

BOLIVAR PENINSULA SPECIAL UTILITY DISTRICT
IMPACT FEE STUDY
(2022)

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Table of Contents

List of Tables	2
List of Appendices	2
1.0 Executive Summary	3
1.1 Land Use Assumptions and Projected Population	3
1.2 Recommendations	3
1.3 Estimated Construction Cost	3
1.4 Impact Fee per Equivalent Single Family Connection	3
2.0 Existing Water Infrastructure	4
2.1 High Island North Water Plant / Pressure Plane 1	4
2.2 High Island South Water Plant / Pressure Plane 2	4
2.3 Singing Sands Water Plant / Pressure Plane 3	5
2.4 Port Bolivar Water Plant / Pressure Plane 4	5
3.0 Improvements Needed to Meet Existing Demands and TCEQ Rules	5
3.1 Water Distribution System	5
3.2 TCEQ Rules and Regulations	9
3.2.1 TCEQ Rule 290.45(b) (2) (A-D)	10
3.2.2 TCEQ Rule 290.45(b)(2)(E)	10
3.2.3 TCEQ Rule 290.45(b)(2)(F)	10
3.2.4 TCEQ Rule 290.45(b)(2)(G)	11
3.2.5 TCEQ Rule 290.45(b)(2)(H)	12
4.0 Land Use Assumptions and Base Growth Rate	12
4.1 Pressure Plane 1 (High Island North) Base Growth Rate	12
4.2 Pressure Plane 2 (High Island South) Base Growth Rate	13
4.3 Pressure Plane 3 (Singing Sands) Base Growth Rate	13
4.4 Pressure Plane 4 (Port Bolivar) Base Growth Rate	14
5.0 Improvements Needed to Meet 2032 Projected Demands and TCEQ Rules	15
5.1 Water Distribution System	15
5.2 TCEQ Rules and Regulations	15
5.2.1 TCEQ Rules 290.45(b) (2) (A-D)	16
5.2.2 TCEQ Rule 290.45(b)(2)(E)	16
5.2.3 TCEQ Rule 290.45(b)(2)(F)	16
5.2.4 TCEQ Rule 290.45(b)(2)(G)	17
5.2.5 TCEQ Rule 290.45(b)(2)(H)	18
6.0 Cost Estimate for 2022 Improvements	18

7.0 Cost Estimate for 2032 Improvements	19
8.0 Impact Fee Per ESFC	19

List of Tables

Table 1: Summary of Growth Rates.....	3
Table 2: High Island North Water Plant Assets	4
Table 3: High Island South Water Plant Assets	4
Table 4: Singing Sands Water Plant Assets	5
Table 5: Port Bolivar Water Plant Assets	5
Table 6: Breakdown of Estimated Construction Costs for Waterline Replacements.....	6
Table 7: Proposed Waterline Replacements.....	6
Table 8: 2022 Purchased Water Amount.....	10
Table 9: 2022 TCEQ Total Storage Requirement.....	10
Table 10: 2022 TCEQ Service Pump Requirements	11
Table 11: 2022 TCEQ Elevated Storage Requirement	11
Table 12: Pressure Plane 2 Development.....	13
Table 13: Pressure Plane 3 Development.....	14
Table 14: Pressure Plane 4 Development.....	14
Table 15: 2032 Projected Connections and Water Demands	15
Table 16: 2032 Purchased Water Amount.....	16
Table 17: 2032 TCEQ Total Storage Requirement.....	16
Table 18: 2032 TCEQ Service Pump Requirements	17
Table 19: 2032 TCEQ Elevated Storage Requirement	18
Table 20: 2022 Cost Estimate.....	18
Table 21: 2032 Cost Estimate.....	19
Table 22: ESFC Cost	19
Table 23: Cost per ESFC Multiplier	19

List of Appendices

Appendix 1- BPSUD Overall Map
Appendix 2- BPSUD High Island North Water Plant
Appendix 3- BPSUD Pressure Plane 1
Appendix 4- BPSUD High Island South Water Plant
Appendix 5- BPSUD Pressure Plane 2
Appendix 6- BPSUD Singing Sands Water Plant
Appendix 7- BPSUD Pressure Plane 3
Appendix 8- BPSUD Port Bolivar Water Plant
Appendix 9- BPSUD Pressure Plane 4
Appendix 10- KYPipe Model Data of Existing BPSUD Water System
Appendix 11- KYPipe Model Data of Proposed BPSUD Water System
Appendix 12- Summary of Recommended Projects
Appendix 13- Land Use Assumptions and Summary of Growth Rates
Appendix 14- 30 TAC §290.44(c)

1.0 Executive Summary

The purpose of this Water Impact Fee Study is to provide Bolivar Peninsula Special Utility District (BPSUD) with a basis for calculation of the water impact fees as outlined in Title 30 Chapter 293.172 of the Texas Administrative Code. See Appendix 1 for the extent of this area. The study includes an analysis of the existing facilities within the service area and identifies improvements necessary to meet the current demand and regulatory standards. The study also evaluates expected growth within BPSUD over a 10-year period, including changes in water demands, and identifies water system improvements necessary to meet this future demand. Estimated construction costs for the Capital Improvements were developed and used to calculate the Impact Fee per Equivalent Single Family Connection (ESFC).

1.1 Land Use Assumptions and Projected Population

The BPSUD water system operates as 4 independent pressure planes, which requires that each pressure plane be analyzed as a stand-alone system. The defined area is depicted in Appendix 1. Different growth rates were used for each of the 4 pressure planes. A growth rate of 1.69% was used as a natural growth rate, which is the published growth rate for Bolivar Peninsula by the Texas Water Development Board (TWDB). Additionally, the current development patterns were evaluated using Preliminary Application for Service to Subdivision forms to project the additional growth rate for the next 10 years for each individual pressure plane. This additional growth rate was added to the natural growth rate to develop the base growth rate. Additional growth varied by pressure plane, resulting in different growth rates for each pressure plane. Table 1 summarizes the growth rates for each pressure plane. See section 4 for further details.

Table 1: Summary of Growth Rates

Pressure Plane	2022 Existing Connections	2022 Existing Water Demands	Base Growth Rate	2032 Projected Connections	2032 Projected Water Demand
1	318	52 gpm	1.69%	376	62 gpm
2	684	113 gpm	5.81%	1,203	198 gpm
3	2,909	473 gpm	2.57%	3,748	610 gpm
4	2,581	432 gpm	4.37%	3,961	663 gpm
Total	6,492	1,070 gpm	3.61% (Avg.)	9,288	1,533 gpm

1.2 Recommendations

To meet the projected growth demands anticipated for 2032, the water distribution system needs to be improved with larger waterlines in key areas as well as improvements to the water plants, including adding booster pumps at the Port Bolivar Water Plant. See Appendix 12 for a summary of recommended projects including estimated construction costs for the projects.

1.3 Estimated Construction Cost

The total estimated construction cost over the next 10 years is \$15,154,440. Section 6 and 7 break down the estimated construction costs for the Capital Improvements.

1.4 Impact Fee per Equivalent Single Family Connection

The total estimated construction costs over the next 10 years is \$15,154,440 and the increase in connections is projected to be 2,796. The impact fee is calculated to be \$5,500 per ESFC.

Estimated Construction Cost	\$15,154,440
Projected Increase of Connections	2,796
Impact Fee	\$5,500

2.0 Existing Water Infrastructure

BPSUD owns and operates potable water distribution facilities in the area known as Bolivar Peninsula, which includes the areas known as Port Bolivar, Crystal Beach, Gilchrist, and High Island. BPSUD purchases treated water from the Lower Neches Valley Authority (LNVA). LNVA provides a maximum of 5.5 million gallons per day (MGD) of treated surface water through a 12-inch transmission line along TX-124, which conveys water to both the High Island North Water Plant and the High Island South Water Plant. The BPSUD currently owns and operates four water plants which are interconnected; however, they typically operate independently of each other on four separate pressure planes. Each of the four water plants is further described in the following sections.

2.1 High Island North Water Plant / Pressure Plane 1

The High Island North Water Plant is located along TX-124, see Appendix 2. Water purchased from LNVA is first treated with liquid ammonium sulfate (LAS) and chlorine (CL2) to boost the residual disinfectant in the water, then it is pumped into the 0.5 Million Gallon (MG) ground storage tank (GST). High service pumps pump the water from the GST into Pressure Plane 1 as needed. See Appendix 3 for the limits of Pressure Plane 1. See Table 2 for a list of assets located at the High Island North Water Plant.

Table 2: High Island North Water Plant Assets

Asset	Quantity	Capacity
Ground Storage Tank	1	0.5 MG
Service Pumps	3	1,500 gallons per minute (gpm)
	1	400 gallons per minute (gpm)
Pressure Tank	1	15,000 Gallons

2.2 High Island South Water Plant / Pressure Plane 2

The High Island South Water Plant is located along TX-124, just south of the High Island North Water Plant, see Appendix 4. Similar to the High Island North Water Plant, water purchased from LNVA is first treated with liquid ammonium sulfate (LAS) and chlorine (CL2) to boost the residual disinfectant in the water, then it is pumped into the 1.0 MG GST. High service pumps pump the water from the GST into either Pressure Plane 2 as needed, or to the Singing Sands Water Plant in Crystal Beach via a 20-inch dedicated transmission line as needed. See Appendix 5 for the limits of Pressure Plane 2. See Table 3 for a list of assets located at the High Island South Water Plant.

Table 3: High Island South Water Plant Assets

Asset	Quantity	Capacity
Ground Storage Tank	1	1.0 MG
Service Pumps	3	1,500 gpm
	1	400 gpm
Elevated Storage Tank (EST)	1	0.25 MG

2.3 Singing Sands Water Plant / Pressure Plane 3

The Singing Sands Water Plant is located at the intersection of TX-87 and N. Tuna Dr., see Appendix 6. Water pumped from the High Island South Water Plant via the 20-inch waterline along TX-87 passes through a pressure sustaining valve (PSV) prior to entering the Singing Sands GST. The PSV is set to a pressure of 47 pounds per square inch (psi). This valve throttles the flow in the 20-inch waterline and maintains a 47-psi minimum pressure upstream of the Singing Sands Water Plant. The water is first treated with liquid ammonium sulfate (LAS) and chlorine (CL2) to boost residual disinfectant in the water prior to flowing into the GST. Similar to the operation of the High Island South Water Plant, high service pumps pump the water from the GST into either Pressure Plane 3 as needed, or to the Port Bolivar Water Plant in the Port Bolivar area via a 20-inch dedicated transmission line as needed. See Appendix 7 for the limits of Pressure Plane 3. See Table 4 for a list of assets located at the Singing Sands Water Plant, including its service area.

Table 4: Singing Sands Water Plant Assets

Asset	Quantity	Capacity
Ground Storage Tank	1	2.0 MG
Service Pumps	3	2,350 gpm
Elevated Storage Tank ⁽¹⁾	1	1.0 MG

(1) The elevated storage tank in Pressure Plane 3 is located near the intersection of TX-87 and Kahla Drive, approximately 22,700 feet from the Singing Sands Water Plant.

2.4 Port Bolivar Water Plant / Pressure Plane 4

The Port Bolivar Water Plant is located along TX-87 near Boyt Rd., see Appendix 8. Water is pumped from the Singing Sands Water Plant via a 20-inch dedicated transmission line to the Port Bolivar Water Plant GST. A PSV that is set to a pressure of 47-psi will throttle the flow into the GST and maintain a 47-psi minimum pressure upstream of the Port Bolivar Water Plant, similar to the operation of the Singing Sands Water Plant. The water is first treated with liquid ammonium sulfate (LAS) and chlorine (CL2) to boost the residual disinfectant in the water prior to flowing into the GST. Water is pumped into Pressure Plane 4 via an 18-inch waterline as needed. See Appendix 9 for the limits of Pressure Plane 4. See Table 5 for a list of assets located at the Port Bolivar Water Plant.

Table 5: Port Bolivar Water Plant Assets

Asset	Quantity	Capacity
Ground Storage Tank	1	1.0 MG
Service Pumps	3	1,300 gpm
	1	400 gpm
Elevated Storage Tank	1	0.5 MG

3.0 Improvements Needed to Meet Existing Demands and TCEQ Rules

3.1 Water Distribution System

The existing water distribution system was hydraulically modeled using KYPipe (Pipe 2022 KYnetic), see Appendix 10. The model results indicate that the 2-inch and 2.5-inch waterlines along Van Sant, Mabry Street, and North Tinkle Lane are undersized to meet the current peak water demands. Additionally, the 2-inch waterlines along Diamond Rd., Island Blvd., Mom's Road, and Rainbow Drive are also undersized

to meet the current peak water demands. The Texas Commission on Environmental Quality (TCEQ) Chapter 290 Public Drinking Water includes the rules and regulations that all public drinking water systems in the state of Texas must follow. The model indicates that the pressure for these waterlines fall below the TCEQ required minimum pressure of 35 psi during peak demand. The proposed waterline replacements will improve pressures in these areas to over 50 psi, fully complying with TCEQ minimum pressure requirements. The recommended line sizes are sufficient to also serve the future (10-year) estimated demands.

TCEQ Rule 290.44(c) limits the number of connections allowed for each waterline size. See Appendix 14 for specific limitations. While the model indicated that numerous 2 inch thru 4 inch waterlines located throughout BPSUD are maintaining adequate water pressures during peak demands, these same waterlines are not compliant with 290.44(c) because they have more than the maximum allowed number of connections. We are proposing to replace and upsize these 2 inch thru 4 inch waterlines to meet TCEQ requirements as well as accommodate for future growth. See Table 6 and 7 below for a summary of the proposed waterline improvements. Table 6 breaks down the anticipated construction costs for these waterline improvements into two-year increments, generally grouped in order of importance. See Appendix 12 for a detailed breakdown of the recommended waterline improvements.

Table 6: Breakdown of Estimated Construction Costs for Waterline Replacements

Year	Estimated Construction Costs
2022-2024	\$2,839,650
2024-2026	\$2,133,450
2026-2028	\$4,214,100
2028-2030	\$2,016,300
2030-2032	\$2,861,100

Table 7: Proposed Waterline Replacements

Street	Existing Waterline Size(s) ⁽¹⁾	Length	Existing Connections ⁽¹⁾	No. of Lots Platted ⁽¹⁾	Max. Connections Allowed on Existing Line Per TCEQ	Prop. Waterline Size	Max. Connections Allowed on Proposed Line Per TCEQ
4th Street (Bolivar)	2-inch	400 LF	4	81	10	4-inch	100
A Road	2-inch	1,500 LF	11	23	10	4-inch	100
Albatross (Holiday Sub)	2.5-inch	900 LF	15	32	25	4-inch	100
Alma	2-3-inch	2,300 LF	12	107	50	6-inch	250
Antigua (East)	2-inch	500 LF	17	21	10	4-inch	100
Austin	2-inch	500 LF	2	20	10	4-inch	100
Avenue A	2-inch	400 LF	2	18	10	4-inch	100
Beach Front	2.5-inch	2,200 LF	8	91	25	4-inch	100
Beaumont	2-inch	400 LF	1	15	10	4-inch	100
Biscayne	2-inch	700 LF	16	24	10	4-inch	100

Blacks Slip	2-inch/ 2.5-inch	2,800 LF	10	103	25	6-inch	250
Breaker (Holiday Sub)	2-inch	1,300 LF	20	46	10	4-inch	100
Bud	2.5-inch	800 LF	11	26	25	4-inch	100
Butterfly/ SeaDrift	2-inch/ 2.5-inch	3,400 LF	11	35	25	4-inch	100
Canal	2.5-inch	700 LF	7	126	25	6-inch	250
Church	2-inch	700 LF	6	23	10	4-inch	100
Crane (Holiday Sub)	2.5-inch	900 LF	15	29	25	4-inch	100
Crestview	2-inch	800 LF	7	11	10	4-inch	100
Deens	2-inch	400 LF	2	24	10	4-inch	100
Diamond Rd.	2-inch	3,400 LF	22	108	10	6-inch	250
Dolly	2-inch	400 LF	4	21	10	4-inch	100
Dolphin	2-inch	800 LF	4	23	10	4-inch	100
Driftwood	2.5-inch	1,500 LF	25	42	25	4-inch	100
E Mexico Rd	2-inch	2,500 LF	10	TBD	10	6-inch	250
E. Elm Grove (Sub. Sea Breeze)	2-inch	700 LF	9	12	10	4-inch	100
E. Hannas Reef Dr.	2-inch	500 LF	9	12	10	4-inch	100
E. Side Martinique (off Barbados)	2-inch	1,300 LF	16	21	10	4-inch	100
E. Smith Point (Sub. Sea Breeze)	2-inch	600 LF	7	12	10	4-inch	100
E.Croaker/ Oleander/ Dandelion/ Bluebonnet	2.5-inch	1,600 LF	18	74	25	4-inch	100
Elizabeth	2-inch	500 LF	3	18	10	4-inch	100
Emerald	2.5-inch	1,400 LF	17	43	25	4-inch	100
Faggards (N. Faggard's Dr.)	2-inch	400 LF	0	19	10	4-inch	100
Faggards Rd	2-inch/ 2.5-inch	1,700 LF	7	46	25	4-inch	100
Faggards Slip	2.5-inch	3,700 LF	11	143	25	6-inch	250
Gator Point	2-inch	800 LF	9	36	10	4-inch	100
Gayle N	2-inch	600 LF	5	18	10	4-inch	100
Gayle S	2-inch	500 LF	2	14	10	4-inch	100
Hamm	2-inch	1,100 LF	7	37	10	4-inch	100
Head Hunter	2.5-inch	800 LF	9	30	25	4-inch	100
Honeysuckle	2-inch/ 2.5-inch	1,600 LF	17	30	25	4-inch	100

	2.5-inch						
Idyle View	2-inch	900 LF	8	22	10	4-inch	100
Island Blvd.	2-inch/ 2.5-inch	4,100 LF	23/24	30/29	25	4-inch	100
Jean	2-inch	700 LF	2	20	10	4-inch	100
Jewel Dr.	2-inch	1,200 LF	11	32	10	4-inch	100
Johnson Rd. (Gilchrist)	2-inch	1,000 LF	2	32	10	4-inch	100
Joy	2-inch	1,200 LF	6	25	10	6-inch	250
Kahla	2.5-4-inch	2,900 LF	52	121	100	6-inch	250
Kirk Patrick	2-inch	600 LF	1	24	10	4-inch	100
Lazy Lane	2-inch	300 LF	4	18	10	4-inch	100
Mabry Street	2-inch/ 2.5-inch	6,900 LF	63	222	25	6-inch	250
Mae	2-inch	500 LF	1	20	10	4-inch	100
Mae Circle North/Mae Circle South	2-inch	1,100 LF	25	66	10	4-inch	100
Margaret	2-inch	500 LF	4	19	10	4-inch	100
Marjorie	2-inch	500 LF	2	14	10	4-inch	100
Miami	2-inch	300 LF	4	11	10	4-inch	100
Mom's Road	2-inch	2,300 LF	25	68	10	4-inch	100
Monkhouse South	2-4-inch	2,800 LF	52	153	100	6-inch	250
Mr. G	2-inch	2,500 LF	14	44	10	4-inch	100
N. Cove	2-inch	1,200 LF	6	33	10	4-inch	100
N. Fisherman	2.5-inch	900 LF	7	36	25	4-inch	100
N. Gateway	2-inch	1,100 LF	1	30	10	4-inch	100
North Bay Street	2-inch	600 LF	5	18	10	4-inch	100
North Tinkle Lane	2-inch/ 2.5-inch	4,400 LF	39	163	25	6-inch	250
Ocean Breeze	2-inch	900 LF	18	33	10	4-inch	100
Ocean Sand	2-inch	300 LF	9	32	10	4-inch	100
Ocean Shore	2-inch	900 LF	22	42	10	4-inch	100
Ocean Tide Dr.	2-inch	800 LF	16	32	10	4-inch	100
Ocean View	2-inch	1,000 LF	20	45	10	4-inch	100
Odem	2-inch	600 LF	2	34	10	4-inch	100
Paisley	2-inch	1,800 LF	13	128	10	6-inch	250
Palm View	2-inch	1,100 LF	13	31	10	4-inch	100
Pampano (East)	2-inch	600 LF	13	24	10	4-inch	100
Pampano (West)	2.5-inch	1,000 LF	9	27	25	4-inch	100
Pennington	2-inch	1,700 LF	5	132	10	6-inch	250
Pontiff	2-inch	500 LF	0	24	10	4-inch	100
Rainbow Dr.	2-inch	2,700 LF	19	23	10	4-inch	100
Ramada	2-inch/ 2.5-inch	1,400 LF	17	26	25	4-inch	100

Redfish (East)	2-inch	600 LF	15	29	10	4-inch	100
Rollover Circle	2-inch	4,800 LF	10	68	10	4-inch	100
S. Clara	2.5-inch	1,100 LF	20	64	25	4-inch	100
S. Cove	3-inch	1,800 LF	25	54	50	4-inch	100
S. Fisherman	3-inch	1,700 LF	22	51	50	4-inch	100
S. Gateway	2-inch	800 LF	10	38	10	4-inch	100
S. Jacks	3-inch	2,300 LF	36	82	50	4-inch	100
S. Redfish	2-3-inch	1,700 LF	28	69	50	4-inch	100
S. Stingaree	2-3-inch	1,700 LF	26	66	50	4-inch	100
S. Tinkle	2-3-inch	2,300 LF	39	83	50	6-inch	250
Sams/Yeager	2-inch	600 LF	2	13	10	4-inch	100
Sand Dollar	2-4-inch	2,800 LF	34	108	100	6-inch	250
Sand Drift (Driftwood)	2-inch	1,900 LF	17	25	10	4-inch	100
Sea Drift	2.5-inch	1,500 LF	20	42	25	4-inch	100
Seagull	2-inch	1,000 LF	4	24	10	4-inch	100
South Bay St	2-inch	500 LF	3	18	10	4-inch	100
Surfview (Emerald 1)	2.5 inch	1,900 LF	35	70	25	4-inch	100
Tidelands	2.5-inch	1,300 LF	18	43	25	4-inch	100
Tradewinds	2-inch/ 2.5-inch	600 LF	18	46	25	4-inch	100
Van Sant	2-inch/ 2.5-inch	6,400 LF	63	215	25	6-inch	250
Verdia (off Boyt)	2-inch	600 LF	18	34	10	4-inch	100
Verdia E&W	3-inch	3,000 LF	17/21	38/61	50	6-inch	250
Vista	2-inch	900 LF	12	23	10	4-inch	100
Waco	2-inch/ 2.5-inch	3,900 LF	25	161	25	6-inch	250
Whitecap (Holiday Sub)	2-inch	1,300 LF	22	40	10	4-inch	100
Yucca	2-inch	1,100 LF	12	32	10	4-inch	100
4th Street (Gilchrist)	2-inch/ 2.5-inch	7,900 LF	9	188	25	6-inch	250

(1) The information was provided by BPSUD.

3.2 TCEQ Rules and Regulations

As previously discussed in Section 2, since BPSUD purchases their treated water from LNVA, TCEQ Rule 290.45(f) applies to this water system. In addition to having a water purchase contract which authorizes the purchase of enough water to meet the needs of the water system, the public water system must meet all the other minimum requirements in 290.45. BPSUD water distribution system was analyzed based on Rules 290.45(b) (2) (A-H)- Minimum Water System Capacity Requirements, which apply to water distribution systems that are supplied by surface water.

3.2.1 TCEQ Rule 290.45(b) (2) (A-D)

TCEQ Rules 290.45(b) (2) (A-D) apply to public water systems that own and operate surface water treatment plants. These rules do not apply to BPSUD, however per 290.45(f) every water system must have the capability to provide 0.6 gpm per connection. The current contract with LNVA has a maximum deliverable amount of 5.5 MGD or approximately 3,820 gpm. Per this TCEQ rule, 3,896 gpm is required for the system to meet the requirement. The current contract needs to be increased to provide the additional 76 gpm needed, see Table 8.

Table 8: 2022 Purchased Water Amount

Maximum Deliverable Amount	Existing Connections	Requirement	TCEQ Required Amount	Additional Capacity Required
3,820 gpm (5.5 MGD)	6,492	0.6 gpm per connection	3,896 gpm	76 gpm

3.2.2 TCEQ Rule 290.45(b)(2)(E)

According to TCEQ Rule 290.45(b)(2)(E), the water distribution system must have a total storage capacity of 200 gallons per connection. The total storage includes all ground storage tanks and elevated storage tanks within the service area or pressure plane, see Table 9. The existing water distribution system meets the TCEQ requirement.

Table 9: 2022 TCEQ Total Storage Requirement

Water Plant/Pressure Plane	Total Capacity	Existing Connections	Required Storage	Additional Capacity Required
High Island North Water Plant/Pressure Plane 1	500,000 gallons	318	63,600 gallons	No Additional Capacity Required
High Island South Water Plant/Pressure Plane 2	1,250,000 gallons	684	136,800 gallons	No Additional Capacity Required
Singing Sands Water Plant/Pressure Plane 3	3,000,000 gallons	2,909	581,800 gallons	No Additional Capacity Required
Port Bolivar Water Plant/Pressure Plane 4	1,500,000 gallons	2,581	516,200 gallons	No Additional Capacity Required

3.2.3 TCEQ Rule 290.45(b)(2)(F)

According to TCEQ Rule 290.45(b)(2)(F), every water plant or pressure plane must provide service pumps with a total capacity of 2.0 gpm per connection or have a total capacity of at least 1,000 gpm and the ability to meet the peak hourly demands with the largest pump out of service. Pressure planes that provide an elevated storage capacity of 200 gallons per connection are required to provide 2 service pumps with a minimum combined capacity of 0.6 gpm per connection. Pressure Planes 2 and 3 provide at least 200 gallons per connection so the latter part of the requirement applies to these pressure planes. Each individual pressure plane was evaluated individually, see Table 10. The Port Bolivar Water

Plant, Pressure Plane 4, requires an additional 862 gpm. The other water plants/pressure planes meet the TCEQ requirement.

Table 10: 2022 TCEQ Service Pump Requirements

Water Plant	Provided Pump Capacity	Requirement	Existing Number of Connections	Required Pump Capacity	Additional Capacity Required
High Island North Water Plant-Pressure Plane 1	4,900 gpm	2 gpm per connection/ Min. of 1,000 gpm	318	636 gpm	No Additional Capacity Required
High Island South Water Plant- Pressure Plane 2	4,900 gpm	0.6 gpm per connection	684	410 gpm	No Additional Capacity Required
Singing Sands Water Plant- Pressure Plane 3	7,050 gpm	0.6 gpm per connection	2,909	1,745 gpm	No Additional Capacity Required
Port Bolivar Water Plant- Pressure Plane 4	4,300 gpm	2 gpm per connection/ Min. of 1,000 gpm	2,581	5,162 gpm	862 gpm (An additional 1,300 gpm pump is recommended to match existing service pump size)

3.2.4 TCEQ Rule 290.45(b)(2)(G)

According to TCEQ Rule 290.45(b)(2)(G), the water distribution system must have an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection. Each pressure plane was analyzed separately, see Table 11. The existing elevated storage and pressure tank capacities meet the TCEQ requirement.

Table 11: 2022 TCEQ Elevated Storage Requirement

Pressure Plane (Water Plant)	Connections in Pressure Plane	Requirement	Provided Elevated Storage Capacity/Pressure Tank Capacity	Required Capacity	Additional Capacity Required
Pressure Plane 1 (High Island North Water Plant)	318 Connections	20 gallons per connection (Pressure Tank)	15,000 gallons (Pressure Tank)	6,360 gallons	No Additional Capacity Required
Pressure Plane 2 (High Island South Water Plant)	684 Connections	100 gallons per connection (EST)	250,000 gallons (EST)	68,400 gallons	No Additional Capacity Required
Pressure Plane 3 (Singing Sands Water Plant)	2,909 Connections	100 gallons per connection (EST)	1,000,000 gallons (EST)	290,900 gallons	No Additional Capacity Required
Pressure Plane 4 (Port Bolivar Water Plant)	2,581 Connections	100 gallons per connection (EST)	500,000 gallons (EST)	258,100 gallons	No Additional Capacity Required

3.2.5 TCEQ Rule 290.45(b)(2)(H)

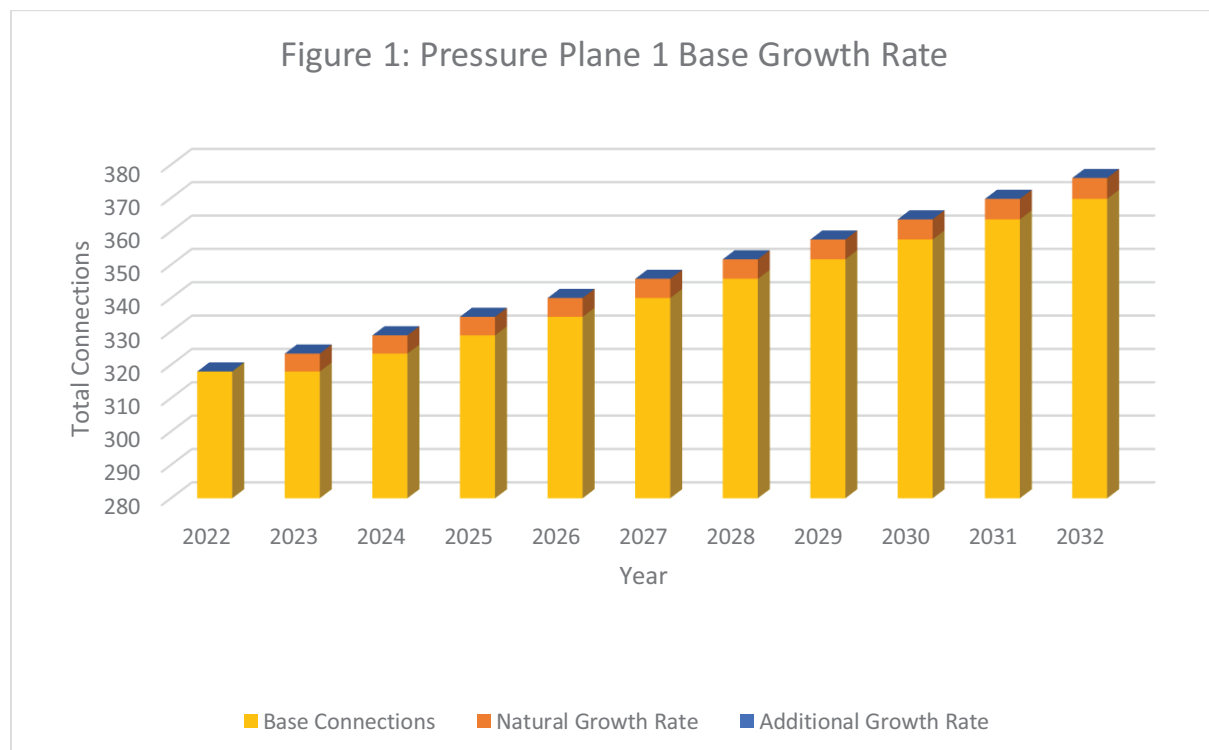
According to TCEQ Rule 290.45(b)(2)(H), sufficient emergency power must be provided to deliver a minimum of 0.35 gpm per connection to the distribution system in the event of the loss of normal power supply for systems that serve more than 250 connections and do not meet the elevated storage requirement. The existing system meets the elevated storage requirement as shown in section 3.2.4 TCEQ Rule 290.45(b)(2)(G), so this rule does not apply.

4.0 Land Use Assumptions and Base Growth Rate

In addition to evaluating existing condition, this Impact Fee Study evaluates expected growth in BPSUD and improvements that will be required to serve the future growth. Growth comes in 2 forms, including what is called “fill in” growth and then also new developments of undeveloped property. In existing developed areas such as Crystal Beach there are empty lots dispersed throughout the area that will be developed. This is “fill in” growth or natural growth. New development growth is where larger tracts of land that are currently undeveloped are cleared and developed. A growth rate of 1.69% was used as a natural growth rate, which is the published growth rate for Bolivar Peninsula by the TWDB. Additionally, the current development patterns were evaluated using Preliminary Application for Service to Subdivision forms to project the additional growth rate for the next 10 years for each individual pressure plane. This additional growth rate was added to the natural growth rate to develop the base growth rate for each pressure plane.

4.1 Pressure Plane 1 (High Island North) Base Growth Rate

There are currently no submitted applications for new developments in Pressure Plane 1. A base growth rate of 1.69% was used for this pressure plane. Figure 1 illustrates the Base Growth Rate for Pressure Plane 1 over the next 10 years.

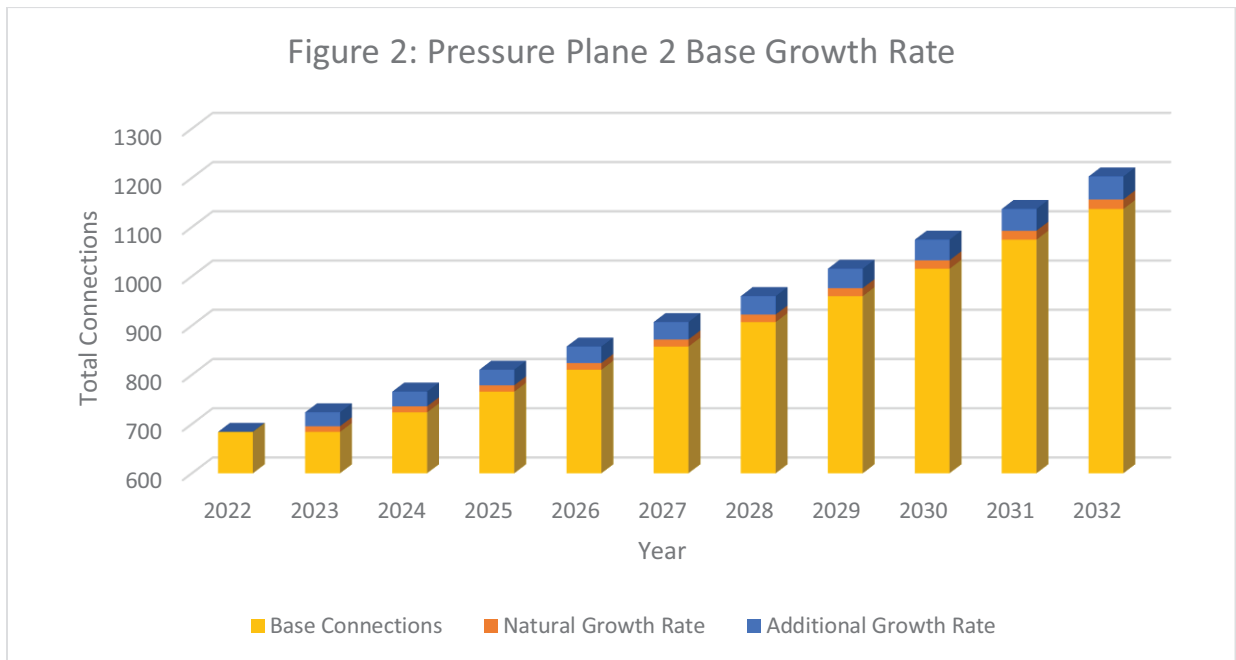


4.2 Pressure Plane 2 (High Island South) Base Growth Rate

Pressure Plane 2 currently has approximately 684 active connections and at the time of this report had two applications for a total of 140 connections for known development as well as up to 200 connections for Canal City, see Table 12. This additional growth rate of 4.12% as well as the natural growth rate of 1.69% results in a base growth rate of 5.81%. Figure 2 illustrates the Base Growth Rate for Pressure Plane 2.

Table 12: Pressure Plane 2 Development

Known Development	Number of Proposed Connections
Cory Morehead Subdivision 24	88 connections
The Villas at Rollover Pass	52 connections
Canal City	Up to 200 connections

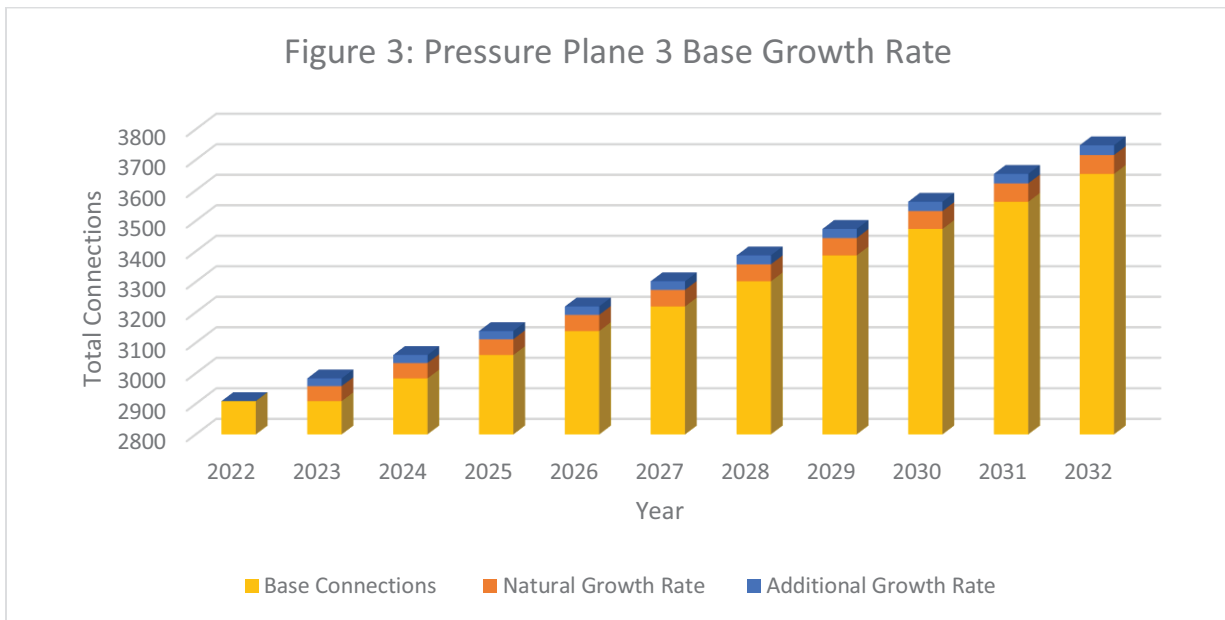


4.3 Pressure Plane 3 (Singing Sands) Base Growth Rate

Pressure Plane 3 has approximately 2,909 active connections and at the time of this report had seven applications for a total of 265 connections for known development, see Table 13, this additional growth rate of 0.88% as well as the natural growth rate of 1.69% results in a base growth rate of 2.57%. Figure 3 illustrates the Base Growth Rate for Pressure Plane 3.

Table 13: Pressure Plane 3 Development

Known Development	Number of Proposed Connections
Cory Morehead Subdivision 25	30 connections
The Wetlands at Crystal Beach	120 connections
Island Breeze Estates	28 connections
North Redfish	30 connections
Sandpiper Beach Section 4 Phase 3	18 connections
Sandpiper Beach Section 4 Phase 4	19 connections
Lunas Landing	20 connections

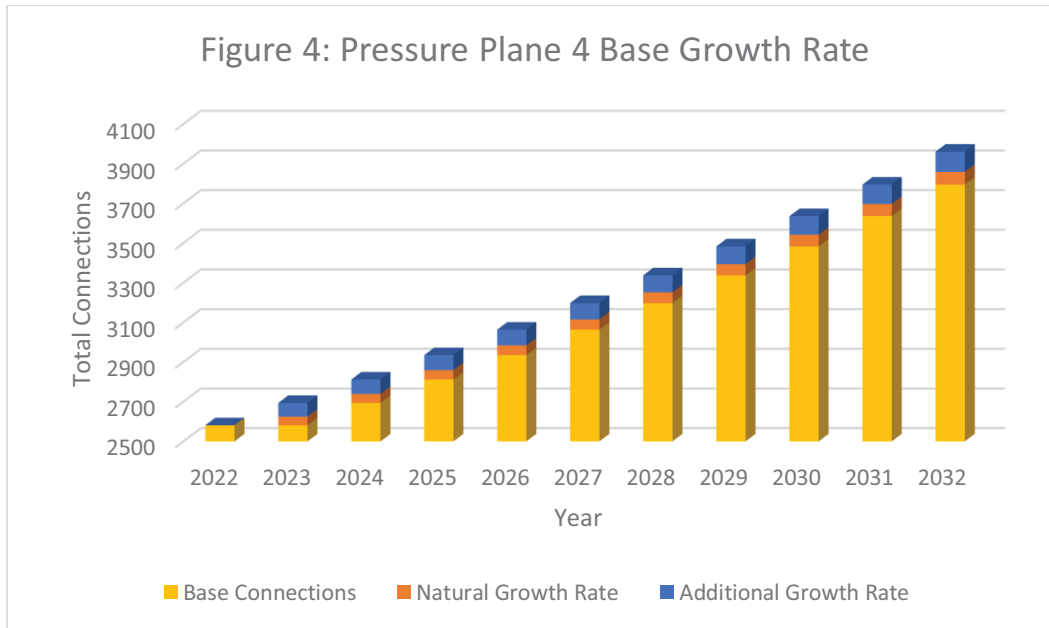


4.4 Pressure Plane 4 (Port Bolivar) Base Growth Rate

Pressure Plane 4 has approximately 2,581 active connections and at the time of this report had four applications for a total of 627 connections as well as up to 156 connections for known development along N. Tinkle Lane, see Table 14, this additional growth rate of 2.68% as well as the natural growth rate of 1.69% results in a base growth rate of 4.37%. Figure 4 illustrates the Base Growth Rate for Pressure Plane 4.

Table 14: Pressure Plane 4 Development

Known Development	Number of Proposed Connections
Sanderlane	38 connections
Crystal Cove Subdivision	18 connections
The Zoo	400 connections
Camp Margaritaville	171 connections
N. Tinkle Lane	Up to 156 connections



5.0 Improvements Needed to Meet 2032 Projected Demands and TCEQ Rules

The base growth rates developed in section 4 of this report were utilized to project the future connections and water demands for each pressure plane for the year 2032, see Table 15.

Table 15: 2032 Projected Connections and Water Demands

Pressure Plane	2022 Existing Connections	2022 Existing Water Demands	Base Growth Rate	2032 Projected Connections	2032 Projected Water Demand
1	318	52 gpm	1.69%	376	62 gpm
2	684	113 gpm	5.81%	1,203	198 gpm
3	2,909	473 gpm	2.57%	3,748	610 gpm
4	2,581	432 gpm	4.37%	3,961	663 gpm
Total	6,492	1,070 gpm	3.61% (Avg.)	9,288	1,533 gpm

5.1 Water Distribution System

The projected water demands were hydraulically modeled using KYPipe (Pipe 2022 KYnetic), see Appendix 11. The model results indicated that the water distribution system can handle the projected water demands without any additional proposed water lines.

5.2 TCEQ Rules and Regulations

Similar to the analysis performed in Section 3.2, this section analyzes the water distribution system based on Rules 290.45(b) (2) (A-H)- Minimum Water System Capacity Requirement. The 2032 projected connections in Table 15 were utilized for this analysis.

5.2.1 TCEQ Rules 290.45(b) (2) (A-D)

TCEQ Rules 290.45(b) (2) (A-D) apply to public water systems that own and operate surface water treatment plants. As previously mentioned in Section 3.2.1, TCEQ Rules 290.45(b) (2) (A-D) do not apply to BPSUD, however per 290.45(f) every water system must have the capability to provide 0.6 gpm per connection. In Section 3.2.1, the current contract with LNVA was recommended to be increased to 3,896 gpm for the existing system to meet the TCEQ Rules and Regulations. Per the TCEQ rule, 5,573 gpm will be required for the system to meet this requirement in 2032. The contract will need to be increased to provide the additional 1,677 gpm needed, see Table 16.

Table 16: 2032 Purchased Water Amount

Maximum Deliverable Amount	2032 Projected Connections	Requirement	TCEQ Required Amount	Additional Capacity Required
3,896 gpm (assuming recommended upgrade is made in 2022)	9,288	0.6 gpm per connection	5,573 gpm	1,677 gpm

5.2.2 TCEQ Rule 290.45(b)(2)(E)

According to TCEQ Rule 290.45(b)(2)(E), the water distribution system must have a total storage capacity of 200 gallons per connection. The total storage includes all ground storage tanks and elevated storage tanks within the service area or pressure plane, see Table 17. The projected water distribution system meets the TCEQ requirement.

Table 17: 2032 TCEQ Total Storage Requirement

Water Plant/Pressure Plane	Total Capacity	Projected Connections	Required Storage	Additional Capacity Required
High Island North Water Plant/Pressure Plane 1	500,000 gallons	376	75,200 gallons	No Additional Capacity Required
High Island South Water Plant/Pressure Plane 2	1,250,000 gallons	1,203	240,600 gallons	No Additional Capacity Required
Singing Sands Water Plant/Pressure Plane 3	3,000,000 gallons	3,748	749,600 gallons	No Additional Capacity Required
Port Bolivar Water Plant/Pressure Plane 4	1,500,000 gallons	3,961	792,200 gallons	No Additional Capacity Required

5.2.3 TCEQ Rule 290.45(b)(2)(F)

According to TCEQ Rule 290.45(b)(2)(F), every water plant or pressure plane must provide service pumps with a total capacity of 2.0 gpm per connection or have a total capacity of at least 1,000 gpm and the ability to meet the peak hourly demands with the largest pump out of service. Pressure planes that provide an elevated storage capacity of 200 gallons per connection are required to provide 2 service

pumps with a minimum combined capacity of 0.6 gpm per connection. Pressure Planes 2 and 3 provide at least 200 gallons per projected connection so the latter part of the requirement applies to these pressure planes. Each pressure plane was evaluated individually, see Table 18. The Port Bolivar Water Plant, Pressure Plane 4, will require additional capacity of 2,322 gpm.

Table 18: 2032 TCEQ Service Pump Requirements

Water Plant	Provide Pump Capacity (2022)	Requirement	Projected Number of Connections	Required Pump Capacity (2032)	Additional Capacity Required
High Island North Water Plant - Pressure Plane 1	4,900 gpm	2 gpm per connection/ Min. of 1,000 gpm	376	752 gpm	No Additional Capacity Required
High Island South Water Plant - Pressure Plane 2	4,900 gpm	0.6 gpm per connection	1,203	722 gpm	No Additional Capacity Required
Singing Sands Water Plant - Pressure Plane 3	7,050 gpm	0.6 gpm per connection	3,748	2,249 gpm	No Additional Capacity Required
Port Bolivar Water Plant - Pressure Plane 4	5,600 gpm (Assuming the recommended additional 1,300 gpm pump is installed in 2022)	2 gpm per connection/ Min. of 1,000 gpm	3,961	7,922 gpm	2,322 gpm (An additional 2,400 gpm pump is recommended)

5.2.4 TCEQ Rule 290.45(b)(2)(G)

According to TCEQ Rule 290.45(b)(2)(G), the water distribution system must have an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection. Each pressure plane was analyzed individually, see Table 19. The existing elevated storage and pressure tank capacities meet the TCEQ requirement.

Table 19: 2032 TCEQ Elevated Storage Requirement

Pressure Plane (Water Plant)	Projected Connections in Pressure Plane	Requirement	Provided Elevated Storage Capacity/Pressure Tank Capacity	Required Capacity	Additional Capacity Required
Pressure Plane 1 (High Island North Water Plant)	376 Connections	20 gallons per connection (Pressure Tank)	15,000 gallons (Pressure Tank)	7,520 gallons	No Additional Capacity Required
Pressure Plane 2 (High Island South Water Plant)	1,203 Connections	100 gallons per connection (EST)	250,000 gallons (EST)	120,300 gallons	No Additional Capacity Required
Pressure Plane 3 (Singing Sands Water Plant)	3,748 Connections	100 gallons per connection (EST)	1,000,000 gallons (EST)	374,800 gallons	No Additional Capacity Required
Pressure Plane 4 (Port Bolivar Water Plant)	3,961 Connections	100 gallons per connection (EST)	500,000 gallons (EST)	396,100 gallons	No Additional Capacity Required

5.2.5 TCEQ Rule 290.45(b)(2)(H)

According to TCEQ Rule 290.45(b)(2)(H), sufficient emergency power must be provided to deliver a minimum of 0.35 gpm per connection to the distribution system in the event of the loss of normal power supply for systems that serve more than 250 connections and do not meet the elevated storage requirement. The projected system meets the elevated storage requirement as shown in section 5.2.4 TCEQ Rule 290.45(b)(2)(G), so this rule does not apply.

6.0 Cost Estimate for 2022 Improvements

The breakdown for the proposed improvements for 2022 are listed in Table 20.

Table 20: 2022 Cost Estimate

Item	Quantity	Unit Cost	Total Cost
4-inch Waterlines	94,400 LF	\$50	\$4,720,000
6-inch Waterlines	63,400 LF	\$60	\$3,804,000
1,300 gpm Service Pump (Port Bolivar Water Plant)	1	\$305,500	\$305,500
Mobilization and Bonds (10%)			\$882,950
Contingency (25%)			\$2,428,120
Engineering Fee (20%)			\$2,428,120
Total Cost			\$14,568,690

7.0 Cost Estimate for 2032 Improvements

The breakdown for the proposed improvements for 2032 are listed in Table 21.

Table 21: 2032 Cost Estimate

Item	Quantity	Unit Cost	Total Cost
2,400 gpm Service Pump (Port Bolivar Water Plant)	1	\$355,000	\$355,000
Mobilization and Bonds (10%)			\$35,500
Contingency (25%)			\$97,625
Engineering Fee (20%)			\$97,625
Total Cost			\$585,750

8.0 Impact Fee Per ESFC

The typical size for a residential meter is 5/8-inch. This will be the basis for the cost per ESFC, see Table 22. Larger size meters will have a cost multiplier based on the flow rate as determined by ANSI/AWWA C700 and C710, see Table 23.

Table 22: ESFC Cost

Total Cost (2022 and 2032)	2022 ESFCs	2032 ESFCs	Net ESFCs Served	Cost per ESFC (for 5/8-inch meter)
\$15,154,440	6,492	9,288	2,796	\$5,500

Table 23: Cost per ESFC Multiplier

Meter Size (inch)	Flow Rate (gpm)	Flow Rate/ Cost Multiplier	Cost
5/8	15	1	\$5,500
1	40	2.67	\$14,700
1 1/2	60	4	\$22,000
2	100	6.67	\$36,700
4	400	26.67	\$146,700
6	800	53.33	\$293,400
8	1,000	66.67	\$366,700