CITY OF LODI
INFORMAL INFORMATIONAL MEETING
"SHIRTSLEEVE" SESSION
CARNEGIE FORUM
305 W. PINE STREET
TUESDAY, AUGUST 10, 1999

An Informal Informational Meeting ("Shirtsleeve" Session) of the Lodi City Council was held Tuesday, August 10, 1999 commencing at 7:00 a.m.

ROLL CALL

Present: Council Members – Mann (left at 8:00 a.m.), Pennino and Land (Mayor)

Absent: Council Members – Hitchcock and Nakanishi

Also Present: City Manager Flynn, Deputy City Manager Keeter, Public Works Director Prima, Finance Director McAthie, City Attorney Hays and City Clerk Reimche

Also present in the audience was a representative from the Lodi News Sentinel and The Record.

TOPIC(S)

1. Wastewater Discharge Permit Update
2. Sidewalk Installation Policy

ADJOURNMENT

No action was taken by the City Council. The meeting was adjourned at approximately 8:10 a.m.

ATTEST:

Alice M. Reimche
City Clerk

MEMORANDUM, City of Lodi, Public Works Department

To: Dixon Flynn, City Manager
Keith Land, Mayor
Steve Mann, Mayor Pro Tempore
Susan Hitchcock, Council Member
Alan Nakanishi, Council Member
Phil Pennino, Council Member

From: Richard Prima, Public Works Director

Date: August 4, 1999

Subject: August 10, 1999 Shirtsleeve Session

We will be covering two items at this meeting:

Wastewater Discharge Permit/Master Plan Update

The attached material and the brief presentation that will be made at the meeting describe two basic design parameters that affect the results of our master plan study. The main point that the Council should consider is the population projection. We intend to use a 1.5% average annual growth rate over 20 years. This is mid-way between the City's General Plan growth limit of 2% and the San Joaquin County Council of Governments' projection of 0.99%. The main advantage of a lower growth rate is that we will not be planning for the cost of higher oversizing. The main disadvantage is that if growth exceeds this estimate, we will be planning for an expansion sooner than anticipated.

The City's discharge permit is still being prepared by the State Regional Water Quality Control Board. From two administrative drafts and meetings with Board staff, we have a good feel for the minimum requirements that will be imposed. However, based on comments made by DeltaKeeper on the City of Modesto's permit, the Board may be preparing additional requirements. On the other hand, we feel that conditions in the Delta near our discharge point are significantly different than those affecting Modesto and we may not have to deal with those issues—yet. Recognizing this problem, the discharge requirements section discusses "anticipated" requirements based on our recent discussions with Board staff and "future" requirements that are likely to be in place in the next decade. In any event, "business as usual" is a thing of the past for our wastewater treatment facility.

Sidewalk Installation Policy

Recently, the Council decided to use Measure K funds to install new sidewalk along seven parcels on Turner Road and directed staff to develop a policy on an ongoing program to install sidewalk where none exists. This is a major departure from past policy and staff has been working on drafting a policy that will be workable within City codes and development requirements. The attached draft provides some policy direction as to prioritizing locations and describes the types of locations—mainly vacant property—to which the policy would not apply.

We have not dealt with one major "conflict" between the draft policy and the City code regarding off-site improvements and building permits. The code requires the installation of sidewalk (along with other necessary improvements to meet City standards) when the value of a building remodel exceeds a threshold amount (currently $30,200, adjusted every July 1). A generous implementation of the draft policy would essentially negate this requirement and probably should trigger a code change. A more strict implementation would still require the installation at the owner's expense, or perhaps the City could share the cost. We look forward to discussing this with the Council.

RCP/lm

attachments

cc: Fran Forkas, Water/Wastewater Superintendent
George Bradley, Street Superintendent
Sharon Blaufus, Administrative Assistant
Wes Fujitani, Senior Civil Engineer

WWDSCHGPRMTSWINSTALLPOL.DOC

DRAFT

STREETS – 6.1 NEW SIDEWALK INSTALLATION POLICY 7/20/99

This policy covers the installation of new sidewalk on City streets at City expense. Repair and replacement of existing sidewalk is addressed in Public Works' Streets Policy 6 – Curb, Gutter & Sidewalk Repair. City will install new sidewalk where sidewalks do not exist and where right of way is available under the following circumstances:

A. As part of major reconstruction projects on City streets.

B. Under a special installation program funded through Measure K sales tax revenue. The following guidelines and priorities will apply for this program:

   1. Areas generating high amounts of pedestrian traffic.
   2. Suggested routes to school.
   3. Blocks with relatively small areas lacking sidewalk i.e., "gaps".
   4. In other areas determined by the City Council.

C. Locations where the City has a prior agreement or commitment to install sidewalk.

City will not be responsible for the replacement or relocation of fences, structures or landscaping within the right of way that are affected by the installation of sidewalk. Removal of improvements and modification to irrigation lines will be done by the City at no cost to the owner.

The program for installation of sidewalk at City expense does not apply in the following instances unless specifically approved by the City Council:

A. Unimproved properties (bare land, no street improvements);

B. Partially improved properties (bare land, partial street improvements);

C. Developed commercial and industrial properties (on-site improvements, partial street improvements);

D. Properties whose previous or present owners have entered into an improvement deferral agreement with the City; and

E. Properties where only partial street improvement installation has been made due to the timing of the development of that property.

Res. No. _____ adopted by the City Council at its meeting of ______________, 1999.

SECTION 3. FLOW AND LOADING PROJECTIONS

This section quantifies existing wastewater flows and loadings, and presents projections for future flow rates and loadings through the year 2020. Flows affect the design of pumps, pipes and other system components. Loadings affect the biological treatment process components such as aeration basins and anaerobic digesters. Projections are presented for both domestic and industrial sewer wastewater flows. In addition, this section presents an initial analysis of infiltration and inflow (I/I) into the City's municipal wastewater collection system.

POPULATION PROJECTIONS

The City's most recent General Plan was completed in 1991. The target population through 2007, the end of the General Plan period, was 70,741. This represents a 2 percent annual growth rate from the 1987 population level of 45,794.

According to the City's 1998 Residential Growth Management Schedule[1], the population of Lodi was 55,681 in January 1998. Population projections for San Joaquin County and its cities have been developed by the San Joaquin Council of Governments for Year 2020. Their projection for Lodi is that the City will grow to a population of 69,156 by 2020 – a growth rate of 0.99%. This is the lowest rate of the seven cities in the county. The total county growth rate was estimated to be 1.92%. At the General Plan target 2% growth rate, the population would be 86,000 by the year 2020. Population projections for 1%, 2%, and a mid-range value of 1.5% through 2020 are shown in Figure 3-1

LAND USE

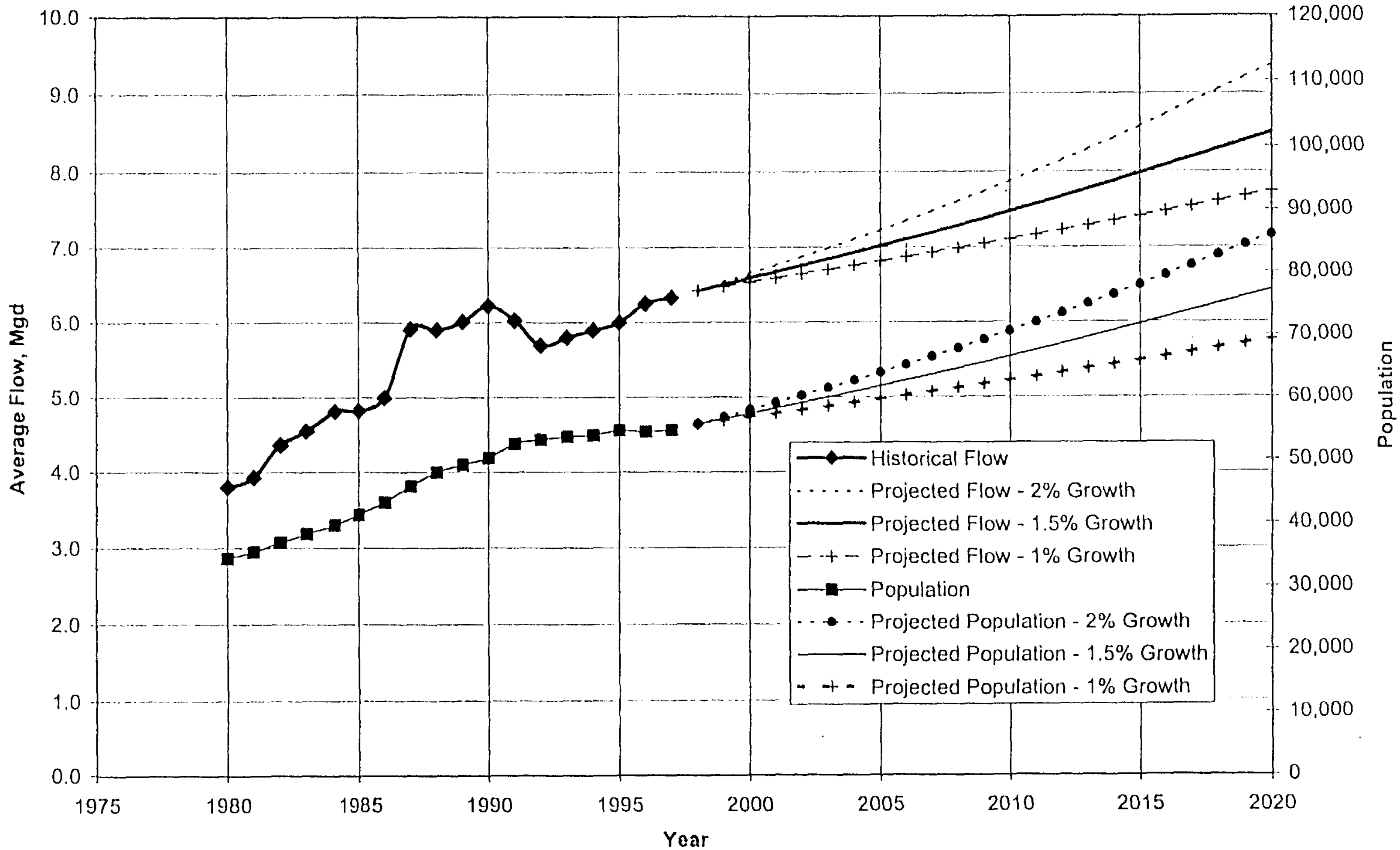
The ratios of future land uses are expected to remain relatively constant over the next 20 years[2]. For residential units, the current proportions are projected to remain approximately constant for at least the next decade at 65 percent single family, 10 percent medium density, and 25 percent high density. If the land uses and residential mix stay constant as expected, wastewater flows should correlate well with projected population.

DOMESTIC WASTEWATER FLOW PROJECTIONS

Average Flow

Historical wastewater flows (annual average) and projected wastewater flows for 1980 through 2020 are shown in Figure 3-1. Flows have generally correlated with population, except for an increase during the late 1980's and a decrease during the latter stages of the 1987 to 1992 drought. The increase during the late 1980's may be partly explained by calibration problems with the old flow meter around 1985 through 1987. A new flow meter was installed in mid-1988. The decrease in flow during 1991 and 1992 was probably due to water conservation efforts. Since the end of the drought, flows have been increasing slightly faster than population as water conservation efforts have probably lessened. This recent pattern has been evident in wastewater flow data for many municipalities in the area.

FIGURE 3-1. POPULATION AND WASTEWATER FLOW



Based on the historical flows and population for 1980 through 1997, the average wastewater flow per resident was 116 gpd/capita. The wastewater flow rate per resident in 1997 was also 116 gpd/capita. These flows included all commercial customers and some industrial customers. New development in Lodi uses mandated low flow toilets and showerheads. This should reduce average flow per new resident to approximately 97 gpd/capita[3]. Flow projections were developed using the 97 gpd/capita for new growth and 1%, 1.5%, and 2% annual population growth. As can be seen in Figure 3-1, the projected average flow range for 2020 is 7.7 to 9.4 million gallons per day (Mgd). The 1.5 percent growth rate curve (8.5 Mgd at Year 2020) will be used for planning purposes in this study.

Wastewater Flow Peaking Factors

Daily wastewater flows for mid 1994 through early 1999 are shown in Figure 3-2. It is interesting to note that Lodi's wastewater flows are higher in summer months than winter months, which is atypical for cities in the Central Valley. As discussed below, this is probably because Lodi's sewer system has much lower wintertime inflow and infiltration than most other cities' sewer systems. In addition, some of Lodi's businesses have greater activity in the summer months. Because of this pattern, the average annual flow is a better parameter to use for planning purposes than average dry weather flow.

The average annual, peak month, peak day, and peak hour flow rates and peaking factors for the August 1994 through January 1999 period are shown in Table 3-1. These flow rates are based on influent flow meter readings. Seasonal wastewater flow variation is shown in Figure 3-3 along with the maximum monthly flow factors for the period. The daily wastewater flow frequency distribution for this period is shown in Figure 3-4. A graph showing sustained peak flow factors versus number of days is provided as Figure 3-5. The values from Figures 3-3 through 3-5 can be multiplied by projected future average flows for use in sizing treatment and disposal/reuse facilities.

The peak hour flow rate for the period was observed for the storm event peaking on Tuesday, February 3, 1998. The peaking factors shown in Table 3-1 are relatively low compared to most municipal wastewater systems.

Table 3-1. Peak Flow Rates and Peaking Factors

	Flow, Mgd	Peaking Factor
Annual Average	6.2	1.0
Peak Month	7.0	1.13
Peak Day, Dry[a]	7.3	1.18
Peak Day, Wet[b]	8.0	1.29
Peak Hour	11.9	1.92

[a] Daily rainfall less than 0.3 inches
[b] Daily rainfall greater than 1.0 inches

FIGURE 3-2. DAILY INFLUENT FLOWS

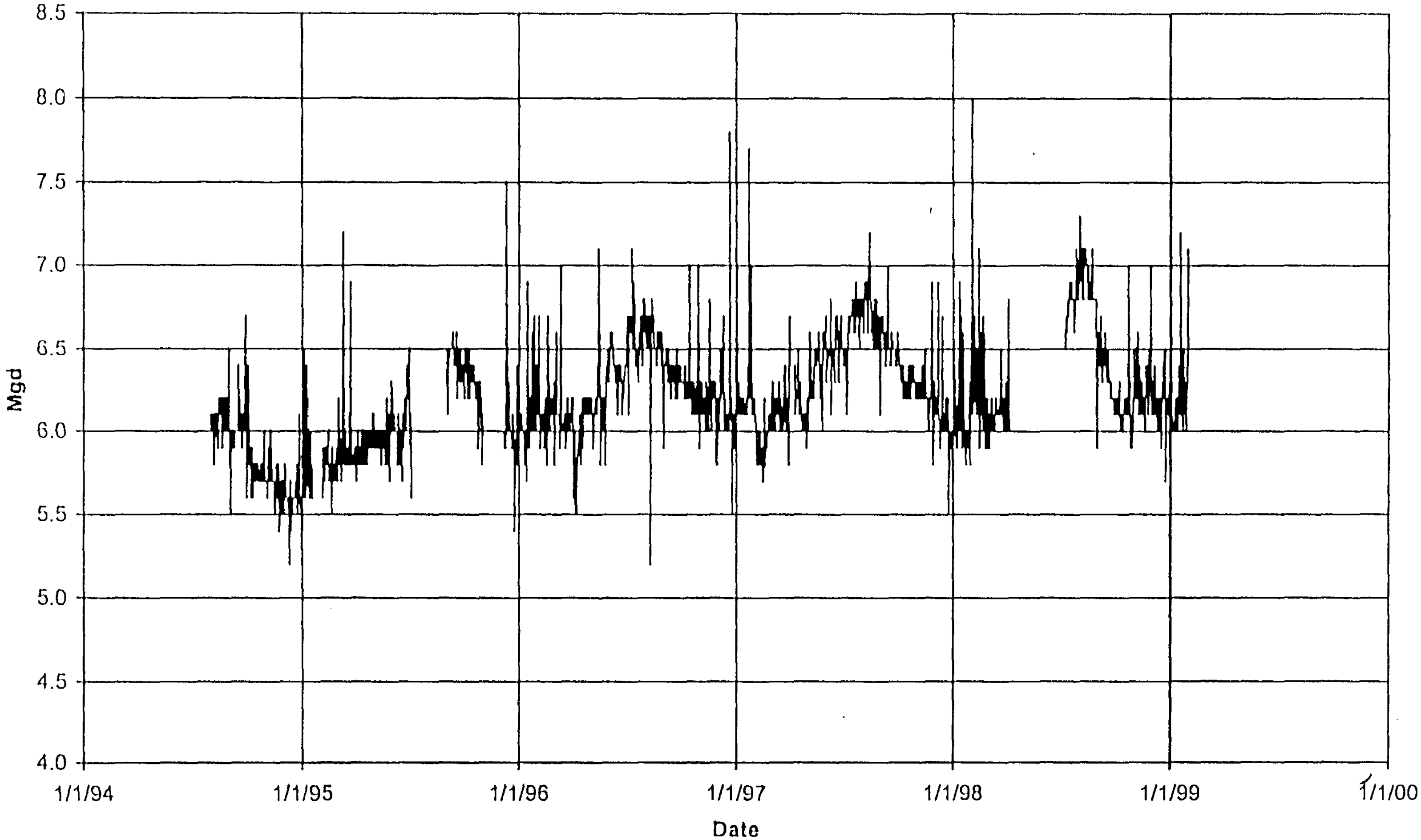


FIGURE 3-3. WASTEWATER FLOW FACTORS BY MONTH (8/94 - 1/99)

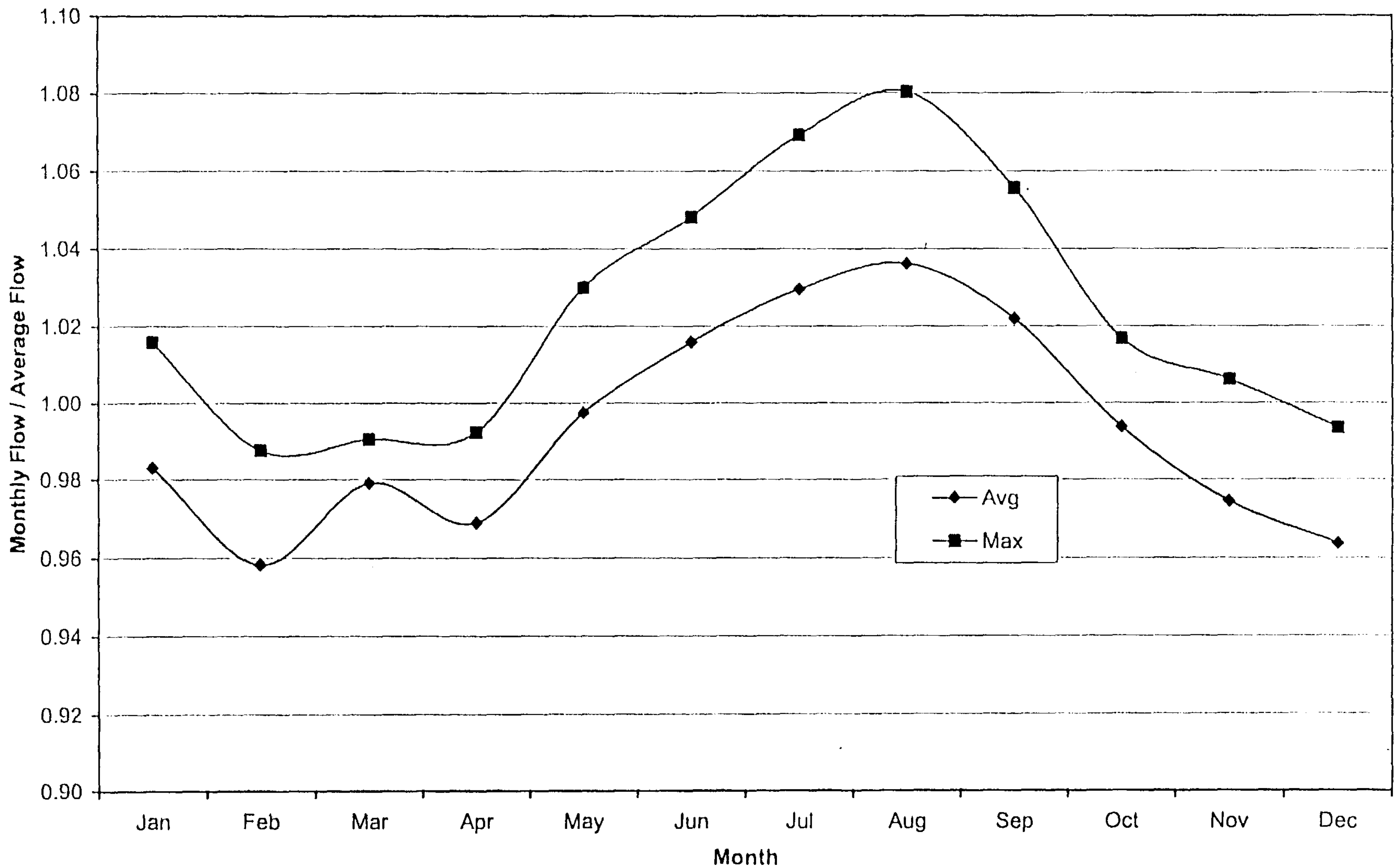


FIGURE 3-4. NORMALIZED DAILY FLOWS FREQUENCY DISTRIBUTION

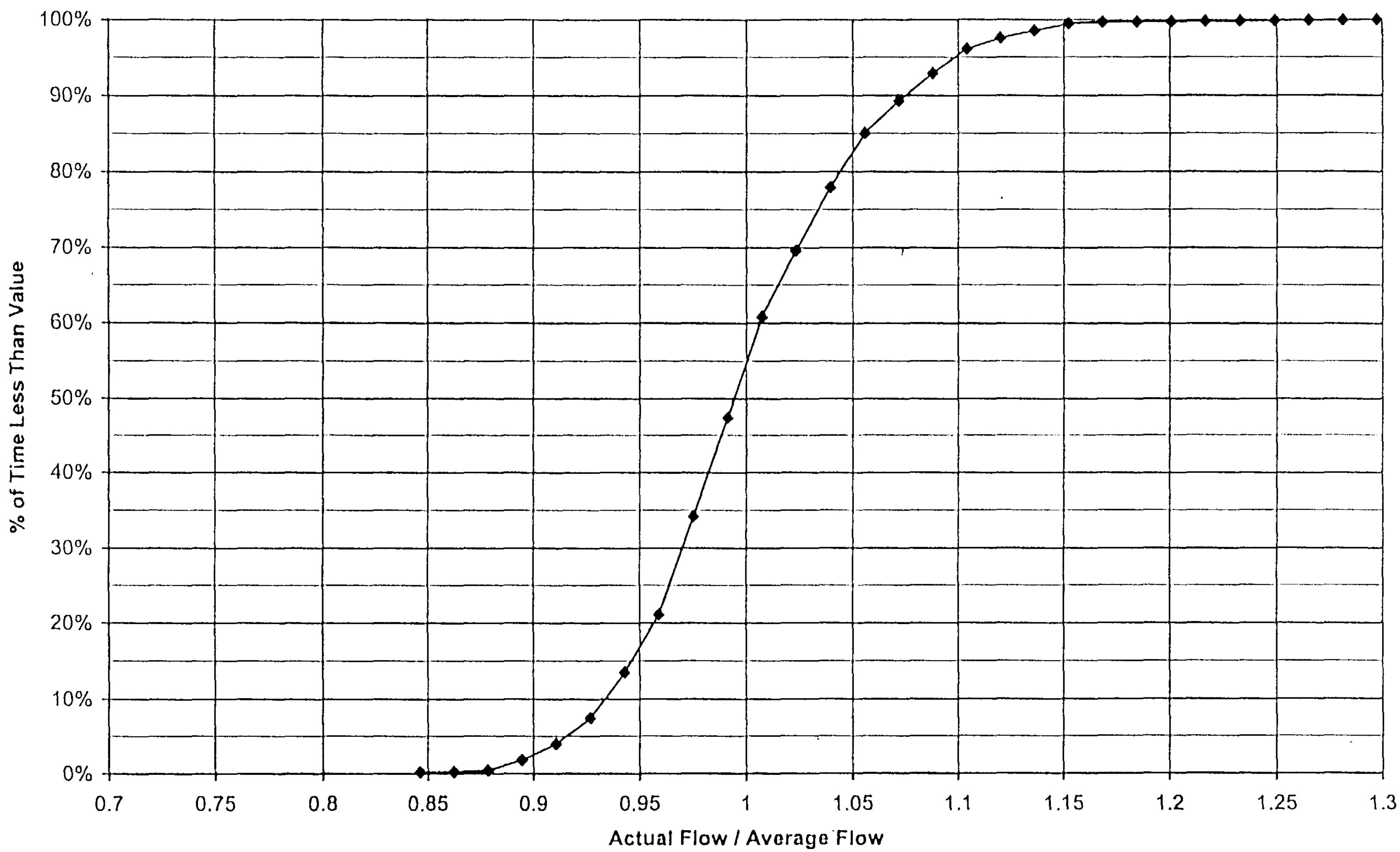
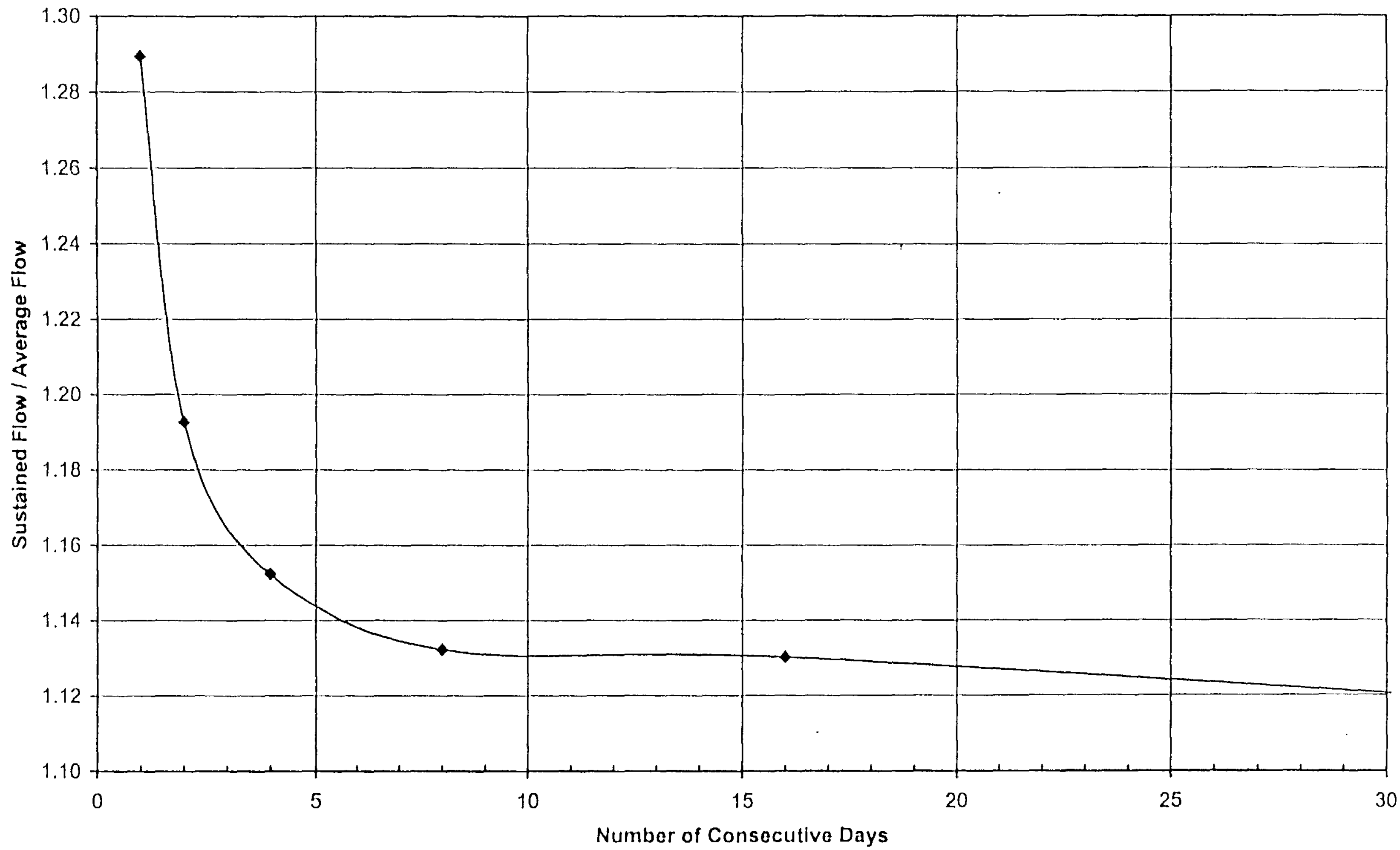


FIGURE 3-5. SUSTAINED PEAK FLOW FACTORS (8/94 - 1/99)



Analysis of Inflow/Infiltration

Direct inflow into wastewater collection systems is defined as surface flows into collection system structures, such as manhole lids, catch basins, yard and roof drains, *etc*. Infiltration is defined as groundwater entering the sewer system through joints and cracks in the system. The purpose of analyzing I/I is to determine whether there is excessive I/I that would be more effective to eliminate through collection system improvements rather than be included in treatment capacity planning.

Groundwater levels are typically highest in late winter months at approximately 40 feet below ground surface. Based on the fact that the wastewater influent flows to the treatment plant are higher in the summer than the winter months (see Figure 3-2), there is no distinguishable infiltration into the Lodi wastewater collection system.

During peak storm events, influent wastewater flows have increased. The average, maximum, and minimum flows during days with rainfall greater than 1.0 inches are compared with the average, maximum, and minimum flows for days with less than 0.3 inches of rainfall in Table 3-2. The peak storm event of February 3, 1998 had an inflow of approximately 2 million gallons over a 24-hour period. The amounts of inflow are very low compared to most wastewater collection systems in the Central Valley of California, and would definitely not be considered excessive.

Table 3-2. Average Inflows During Storm Events (Averages for 1994 through 1998)

	Influent Flow During Dry Periods, Mgd	Influent Flow During Rainstorms,[a] Mgd	Calculated Inflow, gallons
Average for 24 Hours	6.19	6.69	500,000
Average Maximum Hour	7.75	8.96	50,000
Average Minimum Hour	2.94	2.99	2,000

(a) Rainfall greater than 1.0 inch per day

Projected Flows

The average and peak projected flows for planning purposes are listed in Table 3-3. These were calculated using the projected average flows at a 1.5 percent growth rate (Figure 3-1) and the peaking factors from Table 3-1. The frequency distribution and sustained peak flow factors can be used to develop other peaking factors specific to some of the treatment processes.

Table 3-3. Projected Flows, Mgd

	2010	2020
Average	7.5	8.5
Peak Month	8.5	9.7
Peak Day	9.7	11.0
Peak Hour	14.4	16.3

DOMESTIC WASTEWATER QUALITY AND LOADING PROJECTIONS

Concentrations of Major Constituents

The concentrations of major constituents for wastewater entering the Lodi Water Pollution Control Plant are fairly typical of medium strength municipal wastewater. Average and projected concentrations for the major constituents are shown in Table 3-4. Concentrations of minor constituents are addressed in Section 3, Waste Discharge Requirements.

Table 3-4. Average Influent Concentrations of Major Constituents (1995 through 1998)

Item	Units	Historical Average	Projected Year 2010	Projected Year 2020	Existing Treatment Plan Design Criteria
Chemical Oxygen Demand (COD)	mg/L	555	573	584	N/A
Biochemical Oxygen Demand (BOD)	mg/L	272	281	286	220
Total Suspended Solids (TSS)	mg/L	245	253	258	240
Ammonia	mg/L	17.3	17.9	18.2	—
Total Kjeldahl Nitrogen	mg/L	28.5	29.4	30.0	—

Although the land uses and the mix of residential units are not expected to change significantly through Year 2020, new development should have a lower average flow rate per capita. This will result in an increase in the concentrations of major constituents for new development because the constituent loading rates per capita should remain essentially unchanged. This explains the slight increase in concentrations projected over time shown in Table 3-4.

Loading Rates for Major Constituents

Influent loading rates of BOD and TSS have been evaluated for 1994 through 1998. The daily BOD loading rate frequency distribution and sustained peak loading factors are shown in Figures 3-6 and 3-7, respectively. The daily TSS loading rate frequency distribution and sustained peak loading factors are shown in Figures 3-8 and 3-9, respectively. The projected loading rates of major constituents are shown in Table 3-5.

Table 3-5. Projected Average and Sustained Peak Loading Rates in lbs/day

Constituent	2010		2020	
	Average	Sustained Peak 30 Day Loading	Average	Sustained Peak 30 Day Loading
BOD	18,600	21,100	22,600	25,700
TSS	16,700	20,800	20,400	25,400

FIGURE 3-6. NORMALIZED DAILY BOD LOADING FREQUENCY DISTRIBUTION

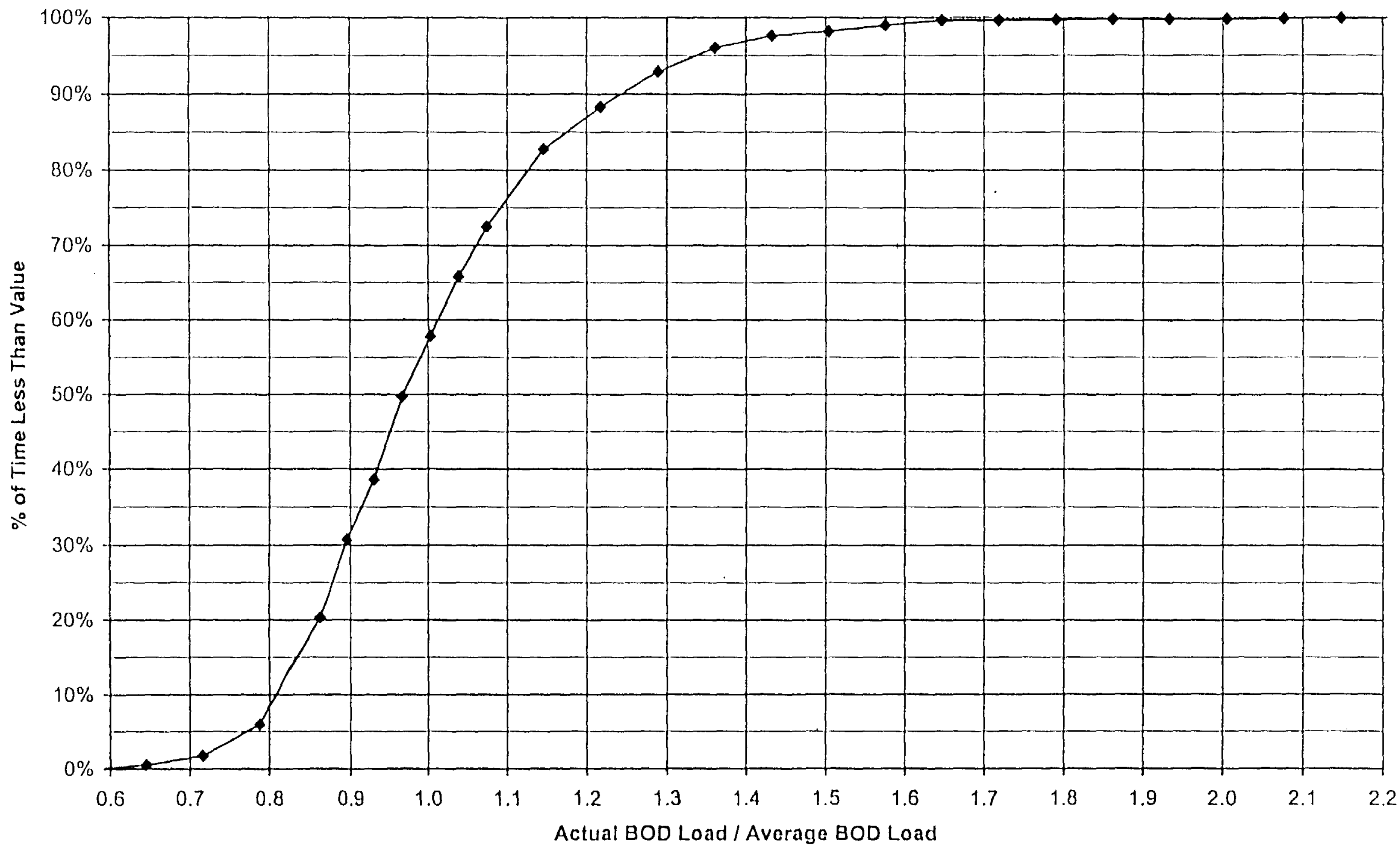


FIGURE 3-7. SUSTAINED PEAK BOD LOADING FACTORS (8/94 - 1/99)

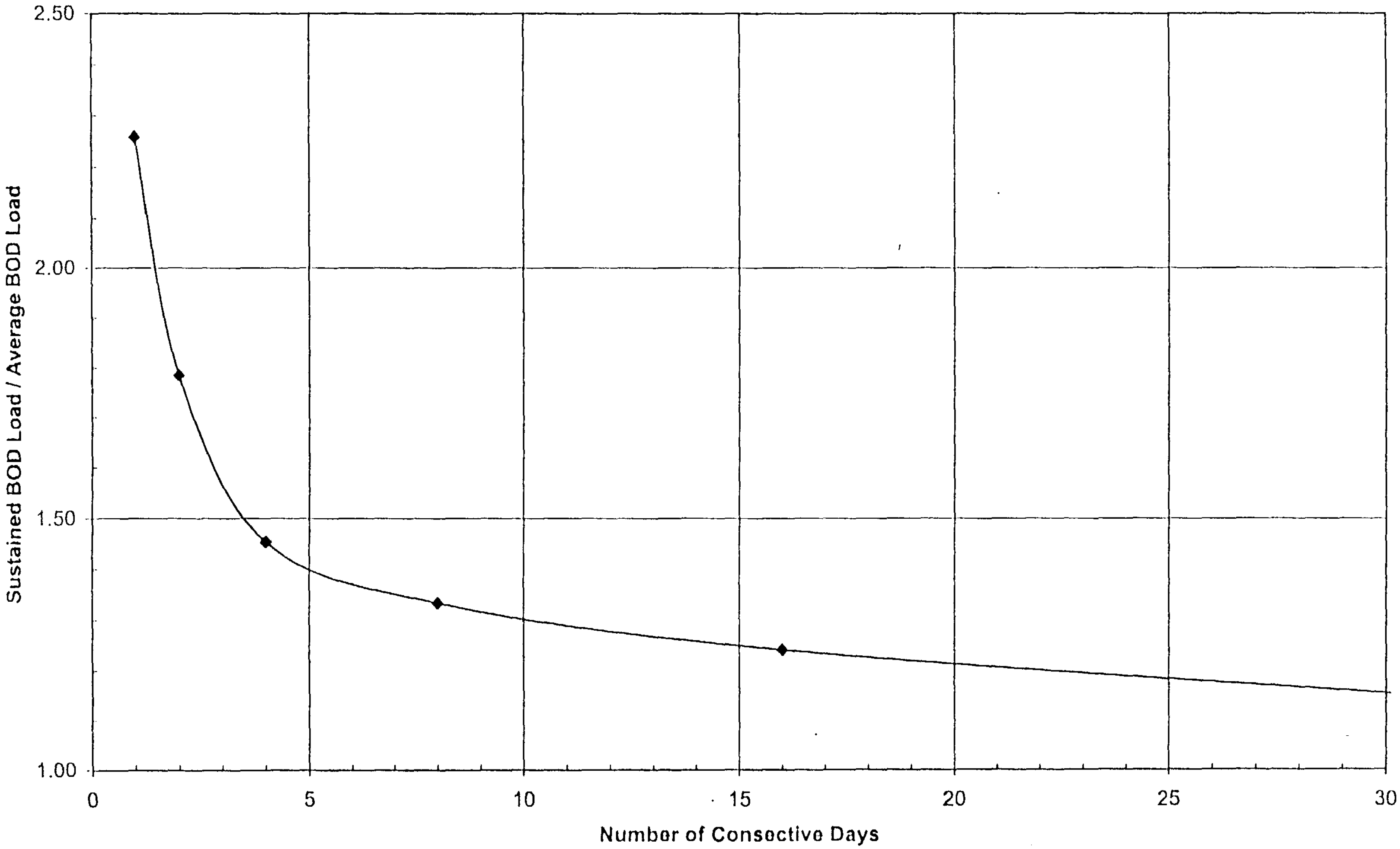


FIGURE 3-8. NORMALIZED DAILY TSS LOADING FREQUENCY DISTRIBUTION

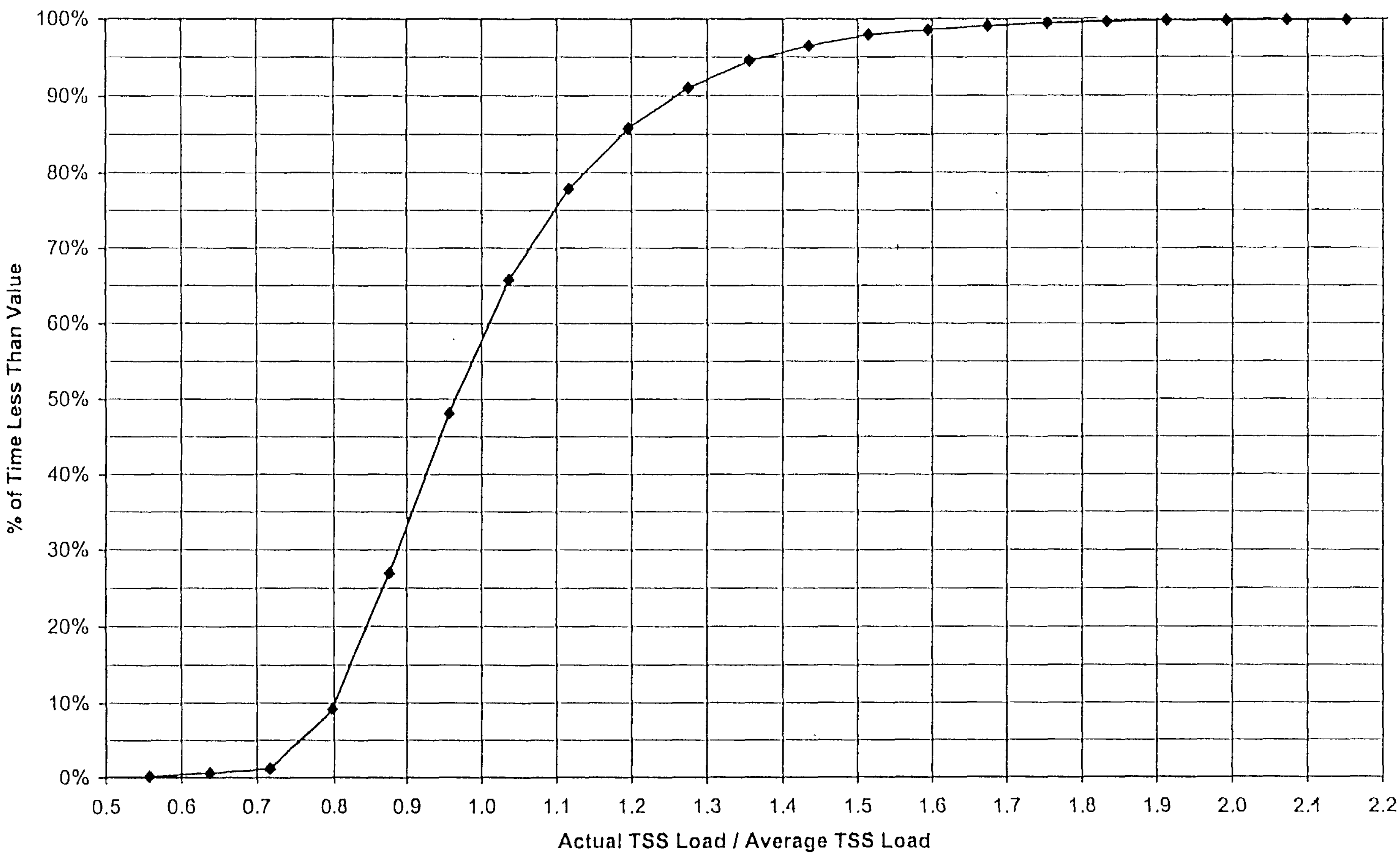
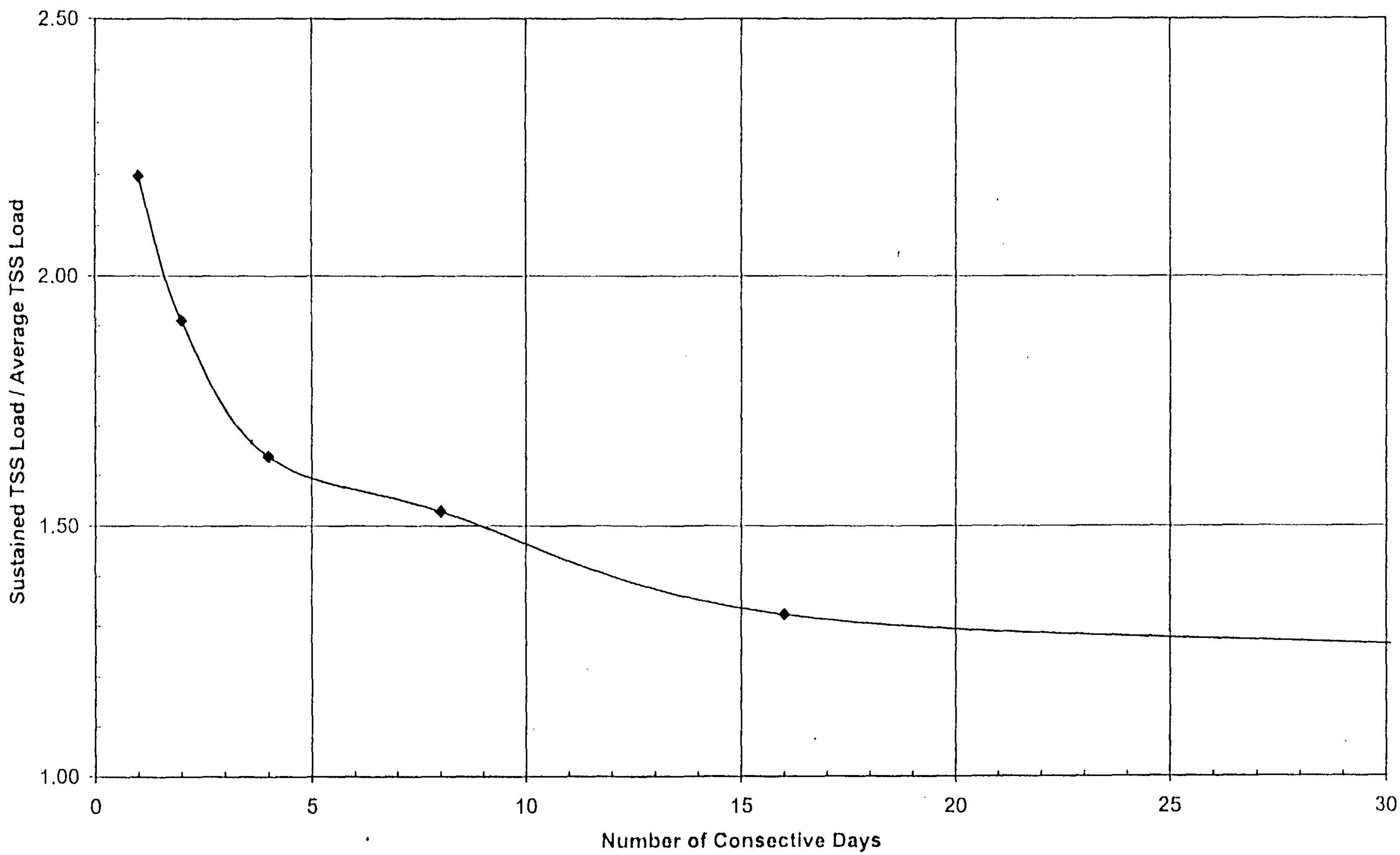


FIGURE 3-9. SUSTAINED PEAK TSS LOADING FACTORS (8/94 - 1/99)



INDUSTRIAL WASTEWATER FLOW AND LOADING PROJECTIONS

The City has a separate 33" sewer trunk line which serves the Pacific Coast Producers (PCP) cannery and several small industries. PCP processes primarily apricots during June, and tomatoes and peaches during June through October. PCP also produces sauces and processes other products, but the flows and loads from these operations are very minor.

The smaller industries connected to the industrial sewer system include a cherry packer, metal finishers and several other industries. The combined annual total flow from these industries (other than PCP) is only approximately 14 million gallons versus the 300 million gallons annually from PCP.

Monthly industrial wastewater flows for 1997 and 1998 are shown in Figure 3-10. The 1997 flows were moderate, and the 1998 flows were the highest on record. In conversations with PCP management, flows in 1998 are not considered to be representative, because PCP had to use extra dilution water to achieve a desired effluent pH. New equipment is being installed to eliminate the need for the extra dilution water. PCP production may expand slightly in the future, but no new major production lines are planned. Based on discussions with PCP management and City staff, the projected flows and loadings were estimated to be the average of 1997 and 1998 values. Projected flows are shown in Table 3-6 and Figure 3-10. Projected loadings are shown in Table 3-6.

Table 3-6. Projected Industrial Flows and Loadings

Month	Flow, Mgal	BOD, lbs	BOD, mg/L	TSS, lbs	TSS, mg/L
Jan	4.5	9,301	251	9,301	251
Feb	3.7	7,369	240	7,369	240
Mar	1.0	741	87	741	87
Apr	1.0	744	87	744	87
May	2.8	5,167	222	5,167	222
Jun	5.9	17,655	362	7,355	151
Jul	53.4	482,508	1,083	137,217	308
Aug	93.9	1,449,844	1,851	715,627	914
Sep	96.5	1,526,763	1,898	829,589	1,031
Oct	35.0	256,053	877	84,035	288
Nov	1.3	1,412	131	1,412	131
Dec	1.5	2,030	158	2,030	158
Totals	300.4	3,759,600	N/A	1,800,600	N/A

Note:

PCP flows for Nov through May not sampled – 300 mg/L BOD and TSS assumed. BOD and TSS for other industries assumed to be an average 100 mg/L.

DRAFT

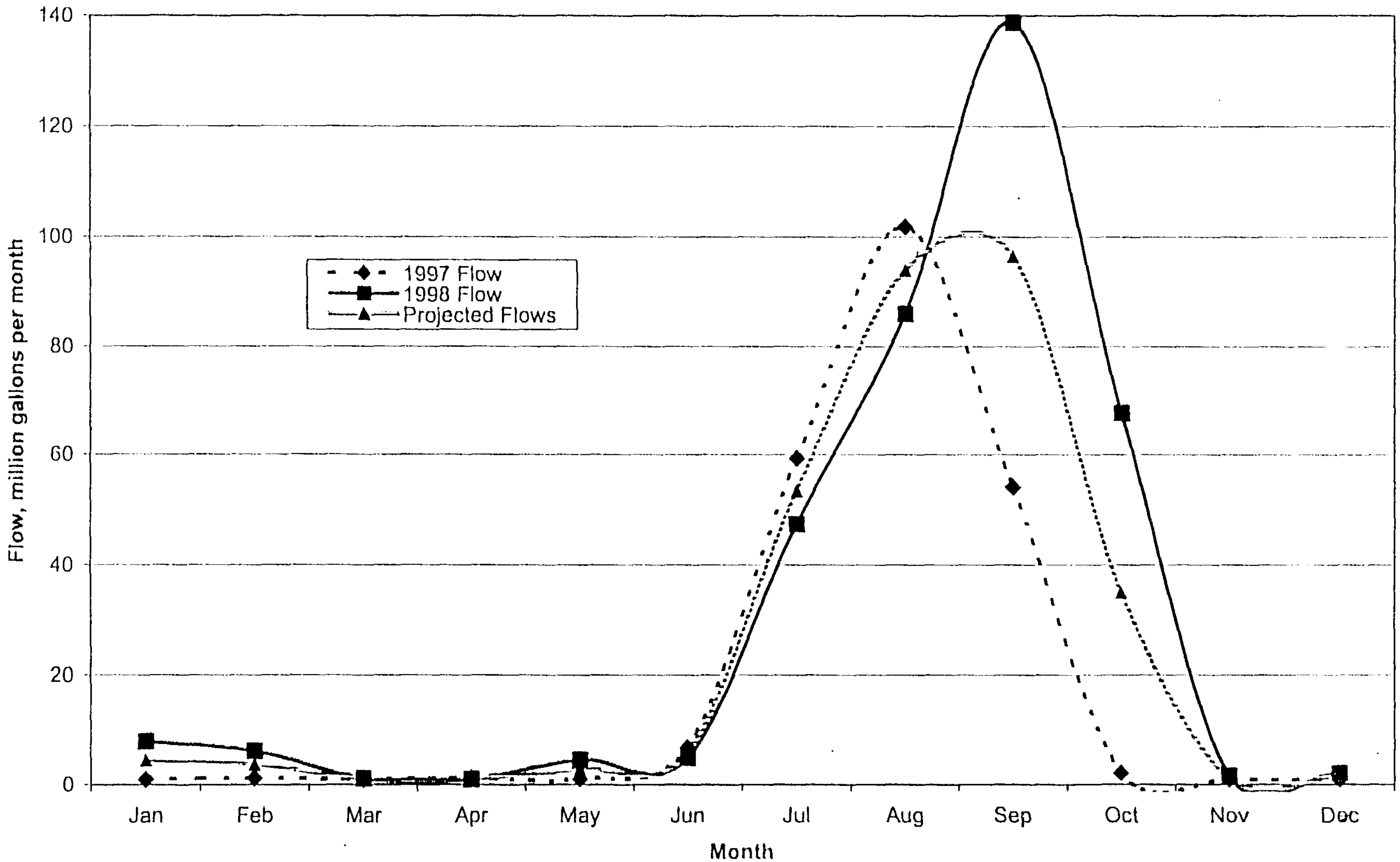
REFERENCES

1 *City of Lodi Residential Growth Management Schedule 1998*, adopted in accordance with Ordinance #1521 dated September 18, 1991.

2 Personal phone conversation with Konradt Bartlam, March 1999.

3 Wastewater flow reduction values calculated from *Wastewater Engineering, Treatment, Disposal, and Reuse*. Tchobanoglous, G. and F.L. Burton. Metcalf and Eddy, Inc. Third Edition, 1991.

FIGURE 3-10. 1997 - 1998 AND PROJECTED INDUSTRIAL WASTEWATER FLOWS



DRAFT

SECTION 4. ANTICIPATED DISCHARGE REQUIREMENTS AND ISSUES

INTRODUCTION

The prime objective for the City of Lodi's (City) wastewater facilities is to reliably meet discharge requirements. The purpose of this task was to formulate a set of anticipated and potential future discharge requirements for use in the development and evaluation of upgrades to the City's treatment, reuse, and discharge facilities.

BACKGROUND

Current Processes and Operations

The current treatment process includes primary clarification followed by conventional activated sludge secondary treatment and chlorine gas disinfection. Primary and secondary solids are further treated in anaerobic digesters and a biosolids lagoon. Most treated effluent is either discharged to surface waters or used for agricultural irrigation of animal feed crops. Small amounts of treated effluent are used for the Mosquito Abatement District fish ponds and the NCPA Power Plant. Biosolids are mixed with effluent and land applied on City owned property.

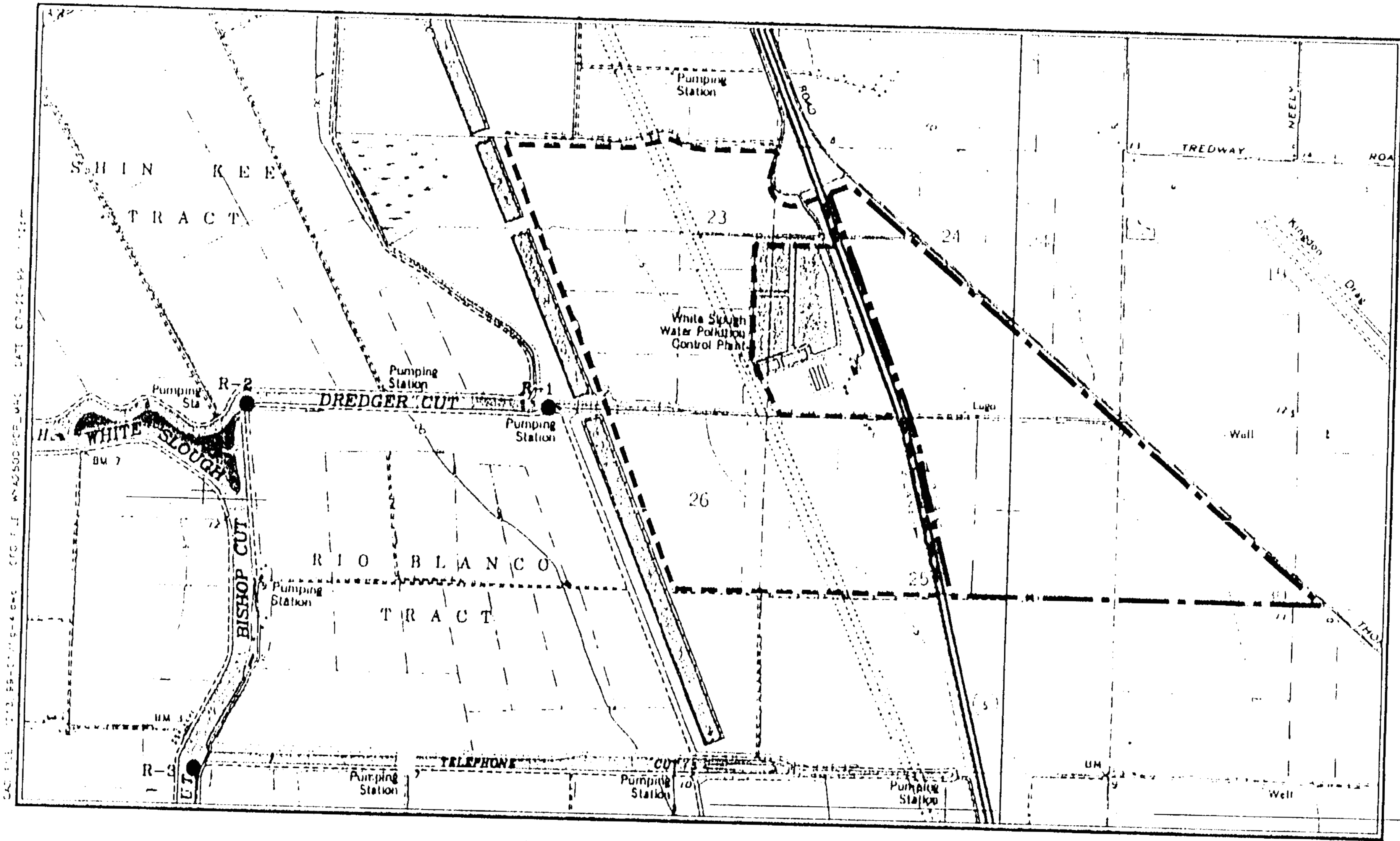
Receiving Waters

The City of Lodi discharges to Dredger Cut, which connects with White Slough and Bishop Cut in the Delta as shown in Figure 4-1. Dredger Cut is a manmade channel which was constructed in the early 1900s to provide drainage for agricultural lands in the area. Dredger Cut, White Slough, Bishop Cut, and other Delta channels are normally dominated by tidal flows. Water from Bishop Cut typically flows to the San Joaquin River and Stockton Deepwater Ship Channel through Disappointment Slough[1] as shown in Figure 4-2. During periods of no exports from the Delta, there is a net flow west from Disappointment Slough towards San Francisco Bay. During periods of high water exports from the Delta, there is a reverse net flow up the San Joaquin River to the confluence with Turner Cut.

Current Discharge Requirements for Municipal Wastewater

Lodi's current (issued March, 1993) discharge requirements for municipal effluent are applied at the confluence of Dredger Cut with Bishop Cut and White Slough (R-2). The current discharge requirements include typical secondary treatment and disinfection limits, biotoxicity requirements, dissolved oxygen limits, nitrogen loading limits for land application, and related requirements. The most significant current discharge requirements related to treatment facility capacities and operation for municipal effluent are listed in Table 4-1.

Effluent from the Water Pollution Control Facility (WPCF) has consistently complied with the existing discharge requirements for BOD, TSS, and toxicity. There were three instances in 1996



LEGEND:

Effluent crop irrigation area

Current crop irrigation area & potential future sports complex

N

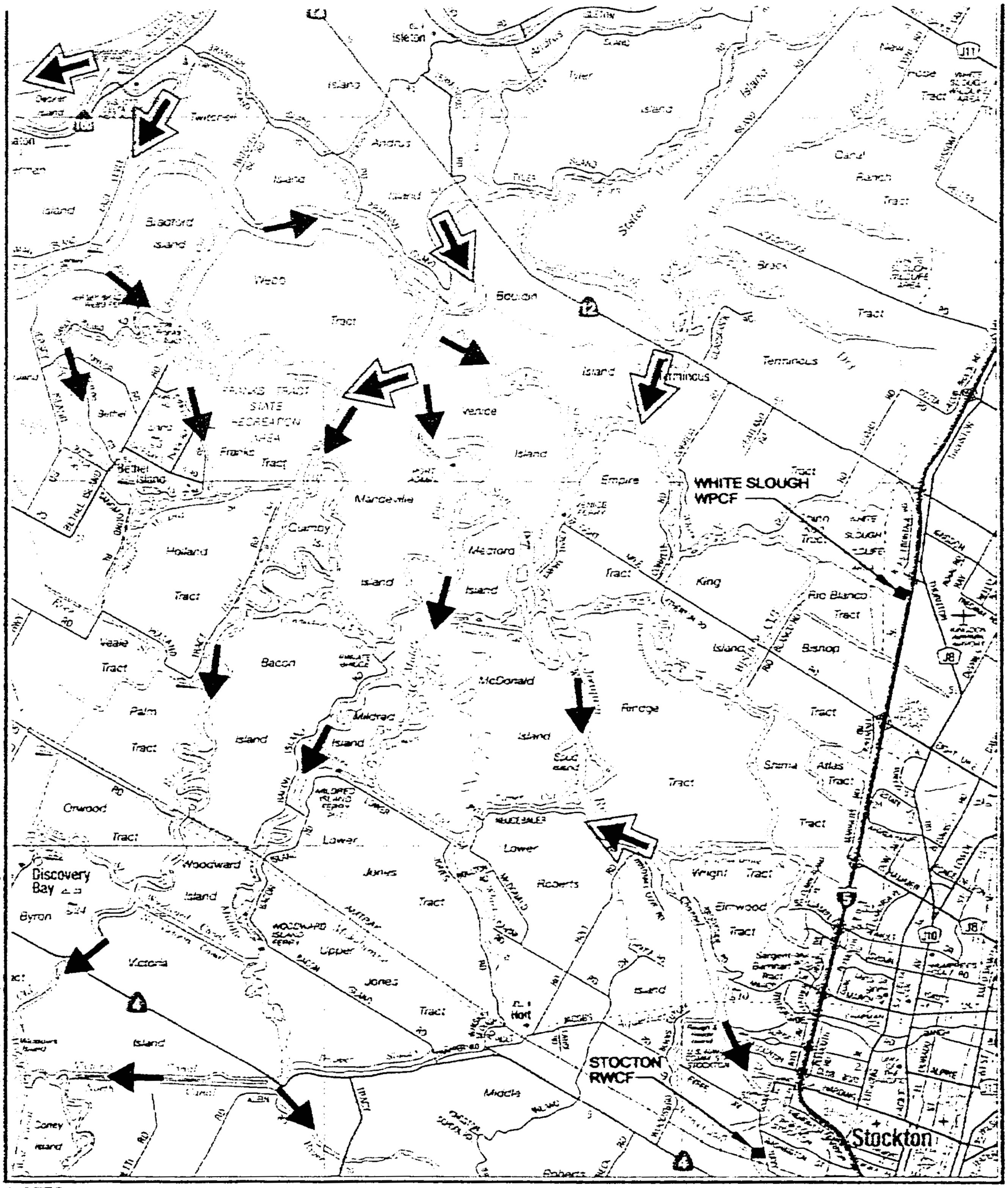
0 1000 2000
SCALE IN FEET

Figure 4-1

City of Lodi
WasteWater Master Plan

Discharge & Reuse Locations

WEST YOST & ASSOCIATES



NOTES:

1. SOURCE OF UNDERLYING MAPPING SHOWN HEREON IS A SCANNED MAP.

LEGEND:

POSITIVE FLOW

REVERSE FLOW

N

NOT TO SCALE

Figure 4-2

City of Lodi
Wastewater Master Plan

DELTA CIRCULATION PATTERNS
LOW FLOWS / HIGH EXPORT

WEST YOST & ASSOCIATES

Table 4-1. Current Requirements for Discharge of Treated Municipal Effluent – Major Parameters

Constituent or Parameter	Units	Limit
BOD (June – Oct 15.)	mg/L	20/40/50[a]
BOD (Oct. 16 – May)	mg/L	30/45/50[a]
TSS (June – Oct 15.)	mg/L	20/40/50[a]
TSS (Oct. 16 – May)	mg/L	30/45/50[a]
Total Coliform	MPN/100 mL	23
Acute Toxicity	Survival one/three	70%/90%
Chronic Toxicity	TCUs	10
Dissolved Oxygen (in White Slough)	mg/L	5.0 minimum

(a) Monthly average/weekly average/daily maximum.

and one instance in 1999 when individual biotoxicity test results were outside the allowable survival rate, but the adverse results did not occur in consecutive tests so as to cause a violation of the permit requirements. The suspected cause for the instances of toxicity in 1996 was excessive use of sulfur dioxide for dechlorination. The current discharge requirements do not include discharge limits for specific trace toxins.

Reclamation Requirements

The City irrigates animal feed crops on its own land surrounding the treatment plant using a mixture of non-disinfected secondary effluent, digested biosolids, and industrial (mostly cannery) wastewater. The current discharge requirements for the secondary effluent are 40 mg/L BOD and 0.2 mL/L settable matter (SM) (monthly averages). The current discharge requirements also contain other operational restrictions derived from Title 22, Division 4 Reclamation Requirements or Department of Health Services guidelines.

The reclamation requirements state that nutrient loading of the reclamation area shall not exceed the crop demand. The City's nitrogen loading rates have been consistently below agronomic use rates. However, nitrate concentrations in several of the shallow groundwater monitoring wells have exceeded the 10 mg/L drinking water standard. The causes of the relatively high nitrate levels have not been determined.

Solids Disposal/Reuse Discharge Requirements

Biosolids disposal and reuse practices are required to conform with Section 405(d) of the Federal Clean Water Act. In addition, nitrogen loading rates from biosolids are included in the total reported nitrogen loadings for the City's land. Total nitrogen loading rates are not to exceed crop uptake and denitrification rates in order to protect groundwater quality.

Industrial Wastewater Discharge Requirements

Because the industrial wastewater is applied directly to the land, there are no specific effluent quality requirements. The main requirements are related to the prevention of odors and groundwater impacts.

Receiving Waters Modeling

A dilution study of White Slough and Bishop Cut receiving waters was performed by Whitley Burchett & Associates in 1994. The average dilution ratio over the tidal cycle at the confluence of White Slough and Bishop Cut (monitoring point R-2, see Figure 4-1) was estimated to be approximately 8:1 for an effluent flow of approximately 6 Mgd.

A more detailed model of Dredger Cut, White Slough, and Bishop Cut was completed in 1998 by Gary Litton and Jason Nikaido at the University of the Pacific.[2] The average dilution in Dredger Cut was estimated to be 2:1 for an 8.5 Mgd effluent flow rate. The average dilution at the east side of the confluence of Dredger Cut and White Slough (R-2) was estimated to be 4:1.

Sampling and modeling dissolved oxygen concentrations within Dredger Cut were the main focus of the Litton study. One of the most significant results was that dissolved oxygen (DO) levels in Dredger Cut dropped below 5 mg/L on several occasions during the testing period even when the treatment plant was not discharging, indicating impacts from other non-point sources of pollution. The dissolved oxygen model predicted that treatment plant effluent with 20 mg/L BOD would cause D.O. levels in Dredger Cut to drop below 5 mg/L at low slack tides. At an effluent BOD concentration of 10 mg/L, the D.O. concentration was predicted to remain above 5 mg/L at low slack tides assuming inputs from non-point pollutions sources were not severe.

POTENTIAL CHANGES TO DISCHARGE LOCATION AND BENEFICIAL USES

Discharge to White Slough/Bishop Cut

Construction of an outfall pipeline or channel to White Slough or Bishop Cut is a potential alternative for providing improved effluent dilution flows. Water quality objectives for the receiving water would be easier to meet with more dilution. A diffuser across the most active portion of the channel would provide an estimated average dilution of approximately 20:1 based on the Whitley Burchett Study. Further study is needed to verify dilution ratios in White Slough/Bishop Cut and the variability in dilution ratios.

Sports Complex

A sports complex has been proposed for 400 acres in the southeastern portion of the City's property. This complex would include a significant portion of grass fields which would need irrigation. The current project concept calls for the use of up to 2.5 Mgd of treated effluent meeting Title 22, Division 4 Reclamation Requirements for unrestricted irrigation as the irrigation water source for the fields.

FUTURE DISCHARGE REQUIREMENTS

General

The Regional Board is currently preparing new waste discharge requirements for the City. These will probably become effective later in 1999. For discussion purposes, these anticipated new waste discharge requirements are referred to in this report as "anticipated discharge requirements". Requirements which may be imposed in future permits are referred to as "potential future discharge requirements". Anticipated and potential future discharge requirements presented in this report were developed from discussions with Regional Board staff, draft 1999 discharge requirements, and the review of relevant research and guidelines.

Municipal Effluent Discharge to Dredger Cut

Discharge to Dredger Cut will need to satisfy current and future discharge requirements mandated by the EPA and Regional Water Quality Control Board. The most significant new requirements will be related to trace toxins, dissolved oxygen objectives, disinfection, and biosolids reuse. Current, anticipated, and potential future discharge requirements are listed in Table 4-2 along with average and peak values from the last 5 to 10 years for comparison purposes. The anticipated and future discharge requirements include an assumed 2:1 dilution factor in Dredger Cut for water quality objectives. The enlarged bold values are those likely to be difficult to meet with current facilities. Complete results from the City's trace toxins sampling program since December 1992 are shown in Appendix [redacted]

The current discharge requirements shown in Table 4-2 are for Delta water quality objectives at Location R-2 in White Slough. Anticipated and potential future discharge requirements are based on meeting Delta water quality objectives at Location R-1 in Dredger Cut. Anticipated BOD requirements are effectively dictated by the DO objective for Dredger Cut. As discussed previously, modeling indicates that the 5 mg/L DO requirement cannot be reliably met for effluent with BOD above 10 mg/L. Potential future TSS requirements are dictated by whether or not filtration is required as part of the effluent disinfection system.

Contact recreation and agricultural irrigation are listed in the Basin Plan as beneficial uses of the Delta. The anticipated and potential future disinfection requirements for discharge to surface waters with recreation and irrigation beneficial uses are difficult to determine with certainty at this time. The Department of Health Services has made the general recommendation that discharges to streams with little dilution should be treated to the same levels as required for unrestricted irrigation water as per Title 22, Division 4. It is unclear whether that recommendation is legally applicable since it was not developed in accordance with the California Water Code. The recommendation is also very non-specific for situations where there is a significant amount of dilution water for the effluent. Therefore, the coliform numbers in Table 4-2 conservatively assume that the most stringent recommendations will be applied through some legal means in the future.

The potential for nutrient mass limits in the future is based on the fact that Total Mass Daily Loadings are being proposed for Stockton and other dischargers who may contribute to the dissolved oxygen sag in the Stockton Deepwater Ship Channel. The current proposals only address BOD limits, but excess nutrients are recognized as contributors to the problem. Lodi's

Table 4-2. Current and Potential Future Discharge Requirements For Discharge to Dredger Cut

Constituent or Parameter	Units	Current	Anticipated	Potential Future	Historical Average	Historical Peak
BOD	mg/L (30 day)	30	**10**	**10**	8.4	16
TSS	mg/L (30 day)	30	**10**	**10**	10.0	24
D.O.	mg/L (receiving water)	5 at White Slough	**5**[a]	**5**[a]	5.2	0.6 (min.)
Temperature	Δ°F (receiving water)	5 at White Slough	**4**[a]	**4**[a]	9.3	21.6
Chlorine Residual	mg/L	0.1	0.02[b]	0.02[b]	<0.1	4.6
Coliform (summer)	MPN/100 mL	23	**2.2 filtered**[c]	**2.2 filtered**[c]	2	13[d]
Coliform (winter)	MPN/100 mL	23	23	**2.2 filtered**[c]	2	13[d]
Lead	ug/L	n/a	n/a	5.6[b]	<5 (total)	10 (total)
Zinc	ug/L	n/a	**130**[e]	**100**[a]	105 (total)	160 (total)
Cyanide	ug/L	n/a	10[a]	10[a]	<10	49
Mercury	ug/L	n/a	N/A	**0.050**[e] **or 0.012**[b]	<0.2	0.63
Bis-2 ethyhexyl phthalate	ug/L	n/a	n/a	**11.8**[e]	<15 (median)	190
Chloroform	ug/L	n/a	**n/a**	**10.4**[e]	21	102
Chronic Toxicity	TCU	10	**2**[a]	**2**[a]	1 (median)	>16
Acute Toxicity	% survival	70/90	70/90	70/90	99.2	85 (min.)
Ammonia	mg/L	n/a	n/a	**5.2**[b]	1.2	6.5
Total Nitrogen	mg/L	n/a	n/a	**TML**[f]	9.4	
Total Phosphorous	mg/L	n/a	n/a	**TML**[f]	0.23	

(a) Basin Plan, metals limits expressed as dissolved concentrations.
(b) EPA Ambient Water Quality Criteria, metals criteria expressed as dissolved concentrations (imposed through Basin Plan narrative toxicity requirements), 2:1 dilution assumed for 4-day criteria.
(c) Proposed DHS/Regional Board guidelines, may be incorporated into future Basin Plan.
(d) Monthly median, 9 days have exceeded 500 MPN/100mL since Jan 1994.
(e) Draft EPA California Toxics Rule, metals limits expressed as dissolved concentrations.
(f) No specific requirements pending, Total Mass Limits may be applied in the future.

discharge only appears to impact the lowermost reach of the Deepwater Ship Channel under high export conditions. This reach below (northwest of) Turner Cut does not experience dissolved oxygen sags which violate Delta water quality objectives[3] (see Figure 4-2). However, it would be prudent to begin considering the possibility of nutrient limitations in long term planning.

Compliance with Anticipated Requirements. The treatment plant was designed to produce an effluent with a BOD concentration of 20 Mg/L at 8.5 Mgd without nitrification. The WPCF has historically produced effluent with an average BOD of less than 10 mg/L and essentially all ammonia converted to nitrate (full nitrification). There have been a few recent instances when the City had difficulty achieving full nitrification, so it appears that the plant may be reaching its nitrification capacity limit at approximately 6.5 Mgd. Disinfection and biotoxicity test results could be adversely affected if the treatment plant cannot fully nitrify. Reliably achieving 10 mg/L BOD could also become more difficult as the plant approaches its 8.5 Mgd original design capacity.

Since the treatment process does not currently include filters, meeting Title 22, Division 4 treatment, and disinfection requirements would not be possible. However, it may be possible to avoid the anticipated summer disinfection limits by discharging only to land during the irrigation season.

Some anticipated discharge requirements related to trace toxins may be difficult to consistently meet. The plant effluent has contained concentrations of zinc ranging up to 160 mg/L (as total recoverable metal). This could be in excess of the anticipated discharge limits for zinc, depending upon the relationship between total and dissolved zinc for the treatment plant effluent. The plant effluent contained cyanide in excess of the anticipated limit on two occasions in 1995 and one occasion in 1996.

During winter months, the plant effluent is considerably warmer than the water in Dredger Cut. Draft permit requirements specify that the surface water temperature cannot be raised by more than 4°F at any location. While it is unlikely that aquatic life is adversely affected by the warmer water temperature near the discharge, there could be a technical violation of the temperature requirement. If a mixing zone is allowed, the temperature objective may be achievable.

Compliance with Potential Future Requirements. The potential future requirements in Table 4-2 which are more restrictive than the anticipated discharge requirements are the requirements for ammonia, mercury, zinc, chloroform, and nutrients. As discussed above, the treatment plant probably cannot reliably nitrify at flows much greater than 6.5 Mgd. Therefore an ammonia limit would be difficult to meet.

Although there has been only one sampling result which contained detectable mercury, the detection limit for mercury (0.20 ug/L) was higher than EPA ambient water quality criteria for chronic toxicity (0.012 ug/L). Based on effluent quality measurements to date, meeting potential future requirements for mercury, zinc, and nutrients would not be possible with existing treatment facilities.

Chloroform and other trihalomethanes are formed as byproducts of chlorine disinfection. There are no established diversions for drinking water use in the northwestern portion of the Delta. It is unclear what mixing zone and dilution would be allowed for this water quality objective since it is intended to protect sources of drinking water rather than aquatic life. Assuming only the dilution in Dredger Cut, this potential requirement would be very difficult to meet with existing facilities. If dilution beyond Dredger Cut were allowed to be considered, the chloroform objective could probably be satisfied.

Municipal Effluent Discharge to White Slough/Bishop Cut

As discussed previously, one of the obvious alternatives for the City is to construct an outfall to White Slough/Bishop Cut. This would provide more dilution for meeting receiving water quality objectives. In addition, water at R-2 has contained dissolved oxygen concentrations substantially greater than the 5.0 mg/L water quality objective for the Delta almost all the time. Water at R-3 in Bishop Cut (see Figure 4-1) always contained dissolved oxygen substantially above 5.0 mg/L during the 1995 to 1998 monitoring period. Taking the greater available dilution into account, the current, near-term anticipated, and potential future discharge requirements are listed in Table 4-3. Anticipated and potential future effluent limits shown for trace toxins are based on either an assumed 20:1 average dilution and continuous concentration criteria or maximum concentration criteria, whichever is more restrictive. Values shown in enlarged bold are those likely to be difficult to meet with current facilities.

Compliance with Anticipated Requirements. If treated effluent is discharged directly to White Slough or Bishop Cut, effluent quality similar to that achieved historically should be adequate to satisfy anticipated discharge requirements. There may be some difficulty achieving consistent disinfection results as flows increase, especially if nitrification cannot be assured throughout the year.

Compliance with Potential Future Requirements. Disinfection requirements could become more stringent in the future depending upon actual dilution ratios in White Slough/Bishop Cut. Total mass limits could be adopted for BOD and nutrients in the future. New treatment processes would probably be required should nutrient loading limits ever be adopted for the Delta.

Municipal Effluent Reuse - Unrestricted Irrigation

The anticipated discharge requirements for unrestricted irrigation of fields at the proposed Sports Complex or food crops are shown in Table 4-4. These requirements generally reflect standard Reclamation Requirements from Title 22, Division 4 of the Water Code. New tertiary filtration treatment facilities would be required to satisfy these requirements.

Municipal Effluent Reuse —Animal Feed Crops

Discharge requirements for irrigation of animal feed crops are not anticipated to change substantially in the future. These are shown in Table 4-5.

The anticipated and future potential requirements for animal feed crop irrigation should be easy to satisfy with existing treatment processes. Effluent disinfection could potentially be required to satisfy future site specific concerns regarding potential public or farm worker contact with the effluent.

Table 4-3. Current and Potential Future Discharge Requirements For Discharge to White Slough/Bishop Cut

Constituent or Parameter	Units	Current	Anticipated	Potential Future	Historical Average	Historical Peak
BOD	mg/L (30 day)	30	30	TML	8.4	16
TSS	mg/L (30 day)	30	30	30	10.0	24
D.O.	mg/L (receiving)	5	5[a]	5[a]	9.3	2.9 (min.)
Temperature	Δ°F (receiving)	20	4[a]	4[a]	9.3	21.6
Chlorine Residual	mg/L	0.1	0.02[b]	0.02[b]	<0.1	4.6
Coliform	MPN/100 mL	23	23	**2.2**[c]	2	13
Zinc	ug/L (receiving)	n/a	100[a]	100[a]		
Zinc	ug/L (effluent)		**130**[d]	**130**[d]	105	160 (total)
Cyanide	ug/L (receiving)	n/a	10[a]	10[a]		
Cyanide	ug/L (effluent)		22[d]	22[d]	<10	49
Mercury	ug/L (receiving)	n/a	**0.050**[d]	**0.012**[b]		
Mercury	ug/L (effluent)		1.4[d]	1.4[d]	<0.2	0.63
Bis-2 ethyhexyl phthalate	ug/L	n/a	n/a	118[d]	<15 (median)	190
Chloroform	ug/L	n/a	n/a	104[d]	21	102
Chronic Toxicity	TCU	10	10[a]	10[a]	1 (median)	>16
Acute Toxicity	% survival	70/90	70/90	70/90	99.2	85 (min.)
Ammonia	mg/L	n/a	n/a	14.9	1.2	6.5
Total Nitrogen	mg/L	n/a	n/a	**TML**[e]	9.4	
Total Phosphorous	mg/L	n/a	n/a	**TML**[e]	0.23	

(a) Basin Plan.
(b) EPA Ambient Water Quality Criteria (imposed through Basin Plan narrative toxicity requirements).
(c) Proposed DHS/Regional Board guidelines, may be incorporated into future Basin Plan.
(d) Draft California Toxics Rule.
(e) No specific requirements pending, future Total Mass Limits may apply.

Table 4-4. Anticipated Discharge Requirements for Unrestricted Irrigation

Constituent or Parameter	Units	Anticipated
BOD	mg/L	**10**
TSS	mg/L	**10**
Turbidity	NTU	**2**
Coliform	MPN/100 mL	**2.2 filtered**
Ammonia + Nitrate	lbs/ac/yr	Agronomic use

Table 4-5. Current and Potential Future Discharge Requirements For Irrigation of Animal Feed Crops

Constituent or Parameter	Units	Current	Anticipated	Potential Future
BOD	mg/L	40	30	30
TSS	mg/L	n/a	30	30
Coliform	MPN/100 mL	Secondary	Secondary	23
Ammonia + Nitrate	lbs/ac/yr	Agronomic use	Agronomic use	Agronomic use

Industrial Effluent Irrigation Reuse

The industrial wastewater is principally from the Pacific Coast Producers (PCP) cannery. The main discharge requirements for industrial wastewater involve the prevention of nuisance odors and adverse impacts to groundwater. Current, anticipated, and potential future requirements are listed in Table 4-6.

Table 4-6. Current and Potential Future Discharge Requirements For Irrigation with Industrial Wastewater

Constituent or Parameter	Units	Current	Anticipated	Potential Future
BOD	lbs/ac/day	n/a	n/a	200
Hydrogen Sulfide	mg/L	n/a	n/a	**1.0**
Dissolved Oxygen	mg/L	n/a	n/a	**1.0 minimum**
Salinity	lbs/ac/yr	n/a	No significant impacts	No significant impacts
Ammonia + Nitrate	lbs/ac/yr	Agronomic use	Agronomic use	Agronomic use

Distribution facilities may need some improvements to minimize the potential for sulfide generation and odors from industrial wastewater irrigation. Average fixed mineral TDS for the industrial effluent is approximately 800 mg/L *vs.* 400 to 500 mg/L for the municipal effluent. The industrial wastewater would be considered good quality for irrigation and should not cause significant impacts to groundwater. A zero degradation objective applied to major mineral constituents is a remote future possibility. It would be nearly impossible to meet if strictly interpreted and applied to shallow groundwater directly under the irrigation fields.

Biosolids Disposal/Reuse

The City currently produces approximately 320 metric tons (dry weight basis) of biosolids annually. The existing anaerobic digesters and lagoon produce Class "B" biosolids under the new Federal 40 CFR Part 503 regulations. The biosolids are mixed with the irrigation water and applied via surface irrigation to land designated for annual row crops (approximately 300 acres irrigation in any one year). A total of 600 acres (243 ha) is used for biosolids application on a multi-year rotation. The anticipated discharge requirements for biosolids are derived from the Federal Part 503 regulations and the proposed General Biosolids Permit authored by the Regional Board. These requirements generally address maximum concentrations and loading rates for heavy metals and operational procedures to prevent pathogen transmission. The maximum concentrations and loading rates for metals and other constituents under the Part 503 regulations are included in Table 4-7. The proposed General Biosolids Permit is not applicable to areas in the statutory Delta, but many of the operational requirements from the General Biosolids Permit will undoubtedly be applied to Lodi's site specific permit.

Table 4-7. Anticipated Biosolids Limits

Constituent	Ceiling Concentration, mg/kg	Max. Cumulative Loading, kg/ha	Historical Concentration, mg/kg	Average Loading, kg/ha/yr	Life of Existing Site, years
Arsenic	75	41	7.8	0.01	4,100
Cadmium	85	39	5.6	0.007	5,600
Copper	4,300	1,500	246.0	0.32	4,700
Lead	840	300	30.5	0.04	7,500
Mercury	57	17	5.5	0.007	2,400
Molybdenum	75	—	11.1	0.014	—
Nickel	420	420	15.0	0.019	22,000
Selenium	100	100	1.2	0.002	50,000
Zinc	7,500	2,800	604.0	0.80	3,500
Total N (lbs/ac/yr)	Agronomic use	Agronomic use	—	—	—

Compliance with Anticipated Biosolids Limits. The biosolids limits should be reasonably easy to comply with as long as sufficient land continues to be available for biosolids application. The distribution uniformity of biosolids may have to be improved to effectively utilize all available land.

SUMMARY AND CONCLUSIONS

Discharge to Dredger Cut will require more highly treated effluent than is reliably obtainable with current facilities, especially during summer months. Compliance with dissolved oxygen, disinfection, and zinc requirements will be problematic. During winter months, disinfection requirements are not likely to be as stringent, but dissolved oxygen and zinc requirements will still be difficult to meet. Potential future requirements for other trace toxins and nutrients may also be impossible to meet with current facilities.

Requirements for discharge to White Slough/Bishop Cut could probably be satisfied using existing treatment processes with the addition of capacity for full nitrification. Future mass loading requirements for nutrients and BOD could become more restrictive.

Land application and irrigation reuse of effluent on animal feed crops would have the least restrictive treatment requirements. Landscape irrigation or irrigation of food crops would require compliance with Title 22 Reclamation requirements, including tertiary filtration and advanced disinfection.

Dilution flows and dissolved oxygen impacts in White Slough and Bishop Cut should be evaluated for a discharge into the west portion of Bishop Cut at the junction with White Slough. The potential impacts of BOD and nutrients in downstream Delta channels should also be evaluated.

---

1 State Water Resources Control Board. *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. Pub. # 95-1WR, May, 1995.

2 Litton, G.M. and J. Nikaido. *Water Quality Impact Report White Slough Water Pollution Control Facility*. Draft, University of the Pacific, Department of Civil Engineering, October, 1998.

3 Jones and Stokes Associates. *Potential Solutions for Achieving the San Joaquin River Dissolved Oxygen Objectives*. Prepared for DeCuir and Somach and the City of Stockton. June, 1998.

DRAFT

SECTION 3. FLOW AND LOADING PROJECTIONS

This section quantifies existing wastewater flows and loadings, and presents projections for future flow rates and loadings through the year 2020. Flows affect the design of pumps, pipes and other system components. Loadings affect the biological treatment process components such as aeration basins and anaerobic digesters. Projections are presented for both domestic and industrial sewer wastewater flows. In addition, this section presents an initial analysis of infiltration and inflow (I/I) into the City's municipal wastewater collection system.

POPULATION PROJECTIONS

The City's most recent General Plan was completed in 1991. The target population through 2007, the end of the General Plan period, was 70,741. This represents a 2 percent annual growth rate from the 1987 population level of 45,794.

According to the City's 1998 Residential Growth Management Schedule[1], the population of Lodi was 55,681 in January 1998. Population projections for San Joaquin County and its cities have been developed by the San Joaquin Council of Governments for Year 2020. Their projection for Lodi is that the City will grow to a population of 69,156 by 2020 – a growth rate of 0.99%. This is the lowest rate of the seven cities in the county. The total county growth rate was estimated to be 1.92%. At the General Plan target 2% growth rate, the population would be 86,000 by the year 2020. Population projections for 1%, 2%, and a mid-range value of 1.5% through 2020 are shown in Figure 3-1

LAND USE

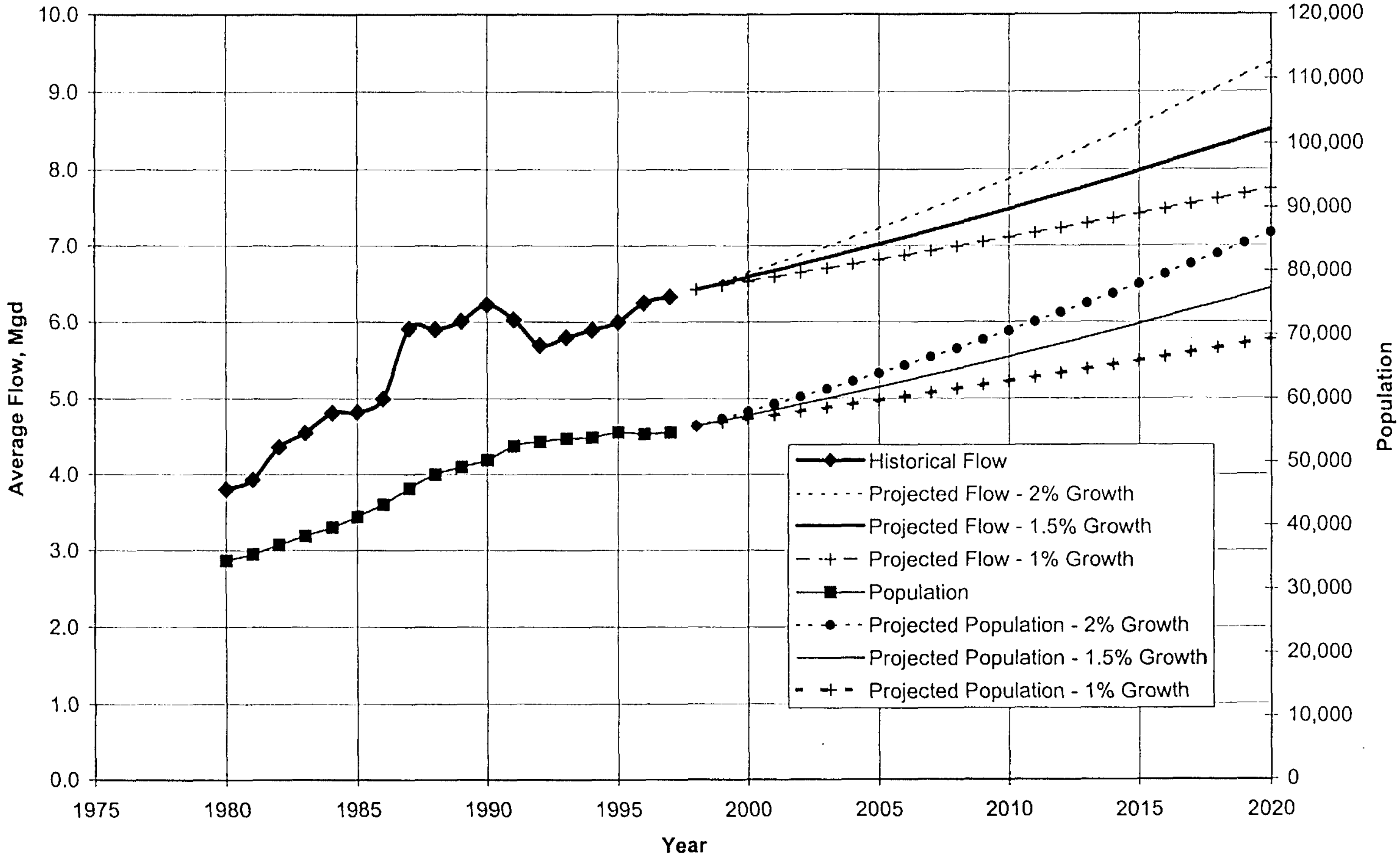
The ratios of future land uses are expected to remain relatively constant over the next 20 years[2]. For residential units, the current proportions are projected to remain approximately constant for at least the next decade at 65 percent single family, 10 percent medium density, and 25 percent high density. If the land uses and residential mix stay constant as expected, wastewater flows should correlate well with projected population.

DOMESTIC WASTEWATER FLOW PROJECTIONS

Average Flow

Historical wastewater flows (annual average) and projected wastewater flows for 1980 through 2020 are shown in Figure 3-1. Flows have generally correlated with population, except for an increase during the late 1980's and a decrease during the latter stages of the 1987 to 1992 drought. The increase during the late 1980's may be partly explained by calibration problems with the old flow meter around 1985 through 1987. A new flow meter was installed in mid-1988. The decrease in flow during 1991 and 1992 was probably due to water conservation efforts. Since the end of the drought, flows have been increasing slightly faster than population as water conservation efforts have probably lessened. This recent pattern has been evident in wastewater flow data for many municipalities in the area.

FIGURE 3-1. POPULATION AND WASTEWATER FLOW



Based on the historical flows and population for 1980 through 1997, the average wastewater flow per resident was 116 gpd/capita. The wastewater flow rate per resident in 1997 was also 116 gpd/capita. These flows included all commercial customers and some industrial customers. New development in Lodi uses mandated low flow toilets and showerheads. This should reduce average flow per new resident to approximately 97 gpd/capita[3]. Flow projections were developed using the 97 gpd/capita for new growth and 1%, 1.5%, and 2% annual population growth. As can be seen in Figure 3-1, the projected average flow range for 2020 is 7.7 to 9.4 million gallons per day (Mgd). The 1.5 percent growth rate curve (8.5 Mgd at Year 2020) will be used for planning purposes in this study.

Wastewater Flow Peaking Factors

Daily wastewater flows for mid 1994 through early 1999 are shown in Figure 3-2. It is interesting to note that Lodi's wastewater flows are higher in summer months than winter months, which is atypical for cities in the Central Valley. As discussed below, this is probably because Lodi's sewer system has much lower wintertime inflow and infiltration than most other cities' sewer systems. In addition, some of Lodi's businesses have greater activity in the summer months. Because of this pattern, the average annual flow is a better parameter to use for planning purposes than average dry weather flow.

The average annual, peak month, peak day, and peak hour flow rates and peaking factors for the August 1994 through January 1999 period are shown in Table 3-1. These flow rates are based on influent flow meter readings. Seasonal wastewater flow variation is shown in Figure 3-3 along with the maximum monthly flow factors for the period. The daily wastewater flow frequency distribution for this period is shown in Figure 3-4. A graph showing sustained peak flow factors versus number of days is provided as Figure 3-5. The values from Figures 3-3 through 3-5 can be multiplied by projected future average flows for use in sizing treatment and disposal/reuse facilities.

The peak hour flow rate for the period was observed for the storm event peaking on Tuesday, February 3, 1998. The peaking factors shown in Table 3-1 are relatively low compared to most municipal wastewater systems.

Table 3-1. Peak Flow Rates and Peaking Factors

	Flow, Mgd	Peaking Factor
Annual Average	6.2	1.0
Peak Month	7.0	1.13
Peak Day, Dry[(a)]	7.3	1.18
Peak Day, Wet[(b)]	8.0	1.29
Peak Hour	11.9	1.92

(a) Daily rainfall less than 0.3 inches
(b) Daily rainfall greater than 1.0 inches

FIGURE 3-2. DAILY INFLUENT FLOWS

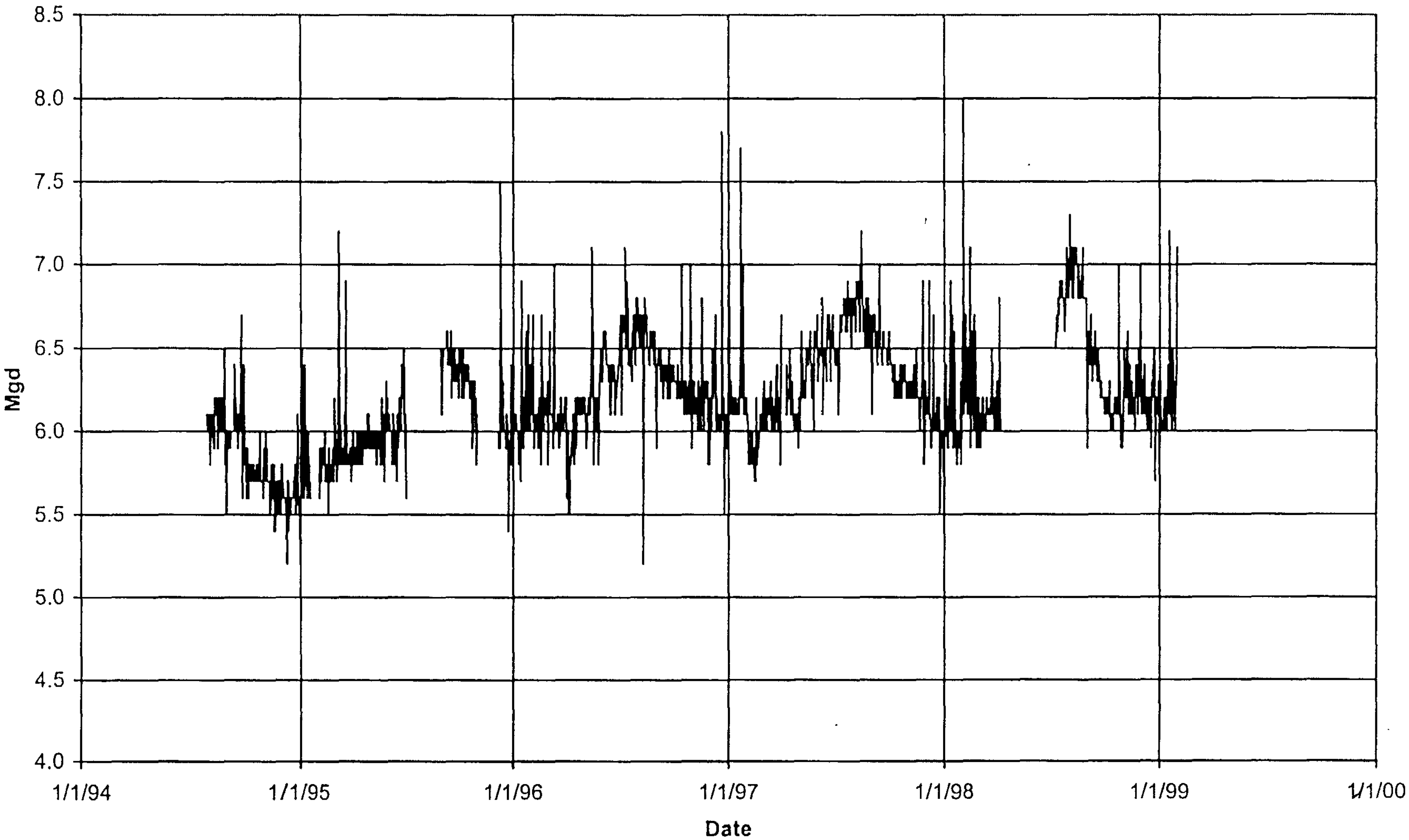


FIGURE 3-3. WASTEWATER FLOW FACTORS BY MONTH (8/94 - 1/99)

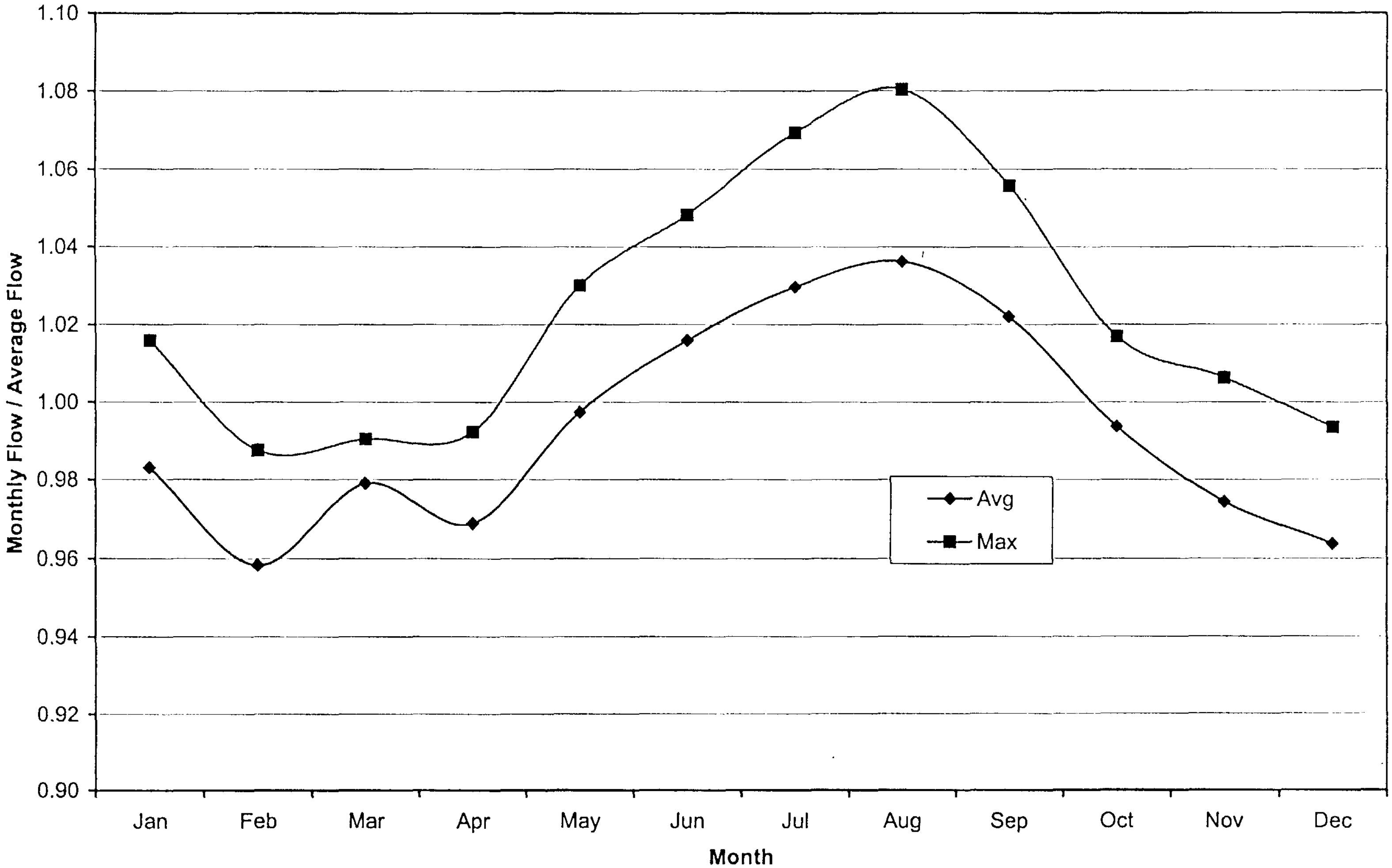


FIGURE 3-4. NORMALIZED DAILY FLOWS FREQUENCY DISTRIBUTION

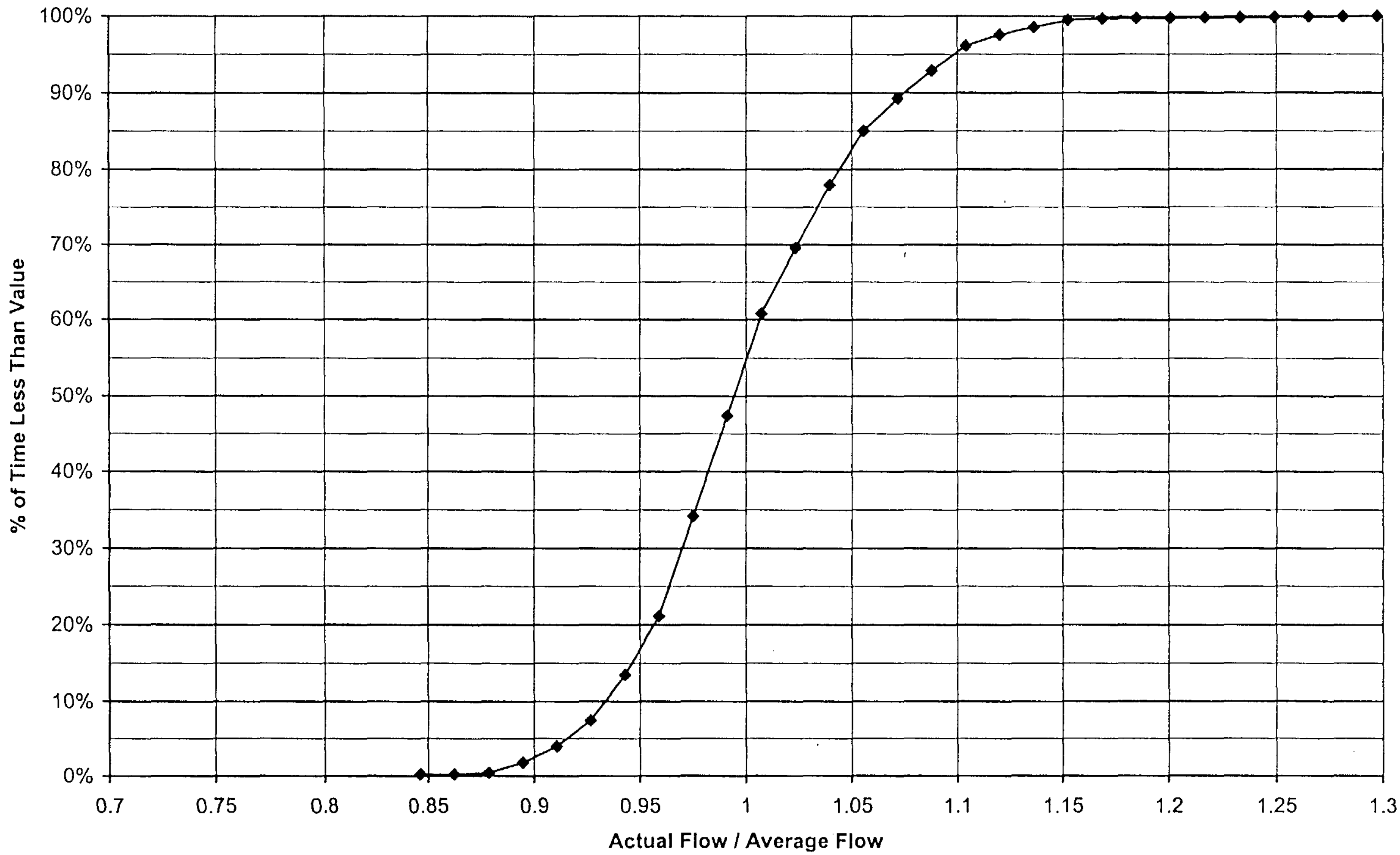
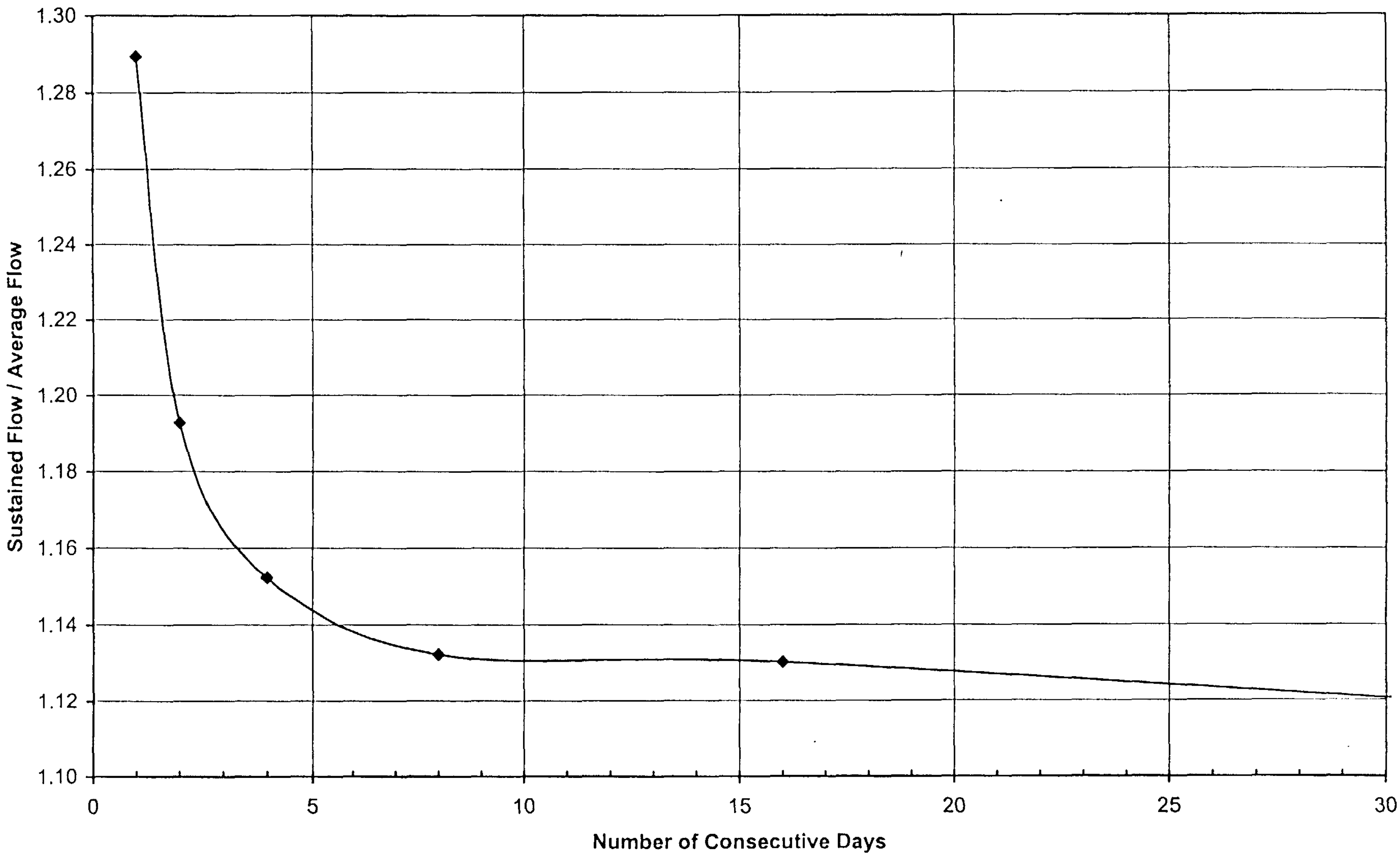


FIGURE 3-5. SUSTAINED PEAK FLOW FACTORS (8/94 - 1/99)



Analysis of Inflow/Infiltration

Direct inflow into wastewater collection systems is defined as surface flows into collection system structures, such as manhole lids, catch basins, yard and roof drains, *etc.* Infiltration is defined as groundwater entering the sewer system through joints and cracks in the system. The purpose of analyzing I/I is to determine whether there is excessive I/I that would be more effective to eliminate through collection system improvements rather than be included in treatment capacity planning.

Groundwater levels are typically highest in late winter months at approximately 40 feet below ground surface. Based on the fact that the wastewater influent flows to the treatment plant are higher in the summer than the winter months (see Figure 3-2), there is no distinguishable infiltration into the Lodi wastewater collection system.

During peak storm events, influent wastewater flows have increased. The average, maximum, and minimum flows during days with rainfall greater than 1.0 inches are compared with the average, maximum, and minimum flows for days with less than 0.3 inches of rainfall in Table 3-2. The peak storm event of February 3, 1998 had an inflow of approximately 2 million gallons over a 24-hour period. The amounts of inflow are very low compared to most wastewater collection systems in the Central Valley of California, and would definitely not be considered excessive.

Table 3-2. Average Inflows During Storm Events (Averages for 1994 through 1998)

	Influent Flow During Dry Periods, Mgd	Influent Flow During Rainstorms,[a] Mgd	Calculated Inflow, gallons
Average for 24 Hours	6.19	6.69	500,000
Average Maximum Hour	7.75	8.96	50,000
Average Minimum Hour	2.94	2.99	2,000

[a] Rainfall greater than 1.0 inch per day

Projected Flows

The average and peak projected flows for planning purposes are listed in Table 3-3. These were calculated using the projected average flows at a 1.5 percent growth rate (Figure 3-1) and the peaking factors from Table 3-1. The frequency distribution and sustained peak flow factors can be used to develop other peaking factors specific to some of the treatment processes.

Table 3-3. Projected Flows, Mgd

	2010	2020
Average	7.5	8.5
Peak Month	8.5	9.7
Peak Day	9.7	11.0
Peak Hour	14.4	16.3

DOMESTIC WASTEWATER QUALITY AND LOADING PROJECTIONS

Concentrations of Major Constituents

The concentrations of major constituents for wastewater entering the Lodi Water Pollution Control Plant are fairly typical of medium strength municipal wastewater. Average and projected concentrations for the major constituents are shown in Table 3-4. Concentrations of minor constituents are addressed in Section 3, Waste Discharge Requirements.

Table 3-4. Average Influent Concentrations of Major Constituents (1995 through 1998)

Item	Units	Historical Average	Projected Year 2010	Projected Year 2020	Existing Treatment Plan Design Criteria
Chemical Oxygen Demand (COD)	mg/L	555	573	584	N/A
Biochemical Oxygen Demand (BOD)	mg/L	272	281	286	220
Total Suspended Solids (TSS)	mg/L	245	253	258	240
Ammonia	mg/L	17.3	17.9	18.2	—
Total Kjeldahl Nitrogen	mg/L	28.5	29.4	30.0	—

Although the land uses and the mix of residential units are not expected to change significantly through Year 2020, new development should have a lower average flow rate per capita. This will result in an increase in the concentrations of major constituents for new development because the constituent loading rates per capita should remain essentially unchanged. This explains the slight increase in concentrations projected over time shown in Table 3-4.

Loading Rates for Major Constituents

Influent loading rates of BOD and TSS have been evaluated for 1994 through 1998. The daily BOD loading rate frequency distribution and sustained peak loading factors are shown in Figures 3-6 and 3-7, respectively. The daily TSS loading rate frequency distribution and sustained peak loading factors are shown in Figures 3-8 and 3-9, respectively. The projected loading rates of major constituents are shown in Table 3-5.

Table 3-5. Projected Average and Sustained Peak Loading Rates in lbs/day

	2010		2020	
Constituent	Average	Sustained Peak 30 Day Loading	Average	Sustained Peak 30 Day Loading
BOD	18,600	21,100	22,600	25,700
TSS	16,700	20,800	20,400	25,400

FIGURE 3-6. NORMALIZED DAILY BOD LOADING FREQUENCY DISTRIBUTION

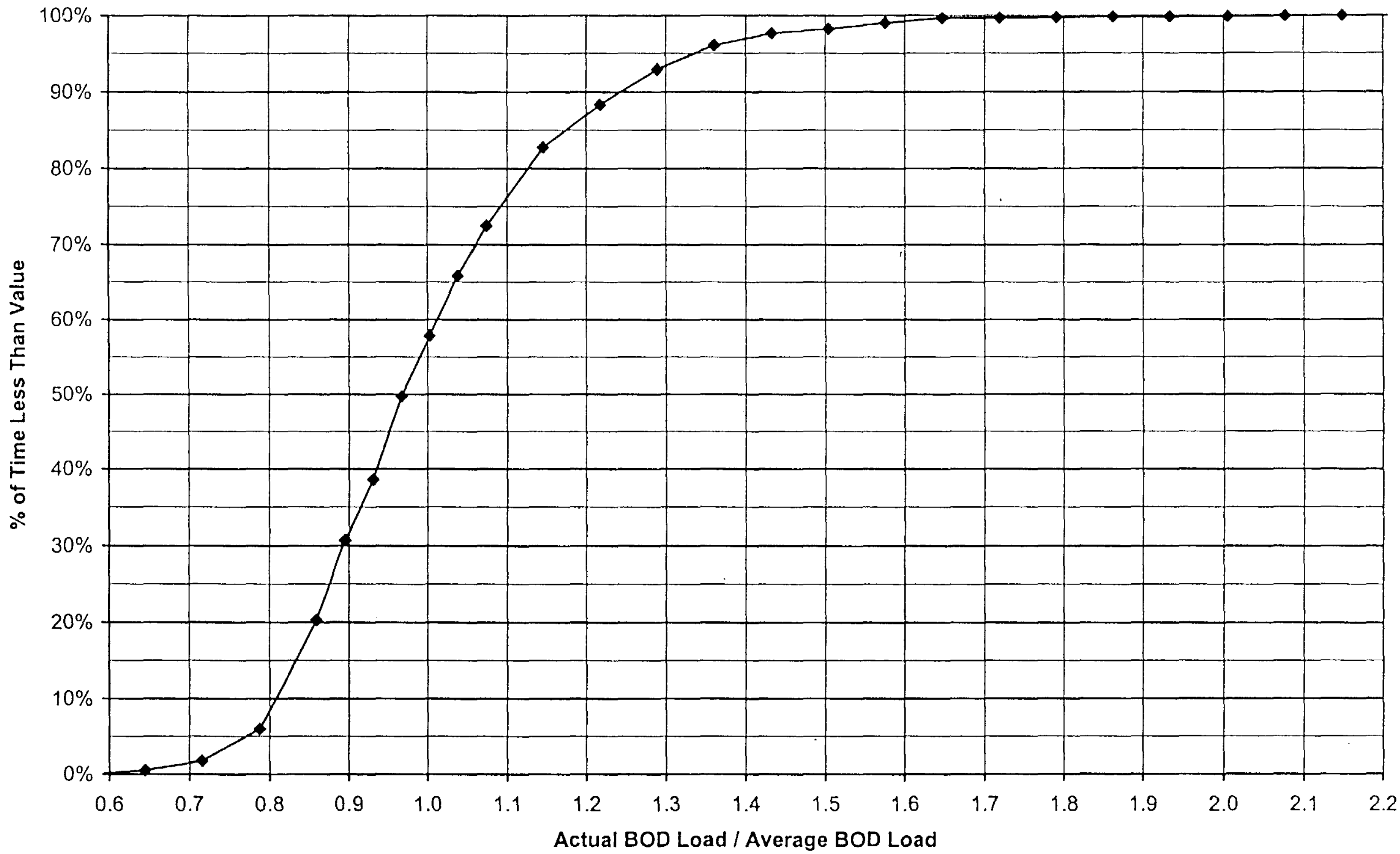


FIGURE 3-7. SUSTAINED PEAK BOD LOADING FACTORS (8/94 - 1/99)

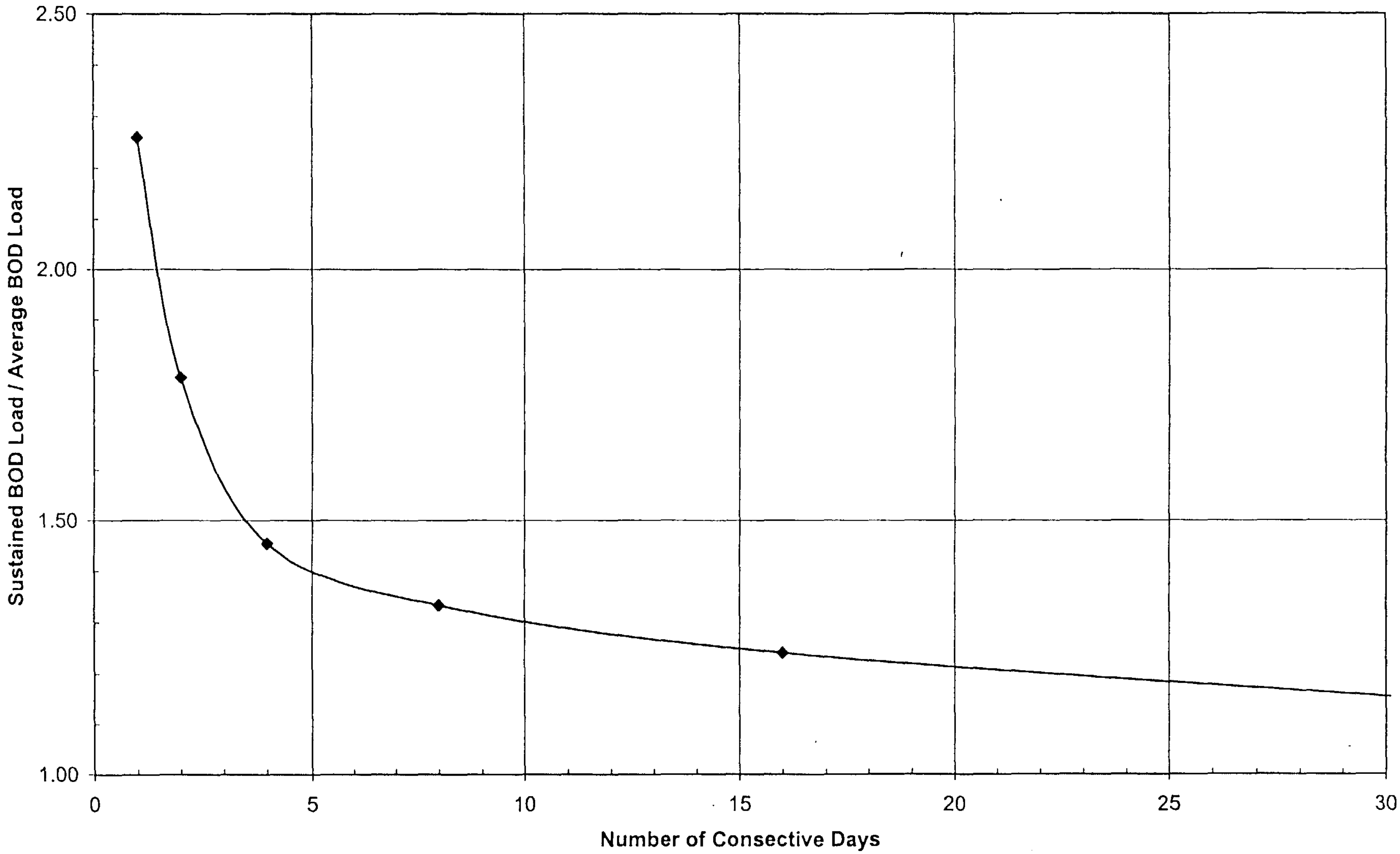


FIGURE 3-8. NORMALIZED DAILY TSS LOADING FREQUENCY DISTRIBUTION

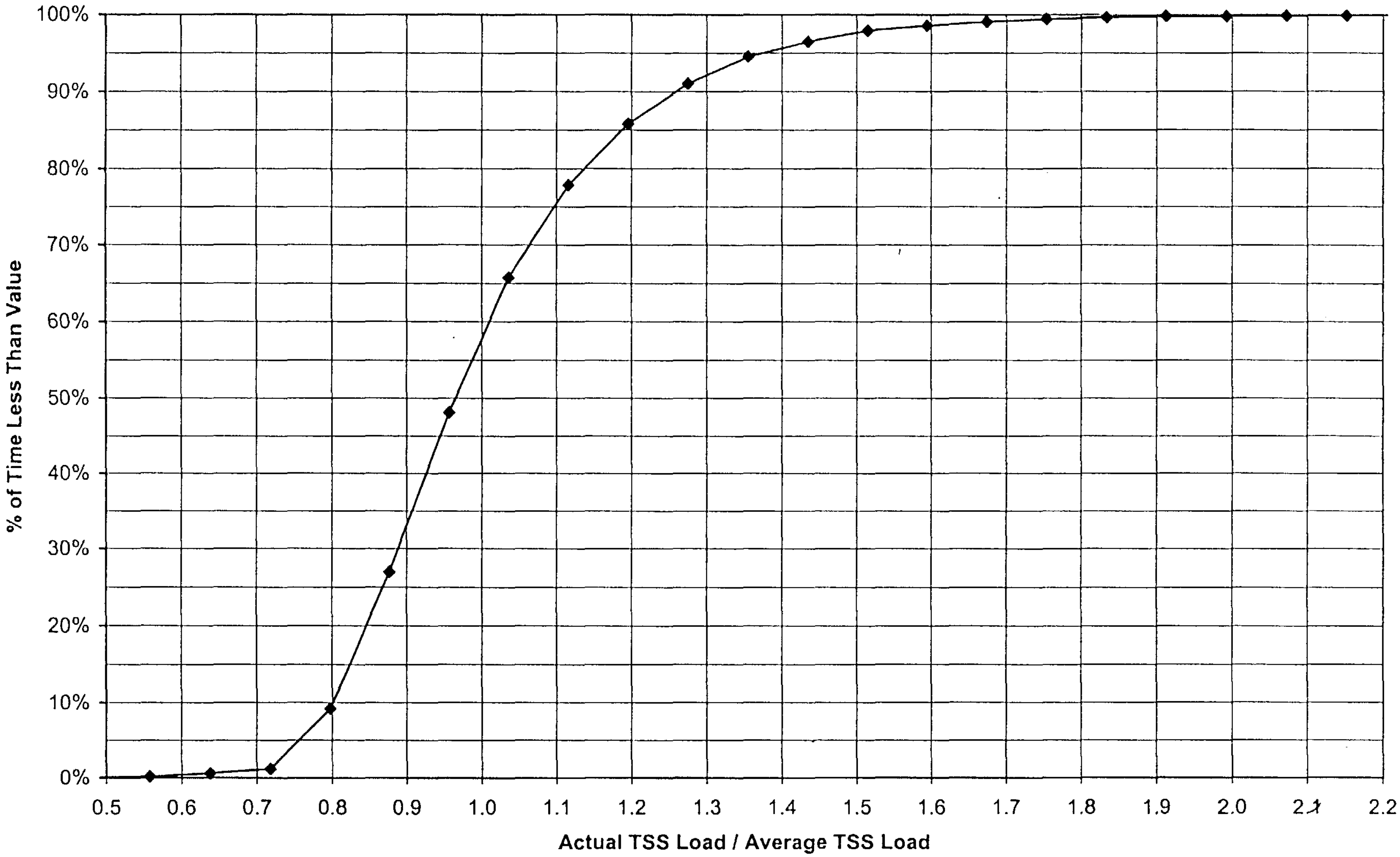
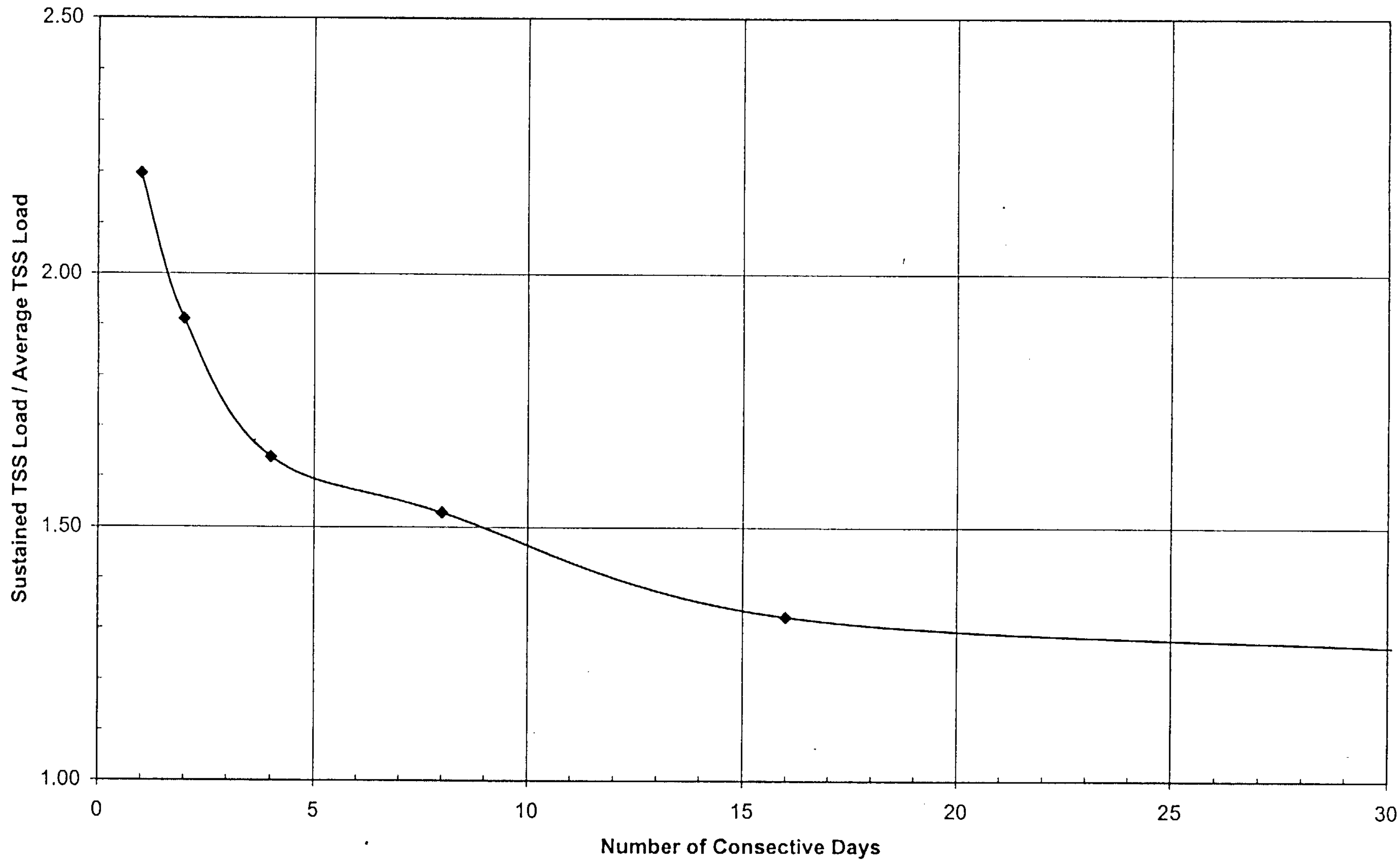


FIGURE 3-9. SUSTAINED PEAK TSS LOADING FACTORS (8/94 - 1/99)



INDUSTRIAL WASTEWATER FLOW AND LOADING PROJECTIONS

The City has a separate 33" sewer trunk line which serves the Pacific Coast Producers (PCP) cannery and several small industries. PCP processes primarily apricots during June, and tomatoes and peaches during June through October. PCP also produces sauces and processes other products, but the flows and loads from these operations are very minor.

The smaller industries connected to the industrial sewer system include a cherry packer, metal finishers and several other industries. The combined annual total flow from these industries (other than PCP) is only approximately 14 million gallons versus the 300 million gallons annually from PCP.

Monthly industrial wastewater flows for 1997 and 1998 are shown in Figure 3-10. The 1997 flows were moderate, and the 1998 flows were the highest on record. In conversations with PCP management, flows in 1998 are not considered to be representative, because PCP had to use extra dilution water to achieve a desired effluent pH. New equipment is being installed to eliminate the need for the extra dilution water. PCP production may expand slightly in the future, but no new major production lines are planned. Based on discussions with PCP management and City staff, the projected flows and loadings were estimated to be the average of 1997 and 1998 values. Projected flows are shown in Table 3-6 and Figure 3-10. Projected loadings are shown in Table 3-6.

Table 3-6. Projected Industrial Flows and Loadings

Month	Flow, Mgal	BOD, lbs	BOD, mg/L	TSS, lbs	TSS, mg/L
Jan	4.5	9,301	251	9,301	251
Feb	3.7	7,369	240	7,369	240
Mar	1.0	741	87	741	87
Apr	1.0	744	87	744	87
May	2.8	5,167	222	5,167	222
Jun	5.9	17,655	362	7,355	151
Jul	53.4	482,508	1,083	137,217	308
Aug	93.9	1,449,844	1,851	715,627	914
Sep	96.5	1,526,763	1,898	829,589	1,031
Oct	35.0	256,053	877	84,035	288
Nov	1.3	1,412	131	1,412	131
Dec	1.5	2,030	158	2,030	158
Totals	300.4	3,759,600	N/A	1,800,600	N/A

Note:

PCP flows for Nov through May not sampled – 300 mg/L BOD and TSS assumed. BOD and TSS for other industries assumed to be an average 100 mg/L.

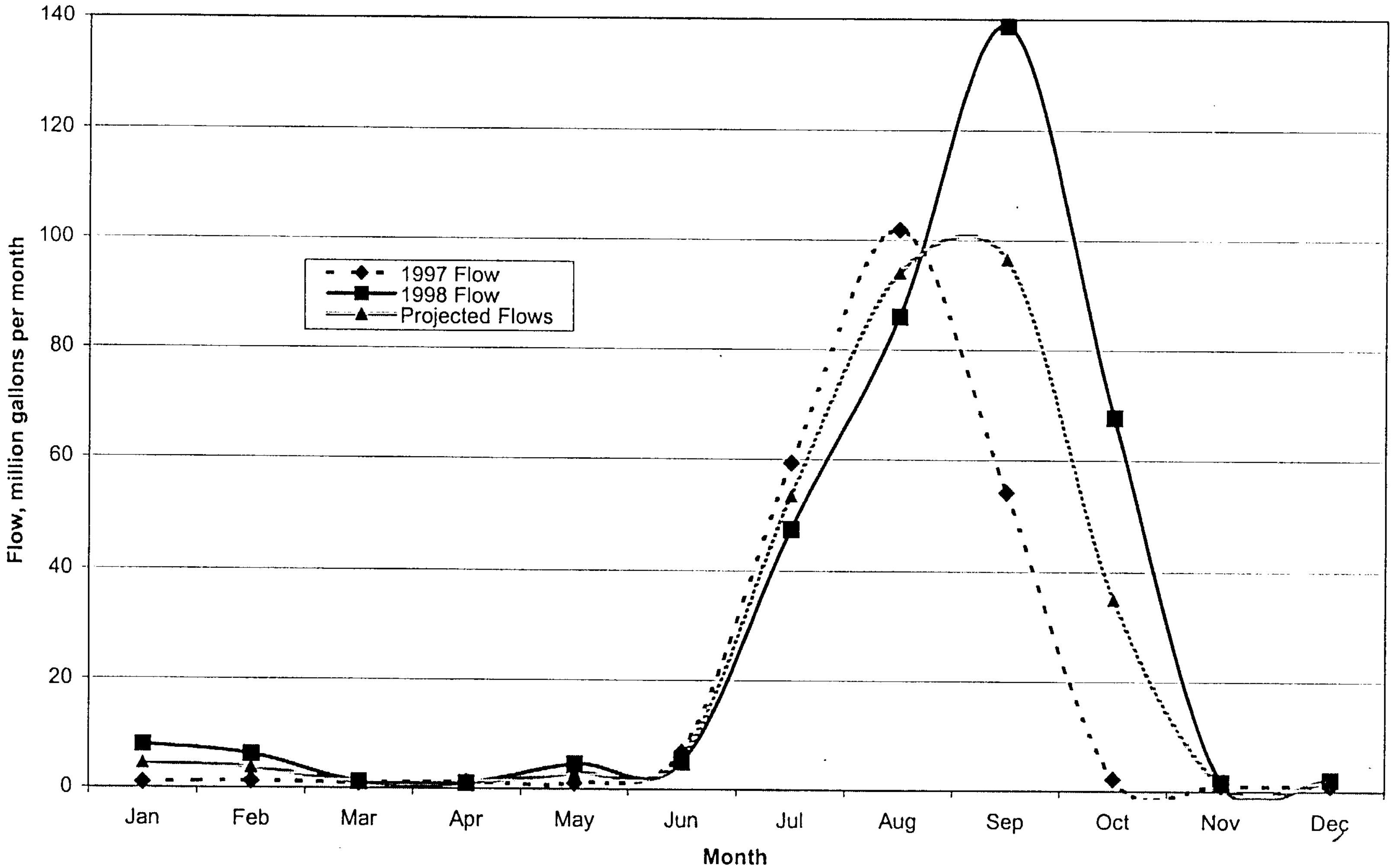
REFERENCES

[1] *City of Lodi Residential Growth Management Schedule 1998*, adopted in accordance with Ordinance #1521 dated September 18, 1991.

[2] Personal phone conversation with Konradt Bartlam, March 1999.

[3] Wastewater flow reduction values calculated from *Wastewater Engineering, Treatment, Disposal, and Reuse.* Tchobanoglous, G. and F.L. Burton. Metcalf and Eddy, Inc. Third Edition, 1991.

FIGURE 3-10. 1997 - 1998 AND PROJECTED INDUSTRIAL WASTEWATER FLOWS



SECTION 4. ANTICIPATED DISCHARGE REQUIREMENTS AND ISSUES

INTRODUCTION

The prime objective for the City of Lodi's (City) wastewater facilities is to reliably meet discharge requirements. The purpose of this task was to formulate a set of anticipated and potential future discharge requirements for use in the development and evaluation of upgrades to the City's treatment, reuse, and discharge facilities.

BACKGROUND

Current Processes and Operations

The current treatment process includes primary clarification followed by conventional activated sludge secondary treatment and chlorine gas disinfection. Primary and secondary solids are further treated in anaerobic digesters and a biosolids lagoon. Most treated effluent is either discharged to surface waters or used for agricultural irrigation of animal feed crops. Small amounts of treated effluent are used for the Mosquito Abatement District fish ponds and the NCPA Power Plant. Biosolids are mixed with effluent and land applied on City owned property.

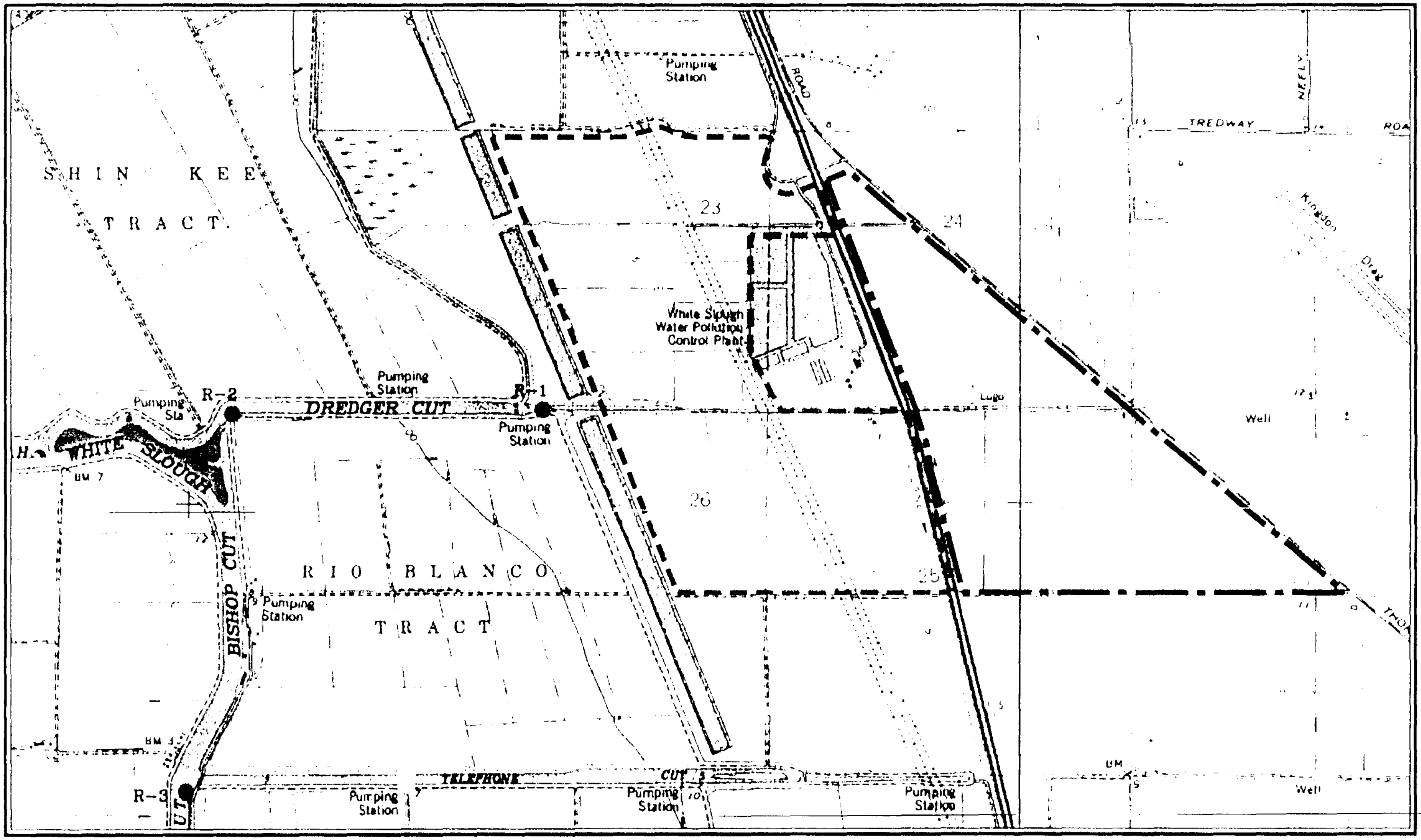
Receiving Waters

The City of Lodi discharges to Dredger Cut, which connects with White Slough and Bishop Cut in the Delta as shown in Figure 4-1. Dredger Cut is a manmade channel which was constructed in the early 1900s to provide drainage for agricultural lands in the area. Dredger Cut, White Slough, Bishop Cut, and other Delta channels are normally dominated by tidal flows. Water from Bishop Cut typically flows to the San Joaquin River and Stockton Deepwater Ship Channel through Disappointment Slough[1] as shown in Figure 4-2. During periods of no exports from the Delta, there is a net flow west from Disappointment Slough towards San Francisco Bay. During periods of high water exports from the Delta, there is a reverse net flow up the San Joaquin River to the confluence with Turner Cut.

Current Discharge Requirements for Municipal Wastewater

Lodi's current (issued March, 1993) discharge requirements for municipal effluent are applied at the confluence of Dredger Cut with Bishop Cut and White Slough (R-2). The current discharge requirements include typical secondary treatment and disinfection limits, biotoxicity requirements, dissolved oxygen limits, nitrogen loading limits for land application, and related requirements. The most significant current discharge requirements related to treatment facility capacities and operation for municipal effluent are listed in Table 4-1.

Effluent from the Water Pollution Control Facility (WPCF) has consistently complied with the existing discharge requirements for BOD, TSS, and toxicity. There were three instances in 1996



LEGEND:

Effluent crop irrigation area

Current crop irrigation area & potential future sports complex

N

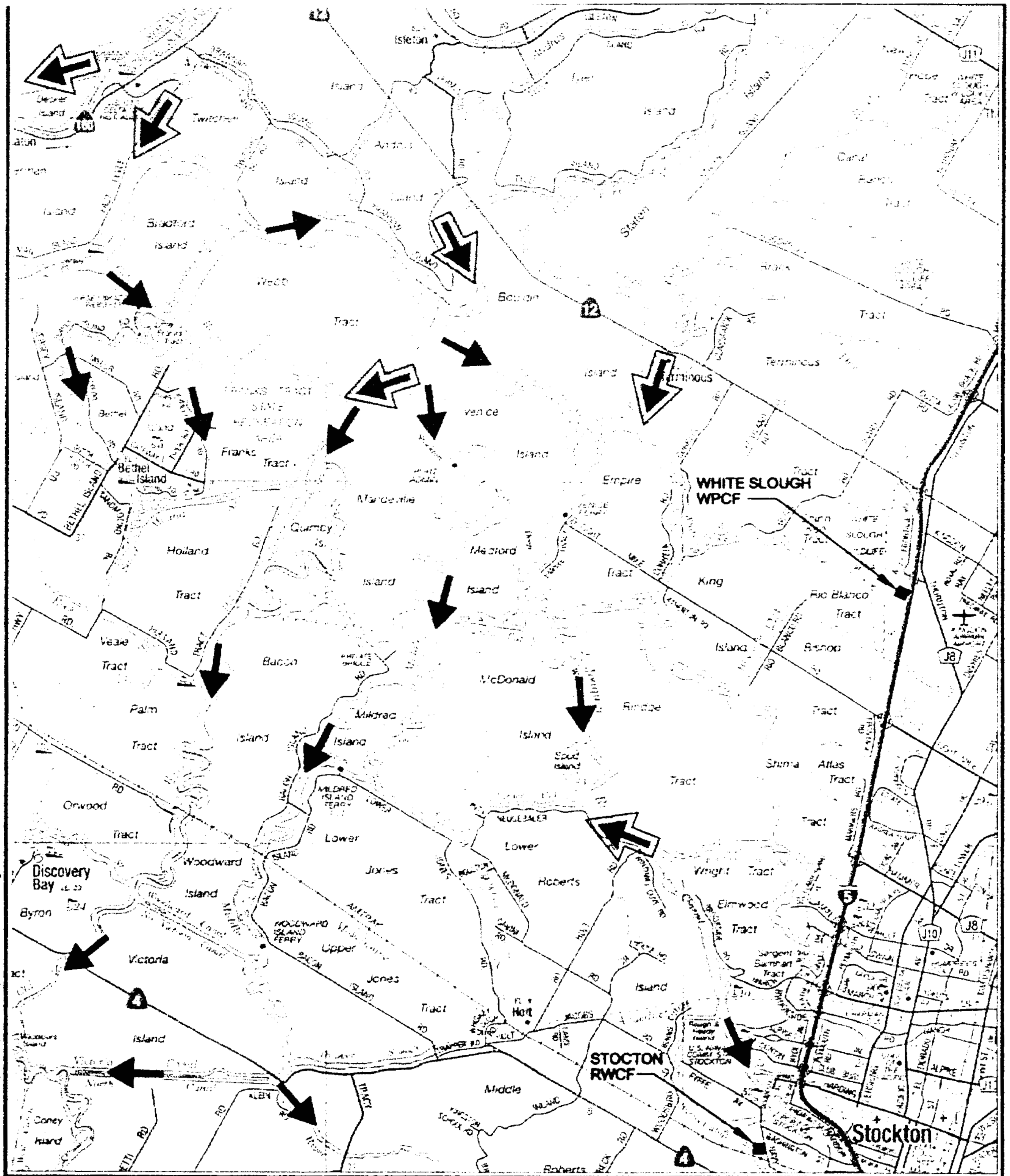
0 1000 2000
SCALE IN FEET

Figure 4-1

City of Lodi
WasteWater Master Plan

Discharge & Reuse Locations

WEST YOST & ASSOCIATES



CAD FILE: I:/213/99-01/213f-4-2.dwg CFG FILE: WYA2500.PCP.MRG DATE: 07-21-99 4:15pm

NOTES:

1. SOURCE OF UNDERLYING MAPPING SHOWN HEREON IS A SCANNED MAP.

LEGEND:

POSITIVE FLOW

REVERSE FLOW

N

NOT TO SCALE

Figure 4-2

City of Lodi
Wastewater Master Plan

DELTA CIRCULATION PATTERNS
LOW FLOWS / HIGH EXPORT

WEST YOST & ASSOCIATES

Table 4-1. Current Requirements for Discharge of Treated Municipal Effluent – Major Parameters

Constituent or Parameter	Units	Limit
BOD (June – Oct 15.)	mg/L	20/40/50[a]
BOD (Oct. 16 – May)	mg/L	30/45/50[a]
TSS (June – Oct 15.)	mg/L	20/40/50[a]
TSS (Oct. 16 – May)	mg/L	30/45/50[a]
Total Coliform	MPN/100 mL	23
Acute Toxicity	Survival one/three	70%/90%
Chronic Toxicity	TCUs	10
Dissolved Oxygen (in White Slough)	mg/L	5.0 minimum

(a) Monthly average/weekly average/daily maximum.

and one instance in 1999 when individual biotoxicity test results were outside the allowable survival rate, but the adverse results did not occur in consecutive tests so as to cause a violation of the permit requirements. The suspected cause for the instances of toxicity in 1996 was excessive use of sulfur dioxide for dechlorination. The current discharge requirements do not include discharge limits for specific trace toxins.

Reclamation Requirements

The City irrigates animal feed crops on its own land surrounding the treatment plant using a mixture of non-disinfected secondary effluent, digested biosolids, and industrial (mostly cannery) wastewater. The current discharge requirements for the secondary effluent are 40 mg/L BOD and 0.2 mL/L settable matter (SM) (monthly averages). The current discharge requirements also contain other operational restrictions derived from Title 22, Division 4 Reclamation Requirements or Department of Health Services guidelines.

The reclamation requirements state that nutrient loading of the reclamation area shall not exceed the crop demand. The City's nitrogen loading rates have been consistently below agronomic use rates. However, nitrate concentrations in several of the shallow groundwater monitoring wells have exceeded the 10 mg/L drinking water standard. The causes of the relatively high nitrate levels have not been determined.

Solids Disposal/Reuse Discharge Requirements

Biosolids disposal and reuse practices are required to conform with Section 405(d) of the Federal Clean Water Act. In addition, nitrogen loading rates from biosolids are included in the total reported nitrogen loadings for the City's land. Total nitrogen loading rates are not to exceed crop uptake and denitrification rates in order to protect groundwater quality.

Industrial Wastewater Discharge Requirements

Because the industrial wastewater is applied directly to the land, there are no specific effluent quality requirements. The main requirements are related to the prevention of odors and groundwater impacts.

Receiving Waters Modeling

A dilution study of White Slough and Bishop Cut receiving waters was performed by Whitley Burchett & Associates in 1994. The average dilution ratio over the tidal cycle at the confluence of White Slough and Bishop Cut (monitoring point R-2, see Figure 4-1) was estimated to be approximately 8:1 for an effluent flow of approximately 6 Mgd.

A more detailed model of Dredger Cut, White Slough, and Bishop Cut was completed in 1998 by Gary Litton and Jason Nikaido at the University of the Pacific.[2] The average dilution in Dredger Cut was estimated to be 2:1 for an 8.5 Mgd effluent flow rate. The average dilution at the east side of the confluence of Dredger Cut and White Slough (R-2) was estimated to be 4:1.

Sampling and modeling dissolved oxygen concentrations within Dredger Cut were the main focus of the Litton study. One of the most significant results was that dissolved oxygen (DO) levels in Dredger Cut dropped below 5 mg/L on several occasions during the testing period even when the treatment plant was not discharging, indicating impacts from other non-point sources of pollution. The dissolved oxygen model predicted that treatment plant effluent with 20 mg/L BOD would cause D.O. levels in Dredger Cut to drop below 5 mg/L at low slack tides. At an effluent BOD concentration of 10 mg/L, the D.O. concentration was predicted to remain above 5 mg/L at low slack tides assuming inputs from non-point pollutions sources were not severe.

POTENTIAL CHANGES TO DISCHARGE LOCATION AND BENEFICIAL USES

Discharge to White Slough/Bishop Cut

Construction of an outfall pipeline or channel to White Slough or Bishop Cut is a potential alternative for providing improved effluent dilution flows. Water quality objectives for the receiving water would be easier to meet with more dilution. A diffuser across the most active portion of the channel would provide an estimated average dilution of approximately 20:1 based on the Whitley Burchett Study. Further study is needed to verify dilution ratios in White Slough/Bishop Cut and the variability in dilution ratios.

Sports Complex

A sports complex has been proposed for 400 acres in the southeastern portion of the City's property. This complex would include a significant portion of grass fields which would need irrigation. The current project concept calls for the use of up to 2.5 Mgd of treated effluent meeting Title 22, Division 4 Reclamation Requirements for unrestricted irrigation as the irrigation water source for the fields.

FUTURE DISCHARGE REQUIREMENTS

General

The Regional Board is currently preparing new waste discharge requirements for the City. These will probably become effective later in 1999. For discussion purposes, these anticipated new waste discharge requirements are referred to in this report as "anticipated discharge requirements". Requirements which may be imposed in future permits are referred to as "potential future discharge requirements". Anticipated and potential future discharge requirements presented in this report were developed from discussions with Regional Board staff, draft 1999 discharge requirements, and the review of relevant research and guidelines.

Municipal Effluent Discharge to Dredger Cut

Discharge to Dredger Cut will need to satisfy current and future discharge requirements mandated by the EPA and Regional Water Quality Control Board. The most significant new requirements will be related to trace toxins, dissolved oxygen objectives, disinfection, and biosolids reuse. Current, anticipated, and potential future discharge requirements are listed in Table 4-2 along with average and peak values from the last 5 to 10 years for comparison purposes. The anticipated and future discharge requirements include an assumed 2:1 dilution factor in Dredger Cut for water quality objectives. The enlarged bold values are those likely to be difficult to meet with current facilities. Complete results from the City's trace toxins sampling program since December 1992 are shown in Appendix [redacted]

The current discharge requirements shown in Table 4-2 are for Delta water quality objectives at Location R-2 in White Slough. Anticipated and potential future discharge requirements are based on meeting Delta water quality objectives at Location R-1 in Dredger Cut. Anticipated BOD requirements are effectively dictated by the DO objective for Dredger Cut. As discussed previously, modeling indicates that the 5 mg/L DO requirement cannot be reliably met for effluent with BOD above 10 mg/L. Potential future TSS requirements are dictated by whether or not filtration is required as part of the effluent disinfection system.

Contact recreation and agricultural irrigation are listed in the Basin Plan as beneficial uses of the Delta. The anticipated and potential future disinfection requirements for discharge to surface waters with recreation and irrigation beneficial uses are difficult to determine with certainty at this time. The Department of Health Services has made the general recommendation that discharges to streams with little dilution should be treated to the same levels as required for unrestricted irrigation water as per Title 22, Division 4. It is unclear whether that recommendation is legally applicable since it was not developed in accordance with the California Water Code. The recommendation is also very non-specific for situations where there is a significant amount of dilution water for the effluent. Therefore, the coliform numbers in Table 4-2 conservatively assume that the most stringent recommendations will be applied through some legal means in the future.

The potential for nutrient mass limits in the future is based on the fact that Total Mass Daily Loadings are being proposed for Stockton and other dischargers who may contribute to the dissolved oxygen sag in the Stockton Deepwater Ship Channel. The current proposals only address BOD limits, but excess nutrients are recognized as contributors to the problem. Lodi's

Table 4-2. Current and Potential Future Discharge Requirements For Discharge to Dredger Cut

Constituent or Parameter	Units	Current	Anticipated	Potential Future	Historical Average	Historical Peak
BOD	mg/L (30 day)	30	**10**	**10**	8.4	16
TSS	mg/L (30 day)	30	**10**	**10**	10.0	24
D.O.	mg/L (receiving water)	5 at White Slough	**5**[(a)]	**5**[(a)]	5.2	0.6 (min.)
Temperature	Δ°F (receiving water)	5 at White Slough	**4**[(a)]	**4**[(a)]	9.3	21.6
Chlorine Residual	mg/L	0.1	0.02[(b)]	0.02[(b)]	<0.1	4.6
Coliform (summer)	MPN/100 mL	23	**2.2 filtered**[(c)]	**2.2 filtered**[(c)]	2	13[(d)]
Coliform (winter)	MPN/100 mL	23	23	**2.2 filtered**[(c)]	2	13[(d)]
Lead	ug/L	n/a	n/a	5.6[(b)]	<5 (total)	10 (total)
Zinc	ug/L	n/a	**130**[(e)]	**100**[(a)]	105 (total)	160 (total)
Cyanide	ug/L	n/a	10[(a)]	10[(a)]	<10	49
Mercury	ug/L	n/a	N/A	**0.050**[(e)] **or 0.012**[(b)]	<0.2	0.63
Bis-2 ethyhexyl phthalate	ug/L	n/a	n/a	**11.8**[(e)]	<15 (median)	190
Chloroform	ug/L	n/a	**n/a**	**10.4**[(e)]	21	102
Chronic Toxicity	TCU	10	**2**[(a)]	**2**[(a)]	1 (median)	>16
Acute Toxicity	% survival	70/90	70/90	70/90	99.2	85 (min.)
Ammonia	mg/L	n/a	n/a	**5.2**[(b)]	1.2	6.5
Total Nitrogen	mg/L	n/a	n/a	**TML**[(f)]	9.4	
Total Phosphorous	mg/L	n/a	n/a	**TML**[(f)]	0.23	

(a) Basin Plan, metals limits expressed as dissolved concentrations.
(b) EPA Ambient Water Quality Criteria, metals criteria expressed as dissolved concentrations (imposed through Basin Plan narrative toxicity requirements), 2:1 dilution assumed for 4-day criteria.
(c) Proposed DHS/Regional Board guidelines, may be incorporated into future Basin Plan.
(d) Monthly median, 9 days have exceeded 500 MPN/100mL since Jan 1994.
(e) Draft EPA California Toxics Rule, metals limits expressed as dissolved concentrations.
(f) No specific requirements pending, Total Mass Limits may be applied in the future.

discharge only appears to impact the lowermost reach of the Deepwater Ship Channel under high export conditions. This reach below (northwest of) Turner Cut does not experience dissolved oxygen sags which violate Delta water quality objectives[3] (see Figure 4-2). However, it would be prudent to begin considering the possibility of nutrient limitations in long term planning.

Compliance with Anticipated Requirements. The treatment plant was designed to produce an effluent with a BOD concentration of 20 Mg/L at 8.5 Mgd without nitrification. The WPCF has historically produced effluent with an average BOD of less than 10 mg/L and essentially all ammonia converted to nitrate (full nitrification). There have been a few recent instances when the City had difficulty achieving full nitrification, so it appears that the plant may be reaching its nitrification capacity limit at approximately 6.5 Mgd. Disinfection and biotoxicity test results could be adversely affected if the treatment plant cannot fully nitrify. Reliably achieving 10 mg/L BOD could also become more difficult as the plant approaches its 8.5 Mgd original design capacity.

Since the treatment process does not currently include filters, meeting Title 22, Division 4 treatment, and disinfection requirements would not be possible. However, it may be possible to avoid the anticipated summer disinfection limits by discharging only to land during the irrigation season.

Some anticipated discharge requirements related to trace toxins may be difficult to consistently meet. The plant effluent has contained concentrations of zinc ranging up to 160 mg/L (as total recoverable metal). This could be in excess of the anticipated discharge limits for zinc, depending upon the relationship between total and dissolved zinc for the treatment plant effluent. The plant effluent contained cyanide in excess of the anticipated limit on two occasions in 1995 and one occasion in 1996.

During winter months, the plant effluent is considerably warmer than the water in Dredger Cut. Draft permit requirements specify that the surface water temperature cannot be raised by more than 4°F at any location. While it is unlikely that aquatic life is adversely affected by the warmer water temperature near the discharge, there could be a technical violation of the temperature requirement. If a mixing zone is allowed, the temperature objective may be achievable.

Compliance with Potential Future Requirements. The potential future requirements in Table 4-2 which are more restrictive than the anticipated discharge requirements are the requirements for ammonia, mercury, zinc, chloroform, and nutrients. As discussed above, the treatment plant probably cannot reliably nitrify at flows much greater than 6.5 Mgd. Therefore an ammonia limit would be difficult to meet.

Although there has been only one sampling result which contained detectable mercury, the detection limit for mercury (0.20 ug/L) was higher than EPA ambient water quality criteria for chronic toxicity (0.012 ug/L). Based on effluent quality measurements to date, meeting potential future requirements for mercury, zinc, and nutrients would not be possible with existing treatment facilities.

Chloroform and other trihalomethanes are formed as byproducts of chlorine disinfection. There are no established diversions for drinking water use in the northwestern portion of the Delta. It is unclear what mixing zone and dilution would be allowed for this water quality objective since it is intended to protect sources of drinking water rather than aquatic life. Assuming only the dilution in Dredger Cut, this potential requirement would be very difficult to meet with existing facilities. If dilution beyond Dredger Cut were allowed to be considered, the chloroform objective could probably be satisfied.

Municipal Effluent Discharge to White Slough/Bishop Cut

As discussed previously, one of the obvious alternatives for the City is to construct an outfall to White Slough/Bishop Cut. This would provide more dilution for meeting receiving water quality objectives. In addition, water at R-2 has contained dissolved oxygen concentrations substantially greater than the 5.0 mg/L water quality objective for the Delta almost all the time. Water at R-3 in Bishop Cut (see Figure 4-1) always contained dissolved oxygen substantially above 5.0 mg/L during the 1995 to 1998 monitoring period. Taking the greater available dilution into account, the current, near-term anticipated, and potential future discharge requirements are listed in Table 4-3. Anticipated and potential future effluent limits shown for trace toxins are based on either an assumed 20:1 average dilution and continuous concentration criteria or maximum concentration criteria, whichever is more restrictive. Values shown in enlarged bold are those likely to be difficult to meet with current facilities.

Compliance with Anticipated Requirements. If treated effluent is discharged directly to White Slough or Bishop Cut, effluent quality similar to that achieved historically should be adequate to satisfy anticipated discharge requirements. There may be some difficulty achieving consistent disinfection results as flows increase, especially if nitrification cannot be assured throughout the year.

Compliance with Potential Future Requirements. Disinfection requirements could become more stringent in the future depending upon actual dilution ratios in White Slough/Bishop Cut. Total mass limits could be adopted for BOD and nutrients in the future. New treatment processes would probably be required should nutrient loading limits ever be adopted for the Delta.

Municipal Effluent Reuse - Unrestricted Irrigation

The anticipated discharge requirements for unrestricted irrigation of fields at the proposed Sports Complex or food crops are shown in Table 4-4. These requirements generally reflect standard Reclamation Requirements from Title 22, Division 4 of the Water Code. New tertiary filtration treatment facilities would be required to satisfy these requirements.

Municipal Effluent Reuse —Animal Feed Crops

Discharge requirements for irrigation of animal feed crops are not anticipated to change substantially in the future. These are shown in Table 4-5.

The anticipated and future potential requirements for animal feed crop irrigation should be easy to satisfy with existing treatment processes. Effluent disinfection could potentially be required to satisfy future site specific concerns regarding potential public or farm worker contact with the effluent.

DRAFT

Table 4-3. Current and Potential Future Discharge Requirements For Discharge to White Slough/Bishop Cut

Constituent or Parameter	Units	Current	Anticipated	Potential Future	Historical Average	Historical Peak
BOD	mg/L (30 day)	30	30	TML	8.4	16
TSS	mg/L (30 day)	30	30	30	10.0	24
D.O.	mg/L (receiving)	5	5[a]	5[a]	9.3	2.9 (min.)
Temperature	Δ°F (receiving)	20	4[a]	4[a]	9.3	21.6
Chlorine Residual	mg/L	0.1	0.02[b]	0.02[b]	<0.1	4.6
Coliform	MPN/100 mL	23	23	**2.2[c]**	2	13
Zinc	ug/L (receiving)	n/a	100[a]	100[a]		
Zinc	ug/L (effluent)		**130[d]**	**130[d]**	105	160 (total)
Cyanide	ug/L (receiving)	n/a	10[a]	10[a]		
Cyanide	ug/L (effluent)		22[d]	22[d]	<10	49
Mercury	ug/L (receiving)	n/a	**0.050[d]**	**0.012[b]**		
Mercury	ug/L (effluent)		1.4[d]	1.4[d]	<0.2	0.63
Bis-2 ethyhexyl phthalate	ug/L	n/a	n/a	118[d]	<15 (median)	190
Chloroform	ug/L	n/a	n/a	104[d]	21	102
Chronic Toxicity	TCU	10	10[a]	10[a]	1 (median)	>16
Acute Toxicity	% survival	70/90	70/90	70/90	99.2	85 (min.)
Ammonia	mg/L	n/a	n/a	14.9	1.2	6.5
Total Nitrogen	mg/L	n/a	n/a	**TML[e]**	9.4	
Total Phosphorous	mg/L	n/a	n/a	**TML[e]**	0.23	

[a] Basin Plan.
[b] EPA Ambient Water Quality Criteria (imposed through Basin Plan narrative toxicity requirements).
[c] Proposed DHS/Regional Board guidelines, may be incorporated into future Basin Plan.
[d] Draft California Toxics Rule.
[e] No specific requirements pending, future Total Mass Limits may apply.

Table 4-4. Anticipated Discharge Requirements for Unrestricted Irrigation

Constituent or Parameter	Units	Anticipated
BOD	mg/L	**10**
TSS	mg/L	**10**
Turbidity	NTU	**2**
Coliform	MPN/100 mL	**2.2 filtered**
Ammonia + Nitrate	lbs/ac/yr	Agronomic use

Table 4-5. Current and Potential Future Discharge Requirements For Irrigation of Animal Feed Crops

Constituent or Parameter	Units	Current	Anticipated	Potential Future
BOD	mg/L	40	30	30
TSS	mg/L	n/a	30	30
Coliform	MPN/100 mL	Secondary	Secondary	23
Ammonia + Nitrate	lbs/ac/yr	Agronomic use	Agronomic use	Agronomic use

Industrial Effluent Irrigation Reuse

The industrial wastewater is principally from the Pacific Coast Producers (PCP) cannery. The main discharge requirements for industrial wastewater involve the prevention of nuisance odors and adverse impacts to groundwater. Current, anticipated, and potential future requirements are listed in Table 4-6.

Table 4-6. Current and Potential Future Discharge Requirements For Irrigation with Industrial Wastewater

Constituent or Parameter	Units	Current	Anticipated	Potential Future
BOD	lbs/ac/day	n/a	n/a	200
Hydrogen Sulfide	mg/L	n/a	n/a	**1.0**
Dissolved Oxygen	mg/L	n/a	n/a	**1.0 minimum**
Salinity	lbs/ac/yr	n/a	No significant impacts	No significant impacts
Ammonia + Nitrate	lbs/ac/yr	Agronomic use	Agronomic use	Agronomic use

Distribution facilities may need some improvements to minimize the potential for sulfide generation and odors from industrial wastewater irrigation. Average fixed mineral TDS for the industrial effluent is approximately 800 mg/L *vs.* 400 to 500 mg/L for the municipal effluent. The industrial wastewater would be considered good quality for irrigation and should not cause significant impacts to groundwater. A zero degradation objective applied to major mineral constituents is a remote future possibility. It would be nearly impossible to meet if strictly interpreted and applied to shallow groundwater directly under the irrigation fields.

Biosolids Disposal/Reuse

The City currently produces approximately 320 metric tons (dry weight basis) of biosolids annually. The existing anaerobic digesters and lagoon produce Class "B" biosolids under the new Federal 40 CFR Part 503 regulations. The biosolids are mixed with the irrigation water and applied via surface irrigation to land designated for annual row crops (approximately 300 acres irrigation in any one year). A total of 600 acres (243 ha) is used for biosolids application on a multi-year rotation. The anticipated discharge requirements for biosolids are derived from the Federal Part 503 regulations and the proposed General Biosolids Permit authored by the Regional Board. These requirements generally address maximum concentrations and loading rates for heavy metals and operational procedures to prevent pathogen transmission. The maximum concentrations and loading rates for metals and other constituents under the Part 503 regulations are included in Table 4-7. The proposed General Biosolids Permit is not applicable to areas in the statutory Delta, but many of the operational requirements from the General Biosolids Permit will undoubtedly be applied to Lodi's site specific permit.

Table 4-7. Anticipated Biosolids Limits

Constituent	Ceiling Concentration, mg/kg	Max. Cumulative Loading, kg/ha	Historical Concentration, mg/kg	Average Loading, kg/ha/yr	Life of Existing Site, years
Arsenic	75	41	7.8	0.01	4,100
Cadmium	85	39	5.6	0.007	5,600
Copper	4,300	1,500	246.0	0.32	4,700
Lead	840	300	30.5	0.04	7,500
Mercury	57	17	5.5	0.007	2,400
Molybdenum	75	—	11.1	0.014	—
Nickel	420	420	15.0	0.019	22,000
Selenium	100	100	1.2	0.002	50,000
Zinc	7,500	2,800	604.0	0.80	3,500
Total N (lbs/ac/yr)	Agronomic use	Agronomic use	—	—	—

Compliance with Anticipated Biosolids Limits. The biosolids limits should be reasonably easy to comply with as long as sufficient land continues to be available for biosolids application. The distribution uniformity of biosolids may have to be improved to effectively utilize all available land.

SUMMARY AND CONCLUSIONS

Discharge to Dredger Cut will require more highly treated effluent than is reliably obtainable with current facilities, especially during summer months. Compliance with dissolved oxygen, disinfection, and zinc requirements will be problematic. During winter months, disinfection requirements are not likely to be as stringent, but dissolved oxygen and zinc requirements will still be difficult to meet. Potential future requirements for other trace toxins and nutrients may also be impossible to meet with current facilities.

Requirements for discharge to White Slough/Bishop Cut could probably be satisfied using existing treatment processes with the addition of capacity for full nitrification. Future mass loading requirements for nutrients and BOD could become more restrictive.

Land application and irrigation reuse of effluent on animal feed crops would have the least restrictive treatment requirements. Landscape irrigation or irrigation of food crops would require compliance with Title 22 Reclamation requirements, including tertiary filtration and advanced disinfection.

Dilution flows and dissolved oxygen impacts in White Slough and Bishop Cut should be evaluated for a discharge into the west portion of Bishop Cut at the junction with White Slough. The potential impacts of BOD and nutrients in downstream Delta channels should also be evaluated.

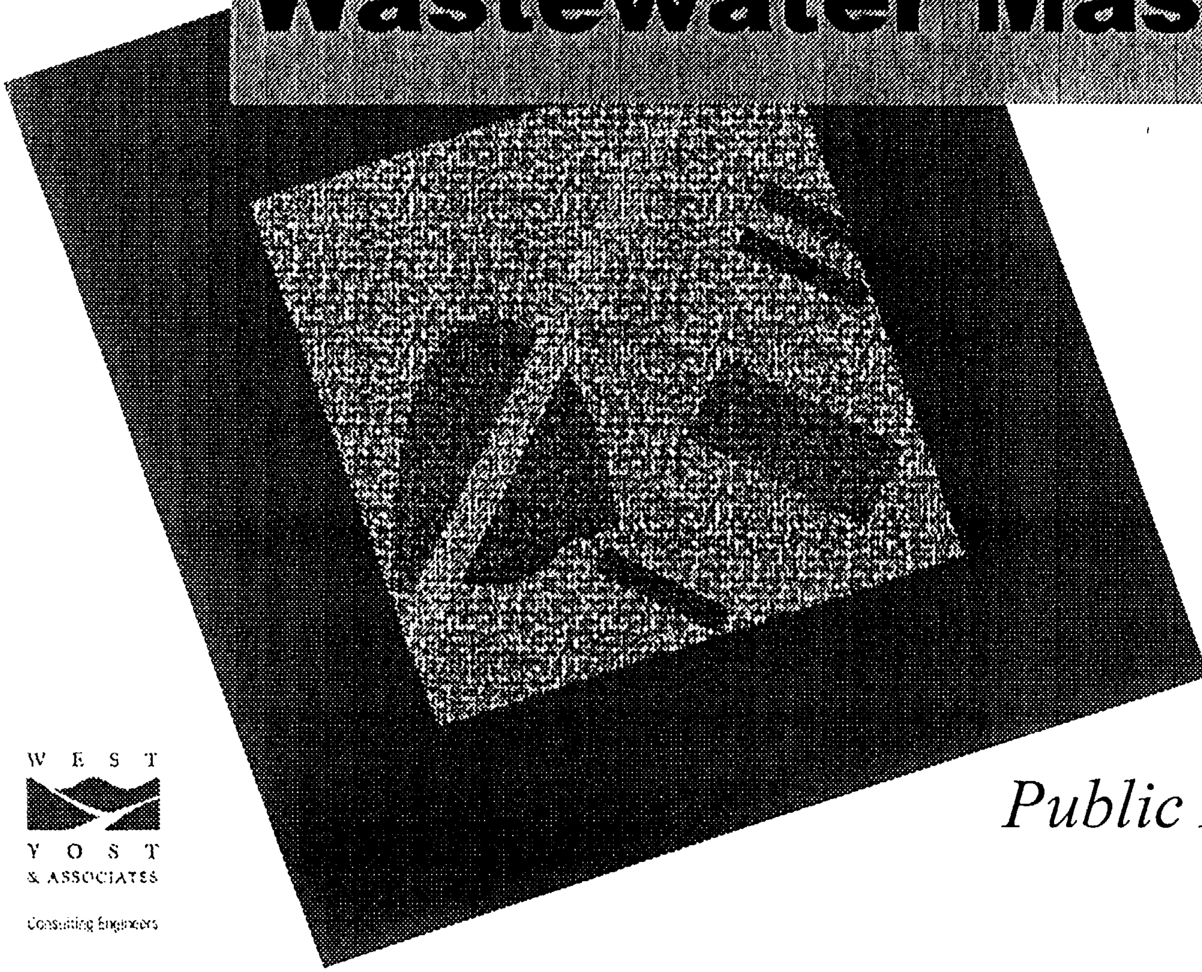
---

1 State Water Resources Control Board. *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. Pub. # 95-1WR, May, 1995.

2 Litton, G.M. and J. Nikaido. *Water Quality Impact Report White Slough Water Pollution Control Facility*. Draft, University of the Pacific, Department of Civil Engineering, October, 1998.

3 Jones and Stokes Associates. *Potential Solutions for Achieving the San Joaquin River Dissolved Oxygen Objectives*. Prepared for DeCuir and Somach and the City of Stockton. June, 1998.

City of Lodi
Wastewater Master Plan



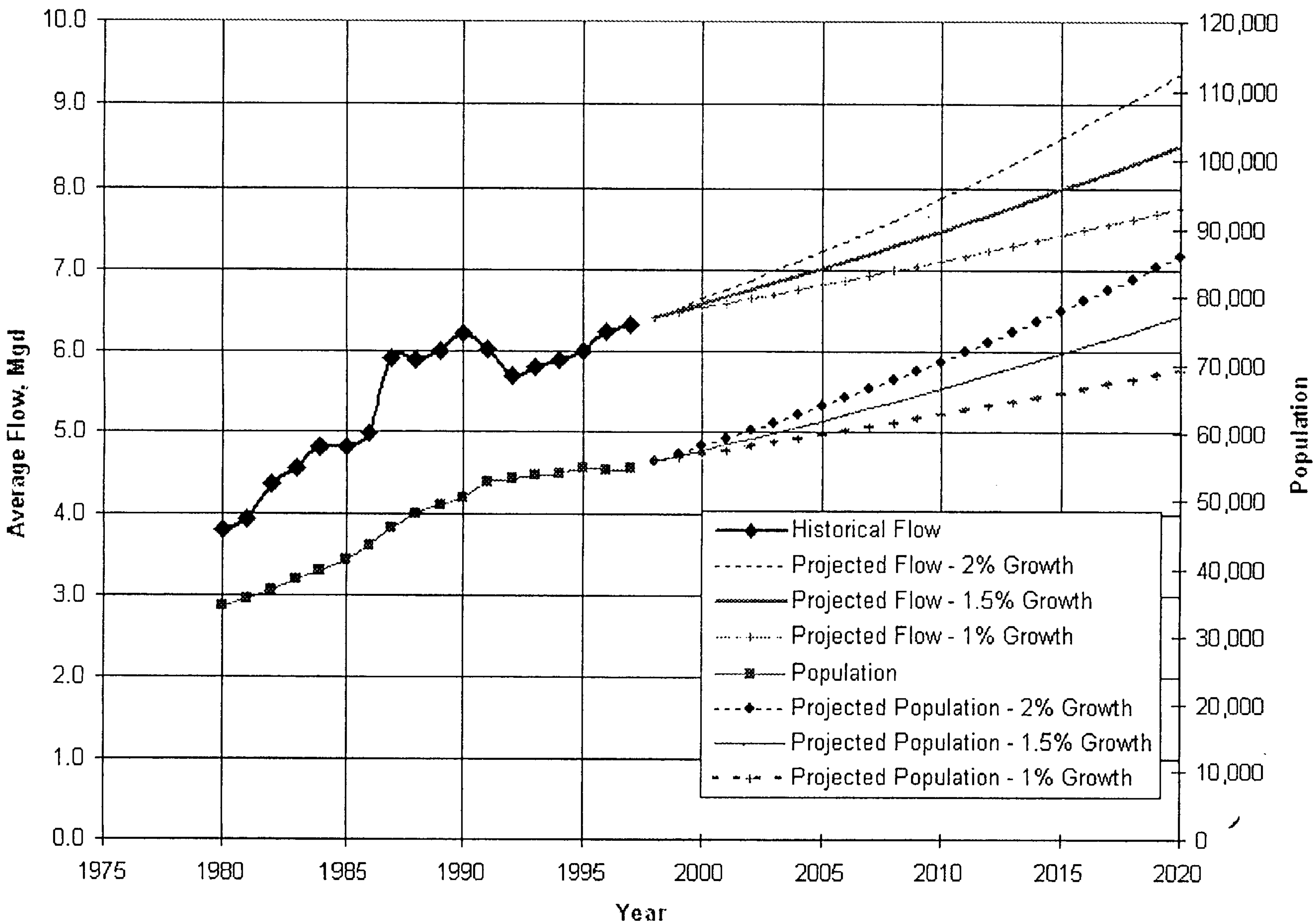
Presented to
Public Advisory Committee
August 3, 1999

W E S T
Y O S T
& ASSOCIATES
Consulting Engineers

ADVISORY PANEL

NAME	E-MAIL ADDRESS	PHONE
Bob Andosca Lodi Chamber of Commerce 35 S. School Street Lodi, CA 95240	chamber@softcom.net	(209) 367-7840
Wade Broughton Senior Environmental Engineer General Mills Operations, Inc. P. O. Box 3002 Lodi, CA 95241-1906	broug000@mail.genmills.com	(209) 334-7090
Liz Carey P.O. Box 2162 Lodi, CA 95241	avogadro@softcom.net	(209) 331-7719 am (209) 331-7715 pm (209) 931-4357 home
Bill Ferrero Field Manager Central Valley Waste Services 1333 E. Turner Road Lodi, CA 95240	mokel@aol.com	(209) 369-8274
David P. Harrington Director of Operations ACRT-West 801 S. Fairmont Avenue, Suite #7 Lodi, CA 95240	dharrington@acrtinc.com	(209) 367-4196
Kenn Lamb Director-Manufacturing Holz Rubber Company, Inc. 1129 So. Sacramento Street Lodi, CA 95240	holz@holzrubber.com	(209) 368-7171
James L. Schweickardt 2335 Woodlake Circle Lodi, CA 95242		(209) 333-1863
Jean Thompson 305 Audubon Drive Lodi, CA 95240	jeanthom@cwo.com	(209) 333-2792
Michael B. Weidner Director of Project Development ACRT-West 801 S. Fairmont Avenue, Suite #7 Lodi, CA 95240	mweidner@acrtinc.com	(209) 367-4196
Rich Freitas, Plant Manager Pacific Coast Producers P. O. Box 880 Lodi, CA 95241-0880	rfreitas@pcoastp.comm	(209) 367-7213 (209) 369-3489 FAX

Population & Flow



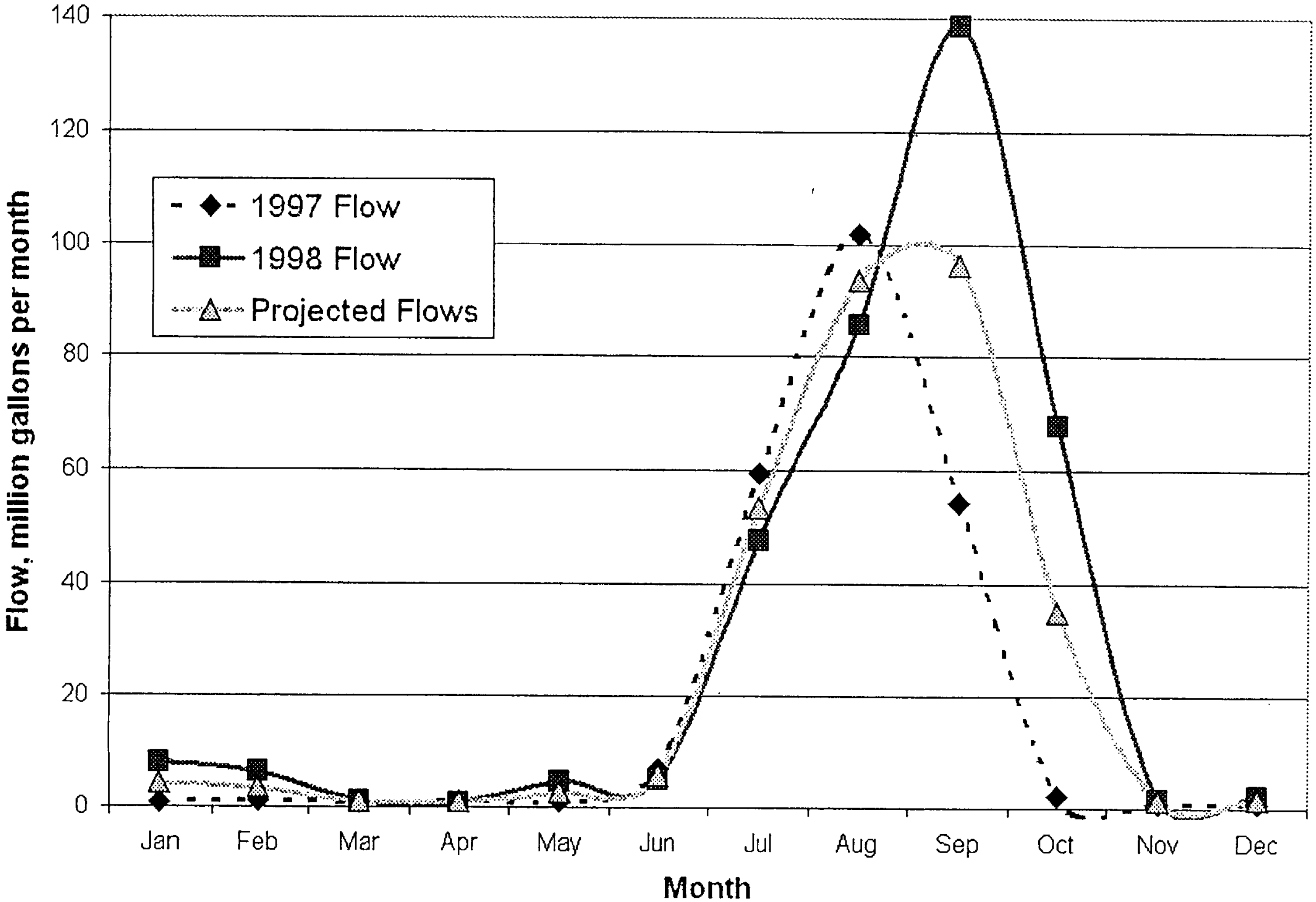
Projected Flows, Mgd

	2010	2020
Average	7.5	8.5
Peak Month	8.5	9.7
Peak Day	9.7	11.0
Peak Hour	14.4	16.3

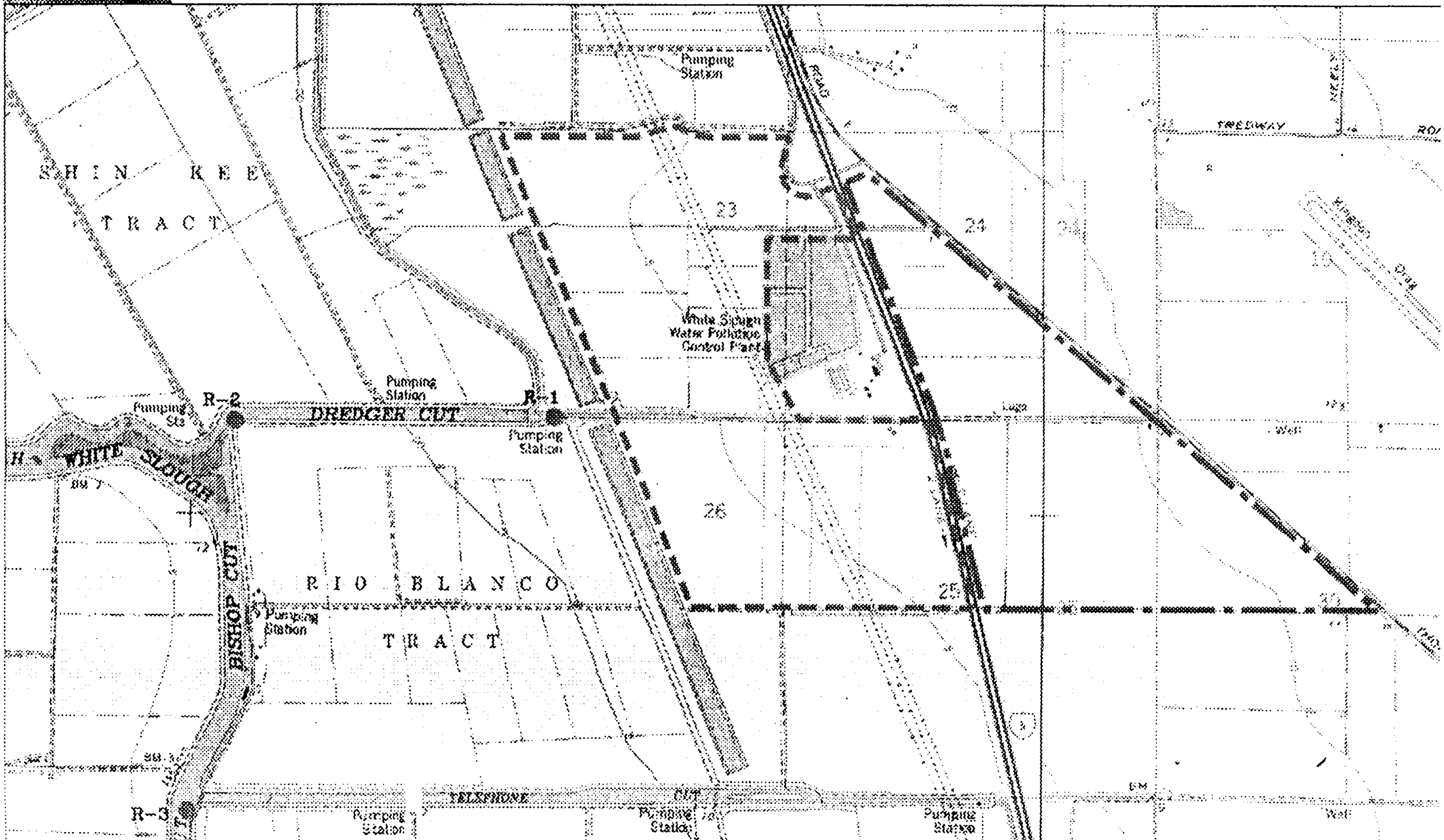
Average Influent Concentrations of Major Constituents

Item	Units	Historical Average	Projected Year 2010	Projected Year 2020	Existing Treatment Plan Design Criteria
Biochemical Oxygen Demand (BOD)	mg/L	265	274	279	220
Total Suspended Solids (TSS)	mg/L	235	243	248	240
Ammonia	mg/L	17.3	17.9	18.2	—

1997-1998 & Projected Industrial Wastewater Flows

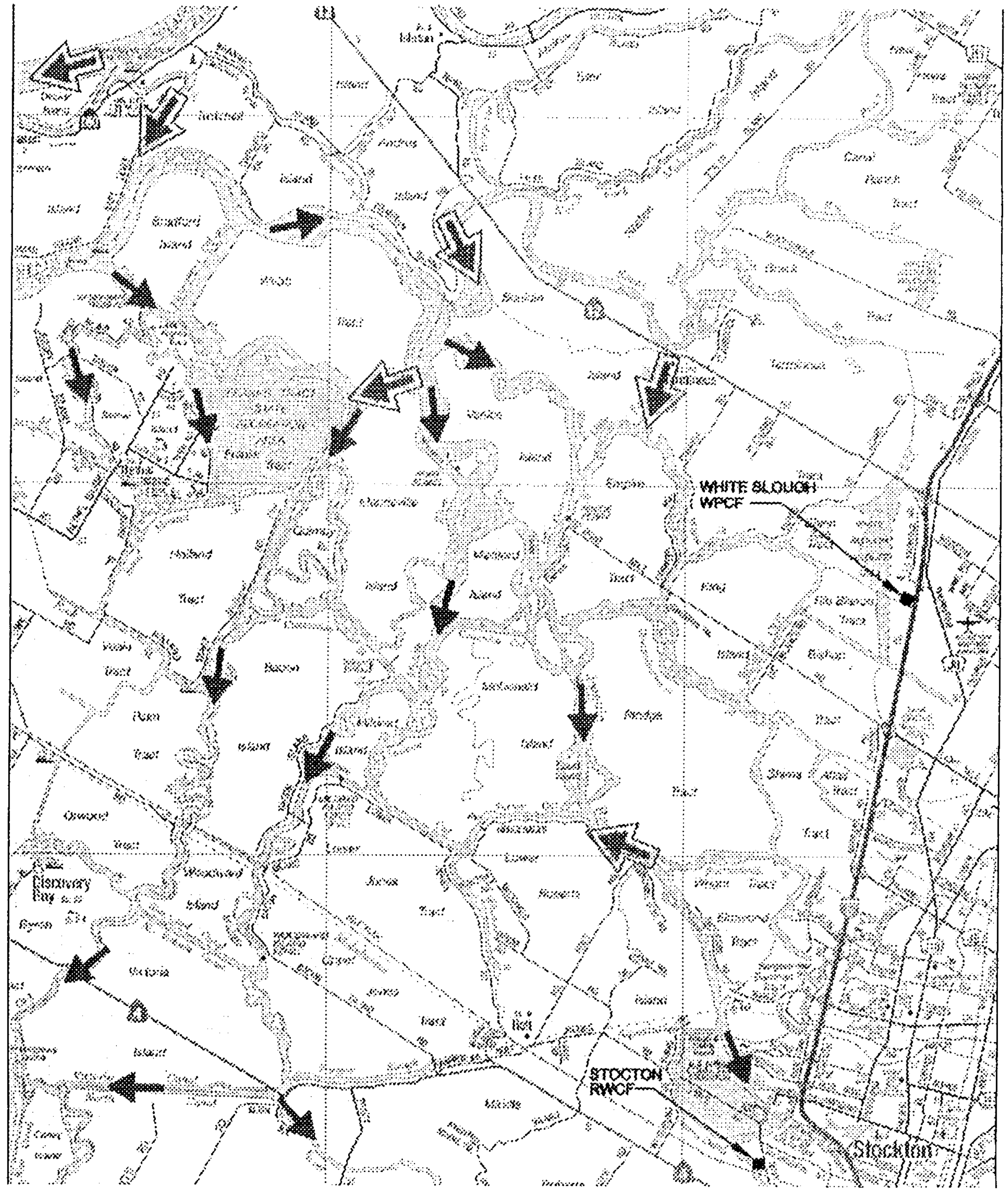


Discharge Locations



Delta Circulation Patterns

Low Flows/ High Export



Discharge to Dredger Cut

Constituent or Parameter	Units	Current	Anticipated	Potential Future	Historical Average	Historical Peak
BOD	mg/L (30 day)	30	10	10	8.4	16
TSS	mg/L (30 day)	30	10	10	10.0	24
D.O.	mg/L (receiving water)	5 at White Slough	5	5	5.2	0.6 (min.)
Temperature	ΔºF (receiving water)	5 at White Slough	4	4	9.3	21.6
Coliform (summer)	MPN/100 mL	23	2.2 filtered	2.2 filtered	2	13
Coliform (winter)	MPN/100 mL	23	23	2.2 filtered	2	13
Zinc	ug/L	n/a	130	100	105 (total)	160 (total)
Mercury	ug/L	n/a	n/a	0.1 or 0.024	<0.2	0.63
Chloroform	ug/L	n/a	n/a	10.4	21	102
Chronic Toxicity	TCU	10	2	2	1 (median)	>16
Ammonia	mg/L	n/a	n/a	5.2	1.2	6.5
Total N	mg/L	n/a	n/a	TML	9.4	
Total P	mg/L	n/a	n/a	TML	0.23	

Discharge to White Slough/ Bishop Cut

Constituent or Parameter	Units	Current	Anticipated	Potential Future	Historical Average	Historical Peak
BOD	mg/L (30 day)	30	30	TML	8.4	16
TSS	mg/L (30 day)	30	30	30	10.0	24
D.O.	mg/L (receiving)	5	5	5	9.3	2.9 (min.)
Temperature	Δ°F (receiving)	20	4	4	9.3	21.6
Coliform	MPN/100 mL	23	23	2.2	2	13
Zinc	ug/L (receiving)	n/a	100	100		
Zinc	ug/L (effluent)		130	130	105	160 (total)
Mercury	ug/L		n/a	0.24	<0.2	0.63
Chloroform	ug/L	n/a	n/a	104	21	102
Chronic Toxicity	TCU	10	10	10	1 (median)	>16
Ammonia	mg/L	n/a	n/a	14.9	1.2	6.5
Total N	mg/L	n/a	n/a	TML	9.4	
Total P	mg/L	n/a	n/a	TML	0.23	

Anticipated Discharge Requirements for Unrestricted Irrigation

Constituent or Parameter	Units	Anticipated
BOD	mg/L	10
TSS	mg/L	10
Turbidity	NTU	2
Coliform	MPN/100 mL	2.2 filtered
Ammonia + Nitrate	lbs/ac/yr	Agronomic use

Irrigation of Animal Feed Crops

Constituent or Parameter	Units	Current	Anticipated	Potential Future
BOD	mg/L	40	30	30
TSS	mg/L	n/a	30	30
Coliform	MPN/100 mL	Secondary	Secondary	23
Ammonia + Nitrate	lbs/ac/yr	Agronomic use	Agronomic use	Agronomic use

Irrigation with Industrial Wastewater

Constituent or Parameter	Units	Current	Anticipated	Potential Future
BOD	lbs/ac/day	n/a	n/a	200
Hydrogen Sulfide	mg/L	n/a	n/a	1.0
Dissolved Oxygen	mg/L	n/a	n/a	1.0 minimum
Salinity	lbs/ac/yr	n/a	No significant impacts	No significant impacts
Ammonia + Nitrate	lbs/ac/yr	Agronomic use	Agronomic use	Agronomic use

Anticipated Biosolids Limits

Constituent	Ceiling Concentration, mg/kg	Max. Cumulative Loading, kg/ha	Historical Concentration, mg/kg	Average Loading, kg/ha/yr	Life of Existing Site, years
Arsenic	75	41	7.8	0.01	4,100
Cadmium	85	39	5.6	0.007	5,600
Copper	4,300	1,500	246.0	0.32	4,700
Lead	840	300	30.5	0.04	7,500
Mercury	57	17	5.5	0.007	2,400
Molybdenum	75	—	11.1	0.014	—
Nickel	420	420	15.0	0.019	22,000
Selenium	100	100	1.2	0.002	50,000
Zinc	7,500	2,800	604.0	0.80	3,500
Total N (lbs/ac/yr)	Agronomic use	Agronomic use	—	—	—

Summary - Requirements

- Discharge to Dredger Cut Will Require More Highly Treated Effluent
- Requirements for Discharge to White Slough/Bishop Cut Could Probably Be Satisfied Using Existing Treatment Processes with Nitrification Added
- Irrigation Reuse of Effluent on Animal Feed Crops Would Have the Least Restrictive Treatment Requirements
  - Landscape irrigation of food crops would require tertiary filtration & advanced disinfection
- Dilution Flows & Dissolved Oxygen Impacts in White Slough & Bishop Cut Should Be Evaluated in More Detail

Alternatives for Satisfying Municipal Discharge Requirements

Alternative	Discharge Requirements								
	Anticipated						Possible Future		
	DO	BOD	Temp	Bact.	Zinc	NH3	Hg	N	P
Bishop Cut Outfall Pipeline	★★★	★★	★	★★	★		★		
Bishop Cut Outfall Wetlands	★★★	★★	★★★	★★	★★		★★	★★	
Other Treatment Wetlands			★★★		★★		★★	★★	
Tertiary Filtration		★		★★★	★		★		
Nitrification		★				★★★			
Biological N Removal								★★	
Biological P Removal									★★
Metal Salts Addition					★★				★★★
Additional Irrigated Land	★	★		★★				★	★
Winter Percolation (Zero Discharge)	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★	★★★
Additional Storage	★		★★						
Source Control					★		★		

★ Helps meet anticipated and future requirements
★★ Meets anticipated requirements and probably meets future requirements
★★★ Reliably meets anticipated and future requirements

Apparent Reasonable Combinations of Alternatives

Combination	Discharge Point	Facilities Needed for Anticipated Requirements*	Facilities Needed for Potential Future Requirements
1S	Dredger Cut (Year-round)	Additional Storage Tertiary Filtration Source Control	Biological N Removal Biological P Removal Metal Salts Addition
1W	Dredger Cut (Year-round)	Tertiary Filtration Wetlands	Biological P Removal
2S	Dredger Cut (Seasonal)	Additional Land Additional Storage Enhanced Clarification Source Control	Biological P Removal Metal Salts Addition
2W	Dredger Cut (Seasonal)	Additional Land Additional Storage Enhanced Clarification Wetlands	Biological P Removal
2P	Dredger Cut (Seasonal)	Additional Land Additional Storage Percolation Fields Enhanced Clarification Source Control	Biological P Removal Metal Salts Addition

* Nitrification needed for all alternatives

Apparent Reasonable Combinations of Alternatives (cont).

Combination	Discharge Point	Facilities Needed for Anticipated Requirements*	Facilities Needed for Potential Future Requirements
3	Bishop Cut (Year-round)	Outfall Pipeline Source Control	Biological N Removal Biological P Removal Metal Salts Addition
3W	Bishop Cut (Year-round)	Outfall Wetlands	Biological P Removal
4	Zero Discharge	Percolation Basins & Fields Additional Land Biological N Removal	

* Nitrification needed for all alternatives

Potential Evaluation Criteria

- Compliance with Anticipated Discharge Standards
- Cost: Planning Level Capital and O&M Costs
- Reliability: Equipment & Process Performance
- Flexibility: Ability to Meet Undefined Future Requirements & Conditions
- Ease of Implementation
- Environmental Impacts or Benefits
- Safety: Safety of Plant Staff & the General Public
- Potential Recreational/Open Space Benefits
- Secondary Economic Benefits
- Resource Management Considerations

State of the Delta 1999

DeltaKeeper Bill Jennings addressed the Commonwealth Club of California in Oakland on March 2, 1999. Here are excerpts from his talk.

How good is the water in the San Francisco Bay and Delta? Bad..., very bad.

Bill Jennings

Who we are

DeltaKeeper is a highly visible on-the-water grassroots education and enforcement campaign established to discover, investigate and deter violations of environmental laws enacted to protect habitat and water quality. We are a staff of three with several interns and about 120 volunteers. Using three boats, we patrol Delta waterways and respond to incidents reported to our toll-free hotline, 1-800-KEEPBAY.

We monitor water quality. Currently, our monitoring projects include:

1. a CalFed funded study of toxicity in the Delta

2. an EPA funded project using volunteers and students to monitor urban streams in and around Stockton

3. a project to evaluate the toxicity of urban stormwater runoff, and

4. a program that monitors dairy waste discharges.

What we find

Water quality has all too often been treated like the crazy aunt kept locked in the closet at home. It has certainly taken a back seat, as CalFed (the state/federal effort to deal with the water problems of California) has concentrated on flow and water project issues. Several proposed solutions (like the barriers at Old River and cross-Delta channel widening) have enormous potential to further degrade water quality. We can spend billions of dollars for habitat restoration and techno-fixes but if we're left with water toxic to aquatic life we're whistling "Dixie."

It's estimated that up to 40,000 tons of pollutants—more or less—are annually dumped into the estuary - almost all of it in violation of existing laws and regulations. When someone pollutes in violation of these regulations, they have committed a crime. In-so-far as they discharge substances dangerous to life, they are dangerous criminals.

Our waterways and their inhabitants, like the air around us, are part of the public trust. They are a property right we hold in common. None of us would allow someone to dump toxic chemicals in our parks or libraries. Nor should we accept them dumped in our rivers. However, in a "business friendly world" it's somewhat unfashionable to vigorously employ the enforcement hammer. We prefer painless, friendly and consensual solutions. If we pursued thieves like we pursue polluters, our prisons would stand vacant.

"If we pursued thieves like we pursue polluters, our prisons would stand vacant."

Weak enforcement

I have developed the highest respect for the competence and dedication of the Central Valley Regional Water Quality Control Board staff. But, they are overwhelmed by workload and outgunned by consultants retained by dischargers.

For example: the Central Valley Board has only 2 full time and 1 part time dairy inspectors to regulate the 1,600 dairies in the Central Valley despite staff estimates that 60% to 80% (depending on water year) are in noncompliance. The Valley's 891,000 cows create as much waste as a city of 21 million people. Our patrols find dairy wastes in streams every time they venture out.

Enforcement actions are very time consuming. For example, bringing the Port of Stockton into compliance has, so far, consumed half the time of a staff engineer over the last 2 years. But that effort will now have to be set aside because that engineer must now focus on Stockton's new wastewater permit and renewal of the city's stormwater permit—both of which have serious problems and will be highly contested.

Enforcement of water quality statutes is like a Potemkin village. Illusion replaces substance.

Business responds to lawsuits

Unfortunately, 80% of businesses that are legally required to obtain stormwater permits have failed to get them. And the State lacks the staff to compel them to do so. Further, the annual reports and monitoring data submitted by those who do have permits almost never get reviewed for adequacy—indeed, they are lucky to make it into a filing cabinet. Our investigations lead us to believe that over half of the 20% of businesses that have stormwater permits are not complying with permit requirements.

As a result, urban waterways throughout the Central Valley routinely become toxic following storms. In Stockton, stormwater discharged from every monitored municipal outfall during every monitored storm is acutely toxic from pesticides, metals and other contaminants. Our patrols discover frequent fish kills. Our bioassays reveal that receiving waters are toxic to aquatic life. Last Autumn, DeltaKeeper sent 16 notice letters to Stockton area businesses informing them that they would be sued if they didn't comply with stormwater regulations. We have settled with most of them. We have identified several hundred additional Stockton facilities in violation of the General Permit and, while preferring voluntary compliance, we are prepared to litigate, if necessary. People need to know why we sue people—and why we're gonna sue a whole lot more.

Pesticides

Pesticide toxicity is probably the single most pressing problem facing Central Valley waterways. Organophosphate pesticides (principally, diazinon and chlorpyrifos)are routinely detected in urban runoff in the Central Valley, above the threshold for toxicity to invertebrate and fish life.

In 1996, the Department of Pesticide Regulation promised to launch a voluntary program to reduce pesticide discharges to surface waters—to secure voluntary sponsors and develop water quality objectives. The sponsors were then to develop plans containing targets, timetables, measures of success, a monitoring program and sources of funding.

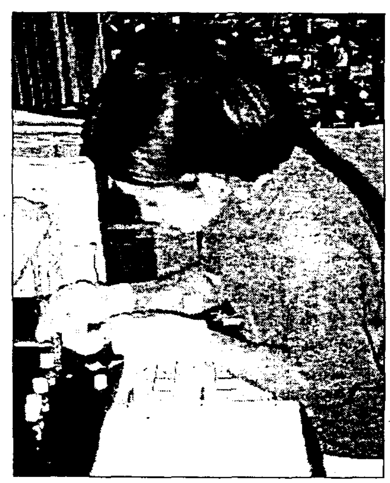
Three years later, DPR has not found a single sponsor. Instead, DPR has prevented the water boards from exercising their responsibility to regulate pollutant discharges to surface waters. Pesticides remain essentially unregulated. Unfortunately, CalFed has unwisely chosen to embrace this voluntary "system."

Degrading water degrades us

The Delta's impairment is our impairment. The environment is not something apart from ourselves. Humankind developed in continuous and dynamic interaction with the natural world. Our skin is not an impenetrable barrier. The environment is the water we drink, the air we breath and the food we eat. A degraded environment will produce degraded humans. A world that is not safe for fish, frogs, and butterflies will not long be safe for children. And even if we can physically survive a degraded environment, we will not likely retain our mental health if we lose contact with the natural forces that have shaped our biological and mental nature.

I'd like to think that when history is written in the distant future it will be recorded that we—our generation—heard the voices of earth cry out. We heard the voices of the waters and the fish and the toads in the mud and through commitment and hard work we turned the corner and began the path to restoration. The alternative is unthinkable.

The unabridged version of Bil Jennings' talk is on the April Connections website: www.sonnet.com/usr/pjc.



Water...it's what's for dinner.