utilities plan

Introduction:

A utility system that provides efficient levels of service at affordable rates, supports economic development, and promotes efficient use of natural resources is a critical component of a well functioning community. This portion of the Comprehensive Plan focuses on municipal water supply, wastewater (sewer) collection and treatment, and electrical power supply.

Vision Objectives

Four basic themes related to utilities infrastructure were developed during the visioning process. The first theme focuses on developing efficient and well-maintained utility systems with capacities that meet current and future consumer demands. The second theme focuses on competitive and affordable utility rates and fees, and the financial sustainability of utility operations. The third theme relates to the expansion and extension of utility systems to promote and support the community's economic development. The fourth theme stresses the efficient conservation and use of water and electrical resources by the consumer, and the use of renewable energy sources (Figure 1).

	DIRECT	INDIRECT
PROSPEROUS		•
EFFICIENT	•	
FUNCTIONING	•	
SAFE	•	
TALENTED		
HEALTHY		•
LIVABLE		•
VIBRANT		•
ENGAGED		
COLLABORATIVE		•
EQUITABLE		•
SUSTAINABLE		•

Figure 1. Vision Themes Related to the Utilities Plan

Although there are many utility suppliers that provide services in Brownsville and its Extra-Territorial Jurisdiction (ETJ), the bulk of the municipal water, wastewater, and electrical services are provided by the Brownsville Public Utilities Board (BPUB).

The BPUB is the City of Brownsville's municipally owned utility (MOU). The citizens of Brownsville exercise control over its management through a local Board of Directors appointed by the Brownsville City Commission. This report concentrates primarily on areas and populations served by the BPUB.

BPUB is in a strong position with respect to both levels of service and financial strength. Brownsville PUB is aggressively competing in the water and electric markets and continues to strive for excellence in customer service, community outreach, energy production, and delivering of water, wastewater and electric services.

It is ranked as one of the largest MOU's in the State and has a "Superior" water system rating in accordance with current TCEQ standards. On the financial side, Fitch Ratings has assigned BPUB's recent bond issues an 'A' rating which is reflective of its historically solid financial performance. In 2005, BPUB received an upgrade in ratings from "Baa1" to "A2" from Moody's Investors and from "A-" to an "A" rating from Standard & Poor's. The upgraded ratings reflect the continuing expansion of the system's solid service area and measures taken by the BPUB to make the system competitive and fiscally solid. In addition, Standard and Poor's also cited the Board's competitive user rates and the city's role as a growing economic center for the region as its rationale for the upgrade.

Three major sources were used to evaluate the system demands, capacities and proposed strategies. First, the current BPUB 2010 Water and Wastewater Master Plan prepared by AECOM; second, the Region M Water Supply Plan prepared by NRS in 2005; and personal interviews with BPUB personnel. The BPUB Water and Wastewater plan provides an analysis of the BPUB's future water and wastewater system needs in Brownsville. It presents a fairly comprehensive inventory of major water and wastewater system infrastructure components, an evaluation of existing capacity and condition of the major components and, finally, an assessment of infrastructure improvements needs based on projected future water and wastewater demand, in conformance with TCEQ requirements.

WATER

The Texas Commission on Environmental Quality (TCEQ) is responsible for regulation and oversight of municipal water services in Texas. The TCEQ issues Certificates of Convenience and Necessity (CCN) that establish specific service areas for Water Utilities. A CCN service area authorizes and obligates the Water Utility to provide continuous and adequate water service to customers who request service in that particular area. .

Although there are nine (9) water suppliers that have been issued CCN service areas either in or around Brownsville and its ETJ, the bulk of the municipal water needs of the city of Brownsville are supplied by Brownsville Public Utilities Board (BPUB).

Each entity has a responsibility to provide adequate facilities to produce, transport, and deliver potable water to customers within its service area, in accordance with TCEQ guidelines. The other water suppliers servicing customers in the Brownsville area are listed below:

- El Jardin Water Supply Corporation
- Brownsville Navigation District
- Olmito Water Supply Corporation
- Military Highway Water Supply Corporation
- Valley Municipal Utility District No. 2 (Rancho Viejo)
- East Rio Hondo Water Supply Corporation
- Laguna Madre Water District
- City of Los Fresnos

The BPUB provides potable water to populations within its CCN service area. Populations in outlying areas, i.e. not within BPUB designated water service areas, must rely on one of the other water suppliers for provision of water services.

Figure 2 provides a map of the City of Brownsville and its ETJ showing the CCN service area of BPUB and those of the other water suppliers in the area.

RAW WATER SUPPLY

BPUB has sufficient current raw water supply capacity to satisfy system demands until approximately the year 2018. Implementation of advanced water conservation measures can extend the existing capacity until approximately the year 2020. In order to meet demands beyond this point BPUB will need to identify and implement the optimal mix and timing of supply and demand management alternatives (i.e., supply side and demand side conservation, reuse, fresh surface water, brackish water, groundwater and/or seawater) that best balances the life cycle costs and the risk of water supply shortfalls.

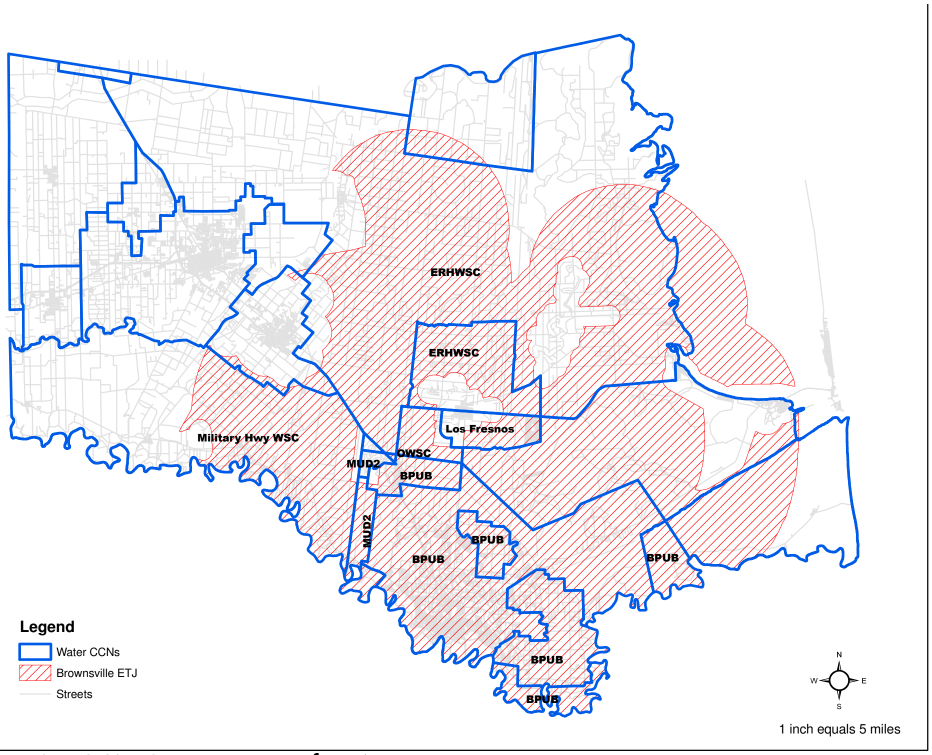

Figure 2. CCN Service areas for Water

Current Raw Water Supply Capacity

Current Surface Water Supply Capacity – Water Rights M865-000

The majority of BPUB's water supply comes from surface water from the Rio Grande. BPUB has acquired water rights, regulated through the Texas Commission of Environmental Quality (TCEQ Water Right M865-000), entitling it to an annual allotment of up to 29,285.11 acre-feet of surface water from the Rio Grande. This corresponds to approximately 9.54 billion gallons per year or 26.14 MGD (million gallons per day).

Current Groundwater Supply Capacity

Up until 2004, BPUB depended exclusively on surface water drawn from the Rio Grande as its sole raw water supply source. Although it still relies heavily on surface water from the Rio Grande, the BPUB has now added previously untapped brackish groundwater resources as an alternative raw water supply.

BPUB is 92.9% owner of Southmost Regional Water Authority (SWRA), which operates a groundwater well field in Cameron County, just west of Brownsville, near Military Highway. BPUB is entitled to 92.9% of brackish groundwater produced by SWRA's twenty (20) active wells. The brackish groundwater is pumped from Rio Grande Alluvium aquifer and piped to SWRA's 7.5 MGD treatment plant located on FM 511 in north Brownsville, between US 77/83 and Paredes Line Rd. The BPUB's current groundwater supply capacity is limited by the BPUB's proportional ownership of the SWRA's treatment capacity which equals approximately 7,841 acre-feet per year. This corresponds to approximately 2.55 billion gallons per year or 7.0 MGD (million gallons per day).

BPUB's current overall raw water supply capacity, consisting of surface water rights plus groundwater is 37,126 ac-ft per year. This equates to 12.1 billion gallons per year, or an average of 33.14 MGD (million gallons per day)

Recent Historical Demand

Figure 3 shows raw water intake values as reported in BPUB's Water Use Survey, provided annually to the Texas Water Development Board (TWDB). The table shows groundwater and surface water

Calendar Year	Surface Water Intake	Groundwater Intake	Total Raw Water Intake for BPUB Municipal Water Supply	% Overall Raw Water Supply Capacity (37,126 ac-ft)
2005	7,543,796,000 gal 23,151 ac-ft 87.20%	1,103,572,000 gal 3,387 ac-ft 12.80%	8,647,368,000 gal 26,538 ac-ft	71.50%
2006	7,108,326,000 gal 21,815 ac-ft 80.50%	1,720,735,000 gal 5,281 ac-ft 19.50%	8,829,061,000 gal 27,095 ac-ft	73.00%
2007	6,704,896,000 gal 20,577 ac-ft 79.10%	1,760,930,000 gal 5,404 ac-ft 20.80%	8,465,826,000 gal 25,981 ac-ft	70.00%
2008	7,511,573,000 gal 23,052 ac-ft 83.90%	1,438,503,000 gal 4,415 ac-ft 16.10%	8,950,076,000 gal 27,467 ac-ft	74%

The decrease in groundwater intake from 2007 to 2008 can be attributed to SWRA plant modifications made during the summer and fall of 2008, during which plant-operating capacity was temporarily limited. Groundwater intake is expected to return to its previous levels in 2009, and again account for roughly 20% of the BPUB's raw water supply.

Figure 3. BPUB Raw water intakes

intake volumes for calendar years 2005 through 2008. The sum of the ground water and surface water intake volumes represents BPUB's raw water intake for the given year. From 2005 to 2008, the overall raw water intake (i.e. surface water plus groundwater) has fluctuated very little, from a low of 25,591 ac-ft in 2007, to a high of 27,467 ac-ft in 2008. Based on these figures, the BPUB's current overall raw water intake represents approximately 74% of the current raw water supply capacity.

The BPUB also holds TCEQ Permit No. 1838 entitling it to 40,000 acre-feet of surplus water in the Rio Grande. Internal records provided by BPUB staff show additional diversions under Permit 1838 of 5,156 ac-ft (1.68 billion gallons) in 2006, and 2,148 ac-ft (0.7 billion gallons) in 2007. These amounts are considered to be in addition to the intake volumes reported in TWDB Water Use Surveys.

For the purposes of this report we have combined the raw water intake volumes reported on the Water Use Surveys with the surplus water intake volumes provided by BPUB staff, to determine a realistic estimate of actual raw water intake. Given that no surplus water intake values were provided for the year 2008, the combined reported and unreported values for the years 2006 and 2007 was used as a basis for our determination.

For 2006, with the 27,095 ac-ft reported on TWDB Water Use Survey, plus the 5,156 ac-ft surplus water under Permit 1838 (unreported), the raw water intake was roughly 32,251 ac-ft. For 2007, however, with 25,981 ac-ft reported on TWDB Water Use Survey, plus the 2,148 ac-ft surplus water under Permit 1838 (unreported), the raw water intake fell to 28,129. Noting the significant difference between the 2006 and 2007 figures, we have estimated that the current raw water intake is roughly 30,000 ac-ft per year, including surplus water drawn under Permit No. 1838.

Projected Raw Water Demand

Assuming current raw water demand of 30,000 ac-ft, and an annual growth rate of 2.4%, the BPUB current raw water supply capacity of 37,126 ac-ft per year (not including surplus water), will be exceeded by approximately the year 2018.

The current estimated per capita raw water demand is about 144 gallons per person per day. With successful implementation of advanced water conservation measures (i.e. high efficiency washing machines, toilets, showerheads), the per capita demand can be gradually reduced conservatively by as much as 15 gallons per person per day by the year 2025. If these conservations are realized, the BPUB's current raw water supply capacity can be extended to approximately the year 2020; and additional conservation measures based on public information as well as financial and regulatory incentives could increase the value beyond that.

To avoid shortfall in the future raw water supply beyond the year 2020, the BPUB will need to plan for and implement the most optimal mix and timing of supply and demand management alternatives (i.e., supply side and demand side conservation, reuse, fresh surface water, brackish water, groundwater and/or seawater) to meet future water demands that best balances the life cycle costs and the risk of water supply shortfalls. A discussion of various options available to extend BPUB's water supply capacity is presented below.

Strategies

1. Surface Water - Purchase of Additional Water Rights

BPUB collects water rights fees from all new developments and has accumulated substantial funds for acquisition of additional water rights. A Water Rights Fee of $1815 per acre is charged to developers to acquire water rights. BPUB's records indicate that no water rights have been acquired since 2003 when 6 ac-ft were acquired. The relatively low cost of conventional surface water treatment would make this an attractive element of the future water supply plan. This option is even more appealing since a recent study indicated that Water Treatment Plant No. 1, a conventional surface water treatment facility, could be re-rated from 20 to 27 MGD capacity without major capital improvements. However, since the availability of surface water from the Rio Grande is vulnerable to recurring drought, Mexico treaty non-compliance, and other factors, the risk of over-dependence on surface water rights needs to be taken into consideration. Nevertheless, purchase of additional water rights can be part of an overall water supply strategy. Considering possible future volatility in the water rights 'market', a water rights acquisition plan and timetable should be considered as part of the overall effort to determine the optimal mix of water supply options.

2. Surface Water – Brownsville Matamoros Weir and Reservoir Project

The proposed Brownsville-Matamoros Weir and Reservoir Project would help BPUB develop its long-term raw water supply. The project was made possible by TCEQ Permit 5259 allowing it to impound 6,000 ac-ft of surface water behind the proposed weir which would help BPUB take full advantage of TCEQ Permit No. 1838 entitling it to up to 40,000 ac-ft of surplus water per year and is estimated to provide a reliable yield of 20,643 ac-ft/year. The weir would capture and store excess surface water in the Rio Grande that reaches Brownsville including U.S. waters released from Falcon Reservoir that are not diverted by other U.S. users as well other unused flows. The location of the proposed weir would be about eight river miles downstream from Brownsville's Gateway International Bridge at the current site of Brownsville Irrigation District's rock weir. The captured water would create a pool within the riverbanks extending about 42 river miles upstream from the weir. The pool would average 100 feet in width with normal top of water elevation of +26 ft MSL (mean sea level), with a capacity of about 6,000 ac-ft. The original estimated cost for the weir dam was approximately $40 million. However, the estimated cost is now on the order of $60 million and costs are expected to rise by 4% annually.

3. Additional Groundwater

BPUB's current groundwater supply capacity (7,841 ac-ft or 2.55 billion gallons per year, or average 7.0 MGD) is based on the maximum treatment capacity of the SWRA plant. However, results of an extensive aquifer test program commissioned by BPUB to determine the actual long-term quality and quantity of brackish water availability indicate that the test area could conservatively produce 10 MGD with relatively low salinity (TDS < 3,000 mg/l).

This additional ground water capacity would require an expansion of the SWRA treatment capacity. The SWRA plant is designed to allow for future expansion from 7.5 MGD to 15 MGD (BPUB's share would be 14 MGD). To fully utilize this option, however, continued aquifer testing will need to confirm that the aquifer can reliably produce 15 MGD. Informal reports from BPUB staff indicate that ongoing aquifer testing results are very promising. Should tests confirm that a 15 MGD yield can be realized, expansion of SWRA to 15 MGD would increase BPUB's groundwater supply capacity by another 7,841 acre-feet or 2.55 billion gallons per year (average 7.0 MGD). The advantage of this option is that it does not require the additional acquisition of water rights.

4. Seawater Desalination

Pilot studies have confirmed that seawater desalination at Brownsville Ship Channel is feasible. BPUB is currently considering construction of a 2.5 MGD demonstration-scale seawater desalination plant at Port Brownsville at an estimated cost of approximately $70 million. At full capacity, the 2.5 MGD plant the unit capital costs would be approximately $28 per gallon. The 2.5 MGD pilot plant would provide operating data that could be used to design a more efficient full-scale facility producing 25 MGD at an estimated cost of $182 million (2008 dollars). The 25 MGD plant would be provide an additional 28,000 ac-ft per year. As is the case with groundwater, the acquisition of additional water rights is not required for this option.

5. Unaccounted for Water

Reducing "unaccounted for water" can be a significant mechanism for extending water supply capacity. A target goal of 10% unaccounted water is recommended by the American Water Works Association. Precise estimates of BPUB's unaccounted water figures are difficult to obtain.

A rough average estimate provided by BPUB is approximately 14% although it is highly variable. It is recommended that a more systematic approach for estimating unaccounted for water be developed as part of the overall effort to establish the optimal mix of supply and demand management options needed to extend the BPUB's water supply capacity.

6. Water Conservation

Water reuse is sometimes referred to as the world's greatest untapped natural resource. The need to conserve water has pushed water utilities to look for every means possible to reduce the amount of water used by the customers of municipal water companies. Use of innovations in water conservation, including new low-water use washing machines and conventional water saving devices such as low-flow toilets and low-flow showerheads, is essential to maximize water conservation and re-use. Advanced (indoor) water conservation measures can conservatively result in a reduction of 15 gallons per person per day in municipal water consumption by the year 2025. This can translate directly to an equivalent reduction in wastewater production. Additional conservation benefits could be obtained via outdoor conservation measures, public education as well as financial and regulatory incentives.

Water Efficient Washing Machines

It is estimated that a typical household in the U.S. does about one load of laundry daily, using about 40 gallons per full load with a conventional washer. New horizontal-axis washing machines, however, only use 20 to 25 gallons per load. These water-efficient clothes washers not only use less water than conventional washers, but also less energy. They are made by a number of different manufactures and are carried by appliance retailers nationwide.

For the purpose of this Plan, we have assumed that all washing machines in operation in 2007 use 40 gallons per load. It is also assumed that by the year 2025, the new 25-gallon per load, water-efficient models, will replace all of the old 40-gallon machines.

High Efficiency Toilets

Over the past 50 years, water use in toilet tanks has decreased from 7 gallons per flush prior to 1950's, to 5.5 gallons per flush in the 1960's, to 3.5 gallons per flush in the 1980's. Finally, in 1991, the Texas legislature passed a law requiring that, beginning in 1992, all new fixtures sold must include water conserving plumbing devices such as 1.6-gallons-per-flush toilets. Today, all new toilets use no more than 1.6 gallons of water. For the purpose of this Plan, we have assumed that 50% of the toilets currently in operation use 3.5 gallons of water per flush, and that the remainder are newer models using 1.6 gallon per flush toilets. It is also assumed that through the year 2025, the new 1.6-gallon low-consumption models will replace all remaining 3.5-gallon toilets.

Shower Heads

Studies have shown that showers account for approximately 17 percent of indoor water use, ranking third behind clothes washers and toilets. EPA has developed a specification for high-efficiency showerheads. The benchmark, as specified in the Energy Policy Act of 1992, is a maximum water use of 2.5 gallons per minute (gpm) when measured at a flowing pressure of 80 pounds per square inch (psi). This compares to older models which use 5 gallons per minute, or more.

For the purpose of this Plan, it was assumed that 50% of showerheads currently in operation use the older 5-gpm showerheads; and that the remaining units are newer models using 2.5 gallons per minute. It is also assumed that through the year 2025, the new 2.5-gallon models will replace all remaining 5 gpm showerheads.

Re-Use of Water Drained Through Bathroom Sinks

It is estimated that about 5% of domestic water consumption runs from the lavatory faucet into the sink, and eventually into the sanitary sewer. There are systems on the market today that allow homeowners to use water that drains from bathroom sinks to flush toilets. These systems work in conjunction with existing plumbing to capture water from bathroom sinks. The captured water is filtered and disinfected, then pumped into toilet tanks for re-use. Tests indicate these systems can reduce metered water usage by as much as 10 gallons per person per day. Although re-use of lavatory sink water is not included in our estimates, this represents yet another example of water conservation that can be achieved in the future to further reduce our rate of municipal water consumption.

Other Methods

The conservation methods discussed previously focused on indoor water conservation measures. Additional options are available for improving target conservation goals that focus on outdoor conservation methods and that combine educational programs together with financial and regulatory incentives, as well as reuse.

The optimal mix of strategies will ultimately depend on the marginal life-cycle costs of each option, their reliability and the acceptable risk of shortfalls. Ultimately, water conservation provides significant benefits by reducing operating costs, reducing the size and frequency of cost intensive capital investments, and extending the life of valuable natural resources.

RAW SURFACE WATER STORAGE

BPUB has sufficient raw water storage capacity to satisfy current and future system needs until the year 2023. Implementation of advanced water conservation measures alone can extend existing capacity conservatively to the year 2025. In order to meet demands beyond the year 2025, BPUB will need to construct additional dedicate water storage reservoir capacity and/or increase the available storage in the resaca system.

Current Raw Surface Water Storage Capacity

The BPUB draws its surface water from the Rio Grande and transports it to Water Treatment Plant No. 1 located nearby the river, and across town through a 30-inch diameter pipe to Water Treatment Plant No. 2. In route to WTP No. 2, a portion of the raw water flow is diverted for additional storage in the local resaca system. It is estimated that the current BPUB storage capacity is approximately 2,800 ac-ft.

Current Raw Surface Water Storage Demand

TCEQ requires that for conventional surface water treatment there must be sufficient water storage (prior to treatment) to accommodate a 30-day supply. For 2006, with the 21,815 ac-ft surface water intake reported on TWDB Water Use Survey, plus the 5,156 ac-ft surplus water under Permit 1838 (unreported), the surface water intake was roughly 26,971 ac-ft. For 2007, however, with 20,577 ac-ft surface water intake reported on TWDB Water use Survey, plus the 2,148 ac-ft surplus water under Permit 1838 (unreported), the surface water intake fell to 22,725 ac-ft. Noting the significant difference between the 2006 and 2007 figures, we have estimated that our current raw water intake is roughly 25,000 ac-ft per year, including surplus water drawn under Permit No. 1838. Assuming current raw surface water raw intake of 25,000 ac-ft per year, the required 30-day storage volume would be about 2,083 ac-ft.

Projected Raw Surface Water Storage Demand

Assuming current raw surface water storage requirement of 2,083 ac-ft, and an annual growth rate of 2.4%, the BPUB current raw surface water storage capacity of 2,800 ac-ft, will be exceeded by the year 2023. With successful implementation of advanced water conservation measures (i.e. high efficiency washing machines, toilets, showerheads), the BPUB's current raw surface water storage capacity can be extended to the year 2025.

Strategy

To avoid a shortfall in the raw surface water storage capacity beyond the year 2025, the BPUB will need to plan for an economically effective solution. In addition to adding to the raw water storage reservoirs at existing or future water treatment plants, one key element to the solution would be the Resaca Restoration Project. This project would result in deepening the existing resaca system throughout town by removing silt deposits that have accumulated on the resaca bottoms over several decades. It is estimated that the potential increase in overall storage capacity would be approximately 2,800 ac-ft, effectively doubling the existing capacity and providing sufficient raw surface water storage capacity for years to come. The project would also provide environmental benefits, and improve performance of the storm drainage systems throughout the community.

Over the next three years, BPUB is also planning non-capacity related capital improvements associated with its raw surface water supply system. The total cost of these improvements is estimated to be about $2.3 million. The majority of these expenditures (about $2 million) are for dredging existing raw water storage reservoirs.

POTABLE WATER TREATMENT

BPUB has sufficient potable water treatment capacity to satisfy current and future system needs until the year 2019. Implementation of advanced water conservation measures can extend existing capacity to the year 2021. In order to meet demands beyond the year 2021, BPUB will need to plan for and implement the most economically effective combination of surface water, brackish groundwater, and/or seawater desalination treatment options.

Current Water Treatment Capacity

The Brownsville Public Utilities Board (BPUB) currently has three potable water treatment plants. The total combined water treatment plant capacity for all three plants is 47 million gallons per day (47 MGD).

Surface Water Treatment Capacity

BPUB's operates two conventional surface water treatment facilities: Water Treatment Plant No. 1 (WTP No. 1), or the Riverside Plant, is located in west Brownsville close to the Rio Grande; and Water Treatment Plant No. 2 (WTP No. 2) which is located in the Land-o-Lakes area. Both rely on fresh surface water from the Rio Grande are fully owned and operated by the BPUB.

Both plans have a capacity of 20 MGD and together provide a combined surface water treatment capacity of 40 MGD.

Groundwater Treatment Capacity

The BPUB owns 92.9% of the SWRA reverse-osmosis (R-O) brackish groundwater treatment plant. This is the largest such facility in Texas. The plant pumps groundwater from the Rio Grande Alluvium aquifer at a site near US 281 (Military Highway) west of Brownsville.

The SWRA R-O desalination plant has a capacity to produce up to 7.5 MGD of treated water. BPUB is entitled to 92.9% of the water produced by the SWRA plant. This amounts to approximately 7 MGD.

Projected Water Treatment Demand

According the BPUB's 2010 Water and Wastewater Master Plan, the total average water demand in 2007 was 23.7 MGD, equating to 126 gallons per person per day. However, the required water treatment capacity is not based on average demand but on "peak day" demand. With a reported "average day-to-peak day" factor of 1.54, the peak day demand for 2007 was estimated to be 36.5 MGD. The average water demand in 2010 is projected to be 25.2 MGD, with peak day demand of 38.9 MGD. The average water demand in 2015 is projected to be 27.6 MGD, with a peak daily demand of 42.5 MGD. Given that BPUB's current combined water treatment capacity is 47 MGD, the existing BPUB treatment capacity is sufficient to meet the projected demands through the year 2015. However, for the year 2025, the average water demand is projected to be 32.7 MGD, with peak daily demand of 50.3 MGD, which exceeds the BPUB current water treatment capacity. Actually, the projected peak day flow would exceed the existing treatment capacity prior to that, in the year 2019. With successful implementation of advanced water conservation measures (i.e. high efficiency washing machines, toilets, showerheads), the per capita demand can be gradually reduced by as much as 15 gallons per person per day by the year 2023. If such conservation can be realized, the BPUB's current water treatment capacity can be extended to the year 2021.

Strategies

To avoid a shortfall in the water treatment capacity beyond the year 2021, the BPUB is considering two realistic alternatives, either of which would increase current overall water treatment capacity by 7 MGD, from 47 MGD to 54 MGD.

The first alternative involves re-rating the existing BPUB Water Treatment Plant No. 1 (Riverside) from 20 MGD to 27 MGD. As previously noted, the relatively low cost of conventional surface water treatment, together with the results of a recent study showing that Water Treatment Plant No. 1 might be re-rated to 27 MGD capacity without major capital improvements, makes this an attractive option. The estimated cost shown for this alternative, according to the 2010 Water and wastewater Master Plan is $100,000.

The other alternative being considered is to upgrade the SWRA groundwater treatment plant capacity from 7.5 MGD to 15 MGD, thus increasing BPUB's allotment from 7 MGD to 14 MGD. While brackish water desalination costs are considerably higher than costs of conventional surface water treatment, this alternative would serve to reduce the BPUB's dependence on surface water and lessen the risk of raw water shortage during period of severe drought. Furthermore, water system modeling has determined that this alternative produces a more balanced water distribution overall, with improved circulation in the systems elevated storage tanks. Also, since brackish groundwater would be utilized as the raw water source for treatment, no acquisition of additional surface water rights would be required for this particular upgrade, The estimated cost of this alternative is $18.1 million according to 2010 Water and Wastewater Master Plan.

With respect to the alternatives discussed above, it should be noted that raw surface water from the Rio Grande is vulnerable to recurring drought and other factors, and raw ground water (brackish water used at SWRA) is limited by well production and aquifer recharge rates. Therefore, as discussed in the raw water supply section of this report, another alternative is seawater desalination at Brownsville Ship Channel. BPUB is considering construction of a 2.5 MGD demonstration-scale seawater desalination plant at Port Brownsville, at an estimated cost is about $70 million. The pilot plan could be used to design a more efficient full-scale facility producing 25 MGD with an estimated construction cost of $182 million (2008 dollars). Although the unit treatment costs for this alternative would be quite high, the innovative nature of this project would external funding a distinct possibility. BPUB should continue to carefully invest in brackish groundwater and seawater desalination to further diversify its raw water supply sources. Through its use of seawater, the desalination plant envisioned at Port Brownsville would represent a major breakthrough for the BPUB to reduce its long-term reliance on conventional raw water supply sources. An additional advantage is that acquisition of additional water rights are not needed for these projects.

Over the next ten years, the BPUB is also planning non-capacity related capital improvements at all three water treatment plants. The total cost of these improvements is estimated to be about $19.5 million. Water Treatment Plant No. 1 will require rehabilitation of its filter system and a backwash pump generator. The estimated cost of these improvements is $1.6 million. Water Treatment Plant No. 2 will require a backup power generator and re-wiring, and upgrade and expansion of its filter system. The estimated cost of these improvements is about $2.1 million. The SWRA plant will require pre-treatment system to allow operation at full treatment capacity, and upgrade of the backup power generator, upgrade of the header system and backup generators at the existing well field. The cost of these improvements is estimated to be about $15.8 million, most of that being associated with the pre-treatment system.

POTABLE WATER STORAGE – GROUND STORAGE (CLEARWELLS)

BPUB has sufficient capacity in its potable water ground storage (clearwell) facilities to satisfy current and projected demand beyond the year 2025.

Current Ground Storage Capacity

BPUB has three main ground storage (clearwell) reservoir facilities. Water Treatment Plant No. 1 (Riverside) has an existing clearwell storage capacity of 2.85 million gallons. The clearwell storage facilities at BPUB Water Treatment Plant No. 2 (Land-o-Lakes) have a capacity of 4 million gallons. The SWRA groundwater treatment plant has a existing clearwell capacity of 7.5 million gallons, and it is assumed that the BPUB share is roughly 7 million gallons.

The current combined BPUB ground storage (clearwell) capacity is 13.85 MG.

Ground Storage Capacity Requirements

The TCEQ requires that all water supply systems having more than 250 connections provide a covered clearwell storage capacity at the treatment plant of at least 5% of daily treatment capacity. Currently, Water Treatment Plants No. 1 and No. 2 each require 1 MG ground storage capacity, and SWRA requires 0.35 ground storage capacity. The current ground storage capacities provided at each plant exceed these requirements.

In the future, when BPUB treatment capacity is increased, the two alternatives being considered are expansion of Water Treatment Plant No. 1 to 27 MGD capacity, or expansion of SWRA to 15 MGD capacity. If WTP No. 1 is expanded, its new required ground storage capacity will be 1.35 MG. If SWRA is expanded, its new required ground storage capacity will be 0.7 MG. In either case, the existing potable water ground storage facilities will comply with the TCEQ "5% of daily plant capacity" requirement, and no additional capacity is needed until beyond the year 2025.

A breakdown of the treatment capacities and ground storage capacities required at each of BPUB's three treatment plants is provided in Figure 4.

Water Treatment Plant	Current Treatment Plant Capacity	Req'd Clearwell Storage Capacity (5%)	Current Clearwell Storage Capacity
WTP No. 1	20 MGD	1 MG	2.85 MG
WTP No. 2	20 MGD	1 MG	4 MG
SWRA	7 MGD (PUB share)	0.35 MG	7 MGD (PUB share)
COMBINED	47 MGD	2.35 MG	13.85 MG
After 2025 Water Treatment Capacity Increase			
COMBINED	54 MGD	2.7 MG	13.85 MG

Figure 4. Ground Storage Capacities.

YEAR	Projected Number BPUB Connections*	Projected Total Storage Capacity
2010	48,059	9.61 MG
2015	52,869	10.57 MG
2025	63,168	12.63 MG

Figure 5. Projected Total Storage Capacity Requirements.

Combined Ground Storage Capacity Requirements
TCEQ requires that all water supply systems provide total storage capacity of 200 gallons per connection. According to the BPUB's 2010 Water and Wastewater Master Plan, the number of service connections to the BPUB water system is projected to be 48,059 in the year 2010. The number of connections projected for the year 2015 is 52,869, and the number of connections projected in the year 2025 is 63,168. To meet the "200 gallon per connection" requirement, the BPUB would need total storage capacity of 9.61 MG in the year 2010, 10.57 MG in the year 2015, and 12.63 MG in the year 2025 (Figure 5).

As stated previously, the BPUB existing potable water ground storage facilities provide a total combined storage capacity of 13.85 MG. This total storage capacity is sufficient to comply with the TCEQ "200 gallon per connection" requirement, and no additional capacity is needed until beyond the year 2025.

POTABLE WATER – ELEVATED STORAGE

The BPUB has sufficient elevated water storage capacity to satisfy current and projected demand beyond the year 2025. No additional elevated storage capacity is needed until beyond the year 2025.

Current Elevated Storage Capacity (Water Towers)
The BPUB currently has five (5) elevated potable water storage tanks (water towers) located throughout its service area. Three of these elevated tanks, EST-4 (at Southmost and E 30th); EST-5 (UTB-TSC Campus); and EST-EJ (a new elevated tank in El Jardin area, on Browne Avenue), each have a 1 million gallon (MG) potable water storage capacity. Two tanks, EST-6 (on Alton Gloor Boulevard), and EST-7 (a new elevated tank on Martinal Road, near Roselawn Cemetery), each have a 2 MG storage capacity.

The current BPUB combined elevated storage (water towers) capacity is 7 MG (Figure 6).

Projected Elevated Storage Capacity Requirements
TCEQ requires that all water supply systems with more than 2,500 connections provide 100 gallons of elevated storage capacity per connection. According to the BPUB's 2010 Water and Wastewater Master Plan, the number of service connections to the BPUB water system is projected to be 48,059 in 2010, 52,869 in 2015 and 63,168 in 2025. To meet the "100 gallon per connection" requirement, the BPUB would need elevated storage capacity of 4.81 MG in 2010, 5.29 MG in 2015 and 6.32 MG in 2025.

As stated previously, the BPUB's existing potable water elevated storage facilities provide a total

BPUB Elevated Storage Tank	Current Elevated Storage Capacity
EST-4	1 MG
EST-5	1 MG
EST-6	2 MG
EST-7	2 MG
EST-EJ	1 MG
COMBINED	7 MG

Figure 6. Elevated Storage Capacities.

YEAR	Projected Number BPUB Connections*	Projected Elevated Storage Capacity Required (100
2010	48,059	4.81 MG
2015	52,869	5.29 MG
2025	63,168	6.32 MG

Note: Existing 7 MG elevated storage capacity exceeds requirements beyond 2025

Figure 7. Needed Elevated Storage Capacities.

combined storage capacity of 7 MG. This total elevated storage capacity is sufficient to comply with the TCEQ "100 gallon per connection" requirement, and no additional capacity is needed until beyond the year 2025 (Figure 7).

HIGH SERVICE PUMP STATIONS

Existing pump configurations of the high-service pump stations at BPUB's water treatment plants are sufficient to meet projected peak-hour flows through the year 2025. Depending on which treatment plant BPUB chooses to expand, in the future additional high service pumps will be required at that time, either at WTP No. 1 or at SWRA.

Current High-Service Pumping Capacities

Each of BPUB's water treatment plants has a high-service pump station that pumps treated water from the plants into the distribution system and to the various elevated storage tanks throughout its service area. Currently, Water Treatment Plant No. 1 has three high service pumps – two rated at 4,650 gpm and one at 7,500 gpm. Water Treatment Plant No. 2 at Land-o-Lakes also has three high service pumps, each rated at 5,150 gpm. The SWRA Plant has a single 5,000-gpm high service pump (Figure 8). The pump ratings assume total dynamic heads ranging from of 150 ft to 175 ft.

Projected Pumping Capacity Requirements

T.C.E.Q. requires that the BPUB provide pumping capacity equal to 2 gpm per connection, or the ability to meet peak hourly flow demands for each treatment plant. Based on current and projected number of connections the BPUB cannot meet the 2 gpm per connection requirement, however, the BPUB does meet the second criteria.

According to the 2010 Water and Wastewater Master Plan, system modeling results indicate that the existing high-service pump station at Water Treatment Plant No. 1 is capable of handling peak hour flows equivalent to 25.7 MGD, which is the projected peak hour rate for the year 2025, if the treatment capacity remains at 20 MGD. However, if Water Plant No. 1 is re-rated to 27 MGD capacity, the peak hour flow would increase to an equivalent rate of 30.7 MGD, and an additional pump (4,650 GPM @ 170 ft. TDH) will need to be added to the pump configuration to deliver the required flow.

The system modeling also indicates that the existing high-service pump configuration at Southmost Regional Water Authority (SWRA) treatment plant is capable of handling peak hour flows equivalent to 9.1 MGD, which is projected peak hour flow rate for the year 2025, if the BPUB treatment capacity remains at 7 MGD. However, if the SWRA treatment plant is expanded from 7 to 14 MGD capacity (BPUB share), the peak hour flow would increase to an equivalent rate of 15.1 MGD, and an additional pump (5,000 GPM @ 175 ft. TDH) will need to be added to the pump configuration to deliver the required flow.

System modeling shows that the existing high-service pump configuration at Water Treatment Plant No. 2 is capable of handling peak hour flows equivalent to a 24.7 MGD, which would be

Water Treatment Plant No. 1 - Riverside	4,650 gpm
	4,650 gpm
	7,500 gpm
Water Treatment Plant No. 2 - Land-o-Lakes	5,150 gpm
	5,150 gpm
	5,150 gpm
Southmost Regional Water Authority	5,000 gpm
Combined High Service Pumping Capacity	37,250 gpm

Figure 8. Current High-Service Pumping Capacities.

the highest projected peak hour flow rate under any scenario in the year 2025. No additional pumping capacity will be required until beyond the year 2025.

WATER DISTRIBUTION SYSTEM

The BPUB's existing water distribution system is adequate to handle current needs. However, numerous 'growth driven' capital improvement projects will be necessary to provide additional capacity to meet demands of future populations. The estimated cost of these capacity related improvements, through the year 2025, is $43 million.

As of 2008, the BPUB water distribution system consisted of about 624 miles of water pipe ranging from 2- to 42-inch diameter. BPUB supplies municipal water to most of Brownsville, to El Jardin Water Supply Corporation and to Brownsville Navigation District.

As part of BPUB's 2010 Water and Wastewater Master Plan, a model of BPUB's water distribution system was developed, including the three treatment plants, the five elevated storage tanks and main distribution lines. Projected water demands were developed and distributed to the water pipe model. The result of the modeling effort was a series of recommended "growth driven" capital improvements, which will be necessary to provide additional capacity to meet the demands of future populations. An itemized breakdown of the various water distribution system improvements recommended through the year 2025 is provided in the 2010 Water and Wastewater Master Plan. The total estimated cost of these capacity-related capital improvements is about $43 million.

In addition, over the next 10 years, BPUB plans to modify, adjust or remove/replace various portions of the existing water distribution system throughout the city. These projects include new water connections, and the continuing city-wide replacement of old AC waterlines with new PVC water lines. An itemized breakdown of the projects being planned through the year 2018 is provided in the BPUB Ten Year Capital Improvements Plan. The total estimated cost of these water distribution system projects (non capacity related) in BPUB Ten-Year Capital Improvement Plan is approximately $31 million, through the year 2018.

WASTEWATER (SEWER)

The Texas Commission on Environmental Quality (TCEQ) is the state agency that is responsible for regulation and oversight of municipal wastewater services in Texas. The TCEQ issues Certificates of Convenience and Necessity (CCN) that establish specific service areas for wastewater utilities. A CCN service area authorizes and obligates the wastewater utility to provide continuous and adequate wastewater service to customers who request service in that particular area.

Although there are eight (8) wastewater utilities that have been issued CCN service areas in Brownsville and surrounding areas, the bulk of the wastewater services in the city of Brownsville are provided by Brownsville Public Utilities Board (BPUB), the city-owned, non-profit utility.

Besides BPUB, the other wastewater utilities servicing customers in the Brownsville area are listed below. Each entity has a responsibility to provide adequate facilities to collect and treat municipal wastewater from customers within its service area, in accordance with TCEQ guidelines.

- Brownsville Navigation District
- Olmito Water Supply Corporation
- Military Highway Water Supply Corporation
- Valley Municipal Utility District No. 2 (Rancho Viejo)
- Laguna Madre Water District
- City of Los Fresnos

The BPUB provides wastewater services to populations within its CCN service area. All populations in outlying areas, i.e. not within BPUB's designated wastewater service area, must rely on one of the other wastewater utilities for provision of wastewater services.

All populations residing outside the BPUB's service areas, and not served by other entities, are served by on-site sewer facilities (septic tank systems) until the BPUB or another entity extends wastewater collection system to serve them.

Other than the BPUB, the City of Brownsville plays no part in management of these other wastewater utilities and, therefore, has only limited control over wastewater system infrastructure in these areas. To maximize its ability to deter or enhance development based on its Land Use Plan, the City of Brownsville and BPUB should work together to highlight key areas not currently within BPUB's wastewater CNN service area, and look into ways to expand its service into such areas.

Figure 9 provides a map of Brownsville and its ETJ showing the CCN service areas of the various wastewater utilities in the area.

WASTEWATER TREATMENT

BPUB has sufficient overall wastewater treatment capacity to satisfy current demands. However, wastewater flow distribution to the two treatment plants is grossly unbalanced. Force mains must be rerouted to transfer excess flow away from Robindale WWTP to Southside WWTP, which has excess capacity available. In addition, Robindale WWTP will need to be expanded to 14.5 MGD capacity. With these improvements, BPUB treatment capacity will be adequate to handle wastewater demand beyond the year 2025.

Current Wastewater Treatment Capacity

The BPUB currently operates two wastewater treatment facilities. The Southside Wastewater Treatment Plant, located on East Avenue, has a treatment capacity of 12.8 million gallons per day (MGD). The other plant, the Robindale Wastewater Treatment Plant, located on Robindale Rd. in north Brownsville, has a treatment capacity of 10 MGD. However, the plant's permit renewal in 2010 is expected to result in a 20% capacity de-rating. Therefore, it is assumed that in 2010, the rated capacity of the Robindale Wastewater Plant will be 8 MGD.

Currently, BPUB's total combined wastewater

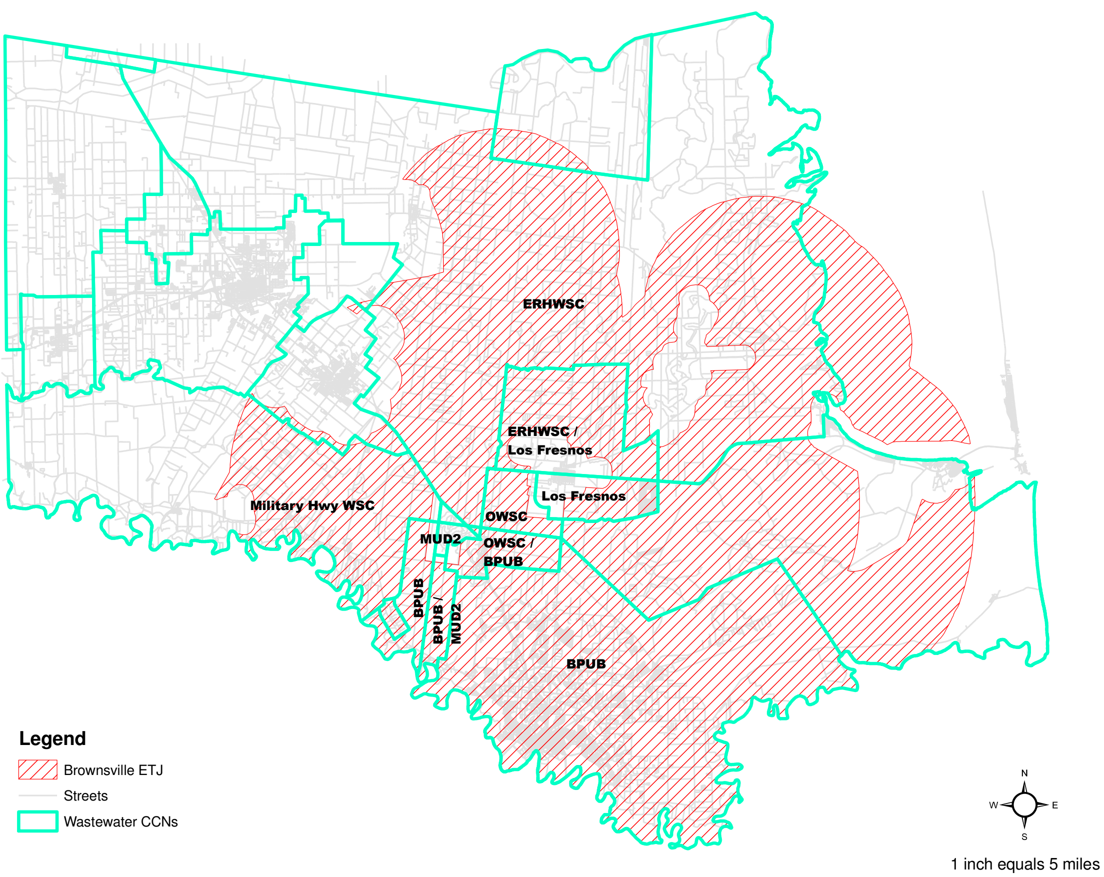

Figure 9. BPUB Wastewater CCN Areas

treatment capacity is 22.8 MGD. After the expected de-rating of the Robindale Wastewater Treatment Plant in 2010, BPUB's total combined wastewater treatment capacity will be 20.8 MGD.

Current Wastewater Flow Distribution

The BPUB wastewater system is divided into two primary sewer sheds that provide the framework upon which the system is designed and planned. These sewer sheds are basically the separate areas contributing flows to the BPUB Southside WWTP (the South System) and BPUB Robindale WWTP (the North System), respectively.

According to the BPUB 2010 Water and Wastewater Master Plan, the 2007 "average dry day" flow generated by the entire BPUB wastewater service area was roughly 13 MGD. However, this overall flow is not well balanced between the two plants. For example, in 2007 the Southside WWTP had an average dry day flow of 5.4 million gallons per day, or slightly less than 45% of its 12.8 MGD rated capacity. By contrast, the Robindale WWTP had an average 'dry day' flow of 7.6 million gallons per day, or roughly 76% of its 10 MGD rated capacity.

Flows into the BPUB Robindale WWTP already exceed the maximum 75% percent of treatment capacity allowed by TCEQ. That, and the impending de-rating of Robindale WWTP from 10 MGD to 8 MGD, have made it critical that wastewater flows to the Robindale plant be immediately reduced.

The BPUB has already begun to address this Robindale WWTP capacity issue by re-routing some of the wastewater flows from the North System (specifically, from Lift Station 41 and its upstream lift stations) away from the Robindale WWTP and to the Southside WWTP. Once this is accomplished, the current flow being handled by Robindale WWTP will be decreased by approximately 1 MGD. This transfer should be in place by the year 2010.

To more fully utilize the Southside WWTP, and to help keep future flows to the expanded Robindale WWTP within TCEQ limits, additional re-routing of wastewater flows away from Robindale and to Southside WWTP is planned for the year 2025. This will reduce flows into Robindale by another 2 MGD.

Projected Wastewater Treatment Capacity Requirements

Robindale WWTP

According to BPUB's 2010 Water and Wastewater Master Plan, after the initial 1.0 MGD transfer of flow from the Robindale system to the Southside Plant, the projected average dry day flow wastewater flow to the Robindale WWTP will be 7.4 MGD in 2010, and 8.7 MGD in 2015. Assuming the future transfer of another 2 MGD from the Robindale system to the Southside WWTP, the projected average dry day flow to the Robindale Plant for the year 2025 will be 9.4 MGD. This exceeds the 8 MGD (after 2010 re-rating) treatment capacity current.

Strategies

Given its location in north Brownsville, it is expected that Robindale WWTP will receive 90% of future flows from new development. To meet the increased demand, the BPUB has already begun plans to expand the Robindale Treatment Plant from its expected 8 MGD (after 2010 de-rating) to 14.5 MGD treatment capacity for the year 2015. The proposed 14.5 MGD treatment capacity will be sufficient to handle projected wastewater flows beyond the year 2025. The projected 9.4 MGD flow for 2025 would represent about 65% of the proposed future capacity, well within TCEQ limits. The estimated cost of the Robindale WWTP expansion is $22.8 million, to be completed by the year 2012.

In addition, the BPUB plans other improvements to the Robindale WWTP, such as rehabilitation of the existing portion of the plant, provision of back-up power, and a sludge loading dock. These improvements, also planned for 2012, will cost an estimated $5.8 million.

Southside WWTP

According to BPUB's 2010 Water and Wastewater Master Plan, after the initial 1.0

MGD transfer of flow from the North system to the Southside WWTP, the projected average dry day wastewater flow to the Southside WWTP in 2010 will be 6.5 MGD, and 6.6 MGD in 2015. Assuming the future transfer of another 2 MGD from the Robindale system to the Southside WWTP, the projected average dry day flow to the Southside Robindale Plant for the year 2025 will be 8.9 MGD.

The current 12.8 MGD wastewater treatment capacity is sufficient to handle projected flows beyond the year 2025. The projected 8.9 MGD flow for 2025 represents about 70% of the current capacity, well within TCEQ limits.

Strategies

Although no capacity-related expansion is needed at the Southside WWTP, the BPUB plans to install several relatively minor improvements for the year 2010. These include restoration of one of the gravity thickeners and odor control measures. The estimated cost for these improvements is approximately $430,000.

COLLECTION SYSTEM

The BPUB owns and operates an extensive wastewater collection system, which serves customers throughout its CCN service area. The BPUB system also collects wastewater from customers of El Jardin WSC, which does not operate its own wastewater facilities. The BPUB system uses a combination of gravity flow, pumping stations (or lift stations), and pressure pipe flow (force mains) to route all collected wastewater to one of BPUB's two wastewater treatment plants.

According to BPUB's 2010 Water and Wastewater Master Plan, the wastewater collection system consists of 496 linear miles of gravity sanitary sewer main, and 88 linear miles of sanitary sewer force mains (pressure pipes) ranging from 4 inches to 30 inches in diameter. Updated information, provided by BPUB staff in May 2008, indicated 501 linear miles of gravity mains and 90 linear miles of force mains.

At the upstream end, the BPUB'S wastewater system collects wastewater through localized gravity pipeline systems, which receive flow directly via customer sewer hook-ups. These systems require minimum pipe slopes to drive the gravity flow, therefore, the further they extend, the deeper the pipelines become. At some point, the presence of excessive groundwater, and mounting costs of excavation and backfill make it unpractical to extend the gravity system any further.

Consequently, each localized gravity collection system eventually discharges into a lift station, which consists of a large wet well (holding tank) with submersible pumps. Wastewater is pumped from the lift station and routed through the force main(s), and often through other downstream lift stations, to one of the two wastewater treatment plants. Therefore, in almost all cases localized gravity systems are located upstream of the lift station serving a particular area.

VC Sewer Line Replacement

Except for older parts of town, where vitrified clay sewer pipes and concrete/brick manholes are still being used, the gravity wastewater collection lines (gravity sewers) are comprised of PVC pipe with fiberglass manholes. PVC and fiberglass have proven to be highly resistant over the long term to wastewater service environment.

Strategies

In its Ten Year Capital Improvements Plan, the BPUB plans to continue systematically replacing the old vitrified clay gravity line infrastructure with new PVC pipe. Over the next ten years, the BPUB has budgeted $7.5 million for this project. (CIP 44).

The 2010 Water and Wastewater Master Plan was developed using an updated model of the BPUB wastewater system, which includes all lift stations, force mains, and selected sections of the gravity collection system. The updated model also includes new force main improvements, already under construction, designed to transfer flows of up to 1 MGD from the North System to the South System.

The projected future wastewater flows were developed based on 2007 average dry day flow, which took into account daily flow records from both treatment plants. Flows on wet days, or rain days, were not counted in the average dry day flow.

The 2007 average dry day wastewater flow was determined to be 13.0 million gallons per day (MGD), for both treatment plants combined. This flow was then divided by the estimated 2007 BPUB service population (186,293), to determine a per capita dry day flow rate of 69.7 gallons per person per day. The per capita dry day flow rate was used to project future wastewater flows based on projected future populations.

The table below shows projected future wastewater flows for both treatment plants combined (Figure 10).

The 2010 Water and Wastewater Master Plan also determined the average persons per connection. This was accomplished by taking the BPUB 2007 service population (186,293) and dividing it by the total number of BPUB water meters (44,966). Based on the resulting computation, the average persons per connection was determined be 4.14.

As discussed previously, the BPUB wastewater system is divided into two main sewer sheds – the North System, which routes wastewater flows to the Robindale Wastewater Treatment Plant; and the South System, which routes flows to the Southside WWTP.

These systems are comprised of gravity collection lines, lift stations and force mains that route the flows to their respective treatment plant. To determine the average daily dry day wastewater flow at each lift station, the BPUB's GIS system was used to overlay known meter locations upon the modeled gravity system, for each lift station service area.

The number of water meters assigned to each lift station was multiplied by the average persons per meter (4.14) to determine service population for each lift station. The average daily dry day flow for each lift station was determined by multiplying the estimated service population of each lift station service area by the per capita dry day flow rate (69.7 gallons per person per day).

Peak wet weather factor for each lift station was determined using pumping records during the March 12, 2007 storm event, which was classified as a 50 to 100 year storm. The pumping times for this event were divided by typical dry day pump run times to calculate peaking factors for each lift station.

Other factors were used to determine flow inputs for the model including peak factor based on population, local drainage areas, maximum force main flow velocity of 6 feet per second and maximum 24 hour pump run time over 48 hour.

The results from the model runs were analyzed to determine proposed improvements. The proposed improvements were then added to the model to develop models of the future system through the year 2025. The results of the model runs were used to determine recommended wastewater collection system improvements through the year 2025.

LIFT STATIONS

BPUB wastewater lift stations are adequate to handle current needs. However, numerous 'growth-driven' capital improvements will be necessary to meet the demands of future populations.

Year	BPUB Projected Service Population	Average Dry-Day Wastewater Flow per Capita	Average Dry-Day Wastewater Flow (both treatment plants)
2007	186,293	69.7 gal/person/day	13.0 MGD
2010	199,107	69.7 gal/person/day	13.9 MGD
2015	219,036	69.7 gal/person/day	15.3 MGD
2025	261,702	69.7 gal/person/day	18.3 MGD

Figure 10. Projected Future Wastewater Flows

Through the year 2025, the estimated cost of these capacity-related lift station improvements is $29.7 million.

Lift stations are essential in this area of flat topography because of the limitations of gravity flows (e.g. distance, depth, groundwater) The BPUB currently operates more than 150 sanitary sewer lift stations. The North System, which conveys wastewater to the Robindale WWTP, currently has 100 lift stations. However, as discussed previously, there is a force main project already under construction, designed to transfer about 1 MGD of flow from the North System to the South System. This 1 MGD transfer involves flows from Lift Station 41, plus the other eleven (11) 'upstream' lift stations that discharge into Lift Station 41. After this 1 MGD transfer is completed, the North System will have 88 lift stations.

The updated model used in the 2010 Water and Wastewater Master Plan included the BPUB wastewater lift station system.

Strategies

Based on the modeling results, the BPUB has already begun upgrade of four lift stations to install larger pumps. In addition, there are another eighteen lift stations throughout the BPUB's system that need to be upgraded for the year 2010. The estimated cost of these lift station upgrades is about $7.9 million. By the year 2015, another eleven lift stations will require upgrade. The estimated cost to upgrade these lift stations will be about $5 million. Another twelve lift stations will need to be upgraded by 2025. The estimated cost of these improvements is about $11,000,000. In all, through the year 2025, BPUB plans to expand forty-one lift stations at a total estimated cost of $23.9 million. (CIP 51)

In addition, the BPUB plans to install a series of 'regional' lift stations and force mains to reroute wastewater flows from US 77 (near Sports Park) eastward paralleling FM 511 across the north side of the Brownsville, then south to Robindale WWTP. The estimated cost of these regional lift stations is $5.8 million. (CIP 65) The BPUB should work with developers to establish regional lift stations to minimize the number of future stations that are required.

Although not considered a capacity related project, the BPUB plans to expand Lift Station 20, near Gladys Porter Zoo, at an estimated cost of $1.4 million. This project is planned for the year 2010.

FORCE MAINS

BPUB wastewater force mains are adequate to handle current needs. However, numerous 'growth-driven' capital improvements will be necessary to meet the demands of future populations. Through the year 2025, the estimated cost of these capacity-related force main improvements is $20.7 million. Force main improvements are particularly critical in northwest Brownsville, where most of the future population growth is expected to occur

The BPUB wastewater system includes numerous pressure pipelines, or force mains, that carry flows pumped from multiple lift stations. With future population growth, flow rates through the BPUB lift station system and, consequently, through its force mains will also increase.

Most of the population growth in the BPUB wastewater CCN service area is expected to occur in the northwest part of the city. Based on projected wastewater flows in these areas, the existing wastewater collection system will be significantly burdened, and several lift stations and force mains in this part of town will exceed their capacity and will need to be upgraded.

The force main of greatest concern in northwest Brownsville is the 12" force main that runs from east from US 77 along Alton Gloor to Stagecoach Trail, then south along Stagecoach Trail to Morrison Road, then east along Morrison Road (where the force main increases to 15-inch diameter) to Paredes Line Road, and south to Lift Station 65 on Ruben Torres Blvd (FM 802). According to the BPUB's 2010 Water and Wastewater Master Plan, this particular force main carries flow from 31 lift stations (all part of the North System), and serves approximately 36,500 persons (about 20% of BPUB's total estimated water service population).

Currently, the estimated flow velocities assuming peak wet weather flow, exceed 5 feet per second. Projected flows for the year 2015 will result in flow velocities greater than 6 feet per second, requiring upgrade and/or re-routing of the force main system.

Strategies

To address this situation, the BPUB initial plan is to replace the 15-inch force main segment along Morrison Rd., from Stagecoach Trail to Paredes Line Road, with a new 24-inch force main. This project is planned for the year 2010 is estimated to cost $1 million. (CIP 87)

However, according to the BPUB's 2010 Water and Wastewater Master Plan, this alone will not be enough to sufficiently reduce overall flow velocities. In addition, one strategy being strongly considered is to reduce flow through this segment by re-routing flow from Lift Station 90 (and it upstream lift stations) northward to Lift Station 159 (at Brownsville Sports Park), then through a future 'regional' force main that would run eastward, south of FM 511, across the north side of the Brownsville, then south to Robindale WWTP. The force main improvements are planned for the years 2014 to 2018, at a cost of $11.1 million. (CIP 65)

In addition, the 2010 BPUB Water and Wastewater Master Plan indicates that projected flows into Lift Station 65 will exceed capacity. To remedy this, BPUB is considering installing a new force main from the Lift Station 111, at Paredes Line Rd. / Morrison Rd. intersection, directly to the Robindale Plant (alongside Cameron County Drainage District No. 1 Ditch No. 1), thereby bypassing Lift Station 65 altogether. This will reduce overall incoming flow into Lift Station 65 to within its capacity. This project is planned for the year 2013, at an estimated cost of $3.3 million. (CIP 72).

Also, the BPUB plans to reroute flow from several lift stations to Lift Station 27, and install new force main to Lift Station 20. This project is planned for the year 2025, at an estimated cost of $5.3 million.

The BPUB is also considering the use of a large diameter PVC gravity line along Ruben Torres Boulevard (FM 802) to collect flows from various lift stations. Where depths permit, wastewater from areas west of Robindale Road would be collected by a proposed 24" gravity line that would run eastward along FM 802 for discharge at Lift Station 63. Wastewater would then pumped and routed, via force main, from Lift Station 63 directly to Robindale WWTP. The BPUB 2010 Water and Wastewater Master Plan identifies which existing lift stations could potentially be taken off-line if such a 24-inch gravity main is installed. Wastewater generated in areas east of Robindale Road would be collected by a proposed gravity line, ranging in size from 15-inch to 30-inch diameter, which would run westward along FM 802 for discharge at Lift Station 136. Lift Station 136 would need to be upgraded. Wastewater would then be pumped from Lift Station 136 and routed, via force main, directly to Robindale WWTP. According to the BPUB's 2010 Water and Wastewater Master Plan, thirteen existing lift stations could be taken off-line if such a line is installed. In addition, Lift Station 3 could be taken off line, if the gravity line is further extended. The estimated cost of this gravity main is $9.1 million, and is planned for the years 2016 to 2018. The 2010 Water and Wastewater Master Plan Comparing compares estimated cost of the FM 802 gravity line improvements versus the present value of maintaining the existing FM 802 lift stations (Table 8-4, BPUB 2010 Water and Wastewater Master Plan). The cost analysis suggests that this plan will improve long-term cost efficiency.

Localized Improvements

Future demands imposed by new localized development will be met either by installation of new gravity collection systems, or extension of existing gravity systems. In some cases, such improvements may also require installation of new lift stations or force mains, or upgrade of existing facilities to serve these new areas of development. Typically, construction costs for these localized improvements are incurred by private Developers, not BPUB. In some cases, Developers are required to oversize certain new facilities (beyond the specific needs of the new development) to accommodate future growth in other nearby areas. The costs incurred by Developers for such over-sizing are subject to reimbursement over a period of time, as other nearby areas become developed in the future.

Wastewater Use Rate Reduction

Advanced water conservation measures can result conservatively in a reduction of 15 gallons per person per day in municipal water consumption by the year 2025 which translates directly to an equivalent reduction in wastewater production.

Sludge Reuse - Composting

BPUB currently disposes its wastewater sludge at a dedicated land disposal facility located near the Port of Brownsville. BPUB recently implemented a sludge dewatering process to reduce the transported volume and associated disposal costs. The BPUB should evaluate the option of reusing part of its wastewater sludge production in order to extend the life of the site, reduce long term environmental liabilities, and use resources more efficiently.

Composting is an aerobic bacterial decomposition process to stabilize organic wastes and produce humus (compost). Compost contains nutrients and organic carbon which are excellent soil conditioners. Composting takes place naturally on a forest floor where organic materials are converted to more stable organic materials (humus) and the nutrients are released and made available for plant uptake. The optimum conditions for composting are a moisture content of about 50 %, a carbon to nitrogen ratio of about 25 to 30, and temperature of 55 C. Because wastewater sludge is rich in nutrients, its carbon to nitrogen ratio is low (5 to 10). It is also high in moisture. Addition of dry sawdust, which is very high in carbon to nitrogen ratio (500) can adjust both the moisture and carbon-to-nitrogen ratio. Other waste materials that can be used for this purpose are mulched garden wastes, forest wastes and shredded newspaper. Composting can be carried out in a specially built composter, such as an inclined rotating cylinder, fed on one end with the raw materials, and the aerated product collected at the other end. As the materials are slowly tumbled over a period of about one week, they are mixed and aerated. Because bacterial decomposition produces heat, temperatures in the insulated composter can easily reach 55 C. The immature compost is then windrowed for at least 12 weeks to allow the composting process to complete, with occasional turning of the window. Composting can be more simply carried out in windrows. Regular turning of the windrows assists with mixing of the materials and more importantly supply the oxygen to the bacteria. Temperatures can reach 55 C, because compost has a good

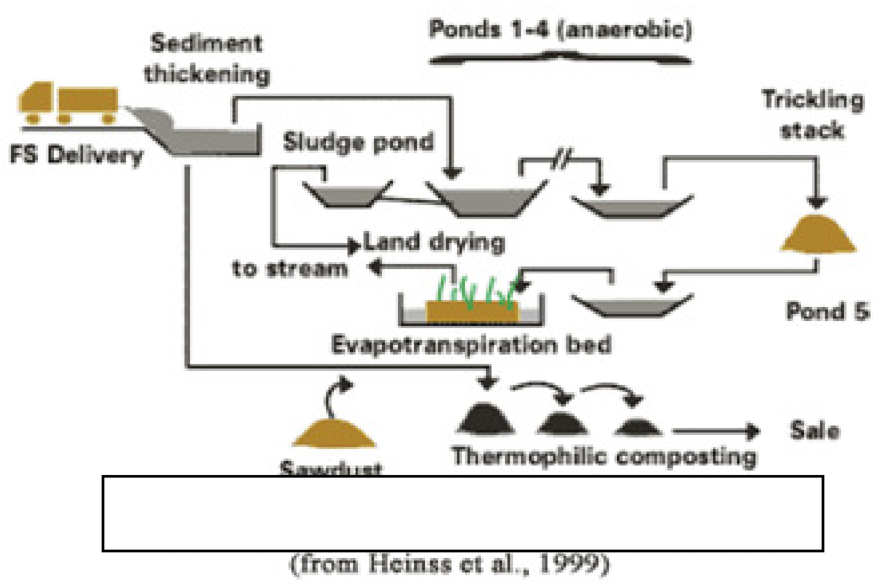

Figure 11. Projected Future Wastewater Flows

heat insulating property. Turning of the compost also ensures that all parts of the windrow reach the required 55 C essential for pathogen destruction. Turning is required every two to three days in the first two weeks when temperature is 55 C or above. After this period frequent turning of the compost windrow is not required as less heat is generated and less oxygen is required while the compost undergoes maturation.

Facilities in Texas have transformed more than 2 million pounds of wastewater sludge and about 20,000 cubic yards of wood chips, into a product with great benefits for its users. The sales price is $10 per cubic yard.

Regionalization and Outlying Areas

Populations outside of the PUB designated service areas but within Brownsville's City limits and/or ETJ must rely on other utility suppliers for provision of water and wastewater services. This overlapping of jurisdictions creates both opportunities and challenges.

One major challenge is the lack of uniform infrastructure development policies among the different water supply corporations. Although the City has some control over development in outlying areas, inconsistent infrastructure development policies among different utilities can have a negative effect on the City's land use objectives.

However, the creation of regional facilities owned and operated jointly among the different utility providers can be a positive opportunity. Not only can regional facilities provide operational efficiencies that can lead to lower rates, but they can also provide a mechanism for standardizing development policies that are consistent with the City's land use plan objectives.

In the absence of opportunities for regionalization, the BPUB should evaluate opportunities for the acquisition of additional service areas for its utility systems where technically and economically feasible.

ELECTRICAL SERVICE

The Public Utility Commission (PUC) of Texas is the state agency that is responsible for regulation and oversight of electric services in Texas. The PUC certifies electric utilities to serve certain specific areas in Texas. A PUC-established service area authorizes the electric utility to provide continuous and adequate electric service to customers who request service in that particular area.
Although there are three (3) electric utilities that have service areas in Brownsville and surrounding areas, the bulk of the electrical service inside the city is supplied by Brownsville Public Utilities Board (BPUB), the city-owned, non-profit utility. The other major electric service providers are:

- AEP/CPL
- Magic Valley Electric Cooperative

According to the BPUB's 2007-2008 Annual Budget Report, the existing electric service area covers about 133 square miles, which includes most of the city, and some areas outside city limits. Those areas not served by BPUB, are served by either Magic Valley Electric Cooperative or AEP / CPL.

Current Electric Power Supply

The City of Brownsville, through the BPUB, has substantial electrical generating capacity to handle today's needs. Assuming an annual peak electrical load growth rate of 2.4%, the BPUB's existing electrical capacity is adequate to serve current and future populations until the year 2019. Beyond 2019, BPUB will need to plan for and implement the most economically effective combination of generated and purchased power supply.

The BPUB currently satisfies its power supply demands through the operation of three electric generating power plants. The Silas Ray Power Production Facilities, a gas- and oil-fired plant, is owned and operated by the Brownsville BPUB. This power plant, located in west Brownsville's Riverside neighborhood, is comprised of a conventional steam turbine unit, and a re-powered steam turbine in combined cycle with a combustion turbine and GE LM6000 gas turbine generator. The estimated power generation capability of the

Silas Ray power plant is 124 megawatts (124 MW). The Oklaunion Unit No. 1, a coal-fired steam electric generating facility, is jointly owned by BPUB and three other electric utilities - AEP Texas Central Company, Oklahoma Municipal Power Authority and Public Service Company of Oklahoma. Based on its share of ownership in Oklaunion Unit No. 1, the BPUB is entitled to 122 megawatts of electrical capacity (122 MW). The Calpine/Hidalgo Power Plant is a combined cycle power production facility, jointly owned by the BPUB and other electric utilities. The BPUB's ownership interest in the Calpine/Hidalgo plant entitles it to 105 megawatts of capacity (105 MW). The combined electrical capacity of the BPUB's three resources is 351 megawatts (351 MW).

Electric Power Demand – Peak Load

According to the BPUB's 2007-08 Annual Budget Report, its electric system currently serves approximately 43,000 customers (number of meters), with a peak load of 270 megawatts.
Distribution Capacity

The BPUB currently distributed power through more than 1,200 miles of lines, and owns and operates 10 electric substations throughout its service area, plus the substations at the Silas Ray Power Plant. These are as follows:

- Filter Plant
- Price Road
- FM 802
- Midtown
- Military Highway
- Airport
- Loma Alta
- Sixth Street
- Fort Brown
- Water Port
- Power Plant Substations

To meet the growing demand for electricity in this area, the BPUB completed a system wide Conversion Project, which increased the capacity of all the electric substations from 69 kilovolts (kV) to 138 kV.

STRATEGIES

According to its 2007-08 Annual Budget Report, the BPUB has an Electric Capital Improvement Plan, which identifies $59.3 million in generation, transmission and distribution projects. Of these, 3.1% projected to be bond financed. Based on information provided by the BPUB Electric Department, over the next 10 years, the BPUB has budgeted over $65,000,000 for capital improvements to the electrical system. The initiatives below are not included in the budget, but are critical to supporting economic development in the area.

1. *345,000-Volt Electric Transmission Lines for Port Brownsville*

City of Brownsville should consider supporting major electrical projects that BPUB will need to undertake in the future to eventually open up Brownsville to major electrical load additions. One of the principal areas of focus should be Port Brownsville, namely the installation of 345,000-volt lines from San Benito to Loma Alta (Port Brownsville), and another from Loma Alta to Rio Hondo. The cost of the San Benito-to-Loma Alta transmission line is roughly estimated at $40 million. The cost of the Loma Alta-to-Rio Hondo transmission line would be about $50 million. In addition, another $15 million would be needed for sub-stations and other system improvements, relating to the above Port. The total cost estimate for this project would be approximately $105 million

2. New Electric Sub-Stations for Northwest Brownsville

Another area of focus should be the northwest side of Brownsville, where BPUB will eventually need new electrical substations on US 281 and FM 1732. The cost of these sub-stations is roughly estimated to be $4,000,000.

3. Increase Electrical Capacity to Support Industrial Development

There was a strong consensus among those members of the Imagine Brownsville task force, public workshop attendees, Port of Brownsville officials, and business leaders in Brownsville's heavy and light manufacturing sectors that lack of adequate electrical capacity is one of the principal limitations to being able to take advantage of economic development opportunities at the Port Brownsville. The Port is a principal competitive advantage for Brownsville and having sufficient electrical industrial capacity is a critical element in overcoming the serious economic challenges facing the City. BPUB currently has a peak load capacity of about 25 MW at the Port. Leaders in the manufacturing industries indicated that the Port needs to have at minimum an additional 75 MW capacity. Based on an approximate unit cost of $2,000 to $3,000 per KW of generating capacity, a 75 MW power plant would cost in the neighborhood of $200 million.

4. Electric Conservation

The U.S. Department of Energy's (DOE) Building America program is a private/public partnership that develops energy saving solutions for new and existing homes. Building America research teams work with industry leaders to demonstrate that 30-50% energy savings can be achieved in new home construction. Building America has partnered with Brownsville Affordable Homeownership Corporation (BAHC) in conjunction with the City of Brownsville to build 14 affordable houses that meet the U.S. DOE's Builders Challenge. The Building America Industrialized Housing Partnership (BAIHP), one of the BA research teams, provided simulation analysis, recommendations, and worked with BAHC to identify a way to meet their Builders Challenge goal within the context of their established construction practices. BAIHP contracted a local certified home energy rater to carry out the necessary training, inspections and testing to assist BAHC and their builder, in implementing the package of recommendations. As of May '08) two houses have been rated, scoring HERS indexes of 70 and 69 (30% energy savings), thus meeting the HERS Index requirement of the DOE Builders Challenge. The homes are single family detached dwellings, modest in size (up to 1144 square feet), single story, slab on grade, wood frame construction, with fluorescent lighting, tile floors, energy efficient air Conditioners and refrigerators, electric resistance heating, R-30 or R-44 attic insulation, R-13 wall insulation, leak free windows and duct work, sealed and tested to ensure a tight building envelope, and radiant barrier decking.

The City of Brownsville can help BPUB control its future load growth by enacting local codes and offering financial incentives to promote this program. It is estimated that if 20% of new homes constructed between 2009 and 2025 are built to meet Building America standards, that a 1.7% savings in overall electric usage can be realized community wide.

5. Renewable Energy

The current administration is heading towards aggressive reform of the nation's energy policy that will encourage cleaner and renewable sources of energy including biofuels, wind and solar. Bills currently under consideration in Congress specify goals and timetables for the percent of renewable energy use in the future. The various bills have goals that vary from 15% to 20% renewable energy use by power producers by the next decade to more modest goals of 3 to 6% for most utilities over the next 3 years. Given that, excluding hydroelectric power, the current total US renewable power use is about 3%, the proposed goals will require a significant restructuring of the current power generating infrastructure.

The Port of Brownsville and surrounding areas provide potential sites for the development of wind and solar power installations. Moreover, a research group, working in collaboration with UTB/TSC, has recently received funding to conduct research on the development of biofuel manufacturing technologies in Brownsville. Additionally, a major strategic focus of the economic development plan includes the development of heavy and light manufacturing clusters focused on the manufacture of renewable energy products.

Although BPUB currently does not generate any of its power using renewable energy sources, BPUB should develop a plan to determine the optimal mix of energy sources to transition from its current gas/oil and coal power generating base, and to establish target goals/timelines for the percentage of renewable energy production. Part of the plan should also include an evaluation of a lobbying effort to determine if BPUB's current coal generating capacity can be protected under the current cap-and-trade climate legislation moving through congress.

6. Utility Costs

The efficiency and affordability of utility costs are an important component of the community's vision. A comparative analysis was conducted of the water, wastewater and electrical utility rates to determine the relative efficiency of BPUB's rates. A typical baseline monthly consumption of 10,000 gallons of water/wastewater and 1,000 kWh was used for the comparative analysis. Five cities in Texas were used: Harlingen, McAllen, San Antonio, Austin and Dallas. The rates are presented in Figure 12.

Although BPUB's water rates are among the highest of the comparison cities, the total cost of utilities including electricity is the second lowest and is bested only by San Antonio. Brownsville's total utility cost is almost 15% lower than the average of the five cities. A large contributing factor is the cost of electricity. Electricity accounts for the majority of a typical utility bill and BPUB's electrical rates are second only to San Antonio.

Strategic Initiatives

- *Construct essential water and wastewater infrastructure projects identified in BPUB's master plan, particularly the Robindale WWTP Rehabilitation and Expansion, and the associated wastewater transfers to the Southside WWTP, and the construction of the SWRA Pre-treatment and capacity expansion.*
- *Determine the most economically efficient mix of energy sources to increase the existing electrical system capacity that is critical to the development of the Multimodal Logistics/Heavy Manufacturing HUB at the airport/port node.*
- *Use the most current operational and cost data to determine/update the optimal mix and timing of supply and demand management alternatives (i.e., supply side and demand side conservation, reuse, fresh surface water, brackish water, groundwater and/or sweater) to meet future water demands that best balances the life cycle costs and the risk of water supply shortfalls.*
- *Develop and implement a water and electricity conservation pilot program to determine the optimal mix of education, regulatory and financial incentives to maximize the avoided life-cycle costs of additional water/electricity production while managing potential revenue reductions.*
- *Continue to evaluate opportunities with other local water supply providers to partner in the planning, design, construction and operation of regional facilities. In the absence of opportunities for regionalization, the BPUB should evaluate opportunities for the acquisition of additional service areas for its utility systems where technically and economically feasible.*

	Water 10,000 gallons	Wastewater	Electricity 1,000 kWh	Total
San Antonio	$ 16.85	$ 25.25	$ 90.18	$ 132.28
McAllen	$ 17.00	$ 22.00	$ 123.80	$ 162.80
Dallas	$ 26.70	$ 45.39	$ 113.67	$ 185.76
Harlingen	$ 24.43	$ 38.78	$ 124.76	$ 187.97
Austin	$ 31.09	$ 74.10	$ 99.38	$ 204.57
AVERAGE	**$ 21.24**	**$ 32.86**	**$ 113.10**	**$ 167.20**
Brownsville	$ 29.55	$ 25.31	$ 91.40	$ 146.26
% Difference	28%	-30%	-24%	-14%

Figure 12. Comparison of Utility rates among 6 Texas cities