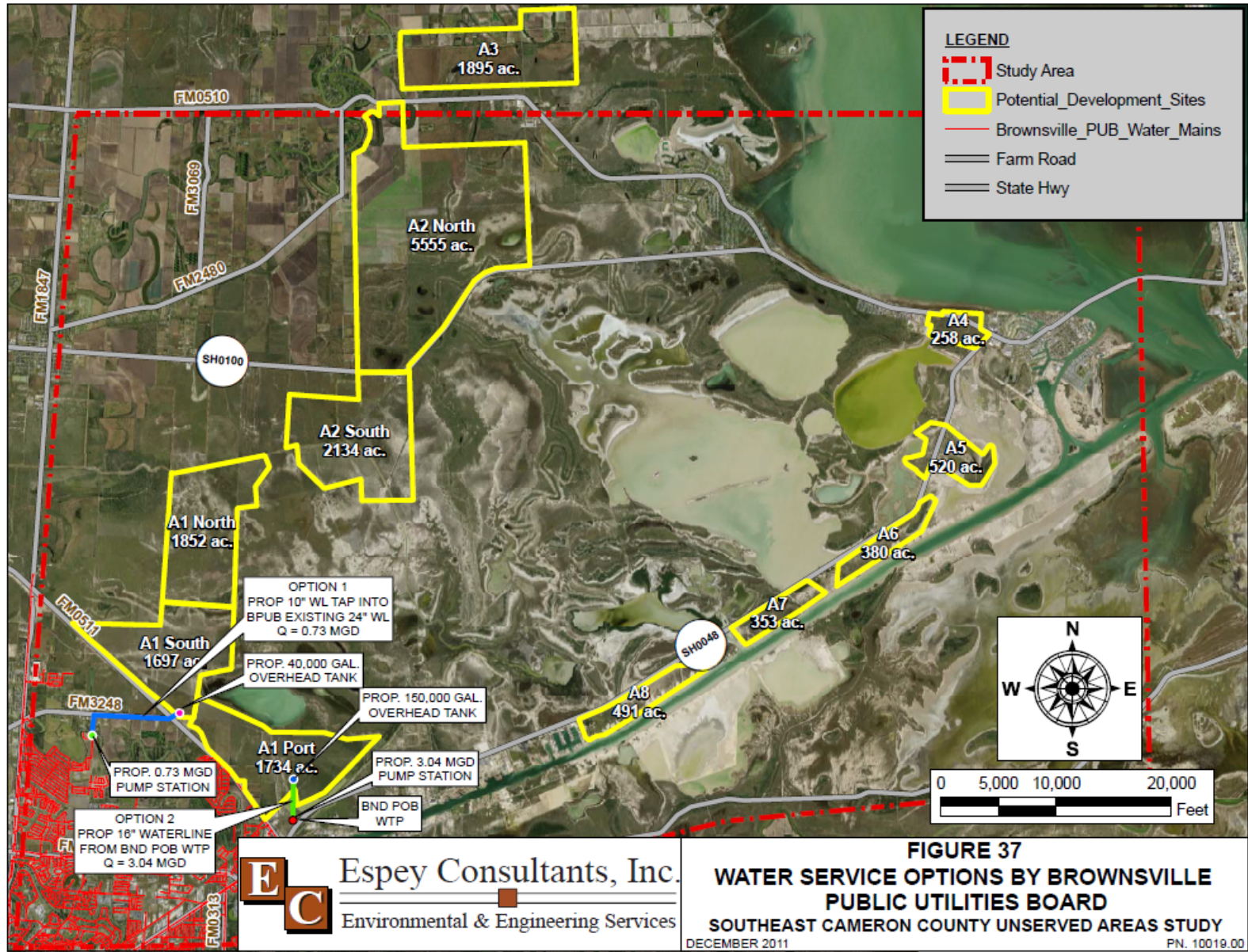


Figure 37 Water service options by Brownsville Public Utilities Board.

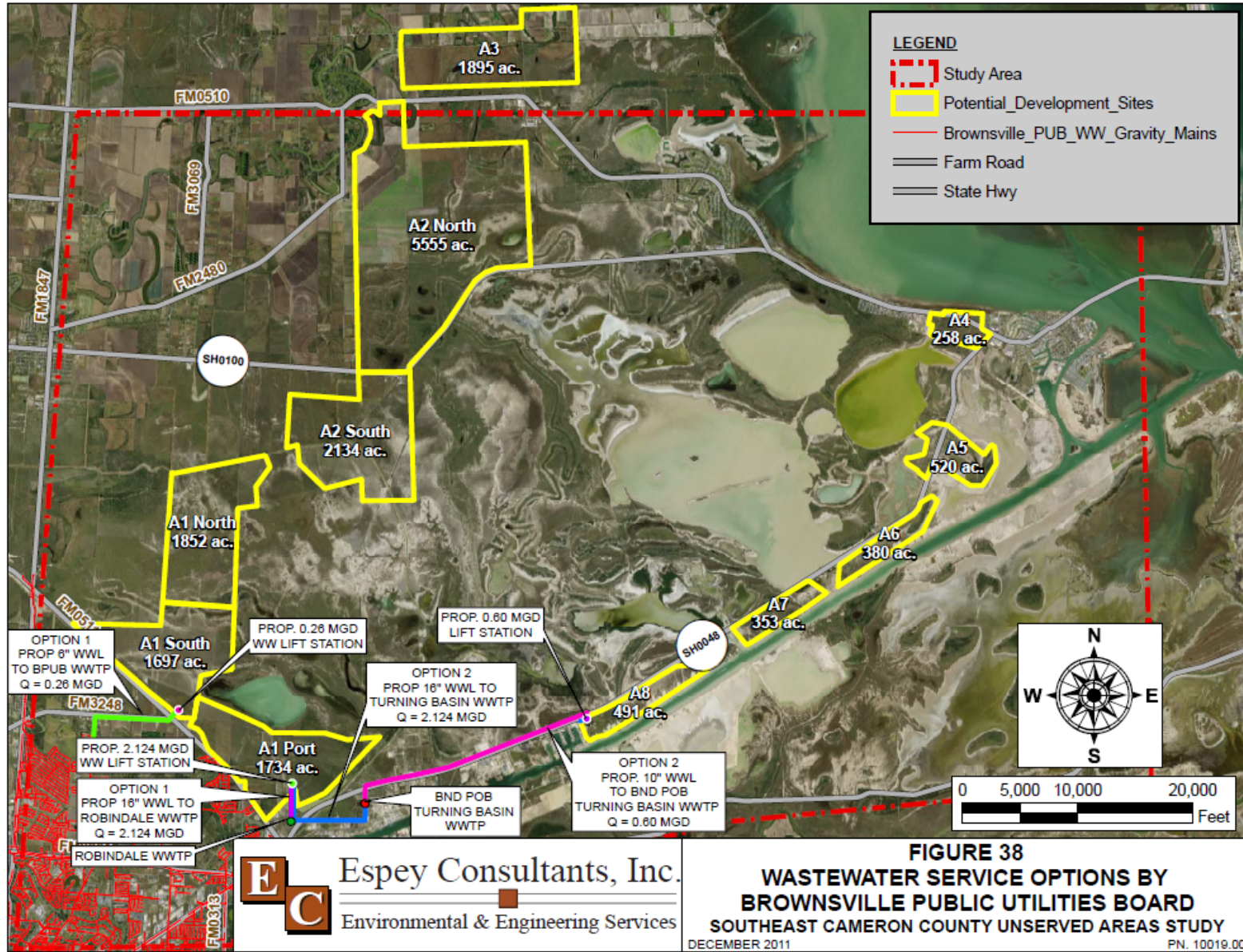


Figure 38 Wastewater service options by Brownsville Public Utilities Board.

8 Acknowledgments

Espey Consultants, Inc. (EC), recognizes that studies become more useful when those affected by the study have involvement in its development. For this study, EC gratefully recognizes and extends its appreciation to the following individuals making up the Technical Advisory Committee, each of which are stakeholders in the outcome of the study and contributed their time and experience as seasoned utility management to improve the study methodology and outcome:

Entity Represented	Names
Laguna Madre Water District	Gavino Sotelo, Maribel Hinojosa, Pete Capistran
City of Los Fresnos	Mark Milum, Carlos Salazar, Pam Denny
Port of Brownsville	Ariel Chavez II, Eduardo Campirano
East Rio Hondo Water Supply Corporation	Brian Macmanus

This page is intentionally blank.

9 References

- USFWS (U.S. Fish & Wild Life Services) – Branch of Habitat Assessment, 2010, National Wetlands Inventory.
- FEMA (Federal Emergency Management Agency), Panel ID: 4801010350B, 1983, 100-yr & 500-yr Floodplain Maps.
- FEMA (Federal Emergency Management Agency), Panel ID: 4801010275C, 1991, 100-yr & 500-yr Floodplain Maps.
- FEMA (Federal Emergency Management Agency), Panel ID: 4801010375D, 1992, 100-yr & 500-yr Floodplain Maps.
- FEMA (Federal Emergency Management Agency), Panel ID: 4801010300E, 1999, 100-yr & 500-yr Floodplain Maps.
- TCEQ (Texas Commission on Environmental Quality), 2010, Water & Wastewater Utilities Database.
- TWDB (Texas Water Development Board), 2011, Region M Master Water Plan.
- USFWS (U.S. Fish & Wild Life Services) – Branch of Habitat Assessment, 2010, National Wetlands Inventory.

This page is intentionally blank.

10 Appendix A

Cost Estimate Tables

This page is intentionally blank.

Table CE-1
Laguna Madre Water District
Unserved Areas Study
Parcel A1 North - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	12" Fusible PVC	23,200	LF	\$34.19	\$793,302
2	Connection Fittings	10	EA	\$2,500	\$25,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$822,302
B	Pump Station				
1	Booster Pump Station (0.8 MGD, 25HP In-line Pump Station)	1	LS	\$ 95,000	\$95,000
2	Electrical and Instrumentation	5%			\$4,750
3	EST (100,000 gal)	1	LS	\$ 400,000	\$400,000
SUBTOTAL ITEMS B1-B3					\$499,750
SUBTOTAL (A+B)					\$1,322,052
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$66,103
2	Contractor's Profit and Overhead	15%	-	-	\$198,308
3	Contingency	10%	-	-	\$132,205
SUBTOTAL ITEMS C1-C3					\$396,616
SUBTOTAL (A+B+C)					\$1,718,668
TOTAL CONSTRUCTION COST					\$1,719,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$343,734
SUBTOTAL (A+B+C+D)					\$2,062,402
TOTAL PROJECT COST					\$2,062,000

Table CE-2
Laguna Madre Water District
Unserved Areas Study
Parcel A1 North - Option 2 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	12" Fusible PVC	24,800	LF	\$34.19	\$848,013
2	Connection Fittings	10	EA	\$2,500	\$25,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$877,013
B	Pump Station				
1	Booster Pump Station (0.8 MGD, 25HP In-line Pump Station)	1	LS	\$ 95,000	\$95,000
2	Electrical and Instrumentation	5%			\$4,750
3	EST (100,000 gal)	1	LS	\$ 400,000	\$400,000
SUBTOTAL ITEMS B1-B2					\$499,750
SUBTOTAL (A+B)					\$1,376,763
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$68,838
2	Contractor's Profit and Overhead	15%	-	-	\$206,514
3	Contingency	10%	-	-	\$137,676
SUBTOTAL ITEMS C1-C3					\$413,029
SUBTOTAL (A+B+C)					\$1,789,792
TOTAL CONSTRUCTION COST					\$1,790,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$357,958
SUBTOTAL (A+B+C+D)					\$2,147,750
TOTAL PROJECT COST					\$2,148,000

Table CE-3
Laguna Madre Water District
Unserved Areas Study
Parcel A1 North - Option 3 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	12" Fusible PVC	22,000	LF	\$34.19	\$752,269
2	Connection Fittings	10	EA	\$2,500	\$25,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$781,269
B	Treatment Plant and Pump Station				
1	0.8 MGD Packaged Treatment Plant	1	LS	\$4,800,000	\$4,800,000
2	Clearwell (40,000 gal)	1	LS	\$24,000	\$24,000
3	Site Work	5%			\$241,200
4	Booster Pump Station (1MGD, 15HP Vertical Turbine Pump Station)	1	LS	\$ 80,000	\$80,000
5	Electrical and Instrumentation	5%			\$4,000
SUBTOTAL ITEMS B1-B5					\$5,149,200
SUBTOTAL (A+B)					\$5,930,469
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$296,523
2	Contractor's Profit and Overhead	15%	-	-	\$889,570
3	Contingency	10%	-	-	\$593,047
SUBTOTAL ITEMS C1-C3					\$1,779,141
SUBTOTAL (A+B+C)					\$7,709,610
TOTAL CONSTRUCTION COST					\$7,710,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$1,541,922
SUBTOTAL (A+B+C+D)					\$9,251,532
TOTAL PROJECT COST					\$9,252,000

Table CE-4
Laguna Madre Water District
Unserved Areas Study
Parcel A1 North - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	6" Fusible PVC	20,000	LF	\$17.10	\$341,941
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	10	EA	\$4,000	\$40,000
4	4" Manhole	10	EA	\$2,000	\$20,000
5	Raw Wastewater Lift Station (0.3 MGD, 10 HP Duplex pump station)	1	LS	\$60,000	\$60,000
6	Electrical and Instrumentation	5%			\$3,000
SUBTOTAL ITEMS A1-A6					\$479,941
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$23,997
2	Contractor's Profit and Overhead	15%	-	-	\$71,991
3	Contingency	10%	-	-	\$47,994
SUBTOTAL ITEMS B1-B3					\$143,982
SUBTOTAL (A+B)					\$623,923
TOTAL CONSTRUCTION COST					\$624,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$124,785
SUBTOTAL (A+B+C)					\$748,707
TOTAL PROJECT COST					\$749,000

Table CE-5
Laguna Madre Water District
Unserved Areas Study
Parcel A1 North - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	On-Site Treatment Plant				
1	0.3 MGD Package Plant	1	LS	\$1,668,000	\$1,668,000
2	Site Work	5%			\$83,400
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.3 MGD, 5 HP Duplex pump station)	1	LS	\$60,000	\$60,000
6	Electrical and Instrumentation	5%			\$86,400
SUBTOTAL ITEMS A1-A6					\$1,905,800
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$95,290
2	Contractor's Profit and Overhead	15%	-	-	\$285,870
3	Contingency	10%	-	-	\$190,580
SUBTOTAL ITEMS B1-B3					\$571,740
SUBTOTAL (A+B)					\$2,477,540
TOTAL CONSTRUCTION COST					\$2,478,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$495,508
SUBTOTAL (A+B+C)					\$2,973,048
TOTAL PROJECT COST					\$2,973,000

Table CE-6
Laguna Madre Water District
Unserved Areas Study
Parcel A1 Port - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	16" Fusible PVC	3,400	LF	\$45.59	\$155,013
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$174,013
B	Pump Station				
1	Booster Pump Station (3.035 MGD, 80HP In-line Pump Station)	1	LS	\$152,000	\$152,000
2	Electrical and Instrumentation	5%			\$7,600
3	EST (175,000 gal)	1	LS	\$ 700,000	\$700,000
SUBTOTAL ITEMS B1-B2					\$859,600
SUBTOTAL (A+B)					\$1,033,613
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$51,681
2	Contractor's Profit and Overhead	15%	-	-	\$155,042
3	Contingency	10%	-	-	\$103,361
SUBTOTAL ITEMS C1-C3					\$310,084
SUBTOTAL (A+B+C)					\$1,343,697
TOTAL CONSTRUCTION COST					\$1,344,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$268,739
SUBTOTAL (A+B+C+D)					\$1,612,436
TOTAL PROJECT COST					\$1,612,000

Table CE-7
Laguna Madre Water District
Unserved Areas Study
Parcel A1 Port - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	8" Fusible PVC	9,700	LF	\$22.80	\$221,122
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	5	EA	\$4,000	\$19,400
4	4" Manhole	10	EA	\$2,000	\$20,000
5	Raw Wastewater Lift Station (2.124 MGD, 30 HP Duplex pump station)	1	LS	\$90,000	\$90,000
6	Electrical and Instrumentation	5%			\$4,500
SUBTOTAL ITEMS A1-A6					\$370,022
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$18,501
2	Contractor's Profit and Overhead	15%	-	-	\$55,503
3	Contingency	10%	-	-	\$37,002
SUBTOTAL ITEMS B1-B3					\$111,006
SUBTOTAL (A+B)					\$481,028
TOTAL CONSTRUCTION COST					\$481,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$96,206
SUBTOTAL (A+B+C)					\$577,234
TOTAL PROJECT COST					\$577,000

Table CE-8
Laguna Madre Water District
Unserviced Areas Study
Parcel A1 Port - Option 2 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	16" Fusible PVC	1,000	LF	\$45.59	\$45,592
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$64,592
B	Pump Station				
1	Booster Pump Station (3.035 MGD, 75HP In-line Pump Station)	1	LS	\$ 152,000	\$152,000
2	Electrical and Instrumentation	5%			\$7,600
3	EST (175,000 gal)	1	LS	\$ 700,000	\$700,000
SUBTOTAL ITEMS B1-B2					\$859,600
SUBTOTAL (A+B)					\$924,192
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$46,210
2	Contractor's Profit and Overhead	15%	-	-	\$138,629
3	Contingency	10%	-	-	\$92,419
SUBTOTAL ITEMS C1-C3					\$277,258
SUBTOTAL (A+B+C)					\$1,201,450
TOTAL CONSTRUCTION COST					\$1,201,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$240,290
SUBTOTAL (A+B+C+D)					\$1,441,740
TOTAL PROJECT COST					\$1,442,000

Table CE-9
Laguna Madre Water District
Unsewered Areas Study
Parcel A1 Port - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	8" Fusible PVC	11,000	LF	\$22.80	\$250,756
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	6	EA	\$4,000	\$22,000
4	4" Manhole	10	EA	\$2,000	\$20,000
5	Raw Wastewater Lift Station (2.124 MGD, 35 HP Duplex pump station)	1	LS	\$90,000	\$90,000
6	Electrical and Instrumentation	5%			\$4,500
SUBTOTAL ITEMS A1-A6					\$402,256
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$20,113
2	Contractor's Profit and Overhead	15%	-	-	\$60,338
3	Contingency	10%	-	-	\$40,226
SUBTOTAL ITEMS B1-B3					\$120,677
SUBTOTAL (A+B)					\$522,933
TOTAL CONSTRUCTION COST					\$523,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$104,587
SUBTOTAL (A+B+C)					\$627,520
TOTAL PROJECT COST					\$628,000

Table CE-10
Laguna Madre Water District
Unserved Areas Study
Parcel A1 Port - Option 3 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	On-Site Treatment Plant				
1	0.51 MGD Package Plant	1	LS	\$3,084,000	\$3,084,000
2	Site Work	5%			\$154,200
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.51 MGD, 7.5 HP Duplex pump station)	1	LS	\$90,000	\$90,000
6	Electrical and Instrumentation	5%			\$158,700
SUBTOTAL ITEMS A1-A6					\$3,494,900
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$174,745
2	Contractor's Profit and Overhead	15%	-	-	\$524,235
3	Contingency	10%	-	-	\$349,490
SUBTOTAL ITEMS B1-B3					\$1,048,470
SUBTOTAL (A+B)					\$4,543,370
TOTAL CONSTRUCTION COST					\$4,543,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$908,674
SUBTOTAL (A+B+C)					\$5,452,044
TOTAL PROJECT COST					\$5,452,000

Table CE-11

**Laguna Madre Water District
Unserviced Areas Study
Parcel A1 South - Option 1 Water Infrastructure
Opinion of Probable Construction Cost**

ITEM NO	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	10" Fusible PVC	9,200	LF	\$28.50	\$262,155
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$281,155
B	Pump Station				
1	Booster Pump Station (0.75 MGD, 25HP In-line Pump Station)	1	LS	\$ 88,000	\$88,000
2	Electrical and Instrumentation	5%			\$4,400
3	EST (175,000 gal)	1	LS	\$ 700,000	\$700,000
SUBTOTAL ITEMS B1-B2					\$792,400
SUBTOTAL (A+B)					\$1,073,555
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$53,678
2	Contractor's Profit and Overhead	15%	-	-	\$161,033
3	Contingency	10%	-	-	\$107,355
SUBTOTAL ITEMS C1-C3					\$322,066
SUBTOTAL (A+B+C)					\$1,395,621
TOTAL CONSTRUCTION COST					\$1,396,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$279,124
SUBTOTAL (A+B+C+D)					\$1,674,745
TOTAL PROJECT COST					\$1,675,000

Table CE-12
Laguna Madre Water District
Unservd Areas Study
Parcel A1 South - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	6" Fusible PVC	22,100	LF	\$17.10	\$377,844
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	11	EA	\$4,000	\$44,200
4	4" Manhole	10	EA	\$2,000	\$20,000
5	Raw Wastewater Lift Station (0.255 MGD, 7.5 HP Duplex pump station)	1	LS	\$64,000	\$64,000
6	Electrical and Instrumentation	5%			\$3,200
SUBTOTAL ITEMS A1-A6					\$524,244
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$26,212
2	Contractor's Profit and Overhead	15%	-	-	\$78,637
3	Contingency	10%	-	-	\$52,424
SUBTOTAL ITEMS B1-B3					\$157,273
SUBTOTAL (A+B)					\$681,518
TOTAL CONSTRUCTION COST					\$682,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$136,304
SUBTOTAL (A+B+C)					\$817,821
TOTAL PROJECT COST					\$818,000

Table CE-13

**Laguna Madre Water District
Unserviced Areas Study
Parcel A1 South - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost**

ITEM NO	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	6" Fusible PVC	9,200	LF	\$17.10	\$157,293
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	5	EA	\$4,000	\$18,400
4	4" Manhole	10	EA	\$2,000	\$20,000
5	Raw Wastewater Lift Station (0.255 MGD, 5 HP Duplex pump station)	1	LS	\$64,000	\$64,000
6	Electrical and Instrumentation	5%			\$3,200
SUBTOTAL ITEMS A1-A6					\$277,893
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$13,895
2	Contractor's Profit and Overhead	15%	-	-	\$41,684
3	Contingency	10%	-	-	\$27,789
SUBTOTAL ITEMS B1-B3					\$83,368
SUBTOTAL (A+B)					\$361,261
TOTAL CONSTRUCTION COST					\$361,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$72,252
SUBTOTAL (A+B+C)					\$433,513
TOTAL PROJECT COST					\$434,000

Table CE-14
Laguna Madre Water District
Unserviced Areas Study
Parcel A1 South - Option 2 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Pipeline and Pumping				
1	10" Fusible PVC	15,600	LF	\$28.50	\$444,523
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	2	EA	\$2,000	\$4,000
SUBTOTAL ITEMS A1-A3					\$463,523
B	Pump Station				
1	High Service Pump Station (0.75 MGD, 25HP Vertical Turbine Pump Station)	1	LS	\$88,000	\$88,000
2	Electrical and Instrumentation	5%			\$4,400
3	EST (175,000 gal)	1	LS	\$ 700,000	\$700,000
SUBTOTAL ITEMS B1-B2					\$792,400
SUBTOTAL (A+B)					\$1,255,923
C	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$62,796
2	Contractor's Profit and Overhead	15%	-	-	\$188,388
3	Contingency	10%	-	-	\$125,592
SUBTOTAL ITEMS C1-C3					\$376,777
SUBTOTAL (A+B+C)					\$1,632,700
TOTAL CONSTRUCTION COST					\$1,633,000
D	Engineering, Surveying, and Geotechnical Fees	20%			\$326,540
SUBTOTAL (A+B+C+D)					\$1,959,240
TOTAL PROJECT COST					\$1,959,000

Table CE-15

**Laguna Madre Water District
Unserviced Areas Study
Parcel A1 South - Option 3 Wastewater Infrastructure
Opinion of Probable Construction Cost**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	On-Site Treatment Plant				
1	0.255 MGD Package Plant	1	LS	\$1,530,000	\$1,530,000
2	Site Work	5%			\$76,500
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.255 MGD, 5 HP Duplex pump station)	1	LS	\$64,000	\$64,000
6	Electrical and Instrumentation	5%			\$79,700
SUBTOTAL ITEMS A1-A6					\$1,758,200
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$87,910
2	Contractor's Profit and Overhead	15%	-	-	\$263,730
3	Contingency	10%	-	-	\$175,820
SUBTOTAL ITEMS B1-B3					\$527,460
SUBTOTAL (A+B)					\$2,285,660
TOTAL CONSTRUCTION COST					\$2,286,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$457,132
SUBTOTAL (A+B+C)					\$2,742,792
TOTAL PROJECT COST					\$2,743,000

Table CE-16

**Laguna Madre Water District
Unserved Areas Study
Parcel A2 North - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	8" Fusible PVC	16,500	LF	\$22.80	\$376,135
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	8	EA	\$4,000	\$33,000
4	4" Manhole	16	EA	\$2,000	\$32,000
5	Raw Wastewater Lift Station (0.7 MGD, 25 HP Submersible Pump)	1	LS	\$125,000	\$125,000
6	Electrical and Instrumentation	5%			\$6,250
SUBTOTAL ITEMS A1-A6					\$587,385
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$29,369
2	Contractor's Profit and Overhead	15%	-	-	\$88,108
3	Contingency	10%	-	-	\$58,738
SUBTOTAL ITEMS B1-B3					\$176,215
SUBTOTAL (A+B)					\$763,600
TOTAL CONSTRUCTION COST					\$764,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$152,720
SUBTOTAL (A+B+C)					\$916,320
TOTAL PROJECT COST					\$916,000

Table CE-17
Laguna Madre Water District
Unserved Areas Study
Parcel A2 North - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	12" Fusible PVC	11,000	LF	\$34.19	\$376,135
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	6	EA	\$2,000	\$11,000
4	Pump Station (1.92 MGD, 75HP Duplex Pump Station)	1	LS	\$160,000	\$160,000
5	Electrical and Instrumentation	5%			\$8,000
6	EST, Connections and Fittings (225,000 gal)	1	LS	\$900,000	\$900,000
SUBTOTAL ITEMS A1-A6					\$1,470,135
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$73,507
2	Contractor's Profit and Overhead	15%	-	-	\$220,520
3	Contingency	10%	-	-	\$147,013
SUBTOTAL ITEMS B1-B3					\$441,040
SUBTOTAL (A+B)					\$1,911,175
TOTAL CONSTRUCTION COST					\$1,911,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$382,235
SUBTOTAL (A+B+C)					\$2,293,410
TOTAL PROJECT COST					\$2,293,000

Table CE-18
Laguna Madre Water District
Unserved Areas Study
Parcel A2 North - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	On-Site Treatment Plant				
1	0.7 MGD Package Plant	1	LS	\$4,002,000	\$4,002,000
2	Site Work	5%			\$200,100
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.7 MGD, 10 HP Submersible pump)	1	LS	\$125,000	\$125,000
6	Electrical and Instrumentation	5%			\$206,350
SUBTOTAL ITEMS A1-A6					\$4,541,450
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$227,073
2	Contractor's Profit and Overhead	15%	-	-	\$681,218
3	Contingency	10%	-	-	\$454,145
SUBTOTAL ITEMS B1-B3					\$1,362,435
SUBTOTAL (A+B)					\$5,903,885
TOTAL CONSTRUCTION COST					\$5,904,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$1,180,777
SUBTOTAL (A+B+C)					\$7,084,662
TOTAL PROJECT COST					\$7,085,000

Table CE-19
Laguna Madre Water District
Unserved Areas Study
Parcel A2 North - Option 2 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	12" Fusible PVC	17,200	LF	\$34.19	\$588,138
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	9	EA	\$2,000	\$17,200
4	High Service Pump Station (1.92 MGD, 100HP Vertical Turbine Pump station)	1	LS	\$160,000	\$160,000
5	Electrical and Instrumentation	5%			\$8,000
6	EST, Connections and Fittings (225,000 gal)	1	LS	\$900,000	\$900,000
SUBTOTAL ITEMS A1-A6					\$1,688,338
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$84,417
2	Contractor's Profit and Overhead	15%	-	-	\$253,251
3	Contingency	10%	-	-	\$168,834
SUBTOTAL ITEMS B1-B3					\$506,501
SUBTOTAL (A+B)					\$2,194,839
TOTAL CONSTRUCTION COST					\$2,195,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$438,968
SUBTOTAL (A+B+C)					\$2,633,807
TOTAL PROJECT COST					\$2,634,000

Table CE-20

**Laguna Madre Water District
Unserved Areas Study
Parcel A2 North - Option 3 Water Infrastructure
Opinion of Probable Construction Cost**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Raw Water Pipeline and Pumping				
1	12" Fusible PVC	1,300	LF	\$34.19	\$44,452
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	1	EA	\$2,000	\$1,300
4	4" Air Release/Vacuum Valves	1	EA	\$4,000	\$2,600
5	Raw Pump Station (2.3 MGD, 20 HP Duplex Pump Station)	1	LS	\$125,000	\$125,000
6	Water Treatment Plant (1.92 MGD)	1	LS	\$7,680,000	\$7,680,000
7	Site Worth	5%			\$384,000
8	Electrical and Instrumentation	5%			\$390,250
9	Clearwell, Connections and Fittings (100,000 gal)	1	EA	\$60,000	\$60,000
SUBTOTAL ITEMS A1-A9					\$8,702,602
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$435,130
2	Contractor's Profit and Overhead	15%	-	-	\$1,305,390
3	Contingency	10%	-	-	\$870,260
SUBTOTAL ITEMS B1-B3					\$2,610,781
SUBTOTAL (A+B)					\$11,313,383
TOTAL CONSTRUCTION COST					\$11,313,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$2,262,677
SUBTOTAL (A+B+C)					\$13,576,060
TOTAL PROJECT COST					\$13,576,000

Table CE-21
Laguna Madre Water District
Unserved Areas Study
Parcel A2 South - Option 2 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Raw Water Pipeline and Pumping				
1	10" Fusible PVC	1,000	LF	\$28.50	\$28,495
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	1	EA	\$2,000	\$1,000
4	Water Treatment Plant (0.74 MGD)	1	LS	#####	\$4,440,000
5	Site Work	5%			\$222,000
6	Raw Water Pump Station (0.88 MGD, 25HP Duplex Pump Station)	1	LS	\$95,000	\$95,000
7	Electrical and Instrumentation	5%			\$226,750
8	Clearwell, Connections and Fittings (40,000 gal)	1	EA	\$24,000	\$24,000
SUBTOTAL ITEMS A1-A8					\$5,052,245
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$252,612
2	Contractor's Profit and Overhead	15%	-	-	\$757,837
3	Contingency	10%	-	-	\$505,225
SUBTOTAL ITEMS B1-B3					\$1,515,674
SUBTOTAL (A+B)					\$6,567,919
TOTAL CONSTRUCTION COST					\$6,568,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$1,313,584
SUBTOTAL (A+B+C)					\$7,881,502
TOTAL PROJECT COST					\$7,882,000

Table CE-22
Laguna Madre Water District
Unserved Areas Study
Parcel A2 South - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	10" Fusible PVC	32,000	LF	\$28.50	\$911,842
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	16	EA	\$2,000	\$32,000
4	High Service Pump Station (0.74 MGD, 30HP Vertical Turbine Pump Station)	1	LS	\$95,000	\$95,000
5	Electrical and Instrumentation	5%			\$4,750
6	EST, Connections and Fittings (100,000 gal)	1	LS	\$400,000	\$400,000
SUBTOTAL ITEMS A1-A6					\$1,458,592
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$72,930
2	Contractor's Profit and Overhead	15%	-	-	\$218,789
3	Contingency	10%	-	-	\$145,859
SUBTOTAL ITEMS B1-B3					\$437,578
SUBTOTAL (A+B)					\$1,896,169
TOTAL CONSTRUCTION COST					\$1,896,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$379,234
SUBTOTAL (A+B+C)					\$2,275,403
TOTAL PROJECT COST					\$2,275,000

Table CE-23
Laguna Madre Water District
Unserved Areas Study
Parcel A2 South - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	6" Fusible PVC	32,000	LF	\$17.10	\$547,105
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	16	EA	\$4,000	\$64,000
4	4" Manhole	16	EA	\$2,000	\$32,000
5	Raw Wastewater Lift Station (0.26 MGD, 10 HP Submersible Pump)	1	LS	\$60,000	\$60,000
6	Electrical and Instrumentation	5%			\$3,000
SUBTOTAL ITEMS A1-A6					\$721,105
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$36,055
2	Contractor's Profit and Overhead	15%	-	-	\$108,166
3	Contingency	10%	-	-	\$72,111
SUBTOTAL ITEMS B1-B3					\$216,332
SUBTOTAL (A+B)					\$937,437
TOTAL CONSTRUCTION COST					\$937,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$187,487
SUBTOTAL (A+B+C)					\$1,124,924
TOTAL PROJECT COST					\$1,125,000

Table CE-24
Laguna Madre Water District
Unserved Areas Study
Parcel A2 South - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	On-Site Treatment Plant				
1	0.26 MGD Package Plant	1	LS	#####	\$1,536,000
2	Site Work	5%			\$76,800
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.26 MGD, 5 HP Submersible pump)	1	LS	\$60,000	\$60,000
6	Electrical and Instrumentation	5%			\$79,800
SUBTOTAL ITEMS A1-A6					\$1,760,600
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$88,030
2	Contractor's Profit and Overhead	15%	-	-	\$264,090
3	Contingency	10%	-	-	\$176,060
SUBTOTAL ITEMS B1-B3					\$528,180
SUBTOTAL (A+B)					\$2,288,780
TOTAL CONSTRUCTION COST					\$2,289,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$457,756
SUBTOTAL (A+B+C)					\$2,746,536
TOTAL PROJECT COST					\$2,747,000

Table CE-25
Laguna Madre Water District
Unserved Areas Study
Parcel A3 - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	12" Fusible PVC	100	LF	\$34.19	\$3,419
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	1	EA	\$2,000	\$2,000
4	Overhead Storage Tank (230,000 gal)	1	LS	\$920,000	\$920,000
5	Treated Water Booster Pump Station (1.96 MGD, 50HP In-line Pump Station)	1	EA	\$150,000	\$150,000
6	Electrical and Instrumentation	5%			\$7,500
SUBTOTAL ITEMS A1-A6					\$1,097,919
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$54,896
2	Contractor's Profit and Overhead	15%	-	-	\$164,688
3	Contingency	10%	-	-	\$109,792
SUBTOTAL ITEMS B1-B3					\$329,376
SUBTOTAL (A+B)					\$1,427,295
TOTAL CONSTRUCTION COST					\$1,427,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$285,459
SUBTOTAL (A+B+C)					\$1,712,754
TOTAL PROJECT COST					\$1,713,000

Table CE-26

**Laguna Madre Water District
Unsewered Areas Study**

**Parcel A2 South - Option 3 Water Infrastructure
Opinion of Probable Construction Cost**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	10" Fusible PVC	25,800	LF	\$28.50	\$735,172
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	13	EA	\$2,000	\$25,800
4	High Service Pump Station (0.74 MGD, 30HP Vertical Turbine Pump Station)	1	LS	\$95,000	\$95,000
5	Electrical and Instrumentation	5%			\$4,750
6	EST, Connections and Fittings (100,000 gal)	1	LS	\$400,000	\$400,000
SUBTOTAL ITEMS A1-A6					\$1,275,722
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$63,786
2	Contractor's Profit and Overhead	15%	-	-	\$191,358
3	Contingency	10%	-	-	\$127,572
SUBTOTAL ITEMS B1-B3					\$382,717
SUBTOTAL (A+B)					\$1,658,439
TOTAL CONSTRUCTION COST					\$1,658,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$331,688
SUBTOTAL (A+B+C)					\$1,990,127
TOTAL PROJECT COST					\$1,990,000

Table CE-27
Laguna Madre Water District
Unserved Areas Study
Parcel A3 - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	8" Fusible PVC	17,000	LF	\$22.80	\$387,533
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	9	EA	\$4,000	\$34,000
4	4" Manhole	9	EA	\$2,000	\$17,000
5	Raw Wastewater Lift Station (0.7 MGD, 30 HP Submersible pump station)	1	LS	\$125,000	\$125,000
6	Electrical and Instrumentation	5%			\$6,250
SUBTOTAL ITEMS A1-A6					\$584,783
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$29,239
2	Contractor's Profit and Overhead	15%	-	-	\$87,717
3	Contingency	10%	-	-	\$58,478
SUBTOTAL ITEMS B1-B3					\$175,435
SUBTOTAL (A+B)					\$760,218
TOTAL CONSTRUCTION COST					\$760,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$152,044
SUBTOTAL (A+B+C)					\$912,261
TOTAL PROJECT COST					\$912,000

Table CE-28
Laguna Madre Water District
Unserved Areas Study
Parcel A3 - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	On-Site Treatment Plant				
1	0.7 MGD Package Plant	1	LS	\$4,092,000	\$4,092,000
2	Site Work	5%			\$204,600
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.7 MGD, 10 HP Submersible pump station)	1	LS	\$130,000	\$130,000
6	Electrical and Instrumentation	5%			\$211,100
SUBTOTAL ITEMS A1-A6					\$4,645,700
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$232,285
2	Contractor's Profit and Overhead	15%	-	-	\$696,855
3	Contingency	10%	-	-	\$464,570
SUBTOTAL ITEMS B1-B3					\$1,393,710
SUBTOTAL (A+B)					\$6,039,410
TOTAL CONSTRUCTION COST					\$6,039,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$1,207,882
SUBTOTAL (A+B+C)					\$7,247,292
TOTAL PROJECT COST					\$7,247,000

Table CE-29
Laguna Madre Water District
Unserved Areas Study
Parcel A3 - Option 2 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	16" Fusible PVC	24,000	LF	\$45.59	\$1,094,210
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4' Manholes	1	EA	\$2,000	\$2,000
4	High Service Pump Station (1.96 MGD, 70HP Vertical turbine Pumps)	1	EA	\$175,000	\$175,000
5	Electrical and Instrumentation	5%			\$8,750
6	Overhead Storage Tank (230,000 gal)	1	LS	\$920,000	\$920,000
SUBTOTAL ITEMS A1-A3					\$2,214,960
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$110,748
2	Contractor's Profit and Overhead	15%	-	-	\$332,244
3	Contingency	10%	-	-	\$221,496
SUBTOTAL ITEMS B1-B3					\$664,488
SUBTOTAL (A+B)					\$2,879,448
TOTAL CONSTRUCTION COST					\$2,879,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$575,890
SUBTOTAL (A+B+C)					\$3,455,338
TOTAL PROJECT COST					\$3,455,000

Table CE-30
Laguna Madre Water District
Unserved Areas Study
Parcel A5, A6, & A7 - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	16" Fusible PVC	28,560	LF	\$45.59	\$1,302,110
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	EST (200,000 gal)	1	LS	\$800,000	\$800,000
4	High Service Pump Station (2.2 MGD, 75HP Duplex Pump station)	1	LS	\$210,000	\$210,000
5	Electrical and Instrumentation	5%			\$10,500
SUBTOTAL ITEMS A1-A5					\$2,337,610
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$116,881
2	Contractor's Profit and Overhead	15%	-	-	\$350,642
3	Contingency	10%	-	-	\$233,761
SUBTOTAL ITEMS B1-B3					\$701,283
SUBTOTAL (A+B)					\$3,038,893
TOTAL CONSTRUCTION COST					\$3,039,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$607,779
SUBTOTAL (A+B+C)					\$3,646,672
TOTAL PROJECT COST					\$3,647,000

Table CE-31
Laguna Madre Water District
Unserved Areas Study
Parcel A5, A6, & A7 - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	12" Fusible PVC	30,900	LF	\$34.19	\$1,056,597
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	15	EA	\$4,000	\$61,800
4	4" Manhole	15	EA	\$2,000	\$30,900
5	Raw Wastewater Lift Station (1.5 MGD, 60HP Submersible Pump Station)	1	LS	\$150,000	\$150,000
6	Electrical and Instrumentation	5%			\$7,500
SUBTOTAL ITEMS A1-A6					\$1,321,797
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$66,090
2	Contractor's Profit and Overhead	15%	-	-	\$198,269
3	Contingency	10%	-	-	\$132,180
SUBTOTAL ITEMS B1-B3					\$396,539
SUBTOTAL (A+B)					\$1,718,336
TOTAL CONSTRUCTION COST					\$1,718,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$343,667
SUBTOTAL (A+B+C)					\$2,062,003
TOTAL PROJECT COST					\$2,062,000

Table CE-32
Laguna Madre Water District
Unserved Areas Study
Parcel A8 - Option 1 Water Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	8" Fusible PVC	44,200	LF	\$22.80	\$1,007,585
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	High Service Pump Station (0.86 MGD, 50HP Pump Station)	1	LS	\$115,000	\$115,000
4	Electrical and Instrumentation	5%			\$5,750
SUBTOTAL ITEMS A1-A4					\$1,143,335
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$57,167
2	Contractor's Profit and Overhead	15%	-	-	\$171,500
3	Contingency	10%	-	-	\$114,334
SUBTOTAL ITEMS B1-B3					\$343,001
SUBTOTAL (A+B)					\$1,486,336
TOTAL CONSTRUCTION COST					\$1,486,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$297,267
SUBTOTAL (A+B+C)					\$1,783,603
TOTAL PROJECT COST					\$1,784,000

Table CE-33

**Laguna Madre Water District
Unserved Areas Study
Parcel A8 - Option 1 Wastewater Infrastructure
Opinion of Probable Construction Cost**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	8" Fusible PVC	1,000	LF	\$22.80	\$22,796
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	1	EA	\$4,000	\$4,000
4	4" Manhole	2	EA	\$2,000	\$4,000
5	Raw Wastewater Lift Station (0.6 MGD, 5HP Submersible Pump Station)	1	LS	\$75,000	\$75,000
6	Electrical and Instrumentation	5%			\$3,750
SUBTOTAL ITEMS A1-A6					\$124,546
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$6,227
2	Contractor's Profit and Overhead	15%	-	-	\$18,682
3	Contingency	10%	-	-	\$12,455
SUBTOTAL ITEMS B1-B3					\$37,364
SUBTOTAL (A+B)					\$161,910
TOTAL CONSTRUCTION COST					\$162,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$32,382
SUBTOTAL (A+B+C)					\$194,292
TOTAL PROJECT COST					\$194,000

Table CE-34

**Laguna Madre Water District
Unserved Areas Study
Parcel A8 - Option 3 Wastewater Infrastructure
Opinion of Probable Construction Cost**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	Wastewater Treatment Plant (0.6 MGD)	1	LS	\$3,600,000	\$3,600,000
2	Site Work	5%			\$180,000
3	Connection Fittings	6	EA	\$2,500	\$15,000
4	4" Air Release Valves	1	EA	\$4,000	\$4,000
5	4" Manhole	2	EA	\$2,000	\$4,000
6	6" Fusible PVC	6,000	LF	\$17.10	\$102,582
7	Raw Wastewater Lift Station (0.6 MGD, 5 HP Submersible Pump Station)	1	LS	\$75,000	\$75,000
8	Electrical and Instrumentation	5%			\$183,750
SUBTOTAL ITEMS A1-A7					\$4,164,332
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$208,217
2	Contractor's Profit and Overhead	15%	-	-	\$624,650
3	Contingency	10%	-	-	\$416,433
SUBTOTAL ITEMS B1-B3					\$1,249,300
SUBTOTAL (A+B)					\$5,413,632
TOTAL CONSTRUCTION COST					\$5,414,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$1,082,726
SUBTOTAL (A+B+C)					\$6,496,358
TOTAL PROJECT COST					\$6,496,000

Table CE-35

**Laguna Madre Water District
Unserved Areas Study
Parcel A7 & A8 - Option 2 Water Infrastructure
Opinion of Probable Construction Cost**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Treated Water Pipeline and Pumping				
1	8" Fusible PVC	43,000	LF	\$22.80	\$980,230
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	High Service Pump Station (0.86 MGD, 50HP Pump Station)	1	LS	\$115,000	115,000
4	Electrical and Instrumentation	5%			\$5,750
SUBTOTAL ITEMS A1-A4					\$1,115,980
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$55,799
2	Contractor's Profit and Overhead	15%	-	-	\$167,397
3	Contingency	10%	-	-	\$111,598
SUBTOTAL ITEMS B1-B3					\$334,794
SUBTOTAL (A+B)					\$1,450,774
TOTAL CONSTRUCTION COST					\$1,451,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$290,155
SUBTOTAL (A+B+C)					\$1,740,929
TOTAL PROJECT COST					\$1,741,000

Table CE-36
Laguna Madre Water District
Unserved Areas Study
Parcel A8 - Option 2 Wastewater Infrastructure
Opinion of Probable Construction Cost

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED AMOUNT
A	Wastewater Pipeline and Pumping				
1	8" Fusible PVC	21,800	LF	\$22.80	\$496,954
2	Connection Fittings	6	EA	\$2,500	\$15,000
3	4" Air Release Valves	11	EA	\$4,000	\$43,600
4	4" Manhole	11	EA	\$2,000	\$21,800
5	Raw Wastewater Lift Station (0.6 MGD, 20 HP Duplex Pump Station)	1	LS	\$90,000	\$90,000
6	Electrical and Instrumentation	5%			\$4,500
SUBTOTAL ITEMS A1-A6					\$671,854
B	GENERAL COST ITEMS				
1	Mobilization and Demobilization, Performance, Payment Bonds and Cost of Insurance	5%	-	-	\$33,593
2	Contractor's Profit and Overhead	15%	-	-	\$100,778
3	Contingency	10%	-	-	\$67,185
SUBTOTAL ITEMS B1-B3					\$201,556
SUBTOTAL (A+B)					\$873,410
TOTAL CONSTRUCTION COST					\$873,000
C	Engineering, Surveying, and Geotechnical Fees	20%			\$174,682
SUBTOTAL (A+B+C)					\$1,048,092
TOTAL PROJECT COST					\$1,048,000

11 Appendix B

Scope

This page is intentionally blank.

ATTACHMENT A
REGIONAL WATER/WASTEWATER FACILITY PLANNING GRANT
SOUTHEAST CAMERON COUNTY UNSERVED AREAS STUDY
Scope of Services

I. Scope of Services

The following scope of work has been prepared to present the tasks to be completed for the proposed study. Each item within the scope is addressed through tasks to be performed which are then aligned with the projected costs for completing each task:

Task 0: Project Management – Project management is intended to encompass three actions critical to the overall success of the project.

- 1. Project Kickoff Meeting.** Engineer shall facilitate a meeting with Laguna Madre Water District (LMWD) to establish an overall project management plan for the project's execution. Engineer's efforts will be directed to analyzing the overall project schedule to identify critical decision points, key milestones where public involvement will be required, the manner to be used in soliciting public involvement, and the plan for integrating participants' involvement through a formal stakeholders committee.
- 2. Project Advisory Committee.** Engineer shall establish the structure for coordination with a committee composed of LMWD and the participants. Actions to be developed will include a focused discussion on the schedule for implementation of the project, the coordination for collection of initial information required for the project, and for consensus development on the mission statement for the project.
- 3. Public Involvement.** Engineer shall develop a plan for accessing key public organizations and communicating with the general public for coordination of communications throughout the project.

Task 1: Service Area Delineation – The purpose of this task is to develop a geo-referenced base map for consistent use throughout the course of the project. Engineer shall perform the following services to complete this task:

- 1. Collection of Baseline Information.** Engineer shall collect mapping from all public entities including the County within the proposed study area and adjacent to the study area. All mapping will be obtained electronically to the extent possible and multiple types of mapping will additionally be collected for providing different types of information.
- 2. Collection of Existing Utility Data.** Engineer shall collect plan drawings in electronic format if available for all water and wastewater facilities in the areas adjacent to the planned study area. Some of this data may be expanded to include remote treatment or intermediate pumping or storage facilities.
- 3. Creation of Geo-referenced Base Map.** Engineer shall utilize a GIS for creating a project GIS for the development of mapping and quantified takeoffs for the existing jurisdictions and the existing utilities.

Task 2: Demand Development – The purpose of this task is to access available regional databases for population, to develop a basis for geo-referenced water use and wastewater generation, and to develop a consensus on planning demands throughout the service area.

1. **Obtain Regional Databases.** Engineer shall access regional databases for collecting population and land use data. This information will similarly be integrated into the base mapping for the project to provide accessible population extractions for select areas within the proposed study area.
2. **Obtain individual community population data.** Engineer shall obtain locally available population data for use in comparing to regional planning data.
3. **Obtain water/wastewater local utilization.** Engineer shall obtain or develop as necessary utilization rates for existing water use and wastewater generation.
4. **Develop geo-referenced population trends.** Engineer shall utilize the population trending to develop an envelope encompassing the highest and lowest population projections using collected data.
5. **Develop geo-referenced water and wastewater demands.** Engineer shall apply the unit rates for water use and wastewater generation to the service area and the population projections per area to define the proposed demands to be addressed through the project.

Task 3: Identification of Water and Wastewater Service Options – Engineer shall consider existing water and wastewater facilities for meeting future demands through the following approach.

1. **Identify Service Options From LMWD.** Engineer shall prepare a conceptual connection from the Port area of the study area to LMWD facilities for both water and wastewater, sized to accommodate two growth scenarios, ultimate growth and twenty year growth. Service options will be prepared for service to the port area given its close proximity to the LMWD service area.
2. **Identify Service Options From Others.** Engineer shall prepare a conceptual design for the provision of water and wastewater service through regional onsite or alternative means other than LMWD to serve the Port area of the proposed study area. Engineer shall size facilities to accommodate two growth scenarios, ultimate growth and twenty year growth. Service options may necessarily include consideration of onsite water or wastewater services, regionalized to provide additional service to other parts of the proposed study area.
3. **Identify Onsite Service Options for Port.** Engineer shall prepare alternative onsite non regional facilities to meet the immediate needs of the Port area of the proposed study area. This concept will be prepared to provide an interim step towards development of additional future regional service.
4. **Identify Laguna Vista West Area Expansion from LMWD.** Engineer shall prepare a conceptual connection from the northern portion of the study area adjacent to highway frontage to LMWD facilities for both water and wastewater, sized to accommodate two growth scenarios, ultimate growth and twenty year growth. Service options will be prepared for service to this northern area given its close proximity to the LMWD service area.

- 5. Identify Service Option for Northern Study Area by Others.** Engineer shall prepare a conceptual plan for providing water and/or wastewater service from either the City of Los Fresnos or the East Rio Hondo Water Supply Corporation. Plan shall be developed with two growth scenarios and will be considered as an option to be compared to LMWD service to this area.

Task 4: Evaluation of Service Alternatives for Study Area – Engineer shall establish the basis for comparing the service options for the project Advisory Committee in advance of soliciting public comments.

- 1. Establish Criteria for Evaluation.** Engineer shall develop measurable criteria which can be applied to the multiple service options. Criteria are expected to include such variables as the portion of the service area that can receive water or wastewater service immediately and the extent of infrastructure in place to accommodate the service without additional initial investment. Engineer shall develop weighting for use in comparing the alternative service options.
- 2. Port Area Comparison of Alternatives.** Engineer shall establish the basis for construction and operation costs for each alternative and shall apply the criteria for comparison of the options identifying at a minimum costs of service differences.
- 3. Northern Area Comparison of Alternatives.** Engineer shall establish the basis for construction and operation costs for each alternative and shall apply the criteria for comparison of the options identifying at a minimum costs of service differences.
- 4. Evaluation of Alternatives for Remaining Unserved Areas.** Engineer shall refine the alternatives to identify any areas within the proposed study area not addressed with the two primary regional alternatives. Engineer shall evaluate the option of modifying one of the identified regional alternatives versus providing for some level of temporary onsite service, defining the costs for same.
- 5. Conduct Stakeholder Meeting and Public Meeting.** Engineer shall facilitate a public meeting to present the anticipated populations to be served, the alternatives for this service, and preliminary costs for this service in order to provide the basis for public education and comment.

Task 5: Conceptual Planning and Design – Engineer shall evaluate the general features of the identified alternatives that result in limiting the feasibility of any of the options or result in adding additional implementation hidden costs.

- 1. Evaluate Jurisdictional Issues.** Engineer shall evaluate the extent of ETJs, CCNs, or other jurisdictional boundaries. Engineer's review shall include defining the limitations or benefits of any jurisdiction that is affected by a proposed service area or infrastructure required for each alternative.
- 2. Evaluate Flood Potential.** Engineer shall review the potential for flooding impacts to planned service areas or planned utility infrastructure for each alternative.
- 3. Characterize Environmental Impacts.** Engineer shall perform a limited survey of sensitive wetland areas that might effectively limit installation of infrastructure.

4. **Conceptual Layout of Infrastructure.** Engineer shall review identified limitations to each alternative and shall refine alternatives to reduce impacts to the extent possible.
5. **Summarize Implementation Issues per Alternative.** Engineer shall prepare a summary of identified impacts that remain with the implementation of the proposed alternatives.

Task 6: Evaluate Alternative Costs – Engineer shall refine capital, operating and unit costs for water used and wastewater treated for each of the alternatives. Costs will be structured for presentation based upon traditional funding mechanisms.

Task 7: Benefit/Cost Analysis – Engineer shall prepare a summary of benefits for each of the water and wastewater service alternatives, inclusive of comparisons to area systems on a unit cost basis. Engineer’s summary shall conclude with a recommended set of alternatives that are deemed viable for implementation.

Task 8: Implementation and Phasing – Engineer shall develop a final recommendation for implementation of the most optimal water and wastewater service options evaluated during the study. The recommendation will be combined with a schedule for implementation, a report summarizing the methodology used to support the conclusions. Engineer shall then present the results of the study in a final Public Meeting to seek input from the general public. This input will be considered along with comments from the study applicant, participants, and the TWDB staff prior to finalizing the report.

II. Schedule

The following schedule represents the expected time of performance for the above scope of services.

Task	Task Name	Following Authorization, Month									
		1	2	3	4	5	6	7	8	9	10
0	Project Management										
1	Service Area Delineation	X									
2	Demand Development										
3	Identification of Water and Wastewater Service Options										
4	Evaluation of Alternatives per Service Area						X				
5	Conceptual Planning and Design										
6	Evaluate Alternative Costs										
7	Benefit/Cost Analysis										
8	Implementation and Phasing										X
Note: Public Meeting denoted with “X”											

12 Appendix C

Public Meeting Documentation

This page is intentionally blank.

SE Cameron County Unserved Area
 Reg Water + Wastewater Planning Study
 Kickoff Mtg
 May 13, 2010

<u>Attendee</u>	<u>Representing</u>	<u>Phone</u>	<u>Email</u>
Pam Denny	City of Los Fresnos	(956) 233-5768	pdenny@cityoflosfresnos.com
ARIEL CHAVEZ II	Bro. Navigation Dist.	956/992-3973	achavez@portofbrownsville.com
Windo Sotelo	LMWD	943-2626	gsotelo@lmwd.org
EDUARDO A. CAMPIRANO	BND	956/831-4572	ecampirano@portofbrownsville.com
Carlos Salazar	City Los Fresnos	956-213-5768	
Brian Macmanus	East Rio Hondo WSC	956 748-2605 ext 215	bmacmanus@erhws.com
Whiter	Espay Consult	214 951-0807	whiter@espayconsultants.com

This page is intentionally blank.



**Public Meeting Sign-In Sheet
Regional Water/Wastewater Facility Planning Grant
Southeast Cameron County Unserved Areas Study
June 1, 2010**

Name	Organization/Sponsor (if any)	Phone Number	E-Mail
Connie Townsend	TWDB	512-463-8290	Connie.townsend@twdb.state.tx.us
B. J. SIMPSON	ERHWS	956-367-2205	
SAM DELGADO	Kappel Amfels	831-6248	
RAY COSME	KAPPEL AMFELS	592-6182	RLCOB@AOL.COM
WAYNE HUNTER	ESPEY CONSULTANTS	214 951-0807	
KEN JONES	LRGUDC	682-3481	knjones@lrgudc.org
B. J. Jaffe	LMRD	772-1305	RFUDJE@RGU.RR.COM
EDUARDO A. CAMERON	PORT OF BROWNSVILLE	831-4592	ecameron@portofbrownsville.com
Manuel Ortiz	Port of Brownsville	831 4592	MORTIZ@portofbrownsville.com



**Public Meeting Sign-In Sheet
Regional Water/Wastewater Facility Planning Grant
Southeast Cameron County Unserved Areas Study
June 1, 2010**

Name	Organization/Sponsor (if any)	Phone Number	E-Mail
<i>Arturo Martinez</i>	<i>LMWD</i>	<i>956 943 2626</i>	



**Public Meeting Sign-In Sheet
Regional Water/Wastewater Facility Planning Grant
Southeast Cameron County Unserved Areas Study
March 8, 2011 5:00 PM LMWD General Offices**

Name	Organization/Sponsor (if any)	Phone Number	E-Mail
Mark Milon	City of Los Fresnos	956-233-5768	mmilon@citylf.us
Pete F. Capistran	LMWD	956 943 2626	pcapistran@lmwd.org
Carlos J. Galvan, Jr	LMWD	956-943-2626	cgalvan@lmwd.org
Connie Townsend	TWDB	512-463-8290	connie.townsend@twdb.state.tx.us
Assist. to GM MARIBEL HINOJOSA	LMWD	956-943-2626	mhinojosa@lmwd.org
Steve Bearden	PISB IV District	956-943-7826	
ARIEL CHAVEZ II	Port of Brownsville	956/592-3973	achavez@portofbrownsville.com

This page is intentionally blank.



**Final Public Meeting Sign-In Sheet
Regional Water/Wastewater Facility Planning Grant
Southeast Cameron County Unserved Areas Study
November 29, 2011**

Name	Organization/Sponsor (if any)	Phone Number	E-Mail
Charles Ortiz	L MWD	943-2626	cortiz@lrawd.org
Connie Townsend	TWDB	512-463-8290	Connie.townsend@twdb.state.tx.us
EDUARDO A. CAMPIRANO	PORT OF BROWNSVILLE	956-838-7007	ecampirano@portofbrownsville.com
ARIEL CHAVEZ II	Port of Brownsville	956/592-3973	achavez@portofbrownsville.com
JAVINO D. SORIELO	L MWD	943-2626	jsoriolo@lrawd.org
Wyn K. Hunter	Espey Consultants	214 951-0807	whunter@espeyconsultants.com

This page is intentionally blank.

13 Appendix D

TWDB Draft Report Comments and Responses

December 13, 2011

Gavino Sotelo
General Manager
Laguna Madre Water District
105 Port Road
Port Isabel, Texas 78578

Re: Regional Water and Wastewater Facility Planning Grant Contract between the Texas Water Development Board (TWDB) and the Laguna Madre Water District (LMWD); TWDB Contract No. 1004831076, Draft Report Comments

Dear Mr. Sotelo:

Staff members of the TWDB have completed a review of the draft report prepared under the above-referenced contract. ATTACHMENT I provides the comments resulting from this review. As stated in the TWDB contract, LMWD will consider incorporating draft report comments from the EXECUTIVE ADMINISTRATOR as well as other reviewers into the final report. In addition, LMWD will include a copy of the EXECUTIVE ADMINISTRATOR'S draft report comments in the Final Report.

The TWDB looks forward to receiving one (1) electronic copy of the entire Final Report in Portable Document Format (PDF) and six (6) bound double-sided copies. LMWD shall also submit one (1) electronic copy of any computer programs or models, and, if applicable, an operations manual developed under the terms of this Contract.

If you have any questions concerning the contract, please contact Connie Townsend, the TWDB's designated Contract Manager for this project at (512) 463-8290.

Sincerely,



Carolyn L. Brittin
Deputy Executive Administrator
Water Resources Planning and Information

Enclosures

c: Connie Townsend, TWDB

This page is intentionally blank.

Attachment I

Southeast Cameron County

Unserved Areas Study Report

(Contract No. 1004831076) Draft Report Review Comments

1. Scope of Work (SOW): Please include a copy of the contract Exhibit B Scope of Work in the final report; this can appear as an appendix at the end of the report that is referenced in the introduction section of the final report.
2. SOW Task 0 – Project Management: Please provide documentation in the final report for the public involvement and required public meetings subtasks.
3. SOW Task 2.2 – Obtain individual community population data: Please provide this data in the final report or explain why this subtask was not completed.
4. SOW Task 2.4 – Develop geo-referenced population trends: Please provide this data in the final report or explain why this subtask was not completed.
5. SOW Task 3 – Identification of water and wastewater service options: All subtasks state that options will size facilities to accommodate two growth scenarios – ultimate growth and 20-year growth. Please provide data for these two scenarios or explain why these subtasks were not completed.
6. SOW Task 7 – Benefit/cost analysis: In the final report, please provide a clear explanation for the underlying premise and assumptions contained in the cost/benefit analysis. The draft report appears to only present the benefits of the study.
7. SOW Task 7 – Benefit/cost analysis: In the final report, please explain the parameters used in the cost/benefit analysis to better define what each situational parameter means and clarify that they are all on the cost side, since they cannot be considered benefits from an analysis standpoint.
8. SOW Task 7 – Benefit/cost analysis; end of Section 6.1: Please provide a summary evaluation matrix table containing the Parcel, Water Demand, Option Number, Option Service Provider, Total Infrastructure Capital Cost, Total Annual Cost Per Lot, and the Overall Ranking. This will provide transparency for evaluations and recommendations that will be made in the next section.
9. SOW Task 8 – Implementation and phasing: One of the subtasks is to develop an implementation schedule for the recommendations. Please provide this data in the final report or explain why this subtask was not completed.
10. Section 2.2 (Methodology), page 8: Please provide concise summary descriptions of methodologies in the final report for developing evaluation criteria and for the various types of analyses that were performed in this study.
11. Section 3.5.1 (Service Area), page 19, line 4: text specifies “nine” (9) development parcels were defined; however Tables 1 and 2, and Figures 6, 7, and 8 indicate “eleven” (11) development parcels were defined. Also, parcel A3 appears to be outside of the defined study area. Please clarify in the final report.
12. Section 3.6, page 22: Please revise text in the final report to more accurately reflect that regional water plans are developed by each of the 16 Regional Water Planning Groups, not by the TWDB. The correct year for the State Water Plan referred to in this report is 2007.
13. Section 3.8 (Utility Service Demand), page 27; and Section 5.1 (Cost Estimation), pages 64-65: In the final report, please provide an additional column to Table 7 for the alternative calculated water demands utilized in the cost estimation section and please provide explanation for their use in lieu of the TCEQ water use rate.

14. Section 5.1, pages 67-69, Tables 22 and 23: In the final report, please display alternative water demands utilized in this study in column 2 and add table footnote regarding TCEQ water use rate as addressed in comment #13 above.
15. Section 4 (Utility Service Options), page 29, Table 9: In the final report, please provide a 5th table column for “Percent Capacity Available” data, which are utilized in the option evaluations. Also, column 4 (Total Treatment Capacity) of this table is missing data for City of Los Fresnos WWTP and Port of Brownsville WWTP.
16. Section 7.1, page 77: Please provide discussion in the final report regarding Table 9 information on percent capacity available at existing water and wastewater treatment facilities as addressed in comment #15 above.
17. Section 4 (Utility Service Options), page 29: Please clarify in the text of the final report the difference between total treatment plant capacities and the current excess capacities that would be available for future development.
18. General: The naming convention used for land parcels and service alternatives is confusing and difficult to follow throughout the report. Please consider a more unique naming convention for the final report that differentiates between residential/commercial and water/wastewater, such as: Parcels = R1-R6; C1-C5; then alternatives for water service to A1 North would be WR1-1, WR1-2, WR1-3; and, alternatives for wastewater service to A1 Port would be WWC1-1, WWC1-2.
19. Section 7.2, page 81, Table 38: In the final report, please revise the Recommendations table to include the appropriate alternative identification number for ease of reference and comparison to data in the various evaluation tables.

~~~~~

**Attachment D**  
**Southeast Cameron County**  
**Unserved Areas Study Report**

**RESPONSES**

*1. Scope of Work (SOW): Please include a copy of the contract Exhibit B Scope of Work in the final report; this can appear as an appendix at the end of the report that is referenced in the introduction section of the final report.*

The reference to the scope of work for the study has been cited in the Appendix at the end of the Section 2 Introduction.

*2. SOW Task 0 – Project Management: Please provide documentation in the final report for the public involvement and required public meetings subtasks.*

Reference has been added in the report under Section 2.2 Methodology referring to the process used to engage the general public throughout the study using advertised Public Meetings. Additionally, documentation for these meetings has been referenced as being to the appendix with this documentation. Last, TWDB comments to the report and this response are referenced and included in the appendix.

*3. SOW Task 2.2 – Obtain individual community population data: Please provide this data in the final report or explain why this subtask was not completed.*

The intent of the study was to provide the best alternatives for water and wastewater service within the study area. The study area was established as areas which are not presently served for water or wastewater. Coincident to this feature of the study area is that without population, it was discovered during the study that these areas also do not have either existing population or projected population. This was proven through research of Regional Planning Group population projections and those of Cameron County and the surrounding cities. This statement has been added to Section 3.6 Population Projections to explain why population projections for the study area were not used, while population projections for adjacent surrounding areas to the study area were considered.

*4. SOW Task 2.4 – Develop geo-referenced population trends: Please provide this data in the final report or explain why this subtask was not completed.*

See comment 3 above. Georeferenced population trends were not formally performed due to the lack of available population data within the study area. Population trends from adjacent communities to the study area identified in section 3.6 however, were considered by the Technical Advisory Committee in developing estimated service populations for areas within the study area.

*5. SOW Task 3 – Identification of water and wastewater service options: All subtasks state that options will size facilities to accommodate two growth scenarios - ultimate growth and 20-year growth. Please provide data for these two scenarios or explain why these subtasks were not completed.*

The scope proposed use of two growth scenarios, ultimate growth and 20 year growth. The Technical Advisory Committee determined that based on present growth rates for development

of undeveloped land, ultimate development was actually approximately 20 years because of the high cost for development of undeveloped land. The Technical Advisory Committee established that the study should focus on fifty per cent of this proposed twenty year or ultimate growth for considering alternative water and wastewater service alternatives and that after fifty percent growth is achieved, the option of the recommended water or wastewater service alternative would no longer be in question. Accordingly, Section 3.8 and specifically a footnote provided to Table 7 addresses the use of the fifty per cent development scenario for demands considered for the study.

*6. SOW Task 7 – Benefit/cost analysis: In the final report, please provide a clear explanation for the underlying premise and assumptions contained in the cost/benefit analysis. The draft report appears to only present the benefits of the study.*

This study contemplated use of a benefit cost analysis for the purpose of providing further analysis and evaluation of the alternatives. For a benefit cost analysis to be completed, some differentiation is needed with the solution so that the benefit might be construed in evaluation to be greater or lesser in providing a benefit based on the solution comparison between alternatives. Through the course of this study, the Technical Advisory Committee established an intended development plan based upon the location of the unserved parcels within the study area. This designation established one intended development plan per parcel, appropriate given that the development potential was assumed to be viable but that the development type might vary depending upon the desires and market conditions present at the time of development. As a result, there are not multiple development scenarios for each parcel, thus there will be no more than one benefit per parcel and the actual benefit for the recommended alternative will be determined on the basis of least cost. The report has been modified to add this text at the start of Section 6.2.

*7. SOW Task 7 – Benefit/cost analysis: In the final report, please explain the parameters used in the cost/benefit analysis to better define what each situational parameter means and clarify that they are all on the cost side, since they cannot be considered benefits from an analysis standpoint.*

A statement has been added to clarify that situational parameters considered in the evaluation criteria relate to both cost and non-cost items, inserted in Section 6.1.

*8. SOW Task 7 – Benefit/cost analysis; end of Section 6.1: Please provide a summary evaluation matrix table containing the Parcel, Water Demand, Option Number, Option Service Provider, Total Infrastructure Capital Cost, Total Annual Cost Per Lot, and the Overall Ranking. This will provide transparency for evaluations and recommendations that will be made in the next section.*

The requested table has been prepared and inserted at the end of Section 6.1.

*9. SOW Task 8 – Implementation and phasing: One of the subtasks is to develop an implementation schedule for the recommendations. Please provide this data in the final report or explain why this subtask was not completed.*

An implementation schedule was proposed for the study however during the course of the study, it was determined that the funding of the recommended improvements to provide water and wastewater service would not be paid for by the existing utility service providers but rather

would be provided at the time of development by the developer. Since that is unknown, there was no implementation schedule developed or provided.

*10. Section 2.2 (Methodology), page 8: Please provide concise summary descriptions of methodologies in the final report for developing evaluation criteria and for the various types of analyses that were performed in this study.*

A concise summary of the process for developing evaluation criteria was prepared and inserted into Section 2.2. In this context, the evaluation criteria are for demand development which is then used for infrastructure cost development for use in comparing alternative scenarios.

*11. Section 3.5.1 (Service Area), page 19, line 4: text specifies "nine" (9) development parcels were defined; however Tables 1 and 2, and Figures 6, 7, and 8 indicate "eleven" (11) development parcels were defined. Also, parcel A3 appears to be outside of the defined study area. Please clarify in the final report.*

The text for this section was edited to correct the final number of parcels from nine to eleven. Originally, there were nine parcels however the number of parcels increased in response to requests for partitioning two of the parcels in one of the Public Meetings.

*12. Section 3.6, page 22: Please revise text in the final report to more accurately reflect that regional water plans are developed by each of the 16 Regional Water Planning Groups, not by the TWDB. The correct year for the State Water Plan referred to in this report is 2007.*

The text was edited to revise the Region M Water Plan to 2007 version. However, the text clearly states that the regional planning group, not TWDB, developed these population projections, so no change has been made in this area.

*13. Section 3.8 (Utility Service Demand), page 27; and Section 5.1 (Cost Estimation), pages 64-65: In the final report, please provide an additional column to Table 7 for the alternative calculated water demands utilized in the cost estimation section and please provide explanation for their use in lieu of the TCEQ water use rate.*

Edits to the report have been provided in Section 3.8 to address assumptions regarding use of TCEQ criteria. In no case has TCEQ criteria not been followed except when TCEQ criteria does not exist for the development scenario.

*14. Section 5.1, pages 67-69, Tables 22 and 23: In the final report, please display alternative water demands utilized in this study in column 2 and add table footnote regarding TCEQ water use rate as addressed in comment # 13 above.*

In no case has TCEQ criteria not been followed except when TCEQ criteria does not exist for the development scenario. Tables 22 and 23 were edited to display the alternative water demands.

*15. Section 4 (Utility Service Options), page 29, Table 9: In the final report, please provide a 5th table column for "Percent Capacity Available" data, which are utilized in the option evaluations. Also, column 4 (Total Treatment Capacity) of this table is missing data for City of Los Fresnos WWTP and Port of Brownsville WWTP.*

The requested column of per cent available has not been added because the technical Advisory Committee members, composed of most of the adjacent service providers, identified planned expansions of their facilities without regard to new service from the unserved areas. When water



demands or wastewater flows meet certain thresholds, each of these utilities was presumed to have sufficient revenues from the existing populations being served to accommodate these expansions. So, no attempt was made to evaluate timing or per cent utilization because this utilization would likely be different at the time development of an unserved area was initiated.

*16. Section 7.1, page 77: Please provide discussion in the final report regarding Table 9 information on percent capacity available at existing water and wastewater treatment facilities as addressed in comment #15 above.*

See comment 15 response.

*17. Section 4 (Utility Service Options), page 29: Please clarify in the text of the final report the difference between total treatment plant capacities and the current excess capacities that would be available for future development.*

See comment 15 response.

*18. General: The naming convention used for land parcels and service alternatives is confusing and difficult to follow throughout the report. Please consider a more unique naming convention for the final report that differentiates between residential/commercial and water/wastewater, such as: Parcels= R1-R6; C1C5; then alternatives for water service to AI North would be WR1-1, WR1-2, WR1-3; and, alternatives for wastewater service to AI Port would be WWCI-1, WWCI-2.*

The naming convention suggestion was reviewed and considered. It may be that with the proposed change, the report might have clearer interpretation, however, the level of effort in modifying nearly all of the exhibits and tables, let alone the text, was deemed to be greater than the value for doing so. This naming convention used in the report has been presented in numerous public meetings with the general public and with the entities providing local share funding and the issues of this type of clarification being needed have not been suggested. Thus, for continuity with the existing parties, it is requested that this suggested change be denied on the basis of coming too late in the process of report preparation.

*19. Section 7.2, page 81, Table 38: In the final report, please revise the Recommendations table to include the appropriate alternative identification number for ease of reference and comparison to data in the various evaluation tables.*

See comment 18 above.