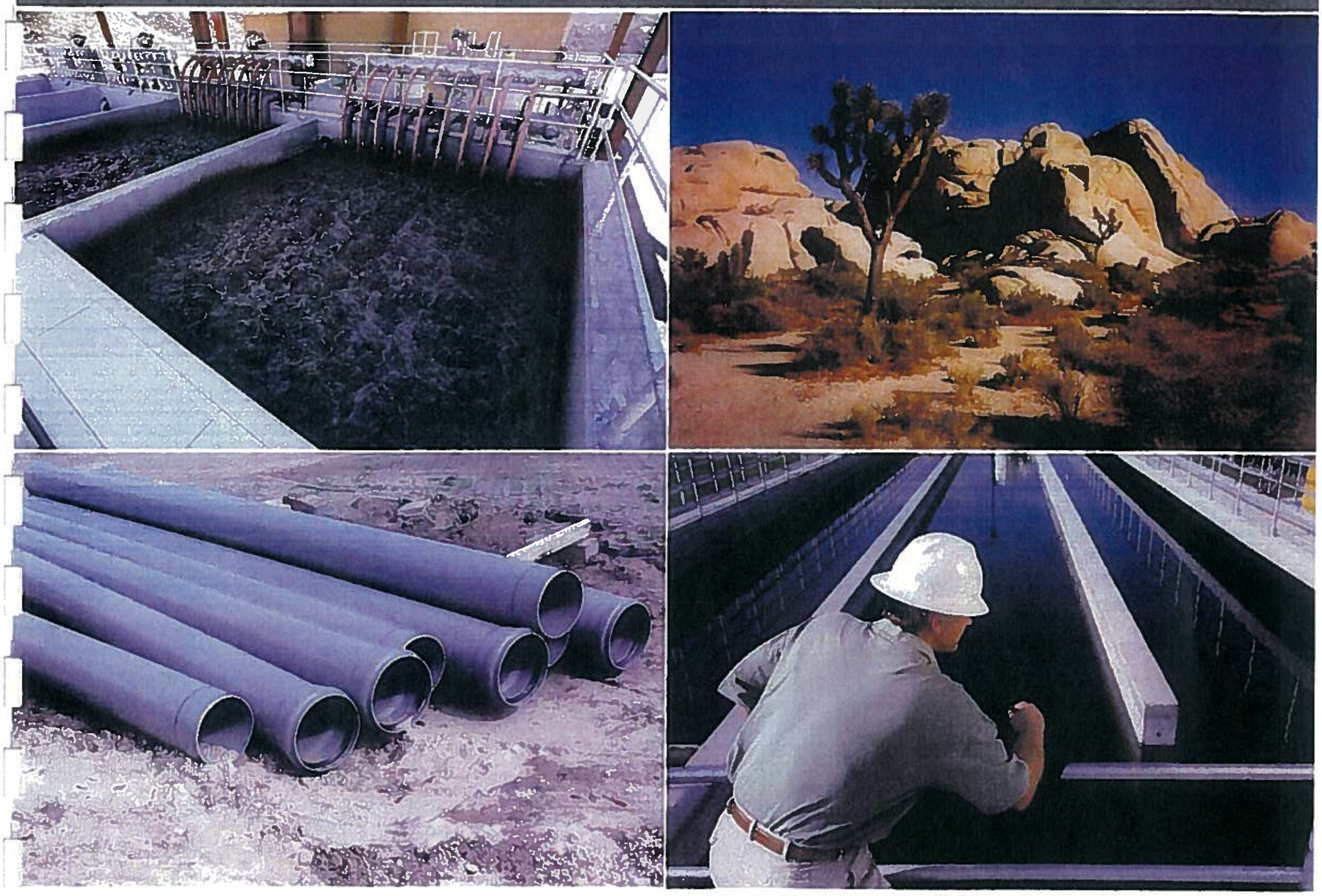
JOSHUA BASIN WATER DISTRICT

WASTEWATER TREATMENT STRATEGY



June 2009

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Executive Summary

The Joshua Basin Water District (District) encompasses an area of approximately 96 square miles, and serves the unincorporated area of Joshua Tree, California. The District relies on local groundwater for its drinking water supply, encompassing two subbasins of the greater Morongo Groundwater Basin – the Joshua Tree and Copper Mountain Subbasins. It has been estimated that recharge from individual septic systems may currently represent as much as 80 percent of the annual recharge within the District's groundwater basins. These septic return flows result in increased nitrate and total dissolved solids degradation of the groundwater. The long-term cumulative impact of wastewater discharges continues to be a primary concern for the District. Prohibition of new individual septic systems will gradually be required, replaced by local package treatment facilities that provide better treatment – thus protecting the District's local groundwater resources.

The development and implementation of localized and/or regional wastewater collection, treatment and disposal facilities is not something that is enacted quickly. For this reason, the District commissioned the development of its Wastewater Treatment Strategy (WTS). The WTS identifies both the short- and long-term strategies for implementation of needed groundwater protection facilities.

The WTS study area encompasses approximately 35 square miles, draining from the west to the east along the 29 Palms Highway corridor. The existing development is predominantly residential, with smaller areas of commercial and institutional development. Vacant undeveloped land within the study area is assumed to potentially become tributary to a near- or long-term wastewater collection and treatment system. Occupied parcels are included in the WTS evaluation only where the general plan indicates a potential for denser development in the future. Existing developed parcels are assumed to be safely treating and discharging wastewater flows through use of septic tanks in accordance with existing environmental law. More importantly, the cost of implementing the WTS is assumed to be born by future development, and not existing customers.

In the development of the WTS, existing and future development was projected, as well as the wastewater flows from those developments. The average existing development density across the study area was determined to be approximately 0.30 EDU per acre. Existing customers are projected to continue to be served by individual on-site septic systems. Existing vacant land will not be allowed to use on-site septic systems as tract development over 15 units occurs. Ultimate wastewater flow from the study area, for new developments only, is projected to be approximately 3.8 million gallons per day.

The WTS evaluates various wastewater treatment options, ranging from conventional activated sludge treatment to more advanced Membrane Bio Reactor (MBR) equipment. The WTS also evaluates the treatment needs of various development sizes, and how these treatment facilities will be constructed over time as development occurs. Regulatory issues and requirements are also considered, which may increase treatment needs in the future. Treated effluent and biosolids disposal consideration are also addressed for projected District needs.

Development pressure will determine the wastewater treatment requirements on a case by case basis. In addition, the development conditions will impact the wastewater treatment decision process. For example, if development progresses in smaller, geographically diverse tracts, the District will be required to evaluate the size and number of package treatment facilities it is managing. Minimizing the number of individual treatment plants will be beneficial from a cost and maintenance standpoint for the District. However, if a large development is proposed that facilitates construction of the regional collection and treatment facilities, the District will benefit through elimination of multiple package treatment plant construction. It is projected that development will likely progress at a slower rate, with larger developments built in the distant future. However, there is no way to fully predict which development schedule will occur. For purposes of planning, the following treatment thresholds are defined and evaluated:

Single Home Developers – Up to 15 EDUs

Small Developments – 15 to 300 EDUs

Medium Developments – 300 to 1,500 EDUS

Large Developments – 1,500 to 2,500 EDUs

Regional Facilities – Greater than 2,500 EDUs

These thresholds represent the approximate levels at which wastewater treatment requirements will progress as the WTS is implemented. Implementation of the WTS will dictate the transition from one threshold to another.

Funding of the needed collection and treatment facilities is a primary consideration within the WTS. In summary, the District is projected to use three funding mechanisms, including connection fees, community facility district (CFD) fees and service fees. Initial collection and treatment facilities are intended to be paid for and constructed by the individual developers. The District will collect CFD fees for the replacement of the treatment facilities. These fees are anticipated to range between $200 and $700 per year. Annual operation and maintenance of the wastewater collection and treatment facilities will be paid through a monthly service charge – projected to range between $20 and $50 per month.

Ultimately, the WTS projects the need for construction of a regional wastewater treatment facility and interceptor sewer system to limit the proliferation of small package treatment plants throughout the District. A regional plant provides cost benefits and economies of scale that lower overall cost to the customers. The projected cost of these regional facilities is approximately $91,000,000. The WTS proposes use of connection fees to collect the funding for construction of these regional facilities. Current projections result in a connection fee for new development of approximately $5,200 per equivalent dwelling unit.

The WTS provides the District with a timely strategy for planning its wastewater collection and treatment future. More importantly, the WTS establishes a mechanism whereby the District can protect its long-term water supplies from potential degradation. The WTS implementation is further enhanced by eliminating the need for existing residents to participate in payment for the needed facilities, at least until such time as they may need to abandon their septic systems and connect to the regional wastewater system.

Section 1 Introduction

The Joshua Basin Water District (District) is located in the southern portion of San Bernardino County, approximately seven miles east of Yucca Valley, and 14 miles west of Twenty-nine Palms. The District encompasses an area of approximately 96 square miles, and serves the unincorporated area of Joshua Tree, California. Historically, the District has served the water supply needs of its constituency, with wastewater disposal accomplished through the exclusive use of on-site septic systems.

The District has traditionally relied on local groundwater for its drinking water supply, encompassing two subbasins of the greater Morongo Groundwater Basin – the Joshua Tree and Copper Mountain Subbasins. The District maintains approximately 4,500 water connections within its service area. With an average annual rainfall of approximately 4.5 inches, protection of its groundwater quality is a primary goal of the District.

It has been estimated that recharge from individual septic systems may currently represent as much as 80 percent of the annual recharge within the District's groundwater basins. These septic return flows result in increased nitrate and total dissolved solids degradation of the groundwater. As a result, local groundwater protection agencies have increased regional emphasis on local and regional wastewater treatment to curtail the long-term degradation of regional water supplies. The District has also increased its activity relative to local groundwater supply protection by activating its wastewater management powers and conduct of various local groundwater studies targeted at identifying the impact of local septic discharges.

The long-term cumulative impact of wastewater discharges continues to be a primary concern for the District. Despite the current downturn in local development pressure, population increases are projected for the District's service area. As a result of this projected growth, development and implementation of alternative wastewater treatment and disposal strategies is needed to adequately protect the District's local water supplies. Prohibition of new individual septic systems will gradually be required, replaced by local package treatment facilities that provide better treatment – thus protecting the District's local groundwater resources. Ultimately, regional wastewater treatment and disposal facilities may be required to assure regional water supply protection.

The development and implementation of localized and/or regional wastewater collection, treatment and disposal facilities is not something that is enacted quickly. The planning, design and construction of such facilities require significant investment of time and money. For this reason, the District commissioned the development of its Wastewater Treatment Strategy (WTS). The primary purpose of the WTS is to identify how the District will, over time, economically implement needed wastewater treatment facilities for protection of its groundwater resources.

Recent groundwater studies[1,2] have shown that a relatively small portion of the District's overall service area currently exhibits localized groundwater impacts from septic discharges. This area is located approximately either side of 29 Palms Highway, as shown on Figure 1. Because of this areas impact on

[1] Groundwater Availability Evaluation - Joshua Basin Water District, Dudek, May 2006

[2] Evaluation of Geohydrologic Framework, Recharge Estimates, and Ground-water Flow of the Joshua Tree Area, San Bernardino County, California; Tracy Nishkawa, et. al.; Scientific Investigations Report 2004-5267; U.S. Department or the Interior, U.S. Geological Survey; 2004

District groundwater supplies, it has been selected as the study area for WTS development. Over time, additional areas will be required to implement the WTS, as development and growth pressures dictate.

This report identifies both the short- and long-term strategies for implementation of needed groundwater protection facilities. This report identifies the strategic requirements of such a program, not the individual sizing and exact location of needed facilities. Over time, implementation of the WTS will result in identification of the exact sizing and location of the required facilities, particularly in the form of a wastewater system master plan. For now, the goal is the development of the overall strategy and the financial mechanisms needed to provide the framework of the overall District plan.

Section 2 Project Study Area

The project study area is shown on Figure 1. The study area encompasses approximately 35 square miles, and drains predominantly from the west to the east along the 29 Palms Highway corridor. Drainage north of the highway slopes generally southward, while the areas south of the highway slope northward. A small area along Rocking Chair Road is also included in the study area. For purposes of this study, the study area was divided into 15 Drainage areas (as shown on Figure 1), corresponding to the general topography of the land, the major road alignments, and the 29 Palms Highway alignment.

The existing development is predominantly residential, with smaller areas of commercial and institutional development. Developing over the last 40 years, the existing development uses on-site septic systems exclusively for treatment and disposal of wastewater flows. Based on previous studies and considering an increasing water conservation trend in California, wastewater production is estimated to be 220 gallons per day per equivalent dwelling unit (EDU). An EDU is the equivalent wastewater production of a single family home. Using this measure, wastewater production is evaluated and expressed in a common unit value.

For the purposes of this study, vacant undeveloped land within the study area is assumed to potentially become tributary to a near- or long-term wastewater collection and treatment system. Currently, occupied parcels are included in the WTS evaluation only where the general plan indicates a potential for denser development in the future.

The reason for this assumption is two fold. First, existing developed parcels are assumed to be safely treating and discharging wastewater flows through use of septic tanks in accordance with existing environmental law. As such, it would be unnecessary to require changes to existing conditions. Secondly, and more importantly, the cost of implementing the WTS is assumed to be born by future development, and not existing customers. As such, future impacts to local groundwater resources will be curtailed.

It is noted that septic treatment systems do not last forever. Eventually, septic systems exhaust the percolation capacity of the local soils and can become ineffective. In these cases, the owner of the parcel may more cost-effectively connect to the local or regional wastewater system, rather than install a new septic system. For the purposes of this study, no existing customers are assumed to have these conditions. It is noted that the future wastewater system will have sufficient capacity to accommodate additional future participants, as required.

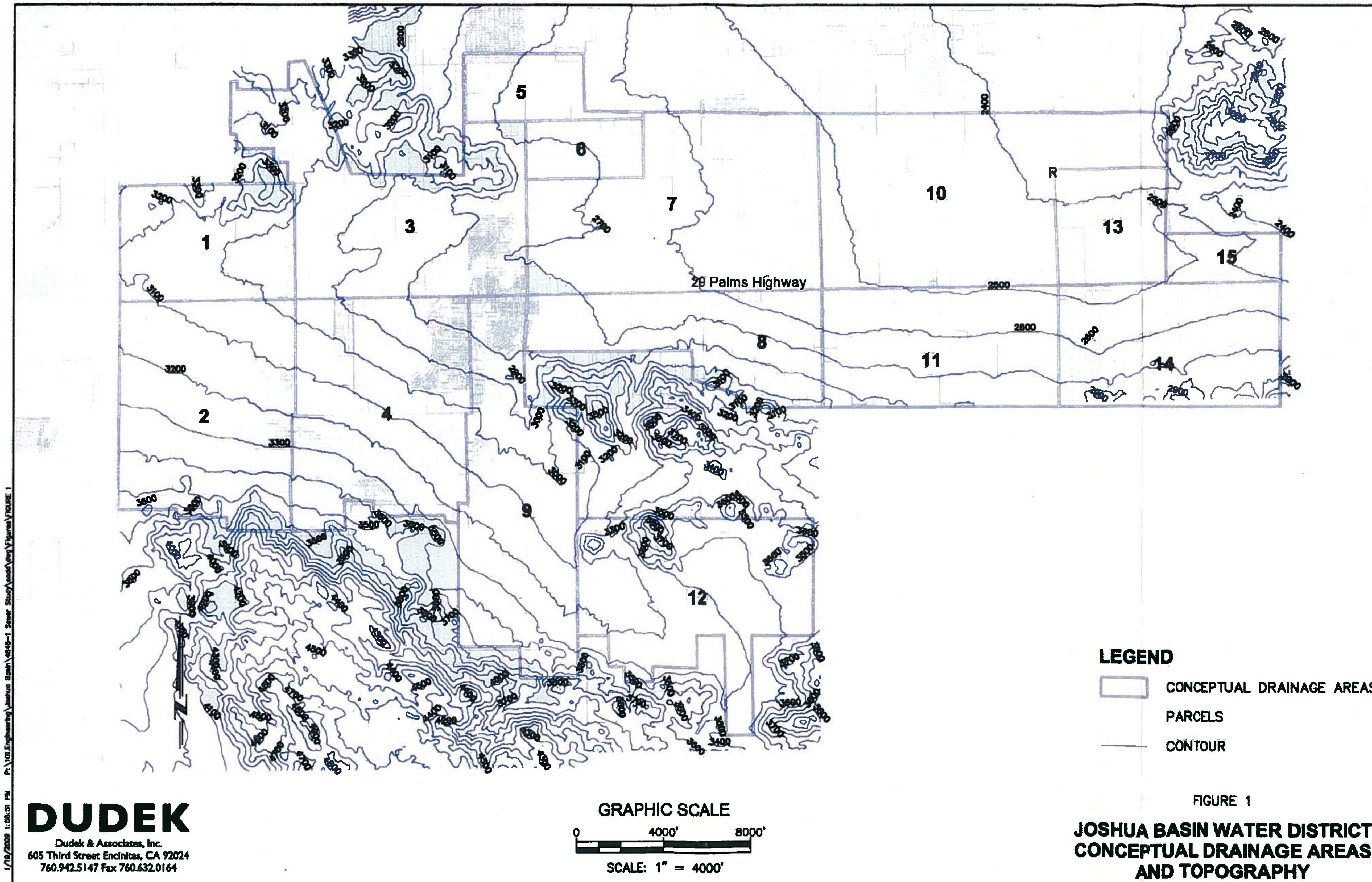

Figure 1 **Conceptual Drainage Areas and Topography**

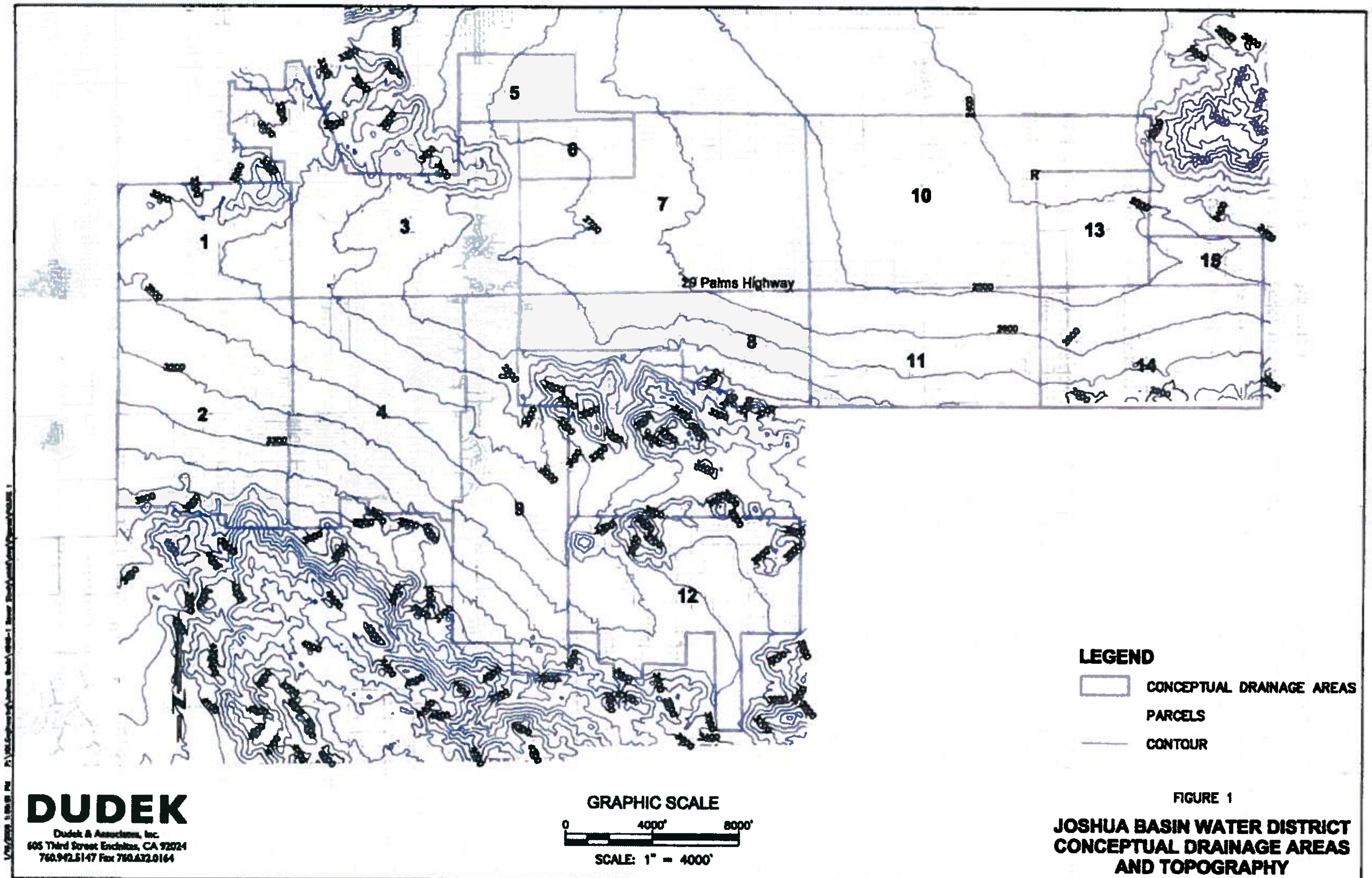

Figure 1 Conceptual Drainage Areas and Topography

2.1 Existing Development

It is necessary to identify the existing developed and undeveloped parcels within the project study area. To accomplish this task, the District's geographic information system (GIS) was used. The GIS data was reviewed, and a parcel analysis conducted for the entire study area. Parcels were categorized into the aforementioned drainage areas for analysis. The results of that parcel-level analysis are presented in Table 1.

Table 1 JBWD Drainage Area Parcel Analysis

Drainage Area	Drainage Area in Acres	Total Parcels	Occupied Parcels	Occupied Acres	Occupied EDU/acre	Unoccupied Parcels	Unoccupied Acres
1	1,001	88	4	46	0.09	84	956
2	1,952	575	295	1,001	0.29	280	951
3	2,325	881	439	1,159	0.38	442	1,166
4	1,744	1,671	927	967	0.96	744	777
5	511	187	91	249	0.37	96	262
6	319	101	51	161	0.32	50	158
7	2,047	740	118	326	0.36	622	1,721
8	1,811	324	103	576	0.18	221	1,235
9	2,617	942	549	1,525	0.36	393	1,092
10	2,004	461	21	91	0.23	440	1,913
11	1,206	240	33	166	0.20	207	1,040
12	2,526	373	211	1,429	0.15	162	1,097
13	832	55	5	76	0.07	50	756
14	1,223	447	123	337	0.37	324	886
15	316	47	1	7	0.15	46	309
Totals	22,434	7,132	2,971	8,115	0.30	4,161	14,319

The number of currently developed parcels (assumed to be those parcels having an existing active water meter) was determined. The project study area was determined to have a total of 2,971 existing developed parcels. It was assumed that these parcels have one EDU per developed parcel. The highest existing development density was calculated to be approximately 0.96 EDU per acre for Drainage Area No. 4. This drainage area is roughly bordered by Sunny Vista Road on the west, 29 Palms Highway on the north, and Quail Haven Road on the east.

Existing occupied parcels vary in size, ranging from less than 1/10 of an acre to greater than 20 acres. In many cases, the General Plan for Land Use in the Joshua Basin area identifies higher densities on these parcels than currently exist.

The minimum existing development density within the project study area was determined to be approximately 0.07 EDU per acre for Drainage Area No. 13. Drainage Area 13 is located on the eastern side of the study area, in the vicinity of Copper Mountain College.

The average existing development density across the entire study area was determined to be approximately 0.30 EDU per acre. As stated previously, each of these existing parcels are currently served by individual on-site septic treatment and disposal systems.

2.1.1 Development Potential

Within the project study area, specific areas have lower potential to be developed. This land includes areas within the Federal Emergency Management Agency (FEMA) flood plain, as well as steeply sloped and rocky areas, as shown on Figure 2. The flood plain is located longitudinally across the center of the study area, primarily impacting Drainage Areas 1, 3, 7, 8, 10 and 13. The flood plain extends to the northeast outside the study area. From aerial photos documentation, several sparse isolated developments are evident within the flood zone. However, no additional development is currently proposed within the flood plain. The total flood plain area is approximately 3,070 acres, equivalent to 14 percent of the total study area.

There are also smaller areas which would be very difficult to develop. These areas include land that has steep slopes or is covered with large rock outcrops. Areas of these types are found in Drainage Area 14, along the south edge, Drainage Area 8, along the lower portion to the south, Drainage Area 3, in the northeast portion south of Drainage Area 5, in several spots along the north edge of Drainage Area 12, and several small spots along the south edge of Drainage Area 2. The total rock area amounts to approximately 1,147 acres, or 5 percent of the total study area. Subtracting these areas leaves a total of approximately 18,388 acres.

The Roy Williams Airport, located in the northern part of Drainage Area 10, is approximately 80 acres and is also removed from further analysis.

2.2 Vacant Parcels

The WTS evaluation assumes that existing vacant land within the project study area will not be allowed to use on-site septic systems for future wastewater treatment and disposal, unless the development is on half acre lots or larger. As a result, these parcels are assumed to become tributary to the District's future wastewater collection and treatment systems.

It is projected that larger developed parcels will eventually become more valuable, and be subdivided. For example, a ten-acre parcel with a total of one EDU may be purchased and subdivided providing a more dense development. In these cases, with denser proposed development, the new development would be expected to be tributary to the future wastewater systems, and would not be allowed to be constructed with individual on-site septic systems.

The total number of potential vacant parcels within the project study area, based on proposed development densities, is approximately 15,377 parcels. The existing average density across the study area is approximately 0.30 EDU per acre. The planned land uses for existing occupied and vacant parcels have been reviewed to determine the total number of ultimate developed parcels.

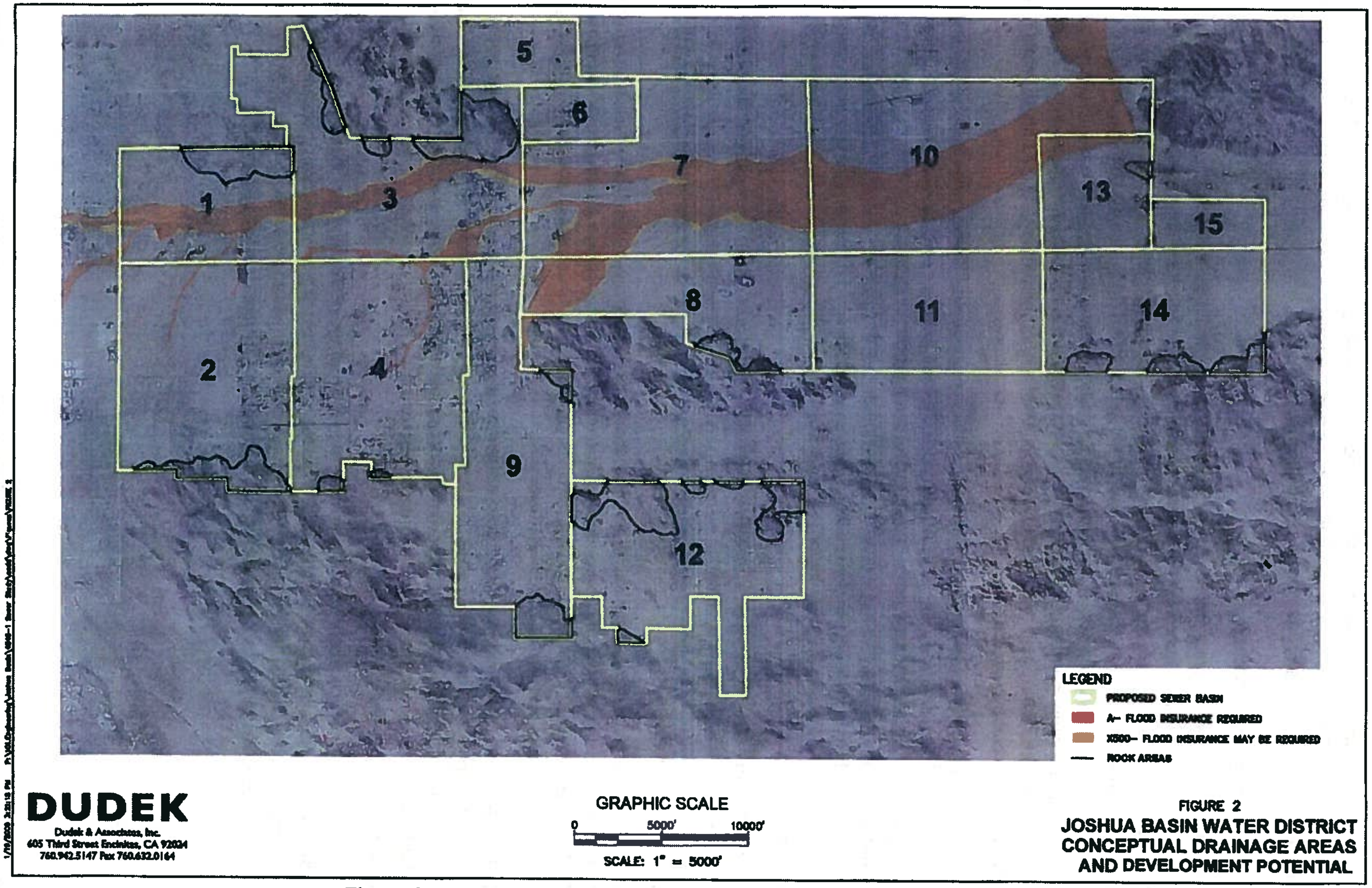

Figure 2 Conceptual Drainage Areas and Development Potential

2.2.1 Development Projected for Drainage Area 2

For known planned developments such as the proposed development in Section 33 of Drainage Area 2, specific development plans have been included in the WTS analysis. The development of Section 33 is proposed to include a total of 2,700 EDUs within its one square mile area. This development provides for a potential development density of approximately 4.2 EDU per acre. The total development area of Drainage Area 2 is approximately 1,952 acres, with approximately 295 currently occupied parcels.

The Land Use Plan projects 4,021 EDUs for Drainage Area 2 on existing vacant parcels, and 1,028 EDUs on currently occupied land, for a total of approximately 5,049 EDU's. Existing occupied land development is projected to increase from 295 EDUs to 1,028 EDUs. Approximately 406 EDUs are proposed to be developed on vacant land in Drainage Area 2. These larger lots may be serviced by new septic systems. The total density for Drainage Area 2 is projected to be approximately 5,455 EDUs over the 1,952 acres, or approximately 2.8 EDU/acre.

2.2.2 Development Potential for Drainage Area 4

Within Drainage Area 4, another proposed development includes the addition of 220 homes in the Friendly Hills development. Drainage Area 4 has an existing development density of approximately 0.96 EDU per acre. The total development projected for vacant land in this area is approximately 2,329 EDUs. However, approximately 472 of these EDU's are projected to be on larger lots, and will not be connected to the new sewer systems. Occupied developments in Drainage Area 4 total approximately 1,944 EDUs. Of these, approximately 1,463 EDUs are projected to be tributary to future collection systems. There are approximately 879 existing water meters in the area, indicating existing septic tank usage, leaving approximately 584 new EDU's contributing to future sewer systems. The total development which will contribute wastewater from Drainage Area 4 is project to be approximately 2,441 EDUs. The future density for Drainage Area 4 will therefore be approximately 2.4 EDU/acre.

2.2.3 Development Potential for Drainage Area 1

Another proposed development includes an additional 232 units in Drainage Area 1. Drainage Area 1 has a total projected development of approximately 304 EDUs on vacant land, with 223 contributing flow to future sewer systems and approximately 710 EDUs proposed for occupied land. Of these approximate 710 EDUs, 690 EDUs are projected to contribute to future sewer systems, approximately 685 EDUs not currently existing. The total development projected for Drainage Area 1 is approximately 907 EDUs, resulting in a density of approximately 1.01 EDU/acre.

2.2.4 Commercial Institutional and Retail Development

Planned commercial, institutional, light industrial and retail acreage were assigned a development value of 4.0 EDU per acre. These development categories comprise approximately 651 acres in vacant land and 436 acres of developed land within the study area. This area, using an average of 4.0 EDU per acre, results in total development of approximately 4,348 EDUs.

2.3 Wastewater Flows

As a part of the WTS analysis, it is necessary to project the needed facilities for the various interim and ultimate treatment and disposal systems. As such, wastewater flow projections were made for each drainage area, including both existing and future developable parcels within each drainage area.

The basic premise of the WTS is that denser developments will require construction of a wastewater collection and treatment system, and existing or less densely developed area will continue to use septic systems. Using the Joshua Basin Land Use Projections for both vacant land and occupied land, development and wastewater flow projections are computed as shown in Table 2.

The upper portion of Table 2 presents the development for identified vacant land. The leftmost columns provide the Land Use Designations and the development acres per EDU. The top three land uses have residential development densities ranging from 0.1 to 0.25 acres per EDU, resulting in development densities ranging from 4 to 10 EDU per acre.

The land uses highlighted in red on Table 2 represent development that is projected to require between 1 and 20 acres per EDU or development densities ranging from 0.05 to 1.0 EDU per acre. Because these densities are less than 2.0 EDU per acre, these developments are projected to continue to be served by septic systems. Conversely, the other land uses have densities between 2.2 and 5 EDU per acre, and are projected to require wastewater collection and treatment systems.

The bottom half of the table projects development for currently occupied land. Land use planning projects higher development densities for occupied land than currently exists. Table 1 identifies a total of approximately 2,971 occupied parcels, assumed to be 2,971 EDUs on occupied land in Table 2. This assumption results in a total of approximately 9,613 EDUs projected for occupied land in the future.

2.3.1 Commercial, Institutional, and Retail Development

Section 2.2.4 identified the total development of commercial, institutional, and retail area to be approximately 4,268 EDUs. Based on a flow rate of 220 gpd per EDU, the estimated ultimate non-residential wastewater flow is approximately 0.94 million gallons per day (mgd). Primary non-residential areas are along 29 Palms Highway. However, some non-residential development is projected within each of the 15 drainage areas. Non-residential flow is projected to range from approximately 4,000 gpd in Drainage Area 15 to 190,000 gpd in Drainage Area 7. Other significant areas of non-residential development include Drainage Areas 3, 8, 10, and 13, primarily along the frontage along 29 Palms Highway.

2.3.2 Existing Development Flows

Wastewater flow from each occupied developed parcel was computed within each drainage area. Table 2 presents the total number of projected EDUs which are proposed for currently occupied land, totaling approximately 9,613 EDUs. A total of 3,072 EDU are projected to occupy low density development, with lot sizes ranging from 1 to 20 acres. The remaining development includes approximately 6,542 EDUs, which is reduced by the number of existing EDUs to a remaining development count of 4,045 EDUs. The ultimate wastewater flow projected from currently developed and vacant non-residential development is approximately 890,000 gpd.

Table 2 Estimate of Residential Parcel Distribution and Contributing Wastewater Flow

Vacant Residential Land

Land Use Designation	Acres/EDU	Drainge Area 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total EDUs
20m-RM-40m - MULTIPLE RESIDENTIAL	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	308	0	308
3m-RM; MULTIPLE RESIDENTIAL	0.1	0	0	215	0	0	0	3	22	174	0	0	0	0	0	0	413
4m-RM; MULTIPLE RESIDENTIAL	0.15	146	629	251	286	0	0	220	119	0	237	301	0	307	291	0	2785
R-HR; HILLSIDE RESERVE (1 DU/20 AC)	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL; RURAL LIVING	1	62	406	244	75	217	172	567	445	352	831	735	601	0	416	0	5122
RL-10; RURAL LIVING	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL-20; RURAL LIVING	20	13	0	20	0	0	0	0	0	0	0	0	0	0	0	0	33
RL-5; RURAL LIVING	5	0	0	1	0	0	0	0	11	30	12	27	9	69	53	51	262
RS-1; SINGLE RESIDENTIAL	1	6	0	0	397	0	0	178	0	4	53	178	0	0	0	0	816
RS-10m; SINGLE RESIDENTIAL	0.23	76	2888	0	1035	0	0	0	0	0	4	0	0	0	0	0	4003
RS-18m; SINGLE RESIDENTIAL	0.41	0	95	0	168	19	0	50	0	206	0	0	0	0	0	0	538
RS-20m; SINGLE RESIDENTIAL	0.46	0	0	0	0	0	0	0	0	0	0	1	0	0	229	0	230
R-S-5 (SP); RESIDENTIAL SINGLE FAMILY	0.2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
RS-8m; SINGLE RESIDENTIAL	0.18	0	0	107	369	0	0	0	42	346	0	0	0	0	0	0	864
	EDUs	304	4021	837	2329	236	172	1017	638	1113	1136	1241	611	376	1296	51	15377
Net EDUs Contributing Sewage Flow		**223**	**3615**	**573**	**1858**	**19**	**0**	**272**	**182**	**726**	**240**	**301**	**0**	**307**	**828**	**0**	**9143**

Occupied Residential Land

Land Use Designation	Acres/EDU	Drainage Area 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total EDUs
20m-RM-40m; MULTIPLE RESIDENTIAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0	96
3m-RM; MULTIPLE RESIDENTIAL	0	0	0	508	3	0	0	15	79	440	0	0	0	0	0	0	1045
4m-RM; MULTIPLE RESIDENTIAL	0	495	285	92	182	0	0	156	11	45	175	21	0	61	93	15	1632
R-HR; HILLSIDE RESERVE (1 DU/20 AC)	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL; RURAL LIVING	1	19	206	88	127	158	151	189	168	487	134	165	637	0	104	0	2633
R-L-1; RURAL LIVING (1 DU/1 AC)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL-10; RURAL LIVING	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL-20; RURAL LIVING	20	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	11
RL-5; RURAL LIVING	5	0	0	0	0	0	0	0	1	17	1	5	1	1	1	2	28
RS-1; SINGLE RESIDENTIAL	1	1	0	0	355	0	0	11	0	9	16	9	0	0	0	0	400
RS-10m; SINGLE RESIDENTIAL	0	194	246	0	118	0	0	0	0	0	1	0	0	0	0	0	559
RS-18m; SINGLE RESIDENTIAL	0	0	290	1	373	47	0	82	0	173	0	0	0	0	0	0	967
RS-20m; SINGLE RESIDENTIAL	0	0	0	0	0	0	0	0	0	0	0	8	0	0	245	0	253
R-S-5 (SP); RESIDENTIAL SINGLE FAMILY	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
RS-8m; SINGLE RESIDENTIAL	0	0	0	353	787	0	0	0	49	800	0	0	0	0	0	0	1989
	EDUs	710	1028	1053	1944	205	151	454	308	1970	327	208	638	63	538	17	9613
Net EDUs Contributing Sewage Flow		690	822	954	1463	47	0	254	139	1457	176	29	0	61	434	15	6542
Metered EDUs (Deducted)		5	303	415	879	77	54	97	82	510	15	29	191	1	113	1	2772
Net Net EDUs Contributing Sewage Flow		**685**	**519**	**539**	**584**	**0**	**0**	**157**	**57**	**947**	**161**	**0**	**0**	**60**	**321**	**14**	**4045**

Total Estimated Sewer Flow

	Drainage Area 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total EDUs
Total EDUs Contributing Ultimate Sewage Flow	907	4134	1112	2441	19	0	429	240	1673	401	301	0	367	1148	14	13188
Estimated Ultimate Residential Flow, MGD	0.200	0.909	0.245	0.537	0.004	0.000	0.094	0.053	0.368	0.088	0.066	0.000	0.081	0.253	0.003	2.901
Estimated Ultimate Commercial Flow, MGD	0.047	0.024	0.104	0.051			0.190	0.187	0.024	0.135	0.026	0.000	0.110	0.037	0.004	0.939
Total Ultimate Estimated Flow, MGD	0.246	0.934	0.349	0.588	0.004	0.000	0.284	0.240	0.392	0.223	0.092	0.000	0.191	0.290	0.007	3.840
Percent of Total Flow	**6.4%**	**24.3%**	**9.1%**	**15.3%**	**0.1%**	**0.0%**	**7.4%**	**6.3%**	**10.2%**	**5.8%**	**2.4%**	**0.0%**	**5.0%**	**7.5%**	**0.2%**	

Table 2 Estimate of Residential Parcel Distribution and Contributing Wastewater Flow

Vacant Residential Land

Land Use Designation	Acres/EDU	Drainage Area 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total EDUs
20m-RM-40m - MULTIPLE RESIDENTIAL	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	308	0	308
3m-RM; MULTIPLE RESIDENTIAL	0.1	0	0	215	0	0	0	3	22	174	0	0	0	0	0	0	413
4m-RM; MULTIPLE RESIDENTIAL	0.15	146	629	251	286	0	0	220	119	0	237	301	0	307	291	0	2785
R-HR; HILLSIDE RESERVE (1 DU/20 AC)	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL; RURAL LIVING	1	62	406	244	75	217	172	567	445	352	831	735	601	0	416	0	5122
RL-10; RURAL LIVING	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL-20; RURAL LIVING	20	13	0	20	0	0	0	0	0	0	0	0	0	0	0	0	33
RL-5; RURAL LIVING	5	0	0	1	0	0	0	0	11	30	12	27	9	69	53	51	262
RS-1; SINGLE RESIDENTIAL	1	6	0	0	397	0	0	178	0	4	53	178	0	0	0	0	816
RS-10m; SINGLE RESIDENTIAL	0.23	76	2888	0	1035	0	0	0	0	0	4	0	0	0	0	0	4003
RS-18m; SINGLE RESIDENTIAL	0.41	0	95	0	168	19	0	50	0	206	0	0	0	0	0	0	538
RS-20m; SINGLE RESIDENTIAL	0.46	0	0	0	0	0	0	0	0	0	0	1	0	0	229	0	230
R-S-5 (SP); RESIDENTIAL SINGLE FAMILY	0.2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
RS-8m; SINGLE RESIDENTIAL	0.18	0	0	107	369	0	0	0	42	346	0	0	0	0	0	0	864
	EDUs	304	4021	837	2329	236	172	1017	638	1113	1136	1241	611	376	1296	51	15377
Net EDUs Contributing Sewage Flow		223	3615	573	1858	19	0	272	182	726	240	301	0	307	828	0	9143

Occupied Residential Land

Land Use Designation	Acres/EDU	Drainage Area 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total EDUs
20m-RM-40m; MULTIPLE RESIDENTIAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0	96
3m-RM; MULTIPLE RESIDENTIAL	0	0	0	508	3	0	0	15	79	440	0	0	0	0	0	0	1045
4m-RM; MULTIPLE RESIDENTIAL	0	495	285	92	182	0	0	156	11	45	175	21	0	61	93	15	1632
R-HR; HILLSIDE RESERVE (1 DU/20 AC)	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL; RURAL LIVING	1	19	206	88	127	158	151	189	168	487	134	165	637	0	104	0	2633
R-L-1; RURAL LIVING (1 DU/1 AC)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL-10; RURAL LIVING	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RL-20; RURAL LIVING	20	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	11
RL-5; RURAL LIVING	5	0	0	0	0	0	0	0	1	17	1	5	1	1	1	2	28
RS-1; SINGLE RESIDENTIAL	1	1	0	0	355	0	0	11	0	9	16	9	0	0	0	0	400
RS-10m; SINGLE RESIDENTIAL	0	194	246	0	118	0	0	0	0	0	1	0	0	0	0	0	559
RS-18m; SINGLE RESIDENTIAL	0	0	290	1	373	47	0	82	0	173	0	0	0	0	0	0	967
RS-20m; SINGLE RESIDENTIAL	0	0	0	0	0	0	0	0	0	0	0	8	0	0	245	0	253
R-S-5 (SP); RESIDENTIAL SINGLE FAMILY	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
RS-8m; SINGLE RESIDENTIAL	0	0	0	353	787	0	0	0	49	800	0	0	0	0	0	0	1989
	EDUs	710	1028	1053	1944	205	151	454	308	1970	327	208	638	63	538	17	9613
Net EDUs Contributing Sewage Flow		690	822	954	1463	47	0	254	139	1457	176	29	0	61	434	15	6542
Metered EDUs (Deducted)		5	303	415	879	77	54	97	82	510	15	29	191	1	113	1	2772
Net Net EDUs Contributing Sewage Flow		685	519	539	584	0	0	157	57	947	161	0	0	60	321	14	4045

Total Estimated Sewer Flow

	Drainage Area 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total EDUs
Total EDUs Contributing Ultimate Sewage Flow	907	4134	1112	2441	19	0	429	240	1673	401	301	0	367	1148	14	13188
Estimated Ultimate Residential Flow, MGD	0.200	0.909	0.245	0.537	0.004	0.000	0.094	0.053	0.368	0.088	0.066	0.000	0.081	0.253	0.003	2.901
Estimated Ultimate Commercial Flow, MGD	0.047	0.024	0.104	0.051			0.190	0.187	0.024	0.135	0.026	0.000	0.110	0.037	0.004	0.939
Total Ultimate Estimated Flow, MGD	0.246	0.934	0.349	0.588	0.004	0.000	0.284	0.240	0.392	0.223	0.092	0.000	0.191	0.290	0.007	3.840
Percent of Total Flow	6.4%	24.3%	9.1%	15.3%	0.1%	0.0%	7.4%	6.3%	10.2%	5.8%	2.4%	0.0%	5.0%	7.5%	0.2%	

2.3.2 Future Development Flows

Currently vacant land within each drainage area yields the potential development shown in the upper portion of Table 2. There are a total of 15,377 EDUs projected for currently vacant land across the 15 drainage areas. Of this total, approximately 6,233 EDUs are projected to reside in low density areas, and these EDU's were subtracted from the total EDU count to determine wastewater production. The total development count of 9,143 EDU's generates an ultimate wastewater flow rate of 2.01 mgd.

2.4 Projected Collection System

A computerized sewer model was developed based on parcel information developed from the District's GIS data. The number of parcels and assumed density within the project study area comprised the basis for development of tributary wastewater flows.

Traditional sewer system design requires a minimum velocity of at least 2.0 feet per second within the collection system. The study area exhibits a substantial slope from west to east. The analysis generally assumes the minimum sewer size to be 8 inches in diameter. However, the projected flow rates in several drainage areas are forecast to produces flows such that only a 4-inch or 6-inch sewer could be used. It may be best to have a few additional homes use septic system in these cases.

Trunk sewers were sized to flow half full for sewers 12 inches and smaller, and ¾ full for sewers larger than 12 inches in diameter. The proposed trunk sewer sizing for ultimate development of the study area is shown on Figure 3. Projected pipe sizes range between 4 and 21 inches in diameter.

Pipe sizes represent the "backbone" of the future District wastewater collection system. As development occurs in remote areas, the main trunk sewers will need to be constructed to the sizes as shown to allow District wide development.

2.5 Raw Wastewater Characteristics

As a result of water conservation, many agencies experience significantly reduced wastewater flow. The resulting strength of the raw wastewater is proportionately increased as less water is used to transport the same amount of waste material. The District's 2006 Wastewater Study estimated BOD5 and TSS loadings of 250 mg/L. As water conservation is increased, flow estimates are reduced and wastewater strength is correspondingly increased. Therefore, District treatment facilities need to be designed for the lower flow rate and an influent BOD5 and TSS concentration of 300 mg/L, each.

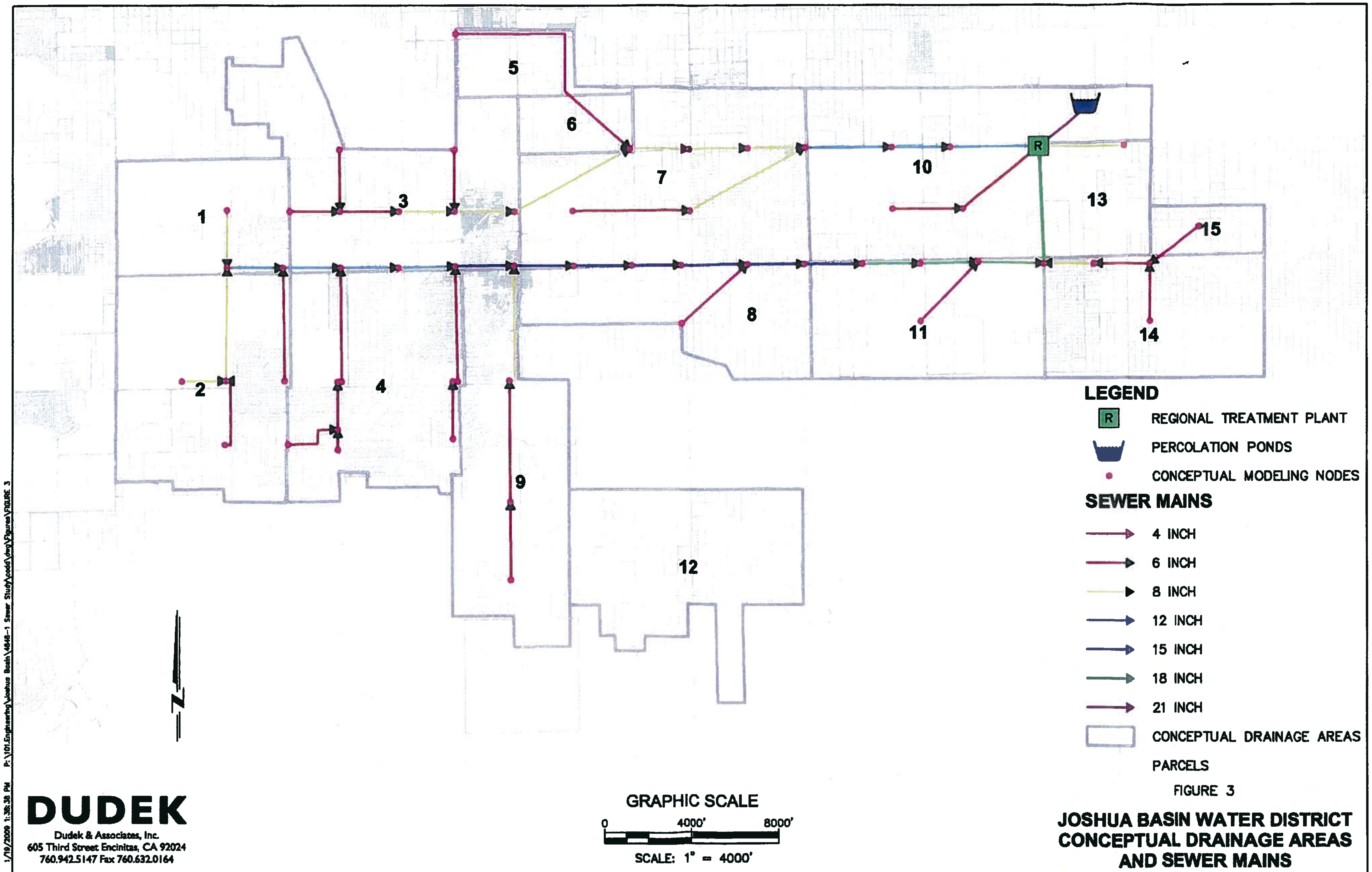

Figure 3 Conceptual Drainage Areas and Sewer Mains

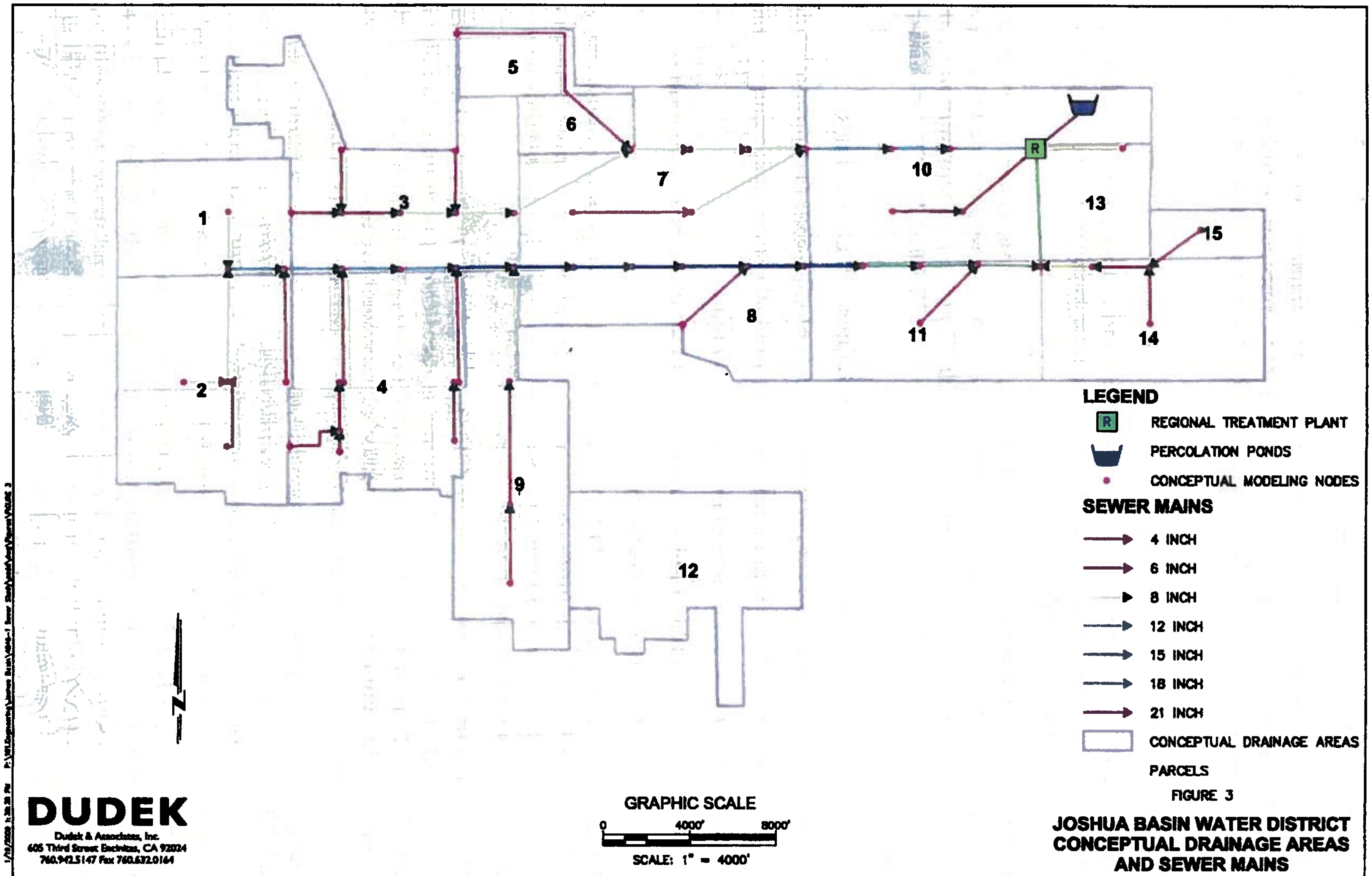

Figure 3 Conceptual Drainage Areas and Sewer Mains

Section 3 Regulatory Considerations

The District lies within the California Regional Water Quality Control Board (RWQCB) – Colorado River Region (Regional Board, Region 7). The Regional Board is responsible for water quality planning in each of its hydrologic units. It also regulates the discharge of treated waste within its area of responsibility.

3.1 Existing RWQCB Considerations

The District overlies the Joshua Tree hydrologic unit planning area, which is where the District currently derives its water supply. Also, the District is pursuing import and recharge of State Project Water (SPW) to supplement local natural recharge.

The RWQCB's Basin Plan requires that groundwater designated for use as domestic or municipal water supply comply with Title 22, Chapter 15, Article 4. Biochemical oxygen demand (BOD5) and total suspended solids (TSS) are required to be less than 30 mg/L for discharges from wastewater treatment facilities. The Regional Board has an informal policy that conforms to AB 885 and Senate Bill 390, requiring the following:

- Projects equal to or greater than 10 EDU require a report of waste discharge.
- Board staff reviews the project and evaluates each project for impacts referenced in AB 885.
- Following an analysis of the site conditions, density and other factors, a permit may be issued.
- The primary regulated discharge limit parameter is nitrogen.
- The limit is 10 mg/L total inorganic nitrogen (TIN); there is no waiver for discharges.
- Individual homes generally do not require permits.

The United States Geological Survey (USGS) analyzed the nature and capacity of the District's local groundwater basin in 2004. That study concluded that nitrogen from septic tanks in the Joshua Basin region will, if unregulated, eventually reach the water table. The USGS projected that future regulation of nitrate in the groundwater may be required by the RWQCB.

Title 22 requires that nitrogen levels not exceed 45 mg/L (10 mg/L as nitrogen) and TDS not exceed 500 mg/L. Additionally, the State of California adopted regulations for Groundwater Recycled Recharge Projects (Title 22, Division 4, Chapter 3, Article 5.1). These regulations require, for continuing use of groundwater as a drinking water source, protection of groundwater through reducing or eliminating the use of septic system discharges and compliance with Groundwater Recycled Recharge Projects criteria.

Therefore, future septic systems which do not nitrify and denitrify will be eliminated in tracts of more than 2.0 EDU per acre. There are available commercial septic systems that provide nitrification and denitrification. However, these facilities are very expensive. Wastewater treatment technology exists, and it is more cost-effective on a larger wastewater treatment scale, to accomplish nitrogen removal.

The RWQCB is in the process of establishing the regulations that will govern the nutrient limits in wastewater discharges. Based on our discussions with the agency, the RWQCB is currently considering an effluent limit of between 10 and 15 mg/L as N. Future nitrogen regulations have been discussed with RWQCB staff, and they indicated that any wastewater discharged from tracts over 2.0 EDU per acre within Joshua Basin will be regulated to a level below 10 mg/L total inorganic nitrogen (TIN).

3.2 Future Regulatory Requirements

Draft groundwater recycled recharge project requirements indicate that recharge of groundwater with recycled water requires a limited percentage of recycled water in the recharge water, as low as 20 to 50 percent. Assembly Bill 885 addresses Onsite Wastewater Treatment System (OWTS). The legislation requires the adoption of regulations or standards for the permitting and operation of the following OWTS in the state:

- Any system that is constructed or replaced
- Any system that is subject to a major repair
- Any system that pools or discharges to the surface
- Any system that discharges waste that has the potential to cause a violation of water quality objectives or to impair the present or future beneficial uses of water, to cause pollution, nuisance, or contamination of waters of the state.

The draft RWQCB regulations are divided into four articles:

- Definitions, applicability of the regulations, and general requirements
- Groundwater level determinations for new OWTS
- Requirements for supplemental treatment and OWTS dispersal systems
- Requirements for protecting impaired surface waters.

For the proposed regulations, an OWTS includes individual disposal systems, community collection and disposal systems, and alternative collection and disposal systems that use subsurface disposal. The proposed regulations apply to new or replaced OWTS discharges of 3,500 gallons-per-day (gpd) and greater. Therefore, for discharges greater than 3,500 gpd, a Notice of Waste Discharge must be filed with the RWQCB. The Colorado River RWQCB will likely retain a 10 mg/L limit for TIN.

Section 4 Wastewater Treatment Alternatives

4.1 Conventional Treatment (Primary and Secondary)

There are several levels of wastewater treatment (preliminary, primary, secondary and tertiary) which are considered for potential use for Joshua Basin. In general, wastewater treatment plants (WWTP) include several levels of treatment, including:

- Preliminary Treatment – consists of bar screens, flow measurement, grit removal, and often pumping, to lift the wastewater to the elevation of the next treatment process.
- Primary Treatment – includes primary clarifiers, and primary sludge pumping. Primary treatment will often reduce the influent total suspended solids (TSS) by 50-60 percent, and can reduce the biochemical oxygen demand (BOD) by 30-35 percent.
- Secondary Treatment – typically includes a secondary BOD removal process, such as an aeration basin, followed by a solids removal step, usually a secondary clarifier. The secondary treatment process functions as a TSS and BOD removal process through recycling sludge settled in the secondary clarifier. The secondary treatment portion of the plant typically lowers BOD and TSS remaining after primary treatment down to the regulated level, i.e. BOD and TSS of 30 mg/L.

- Nitrogen Removal – Removal of nitrogen is accomplished by processes which are part of secondary treatment process – nitrification and denitrification. Nitrification converts ammonia to nitrate. Denitrification is where nitrate is removed in an anoxic or anaerobic zone, when nitrate is converted by denitrifying organisms to nitrogen gas.
- Tertiary Treatment – Tertiary treatment is Title 22 recycled water, which is approved for full body contact recreation, and use in lakes for boating and fishing. Tertiary treatment consists of coagulation and filtration, followed by disinfection with chlorine or ultraviolet light. Title 22 requires disinfection for irrigation of parks and schools to produce a bacteria and virus kill to a level of 2.2 coliform bacteria per 100 ml of water.
- Advanced Treatment – Membrane Bioreactors (MBRs) are a technology that accomplishes the production of high quality tertiary water and both secondary and tertiary treatment in a single process. The MBR process uses an aeration basin which operates at a much higher mixed liquor suspended solids (MLSS) level of 8,000 to 12,000 mg/L. The MBR process has ultrafiltration membranes. The water from an MBR plant has higher quality effluent water than conventional Title 22 water, and, because the TSS is very low, disinfection works very well.

4.2 Treatment Equipment Alternatives

Smaller "package" treatment facilities range in size from 5,000 gallons per day (gpd) up to 100,000 or 200,000 gpd. The smallest package plants are typically constructed of steel tanks that rest on a below grade slab. Steel tank package treatment plants can be relocated, if desired. Larger wastewater treatment facilities (200,000 gpd and larger) are typically constructed of cast-in-place concrete tanks, which are more permanent facilities.

There are a number of potential manufacturers of package extended aeration treatment plants. For the purposes of this evaluation, the following list of manufacturers was developed. The criteria for development of the list required that the manufacturer provide and market a California-approved package plant that successfully nitrifies and denitrifies (NDN) to a level under 10 mg/L TIN. The three most viable manufacturers of these package plants include:

- Smith & Loveless ADDIGEST with NDN – in a fabricated steel tank
- Purestream BESST process with NDN, in a steel tank
- Aero-mod BNR (Biological Nutrient Removal) process – concrete tank

As discussed in Section 2, a large range of wastewater flows are being considered under this study. Package plant manufacturers have different characteristics and costs for different flow ranges. The summaries below discuss the various strengths of each proposed unit. The flow rate after the equipment name is each manufacturer's most competitively priced flow range for consideration.

- Smith & Loveless (10,000 gpd to 1.0 mgd). Smith and Loveless has extended aeration package plants with flow capacities from 10,000 gpd to 500,000 gpd. Two 500,000 gpd plants would be combined for a 1.0 mgd plant. Processes include Flow Equalization, Aeration, Anoxic Zone, Secondary Clarifier, and Effluent Filtration. S&L includes aerobic digestion to stabilize the sludge, and has the Titan MBR treatment process, which can treat a flow rate of 20,000 gpd.
- Purestream BESST (5,000 gpd to 140,000 gpd). The Purestream Biologically-Engineered Single Stage Treatment (BESST) process accomplishes secondary treatment with nitrogen removal, achieving typical effluent quality of 10 mg/L for both BOD5 and TSS, with total N less than 10 mg/L. The BESST process is an activated sludge plant with both aerobic and anoxic zones, and is regularly installed for flow rates as low as 5,000 gpd, and can be cost-competitive in flow rates

up to 140,000 gpd. The largest steel tank is 50,000 gpd in capacity, and a 140,000 gpd plant is composed of two 50,000 gpd plant tanks, and an extra tank which has space for pretreatment and a special anoxic zone. The manufacturer provides an aerated sludge holding tank, which can function as a simple aerobic digester.

- Aero-Mod BNR Process (50,000 gpd to 1.0 mgd). Aero-Mod provides a BNR process, titled the Sequox Process. The process has a selector, first stage aeration nitrification, second stage sequencing aeration and denitrification, then a secondary clarifier. There is also available an add-on optional effluent filter, if tertiary treatment is ever required. The Sequox process can easily be modular, starting at a flow rate of 50,000 gpd up to 500,000 gpd. The Aero-Mod package plant also includes aerobic digestion to stabilize the sludge. The AeroMod basic design business model is for providing equipment into a cast-in-place concrete tank, and is more competitive in plant flows greater than 50,000 gpd.
- Conventional Activated Sludge and Oxidation Ditches. For wastewater flows greater than 1.0 mgd, it is more likely to require a conventional activated sludge process. Conventional activated sludge system requires an aeration detention time of only 4 to 6 hours. Extended aeration Oxidation Ditches requires 24 hours. The Oxidation Ditch plant is easier to operate, but because of the huge aeration basin, have a higher capital cost. The conventional activated sludge process is somewhat more difficult to operate, but it is much more efficient than an oxidation ditch at NDN.

4.3 Cost Comparisons

Construction, operation and maintenance costs for each vendor were developed for the anticipated range of tributary wastewater flows, including 20,000 gpd and 200,000 gpd. In the following tables, construction costs are defined for each alternative system. Capital costs include an additional 35 percent for project soft costs. Package treatment facilities have an estimated life of 15 years. Assuming an interest rate of 5 percent, capital costs are annualized over 15 years and combined with annual O&M costs to estimate the total annual cost of each alternative.

4.3.1 Cost Comparison for 20,000 gpd Plants

For treatment systems with capacity up to 20,000 gpd, the following four manufacturers were identified for potential use by the District: 1) Smith & Loveless ADDIGEST; 2) Aero-Mod; 3) Purestream; and 4) Smith & Loveless MBR. The anticipated expenditures for each of these alternatives are summarized in Table 3.

Table 3 20,000 GPD Treatment Capacity Cost Comparison

Capacity (gpd)	Vendor	Treatment Process	Construction Cost ($)	Cost per Gallon	Capital Cost ($)	Annual O&M ($)	Total Annual Cost ($)
20,000	Smith & Loveless	ADDIGEST Ext. Arr. NDN	$375,000	$19	$510,000	$60,400	$110,000
20,000	Aero-Mod	Sequox BNR Ext. Aer.	$347,000	$17	$468,000	$59,500	$105,000
20,000	Purestream	BESST Act. Sludge w/ NDN	$320,000	$16	$432,000	$50,500	$92,000
20,000	Smith & Loveless	Titan MBR, Adv. Tertiary	$615,000	$31	$830,000	$86,000	$166,000

Consideration of cost competitiveness is not the primary consideration for the District. The Purestream system is constructed of steel tankage, making the systems easier to relocate. Relocation capability is a primary consideration relative to overall WTS planning. Also, the MBR process produces a significantly higher effluent quality. Consideration of existing and emerging regulatory requirements may necessitate that MBR processes be used to attain higher effluent quality and better environmental protection. Selection of the appropriate treatment technology will be decided by the District at the time of implementation, and will be based on the identified treatment requirements which the District will be required to meet. The developer will be required to implement the identified treatment technology for WTS implementation.

4.3.2 Cost Comparison for 200,000 gpd Plants

For treatment systems with capacity greater than 20,000 gpd up to 200,000 gpd, the following three manufacturers were identified for potential use by the District: 1) Smith & Loveless ADDIGEST; 2) Aero-Mod; and 3) Purestream. The anticipated expenditures for each of these alternatives are summarized in Table 4.

Table 4 200,000 GPD Treatment Capacity Cost Comparison

Capacity (gpd)	Vendor	Treatment Process	Construction Cost ($)	Cost per Gallon	Capital Cost ($)	Annual O&M ($)	Total Annual Cost ($)
200,000	Smith & Loveless	ADDIGEST Ext. Arr. NDN	$3,290,000	$16	$4,442,000	$220,000	$648,000
200,000	Aero-Mod	Sequox BNR Ext. Aer.	$2,562,000	$13	$3,459,000	$212,000	$545,000
200,000	Purestream	BESST Act. Sludge w/ NDN	$2,745,000	$14	$3,706,000	$208,000	$565,000

Aero-Mod equipment is typically installed in cast-in-place concrete basins at these capacities. Where relocation ability remains a consideration at this capacity level, the Purestream BESST system would emerge as the preferred system selection. As with previous discussions, the required treatment requirements for regulatory compliance will dictate the treatment alternatives to be implemented.

For treatment capacities beyond the 200,000 gpd range, the Aero-Mod system represents the best selection, particularly for its nitrogen removal efficiency. As a comparative value, the costs for a 600,000 gpd Aero-Mod facility are provided as follows:

- Construction cost is approximately $9,000,000
- Total Annual O&M is estimated to be approximately $490,000 per year

As noted previously, the long-term strategy for the District may include the development of a centralized regional wastewater treatment facility. Based on the information developed in Section 2, the approximate capacity of this long-term alternative would be approximately 3.8 million gallons per day (mgd). Treatment of such large volumes of wastewater will require construction of a more conventional activated sludge treatment facility. For purposes of comparison, the costs of a traditional oxidation ditch treatment facility are provided below. The oxidation ditch provides relative ease of operation and maintenance.

- Construction cost is approximately $42,000,000 (not including collection system costs)
- Total Annual O&M cost is estimated to be approximately $1,300,000 per year

A comparatively sized MBR treatment plant would provide higher quality and reliable treatment, as well as provide capability to accommodate future treatment requirements. MBR costs are estimated to be:

- Construction cost is approximately $65,000,000 (not including collection system costs)
- Total Annual O&M cost is estimated to be as much as $2,000,000 to $2,500,000 per year

It is noted that future treatment requirements, beyond those currently in force, may require that higher levels of treatment (i.e. MBR treatment) be considered. These considerations will be taken into account at the time of design and construction of the regional treatment facilities. As the need for such a facility is well out into the future, no attempt is made to further develop these considerations at this time.

4.4 Preferred Treatment System(s)

Based on the analyses performed for the 20,000 gpd and less flow capacity, the Purestream BESST system was found to provide the lowest overall capital and annual operation cost. This system also provides for steel tank construction that can be relocated as the District's wastewater treatment needs increase. The system is also modular to allow a single treatment plant to be expanded as wastewater flows increase. Also, as necessary, several existing or new treatment units may be combined at a new location to accommodate existing and new wastewater treatment needs. Purestream systems are currently installed at several locations within in the 29 Palms area. These installations report a successful local track record and RWQCB support of the installations. Therefore, Purestream BESST is identified as the preferred technology for treatment capacities between 5,000 gpd and approximately 150,000 gpd.

As the District develops into the near-term future and treatment capacities exceed 150,000 gpd, approaching the 200,000 gpd capacity, the Purestream BESST process begins to exceed its target capabilities. In addition, these treatment facilities are anticipated to be more permanent in design, providing a longer period of service to the District. As a result, the preferred treatment system for these higher tributary flows is the Aero-Mod system. Aero-Mod facilities have been successfully installed throughout California, providing treatment of flows between 200,000 and 1,000,000 gpd. These facilities typically involve construction of cast-in-place tankage.

As stated previously, the MBR process provides both better overall treatment and potential protection against future emerging regulations. The District may require the MBR process preferentially over other methods.

As the District continues to develop into the long-term future, the need for a more centralized wastewater treatment capability will emerge. The time frame of this need is not known at this time. Tributary wastewater flows will exceed 1,000,000 gpd, approaching the estimated ultimate capacity of 3.8 mgd. At these capacities, oxidation ditches and other conventional activated sludge treatment processes will be necessary. Due to the lower construction costs and high treatment effectiveness of conventional activated sludge plants, design and construction of a conventional activated sludge process would be recommended for plants larger than 1.5 mgd.

As noted previously, emerging regulations may result in the need for higher treatment requirements in the future. As a result, it may be in the best interest of the District to standardize treatment facilities to accommodate unknown future treatment requirements. In this case, the MBR becomes the preferred treatment alternative. The District will be able to make the decision on treatment facility selection at the time of development and thereby address these concerns.

4.5 Effluent Disposal Options

Consideration of the long-term effluent disposal needs of the District is a key component to development of a workable WTS plan. Existing effluent is discharged through individual leach fields from local septic systems, subsequently percolating into the underlying aquifer; thus, the current concern of potential impact to the District's groundwater supplies.

Availability of effluent disposal options is limited within high desert communities, typically involving the use of percolation or infiltration basins to achieve disposal goals. In these basins, treated effluent is discharged and allowed to percolate into the ground for disposal. The effluent, receiving the higher levels of treatment to remove harmful nutrients, is no longer harmful to the underlying groundwater supplies. Percolation of treated effluent is considered a beneficial reuse of the water resources of the District.

Another option for the District is direct non-potable reuse of the treated effluent. This option would involve the development of a secondary non-potable water distribution system, through which the District would provide non-potable water for landscape irrigation purposes. However, the development of a secondary distribution system can be costly, both in capital construction costs as well as long-term maintenance. Yet, the availability of treated water for non-potable uses may represent a valuable resource to the District in the future.

Based on current understanding of the District's water use patterns, it is anticipated that percolation basins will be used for effluent disposal at all levels of treatment identified for the WTS plan. Each treatment facility, regardless of capacity, will be required to provide sufficient area for percolation and disposal of its treated effluent. Based on recent information developed for the District, a percolation capacity of 1.0 feet per day is anticipated for percolation pond design. However, site specific evaluations will be required to fully identify the percolation area needs on a case by case basis.

4.6 Biosolids Handling and Disposal

Biosolids are the residual materials left behind from the overall wastewater treatment process. It is traditionally accepted that on-site treatment of wastewater biosolids is only cost-effective for treatment capacities greater than approximately 1.0 mgd. As a result, the majority of the District's initial package treatment installations will not be capable of cost effective on-site solids handling. The alternative is the storage and hauling of these biosolids to off-site facilities.

Assuming that residual solids contain approximately 3.5 percent solids (the remainder of which is water), a 20,000 gpd facility would be expected to produce approximately 1,600 gpd of waste activated sludge, including some screenings or other waste solids. Therefore, a 25,000 gallon aerated holding tank could store approximately 15 days of residual biosolids prior to needing to be hauled to an off-site facility. These biosolid volumes can be reduced by the use of aerobic digestion facilities. However, aerobic digestion results in additional operation costs. The Purestream BESST and Aero-Mod processes include aerobic digester facilities with detention times of approximately 10 days. The preferred option for District facilities will be determined on a case by case basis, with all facilities providing an aerated holding tank, at a minimum. In this manner, a liquid sludge haul truck can be use to haul sludge to an ultimate disposal site.

Section 5 Wastewater Treatment Strategy

Development of the District's WTS involves consideration of a variety of currently undefined growth and development concepts. These considerations include, but are not limited to:

- Identification of conditions under which septic systems will continue to be used,
- Identification of conditions where small package treatment systems will be required,
- Identification of conditions where larger treatment systems are required,
- Definition of strategies for relocation and clustering of smaller treatment facilities,
- Determination of when regional treatment facilities are required, and
- Definition of appropriate effluent and biosolids handling alternatives.

The following discussions address the "thresholds" at which these various treatment alternatives are to be implemented. The timing of when a given threshold will be exceeded is highly dependent on development pressure and patterns. The intent of this discussion is to identify the thresholds and the facilities needed to accommodate the resulting wastewater flows.

5.1 Wastewater Treatment "Thresholds"

Establishment of the various treatment thresholds will be handled on a case by case basis at the time of development. For the purpose of defining the WTS, the following discussions identify the probable levels of development necessary for transition from one level of treatment to another.

For example, it is generally accepted that developments producing less than 3,500 gpd, with a development density less than 2 EDU per acre, will likely continue the use of septic systems for wastewater treatment. As development size and density increase to the level of a small neighborhood, it is anticipated that the treatment threshold will be exceeded requiring installation of a localized package treatment system. If the development exceeds the treatment capacity of a single treatment facility, construction of multiple, clustered or larger treatment facilities will be required. As the overall treatment requirements continue to increase, larger clusters of treatment facilities will be required, leading ultimately to the development of a regional treatment facility. Of course, planning of conveyance piping, effluent disposal and biosolids handling will be required at each level of treatment as well.

5.1.1 Single Home Project (less than 15 EDU per project)

The majority of development throughout the District is anticipated to involve the construction of single homes on relative large parcels of land. As such, these developments are not anticipated to exceed the criteria for continued use of on-site septic systems. Each development will be evaluated on a case by case basis, with overall protection of the District's groundwater supplies as the primary objective. In general, where developments involve construction of less than two homes per acre, septic systems will continue to be allowed. It is noted that all septic systems will be required to be designed in a manner to allow discontinuation of the septic system and connection to a local collection system in the future. This requirement will allow the District to adjust treatment requirements as future growth occurs.

As developments increase in density, local treatment facilities will be required. It is anticipated that developments with as few as eight homes on a single street may require construction of a localized collection and treatment system.

5.1.2 Small Developments (15 to 300 EDUs)

Figure 4 provides an illustration of the anticipated conditions for small development within the District. Small developments are defined to be those that contain more than 15 dwelling units, but less than approximately 300 EDUs. As with all developments, the District will evaluate the pre-construction conditions and set the treatment requirements based on the projected impact to the groundwater supplies.

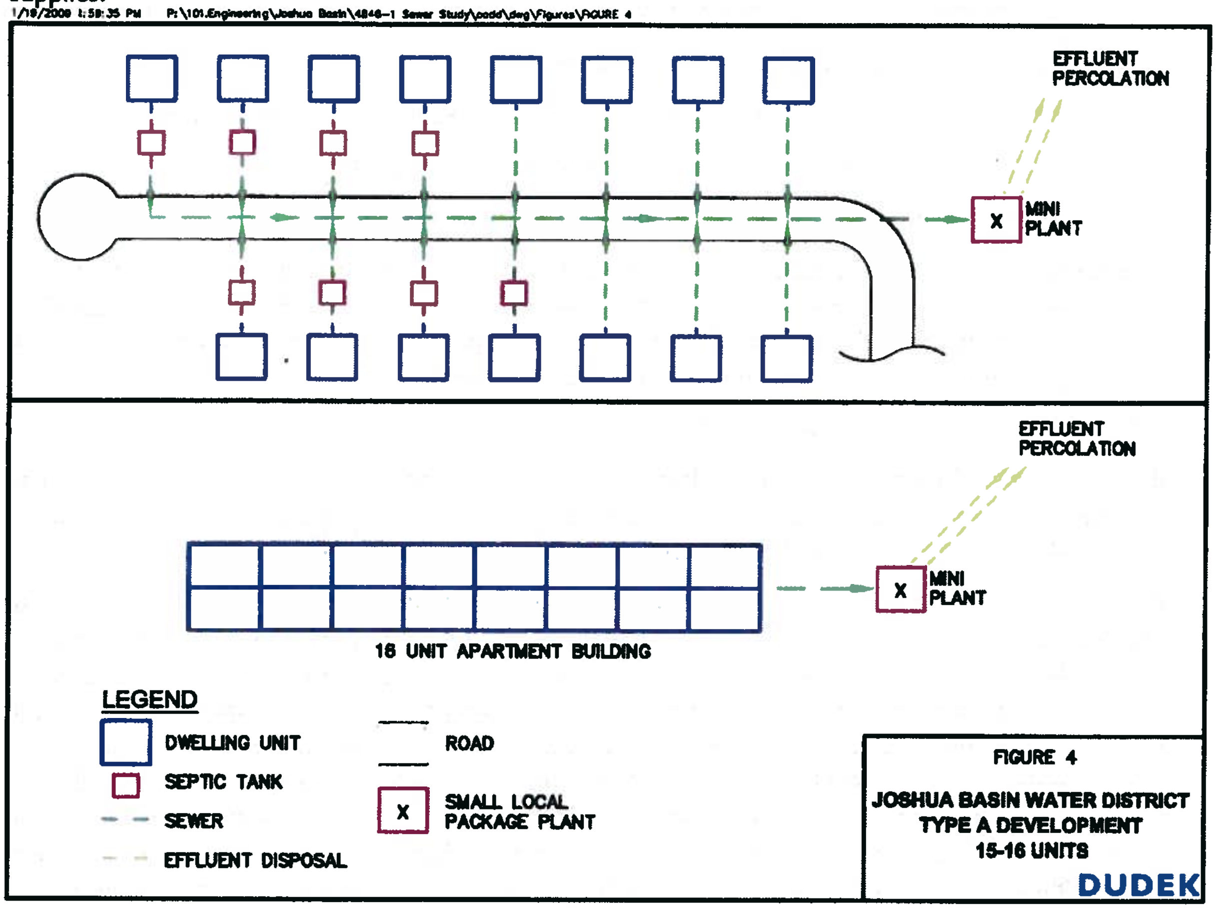

Figure 4 Type A Development 15-16 Units

Based on the conditions shown in Figure 4, the initial EDUs may be required to construct temporary septic systems. It is noted that the District will more likely require the developer to construct the collection and treatment system initially. The defining factor will be the ability of the small development to sustain treatment plant operations. Treatment facilities require a minimum amount of tributary wastewater to sustain operations. Depending on the speed of the development, the initial homes may not produce sufficient wastewater to support the treatment process. In this case, the initial homes would be placed on septic systems, with an agreement that all homes would be converted to a localized treatment facility prior to full occupancy of the development. The developer will be responsible for construction and operation of the treatment facility until such time as all homes are sold.

Once the development attains sufficient wastewater production, the developer will be required to install a sewer line and package wastewater treatment facility. The treatment facility will be required to meet the District's treatment requirements at the time of construction. Treated effluent will be percolated into the ground using a small percolation pond, which will be provided by the developer with necessary security and safety facilities. Waste biosolids will be stored on-site in an aerated tank, and hauled away periodically.

Based on these assumptions, the Type A development of 15 homes, or 15 EDU's, will produce a total wastewater flow rate of 3,300 gpd. A package treatment plant for a flow rate of 4,000 gpd would be required, with an estimated cost of approximately $90,000, or $22 per gallon per day of treatment.

The critical threshold issue of these developments will be the initiation of treatment facility installation. For example, if one homeowner builds their house isolated from the other homes, that home would require and could realistically justify installation of an individual septic system. In the future, when additional homes are constructed, the District may require the installation of the collection and treatment facilities. At what point will the District require the original homeowner to connect to the collection system? This issue will be required to be addressed at the time of development approval – eliminating the later argument. Also, the developer will be required to accommodate these connections during design of the homes to facilitate the connection process – as the developer will not be allowed to occupy the remainder of the homes until the collection system and treatment systems are installed, connected and operational. However, if the development is a series of smaller single home developers, the District will be faced with the need to collect the funds from the individual home owners for subsequent installation of the needed facilitates.

5.1.3 Medium Development (300 to 1,500 homes)

Medium developments are defined to exceed 300 homes, but not more than 1,500 homes. Figure 5 provides an illustration of several development concepts, including:

- A single package plant (X1) serving several early residential developments
- A single package plant (X2) serving a larger development within the same vicinity
- A clustered package plant involving a new package plant (X3) combined with relocation of both previously constructed package plans (X1 and X2)

It is noted that each subsequent treatment facility requires that the collection systems of the previously developed facilities be re-routed to the future treatment location. As such, evaluation of the overall collection and treatment system will be necessary to make certain that elevation is available to maintain gravity flow from home to treatment facility.

The general concept illustrated by the described sequence of construction can, and will be required to, be flexible based on the site specifics of each location. Ideally, each development will be guided by development approval requirements and the District's WTS to assure that development occurs such that appropriate gravity flow conditions are maintained.

The District will participate though the addition of trunk sewers between the various treatment sites, with pipelines becoming larger as development proceeds. This participation can be accomplished through direct construction by the District using collected fees for future wastewater system development, or through requirements for subsequent developers to provide the needed or upsized facilities.

Based on this level of development, treatment facilities with capacities of 100,000 gpd are projected to have a capital construction cost of approximately $1,700,000, or $17 per gallon treated.

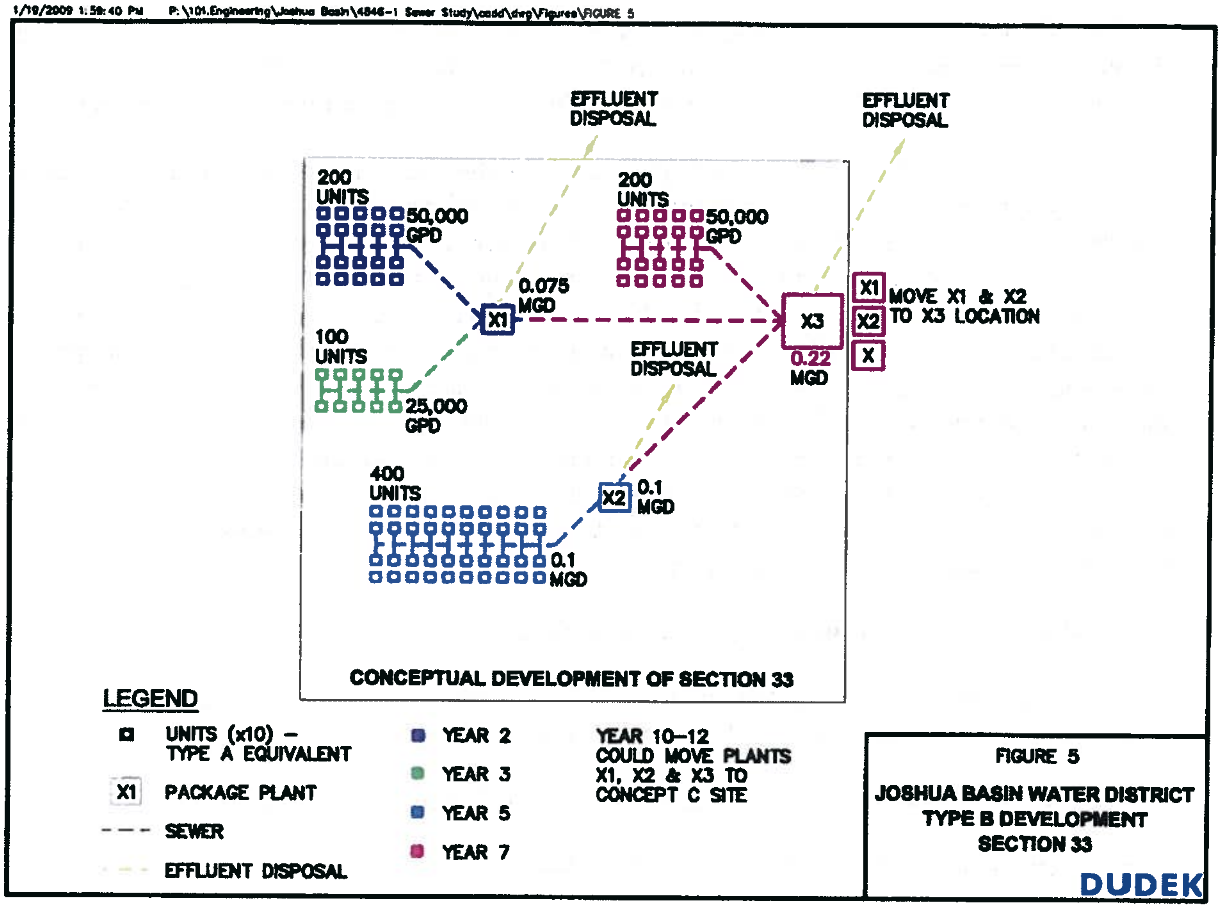

Figure 5 Type B Development Section 33

5.1.4 Large Developments (1,500 to 2,500 EDUs)

Depending on overall development pressure, the number of small to medium sized treatment facilities could become excessive. Yet, at this point in the District's development, the need for a regional treatment facility may not have been established. Figure 6 illustrates a potential scenario under such a condition.

In this example, a single treatment facility may be serving the needs of the Section 33 development, along with other treatment plants operating at another location (TP2 on the figure). There may also be other treatment facilities serving various other locations throughout the District. Depending on development pressure, additional trunk sewers will be installed and treatment plants built and/or relocated, to reduce the overall number of treatment facilities. The District will be required to coordinate these activities with fee collection to assure that funding is maintained to accommodate the necessary facilities. In this manner, the overall number of treatment facilities will be controlled and District operational cost minimized.

It is noted, under the WTS plan, that a treatment facility will eventually be constructed on the site of the future regional treatment facility. As development progresses, the District will need to identify the location of the regional facility, and actively direct collection system construction toward the site. In this manner, the long-term objective of the WTS is maintained. As the treatment facilities become larger in capacity, the cost of construction and operation will increase. Based on the discussions above, the treatment facilities will be approaching 220,000 gpd, with a construction cost of approximately $3,500,000, or $16 per gallon treated.

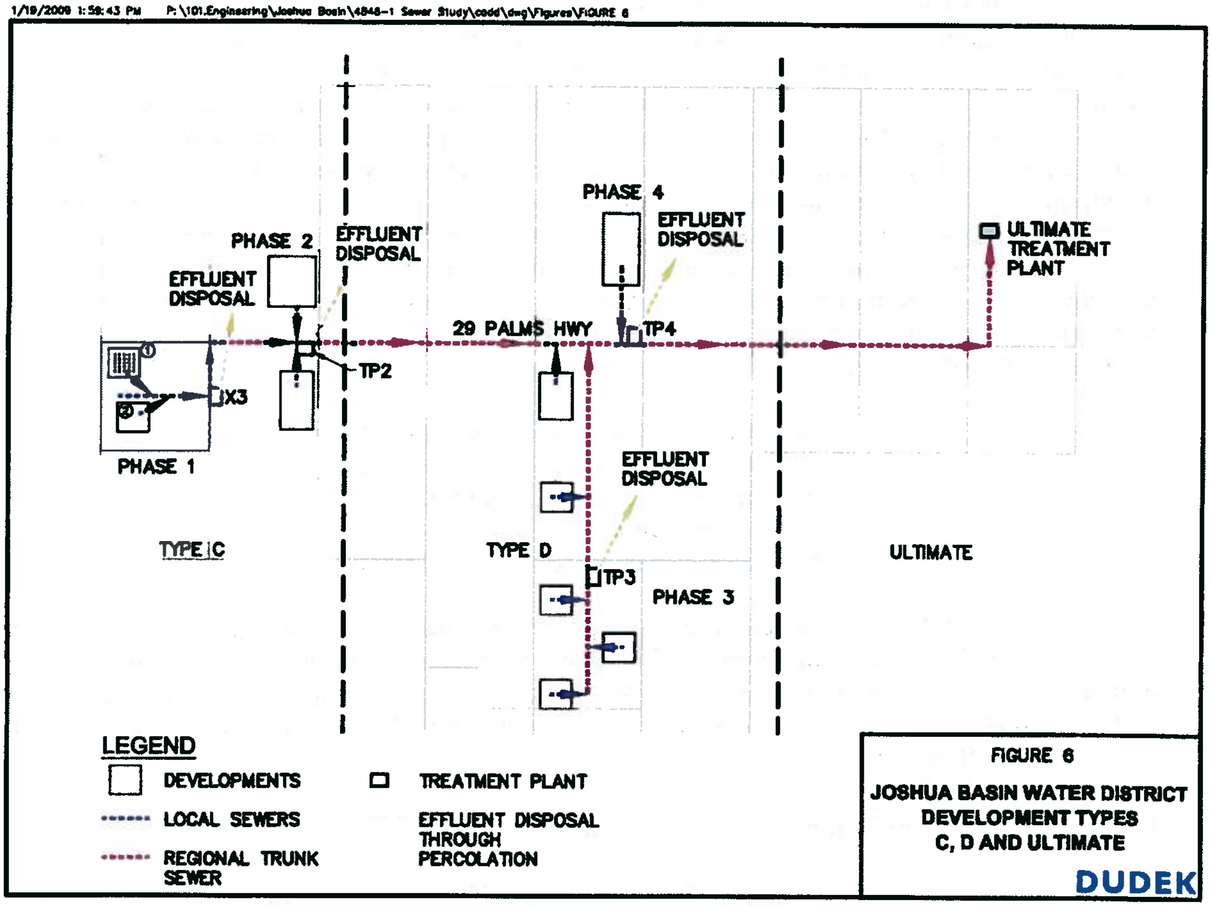

Figure 6 Development Types C, D and Ultimate

5.1.5 Regional Treatment (greater than 2,500 EDUs)

As the District continues to implement the WTS, development will continue to increase to a point when regional treatment will be economical and viable. Based on the WTS plan, the funding for construction of the regional plant will be collected prior to the need for such a facility. Furthermore, the regional treatment site will be identified, acquired, and a smaller treatment facility may be already operating on the regional treatment site.

The necessary wastewater collection system to transport wastewater to the regional treatment site should be substantially complete as a result of the previous phases of development, particularly if larger developments along the 29 Palms Highway alignment are realized. The District would construct the necessary additional conveyance pipelines to transport wastewater to the regional site.

Depending on the amount of wastewater transported to the regional site, the treatment facility could have a capacity of as much as 3,800,000 gpd. Based on these assumptions, the regional treatment plant will cost approximately $42,000,000, or $11 per gallon treated.

5.1.6 Summary of Treatment Thresholds

As previously noted, development pressure will determine the wastewater treatment requirements on a case by case basis. In addition, the development conditions will impact the wastewater treatment decision process. For example, if development progresses in smaller, geographically diverse tracts, the District will be required to evaluate the size and number of package treatment facilities it is managing. Minimizing the number of individual treatment plants will be beneficial from a cost and maintenance standpoint for the District. However, if a large development is proposed that facilitates construction of the regional collection and treatment facilities, the District will benefit through elimination of multiple package treatment plant construction. It is projected that development will likely progress at a slower rate, with larger developments built in the distant future. However, there is no way to fully predict which development schedule will occur. For purposes of planning, we have defined the following treatment thresholds (as discussed in previous sections):

Single Home Developers – Up to 15 EDUs
Small Developments – 15 to 300 EDUs
Medium Developments – 300 to 1,500 EDUS
Large Developments – 1,500 to 2,500 EDUs
Regional Facilities – Greater than 2,500 EDUs

The above thresholds represent the approximate levels at which wastewater treatment requirements will progress as the WTS is implemented. Treatment requirements will range from small local package treatment facilities to larger, clustered package treatment facilities to the establishment of a regional treatment facility. The following discussions summarize how these thresholds are be used in the implementation of the WTS.

5.2 Strategic Plan Implementation Issues

It is important to reiterate that implementation of the WTS plan will require additional studies to be completed. The WTS is merely a strategic plan of how the District will pursue the transition from septic systems to localized and/or regional wastewater treatment. A wastewater master plan will be required to evaluate the overall location and alignment of wastewater facilities, allowing the District to manage the overall implementation process with certainty in the adequacy of installed facilities. The master planning process will also provide clarity with respect to where facilities will be required, how much those facilities will actually cost, and what fees will need to be collected to assure funding of the overall system. In addition, the District will require the development of a master plan to allow the opportunity to apply for various funding assistance, either in the form of grants or low interest loans.

5.2.1 Effluent, Biosolids and Siting Considerations

The concepts for accommodating the requirements of effluent and biosolids disposal have been presented previously in this report. Figure 7 provides an illustration of how a typical treatment plant site might be arranged. As stated previously, the developer will be required to provide the site and design of needed treatment facilities. However, the District will review and approve all facilities, consistent with its standards and WTS planning needs.

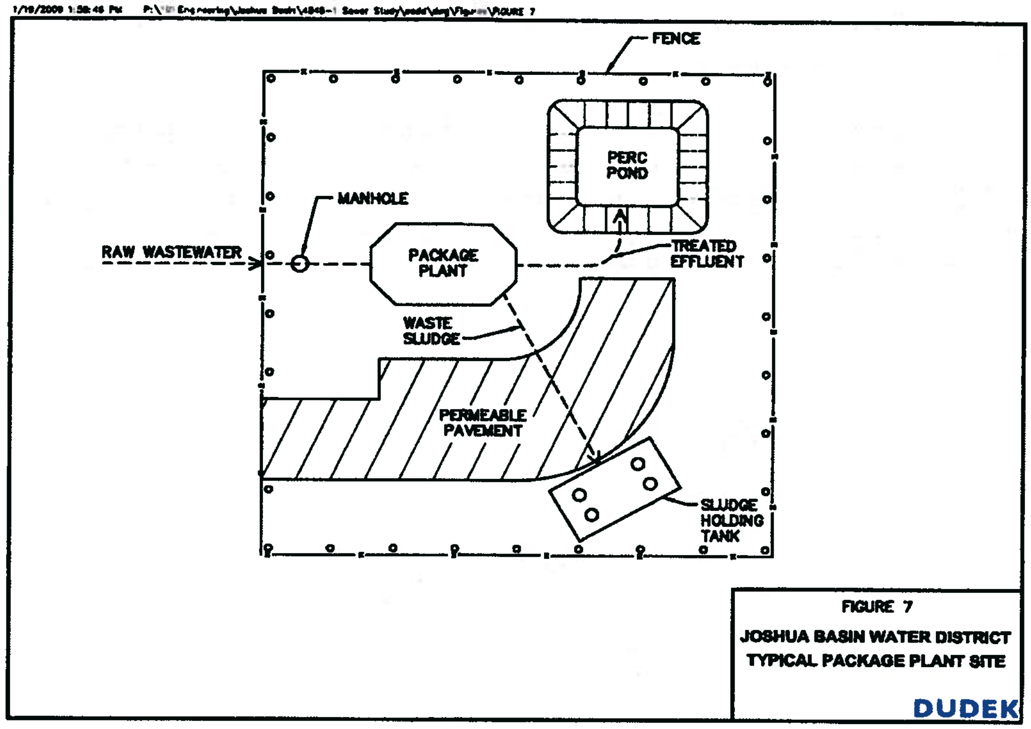

Figure 7 Typical Package Plant Site

A typical package treatment plant will be located on a secure site, with an appropriately sized and located percolation pond. Location of the treatment site may be as much dictated by the topography as by the percolation capacity of the site. The site will include waste sludge (or biosolids) holding facilities, with appropriate access for off-site hauling trucks. Treated effluent will flow to the unlined percolation pond, where it will percolate into the ground. Waste biosolids, stored in aerated on-site tanks, will be hauled away for disposal.

Of course, additional site specific requirements may be added based on the location and proximity of the site to local residents. The District will need to negotiate all site improvements with the developer to assure that all costs are borne by the appropriate developer.

5.2.2 Package Treatment Plant Relocation

The potential to relocate smaller treatment facilities is a significant cost-saving measure for the District. As stated previously, development will likely begin with smaller single family homes. These single developments will likely be allowed to continue to use individual septic systems where impact to the groundwater is determined to not be an issue. However, smaller developments of more than six homes may require the construction of a localized collection and treatment system. However, the District will not want a situation where a large number of these small treatment facilities are active at one time.

Relocation of existing treatment plants will allow the District to maintain control on the overall number and location of smaller treatment facilities. As areas become more developed, the smaller facilities can be relocated and clustered together to form larger, more cost effective treatment facilities. Of course, package treatment facilities have a useful life, and that life expectancy will dictate the cost effectiveness of relocation. Each facility will require a site specific evaluation at the time of development to determine the appropriate course of action.

Figure 8 and Figure 9 illustrate the general concept of physically relocating a package treatment facility. Treatment of the wastewater tributary to the existing treatment facility must be maintained at all times. Figure 8 illustrates how the initial developments might progress. The initial developments will design and construct the necessary pipelines, manholes, and initial treatment facility.

1/19/2009 1:59.51 PM P:\101.Engineering\Joshua Basin\4848-1 Sewer Study\cadd\dwg\Figures\FIGURE 8

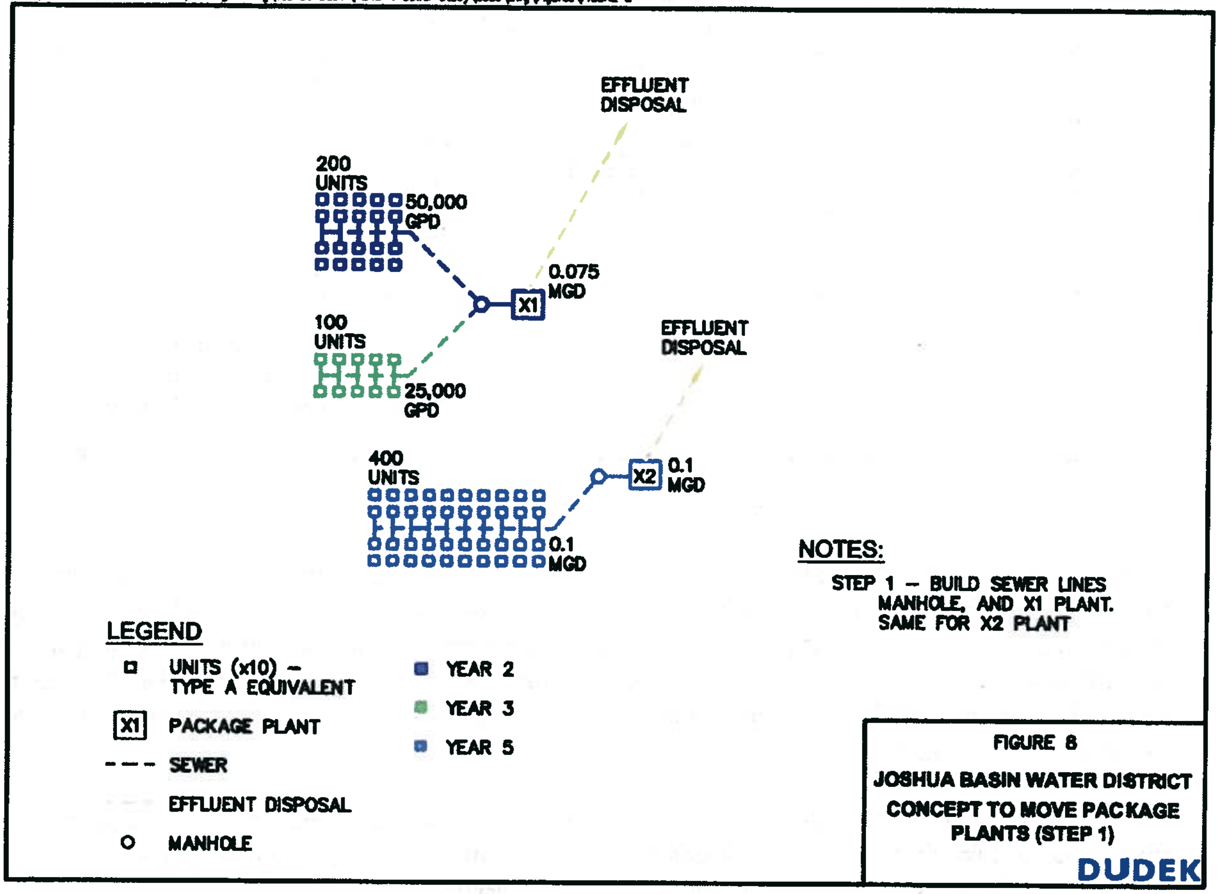

Figure 8 Concept to Move Package Plants (Step 1)

Figure 9 illustrates how the two existing treatment facilities might be combined and relocated to a third site, creating a larger facility serving a larger area. Application of this relocation methodology will limit the number of overall treatment facilities, lowering cost and operational considerations.

It is noted that the relocation scheme is only valid up to the point where the treatment plant size exceeds approximately 200,000 gpd. At that capacity, the Purestream BESST facilities are no longer cost effective, and Aero-Mod facilities are preferred. However, it may be possible to relocate several Purestream systems to a single site, and thereby forego the construction of the more permanent Aero-Mod facility. Actual conditions at the time of development will dictate the appropriate course of action. In the end, relocation of existing treatment facilities will be dependant on the remaining useful life of the existing equipment, the size of the development under consideration, and the time available for construction. Any of these characteristics could result in the District making the decision that relocation of the existing facility is not appropriate, and that a new facility will be required. As stated previously, the developer will be burdened with the cost of design and construction of the appropriate facilities, based on the decision of the District.

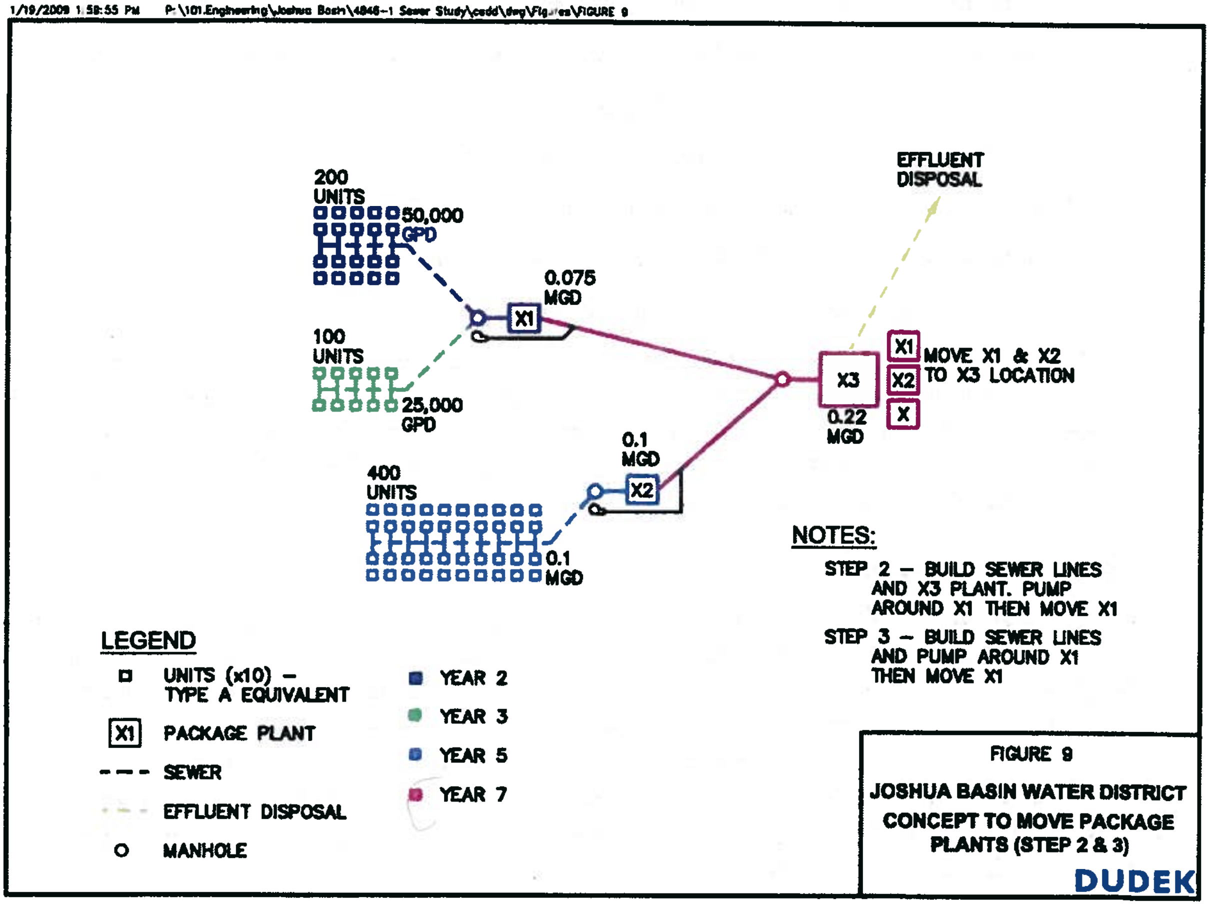

Figure 9 Concept to Move Package Plants (Step 2 & 3)

Section 6 Wastewater Facilities Costs

A primary objective of the WTS planning effort is the development of a sound financial plan that allows the District to successfully acquire the needed funding for near- and long-term maintenance of the plan. To identify the financial needs of the plan, it is necessary to project the approximate cost of the needed facilities over the WTS planning horizon. As such, planning-level cost opinions have been developed for a variety of needed collection system improvements, including gravity sewers, manholes, pump stations, package treatment plants, intermediate sized treatment plants, percolation ponds, and sludge holding tanks. Sizing of the overall wastewater collection and conveyance facilities were presented previously in Section 2, summarized into 15 drainage areas.

6.1 Collection Pipelines

Gravity collection systems were defined and presented in Section 2 of this report. The following discussions present the identified cost of those facilities, for subsequent use in the financial analyses of this study.

6.1.1 Cost Estimating Assumptions

The following assumptions were incorporated to facilitate the identification of future District collection and conveyance facilities:

- Preliminary cost opinions are developed based upon 2008 construction costs
- Gravity pipelines are estimated at a cost of $12 per inch diameter per foot of pipeline
- Manhole are estimated at a cost of $7,000 each
- Manholes are assumed to be required every 450 feet
- Design standards are typical of sewer construction for 2008
- Interceptor and trunk sewers are assumed to previously collected connection fees
- Local collection sewers with developments are paid for by developers

Identifying the alignment of collection pipelines within each Drainage area requires an assumed level of development density within each development. In Section 33 of Drainage Area 2, the proposed development of 2,700 homes per square mile is a density of 4.2 EDU per acre. Much of the proposed development in the Joshua Basin area is for a density of 3 to 10 EDU per acre. Application of development densities was presented in Section 2 of this report.

6.1.2 Collection System Costs

The interceptor and trunk sewer system presented in Figure 3 does not identify each of the individual sewers necessary for proper collection of wastewater within each Drainage area. For example, in Drainage Area 2, which is 1,952 acres in size, approximately 18,300 linear feet of the trunk sewer is located inside the Drainage area, and 3,500 linear feet is located on the northern boundary with Drainage Area 1. It is estimated that service to the entire Drainage Area will require installation of additional lengths of collection sewers. This additional sewer and manholes in Drainage Area 2 is estimated to cost approximately $3,000,000. However, this cost is assumed to be borne entirely by the developers within that drainage area.

The construction cost estimate for the entire study area, necessary to serve all 15 Drainage Areas, in 2008 dollars is approximately $25,900,000. This value is detailed by approximate apportionment to each drainage area in Table 5. Of this value, approximately $8,500,000 is projected to be associated with construction of the main trunk interceptor within Twentynine Palms Highway.

As an example, the main trunk sewer cost for Drainage Area 2 is estimated to be approximately $5,358,000. Therefore, the total sewer collection system cost in Drainage Area No. 2 would be approximately $8,358,000 (adding the $3,000,000 identified above). In addition, the cost of the 900,000 gpd of treatment capacity would increase the cost by approximately $13,000,000. Dividing the total Drainage Area 2 cost of $21,358,000 by the estimated development within Drainage Area No. 2, estimated to be 4,134 EDUs, results in a cost per EDU of approximately $5,200.

Table 5 Interceptor and Trunk Sewer Cost by Drainage Basin

Drainage Basin	Construction Cost
1	$ 1,194,000
2	$ 5,358,000
3	$ 5,180,000
4	$ 3,134,000
5	$ 877,000
6	$ 0
7	$ 2,852,000
8	$ 833,000
9	$ 3,169,000
10	$ 1,368,000
11	$ 409,000
12	$ 0
13	$ 513,000
14	$ 838,000
15	$ 214,000
Sub Total	**$ 25,939,000**

6.2 Effluent Disposal and Biosolids Handling

Costs for effluent disposal consist of construction of unlined percolation ponds, corresponding to the individual treatment facilities capacity. As can be determined, the infiltration rate for these facilities will greatly impact their size and cost. For purposes of this evaluation, we have assumed an infiltration rate of 1.0 feet per day. For percolation of treated secondary effluent, there is the potential for partial blinding of the soil surface, resulting in decreased percolation capability. The following provides estimated area and cost for needed percolation facilities based on the anticipated treatment facility capacities:

- A 20,000 gpd treatment facility will require a 750 square-foot percolation basin. This basin would be approximately 27 linear feet square, and is estimated to have a construction cost of approximately $15,000.
- A 200,000 gpd treatment facility will require a percolation basin size of 7,500 square feet, or 90 linear feet square. The estimated construction cost of this earthen basin is approximately $90,000.

As for percolation basins, biosolids handling is required at each treatment facility. As stated previously, it is assumed that biosolids will be stored on site and trucked to ultimate disposal. The following provide the estimated costs of these facilities:

- Biosolids handling at a 20,000 gpd facility will required an aerated storage tank size of 25,000 gallons. A tank of that capacity, with appropriate aeration systems, is estimated to have a construction cost of approximately $40,000.
- For a 200,000 gpd facility, the required storage system will be approximately 150,000 gallons. An aerated storage tank of that size is estimated to have a construction cost of approximately $210,000.

6.3 Treatment Facility Costs

In addition to the costs associated with collection, disposal and solids handling, the largest cost will involve the actual treatment of wastewater. The following delineate the costs for various capacities of required treatment for the anticipated flows.

6.3.1 Treatment Facility Cost Assumptions

The cost for various package treatment systems were presented in Section 4 for both 20,000 gpd and 200,000 gpd, as well as for the anticipated regional treatment requirement. The capital cost for a typical 20,000 gpd package plant, using the Purestream BESST system, is approximately $430,000. The anticipated annual O&M cost is projected to be approximately $59,500 per year. The projected capital cost for a typical 200,000 gpd treatment facility, using the Aero-Mod process, is approximately $3,460,000, with an annual O&M cost of approximately $212,000 per year. As presented previously, the actual cost will be determined by the develop-specific conditions, and will be borne by the developer in each circumstance.

6.4 Regional Conveyance Systems

Regional conveyance systems are defined to comprise those facilities that will be needed to connect the various package treatment systems, over time, into a larger, regional collection system. These facilities will be developed over a long period of time, depending on development pressure. The development of an overall wastewater master plan will be needed to accurately predict facilities to be constructed. For this reason, costs for these facilities are not identified at this time. Instead, the cost of anticipated ultimate conveyance system has been identified, as discussed in Section 6.1 above.

6.5 Clustered and Regional Treatment Facilities

Actual costs for these facilities will be based on the ability and opportunity for clustering of existing treatment facilities for cost and operational savings. Site specific conditions will dictate the ability for clustered treatment facilities. For purposes of comparison, the following treatment levels have been developed:

- The preliminary capital cost for a 200,000 gpd treatment facility is estimate to be approximately $3,460,000, with an annual O&M cost of approximately $212,000 per year.
- The preliminary capital cost of a 600,000 gpd treatment facility is estimate to be approximately $9,000,000, with an annual O&M cost of approximately $490,000 per year.
- The preliminary capital cost of a 3.8 mgd extended aeration treatment facility is estimated to be approximately $42,000,000, with an annual O&M cost of approximately $1,300,000 per year.
- The preliminary capital cost of a 3.8 mgd MBR treatment facility is estimated to be approximately $ 65,000,000, with an annual O&M cost of approximately $2,500,000 per year.

Section 7 Financial Alternatives for WTS Implementation

7.1 Financial Alternatives

The following discussions identify options available to the Joshua Basin Water District for financing the construction and ongoing maintenance of its future wastewater collection and treatment facilities. This section provides descriptions of the most viable financing options, service these financing options can provide, the relevant state statues involved, how the financing options are implemented, and the advantages and disadvantages of each option. The financing options considered include Assessment Districts, Community Facilities Districts (CFDs - otherwise known as "Mello-Roos Districts"), Connection Fees, Parcel Taxes, Sewer Rates, Revenue Bonds, Certificates of Participation (COPs), and State and Federal Financial Assistance.

7.1.1 Assessment Districts

Assessment Districts are special benefit districts that are formed to pay for certain public facilities, such as water distribution and treatment, and wastewater collection, transmission and treatment. An assessment lien is attached against the properties within the district based upon the benefit that each property receives from those public facilities. The majority of Assessment Districts for public facilities are formed under the Municipal Improvement Act of 1913. If bonds are issued in conjunction with the Assessment District, they are usually issued under the Improvement Bond Act of 1915. To form an Assessment District, an Engineer's Report must be prepared, assessment ballots must be mailed out to all property owners within the district, and the ballots must be tabulated. The Assessment District is approved if 50% or greater of the ballots are in favor of the assessment, with the ballots being weighted according to the proportional financial obligation of the affected property.

An advantage of forming an Assessment District is that the costs of the public facilities can be financed over an extended period of time, typically 30 years, using tax-exempt bonds with relatively lower interest rates than standard bonds. Since the costs of the public facilities are financed, the developer's costs are lower and theoretically these savings could result in a lower purchase price for the homes. One of the disadvantages in forming an Assessment District is that the district is subject to the benefit nexus requirements of Articles XIIIC and XIIID of the California Constitution (Proposition 218). Each property can only be assessed for the special benefit that it receives from the public facilities. An Engineer's Report must be prepared that develops an assessment methodology that spreads the costs of the public facilities to each property based upon the special benefit that the property receives. Only special benefits are assessable, and the agency must separate the general benefits from the special benefits conferred upon the property.

If bonds are issued, that creates some additional duties. The Agency would be responsible for annual disclosure requirements regarding the district and the bonds. Additionally, the Agency would be responsible for managing delinquency issues within the district. If delinquencies become extreme, then bond delinquency covenants may call for the Agency to proceed with foreclosure proceedings to cure the delinquencies. Agencies frequently hire third party consultants to handle these various additional duties. In any case, the bonds are limited obligations, and the Agency is not directly liable for payment of debt service.

7.1.2 Community Facilities Districts

A community facilities district ("CFD") is a financing tool that may be used to pay for the cost of, among other things, public facilities with a useful life greater than five years. A CFD imposes a "special tax" upon a property, as opposed to an assessment lien imposed by an assessment district. Bonds may be issued in conjunction with a CFD.

Community Facilities Districts are authorized to be formed under the Mello-Roos Community Facilities Act of 1982 (the "Act"). The Act was passed in order to give agencies an alternative financing tool to fund certain public facilities and/or services. The Act allows for the formation of a CFD in order to finance the purchase, construction, expansion, improvement, or rehabilitation of any real property with an estimated useful life of five years or longer, or may finance the planning and design work related to such real property. The CFD can also be used to pay for incidental expenses such as costs associated with the creation of the district, issuance of bonds, determination of the amount of taxes, and collection of taxes. Bonds are usually issued in conjunction with a public facility CFD in order to pay for the public facility improvements.

In order to provide funds to make the bond payments and pay for incidental expenses, a special tax lien is placed upon the taxable properties within the district. A document called the Rate and Method of Apportionment (the "RMA") dictates which properties are taxable and specifies how the annual special tax requirement (the amount necessary to service the bond payments and pay for incidental expenses) is spread among taxable property within the district. The RMA specifies the annual maximum special tax rates for each class of property, as well as the method of apportionment used to allocate the special tax requirement among the different property classes.

However, the Agency would have some constraints in setting the maximum special tax rates. Bond underwriting requirements, and the Act, state that revenues from special taxes must be sufficient to provide at least 110% coverage for debt service requirements, throughout the life of the bonds. That is, the maximum special tax rates and the method of apportionment must allow the issuer the ability to collect at least 10% more than is necessary for the bond payments and the incidental expenses.

The Agency would receive the proceeds from the sale of the bonds, and would be able to use the proceeds to pay for public facilities. A Notice of Special Tax Lien would be filed with the County Recorder, placing a special tax lien upon the taxable property within the district. Each fiscal year, the special tax requirement for the district would be determined and the amount of special taxes to be levied on each class of property would have to be calculated. The special taxes would be collected by the County on the property tax bills, and the proceeds of these taxes would be delivered to the Agency. The Agency would then in turn use the special tax proceeds to pay for the debt service on the bonds and to pay for the incidental expenses associated with the district.

7.1.3 Connection Fees

The use of development impact fees is a common method of ensuring that new development pays for the costs of its needed infrastructure. Sewer connection fees are development impact fees that are charged to new development in order to mitigate the costs to the Agency for the new development's wastewater treatment capital needs. Sewer connection fees are paid by developers typically when a building permit is issued. These fees are authorized by the Mitigation Fee Act, contained in Government Code Sections 66000 through 66025.

Sewer connection fees only need a majority vote of the legislative body for adoption. However, the Mitigation Fee Act requires five statutory findings in order for the Agency to adopt the fees. The five statutory findings are listed below:

- Identify the purpose of the fee.

- Identify the use to which the fee is to be put.
- Determine how there is a reasonable relationship between the fee's use and the type of development project on which the fee is imposed.
- Determine how there is a reasonable relationship between the need for the public facility and the type of development project on which the fee is imposed.
- Determine how there is a reasonable relationship between the amount of the fee and the cost of the public facility attributable to the development on which the fee is imposed.

The District may levy connection fees on developers for the construction of the treatment plants and related capital facilities that serve the new development. They are typically not allowed for maintenance and operation of the facilities although there is one exception to this rule. A connection fee may be utilized for operations and maintenance of wastewater facilities if the improvement is to serve only the specific development on which the fee is imposed and the improvement serves 19 or few lots or units. The caveat with this approach is that the District would have to make findings, citing substantial evidence that it is infeasible or impractical to form an assessment district or to annex.

7.1.4 Parcel Taxes

A parcel tax is a special tax that may be passed for a wide range of general services or may be specific to public projects such as wastewater treatment facilities. Similar to a CFD, a parcel tax is considered a special tax, as opposed to an assessment lien associated with an Assessment District. Revenues generated from the tax can be used for any District purpose, capital, operating or debt service, as specified in the ballot language for the tax. Registered voters within District boundaries would be eligible to vote on the tax measure.

Parcel taxes are authorized under Government Code Section 37100.5. The taxes are primarily levied on a flat per-parcel rate (thus the term "parcel tax"). However, a parcel tax can also be levied on a variable rate based upon land use, size of the parcel, or the number of units on the parcel. Parcel taxes may be excise taxes that are based on the use or availability of facilities and/or services. Parcel taxes may also be subject to a proportionality requirement. This concept requires a tax to be based upon a measure that reflects the proportion of the taxed activity that is actually carried on within the jurisdiction. A parcel tax can be levied for a predetermined number of years, although it is possible to adopt a permanent parcel tax.

7.1.5 Sewer Rates

Sewer rates are fees that could be charged by the District for wastewater utility services. They are charges that are paid on an ongoing basis by the users of the Districts wastewater systems. Most costs associated with the operation of the wastewater system can be factored into the sewer rates, including capital expenditure costs, operation & maintenance costs, and debt servicing. These fees or rates are supported by a cost of service study showing the revenue requirement that will be met through the collection of the fees as well as the method for reasonably apportioning the revenue to customers.

Fees for sewer service in California are considered to be property-related and therefore the substantive and procedural requirements of Article XIIID of the California Constitution (Proposition 218). For the District to impose new or increased sewer rates to finance wastewater operations and capital needs, the Proposition 218 noticing and public hearing requirement would be mandatory. Notices of the proposed new rates or rate increase must be sent to all affected customers. The notice must also announce the date, time and place for a public hearing regarding the rate increase. If more than 50% of the affected customers protest the rate increase *in writing*, the increase must be abandoned. If there is not a majority protest, the District would be able to adopt the new rates. If the sewer rates were designed to pay all or a portion of revenue bonds, the procedural requirements of the Revenue Bond Law of 1941 would likely apply as well.

7.1.6 Revenue Bonds

Revenue bonds, issued pursuant to the Sewer Revenue Bond Act of 1933 (Health and Safety Code Section 4950 et seq) or the Revenue Bond Law of 1941 (Government Code Section 54300 et seq), are issued to acquire, construct or expand public projects, including wastewater systems, for which fees, charges or admissions are charged. In the case of the District, the sources of bond repayment could be wastewater service charges, connection fees, leases, rents and standby charges identified for purposes of debt service related to the financed facilities. Because the debt service is directly paid from the income generated by the financed facilities, such debt is considered self liquidating and generally does not constitute debt of the District. To authorize a revenue bond issue, the District would be required to pass a resolution or ordinance and hold a public hearing to set rate or fees to support the debt service. Additionally, many types of revenue bonds require majority voter approval to authorize the size and purpose of the bond issue. Voter approval is not required if statutes specifically permit, or in certain cases if bonds are sold through joint powers authorities. It is our understanding that the District would require voter approval prior to issuing debt under either statutory authority.

7.1.7 Certificates of Participation (COPs)

This financing technique provides long-term financing through a lease or installment sale agreement that does not require voter approval. COP financing is based upon the same theory as non-profit corporation financing, which is, providing long-term financing through a long-term lease arrangement. COPs represent a proportionate interest of the holder's right to receive a portion of each payment made by the public agency (District) under the installment sale agreement or lease between the District and a third party.

The issuance of COPs is not subject to the statutory requirements applicable to the issuance of revenue bonds of a non-profit corporation. COPs are not considered debt under the California Constitution and voter approval is not required as may be the case with revenue bonds. The project and site are leased to the obligator and, in exchange for the right to use the project and the site, the obligator makes lease payments to a lessor. Bonds are payable solely from these payments made by the obligator. Similar to revenue bonds, reserves are typically required with COPs and may take the form of a reserve fund account. Reserves are typically required with COPs and may take the form of a reserve fund account.

7.1.7 State and Federal Financial Assistance

There are several sources of state and federal financial assistance for wastewater system design and construction. The two more popular options available to the District are: 1) State Revolving Fund Loans and 2) USDA Rural Utilities Service Loans and Grants.

7.1.7.1 State Revolving Fund Loans

The Clean Water State Revolving Fund (SRF) programs operate like banks. Federal and state contributions are used to set up the programs. These assets, in turn, are used to make low interest loans for projects such as wastewater collection and treatment facilities. Funds are then repaid to the SRF over terms as long as 20 years. Repaid funds are recycled to fund other water quality projects. These SRF resources can help supplement the limited financial resources currently available for decentralized treatment systems. The sources of repayment by the District would need to be identified prior to application. Such sources may include District property tax revenue, sewer rates, assessment or tax funds, and connection fees.

7.1.7.2 USDA Rural Utilities Service

USDA Rural Utilities Service Water and Wastewater Disposal Loans and Grants are available to develop water and wastewater disposal systems in rural areas and towns with a population of less than 10,000. The grant funds are available to reduce water and waste disposal costs to a reasonable level for rural users. Grants may be made for up to 75 percent of eligible project costs in some cases. The Rural Utilities Service also guarantees water and waste disposal loans made by banks and other eligible lenders. The facilities financed must be owned and controlled by the borrower/grantee. Financed decentralized systems within the District would have to be owned and managed by the RUS borrower/grantee.

7.2 Comparative Analysis of Financial Alternatives

Funding Option	Description	Pros/Cons	Funding Restrictions	Approval Procedure
Special Assessments	A benefit assessment imposed on real property for financing capital facilities and operations and maintenance of wastewater systems that directly benefits that property.	**Pro** • Flexible financing mechanism capable of funding wastewater capital and O&M needs • Economic efficiency (only those who benefit pay) • Developers more motivated to develop projects with assessment district formed • Simple majority vote required rather than super-majority (2/3) • Assessment bonds are not a financial obligation of the District **Con** • Must conduct benefit finding test and prepare Engineer's report • Must go through Proposition 218 noticing and balloting procedure (easier to do when one property owner is single voter) • Potential adverse property owner reaction to an assessment lien • Lien could impact future value or ability to resell improved property • Ongoing administration of assessment district • Cash flow governed by County tax reimbursements to JBWD	Bond proceeds and annual assessments can only be used for capital and O&M needs related to wastewater systems and administration of assessment district. Assessments appear on property owners' tax bill.	Proposition 218 noticing and balloting requirements. Majority protest procedure weighted by the dollar amount of the ballots cast. County Registrar of Voters is not required to conduct balloting procedure.

Funding Option	Description	Pros/Cons	Funding Restrictions	Approval Procedure
CFDs ("Mello Roos")	A special tax district that may be used to pay for the cost of wastewater facilities with a useful life greater than five years. Bonds may be issued in conjunction with a CFD.	**Pro** • Flexible financing mechanism capable of funding wastewater capital needs • No benefit nexus requirements • Greater flexibility than assessment district in annexing land to CFD in the future as more users come on line to the system(s) • New development pays its fair share • Developers more motivated to develop projects with CFD formed • CFD bonds are not a financial obligation of the JBWD **Con** • Can only fund wastewater capital needs, not O&M • Special election procedure • Higher voter threshold (2/3 vote of registered voters within CFD or landowners if less than 12 registered voters) • Potential adverse property owner reaction to a special tax • Ongoing administration of CFD and related bonds • Cash flow governed by County tax reimbursements to JBWD	Bond proceeds and annual tax payments can only be used for capital needs.	Special election procedures can be held at any time during the year. Registered voter vote or landowner vote is less than 12 registered voters within CFD boundaries. County Registrar of Voters is not required to conduct election.

Funding Option	Description	Pros/Cons	Funding Restrictions	Approval Procedure
Connection Fees	Sewer connection fees utilized to fund the cost of wastewater system design and construction. Fees are charged to new development for its fair share of costs associated with wastewater collection and treatment facilities.	**Pro** • "Growth pays for growth" • Fee is paid upfront by developer • "Pay as you go" financing often more desirable than issuing long-term debt **Con** • A clear and defensible nexus must be determined to implement fees • Can only pay for capital not O&M • Annual administration and accounting of fees • Can be politically-charged within the development community • Risk of development slowdown which will reduce fee revenues	Fee revenues can only be utilized for capital needs. Fee revenues must be accounted for annually and spent on identified facilities within 5 years; however, some latitude does exist in this requirement.	No voter approval necessary. Must go through legislative body-conducted public hearing. 60-day protest period must transpire before implementing and collecting fees.
Funding Option	**Description**	**Pros/Cons**	**Funding Restrictions**	**Approval Procedure**
Parcel Taxes	Special non ad valorem tax on parcels of property generally based on either a flat per-parcel rate or a variable rate.	**Pro** • No benefit nexus requirements • Often are passed successfully because they are tied to specific purposes • Can fund capital, O&M and debt service needs **Con** • Super-majority approval requirement (2/3 of registered votes in JBWD boundaries) • Vote can only occur on certain dates in a year • Cash flow restricted to County disbursement of taxes • Special election can be costly	Parcel tax revenues can only be allocated to specific purposes identified in ballot materials.	Registered voter approval process conducted through the County Registrar of Voters. Special election can be costly to the District.

Funding Option	Description	Pros/Cons	Funding Restrictions	Approval Procedure
Sewer Rates	A property-related charge imposed on a parcel or upon a person as an incident of property ownership for wastewater service	**Pro** • Can fund capital, O&M and debt service needs • Regular cash flow if billed on a regular basis • No voter approval requirement **Con** • Strict cost of service analysis must be performed • Mailed notice and public hearing requirement with majority protest component • Cash flow restricted to County disbursement of rate revenue if charge placed on County tax rolls	Use of funds must be specified in cost of service report and Proposition 218 notices.	Mailed notices must go to each property owner and/or ratepayer affected by new or increased sewer rate. Public hearing must be conducted with JBWD Board no earlier than 45 days after notices mailed. Majority written protest requirement.

Funding Option	Description	Pros/Cons	Funding Restrictions	Approval Procedure
Revenue Bonds	Bonds issued to design and construct capital facilities secured through revenue sources identified by the District, typically user charges.	**Pro** • Depending on revenue stream, significant capital can be raised to construct wastewater systems • Longer term of maturity for bonds (30 years) than low-interest SRF loans **Con** • Likely voter approval requirement • Cannot fund O&M requirements • Debt coverage ratios must be adequate to issue bonds • Must identify stable revenue stream to pay annual debt service	Bond proceeds can only be utilized for wastewater capital projects identified in bond covenants. Debt coverage ratios and other covenants must be met.	Public hearing process with District Board. Voter approval likely.

Funding Option	Description	Pros/Cons	Funding Restrictions	Approval Procedure
Certificates of Participation	A financing technique that provides long-term financing through a lease or installment sale agreement.	**Pro** • Flexible financing mechanism that does not incur bonded indebtedness for the District • No voter approval requirement **Con** • Can be complex to set up financing framework • Cannot fund O&M requirements • Debt coverage ratios must be adequate to issue COPs	Bond proceeds can only be utilized for wastewater capital projects identified in bond covenants. Debt coverage ratios and other covenants must be met.	District Board approval required. No voter approval requirement.
Funding Option	**Description**	**Pros/Cons**	**Funding Restrictions**	**Approval Procedure**
State and Federal Financial Assistance	Grants and low-interest loans made available to agencies through a competitive process for wastewater system design and construction.	**Pro** • Low interest loans • Provides financial bridge for projects that are close to being viable **Con** • Risk associated with loans for projects • Competitive process for loan and grant assistance • CA budget crisis may restrict amount of funds available • Shorter term (20 years) than other forms of debt financing • Grants can only cover a portion of eligible costs	Funds can only be used for capital facilities. Grants can only cover up to 75 percent of eligible facility costs. For low-interest loans, sufficient revenue sources must be identified to repay loans.	No voter approval required. District must go through competitive application process.

7.3 Annual Cost Considerations

Development of a long-range financial plan makes use of hypothetical scenarios, defining a range of options to meet the needs of the District as it grows. This approach is challenging, as development activity and related infrastructure requirements are difficult to predict when the planning horizon extends beyond five years. Future planning is particularly difficult for the District as it attempts to project development activity throughout the study area boundary, along with related wastewater collection and treatment facility needs and regulations.

For this analysis, three recommended financial mechanisms are defined for capital and O&M needs related to wastewater collection, treatment facilities and services. The three financing alternatives include Connection Fees, Community Facilities Districts, and Sewer Service Charges. These mechanisms are used concurrently at the time of development, or can be adopted separately depending on the development type. This report serves as the nexus study analysis for adoption of connection fees. This report does not serve as a Special Tax Report for CFD formation, nor does it serve as a basis for setting Sewer Service Charges. It is recommended that separate reports for these mechanisms be developed at the time of development to ensure that the report accurately assesses the amount of funding needed and the number of development units, or EDUs, that will be created in each development. This approach assures the most technically defensible reporting and justification for each funding mechanism.

7.3.1 Connection Fee Analysis

Utility connection fees are suggested to finance the estimated costs associated with wastewater collection and treatment facility construction. Connection fees, however, cannot be used to fund the annual operations and maintenance costs of these facilities. To fund the O&M costs, the District will need to impose sewer rates - to be billed regularly to the property owner/ratepayer of each account within a particular development.

This approach centers on the costs associated with the assumed future connection to a larger, regional collection and treatment system. Should the regional treatment facilities not be constructed within the useful life of a single developments package treatment facility, the connection fee revenue collected would be used for replacement of that package treatment plant. If the connection fee funds are not sufficient to finance the entire package plant, the District will use a CFD, formed at the time the development project is constructed, to fund the additional revenue needed. This arrangement should be noted in the accompanying Special Tax Report for CFD formation.

The primary policy objective of the District's connection fee program is to assure that new users and/or new development pays their fair share of the capital costs associated with demands on the wastewater collection and treatment system. To fulfill this objective, the District will review and update its connection fee schedule and charge periodically to incorporate the best available information at the time.

Connection fees are one-time fees, typically paid when applying for new or increased service, and are imposed on development projects by local agencies. To guide the widespread imposition of such charges, the State Legislature adopted the Mitigation Fee Act ("Act") with Assembly Bill 1600 in 1987 and subsequent amendments. The Act, contained in California Government Code (beginning with Section 66000), establishes requirements on local agencies for the imposition and administration of fee and charge programs. The Act requires local agencies to document five findings when adopting a fee. The five findings in the Act required for adoption of the maximum justified fees documented in this report are: 1) Purpose of fee, 2) Use of fee revenues, 3) Benefit relationship, 4) Burden relationship, and 5) Proportionality. These findings are discussed below and supported throughout this report.

7.3.1.1 Purpose of Fee

- *Identify the purpose of the fee (§66001(a)(1) of the Act).*

It is the expressed desire that new users and/or new development not burden existing users with the cost of public facilities required to accommodate growth. The purpose of a Connection Fee, as documented by this Report, is to implement a system whereby a funding source is developed from new users for needed infrastructure. The exaction of the fee advances a legitimate interest by enabling the District to meet the wastewater collection and treatment needs of new users.

7.3.1.2 Use of Fee Revenues

- *Identify the use to which the fees will be put. If the use is financing facilities, the facilities shall be identified. That identification may, but need not, be made by reference to a capital improvement plan as specified in §65403 or §66002, may be made in applicable general or specific plan requirements, or may be made in other public documents that identify the facilities for which the fees are charged (§66001(a)(2) of the Act).*

The Connection Fee, as documented by this Report, will be used to create new capacity for wastewater collection and treatment as development occurs within the defined service area. Collected revenues will then be used by the District for capital investments resulting from new development for new wastewater collection and treatment facilities, to upgrade existing facilities, or for other capital infrastructure costs to keep the system operating at acceptable levels.

7.3.1.3 Benefit Relationship

- *Determine the reasonable relationship between the fees' use and the type of development project on which the fees are imposed (§66001(a)(3) of the Act.*

The District's new collection and treatment facilities establish a district-wide network of service accessible to the buildings and other facilities resulting from new users and/or new development. Fee revenues will be used to develop new wastewater facilities, which will benefit those new users. Thus, there is a reasonable relationship between the use of fee revenues and the types of new users or new development that will pay these charges.

7.3.1.4 Burden Relationship

- *Determine the reasonable relationship between the need for the public facilities and the types of development on which the fees are imposed (§66001(a)(4) of the Act).*

The need for the new wastewater facilities is based on the cumulative demand for wastewater collection and treatment imposed on the District based on the estimated wastewater flows within each proposed development project. Thus, there is a reasonable relationship based on sound engineering principles for the charges imposed.

7.3.1.5 Proportionality

- *Determine how there is a reasonable relationship between the fees amount and the cost of the facilities or portion of the facilities attributable to the development on which the fee is imposed (§66001(b) of the Act).*

This reasonable relationship between the Connection Fee, for a specific development project, and the cost of the facilities, attributable to wastewater demand resulting from that development project, will reflect the estimated system capacity demand of that project. The total charge for a specific project is based on the project's projected use of wastewater system capacity. The schedule of charges converts the estimated capacity that a development project will use in the system into a charge based on the wastewater flow generated by that project. Thus, the schedule of charges assures a reasonable relationship between the fee for a specific development project and the cost of the facilities associated with demand resulting from that development project.

7.3.2 Connection Fee Quantification

The table below presents the unit cost per gallon per day (gpd) of estimated wastewater flow (cost per capacity demand), which is used as the basis of determining the connection fee. Using conservative estimates defined in previous sections of this report for construction costs of the regional treatment facility ($65 million for MBR treatment) and the collection system ($26 million) and the projected capacity needs at build out within the study area boundary, the unit cost is determined. Assuming a 3.8 mgd MBR treatment facility will ultimately be required to serve future development within the study area, the cost per gallon per day would be approximately $23.95.

Unit cost per GPD (Regional Facility)

Wastewater Collection & Treatment Capital Cost	$	91,000,000
Demand Flow of Future Users		3,800,000
Capital Cost per GPD	$	23.95

The following table identifies the cost, in terms of system cost, per residential unit. The cost of system infrastructure needed to provide adequate capacity to serve development is based on the cost per gpd ($23.95) multiplied by the average daily effluent flow of a single EDU - defined to be approximately 220 gallons per day. Although the basis for the connection fee is the cost per gpd flow, the fees will ultimately be assessed based on development type and would need to be modified should development vary significantly from a predominantly single-family residential environment.

Fee per Equivalent Dwelling Unit (EDU)

Capital Cost per GPD	$	23.95
Flow per EDU (gpd)		220
Fee per EDU	$	5,270

Connection fees are required, under the Act, to fund new development's fair portion of needed facilities. Should the District opt to use fee revenue for projects that serve both new and existing development, the District should consider how deficiencies (related to existing development) might be supplemented through the use of alternative funding sources. Potential sources of revenue may include CFD special taxes and/or sewer service charges.

It is noted that the above analysis is based on an assumed MBR treatment plant for the District's regional wastewater treatment facility. This assumption has been made to develop the most conservative estimate of potential costs per EDU. As development progresses, the District may decide that less costly alternatives will sufficiently meet current or near-term regulation requirements. As such, the District may enforce less stringent treatment requirements. For the purposes of establishing the District wastewater treatment strategy, the most conservative estimates have been used.

7.3.2.1 Inflation Adjustment

Appropriate inflation indexes will be identified in a connection fee ordinance, including an automatic annual adjustment to the charge. The annual increase can be based on a construction cost index, which may be based on recent capital project experience or taken from any reputable source (such as the Engineering News Record). To calculate prospective fee increases, each index is weighed against its share of total planned facility costs represented by land or construction, as appropriate.

7.3.2.1 Annual Reporting

The District will comply with the annual reporting requirements of the Act, as detailed in California Government Code Section 66000 et seq. For facilities to be funded by a combination of connection fees and other revenues, identification of the source and amount of these non-fee revenues is essential. Identification of the timing of receipt of other revenues to fund the facilities is also important.

The District will deposit connection fee revenues into a restricted account. Capacity charges collected for a given facility category will only be expended consistent with the "Use of Fee Revenues" finding documented in the previous discussions.

7.3.2.3 Programming Revenues and Projects with the CIP

The District will maintain a Capital Improvement Plan (CIP) to adequately plan its future infrastructure needs. The District will commit projected connection fee revenues and fund balances to specific projects. These commitments represent the types of facilities needed to serve new growth as described in this report. The use of the CIP in this manner documents a reasonable relationship between new development and the use of collected revenues.

7.3.2.4 Estimated Sewer Service Charges for Regional Plant Operations

Under this scenario, there will be ongoing annual operations and maintenance expenses associated with the proposed MBR treatment plant. We recommend the District utilize sewer service charges to fund these O&M costs. Assuming that the MBR treatment plant would cost $2.5 million in today's dollars to operate annually (see page 19 of this report) and would serve approximately 17,272 EDUs each year (3.8 million gallons / 220 gpd per EDU), the estimated annual sewer service charge would be $145 per

EDU per year. We recommend the District conduct a comprehensive sewer rate study at the time the plant is near completion to accurately reflect all costs associated with the plant operations and maintenance as well as include an inflator to the rate schedule to keep rates in line with rising costs.

7.4 CFD and Sewer Service Charge Scenarios

The District will adopt a connection fee similar to the one identified in the preceding discussions. This approach allows the District to collect fee revenues for capital facilities associated with large-scale growth, which will take place over time as development activity ensues. Using the build-out approach, the establishment of a fee at the time of the writing of this report is reasonable and affords the District the opportunity to appropriately plan for needed facilities as development occurs.

Before large-scale development occurs, however, the District also needs additional funding sources to cover shorter-term capital and O&M needs. Because these near-term needs and development activity is relatively fluid at this time, we have developed several representations of near-term growth and related capital and O&M requirements to address those needs.

We do not recommend that the District develop a CFD with an accompanying Special Tax Report and Rate and Method of Special Tax Apportionment or a Sewer Service Charge until the District has definitive understanding of the status of the development schedule and product mix. Adopting a CFD and/or Sewer Service Charge without knowing the number of development units, development type and related wastewater facilities would be premature and cause significant re-formation and Proposition 218 noticing challenges in the future. However, the following discussions provide the District with general CFD and Sewer Service Charge guidelines that may help the District plan for growth and provides an order-of-magnitude approximation for the taxes and charges needed.

7.4.1 Scenario 1 – Incremental, Small-scale Development within next 15 Years

This first discussion relates to the development scenario portrayed in Figure 4 of this report. The assumption is that small-scale development projects, ranging from 15 units to 400 residential units, would be created within a long-term time frame of 10 to 20 years. This scenario assumes that a large-scale development project has not occurred within the 20 years period, and that few smaller subdivisions would be developed such that a regional treatment facility is not warranted.

This development scenario consists of several small development projects, each connecting to a package or smaller clustered wastewater treatment plant. Under the District's plan, each initial package treatment plant and its associated collection system would be constructed by the developer as part of the development agreement process. Once units are occupied, each subdivision and related dwelling unit would be responsible for the annual operations and maintenance costs associated with the plant serving its respective subdivision. We have assumed that each package plant has a life expectancy of approximately fifteen (15) years.

7.4.1.1 Recommended Financing Mechanism(s)

Because each developer would be responsible for initial construction of a 15-year package treatment plant, each subdivision would initially be responsible solely for the annual operations and maintenance of the plant. At the point in time that the package treatment plant needs to be replaced, the existing development units would be responsible for this expense (unless the District exacts an additional payment from the developer at time of initial construction commensurate with the estimated value of the replacement of the plant and held in a separate fund by the District for this purpose). This development scenario requires flexible funding and financing arrangements because development is sporadic and small-scale.

7.4.1.2 Recommended: Combination of Community Facilities District and Sewer Service Charges

It is recommended that the District use of Community Facilities Districts (CFDs) to finance the estimated cost associated with replacement of each development's package treatment plant, once the initial plant has reached its useful life. However, CFDs cannot fund the annual operations and maintenance costs of the proposed facilities. To fund the O&M costs, it is recommended that the District impose a sewer service charge, to be billed regularly to the property owner/ratepayer of each account within the development.

If the CFD mechanism is used to fund future replacement of each package treatment plant, it could also be utilized to consolidate nearby package treatment plants at neighboring development projects should the District decide it is the most effective means of effluent collection and treatment. This consolidation would be implemented through an annexation to one of the existing CFDs. This approach could also benefit the District by providing the means to finance future expansion and connection to a regional treatment plant, if the connection fee revenues were not sufficient. If either scenario were to occur, the rate and method of apportionment of each CFD would need to account for these possibilities in the future, thus requiring solid development and cost projections at the time of initial formation of each CFD. The tax rate would be established for each property within the CFD boundaries and any amount tax up to the maximum tax rate could be imposed by the District for the identified facilities.

7.4.1.3 Who Pays the CFD Special Tax?

Property owners pay the annual CFD tax on their general property tax bills. The property owners could be the developer or the homeowner, depending on ownership of the property at the time tax bills are distributed by the County.

7.4.1.4 Not Recommended: 1913/15 Act Assessment District

A 1913/15 Act Assessment District mechanism would not be appropriate to fund the annual operations and maintenance of the initial package plants. The statute governing these assessment districts limits O&M funding to facilities constructed by bonds issued through the assessment district itself. Because the initial plants are proposed to be constructed by the developer, there would be no 1913/15 Act bonds issued to construct facilities. At the point in time when the initial package plant would need to be repaired or replaced, an assessment district arrangement could be explored to issue bonds for construction and subsequent O&M. However, this process could not occur until the actual facility and related costs are identified and the existing property owners approve such an assessment district through a Proposition 218 notice and balloting process.

The table below illustrates the estimated revenue sources to be paid based under the Scenario I approach. In this approach, we assume a small development project of 90 residential dwelling units or

EDU requiring a 20,000 gpd Purestream treatment plant with estimated capital costs of $432,000 and annual operations and maintenance expenses of $50,500 (see Table 3). Utilizing an assumed 90 EDU count allows us to calculate the maximum estimated annual CFD tax rate and sewer service charge that the District could charge for Scenario 1 development projects. Larger development projects would enjoy economies of scale and the resulting tax rates and sewer charges might be lower per EDU.

The resulting CFD annual special tax rate beginning in Fiscal Year 2009/10 is estimated at $320 per dwelling unit and the estimated annual sewer rate would be $561 per dwelling unit, or $47 per month. Each annual amount could be subject to an inflation adjustment each year by a factor determined by the District. Should the District choose the CFD option, we recommend that the District establish the CFD once it is known the product mix and size the development project will be and its timeline for completion.

Scenario 1, Estimated Funding Amounts, FY 2009/10

20,000 gpd PurestreamTreatment Plant		
CFD		
Estimated Annual Costs Allocated to Construction [1]	$	28,800
Assumed Number of Taxable Dwelling Units		90
Estimated Maximum Annual Special Tax per Unit	$	320
Sewer Rates - Annual O&M		
Estimated Annual O&M	$	50,500
Assumed Total EDU		90
Estimated Annual O&M Cost per EDU	$	561
Estimated Monthly O&M Cost per EDU	$	47

1. Assumes $432,000 capital costs spread over 15-year period.

Sources: Joshua Basin Water District; Dudek Engineering.

7.4.2 Scenario 2 – Incremental, Small-scale Development, Followed by a Large-scale Development Project within next 15 Years

The assumption under this scenario is that small-scale development projects ranging from 15 units to 400 residential units would be created within a medium-term time frame of 5 - 10 years followed by a large-scale development project of a minimum dwelling unit count of 900 homes developing within a 15 year period. The smaller development projects would rely on small package treatment plants to treat effluent until the larger development project warrants construction of a larger treatment facility of up to 200,000 gpd capacity. The smaller developments would subsequently connect to the larger facility, along with the larger development, via construction of interceptors and collectors.

Similar to Scenario 1, this scenario consists of several small residential subdivision projects ranging from 15 to 400 residential units, each connecting to a package or small cluster wastewater treatment plant.

Each package treatment plant would be constructed by the developer as part of the development agreement process. Once units are occupied, each subdivision and related dwelling unit would be responsible for the annual operations and maintenance costs associated with the plant serving its respective subdivision. We have assumed that each package plant has a life expectancy of fifteen (15) years. Within the 15-year time frame, the larger dwelling unit project would be developed and a larger treatment plant would be constructed to serve this project as well as existing small subdivisions.

All dwelling units would be responsible for their proportionate share of the annual O&M costs of the larger facility. The larger development project would be responsible for its fair share of the construction costs of the facility. The existing smaller subdivisions would be responsible for their fair share of the regional facility construction costs in addition to the costs of construction their proportionate share of the interceptors and collectors serving their respective development projects.

7.4.2.1 Recommended Financing Mechanism(s)

Because each developer would be responsible for initial construction of a 15-year package treatment plant, each smaller subdivision would initially be responsible solely for the annual operations and maintenance of the plant (this situation is similar to Scenario 1). We assume in Scenario 2 that the smaller development projects will connect to the larger treatment facility before their initial package treatment plants reach the end of their useful life. Therefore, any existing financing mechanism established would be utilized for the larger facility rather than for the replacement of the package treatment plant.

7.4.2.2 Recommended: Combination of Community Facilities District and Sewer Rates for the Smaller Development Projects; CFDs, Previously Established Connection Fees and Sewer Rates for the Larger Projects

We recommend the District use Community Facilities Districts (CFDs) and connection fees to finance the estimated costs associated with connection to the larger facility for the smaller development projects. To fund the O&M costs of the package plants and subsequently the regional facility, we recommend the imposition of sewer rates to be billed regularly to the property owner/ratepayer of each account within the subdivision.

For the larger development project of an assumed dwelling unit count of 900, we recommend the District consider a CFD to fund the capital facilities *if the previously collected connection fee revenues are insufficient to fund all facilities.* The annual O&M expenses could be funded via sewer rates.

7.4.2.3 Who Pays the CFD Special Taxes?

Property owners pay CFD taxes on their general property tax bills. The property owners could be the developer or the homeowner, depending on ownership of the property at the time tax bills are distributed by the County.

7.4.3 CFD Revenue Quantification

The table below illustrates the estimated revenue sources to be paid based on the Scenario 2 approach at the time that the large development project is developed and the appropriate facility is constructed. In this approach, we assume the small development type consists of 90 residential dwelling units with similar cost structures to connect to the larger facility and the large development project consists of 900 dwelling units. The figures included in this table are considered to be in FY 2009/10 dollars and the resulting rates and sewer service charges can be inflated should the District decide to implement inflation factors.

Scenario 2, Estimated Funding Amounts, FY 2009/10

200,000 gpd Purestream Reg Treatment Plant

CFD		
Estimated Annual Debt Service [1]	$	265,584
Assumed Number of Taxable Units		900
Estimated Max Annual Special Tax/Unit	$	295
Sewer Rates - Annual O&M		
Estimated Annual O&M	$	208,000
Assumed Total EDU		900
Estimated Annual O&M Cost per EDU	$	231
Estimated Monthly O&M Cost per EDU	$	19

1. Assumes $3,706,000 construction costs, 30-year term, 5.75% interest rate, 10% reserve fund, 3% costs of issuance and 1-year capitalized interest.

Sources: Table 4; Joshua Basin Water District; Dudek Engineering.

The resulting CFD annual special tax rate beginning in Fiscal Year 2009/10 is estimated at $295 per dwelling unit. The estimated annual O&M assessment would be approximately $231 per dwelling unit. Please note that these figures assume the 900 dwelling units are the only contributors to the larger facility. We performed this calculation to demonstrate the estimated maximum amounts for each funding mechanism. Previously collected revenues, such as connection fees, and additional dwelling units added to the calculations would likely reduce the funding amounts.

In summary, we recommend that the District adopt connection fees in accordance with this report prior to development activity ensuing within the study area boundaries. Adopting these fees will afford the District the opportunity to collect capital facilities fees before development activity begins and keeping these revenues in a separate account to be used for larger facility needs once development levels require the need for a regional wastewater system. As soon as the first development activity begins, the District should then consider forming CFDs for each development and sewer service charges should be imposed on properties once they have connected to a package treatment plant or a larger wastewater facility, whichever comes first.