CITY OF CLOVIS

WASTEWATER MASTER PLAN UPDATE

PHASE 1-B

NOVEMBER 20, 1996

Prepared By:

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CLOVIS WASTEWATER MASTER PLAN UPDATE

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SECTION 1.
EXECUTIVE SUMMARY

1.1 INTRODUCTION

The purpose of the Clovis Wastewater Master Plan Update process is to develop a course of action for the City of Clovis with respect to wastewater service needs through the year 2030, in keeping with the 1993 Clovis General Plan and its development guidelines. This will require the acquisition of new wastewater capacity, beyond that heretofore planned for Clovis in the regional system (where Clovis currently derives its wastewater service). Figure 1-1 shows the General Plan boundaries, the existing Clovis sewer service areas, and the existing regional system providing wastewater service to Clovis.

The new capacity can be achieved by either (1) participation in expansion of the Fresno-Clovis Regional System of treatment/disposal facilities and trunk sewers, (2) development of new (Clovis only) treatment/disposal facilities within the boundaries of the 1993 Clovis General Plan, or (3) a combination of both.

Six primary alternatives for providing service through year 2030 were studied, which ranged from total reliance upon expansion of the regional system (a continuation of current policy) on one hand, to withdrawal from the regional system and constructing Clovis facilities for all Clovis' wastewater service needs on the other. Other alternatives fell between these extremes.

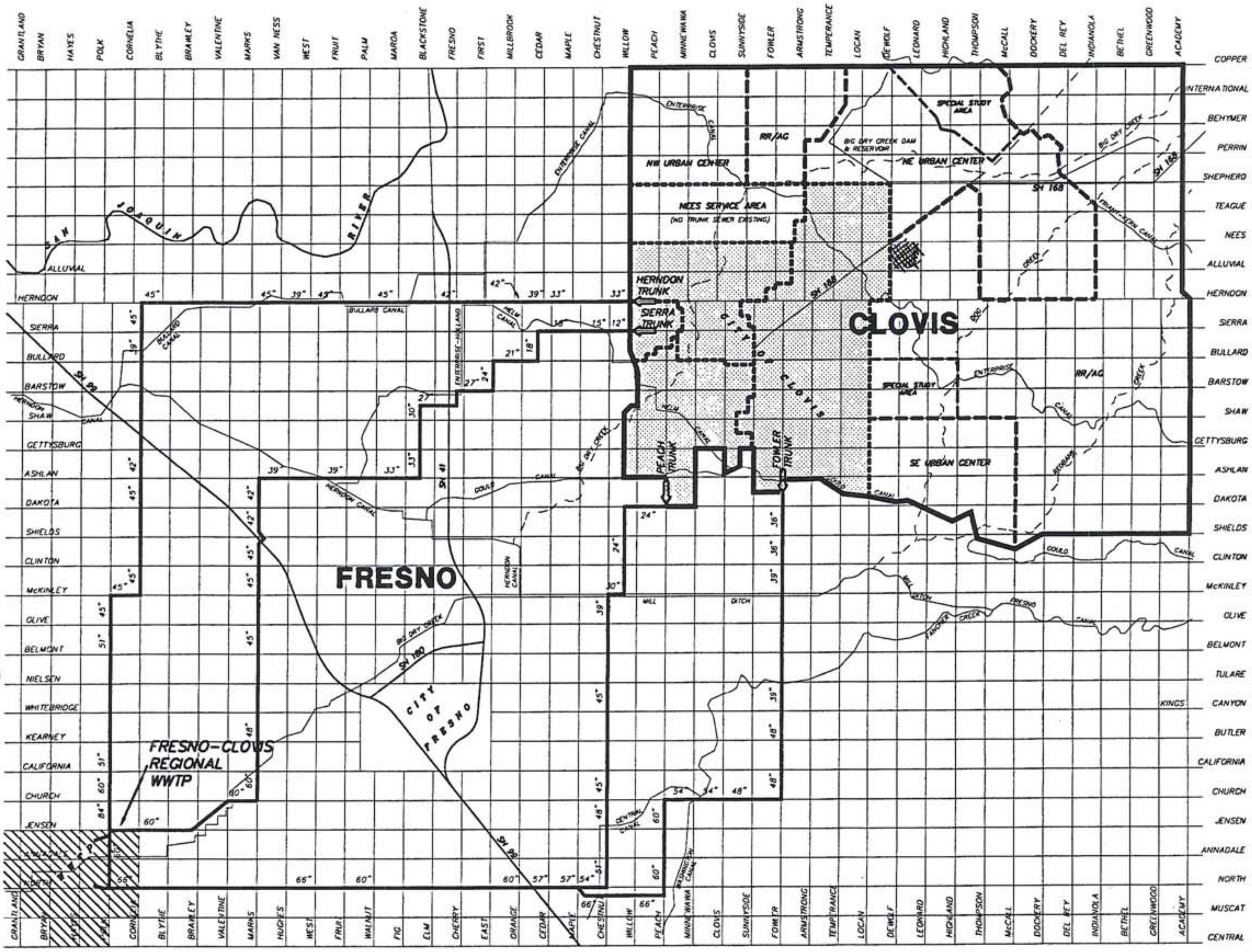
Alternatives studied which involve potential satellite treatment/disposal facilities in Clovis all stress a common theme; water reclamation and beneficial reuse. All treatment processes considered involve advanced tertiary treatment and disinfection, which allow virtually unlimited recycling for irrigation purposes.

1.2 WASTEWATER SERVICE CAPACITY DEMAND

Clovis' future requirements for additional capacity are graphically depicted on Figure 1-2. Clovis current flow is about 6.27 million gallons per day (MGD), average flow. At full buildout of the existing sewer service areas of Clovis within the current sphere of influence, including the Nees Service Area, the capacity requirement is projected to grow by 6.65 MGD to a total of 12.92 MGD. Development of the growth areas of the 1993 Clovis General Plan, the three urban villages, will add an additional 8.71 MGD of required capacity, resulting in a total projected requirement for wastewater capacity of 21.63 MGD at year 2030.

1.3 AVAILABLE WASTEWATER SERVICE CAPACITY

Clovis currently has acquired a total useable capacity in the regional system of 9.30 MGD (including 3.00 MGD of new treatment capacity recently agreed to). Under previous regional planning, this could be expanded to a maximum of 15.87 MGD, by purchasing additional treatment capacity and participating in completion of the regional trunk system previously planned to serve Clovis (a missing downstream segment of the Fowler Trunk Sewer is yet to be constructed in North Avenue from Maple Avenue to the Regional Wastewater Treatment Plant). Achieving this maximum capacity would require full efficient utilization of all four existing regional trunk sewers serving Clovis; the Peach (3.00 MGD planned maximum capacity), Herndon (2.80 MGD), Fowler (9.57 MGD) and Sierra (0.50 MGD).



LEGEND

BOUNDARY OF 1993 CLOVIS GENERAL PLAN AREA

EXISTING REGIONAL TRUNK SEWER RECEIVING CLOVIS FLOW

BOUNDARY OF EXISTING PLANNED CLOVIS SEWER SERVICE AREA

BOUNDARY OF CLOVIS GENERAL PLAN EXPANSION SUB-AREA

SEWER SERVICE AREA WITH PLANNED REGIONAL TRUNK SEWER

N

SCALE: 1" = 15,000'

0 10,000 15,000 20,000

SCALE IN FEET

FIGURE 1-1

CLOVIS WASTEWATER MASTER PLAN UPDATE

CLOVIS PLANNING AREA AND EXISTING REGIONAL SYSTEM SERVING CLOVIS

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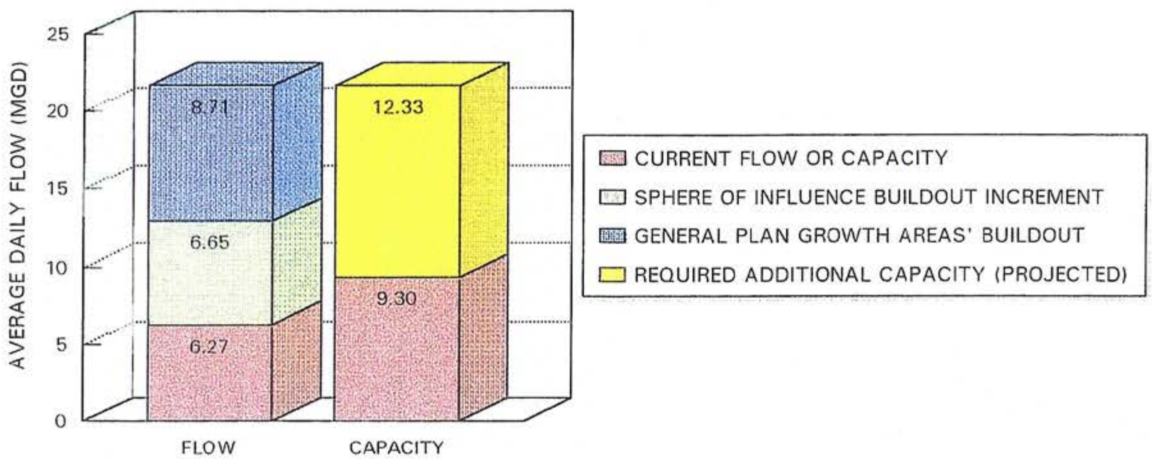
FIGURE 1-2
PROJECTED WASTEWATER SERVICE DEMAND



Although achieving this maximum capacity (15.87 MGD) in the regional system could provide buildout wastewater service to the current sphere of influence area of Clovis (the presently planned sewer service areas), it falls far short of being sufficient to meet the needs (21.63 MGD) of the Clovis General Plan expansion areas. New capacity will have to be developed, either through new expansion of the regional system or through development of new capacity within Clovis' planning area.

The current surplus afforded by the difference between Clovis' 9.30 MGD of existing acquired capacity in the regional system and today's demand of 6.27 MGD should, in the meantime, allow room for the addition of approximately 10,000 new equivalent single-family residential units (a population increase of about 30,000 Clovis residents), which represents well over 10 years of growth at recent Clovis growth rates. This allows Clovis time to plan for its future course of action, and to accomplish the construction of facilities required in response to anticipated future growth.

In order to take advantage of existing available capacity, all of the alternatives studied as a part of the master plan update process are identical in one respect. They all utilize the existing regional trunk sewer system, together with internal Clovis collection system, to provide the maximum ability to serve the core area of the City with the existing planned regional trunk system. Alternative 6 involves this concept on a temporary basis, while all of the other alternatives include it as a part of their ultimate plan.

1.4 POTENTIAL REGIONAL SYSTEM EXPANSION

Two of the six alternative plans studied for Clovis' master plan update include utilization of an expanded regional system as the exclusive source of wastewater service for Clovis. The Fresno-Clovis Regional Wastewater Master Plan Update, which has been developed concurrently with Clovis' study, proposes expansion of regional treatment capacity adequate to serve the future needs of both Fresno and Clovis.

This expansion may involve further enlargement of the Fresno-Clovis Regional Wastewater Treatment Plant (WWTP) located Southwest of Fresno (to 162 MGD by year 2020), or may alternately involve a smaller expansion of the regional plant together with the establishment of one or more regional satellite treatment/reclamation plant facilities (WWRF) in Fresno (Figure 1-3). Either scenario would involve the need for new (and heretofore unplanned) trunk sewer facilities to serve the new growth areas of Fresno and Clovis.

The regional master plan update recommends further, more comprehensive, study of the regional satellite plant options, and is thus inconclusive as to their eventual viability. The Clovis master plan update strives to coordinate its alternatives with those of the regional plan, so that meaningful comparison of Clovis' alternatives is possible. Clovis does not have the ability, however, to assure any action by the Regional Authority. This being the case, Clovis must be mindful that while a particular regional alternative may be preferable to Clovis, it may not be to Fresno, and thus may not be implementable.

1.5 ALTERNATIVES FOR SERVICE INTO THE FUTURE FOR CLOVIS

Six alternative conceptual plans for ultimate wastewater service for the area within the boundaries of the 1993 Clovis General Plan were included in the scope of work for this study, as outlined in Table 1-1. Plates depicting the features of each alternative are as identified in the table, and may be found in the Plates (foldout) section of this report. Plates 1A, 1B, 1C and 1D depict the regional system aspects of these plans, whereas Plates 1E, 1F, 1G, 1H and 1I delineate the local aspects of the plans, within the 1993 Clovis General Plan area.

Alternatives 1 and 2 are totally dependent upon the regional system for service, whereas Alternatives 3, 4 and 5 are partially dependent upon the regional system. Alternative 6 is a "Clovis Only" alternative, ultimately independent of the regional system. Alternative 2 was subdivided into Alternatives 2A and 2B, to conform to options presented in the regional master plan update. With the exception of Alternative 6, these alternatives were identified in the Environmental Impact Report for the 1993 Clovis General Plan.

For alternatives involving potential Clovis satellite wastewater treatment plants (Alternatives 3, 4, 5 and 6), the treatment process proposed is identical from site to site. The process consists of oxidation ditch basic aerobic treatment technology, together with advanced tertiary treatment consisting of biological nutrient removal, filtration, and ultra-violet disinfection. For plants of the size needed for Clovis, the oxidation ditch type of treatment process is one of the least expensive types to construct, and is one of the simplest to operate and maintain. It is also an aerobic process in which potential odors are readily controlled.

The quality of the treated water under the above described processes is such that, with the acquisition of the required permits, it can be utilized for virtually unlimited irrigation uses. The only true limitation, which is not health related, exists with the potential for direct undiluted application to certain crops sensitive to sodium (particularly in the more clayey soils), where production levels can be adversely affected. Reclamation/disposal alternatives presented in this study predominantly involve dilution of reclaimed water with canal water before application to production crops.

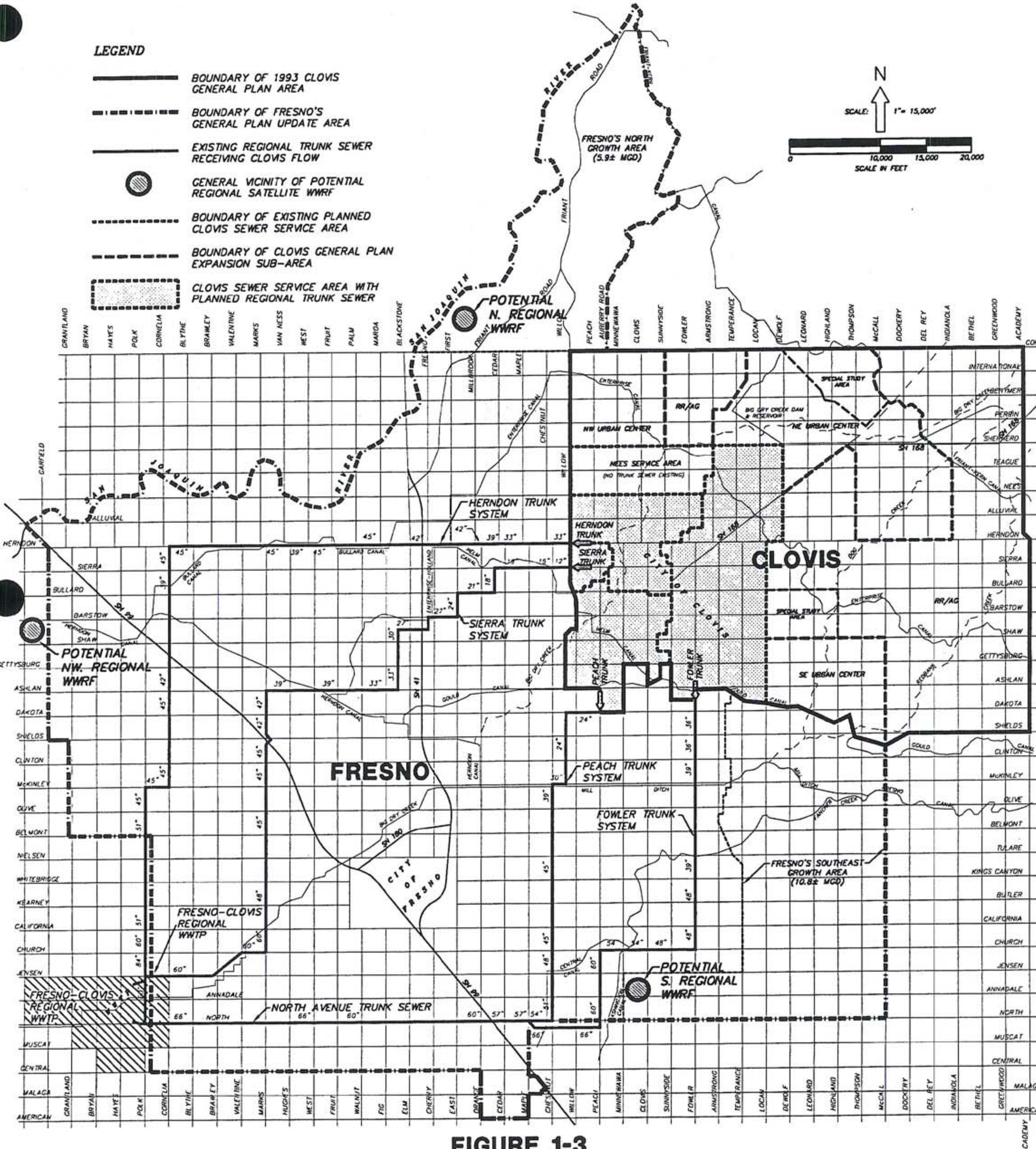


FIGURE 1-3

CLOVIS WASTEWATER MASTER PLAN UPDATE

FRESNO-CLOVIS PLANNING AREAS AND POTENTIAL REGIONAL SATELLITE WWRF[S]

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TABLE 1-1			
STUDIED ALTERNATIVES FOR SERVICE TO CLOVIS			
ALT. NO.	**PLATE NO.**	**DISPOSITION OF CLOVIS' FLOW IN EXISTING FOUR TRUNK SEWERS**	**DISPOSITION OF FLOW FROM 1993 CLOVIS GENERAL PLAN EXPANSION AREAS**
1	1A & 1E	To expanded Regional WWTP	To expanded Regional WWTP
2A	1B & 1E	To expanded Regional WWTP and Regional Satellite WWRF in South	To 2 Regional Satellite WWRF(s): South & North
2B	1C & 1E	To expanded Regional WWTP and Regional Satellite WWRF in South	To 2 Regional Satellite WWRF(s): South & NW
3	1D & 1F	To expanded Regional WWTP	To 3 Clovis Satellite WWRF(s); NW, SE & NE
4	1D & 1G	To expanded Regional WWTP	To 2 Clovis Satellite WWRF(s); NW & SE
5	1D & 1H	To expanded Regional WWTP	To 1 Clovis Satellite WWRF; SE
6	1I	To Clovis Satellite WWRF(s); NW & SE	To 2 Clovis Satellite WWRF(s); NW & SE

The water reclamation/reuse proposal recommended for any of the potential Clovis satellite WWRF's consists of a conjunctive use of the treated water.

The primary emphasis of the reclamation/reuse plan would be for the delivery of reclaimed water directly to users (such as for landscape irrigation of parks, schools, freeways, median islands and beltways, for agricultural irrigation, and potentially for some industries) within the study area. This would require constructing a pressure transmission system, generally within major streets, from the satellite plant to the general area of these sources of the demand.

Since there will be periods of time during the year when there is insufficient demand from direct users for the recycled water, particularly in the winter months when there is little demand for irrigation water, a secondary use for the water will also be necessary. The secondary emphasis of this plan would be the delivery of reclaimed water to Fresno Irrigation District (FID) and associated facilities, for agricultural irrigation (and incidental groundwater recharge). This would be accomplished by pipeline transmission of the treated effluent to FID canals and associated watercourses. Control structures would allow diversion of all or part of the reclaimed water to alternate facilities, depending on demand and capacity. Flows discharged directly to FID canals for agricultural use may qualify for exchange for surface water from the Fresno Irrigation District. The Enterprise Canal and Gould Canal are not proposed to receive reclaimed water under this plan, inasmuch as domestic water treatment facilities are master planned by Clovis and Fresno to utilize surface water from these canals.

Capacity for storage of treated effluent would be provided on-site at the satellite facilities for those periods when the Fresno Irrigation District's system and associated watercourses would be unavailable for receiving discharge due to storm flows or canal maintenance operations.

A potential supplement to the primary reclamation/reuse plan would be opportunities for use of the reclaimed water for other purposes, such as for recreational purposes, wetland creation or restoration, dedicated groundwater recharge facilities, and possibly other uses. These would be considered as supplements to the primary plan reclamation/reuse strategies, where such opportunities arise.

1.6 ESTIMATES OF COST

Estimates of cost were prepared which include the various elements comprising each alternative. Capital cost, as well as the annual cost of operations, maintenance and replacement (O,M&R) were estimated. Comparative estimates were prepared for two time periods; through year 2015 (as a guide to mid-term costs), and for the total Clovis General Plan planning period through year 2030. Where Clovis and Fresno would share the cost of proposed facilities within the Fresno-Clovis Regional System, the costs were prorated on the basis of design flow proportion for each entity (unless information to the contrary was evident). Reimbursements which may accrue to Clovis under Alternative 6, due to the potential sale of Clovis' existing capacity in the regional system back to the City of Fresno, were also estimated and included.

Table 1-2 summarizes the estimates of cost. All estimates of capital cost are in 1996 dollars, and include allowances for the cost of construction, engineering and construction management, and contingencies. The O,M&R estimates represent the present value of annual costs over the period.

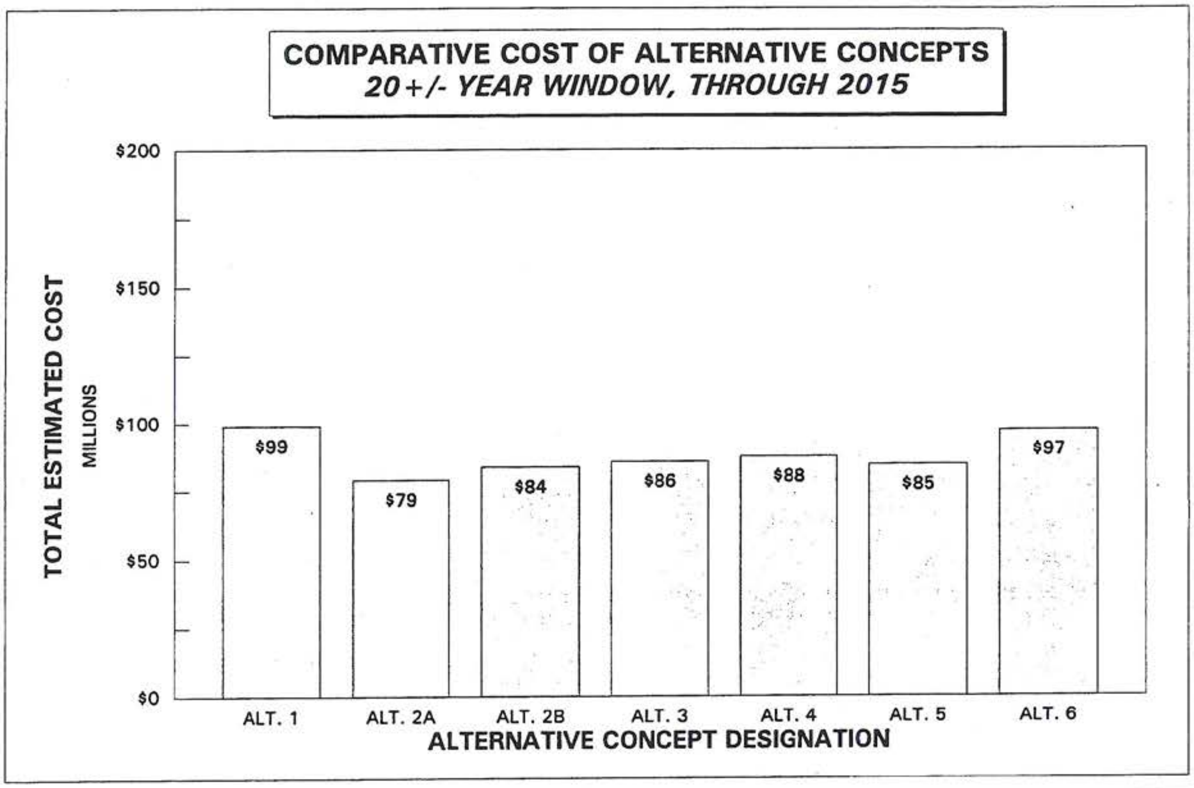
TABLE 1-2

ESTIMATES OF COST OF ALTERNATIVES THROUGH YEAR 2015 (ALL COSTS IN MILLIONS)							
	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
CAPITAL COSTS	$57.888	$40.530	$44.983	$46.019	$47.777	$45.306	$59.095
O,M&R COSTS	$41.253	$38.708	$38.840	$39.722	$39.744	$39.214	$38.074
TOTAL COSTS	**$99.141**	**$79.238**	**$83.823**	**$85.741**	**$87.521**	**$84.520**	**$97.169**
ESTIMATES OF COST OF ALTERNATIVES THROUGH YEAR 2030 (ALL COSTS IN MILLIONS)							
	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
CAPITAL COSTS	$105.254	$74.581	$77.995	$95.808	$87.675	$82.597	$93.106
O,M&R COSTS	$71.093	$60.155	$59.750	$66.522	$66.792	$63.227	$59.202
TOTAL COSTS	**$176.347**	**$134.736**	**$137.745**	**$162.330**	**$154.467**	**$145.824**	**$152.308**

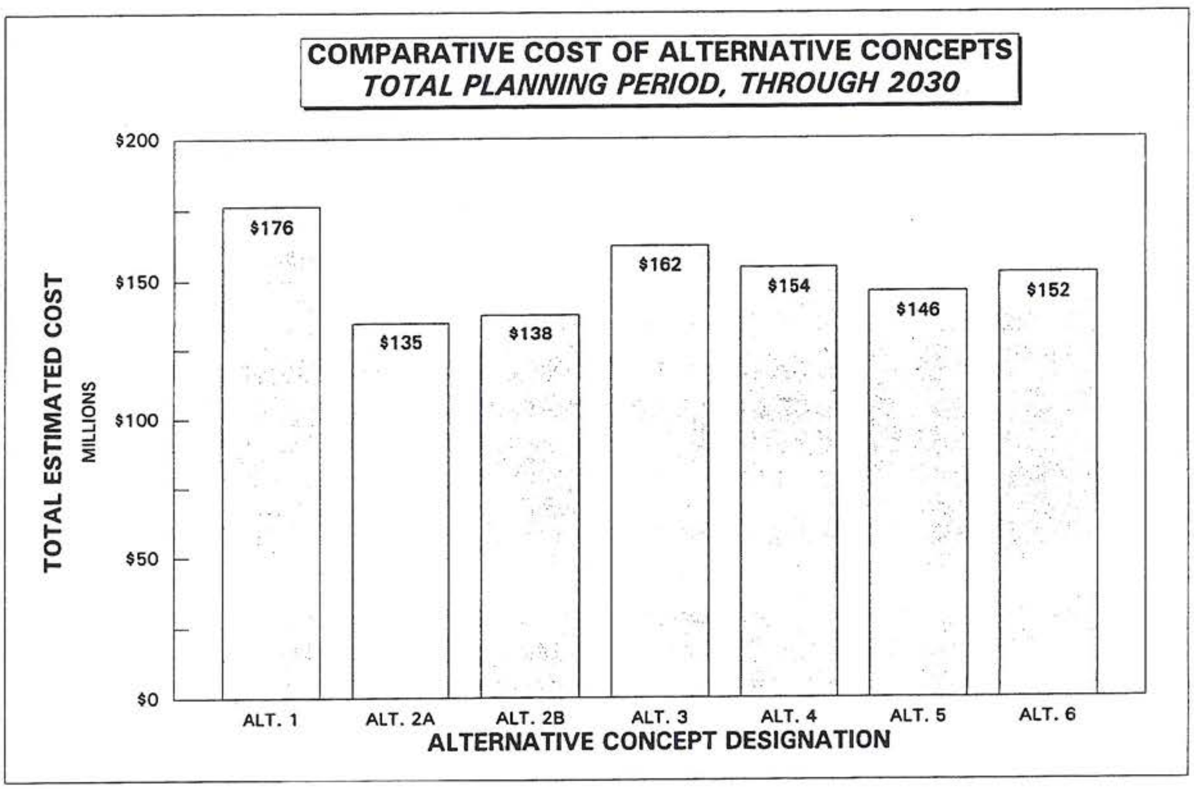
Figure 1-4 graphically indicates the total estimated costs, rounded to millions, of the alternatives for both time periods analyzed.

Prior to the commencement of this study, it was recognized by City staff that a financial analysis would likely be needed, once estimated costs were developed. Although work beyond developing the relative costs of the alternatives was not included in the scope of this study, it is recommended that a financial analysis be undertaken, so as to identify funding strategies and the impact of facility costs on user charges and development fees. This work might be developed internally by Clovis City staff.

FIGURE 1-4



COMPARATIVE COST OF ALTERNATIVE CONCEPTS
20+/- YEAR WINDOW, THROUGH 2015
TOTAL ESTIMATED COST
MILLIONS
$200
$150
$100
$50
$0
$99
$79
$84
$86
$88
$85
$97
ALT. 1
ALT. 2A
ALT. 2B
ALT. 3
ALT. 4
ALT. 5
ALT. 6
ALTERNATIVE CONCEPT DESIGNATION



COMPARATIVE COST OF ALTERNATIVE CONCEPTS
TOTAL PLANNING PERIOD, THROUGH 2030
TOTAL ESTIMATED COST
MILLIONS
$200
$150
$100
$50
$0
$176
$135
$138
$162
$154
$146
$152
ALT. 1
ALT. 2A
ALT. 2B
ALT. 3
ALT. 4
ALT. 5
ALT. 6
ALTERNATIVE CONCEPT DESIGNATION

1.7 EVALUATION OF ALTERNATIVES

Alternatives were evaluated and rated based upon monetary and non-monetary factors, with the goal of providing a comprehensive numerical summary resulting from the rating process. The overall structure of the scoring matrix, components to be evaluated, and relative weighting system to be employed were reviewed and approved in concept by the Clovis City Council at a progress meeting held in March, 1996.

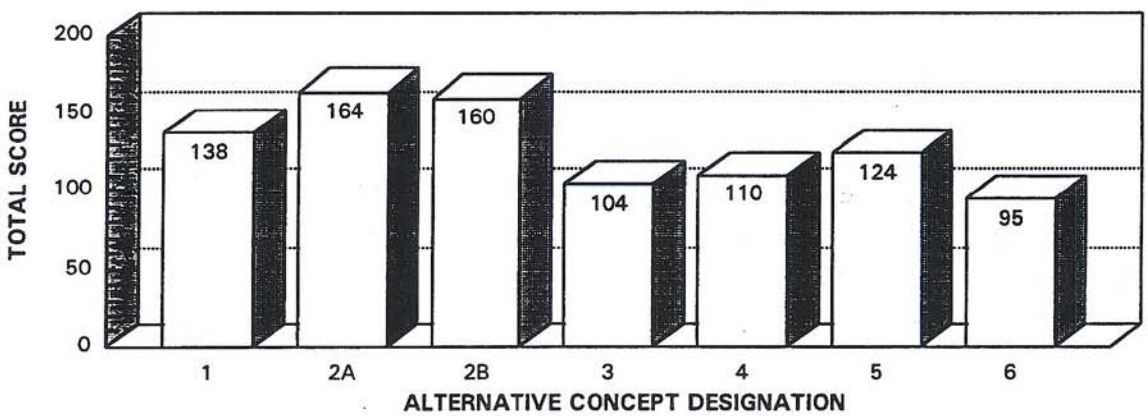
Evaluation factors included financial impacts, community needs, public acceptance, environmental impacts, water reclamation benefits to Clovis, reliability of disposal options, ease of implementation, and administrative impacts. Component evaluation parameters were assigned weight factors for each individual parameter, and a range of scale factors was universally applied. Table 1-3 contains the results of the evaluation process, and Figure 1-5 indicates the results graphically.

TABLE 1-3

SCORING OF ALTERNATIVES BY EVALUATION PARAMETERS
(Please Note: A Higher Total Score Represents a Better Scored Alternative)

	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
TOTAL SCORE	138	164	160	104	110	124	95

FIGURE 1-5
SUMMARY OF SCORING OF ALTERNATIVES



Please Note: A Higher Score Represents a Better Scored Alternative

Although the scoring system utilized required subjective judgement, the total scores resulting from the system should provide a reasonable indication of probable relative merit. This is particularly true of the extremes of the total scores, high versus low, and true to a lesser degree for scores that are relatively close. Alternatives with total score differences of less than 10 points should probably not be considered as having a significant difference in rating.

The rating of the alternatives by the system of scores produced by the evaluation parameters should only be considered as another piece of information in the decision making process, and final judgements should be made based upon all of the knowledge available.

1.8 RECOMMENDED ALTERNATIVE(S)

Two recommendations are presented for consideration; a primary and an alternative recommendation.

Primary Recommendation

It is recommended that the City of Clovis pursue a *primary* course of action in its wastewater master plan that continues to utilize the regional system for service (Alternatives 2A, 2B, and possibly Alternative 1). This would include not only the existing service areas of Clovis, but also the future growth areas as identified in the 1993 Clovis General Plan. In that regard, Clovis should endeavor to exert its influence wherever possible toward realization of the regional satellite facility options, particularly **Alternative 2A** (regional satellite treatment/reclamation plants located North of Fresno and South of Fresno).

It is further recommended that Clovis consider retaining a *backup* plan, such as Alternative 4 or Alternative 5, at least for the near term, which would allow Clovis the ability to provide service to its future g'owth areas on its own in the event that the Regional Authority, for whatever reason, is unable to provide reasonably economical service to Clovis on an as-needed basis. **Alternate 4** might best serve that purpose, inasmuch as the basic gravity trunk system proposed within Clovis under Alternative 4 is identical with that proposed under any of the regional alternatives. Should the backup plan be implemented, the core of the City of Clovis would continue permanently to be serviced by the existing four regional trunk sewers (maximized in capacity by Clovis' participation in the second barrel of the North Avenue Trunk Sewer), while the future growth areas outside the core area of Clovis would be eliminated from participation in the regional system in favor of future service by Clovis satellite treatment/reclamation facilities.

The regional alternatives involving regional satellite facilities, Alternative 2A and 2B, and particularly **Alternative 2A** with its North (as opposed to Northwest) and South regional satellite WWRF(s), exhibit several apparent advantages over other alternatives. These include:

- Lowest estimated overall costs, both for the interim period through year 2015, and through the planning horizon of year 2030.
- Greater probability of public acceptability in Clovis.
- Easier implementation.
- Fewer environmental impacts in Clovis.
- Lower administrative load.

Significant disadvantages of continued service exclusively through the regional system include the following:

- If the regional satellite facilities drop out of Fresno's planning, or are not implemented for any other reason, servicing Clovis' General Plan growth areas to a further expanded regional plant (Alternative 1) becomes *the* regional plan. Alternative 1 is more expensive for Clovis than the other plans, although it scores relatively high in the evaluation process based upon non-economic factors).

- Fewer potential direct water reclamation benefits to Clovis.

- Clovis' control over its own destiny with respect to wastewater service is less than with other alternatives.

The backup plan (Alternative 4 suggested) could be retained until more is known about Fresno's progress on the regional satellite plant options. The potential Northwest and Southeast Clovis satellite plants are not proposed to be located within future areas of urban development, and thus should not preclude development of specific plans for these areas. The general vicinities of the potential Clovis satellite facilities could be indicated on the specific plans, so that any associated contingency planning considerations within each specific plan area could be addressed.

The backup plan could remain as a viable option until such time as a decision may be forced on Clovis by impending construction of regional facilities. This may happen relatively soon, as planning proceeds on the Grantland Trunk Sewer and the second barrel of the North Avenue Trunk Sewer. Fresno will be faced with similar planning decisions at the same time, as sizing of the proposed facilities becomes dependent upon how their North and Southeast growth areas are to be served in the future.

Since Clovis' needs for future service to its growth areas are related to Fresno's similar needs at the regional level, it is likely that Fresno will need service for its growth areas within the same general time frame that Clovis will need service to its growth areas. This should provide an opportunity for Clovis to see Fresno's plans develop more fully, and may more clearly identify Clovis' costs for additional capacity in the regional system.

<u>Alternative Recommendation</u>

Alternately, Clovis could make a resolute decision now to continue to participate in the regional system only to the extent of maximizing its utilization of the existing four trunk sewers serving Clovis, which would be accomplished under either of **Alternatives 3, 4 or 5.** Either of these alternatives would be a viable choice if the potential benefits of direct water reclamation in the future growth areas were seen to outweigh the impacts of establishing one or more satellite wastewater reclamation plants within the 1993 Clovis General Plan area. Of these three alternatives, the most economical (particularly in the long term) and highest scoring, considering all of the evaluation parameters, is Alternative 5. In the absence of a need to conform the future growth areas' gravity trunk system with the regional alternatives, Alternative 5 would appear to be an advantageous choice. Alternatives 3 and 4, however, offer more potential for direct water reclamation in a greater geographical area of the City, although they are more costly in the long term.

In summary, based upon the evaluation system previously established, Alternative 2A and 2B stand out as advantageous choices, with Alternative 2A scoring the highest of all of the alternatives studied. Alternate 1, though estimated to be more costly than the other alternatives, also scores relatively high, based upon non-economic factors. Alternatives 3, 4 and 5 offer the advantage of local direct water reclamation. Alternative 6, while offering complete independence from the regional system, scores the lowest of the alternatives in the established rating system.

As is sometimes the case in infrastructure planning, a major decision on which critical direction to take may involve much more than just consideration of the technical parameters developed through engineering study. Particularly when alternatives do not reveal "fatal flaws", or do not vary radically in cost or other attributes, the decision becomes one more of a vision for the City's future direction and less one of calculated objective judgement. The multiple recommendations presented herein recognize that this may well be one of those cases.

1.9 TIMING CONSIDERATIONS

Clovis' current 3.00± MGD surplus capacity in the regional system should provide for well over 10 years of Clovis' growth. Additional capacity will then be required to allow the complete buildout of the Peach, Herndon, Sierra and Fowler Service Areas, as well as to allow development of the future growth areas as identified in the 1993 Clovis General Plan. Following is a summary of timing issues related to projected capacity needs under the alternatives studied.

- *Peach, Herndon and Sierra Service Areas*

  Under each of the studied alternatives, full treatment and trunk sewer capacity in the regional system now exists for buildout of the Peach, Herndon and Sierra Trunk Sewer Service Areas, as said service areas have been modified by the master plan. Under Alternative 6, this is true until such time that Clovis satellite wastewater reclamation facilities would be constructed under that alternative.

- *Fowler Service Area*

  Under each of the alternatives, capacity in the Fowler Trunk Sewer Service Area (as modified by the master plan) is currently limited to 3.00 MGD, the capacity acquired by Clovis for Fowler Trunk Sewer flow in the regional North Avenue Trunk Sewer. Current Clovis flow in the Fowler Trunk Sewer is averaging about 2.70 MGD, which would allow about 1,000 equivalent single family residential units of growth in the Fowler Service Area before acquired capacity would be exceeded.

  No additional capacity is available to Clovis in the existing regional North Avenue Trunk Sewer. At current trends, the design capacity of the North Avenue Trunk Sewer will be exceeded by the combination of Fresno and Clovis flows by year 2000 to 2002. This will precipitate the construction of a new second pipeline paralleling the existing North Avenue Trunk Sewer from Maple Avenue to the Regional Wastewater Treatment Plant. This parallel pipeline will be necessary, whether a South regional satellite wastewater reclamation plant is contemplated by the Regional Authority, or not.

The required size of the parallel pipeline, as well as a decision as to whether or not Clovis would potentially participate in its construction to obtain capacity, would be affected by a prior Regional Authority decision to construct a South regional satellite treatment facility. If a South regional satellite treatment facility was assured of becoming a reality, Clovis would not need to participate in the construction of the second barrel of the North Avenue Trunk Sewer (nor purchase associated additional capacity at the regional plant), but could rather participate in obtaining capacity in the less expensive (for Clovis) South regional satellite treatment facility. Since about 3 years would be required for the design and construction of the new parallel barrel of the North Avenue Trunk Sewer, it is likely that Clovis would need to make a decision on participation in its construction within the next 3 years.

Inasmuch as it is possible for Clovis to temporarily divert some of the Fowler Service Area flow to the Herndon Trunk Sewer (through reactivation of the currently decommissioned pump station at Barstow and Villa Avenues), it is likely that Clovis could provide capacity for development within the Fowler Service Area through the early 2000's, at which time relief should be available through either the second barrel of the North Avenue Trunk Sewer or through a potential South regional satellite treatment plant. If the South regional satellite plant was not yet constructed (but assured to be constructed in the future), Clovis could obtain temporary conveyance capacity (which should be readily available) in the second barrel of the North Avenue Trunk Sewer, until such time as the South regional satellite plant was constructed.

With regard to Alternative 6, a Clovis Southeast satellite wastewater reclamation plant would need to be constructed by the time that the 3.00 MGD available capacity in the North Avenue Trunk Sewer for Fowler Service Area flow was exceeded. The temporary diversion described above could be utilized to somewhat delay the satellite plant construction.

- *Future Growth Areas Outside the Peach, Herndon, Sierra and Fowler Service Areas*

Significant development requiring major wastewater facilities in the Northwest and Southeast Clovis future growth areas outside the modified boundaries of the existing trunk sewer service areas is not projected to occur before about year 2010. Prior to that time, some development in these areas could be serviced by temporary diversion of flow to adjacent existing trunk sewer service areas. The Northeast future growth area is not projected to begin any urban type development until after year 2015.

For Alternatives 3, 4, 5 and 6, all of which include servicing these future growth areas to potential Clovis satellite reclamation plants, a lead time of between 6 and 7 years would probably be required to environmentally clear, design and construct any such satellite facility.

With respect to the Clovis Southeast growth area and Alternatives 1, 2A and 2B (the regional service alternatives), the second barrel of the North Avenue Trunk Sewer should have been constructed and a South regional satellite treatment plant (if remaining a viable part of the regional master plan) should be near construction, or constructed, by year 2010. The Leonard Trunk Sewer, connecting the Southeast Clovis growth area with the second barrel of the North Avenue Trunk Sewer (or a South regional satellite treatment plant), would also need to be constructed by Fresno and Clovis by year 2010, preceded by a design and construction period of about 3 to 4 years.

With respect to Clovis' Northwest growth area and Alternatives 1, 2A and 2B (the regional service alternatives), a North or Northwest regional satellite plant (if remaining a viable part of the regional master plan), together with connecting trunk sewer system, would need to be constructed by about year 2010. For Alternative 1, Clovis would need to acquire capacity in the Grantland Trunk Sewer, and participate in the construction of regional trunk sewer facilities connecting Northwest Clovis with the Grantland Trunk Sewer, by about year 2010. The Grantland Trunk Sewer is anticipated to be (fast-track) designed and constructed over about a 2½ year period beginning in early 1997. Both Fresno and Clovis, depending on the exigencies of the design process, may be required to come to a decision within the next year as to capacity needs in the Grantland Trunk sewer for their future growth areas.

SECTION 2.
BACKGROUND

2.1 GENERAL

The Clovis Wastewater Master Plan Update is a multi-phase project which commenced just over two years ago. It is designed to provide a course of action for the City of Clovis with respect to wastewater service needs through the year 2030, in conformance with the 1993 Clovis General Plan and its planning horizon. The boundaries of the study area coincide with those of the 1993 Clovis General Plan, extending North to Copper Avenue and East to Academy Avenue.

2.2 PHASES OF CLOVIS' MASTER PLAN UPDATE

The Clovis planning effort is divided into two major phases. Phase 1 is the conceptual phase, where the City is provided information upon which to select an overall direction for future wastewater service and possible recycling of treated wastewater. Phase 2 will be the more specific planning phase, where the concept (or concepts) selected by the Clovis City Council from the Phase 1 work is integrated with the specific planning process for the urban villages proposed in the General Plan.

The Phase 1 study was subdivided into two work efforts. Phase 1-A concentrated on assessing current wastewater flows, existing trunk sewer capacities, projected buildout flow from the existing trunk sewer service areas, and the general relationship of the quantity of flow to be generated by future growth areas to existing trunk sewer capacity. The Phase 1-A study was completed in June, 1995.

Phase 1-B was commenced in August, 1995, and was intended to present conceptual alternatives for wastewater service to Clovis, for the entire 1993 Clovis General Plan area. The information gathered in the Phase 1-A portion of the work was vital to the successful prosecution of the Phase 1-B study, providing a firm foundation of current data necessary for a thorough evaluation of alternatives. The Phase 1-B effort will be culminated by the Clovis City Council's selection of a course of action with respect to the alternatives presented.

Once a decision has been made by the City of Clovis relative to wastewater service into the future, a more detailed blueprint for the individual components of the selected plan can be developed (through Phase 2) in conjunction with the specific planning processes for the three urban villages.

2.2.1 SUMMARY OF FINDINGS OF PHASE 1-A STUDY

The Phase 1-A study included a determination of rates of wastewater flow generation for typical developments in Clovis. Design flow generation rates were developed for the major categories of land use, as shown in Table 2-1.

These flow generation rates were then utilized to project the magnitude of flows to be expected at buildout of the existing sewer service areas within the City of Clovis. This was accomplished by conducting an inventory of undeveloped land within each service area, applying the design flow generation rates at the various land use designations set forth on the 1993 General Plan, and then adding the calculated buildout increment of flow to the existing metered flow from the service area.

TABLE 2-1	
CLOVIS DESIGN WASTEWATER FLOW GENERATION RATES	
LAND USE DESIGNATION	**DESIGN FLOW GENERATION RATE**
Single-family residential	270 gallons per dwelling unit per day
Multi-family residential	220 gallons per dwelling unit per day
Industrial	1,000 gallons per gross acre per day
Professional office	1,200 gallons per gross acre per day
Commercial	1,400 gallons per gross acre per day

For purposes of the Phase 1-A study, the maximum densities allowed by the General Plan were utilized in calculating the buildout flow projection. The results of the buildout flow estimating process for the existing Clovis trunk sewer service areas are shown in Table 2-2.

TABLE 2-2			
ESTIMATED MAXIMUM BUILDOUT FLOW IN CLOVIS' EXISTING SEWER SERVICE AREAS (MGD AVERAGE FLOW)			
SEWER SERVICE AREA	**1995 METERED FLOW**	**BUILDOUT INCREMENT**	**TOTAL BUILDOUT FLOW**
PEACH	2.63	0.98	3.61
FOWLER	2.55	4.51	7.06
HERNDON	0.98	1.53	2.51
SIERRA	0.11	0.18	0.29
NEES[1]	0.00	1.60	1.60
TOTAL	***6.27***	***8.80***	***15.07***

[1] Nees Service Area has no regional trunk sewer assigned to it.
Nees 1995 service area flow included in Herndon 1995 service area flow.

Buildout flow estimates for the existing trunk sewer service areas were then compared with the planned capacity of the existing regional trunk sewers serving Clovis, as indicated in Table 2-3. The Peach service area has a projected deficit of 0.61 MGD, while the Nees Service area (which has no regional trunk sewer assigned to it), has a deficiency of 1.60 MGD (see Table 2-3).

TABLE 2-3			
COMPARISON OF ESTIMATED MAXIMUM BUILDOUT FLOW WITH CLOVIS' PLANNED CAPACITY IN EXISTING TRUNK SEWERS (MGD AVERAGE FLOW)			
TRUNK SEWER SERVICE AREA	**TOTAL BUILDOUT FLOW**	**TRUNK SEWER PLANNED CAPACITY**	**SURPLUS OR DEFICIENCY ( )**
PEACH	3.61	3.00	(0.61)
FOWLER	7.06	9.57	2.51
HERNDON	2.51	2.80	0.29
SIERRA	0.29	0.50	0.21
NEES[1]	1.60	0.00	(1.60)
TOTAL	***15.07***	***15.87***	***0.80***

[1] Nees Service Area has no regional trunk sewer assigned to it.

When considering all of the existing planned service areas in total, a net surplus of 0.80 MGD exists, assuming balanced distribution of capacity and assuming that planned treatment and trunk sewer capacity in the regional system is achieved by Clovis. Full planned capacity has been acquired by Clovis in the Peach, Herndon and Sierra Trunk Sewers, and in the Fowler Trunk Sewer from the City of Clovis to its connection to the North Avenue Trunk Sewer (where only 3.00 MGD of capacity exists for Fowler Trunk Sewer flows to the Regional WWTP). Table 2-4 summarizes Clovis' currently useable acquired capacity in the regional system.

TABLE 2-4			
CLOVIS' CURRENT USEABLE CAPACITY IN THE REGIONAL SYSTEM (MGD AVERAGE FLOW)			
SEWER SERVICE AREA	**TRUNK SEWER CAPACITY**	**TREATMENT CAPACITY AT WWTP**	**USEABLE CAPACITY**
PEACH	3.00	3.00	3.00
FOWLER[1]	9.57	3.00	3.00
HERNDON	2.80	2.80	2.80
SIERRA	0.50	0.50	0.50
TOTAL	***15.87***	***9.30***	***9.30***

[1] Clovis possesses a capacity of only 3.00 MGD in the North Avenue Trunk Sewer downstream of Maple Avenue for Fowler Trunk Sewer flows. The acquisition by Clovis of treatment capacity of 3.00 MGD has been agreed upon in concept.

Clovis' current useable capacity of 9.30 MGD is approximately 3.00 MGD (nearly 50%) more than the present total average wastewater flow from Clovis. This represents available capacity for about 10,000 new equivalent single-family residential units, or a population increase of about 30,000 Clovis residents. Assuming a relatively stable growth rate for the City of Clovis over the next several years, Clovis' current useable capacity in the regional system should be sufficient for well in excess of 10 years' growth. Please refer to Section 6 for a detailed discussion of regional system expansion issues.

Although there are potential deficits in required buildout capacity in the Peach Service Area (as much as 0.61 MGD) and in the Nees Service Area (as much as 1.60 MGD), there are opportunities for adjusting the boundaries of service areas by structural means to balance flows and take better advantage of a net excess of currently planned capacity in the regional system. The future growth areas designated in the 1993 Clovis General Plan, however, will require the acquisition or development of new capacity over and above that currently allocated to (or planned for) Clovis in the regional system.

This new capacity for the future growth areas of Clovis can be accomplished by (1) acquiring increased capacity in the regional system, or (2) by Clovis establishing its own satellite wastewater treatment and reclamation facilities, or (3) by a combination of both. These are alternatives that were prescribed to be examined in the Phase 1-B study.

2.2.2 ALTERNATIVES TO BE EVALUATED IN THE PHASE 1-B STUDY

Six alternative conceptual plans for ultimate wastewater service for the area within the boundaries of the 1993 Clovis General Plan were eventually included in the scope of work for this study, as follows:

Alternative 1: All existing and future Clovis flows to be directed to an expanded Fresno-Clovis Regional Wastewater Treatment Plant

Alternative 2: All existing and future Clovis flows to be directed to a combination of an expanded Fresno-Clovis Regional Wastewater Treatment Plant and new Fresno-Clovis Regional Satellite Wastewater Reclamation Facilities located outside of the 1993 Clovis General Plan boundaries

Alternatives 3, 4 and 5:

Maximize service into the existing four regional trunk sewers, with the balance of future flow from development of the 1993 Clovis General Plan areas to be served by one or more proposed Clovis Satellite Wastewater Reclamation Facilities (WWRF's):

Alternative 3: Three proposed Clovis Satellite WWRF'S, one located within or near each of the urban villages proposed on the 1993 Clovis General Plan

Alternative 4: Two proposed Clovis Satellite WWRF'S, one located within or near the proposed Northwest urban village, and one located within or near the proposed Southeast urban village

Alternative 5: One proposed Clovis Satellite WWRF, located within or near the proposed Southeast urban village

Alternative 6: All existing and future Clovis flows, including those currently planned for service to the existing Fresno-Clovis regional system, to be directed to, and served by, two proposed Clovis Satellite WWRF'S, one located within or near the proposed Northwest urban village, and one located within or near the proposed Southeast urban village

Alternatives 1 and 2 are totally dependent upon the regional system for service, whereas Alternatives 3, 4 and 5 are partially dependent upon the regional system. Alternative 6 is a "Clovis Only" alternative, independent of the regional system.

With the exception of Alternative 6, these alternatives were specifically identified in the Environmental Impact Report for the 1993 Clovis General Plan. These alternatives were also confirmed in the "Progress Report and Interim Findings Review" with the Clovis City Council on March 4, 1996.

2.3 FRESNO-CLOVIS REGIONAL WASTEWATER MASTER PLAN UPDATE

A wastewater master plan update is nearing completion by the regional authority, scheduled for completion and adoption by early 1997. The study is being performed by John Carollo Engineers.

The regional wastewater master plan update primarily involves issues related to expansion of the capacity of the Regional Wastewater Treatment Plant, together with a reconnaissance level study of the potential of establishing regional satellite wastewater treatment facilities as an alternative to, or a supplement to, additional regional plant capacity.

The regional wastewater master plan update evaluates the further expansion requirements of the regional plant, including projected flow growth and flow characteristics, regulatory requirements, standby criteria, effluent reuse/disposal, biosolids reuse/disposal, and associated issues. The regional master plan update is intended to provide comprehensive guidance into the future, so that expansion requirements can be anticipated far enough in advance to allow a systematic approach to funding, design and construction. The plan is intended to be a dynamic one, in that reassessments are to be accomplished on a periodic basis (every few years) to assure that opportunities are available for adjustments in the expansion schedule and associated treatment/disposal component elements.

The regional wastewater master plan update includes a reconnaissance level study of possible regional satellite wastewater treatment and disposal/reclamation/reuse facilities, as a potential alternative (or supplement) to expansion at the regional plant. The study concludes that regional satellite WWRF's are feasible alternatives, both economically and non-economically, to equivalent capacity expansion of the regional WWTP. Further recommendations in the master plan include additional, more comprehensive, analyses of satellite options and provisions for funding the additional studies.

Trunk sewer planning was not included in the regional wastewater master plan update, except in the general context of estimating potential avoided conveyance facility costs in the regional satellite alternatives' cost analyses. It was necessary, therefore, in preparing Clovis' Phase 1-B study, to prepare reconnaissance level conceptual designs for the regional conveyance facilities required to serve Clovis, in order to determine the probable magnitude of Clovis' share of the costs of expansion of the regional system.

It was also necessary to develop conceptual designs within the Phase 1-B study for the potential regional satellite wastewater reclamation plants, both to determine the feasibility of water recycling alternatives for these plants, and to be able to realistically estimate the cost of the facilities. The approach taken in the regional master plan update with respect to estimates of cost of the satellite facilities was one which focused on relative cost differences between satellite plant development and regional plant expansion, rather than on determining the individual estimated costs of satellite plants.

There were also significant differences between the approach taken in the regional study to that taken in Clovis' Phase 1-B study relative to cost estimating parameters. Since Clovis' study involved actual conceptual layouts and inventories of the individual components required for the potential satellite facilities (both regional and Clovis only), it was possible to use less conservative estimating factors and allowances for contingencies in the cost estimating process. This also provided for a realistic comparison of the estimated costs of regional satellite facilities versus potential Clovis (only) satellite facilities.

2.4 CONFORMANCE WITH CLOVIS' WATER MASTER PLAN UPDATE

The City of Clovis' Phase 1 Water Master Plan Update was completed in 1995. The water master plan includes a conceptual strategy of joint utilization of groundwater and treated surface (canal) water for long term supplies for the City's growth needs.

Although Clovis' water master plan makes reference to reclaimed wastewater as a potential source of water for landscape and agricultural irrigation, and for groundwater recharge, such actions are not relied upon in the plan's water supply assumptions for Clovis' future needs. The plan recognizes, however, that reclaimed wastewater could help to maintain local water balances and supplement water supplies, particularly in areas with limited water resources.

The water master plan suggests that the source of surface water for a Clovis water treatment plant could be the Enterprise Canal or Gould Canal, with the Enterprise Canal being favored because less storm water runoff is discharged to the Enterprise Canal than the Gould Canal. Because of the potential use of surface water from these canals for domestic use (both in Clovis and Fresno), both canals were eliminated from consideration as discharge points for reclaimed water from potential Clovis satellite wastewater reclamation facilities.

The Clovis wastewater master planning effort conforms with the recommendations of the Clovis Water Master Plan Update. The potential reclaiming of Clovis' wastewater for landscape irrigation, agricultural irrigation, groundwater recharge, and other uses, was examined, and conceptual alternatives presented for consideration.

SECTION 3.
WASTEWATER FLOW AND LOADING PROJECTIONS

3.1 GENERAL

Projections for wastewater flow and organic and suspended solids loading were prepared for all existing and potential service areas within the boundaries of the 1993 Clovis General Plan. These projections were framed in five year increments, beginning with the existing (base year) conditions in 1995, and extending to buildout of all areas in 2030, as predicted in the General Plan. All projections were "Land-Use Based", essentially tieing wastewater service demands to the probable ultimate use of undeveloped land.

3.2 WASTEWATER FLOW PROJECTIONS

Projections were made for the following parameters of wastewater flow:

- AVERAGE DAY ANNUAL FLOW (ADAF)
  The average daily flow based on the calendar year.

- AVERAGE DRY WEATHER FLOW (ADWF)
  The average flow occurring over the three consecutive lowest flow months of the year. The ADWF for Clovis typically occurs in April, May and June.

- AVERAGE DAY MAXIMUM MONTH FLOW (ADMMF)
  The average daily flow occurring during the maximum flow month of the year. The ADMMF for Clovis is typically during the month of September during the food processing season.

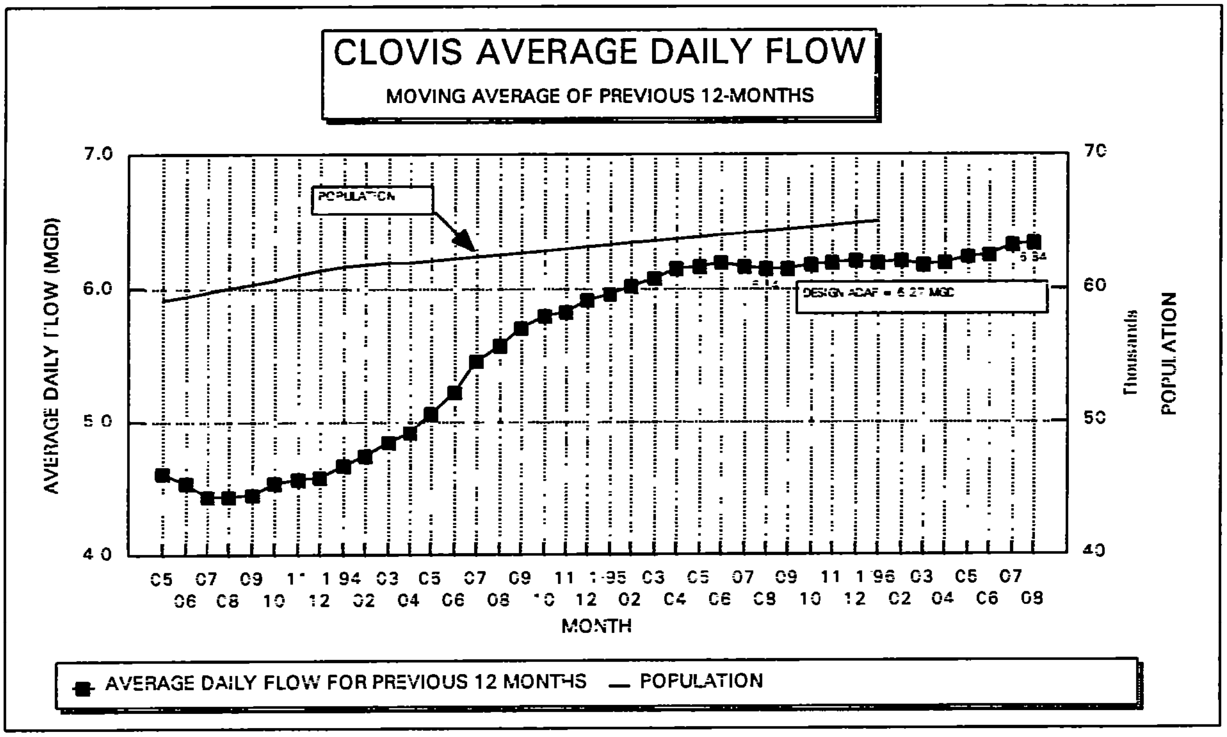
- PEAK HOUR WET WEATHER FLOW (PHWWF)
  The peak hour flow resulting from the design rainfall event. The PHWWF typically occurs during the wet weather period of December through March, and is ultimately limited by the hydraulic capacity of the trunk sewer system. Because of the severity of the occurrence and the availability of hourly flow data, the storm of March 9, 10 and 11, 1995, was utilized as the design rainfall event.

3.2.1 AVERAGE DAY ANNUAL FLOW (ADAF)

The total 1995 (base year) average day annual flow for the four Clovis trunk sewers was designated at 6.27 million gallons per day (MGD). This value was selected for design, being slightly above the moving average of previous 12 month periods of 1995 as indicated on Figure 3-1. This value also corresponds with the estimate of average daily flow set forth in the June, 1995 , Phase 1-A Wastewater Master Plan Update.

ADAF for the buildout increment for each existing service area was determined by applying design wastewater flow generation rates developed in the Phase 1-A study to an inventory of undeveloped property within each existing service area. The inventory, accomplished by inspection of aerial photographs taken April 21, 1994, was arranged by land use categories as set forth on the 1993 Clovis General Plan. The ADAF buildout increment was calculated utilizing "projected" residential densities, as established in the Environmental Impact Report, December, 1992, (EIR) for the Clovis General Plan. The "projected" residential densities fall somewhere between the "low range" and "high range" estimates as set forth in the EIR. The "high range" estimates would result in buildout increment flows in the existing four trunk sewer service areas which are 10% to 20% higher than those calculated at the "projected" densities.

FIGURE 3-1



The ADAF for all other proposed service areas was determined by applying the same design flow generation rates developed in the Phase 1-A study to the territories designated for various land uses in the 1993 General Plan. This was accomplished by rectifying the Land Use Plan as contained in the General Plan to a more accurate geographic representation, utilizing existing U.S. Geological Survey 7½' quadrangle maps. Again, the ADAF buildout increment was calculated utilizing "projected" residential densities, falling somewhere between the low and high range projections in the General Plan EIR. The "high range" estimates would result in buildout increment flows in the proposed sewer service areas which are as much as 40% higher than those calculated at the "projected" densities.

Rows 27 through 39 of Table 3-1 contain ADAF data, both existing, and projected to buildout, for the existing trunk sewer service areas and the proposed additional service areas within the 1993 Clovis General Plan boundaries. ADAF is used to size certain wastewater collection, transmission, treatment and disposal facility components.

Appendix A3 contains tabulated design flow generation rates, together with land-use based flow projection data to buildout, for each service area.

TABLE 3-1
PROJECTED CLOVIS FLOW GENERATION PARAMETERS FOR WASTEWATER FACILITIES PLANNING PURPOSES

ROW	COLUMN ->		EXISTING PLANNED SEWER SERVICE AREAS (1992 SPHERE OF INFLUENCE)							1993 GP EXPANSION SERVICE AREAS				TOTALS	POTENTIAL ADD'NL 93 GP SERVICE AREAS					GRAND
			SERVICE AREAS WITH EXISTING TRUNK SEWERS												SPECIAL STUDY AREAS		RURAL DESIGNATIONS			
			PEACH	FOWLER	HERNDON	SIERRA	SUBTOTAL	NEES	SUBTOTAL 92 SPHERE	SE	NW*	NE**	SUBTOTAL GP EXP AREAS	ALL 93 GP SERV. AREAS	SE	NE	RR	AG	SUBTOTAL	TOTALS ALL AREAS
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	**POPULATION SERVED**																			
2	EXISTING (1995)	(PERS)	26,500	25,600	9,800	1,100	63,000	0	63,000	0	0	0	0	63,000	0	0	0	0	0	63,000
3	BUILDOUT INCREMENT	(PERS)	6,200	30,100	10,500	1,300	48,100	10,500	58,600	20,400	12,300	33,900	66,600	125,200	6,200	6,500	18,200	1,500	32,400	157,600
4	TOTAL	(PERS)	32,700	55,700	20,300	2,400	111,100	10,500	171,600	20,400	12,300	33,900	66,600	188,200	6,200	6,500	18,200	1,500	32,400	220,600
5	TOTAL SERVED BY																			
6	1995	(PERS)	26,500	25,600	9,800	1,100	63,000	0	63,000	0	0	0	0	63,000	0	0	0	0	0	63,000
7	2000	(PERS)	29,300	33,200	12,500	1,800	76,800	1,500	78,300	0	0	0	0	78,300	0	0	0	0	0	78,300
8	2005	(PERS)	31,800	40,700	15,200	2,200	89,900	3,000	92,900	2,000	0	0	2,000	94,900	0	0	0	0	0	94,900
9	2010	(PERS)	32,200	48,200	17,800	2,300	100,500	4,500	105,000	5,100	2,400	600	8,100	113,100	0	0	0	0	0	113,100
10	2015	(PERS)	32,700	55,700	20,300	2,400	111,100	6,000	117,100	10,200	3,100	1,300	14,600	131,700	0	0	0	0	0	131,700
11	2020	(PERS)	32,700	55,700	20,300	2,400	111,100	7,500	118,600	15,300	6,200	11,700	33,200	151,800	0	0	0	0	0	151,800
12	2025	(PERS)	32,700	55,700	20,300	2,400	111,100	9,000	120,100	20,400	9,300	22,800	52,500	172,600	3,100	3,300	0	0	6,400	179,000
13	2030	(PERS)	32,700	55,700	20,300	2,400	111,100	10,500	171,600	20,400	12,300	33,900	66,600	188,200	6,200	6,500	18,200	1,500	32,400	220,600
14	**RESIDENTIAL CONNECTIONS**																			
15	EXISTING	(EA)	9,700	9,300	3,600	400	23,000	0	23,000	0	0	0	0	23,000	0	0	0	0	0	23,000
16	BUILDOUT INCREMENT	(EA)	1,900	10,500	3,600	500	16,500	3,700	20,200	7,300	4,400	12,100	23,800	44,000	2,200	2,300	5,800	500	10,800	54,800
17	TOTAL	(EA)	11,600	19,800	7,200	900	39,500	3,700	43,200	7,300	4,400	12,100	23,800	67,000	2,200	2,300	5,800	500	10,800	77,800
18	TOTAL CONNECTED BY																			
19	1995	(EA)	9,700	9,300	3,600	400	23,000	0	23,000	0	0	0	0	23,000	0	0	0	0	0	23,000
20	2000	(EA)	10,400	11,800	4,400	600	27,200	500	27,700	0	0	0	0	27,700	0	0	0	0	0	27,700
21	2005	(EA)	11,300	14,500	5,400	800	32,000	1,100	33,100	700	0	0	700	33,800	0	0	0	0	0	33,800
22	2010	(EA)	11,500	17,200	6,300	800	35,800	1,600	37,400	1,800	900	200	2,900	40,300	0	0	0	0	0	40,300
23	2015	(EA)	11,600	19,800	7,200	900	39,500	2,100	41,600	3,600	1,100	500	5,200	46,800	0	0	0	0	0	46,800
24	2020	(EA)	11,600	19,800	7,200	900	39,500	2,700	47,200	5,400	2,200	4,200	11,800	54,000	0	0	0	0	0	54,000
25	2025	(EA)	11,600	19,800	7,200	900	39,500	3,200	42,700	7,300	3,300	8,100	18,700	[illegible]	1,100	1,200	0	0	2,300	63,700
26	2030	(EA)	11,600	19,800	7,200	900	39,500	3,700	43,200	7,300	4,400	12,100	23,800	67,000	2,200	2,300	5,800	500	10,800	77,800
27	**AVG. DAY ANNUAL FLOW**																			
28	EXISTING	(MGD)	2.63	2.55	0.98	0.11	6.27	0.00	6.27	0.00	0.00	0.00	0.00	6.27	0.00	0.00	0.00	0.00	0.00	6.27
29	BUILDOUT INCREMENT	(MGD)	0.81	3.44	1.21	0.15	5.61	1.15	6.76	2.24	1.35	3.73	7.32	14.05	0.68	0.71	1.55	0.13	3.07	17.15
30	TOTAL	(MGD)	3.44	5.99	2.19	0.26	11.88	1.15	13.03	2.24	1.35	3.73	7.32	20.35	0.68	0.71	1.55	0.13	3.07	23.42
31	TOTAL ADAF BY																			
32	1995	(MGD)	2.63	2.55	0.98	0.11	6.27	0.00	6.27	0.00	0.00	0.00	0.00	6.27	0.00	0.00	0.00	0.00	0.00	6.27
33	2000	(MGD)	3.08	3.57	1.35	0.20	8.20	0.16	8.36	0.00	0.00	0.00	0.00	8.36	0.00	0.00	0.00	0.00	0.00	8.36
34	2005	(MGD)	3.35	4.38	1.64	0.24	9.61	0.33	9.94	0.22	0.00	0.00	0.22	10.16	0.00	0.00	0.00	0.00	0.00	10.16
35	2010	(MGD)	3.39	5.18	1.92	0.25	10.74	0.49	11.73	0.56	0.26	0.07	0.89	12.12	0.00	0.00	0.00	0.00	0.00	12.12
36	2015	(MGD)	3.44	5.99	2.19	0.26	11.88	0.66	12.54	1.12	0.34	0.14	1.60	14.14	0.00	0.00	0.00	0.00	0.00	14.14
37	2020	(MGD)	3.44	5.99	2.19	0.26	11.88	0.82	12.70	1.68	0.68	1.29	3.65	16.35	0.00	0.00	0.00	0.00	0.00	16.35
38	2025	(MGD)	3.44	5.99	2.19	0.26	11.88	0.99	12.87	2.24	1.02	2.51	5.77	18.64	0.34	0.36	0.00	0.00	0.70	19.34
39	2030	(MGD)	3.44	5.99	2.19	0.26	11.88	1.15	13.03	2.24	1.35	3.73	7.32	20.35	0.68	0.71	1.55	0.13	3.07	23.42

* PORTION NORTH OF NEES SERVICE AREA

** 0.25MGD OF THIS AREA'S AVERAGE DAY ANNUAL FLOW IS GENERATED BY AREAS EAST OF BIG DRY CREEK RESERVOIR AND NORTH OF FUTURE FREEWAY #168.

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TABLE 3-2
PROJECTED CLOVIS FLOW GENERATION PARAMETERS FOR WASTEWATER FACILITIES PLANNING PURPOSES

ROW		EXISTING PLANNED SEWER SERVICE AREAS (1992 SPHERE OF INFLUENCE) SERVICE AREAS WITH EXISTING TRUNK SEWERS PEACH	FOWLER	HERNDON	SIERRA	SUBTOTAL	NEES	SUBTOTAL 92 SPHERE	1993 GP EXPANSION SERVICE AREAS SE	NW*	NE	SUBTOTAL GP EXP AREAS	TOTALS ALL 93 GP SERV. AREAS	POTENTIAL ADD'NL 93 GP SERVICE AREAS SPECIAL STUDY AREAS SE	NE	RURAL DESIGNATIONS RR	AG	SUBTOTAL	GRAND TOTALS ALL AREAS
	COLUMN ->	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	**AVG. DRY WEATHER FLOW**																		
2	EXISTING (MGD)	2.57	2.44	0.94	0.11	6.01	0.00	6.01	0.00	0.00	0.00	0.00	6.01	0.00	0.00	0.00	0.00	0.00	6.01
3	BUILDOUT INCREMENT (MGD)	0.78	3.30	1.16	0.14	5.38	1.10	6.48	2.15	1.29	3.58	7.02	13.50	0.65	0.68	1.49	0.12	2.94	16.44
4	TOTAL (MGD)	3.30	5.74	2.10	0.25	11.39	1.10	12.49	2.15	1.29	3.58	7.02	19.51	0.65	0.68	1.49	0.12	2.94	22.45
5	TOTAL ADWF BY																		
6	1995 (MGD)	2.52	2.44	0.94	0.11	6.01	0.00	6.01	0.00	0.00	0.00	0.00	6.01	0.00	0.00	0.00	0.00	0.00	6.01
7	2000 (MGD)	2.96	3.42	1.29	0.19	7.86	0.15	8.01	0.00	0.00	0.00	0.00	8.01	0.00	0.00	0.00	0.00	0.00	8.01
8	2005 (MGD)	3.21	4.20	1.57	0.23	9.21	0.32	9.53	0.21	0.00	0.00	0.21	9.74	0.00	0.00	0.00	0.00	0.00	9.74
9	2010 (MGD)	3.25	4.97	1.84	0.24	10.30	0.47	10.77	0.53	0.25	0.07	0.85	11.62	0.00	0.00	0.00	0.00	0.00	11.62
10	2015 (MGD)	3.30	5.74	2.10	0.25	11.39	0.63	12.02	1.07	0.33	0.13	1.53	13.55	0.00	0.00	0.00	0.00	0.00	13.55
11	2020 (MGD)	3.30	5.74	2.10	0.25	11.39	0.79	12.18	1.61	0.65	1.74	3.50	15.68	0.00	0.00	0.00	0.00	0.00	15.68
12	2025 (MGD)	3.30	5.74	2.10	0.25	11.39	0.95	12.34	2.14	0.98	2.41	5.53	17.87	0.32	0.35	0.00	0.00	0.67	18.54
13	2030 (MGD)	3.30	5.74	2.10	0.25	11.39	1.10	12.49	2.15	1.29	3.58	7.02	19.51	0.65	0.68	1.49	0.12	2.94	22.45
14	**AVG. DAY MAX. MONTH FLOW**																		
15	EXISTING (MGD)	2.85	2.76	1.31	0.12	6.79	0.00	6.79	0.00	0.00	0.00	0.00	6.79	0.00	0.00	0.00	0.00	0.00	6.79
16	BUILDOUT INCREMENT (MGD)	0.88	3.73	1.31	0.16	6.08	1.24	7.32	2.42	1.46	4.05	7.93	15.25	0.73	0.77	1.68	0.14	3.32	18.57
17	TOTAL (MGD)	3.73	6.49	2.62	0.28	12.87	1.24	14.11	2.42	1.46	4.05	7.93	22.04	0.73	0.77	1.68	0.14	3.32	25.36
18	TOTAL ADMMF BY																		
19	1995 (MGD)	2.85	2.76	1.31	0.12	6.79	0.00	6.79	0.00	0.00	0.00	0.00	6.79	0.00	0.00	0.00	0.00	0.00	6.79
20	2000 (MGD)	3.34	3.86	1.64	0.21	8.88	0.17	9.05	0.00	0.00	0.00	0.00	9.05	0.00	0.00	0.00	0.00	0.00	9.05
21	2005 (MGD)	3.63	4.75	1.97	0.26	10.41	0.36	10.77	0.24	0.00	0.00	0.24	11.01	0.00	0.00	0.00	0.00	0.00	11.01
22	2010 (MGD)	3.67	5.62	2.30	0.27	11.64	0.53	12.17	0.60	0.28	0.08	0.96	13.13	0.00	0.00	0.00	0.00	0.00	13.13
23	2015 (MGD)	3.73	6.49	2.62	0.28	12.87	0.71	13.58	1.21	0.37	0.15	1.73	15.31	0.00	0.00	0.00	0.00	0.00	15.31
24	2020 (MGD)	3.73	6.49	2.62	0.28	12.87	0.89	13.76	1.83	0.73	1.40	3.95	17.72	0.00	0.00	0.00	0.00	0.00	17.72
25	2025 (MGD)	3.73	6.49	2.62	0.28	12.87	1.07	13.94	2.42	1.11	2.72	6.25	20.19	0.36	0.40	0.00	0.00	0.76	20.95
26	2030 (MGD)	3.73	6.49	2.62	0.28	12.87	1.24	14.11	2.42	1.46	4.05	7.93	22.04	0.73	0.77	1.68	0.14	3.32	25.36
27	**PEAK HR WET WEATHER FLOW**																		
28	EXISTING (MGD)	6.56	6.34	2.44	0.79	15.63	0.00	15.63	0.00	0.00	0.00	0.00	15.63	0.00	0.00	0.00	0.00	0.00	15.63
29	BUILDOUT INCREMENT (MGD)	2.02	8.58	3.02	0.36	13.98	2.86	16.84	5.59	3.35	9.31	18.25	35.09	1.69	1.77	3.87	0.31	7.64	42.73
30	TOTAL (MGD)	8.58	14.92	5.46	0.65	29.61	2.86	32.47	5.59	3.35	9.31	18.25	50.72	1.69	1.77	3.87	0.31	7.64	58.36
31	TOTAL PHWWF BY																		
32	1995 (MGD)	6.56	6.34	2.44	0.79	15.63	0.00	15.63	0.00	0.00	0.00	0.00	15.63	0.00	0.00	0.00	0.00	0.00	15.63
33	2000 (MGD)	7.71	8.89	3.35	0.49	20.44	0.39	20.83	0.00	0.00	0.00	0.00	20.83	0.00	0.00	0.00	0.00	0.00	20.83
34	2005 (MGD)	8.35	10.92	4.08	0.60	23.95	0.83	24.78	0.55	0.00	0.00	0.55	25.33	0.00	0.00	0.00	0.00	0.00	25.33
35	2010 (MGD)	8.46	12.92	4.78	0.62	26.78	1.22	28.00	1.38	0.65	0.18	2.21	30.21	0.00	0.00	0.00	0.00	0.00	30.21
36	2015 (MGD)	8.58	14.92	5.46	0.65	29.61	1.64	31.25	2.78	0.86	0.34	3.98	35.23	0.00	0.00	0.00	0.00	0.00	35.23
37	2020 (MGD)	8.58	14.92	5.46	0.65	29.61	2.05	31.67	4.19	1.69	3.22	9.10	40.77	0.00	0.00	0.00	0.00	0.00	40.77
38	2025 (MGD)	8.58	14.92	5.46	0.65	29.61	2.47	32.08	5.56	2.55	6.27	14.38	46.45	0.83	0.91	0.00	0.00	1.74	48.20
39	2030 (MGD)	8.58	14.92	5.46	0.65	29.61	2.86	32.47	5.59	3.35	9.31	18.25	50.72	1.69	1.77	3.87	0.31	7.64	58.36

* PORTION NORTH OF NEES SERVICE AREA

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3.2.2 AVERAGE DRY WEATHER FLOW (ADWF)

The average dry weather flow for base year 1995 for the four existing Clovis trunk sewers totaled 6.01 MGD, and represented the average flow for the months of April, May and June, 1995. The projected ADWF for the buildout increment in each service area was determined by the following relationship:

$$ADWF/ADAF = 6.01MGD/6.27MGD = 0.96$$

$$\text{or,} \quad ADWF = (0.96)(ADAF)$$

Rows 1 through 13 of Table 3-2 contain ADWF data, both existing, and projected to buildout, for the existing trunk sewer service areas and the proposed additional service areas within the 1993 Clovis General Plan boundaries. The ADWF is a measure of the lowest flow period of the year, when maintenance downtime is least objectionable.

3.2.3 AVERAGE DAY MAXIMUM MONTH FLOW (ADMMF)

The current average day maximum month flow for Clovis is estimated at 6.79 MGD, with the Herndon Trunk Sewer discharging a maximum of 1.31 MGD average daily flow during September, 1994. Because the ADMMF is heavily influenced by food processing facilities, which are a significant presence in the Herndon Trunk Sewer service area, the unusual ADMMF for the Herndon Trunk Sewer was accounted for in the existing ADMMF, but not in the estimate for buildout increment. The ADMMF for the buildout increment in each service area was determined by the following relationship to ADWF:

$$ADMMF/ADWF = 6.79MGD/6.01MGD = 1.13$$

$$\text{or,} \quad ADMMF = (1.13)(ADWF)$$

Rows 14 through 26 of Table 3-2 contain ADMMF data, both existing, and projected to buildout, for the existing trunk sewer service areas and the proposed additional service areas within the 1993 Clovis General Plan boundaries. The ADMMF is utilized to size certain treatment and disposal facility components.

3.2.4 PEAK HOUR WET WEATHER FLOW (PHWWF)

The current peak hour wet weather flow for Clovis' four existing trunk sewers is estimated at a total of 15.63 MGD. This estimate was made utilizing limited hourly flow data for March, 1995, and January, 1995, storm events. The PHWWF for the buildout increment in each service area was determined by the following relationship to ADWF:

$$PHWWF/ADWF = 15.63MGD/6.01MGD = 2.60$$

$$\text{or,} \quad PHWWF = (2.60)(ADWF)$$

Rows 27 through 39 of Table 3-2 contain PHWWF data, both existing, and projected to buildout, for the existing trunk sewer service areas and the proposed additional service areas within the 1993 Clovis General Plan boundaries. The ADMMF is utilized to size treatment and disposal facility hydraulic conveyance components.

3.3 WASTEWATER LOADING PROJECTIONS (BIOCHEMICAL OXYGEN DEMAND AND SUSPENDED SOLIDS)

Projections were made for the following parameters of wastewater load:

- <u>AVERAGE DAY ANNUAL LOAD (ADAL)</u>
  The average daily organic or suspended solids load based on the calendar year.

- <u>AVERAGE DRY WEATHER LOAD (ADWL)</u>
  The average organic and suspended solids load occurring over the three consecutive lowest flow months of the year. The ADWL for Clovis typically occurs in April, May and June.

- <u>AVERAGE DAY MAXIMUM MONTH LOAD (ADMML)</u>
  The average daily organic or suspended solids load occurring during the maximum load month of the year. The ADMML for Clovis is typically during the month of September during the food processing season.

3.3.1 AVERAGE DAY ANNUAL LOAD (ADAL)

The existing average day annual load for the four Clovis trunk sewers was estimated based upon records supplied by the City of Fresno for the period July, 1994, through August, 1995. These records consisted of the results of periodic grab sample analyses of flow in the Herndon and Peach Trunk Sewers, and composite sampling of the Fowler Trunk Sewer flow. Although the Sierra Trunk Sewer flow was not tested, it was assumed to be consistent with average loading in the Peach and Fowler Trunk Sewers. The Sierra Trunk Sewer carries only about 2% of the total Clovis flow. ADAL is used to size certain wastewater treatment facility components.

3.3.1.1 *ADAL - BOD*

The base year ADAL five-day biochemical oxygen demand (BOD) for the total of the four existing Clovis trunk sewers was designated at 12,100 pounds per day. This value was selected for the 1995 (base year) estimate, being slightly above the actual amounts recorded during the period of record. The base year ADAL BOD for each of the existing service areas is indicated in Row 2 of Table 3-3.

Projections of future ADAL BOD for buildout of the existing Clovis service areas, and for all proposed future service areas, are indicated in Rows 3 through 13 of Table 3-3. The projections are based upon a design concentration of 240 parts per million, which is about 25% higher than the current average for the Peach and Fowler Trunk Sewer service areas. The Herndon Trunk sewer service area, with its high loading during the food processing season, was not considered representative for purposes of projecting future loading increments. The 25% increase factor was utilized to provide for the fact that all new construction requires water conservation fixtures, which tend to increase loading concentrations. Loading estimates for the buildout increment were then calculated by applying the loading concentration to the respective flow projections for ADAF.

3.3.1.2 *ADAL - TSS*

The 1995 (base year) ADAL total suspended solids (TSS) for the four existing Clovis trunk sewers was designated at 9,100 pounds per day. This value was selected for the 1995 estimate, being slightly above the actual amounts recorded during the period of record. The current ADAL TSS for each of the existing service areas is indicated in Row 2 of Table 3-4.

TABLE 3-3
PROJECTED FLOW LOADING PARAMETERS FOR WASTEWATER FACILITIES PLANNING PURPOSES

ROW	COLUMN ->	EXISTING PLANNED SEWER SERVICE AREAS (1992 SPHERE OF INFLUENCE) SERVICE AREAS WITH EXISTING TRUNK SEWERS PEACH A	FOWLER B	HERNDON C	SIERRA D	SUBTOTAL E	NETS F	SUBTOTAL 92 SPHERE G	1993 GP EXPANSION SERVICE AREAS SE H	NW* I	NE J	SUBTOTAL GP EXP AREAS K	TOTALS ALL 93 GP SERV. AREAS L	POTENTIAL ADD'NL 93 GP SERVICE AREAS SPECIAL STUDY AREAS SE M	NE N	RURAL DESIGNATIONS RR O	AG P	SUBTOTAL Q	GRAND TOTALS ALL AREAS R
1	**AVG. DAY ANNUAL LOAD (BOD)**																		
2	EXISTING (PPD)	4,300	4,100	3,500	200	12,100	0	12,100	0	0	0	0	12,100	0	0	0	0	0	12,100
3	BUILDOUT INCREMENT (PPD)	1,600	6,900	2,400	300	11,200	2,300	13,500	4,500	2,700	7,500	14,700	28,200	1,400	1,400	3,100	300	6,200	34,400
4	TOTAL (PPD)	5,900	11,000	5,900	500	23,300	2,300	25,600	4,500	2,700	7,500	14,700	40,300	1,400	1,400	3,100	300	6,200	46,500
5	TOTAL ADAL (BOD) BY																		
6	1995 (PPD)	4,300	4,100	3,500	200	12,100	0	12,100	0	0	0	0	12,100	0	0	0	0	0	12,100
7	2000 (PPD)	5,200	6,100	4,700	400	15,900	300	16,200	0	0	0	0	16,200	0	0	0	0	0	16,200
8	2005 (PPD)	5,700	7,800	4,800	500	18,800	700	19,500	400	0	0	400	19,900	0	0	0	0	0	19,900
9	2010 (PPD)	5,800	9,400	5,400	500	21,100	1,000	22,100	1,100	500	100	1,700	23,800	0	0	0	0	0	23,800
10	2015 (PPD)	5,900	11,000	5,900	500	23,300	1,300	24,600	2,200	700	300	3,200	27,800	0	0	0	0	0	27,800
11	2020 (PPD)	5,900	11,000	5,900	500	23,300	1,600	24,900	3,400	1,400	2,600	7,400	32,300	0	0	0	0	0	32,300
12	2025 (PPD)	5,900	11,000	5,900	500	23,300	2,000	25,300	4,500	2,000	5,000	11,500	36,800	700	700	0	0	1,400	38,200
13	2030 (PPD)	5,900	11,000	5,900	500	23,300	2,300	25,600	4,500	2,700	7,500	14,700	40,300	1,400	1,400	3,100	300	6,200	46,500
14	**AVG. DRY WTHR. LOAD (BOD)**																		
15	EXISTING (PPD)	3,900	3,400	1,600	200	9,100	0	9,100	0	0	0	0	9,100	0	0	0	0	0	9,100
16	BUILDOUT INCREMENT (PPD)	1,400	5,800	2,000	200	9,400	1,900	11,300	3,800	2,300	6,300	12,400	23,700	1,100	1,200	2,600	200	5,100	28,800
17	TOTAL (PPD)	5,300	9,200	3,600	400	18,500	1,900	20,400	3,800	2,300	6,300	12,400	32,800	1,100	1,200	2,600	200	5,100	37,900
18	TOTAL ADWL (BOD) BY																		
19	1995 (PPD)	3,900	3,400	1,600	200	9,100	0	9,100	0	0	0	0	9,100	0	0	0	0	0	9,100
20	2000 (PPD)	4,700	5,100	2,200	300	12,300	300	12,600	0	0	0	0	12,600	0	0	0	0	0	12,600
21	2005 (PPD)	5,100	6,500	2,700	400	14,700	600	15,300	400	0	0	400	15,700	0	0	0	0	0	15,700
22	2010 (PPD)	5,200	7,900	3,200	400	16,700	800	17,500	900	400	100	1,400	18,900	0	0	0	0	0	18,900
23	2015 (PPD)	5,300	9,200	3,600	400	18,500	1,100	19,600	1,900	600	200	2,700	22,300	0	0	0	0	0	22,300
24	2020 (PPD)	5,300	9,200	3,600	400	18,500	1,400	19,900	2,800	1,100	2,200	6,100	26,000	0	0	0	0	0	26,000
25	2025 (PPD)	5,300	9,200	3,600	400	18,500	1,700	20,200	3,800	1,700	4,200	9,700	29,900	600	600	0	0	1,200	31,100
26	2030 (PPD)	5,300	9,200	3,600	400	18,500	1,900	20,400	3,800	2,300	6,300	12,400	32,800	1,100	1,200	2,600	200	5,100	37,900
27	**AVG. DAY MAX MTH. LD. (BOD)**																		
28	EXISTING (PPD)	5,900	4,700	10,400	300	18,100	0	18,100	0	0	0	0	18,100	0	0	0	0	0	18,100
29	BUILDOUT INCREMENT (PPD)	2,200	9,200	3,200	400	15,000	3,100	18,100	6,000	3,600	10,000	19,600	37,700	1,800	1,900	4,100	300	8,100	45,800
30	TOTAL (PPD)	8,100	13,900	13,600	700	33,100	3,100	36,200	6,000	3,600	10,000	19,600	55,800	1,800	1,900	4,100	300	8,100	63,900
31	TOTAL ADMML (BOD) BY																		
32	1995 (PPD)	5,900	4,700	10,400	300	18,100	0	18,100	0	0	0	0	18,100	0	0	0	0	0	18,100
33	2000 (PPD)	7,100	4,400	11,200	500	23,200	400	23,600	0	0	0	0	23,600	0	0	0	0	0	23,600
34	2005 (PPD)	7,800	9,600	12,000	600	27,000	900	27,900	600	0	0	600	28,500	0	0	0	0	0	28,500
35	2010 (PPD)	7,900	11,700	12,800	700	30,000	1,300	31,300	1,500	700	200	2,400	33,700	0	0	0	0	0	33,700
36	2015 (PPD)	8,100	13,900	13,600	700	33,100	1,700	34,800	3,000	900	400	4,300	39,100	0	0	0	0	0	39,100
37	2020 (PPD)	8,100	13,900	13,600	700	33,100	2,200	35,300	4,500	1,800	3,400	9,700	45,000	0	0	0	0	0	45,000
38	2025 (PPD)	8,100	13,900	13,600	700	33,100	2,600	35,700	6,000	2,700	6,700	15,400	51,100	900	1,000	0	0	1,900	53,000
39	2030 (PPD)	8,100	13,900	13,600	700	33,100	3,100	36,200	6,000	3,600	10,000	19,600	55,800	1,800	1,900	4,100	300	8,100	63,900

* PORTION NORTH OF NETS SERVICE AREA

3617TPR4 WK4 09/04/96

TABLE 3-4
PROJECTED FLOW LOADING PARAMETERS FOR WASTEWATER FACILITIES PLANNING PURPOSES (CONTINUED)

ROW	COLUMN ->	EXISTING PLANNED SEWER SERVICE AREAS (1992 SPHERE OF INFLUENCE) – SERVICE AREAS WITH EXISTING TRUNK SEWERS – PEACH A	TOWLER B	HERNDON C	SIERRA D	SUBTOTAL E	NFES F	SUBTOTAL 92 SPHERE G	1993 GP EXPANSION SERVICE AREAS – SE H	NW* I	NE J	SUBTOTAL GP EXP AREAS K	TOTALS ALL 93 GP SERV. AREAS L	POTENTIAL ADD'NL 93 GP SERVICE AREAS – SPECIAL STUDY AREAS – SE M	NT N	RURAL DESIGNATIONS – RR O	AG P	SUBTOTAL Q	GRAND TOTALS ALL AREAS R
1	**AVG. DAY ANNUAL LOAD (TSS)**																		
2	EXISTING (PPD)	4,100	3,200	1,600	200	9,100	0	9,100	0	0	0	0	9,100	0	0	0	0	0	9,100
3	BUILDOUT INCREMENT (PPD)	1,500	6,300	2,200	300	10,300	2,100	12,400	4,100	2,500	6,900	13,500	25,900	1,300	1,300	2,900	200	5,700	31,600
4	TOTAL (PPD)	5,600	9,500	3,800	500	19,400	2,100	21,500	4,100	2,500	6,900	13,500	35,000	1,300	1,300	2,900	200	5,700	40,700
5	TOTAL ADAL (TSS) BY																		
6	1995 (PPD)	4,100	3,200	1,600	200	9,100	0	9,100	0	0	0	0	9,100	0	0	0	0	0	9,100
7	2000 (PPD)	4,900	5,100	2,300	400	12,700	300	13,000	0	0	0	0	13,000	0	0	0	0	0	13,000
8	2005 (PPD)	5,400	6,600	2,800	400	15,200	600	15,800	400	0	0	400	16,200	0	0	0	0	0	16,200
9	2010 (PPD)	5,500	8,000	3,300	500	17,300	900	18,200	1,000	500	100	1,600	19,800	0	0	0	0	0	19,800
10	2015 (PPD)	5,600	9,500	3,800	500	19,400	1,200	20,600	2,100	600	300	3,000	23,600	0	0	0	0	0	23,600
11	2020 (PPD)	5,600	9,500	3,800	500	19,400	1,500	20,900	3,100	1,300	2,400	6,800	27,700	0	0	0	0	0	27,700
12	2025 (PPD)	5,600	9,500	3,800	500	19,400	1,800	21,200	4,100	1,900	4,600	10,600	31,800	600	700	0	0	1,300	33,100
13	2030 (PPD)	5,600	9,500	3,800	500	19,400	2,100	21,500	4,100	2,500	6,900	13,500	35,000	1,300	1,300	2,900	200	5,700	40,700
14	**AVG. DRY WTHR. LOAD (TSS)**																		
15	EXISTING (PPD)	2,900	2,600	1,500	200	7,200	0	7,200	0	0	0	0	7,200	0	0	0	0	0	7,200
16	BUILDOUT INCREMENT (PPD)	1,100	4,800	1,700	200	7,800	1,600	9,400	3,100	1,900	5,200	10,200	19,600	900	1,000	2,100	200	4,200	23,800
17	TOTAL (PPD)	4,000	7,400	3,200	400	15,000	1,600	16,600	3,100	1,900	5,200	10,200	26,800	900	1,000	2,100	200	4,200	31,000
18	TOTAL ADWL (TSS) BY																		
19	1995 (PPD)	2,900	2,600	1,500	200	7,200	0	7,200	0	0	0	0	7,200	0	0	0	0	0	7,200
20	2000 (PPD)	3,500	4,000	2,000	300	9,800	200	10,000	0	0	0	0	10,000	0	0	0	0	0	10,000
21	2005 (PPD)	3,900	5,100	2,400	400	11,800	500	12,300	300	0	0	300	12,600	0	0	0	0	0	12,600
22	2010 (PPD)	4,000	6,200	2,800	400	13,400	700	14,100	800	400	100	1,300	15,400	0	0	0	0	0	15,400
23	2015 (PPD)	4,000	7,400	3,200	400	15,000	900	15,900	1,500	500	200	2,200	18,100	0	0	0	0	0	18,100
24	2020 (PPD)	4,000	7,400	3,200	400	15,000	1,100	16,100	2,300	900	1,800	5,000	21,100	0	0	0	0	0	21,100
25	2025 (PPD)	4,000	7,400	3,200	400	15,000	1,400	16,400	3,100	1,400	3,500	8,000	24,400	500	500	0	0	1,000	25,400
26	2030 (PPD)	4,000	7,400	3,200	400	15,000	1,600	16,600	3,100	1,900	5,200	10,200	26,800	900	1,000	2,100	200	4,200	31,000
27	**AVG. DAY MAX MTH. LD. (TSS)**																		
28	EXISTING (PPD)	5,800	4,300	2,700	300	13,100	0	13,100	0	0	0	0	13,100	0	0	0	0	0	13,100
29	BUILDOUT INCREMENT (PPD)	2,100	8,800	3,100	400	14,400	2,900	17,300	5,700	3,500	9,600	[illegible]	36,100	1,700	1,800	4,000	300	7,800	43,900
30	TOTAL (PPD)	7,900	13,100	5,800	700	27,500	2,900	30,400	5,700	3,500	9,600	[illegible]	[illegible]	1,700	1,800	4,000	300	7,800	57,000
31	TOTAL ADMML (TSS) BY																		
32	1995 (PPD)	5,800	4,300	2,700	300	13,100	0	13,100	0	0	0	0	13,100	0	0	0	0	0	13,100
33	2000 (PPD)	7,000	6,900	3,500	500	17,900	400	18,300	0	0	0	0	18,300	0	0	0	0	0	18,300
34	2005 (PPD)	7,600	9,000	4,300	600	21,500	900	22,400	600	0	0	600	23,000	0	0	0	0	0	23,000
35	2010 (PPD)	7,700	11,100	5,000	700	24,500	1,300	25,800	1,400	200	700	2,300	28,100	0	0	0	0	0	28,100
36	2015 (PPD)	7,900	13,100	5,800	700	27,500	1,700	29,200	2,900	900	400	4,200	33,400	0	0	0	0	0	33,400
37	2020 (PPD)	7,900	13,100	5,800	700	27,500	2,100	29,600	4,300	1,700	3,300	9,300	38,900	0	0	0	0	0	38,900
38	2025 (PPD)	7,900	13,100	5,800	700	27,500	2,500	30,000	5,700	2,600	6,400	14,700	44,700	900	900	0	0	1,800	46,500
39	2030 (PPD)	7,900	13,100	5,800	700	27,500	2,900	30,400	5,700	3,500	9,600	18,800	49,200	1,700	1,800	4,000	300	7,800	57,000

* PORTION NORTH OF NEFS SERVICE AREA

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Projections of future ADAL TSS for buildout of the existing Clovis service areas, and for all proposed future service areas, are indicated in Rows 3 through 13 of Table 3-4. The projections are based upon a design concentration of 220 parts per million, which is about 25% higher than the current average for the existing Clovis service areas. The 25% increase factor was utilized to provide for the fact that all new construction requires water conservation fixtures, which tend to increase loading concentrations. Loading estimates for the buildout increment were then calculated by applying the loading concentration to the respective flow projections for ADAF.

3.3.2 AVERAGE DRY WEATHER LOAD (ADWL)

The 1995 (base year) dry weather load for the four Clovis trunk sewers was also estimated based upon records supplied by the City of Fresno for the period July, 1994, through August, 1995. The ADWL is a measure of base wastewater load projections, useful in scheduling necessary unit process downtime.

3.3.2.1 *ADWL - BOD*

The 1995 (base year) ADWL five-day BOD for the total of the four existing Clovis trunk sewers was designated at 9,100 pounds per day. This value was selected for the 1995 estimate, being slightly above the individual amounts recorded for the existing trunk sewers during the period of record. The base year ADWL BOD designated for each of the existing service areas is indicated in Row 15 of Table 3-3.

Projections of future ADWL BOD for buildout of the existing Clovis service areas, and for all proposed future service areas, are indicated in Rows 16 through 26 of Table 3-3. The projected ADWL BOD concentration for future development was estimated to be about 211 parts per million. This is about 20% higher than current average for the Peach and Fowler Trunk Sewer service areas. Again, the Herndon Trunk sewer service area, with its high loading during the food processing season, was not considered representative for purposes of projecting future loading increments. The 20% increase factor was utilized to provide for future potential increases in loading concentrations, as in ADAL estimates. Loading estimates (ADWL BOD) for the buildout increment were then calculated by applying the loading concentration to the respective flow projections for ADWF.

3.3.2.2 *ADWL - TSS*

The 1995 (base year) ADWL total suspended solids (TSS) for the four existing Clovis trunk sewers was designated at 7,200 pounds per day. This value was selected for the 1995 estimate, approximating the actual amounts recorded during the period of record. The base year ADWL TSS for each of the existing service areas is indicated in Row 15 of Table 3-4.

Projections of future ADWL TSS for buildout of the existing Clovis service areas, and for all proposed future service areas, are indicated in Rows 16 through 26 of Table 3-4. The projections are based upon a design concentration of 173 parts per million, which is about 20% higher than the current average for the existing Clovis service areas. The 20% increase factor was utilized to provide for future potential increases in loading concentrations, as in ADAL estimates. Loading estimates (ADWL TSS) for the buildout increment were then calculated by applying the loading concentration to the respective flow projections for ADWF.

3.3.3 AVERAGE DAY MAXIMUM MONTH LOAD (ADMML)

The 1995 (base year) average day maximum month load for the four Clovis trunk sewers was also estimated based upon records supplied by the City of Fresno for the period July, 1994, through August, 1995. The ADMML is utilized to size certain wastewater treatment facility components.

3.3.3.1 *ADMML - BOD*

The 1995 (base year) ADMML five-day BOD for the total of the four existing Clovis trunk sewers was designated at 18,100 pounds per day. This value approximates the actual amount recorded for the existing service areas during the period of record. The current ADMML BOD designated for each of the existing service areas is indicated in Row 28 of Table 3-3.

Projections of future ADMML BOD for buildout of the existing Clovis service areas, and for all proposed future service areas, are indicated in Rows 29 through 39 of Table 3-3. The projected ADMML BOD concentration for future development was estimated to be about 295 parts per million. This is about 30% higher than current average for the Peach and Fowler Trunk Sewer service areas. Again, the Herndon Trunk sewer service area, with its high loading during the food processing season, was not considered representative for purposes of projecting future loading increments. The 30% increase factor was utilized to provide for future potential increases in loading concentrations, as in ADAL estimates. Loading estimates (ADMML BOD) for the buildout increment were then calculated by applying the loading concentration to the respective flow projections for ADMMF.

3.3.3.2 *ADMML - TSS*

The 1995 (base year) ADMML total suspended solids (TSS) for the four existing Clovis trunk sewers was designated at 13,100 pounds per day. This value was selected for the 1995 estimate, approximating the actual amounts recorded during the period of record. The current ADMML TSS for each of the existing service areas is indicated in Row 28 of Table 3-4.

Projections of future ADMML TSS for buildout of the existing Clovis service areas, and for all proposed future service areas, are indicated in Rows 29 through 39 of Table 3-4. The projections are based upon a design concentration of 284 parts per million, which is about 30% higher than the current average for the existing Clovis service areas. The 30% increase factor was utilized to provide for future potential increases in loading concentrations, as in ADAL estimates. Loading estimates (ADMML TSS) for the buildout increment were then calculated by applying the loading concentration to the respective flow projections for ADMMF.

3.4 ESTIMATES OF POPULATION AND RESIDENTIAL SERVICE CONNECTIONS

Estimates of population to be served by Clovis' wastewater collection facilities, together with estimates of numbers of corresponding residential service connections (households) to be served, were also prepared. These estimates, in concert with the information from other sources described below, were utilized as a guide to the distribution of the growth increment for flow and loading.

3.4.1 POPULATION ESTIMATES

The official January, 1995, population of the City of Clovis, as determined by the California State Department of Finance, was 63,181 residents (reduced from its previous estimate of 64,755). For purposes of estimating incremental population growth into the future, it was assumed that approximately 63,000 residents were served by the City's wastewater collection system in 1995, accounting for unsewered rural properties within the City limits. The existing estimated population served was then allocated to the existing four trunk sewer service areas by proportion of the total current average day annual wastewater flow.

Projections of the City of Clovis' population growth into the future were made with the aid of the Clovis City Planning and Development Services Department, and by utilization of information contained in the 1993 Clovis General Plan, the General Plan Environmental Impact Report, and a analysis prepared by Stanley R. Hoffman Associates for the City of Clovis in February, 1993, entitled "Clovis Housing Projections and Existing Sphere of Influence". A copy of the Hoffman report is included in Appendix A3.

Rows 1 through 13 of Table 3-1 include population projections for all existing and potential service areas within the boundaries of the 1993 Clovis General Plan. These projections were framed in five year increments, beginning with existing conditions in 1995, and extending to buildout of all areas in 2030, as predicted in the General Plan. All projections were "Land-Use Based", essentially tieing future population receiving wastewater service to the probable ultimate use of undeveloped land.

The population calculations were accomplished utilizing the estimates of average day annual flow, which had been developed based upon land use designations as set forth in the 1993 Clovis General Plan, together with an average design wastewater flow generation rate of 110 gallons per person per day (average day annual flow per person). This allowed "population served" estimates to be generated from projected land use. The wastewater flow generation rate of 110 gallons per person per day is a composite rate which includes within it all flow, residential and non-residential. It is a conservative estimate, in that the existing composite wastewater flow generation rate for Clovis is approximately 100 gallons per person per day.

3.4.2 RESIDENTIAL SERVICE CONNECTION ESTIMATES

For purposes of this study, the definition of "residential service connection" is any residence connected to the City's wastewater collection system. Rows 14 through 26 of Table 3-1 indicate projections for numbers of Clovis residential connections.

The number of existing residential Clovis wastewater service connections in base year 1995 was estimated by Clovis City staff at approximately 23,000. The estimates for 1995 connections in the four existing trunk sewer service areas, as indicated in Row 15 of Table 3-1, were allocated to those sewer service areas on the basis of each area's proportion of total 1995 average day annual wastewater flow.

Projections of buildout increment connections into the future were based upon a household population density of 2.81 persons per unit, as predicted in the Hoffman report. Population projections were divided by 2.81 persons per unit to derive the estimated number of units for the projection.

3.4.3 GROWTH RATES AND PATTERNS

As indicated above, projections of the City of Clovis' population growth into the future were made with the aid of the Clovis City Planning and Development Services Department, and by utilization of information contained in the 1993 Clovis General Plan, the General Plan Environmental Impact Report, and the Hoffman report. The growth rates and patterns so determined are reflected in the data presented in Tables 3-1, 3-2, 3-3 and 3-4.

Figures 3-2 and 3-3 graphically depict these growth projections for the planned urbanizing area as set forth on the 1993 Clovis General Plan, not including the "Special Study Areas" adjacent to the Southeast Urban Center, and within the Northeast Urban Center.

Figures 3-4 and 3-5 graphically depict the growth projections for the entire 1993 Clovis General Plan Area, including not only the planned urbanizing area, but also the "Special Study Areas", all rural residential designated areas, and all agricultural designated areas.

FIGURE 3-2

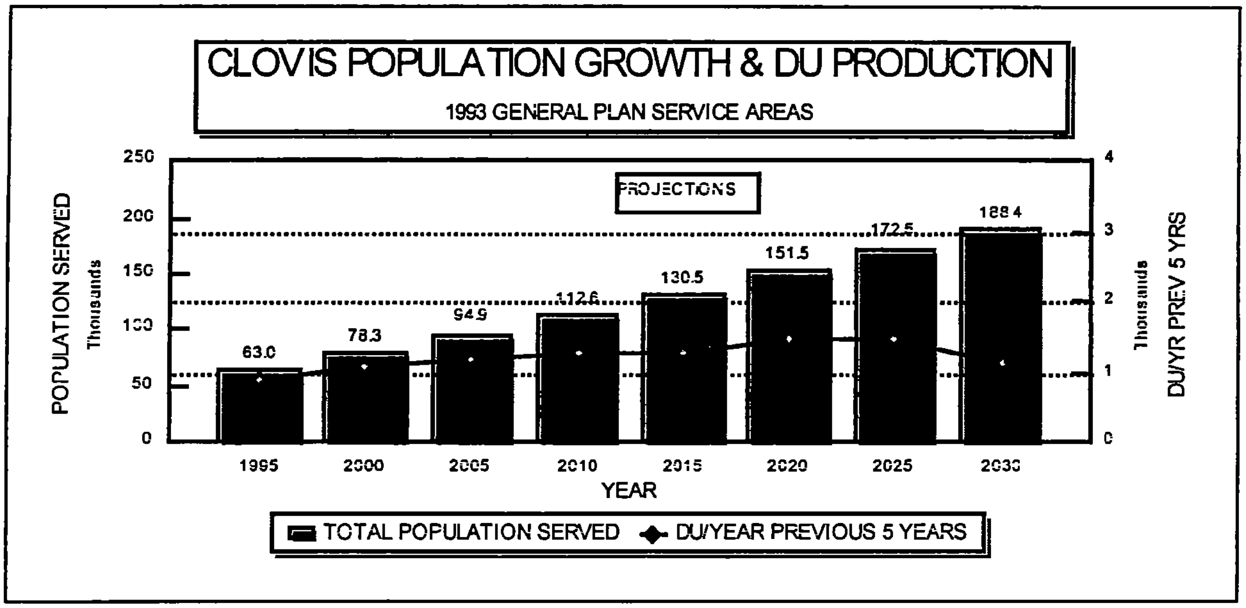


FIGURE 3-3

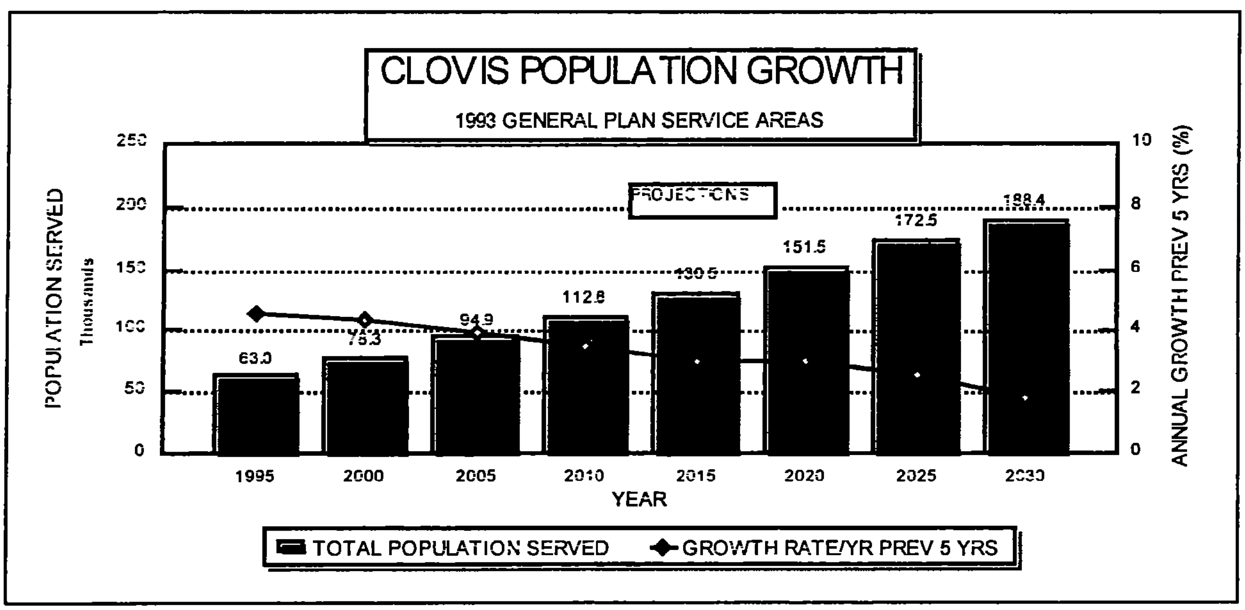


FIGURE 3-4

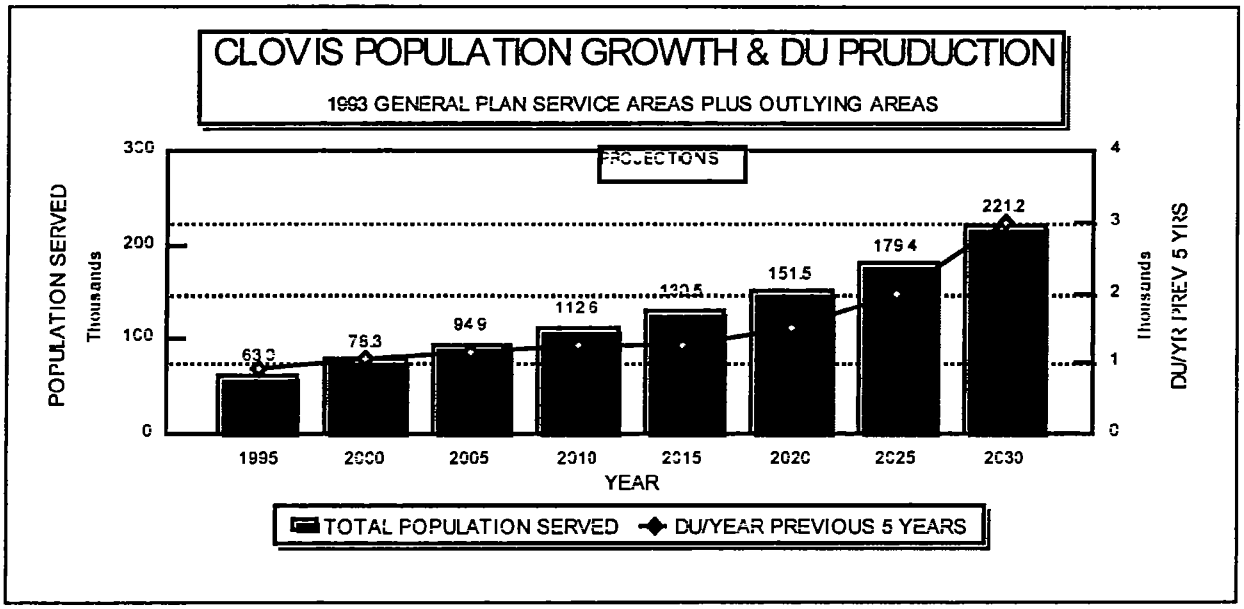
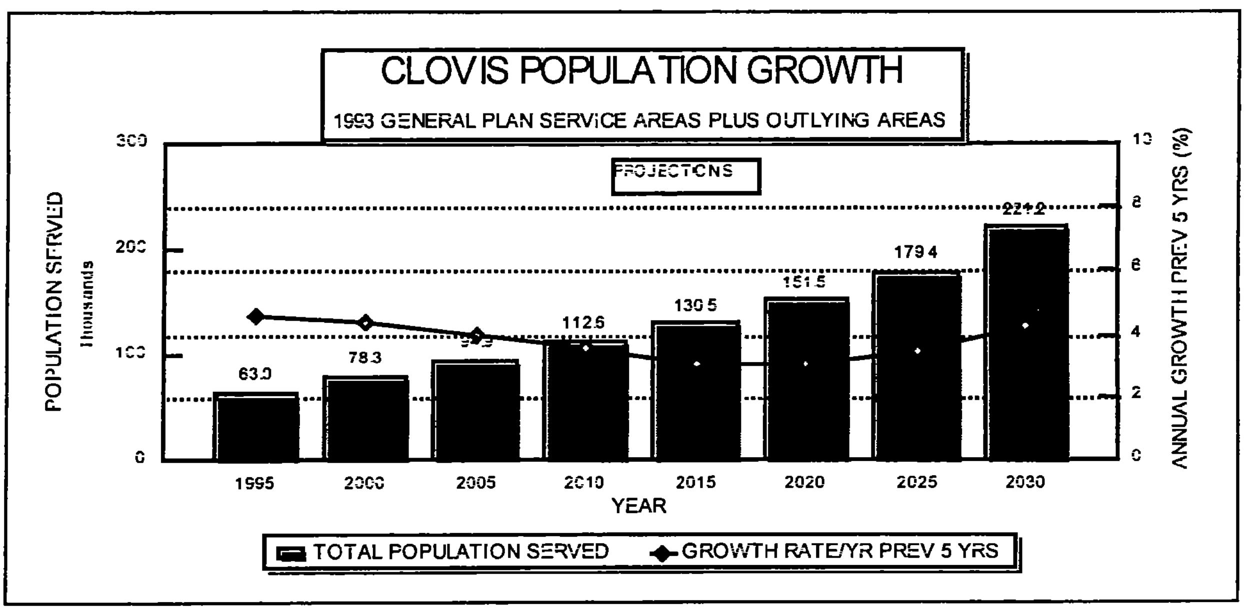


FIGURE 3-5



3.5 ESTIMATES OF WASTEWATER FLOW FOR SUB-SERVICE AREAS

In order to analyze various alternatives for wastewater service to existing and future growth areas, the potential service areas were broken into sub-service areas which could be combined in various ways to form major service areas. Estimates were then made of both projected and maximum wastewater flows which would be generated by each sub-service area, and then, accordingly, each combined major service area.

3.5.1 BOUNDARIES OF SUB-SERVICE AREAS

The entire 1993 Clovis General Plan was divided into sub-service areas which would lend themselves to combination into major service areas, and which would provide for the various alternative service arrangements contemplated.

Plate 3A graphically indicates the boundaries of the sub-service areas studied. Each sub-service area was assigned a designation (such as "Peach-1" or "SE-2"), which was somehow indicative of its original trunk sewer service area assignment, or general location within the study area.

3.5.2 WASTEWATER FLOW ESTIMATES FOR SUB-SERVICE AREAS

Estimates of ADAF wastewater flow to be generated by each sub-service area were calculated based upon both "projected" development, and "maximum" development, within each land use type, as described in Section 3.2.1. Projections were made in 5-year increments, from the base year 1995, through year 2030, the total buildout year as predicted in the General Plan.

Table 3-5 contains the average day annual flow estimates for all areas designated on the 1993 Clovis General Plan for urban uses.

Table 3-6 contains the average day annual flow estimates for all areas of the 1993 Clovis General Plan, including those designated for rural-residential and agricultural uses, as well as for urban uses. The flow estimates for the non-urban use designated areas were calculated for the non-urban use designated, rather than at some urban use. In other words, the estimates of Table 3-6 provide for the potential need for servicing rural-residential and agricultural uses with public sewers.

Appendix A3 contains tabulated design flow generation rates, together with land-use based flow projection data to buildout, for each sub-service area.

Plate 3A depicts graphically the projected and maximum estimated average day annual flow for the sub-service areas.

3.6 COMBINING SUB-SERVICE AREA FLOW ESTIMATES

Table 3-7 contains a summary of estimates of wastewater flow for all sub-service areas, combined into logical service delivery groups. The groups are divided into categories of existing sewer service areas and future growth areas outside the existing service areas. A more detailed discussion of combining of sub-service areas to maximize the use of the existing trunk sewer system is contained in Section 4.

TABLE 3-5

AVERAGE DAY ANNUAL FLOW, IN MGD, FOR URBAN DESIGNATIONS ESTIMATED TOTAL FLOW BY YEAR INDICATED

SUB-SERVICE AREA	YEAR							
	1995	2000	2005	2010	2015	2020	2025	2030
				PROJECTED FLOWS				
PEACH-1	2.29	2.69	2.92	2.96	3.00	3.00	3.00	3.00
PEACH-2	0.34	0.39	0.43	0.43	0.44	0.44	0.44	0.44
FOWLER-1	2.55	3.57	4.38	5.18	5.99	5.99	5.99	5.99
HERNDON-1	0.72	0.99	1.20	1.40	1.60	1.60	1.60	1.60
HERNDON-2	0.26	0.36	0.44	0.52	0.59	0.59	0.59	0.59
SIERRA	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
NEES-1	0.00	0.02	0.04	0.06	0.07	0.07	0.07	0.07
NEES-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEES-3	0.00	0.14	0.27	0.40	0.53	0.53	0.53	0.53
NEES-4	0.00	0.00	0.02	0.03	0.06	0.22	0.39	0.44
NW-1	0.00	0.00	0.00	0.26	0.34	0.68	1.02	1.35
NW-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE-1	0.00	0.00	0.09	0.29	0.72	1.23	1.73	1.73
SE-2	0.00	0.00	0.13	0.27	0.40	0.45	0.51	0.51
SE-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.68
NE-1	0.00	0.00	0.00	0.00	0.00	0.95	1.89	2.85
NE-2	0.00	0.00	0.00	0.00	0.00	0.13	0.26	0.39
NE-3	0.00	0.00	0.00	0.07	0.14	0.21	0.24	0.24
NE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE-5	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.96
RR-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RR-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	21.63
				MAXIMUM FLOWS				
PEACH-1	2.29	2.62	3.00	3.00	3.00	3.00	3.00	3.00
PEACH-2	0.34	0.41	0.52	0.56	0.61	0.61	0.61	0.61
FOWLER-1	2.55	4.21	5.16	6.11	7.06	7.06	7.06	7.06
HERNDON-1	0.70	1.11	1.34	1.57	1.79	1.79	1.79	1.79
HERNDON-2	0.28	0.44	0.54	0.63	0.72	0.72	0.72	0.72
SIERRA	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
NEES-1	0.00	0.03	0.05	0.07	0.09	0.09	0.09	0.09
NEES-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEES-3	0.00	0.18	0.35	0.53	0.70	0.70	0.70	0.70
NEES-4	0.00	0.02	0.07	0.09	0.14	0.37	0.61	0.68
NW-1	0.00	0.00	0.00	0.35	0.46	0.93	1.39	1.84
NW-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE-1	0.00	0.00	0.11	0.40	0.98	1.67	2.36	2.36
SE-2	0.00	0.00	0.19	0.37	0.56	0.64	0.72	0.72
SE-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
NE-1	0.00	0.00	0.00	0.00	0.00	1.35	2.57	3.81
NE-2	0.00	0.00	0.00	0.00	0.00	0.19	0.37	0.55
NE-3	0.00	0.00	0.00	0.07	0.14	0.21	0.24	0.24
NE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE-5	0.00	0.00	0.00	0.00	0.00	0.00	0.71	1.42
RR-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RR-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AG-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	26.88

TABLE 3-6

AVERAGE DAY ANNUAL FLOW, IN MGD, FOR ALL DESIGNATIONS
ESTIMATED TOTAL FLOW BY YEAR INDICATED

SUB-SERVICE AREA	YEAR							
	1995	2000	2005	2010	2015	2020	2025	2030
PROJECTED FLOWS								
PEACH-1	2.29	2.69	2.92	2.96	3.00	3.00	3.00	3.00
PEACH-2	0.34	0.39	0.43	0.43	0.44	0.44	0.44	0.44
FOWLER-1	2.55	3.57	4.38	5.18	5.99	5.99	5.99	5.99
HERNDON-1	0.72	0.99	1.20	1.40	1.60	1.60	1.60	1.60
HERNDON-2	0.26	0.36	0.44	0.52	0.59	0.59	0.59	0.59
SIERRA	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
NEES-1	0.00	0.02	0.04	0.06	0.07	0.07	0.07	0.07
NEES-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
NEES-3	0.00	0.14	0.27	0.40	0.53	0.53	0.53	0.53
NEES-4	0.00	0.00	0.02	0.03	0.06	0.22	0.39	0.44
NW-1	0.00	0.00	0.00	0.26	0.34	0.68	1.02	1.35
NW-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
NW-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
SE-1	0.00	0.00	0.09	0.29	0.72	1.23	1.73	1.73
SE-2	0.00	0.00	0.13	0.27	0.40	0.45	0.51	0.51
SE-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
SE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.68
NE-1	0.00	0.00	0.00	0.00	0.00	0.95	1.89	2.85
NE-2	0.00	0.00	0.00	0.00	0.00	0.13	0.26	0.39
NE-3	0.00	0.00	0.00	0.07	0.14	0.21	0.24	0.24
NE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE-5	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.96
RR-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
RR-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34
AG-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
AG-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
AG-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
AG-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	23.42
MAXIMUM FLOWS								
PEACH-1	2.29	2.82	3.00	3.00	3.00	3.00	3.00	3.00
PEACH-2	0.34	0.41	0.52	0.56	0.61	0.61	0.61	0.61
FOWLER-1	2.55	4.21	5.16	6.11	7.06	7.06	7.06	7.06
HERNDON-1	0.70	1.11	1.34	1.57	1.79	1.79	1.79	1.79
HERNDON-2	0.28	0.44	0.54	0.63	0.72	0.72	0.72	0.72
SIERRA	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
NEES-1	0.00	0.03	0.05	0.07	0.09	0.09	0.09	0.09
NEES-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
NEES-3	0.00	0.18	0.35	0.53	0.70	0.70	0.70	0.70
NEES-4	0.00	0.02	0.07	0.09	0.14	0.37	0.61	0.68
NW-1	0.00	0.00	0.00	0.35	0.46	0.93	1.39	1.84
NW-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
NW-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
SE-1	0.00	0.00	0.11	0.40	0.98	1.67	2.36	2.36
SE-2	0.00	0.00	0.19	0.37	0.56	0.64	0.72	0.72
SE-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
SE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
NE-1	0.00	0.00	0.00	0.00	0.00	1.35	2.57	3.81
NE-2	0.00	0.00	0.00	0.00	0.00	0.19	0.37	0.55
NE-3	0.00	0.00	0.00	0.07	0.14	0.21	0.24	0.24
NE-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE-5	0.00	0.00	0.00	0.00	0.00	0.00	0.71	1.42
RR-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
RR-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34
AG-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
AG-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
AG-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
AG-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	28.67

TABLE 3-7

SUMMARY OF ESTIMATES OF AVERAGE DAILY WASTEWATER FLOW GENERATION FOR SEWER SUB-SERVICE AREAS OF THE CITY OF CLOVIS

SERVICE OR SUB-SERVICE AREA DESIGNATION	PLANNED URBAN AREAS ONLY					ALL GENERAL PLAN AREAS AT PLANNED DENSITIES				
	PROJECTED FLOW (MGD)	MAXIMUM FLOW (MGD)	EXISTING TRUNK CAPACITY (MGD)	CAPACITY SURPLUS RANGE HIGH (MGD)	CAPACITY SURPLUS RANGE LOW (MGD)	PROJECTED FLOW (MGD)	MAXIMUM FLOW (MGD)	EXISTING TRUNK CAPACITY (MGD)	CAPACITY SURPLUS RANGE HIGH (MGD)	CAPACITY SURPLUS RANGE LOW (MGD)
EXISTING SEWER SERVICE AREAS WITHIN CURRENT SPHERE OF INFLUENCE										
ORIGINAL SEWER SERVICE AREAS										
PEACH TRUNK	3.44	3.61	3.00	-0.44	-0.61	3.44	3.61	3.00	-0.44	-0.61
FOWLER TRUNK	5.99	7.06	9.57	3.58	2.51	5.99	7.06	9.57	3.58	2.51
HERNDON TRUNK	2.19	2.51	2.80	0.61	0.29	2.19	2.51	2.80	0.61	0.29
SIERRA TRUNK	0.26	0.29	0.50	0.24	0.21	0.26	0.29	0.50	0.24	0.21
SUBTOTAL EXIST. TRUNK SEWER SA'S	11.88	13.47	15.87	3.99	2.40	11.88	13.47	15.87	3.99	2.40
NEES SERVICE AREA	1.04	1.49	0.00	-1.04	-1.49	1.15	1.60	0.00	-1.15	-1.60
TOTAL CURRENT CLOVIS SPHERE AREA	12.92	14.96	15.87	2.95	0.91	13.03	15.07	15.87	2.84	0.80
ADJUSTMENTS TO SEWER SERVICE AREAS										
PEACH TRUNK SEWER										
PEACH (ORIGINAL)	3.44	3.61				3.44	3.61			
PEACH-2 (PUMPED DIVERSION OUT)	-0.44	-0.61				-0.44	-0.61			
NET PEACH (PEACH-1)	3.00	3.00	3.00	0.00	0.00	3.00	3.00	3.00	0.00	0.00
FOWLER TRUNK SEWER										
FOWLER-1 (ORIGINAL)	5.99	7.06				5.99	7.06			
PEACH-2 (PUMPED DIVERSION IN)	0.44	0.61				0.44	0.61			
HERNDON-2 (PUMPED DIVERSION IN)	0.59	0.72				0.59	0.72			
SE-2	0.51	0.72				0.51	0.72			
NE-2	0.39	0.55				0.39	0.55			
TOTAL FOWLER	7.92	9.66	9.57	1.65	-0.09	7.92	9.66	9.57	1.65	-0.09
HERNDON TRUNK SEWER										
HERNDON ORIGINAL	2.19	2.51				2.19	2.51			
HERNDON-2 (PUMPED DIVERSION OUT)	-0.59	-0.72				-0.59	-0.72			
NEES-2						0.11	0.11			
NEES-3	0.53	0.70				0.53	0.70			
TOTAL HERNDON	2.13	2.49	2.80	0.67	0.31	2.24	2.60	2.80	0.56	0.20
TOTAL SIERRA TRUNK SEWER	0.26	0.29	0.50	0.24	0.21	0.26	0.29	0.50	0.24	0.21
TOTAL ADJUSTED FOUR TRUNK SEWER AREAS	13.31	15.44	15.87	2.56	0.43	13.42	15.55	15.87	2.45	0.32
FUTURE GROWTH AREAS OUTSIDE EXISTING SERVICE AREAS										
NORTHWEST GROWTH AREA										
NW-1	1.35	1.84				1.35	1.84			
NEES-1	0.07	0.09				0.07	0.09			
NEES-4	0.44	0.68				0.44	0.68			
NE-3	0.24	0.24				0.24	0.24			
NW-2						0.01	0.01			
NW-3						0.02	0.02			
RR-1						0.19	0.19			
AG-1						0.01	0.01			
TOTAL NORTHWEST SERVICE AREA	2.10	2.85				2.33	3.08			
SOUTHEAST GROWTH AREA										
SE-1	1.73	2.36				1.73	2.36			
SE-4	0.68	1.00				0.68	1.00			
SE-3						0.01	0.01			
RR-2						1.34	1.34			
AG-3						0.01	0.01			
AG-4						0.02	0.02			
TOTAL SOUTHEAST SERVICE AREA	2.41	3.36				3.79	4.74			
NORTHEAST GROWTH AREA										
NE-1	2.85	3.81				2.85	3.81			
NE-5	0.96	1.42				0.96	1.42			
AG-2						0.07	0.07			
TOTAL NORTHEAST SERVICE AREA	3.81	5.23				3.88	5.30			
TOTAL FUTURE GROWTH AREAS	8.32	11.44				10.00	13.12			
GRAND TOTAL ALL SERVICE AREAS										
GRAND TOTAL ALL ADJUSTED AREAS	21.63	26.89				23.42	28.67			

SECTION 4.
OPTIMIZING USE OF EXISTING TRUNK SEWER SYSTEM

4.1 GENERAL

Several modifications of existing trunk sewer service area boundaries are proposed, in order to optimize the potential use of the existing trunk sewer system. These modifications not only provide for the direction of generated flow to trunk sewers where capacity exists for such flow, but also afford the opportunity to service some territories currently outside, but adjacent to, the existing trunk sewer service areas. Plate 4A depicts an overview of the service area modifications proposed.

4.2 METHOD OF ANALYSIS

At each location of proposed modification of service area boundaries, an analysis was performed to determine the optimum area to be accommodated within the target service area. This optimum area would be then designated as a sub-service area, as described in Section 3. Since the area that can be accommodated into the target service area at any particular location may be limited by the capacity of the existing sewer system downstream of the point(s) of connection to the existing system, the existing system capacity downstream of these points was verified in each case to determine acceptability of the added sub-service area.

An analysis was also performed within each new sub-service area to be annexed to an existing trunk sewer service area, to determine serviceability to the point(s) of connection to the existing trunk sewer service area. This included a concept level study of proposed new major sewer line sizes, depths and slopes.

In optimizing the potential use of the existing trunk sewer system, the summation of "maximum" flows calculated for all contributing sub-service areas was compared with the design capacity of the particular trunk sewer. The summation of maximum flows was not allowed to exceed trunk sewer design capacity by any significant amount, so as to minimize the potential for future trunk sewer capacity inadequacy.

4.3 DIVERSION OF PORTION OF PEACH SERVICE AREA TO FOWLER TRUNK SEWER

It is necessary to divert flow from the Peach Service Area, because of a lack of capacity in the Peach Trunk Sewer for buildout of the Peach Service Area. The capacity of the Peach Trunk sewer is 3.00 MGD average day annual flow, while its current service area is estimated to generate a projected flow of 3.44 MGD (or a maximum flow of 3.61 MGD).

The Fowler Trunk Sewer has the capacity, subject to regional capacity limitations in its downstream connection to regional wastewater treatment facilities, for the projected 0.44 MGD excess flow from the Peach Service Area (and other areas as well), in addition to its own service area buildout flow.

In the 1970's and before the Fowler Trunk Sewer was constructed, a wastewater pumping station was constructed at the Southeast corner of Villa and Barstow Avenues to divert flow from the Southeasterly portion of the City to the Herndon Trunk Sewer. The diversion was accomplished by pumping wastewater through a force main North in Villa Avenue to Bullard Avenue, where it entered a gravity sewer leading to the Herndon Trunk Sewer (see Plate 4B). Although this pump station has not been used for several years (it was no longer required when the Fowler Trunk sewer was placed in service), it can be recommissioned and placed into service relatively inexpensively.

Eventually, a new 10-inch force main will be required in Barstow Avenue from the existing pump station to Sunnyside Avenue, at which point it would connect to the Westerly leg of the Fowler Trunk Sewer system. Additionally, pump station sulfide control facilities would also have to be installed at the same time, because of the length of the force main. In the meantime and until there is no longer excess capacity in the Herndon Trunk sewer, the existing force main in Villa Avenue can be utilized in conjunction with the recommissioned pump station to divert flow from the Peach Service area to the Herndon Trunk Sewer.

Plate 4B indicates the approximate service area, designated "PEACH-2", which would be diverted to the Fowler Trunk Sewer system. The exact boundary of the diverted service area is not definable, as the pump station will divert only part of the flow which is tributary to the point of diversion.

The diversion of flow from the Peach service area will not be required until average flow in the Peach Trunk Sewer begins to exceed 3.00 MGD. The current flow (ADAF) in the Peach Trunk Sewer averages about 2.70 MGD, and will probably reach 3.00 MGD prior to year 2000. Excess capacity should exist in the Herndon Trunk Sewer for at least 10 to 15 years for flow temporarily diverted from the Peach Service Area. This will forestall the need to construct the Barstow Avenue force main for a similar period.

The estimated costs of facilities required for the diversion of subservice area "PEACH-2" flows are indicated in Table 4-1 and 4-2, and are summarized as follows:

Interim Use of Pump Station and Existing Force Main

Recommission existing pump station $21,000

Annual cost operations, maintenance and replacement $10,200

New Force Main in Barstow Avenue from Villa Avenue to Sunnyside Avenue

Construct new force main in Barstow Avenue $363,000

Annual cost operations, maintenance and replacement $38,200

All costs are estimated in current, 1996, dollars, and include allowances for incidental expenses and contingencies. Pump station and force main calculations may be found in Table A4-1 and A4-2, in Appendix A4.

4.4 DIVERSION OF PORTION OF NEES SERVICE AREA TO HERNDON TRUNK SEWER

The Nees Service Area is somewhat unique, in that although it was planned for sewer service in conjunction with the Herndon-Shepherd Specific Plan (and lies within the current Clovis sphere of influence), it has never had regional trunk sewer service specifically assigned to it. The assumption has been that the Nees Service Area eventually would either receive regional trunk sewer service by way of a new trunk sewer to the Regional Wastewater Treatment Plant, or optionally, would have its flows diverted by pumping to the Fowler Trunk Sewer system.

Because the Nees Service Area is immediately North of (and generally uphill of), the current Herndon Service Area, and within the existing Clovis sphere of influence, it is advantageous to maximize its direct service potential into the Herndon Trunk Sewer system. A portion of the Nees Service Area

TABLE 4-1

ESTIMATE OF COST OF TEMPORARY DIVERSION OF PORTION OF PEACH SERVICE AREA TO HERNDON SERVICE AREA

BARSTOW/VILLA DIVERSION

ITEM NO.	*CONSTRUCTION COSTS*	ESTIMATED QUANTITY		UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1	LUMP SUM	$1,000.00	$1,000.00
2	REMOBILIZE PUMP STATION	1	LUMP SUM	$10,000.00	$10,000.00
3	PLUG REMOVAL	1	LUMP SUM	$1,000.00	$1,000.00
4	MISCELLANEOUS FACILITIES AND OPERATIONS	1	LUMP SUM	$1,000.00	$1,000.00
	SUBTOTAL				$13,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS			40.0%	$5,000.00
	SUBTOTAL				$18,000.00
	CONSTRUCTION CONTINGENCIES			15.0%	$3,000.00
	TOTAL ESTIMATED CONSTRUCTION COST				$21,000.00
	EASEMENTS	0.00	ACRE	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST				**$21,000.00**

ITEM NO.	*OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS* DESCRIPTION	ESTIMATED QUANTITY		UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1	LUMP SUM	$2,700.00	$2,700.00
2	ANNUAL SULFIDE CONTROL COSTS	1	LUMP SUM	NA	$0.00
3	ANNUAL MAINTENANCE COSTS	1	LUMP SUM	$4,500.00	$4,500.00
4	ANNUAL REPLACEMENT COSTS*	$60,000.00	COST	20 YEARS	$3,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)				**$10,200.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE 4-2

ESTIMATE OF COST OF PERMANENT DIVERSION OF PORTION OF PEACH SERVICE AREA TO FOWLER SERVICE AREA

BARSTOW/VILLA DIVERSION

ITEM NO.		ESTIMATED QUANTITY		UNIT ESTIMATE	EXTENSION
	CONSTRUCTION COSTS				
1	MOBILIZATION	1	LUMP SUM	$10,000.00	$10,000.00
2	10" PVC FORCE MAIN	6,600	LF	$15.00	$99,000.00
3	18" STEEL CASING, JACKED	80	LF	$180.00	$14,400.00
4	FORCE MAIN CLEANOUTS	11	EA	$500.00	$5,500.00
5	CONNECT TO EXISTING MANHOLE	1	LUMP SUM	$1,000.00	$1,000.00
6	SURFACE RESTORATION	6,500	LF	$15.00	$97,500.00
7	REMOBILIZE PUMP STATION	1	LUMP SUM	$0.00	$0.00
8	SULFIDE CONTROL PROVISIONS	1	LUMP SUM	$30,000.00	$30,000.00
9	TRAFFIC & DUST CONTROL	1	LUMP SUM	$10,000.00	$10,000.00
10	MISCELLANEOUS FACILITIES AND OPERATIONS	1	LUMP SUM	$13,600.00	$13,600.00
	SUBTOTAL				$281,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS			12.5%	$35,000.00
	SUBTOTAL				$316,000.00
	CONSTRUCTION CONTINGENCIES			15.0%	$47,000.00
	TOTAL ESTIMATED CONSTRUCTION COST				$363,000.00
	EASEMENTS	0.00	ACRE	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST				**$363,000.00**
	OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS				
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY		UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1	LUMP SUM	$4,500.00	$4,500.00
2	ANNUAL SULFIDE CONTROL COSTS	1	LUMP SUM	$26,200.00	$26,200.00
3	ANNUAL MAINTENANCE COSTS	1	LUMP SUM	$4,500.00	$4,500.00
4	ANNUAL REPLACEMENT COSTS*	$60,000.00	COST	20 YEARS	$3,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)				**$38,200.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

is currently flowing (under temporary arrangements) to the Herndon Trunk Sewer, including the Buchanan Educational Center and developing properties West of Peach Avenue and North of Nees Avenue. Under this proposed plan, these areas, together with additional surrounding areas (as shown on Plate 4C) would be permanently serviced into the Herndon Trunk Sewer system. This would leave only a limited portion of the original Nees Service Area remaining to be serviced elsewhere.

An area planned for urban development Southerly of, and generally adjacent to, Shepherd Avenue, from Willow Avenue to Armstrong Avenue, would be serviced Northerly into facilities designed for the Northwest Urban Village of the 1993 Clovis General Plan. The remainder of the original Nees Service Area, lying generally Southerly of the Enterprise Canal and Easterly of Big Dry Creek, is designated for rural-residential development on the General Plan and thus is not expected to require a public wastewater system. Should a public system become necessary, the rural-residential area can be accommodated in the Herndon Trunk Sewer system.

The portion of the Nees Service Area to be diverted to the Herndon Trunk Sewer system is graphically shown as area "NEES-3" on Plate 4C. This 653± acre area is projected to generate 0.53 MGD at buildout. The existing sewer lift station recently installed at the Northwest corner of Peach and Nees Avenues would become a permanent facility (no upsizing required), while all other areas of the expanded Herndon Service Area would be serviced by gravity sewers, under this plan. Capacity exists within the downstream legs of the Herndon service area for the expanded service area. No significant direct additional costs, except for the related diversion of a portion of the Herndon service Area to the Fowler Trunk Sewer system as described in the following section, are associated with this modification of service boundaries.

4.5 DIVERSION OF PORTION OF HERNDON SERVICE AREA TO THE FOWLER TRUNK SEWER

In order to accommodate the increase in flow to the Herndon Service Area resulting from expansion of the service area to include a major portion of the Nees Service Area, it is necessary to divert a similar quantity of flow from the Herndon Service Area to the Fowler Trunk Sewer system, where sufficient capacity exists for the diverted flow.

Plate 4D indicates the 676± acre area of the diversion, designated as area "HERNDON-2", and the facilities involved. By installing a pump station at the intersection of Clovis and Herndon Avenues, together with a force main in Herndon Avenue from the pump station to Armstrong Avenue, it is possible to divert a projected flow of 0.59 MGD from the Herndon Service area to the Fowler Trunk Sewer system, by way of the Armstrong Interceptor. As a part of the pump station installation, sulfide control facilities would also have to be installed because of the length of the force main.

The construction of these facilities will not be required for many years, until the Herndon Trunk Sewer approaches its design capacity of 2.80 MGD average day annual flow. The Herndon Trunk Sewer is currently flowing at an average (ADAF) of about 1.00 MGD or less. The current available additional capacity in the Herndon Trunk sewer of 1.80 MGD is equal to over 6,000 equivalent single family residential units of development. This represents many years of development within the City of Clovis, all of which, of course, will not be located within the Herndon Service Area. Depending upon the rate of development of the Herndon Service Area, the pump station and force main will probably not be required for at least 15-20 years.

The estimated costs of the diversion facilities required are indicated in Table 4-3, and are summarized as follows:

Pump station and force main $592,000

Annual cost operations, maintenance and replacement $52,000

These estimated costs are in current, 1996, dollars. Pump station and force main calculations may be found in Table A4-3, in Appendix A4.

4.6 EXPANSION OF THE FOWLER TRUNK SEWER SERVICE AREA BOUNDARIES

Even with the addition of flows diverted from the Peach Service Area (as described in Section 4.3), and flows diverted from the Herndon Service Area (as described in Section 4.5), there remains additional useable capacity within the Fowler Trunk Sewer, subject to regional capacity limitations in its downstream connection to regional wastewater treatment facilities. Two areas lend themselves to efficient service into the Fowler Service Area to take advantage of this capacity.

4.6.1 PORTION OF THE SOUTHEAST URBAN VILLAGE

A 654± acre area located East of the original Fowler Trunk Sewer service area, and representing a 0.51 MGD projected buildout flow (ADAF), can be efficiently added to the Fowler Trunk Sewer service area. This area is designated as "SE-2" on Plate 4A. A 15" diameter sewer has already been planned for extension into the area for temporary service to the new Clovis Unified School District Educational Complex, which sewer would provide permanent service into the Fowler Trunk Sewer system for the indicated area under this plan.

Downstream sewer lines have sufficient capacity for this addition, which is particularly advantageous because its flow enters the Fowler Trunk Sewer system at its extreme downstream end, unaffecting useable line capacity upstream in the system.

There is no significant increase in major sewer system cost as a result of this service area adjustment.

4.6.1 PORTION OF THE NORTHEAST URBAN VILLAGE

A 377± acre area located Easterly of the original Fowler Trunk Sewer service area at its North end, and representing a 0.39 MGD projected buildout flow (ADAF), can also be efficiently added to the Fowler Trunk Sewer service area. This area is designated as "NE-2" on Plate 4A.

The area lies uphill of the downstream Fowler Trunk Sewer system, and would be difficult to service otherwise. Sufficient capacity is available in the portion of the downstream system that now exists, and by a minor upward size adjustment in the planned sewer in Tollhouse Road Northeasterly of the existing Armstrong Interceptor Sewer (from 12" to 15" diameter), the additional area can be readily accommodated.

There is no significant increase in major sewer system cost as a result of this service area adjustment.

TABLE 4-3

ESTIMATE OF COST OF DIVERSION OF PORTION OF HERNDON SERVICE AREA TO FOWLER SERVICE AREA

HERNDON/CLOVIS DIVERSION

ITEM NO.	*CONSTRUCTION COSTS*	ESTIMATED QUANTITY		UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1	LUMP SUM	$15,000.00	$15,000.00
2	10" PVC FORCE MAIN	8,200	LF	$15.00	$123,000.00
3	FORCE MAIN CLEANOUTS	16	EA	$600.00	$9,600.00
4	MANHOLES, STANDARD	1	EA	$1,800.00	$1,800.00
5	MANHOLES, PVC LINED	1	EA	$10,000.00	$10,000.00
6	SURFACE RESTORATION	8,100	LF	$15.00	$121,500.00
7	PUMP STATION AND APPURTENANCES	1	LUMP SUM	$100,000.00	$100,000.00
8	SULFIDE CONTROL PROVISIONS	1	LUMP SUM	$30,000.00	$30,000.00
9	TRAFFIC & DUST CONTROL	1	LUMP SUM	$10,000.00	$10,000.00
10	MISCELLANEOUS FACILITIES AND OPERATIONS	1	LUMP SUM	$21,100.00	$21,100.00
	SUBTOTAL				$442,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS			12.5%	$55,000.00
	SUBTOTAL				$497,000.00
	CONSTRUCTION CONTINGENCIES			15.0%	$75,000.00
	TOTAL ESTIMATED CONSTRUCTION COST				$572,000.00
	EASEMENTS	0.20	ACRE	$100,000.00	$20,000.00
	TOTAL ESTIMATED CONSTRUCTION COST				**$592,000.00**

ITEM NO.	*OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS* DESCRIPTION	ESTIMATED QUANTITY		UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1	LUMP SUM	$11,100.00	$11,100.00
2	ANNUAL SULFIDE CONTROL COSTS	1	LUMP SUM	$32,900.00	$32,900.00
3	ANNUAL MAINTENANCE COSTS	1	LUMP SUM	$4,500.00	$4,500.00
4	ANNUAL REPLACEMENT COSTS*	$70,000.00	COST	20 YEARS	$3,500.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS, ROUNDED)				**$52,000.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

SECTION 5.
ALTERNATIVE CONCEPTUAL PLANS FOR WASTEWATER SERVICE FOR CLOVIS

5.1 GENERAL

Six base alternative conceptual plans for ultimate wastewater service for the area within the boundaries of the 1993 Clovis General Plan were included in the scope of work for this study, as follows:

Alternative 1: All existing and future Clovis flows to be directed to an expanded Fresno-Clovis Regional Wastewater Treatment Plant (see Plate 1A and 1E)

Alternative 2: All existing and future Clovis flows to be directed to a combination of an expanded Fresno-Clovis Regional Wastewater Treatment Plant and new Fresno-Clovis Regional Satellite Wastewater Reclamation Facilities located outside of the 1993 Clovis General Plan boundaries (see Plates 1B, 1C and 1E)

Alternatives 3, 4 and 5:

Maximize service into the existing four regional trunk sewers, with the balance of future flow from development of the 1993 Clovis General Plan areas to be served by one or more proposed Clovis Satellite Wastewater Reclamation Facilities (WWRF's):

Alternative 3: Three proposed Clovis Satellite WWRF'S, one located within or near each of the urban villages proposed on the 1993 Clovis General Plan (see Plates 1D and 1F)

Alternative 4: Two proposed Clovis Satellite WWRF'S, one located within or near the proposed Northwest urban village, and one located within or near the proposed Southeast urban village (see Plates 1D and 1G)

Alternative 5: One proposed Clovis Satellite WWRF, located within or near the proposed Southeast urban village (see Plates 1D and 1H)

Alternative 6: All existing and future Clovis flows, including those currently planned for service to the existing Fresno-Clovis regional system, to be directed to, and served by, two proposed Clovis Satellite WWRF'S, one located within or near the proposed Northwest urban village, and one located within or near the proposed Southeast urban village (see Plate 1I)

Alternatives 1 and 2 are totally dependent upon the regional system for service, whereas Alternatives 3, 4 and 5 are partially dependent upon the regional system. Alternative 6 is a "Clovis Only" alternative, ultimately independent of the regional system.

With the exception of Alternative 6, these alternatives were specifically identified in the Environmental Impact Report for the 1993 Clovis General Plan.

Plates 1A, 1B, 1C and 1D depict the regional system aspects of these plans, whereas Plates 1E, 1F, 1G, 1H and 1I delineate the local aspects of the plans, within the 1993 Clovis General Plan area.

During development of this study, it was determined that Alternative 2 should be separated into two sub-alternatives, as follows:

Alternative 2A: All existing and future Clovis flows to be directed to a combination of an expanded Fresno-Clovis Regional Wastewater Treatment Plant and new Fresno-Clovis Regional Satellite WWRF'S located outside of the 1993 Clovis General Plan boundaries. One Regional Satellite WWRF to be located Southeast of Fresno (South Regional Satellite WWRF), and one Regional Satellite WWRF to be located *North of Fresno* (see Plates 1B and 1E).

Alternative 2B: All existing and future Clovis flows to be directed to a combination of an expanded Fresno-Clovis Regional Wastewater Treatment Plant and new Fresno-Clovis Regional Satellite WWRF'S located outside of the 1993 Clovis General Plan boundaries. One Regional Satellite WWRF to be located Southeast of Fresno, and one Regional Satellite WWRF to be located *Northwest of Fresno* (see Plates 1C and 1E).

The components of these sub-alternatives parallel the alternative regional satellite treatment and disposal facilities being proposed as part of the Regional Wastewater Treatment and Disposal Master Plan Update.

5.2 CONCEPTUAL DESIGN ANALYSIS OF SYSTEM COMPONENTS

The approach taken in studying each alternative plan was generally as described below:

- Determine the boundaries of major service areas within the overall study area by combining sub-service areas (as described in Section 3) into potentially efficiently serviced areas
- Determine the projected and maximum buildout wastewater flow, in million gallons per day, average day annual flow (ADAF), for each service area within each alternative plan
- Prepare a reconnaissance level conceptual major collection system layout for each primary service area
- Calculate the maximum buildout design flow rate (ADAF) for each major leg of the proposed collection system
- Define the appropriate diameter, slope and invert elevation for each major leg of the proposed collection system
- Determine the size and approximate location of major pump stations and force mains

- Route the flow from each primary service area to a point of disposal, sizing major collection and transmission facilities

- Determine the size, type and general location of potential satellite wastewater reclamation facilities when they form a part of the alternative plan

- Determine the nature and extent of potential reclaimed water disposal facilities

- For regional alternatives, determine the proportion of regional facilities attributable to Clovis' flows

Additional discussion of these methods follow.

5.2.1 SERVICE AREA FLOW ESTIMATES FOR EACH ALTERNATIVE

Estimates of buildout ADAF wastewater flow to be generated by sub-service areas, determined as described in Section 3, were appropriately combined to ascertain the buildout ADAF wastewater flow for each major service area, for each alternative plan. A major service area was defined by flow destination; an area tributary to a regional trunk sewer or to a potential Clovis satellite wastewater reclamation facility.

The buildout major service area flows, once determined, were then broken down into 5-year incremental flow generation totals, as described in Section 3, for years 1995 through 2030. Four different estimate summaries were prepared, as follows:

- Projected flow for all General Plan *urban* designations (see Table 5-1)

- Maximum flow for all General Plan *urban* designations (see Table 5-2)

- Projected flow for *all* General Plan designations (see Table 5-3)

- Maximum flow for *all* General Plan designations (see Table 5-4)

The tabulations of sub-service area flows into major service areas, for each alternative, may be found in Appendix A5. Projected and maximum flows for Clovis General Plan urban designations, forming the basis for the information summarized in Tables 5-1 and 5-2, appear on Tables A5-1 through A5-5 in Appendix 5. Projected and maximum flows for all Clovis General Plan designations, forming the basis for information summarized in Tables 5-3 and 5-4, appear on Tables A5-6 through A5-10 in Appendix 5.

These summaries of these estimates formed the basis for analysis of major trunk sewers, regional and Clovis satellite wastewater reclamation facilities, and regional plant capacity acquisition requirements.

TABLE 5-1

AVERAGE DAY ANNUAL FLOW, IN MGD, FOR URBAN DESIGNATIONS ESTIMATED TOTAL FLOW BY YEAR INDICATED

PROJECTED FLOWS

FLOW DESTINATION	YEAR							
	1995	2000	2005	2010	2015	2020	2025	2030
				ALTERNATE 1 AND 2				
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.13
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.02	0.06	0.42	0.61	1.18	1.72	2.10
LEONARD TRUNK SEWER	0.00	0.00	0.09	0.29	0.72	2.18	4.44	6.22
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	21.63
				ALTERNATE 3				
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.13
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.02	0.06	0.42	0.61	1.15	1.72	2.10
SE SATELLITE WWRF	0.00	0.00	0.09	0.29	0.72	1.23	2.07	2.41
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.95	2.37	3.81
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	21.63
				ALTERNATE 4				
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.13
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.02	0.06	0.42	0.61	1.18	1.72	2.10
SE SATELLITE WWRF	0.00	0.00	0.09	0.29	0.72	2.18	4.44	6.22
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	21.63
				ALTERNATE 5				
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.13
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.02	0.15	0.71	1.33	3.36	6.16	8.32
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	21.63
				ALTERNATE 6				
PEACH TRUNK SEWER	2.63	3.00	0.00	0.00	0.00	0.00	0.00	0.00
FOWLER TRUNK SEWER	2.55	3.57	0.00	0.00	0.00	0.00	0.00	0.00
HERNDON TRUNK SEWER	0.98	1.57	0.00	0.00	0.00	0.00	0.00	0.00
SIERRA TRUNK SEWER	0.11	0.20	0.00	0.00	0.00	0.00	0.00	0.00
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.02	1.77	2.47	3.00	3.57	4.11	4.49
SE SATELLITE WWRF	0.00	0.00	8.39	9.65	11.14	12.78	15.23	17.14
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	21.63

TABLE 5-2

AVERAGE DAY ANNUAL FLOW, IN MGD, FOR URBAN DESIGNATIONS ESTIMATED TOTAL FLOW BY YEAR INDICATED

MAXIMUM FLOWS

FLOW DESTINATION	YEAR							
	1995	2000	2005	2010	2015	2020	2025	2030
ALTERNATE 1 AND 2								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.49
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.05	0.12	0.58	0.83	1.60	2.33	2.85
LEONARD TRUNK SEWER	0.00	0.00	0.11	0.40	0.98	3.02	6.14	8.59
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	26.88
ALTERNATE 3								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.49
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.05	0.12	0.58	0.83	1.60	2.33	2.85
SE SATELLITE WWRF	0.00	0.00	0.11	0.40	0.98	1.67	2.86	3.36
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	1.35	3.28	5.23
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	26.88
ALTERNATE 4								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.49
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.05	0.12	0.58	0.83	1.60	2.33	2.85
SE SATELLITE WWRF	0.00	0.00	0.11	0.40	0.98	3.02	6.14	8.59
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	26.88
ALTERNATE 5								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.49
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.05	0.23	0.98	1.61	4.62	8.47	11.44
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	26.88
ALTERNATE 6								
PEACH TRUNK SEWER	2.63	3.00	0.00	0.00	0.00	0.00	0.00	0.00
FOWLER TRUNK SEWER	2.55	4.21	0.00	0.00	0.00	0.00	0.00	0.00
HERNDON TRUNK SEWER	0.98	1.96	0.00	0.00	0.00	0.00	0.00	0.00
SIERRA TRUNK SEWER	0.11	0.22	0.00	0.00	0.00	0.00	0.00	0.00
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.05	2.08	2.96	3.61	4.35	5.11	5.63
SE SATELLITE WWRF	0.00	0.00	9.52	11.07	12.93	15.24	16.62	21.25
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	26.88

TABLE 5-3

AVERAGE DAY ANNUAL FLOW, IN MGD, FOR ALL DESIGNATIONS
ESTIMATED TOTAL FLOW BY YEAR INDICATED

PROJECTED FLOWS

FLOW DESTINATION	YEAR							
	1995	2000	2005	2010	2015	2020	2025	2030
ALTERNATE 1 AND 2								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.24
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.02	0.06	0.42	0.61	1.18	1.72	2.33
LEONARD TRUNK SEWER	0.00	0.00	0.09	0.29	0.72	2.18	4.44	7.67
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	23.42
ALTERNATE 3								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.24
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.02	0.06	0.42	0.61	1.18	1.72	2.33
SE SATELLITE WWRF	0.00	0.00	0.09	0.29	0.72	1.23	2.07	3.79
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.95	2.37	3.88
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	23.42
ALTERNATE 4								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.24
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.02	0.06	0.42	0.61	1.18	1.72	2.33
SE SATELLITE WWRF	0.00	0.00	0.09	0.29	0.72	2.18	4.44	7.67
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	23.42
ALTERNATE 5								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	3.57	4.51	5.45	7.42	7.60	7.79	7.92
HERNDON TRUNK SEWER	0.98	1.57	2.26	2.71	2.13	2.13	2.13	2.24
SIERRA TRUNK SEWER	0.11	0.20	0.24	0.25	0.26	0.26	0.26	0.26
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.02	0.15	0.71	1.33	3.36	6.16	10.00
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	23.42
ALTERNATE 6								
PEACH TRUNK SEWER	2.63	3.00	0.00	0.00	0.00	0.00	0.00	0.00
FOWLER TRUNK SEWER	2.55	3.57	0.00	0.00	0.00	0.00	0.00	0.00
HERNDON TRUNK SEWER	0.98	1.57	0.00	0.00	0.00	0.00	0.00	0.00
SIERRA TRUNK SEWER	0.11	0.20	0.00	0.00	0.00	0.00	0.00	0.00
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.02	1.77	2.47	3.00	3.57	4.11	4.83
SE SATELLITE WWRF	0.00	0.00	8.39	9.65	11.14	12.78	15.23	18.59
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	8.36	10.16	12.12	14.14	16.35	19.34	23.42

TABLE 5-4

AVERAGE DAY ANNUAL FLOW, IN MGD, FOR ALL DESIGNATIONS
ESTIMATED TOTAL FLOW BY YEAR INDICATED

MAXIMUM FLOWS

FLOW DESTINATION	YEAR 1995	2000	2005	2010	2015	2020	2025	2030
ALTERNATE 1 AND 2								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.60
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.05	0.12	0.58	0.83	1.60	2.33	3.08
LEONARD TRUNK SEWER	0.00	0.00	0.11	0.40	0.98	3.02	6.14	10.04
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	28.67
ALTERNATE 3								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.60
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.05	0.12	0.58	0.83	1.60	2.33	3.08
SE SATELLITE WWRF	0.00	0.00	0.11	0.40	0.98	1.67	2.86	4.74
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	1.35	3.28	5.30
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	28.67
ALTERNATE 4								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.60
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.05	0.12	0.58	0.83	1.60	2.33	3.08
SE SATELLITE WWRF	0.00	0.00	0.11	0.40	0.98	3.02	6.14	10.04
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	28.67
ALTERNATE 5								
PEACH TRUNK SEWER	2.63	3.00	3.00	3.00	3.00	3.00	3.00	3.00
FOWLER TRUNK SEWER	2.55	4.21	5.35	7.67	8.95	9.22	9.48	9.66
HERNDON TRUNK SEWER	0.98	1.96	2.75	2.10	2.49	2.49	2.49	2.60
SIERRA TRUNK SEWER	0.11	0.22	0.27	0.28	0.29	0.29	0.29	0.29
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE SATELLITE WWRF	0.00	0.05	0.23	0.98	1.81	4.62	8.47	13.12
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	28.67
ALTERNATE 6								
PEACH TRUNK SEWER	2.63	3.00	0.00	0.00	0.00	0.00	0.00	0.00
FOWLER TRUNK SEWER	2.55	4.21	0.00	0.00	0.00	0.00	0.00	0.00
HERNDON TRUNK SEWER	0.98	1.96	0.00	0.00	0.00	0.00	0.00	0.00
SIERRA TRUNK SEWER	0.11	0.22	0.00	0.00	0.00	0.00	0.00	0.00
SHEPHERD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEONARD TRUNK SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW SATELLITE WWRF	0.00	0.05	2.08	2.96	3.61	4.38	5.11	5.97
SE SATELLITE WWRF	0.00	0.00	9.52	11.07	12.93	15.24	18.62	22.70
NE SATELLITE WWRF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	6.27	9.44	11.60	14.03	16.54	19.62	23.73	28.67

5.2.2 MAJOR COLLECTION PIPELINES WITHIN THE CLOVIS STUDY AREA

A conceptual design for new major pipeline facilities was carried out for each alternative. Design criteria for the conceptual design of new pipelines within the 1993 Clovis General Plan area were established as follows:

- All pipeline hydraulic design to be based upon the Manning equation, with n = 0.013.
- The target maximum relative depth of average daily design flow to diameter of pipeline (d/D) to be no more than 0.54
- The target maximum relative depth of peak design flow to diameter of pipeline (d/D) to be no more than 0.82
- Indicated allowable peaking factor , or ratio of peak flow capacity to average flow capacity, will be no less than 1.76, as determined by use of the above relative flow depths (d/D)
- Minimum depth from existing ground surface to flow elevation of pipeline at upstream ends of system to be no less than 6 feet
- The target minimum slope of pipelines within the Clovis system to be no less than:

8-inch diameter . . .	0.0024 feet per foot slope
10-inch diameter . . .	0.0020 feet per foot slope
12-inch diameter . . .	0.0014 feet per foot slope
15-inch diameter . . .	0.0012 feet per foot slope
18-inch diameter and larger . . .	0.0010 feet per foot slope

  Steeper slopes shall be used whenever possible, subject to pipeline depth considerations.

- The target maximum depth to flow line of sewers to be no greater than 20 feet, except where unavoidable because of service area topography

Conceptual level design data for the proposed new trunk gravity collection systems (24-inches in diameter and larger) within Clovis for each alternative may be found in Appendix A5. Table A5-11 contains trunk pipeline design data for Alternatives 1, 2A and 2B. Tables A5-12 through A5-15 contain trunk pipeline design data for Alternatives 3, 4, 5 and 6. Plates 1E through 1I depict the proposed new trunk facilities for each alternative.

5.2.3 MAJOR PUMP STATIONS AND FORCE MAINS WITHIN THE CLOVIS STUDY AREA

Alternatives 3, 4, 5 and 6 all require new pump stations and force mains to move wastewater flow within the Clovis study area to potential Clovis Satellite Wastewater Reclamation Facilities. A reconnaissance level conceptual design was prepared for each of these proposed new pump stations, and associated force mains.

The conceptual designs included sulfide control provisions, because of the length of the force mains and magnitude of the planned flows. Sulfide controls not only prevent the deterioration of equipment and concrete surfaces due to acid attack, but also minimize odor and other problems at the point of discharge of the force main.

Energy requirements to transport the flow from the pump station to the point of discharge were also analyzed. Frictional losses in the force main, together with the lift required and pump station hydraulic losses, were included. The force main was then sized, in each case, to minimize the sum of the annual energy and sulfide control costs at the design rate of flow. The Hazen-Williams formula was utilized for pressure pipe flow analyses, employing a Hazen-Williams coefficient of 115.

Conceptual design calculations for the new pump stations and force mains within the Clovis study area may be found in Appendix A5. Calculations for Alternatives 3 and 4 appear on Table A5-16, Alternative 5 on Table A5-17, and Alternative 6 on Tables A5-18 through A5-21. The locations of the pump stations and force mains within the Clovis study area are depicted on Plates 1F, 1G, 1H and 1I (Alternatives 3, 4, 5 and 6).

5.2.4 MAJOR FRESNO-CLOVIS REGIONAL TRUNK SEWERS AND TRANSMISSION FACILITIES

Although a regional wastewater master plan update is currently under way and nearing completion (with the City of Fresno as the lead agency), its focus is primarily on treatment, reclamation and disposal issues, rather than on the regional trunk sewer system. Five of the six alternatives under the Clovis study involve the regional system. It was necessary, therefore, as a part of the Clovis Wastewater Master Plan Update, to develop reconnaissance level conceptual plans for those regional facilities which affect the City of Clovis and the cost of the regional alternatives.

Conceptual designs were prepared for the regional trunk sewers and transmission facilities which form a part of Alternatives 1 through 5 (Alternative 6 contains no regional components). Design data for these regional facilities, including estimated flow proportioning between Clovis and Fresno, are included in Appendix 5. Although the conceptual designs are necessarily based on preliminary assumptions for required flow depth, Fresno flow increments, and other factors, they should provide a reasonable representation of the extent and general nature of Clovis' share of required regional facilities for each alternative plan involving the regional system.

Regional trunk sewers required for **Alternative 1** are shown on Plate 1A, and are described as follows:

- A new trunk sewer would be required to service the general area of the East and Northeast Urban Villages of the 1993 Clovis General Plan, as well as the City of Fresno's Southeast Growth Area. This trunk sewer, entitled the *Leonard Trunk Sewer* (the street it occupies at its point of exit from Clovis), would flow Southerly from Clovis, picking up Fresno's Southeast Growth Area flows incrementally as it extends Southerly and Westerly to the intersection of North and Maple Avenues. At that point, it would become an enlarged second barrel of the parallel North Avenue Trunk Sewer, extending Westerly in North Avenue to its termination at the Regional Wastewater Treatment Plant (RWWTP). Conceptual level design data for these proposed new regional trunk sewers may be found in Table A5-22 in Appendix 5. Please refer to Section 6 for a detailed discussion of regional system expansion issues.

- A system of new trunk sewers would be required to service the general area of the Northwest Urban Village of the 1993 Clovis General Plan, together with the City of Fresno's North Growth Area. The Clovis trunk sewer, entitled the *Shepherd Trunk Sewer* (the street it occupies at its point of exit from Clovis), would flow Westerly from Clovis to a point near the intersection of Shepherd Avenue and Friant Road, where it would join a trunk sewer extending Southerly from Fresno's North Growth Area. From that point, a new shared capacity North cross-town trunk sewer would extend Southerly and Westerly to the intersection of Herndon and Cornelia Avenues. At that point, it would join the Grantland Trunk Sewer (currently under design by the City of Fresno), extending Southerly to the Regional Wastewater Treatment Plant (RWWTP). Conceptual level design data for these proposed new regional trunk sewers may be found in Table A5-23 in Appendix 5. Please refer to Section 6 for a detailed discussion of regional system expansion issues.

Regional trunk sewers and transmission facilities required for **Alternative 2A** are shown on Plate 1B, and are described as follows:

- A new trunk sewer would be required to service the general areas of the East and Northeast Urban Villages of the 1993 Clovis General Plan, as well as the City of Fresno's Southeast Growth Area. This trunk sewer, entitled the *Leonard Trunk Sewer*, would flow Southerly from Clovis, picking up Fresno's Southeast Growth Area flows incrementally as it extends Southerly and Westerly to a proposed new South Regional Satellite Wastewater Reclamation Facility (WWRF) in the vicinity of North and Clovis Avenues. Additionally, a new connector trunk sewer would be required from the Fowler Trunk Sewer at Church Avenue to the Regional Satellite WWRF. Conceptual level design data for the proposed new regional Leonard Trunk Sewer may be found in Table A5-24 in Appendix 5.

- Even with the construction of a Regional Satellite WWRF in the Southeast area of Fresno, a new second barrel paralleling the existing North Avenue Trunk Sewer, from Maple Avenue to the RWWTP, would still be required by the City of Fresno to augment system capacity. Clovis would not share in the capacity or cost of this new parallel trunk sewer. Conceptual level design data for the proposed second barrel of the North Avenue Trunk Sewer may be found in Table A5-24 in Appendix 5.

- A new pump station and 18-inch force main would be required to transmit the flow generated by the general area of the Northwest Urban Village of the 1993 Clovis General Plan to a proposed new North Regional Satellite WWRF in the vicinity of the San Joaquin River and Copper Avenue. The pump station and force main are required because the location of the proposed North Regional Satellite WWRF lies uphill from the Clovis service area. The pump station and force main facilities would be utilized only by Clovis flows. Conceptual level design calculations for the proposed new pump station and force main may be found in Table A5-25 in Appendix 5.

Regional trunk sewers and transmission facilities required for **Alternative 2B** are shown on Plate 1B, and are described as follows:

- Identically with Alternative 2A, a new *Leonard Trunk Sewer* would be required to service the general areas of the East and Northeast Urban Villages of the 1993 Clovis General Plan, as well as the City of Fresno's Southeast Growth Area. This trunk sewer would extend to the proposed new South Regional Satellite WWRF in the vicinity of North and Clovis Avenues. As in Alternative 2A, the new connector trunk sewer would be required from the Fowler Trunk Sewer at Church Avenue to the Regional Satellite WWRF. Conceptual level design data for the proposed new regional Leonard Trunk Sewer may be found in Table A5-26 in Appendix 5.

- A system of new trunk sewers and a Northwest Satellite WWRF would be required to service the general area of the Northwest Urban Village of the 1993 Clovis General Plan, together with the City of Fresno's North Growth Area. A Clovis *Shepherd Trunk Sewer* would flow Westerly from Clovis to a point near the intersection of Shepherd Avenue and Friant Road, where it would join a trunk sewer extending Southerly from Fresno's North Growth Area. From that point, a new shared capacity North cross-town trunk sewer would extend Southerly and Westerly to a proposed new Northwest Regional Satellite WWRF in the general vicinity of Shaw and Garfield Avenues. Conceptual level design data for these proposed new regional trunk sewers may be found in Table A5-27 in Appendix 5.

Regional trunk sewer issues involving Clovis for **Alternatives 3, 4 and 5** involve only the construction of an additional trunk sewer in North Avenue from Maple Avenue to the RWWTP, to allow the full potential of the Fowler Trunk sewer to be realized by the City of Clovis. Plate 1D depicts these regional facilities.

- A second barrel (pipeline) parallel to the North Avenue Trunk Sewer would be needed by both Fresno and Clovis, extending Westerly in North Avenue to its termination at the Regional Wastewater Treatment Plant. This trunk sewer would not only allow Clovis' full potential of the Fowler Trunk Sewer to be realized, but would also augment Fresno's capacity in the North Trunk Sewer and provide capacity for Fresno's's new Southeast Growth Area. Conceptual level design data for this proposed second barrel of the North Avenue Trunk sewer may be found in Table A5-28 in Appendix 5.

Regional trunk sewers and transmission facilities are not required for **Alternative 6**, as all existing and future Clovis flows would ultimately be handled in Clovis facilities under Alternative 6.

5.2.5 WASTEWATER TREATMENT, RECLAMATION AND DISPOSAL FACILITIES

Each of the six alternative plans studied contains wastewater treatment, reclamation and disposal elements. Although these subjects are explored in more detail in Sections 6 and 7, the facilities contemplated are generally described below.

Table 5-5 summarizes Clovis' wastewater treatment requirements, as related to the six alternative plans, for 20± year requirements through year 2015, and for ultimate buildout through year 2030.

TABLE 5-5

CLOVIS WASTEWATER MASTER PLAN
CLOVIS' PROJECTED AVERAGE DAY ANNUAL FLOW WASTEWATER TREATMENT REQUIREMENTS

	UNITS	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
20+/-YEAR REQUIREMENTS, THROUGH YEAR 2015								
CURRENT FLOW RATE	(MGD)	6.27	6.27	6.27	6.27	6.27	6.27	6.27
FLOW RATE AT END OF PERIOD	(MGD)	14.14	14.14	14.14	14.14	14.14	14.14	14.14
PREVIOUSLY PURCHASED TREATMENT CAPACITY	(MGD)	9.30	9.30	9.30	9.30	9.30	9.30	9.30
ADDITIONAL TREATMENT CAPACITY REQUIRED	(MGD)	4.84	4.84	4.84	4.84	4.84	4.84	4.84
REGIONAL WWTP	(MGD)	4.84	0.00	0.00	3.51	3.51	3.51	-9.30
REGIONAL SATELLITE WWRF'S								
NORTH WWRF	(MGD)	0.00	0.61	0.00	0.00	0.00	0.00	0.00
NORTHWEST WWRF	(MGD)	0.00	0.00	0.61	0.00	0.00	0.00	0.00
SOUTH WWRF	(MGD)	0.00	4.23	4.23	0.00	0.00	0.00	0.00
CLOVIS SATELLITE WWRF'S								
NW WWRF	(MGD)	0.00	0.00	0.00	0.61	0.61	0.00	3.00
SE WWRF	(MGD)	0.00	0.00	0.00	0.72	0.72	1.33	11.14
NE WWRF	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ULTIMATE REQUIREMENTS, THROUGH YEAR 2030								
CURRENT FLOW RATE	(MGD)	6.27	6.27	6.27	6.27	6.27	6.27	6.27
FLOW RATE AT END OF PERIOD	(MGD)	21.63	21.63	21.63	21.63	21.63	21.63	21.63
PREVIOUSLY PURCHASED TREATMENT CAPACITY	(MGD)	9.30	9.30	9.30	9.30	9.30	9.30	9.30
ADDITIONAL TREATMENT CAPACITY REQUIRED	(MGD)	12.33	12.33	12.33	12.33	12.33	12.33	12.33
REGIONAL WWTP	(MGD)	12.33	0.00	0.00	4.01	4.01	4.01	-9.30
REGIONAL SATELLITE WWRF'S								
NORTH WWRF	(MGD)	0.00	2.10	0.00	0.00	0.00	0.00	0.00
NORTHWEST WWRF	(MGD)	0.00	0.00	2.10	0.00	0.00	0.00	0.00
SOUTH WWRF	(MGD)	0.00	10.23	10.23	0.00	0.00	0.00	0.00
CLOVIS SATELLITE WWRF'S								
NW WWRF	(MGD)	0.00	0.00	0.00	2.10	2.10	0.00	4.49
SE WWRF	(MGD)	0.00	0.00	0.00	2.41	6.22	8.32	17.14
NE WWRF	(MGD)	0.00	0.00	0.00	3.81	0.00	0.00	0.00

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5.2.5.1 *REGIONAL PLANT EXPANSION*

Clovis' current status with respect to treatment capacity at the Fresno-Clovis Regional Wastewater Treatment Plant (WWTP) is as follows:

6.30 MGD	Currently owned by Clovis through existing joint powers agreements
3.00 MGD	Agreed Clovis additional purchase (under negotiation)
9.30 MGD	Total Clovis "current" treatment capacity at Regional WWTP (assumed included in current total for purposes of this report)

Alternatives 1,3,4 and 5 each require the acquisition by Clovis of additional treatment capacity at the Regional WWTP, as follows:

Alternate 1.

12.33 MGD	Additional required buildout capacity to be acquired by year 2030
21.63 MGD	Total required buildout capacity at Regional WWTP by year 2030

Alternatives 3, 4 and 5.

4.01 MGD	Additional required buildout capacity to be acquired by year 2030
13.31 MGD	Total required buildout capacity at Regional WWTP by year 2030

Alternatives 2A and 2B do not require acquisition of additional treatment capacity for Clovis at the Regional WWTP beyond the current 9.30 MGD capacity. Alternative 6 envisions selling back Clovis' current 9.30 MGD capacity at the Regional WWTP to Fresno.

The Regional WWTP is currently completing an expansion to bring it from a capacity of 60 MGD to 68 MGD. Immediately thereafter and scheduled for completion in 1998, another expansion will increase the Regional WWTP capacity to 80 MGD. It is within the 68 to 80 MGD expansion that Clovis' agreed additional purchase of 3.00 MGD will be incorporated.

Future expansion of the Regional WWTP will be required as flow growth continues in Fresno and Clovis, dependent also upon the regional system's alternate plans for potential Satellite Plants. The current regional Wastewater Master Plan Update is intended to provide improved guidance for anticipating, planning and constructing additional capacity, so that required capacity will be available when needed.

Treatment and disposal processes at the plant currently consist of secondary treatment (using the activated sludge process) with disposal predominantly to over 1,400 acres of evaporation/percolation ponds located on site. Additional disposal ponds are currently being added. Some water is reclaimed by extraction wells beneath the ponds for use by the Fresno Irrigation District (FID). Under a current agreement with the regional authority, FID delivers approximately 0.45 acre-foot of surface water to the regional authority for municipal/industrial use for every acre-foot of reclaimed water delivered to FID.

The Regional Wastewater Master Plan Update will recommend increased water reclamation through a cooperative effort of the Regional System and the Fresno Irrigation District, with other irrigation districts located downstream of the Regional WWTP, or a combination of both. One of the cooperative effort options with the Fresno Irrigation District would consist of transmission of secondarily treated effluent to a ponding site Easterly of the WWTP, with extraction wells beneath the ponds delivering reclaimed water to the Fresno Irrigation District's canal system. Although formal negotiations have not started, there are strong indications that an exchange rate more favorable to the Cities is a likely outcome of increased reclamation efforts with the Fresno Irrigation District. The Fresno Irrigation District currently does not plan to purchase reclaimed water, however.

5.2.5.2 *POTENTIAL REGIONAL SATELLITE WASTEWATER RECLAMATION FACILITIES*

Alternatives 2A and 2B envision some of Clovis' future flows to be directed to new Fresno-Clovis Regional Satellite Wastewater Reclamation Facilities located outside of the 1993 Clovis General Plan boundaries. Three such satellite sites are included as options in the Regional Wastewater Master Plan Update, as follows:

North Site	Vicinity of Copper Avenue and San Joaquin River
Northwest Site	Vicinity Shaw and Garfield Avenues
South Site	Vicinity Clovis and Jensen Avenues

Clovis' ultimate buildout quantities and destination of flow to the potential Regional Satellite Wastewater Reclamation Plants under each of these two alternatives is as follow:

Alternative 2A.

2.10 MGD	North Site (total North Satellite WWRF capacity = 8.00 MGD)
10.23 MGD	South Site (total South Satellite WWRF capacity = 32.10 MGD)

Alternative 2B.

2.10 MGD	Northwest Site (total NW Satellite WWRF capacity = 8.00 MGD)
10.23 MGD	South Site (total South Satellite WWRF capacity = 32.10 MGD)

<u>North Regional Satellite Wastewater Reclamation Facility</u>

The potential North Regional Satellite WWRF, as defined in the Regional Wastewater Master Plan Update, would service the North Fresno Growth Area (North of Copper Avenue), together with the Northwest Urban Center area of Clovis. Plate 1B depicts the general location of the satellite plant and service areas.

Two treatment/disposal alternatives are suggested in the Regional Master Plan for this site. These include:

- *Alternative N-1*. This plan consists of oxidation ditch basic aerobic treatment technology, together with biological nutrient removal, filtration and disinfection, to provide an advanced level of tertiary treatment appropriate for the intended method of disposal. Disposal of treated effluent would be accomplished by discharge to the San Joaquin River, potentially in exchange for additional Central Valley Project Water. This alternative has the disadvantage of a potentially difficult and time consuming permitting process for disposal to the San Joaquin River.

- *Alternative N-2*. This plan consists of oxidation ditch basic aerobic treatment technology, together with filtration and disinfection, to provide an advanced level of tertiary treatment appropriate for the intended method of disposal. Disposal of treated effluent would be accomplished by discharge to local golf courses and the Garfield Irrigation District during the irrigation season, and to the Fresno Irrigation District's Enterprise Canal during the non-irrigation season. Discharges to the Enterprise Canal would be downstream of a proposed Fresno water treatment plant to be located on the Enterprise Canal near the intersection of Chestnut and Behymer Avenues. Capacity for storage of treated effluent would be provided at the North site for those periods when the Enterprise Canal would be unavailable for receiving discharge due to storm flows or canal maintenance operations.

Although the Regional Master Plan Update suggests that Alternate N-1 may be less costly than Alternate N-2, the Clovis study assumes (for purposes of comparison of cost of alternatives) that Alternate N-2 would be selected because of non-economic considerations.

Northwest Regional Satellite Wastewater Reclamation Facility

The potential Northwest Regional Satellite WWRF, as defined in the Regional Wastewater Master Plan Update, would service the North Fresno Growth Area (North of Copper Avenue), together with the Northwest Urban Center area of Clovis. This would be accomplished by new trunk sewers to convey the flow from these service areas across the North side of Fresno to the Northwest Regional Satellite Plant. Plate 1C depicts the general location of the satellite plant, required trunk sewers, and service areas.

Three treatment/disposal alternatives are suggested in the Regional Master Plan for this site. These include:

- *Alternative NW-1*. This plan consists of oxidation ditch basic aerobic treatment technology, together with biological nutrient removal, filtration and disinfection, to provide an advanced level of tertiary treatment appropriate for the intended method of disposal. Disposal of treated effluent would be accomplished by discharge to the San Joaquin River, potentially in exchange for additional Central Valley Project Water. This alternative has the disadvantage of an potentially difficult and time consuming permitting process for disposal to the San Joaquin River.

- *Alternative NW-2*. This plan consists of oxidation ditch basic aerobic treatment technology, together with filtration and disinfection, to provide an advanced level of tertiary treatment appropriate for the intended method of disposal. Disposal of treated effluent would be accomplished by discharge to the Fresno Irrigation District's Herndon Canal, or to on-site evaporation/disposal ponds during those periods when the Herndon Canal would be unavailable for receiving discharge due to storm flows or canal maintenance operations. The Regional Master Plan Update also suggests under this alternative that secondarily treated effluent could be directly discharged to the evaporation/disposal ponds during the non-irrigation season, with groundwater recovery wells extracting water for delivery to the Herndon Canal during the irrigation season.

- *Alternative NW-3*. This plan consists of oxidation ditch basic aerobic treatment technology, to provide a secondary level of treatment. Disposal of treated effluent would be accomplished by discharge to on-site evaporation/disposal ponds for permanent disposal (no recovery).

Although the Regional Master Plan Update suggests that Alternate NW-3 may be less costly than Alternate NW-1 and NW-2, the Clovis study assumes (for purposes of comparison of cost of alternatives) that Alternate NW-2 would be selected because of non-economic considerations. The Clovis study also assumes that all wastewater under Alternate NW-2 would receive the advanced level of treatment described under that alternative.

South Regional Satellite Wastewater Reclamation Facility

The potential South Regional Satellite WWRF, as defined in the Regional Wastewater Master Plan Update, would service the Southeast Fresno Growth Area, together with the general areas of the Southeast and Northeast Urban Centers of Clovis. It would also divert all of Fresno's (Fowler Trunk Sewer) flow, and all but 3.00 MGD of Clovis' (Fowler Trunk Sewer) flow, from the Fowler Trunk Sewer at Church and Fowler Avenues, to the potential South Regional Satellite WWRF. Service to Clovis and Fresno growth areas would be accomplished by a new trunk sewer to convey the flow from these service areas to the South Regional Satellite Plant. An additional trunk sewer would be required to carry the diverted flow from the Fowler Trunk sewer at Church Avenue to the South Regional Satellite Plant site. Plates 1B and 1C depict the general location of the satellite plant, required trunk sewers, and service areas. The South Regional Satellite WWRF is common to both of Clovis Alternatives 2A and 2B.

Only one treatment/disposal plan is suggested in the Regional Master Plan for this site. It is described as follows:

- This plan consists of oxidation ditch basic aerobic treatment technology, together with filtration and disinfection, to provide an advanced level of tertiary treatment appropriate for the intended method of disposal. Disposal of treated effluent would be accomplished by discharge to Fresno Irrigation District's Washington (and Central) Canal, or to on-site evaporation/disposal ponds during those periods when the canals would be unavailable for receiving discharge due to storm flows or canal maintenance operations. The Regional Master Plan Update also suggests under this plan that secondarily treated effluent could be directly discharged to the evaporation/disposal ponds during the non-irrigation season, with groundwater recovery wells extracting water for delivery to the Washington and Central Canals during the irrigation season.

The Clovis study assumes (for purposes of comparison of cost of alternatives) that all wastewater under this plan would receive the advanced level of treatment described above. Clovis' study also utilizes less land requirements than the regional study for this alternative, based upon discussions of operating needs with the staff of the Fresno Irrigation District. Their plan would be to control flow between the Washington Canal, Central Canal, and the evaporation/disposal ponds in such a manner that the extent of the ponds could be greatly reduced.

5.2.5.3 *POTENTIAL CLOVIS SATELLITE WASTEWATER RECLAMATION FACILITIES*

Alternatives 3, 4, 5 and 6 include the provision for from one to three Clovis Satellite Wastewater Reclamation Facilities to be located within the boundaries of the 1993 Clovis General Plan area. Alternatives 3, 4 and 5 envision Clovis Satellite WWRF's to service generally the growth areas of the Clovis General Plan (the three urban villages), while the existing four trunk sewers continue to discharge into the regional system. Alternative 6, on the other hand, involves Clovis Satellite WWRF's to serve all of Clovis' present and future growth flows.

As described in the Environmental Impact Report for the 1993 Clovis General Plan, Clovis Satellite WWRF's would potentially be located within or near the Northwest Urban Village, the Southeast Urban Village, and the Northeast Urban Village.

The ultimate buildout (year 2030) treatment and disposal capacities of the potential Satellite WWRF's for each alternative plan is as follows:

Alternative 3.

2.10 MGD	Northwest Clovis Satellite WWRF
2.41 MGD	Southeast Clovis Satellite WWRF
3.81 MGD	Northeast Clovis Satellite WWRF

Alternative 4.

2.10 MGD	Northwest Clovis Satellite WWRF
6.22 MGD	Southeast Clovis Satellite WWRF

Alternative 5.

8.32 MGD	Southeast Clovis Satellite WWRF

Alternative 6.

4.49 MGD	Northwest Clovis Satellite WWRF
17.14 MGD	Southeast Clovis Satellite WWRF

Although a more detailed description of potential Clovis Satellite Reclamation Facilities may be found in Section 7, following is a general description of the satellite treatment, reclamation and disposal facilities which form a part of Alternatives 3, 4, 5 and 6.

Northwest Clovis Satellite Wastewater Reclamation Facility

Plates 1F, 1G and 1I show the general vicinity of where the facility would be located, as well as the service areas involved under each alternative. Alternatives 3 and 4 are identical with respect to the Northwest satellite facility, while Alternate 6 requires about twice the capacity at buildout because no flows would go to a regional facility under this alternative. The Northwest Satellite WWRF is proposed to be generally located in an agricultural area just east of the area proposed for urbanization (Northwest Urban Village) in the 1993 Clovis General Plan. No specific site is suggested in this conceptual study.

The treatment process proposed for each of the potential Clovis Satellite WWRF's is identical from site to site. The process consists of oxidation ditch basic aerobic treatment technology, together with advanced tertiary treatment consisting of biological nutrient removal, filtration, and ultra-violet disinfection. For the size of plant needed for Clovis, the oxidation ditch type of treatment process is one of the least expensive types to construct, and is one of the simplest to operate and maintain. It is also an aerobic process in which potential odors are easily controlled. Section 7 describes the specifics of the facilities involved in much more detail.

The quality of the treated water under the above described processes is such that, with the acquisition of the required permits, it can be utilized for virtually unlimited irrigation uses. The only true limitation, which is not health related, exists with the potential for direct undiluted application to stone fruit and other crops sensitive to sodium. The production levels of these crops are adversely affected over time by higher sodium levels, and the more clayey soils amplify the sodium problem. Reclamation/disposal alternatives presented in this study predominantly involve dilution of reclaimed water before application to production crops. A more thorough discussion of these issues is contained in Section 7.

Treated water from the above described tertiary process at this facility is proposed to be reclaimed/reused as described below:

- *Primary Plan*. The water reclamation/reuse proposal recommended for the potential Clovis Satellite WWRF's consists of a conjunctive use of the treated water.

  The primary emphasis of the reclamation/reuse plan would be for the delivery of reclaimed water directly to users (such as for landscape irrigation of parks, schools, freeways, median islands and beltways, for agricultural irrigation, and potentially for some industries) within the study area. This would require constructing a pressure transmission system, generally within major streets, from the satellite plant to the general area of these sources of the demand.

  Since there will be periods of time during the year when there is insufficient demand from direct users for the recycled water, particularly in the winter months when there is little demand for irrigation water, a secondary use for the water will also be necessary. The secondary emphasis of this plan would be the delivery of reclaimed water to Fresno Irrigation District and associated facilities, for agricultural irrigation (and incidental groundwater recharge). This could most effectively be accomplished by pipeline transmission of the treated effluent to Big Dry Creek Channel South of the Enterprise Canal, and interchangeably, to the adjacent Fresno Irrigation District's Helm-Colonial Canal. Control structures would allow diversion of all or part of the reclaimed water to either facility, depending on demand and capacity. Big Dry Creek flows Southwesterly, ultimately discharging into the Fresno Irrigation District's Herndon Canal. Flows directed to the Helm-Colonial Canal may qualify for exchange for surface water from the Fresno Irrigation District, while flow directed to Big Dry Creek may not.

  Capacity for storage of treated effluent would be provided on-site at the satellite facility for those periods when Big Dry Creek and the Fresno Irrigation District's system would be unavailable for receiving discharge due to storm flows or canal maintenance operations.

Fundamental considerations for this plan include the requirement for permits and agreements with the Fresno Irrigation District and the Fresno Metropolitan Flood Control District, surface water discharge requirements from the California Regional Water Quality Control Board, and other permits as required.

- *Potential Supplement to Plan.* A potential supplement to the primary reclamation/reuse plan would be opportunities for use of the reclaimed water for other purposes, such as for recreational purposes, wetland creation or restoration, dedicated groundwater recharge facilities, and possibly other uses. These would be considered as supplements to the primary plan reclamation/reuse strategies, where such opportunities arise.

A more detailed discussion of reclamation/reuse/disposal may be found in Section 7.

Plate 5A shows a layout typical for a satellite plant such as the Clovis Northwest Satellite WWRF. Land requirements for this site, including capacity for the necessary treated water holding ponds, are of the order of magnitude of 30 acres for each of Alternatives 3, 4 and 6. These land requirements may vary with the precise location of the facility, taking into account nearby land uses and associated buffering needs.

These land requirements are for the ultimate capacity requirements for the site. Interim land requirements may be somewhat less, which would allow potential continued agricultural uses in the intervening years.

<u>*Southeast Clovis Satellite Wastewater Reclamation Facility*</u>

Plates 1F, 1G, 1H and 1I show the general vicinity of where the facility would be located, as well as the service areas involved under each alternative. Alternative 3 requires the least capacity at the Southeast satellite facility, with each subsequent alternative respectively requiring a greater capacity at buildout. The Southeast Satellite WWRF is proposed to be generally located in an agricultural area just east of the area proposed for urbanization (Southeast Urban Village) in the 1993 Clovis General Plan. No specific site is suggested in this conceptual study.

Identical with the potential Northwest Satellite WWRF, the treatment process would consist of oxidation ditch basic aerobic treatment technology, together with advanced tertiary treatment consisting of biological nutrient removal, filtration, and ultra-violet disinfection. This will produce reclaimed water that can be utilized for virtually unlimited irrigation uses (subject to dilution considerations to adjust the water chemistry for certain crops).

Treated water from the above described tertiary process at this facility is proposed to be reclaimed/reused as described below:

- *Primary Plan.* The water reclamation/reuse proposal recommended for the potential Clovis Satellite WWRF's consists of a conjunctive use of the treated water.

  The primary emphasis of the reclamation/reuse plan would be for the delivery of reclaimed water directly to users (such as for landscape irrigation of parks, schools, median islands and beltways, for agricultural irrigation, and potentially for some industries) within the study area. This would require constructing a pressure transmission system, generally within major streets, from the satellite plant to the general area of these sources of the demand.

Since there will be periods of time during the year when there is insufficient demand from direct users for the recycled water, particularly in the winter months when there is little demand for irrigation water, a secondary use for the water will also be necessary. The secondary emphasis of this plan would be the delivery of reclaimed water to Fresno Irrigation District and associated facilities, for agricultural irrigation (and incidental groundwater recharge). This could most effectively be accomplished by pipeline transmission of the treated effluent to the Fresno Irrigation District's Mill Ditch (or alternately Fancher Creek), and interchangeably, to Redbank Creek near the satellite facility (or alternately to an improved Dog Creek). Control structures could allow diversion of all or part of the reclaimed water to either facility, depending on demand and capacity. If used, capacity enhancements would be required on Dog Creek, the extent of which would depend on the satellite plant's discharge capacity. Dog Creek and Redbank Creek flow Southwesterly to the Mill Ditch. Flows directed to the Mill Ditch and Fancher Creek may qualify for exchange for surface water from the Fresno Irrigation District.

Capacity for storage of treated effluent would be provided on-site for those periods when Redbank Creek (or Dog Creek) and/or the Fresno Irrigation District's canal system would be unavailable for receiving discharge due to storm flows or maintenance operations.

Fundamental considerations for this plan include the requirement for permits and agreements with the Fresno Irrigation District and the Fresno Metropolitan Flood Control District, surface water discharge requirements from the California Regional Water Quality Control Board, and other permits as required.

- *Potential Supplement to Plan.* A potential supplement to the primary reclamation/reuse plan would be opportunities for use of the reclaimed water for other purposes, such as for recreational purposes, wetland creation or restoration, dedicated groundwater recharge facilities, and possibly other uses. These would be considered as supplements to the primary plan reclamation/reuse strategies, where such opportunities arise.

A more detailed discussion of treatment, and of reclamation/reuse/disposal, may be found in Section 7.

Plate 5A shows a layout typical for a satellite plant such as the Clovis Southeast Satellite WWRF. Land requirements for this site, including capacity for the necessary treated water holding ponds, are of the order of magnitude of those listed below:

30 Acres	Alternatives 3 and 4
40 Acres	Alternatives 5 and 6

These land requirements may vary with the precise location of the facility, taking into account nearby land uses and associated buffering needs. The land requirements are for the ultimate capacity requirements for the site. Interim land requirements may be somewhat less, which would allow potential continued agricultural uses in the intervening years.

Northeast Clovis Satellite Wastewater Reclamation Facility

Plate 1F shows the general vicinity of where the facility would be located, as well as the service area involved. The Northeast Satellite WWRF is proposed to be generally located within or near a large park area of the Northeast Urban Village as shown on the 1993 Clovis General Plan. No specific site is suggested in this conceptual study.

Identical with the potential Northwest and Southeast Satellite WWRF's, the treatment process would consist of oxidation ditch basic aerobic treatment technology, together with advanced tertiary treatment consisting of biological nutrient removal, filtration, and ultra-violet disinfection. This will produce reclaimed water that can be utilized for virtually unlimited irrigation uses, subject to dilution considerations to adjust the water chemistry for certain crops. Dilution considerations are more critical in the Northeast area of Clovis because of the more clayey soils.

Treated water from the above described tertiary process at this facility is proposed to be reclaimed/reused as described below:

- *Primary Plan*. The water reclamation/reuse proposal recommended for the potential Clovis Satellite WWRF's consists of a conjunctive use of the treated water.

  The primary emphasis of the reclamation/reuse plan would be for the delivery of reclaimed water directly to users (such as for landscape irrigation of parks, schools, freeways, median islands and beltways, for agricultural irrigation, and potentially for some industries) within the study area. This would require constructing a pressure transmission system, generally within major streets, from the satellite plant to the general area of these sources of the demand.

  Since there will be periods of time during the year when there is insufficient demand from direct users for the recycled water, particularly in the winter months when there is little demand for irrigation water, a secondary use for the water will also be necessary. The secondary emphasis of this plan would be the delivery of reclaimed water to Fresno Irrigation District and associated facilities, for agricultural irrigation (and incidental groundwater recharge). This could most effectively be accomplished by pipeline transmission of the treated effluent to the Fresno Irrigation District's Mill Ditch (or alternately Fancher Creek), and Redbank Creek, and interchangeably, to Dog Creek near the satellite facility site. Control structures could allow diversion of all or part of the reclaimed water to either facility, depending on demand and capacity. Capacity enhancements would be required on Dog Creek, particularly South of the Gould Canal. Water discharged to Dog Creek or Redbank Creek would flow Southwesterly to the Mill Ditch. Flows directed to the Mill Ditch and Fancher Creek may qualify for exchange for surface water from the Fresno Irrigation District.

  Capacity for storage of treated effluent would be provided on-site for those periods when Dog Creek, Redbank Creek, and/or the Fresno Irrigation District's system would be unavailable for receiving discharge due to storm flows or maintenance operations.

  Fundamental considerations for this plan include the requirement for permits and agreements with the Fresno Irrigation District and the Fresno Metropolitan Flood Control District, surface water discharge requirements from the California Regional Water Quality Control Board, and other permits as required.

- *Potential Supplement to Plan.* A potential supplement to the primary reclamation/reuse plan would be opportunities for use of the reclaimed water for other purposes, such as for recreational purposes, wetland creation or restoration, dedicated groundwater recharge facilities, and possibly other uses. These would be considered as supplements to the primary plan reclamation/reuse strategies, where such opportunities arise.

A more detailed discussion of treatment, and of reclamation/reuse/disposal, may be found in Section 7.

Plate 5A shows a layout typical for a satellite plant such as the Clovis Northeast Satellite WWRF. Land requirements for this site, including capacity for the necessary treated water holding ponds, are of the order of magnitude of 30 acres. These land requirements may vary with the precise location of the facility, taking into account nearby land uses and associated buffering needs.

These land requirements are for the ultimate capacity requirements for the site. Interim land requirements may be somewhat less, which would allow potential continued agricultural uses in the intervening years.

SECTION 6.
REGIONAL SYSTEM EXPANSION ISSUES

6.1 GENERAL

All alternative plans studied for providing wastewater service into the future for Clovis, with the exception of Alternative 6, rely upon Clovis' obtaining additional capacity within the regional system. Additional regional capacity can only be obtained by expansion of the regional system, because excess capacity, for the most part, does not exist within the regional system.

Alternatives 1, 2A and 2B rely entirely on expansion of the regional system for Clovis' future growth, while Alternatives 3,4 and 5 rely partially on such expansion.

A wastewater master plan update is nearing completion by the regional authority, scheduled for completion and adoption by early 1997. The study is being performed by John Carollo Engineers. That study focuses primarily on wastewater treatment and disposal/reuse/reclamation issues, rather than on conveyance facilities.

6.2 WASTEWATER TREATMENT AND DISPOSAL/REUSE/RECLAMATION ISSUES

The regional wastewater master plan update primarily involves issues related to expansion of the capacity of the Regional Wastewater Treatment Plant, together with evaluation of the potential of establishing regional satellite wastewater treatment facilities as an alternate to, or a supplement of, additional regional plant capacity.

6.2.1 REGIONAL PLANT EXPANSION

The Fresno-Clovis Regional Wastewater Treatment Plant is currently completing an expansion to a nominal capacity of 68 MGD, which is occasionally exceeded by the current monthly average inflow. Another expansion project will follow immediately thereafter to provide an additional 12 MGD, which will bring the nominal capacity of the facility to 80 MGD in 1998. The City of Clovis has agreed to purchase 3.00 MGD from the later expansion, which should satisfy Clovis' growth for the next 10 years or more.

The planning window for the regional master plan update is year 2020. Projections in the plan anticipate a potential growth in flow to a total of as much as 162 MGD by 2020. Figure 6-1 indicates the relative location of the regional plant to the planning areas of the Cities of Clovis and Fresno.

In February, 1996, the California Regional Water Quality Control Board, Central Valley Region, issued a Cease and Desist Order (C&D) to the Cities of Fresno and Clovis relative to violations of waste discharge requirements at the regional plant. Corrective actions were ordered by the C&D in accordance with a prescribed time schedule for corrections and reporting.

In August, 1996, a progress report to the California Regional Water Quality Control Board presented by their staff indicated that steps taken by the regional authority to correct violations of the waste discharge requirements and address the concerns of the board were on schedule.

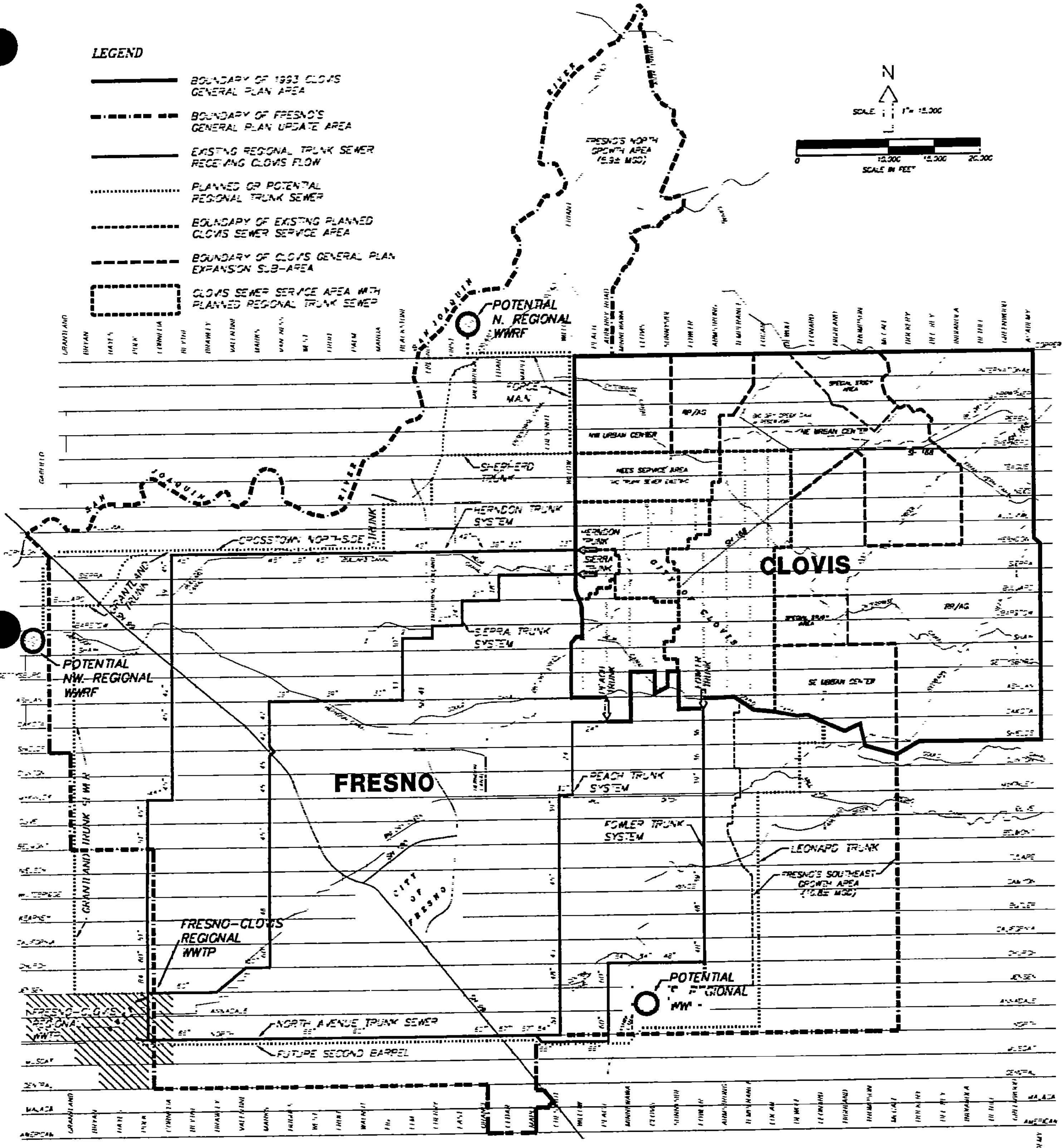

FIGURE 6-1

CLOVIS WASTEWATER MASTER PLAN UPDATE

FRESNO-CLOVIS PLANNING AREAS AND REGIONAL SYSTEM AFFECTING CLOVIS

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The regional wastewater master plan update evaluates the further expansion requirements of the regional plant, including projected flow growth and flow characteristics, regulatory requirements, standby criteria, effluent reuse/disposal, biosolids reuse/disposal, and associated issues. The regional master plan update is intended to provide comprehensive guidance into the future, so that expansion requirements can be anticipated far enough in advance to allow a systematic approach to funding, design and construction. The plan is intended to be a dynamic one, in that reassessments are to be accomplished on a periodic basis (every few years) to assure that opportunities are available for adjustments in the expansion schedule and associated treatment/disposal component elements.

Although the past few years have required (and certainly the next few years will continue to require) a process of "catch up" at the regional plant, adherence to the new wastewater master plan should eventually result in the construction of additional capacity in advance of, and commensurate with, anticipated inflow growth.

The regional wastewater master plan is designed to provide a blueprint for accomplishing projected capacity needs while at the same time attaining (and maintaining) adherence with the applicable waste discharge requirements. Although failure on the part of the regional authority to provide necessary expansion and/or meet the applicable waste discharge requirements could result in consequences which would slow, or even stop, the addition of service connections to the system, adherence by the regional authority to the master plan and its dynamic scheduling of plant expansion improvements should provide for capacity to be available for purchase by Clovis, as needed.

6.2.2 REGIONAL SATELLITE PLANT ALTERNATIVES

The regional wastewater master plan update includes a reconnaissance level study of possible regional satellite wastewater treatment and disposal/reclamation/reuse facilities, as a potential alternative (or supplement) to expansion at the regional plant. Figure 6-1 indicates the relative location of the regional satellite plants studied to the regional plant and the planning areas of the Cities of Clovis and Fresno.

The study looks at a potential South Regional Satellite WWRF, which would serve Clovis' Southeast and Northeast growth areas, and much of Clovis' flow component in the Fowler Avenue Trunk Sewer, together with Fresno's Southeast growth areas and part of Fresno's flow component in the Fowler Trunk Sewer. The capacity of the South Regional Satellite WWRF studied was 32.1 MGD.

The study also looks at a potential North (or Northwest) Regional Satellite WWRF, which would serve Clovis' Northwest growth area together with Fresno's North growth area. The capacity of the North (or Northwest) Regional Satellite WWRF studied was 8.0 MGD.

The sum of the capacity of the regional satellite WWRF's studied, being just over 40 MGD, would not satisfy the regional system's planning window capacity expansion needs (to 162±MGD by 2020) without additional expansion of the regional plant, or additional satellite facilities.

The regional master plan update concludes that regional satellite WWRF's are feasible alternatives, both economically and non-economically, to equivalent capacity expansion of the regional WWTP. Further recommendations in that master plan include additional, more comprehensive, analyses of satellite options and provisions for funding the additional studies.

The more comprehensive studies would evaluate facility size as related to potential location, so as to optimize the capacity of a prospective satellite facility with respect to potential service areas, relief of existing trunk sewers, reclamation/reuse options, and other factors.

A preliminary implementation schedule, included in the regional study, suggests that under normal conditions between 6 and 7 years would be required, after a decision was made to proceed, to plan, environmentally clear, and construct a regional satellite facility. It further indicates that a decision to proceed on a South regional satellite facility would need to be made as quickly as possible, in order for Clovis to avoid participation in the second barrel of the North Avenue Trunk Sewer.

If the regional wastewater master plan update is adopted as presented (without elimination of the satellite plant options), and if the recommendations of the plan are carried out by the regional authority, there will be further, more comprehensive studies performed for the regional satellite facility alternatives. These may, or may not, lead to the construction of one or more regional satellite facilities. If one or more regional satellite plants are constructed, it is unlikely that the first satellite facility would be on line earlier than year 2003.

6.3 EXPANSION OF CONVEYANCE SYSTEM CAPACITY

Trunk sewer planning was not included in the regional wastewater master plan update, except in the general context of estimating potential avoided conveyance facility costs in the regional satellite alternatives' cost analyses.

Regional trunk sewer systems, existing and proposed, which affect Clovis' future capacity needs in the regional system include the following (see Figure 6-1):

- *Peach Trunk Sewer (and Downstream System to Regional WWTP)*

  This system is in place, with Clovis having previously acquired 3.00 MGD average flow capacity in the system. Inasmuch as no additional capacity is available to Clovis in this system, and the Peach Service Area is projected to generate buildout flow in excess of this capacity, a portion of the Peach Service area must ultimately be diverted to the Fowler Trunk Sewer system (see Section 4).

- *Herndon Trunk Sewer (and Downstream System to Regional WWTP)*

  This system is in place, with Clovis having previously acquired 2.80 MGD average flow capacity in the system. No additional capacity is available to Clovis in this system. Adjustments are proposed in the boundaries of the Herndon Service Area to stay within the acquired capacity of the Herndon Trunk Sewer at buildout of the area (see Section 4).

- *Sierra Trunk Sewer (and Downstream System to Regional WWTP)*

  This system is in place, with Clovis having previously acquired 0.50 MGD average flow capacity in the system. No additional capacity is anticipated to be needed by Clovis in this system at buildout of the service area.

- *Fowler Trunk Sewer to North Avenue Trunk Sewer (at Maple and North Avenues)*

  This system is in place, with Clovis having previously acquired a net 9.57 MGD average flow capacity in the system. Although some marginal additional capacity could possibly be obtained in the system by relaxing certain design standards (which might affect service life of the facility), such additional capacity would be difficult to efficiently utilize. Expansions proposed in the boundaries of the Fowler Service Area result in projected flow generation, at buildout of the service area, within the acquired capacity of the Fowler Trunk Sewer upstream of its connection with the North Avenue Trunk Sewer.

- *North Avenue Trunk Sewer From Maple Avenue to Regional WWTP*

  The first barrel of a planned two parallel barrel system is in place, with Clovis having previously acquired 6.00 MGD average flow capacity in this trunk sewer. This consists of 3.00 MGD capacity for Peach Trunk Sewer flows (equal to Clovis' upstream acquired capacity in the Peach Trunk Sewer system), and 3.00 MGD capacity for Fowler Trunk Sewer flows (5.57 MGD short of Clovis' upstream capacity in the Fowler Avenue Trunk Sewer). Until a second barrel of the North Avenue Trunk Sewer is constructed, no additional capacity will be available to Clovis in this system.

  It is estimated that flow generated by Clovis in the Fowler Trunk Sewer will exceed 3.00 MGD within the next two to three years, and the 6.00 MGD capacity owned by Clovis in the North Avenue Trunk Sewer will be reached by year 2000. Fresno-Clovis joint capacity (25 ± MGD) in the existing North Avenue Trunk Sewer is projected to be exceeded by year 2000 to 2002.

  A second barrel of the North Avenue Trunk Sewer needs to be constructed prior to the time that capacity of the existing barrel is exceeded. Although no funding is currently in place specifically identified for construction of this line, the City of Fresno is aware of its need and must plan accordingly. Because of a sizeable shortage of design capacity in the existing North Avenue Trunk Sewer to serve its current service area, a second barrel will almost certainly be required even if a South regional satellite WWRF is constructed. The size of the second barrel could, of course, be smaller if a regional satellite facility were planned for the area.

  Clovis would need to participate in the construction of the second barrel of the North Avenue Trunk Sewer under Clovis' Alternatives 1, 3, 4 and 5. Participation under Alternative 1 is estimated to cost Clovis $7,480,000, while participation under Alternatives 3, 4 and 5 is estimated to cost Clovis $4,708,000. Alternatives 2A and 2B, as well as Alternative 6, do not require additional capacity in the North Avenue Trunk Sewer for Clovis flows.

- *Leonard Trunk Sewer*

  This is a new potential regional trunk sewer necessary under Clovis' Alternatives 1, 2A and 2B (the total regional service alternatives). This trunk sewer would receive flow from Clovis' Southeast and Northeast growth areas, together with flow from Fresno's Southeast growth area, traversing the East side of Fresno from North to South and then West in North Avenue.

  Under the concept of Clovis' Alternative 1, the Leonard Trunk Sewer would extend South from the Southeast growth area of Clovis and then West in North Avenue to the intersection of Maple and North Avenues, where it would discharge into the future second barrel of the North Avenue Trunk Sewer. Clovis' share of the cost of the Leonard Trunk Sewer under Alternative 1 is estimated at $13,528,000.

Under the concept of Clovis' Alternative 2A and 2B, the Leonard Trunk Sewer would extend South from the Southeast growth area of Clovis, and then West in North Avenue to a proposed South Regional WWRF, near North and Clovis Avenues. Clovis' share of the cost of the Leonard Trunk Sewer under Alternative 2A and 2B is estimated at $11,860,000. Under Alternatives 2A and 2B, a diversion trunk will also be needed to connect the Fowler Avenue Trunk Sewer at Church avenue with the proposed South Regional Satellite WWRF. Clovis' share of participation in this diversion trunk sewer is estimated to cost $2,381,000. The sum total estimated cost to Clovis of the Leonard Trunk Sewer, together with the diversion trunk sewer (both of which are required under Alternatives 2A and 2B) is $14,241,000.

The construction of the Leonard Trunk sewer from the Southeast Clovis growth area to either the North Avenue Trunk Sewer at Maple and North Avenues (under Alternative 1), or a South Regional Satellite WWRF (under Alternatives 2A or 2B) is projected to not be required before approximately year 2010. Minor flows expected to be generated by development prior to that time can most likely be temporarily shunted to existing sewers.

Timing issues with respect to the need for construction of the Leonard Trunk Sewer, however, are not independent of Fresno, as the facilities would be shared by both cities. Cooperation would be required between the cities to accomplish construction within a time window appropriate to both city's needs.

- *Grantland Trunk Sewer*

This is a planned regional trunk sewer, scheduled for construction in 1998. It is designed to serve Fresno's Grantland Service Area (West and Northwest of Fresno), and Fresno's and Clovis' Herndon Service Areas (by relieving the existing Cornelia Trunk Sewer). The Grantland Trunk Sewer will connect to the Herndon-Cornelia Trunk Sewer at Herndon and Cornelia Avenues, and then traverse Southwesterly, and then Southerly along Grantland Avenue to the Regional WWTP.

Participation in the Grantland Trunk Sewer by Clovis is only required under Clovis' Alternative 1, wherein Clovis' Northwest growth area (together with Fresno's North growth area) would be served by new trunk sewers extending to the Grantland Trunk Sewer, and then on to the Regional WWTP. Clovis' share of participation in the Grantland Trunk Sewer under Alternative 1, not including the cross-town connection from Clovis to the Grantland Trunk Sewer, is estimated to cost $1,939,000.

Clovis' previously acquired 2.80 MGD capacity in the Herndon Trunk Sewer (and Cornelia Trunk Sewer) will be unaffected by diversion of Herndon Trunk Sewer flow from the Cornelia Trunk Sewer into the new Grantland Trunk Sewer, and no costs will accrue to Clovis for this conversion.

The feasibility of Clovis' potential participation in the Grantland Trunk Sewer will be highly influenced by Fresno's ultimate plan for wastewater service to their North growth area. If Fresno's North growth area is not to be served by a crosstown Northside trunk sewer, the costs to Clovis to construct such a facility totally on its own, for 2.10 MGD service to its Northwest growth area, would be prohibitive.

- *Shepherd Trunk Sewer and Crosstown Northside Link*

  This is a new potential regional trunk sewer necessary under Clovis' Alternatives 1 and 2B (both are total regional service alternatives). This trunk sewer would receive flow from Clovis' Northwest growth area, together with flow from Fresno's North growth area, commencing from Northwest Clovis and traversing the North side of Fresno from East to West.

  Under the concept of Clovis' Alternative 1, the Shepherd Trunk Sewer would extend West in Shepherd Avenue to about Friant Road, where it would connect with a link from Fresno's North growth area. A new crosstown Northside link would extend South and then West to the intersection of Herndon and Cornelia Avenues, where it would discharge into the Grantland Trunk Sewer. Clovis' share of the cost of the Shepherd Trunk Sewer and crosstown Northside link under Alternative 1 is estimated to be $6,815,000.

  Under the concept of Clovis' Alternative 2B, the Shepherd Trunk Sewer would extend West in Shepherd Avenue to about Friant Road, where it would connect with a link from Fresno's North growth area. A new crosstown Northside link would extend South and then West to a Regional Satellite WWRF near the intersection of Shaw and Garfield Avenues. Clovis' share of the cost of the Shepherd Trunk Sewer and crosstown Northside link under Alternative 2B is estimated at $8,506,000.

  The construction of the Shepherd Trunk Sewer and crosstown Northside link from the Northwest Clovis growth area to either the Grantland Trunk Sewer at Herndon and Cornelia Avenues (under Alternative 1), or a Northwest Regional Satellite WWRF (under Alternative 2B) is projected to not be required by Clovis before approximately year 2010. Minor flows expected to be generated by development prior to that time can most likely be temporarily shunted to existing sewers.

  Timing issues with respect to the need for construction of these facilities, however, are not independent of Fresno, as the facilities would be shared by both cities. Cooperation would be required between the cities to accomplish construction within a time window appropriate to both city's needs.

- *Northwest Pump Station and Force Main to North Regional Satellite WWRF*

  These are new potential regional facilities necessary under Clovis' Alternative 2A (one of the total regional service alternatives). These facilities would receive flow from Clovis' Northwest growth area, pumping the flow to a new North Regional Satellite WWRF located in the general vicinity North of Copper Avenue and East of the San Joaquin River. The pump station and force main is estimated to cost Clovis $3,030,000, and would carry no Fresno flows.

  The Northwest pump station and force main to a North Regional Satellite WWRF (under Alternative 2A) is projected to not be required before approximately year 2010, although the timing of construction of a potential North Satellite WWRF would be a function of both Clovis' and Fresno's needs. Minor flows expected to be generated by development prior to year 2010 in Clovis' Northwest growth area can most likely be temporarily shunted to existing sewers to the South.

SECTION 7.
POTENTIAL CLOVIS SATELLITE WASTEWATER RECLAMATION FACILITIES

7.1 GENERAL

Early in the current wastewater master plan update process, it was decided that water reclamation/reuse would be the major focus of any satellite treatment/disposal facility that would be contemplated as an alternative for Clovis. There were several basic reasons for this, as follows:

- Water is a not necessarily available in abundant quantities in the future growth areas of Clovis
- Modern technology provides efficient ways to reclaim wastewater to virtually unlimited irrigation uses
- Clovis is geographically located in an area of the community generally on the upstream side of the Fresno Irrigation District's delivery system
- The typically less expensive combination of secondary (only) treatment with land-based disposal in evaporation/percolation ponds, is only feasible where soil conditions allow, and where vast amounts of land are available for disposal
- Reclamation/reuse is highly encouraged, if not demanded, by the California Regional Water Quality Control Board
- Reclamation/reuse is environmentally superior

7.2 CANDIDATE TREATMENT PROCESSES

In order to be considered as a viable candidate treatment process for Clovis, a process must be capable of achieving required water quality standards for the intended reclamation/reuse. Such water quality standards are listed below:

> Secondary treatment process to provide for effluent with a biochemical oxygen demand of less than 20 milligrams per liter.
>
> Secondary treatment process to provide for effluent with a total suspended solids of less than 20 milligrams per liter.
>
> Tertiary treated water to have a turbidity of less than an average of 2 ntu's over a 24-hour period, and not to exceed 5 ntu's more than 15% of the time.
>
> Treated water to have less than 10 milligrams per liter of total nitrogen as N (nitrogen).
>
> Treated water to have a MPN (most probable number) of coliform count of less than 2.2 per 100 milliliters.

Treatment processes capable of achieving the above standards and otherwise initially considered potentially viable for Clovis are described below. Each involves advanced levels of treatment commonly referred to as "tertiary". Although there are many variations available of the technologies listed, the basic processes are as described.

7.2.1 CONVENTIONAL ACTIVATED SLUDGE PROCESS

The conventional activated sludge type process is in common use, with thousands of treatment plants in operation using this technology. The Fresno-Clovis Regional Wastewater Treatment Plant utilizes this basic technology, with treatment limited to a secondary level before disposing of the effluent in evaporation/disposal ponds.

The major components of a system that would treat wastewater to an advanced level, utilizing the conventional activated sludge process, are as follows:

- *Influent Pump Station.* A facility to lift the inflow from the incoming trunk sewer(s) to a level where the treatment process can be carried out predominantly by gravity.

- *Headworks.* A bar screen system for removing rags, pieces of wood, and other non-degradable type materials. Includes a grit removal system.

- *Grit Removal System.* A facility within the headworks to remove sand, rocks and other types of inert, non-floating materials.

- *Primary Clarifiers.* Concrete sedimentation basins for removing 40% to 60% of suspended solids and biochemical oxygen demand (BOD) by gravity.

- *Aeration Basins.* Large concrete basins in which air is introduced into the wastewater to allow bacteria to consume the organic matter, converting dissolved organic matter to cellular material.

- *Secondary Clarifiers.* Concrete basins in which the activated sludge suspended solids are settled out by gravity producing relatively clear effluent that flows over a weir and out of the secondary clarifier.

- *Anaerobic Digesters.* These are used in the larger plants. They are sealed tanks to which waste primary and activated sludge suspended solids removed by the primary and secondary clarifiers are sent. The solids are digested anaerobically (without oxygen) by anaerobic bacteria and transformed into a stabilized sludge that will meet the federal regulations (40 CFR, Part 503, pursuant to the Clean Water Act). There is a reduction of approximately 50% in the total weight of solids accomplished by the bacteria in both the aeration basins and the digesters. Anaerobic digesters generate methane, carbon dioxide and hydrogen sulfide. These gases must be scrubbed, and either utilized in engines and/or sludge heaters, or burned. They are most often used to heat the anaerobic digesters, but there may be more gas generated than can be utilized so the balance is burned. These gases are a potential source of objectionable odor, and must be controlled. The sludge that is generated from the digesters is also a potential source of objectionable odors, which must be controlled.

- *Sludge Dewatering.* Within a building, sludge is dewatered mechanically by centrifuges, belt presses, or other processes, to remove excess water, so that it can be sent to air drying beds, composting or landfill. The sludge will be approximately 2 to 7% solids before dewatering and 14 to 30% solids after dewatering. The supernatant from the dewatering is sent back to the plant process. Since the sludge often has a high odor potential, an air scrubbing system must be installed on the sludge building to control the sludge odors.

- *Nutrient Removal System*. This consists of anoxic tanks ahead of the aeration basins utilized to allow the bacteria in the sewage flow to utilize the nitrified ion (converted from ammonia) in the recirculated activated sludge as an oxygen source (as a substitute for dissolved oxygen). The nitrate is stripped of oxygen by bacteria to release nitrogen gas into the air.

- *Tertiary Filtration System*. Secondary effluent from the secondary clarifiers is filtered through multi-media or sand filters to further remove suspended solids that were not removed by the secondary clarifiers. Coagulants such as alum and polymers are added to foster better flocculation and coagulation of the suspended solids, and to enhance the filtration process.

- *Disinfection*. Tertiary effluent is exposed to radiation by ultraviolet light or to high doses of chlorine to kill pathogenic organisms that were not removed by the tertiary filters.

- *Odor Control*. Activated sludge rich in oxygen from the aeration basins can be pumped to the influent pump station or headworks. Because the waste activated sludge acts on the sulfides, up to 90% of sulfide odors can be eliminated in the influent pump station, headworks, and primary clarifiers utilizing this method. A second method to eliminate odors in the influent pump station, headworks, and primary clarifiers is to cover the facilities, capture all of the gases, and scrub the odors. The rest of the potential odors from the anaerobic digesters and sludge dewatering facilities must be captured and scrubbed, since anaerobically digested sludge produces sulfides.

Advantages of the conventional activated sludge type process are:

It is a proven, reliable process, with thousands of plants in operation, providing a wealth of treatment experience.

The process can produce a very high quality effluent.

The physical treatment components of the plant do not require large areas of land.

When anaerobic digesters are used, they generate useable methane gas.

Disadvantages of the conventional activated sludge type process are:

Odor control can be difficult and expensive; when located near residential areas elaborate odor control systems are required.

If anaerobic sludge digesters are used, there is a potential for upset, generating sulfides.

The treatment process can be easily upset by rapid changes in flow quantity or strength; shock loadings of industrial wastes can upset the process.

Initial costs tend to be more expensive than most other processes.

Relatively high manpower levels are required for operation.

7.2.2 OXIDATION DITCH, ACTIVATED SLUDGE/EXTENDED AERATION PROCESS

The oxidation ditch, activated sludge/extended aeration process is capable of consistently producing a very high quality effluent. The method has a long history of reliability, and potential odors are easily controlled because all of the attendant treatment processes are aerobic (in the presence of oxygen).

The major components of a system that would treat wastewater to an advanced level, utilizing the oxidation ditch, activated sludge/extended aeration process, are as follows:

- *Influent Pump Station.* A facility to lift the inflow from the incoming trunk sewer(s) to a level where the treatment process can be carried out predominantly by gravity.

- *Headworks.* A bar screen system for removing rags, pieces of wood, and other non-degradable type materials. Includes a grit removal system.

- *Grit Removal System.* A facility within the headworks to remove sand, rocks and other types of inert, non-floating materials

- *Oxidation Ditches (Extended Aeration Basins):* An oxidation ditch is a large, concrete aeration basin (a channel shaped like a racetrack) that uses surface rotary brushes, turbines, or diffusors to aerate the wastewater, imparting dissolved oxygen and thus allowing bacteria to consume the organic matter. The aerators also propel the wastewater around the basin in a circular manner. This keeps the sludge or suspended solids from settling to the bottom of the channel. The organic matter, as measured by biochemical oxygen demand (BOD), is used by bacteria in the basin and converted to cellular matter called activated sludge, and to carbon dioxide. The extended aeration process is usually designed for a minimum detention time of 24 hours in the basin, thus providing sufficient time for the bacteria in the basin to consume the organic matter. Multiple basins are usually provided, the number and size based upon design plant capacity. The potential for objectionable odors being released from these types of basins is very low, because the process is entirely aerobic.

- *Secondary Clarifiers.* These are concrete or stainless steel basins which remove activated sludge from the oxidation ditch effluent. Wastewater leaving the oxidation ditch is sent to the secondary clarifier, where the velocity of flow is dramatically slowed to allow the suspended solids to fall to the bottom of the clarifier. The clear effluent is then allowed to pass over a weir and out of the secondary clarifier to the tertiary filters.

- *Aerobic Digesters.* Unlike anaerobic digesters (see Section 7.2.1), aerobic digesters keep the partially digested sludge from the oxidation ditch constantly aerated. Aerators are used to force dissolved oxygen into the sludge, allowing aerobic type bacteria to continue to consume and break down the organic matter even further. The digested sludge is then sent to the dewatering facility. Because the digestion process is aerobic, there is little or no potential for objectionable odors, except in the case of mechanical failure. Aerobically digested sludge generates carbon dioxide, rather than hydrogen sulfide and methane.

- *Sludge Dewatering.* Within a building, sludge is dewatered mechanically by centrifuges, belt presses, or other processes, to remove excess water, so that it can be sent to air drying beds, composting or landfill. The sludge will be approximately 2 to 7% solids before dewatering and 14 to 30% solids after dewatering. The supernatant from the dewatering is sent back to the plant process. The aerobically digested sludge generates little odor compared to anaerobically digested sludge.

- *Nutrient Removal System.* Ammonia in the influent is converted to nitrate by aeration in the aeration basins. A method referred to as oxygen reduction potential (ORP) utilizes a dissolved oxygen probe to automatically turn off the aerators allowing the dissolved oxygen in the aeration basin to drop to zero, temporarily converting the aeration basin to an anoxic basin. During the anoxic period, the nitrate is stripped of oxygen by bacteria to release nitrogen gas into the air. After a short period, the aerators are turned back on.

- *Tertiary Filtration System.* Secondary effluent from the secondary clarifiers is filtered through multi-media or sand filters to further remove suspended solids that were not removed by the secondary clarifiers. Coagulants such as alum and polymers are added to foster better flocculation and coagulation of the suspended solids, and to enhance the filtration process.

- *Disinfection.* Tertiary effluent is exposed to radiation by ultraviolet light or to high doses of chlorine to kill pathogenic organisms that were not removed by the tertiary filters.

- *Odor Control.* Activated sludge rich in oxygen from the aeration basins can be pumped to the influent pump station or headworks. Because the waste activated sludge acts on the sulfides, up to 90% of sulfide odors can be eliminated in the influent pump station, headworks, and primary clarifiers, utilizing this method. A second method to eliminate odors in the influent pump station and headworks is to cover the facilities, capture all of the gases, and scrub the odors. Upstream chlorination, treatment with oxygen containing chemicals, or other sulfide controls may also help.

Advantages of the oxidation ditch, activated sludge/extended aeration type process are:

The process has a long history of proven reliability and use.

The process can produce a very high quality effluent.

Aerobic processes have low potential for objectionable odors and relatively low sludge quantity.

Aerobically digested sludge is better suited for composting than anaerobically digested sludge.

The process requires relatively less mechanical equipment and maintenance than most other processes.

The process is easily operated and controlled, and manpower requirements are low.

The process is well suited to handle shock loadings and is difficult to upset.

Initial costs tend to be somewhat lower than conventional treatment.

Disadvantages of the oxidation ditch, activated sludge/extended aeration type process are:

Aerobic treatment results in somewhat higher energy costs than anaerobic processes.

The oxidation ditches (aeration basins) are generally too large to effectively cover and scrub as an odor control measure (but since the process is aerobic, objectionable odors are not a byproduct of a properly operating plant).

Land area requirements can be large for the larger size plants.

7.2.3 SEQUENCING BATCH REACTORS AND EXTENDED AERATION

There are many proprietary variations of activated sludge technology. One process becoming popular is the Sequencing Batch Reactor (SBR). This process is another type of extended aeration.

The major components of the SBR system that would treat wastewater to an advanced level, are as follows:

- *Influent Pump Station.* A facility to lift the inflow from the incoming trunk sewer(s) to a level where the treatment process can be carried out predominantly by gravity.

- *Headworks.* A bar screen system for removing rags, pieces of wood, and other non-degradable type materials. Includes a grit removal system.

- *Grit Removal System.* A facility within the headworks to remove sand, rocks and other types of inert, non-floating materials

- *Aeration Basins.* The SBR process utilizes dual concrete tanks that are covered. The first tank fills with wastewater and mixes for a period of time, then new flows are sent to the second SBR tank. The first SBR tank mixes and aerates for a set period of time; then is allowed to settle and decant. The clear effluent (1/3 of tank) is then drawn off and sent to the tertiary filters. Also, some of the settled sludge is removed. The process then starts over with the tank filling with new wastewater (two thirds of the tank is occupied by the remaining sludge and mixed liquor form the previous batch or cycle). The two SBR units switch back and forth alternating filling and treating in batches. By adding a mixing only stage after the mixing and aeration stage is completed, the basin becomes an anoxic basin and will remove nutrients.

- *Secondary Clarifiers.* This process does not use clarifiers.

- *Aerobic Digesters.* Unlike anaerobic digesters (see Section 7.2.1), aerobic digesters keep the partially digested sludge constantly aerated. Aerators are used to force dissolved oxygen into the sludge, allowing aerobic bacteria to continue to consume and break down the organic matter even further. The digested sludge is then sent to the dewatering facility. Because the digestion process is aerobic, there is little or no potential for objectionable odors, except in the case of mechanical failure. The process generates carbon dioxide, rather than hydrogen sulfide and methane.

- *Sludge Dewatering.* Within a building, sludge is dewatered mechanically by centrifuges, belt presses, or other processes, to remove excess water, so that it can be sent to air drying beds, composting or landfill. The sludge will be approximately 2 to 7% solids before dewatering and 14 to 30% solids after dewatering. The supernatant from the dewatering is sent back to the plant process. The aerobically digested sludge generates little odor compared to anaerobically digested sludge.

- *Nutrient Removal System.* Nutrient removal is accomplished by adding a mixing stage after the aeration stage in the batch reactors. The mixing stage becomes an anoxic stage which allows the bacteria to denitrify the nitrified wastewater.

- *Tertiary Filtration System.* Secondary effluent from the secondary clarifiers is filtered through multi-media or sand filters to further remove suspended solids that were not removed by the secondary clarifiers. Coagulants such as alum and polymers are added to foster better flocculation and coagulation of the suspended solids, and to enhance the filtration process.

- *Disinfection.* Tertiary effluent is exposed to radiation by ultraviolet light or to high doses of chlorine to kill pathogenic organisms that were not removed by the tertiary filters.

- *Odor Control.* The influent pump station, headworks and grit removal system would have the same odor control system as described in 7.2.2. SBR tanks are totally enclosed.

Advantages of the sequencing batch reactor, extended aeration type process are:

Process can produce high quality effluent and effectively remove nutrients.

Odor control is easily attainable.

Disadvantages of the sequencing batch reactor, extended aeration type process are:

Process requires 24-hour per day supervision for most treatment plants over 2 MGD.

Process has higher capital costs than other comparable processes.

Process has higher operation and maintenance costs than other available processes.

7.2.4 NATURAL TREATMENT SYSTEMS, AERATED LAGOONS AND AQUATIC PLANTS

The major components of a system that would treat wastewater to an advanced level, utilizing such technology, are as follows:

- *Influent Pump Station.* A facility to lift the inflow from the incoming trunk sewer(s) to a level where the treatment process can be carried out predominantly by gravity.

- *Headworks.* A bar screen system for removing rags, pieces of wood, and other non-degradable type materials. Includes a grit removal system.

- *Grit Removal System.* A facility within the headworks to remove sand, rocks and other types of inert, non-floating materials.

- *Primary Clarifiers.* Optional concrete basins for removing 40 to 60% of suspended solids by gravity.

- *Aeration Basins.* Large lagoons, which may include a serpentine design, and floating aerators to mix and aerate the wastewater. This allows the bacteria to utilize the organic matter as a food source and keeps the suspended solids in suspension. This extended aeration process is usually designed for a minimum 24-hour detention time and often much more. These lagoons are normally four to six feet deep.

- *Polishing Basins.* Large lagoons with or without aquatic plants that utilize most of the remaining organic matter, suspended solids and nutrients. The polishing basins are normally designed to have at least a 20-day detention period for the wastewater.

- *Digesters.* Needed only if primary clarification is used. Optional anaerobic or aerobic process as described in 7.2.1 or 7.2.2.

- *Sludge Dewatering.* Needed only if primary clarification is utilized. See 7.2.1 and 7.2.2 for description.

- *Nutrient Removal System.* Aquatic plants utilize nutrients as part of their food source.

- *Tertiary Filtration System.* Secondary effluent from polishing ponds may be filtered through multi-media or sand filters to further remove suspended solids that were not removed by the secondary clarifiers. Coagulants such as alum and polymers are added to foster better flocculation and coagulation of the suspended solids, and to enhance the filtration process. Secondary effluent from aquatic type polishing ponds is not normally filtered because of algae from the ponds that clog the filters.

- *Disinfection.* Tertiary effluent is exposed to radiation by ultraviolet light or high doses of chlorine to kill pathogenic organisms that were not removed by the tertiary filters.

- *Odor Control.* To eliminate odors in the influent pump station and headworks, the facilities may be covered to capture all of the gases and scrub the odors.

Advantages of natural treatment systems are as follows:

Process can produce very high quality effluent.

Process has lower capital costs than other comparable processes.

Processes are well suited to shock loadings.

Lagoons act as equalization basins.

Disadvantages of natural treatment systems are as follows:

Large land requirements, three to four times the land requirements of conventional processes.

Labor intensive during growing season to harvest aquatic plants.

Large amounts of plant material to dispose of.

Digested sludge will gradually fill polishing lagoon and will have to be cleaned out after period of time (10 to 15 years).

Tertiary filtration is more complicated than other types of treatment and may be impractical from a cost and maintenance stand point.

7.2.5 TRICKLING FILTERS AND ROTATING BIOLOGICAL CONTACTORS WITH ANAEROBIC SLUDGE DIGESTION

Trickling filters and rotating biological contactor (RBC) treatment systems, with anaerobic sludge digestion, also involve proven and reliable technology.

The major components of these systems are as follows:

- *Influent Pump Station.* Facility to lift the inflow from the incoming trunk sewer(s) to a level where the treatment process can be carried out predominantly by gravity.
- *Headworks.* Bar screen system for removing rags, pieces of wood, and other non-degradable type materials. Includes a grit removal system.
- *Grit Removal System.* A facility within the headworks to remove sand, rocks and other types of inert, non-floating materials.
- *Primary Clarifiers.* Concrete sedimentation basins for removing 40% to 60% of suspended solids and biochemical oxygen demand (BOD) by gravity. This is optional for the RBC process.
- *Biological Contactors.* Large concrete basins that include either:

  a) Trickling Filters - Media (crushed rock or preformed porous plastic) fills basin and wastewater flows downward at a low rate through the media at a loading rate of up to 1.5 gpd/sq.ft. Zoological mass growing on the media utilizes organic material as a food source. Two filters in series are needed to achieve 90% removal, and three trickling filters in series are necessary to remove 95%+ of the BOD. Air can be forced up through the media to increase the loading rate.

  b) Rotating Biological Contactors or Submerged Biological Contactors (RBC/SBC) - Media rotates on horizontal shaft with part of media submerged in wastewater and part of media exposed to air (to obtain oxygen). Zoological mass growing on the media utilizes BOD as a food source. Wastewater flows through a series of rotating contactors. Units normally have covers. Diffused air is injected up from bottom of basins to aid in the aeration process.

- *Secondary Clarifiers.* Large concrete basins in which sludge suspended solids from trickling filter or RBC/SBC is settled out by gravity producing relatively clear effluent that flows over a weir and out of the secondary clarifier.

- *Anaerobic Digesters.* Sealed tanks to which waste primary and activated sludge suspended solids removed by the primary and secondary is sent. The solids are digested anaerobically (without oxygen) by anaerobic bacteria and transformed into a stabilized sludge that will meet the Federal 503 regulations. There is a reduction of approximately 50% in the total weight of solids accomplished by the bacteria in both the aeration basins and the digesters. Anaerobic digesters generate methane, carbon dioxide and hydrogen sulfide. These gases must be scrubbed, and either utilized in sludge heaters, or burned. The combustible gas is most often used to heat the anaerobic digesters, but there may be more gas generated than can be utilized for heating in which case the balance is burned of in a flare. The sulfide gas and other products are potential sources of objectionable odor, and must be controlled. The sludge that is generated from the digesters is also a potential source of objectionable odors, which must be controlled. If there are no primary clarifiers, sludge digestion may be by aerobic digestion (see 7.2.2).

- *Sludge Dewatering.* Within a building, sludge is dewatered mechanically by centrifuges, belt presses, or other processes, to remove excess water, so that it can be sent to air drying beds, composting or landfill. The sludge will be approximately 2 to 7% solids before dewatering and 14 to 30% solids after dewatering. The supernatant from the dewatering is sent back to the plant process. Since the sludge often has a high odor potential, an air scrubbing system must be installed on the sludge building to control the sludge odors.

- *Nutrient Removal System.* Trickling filters do not readily remove nutrients without additional elaborate systems. Achieving less than 10 mg/l total nitrogen as N requires a carbonaceous reduction process, a nitrification process and then with the addition of methanol, a denitrification process. The RBC process removes nutrients with the SBC process by completely submerging the rotating media and providing no aeration, thus creating an anoxic process. These units follow the normal RBC or SBC aerated units.

- *Tertiary Filtration System.* Effluent from the nutrient removal process is filtered through multi-media or sand filters to further remove suspended solids that were not removed by the secondary clarifiers. Coagulants such as alum and polymers are added to foster better flocculation and coagulation of the suspended solids, and to enhance the filtration process.

- *Disinfection.* Tertiary effluent is exposed to radiation by ultraviolet light or to high doses of chlorine to kill pathogenic organisms that were not removed by the tertiary filters.

- *Odor Control.* Headworks and primary clarifiers must be covered and the air scrubbed. The trickling filters can be readily covered. RBC's and SBC's are normally covered. The gases from the anaerobic digesters and sludge dewatering processes must be captured and scrubbed. Aerobic digesters may be substituted for anaerobic digesters, usually for treatment plants of less than 5 mgd.

Advantages of the trickling filter/rotating biological contactor process are as follows:

- They are proven, reliable processes, with many in operation, providing a wealth of treatment experience.
- They can provide high quality effluent.
- Physical treatment components do not require large areas of land.

Disadvantages of the trickling filter/rotating biological contactor process are as follows:

- Nutrient removal can be expensive and complex, adding substantial cost.

7.3 RECLAMATION/REUSE OF TREATED WASTEWATER

Disposition of the treated wastewater is fundamental to any plan for potential satellite facilities. Opportunities exist for reuse of the treated water, subject to permitting processes, institutional agreements, community acceptance and facility construction. Feasibility of reclamation/reuse is subject to a number of limiting factors, however. These factors include potential customers for the reclaimed water, and availability of reliable disposal sites for the reclaimed water when there is little or no customer demand in the winter and rainy seasons.

Since options for reuse in the Clovis area primarily involve irrigation uses, the quality of the treated water as it relates to agricultural irrigation is also of vital importance.

7.3.1 QUALITY OF RECLAIMED WATER

An analysis was performed to determine the probable quality of the reclaimed water for use as irrigation water for agriculture in the Fresno/Clovis area. Inasmuch as the quality of the reclaimed water is a function of both the treatment process and the source water, the analysis was based on a sample of the raw wastewater from the Fowler Avenue Trunk Sewer in Clovis. Table 7-1 indicates the data from tests of the raw wastewater.

The raw wastewater in a Clovis satellite treatment facility would undergo primary, secondary, and tertiary treatment, together with full disinfection. The inorganic constituents would change very little, while the BOD and TSS would be less than 10 mg/l after treatment, the NTU's less than 2 after treatment, and the coliform count less than 2.2 MPN per 100 ml after disinfection. All requirements for Title 22, Division 4, of the California Code of Regulations, would be met for unlimited (non-domestic) use of the reclaimed water.

The United States Department of Agriculture Handbook No. 60, "Diagnosis and Improvement of Saline and Alkali Soils", Chapter 5, titled "Quality of Irrigation Water", states that the characteristics of irrigation water that appear to be most important in determining its quality are:

(1) Total concentration of soluble salts
(2) Relative proportion of sodium to other cations
(3) Concentration of boron or other elements that may be toxic
(4) Under some conditions, the bicarbonate concentrations as related to the concentration of calcium plus magnesium

TABLE 7-1			
RAW WASTEWATER QUALITY, FOWLER TRUNK SEWER MARCH 20, 1996			
Analyzed Item	Other Value	Milligrams per Liter (mg/l)	Milliequivalent per Liter (meq/l)
pH	7.6 sampled		
EC in umhos/cm @ 25°C	855 sampled		
Total Filterable Residue		444	
Bicarbonate (HCO_3)		364	5.96
Carbonate (zero when < 8.3 pH)		0	0.00
Sodium (Na)		87	3.78
Calcium (Ca)		35.5	1.78
Magnesium (Mg)		19	1.56
Potassium (K)		12.6	0.32
Sulfate (SO_4)		24.4	0.51
Chloride (Cl)		64	1.81
Boron (B)		0.38	0.18
BOD (biochemical oxygen demand)		224	
TSS (total suspended solids)		265	
Calculated Item	Other Value		
Sodium Adsorption Ratio (SAR)	2.92		
Potential Salinity	2.10		
Residual Sodium Carbonate	2.62		

The following analysis relative to these characteristics in reclaimed Clovis wastewater contains input and comment from Mr. Don Munk, University of California, Cooperative Extension, County of Fresno.

(1) *Salinity Effects*

The total concentration of soluble salts (referred to as the Salinity Hazard) in irrigation water can be adequately expressed for purposes of diagnosis and classification in terms of electrical conductivity (EC). Waters are dividing into four classes with respect to conductivity. The dividing points, as measured in micromhos/cm, between classes are as follows: S1 is less that 250, S2 is between 250 and 750, S3 is between 750 and 2,250, and S4 is greater than 2,250 micromhos/cm. The sample from the Fowler Trunk Sewer had an EC of 855 micromhos per centimeter, which would be classified as medium to high salinity hazard (S3). Handbook No. 60 recommends that high salinity water (S3) should not be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

A second classification for salinity is "potential salinity" which is defined as the chloride concentration, plus half of the sulfate concentration measured in meq/l. The Fowler Trunk Sewer sample had a "potential salinity" of 2.1 meq/l which is classified as Class 1 Irrigation water (<3 meq/l), and is safe for all soils as far as the "potential salinity" is concerned.

(2) *Sodium Effects*

The classification of waters with respect to the relative proportion of sodium to other cations (Ca and Mg), is more complicated than the salinity hazard. The problem is generally approached from the probable extent to which soil will adsorb sodium from the water and the rate at which adsorption will occur as the water is applied. The soluble inorganic constituents of irrigation waters react with soils as ions rather than as molecules. The alkali hazard involved in the use of a water for irrigation is determined by the absolute and relative concentrations of the cations (Na, Ca, Mg, K). If the proportion of sodium is high, the alkali hazard is high; and, conversely, if calcium and magnesium predominate, the hazard is low. Alkali soils are formed by accumulation of exchangeable sodium and are often characterized by poor tilth and low permeability.

The Sodium Adsorption Ratio (SAR) is used to determine the classification of water for the sodium hazard and is based primarily on the effect of exchangeable sodium on the physical condition of the soil. Sodium sensitive plants may, however, suffer injury as a result of sodium accumulation in plant tissues when exchangeable sodium values are lower than those effective in causing deterioration of the physical condition of the soil.

The Fowler Trunk Sewer raw water sample has a SAR of 2.92, which is very low and corresponds to a classification of S1. Low sodium hazard water (S1) can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium. However, sodium sensitive crops such as stone fruit and citrus could accumulate injurious concentrations of sodium. The soluble percentage of sodium for the Fowler Trunk Sewer sample was less than 60% (53%), and therefore is not considered a problem for irrigation.

(3) *Chloride and Sulfate Effects*

The chlorides for the Fowler Interceptor sample were less than 2.0 meq/l (1.8 meq/l), the sulfates were less than 4.0 meq/l (0.5 meq/l) which levels are all considered to be necessary for Class 1 irrigation water. Although stone fruit, citrus and vine crops are sensitive to chlorides, the sample taken is considered safe for irrigation of these types of crops when considering potential chloride toxicity effects.

(4) *Boron Effects*

Boron is essential to the normal growth of all plants, but the quantity required is very small. Boron is very toxic to certain plant species and the concentration that will injure these sensitive plants is often approximately that required for normal growth of very tolerant plants. The concentration of boron in the sample shown in the above table (0.38 mg/l) is classified as low and is not anticipated to cause any effects on irrigation.

(5) *Bicarbonate Effects*

In waters containing high concentrations of bicarbonate ion, there is a tendency for calcium and magnesium to precipitate as carbonates as the soil solution becomes more concentrated. This reaction does not go to completion under ordinary circumstances, but insofar as it does proceed, the concentrations of calcium and magnesium are reduced and the relative proportion of sodium is increased. The Residual Sodium Carbonate (RSC) is utilized to measure the effects of bicarbonates on the quality of irrigation waters. The sample taken from the Fowler Trunk Sewer had a RSC of 2.62, which is classified as not suitable for irrigation purposes. Less than 2.5 for the RSC is considered marginal, and less than 1.25 is considered safe.

The soils in the areas that have potential satellite treatment plants for the City of Clovis are sandy to clayey loams, classified by the "US Dept. of Agriculture, Soil Conservation Service, Soil Survey for Eastern Fresno" as Atwater, Exeter, Ramona, and San Joaquin loams. These soils have poor vertical drainage with layers of hard pan, and therefore the use of undiluted reclaimed water is not recommended for use on these soils. A common crop in the Clovis area is stone fruits, which are sensitive to sodium and definitely not suitable for irrigation with undiluted reclaimed water in these soils.

The Fresno Irrigation District utilizes water from the King's River as its principal irrigation water supply source. An inorganic chemical analysis of King's River water indicates the following average constituents: pH=6.9, Ca=4.8 mg/l, Mg=0.7 mg/l, Na=2.0 mg/l, K=1.1 mg/l, SO_4=2.4 mg/l, Cl=1.1 mg/l, HCO_3=1.8 mg/l, TDS=4.4 mg/l, NO_3 =0.6 mg/l, and B=0.0 mg/l. Diluting the reclaimed water with 50% of Fresno Irrigation District's King's River water would lower the electrical conductivity (EC) to 470 microhohms/cm, sodium adsorption ratio (SAR) to 2.03 meq/l, and the residual sodium carbonate (RSC) to 1.18 meq/l. These would all be acceptable values for agricultural irrigation, with the possible exception of avocado and stone fruit crops, which may require higher dilution ratios.

It can be concluded, therefore, that water reclaimed from treated Clovis wastewater can be safely used for agricultural irrigation, if the reclaimed water is mixed at an appropriate dilution rate with Fresno Irrigation District's canal water originating from the King's River. A dilution rate of 50% would normally be adequate, except for application to avocados and stone fruit crops.

Opportunities may exist for dilution of reclaimed water with water from other sources, as well. Each source, as compared to the intended agricultural use, would need to be reviewed to determine appropriate dilution factors. The University of California, Cooperative Extension, Fresno County Office, is available for such consultation.

Potential agricultural irrigation uses may only be limited, then, in those cases where a lack of opportunity for dilution of the reclaimed water is available, particularly for certain sensitive crops. Turfgrass and ornamental plantings (such as in parks, golf courses, school grounds and other landscaped areas) could be safely irrigated with undiluted reclaimed water.

Other uses for the treated water, such as for groundwater recharge, recreation, wetlands, and industrial processes, may also be practicable.

Following is a discussion of potentially feasible reuse alternatives available.

7.3.2 POTENTIAL DELIVERY OF RECLAIMED WATER TO FRESNO IRRIGATION DISTRICT (FID) AND ASSOCIATED FACILITIES

Clovis' geographic location in relation to Fresno Irrigation District's service area (Figure 7-1) and conveyance (and supply) system of canals, pipelines and natural watercourses (Plate 7A) makes delivery of reclaimed water to the FID an obvious water reuse option to be explored. Delivery to the canal system would also provide for dilution of the reclaimed water necessary for agricultural use.

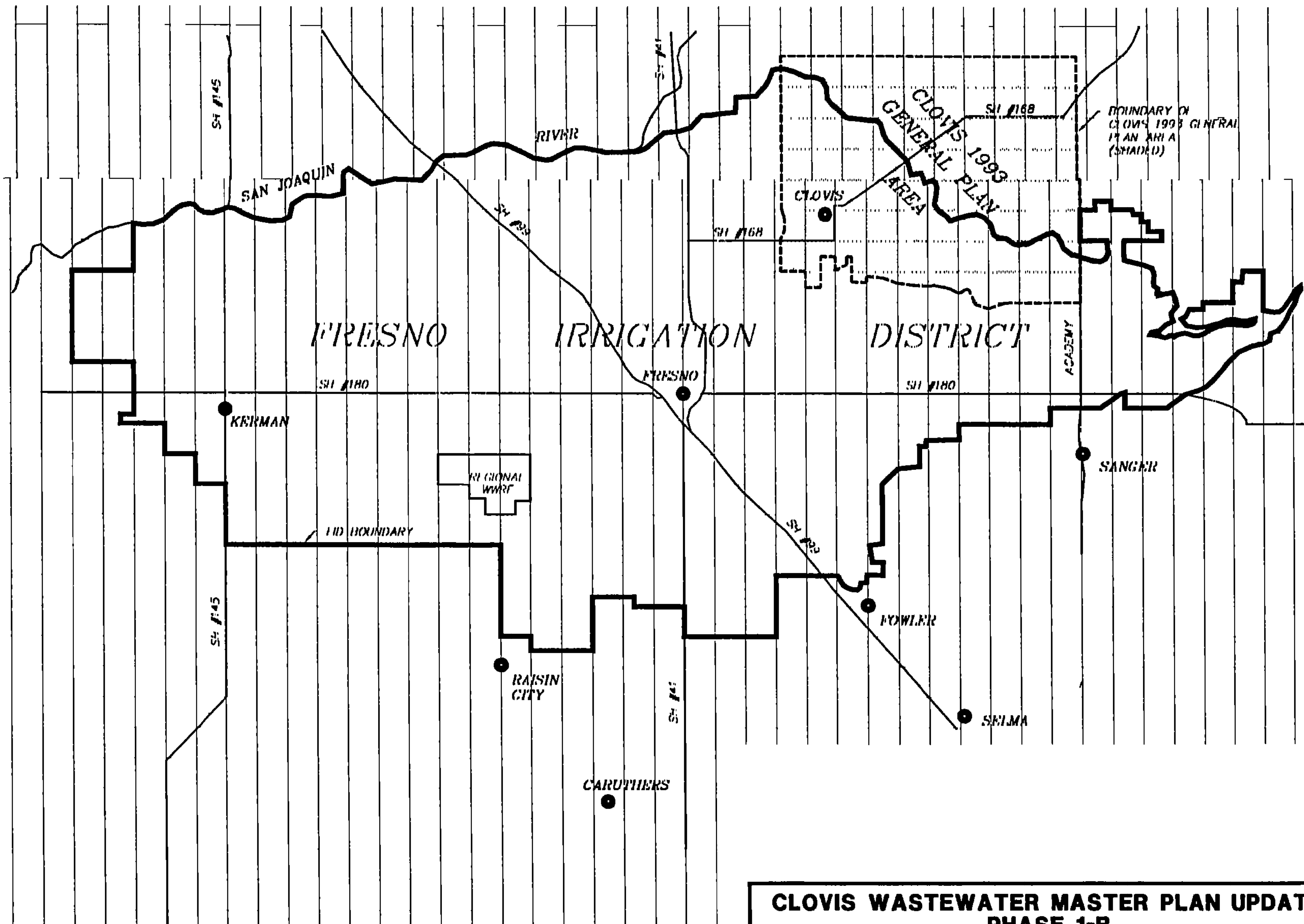
The FID, through its staff, has informally expressed an interest in the concept of accepting tertiary treated, fully disinfected reclaimed water into its system, where the conveyance system involved does not supply water for domestic use. The FID might exchange reclaimed water for canal water to be utilized by Clovis for a domestic water filtration plant, but FID is not indicating an interest at this time in purchasing reclaimed water.

Additionally, staff of the Fresno Metropolitan Flood Control District (FMFCD), as well as FID's staff, have indicated that natural watercourses interconnected with the FID canal system, such as Big Dry Creek, Redbank Creek and Dog Creek, could conceptually accept tertiary treated, fully disinfected, reclaimed water from Clovis, under certain conditions. These conditions would include such elements as provisions for storage of reclaimed water for a minimum of two days during peak storm events, capacity enhancements which may be required in Dog Creek, other environmental considerations, and approval of the governing boards of those agencies having jurisdiction over the particular facility.

Canals master planned for potential future sites of domestic water filtration plants, including the Enterprise Canal and the Gould Canal, are not considered suitable for receiving reclaimed water upstream of the proposed filtration plants. Additionally, there are California Department of Health Services requirements for a physical barrier between any downstream discharge point and any filtration plant, so as to not allow any possibility of reclaimed water flowing back to a filtration plant. Because Clovis' water master plan recommends a potential Clovis water treatment plant utilizing water from the Enterprise Canal, and because a proposed Fresno water filtration plant is to be supplied by the Enterprise Canal Westerly (downstream) of Clovis near Chestnut and Behymer Avenues, the Enterprise Canal was eliminated from consideration as a destination for Clovis' potential reclaimed water.

A future Clovis water filtration plant could also be located on the Gould Canal in Clovis, which would eliminate it from consideration for discharge of reclaimed water upstream of the site. Certain additional restrictions undoubtedly also apply for the Gould Canal downstream of a proposed filtration plant in Clovis and upstream of the City of Fresno's Leaky Acres groundwater recharge facility at Winery and Ashlan Avenues, inasmuch as Fresno's Leaky Acres is a dedicated groundwater recharge facility whose major source of water is the Gould Canal. For these reasons, the Gould Canal was also not considered to have the potential for accepting reclaimed water.

The draft regulations that govern groundwater recharge with reclaimed water, as will be set forth in Title 22, California Code of Regulations, may be generally summarized as follows; (a) No more than 20% of total recharge to be reclaimed water; (b) domestic wells are not to be located within 1,000 feet of the recharge point, and; (c) recharged water must have a minimum of 6-months of retention in the ground before it is pumped out by a domestic well. These regulations presumably do not apply to facilities used incidentally for, but not dedicated primarily to, groundwater recharge.



MAP OF BOUNDARIES OF FRESNO IRRIGATION DISTRICT

CLOVIS WASTEWATER MASTER PLAN UPDATE
PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS -- FRESNO, CALIFORNIA

In Conjunction With:

NDS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

SCALE IN MILES

SCALE 1" = 1 MILE

B.C.F. FILE NO. 9 3617 PH 1 B
COMPUTER FILE NO. 3617/FID1.DWG

OCTOBER 11, 1996 | **Page 7-16** | **FIGURE 7-1**

Several other canals exist within reasonable distances of the potential Clovis Satellite WWRF's that are not planned for water filtration plants, nor do they ultimately flow into such canals. These include the Mill Ditch (or alternatively Fancher Creek), the Helm-Colonial Ditch and the Maupin Ditch, all of which are perceived by Fresno Irrigation District staff as conditionally potential discharge points for reclaimed Clovis water. These canals carry water predominantly for agricultural irrigation purposes.

Additionally, Big Dry Creek, Redbank Creek and Dog Creek, all natural watercourses, interconnect with the FID canal system. Big Dry Creek discharges to the Herndon canal, while Dog Creek and Redbank Creek discharge to the Mill Ditch. Structural facilities exist for discharging water from irrigation canals into Big Dry Creek and Redbank Creek. As such, the natural watercourses and FID canal system form a unique interconnected system of conveyance for multiple purposes.

Discharge of reclaimed water to virtually any canal (or associated conveyance) system could conceivably be considered as contributing to groundwater recharge, inasmuch as some of the water flowing in the canals (and certainly a portion of the water delivered by the canal system to agriculture), will seep down into the underground. The defining difference, which should separate this use from the proposed groundwater recharge regulations, is the purpose of the facility into which the discharge of reclaimed water is made. Any recharge resulting from flow in a canal delivering agricultural irrigation water, or any recharge resulting from the actual application of irrigation water delivered by the canal to agricultural crops, is *incidental* to its primary purpose, which is agricultural irrigation. Reclaimed wastewater added to, and diluted by, canal irrigation water, does not change this primary purpose. In the absence of this distinction, it would be virtually impossible to utilize reclaimed wastewater for irrigation purposes in a vast, interconnected system of canals and other watercourses, such as the Fresno Irrigation District's system.

Despite this distinction, there could be a challenge from several sources to Clovis' discharge of reclaimed water into the Mill Ditch (or for that matter, any canal or other watercourse located upstream of the City of Fresno or its underground water supply influence area), made on the basis of the groundwater recharge regulations. These would probably be centered on arguments relating to the existence of domestic wells located proximate to downstream canals, or drainage basins intermittently used for groundwater recharge receiving water from the downstream canals. Because the purpose of all of the canals involved in Clovis' potential reclamation plans is predominantly to convey and supply irrigation water for agriculture, it should be possible to strongly defend their use for the water reclamation effort.

7.3.2.1 *POTENTIAL NORTHWEST CLOVIS SATELLITE WWRF*

The potential Northwest Clovis Satellite WWRF is in the general vicinity of the Fresno Irrigation District's Helm-Colonial Canal, and alternately (but considerably further distant), the FID's Maupin Ditch (see Plate 7A). Big Dry Creek is also near the potential Northwest Clovis Satellite WWRF.

FID staff has indicated that the concept of accepting reclaimed water into the Helm-Colonial Canal, South of the Enterprise Canal, may be workable, subject to several conditions. Staff of FMFCD and FID have also indicated that the concept of accepting reclaimed water into Big Dry Creek, South of the Enterprise Canal, may be also be workable, subject to a similar set of conditions. FID's long term concern with respect to the Helm-Colonial Canal (which would be true for the more distant Maupin Ditch, as well) is that over time, urbanization will eliminate the need for the canal for agricultural uses.

Conditions (beyond institutional) for utilization of these facilities for reclaimed water would include the construction of discharge facilities which would allow control of the flow of reclaimed water to either the Helm-Colonial Canal, Big Dry Creek, or an on-site storage facility which would provide capacity for at least two-day's outflow of treated water from the WWRF. Use of the on-site storage facility would be required during peak storm flow in the canals or watercourses.

Approximate capacities of the facilities are as follows:

15 CFS	Helm-Colonial Canal System
150 CFS	Big Dry Creek
3.2 CFS	NW Clovis Satellite WWRF per Alternate 3 and 4
6.9 CFS	NW Clovis Satellite WWRF per Alternate 6

In addition to control structures and on-site storage facilities, a transmission pipeline would be required to convey the treated water to the aforementioned points of discharge. The transmission line would be 18-inches in diameter for Alternatives 3 and 4, and 20-inches in diameter for Alternative 6.

7.3.2.2 *POTENTIAL SOUTHEAST CLOVIS SATELLITE WWRF*

The potential Southeast Clovis Satellite WWRF is within two miles of the Fresno Irrigation District's Mill Ditch (see Plate 7A). Redbank Creek and Dog Creek are proximate to the potential Southeast Clovis Satellite WWRF, while Fancher Creek is about one-half mile Southerly of Mill Ditch at Leonard Avenue.

FID staff has indicated that, conceptually, reclaimed water may be conditionally accepted into the Mill Ditch. Staff of FMFCD and FID have also indicated that the concept of accepting reclaimed water into Redbank Creek, Dog Creek, and Fancher Creek (which is part of the irrigation water delivery system), would probably also be workable, subject to several conditions.

Conditions (beyond institutional) for utilization of these facilities for reclaimed water would include the construction of discharge facilities which would allow control of the flow of reclaimed water to either the Mill Ditch, Fancher Creek, Redbank Creek, Dog Creek (which flows into Redbank Creek and then into the Mill Ditch), or an on-site storage facility which would provide capacity for at least two-day's outflow of treated water from the WWRF. Use of the on-site storage facility would be required during peak storm flow in the canals or watercourses. Certain physical improvements may also be required in Dog Creek, if used, to accommodate the ultimate discharge rate from the Satellite WWRF.

Approximate capacities of the facilities are as follows:

900 CFS	Mill Ditch
50 CFS	Fancher Creek (carries 21 CFS irrigation flow)
<5 CFS	Dog Creek South of Gould Canal
300 CFS	Redbank Creek
3.7 CFS	SE Clovis Satellite WWRF per Alternate 3
9.6 CFS	SE Clovis Satellite WWRF per Alternate 4
12.9 CFS	SE Clovis Satellite WWRF per Alternate 5
26.5 CFS	SE Clovis Satellite WWRF per Alternate 6

In addition to control structures and on-site storage facilities, transmission pipelines would be required to convey the treated water to the points of discharge at the Mill Ditch, Fancher Creek (an extension of the line to Mill Ditch), and to Redbank Creek (or alternately, an improved Dog Creek). The transmission lines would be 18-inches in diameter for Alternative 3, 24-inches for Alternatives 4 and 5, and 36-inches in diameter for Alternative 6.

7.3.2.3 *POTENTIAL NORTHEAST CLOVIS SATELLITE WWRF*

The potential Northeast Clovis Satellite WWRF is about six-miles distant from the Fresno Irrigation District's Mill Ditch (see Plate 7A). Dog Creek is proximate to the potential Northeast Clovis Satellite WWRF, while Fancher Creek is about one-half mile Southerly of Mill Ditch at Leonard Avenue.

FID staff has indicated that, conceptually, reclaimed water may be conditionally accepted into the Mill Ditch. Staff of FMFCD and FID have also indicated that the concept of accepting reclaimed water into Redbank Creek, Dog Creek, and Fancher Creek (which is part of the irrigation water delivery system), would probably also be workable, subject to several conditions.

Conditions (beyond institutional) for utilization of these facilities for reclaimed water would include the construction of discharge facilities which would allow control of the flow of reclaimed water to either the Mill Ditch, Fancher Creek, Dog Creek, Redbank Creek, or an on-site storage facility which would provide capacity for at least two-day's outflow of treated water from the WWRF. Use of the on-site storage facility would be required during peak storm flow in the canals or watercourses. Certain physical improvements may also be required in Dog Creek to accommodate the ultimate discharge rate from the Satellite WWRF.

Approximate capacities of the facilities are as follows:

900 CFS	Mill Ditch
50 CFS	Fancher Creek (carries 21 CFS irrigation flow)
<5 CFS	Dog Creek
300 CFS	Redbank Creek
5.9 CFS	NE Clovis Satellite WWRF per Alternate 3

In addition to control structures and on-site storage facilities, transmission pipelines would be required to convey the treated water to the points of discharge at the Mill Ditch, Fancher Creek (an extension of the line to Mill Ditch), Redbank Creek and to Dog Creek. The transmission lines would be 20-inches in diameter.

7.3.3 POTENTIAL DELIVERY OF RECLAIMED WATER DIRECTLY TO USERS WITHIN THE STUDY AREA

Reclaimed water of the quality proposed from any potential Clovis Satellite WWRF can be used for irrigation of parks, schools, golf courses, cemeteries, median islands and other landscaped areas, such as along beltways, major street planting strips, etc. Reclaimed water can also be used, of course, directly by agriculture for irrigation of crops, subject to the availability of other water to satisfy dilution considerations which may exist in the study area (see Section 7.3.1). Additionally, reclaimed water can be utilized by suitable industries, for such uses as cooling water and non-food process water.

In the local area, the total irrigation requirement for landscaped areas, taking into consideration normal rainfall, plant evapotranspiration, and irrigation efficiency, is about 61-inches per year. Less than 1.5-inches of this total, or about 2%, is required during the months of November, December, January and February (zero demand in December and January). Table 7-2, which forms a part of the Regional Wastewater Master Plan Update Study, presents this information on a month-by-month basis in detail.

Relating these landscape irrigation demands to Clovis Satellite WWRF capacities on an annual basis, results in the following relationship, assuming 100% irrigation with reclaimed water:

1.0 MGD of reclaimed wastewater = Landscape irrigation demand for 220± acres of landscaped area

In practice, some sites may utilize less than 100% reclaimed water, depending on irrigation practices, landscape type, and other factors.

During the eight months of greatest irrigation demand, however, the relationship of landscape irrigation demand to Clovis Satellite WWRF capacity, assuming 100% irrigation with reclaimed water, is the following:

1.0 MGD of reclaimed wastewater = Landscape irrigation demand for 150± acres of landscaped area

This relationship would require, of course, other uses for the reclaimed water (which will be produced at a relatively constant rate from month-to-month over a year's time) during the four month's of little or no demand for landscape irrigation. This relationship does, however, indicate the practicality of use of reclaimed water for landscape irrigation, particularly for the smaller capacity satellite WWRF(s) proposed under Alternatives 3 and 4.

TABLE 7-2				
LANDSCAPE IRRIGATION REQUIREMENTS IN LOCAL AREA				
Month	Effective Rainfall(1) (Inches)	Landscape Evapo-transpiration (Inches)	Net Irrigation Requirement (2) (Inches)	Total Irrigation Requirement(3) (Inches)
January	0.86	0.86	0.00	0.00
February	1.13	1.62	0.49	0.70
March	1.29	3.14	1.85	2.66
April	0.74	4.56	3.82	5.49
May	0.21	6.37	6.16	8.86
June	0.00	7.41	7.41	10.65
July	0.00	7.98	7.98	11.47
August	0.00	6.75	6.75	9.70
September	0.14	4.94	4.80	6.90
October	0.36	3.04	2.68	3.85
November	0.87	1.33	0.46	0.66
December	0.57	0.57	0.00	0.00
Total	**6.17**	**48.57**	**42.40**	**60.94**

(1) Based on the Blainey-Criddle Method.
(2) Net Irrigation = Evapotranspiration (ET) - Effective Rainfall
(3) Total = (Net x 1.15)/0.8, where 1.15 = 15% Leaching Requirement, 0.8 = Irrigation Efficiency Factor.

Agricultural irrigation water demand per acre varies with the type of crop, from a high of alfalfa hay (with about the same demand as landscape areas), to a much lower demand, about a third of that of alfalfa hay, for truck crops.

Potential industrial uses for reclaimed water include cooling water, process water and irrigation water. The specific types of industry that may locate into the growth areas near the potential Clovis Satellite WWRF's are unknown, although areas are planned for industrial use in each of the three urban villages as shown on the 1993 Clovis General Plan. Demand for reclaimed water by new industry in the developing areas will depend, most likely, on incentives (or requirements, as may be imposed by the City) for its use.

7.3.3.1 *RECLAIMED WATER USES FROM POTENTIAL NORTHWEST CLOVIS SATELLITE WWRF*

Opportunities exist for direct use of reclaimed water in the Northwest Urban Village area, as well as other areas outside the proposed growth area.

The 1993 Clovis General Plan indicates several proposed parks in the area, together with an extensive linear beltway adjoining the area. Although no new schools are planned within the area, the existing 160 acre Clovis Unified School District Buchanan Educational Center lies within one-half mile of the village. Areas of planned agricultural use are indicated on the General Plan, to the East of the proposed village. All of these are potential users of reclaimed water for irrigation purposes.

The park sites planned for the area total about 100 acres in area, virtually all of which would be landscaped. The Buchanan Educational Center has about half its area, or 80± acres, in turf and other landscaping. The proposed beltway, and other major streets in the area, could add an additional area approaching 100 acres in landscaping. The average irrigation demand for the total 280 acres of landscaped areas indicated, over the eight-month peak irrigation season, would be on the order of magnitude of 1.9 MGD.

The ultimate required capacity of the potential Clovis Northwest Satellite WWRF is 2.10 MGD under Alternatives 3 and 4, and 4.49 MGD under Alternative 6. Landscape irrigation demand could satisfy a major portion of the summer treatment capacity under Alternatives 3 and 4, and a fairly significant portion of the summer treatment capacity under Alternative 6.

In addition, over 800 acres of land is shown on the Clovis General Plan to ultimately remain in agriculture just East of the Northwest Urban Village. Depending on the availability of other water for dilution, the soil classification, and the type of crops to be irrigated, this agricultural area may also potentially utilize reclaimed water.

Over 200 acres of industrial uses are shown on the Clovis General Plan for the Northwest Urban Village, with such uses generally located along the East side of Willow Avenue between Shepherd and Behymer Avenues. The extent of potential opportunities for use of reclaimed water in the industrial areas is unknown at this time.

Taken together, the landscape irrigation, agricultural irrigation and industrial potential for use of reclaimed water from a Clovis Northwest Satellite WWRF is large enough to satisfy a major portion of, if not all, of the eight month irrigation season output from the Northwest facility, particularly under Alternatives 3 and 4. A pressure system of pipelines (consisting of uniquely colored pipe) in the major street grid, together with pumping and storage facilities at the Satellite WWRF, would be required to deliver reclaimed water for these uses. Other means of disposal of the reclaimed water would be needed for the non-irrigation winter months, and at all times for the disparity between plant output flow rate and direct user demand.

7.3.3.2 *RECLAIMED WATER USES FROM POTENTIAL SOUTHEAST CLOVIS SATELLITE WWRF*

Opportunities also exist for direct use of reclaimed water in the Southeast Urban Village area, as well as other areas outside the proposed growth area.

The 1993 Clovis General Plan indicates two proposed parks in the area, together with an extensive linear beltway adjoining the area. The 140± acre Clovis Unified School District Southeast Educational Center, to be occupied by in 1998, lies within the village. Areas of planned agricultural use are indicated on the General Plan, just outside of the proposed village. All of these are potential users of reclaimed water for irrigation purposes.

The park sites planned for the area total just over 20 acres in area, virtually all of which would be landscaped. The Southeast Educational Center has about half its area, or 70± acres, proposed for turf and other landscaping. The site currently is planned to utilize Fresno Irrigation District canal water for its primary irrigation source. The proposed beltway, and other major streets in the area, could add an additional area of about 50 acres in landscaping. The average irrigation demand for the total 140± acres of landscaped areas indicated, over the eight-month peak irrigation season, would be on the order of magnitude of 0.9 MGD.

The ultimate required capacity of the potential Clovis Southeast Satellite WWRF is as follows:

2.41 MGD	Alternative 3
6.22 MGD	Alternative 4
8.32 MGD	Alternative 5
17.14 MGD	Alternative 6

Landscape irrigation demand could satisfy a significant portion of the summer treatment capacity under Alternative 3, with lesser proportions of Alternatives 4 and 5. The potential summer landscape irrigation demand is only 5% of the ultimate capacity of the SE Satellite WWRF under Alternative 6.

About 1,800 acres of land is shown on the Clovis General Plan to ultimately remain in agriculture, adjacent to the East and Southeast of the Southeast Urban Village. Additionally, over 900 acres of land to the North of, and adjacent to, the Southeast Urban Village, may remain designated for agriculture, pending special study per the 1993 Clovis General Plan. Since the vast majority of the area is within the Fresno Irrigation District, water needed for dilution of the reclaimed water should be available for at least part of the irrigation season (depending upon the duration of the FID delivery season in any particular year). Depending on this availability, soil classification, and the type of crops to be irrigated, these agricultural area may potentially utilize reclaimed water.

About 70 acres of industrial uses are shown on the Clovis General Plan for the Southeast Urban Village, with such uses generally located along Shaw Avenue. The extent of potential opportunities for use of reclaimed water in the industrial areas is unknown at this time.

Taken together, the landscape irrigation, industrial, and particularly agricultural irrigation potential for use of reclaimed water from a Clovis Southeast Satellite WWRF may be large enough to satisfy a major portion of, if not all, of the eight month irrigation season output from the Southeast facility under Alternative 3. To a lesser extent, these uses may satisfy a significant portion of the SE plant output under Alternatives 4, 5 and 6.

A pressure system of pipelines in the major street grid, together with pumping and storage facilities at the SE Satellite WWRF, would be required to deliver reclaimed water for these uses. Other means of disposal of the reclaimed water would be needed for the non-irrigation winter months, and at all times for the disparity between plant output flow rate and direct user demand.

7.3.3.3 *RECLAIMED WATER USES FROM POTENTIAL NORTHEAST CLOVIS SATELLITE WWRF*

Opportunities exist for direct use of reclaimed water in the Northeast Urban Village area, as well as other areas outside the proposed growth area.

The 1993 Clovis General Plan indicates a major system of proposed parks in the Northeast Village, together with an extensive linear beltway passing through the area. Two sites for Clovis Unified School District major new school facilities are shown on the plan, totaling about 230 acres. Areas of planned agricultural use are indicated on the General Plan, to the East, North and West of the proposed village. All of these are, to some degree, potential users of reclaimed water for irrigation purposes.

The system of lineal parks planned for the area total about 300 acres in area, virtually all of which would be landscaped. The school sites are estimated to have about half their area, or 110± acres, in turf and other landscaping. The proposed beltway, and other major streets in the area, could add an additional area approaching 70 acres in landscaping. The average irrigation demand for the total 480 acres of landscaped areas indicated, over the eight-month peak irrigation season, would be on the order of magnitude of 3.2 MGD.

The ultimate capacity of the potential Clovis Northeast Satellite WWRF is 3.81 MGD (Alternative 3 being the only alternative involving a Northeast facility). Landscape irrigation demand could satisfy a major portion of the summer treatment capacity of this facility.

In addition, several thousand acres of land are shown on the Clovis General Plan to ultimately remain in agriculture East and Northeast of the Northeast Urban Village. Additionally, over 500 acres of such agriculturally planned land lies immediately to the West of the Northeast Village South of State Highway #168. Depending on the availability of other water for dilution, soil classification, and the type of crops to be irrigated, this agricultural area may also potentially utilize reclaimed water.

Over 300 acres of industrial uses are shown on the Clovis General Plan for the Northeast Urban Village, with such uses generally located along the South side of State Highway #168. The extent of potential opportunities for use of reclaimed water in these industrial areas is unknown at this time.

Taken together, the landscape irrigation, agricultural irrigation and industrial potential for use of reclaimed water from a Clovis Northeast Satellite WWRF is large enough to satisfy a major portion of, if not all, of the eight month irrigation season output from the Northeast facility. A pressure system of pipelines in the major street grid, together with pumping and storage facilities at the Satellite WWRF, would be required to deliver reclaimed water for these uses. Other sources of disposal of the reclaimed water would be needed for the non-irrigation winter months, and at all times for the disparity between plant output flow rate and direct user demand.

7.3.4 OTHER POTENTIAL USES OF RECLAIMED WATER

Tertiary treated and fully disinfected reclaimed wastewater may be utilized for purposes other than landscape and agricultural irrigation (with associated incidental groundwater recharge), and industrial uses.

Such uses might include dedicated groundwater recharge, recreational uses, and wetlands creation (or restoration). Surface discharge to the San Joaquin River was eliminated from consideration on the basis of environmental issues, coupled with the issue of net loss of water from the area.

7.3.4.1 *DEDICATED GROUNDWATER RECHARGE*

Dedicated groundwater recharge would provide the benefit of helping to replenish the underground water supply in the area. A major advantage of dedicated groundwater recharge is that is a fairly constant means of reuse, without major seasonal fluctuations. The major disadvantage of dedicated groundwater recharge is the large amounts of land required to accomplish the recharge, and the regulations that pertain to this method.

Land area requirements for groundwater recharge are a function of the sustainable percolation rate which the soils at the site will allow, the configuration of the site (sideslopes, berms for separating individual recharge cells, access roads, etc.), and the excess cells that must be provided to allow drying of cells on a rotational basis for rehabilitation.

While percolation rates vary widely in the Clovis area, and any particular site may exhibit a higher or lower rate, a sustainable rate of 0.10 foot per day may be considered a reasonable average for a properly maintained site located in an outlying area of Clovis. Evaporation losses may be considered a safety factor to the sustained percolation rate selected. A typical recharge site will require about 20% of its land area for berming, access, and uses other than direct wetted surface for percolation. Further, at least one-third of the cells should be redundant, to allow rotation, drying and maintenance on a site that is used year round.

Utilizing an estimated average sustainable percolation rate of 0.10 foot per day, with a 33% allowance for excess cells for rehabilitation and an 80% effective net site percolation area, the relationship of gross area of land (committed to groundwater recharge) to satellite WWRF treated water output is approximately 60 acres of land per 1.0 MGD. This land requirement is in addition to the Satellite WWRF physical requirement for land, which may be of the order of 15 to 20 acres (or more, for the plants of larger capacity).

The smallest potential Clovis Satellite WWRF, the Northwest WWRF under Alternatives 3 and 4, has a capacity of 2.10 MGD, which would require over 125 acres dedicated to percolation. The larger potential Clovis Satellite WWRF's would require even more land (as much as 1,000 acres for the potential Southeast Clovis Satellite WWRF under Alternative 6). As these numbers indicate, dedicated groundwater recharge as a method of reuse of reclaimed water is very land intensive, and may only be feasible (from a land requirement standpoint) for the smaller capacity satellite facilities, or as only a portion of the total reuse plan for a particular facility.

As indicated earlier in this section, the proposed regulations that govern groundwater recharge with reclaimed water, to be set forth in Title 22, California Code of Regulations, require (among other things) that no more than 20% of total recharge may be reclaimed water. Since this is applicable to the underground water in the general area rather than the specific site, in most cases it can be shown through modeling that other sources of replenishment of the underground supply (such as percolation of surface irrigation water, rainfall, and underground inflow in the general area) satisfy this requirement on an annual basis.

Additional proposed regulations that would apply to groundwater recharge with reclaimed water include the requirement that domestic wells are not to be located within 1,000 feet of the recharge point, and recharged water must have a minimum of 6-months of retention in the ground before it is pumped out by a domestic well. The large size of the sites required, coupled with the well separation requirement, renders use of dedicated groundwater recharge sites in all but the most remote areas only marginally feasible as a primary method of reclamation/reuse. There may be, however, opportunities for limited use of groundwater recharge for the satellite WWRF's as a part of the overall reclamation/reuse plan.

7.3.4.2 *RECREATIONAL USES*

Reclaimed water could contribute to recreation. Recreational uses could include such features as man-made lakes, streams, ponds, and fountains.

Although these uses are possible, none necessarily result in significant disposal of the reclaimed water, except through evaporation and percolation (which may be considered incidental groundwater recharge).

Presumably, it is possible to create a large enough waterfeature to create a balance between satellite WWRF treated water output and losses due to evaporation and percolation. One such opportunity that could be explored would be the creation of a large, man-made lake within the Big Dry Creek Reservoir. Physical requirements would include the excavation, and removal of excavated material from the reservoir, equal to the volume to be occupied by the lake, so as to not decrease the capacity of the reservoir. Transmission pipeline facilities would also have to be provided to convey the reclaimed water to the site.

Since recreational uses typically result in a significant net loss of water to the area (inasmuch as disposal normally is a result of evaporation and only incidental groundwater recharge), these uses are recommended to be considered only as potential secondary uses, as opposed to primary sources of satellite WWRF disposal.

7.3.4.3 *WETLANDS CREATION*

Similar to recreational uses, the creation (or restoration) of artificial wetlands is possible utilizing reclaimed water, although it is recommended only as a secondary potential use in this case. This is primarily because of the large amounts of land that would be required to be dedicated to wetlands in order to satisfy the outflow requirements of the potential satellite WWRF's. Opportunities, however, may exist for wetlands creation on a small scale, particularly in concert with other reclamation methods.

7.4 RECOMMENDED TREATMENT/RECLAMATION/REUSE SYSTEM

The basic type of treatment process recommended for potential Clovis Satellite WWRF's, under all of the alternatives studied which involve such facilities, is the "oxidation ditch, activated sludge, extended aeration" process. This type of treatment is one of the most cost effective available in the size of plant required, is one of the simplest and least costly to maintain, and involves an aerobic process in which objectionable odors are easily controlled.

The water reclamation/reuse proposal recommended for the potential Clovis Satellite WWRF's consists of a conjunctive use of the treated water. The primary emphasis of the reclamation/reuse plan would be for the delivery of reclaimed water directly to users (such as for landscape irrigation of parks, schools, and median islands, and for agricultural irrigation) within the study area. The secondary emphasis would be the delivery of reclaimed water to Fresno Irrigation District and associated facilities, for agricultural irrigation (and incidental groundwater recharge). Opportunities for use of the reclaimed water for other described purposes, such as dedicated groundwater recharge, recreation, and wetland creation, would be considered as options to the primary and secondary reclamation/reuse strategies where such particular opportunities arise.

The basic arrangement of the physical components of a Clovis Satellite WWRF related to treatment would consist of an influent pump station, headworks, oxidation ditch structures, secondary clarifiers, equalization basins, aerobic digesters, tertiary filters, ultra violet disinfection (with supplementary chlorine disinfection capability), sludge dewatering centrifuges, stormwater and backwash basin, a control building, a sludge handling building, and temporary storage ponds (for treated water). The general arrangement of these facilities for a typical Clovis Satellite WWRF is shown on Plate 5-A. A minimum buffer of 1,000 to 2,000 feet between the physical treatment components and any residential property is recommended. The influent pump station and headworks would be covered and scrubbed for odor control, in addition to the return activated sludge natural-biological odor control system. All processes in the plant would be aerobic (in the presence of oxygen).

The physical components of the recommended water reclamation/reuse plan includes storage, pumping and transmission facilities to temporarily store and distribute reclaimed water to direct users, and to Fresno Irrigation District irrigation canals and associated watercourses. Alternately, these same transmission facilities, with extensions, could be utilized to convey treated water to other potential use sites, should opportunities arise. The storage facilities would consist of on-site ponds, sized to accommodate no less than two days treated water outflow from the plant. The distribution system would consist of a grid of pressure reclaimed water lines in major streets, fed by pumps located at the satellite facility. Separate pipelines would supply excess treated water (over and above the demand from direct users) from the satellite facility to the Fresno Irrigation District canal system, and to local associated watercourses. Control systems would be provided to allow alternate distribution of the treated water, depending upon the seasonal or instantaneous demand for the water. Improvements would be required in some of the natural watercourses where the current capacity is insufficient for the planned outflow.

During the winter months of least irrigation demand (both landscape and agricultural), virtually all of the treated water would be directed alternately to the FID system or associated natural watercourses, depending on storm water flows and maintenance activities that may be occurring at the time. During peak storm flow events, treated water would be stored for up to two days in satellite plant storage ponds provided on-site. The fluctuations in demand for the treated water, particularly with respect to those periods when there is little demand during the winter months, would be considerably more manageable with the smaller sized satellite facilities (2 to 6 ± MGD), than with the larger ones (up to 17 ± MGD).

The recommended treatment/reclamation/reuse systems should provide safe, reliable, and environmentally responsible recycling of wastewater processed in a potential Clovis Satellite WWRF. The system should also satisfy goals of the Regional Water Quality Control Board, Fresno Region, and its basin plan, for emphasizing the reclaiming of effluent.

The goals of the Fresno Irrigation District to reclaim water from within the District and not allow its unmitigated export, would also be met. Opportunities exist for an exchange of Clovis' reclaimed water delivered to FID, for surface water delivered by FID to Clovis (for municipal uses). An exchange rate would have to be negotiated, along with agreements for such reclaimed water discharges to the FID system. Possibilities may also exist for such exchanges in areas of Clovis outside the boundaries of the Fresno Irrigation District.

The recommended treatment/reclamation/reuse systems also lend themselves to planned, staged construction, as capacity requirements increase with the development of the various service areas in conformance with the 1993 Clovis General Plan.

SECTION 8.
ESTIMATES OF COST

8.1 GENERAL

In order to weigh the relative costs of the alternatives studied, and to determine the order of magnitude of the total costs involved in providing wastewater service to Clovis through year 2030, estimates of cost were prepared for the various elements comprising each alternative. Capital cost, as well as the annual cost of operations, maintenance and replacement were estimated. Comparative estimates were prepared for two time periods; through year 2015 (as a guide to mid-term costs), and for the total Clovis General Plan planning period through year 2030. Where Clovis and Fresno share the cost of proposed facilities within the Fresno-Clovis Regional System, the costs were prorated on the basis of design flow proportion for each entity. Where supplemental information was available which indicated a cost sharing not in proportion to design flow, the supplemental information was used and so identified. Reimbursements which may accrue to Clovis under Alternative 6, due to the potential sale of Clovis' existing capacity in the regional system back to the City of Fresno, were also estimated.

8.2 CAPITAL COSTS

Estimates were prepared of the capital cost of all required improvements under the master plan which would affect the relative cost of the alternatives studied. These improvements include conveyance facilities (such as trunk sewers leading to points of disposal), and treatment and disposal facilities. All estimates were in 1996 dollars and include allowances for the cost of construction, engineering and construction management, and contingencies.

8.2.1 CONVEYANCE FACILITIES

These facilities include trunk sewers in the Fresno-Clovis Regional System, pumps stations and force mains in the regional system, trunk sewers within the Clovis study area, and pumps stations and force mains within the Clovis study area, all conveying untreated collected wastewater to, or toward, a point of treatment and disposal.

8.2.1.1 *TRUNK SEWERS WITHIN THE REGIONAL SYSTEM (OUTSIDE CLOVIS)*

An estimated average unit cost for regional trunk sewers, in the units cost per inch of diameter per lineal foot of sewer constructed, was developed. This cost was determined by factoring down the actual costs of the Fowler Avenue Trunk Sewer, including all incidental expenses, into a cost per diameter inch per lineal foot, and then inflating that cost to 1996 dollars. Adjustments were also made to provide for PVC lining of all concrete sewer pipe, to provide maximum design life.

A check of the cost variation through the range of sizes in the Fowler Avenue Trunk Sewer project, 36-inch to 66-inch diameter, confirmed that the unit cost, expressed in dollars per inch of diameter per lineal foot of sewer, did not vary significantly from the largest to the smallest diameters. The Fowler Avenue Trunk Sewer project is believed to be representative of the studied trunk sewers, considering size, depth, relative average complexity, and other factors. Calculations for the estimated average trunk sewer unit cost appear on Table A8-1 in Appendix 8.

The unit cost so determined was then applied to average segments of the proposed trunk sewers. Where unusual circumstances were anticipated to affect the segment so that the average cost would not be representative, the unit cost was adjusted up or down to reflect the anticipated conditions. Such circumstances would include freeway crossings, unusually deep or shallow sections, and others unusual conditions affecting costs.

Pipeline materials for trunk sewers were considered to be 360° PVC lined reinforced concrete pipe, and alternately, solid wall PVC pipe with special aggregate bedding in pipelines with 24-inch and 27-inch diameters.

The estimated cost of proposed regional system trunk sewers, including cost proportioning between the Cities of Clovis and Fresno, are included in Appendix 8, as follows:

Table A8-2	Alternative 1.	Leonard Trunk Plus Second North Avenue Trunk Barrel to Regional WWTP
Table A8-3	Alternative 1.	Shepherd Trunk Plus New Crosstown Northside and Westside (Grantland) Trunk to Regional WWTP
Table A8-4	Alternative 2A & 2B	Leonard Trunk to New Regional South Satellite WWRF; Plus Second North Avenue Trunk Barrel to Regional WWTP
Table A8-5	Alternative 2A & 2B	Diversion Trunk to New Regional South Satellite WWRF, from Fowler Avenue Trunk Sewer at Church Avenue
Table A8-6	Alternative 2B	Shepherd Trunk Plus New Crosstown Northside Trunk to Regional Satellite WWRF
Table A8-7	Alternative 3 through 5	Second North Avenue Trunk Sewer Barrel from Maple Avenue to Regional WWTP

These facilities, under any particular alternative studied, must be constructed prior to year 2015 to serve development anticipated by that time.

Estimates for potential purchase of Clovis' current acquired capacity in the regional system are presented in Section 8.4.

8.2.1.2 *PUMPS STATIONS AND FORCE MAINS WITHIN THE REGIONAL SYSTEM (OUTSIDE CLOVIS)*

Alternative 2A involves a pump station and force main within the Fresno-Clovis Regional System, to convey flow from the Northwest growth area of Clovis to a proposed North regional Satellite WWRF. These facilities would carry only Clovis flows, so the total cost would be borne by Clovis. These facilities must be constructed prior to year 2015 to serve development anticipated by that time.

An itemized estimate of cost of these facilities is included in Table A8-8 of Appendix 8. Sulfide control facilities were included in the estimate because of the extended length of the proposed force main.

8.2.1.3 *TRUNK SEWERS WITHIN THE CLOVIS STUDY AREA*

Estimates of cost were prepared for proposed trunk sewers within the Clovis study area under each alternative. The unit cost method was utilized, identical to that used for estimating the costs of trunk sewers in the regional system.

Although major sewers smaller than 24-inches in diameter were conceptually designed for each alternative (to provide a guideline for extension of facilities within each sub-service area), cost estimates were made for sewers 24-inches and larger only. Sewers 24-inches and larger, in Clovis, are considered trunk sewers, larger than those sewers receiving reimbursements for oversizing on a routine basis. Trunk sewers are usually funded by developer fees, on a citywide basis, and do not have a standard cost reimbursement schedule.

The estimates of cost of proposed trunk sewers within the Clovis 1993 General Plan area are included in Appendix 8, as follows:

Table A8-9	Alternative 1, 2A & 2B	Clovis Trunk Sewers Required by Year 2015
Table A8-10	Alternative 1, 2A & 2B	Clovis Trunk Sewers Ultimately Required, by Year 2030
Table A8-11	Alternative 3.	Clovis Trunk Sewers Required by Year 2015
Table A8-12	Alternative 3.	Clovis Trunk Sewers Ultimately Required, by Year 2030
Table A8-13	Alternative 4.	Clovis Trunk Sewers Required by Year 2015
Table A8-14	Alternative 4.	Clovis Trunk Sewers Ultimately Required, by Year 2030
Table A8-15	Alternative 5.	Clovis Trunk Sewers Required by Year 2015
Table A8-16	Alternative 5.	Clovis Trunk Sewers Ultimately Required, by Year 2030
Table A8-17	Alternative 6.	Clovis Trunk Sewers Required by Year 2015
Table A8-18	Alternative 6.	Clovis Trunk Sewers Ultimately Required, by Year 2030

8.2.1.4 *PUMPS STATIONS AND FORCE MAINS WITHIN THE CLOVIS STUDY AREA*

Itemized estimates of cost were prepared for pump stations and force mains required to serve the growth areas of Clovis within the study area, and to divert existing major trunk sewers under Alternative 6. Sulfide control facilities were included in the estimates because of the lengths of the proposed force mains. These pump stations and force mains, under all alternatives studied, must be constructed prior to year 2015 to serve development anticipated by that time.

Estimates of cost of those facilities required to adjust existing service area flows under all of the alternatives are identified in Section 4.

The estimates of cost of pump stations and force mains required to service the areas within the Clovis 1993 General Plan area under each alternative studied are included in Appendix 8, as follows:

Table A8-19	Alternative 3, & 4	NW Pump Station and Force Main to NW Clovis Satellite WWRF
Table A8-20A	Alternative 5.	NW Pump Station and Force Main to SE Clovis Satellite WWRF
Table A8-20B	Alternative 6.	NW Pump Station and Force Main to NW Clovis Satellite WWRF
Table A8-21	Alternative 6.	Herndon/Sierra Trunk Sewer Pump Station and Force Main to NW Clovis Satellite WWRF
Table A8-22	Alternative 6.	Peach Trunk Sewer Pump Station and Force Main to SE Clovis Satellite WWRF
Table A8-23	Alternative 6.	Fowler Trunk Sewer Pump Station and Force Main to SE Clovis Satellite WWRF

8.2.2 TREATMENT AND DISPOSAL (REUSE/RECLAMATION) FACILITIES

These facilities include expansion of the Fresno-Clovis Regional Wastewater Treatment Plant, potential regional satellite wastewater treatment plants and associated reuse/reclamation facilities, and potential Clovis satellite treatment plants with associated reuse/reclamation facilities.

8.2.2.1 *EXPANSION OF THE FRESNO-CLOVIS REGIONAL WASTEWATER TREATMENT PLANT*

The estimated costs of further expansion of the regional plant were extracted from a financial analysis performed as a part of the Regional Wastewater Master Plan Update. These costs are for expansion beyond a capacity of 80 MGD (construction from 68 to 80 MGD now pending) at the regional plant.

These costs are presented in the tables of cost estimating parameters accompanying the cost summaries for the various alternatives, as shown in Section 8.4. Costs were estimated for additional treatment capacity required to year 2015, and for the ultimate capacity requirements under the 1993 Clovis General Plan at year 2030.

8.2.2.2 *POTENTIAL REGIONAL SATELLITE WASTEWATER TREATMENT PLANTS AND ASSOCIATED REUSE/RECLAMATION FACILITIES*

Estimates of cost were prepared in this (Clovis) study for potential regional satellite plants and associated facilities. These costs were developed for facilities plans essentially consistent with the Regional Wastewater Master Plan Update findings, except that in this study a reuse/reclamation option was selected for cost estimating purposes, in each case, that included discharge to Fresno Irrigation District' canal system. The regional report's other reclamation/reuse options, such as discharge to the San Joaquin River, were not used. The regional report's cost estimates for regional satellite facilities also were not used.

The purpose of the cost analysis in the Regional Wastewater Master Plan Update was to preliminarily determine whether potential satellite facilities should be carried as recommended options in the regional study, to be subsequently studied in more detail if the relative costs of the satellite facilities did not prove significantly greater than expansion of the regional plant. The regional report, consequently, utilized estimating procedures that were not consistent with those used in the Clovis study.

The Clovis study involved much more detailed and itemized cost estimates for the potential satellite facilities than the regional study, which utilized an approach more focused on estimated relative costs than estimated absolute costs for the satellite facilities. Further, the Clovis study utilized different estimating procedures for factors such as incidental costs, and contingencies.

Estimated costs in this study for the satellite treatment facilities include the oxidation ditch basic aerobic treatment technology, together with biological nutrient removal, filtration and disinfection. Cost were also estimated for reuse/reclamation facilities, such as storage ponds for treated water, effluent pump stations, and outfall lines to FID canals. Estimated costs for land and site improvements were also included.

Itemized estimates of cost of proposed regional satellite wastewater treatment plants and associated reuse/reclamation facilities are included in Appendix 8, as follows:

Table A8-24	Alternative 2A & 2B	Potential South Regional Satellite WWRF
Table A8-25	Alternative 2A	Potential North Regional Satellite WWRF
Table A8-26	Alternative 2B	Potential Northwest Regional Satellite WWRF

Costs were estimated for additional treatment capacity required to year 2015, and for the ultimate capacity requirements under the 1993 Clovis General Plan at year 2030. Some, but not all, of the facilities can be phased.

The City of Clovis' share of costs in the regional satellite facilities were assumed to be in proportion to Clovis' design capacity in the facility.

8.2.2.3 *POTENTIAL CLOVIS SATELLITE WASTEWATER TREATMENT PLANTS AND ASSOCIATED REUSE/RECLAMATION FACILITIES*

Estimates of cost were prepared for potential Clovis satellite treatment plants and associated reuse/reclamation facilities. Estimated costs for the satellite treatment facilities include the oxidation ditch basic aerobic treatment technology, together with biological nutrient removal, filtration, disinfection, and full odor control. Cost were also estimated for reuse/reclamation facilities, such as temporary storage basins for treated water, effluent pump stations, outfall lines to FID canals and associated natural watercourses, and pressure transmission systems for providing access to direct users. Estimated costs for land and site improvements were also included.

The pressure transmission systems contemplated for providing access of treated water to direct users consists of a grid of 12-inch diameter treated water lines located in major streets, for each Clovis Satellite WWRF.

Costs for potential Clovis satellite WWRF's were estimated for additional treatment capacity required to year 2015, and for the ultimate capacity requirements under the 1993 Clovis General Plan at year 2030. Some, but not all, of the facilities can be phased.

Itemized estimates of cost of potential Clovis satellite wastewater treatment plants and associated reuse/reclamation facilities are included in Appendix 8, as follows:

Table A8-27	Alternative 3 & 4	Potential Northwest Clovis Satellite WWRF
Table A8-28	Alternative 3	Potential Southeast Clovis Satellite WWRF
Table A8-29	Alternative 3	Potential Northeast Clovis Satellite WWRF
Table A8-30	Alternative 4	Potential Southeast Clovis Satellite WWRF
Table A8-31	Alternative 5	Potential Southeast Clovis Satellite WWRF
Table A8-32	Alternative 6	Potential Northwest Clovis Satellite WWRF
Table A8-33	Alternative 6	Potential Southeast Clovis Satellite WWRF

8.3 ANNUAL OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS

Estimates were prepared of the annual cost of operations, maintenance and replacement (O,M&R) of all required improvements under the master plan which would affect the relative cost of the alternatives studied. These improvements include conveyance facilities (such as pump stations discharging wastewater to points of disposal), and treatment and disposal facilities. Estimates were prepared for the present value of the annual costs of operations, maintenance, and replacement for two time periods; (1) through year 2015, and (2) through year 2030. All costs presented are in 1996 dollars.

8.3.1 CONVEYANCE FACILITIES

These facilities include trunk sewers in the Fresno-Clovis Regional System, pumps stations and force mains in the regional system, trunk sewers within the Clovis study area, and pumps stations and force mains within the Clovis study area, all conveying untreated collected wastewater to, or toward, a point of treatment and disposal.

8.3.1.1 *TRUNK SEWERS*

The annual operations, maintenance and replacement cost for trunk sewers was estimated at 1% of the capital cost of the facility. Modern trunk sewers are designed for a service life of 100 years. For the regional trunk sewers, Clovis' annual cost was based upon Clovis' share of the capital cost of the facilities. For purposes of these estimates of cost, O,M&R costs for new trunk sewers were not considered to commence for an initial period of 10 years. The series of delayed payments was then converted back to an equivalent present value.

The present value of the annual cost of operations, maintenance and replacement of trunk sewers is indicated in the summary information in Tables 8-1 and 8-2.

8.3.1.2 *PUMP STATIONS AND FORCE MAINS*

The annual operations, maintenance and replacement costs for pump stations and force mains were estimated. The cost of operations included energy costs and sulfide control costs.

Energy costs were estimated at $0.12 per kilowatt-hour. Sulfide control costs were based upon the injection of nitrate salts at the required rate to eliminate sulfide buildup. Annual maintenance costs were estimated at 5% of pump station cost. Annual cost of replacement was based upon replacement of equipment equivalent to 65% of the cost of the pump station in 20 years.

Annual O,M&R costs for each time period analyzed were estimated by adjusting the full annual cost of O,M&R to take into consideration the average flow rate for the estimating period. For purposes of these estimates of cost, O,M&R costs for pump stations and force mains were not considered to commence for an initial period of 10 years. The series of delayed payments was then converted back to an equivalent present value.

The estimated annual costs of operations, maintenance and replacement of pump stations and force mains (at full capacity) required under each alternative studied are included in Appendix 8 (with supporting calculations in Appendix 5), as follows:

Table A8-8	Alternative 2A	NW Pump station and Force Main to North Regional Satellite WWRF (Table A5-25, Appendix 5)
Table A8-19	Alternative 3 & 4	NW Pump Station and Force Main to NW Clovis Satellite WWRF (Table A5-16, Appendix 5)
Table A8-20A	Alternative 5.	NW Pump Station and Force Main to SE Clovis Satellite WWRF (Table A5-17, Appendix 5)
Table A8-20B	Alternative 6.	NW Pump Station and Force Main to NW Clovis Satellite WWRF (Table A5-18, Appendix 5)
Table A8-21	Alternative 6.	Herndon/Sierra Trunk Sewer Pump Station and Force Main to NW Clovis Satellite WWRF (Table A5-19, Appendix 5)
Table A8-22	Alternative 6.	Peach Trunk Sewer Pump Station and Force Main to SE Clovis Satellite WWRF (Table A5-20, Appendix 5)
Table A8-23	Alternative 6.	Fowler Trunk Sewer Pump Station and Force Main to SE Clovis Satellite WWRF (Table A5-21, Appendix 5)

8.3.2 TREATMENT AND DISPOSAL (REUSE/RECLAMATION) FACILITIES

These facilities include expansion of the Fresno-Clovis Regional Wastewater Treatment Plant, potential regional satellite wastewater treatment plants and associated reuse/reclamation facilities, and potential Clovis satellite treatment plants with associated reuse/reclamation facilities.

8.3.2.1 *EXPANSION OF THE FRESNO-CLOVIS REGIONAL WASTEWATER TREATMENT PLANT*

Clovis' costs of operations, maintenance and replacement at an expanded regional plant were estimated from Clovis' current charges by the regional authority, checked against information extracted from a financial analysis performed as a part of the Regional Wastewater Master Plan Update.

These costs are presented in the tables of cost estimating parameters accompanying the cost summaries for the various alternatives, as shown in Section 8.4. O,M&R costs were estimated for treatment capacity required to year 2015, and for the ultimate capacity requirements under the 1993 Clovis General Plan at year 2030. Annual O,M&R costs for each time period analyzed were estimated by adjusting the full annual cost of O,M&R to take into consideration the average flow rate for the estimating period. For those alternatives involving satellite facilities (regional or Clovis only), all wastewater service was assumed to be provided at the regional plant for the first 10 years.

8.3.2.2 *POTENTIAL SATELLITE WASTEWATER TREATMENT PLANTS AND ASSOCIATED REUSE/RECLAMATION FACILITIES*

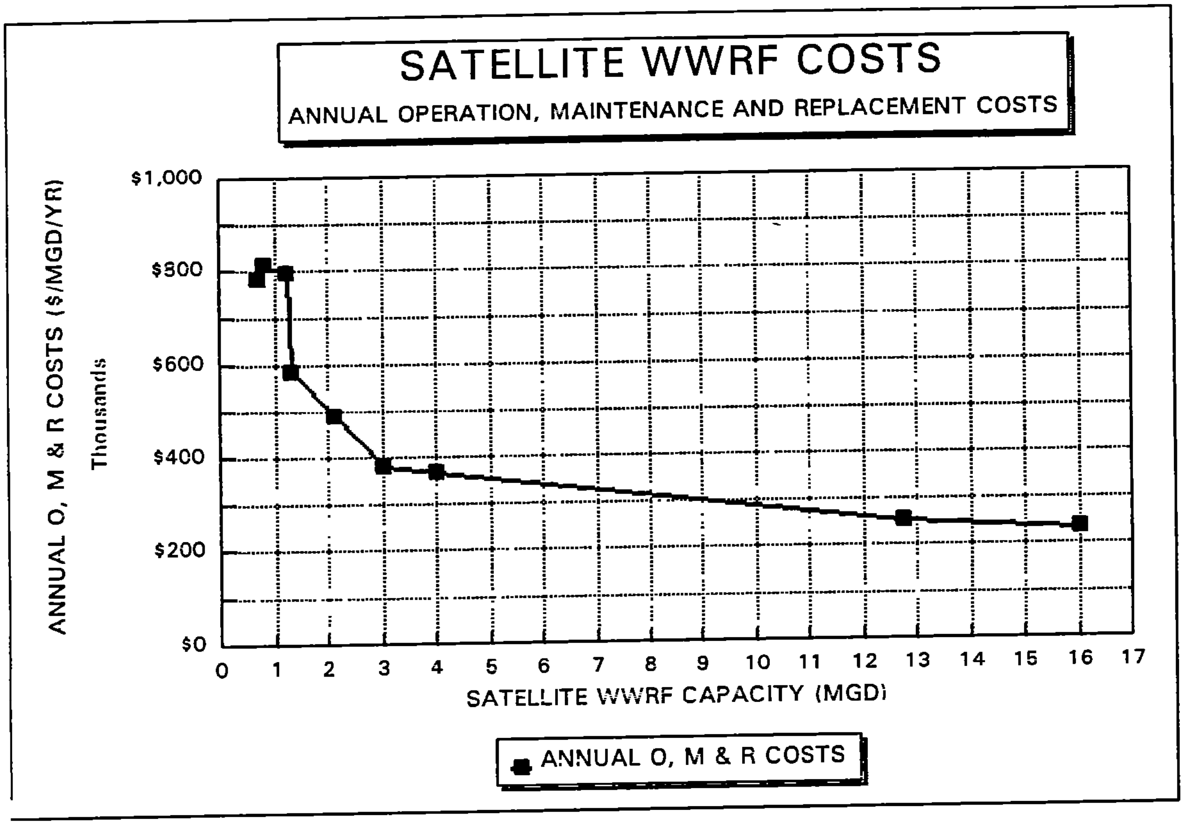
The annual operations, maintenance and replacement costs for potential satellite wastewater treatment plants and associated reuse/reclamation facilities were estimated. These estimates were prepared for potential regional facilities, as well as potential Clovis (only) facilities.

Costs included administration, personnel, energy, materials, laboratory, biosolids disposal, replacement, and miscellaneous. Replacement was based upon the anticipated life of the particular component, which varied between a 20 year and 100 year life.

The full annual cost of O,M&R was estimated for the initial phase of each facility. Figure 8-1 indicates the estimated annual O,M&R cost for the various plant capacities analyzed. O,M&R costs for subsequent phases were estimated by selecting the appropriate rate from Figure 8-1.

Annual O,M&R costs for each time period analyzed were estimated by adjusting the full annual cost of O,M&R to take into consideration the average flow rate for the estimating period. For purposes of these estimates of cost, O,M&R costs for potential satellite wastewater treatment plants and associated reuse/reclamation facilities were not considered to commence for an initial period of 10 years. The series of delayed payments was then converted back to an equivalent present value.

FIGURE 8-1



The estimated annual costs of operations, maintenance and replacement required under each alternative studied are included in Appendix 8, as follows:

Table A8-24	Alternative 2A	Potential South Regional Satellite WWRF
Table A8-25	Alternative 2A	Potential North Regional Satellite WWRF
Table A8-26	Alternative 2B	Potential Northwest Regional Satellite WWRF
Table A8-27	Alternative 3 & 4	Potential Northwest Clovis Satellite WWRF
Table A8-28	Alternative 3	Potential Southeast Clovis Satellite WWRF
Table A8-29	Alternative 3	Potential Northeast Clovis Satellite WWRF
Table A8-30	Alternative 4	Potential Southeast Clovis Satellite WWRF
Table A8-31	Alternative 5	Potential Southeast Clovis Satellite WWRF
Table A8-32	Alternative 6	Potential Northwest Clovis Satellite WWRF
Table A8-33	Alternative 6	Potential Southeast Clovis Satellite WWRF

8.4 POTENTIAL REIMBURSEMENTS TO CLOVIS FROM THE CITY OF FRESNO

Alternative 6 involves all existing and future Clovis flows, including those currently planned for service to the existing Fresno-Clovis regional system, to be directed to, and served by, two proposed Clovis Satellite WWRF'S. This would involve the complete withdrawal of Clovis from the regional system.

Since the early 1970's, when Clovis decommissioned its wastewater treatment plant (located Southeast of the intersection of Peach and Ashlan Avenue), the City has entered into several joint powers agreements with the City of Fresno for acquisition of service capacity in the regional system. These agreements involve capacity in trunk sewers, as well as treatment plant capacity.

Table 8-1 indicates the cost to Clovis for capacity in portions of the regional system as identified by each agreement. Generally, Clovis' cost for capacity was calculated on a prorata basis with Fresno' capacity. In the case of the most recent trunk system capacity purchase (an additional 3.00 MGD capacity in the North Avenue Trunk Sewer), Clovis' cost was calculated as its prorata share, based on capacity, of the depreciated original cost of the facility. The cost of the pending 3.00 MGD purchase of additional treatment capacity was estimated at $15 million, although the exact amount is not yet known.

Reimbursements which may accrue to Clovis under Alternative 6, due to the potential sale of Clovis' existing capacity in the regional system back to the City of Fresno, were estimated and also appear in Table 8-1.

In the case of reimbursement for existing treatment and disposal capacity, it was assumed that the costs originally paid by Clovis would be reimbursed in full, inasmuch as the value of the capacity has increased more than depreciation would devalue facilities purchased.

In the case of reimbursement for trunk sewer facilities, original costs were depreciated on a straight line basis, assuming a 50 year life (from the date of purchase of capacity by Clovis) for all trunk sewers except the Fowler Trunk Sewer, for which a service life of 100 years was assigned. Additionally, potential reimbursement was reduced for two trunk sewers where available capacity could probably not be utilized by Fresno. These include: (1) the Herndon-Cornelia Trunk Sewer, from Millbrook to Willow Avenues, where no capacity is needed by Fresno, and (2) the Fowler Trunk Sewer, particularly in its upper reaches, where only a small percentage of the capacity of the line is useable by Fresno.

The potential reimbursements indicated in Table 8-1 represent only preliminary estimates, as any reimbursements would have to be negotiated with Fresno. The basis of the estimates is equitable share of *costs* (which has been the principle utilized in all of the joint powers agreements with the regional authority relating to wastewater service), which doesn't necessarily correspond with *value*. Today's value of treatment capacity purchased in earlier years is obviously an issue which could be debated if Alternative 6 were to appear viable.

8.5 SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES

Summaries were prepared comparing the items of cost of each alternative plan studied, within the major categories of; (1) capital costs, and (2) present value of the annual cost of operations, maintenance and replacement. Summaries were prepared for two time periods; through year 2015, and for the total Clovis General Plan planning period through year 2030. Figure 8-2 depicts the two categories of cost graphically.

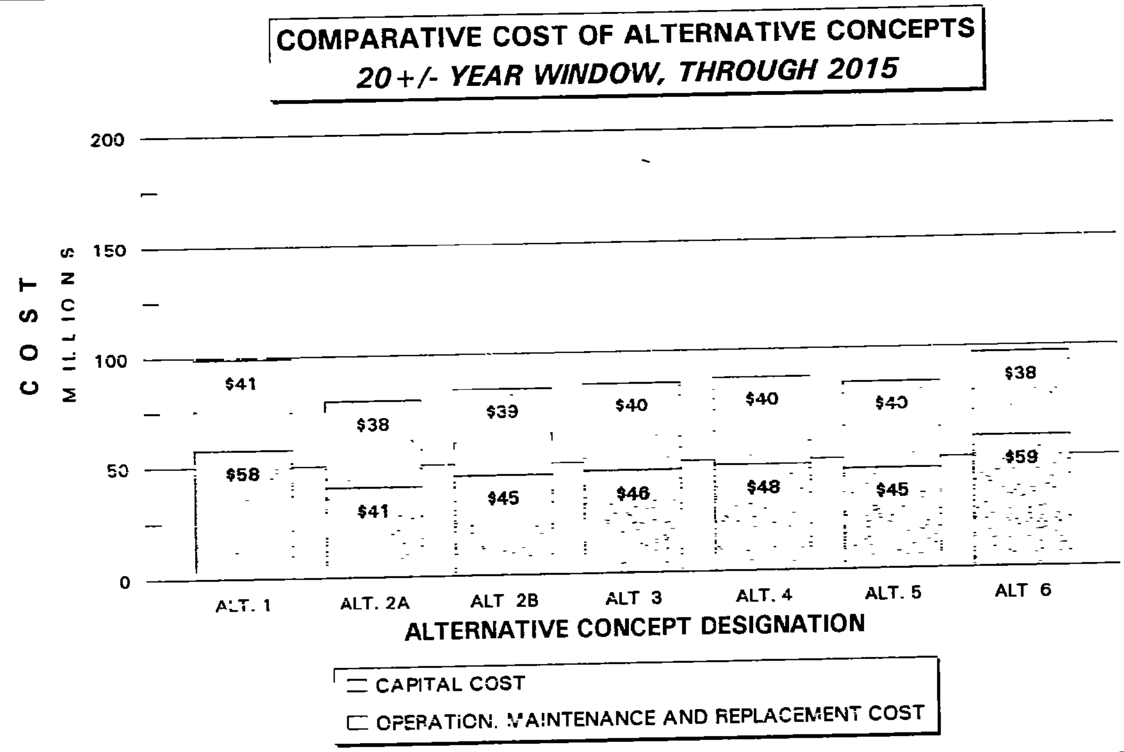
TABLE 8-1

CLOVIS WASTEWATER MASTER PLAN
COST OF EXISTING CAPACITY IN REGIONAL SYSTEM AND POTENTIAL REIMBURSEMENTS

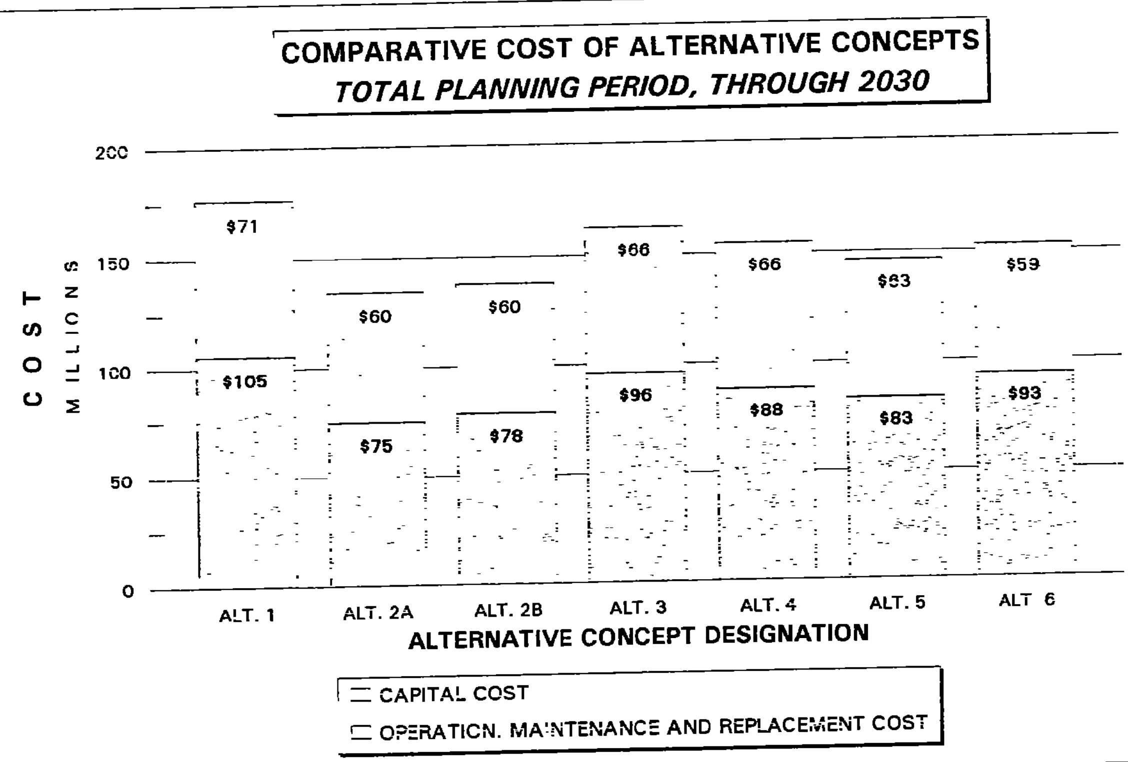
CLOVIS' COSTS OF CAPACITY IN REGIONAL TRUNK SEWERS AND WWTP					
		CAPACITY ACQUIRED		COST	
DATE OF AGREEMENT	DESCRIPTION	CONVEYANCE (MGD)	TREATMENT (MGD)	CONVEYANCE	TREATMENT
10/03/70	PEACH & NORTH TRUNK SEWERS	3.00		$185,000	
03/03/77	HERNDON-CORNELIA TRUNK SEWER, WWTP TO MILLBROOK	2.80		$847,000	
03/03/77	HERNDON-CORNELIA TRUNK SEWER, MILLBROOK TO WILLOW	2.80		$1,190,000	
03/03/77	SIERRA TRUNK SEWER	0.50		$127,300	
03/03/77	WWTP LAND CAPACITY		6.30		$119,820
03/03/77	WWTP PRE-PHASE II CAPACITY		6.30		$405,938
03/03/77	WWTP PHASE II CAPACITY		6.30		$810,161
10/11/87	FOWLER TRUNK SEWER, ASHLAN TO NORTH/MAPLE	9.80		$10,447,000	
09/01/95	WWTP LAND CAPACITY ADJUSTMENT		6.30		$45,814
09/01/95	NORTH AVENUE TRUNK SEWER	3.00		$49,615	
09/01/95	CHURCH AVENUE RELIEF TRUNK SEWER			$33,250	
09/01/95	CORNELIA SEWER, CHURCH TO WWTP			$3,526	
PENDING	WWTP CAPACITY		3.00		$15,000,000
	TOTALS		9.30	***$12,882,691***	***$16,381,753***

ESTIMATED POTENTIAL CAPACITY SALE BACK TO REGIONAL SYSTEM					
		% OF COST REIMBURSED		ESTIMATED REIMBURSEMENT	
DATE OF AGREEMENT	DESCRIPTION	CONVEYANCE	TREATMENT	CONVEYANCE (DEPRECIATED)	TREATMENT (AT COST)
10/03/70	PEACH & NORTH TRUNK SEWERS	100%		$89,000	
03/03/77	HERNDON-CORNELIA TRUNK SEWER, WWTP TO MILLBROOK	100%		$525,000	
03/03/77	HERNDON-CORNELIA TRUNK SEWER, MILLBROOK TO WILLOW	0%		$0	
03/03/77	SIERRA TRUNK SEWER	100%		$79,000	
03/03/77	WWTP LAND CAPACITY		100%		$119,820
03/03/77	WWTP PRE-PHASE II CAPACITY		100%		$405,939
03/03/77	WWTP PHASE II CAPACITY		100%		$810,181
10/11/87	FOWLER TRUNK SEWER, ASHLAN TO NORTH/MAPLE	50%		$5,067,000	
09/01/95	WWTP LAND CAPACITY ADJUSTMENT		100%		$45,814
09/01/95	NORTH AVENUE TRUNK SEWER	100%		$49,000	
09/01/95	CHURCH AVENUE RELIEF TRUNK SEWER	100%		$33,000	
09/01/95	CORNELIA SEWER, CHURCH TO WWTP	100%		$3,000	
PENDING	WWTP CAPACITY		100%		$15,000,000
	TOTALS (ROUNDED)	45%	100%	***$5,845,000***	***$16,382,000***

FIGURE 8-2



COMPARATIVE COST OF ALTERNATIVE CONCEPTS
20+/- YEAR WINDOW, THROUGH 2015
200
150
100
50
0
COST
MILLIONS
$41
$58
$38
$41
$39
$45
$40
$46
$40
$48
$40
$45
$38
$59
ALT. 1
ALT. 2A
ALT 2B
ALT 3
ALT. 4
ALT. 5
ALT 6
ALTERNATIVE CONCEPT DESIGNATION
CAPITAL COST
OPERATION, MAINTENANCE AND REPLACEMENT COST



COMPARATIVE COST OF ALTERNATIVE CONCEPTS
TOTAL PLANNING PERIOD, THROUGH 2030
200
150
100
50
0
COST
MILLIONS
$71
$105
$60
$75
$60
$78
$66
$96
$66
$88
$63
$83
$59
$93
ALT. 1
ALT. 2A
ALT. 2B
ALT. 3
ALT. 4
ALT. 5
ALT 6
ALTERNATIVE CONCEPT DESIGNATION
CAPITAL COST
OPERATION, MAINTENANCE AND REPLACEMENT COST

Summaries of estimating parameters for each alternative plan within each of the two planning periods were also prepared. The cost presented represent estimates of all major facility costs involved in implementing each alternative plan.

8.5.1 PLANNING PERIOD THROUGH YEAR 2015

Table 8-2 contains the summary of estimated costs through year 2015, for implementation of each alternative plan studied. Table 8-4 contains estimating parameters used in calculating the costs presented in Table 8-2. The year 2015 estimates were prepared as a guide to costs for the mid-term of the planning horizon of the 1993 Clovis General Plan.

8.5.2 PLANNING PERIOD THROUGH YEAR 2030

Table 8-3 contains the summary of cost through the Clovis General Plan planning period, year 2030, for implementation of each alternative plan studied. Table 8-5 contains estimating parameters used in calculating the costs presented in Table 8-3.

TABLE 8-2

CLOVIS WASTEWATER MASTER PLAN
SUMMARY OF ESTIMATES OF COST OF ALTERNATIVES, THROUGH YEAR 2015

COST ESTIMATES; CAPITAL COST PLUS PRESENT VALUE 20 +/- YEAR OPERATIONS, MAINTENANCE AND REPLACEMENT	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4	ALT 5	ALT 6
CAPITAL COSTS							
CONVEYANCE FACILITIES							
REGIONAL TRUNK SEWER SYSTEMS	$29,762,000	$14,241,000	$22,747,000	$4,708,000	$4,708,000	$4,708,000	($5,845,000)
REGIONAL PUMPS AND FORCE MAINS	$0	$3,030,000	$0	$0	$0	$0	$0
CLOVIS INTERNAL TRUNK SEWER SYSTEM (24" & LARGER)	$2,474,000	$2,474,000	$2,474,000	$1,446,000	$2,698,000	$8,591,000	$3,126,000
CLOVIS INTERNAL PUMPS AND FORCE MAINS	$0	$0	$0	$1,593,000	$1,593,000	$2,545,000	$11,249,000
SUBTOTAL CONVEYANCE FACILITIES	$32,236,000	$19,745,000	$25,221,000	$7,747,000	$8,999,000	$15,844,000	$8,530,000
TREATMENT AND DISPOSAL FACILITIES							
REGIONAL WWTP EXPANSION	$25,652,000	$0	$0	$18,603,000	$18,603,000	$18,603,000	($16,382,000)
REGIONAL SATELLITE WWRF'S							
NORTH WWRF	$0	$5,007,000	$0	$0	$0	$0	$0
NORTHWEST WWRF	$0	$0	$3,984,000	$0	$0	$0	$0
SOUTH WWRF	$0	$15,778,000	$15,778,000	$0	$0	$0	$0
CLOVIS SATELLITE WWRF'S							
NW WWRF	$0	$0	$0	$9,392,000	$9,392,000	$0	$22,866,000
SE WWRF	$0	$0	$0	$10,277,000	$10,783,000	$10,859,000	$44,081,000
NE WWRF	$0	$0	$0	$0	$0	$0	$0
SUBTOTAL TREATMENT AND DISPOSAL FACILITIES	$25,652,000	$20,785,000	$19,762,000	$38,272,000	$38,778,000	$29,462,000	$50,565,000
SUBTOTAL CAPITAL COSTS	*$57,888,000*	*$40,530,000*	*$44,983,000*	*$46,019,000*	*$47,777,000*	*$45,306,000*	*$59,095,000*
PRESENT VALUE OF ANNUAL COST OF OPERATION, MAINT. AND REPLACEMENT							
CONVEYANCE FACILITIES							
TRUNK SEWERS	$1,224,000	$635,000	$958,000	$234,000	$281,000	$505,000	$119,000
PUMPS AND FORCE MAINS	$0	$191,000	$0	$94,000	$94,000	$167,000	$3,732,000
TREATMENT AND DISPOSAL FACILITIES							
REGIONAL WWTP	$40,029,000	$37,178,000	$37,178,000	$37,178,000	$37,178,000	$37,178,000	$21,287,000
REGIONAL SATELLITE WWRF	$0	$704,000	$704,000	$0	$0	$0	$0
CLOVIS SATELLITE WWRF	$0	$0	$0	$2,218,000	$2,191,000	$1,364,000	$12,936,000
SUBTOTAL OPERATION, MAINTENANCE AND REPLACEMENT	*$41,253,000*	*$38,708,000*	*$38,840,000*	*$39,722,000*	*$39,744,000*	*$39,214,000*	*$38,074,000*
TOTAL ESTIMATED 20-YEAR +/- COSTS (THROUGH YEAR 2015)	$99,141,000	$79,238,000	$83,823,000	$85,741,000	$87,521,000	$84,520,000	$97,169,000

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TABLE 8-3

CLOVIS WASTEWATER MASTER PLAN
SUMMARY OF ESTIMATES OF COST OF ALTERNATIVES, THROUGH YEAR 2030

COST ESTIMATES; CAPITAL COST PLUS PRESENT VALUE 35 +/- YEAR OPERATIONS, MAINTENANCE AND REPLACEMENT	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4	ALT 5	ALT 6
CAPITAL COSTS							
CONVEYANCE FACILITIES							
REGIONAL TRUNK SEWER SYSTEMS	$29,762,000	$14,241,000	$22,747,000	$4,708,000	$4,708,000	$4,708,000	($5,845,000)
REGIONAL PUMPS AND FORCE MAINS	$0	$3,030,000	$0	$0	$0	$0	$0
CLOVIS INTERNAL TRUNK SEWER SYSTEM (24" & LARGER)	$10,143,000	$10,143,000	$10,143,000	$5,376,000	$10,367,000	$16,260,000	$10,795,000
CLOVIS INTERNAL PUMPS AND FORCE MAINS	$0	$0	$0	$1,593,000	$1,593,000	$2,545,000	$11,249,000
SUBTOTAL CONVEYANCE FACILITIES	$39,905,000	$27,414,000	$32,890,000	$11,677,000	$16,668,000	$23,513,000	$16,199,000
TREATMENT AND DISPOSAL FACILITIES							
REGIONAL WWTP EXPANSION	$65,349,000	$0	$0	$21,253,000	$21,253,000	$21,253,000	($16,382,000)
REGIONAL SATELLITE WWRF'S							
NORTH WWRF	$0	$13,490,000	$0	$0	$0	$0	$0
NORTHWEST WWRF	$0	$0	$11,428,000	$0	$0	$0	$0
SOUTH WWRF	$0	$33,677,000	$33,677,000	$0	$0	$0	$0
CLOVIS SATELLITE WWRF'S							
NW WWRF	$0	$0	$0	$17,982,000	$17,982,000	$0	$30,402,000
SE WWRF	$0	$0	$0	$18,714,000	$31,772,000	$37,831,000	$62,887,000
NE WWRF	$0	$0	$0	$26,182,000	$0	$0	$0
SUBTOTAL TREATMENT AND DISPOSAL FACILITIES	$65,349,000	$47,167,000	$45,105,000	$84,131,000	$71,007,000	$59,084,000	$76,907,000
SUBTOTAL CAPITAL COSTS	*$105,254,000*	*$74,581,000*	*$77,995,000*	*$95,808,000*	*$87,675,000*	*$82,597,000*	*$93,106,000*
PRESENT VALUE OF ANNUAL COST OF OPERATION, MAINT. AND REPLACEMENT							
CONVEYANCE FACILITIES							
TRUNK SEWERS	$2,797,000	$1,709,000	$2,305,000	$707,000	$1,056,000	$1,469,000	$757,000
PUMPS AND FORCE MAINS	$0	$1,001,000	$0	$493,000	$493,000	$872,000	$7,650,000
TREATMENT AND DISPOSAL FACILITIES							
REGIONAL WWTP	$68,296,000	$51,500,000	$51,500,000	$51,500,000	$51,500,000	$51,500,000	$21,287,000
REGIONAL SATELLITE WWRF	$0	$5,945,000	$5,945,000	$0	$0	$0	$0
CLOVIS SATELLITE WWRF	$0	$0	$0	$13,822,000	$13,743,000	$9,386,000	$29,508,000
SUBTOTAL, OPERATION, MAINTENANCE AND REPLACEMENT	*$71,093,000*	*$60,155,000*	*$59,750,000*	*$66,522,000*	*$66,792,000*	*$63,227,000*	*$59,202,000*
TOTAL ESTIMATED 35-YEAR +/- COSTS (THROUGH YEAR 2030)	$176,347,000	$134,736,000	$137,745,000	$162,330,000	$154,467,000	$145,824,000	$152,308,000

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TABLE 8-4

CLOVIS WASTEWATER MASTER PLAN
PARAMETERS FOR ESTIMATING COSTS OF ALTERNATIVES, TROUGH YEAR 2015

ESTIMATING PARAMETERS FOR 20+/- YEAR WINDOW, THROUGH 2015	UNITS	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
TIME PERIOD	(YEARS)	19	19	19	19	19	19	19
INTEREST RATE	(%)	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
CURRENT FLOW RATE	(MGD)	6.27	6.27	6.27	6.27	6.27	6.27	6.27
FLOW RATE AT END OF PERIOD	(MGD)	14.14	14.14	14.14	14.14	14.14	14.14	14.14
PREVIOUSLY PURCHASED TREATMENT CAPACITY	(MGD)	9.30	9.30	9.30	9.30	9.30	9.30	9.30
ADDITIONAL TREATMENT CAPACITY TO BE ACQUIRED								
REGIONAL WWTP	(MGD)	4.84	0.00	0.00	3.51	3.51	3.51	-0.30
REGIONAL SATELLITE WWRF'S								
NORTH WWRF	(MGD)	0.00	0.61	0.00	0.00	0.00	0.00	0.00
NORTHWEST WWRF	(MGD)	0.00	0.00	0.61	0.00	0.00	0.00	0.00
SOUTH WWRF	(MGD)	0.00	4.23	4.23	0.00	0.00	0.00	0.00
CLOVIS SATELLITE WWRF'S								
NW WWRF	(MGD)	0.00	0.00	0.00	0.61	0.61	0.00	3.00
SE WWRF	(MGD)	0.00	0.00	0.00	0.72	0.72	1.33	11.14
NE WWRF	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COST OF ADDITIONAL TREATMENT CAPACITY								
REGIONAL WWTP	($/MGD)	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000
REGIONAL SATELLITE WWRF								
NORTH WWRF	($/MGD)	NA	$8,208,000	NA	NA	NA	NA	NA
NORTHWEST WWRF	($/MGD)	NA	NA	$6,531,000	NA	NA	NA	NA
SOUTH WWRF	($/MGD)	NA	$3,730,000	$3,730,000	NA	NA	NA	NA
CLOVIS SATELLITE WWRF								
NW WWRF	($/MGD)	NA	NA	NA	$15,396,000	$15,396,000	NA	$7,622,000
SE WWRF	($/MGD)	NA	NA	NA	$14,273,000	$14,977,000	$8,165,000	$3,957,000
NE WWRF	($/MGD)	NA	NA	NA	NA	NA	NA	NA
ANNUAL COST OPERATION, MAINT & REPLMT OF TRUNK SEWERS	(% CAP $)	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
AVERAGE FLOW RATE FOR PUMPS & FORCE MAINS								
SHEPHERD SERVICE AREA	(MGD)	0.00	0.36	0.00	0.36	0.36	0.36	0.36
HERNDON/SIERRA SERVICE AREAS	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	2.05
PEACH SERVICE AREA	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	2.96
FOWLER SERVICE AREA	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	6.40
ANNUAL COST O, M & R OF PUMP STATIONS & FORCE MAINS								
SHEPHERD SERVICE AREA	($/MGD)	NA	$140,000	NA	$69,000	$69,000	$122,000	$69,000
HERNDON/SIERRA SERVICE AREAS	($/MGD)	NA	NA	NA	NA	NA	NA	$109,000
PEACH SERVICE AREA	($/MGD)	NA	NA	NA	NA	NA	NA	$114,000
FOWLER SERVICE AREA	($/MGD)	NA	NA	NA	NA	NA	NA	$62,000
AVERAGE FLOW RATE FOR TREATMENT AND DISPOSAL FACILITIES								
REGIONAL WWTP	(MGD)	10.21	9.48	9.48	9.48	9.48	9.48	8.26
REGIONAL SATELLITE WWRF	(MGD)	0.00	0.73	0.73	0.00	0.00	0.00	0.00
CLOVIS SATELLITE WWRF								
NW WWRF	(MGD)	0.00	0.00	0.00	0.36	0.36	0.00	2.41
SE WWRF	(MGD)	0.00	0.00	0.00	0.37	0.37	0.73	9.73
NE WWRF	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL COST OPERATION, MAINTENANCE AND REPLACEMENT								
REGIONAL WWTP	($/MGD)	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000
REGIONAL SATELLITE WWRF	($/MGD)	NA	$254,000	$254,000	NA	NA	NA	NA
CLOVIS SATELLITE WWRF								
NW WWRF	($/MGD)	NA	NA	NA	$784,000	$784,000	NA	$381,000
SE WWRF	($/MGD)	NA	NA	NA	$814,000	$796,000	$492,000	$256,000
NE WWRF	($/MGD)	NA	NA	NA	NA	NA	NA	NA

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TABLE 8-5

CLOVIS WASTEWATER MASTER PLAN
PARAMETERS FOR ESTIMATING COSTS OF ALTERNATIVES, THROUGH YEAR 2030

ESTIMATING PARAMETERS FOR TOTAL PLANNING PERIOD, THROUGH 2030	UNITS	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
TIME PERIOD	(YEARS)	34	34	34	34	34	34	34
INTEREST RATE	(%)	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
CURRENT FLOW RATE	(MGD)	6.27	6.27	6.27	6.27	6.27	6.27	6.27
FLOW RATE AT END OF PERIOD	(MGD)	21.63	21.63	21.63	21.63	21.63	21.63	21.63
PREVIOUSLY PURCHASED TREATMENT CAPACITY	(MGD)	9.30	9.30	9.30	9.30	9.30	9.30	9.30
ADDITIONAL TREATMENT CAPACITY TO BE ACQUIRED								
REGIONAL WWTP	(MGD)	12.33	0.00	0.00	4.01	4.01	4.01	-9.30
REGIONAL SATELLITE WWRF'S								
NORTH WWRF	(MGD)	0.00	2.10	0.00	0.00	0.00	0.00	0.00
NORTHWEST WWRF	(MGD)	0.00	0.00	2.10	0.00	0.00	0.00	0.00
SOUTH WWRF	(MGD)	0.00	10.23	10.23	0.00	0.00	0.00	0.00
CLOVIS SATELLITE WWRF'S								
NW WWRF	(MGD)	0.00	0.00	0.00	2.10	2.10	0.00	4.49
SE WWRF	(MGD)	0.00	0.00	0.00	2.41	6.22	8.32	17.14
NE WWRF	(MGD)	0.00	0.00	0.00	3.81	0.00	0.00	0.00
COST OF ADDITIONAL TREATMENT CAPACITY								
REGIONAL WWTP	($/MGD)	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000
REGIONAL SATELLITE WWRF								
NORTH WWRF	($/MGD)	NA	$6,424,000	NA	NA	NA	NA	NA
NORTHWEST WWRF	($/MGD)	NA	NA	$5,442,000	NA	NA	NA	NA
SOUTH WWRF	($/MGD)	NA	$3,292,000	$3,292,000	NA	NA	NA	NA
CLOVIS SATELLITE WWRF								
NW WWRF	($/MGD)	NA	NA	NA	$8,563,000	$8,563,000	NA	$6,771,000
SE WWRF	($/MGD)	NA	NA	NA	$7,765,000	$5,108,000	$4,547,000	$3,669,000
NE WWRF	($/MGD)	NA	NA	NA	$6,872,000	NA	NA	NA
ANNUAL COST OPERATION & MAINTENANCE OF TRUNK SEWERS	(% CAP $)	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
AVERAGE FLOW RATE FOR PUMPS & FORCE MAINS								
SHEPHERD SERVICE AREA	(MGD)	0.00	1.02	0.00	1.02	1.02	1.02	1.02
HERNDON/SIERRA SERVICE AREAS	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	2.22
PEACH SERVICE AREA	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	2.98
FOWLER SERVICE AREA	(MGD)	0.00	0.00	0.00	0.00	0.00	0.00	7.09
ANNUAL COST O, M & R OF PUMP STATIONS & FORCE MAINS								
SHEPHERD SERVICE AREA	($/MGD)	NA	$140,000	NA	$69,000	$69,000	$122,000	$69,000
HERNDON/SIERRA SERVICE AREAS	($/MGD)	NA	NA	NA	NA	NA	NA	$109,000
PEACH SERVICE AREA	($/MGD)	NA	NA	NA	NA	NA	NA	$114,000
FOWLER SERVICE AREA	($/MGD)	NA	NA	NA	NA	NA	NA	$62,000
AVERAGE FLOW RATE FOR TREATMENT AND DISPOSAL FACILITIES								
REGIONAL WWTP	(MGD)	13.55	10.21	10.21	10.21	10.21	10.21	8.26
REGIONAL SATELLITE WWRF	(MGD)	0.00	3.34	3.34	0.00	0.00	0.00	0.00
CLOVIS SATELLITE WWRF								
NW WWRF	(MGD)	0.00	0.00	0.00	1.02	1.02	0.00	3.24
SE WWRF	(MGD)	0.00	0.00	0.00	1.13	2.32	3.34	12.39
NE WWRF	(MGD)	0.00	0.00	0.00	1.19	0.00	0.00	0.00
ANNUAL COST OPERATION, MAINTENANCE AND REPLACEMENT								
REGIONAL WWTP	($/MGD)	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000
REGIONAL SATELLITE WWRF	($/MGD)	NA	$254,000	$254,000	NA	NA	NA	NA
CLOVIS SATELLITE WWRF								
NW WWRF	($/MGD)	NA	NA	NA	$642,000	$642,000	NA	$371,000
SE WWRF	($/MGD)	NA	NA	NA	$652,000	$563,000	$401,000	$243,000
NE WWRF	($/MGD)	NA	NA	NA	$488,000	NA	NA	NA

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SECTION 9.
EVALUATION OF ALTERNATIVES

9.1 GENERAL

Alternatives were evaluated and rated based upon monetary and non-monetary factors, with the goal of providing a comprehensive numerical summary resulting from the rating process. The results of the evaluation and rating processes would then be used in providing recommendations to the City Council, and subsequently in the Council's process of informed decision making.

The overall structure of the scoring matrix, components to be evaluated, and relative weighting system to be employed were reviewed and approved in concept by the Clovis City Council at a progress meeting held in March, 1996.

9.2 ALTERNATIVES FOR WASTEWATER SERVICE FOR CLOVIS

Six alternative conceptual plans for ultimate wastewater service for the area within the boundaries of the 1993 Clovis General Plan were included in the scope of work for this study, as follows:

Alternative 1: All existing and future Clovis flows to be directed to an expanded Fresno-Clovis Regional Wastewater Treatment Plant (see Plate 1A and 1E)

Alternative 2A and 2B:

All existing and future Clovis flows to be directed to a combination of an expanded Fresno-Clovis Regional Wastewater Treatment Plant and new Fresno-Clovis Regional Satellite Wastewater Reclamation Facilities (WWRF's) located outside of the 1993 Clovis General Plan boundaries (see Plates 1B. 1C and 1E):

Alternative 2A: Expand Regional Plant and Construct New South and North Regional Satellite WWRF's

Alternative 2A: Expand Regional Plant and Construct New South and Northwest Regional Satellite WWRF's

Alternatives 3, 4 and 5:

Maximize service into the existing four regional trunk sewers, with the balance of future flow from development of the 1993 Clovis General Plan areas to be served by one or more proposed Clovis Satellite WWRF's:

Alternative 3: Three proposed Clovis Satellite WWRF'S, one located within or near each of the urban villages proposed on the 1993 Clovis General Plan (see Plates 1D and 1F)

Alternative 4: Two proposed Clovis Satellite WWRF'S, one located within or near the proposed Northwest urban village, and one located within or near the proposed Southeast urban village (see Plates 1D and 1G)

Alternative 5: One proposed Clovis Satellite WWRF, located within or near the proposed Southeast urban village (see Plates 1D and 1H)

Alternative 6: All existing and future Clovis flows, including those currently planned for service to the existing Fresno-Clovis regional system, to be directed to, and served by, two proposed Clovis Satellite WWRF'S, one located within or near the proposed Northwest urban village, and one located within or near the proposed Southeast urban village (see Plate 1I)

Alternatives 1 and 2 are totally dependent upon the regional system for service, whereas Alternatives 3, 4 and 5 are partially dependent upon the regional system. Alternative 6 is a "Clovis Only" alternative, independent of the regional system.

9.3 EVALUATION PARAMETERS

Component evaluation parameters conceptually approved by Council to be used in the rating process of the alternatives included the following:

- *Financial Impacts*

  The capital cost of construction of facilities within the 1993 Clovis General Plan Area; Clovis' share of the capital cost of regional system expansion; the annual cost of operations, maintenance and replacement; resultant effects on development fees and user charges.

- *Community Needs*

  The ability to meet the service needs of the General Plan; Clovis' control over its own destiny.

- *Public Acceptance*

  Appearance; noise and light; perception of potential health concerns; perception of potential degradation of water quality, air quality or property values.

- *Environmental Impacts*

  Impacts and mitigation measures; aesthetics.

- *Water Reclamation Benefits to Clovis*

  Potential for water transfers, trades or sales; beneficial use of reclaimed water within the planning area; groundwater recharge potential; potential for recreational benefits.

- *Reliability of Disposal Options*

  Availability of long term agreements; stability of source of disposal; stability of regulatory requirements.

- *Ease of Implementation*

  Contracts required with other agencies (i.e. City of Fresno, Fresno Irrigation District, Fresno Metropolitan Flood Control District); opportunities for staged construction and implemetation; timing as related to opportunities for staging.

- *Administrative Impacts (Ownership vs Partnership)*

  Staffing impacts; regulatory requirements (i.e. discharge requirements, industrial pretreatment program); risk management (exposure).

9.4 SCORING MATRIX COMPOSITION

Component evaluation parameters were arranged in a matrix, as indicated in Table 9-1, which includes assigned weight factors for each individual parameter, and a range of scale factors to be universally applied for each parameter.

TABLE 9-1

SCORING MATRIX FORMAT

(Please Note: A Higher Total Score Will Represent a Better Scored Alternative)

ITEM	WEIGHT FACTOR	SCALE FACTOR	MAXIMUM SCORE
FINANCIAL IMPACTS	6	1 TO 5	30
COMMUNITY NEEDS	6	1 TO 5	30
PUBLIC ACCEPTANCE	6	1 TO 5	30
ENVIRONMENTAL IMPACTS	5	1 TO 5	25
WATER RECLAMATION BENEFITS TO CLOVIS	5	1 TO 5	25
RELIABILITY OF DISPOSAL OPTIONS	5	1 TO 5	25
EASE OF IMPLEMENTATION	4	1 TO 5	20
ADMINISTRATIVE IMPACTS	3	1 TO 5	15
TOTAL			*200*

9.4.1 WEIGHT FACTOR

Weight factors were assigned to each component evaluation parameter on a scale of 1 to 6, with 6 being the highest relative weight possible. These weight factors are intended to provide a measure of relative importance from one evaluation parameter to another.

For instance, financial impacts, community needs and public acceptance (all with assigned weight factors of 6) are considered equal in importance to one another, but are each considered twice as important as administrative impacts (with an assigned weight factor of 3).

9.4.2 SCALE FACTOR

Scale factors are used to rate each alternative within a particular evaluation parameter. The scale factor may vary between 1 and 5, with 5 being the highest, or best possible relative rating for a particular evaluation parameter.

For example, within the parameter of financial impacts, the least expensive alternative would be rated with a higher scale factor than the most expensive alternative, with the actual scale factors assigned dependent on the difference between the cost of the alternatives, and how the costs of each relate to current costs of service. Scale factor definitions may be generally categorized as follows:

Scale Factor	Definition
5	Excellent
4	Good
3	Satisfactory
2	Fair
1	Poor

9.4.3 CALCULATION OF SCORES

For each alternative, the score for each particular component evaluation item is determined by multiplying the associated weight factor times the assigned scale factor, to arrive at the item score. The item scores for a particular alternative are then summed to arrive at the total relative score for that alternative. The total score for that alternative can then be compared with the total scores of the other alternatives as a measure of relative merit.

9.5 SCORING OF ALTERNATIVES BY EVALUATION PARAMETERS

Table 9-2 provides the scoring of each alternative studied, by parameter, and the total scoring of each alternative after considering all factors described. Table A9-1 in Appendix A9 provides the details of the scoring calculations.

It is not possible to develop a comprehensive scoring system that does not rely on at least some subjective judgement, particularly on the more abstract parameters. Further, any scoring system which assigns a relative weight factor to the scoring of each of the items might be designed somewhat differently by each participant, adding once again to the subjectivity of the process.

TABLE 9-2							
SCORING OF ALTERNATIVES BY EVALUATION PARAMETERS [1] (Please Note: A Higher Total Score Will Represent a Better Scored Alternative)							
ITEM	ALT. 1	ALT. 2A	ALT. 2B	ALT. 3	ALT. 4	ALT. 5	ALT. 6
FINANCIAL IMPACTS	6	30	30	12	18	24	12
COMMUNITY NEEDS	12	12	12	24	24	24	30
PUBLIC ACCEPTANCE	30	30	30	12	12	12	6
ENVIRONMENTAL IMPACTS	25	25	25	10	10	15	5
WATER RECLAMATION BENEFITS TO CLOVIS	5	10	10	20	20	20	25
RELIABILITY OF DISPOSAL OPTIONS	25	25	25	15	15	15	10
EASE OF IMPLEMENTATION	20	20	16	8	8	8	4
ADMINISTRATIVE IMPACTS	15	12	12	3	3	6	3
TOTAL SCORE	***138***	***164***	***160***	***104***	***110***	***124***	***95***

(1) Please refer to Table A9-1 in Appendix A9 for details of the scoring calculations.

Although the scoring system developed does require subjective judgement, both in weighting and scaling of items, the total scores resulting from the system do provide an indication of probable relative merit. This is particularly true of the extremes of the total scores, high versus low, and true to a lesser degree for scores that are relatively close. Alternatives with total score differences of less than 10 points should probably not be considered as having a significant difference in rating.

The rating of the alternatives by the system of scores produced by the evaluation parameters should only be considered as another piece of information in the decision making process, and final judgements should be made based upon all of the knowledge available.

9.5.1 DISCUSSION OF SCORING OF PARAMETERS

Following is a brief discussion of some of the thinking that went into the process of scoring the individual evaluation parameters.

9.5.1.1 *Financial Impacts*

The evaluation parameter "financial impacts" allowed probably the most objective scoring of any of the items of evaluation.

It could be argued that financial concerns are paramount, as is the case in most infrastructure projects. Their importance is demonstrated by the fact that the impact of cost is difficult to keep from overlapping into some of the other items of evaluation. For these reasons, relatively large scaling differences were used between alternatives with cost differences, even though the differences, in and of themselves, may not have been overwhelming.

Alternatives 2A and 2B, the regional satellite WWRF options, are the least costly of all of the alternatives studied (through year 2030), and were thus assigned high scores. Alternate 1 is the most costly through year 2030, and was assigned the lowest possible score. Alternatives 3 and 6 were given only slightly higher scores.

9.5.1.2 *Community Needs*

Each of the alternatives was designed so that, if carried out, it would meet the service needs of the Clovis General Plan. Control by Clovis over its own destiny, however, varied between the alternatives.

Alternative 6, if enacted, would allow total control by Clovis, and was thus assigned the highest possible score. Alternatives 1, 2A and 2B, if enacted, would continue all service through the regional system, and were thus assigned a low scale factor. Alternatives 3, 4 and 5, which provide for most future growth to be controlled by Clovis (but with considerable reliance upon the regional system for the core area) were given a relatively high scaling.

9.5.1.3 *Public Acceptance*

Public acceptance is another very important evaluation parameter. Virtually nothing can be accomplished successfully in major infrastructure development without public acceptance, if not public support. Scoring of this item was based upon acceptance, primarily, by Clovis' citizens, as opposed to the general public in the entire Fresno-Clovis community.

Public acceptance of Alternative 1 was given the highest possible score, since it is a continuation of an existing service which is now accepted. Alternatives 2A and 2B were also assigned the highest score, because the regional satellite facilities contemplated are located away from Clovis. Alternatives 3, 4, 5 and 6 were all assigned lower values, with Alternative 6 receiving the lowest possible score because of the scale of the facilities involved in that alternative.

The providing of information to the public can, over time, improve attitudes relative to wastewater treatment facilities and water reclamation/reuse. As water becomes even more valuable in the future, with inevitable regional population growth, the public's attitude toward recycled water, and the structural facilities necessary to process it, will probably improve, as it has in other arid areas of the state and nation.

Although the concept of utilizing reclaimed water for agriculture and landscape irrigation may be new compared with the immediate area's current practices, there is already a strong public interest in maintaining an overall groundwater balance for future domestic supply. This may help to mitigate some of the objection of using reclaimed water, in lieu of pumping like amounts from the underground.

9.5.1.4 *Environmental Impacts*

Scoring of this item was based largely upon environmental impacts within Clovis' planning area, as opposed to regional impacts, of enacting a particular alternative's wastewater treatment and reuse/reclamation/disposal plan. This was not meant as a rating mechanism for judging the overall environmental impacts of providing new wastewater service to outlying growth areas, as these impacts were addressed in the environmental impact report for the 1993 Clovis General Plan, and would be identical for all of the alternatives.

Alternative 1 was given the highest possible score (least impacts) for environmental impacts, since it is a continuation of an existing wastewater treatment and disposal service which is carried out away from Clovis. Alternatives 2A and 2B, although involving new facilities, were also assigned the highest score, because the regional satellite facilities contemplated are also located away from Clovis. Alternatives 3, 4, 5 and 6 were all assigned lower values, with Alternative 6 receiving the lowest possible score because of the scale of the facilities involved in that alternative.

Alternatives 3, 4, 5 or 6, if selected, would require an environmental impact report by the City of Clovis prior to initiating any satellite wastewater treatment and reclamation/reuse facilities. The usual environmental issues would have to be addressed. Major issues would probably include proximity to residences, odor control measures, biosolids disposal, treated water reuse, and others.

9.5.1.5 *Water Reclamation Benefits to Clovis*

Alternative 1 was given the lowest possible score for water reclamation benefits, inasmuch as it involves continuation of existing wastewater treatment and disposal at or near the existing regional plant Southwest of Fresno and distant downslope from Clovis (and in the Southwesterly portion of the Fresno Irrigation District). Alternatives 2A and 2B were assigned somewhat higher scores, even though the regional satellite facilities contemplated are also located away from Clovis. Establishment of the regional satellite facilities in areas useful to the Fresno Irrigation District may allow negotiation with them for surface water for Clovis in exchange for Clovis' share of reclaimed water.

Alternatives 3, 4, 5 and 6 were all assigned high values, with Alternative 6 receiving the highest possible score because all of Clovis' water would be controlled by Clovis. Alternatives 3, 4 and 5 were considered equal, and rated only slightly lower than Alternative 6, because direct reuse of quantities of reclaimed water in excess of the available quantity from these three alternatives would be difficult.

9.5.1.6 *Reliability of Disposal Options*

Scoring of this item was based primarily upon reliability of each alternative plan's disposal options to the City of Clovis, as opposed to the region as a whole.

Alternative 1 was given the highest possible score for reliability insofar as Clovis is concerned, since it involves a continuation of existing disposal practices at the regional plant augmented by expansion recommended in the regional wastewater master plan update. Alternatives 2A and 2B were also assigned the highest score, because the regional satellite facilities contemplated would also be operated by the regional authority.

Alternatives 3, 4, 5 and 6 were all assigned only somewhat lower values, with Alternative 6 receiving the lowest score of the four because of the scale of the facilities involved in that alternative. Alternatives 3, 4 and 5 were considered equal for this rating. Although all four of these alternatives require long term agreements (and extensive permitting) for continued operation, and rely on the stability of regulatory requirements, reliability of the disposal methods recommended is considered achievable.

9.5.1.7 *Ease of Implementation*

Scoring of this item was based primarily upon the ease of implementation of each alternative plan to the City of Clovis, as opposed to the region as a whole.

Alternative 1 was given the highest possible score for ease of implementation insofar as Clovis is concerned, since it involves a continuation of existing wastewater service at the regional plant augmented by expansion recommended in the regional wastewater master plan update. It received this score in spite of the difficulty of servicing the growth areas with the required long trunk sewers, which would have to be jointly constructed with Fresno.

Alternatives 2A was also assigned the highest score, because not only would the regional satellite facilities contemplated be constructed and operated by the regional authority, but the Northwest Regional Satellite WWRF would be located within a reasonable distance of Clovis and transmission facilities required to serve the Northwest area would require only Clovis' participation. Alternative 2B was assigned a slightly lower score, because the Northwest Regional Satellite WWRF would be located at a much farther distance from Clovis, and would require a longer trunk sewer, constructed jointly with Fresno, to service Clovis Northwest growth area.

Alternatives 3, 4, 5 and 6 were all assigned lower values, with Alternative 6 receiving the lowest possible score because of the scale of the facilities involved in that alternative. Alternatives 3, 4 and 5 were considered equal for this rating. The lower scores for these for these four alternatives were based largely on the potential difficulty in implementing satellite WWRF's in Clovis. This outweighed the benefits of avoiding the construction of long regional trunk sewers.

9.5.1.8 *Administrative Impacts*

Alternative 1 was given the highest possible score (least impacts), since it is a continuation of existing wastewater treatment and disposal services which are carried out by the regional authority. Alternatives 2A and 2B were assigned only a slightly lower score, because the regional satellite facilities contemplated would also be operated by the regional authority. The slightly lower score reflects some increase in administrative load by virtue of the addition of new regional sites, and Clovis staff's involvement in that process.

Alternatives 3, 4, 5 and 6 were all assigned lower values, with Alternative 3 and 4 receiving the lowest possible score because of the number of Clovis satellite facilities involved. Alternative 6 also received the lowest possible score because of the scale of the facilities involved in that alternative. Alternative 5 was rated slightly above the lowest possible score, because it involves only one site.

SECTION 10.
IMPLEMENTATION ISSUES

10.1 GENERAL

Implementation of a plan for wastewater service will vary significantly depending upon the alternative selected. Alternatives 1, 2A and 2B may be implemented much as the existing system has been, by joint construction of regional facilities and incremental additions to the collection system in Clovis. Alternatives 3, 4, 5 or 6, on the other hand, will require the City of Clovis to embark on an extensive process of negotiating (and consummating) agreements and obtaining necessary permits.

Included in this section is a brief overview of the major implementation issues involved, particularly with respect to those alternatives related to potential Clovis satellite reclamation facilities.

10.2 IMPLEMENTATION ISSUES FOR PLANS INVOLVING POTENTIAL CLOVIS SATELLITE WASTEWATER RECLAMATION FACILITIES

Alternatives 3, 4, 5 or 6 will require extensive environmental and permitting processes to allow the eventual construction of potential Clovis satellite wastewater reclamation facilities.

10.2.1 ENVIRONMENTAL PROCESS

Under the California Environmental Quality Act (CEQA), an environmental impact report (EIR) would be required for the siting of any new satellite wastewater reclamation facility. If the concept represented by Alternatives 3, 4, 5 or 6 is contemplated by Clovis as its designated Wastewater Master Plan, a Program Environmental Impact Report should be prepared.

A Program EIR would describe the various alternatives and characterize their environmental impacts, leading to a recommendation of a preferred project. The Program EIR could then serve as the basis for evaluation of site specific issues for the various elements of the master plan. This approach should avoid repetitive discussions of matters common to the various facilities in the plan, such as groundwater concerns, use of reclaimed water for irrigation purposes, biosolids disposal, etc.

Particular issues of concern to be addressed in the environmental process will include such matters as land use and property values, potential odors, health, noise, light, aesthetics, water quality, fish and wildlife, and air quality.

The Program EIR environmental process is estimated to require between one and two years to complete.

10.2.2 REGULATORY REQUIREMENTS AND PERMITS

A general overview of the primary applicable regulations and permits requirements relating to the alternatives which involve potential Clovis satellite wastewater treatment and reclamation facilities is presented below. Inasmuch as the regulatory processes involved with such facilities are constantly changing, this information is not intended to be a comprehensive outline of necessarily all of the regulatory processes and approvals that may be involved in satellite facilities at the time they are actually to be developed. The information presented is, rather, a guide to the general scope of the permitting process and basis therefor.

10.2.2.1 *BASIN PLANS*

The State of California, pursuant to the California Water Code and the Federal Clean Water Act, adopted sixteen water quality control plans in 1975, entitled basin plans. These basin plans designate beneficial uses of water within an area to be protected, water quality objectives to protect those uses, and various implementing policies. The basin plans are considered regulatory references for meeting state and federal requirements for water quality, and establish standards for groundwater as well as surface water. These plans contain language that automatically incorporate all other federal and state regulations applicable to the waters of the basin.

Clovis' planning area is located within the "Tulare Lake Basin" plan. The Tulare Lake Basin Plan does not prohibit, or discourage, satellite wastewater treatment plants. It does, however, strongly encourage reclamation and reuse of the treated wastewater wherever feasible. Water quality objectives of the plan include control of salinity increases, and control of concentrations of chemical constituents.

The San Joaquin River, which receives discharge from the Fresno Irrigation District's canal system, is located within the "Sacramento River and San Joaquin River Basin" plan. The basin plan affecting the San Joaquin River contains water quality objectives including specific salinity criteria for the San Joaquin River between Friant and the Mendota Pool.

Potential Clovis satellite wastewater reclamation facilities would need to conform to the applicable basin plans, as regulated by the California Regional Water Quality Control Board (RWQCB). The Tulare Lake Basin Plan would likely be the predominant plan affecting potential Clovis satellite wastewater reclamation facilities, although the San Joaquin River plan could affect discharges to the Fresno Irrigation District (and the river itself, if proposed).

10.2.2.2 *REGULATORY AGENCIES WITH JURISDICTION OVER RECYCLED WATER*

The major state agencies having jurisdiction over water recycling in our area include the State Water Resources Control Board, the California Regional Water Quality Control Board, Central Valley Region (RWQCB), and the California Department of Health Services (DHS). Discharges to surface water courses would also involve the Department of Fish and Game (DFG).

In addition to the state agencies, there may also be involvement by County and local agencies. Currently, there are no federal regulations directly relative to water recycling, although the federal Clean Water Act and National Pollutant Discharge Elimination System apply to discharges to surface waters (such as rivers, canals and other watercourses). The United States Environmental Protection Agency (U.S.EPA) also has set forth regulations for biosolids disposal and reuse.

The California Department of Health Services, the State Water Resources Control Board and the Regional Water Quality Control Board work together through a memorandum of agreement to develop discharge permits for water recycling projects. The California Department of Health Services generally interprets the laws applicable to recycling and makes recommendations on particular projects to Regional Water Quality Control Board, which is overseen by the State Water Resources Control Board. The Regional Water Quality Control Board has the responsibility for issuing permits for water recycling projects.

Any potential Clovis satellite wastewater reclamation facility would require waste discharge requirements and a federal National Pollutant Discharge Elimination System (NPDES) permit from the California Regional Water Quality Control Board (RWQCB).

10.2.2.3 *REGULATIONS PERTAINING TO RECYCLED WATER*

Regulations governing wastewater treatment processes and reclaimed water quality are contained in Title 22, Division 4, of the California Code of Regulations. These regulations include methods of treatment, operational and reliability requirements, allowable uses of recycled water, sampling and analysis, general requirements of design, and preparation of required engineering reports.

The California Department of Health Services has also issued a document entitled "Guidelines for Use of Reclaimed Water". Recommendations of the California Department of Health Services to the Regional Board include provisions from the guidelines that subsequently become part of the permit for water recycling projects. The guidelines are important supplemental documents which expand on the law and detail appropriate recycled water uses and requirements.

Groundwater recharge criteria is currently governed by draft regulations of the California Department of Health Services entitled "Proposed Regulations for Groundwater Recharge with Reclaimed Municipal Wastewater". This document outlines proposed standards for treatment processes, effluent quality, dilution requirements, depths to groundwater, time of residence underground, horizontal distance to nearest domestic wells, and other factors.

Although the draft groundwater recharge regulations are not yet law, the Department of Health Services employs the provisions of the draft regulations in their recommendations to the Regional Water Quality Control Board relative to any project proposing to utilize recycled water for groundwater recharge.

Although the use of reclaimed water for industrial uses is not specifically addressed in the existing regulations, it is allowed when the water quality is appropriate to the use of the reclaimed water, subject to environmental health concerns.

The waste discharge requirements necessary from the California Regional Water Quality Control Board for the establishment of any potential Clovis satellite wastewater reclamation facility would include provisions pursuant to the above regulations and guidelines. The advanced treatment processes recommended in this report for potential Clovis satellite wastewater reclamation plants should qualify the reclaimed water for virtually unlimited irrigation uses, and for groundwater recharge under the conditions set forth in the draft regulations.

10.2.2.4 *NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)*

Federal requirements under Code of Federal Regulations 40, Part 122, requires NPDES permits for discharges to surface waters, such as rivers, canals and other watercourses. These permits contain requirements relative to water quality and toxicity when the discharge has a reasonable potential for causing instream toxicity. Such permits are issued by the California Regional Water Quality Control Board with U.S.EPA input.

Conceptual plans for all potential Clovis satellite wastewater reclamation facilities contemplate at least a portion of their treated water to be discharged to canals and other watercourses, and such facilities would thus require an NPDES permit (together with the previously described waste discharge requirements for reclaimed water use) from the California Regional Water Quality Control Board.

10.2.2.5 *CALIFORNIA DEPARTMENT OF FISH AND GAME*

Issues of concern to the California Department of Fish and Game relative to discharges of reclaimed water to watercourses, such as toxicity, dissolved oxygen, residual chlorine, etc., would be included in the NPDES permit issued by the California Regional Water Quality Control Board.

10.2.2.6 *BIOSOLIDS MANAGEMENT*

The characteristics of biosolids which make them acceptable for reuse options are set forth in Federal and evolving state, regional and local regulations. National minimum standards for sludge disposal and reuse are set forth in 40 CFR, Part 503, enacted pursuant to the federal Clean Water Act.

For purposes of this study, it was assumed that biosolids would be managed by contracting with private sources for removal, further processing, and reuse. Other options, such as use for landfill cover, may also be possible.

10.2.2.7 *AIR QUALITY ISSUES*

Air pollution control of new facilities would be generally under the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District. The District administers regulations that apply to stationary and mobile sources that emit air contaminants in the San Joaquin Valley air basin.

The District issues Permits to Construct and Permits to Operate, both being required for any new source. These permits contain conditions that require conformance with air pollution control regulations. Potential sources of air pollution on satellite reclamation facilities include engine emissions, odors, aerosols, architectural coatings, gasoline transfer, solvents, dust, etc. Prior to issuing permits, a risk assessment would be performed by the District.

Any potential Clovis satellite wastewater reclamation facility would require a Permit to Construct and Permit to Operate from the San Joaquin Valley Unified Air Pollution Control District.

10.2.2.8 *OTHER PERMITS*

A permit to connect would be required from the Fresno Irrigation District, and from the Fresno Metropolitan Flood Control District, for watercourses under their jurisdiction. These permits would probably form a part of long term agreements between Clovis and these agencies, as described in Section 10.2.3. Channel improvements may be required as a condition of the permits for certain watercourses. Any water quality requirements of the Fresno Metropolitan Flood Control District would normally be addressed by the California Regional Water Quality Control Board in the NPDES Permit.

A federal NPDES construction permit would be required if more than five acres of land is to be disturbed during construction of a facility. This permit is designed to prevent surface water pollution resulting from construction activities.

Other permits typically required for construction projects would also apply.

10.2.3 LONG TERM AGREEMENTS

For any of the alternatives involving Clovis satellite plants, long term agreements with the Fresno Irrigation District and the Fresno Metropolitan Flood Control District will be necessary to assure a reliable source of reclamation/reuse/disposal, particularly during the winter months when landscape irrigation requirements are minimal.

10.2.3.1 *FRESNO IRRIGATION DISTRICT (FID)*

In addition to a permit to connect, a long term agreement would need to be negotiated with the Fresno Irrigation District. The agreement should provide for the Fresno Irrigation District to accept into its system of canals and associated watercourses fully treated and disinfected reclaimed water from Clovis' satellite wastewater reclamation facilities, subject to a number of conditions.

The conditions would probably concern the following:

- Quality of the reclaimed water
- Water accepted by FID only after demand from direct users of reclaimed water were satisfied
- On-site storage would need to be provided for minimum of two-days satellite plant outflow, for offloading during peak storm events and canal maintenance
- FID would control the destination of the flow between the multiple potential points of discharge
- FID may require channel improvements where channel capacity is inadequate

The agreement should also address the issue of water exchange, wherein Clovis would receive surface water from FID in exchange for fully treated and disinfected reclaimed water from Clovis, at an exchange rate to be determined.

The agreement should be for a extended length of time, at least 20 years, to provide assurance of a stable, long term source of reclamation/reuse/disposal. This would also provide adequate lead time for renegotiating extensions, or other arrangements.

10.2.3.2 *FRESNO METROPOLITAN FLOOD CONTROL DISTRICT (FMFCD)*

Similar to FID, a long term agreement will probably be required with the Fresno Metropolitan Flood Control District, in addition to a permit to connect. FMFCD and FID have overlapping rights and responsibilities in many of the area's watercourses and canals.

The conditions to be addressed in the agreement are anticipated to be similar to the FID conditions. Coordination of control functions relative to the destination of flow would need to be worked out between the agencies involved.

10.2.4 ACCOMPLISHING THE DIRECT REUSE OF RECLAIMED WATER

If Clovis satellite wastewater reclamation facilities are to be undertaken, measures may need to be to taken to encourage the direct use of reclaimed water from these facilities. This could take the form of incentives, or requirements, or a combination of both. Municipal facilities such as parks, beltways, median strips, etc., should, as a matter of City policy, be irrigated with reclaimed water, wherever feasible.

A strong incentive to potential institutional, industrial and direct agricultural users would be a reduced water rate for use of reclaimed water as opposed to domestic water. Although the magnitude of a successful incentive would be dependent upon several factors, including public attitudes and the cost of water, discounted rates in other areas using reclaimed water for institutional customer landscaping and industrial uses are often 70 to 80% of the domestic rate. Greater discounts, or even little or no charge for the water, may be required locally to provide an effective incentive, particularly for agriculture.

An alternative for accomplishing direct use of reclaimed water, which might be considered particularly if the incentive program were not successful, would be the requirement for new institutional developments, and/or new industrial developments of a certain magnitude, to utilize reclaimed water for landscape irrigation. Where parks and sizeable landscaped areas are required as conditions of approval for residential development, reclaimed water systems could also be incorporated.

10.2.5 IMPLEMENTATION SUMMARY

Table 10-1 provides a general summary of major regulatory permits, agreements and other measures required for implementing potential Clovis satellite wastewater reclamation facilities. Other permits, agreements, or actions beyond those itemized may be required.

10.3 STAGING OF CONSTRUCTION

Opportunities exist (to varying degrees) within each alternative for the staging of construction of required facilities.

Satellite wastewater reclamation facilities, of the type recommended, have major components which are readily constructed in modules. Some elements of the plant (outfall facilities and control buildings for example), must be constructed with the initial phase. Required redundancies may also significantly affect the initial phase. The first phase of a multi-phase satellite wastewater plant is virtually always more expensive, per gallon of capacity, than subsequent phases.

The facility is normally constructed to a capacity which will service developing areas over a planned interval, and then subsequent phases are constructed as the capacity of the facility is approached.

Regional conveyance facilities, for the most part, do not lend themselves to phasing when considering Clovis' needs. Inasmuch as Clovis is on the upstream end of the regional system, trunk sewers must be constructed in their entirety from Clovis to the point of discharge (be it the Regional WWTP or Regional Satellite WWRF's) in order to provide capacity to Clovis. There is no economy in constructing multiple parallel lines in lieu of one larger trunk sewer.

TABLE 10-1

SUMMARY OF MAJOR PERMITS, AGREEMENTS AND OTHER MEASURES REQUIRED FOR IMPLEMENTING POTENTIAL CLOVIS SATELLITE WASTEWATER RECLAMATION FACILITIES

REQUIRED ITEM	PRIMARY AGENCY	COMMENT
Environmental Impact Report	City of Clovis	Program EIR Recommended
Waste Discharge Requirements	California Regional Water Quality Control Board, Central Valley Region	Water Quality Requirements Water Reuse Requirements
NPDES Permit (for Discharge)	California Regional Water Quality Control Board, Central Valley Region	Water Quality Requirements
NPDES Permit (for Construction Activities)	California Regional Water Quality Control Board, Central Valley Region	Water Quality Requirements for Construction Activities
Permit to Construct Permit to Operate	San Joaquin Valley Unified Air Pollution Control District	Air Quality Requirements
Long Term Agreement and Permit to Connect	Fresno Irrigation District	Water Reuse and Water Exchange
Long Term Agreement and Permit to Connect	Fresno Metropolitan Flood Control District	Overlapping Jurisdiction with FID on Watercourses
Institute Incentives and/or Requirements for Direct Water Reuse in Clovis	City of Clovis	Institutional, Major Industrial and Agricultural Users
Other Permits or Agreements	As Required	Dynamic Regulatory Process

Future major conveyance facilities required within Clovis may be incrementally constructed, except in cases where allowed development is remote from existing trunk sewers. In many cases, development tends to occur where services are nearby.

The estimates of cost presented in Section 8 include phasing commensurate with anticipated rates of growth in the planning area. The costs of each alternative reflect the effects of anticipated phasing.

10.4 LEGAL CONSIDERATIONS RELATING TO CLOVIS' PARTICIPATION IN THE REGIONAL SYSTEM

Clovis' legal counsel was consulted relative to joint powers agreements which exist between the Cities of Clovis and Fresno, and possible legal ramifications which might affect implementation of any of the studied alternatives. The conclusions of Mr. Thomas J. Riggs, of the firm of Lozano Smith Smith Woliver & Behrens, are summarized as follows:

1. Clovis has an irrevocable right to purchase increased capacity in the regional system, and Fresno has a reciprocal responsibility to provide Clovis such opportunity.

2. Except for very limited exceptions for two specific areas currently served by the existing sewer system (a single parcel on Winery Avenue, and a particular area in South Clovis near Clovis Avenue), there is nothing in the joint powers agreements which limits service in particular trunk sewers to specific geographic areas.

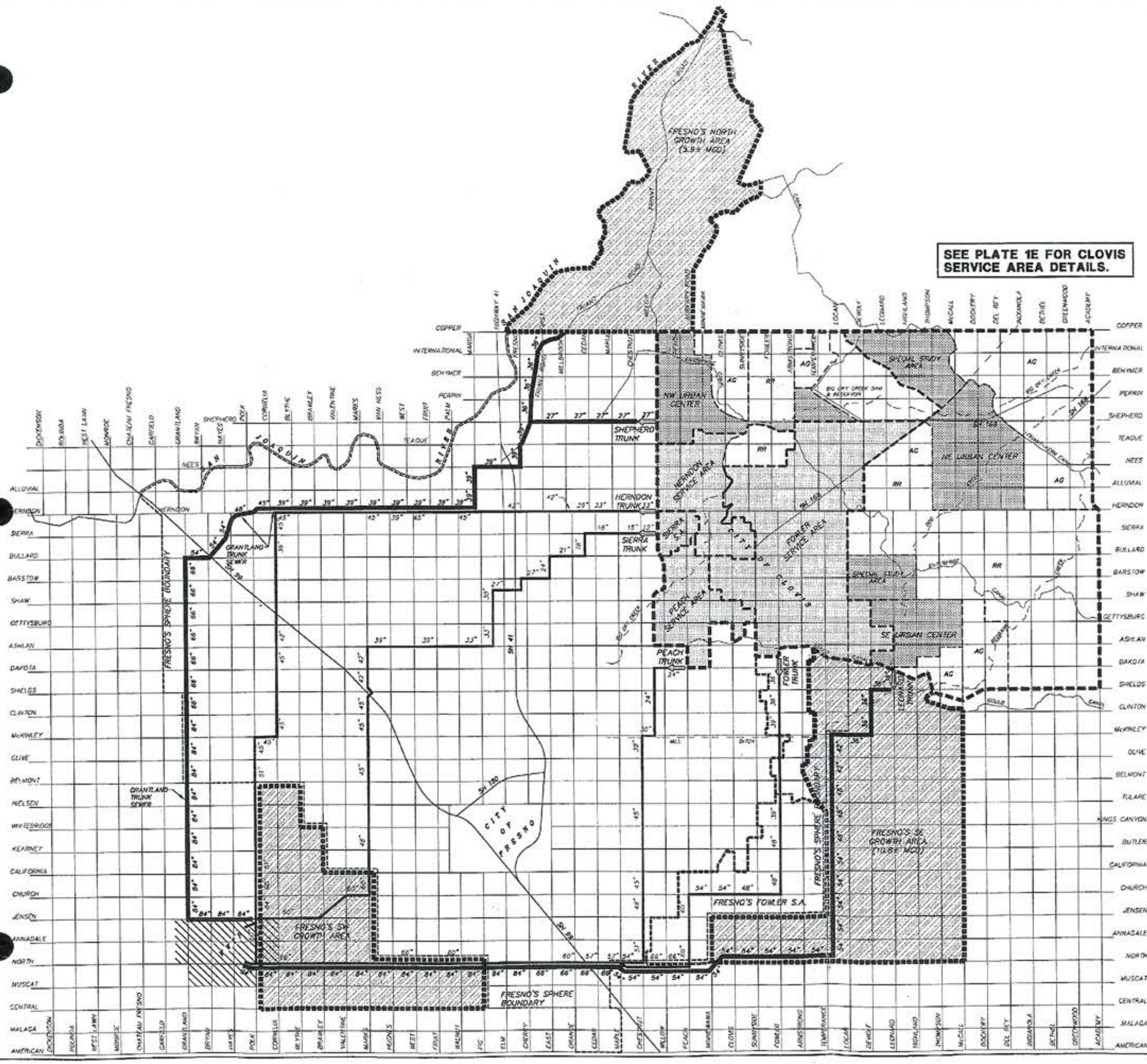
3. As to Clovis' rights in the decision making process of the regional authority, the joint powers agreements are silent (with the exception of general references) as to the decision making process related to future facilities. All that the parties have agreed to is that Fresno generally has been designated to be the principal planning agency and both cities have obligated themselves to cooperate and communicate with one another regarding the system. If Fresno does undertake planning efforts, it is obligated to communicate with the City of Clovis. The City of Clovis is, of course, not obligated to agree with any decisions made by the City of Fresno. The City of Clovis, also, is free to undertake its own planning efforts.

4. Relative to Clovis' ability to enter into a separate agreement with the Fresno Irrigation District (FID) for the delivery of reclaimed water through a Fresno-Clovis regional satellite plant, while retaining ownership rights to Clovis' share of the reclaimed water the regional satellite plant produces, the agreements are silent. Any such arrangements would be the subject of future contract negotiations between the Cities. If the City of Clovis desires to enter into an agreement with FID and to retain ownership of its reclaimed water, that is the position it should assert in future negotiations. Absent any future agreement to the contrary from Fresno, Clovis is free to enter into agreements with other agencies.

5. Clovis is committed through its joint powers agreements with the City of Fresno to cooperate in maintaining an environmentally suitable and physically and financially sound sewerage system with respect to existing flows. In the absence of a technical necessity to send the Clovis flow through the regional system to accomplish same, Clovis is under no obligation to continue discharging its existing flow to the regional system, even though the City of Fresno has been designated by the Fresno County Board of Supervisors as the "chief sewering agent for the Fresno-Clovis metropolitan area". As to the discharge of future flows, this would be the subject of future contract negotiations and Clovis is under no present obligation as to how it must handle such flows.

6. As to legal ramifications that could result in potential additional costs to Clovis for unused regional facilities, should Clovis withdraw from the regional system, Clovis does have certain obligations. Over the years, Clovis has invested substantial sums of money in the regional system. Were it to withdraw its discharge from the system, Fresno would be under no obligation to repay Clovis' investment. In addition, both Clovis and Fresno have incurred bonded indebtedness in connection with the system. Clovis has obligated itself to repay its portion of such indebtedness, whether or not Clovis continues to utilize the system.

PLATES



REGIONAL PERSPECTIVE

ALTERNATIVE 1
ALL FLOWS TO EXPANDED REGIONAL WWTP

LEGEND

- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF CLOVIS STUDY AREA
- BOUNDARY OF TRUNK SEWER SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- FRESNO GROWTH AREA BOUNDARY
- FRESNO SPHERE OF INFLUENCE BOUNDARY
- EXISTING REGIONAL TRUNK SEWER
- PROPOSED NEW REGIONAL TRUNK SEWER
- EXISTING CLOVIS SERVICE AREAS
- FUTURE CLOVIS SERVICE AREAS UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- FUTURE FRESNO GROWTH SERVICE AREAS UNDER FRESNO'S GENERAL PLAN UPDATE
- EXISTING OR PROPOSED REGIONAL TRUNK SEWER AT POINT OF EXIT FROM CLOVIS

SEE PLATE 1E FOR CLOVIS SERVICE AREA DETAILS.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA

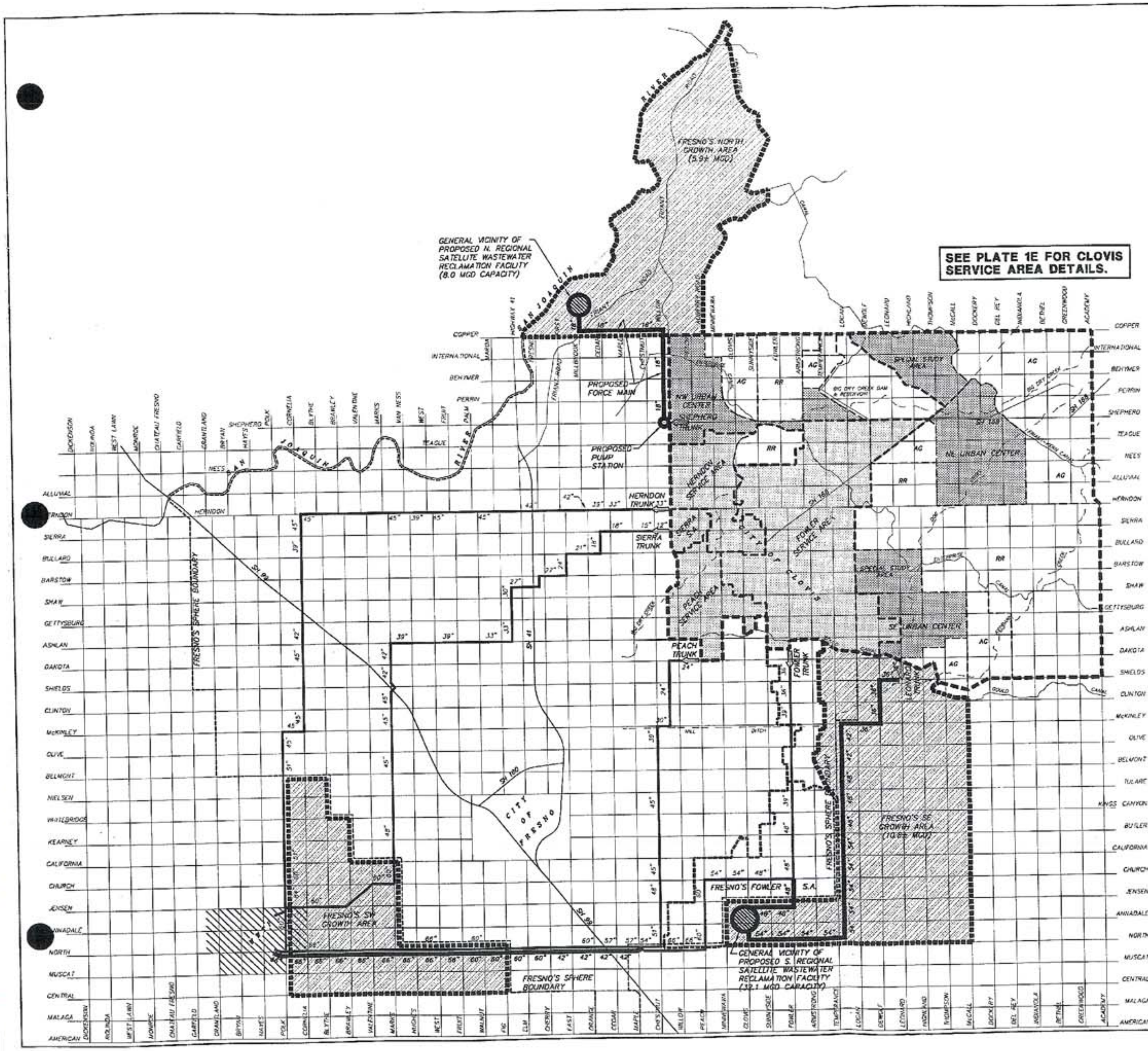
In Conjunction With:

NBS/LOWRY ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

SCALE: 1" = 12,000'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617RGL1.DWG

NOVEMBER 13, 1996 | Page P1 | **PLATE 1A**



REGIONAL PERSPECTIVE

ALTERNATIVE 2A

ALL FLOWS TO EXPANDED REGIONAL WWTP AND NEW REGIONAL SATELLITE WWRF'S [NORTH PLANT OPTION]

LEGEND

- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF CLOVIS STUDY AREA
- BOUNDARY OF TRUNK SEWER SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- FRESNO GROWTH AREA BOUNDARY
- FRESNO SPHERE OF INFLUENCE BOUNDARY
- 48" EXISTING REGIONAL TRUNK SEWER
- 48" PROPOSED NEW REGIONAL TRUNK SEWER
- EXISTING CLOVIS SERVICE AREAS
- FUTURE CLOVIS SERVICE AREAS UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- FUTURE FRESNO GROWTH SERVICE AREAS UNDER FRESNO'S GENERAL PLAN UPDATE
- EXISTING OR PROPOSED REGIONAL TRUNK SEWER AT POINT OF EXIT FROM CLOVIS

SEE PLATE 1E FOR CLOVIS SERVICE AREA DETAILS.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

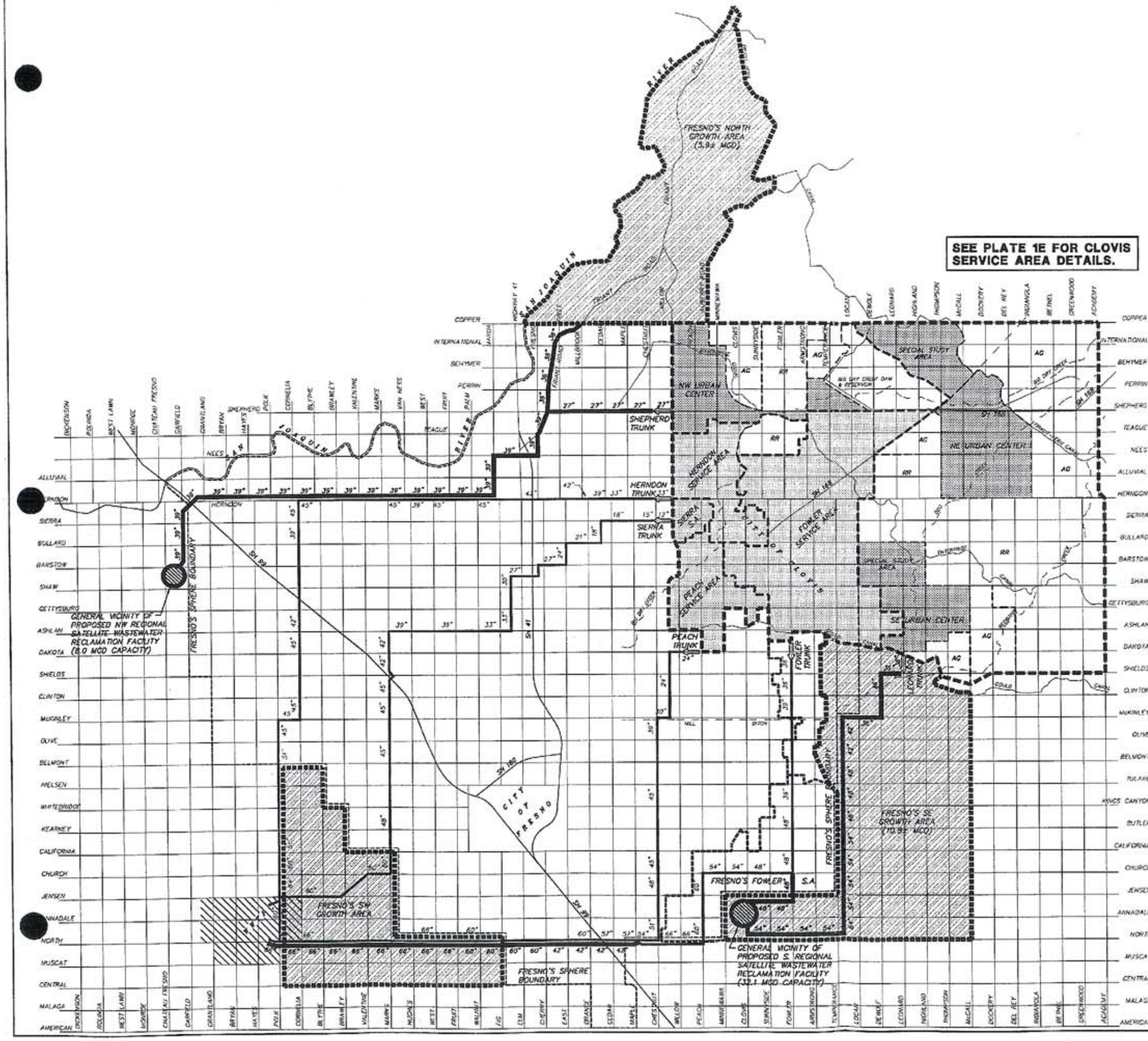
BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

SCALE: 1" = 12,000'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617REG2.DWG

NOVEMBER 13, 1996 | Page P2 | **PLATE 1B**



REGIONAL PERSPECTIVE

ALTERNATIVE 2B

ALL FLOWS TO EXPANDED REGIONAL WWTP AND NEW REGIONAL SATELLITE WWRF'S (NORTHWEST PLANT OPTION)

LEGEND

- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF CLOVIS STUDY AREA
- BOUNDARY OF TRUNK SEWER SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- FRESNO GROWTH AREA BOUNDARY
- FRESNO SPHERE OF INFLUENCE BOUNDARY
- 48" EXISTING REGIONAL TRUNK SEWER
- 48" PROPOSED NEW REGIONAL TRUNK SEWER
- EXISTING CLOVIS SERVICE AREAS
- FUTURE CLOVIS SERVICE AREAS UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- FUTURE FRESNO GROWTH SERVICE AREAS UNDER FRESNO'S GENERAL PLAN UPDATE
- EXISTING OR PROPOSED REGIONAL TRUNK SEWER AT POINT OF EXIT FROM CLOVIS

SEE PLATE 1E FOR CLOVIS SERVICE AREA DETAILS.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

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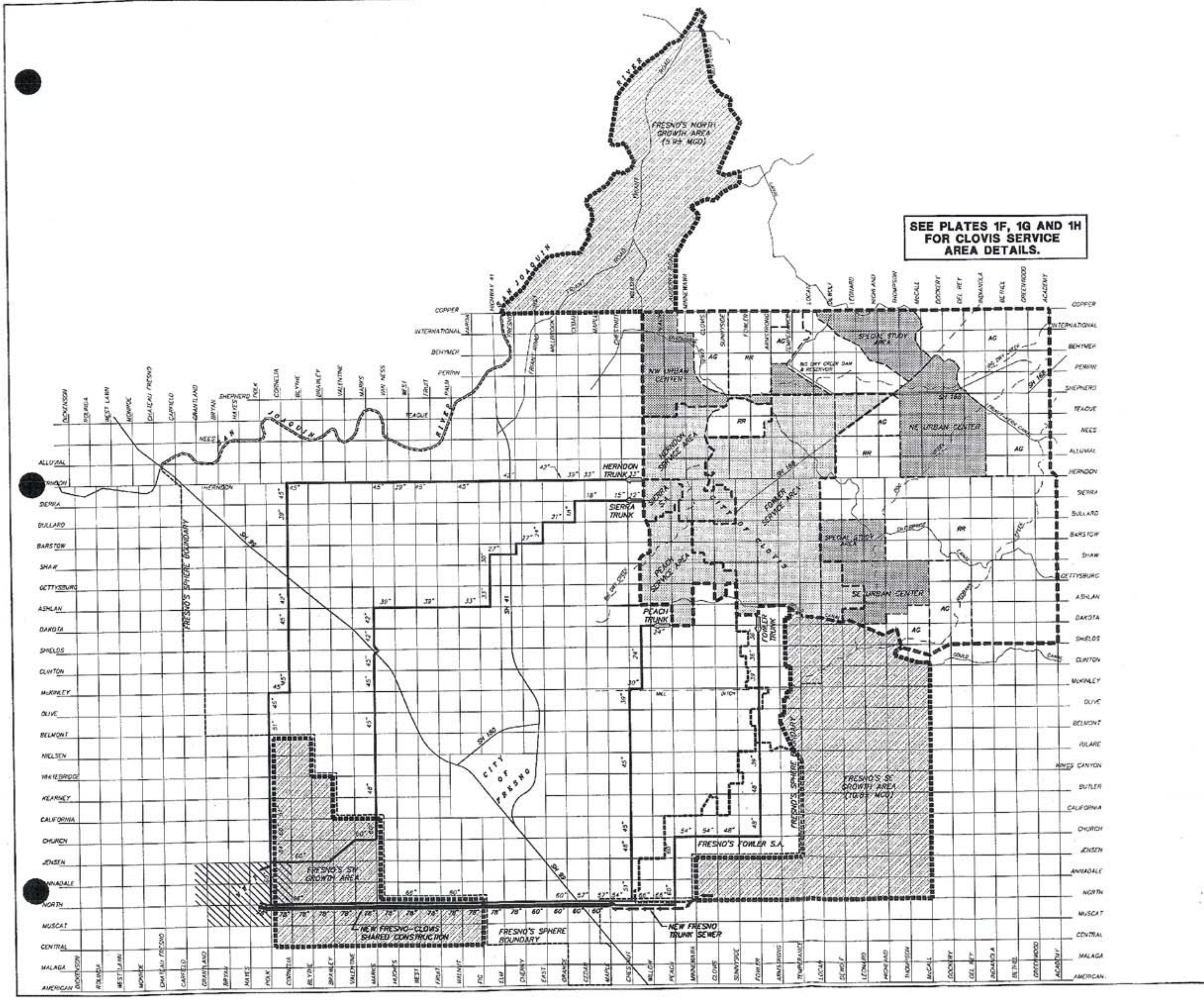
SCALE: 1" = 12,000'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617REG3.DWG

NOVEMBER 13, 1996 | Page P3 | PLATE 1C



REGIONAL PERSPECTIVE

ALTERNATIVES 3, 4 AND 5

ALL CURRENT TRUNK SEWER SERVICE AREA FLOWS TO EXPANDED REGIONAL WWTP; GP EXPANSION AREA FLOWS TO CLOVIS SATELLITE WWRF(S)

LEGEND

- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF CLOVIS STUDY AREA
- BOUNDARY OF TRUNK SEWER SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- FRESNO GROWTH AREA BOUNDARY
- FRESNO SPHERE OF INFLUENCE BOUNDARY
- 45" EXISTING REGIONAL TRUNK SEWER
- 48" PROPOSED NEW REGIONAL TRUNK SEWER
- EXISTING CLOVIS SERVICE AREAS
- FUTURE CLOVIS SERVICE AREAS UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- FUTURE FRESNO GROWTH SERVICE AREAS UNDER FRESNO'S GENERAL PLAN UPDATE
- EXISTING REGIONAL TRUNK SEWER AT POINT OF EXIT FROM CLOVIS

ALTERNATIVE 3:
SEE PLATE 1F FOR CLOVIS SERVICE AREA DETAILS.

ALTERNATIVE 4:
SEE PLATE 1G FOR CLOVIS SERVICE AREA DETAILS.

ALTERNATIVE 5:
SEE PLATE 1H FOR CLOVIS SERVICE AREA DETAILS.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA

In Conjunction With:

NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

0 3,000 6,000 12,000 SCALE IN FEET

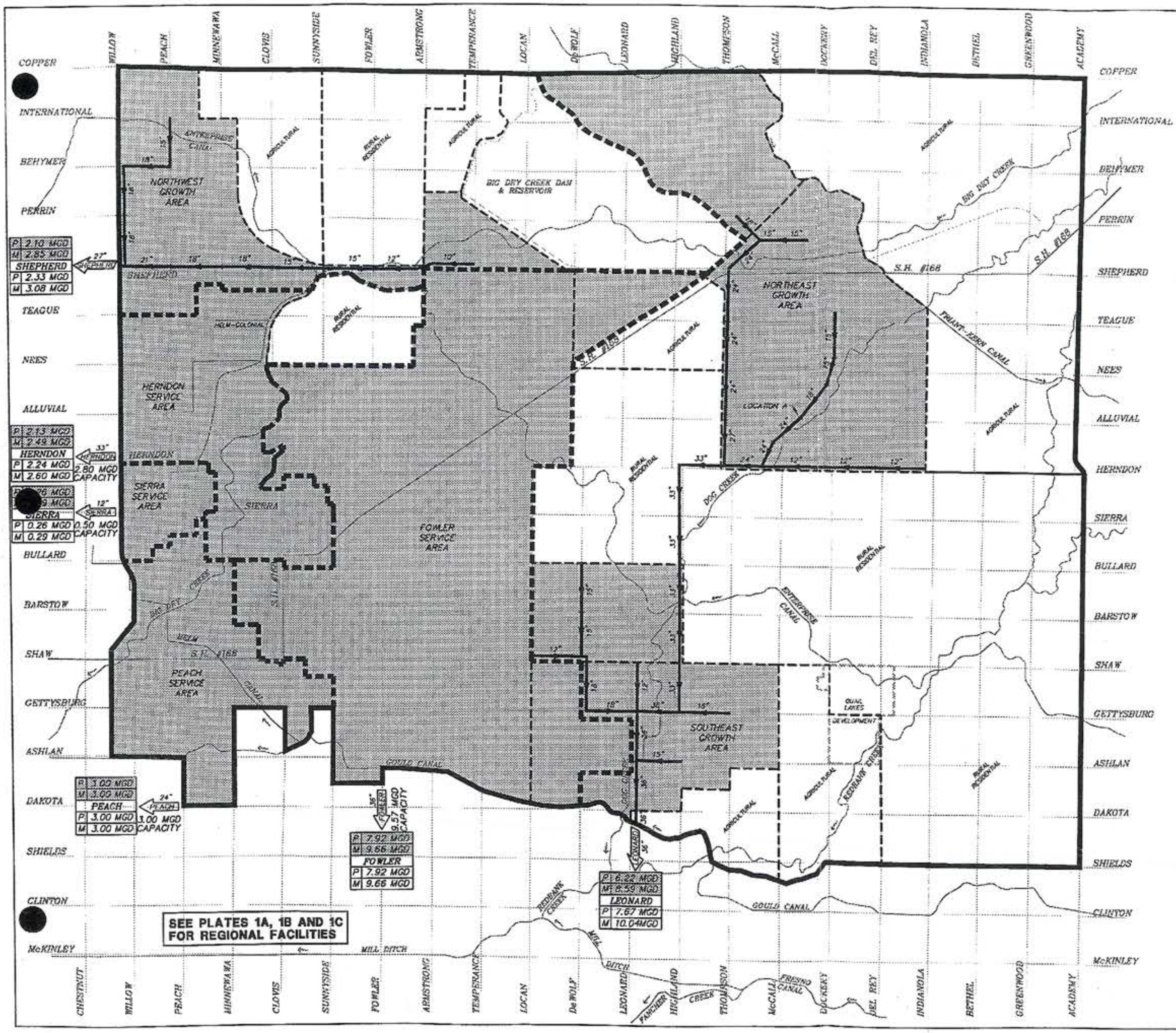
SCALE: 1" = 12,000'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617REG4.DWG

NOVEMBER 13, 1996 | **Page P4** | **PLATE 1D**

PROPOSED SERVICE AREA BOUNDARIES AND MAJOR FACILITES

ALTERNATIVES 1 & 2
ALL FLOWS TO REGIONAL SYSTEM



LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- TRUNK SEWER SERVICE AREA BOUNDARY
- SUB-SERVICE AREA BOUNDARY
- AREAS REQUIRING SERVICE UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- TOTAL 15.87 MGD CAPACITY — EXISTING REGIONAL TRUNK SEWER, WITH DESIGN CAPACITY (AVERAGE DAILY ANNUAL FLOW)
- 24" — PROPOSED CLOVIS MAJOR SEWER
- LEONARD — PROPOSED REGIONAL TRUNK SEWER

P	21.63 MGD	PROJECTED AVERAGE DAILY FLOW, SHADED AREAS
M	25.88 MGD	MAXIMUM AVERAGE DAILY FLOW, SHADED AREAS
TOTALS		TRUNK SEWER DESIGNATION
P	23.42 MGD	PROJECTED AVERAGE DAILY FLOW, ALL AREAS
M	28.67 MGD	MAXIMUM AVERAGE DAILY FLOW, ALL AREAS

SEE PLATES 1A, 1B AND 1C FOR REGIONAL FACILITIES.

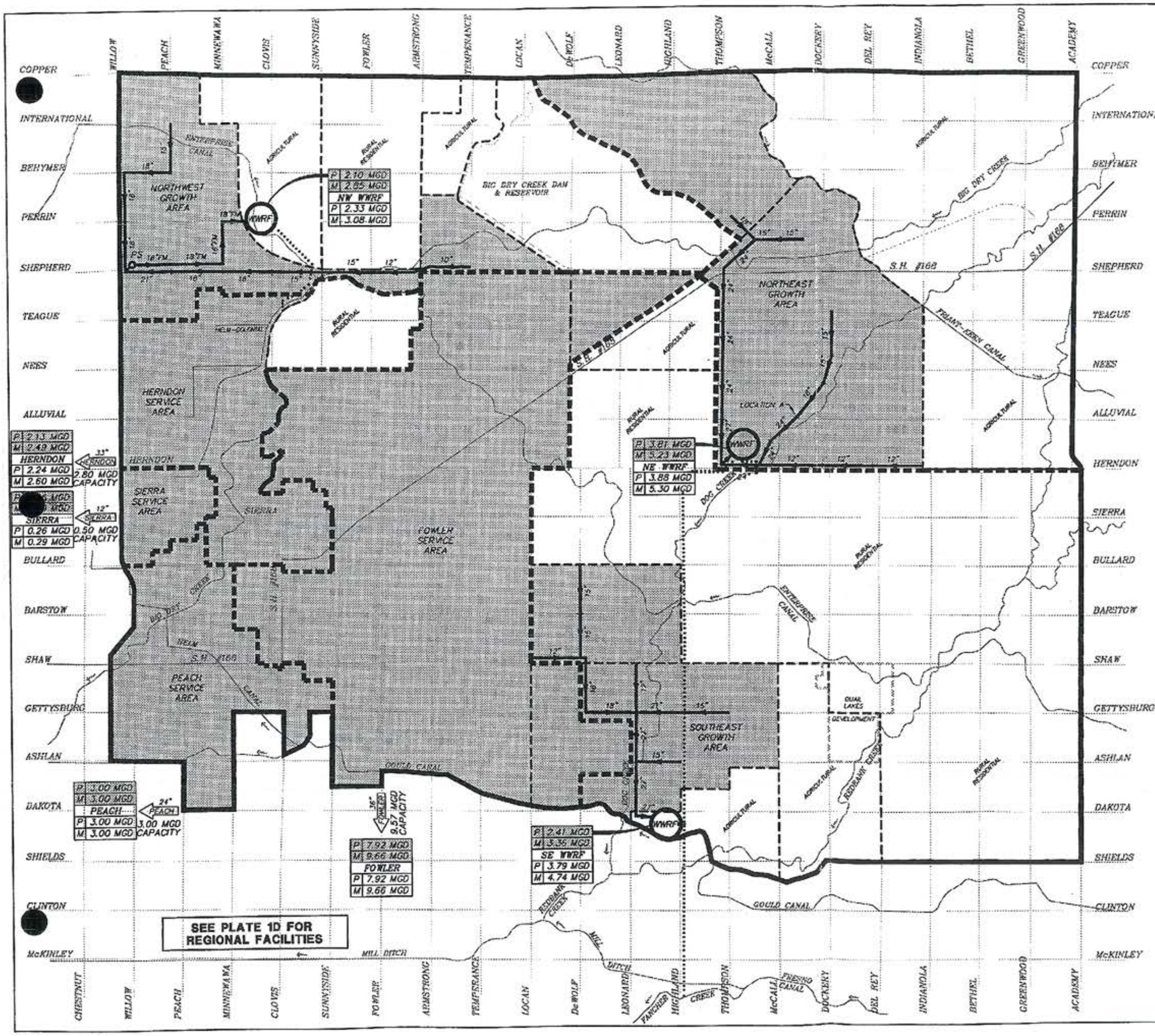
CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N
SCALE: 1" = 1 MILE
0 1/4 1/2 1 SCALE IN MILES

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617CON2.DWG

NOVEMBER 13, 1996 | Page P5 | **PLATE 1E**



PROPOSED SERVICE AREA BOUNDARIES AND MAJOR FACILITES

ALTERNATIVE 3

EXISTING TRUNK SEWER FLOWS TO REGIONAL SYSTEM; GP EXPANSION AREA FLOWS TO 3 CLOVIS SATELLITE WWRF'S

LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF TRUNK SEWER SERVICE AREA OR POSSIBLE SATELLITE WWRF SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- AREAS REQUIRING SERVICE UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- TOTAL 15.87 MGD CAPACITY — EXISTING REGIONAL TRUNK SEWER, WITH DESIGN CAPACITY (AVERAGE DAILY ANNUAL FLOW)
- 24" — PROPOSED CLOVIS MAJOR SEWER
- PS — PROPOSED PUMP STATION
- 18"FM — PROPOSED FORCE MAIN
- P 2.13 MGD — PROJECTED AVERAGE DAILY FLOW, SHADED AREAS
- M 2.49 MGD — MAXIMUM AVERAGE DAILY FLOW, SHADED AREAS
- HERNDON — TRUNK SEWER OR SATELLITE WWRF DESIGNATION
- P 2.24 MGD — PROJECTED AVERAGE DAILY FLOW, ALL AREAS
- M 2.60 MGD — MAXIMUM AVERAGE DAILY FLOW, ALL AREAS
- WWRF — GENERAL VICINITY OF POSSIBLE SATELLITE WASTEWATER RECLAMATION FACILITY (WWRF) SITE
- PROPOSED OUTFALL TO FID CANAL OR OTHER WATERCOURSE

SEE PLATE 1D FOR REGIONAL FACILITIES.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

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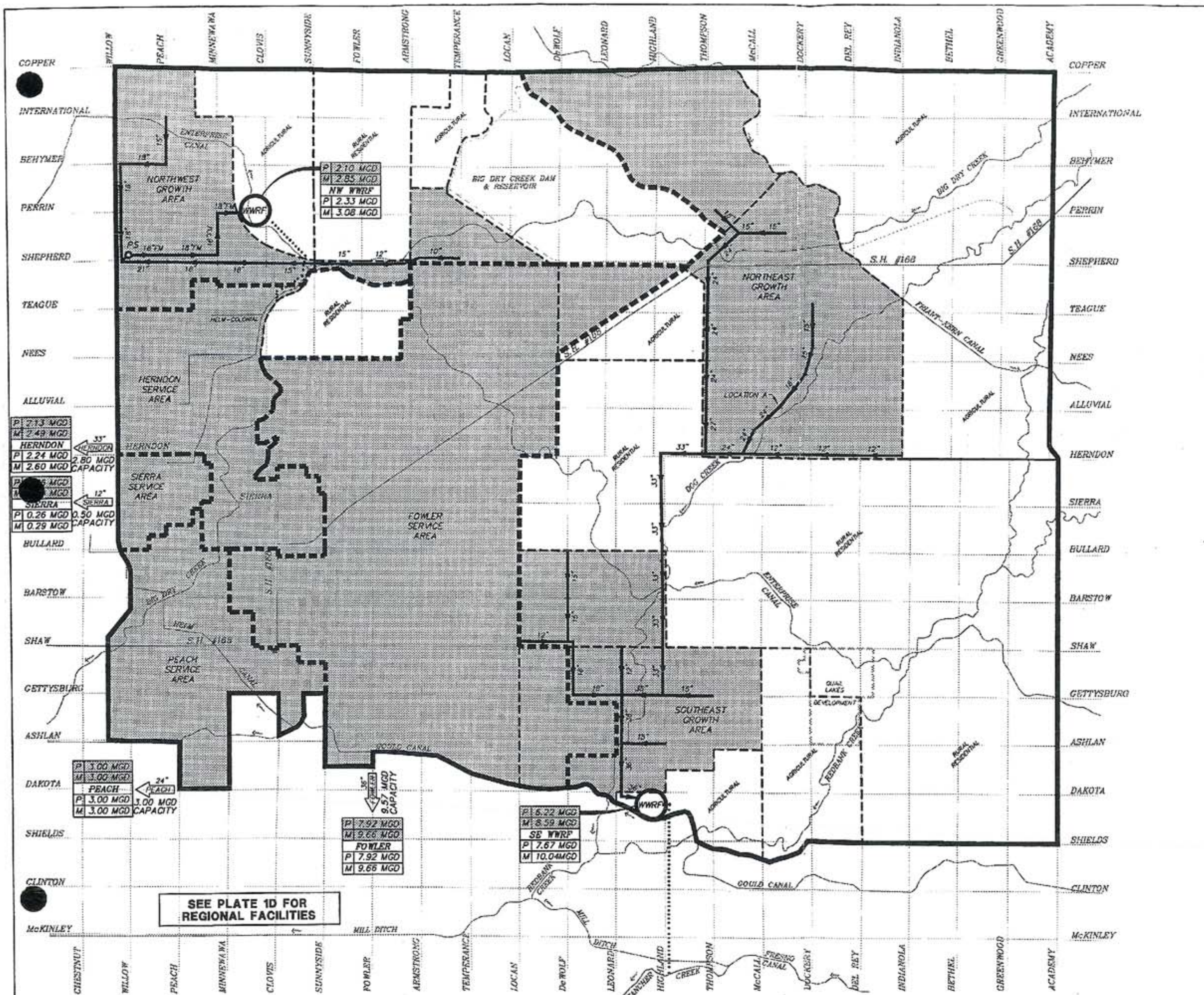
SCALE: 1" = 1 MILE

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617CON3.DWG

NOVEMBER 13, 1996 | Page P6 | PLATE 1F



PROPOSED SERVICE AREA BOUNDARIES AND MAJOR FACILITES

ALTERNATIVE 4

EXISTING TRUNK SEWER FLOWS TO REGIONAL SYSTEM; GP EXPANSION AREA FLOWS TO 2 CLOVIS SATELLITE WWRF'S

LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF TRUNK SEWER SERVICE AREA OR POSSIBLE SATELLITE WWRF SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- AREAS REQUIRING SERVICE UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- TOTAL 15.87 MGD CAPACITY — EXISTING REGIONAL TRUNK SEWER, WITH DESIGN CAPACITY (AVERAGE DAILY ANNUAL FLOW)
- 24" — PROPOSED CLOVIS MAJOR SEWER
- PS — PROPOSED PUMP STATION
- 21"FM — PROPOSED FORCE MAIN
- P 2.13 MGD — PROJECTED AVERAGE DAILY FLOW, SHADED AREAS
- M 2.49 MGD — MAXIMUM AVERAGE DAILY FLOW, SHADED AREAS
- HERNDON — TRUNK SEWER OR SATELLITE WWRF DESIGNATION
- P 2.24 MGD — PROJECTED AVERAGE DAILY FLOW, ALL AREAS
- M 2.60 MGD — MAXIMUM AVERAGE DAILY FLOW, ALL AREAS
- WWRF — GENERAL VICINITY OF POSSIBLE SATELLITE WASTEWATER RECLAMATION FACILITY (WWRF) SITE
- PROPOSED OUTFALL TO FID CANAL OR OTHER WATERCOURSE

SEE PLATES 1D FOR REGIONAL FACILITIES.

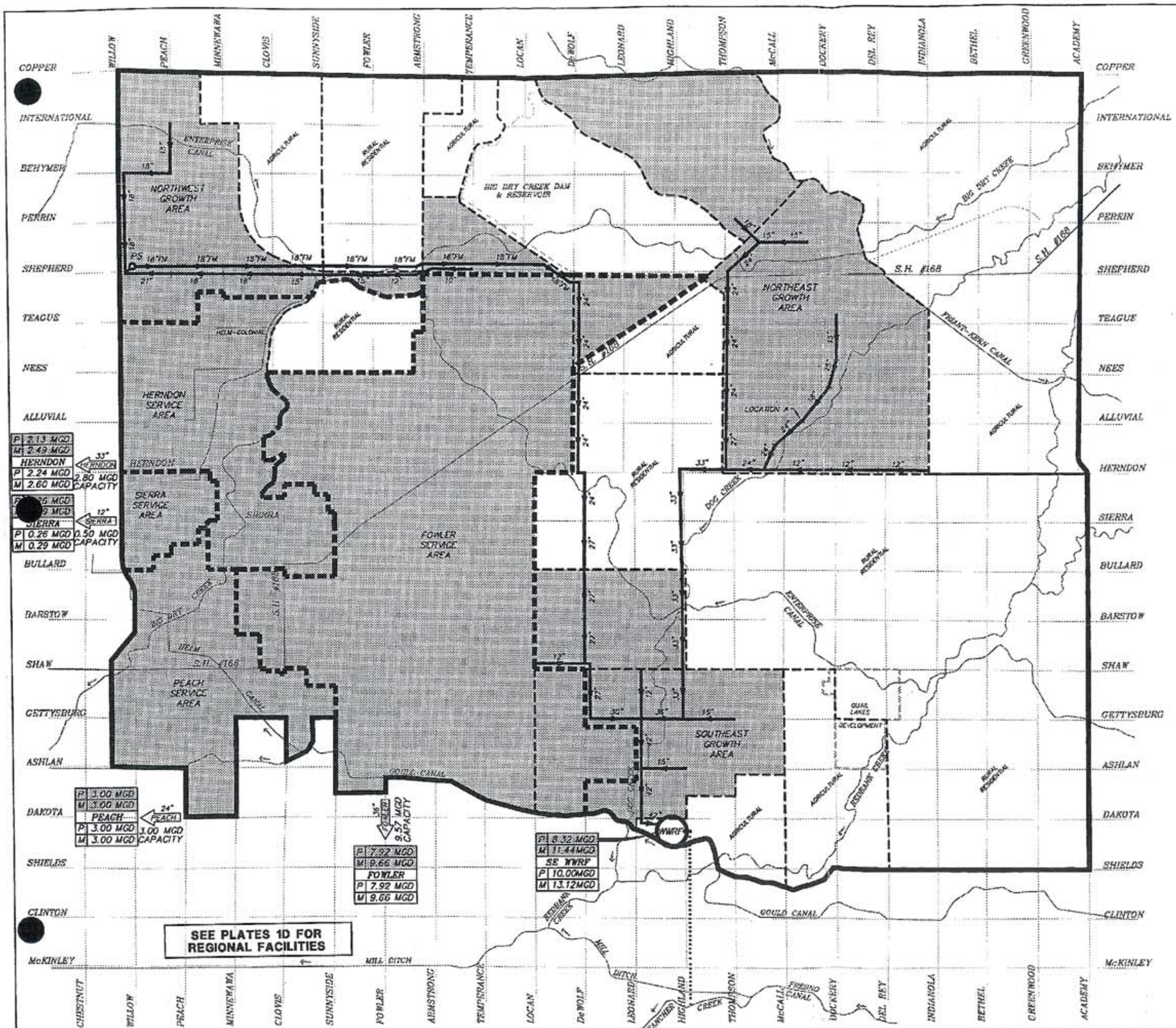
CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N — SCALE: 1" = 1 MILE

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617CON4.DWG

NOVEMBER 13, 1996 | Page P7 | PLATE 1G



PROPOSED SERVICE AREA BOUNDARIES AND MAJOR FACILITES

ALTERNATIVE 5

EXISTING TRUNK SEWER FLOWS TO REGIONAL SYSTEM; GP EXPANSION AREA FLOWS TO ONE CLOVIS SATELLITE WWRF

LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF TRUNK SEWER SERVICE AREA OR POSSIBLE SATELLITE WWRF SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- AREAS REQUIRING SERVICE UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- TOTAL 15.87 MGD CAPACITY — EXISTING REGIONAL TRUNK SEWER, WITH DESIGN CAPACITY (AVERAGE DAILY ANNUAL FLOW)
- 24" — PROPOSED CLOVIS MAJOR SEWER
- PS — PROPOSED PUMP STATION
- 18"FM — PROPOSED FORCE MAIN
- P 2.13 MGD — PROJECTED AVERAGE DAILY FLOW, SHADED AREAS
- M 2.49 MGD — MAXIMUM AVERAGE DAILY FLOW, SHADED AREAS
- HERNDON — TRUNK SEWER OR SATELLITE WWRF DESIGNATION
- P 2.24 MGD — PROJECTED AVERAGE DAILY FLOW, ALL AREAS
- M 2.60 MGD — MAXIMUM AVERAGE DAILY FLOW, ALL AREAS
- WWRF — GENERAL VICINITY OF POSSIBLE SATELLITE WASTEWATER RECLAMATION FACILITY (WWRF) SITE
- PROPOSED OUTFALL TO FID CANAL OR OTHER WATERCOURSE

SEE PLATE 1D FOR REGIONAL FACILITIES.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA

In Conjunction With:

NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

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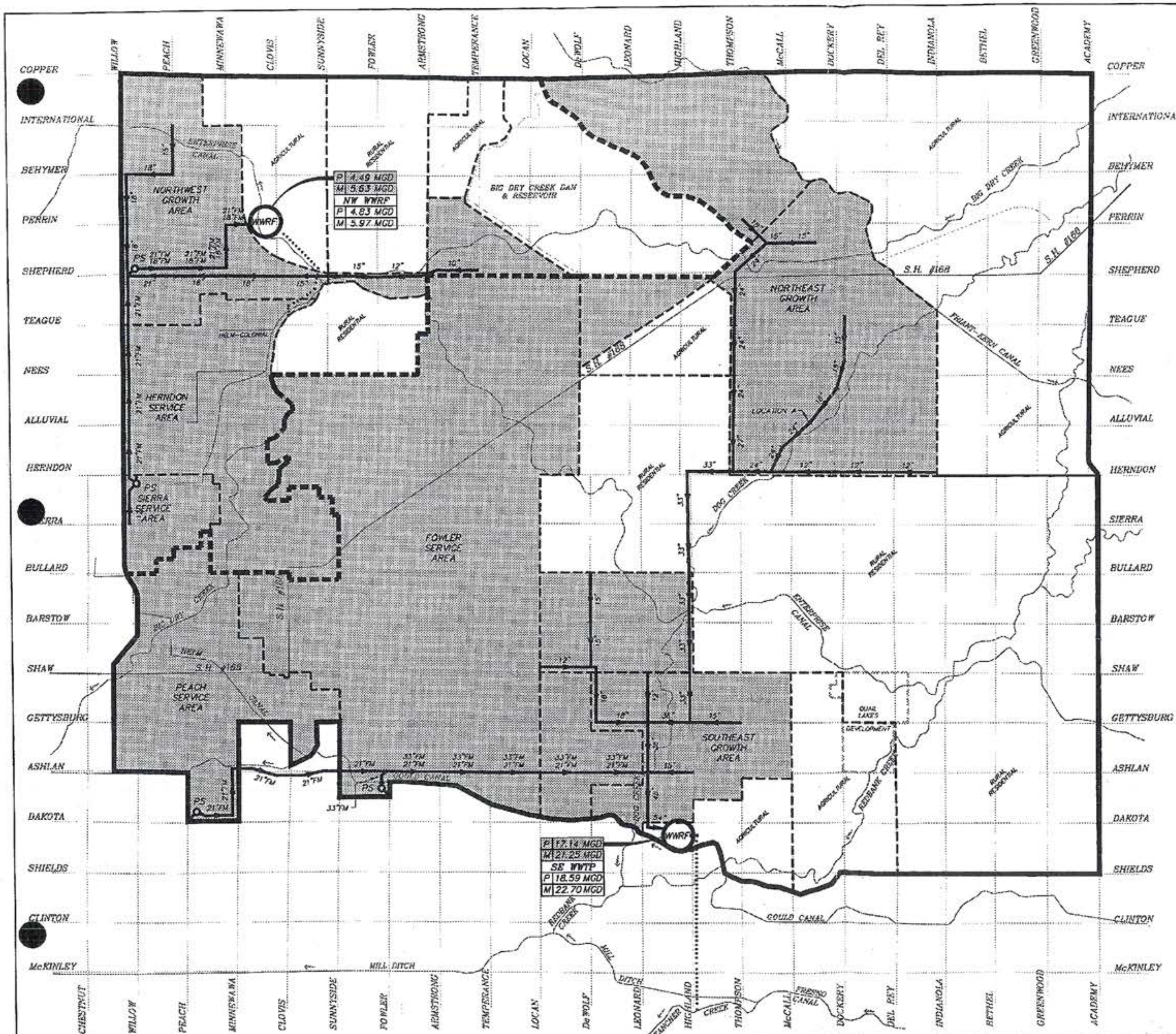
SCALE: 1" = 1 MILE

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617CONS.DWG

NOVEMBER 13, 1996 | Page P8 | **PLATE 1H**

PROPOSED SERVICE AREA BOUNDARIES AND MAJOR FACILITES

ALTERNATIVE 6
ALL CLOVIS FLOWS TO 2 CLOVIS SATELLITE WWRF'S



LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF POSSIBLE CLOVIS SATELLITE WWRF SERVICE AREA
- SUB-SERVICE AREA BOUNDARY
- AREAS REQUIRING SERVICE UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- 24" PROPOSED CLOVIS MAJOR SEWER
- PS PROPOSED PUMP STATION
- 21"FM PROPOSED FORCE MAIN
- P 4.49 MGD — PROJECTED AVERAGE DAILY FLOW, SHADED AREAS
- M 5.63 MGD — MAXIMUM AVERAGE DAILY FLOW, SHADED AREAS
- NW WWRF — SATELLITE WWRF DESIGNATION
- P 4.83 MGD — PROJECTED AVERAGE DAILY FLOW, ALL AREAS
- M 5.97 MGD — MAXIMUM AVERAGE DAILY FLOW, ALL AREAS
- WWRF — GENERAL VICINITY OF POSSIBLE SATELLITE WASTEWATER RECLAMATION FACILITY (WWRF) SITE
- PROPOSED OUTFALL TO FID CANAL OR OTHER WATERCOURSE

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS - FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

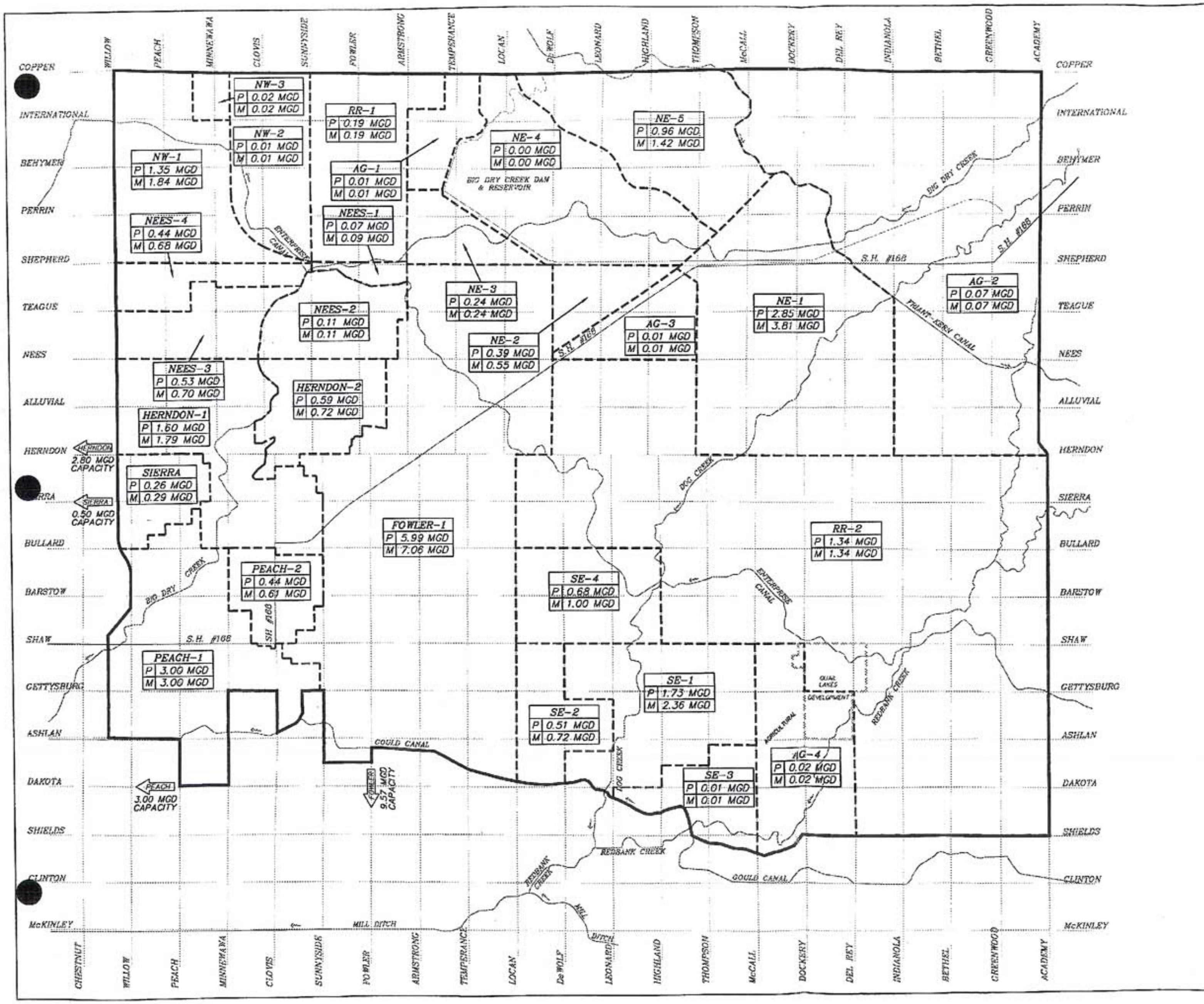
SCALE: 1" = 1 MILE

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617CON6.DWG

NOVEMBER 13, 1996

PLATE 11

SUB-SERVICE AREA BOUNDARIES AND FLOW PROJECTIONS



LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- SUB-SERVICE AREA BOUNDARY
- TOTAL 15.87 MGD CAPACITY — EXISTING REGIONAL TRUNK SEWER, WITH DESIGN CAPACITY (AVERAGE DAILY ANNUAL FLOW)
- TOTALS P 23.42 MGD M 28.67 MGD — SUB-SERVICE AREA DESIGNATION PROJECTED AVERAGE DAILY FLOW (ADAF)* MAXIMUM AVERAGE DAILY FLOW (ADAF)*

* ESTIMATES OF AVERAGE DAY ANNUAL FLOW AT BUILDOUT. ASSUMES ALL PROPERTIES ARE SERVED AT 1993 CLOVIS GENERAL PLAN DENSITIES, INCLUDING PROPERTIES DESIGNATED FOR RURAL RESIDENTIAL AND AGRICULTURAL USES.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA

In Conjunction With:

NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

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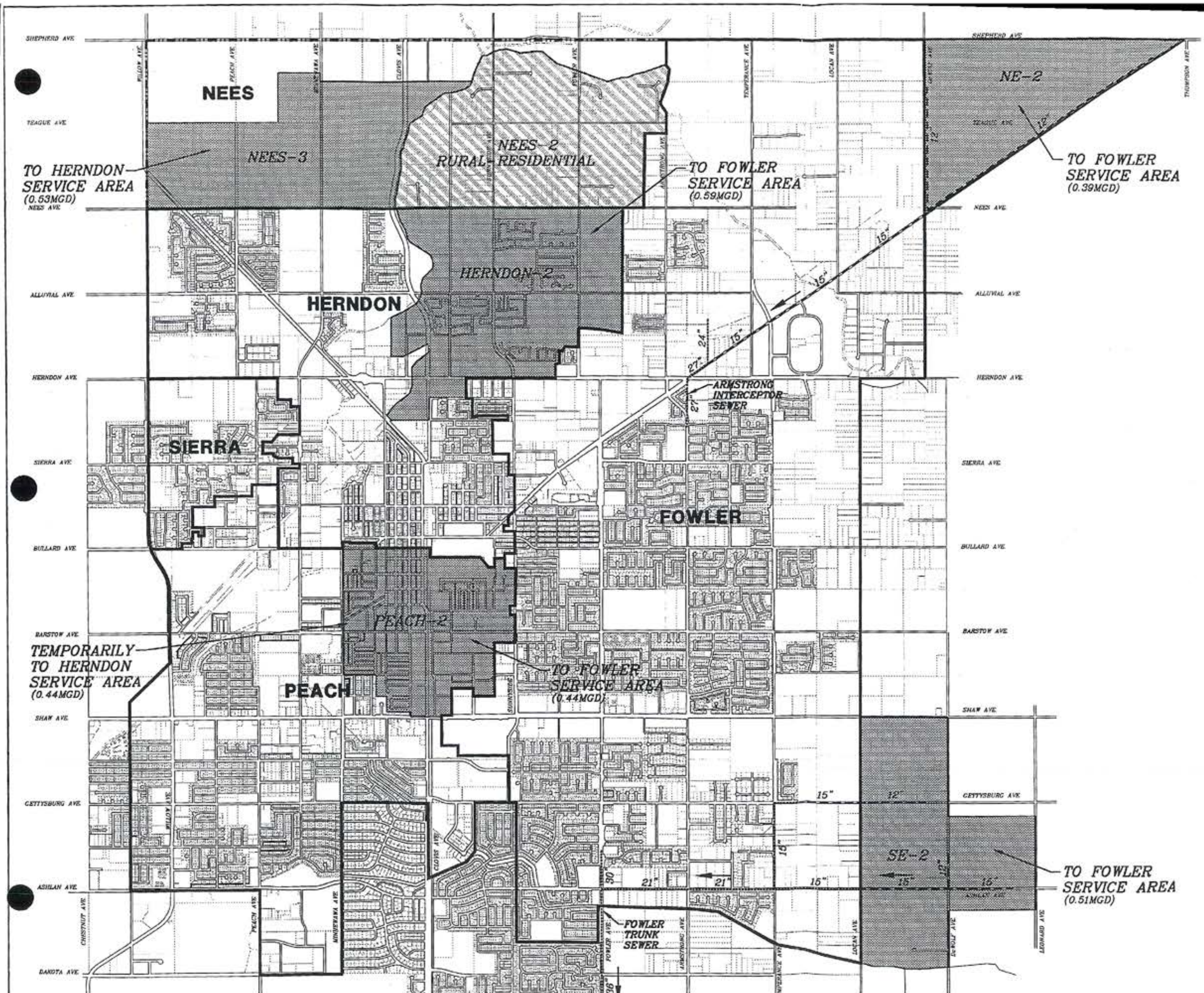
SCALE: 1" = 1 MILE

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617MGDA.DWG

NOVEMBER 13, 1996 | Page P10 | **PLATE 3A**



PROPOSED MODIFICATIONS OF EXISTING SERVICE AREAS

LEGEND

- EXISTING BOUNDARY OF TRUNK SEWER SERVICE AREA
- EXISTING BOUNDARY OF NEES SERVICE AREA
- AREA PROPOSED FOR SERVICE AREA MODIFICATION
- RURAL-RESIDENTIAL AREA WITHIN NEES SERVICE AREA
- (0.44MGD) FLOW TO BE DIVERTED (MILLION GALLONS PER DAY, AVERAGE DAILY FLOW)
- 15" PROPOSED SEWER MAIN, WITH DIAMETER
- 15" EXISTING SEWER MAIN, WITH DIAMETER

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS - FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

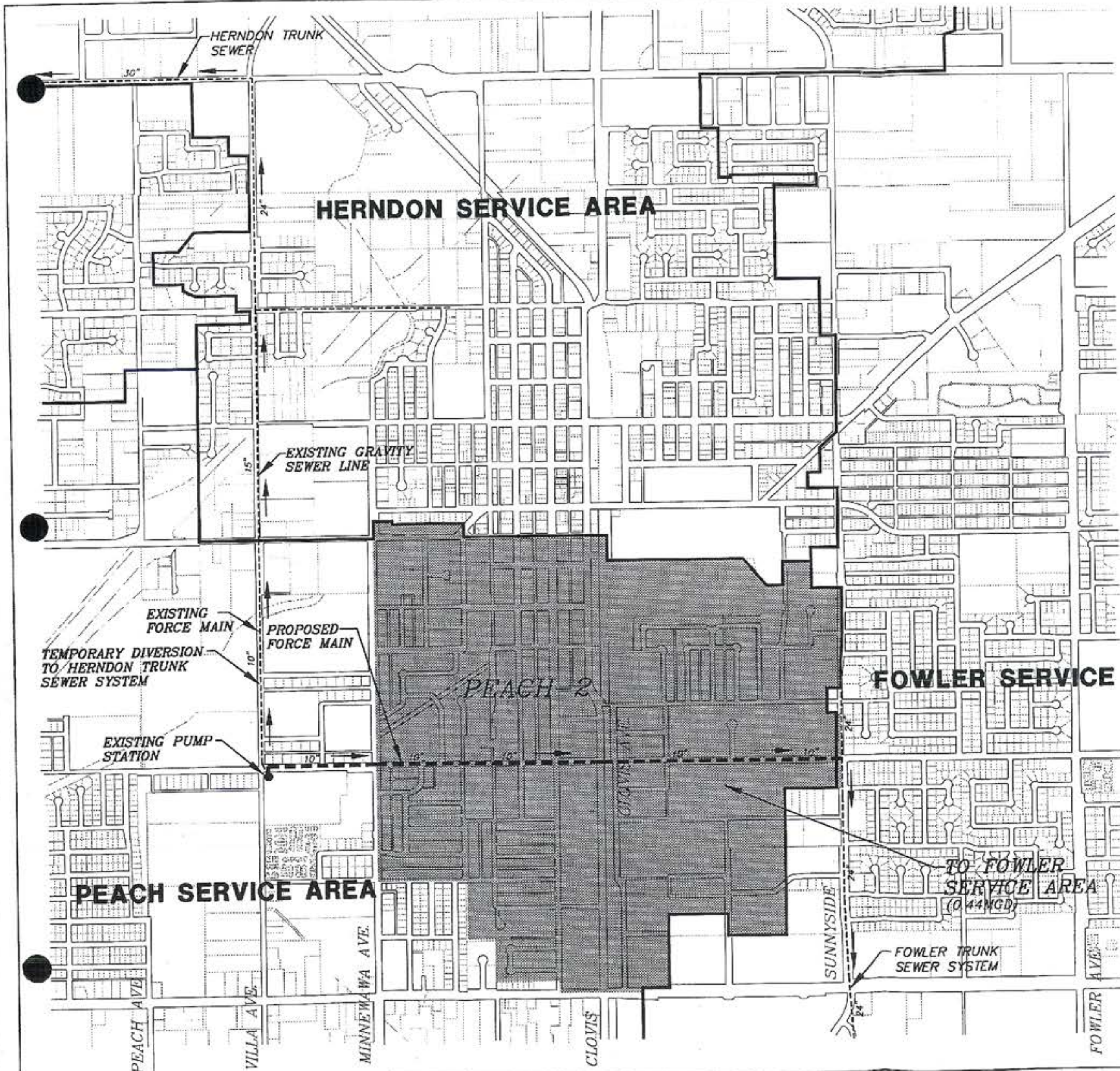
0 500' 1000' 1500' 3000'
SCALE IN FEET

SCALE: 1" = 3000'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617BOU1.DWG

OCTOBER 17, 1996 | Page P11 | PLATE 4A

PROPOSED MODIFICATION OF PORTION OF EXISTING PEACH AND FOWLER SERVICE AREAS



LEGEND

(solid line)	CURRENT BOUNDARY OF TRUNK SEWER SERVICE AREA
(shaded)	AREA PROPOSED FOR SERVICE AREA MODIFICATION
(0.44MGD)	FLOW TO BE DIVERTED (MILLION GALLONS PER DAY, AVERAGE DAILY FLOW)
(dotted line)	EXISTING MAIN SEWER
(dashed line)	PROPOSED NEW FORCE MAIN

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

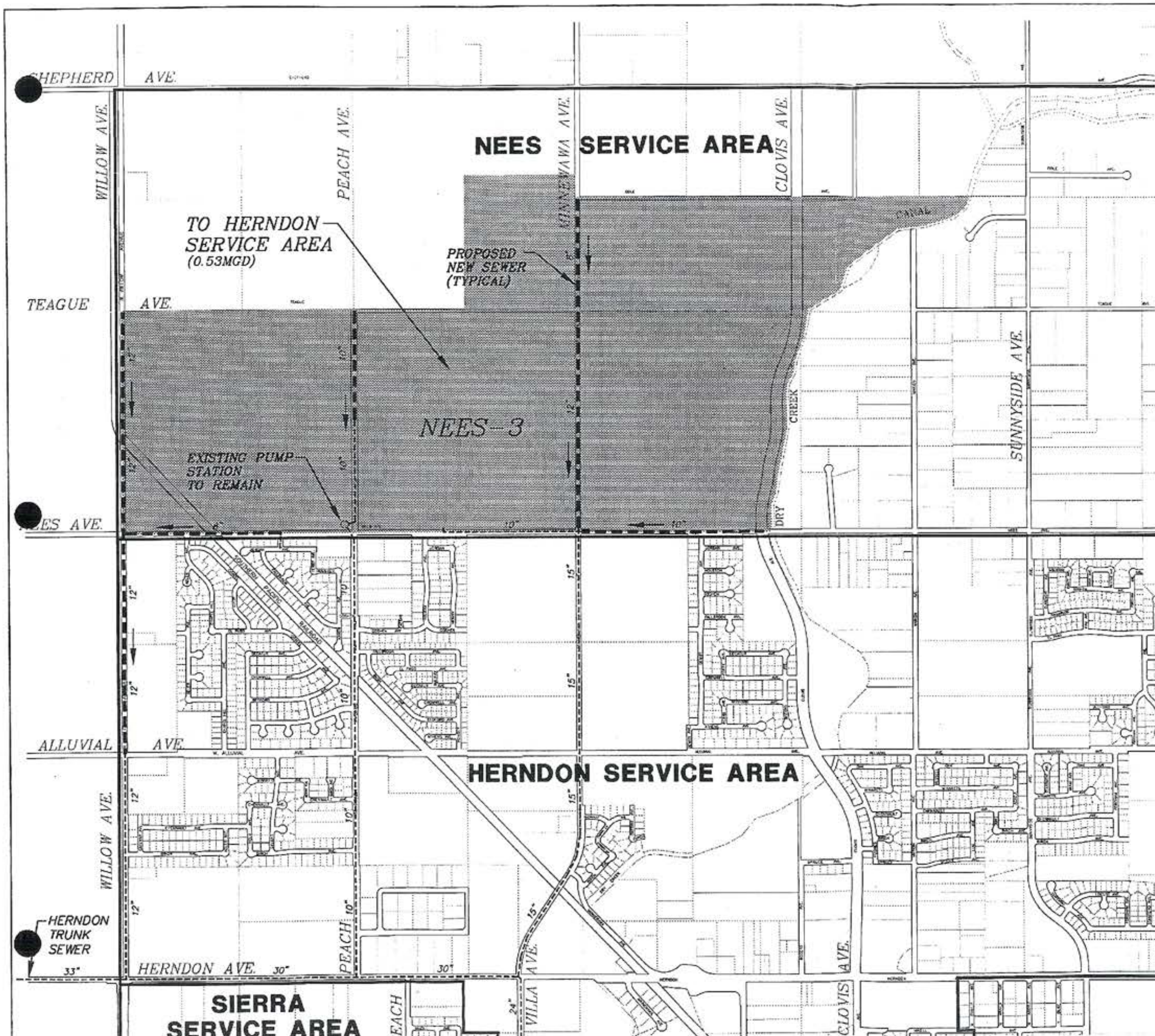
N

0 200 400 600 1200 SCALE IN FEET
SCALE: 1" = 1200'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617BOP3.DWG

OCTOBER 17, 1996 | **Page P12** | **PLATE 4B**

PROPOSED MODIFICATION OF PORTION OF EXISTING NEES AND HERNDON SERVICE AREAS



LEGEND

———	CURRENT BOUNDARY OF SEWER SERVICE AREA
(shaded)	AREA PROPOSED FOR SERVICE AREA MODIFICATION
(0.53MGD)	FLOW TO BE DIVERTED (MILLION GALLONS PER DAY, AVERAGE DAILY FLOW)
- - - - - -	EXISTING MAIN SEWER
▬ ▬ ▬	PROPOSED NEW SEWER

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA

In Conjunction With:

NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

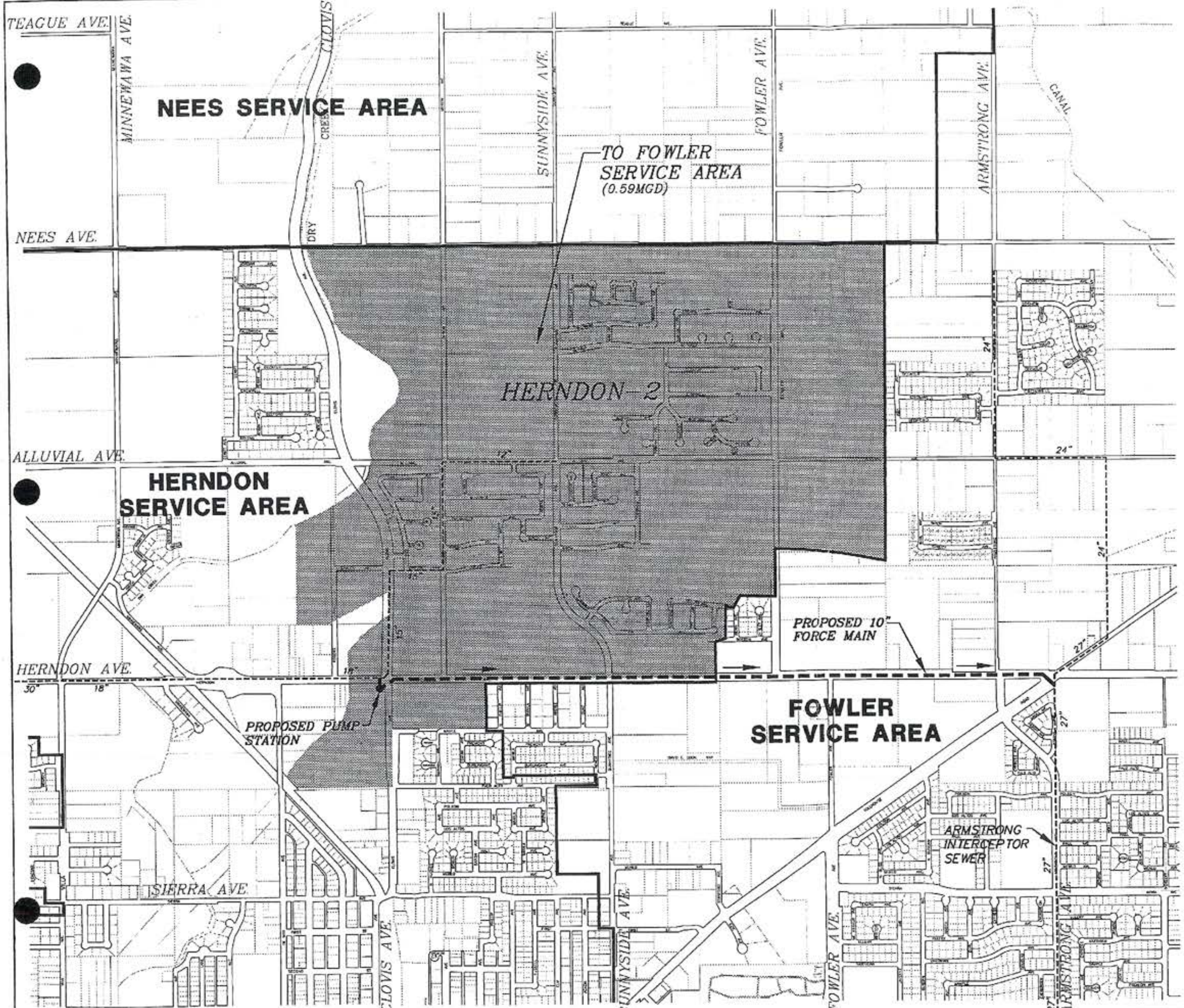
0 200' 400' 600' 1200'
SCALE IN FEET

SCALE: 1" = 1200'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617BOH1.DWG

OCTOBER 17, 1996 | Page P13 | PLATE 4C

PROPOSED MODIFICATION OF PORTION OF EXISTING HERNDON AND FOWLER SERVICE AREAS



LEGEND

———	CURRENT BOUNDARY OF SEWER SERVICE AREA
(shaded)	AREA PROPOSED FOR SERVICE AREA MODIFICATION
(0.59MGD)	FLOW TO BE DIVERTED (MILLION GALLONS PER DAY, AVERAGE DAILY FLOW)
-------	EXISTING MAIN SEWER
▬ ▬ ▬	PROPOSED NEW SEWER

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA

In Conjunction With:

NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

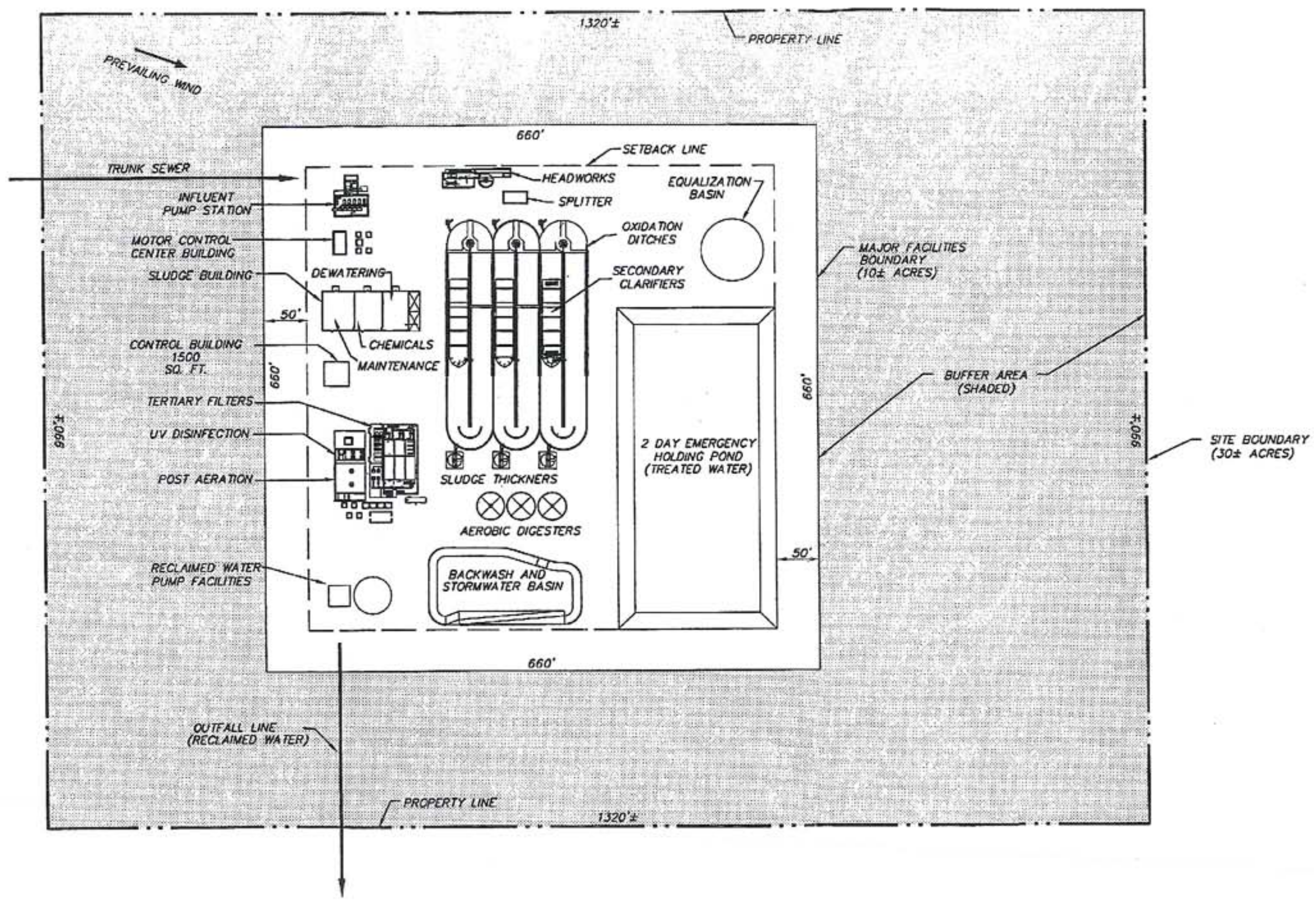
0 200 400 600 1200' SCALE IN FEET

SCALE: 1" = 1200'

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617BOH2.DWG

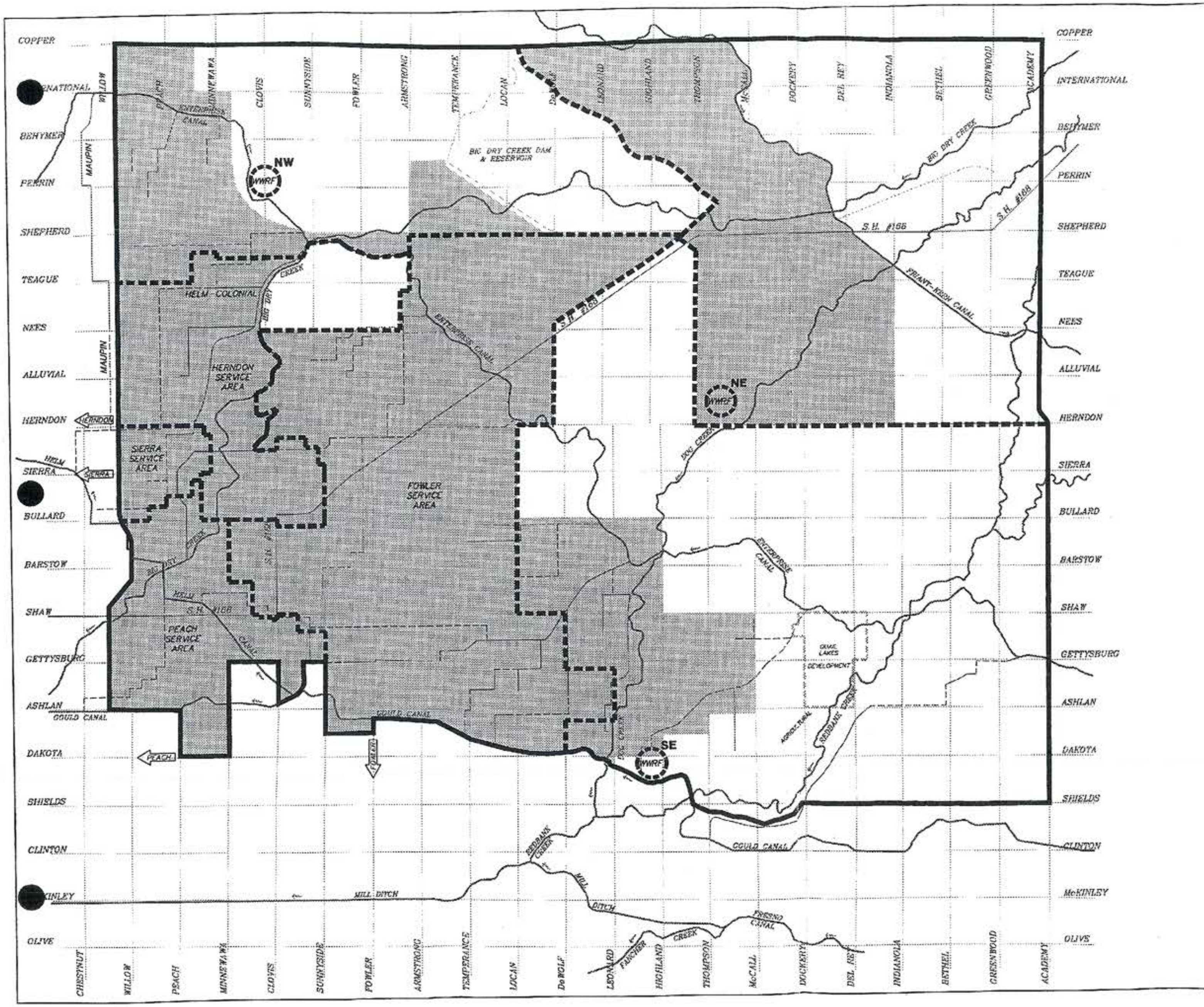
OCTOBER 17, 1996 | **Page P14** | **PLATE 4D**

TYPICAL LAYOUT FOR POTENTIAL CLOVIS SATELLITE WASTEWATER RECLAMATION FACILITY



NOTE:
SITE AREAS ARE TYPICAL FOR PLANTS UNDER ALTERNATIVES 3 AND 4. LARGER PLANTS MAY REQUIRE 40± ACRE SITE.

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B		
BLAIR, CHURCH & FLYNN CONSULTING ENGINEERS CLOVIS – FRESNO, CALIFORNIA In Conjunction With: NBS/LOWRY ENGINEERS & PLANNERS SAN BERNARDINO, CALIFORNIA		SCALE: 1" = 150'± B.C.F. FILE NO.: 9-3617 PH. 1-B COMPUTER FILE NO. 3617PL5A.DWG
NOVEMBER 13, 1996	Page P15	PLATE 5A



MAJOR WATERCOURSES AND FRESNO IRRIGATION DISTRICT CANALS AND PIPELINES IN STUDY AREA

LEGEND

- BOUNDARY OF OVERALL STUDY AREA
- STREET OR 1/4 SECTION LINE ALIGNMENT
- BOUNDARY OF TRUNK SEWER SERVICE AREA OR POSSIBLE SATELLITE WWRF SERVICE AREA
- WWRF — WASTEWATER RECLAMATION FACILITY
- AREAS REQUIRING SERVICE UNDER 1993 CLOVIS GENERAL PLAN (URBAN DENSITIES)
- EXISTING REGIONAL TRUNK SEWER
- EXISTING MAJOR CREEK OR MAJOR FID CANAL
- EXISTING FID DISTRIBUTION CANAL
- EXISTING FID DISTRIBUTION PIPELINE
- GENERAL VICINITY OF POTENTIAL SATELLITE WASTEWATER RECLAMATION FACILITY (WWRF) SITE

CLOVIS WASTEWATER MASTER PLAN UPDATE PHASE 1-B

BLAIR, CHURCH & FLYNN
CONSULTING ENGINEERS
CLOVIS – FRESNO, CALIFORNIA
In Conjunction With:
NBS/LOWRY
ENGINEERS & PLANNERS
SAN BERNARDINO, CALIFORNIA

N

SCALE: 1" = 1 MILE (0, 1/4, 1/2, 1 SCALE IN MILES)

B.C.F. FILE NO.: 9-3617 PH. 1-B
COMPUTER FILE NO. 3617FID2.DWG

NOVEMBER 13, 1996 | Page P16 | **PLATE 7A**

APPENDIX A3

(MATERIALS RELATED TO SECTION 3)

TABLE A3-1

PROJECTED AVERAGE DAILY WASTEWATER FLOW GENERATION IN EXISTING TRUNK SEWER SERVICE AREAS OF THE CITY OF CLOVIS

PROJECTED UNDEVELOPED LAND BUILDOUT INCREMENT OF FLOW												
LAND USE		AVERAGE	PEACH TRUNK		FOWLER TRUNK		HERNDON TRUNK		SIERRA TRUNK		ALL TRUNK AREAS	
CODE	ABBREV.	FLOW GENERATION RATE (MGD/ACRE)*	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)
1	RR	0.00014			318.860	0.043					318.860	0.043
2	PCSFR	0.00054									0.000	0.000
3	LLSFR	0.00054			934.761	0.505			6.215	0.003	940.976	0.508
4	LDSFR-L	0.00073									0.000	0.000
5	LDSFR-M	0.00073					130.575	0.095	9.707	0.007	140.282	0.102
6	LDSFR-H	0.00073	14.613	0.011	1,519.992	1.109	578.979	0.422	76.937	0.056	2,190.521	1.597
7	MLDSFR	0.00073			0.800	0.001					0.800	0.001
8	MDSFR-L	0.00111	5.831	0.006	4.854	0.005	8.945	0.010			19.630	0.021
9	MDSFR-H	0.00111	118.562	0.131	191.133	0.212	56.537	0.063			366.232	0.406
20	LDMFR-L	0.00224	8.241	0.018	8.835	0.020	33.695	0.076			50.771	0.114
21	LDMFR-H	0.00224	21.640	0.049	101.764	0.228	19.726	0.044			143.130	0.321
22	HDMFR	0.00376	23.796	0.090	130.668	0.492	7.668	0.029			162.132	0.611
30	OFFICE	0.00120	26.759	0.032	218.956	0.263	31.443	0.038	38.577	0.046	315.735	0.379
40	INDUST	0.00100	121.988	0.122	105.423	0.105	132.426	0.132			359.837	0.359
50	COMM	0.00140	147.289	0.206	113.709	0.159	93.195	0.130	16.793	0.024	370.986	0.519
51	BUSS	0.00140			52.015	0.073	113.888	0.159			165.903	0.232
52	TRADE	0.00140	12.071	0.017			11.574	0.016			23.645	0.033
60	PMU	BY GP USE									0.000	0.000
70	OS	0.00000			246.658	0.000	145.376	0.000			392.034	0.000
80	H	0.00030			19.790	0.078					19.790	0.078
90	ES	0.00060			64.786	0.019	16.769	0.005			81.555	0.024
91	MS	0.00140						0.003			0.000	0.003
92	HS	0.00160						0.013			0.000	0.013
SUBTOTALS			500.790	0.682	4,033.004	3.311	1,380.796	1.235	148.229	0.136	6,062.819	5.364
ADJUSTMENTS**								(0.076)				(0.076)
BUILDOUT FLOW INCREMENT			*500.790*	*0.682*	*4,033.004*	*3.311*	*1,380.796*	*1.159*	*148.229*	*0.136*	*6,062.819*	*5.288*

PROJECTED TOTAL FLOW AT BUILDOUT (ROUNDED)	PEACH TRUNK (MGD)	FOWLER TRUNK (MGD)	HERNDON TRUNK (MGD)	SIERRA TRUNK (MGD)	ALL TRUNK AREAS (MGD)
1995 METERED FLOW	2.63	2.55	0.98	0.11	6.27
ALLOWANCE FOR FLOW GROWTH	0.13	0.13	0.05	0.01	0.32
BUILDOUT FLOW INCREMENT	0.68	3.31	1.16	0.14	5.29
TOTAL PROJECTED FLOW	*3.44*	*5.99*	*2.19*	*0.26*	*11.88*

* EXCEPT WHERE UNIT OF MEASURE IS NOT BY AREA, SUCH AS BY STUDENT POPULATION OF SCHOOLS, OR BEDS IN HOSPITAL

** REDUCTION WILL OCCUR WHEN BUCHANAN EDUCATIONAL COMPLEX IS TRANSFERRED TO NEES SERVICE AREA
CAPACITY OF COMPLEX IS 3,000 STUDENTS GRADE 9-12, 1650 STUDENTS GRADE 7-8, 800 STUDENTS GRADE K-6

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-2

ESTIMATED MAXIMUM AVERAGE DAILY WASTEWATER FLOW GENERATION IN EXISTING TRUNK SEWER SERVICE AREAS OF THE CITY OF CLOVIS

ESTIMATED MAXIMUM UNDEVELOPED LAND BUILDOUT INCREMENT OF FLOW												
LAND USE		AVERAGE	PEACH TRUNK		FOWLER TRUNK		HERNDON TRUNK		SIERRA TRUNK		ALL TRUNK AREAS	
CODE	ABBREV.	FLOW GENERATION RATE (MGD/ACRE)*	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)	AREA (ACRES)	FLOW (MGD)
1	RR	0.00014			318.860	0.043					318.860	0.043
2	PCSFR	0.00054									0.000	0.000
3	LLSFR	0.00059			934.761	0.555			6.215	0.004	940.976	0.559
4	LDSFR-L	0.00081									0.000	0.000
5	LDSFR-M	0.00095					130.575	0.123	9.707	0.009	140.282	0.132
6	LDSFR-H	0.00108	14.613	0.016	1,519.992	1.642	578.979	0.625	76.937	0.083	2,190.521	2.366
7	MLDSFR	0.00105			0.800	0.001					0.800	0.001
8	MDSFR-L	0.00135	5.831	0.008	4.854	0.007	8.945	0.012			19.630	0.027
9	MDSFR-H	0.00189	118.562	0.224	191.133	0.361	56.537	0.107			366.232	0.692
20	LDMFR-L	0.00264	8.241	0.022	8.835	0.023	33.695	0.089			50.771	0.134
21	LDMFR-H	0.00330	21.640	0.071	101.764	0.336	19.726	0.065			143.130	0.472
22	HDMFR	0.00550	23.796	0.131	130.668	0.719	7.668	0.042			162.132	0.892
30	OFFICE	0.00120	26.759	0.032	218.956	0.263	31.443	0.038	38.577	0.046	315.735	0.379
40	INDUST	0.00100	121.988	0.122	105.423	0.105	132.426	0.132			359.837	0.359
50	COMM	0.00140	147.289	0.206	113.709	0.159	93.195	0.130	16.793	0.024	370.986	0.519
51	BUSS	0.00140			52.015	0.073	113.888	0.159			165.903	0.232
52	TRADE	0.00140	12.071	0.017			11.574	0.016			23.645	0.033
60	PMU	BY GP USE									0.000	0.000
70	OS	0.00000			246.658	0.000	145.376	0.000			392.034	0.000
80	H	0.00030			19.790	0.078					19.790	0.078
90	ES	0.00060			64.736	0.019	16.769	0.005			81.555	0.024
91	MS	0.00140						0.003			0.000	0.003
92	HS	0.00160						0.013			0.000	0.013
SUBTOTALS			500.790	0.849	4,033.004	4.384	1,380.796	1.559	148.229	0.166	6,062.819	6.958
ADJUSTMENTS**								(0.076)				(0.076)
BUILDOUT FLOW INCREMENT			*500.790*	*0.849*	*4,033.004*	*4.384*	*1,380.796*	*1.483*	*148.229*	*0.166*	*6,062.819*	*6.882*

ESTIMATED MAXIMUM TOTAL FLOW AT BUILDOUT (ROUNDED)	PEACH TRUNK (MGD)	FOWLER TRUNK (MGD)	HERNDON TRUNK (MGD)	SIERRA TRUNK (MGD)	ALL TRUNK AREAS (MGD)
1995 METERED FLOW	2.63	2.55	0.98	0.11	6.27
ALLOWANCE FOR FLOW GROWTH	0.13	0.13	0.05	0.01	0.32
BUILDOUT FLOW INCREMENT	0.85	4.38	1.48	0.17	6.88
TOTAL ESTIMATED MAXIMUM	*3.61*	*7.06*	*2.51*	*0.29*	*13.47*

* EXCEPT WHERE UNIT OF MEASURE IS NOT BY AREA, SUCH AS BY STUDENT POPULATION OF SCHOOLS OR BEDS IN HOSPITAL

** REDUCTION WILL OCCUR WHEN BUCHANAN EDUCATIONAL COMPLEX IS TRANSFERRED TO NEES SERVICE AREA
CAPACITY OF COMLEX IS 3,000 SUDENTS GRADE 9-12, 1650 STUDENTS GRADE 7-8, 800 STUDENTS GRADE K-6.

"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-3

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

ORIGINAL NEES SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.000	0.000	0.000
RURAL	769	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.108	0.108	0.108
VERY LOW	56	0.60	2.00	2.00	0.00016	0.00054	0.00054	0.009	0.030	0.030
LOW	600	2.10	4.00	2.70	0.00057	0.00108	0.00073	0.342	0.648	0.438
MEDIUM	56	4.10	7.00	4.10	0.00111	0.00189	0.00111	0.095	0.163	0.095
MEDIUM-HIGH	74	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.115	0.244	0.166
MEDIUM HIGH (FROM MIXED)	18	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.028	0.059	0.040
HIGH	40	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.133	0.220	0.150
HIGH (FROM MIXED)	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
VILLAGE CENTER	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
SUBTOTAL	1,643							0.830	1.472	1.027
NON-RESIDENTIAL USES										
COMMERCIAL	28				0.00140	0.00140	0.00140	0.039	0.039	0.039
COMMERCIAL (FROM MIXED)	0				0.00140	0.00140	0.00140	0.000	0.000	0.000
OFFICE	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM MIXED)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM PUBLIC)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
INDUSTRIAL	0				0.00100	0.00100	0.00100	0.000	0.000	0.000
SCHOOLS	167				0.00050	0.00050	0.00050	0.084	0.084	0.084
PARKS	52				0.00000	0.00000	0.00000	0.000	0.000	0.000
OPEN SPACE	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
WATER BASIN	31				0.00000	0.00000	0.00000	0.000	0.000	0.000
BELTWAY	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
SUBTOTAL	278							0.123	0.123	0.123
TOTALS	1,921							0.953	1.595	1.150
TOTALS (ROUNDED)	*1,921*							*0.95*	*1.60*	*1.15*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-4

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

HERNDON-2 SERVICE AREA						
LAND USE CODE	LAND USE ABBREVIATION	AVERAGE FLOW GENERATION RATE		AREA (ACRES)	DWELLING UNITS OR OTHER MEASURE	FLOW (MGD)
ESTIMATED MAXIMUM						
1	RR	0.00014	MGD/AC	0.000		0.000
2	PCSFR	0.00054	MGD/AC	0.000		0.000
3	LLSFR	0.00059	MGD/AC	0.000		0.000
4	LDSFR-L	0.00081	MGD/AC	0.000		0.000
5	LDSFR-M	0.00095	MGD/AC	0.000		0.000
6	LDSFR-H	0.00108	MGD/AC	305.870		0.330
7	MLDSFR	0.00108	MGD/AC	0.000		0.000
8	MDSFR-L	0.00135	MGD/AC	0.000		0.000
9	MDSFR-H	0.00199	MGD/AC	1.763		0.003
10	SFR-EXISTING	270	GAL/UNIT/DAY	111.132	433	0.117
20	LDMFR-L	0.00264	MGD/AC	15.428		0.041
21	LDMFR-H	0.00330	MGD/AC	0.000		0.000
22	HDMFR	0.00550	MGD/AC	7.668		0.042
30	OFFICE	0.00120	MGD/AC	0.000		0.000
40	INDUST	0.00100	MGD/AC	9.968		0.010
50	COMM	0.00140	MGD/AC	12.180		0.017
51	BUSS	0.00140	MGD/AC	110.014		0.154
52	TRADE	0.00140	MGD/AC	0.000		0.000
60	PMU	BY GP USE		0.000		0.000
70	CS	0.00000	MGD/AC	85.680		0.000
80	H	0.00030	MGD/BED	0.000		0.000
90	ES	0.00060	MGD/100STUDENTS	16.769	9.0*	0.005
91	MS	0.00140	MGD/100STUDENTS	0.000		0.000
92	HS	0.00160	MGD/100STUDENTS	0.000		0.000
TOTALS				676.472	433	0.719
TOTALS (ROUNDED)				*676*	*433*	*0.72*
PROJECTION						
1	RR	0.00014	MGD/AC	0.000		0.000
2	PCSFR	0.00054	MGD/AC	0.000		0.000
3	LLSFR	0.00054	MGD/AC	0.000		0.000
4	LDSFR-L	0.00073	MGD/AC	0.000		0.000
5	LDSFR-M	0.00073	MGD/AC	0.000		0.000
6	LDSFR-H	0.00073	MGD/AC	305.870		0.223
7	MLDSFR	0.00073	MGD/AC	0.000		0.000
8	MDSFR-L	0.00111	MGD/AC	0.000		0.000
9	MDSFR-H	0.00111	MGD/AC	1.763		0.002
10	SFR-EXISTING	270	GAL/UNIT/DAY	111.132	433	0.117
20	LDMFR-L	0.00224	MGD/AC	15.428		0.035
21	LDMFR-H	0.00224	MGD/AC	0.000		0.000
22	HDMFR	0.00376	MGD/AC	7.668		0.029
30	OFFICE	0.00120	MGD/AC	0.000		0.000
40	INDUST	0.00100	MGD/AC	9.968		0.010
50	COMM	0.00140	MGD/AC	12.180		0.017
51	BUSS	0.00140	MGD/AC	110.014		0.154
52	TRADE	0.00140	MGD/AC	0.000		0.000
60	PMU	BY GP USE		0.000		0.000
70	CS	0.00000	MGD/AC	85.680		0.000
80	H	0.00030	MGD/BED	0.000		0.000
90	ES	0.00060	MGD/100STUDENTS	16.769	9.0*	0.005
91	MS	0.00140	MGD/100STUDENTS	0.000		0.000
92	HS	0.00160	MGD/100STUDENTS	0.000		0.000
TOTALS				676.472	433	0.592
TOTALS (ROUNDED)				*676*	*433*	*0.59*

* 100'S OF STUDENTS

TABLE A3-5

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

SE-2 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.000	0.000	0.000
RURAL	0	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.000	0.000	0.000
VERY LOW	0	0.60	2.00	2.00	0.00016	0.00054	0.00054	0.000	0.000	0.000
LOW	432	2.10	4.00	2.70	0.00057	0.00108	0.00073	0.246	0.467	0.315
MEDIUM	79	4.10	7.00	4.10	0.00111	0.00189	0.00111	0.085	0.149	0.088
MEDIUM-HIGH	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
MEDIUM HIGH (FROM MIXED)	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
HIGH	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
HIGH (FROM MIXED)	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
VILLAGE CENTER	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
SUBTOTAL	511							0.334	0.616	0.403
NON-RESIDENTIAL USES										
COMMERCIAL	10				0.00140	0.00140	0.00140	0.014	0.014	0.014
COMMERCIAL (FROM MIXED)	0				0.00140	0.00140	0.00140	0.000	0.000	0.000
OFFICE	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM MIXED)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM PUBLIC)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
INDUSTRIAL	0				0.00100	0.00100	0.00100	0.000	0.000	0.000
SCHOOLS	133				0.00068	0.00068	0.00068	0.091	0.091	0.091
PARKS	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
OPEN SPACE	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
WATER BASIN	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
BELTWAY	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
SUBTOTAL	143							0.105	0.105	0.105
TOTALS	654							0.439	0.721	0.506
TOTALS (ROUNDED)	*654*							*0.44*	*0.72*	*0.51*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY

DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN.

TABLE A3-6

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NE-2 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.000	0.000	0.000
RURAL	0	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.000	0.000	0.000
VERY LOW	0	0.60	2.00	2.00	0.00016	0.00054	0.00054	0.000	0.000	0.000
LOW	307	2.10	4.00	2.70	0.00057	0.00108	0.00073	0.175	0.332	0.224
MEDIUM	0	4.10	7.00	4.10	0.00111	0.00189	0.00111	0.000	0.000	0.000
MEDIUM-HIGH	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
MEDIUM HIGH (FROM MIXED)	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
HIGH	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
HIGH (FROM MIXED)	31	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.103	0.171	0.117
VILLAGE CENTER	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
SUBTOTAL	338							0.278	0.503	0.341
NON-RESIDENTIAL USES										
COMMERCIAL	7				0.00140	0.00140	0.00140	0.010	0.010	0.010
COMMERCIAL (FROM MIXED)	16				0.00140	0.00140	0.00140	0.022	0.022	0.022
OFFICE	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM MIXED)	16				0.00120	0.00120	0.00120	0.019	0.019	0.019
OFFICE (FROM PUBLIC)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
INDUSTRIAL	0				0.00100	0.00100	0.00100	0.000	0.000	0.000
SCHOOLS	0				0.00068	0.00068	0.00065	0.000	0.000	0.000
PARKS	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
OPEN SPACE	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
WATER BASIN	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
BELTWAY	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
SUBTOTAL	39							0.051	0.051	0.051
TOTALS	377							0.329	0.554	0.392
TOTALS (ROUNDED)	*377*							*0.33*	*0.55*	*0.39*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-7

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NEES-3 SERVICE AREA						
LAND USE CODE	ABBREVIATION	AVERAGE FLOW GENERATION RATE		AREA (ACRES)	DWELLING UNITS OR OTHER MEASURE	FLOW (MGD)
ESTIMATED MAXIMUM						
1	RR	0 00014	MGD/AC	0.000		0.000
2	PCSFR	0 00054	MGD/AC	0 000		0 000
3	LLSFR	0 00059	MGD/AC	0 000		0 000
4	LDSFR-L	0 00081	MGD/AC	0 000		0 000
5	LDSFR-M	0 00095	MGD/AC	0 000		0.000
6	LDSFR-H	0 00108	MGD/AC	337 800		0 365
7	MLDSFR	0 00108	MGD/AC	0 000		0 000
8	MDSFR-L	0 00135	MGD/AC	0 000		0 000
9	MDSFR-H	0 00189	MGD/AC	0 000		0 000
10	SFR-EXISTING	270	GAL/UNIT/DAY	78.500	239	0 065
20	LDMFR-L	0 00264	MGD/AC	0.000		0.000
21	LDMFR-H	0 00330	MGD/AC	47.000		0 155
22	HDMFR	0 00550	MGD/AC	0 000		0 000
30	OFFICE	0 00120	MGD/AC	0 000		0 000
40	INDUST	0 00100	MGD/AC	0 000		0 000
50	COMM	0 00140	MGD/AC	20.000		0 028
51	BUSS	0 00140	MGD/AC	0 000		0.000
52	TRADE	0 00140	MGD/AC	0 000		0.000
60	PMU	BY GP USE		0 000		0 000
70	OS	0 00000	MGD/AC	3 000		0 000
80	H	0 00030	MGD/BED	0 000		0 000
90	ES	0 00060	MGD/100STUDENTS	30 000	9 5*	0 005
91	MS	0 00140	MGD/100STUDENTS	50 000	18.0*	0 025
92	HS	0 00160	MGD/100STUDENTS	87.000	33 0*	0.053
TOTALS				653 300	239	0.696
TOTALS (ROUNDED)				*653*	*239*	*0 70*
PROJECTION						
1	RR	0 00014	MGD/AC	0 000		0.000
2	PCSFR	0 00054	MGD/AC	0 000		0 000
3	LLSFR	0 00054	MGD/AC	0 000		0 000
4	LDSFR-L	0 00073	MGD/AC	0 000		0 000
5	LDSFR-M	0 00073	MGD/AC	0 000		0 000
6	LDSFR-H	0 00073	MGD/AC	337 800		0 247
7	MLDSFR	0 00073	MGD/AC	0 000		0 000
8	MDSFR-L	0 00111	MGD/AC	0 000		0 000
9	MDSFR-H	0 00111	MGD/AC	0 000		0 000
10	SFR-EXISTING	270	GAL/UNIT/DAY	78 500	239	0 065
20	LDMFR-L	0 00224	MGD/AC	0.000		0 000
21	LDMFR-H	0 00224	MGD/AC	47 000		0 105
22	HDMFR	0 00376	MGD/AC	0 000		0.000
30	OFFICE	0 00120	MGD/AC	0 000		0 000
40	INDUST	0 00100	MGD/AC	0 000		0 000
50	COMM	0 00140	MGD/AC	20 000		0 028
51	BUSS	0 00140	MGD/AC	0.000		0 000
52	TRADE	0.00140	MGD/AC	0 000		0 000
60	PMU	BY GP USE		0 000		0 000
70	OS	0 00000	MGD/AC	3 000		0 000
80	H	0 00030	MGD/BED	0 000		0.000
90	ES	0 00060	MGD/100STUDENTS	30 000	9 5*	0 005
91	MS	0 00140	MGD/100STUDENTS	50 000	18 0*	0 025
92	HS	0.00160	MGD/100STUDENTS	87.000	33 0*	0.053
TOTALS				653.300	239	0 528
TOTALS (ROUNDED)				*653*	*239*	*0 53*

* 100'S OF STUDENTS

TABLE A3-8

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NW-1 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0 05	0.05	0 05	0.00001	0.00001	0 00001	0.000	0 000	0 000
RURAL	0	0.50	0.50	0 50	0 00014	0 00014	0 00014	0 000	0 000	0.000
VERY LOW	161	0 60	2.00	2 00	0.00016	0 00054	0 00054	0.026	0.087	0.087
LOW	764	2.10	4 00	2.70	0 00057	0 00108	0 00073	0 435	0 825	0 558
MEDIUM	135	4 10	7.00	4.10	0.00111	0.00189	0.00111	0 150	0.255	0 150
MEDIUM-HIGH	78	7.10	15 00	10.20	0.00156	0 00330	0.00224	0 122	0 257	0.175
MEDIUM HIGH (FROM MIXED)	0	7 10	15 00	10 20	0 00156	0 00330	0 00224	0.000	0.000	0.000
HIGH	0	15 10	26.00	17.10	0 00332	0 00550	0 00376	0 000	0 000	0 000
HIGH (FROM MIXED)	20	15 10	25.00	17 10	0 00332	0.00550	0 00376	0.066	0.110	0 075
VILLAGE CENTER	0	15 10	25 00	17 10	0 00332	0 00550	0 00376	0.000	0.000	0 000
SUBTOTAL	1,158							0 799	1 534	1.045
NON-RESIDENTIAL USES										
COMMERCIAL	0				0.00140	0 00140	0 00140	0 000	0 000	0 000
COMMERCIAL (FROM MIXED)	20				0 00140	0 00140	0.00140	0.028	0.028	0 028
OFFICE	0				0 00120	0 00120	0 00120	0.000	0 000	0.000
OFFICE (FROM MIXED)	40				0 00120	0 00120	0 00120	0.048	0.048	0 048
OFFICE (FROM PUBLIC)	13				0 00120	0.00120	0 00120	0 016	0 016	0 016
VILLAGE CENTER	0				0 00120	0 00120	0.00120	0 000	0 000	0.000
INDUSTRIAL	216				0 00100	0 00100	0 00100	0 216	0.216	0 216
SCHOOLS	0				0.00068	0 00068	0 00068	0 000	0 000	0.000
PARKS	53				0 00000	0 00000	0 00000	0 000	0.000	0 000
OPEN SPACE	0				0 00000	0 00000	0 00000	0.000	0 000	0 000
WATER BASIN	0				0 00000	0 00000	0.00000	0 000	0 000	0 000
BELTWAY	60				0 00000	0 00000	0.00000	0 000	0 000	0 000
SUBTOTAL	402							0.308	0.308	0.308
TOTALS	1,560							1 107	1 842	1 353
TOTALS (ROUNDED)	*1,560*							*1.11*	*1 84*	*1.35*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN.

TABLE A3-9

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NEES-1 SERVICE AREA						
LAND USE		AVERAGE FLOW GENERATION		AREA	DWELLING UNITS OR OTHER	FLOW
CODE	ABBREVIATION	RATE		(ACRES)	MEASURE	(MGD)
		ESTIMATED MAXIMUM				
1	RR	0.00014	MGD/AC	0.000		0.000
2	PCSFR	0.00054	MGD/AC	0.000		0.000
3	LLSFR	0.00059	MGD/AC	56.000		0.033
4	LDSFR-L	0.00081	MGD/AC	0.000		0.000
5	LDSFR-M	0.00095	MGD/AC	0.000		0.000
6	LDSFR-H	0.00108	MGD/AC	0.000		0.000
7	MLDSFR	0.00108	MGD/AC	0.000		0.000
8	MDSFR-L	0.00135	MGD/AC	0.000		0.000
9	MDSFR-H	0.00189	MGD/AC	0.000		0.000
10	SFR-EXISTING	270	GAL/UNIT/DAY	0.000	0	0.000
20	LDMFR-L	0.00264	MGD/AC	18.000		0.048
21	LDMFR-H	0.00330	MGD/AC	0.000		0.000
22	HDMFR	0.00550	MGD/AC	0.000		0.000
30	OFFICE	0.00120	MGD/AC	0.000		0.000
40	INDUST	0.00100	MGD/AC	0.000		0.000
50	COMM	0.00140	MGD/AC	0.000		0.000
51	BUSS	0.00140	MGD/AC	0.000		0.000
52	TRADE	0.00140	MGD/AC	0.000		0.000
60	PMU	BY GP USE		0.000		0.000
70	OS	0.00000	MGD/AC	0.000		0.000
80	H	0.00030	MGD/BED	0.000		0.000
90	ES	0.00060	MGD/100STUDENTS	0.000	0.0	0.000
91	MS	0.00140	MGD/100STUDENTS	0.000	0.0	0.000
92	HS	0.00160	MGD/100STUDENTS	0.000	0.0	0.000
TOTALS				74.000		0.081
TOTALS (ROUNDED UP)				*74*		*0.09*
		PROJECTION				
1	RR	0.00014	MGD/AC	0.000		0.000
2	PCSFR	0.00054	MGD/AC	0.000		0.000
3	LLSFR	0.00054	MGD/AC	56.000		0.030
4	LDSFR-L	0.00073	MGD/AC	0.000		0.000
5	LDSFR-M	0.00073	MGD/AC	0.000		0.000
6	LDSFR-H	0.00073	MGD/AC	0.000		0.000
7	MLDSFR	0.00073	MGD/AC	0.000		0.000
8	MDSFR-L	0.00111	MGD/AC	0.000		0.000
9	MDSFR-H	0.00111	MGD/AC	0.000		0.000
10	SFR-EXISTING	270	GAL/UNIT/DAY	0.000	0	0.000
20	LDMFR-L	0.00224	MGD/AC	18.000		0.040
21	LDMFR-H	0.00224	MGD/AC	0.000		0.000
22	HDMFR	0.00376	MGD/AC	0.000		0.000
30	OFFICE	0.00120	MGD/AC	0.000		0.000
40	INDUST	0.00100	MGD/AC	0.000		0.000
50	COMM	0.00140	MGD/AC	0.000		0.000
51	BUSS	0.00140	MGD/AC	0.000		0.000
52	TRADE	0.00140	MGD/AC	0.000		0.000
60	PMU	BY GP USE		0.000		0.000
70	OS	0.00000	MGD/AC	0.000		0.000
80	H	0.00030	MGD/BED	0.000		0.000
90	ES	0.00060	MGD/100STUDENTS	0.000	0.0	0.000
91	MS	0.00140	MGD/100STUDENTS	0.000	0.0	0.000
92	HS	0.00160	MGD/100STUDENTS	0.000	0.0	0.000
TOTALS				74.000		0.070
TOTALS (ROUNDED UP)				*74*		*0.07*

* 100'S OF STUDENTS

TABLE A3-10

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

CODE	LAND USE ABBREVIATION	AVERAGE FLOW GENERATION RATE		AREA (ACRES)	DWELLING UNITS OR OTHER MEASURE	FLOW (MGD)
NEES-4 SERVICE AREA						
ESTIMATED MAXIMUM						
1	RR	0 00014	MGD/AC	0.000		0.000
2	PCSFR	0 00054	MGD/AC	0 000		0 000
3	LLSFR	0 00059	MGD/AC	0 000		0.000
4	LDSFR-L	0.00081	MGD/AC	0.000		0 000
5	LDSFR-M	0 00095	MGD/AC	0 000		0 000
6	LDSFR-H	0 00108	MGD/AC	186 700		0 202
7	MLDSFR	0 00108	MGD/AC	0 000		0 000
8	MDSFR-L	0 00135	MGD/AC	0 000		0 000
9	MDSFR-H	0 00189	MGD/AC	86.000		0 163
10	SFR-EXISTING	270	GAL/UNIT/DAY	0 000	0	0 000
20	LDMFR-L	0 00264	MGD/AC	0.000		0.000
21	LDMFR-H	0 00330	MGD/AC	27.000		0.089
22	HDMFR	0 00550	MGD/AC	40 000		0.220
30	OFFICE	0 00120	MGD/AC	0 000		0.000
40	INDUST	0.00100	MGD/AC	0 000		0 000
50	COMM	0 00140	MGD/AC	0 000		0 000
51	BUSS	0 00140	MGD/AC	0 000		0 000
52	TRADE	0 00140	MGD/AC	0 000		0.000
60	PMU	BY GP USE		0 000		0 000
70	OS	0 00000	MGD/AC	83 000		0 000
80	H	0 00030	MGD/BED	0 000		0.000
90	ES	0 00060	MGD/100STUDENTS	0 000	0 0	0 000
91	MS	0 00140	MGD/100STUDENTS	0 000	0 0	0 000
92	HS	0 00160	MGD/100STUDENTS	0.000	0 0	0 000
TOTALS				422 700		0.674
TOTALS (ROUNDED UP)				*423*		*0 68*
PROJECTION						
1	RR	0 00014	MGD/AC	0.000		0 000
2	PCSFR	0.00054	MGD/AC	0.000		0 000
3	LLSFR	0 00054	MGD/AC	0 000		0.000
4	LDSFR-L	0 00073	MGD/AC	0 000		0.000
5	LDSFR-M	0 00073	MGD/AC	0 000		0.000
6	LDSFR-H	0 00073	MGD/AC	186.700		0 136
7	MLDSFR	0 00073	MGD/AC	0.000		0 000
8	MDSFR-L	0 00111	MGD/AC	0 000		0.000
9	MDSFR-H	0 00111	MGD/AC	86 000		0 095
10	SFR-EXISTING	270	GAL/UNIT/DAY	0 000	0	0.000
20	LDMFR-L	0 00224	MGD/AC	0 000		0.000
21	LDMFR-H	0 00224	MGD/AC	27 000		0 060
22	HDMFR	0 00376	MGD/AC	40 000		0 150
30	OFFICE	0 00120	MGD/AC	0 000		0 000
40	INDUST	0 00100	MGD/AC	0 000		0 000
50	COMM	0 00140	MGD/AC	0 000		0.000
51	BUSS	0.00140	MGD/AC	0 000		0 000
52	TRADE	0 00140	MGD/AC	0.000		0.000
60	PMU	BY GP USE		0 000		0.000
70	OS	0 00000	MGD/AC	83 000		0 000
80	H	0 00030	MGD/BED	0 000		0 000
90	ES	0 00060	MGD/100STUDENTS	0 000	0 0	0.000
91	MS	0 00140	MGD/100STUDENTS	0 000	0 0	0.000
92	HS	0 00160	MGD/100STUDENTS	0.000	0 0	0.000
TOTALS				422.700		0 441
TOTALS (ROUNDED UP)				*423*		*0 44*

* 100'S OF STUDENTS

TABLE A3-11

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NE-3 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0 05	0 05	0 05	0 00001	0.00001	0 00001	0 000	0.000	0 000
RURAL	0	0 50	0 50	0 50	0 00014	0 00014	0.00014	0.000	0 000	0 000
VERY LOW	443	0 60	2 00	2 00	0 00016	0.00054	0 00054	0.071	0 239	0 239
LOW	0	2 10	4 00	2 70	0 00057	0 00108	0 00073	0.000	0 000	0 000
MEDIUM	0	4 10	7 00	4 10	0 00111	0.00189	0.00111	0 000	0 000	0 000
MEDIUM-HIGH	0	7 10	15 00	10 20	0 00156	0 00330	0 00224	0 000	0 000	0.000
MEDIUM HIGH (FROM MIXED)	0	7 10	15.00	10.20	0 00156	0.00330	0 00224	0 000	0.000	0 000
HIGH	0	15.10	25.00	17.10	0 00332	0.00550	0 00376	0 000	0 000	0 000
HIGH (FROM MIXED)	0	15.10	25 00	17.10	0 00332	0.00550	0.00376	0 000	0 000	0 000
VILLAGE CENTER	0	15 10	25.00	17 10	0.00332	0.00550	0 00376	0 000	0.000	0.000
SUBTOTAL	443							0 071	0.239	0 239
NON-RESIDENTIAL USES										
COMMERCIAL	0				0.00140	0 00140	0 00140	0 000	0 000	0 000
COMMERCIAL (FROM MIXED)	0				0 00140	0 00140	0.00140	0.000	0 000	0 000
OFFICE	0				0 00120	0 00120	0 00120	0 000	0 000	0 000
OFFICE (FROM MIXED)	0				0 00120	0 00120	0 00120	0.000	0.000	0 000
OFFICE (FROM PUBLIC)	0				0 00120	0.00120	0.00120	0.000	0 000	0.000
VILLAGE CENTER	0				0 00120	0.00120	0 00120	0 000	0.000	0.000
INDUSTRIAL	0				0 00100	0.00100	0 00100	0 000	0 000	0 000
SCHOOLS	0				0 00068	0 00068	0 00068	0 000	0 000	0 000
PARKS	0				0 00000	0 00000	0 00000	0 000	0 000	0 000
OPEN SPACE	0				0 00000	0 00000	0 00000	0.000	0 000	0 000
WATER BASIN	0				0 00000	0.00000	0 00000	0.000	0 000	0 000
BELTWAY	0				0.00000	0 00000	0 00000	0 000	0 000	0 000
SUBTOTAL	0							0 000	0.000	0 000
TOTALS	443							0 071	0 239	0 239
TOTALS (ROUNDED)	*443*							*0 07*	*0 24*	*0 24*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-12

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

LAND USES FROM GENERAL PLAN	GROSS AREAS (ACRES)	RANGE OF DENSITIES LOW (DU/AC)	MAXI-MUM (DU/AC)	PRO-JECTED (DU/AC)	UNIT FLOW GENERATION RATE LOW (GPD/AC)	MAXI-MUM (GPD/AC)	PRO-JECTED (GPD/AC)	ESTIMATED FLOW TO BE GENERATED LOW (MGD)	MAXI-MUM (MGD)	PRO-JECTED (MGD)
SE-1 SERVICE AREA										
RESIDENTIAL USES										
AGRICULTURAL	0	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.000	0.000	0.000
RURAL	0	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.000	0.000	0.000
VERY LOW	543	0.60	2.00	2.00	0.00016	0.00054	0.00054	0.087	0.293	0.293
LOW	157	2.10	4.00	2.70	0.00057	0.00108	0.00073	0.089	0.170	0.115
MEDIUM	275	4.10	7.00	4.10	0.00111	0.00189	0.00111	0.305	0.520	0.305
MEDIUM-HIGH	100	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.156	0.330	0.224
MEDIUM HIGH (FROM MIXED)	6	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.009	0.020	0.013
HIGH	62	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.206	0.341	0.233
HIGH (FROM MIXED)	18	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.060	0.099	0.068
VILLAGE CENTER	60	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.199	0.330	0.226
SUBTOTAL	1,221							1.111	2.103	1.477
NON-RESIDENTIAL USES										
COMMERCIAL	10				0.00140	0.00140	0.00140	0.014	0.014	0.014
COMMERCIAL (FROM MIXED)	79				0.00140	0.00140	0.00140	0.111	0.111	0.111
OFFICE	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM MIXED)	54				0.00120	0.00120	0.00120	0.065	0.065	0.065
OFFICE (FROM PUBLIC)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
INDUSTRIAL	67				0.00100	0.00100	0.00100	0.067	0.067	0.067
SCHOOLS	12	(AG CAMPUS ONLY)			0.00000	0.00000	0.00000	0.000	0.000	0.000
PARKS	23				0.00000	0.00000	0.00000	0.000	0.000	0.000
OPEN SPACE	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
WATER BASIN	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
BELTWAY	25				0.00000	0.00000	0.00000	0.000	0.000	0.000
SUBTOTAL	270							0.257	0.257	0.257
TOTALS	1,491							1.368	2.360	1.734
TOTALS (ROUNDED)	*1,491*							*1.37*	*2.36*	*1.73*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-13

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

SE-4 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0 05	0 05	0.05	0 00001	0 00001	0 00001	0 000	0 000	0.000
RURAL	0	0 50	0 50	0 50	0 00014	0 00014	0.00014	0 000	0 000	0.000
VERY LOW	0	0 60	2 00	2.00	0 00016	0 00054	0.00054	0 000	0.000	0.000
LOW	928	2 10	4 00	2 70	0.00057	0 00108	0 00073	0 529	1 002	0.677
MEDIUM	0	4 10	7.00	4 10	0 00111	0 00189	0.00111	0.000	0 000	0 000
MEDIUM-HIGH	0	7 10	15 00	10.20	0 00156	0 00330	0 00224	0.000	0.000	0 000
MEDIUM HIGH (FROM MIXED)	0	7 10	15.00	10 20	0 00156	0 00330	0 00224	0.000	0.000	0 000
HIGH	0	15 10	25 00	17.10	0 00332	0 00550	0.00376	0 000	0.000	0.000
HIGH (FROM MIXED)	0	15 10	25.00	17.10	0 00332	0.00550	0 00376	0.000	0.000	0.000
VILLAGE CENTER	0	15 10	25 00	17 10	0 00332	0 00550	0 00376	0.000	0.000	0 000
SUBTOTAL	928							0.529	1.002	0 677
NON-RESIDENTIAL USES										
COMMERCIAL	0				0.00140	0 00140	0 00140	0.000	0.000	0 000
COMMERCIAL (FROM MIXED)	0				0 00140	0 00140	0 00140	0 000	0 000	0.000
OFFICE	0				0 00120	0 00120	0 00120	0 000	0.000	0.000
OFFICE (FROM MIXED)	0				0 00120	0 00120	0 00120	0.000	0 000	0 000
OFFICE (FROM PUBLIC)	0				0 00120	0 00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0 00120	0 00120	0 00120	0 000	0 000	0 000
INDUSTRIAL	0				0 00100	0 00100	0 00100	0 000	0.000	0 000
SCHOOLS	0				0 00000	0 00000	0.00000	0 000	0 000	0 000
PARKS	0				0 00000	0 00000	0 00000	0 000	0.000	0 000
OPEN SPACE	0				0 00000	0 00000	0 00000	0 000	0 000	0 000
WATER BASIN	41				0 00000	0 00000	0.00000	0 000	0.000	0 000
BELTWAY	0				0 00000	0.00000	0.00000	0.000	0 000	0.000
SUBTOTAL	41							0 000	0 000	0 000
TOTALS	969							0 529	1 002	0 677
TOTALS (ROUNDED)	*969*							*0 53*	*1 00*	*0.68*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-14

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NE-1 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXIMUM	PROJECTED	LOW	MAXIMUM	PROJECTED	LOW	MAXIMUM	PROJECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	0	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.000	0.000	0.000
RURAL	0	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.000	0.000	0.000
VERY LOW	777	0.60	2.00	2.00	0.00016	0.00054	0.00054	0.124	0.420	0.420
LOW	734	2.10	4.00	2.70	0.00057	0.00108	0.00073	0.418	0.793	0.536
MEDIUM	395	4.10	7.00	4.10	0.00111	0.00189	0.00111	0.438	0.747	0.438
MEDIUM-HIGH	93	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.145	0.307	0.208
MEDIUM HIGH (FROM MIXED)	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
HIGH	115	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.382	0.633	0.432
HIGH (FROM MIXED)	33	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.110	0.182	0.124
VILLAGE CENTER	20	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.066	0.110	0.075
SUBTOTAL	2,167							1.683	3.192	2.233
NON-RESIDENTIAL USES										
COMMERCIAL	36				0.00140	0.00140	0.00140	0.050	0.050	0.050
COMMERCIAL (FROM MIXED)	67				0.00140	0.00140	0.00140	0.094	0.094	0.094
OFFICE	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM MIXED)	34				0.00120	0.00120	0.00120	0.041	0.041	0.041
OFFICE (FROM PUBLIC)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
INDUSTRIAL	320				0.00100	0.00100	0.00100	0.320	0.320	0.320
SCHOOLS	230				0.00050	0.00050	0.00050	0.115	0.115	0.115
PARKS	316				0.00000	0.00000	0.00000	0.000	0.000	0.000
OPEN SPACE	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
WATER BASIN	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
BELTWAY	55				0.00000	0.00000	0.00000	0.000	0.000	0.000
SUBTOTAL	1,058							0.620	0.620	0.620
TOTALS	3,225							2.303	3.812	2.853
TOTALS (ROUNDED)	*3,225*							*2.30*	*3.81*	*2.85*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN.
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

TABLE A3-15

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

NE-5 SERVICE AREA										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RESIDENTIAL USES										
AGRICULTURAL	193	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.002	0.002	0.002
RURAL	0	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.000	0.000	0.000
VERY LOW	0	0.60	2.00	2.00	0.00016	0.00054	0.00054	0.000	0.000	0.000
LOW	1,317	2.10	4.00	2.70	0.00057	0.00108	0.00073	0.751	1.422	0.961
MEDIUM	0	4.10	7.00	4.10	0.00111	0.00189	0.00111	0.000	0.000	0.000
MEDIUM-HIGH	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
MEDIUM HIGH (FROM MIXED)	0	7.10	15.00	10.20	0.00156	0.00330	0.00224	0.000	0.000	0.000
HIGH	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
HIGH (FROM MIXED)	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
VILLAGE CENTER	0	15.10	25.00	17.10	0.00332	0.00550	0.00376	0.000	0.000	0.000
SUBTOTAL	1,510							0.753	1.424	0.963
NON-RESIDENTIAL USES										
COMMERCIAL	0				0.00140	0.00140	0.00140	0.000	0.000	0.000
COMMERCIAL (FROM MIXED)	0				0.00140	0.00140	0.00140	0.000	0.000	0.000
OFFICE	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM MIXED)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
OFFICE (FROM PUBLIC)	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
VILLAGE CENTER	0				0.00120	0.00120	0.00120	0.000	0.000	0.000
INDUSTRIAL	0				0.00100	0.00100	0.00100	0.000	0.000	0.000
SCHOOLS	0				0.00050	0.00050	0.00050	0.000	0.000	0.000
PARKS	0				0.00000	0.00000	0.00000	0.000	0.000	0.000
OPEN SPACE	1,449				0.00000	0.00000	0.00000	0.000	0.000	0.000
WATER BASIN	414				0.00000	0.00000	0.00000	0.000	0.000	0.000
BELTWAY	49				0.00000	0.00000	0.00000	0.000	0.000	0.000
SUBTOTAL	1,912							0.000	0.000	0.000
TOTALS	3,422							0.753	1.424	0.963
TOTALS (ROUNDED)	*3,422*							*0.75*	*1.42*	*0.96*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN.

TABLE A3-16

ESTIMATED AVERAGE DAILY WASTEWATER FLOW GENERATION

POTENTIAL RURAL-RESIDENTIAL AND AGRICULTURAL SERVICE AREAS										
LAND USES FROM GENERAL PLAN	GROSS AREAS	RANGE OF DENSITIES			UNIT FLOW GENERATION RATE			ESTIMATED FLOW TO BE GENERATED		
		LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED	LOW	MAXI-MUM	PRO-JECTED
	(ACRES)	(DU/AC)	(DU/AC)	(DU/AC)	(GPD/AC)	(GPD/AC)	(GPD/AC)	(MGD)	(MGD)	(MGD)
RURAL RESIDENTIAL AREAS										
NEES-2	769	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.108	0.108	0.108
RR-1	1,367	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.191	0.191	0.191
RR-2	9,544	0.50	0.50	0.50	0.00014	0.00014	0.00014	1.336	1.336	1.336
NW-3	127	0.50	0.50	0.50	0.00014	0.00014	0.00014	0.018	0.018	0.018
TOTALS	11,807							1.653	1.653	1.653
TOTALS (ROUNDED UP)	*11,807*							*1.66*	*1.66*	*1.66*
AGRICULTURAL AREAS										
AG-1	390	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.005	0.005	0.005
AG-2	5,063	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.068	0.068	0.068
AG-3	547	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.007	0.007	0.007
AG-4	1,214	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.016	0.016	0.016
NW-2	941	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.013	0.013	0.013
SE-3	578	0.05	0.05	0.05	0.00001	0.00001	0.00001	0.008	0.008	0.008
TOTALS	8,733							0.117	0.117	0.117
TOTALS (ROUNDED)	*8,733*							*0.12*	*0.12*	*0.12*

DESIGN SINGLE-FAMILY RESIDENTIAL FLOW GENERATION RATE = 270 GALLONS PER UNIT PER DAY
DESIGN MULTI-FAMILY RESIDENTIAL FLOW GENERATION RATE = 220 GALLONS PER UNIT PER DAY

"PROJECTED" FLOW BASED UPON EXPECTED LEVEL OF DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN.
"ESTIMATED MAXIMUM" FLOW BASED UPON MAXIMUM DEVELOPMENT OF LAND USES PRESCRIBED IN 1993 CLOVIS GENERAL PLAN

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Newport Beach, CA (714) 752-6741

MEMORANDUM

RECEIVED
FEB 16 1993
CITY OF CLOVIS
PLANNING DEPT.

DATE: February 12, 1993

TO: John Wright
City of Clovis

FROM: Dennis Wambem
Marcine Osborn

SUBJECT: Clovis Housing Projections and Existing Sphere of Influence

This memorandum presents an analysis of the holding capacity of the existing Clovis Sphere of Influence in the context of housing projections prepared for the General Plan.

Summary of Results

Sphere Holding Capacity. It is our conclusion that the housing capacity of the existing Sphere of Influence will be substantially built out between the years 2002 and 2005, depending on the projection used. As shown below, between one and three years of housing development capacity will remain in the year 2002. This analysis is based on utilization of 90 percent of the residential development opportunities. The 90 percent assumption is based on the condition that not all of the residential opportunities will be built out, because of specialized circumstances of ownership, site size, and configuration.

Remaining Housing Capacity
Year 2002
Existing Clovis Sphere of Influence

Baseline Projection	2.9 years
High Projection	1.0 years

Baseline and High Projections. The Baseline Projection assumes that the Clovis share of Fresno-Clovis Metropolitan Area (FCMA) housing will remain constant at current levels of about 13.2 percent. Under the High Projection, the Clovis share of FCMA housing is projected to increase to about 15.5 percent by 2030. This increase in the Clovis share under the high projection is considered likely for two reasons:

- First, the performance of Clovis over the 1980-1992 period shows an increasing share of FCMA housing--from 12.6 percent in 1980 to 13.2 percent in 1992.

- Second, as development opportunities in the Woodward Park-Highway 41 corridor area are built out, development pressures will move to the east, along the Clovis northern Sphere of Influence.

In any case, the existing Sphere of Influence contains housing opportunities sufficient to accommodate only 10-12 years of future housing demand.

The Need for an Additional Supply Allowance. It is recognized that the residential land market should contain an allowance of additional supply. This allowance is to provide competition and efficiency in the development market, diversity of development opportunities, and to prevent a few parties from exercising undue influence over housing mix and pricing. Thus, the exhaustion of all residential land over a period of 10-12 years implies that the supply should be augmented several years prior to that time, to provide an additional supply allowance.

LAFCO Policy Regarding Sphere Expansions. Based on the Fresno County LAFCO Revision of Sphere of Influence Application, the following guidelines for sphere revisions are summarized:

> "A sphere of influence should be comprehensive and based on historical growth patterns, using a twenty to twenty five year projection, done in conjunction with a city and county general plan update for the community". (Section 300.5, October 1, 1990)

Based on these guidelines, the ongoing General Plan program for Clovis, the clear insufficiency of development opportunities in the existing Sphere, and the need for a supply allowance, an expansion of the Sphere to encompass the General Plan Project Area can be supported.

2. Long Range Projections

The long range projections have been prepared on the basis of our projections model for the San Joaquin Valley, with additional refinements for Fresno County and the FCMA based on the White Paper prepared by the Cities of Fresno and Clovis, Fresno County and the Council of Fresno County Governments in August of 1992.

Tables 1-4 present the long range projections prepared for the Clovis General Plan Program. The Baseline Projection is presented in Tables 1 and 2 and the High Projection is presented in Tables 3 and 4. Under the Baseline Projection, housing unit growth is projected to range from 808 units per year over the 1992-2000 period, and 981 units per year over the period from 2000-2010. Under the High Projection, annual growth of 950 housing units is projected from 1992-2000; and annual growth of 1,152 units is projected from 2000-2010. For comparison purposes, annual housing growth was about 560 units over the 1980-1990 period; and was about 875 units per year for the 1990-1992 period.

3. Holding Capacity Estimates

The holding capacity estimates for the existing Sphere of Influence are presented in Table 5. These estimates are derived from the land use data prepared at Traffic Analysis Zone (TAZ) level for the General Plan. However, the net acres designated for High Mixed Use residential development have been reduced from about 492 acres to 123 acres. This reduction reflects our refinements of the mixed use designations since the TAZ allocations were prepared.

In total, the holding capacity is estimated at 39,058 units, if all land is utilized. However, 90 percent of land utilization is regarded as a more realistic estimate of holding capacity, resulting in 35,153 potential units in the Sphere, including all existing and future units.

4. Utilization of Holding Capacity over Time

Table 6 presents the utilization of holding capacity over time, using the housing growth projections under both the Baseline and High scenarios. This table presents the year-by-year housing totals, remaining holding capacity, and years of capacity remaining. Remaining holding capacity (e.g., to accommodate new growth) is estimated at only about 9,800 units, which is only a 10-12 year supply, depending on the projection scenario.

TABLE 1
CLOVIS GENERAL PLAN PROGRAM
BASELINE PROJECTION OF POPULATION, HOUSING AND EMPLOYMENT
CLOVIS GENERAL PLAN PROJECT AREA, FRESNO-CLOVIS METROPOLITAN AREA AND FRESNO COUNTY

	Historic Trends			Projections							
	1980	1990	1992	1997	2000	2005	2010	2015	2020	2025	2030
A. POPULATION, HOUSING AND EMPLOYMENT LEVELS											
Clovis General Plan Project Area											
Population	45,237	62,423	67,217	79,311	87,166	100,005	114,734	132,407	152,789	176,332	203,494
Housing units	17,216	22,808	24,559	28,503	31,022	35,591	40,833	47,122	54,376	62,755	72,422
Employment	12,590	20,869	20,395	24,739	28,663	34,757	41,806	49,957	59,425	70,636	83,889
Fresno-Clovis Metropolitan Area (FCMA)											
Population	358,800	477,400	510,464	589,224	642,200	740,870	854,700	985,839	1,137,100	1,311,824	1,513,395
Housing units	146,005	174,413	181,819	210,835	229,339	262,980	301,555	347,820	401,184	462,829	533,946
Employment	171,979	229,217	224,008	251,210	273,840	316,032	364,725	420,682	485,224	559,783	645,797
Fresno County											
Population	514,621	667,490	713,719	820,562	892,200	1,029,141	1187100	1,369,229	1,579,300	1,821,971	2,101,930
Housing units	193,653	235,563	246,216	283,276	308,139	353,338	405,167	467,329	539,029	621,854	717,407
Employment	263,453	320,878	313,585	362,066	394,681	455,492	525672	606,322	699,346	806,806	930,778
B. DEMOGRAPHIC RELATIONSHIPS											
Clovis General Plan Project Area											
Population per housing unit	2.63	2 74	2.74	2.78	2 81	2 81	2 81	2.81	2.81	2.81	2 81
Jobs per housing unit	0.73	0.91	0 83	0.87	0.92	0.98	1.02	1.06	1.09	1.13	1.16
Fresno-Clovis Metropolitan Area											
Population per housing unit	2 46	2.74	2.81	2.79	2.80	2 82	2.83	2 83	2.83	2 83	2.83
Jobs per housing unit	1.18	1.31	1.23	1.19	1.19	1.20	1.21	1.21	1 21	1 21	1.21
Fresno County											
Population per housing unit	2.66	2.83	2 90	2 90	2.90	2.91	2.93	2 93	2 93	2 93	2 93
Jobs per housing unit	1.36	1.36	1.27	1 28	1.28	1 29	1.30	1.30	1.30	1.30	1.30
C. FCMA and CLOVIS SHARES											
FCMA SHARE OF COUNTY											
Population	69 7%	71.5%	71.5%	70.9%	70.9%	70 9%	70 9%	70 9%	70 9%	70 9%	70 9%
Housing units	75.4%	74.0%	73.8%	74.4%	74.4%	74.4%	74 4%	74 4%	74.4%	74 4%	74 4%
Employment	65.3%	71.4%	71.4%	69.4%	69.4%	69.4%	69 4%	69.4%	69.4%	69.4%	69.4%
CLOVIS SHARE OF FCMA											
Population	12.6%	13.1%	13 2%	13.5%	13 6%	13 5%	13 4%	13.4%	13 4%	13 4%	13 4%
Housing units	11.8%	13 1%	13 5%	13 5%	13.5%	13.5%	13 5%	13 5%	13 6%	13 6%	13 6%
Employment	7.3%	9.1%	9.1%	9.8%	10.5%	11.0%	11 5%	11.9%	12.2%	12 6%	13 0%

Source: Stanley R Hoffman Associates, Inc.
City of Fresno White Paper, "Existing Trends, Population Projections in the FCMA," August 27, 1992.

BASELINE PROJECTION

TABLE 2

CLOVIS GENERAL PLAN PROGRAM

BASELINE PROJECTION ANNUAL GROWTH INCREMENTS AND GROWTH RATES

CLOVIS PROJECT AREA

	Historic Period	Projected Periods			
	1980-1992	1992-2000	2000-2010	2010-2020	2020-2030
A. Annual Growth Increments					
Population	1,832	2,494	2,757	3,805	5,071
Housing units	612	808	981	1,354	1,805
Employment	650	1,034	1,314	1,762	2,446
B. Average Annual Growth Rates					
Population	3.4%	3.3%	2.8%	2.9%	2.9%
Housing units	3.0%	3.0%	2.8%	2.9%	2.9%
Employment	4.1%	4.3%	3.8%	3.6%	3.5%

Source: Stanley R. Hoffman Associates, Inc.

HIGH PROJECTION

TABLE 3
CLOVIS GENERAL PLAN PROGRAM
HIGH PROJECTION OF POPULATION, HOUSING AND EMPLOYMENT
CLOVIS GENERAL PLAN PROJECT AREA, FRESNO-CLOVIS METROPOLITAN AREA AND FRESNO COUNTY

	Historic Trends			Projections							
	1980	1990	1992	1997	2000	2005	2010	2015	2020	2025	2030
A. POPULATION, HOUSING AND EMPLOYMENT LEVELS											
Clovis General Plan Project Area											
Population	45,237	62,423	67,217	80,919	90,373	105,333	122,738	143,824	168,490	197,379	231,168
Housing units	17,216	22,808	24,559	29,081	32,163	37,487	43,681	51,185	59,964	70,245	82,270
Employment	12,590	20,869	20,395	24,739	29,002	35,819	44,049	53,933	65,814	80,087	97,193
Fresno-Clovis Metropolitan Area (FCMA)											
Population	358,800	477,400	510,464	589,224	642,200	740,870	854,700	985,839	1,137,100	1,311,824	1,513,395
Housing units	146,005	174,413	181,819	210,835	229,339	262,980	301,555	347,820	401,184	462,829	533,948
Employment	171,979	229,217	224,008	251,210	273,840	316,032	364,725	420,682	485,224	559,783	645,797
Fresno County											
Population	514,621	667,490	713,719	820,562	892,200	1,029,141	1187100	1,369,229	1,579,300	1,821,971	2,101,930
Housing units	193,653	235,563	246,216	283,276	308,139	353,338	405,167	467,329	539,029	621,854	717,407
Employment	263,453	320,878	313,585	362,066	394,681	455,492	525672	606,322	699,346	806,806	930,778
B. DEMOGRAPHIC RELATIONSHIPS											
Clovis General Plan Project Area											
Population per housing unit	2 63	2 74	2 74	2.78	2.81	2 81	2 81	2 81	2.81	2 81	2.81
Jobs per housing unit	0.73	0.91	0.83	0.85	0.90	0.96	1.01	1.05	1.10	1.14	1.18
Fresno-Clovis Metropolitan Area											
Population per housing unit	2.46	2.74	2 81	2.79	2 80	2 82	2 83	2 83	2 83	2 83	2 83
Jobs per housing unit	1.18	1.31	1.23	1.19	1.19	1.20	1.21	1.21	1.21	1.21	1 21
Fresno County											
Population per housing unit	2.66	2 83	2 90	2 90	2.90	2 91	2.93	2.93	2.93	2 93	2 93
Jobs per housing unit	1.36	1.36	1.27	1.28	1.28	1.29	1.30	1.30	1.30	1.30	1.30
C. FCMA and CLOVIS SHARES											
FCMA SHARE OF COUNTY											
Population	69 7%	71 5%	71.5%	70.9%	70.9%	70.9%	70 9%	70.9%	70.9%	70 9%	70 9%
Housing units	75 4%	74.0%	73 8%	74.4%	74.4%	74 4%	74.4%	74 4%	74.4%	74.4%	74.4%
Employment	65.3%	71.4%	71.4%	69.4%	69.4%	69.4%	69.4%	69.4%	69.4%	69.4%	69.4%
CLOVIS SHARE OF FCMA											
Population	12 6%	13.1%	13 2%	13 7%	14 1%	14 2%	14.4%	14 6%	14 8%	15.0%	15 3%
Housing units	11.8%	13.1%	13 5%	13 8%	14 0%	14.3%	14 5%	14 7%	14 9%	15 2%	15 4%
Employment	7 3%	9.1%	9 1%	9 8%	10.6%	11.3%	12.1%	12.8%	13.6%	14.3%	15.1%

Source. Stanley R Hoffman Associates, Inc.
City of Fresno White Paper, "Existing Trends, Population Projections in the FCMA," August 27, 1992.

HIGH PROJECTION

TABLE 4

CLOVIS GENERAL PLAN PROGRAM

HIGH PROJECTION ANNUAL GROWTH INCREMENTS AND GROWTH RATES

CLOVIS PROJECT AREA

	Historic Period	Projected Periods			
	1980-1992	1992-2000	2000-2010	2010-2020	2020-2030
A. Annual Growth Increments					
Population	1,832	2,894	3,237	4,575	6,268
Housing units	612	950	1,152	1,628	2,231
Employment	650	1,076	1,505	2,177	3,138
B. Average Annual Growth Rates					
Population	3.4%	3.8%	3.1%	3.2%	3.2%
Housing units	3.0%	3.4%	3.1%	3.2%	3.2%
Employment	4.1%	4.5%	4.3%	4.1%	4.0%

Source: Stanley R. Hoffman Associates, Inc.

TABLE 5

CLOVIS GENERAL PLAN PROGRAM

RESIDENTIAL DEVELOPMENT

BUILDOUT POTENTIAL OF LAND WITHIN EXISTING CLOVIS SPHERE OF INFLUENCE

Dwelling Unit Type	Units per Acre Gross	Units per Acre Net	Net Acres	Potential Units	Buildout Units @ 90% of Potential
Agriculture	0.05	n/a	0	0	0
Rural	0.50	0.55	848	466	419
Very Low	2.00	2.80	686	1,921	1,729
Low	2.70	4.20	2,786	11,701	10,531
Medium	4.10	6.80	1,533	10,427	9,384
Medium-High	10.20	13.64	126	1,721	1.549
High	17.70	19.00	552	10,490	9,441
High Mixed Use	16.50	19.00	123	2.333	2.100
Total			6,655	39,058	35,153

Source: Stanley R. Hoffman Associates, Inc.

TABLE 6

CLOVIS GENERAL PLAN PROGRAM

EVALUATION OF RESIDENTIAL HOLDING CAPACITY

EXISTING SPHERE OF INFLUENCE

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Projected Housing Units[1]										
Baseline Projection	25,302	26,066	26,855	27,667	28,503	29,319	30,159	31,022	31,886	32,775
High Projection	25,403	26,277	27,180	28,114	29,081	30,074	31,101	32,163	33,164	34,195
Remaining Residential Holding Capacity in Existing Sphere of Influence[2]										
Baseline Projection	9,851	9,087	8,298	7,486	6,650	5,834	4,994	4,131	3,267	2,378
High Projection	9,750	8,876	7,973	7,039	6,072	5,079	4,052	2,990	1,989	958
Number of Years of Residential Development remaining in Existing Sphere of Influence										
Baseline Projection	11.9	10.9	10.0	9.0	8.0	7.0	6.0	5.0	3.9	2.9
High Projection	10.0	9.1	8.2	7.2	6.2	5.2	4.1	3.1	2.0	1.0

Source: Stanley R. Hoffman Associates, Inc.

Notes: 1. Housing units include all existing units within the City and project area, plus future units based on long range projections.

2. Remaining holding capacity is based on total Sphere holding capacity of 35,153 units from Table 5, minus projected units.

APPENDIX A4

(MATERIALS RELATED TO SECTION 4)

TABLE A4-1

CALCULATIONS FOR EXISTING BARSTOW/VILLA PUMP STATION AND EXISTING FORCE MAIN

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	0 44	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	306	GALLONS PER MINUTE
PUMP DISCHARGE	612	GALLONS PER MINUTE
FORCE MAIN DIAMETER	10	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2.5	FEET PER SECOND
FORCE MAIN LENGTH	2,700	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	335	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	349	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	3.10	FEET
HEAD LOSS IN FORCE MAIN	8	FEET
HEAD LOSS THROUGH PUMP STATION	5	FEET
TOTAL ENERGY HEAD LOSS	27	FEET
ENERGY UNIT COST	$0.12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$7.50	PER DAY
AVERAGE ANNUAL ENERGY COST	$2,700 00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	NA	GALLONS
WET WELL VOLUME	NA	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	NA	GALLONS
SYSTEM AVERAGE DETENTION TIME	NA	HOURS
SULFIDE CONCENTRATION	NA	MILLOGRAMS PER LITER
SULFUR PRODUCTION	NA	POUNDS PER DAY
BIOXIDE DOSAGE RATE	NA	TO 1.0
BIOXIDE CONCENTRATION	NA	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	NA	GALLONS PER DAY
BIOXIDE COST PER GALLON	NA	PER GALLON
AVERAGE BIOXIDE COST PER DAY	NA	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST	NA	PER YEAR

TABLE A4-2

CALCULATIONS FOR
EXISTING BARSTOW/VILLA PUMP STATION AND PROPOSED FORCE MAIN

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	0.44	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	306	GALLONS PER MINUTE
PUMP DISCHARGE	612	GALLONS PER MINUTE
FORCE MAIN DIAMETER	10	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2.5	FEET PER SECOND
FORCE MAIN LENGTH	6,600	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	335	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	354	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	3 10	FEET
HEAD LOSS IN FORCE MAIN	20	FEET
HEAD LOSS THROUGH PUMP STATION	5	FEET
TOTAL ENERGY HEAD LOSS	44	FEET
ENERGY UNIT COST	$0.12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$12.20	PER DAY
AVERAGE ANNUAL ENERGY COST	$4,500 00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	26,910	GALLONS
WET WELL VOLUME	2,200	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	29,110	GALLONS
SYSTEM AVERAGE DETENTION TIME	1.59	HOURS
SULFIDE CONCENTRATION	14.24	MILLOGRAMS PER LITER
SULFUR PRODUCTION	52.3	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1.0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	35 9	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2 00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$71.80	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST	$26,200 00	PER YEAR

TABLE A4-3

CALCULATIONS FOR PROPOSED HERNDON/CLOVIS PUMP STATION AND FORCE MAIN

	FORCE MAIN CALCULATIONS	
AVERAGE DAILY INFLOW	0.59	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	410	GALLONS PER MINUTE
PUMP DISCHARGE	820	GALLONS PER MINUTE
FORCE MAIN DIAMETER	10	INCHES
VELOCITY OF FLOW IN FORCE MAIN	3.4	FEET PER SECOND
FORCE MAIN LENGTH	8.200	LINEAL FEET
	ENERGY COST CALCULATIONS	
PUMP SUMP WATER SURFACE ELEVATION	344	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	372	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	5.33	FEET
HEAD LOSS IN FORCE MAIN	44	FEET
HEAD LOSS THROUGH PUMP STATION	10	FEET
TOTAL ENERGY HEAD LOSS	82	FEET
ENERGY UNIT COST	$0 12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$30.50	PER DAY
AVERAGE ANNUAL ENERGY COST	$11.100 00	PER YEAR
	SULFIDE CONTROL CALCULATIONS	
FORCE MAIN VOLUME	33,440	GALLONS
WET WELL VOLUME	2,900	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	36,340	GALLONS
SYSTEM AVERAGE DETENTION TIME	1.48	HOURS
SULFIDE CONCENTRATION	13.33	MILLOGRAMS PER LITER
SULFUR PRODUCTION	65.6	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1 0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	45 0	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2.00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$90.00	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST	$32,900 00	PER YEAR

APPENDIX A5

(MATERIALS RELATED TO SECTION 5)

TABLE A5-1

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR URBAN DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVES 1 AND 2										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.44								0.44
FOWLER-1		5.99								5.99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0.26
NEES-1					0.07					0.07
NEES-2			0.00							0.00
NEES-3			0.53							0.53
NEES-4					0.44					0.44
NW-1					1.35					1.35
NW-2					0.00					0.00
NW-3					0.00					0.00
SE-1						1.73				1.73
SE-2		0.51								0.51
SE-3						0.00				0.00
SE-4						0.68				0.68
NE-1						2.85				2.85
NE-2		0.39								0.39
NE-3					0.24					0.24
NE-4					0.00					0.00
NE-5						0.96				0.96
RR-1					0.00					0.00
RR-2						0.00				0.00
AG-1					0.00					0.00
AG-2						0.00				0.00
AG-3						0.00				0.00
AG-4						0.00				0.00
TOTALS	3.00	7.92	2.13	0.26	2.10	6.22	0.00	0.00	0.00	21.63
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0.72								0.72
SIERRA				0.29						0.29
NEES-1					0.09					0.09
NEES-2			0.00							0.00
NEES-3			0.70							0.70
NEES-4					0.68					0.68
NW-1					1.84					1.84
NW-2					0.00					0.00
NW-3					0.00					0.00
SE-1						2.36				2.36
SE-2		0.72								0.72
SE-3						0.00				0.00
SE-4						1.00				1.00
NE-1						3.81				3.81
NE-2		0.55								0.55
NE-3					0.24					0.24
NE-4					0.00					0.00
NE-5						1.42				1.42
RR-1					0.00					0.00
RR-2						0.00				0.00
AG-1					0.00					0.00
AG-2						0.00				0.00
AG-3						0.00				0.00
AG-4						0.00				0.00
TOTALS	3.00	9.66	2.49	0.29	2.85	8.59	0.00	0.00	0.00	26.88

TABLE 5A-2

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR URBAN DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 3										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.44								0.44
FOWLER-1		5.99								5.99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0.26
NEES-1							0.07			0.07
NEES-2			0.00							0.00
NEES-3			0.53							0.53
NEES-4							0.44			0.44
NW-1							1.35			1.35
NW-2							0.00			0.00
NW-3							0.00			0.00
SE-1								1.73		1.73
SE-2		0.51								0.51
SE-3								0.00		0.00
SE-4								0.68		0.68
NE-1									2.85	2.85
NE-2		0.39								0.39
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5									0.96	0.96
RR-1							0.00			0.00
RR-2								0.00		0.00
AG-1							0.00			0.00
AG-2									0.00	0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	3.00	7.92	2.13	0.26	0.00	0.00	2.10	2.41	3.81	21.63
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0.72								0.72
SIERRA				0.29						0.29
NEES-1							0.09			0.09
NEES-2			0.00							0.00
NEES-3			0.70							0.70
NEES-4							0.68			0.68
NW-1							1.84			1.84
NW-2							0.00			0.00
NW-3							0.00			0.00
SE-1								2.36		2.36
SE-2		0.72								0.72
SE-3								0.00		0.00
SE-4								1.00		1.00
NE-1									3.81	3.81
NE-2		0.55								0.55
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5									1.42	1.42
RR-1							0.00			0.00
RR-2								0.00		0.00
AG-1							0.00			0.00
AG-2									0.00	0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	3.00	9.66	2.49	0.29	0.00	0.00	2.85	3.36	5.23	26.88

TABLE A5-3

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR URBAN DESIGNATIONS
PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 4

SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.44								0.44
FOWLER-1		5.99								5.99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0.26
NEES-1							0.07			0.07
NEES-2			0.00							0.00
NEES-3			0.53							0.53
NEES-4							0.44			0.44
NW-1							1.35			1.35
NW-2							0.00			0.00
NW-3							0.00			0.00
SE-1								1.73		1.73
SE-2		0.51								0.51
SE-3								0.00		0.00
SE-4								0.68		0.68
NE-1								2.85		2.85
NE-2		0.39								0.39
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5								0.96		0.96
RR-1							0.00			0.00
RR-2								0.00		0.00
AG-1							0.00			0.00
AG-2								0.00		0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	3.00	7.92	2.13	0.26	0.00	0.00	2.10	6.22	0.00	21.63
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0.72								0.72
SIERRA				0.29						0.29
NEES-1							0.09			0.09
NEES-2			0.00							0.00
NEES-3			0.70							0.70
NEES-4							0.68			0.68
NW-1							1.84			1.84
NW-2							0.00			0.00
NW-3							0.00			0.00
SE-1								2.36		2.36
SE-2		0.72								0.72
SE-3								0.00		0.00
SE-4								1.00		1.00
NE-1								3.81		3.81
NE-2		0.55								0.55
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5								1.42		1.42
RR-1							0.00			0.00
RR-2								0.00		0.00
AG-1							0.00			0.00
AG-2								0.00		0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	3.00	9.66	2.49	0.29	0.00	0.00	2.85	8.59	0.00	26.88

TABLE A5-4

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR URBAN DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 5										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.44								0.44
FOWLER-1		5.99								5.99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0.26
NEES-1								0.07		0.07
NEES-2			0.00							0.00
NEES-3			0.53							0.53
NEES-4								0.44		0.44
NW-1								1.35		1.35
NW-2								0.00		0.00
NW-3								0.00		0.00
SE-1								1.73		1.73
SE-2		0.51								0.51
SE-3								0.00		0.00
SE-4								0.68		0.68
NE-1								2.85		2.85
NE-2		0.39								0.39
NE-3								0.24		0.24
NE-4								0.00		0.00
NE-5								0.96		0.96
RR-1								0.00		0.00
RR-2								0.00		0.00
AG-1								0.00		0.00
AG-2								0.00		0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	3.00	7.92	2.13	0.26	0.00	0.00	0.00	8.32	0.00	21.63
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0.72								0.72
SIERRA				0.29						0.29
NEES-1								0.09		0.09
NEES-2			0.00							0.00
NEES-3			0.70							0.70
NEES-4								0.68		0.68
NW-1								1.84		1.84
NW-2								0.00		0.00
NW-3								0.00		0.00
SE-1								2.36		2.36
SE-2		0.72								0.72
SE-3								0.00		0.00
SE-4								1.00		1.00
NE-1								3.81		3.81
NE-2		0.55								0.55
NE-3								0.24		0.24
NE-4								0.00		0.00
NE-5								1.42		1.42
RR-1								0.00		0.00
RR-2								0.00		0.00
AG-1								0.00		0.00
AG-2								0.00		0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	3.00	9.66	2.49	0.29	0.00	0.00	0.00	11.44	0.00	26.88

TABLE A5-5

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR URBAN DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 6

SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1								3.00		3.00
PEACH-2								0.44		0.44
FOWLER-1								5.99		5.99
HERNDON-1							1.60			1.60
HERNDON-2								0.59		0.59
SIERRA							0.26			0.26
NEES-1							0.07			0.07
NEES-2							0.00			0.00
NEES-3							0.53			0.53
NEES-4							0.44			0.44
NW-1							1.35			1.35
NW-2							0.00			0.00
NW-3							0.00			0.00
SE-1								1.73		1.73
SE-2								0.51		0.51
SE-3								0.00		0.00
SE-4								0.68		0.68
NE-1								2.85		2.85
NE-2								0.39		0.39
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5								0.96		0.96
RR-1							0.00			0.00
RR-2								0.00		0.00
AG-1							0.00			0.00
AG-2								0.00		0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	0.00	0.00	0.00	0.00	0.00	0.00	4.49	17.14	0.00	21.63
MAXIMUM FLOWS										
PEACH-1								3.00		3.00
PEACH-2								0.61		0.61
FOWLER-1								7.06		7.06
HERNDON-1							1.79			1.79
HERNDON-2								0.72		0.72
SIERRA							0.29			0.29
NEES-1							0.09			0.09
NEES-2							0.00			0.00
NEES-3							0.70			0.70
NEES-4							0.68			0.68
NW-1							1.84			1.84
NW-2							0.00			0.00
NW-3							0.00			0.00
SE-1								2.36		2.36
SE-2								0.72		0.72
SE-3								0.00		0.00
SE-4								1.00		1.00
NE-1								3.81		3.81
NE-2								0.55		0.55
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5								1.42		1.42
RR-1							0.00			0.00
RR-2								0.00		0.00
AG-1							0.00			0.00
AG-2								0.00		0.00
AG-3								0.00		0.00
AG-4								0.00		0.00
TOTALS	0.00	0.00	0.00	0.00	0.00	0.00	5.63	21.25	0.00	26.88

TABLE A5-6

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR ALL DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVES 1 AND 2										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.44								0.44
FOWLER-1		5.99								5.99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0.26
NEES-1					0.07					0.07
NEES-2			0.11							0.11
NEES-3			0.53							0.53
NEES-4					0.44					0.44
NW-1					1.35					1.35
NW-2					0.01					0.01
NW-3					0.02					0.02
SE-1						1.73				1.73
SE-2		0.51								0.51
SE-3						0.01				0.01
SE-4						0.68				0.68
NE-1						2.85				2.85
NE-2		0.39								0.39
NE-3					0.24					0.24
NE-4					0.00					0.00
NE-5						0.96				0.96
RR-1					0.19					0.19
RR-2						1.34				1.34
AG-1					0.01					0.01
AG-2						0.07				0.07
AG-3						0.01				0.01
AG-4						0.02				0.02
TOTALS	3.00	7.92	2.24	0.26	2.33	7.67	0.00	0.00	0.00	23.42
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0.72								0.72
SIERRA				0.29						0.29
NEES-1					0.09					0.09
NEES-2			0.11							0.11
NEES-3			0.70							0.70
NEES-4					0.68					0.68
NW-1					1.84					1.84
NW-2					0.01					0.01
NW-3					0.02					0.02
SE-1						2.36				2.36
SE-2		0.72								0.72
SE-3						0.01				0.01
SE-4						1.00				1.00
NE-1						3.81				3.81
NE-2		0.55								0.55
NE-3					0.24					0.24
NE-4					0.00					0.00
NE-5						1.42				1.42
RR-1					0.19					0.19
RR-2						1.34				1.34
AG-1					0.01					0.01
AG-2						0.07				0.07
AG-3						0.01				0.01
AG-4						0.02				0.02
TOTALS	3.00	9.66	2.60	0.29	3.08	10.04	0.00	0.00	0.00	28.67

TABLE 5A-7

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR ALL DESIGNATIONS
PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 3										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
					PROJECTED FLOWS					
PEACH-1	3.00									3 00
PEACH-2		0.44								0.44
FOWLER-1		5 99								5.99
HERNDON-1			1 60							1 60
HERNDON-2		0 59								0.59
SIERRA				0 26						0.26
NEES-1							0.07			0.07
NEES-2			0 11							0.11
NEES-3			0 53							0.53
NEES-4							0.44			0.44
NW-1							1 35			1.35
NW-2							0 01			0.01
NW-3							0 02			0 02
SE-1								1 73		1 73
SE-2		0 51								0.51
SE-3								0.01		0.01
SE-4								0 68		0.68
NE-1									2.85	2.85
NE-2		0.39								0 39
NE-3							0.24			0 24
NE-4							0.00			0 00
NE-5									0 96	0 96
RR-1							0 19			0.19
RR-2								1.34		1 34
AG-1							0.01			0 01
AG-2									0 07	0.07
AG-3								0.01		0 01
AG-4								0.02		0.02
TOTALS	3 00	7.92	2 24	0 26	0 00	0 00	2.33	3 79	3 88	23 42
					MAXIMUM FLOWS					
PEACH-1	3 00									3.00
PEACH-2		0 61								0.61
FOWLER-1		7 06								7 06
HERNDON-1			1 79							1.79
HERNDON-2		0 72								0.72
SIERRA				0 29						0 29
NEES-1							0 09			0.09
NEES-2			0.11							0.11
NEES-3			0 70							0 70
NEES-4							0.68			0.68
NW-1							1 84			1 84
NW-2							0.01			0.01
NW-3							0 02			0 02
SE-1								2.36		2.36
SE-2		0.72								0 72
SE-3								0 01		0 01
SE-4								1.00		1.00
NE-1									3.81	3.81
NE-2		0.55								0 55
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5									1.42	1.42
RR-1							0 19			0.19
RR-2								1 34		1.34
AG-1							0 01			0.01
AG-2									0.07	0.07
AG-3								0 01		0 01
AG-4								0.02		0 02
TOTALS	3 00	9 66	2 60	0 29	0 00	0 00	3 08	4 74	5 30	28 67

TABLE A5-8

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR ALL DESIGNATIONS
PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 4										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3 00
PEACH-2		0.44								0 44
FOWLER-1		5.99								5 99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0 26
NEES-1							0 07			0.07
NEES-2			0 11							0 11
NEES-3			0.53							0.53
NEES-4							0 44			0.44
NW-1							1 35			1.35
NW-2							0 01			0.01
NW-3							0.02			0.02
SE-1								1.73		1.73
SE-2		0.51								0 51
SE-3								0.01		0 01
SE-4								0.68		0 68
NE-1								2 85		2 85
NE-2		0.39								0 39
NE-3							0.24			0 24
NE-4							0.00			0 00
NE-5								0 96		0 96
RR-1							0.19			0.19
RR-2								1.34		1 34
AG-1							0.01			C.01
AG-2								0.07		C 07
AG-3								0.01		0.01
AG-4								0 02		0.02
TOTALS	3 00	7 92	2 24	0 26	0 00	0 00	2 33	7 67	0 00	23 42
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0 72								0 72
SIERRA				0.29						0.29
NEES-1							0.09			0 09
NEES-2			0 11							0.11
NEES-3			0 70							0.70
NEES-4							0.68			0.68
NW-1							1.84			1.84
NW-2							0 01			0.01
NW-3							0 02			0.02
SE-1								2.36		2 36
SE-2		0 72								0.72
SE-3								0.01		0.01
SE-4								1.00		1.00
NE-1								3 81		3.81
NE-2		0 55								0.55
NE-3							0.24			0 24
NE-4							0.00			0 00
NE-5								1.42		1.42
RR-1							0.19			0.19
RR-2								1.34		1.34
AG-1							0.01			0.01
AG-2								0.07		0.07
AG-3								0 01		0.01
AG-4								0.02		0 02
TOTALS	3 00	9 66	2 60	0 29	0 00	0 00	3 08	10.04	0 00	28 67

TABLE A5-9

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR ALL DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 5

SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS: EXISTING TRUNK SEWER				PROPOSED: TRUNK SEWER		PROPOSED: SATELLITE WWRF			TOTAL FLOW
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.44								0.44
FOWLER-1		5.99								5.99
HERNDON-1			1.60							1.60
HERNDON-2		0.59								0.59
SIERRA				0.26						0.26
NEES-1								0.07		0.07
NEES-2			0.11							0.11
NEES-3			0.53							0.53
NEES-4								0.44		0.44
NW-1								1.35		1.35
NW-2								0.01		0.01
NW-3								0.02		0.02
SE-1								1.73		1.73
SE-2		0.51								0.51
SE-3								0.01		0.01
SE-4								0.68		0.68
NE-1								2.85		2.85
NE-2		0.39								0.39
NE-3								0.24		0.24
NE-4								0.00		0.00
NE-5								0.96		0.96
RR-1								0.19		0.19
RR-2								1.34		1.34
AG-1								0.01		0.01
AG-2								0.07		0.07
AG-3								0.01		0.01
AG-4								0.02		0.02
TOTALS	3.00	7.92	2.24	0.26	0.00	0.00	0.00	10.00	0.00	23.42

SUB-SERVICE AREA	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	TOTAL FLOW
MAXIMUM FLOWS										
PEACH-1	3.00									3.00
PEACH-2		0.61								0.61
FOWLER-1		7.06								7.06
HERNDON-1			1.79							1.79
HERNDON-2		0.72								0.72
SIERRA				0.29						0.29
NEES-1								0.09		0.09
NEES-2			0.11							0.11
NEES-3			0.70							0.70
NEES-4								0.68		0.68
NW-1								1.84		1.84
NW-2								0.01		0.01
NW-3								0.02		0.02
SE-1								2.36		2.36
SE-2		0.72								0.72
SE-3								0.01		0.01
SE-4								1.00		1.00
NE-1								3.81		3.81
NE-2		0.55								0.55
NE-3								0.24		0.24
NE-4								0.00		0.00
NE-5								1.42		1.42
RR-1								0.19		0.19
RR-2								1.34		1.34
AG-1								0.01		0.01
AG-2								0.07		0.07
AG-3								0.01		0.01
AG-4								0.02		0.02
TOTALS	3.00	9.66	2.60	0.29	0.00	0.00	0.00	13.12	0.00	28.67

TABLE A5-10

AVERAGE DAY ANNUAL FLOW AT BUILDOUT, IN MGD, FOR ALL DESIGNATIONS PROPOSED DESTINATIONS OF FLOW

ALTERNATIVE 6										
SUB-SERVICE AREA	DESTINATION OF SUB-SERVICE AREA FLOWS									TOTAL FLOW
	EXISTING TRUNK SEWER				PROPOSED					
					TRUNK SEWER		SATELLITE WWRF			
	PEACH	FOWLER	HERNDON	SIERRA	SHEPHERD	LEONARD	NW	SE	NE	
PROJECTED FLOWS										
PEACH-1	3.00							3.00		3.00
PEACH-2								0.44		0.44
FOWLER-1								5.99		5.99
HERNDON-1							1.60			1.60
HERNDON-2								0.59		0.59
SIERRA							0.26			0.26
NEES-1							0.07			0.07
NEES-2							0.11			0.11
NEES-3							0.53			0.53
NEES-4							0.44			0.44
NW-1							1.35			1.35
NW-2							0.01			0.01
NW-3							0.02			0.02
SE-1								1.73		1.73
SE-2								0.51		0.51
SE-3								0.01		0.01
SE-4								0.68		0.68
NE-1								2.85		2.85
NE-2								0.39		0.39
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5								0.96		0.96
RR-1							0.19			0.19
RR-2								1.34		1.34
AG-1							0.01			0.01
AG-2								0.07		0.07
AG-3								0.01		0.01
AG-4								0.02		0.02
TOTALS	3.00	0.00	0.00	0.00	0.00	0.00	4.83	18.59	0.00	23.42
MAXIMUM FLOWS										
PEACH-1								3.00		3.00
PEACH-2								0.61		0.61
FOWLER-1								7.06		7.06
HERNDON-1							1.79			1.79
HERNDON-2								0.72		0.72
SIERRA							0.29			0.29
NEES-1							0.09			0.09
NEES-2							0.11			0.11
NEES-3							0.70			0.70
NEES-4							0.68			0.68
NW-1							1.84			1.84
NW-2							0.01			0.01
NW-3							0.02			0.02
SE-1								2.36		2.36
SE-2								0.72		0.72
SE-3								0.01		0.01
SE-4								1.00		1.00
NE-1								3.81		3.81
NE-2								0.55		0.55
NE-3							0.24			0.24
NE-4							0.00			0.00
NE-5								1.42		1.42
RR-1							0.19			0.19
RR-2								1.34		1.34
AG-1							0.01			0.01
AG-2								0.07		0.07
AG-3								0.01		0.01
AG-4								0.02		0.02
TOTALS	0.00	0.00	0.00	0.00	0.00	0.00	5.97	22.70	0.00	28.67

TABLE A5-11

ALTERNATIVES 1, 2A AND 2B
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
INTERNAL CLOVIS MAJOR TRUNK SYSTEM

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION: DESIGN FLOW (ADAF) CLOVIS (MGD)	DESIGN FLOW (ADAF) TOTAL (MGD)	DIAM (IN)	SLOPE FT/FT	DESIGN CAPACITY ADAF (MGD)	DISTANCE (FEET)	LOCATION INFORMATION: ELEV SOFFIT (FEET)	ELEV FL (FEET)	ELEV GROUND (FEET)	CUT TO FL +/- (FEET)
LOCATION @ A						0	410.50	408 50	425.00	17
MCCALL @ N/O HERNDON	1.78	1.78	24	0.00100	2.63	1,927	408.57	406.57	423.00	16
MCCALL @ HERNDON	1.78	1.78	24	0.00303	4 58	1,508	404.00	402.00	416 00	14
HERNDON @ THOMPSON	2.09	2.09	24	0.00197	3.68	2,016	400.04	398.04	413.00	15
FWY 168 @ N/O SHEPHERD						0	423.59	421.59	440.00	18
THOMPSON @ SHEPHERD	2.13	2.13	24	0.00100	2.63	2,145	421.44	419.44	435.00	16
THOMPSON @ TEAGUE	2.58	2.58	24	0 00140	3.11	2,920	417.35	415.35	430.00	15
THOMPSON @ NEES	2.83	2 83	24	0 00280	4 40	2,627	410.00	408.00	421.00	13
THOMPSON @ ALLUVIAL	2.96	2.96	24	0 00280	4 40	2,650	402 58	400 58	421 00	20
THOMPSON @ ALLUVIAL			27				402.58	400.33	413.00	13
THOMPSON @ HERNDON	2 96	2 96	27	0.00100	3.60	2,542	400.04	397.79	413.00	15
HERNDON @ THOMPSON			33				400.04	397.29	413.00	16
HERNDON @ HIGHLAND	5 06	5 06	33	0.00472	13.36	2,173	389.77	387.02	402.00	15
HIGHLAND @ SIERRA	5 06	5.06	33	0 00100	6.14	2,711	387.06	384.31	404.00	20
HIGHLAND @ BULLARD	5 06	5.06	33	0.00100	6.14	2,617	384.44	381 69	398.00	16
HIGHLAND @ BARSTOW	5.06	5.06	33	0.00100	6 14	2,661	381.78	379 03	395.00	16
HIGHLAND @ SHAW	5.06	5.06	33	0.00443	12.93	2,661	370.00	367.25	385.00	18
HIGHLAND @ GETTYSBURG	5 06	5 06	33	0.00321	11.00	2,650	361.50	358.75	375.00	16
GETTYSBURG @ HIGHLAND			36				361.50	358.50	375.00	17
GETTYSBURG @ LEONARD	6 30	6.30	36	0 00112	8.22	2,672	358.50	355.50	374 00	19
LEONARD @ ASHLAN	7 62	7 62	36	0.00104	7.89	2,892	355.50	352.50	367.00	15
LEONARD @ DAKOTA	8 37	8 37	36	0.00220	11.49	2,483	350.04	347.04	365.00	18
LEONARD @ GOULD CANAL	8.37	8 37	36	0 00119	8.45	540	349 40	346.40	365.00	19
AVERAGE	4.45	4.45		0.00142						16
TOTAL						42,395				

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-12

ALTERNATIVE 3
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
INTERNAL CLOVIS MAJOR TRUNK SYSTEM

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL+/-
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LOCATION @ A							0	410.50	408.50	425.00	17
MCCALL @ N/O HERNDON		1.78	1 78	24	0.00100	2.63	1,927	408.57	406.57	423.00	16
MCCALL @ HERNDON		1 78	1.78	24	0.00303	4.58	1,508	404.00	402.00	416.00	14
HERNDON @ THOMPSON		2.09	2.09	24	0.00197	3.68	2,016	400.04	398.04	413.00	15
FWY 168 @ N/O SHEPHERD							0	423.59	421 59	440.00	18
THOMPSON @ SHEPHERD		2.13	2.13	24	0.00100	2.63	2,145	421.44	419.44	435.00	16
THOMPSON @ TEAGUE		2.58	2.58	24	0.00140	3.11	2,920	417 35	415.35	430.00	15
THOMPSON @ NEES		2.83	2 83	24	0.00280	4.40	2,627	410.00	408.00	421.00	13
THOMPSON @ ALLUVIAL		2.96	2.96	24	0 00280	4.40	2,650	402.58	400 58	421.00	20
THOMPSON @ ALLUVIAL				27				402.58	400.33	413.00	13
THOMPSON @ HERNDON		2 96	2 96	27	0.00100	3.60	2,542	400.04	397.79	413.00	15
THOMPSON @ HERNDON				33				400.04	397.29	413 00	16
NE SATELLITE WWRF		5.05	5 05	33	0.00100	6.14	1,320	398.72	395.97	420.00	24
GETTYSBURG @ LEONARD							0	358 50	356.25	374.00	18
LEONARD @ ASHLAN		2.55	2.55	27	0.00104	3 66	2,892	355.50	353.25	367.00	14
LEONARD @ DAKOTA		3.30	3.30	27	0.00220	5.34	2,483	350.04	347.79	365.00	17
SE SATELLITE WWRF		3.30	3.30	27	0 00110	3 78	1,320	348.58	346.33	365.00	19
AVERAGE		2.78	2 78		0 00228						16
TOTAL							26,350				

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-13

ALTERNATIVE 4
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
INTERNAL CLOVIS MAJOR TRUNK SYSTEM

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL+/-
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT)	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LOCATION @ A							0	410 50	408.50	425 00	17
MCCALL @ N/O HERNDON		1.78	1.78	24	0.00100	2.63	1,927	408.57	406.57	423.00	16
MCCALL @ HERNDON		1.78	1.78	24	0.00303	4 58	1,508	404.00	402.00	416 00	14
HERNDON @ THOMPSON		2 09	2.09	24	0 00197	3.68	2,016	400.04	398 04	413.00	15
FWY 168 @ N/O SHEPHERD							0	423.59	421.59	440.00	18
THOMPSON @ SHEPHERD		2 13	2.13	24	0 00100	2.63	2,145	421.44	419.44	435.00	16
THOMPSON @ TEAGUE		2.58	2.58	24	0.00140	3 11	2,920	417.35	415 35	430.00	15
THOMPSON @ NEES		2 83	2 83	24	0 00280	4.40	2,627	410 00	408 00	421.00	13
THOMPSON @ ALLUVIAL		2.96	2.96	24	0 00280	4.40	2,650	402.58	400 58	421.00	20
THOMPSON @ ALLUVIAL				27				402.58	400.33	413 00	13
THOMPSON @ HERNDON		2.96	2 96	27	0 00100	3.60	2,542	400.04	397.79	413 00	15
HERNDON @ THOMPSON				33				400.04	397.29	413 00	16
HERNDON @ HIGHLAND		5 06	5 06	33	0 00472	13.36	2,173	389.77	387.02	402.00	15
HIGHLAND @ SIERRA		5 06	5 06	33	0.00100	6 14	2,711	387.06	384 31	404.00	20
HIGHLAND @ BULLARD		5.06	5.06	33	0.00100	6.14	2,617	384.44	381 69	398.00	16
HIGHLAND @ BARSTOW		5 06	5 06	33	0 00100	6.14	2,661	381.78	379.03	395 00	16
HIGHLAND @ SHAW		5.06	5 06	33	0 00443	12 93	2,661	370 00	367.25	385.00	18
HIGHLAND @ GETTYSBURG		5.06	5.06	33	0 00321	11.00	2,650	361.50	358.75	375.00	16
GETTYSBURG @ HIGHLAND				36				361.50	358 50	375 00	17
GETTYSBURG @ LEONARD		6.30	6 30	36	0.00112	8.22	2,672	358.50	355.50	374.00	19
LEONARD @ ASHLAN		7.62	7 62	36	0.00104	7.89	2,892	355.50	352.50	367.00	15
LEONARD @ DAKOTA		8.37	8 37	36	0 00220	11.49	2,483	350.04	347.04	365 00	18
SE SATELLITE WWRF		8.37	8 37	36	0 00123	8.59	1,320	348 42	345.42	367 00	22
AVERAGE		4.45	4 45		0.00134						17
TOTAL							43,175				

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-14

ALTERNATIVE 5
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
INTERNAL CLOVIS MAJOR TRUNK SYSTEM

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL +/-
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LOCATION @ A							0	410.50	408.50	425.00	17
MCCALL @ N/O HERNDON		1.78	1.78	24	0.00100	2.63	1,927	408.57	406.57	423.00	16
MCCALL @ HERNDON		1.78	1.78	24	0.00303	4.58	1,508	404.00	402.00	416.00	14
HERNDON @ THOMPSON		2.09	2.09	24	0.00197	3.68	2,016	400.04	398.04	413.00	15
FWY 168 @ N/O SHEPHERD							0	423.59	421.59	440.00	18
THOMPSON @ SHEPHERD		2.13	2.13	24	0.00100	2.63	2,145	421.44	419.44	435.00	16
THOMPSON @ TEAGUE		2.58	2.58	24	0.00140	3.11	2,920	417.35	415.35	430.00	15
THOMPSON @ NEES		2.83	2.83	24	0.00280	4.40	2,627	410.00	408.00	421.00	13
THOMPSON @ ALLUVIAL		2.96	2.96	24	0.00280	4.40	2,650	402.58	400.58	421.00	20
THOMPSON @ ALLUVIAL				27				402.58	400.33	413.00	13
THOMPSON @ HERNDON		2.96	2.96	27	0.00100	3.60	2,542	400.04	397.79	413.00	15
HERNDON @ THOMPSON				33				400.04	397.29	413.00	16
HERNDON @ HIGHLAND		5.06	5.06	33	0.00472	13.36	2,173	389.77	387.02	402.00	15
HIGHLAND @ SIERRA		5.06	5.06	33	0.00100	6.14	2,711	387.06	384.31	404.00	20
HIGHLAND @ BULLARD		5.06	5.06	33	0.00100	6.14	2,617	384.44	381.69	398.00	16
HIGHLAND @ BARSTOW		5.06	5.06	33	0.00100	6.14	2,661	381.78	379.03	395.00	16
HIGHLAND @ SHAW		5.06	5.06	33	0.00443	12.93	2,661	370.00	367.25	385.00	18
HIGHLAND @ GETTYSBURG		5.06	5.06	33	0.00321	11.00	2,650	361.50	358.75	375.00	16
GETTYSBURG @ HIGHLAND				36				361.50	358.50	375.00	17
GETTYSBURG @ LEONARD		6.30	6.30	36	0.00112	8.22	2,672	358.50	355.50	374.00	19
DEWOLF @ SHEPHERD							0	404.75	402.75	411.00	8
DEWOLF @ TEAGUE		2.80	2.80	24	0.00252	4.17	2,623	398.15	396.15	405.00	9
DEWOLF @ NEES		2.80	2.80	24	0.00120	2.88	2,623	395.00	393.00	407.00	14
DEWOLF @ ALLUVIAL		2.80	2.80	24	0.00333	4.80	2,646	386.19	384.19	398.00	14
DEWOLF @ HERNDON		2.80	2.80	24	0.00120	2.88	2,657	383.00	381.00	395.00	14
HERNDON @ DEWOLF (S)		2.80	2.80	24	0.00156	3.28	630	382.02	380.02	397.00	17
DEWOLF (S) @ SIERRA		2.80	2.80	24	0.00160	3.32	2,604	377.85	375.85	389.00	13
DEWOLF @ SIERRA				27				377.85	375.60	389.00	13
DEWOLF @ BULLARD		2.80	2.80	27	0.00100	3.60	2,603	375.25	373.00	389.00	16
DEWOLF @ BARSTOW		3.19	3.19	27	0.00113	3.83	2,657	372.25	370.00	388.00	18
DEWOLF @ SHAW		3.19	3.19	27	0.00113	3.82	2,661	369.25	367.00	386.00	19
DEWOLF @ SHAW				27				364.61	362.36	386.00	24
DEWOLF @ GETTYSBURG		3.55	3.55	27	0.00117	3.89	2,654	361.50	359.25	378.00	19
GETTYSBURG @ DEWOLF				30				361.50	359.00	378.00	19
GETTYSBURG @ LEONARD		3.82	3.82	30	0.00113	5.05	2,666	358.50	356.00	374.00	18
LEONARD @ GETTYSBURG				42				358.50	355.00	374.00	19
LEONARD @ ASHLAN		10.42	10.42	42	0.00104	11.90	2,892	355.50	352.00	367.00	15
LEONARD @ DAKOTA		11.17	11.17	42	0.00220	17.34	2,483	350.04	346.54	365.00	18
SE SATELLITE WWRF		11.17	11.17	42	0.00123	12.96	1,320	348.42	344.92	367.00	22
AVERAGE		4.20	4.20		0.00083						16
TOTAL							70,199				

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-15

ALTERNATIVE 6
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
INTERNAL CLOVIS MAJOR TRUNK SYSTEM

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL+/-
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LOCATION @ A							0	410.50	408.50	425 00	17
MCCALL @ N/O HERNDON		1.78	1.78	24	0.00100	2.63	1,927	408.57	406.57	423.00	16
MCCALL @ HERNDON		1 78	1 78	24	0.00303	4.58	1,508	404.00	402.00	416.00	14
HERNDON @ THOMPSON		2.09	2.09	24	0.00197	3.68	2,016	400.04	398.04	413.00	15
FWY 168 @ N/O SHEPHERD							0	423.59	421.59	440.00	18
THOMPSON @ SHEPHERD		2.13	2.13	24	0.00100	2 63	2,145	421.44	419.44	435.00	16
THOMPSON @ TEAGUE		2.58	2 58	24	0.00140	3.11	2,920	417.35	415.35	430.00	15
THOMPSON @ NEES		2 83	2 83	24	0.00280	4.40	2,627	410.00	408.00	421.00	13
THOMPSON @ ALLUVIAL		2.96	2 96	24	0.00280	4.40	2,650	402.58	400.58	421.00	20
THOMPSON @ ALLUVIAL				27				402.58	400.33	413.00	13
THOMPSON @ HERNDON		2 96	2 96	27	0 00100	3.60	2,542	400.04	397.79	413 00	15
HERNDON @ THOMPSON				33				400.04	397.29	413.00	16
HERNDON @ HIGHLAND		5 06	5 06	33	0.00472	13.36	2,173	389.77	387.02	402 00	15
HIGHLAND @ SIERRA		5.06	5.06	33	0.00100	6.14	2,711	387.06	384 31	404.00	20
HIGHLAND @ BULLARD		5.06	5.06	33	0.00100	6 14	2,617	384 44	381.69	398.00	16
HIGHLAND @ BARSTOW		5.06	5 06	33	0.00100	6 14	2,661	381.78	379.03	395 00	16
HIGHLAND @ SHAW		5 06	5 06	33	0.00443	12.93	2,661	370.00	367.25	385.00	18
HIGHLAND @ GETTYSBURG		5.06	5.06	33	0 00321	11.00	2,650	361.50	358.75	375.00	16
GETTYSBURG @ HIGHLAND				36				361.50	358.50	375 00	17
GETTYSBURG @ LEONARD		6.30	6 30	36	0.00112	8 22	2,672	358 50	355.50	374 00	19
LEONARD @ ASHLAN		7.62	7.62	36	0.00104	7.89	2,892	355.50	352.50	367.00	15
LEONARD @ ASHLAN				48				355.50	351.50	367.00	16
LEONARD @ DAKOTA		20.23	20.23	48	0.00220	24.75	2,483	350.04	346.04	365.00	19
LEONARD @ DAKOTA				54				350.04	345.54	365.00	19
SE SATELLITE WWRF		20 23	20.23	54	0.00100	22.85	1,320	348.72	344 22	367.00	23
AVERAGE		5.77	5.77		0.00134						17
TOTAL							43,175				

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-16

ALTERNATIVES 3 AND 4
CALCULATIONS FOR
PROPOSED NW PUMP STATION AND FORCE MAIN
TO CLOVIS NORTHWEST SATELLITE WWRF

FORCE MAIN CALCULATIONS	
AVERAGE DAILY INFLOW	2.10 MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	1,460 GALLONS PER MINUTE
PEAK DAILY INFLOW	3.02 MILLION GALLONS PER DAY
PEAK DAILY INFLOW	2,100 GALLONS PER MINUTE
PUMP DISCHARGE	2,100 GALLONS PER MINUTE
FORCE MAIN DIAMETER	18 INCHES
VELOCITY OF FLOW IN FORCE MAIN	2 6 FEET PER SECOND
FORCE MAIN LENGTH	10,600 LINEAL FEET
ENERGY COST CALCULATIONS	
PUMP SUMP WATER SURFACE ELEVATION	346 FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	372 FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115 (DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1.74 FEET
HEAD LOSS IN FORCE MAIN	18 FEET
HEAD LOSS THROUGH PUMP STATION	15 FEET
TOTAL ENERGY HEAD LOSS	59 FEET
ENERGY UNIT COST	$0.12 PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$78.10 PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$29,000 00 PER YEAR
SULFIDE CONTROL CALCULATIONS	
FORCE MAIN VOLUME	140,050 GALLONS
WET WELL VOLUME	4,200 GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	144,250 GALLONS
SYSTEM AVERAGE DETENTION TIME	1.65 HOURS
SULFIDE CONCENTRATION	9.19 MILLOGRAMS PER LITER
SULFUR PRODUCTION	161.0 POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4 TO 1.0
BIOXIDE CONCENTRATION	3.5 POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	110.4 GALLONS PER DAY
BIOXIDE COST PER GALLON	$2 00 PER GALLON
AVERAGE BIOXIDE COST PER DAY	$220 80 PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$81,000 00 PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$110,000.00 PER YEAR

TABLE A5-17

ALTERNATIVE 5
CALCULATIONS FOR
PROPOSED NW PUMP STATION AND FORCE MAIN
TO CLOVIS SOUTHEAST SATELLITE WWRF

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	2 10	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	1,460	GALLONS PER MINUTE
PEAK DAILY INFLOW	3.02	MILLION GALLONS PER DAY
PEAK DAILY INFLOW	2,100	GALLONS PER MINUTE
PUMP DISCHARGE	2,100	GALLONS PER MINUTE
FORCE MAIN DIAMETER	18	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2 6	FEET PER SECOND
FORCE MAIN LENGTH	23,800	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	346	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	404	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1.74	FEET
HEAD LOSS IN FORCE MAIN	41	FEET
HEAD LOSS THROUGH PUMP STATION	15	FEET
TOTAL ENERGY HEAD LOSS	114	FEET
ENERGY UNIT COST	$0.12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$150 80	PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$55,000 00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	314,460	GALLONS
WET WELL VOLUME	4,200	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	318,660	GALLONS
SYSTEM AVERAGE DETENTION TIME	3.64	HOURS
SULFIDE CONCENTRATION	19.07	MILLOGRAMS PER LITER
SULFUR PRODUCTION	334.0	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1.0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	229 0	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2 00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$458.00	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$167,000 00	PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$222,000 00	PER YEAR

TABLE A5-18

ALTERNATIVE 6
CALCULATIONS FOR
PROPOSED NW PUMP STATION AND FORCE MAIN
TO CLOVIS NORTHWEST SATELLITE WWRF

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	2 10	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	1,460	GALLONS PER MINUTE
PEAK DAILY INFLOW	3 02	MILLION GALLONS PER DAY
PEAK DAILY INFLOW	2,100	GALLONS PER MINUTE
PUMP DISCHARGE	2,100	GALLONS PER MINUTE
FORCE MAIN DIAMETER	18	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2.6	FEET PER SECOND
FORCE MAIN LENGTH	10,600	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	346	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	372	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1.74	FEET
HEAD LOSS IN FORCE MAIN	18	FEET
HEAD LOSS THROUGH PUMP STATION	15	FEET
TOTAL ENERGY HEAD LOSS	59	FEET
ENERGY UNIT COST	$0 12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$78.10	PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$29,000.00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	140,050	GALLONS
WET WELL VOLUME	4,200	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	144,250	GALLONS
SYSTEM AVERAGE DETENTION TIME	1.65	HOURS
SULFIDE CONCENTRATION	9.19	MILLOGRAMS PER LITER
SULFUR PRODUCTION	161.0	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1.0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	110.4	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2 00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$220.80	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$81,000 00	PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$110,000 00	PER YEAR

TABLE A5-19

ALTERNATIVE 6
CALCULATIONS FOR
PROPOSED HERNDON/SIERRA TRUNK SEWER PUMP STATION
AND FORCE MAIN
TO CLOVIS NORTHWEST SATELLITE WWRF

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	2 39	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	1,660	GALLONS PER MINUTE
PEAK DAILY INFLOW	3.47	MILLION GALLONS PER DAY
PEAK DAILY INFLOW	2,410	GALLONS PER MINUTE
PUMP DISCHARGE	2,410	GALLONS PER MINUTE
FORCE MAIN DIAMETER	21	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2.2	FEET PER SECOND
FORCE MAIN LENGTH	21,200	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	331	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	372	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1 06	FEET
HEAD LOSS IN FORCE MAIN	22	FEET
HEAD LOSS THROUGH PUMP STATION	15	FEET
TOTAL ENERGY HEAD LOSS	78	FEET
ENERGY UNIT COST	$0 12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$117.40	PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$43,000.00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	381,250	GALLONS
WET WELL VOLUME	4,900	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	386,150	GALLONS
SYSTEM AVERAGE DETENTION TIME	3 88	HOURS
SULFIDE CONCENTRATION	17.93	MILLOGRAMS PER LITER
SULFUR PRODUCTION	357.4	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1 0
BIOXIDE CONCENTRATION	3 5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	245.1	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2.00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$490 20	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$179,000 00	PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$222,000 00	PER YEAR

TABLE A5-20

ALTERNATIVE 6
CALCULATIONS FOR
PROPOSED PEACH TRUNK SEWER PUMP STATION AND FORCE MAIN TO CLOVIS SOUTHEAST SATELLITE WWRF

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	3 00	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	2,080	GALLONS PER MINUTE
PEAK DAILY INFLOW	4.35	MILLION GALLONS PER DAY
PEAK DAILY INFLOW	3,020	GALLONS PER MINUTE
PUMP DISCHARGE	3,020	GALLONS PER MINUTE
FORCE MAIN DIAMETER	21	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2.8	FEET PER SECOND
FORCE MAIN LENGTH	27,000	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	322	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	360	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1.60	FEET
HEAD LOSS IN FORCE MAIN	43	FEET
HEAD LOSS THROUGH PUMP STATION	15	FEET
TOTAL ENERGY HEAD LOSS	96	FEET
ENERGY UNIT COST	$0.12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$181 40	PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$66,000 00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	485,560	GALLONS
WET WELL VOLUME	6,100	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	491,660	GALLONS
SYSTEM AVERAGE DETENTION TIME	3 94	HOURS
SULFIDE CONCENTRATION	18 19	MILLOGRAMS PER LITER
SULFUR PRODUCTION	455.1	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2 4	TO 1.0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	312.1	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2.00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$624 20	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$228,000 00	PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$294,000 00	PER YEAR

TABLE A5-21

ALTERNATIVE 6
CALCULATIONS FOR
PROPOSED FOWLER TRUNK SEWER PUMP STATION AND FORCE MAIN TO CLOVIS SOUTHEAST SATELLITE WWRF

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	7.92	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	5,500	GALLONS PER MINUTE
PEAK DAILY INFLOW	11.48	MILLION GALLONS PER DAY
PEAK DAILY INFLOW	7,970	GALLONS PER MINUTE
PUMP DISCHARGE	7,970	GALLONS PER MINUTE
FORCE MAIN DIAMETER	33	INCHES
VELOCITY OF FLOW IN FORCE MAIN	3.0	FEET PER SECOND
FORCE MAIN LENGTH	14,700	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	329	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	359	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1.07	FEET
HEAD LOSS IN FORCE MAIN	16	FEET
HEAD LOSS THROUGH PUMP STATION	20	FEET
TOTAL ENERGY HEAD LOSS	66	FEET
ENERGY UNIT COST	$0 12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$329.30	PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$120,000 00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	652,810	GALLONS
WET WELL VOLUME	16,000	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	668,810	GALLONS
SYSTEM AVERAGE DETENTION TIME	2.03	HOURS
SULFIDE CONCENTRATION	7.2	MILLOGRAMS PER LITER
SULFUR PRODUCTION	475.6	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1.0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	326 1	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2.00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$652 20	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$238,000 00	PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$358,000 00	PER YEAR

TABLE A5-22

ALTERNATIVE 1
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
LEONARD TRUNK PLUS SECOND NORTH AVE. TRUNK BARREL TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL +/-
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LEONARD @ GOULD CANAL	0.00	6.22	6 22	36	0.00120	8.49	0	349 40	346.40	365.00	19
LEONARD @ SHIELDS	0.00	6.22	6.22	36	0 00120	8 49	2,100	346.88	343 88	356.00	12
SHIELDS @ DEWOLF	0 00	6.22	6.22	36	0.00190	10 68	2,640	341.86	338 86	356.00	17
DEWOLF @ CLINTON	0.00	6.22	6 22	36	0.00210	11.23	2,640	336.32	333.32	355 00	22
DEWOLF @ MCKINLEY	0 00	6.22	6 22	36	0 00120	8.49	2,640	333.15	330.15	351.00	21
MCKINLEY @ LOCAN	0 00	6.22	6.22	36	0.00120	8 49	2,640	329 98	326.98	345.00	18
MCKINLEY @ TEMPERANCE	0 00	6.22	6 22	36	0.00120	8.49	2,640	326.81	323.81	345 00	21
MCKINLEY @ TEMPERANCE				42				326.81	323.31	345.00	22
TEMPERANCE @ OLIVE	2 85	6.22	9 07	42	0.00200	16 53	2,640	321.53	318.03	339 00	21
TEMPERANCE @ BELMONT	4 05	6.22	10 27	42	0 00120	12.81	2,640	318.36	314.86	337.00	22
TEMPERANCE @ BELMONT				48				318.36	314.36	337.00	23
TEMPERANCE @ TULARE	5 10	6.22	11 32	48	0.00080	14 93	2,640	316.25	312 25	345.00	33
TEMPERANCE @ KINGS CYN.	6.00	6.22	12.22	48	0 00080	14 93	2,640	314.14	310.14	332 00	22
TEMPERANCE @ BUTLER	6.96	6.22	13.18	48	0 00190	23 00	2,640	309.12	305 12	327 00	22
TEMPERANCE @ BUTLER				54				309.12	304 62	327.00	22
TEMPERANCE @ CALIFORNIA	7 92	6 22	14.14	54	0 00070	19.12	2,640	307 27	302.77	325 00	22
TEMPERANCE @ CHURCH	8 88	6 22	15.10	54	0.00070	19 12	2,640	305.42	300 92	325.00	24
TEMPERANCE @ JENSEN	9.84	6 22	16.06	54	0.00070	19.12	2,640	303.57	299.07	321.00	22
TEMPERANCE @ ANNADALE	9.84	6.22	16.06	54	0.00070	19 12	2,640	301.72	297.22	326.00	29
TEMPERANCE @ NORTH	9.84	6 22	16.06	54	0 00070	19.12	2,640	299.87	295.37	323.00	28
NORTH @ ARMSTRONG	9 84	6 22	16 06	54	0.00070	19.12	2,640	298 02	293 52	321 00	27
NORTH @ FOWLER	9 84	6.22	16 06	54	0 00070	19.12	2,640	296 17	291 67	317 00	25
NORTH @ SUNNYSIDE	9.84	6 22	16.06	54	0 00070	19.12	2,640	294.32	289.82	311 00	21
NORTH @ CLOVIS	10.32	6.22	16 54	54	0.00070	19.12	2,640	292.47	287 97	309 00	21
NORTH @ MINNEWAWA	10 80	6 22	17.02	54	0.00170	29.79	2,640	287 98	283.48	304.00	21
NORTH @ PEACH	10.80	6 22	17.02	54	0.00070	19.12	2,640	286.13	281.63	301.00	19
NORTH @ WILLOW	10 80	6 22	17.02	54	0.00070	19 12	2,640	284.28	279.78	299 00	19
NORTH @ CHESTNUT	10.80	6 22	17.02	54	0.00070	19.12	2,640	282 43	277.93	295.00	17
NORTH @ MAPLE	10 80	6.22	17 02	54	0 00070	19 12	2,640	280.58	276 08	291 00	15
NORTH @ MAPLE				66				280.58	275 08	291.00	16
NORTH @ CEDAR	27.20	13.01	40.21	66	0.00130	44.49	2,706	277.06	271.56	287.00	15
NORTH @ ORANGE	28.33	13.01	41.34	66	0 00130	44.49	2,665	273.60	268.10	283 00	15
NORTH @ EAST	20 99	13 01	34.00	66	0 00100	39 02	2,634	270.97	265 47	279 00	14
NORTH @ CHERRY	22.65	13 01	35.66	66	0.00100	39.02	2,706	268.26	262.76	277.00	14
NORTH @ CHERRY				84				268.26	261.26	277.00	16
NORTH @ ELM	42.26	13 01	55.27	84	0.00080	66.39	2,646	266.14	259.14	274.00	15
NORTH @ FIG	42 95	13.01	55 96	84	0 00080	66.39	2,646	264.02	257.02	272.00	15
NORTH @ WALNUT	43.01	13.01	56 02	84	0.00080	66.39	2,646	261 90	254.90	269.00	14
NORTH @ FRUIT	43.38	13 01	56.39	84	0 00080	66.39	2,646	259.78	252.78	267.00	14
NORTH @ WEST	49.43	13.01	62 44	84	0.00086	68 83	2,611	257.53	250.53	265.00	14
NORTH @ HUGHES	49.43	13 01	62.44	84	0.00086	68.83	2,600	255.29	248.29	262.00	14
NORTH @ MARKS	49.43	13 01	62.44	84	0.00086	68.83	2,600	253.05	246 05	258 00	12
NORTH @ VALENTINE	49.43	13 01	62.44	84	0.00080	66.39	2,608	250.96	243.96	258.00	14
NORTH @ BRAWLEY	49 43	13 01	62.44	84	0.00080	66 39	2,608	248.87	241.87	257.00	15
NORTH @ BLYTHE	49.45	13.01	62.46	84	0 00080	66.39	2,655	246.75	239.75	254.00	14
NORTH @ CORNELIA	49 45	13.01	62 46	84	0.00080	66.39	2,656	244.63	237.63	251.00	13
NORTH @ POLK	49.45	13 01	62.46	84	0.00080	66 39	2,656	242 51	235.51	248 00	12
WWTP	49 45	13.01	62 46	84	0.00080	66 39	5,000	238.51	231 51	250 00	18
AVERAGE	24.47	8.90	29 39		0.00102						19
TOTAL							112,749				

NOTES: ADAF INDICATES AVERAGE DAY ANNUAL FLOW
FRESNO SE GROWTH AREA FLOWS BASED UPON PROPORTIONING OF 10.8 MGD OVER SERVICE AREA.
FRESNO'S NORTH AVENUE TRUNK SEWER CAPACITY DEFICIENCIES FROM TABLE RECEIVED FROM FRESNO CITY STAFF 8/21/95,
PLUS 1.5 MGD ADDITIONAL FROM FRESNO'S CURRENT UNSERVED "NORTH" FOWLER SERVICE AREA.

TABLE A5-23

ALTERNATIVE 1
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
SHEPHERD TRUNK PLUS NEW CROSSTOWN NORTHSIDE & WESTSIDE (GRANTLAND) TRUNKS TO RWWTP

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
		DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL+/-
		FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT)	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
SHEPHERD	@ WILLOW	0.00	2.10	2 10	27	0.00100	3.60	0	351 85	349.60	369.00	19
SHEPHERD	@ CHESTNUT	0 00	2.10	2 10	27	0 00100	3.60	2,640	349.21	346.96	368 00	21
SHEPHERD	@ MAPLE	0.00	2.10	2.10	27	0.00100	3.60	2,640	346.57	344.32	365 00	21
SHEPHERD	@ CEDAR	0.00	2.10	2.10	27	0.00100	3.60	2,640	343.93	341.68	372.00	30
SHEPHERD	@ MILLBROOK	0.00	2.10	2 10	27	0 00100	3.60	2,640	341.29	339.04	362.00	23
SHEPHERD	@ FIRST	0.00	2.10	2.10	27	0.00100	3.60	2,640	338 65	336.40	360 00	24
SHEPHERD	@ FRIANT RD	0 00	2 10	2 10	27	0.00100	3 60	1,360	337.29	335.04	359.00	24
SHEPHERD	@ FRIANT RD				39				337.29	334 04	359 00	25
FRIANT RD	@ TEAGUE	5.90	2.10	8 00	39	0.00080	8 58	2,900	334.97	331.72	355.00	23
FRESNO	@ NEES	5.90	2.10	8.00	39	0.00080	8.58	2,700	332.81	329.56	350 00	20
NEES	@ BLACKSTONE	5 90	2.10	8.00	39	0.00080	8.58	2,100	331.13	327.88	355.00	27
NEES	@ INGRAM	5.90	2.10	8.00	39	0.00080	8 58	3,200	328.57	325.32	350.00	25
INGRAM	@ ALLUVIAL	5.90	2 10	8.00	39	0 00080	8.58	2,640	326.46	323.21	345.00	22
INGRAM	@ HERNDON	5.90	2.10	8 00	39	0 00080	8.58	2,640	324.35	321.10	341.00	20
HERNDON	@ PALM (S)	5.90	2 10	8.00	39	0.00080	8 58	1,900	322 83	319.58	336 00	16
HERNDON	@ FRUIT (S)	5 90	2 10	8.00	39	0 00080	8.58	2,640	320.72	317.47	337 00	20
HERNDON	@ WEST (S)	5.90	2.10	8.00	39	0.00139	11.29	2,640	317 06	313.81	335.00	21
HERNDON	@ VAN NESS	5 90	2.10	8 00	39	0.00100	9.59	2,640	314.42	311.17	326 00	15
HERNDON	@ MARKS (S)	5.90	2.10	8.00	39	0.00100	9 59	2,640	311.78	308.53	326.00	17
HERNDON	@ VALENTINE (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	309.14	305.89	327.00	21
HERNDON	@ BRAWLEY (S)	5 90	2 10	8.00	39	0 00100	9.59	2,640	306.50	303.25	322 00	19
HERNDON	@ BLYTH (S)	5 90	2.10	8.00	39	0.00100	9 59	2,640	303 86	300 61	320.00	19
HERNDON	@ CORNELIA (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	301.22	297.97	314.00	16
HERNDON	@ CORNELIA (S)				45				301.22	297.47	314.00	17
HERNDON	@ SANTA FE	28.30	2.10	30.40	45	0.00293	31.01	1,609	296.51	292.76	314.00	21
HERNDON	@ SANTA FE				48				296.51	292.51	314.00	21
OPL	@ HAYES	29.10	2 10	31 20	48	0.00272	35 49	4,230	285 00	281.00	307.00	26
OPL	@ HAYES				54				285 00	280 50	307.00	27
BULLARD	@ BRYAN	30 60	2.10	32.70	54	0.00137	34.51	6,414	276.20	271.70	291 00	19
BULLARD	@ GRANTLAND	31.80	2.10	33.90	54	0.00067	24.15	1,320	275.31	270.81	289.00	18
GRANTLAND	@ BULLARD				66				275.31	269 81	289 00	19
GRANTLAND	@ GETTYSBURG	33.90	2.10	36.00	66	0 00067	43.87	7,910	269.99	264.49	290 00	26
GRANTLAND	@ CLINTON	38 10	2 10	40.20	66	0.00170	60.12	10,603	251.96	246 46	266.00	20
GRANTLAND	@ CLINTON				84				251.96	244.96	266.00	21
WWTP	@ STUB	40 80	2 10	42 90	84	0 00043	57 25	31,646	238 48	231 48	251.00	20
AVERAGE		14.60	2.10	13.17		0.00100						21
TOTAL								117,492				

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-24

ALTERNATIVE 2A
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
LEONARD TRUNK TO NEW REGIONAL SOUTH SATELLITE WWTP
SECOND NORTH AVE. TRUNK BARREL TO RWWTP

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
		DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL +/-
		FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LEONARD	@ GOULD CANAL	0.00	6 22	6.22	36	0.00120	8.49	0	349.40	346.40	365.00	19
LEONARD	@ SHIELDS	0.00	6.22	6 22	36	0 00120	8 49	2,100	346.88	343.88	356.00	12
SHIELDS	@ DEWOLF	0.00	6.22	6 22	36	0.00190	10.68	2,640	341.86	338 86	356 00	17
DEWOLF	@ CLINTON	0.00	6 22	6.22	36	0.00210	11.23	2,640	336.32	333.32	355.00	22
DEWOLF	@ MCKINLEY	0.00	6.22	6.22	36	0.00120	8.49	2,640	333.15	330.15	351.00	21
MCKINLEY	@ LOCAN	0.00	6 22	6.22	36	0 00120	8.49	2,640	329 98	326.98	345 00	18
MCKINLEY	@ TEMPERANCE	0 00	6.22	6.22	36	0 00120	8.49	2,640	326.81	323.81	345.00	21
MCKINLEY	@ TEMPERANCE				42				326.81	323.31	345 00	22
TEMPERANCE	@ OLIVE	2 85	6.22	9 07	42	0 00200	16.53	2,640	321.53	318.03	339.00	21
TEMPERANCE	@ BELMONT	4.05	6 22	10.27	42	0.00120	12.81	2,640	318.36	314.86	337.00	22
TEMPERANCE	@ BELMONT				48				318.36	314.36	337 00	23
TEMPERANCE	@ TULARE	5.10	6.22	11.32	48	0.00080	14 93	2,640	316.25	312.25	345.00	33
TEMPERANCE	@ KINGS CYN.	6.00	6.22	12.22	48	0.00080	14.93	2,640	314.14	310.14	332.00	22
TEMPERANCE	@ BUTLER	6 96	6.22	13.18	48	0 00190	23 00	2,640	309.12	305.12	327.00	22
TEMPERANCE	@ BUTLER				54				309.12	304.62	327.00	22
TEMPERANCE	@ CALIFORNIA	7.92	6.22	14 14	54	0.00070	19.12	2,640	307.27	302.77	325.00	22
TEMPERANCE	@ CHURCH	8 88	6 22	15.10	54	0 00070	19.12	2,640	305.42	300 92	325.00	24
TEMPERANCE	@ JENSEN	9 84	6.22	16.06	54	0 00070	19.12	2,640	303.57	299 07	321.00	22
TEMPERANCE	@ ANNADALE	9.84	6 22	16 06	54	0.00070	19.12	2,640	301.72	297.22	326.00	29
TEMPERANCE	@ NORTH	9 84	6 22	16.06	54	0.00070	19.12	2,640	299.87	295.37	323 00	28
NORTH	@ ARMSTRONG	9.84	6 22	16.06	54	0.00070	19 12	2,640	298.02	293.52	321.00	27
NORTH	@ FOWLER	9 84	6 22	16.06	54	0.00070	19.12	2,640	296.17	291.67	317.00	25
NORTH	@ SUNNYSIDE	9.84	6.22	16.06	54	0.00070	19.12	2,640	294.32	289.82	311.00	21
NORTH	@ CLOVIS	10.32	6 22	16 54	54	0.00070	19.12	2,640	292.47	287.97	309.00	21
NORTH	@ S. SAT. PLANT	10 80	6 22	17.02	54	0.00070	19.12	2,640	290 62	286.12	311 00	25
												22
AVERAGE		8.13	6.22	11.76		0.00098						
TOTAL								54,900				
NORTH	@ MAPLE				42				280 58	277.08	291.00	14
NORTH	@ CEDAR	8.08	0 00	8 08	42	0 00130	13 33	2,706	277.06	273.56	287.00	13
NORTH	@ ORANGE	9.21	0.00	9.21	42	0 00130	13.33	2,665	273.60	270.10	283.00	13
NORTH	@ EAST	1.87	0.00	1 87	42	0.00100	11.69	2,634	270.97	267.47	279 00	12
NORTH	@ CHERRY	3.53	0.00	3.53	42	0 00100	11.69	2,706	268 26	264.76	277.00	12
NORTH	@ CHERRY				60				268 26	263.26	277.00	14
NORTH	@ ELM	23.14	0.00	23.14	60	0 00080	27.07	2,646	266.14	261.14	274.00	13
NORTH	@ FIG	23.83	0.00	23.83	60	0.00080	27.07	2,646	264.02	259.02	272.00	13
NORTH	@ WALNUT	23.89	0 00	23.89	60	0 00080	27 07	2,646	261.90	256.90	269.00	12
NORTH	@ FRUIT	24 26	0 00	24.26	60	0.00080	27.07	2,646	259.78	254.78	267.00	12
NORTH	@ FRUIT				66				259.78	254.28	267.00	12
NORTH	@ WEST	30.31	0.00	30.31	66	0 00086	36.18	2,611	257.53	252.03	265.00	13
NORTH	@ HUGHES	30.31	0 00	30.31	66	0.00086	36 18	2,600	255.29	249.79	262.00	12
NORTH	@ MARKS	30 31	0.00	30.31	66	0 00086	36.18	2,600	253.05	247.55	258.00	10
NORTH	@ VALENTINE	30 31	0 00	30 31	66	0.00080	34.90	2,608	250.96	245.46	258.00	13
NORTH	@ BRAWLEY	30.31	0.00	30.31	66	0.00080	34.90	2,608	248.87	243.37	257.00	14
NORTH	@ BLYTHE	30 33	0.00	30.33	66	0.00080	34 90	2,655	246 75	241.25	254.00	13
NORTH	@ CORNELIA	30.33	0 00	30.33	66	0.00080	34.90	2,656	244.63	239.13	251.00	12
NORTH	@ POLK	30 33	0.00	30.33	66	0.00080	34.90	2,656	242.51	237.01	248.00	11
WWTP		30 33	0.00	30 33	66	0 00080	34 90	5,000	238 51	233.01	250.00	17
												13
AVERAGE		22.98	0 00	22.98		0.00087						
TOTAL								47,289				

NOTES

ADAF INDICATES AVERAGE DAY ANNUAL FLOW.
FRESNO SE GROWTH AREA FLOWS BASED UPON PROPORTIONING OF 10 8 MGD OVER SERVICE AREA.
FRESNO'S NORTH AVENUE TRUNK SEWER CAPACITY DEFICIENCIES FROM TABLE RECEIVED FROM FRESNO CITY STAFF 8/21/95.

TABLE A5-25

ALTERNATIVE 2A
CALCULATIONS FOR
PROPOSED NW PUMP STATION AND FORCE MAIN
TO NORTH REGIONAL SATELLITE WWRF

FORCE MAIN CALCULATIONS		
AVERAGE DAILY INFLOW	2.10	MILLION GALLONS PER DAY
AVERAGE DAILY INFLOW	1,460	GALLONS PER MINUTE
PEAK DAILY INFLOW	3 02	MILLION GALLONS PER DAY
PEAK DAILY INFLOW	2,100	GALLONS PER MINUTE
PUMP DISCHARGE	2,100	GALLONS PER MINUTE
FORCE MAIN DIAMETER	18	INCHES
VELOCITY OF FLOW IN FORCE MAIN	2.6	FEET PER SECOND
FORCE MAIN LENGTH	30,000	LINEAL FEET
ENERGY COST CALCULATIONS		
PUMP SUMP WATER SURFACE ELEVATION	346	FEET
ELEVATION CENTERLINE FORCE MAIN AT DISCHARGE POINT	385	FEET
HAZEN-WILLIAMS FLOW COEFFICIENT FOR PVC PIPE	115	(DIMENSIONLESS)
HEAD LOSS IN FORCE MAIN PER 1,000 LF OF PIPE	1.74	FEET
HEAD LOSS IN FORCE MAIN	52	FEET
HEAD LOSS THROUGH PUMP STATION	15	FEET
TOTAL ENERGY HEAD LOSS	106	FEET
ENERGY UNIT COST	$0.12	PER KILOWATT HOUR
AVERAGE DAILY ENERGY COST	$140.20	PER DAY
AVERAGE ANNUAL ENERGY COST (ROUNDED)	$51,000.00	PER YEAR
SULFIDE CONTROL CALCULATIONS		
FORCE MAIN VOLUME	396,370	GALLONS
WET WELL VOLUME	4,200	GALLONS
TOTAL VOLUME FORCE MAIN PLUS WET WELL	400,570	GALLONS
SYSTEM AVERAGE DETENTION TIME	4.57	HOURS
SULFIDE CONCENTRATION	23.69	MILLOGRAMS PER LITER
SULFUR PRODUCTION	414.9	POUNDS PER DAY
BIOXIDE DOSAGE RATE	2.4	TO 1.0
BIOXIDE CONCENTRATION	3.5	POUNDS PER GALLON
BIOXIDE VOLUME REQUIRED	284.5	GALLONS PER DAY
BIOXIDE COST PER GALLON	$2.00	PER GALLON
AVERAGE BIOXIDE COST PER DAY	$569.00	PER DAY
AVERAGE ANNUAL SULFIDE CONTROL COST (ROUNDED)	$208,000 00	PER YEAR
TOTAL ENERGY PLUS SULFIDE CONTROL COSTS	$259,000 00	PER YEAR

TABLE A5-26

ALTERNATIVE 2B

REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS

LEONARD TRUNK TO NEW REGIONAL SOUTH SATELLITE WWTP

SECOND NORTH AVE. TRUNK BARREL TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL +/-
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
LEONARD @ GOULD CANAL	0.00	6.22	6 22	36	0.00120	8.49	0	349.40	346.40	365.00	19
LEONARD @ SHIELDS	0.00	6 22	6 22	36	0.00120	8.49	2,100	346.88	343 88	356.00	12
SHIELDS @ DEWOLF	0.00	6.22	6.22	36	0.00190	10 68	2,640	341.86	338.86	356.00	17
DEWOLF @ CLINTON	0.00	6.22	6.22	36	0.00210	11.23	2,640	336.32	333.32	355.00	22
DEWOLF @ MCKINLEY	0.00	6 22	6.22	36	0.00120	8.49	2,640	333 15	330.15	351.00	21
MCKINLEY @ LOCAN	0 00	6.22	6 22	36	0.00120	8.49	2,640	329.98	326.98	345.00	18
MCKINLEY @ TEMPERANCE	0 00	6.22	6.22	36	0.00120	8.49	2,640	326.81	323.81	345.00	21
MCKINLEY @ TEMPERANCE				42				326.81	323.31	345 00	22
TEMPERA @ OLIVE	2.85	6.22	9 07	42	0.00200	16.53	2,640	321.53	318.03	339.00	21
TEMPERA @ BELMONT	4.05	6 22	10 27	42	0.00120	12.81	2,640	318.36	314.86	337.00	22
TEMPERA @ BELMONT				48				318.36	314.36	337 00	23
TEMPERA @ TULARE	5.10	6.22	11.32	48	0.00080	14.93	2,640	316.25	312.25	345 00	33
TEMPERA @ KINGS CYN.	6.00	6.22	12 22	48	0.00080	14 93	2,640	314.14	310.14	332 00	22
TEMPERA @ BUTLER	6.96	6 22	13.18	48	0.00190	23.00	2,640	309.12	305.12	327.00	22
TEMPERA @ BUTLER				54				309.12	304.62	327.00	22
TEMPERA @ CALIFORNIA	7.92	6 22	14 14	54	0.00070	19 12	2,640	307.27	302.77	325 00	22
TEMPERA @ CHURCH	8 88	6 22	15.10	54	0 00070	19.12	2,640	305.42	300.92	325.00	24
TEMPERA @ JENSEN	9 84	6.22	16.06	54	0 00070	19.12	2,640	303.57	299.07	321 00	22
TEMPERA @ ANNADALE	9 84	6 22	16.06	54	0.00070	19.12	2,640	301.72	297.22	326.00	29
TEMPERA @ NORTH	9 84	6 22	16.06	54	0 00070	19.12	2,640	299.87	295.37	323.00	28
NORTH @ ARMSTRONG	9.84	6.22	16.06	54	0 00070	19.12	2,640	298.02	293.52	321.00	27
NORTH @ FOWLER	9.84	6 22	16.06	54	0.00070	19.12	2,640	296.17	291.67	317.00	25
NORTH @ SUNNYSIDE	9 84	6.22	16 06	54	0.00070	19.12	2,640	294.32	289.82	311 00	21
NORTH @ CLOVIS	10.32	6 22	16.54	54	0 00070	19.12	2,640	292.47	287.97	309 00	21
NORTH @ S. SAT PLANT	10.80	6 22	17.02	54	0 00070	19.12	2,640	290.62	286 12	311 00	25
AVERAGE	8.13	6.22	11.76		0 00098						22
TOTAL							54,900				
NORTH @ MAPLE				42				280 58	277.08	291.00	14
NORTH @ CEDAR	8.08	0.00	8 08	42	0.00130	13.33	2,706	277.06	273 56	287.00	13
NORTH @ ORANGE	9 21	0.00	9 21	42	0.00130	13.33	2,665	273.60	270 10	283 00	13
NORTH @ EAST	1.87	0 00	1.87	42	0.00100	11.69	2,634	270.97	267.47	279.00	12
NORTH @ CHERRY	3 53	0 00	3.53	42	0.00100	11.69	2,706	268.26	264.76	277.00	12
NORTH @ CHERRY				60				268.26	263.26	277.00	14
NORTH @ ELM	23 14	0 00	23 14	60	0 00080	27 07	2,646	266 14	261 14	274.00	13
NORTH @ FIG	23 83	0 00	23 83	60	0 00080	27.07	2,646	264 02	259 02	272.00	13
NORTH @ WALNUT	23 89	0.00	23 89	60	0 00080	27.07	2,646	261.90	256 90	269.00	12
NORTH @ FRUIT	24 26	0.00	24 26	60	0.00080	27.07	2,646	259.78	254.78	267.00	12
NORTH @ FRUIT				66				259.78	254.28	267.00	12
NORTH @ WEST	30.31	0.00	30.31	66	0.00086	36.18	2,611	257.53	252.03	265.00	13
NORTH @ HUGHES	30 31	0.00	30.31	66	0 00086	36.18	2,600	255.29	249.79	262 00	12
NORTH @ MARKS	30.31	0.00	30.31	66	0 00086	36.18	2,600	253.05	247.55	258 00	10
NORTH @ VALENTINE	30 31	0.00	30.31	66	0.00080	34.90	2,608	250.96	245 46	258 00	13
NORTH @ BRAWLEY	30.31	0 00	30 31	66	0.00080	34.90	2,608	248.87	243 37	257.00	14
NORTH @ BLYTHE	30.33	0.00	30 33	66	0.00080	34.90	2,655	246.75	241.25	254.00	13
NORTH @ CORNELIA	30.33	0.00	30 33	66	0.00080	34.90	2,656	244.63	239.13	251.00	12
NORTH @ POLK	30.33	0 00	30 33	66	0.00080	34.90	2,656	242.51	237.01	248.00	11
WWTP	30.33	0 00	30 33	66	0 00080	34.90	5,000	238.51	233 01	250 00	17
AVERAGE	22 98	0 00	22.98		0 00087						13
TOTAL							47,289				

NOTES: ADAF INDICATES AVERAGE DAY ANNUAL FLOW.
FRESNO SE GROWTH AREA FLOWS BASED UPON PROPORTIONING OF 10.8 MGD OVER SERVICE AREA.
FRESNO'S NORTH AVENUE TRUNK SEWER CAPACITY DEFICIENCIES FROM TABLE RECEIVED FROM FRESNO CITY STAFF 8/21/95.

TABLE A5-27

ALTERNATIVE 2B
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
SHEPHERD TRUNK PLUS NEW CROSSTOWN NORTHSIDE TRUNK TO NEW REGIONAL NORTHWEST SATELLITE WWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL +/-
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT)	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
SHEPHERD @ WILLOW	0.00	2.10	2.10	27	0.00100	3.60	0	351.85	349.60	369.00	19
SHEPHERD @ CHESTNUT	0.00	2.10	2.10	27	0.00100	3.60	2,640	349.21	346.96	368.00	21
SHEPHERD @ MAPLE	0.00	2.10	2.10	27	0.00100	3.60	2,640	346.57	344.32	365.00	21
SHEPHERD @ CEDAR	0.00	2.10	2.10	27	0.00100	3.60	2,640	343.93	341.68	372.00	30
SHEPHERD @ MILLBROOK	0.00	2.10	2.10	27	0.00100	3.60	2,640	341.29	339.04	362.00	23
SHEPHERD @ FIRST	0.00	2.10	2.10	27	0.00100	3.60	2,640	338.65	336.40	360.00	24
SHEPHERD @ FRIANT RD	0.00	2.10	2.10	27	0.00100	3.60	1,360	337.29	335.04	359.00	24
SHEPHERD @ FRIANT RD				39				337.29	334.04	359.00	25
FRIANT R @ TEAGUE	5.90	2.10	8.00	39	0.00080	8.58	2,900	334.97	331.72	355.00	23
FRESNO @ NEES	5.90	2.10	8.00	39	0.00080	8.58	2,700	332.81	329.56	350.00	20
NEES @ BLACKSTONE	5.90	2.10	8.00	39	0.00080	8.58	2,100	331.13	327.88	355.00	27
NEES @ INGRAM	5.90	2.10	8.00	39	0.00080	8.58	3,200	328.57	325.32	350.00	25
INGRAM @ ALLUVIAL	5.90	2.10	8.00	39	0.00080	8.58	2,640	326.46	323.21	345.00	22
INGRAM @ HERNDON	5.90	2.10	8.00	39	0.00080	8.58	2,640	324.35	321.10	341.00	20
HERNDON @ PALM (S)	5.90	2.10	8.00	39	0.00080	8.58	1,900	322.83	319.58	336.00	16
HERNDON @ FRUIT (S)	5.90	2.10	8.00	39	0.00080	8.58	2,640	320.72	317.47	337.00	20
HERNDON @ WEST (S)	5.90	2.10	8.00	39	0.00139	11.31	2,640	317.05	313.80	335.00	21
HERNDON @ VAN NESS	5.90	2.10	8.00	39	0.00100	9.59	2,640	314.41	311.16	326.00	15
HERNDON @ MARKS (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	311.77	308.52	326.00	17
HERNDON @ VALENTINE (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	309.13	305.88	327.00	21
HERNDON @ BRAWLEY (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	306.49	303.24	322.00	19
HERNDON @ BLYTH (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	303.85	300.60	320.00	19
HERNDON @ CORNELIA (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	301.21	297.96	315.00	17
HERNDON @ POLK (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	298.57	295.32	308.00	13
HERNDON @ HAYES (S)	5.90	2.10	8.00	39	0.00100	9.59	2,640	295.93	292.68	305.00	12
HERNDON @ BRYAN (S)	5.90	2.10	8.00	39	0.00200	13.57	2,640	290.65	287.40	300.00	13
HERNDON @ GRANTLAND	5.90	2.10	8.00	39	0.00200	13.57	2,400	285.85	282.60	295.00	12
GARFIELD @ SIERRA	5.90	2.10	8.00	39	0.00130	10.94	4,000	280.65	277.40	290.00	13
GARFIELD @ BULLARD	5.90	2.10	8.00	39	0.00200	13.57	2,640	275.37	272.12	282.00	10
GARFIELD @ BARSTOW	5.90	2.10	8.00	39	0.00080	8.58	2,640	273.26	270.01	285.00	15
NW. SATELLITE PLANT	5.90	2.10	8.00	39	0.00080	8.58	1,000	272.46	269.21	285.00	16
AVERAGE	5.90	2.10	8.00		0.00113						19
TOTAL							74,360				

NOTES: ADAF INDICATES AVERAGE DAY ANNUAL FLOW.

TABLE A5-28

ALTERNATIVES 3, 4 AND 5
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
SECOND NORTH AVE. TRUNK BARREL FROM MAPLE AVE. TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							LOCATION INFORMATION			
	DESIGN FLOW (ADAF)			DIAM	SLOPE	DESIGN CAPACITY ADAF	DISTANCE	ELEV SOFFIT	ELEV FL	ELEV GROUND	CUT TO FL +/-
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	FT/FT)	(MGD)	(FEET)	(FEET)	(FEET)	(FEET)	(FEET)
NORTH @ MAPLE				60				280.58	275.58	291.00	15
NORTH @ CEDAR	21.58	6.79	28 37	60	0.00130	34.50	2,706	277.06	272.06	287.00	15
NORTH @ ORANGE	22.71	6 79	29.50	60	0.00130	34.50	2,665	273.60	268.60	283.00	14
NORTH @ EAST	15.37	6.79	22.16	60	0.00100	30.26	2,634	270.97	265.97	279.00	13
NORTH @ CHERRY	17.03	6.79	23.82	60	0.00100	30.26	2,706	268.26	263.26	277 00	14
NORTH @ CHERRY				78				268 26	261.76	277.00	15
NORTH @ ELM	36 64	6.79	43.43	78	0.00080	54.48	2,646	266.14	259.64	274 00	14
NORTH @ FIG	37.33	6.79	44.12	78	0.00080	54.48	2,646	264.02	257.52	272.00	14
NORTH @ WALNUT	37.39	6 79	44.18	78	0 00080	54.48	2,646	261.90	255.40	269.00	14
NORTH @ FRUIT	37.76	6 79	44.55	78	0 00080	54.48	2,646	259.78	253.28	267.00	14
NORTH @ WEST	43 81	6.79	50.60	78	0.00086	56.49	2,611	257.53	251.03	265.00	14
NORTH @ HUGHES	43.81	6 79	50.60	78	0.00086	56.49	2,600	255.29	248.79	262.00	13
NORTH @ MARKS	43.81	6 79	50 60	78	0 00086	56.49	2,600	253.05	246 55	258.00	11
NORTH @ VALENTINE	43.81	6.79	50.60	78	0.00080	54.48	2,608	250.96	244.46	258 00	14
NORTH @ BRAWLEY	43.81	6 79	50 60	78	0.00080	54.48	2,608	248.87	242.37	257.00	15
NORTH @ BLYTHE	43.83	6 79	50.62	78	0.00080	54.48	2,655	246 75	240.25	254.00	14
NORTH @ CORNELIA	43.83	6.79	50.62	78	0.00080	54.48	2,656	244 63	238.13	251.00	13
NORTH @ POLK	43 83	6.79	50 62	78	0.00080	54.48	2,656	242.51	236.01	248 00	12
WWTP	43.83	6.79	50 62	78	0.00080	54.48	5,000	238 51	232.01	250.00	18
AVERAGE	36.48	6.79	43.27		0 00087						14
TOTAL							47,289				

NOTES: ADAF INDICATES AVERAGE DAY ANNUAL FLOW.
FRESNO'S NORTH AVENUE TRUNK SEWER CAPACITY DEFICIENCIES FROM TABLE RECEIVED FROM FRESNO CITY STAFF 8/21/95.

APPENDIX A8

(MATERIALS RELATED TO SECTION 8)

TABLE A8-1

TRUNK SEWER ESTIMATED UNIT COSTS
CLOVIS-FRESNO AREA

FOWLER TRUNK SEWER UNIT COSTS, 1991
BARE CONSTRUCTION COST PLUS EASEMENTS

ITEM	LENGTH (LN FT)	DIAM x LENGTH (IN-DIAM FEET)	COST	TOTAL COST	COST PER IN-DIAM FOOT
PIPE PROCUREMENT					
36 " SEWER	7,910	284,760	$383,200		
39 " SEWER	14,148	551,772	$890,400		
48 " SEWER	11,855	569,040	$973,600		
54 " SEWER	5,504	297,216	$460,300		
60 " SEWER	7,970	478,200	$864,700		
66 " SEWER	8,066	532,356	$998,500		
SUBTOTAL	55,453	2,713,344		$4,570,700	$1.68
CONSTRUCTION COST					
UNIT A	16,036	1,010,556	$3,077,300		$4 89 *
UNIT B			$2,713,100		
UNIT C			$2,516,100		
SUBTOTAL				$8,306,500	
EASEMENTS			$377,500	$377,500	
TOTALS	55,453	2,713,344		$13,254,700	$4 89

* UNIT A INCLUDES 60" AND 66" PIPE DIAMETERS ONLY AGREES WITH OVERALL PROJECT UNIT COST

ADJUSTMENT FOR UNIVERSAL 360 DEGREE PVC LINING OF PIPE AND STRUCTURES

ITEM	NON-LINED CL 3 PIPE 1991 AVG. COST ($/LF)	NON-LINED CL 3 PIPE 1995 AVG. COST ($/LF)	PVC LINED 360 DEG 1995 COST ($/LF)	COST DIFFERENCE ($)	COST DIFFERENCE (%)
36 " SEWER	$50 13	$58.70	$86.70	$28.00	48%
39 " SEWER	$65.15	$76 30	$93.20	$16.90	22%
48 " SEWER	$85.31	$99 90	$113 60	$13.70	14%
54 " SEWER	$89 63	$105 00	$131.80	$26.80	26%
60 " SEWER	$112.62	$131.90	$153.70	$21 80	17%
66 " SEWER	$129.00	$151.10	$173 50	$22.40	15%
AVERAGE DIFFERENCE					24%
COST ADJUSTMENT FOR PIPE AND STRUCTURES					22%
PORTION OF TOTAL PROJECT COST ATTRIBUTABLE TO PIPE AND STRUCTURE MATERIAL COST					45%
NET COST ADJUSTMENT FOR UNIVERSAL PVC LINING TO BE APPLIED TO COST PER IN-DIAM-FOOT					10%

ADJUSTED TRUNK SEWER UNIT COSTS

ITEM	ENR CONST COST INDEX	% OF CONST COST	COST PER IN-DIAM FOOT
TOTAL 1991 UNIT CONSTRUCTION COST			$4 89
ENR CONSTRUCTION COST INDEX 07/91 +/-	4,850		
ENR CONSTRUCTION COST INDEX 10/96 +/-	5,680		
ESTIMATED 1996 UNIT CONSTRUCTION COST			$5.73
ADJUSTMENT FOR UNIVERSAL PVC LINING OF PIPE AND STRUCTURES		10.0%	$0 57
ESTIMATED 1996 UNIT CONSTRUCTION COST			$6.30
ENGINEERING & CONST MANAGEMENT		12.5%	$0 79
CONSTRUCTION CONTINGENCIES		15.0%	$0 95
TOTAL ESTIMATED 1996 UNIT COST (ROUNDED)			*$8.00*

TABLE A8-2

ALTERNATIVE 1
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
LEONARD TRUNK PLUS SECOND NORTH AVE. TRUNK BARREL TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO	UNIT	TOTAL	FRESNO'S	CLOVIS'
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	FL +/- (FEET)	COST ($/IN-DIA-FT)	REACH COST (ROUNDED)	SHARE OF COST (ROUNDED)	SHARE OF COST (ROUNDED)
LEONARD @ GOULD CANA	0.00	6.22	6 22	36	0	19				
LEONARD @ SHIELDS	0 00	6 22	6.22	36	2,100	12	$8.00	$605,000	$0	$605,000
SHIELDS @ DEWOLF	0.00	6.22	6.22	36	2,640	17	$8.00	$760,000	$0	$760,000
DEWOLF @ CLINTON	0.00	6.22	6.22	36	2,640	22	$8.00	$760,000	$0	$760,000
DEWOLF @ MCKINLEY	0.00	6.22	6.22	36	2,640	21	$8.00	$760,000	$0	$760,000
MCKINLEY @ LOCAN	0.00	6.22	6.22	36	2,640	18	$8.00	$760,000	$0	$760,000
MCKINLEY @ TEMPERANCE	0.00	6.22	6.22	36	2,640	21	$8 00	$760,000	$0	$760,000
MCKINLEY @ TEMPERANCE				42		22				
TEMPERANCE @ OLIVE	2.85	6.22	9.07	42	2,640	21	$8 00	$887,000	$279,000	$608,000
TEMPERANCE @ BELMONT	4.05	6.22	10.27	42	2,640	22	$8 00	$887,000	$350,000	$537,000
TEMPERANCE @ BELMONT				48		23				
TEMPERANCE @ TULARE	5.10	6.22	11.32	48	2,640	33	$9 00	$1,140,000	$514,000	$626,000
TEMPERANCE @ KINGS CYN.	6.00	6.22	12.22	48	2,640	22	$8.00	$1,014,000	$498,000	$516,000
TEMPERANCE @ BUTLER	6 96	6.22	13.18	48	2,640	22	$8.00	$1,014,000	$535,000	$479,000
TEMPERANCE @ BUTLER				54		22				
TEMPERANCE @ CALIFORNIA	7.92	6 22	14.14	54	2,640	22	$8.00	$1,140,000	$639,000	$501,000
TEMPERANCE @ CHURCH	8.88	6.22	15.10	54	2,640	24	$8.00	$1,140,000	$670,000	$470,000
TEMPERANCE @ JENSEN	9.84	6.22	16.06	54	2,640	22	$8.00	$1,140,000	$698,000	$442,000
TEMPERANCE @ ANNADALE	9 84	6.22	16.06	54	2,640	29	$9.00	$1,283,000	$786,000	$497,000
TEMPERANCE @ NORTH	9.84	6.22	16.06	54	2,640	28	$9.00	$1,283,000	$786,000	$497,000
NORTH @ ARMSTRONG	9.84	6.22	16.06	54	2,640	27	$9.00	$1,283,000	$786,000	$497,000
NORTH @ FOWLER	9.84	6.22	16.06	54	2,640	25	$9.00	$1,283,000	$786,000	$497,000
NORTH @ SUNNYSIDE	9.84	6 22	16.06	54	2,640	21	$8.00	$1,140,000	$698,000	$442,000
NORTH @ CLOVIS	10.32	6.22	16.54	54	2,640	21	$8.00	$1,140,000	$711,000	$429,000
NORTH @ MINNEWAWA	10.80	6.22	17.02	54	2,640	21	$8.00	$1,140,000	$723,000	$417,000
NORTH @ PEACH	10.80	6.22	17.02	54	2,640	19	$8.00	$1,140,000	$723,000	$417,000
NORTH @ WILLOW	10.80	6.22	17.02	54	2,640	19	$8.00	$1,140,000	$723,000	$417,000
NORTH @ CHESTNUT	10.80	6.22	17.02	54	2,640	17	$8 00	$1,140,000	$723,000	$417,000
NORTH @ MAPLE	10 80	6.22	17.02	54	2,640	15	$8.00	$1,140,000	$723,000	$417,000
NORTH @ MAPLE				66		16				
NORTH @ CEDAR	27.20	13 01	40.21	66	2,706	15	$10 00	$1,786,000	$1,208,000	$578,000
NORTH @ ORANGE	28.33	13 01	41.34	66	2,665	15	$10.00	$1,759,000	$1,205,000	$554,000
NORTH @ EAST	20.99	13 01	34.00	66	2,634	14	$8.00	$1,391,000	$859,000	$532,000
NORTH @ CHERRY	22.65	13 01	35.66	66	2,706	14	$8.00	$1,429,000	$908,000	$521,000
NORTH @ CHERRY				84		16				
NORTH @ ELM	42.26	13.01	55.27	84	2,646	15	$8.00	$1,778,000	$1,359,000	$419,000
NORTH @ FIG	42.95	13.01	55.96	84	2,646	15	$8.00	$1,778,000	$1,365,000	$413,000
NORTH @ WALNUT	43.01	13 01	56.02	84	2,646	14	$8.00	$1,778,000	$1,365,000	$413,000
NORTH @ FRUIT	43 38	13 01	56.39	84	2,646	14	$8.00	$1,778,000	$1,368,000	$410,000
NORTH @ WEST	49.43	13.01	62.44	84	2,611	14	$8.00	$1,755,000	$1,389,000	$366,000
NORTH @ HUGHES	49.43	13.01	62.44	84	2,600	14	$8.00	$1,747,000	$1,383,000	$364,000
NORTH @ MARKS	49.43	13.01	62.44	84	2,600	12	$8 00	$1,747,000	$1,383,000	$364,000
NORTH @ VALENTINE	49.43	13.01	62.44	84	2,608	14	$8.00	$1,753,000	$1,388,000	$365,000
NORTH @ BRAWLEY	49.43	13.01	62.44	84	2,608	15	$8.00	$1,753,000	$1,388,000	$365,000
NORTH @ BLYTHE	49.45	13.01	62.46	84	2,655	14	$8.00	$1,784,000	$1,412,000	$372,000
NORTH @ CORNELIA	49.45	13 01	62.46	84	2,656	13	$8.00	$1,785,000	$1,413,000	$372,000
NORTH @ POLK	49.45	13.01	62.46	84	2,656	12	$8 00	$1,785,000	$1,413,000	$372,000
WWTP	49 45	13.01	62.46	84	5,000	18	$8 00	$3,360,000	$2,660,000	$700,000
TOTALS ($)								$56,825,000	$35,817,000	$21,008,000
TOTALS (%)								100.0%	63.0%	37.0%
TOTALS ($/MGD)		ROUNDED						$1,933,000	$1,464,000	$2,360,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-3

ALTERNATIVE 1
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
SHEPHERD TRUNK PLUS NEW CROSSTOWN NORTHSIDE & WESTSIDE (GRANTLAND) TRUNKS TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL+/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	FRESNO'S SHARE OF COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
COPPER FRIANT RD	5.90	0.00	5.90	36	0	17				
SHEPHERD FRIANT ROAD	5.90	0.00	5.90	36	13,000	24	$9.00	$4,212,000	$4,212,000	$0
SHEPHERD @ WILLOW	0.00	2.10	2.10	27	0	19				
SHEPHERD @ CHESTNUT	0.00	2.10	2.10	27	2,640	21	$8.00	$570,000	$0	$570,000
SHEPHERD @ MAPLE	0.00	2.10	2.10	27	2,640	21	$8.00	$570,000	$0	$570,000
SHEPHERD @ CEDAR	0.00	2.10	2.10	27	2,640	30	$9.00	$642,000	$0	$642,000
SHEPHERD @ MILLBROOK	0.00	2.10	2.10	27	2,640	23	$9.00	$642,000	$0	$642,000
SHEPHERD @ FIRST	0.00	2.10	2.10	27	2,640	24	$8.00	$570,000	$0	$570,000
SHEPHERD @ FRIANT RD	0.00	2.10	2.10	27	1,360	24	$8.00	$294,000	$0	$294,000
SHEPHERD @ FRIANT RD				39		25				
FRIANT R @ TEAGUE	5.90	2.10	8.00	39	2,900	23	$9.00	$1,018,000	$751,000	$267,000
FRESNO @ NEES	5.90	2.10	8.00	39	2,700	20	$8.00	$842,000	$621,000	$221,000
NEES @ BLACKSTONE	5.90	2.10	8.00	39	2,100	27	$9.00	$737,000	$544,000	$193,000
NEES @ INGRAM	5.90	2.10	8.00	39	3,200	25	$9.00	$1,123,000	$828,000	$295,000
INGRAM @ ALLUVIAL	5.90	2.10	8.00	39	2,640	22	$8.00	$824,000	$608,000	$216,000
INGRAM @ HERNDON	5.90	2.10	8.00	39	2,640	20	$8.00	$824,000	$608,000	$216,000
HERNDON @ PALM (S)	5.90	2.10	8.00	39	1,900	16	$9.00	$667,000	$492,000	$175,000
HERNDON @ FRUIT (S)	5.90	2.10	8.00	39	2,640	20	$9.00	$927,000	$684,000	$243,000
HERNDON @ WEST (S)	5.90	2.10	8.00	39	2,640	21	$9.00	$927,000	$684,000	$243,000
HERNDON @ VAN NESS	5.90	2.10	8.00	39	2,640	15	$9.00	$927,000	$684,000	$243,000
HERNDON @ MARKS (S)	5.90	2.10	8.00	39	2,640	17	$9.00	$927,000	$684,000	$243,000
HERNDON @ VALENTINE (S)	5.90	2.10	8.00	39	2,640	21	$9.00	$927,000	$684,000	$243,000
HERNDON @ BRAWLEY (S)	5.90	2.10	8.00	39	2,640	19	$9.00	$927,000	$684,000	$243,000
HERNDON @ BLYTH (S)	5.90	2.10	8.00	39	2,640	19	$9.00	$927,000	$684,000	$243,000
HERNDON @ CORNELIA (S)	5.90	2.10	8.00	39	2,640	16	$9.00	$927,000	$684,000	$243,000
HERNDON @ CORNELIA (S)				45		17				
HERNDON @ SANTA FE	28.30	2.10	30.40	45	1,609	21	$8.00	$579,000	$539,000	$40,000
HERNDON @ SANTA FE				48		21				
OPL @ HAYES	29.10	2.10	31.20	48	4,230	26	$8.00	$1,624,000	$1,515,000	$109,000
OPL @ HAYES				54		27				
BULLARD @ BRYAN	30.60	2.10	32.70	54	6,414	19	$8.00	$2,771,000	$2,593,000	$178,000
BULLARD @ GRANTLAND	31.80	2.10	33.90	54	1,320	18	$8.00	$570,000	$535,000	$35,000
GRANTLA @ BULLARD				66		19				
GRANTLA @ GETTYSBURG	33.90	2.10	36.00	66	7,910	26	$8.00	$4,176,000	$3,932,000	$244,000
GRANTLA @ CLINTON	38.10	2.10	40.20	66	10,603	20	$8.00	$5,598,000	$5,306,000	$292,000
GRANTLA @ CLINTON				84		21				
WWTP @ STUB	40.80	2.10	42.90	84	31,646	20	$8.00	$21,266,000	$20,225,000	$1,041,000
TOTALS ($)								$57,535,000	$48,781,000	$8,754,000
TOTALS (%)								100.0%	84.8%	15.2%
TOTALS ($/MGD)		ROUNDED						$4,369,000	$3,341,000	$4,169,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-4

ALTERNATIVES 2A & 2B
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
LEONARD TRUNK TO NEW REGIONAL SOUTH SATELLITE WWTP
SECOND NORTH AVE. TRUNK BARREL TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL +/-	UNIT COST	TOTAL REACH COST	FRESNO'S SHARE OF COST	CLOVIS' SHARE OF COST
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)	($/IN-DIA-FT)	(ROUNDED)	(ROUNDED)	(ROUNDED)
LEONARD @ GOULD CANAL	0.00	6.22	6.22	36	0	19				
LEONARD @ SHIELDS	0 00	6.22	6 22	36	2,100	12	$8.00	$605,000	$0	$605,000
SHIELDS @ DEWOLF	0.00	6 22	6.22	36	2,640	17	$8.00	$760,000	$0	$760,000
DEWOLF @ CLINTON	0.00	6.22	6.22	36	2,640	22	$8.00	$760,000	$0	$760,000
DEWOLF @ MCKINLEY	0.00	6.22	6.22	36	2,640	21	$8.00	$760,000	$0	$760,000
MCKINLEY @ LOCAN	0.00	6.22	6.22	36	2,640	18	$8 00	$760,000	$0	$760,000
MCKINLEY @ TEMPERANCE	0 00	6.22	6 22	36	2,640	21	$8.00	$760,000	$0	$760,000
MCKINLEY @ TEMPERANCE				42		22				
TEMPERANCE @ OLIVE	2.85	6.22	9.07	42	2,640	21	$8.00	$887,000	$279,000	$608,000
TEMPERANCE @ BELMONT	4.05	6.22	10.27	42	2,640	22	$8.00	$887,000	$350,000	$537,000
TEMPERANCE @ BELMONT				48		23				
TEMPERANCE @ TULARE	5.10	6.22	11.32	48	2,640	33	$9.00	$1,140,000	$514,000	$626,000
TEMPERANCE @ KINGS CYN.	6.00	6.22	12.22	48	2,640	22	$8 00	$1,014,000	$498,000	$516,000
TEMPERANCE @ BUTLER	6.96	6.22	13.18	48	2,640	22	$8.00	$1,014,000	$535,000	$479,000
TEMPERANCE @ BUTLER				54		22				
TEMPERANCE @ CALIFORNIA	7.92	6.22	14.14	54	2,640	22	$8 00	$1,140,000	$639,000	$501,000
TEMPERANCE @ CHURCH	8.88	6 22	15.10	54	2,640	24	$8.00	$1,140,000	$670,000	$470,000
TEMPERANCE @ JENSEN	9.84	6 22	16.06	54	2,640	22	$8.00	$1,140,000	$698,000	$442,000
TEMPERANCE @ ANNADALE	9.84	6.22	16.06	54	2,640	29	$9.00	$1,283,000	$786,000	$497,000
TEMPERANCE @ NORTH	9 84	6 22	16.06	54	2,640	28	$9.00	$1,283,000	$786,000	$497,000
NORTH @ ARMSTRONG	9 84	6.22	16.06	54	2,640	27	$9.00	$1,283,000	$786,000	$497,000
NORTH @ FOWLER	9.84	6 22	16.06	54	2,640	25	$9 00	$1,283,000	$786,000	$497,000
NORTH @ SUNNYSIDE	9.84	6.22	16.06	54	2,640	21	$8.00	$1,140,000	$698,000	$442,000
NORTH @ CLOVIS	10 32	6.22	16.54	54	2,640	21	$8.00	$1,140,000	$711,000	$429,000
NORTH @ S. SAT. PLANT	10.80	6.22	17.02	54	2,640	25	$8 00	$1,140,000	$723,000	$417,000
TOTALS ($)								$21,319,000	$9,459,000	$11,860,000
TOTALS (%)								100 0%	44.4%	55.6%
TOTALS ($/MGD)	ROUNDED AVERAGE							$1,813,000	$1,163,000	$1,907,000
NORTH @ MAPLE				42		14				
NORTH @ CEDAR	8 08	0 00	8.08	42	2,706	13	$10.00	$1,137,000	$1,137,000	$0
NORTH @ ORANGE	9 21	0.00	9.21	42	2,665	13	$10.00	$1,119,000	$1,119,000	$0
NORTH @ EAST	1.87	0 00	1 87	42	2,634	12	$8.00	$885,000	$885,000	$0
NORTH @ CHERRY	3 53	0.00	3 53	42	2,706	12	$8.00	$909,000	$909,000	$0
NORTH @ CHERRY				60		14				
NORTH @ ELM	23.14	0.00	23.14	60	2,646	13	$8.00	$1,270,000	$1,270,000	$0
NORTH @ FIG	23.83	0.00	23.83	60	2,646	13	$8.00	$1,270,000	$1,270,000	$0
NORTH @ WALNUT	23.89	0.00	23 89	60	2,646	12	$8.00	$1,270,000	$1,270,000	$0
NORTH @ FRUIT	24.26	0.00	24 26	60	2,646	12	$8.00	$1,270,000	$1,270,000	$0
NORTH @ FRUIT				66		12				
NORTH @ WEST	30 31	0.00	30.31	66	2,611	13	$8.00	$1,379,000	$1,379,000	$0
NORTH @ HUGHES	30.31	0 00	30.31	66	2,600	12	$8.00	$1,373,000	$1,373,000	$0
NORTH @ MARKS	30.31	0.00	30 31	66	2,600	10	$8.00	$1,373,000	$1,373,000	$0
NORTH @ VALENTINE	30.31	0.00	30.31	66	2,608	13	$8.00	$1,377,000	$1,377,000	$0
NORTH @ BRAWLEY	30.31	0.00	30.31	66	2,608	14	$8.00	$1,377,000	$1,377,000	$0
NORTH @ BLYTHE	30.33	0 00	30.33	66	2,655	13	$8.00	$1,402,000	$1,402,000	$0
NORTH @ CORNELIA	30.33	0.00	30.33	66	2,656	12	$8.00	$1,402,000	$1,402,000	$0
NORTH @ POLK	30.33	0.00	30.33	66	2,656	11	$8.00	$1,402,000	$1,402,000	$0
WWTP	30.33	0.00	30.33	66	5,000	17	$8.00	$2,640,000	$2,640,000	$0
TOTALS ($)								$22,855,000	$22,855,000	$0
TOTALS (%)								100.0%	100.0%	0 0%
TOTALS ($/MGD)	ROUNDED AVERAGE							$995,000	$995,000	$0

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL PIPE ASSUMED TO BE PVC LINED 360 DEGREES

TABLE A8-5

ALTERNATIVES 2A & 2B
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
DIVERSION TRUNK TO NEW REGIONAL SOUTH SATELLITE WWTP FROM FOWLER AVENUE TRUNK SEWER AT CHURCH AVENUE

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
		DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL +/- EST.	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	FRESNO'S SHARE OF COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
		FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
FOWLER	@ CHURCH	5.32	9.79	15.11	48	0	22	$8.00			
FOWLER	@ JENSEN	5.32	9.79	15.11	48	2,640	28	$9.00	$1,140,000	$401,000	$739,000
JENSEN	@ SUNNYSIDE	5.32	9.79	15.11	48	2,640	25	$8.00	$1,014,000	$357,000	$657,000
JENSEN	@ CLOVIS	5.32	9.79	15.11	48	2,640	24	$8.00	$1,014,000	$357,000	$657,000
CLOVIS	@ S. SAT. PLANT	5.32	9.79	15.11	48	1,320	23	$8.00	$507,000	$179,000	$328,000
TOTALS ($)									$3,675,000	$1,294,000	$2,381,000
TOTALS (%)									100.0%	35.2%	64.8%
TOTALS ($/MGD)		ROUNDED AVERAGE							$243,000	$243,000	$243,000

NOTES. ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-6

ALTERNATIVE 2B
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
SHEPHERD TRUNK PLUS NEW CROSSTOWN NORTHSIDE TRUNK TO NEW REGIONAL NORTHWEST SATELLITE WWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL +/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	FRESNO'S SHARE OF COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
COPPER @ FRIANT RD	5.90	0.00	5.90	36	0	17				
SHEPHERD @ FRIANT RD	5.90	0.00	5 90	36	13,000	24	$9 00	$4,212,000	$4,212,000	$0
SHEPHERD @ WILLOW	0.00	2.10	2.10	27	0	19				
SHEPHERD @ CHESTNUT	0.00	2.10	2.10	27	2,640	21	$8 00	$570,000	$0	$570,000
SHEPHERD @ MAPLE	0.00	2.10	2.10	27	2,640	21	$8.00	$570,000	$0	$570,000
SHEPHERD @ CEDAR	0.00	2.10	2.10	27	2,640	30	$9 00	$642,000	$0	$642,000
SHEPHERD @ MILLBROOK	0.00	2.10	2.10	27	2,640	23	$9 00	$642,000	$0	$642,000
SHEPHERD @ FIRST	0.00	2.10	2.10	27	2,640	24	$8.00	$570,000	$0	$570,000
SHEPHERD @ FRIANT RD	0.00	2.10	2.10	27	1,360	24	$8.00	$294,000	$0	$294,000
SHEPHERD @ FRIANT RD				39		26				
FRIANT R @ TEAGUE	5 90	2 10	8.00	39	2,900	23	$9.00	$1,018,000	$751,000	$267,000
FRESNO @ NEES	5.90	2.10	8.00	39	2,700	20	$8.00	$842,000	$621,000	$221,000
NEES @ BLACKSTONE	5 90	2 10	8 00	39	2,100	27	$9.00	$737,000	$544,000	$193,000
NEES @ INGRAM	5.90	2.10	8 00	39	3,200	25	$9.00	$1,123,000	$828,000	$295,000
INGRAM @ ALLUVIAL	5.90	2.10	8.00	39	2,640	22	$8.00	$824,000	$608,000	$216,000
INGRAM @ HERNDON	5 90	2.10	8 00	39	2,640	20	$8 00	$824,000	$608,000	$216,000
HERNDON @ PALM (S)	5 90	2 10	8 00	39	1,900	16	$9.00	$667,000	$492,000	$175,000
HERNDON @ FRUIT (S)	5 90	2.10	8.00	39	2,640	20	$9.00	$927,000	$684,000	$243,000
HERNDON @ WEST (S)	5 90	2.10	8.00	39	2,640	21	$9.00	$927,000	$684,000	$243,000
HERNDON @ VAN NESS	5.90	2.10	8 00	39	2,640	15	$9.00	$927,000	$684,000	$243,000
HERNDON @ MARKS (S)	5.90	2.10	8 00	39	2,640	17	$9.00	$927,000	$684,000	$243,000
HERNDON @ VALENTINE (S)	5.90	2.10	8.00	39	2,640	21	$9.00	$927,000	$684,000	$243,000
HERNDON @ BRAWLEY (S)	5.90	2.10	8 00	39	2,640	19	$9.00	$927,000	$684,000	$243,000
HERNDON @ BLYTH (S)	5.90	2.10	8 00	39	2,640	19	$9.00	$927,000	$684,000	$243,000
HERNDON @ CORNELIA (S)	5.90	2.10	8.00	39	2,640	17	$9 00	$927,000	$684,000	$243,000
HERNDON @ POLK (S)	5.90	2.10	8 00	39	2,640	13	$9.00	$927,000	$684,000	$243,000
HERNDON @ HAYES (S)	5.90	2.10	8.00	39	2,640	12	$8 00	$824,000	$608,000	$216,000
HERNDON @ BRYAN (S)	5 90	2.10	8 00	39	2,640	13	$8.00	$824,000	$608,000	$216,000
HERNDON @ GRANTLAND	5 90	2.10	8 00	39	2,400	12	$8.00	$749,000	$552,000	$197,000
GARFIELD @ SIERRA	5 90	2.10	8 00	39	4,000	13	$9.00	$1,404,000	$1,035,000	$369,000
GARFIELD @ BULLARD	5 90	2.10	8 00	39	2,640	10	$7.00	$721,000	$532,000	$189,000
GARFIELD @ BARSTOW	5.90	2.10	8 00	39	2,640	15	$7.00	$721,000	$532,000	$189,000
NW. SATELLITE PLANT	5.90	2.10	8 00	39	1,000	16	$7.00	$273,000	$201,000	$72,000
TOTALS ($)								$27,394,000	$18,888,000	$8,506,000
TOTALS (%)								100.0%	68.9%	31.1%
TOTALS ($/MGD)	ROUNDED AVERAGE							$3,424,000	$3,201,000	$4,050,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES

TABLE A8-7

ALTERNATIVES 3 THROUGH 5
REGIONAL TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
SECOND NORTH AVE. TRUNK BARREL FROM MAPLE AVE. TO RWWTP

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL+/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	FRESNO'S SHARE OF COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
	FRESNO EST. (MGD)	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
NORTH @ MAPLE				60		15				
NORTH @ CEDAR	21.58	6 79	28.37	60	2,706	15	$10.00	$1,624,000	$1,235,000	$389,000
NORTH @ ORANGE	22.71	6.79	29 50	60	2,665	14	$10.00	$1,599,000	$1,231,000	$368,000
NORTH @ EAST	15.37	6.79	22.16	60	2,634	13	$8 00	$1,264,000	$877,000	$387,000
NORTH @ CHERRY	17.03	6 79	23.82	60	2,706	14	$8.00	$1,299,000	$929,000	$370,000
NORTH @ CHERRY				78		15				
NORTH @ ELM	36.64	6.79	43 43	78	2,646	14	$8.00	$1,651,000	$1,393,000	$258,000
NORTH @ FIG	37.33	6 79	44.12	78	2,646	14	$8 00	$1,651,000	$1,397,000	$254,000
NORTH @ WALNUT	37.39	6.79	44.18	78	2,646	14	$8.00	$1,651,000	$1,397,000	$254,000
NORTH @ FRUIT	37.76	6.79	44.55	78	2,646	14	$8 00	$1,651,000	$1,399,000	$252,000
NORTH @ WEST	43.81	6.79	50.60	78	2,611	14	$8.00	$1,629,000	$1,410,000	$219,000
NORTH @ HUGHES	43.81	6.79	50.60	78	2,600	13	$8.00	$1,622,000	$1,404,000	$218,000
NORTH @ MARKS	43.81	6.79	50.60	78	2,600	11	$8.00	$1,622,000	$1,404,000	$218,000
NORTH @ VALENTINE	43.81	6.79	50.60	78	2,608	14	$8.00	$1,627,000	$1,409,000	$218,000
NORTH @ BRAWLEY	43 81	6 79	50.60	78	2,608	15	$8.00	$1,627,000	$1,409,000	$218,000
NORTH @ BLYTHE	43.83	6 79	50.62	78	2,655	14	$8.00	$1,657,000	$1,435,000	$222,000
NORTH @ CORNELIA	43 83	6 79	50.62	78	2,656	13	$8.00	$1,657,000	$1,435,000	$222,000
NORTH @ POLK	43.83	6.79	50.62	78	2,656	12	$8.00	$1,657,000	$1,435,000	$222,000
WWTP	43 83	6 79	50 62	78	5,000	18	$8 00	$3,120,000	$2,701,000	$419,000
TOTALS ($)								$28,608,000	$23,900,000	$4,708,000
TOTALS (%)								100.0%	83.5%	16.5%
TOTALS ($/MGD)	ROUNDED							$661,000	$655,000	$693,000

NOTES ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-8

ALTERNATIVE 2A
ESTIMATE OF COST OF
PROPOSED NW PUMP STATION AND FORCE MAIN
TO NORTH REGIONAL SATELLITE WWRF

ITEM NO.		ESTIMATED QUANTITY		UNIT ESTIMATE	EXTENSION
	CONSTRUCTION COSTS				
1	MOBILIZATION	1	LUMP SUM	$20,000.00	$20,000.00
2	18" FORCE MAIN	30,000	LF	$40.00	$1,200,000.00
3	FORCE MAIN CLEANOUTS	50	EA	$600.00	$30,000.00
4	SURFACE RESTORATION	30,000	LF	$15 00	$450,000.00
5	PUMP STATION AND APPURTENANCES	1	LUMP SUM	$420,000 00	$420,000.00
6	SULFIDE CONTROL PROVISIONS	1	LUMP SUM	$80,000.00	$80,000.00
7	TRAFFIC & DUST CONTROL	1	LUMP SUM	$30,000.00	$30,000.00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1	LUMP SUM	$112,000.00	$112,000 00
	SUBTOTAL				$2,342,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS			12.5%	$293,000.00
	SUBTOTAL				$2,635,000.00
	CONSTRUCTION CONTINGENCIES			15.0%	$395,000.00
	TOTAL ESTIMATED CONSTRUCTION COST				$3,030,000.00
	EASEMENTS	0.00	ACRE	$100,000 00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST				**$3,030,000.00**
	OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS				
ITEM NO	DESCRIPTION	ESTIMATED QUANTITY		UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1	LUMP SUM	$51,000.00	$51,000 00
2	ANNUAL SULFIDE CONTROL COSTS	1	LUMP SUM	$208,000.00	$208,000.00
3	ANNUAL MAINTENANCE COSTS	1	LUMP SUM	$20,000.00	$20,000.00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$280,000.00	COST	20 YEARS	$14,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)				**$293,000.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-9

ALTERNATIVES 1, 2A & 2B
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM REQUIRED BY 2015

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
		DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL+/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)		CLOVIS' SHARE OF COST (ROUNDED)
			CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
LOCATION	@ A						17				
MCCALL	@ N/O HERNDON		1 78	1.78	24	1,927	16				
MCCALL	@ HERNDON		1.78	1.78	24	1,508	14				
HERNDON	@ THOMPSON		2.09	2 09	24	2,016	15				
FWY 168	@ N/O SHEPHERD						18				
THOMPSON	@ SHEPHERD		2.13	2.13	24	2,145	16				
THOMPSON	@ TEAGUE		2.58	2 58	24	2,920	15				
THOMPSON	@ NEES		2.83	2 83	24	2,627	13				
THOMPSON	@ ALLUVIAL		2.96		24	2,650	20				
THOMPSON	@ ALLUVIAL				27		13				
THOMPSON	@ HERNDON		2.96	2.96	27	2,542	15				
HERNDON	@ THOMPSON				33		16				
HERNDON	@ HIGHLAND		5.06		33	2,173	15				
HIGHLAND	@ SIERRA		5 06	5 06	33	2,711	20				
HIGHLAND	@ BULLARD		5.06	5.06	33	2,617	16				
HIGHLAND	@ BARSTOW		5.06	5.06	33	2,661	16				
HIGHLAND	@ SHAW		5 06	5 06	33	2,661	18				
HIGHLAND	@ GETTYSBURG		5.06	5 06	33	2,650	16				
GETTYSBURG	@ HIGHLAND				36		17				
GETTYSBURG	@ LEONARD		6.30	6.30	36	2,672	19	$8.00	$770,000		$770,000
LEONARD	@ ASHLAN		7.62	7.62	36	2,892	15	$8.00	$833,000		$833,000
LEONARD	@ DAKOTA		8 37	8.37	36	2,483	18	$8 00	$715,000		$715,000
LEONARD	@ GOULD CANAL		8 37	8 37	36	540	19	$8 00	$156,000		$156,000
TOTALS ($)									$2,474,000		$2,474,000
TOTALS (%)									100.0%		100 0%
TOTALS ($/MGD)			ROUNDED						$323,000		$323,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-10

ALTERNATIVES 1, 2A & 2B
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM ULTIMATELY REQUIRED BY 2030

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							
	DESIGN FLOW (ADAF)		DIAM	DISTANCE	CUT TO FL +/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)			
LOCATION @ A					17			
MCCALL @ N/O HERNDON	1.78	1.78	24	1,927	16	$8.00	$370,000	$370,000
MCCALL @ HERNDON	1.78	1.78	24	1,508	14	$8.00	$290,000	$290,000
HERNDON @ THOMPSON	2 09	2.09	24	2,016	15	$8.00	$387,000	$387,000
FWY 168 @ N/O SHEPHERD					18			
THOMPSON @ SHEPHERD	2.13	2.13	24	2,145	16	$8 00	$412,000	$412,000
THOMPSON @ TEAGUE	2.58	2.58	24	2,920	15	$8.00	$561,000	$561,000
THOMPSON @ NEES	2 83	2.83	24	2,627	13	$8.00	$504,000	$504,000
THOMPSON @ ALLUVIAL	2 96	2.96	24	2,650	20	$8.00	$509,000	$509,000
THOMPSON @ ALLUVIAL			27		13			
THOMPSON @ HERNDON	2.96	2 96	27	2,542	15	$8.00	$549,000	$549,000
HERNDON @ THOMPSON			33		16			
HERNDON @ HIGHLAND	5.06	5 06	33	2,173	15	$8.00	$574,000	$574,000
HIGHLAND @ SIERRA	5.06	5 06	33	2,711	20	$8.00	$716,000	$716,000
HIGHLAND @ BULLARD	5 06	5.06	33	2,617	16	$8.00	$691,000	$691,000
HIGHLAND @ BARSTOW	5.06	5.06	33	2,661	16	$8.00	$703,000	$703,000
HIGHLAND @ SHAW	5 06	5 06	33	2,661	18	$8.00	$703,000	$703,000
HIGHLAND @ GETTYSBURG	5.06	5.06	33	2,650	16	$8.00	$700,000	$700,000
GETTYSBURG @ HIGHLAND			36		17			
GETTYSBURG @ LEONARD	6.30	6 30	36	2,672	19	$8.00	$770,000	$770,000
LEONARD @ ASHLAN	7.62	7.62	36	2,892	15	$8.00	$833,000	$833,000
LEONARD @ DAKOTA	8.37	8.37	36	2,483	18	$8.00	$715,000	$715,000
LEONARD @ GOULD CANAL	8 37	8 37	36	540	19	$8 00	$156,000	$156,000
TOTALS ($)							$10,143,000	$10,143,000
TOTALS (%)							100.0%	100 0%
TOTALS ($/MGD)	ROUNDED						$2,279,000	$2,279,000

NOTES. ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-11

ALTERNATIVE 3
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM REQUIRED BY 2015

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION								
	DESIGN FLOW (ADAF)		DIAM	DISTANCE	CUT TO FL +/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)		CLOVIS' SHARE OF COST (ROUNDED)
	CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
LOCATION @ A					17				
MCCALL @ N/O HERNDON	1.78	1 78	24	1,927	16				
MCCALL @ HERNDON	1.78	1.78	24	1,508	14				
HERNDON @ THOMPSON	2.09	2.09	24	2,016	15				
FWY 168 @ N/O SHEPHERD					18				
THOMPSON @ SHEPHERD	2.13	2.13	24	2,145	16				
THOMPSON @ TEAGUE	2.58	2.58	24	2,920	15				
THOMPSON @ NEES	2 83	2.83	24	2,627	13				
THOMPSON @ ALLUVIAL	2.96		24	2,650	20				
THOMPSON @ ALLUVIAL			27		13				
THOMPSON @ HERNDON	2.96	2.96	27	2,542	15				
THOMPSON @ HERNDON			33		16				
NE SATELLITE WWRF	5.05	5.05	33	1,320	24				
GETTYSBURG @ LEONARD					18				
LEONARD @ ASHLAN	2.55	2 55	27	2,892	14	$8 00	$625,000		$625,000
LEONARD @ DAKOTA	3 30	3 30	27	2,483	17	$8.00	$536,000		$536,000
SE SATELLITE WWRF	3 30	3 30	27	1,320	19	$8 00	$285,000		$285,000
TOTALS ($)							$1,446,000		$1,446,000
TOTALS (%)							100 0%		100 0%
TOTALS ($/MGD)	ROUNDED						$520,000		$520,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES

TABLE A8-12

ALTERNATIVE 3
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM ULTIMATELY REQUIRED BY 2030

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION: DESIGN FLOW (ADAF) CLOVIS (MGD)	DESIGN FLOW (ADAF) TOTAL (MGD)	DIAM (IN)	DISTANCE (FEET)	CUT TO FL +/- (FEET)	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
LOCATION @ A					17			
MCCALL @ N/O HERNDON	1.78	1.78	24	1,927	16	$8.00	$370,000	$370,000
MCCALL @ HERNDON	1 78	1.78	24	1,508	14	$8.00	$290,000	$290,000
HERNDON @ THOMPSON	2.09	2.09	24	2,016	15	$8.00	$387,000	$387,000
FWY 168 @ N/O SHEPHERD					18			
THOMPSON @ SHEPHERD	2.13	2.13	24	2,145	16	$8.00	$412,000	$412,000
THOMPSON @ TEAGUE	2.58	2 58	24	2,920	15	$8.00	$561,000	$561,000
THOMPSON @ NEES	2.83	2.83	24	2,627	13	$8.00	$504,000	$504,000
THOMPSON @ ALLUVIAL	2.96	2 96	24	2,650	20	$8 00	$509,000	$509,000
THOMPSON @ ALLUVIAL			27		13			
THOMPSON @ HERNDON	2.96	2.96	27	2,542	15	$8.00	$549,000	$549,000
THOMPSON @ HERNDON			33		16			
NE SATELLITE WWRF	5.05	5.05	33	1,320	24	$8.00	$348,000	$348,000
GETTYSBURG @ LEONARD					18	$8.00	$0	$0
LEONARD @ ASHLAN	2.55	2 55	27	2,892	14	$8 00	$625,000	$625,000
LEONARD @ DAKOTA	3.30	3.30	27	2,483	17	$8.00	$536,000	$536,000
SE SATELLITE WWRF	3 30	3 30	27	1,320	19	$8 00	$285,000	$285,000
TOTALS ($)							$5,376,000	$5,376,000
TOTALS (%)							100 0%	100.0%
TOTALS ($/MGD)	ROUNDED						$1,934,000	$1,934,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES

TABLE A8-13

ALTERNATIVE 4
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM REQUIRED BY 2015

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO	UNIT	TOTAL		CLOVIS'
		CLOVIS	TOTAL			FL +/-	COST	REACH		SHARE
							($/IN-	COST		OF COST
		(MGD)	(MGD)	(IN)	(FEET)	(FEET)	DIA-FT)	(ROUNDED)		(ROUNDED)
LOCATION @ A						17				
MCCALL @ N/O HERNDON		1.78	1.78	24	1,927	16				
MCCALL @ HERNDON		1.78	1 78	24	1,508	14				
HERNDON @ THOMPSON		2 09	2.09	24	2,016	15				
FWY 168 @ N/O SHEPHERD						18				
THOMPSON @ SHEPHERD		2.13	2.13	24	2,145	16				
THOMPSON @ TEAGUE		2 58	2.58	24	2,920	15				
THOMPSON @ NEES		2 83	2.83	24	2,627	13				
THOMPSON @ ALLUVIAL		2 96		24	2,650	20				
THOMPSON @ ALLUVIAL				27		13				
THOMPSON @ HERNDON		2 96	2.96	27	2,542	15				
HERNDON @ THOMPSON				33		16				
HERNDON @ HIGHLAND		5.06		33	2,173	15				
HIGHLAND @ SIERRA		5.06	5.06	33	2,711	20				
HIGHLAND @ BULLARD		5.06	5.06	33	2,617	16				
HIGHLAND @ BARSTOW		5.06	5.06	33	2,661	16				
HIGHLAND @ SHAW		5 06	5.06	33	2,661	18				
HIGHLAND @ GETTYSBURG		5 06	5.06	33	2,650	16				
GETTYSBURG @ HIGHLAND				36		17				
GETTYSBURG @ LEONARD		6 30	6.30	36	2,672	19	$8.00	$770,000		$770,000
LEONARD @ ASHLAN		7.62	7.62	36	2,892	15	$8:00	$833,000		$833,000
LEONARD @ DAKOTA		8.37	8.37	36	2,483	18	$8.00	$715,000		$715,000
SE SATELLITE @		8.37	8 37	36	1,320	22	$8 00	$380,000		$380,000
TOTALS ($)								$2,698,000		$2,698,000
TOTALS (%)								100.0%		100.0%
TOTALS ($/MGD)		ROUNDED						$352,000		$352,000

NOTES. ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-14

ALTERNATIVE 4
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM ULTIMATELY REQUIRED BY 2030

LOCATION	REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL +/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)		CLOVIS' SHARE OF COST (ROUNDED)
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
LOCATION @ A						17				
MCCALL @ N/O HERNDON		1.78	1.78	24	1,927	16	$8.00	$370,000		$370,000
MCCALL @ HERNDON		1.78	1.78	24	1,508	14	$8 00	$290,000		$290,000
HERNDON @ THOMPSON		2.09	2.09	24	2,016	15	$8.00	$387,000		$387,000
FWY 168 @ N/O SHEPHERD						18				
THOMPSON @ SHEPHERD		2 13	2.13	24	2,145	16	$8.00	$412,000		$412,000
THOMPSON @ TEAGUE		2 58	2.58	24	2,920	15	$8.00	$561,000		$561,000
THOMPSON @ NEES		2 83	2.83	24	2,627	13	$8.00	$504,000		$504,000
THOMPSON @ ALLUVIAL		2 96	2 96	24	2,650	20	$8.00	$509,000		$509,000
THOMPSON @ ALLUVIAL				27		13				
THOMPSON @ HERNDON		2.96	2.96	27	2,542	15	$8.00	$549,000		$549,000
HERNDON @ THOMPSON				33		16				
HERNDON @ HIGHLAND		5.06	5 06	33	2,173	15	$8.00	$574,000		$574,000
HIGHLAND @ SIERRA		5 06	5 06	33	2,711	20	$8.00	$716,000		$716,000
HIGHLAND @ BULLARD		5.06	5.06	33	2,617	16	$8.00	$691,000		$691,000
HIGHLAND @ BARSTOW		5 06	5 06	33	2,661	16	$8.00	$703,000		$703,000
HIGHLAND @ SHAW		5 06	5.06	33	2,661	18	$8.00	$703,000		$703,000
HIGHLAND @ GETTYSBURG		5.06	5 06	33	2,650	16	$8.00	$700,000		$700,000
GETTYSBURG @ HIGHLAND				36		17				
GETTYSBURG @ LEONARD		6 30	6.30	36	2,672	19	$8.00	$770,000		$770,000
LEONARD @ ASHLAN		7.62	7.62	36	2,892	15	$8.00	$833,000		$833,000
LEONARD @ DAKOTA		8.37	8.37	36	2,483	18	$8.00	$715,000		$715,000
SE SATELLITE @ 0		8 37	8 37	36	1,320	22	$8 00	$380,000		$380,000
TOTALS ($)								$10,367,000		$10,367,000
TOTALS (%)								100.0%		100.0%
TOTALS ($/MGD)		ROUNDED						$2,330,000		$2,330,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-15

ALTERNATIVE 5
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM REQUIRED BY 2015

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							
		DESIGN FLOW (ADAF)		DIAM	DISTANCE	CUT TO FL +/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)			
LOCATION	@ A					17			
MCCALL	@ N/O HERNDON	1.78	1.78	24	1,927	16			
MCCALL	@ HERNDON	1.78	1.78	24	1,508	14			
HERNDON	@ THOMPSON	2.09	2.09	24	2,016	15			
FWY 168	@ N/O SHEPHERD					18			
THOMPSON	@ SHEPHERD	2.13	2.13	24	2,145	16			
THOMPSON	@ TEAGUE	2.58	2.58	24	2,920	15			
THOMPSON	@ NEES	2.83	2.83	24	2,627	13			
THOMPSON	@ ALLUVIAL	2.96	2.96	24	2,650	20			
THOMPSON	@ ALLUVIAL			27		13			
THOMPSON	@ HERNDON	2.96	2.96	27	2,542	15			
HERNDON	@ THOMPSON			33		16			
HERNDON	@ HIGHLAND	5.06	5.06	33	2,173	15			
HIGHLAND	@ SIERRA	5.06	5.06	33	2,711	20			
HIGHLAND	@ BULLARD	5.06	5.06	33	2,617	16			
HIGHLAND	@ BARSTOW	5.06	5.06	33	2,661	16			
HIGHLAND	@ SHAW	5.06	5.06	33	2,661	18			
HIGHLAND	@ GETTYSBURG	5.06	5.06	33	2,650	16			
GETTYSBURG	@ HIGHLAND			36		17			
GETTYSBURG	@ LEONARD	6.30	6.30	36	2,672	19	$8.00	$770,000	$770,000
DEWOLF	SHEPHERD					8			
DEWOLF	TEAGUE	2.80	2.80	24	2,623	9	$8.00	$504,000	$504,000
DEWOLF	NEES	2.80	2.80	24	2,623	14	$8.00	$504,000	$504,000
DEWOLF	ALLUVIAL	2.80	2.80	24	2,646	14	$8.00	$508,000	$508,000
DEWOLF	HERNDON	2.80	2.80	24	2,657	14	$8.00	$510,000	$510,000
HERNDON	DEWOLF (S)	2.80	2.80	24	630	17	$8.00	$121,000	$121,000
DEWOLF (S)	SIERRA	2.80	2.80	24	2,604	13	$8.00	$500,000	$500,000
DEWOLF	SIERRA			27		13			
DEWOLF	BULLARD	2.80	2.80	27	2,603	16	$8.00	$562,000	$562,000
DEWOLF	BARSTOW	3.19	3.19	27	2,657	18	$8.00	$574,000	$574,000
DEWOLF	SHAW	3.19	3.19	27	2,661	19	$8.00	$575,000	$575,000
DEWOLF	SHAW	0.00	0.00	27	0	24	$8.00	$0	$0
DEWOLF	GETTYSBURG	3.55	3.55	27	2,654	19	$8.00	$573,000	$573,000
GETTYSBURG	DEWOLF			30		19			
GETTYSBURG	LEONARD	3.82	3.82	30	2,666	18	$8.00	$640,000	$640,000
LEONARD	GETTYSBURG					19			
LEONARD	@ ASHLAN	10.42	10.42	42	2,892	15	$8.00	$972,000	$972,000
LEONARD	@ DAKOTA	11.17	11.17	42	2,483	18	$8.00	$834,000	$834,000
SE SATELLITE WWRF		11.17	11.17	42	1,320	22	$8.00	$444,000	$444,000
TOTALS ($)								$8,591,000	$8,591,000
TOTALS (%)								100.0%	100.0%
TOTALS ($/MGD)		ROUNDED						$1,898,000	$1,898,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-16

ALTERNATIVE 5
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM ULTIMATELY REQUIRED BY 2030

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION								
	DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO FL +/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)		CLOVIS' SHARE OF COST (ROUNDED)
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)				
LOCATION @ A						17				
MCCALL @ N/O HERNDON		1.78	1.78	24	1,927	16	$8.00	$370,000		$370,000
MCCALL @ HERNDON		1 78	1.78	24	1,508	14	$8.00	$290,000		$290,000
HERNDON @ THOMPSON		2.09	2 09	24	2,016	15	$8.00	$387,000		$387,000
FWY 168 @ N/O SHEPHERD		-				18				
THOMPSON @ SHEPHERD		2.13	2.13	24	2,145	16	$8.00	$412,000		$412,000
THOMPSON @ TEAGUE		2.58	2.58	24	2,920	15	$8.00	$561,000		$561,000
THOMPSON @ NEES		2.83	2 83	24	2,627	13	$8 00	$504,000		$504,000
THOMPSON @ ALLUVIAL		2.96	2.96	24	2,650	20	$8.00	$509,000		$509,000
THOMPSON @ ALLUVIAL				24		13				
THOMPSON @ HERNDON		2 96	2 96	27	2,542	15	$8.00	$549,000		$549,000
HERNDON @ THOMPSON				33		16				
HERNDON @ HIGHLAND		5.06	5.06	33	2,173	15	$8.00	$574,000		$574,000
HIGHLAND @ SIERRA		5.06	5 06	33	2,711	20	$8.00	$716,000		$716,000
HIGHLAND @ BULLARD		5.06	5.06	33	2,617	16	$8.00	$691,000		$691,000
HIGHLAND @ BARSTOW		5.06	5.06	33	2,661	16	$8.00	$703,000		$703,000
HIGHLAND @ SHAW		5 06	5.06	33	2,661	18	$8.00	$703,000		$703,000
HIGHLAND @ GETTYSBURG		5.06	5.06	33	2,650	16	$8.00	$700,000		$700,000
GETTYSBURG @ HIGHLAND				36		17				
GETTYSBURG @ LEONARD		6.30	6.30	36	2,672	19	$8.00	$770,000		$770,000
DEWOLF @ SHEPHERD						8				
DEWOLF @ TEAGUE		2.80	2 80	24	2,623	9	$8.00	$504,000		$504,000
DEWOLF @ NEES		2.80	2 80	24	2,623	14	$8.00	$504,000		$504,000
DEWOLF @ ALLUVIAL		2.80	2.80	24	2,646	14	$8.00	$508,000		$508,000
DEWOLF @ HERNDON		2.80	2.80	24	2,657	14	$8 00	$510,000		$510,000
HERNDON @ DEWOLF (S)		2 80	2.80	24	630	17	$8.00	$121,000		$121,000
DEWOLF (S) @ SIERRA		2 80	2 80	24	2,604	13	$8.00	$500,000		$500,000
DEWOLF @ SIERRA				27		13				
DEWOLF @ BULLARD		2 80	2.80	27	2,603	16	$8.00	$562,000		$562,000
DEWOLF @ BARSTOW		3 19	3.19	27	2,657	18	$8.00	$574,000		$574,000
DEWOLF @ SHAW		3.19	3.19	27	2,661	19	$8 00	$575,000		$575,000
DEWOLF @ SHAW		0.00	0 00	27	0	24	$8.00	$0		$0
DEWOLF @ GETTYSBURG		3.55	3 55	27	2,654	19	$8.00	$573,000		$573,000
GETTYSBURG @ DEWOLF				30		19				
GETTYSBURG @ LEONARD		3 82	3 82	30	2,666	18	$8.00	$640,000		$640,000
LEONARD @ GETTYSBURG						19				
LEONARD @ ASHLAN		10 42	10.42	42	2,892	15	$8.00	$972,000		$972,000
LEONARD @ DAKOTA		11.17	11.17	42	2,483	18	$8 00	$834,000		$834,000
SE SATELLITE WWRF		11.17	11.17	42	1,320	22	$8.00	$444,000		$444,000
TOTALS ($)								$16,260,000		$16,260,000
TOTALS (%)								100.0%		100.0%
TOTALS ($/MGD)		ROUNDED						$3,871,000		$3,871,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-17

ALTERNATIVE 6
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM REQUIRED BY 2015

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION									
		DESIGN FLOW (ADAF)			DIAM	DISTANCE	CUT TO	UNIT	TOTAL		CLOVIS'
			CLOVIS	TOTAL			FL +/-	COST	REACH		SHARE
								($/IN-	COST		OF COST
			(MGD)	(MGD)	(IN)	(FEET)	(FEET)	DIA-FT)	(ROUNDED)		(ROUNDED)
LOCATION	@ A						17				
MCCALL	@ N/O HERNDON		1.78	1.78	24	1,927	16				
MCCALL	@ HERNDON		1.78	1.78	24	1,508	14				
HERNDON	@ THOMPSON		2.09	2.09	24	2,016	15				
FWY 168	@ N/O SHEPHERD						18				
THOMPSON	@ SHEPHERD		2.13	2.13	24	2,145	16				
THOMPSON	@ TEAGUE		2.58	2.58	24	2,920	15				
THOMPSON	@ NEES		2.83	2.83	24	2,627	13				
THOMPSON	@ ALLUVIAL		2.96		24	2,650	20				
THOMPSON	@ ALLUVIAL				27		13				
THOMPSON	@ HERNDON		2 96	2 96	27	2,542	15				
HERNDON	@ THOMPSON				33		16				
HERNDON	@ HIGHLAND		5.06		33	2,173	15				
HIGHLAND	@ SIERRA		5.06	5 06	33	2,711	20				
HIGHLAND	@ BULLARD		5.06	5 06	33	2,617	16				
HIGHLAND	@ BARSTOW		5.06	5.06	33	2,661	16				
HIGHLAND	@ SHAW		5.06	5.06	33	2,661	18				
HIGHLAND	@ GETTYSBURG		5 06	5.06	33	2,650	16				
GETTYSBURG	@ HIGHLAND				36		17				
GETTYSBURG	@ LEONARD		6 30	6 30	36	2,672	19	$8 00	$770,000		$770,000
LEONARD	@ ASHLAN		7.62	7 62	36	2,892	15	$8.00	$833,000		$833,000
LEONARD	@ ASHLAN				48		16				
LEONARD	@ DAKOTA		20.23	20.23	48	2,483	19	$8 00	$953,000		$953,000
LEONARD	@ DAKOTA				54		19				
SE SATELLITE WWRF			20 23	20 23	54	1,320	23	$8.00	$570,000		$570,000
TOTALS ($)									$3,126,000		$3,126,000
TOTALS (%)									100.0%		100.0%
TOTALS ($/MGD)			ROUNDED						$230,000		$230,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-18

ALTERNATIVE 6
TRUNK SEWER CONCEPTUAL DESIGN ANALYSIS
ESTIMATE OF COST
INTERNAL CLOVIS MAJOR TRUNK SYSTEM ULTIMATELY REQUIRED BY 2030

LOCATION		REACH EXTENDING FROM NEAREST UPSTREAM LOCATION							
		DESIGN FLOW (ADAF)		DIAM	DISTANCE	CUT TO FL+/-	UNIT COST ($/IN-DIA-FT)	TOTAL REACH COST (ROUNDED)	CLOVIS' SHARE OF COST (ROUNDED)
		CLOVIS (MGD)	TOTAL (MGD)	(IN)	(FEET)	(FEET)			
LOCATION	@ A					17			
LOCATION	@ A	1.78	1 78	24	1,927	16	$8.00	$370,000	$370,000
MCCALL	@ N/O HERNDON	1.78	1.78	24	1,608	14	$8.00	$290,000	$290,000
MCCALL	@ HERNDON	2.09	2.09	24	2,016	15	$8.00	$387,000	$387,000
						18			
FWY 168	@ N/O SHEPHERD	2.13	2 13	24	2,145	16	$8.00	$412,000	$412,000
THOMPSON	@ SHEPHERD	2.58	2.58	24	2,920	15	$8 00	$561,000	$561,000
THOMPSON	@ TEAGUE	2 83	2.83	24	2,627	13	$8.00	$504,000	$504,000
THOMPSON	@ NEES	2.96	2.96	24	2,650	20	$8.00	$509,000	$509,000
THOMPSON	@ ALLUVIAL			27		13			
THOMPSON	@ ALLUVIAL	2.96	2.96	27	2,542	15	$8.00	$549,000	$549,000
THOMPSON	@ HERNDON			33		16			
HERNDON	@ THOMPSON	5.06	5.06	33	2,173	15	$8 00	$574,000	$574,000
HERNDON	@ HIGHLAND	5.06	5.06	33	2,711	20	$8.00	$716,000	$716,000
HIGHLAND	@ SIERRA	5.06	5.06	33	2,617	16	$8.00	$691,000	$691,000
HIGHLAND	@ BULLARD	5.06	5 06	33	2,661	16	$8.00	$703,000	$703,000
HIGHLAND	@ BARSTOW	5 06	5.06	33	2,661	18	$8.00	$703,000	$703,000
HIGHLAND	@ SHAW	5.06	5.06	33	2,650	16	$8.00	$700,000	$700,000
HIGHLAND	@ GETTYSBURG			36		17			
GETTYSBURG	@ HIGHLAND	6.30	6.30	36	2,672	19	$8.00	$770,000	$770,000
GETTYSBURG	@ LEONARD	7.62	7 62	36	2,892	15	$8.00	$833,000	$833,000
LEONARD	@ ASHLAN			48		16			
LEONARD	@ ASHLAN	20 23	20 23	48	2,483	19	$8.00	$953,000	$953,000
LEONARD	@ DAKOTA			48		19			
SE SATELLITE WWRF		20 23	20 23	54	1,320	23	$8 00	$570,000	$570,000
TOTALS ($)								$10,795,000	$10,795,000
TOTALS (%)								100.0%	100.0%
TOTALS ($/MGD)		ROUNDED						$1,871,000	$1,871,000

NOTES: ESTIMATES OF $ PER INCH-DIAMETER PER LINEAL FOOT INCLUDE COSTS OF CONSTRUCTION, DESIGN, INSPECTION, RIGHT-OF-WAY ACQUISITION, OTHER INCIDENTAL EXPENSES AND AN ALLOWANCE FOR CONTINGENCIES.

ALL CONCRETE PIPE ASSUMED TO BE PVC LINED 360 DEGREES.

TABLE A8-19

ALTERNATIVE 3 & 4
ESTIMATE OF COST OF
PROPOSED NW PUMP STATION AND FORCE MAIN
TO CLOVIS NORTHWEST SATELLITE WWRF

CONSTRUCTION COSTS				
ITEM NO.		ESTIMATED QUANTITY	UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1 LUMP SUM	$20,000 00	$20,000 00
2	18" FORCE MAIN	10,600 LF	$40.00	$424,000.00
3	FORCE MAIN CLEANOUTS	18 EA	$600.00	$10,800.00
4	SURFACE RESTORATION	8,000 LF	$15.00	$120,000.00
5	PUMP STATION AND APPURTENANCES	1 LUMP SUM	$420,000.00	$420,000.00
6	SULFIDE CONTROL PROVISIONS	1 LUMP SUM	$80,000.00	$80,000.00
7	TRAFFIC & DUST CONTROL	1 LUMP SUM	$10,000.00	$10,000.00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1 LUMP SUM	$54,200.00	$54,200.00
	SUBTOTAL			$1,139,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS		12.5%	$142,000.00
	SUBTOTAL			$1,281,000 00
	CONSTRUCTION CONTINGENCIES		15.0%	$192,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			$1,473,000.00
	EASEMENTS	1.20 ACRE	$100,000.00	$120,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			$1,593,000.00
OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS				
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1 LUMP SUM	$29,000.00	$29,000.00
2	ANNUAL SULFIDE CONTROL COSTS	1 LUMP SUM	$81,000.00	$81,000.00
3	ANNUAL MAINTENANCE COSTS	1 LUMP SUM	$20,000.00	$20,000 00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$280,000.00 COST	20 YEARS	$14,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)			$144,000.00

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-20A

ALTERNATIVE 5
ESTIMATE OF COST OF
PROPOSED NW PUMP STATION AND FORCE MAIN
TO CLOVIS SOUTHEAST SATELLITE WWRF

CONSTRUCTION COSTS					
ITEM NO.		ESTIMATED QUANTITY		UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1	LUMP SUM	$20,000.00	$20,000.00
2	18" FORCE MAIN	23,800	LF	$40.00	$952,000.00
3	FORCE MAIN CLEANOUTS	40	EA	$600.00	$24,000.00
4	SURFACE RESTORATION	23,800	LF	$15.00	$357,000.00
5	PUMP STATION AND APPURTENANCES	1	LUMP SUM	$420,000.00	$420,000.00
6	SULFIDE CONTROL PROVISIONS	1	LUMP SUM	$80,000.00	$80,000.00
7	TRAFFIC & DUST CONTROL	1	LUMP SUM	$20,000.00	$20,000.00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1	LUMP SUM	$94,000.00	$94,000.00
	SUBTOTAL				$1,967,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS			12.5%	$246,000.00
	SUBTOTAL				$2,213,000.00
	CONSTRUCTION CONTINGENCIES			15.0%	$332,000.00
	TOTAL ESTIMATED CONSTRUCTION COST				$2,545,000.00
	EASEMENTS	0.00	ACRE	$100,000.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST				$2,545,000.00
OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS					
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY		UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1	LUMP SUM	$55,000.00	$55,000.00
2	ANNUAL SULFIDE CONTROL COSTS	1	LUMP SUM	$167,000.00	$167,000.00
3	ANNUAL MAINTENANCE COSTS	1	LUMP SUM	$20,000.00	$20,000.00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$280,000.00	COST	20 YEARS	$14,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)				$256,000.00

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-20B

ALTERNATIVE 6
ESTIMATE OF COST OF
PROPOSED NW PUMP STATION AND FORCE MAIN
TO CLOVIS NORTHWEST SATELLITE WWRF

ITEM NO.	*CONSTRUCTION COSTS*	ESTIMATED QUANTITY	UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1 LUMP SUM	$20,000 00	$20,000.00
2	18" FORCE MAIN	10,600 LF	$40 00	$424,000 00
3	FORCE MAIN CLEANOUTS	18 EA	$600.00	$10,800.00
4	SURFACE RESTORATION	8,000 LF	$15.00	$120,000 00
5	PUMP STATION AND APPURTENANCES	1 LUMP SUM	$420,000.00	$420,000 00
6	SULFIDE CONTROL PROVISIONS	1 LUMP SUM	$80,000 00	$80,000.00
7	TRAFFIC & DUST CONTROL	1 LUMP SUM	$10,000 00	$10,000 00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1 LUMP SUM	$54,200.00	$54,200 00
	SUBTOTAL			$1,139,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS		12.5%	$142,000.00
	SUBTOTAL			$1,281,000.00
	CONSTRUCTION CONTINGENCIES		15 0%	$192,000 00
	TOTAL ESTIMATED CONSTRUCTION COST			$1,473,000.00
	EASEMENTS	1.20 ACRE	$100,000.00	$120,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			**$1,593,000.00**

ITEM NO.	DESCRIPTION (*OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS*)	ESTIMATED QUANTITY	UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1 LUMP SUM	$29,000.00	$29,000.00
2	ANNUAL SULFIDE CONTROL COSTS	1 LUMP SUM	$81,000 00	$81,000 00
3	ANNUAL MAINTENANCE COSTS	1 LUMP SUM	$20,000.00	$20,000.00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$280,000.00 COST	20 YEARS	$14,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)			**$144,000.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-21

ALTERNATIVE 6
ESTIMATE OF COST OF
PROPOSED HERNDON/SIERRA TRUNK SEWER PUMP STATION AND FORCE MAIN TO CLOVIS NORTHWEST SATELLITE WWRF

CONSTRUCTION COSTS				
ITEM NO.		ESTIMATED QUANTITY	UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1 LUMP SUM	$20,000.00	$20,000.00
2	21" FORCE MAIN	21,200 LF	$45 00	$954,000.00
3	FORCE MAIN CLEANOUTS	36 EA	$600.00	$21,600 00
4	SURFACE RESTORATION	21,200 LF	$15.00	$318,000.00
5	PUMP STATION AND APPURTENANCES	1 LUMP SUM	$480,000.00	$480,000.00
6	SULFIDE CONTROL PROVISIONS	1 LUMP SUM	$80,000.00	$80,000.00
7	TRAFFIC & DUST CONTROL	1 LUMP SUM	$20,000.00	$20,000.00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1 LUMP SUM	$94,400.00	$94,400 00
	SUBTOTAL			$1,988,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS		12.5%	$249,000.00
	SUBTOTAL			$2,237,000.00
	CONSTRUCTION CONTINGENCIES		15.0%	$336,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			$2,573,000.00
	EASEMENTS	0 00 ACRE	$100,000.00	$0 00
	TOTAL ESTIMATED CONSTRUCTION COST			$2,573,000.00

OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS				
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1 LUMP SUM	$43,000.00	$43,000.00
2	ANNUAL SULFIDE CONTROL COSTS	1 LUMP SUM	$179,000.00	$179,000.00
3	ANNUAL MAINTENANCE COSTS	1 LUMP SUM	$23,000.00	$23,000.00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$320,000.00 COST	20 YEARS	$16,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)			$261,000.00

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-22

ALTERNATIVE 6
ESTIMATE OF COST OF
PROPOSED PEACH TRUNK SEWER PUMP STATION AND FORCE MAIN
TO CLOVIS SOUTHEAST SATELLITE WWRF

ITEM NO.	*CONSTRUCTION COSTS*	ESTIMATED QUANTITY	UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1 LUMP SUM	$20,000 00	$20,000.00
2	21" FORCE MAIN	27,000 LF	$45.00	$1,215,000.00
3	FORCE MAIN CLEANOUTS	45 EA	$600.00	$27,000.00
4	SURFACE RESTORATION	27,000 LF	$15.00	$405,000.00
5	PUMP STATION AND APPURTENANCES	1 LUMP SUM	$600,000.00	$600,000.00
6	SULFIDE CONTROL PROVISIONS	1 LUMP SUM	$80,000.00	$80,000.00
7	TRAFFIC & DUST CONTROL	1 LUMP SUM	$40,000.00	$40,000.00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1 LUMP SUM	$119,000.00	$119,000.00
	SUBTOTAL			$2,506,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS		12.5%	$313,000.00
	SUBTOTAL			$2,819,000 00
	CONSTRUCTION CONTINGENCIES		15.0%	$423,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			$3,242,000 00
	EASEMENTS	0.00 ACRE	$100,000 00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST			**$3,242,000 00**

ITEM NO.	*OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS* DESCRIPTION	ESTIMATED QUANTITY	UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1 LUMP SUM	$66,000.00	$66,000.00
2	ANNUAL SULFIDE CONTROL COSTS	1 LUMP SUM	$228,000.00	$228,000.00
3	ANNUAL MAINTENANCE COSTS	1 LUMP SUM	$29,000.00	$29,000.00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$390,000.00 COST	20 YEARS	$20,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)			**$343,000.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-23

ALTERNATIVE 6
ESTIMATE OF COST OF
PROPOSED FOWLER TRUNK SEWER PUMP STATION AND FORCE MAIN
TO CLOVIS SOUTHEAST SATELLITE WWRF

ITEM NO.	*CONSTRUCTION COSTS*	ESTIMATED QUANTITY	UNIT ESTIMATE	EXTENSION
1	MOBILIZATION	1 LUMP SUM	$20,000.00	$20,000.00
2	33" FORCE MAIN	14,700 LF	$60.00	$882,000.00
3	FORCE MAIN CLEANOUTS	25 EA	$600.00	$15,000.00
4	SURFACE RESTORATION	14,700 LF	$15.00	$220,500.00
5	PUMP STATION AND APPURTENANCES	1 LUMP SUM	$1,580,000.00	$1,580,000.00
6	SULFIDE CONTROL PROVISIONS	1 LUMP SUM	$100,000.00	$80,000.00
7	TRAFFIC & DUST CONTROL	1 LUMP SUM	$30,000.00	$30,000 00
8	MISCELLANEOUS FACILITIES AND OPERATIONS	1 LUMP SUM	$141,500.00	$141,500 00
	SUBTOTAL			$2,969,000.00
	DESIGN, INSPECTION, STAKING, INCIDENTALS		12 5%	$371,000.00
	SUBTOTAL			$3,340,000.00
	CONSTRUCTION CONTINGENCIES		15.0%	$501,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			$3,841,000 00
	EASEMENTS	0 00 ACRE	$100,000.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST			**$3,841,000.00**

ITEM NO.	*OPERATIONS, MAINTENANCE AND REPLACEMENT COSTS* DESCRIPTION	ESTIMATED QUANTITY	UNIT COST OR LIFE	ESTIMATED ANNUAL COST
1	ANNUAL ENERGY COSTS	1 LUMP SUM	$120,000 00	$120,000.00
2	ANNUAL SULFIDE CONTROL COSTS	1 LUMP SUM	$238,000.00	$238,000.00
3	ANNUAL MAINTENANCE COSTS	1 LUMP SUM	$79,000.00	$79,000.00
4	ANNUAL REPLACEMENT COSTS (ROUNDED)*	$1,030,000.00 COST	20 YEARS	$52,000.00
	TOTAL ESTIMATED ANNUAL COST (1996 COSTS)			**$489,000.00**

* BASED ON AVERAGE LIFE OF FEATURES DEEMED TO REQUIRE REPLACEMENT.

TABLE A8-24
SOUTH REGIONAL SATELLITE WWRF
ESTIMATE OF COST
32 mgd @ 250 BOD/250 TSS w/2.5 Peaking Factor

	TREATMENT ITEMS		3x5.33 mgd Phase 1 - Cost Estimate	3x5.33 mgd Phase 2 - Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$600,000	$600,000
	b.	Mechanical System	100,000	100,000
	c.	Pumps and Motors	250,000	250,000
			950,000	950,000
2.	INFLUENT SEWER LINE		100,000	0
			100,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	200,000	200,000
	b.	Pumps and Motors	200,000	220,000
			400,000	420,000
4.	HEADWORKS			
	a.	Structure	600,000	600,000
	b.	Bar Screen System	450,000	450,000
	c.	Grit Removal System	300,000	300,000
			1,350,000	1,350,000
5.	OXIDATION DITCHES			
	a.	Ditches	8,000,000	8,000,000
	b.	Mechanical System	500,000	500,000
	c.	Secondary Clarifiers	3,600,000	3,600,000
	d.	Aerators and Gear Boxes	2,700,000	2,700,000
	e.	C-Wall Baffle for Aerators	300,000	300,000
	f.	Submersible Mixers	350,000	350,000
	g.	Scum System	150,000	150,000
			15,600,000	15,600,000

TABLE A8-24
SOUTH REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS	3x5.33 mgd Phase 1 - Cost Estimate	3x5.33 mgd Phase 2 - Cost Estimate
6.	MCC BUILDING	100,000	100,000
		100,000	100,000
7.	TERTIARY FILTERS		
	a. Structures	400,000	400,000
	b. Filters (traveling bridge type)	1,000,000	700,000
	c. Mechanical System	200,000	200,000
	d. Equalization Basin	400,000	400,000
	e. Miscellaneous	100,000	100,000
		2,100,000	1,800,000
8.	SLUDGE THICKENERS		
	a. Thickeners	1,100,000	1,100,000
	b. Miscellaneous	400,000	400,000
		1,500,000	1,500,000
9.	AEROBIC DIGESTERS		
	a. Structures	800,000	800,000
	b. Aerators	250,000	200,000
	c. Pumps	100,000	75,000
	d. Piping	100,000	100,000
		1,250,000	1,175,000
10.	SLUDGE HANDLING		
	a. Building	900,000	0
	b. Centrifuges	1,400,000	900,000
	c. Alum and Polymer System	200,000	150,000
	d. Conveyor System	600,000	250,000
		3,100,000	1,300,000

TABLE A8-24
SOUTH REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS		3x5.33 mgd Phase 1 - Cost Estimate	3x5.33 mgd Phase 2 - Cost Estimate
11.	DISINFECTION			
	a.	Structures for Ultraviolet System	250,000	150,000
	b.	UV System	2,000,000	1,600,000
	c.	Structures for Post Aeration Tank System	150,000	150,000
	d.	Mechanical for Post Aeration Tank System	150,000	150,000
	e.	Chlorine System	350,000	350,000
			2,900,000	2,400,000
12.	PIPING			
	a.	Yard	2,000,000	2,000,000
	b.	Potable	50,000	0
			2,050,000	2,000,000
13.	ELECTRICAL			
	a.	Transformer and Related	1,250,000	750,000
	b.	Standby Generators	1,500,000	1,500,000
	c.	Conduits	300,000	200,000
	d.	Wiring	450,000	300,000
	e.	Miscellaneous	450,000	300,000
			3,950,000	3,050,000
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	50,000	30,000
	b.	Oxidation Ditches	50,000	30,000
	c.	Sludge Thickener	10,000	10,000
	d.	Tertiary	50,000	30,000
	e.	Ultraviolet Disinfection	50,000	30,000
	f.	Dewatering of Sludge	30,000	10,000
			240,000	140,000

TABLE A8-24
SOUTH REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS		3x5.33 mgd Phase 1 - Cost Estimate	3x5.33 mgd Phase 2 - Cost Estimate
15.	CONTROL BUILDING		800,000	0
			800,000	0
16.	OTHER			
	a.	Site Work & Miscellaneous	2,800,000	1,500,000
	b.	Backwash and Storm Water Basin	500,000	0
	c.	Recycle Pump Station	280,000	0
	d.	Outfall Piping	1,360,000	0
	e.	Landscaping	100,000	0
	f.	Mechanical	1,200,000	1,200,000
	g.	Instrumentation (SCADA)	1,800,000	800,000
	h.	Effluent Pump Facilities	100,000	100,000
	I.	Percolation Ponds for FID (40 acres)	500,000	500,000
	j.	FID Improvement to Canals	500,000	0
	k.	Emergency Storage Ponds - 8 Ac	100,000	100,000
			9,240,000	4,200,000
17.	MOBILIZATION			
	a.	Bonds & Legal	440,000	440,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	100,000	100,000
	e.	Miscellaneous	100,000	100,000
			$870,000	$870,000
		TOTAL	$46,500,000	$36,855,000

TABLE A8-24
SOUTH REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS	3x5.33 mgd Phase 1 - Cost Estimate	3x5.33 mgd Phase 2 - Cost Estimate
18.	15% Contingencies	6,975,000	5,528,000
19.	Engineering & Environmental	2,800,000	1,800,000
20.	Construction Management	2,000,000	1,200,000
21.	Land - 80 Acres	1,400,000	600,000
	TOTAL	$59,675,000	$45,983,000
	GRAND TOTAL	$105,658,000 =	
		$3.30 /gpd	

TABLE A8-24
ESTIMATED O, M & R COSTS FOR REGIONAL SATELLITE 16.0 WWRF
(16 mgd @ 250 mg/ BOD & 45 mg/ TKN)

			Category		Estimated Annual Costs
I.	ADMINISTRATION (from main plant personnel)				--
II.	PERSONNEL (Assumes alarms to main plant and maintenance crews from main plant)				
	A.	Operations			
		1.	Superintendent - Grade IV		$45,000
		2.	Grade III Operator (2) @ $40,000 ea		80,000
		3.	Grade II Operators (3) @ $35,000 ea		105,000
	B.	Maintenance			
		Maintenance Person/Grade I (2) Operator @ $30,000 each			60,000
	C.	Salary Burden @ 50% Direct Salary			145,000
					$435,000
III.	POWER (@ $0.085/KWH average)			KWH/mg	
	A.	Headworks		20	
	B.	Influent Pump Station		300	
	C.	Aeration Basins		1,300	
	D.	Aerobic Digesters		400	
	E.	Solid Handling		100	
	F.	Filters		80	
	E.	Miscellaneous		300	
			Total	2,500	
	2,500 KWH/mg x 16.0 mgd x 365 d/yr x 0.085/KWH				$1,241,000

TABLE A8-24
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 16.0 mgd x 365 x $0.085 KWH	$193,600
V.	CHEMICALS, MATERIALS & SUPPLIES	$120,000
VI.	LABORATORY & MISCELLANEOUS	$120,000
VII.	BIOSOLIDS DISPOSAL	
	16.0 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 16.7 tons/day	
	16.7 tons/day solids x 0.52 reduction factor ÷ 27% solids/wet ton = 32.2 wet tons per day	
	32.2 wet tons per day x $26.00/wet tons x 365	$305,800
IV.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	$1,390,600
	TOTAL OPERATIONS, MAINTENANCE & REPLACEMENT	$3,806,000
	O, M & R ÷ 16.0 mgd =	$652 /mg

1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-25
NORTH REGIONAL SATELLITE WWRF
ESTIMATE OF COST
8.0 mgd @ 250 BOD/250 TSS w/2.5 Peaking Factor

	TREATMENT ITEMS		3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$270,000	$270,000
	b.	Mechanical System	50,000	50,000
	c.	Pumps and Motors	120,000	120,000
			440,000	440,000
2.	INFLUENT SEWER LINE		50,000	0
			50,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	80,000	60,000
	b.	Pumps and Motors	120,000	90,000
			200,000	150,000
4.	HEADWORKS			
	a.	Structure	250,000	250,000
	b.	Bar Screen System	250,000	0
	c.	Grit Removal System	250,000	0
			750,000	250,000
5.	OXIDATION DITCHES			
	a.	Ditches	2,000,000	2,000,000
	b.	Mechanical System	200,000	200,000
	c.	Secondary Clarifiers	2,000,000	1,600,000
	d.	Aerators and Gear Boxes	800,000	700,000

TABLE A8-25
NORTH REGIONAL SATELLITE WWRF
(continued)

TREATMENT ITEMS		3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
e.	C-Wall Baffle for Aerators	80,000	80,000
f.	Submersible Mixers	170,000	170,000
g.	Scum System	70,000	50,000
		5,320,000	4,800,000
6.	MCC BUILDING	60,000	0
		60,000	0
7.	TERTIARY FILTERS		
a.	Structures	160,000	160,000
b.	Filters (traveling bridge type)	350,000	250,000
c.	Mechanical System	100,000	100,000
d.	Equalization Basin	200,000	200,000
e.	Miscellaneous	50,000	50,000
		860,000	760,000
8.	SLUDGE THICKENERS		
a.	Thickeners	300,000	300,000
b.	Miscellaneous	150,000	120,000
		450,000	420,000
9.	AEROBIC DIGESTERS		
a.	Structures	200,000	200,000
b.	Aerators	100,000	75,000
c.	Pumps	40,000	30,000
d.	Piping	40,000	30,000
		380,000	335,000

TABLE A8-25
NORTH REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS	3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
10.	SLUDGE HANDLING		
a.	Building	500,000	0
b.	Centrifuges	500,000	250,000
c.	Alum and Polymer System	150,000	50,000
d.	Conveyor System	200,000	100,000
		1,350,000	400,000
11.	DISINFECTION		
a.	Structures for Ultraviolet System	100,000	50,000
b.	UV System	700,000	500,000
c.	Structures for Post Aeration Tank System	100,000	50,000
d.	Mechanical for Post Aeration Tank System	100,000	100,000
		1,000,000	700,000
12.	PIPING		
a.	Yard	1,000,000	1,000,000
b.	Potable	50,000	0
		1,050,000	1,000,000
13.	ELECTRICAL		
a.	Transformer and Related	500,000	500,000
b.	Standby Generators	500,000	500,000
c.	Conduits	200,000	100,000
d.	Wiring	250,000	200,000
e.	Miscellaneous	250,000	200,000
		1,700,000	1,500,000

TABLE A8-25
NORTH REGIONAL SATELLITE WWRF
(continued)

		TREATMENT ITEMS	3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	50,000	30,000
	b.	Oxidation Ditches	50,000	30,000
	c.	Sludge Thickener	10,000	10,000
	d.	Tertiary	50,000	30,000
	e.	Ultraviolet Disinfection	50,000	30,000
	f.	Dewatering of Sludge	30,000	10,000
			240,000	140,000
15.	CONTROL BUILDING		600,000	0
			600,000	0
16.	OTHER			
	a.	Site Work & Miscellaneous	1,300,000	600,000
	b.	Backwash and Storm Water Basin	300,000	0
	c.	Recycle Pump Station	180,000	0
	d.	Outfall Piping	1,440,000	0
	e.	Landscaping	100,000	0
	f.	Mechanical	500,000	500,000
	g.	Instrumentation (SCADA)	1,000,000	400,000
	h.	Effluent Pump Facilities	100,000	100,000
	i.	Percolation Ponds	1,635,000	1,625,000
			6,555,000	3,225,000
17.	MOBILIZATION			
	a.	Bonds & Legal	250,000	250,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	75,000	75,000
	e.	Miscellaneous	75,000	75,000
			$630,000	$630,000

TABLE A8-25
NORTH REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS	3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
	TOTAL	21,635,000	14,750,000
18.	15% Contingencies	3,245,000	2,213,000
19.	Engineering & Environmental	1,800,000	900,000
20.	Construction Management	900,000	700,000
21.	Land - 150 Acres	5,250,000	0
	TOTAL	$32,830,000	$18,563,000
	GRAND TOTAL	$51,393,000 =	
		$6.42 /gpd	

TABLE A8-25 and TABLE A8-26
ESTIMATED O, M & R COSTS FOR
NORTH REGIONAL & NORTHWEST REGIONAL SATELLITE 4.0 WWRF
(4.0 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category				Estimated Annual Costs
I.	ADMINISTRATION (from main plant personnel)				--
II.	PERSONNEL (Assumes alarms to main plant and maintenance crews from main plant)				
	A.	Operations			
		1.	Superintendent - Grade IV		$45,000
		2.	Grade III Operator (1) @ $40,000 ea		40,000
		3.	Grade II Operators (2) @ $35,000 ea		70,000
	B.	Maintenance			
		Maintenance Person/Grade I (1) Operator @ $30,000 each			30,000
	C.	Salary Burden @ 50% Direct Salary			92,500
					$277,500
III.	POWER (@ $0.085/KWH average)			KWH/mg	
	A.	Headworks		20	
	B.	Influent Pump Station		300	
	C.	Aeration Basins		1,300	
	D.	Aerobic Digesters		400	
	E.	Solid Handling		100	
	F.	Filters		80	
	E.	Miscellaneous		300	
		Total		2,500	
	2,500 KWH/mg x 4.0 mgd x 365 d/yr x 0.085/KWH				$310,300

TABLE A8-25 and TABLE A8-26
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 4.0 mgd x 365 x \$0.085 KWH	\$48,400
V.	CHEMICALS, MATERIALS & SUPPLIES	\$35,000
VI.	LABORATORY & MISCELLANEOUS	\$70,000
VII.	BIOSOLIDS DISPOSAL	
	4.0 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 4.2 tons/day	
	4.2 tons/day solids x 0.52 reduction factor ÷ 25% solids/wet ton = 8.7 wet tons per day	
	8.7 wet tons per day x \$26.00/wet tons x 365	\$82,200
IV.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	\$646,600
	TOTAL OPERATIONS, MAINTENANCE & REPLACEMENT	1,470,000
	O, M & R ÷ 4.0 mgd =	\$1007 /mg

1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 55% transmission, the power consumption is 884 KWH/mg.

TABLE A8-26
NORTHWEST REGIONAL SATELLITE WWRF
ESTIMATE OF COST
8.0 mgd @ 250 BOD/250 TSS w/2.5 Peaking Factor

	TREATMENT ITEMS		3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$270,000	$270,000
	b.	Mechanical System	50,000	50,000
	c.	Pumps and Motors	120,000	120,000
			440,000	440,000
2.	INFLUENT SEWER LINE		50,000	0
			50,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	80,000	60,000
	b.	Pumps and Motors	120,000	90,000
			200,000	150,000
4.	HEADWORKS			
	a.	Structure	250,000	250,000
	b.	Bar Screen System	250,000	0
	c.	Grit Removal System	250,000	0
			750,000	250,000
5.	OXIDATION DITCHES			
	a.	Ditches	2,000,000	2,000,000
	b.	Mechanical System	200,000	200,000
	c.	Secondary Clarifiers	2,000,000	1,600,000
	d.	Aerators and Gear Boxes	800,000	700,000

TABLE A8-26
NORTHWEST REGIONAL SATELLITE WWRF
(continued)

TREATMENT ITEMS		3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
e.	C-Wall Baffle for Aerators	80,000	80,000
f.	Submersible Mixers	170,000	170,000
g.	Scum System	70,000	50,000
		5,320,000	4,800,000
6.	MCC BUILDING	60,000	0
		60,000	0
7.	TERTIARY FILTERS		
a.	Structures	160,000	160,000
b.	Filters (traveling bridge type)	350,000	250,000
c.	Mechanical System	100,000	100,000
d.	Equalization Basin	200,000	200,000
e.	Miscellaneous	50,000	50,000
		860,000	760,000
8.	SLUDGE THICKENERS		
a.	Thickeners	300,000	300,000
b.	Miscellaneous	150,000	120,000
		450,000	420,000
9.	AEROBIC DIGESTERS		
a.	Structures	200,000	200,000
b.	Aerators	100,000	75,000
c.	Pumps	40,000	30,000
d.	Piping	40,000	30,000
		380,000	335,000

TABLE A8-26
NORTHWEST REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS		3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
10.	SLUDGE HANDLING			
	a.	Building	500,000	0
	b.	Centrifuges	500,000	250,000
	c.	Alum and Polymer System	150,000	50,000
	d.	Conveyor System	200,000	100,000
			1,350,000	400,000
11.	DISINFECTION			
	a.	Structures for Ultraviolet System	100,000	50,000
	b.	UV System	700,000	500,000
	c.	Structures for Post Aeration Tank System	100,000	50,000
	d.	Mechanical for Post Aeration Tank System	100,000	100,000
			1,000,000	700,000
12.	PIPING			
	a.	Yard	1,000,000	1,000,000
	b.	Potable	50,000	0
			1,050,000	1,000,000
13.	ELECTRICAL			
	a.	Transformer and Related	500,000	500,000
	b.	Standby Generators	500,000	500,000
	c.	Conduits	200,000	100,000
	d.	Wiring	250,000	200,000
	e.	Miscellaneous	250,000	200,000
			1,700,000	1,500,000

TABLE A8-26
NORTHWEST REGIONAL SATELLITE WWRF
(continued)

		TREATMENT ITEMS	3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	50,000	30,000
	b.	Oxidation Ditches	50,000	30,000
	c.	Sludge Thickener	10,000	10,000
	d.	Tertiary	50,000	30,000
	e.	Ultraviolet Disinfection	50,000	30,000
	f.	Dewatering of Sludge	30,000	10,000
			240,000	140,000
15.	CONTROL BUILDING		600,000	0
			600,000	0
16.	OTHER			
	a.	Site Work & Miscellaneous	1,300,000	600,000
	b.	Backwash and Storm Water Basin	300,000	0
	c.	Recycle Pump Station	180,000	0
	d.	Outfall Piping	270,000	0
	e.	Landscaping	100,000	0
	f.	Mechanical	500,000	500,000
	g.	Instrumentation (SCADA)	1,000,000	400,000
	h.	Effluent Pump Facilities	100,000	100,000
	i.	Percolation Ponds	625,000	625,000
			4,375,000	2,225,000
17.	MOBILIZATION			
	a.	Bonds & Legal	250,000	250,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	75,000	75,000
	e.	Miscellaneous	75,000	75,000
			$630,000	$630,000

TABLE A8-26
NORTHWEST REGIONAL SATELLITE WWRF
(continued)

	TREATMENT ITEMS	3x1.33 mgd Phase 1 Cost Estimate	2x2.0 mgd Phase 2 Cost Estimate
	TOTAL	$19,455,000	$13,750,000
18.	15% Contingencies	2,918,000	2,063,000
19.	Engineering & Environmental	1,800,000	900,000
20.	Construction Management	900,000	700,000
21.	Land - 70 Acres	1,050,000	0
	TOTAL	$26,123,000	$17,413,000
	GRAND TOTAL	$43,536,000 =	
		$5.44 /gpd	

TABLE A8-27
ALTERNATIVE 3 & 4 - NORTHWEST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
2.1 mgd @ 250 BOD/250 TSS/2.5 Peaking Factor

		TREATMENT ITEMS	1x0.7 mgd Phase 1 Cost Estimate	2x0.7 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$100,000	$0
	b.	Piping	30,000	40,000
	c.	Pumps and Motors	40,000	40,000
			170,000	80,000
2.	INFLUENT SEWER LINE		20,000	0
			20,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	30,000	60,000
	b.	Pumps and Motors	30,000	60,000
			60,000	120,000
4.	HEADWORKS			
	a.	Structure	120,000	0
	b.	Piping	30,000	30,000
	c.	Grit Removal System	120,000	0
	d.	Bar Screen System	150,000	0
			420,000	30,000
5.	OXIDATION DITCHES			
	a.	Ditches	400,000	800,000
	b.	Mechanical System	60,000	120,000
	c.	Clarifiers	300,000	600,000
	d.	Brush Aerators	140,000	180,000
	e.	C-Wall Baffle for Aerators	0	0
	f.	ORP System	0	0
	g.	Scum Control	50,000	50,000
	h.	Piping	80,000	160,000
			1,030,000	1,910,000

TABLE A8-27
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x0.7 mgd Phase 1 Cost Estimate	2x0.7 mgd Phase 2 Cost Estimate
6.	MCC BUILDING		25,000	0
			25,000	0
7.	TERTIARY FILTERS			
	a.	Structures	75,000	0
	b.	Filters	150,000	150,000
	c.	Mechanical System	150,000	150,000
	d.	Equalization Basin (0.75 mg)	100,000	0
	e.	Miscellaneous	50,000	25,000
	f.	Recycle Pump Station	80,000	0
			605,000	325,000
8.	SLUDGE THICKENERS			
	a.	Tanks and Pumps	75,000	150,000
	b.	Structures	10,000	10,000
	c.	Piping	10,000	10,000
			95,000	170,000
9.	AEROBIC DIGESTERS			
	a.	Structures	50,000	100,000
	b.	Aerators	20,000	40,000
	c.	Pumps & Motors	20,000	40,000
	d.	Piping	10,000	20,000
			100,000	200,000
10.	SLUDGE HANDLING			
	a.	Building	250,000	0
	b.	Centrifuges	200,000	400,000
	c.	Alum and Polymer System	100,000	25,000
	d.	Conveyor System	100,000	50,000
			650,000	475,000

TABLE A8-27
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

		TREATMENT ITEMS	1x0.7 mgd Phase 1 Cost Estimate	2x0.7 mgd Phase 2 Cost Estimate
11.	DISINFECTION			
	a.	Structures for UV Sys. & Post Aeration Tank System	100,000	0
	b.	UV System	200,000	200,000
	c.	Piping	20,000	20,000
	d.	Mechanical for Post Aeration Tank System	20,000	40,000
			340,000	260,000
12.	PIPING			
	a.	Yard	150,000	200,000
	b.	Potable	50,000	0
			200,000	200,000
13.	ELECTRICAL			
	a.	Transformer and Related	200,000	100,000
	b.	Standby Generators	200,000	0
	c.	Conduits	100,000	50,000
	d.	Wiring	100,000	50,000
	e.	Miscellaneous	50,000	50,000
			650,000	250,000
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	10,000	0
	b.	Anoxic	0	0
	c.	Oxidation Ditches	10,000	5,000
	d.	Sludge Thickeners	10,000	5,000
	e.	Tertiary	20,000	5,000
	f.	Ultraviolet Disinfection	20,000	5,000
	g.	Dewatering of Sludge	20,000	5,000
			90,000	25,000

TABLE A8-27
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x0.7 mgd Phase 1 Cost Estimate	2x0.7 mgd Phase 2 Cost Estimate
15.	CONTROL BUILDING		300,000	0
			300,000	0
16.	OTHER			
	a.	Site Work	300,000	100,000
	b.	Backwash and Storm Water Basin (0.5 mg)	100,000	0
	c.	Recycle Pump Station	50,000	25,000
	d.	Outfall Piping	420,000	0
	e.	Landscaping	50,000	0
	f.	Mechanical	100,000	150,000
	g.	Instrumentation (SCADA sys.)	200,000	50,000
	h.	Effluent Pump Station & Tank	200,000	50,000
	i.	12" Reclaimed Water Transmission System	750,000	610,000
	j.	Emergency Holding Ponds (1.4 mg)	50,000	100,000
			2,220,000	1,085,000
17.	MOBILIZATION			
	a.	Bonds & Legal	110,000	110,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	50,000	50,000
	e.	Miscellaneous	50,000	50,000
			$440,000	$440,000

TABLE A8-27
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x0.7 mgd Phase 1 Cost Estimate	2x0.7 mgd Phase 2 Cost Estimate
		TOTAL	$7,415,000	$5,570,000
18.	15% Contingencies		1,112,000	836,000
19.	Engineering & Environmental		1,200,000	400,000
20.	Construction Management		600,000	400,000
21.	Land - 30 Acres		450,000	0
		TOTAL	$10,777,000	$7,206,000
		GRAND TOTAL	17,983,000	=
			$8.56	/gpd

TABLE A8-27
ESTIMATED O, M & R COSTS FOR ALTERNATIVE 3 - PHASE 1
(0.7 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category	Estimated Annual Costs
I.	ADMINISTRATION (Main Plant)	--
II.	PERSONNEL	
	A. Operations	
	1. Superintendent - Grade IV	$15,000
	2. Grade III Operator (1) @ $40,000 ea	40,000
	3. Grade II Operators (1) @ $35,000 ea	35,000
	B. Maintenance	
	Maintenance Person/Grade I (1) Operator @ $30,000 each	30,000
	C. Salary Burden @ 50% Direct Salary	60,000
		$180,000
III.	POWER (@ $0.085/KWH average)	

		KWH/mg
A.	Headworks	20
B.	Influent Pump Station	300
C.	Aeration Basins	1,300
D.	Aerobic Digesters	400
E.	Solids Handling	100
F.	Filters	80
E.	Miscellaneous	300
	Total	2,500

2,500 KWH/mg x 0.7 mgd x 365 d/yr x 0.085/KWH — $54,300

TABLE A8-27
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 0.7 mgd x 365 x $0.085 KWH	$8,500
V.	CHEMICALS, MATERIALS & SUPPLIES	$30,000
VI.	LABORATORY & MISCELLANEOUS	$40,000
VII.	BIOSOLIDS DISPOSAL	
	0.7 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 0.73 tons/day	
	0.73 tons/day solids x 0.52 reduction factor ÷ 25% solids/wet ton = 1.5 wet tons per day	
	1.5 wet tons per day x $26.00/wet tons x 365 =	$14,400
	TOTAL ESTIMATED O&M COSTS	327,200
VIII.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	$221,800
	GRAND TOTAL	$549,000

O, M & R ÷ 0.7 mgd = $2,149 /mg

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1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-28
ALTERNATIVE 3, SOUTHEAST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
2.4 mgd @ 250 BOD/250 TSS/2.6 Peaking Factor

	TREATMENT ITEMS	1x0.8 mgd Phase 1 Cost Estimate	2x0.8 mgd Phase 2&3 Cost Estimate
1.	INFLUENT PUMP STATION		
	a. Structure	$150,000	$0
	b. Piping	120,000	0
	c. Pumps and Motors	60,000	60,000
		330,000	60,000
2.	INFLUENT SEWER LINE	20,000	0
		20,000	0
3.	ODOR CONTROL SYSTEM		
	a. Piping	30,000	60,000
	b. Pumps and Motors	30,000	60,000
		60,000	120,000
4.	HEADWORKS		
	a. Structure	160,000	0
	b. Piping	30,000	30,000
	c. Grit Removal System	150,000	0
	d. Bar Screen System	150,000	0
		490,000	30,000
5.	ANOXIC NUTRIENT SYSTEM*		
	a. Structures and Weirs	0	0
	b. Mechanical System	0	0
	c. Bio-recycle System	0	0
	d. Splitter	0	0
	e. Piping	0	0
		0	0

* Nutrient removal (nitrate) will be done using the ORP system (Oxygen Reduction Potential) in the oxidation ditch.

TABLE A8-28
ALTERNATIVE 3, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS	1x0.8 mgd Phase 1 Cost Estimate	2x0.8 mgd Phase 2&3 Cost Estimate
6.	OXIDATION DITCHES		
a.	Ditches	450,000	850,000
b.	Mechanical System	120,000	120,000
c.	Clarifiers	350,000	700,000
d.	Brush Aerators	135,000	180,000
e.	C-Wall Baffle for Aerators	0	0
f.	ORP System	50,000	100,000
g.	Scum System	25,000	50,000
h.	Piping	100,000	160,000
		1,230,000	2,160,000
7.	MCC BUILDING	25,000	0
		25,000	0
8.	TERTIARY FILTERS		
a.	Structures	100,000	0
b.	Filters	150,000	200,000
c.	Mechanical System	150,000	150,000
d.	Equalization Basin (0.25 mg)	75,000	75,000
e.	Miscellaneous	50,000	50,000
f.	Recycle Pump Station	80,000	20,000
		605,000	495,000
9.	SLUDGE THICKENERS		
a.	Tanks and Pumps	90,000	180,000
b.	Structures	10,000	10,000
c.	Piping	10,000	10,000
		110,000	200,000

TABLE A8-28
ALTERNATIVE 3, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS	1x0.8 mgd Phase 1 Cost Estimate	2x0.8 mgd Phase 2&3 Cost Estimate
10.	AEROBIC DIGESTERS		
a.	Structures	60,000	100,000
b.	Aerators	60,000	30,000
c.	Pumps & Motors	30,000	30,000
d.	Piping	20,000	20,000
		170,000	180,000
11.	SLUDGE HANDLING		
a.	Building	250,000	0
b.	Centrifuges	200,000	200,000
c.	Alum and Polymer System	100,000	0
d.	Conveyor System	100,000	50,000
		650,000	250,000
12.	DISINFECTION		
a.	Structures for UV Sys. & Post Aeration Tank System	150,000	0
b.	UV System	200,000	300,000
c.	Piping	20,000	20,000
d.	Mechanical for Post Aeration Tank System	40,000	40,000
		410,000	360,000
13.	PIPING		
a.	Yard	150,000	150,000
b.	Potable	50,000	0
		200,000	150,000

TABLE A8-28
ALTERNATIVE 3, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

		TREATMENT ITEMS	1x0.8 mgd Phase 1 Cost Estimate	2x0.8 mgd Phase 2&3 Cost Estimate
14.	ELECTRICAL			
	a.	Transformer and Related	150,000	100,000
	b.	Standby Generators	150,000	0
	c.	Conduits	75,000	50,000
	d.	Wiring	75,000	50,000
	e.	Miscellaneous	50,000	50,000
			500,000	250,000
15.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	10,000	10,000
	b.	Anoxic	0	0
	c.	Oxidation Ditches	10,000	10,000
	d.	Sludge Thickeners	10,000	10,000
	e.	Tertiary	20,000	10,000
	f.	Ultraviolet Disinfection	20,000	10,000
	g.	Dewatering of Sludge	20,000	10,000
			90,000	60,000
16.	CONTROL BUILDING		300,000	0
			300,000	0
17.	OTHER			
	a.	Site Work	250,000	100,000
	b.	Backwash and Storm Water Basin (0.5 mg)	100,000	0
	c.	Recycle Pump Station	50,000	25,000
	d.	Outfall Piping	780,000	0
	e.	Landscaping	50,000	0
	f.	Mechanical	150,000	100,000
	g.	Instrumentation (SCADA sys.)	200,000	50,000
	h.	Effluent Pump Station & Tank	200,000	50,000

TABLE A8-28
ALTERNATIVE 3, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

		TREATMENT ITEMS	1x0.8 mgd Phase 1 Cost Estimate	2x0.8 mgd Phase 2&3 Cost Estimate
	i.	12" Reclaimed Water Transmission System	512,000	400,000
	j.	Emergency Holding Ponds (1.4 mg)	50,000	100,000
			2,342,000	825,000
18.	MOBILIZATION			
	a.	Bonds & Legal	110,000	110,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	50,000	50,000
	e.	Miscellaneous	50,000	50,000
			440,000	440,000
		TOTAL	$7,972,000	$5,580,000
19.	15% Contingencies		1,196,000	837,000
20.	Engineering & Environmental		1,200,000	400,000
21.	Construction Management		600,000	400,000
22.	Land - 30 Acres		450,000	0
		TOTAL	$11,418,000	$7,217,000
		GRAND TOTAL	$18,635,000	=
			$7.76	/gpd

TABLE A8-28
ESTIMATED O, M & R COSTS FOR
ALTERNATIVE 3
(0.8 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category		Estimated Annual Costs
I.	ADMINISTRATION (Main Plant)		$75,000
II.	PERSONNEL		
	A. Operations		
	1. Superintendent - Grade IV		15,000
	2. Grade III Operator (1) @ $40,000 ea		40,000
	3. Grade II Operators (1) @ $35,000 ea		35,000
	B. Maintenance		
	Maintenance Person/Grade I (1) Operator @ $30,000 each		30,000
	C. Salary Burden @ 50% Direct Salary		60,000
			$180,000
III.	POWER (@ $0.085/KWH average)	KWH/mg	
	A. Headworks	20	
	B. Influent Pump Station	300	
	C. Aeration Basins	1,300	
	D. Aerobic Digesters	400	
	E. Solids Handling	100	
	F. Filters	80	
	E. Miscellaneous	300	
	Total	2,500	
	2,500 KWH/mg x 0.8 mgd x 365 d/yr x 0.085/KWH		$62,000

TABLE A8-28
ALTERNATIVE 3
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 0.8 mgd x 365 x $0.085 KWH	$ 9,700
V.	CHEMICALS, MATERIALS & SUPPLIES	$30,000
VI.	LABORATORY & MISCELLANEOUS	$40,000
VII.	BIOSOLIDS DISPOSAL	
	0.8 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 0.8 tons/day	
	0.8 tons/day solids x 0.52 reduction factor ÷ 25% solids/wet ton = 1.7 wet tons per day	
	1.7 wet tons per day x $26.00/wet tons x 365 =	$16,400
	TOTAL ESTIMATED O&M COSTS	$413,100
VIII.	REPLACEMENT FUND (2.6% of Construction Costs + Cont.)	$237,900
	GRAND TOTAL	$651,000

O, M & R ÷ 0.8 mgd = $2,229 /mg

1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-29
ALTERNATIVE 3 - NORTHEAST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
4.0 mgd @ 250 BOD/250 TSS/2.5 Peaking Factor

		TREATMENT ITEMS	1x1.3 mgd Phase 1 Cost Estimate	2x1.3 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$300,000	$0
	b.	Piping	100,000	100,000
	c.	Pumps and Motors	100,000	100,000
			500,000	200,000
2.	INFLUENT SEWER LINE		20,000	0
			20,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	90,000	100,000
	b.	Pumps and Motors	80,000	80,000
			170,000	180,000
4.	HEADWORKS			
	a.	Structure	250,000	0
	b.	Piping	60,000	60,000
	c.	Grit Removal System	150,000	0
	d.	Bar Screen System	200,000	0
			660,000	60,000
5.	OXIDATION DITCHES			
	a.	Ditches	700,000	1,400,000
	b.	Mechanical System	70,000	140,000
	c.	Secondary Clarifiers	500,000	800,000
	d.	Turbine Aerators	250,000	300,000
	e.	C-Wall Baffle for Aerators	0	0
	f.	ORP System	100,000	200,000
	g.	Scum System	25,000	50,000
	h.	Piping	100,000	180,000
			1,745,000	3,070,000

TABLE A8-29
ALTERNATIVE 3 - NORTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x1.3 mgd Phase 1 Cost Estimate	2x1.3 mgd Phase 2 Cost Estimate
6.	MCC BUILDING		60,000	0
			60,000	0
7.	TERTIARY FILTERS			
	a.	Structures	150,000	150,000
	b.	Filters	250,000	300,000
	c.	Mechanical System	200,000	200,000
	d.	Equalization Basin (0.75 mg)	250,000	0
	e.	Miscellaneous	50,000	50,000
	f.	Recycle Pump Station	120,000	0
			1,020,000	700,000
8.	SLUDGE THICKENERS			
	a.	Tanks and Pumps	100,000	200,000
	b.	Structures	15,000	30,000
	c.	Piping	15,000	30,000
			130,000	260,000
9.	AEROBIC DIGESTERS			
	a.	Structures	80,000	75,000
	b.	Aerators	50,000	30,000
	c.	Pumps & Motors	40,000	20,000
	d.	Piping	30,000	10,000
			200,000	135,000
10.	SLUDGE HANDLING			
	a.	Building	250,000	0
	b.	Centrifuges	300,000	150,000
	c.	Alum and Polymer System	100,000	0
	d.	Conveyor System	150,000	0
			800,000	150,000

TABLE A8-29
ALTERNATIVE 3 - NORTHEAST CLOVIS SATELLITE WWRF
(continued)

		TREATMENT ITEMS	1x1.3 mgd Phase 1 Cost Estimate	2x1.3 mgd Phase 2 Cost Estimate
11.	DISINFECTION			
	a.	Structures for UV Sys. & Post Aeration Tank System	150,000	0
	b.	UV System	300,000	200,000
	c.	Piping	40,000	20,000
	d.	Mechanical for Post Aeration Tank System	60,000	30,000
			550,000	250,000
12.	PIPING			
	a.	Yard	250,000	100,000
	b.	Potable	50,000	0
			300,000	100,000
13.	ELECTRICAL			
	a.	Transformer and Related	200,000	100,000
	b.	Standby Generators	200,000	0
	c.	Conduits	100,000	50,000
	d.	Wiring	100,000	50,000
	e.	Miscellaneous	50,000	50,000
			650,000	250,000
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	30,000	10,000
	b.	Anoxic	30,000	10,000
	c.	Oxidation Ditches	30,000	10,000
	d.	Sludge Thickeners	30,000	10,000
	e.	Tertiary	30,000	10,000
	f.	Ultraviolet Disinfection	30,000	10,000
	g.	Dewatering of Sludge	20,000	0
			200,000	60,000

TABLE A8-29
ALTERNATIVE 3 - NORTHEAST CLOVIS SATELLITE WWRF
(continued)

		TREATMENT ITEMS	1x1.3 mgd Phase 1 Cost Estimate	2x1.3 mgd Phase 2 Cost Estimate
15.	CONTROL BUILDING		300,000	0
			300,000	0
16.	OTHER			
	a.	Site Work	400,000	200,000
	b.	Backwash and Storm Water Basin (1.0 mg)	150,000	0
	c.	Recycle Pump Station	80,000	40,000
	d.	Outfall Piping	2,080,000	0
	e.	Landscaping	50,000	0
	f.	Mechanical	200,000	100,000
	g.	Instrumentation (SCADA sys.)	200,000	50,000
	h.	Effluent Pump Station & Tank	200,000	50,000
	i.	12" Reclaimed Water Transmission System	600,000	680,000
	j.	Emergency Holding Ponds (8.0 mg)	100,000	50,000
			4,060,000	1,170,000
17.	MOBILIZATION			
	a.	Bonds & Legal	110,000	110,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	75,000	50,000
	e.	Miscellaneous	75,000	50,000
			490,000	440,000

TABLE A8-29
ALTERNATIVE 3 - NORTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x1.3 mgd Phase 1 Cost Estimate	2x1.3 mgd Phase 2 Cost Estimate
		TOTAL	$11,855,000	$7,025,000
18.	15% Contingencies		1,778,000	1,054,000
19.	Engineering & Environmental		1,200,000	600,000
20.	Construction Management		700,000	400,000
21.	Land - 30 Acres		1,500,000	0
		TOTAL	$17,033,000	$9,079,000
		GRAND TOTAL	$26,112,000 =	
			$6.53 /gpd	

TABLE A8-29
ESTIMATED O, M & R COSTS FOR
ALTERNATIVE 3 - PHASE 1
(1.3 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category			Estimated Annual Costs
I.	ADMINISTRATION			---
II.	PERSONNEL			
	A.	Operations		
		1.	Superintendent - Grade IV	15,000
		2.	Grade III Operator (1) @ $40,000 ea	40,000
		3.	Grade II Operators (1) @ $35,000 ea	35,000
	B.	Maintenance		
		Maintenance Person/Grade I (1) Operator @ $30,000 each		30,000
	C.	Salary Burden @ 50% Direct Salary		60,000
				$180,000

III. POWER (@ $0.085/KWH average)

		KWH/mg
A.	Headworks	20
B.	Influent Pump Station	300
C.	Aeration Basins	1,300
D.	Aerobic Digesters	400
E.	Solids Handling	100
F.	Filters	80
E.	Miscellaneous	300
	Total	2,500

2,500 KWH/mg x 1.3 mgd x 365 d/yr x 0.085/KWH — $100,700

TABLE A8-29
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 1.3 mgd x 365 x $0.085 KWH	$15,800
V.	CHEMICALS, MATERIALS & SUPPLIES	$38,000
VI.	LABORATORY & MISCELLANEOUS	$45,000
VII.	BIOSOLIDS DISPOSAL	
	1.3 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 1.3 tons/day	
	1.3 tons/day solids x 0.52 reduction factor ÷ 25% solids/wet ton = 2.7 wet tons per day	
	2.7 wet tons per day x $26.00/wet tons x 365 =	$25,600
	TOTAL ESTIMATED O&M COSTS	$405,100
VIII.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	$354,900
	GRAND TOTAL	$760,000

O, M & R ÷ 1.3 mgd = $1,602 /mg

1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-30
ALTERNATIVE 4, SOUTHEAST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
6.2 mgd @ 250 BOD/250 TSS/2.6 Peaking Factor

	TREATMENT ITEMS	1x1.2 mgd Phase 1 Cost Estimate	2x2.5 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION		
	a. Structure	$250,000	$50,000
	b. Piping	100,000	100,000
	c. Pumps and Motors	100,000	100,000
		450,000	250,000
2.	INFLUENT SEWER LINE	30,000	0
		30,000	0
3.	ODOR CONTROL SYSTEM		
	a. Piping	40,000	60,000
	b. Pumps and Motors	40,000	80,000
		80,000	140,000
4.	HEADWORKS		
	a. Structure	300,000	0
	b. Piping	60,000	60,000
	c. Grit Removal System	250,000	0
	d. Bar Screen System	250,000	0
		860,000	60,000
5.	OXIDATION DITCHES		
	a. Ditches	950,000	1,800,000
	b. Mechanical System	160,000	160,000
	c. Clarifiers	650,000	1,300,000
	d. Turbine Aerators	600,000	600,000
	e. C-Wall Baffle for Aerators	40,000	60,000
	f. ORP System	150,000	200,000
	g. Scum System	25,000	50,000
	h. Piping	100,000	200,000
		2,675,000	4,370,000

TABLE A8-30
ALTERNATIVE 4, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x1.2 mgd Phase 1 Cost Estimate	2x2.5 mgd Phase 2 Cost Estimate
6.	MCC BUILDING		60,000	0
			60,000	0
7.	TERTIARY FILTERS			
	a.	Structures	120,000	160,000
	b.	Filters (Traveling Bridge Type)	300,000	300,000
	c.	Mechanical System	200,000	200,000
	d.	Equalization Basin (0.6 mg)	200,000	200,000
	e.	Miscellaneous	100,000	100,000
	f.	Recycle Pump Station	120,000	0
			1,040,000	960,000
8.	SLUDGE THICKENERS			
	a.	Tanks and Pumps	150,000	300,000
	b.	Structures	15,000	15,000
	c.	Piping	15,000	15,000
			180,000	330,000
9.	AEROBIC DIGESTERS			
	a.	Structures	100,000	200,000
	b.	Aerators	80,000	80,000
	c.	Pumps & Motors	40,000	80,000
	d.	Piping	30,000	60,000
			250,000	420,000
10.	SLUDGE HANDLING			
	a.	Building	350,000	0
	b.	Centrifuges	300,000	400,000
	c.	Alum and Polymer System	100,000	50,000
	d.	Conveyor System	150,000	100,000
			900,000	550,000

TABLE A8-30
ALTERNATIVE 4, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x1.2 mgd Phase 1 Cost Estimate	2x2.5 mgd Phase 2 Cost Estimate
11.	DISINFECTION			
	a.	Structures for UV Sys. & Post Aeration Tank System	100,000	150,000
	b.	UV System	400,000	500,000
	c.	Piping	40,000	40,000
	d.	Mechanical for Post Aeration Tank System	60,000	60,000
			600,000	750,000
12.	PIPING			
	a.	Yard	400,000	500,000
	b.	Potable	50,000	0
			450,000	500,000
13.	ELECTRICAL			
	a.	Transformer and Related	300,000	300,000
	b.	Standby Generators	300,000	200,000
	c.	Conduits	100,000	50,000
	d.	Wiring	200,000	100,000
	e.	Miscellaneous	150,000	100,000
			1,050,000	750,000
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	30,000	20,000
	b.	Anoxic	30,000	20,000
	c.	Oxidation Ditches	30,000	20,000
	d.	Sludge Thickeners	30,000	20,000
	e.	Tertiary	30,000	20,000
	f.	Ultraviolet Disinfection	30,000	20,000
	g.	Dewatering of Sludge	20,000	10,000
			200,000	130,000

TABLE A8-30
ALTERNATIVE 4, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS	1x1.2 mgd Phase 1 Cost Estimate	2x2.5 mgd Phase 2 Cost Estimate
15.	CONTROL BUILDING	400,000	0
		400,000	0
16.	OTHER		
a.	Site Work	600,000	300,000
b.	Backwash and Storm Water Basin (1.2 mg)	200,000	0
c.	Recycle Pump Station	60,000	120,000
d.	Outfall Piping	1,170,000	0
e.	Landscaping	70,000	0
f.	Mechanical	300,000	200,000
g.	Instrumentation (SCADA sys.)	300,000	100,000
h.	Effluent Pump Station & Tank	260,000	0
i.	12" Reclaimed Water Transmission System	512,000	400,000
j.	Emergency Holding Ponds (12.4 mg)	200,000	200,000
		$3,672,000	$1,320,000
17.	MOBILIZATION		
a.	Bonds & Legal	220,000	220,000
b.	Field Office & Related	80,000	80,000
c.	Supervisory Personnel	150,000	150,000
d.	Equipment Move	75,000	75,000
e.	Miscellaneous	75,000	75,000
		600,000	600,000

TABLE A8-30
ALTERNATIVE 4, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x1.2 mgd Phase 1 Cost Estimate	2x2.5 mgd Phase 2 Cost Estimate
		Total	$13,497,000	$11,130,000
18.	15% Contingencies		2,025,000	1,670,000
19.	Engineering & Environmental		1,200,000	500,000
20.	Construction Management		800,000	400,000
21.	Land - 30 Acres		450,000	0
		TOTAL	$17,972,000	$13,700,000
		GRAND TOTAL	$31,672,000 =	
			$5.11 /gpd	

TABLE A8-30
ESTIMATED O, M & R COSTS FOR
ALTERNATIVE 4 - PHASE 1
(1.2 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category			Estimated Annual Costs
I.	ADMINISTRATION			$75,000
II.	PERSONNEL			
	A.	Operations		
		1.	Superintendent - Grade IV	45,000
		2.	Grade III Operator (1) @ $40,000 ea	40,000
		3.	Grade II Operator (1) @ $35,000 ea	35,000
	B.	Maintenance		
		Maintenance Person/Grade I (1) Operator @ $30,000 each		30,000
	C.	Salary Burden @ 50% Direct Salary		75,000
				$225,000

III. POWER (@ $0.085/KWH average)

		KWH/mg
A.	Headworks	20
B.	Influent Pump Station	300
C.	Aeration Basins	1,300
D.	Aerobic Digesters	400
E.	Solid Handling	100
F.	Filters	80
E.	Miscellaneous	300
	Total	2,500

2,500 KWH/mg x 1.2 mgd x 365 d/yr x 0.085/KWH — $132,900

TABLE A8-30
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 1.2 mgd x 365 x $0.085 KWH	$14,600
V.	CHEMICALS, MATERIALS & SUPPLIES	$35,000
VI.	LABORATORY & MISCELLANEOUS	$45,000
VII.	BIOSOLIDS DISPOSAL	
	1.2 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 1.2 tons/day	
	1.2 tons/day solids x 0.52 reduction factor ÷ 25% solids/wet ton = 2.2 wet tons per day	
	2.2 wet tons per day x $26.00/wet tons x 365 =	$23,600
	TOTAL ESTIMATED O&M COSTS	$551,100
VIII.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	$403,900
	GRAND TOTAL	$955,000

O, M & R ÷ 1.2 mgd = $2,180 /mg

[1] All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-31
ALTERNATIVE 5, SOUTHEAST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
8.4 mgd @ 250 BOD/250 TSS/2.5 Peaking Factor

	TREATMENT ITEMS		1x2.1 mgd Phase 1 Cost Estimate	3x2.1 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$150,000	$200,000
	b.	Piping	50,000	120,000
	c.	Pumps and Motors	50,000	150,000
			250,000	470,000
2.	INFLUENT SEWER LINE		50,000	0
			50,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	40,000	120,000
	b.	Pumps and Motors	80,000	150,000
			120,000	270,000
4.	HEADWORKS			
	a.	Structure	200,000	250,000
	b.	Piping	60,000	90,000
	c.	Grit Removal System	150,000	200,000
	d.	Bar Screen System	150,000	200,000
			560,000	740,000
5.	OXIDATION DITCHES			
	a.	Ditches	1,000,000	3,000,000
	b.	Mechanical System	100,000	300,000
	c.	Clarifiers	700,000	2,100,000
	d.	Turbine Aerators	500,000	750,000
	e.	C-Wall Baffle for Aerators	30,000	90,000
	f.	ORP System	100,000	200,000
	g.	Scum System	50,000	75,000
	h.	Piping	100,000	300,000
			2,580,000	6,815,000

TABLE A8-31
ALTERNATE 5, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS	1x2.1 mgd Phase 1 Cost Estimate	3x2.1 mgd Phase 2 Cost Estimate
6.	MCC BUILDING	60,000	30,000
		60,000	30,000
7.	TERTIARY FILTERS		
	a. Structures	120,000	150,000
	b. Filters	200,000	300,000
	c. Mechanical System	200,000	300,000
	d. Equalization Basin (0.6 mg)	200,000	300,000
	e. Miscellaneous	100,000	50,000
	f. Recycle Pump Station	120,000	0
		940,000	1,100,000
8.	SLUDGE THICKENERS		
	a. Tanks and Pumps	150,000	450,000
	b. Structures	15,000	25,000
	c. Piping	15,000	25,000
		180,000	500,000
9.	AEROBIC DIGESTERS		
	a. Structures	100,000	300,000
	b. Aerators	50,000	75,000
	c. Pumps & Motors	40,000	60,000
	d. Piping	30,000	45,000
		220,000	480,000
10.	SLUDGE HANDLING		
	a. Building	400,000	0
	b. Centrifuges	400,000	600,000
	c. Alum and Polymer System	100,000	100,000
	d. Conveyor System	150,000	150,000
		1,050,000	850,000

TABLE A8-31
ALTERNATE 5, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

		TREATMENT ITEMS	1x2.1 mgd Phase 1 Cost Estimate	3x2.1 mgd Phase 2 Cost Estimate
11.	DISINFECTION			
	a.	Structures for UV Sys. & Post Aeration Tank System	100,000	200,000
	b.	UV System	400,000	500,000
	c.	Piping	40,000	60,000
	d.	Mechanical for Post Aeration Tank System	60,000	90,000
			600,000	850,000
12.	PIPING			
	a.	Yard	300,000	600,000
	b.	Potable	50,000	0
			350,000	600,000
13.	ELECTRICAL			
	a.	Transformer and Related	250,000	500,000
	b.	Standby Generators	250,000	500,000
	c.	Conduits	100,000	100,000
	d.	Wiring	200,000	100,000
	e.	Miscellaneous	200,000	50,000
			1,000,000	1,250,000
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	20,000	30,000
	b.	Anoxic	20,000	30,000
	c.	Oxidation Ditches	20,000	30,000
	d.	Sludge Thickener	20,000	30,000
	e.	Tertiary	20,000	30,000
	f.	Ultraviolet Disinfection	20,000	30,000
	g.	Dewatering of Sludge	20,000	10,000
			140,000	190,000

TABLE A8-31
ALTERNATE 5, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		1x2.1 mgd Phase 1 Cost Estimate	3x2.1 mgd Phase 2 Cost Estimate
15.	CONTROL BUILDING		400,000	0
			400,000	0
16.	OTHER			
	a.	Site Work	500,000	600,000
	b.	Backwash and Storm Water Basin (1.5mg)	200,000	0
	c.	Recycle Pump Station	80,000	120,000
	d.	Outfall Piping	1,170,000	0
	e.	Landscaping	50,000	0
	f.	Mechanical	300,000	300,000
	g.	Instrumentation (SCADA sys.)	300,000	100,000
	h.	Effluent Pump Station & Tank	200,000	200,000
	i.	12" Reclaimed Water Transmission System	512,000	400,000
	j.	Emergency Holding Ponds (16.8 mg)	150,000	400,000
			3,462,000	2,120,000
17.	MOBILIZATION			
	a.	Bonds & Legal	220,000	220,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	75,000	75,000
	e.	Miscellaneous	75,000	75,000
			600,000	600,000

TABLE A8-31
ALTERNATE 5, SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

TREATMENT ITEMS		1x2.1 mgd Phase 1 Cost Estimate	3x2.1 mgd Phase 2 Cost Estimate
	TOTAL	$12,562,000	$16,865,000
18. 15% Contingencies		1,884,000	2,530,000
19. Engineering & Environmental		1,200,000	600,000
20. Construction Management		900,000	600,000
21. Land - 40 Acres		600,000	0
	TOTAL	$17,146,000	$20,595,000
	GRAND TOTAL	$37,741,000 =	
		$4.49 /gpd	

TABLE A8-31
ESTIMATED O, M & R COSTS FOR
ALTERNATIVE 5
(2.1 mgd @ 250 mg/ BOD & 45 mg/ TKN)

Category			Estimated Annual Costs
I.	ADMINISTRATION		$75,000
II.	PERSONNEL		
	A. Operations		
	1. Superintendent - Grade IV		45,000
	2. Grade III Operator (1) @ $40,000 ea		40,000
	3. Grade II Operators (1) @ $35,000 ea		35,000
	B. Maintenance		
	Maintenance Person/Grade I (2) Operator @ $30,000 each		60,000
	C. Salary Burden @ 50% Direct Salary		90,000
			$270,000
III.	POWER (@ $0.085/KWH average)	KWH/mg	
	A. Headworks	20	
	B. Influent Pump Station	300	
	C. Aeration Basins	1,300	
	D. Aerobic Digesters	400	
	E. Solid Handling	100	
	F. Filters	80	
	E. Miscellaneous	300	
	Total	2,500	
	2,500 KWH/mg x 2.1 mgd x 365 d/yr x 0.085/KWH		$162,900

TABLE A8-31
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 2.1 mgd x 365 x $0.085 KWH	$25,400
V.	CHEMICALS, MATERIALS & SUPPLIES	$40,000
VI.	LABORATORY & MISCELLANEOUS	$40,000
VII.	BIOSOLIDS DISPOSAL	
	2.1 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 2.1 tons/day	
	2.1 tons/day solids x 0.52 reduction factor ÷ 25% solids/wet ton = 4.6 wet tons per day	
	4.6 wet tons per day x $26.00/wet tons x 365 =	$43,600
	TOTAL ESTIMATED O&M COSTS	$656,900
VIII.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	$376,100
	GRAND TOTAL	$1,033,000

O, M & R ÷ 2.1 mgd = $1,348 /mg

[1] All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-32
NORTHWEST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
4.5 mgd @ 250 BOD/250 TSS

	TREATMENT ITEMS	2x1.5 mgd Phase 1 Cost Estimate	1x1.5 mgd Phase 2 Cost Estimate
1.	INFLUENT PUMP STATION		
a.	Structure	$300,000	$0
b.	Mechanical System	100,000	100,000
c.	Pumps and Motors	100,000	100,000
		500,000	200,000
2.	INFLUENT SEWER LINE	20,000	0
		20,000	0
3.	ODOR CONTROL SYSTEM		
a.	Piping	100,000	50,000
b.	Pumps and Motors	80,000	40,000
		180,000	90,000
4.	HEADWORKS		
a.	Structure	350,000	0
b.	Bar Screen System	150,000	0
c.	Grit Removal System	150,000	0
		650,000	0
5.	OXIDATION DITCHES		
a.	Ditches	1,500,000	750,000
b.	Mechanical System	150,000	75,000
c.	Clarifiers	1,200,000	600,000
d.	Aerators and Gear Boxes	600,000	250,000
e.	C-Wall Baffle for Aerators	80,000	30,000
f.	ORP System	0	0
g.	Scum System	70,000	25,000
		3,600,000	1,730,000

TABLE A8-32
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		2x1.5 mgd Phase 1 Cost Estimate	1x1.5 mgd Phase 2 Cost Estimate
6.	MCC BUILDING		60,000	0
			60,000	0
7.	TERTIARY FILTERS			
	a.	Structures	250,000	0
	b.	Filters (traveling bridge type)	300,000	150,000
	c.	Mechanical System	200,000	40,000
	d.	Equalization Basin	300,000	0
	e.	Miscellaneous	50,000	50,000
			1,100,000	240,000
8.	SLUDGE THICKENERS			
	a.	Tanks and Pumps	200,000	100,000
	b.	Miscellaneous	60,000	40,000
			260,000	140,000
9.	AEROBIC DIGESTERS			
	a.	Structures	120,000	60,000
	b.	Aerators	60,000	30,000
	c.	Pumps	30,000	15,000
	d.	Piping	40,000	20,000
			250,000	125,000
10.	SLUDGE HANDLING			
	a.	Building	300,000	0
	b.	Centrifuges	400,000	200,000
	c.	Alum and Polymer System	100,000	50,000
	d.	Conveyor System	150,000	50,000
			950,000	300,000

TABLE A8-32
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		2x1.5 mgd Phase 1 Cost Estimate	1x1.5 mgd Phase 2 Cost Estimate
11.	DISINFECTION			
	a.	Structures for Ultraviolet System	150,000	50,000
	b.	UV System	350,000	200,000
	c.	Structures for Post Aeration Tank System	50,000	0
	d.	Mechanical for Post Aeration Tank System	50,000	20,000
			600,000	270,000
12.	PIPING			
	a.	Yard	600,000	300,000
	b.	Potable	50,000	0
			650,000	300,000
13.	ELECTRICAL			
	a.	Transformer and Related	450,000	100,000
	b.	Standby Generators	450,000	0
	c.	Conduits	100,000	50,000
	d.	Wiring	150,000	50,000
	e.	Miscellaneous	150,000	50,000
			1,300,000	250,000
14.	INSTRUMENTATION AND CONTROLS			
	a.	Influent Pump Station	40,000	10,000
	b.	Headworks	40,000	10,000
	c.	Oxidation Ditches	40,000	10,000
	d.	Sludge Thickener	10,000	10,000
	e.	Tertiary	40,000	10,000
	f.	Ultraviolet Disinfection	40,000	10,000
	g.	Dewatering of Sludge	30,000	0
			240,000	60,000

TABLE A8-32
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		2x1.5 mgd Phase 1 Cost Estimate	1x1.5 mgd Phase 2 Cost Estimate
15.	CONTROL BUILDING		600,000	0
			600,000	0
16.	OTHER			
	a.	Site Work & Miscellaneous	1,000,000	500,000
	b.	Backwash and Storm Water Basin	300,000	0
	c.	Recycle Pump Station	180,000	0
	d.	Outfall Piping	455,000	0
	e.	Landscaping	100,000	0
	f.	Mechanical	700,000	200,000
	g.	Effluent Pump Station and Tank	200,000	0
	h.	12" Reclaimed Water Transmission System	750,000	610,000
	i.	Instrumentation	1,400,000	100,000
	j.	Emergency Ponds (2 day storage)	500,000	200,000
			5,585,000	1,610,000
17.	MOBILIZATION			
	a.	Bonds & Legal	220,000	220,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	75,000	75,000
	e.	Miscellaneous	75,000	75,000
			$600,000	$600,000

TABLE A8-32
NORTHWEST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS	2x1.5 mgd Phase 1 Cost Estimate	1x1.5 mgd Phase 2 Cost Estimate
	TOTAL	$17,145,000	$5,915,000
18.	15% Contingencies	2,572,000	887,000
19.	Engineering & Environmental	1,800,000	400,000
20.	Construction Management	900,000	400,000
21.	Land - 30 Acres	450,000	0
	TOTAL	$22,867,000	$7,602,000
	GRAND TOTAL	$30,469,000 =	
		$6.77 /gpd	

TABLE A8-32
ESTIMATED O, M & R COSTS FOR NORTHWEST CLOVIS SATELLITE 3.0 WWRF - PHASE 1
(3 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category			Estimated Annual Costs
I.	ADMINISTRATION (from main plant personnel)			--
II.	PERSONNEL (Assumes alarms to main plant and maintenance crews from main plant)			
	A.	Operations		
		1.	Superintendent - Grade IV	$10,000
		2.	Grade III Operator (2) @ $40,000 ea	40,000
		3.	Grade II Operators (3) @ $35,000 ea	70,000
	B.	Maintenance		
		Maintenance Person/Grade I (2) Operator @ $30,000 each		30,000
	C.	Salary Burden @ 50% Direct Salary		75,000
				$225,000

III. POWER (@ $0.085/KWH average)

		KWH/mg
A.	Headworks	20
B.	Influent Pump Station	300
C.	Aeration Basins	1,300
D.	Aerobic Digesters	400
E.	Solid Handling	100
F.	Filters	80
E.	Miscellaneous	300
	Total	2,500

2,500 KWH/mg x 3.0 mgd x 365 d/yr x 0.085/KWH — $232,700

IV. UV DISINFECTION[1]

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1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

TABLE A8-32
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
	390 KWH/mg x 3.0 mgd x 365 x $0.085 KWH	$ 36,300
V.	CHEMICALS, MATERIALS & SUPPLIES	$40,000
VI.	LABORATORY & MISCELLANEOUS	$40,000
VII.	BIOSOLIDS DISPOSAL	
	3.0 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 3.1 tons/day	
	3.1 tons/day solids x 0.52 reduction factor ÷ 27% solids/wet ton = 6.0 wet tons per day	
	6.0 wet tons per day x $26.00/wet tons x 365	$ 56,900
IV.	REPLACEMENT FUND (2.6% Construction Cost + Cont.)	$ 513,100
	TOTAL OPERATIONS, MAINTENANCE & REPLACEMENT	$1,144,000

O, M & R ÷ 3.0 mgd = $1,045 /mg

TABLE A8-33
SOUTHEAST CLOVIS SATELLITE WWRF
ESTIMATE OF COST
17.0 mgd @ 250 BOD/250 TSS

	TREATMENT ITEMS		3x4.25 mgd Phase 1 Cost Estimate	1x4.25 mgd Phases 2 & 3 Cost Estimate
1.	INFLUENT PUMP STATION			
	a.	Structure	$700,000	$0
	b.	Mechanical System	100,000	60,000
	c.	Pumps and Motors	250,000	150,000
			1,050,000	210,000
2.	INFLUENT SEWER LINE		70,000	0
			70,000	0
3.	ODOR CONTROL SYSTEM			
	a.	Piping	200,000	40,000
	b.	Pumps and Motors	220,000	60,000
			420,000	100,000
4.	HEADWORKS			
	a.	Structure	700,000	0
	b.	Bar Screen System	400,000	0
	c.	Grit Removal System	300,000	0
			1,400,000	0
5.	OXIDATION DITCHES			
	a.	Ditches	7,000,000	2,000,000
	b.	Mechanical System	400,000	150,000
	c.	Clarifiers	3,000,000	1,000,000
	d.	Aerators and Gear Boxes	2,100,000	600,000
	e.	C-Wall Baffle for Aerators	80,000	30,000
	f.	ORP System	0	0
	g.	Scum System	100,000	50,000
			12,680,000	3,830,000

TABLE A8-33
SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		3x4.25 mgd Phase 1 Cost Estimate	1x4.25 mgd Phases 2 & 3 Cost Estimate
6.	MCC BUILDING		100,000	0
			100,000	0
7.	TERTIARY FILTERS			
	a.	Structures	400,000	150,000
	b.	Filters (traveling bridge type)	800,000	200,000
	c.	Mechanical System	200,000	50,000
	d.	Equalization Basin (2.9 mg)	600,000	0
	e.	Miscellaneous	50,000	50,000
			2,050,000	450,000
8.	SLUDGE THICKENERS			
	a.	Tanks and Pumps	900,000	300,000
	b.	Miscellaneous	300,000	120,000
			1,200,000	420,000
9.	AEROBIC DIGESTERS			
	a.	Structures	400,000	150,000
	b.	Aerators	150,000	50,000
	c.	Pumps	75,000	25,000
	d.	Piping	75,000	25,000
			700,000	250,000
10.	SLUDGE HANDLING			
	a.	Building	900,000	0
	b.	Centrifuges	1,200,000	300,000
	c.	Alum and Polymer System	150,000	50,000
	d.	Conveyor System	400,000	150,000
			2,650,000	500,000

TABLE A8-33
SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

TREATMENT ITEMS		3x4.25 mgd Phase 1 Cost Estimate	1x4.25 mgd Phases 2 & 3 Cost Estimate
11.	DISINFECTION		
a.	Structures for Ultraviolet System	250,000	50,000
b.	UV System	1,500,000	500,000
c.	Structures for Post Aeration Tank System	100,000	0
d.	Mechanical for Post Aeration Tank System	100,000	50,000
		1,950,000	600,000
12.	PIPING		
a.	Yard	1,800,000	400,000
b.	Potable	50,000	0
		1,850,000	400,000
13.	ELECTRICAL		
a.	Transformer and Related	1,000,000	300,000
b.	Standby Generators	1,000,000	300,000
c.	Conduits	200,000	100,000
d.	Wiring	350,000	100,000
e.	Miscellaneous	350,000	100,000
		2,900,000	900,000
14.	INSTRUMENTATION AND CONTROLS		
a.	Influent Pump Station	50,000	30,000
b.	Anoxic	50,000	30,000
c.	Oxidation Ditches	50,000	30,000
d.	Sludge Thickeners	10,000	10,000
e.	Tertiary	50,000	30,000
f.	Ultraviolet Disinfection	50,000	30,000
g.	Dewatering of Sludge	30,000	10,000
		290,000	170,000

TABLE A8-33
SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS		3x4.25 mgd Phase 1 Cost Estimate	1x4.25 mgd Phases 2 & 3 Cost Estimate
15.	CONTROL BUILDING		800,000	60,000
			800,000	60,000
16.	OTHER			
	a.	Site Work & Misc.	2,400,000	60,000
	b.	Backwash and Storm Water Basin	500,000	0
	c.	Recycle Pump Station	280,000	0
	d.	Outfall Piping	1,950,000	0
	e.	Landscaping	100,000	0
	f.	Mechanical	1,000,000	300,000
	g.	Effluent Pump Station & Tank	300,000	100,000
	h.	12" Reclaimed Water Transmission System	512,000	400,000
	I.	Instrumentation	1,400,000	400,000
	j.	Emergency Ponds (2 day storage)	800,000	200,000
			9,242,000	1,460,000
17.	MOBILIZATION			
	a.	Bonds & Legal	440,000	250,000
	b.	Field Office & Related	80,000	80,000
	c.	Supervisory Personnel	150,000	150,000
	d.	Equipment Move	100,000	75,000
	e.	Miscellaneous	100,000	75,000
			$870,000	$630,000

TABLE A8-33
SOUTHEAST CLOVIS SATELLITE WWRF
(continued)

	TREATMENT ITEMS	3x4.25 mgd Phase 1 Cost Estimate	1x4.25 mgd Phases 2 & 3 Cost Estimate
	TOTAL	$40,222,000	$9,980,000
18.	15% Contingencies	6,033,000	1,497,000
19.	Engineering & Environmental	2,400,000	400,000
20.	Construction Management	1,200,000	400,000
21.	Land - 40 Acres	600,000	0
	TOTAL	$50,455,000	$12,277,000
	GRAND TOTAL	$62,732,000 =	
		$3.69 /gpd	

TABLE A8-33
ESTIMATED O, M & R COSTS FOR
SOUTHEAST CLOVIS SATELLITE 12.75 WWRF - PHASE 1
(12.75 mgd @ 250 mg/ BOD & 45 mg/ TKN)

	Category			Estimated Annual Costs
I.	ADMINISTRATION			$150,000
II.	PERSONNEL			
	A.	Operations		
		1.	Superintendent - Grade IV	$45,000
		2.	Grade III Operator (2) @ $40,000 ea	40,000
		3.	Grade II Operators (3) @ $35,000 ea	70,000
	B.	Maintenance		
		Maintenance Person/Grade I (2) Operator @ $30,000 each		60,000
	C.	Salary Burden @ 50% Direct Salary		107,500
				$322,500

III. POWER (@ $0.085/KWH average)

		KWH/mg
A.	Headworks	20
B.	Influent Pump Station	300
C.	Aeration Basins	1,300
D.	Aerobic Digesters	400
E.	Solid Handling	100
F.	Filters	80
E.	Miscellaneous	300
	Total	2,500

2,500 KWH/mg x 12.75 mgd x 365 d/yr x 0.085/KWH — $988,700

TABLE A8-33
ESTIMATED O, M & R COSTS
(continued)

	Category	Estimated Annual Costs
IV.	UV DISINFECTION[1]	
	390 KWH/mg x 12.75 mgd x 365 x $0.085 KWH	$154,300
V.	CHEMICALS, MATERIALS & SUPPLIES	$100,000
VI.	LABORATORY & MISCELLANEOUS	$70,000
VII.	BIOSOLIDS DISPOSAL	
	12.75 mgd x 8.34 lbs/mgd x 250 mg/ℓ ÷ 2,000 lb/ton = 13.5 tons/day	
	13.5 tons/day solids x 0.52 reduction factor ÷ 27% solids/wet ton = 29 wet tons per day	
	29 wet tons per day x $26.00/wet tons x 365	$275,200
IV.	REPLACEMENT FUND (2.6% of Construction Cost + Cont.)	$1,202,300
	TOTAL OPERATIONS, MAINTENANCE & REPLACEMENT	$3,263,000

O, M & R ÷ 12.75 mgd = $701 /mg

1 All tests for Trojan UV 4000 system for 2 NTU's is 70% transmission. At 70% transmission, the power consumption is 390 KWH/mg.

APPENDIX A9

(MATERIALS RELATED TO SECTION 9)

TABLE A9-1

CLOVIS WASTEWATER MASTER PLAN
DETAILS OF SCORING OF ALTERNATIVES BY EVALUATION PARAMETERS

ITEM	WEIGHT FACTOR	ALTERNATIVE 1		ALTERNATIVE 2A		ALTERNATIVE 2B		ALTERNATIVE 3		ALTERNATIVE 4		ALTERNATIVE 5		ALTERNATIVE 6	
		SCALE FACTOR	SCORE	SCALE FACTOR	SCORE	SCALE FACTOR	SCORE	SCALE FACTOR	SCORE	SCALE FACTOR	SCORE	SCALE FACTOR	SCORE	SCALE FACTOR	SCORE
FINANCIAL IMPACTS	6	1	6	5	30	5	30	2	12	3	18	4	24	2	12
COMMUNITY NEEDS	6	2	12	2	12	2	12	4	24	4	24	4	24	5	30
PUBLIC ACCEPTANCE	6	5	30	5	30	5	30	2	12	2	12	2	12	1	6
ENVIRONMENTAL IMPACTS	5	5	25	5	25	5	25	2	10	2	10	3	15	1	5
WATER RECLAMATION BENEFITS	5	1	5	2	10	2	10	4	20	4	20	4	20	5	25
RELIABILITY OF DISPOSAL OPTIONS	5	5	25	5	25	5	25	3	15	3	15	3	15	2	10
EASE OF IMPLEMENTATION	4	5	20	5	20	4	16	2	8	2	8	2	8	1	4
ADMINISTRATIVE IMPACTS	3	5	15	4	12	4	12	1	3	1	3	2	6	1	3
TOTAL			*138*		*164*		*160*		*104*		*110*		*124*		*95*