REGIONAL STORMWATER MASTER PLAN

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VOLUME II

Prepared for

South Texas Water Authority
City of Corpus Christi
Nueces County, Texas

Prepared by

Camp Dresser & McKee Inc.
Archie Walker Engineering Inc.
Wood, Boykin & Wolter
Morehead, Dotts, & LaPorte, Inc.

SOUTH TEXAS WATER AUTHORITY
REGIONAL STORMWATER MASTER PLAN

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1.0 INTRODUCTION

1.1 PURPOSE

The projection of future population, land use, and development will provide information necessary for nonpoint source (NPS) pollution and hydraulic modeling to be performed in Tasks 2.I.(2)(b) and 2.II.C respectively of this Regional Stormwater Master Plan. State and local planning agencies have developed estimates of future population, land use, and growth trends for the Corpus Christi area. This information will serve as input to NPS and hydrologic models which rely on these projections to calculate future stormwater flows and associated NPS pollutant loadings to the stormwater management system. The ability to predict future needs allows cost-effective improvements to the stormwater management system which meet both existing and future drainage demands.

1.2 BACKGROUND

Five, ten, and twenty-year projections have been developed using low, medium and high growth rate scenarios. An ultimate development condition is also presented. Population projections are described in Section 2.0 of this report.

Land use projections are required to estimate future runoff volumes from a given area. For subsequent master plan application, land use has been categorized as follows:

1) Industrial
2) Agricultural/Open Space
3) Undeveloped
4) Residential
5) Commercial

These land use categories exhibit different runoff characteristics. For instance, typical impervious area percentages vary greatly between the categories listed above.

1.3. RESOURCES

Two sources of population projections are presented in this report: 1) Texas Water Development Board (TWDB) Population Projections; and 2) Corpus Christi City Planning and Urban Development Department (City) Population Projections.

The Texas Water Development Board's primary concern is water supply; therefore, their projections focus on population data. The City has projected land use, development, ultimate development conditions, as well as population within the City of Corpus Christi.

2.0 POPULATION PROJECTIONS

2.1 METHODOLOGY

2.1.1 TEXAS WATER DEVELOPMENT BOARD

For the population projections presented in this report, the Texas Department of Water Resources Water Development Board used a modified cohort-component methodology to generate population projections (detailed discussion in Appendix A). A cohort is defined as a group of individuals possessing like characteristics. For example: A group of white males between the ages of 5 and 9 years would be cohort. The cohort system uses 16 age groups, three ethnic groups, and two sex groups to produce a total of 96 cohorts (3 x 2 x 16 = 96). Population based on U.S. Bureau of Census is broken down into individual age, race, sex cohorts, and then modified by birth, death, and migration rate coefficients to produce a future projection.

The birth rate coefficient is based on: 1) historic birth rates taken from the Bureau of Census; 2) Texas county birth rates taken from the Texas Department of Health; and 3) projected birth rates taken from the Bureau of Census. These values are then weighted with specific Texas county factors. The death rate coefficient is based on Texas Department of Health death rates for Nueces County. The coefficient for migration rates is based on values for several variables such as population, income, college enrollment, temperature conditions in bordering counties, distances to bordering counties, housing starts, lignite and transportation variables, and is calculated through the use of multiple regression techniques.

2.1.2 CORPUS CHRISTI CITY PLANNING & URBAN DEVELOPMENT DEPARTMENT

Recently, City planning staff used a phased approach to determine 5, 10, and 20-year population projections. In Phase 1, the City was subdivided by Area Development Plan (ADP), as listed below, which allowed the growth for each ADP to be studied (Figure 2-1).

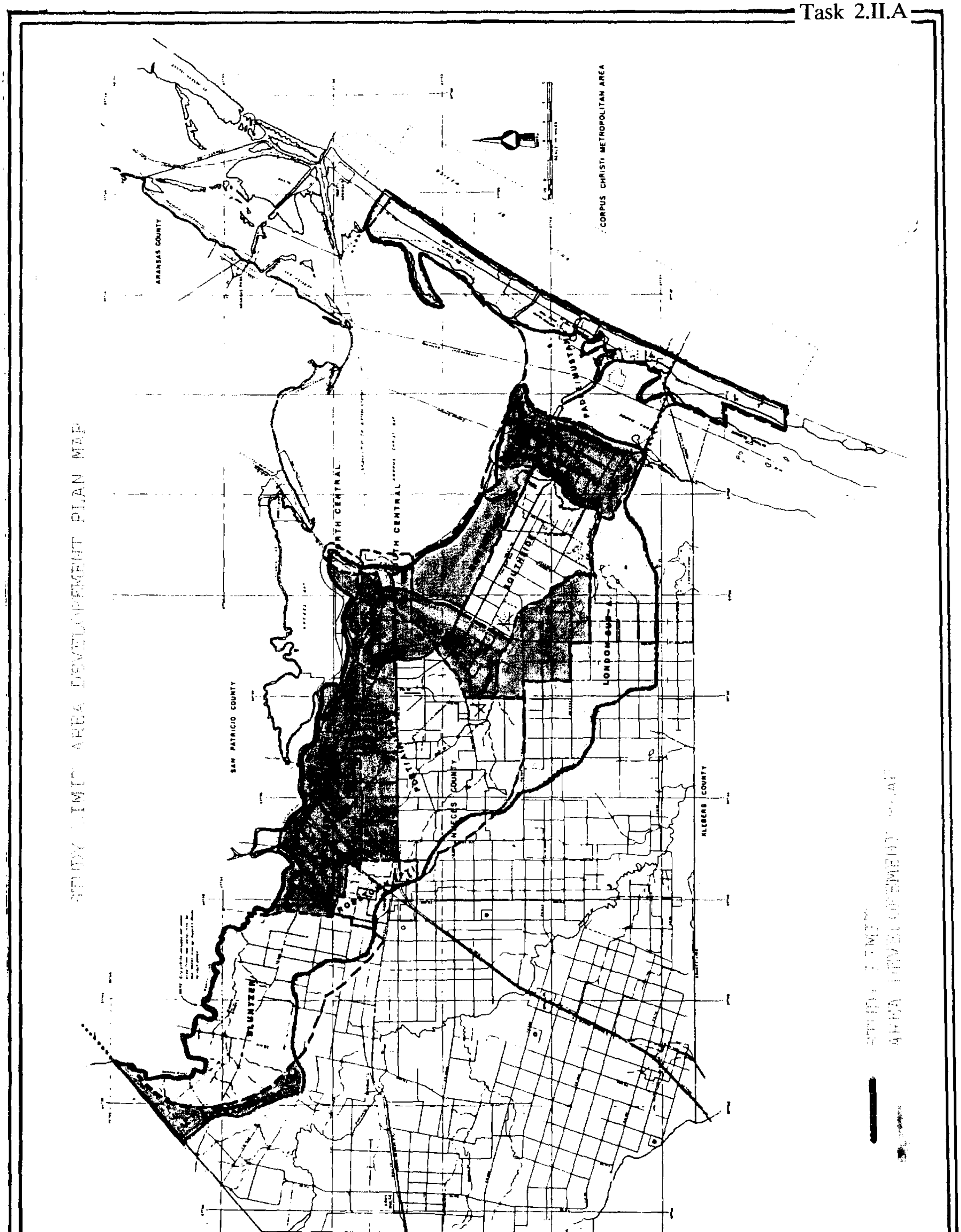

STUDY LIMIT AREA DEVELOPMENT PLAN MAP
ARANSAS COUNTY
SAN PATRICIO COUNTY
NUECES COUNTY
KLEBERG COUNTY
JIM WELLS COUNTY
CORPUS CHRISTI METROPOLITAN AREA
SOUTHSIDE
BLUNTZER

FIGURE 2-1

These Area Development Plans define 14 sub-areas of the Corpus Christi area wherein the Planning Department has spent considerable time during the past five years determining land use, traffic, infrastructure needs, and population growth trends. Due to the availability of existing information, these planning areas were utilized for the development of growth and land development trends affecting the Regional Master Plan.

AREA DEVELOPMENT PLANS

1.	Bluntzer	8.	Northwest
2.	Bluntzer Sub-A	9.	Port/Airport/Violet
3.	Flour Bluff	10.	Robstown
4.	London	11.	South Central
5.	London Sub-A	12.	Southeast
6.	Mustang/Padre	13.	Southside
7.	North Central	14.	Westside

In Phase 2, various population projections were generated by City planning staff using the following models:

Population Projection Models

1) Linear Direct
2) Linear Regression
3) Exponential Regression
4) Cohort Survival Model

Population trends were identified using census data which, in some cases, went as far back as 1940. As opposed to the TWDB population projections, the City's projections incorporated data from the recent 1990 census. In addition to population trends, land use was generated using existing and proposed zoning, aerial photos, and field surveys.

After models were used to generate output, City planning staff reviewed the results in order to compare models to each other and to TWDB projections. At this point, the Linear Direct model -4% was selected for low series projections, the Linear Direct Model was selected for medium series projections, and the Exponential Regression Model was selected for high series projections. The difference between the medium and high series projections was 4 percent. The low series projection assumed a corresponding 4% reduction in the medium series projections. A discussion of model selection methodology is included in the City's Population and Land Use Projection Report (Appendix B).

In Phase 3, the City generated future land use projections considering existing land use developed in Phase 2.

2.2 POPULATION PROJECTION RESULTS

2.2.1 TEXAS WATER DEVELOPMENT BOARD

Texas Water Development Board projections are shown in Appendix C. The TWDB's low projection series begins with the 1990 population of 270,147 and is projected to increase by 21.9% during the period between 1990 and 2010, to a population of 329,432 in 2010. High projection series population begins with the 1990 population of 271,810 and is expected to increase by 29.2% during the period between 1990 and 2010, to a population of 351,142 in 2010. TWDB results are shown in Figure 2-2.

2.2.2 CORPUS CHRISTI CITY PLANNING & URBAN DEVELOPMENT DEPARTMENT

City population projections are contained in Appendix B and are summarized in Figure 2-3. The population for the low projection series begins with the 1990 population of 271,289 and is projected to increase by 14.3% in the period between 1990 and 2010, for a total population of 310,162 by the year 2010. Medium projection series population begins with the 1990 population of 271,289 and is projected to increase by 19.17%

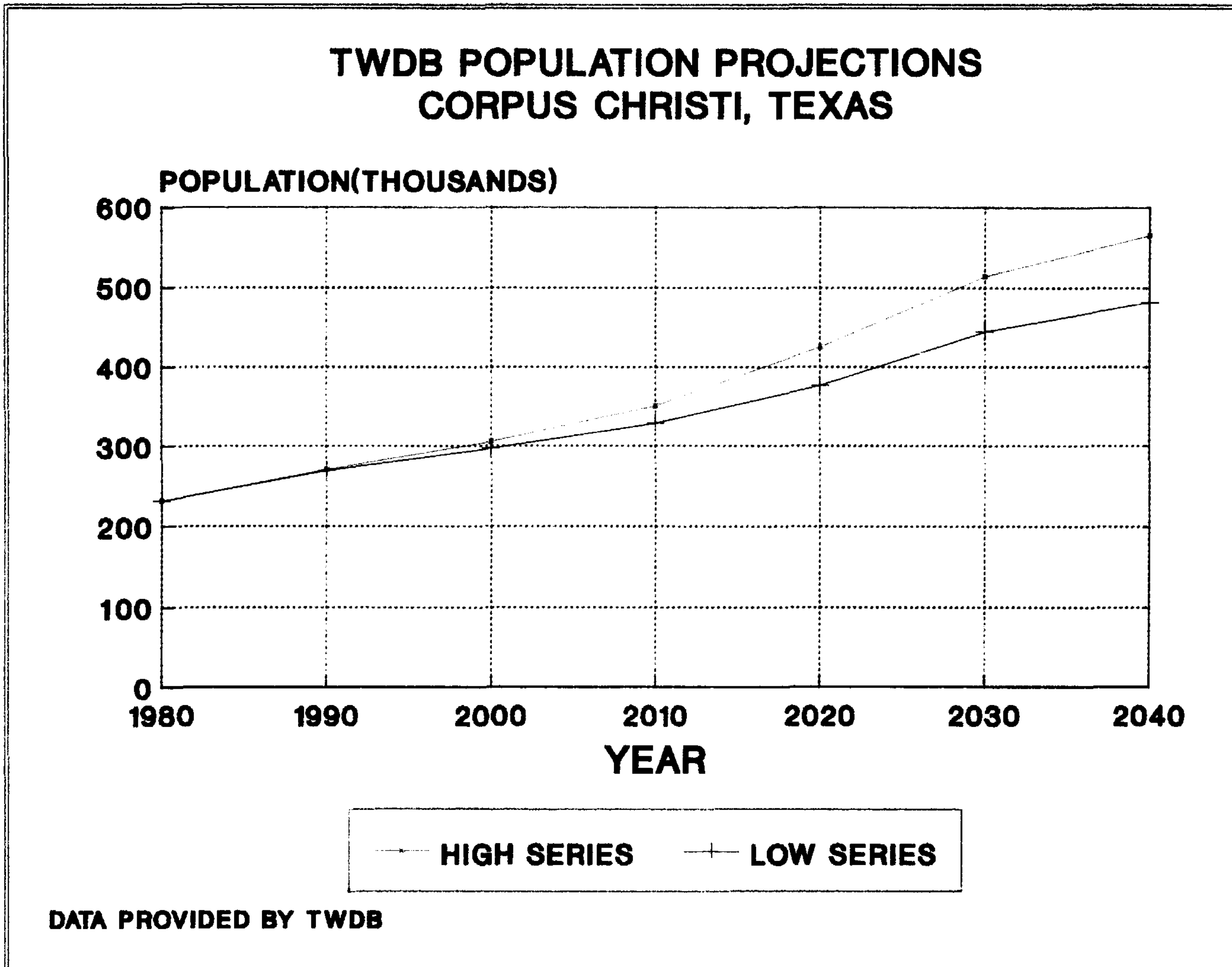

TWDB POPULATION PROJECTIONS
CORPUS CHRISTI, TEXAS
POPULATION(THOUSANDS)
600
500
400
300
200
100
0
1980
1990
2000
2010
2020
2030
2040
YEAR
HIGH SERIES
LOW SERIES
DATA PROVIDED BY TWDB

FIGURE 2-2

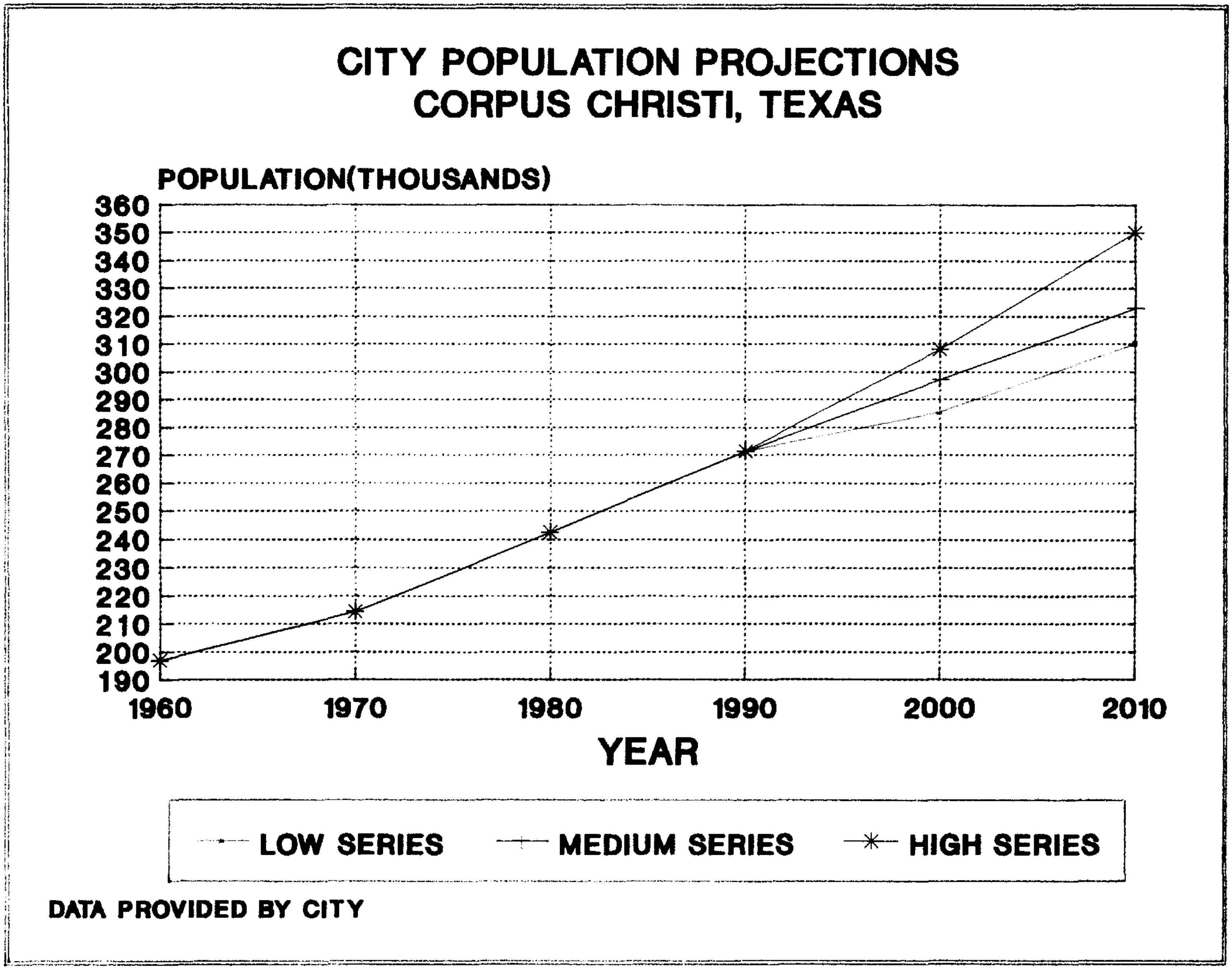

CITY POPULATION PROJECTIONS
CORPUS CHRISTI, TEXAS
POPULATION(THOUSANDS)
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
1960
1970
1980
1990
2000
2010
YEAR
LOW SERIES
MEDIUM SERIES
HIGH SERIES
DATA PROVIDED BY CITY

FIGURE 2-3

in the period between 1990 and 2010, for a total of 323,021 in 2010. The high projection series begins with the 1990 population of 271,289 and is projected to increase by 29.1% in the period between 1990 and 2010, for a total population of 349,985 in 2010.

City planning staff population projections were also developed for each Area Development Plan. Population data, when evaluated by Area Development Plan, indicates variable growth rates within the City. The Southside, Bluntzer, Flour Bluff, Northwest, Mustang/Padre, and Port/Airport/Violet areas are projected to have an increase in population between 1990 and 2010, while the Robstown, London, Westside, Southeast, North Central and South Central areas are projected to have unchanged or decreasing population.

2.3 COMPARISON OF TWDB AND CITY PROJECTIONS

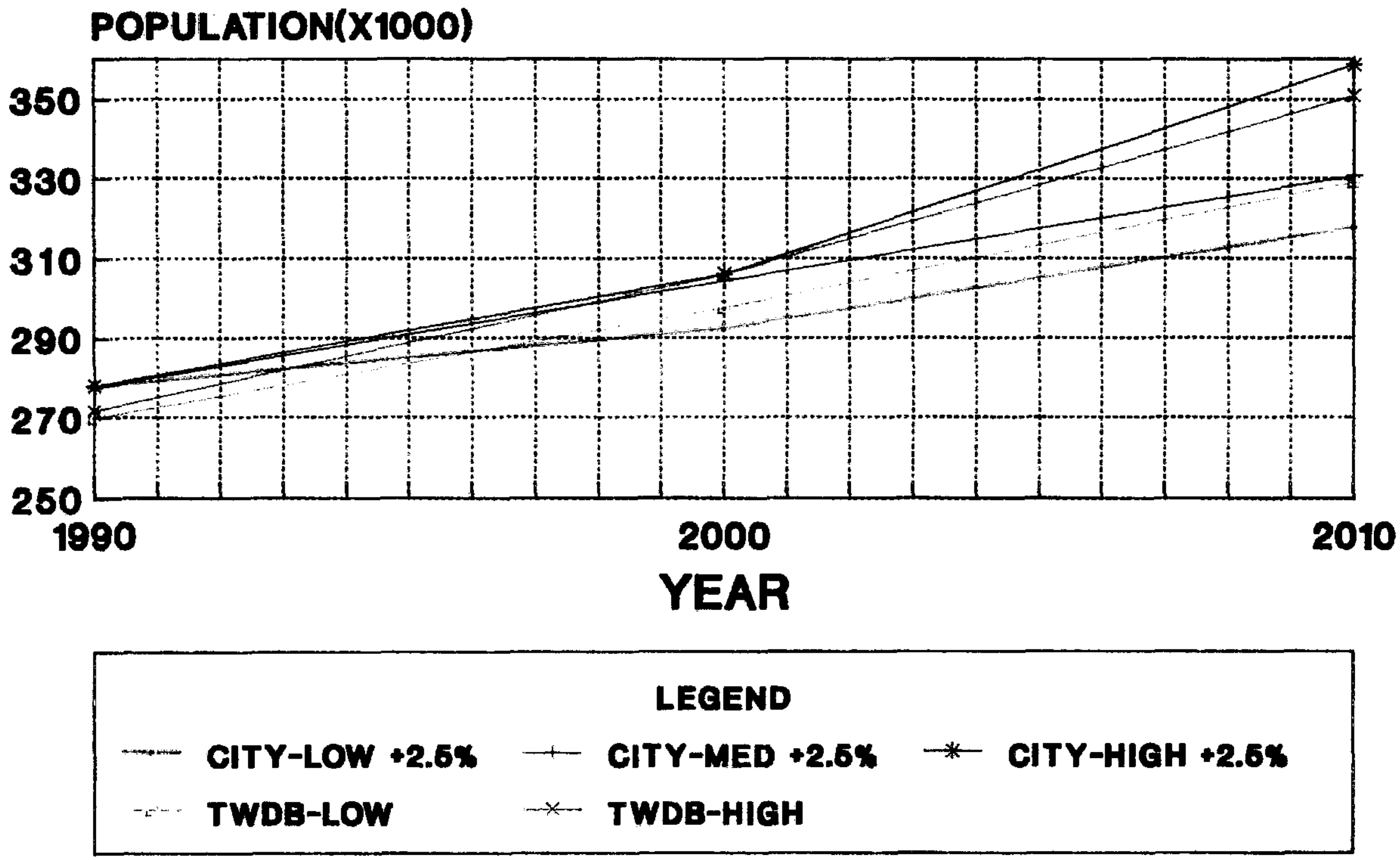
City projections, when compared to TWDB projections, indicate statistically similar results for each projection series. Corpus Christi population for 1990 based on initial census results was 271,289. For the year 2000, the City projected a high series population of 308,093, while the TWDB projected a slightly lower population of 306,180. The 2010 population was projected by the City to be 349,985, while the TWDB projected a population of 351,142. In both cases, the results of these high series projections using different models can be considered statistically equivalent.

The low projection series results, however, vary somewhat. Using the 1990 population as a starting point, the TWDB projections increase at a slightly higher rate than the City projections. The year 2000 population as projected by the City is 285,368, while the TWDB's projections indicated a population of 297,749. In this case, the City's projection is 12,381 people lower than the TWDB. The City projection for 2010 indicated a population of 310,162, while TWDB projections indicate a population of 329,432. The medium growth series as projected by the City is much closer to the TWDB low series with a population of 323,021 in 2010. The difference in City and TWDB low series projections may be explained by the beginning (1990) data sets and the intended use of the data. The City started with different initial numbers (1990 census data) than the TWDB projections. Also, since the TWDB is primarily concerned with meeting water supply demands, it stands to reason that their low series projection would be conservatively high (and similar to the medium series projections developed by the City). Comparisons of Texas Water Development Board and City results are shown in Figure 2-4 and Table 2-1.

When considering city-wide population projections, the City and TWDB data do not vary significantly. For application in subsequent master plan activities, City population projections will be used since these projections included 1990 census data and sub-area (ADP) specific detail. At this time, it is not expected that resulting stormwater master plan recommendations will vary among the similar population data sets.

It is also important to note that the U.S. Census Bureau is currently revising its population estimates for 1990. City staff estimates a 2.5% increase in the 1990 census data. If a 2.5% increase is assumed for all City population data, the comparison to TWDB would provide the resulting data shown in Figure 2-5 and Table 2-2.

COMPARISON OF POPULATION PROJECTIONS USING 1990 CENSUS DATA +2.5%



CITY DATA INCREASED BY 2.5%
TWDB DATA UNCHANGED

FIGURE 2-4

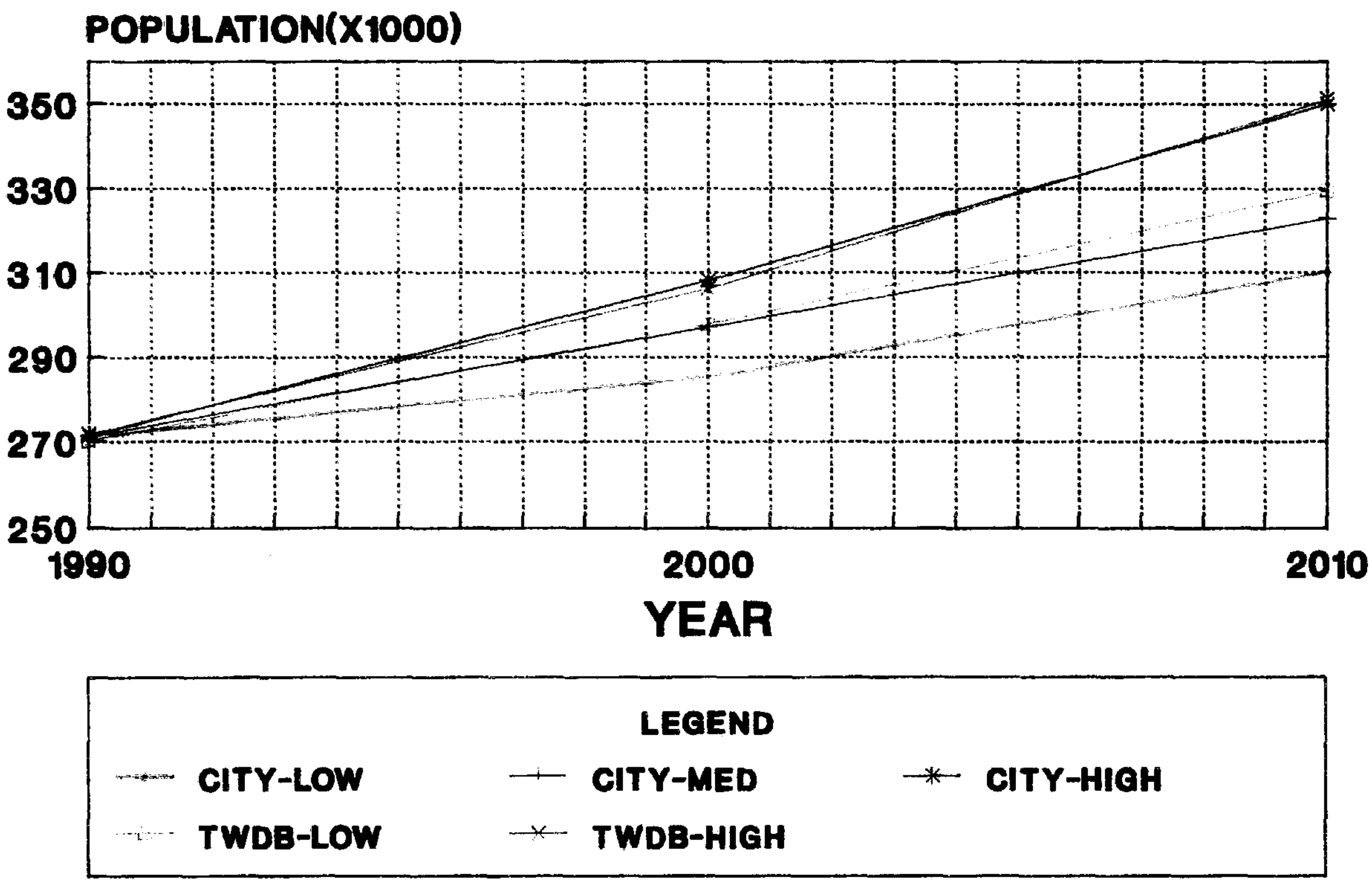
TABLE 2-1

COMPARISON OF POPULATION PROJECTIONS USING 1990 CENSUS DATA

High Series	1990	2000	2010
City	271,289	308,093	349,985
TWDB	271,810	306,180	351,142
% Difference*	.19%	.62%	.33%
Medium Series			
City Medium	271,289	297,212	323,021
TWDB Low	270,147	297,749	329,432
% Difference*	.42%	.18%	1.95%
Low Series			
City	271,289	285,368	310,162
TWDB	270,147	297,749	329,432
% Difference*	.42%	4.16%	5.85%

* % Difference Calculated Using $\left| \frac{(\text{City} - \text{TWDB})}{\text{City}} \right| 100$

COMPARISON OF POPULATION PROJECTIONS
CORPUS CHRISTI, TEXAS



DATA PROVIDED BY CITY AND TWDB

FIGURE 2-5

TABLE 2-2

COMPARISON OF POPULATION PROJECTIONS
USING 1990 CENSUS DATA PLUS 2.5%

High Series	1990	2000	2010
City	278,071	315,795	358,735
TWDB	271,810	306,180	351,142
% Difference*	2.30%	3.14%	2.16%
Medium Series			
City Medium	278,071	304,642	331,096
TWDB Low	270,147	297,749	329,432
% Difference*	2.93%	2.32%	.51%
Low Series			
City	278,071	292,502	317,916
TWDB	270,147	297,749	329,432
% Difference*	2.93%	1.76%	3.50%

* % Difference Calculated Using $\left| \frac{(\text{City} - \text{TWDB})}{\text{City}} \right| 100$

3.0 LAND USE PROJECTIONS

3.1 METHODOLOGY

Land use projections as provided by the City will be used for NPS and hydrologic/hydraulic modeling tasks. Land use data is necessary to estimate pollutant concentrations, loadings, volumes of flow and peak flows associated with the specific watersheds which contribute to a selected outfall or conveyance system. The five categories of land use as listed below (per Section 1.1) which compose the total area of a selected watershed will be necessary in order to ascertain a weighted curve number which will represent the runoff potential of the watershed and to develop non-point source pollutant concentration and loading factors.

Land Use Categories

Agricultural	Land in cultivation or used for grazing livestock. Example: fields, pasture
Open Space	Land which has been graded, cultivated or grazed in the past. Example: Parks, vacant lots, unused pasture and unused farmland
Undeveloped	Land which has not been graded or used for any purpose.
Residential	Land used for residential housing location.
Commercial	Land used for businesses, motels, hospitals, office buildings locations.
Industrial	Land used to locate industrial organizations.

Although the category of "Open Space" was included by the City in their computations under the category as "Undeveloped", "Open Space", in view of runoff modeling, is most similar to agricultural land use since this area is vegetated and generally graded to improve drainage. "Open Space" will be considered to exhibit the same characteristics as agricultural land use and will be modeled as such.

In regards to future water quality modeling, the agricultural land use category will be divided into several subcategories based on the types and amounts of pollutants generated. Distinct subcategories of agricultural lands include croplands, citrus, confined feedlots and grazing lands. Open space and undeveloped lands generally exhibit similar pollutant generation characteristics.

Land use for areas not included in existing ADP studies were generated through the use of aerial photos (1983) and field surveys. Once land use was obtained for all sub-areas within the study area, City staff used the rates of population change discussed previously to project future land use and an ultimate development condition.

3.2 LAND USE PROJECTION RESULTS

Present land use determined by the City is as follows:

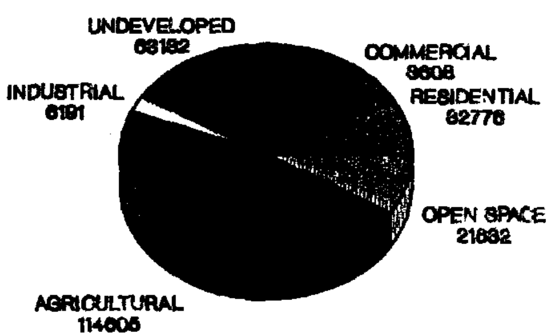
Residential	32,776 Acres
Commercial	3,608 Acres
Industrial	6,191 Acres
Open Space	21,632 Acres
Undeveloped	63,132 Acres
Agricultural	114,605 Acres

Land use is expected to change between 1990 (existing) and the ultimate development land use (future) as follows:

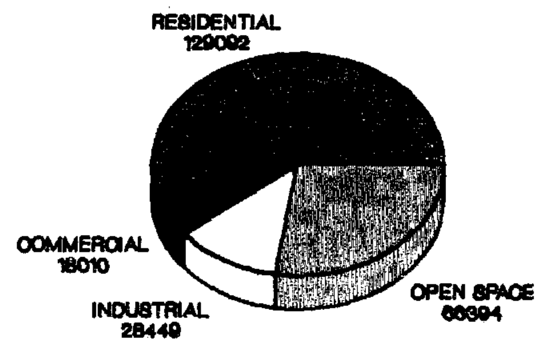
Residential	129,092 Acres
Commercial	18,010 Acres
Industrial	28,449 Acres
Open Space	66,394 Acres
Undeveloped	0 Acres
Agricultural	0 Acres

A shift from agricultural and undeveloped land use to residential, commercial, and industrial area is indicative of ultimate development conditions. Figure 3-1, demonstrates the change in land use as Corpus Christi develops from 1990 to a future ultimate development land use. Detailed land use data is included in Appendix B.

LAND USE PROJECTIONS
CORPUS CHRISTI, TEXAS



EXISTING LAND USE (ACRES)



ULTIMATE LAND USE (ACRES)

DATA PROVIDED BY CITY

FIGURE 3-1

Task 2.II.A

4.0 DEVELOPMENT ACTIVITIES PROJECTIONS

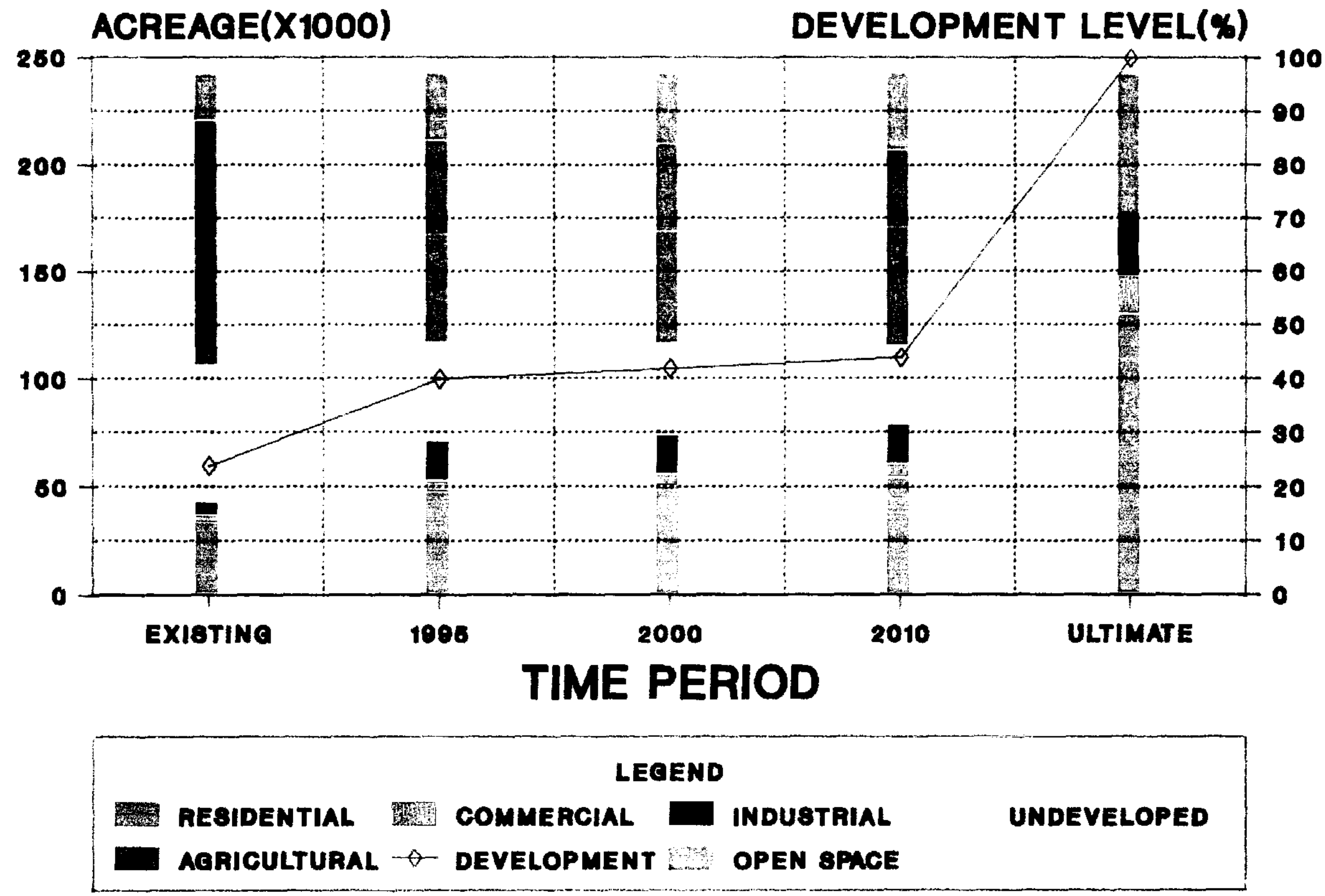
4.1 METHODOLOGY

Development changes are expected to follow trends as expressed by land use projections in Section 3.0 which indicate a development scenario consisting of land use shifting from agricultural and undeveloped land use to residential, commercial, and industrial areas.

Projected land development for 1995, 2000, and 2010 were generated based on population projections developed by the City. Once population is projected for a specific time, projected land use based on historical uses of land for a similar population total can be generated.

Figure 4-1, illustrates the study-wide totals for each land use category through the condition of ultimate development.

LAND DEVELOPMENT PROJECTIONS
CORPUS CHRISTI, TEXAS



DATA PROVIDED BY CITY

FIGURE 4-1

Task 2.II.A

5.0 PROJECTION DATA APPLICATION

5.1 NONPOINT SOURCE POLLUTION MODELING

In Task 2.I.B.(2)(b), a preliminary application of the NPS model is presented. This model predicts total annual pollutant loadings for a given area based on a number of inputs including land use distribution. Various land uses generate different quantities of both runoff volume and pollutant loadings. The event mean concentration (EMC) of pollutants vary with land use, with agriculture generally showing the highest nutrient concentrations and the more impervious land uses (commercial, industrial, etc.) showing higher concentrations of heavy metals. The NPS model selected in Task 2.I.B.(1) may also be applied to future developed conditions to predict increases in pollutant loadings due to increases in development. Based on the modeling of potential future stormwater management strategies, the most effective and cost-effective strategy can be determined.

5.2 HEC-II PEAK FLOOD MODELING

Task 2.II.C (HEC-II, Peak Flood Modeling) will use population, land use, and development projection data to determine peak flows resulting from both the 25-year and 100-year rainfall event. The 25-year flow information will yield floodplain boundaries which will be used to determine drainage problem areas. The 25 year rainfall event peak flow is used (per Nueces County design criteria) as the accepted design storm. Therefore, storm runoff structures are designed with the capability of conveying a 25-year storm peak flow.

The 100-year floodplain is necessary for Federal Emergency Management Agency (FEMA) use. This agency produces flood insurance rate maps for use in determining the risk associated with an area in terms of potential flooding. Insurance agencies rely on this mapping system to determine areas where flood insurance is necessary for new and existing structures such as homes, business and any other structure which could be damaged by flooding.

Computer models such as HEC-II enable modeling of future changes projected in the watersheds which contribute to a drainageway. As watersheds reach higher levels of development, they produce greater amounts of runoff, which in turn raises floodplain levels.

By modeling future flows and the flooding potential associated with them, present structural designs can accommodate future needs.

6.0 REFERENCES

Corbitt, Robert A., Environmental Engineering Handbook, McGraw-Hill, Inc., 1989.

Corpus Christi City Planning and Urban Development Department, Population and Land Use Projections, May 28, 1991.

Federal Emergency Management Agency, Brochure, 12 pages, Washington, D.C. 20472. April 1981.

Personal communication, Corpus Christi City Planning and Urban Development Department, June 1991.

Texas Water Development Board, Methods for Projecting Population for Texas Counties, 26 Pages, September 1982.

APPENDIX A

METHODS FOR PROJECTING POPULATION FOR TEXAS COUNTIES - DRAFT (TWDB)

DRAFT
SUBJECT TO REVISION

METHODS FOR

PROJECTING POPULATION FOR TEXAS COUNTIES

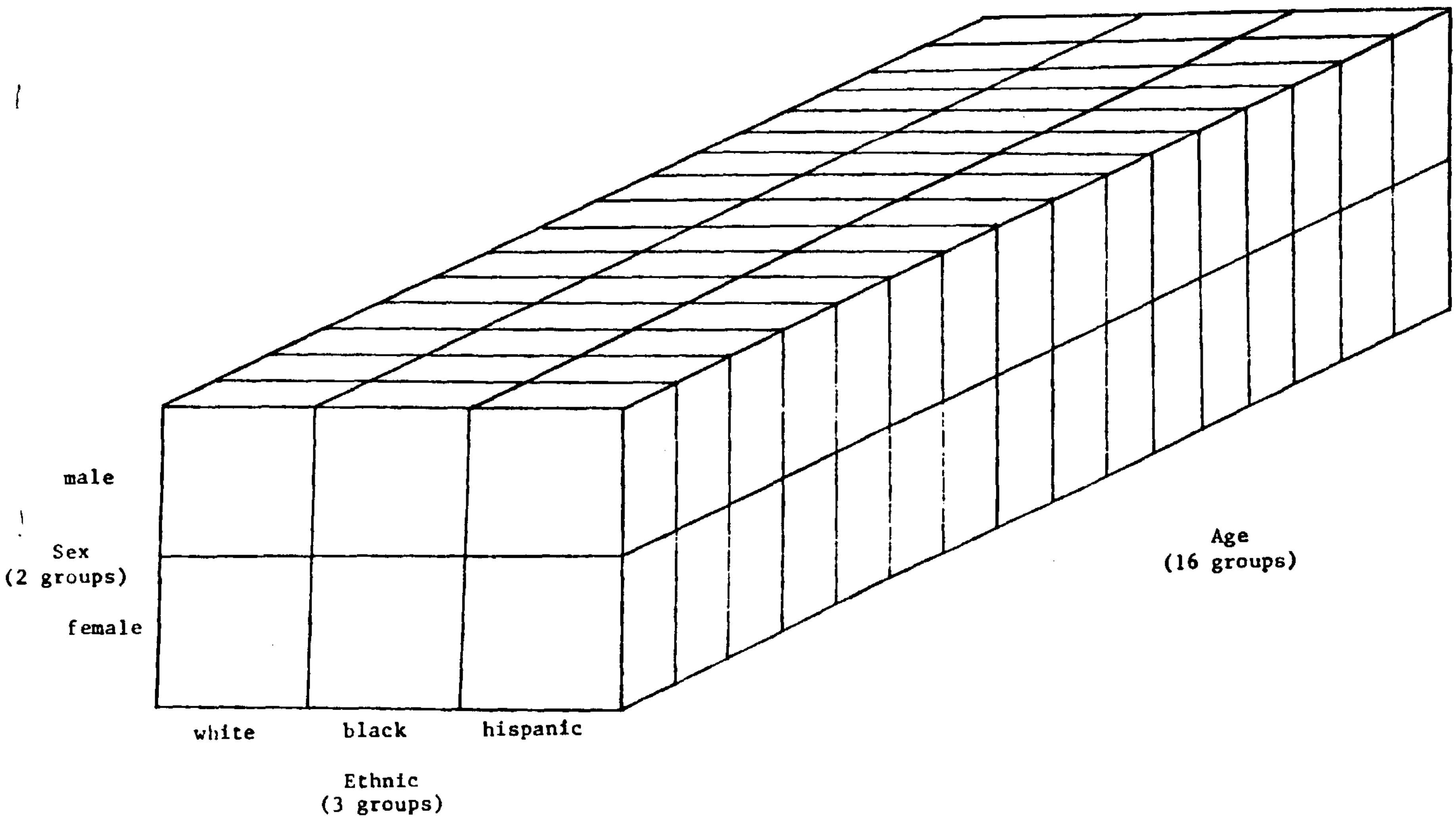
1990, 2000, 2010, 2020 and 2030

County population projections are calculated via a modified "cohort-component" approach, in which the numbers for the separate parts of the population are projected and then summed to obtain county totals. A cohort is defined as a group of people having similar characteristics, such as the group of white females who are between the ages of five and nine years. For purposes of making population projections for use in water planning, 16 age groups, three ethnic groups, and two sex groups for each county, making a total of 96 cohorts are used. Birth, death, and migration rates characteristic of each cohort, of each Texas county, are used in making the projections. The results for counties are summed to obtain the State totals for each projection year.

The modified cohort-component method considers the differences in age characteristics of the population of the counties of Texas, and the effects of these differences upon population in future years. For example, women 20-24 are more likely to have children than women 40-44; it is useful to know the number of women in each age group rather than just the total number of women when projecting births. Or, men 75-79 are less likely to survive another ten years than men 35-39, exemplifying that numbers of deaths are also better projected with age-detailed data. Thus, for projection purposes, the population of each county in 1980 is divided into an age/race/sex cohort matrix as illustrated by Figure 1. Then to each cell of the county population matrix, characteristic birth rates, where applicable, and death and migration rates are applied to determine the cohort populations for the next projection date, i.e.;

FIGURE 1

Population Data for a County



2. County population from 5,000 to 99,999:

Migration = b_1 x INSTRUMENT + b_2 x MIGRATION 60-70

+ b_3 x MIGRATION 50-60 + b_4 x NEIGHBOR 1 + b_5 x NEIGHBOR 2

+ b_6 x NEIGHBOR 3 + b_7 x NEIGHBOR 4 + b_8 x PER CAPITA INCOME RATIO

+ b_9 x HOUSING STARTS + b_{10} x INCOME INCREASE

+ b_{11} x POPULATION 1970 + b_{12} x JUNIOR COLLEGE

+ b_{13} x JANUARY TEMPERATURE + b_{14} x TRAVEL DISTANCE

+ b_{15} x MEXICAN BORDER + b_{16} x TRAVEL DISTANCE

+ b_{17} x LIGNITE DEPOSITS + b_{18} x HILL COUNTRY + b_0

3. County populations of less than 5,000

Migration = b_1 x INSTRUMENT + b_2 MIGRATION 60-70

+ b_3 x MIGRATION 50-60 + b_5 x NEIGHBOR 3

+ b_6 x NEIGHBOR 2 + b_7 x NEIGHBOR 1

+ b_8 x PER CAPITA INCOME RATION + b_9 x HOUSING STARTS

+ b_{10} x INCOME INCREASE + b_{11} x POPULATION 1970

+ b_{13} x JANUARY TEMPERATURE + b_{14} x HIGHWAYS

+ b_{15} x MEXICAN BORDER + b_{16} x TRAVEL DISTANCE

+ b_{18} x HILL COUNTRY + b_0

The second variable (migration 60-70) in the regression equation is the county's net migration rate lagged one ten year period. Thus, the variable's value is the county's 1960-1970 migration rate for the 1970-1980 projection period. The projected 1970-1980 rate then becomes the value used for the 1980-1990 projection period, and so on through the entire projection process.

Migration 50-60 is the migration rate lagged two periods; 1950-1960 for the 1970-1980 projection period, 1960-1970 for the 1980-1990 projection period, etc. In most cases the regression coefficient for this variable is negative.

The next four "NEIGHBOR" variables (4-7) are instrument variables related to the population at the beginning of the projection period for counties contiguous to the projected county. The instrument values assigned are 1 if the condition exists; zero otherwise. These variables help to explain some of the variance in migration brought about by neighboring counties. The conditions for each county are:

1). for variable (4), a contiguous county with a population greater than 1,000,000

2). for variable (5), a contiguous county with a population between 250,000 and 999,999

3). for variable (6), a contiguous county with a population between 100,000 and 249,000

4). for variable (7), a contiguous county with a population between 50,000 and 99,999

All population conditions are evaluated at the beginning of the projection period, thus, the values of these variables change over time as the projected populations of contiguous counties change.

Variable eight (per capita income ratio) is the county's average annual per capita income for 1973-1977 relative to the U.S. average annual per capita income for the same time period. The U.S. average was chosen as the standard of comparison because many migrants to a county are drawn from beyond the borders of Texas. After the initial projection period, growth rates for relative per capita income are for the U.S. Department of Commerce, Bureau of

Economics Analysis (BEA) areas (Regional Economic Projections, OBERS, 1980). Each county within the BEA area is assigned the growth rate for that area.

Housing starts is a variable used to express the effect of a county's proximity to economically and demographically "booming" areas. If the population center of a county is within 100 miles of the population center of a county with at least 400,000 people, then this variable is the ratio between the natural log of the historical average yearly number of housing starts in that county over the period of 1975-1979 and the natural log of the distance between the two population centers. For example, Austin County's focal point is 56 miles from that of Harris County. Harris County had an average yearly 25,883 housing starts for the period 1975-1979 (U.S. Census Bureau, C-40 Reports, No. 13). Thus the value for this variable for Austin County is ln(25,883)/ln(56) = 2.524.

If a county is within 100 miles of two or more counties with at least 400,000 people, the number of housing starts in the counties furthest away are reduced by weighted distance then added to the number of housing starts in the nearest county. For example, Comal County's population center is 31 miles from the Bexar County's center and 48 from Travis County's, both of which had over 400,000 people in 1980. The average number of housing starts per year for Bexar County is 6,116, and for Travis County 5,368 (U.S. Census Bureau, C-40 Reports, No. 13). The variable's value is thus; ln(6,116+(5,368 x 31/48))ln(31) = 2.670. For counties not within 100 miles of a large county the value for this variable is zero.

The income increase variable in the regression equation is the percentage increase in real per capita income (constant dollars) for the time period five to fifteen years before the projection period, e.g., 1965-1975 for the correlation with migratory movements. Each county has some tourist activities, some counties much more than others, and related travel expenditures, that are associated with tourism. Other travel expenditures within a county will associate with the relocation of individuals and families into and out of the county. The relative level of expenditures on travel then can be used as a statistical correlate or surrogate, in part, for explaining net migration activity. The power of this variable alone to explain net migration is not great, but it is statistically significant and when used in combination with other variables contributes to a more complete and reliable explanation of net migration.

The seventeenth variable (Lignite Deposits) is another instrument variable representing the current presence of significant mining or availability of lignite deposits. The variable is assigned a value of one for 24 counties with lignite deposits and zero elsewhere.

The last variable was included after the other variables failed to predict reliably the 1970-1980 migration rates of several Edwards Plateau counties. The instrument variable was assigned a value of two for counties most likely to be considered "Hill Country" counties, one for border "Hill Country" counties, and zero for all others.

Two variables for which data were collected and tested were discarded from the predictive equations because the effect of these variables on migration is too cyclical or otherwise unstable from decade to decade. They are: 1) the percentage of population in senior colleges, and 2) the percentage of the population in the armed forces. Fluctuations in the age composition of the population can make a college county grow or decline and thus the sign of the variable in a regression equation could change from decade to decade in the prediction of overall migration rates. For counties with military installations, the complement of population related to these installations often is subjected to unpredictable and sizeable increases or decreases. Thus, the senior college enrollment and military complement of a county's population were included in total population but not singled out as a determining influence on the migration component of the overall projection equation.

The coefficients of the three, size-specific migration projection equations, specific numeric values for the b_i terms, are estimated based upon the historical data identified in the discussion of each variable. When given an estimated numerical value, each coefficient then reflects the relative effect of its associated independent variable upon the dependent variable, observed county-specific net migration rates for the 1970-1980 period. Once estimated, the numerical values assigned the coefficients are not changed through time, hence the relative unit effect of each independent variable is implicitly assumed to remain constant through time. However, the values taken on by the independent variables do change through time for all those independent variables for which projected future values are available. For some independent variables, e.g., "Housing Starts" and "Junior College", projections of future values are not available and, thus, these values are held constant through time at the value used for the initial estimation, i.e., the data used in reproducing the observed 1970-1980 migration rates are used in subsequent time periods. The migration variables and several of the instrument variables change from decade to decade and the new values for these type independent variables are a result of applying the model for a previous decade. For example, the second independent variable in the regression is migration lagged one 10-year period. The value of this variable in the 1980-1990 projection period is the projected value derived from applying the regression equation in county's migration rate, additive factors were included in the regression equations to match the reported 1970-1980 migration rate.

For each projection period, all county migration rates were finally adjusted so that estimated migration for each of the 254 counties in Texas would sum to an independently derived state migration control total. Depending on whether the net sum over all counties of estimated migrants fell short of or exceeded the independently derived state migration total, each county's migration rate was either increased or decreased to achieve agreement between these two totals. To accomplish this, each county's rate was increased or decreased proportional to the inverse of the ratio of the net sum of population to the independently developed state population count.

Two different procedures were used for estimating control totals of net migration into Texas in each of the decades from 1980 to 2030. The results of the two procedures, when processed through the cohort component population projection model specified above, are two different sets of county-specific, and state, population projections, a low and high case, for the decadal years 1990 to 2030. The cohort-specific birth and death rates are not differentiated between the low and high case projections, only different rates of migration, and, thus, different numbers of migrants, both into Texas and between counties within Texas. While cohort-specific birth and death rates are the same in both cases of projections, their affect is not. Birth rates (one birth rate for each female cohort grouping within the range of childbearing age) and death rates (one for each of the 96 cohort groupings) operate upon the number of persons in a particular cohort grouping. Interstate migration into Texas, and intercounty migration within Texas, moves people into cohort groupings laterally instead of sequentially, as would be the situation with ordinary birth and aging processes. Based on Bureau of Census data, both current and historical, migrants moreover, are heavily concentrated in those age groupings with the highest incidence of childbirth, thus through time increasing the county and state population in a compound manner. The rate and number of immigrants, then, affects the pace for the rate and overall growth in population, both for specific counties and cumulatively for the State.

The state migration control total for the 1980-1990 projection period was based on 1970-1980 Texas migration data, as reported in the 1980 Census, and on an estimate of the pool of potential migrants in the rest of the U.S. This estimate of the total number of potential migrants in the U.S. and outside of Texas was made from Bureau of the Census estimates of age-specific mobility patterns, expressed as a percentage of all individuals in any specific age groupings, applied to the total U.S. population in 1980 in each age grouping. For the high case control total, Texas' share of this pool of potential migrants is projected to be proportional to Texas' observed share of total migrants in the 1970-1980 period. As applied, this technique carries forward into the decade 1980-1990 the high rate of immigration into Texas that occurred in the decade of the 1970's, in the high case projections.

The low case projections, designed as an alternate to the high case, are based on an opposite circumstance regarding immigration into Texas during the 1980-1990 decade. The low case projections are based on the same vital statistics regarding birth and death rates as used in the high case but with net migration characteristics that reflect migration patterns of the past three decades (1950-1980), which has the effect of reducing the influence of the very high rate of immigration into Texas in the latter portion of the decade of the 1970's. Specifically, the low-case state migration control total for the 1980-1990 projection period was based on a weighted average of reported migration into Texas within each of the three decadal periods 1950-1960, 1960-1970, and

1970-1980, as reported by the Bureau of the Census. The weights chosen in forming this average migration rate for the 1980-1990 decade were the decadal deviations from the three-period arithmetic average. Weighted in this fashion, the high inmigration rate during the decade 1970-1980 is given some emphasis but this emphasis is tempered by the observed experience of the other two decades. Taken collectively, the weighted average inmigration rate projected for 1980-1990 from this procedure has the effect of characterizing the near term, and the long term, as will be discussed below, inmigration effect on total population as being more in line with the past 30 years pattern than in line with the last 20 years, as is the effect in the high case projections.

Control totals for immigration for projection periods beyond 1990, for both low case and high case, were calculated from the migration rates projected for the 1980-1990 decade. The procedure used was to decrease the rate applicable to the 1980-1990 decade along a linearly declining path constructed to converge to zero in the year 2100. Since the migration rate applicable to a particular decade applies to a base population in the State in the preceding decade and since through time this application has a compound effect much the same as an interest rate applies to a principal value or an inflation rate to an economic base value, the migration rate must be damped through time to compensate mechanically for the growing population base. Relatedly, it is not realistic to presume that the number of migrants into Texas will grow continuously at a constant rate (a constant percent of the base population at any time) through distant future time as a result of the relative attractiveness of Texas as a place to live and work.

Reading the migration rate applicable to future decades from a linear path designed to converge to zero in the year 2100 is a mechanical procedure for determining an exact number; the reasonableness of the procedure and the distant future year selected for convergence, were guided by independent projections of future manufacturing, mining, and agricultural activity in Texas prepared by the Texas Department of Water Resources. That is, the projected population of Texas in future decades is consistent with the number of available jobs and a reasonable proportion of the population participating in the work force. This was done by converting the projected future adult population into a measure of the labor force by using labor force participation rates produced by the U.S. Department of Labor, Bureau of Labor Statistics, modified for Texas, and comparing these with projections of growth in economic activity in Texas.

An unusual circumstance exists in the Lower Rio Grande Valley area of Texas that complicates projections of population for this region. The four counties — Cameron, Hidalgo, Starr, and Willacy — that make up this area are an increasingly popular location for residents of other states to spend a portion of the year, usually the winter months, though for some, all except the summer months. Cameron and Hidalgo Counties are especially popular with these long-term visitors. Based on surveys of trailer-park space rentals and occupancy rates in residential rental properties, the population in some cities, Harlingen, for example is estimated to double during the winter months as a result of short-term residents.

In forming projections of population for these counties, however, estimates are included of these part-year residents, expressed in the form of full-year resident equivalencies, i.e., as if these persons were in residence in the respective counties all year round. The data forming a basis for this estimation were taken from surveys, studies, and interviews done by the Brownsville, Harlingen, McAllen, and Rio Grande Valley Chambers of Commerce and from the Bureau of Business and Economic Research, Pan American University, Edinburg, Texas. Based on these data and consistent with the judgement of administrators and researchers within these organizations, it is estimated that the number of full-time equivalent residents comprised from part-year, but long-term, visitors approximates 10 percent of the county's base population. In projections tabulated for these Valley counties, counts of full-year equivalents of part-year residents are included in the total county population estimates.

Data

There are four major components to the populations prediction. They are:

1. Historic and current POPULATIONS for Texas counties which are taken from the Bureau of the Census.

2. Historic BIRTH RATES are taken from the Bureau of the Census data for 1975-1980 (Bureau of the Census P-25 Report No. 704). Texas county birth rates are from the Texas Department of Public Health and the projected birth rates are from the Bureau of the Census (Bureau of the Census P-25 Report No. 796). Projected birth rates are weighted with specific Texas county rates.

3. National DEATH RATES are from 1969-1971 (Bureau of the Census Report P-25 No. 704). Texas county specific death rates are from the Texas Department of Health and are used to weight the national rates.

4. MIGRATION rates for Texas counties are calculated from several variables through the use of multiple regression techniques. The variables are:

   A. Population. Bureau of the Census population figures were used for both gross county populations and for cohort-specific counts. Net migration was determined as the difference between county populations and county populations expected without migration.

   B. Per Capita Income was taken from the BEA Regional Economic Projections, OBERS 1980.

   C. Income Increase is the percentage increase in income calculated from 4B above.

   D. Junior College Enrollment statistics were taken from the Coordinating Board - Texas College and University Systems.

E. January Mean Temperature is from the Weather and Climate Section at TDWR.

F. Border Counties are from the examination of a Texas State map.

G. Hill Counties are as follows:

1. Bandera
2. Bexar
3. Blanco
4. Comal
5. Edwards
6. Hays
7. Gillespie
8. Kendall
9. Kerr
10. Kinney
11. Medina
12. Real
13. Travis
14. Uvalde
15. Val Verde

H. Travel Distance is from the travel model by the U.S. Travel Center.

I. Housing Starts data are from the Bureau of the Census C-40 Reports, No. 13.

J. Lignite is from the Bureau of Economic Geology at the University of Texas at Austin. The reports are:

1. Report of Investigations 104
2. Report of Investigations 50
3. Report of Investigations 79

K. Highways is from a Texas State map.

Summary

Modified cohort-component methodology was used to generate a population projection series for each of the 254 counties of Texas. The total county population for each ten year period is the summation of cohort (age/ethnic/sex) populations in each county. The projections for each subsequent ten year period were obtained by multiplying a county cohort population matrix at the beginning of the population period by birth, death and migration rate matrices applicable to the projection period. The individual cohort-component rates were derived using historical and the most recent data.

The cohort-component projections were summed to obtain total county population projections for ten year periods from 1990-2030. State total projections, low and high case, including historical population, are tabulated below and exhibited graphically (Table I and Figure II); county projections are contained in the attachments to this report. Statewide population growth during the decade of the 1970's was the highest ever recorded for Texas, 26.7 percent, though the decade of the 1950's approached this level, 24.6 percent (Table 1). This exceptionally high rate of growth observed during the past decade is not expected to continue on into future decades but is expected to decrease to a decadal rate of growth of about 17 percent (Table 1). Though the decadal rate of growth is anticipated to settle back from the high rate observed during the 1970's, the population of Texas is expected to grow significantly through time from 14.2 million in 1980 to 21.2 million in 2000 and to 34.3 million in 2030 Table 1).

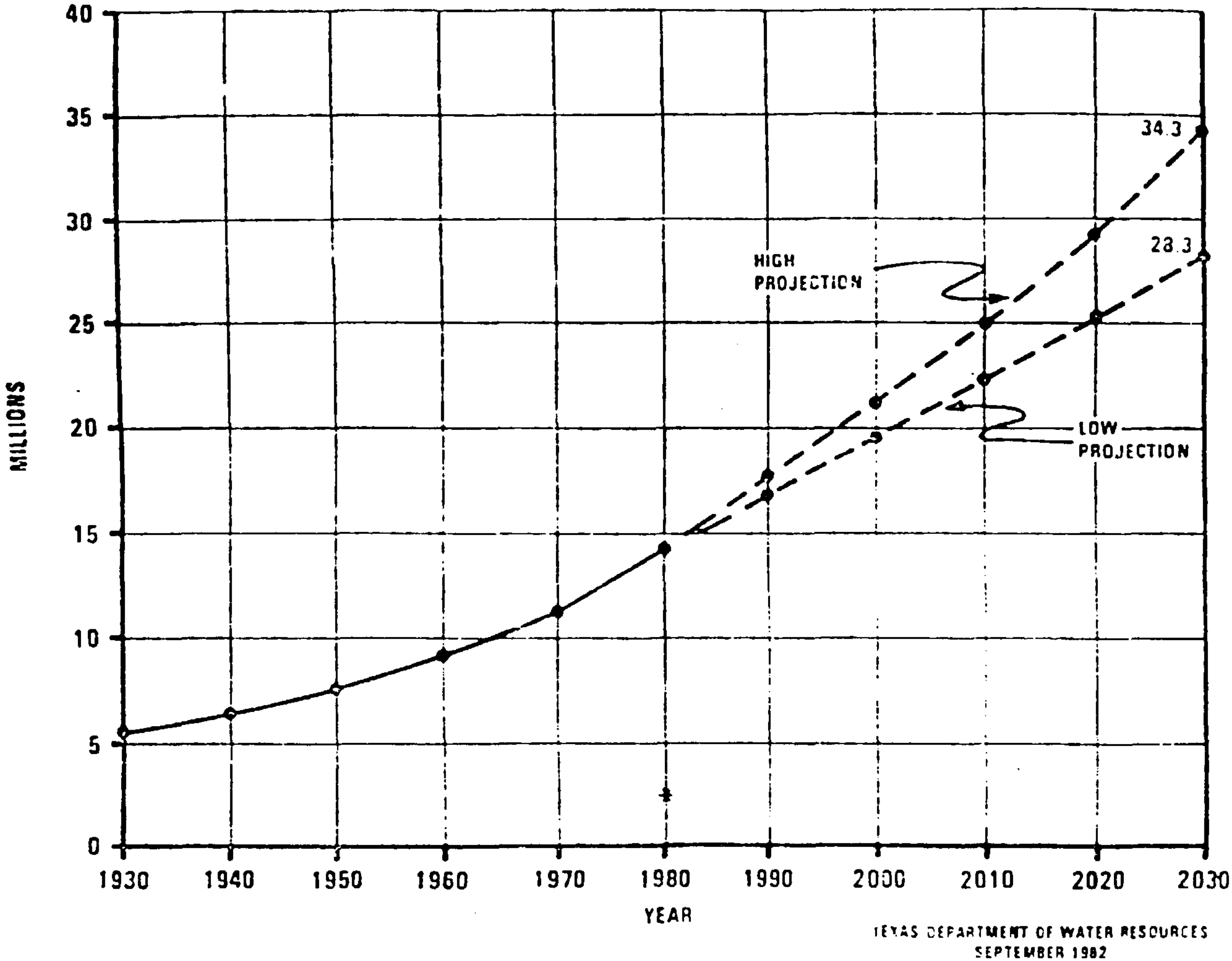
Table I. Texas Population with Low and High Projections to 2030.

Year	Low Case		High Case	
	Population	Rate of Growth	Population	Rate of Growth
	(millions)	(percent)	(millions)	(percent)
1930	5.8	—	5.8	—
1940	6.4	10.3	6.4	10.3
1950	7.7	20.3	7.7	20.3
1960	9.6	24.6	9.6	24.6
1970	11.2	16.6	11.2	16.6
1980	14.2	26.7	14.2	26.7
1990	16.8	18.3	17.8	25.4
2000	19.6	16.4	21.2	19.0
2010	22.3	13.8	24.8	17.0
2020	25.1	12.7	29.1	17.3
2030	28.3	12.6	34.3	17.7

SOURCE: U.S. Bureau of the Census with projections by the Texas Department of Water Resources.

Figure II

TEXAS POPULATION PROJECTIONS



APPENDIX B

POPULATION AND LAND USE PROJECTIONS
(CITY PLANNING DEPARTMENT)

City of Corpus Christi

July 19, 1991

TO:	*James Dodson, City Wastewater Services Coordinator*
	Randy Thompson, P.E., Vice President, Archie Walker Engineering, Inc.
	Joseph G. Pantalion, Camp Dresser & McKee Inc.
FROM:	*Robert E. Payne, Senior City Planner*
SUBJECT:	*Population and Land Use Projections*

I have attached a revised Final Draft report for your review and comments. I believe it contains all of the information requested.

For your information each of the tables in the report contain notes on the source of information, methodology, and any special concerns. An example of a special concern can be found in the Mustang Padre land use information, where tidal flats have been excluded from the calculations since they are considered undevelopable. In other words, we have not projected future development in these areas. Hopefully these notes will help explain how we arrived at the future land use projections (see adjusted estimate columns 4, 7 and 11) in tables V, VI and VII.

The population projections in the report do not reflect the increase in total population recently discussed in the news. The revised 1990 census figures are not yet published or official and therefore can not be used at this time.

Please let me know when you would like to discuss these projections.

Robert E. Payne

Robert E. Payne, AICP
Senior City Planner

cc: *Bill Hennings, Executive Director of Development Services*
Brandol M. Harvey, Director of Planning and Urban Development
Willie Pulido, Planner III
Nancy Harvieux, Planner I

Attachments

POPULATION AND LAND USE PROJECTIONS
FOR THE REGIONAL STORMWATER MASTER PLAN (RSMP)
JULY 19, 1991

PREPARED BY: THE CORPUS CHRISTI CITY
PLANNING AND URBAN DEVELOPMENT DEPARTMENT

POPULATION AND LAND USE PROJECTIONS FOR THE REGIONAL STORMWATER MASTER PLAN (RSMP)

TABLE OF CONTENTS

METHODOLOGY

This study develops growth factors that can be applied to vacant or partially developed land for estimating future land use. Resulting projected land use (see Tables V, VI, and VII, Adjusted Estimated Land Use), combined with engineering data can identify needed improvements to the existing or future stormwater drainage system.

The overall rational and method for developing these land use projections was relatively simple. Planning Staff used Census data from 1960 through 1990 to establish a trend for each ADP area. Using several different methods the population for each ADP was projected. Total City projected population was compared with the Texas Water Development Board population projections. The Linear Direct and Exponential Regression Models (see Appendix A) were chosen as they provided a close fit to the Texas Water Development Board's Projections. Using these models the ADP areas (the study area boundary required the creation of two "sub" areas that are not ADP areas) were studied to determine the most likely rate of population change between 1990 - 1995, 1995 - 2000, and 2000 - 2010. These rates, or percentages of change, were then multiplied by existing residential, commercial, and industrial land use acreages.

Using the Linear Direct and Exponential Regression Models for medium and high projections Staff then developed a low projection. The Low projection was simply the Linear Direct projection with a 4% reduction. The 4% reduction was the difference between medium and high projections.

Staff compared Low, Medium, and High projections with the Texas Water Development Board projections (see Appendix B). The intent was to find the models which best fit the Corpus Christi area and study parameters. These new projections used 1990 census data that was not available when the Texas Water Development Board completed its projections. Therefore, at the outset, Staff expected some deviation from the Authority's existing projections.

The Water Board's High Series Projection was approximately 3% higher than the RSMP High Series Projection. The Water Board's Low Series Projection was approximately 8% higher than the RSMP Low Series Projection. The Water Board doesn't have a medium projection, however the Board's Low Series was only 4% higher than the RSMP Medium Series Projection. For these comparisons the Robstown population figures in the Texas Water Development Board's Projections were reduced by 40% since RSMP study area only encompasses a portion of Robstown.

In Staffs opinion, differences between the Texas Water Development Board's Projections and RSMP are largely due to the use of 1990 Census data in RSMP Projections, differences in projection methods, and differences in geographic areas. However the deviations that occurred, especially between the RSMP High and Medium Projections, were so slight they were almost insignificant.

Ultimate land use acreages in the study were obtained from an adopted land use plan or were "generated" by Staff. Where ultimate land use was generated Staff assumed the same proportion of existing residential, commercial and industrial property. For example if existing residential property was 50% of all developed property, then 50% would be multiplied by the total area of the ADP. If existing commercial property was 10% of the total developed property then 10% would be multiplied by the total land area, etc.

One of the problems with the model used is that population decline translates into a decline in residential, commercial, and industrial land use. As these land use acreages get smaller the undeveloped category gets larger. In rural areas the undeveloped category may get larger. However, this is not true for the South Central area (downtown). Therefore, rather than use the Adjusted Projected figures for South Central one should use the existing land use (1990) for 1995, 2000, and 2010.

The acreages for 1990 exempt property in Tables V, VI, and VII refers to those properties having an agricultural exemptions for farming. Exemptions for pasture lands were excluded from these acreages.

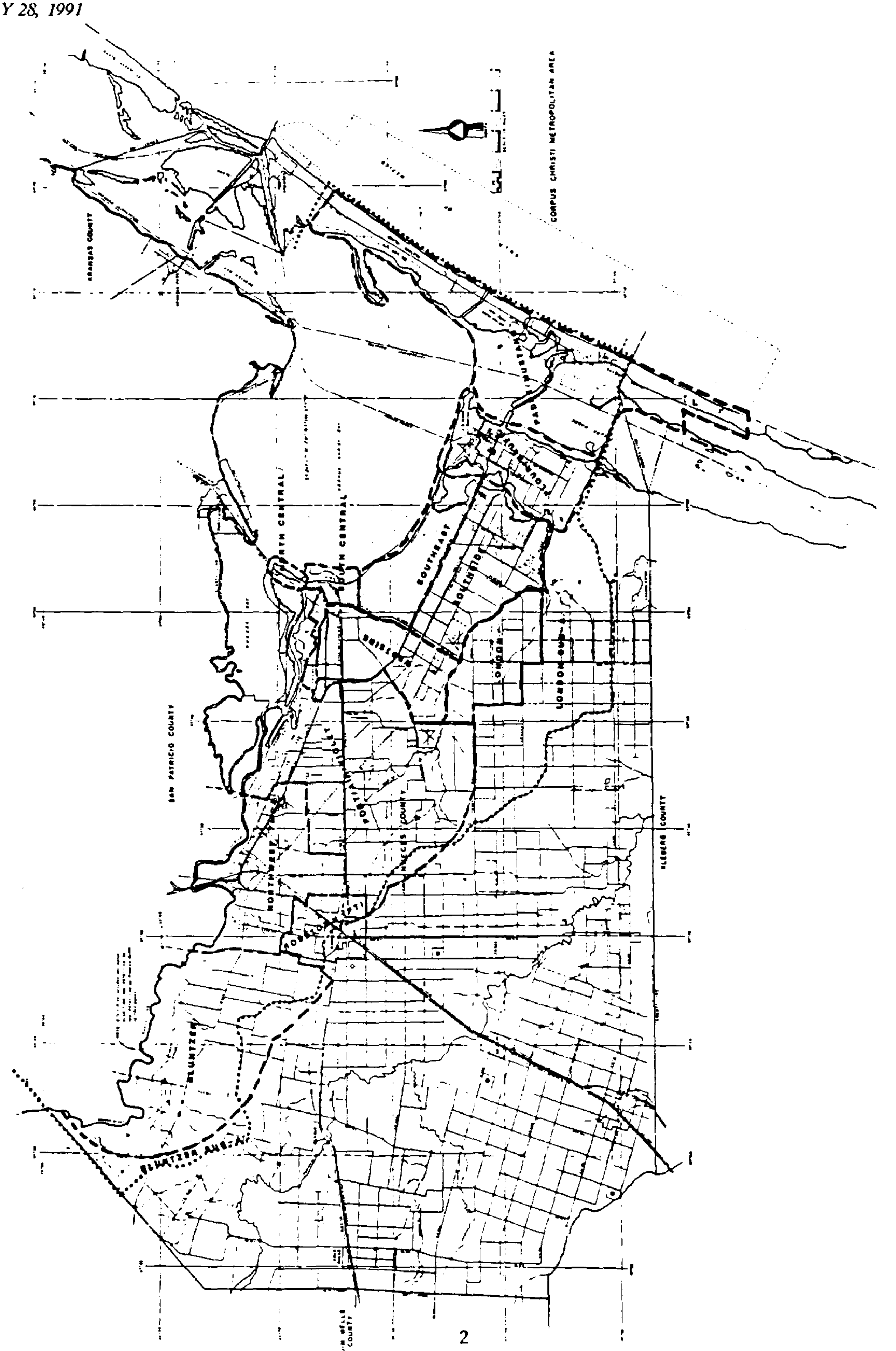

CORPUS CHRISTI METROPOLITAN AREA
ARANSAS COUNTY
SAN PATRICIO COUNTY
NUECES COUNTY
KLEBERG COUNTY
JIM WELLS COUNTY
SOUTHEAST
LONDON
NORTHWEST
BLUNTZER

TABLE I.

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

POPULATION PROJECTION

LOW PROJECTION SERIES

POPULATION COUNTS 1960 THRU 1990

POPULATION PROJECTION METHODOLOGY: LINEAR DIRECT MODEL WITH A 4% REDUCTION
POPULATION PROJECTIONS FROM 1995 THRU 2010

AREA DEVELOPMENT PLAN	GROSS ACREAGE	SQ. MI.	1960 POP	1970 POP	60-70 CHANGE	% CHANGE	1980 POP	70-80 CHANGE	% CHANGE	1990 POP	80-90 CHANGE	% CHANGE
BLUNTZER	33,686	52.63	894	1,664	770	86.1%	1,837	173	10.4%	2,298	461	25.1%
BLUNZTER SUB-A	5,959	9.31	150	157	7	4.7%	164	7	4.5%	178	14	8.5%
FLOUR BLUFF	7,603	11.88	4,902	6,999	2,097	42.8%	11,961	4,962	70.9%	16,771	4,810	40.2%
LONDON	11,579	18.09	405	375	-30	-7.4%	257	-118	-31.5%	130	-127	-49.4%
LONDON SUB-A	34,776	54.34	325	275	-50	-15.4%	200	-75	-27.3%	257	57	28.5%
NORTH CENTRAL	385	0.60	1,681	831	-850	-50.6%	1,033	202	24.3%	415	-618	-59.8%
NORTHWEST	21,209	33.14	8,166	9,399	1,233	15.1%	14,127	4,728	50.3%	22,758	8,631	61.1%
MUSTANG/PADRE	28,837	45.06	50	134	84	168.0%	350	216	161.2%	2,941	2,591	740.3%
PORT/AIRPT./VIOLET	52,995	82.80	667	4,017	3,350	502.2%	6,667	2,650	66.0%	5,065	-1602	-24.0%
ROBSTOWN (PT)	5,208	8.14	10,570	9,746	-824	-7.8%	9,650	-96	-1.0%	8,907	-743	-7.7%
SOUTH CENTRAL	1,154	1.80	13,603	9,163	-4440	-32.6%	9,322	159	1.7%	6,378	-2944	-31.6%
SOUTHEAST	10,474	16.37	79,712	88,390	8,678	10.9%	81,915	-6475	-7.3%	81,103	-812	-1.0%
SOUTHSIDE	20,410	31.89	5,097	20,817	15,720	308.4%	42,227	21,410	102.8%	68,581	26,354	62.4%
WESTSIDE	16,394	25.62	70,547	62,427	-8120	-11.5%	62,760	333	0.5%	55,507	-7253	-11.6%
ALL ADP'S	250,669	392	196,769	214,394	17,625	9.0%	242,470	28,076	13.1%	271,289	28,819	11.9%

AREA DEVELOPMENT PLAN	1995 POP	90-95 CHANGE	% CHANGE	2000 POP	95-00 CHANGE	% CHANGE	2010 POP	00-10 CHANGE	% CHANGE
BLUNTZER	2,477	179	7.8%	2655	179	7.2%	3105	449	16.9%
BLUNZTER SUB-A	179	1	0.4%	180	1	0.4%	189	10	5.3%
FLOUR BLUFF	18,334	1,563	9.3%	19898	1,563	8.5%	23697	3,799	19.1%
LONDON	265	135	104.2%	401	135	51.0%	412	11	2.8%
LONDON SUB-A	241	-16	-6.3%	225	-16	-6.7%	204	-21	-9.4%
NORTH CENTRAL	556	141	34.0%	697	141	25.4%	1124	427	61.2%
NORTHWEST	24,638	1,880	8.3%	26517	1,880	7.6%	31187	4,669	17.6%
MUSTANG/PADRE	3,353	412	14.0%	3764	412	12.3%	4706	942	25.0%
PORT/AIRPT./VIOLET	5,667	602	11.9%	6270	602	10.6%	7677	1,407	22.4%
ROBSTOWN (PT)	8,463	-444	-5.0%	8019	-444	-5.2%	7486	-533	-6.6%
SOUTH CENTRAL	5,095	-1283	-20.1%	3811	-1283	-25.2%	1499	-2313	-60.7%
SOUTHEAST	79,704	-1399	-1.7%	78304	-1399	-1.8%	78749	444	0.6%
SOUTHSIDE	77,367	8,786	12.8%	86152	8,786	11.4%	106468	20,316	23.6%
WESTSIDE	51,991	-3516	-6.3%	48474	-3516	-6.8%	43661	-4813	-9.9%
ALL ADP'S	278,328	7,039	2.6%	285,368	7,039	2.5%	310,162	24,794	8.7%

SOURCE HISTORICAL POPULATION DATA: 1960 THRU 1990 CENSUS

NOTES:
1. Bluntzer ac. reduced by 4785 - ADP extends beyond study area - pop. adjusted.
2. Bluntzer Sub-A area treated as separate unit - study area extends beyond ADP.
3. Flour Bluff ADP acreage excludes Waldron Fld., Barney M. Davis Plant and NAS.
4. London Sub-A area treated as separate unit - study area extends beyond ADP.
5. Port/Air/Violet ADP ac. reduced by 1,601 as study area overlaps ADP pop. adjusted.
6. Part of City of Robstown included in study area treated as separate unit.
7. Southeast and Southside ADP acreages exludes Cayo Del Oso.
8. London assumed to grow at same rate as the Southside area did during 1960-1990.
9. North Central assumed to grow at same rate as the Mustang/Padre area did during 1960-1990.

TABLE II.

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

POPULATION PROJECTION

MEDIUM PROJECTION SERIES

POPULATION COUNTS 1960 THRU 1990

POPULATION PROJECTION METHODOLOGY: LINEAR DIRECT MODEL
POPULATION PROJECTIONS FROM 1995 THRU 2010

AREA DEVELOPMENT PLAN	GROSS ACREAGE	SQ. MI.	1960 POP	1970 POP	60-70 CHANGE	% CHANGE	1980 POP	70-80 CHANGE	% CHANGE	1990 POP	80-90 CHANGE	% CHANGE	1995 POP	90-95 CHANGE	% CHANGE	2000 POP	95-00 CHANGE	% CHANGE	2010 POP	00-10 CHANGE	% CHANGE
BLUNTZER	33,686	52.63	894	1,664	770	86.1%	1,837	173	10.4%	2,298	461	25.1%	2,532	234	10.2%	2,766	234	9.2%	3,234	468	16.9%
BLUNZTER SUB-A	5,959	9.31	150	157	7	4.7%	164	7	4.5%	178	14	8.5%	183	5	2.5%	187	5	2.5%	197	10	5.3%
FLOUR BLUFF	7,603	11.88	4,902	6,999	2,097	42.8%	11,961	4,962	70.9%	16,771	4,810	40.2%	18,749	1,978	11.8%	20,727	1978	10.5%	24,684	3957	19.1%
LONDON	11,579	18.09	405	375	-30	-7.4%	257	-118	-31.5%	130	-127	-49.4%	265	135	104.2%	401	135	51.0%	412	11	2.8%
LONDON SUB-A	34,776	54.34	325	275	-50	-15.4%	200	-75	-27.3%	257	57	28.5%	246	-12	-4.5%	234	-12	-4.7%	212	-22	-9.4%
NORTH CENTRAL	385	0.60	1,681	831	-850	-50.6%	1,033	202	24.3%	415	-618	-59.8%	556	141	34.0%	697.2	141	25.4%	1,124	427	61.2%
NORTHWEST	21,209	33.14	8,166	9,399	1,233	15.1%	14,127	4,728	50.3%	22,758	8,631	61.1%	25,190	2,432	10.7%	27,622	2432	9.7%	32,486	4864	17.6%
MUSTANG/PADRE	28,837	45.06	50	134	84	168.0%	350	216	161.2%	2,941	2,591	740.3%	3,431	490	16.7%	3,921	490	14.3%	4,902	981	25.0%
PORT/AIRPORT/VIOLET	52,995	82.80	667	4,017	3,350	502.2%	6,667	2,650	66.0%	5,065	-1602	-24.0%	5,798	733	14.5%	6,531	733	12.6%	7,997	1466	22.4%
ROBSTOWN (PT)	5,208	8.14	10,570	9,746	-824	-7.8%	9,650	-96	-1.0%	8,907	-743	-7.7%	8,630	-277	-3.1%	8,353	-277	-3.2%	7,798	-555	-6.6%
SOUTH CENTRAL	1,154	1.80	13,603	9,163	-4440	-32.6%	9,322	159	1.7%	6,378	-2944	-31.6%	5,174	-1204	-18.9%	3,970	-1204	-23.3%	1,561	-2409	-60.7%
SOUTHEAST	10,474	16.37	79,712	88,390	8,678	10.9%	81,915	-6475	-7.3%	81,103	-812	-1.0%	81,335	232	0.3%	81,567	232	0.3%	82,030	463	0.6%
SOUTHSIDE	20,410	31.89	5,097	20,817	15,720	308.4%	42,227	21,410	102.8%	68,581	26,354	62.4%	79,162	10,581	15.4%	89,742	10581	13.4%	110,904	21162	23.6%
WESTSIDE	16,394	25.62	70,547	62,427	-8120	-11.5%	62,760	333	0.5%	55,507	-7253	-11.6%	53,001	-2506	-4.5%	50,494	-2507	-4.7%	45,480	-5014	-9.9%
ALL ADP'S	250,669	392	196,769	214,394	17,625	9.0%	242,470	28,076	13.1%	271,289	28,819	11.9%	284,251	12,962	4.8%	297,212	12,962	4.6%	323,021	25,809	8.7%

SOURCE HISTORICAL POPULATION DATA: 1960 THRU 1990 CENSUS

NOTES:
1. Bluntzer ac. reduced by 4785 - ADP extends beyond study area - pop. adjusted.
2. Bluntzer Sub-A area treated as separate unit - study area extends beyond ADP.
3. Flour Bluff ADP acreage excludes Waldron Fld., Barney M. Davis Plant and NAS.
4. London Sub-A area treated as separate unit - study area extends beyond ADP.
5. Port/Air/Violet ADP ac. reduced by 1,601 as study area overlaps ADP pop. adjusted.
6. Part of City of Robstown included in study area treated as separate unit.
7. Southeast and Southside ADP acreages exludes Cayo Del Oso.
8. London assumed to grow at same rate as the Southside area did during 1960-1990.
9. North Central assumed to grow at same rate as the Mustang/Padre area did during 1960-1990.

TABLE III.

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

POPULATION PROJECTION

HIGH PROJECTION SERIES

POPULATION PROJECTION METHODOLOGY: EXPONENTIAL REGRESSION MODEL

AREA DEVELOPMENT PLAN	POPULATION COUNTS 1960 THRU 1990													POPULATION PROJECTIONS FROM 1995 THRU 2010								
	GROSS ACREAGE	SQ. MI.	1960 POP	1970 POP	60-70 CHANGE	% CHANGE	1980 POP	70-80 CHANGE	% CHANGE	1990 POP	80-90 CHANGE	% CHANGE	1995 POP	90-95 CHANGE	% CHANGE	2000 POP	95-00 CHANGE	% CHANGE	2010 POP	00-10 CHANGE	% CHANGE
BLUNTZER	33,686	52.63	894	1,664	770	86.1%	1,837	173	10.4%	2,298	461	25.1%	2,341	43	1.8%	2,383	43	1.8%	2,358	-25	-1.0%
BLUNZTER SUB-A	5,959	9.31	150	157	7	4.7%	164	7	4.5%	178	14	8.5%	186	8	4.5%	194	8	4.3%	213	19	9.8%
FLOUR BLUFF	7,603	11.88	4,902	6,999	2,097	42.8%	11,961	4,962	70.9%	16,771	4,810	40.2%	20,232	3,461	20.6%	23,692	3,461	17.1%	31,819	8,127	34.3%
LONDON	11,579	18.09	405	375	-30	-7.4%	257	-118	-31.5%	130	-127	-49.4%	33	-98	-75.0%	-65	-98	-300.0%	-305	-240	369.2%
LONDON SUB-A	34,776	54.34	325	275	-50	-15.4%	200	-75	-27.3%	257	57	28.5%	293	36	13.8%	328	36	12.1%	461	133	40.5%
NORTH CENTRAL	385	0.60	1,681	831	-850	-50.6%	1,033	202	24.3%	415	-618	-59.8%	398	-17	-4.1%	381	-17	-4.3%	369	-12	-3.1%
NORTHWEST	21,209	33.14	8,166	9,399	1,233	15.1%	14,127	4,728	50.3%	22,758	8,631	61.1%	28,872	6,114	26.9%	34,986	6,114	21.2%	50,933	15,947	45.6%
MUSTANG/PADRE	28,837	45.06	0	134	134	100.0%	350	216	161.2%	2,941	2,591	740.3%	4,564	1,623	55.2%	6,187	1,623	35.6%	10,777	4,590	74.2%
PORT/AIRPT./VIOLET	52,995	82.80	667	4,017	3,350	502.2%	6,667	2,650	66.0%	5,065	-1602	-24.0%	3,470	-1595	-31.5%	1,875	-1595	-46.0%	-3969	-5844	-311.7%
ROBSTOWN (PT)	5,208	8.14	10,570	9,746	-824	-7.8%	9,650	-96	-1.0%	8,907	-743	-7.7%	8,728	-180	-2.0%	8,548	-180	-2.1%	8,161	-387	-4.5%
SOUTH CENTRAL	1,154	1.80	13,603	9,163	-4440	-32.6%	9,322	159	1.7%	6,378	-2944	-31.6%	6,243	-135	-2.1%	6,108	-135	-2.2%	6,200	92	1.5%
SOUTHEAST	10,474	16.37	79,712	88,390	8,678	10.9%	81,915	-6475	-7.3%	81,103	-812	-1.0%	75,722	-5381	-6.6%	70,341	-5381	-7.1%	55,876	-14465	-20.6%
SOUTHSIDE	20,410	31.89	5,097	20,817	15,720	308.4%	42,227	21,410	102.8%	68,581	26,354	62.4%	84,510	15,929	23.2%	100,439	15,929	18.8%	137,576	37,137	37.0%
WESTSIDE	16,394	25.62	70,547	62,427	-8120	-11.5%	62,760	333	0.5%	55,507	-7253	-11.6%	54,102	-1406	-2.5%	52,696	-1406	-2.6%	49,516	-3180	-6.0%
ALL ADP'S	250,669	392	196,719	214,394	17,675	9.0%	242,470	28,076	13.1%	271,289	28,819	11.9%	289,691	18,402	6.8%	308,093	18,402	6.4%	349,985	41,892	13.6%

SOURCE HISTORICAL POPULATION DATA: 1960 THRU 1990 CENSUS

NOTES:
1. Bluntzer ac. reduced by 4785 - ADP extends beyond study area - pop. adjusted.
2. Bluntzer Sub-A area treated as separate unit - study area extends beyond ADP.
3. Flour Bluff ADP acreage excludes Waldron Fld., Barney M. Davis Plant and NAS.
4. London Sub-A area treated as separate unit - study area extends beyond ADP.
5. Port/Air/Violet ADP ac. reduced by 1,601 as study area overlaps ADP pop. adjusted.
6. Part of City of Robstown included in study area treated as separate unit.
7. Southeast and Southside ADP acreages exludes Cayo Del Oso.
8. London assumed to grow at same rate as the Southside area did during 1960-1990.
9. North Central assumed to grow at same rate as the Mustang/Padre area did during 1960-1990.

TABLE IV.A

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

EXISTING LAND USE

Study Area: Bluntzer

Land Use	Acres
Residential	857
Commercial	25
Industrial	111
Undeveloped	32693
Total	33686
Agricultural	16589

Source: Planning Dept Study

Study Area: Mustang/Padre

Land Use	Acres
Residential	4558
Commercial	49
Industrial	
Undeveloped	15504
Total	20111
*Tidal Flats	8726
Agricultural	0

Source: Adopted Plan

Study Area: South Central

Land Use	Acres
Residential	367
Commercial	145
Industrial	16
Undeveloped	626
Total	1154
Agricultural	0

Source: Planning Dept Study

Study Area: Bluntzer Sub-A

Land Use	Acres
Residential	152
Commercial	4
Industrial	20
Undeveloped	5783
Total	5959
Agricultural	2158

Source: Planning Dept Study

Study Area: North Central

Land Use	Acres
Residential	33
Commercial	23
Industrial	2
Undeveloped	327
Total	385
Agricultural	0

Source: Adopted Plan

Study Area: South East

Land Use	Acres
Residential	7827
Commercial	1012
Industrial	46
Undeveloped	1589
Total	10474
Agricultural	37

Source: Planning Dept Study

Study Area: Flour Bluff

Land Use	Acres
Residential	2151
Commercial	208
Industrial	59
Undeveloped	5186
Total	7603
Agricultural	39

Source: Planning Dept Study

Study Area: North West

Land Use	Acres
Residential	3016
Commercial	252
Industrial	40
Undeveloped	17901
Total	21209
Agricultural	10021

Source: Adopted Plan

Study Area: Southside

Land Use	Acres
Residential	6658
Commercial	775
Industrial	79
Undeveloped	12898
Total	20410
Agricultural	6117

Source: Adopted Plan

Study Area: London

Land Use	Acres
Residential	109
Commercial	10
Industrial	10
Undeveloped	11450
Total	11579
Agricultural	11450

Source: Adopted Plan

Study Area: PAV

Land Use	Acres
Residential	1157
Commercial	63
Industrial	3987
Undeveloped	47788
Total	52995
Agricultural	35551

Source: Planning Dept Study

Study Area: West Side

Land Use	Acres
Residential	5115
Commercial	927
Industrial	1738
Undeveloped	8614
Total	16394
Agricultural	3370

Source: Adopted Plan

Study Area: London Sub-A

Land Use	Acres
Residential	327
Commercial	30
Industrial	30
Undeveloped	34389
Total	34776
Agricultural	24652

Source: Planning Dept Study

Study Area: Robstown

Land Use	Acres
Residential	450
Commercial	85
Industrial	53
Undeveloped	4621
Total	5208
Agricultural	4621

Source: Planning Dept Study

Note: * A significant portion of the Mustang/Padre area is so environmentally sensitive that it is unlikely it will be developed.

TABLE IV.B

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

PROPOSED LAND USE

Study Area: Bluntzer

Land Use	Acres
Residential	21382
Commercial	1856
Industrial	111
Undeveloped	10337
Total	33686
Agricultural	

Source: Planning Dept Study

Study Area: Mustang/Padre

Land Use	Acres
Residential	12553
Commercial	446
Industrial	
Undeveloped	7112
Total	20111
*Tidal Flats	8726
Agricultural	0

Source: Adopted Plan

Study Area: South Central

Land Use	Acres
Residential	238
Commercial	359
Industrial	67
Undeveloped	490
Total	1154
Agricultural	

Source: Adopted Plan

Study Area: Bluntzer Sub-A

Land Use	Acres
Residential	3724
Commercial	323
Industrial	111
Undeveloped	1801
Total	5959
Agricultural	

Source: Planning Dept Study

Study Area: North Central

Land Use	Acres
Residential	109
Commercial	48
Industrial	
Undeveloped	228
Total	385
Agricultural	

Source: Adopted Plan

Study Area: South East

Land Use	Acres
Residential	7830
Commercial	1012
Industrial	46
Undeveloped	1586
Total	10474
Agricultural	

Source: Planning Dept Study

Study Area: Flour Bluff

Land Use	Acres
Residential	5412
Commercial	523
Industrial	148
Undeveloped	1521
Total	7604
Agricultural	

Source: Planning Dept Study

Study Area: North West

Land Use	Acres
Residential	12137
Commercial	1234
Industrial	2373
Undeveloped	5465
Total	21209
Agricultural	

Source: Adopted Plan

Study Area: South Side

Land Use	Acres
Residential	13469
Commercial	2511
Industrial	779
Undeveloped	3651
Total	20410
Agricultural	

Source: Adopted Plan

Study Area: London

Land Use	Acres
Residential	7374
Commercial	640
Industrial	
Undeveloped	3565
Total	11579
Agricultural	

Source: Adopted Plan

Study Area: PAV

Land Use	Acres
Residential	13532
Commercial	4756
Industrial	15977
Undeveloped	18730
Total	52995
Agricultural	

Source: Planning Dept Study

Study Area: West Side

Land Use	Acres
Residential	8682
Commercial	2295
Industrial	4269
Undeveloped	1148
Total	16394
Agricultural	

Source: Adopted Plan

Study Area: London Sub-A

Land Use	Acres
Residential	22147
Commercial	1922
Industrial	
Undeveloped	10707
Total	34776
Agricultural	

Source: Planning Dept Study

Study Area: Robstown

Land Use	Acres
Residential	503
Commercial	85
Industrial	4568
Undeveloped	53
Total	5208
Agricultural	53

Source: Planning Dept Study

Note: * A significant portion of the Mustang/Padre area is so environmentally sensitive that it is unlikely it will be developed.

TABLE V.A — LAND USE PROJECTION — DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT

CITY OF CORPUS CHRISTI

COMPREHENSIVE PLAN AREA:BLUNTZER — LOW PROJECTION SERIES — MAY 23, 1991

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.08	856.63	923.23	923.23	0.07	989.84	989.84	0.17	1,157.32	1,157.32	21,382.00
COMMERCIAL	0.08	25.38	27.35	27.35	0.07	29.32	29.32	0.17	34.28	34.28	1,856.00
INDUSTRIAL	0.08	111.36	120.02	111.00	0.07	128.68	111.00	0.17	150.45	111.00	111.00
SUBTOTAL	NA	993.36	1,070.60	1,061.58	NA	1,147.84	1,130.16	NA	1,342.05	1,302.60	23,349.00
UNDEVELOPED	NA	32,693.00	NA	32,624.78	NA	NA	32,556.20	NA	NA	32,383.76	10,337.00
TOTAL	NA	33,686.36	NA	33,686.36	NA	NA	33,686.36	NA	NA	33,686.36	33,686.00
UNDEV. W/ AG. EXEMPTION		16,589.00		16,554.38	NA	NA	16,519.59	NA	NA	16,432.09	0.00
UNDEV. W/O AG. EXEMPTION		16,104.00		16,070.40	NA	NA	16,036.62	NA	NA	15,951.67	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.B

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:BLUNTZER SUB-A

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.00	152.00	152.65	152.65	0.00	153.30	153.30	0.05	161.50	161.50	3,724.00
COMMERCIAL	0.00	4.00	4.02	4.02	0.00	4.03	4.03	0.05	4.25	4.25	323.00
INDUSTRIAL	0.00	20.00	20.09	20.09	0.00	20.17	20.17	0.05	21.25	21.25	111.00
SUBTOTAL	NA	176.00	176.75	176.75	NA	177.50	177.50	NA	187.00	187.00	4,158.00
UNDEVELOPED	NA	5,783.00	NA	5,782.25	NA	NA	5,781.50	NA	NA	5,772.00	1,801.00
TOTAL	NA	5,959.00	NA	5,959.00	NA	NA	5,959.00	NA	NA	5,959.00	5,959.00
UNDEV. W/ AG. EXEMPTION		2,158.00		2,157.72	NA	NA	2,157.44	NA	NA	2,153.90	0.00
UNDEV. W/O AG. EXEMPTION		3,625.00		3,624.53	NA	NA	3,624.06	NA	NA	3,618.11	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.C

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:FLOUR BLUFF

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.09	2,150.70	2,351.20	2,351.20	0.09	2,551.69	2,551.69	0.19	3,038.84	3,038.84	5,412.00
COMMERCIAL	0.09	207.90	227.28	227.28	0.09	246.66	246.66	0.19	293.75	293.75	523.00
INDUSTRIAL	0.09	58.70	64.17	64.17	0.09	69.64	69.64	0.19	82.94	82.94	148.00
SUBTOTAL	NA	2,417.30	2,642.65	2,642.65	NA	2,868.00	2,868.00	NA	3,415.53	3,415.53	6,083.00
UNDEVELOPED	NA	5,185.80	NA	4,960.45	NA	NA	4,735.10	NA	NA	4,187.57	1,521.00
TOTAL	NA	7,603.10	NA	7,603.10	NA	NA	7,603.10	NA	NA	7,603.10	7,604.00
UNDEV. W/ AG. EXEMPTION		39.00		37.31	NA	NA	35.61	NA	NA	31.49	0.00
UNDEV. W/O AG. EXEMPTION		5,146.80		4,923.14	NA	NA	4,699.49	NA	NA	4,156.08	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.D

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:LONDON

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	1.04	109.00	222.59	222.59	0.51	336.17	336.17	0.03	345.75	345.75	7,374.00
COMMERCIAL	1.04	10.00	20.42	20.42	0.51	30.84	30.84	0.03	31.72	31.72	640.00
INDUSTRIAL	1.04	10.00	20.42	0.00	0.51	30.84	0.00	0.03	31.72	0.00	0.00
SUBTOTAL	NA	129.00	263.43	243.01	NA	397.86	367.02	NA	409.19	377.47	8,014.00
UNDEVELOPED	NA	11,450.00	NA	11,335.99	NA	NA	11,211.98	NA	NA	11,201.53	3,565.00
TOTAL	NA	11,579.00	NA	11,579.00	NA	NA	11,579.00	NA	NA	11,579.00	11,579.00
UNDEV. W/ AG. EXEMPTION		11,450.00		11,335.99	NA	NA	11,211.98	NA	NA	11,201.53	0.00
UNDEV. W/O AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.E

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:LONDON SUB-A

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.06)	327.00	306.41	306.41	(0.07)	285.83	285.83	(0.09)	258.95	258.95	22,147.00
COMMERCIAL	(0.06)	30.00	28.11	28.11	(0.07)	26.22	26.22	(0.09)	23.76	23.76	1,922.00
INDUSTRIAL	(0.06)	30.00	28.11	0.00	(0.07)	26.22	0.00	(0.09)	23.76	0.00	0.00
SUBTOTAL	NA	387.00	362.64	334.52	NA	338.27	312.05	NA	306.47	282.71	24,069.00
UNDEVELOPED	NA	34,389.00	NA	34,441.48	NA	NA	34,463.95	NA	NA	34,493.29	10,707.00
TOTAL	NA	34,776.00	NA	34,776.00	NA	NA	34,776.00	NA	NA	34,776.00	34,776.00
UNDEV. W/ AG. EXEMPTION		24,652.00		24,689.62	NA	NA	24,705.73	NA	NA	24,726.76	0.00
UNDEV. W/O AG. EXEMPTION		9,737.00		9,751.86	NA	NA	9,758.22	NA	NA	9,766.53	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.F

COMPREHENSIVE PLAN AREA:MUSTANG/PADRE

LOW PROJECTION SERIES

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.14	4,558.00	5,195.87	5,195.87	0.12	5,833.74	5,833.74	0.25	7,293.30	7,293.30	12,553.00
COMMERCIAL	0.14	49.00	55.86	55.86	0.12	62.71	62.71	0.25	78.41	78.41	446.00
INDUSTRIAL	0.14	0.00	0.00	0.00	0.12	0.00	0.00	0.25	0.00	0.00	0.00
SUBTOTAL	NA	4,607.00	5,251.73	5,251.73	NA	5,896.46	5,896.46	NA	7,371.70	7,371.70	12,999.00
UNDEVELOPED	NA	15,504.00	NA	14,859.27	NA	NA	14,214.54	NA	NA	12,739.30	7,112.00
TOTAL	NA	20,111.00	NA	20,111.00	NA	NA	20,111.00	NA	NA	20,111.00	20,111.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		15,504.00		14,859.27	NA	NA	14,214.54	NA	NA	12,739.30	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY. NOTE THAT TIDAL FLATS AREAS IN CITY PLANS HAVE BEEN EXCLUDED AS UNDEVELOPABLE AREAS.

TABLE V.G

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:NORTH CENTRAL

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.34	33.00	44.22	44.22	0.25	55.44	55.44	0.61	89.37	89.37	109.00
COMMERCIAL	0.34	23.00	30.82	30.82	0.25	38.64	38.64	0.61	62.29	48.00	48.00
INDUSTRIAL	0.34	1.80	2.41	0.00	0.25	3.02	0.00	0.61	4.87	0.00	0.00
SUBTOTAL	NA	57.80	77.45	75.04	NA	97.10	94.08	NA	156.53	137.37	157.00
UNDEVELOPED	NA	327.00	NA	309.76	NA	NA	290.72	NA	NA	247.43	228.00
TOTAL	NA	384.80	NA	384.80	NA	NA	384.80	NA	NA	384.80	385.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		327.00		309.76	NA	NA	290.72	NA	NA	247.43	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.H

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:NORTH WEST

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.08	3,016.00	3,265.09	3,265.09	0.08	3,514.18	3,514.18	0.18	4,132.99	4,132.99	12,137.00
COMMERCIAL	0.08	252.00	272.81	272.81	0.08	293.62	293.62	0.18	345.33	345.33	1,234.00
INDUSTRIAL	0.08	40.00	43.30	43.30	0.08	46.61	46.61	0.18	54.81	54.81	2,373.00
SUBTOTAL	NA	3,308.00	3,581.20	3,581.20	NA	3,854.41	3,854.41	NA	4,533.14	4,533.14	15,744.00
UNDEVELOPED	NA	17,901.00	NA	17,627.80	NA	NA	17,354.59	NA	NA	16,675.86	5,465.00
TOTAL	NA	21,209.00	NA	21,209.00	NA	NA	21,209.00	NA	NA	21,209.00	21,209.00
UNDEV. W/ AG. EXEMPTION		10,021.00		9,868.06	NA	NA	9,715.12	NA	NA	9,335.17	0.00
UNDEV. W/O AG. EXEMPTION		7,880.00		7,759.74	NA	NA	7,639.47	NA	NA	7,340.70	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.I

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:PORT/AIRPORT/VIOLET

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	27.00	1,157.00	32,396.00	13,532.00	0.11	35,839.34	13,532.00	0.22	43,884.12	13,532.00	13,532.00
COMMERCIAL	27.00	63.00	1,764.00	1,764.00	0.11	1,951.49	1,951.49	0.22	2,389.54	2,389.54	4,756.00
INDUSTRIAL	27.00	3,987.00	111,636.00	15,977.00	0.11	123,501.68	15,977.00	0.22	151,223.84	15,977.00	15,977.00
SUBTOTAL	NA	5,207.00	145,796.00	31,273.00	NA	161,292.51	31,460.49	NA	197,497.50	31,898.54	34,265.00
UNDEVELOPED	NA	47,788.00	NA	21,722.00	NA	NA	21,534.51	NA	NA	21,096.46	18,730.00
TOTAL	NA	52,995.00	NA	52,995.00	NA	NA	52,995.00	NA	NA	52,995.00	52,995.00
UNDEV. W/ AG. EXEMPTION		35,551.00		16,159.68	NA	NA	16,020.20	NA	NA	15,694.32	0.00
UNDEV. W/O AG. EXEMPTION		12,237.00		5,562.32	NA	NA	5,514.31	NA	NA	5,402.14	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.J

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:ROBSTOWN

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.05)	449.65	427.23	427.23	(0.05)	404.82	404.82	(0.07)	377.92	377.92	502.55
COMMERCIAL	(0.05)	84.64	80.42	80.42	(0.05)	76.20	76.20	(0.07)	71.14	71.14	84.64
INDUSTRIAL	(0.05)	52.90	50.26	50.26	(0.05)	47.63	47.63	(0.07)	44.46	44.46	4,567.91
SUBTOTAL	NA	587.19	557.92	557.92	NA	528.64	528.64	NA	493.52	493.52	5,155.10
UNDEVELOPED	NA	4,621.00	NA	4,650.27	NA	NA	4,679.55	NA	NA	4,714.67	53.00
TOTAL	NA	5,208.19	NA	5,208.19	NA	NA	5,208.19	NA	NA	5,208.19	5,208.10
UNDEV. W/ AG. EXEMPTION		4,621.00		4,650.27	NA	NA	4,679.55	NA	NA	4,714.67	0.00
UNDEV. W/O AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.K

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTH CENTRAL

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.20)	367.00	293.15	238.00	(0.25)	219.30	219.30	(0.61)	86.23	86.23	238.00
COMMERCIAL	(0.20)	145.00	115.82	115.82	(0.25)	86.65	86.65	(0.61)	34.07	34.07	359.00
INDUSTRIAL	(0.20)	16.00	12.78	12.78	(0.25)	9.56	9.56	(0.61)	3.76	3.76	67.00
SUBTOTAL	NA	528.00	421.75	366.60	NA	315.51	315.51	NA	124.06	124.06	664.00
UNDEVELOPED	NA	626.00	NA	787.40	NA	NA	838.49	NA	NA	1,029.94	490.00
TOTAL	NA	1,154.00	NA	1,154.00	NA	NA	1,154.00	NA	NA	1,154.00	1,154.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		626.00		787.40	NA	NA	838.49	NA	NA	1,029.94	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.L

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTH EAST

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.02)	7,826.86	7,691.82	7,381.00	(0.02)	7,556.77	7,381.00	0.01	7,599.67	7,381.00	7,381.00
COMMERCIAL	(0.02)	1,012.08	994.62	954.00	(0.02)	977.16	954.00	0.01	982.70	954.00	954.00
INDUSTRIAL	(0.02)	46.12	45.32	43.00	(0.02)	44.53	43.00	0.01	44.78	43.00	43.00
SUBTOTAL	NA	8,885.06	8,731.76	8,378.00	NA	8,578.46	8,378.00	NA	8,627.15	8,378.00	8,378.00
UNDEVELOPED	NA	1,589.04	NA	2,096.10	NA	NA	2,096.10	NA	NA	2,096.10	2,095.00
TOTAL	NA	10,474.10	NA	10,474.10	NA	NA	10,474.10	NA	NA	10,474.10	10,473.00
UNDEV. W/ AG. EXEMPTION		37.00		48.81	NA	NA	48.81	NA	NA	48.81	0.00
UNDEV. W/O AG. EXEMPTION		1,552.04		2,047.29	NA	NA	2,047.29	NA	NA	2,047.29	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.M

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTHSIDE

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.13	6,658.00	7,510.93	7,510.93	0.11	8,363.86	8,363.86	0.24	10,336.14	10,336.14	13,469.00
COMMERCIAL	0.13	775.00	874.28	874.28	0.11	973.56	973.56	0.24	1,203.14	1,203.14	2,511.00
INDUSTRIAL	0.13	79.00	89.12	89.12	0.11	99.24	99.24	0.24	122.64	122.64	779.00
SUBTOTAL	NA	7,512.00	8,474.33	8,474.33	NA	9,436.67	9,436.67	NA	11,661.92	11,661.92	16,759.00
UNDEVELOPED	NA	12,898.00	NA	11,935.67	NA	NA	10,973.33	NA	NA	8,748.08	3,651.00
TOTAL	NA	20,410.00	NA	20,410.00	NA	NA	20,410.00	NA	NA	20,410.00	20,410.00
UNDEV. W/ AG. EXEMPTION		6,117.00		5,660.60	NA	NA	5,204.21	NA	NA	4,148.86	0.00
UNDEV. W/O AG. EXEMPTION		6,781.00		6,275.06	NA	NA	5,769.12	NA	NA	4,599.22	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE V.N

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:WESTSIDE

LOW PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE I.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.06)	5,115.00	4,790.96	4,790.96	(0.07)	4,466.93	4,466.93	(0.10)	4,023.37	4,023.37	8,682.00
COMMERCIAL	(0.06)	927.00	868.27	868.27	(0.07)	809.55	809.55	(0.10)	729.16	729.16	2,295.00
INDUSTRIAL	(0.06)	1,738.00	1,627.90	1,627.90	(0.07)	1,517.79	1,517.79	(0.10)	1,367.08	1,367.08	4,269.00
SUBTOTAL	NA	7,780.00	7,287.14	7,287.14	NA	6,794.27	6,794.27	NA	6,119.61	6,119.61	15,246.00
UNDEVELOPED	NA	8,614.00	NA	9,106.86	NA	NA	9,599.73	NA	NA	10,274.39	1,148.00
TOTAL	NA	16,394.00	NA	16,394.00	NA	NA	16,394.00	NA	NA	16,394.00	16,394.00
UNDEV. W/ AG. EXEMPTION		3,370.00		3,562.82	NA	NA	3,755.64	NA	NA	4,019.58	0.00
UNDEV. W/O AG. EXEMPTION		5,244.00		5,544.04	NA	NA	5,844.09	NA	NA	6,254.81	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE I. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.A

COMPREHENSIVE PLAN AREA:BLUNTZER

LAND USE PROJECTION

MEDIUM PROJECTION SERIES

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.10	856.63	943.85	943.85	0.09	1,031.08	1,031.08	0.17	1,205.54	1,205.54	21,382.00
COMMERCIAL	0.10	25.38	27.96	27.96	0.09	30.54	30.54	0.17	35.71	35.71	1,856.00
INDUSTRIAL	0.10	111.36	122.70	111.00	0.09	134.04	111.00	0.17	156.72	111.00	111.00
SUBTOTAL	NA	993.36	1,094.51	1,082.81	NA	1,195.66	1,172.62	NA	1,397.97	1,352.25	23,349.00
UNDEVELOPED	NA	32,693.00	NA	32,603.55	NA	NA	32,513.74	NA	NA	32,334.11	10,337.00
TOTAL	NA	33,686.36	NA	33,686.36	NA	NA	33,686.36	NA	NA	33,686.36	33,686.00
UNDEV. W/ AG. EXEMPTION		16,589.00		16,543.61	NA	NA	16,498.04	NA	NA	16,406.89	0.00
UNDEV. W/O AG. EXEMPTION		16,104.00		16,059.94	NA	NA	16,015.70	NA	NA	15,927.22	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.B

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:BLUNTZER SUB-A

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.03	152.00	155.84	155.84	0.02	159.69	159.69	0.05	168.22	168.22	3,724.00
COMMERCIAL	0.03	4.00	4.10	4.10	0.02	4.20	4.20	0.05	4.43	4.43	323.00
INDUSTRIAL	0.03	20.00	20.51	20.51	0.02	21.01	21.01	0.05	22.13	22.13	111.00
SUBTOTAL	NA	176.00	180.45	180.45	NA	184.90	184.90	NA	194.79	194.79	4,158.00
UNDEVELOPED	NA	5,783.00	NA	5,778.55	NA	NA	5,774.10	NA	NA	5,764.21	1,801.00
TOTAL	NA	5,959.00	NA	5,959.00	NA	NA	5,959.00	NA	NA	5,959.00	5,959.00
UNDEV. W/ AG. EXEMPTION		2,158.00		2,156.34	NA	NA	2,154.68	NA	NA	2,150.99	0.00
UNDEV. W/O AG. EXEMPTION		3,625.00		3,622.21	NA	NA	3,619.42	NA	NA	3,613.22	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.C

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:FLOUR BLUFF

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.12	2,150.70	2,404.36	2,404.36	0.11	2,658.01	2,658.01	0.19	3,165.46	3,165.46	5,412.00
COMMERCIAL	0.12	207.90	232.42	232.42	0.11	256.94	256.94	0.19	305.99	305.99	523.00
INDUSTRIAL	0.12	58.70	65.62	65.62	0.11	72.55	72.55	0.19	86.40	86.40	148.00
SUBTOTAL	NA	2,417.30	2,702.40	2,702.40	NA	2,987.50	2,987.50	NA	3,557.85	3,557.85	6,083.00
UNDEVELOPED	NA	5,185.80	NA	4,900.70	NA	NA	4,615.60	NA	NA	4,045.25	1,521.00
TOTAL	NA	7,603.10	NA	7,603.10	NA	NA	7,603.10	NA	NA	7,603.10	7,604.00
UNDEV. W/ AG. EXEMPTION		39.00		36.86	NA	NA	34.71	NA	NA	30.42	0.00
UNDEV. W/O AG. EXEMPTION		5,146.80		4,863.84	NA	NA	4,580.89	NA	NA	4,014.83	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.D

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:LONDON

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	1.04	109.00	222.59	222.59	0.51	336.17	336.17	0.03	345.75	345.75	7,374.00
COMMERCIAL	1.04	10.00	20.42	20.42	0.51	30.84	30.84	0.03	31.72	31.72	640.00
INDUSTRIAL	1.04	10.00	20.42	0.00	0.51	30.84	0.00	0.03	31.72	0.00	0.00
SUBTOTAL	NA	129.00	263.43	243.01	NA	397.86	367.02	NA	409.19	377.47	8,014.00
UNDEVELOPED	NA	11,450.00	NA	11,335.99	NA	NA	11,211.98	NA	NA	11,201.53	3,565.00
TOTAL	NA	11,579.00	NA	11,579.00	NA	NA	11,579.00	NA	NA	11,579.00	11,579.00
UNDEV. W/ AG. EXEMPTION		11,450.00		11,335.99	NA	NA	11,211.98	NA	NA	11,201.53	0.00
UNDEV. W/O AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.E

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:LONDON SUB-A

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.04)	327.00	312.37	312.37	(0.05)	297.74	297.74	(0.09)	269.74	269.74	22,147.00
COMMERCIAL	(0.04)	30.00	28.66	28.66	(0.05)	27.32	27.32	(0.09)	24.75	24.75	1,922.00
INDUSTRIAL	(0.04)	30.00	28.66	0.00	(0.05)	27.32	0.00	(0.09)	24.75	0.00	0.00
SUBTOTAL	NA	387.00	369.68	341.03	NA	352.37	325.05	NA	319.24	294.49	24,069.00
UNDEVELOPED	NA	34,389.00	NA	34,434.97	NA	NA	34,450.95	NA	NA	34,481.51	10,707.00
TOTAL	NA	34,776.00	NA	34,776.00	NA	NA	34,776.00	NA	NA	34,776.00	34,776.00
UNDEV. W/ AG. EXEMPTION		24,652.00		24,684.96	NA	NA	24,696.41	NA	NA	24,718.32	0.00
UNDEV. W/O AG. EXEMPTION		9,737.00		9,750.02	NA	NA	9,754.54	NA	NA	9,763.19	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.F

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI

COMPREHENSIVE PLAN AREA:MUSTANG/PADRE

MEDIUM PROJECTION SERIES

MAY 23, 1991

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	17%	4,558.00	5,317.41	5,317.41	14%	6,076.82	6,076.82	25%	7,597.18	7,597.18	12,553.00
COMMERCIAL	17%	49.00	57.16	57.16	14%	65.33	65.33	25%	81.67	81.67	446.00
INDUSTRIAL	17%	0.00	0.00	0.00	14%	0.00	0.00	25%	0.00	0.00	0.00
SUBTOTAL	NA	4,607.00	5,374.57	5,374.57	NA	6,142.14	6,142.14	NA	7,678.86	7,678.86	12,999.00
UNDEVELOPED	NA	15,504.00	NA	14,736.43	NA	NA	13,968.86	NA	NA	12,432.14	7,112.00
TOTAL	NA	20,111.00	NA	20,111.00	NA	NA	20,111.00	NA	NA	20,111.00	20,111.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		15,504.00		14,736.43	NA	NA	13,968.86	NA	NA	12,432.14	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY. NOTE THAT TIDAL FLATS AREAS IN CITY PLANS HAVE BEEN EXCLUDED AS UNDEVELOPABLE AREAS.

TABLE VI.G

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:NORTH CENTRAL

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.34	33.00	44.22	44.22	0.25	55.44	55.44	0.61	89.37	89.37	109.00
COMMERCIAL	0.34	23.00	30.82	30.82	0.25	38.64	38.64	0.61	62.29	48.00	48.00
INDUSTRIAL	0.34	1.80	2.41	0.00	0.25	3.02	0.00	0.61	4.87	0.00	0.00
SUBTOTAL	NA	57.80	77.45	75.04	NA	97.10	94.08	NA	156.53	137.37	157.00
UNDEVELOPED	NA	327.00	NA	309.76	NA	NA	290.72	NA	NA	247.43	228.00
TOTAL	NA	384.80	NA	384.80	NA	NA	384.80	NA	NA	384.80	385.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		327.00		309.76	NA	NA	290.72	NA	NA	247.43	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.H

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:NORTH WEST

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	11%	3,016.00	3,338.30	3,338.30	10%	3,660.60	3,660.60	18%	4,305.20	4,305.20	12,137.00
COMMERCIAL	11%	252.00	278.93	278.93	10%	305.86	305.86	18%	359.72	359.72	1,234.00
INDUSTRIAL	11%	40.00	44.27	44.27	10%	48.55	48.55	18%	57.10	57.10	2,373.00
SUBTOTAL	NA	3,308.00	3,661.50	3,661.50	NA	4,015.01	4,015.01	NA	4,722.02	4,722.02	15,744.00
UNDEVELOPED	NA	17,901.00	NA	17,547.50	NA	NA	17,193.99	NA	NA	16,486.98	5,465.00
TOTAL	NA	21,209.00	NA	21,209.00	NA	NA	21,209.00	NA	NA	21,209.00	21,209.00
UNDEV. W/ AG. EXEMPTION		10,021.00		9,823.11	NA	NA	9,625.22	NA	NA	9,229.43	0.00
UNDEV. W/O AG. EXEMPTION		7,880.00		7,724.39	NA	NA	7,568.78	NA	NA	7,257.55	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.I

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:PORT/AIRPORT/VIOLET

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	27.00	1,157.00	32,396.00	13,532.00	0.13	36,491.60	13,532.00	0.22	44,682.79	13,532.00	13,532.00
COMMERCIAL	27.00	63.00	1,764.00	1,764.00	0.13	1,987.01	1,987.01	0.22	2,433.03	2,433.03	4,756.00
INDUSTRIAL	27.00	3,987.00	111,636.00	15,977.00	0.13	125,749.35	15,977.00	0.22	153,976.04	15,977.00	15,977.00
SUBTOTAL	NA	5,207.00	145,796.00	31,273.00	NA	164,227.95	31,496.01	NA	201,091.86	31,942.03	34,265.00
UNDEVELOPED	NA	47,788.00	NA	21,722.00	NA	NA	21,498.99	NA	NA	21,052.97	18,730.00
TOTAL	NA	52,995.00	NA	52,995.00	NA	NA	52,995.00	NA	NA	52,995.00	52,995.00
UNDEV. W/ AG. EXEMPTION		35,551.00		16,159.68	NA	NA	15,993.78	NA	NA	15,661.97	0.00
UNDEV. W/O AG. EXEMPTION		12,237.00		5,562.32	NA	NA	5,505.21	NA	NA	5,391.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.J

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:ROBSTOWN

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.03)	449.65	435.67	435.67	(0.03)	421.68	421.68	(0.07)	393.66	393.66	502.55
COMMERCIAL	(0.03)	84.64	82.01	82.01	(0.03)	79.38	79.38	(0.07)	74.10	74.10	84.64
INDUSTRIAL	(0.03)	52.90	51.25	51.25	(0.03)	49.61	49.61	(0.07)	46.31	46.31	4,567.91
SUBTOTAL	NA	587.19	568.93	568.93	NA	550.67	550.67	NA	514.08	514.08	5,155.10
UNDEVELOPED	NA	4,621.00	NA	4,639.26	NA	NA	4,657.52	NA	NA	4,694.11	53.00
TOTAL	NA	5,208.19	NA	5,208.19	NA	NA	5,208.19	NA	NA	5,208.19	5,208.10
UNDEV. W/ AG. EXEMPTION		4,621.00		4,639.26	NA	NA	4,657.52	NA	NA	4,694.11	0.00
UNDEV. W/O AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.K

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTH CENTRAL

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.19)	367.00	297.72	238.00	(0.23)	228.44	228.44	(0.61)	89.82	89.82	238.00
COMMERCIAL	(0.19)	145.00	117.63	117.63	(0.23)	90.26	90.26	(0.61)	35.49	35.49	359.00
INDUSTRIAL	(0.19)	16.00	12.98	12.98	(0.23)	9.96	9.96	(0.61)	3.92	3.92	67.00
SUBTOTAL	NA	528.00	428.33	368.61	NA	328.65	328.65	NA	129.23	129.23	664.00
UNDEVELOPED	NA	626.00	NA	785.39	NA	NA	825.35	NA	NA	1,024.77	490.00
TOTAL	NA	1,154.00	NA	1,154.00	NA	NA	1,154.00	NA	NA	1,154.00	1,154.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		626.00		785.39	NA	NA	825.35	NA	NA	1,024.77	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.L

COMPREHENSIVE PLAN AREA:SOUTH EAST

MEDIUM PROJECTION SERIES

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.00	7,826.86	7,849.25	7,381.00	0.00	7,871.64	7,381.00	0.01	7,916.32	7,381.00	7,381.00
COMMERCIAL	0.00	1,012.08	1,014.98	954.00	0.00	1,017.87	954.00	0.01	1,023.65	954.00	954.00
INDUSTRIAL	0.00	46.12	46.25	43.00	0.00	46.38	43.00	0.01	46.65	43.00	43.00
SUBTOTAL	NA	8,885.06	8,910.48	8,378.00	NA	8,935.89	8,378.00	NA	8,986.62	8,378.00	8,378.00
UNDEVELOPED	NA	1,589.04	NA	2,096.10	NA	NA	2,096.10	NA	NA	2,096.10	2,095.00
TOTAL	NA	10,474.10	NA	10,474.10	NA	NA	10,474.10	NA	NA	10,474.10	10,473.00
UNDEV. W/ AG. EXEMPTION		37.00		48.81	NA	NA	48.81	NA	NA	48.81	0.00
UNDEV. W/O AG. EXEMPTION		1,552.04		2,047.29	NA	NA	2,047.29	NA	NA	2,047.29	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.M

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTHSIDE

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

	COL. 1	COL. 2	COL. 3	COL. 4	COL. 5	COL. 6	COL. 7	COL. 8	COL. 9	COL. 10	COL. 11
LAND USE CATEGORY	% POP CHANGE 90-95	1990 AC.	EST 1995 AC.	ADJUSTED EST 1995 AC.	% POP CHANGE 95-00	EST 2000 AC.	ADJUSTED EST 2000 AC.	% POP CHANGE 00-10	EST 2010 AC.	ADJUSTED EST 2010 AC.	ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.15	6,658.00	7,685.18	7,685.18	0.13	8,712.36	8,712.36	0.24	10,766.81	10,766.81	13,469.00
COMMERCIAL	0.15	775.00	894.57	894.57	0.13	1,014.13	1,014.13	0.24	1,253.27	1,253.27	2,511.00
INDUSTRIAL	0.15	79.00	91.19	91.19	0.13	103.38	103.38	0.24	127.75	127.75	779.00
SUBTOTAL	NA	7,512.00	8,670.93	8,670.93	NA	9,829.86	9,829.86	NA	12,147.84	12,147.84	16,759.00
UNDEVELOPED	NA	12,898.00	NA	11,739.07	NA	NA	10,580.14	NA	NA	8,262.16	3,651.00
TOTAL	NA	20,410.00	NA	20,410.00	NA	NA	20,410.00	NA	NA	20,410.00	20,410.00
UNDEV. W/ AG. EXEMPTION		6,117.00		5,567.37	NA	NA	5,017.73	NA	NA	3,918.41	0.00
UNDEV. W/O AG. EXEMPTION		6,781.00		6,171.70	NA	NA	5,562.41	NA	NA	4,343.75	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VI.N

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:WESTSIDE

MEDIUM PROJECTION SERIES

POPULATION PROJECTION METHOD: LINEAR DIRECT MODEL FROM TABLE II.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.05)	5,115.00	4,884.07	4,884.07	(0.05)	4,653.09	4,653.09	(0.10)	4,191.05	4,191.05	8,682.00
COMMERCIAL	(0.05)	927.00	885.15	885.15	(0.05)	843.29	843.29	(0.10)	759.55	759.55	2,295.00
INDUSTRIAL	(0.05)	1,738.00	1,659.53	1,659.53	(0.05)	1,581.05	1,581.05	(0.10)	1,424.05	1,424.05	4,269.00
SUBTOTAL	NA	7,780.00	7,428.75	7,428.75	NA	7,077.43	7,077.43	NA	6,374.65	6,374.65	15,246.00
UNDEVELOPED	NA	8,614.00	NA	8,965.25	NA	NA	9,316.57	NA	NA	10,019.35	1,148.00
TOTAL	NA	16,394.00	NA	16,394.00	NA	NA	16,394.00	NA	NA	16,394.00	16,394.00
UNDEV. W/ AG. EXEMPTION		3,370.00		3,507.42	NA	NA	3,644.86	NA	NA	3,919.81	0.00
UNDEV. W/O AG. EXEMPTION		5,244.00		5,457.83	NA	NA	5,671.71	NA	NA	6,099.54	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE II. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.A

LAND USE PROJECTION

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:BLUNTZER

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.02	856.63	872.47	872.47	0.02	888.31	888.31	(0.01)	878.99	878.99	21,382.00
COMMERCIAL	0.02	25.38	25.84	25.84	0.02	26.31	26.31	(0.01)	26.04	26.04	1,856.00
INDUSTRIAL	0.02	111.36	113.42	111.00	0.02	115.48	111.00	(0.01)	114.27	111.00	111.00
SUBTOTAL	NA	993.36	1,011.73	1,009.31	NA	1,030.10	1,025.62	NA	1,019.30	1,016.03	23,349.00
UNDEVELOPED	NA	32,693.00	NA	32,677.05	NA	NA	32,660.74	NA	NA	32,670.33	10,337.00
TOTAL	NA	33,686.36	NA	33,686.36	NA	NA	33,686.36	NA	NA	33,686.36	33,686.00
UNDEV. W/ AG. EXEMPTION		16,589.00		16,580.91	NA	NA	16,572.63	NA	NA	16,577.50	0.00
UNDEV. W/O AG. EXEMPTION		16,104.00		16,096.14	NA	NA	16,088.11	NA	NA	16,092.83	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.B

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:BLUNTZER SUB-A

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.04	152.00	158.83	158.83	0.04	165.66	165.66	0.10	181.89	181.89	3,724.00
COMMERCIAL	0.04	4.00	4.18	4.18	0.04	4.36	4.36	0.10	4.79	4.79	323.00
INDUSTRIAL	0.04	20.00	20.90	20.90	0.04	21.80	21.80	0.10	23.93	23.93	111.00
SUBTOTAL	NA	176.00	183.91	183.91	NA	191.82	191.82	NA	210.61	210.61	4,158.00
UNDEVELOPED	NA	5,783.00	NA	5,775.09	NA	NA	5,767.18	NA	NA	5,748.39	1,801.00
TOTAL	NA	5,959.00	NA	5,959.00	NA	NA	5,959.00	NA	NA	5,959.00	5,959.00
UNDEV. W/ AG. EXEMPTION		2,158.00		2,155.05	NA	NA	2,152.10	NA	NA	2,145.09	0.00
UNDEV. W/O AG. EXEMPTION		3,625.00		3,620.04	NA	NA	3,615.08	NA	NA	3,603.31	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.C

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI

COMPREHENSIVE PLAN AREA:FLOUR BLUFF

HIGH PROJECTION SERIES

MAY 23, 1991

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.21	2,150.70	2,594.47	2,594.47	0.17	3,038.24	3,038.24	0.34	4,080.44	4,080.44	5,412.00
COMMERCIAL	0.21	207.90	250.80	250.80	0.17	293.70	293.70	0.34	394.44	394.44	523.00
INDUSTRIAL	0.21	58.70	70.81	70.81	0.17	82.92	82.92	0.34	111.37	111.37	148.00
SUBTOTAL	NA	2,417.30	2,916.08	2,916.08	NA	3,414.86	3,414.86	NA	4,586.25	4,586.25	6,083.00
UNDEVELOPED	NA	5,185.80	NA	4,687.02	NA	NA	4,188.24	NA	NA	3,016.85	1,521.00
TOTAL	NA	7,603.10	NA	7,603.10	NA	NA	7,603.10	NA	NA	7,603.10	7,604.00
UNDEV. W/ AG. EXEMPTION		39.00		35.25	NA	NA	31.50	NA	NA	22.69	0.00
UNDEV. W/O AG. EXEMPTION		5,146.80		4,651.77	NA	NA	4,156.74	NA	NA	2,994.16	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.D

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:LONDON

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.75)	109.00	27.25	27.25	(3.00)	(54.50)	(54.50)	3.69	(255.73)	(255.73)	7,374.00
COMMERCIAL	(0.75)	10.00	2.50	2.50	(3.00)	(5.00)	(5.00)	3.69	(23.46)	(23.46)	640.00
INDUSTRIAL	(0.75)	10.00	2.50	0.00	(3.00)	(5.00)	(5.00)	3.69	(23.46)	(23.46)	0.00
SUBTOTAL	NA	129.00	32.25	29.75	NA	(64.50)	(64.50)	NA	(302.65)	(302.65)	8,014.00
UNDEVELOPED	NA	11,450.00	NA	11,549.25	NA	NA	11,643.50	NA	NA	11,881.65	3,565.00
TOTAL	NA	11,579.00	NA	11,579.00	NA	NA	11,579.00	NA	NA	11,579.00	11,579.00
UNDEV. W/ AG. EXEMPTION		11,450.00		11,549.25	NA	NA	11,643.50	NA	NA	11,881.65	0.00
UNDEV. W/O AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.E

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:LONDON SUB-A

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.14	327.00	372.17	372.17	0.12	417.34	417.34	0.41	586.56	586.56	22,147.00
COMMERCIAL	0.14	30.00	34.14	34.14	0.12	38.29	38.29	0.41	53.81	53.81	1,922.00
INDUSTRIAL	0.14	30.00	34.14	0.00	0.12	38.29	0.00	0.41	53.81	0.00	0.00
SUBTOTAL	NA	387.00	440.46	406.31	NA	493.91	455.63	NA	694.19	640.38	24,069.00
UNDEVELOPED	NA	34,389.00	NA	34,369.69	NA	NA	34,320.37	NA	NA	34,135.62	10,707.00
TOTAL	NA	34,776.00	NA	34,776.00	NA	NA	34,776.00	NA	NA	34,776.00	34,776.00
UNDEV. W/ AG. EXEMPTION		24,652.00		24,638.16	NA	NA	24,602.80	NA	NA	24,470.36	0.00
UNDEV. W/O AG. EXEMPTION		9,737.00		9,731.53	NA	NA	9,717.57	NA	NA	9,665.26	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.F

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:MUSTANG/PADRE

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.55	4,558.00	7,073.35	7,073.35	0.36	9,588.69	9,588.69	0.74	16,702.33	12,553.00	12,553.00
COMMERCIAL	0.55	49.00	76.04	76.04	0.36	103.08	103.08	0.74	179.56	179.56	446.00
INDUSTRIAL	0.55	0.00	0.00	0.00	0.36	0.00	0.00	0.74	0.00	0.00	0.00
SUBTOTAL	NA	4,607.00	7,149.39	7,149.39	NA	9,691.77	9,691.77	NA	16,881.89	12,732.56	12,999.00
UNDEVELOPED	NA	15,504.00	NA	12,961.61	NA	NA	10,419.23	NA	NA	7,378.44	7,112.00
TOTAL	NA	20,111.00	NA	20,111.00	NA	NA	20,111.00	NA	NA	20,111.00	20,111.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		15,504.00		12,961.61	NA	NA	10,419.23	NA	NA	7,378.44	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY. NOTE THAT TIDAL FLATS AREAS IN CITY PLANS HAVE BEEN EXCLUDED AS UNDEVELOPABLE AREAS.

TABLE VII.G

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:NORTH CENTRAL

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.04)	33.00	31.65	31.65	(0.04)	30.30	30.30	(0.03)	29.34	29.34	109.00
COMMERCIAL	(0.04)	23.00	22.06	22.06	(0.04)	21.12	21.12	(0.03)	20.45	20.45	48.00
INDUSTRIAL	(0.04)	1.80	1.73	0.00	(0.04)	1.65	0.00	(0.03)	1.60	0.00	0.00
SUBTOTAL	NA	57.80	55.43	53.71	NA	53.06	51.41	NA	51.39	49.79	157.00
UNDEVELOPED	NA	327.00	NA	331.09	NA	NA	333.39	NA	NA	335.01	228.00
TOTAL	NA	384.80	NA	384.80	NA	NA	384.80	NA	NA	384.80	385.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		327.00		331.09	NA	NA	333.39	NA	NA	335.01	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.H

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:NORTH WEST

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.27	3,016.00	3,826.26	3,826.26	0.21	4,636.51	4,636.51	0.46	6,749.89	6,749.89	12,137.00
COMMERCIAL	0.27	252.00	319.70	319.70	0.21	387.40	387.40	0.46	563.98	563.98	1,234.00
INDUSTRIAL	0.27	40.00	50.75	50.75	0.21	61.49	61.49	0.46	89.52	89.52	2,373.00
SUBTOTAL	NA	3,308.00	4,196.70	4,196.70	NA	5,085.41	5,085.41	NA	7,403.39	7,403.39	15,744.00
UNDEVELOPED	NA	17,901.00	NA	17,012.30	NA	NA	16,123.59	NA	NA	13,805.61	5,465.00
TOTAL	NA	21,209.00	NA	21,209.00	NA	NA	21,209.00	NA	NA	21,209.00	21,209.00
UNDEV. W/ AG. EXEMPTION		10,021.00		9,523.50	NA	NA	9,026.01	NA	NA	7,728.40	0.00
UNDEV. W/O AG. EXEMPTION		7,880.00		7,488.79	NA	NA	7,097.59	NA	NA	6,077.21	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.I

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:PORT/AIRPORT/VIOLET

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	27.00	1,157.00	32,396.00	13,532.00	(0.46)	17,505.04	13,532.00	(3.12)	(37,054.68)	(37,054.68)	13,532.00
COMMERCIAL	27.00	63.00	1,764.00	1,764.00	(0.46)	953.17	953.17	(3.12)	(2,017.67)	(2,017.67)	4,756.00
INDUSTRIAL	27.00	3,987.00	111,636.00	15,977.00	(0.46)	60,322.05	15,977.00	(3.12)	(127,689.71)	(127,689.71)	15,977.00
SUBTOTAL	NA	5,207.00	145,796.00	31,273.00	NA	78,780.26	30,462.17	NA	(166,762.05)	(166,762.05)	34,265.00
UNDEVELOPED	NA	47,788.00	NA	21,722.00	NA	NA	22,532.83	NA	NA	219,757.05	18,730.00
TOTAL	NA	52,995.00	NA	52,995.00	NA	NA	52,995.00	NA	NA	52,995.00	52,995.00
UNDEV. W/ AG. EXEMPTION		35,551.00		16,159.68	NA	NA	16,762.88	NA	NA	163,484.20	0.00
UNDEV. W/O AG. EXEMPTION		12,237.00		5,562.32	NA	NA	5,769.95	NA	NA	56,272.85	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.J

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:ROBSTOWN

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.02)	449.65	440.59	440.59	(0.02)	431.53	431.53	(0.05)	411.99	411.99	502.55
COMMERCIAL	(0.02)	84.64	82.93	82.93	(0.02)	81.23	81.23	(0.05)	77.55	77.55	84.64
INDUSTRIAL	(0.02)	52.90	51.83	51.83	(0.02)	50.77	50.77	(0.05)	48.47	48.47	4,567.91
SUBTOTAL	NA	587.19	575.36	575.36	NA	563.52	563.52	NA	538.01	538.01	5,155.10
UNDEVELOPED	NA	4,621.00	NA	4,632.83	NA	NA	4,644.67	NA	NA	4,670.18	53.00
TOTAL	NA	5,208.19	NA	5,208.19	NA	NA	5,208.19	NA	NA	5,208.19	5,208.10
UNDEV. W/ AG. EXEMPTION		4,621.00		4,632.83	NA	NA	4,644.67	NA	NA	4,670.18	0.00
UNDEV. W/O AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.K

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTH CENTRAL

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.02)	367.00	359.23	238.00	(0.02)	351.46	238.00	0.02	356.76	238.00	238.00
COMMERCIAL	(0.02)	145.00	141.93	141.93	(0.02)	138.86	138.86	0.02	140.95	140.95	359.00
INDUSTRIAL	(0.02)	16.00	15.66	15.66	(0.02)	15.32	15.32	0.02	15.55	15.55	67.00
SUBTOTAL	NA	528.00	516.82	395.59	NA	505.65	392.18	NA	513.26	394.51	664.00
UNDEVELOPED	NA	626.00	NA	758.41	NA	NA	761.82	NA	NA	759.49	490.00
TOTAL	NA	1,154.00	NA	1,154.00	NA	NA	1,154.00	NA	NA	1,154.00	1,154.00
UNDEV. W/ AG. EXEMPTION		0.00		0.00	NA	NA	0.00	NA	NA	0.00	0.00
UNDEV. W/O AG. EXEMPTION		626.00		758.41	NA	NA	761.82	NA	NA	759.49	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.L

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTH EAST

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.07)	7,826.86	7,307.57	7,307.57	(0.07)	6,788.27	6,788.27	(0.21)	5,392.32	5,392.32	7,381.00
COMMERCIAL	(0.07)	1,012.08	944.93	944.93	(0.07)	877.78	877.78	(0.21)	697.27	697.27	954.00
INDUSTRIAL	(0.07)	46.12	43.06	43.00	(0.07)	40.00	40.00	(0.21)	31.77	31.77	43.00
SUBTOTAL	NA	8,885.06	8,295.56	8,295.50	NA	7,706.05	7,706.05	NA	6,121.37	6,121.37	8,378.00
UNDEVELOPED	NA	1,589.04	NA	2,178.60	NA	NA	2,768.05	NA	NA	4,352.73	2,095.00
TOTAL	NA	10,474.10	NA	10,474.10	NA	NA	10,474.10	NA	NA	10,474.10	10,473.00
UNDEV. W/ AG. EXEMPTION		37.00		50.73	NA	NA	64.45	NA	NA	101.35	0.00
UNDEV. W/O AG. EXEMPTION		1,552.04		2,127.88	NA	NA	2,703.59	NA	NA	4,251.38	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.M

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:SOUTHSIDE

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	0.23	6,658.00	8,204.42	8,204.42	0.19	9,750.85	9,750.85	0.37	13,356.19	13,356.19	13,469.00
COMMERCIAL	0.23	775.00	955.01	955.01	0.19	1,135.01	1,135.01	0.37	1,554.68	1,554.68	2,511.00
INDUSTRIAL	0.23	79.00	97.35	97.35	0.19	115.70	115.70	0.37	158.48	158.48	779.00
SUBTOTAL	NA	7,512.00	9,256.78	9,256.78	NA	11,001.56	11,001.56	NA	15,069.35	15,069.35	16,759.00
UNDEVELOPED	NA	12,898.00	NA	11,153.22	NA	NA	9,408.44	NA	NA	5,340.65	3,651.00
TOTAL	NA	20,410.00	NA	20,410.00	NA	NA	20,410.00	NA	NA	20,410.00	20,410.00
UNDEV. W/ AG. EXEMPTION		6,117.00		5,289.52	NA	NA	4,462.04	NA	NA	2,532.86	0.00
UNDEV. W/O AG. EXEMPTION		6,781.00		5,863.70	NA	NA	4,946.40	NA	NA	2,807.80	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

TABLE VII.N

DEPARTMENT OF CITY PLANNING AND URBAN DEVELOPMENT
CITY OF CORPUS CHRISTI
MAY 23, 1991

COMPREHENSIVE PLAN AREA:WESTSIDE

HIGH PROJECTION SERIES

POPULATION PROJECTION METHOD: EXPONENTIAL REGRESSION MODEL FROM TABLE III.

LAND USE CATEGORY	COL. 1 % POP CHANGE 90-95	COL. 2 1990 AC.	COL. 3 EST 1995 AC.	COL. 4 ADJUSTED EST 1995 AC.	COL. 5 % POP CHANGE 95-00	COL. 6 EST 2000 AC.	COL. 7 ADJUSTED EST 2000 AC.	COL. 8 % POP CHANGE 00-10	COL. 9 EST 2010 AC.	COL. 10 ADJUSTED EST 2010 AC.	COL. 11 ULTIMATE DEVELOPMENT AC.
RESIDENTIAL	(0.03)	5,115.00	4,985.48	4,985.48	(0.03)	4,855.96	4,855.96	(0.06)	4,562.93	4,562.93	8,682.00
COMMERCIAL	(0.03)	927.00	903.53	903.53	(0.03)	880.05	880.05	(0.06)	826.95	826.95	2,295.00
INDUSTRIAL	(0.03)	1,738.00	1,693.99	1,693.99	(0.03)	1,649.98	1,649.98	(0.06)	1,550.41	1,550.41	4,269.00
SUBTOTAL	NA	7,780.00	7,583.00	7,583.00	NA	7,386.00	7,386.00	NA	6,940.29	6,940.29	15,246.00
UNDEVELOPED	NA	8,614.00	NA	8,811.00	NA	NA	9,008.00	NA	NA	9,453.71	1,148.00
TOTAL	NA	16,394.00	NA	16,394.00	NA	NA	16,394.00	NA	NA	16,394.00	16,394.00
UNDEV. W/ AG. EXEMPTION		3,370.00		3,447.07	NA	NA	3,524.14	NA	NA	3,698.52	0.00
UNDEV. W/O AG. EXEMPTION		5,244.00		5,363.93	NA	NA	5,483.86	NA	NA	5,755.20	0.00

COLUMNS 1, 5 AND 8 - GROWTH FACTORS FROM THIS COLUMN ARE FROM THE PERCENTAGE CHANGE COLUMN IN TABLE III. COLUMN 2 - THE EXISTING ACREAGE FOR EACH AREA IS FROM PLANNING DEPARTMENT FIELD SURVEYS AND INFORMATION OBTAINED FROM AERIAL PHOTOS. COLUMNS 3, 6 AND 9 - ACREAGE IS ESTIMATED ONLY IF THERE IS AVAILABLE LAND IN THE UNDEVELOPED CELL. IF UNDEVELOPED LAND IS AVAILABLE THEN THE GROWTH FACTOR FROM TABLE 2 IS MULTIPLIED TIMES THE APPROPRIATE ACREAGE. IF NO UNDEVELOPED LAND IS AVAILABLE THEN THE PRIOR YEAR ACREAGE FIGURE IS PRINTED. COLUMNS 4, 7 AND 10 - TOTAL DEVELOPED ACREAGE IN COLUMNS 3, 6 AND 9 ARE USED IF THEY DO NOT EXCEED THE TOTAL ACREAGE FOR THE AREA. HOWEVER, IF THE TOTAL ESTIMATED ACREAGE IN COLUMNS 3, 6 OR 9 EXCEED TOTAL ACREAGE THEN ULTIMATE DEVELOPMENT IS ASSUMED. ACREAGE FOR TOTAL ULTIMATE DEVELOPMENT IS OBTAINED FROM THE ADOPTED AREA DEVELOPMENT PLANS. WHERE A PLAN IS NOT AVAILABLE ULTIMATE ACREAGE IS GENERATED BY APPLYING CURRENT DEVELOPMENT ACREAGES/LAND USES TO TOTAL LAND. NOTE: UNDEVELOPED LAND IS REDUCED PROPORTIONAL TO INCREASES IN RESIDENTIAL, COMMERCIAL OR INDUSTRICAL LAND. AS THE TOTAL UNDEVELOPMENT LAND IS DECREASED THE UNDEVELOPED W/AG. AND W/O AG. EXMPTION ARE REDUCED PROPORTIONALLY.

APPENDIX C

POPULATION PROJECTIONS FOR NUECES COUNTY (TWDB)

APPENDIX A

8.2.1 The Linear (Straight-Line) Model

This model is used when the population of the area being studied has exhibited a history of nearly equal absolute increments of population growth per year, decade, or other unit of time, and the assumption is made that this pattern will persist into the future. Mathematically this is the same linear model that we used in correlation and regression analysis of the general form:

$$Y = a + bX$$

Here, however, the dependent variable is population and the independent variable is time; the b coefficient is the average annual increment of growth; and a is the population at the base year from which we are extrapolating. Our linear forecasting model looks like this:

$$P_{t+n} = P_t + b(n) \qquad 8.1$$

where

P = population
t = a time index (for instance, years, or decades)
P_{t+n} = population (n) units of time from (t)
n = number of units of time (in years, decades, etc.)
b = average growth increment per unit of time.

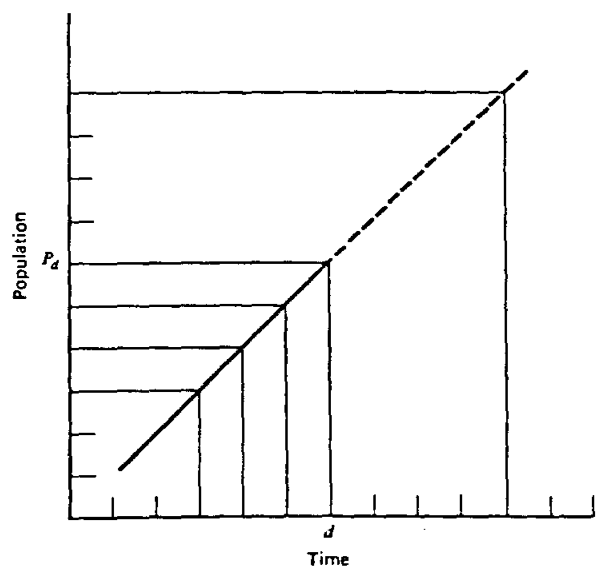


FIGURE 8.1 The linear model.

Algebraically we can define this as

$$b = \frac{\sum_{t=2}^{d} (P_t - P_{t-1})}{m} \qquad 8.2$$

where

m = the number of historical intervals over which the average is calculated

d = the date of the latest data in the historical record being analyzed.

Graphically it looks like Figure 8.1. Suppose, then, that for our community we had the following historical information:

POPULATION	TIME YEAR (t)
6,000	1967 (1)
11,000	1968 (2)
16,000	1969 (3)
21,000	1970 (4)

There are two simple ways we could approach the data to fit a straight line to them. One is simply to graph the data as in Figure 8.2, to observe that, indeed, the historical trend is linear (not significantly curved or irregular), and to take a straightedge and a pencil and to extend the line as the dotted segment has been extended in Figure 8.2. The other approach would be to

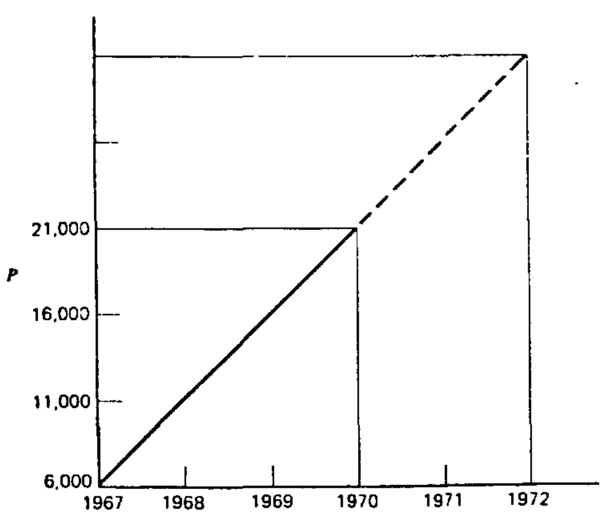


FIGURE 8.2 A graphic linear projection.

calculate the differences in absolute growth for the historical period to determine if they were equal, or nearly so, as below:

Absolute Annual Change

$$P_{68} - P_{67} = 5000$$

$$P_{69} - P_{68} = 5000$$

$$P_{70} - P_{69} = 5000$$

such that

$$b = \frac{\sum_{t=1968}^{1970} (P_t - P_{t-1})}{m}$$

$$b = \frac{(P_{1970} - P_{1969}) + (P_{1969} - P_{1968}) + (P_{1968} - P_{1967})}{3}$$

$$b = \frac{5000 + 5000 + 5000}{3}$$

$$b = \frac{15{,}000}{3} = 5000$$

Thus we can now project from 1970 to 1972 using the formula as

$$P_{t+2} = P_t + 5000(n)$$

$$P_{1970+2} = P_{1970} + 5000(2)$$

$$P_{1972} = 21{,}000 + 10{,}000 = 31{,}000$$

8.2.2 Exponential Curve Projections

Thomas Malthus, an English scholar whom everyone talks about and few have read, claimed that population tends to grow at a geometric rate. It compounds, like interest on money. The exponential curve portrays this idea, growth at a constant rate or percentage, which means that with each unit of time, the absolute addition to population gets bigger and bigger and bigger. The projection model takes this form:

$$P_{t+n} = P_t(1 + r)^n \qquad 8.3$$

where

$$r = \frac{1}{m} \sum_{t=2}^{d} \frac{P_t - P_{t-1}}{P_{t-1}} \qquad 8.4$$

and: P, t, and m are defined as in equations 8.1 and 8.2. This is shown graphically in Figure 8.3. In this case we might have historical data that

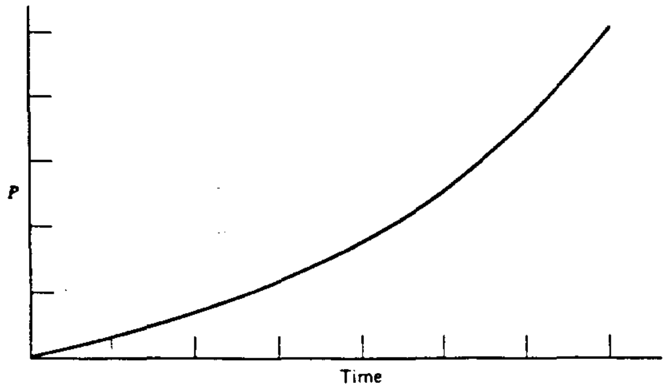


FIGURE 8.3 The exponential curve ($r = .3$).

reads as follows:

POPULATION	YEAR
10,000	1967
13,000	1968
16,900	1969
21,970	1970

The graphic solution to this projection is illustrated in Figure 8.4. The rate of change (r) can be estimated by studying the percentage increases each time period as

$$\frac{P_{1968} - P_{1967}}{P_{1967}} = \frac{13{,}000 - 10{,}000}{10{,}000} = .30$$

$$\frac{P_{1969} - P_{1968}}{P_{1968}} = \frac{16{,}900 - 13{,}000}{13{,}000} = .30$$

$$\frac{P_{1970} - P_{1969}}{P_{1969}} = \frac{21{,}970 - 16{,}900}{16{,}900} = .30$$

We can then use the mathematical formula to project from 1970 to 1972 as

$$P_{t+2} = P_t(1 + .30)^2$$
$$P_{1972} = P_{1970}(1.69)$$
$$P_{1972} = 21{,}970(1.69)$$
$$P_{1972} = 37{,}129$$

The proof that this form of prediction equation expresses a constant percentage increase is exactly the same as that used in Chapter 6 to derive the formula for interest and discount rates. It should be clear from the graph

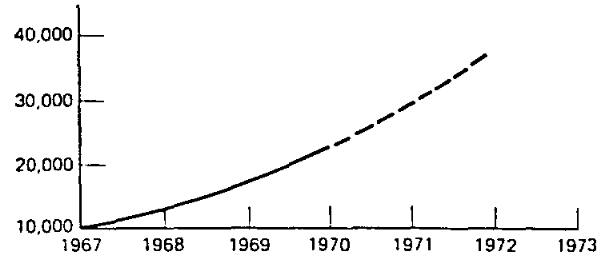


FIGURE 8.4 A graphic approximation of the exponential.

of this function that population growth conditions can seldom maintain a situation where this exponential assumption can hold true in the long run. It leads to scarry predictions of fatal overpopulation in the very long run.

8.2.3 The Modified Exponential

A sometimes more reasonable curve of the exponential family of mathematical functions is one with a declining pace of growth approaching an upper capacity limit. Graphically the curve looks like that shown in Figure 8.5.[1] The prediction formula states that the population in time $t + n$ is found by taking the maximum limit, a capacity (K), and subtracting from it some portion, $(v)^n$, of the unused capacity, $(K - P_t)$. The further in time one projects, the smaller the amount that is subtracted from K, expressing

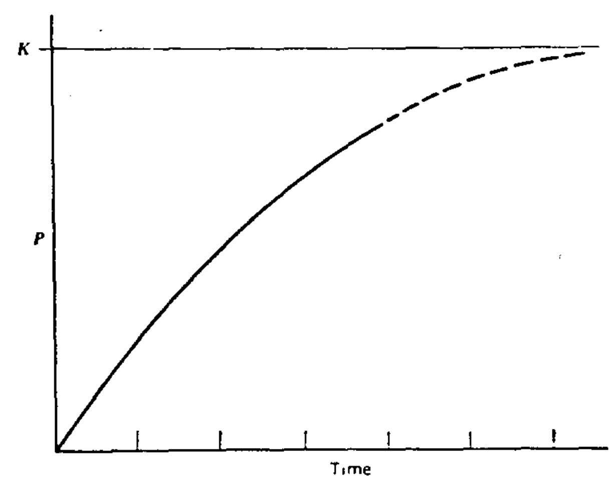


FIGURE 8.5 The modified exponential.

[1] See also Frederick E. Croxton, Dudley J. Cowden, and Sidney Klein, *Applied General Statistics* (Englewood Cliffs, N.J.: Prentice-Hall, 1967), pp. 262–267.

TEXAS WATER DEVELOPMENT BOARD
WATER USE AND PROJECTIONS SECTION

POPULATION PROJECTIONS - LOW SERIES
OCTOBER 1989

COUNTY: 178 NUECES

	CITY	1980	1986	1990	2000	2010	2020	2030	2040
023 (P)	ARANSAS PASS	5.	7.	5.	5.	4.	4.	5.	5.
059	BISHOP	3706.	3780.	3587.	3331.	3502.	3801.	4264.	4625.
135	CORPUS CHRISTI	231999.	263900.	270147.	297749.	329432.	376396.	444435.	482109.
436	NORTH SAN PEDRO	2561.	2769.	2811.	3202.	3367.	3655.	4100.	4448.
475	PORT ARANSAS	1968.	2120.	2302.	2508.	2637.	2862.	3212.	3484.
508	ROBSTOWN	12100.	13220.	13229.	13007.	13673.	14844.	16653.	18066.
571	SOUTH SAN PEDRO	1707.	1846.	1874.	2085.	2192.	2380.	2670.	2896.
757	OTHER	14169.	13758.	13682.	13387.	12913.	12170.	11874.	11729.
	TOTAL	268215.	301400.	307637.	335274.	367720.	416112.	487213.	527362.

APPENDIX B

1990 Statistics

TEXAS WATER DEVELOPMENT BOARD
WATER USE AND PROJECTIONS SECTION

POPULATION PROJECTIONS - HIGH SERIES
OCTOBER 1989

COUNTY: 178 NUECES

	CITY	1980	1986	1990	2000	2010	2020	2030	2040
023 (P)	ARANSAS PASS	5.	7.	6.	6.	5.	5.	6.	6.
059	BISHOP	3706.	3780.	3610.	3426.	3733.	4299.	4943.	5429.
135	CORPUS CHRISTI	231999.	263900.	271810.	306180.	351142.	425706.	515167.	565807.
436	NORTH SAN PEDRO	2561.	2769.	2829.	3293.	3589.	4134.	4753.	5221.
475	PORT ARANSAS	1968.	2120.	2317.	2580.	2811.	3238.	3724.	4089.
508	ROBSTOWN	12100.	13220.	13311.	13376.	14575.	16789.	19304.	21203.
571	SOUTH SAN PEDRO	1707.	1846.	1886.	2145.	2337.	2692.	3095.	3399.
757	OTHER	14169.	13758.	13761.	13761.	13761.	13762.	13761.	13761.
	TOTAL	268215.	301400.	309530.	344767.	391953.	470625.	564753.	618915.

TABLE OF CONTENTS

1.0 INTRODUCTION

Task 2.II.B of the Regional Stormwater Master Plan provides an overview of local design criteria and policies applicable to stormwater management in the Corpus Christi/Nueces County area. Local ordinances, drainage criteria, design manuals and stormwater master plans have been compiled in order to determine 1) current standards for the design and construction of stormwater management systems; 2) current floodplain management policy; and 3) current stormwater runoff pollution management policy. Recommendations have been made to enhance current criteria to provide adequate levels of flood protection and stormwater pollution management.

As part of this review, the following issues were addressed:

- Design rainfall event specifications
- Roadway and structural flood protection
- Easement/right-of-way dedication
- Hydrologic/hydraulic modeling standards
- Stormwater pollution control
- Erosion control

In Section 2.0, an inventory of existing ordinances, design criteria and master plans is presented. Based on these documents, drainage/flood protection and stormwater runoff pollution issues have been consolidated and presented in Section 3.0. Recommendations for enhancement of current criteria and policies are contained in Section 4.0.

2.0 EXISTING DESIGN CRITERIA SOURCES

2.1 ORDINANCES

2.1.1 NUECES COUNTY

For Nueces County, some drainage related criteria are found in the platting ordinance. The Nueces County Platting Ordinance, recorded in Volume 23, Page 181 of the County Records, details the required standards for the subdivision and platting of land within Nueces County but outside the extraterritorial jurisdiction of any incorporated city or town. Regulations contained within the platting ordinance establish minimum requirements for lot sizes, road rights-of-way widths, and ditch slopes. The ordinance requires drainage plans be prepared and submitted by a registered professional engineer to the County Engineer to determine compliance with the platting ordinance.

To maintain eligibility to participate in the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA), Nueces County revised its Flood Damage Prevention Ordinance in 1987. This ordinance was based on "The Flood Insurance Study for Nueces County, Texas" dated September 18, 1984 with accompanying Flood Insurance Rate Maps and Flood Boundary - Floodway Maps (FIRM and FBFM). The ordinance requires the acquisition of development permits to ensure compliance with provisions of the ordinance.

2.1.2 CITY OF CORPUS CHRISTI

City of Corpus Christi Platting Ordinance No. 4168 (adopted 1955 with numerous subsequent amendments) details similar requirements as the County for establishing criteria for design and construction of subdivision improvements. Minimum design flows for drainage, acceptable limits of street flooding, gutter and inlet construction standards are addressed in the City's platting ordinance.

Similar to Nueces County, Corpus Christi passed an ordinance authorizing the enforcement of a Flood Hazard Prevention Code in compliance with FEMA requirements. The ordinance also includes provisions for development permits for construction within the City.

2.2 DESIGN MANUALS

2.2.1 NUECES COUNTY

In conjunction with the development of the 1986 Nueces County Stormwater Master Plan, the Nueces County Drainage Criteria and Design Manual was prepared (Ref. 1). The manual contains detailed drainage design criteria for the calculation of stormwater runoff and the subsequent design of open channels, culverts, bridges, storm sewers, inlets and streetflow. Though the manual has not been formally adopted by Nueces County, the County Engineer uses the manual as a guide for acceptable drainage design practices for development within the County.

2.2.2 CITY OF CORPUS CHRISTI

City of Corpus Christi does not have a single consolidated design criteria manual which contains all of the City's stormwater related technical criteria.

2.3 MASTER PLANS

2.3.1 NUECES COUNTY

Nueces County utilizes the floodplain mapping element of the Nueces County Stormwater Management Plan (1986) to identify the extent of the 100-year floodplain for major creeks throughout the County. These include Oso Creek, Nueces River, Petronila Creek, Pinitas Creek, Agua Dulce Creek, Banquete Creek, Quinta Creek, San Fernando Creek, and Correta Creek. When development is proposed near these creeks, the County Engineer consults the master plan maps to determine if the project lies within a designated floodplain. If it does, then appropriate design measures may be required to prevent the flooding of structures or impediment of floodwaters.

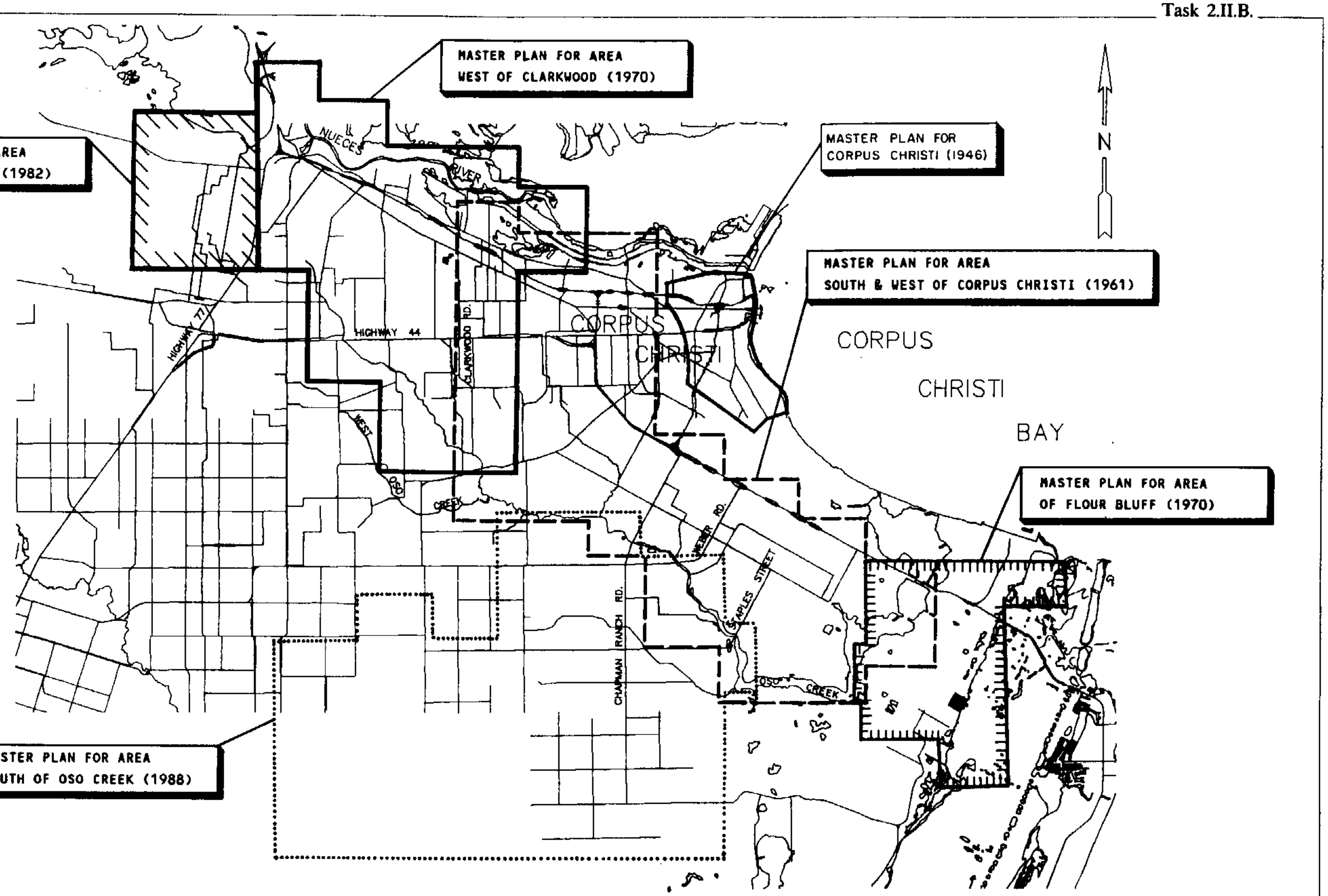
2.3.2 CITY OF CORPUS CHRISTI

In October 1946, an engineering study entitled "A Report on a Storm Sewer System" (Ref. 3) was prepared for the City of Corpus Christi. This report is the earliest engineering study available for Corpus Christi which described in detail the hydraulic parameters and criteria used in the design of a large drainage system. They system was comprised of 15 areas in the north side of and along the bayfront of Corpus Christi which needed a coordinated design. The selection of design criteria for this system became the defacto criteria for many years of future design which interconnected into the main drainage system. This study and report though not on official plan, provided an early example of reasonable design which was incorporated into Corpus Christi Master Plan documents. The area encompassed in the 1946 Northside and Bayfront Report is shown on Figure 2-1, along with subsequent masterplans.

The City of Corpus Christi later prepared a series of drainage master plans beginning in 1961. These plans cover specific areas of Corpus Christi, as shown on Figure 2-1, and are as follows:

A. Southside Master Plan, 1961 (Ref. 4)
B. West of Clarkwood and Flour Bluff Master Plan, 1970 (Ref. 5)
C. Five Points Master Plan, 1982 (Ref. 6)
D. South of Oso Creek, 1988 (Ref. 6)*

* Master Plan for area south of Oso Creek remains unadopted at the date of this report.



MASTER PLANS

FIGURE 2-1

These Master Plans, when adopted, are used by the City to determine appropriate design criteria for expanding the storm drainage system. Contained within these master plans are recommended design criteria such as storm design frequency, location, size, and hydraulic grade line elevation of major drainageways, channel sideslopes, design "n" values and right-of-way requirements. The City relies on these engineering drainage studies and the design judgment of the Engineering Department in sizing structures and calculating hydraulic losses based on standard hydraulic methodology. During drainage system design review, City Engineering Department staff address site specific issues using standard hydraulic principles and assure compatibility with existing drainage master plans (Section 2.3).

2.4 OTHER CRITERIA SOURCES

2.4.1 FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

The Federal Emergency Management Agency (FEMA) has studied the major creeks and drainageways within the study area. As a result, FEMA has established floodplain elevations and floodplain widths for various design storms. Additionally, FEMA has specified floodways which comprise the minimum area of the main stream channel which must remain open and free from future land development improvements in order to pass the 100-year storm with no greater than a one foot rise in flood waters. This effectively prevents the placement of any fills or structures within this area along the main channel. In order to participate in the Federal Flood Insurance Program, the City and County are required to maintain FEMA's criteria for construction within the designated flood hazard areas. The criteria requires structures to be elevated above the 100-year flood elevation (or floodproofed), and to be located outside of the floodway.

3.0 EXISTING DESIGN CRITERIA REVIEW

3.1 FLOOD PROTECTION

3.1.1 DESIGN RAINFALL EVENT

Nueces County follows the design frequency guidelines stated in the Nueces County Design Manual, 1986 as follows:

> *"Storm drainage systems are usually planned to accommodate two levels of storm influx. The initial drainage system handles a 25-year storm event with no disruption of traffic flow or flooding outside the channels. The major drainage system handles the 100-year storm event, perhaps not carrying the load, but at least preventing loss of life and major damage. To provide for an orderly community growth, reduce costs to future generations, and prevent loss of life and major property damage, these two separate and distinct drainage systems should be planned and properly engineered." (Ref.1)*

Under these guidelines, drainage systems are designed to carry the 25-year rainfall runoff within conduits or within ditch banks. Major drainage systems are designed to contain the entire 100-year storm where possible, but all systems are designed to preventing major damage due to storms in excess of the 25-year design frequency.

City of Corpus Christi relies on its adopted Master Plans for the determination of area specific design criteria. The Master Plans cited in Section 2.3.1 have been written and adopted over a period of more than 25 years, from 1961 to 1988. Later Master Plans have recommended improving the design standard due to the need to provide greater levels of flooding protection to the urbanizing areas of the City where, for instance, major commercial or residential centers would be damaged by flooding and where automobile or emergency vehicle traffic to and from these areas may be severely hampered.

Along with increasing design rainfall event frequencies, subsequent Master Plans have recommended increasing design values for imperviousness due to the development of large areas of the City and the greater density of development.

Table 3-1 lists the design frequencies and basic values for percent impervious used for the design of drainageways in the various Master Plans.

Additional criteria for drainage design is contained in the City of Corpus Christi Platting Ordinance (page 28) - "The runoff factor used in design of storm sewers shall be a minimum of one and three-tenths (1.3) cubic feet (per sec.) per acre for a minimum time of concentration of ten (10) minutes." These figures follow closely the runoff tables provided in the 1961 Master Plan for a 35% impervious surface due to a 5-year rainfall event frequency. The design criteria of 1.3 cfs/acre has thus been frequently used as <u>minimum</u> design criteria with site specific issues evaluated independently.

Based upon the Master Plans and Platting Ordinance, the City Engineer enforces the following design criteria for stormwater systems:

> 25-year rainfall event - Bridges, channel structures, and major drainageways indicated on Master Plan maps and generally serving areas greater than approximately 100 acres.
>
> 5-year rainfall event - Closed conduit storm sewers and channels serving minor areas such as residential internal drainage systems.

3.1.2 LEVEL OF PROTECTION

Nueces County requires special precautions for the construction of buildings above the elevation of adjacent roadways and 100-year flood elevations. The Platting Ordinance requires that building floor elevations be constructed above the elevation of the fronting road (6 inches above nearest roadway). Participation in FEMA's National Flood Insurance Program requires the County to ensure construction to be above the FEMA

TABLE 3-1

CITY OF CORPUS CHRISTI

MASTER PLAN DESIGN STORM PARAMETERS

Year	Master Plan Area	Major Drainage Systems Design Frequency	Percent Impervious
1946	Northside/Bayfront	5-year	30% Residential/ 70% Business
1961	Southside	5-year	20%
1970	West of Clarkwood (Oso Creek)	25-year	20%
1970	West of Clarkwood (Nueces River)	25-year	35%
1970	Flour Bluff	25-year	20%
1982	Five Points	25-year	20%
1988	South of Oso Creek	25-year	45%

100-year flood elevations roadway). Participation in FEMA's National Flood Insurance Program requires the County to ensure construction to be above the FEMA 100-year flood elevations. These regulations are enforced by the County Engineer for approving plats and building permits.

The City of Corpus Christi also requires construction to be above the 100-year flood elevations and outside the regulated floodway as explained in Section 2.4.1. Additionally, the City requires that storm sewer systems be designed with the capacity to carry the 5-year design storm with street flooding limited to the street right-of-way. Minimum slope requirements for subdivision lots effectively require that minimum floor elevations be located above adjacent street elevations (normally eighteen inches for compliance with FHA and VA construction requirements).

3.2 DRAINAGE SYSTEM

3.2.1 OPEN CHANNEL DESIGN

The Nueces County Engineer utilizes the design criteria presented in the Nueces County Design Manual (Ref. 1) as a guideline to determine the adequacy of drainage design. The following is a summary of the design parameters used by the County:

Design Method:	Uniform Flow/Manning's Formula for Headloss
Suggested Frictional Coefficients ("n"):	.027 (Short Grass) to 0.50 (Brush on Banks)
Maximum Velocity:	6 feet per second (fps)
Maximum Depth:	No maximum depth specified. Recommended depth to be as shallow as possible considering maintenance cost and available right-of-way

The City of Corpus Christi also has design criteria for channel parameters which have been adopted with the Stormwater Master Plans. These criteria which have varied among Master Plans are summarized as follows:

Design "n" Value = .0225 for unlined straight channels
Maximum Velocity = 5 to 8 fps
Maximum Depth = 6 to 8 feet
Maximum Side Slopes = 2:1

3.2.2 CULVERT DESIGN

Nueces County minimum design criteria for culverts are as follows:

Minimum Size:	18" Diameter
Maximum Velocity:	6 fps - Unlined Downstream 15 fps - Lined Downstream
Design Method:	Sizing Based Upon Entrance, Exit & Frictional Loss

The City of Corpus Christi has not established specific criteria for culvert design, except for the 25-year design rainfall criteria which is included in all of the previous Master Plans. Design aspects, such as consideration of minor losses and backwater effects, are selected consistent with the design rainfall event on a case-by-case basis.

3.2.3 STORM SEWER DESIGN

Nueces County has an established design criteria for storm sewer design based on the Nueces County Drainage Design Manual. Few systems exist within the County's rural jurisdiction, as enclosed storm sewers generally accompany only urban development.

The following is a summary of the design criteria requirements of Nueces County:

Minimum Size:	18" Diameter
Minimum Slope:	0.40%
Maximum Velocity:	15 fps (Collectors) - 12 fps (Mains)
Design Method:	Minor Losses & Friction Loss

In the absence of a specific adopted policy, the City Engineer evaluates storm sewer design based upon site specific parameters and sound hydraulic principles. The City of Corpus Christi requires that underground storm sewer systems be installed to drain the curb and guttered streets in new developments. Inlets and conduits are designed for a 5-year rainfall, inlets having a 6' throat dimension. Conduits are 15" minimum diameter. Hydraulic gradients are calculated based upon Manning's formula for determining headloss. Velocities are typically low due to flat slopes and, therefore, velocity related headlosses are usually not considered.

3.2.4 STREET FLOW DESIGN

Nueces County has established the requirements for roadside ditches which are common in areas of the County's jurisdiction. These requirements provided by the County's platting ordinance are as follows:

Minimum Grade = 0.10%
Maximum Side Slopes = 4:1
Drainage Map Provided of System by Consultant Engineer

Additional criteria for curbed streets are found in the Nueces County Design Criteria and Design Manual (Ref. 1).

Street Storm Classification	Frequency	Maximum Encroachment
Local	10-year	Curb Line
Collector	10-year One Lane Open	Curb Line
Arterial	25-year Two Lanes Open	Curb Line
Expressway	25-year	No Encroachment

The City of Corpus Christi requires the following design criteria established by their platting ordinance be utilized in street design as it relates to drainage:

Roadway Width = 28 ft. to 80 ft. as required by Master Transportation Plan
Residential Section - 4" Roll Curb
Commercial Section - 6" L Curb
Minimum Slope - .30%
Maximum Level of Flooding - Back of Walk During 5-year rainfall event

The City has adopted an administrative policy which requires that major arterials and collector streets have adequate drainage to maintain 2 lanes and 1 lane open respectively for vehicular access for the 10-year rainfall event.

3.3 EASEMENT/RIGHT-OF-WAY DEDICATIONS

General criteria for both Nueces County and City of Corpus Christi is to obtain sufficient right-of-way to contain the ultimate channel required to serve the drainage basin as well as for maintenance operations. Nueces County requires a minimum 15 ft. wide easement. The City of Corpus Christi has adopted the recommendations contained in the Southside Master Plan (Ref. 4) and utilize these criteria wherever possible. This drainage right-of-way dedication includes the ditch top width, maintenance easement of 32 ft. plus area required for excavation stockpile.

3.4 MODELING STANDARDS

3.4.1 HYDROLOGIC STANDARDS

The Nueces County Drainage Criteria and Design Manual recommends the use of the Rational Method for determining peak stormwater runoff from areas less than 400 acres. For larger areas, the USGS Regional Flood Analysis Method is proposed. Other methods are acceptable with the approval of the County Engineer.

The City of Corpus Christi has established several means of calculating runoff for design storms. The accepted means of calculating design runoff quantities varies with the size of the drainage basin. The rational method is used for areas less than 1000 acres. In smaller areas, less than a few acres such as for single site developments, the values from the 1961 Master Plan (Ref. 4) have been used based upon an assumed minimum 30 minute time of concentration. These runoff values for the 5-year design storm were thus 1.30 cfs per acre for residential development (35% impervious) up to 2.60 cfs per acre for commercial (100% impervious). The design of areas up to 1,000 acres utilizes calculated times of concentration and composite land use percentages to determine runoff. Areas greater than 1,000 acres up to 22,000 acres utilize mid-range curves developed in the 1970 Master Plan for areas west of Clarkwood (Ref. 4). Design for areas greater than 22,000 acres is seldom required, but in this event, the regional curves in Texas Water Commission Bulletin 6311 (Ref. 8) are utilized.

FEMA conducts their stream modeling for large areas and have utilized the regional curves in the Texas Water Commission Bulletin 6311 (Ref. 8) for their studies. Therefore, data submitted to FEMA generally follows this method.

3.4.2 HYDRAULIC STANDARDS

The Nueces County Drainage Criteria and Design Manual provides extensive direction on calculating channel and culvert capacities. Numerous nomographs are provided for determining headlosses for various hydraulically controlling situations. Drainage designs are expected to follow these guidelines though drainage calculations are not specifically required to be submitted.

The City of Corpus Christi requires that storm sewer systems be designed with consideration for the hydraulic grade line of the conduit or channel. Hydraulic grade line slopes are calculated based upon Manning's equation for friction headloss. Minor losses related to velocity are included where velocities are high. HEC-2 analysis is utilized where backwater is expected to influence water surface profiles significantly.

3.5 STORMWATER POLLUTION CONTROL

Based on a review of the documents inventoried in Section 2.0, no specific design criteria related to the control of stormwater pollution were found.

There are no specific references to stormwater pollution control in the County's design criteria. As referenced in Task 2.III.A, Nueces County is authorized to prohibit disposal of any manner of waste on property which may ultimately enter into local streams and water courses. Besides this prohibition, Nueces County is limited by statute as to its authority to implement design criteria aimed at the reduction of stormwater pollution. In regards to water quality concerns, an environmental impact assessment was performed for each drainage project proposed in the Nueces County Stormwater Management Master Plan. The assessment focused primarily on expected impacts to downstream estuarine systems. No significant impacts were predicted.

As also referenced in Task 2.III.A, the City of Corpus Christi possesses a wide range of regulatory authority and have available additional authority through the Texas local Government code and water code to address stormwater pollution issues. A review of the City's various master plans was conducted to identify water quality related criteria.

In the "Storm Drainage Plan and Sanitary Sewer Plan for the Area West of Calallen (Five Points)", stormwater quality and design criteria are referenced. Since the raw water intakes for the local water supply are located on the Nueces River just downstream of the study area, the quality of stormwater runoff from this area was an important consideration. The drainage plan presented a basic design concept for stormwater quality treatment. "Relatively shallow flow in broad channels with maintained grass cover", was recommended to provide "overland flow" treatment capacity before discharging to the Nueces River. It was also recommended that stormwater runoff conveyed in confined conduits (storm sewer pipes) should be permitted to enter the river only after passing through a detention pond for water quality enhancement.

The plan identified three basic purposes served by a detention pond: 1) Reduce peakflow rates; 2) provide for sedimentation of pollutants; and 3) provide additional control of water quality. Design criteria suggested for detention ponds were given as follows:

1) Flow through velocity at design Q = 0.5 ft./sec.
2) Siphon outlet structure, baffled and grated, with overflow provision.
3) Provision for fully draining basin to facilitate removal of trapped sediment, debris, and other maintenance.

Multiple use facilities, obtaining easements for future detention facilities, maintaining grass cover and increasing public awareness were also recommended in the drainage plan to promote water quality protection.

3.6 EROSION CONTROL

In the Nueces County Design Criteria Manual, guidelines for flow velocity, channel width, slope and cover have been previously discussed. By controlling flow velocity and promoting uniform flow in open channels, erosion is minimized. Similar recommendations for flow velocity and channel dimensions are found in the City's master plans as previously discussed. Again, these criteria serve to provide proper drainage while minimizing channel erosion.

4.0 RECOMMENDATIONS

4.1 DESIGN MANUAL

Nueces County possesses a design manual which contains comprehensive criteria for municipal drainage system design. The value of such a manual is that it standardizes the minimum level of design of stormwater management facilities in the County while providing flexibility based upon approval by the County Engineer. Minimum design criteria combined with additional design guidelines should be formally adopted by the County. The design criteria found in the Nueces County Drainage Criteria and Design Manual should be reorganized to differentiate between minimum required design criteria and suggested design guidelines. The City of Corpus Christi should proceed with the preparation and adoption of a similar (or the same) document as the Nueces County manual for application in the City. This would assure that all future land development provides adequate levels of flood protection through compliance with consistent criteria.

4.2 DESIGN CRITERIA

Through the process of preparing a design manual, minimum criteria for design will be established for many items which will have impact on the future stormwater drainage system of the region. Major issues such as design storm frequency, hydraulic and hydraulic modeling methodologies acceptable levels of street flooding for vehicular, and a possible stormwater detention policy carry political and economic impacts which need to be addressed by many sectors of the community such as city officials, neighborhood groups, the local engineering community, developers, emergency service departments, and commercial area tenants.

4.2.1 FLOOD PROTECTION

The current City of Corpus Christi policy requires a level of design for the 5-year design rainfall event in the minor drainage system (residential systems and minor developments). This level increases to a 25-year design rainfall event in Master Plan collector ditches and major creeks. The 100-year design rainfall event is reviewed to determine the need for property protection when the drainageway or conduit cannot convey runoff within its banks.

These design rainfall events were selected based on the characteristics of the Corpus Christi area. The flat topography of the study area creates shallow flooding when drainage system capacity is exceeded. This flooding typically does not create large depths nor high velocities of floodwaters. Historically, property damage has been minimal. The inconvenience of brief periods of street inundation should be considered against the high cost of additional storm capacity. The cost of drainage construction in this region is relatively high due to the lack of natural elevation which promotes stormwater runoff. With long distances to travel at flat grades, enclosed drainage structures need to be large to carry runoff from large storm events. Frequent storm tides block stormwater outfalls impeding operation of the drainage system. To assist in assessment of stormwater policy and technical criteria needs particular attention should be given to assuring that adequate overland overflow capacity is provided in areas where the local enclosed drainage system is sized for only the 5-year storm event. This would assure that larger storm events do not result in structural flooding.

The City applies three different design rainfall events to various components of the stormwater drainage system. It is recommended that the City inventory the existing level of service (or protection) for major components of the stormwater management system including major conveyances. The City should strive to provide a consistent level of protection throughout the city.

Priorities should be set to address various structures or drainage components such as:

Minimum Building Floor Elevations for

- Emergency Shelters/Service
- Habitable Structures
- Employment/Service

Minimum Allowable Roadway Inundation to Assure Vehicular Access for

- Evacuation Routes
- Emergency Service
- Arterials
- Collectors
- Neighborhood

Sites

- Urban
- Rural

4.2.2 DRAINAGE SYSTEM

The standard design of open channels, culverts, storm sewers and streetflow facilities have been documented in City and County master plans. While technical drainage criteria for the design of these facilities is fairly straightforward, these criteria should be refined to include considerations for water quality enhancement. An additional future consideration would be the designation of a standard LOP for each of these facilities.

As discussed, brief flooding of streets may be necessary in some areas from a cost-benefit standpoint. But emergency vehicles need to be able to access these same areas without significant delay under any circumstances. Therefore, it is recommended that criteria be established by the City of Corpus Christi to require the design of collector and arterial streets with sufficient drainage to allow passage of emergency vehicles.

4.2.3 EASEMENT/RIGHT-OF-WAY DEDICATIONS

Easement/right-of-way dedication requirements can be employed as a powerful mechanism to control the susceptibility of newly developing areas to flooding. This can be accomplished by requiring dedication of the 10, 25 or 100-year floodplain based on fully developed upstream conditions as a drainage easement concurrent with platting approval for subdivided land. This would preclude all future building construction within these flood hazard areas. This exceeds the FEMA requirements which generally prohibit construction in the floodway but allow construction in the floodplain outside of the floodway. The City and County should consider increased easement dedication requirements if there is significant evidence of chronic flooding for structures on newly plotted lots in floodplain areas. Increased easement requirements also prevent increases in water surface elevations associated with allowing development within the floodplain.

4.2.4 MODELING STANDARDS

The hydrologic and hydraulic modeling methods currently accepted by the City and County in some cases do not reflect the recent technological advances which have occurred in this area. Consideration should be given to adopting runoff hydrograph methodologies for tributary areas exceeding 200 acres because of the increased modeling accuracy associated with hydrograph time dependent modeling of flows for dendritic networks and for ease in modeling future land use conditions. The Soil Conservation Service methods presented in TR-20 and TR-55 are recommended for consideration for both peak flow and hydrographic analysis of drainage systems.

4.2.5 STORMWATER POLLUTION CONTROL

Currently there are no City or County drainage system design criteria which address the control of pollutants in stormwater runoff. This issue will have to be addressed in the near future for compliance with existing federal regulations and with regulations proposed by the Texas Water Commission. There are three major areas that must be addressed: 1) runoff from construction sites; 2) runoff from commercial and residential areas; and 3) runoff from industrial facilities.

Construction site runoff is typically addressed through the use of temporary erosion and sediment controls such as silt fencing, diversion dikes and temporary sedimentation basins which limit the transport of sediments and associated pollutants from construction sites. Implementation of a construction site management program will require a policy and supporting technical criteria for control measures which will apply to public and private construction.

Runoff from commercial, residential and industrial areas can be controlled through land use restrictions and the application of structural controls to treat runoff for pollutant reduction prior to release to receiving waters. The structural controls applied to industrial site runoff are specific to the nature of pollutants associated with a given industrial operation (i.e., toxic organics and metals, and process specific liquids and particulate material). However, runoff from commercial and residential areas are characterized by a spectrum of urban land use pollutants indicative of vehicular traffic, domestic pet fecal bacteria and household pesticides, herbicides and fertilizers. Runoff control can be achieved using standard structural and non structural management practices which have been in use numerous municipal areas for years with well documented pollutant control performance characteristics.

Control techniques for residential and commercial areas include limitations on development intensity and structural controls such as wet retention basins, extended detention basins, filtration basins, artificial wetlands and shallow flow grass swales. These techniques rely primarily on the removal of particulate material and associated pollutants. Wet basins and artificial wetlands also promote removal of dissolved pollutants through biological uptake and degradation.

Runoff from industrial areas are typically treated for pollutant control using the above described techniques in combination with processes such as chemical precipitation, carbon adsorption and ion exchange to control site specific pollutant constituents such as elevated levels of toxic metals and organics.

The City and County should develop a specific policy and supporting technical criteria to limit pollutants in stormwater runoff as required to meet federal and state stormwater discharge quality requirements. These requirements will be defined as the City develops a comprehensive stormwater quality management plan for regulatory compliance.

Reliance on a single best management practice does not guarantee effective stormwater pollution control. Instead, an appropriate mix of management options shown in Figure 4-1 must be determined for each drainage area. In general, each category of the NPS pollution control options applies to increasingly larger areas. As the area served by the management practice increases, the level of confidence in effective pollution control increases because more potential pollutant sources can be served by a single measure. To gain this increased confidence, more planning and regulation is required. However, in areas of existing development, only source controls may be appropriate because other measures are simply not implementable in a cost-effective manner.

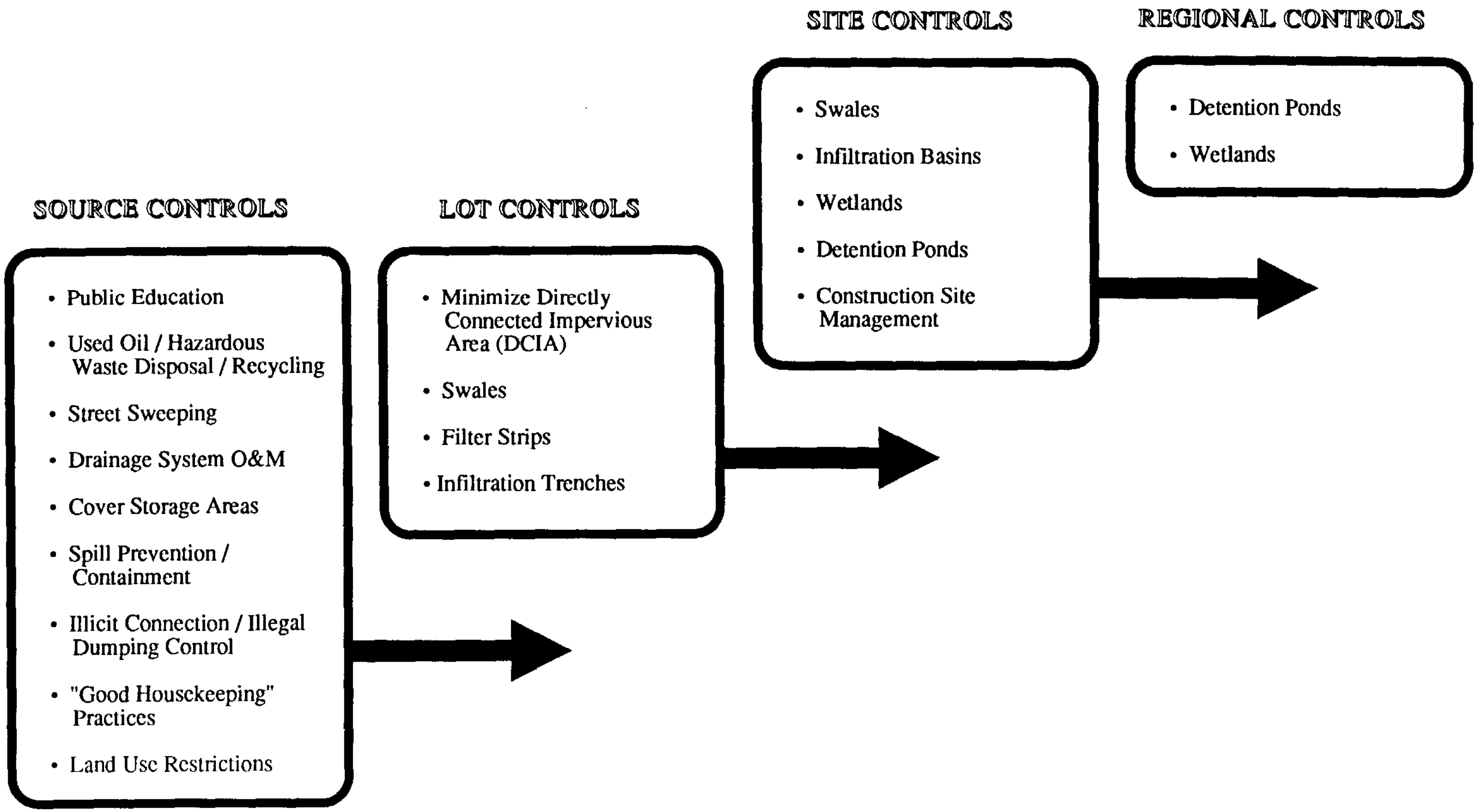
4.2.6 STORMWATER DETENTION

Currently the City and County have no specific policy or technical requirements for stormwater detention to attenuate peak flows from new land development. Some detention facilities have been required in conjunction with new development on an administrative judgement basis. There is a need for specific design criteria for stormwater detention facilities which address structural consideration, outlet flow control, configuration maintenance access and frequency maintenance responsibility and design storm requirements. Additionally, a uniform policy should be developed which specifies the requirements for detention in conjunction with new development.

A regional detention program should be considered because of the economy of scale and improved performance characteristics associated with construction of a small number of large facilities as compared to many small on-site facilities distributed throughout a watershed.

4.2.7 EXISTING MASTER PLANS IMPLEMENTATION

The existing City and County master plans were developed over an extended period of time and there is limited coordination between these plans on levels of flood protection service and supporting technical criteria for hydrologic and hydraulic modeling. Additionally, implementation of the master plans is accomplished through a combination of public and private funding as land development proceeds in each of the individual master plan areas. Currently there is no specific policy on cost share requirements for public/private funding of master plan improvements. A policy should be developed which addresses this issue to assure equity and fairness to land development interest and assure proper use of public funds. Also, the master plans should be upgraded based on consistent technical criteria to provide adequate levels of flood protection service to all areas.



CDM
environmental engineers, scientists, planners, & management consultants

NPS POLLUTION CONTROL OPTIONS

FIGURE NO. 4-1

5.0 REFERENCES

1. "Nueces County Drainage Criteria and Design Manual", NEI, and HDR Infrastructure, Inc. (HDR), Corpus Christi, Texas, July 1986.

2. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study for Nueces County, Texas, 1985.

3. "A Report on a Storm Sewer System for Corpus Christi, Texas, Myers & Noyes Consulting Engineers, Dallas and Corpus Christi, Texas, October 1946.

4. "Master Plan for Storm Drainage for the Area South and West of the City of Corpus Christi, Texas", Blucher and Naismith Consulting Engineers, Inc., Corpus Christi, Texas, 1961.

5. "Master Plan for Storm Drainage for the Area West of Clarkwood Road and the Flour Bluff Area of the City of Corpus Christi, Texas", Naismith Engineers, Inc. (NEI), Corpus Christi, Texas, 1970.

6. "Storm Drainage Plan and Sanitary Sewer Plan for the Area West of Calallen (Five Points)", Naismith Engineers, Corpus Christi, Texas, 1982.

7. "Master Plan for Storm Drainage for the Area South of Oso Creek", Naismith Engineers, Corpus Christi, Texas, 1988.

8. "Floods in Texas - Magnitude and Frequency of Peak Flows", USGS and Texas Water Commission, Austin, Texas, December, 1963.

APPENDIX A

NUECES COUNTY PLATTING ORDINANCE

NUECES CTY PLATTING ORDINANCE

COURT ORDER WITH REFERENCE TO APPROVING SUBDIVISION PLATS FOR RECORDING,
DATE: September 27, 1983, RECORDED IN VOLUME 23 PAGE 181.

AUTHORIZED UNDER ARTICLE 6626a, V.A.C.S., as amended September 1, 1983

AN ORDER ADOPTING AND PROMULGATING RULES AND REGULATIONS GOVERNING THE PLATTING OF LAND INTO SUBDIVISIONS, OUTSIDE EXTRA-TERRITORIAL JURISDICTION OF ANY INCORPORATED CITY OR TOWN AND REQUIRING PLATS TO CONFORM TO SUCH RULES AND REGULATIONS IN ORDER TO PROCURE THE APPROVAL OF THE COUNTY COMMISSIONERS' COURT OF NUECES COUNTY: PROVIDING FOR THE PARTIAL VALIDITY OF SAID ORDER; AND PROVIDING FOR A VARIANCE PROCEDURE AND PROVIDING FOR THE EFFECTIVE DATE AND RECORDATION OF SAID ORDER UPON THE MINUTES OF THE COMMISSIONERS' COURT; AND TO PROVIDE FOR PENALTIES AND ENFORCEMENT BOTH CIVIL AND CRIMINAL.

WHEREAS, it is now certain that the Commissioners' Court of Nueces County is vested with full and complete powers of enforcement for a subdivision regulation within the area outside the extra-territorial jurisdiction of any city within said County.

WHEREAS, the Commissioners' Court of Nueces County deem it necessary to revise the rules and regulations governing conditions under which the Court, in the future, will approve plats of subdivisions for recording, in order to assist the Court in providing for the safety, health and welfare of the public; and after due notice of its intent to assert said regulatory power as provided in Article 6626a Vernon's Annotated Civil Statutes as amended September 1, 1983: NOW, THEREFORE, BE IT ORDERED BY THE COMMISSIONERS' COURT OF NUECES COUNTY that the following rules and regulations be and are hereby adopted as conditions precedent to the Court approving plats of subdivisions for recording or otherwise for the establishment of any existing tract of land, effective this 27th day of September, 1983, and the same shall be recorded upon the Minutes of the Nueces County Commissioners' Court.

1. The plat shall be drawn on first quality paper or Mylar film, 18" x 24" maximum size sheet, in India ink; to a scale of one inch equals one hundred feet (1"=100'), or larger with all figures and letters legible, and the whole proper for filing for record in the Office of the County Clerk, with the following information given:

a) The title or name by which the subdivision is to be identified, North point, the scale shown graphically, and the name and seal of the registered professional engineer or state licensed or registered land surveyor responsible.

b) A definite legal description and identification of the tract being subdivided, this description shall be sufficient for the requirements of title examination. The plat shall be a descriptive diagram drawn to scale, and shall show by reference that the subdivision is a particular portion or part of a previously filed plat or recognized grant or partition.

c) Where the area platted as a subdivision to a city or town, covering parts of lots or blocks in a recorded subdivision or partition of an original survey , the acreage taken from each of the said lots or blocks shall be clearly stated on the plat.

d) The boundaries of the subdivided property, the location or designation of all streets, alleys, parks and other areas intended to be dedicated or deeded to the public use, shall be shown with the proper dimensions and bearings. The boundaries of the subdivision shall be indicated by a heavy line and shall be tied by dimension to the centerlines of all existing boundary streets or roads, or lines of established surveys with such other data furnished to locate the subdivision on the ground.

e) The plat shall show all block, lot and street boundary lines. Blocks and lots shall be numbered or letterd consecutively. The width of all streets shall be shown, measured at right angles or radially, where curved.

f) Accurate dimensions, both linear and angular, of all items on the plat shall be shown. Linear dimensions shall be shown in feet and decimals of a foot; angular dimensions shall be shown by bearing, all principal lines shall have the bearing shown and any deviation from the norm shall be fully described and all essential information given; circular curves shall be defined by actual length of radius and not by degree of curve. The arc definition of a curve shall be used in all computations.

g) The location and description of all lot corners, reference points and beginning and end points, (P.C. & P.T.) of all curves, shall be marked with 5/8" iron pipes 24" to 30" long, set flush with the ground shall be used for block corners.

h) A certificate of dedications, duly acknowledge, on all roads or streets, public highways, utility easements, parks, drainage easements, and all other land intended for public use shall be shown on the plat. A thirty foot (30') minimum drainage easement shall be shown on the plat, fifteen feet (15') minimum each side of the centerline of all gulleys, ravines, draws, sloughs, etc., in the subdivision.

i) A certificate of ownership in fee of all land embraced in the subdivision, and of the authenticity of the plat and dedication, signed and acknowledged by all owners of any interest in said land. The acknowledgement shall be in the form required in the conveyance of real estate. Approval and acceptance of all lien holders shall be included.

j) If the subdivision is located in an area not served by a sanitary sewer system and septic tanks are to be used, a certificate of approval from the City-County Health Department shall be required. If sewer lines are available and of sufficient size to be used, location shall be showing on drawings and arrangements for tying on shall be made.

k) Certificates of approval by the County Engineer and the Commissioners' Court shall appear on the plat.

l) Responsibilities of the Engineer - It shall be the duty of the County Engineer to check and assist the owners' engineer in every way possible. He shall furnish inspection as deemed necessary, but no stakes. He is not allowed to act as superintendent on the job. He is required to point out omissions, discrepancies, and other variations from the plans and specifications and see that corrections are made. His rulings shall be final. The owner's engineer or representative shall either be present on the job at all times or shall be available.

2. Lots shall be a minimum of five thousand (5,000) square feet except lots that require septic tanks must have a minimum of fifteen thousand (15,000) square feet. All lots, so far as practical, shall have their side lines at right angles to the road on which they face, or radial to curved road lines.

3. Corner lots for residential use shall have extra width to permit appropriate buildings set back from both streets.

4. Arterial, or main thoroughfare roads are to be provided where, in the judgment of the County Engineer, they are necessary and shall have a minimum right-of-way width of eighty (80) feet.

5. Collector roads through the subdivision shall have a minimum right-of-way width of sixty (60) feet and shall provide unhamperd circulation through the subdivision and adjoining subdivision.

6. In the event that a roadway is to cover an original survey corner, a marker shall be set on an offset at the right of way line. Such marker to be made of 6 inch diameter concrete and three feet long. The top of the marker shall be set flush with the ground and have a brass plat with an "X" on it. In addition to this a three foot pipe with a minimum diameter of 1 inch shall be set 6 inches (6") below the ground on the right-of-way line and approximately 20 feet from the concrete marker. These markers shall be shown on the plat with the angle and distance to the original survey corner.

7. Where an existing road is continued into a new subdivision, the right-of-way in the new subdivision shall not be of less width than the right-of-way of the existing road.

8. Roads shall be laid out so as to intersect as nearly as possible at right angles.

9. Road jogs with centerline offsets of less than one hundred twenty five (125) feet shall be avoided.

10. Property lines at road intersections shall be rounded with a radius of ten (10) feet or of a greater radius where deemed necessary by the County Engineer.

11. Dead end roads, designed to be so permanently, shall not be longer than five hundred (500) feet and shall be provided at the closed end with a cul-de-sac (turn-around) having an outside right-of-way diameter of at least one hundred (100) feet.

12. Roads which are a continuation of an existing road shall take the name of the existing road.

13. Where part of a road has been dedicated in an adjoining subdivision adjacent to, and along, the common property line of the two subdivisions, the same width, or wider, right-of-way must be dedicated in the new subdivision as was dedicated in the existing subdivision.

14. All arterial, main thoroughfare & collector roads shall be as straight as possible, with a maximum of five (5) degree curve being permitted, except at intersections; minor roads through residential areas may have a maximum of ten (10) degree curve.

15. Roads shall be platted so that continuation of said roads may be made in future subdivisions.

16. Provision must be made for the extension of main thoroughfares; belt loops of main county roads, etc., where required by the County Engineer.

17. A map shall be submitted to the County Engineer on a scale of not more than two hundred (200) feet per inch, and certified to as to accuracy by the engineer, or surveyor, preparing the plat, showing in reasonable detail, the location and width of existing streets, roads, lots and similar facts regarding all property immediately adjacent thereto; also the connecting between the new and the existing subdivisions. If there are no adjacent subdivisions, then an accurate map must be submitted showing ownership of all adjacent property, location and distance of the nearest subdivision, and how the roads in the subdivision offered for record may connect with those in the nearest subdivision.

18. Profiles drawn to scale adequate to show the existing ground line and proposed grades of finished centerline of all roads, and flowline grade of all ditches, must be submitted to the County Engineer prior to plat approval.

19. Roadway & drainage plans shall be prepared by a Registered Professional Engineer (Texas Registration).

20. Roadway & Paving Standards - The following minimum standards shall be agreed to before final approval of a plat.

a) The ground shall be scarified and compacted to a depth of 6 inches (6") and a width of not less than two feet (2') beyond each side of the proposed pavement, for a subgrade. The subgrade shall be tested for compaction by a commercial labortory and shall have a minimum of ninety-five percent (95%) of the standard proctor density as determined at the optimum moisture content prior to the base being laid.

b) All roadways shall have a base of caliche, lime stablized caliche, or shell and sand, having a minimum compacted thickness of six inches (6") and a width of one foot (1') beyond each side of the proposed pavement. The base material shall be compacted to a minimum of ninety-six percent (96%) of modified proctor density. The County Engineer must give prior approval for the source of base materials.

c) The base shall be surfaced with either a hot-mix asphaltic concrete pavement (Item 340) or a cold-mix limestone rock asphaltic concrete pavement (Item 330), each one inch (1") in thickness minimum, or a three-course surface treatment using gravel or crushed rock for all three courses (Item 324) or a two course surface treatment (Item 322) using precoated aggregate for the top course or for both courses, as agreed. Specifications of all of the above to meet current Texas Department of Highways & Public Transportation 1982 Standard Specifications for Construction of Highways, Streets and Bridges.

d) All materials used in subdivision construction shall be subject to testing if warranted. An independent testing laboratory that is normally associated with performing tests on road and street construction shall be employed by the developer and approved by Nueces County. The testing fees will be paid for by the developer to the testing laboratory. The County Engineer will provide the developer with the minimum test requirements.

e) Widths of paving for the various types of streets are as follows: Arterial or main thoroughfare - forty-eight feet (48'), minor roads twenty-four feet (24'). A six foot (6') earth wide shoulder shall be provided on both sides of pavement except where curb & gutter is used.

21. Drainage:

a) In subdivisions where there is no curb & gutter, drainage shall be by roadway ditches, cross ditches, or swales. A map shall be submitted to the County Engineer showing direction of flow, acreage and all necessary drainage calculations. Ditches must have a minimum grade of 0.1' per 100'. Ditch side slopes shall not be steeper than four to one (4 to 1). Pipes shall be placed where required to provide necessary drainage under drives, sidewalks, cross drains, etc. In all instances calculations shall be shown for each drain, but in no instance shall the pipe used be less than eighteen inches (18") diameter. Drainage sketches, referred to above, shall show the drainage carried to its logical point of disposal. Drainage shall not be dumped on the adjoining tract or road to the detriment of that tract or road. All necessary easements shall be provided and ditch work done as an integral part of the subdivision being prepared. It shall be contrary to County policy to allow a subdivision to be built in the mouth of a large gulley, creek, draw or swale area, where heavy rains would cause damage to existing or contemplated improvements. The same would apply to installing streets, paving or other improvements in a new subdivision where the increased runoff will damage existing improvements below. Contours of not more than five foot (5') intervals in hilly land, or one foot (1') intervals in flat land, or in land that is at a twelve foot (12') elevation or less, shall be shown on this map.

b) When a plat involving roads, drainage or utility work shall have been approved and filed for record, then such roads, drainage or utility work shall be completed and accepted within six (6) calendar months from the date of acceptance. In case of inclement weather and upon application and approval, up to six (6) months extension may be granted.

22. A note shall be placed on the plat, where applicable, requiring building floor elevation to be constructed six inches (6") above the nearest roadway, or higher, if deemed necessary by County Engineer.

23. Subdivisions that are located in a flood zone as shown on the "Flood Hazard Boundary Map" for Nueces County will have the following requirements:

a) Permanent type bench marks shall be set in appropriate locations with the description and elevation shown on the plat.

b) A note on the plat stating "A flood permit will be required from Nueces County for building structures".

c) All subdivision proposals shall be consistent with Section D of the Nueces County Flood Damage Prevention Ordinance.

d) Contours at one foot (1') intervals shall be shown on the plat.

24. A certificate from each Tax Collector of a political subdivision in which property is located must accompany the plat to be recorded showing that all taxes are paid and not delinquent.

25. A certificate of title or title insurance on the subdivision must be furnished showing ownership of property and all liens against sale.

26. <u>STREET MARKERS</u>: Two road or street name signs having the following specifications shall be erected at all street intersections in such subdivision for street markers:

a) Signs shall be constructed of one of the following materials: 4" x 4" posts, either treated or untreated, painted white and using 2" standard height letters, giving the official street or road name or number, or

b) The street name sign shall be of the cross-arm type, and shall be reflectorized on aluminum metal blanks. Posts shall be metal or wood (Minimum 2" round galvanzied if the former and 4" square redwood, cedar or Southern yellow pine if the latter) and shall be 12' long, with at least 2'6" in the ground. If a "stop" or "yield" sign is also on the post, it shall be placed so as to not affect the legibility of the name. It shall be 7' minimum from the bottom of the sign to the ground line.

BE IT FURTHER ORDERED that the County Engineer be instructed to approve plats and attach his certificate to the plats only after all the conditions stipulated herein are complied with or that he is satisfied that compliance will be reasonably forthcoming.

VARIANCE AND SEVERABILITY CLAUSES

The Commissioners Court of Nueces County, Texas, shall hear and render judgment on requests for variances from the requirements of this Order subject to the following prerequisites:

(A) Variances shall only be issued upon:

(i) A showing of good and sufficient cause.
(ii) A determination that failure to grant the variance would result in exceptional hardship to the applicant, and
(iii) A determination that the granting of a variance will not cause detriment to the public good or conflict with existing laws or ordinances.

(B) The Commissioners Court shall hear and render judgment on an appeal only when it is alleged there is an error in any requirement, decision, or determination made by the County Engineer in the enforcement or administration of this Order.

(C) Upon consideration of the intent of this Order, the Commissioners Court may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this Order.

Any person or persons aggrieved by the decision of the Commissioners Court may appeal such decision in the courts of competent jurisdiction.

If any provision, section, part, subsection, sentence, clause, phrase, or pragraph of this Order be declared invalid or unsonstitutional, the same shall not affect any other portion or provision hereof, and all other provisions shall remain valid and unaffected by any invalid provision, if any.

ENFORCEMENT

At the request of the Commissioners' Court of Nueces County, the County Attorney may file an action in a Court of competent jurisdiction to enjoin the violation or threatened violation of the requirements established by or adopted under this Order and/or to recover damages in an amount adequate for the County to undertake any construction or other activity necessary to bring about compliance with the requirements established by this Order.

1. A person commits an offense if the person knowingly or intentionally violates a requirement established by or adopted under this act by the Nueces County Commissioners' Court. Said offense is a Class B misdemeanor punishable by a fine of not more than One Thousand Dollars ($1,000) and/or a jail sentence of not more than one hundred eighty (180) days.

2. Any requirement that was established by a previous Order pursuant to Article 2372k Vernon's Annotated Civil Statutes before September 1, 1983, and that after that date, continues to apply to a subdivision of land is enforceable as provided for above.

NOTE:

If any subdivision or addition is located outside of the city limits of any incorporated city or town, but lies within the extra-territorial limits, the form of dedication, etc., must be secured from the City or town and said plat must be first approved by the appropriate governing body before the same will be approved by the Commissioners' Court of Nueces County, Texas.

Any person dedicating such a map is to use such portion of the form as herein listed, which is the approval form for the Commissioners Court.

STATE OF TEXAS ∥
COUNTY OF NUECES ∥

BEFORE ME, the undersigned authority, on this day personally appeared ____________ ________________, President, and ____________________ Secretary of (name of company) known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and considerations therein expressed, and in the capacity stated, and as the act and deed of said corporation.

Given under my hand and seal of office at _____ this __________day of___, A.D. 19____.

____
Notary Public in and for ______County, Texas

****

STATE OF TEXAS ∥
COUNTY OF NUECES ∥

I hereby certify that the foregoing map of __________ complies with all the regulations and requirements of the Commissioners' Court of Nueces County, Texas, effective this date.

Dated this ___________day of _______________, 19_____.

____
County Engineer

****

STATE OF TEXAS ∥
COUNTY OF NUECES ∥

I, Marion Uehlinger, Clerk of the Commissioners' Court of Nueces County, Texas hereby certify that the foregoing map was approved and accepted by said Court on the ____ day of ____________, 19___ as shown by order of record in the minutes of said Court in Volume ___________, Page _______.

Witness my hand and seal of said Court at office in Corpus Christi, Texas, this the ________ day of ______, 19____.

Marion Uehlinger
By:__________________ Deputy

****

STATE OF TEXAS ∥
COUNTY OF NUECES ∥

I, Marion Uehlinger, Clerk of the County Court, in and for Nueces County, Texas, hereby certify that the foregoing map of _____________dated the _____day of ______________, 19___ with its certificate of authentication was filed for record in my office this ____day of ____, 19____ at _______________o'clock ____m and duly recorded in Volume _______, Page ______.

Witness my hand and seal of office in Corpus Christi, Texas this _____day of _____, 19____.

Marion Uehlinger
By:_________________Deputy

****

STATE OF TEXAS]
COUNTY OF NUECES]

I, ____________, Registered Public Surveyor (or Engineer), hereby certify that this plat is true and correct, to the best of my knowledge and ability, and that it was prepared from a survey made on the ground in ______________, 19_____.

Registration Seal Date

____
License No.

****

STATE OF TEXAS]
COUNTY OF NUECES]

I, ___________ hereby certify that I am the owner of all the lands embraced within the bounds of _____________, Nueces County, Texas, subject to a lien held by __________ __________; that I have had said land surveyed and subdivided as here shown, that all streets and alleys shown are dedicated to the use of the public; that all utility easements shown hereon are dedicated to the public for the installation, operation and use of the public utilities; that this map is made for the purposes of description and dedication, this the ________day of _________, 19_____.

____

****

STATE OF TEXAS]
COUNTY OF NUECES]

Before me, the undersigned authority, on this day personally appeared ________________, known to me to be the person whose name is subscribed to the foregoing instrument of writing, and he acknowledged to me that he executed the same for the purposes and considerations therein expressed and in the capacity stated.

Given under my hand and seal of office, this the _______ day of _________ 19____.

____
Notary Public in and for Nueces County, Texas

****

STATE OF TEXAS]
COUNTY OF NUECES]

We, ______________, hereby certify that we are the holders of a lien against the lands embraced within the bounds of _________________, Nueces County, Texas, and that we approve the subdivision and dedications of same for the purposes therein expressed.

This the ____________ day of ___________, 19______.

____

****

STATE OF TEXAS |
COUNTY OF NUECES |

This final plat of ____________________, Nueces County, Texas, approved by the Corpus Christi-Nueces County Health Unit. Any private water supply and/or sewage system shall be approved by the Corpus Christi-Nueces County Health Department prior to installation. Dated the _______ day of ___________________, 19_____.

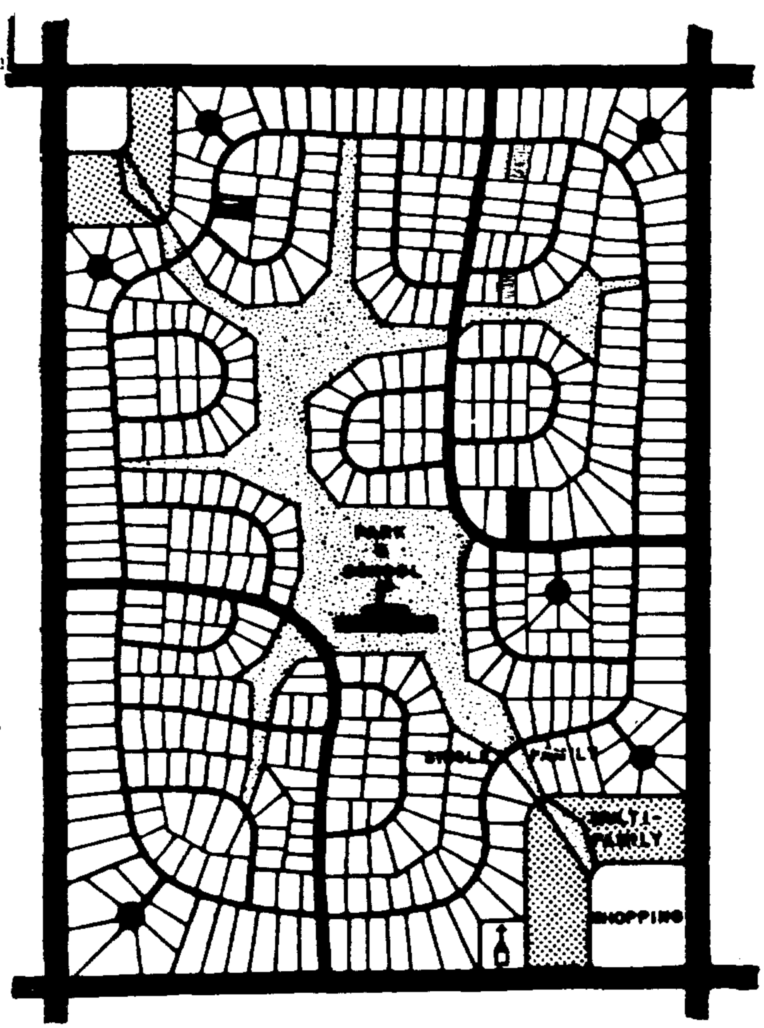
____

Public Health Engineer

****

APPENDIX B

CORPUS CHRISTI PLATTING ORDINANCE



PLATTING ORDINANCE

city of
corpus christi
texas 1984

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CONTENTS - Continued

CONTENTS - Continued

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13. Dead-end streets, designed to be so permanently, shall not be longer than five hundred (500) feet and shall be provided at the closed end with a turn-around having an outside roadway diameter of at least eighty (80) feet, and a street property line diameter of at least one hundred (100) feet.

14. Street grades shall be established with due regard being had for topography, contemplated land use, and the existing land to be subdivided, provided that the minimum street grade shall be two-tenths of one percent (0.2%) except that the minimum grade across valley gutters, where approved, shall be five-tenths percent (0.5%). No land shall be rejected for subdivision purposes for failure to provide for greater street grade than that contained in this ordinance.

15. The flood design section for roadway shall be taken from back of walk to back of walk, provided that in no case shall the height for curbs for subdivision be more than six (6) inches. The run-off factor used in design of storm sewers shall be a minimum of one and three-tenths (1.3) cubic feet per acre for a minimum time of concentration of ten (10) minutes.

16. Where it is necessary for the best utilization of this street system in any subdivision wherein the City limits of the City of Corpus Christi that crossings over drainageways be provided, the developer shall be required to construct such crossings at his total expense if the ultimate bottom width of the drainageway does not exceed 15'. If two or more developers own

property adjacent to the drainageway, they shall each deposit an equal share of the estimated cost of the bridge or crossing. The crossing will then be constructed at such time as all developers involved have deposited their share of the money for the construction. The City will participate in the cost of construction of any drainageway crossing where the ultimate bottom width of the drainageway exceeds 15'. Such participation will be an amount determined by multiplying (the ultimate bottom width less 15' divided by the ultimate bottom width) by the applicable construction costs as defined below. The City will not under any condition participate in the cost of construction of any drainageway crossing if the ultimate bottom width of the drainageway is under 15' even if the property on one side is an existing street or any other public property; nor will the City participate in an amount greater than the amount determined by the above formula even if the property on one side is an existing street or any other public property; nor will the City participate if bridge is located outside the City limits. In estimating the total cost of construction for bridge crossings, the plans shall include the structure, headwalls, retaining walls, embankments, roadways, pavement, curbs and gutter, sidewalk, railing and related drainage structures, testing and engineering, and like related project expenses, within the right-of-way of the drainageway excluding 10 feet of improvements on either side of the right-of-way measured towards the centerline of the drainageway. All engineering work shall be performed by the developer's engineer and approved by the Director of En-

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1.0 SCOPE OF STUDY

1.1 PURPOSE

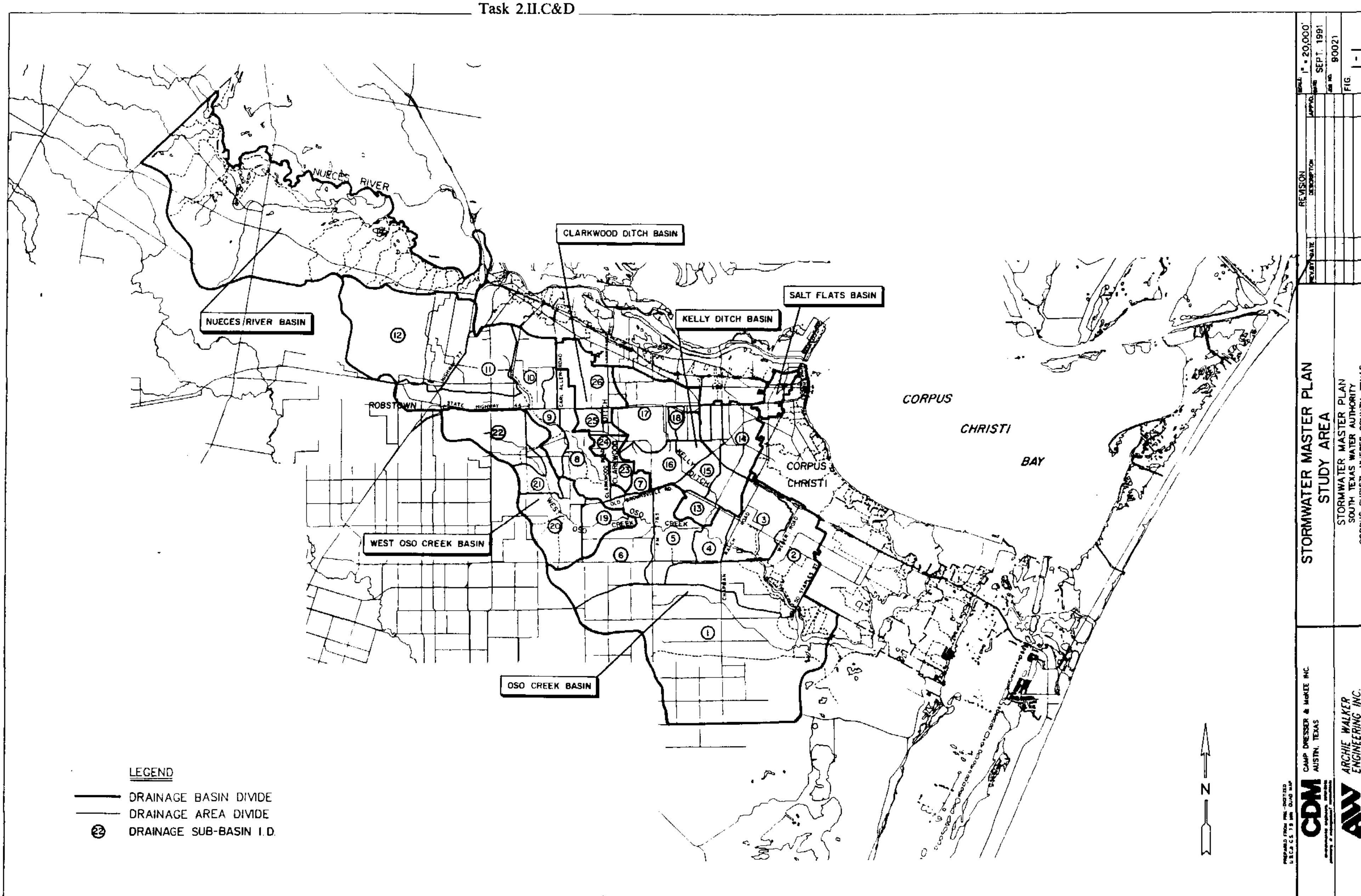
The Stormwater Master Plan requires comprehensive information providing an overview of the hydraulic capacity of the major drainageways within the study area. By determining the location of existing problem areas within the system and predicting future problem areas due to the effects of increased runoff from future land developments, the responsible drainage authorities can plan for the implementation of the required improvements. Task 2.II (D, E, and F) will make recommendations for drainage improvements. The current task specifically is intended to expand on the existing hydrologic data and hydraulic HEC-II models prepared for the South Texas Water Authority in the Nueces County Stormwater Management Master Plan, 1986 (Ref. 6). The modeling will include the determination of the 25-year and 100-year hydraulic gradient and flood plain for existing and future development conditions within the study area.

1.2 INVESTIGATED WATERWAYS

Five (5) specific waterways were specified within the definition of the scope of the Master Plan to be investigated. These waterways or drainageways are as follows:

1. Oso Creek
2. Kelly Ditch
3. Clarkwood Ditch
4. Salts Flats Drainageway
5. Nueces River

Figure 1-1, shows the location of these waterways with their related drainage boundaries and sub-basin designations.


NUECES RIVER
NUECES RIVER BASIN
CLARKWOOD DITCH BASIN
KELLY DITCH BASIN
SALT FLATS BASIN
WEST OSO CREEK BASIN
OSO CREEK BASIN
ROBSTOWN
CORPUS CHRISTI
CORPUS CHRISTI BAY
LEGEND
DRAINAGE BASIN DIVIDE
DRAINAGE AREA DIVIDE
22 DRAINAGE SUB-BASIN I.D.
N
STORMWATER MASTER PLAN STUDY AREA
STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CORPUS CHRISTI, NUECES COUNTY, TEXAS
CDM
CAMP DRESSER & McKEE INC.
AUSTIN, TEXAS
ARCHIE WALKER ENGINEERING, INC.
REVISION
1" = 20,000'
SEPT. 1991
90021
FIG. 1-1

2.0 OSO CREEK

2.1 GENERAL

Oso Creek is the central drainageway for Nueces County. The drainageway travels over 25 meandering miles from the Robstown city limits in northwest Nueces County to its gradual widening in the estuary of Oso Bay. Its drainage area comprises 188 square miles of Nueces County, including approximately 20 square miles northwest of Robstown.

2.2 RUNOFF DETERMINATION

In order to determine the quantity of rainfall runoff to be anticipated for "design" events (i.e., the 25 year and 100 year storm), it is required to establish the following:

* Land Use - Existing and Proposed
* Drainage System Conditions - Channel Condition, Structures
* Contributing Drainage Area - Size, Slope and Soil Types

Kelly Ditch and Clarkwood Ditch, two of the other drainageways to be investigated, lay within the Oso Creek drainage basin. Therefore, the determination of runoff for these two basins was conducted in conjunction with Oso Creek.

2.2.1 LAND USE

Task 2.II.A - Population and Land Use Projections, describes in detail the Area Development Plan (ADP) data provided by the Corpus Christi Planning Department. Their analysis of the nine ADP's encompassing the Oso Creek drainage basin included type and percent of land use for five stages of development, from current development through ultimate development. Their apportionment of development was based upon individual population projections for each ADP. Additionally, a low growth, medium growth, and high growth scenario was provided. This is the first time that this detailed information has been available for utilization in the hydrologic analysis of the Oso Creek basin; and even though there can be some variation in projections and future conditions, this data will greatly improve the hydraulic model for the Oso Creek drainage basin.

For this study, three levels of development were selected for runoff determination as follows:

Existing Development	Year 1990
Intermediate Development	Year 2010
Ultimate Development	-

Ultimate development is projected to include a total population of up to 1,000,000 people within the Corpus Christi planning area which presently contains a population of 271,000. The concept of this size population within the entire drainage basin area at "built out" appears theoretical, but it has occurred in major urban centers. Therefore, stormwater planners should include these considerations in their decisions.

Medium growth scenarios for the above levels of development were selected as being the best estimate of rate of growth. Ultimate development is the same for all growth scenarios.

In order to convert land use into factors which are used in runoff computations, each land use category needs to be assigned a runoff coefficient. When used with the appropriate equation, these coefficients model the percentage of stormwater which runs off the land area.

Two equations frequently employed for estimating runoff based upon land use are the "Rational" method and the Soil Conservation Service (SCS) method. When using the "Rational" method for runoff computation, this coefficient is directly related to the percentage of imperviousness for the type of land use. The SCS Method utilizes Curve Numbers (CN) along with soil types for the same purpose.

The application of the "Rational" method is limited to areas less than 1,500 acres, or 2.5 square miles. For larger areas, the SCS method provides more accurate runoff results. Since the total area of the Oso Creek watershed exceeds 188 square miles, the SCS method was selected for determining the hydrographs for Oso Creek in this study.

Initial runoff coefficient values selected from SCS Handbook charts were assigned as representative coefficients for beginning the analysis. The predominant soil conditions for the Oso Creek drainage basin area is Group D - "soils having a slow infiltration rate when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water or soils with moderately fine to fine texture" (Ref. 1); with a moderate percentage of Group C soils - "High runoff potential: Soils having a very slow infiltration rate when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material" (Ref. 2).

Initial values were checked by hydrologic methods discussed in the following Section 2.2.4 to determine correlation with existing runoff records at the Oso Creek stream gauge station. The resultant coefficients which were found to typify the Oso Creek drainage basin in the five basic types of land use are as follows:

	% Impervious	SCS
Curve No.		
Residential	34%	82
Commercial	84%	90
Industrial	65%	86
Agricultural or Groomed Open Space	8%	72
Undeveloped or Raw Open Space	1%	68

The tabulation of these coefficients for each of the sub-areas of Oso Creek drainage basin as defined by the Area Development Plans are included as Appendix A.

2.2.2 DRAINAGE CONCENTRATION TIME

Time of Concentration (Tc) for drainage runoff was determined for each of the 26 sub-basins based upon assumptions as to average overland flow, closed conduit and open channel velocities and lengths.

For undeveloped areas, drainage was assumed to be overland flow for the first 2,640 ft. at 0.5 fps, since minimal roadside drainage exists on mile grids throughout the area. Once the drainage enters the roadside ditch, the travel time was computed at 2.0 fps to the point where the stormwater enters the major drainageway. Through the major drainageway, computer computations utilize actual stream velocities at different flow regimes to determine downstream times of concentration.

For partially developed areas, the distance for overland flow was reduced to 1,320 ft. representing the subdivision of large parcels and the extension of the minor drainage-ways into the half-mile grid. Flows in these collector ditches were assumed to travel at 2 fps.

For the totally developed condition, closed conduit systems were assumed in place for the first 2,500 ft., or approximately one-half mile of each drainage basin, which is consistent with the existing drainage system development in other areas of the study area, except for entirely commercial areas. Thus, the time of concentration was determined by estimating first the inlet time for a closed conduit system. This includes the time for site runoff into the adjacent street, plus the gutter flow time into the first storm sewer inlet. The inlet time was estimated to be 25 minutes to cover the first 500 ft. of the drainage basin. Upon entering the storm sewer conduit where velocities increase, a velocity of 4 fps was used for the remaining 2000 ft. where the typical system outfalls into an open channel. Shallow open channel flow should remain at 2 fps for all development conditions.

Utilizing these computational procedures, the time of concentration (Tc) for the range of development conditions and for the first 2,640 ft. of drainage system are as follows:

Undeveloped Tc = 88 Minutes
Partially Developed Tc = 55 Minutes
Totally Developed Tc = 33 Minutes

Downstream drainage continues at 2 fps until entering the major drainageway. It is possible that some areas served by open channels will ultimately be enclosed, thus reducing the associated Tc. But the largest channels such as Oso Creek, Kelly Ditch, and Clarkwood Ditch where the majority of travel time occurs, are expected to remain as open/unlined channels. Thus, overall times of concentration for the Oso Creek watershed will not vary significantly from predevelopment to post-development conditions.

Table 2-1 contains the times of concentration utilized for each of the sub-basins in the study area in the development scenarios for Year 1990, Year 2010, and Ultimate Build-Out.

2.2.3 SCS HYDROLOGIC METHOD

The SCS Method for calculation of runoff was developed by the U.S. Soil Conservation Service and is widely used for this purpose. This method is appropriate when considering the effect of land use and development within a large watershed since the runoff formula contains factors or Curve Numbers which can be increased appropriately to model the increase in runoff due to changing and increasing land use.

The time of peak stormwater discharge for sub-basins is also a factor in determining the peak discharge in a large drainageway. Due to the effect of different time to peak values for different size and shape of sub-basins, the peak cumulative discharge is less than the simple additive sums of the individual peaks. The SCS has developed the TR-20 computer program which uses the SCS computational formula along with routing routines to determine the peak discharge at various points within a drainage basin. Storage and routing routines are used in the TR-20 computer program in order to simulate a realistic runoff for design frequency storms. TR-20 was selected for use in

TABLE 2-1

OSO CREEK DRAINAGE BASIN ROUTING DATA

BASIN NODE		AREA(MI.)	TRAVEL LENGTH	Tc1	Tc2	Tc3	CN1	CN2	CN3
Q1	*	43.10	62,300	9.76	9.76	8.86	73	73	79
Q2	*	8.02	33,000	5.69	5.07	4.79	75	76	79
Q3	*	7.08	24,000	4.44	3.82	3.54	75	77	79
Q4	*	2.56	11,016	2.63	2.63	1.73	74	74	79
Q5	*	8.41	22,032	4.16	4.16	3.26	73	73	79
Q6	*	11.28	38,160	6.40	6.40	5.50	73	73	79
Q7	*	1.20	8,000	2.21	2.21	1.31	73	73	78
Q8	*	6.71	30,000	5.27	4.65	4.37	74	79	79
Q9	*	3.20	15,000	3.19	2.57	2.29	74	76	79
Q10	*	9.83	19,500	3.81	3.19	2.91	74	76	79
Q11	*	7.32	21,500	4.09	3.47	3.19	74	76	79
Q12	*	20.33	37,500	6.31	6.31	5.41	73	73	79
Q13	*	1.87	14,472	3.11	3.11	2.21	77	77	81
Q14	*	7.33	25,992	4.71	4.71	3.81	77	77	81
Q15	*	2.95	20,016	3.88	3.88	2.98	77	77	81
Q16	*	4.96	18,000	3.60	2.98	2.70	74	79	79
Q17	*	11.45	25,992	4.71	4.09	3.81	75	79	80
Q18	*	0.46	4,968	1.79	1.17	0.89	75	79	80
Q19	*	3.35	15,984	3.32	3.32	2.42	74	79	79
Q20	*	7.44	16,992	3.46	3.46	2.56	73	73	79
Q21	*	3.19	21,000	4.02	4.02	3.12	73	73	79
Q22	*	6.49	25,992	4.71	4.09	3.81	73	73	79
Q23	*	1.06	8,712	2.31	2.31	1.41	74	76	79
Q24	*	0.93	8,712	2.31	2.31	1.41	73	73	78
Q25	*	1.86	15,480	3.25	2.63	2.35	73	73	78
Q26	*	5.65	27,720	4.95	4.95	4.05	73	73	78

this study because it created a complete hydrograph which simulated the runoff, storage and development condition for the entire Oso Creek watershed. The TR-20 computer model includes separate hydrographs for Kelly Ditch basin, Clarkwood Ditch basin, and West Oso Creek basin, which are integrated into the Oso Creek hydrograph. The procedure for creating the TR-20 model used for this study was as follows:

> The Oso Creek drainage basin was divided into 26 sub-basins which included the Clarkwood and Kelly Ditch drainage basins. Each area was measured using computer routines applied to the digitized drainage maps for this project. Appropriate runoff coefficients (CN) were assigned depending on the area's weighted location in the ADP's (see Table 2-1). The point of contribution to Oso Creek was located and reach lengths measured from maps.
>
> At the locations of contribution, these sections were located on the HEC-II stream model for Oso Creek and Kelly and Clarkwood Ditches. The HEC-II model was run with a range of flows in order to establish a discharge versus storage volume rating curve for each section. The results from this preliminary use of the HEC-II model were input into the TR-20 model in order to depict the potential storage in the drainage system.

Tables of values describing rainfall and runoff are input into the TR-20 program. These tables are regionalized in order to model conditions in the Coastal Bend area of the Gulf Coast.

The hyetograph is a table of values representing rainfall intensity on a time basis. The intensity of rainfall varies considerably during a storm as well as over geographic regions. To represent various regions of the United States, SCS developed four synthetic 24-hour rainfall distributions (I, IA, II, and III) from available National Weather Service (NWS) duration-frequency data, or local storm data. Type IA is the least intense and Type II the most intense short duration fall.

Types I and IA represent the Pacific maritime climate with wet winters and dry summers. Type III represents Gulf of Mexico and Atlantic coastal areas where tropical storms bring large 24-hour rainfall amounts. Type II represents the rest of the country. The Type III distribution was utilized for this study.

The SCS dimensionless unit hydrograph is another input table of values which describes the relationship of stormwater runoff to the characteristics of a particular drainage basin. The unit hydrograph of a drainage basin is defined as the runoff hydrograph resulting from one inch of rainfall excess generated uniformly over the watershed area during a specified period of time.

Rainfall excess is that portion of the rainfall that enters the stream channel as storm runoff. The specified period of time is an interval that is brief enough so that natural fluctuations of the intensity of rainfall during that interval will not materially affect the shape of that hydrograph.

The Delmar VA (DMV) unit hydrograph with a shape factor of 284 is recommended for use on acreage watersheds of 0.5 percent slope or less without benches or terraces (Ref. 10). For the flat coastal region of Nueces County, a shape factor of 256 was deemed appropriate and checked through calibrations as explained in Section 2.2.4.

With the TR-20 computer model and its fixed parameters constructed, the model may be used by specifying a cumulative 24 hour rainfall, the antecedent moisture condition of the soil, and any changes in runoff coefficients due to changing land use. The output is a detailed hour-by-hour analysis of the discharge at any of the selected points within the system.

The Oso Creek model has been run with the antecedent moisture condition (AMC) of II (normal), and III (saturated soil), depending upon information required, but the design storms are run assuming an AMC of II for final analysis.

The 24 hour rainfall totals are derived from the rainfall contours contained in the U.S. Weather Bureau TP-40 (Ref. 3). These totals are additionally adjusted to large area expected rainfall deviation by the method proposed in TP-40. The method is such that the 100 year, 11.5 in./24 hr., total rainfall is adjusted to 92% of that amount due to the average deviation to be expected over a 188 square mile watershed. Thus, the 100-year, 24-hour rainfall for design is 10.6 inches while the adjusted 25-year, 24-hour rainfall is 8.2 inches.

2.2.4 CALIBRATION TO RECORDED EVENT

The TR-20 model can be calibrated by using the rainfall and stream gauge data for an actual storm. The greatest runoff ever recorded at the USGS Oso Creek stream gauge station located at the crossing of FM 763, was for August 10, 1980 when 12,100 cfs was recorded due to Hurricane Allen (Ref. 4).

For this same day of record, hourly rainfall amounts were recorded at the Corpus Christi International Airport. These rainfall records were input into the TR-20 model as a specific storm rather than the typical regional hyetograph. Using these hourly rainfall records, a peak discharge was computed for the section in the model corresponding to the gauge location. The actual runoff coefficient, or CN of the specific watershed can be determined by adjusting the CN value until the calculated peak discharge matches the observed peak discharge.

In this manner, the computer model is calibrated to fit the runoff character of the actual drainage basin. The overall CN value by this calibration method was determined to be 74. The calibrated CN was less than the initial estimate of 78, which was computed strictly from SCS tables of suggested values. This is due to the Oso Creek drainage basin being below average in its runoff components such as slope, soil types, and amount of encatchments.

Checking the validity of the TR-20 model with respect to time was accomplished by examining the extended output for the subject cross-section which indicates hourly discharges at that point. The output for the TR-20 model was plotted and compared to the plot of the hourly discharge recordings by the USGS gauge for the same storm. Figure 2-1 compares the two plots which exhibit a very good fit. The computer program calculated a peak flow of 12,476 cfs at the location of the gauge compared to 12,100 cfs recorded by USGS. The remainder of the two curves closely resemble each other. The difference in the first few hours are the results of the previous day's rainfall which does not show up in the 24 hour storm distribution of the model which does not affect the peak discharge.

2.2.5 RESULTS

Peak discharges were determined for Oso Creek for the 25-year and 100-year frequency rainfalls and for the existing, interim, and ultimate development. Table 2-2, lists these design flows which are used for subsequent hydraulic analysis.

In the mid-areas of the Oso Creek basin, such as at FM 763, these runoff quantities are essentially equal to the flows used by FEMA (Ref. 5) in establishing the current 100-year flood plain, utilizing the USGS regionalized method for estimating the magnitude of floods in Texas. But peak discharges in the lower reaches, below Weber Road, were determined to be as much as 35% greater than FEMA's design discharges.

2.3 FLOOD LEVEL DETERMINATION

The peak discharges determined for the 25-year and 100-year design storms can establish the maximum flood levels to be expected in Oso Creek when these peak discharges are run through a computer model of the physical characteristics of the drainageway. The drainageway computer model determines conveyance based upon representative groundline cross-sections, length of channel and overbanks, frictional coefficients, turbulence factors, and modeling of obstructions.

TABLE 2-2

PEAK STORMWATER DISCHARGE FOR OSO CREEK

LOCATION (TR-20 SECTION NO.)	DESIGN RAINFALL	DEVELOPMENT SCENARIO EXISTING (1990)	INTERMEDIATE (2010)	ULTIMATE
6000' Below Staples	(100 Yr.)	39,444	42,038	46,139
(Sec 1)	(25 Yr.)	27,509	29,645	33,208
Staples Street	(100 Yr.)	31,748	34,163	37,089
(Sec. 2)	(25 Yr.)	22,186	24,182	26,709
Weber Road	(100 Yr.)	32,133	34,812	37,712
(Sec. 3)	(25 Yr.)	22,377	24,627	27,279
Chapman Ranch Road	(100 Yr.)	30,742	33,413	36,193
(Sec 4)	(25 Yr.)	21,469	23,703	26,246
FM 763	(100 Yr.)	19,358	21,006	23,170
(Sec. 6)	(25 Yr.)	13,332	14,685	16,435
Old Brownsville Road	(100 Yr.)	17,779	19,489	21,394
(Sec. 7)	(25 Yr.)	12,066	13,494	15,125
Highway 44	(100 Yr.)	7,262	8,280	9,289
(Sec 10)	(25 Yr.)	4,303	5,627	6,360
Highway 77	(100 Yr.)	4,562	4,542	5,719
(Sec. 12)	(25 Yr.)	3,013	3,025	3,709

FIGU. 2-1

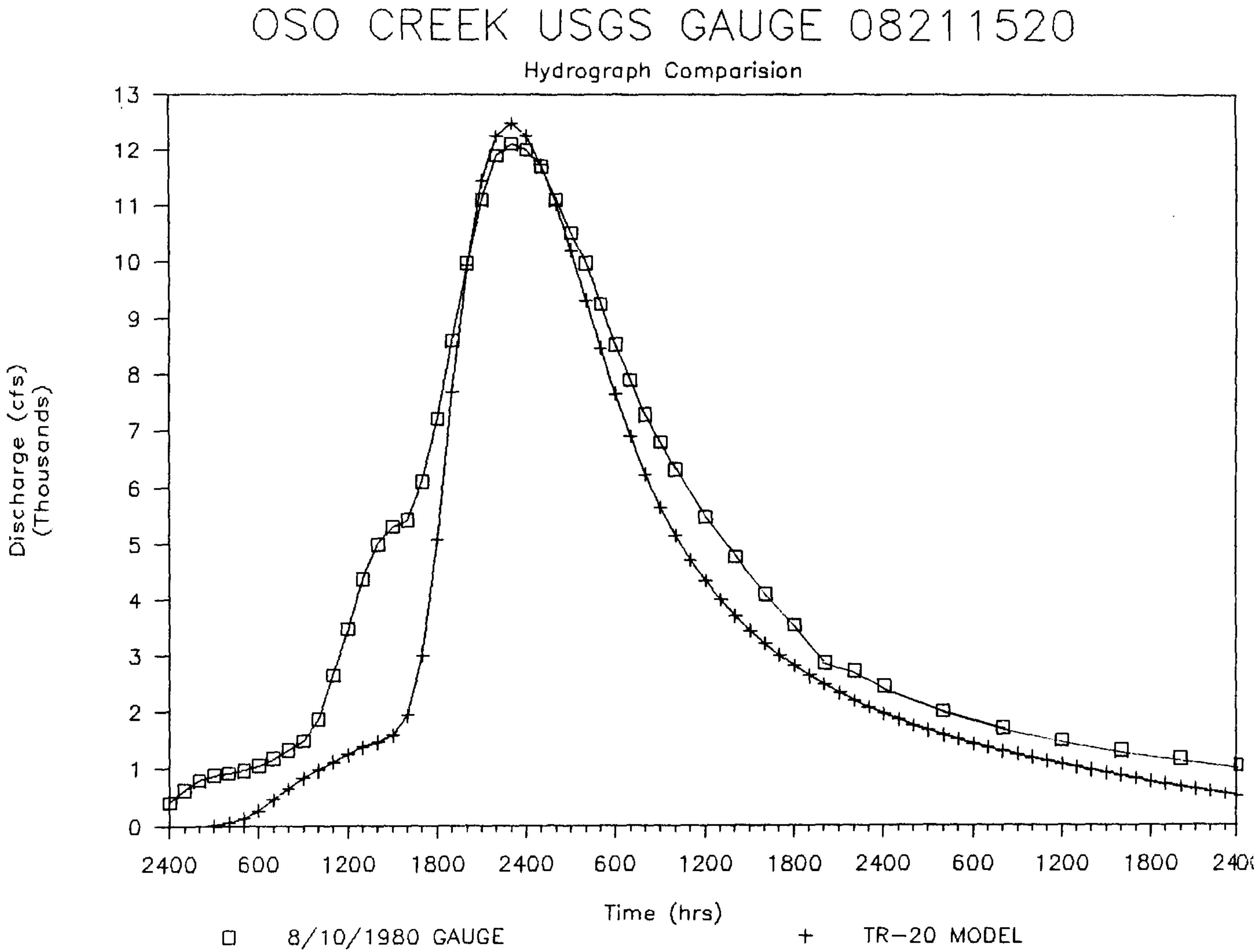


FIGURE 2-1

Task 2.II.C&D

The results of flood level determination will be used to:

1) Establish design hydraulic gradients of Oso Creek for the coordination of future drainage designs which enter the creek; and

2) Identify problem areas within Oso Creek such as over-topped roads, bridges, and overbank areas. Based upon criteria such as frequency and depth of inundation, priorities will be established later in the Master plan as to these problem areas. Recommended alternatives to solve the problems can then be tested through the HEC-II model to determine effectiveness of the proposed solutions.

2.3.1 HEC-II ANALYSIS

The HEC-II computer program (Ref. 7) was developed by the Corps of Engineers Hydrologic Engineering Center for performing standard step backwater calculations to determine flow regimes where flow is nonuniform and controlled by backwater from downstream water surface elevations.
The HEC-II program is utilized by FEMA in calculating the 100-year flood plains throughout the country and, thus, HEC-II has become accepted as standard hydraulic methodology even though many other more sophisticated programs for flood level analysis exist. The 1988 Nueces County Stormwater Master Plan included the preparation of a HEC-II model for numerous streams and creeks in the country, and a model was prepared for Oso Creek from below Staples Street to above Violet Road.

The task of the current plan was to tie into the previous plan, updating where necessary, and adding the new geometry of structures which had been replaced since the original study.

The HEC-II program also contains options for simulating channel improvements which allows the analysis of improvement alternatives. The model prepared for this study utilized the tributary option which allows the combining of several interconnected drainageways into a single mode. The Oso Creek model, thus includes the integrated tributary models of Kelly Ditch, West Oso Creek, and Clarkwood Ditch which are each recalculated with any parameter change anywhere in the model.

2.3.2 DATA COLLECTION

The existing Nueces County Stormwater Master Plan model of Oso Creek was obtained on computer disk as the basis for the new model. Bridges at Weber Road and Highway 44 had been replaced since 1988, so these new bridges were measured and input into the model. At several locations, the previous model contained reach lengths that exceeded the maximum allowed for detailed analysis. Additional cross-sections were input at these locations, the ground elevations being obtained from City one-foot contour interval maps wherever available and five-foot contour interval maps elsewhere. Bridge geometry was reviewed and modifications made to the programmed bridge modeling options where deemed appropriate. The lower end of the Oso Creek had been previously modeled using the original FEMA HEC-II model. Subsequent revisions by FEMA to the reach from below Staples Street to above Weber Road was not contained in the previous Nueces County model. These changes in the FEMA model have now been incorporated into the current model.

2.3.3 CALIBRATION TO RECORDED EVENT

The flood stage discharge rating curve established by the USGS at their gauge station on FM 763 affords the opportunity to check the accuracy of the model with calibrated information. The flood stage rating curve establishes a relationship between water depth and discharge based upon historical events and observations.

After the cross-sectional geometry is accurately input into the computer model, the conveyance factor with the most effect on the resultant flood level from a chosen discharge is the frictional coefficient chosen to represent the channel and overbank areas. This coefficient is the value of "n" in Manning's equation for determining frictional headloss, and is typically selected from a range of representative values for channels in excellent to good to poor condition.

An increase in channel vegetation will increase the "n" value in computations and result in an increase in flood stage elevation for a certain discharge. Therefore, it was possible to calibrate the Oso Creek model "n" values to actual stream conditions by increasing the "n" value until the flood stage discharge rating curves matched. HEC-II program options were utilized which multiply the "n" values by constants in order to uniformly increase or decrease all "n" values within the watershed. The appropriateness of this assumption has to be reviewed by the engineer in making the final judgment on "n" value selection. The values used by FEMA and in the previous study were for overbanks and channel respectively, "n" = .075/.055, which proved to be optimistic as to the condition of the channel. Values for "n" ranging from .06/.045 to .135/.100 were tried in the calibration HEC-II model. The resultant flood stage vs discharge curves are plotted on Figure 2-2. At lower stages where the channel factor is most important, the .09/.065 rating curve approximates the actual rating curve. At higher flood stages where the overbank "n" values become influential, the .135/.100 rating curve appears appropriate. This is consistent with the actual stream bed in the immediate area of the gauge station. The stream which has a narrow channel without vegetation due to constant submergence. The banks are crowded with tall vegetation such as trees which grow well due to the continual water supply. After the flood levels rise out of the channel, the flood water quickly encounters the dense growth along the sides of the channel.

2.3.4 FLOOD LEVEL RESULTS

The results of the HEC-II model computer runs generate water surface elevations, velocities, and top widths along the entire length of Oso Creek. Six profiles have been produced which show the level of the 25 year and 100 year design storms for three levels of land development; existing, intermediate, and ultimate.

Beginning water surface elevations for the 100-year design flows in Oso Creek were based upon the 100-year hurricane tide elevations of 12.8 determined by FEMA. The 25-year design beginning water surface elevation was assumed to be 6.0, representing maximum seasonal tide which might be encountered.

FIGURE 2

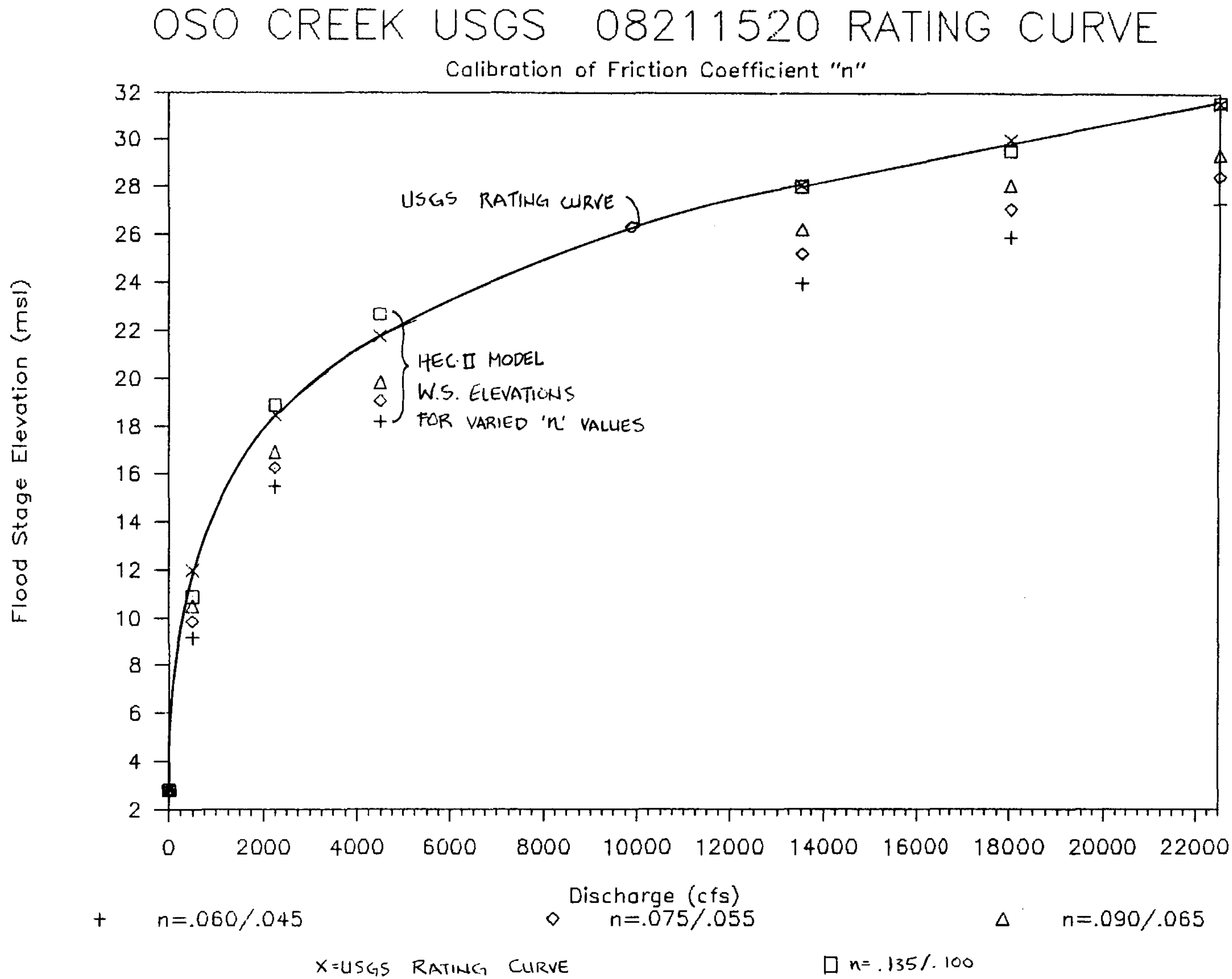


FIGURE 2-2

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Table 2-3 shows the anticipated water surface at various points along Oso Creek in comparison to current FEMA elevations at those locations. These elevations are at the upstream side of the listed structures. The profiles for the 25-year and 100-year storms for all levels of development are presented on Figure 2-3 and Figure 2-4 respectively, before any proposed improvements are being accomplished, in order to show the effect of land development on the creek and flood plain and structures.

The results indicate that existing flood plain design elevations are primarily greater than FEMA's determination due to poor channel conditions. Particularly in the mid-reaches of Oso Creek (between Chapman Ranch Road and Old Brownsville Road), the banks contain tall undergrowth and the channel is not maintained by Corpus Christi, Nueces County, or a drainage district. The improvement in the water surface elevations at Highway 44 is due to the replacement of the smaller of the highway bridges at Highway 44 by the Texas Department of Highways & Public Transportation. The ultimate profiles are generally less than a foot greater than current levels even though ultimate peak discharges are typically 25% greater than current flows.

TABLE 2-3

MAXIMUM (100 YR.) WATER SURFACE ELEVATIONS
FOR OSO CREEK

LOCATION (HEC-II SECTION NO.)	FEMA ELEVATION	DEVELOPMENT SCENARIO EXISTING (1990)	INTERMEDIATE (2010)	ULTIMATE
6000' Below Staples (Section 1.00)	12.8	12.8	12.8	12.8
Staples Street (Section 1.03)	15.1	14.8	15.0	15.2
Weber Road (Section 1.12)	17.0	18.2	18.6	19.0
Chapman Ranch Road (Section 1.19)	19.2	20.5	21.0	21.4
FM 763 (Section 1.29)	27.0	29.8	30.3	30.8
Old Brownsville Road (Section 1.35)	32.0	35.4	36.1	36.9
Highway 44 (Section 1.50)	58.0	55.8	56.2	56.7
Violet Road (Section 1.54)	62.8	63.8	64.0	65.4
Highway 77 (Section 1.60)	71.7	72.5	72.5	72.8

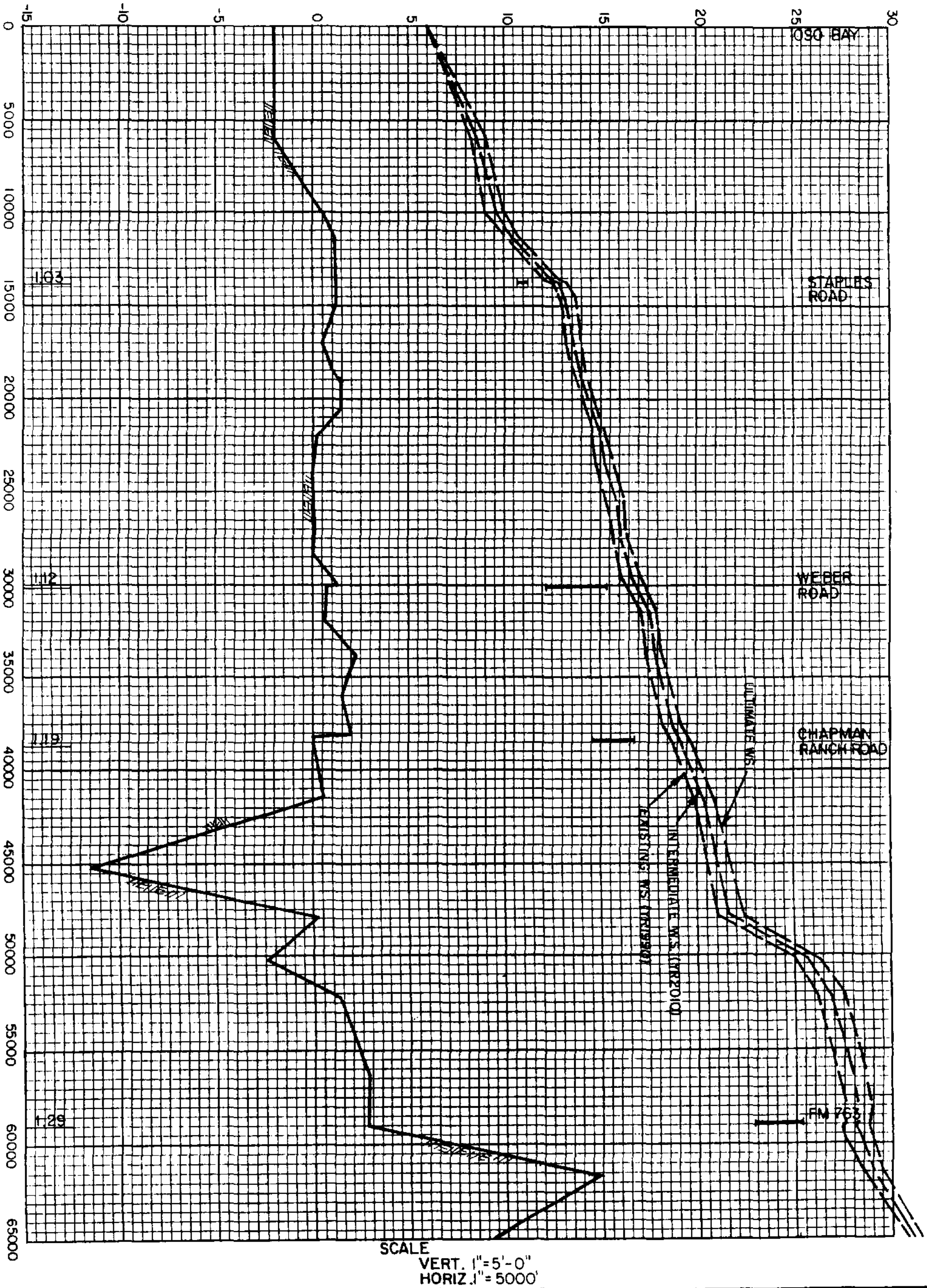
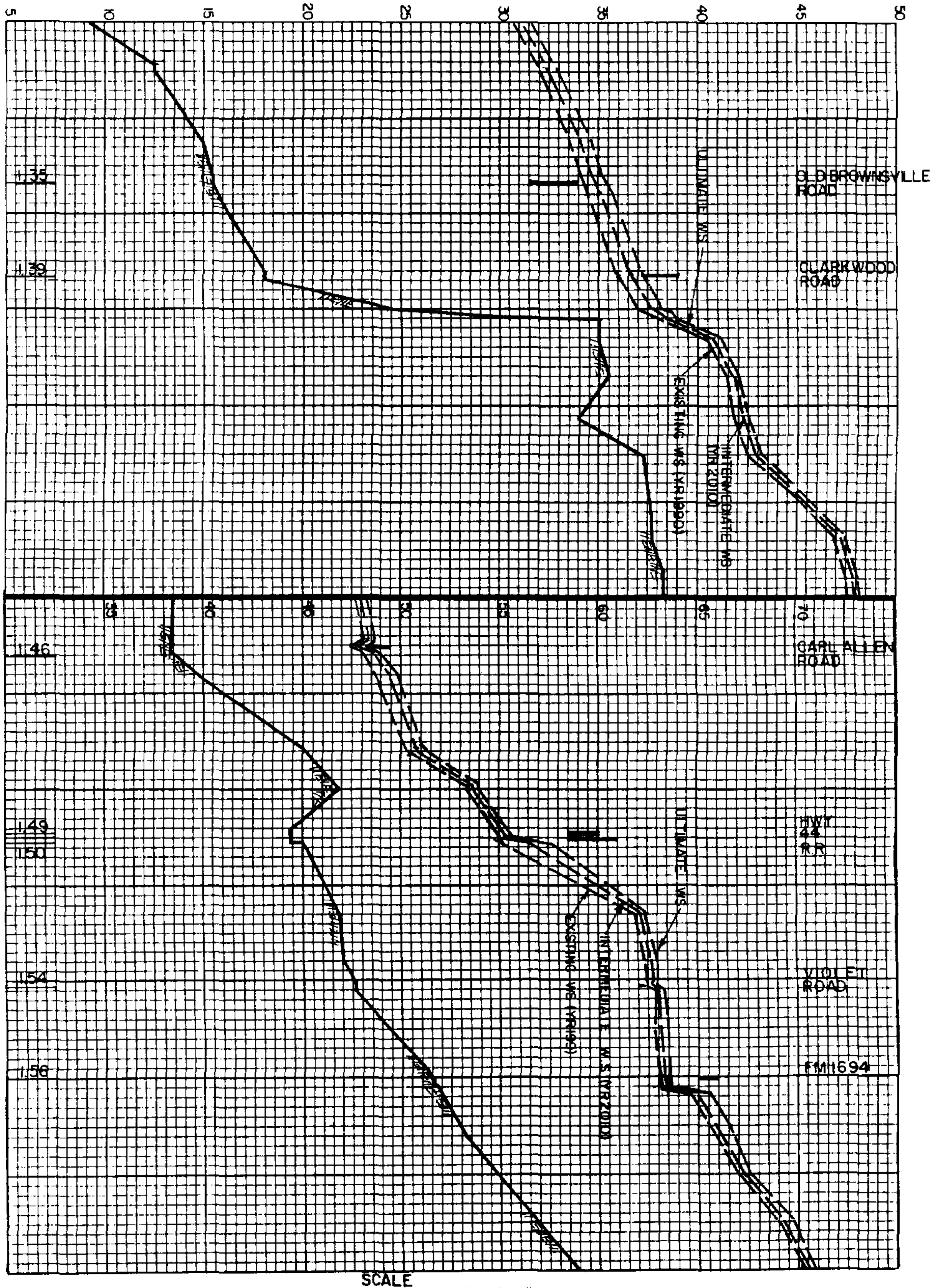


FIG. 2-3 (A)	**STORMWATER MASTER PLAN** SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	**25 YEAR FLOOD PROFILE** **OSO CREEK** DOWNSTREAM REACH



SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 5000'

STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	25 YEAR FLOOD PROFILE OSO CREEK UPSTREAM REACH

FIG. 2-3 (B)

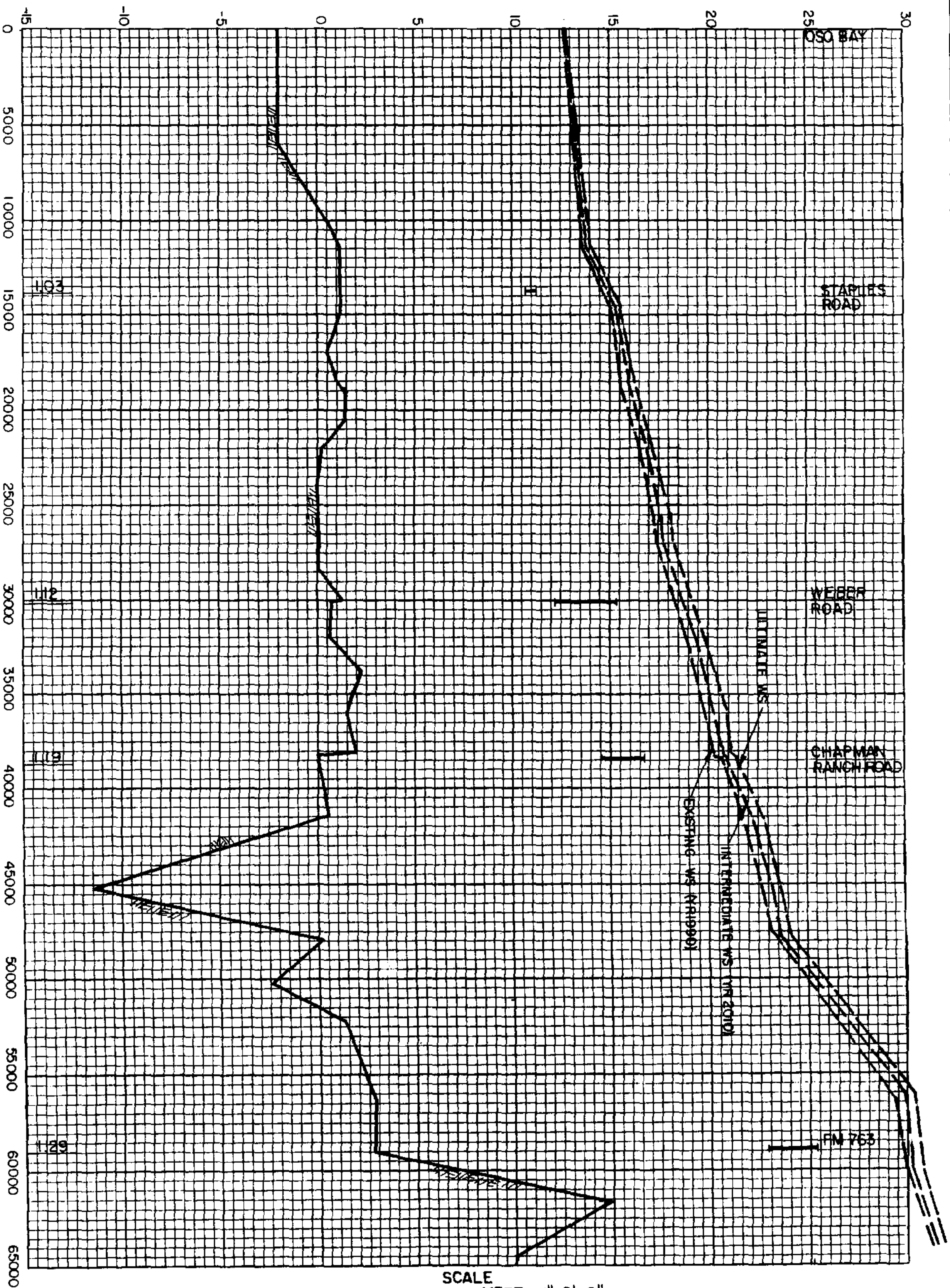
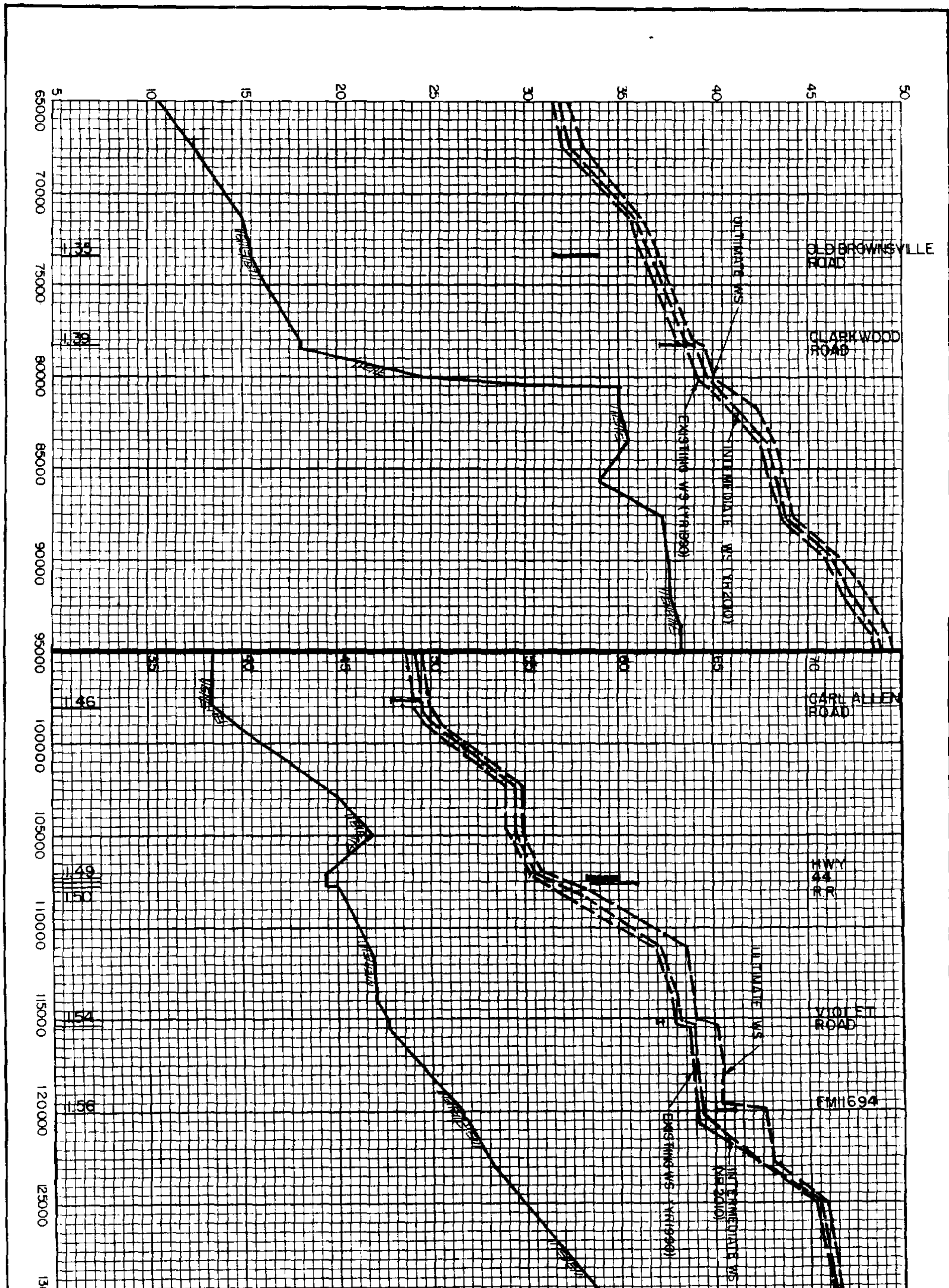
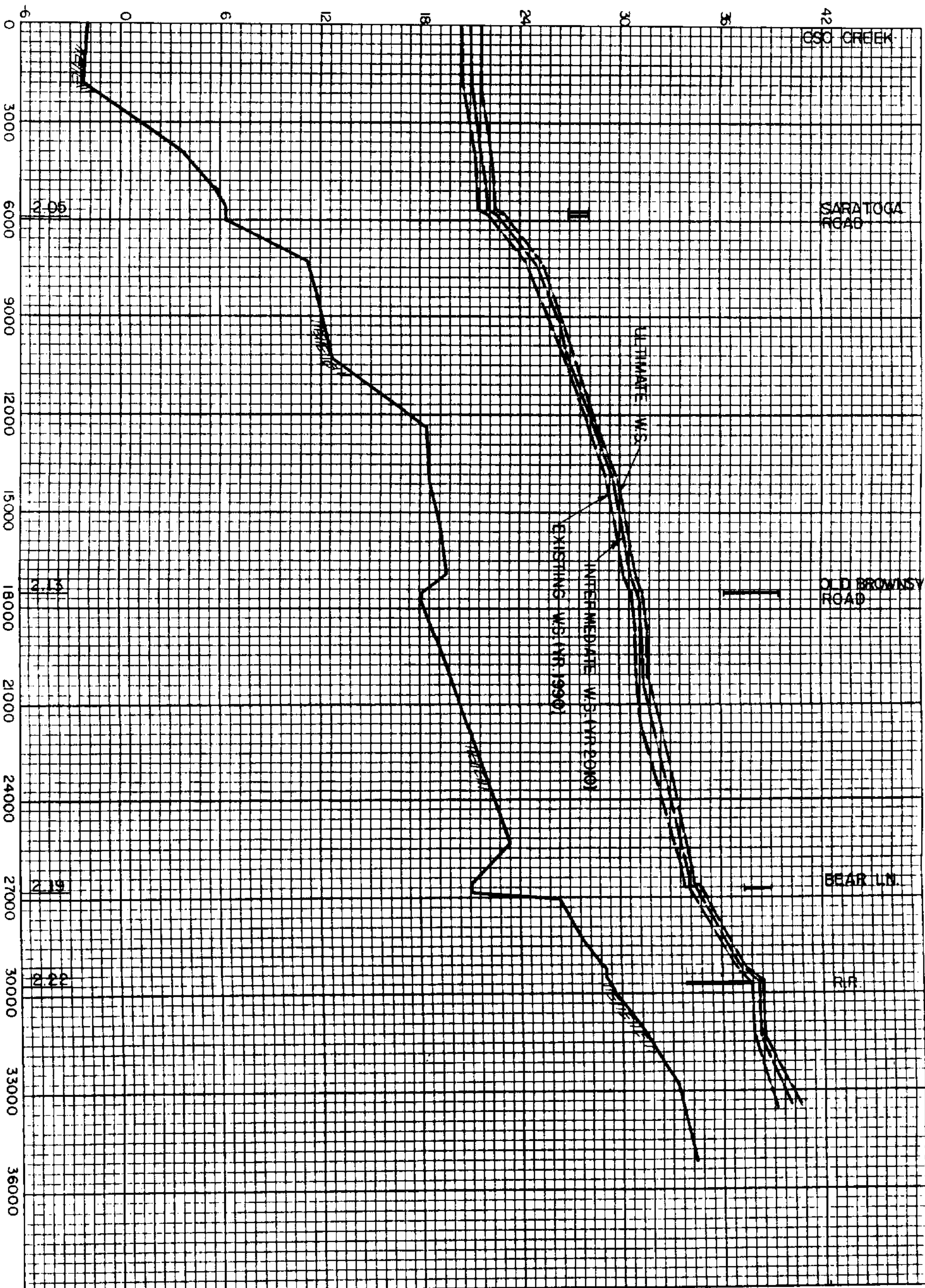


FIG. 2-4(A)	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE OSO CREEK DOWNSTREAM REACH



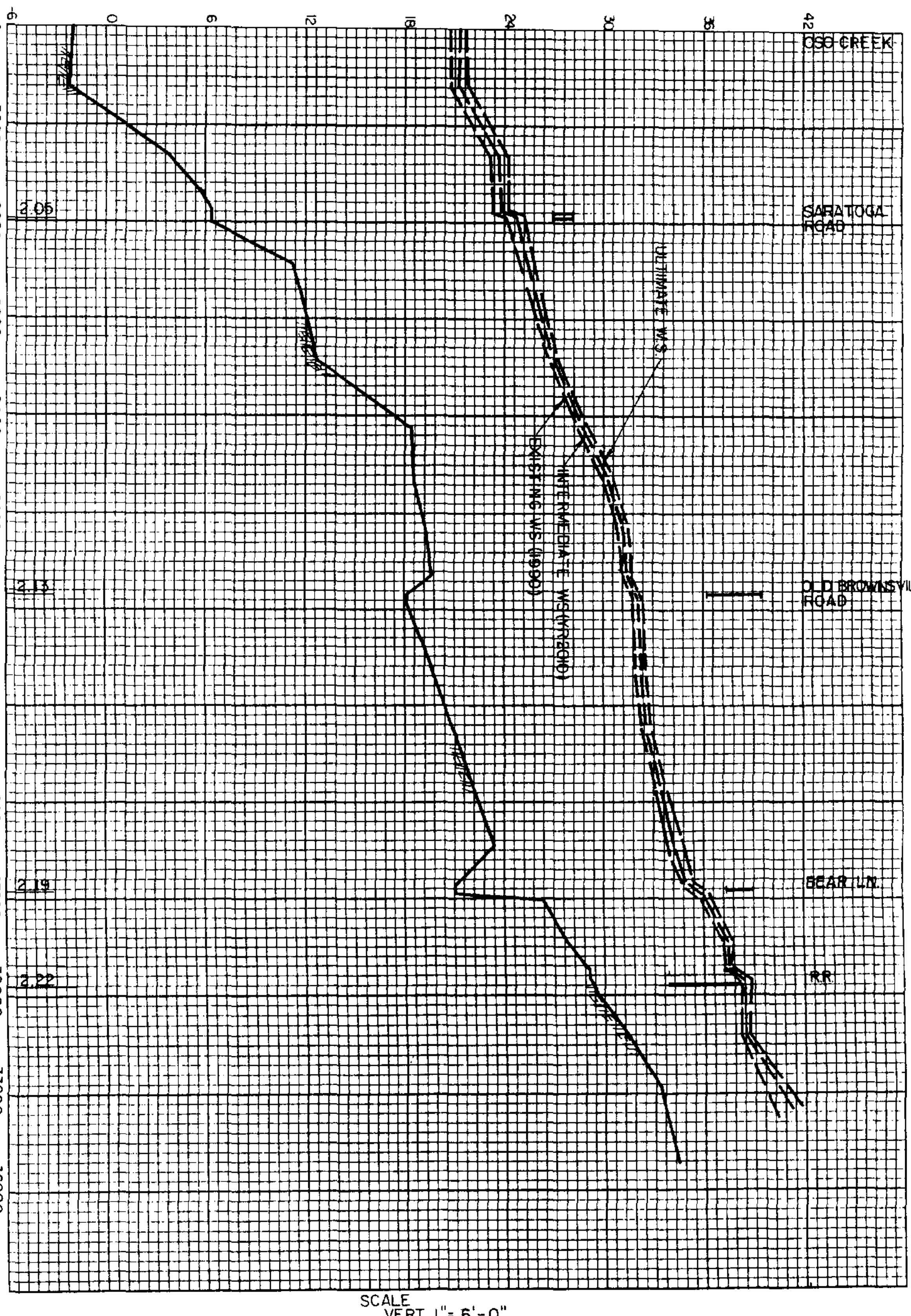
SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 5000'

FIG. 2-4 (B)	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE OSO CREEK UPSTREAM REACH



SCALE
VERT. 1" = 6'-0"
HORIZ. 1" = 3000'

FIG. 3.1	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	25 YEAR FLOOD PROFILE KELLY DITCH



SCALE
VERT. 1" = 6'-0"
HORIZ 1" = 3000'

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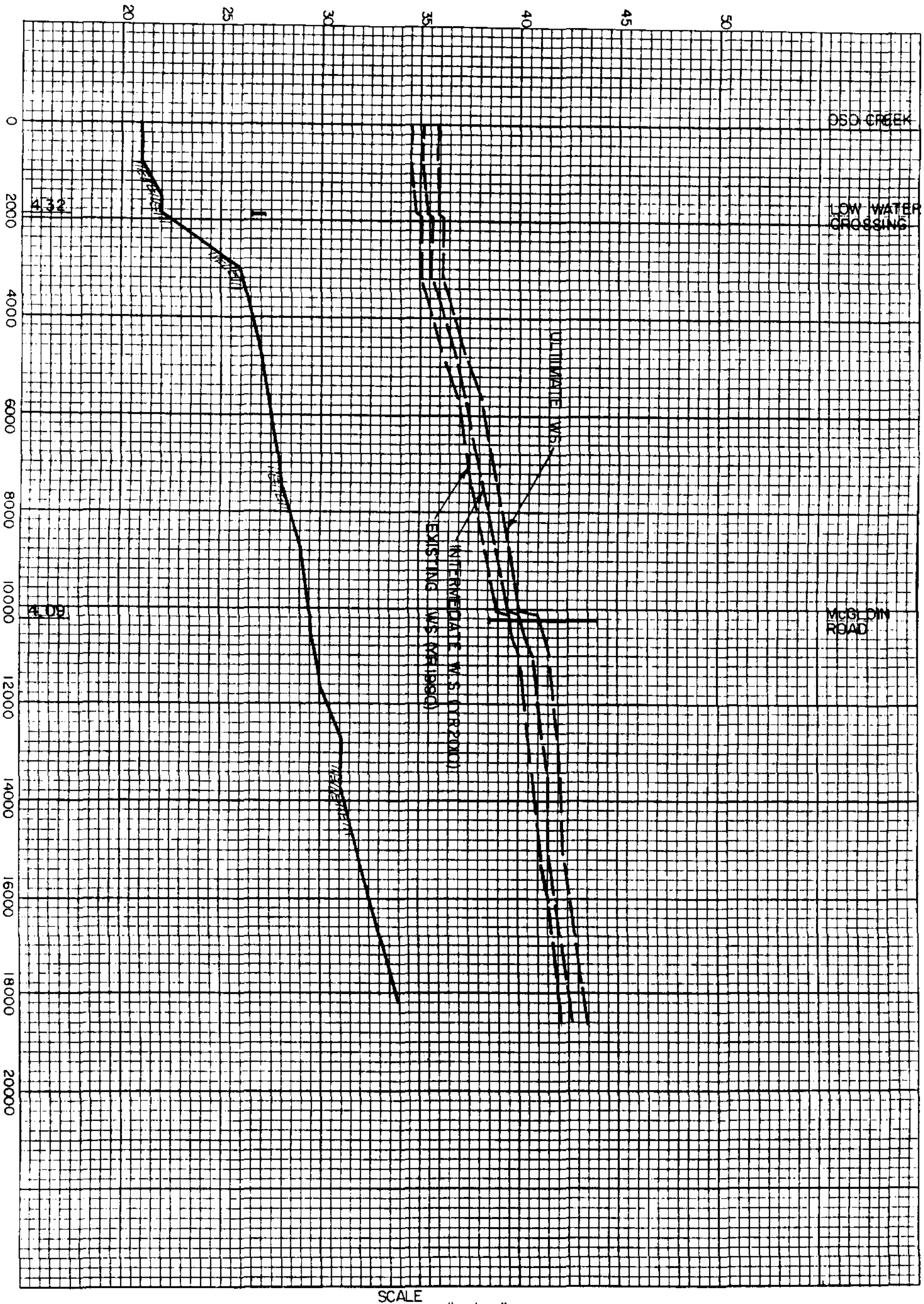
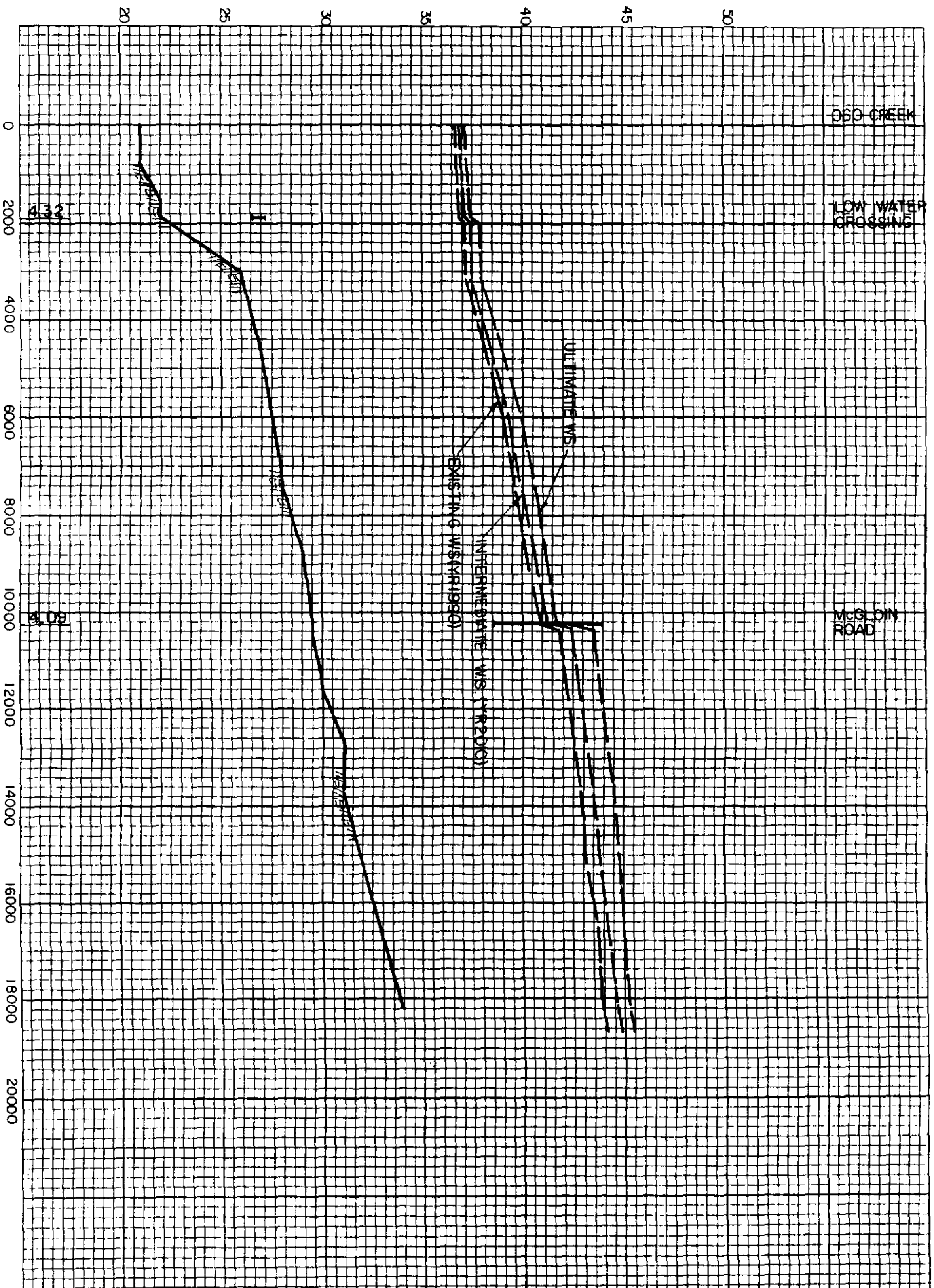
FIG. 3-2	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE KELLY DITCH



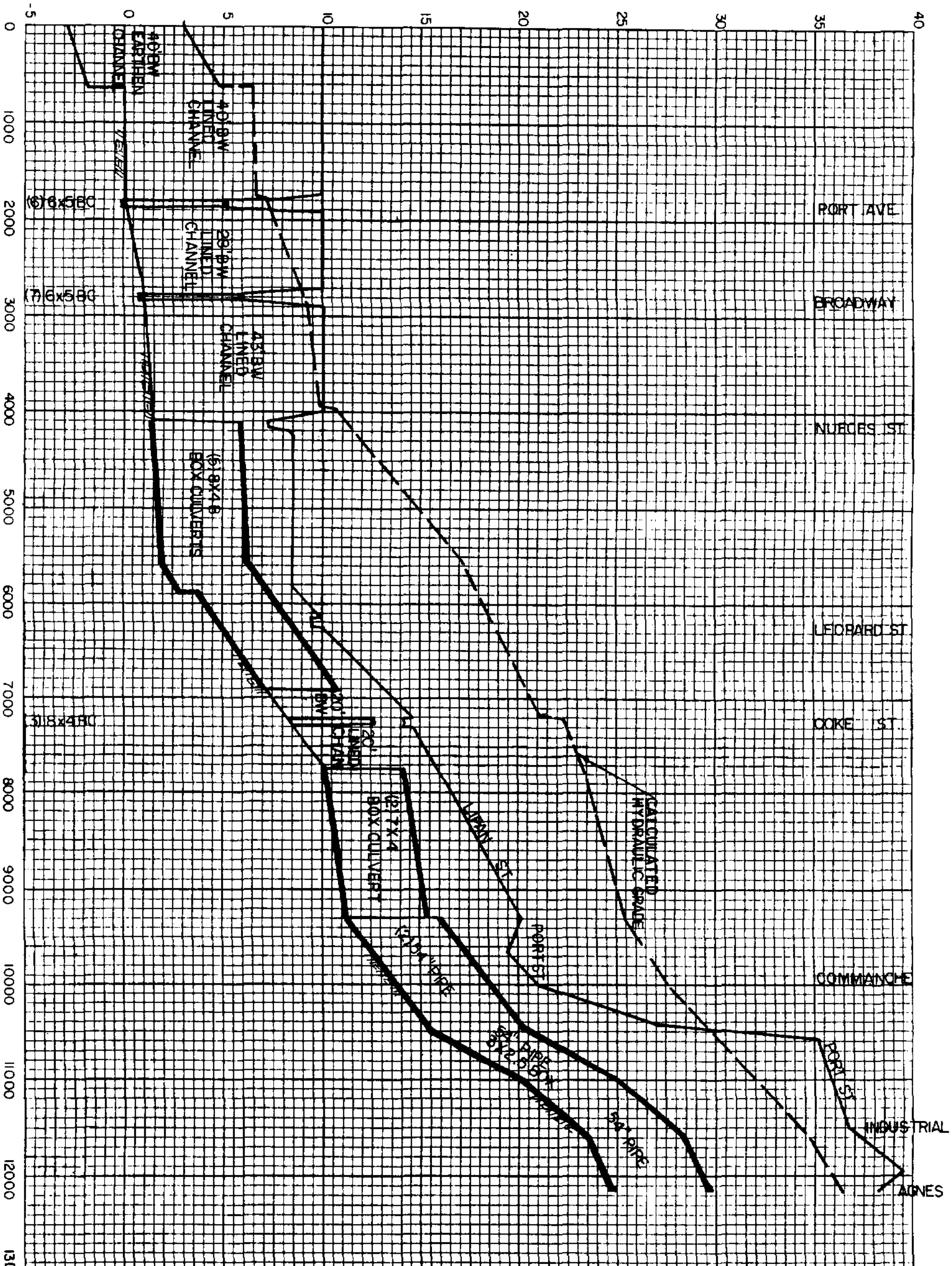
SCALE
VERT 1"=5'-0"
HORIZ. 1"= 2000'

FIG. 4.1	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	25 YEAR FLOOD PROFILE CLARKWOOD DITCH



SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 2000'

FIG 4-2	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE CLARKWOOD DITCH



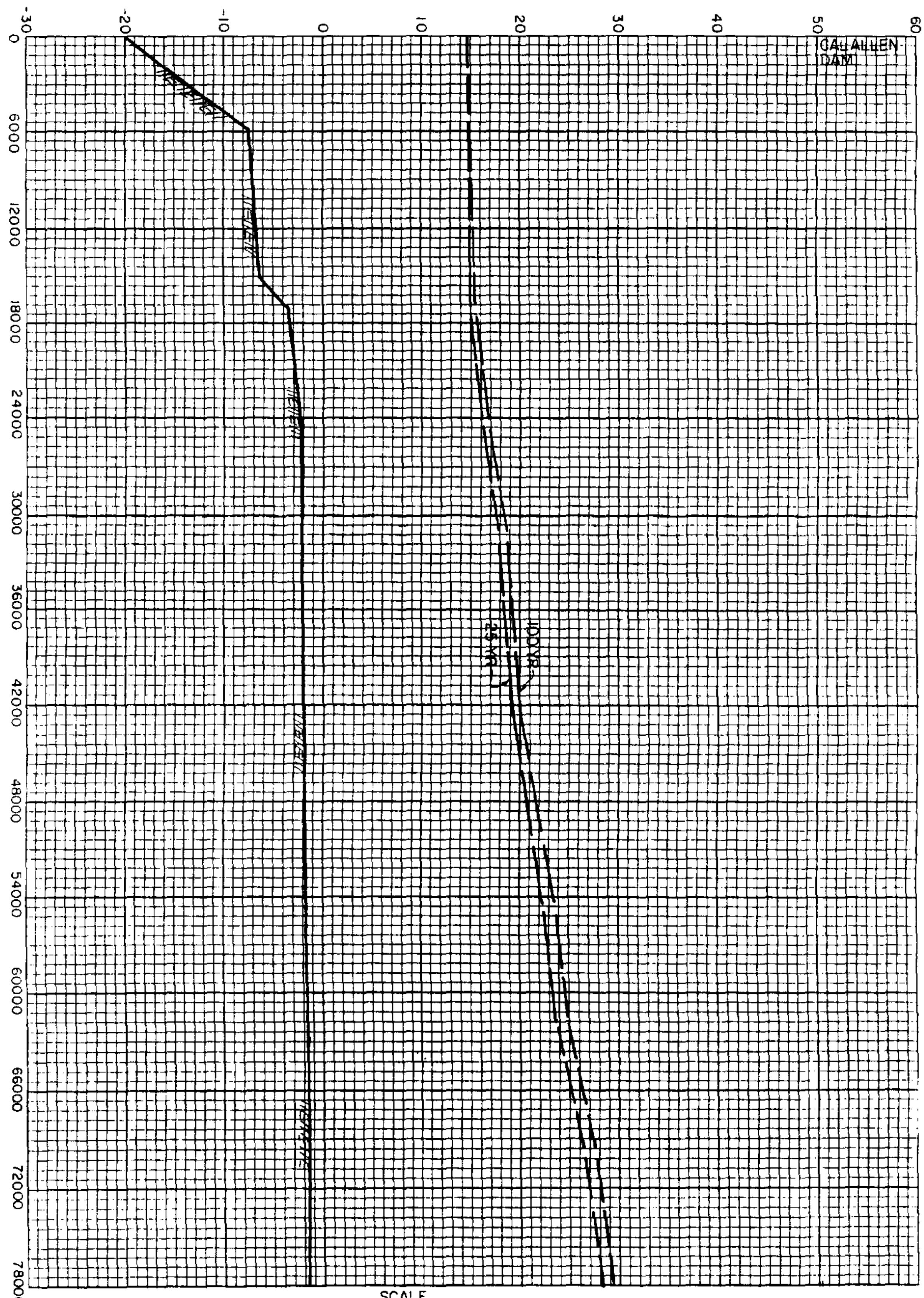
SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 1000'

FIG. 5.1

STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

5 YEAR FLOOD PROFILE

SALTFLATS DRAINAGEWAY



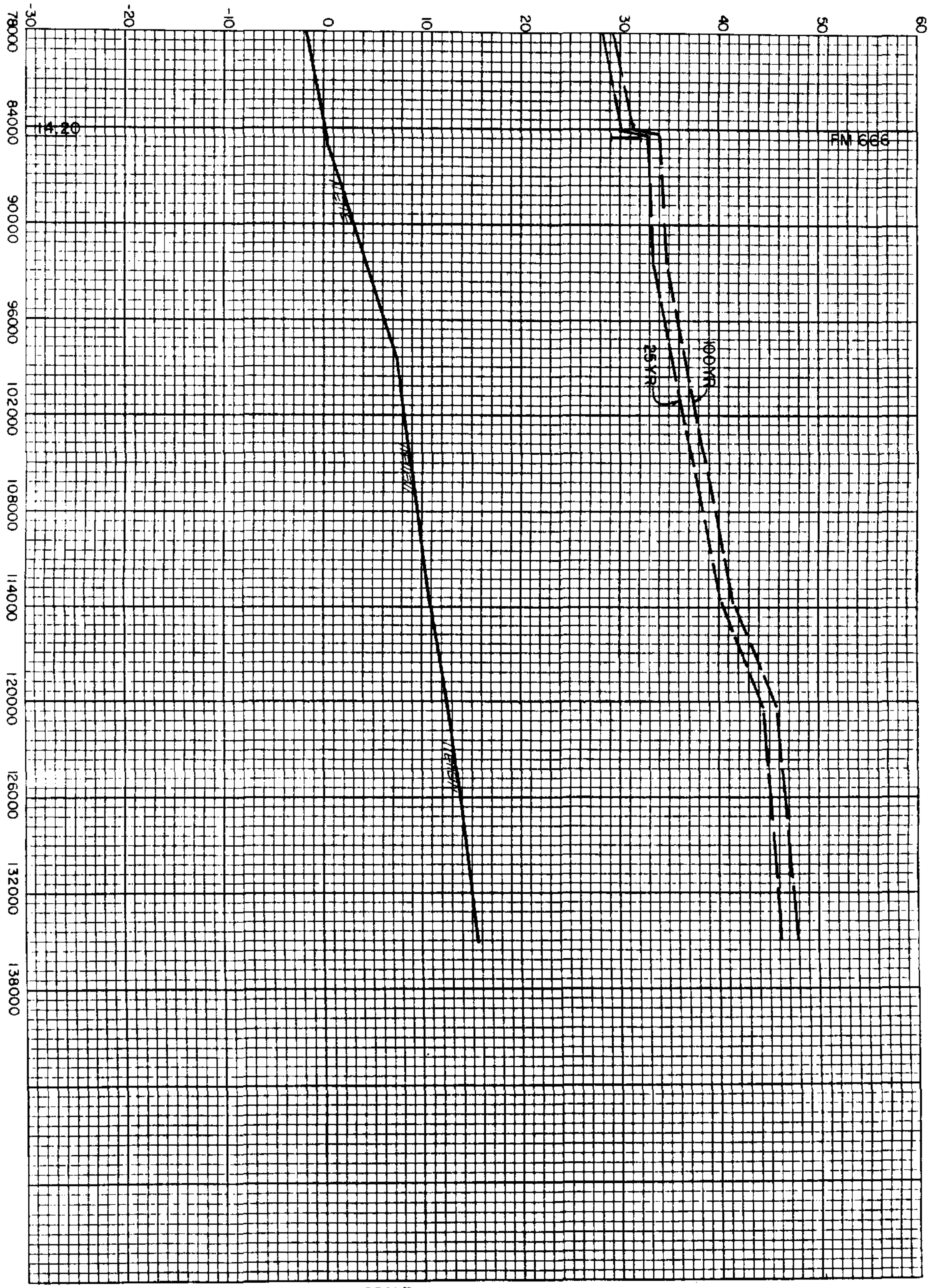
SCALE
VERT. 1"= 10'-0"
HORIZ. 1"= 6000'

FIG. 6-1(A)

STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

25YR & 100YR FLOOD PROFILES

NUECES RIVER
DOWNSTREAM REACH



SCALE
VERT. 1"= 10'-0"
HORIZ. 1"= 6000'

STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	**25YR & 100YR FLOOD PROFILES** **NUECES RIVER** UPSTREAM REACH

FIG. 6-1(B)

3.0 KELLY DITCH

3.1 GENERAL

Kelly Ditch is a drainageway within the Oso Creek drainage basin. Kelly Ditch drains an area of approximately 29 square miles including the airport, land north to Leopard Street, and the west side of Corpus Christi up to Agnes Street. The drainageway runs almost six miles east of the airport to its outfall into Oso Creek two miles upstream of Chapman Ranch Road crossing. The upper four miles of the ditch have been channelized and are maintained by the City of Corpus Christi. The lower two miles are comprised of natural channel and flood plain heavily overgrown.

3.2 RUNOFF DETERMINATION

The Kelly Ditch sub-watershed is a portion of the Oso Creek basin. Therefore, the runoff flows were derived during the same TR-20 computer program runs described in Section 2.2 for Oso Creek. The result of these runoff determinations for the 25-year and 100-year design storms and for existing intermediate and ultimate development are shown on Table 3-1.

3.3 FLOOD LEVEL DETERMINATION

The Oso Creek HEC-II computer model incorporated Kelly Ditch as a tributary within its computations. Cross-sectional information was determined from several sets of construction plans for the constructed ditch portions. One-foot contour maps were used for supplemental cross-section data wherever needed. Bridges were measured for input. Flood levels results are presented as six profiles on Figure 3-1 and Figure 3-2. These elevations are also shown at selected locations on Table 3-2, and compared to existing Master Plan elevations and FEMA elevations for Kelly Ditch. The difference in current design water surface elevations and those produced by FEMA is due to

TABLE 3-1

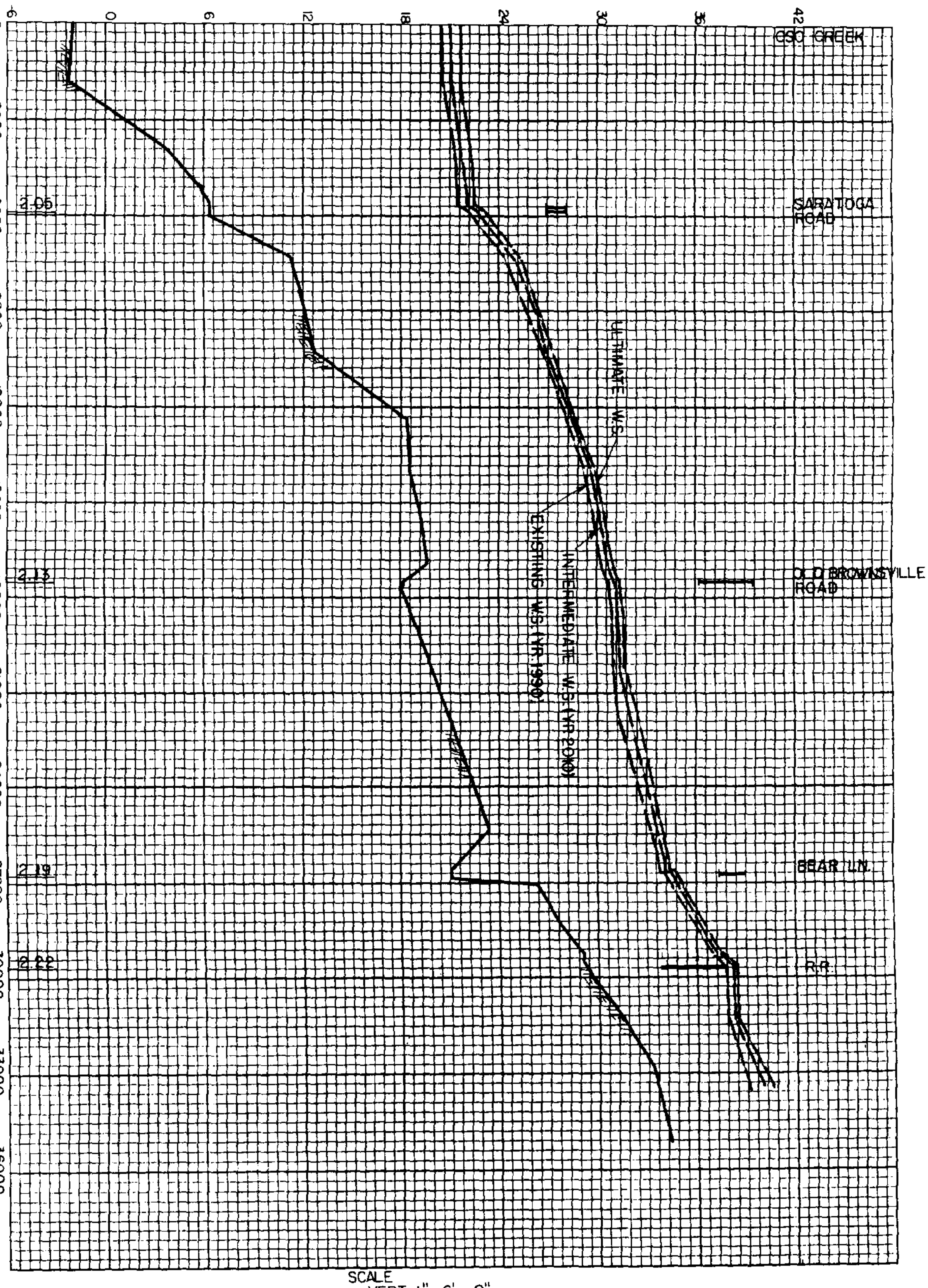
PEAK STORMWATER DISCHARGE FOR KELLY DITCH

LOCATION (TR-20 SECTION NO.)	DESIGN RAINFALL	DEVELOPMENT SCENARIO EXISTING (1990)	INTERMEDIATE (2010)	ULTIMATE
Confluence W/Oso Creek	(100 Yr.)	10,427	11,284	12,094
(Sec. 13)	(25 Yr.)	7,586	8,405	9,195
Saratoga Blvd.	(100 Yr.)	10,669	11,588	12,372
(Sec. 14)	(25 Yr.)	7,962	8,878	9,693
Old Brownsville Rd.	(100 Yr.)	6,698	7,610	7,924
(Sec. 16)	(25 Yr.)	4,935	5,828	6,113
Bear Lane	(100 Yr.)	401	583	703
(Sec. 17)	(25 Yr.)	280	413	508

TABLE 3-2

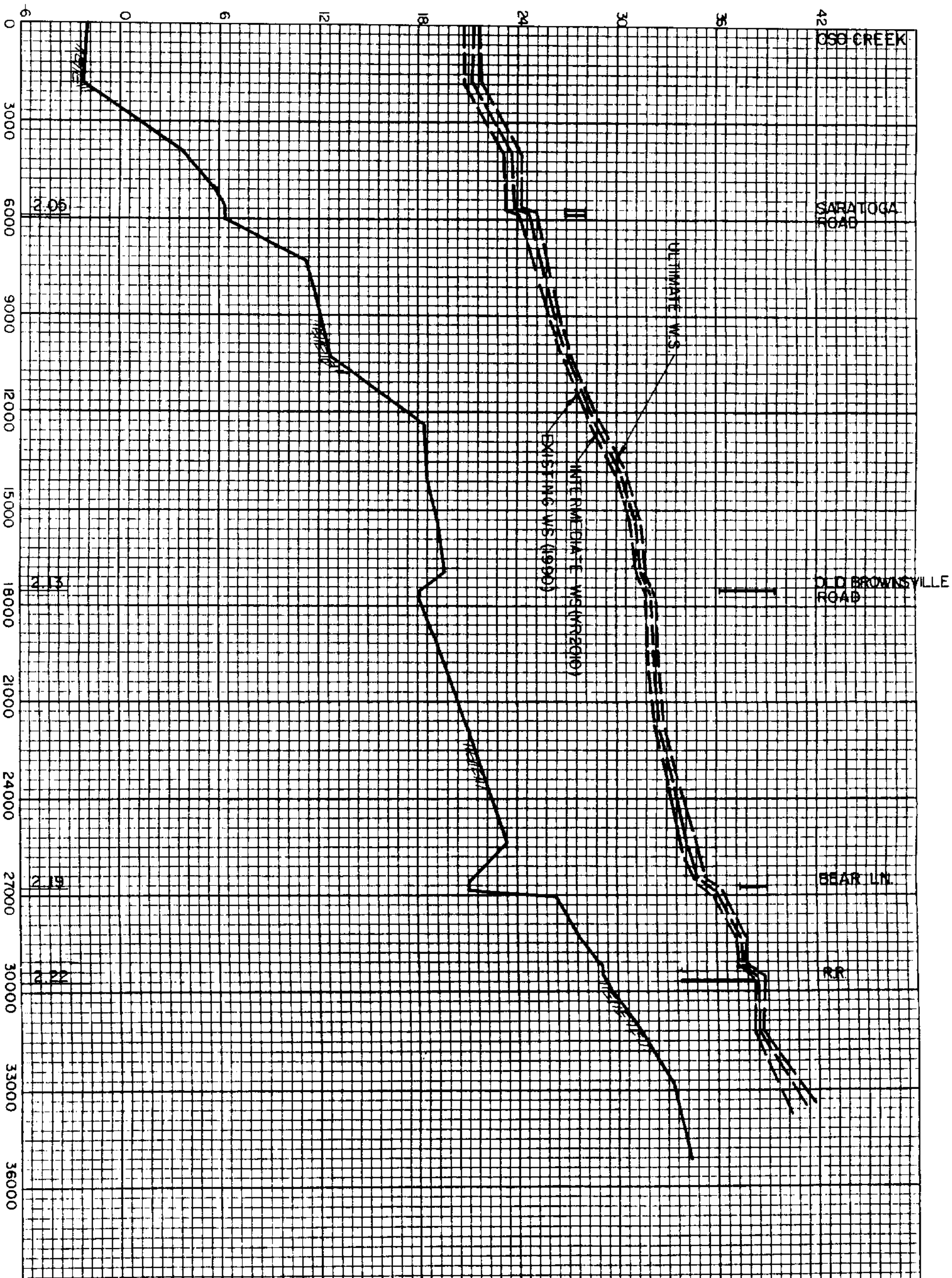
MAXIMUM WATER SURFACE ELEVATIONS FOR KELLY DITCH

LOCATION (HEC-II SECTION NO.)	FEMA	DEVELOPMENT SCENARIO EXISTING (1990)	INTERMEDIATE (2010)	ULTIMATE
Confluence W/Oso Creek (-1.22)	20.5	22.6	23.1	23.6
Saratoga Blvd. (2.05)	22.8	23.7	24.2	24.6
Old Brownsville Rd. (2.13)	29.2	31.6	31.9	32.0
Bear Lane (2.19)	32.4	34.7	35.0	35.1



SCALE
VERT. 1" = 6' - 0"
HORIZ. 1" = 3000'

FIG. 3.1	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	25 YEAR FLOOD PROFILE KELLY DITCH



SCALE
VERT. 1" = 6'-0"
HORIZ 1" = 3000'

FIG. 3-2	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE KELLY DITCH

4.0 CLARKWOOD DITCH

4.1 GENERAL

The Clarkwood Ditch is also a drainageway within the Oso Creek basin. This ditch serves the area of the Clarkwood community west of the Corpus Christi Airport, extending north to Leopard and west to McKenzie Road. The entire drainage area comprises 9 square miles. The drainageway is completely channelized its entire distance of 3.5 miles, beginning at Hwy. 44 and entering Oso Creek above Old Brownsville Road.

4.2 RUNOFF DETERMINATION

The Clarkwood Ditch sub-watershed is a portion of the Oso Creek basin. Therefore, the runoff flows were derived during the same TR-20 computer program runs described in Section 2.2 for Oso Creek. The results of these runoff determinations for the 25-year and 100-year design storms and for existing intermediate and ultimate development are shown on Table 4-1.

4.3 FLOOD LEVEL DETERMINATION

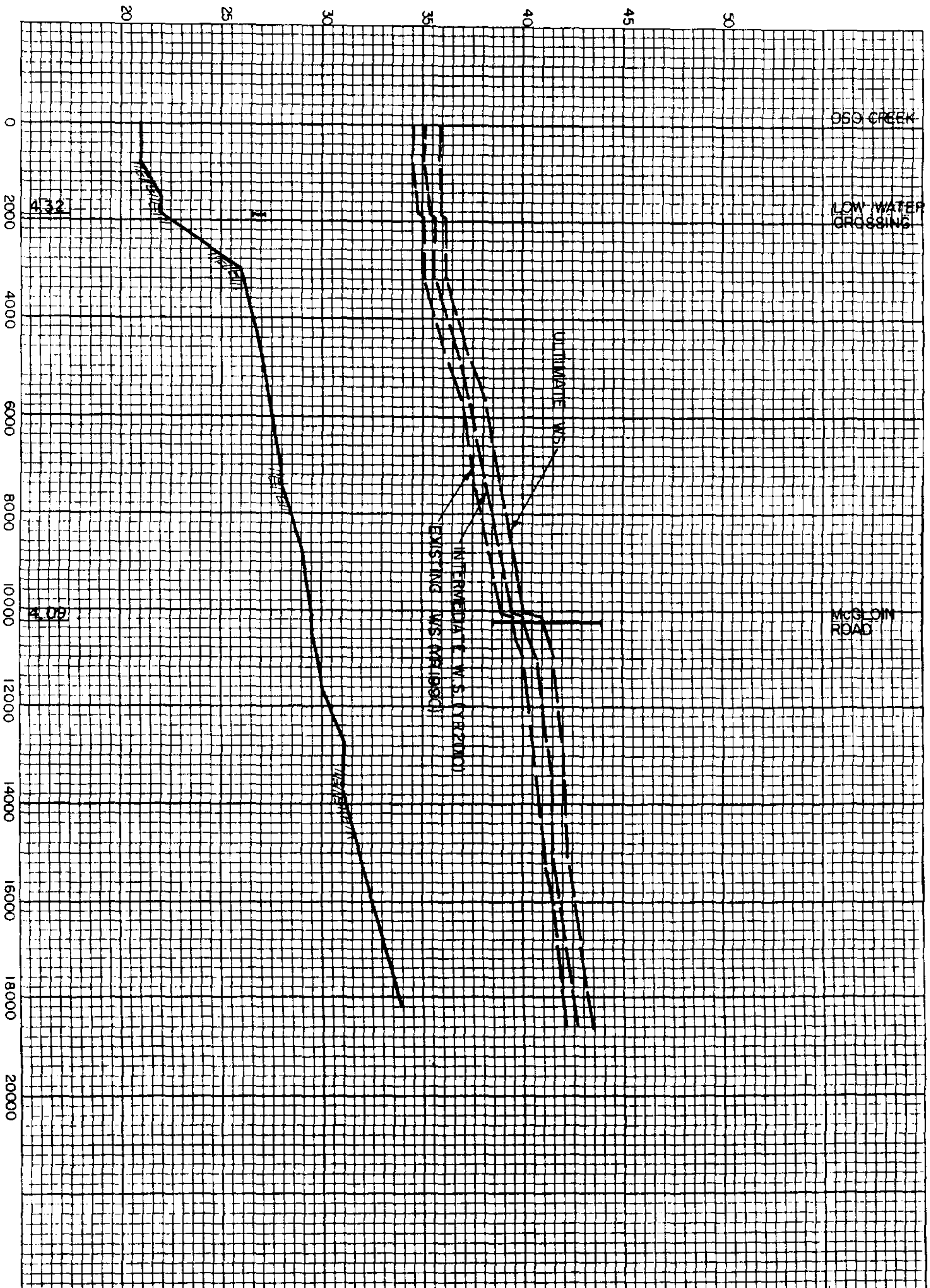
The Oso Creek HEC-II computer model incorporated Clarkwood Ditch as a tributary within its computations. Cross-sectional information was determined from the set of construction plans prepared by the Texas Department of Highways (TDH) (Ref. 8). Bridges were measured for verification before input. Flood level results are presented as six profiles on Figure 4-1 and Figure 4-2. These elevations at selected points are shown on Table 4-2, and compared to THD design elevations.

The current water surface elevations compare closely with the THD design elevations.

TABLE 4-2

MAXIMUM WATER SURFACE ELEVATIONS
FOR CLARKWOOD DITCH

		DEVELOPMENT SCENARIO		
LOCATION (HEC-II SECTION NO.)	THD PLAN	EXISTING (1990)	INTERMEDIATE (2010)	ULTIMATE
Confluence W/Oso Creek (-1.36)	34.0	36.7	37.0	37.3
McGloin Rd. (4.093)	43.5	41.8	42.5	43.6
Highway 44 (4.16)	46.0	44.2	44.7	45.4



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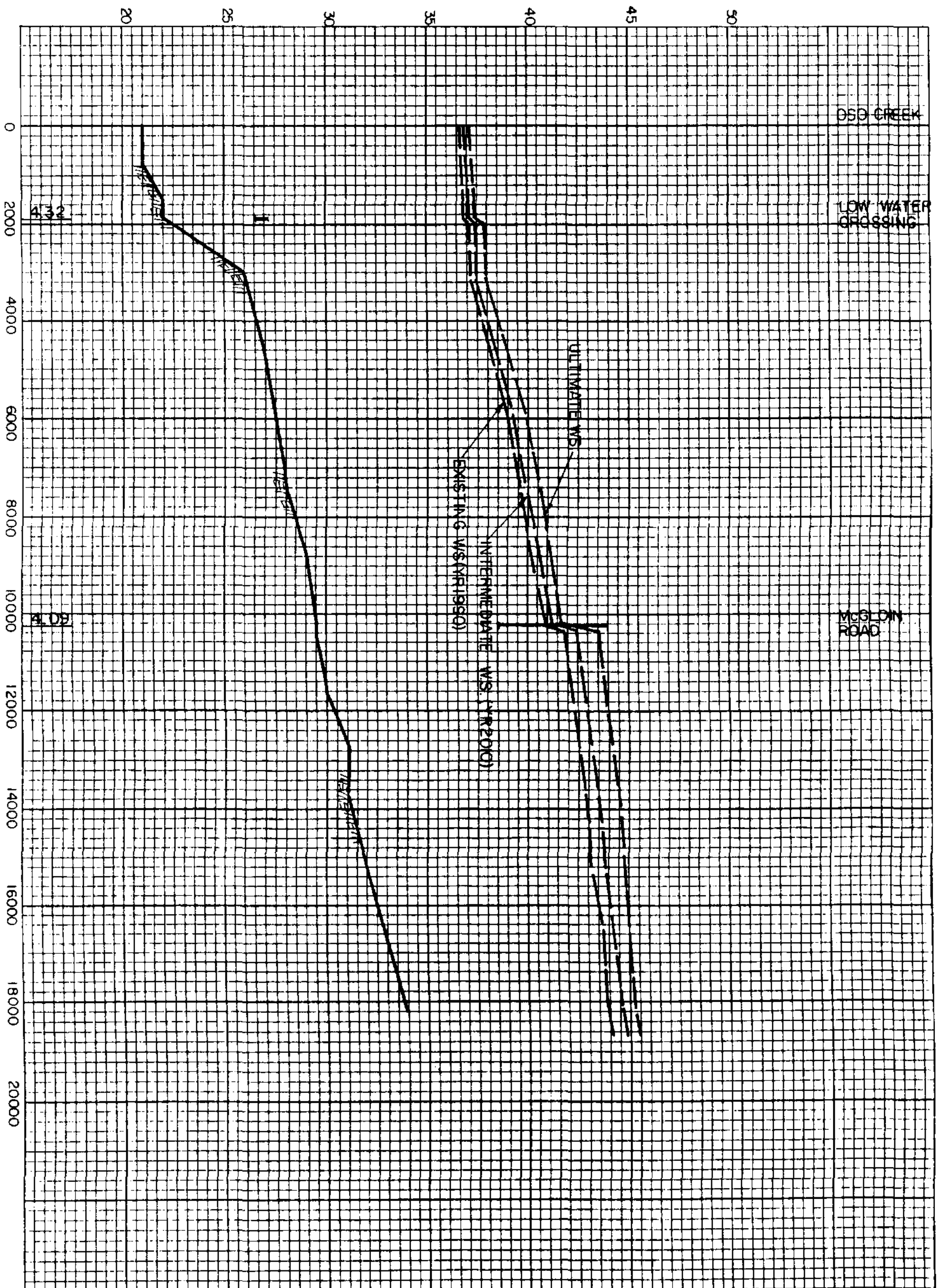
SCALE
VERT 1"=5'-0"
HORIZ. 1"= 2000'

FIG. 4.1	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	25 YEAR FLOOD PROFILE CLARKWOOD DITCH



SCALE
VERT. 1"= 5'-0"
HORIZ.1"= 2000'

FIG 4-2

STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

100 YEAR FLOOD PROFILE

CLARKWOOD DITCH

5.0 SALT FLATS DRAINAGEWAY

5.1 GENERAL

The north side of Corpus Christi is mostly served by the Salt Flats Drainageway which begins near Agnes Street and Old Brownsville Road, extends down Port Street, Lipan Street, across Leopard Street, under the SH 37 and Crosstown Expressway interchange, and runs by open channel across the Port Harbor area before outfalling into the Inner Harbor. The drainageway serves a basin of 2.2 square miles and extends approximately three miles in length (see Figure 1-1). The drainage structures consist of a combination of open channels, multiple box culverts and parallel storm sewer pipes.

5.2 RUNOFF DETERMINATION

The "Rational" formula was utilized for determining runoff for this drainage basin due to its size. Texas Highway Department formulas were used for determining rainfall intensity with respect to time of concentration and containing specific constants for Nueces County. Runoff was determined for 5-year, 10- year, 25-year and 100-year frequency rainfall. The ADP for this area indicate almost complete development at existing population. Therefore, ultimate development runoff coincides with current runoff at an estimated 50% imperviousness according to methods described in Section 2.2.1. Table 5-1 includes the design runoff for storm frequencies from the 5-year storm through the 100-year storm rainfall.

5.3 FLOOD LEVEL DETERMINATION

The HEC-II computer program was used to develop the hydraulic profile from the Inner Harbor up to IH 37 where the drainageway becomes enclosed. From this point onward, it was more appropriate to calculate the hydraulic grade using a tabular method of calculating the frictional headloss through each section of closed conduit along with entrance, exit and other minor losses relative to the velocity head of the discharge. The resultant hydraulic grade elevations were compared to the ground elevations to determine the capacity of the system. Figure 5-1 illustrates the hydraulic profile of this system without additional improvements. Table 5-2 is a tabular list of the flowlines, hydraulic grade elevations, and controlling ground elevations for the system.

The hydraulic grade line for this partially closed system is hypothetical since at various locations when the h.g. exceeds the controlling ground elevation, stormwater will either pond or flow overland, bypassing drainage structures and disrupting the designed drainage pattern.

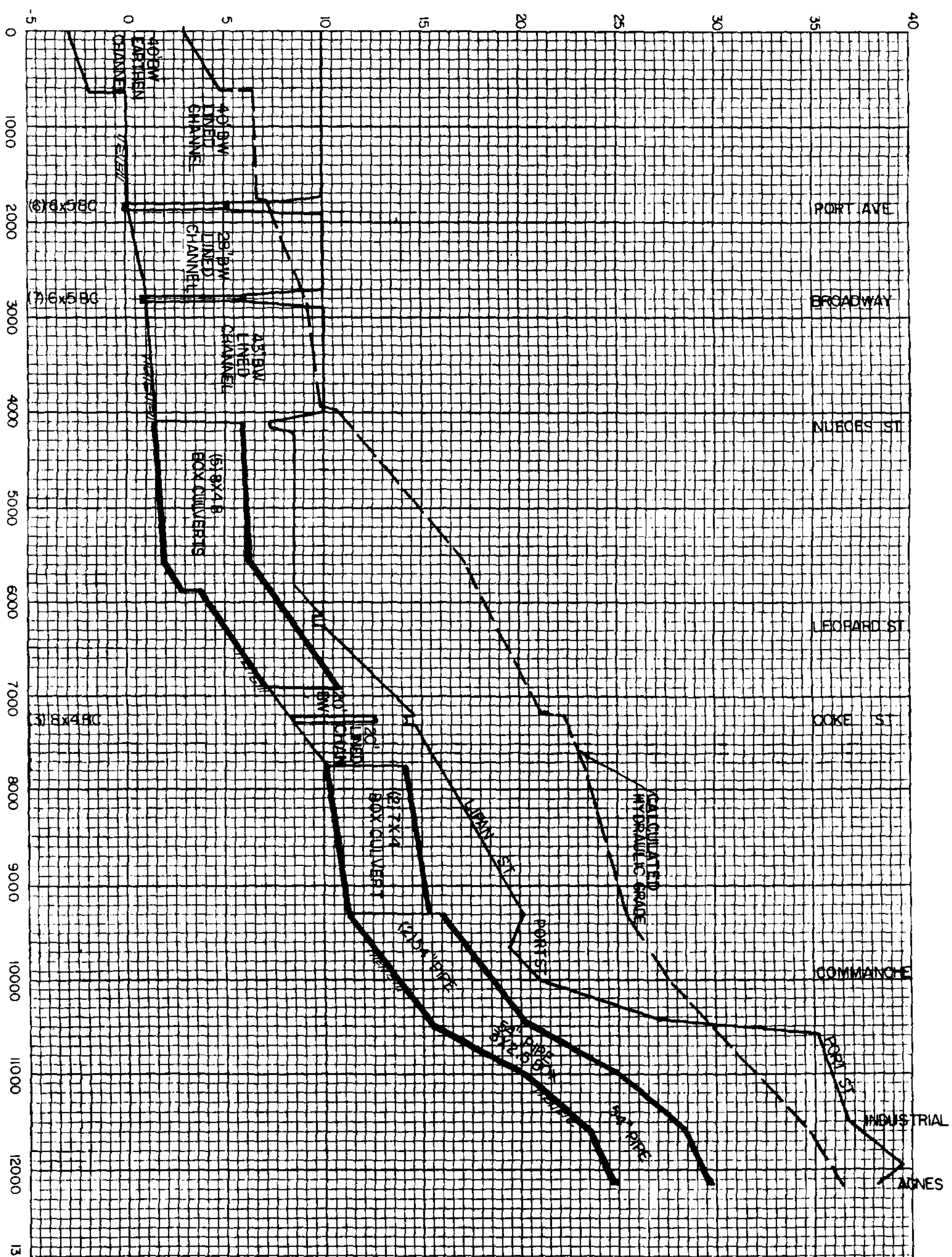
Segments of the system where the velocity is greatest are also subject to the greatest headlosses and are, thus, the areas indicated for improvement.

TABLE 5-2

SALT FLATS DRAINAGEWAY

HYDRAULIC PROFILE COMPUTATIONS

Node	Location	Type of Structure	Length	'n'	Q(5)	velocity	headloss(k)	headloss(f)	H.G.	Ground Elev
1	Inner Harbor	Outfall	-	-	1630	-	-	-	3.00	10.0
2	Port District	40' unlined ditch	640	0.035	1628	-	-	-	4.98/6.39	10.0
3	Nueces St	40' lined channel	3337	0.020	1600	-	-	-	11.23	10.0
4	Interstate 37	(5)8x4 b.c.	1532	0.012	1421	8.88	0.61	5.37	17.21	10.0
5	Crosstown Interchange	(5)8x4 b.c.	295	0.012	1233	7.71	0.00	0.78	17.99	10.0
6	Leopard St.	(4)8x3.25 & (2)8x4 b.c.	995	0.012	1138	6.77	0.00	2.29	20.28	13.2
7	Downstream of Coke St.	20' lined channel	300	0.012	1078	8.62	0.58	0.26	21.11	14.6
8	Coke St. Culvert	(3)8x4 b.c.	60	0.012	1076	11.21	0.98	0.13	22.22	14.6
9	Coke St. to Lipan	20' lined channel	520	0.012	1075	8.60	0.57	0.44	23.24	16.0
10	Lipan & Port Ave.	(2)7x4 b.c.	1550	0.012	275	4.91	0.19	1.77	25.20	20.0
11	Port Ave.	5x3 b.c. & 54" pipe	37	0.012	252	8.16	0.21	0.15	25.56	19.6
12	Port @ Commanche	(2) 54" pipe	630	0.012	212	6.67	0.41	1.56	27.53	19.2
13	Port Ave.	3x2.5 b.c. & 54" pipe	525	0.012	166	7.09	0.39	1.89	29.81	32.0
14	Port Ave.	42" pipe & 54" pipe	155	0.012	153	6.00	0.11	0.36	30.28	35.0
15	Port Ave.	15" pipe & 54" pipe	300	0.012	144	8.42	0.33	1.49	32.09	35.5
16	Port @ Industrial	15" pipe & 54" pipe	400	0.012	130	7.60	0.36	1.61	34.07	36.3
17	Port Ave.	54" pipe	200	0.012	118	7.42	0.17	0.61	34.85	36.6
18	Port @ Agnes	54" pipe	600	0.012	104	6.54	0.00	1.43	36.28	37.8



SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 1000'

FIG. 5.1

STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

5 YEAR FLOOD PROFILE

SALTFLATS DRAINAGEWAY

Task 2.II.C&D

6.0 NUECES RIVER

6.1 GENERAL

The Nueces River within Nueces County consists of a major river channel with an extremely wide flood plain extending into San Patricio County. At the Calallen Dam, the drainage area consists of 16,920 square miles. The Nueces River is greatly regulated by large reservoir dams within its drainage basin which control releases. The FEMA 100 year flood plain study has thoroughly documented the flood levels and flood plain for the Nueces River which were followed in preparing the following model.

6.2 RUNOFF DETERMINATION

Design discharges for the Nueces River were developed by FEMA using the USGS Regional Curves for Estimating the Magnitude and Frequency of Floods in Texas (Ref. 9). Since development within this large size of watershed will never likely occur to the point where it would affect peak discharges, the USGS method is considered appropriate for estimating ultimate discharge. FEMA also considers the peak discharge as occurring when all reservoirs are full, thus passing through all inflow. This probability makes the predicted 100-year discharge an extreme event. The peak discharge of 115,200 cfs was used for the 100-year frequency event, consistent with FEMA's study. The 25-year design frequency rainfall was developed from interpolation of FEMA values as detailed in TP40 (Ref. 3) and was determined to be 83,980 cfs.

6.3 FLOOD LEVEL DETERMINATION

The HEC-II model of the Nueces River was constructed based upon FEMA information for the river and expanding upon the portion prepared for the 1988 Master Plan (Ref. 6). Since no significant improvement can be accomplished within the Nueces River flood plain which would improve the flood level of the river, the model was established to compare closely with the FEMA model. Figure 6-1 contains the hydraulic profile of the Nueces River.

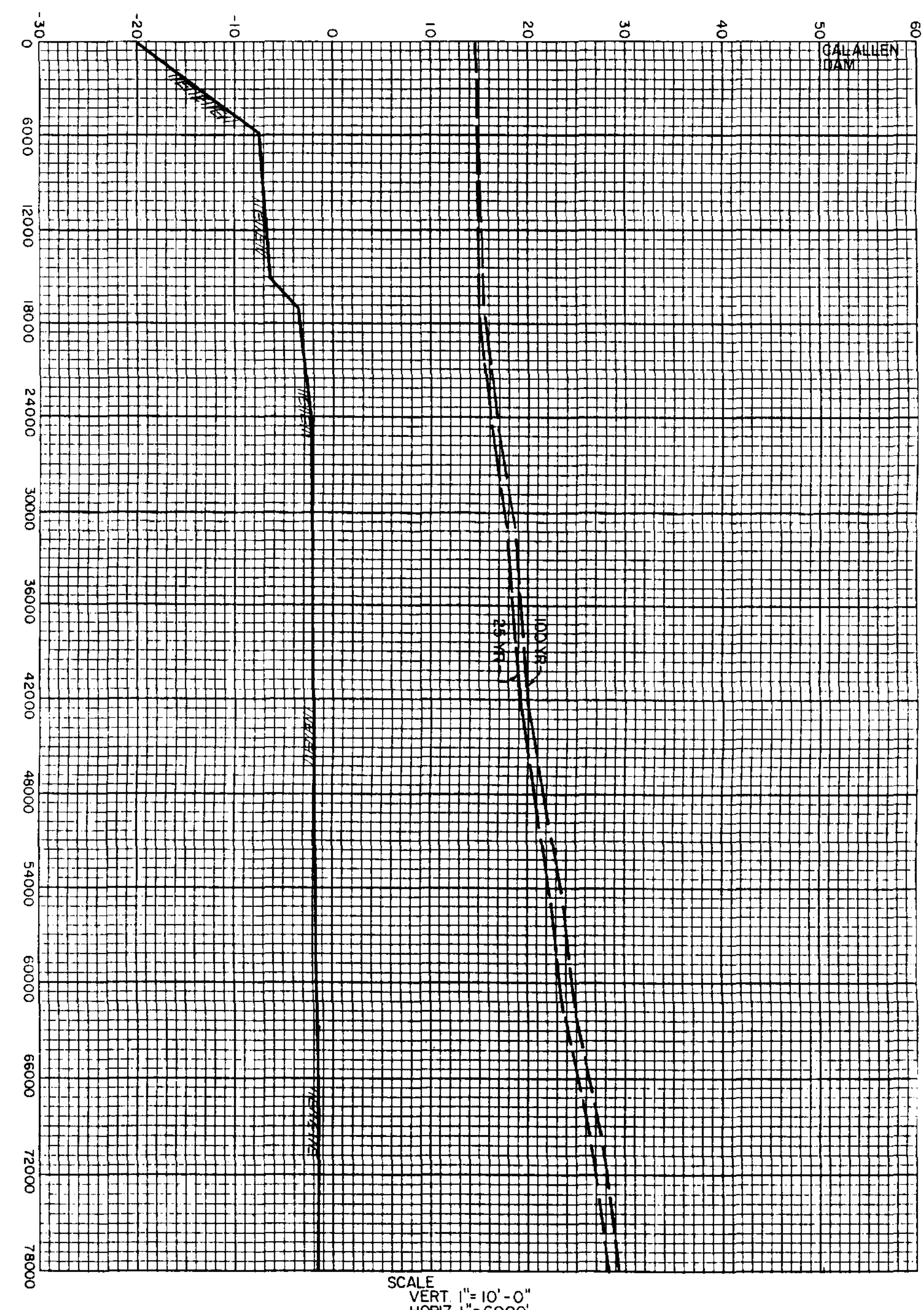
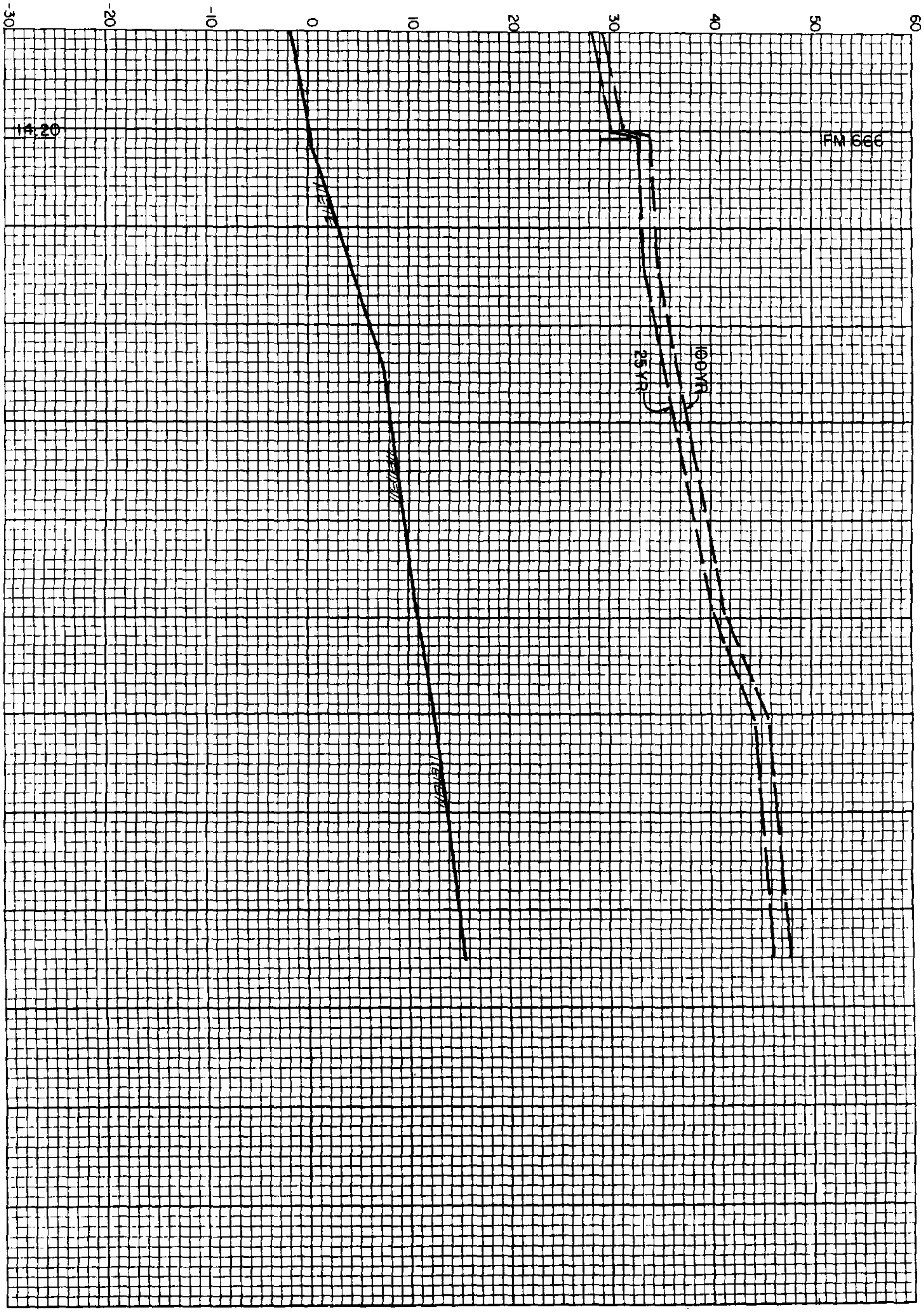


FIG. 6-1(A)

STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

25YR & 100YR FLOOD PROFILES

NUECES RIVER
DOWNSTREAM REACH



SCALE
VERT. 1" = 10'-0"
HORIZ. 1" = 6000'

FIG. 6-1(B)	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	25YR & 100YR FLOOD PROFILES NUECES RIVER UPSTREAM REACH

7.0 DRAINAGE PROBLEM AREAS

7.1 PRIORITY CRITERIA

A priority list of drainage problem areas has been developed based upon the hydraulic profiles determined by this task. The extent of a drainage problem can be measured by the following criteria:

1. Frequency of Occurrence - such as the frequency which a bridge or road will be closed to traffic in a given period of time due to high water, or the frequency which a certain creek will overflow its banks. Length of the occurrence is important on major transportation routes.

2. Damage to Property or Structures - such as flood plain flooding which innundates homes or businesses; and flooding effects which threaten the structural integrity of bridges or levees.

3. Impact on Large Areas Upstream Due to Local Restrictions - such as a bridge which is not submerged itself, but does restrict the stream-flow and cause a resultant backwater effect far upstream.

The flood plains of Oso Creek and Nueces River are regulated by FEMA and, thus, new developments have avoided building in problem areas of the flood plain. All housing and critical structures such as lift stations, public buildings, telephone switch-gear installations are constructed above the 100 year flood plain elevations. Roadways and parks though are often below these elevations along the creeks. The shallow water flooding of streets, parks and yards during 100 year design floods has been acceptable due to the general widespread street flooding, sometimes purely from backwater effects downstream. This type of flooding is not associated with high velocities which can erode earthwork and cause structural failures. This study confirmed the FEMA flood plain areas and has not discovered any area of housing where innundation is a problem. The problem of damage to housing structures is

7.2.3 Channel from Section 1.54 at Violet Road to Section 1.60 at Hwy 77 in Robstown, a distance of 16,280 ft. - High Priority. Channel widening recommended in conjunction with lower channel improvements in order to lower hydraulic grade in Robstown up to 2 ft. from existing 100 year storm and to eliminate increase in water surface due to ultimate development conditions.

7.2.4 Stream Channel from Section 1.43 at Clarkwood Road to Section 1.49 at Highway 44, a distance of 28,877 ft. - Future Priority. Improvements recommended for ultimate development of area. Lack of defined channel creates broad flood plain which will increase with area development.

7.2.5 Staples Street Bridge - Low Priority. Bridge is submerged by backwater from hurricane tides due to low bridge deck elevation. When hurricane tides are not present in Oso Bay, bridge is submerged during existing 100 year storm and 25 or 100 year future storms. Velocity is low at 3.5 fps. Minor (0.15 ft.) restriction to stream flow.

Design Flow	Submergence
Existing 25	-
Existing 100	1.42 ft.
Intermediate 25	0.10 ft.
Intermediate 100	1.90 ft.
Ultimate 25	0.61 ft.
Ultimate 100	2.50 ft.

7.2.6 Weber Road Bridge - Low Priority. Road approach is submerged during all design storms. Bridge deck is submerged during all 100 year scenarios. Velocity is moderate at 4.5 fps. Minor restrictions to stream flow of 0.10 ft.

Design Flow	Submergence
Existing 25	0.79 ft.
Existing 100	2.87 ft.
Intermediate 25	1.15 ft.
Intermediate 100	3.25 ft.
Ultimate 25	1.63 ft.
Ultimate 100	3.71 ft.

7.2.7 Chapman Ranch Road - Low Priority. Bridge is submerged during all design storms. Velocity is moderate at 4.0 fps. Minor restriction to stream flow of 0.35 ft.

Design Flow	Submergence
Existing 25	2.06 ft.
Existing 100	4.59 ft.
Intermediate 25	2.69 ft.
Intermediate 100	5.20 ft.
Ultimate 25	3.39 ft.
Ultimate 100	5.77 ft.

7.2.8 FM 763 - Low Priority. Bridge submerged during all design storms due to downstream backwater effect in clogged channel. Channel cleaning would be required for at least two miles downstream to remove bridge from flooding. Velocity is low at 3.0 fps.

Design Flow	Submergence
Existing 25	0.43 ft.
Existing 100	2.93 ft.
Intermediate 25	1.10 ft.
Intermediate 100	3.49 ft.
Ultimate 25	1.84 ft.
Ultimate 100	4.02 ft.

7.2.9 Entire channel will be impacted by increased flows due to urbanization of the watershed. Lower reaches cannot be significantly improved or channelized due to restrictions on activities within wetland jurisdictional areas. Total anticipated increase in flood levels for ultimate 100 year storm range from 0.8 ft. to 1.2 ft., which is near the maximum of 1.0 ft. allowed by FEMA due to flood plain encroachment. Policy decisions to limit post development drainage to predevelopment quantities or diversion of portions of the watershed are considerations.

7.3 KELLY DITCH

7.3.1 Channel Improvements - Low Priority. Ultimate 100 year approaches bank elevations in upstream sections.

7.3.2 Railroad Spur - Low Priority. Rails are submerged due to small culverts for all scenarious except the existing 25 year storm. Restrictions does cause breakwater upstream for 500 ft.

7.3.3 All highway bridges are above the flood levels in all scenarios so no improvements are recommended.

7.4 CLARKWOOD DITCH

7.4.1 Channel Improvements - Low Priority. Intermediate and Ultimate 100 year approaches bank elevation.

7.4.2 All bridges are above the flood levels in all scenarios. No improvements recommended.

7.5 SALT FLATS DRAINAGEWAY

7.5.1 Multiple Box Culverts from Interstate 37 to Leopard - High Priority. Excessive headloss and low ground elevation creates ponding at Leopard Street intersection 5-year storm.

7.5.2 Multiple Box Culverts Crossing Coke Street Between Lined Channels - High Priority. High velocity creates excessive entrance and exit losses.

7.5.3 Channels From Harbor Outfall to Interstate 37 - Moderate Priority. - Flat grades allow overtopping of roads in the partially undeveloped warehouse area behind the Port.

7.6 NUECES RIVER

7.6.1 Natural channel and wide flood plain contain the design flows within existing FEMA floodways.

7.6.2 FM 666 Bridges - Low Priority. Multiple openings handle lower flows, but are quickly exceeded by design flows and roads become submerged due to low points in road elevations.

8.0 CONCLUSION

The Hydraulic Modeling accomplished in this task establishes several beneficial products which will become elements of the Stormwater Master Plan. First, comprehensive computer models are now available which depict the existing drainage systems selected and which can be used in the future for evaluating improvements within these systems.

Second, the models have established current hydraulic gradients to be expected during design storms which should govern the design of future drainageways connecting into the major systems.

Third, the models have predicted future levels of flood waters due to continuing land development within the watershed. This information led to the determination of flood problem areas and recommendations as to improvements required to maintain allowable flood levels in Tasks 2.II.(E & F).

9.0 REFERENCES

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2. Soil Conservation Service, Soil Survey of Nueces County, Texas, U.S. Department of Agriculture, in cooperation with Texas Agriculture Experiment Station, June 1965.

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4. Oso Creek Stream Gauge Records #08211.520 of August 10, 1980 Event, Supplied by USGS.

5. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study for Nueces County, Texas, 1985.

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APPENDIX A

APPENDIX A

OSO CREEK DRAINAGE BASIN AREA DEVELOPMENT PLAN (ADP) RUNOFF COEFFICIENT TABULATIONS

AREA DEVELOPEMENT PLAN: BLUNTZER
ACREAGE: 33686

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	857	944	1031	1206	21382
COMMERCIAL	84%	90	26	28	31	36	1856
INDUSTRIAL	65%	86	111	111	111	111	111
AGRICULT/GROOMED OPEN SPACE	8%	72	16589	16543	16498	16406	8786
UNDEVELOPED/RAW OPEN SPACE	1%	68	16103	16060	16015	15927	1551
RUNOFF IMPERVIOUSNESS:			6%	6%	6%	6%	29%
SCS COMPOSITE CURVE #			70	70	70	71	79

AREA DEVELOPEMENT PLAN: BLUNTZER-A
ACREAGE: 5959

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	152	156	160	168	3724
COMMERCIAL	84%	90	4	4	4	4	323
INDUSTRIAL	65%	86	20	21	21	22	111
AGRICULT/GROOMED OPEN SPACE	8%	72	2158	2156	2154	2150	1531
UNDEVELOPED/RAW OPEN SPACE	1%	68	3625	3622	3620	3615	270
RUNOFF IMPERVIOUSNESS:			5%	5%	5%	5%	29%
SCS COMPOSITE CURVE #			70	70	70	70	79

AREA DEVELOPEMENT PLAN: LONDON
ACREAGE: 11579

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	109	223	336	346	7374
COMMERCIAL	84%	90	10	20	31	32	640
INDUSTRIAL	65%	86	10	0	0	0	0
AGRICULT/GROOMED OPEN SPACE	8%	72	11450	11336	11212	11201	3030
UNDEVELOPED/RAW OPEN SPACE	1%	68	0	0	0	0	535
RUNOFF IMPERVIOUSNESS:			8%	9%	9%	9%	28%
SCS COMPOSITE CURVE #			72	72	72	72	79

AREA DEVELOPEMENT PLAN: LONDON-A
ACREAGE: 34776

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	327	312	298	270	22147
COMMERCIAL	84%	90	30	29	27	25	1922
INDUSTRIAL	65%	86	30	0	0	0	0
AGRICULT/GROOMED OPEN SPACE	8%	72	24652	24685	24696	24718	9101
UNDEVELOPED/RAW OPEN SPACE	1%	68	9737	9750	9755	9763	1606
RUNOFF IMPERVIOUSNESS:			6%	6%	6%	6%	28%
SCS COMPOSITE CURVE #			71	71	71	71	79

AREA DEVELOPEMENT PLAN: NORTHWEST *** EXISTING & ULTIMATE FIGURES ARE FINAL/ OTHERS ARE PRELIMIN
ACREAGE: 21209

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	3016	3500	3600	3700	12137
COMMERCIAL	84%	90	252	352	452	552	1234
INDUSTRIAL	65%	86	40	50	60	70	2373
AGRICULT/GROOMED OPEN SPACE	8%	72	10021	9500	9400	9250	4645
UNDEVELOPED/RAW OPEN SPACE	1%	68	7880	7807	7697	7637	820
RUNOFF IMPERVIOUSNESS:			10%	11%	12%	12%	33%
SCS COMPOSITE CURVE #			72	73	73	73	80

AREA DEVELOPEMENT PLAN: PORT/AIRPORT/VIOLET
ACREAGE: 52995

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	1157	13532	13532	13532	13532
COMMERCIAL	84%	90	63	1764	1987	2433	4756
INDUSTRIAL	65%	86	3987	15977	15977	15977	15977
AGRICULT/GROOMED OPEN SPACE	8%	72	35551	16160	15994	15662	15921
UNDEVELOPED/RAW OPEN SPACE	1%	68	12237	5562	5505	5391	2810
RUNOFF IMPERVIOUSNESS:			11%	34%	34%	35%	38%
SCS COMPOSITE CURVE #			72	79	79	79	80

AREA DEVELOPEMENT PLAN: ROBSTOWN
ACREAGE: 5208

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	450	436	422	394	503
COMMERCIAL	84%	90	85	82	79	74	85
INDUSTRIAL	65%	86	53	51	50	46	4567
AGRICULT/GROOMED OPEN SPACE	8%	72	4620	4639	4657	4694	45
UNDEVELOPED/RAW OPEN SPACE	1%	68	0	0	0	0	8
RUNOFF IMPERVIOUSNESS:			12%	12%	12%	12%	62%
SCS COMPOSITE CURVE #			73	73	73	73	86

AREA DEVELOPEMENT PLAN: SOUTHSIDE
ACREAGE: 20410

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	6658	7685	8712	10767	13469
COMMERCIAL	84%	90	775	896	1014	1253	2511
INDUSTRIAL	65%	86	79	91	103	128	779
AGRICULT/GROOMED OPEN SPACE	8%	72	6117	5567	5017	3918	3103
UNDEVELOPED/RAW OPEN SPACE	1%	68	6781	6171	5564	4344	548
RUNOFF IMPERVIOUSNESS:			17%	19%	21%	25%	36%
SCS COMPOSITE CURVE #			75	75	76	78	81

AREA DEVELOPEMENT PLAN: WESTSIDE
ACREAGE: 16394

MEDIUM GROWTH SCENARIO

LAND USE	% IMPERVIOUS	SCS CURVE NUMBER	1990	1995	2000	2010	ULTIMATE
RESIDENTIAL	34%	82	5115	4884	4653	4191	8682
COMMERCIAL	84%	90	927	885	843	760	2295
INDUSTRIAL	65%	86	1738	1660	1581	1424	4269
AGRICULT/GROOMED OPEN SPACE	8%	72	3370	3507	3645	3920	976
UNDEVELOPED/RAW OPEN SPACE	1%	68	5244	5458	5672	6099	172
RUNOFF IMPERVIOUSNESS:			24%	23%	22%	21%	47%
SCS COMPOSITE CURVE #			76	76	76	75	83

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1.0 INTRODUCTION

1.1 BACKGROUND

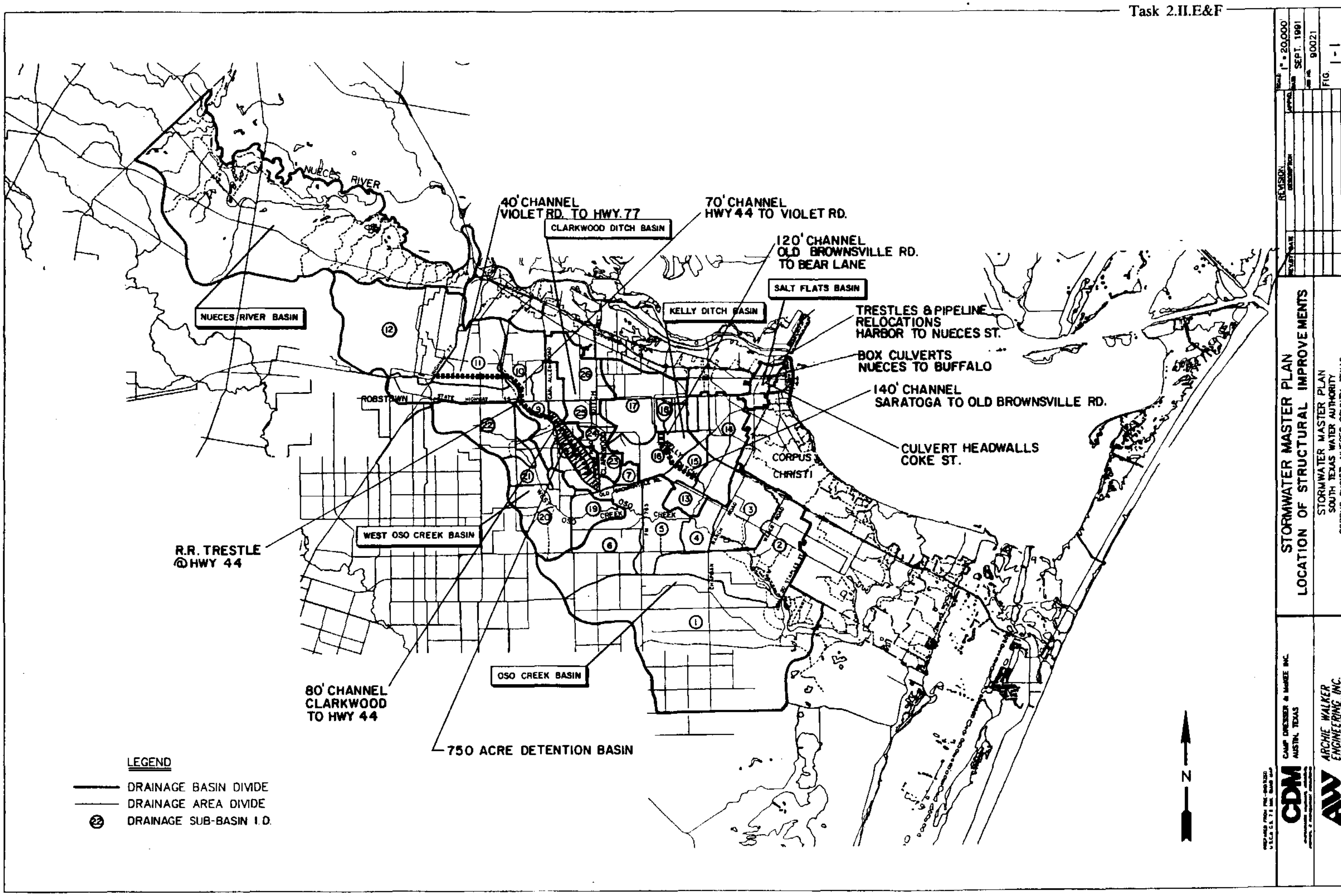
In Tasks 2.II.C&D, hydrologic and hydraulic modeling was conducted on several major conveyances and drainageways in the study area including Oso Creek, Kelly Ditch, Clarkwood Ditch, Salt Flats Drainageway and the Nueces River. Existing and future drainage conditions were evaluated for 25-year and 100-year rainfall events. Based on this evaluation, drainage problem areas were identified along each of the studied drainageways. This document addresses the necessary improvements required to alleviate the identified drainage problems and flood related concerns along these drainageways (see Figure 1-1). Flooding and local drainage problems associated with interior neighborhood drainage systems were not included in the scope of this evaluation.

1.2 LEVEL OF PROTECTION

To facilitate the evaluation of drainage improvement alternatives for varying levels of flood protection, the desired "level of protection" (LOP) against flooding must be defined. In the establishment of a standard LOP or "performance" standard for the design of drainage facilities, the traditional approach has been to associate the desired LOP to a particular frequency of acceptable flooding (e.g., the 25-year rainfall event). For a given flood frequency, the LOP may be further refined to address the allowable depth and/or duration of flooding that would be acceptable for a given roadway, structure or site. Additionally, a designated LOP may contain applicable water quality control requirements. For the purpose of evaluating alternative drainage improvements, water quality control criteria are not addressed in this task (see Task 2.II.B).

The determination of a design level for flood protection is a policy decision which includes several factors which go beyond a conventional cost analysis. The damage caused by floodwaters and the frequency of flooding are weighed against the cost of implementing a greater level of design. Yet other risks and factors (being isolated from

Task 2.II.E&F


NUECES RIVER
40' CHANNEL
VIOLET RD. TO HWY. 77
CLARKWOOD DITCH BASIN
70' CHANNEL
HWY 44 TO VIOLET RD.
120' CHANNEL
OLD BROWNSVILLE RD.
TO BEAR LANE
SALT FLATS BASIN
KELLY DITCH BASIN
TRESTLES & PIPELINE
RELOCATIONS
HARBOR TO NUECES ST.
BOX CULVERTS
NUECES TO BUFFALO
140' CHANNEL
SARATOGA TO OLD BROWNSVILLE RD.
CULVERT HEADWALLS
COKE ST.
NUECES RIVER BASIN
ROBSTOWN
CORPUS
CHRISTI
R.R. TRESTLE
@ HWY 44
WEST OSO CREEK BASIN
OSO CREEK BASIN
80' CHANNEL
CLARKWOOD
TO HWY 44
750 ACRE DETENTION BASIN
LEGEND
DRAINAGE BASIN DIVIDE
DRAINAGE AREA DIVIDE
DRAINAGE SUB-BASIN I.D.
N
STORMWATER MASTER PLAN
LOCATION OF STRUCTURAL IMPROVEMENTS
STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CORPUS CHRISTI, NUECES COUNTY, TEXAS
1" = 20,000'
SEPT. 1991
90021
FIG. I-I
CDM
CAMP DRESSER & McKEE INC.
AUSTIN, TEXAS
ARCHIE WALKER
ENGINEERING, INC.

emergency services, public acceptance) are considered as well. Community participation in the determination of the acceptable LOP is demonstrated by: 1) public approval or disapproval of drainage bond issues; 2) notification of City or County officials of complaints as to poor drainage; and 3) electing public officials sympathetic to their needs and desires.

The current policy of the City of Corpus Christi requires a 5-year rainfall event design on lateral systems with a 25-year rainfall event design on major ditches. The County policy of a minimum 25-year rainfall event design throughout the system provides additional flood protection, but the economics of developing under this policy have not been tested since adoption in 1988 due to minimal development activities in the County. For the cost alternative presented herein, the above criteria were applied.

1.3 PRE-POST POLICY

Limiting post-development peak runoff rates to the levels of pre-development runoff is considered a "pre-post" policy. The effect of urbanization on flood levels is essentially eliminated thereby minimizing the need for major channel or structural improvements. Post development runoff controls include individual on-site stormwater detention ponds or larger regional sites designed to accomplish the same level of reduction in peak discharges.

1.4 FLOODPLAIN BUILDING RESTRICTIONS

It is important for the City and County to continue to enforce FEMA regulations on floodplain building restrictions as referenced in Task 2.11.B. However, the FEMA regulations do allow building encroachment into floodplain areas which can increase the 100 year water surface elevation up to 1 foot, which could possibly cause additional structural flooding. Also, the maintenance of channel and overbank areas of the floodplain will limit property losses due to flooding which exceed the design capacity of structural controls.

1.5 REGIONAL DETENTION

Regional stormwater detention facilities provide a method to reduce downstream peak flows by detaining or "storing" stormwater runoff from upstream and releasing it at a lower controlled rate over a longer period of time. Areas which can be used to locate detention facilities are generally situated along tributaries to the main conveyance or adjacent to the main conveyance. Some designs incorporate these detention areas of the basin to be used as parkland or nature preserves.

Siting of a detention facility requires several considerations. Commonly, sites are chosen in the upper half of the watershed in order to avoid requiring too much land area or excavation and to maximize the length of the stream to benefit from the facility.

The facility needs to be located upstream beyond the major extent of wetland jurisdiction of the Corps of Engineers. The detention structure will be located and sized in order to avoid raising the elevation of floodwaters upstream. Consideration should be given for deposition of excavated material, possible other shared uses of the area, and safety.

In the Oso Creek basin, a site was selected and analyzed for hydraulic effect and cost to determine the potential benefits of a regional stormwater detention facility. This analysis is described in detail in Section 2.4.2.

2.0 OSO CREEK

2.1 GENERAL

In Task 2.II.C&D, the hydraulic study of Oso Creek did not identify any areas of existing housing or commercial development which would sustain flood damage due to the 100-year flood. Shallow flooding would occur which would affect agricultural areas and flood streets and a few isolated uninhabited farm structures, but development to date has occurred primarily outside of the 100-year floodplain. Floodplain and building regulations are in place to protect private property from 100-year flooding under current conditions. Oso Creek has been studied by FEMA which established floodplain elevations and boundaries. These elevations are utilized by Nueces County and Corpus Christi in approving building permits within these areas. Where development has occurred within floodplain fringes, all structures are required to be constructed at or above the existing 100-year flood level. This does not assure that structures will not be subject to flooding as development progresses in the watershed with resultant increases in flood frequency and peak flow rates.

In the future, the effect of ultimate development on the peak flood levels of Oso Creek will be to increase the flood level 0.5 ft. to 1.5 ft. if no improvements are made. To date, current development along floodplain fringes has no noticeable effect on peak flood levels. Development activities have favored higher-ground sites due to 1) the maintenance of floodway zones clear of any development/encroachment, 2) the restriction on any fill activities in jurisdictional wetlands, and 3) the high cost of securing fill material. Several square miles along Oso Creek have experienced development including Kings Crossing, The Lakes, and the Corpus Christi Botanical Gardens. In the hydraulic model of Oso Creek, there is no apparent rise in the peak flood levels due to encroachment from these developments. But the effect of increased runoff due to ultimate development conditions will occur and should be planned for.

In the following recommendations for structural and nonstructural improvements, consideration was given to two basic solutions to flooding conditions as follows:

1) Phase I Projects - Local drainage problem areas where cost-effective conveyance improvements are possible; and

2) Phase II Projects - Methods to reduce the impact of ultimate development on the peak flood levels of Oso Creek on a watershed wide basis.

The recommended Phase I improvements to drainage problems on Oso Creek are intended to eliminate areas of restrictions where the improvements will be of greatest benefit to land areas in close proximity to the improvements. These benefits will occur by reducing the frequency that the tributary drainageways, which are designed to convey a 25-year storm, will be inundated or made nonfunctional by backwater effects from the receiving stream, Oso Creek.

Phase II alternatives improvements such as land use controls as well as drainage area diversions and regional detention facilities were considered as methods to reducing the impact of ultimate development on Oso Creek flood levels. The relative merits of each consideration are discussed within the following sections. Based upon the preliminary design of a selected regional stormwater detention facility, the beneficial effects from this alternative are modeled and detailed in Section 2.5. A detention facility is the only alternative other than land use controls which benefits the downstream estuarine reaches of Oso Creek where flood flows are greatest and channel improvement is prohibited due to wetland preservation regulations. Therefore, it is recommended that a regional stormwater detention facility be considered as the selected method to reduce the impact of ultimate development and reduce flood levels downstream. The final design of a regional detention facility should include extensive reviews and cost benefit analysis of differing configurations and sites to optimize cost effectiveness. The level of design effort required for final site determination is beyond the scope of this study, but the approximate benefits to be expected are established by the following evaluation.

2.2 STRUCTURAL IMPROVEMENTS

2.2.1 TEXAS-MEXICAN RAILROAD TRESTLE AT HIGHWAY 44

The expansion of the existing railroad trestle has become necessary due to increasing flows from new development and the negative impact upon upstream property due to backwater effects from this structure. Previous studies by the U.S. Corps of Engineers and Nueces County Stormwater Management Plan have recommended the improvement of this site. The Texas Department of Highways and Public Transportation has recently improved a bridge downstream, which results in the railroad trestle being the major impediment to flow in this area. The current trestle has an approximate bottom width of 25 ft. and an opening area of 802 square feet (sf). The bridge should be expanded to 80 ft. wide, consistent with the downstream bridge and a waterway opening of 1316 sf, in order to reduce the headloss through the bridge to an acceptable level from the current headloss of 2.16 ft. to 0.72 ft. This improvement will reduce the extent of the ultimate 100-year floodplain by approximately 294 acres between Highway 44 and the upper end of Oso Creek. Currently there are no developments within the existing floodplain. Maintenance is anticipated to be limited to the occasional removal of debris and sediment after major storms. Cost of these improvements are as follows:

<u>Texas-Mexican Railroad Trestle at Highway 44</u>

Demolition	$ 20,000
New Bridge	600,000
Engineering & Administration (25%)	155,000
Implementation Cost =	$775,000
Maintenance Cost =	$500/year

2.2.2 CHANNEL IMPROVEMENTS FROM HIGHWAY 44 (SECTION 1.50) UPSTREAM 6725 FT. TO VIOLET ROAD (SECTION 1.54)

Maintained by the Nueces County Drainage District No. 2 in Robstown, this existing channel should be widened along a 6,725 ft. length after the replacement of the Texas-Mexican Railroad trestle. The existing channel should be increased to a 70 ft. bottom width channel with 3:1 sideslopes. A channel invert slope of .075% is recommended. These improvements will reduce the design flood levels by approximately 2.5 ft. throughout the reach. Approximately 258 acres will be removed from the ultimate 100-year floodplain. Recommended maintenance includes draglining the channel once every five years. The maintenance cost is divided into a yearly cost for comparative purposes. The cost of these improvements are estimated as follows:

<u>Channel Widening from Highway 44</u>

Right-Of-Way (20 acres)	$ 70,000
Excavation (257,000 cubic yards)	514,000
Engineering & Administration (25%)	146,000
Implementation Cost =	$730,000
Maintenance Cost =	$ 10,000/year

2.2.3 CHANNEL IMPROVEMENTS FROM OSO CREEK BELOW VIOLET ROAD (SECTION 1.54) TO HIGHWAY 77 (SECTION 1.60)

This existing channel known as Ditch "A" is under the maintenance of Nueces County Drainage District No. 2 in Robstown. Widening 15,150 feet of the channel will reduce the level of the floodwaters at the upper end of the channel near Highway 77. A reduction in floodwater elevation at this point will increase the capacity of the entire drainage system through Robstown without further improvements. Flood profiles will be reduced overall 0.5 feet up to 3.0 feet near the bridges due to these improvements. Approximately 427 acres will be removed from the ultimate 100-year floodplain. The widening of the ditch will also require replacement of the two bridges crossing the present ditch at Violet Road and CR 1694. Anticipated maintenance includes draglining the channel once every five years. The cost of these improvements are estimated as follows:

40 Ft. Channel Widening from Below Violet Road to Highway 77

Right-of-Way	$ 63,000
Excavation (168,000 cy)	336,000
Bridge Replacement (2)	350,000
Engineering & Administration (25%)	187,250
Implementation Cost =	$936,250
Maintenance Cost =	$ 23,250/year

2.2.4 IMPROVEMENT OF STREAM CHANNEL FROM CLARKWOOD ROAD (SECTION 1.43) TO HIGHWAY 44 (SECTION 1.49)

The improvement of 26,800 feet of this shallow stream section is a future priority as the area develops. Improvements will reduce the flood profile elevations from 1.0 ft. to 2.5 ft. along this reach. Approximately 496 acres will be removed from the ultimate 100-year floodplain. The existing bridge at Carl Allen Road could be modified to fit the new channel. Maintenance of the dredged channel is estimated based upon major dragline work every 10 years and minor maintenance/mowing yearly. The cost of these improvements are estimated as follows:

Right-of-Way (132 acres)	$ 462,000
Excavation (683,000 cy)	1,366,000
Engineering & Administration (25%)	457,000
Implementation Cost =	$2,285,000
Maintenance Cost =	$ 37,500/year

If a regional stormwater detention facility is constructed as described in Section 2.5, channelization from Clarkwood Road to Carl Allen Road would not be necessary. The remaining channelization from Carl Allen Road (Section 1.46) to Highway 44 (Section 1.49), 9,600 ft. in length, would cost the following:

Right-of-Way (47 acres)	$165,000
Excavation (175,000 cy)	350,000
Engineering & Administration (25)	128,750
Implementation Cost =	$643,750
Maintenance Cost =	$ 13,500/Year

2.2.5 FLOODPLAIN CLEARING

In the lower reaches of Oso Creek from Oso Bay up to Weber Road, the channel and floodplain consist of naturalized estuarine habitat which is protected from modification by its wetland designation. In these areas no major improvements to the floodplain are practical, and maintaining the floodplain from encroachment is the best strategy for limiting flood levels.

Above Weber Road, the Oso Creek channel is under wetland jurisdiction which limits channel maintenance activities, but the dense growth along the banks increases due to the decline in salinity influence from Oso Bay. In the areas of Chapman Ranch Road and FM 763, the natural channel is very narrow and dominated by tall bank vegetation. In these reaches, maintenance of the tall vegetation on the upland banks of the creek without disturbing the natural channel will increase the conveyance ability of the creek.

Above Chapman Ranch Road, the creek has been channelized. In these areas, regular channel clearing will reduce the flood levels of Oso Creek due to lowered 'n' values for frictional coefficients. The HEC-2 model of Oso Creek was checked for the effect of a 25% reduction in "n" values, which would be practical if the Oso Creek Park Plan is developed. In the areas recommended for maintenance, the overall effect would be to lower the peak flood by 1.58 ft., which would offset the 0.5 ft. to 1.5 ft. rise anticipated due to ultimate development. Approximately 1,374 acres would be removed from the ultimate 100-year floodplain of the Oso Creek Basin (including West Oso Creek, Kelly Ditch and Clarkwood Ditch).

The estimated cost for floodplain clearing and maintenance of the natural floodplain for the channel from Weber Road up to Clarkwood Road is based upon initial clearing and then regular mowing of the floodplain overbank areas. If the land is set aside as parkland through the platting process at no cost to the City, the cost for maintenance of these improvements would be approximately $75,000 per year. Otherwise, land acquisition costs would add $840,000 to this alternative.

2.3 NONSTRUCTURAL IMPROVEMENTS

The nonstructural alternatives available for utilization in the Oso Creek Basin includes establishment of a pre=post policy, land use controls, floodplain building restrictions and policy on increased channel maintenance schedules.

Pre-post policy and land use controls are designed to prevent any increase in stormwater runoff due to land development. The cost of maintaining on-site stormwater detention ponds (as with a pre-post policy) or the cost of lowered land values to the tax base due to land use controls are far reaching and would have major effects on the economic development. Since the total rise in Oso Creek is predicted to be less than 1.5 ft., other alternatives exist which are more economical.

Increased schedules for maintenance of existing channelized ditches is another nonstructural alternative which will improve channel capacity and reduce flooding. This effort will benefit many of the local drainageways within the Oso Creek drainage basin. Clarkwood Ditch with an optimum ditch condition of "n" = .025 would lower peak flood levels up to 1.46 ft. The upper end of Oso Creek and Kelly Ditch are already proposed for increased channelization, but would benefit further from increased maintenance. Other major ditches within the Oso Creek drainage basin would benefit similarly.

2.4 DRAINAGE AREA DIVERSION

The Oso Creek drainage basin was examined for the feasibility of diverting a portion of the upper drainage area into the Nueces River. An area of approximately 20.3 square miles northwest of and including Robstown, presently drains to the upper end of Ditch "A" at Highway 77. Based upon the existing flowlines of Ditch "A", it is physically possible to intercept this drainage and redirect it into the deep ditch which parallels the MoPac Railroad toward the Five Points area. At a grade of 0.05%, the diversion ditch would meet the flowline of the existing ditch in the area around the CP&L power plant. Right-of-way would need to be acquired adjacent to the MoPac Railroad. In order to minimize the depth of an open ditch and reduce right-of-way requirements, a concrete box could be installed in the bottom of the ditch leaving the area over the box to carry excessive flows as an open ditch.

Downstream, drainage crosses under the Missouri-Pacific (MoPac) Railroad tracks at the O.N. Stevens Water Filtration Plant and then crosses U.S. Interstate 37 (I-37). The culverts under I-37 have not been sized for this amount of diverted runoff. In order for the plan to function, a stormwater detention pond would need to be constructed on the lower corner of the O. N. Stevens Plant property. Using the railroad embankment as part of its levees, the detention pond would be designed to control peak releases to the level of pre-diversion flows.

A water quality benefit would be the increased fresh water inflow into the Nueces River. Based upon average annual rainfall of 30.8 inches and a 10% total runoff coefficient, the 20.3 square mile diversion area would contribute approximately 3,335 acre-feet of fresh water annually into the Nueces Bay system.

In order to determine the beneficial effect of the hypothetical diversion on peak discharge, the diversion of the uppermost of Oso Creek was configured in the TR-20 hydrologic model of the watershed. The TR-20 model calculated that peak discharges at the lower end of Oso Creek decreased only 184 cubic feet per second (cfs), from 46,139 cfs to 45,955 cfs. The reason for the small effect in peak discharge becomes apparent when reviewing the entire discharge hydrograph for Oso Creek.

Due to runoff travel time considerations, there are earlier times in the hydrographic event where a lesser area is contributing virtually the same amount of peak discharge as the larger area contributes at a later time. Thus, diverting the 20.3 square mile area reduces the length (total volume) of the storm hydrograph, but does not substantially affect the height of the peak discharge. Figure 2-3 compares the storm hydrographs at the lower end of Oso Creek for the existing drainage condition and the diversion plan discussed above. For strictly flood control benefits, the cost of diverting flow from this area is not warranted. Yet, the diversion plan does provide environmental benefits to the Nueces River due to the increased inflow of fresh water.

2.5 REGIONAL DETENTION

In conjunction with the development of costs for the structural improvements listed in Section 2.2, a cost analysis was performed related to the implementation of a regional detention system in the Oso Creek basin.

A site was chosen in the Oso Creek basin which met the criteria discussed in Section 1.5. The location begins at Clarkwood Road bridge and continues upstream 3.5 miles to the Carl Allen Road bridge. Approximately 530 acres of 100-year floodplain exist within this reach. The stream channel is poorly defined and occasionally becomes a wide swale in this area. Structural improvements are recommended in Section 2.2.4 to this same reach if a regional detention facility were not constructed. Therefore, an economy exists at this location since the need for other improvements would be eliminated.

Preliminary design of the facility included a detention structure just above Clarkwood Road which will pass the 25-year design storm flow of 9,342 cfs through a conduit at channel elevation. Excess flows would back up behind the structure until reaching the overflow elevation of the spillway. The spillway is modeled as a long broadcrested weir capable of passing the balance of the 100-year design storm flow of 13,882 cfs without

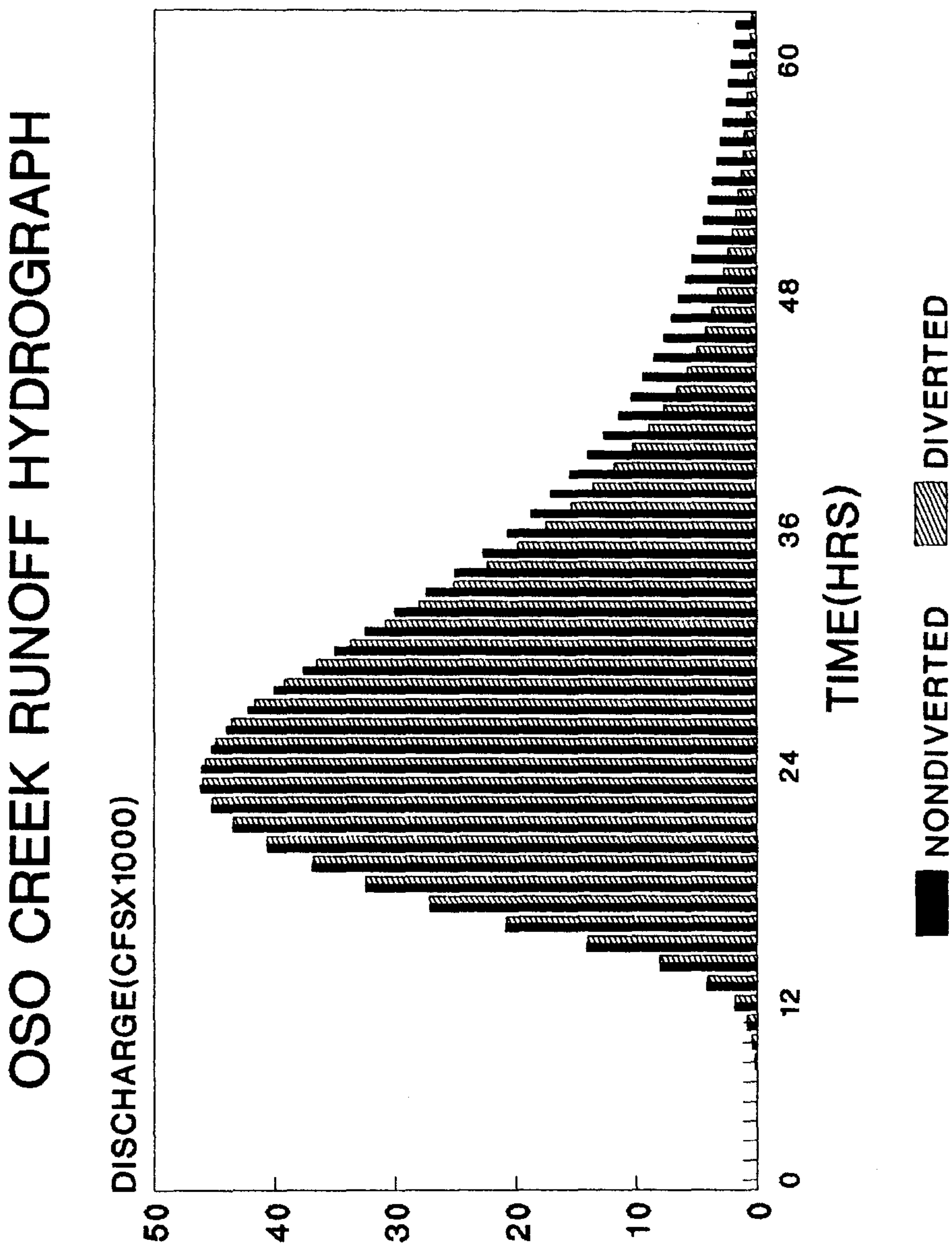


FIGURE 2-3

FIGURE 2-3

exceeding the ultimate 100-year flood profile elevation of 38.2 ft. NGVD. A weir 200 ft. in length with a crest elevation of 30.0 ft. NGVD was selected for further modeling.

Based upon a detention basin of 750 acres in size at average elevation of 25 ft. NGVD, a table of values for water surface elevation, discharge and storage volume was generated for input into the TR-20 Soil Conservation Service computer model described in Task 2.II.C&D, Hydraulic Modeling. The TR-20 model, which considers the peak runoff with respect to time, contains specific functions which evaluate the effect of stormwater detention upon downstream peaks. With the characteristics of the proposed structure input into the model, the 100-year peak flows at ultimate development were computed.
As expected, significant decreases in peak flows occurred downstream of the site. Ultimate flows at the lower end of Oso Creek (Section 1.0) were reduced from 46,140 cfs down to 41,658 cfs, which is near the current predevelopment 100-year flows of 39,444 cfs. From Staples Street bridge to Chapman Ranch bridge, the ultimate flows with detention are equivalent to the current 100-year flows. From Chapman Ranch bridge upstream to Clarkwood Road, the ultimate flows with detention are significantly below the current 100-year flows. This would result in the greatest reduction in flood levels and floodplain area immediately below the structure. Flood levels in the lower reaches of Oso Creek would be effectively maintained at current levels. Figure 2-4 shows a comparison in the 100-year design flows for Oso Creek for the three conditions of: 1) current 100-year design flow; 2) ultimate 100-year design flow; and 3) ultimate 100-year design flow modified by the detention facility.

The modified flows calculated by the TR-20 program were input into the HEC-2 computer model of Oso Creek for determination of the reduction in flood levels attributable to a regional detention structure. The results of these computer runs were compared to the profile calculated for ultimate development. Profile elevations from the regional detention structure downstream were reduced as much as two feet. Upstream elevations above the detention facility were maintained at the same levels as without detention. As a result of the regional detention facility, the ultimate 100-year floodplain would be reduced by approximately 795 acres along the lower reaches of Oso

EFFECTS OF DETENTION ON OSO CREEK

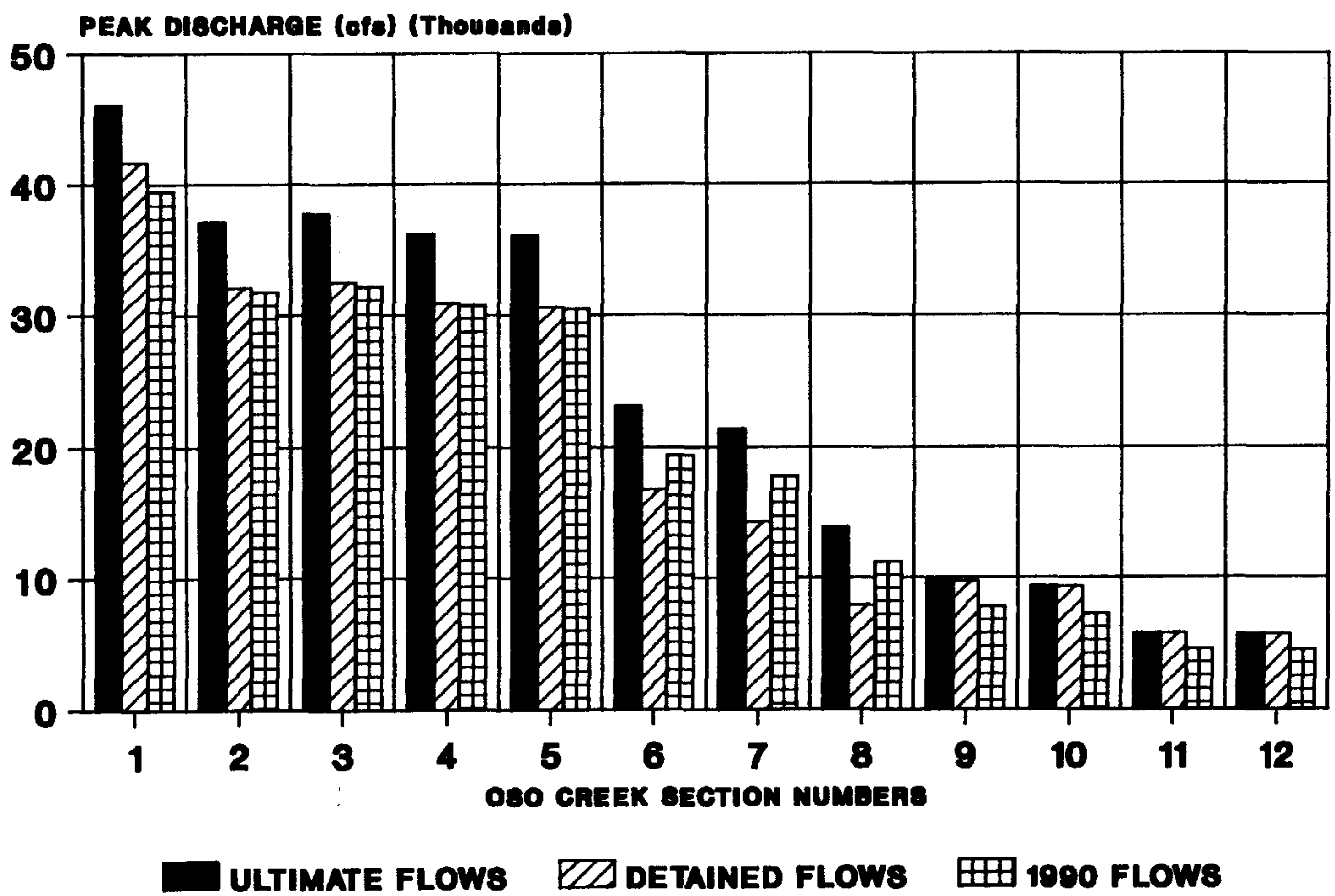


FIGURE 2-4

FIGURE 2-4

Creek. Additionally, an estimated 15 existing homes in the Lakes and Kings Crossing developments and future development will be protected. The proposed water surface profiles of Oso Creek with a regional detention basin are included on Figures 2-1 and 2-2.

The cost of constructing a regional detention facility depends primarily upon the cost of acquiring land and the cost of excavating large volumes of earth. Implementation could occur over a period of time as the structure was needed to offset the effect of development on the peak flood of Oso Creek. Through the platting process, much of the land for the site could be obtained as park or easement dedication. Funds for land acquisition could be available to satisfy other needs of the City for a regional park facility. Excavation can often be accomplished at lower costs where the contractor has a need for the excavated material such as for overpass embankments, site fill requirements, or for sanitary landfill cover. On a long-range basis, these costs will vary due to unknown future economic factors which may significantly change the costs of land and excavation.

The following costs are based upon the estimated costs to construct the facility at current prices. The area required is 750 acres, including 530 acres already within the 100-year flood plain. The volume of excavation would be approximately 7.5 million cubic yards. Maintenance costs are based upon a twice yearly mowing of the overbank storage areas. Improvements and maintenance for utilization of the areas as developed recreational parkland is not included and would come from recreation budgets.

Cost for Regional Detention Facility

Land Acquisition (750 Acres)	$ 965,000
Excavation (7.5 million cy)	7,500,000
Detention/Spillway	325,000
Engineering & Administration (10%)	879,000
Implementation Cost =	$9,669,000
Maintenance Cost =	$ 48,000/Year

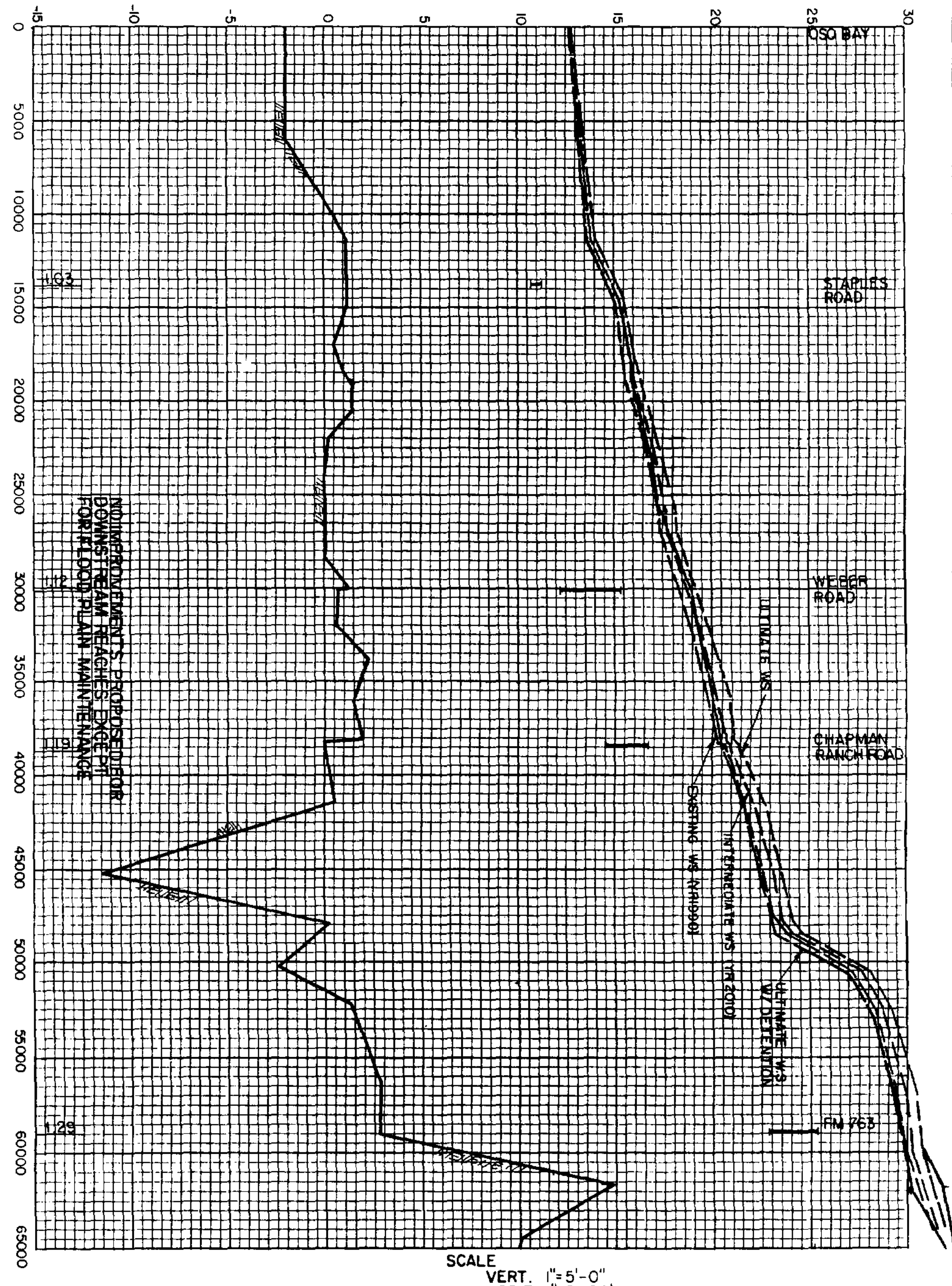
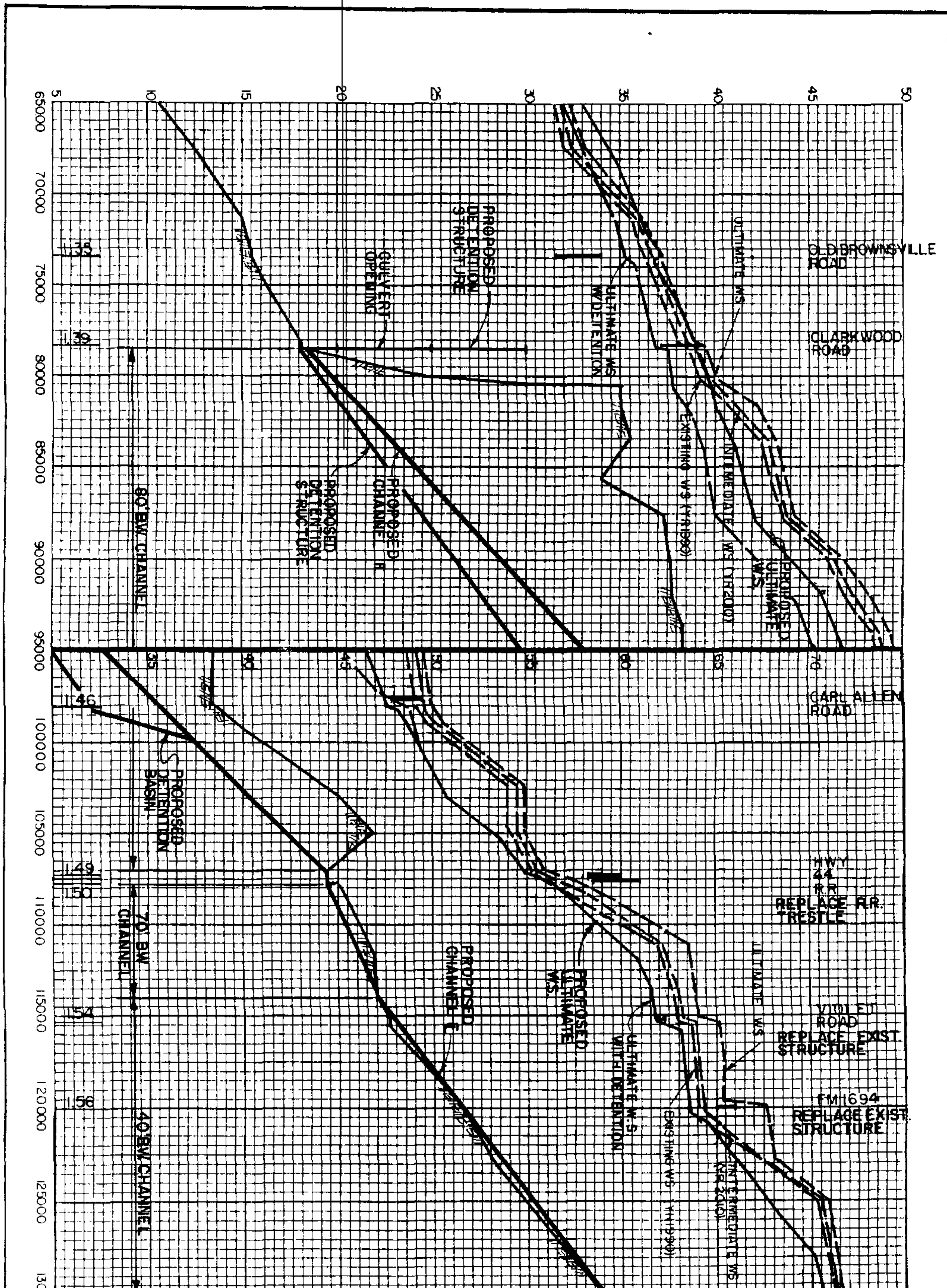


FIG. 2-1	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE OSO CREEK IMPROVED DOWNSTREAM REACH



SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 5000'

FIG. 2-2	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE OSO CREEK IMPROVED UPSTREAM REACH

3.0 KELLY DITCH

3.1 GENERAL

Kelly Ditch is a combination of natural drainageway and channelized ditch. Improvements are recommended which will allow the reduction of the floodplain to within the ditch banks and reduce the 25-year hydraulic gradient to the proposed elevations indicated on the City of Corpus Christi Master Plan for the area.

3.2 STRUCTURAL IMPROVEMENTS

3.2.1 CHANNEL IMPROVEMENTS FROM 3000 FT. ABOVE SARATOGA (SECTION 2.07) TO OLD BROWNSVILLE ROAD (SEC. 2.13)

Based on hydraulic modeling performed in Task 2.II.C&D, the existing channel width should be increased to 140 feet. The improvements should begin approximately 3,000 feet above Saratoga in order to maintain a naturalized area adjacent to the Las Colinas Subdivision. The channel would be constructed with 3:1 sideslopes at 0.10% slope. Approximately 412 acres would be removed from the ultimate 100-year floodplain. Anticipated maintenance includes draglining of the channel once every 10 years. The estimated construction cost of these improvements are as follows:

140 Ft. Channel Widening Between Saratoga and Old Brownsville Road

Right-Of-Way	$ 91,000
Excavation (232,000 cy)	464,000
Engineering & Administration (25%)	138,750
Implementation Cost =	$693,750
Maintenance Cost =	$ 17,600/year

3.2.2 CHANNEL WIDENING FROM OLD BROWNSVILLE ROAD (SECTION 2.13) TO BEAR LANE (SECTION 2.19)

The existing channel should be widened to 120 feet wide from Old Brownsville Road to Bear Lane. Maintenance is anticipated as the dredging of the channel once every 10 years. The estimated construction cost of these improvements are:

<u>120 Ft. Channel Widening Between Old Brownsville Road and Bear Lane</u>

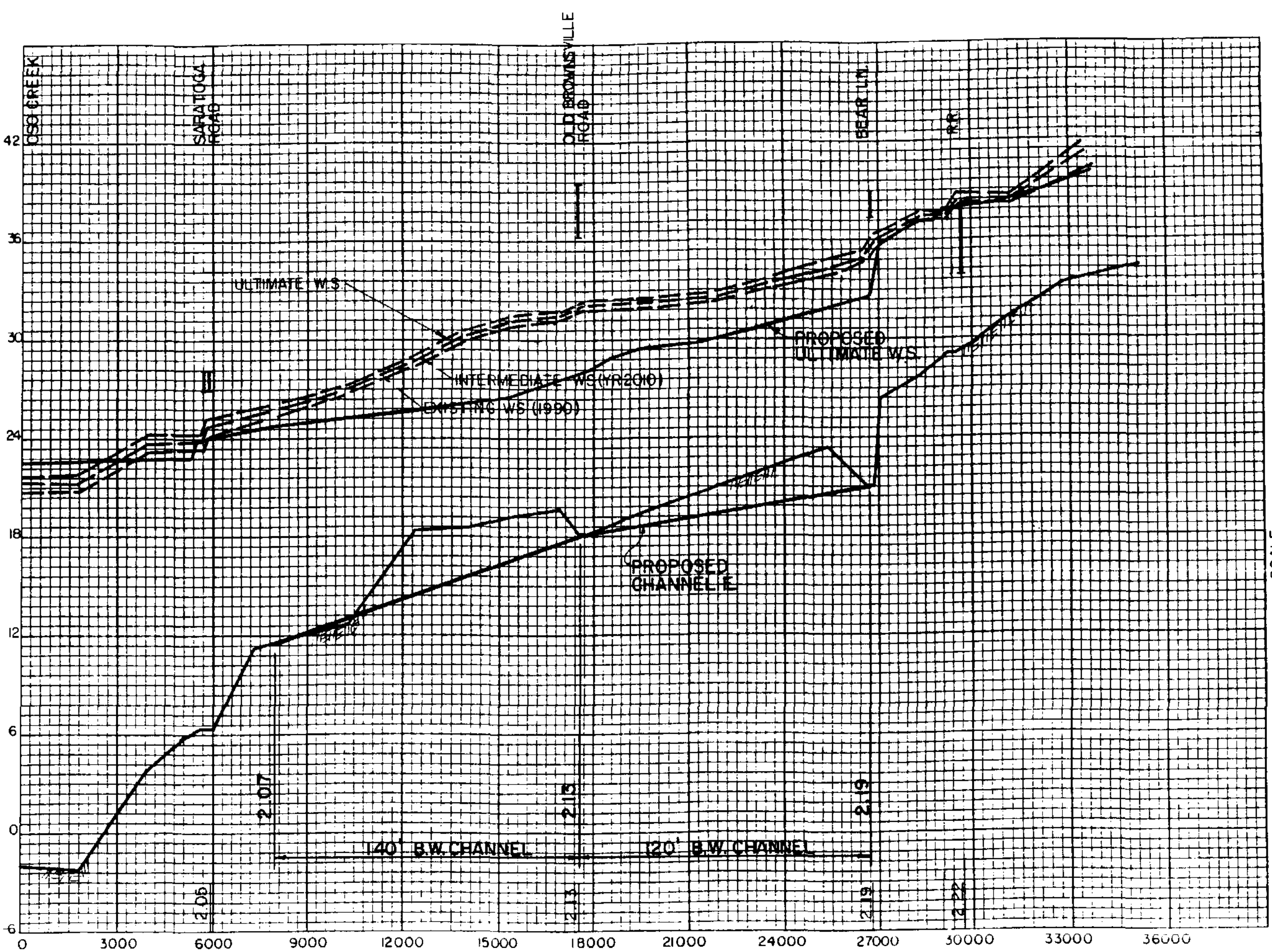
Right-Of-Way	$ 94,000
Excavation (116,000 cy)	232,000
Engineering & Administration (25%)	81,500
Implementation Cost =	$407,500
Maintenance Cost =	$ 13,680/year

3.3 NONSTRUCTURAL IMPROVEMENTS

Even though the existing ditch needs to be increased in size to contain the design flood, the downstream reaches should be left in a naturalized state, from Oso Creek to 3,000 feet above Saratoga. Additional nonstructural improvements should be made to further lower peak flood levels by ditch cleaning. Optimum ditch conditions for the naturalized portion of Kelly Ditch would create an "n" value of .040 if the area was maintained clear of brush and fewer trees. This would lower the peak flood levels by approximately 0.5 feet. Maintenance is anticipated as the regular mowing of the floodplain at least once per year, with periodic clearing as needed. The estimated costs of these improvements are as follows:

Implementation Cost (ROW & Clearing)$120,000
Maintenance Cost$ 13,500/year

Figure 3-1 depicts the flood levels anticipated due to the proposed improvements.



100 YEAR FLOOD PROFILE

KELLY DITCH-IMPROVED

STORMWATER MASTER PLAN

SOUTH TEXAS WATER AUTHORITY

CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

FIG 3-1

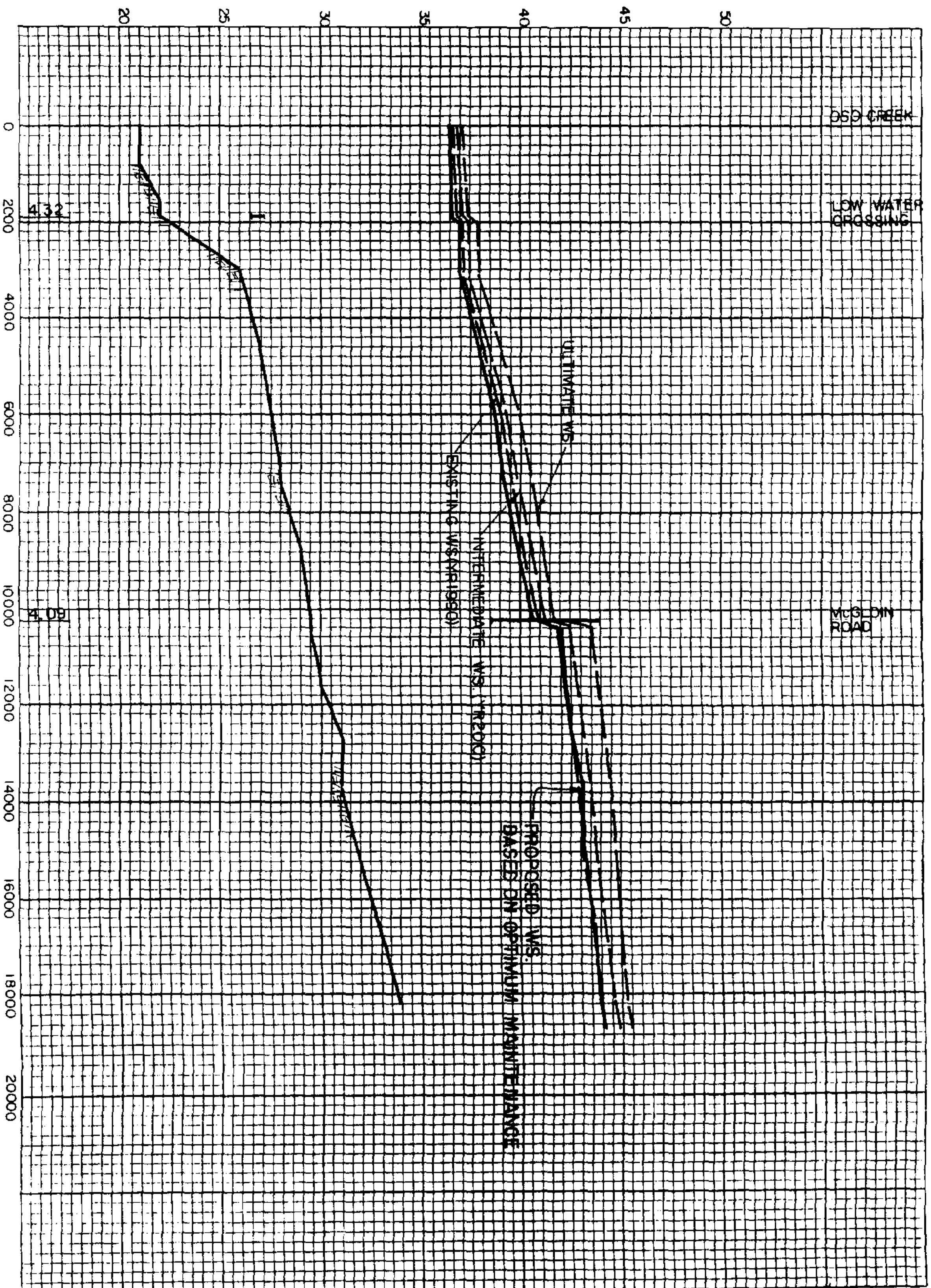
4.0 CLARKWOOD DITCH

4.1 STRUCTURAL IMPROVEMENTS

Structural channel widening is not recommended for Clarkwood Ditch due to the major ditch improvements recently constructed. Periodic channel maintenance will be required to maintain the current flood levels.

4.2 NONSTRUCTURAL IMPROVEMENTS

Maintaining optimum ditch conditions (an "n" value of .025) would lower peak flood levels by up to 1.46 ft. based upon more frequent maintenance. Figure 4-1 depicts the flood level at optimum ditch conditions. Additional maintenance costs are estimated at $28,500 per year.



SCALE
VERT. 1" = 5'-0"
HORIZ. 1" = 2000'

FIG 4-1	STORMWATER MASTER PLAN SOUTH TEXAS WATER AUTHORITY CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY	100 YEAR FLOOD PROFILE CLARKWOOD DITCH - IMPROVED

5.0 SALT FLATS DRAINAGEWAY

5.1 GENERAL

The drainage problem areas in the Salt Flats Drainageway are caused by capacity problems in undersized segments of the system. Figure 5-1 depicts the flood profile due to the following proposed improvements for the Salt Flats Drainageway. Improvements recommended herein will significantly reduce the flooding impacts to approximately eight apartment buildings within the Leathers Housing Project for the ultimate 5-year frequency flood. Table 5-1 is a tabular summary of the resultant hydraulic grades at key points through the drainage system.

5.2 STRUCTURAL IMPROVEMENTS

5.2.1 MULTIPLE BOX CULVERTS FROM NUECES STREET TO BUFFALO STREET

The headloss of the entire system could be reduced to an acceptable level by installing additional box culverts from Nueces Street to Leopard Street. But due to the location of these boxes under the Interstate 37 freeway interchange, improvements would be prohibitively expensive to implement. Therefore, the expansion of five (8' x 4') box culverts from Nueces Street to Buffalo Street at Interstate 37 would be the most practical segment to accomplish. The right-of-way is narrow through the Leathers Housing Project No. 2, and the top of the box is already exposed due to shallowness. Therefore, room does not exist to add to the top of the existing box. The drainage problem which occurs in the Leathers Housing Project is due to the fact that most of the stormwater being carried by the box culvert originates far upstream of the flooded area and resultant flows exceed the capacity of the system. Large floodwater flows through the box cause the hydraulic gradient to exceed the local ground elevation and water flows out of inlets into the streets of the Leathers area. The system could function as a true pressure system if smaller collector drain boxes (approximately 6' x 4') were placed along side the main box to carry local drainage. The main box could

TABLE 5-1
SALT FLATS DRAINAGEWAY
HYDRAULIC PROFILE COMPUTATIONS

After Drainage System Improvements

Node	Location	Type of Structure	Length (feet)	"n"	Q(5) (cfs)	Velocity (fps)	headloss(k) (ft)	headloss(f) (ft)	Hydraulic grade elevation	Ground Elevation
1	Inner Harbor	Outfall	-	-	1630	-	-	-	3.00	10.0
2	Port District	40' unlined ditch	640	0.035	1628	-	-	-	6.29/6.79	10.0
3	Port St to Nueces St	40' lined channel	3337	0.020	1600	-	-	-	8.91	10.0
4	Nueces St. to Buffalo St.	(5) 8x4 & (2) 6x4 b.c.	1532	0.012	1138	4.74	0.00	1.09	10.00	10.0
5	Interstate 37	(5) 8x4 b.c.	295	0.012	1138	7.11	0.00	0.66	10.67	10.0
6	IH 37/Leopard/to Mestina	(4) 8x3.25 & (2) 8x4 b.c.	995	0.012	1138	6.77	0.00	2.29	12.96	13.2
7	Mestina to Coke St.	20' lined channel	300	0.012	1078	8.62	0.58	0.26	13.79	14.6
8	Coke St. Culvert	(3) 8x4 b.c.	60	0.012	1076	11.21	0.98	0.13	14.90	14.6
9	Coke St. to Lipan	20' lined channel	520	0.012	1075	8.60	0.57	0.44	15.92	16.0
10	Lipan & Port Ave.	(2) 7x4 b.c.	1550	0.012	275	4.91	0.19	1.77	17.87	20.0
11	Port Ave.	5x3 b.c. & 54" pipe	37	0.012	252	8.16	0.21	0.15	18.23	19.6
12	Port @ Commanche	(2) 54" pipe	630	0.012	212	6.67	0.41	1.56	20.20	19.2
13	Port Ave.	3x2.5 b.c. & 54" pipe	525	0.012	166	7.09	0.39	1.89	22.49	32.0
14	Port Ave.	42" pipe & 54" pipe	155	0.012	153	6.00	0.11	0.36	22.96	35.0
15	Port Ave.	15" pipe & 54" pipe	300	0.012	144	8.42	0.33	1.49	24.77	35.5
16	Port @ Industrial	15" pipe & 54" pipe	400	0.012	130	7.60	0.36	1.61	26.74	36.3
17	Port Ave.	54" pipe	200	0.012	118	7.42	0.17	0.61	27.53	36.6
18	Port @ Agnes	54" pipe	600	0.012	104	6.54	0.00	1.43	28.95	37.8

be sealed so that it could carry more water under the pressure of hydraulic head. As an example, the existing multiple box culverts carry 434 cfs when flowing full and without overflowing. By increasing the surcharge 12" at the high end, the boxes will carry 760 cfs. In order to carry the five year design flow, the systems require four (4) feet of head. This cannot be accomplished without spilling over into the Leathers Housing Project, unless this system is isolated from local drainage. The following is an estimate of costs to complete the improvements by constructing two (6' x 4') collectors along the sides of the existing boxes:

Seal Existing Inlets & Manholes	$ 50,000
Box Culvert Expansion (1,532 l.f.)	536,200
Engineering & Administration (25%)	146,550
Implementation Cost =	$732,750

5.2.2 CHANNEL FROM INNER HARBOR OUTFALL TO INTERSTATE 37

The 4,000 foot open channel from the Inner Harbor Outfall to Interstate 37 is limited in width and contains several road crossings, train trestles, and pipelines which impede the flow. These flow impediments have an adverse impact on upstream drainage conditions and affect the entire hydraulic gradient through the remainder of the Salt Flats Drainageway system. Improvement of the box culverts, train trestles, and pipeline crossings will reduce the flood profile approximately 2 ft. The benefit from expanding the channel is minor, in the undeveloped area of the open channel, except for reduction to the hydraulic grade upstream of Nueces Street. When land development takes place, these alternatives are recommended. No additional maintenance costs are expected.

Railroad Trestle (2)	$390,000
Pipeline Raisings (3)	150,000
Wooden Bridge (1)	125,000
Engineering & Administration (25%)	166,250
Implementation Cost	$832,250

5.2.3 COKE STREET CULVERTS

The existing three (8' x 4') box culverts should be increased by adding additional culverts. But due to the limited width of the 20 ft. lined channels upstream and downstream of the culverts, it would be preferable to add height to the existing culverts. In lieu of totally replacing these structures, transition structures could be constructed which would reduce the velocity related entrance and exit losses. The costs for these improvements are estimated as follows:

Headwalls (100 LF)	$10,000
Concrete Lining (2000 SF)	8,000
Engineering & Administration	4,500
Implementation Cost	$22,500

Figure 5-1 shows revised 5-year flood profiles based on implementation of these improvements.

5.3 NONSTRUCTURAL IMPROVEMENTS

The existing drainage system is presently complete and the area contributing runoff is essentially totally developed. The opportunity does not exist to significantly reduce flooding by land use control or other nonstructural methods.

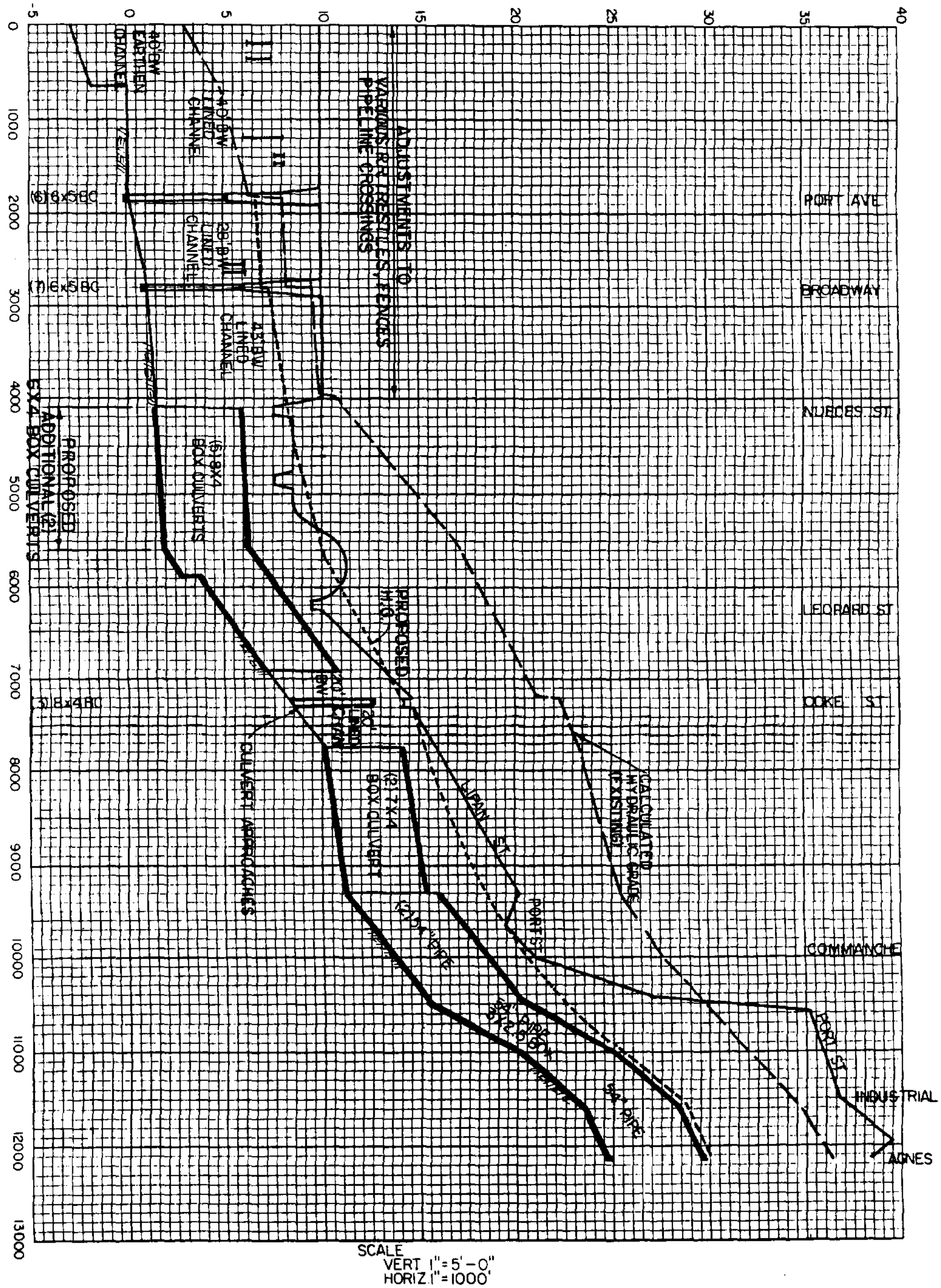


FIG. 5.1

STORMWATER MASTER PLAN
SOUTH TEXAS WATER AUTHORITY
CITY OF CORPUS CHRISTI, TEXAS & NUECES COUNTY

5 YEAR FLOOD PROFILE

SALTFLATS DRAINAGEWAY - IMPROVED

6.0 NUECES RIVER

Due to the magnitude of the Nueces River floodplain, structural improvements to lower flood levels are not practical and, therefore, not recommended. Nonstructural alternatives for flood protection include the enforcement of existing FEMA guidelines for constructing above the 100- year flood levels and prohibiting the encroachment of development into floodway zones.

7.0 SUMMARY

Table 7-1 and Table 7-2 present a summary of the recommended Phase I and Phase II drainage improvements, respectively.

TABLE 7-1
PHASE I DRAINAGE IMPROVEMENTS

Project	Cost	
	Construction	Maintenance
Texas-Mexican Railroad Trestle at Highway 44	$ 775,000	$ 500
Oso Creek Channel Improvements from Hwy. 44 to Violet Road	$ 730,000	$ 10,000
Kelly Ditch Channel Improvements from Saratoga to Old Brownsville Rd.	$ 693,750	$ 17,600
Kelly Ditch Channel Improvements from Old Brownsville Rd. to Bear Lane	$ 407,500	$ 13,680
Kelly Ditch Floodplain Clearing	$ 120,000	$ 13,500
Clarkwood Ditch Maintenance	--	$ 28,500
Salt Flats Drainageway Box Culverts	$ 732,750	--
Salt Flats Improvements	$ 832,250	--
Coke Street Culverts	$ 22,500	--
TOTAL	$4,313,750	$ 83,780

TABLE 7-2

PHASE II DRAINAGE IMPROVEMENTS

Project	Cost: Construction	Cost: Maintenance
Oso Creek Channel Improvements from Violet Road to Hwy. 77	$ 936,250	$ 23,250
Oso Creek Improvements from Clarkwood Road to Hwy. 44	$ 2,285,000	$ 37,500
Oso Creek Floodplain Clearing	$ 840,000	$ 75,000
Regional Detention Facility	$ 9,669,000	$ 48,000
TOTAL	$13,730,250	$183,750

Task 2.III.A

TABLE OF CONTENTS

1.0 REVIEW OF EXISTING AUTHORITIES

1.1 INTRODUCTION

The scope of this portion of the report includes a review of the Codes and Ordinances of the City of Corpus Christi, the statutory authority available to the County of Nueces, and the charter authority available to the South Texas Water Authority to the extent they allow such entities to control flooding and the discharge of pollutants into the storm sewer system. Additionally, the Texas Water Code and Texas Local Government Code were examined for other regulatory authority which might be available to such entities.

In particular, the existing legal authority of the three entities was compared against the specific legal authority requirements of proposed state and current federal regulations. The possible need for additional regulatory authority in order to adequately support implementation of a Stormwater Drainage Master Plan was considered. This portion of the study is comprised of three subsections. The first section evaluates the existing authority of the City of Corpus Christi, Nueces County and the South Texas Water Authority. The second section analyzes additional specific authority provided under the Texas Water Code and the Texas Local Government Code. The third component addresses the issue of the possible need for additional legal authority, ordinances, or rules.

2.0 EXISTING AUTHORITY

2.1 SOUTH TEXAS WATER AUTHORITY

The South Texas Water Authority (STWA) was created by the Texas Legislature pursuant to Article XVI, Section 59 of the Texas Constitution. This Constitutional provision allows for the creation of conservation and reclamation districts to protect the natural resources of the State, in part through control, storage and preservation of flood waters. Although STWA's primary purpose is to provide fresh water supplies to certain communities in South Texas, it may exercise the following powers in connection with the control of water pollution:

1) Exercise any and all powers authorized for a conservation and reclamation district under Chapter 54 of the Texas Water Code and Article XVI, Section 59 of the Texas Constitution [Section 1].

2) Exercise any and all powers necessary or appropriate to carry out, achieve, or effectuate the purposes of the statute establishing the STWA [Section 6(a)].

3) Acquire, lease or otherwise hold any real, personal, or mixed property through purchase, exchange, gift, the exercise of eminent domain, or otherwise, including rights and easements [Section 6(e)].

4) Request and accept appropriations, grants, allocations, subsidies, aid or other donations from the federal government, the state, any city, public agency, political subdivision or other source [Section 6(g)].

5) Exercise any and all powers authorized under Chapter 30 of the Texas Water Code [Section 6(k)].

6) Enter into and enforce contracts or other agreements for any purposes relating to its powers with any other person, firm, corporation, public agency, political subdivision, the state, or the United States or any of its agencies [Section 9(a)].

7) Acquire or construct within or without the boundaries without the SWTA all works, well plants, transmission lines and other facilities necessary or useful for the purpose of diverting, impounding, drilling, storing, treating, and transporting water for any useful purpose [Section 9(a)].

Pursuant to Chapter 30 of the Texas Water Code, as discussed in more detail in the next section, the STWA is vested with the power to cooperate with other governmental entities to prevent and control water pollution and to develop area-wide water control plans. Such authority, in conjunction with some of the general powers enumerated above, would enable the STWA to be a participant in stormwater master planning. The STWA, however, does not possess specific, direct regulatory authority as contemplated by the proposed state and current federal regulations. A summary sheet concerning the South Texas Water Authority's legal authority is attached as Exhibit 1 to this portion of the report.

2.2 COUNTY OF NUECES

Although Nueces County has the power to deal with a broad range of flood control issues, the regulatory authority of county governments in Texas is extremely limited in preventing pollution of the waters of the State and controlling run-off. The County does not have general zoning powers or ordinance-making authority, and its limited ability to raise revenues severely restricts the role Nueces County can play in flood water and drainage management. The existing legal authority of Nueces County related to the issue of stormwater management is listed as follows:

1) Develop flood control and surface water use systems or contract with other governments for such purposes [Texas Local Government Code Chapters 411 and 412].

2) Acquire and operate solid waste disposal systems, or contract for the operation of such systems [Texas Health & Safety Code Chapter 364].

3) Prohibit disposal of any manner of waste on property which may ultimately enter into the streams and water courses [Texas Health & Safety Code § 364.012].

4) Impose limited subdivision regulations for drainage purposes [Texas Local Government Code § 232.003].

5) Sue for violation of any federal, state or local stormwater or pollution regulations [Texas Water Code § 26.124 and § 26.174].

6) Enact land use regulations to prevent flood water damage [Texas Local Government Code § 240.901].

7) Regulate land use in flood prone areas under the Texas Flood Control and Insurance Act [Texas Water Code § 16.311 et seq.].

8) Expend general revenue for public health and sanitation [Texas Health & Safety Code Chapter 121].

9) Enter into local agreements with other political subdivisions for the purpose of carrying out common governmental functions [Texas Government Code Chapter 791].

Under the Texas Flood Control and Insurance Act, Nueces County has substantive authority to regulate land use and development in areas prone to flooding from the Gulf of Mexico. Furthermore, this Act allows the County to implement all regulations reasonably necessary to minimize flood and rising water drainage, including drainage regulations. Nueces County's ability to exercise the full-range of regulatory authority contemplated by the proposed state and current federal regulations across the County, however, is subject to question. Since it lacks general ordinance-making authority, the County would have difficulty adopting general prohibitions on the discharge of pollutants as contemplated by such regulations. Through the exercise of its powers to regulate the disposal of waste and enact other subdivision regulations, though, the County could prevent the illicit discharge of domestic sewage into stormwater drainage systems. Such an action would be within the County's general authority granted under the Health and Safety Code for protection of public health, safety and welfare.

The above-listed general powers would enable the County to participate in a common regulatory scheme with a municipality and impose limited regulations in unincorporated areas. A summary sheet concerning Nueces County's legal authority is attached as Exhibit 2 to this portion of the report.

2.3 CITY OF CORPUS CHRISTI

As a home rule City, the City of Corpus Christi has the greatest potential authority under the Constitution and laws of the State of Texas to apply a broad range of water quality controls. The City has some specific statutory authority to construct and operate stormwater collection and treatment facilities, but the City can impose a wide range of regulations concerning this issue through its broad regulatory and ordinance-making ability. It is specifically authorized to:

1) Construct and operate a stormwater collection and treatment system [Texas Local Government Code Chapter 402].

2) Enact zoning regulations to promote the health, safety and general welfare of the public [Texas Local Government Code Chapter 211]

3) Adopt and enforce local subdivision regulations within the City and its extraterritorial jurisdiction [Texas Local Government Code Chapter 212].

4) Prohibit the pollution of any stream constituting a water supply [Texas Water Code § 26.177].

5) Prosecute civil and criminal actions for discharge violations [Texas Water Code Chapter 26].

6) Cooperate with other governmental entities to promote public health and water quality management [Texas Local Government Code Chapter 391 and Texas Water Code § 26.175].

7) Enter into local agreements with other political subdivisions for the purpose of carrying out common governmental functions [Texas Government Code Chapter 791].

In addition, the City of Corpus Christi, has adopted the following specific ordinances dealing with stormwater regulation:

Ordinance 23-64. This ordinance makes it a Class C misdemeanor to deposit into any public sewer, including a storm sewer, any waste or refuse which would impair the operation of the system. The terms "waste" and "refuse" include, but are not limited to, oil, grease, waste petroleum products, refuse of manufacturers, ashes, rags, earth, straw, hay, shavings, and tinner's scrap.

Ordinance 55-141(h). This ordinance makes it a Class C misdemeanor to discharge any of the following substances into a storm sewer:

Wastewater hotter than 150° Fahrenheit
Flammable or explosive substances
Items which could cause obstruction
Garbage particles up to one-half inch in any dimension
Malodorous substances
Substances which would cause discoloration
Free petroleum oil or grease

Of the three entities examined in this portion of the study, the City of Corpus Christi possesses the greatest degree of regulatory authority necessary to comply with the proposed state and current federal regulations. The above ordinances already adopted by the City form the basic framework for control of discharges into the stormwater system; additional matters of concern can be included within the ordinances as they are identified. A summary sheet concerning the City of Corpus Christi's legal authority is attached as Exhibit 3 to this portion of the report.

3.0 LOCAL GOVERNMENT CODE & WATER CODE PROVISIONS

3.1 TEXAS LOCAL GOVERNMENT CODE

In 1987 the Texas Legislature enacted the Municipal Drainage Utility Systems Act which has been codified at Section 402.041 et seq. of the Texas Local Government Code. This Act provides that any municipality may, upon a three-quarters vote of its governing body, adopt an ordinance declaring that the drainage of the city shall be operated in a manner like a public utility. Prior to adoption of the ordinance, the city council must find that:

(1) The city will establish a schedule of drainage charges against all real property in the city's service area that is subject to charges under the Act.

(2) The city will provide drainage for all real property in the service area on payment of drainage charges, except for real property exempted under the Act.

(3) The city will offer drainage service on nondiscriminatory, reasonable, and equitable terms.

Notice of Hearing. The city council must first publish the text of the proposed ordinance in full in a notice of public hearing at least three times prior to the hearing. The first publication must occur at least thirty (30) days prior to the date of the hearing. Upon conclusion of the hearing, the city council may adopt a drainage system ordinance.

Drainage Charges. Once an ordinance establishing a drainage system has been adopted, the city may levy a schedule of drainage charges against those properties in the service area which also receive water, wastewater or electric service from the city. Charges for each lot or tract for which drainage services are made available may not be assessed on the basis of the value of the property. Instead, the basis for calculation of drainage charges must be directly related to drainage, and the terms of the levy of assessments and any classification of properties must be nondiscriminatory, equitable and reasonable.

All of the eligible lots or tracts of property located within the "service area" of the city must be included within the base for calculation of drainage charges. The "service area" of the city includes all of the properties within the city limits, but for certain cities over 400,000 in population it may also include adjacent areas within the ETJ which are actually served by the drainage system. The city may consider the size, area, topography and land use of a lot or tract in assessing the drainage charges. Unless a person's lot or tract is exempted under the Act, the person may not use the drainage system for such property until the established drainage charge is paid in full.

Exempt Property. The following types of property may be exempt, at the discretion of the City, from application of the ordinance and any charges imposed:

Property owned by the State of Texas,
Property owned by the county,
Property owned by the city, and
Property owned by any school district.

Additionally, the following types of property are required to be exempt from application of the ordinances and the changes imposed:

Property with proper construction and maintenance of a wholly sufficient and privately-owned drainage system,

Property held and maintained in its natural state, until such time that the property is developed and all of the public infrastructure constructed has been accepted by the municipality for maintenance, and

A subdivided lot, until a structure has been built on the lot and a certificate of occupancy has been issued by the municipality.

Billings. The drainage charges may be billed by the city with the city's public utility billings. In the event the owner fails to timely pay the charges, the city may file suit for collection of the amounts due and discontinue any utility service to the property furnished by the city. Employees of the city are authorized to enter the property for the purpose of enforcement of these provisions.

Use of Funds. All income received by the drainage system must be segregated and completely identifiable in a separate city account. Charges solely for the cost of providing services may be transferred to the city's general fund, except for those portions pledged to retire any outstanding indebtedness or obligations incurred or reserved for future construction. Any charges levied for funding of future system improvements, including replacement, new construction, or extensions, may not be transferred to the city's general fund.

Bonds. By a majority vote of the city council, the city may issue revenue bonds secured by the pledge of drainage system revenues. Such bonds may be issued in the same manner as provided for other revenue bonds issued by the city.

Discontinuation. After at least five years of substantially continuous operation of the drainage system, the city council may elect to discontinue the system. The ordinance discontinuing the system must be adopted after providing notice of public hearing in the same manner as provided for implementation of the drainage system. If the city discontinues the drainage system in this manner, it may not adopt another system under the Act for at least five years after such discontinuation.

The Act defines "drainage" very broadly to include all public works and channels, whether natural or artificial, that are used to carry, collect, store, divert or treat water into natural or artificial courses. By virtue of the broad regulatory authority concerning discharges and drainages possessed by municipalities and the ability to impose charges as provided by the Act, any city, including the City of Corpus Christi, may possess a wide range of tools available to comply with the proposed state and current federal regulations.

3.2 TEXAS WATER CODE

Chapter 26. Chapter 26 of the Texas Water Code provides that all local governments which operate storm sewer systems (which are included within the definition of a "sewer" system under Section 26.001(14)) must protect the public health and safety by the following actions:

(1) Controlling and regulating the type, character and quality of "waste" discharged into the system.

(2) Requiring pretreatment, if necessary, of any "waste" discharged into the system.

While the above requirements were primarily designed to govern the operation of sanitary sewer systems, the definition of "sewer" specifically includes a system designed to carry stormwater.

The local government may charge users fees and assessments for the right to discharge into the drainage system. Such fees and assessments must be based upon "volume, type, character and quality of waste" and must consider the techniques, if any, required for treatment. These fees and assessments must also be equitable and fair to all persons assessed. User charges, connection fees, or other assessments may additionally form the basis for the charges.

Pursuant to Chapter 26 of the Texas Water Code, all cities having a population of at least 5,000 persons are required to adopt a water pollution control and abatement program. The program may also encompass the area included within the city's extraterritorial jurisdiction. The program shall include the following services and functions:

(1) Development and maintenance of an inventory of significant waste discharges within the program area.

(2) Regular monitoring of waste discharges.

(3) Sampling and inspection of discharges to insure compliance with applicable laws.

(4) Procedures for obtaining compliance, including legal enforcement, if necessary.

(5) Development and execution of plans to control and abate non-point source pollutants, specifically including stormwater and urban rainwater run-off.

The program developed by the city must additionally be approved by the Texas Water Commission. A comparison of the provisions of Texas Local Government Code Chapter 402 and Texas Water Code Chapter 26 is attached as Exhibit 4 to this portion of the report.

Chapter 30. Section 30.002 of the Texas Water Code authorizes public agencies to cooperate for safe and economical transportation, treatment and disposal of water in order to prevent continued pollution of water in the state. While this provision principally was designed for sanitary sewer considerations, the definition of "disposal system" under Section 30.003 would also include a storm sewer system. As a result, any district created under either Article XVI, Section 59, or Article III, Section 52 of the Texas Constitution may engage in activities under this Chapter. Such districts include the South Texas Water Authority and the Nueces River Authority.

Such a district may acquire, construct, improve, enlarge, extend, repair, operate and maintain a disposal system. It may contract with any other public agency inside or outside its boundaries in order to accomplish such purposes. Other public agencies may contract with a district for provision of a disposal and treatment system. These agencies may use income from waterworks or the sanitary sewer system to make payments on contracts with a district. Specifically, a city may, by election, levy ad valorem taxes to make all or part of such contract payments.

In order to perform its functions, a district may purchase, lease or condemn property, and it may issue bonds secured by contract revenues. The rates charged by the district must be sufficient to pay all contract obligations, expenses of operation and maintenance, and obligations of bonds secured by the revenue of the system. The method of establishing rates is not specified, but following the model of rates for a sanitary sewer system, the rates could take into consideration the drainage characteristics and demands of a particular property.

Additionally under this Chapter, river authorities are granted specific authority to develop regional water quality management plans. They also may contract with other public agencies for development of plans for pollution control and must coordinate efforts in this regard with those plans of other public agencies. Delegation of the various roles and responsibilities of the parties under any such contract would be determined by the agreement of the contracting parties. Absent such an agreement, a river authority would not have the power to impose its requirements on other jurisdictions within its boundaries. Nonetheless, a river authority may become a key player in a stormwater regional master plan.

4.0 ADDITIONAL AUTHORITY TO BE CONSIDERED

In order to adequately operate a stormwater system under the proposed state and current federal regulations, a governmental entity must possess certain minimum standards of legal authority. The legal authority may be derived from statute, ordinance, or contracts with other governmental entities or persons which authorize the governmental entity to:

(a) Control through ordinance, permit, contract, order or similar means, the contribution of pollutants to the storm sewer system by stormwater discharges associated with industrial activity and the quality of stormwater discharged from sites of industrial activity;

(b) Prohibit through ordinance, order or similar means, illicit discharges to the storm sewer system;

(c) Control through ordinance, order or similar means the discharge to a storm sewer system of spills, dumping, or disposal of materials other than stormwater;

(d) Control through interagency agreements among other governmental agencies the contribution of pollutants from one portion of a storm drainage system to another portion of the system;

(e) Require compliance with conditions in ordinances, permits, contracts or orders; and

(f) Carry out all inspection, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions, including the prohibition on illicit discharges to the storm drainage system.

As noted in the analysis above, neither the South Texas Water Authority nor the County of Nueces presently possess under State statutes clear and direct legal authority to address each of the above issues. The City of Corpus Christi, however, pursuant to its ordinances, the Texas Local Government Code and the Texas Water Code, is capable of addressing each of the issues outlined above. Such regulations may be enforced within the City limits of the City and, to a somewhat lesser extent, within the extraterritorial jurisdiction of the City. A present analysis of the City's ordinances compared to the current federal regulations' standards can be set out as follows:

Requirement (a): Control through ordinance, permit, contract, order or similar means, the contribution of pollutants to the municipal storm sewer by storm water discharges associated with industrial activity and the quality of storm water discharged from sites of industrial activity.

City Authority: Ordinance §55-141(a) prohibits discharge into a storm drain or watercourse within the city of any industrial waste that would constitute polluted water or corrosive waste.

Requirement (b): Prohibit through ordinance, order or similar means, illicit discharges to the municipal separate storm sewer.

City Authority: Ordinance §55-141 (l) provides that the sanitary sewer system be used by all persons discharging wastewater, industrial waste or polluted liquids. Ordinance §55-141 (m) provides that no person may discharge wastewater, industrial waste or polluted liquids on public or private property into or adjacent to any natural outlet, watercourse, storm sewer or other area within the jurisdiction of the city. (*1).
Discharge of other specific substances is also addressed in Ordinances § 23-64 and § 55-141(h) as discussed above under Section 1(c).

Requirement (c): Control through ordinance, order or similar means the discharge to a municipal separate storm sewer of spills, dumping or disposal of materials other than storm water;

(1*) A codification error appears to exist in §55-141 (m) which refers to "any waste included in subsection (1) of this section." Reference should be to subsection (1).

City Authority: See Ordinance §55-141 (a), (l) and (m) referred to above. "Illicit discharge" is defined by the EPA as a discharge to a municipal separate storm sewer that is not composed entirely of storm water runoff, snow melt runoff, surface runoff and drainage. Further, illicit discharges include surface runoff and drainage of any liquids resulting from any of the following, to the extent that they are identified as sources of pollution to U. S. waters: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated ground water infiltration; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; air conditioning condensation; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; individual residential car washing; flows from riparian habitats and wetlands; dechlorinated swimming pool discharge; street wash water. City ordinances could be developed which specifically preclude any of the above discharges since certain of the above discharges may not be precluded by §55-141 (a), (l) and (m).

Requirement (d): Control through interagency agreements among coapplicants the contribution of pollutants from one portion of the municipal system to another portion of the municipal system.

City Authority: Not applicable. No such interagency agreements presently exist; however, proposals for such agreements are included in the Task III.C. portion of this report.

Requirement (e): Require compliance with conditions in ordinances, permits, contracts or orders.

City Authority: Ordinance §55-147 (e) authorizes the city to sue for legal and equitable relief, including injunctive relief, for violations of city, federal or state discharge laws, statutes and ordinances. Under §55-147 (f), any person violating provisions of the city's ordinances or permits is guilty of a Class C misdemeanor and subject to fines of not less than $100.00 per day. Further, any person who knowingly falsifies permit applications, monitoring reports or tampers with monitoring devices is guilty of a Class C misdemeanor.

Requirement (f): Carry out all inspection, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions including the prohibition on illicit discharges to the municipal separate storm sewer.

City Authority: Ordinance §55-145 (d) (2) requires owners, occupants and users of premises where wastewater is created or discharged to allow city access at all reasonable times for inspection, sampling and records examination.

The proposed state and current federal permit regulations additionally indicate that the permit applicant must show the authority to control materials, including sand, silt and soils, at construction sites. Chapter XXXI of the Corpus Christi Building Code presently requires that exposed, graded or uncovered land within the City subject to wind erosion must be watered. Sections 13-150 through 13-158 of the Code of Ordinances relating to excavations specifically require that excavation sites be drained of standing water and that soil erosion by water and wind must be factors considered in determining whether to grant an excavation permit. No other existing provisions of the City's Code of Ordinances provide for specific erosion controls. These provisions do not directly address all of the proposed state and current federal permit regulation requirements. While technically the general "discharge" ordinances of the City could apply to construction sites and new development areas, specific ordinances on these issues must be added within the Code to directly address this issue. Such ordinances would provide that surface run-off be controlled through structures such as diversion ditches and retention ponds at all construction and excavation sites to prevent the removal through surface water run-off of illicit materials.

Neither the County nor the South Texas Water Authority have attempted to enact specific regulations of the nature adopted by the City of Corpus Christi. Although the STWA has some general powers relating to flood control, any attempt to adopt regulations along the lines required under the proposed state and current federal regulations would be subject to challenge. Since the STWA is solely a creature of State statute, additional regulatory authority could be attained through amendment of the legislative charter prescribed for the STWA or through the expansion of the Municipal Drainage Utilities Systems Act under the Texas Local Government Code to include the STWA.

In similar fashion, the County of Nueces possesses limited powers under state law to enable it to show the extent of regulatory authority required under the proposed state and current federal regulations. The power of Nueces County, however, is substantially greater than that afforded to the South Texas Water Authority in that it possesses direct and clear authority to establish and operate drainage and flood control systems. As a result, pursuant to the Texas Water Code, Nueces County may have additional regulatory authority, but its lack of general ordinance-making authority will severely limit its ability to enact regulations similar to those imposed by the City of Corpus Christi.

Since Nueces County does not operate under a charter or possess the attributes of home-rule government enjoyed by cities, greater regulatory authority must be obtained from the State of Texas. Other provisions of the Texas Local Government Code apply to counties as well, so the Municipal Drainage Utilities Systems Act could be amended to extend its operation into counties. Otherwise, specific provisions to the Texas Local Government or Water Codes could be added which would provide specific regulatory authority to counties consistent with the proposed state and current federal regulations. Given the historic controversy concerning general ordinance-making or regulatory authority for Texas counties, it would be more likely to obtain special legislation providing limited regulatory authority solely to the extent necessary to comply with state or federal law. Exhibit 5 to this portion of the report contains an initial draft of an amendment to the Texas Water Code meeting this specific purpose.

As noted previously, the City of Corpus Christi possesses the full range of regulatory authority to adequately address stormwater drainage and treatment issues. Through the enforcement of its ordinances concerning the contribution of pollutants into the system, whether from industrial activity, dumping or illicit discharges, the City can demonstrate its present legal authority to meet the proposed state and current federal regulatory requirements. By implementation of the drainage system provisions of the Texas Local Government Code, the City of Corpus Christi may further develop the financial means necessary to operate its stormwater drainage system. Such revenues could supplement or replace the financial resources currently available to the City from its general fund.

APPENDIX A

EXHIBIT 1 - SOUTH TEXAS WATER AUTHORITY

EXHIBIT 2 - NUECES COUNTY

EXHIBIT 3 - CITY OF CORPUS CHRISTI

EXHIBIT 4 - COMPARISON OF LOCAL GOVERNMENT CODE & WATER CODE PROVISIONS

EXHIBIT 5 - PROPOSED LEGISLATION FOR COUNTIES

Exhibit 1

Task 2.III.A

SOUTH TEXAS WATER AUTHORITY

The South Texas Water Authority (STWA) was created by Texas Legislature under Article XVI, Section 59 of the Texas Constitution. Its boundaries cover a small portion of Corpus Christi's ETJ near Robstown and are more particularly described on the excerpt from Section 2 of the charter attached. Its primary purpose is to provide fresh water supplies to the communities of Agua Dulce, Bishop, Driscoll and Kingsville.

General Powers:	Statutory Reference:
o Construct systems and facilities to divert and impound fresh water necessary to accomplish its purposes	STWA CHARTER § 9(A)
o Contract with any person or public agency inside or outside its boundaries for collection, transportation, treatment or disposal of waste.	TEX. WATER CODE § 30.025
o Acquire, construct, improve, enlarge, extend, repair, operate and maintain stormwater disposal systems.	TEX. WATER CODE § 30.021
o Contract with a district for provision of waste disposal and treatment systems.	TEX. WATER CODE § 30.027
o Purchase, lease or condemn property necessary to perform its functions.	TEX. WATER CODE § 30.033
o Cooperate with Nueces River Authority in assessment of water quality within the Nueces River Basin.	TEX. WATER CODE § 26.0135
Financial:	
o Issue bonds	STWA CHARTER § 13
o Levy taxes	STWA CHARTER § 13
o Charge fees for water	STWA CHARTER § 9(a)
o Other public agencies may use income from their waterworks or sanitary sewer system to make payments on contracts with	TEX. WATER CODE § 30.030

STWA. The city may, by election, levy ad valorem taxes to make all or part of its contract payments.

<u>Intergovernmental</u>:

o Contract for any purpose relating to its powers	STWA CHARTER § 9(a)
o Contract with other public agencies for area-wide water control plans	TEX. WATER CODE § 30.103(a)
o Cooperate to prevent and control water pollution	TEX. WATER CODE § 30.002
o Cooperate in watershed water quality assessments.	TEX. WATER CODE § 26.0135

Entity:	South Texas Water Authority
Address:	111 Sage Road Kingsville, Texas 78363
Administrative Control:	Tom Brown, Executive Director
Authority and Special Features:	Created pursuant to Article XVI, Section 59 of the Texas Constitution. Primary purpose is to provide fresh water supplies to Agua Dulce, Bishop, Driscoll and Kingsville.

EXHIBIT 2

NUECES COUNTY

The authority of the County of Nueces in the area of water quality management is limited. Lack of general zoning powers, ordinance-making powers, and severely restricted fiscal authority diminish the role that it may play in floodwater and drainage management, however, Nueces County may engage in certain activities, as noted below.

General Powers:	Statutory Reference:
o Develop flood control and surface water use systems, or contract with other governments for same.	LOCAL GOV'T CODE CHAP. 411
o Acquire and operate solid waste disposal systems, or contract for same.	HEALTH & SAFETY CODE § 364.013
o Regulate disposal of waste in the County	HEALTH & SAFETY CODE § 364.012
Financial:	
o Limited debt financing for condemnation of sewer property to operate works.	TEX CONSTITUTION ART. XI, § 7; LOCAL GOV'T CODE § 273.006
o Levy tax and issue bonds for water supply treatment for county purposes only.	TEX. REV. CIV. STAT. ART. 2352e
Regulatory:	
o Limited subdivision regulations for drainage	LOCAL GOV'T CODE § 232.003
o Regulate land use in flood prone areas under the Texas Flood Control and Insurance Act.	TEX. WATER CODE § 16.311 et seq.
o Sue for discharge violations.	TEX. WATER CODE §§ 26.124 and 26.174
o Enact land use regulations to prevent flood water damage.	LOCAL GOV'T CODE § 240.901
o Regulate transportation of waste.	HEALTH & SAFETY CODE CHAP. 368
o Prosecute for failure to comply with the County's licensing ordinance.	HEALTH & SAFETY CODE § 368.018

Intergovernmental:

o Expend general revenue for public health and sanitation.	HEALTH & SAFETY CODE CHAP. 121
o Interlocal contracting.	TEX. GOV'T CODE CHAP. 791
o Maintain flood control system	LOCAL GOV'T CODE CHAP. 411
o Sell excess water	LOCAL GOV'T CODE CHAP. 412
o Cooperate in regional water quality assessments.	TEX. WATER CODE § 26.0135

Entity: Nueces County

Address: Nueces County Courthouse
901 Leopard Street
Corpus Christi, Texas 78401

Administrative Control: The Honorable Robert N. Barnes
County Judge

Authority and Special Features: General authority as prescribed by the Texas Constitution and general laws of the State of Texas.

EXHIBIT 3

Task 2.III.A

CITY OF CORPUS CHRISTI

As a home-rule city, the City of Corpus Christi has adopted a charter giving it sufficient fiscal and police power to apply the full measure of water quality controls available to municipalities. The City additionally possesses some specific statutory authority to construct and operate stormwater collection and treatment facilities.

General Powers:	Statutory Reference:
o Construct and operate surface collection and treatment system.	LOCAL GOV'T CODE § 402.042 et seq.
Financial:	
o Establish user fees and assessments.	TEX. WATER CODE § 26.176 LOCAL GOV'T CODE §402.047
o Tax for waterworks, sewers and other public improvements.	TEX. TAX CODE CHAP. 301
o Issue tax supported and revenue bonds for water treatment purposes.	TEX. REV. CIV. STAT. ARTS. 823 & 1111; TEX. CONSTITUTION ART. XI §§ 4-7
o Acquire property by gift, purchase or condemnation, jointly or otherwise.	LOCAL GOV'T CODE CHAPS. 273 and 251
Regulatory:	
o Enact zoning regulations to promote health and the general welfare.	LOCAL GOV'T CODE CHAP. 211
o Adopt and enforce local subdivision regulations within the city limits and extraterritorial jurisdiction (ETJ).	LOCAL GOV'T CODE CHAP. 212
o Regulate new construction and land development through building permits and platting requirements.	LOCAL GOV'T CODE CHAPS. 212 AND 214
o Develop water pollution control and abatement plan.	TEX. WATER CODE § 26.177
o Sue for discharge violations.	TEX. WATER CODE § 26.124, 26.174
o Annexation within ETJ and along navigable streams.	LOCAL GOV'T CODE CHAP. 43

Intergovernmental Action:

o Cooperate with other governments to promote public health and water quality management.	LOCAL GOV'T CODE CHAP. 391; TEX. WATER CODE § 26.175
o Intergovernmental contracting.	TEX. GOV'T CODE CHAP. 791
o Cooperate in regional water quality assessment.	TEX. WATER CODE § 26.0135

City of Corpus Christi Ordinances

§ 23-64 -- Misdemeanor to deposit into public sewer any waste or refuse which would impair operation of sewage disposal plants and storm sewers. The terms "waste" and "refuse" include, but are not limited to:

oil	earth
grease	straw
waste petroleum products	hay
refuse of manufacturers	shavings
ashes	tinner's scrap
rags	

§55-141(h) -- Discharge of the following into storm sewers is a class C misdemeanor:

Wastewater hotter than 150°F or hotter than 104°F at introduction of treatment plant
Flammable or explosive substances
Items which could cause obstruction
Garbage particles up ½" in any dimension
Malodorous substances
Substances which would cause discoloration
Free petroleum oil or grease

Entity: Corpus Christi

Address: 1201 Leopard Street
P.O. Box 9277 (78469)
Corpus Christi, Texas 78401

Administrative Control: The Honorable Mary Rhodes
Mayor

Authority and Special Features: Corpus Christi is a home-rule city.

EXHIBIT 4

Task 2.III.A

COMPARISON OF LOCAL GOV'T CODE AND WATER CODE PROVISIONS

Local Government Code §402.047, et seq.
Drainage Systems

Water Code §26.176, et seq.*
Drainage Charges

Criteria for Charges or Fees:

Local Government Code §402.047, et seq. Drainage Systems	Water Code §26.176, et seq. Drainage Charges
o Cannot be on ad valorem basis o Must be related to drainage o Must be based on inventory of lots and tracts o May consider use of benefitted property o May consider size and topography of benefitted property o Upon vote of council, may include cost factors for future construction o Must be equitable	o Must base on volume, type, character and quality of waste o Must consider techniques of treatment o Must be equitable

Cost Factors to include in fee determination:

Local Government Code §402.047, et seq. Drainage Systems	Water Code §26.176, et seq. Drainage Charges
o Land acquisition costs o Facility construction, repair, maintenance o Expenses incident to planning o Cost of machinery, equipment, furniture o Finance charges	o Capital costs and debt retirement expenses o Costs of operation o Other costs directly attributable to waste disposal

Charges or Fees:

Local Government Code §402.047, et seq. Drainage Systems	Water Code §26.176, et seq. Drainage Charges
o System must have schedule of charges.	o User charges o Connection fees o Other assessments

Public Hearing:

Local Government Code §402.047, et seq. Drainage Systems	Water Code §26.176, et seq. Drainage Charges
o Municipality must have public hearing before adopting fee schedule.	o Must have public hearing before TWC to impose charges based on other than the above criteria.

Billing:

Local Government Code §402.047, et seq. Drainage Systems	Water Code §26.176, et seq. Drainage Charges
o Must identify drainage charges separately.	o No statutory language.

Deposit:

Local Government Code §402.047, et seq. Drainage Systems	Water Code §26.176, et seq. Drainage Charges
o May not require deposit.	o No statutory language.

* This Statute controls over others in the event of conflict.

Exhibit 5

PROPOSED LEGISLATION FOR COUNTIES

Texas Water Code, New Section 26.179

(a.) Except where otherwise authorized by the Commission, every county may enact and enforce rules, ordinances, orders or resolutions to control and regulate the type, nature, character and quality of waste which may be discharged into any stormwater or other disposal system operated or maintained within its boundaries and may prohibit any illicit discharge.

(b.) For purposes of this Section, the term "illicit discharge," shall mean the discharge or release into any drain, ditch, pipe, conduit, storm sewer, or other disposal system, except a septic tank or sanitary sewer, any material that is not composed entirely of storm water runoff, snow melt, surface runoff and drainage, as well as surface runoff and drainage of any liquids resulting from any of the following activities, to the extent that such liquids are identified as sources of pollution to waters in the State: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; discharges from potable water sources; foundation drains; air conditioning condensation; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; individual residential car washing; flows from riparian habitats and wetlands; dechlorinated swimming pool discharge and street wash water.

(c.) Every county may develop and maintain an inventory of all significant waste or illicit discharges into or adjacent to the waters of this State within the county without regard to whether or not the discharges are authorized by the Commission.

(d.) Every county may collect samples and conduct periodic inspections and tests of the waste discharged within the county, including illicit discharges, to determine whether the discharges are being conducted in compliance with the rules, ordinances, orders or resolutions adopted by the county.

(e.) Every county provide for criminal prosecution for violation of any rule, ordinance or orders adopted hereunder in accordance with the provisions of Subchapter F of this Chapter.

(f.) Every county may enforce any rules, ordinance or order adopted hereunder through legal enforcement proceedings authorized under 26.124 to enforce civil penalties for discharge violation imposed under Rule 26.122.

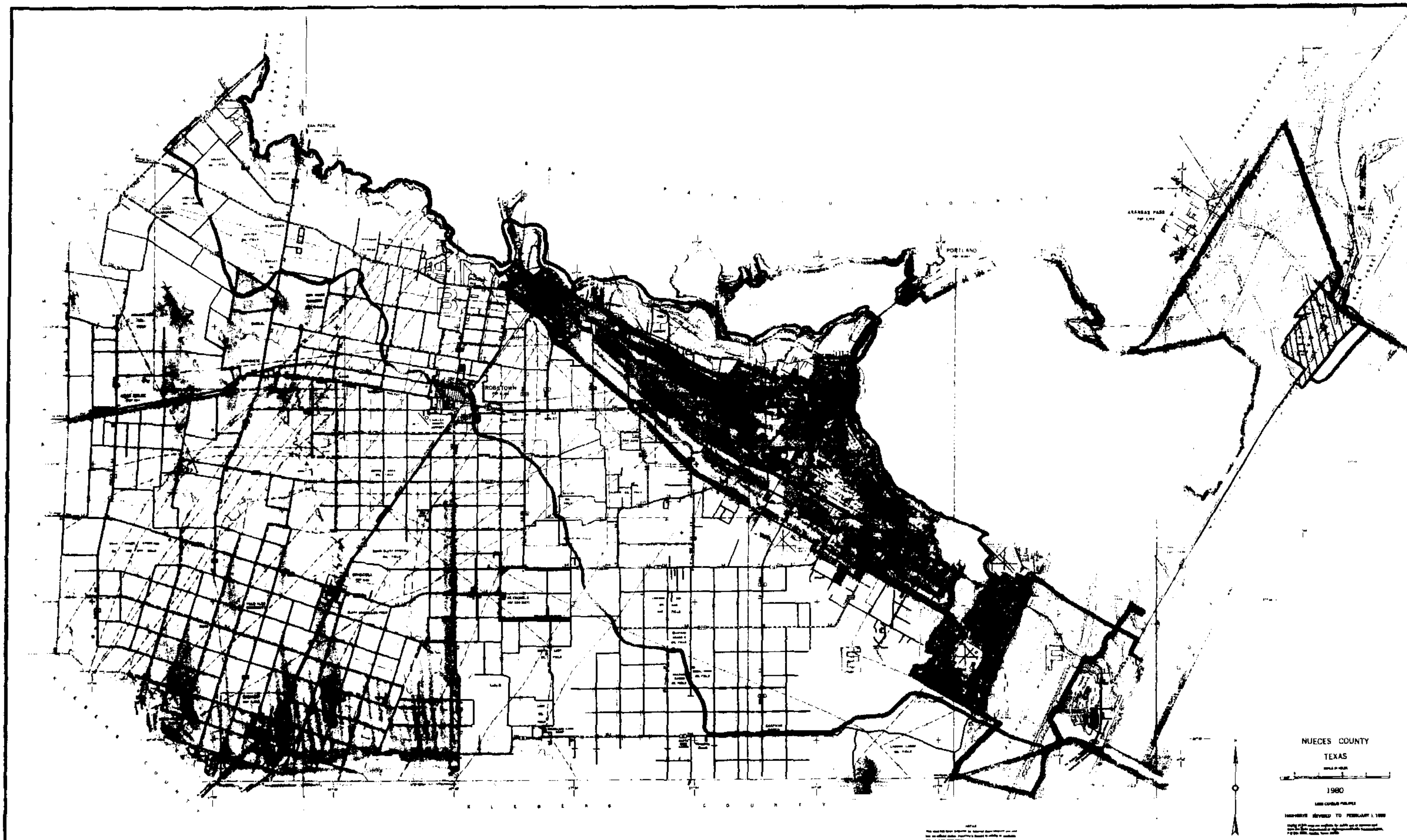
TABLE OF CONTENTS

1.0 REVIEW OF ADJACENT & OVERLAPPING JURISDICTIONS

The scope of this portion of the report includes a review of all governmental entities, jurisdictions and agencies exercising control or having authority over any aspect of drainage or floodwater control which are adjacent to or overlap the City of Corpus Christi, including its extraterritorial jurisdiction, as well as a number of such agencies operating within the remainder of Nueces County. All of these entities are shown in in Figures 1-1, 1-2 and 1-3. A detailed discussion of funding alternatives available to these entities is provided in the portion of the report concerning Task III.D.

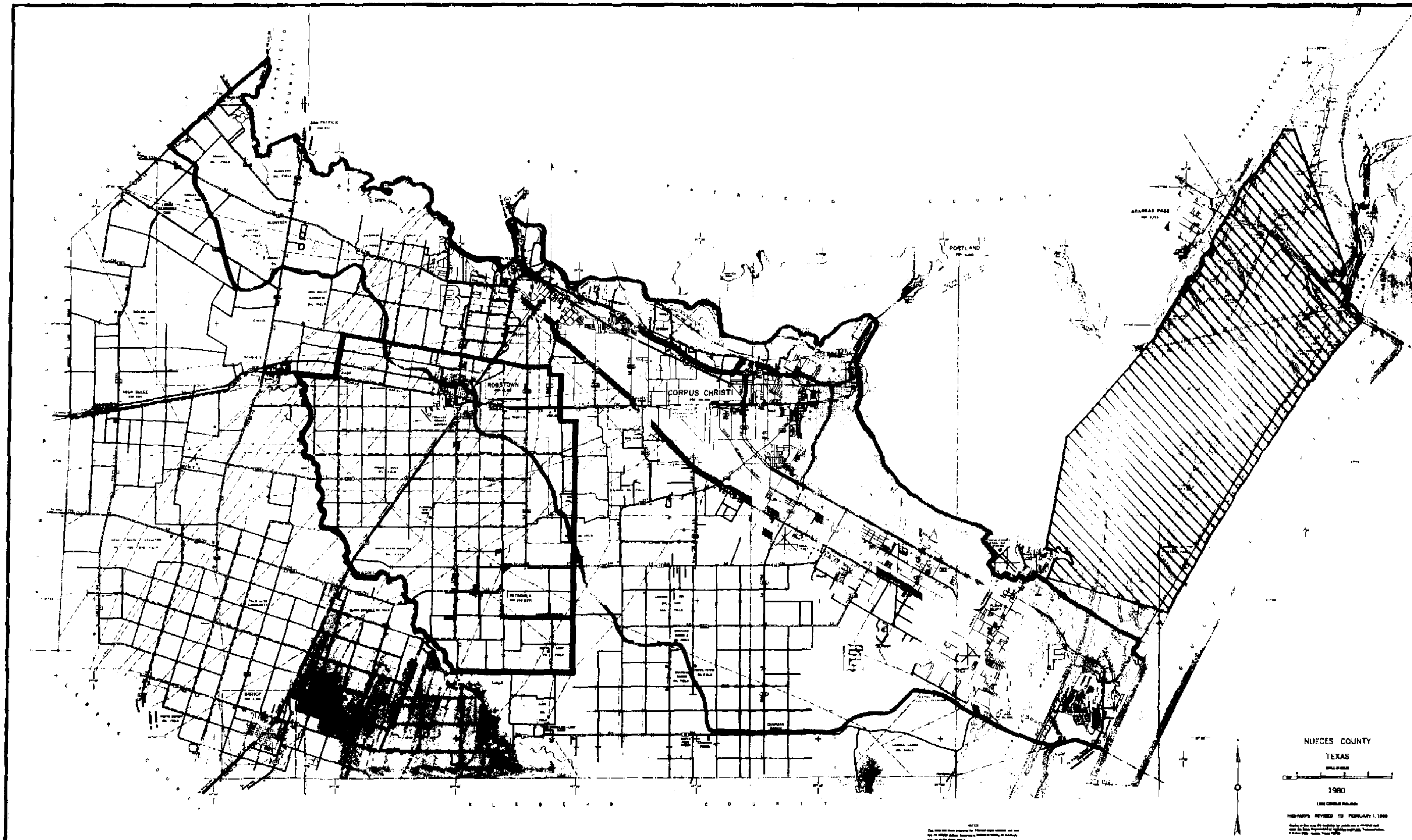
All of the entities included in the study are listed below. Specific reviews of the jurisdiction and authority of the City of Corpus Christi, the County of Nueces and the South Texas Water Authority are contained in the preceding section of this report. The remaining entities are analyzed in this portion of the report.

County of Nueces
Nueces County Water Control-Improvement District No. 3
Nueces County Water Control-Improvement District No. 4
Nueces County Water Control-Improvement District No. 5
Nueces County Drainage and Conservation District No. 2
Nueces County Drainage and Conservation District No. 3
Nueces-Jim Wells-Kleberg-Kenedy Soil and Water Conservation District No. 311
Port of Corpus Christi Authority of Nueces County, Texas
(Nueces County Navigation District No. 1)
City of Corpus Christi
City of Robstown
City of Port Aransas
Naval Air Station Corpus Christi
City of Petronila
Nueces River Authority
Texas Department of Transportation
City of Corpus Christi Industrial Districts
South Texas Water Authority



South Texas Water Authority   Nueces County Line   City of Port Aransas   City of Corpus Christi   City of Robstown   City of Petronila

FIGURE 1-1



Drainage District No. 3 Drainage District No. 2

Nueces County Water Control-Improvement District No. 3
Nueces County Water Control-Improvement District No. 4
Nueces County Water Control-Improvement District No. 5

FIGURE 12

None of the entities listed above have jurisdiction within the study area and the ability to exercise significant authority with regard to drainage and floodwater throughout the study area as contemplated by the proposed state and current federal regulations, with the exception of the Nueces River Authority. Each of these entities, however, possess some degree of regulatory authority concerning stormwater drainage and the authority under the Texas Interlocal Cooperation Act to contract with other entities for governmental functions. Further, the Cities of Robstown and Port Aransas and the Nueces County Drainage and Conservation District No. 2 do have necessary powers to implement the proposed state and current federal permit requirements within their jurisdictional boundaries adjacent to the study area. Summary sheets for each of these entities are attached as exhibits to this section of the report.

It is important to keep in mind that under the Texas Interlocal Cooperation Act, governmental entities are authorized to enter into agreements to provide for governmental functions which all contracting entities possess the legal authority to perform. One governmental entity may not extend its powers into the adjacent jurisdiction of another governmental entity unless that entity possesses the same or similar powers. If both entities, however, have the same authority to regulate, they may mutually agree upon the regulations to be adopted and the personnel which will be assigned to enforce such regulations. Employees of one entity could then be authorized to enforce the regulations within the other participating entities.

1.1 WATER CONTROL AND IMPROVEMENT DISTRICTS

The three Water Control and Improvement Districts operating within the County are located in Robstown, Port Aransas and Banquete. These WCIDs are primarily charged with providing fresh water to their service area. In addition WCID No. 4, located in Port Aransas, is charged with providing a sanitary sewer system to its service area. Due to the very limited scope of their authority, all of these Water Control and Improvement Districts are effectively precluded from having any authority over drainage or flood waters except perhaps to the extent necessary to meet their missions.

The powers and duties of Nueces County's Water Control and Improvement Districts were limited by the County Commissioners at the time they were created; however, the present scope of authority of these Water Control and Improvement Districts includes only a fraction of the authority which such districts can be imparted under Chapter 51 of the Texas Water Code. Under state law, Water Control and Improvement Districts can be created and given authority to control stormwater, process water to restore purity and sanitary condition, drain land and prevent floods. Furthermore, WCIDs can be given authority to hire peace officers to make arrests to prevent or abate violations of district regulations and to set penalties for breach of district regulations.

1.2 DRAINAGE AND CONSERVATION DISTRICTS

Two drainage and conservation districts operate within Nueces County, the Nueces County Drainage and Conservation District No. 2 and the Nueces County Drainage and Conservation District No. 3. District No. 2 primarily serves rural land in the Robstown area and District No. 3 primarily serves the Bishop area. The powers of the Drainage District include reclamation and drainage of overflowed lands and other lands needing drainage within their boundaries. In general, the Districts may use all general law authority granted to water control and improvement districts. As noted above, this includes authority to control stormwater, process water to restore purity and sanitary condition, drain land and prevent floods. The Districts also have power to construct and maintain canals, ditches and levies within their boundaries and have power to issue bonds for payment of improvements, levy taxes and collect fees for service. The Districts have the same enforcement authority granted to water control and improvement districts, including power to set penalties for breach of district regulations and hire peace officers to make arrests for violations of District regulations.

The Districts have the power and authority necessary to implement the proposed state and current federal permit requirements within their boundaries. The Districts are adjacent to the City of Corpus Christi's extraterritorial boundaries, and therefore they have no jurisdictional authority within the study area.

1.3 NUECES-JIM WELLS-KLEBERG-KENEDY SOIL AND WATER CONSERVATION DISTRICT NO. 311

This Soil and Water Conservation District is governed by Texas Agriculture Code Chapter 201 and operates under contract with the federal government. The District's sole responsibility is to prevent and control soil erosion. The District may construct and maintain any improvement necessary to prevent and control soil erosion; however, it has no taxing authority and no authority to implement storm or floodwater plans except in connection with soil erosion.

1.4 PORT OF CORPUS CHRISTI AUTHORITY

The Port of Corpus Christi Authority of Nueces County, Texas (Nueces County Navigation District No. 1), the only navigation district operating within the County, has authority to deal with flood water, but only to the extent necessary to facilitate navigation. The Port of Corpus Christi Authority also has power to annex territory, issue bonds and levy taxes in order to improve, preserve and conserve inland and coastal waters for navigation. The Port is also a major landowner in the port area which is largely outside the city limits of Corpus Christi. It can contract with other governmental entities for operation of part of its drainage system. However, development of extensive drainage or water treatment systems is beyond the scope of its authority.

1.5 CITIES OF ROBSTOWN, PORT ARANSAS AND PETRONILA

The Cities of Robstown and Port Aransas are both home-rule cities which have statutory authority to construct and operate stormwater collection and treatment facilities, prohibit pollution of streams constituting water supplies, cooperate with other governments to promote water quality management, sue for discharge violations, enforce ordinances through imposition of fines and incarceration, tax for waterworks, sewers and other public improvements and establish user fees and assessments. These cities have significant authority to deal with drainage and flood control within the boundaries of the County. They generally possess the same legal authority as the City of Corpus Christi discussed earlier in this report, and they have the capacity to meet the proposed state and current federal regulations. However, a comprehensive review of the authorities of the Cities of Port Aransas and Robstown has been excluded from the study at the specific request of these Cities. Additionally, they fall outside the study area.

The general law City of Petronila falls within the study area. Petronila has the same authority as the Cities of Robstown and Port Aransas outlined above, with the exception of the power to bring civil enforcement actions. Petronila's enforcement authority is limited to imposition of fines for violation of ordinances. Therefore, Petronila can meet the majority of the proposed state and current federal permit requirements, with the exception of certain enforcement requirements.

1.6 NAVAL AIR STATION CORPUS CHRISTI

Naval Air Station Corpus Christi is a naval facility owned and operated by the federal government. The Naval Air Station owns a significant amount of property within the County in addition to the main base in Flour Bluff, over which it has all authority granted to a land owner. None of the other governmental agencies operating within the County have any authority over Naval Air Station Corpus Christi since it is a federal installation. Naval Air Station Corpus Christi has no agreements with any agency in the County relating to drainage, stormwater or flooding. In addition, Naval Air Station Corpus Christi has indicated that it intends to obtain its own permit under the current federal regulations, separate and apart from the actions of any other governmental entities.

1.7 NUECES RIVER AUTHORITY

The Nueces River Authority was created by special legislation under Article XVI, Section 59 of the Texas Constitution. It has significant power to implement systems to handle drainage and floodwater problems, including construction, operation and maintenance of drainage systems, systems to control and divert floodwaters and systems to treat and purify run-off waters. The NRA has also been given power to finance such systems through issuance of bonds, collection of fees and levy of taxes. The NRA has authority to contract with any other governmental entity for provision of such systems and is also authorized to contract and cooperate with other entities located in the Nueces River basin to develop comprehensive water-use and protection systems. The

NRA also has limited authority to aid in financing water use, preservation and protection systems through short-term loans of State funds to local entities.

Shortcomings in the NRA's authority, for federal and state permit purposes, arise in the area of enforcement. The NRA has virtually no power to enforce any type of water use, control or treatment rules or regulations. Although the authority to sample and test drainage and floodwaters on a periodic basis may well be impliedly within the scope of the NRA's powers, such powers have not been specifically granted to the NRA. Further, any use of its powers to operate any drainage or floodwater collection, disposal or treatment systems on behalf of any other entity must be paid for with revenue received from system users, whether on the basis of fees or taxes. NRA funds cannot be devoted to such uses except in the form of loans to be repaid by the entity to which services are provided.

In addition, the NRA is required to study and monitor water quality in the Nueces River Basin under the provisions of Senate Bill 818, adding Section 26.0135 to the Water Code. Under this new statutory authority, the Nueces River Authority is required to conduct assessments of the water quality within the river basin on a continuing basis. The purpose of these assessments is to provide sufficient information to the Texas Water Commission and other governmental bodies to maintain and improve quality of water resources within the state.

The NRA may enter into cooperative agreements and contracts with local governments to develop regional assessments. The assessments are required to include a review of wastewater discharges, nonpoint source pollution, nutrient loading, toxic materials, biological health of aquatic life, public education and involvement in water quality issues, local and regional pollution prevention efforts and regulatory and enforcement issues. A copy of the assessment report must be submitted to the Texas Water Commission, the Governor and the Texas Parks and Wildlife Commission in even-numbered years.

Costs of developing the assessments are to be spread among the water users within the Nueces River Basin. Plans to recover such costs must be reviewed and approved by the Texas Water Commission. A copy of Senate Bill 818 which contains the new Section 26.0135 of the Texas Water Code is attached as Exhibit 10.

1.8 TEXAS DEPARTMENT OF TRANSPORTATION

The highway system included within the study area is a major contributor of stormwater runoff and associated nonpoint source pollutants, but the Texas Department of Transportation, formerly known as the Texas Department of Highways and Public Transportation, has little power to control or treat pollutant runoff. The only statute relating directly to the TDOT's authority to control or treat drainage or storm runoff located during the study empowers it to condemn land for drainage purposes and construct highways. (V.A.T.S. § 6674w-3). As a result, TDOT may acquire the necessary property required for drainage systems and construct drainage improvements related to its highway construction. The "treatment" of pollutant runoff would necessarily be limited to grass swells, detention ponds and other structural forms of treatment. TDOT does not have the legal authority to impose regulations prohibiting discharges into the system or operate any mechanical treatment facilities.

1.9 CITY OF CORPUS CHRISTI INDUSTRIAL DISTRICTS

The City of Corpus Christi has designated certain areas adjacent to its city limits and within its extraterritorial jurisdiction as industrial districts. These "districts" are actually comprised of specific properties for which the land owner has entered into an Industrial District Agreement with the City providing for the following: That the property will not be annexed into the city limits for the next seven (7) years; that the land owner will make certain payments in lieu of taxes to the City; and that certain minimal City regulations will be enforced on the property and others will not. These industrial districts do not constitute a "governmental entity" for the purposes of this study, but such areas should be considered as part of the Regional Stormwater Master Plan. Future modifications to the agreements may be necessary to specifically provide for the enforcement of stormwater regulations developed by the City.

EXHIBITS

EXHIBIT 2

WATER CONTROL AND IMPROVEMENT DISTRICTS (WCID's)

There are currently three (3) WCID's located within Nueces County. All three of these WCID's were created under Art. XVI, § 59 of the Texas Constitution. The powers of these three WCID's are limited to provision of fresh water supplies and, in the case of WCID No. 4, provision of sanitary sewers. Although none of Nueces County's WCID's have jurisdiction over drainage or floodwaters, WCID's can be authorized to exercise certain powers with regard to drainage and flood control. Generally, WCID's can be created and vested with authority to:

Powers :	**Statutory Reference** :
o Construct and maintain canals, drains, ditches and levies; and acquire rights-of-way;	TEX. WATER CODE CHAPTER 56
o Construct works and improvements necessary to prevent floods; drain land (including construction of ditches and other facilities);	TEX. WATER CODE § 51.125
o Construct works and improvements and adopt regulations necessary to preserve the sanitary condition of water controlled by the district;	TEX. WATER CODE § 51.127 & § 51.331
o Construct works and improvements and adopt regulations necessary to prevent waste or unauthorized use of water;	TEX. WATER CODE § 51.127 & § 51.331
o Construct works and improvements necessary to gather, conduct, divert and control local storm water;	TEX. WATER CODE § 51.331
o Construct works and improvements necessary to process water to restore purity and sanitary condition;	TEX. WATER CODE § 51.331
o Cooperate in regional water quality assessment.	TEX. WATER CODE § 26.0135

Financial :

o	Borrow funds to pay maintenance and operating expense	TEX. WATER CODE § 51.126
o	Issue bonds	TEX. CONST. ART. XVI, § 59 TEX. WATER CODE § 51.337
o	Levy tax	TEX. WATER CODE § 51.339
o	Charge fees for services	TEX. WATER CODE § 51.338

Enforcement :

o	Set penalties for breach of regulations	TEX. WATER CODE § 51.131
o	Hire peace officers with powers to make arrests to prevent or abate violations of law or district regulations make arrests in case of injuries to persons or damage to property of the district.	TEX. WATER CODE § 51.132

Entity:	Nueces County W.C.I.D. No. 3
Address:	Box 1147 Robstown, Texas 78380
Telephone:	387-4549
Administrative Control:	Jaro R. Blahuta, Jr. Manager
Authority and Features:	Created September 13, 1920, by the Nueces County Commissioners Special Special Court, presumptively under Article XVI, Section 59, of the Texas Constitution. The district levies no taxes, provides no sewer service, and has no outstanding bonded indebtedness. It sells irrigable and domestic waters.

Entity:	Nueces County W.C.I.D. No. 4
Address:	Box 128 Port Aransas, Texas 78373
Telephone:	749-5201
Administrative Control:	Nona Sherills Manager
Authority and Special Features:	Created in 1952 by the Nueces County Commissioners Court under Article XVI, Section 59, of the Texas Constitution. The district has been vested with tax and debt powers under Chapter 51 of the Texas Water Code; specially charged with providing sanitary sewer services and a fresh water supply.

Entity:	Nueces County W.C.I.D. No. 5
Address:	Box 157 Banquette, Texas 78339
Telephone:	387-7612
Administrative Control:	Antonio Lopez, President
Authority and Special Features:	Created November 28, 1955, by the Nueces County Commissioners Court under Article XVI, Section 59, of the Texas Constitution. The district is specially charged with acquiring all works necessary to deliver an adequate supply of fresh water to its service area.

NOTE: Districts Nos. 1 and 2 no longer exist.

Exhibit 3

NUECES COUNTY DRAINAGE AND CONSERVATION DISTRICTS

Drainage districts operate generally under Chapter 56 of the Water Code. Nueces County Drainage and Conservation Districts No. 2 and No. 3 are also authorized to utilize all general law WCID powers in achieving their purposes. District No. 2 provides drainage for the Robstown area, and District No. 3 serves the Bishop area.

Powers:		Statutory Reference:
o	Construct and maintain canals, drains, ditches and levies; and acquire rights-of-way;	TEX. WATER CODE CHAPTER 56
o	Construct works and improvements necessary to prevent floods; drain land (including construction of ditches and other facilities);	TEX. WATER CODE § 51.125
o	Construct works and improvements and adopt regulations necessary to preserve the sanitary condition of water controlled by the district;	TEX. WATER CODE § 51.127 & § 51.331
o	Construct works and improvements and adopt regulations necessary to prevent waste or unauthorized use of water;	TEX. WATER CODE § 51.125, § 51.129 & § 51.331
o	Construct works and improvements necessary to gather, conduct, divert and control local storm water;	TEX. WATER CODE § 51.331
o	Construct works and improvements necessary to process water to restore purity and sanitary condition;	TEX. WATER CODE § 51.331
o	Cooperate in regional water quality assessment.	TEX. WATER CODE § 26.0135
Financial:		
o	Borrow funds to pay maintenance and operating expense	TEX. WATER CODE § 51.126
o	Issue bonds	TEX CONST. ART. XVI, § 59; TEX. WATER CODE § 51.337
o	Levy taxes	TEX. WATER CODE § 51.339
o	Charge fees for services	TEX. WATER CODE § 51.338

Enforcement:

o	Set penalties for breach of regulations;	TEX. WATER CODE § 51.131,
o	Hire peace officers with powers to make arrests to prevent or abate violations of law or district regulations	TEX. WATER CODE § 51.132

Entity: Nueces County Drainage and Conservation District No. 2

Address: Box 209
Robstown, Texas 78380

Telephone: 387-4015

Administrative Control: Mr. Luis Chavarria, Chairman

Authority and Special Features: The district was chartered by the Texas Legislature in 1915 "for the sole purpose of reclamation and drainage of its overflowed lands and other lands needing drainage." The District may use all general law W.C.I.D. powers in attaining this purpose.

Entity: Nueces County Drainage and Conservation District No. 3

Address: Box 664A
Bishop, Texas 78343

Telephone: 584-3036

Administrative Control: Mr. Dewey S. Lawton, Chairman

Authority and Special Features: The district was chartered by the Texas Legislature in 1927 to control storm and flood waters of rivers and streams and to reclaim and drain overflowed land. The District may use all general law W.C.I.D. powers in attaining this purpose.

Exhibit 4

NUECES-JIM WELLS-KLEBERG-KENEDY
SOIL AND WATER CONSERVATION DISTRICT NO. 311

Soil and water conservation districts are governed by the provisions of TEXAS AGRICULTURE CODE CHAPTER 201. S.W.C.D.'s were created upon petition and election. S.W.C.D.'s have no taxing authority. Any debt incurred must be repaid from current funds or reasonably contemplated revenues and must be secured by a lien on the property improved with the borrowed funds. Although created under state statutes, the Nueces-Jim Wells-Kleberg-Kenedy Soil and Water Conservation District No. 311 operates under contract with the federal government to aid in prevention of soil erosion.

	Powers:	**Statutory Reference**:
o	Carry out preventive and control measures on state lands and other lands with the consent of the occupier.	AGRICULTURE CODE § 201.102
o	Cooperate with other agencies in erosion control efforts.	AGRICULTURE CODE § 201.103
o	Construct, improve and maintain necessary structures; develop and publish comprehensive plans for conservation purposes.	AGRICULTURE CODE § 201.106 § 201.107
o	Upon approval of 90% of the landowners voting, establish land use regulations to prevent soil erosion.	AGRICULTURE CODE § 201.123
o	Cooperate in regional water quality assessment.	TEX. WATER CODE § 26.0135

Entity:	Nueces-Jim Wells-Kleberg-Kenedy Soil and Water Conservation District No. 311
Address:	710 E. Main Robstown, Texas 78380
Telephone:	387-4116
Administrative Control:	Edward Schubert, Chairman
Authority and Special Features:	Chartered March 20, 1941, by the Secretary of State.

Exhibit 5

PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY, TEXAS

Navigation districts are governed by Chapters 60-63 of the Water Code; districts created under Article XVI, Section 59 are specially covered in Chapter 62. The Port of Corpus Christi, Authority of Nueces County, Texas, is a Chapter 62 district. The Port Authority also has all the powers of a major landowner in the Port area.

Powers:		Statutory Reference:
	Annex territory;	TEX. WATER CODE § 62.291, et seq.
o	Improve, preserve and conserve coastal waters for navigation;	TEX. WATER CODE § 62.101, et seq.
o	Control and distribute storm and flood-waters in aid of navigation.	TEX. WATER CODE § 62.101, et seq.
Financial:		
o	Issue bonds and levy taxes	TEX. WATER CODE § 62.191, et seq. and § 62.291, et seq.
Intergovernmental:		
o	Contract with other governmental entities for operation of part of the district's water system.	TEX. WATER CODE § 62.120
o	Cooperate in regional water quality assessment.	TEX. WATER CODE § 26.0135

Entity: Port of Corpus Christi Authority of Nueces County, Texas (Nueces County Navigation District No. 1)

Address: Box 1541
Corpus Christi, Texas 78403

Telephone: 882-5633

Administrative Control: Harry Plomarity
Executive Director

Authority and Special Features: Created November 13, 1922, by the Nueces County Commissioners Court, under Article XVI, Section 59, of the Texas Constitution.

Exhibit 6

INCORPORATED MUNICIPALITIES

All municipalities have some statutory authority to construct and operate stormwater collection and treatment facilities, although planning and enforcement tools available to home rule cities are more extensive than those of cities deriving their powers from general law.

		Statutory Reference:
General Powers:		
o	Construct and operate stormwater collection and treatment system.	LOCAL GOV'T CODE CHAPTER 402
Financial:		
o	Establish user fees and assessments.	TEX. WATER CODE § 26.176, LOCAL GOV'T CODE § 402.047
o	Tax for waterworks, sewers and other public improvements.	TEX. TAX CODE CHAPTER 301
o	Issue tax supported and revenue bonds for water treatment purposes.	TEX. REV. CIV. STAT. ARTS. 823 & 1111; TEX. CONST. ART. XI, § 4-7
o	Acquire property by gift, purchase or condemnation, jointly or otherwise.	LOCAL GOV'T CODE CHAPS. 251 & 273
Regulatory:		
o	Enact zoning regulations to promote health and the general welfare.	LOCAL GOV'T CODE CHAP. 211
o	Adopt and enforce local subdivision regulations, including extraterritorial jurisdiction (ETJ).	LOCAL GOV'T CODE CHAP. 212
o	Prohibit pollution of any stream constituting water supply.	TEX. WATER CODE § 26.177
o	Sue for discharge violations.	TEX. WATER CODE CHAP. 26 (Home rule cities only)
o	Annexation within ETJ and along navigable streams.	LOCAL GOV'T CODE CHAP. 43

Intergovernmental:

o	Cooperate with other governments to promote public health and water quality management.	LOCAL GOVERNMENT CODE CHAP. 391, TEX. WATER CODE § 26.175
o	Intergovernmental contracting.	TEX. GOV'T CODE CHAP. 791
o	Cooperate in regional water quality assessment.	TEX. WATER CODE § 26.0135

Entity: City of Robstown

Address: 480 E. Main
Robstown, Texas 78380

Administrative Control: The Honorable Julio Garcia, Jr.
Mayor

Authority and Special Features: Robstown is a home rule city.

Entity: City of Port Aransas

Address: 710 W. Avenue A
Port Aransas, Texas 78373

Administrative Control: The Honorable J. C. Barr,
Mayor

Authority: Port Aransas is a home rule city.

Entity: City of Petronila

Address: Rt. 3, Box 51
Robstown, Texas 78380

Administrative Control: The Honorable Bill J. Ordner,
Mayor

Authority: Petronila is a general law city.

Exhibit 7

NAVAL AIR STATION CORPUS CHRISTI

The Naval Air Station Corpus Christi is a naval facility operated by the federal government. It owns a significant amount of property within the County, over which it has all authority granted to a land owner. None of the other governmental agencies operating within the County have any authority over Naval Air Station Corpus Christi since it is a federal installation. It has no agreements with any agency in the County relating to drainage, stormwater or flooding.

Exhibit 8

NUECES RIVER AUTHORITY

The Nueces River Authority was created by the Texas Legislature for the purpose of conserving natural resources in the Nueces River Basin. The Authority's boundaries include all of Nueces County. Its purposes include provision of facilities to transport, treat and dispose of waste water including storm water.

Powers:	Statutory Reference:
o Maintain and enhance water quality in the Nueces River Basin.	CHARTER § 1.01
o Provide systems and facilities to transport,- treat and dispose of waste.	CHARTER § 1.01
o NRA may contract with public agency inside or outside its boundaries. NRA may acquire, construct, improve, enlarge, extend, repair, operate and maintain a stormwater disposal system.	TEX. WATER CODE § 30.021 & § 30.025
o Public agency may contract with the NRA for provision of waste disposal and treatment system.	TEX. WATER CODE § 30.103(a)
o NRA may purchase, lease or condemn property necessary to perform its functions.	TEX. WATER CODE § 30.033 and CHARTER § 3.02 (a)
o Control and coordinate water use in the Nueces River Basin as a unit	CHARTER § 3.02 (a)
o Control, transport and treat storm and flood waters	CHARTER § 3.02 (b)(3)
o Develop a drainage system for land in the valleys of the Nueces River	TEX. WATER CODE CHS. 11 AND 12

Financial:

o	Issue bonds	CHARTER §§ 5.01, 5.04, TEX. WATER CODE § 30.051
o	Levy taxes	CHARTER §§ 5.01, 5.04
o	Obtain short-term (3 yr.) loans from Texas Water Commission	TEX. WATER CODE § 26.036
o	Charge fees for transmission and treatment of water	CHARTER § 3.09

Intergovernmental:

o	Contract for transmission and treatment of water	CHARTER § 3.09
o	Contract for development of basin-wide water control plans	TEX. WATER CODE § 30.026 & § 30.103(a)
o	Cooperate to prevent and control water pollution	TEX. WATER CODE § 30.002
o	Cooperate in regional water quality assessment	TEX. WATER CODE § 26.0135

Entity:	Nueces River Authority
Address:	P. O. Box 349 Uvalde, Texas 78802-0349
Administrative Control:	Mr. Con Mims Executive Director
Authority and Special Feature:	Created under Article XVI, Section 59 of the Texas Constitution to develop and conserve natural resources in the Nueces River Basin.

Exhibit 9

TEXAS DEPARTMENT OF TRANSPORTATION

The Texas Department of Transportation's powers are generally set forth in Tex. Rev. Civ. Stat. § 6674 et. seq. The Department has very limited powers to control or drainage or floodwaters. Its powers in this regard appear to be limited to condemnation of land for highway purposes and any drainage control projects made necessary by such purposes.

Powers:	**Statutory Reference**:
o Acquire, purchase and condemn land for highway drainage purposes	TEX. REV. CIV. STAT. § 6674w-3

Entity:	Texas Department of Transportation
Address:	125 E. 11th Street Austin, Texas 78701-2483
Administrative Control:	Mr. Arnold Oliver State Engineer Director

Exhibit 10

CHAPTER 294

S.B. No. 818

AN ACT

relating to water quality and the establishment of water quality standards and the assessment and management of water quality and establishing the plumbing loan fund.

Be it enacted by the Legislature of the State of Texas:

SECTION 1. Subchapter B, Chapter 26, Water Code, is amended by adding Section 26.0135 to read as follows:

Sec. 26.0135. REGIONAL ASSESSMENT OF WATER QUALITY BY WATERSHED/RIVER BASIN. (a) The commission shall ensure the comprehensive regional assessment of water quality in each watershed and river basin of the state. In order to conserve public funds and avoid duplication of effort, river authorities shall, to the greatest extent possible and under the supervision of the commission, conduct regional assessments of their own watersheds. The commission, either directly or through cooperative agreements and contracts with local governments, shall conduct regional assessments of watersheds where a river authority is unable to perform an adequate assessment of its own watershed. The assessment must include a review of wastewater discharges, nonpoint source pollution, nutrient loading, toxic materials, biological health of aquatic life, public education and involvement in water quality issues, local and regional pollution prevention efforts, and other factors that affect water quality within the watershed. The assessment shall also review any significant regulatory or enforcement issues affecting the watershed. The assessment required by this section is a continuing duty, and the assessment shall be revised as necessary to show changes in the factors subject to assessment.

(b) In order to assist in the coordination and development of assessments and reports required by this section, a river authority shall organize and lead a basin-wide steering committee that includes representatives from all appropriate state agencies, political subdivisions, and other governmental bodies with an interest in water quality matters of the watershed or river basin. Each committee member shall help identify significant water quality issues within the basin and shall make available to the river authority all relevant water quality data held by the represented entities. A river authority shall also develop a public input process that provides for meaningful comments and review by private citizens and organizations on each regional assessment and report.

(c) The purpose of the assessment required by this section is not to mandate exhaustive and detailed water quality studies, but rather to identify significant issues affecting water quality within each watershed and river basin of the state and to provide sufficient information for the commission, river authorities, and other governmental bodies to take appropriate corrective action necessary to maintain and improve the quality of the state's water resources. The commission shall establish by rule the level of detail required for each watershed and river basin assessment.

(d) On or before October 1 of each even-numbered year, each river authority shall report in writing to the governor, commission, and Parks and Wildlife Department on the water quality assessment of the authority's watershed, including an identification of any significant regulatory or enforcement issues, and on any actions taken by the authority and other local governments to improve water quality within the authority's watershed. The assessment report must identify each legal, administrative, economic, or other impediment to further water quality efforts by the authority and local governments. The commission shall then prepare a report that summarizes each river authority's assessment report, describes the commission's regional water quality assessment efforts, and lists the commission's past and proposed actions for improving water quality within the watersheds subject to such assessments. The commission shall submit its report, along with the commission's comments and recommendations on regional water quality management, to the governor, the lieutenant governor, and the speaker of the house of representatives on or before December 1 of each even-numbered year.

CHAPTER 294

S.B. No. 818

AN ACT

relating to water quality and the establishment of water quality standards and the assessment and management of water quality and establishing the plumbing loan fund.

Be it enacted by the Legislature of the State of Texas:

SECTION 1. Subchapter B, Chapter 26, Water Code, is amended by adding Section 26.0135 to read as follows:

Sec. 26.0135. REGIONAL ASSESSMENT OF WATER QUALITY BY WATERSHED/RIVER BASIN. (a) The commission shall ensure the comprehensive regional assessment of water quality in each watershed and river basin of the state. In order to conserve public funds and avoid duplication of effort, river authorities shall, to the greatest extent possible and under the supervision of the commission, conduct regional assessments of their own watersheds. The commission, either directly or through cooperative agreements and contracts with local governments, shall conduct regional assessments of watersheds where a river authority is unable to perform an adequate assessment of its own watershed. The assessment must include a review of wastewater discharges, nonpoint source pollution, nutrient loading, toxic materials, biological health of aquatic life, public education and involvement in water quality issues, local and regional pollution prevention efforts, and other factors that affect water quality within the watershed. The assessment shall also review any significant regulatory or enforcement issues affecting the watershed. The assessment required by this section is a continuing duty, and the assessment shall be revised as necessary to show changes in the factors subject to assessment.

(b) In order to assist in the coordination and development of assessments and reports required by this section, a river authority shall organize and lead a basin-wide steering committee that includes representatives from all appropriate state agencies, political subdivisions, and other governmental bodies with an interest in water quality matters of the watershed or river basin. Each committee member shall help identify significant water quality issues within the basin and shall make available to the river authority all relevant water quality data held by the represented entities. A river authority shall also develop a public input process that provides for meaningful comments and review by private citizens and organizations on each regional assessment and report.

(c) The purpose of the assessment required by this section is not to mandate exhaustive and detailed water quality studies, but rather to identify significant issues affecting water quality within each watershed and river basin of the state and to provide sufficient information for the commission, river authorities, and other governmental bodies to take appropriate corrective action necessary to maintain and improve the quality of the state's water resources. The commission shall establish by rule the level of detail required for each watershed and river basin assessment.

(d) On or before October 1 of each even-numbered year, each river authority shall report in writing to the governor, commission, and Parks and Wildlife Department on the water quality assessment of the authority's watershed, including an identification of any significant regulatory or enforcement issues, and on any actions taken by the authority and other local governments to improve water quality within the authority's watershed. The assessment report must identify each legal, administrative, economic, or other impediment to further water quality efforts by the authority and local governments. The commission shall then prepare a report that summarizes each river authority's assessment report, describes the commission's regional water quality assessment efforts, and lists the commission's past and proposed actions for improving water quality within the watersheds subject to such assessments. The commission shall submit its report, along with the commission's comments and recommendations on regional water quality management, to the governor, the lieutenant governor, and the speaker of the house of representatives on or before December 1 of each even-numbered year.

(e) Each local government within the watershed of a river authority shall cooperate in making the assessment under Subsection (a) of this section and in preparing the report by providing to the river authority all information available to the local government about water quality within the jurisdiction of the local government, including the extraterritorial jurisdiction of a municipality. Nothing in this section shall be construed to limit or increase the authority or obligations of a municipality in regard to water pollution control and abatement programs described by Section 26.177 of this code.

(f) If more than one river authority is located in a watershed, all river authorities within the watershed shall cooperate in making the assessments and preparing the reports.

(g) For purposes of this section, solid waste and solid waste management shall have the same meaning as in Chapter 361, Health and Safety Code. Each river authority and local government is authorized and encouraged, but not required, to manage solid waste and to facilitate and promote programs for the collection and disposal of household consumer and agricultural products which contain hazardous constituents or hazardous substances and which, when disposed of improperly, represent a threat of contamination to the water resources of the state. Such programs may include the establishment of a permanent collection site, mobile collection sites, periodic collection events, or other methods which a river authority or local government may deem effective.

(h) The Texas Water Commission shall apportion, assess, and recover the reasonable costs of administering water quality management programs under this section from all users of water and wastewater permit holders in the watershed according to the records of the commission generally in proportion to their right, through permit or contract, to use water from and discharge wastewater in the watershed. The cost to river authorities and others to conduct regional water quality assessment shall be subject to prior review and approval by the commission as to methods of allocation and total amount to be recovered. The commission shall adopt rules to supervise and implement the water quality assessment and associated costs. The rules shall ensure that water users and wastewater dischargers do not pay excessive amounts, that a river authority may recover no more than the actual costs of administering the water quality management programs called for in this section, and that no municipality shall be assessed cost for any efforts that duplicate water quality management activities described in Section 26.177 of this chapter.

(i) In this section, "river authority" means:

(1) a river authority as defined by Section 30.003 of this code that includes 10 or more counties; and

(2) any other river authority or special district created under Article III, Section 52, Subsection (b)(1) or (2), or Article XVI, Section 59, of the Texas Constitution that is designated by rule of the commission to comply with this section.

SECTION 2. Subchapter B, Chapter 26, Water Code, is amended by adding Section 26.0136 to read as follows:

Sec. 26.0136. REGIONAL WATER QUALITY IMPLEMENTATION. The commission is the agency with primary responsibility for implementation of regional water quality management functions, including enforcement actions, within the state. The commission by rule shall coordinate the water quality responsibilities of river authorities within each watershed and shall, where appropriate, delegate water quality functions to local governments under Section 26.175 of this code. Nothing in this section is intended to enlarge, diminish, or supersede the water quality powers, including enforcement authority, authorized by law for river authorities, the State Soil and Water Conservation Board, and local governments. For purposes of this section, river authority shall have the same meaning as that contained in Section 26.0135(i) of this code.

SECTION 3. Section 26.023, Water Code, is amended to read as follows:

Sec. 26.023. WATER QUALITY STANDARDS. The commission by rule shall set water quality standards for the water in the state and may amend the standards from time to time. The commission has the sole and exclusive authority to set water quality standards for all water in the state. *The commission shall consider the existence and effects of nonpoint source pollution, toxic materials, and nutrient loading in developing water quality standards and related waste load models for water quality.*

SECTION 4. Subchapter B, Chapter 26, Water Code, is amended by adding Section 26.0285 to read as follows:

Sec. 26.0285. EXPIRATION OF PERMITS WITHIN SAME WATERSHED. The commission shall, to the greatest extent practicable, require that all permits for the discharge of waste within a single watershed or within a region of a single watershed contain the same expiration date. The commission shall adopt and implement procedures for the simultaneous review and renewal of all those permits within a watershed or region of a watershed. The purpose of the review is to require comprehensive evaluation of the combined effects of permitted discharges on water quality within the watershed and to facilitate the receipt of information from the public and other entities affected by those discharges.

SECTION 5. Subchapter E, Chapter 26, Water Code, is amended by adding Section 26.178 to read as follows:

Sec. 26.178. FINANCIAL ASSISTANCE DEPENDENT ON WATER QUALITY PROGRAMS. All financial assistance from the board to a city having a population of 5,000 or more inhabitants shall be conditioned on the city submitting to the commission for review and in accordance with rules and submission schedules promulgated by the commission a water pollution control and abatement program as required by Section 26.177 of this code. The board may award grants from the research and planning fund of the water assistance fund to river authorities seeking such funds for purposes of performing regional water quality assessments described in Section 26.0135 of this code.

SECTION 6. Chapter 15, Water Code, is amended by adding Subchapter L to read as follows:

SUBCHAPTER L. PLUMBING IMPROVEMENT LOANS

Sec. 15.731. DEFINITIONS. In this subchapter:

(1) "Fund" means the plumbing loan fund.

(2) "Plumbing assistance loan" means a loan provided by the board to a political subdivision for the political subdivision's plumbing improvement loan program.

(3) "Plumbing improvement loan" means a loan provided by a political subdivision to an individual under this subchapter.

(4) "Political subdivision" means a county, a municipality, a nonprofit member-owned, member-controlled water supply corporation organized and operating under Chapter 76, Acts of the 43rd Legislature, 1st Called Session, 1933 (Article 1434a, Vernon's Texas Civil Statutes), or a district or authority created and operating under Article III, Section 52, or Article XVI, Section 59, of the Texas Constitution.

(5) "Water conservation" has the meaning assigned by Section 17.921 of this code.

Sec. 15.732. PLUMBING LOAN FUND. (a) The plumbing loan fund is created.

(b) The fund is held separately from other funds outside the state treasury. The board shall keep and maintain the fund and any accounts established in the fund.

(c) At the direction of the board, the fund or accounts in the fund may be kept and held in escrow and in trust by the state treasurer for and on behalf of the board. If the fund or accounts in the fund are held in escrow and in trust by the state treasurer, the fund or accounts may be used only as provided by this subchapter and, pending their use, shall be invested in authorized investments as provided by any order, resolution, or rule of the board.

(d) Legal title to money and investments in the fund is in the board unless or until paid out as provided by this subchapter or rules of the board.

(e) The state treasurer, as custodian, shall administer the funds strictly and solely as provided by this subchapter and in the orders, resolutions, and rules of the board, and the state shall take no action with respect to the fund other than that specified in this subchapter, an agreement made with the Environmental Protection Agency or another federal agency, applicable federal requirements, and the rules of the board.

Sec. 15.733. ADMINISTRATION AND OPERATION OF FUND. (a) The board shall administer the fund in accordance with state law, rules of the board, and any federal requirements imposed because of a grant of money to the fund by an agency of the federal government.

(b) The board may execute agreements with the Environmental Protection Agency or any other federal agency to establish and administer the fund and may discharge the duties and responsibilities required for the administration of the fund.

(c) The fund consists of money derived from federal grants, from earnings on the investment of money credited to the fund, and, at the board's discretion, from any other available source.

(d) The board shall deposit money received for repayment of a plumbing assistance loan made to a political subdivision in the fund.

(e) At the direction of the governor, any money in the fund may be transferred to the state water pollution control revolving fund under Subchapter J of this chapter.

(f) The fund remains available in perpetuity for providing loans under this subchapter, except to the extent that the fund may be reduced or eliminated as provided by this subchapter.

Sec. 15.734. USE OF FUND. The board may use money in the fund, unless prohibited by an agreement made with a federal agency under this subchapter, to:

(1) make a plumbing assistance loan;

(2) administer the fund; and

(3) grant or lend money to a political subdivision to defray the political subdivision's expenses incurred in administering a plumbing improvement loan program.

Sec. 15.735. APPLICATION SUBMISSION AND APPROVAL. (a) A political subdivision located in the county of Brewster, Cameron, El Paso, Hidalgo, Hudspeth, Maverick, Presidio, Starr, Terrell, Val Verde, Webb, or Zapata in which residences do not have water or wastewater facilities that meet minimum standards established by the Texas Department of Health or the Texas Water Commission or in any other area designated by federal law to benefit from the fund may submit to the board an application for a plumbing assistance loan in accordance with rules adopted by the board. The application must include:

(1) the legal name of the political subdivision and a citation to the law under which it operates and was created;

(2) a description of the water conservation methods to be used in the provision of water and wastewater service in the area the political subdivision proposes to affect by its plumbing improvement loan program;

(3) a map showing the location of the area the political subdivision proposes to affect by its plumbing improvement loan program;

(4) a description of the subdivision's proposed plumbing improvement loan program; and

(5) other information as required by board rule.

(b) The board may approve a plumbing assistance loan to a political subdivision only if the political subdivision is in a county that has adopted the model rules developed under Section 16.343 of this code. The board may approve a plumbing assistance loan to a municipality only if the municipality has adopted the model rules developed under Section 16.343 of this code.

(c) The board may approve a plumbing assistance loan to a political subdivision only if the political subdivision is, or is in an area within the jurisdiction of, an authorized agent of the Texas Department of Health under Subchapter C, Chapter 366, Health and Safety Code.

(d) The board may not approve an application for a plumbing assistance loan to a political subdivision unless the board finds that the political subdivision is financially capable of managing a plumbing improvement loan program and that the public interest will be served by the plumbing assistance loan.

(e) The board shall set interest rates to be charged to political subdivisions on plumbing assistance loans.

Sec. 15.736. POLITICAL SUBDIVISION PLUMBING IMPROVEMENT LOAN PROGRAM ADMINISTRATION; PLUMBING ASSISTANCE LOAN REPAYMENT. (a) A political subdivision that receives a plumbing assistance loan shall establish and administer a program to make plumbing improvement loans to individuals at an interest rate lower than the current market rate, including charging no interest.

(b) A political subdivision may use the proceeds from a plumbing assistance loan to make a plumbing improvement loan to be used to pay:

(1) costs to connect a residence to a water distribution system;

(2) costs to provide yard service connections;

(3) costs to provide a residence with indoor plumbing facilities and fixtures;

(4) costs of connecting a residence to a sewer collection system or of providing a residence with a suitable on-site wastewater disposal system for the residence to meet applicable county or municipal code requirements;

(5) costs of building improvements or correction of building deficiencies necessary to allow plumbing to be installed in a residence;

(6) necessary connection fees and permit fees; or

(7) necessary costs of design related to plumbing improvements.

(c) The political subdivision shall repay its plumbing assistance loan from the money it receives as repayment of plumbing improvement loans it has made. To the extent the political subdivision is unable to collect the payments on its plumbing improvement loans made from the proceeds of a plumbing assistance loan, the political subdivision is not obligated to repay a plumbing assistance loan.

(d) A political subdivision shall use all reasonable means to collect payments on plumbing improvement loans. The board may bring a mandamus action in a district court in Travis County or may use any other legal means to compel a political subdivision to take action to collect plumbing improvement loan payments.

Sec. 15.737. RULES. The board may adopt rules necessary to carry out this subchapter.

SECTION 7. The Texas Water Commission and Texas Water Development Board shall adopt rules within 180 days after the effective date of this Act to carry out the water quality protection purposes required of those agencies by this Act.

SECTION 8. This Act shall be known as the Texas Clean Rivers Act.

SECTION 9. The importance of this legislation and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house be suspended, and this rule is hereby suspended, and that this Act take effect and be in force from and after its passage, and it is so enacted.

Passed the Senate on May 14, 1991: Yeas 31, Nays 0; the Senate concurred in House amendments on May 27, 1991: Yeas 31, Nays 0; passed the House, with amendments, on May 25, 1991: Yeas 106, Nays 24, one present not voting.

Approved June 7, 1991.

Effective June 7, 1991.

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1.0 INTRODUCTION

The initial requirement of this task is compilation and review of existing interjurisdictional agreements, administrative agreements and license agreements pertaining to the construction, operation and maintenance of the drainage and storm sewer system located within the study area. Additionally, this task specifies a presentation of recommendations for interjurisdictional coordination.

Other than the contracts among the STWA and the City of Corpus Christi and Nueces County, no interjurisdictional, administrative or license agreements were located during the course of the study. The STWA has an agreement with the City of Corpus Christi dated October 14, 1980 which provides that the STWA will not sell water to any user within the City's extraterritorial jurisdiction without the written authority of the City of Corpus Christi. The purpose of this contract is primarily to ensure compliance with the City's platting ordinance. In addition, the SWTA has an agreement dated April 17, 1984 with Nueces County wherein the STWA agrees not to sell water for residential use unless the subdivision has been platted and the plat approved in accordance with County rules and regulations as well as the County's Flood Damage Prevention Ordinance.

There is significant opportunity for additional interjurisdictional coordination of drainage system management as well as construction, operation and maintenance which would allow increased efficiency and decreased costs associated with meeting the proposed state and current regulatory requirements on an area-wide basis, as further discussed below.

1.1 MECHANISMS FOR COOPERATION

The Texas Interlocal Cooperation Act, found in Chapter 791 of the Texas Government Code, allows local governmental entities to enter into cooperative agreements to provide for governmental functions which all of the contracting entities possess the legal authority to perform. (A copy of the Act is attached as Appendix A.) One governmental entity may not extend its powers into the adjacent jurisdiction of another governmental entity unless that entity possesses the same or similar powers. If both entities, however, have the same authority to regulate, they may mutually agree upon the regulations to be adopted. The rules, regulations and ordinances of one of the entities may then be applied in the other jurisdiction, and the personnel of one entity may exercise enforcement powers in the other jurisdiction. Under the Act, the term of the agreement may not extend beyond one year, but typically these agreements are renewed automatically on an annual basis absent notice to terminate.

Newly enacted Texas Water Code § 26.0135 also mandates cooperation by all local governments with either the NRA or STWA in development of continuing regional water quality assessments. Local governments may also be required to aid in funding the costs of such assessments according to a plan to be developed by the NRA and approved by the Texas Water Commission. By empowering one agency to coordinate water quality assessment studies within a watershed, Section 26.0135 should result in overall cost savings for all entities involved in such a study. A regional assessment is also more likely to pinpoint areas for cooperative agreements regarding drainage and stormwater collection than individual studies by a variety of governmental entities within the same watershed.

Section 26.175 of the Texas Water Code similarly provides authority for local governmental entities to execute cooperative agreements with the Texas Water Commission or among each other. (A copy of Section 26.175 is attached as Appendix B.) This provision additionally provides that the Texas Water Commission may assign and delegate to a local government the exercise of some of the management, inspection, and enforcement functions vested in the Texas Water Commission. Such a delegation of authority, however, may be rescinded or modified unilaterally by the Commission at any time during the contract.

1.2 COORDINATION BETWEEN NUECES COUNTY AND THE CITY OF CORPUS CHRISTI

1.2.1 CONSTRUCTION AND MAINTENANCE

Nueces County and the City have the legal authority to cooperate in construction of drainage facilities pursuant to Section 26.175 of the Texas Water Code and the Interlocal Cooperation Act. Participation by the County, however, may be limited to its authority to provide "flood control" under Chapters 411 and 412 of the Texas Local Government Code. The County lacks specific statutory authority to construct any facilities that might be necessary for treatment of stormwater unless they are at least indirectly related to flood control. The practical effect, if any, of such statutory limitation would depend upon the nature of the actual construction projects contemplated.

Maintenance of the stormwater system could also be conducted jointly by the County and the City pursuant to an Interlocal Cooperation Agreement. Both governmental entities possess authority to maintain the public ways and easements and expend general revenue for public health and sanitation. The County, however, does not possess the authority to raise funds for this purpose through a drainage system as provided for cities in Chapter 402 of the Local Government Code. As a result, its ability to raise revenues for this purpose would largely be limited to available general funds derived from ad valorem taxation.

1.2.2 REGULATION AND MONITORING

There are generally two areas which create possibilities for coordination of drainage and storm water management between Nueces County and the City of Corpus Christi. The first area involves inspection and monitoring of discharges and the second area involves enforcement of discharge rules and regulations. Simplification of both monitoring and inspection as well as enforcement efforts could be accomplished if the basic regulatory provisions of both the City and County were complimentary. The following discussion addresses existing and recommended authority which would enable the City and County to adopt such complimentary regulations.

Nueces County currently has statutory authority to prohibit any act which would endanger the public health, safety and welfare under pursuant to Chapter 121 of the Texas Health & Safety Code. The existing statutes do not, however, allow the County to regulate all discharges into drainage and storm sewer systems, whether or not such systems are owned by the County. In order to regulate all manner of discharge into drainage and storm sewer systems, whether public or private, on a broader basis, legislation at the state level would be required. Suggested statutory language granting such authority to counties is attached as Exhibit 5 to Task III.A.

Authority to prohibit discharge of water pollutants is presently vested in the City of Corpus Christi under provisions of the Local Government Code and Water Code. The City has enacted ordinances which exercise such authority, although possibly not to the extent required for federal permit purposes as discussed in connection with Task III.A. Task III.A. recommends adoption of ordinances to supplement Corpus Christi's existing discharge ordinances, § 23-64 and § 55-141 (a), (h), (l) and (m), to specifically prohibit discharges deemed to be illicit under the NPDES regulations.

With proper statutory authorization, the County could adopt discharge regulations which track the language of the City's ordinances in order to form the regulatory basis for coordination efforts between the City and County. Once the appropriate regulatory authority has been adopted, (contingent upon proper statutory authority), the City and County could cooperate in regulatory management through adoption of complimentary monitoring, inspection and enforcement procedures.

The County and City both presently have authority to enter property and make inspections and investigations relating to water quality under § 26.173 of the Water Code. The City has additional authority to monitor and inspect discharges under § 26.177 of the Water Code. For example, the City has adopted § 55-145 (d) (2) within its pre-treatment ordinance allowing such activities in connection with sanitary sewage operations as authorized under the statutes cited above:

> *The city shall inspect the facilities of any user to ascertain whether the requirements of this article are being met. Owners, occupants and/or users of premises where wastewater is created or discharged shall allow the city or its representatives ready access at all reasonable times to all parts of the premises for the purposes of inspection, sampling, records examination or copying or in the performance of any of their duties. The city, the EPA and/or appropriate state agencies shall have the right to set up on the user's property such devices as are necessary to conduct sampling, inspection, compliance, monitoring and/or metering operations. Where a user has security measures in force which would require proper identification and clearance before entry into the premises, the user shall make necessary arrangements with its security guards so that upon presentation of suitable identification, personnel from the said entities shall be permitted to enter, without delay, for the purposes of performing their specific responsibilities.*

A similar regulation could be enacted by the City for stormwater regulation, and it could also be adopted by the County, if the proposed enabling legislation were passed at the State level. Adoption of such a regulation by the City and County would require modification of definitions and application directly to stormwater facilities, but the basic format would be the same.

1.2.3 ENFORCEMENT

State statutes currently impose criminal and civil sanctions for discharge violations. Under present law, a discharge violation under § 26.212 of the Water Code is considered a misdemeanor punishable by fines of not less than $10.00 per day nor more than $10,000 per day. Upon delegation of NPDES authority by EPA to the State, fines will be increased to up to $25,000 per day for certain violations. In addition, § 26.122 of the Water Code provides for civil penalties of $50.00 to $10,000 per day for discharge violations. Violations for private sewage facility orders adopted by a county are considered misdemeanors punishable by fines of $10.00 to $200.00 per day under § 26.214 of the Water Code.

Pursuant § 26.124 of the Water Code, the City and County are both authorized to enforce civil penalties imposed in § 26.122 of the Water Code upon approval of their governing bodies. The City has already taken this step through its Ordinance § 55-147 (e). The County Commissioners may wish to consider a similar authorization for the County.

Enforcement of criminal sanctions imposed under the Water Code is also presently available to both the City and County. No additional authorization to enforce such criminal sanctions is required under the law. It should be noted that the City's criminal ordinances provide for minimum fines of $100.00 per day for discharge violations, above the $10.00 minimum created under State statute.

1.2.4 CONCLUSION

Once appropriate authority is instilled in the County by State statute and County regulations, the City and County could contract with one another for performance of construction and maintenance, as well as management functions such as discharge monitoring, inspection and enforcement. Section 26.175 of the Texas Water Code and the Interlocal Cooperation Act allow execution of cooperative agreements for water quality management, inspection and enforcement and for transfer of money or property to pay for water quality management, inspection, enforcement, construction, ownership, purchase, maintenance, and operation of disposal systems. Through such use of cooperative agreements, City and County responsibilities could be delegated to one or the other of the entities, minimizing duplications of equipment purchases, personnel training and other management activities, resulting in cost savings to both entities.

1.3 COORDINATION WITH NUECES COUNTY DRAINAGE AND CONSERVATION DISTRICTS

The City of Corpus Christi and Nueces County may wish to consider entering into agreements with the Nueces County Drainage and Conservation Districts in order to establish mechanisms for dealing with drainage discharged into Nueces County's and the

City of Corpus Christi's drainage systems from the Drainage District. Such agreements could address the type, nature and amount of various stormwater constituents which can be discharged into the City and County systems by the Drainage Districts. They could also allocate treatment, operation, maintenance and capital expenditures for stormwater collection, transportation, storage and treatment between such entities in amounts proportionate to the cost of handling each entity's stormwater. Such agreements are authorized under Section 26.175 of the Texas Water Code and the Interlocal Cooperation Act as discussed above.

Moreover, the Drainage Districts would be in a position to contract for discharge monitoring, inspection and enforcement functions with other entities in the County. As discussed above in connection with the City and County, such cooperation might effectively reduce costs associated with these management functions by eliminating duplications of equipment purchases, training, and related management activities.

1.4 COORDINATION WITH PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY, TEXAS

Potential also exists for entering into an agreement with the Port Authority relating to discharge of Port Authority stormwater runoff into the City and County storm sewers systems, and vice versa. As in the case of the Drainage Districts, such an agreement would ideally address allocation of operation, maintenance and capital costs between the various entities receiving discharge from one another in proportion to the amount of runoff contributed to each of the other entity's storm sewer systems. Again, such agreements would be permissible under Section 26.175 of the Texas Water Code and the Interlocal Cooperation Act.

As noted above in Sections 1 and 2 there is also potential for cooperative monitoring, inspection and enforcement actions between the Port Authority, the City and the County.

1.5 COORDINATION WITH TEXAS DEPARTMENT OF TRANSPORTATION

The City and County may also wish to consider entering into agreements with the Texas Department of Transportation to facilitate diversion, transportation, storage and treatment of highway runoff. TDOT has very limited authority to deal with drainage and stormwater runoff issues. It does, however, have the authority to construct systems to divert highway drainage and to condemn land for drainage and stormwater runoff. Potential exists for using this land acquisition authority to implement passive water treatment activities on TDOT lands such as grass swells and retention ponds. While TDOT is primarily responsible for roadway construction it also has the responsibility to properly deal with the stormwater drainage and retention issues which are ancillary to such construction.

The City, County and TDOT could cooperate in development of consistent road, street and highway drainage standards and specifications. In addition, these entities could agree that, in the course of upgrading and expanding the State highway system, TDOT would exercise its power of eminent domain to acquire property needed to properly divert, store and treat highway runoff in accordance with the specifications and standards adopted by the County and City. TDOT could further agree to coordinate its highway construction and expansion projects with existing and planned drainage facility capabilities, to the extent practicable, in order to minimize the City and County's capital costs for additional storage or treatment facilities in the vicinity of such projects. The County and City then would be responsible for monitoring and enforcement of stormwater regulations since the TDOT, under present law, does not have authority to perform such functions.

1.6 COORDINATION WITH NUECES RIVER AUTHORITY

The NRA has significant power to plan and implement water quality plans and studies within its boundaries, which include all of Nueces County. This authority extends to construction, maintenance, operation and management of drainage and stormwater runoff systems. Limitations of the NRA's authority appear to lie in areas of enforcement and funding. It has no power to enforce discharge regulations through imposition of criminal or civil fines or filing of equitable civil proceedings. Nor does the NRA have authority to tax or levy fees for drainage and stormwater system improvements. Although the NRA can construct, operate and maintain such systems on behalf of other entities through contractual arrangements, the entire cost of such services must be funded by the contracting agency through contract payments.

Nevertheless, the extent of the NRA's geographical boundaries provides potential for coordination of water quality management and enhancement functions over an area which expands beyond the perimeter of Nueces County. By contracting with the NRA for any combination of construction, operation, maintenance and management functions, optimization of resource utilization might be obtained. On the other hand, without cooperation by all entities, contracts by one or two entities with the NRA might not be cost effective if such contracting entities are not contiguous.

1.7 SUMMARY

Area governmental entities have a number of opportunities for coordination of drainage system management as well as construction, operation and maintenance among entities owning and operating such facilities within the study area. Some entities are limited by statute to a certain extent in what they can do in facility construction, operation and maintenance coordination opportunities. Other entities operating drainage facilities within the County operate independently and have little incentive to cooperate or coordinate, except perhaps to the extent that their drainage output impacts systems of other entities.

One particularly attractive area for coordination involves inspection, monitoring and enforcement activities of the City and County. Coordination of such activities may provide opportunity for significant stormwater management cost savings and increased management effectiveness. Adoption of uniform monitoring, inspection and enforcement regulations and delegation of such responsibilities by one of the entities to the other would allow optimization of resources, including manpower and capitol, operation, maintenance and management expenditures associated with meeting proposed state and current federal regulatory requirements throughout the City of Corpus Christi and Nueces County.

APPENDIX A

INTERLOCAL COOPERATION CONTRACTS

APPENDIX 1

CHAPTER 791. INTERLOCAL COOPERATION CONTRACTS

SUBCHAPTER A. GENERAL PROVISIONS

Sec. 791.001. PURPOSE. The purpose of this chapter is to increase the efficiency and effectiveness of local governments by authorizing them to contract, to the greatest possible extent, with one another and with agencies of the state. (V.A.C.S. Art. 4413(32c), Sec. 1.)

Sec. 791.002. SHORT TITLE. This chapter may be cited as the Interlocal Cooperation Act. (V.A.C.S. Art. 4413(32c), Sec. 2.)

Sec. 791.003. DEFINITIONS. In this chapter:

(1) "Administrative functions" means functions normally associated with the routine operation of government, including tax assessment and collection, personnel services, purchasing, records management services, data processing, warehousing, equipment repair, and printing.

(2) "Interlocal contract" means a contract or agreement made under this chapter.

(3) "Governmental functions and services" means all or part of a function or service in any of the following areas:

(A) police protection and detention services;

(B) fire protection;

(C) streets, roads, and drainage;

(D) public health and welfare;

(E) parks and recreation;

(F) library and museum services;

(G) records center services;

(H) waste disposal;

(I) planning;

(J) engineering;

(K) administrative functions;

(L) public funds investment; or

(M) other governmental functions in which the contracting parties are mutually interested.

(4) "Local government" means a:

(A) county, municipality, special district, or other political subdivision of this state or a state that borders this state; or

(B) combination of two or more of those entities.

(5) "Political subdivision" includes any corporate and political entity organized under state law. (V.A.C.S. Art. 4413(32c), Secs. 3, 4(d) (part).)

Sec. 791.004. INTERLOCAL CONTRACT: DUAL OFFICE HOLDING. A person acting under an interlocal contract does not, because of that action, hold more than one civil office of emolument or more than one office of honor, trust, or profit. (V.A.C.S. Art. 4413(32c), Sec. 4(f).)

Sec. 791.005. EFFECT OF CHAPTER. This chapter does not affect an act done or a right, duty, or penalty existing before May 31, 1971. (V.A.C.S. Art. 4413(32c), Sec. 6.)

Sec. 791.006. LIABILITY IN FIRE PROTECTION CONTRACT. If governmental units contract under this chapter to furnish or obtain fire protection services, the governmental unit that would have been responsible for furnishing the services in the absence of the contract is responsible for any civil liability that arises from the furnishing of those services. (V.A.C.S. Art. 4413(32c), Sec. 4(g).)

[Sections 791.007–791.010 reserved for expansion]

SUBCHAPTER B. GENERAL INTERLOCAL CONTRACTING AUTHORITY

Sec. 791.011. CONTRACTING AUTHORITY; TERMS. (a) A local government may contract or agree with another local government to perform governmental functions and services in accordance with this chapter.

(b) A party to an interlocal contract may contract with a:

(1) state agency, as that term is defined by Section 771.002; or

(2) similar agency of a state that borders this state.

(c) An interlocal contract may be to:

(1) study the feasibility of the performance of a governmental function or service by an interlocal contract; or

(2) provide a governmental function or service that each party to the contract is authorized to perform individually.

(d) An interlocal contract must:

(1) be authorized by the governing body of each party to the contract;

(2) state the purpose, terms, rights, and duties of the contracting parties; and

(3) specify that each party paying for the performance of governmental functions or services must make those payments from current revenues available to the paying party.

(e) An interlocal contractual payment must be in an amount that fairly compensates the performing party for the services or functions performed under the contract.

(f) An interlocal contract may be renewed annually. (V.A.C.S. Art. 4413(32c), Secs. 4(a), (b), (e) (part).)

Sec. 791.012. LOCAL LAW APPLICABLE TO CONTRACTING PARTIES. Local governments that are parties to an interlocal contract for the performance of a service may, in performing the service, apply the local law of a party as agreed by the parties. (V.A.C.S. Art. 4413(32c), Sec. 4(c).)

Sec. 791.013. CONTRACT SUPERVISION AND ADMINISTRATION. (a) The parties to an interlocal contract may create an administrative agency or designate an existing local government to supervise the performance of the contract.

(b) The agency or designated local government may employ personnel, perform administrative activities, and provide administrative services necessary to perform the interlocal contract. (V.A.C.S. Art. 4413(32c), Sec. 4(d) (part).)

Sec. 791.014. APPROVAL REQUIREMENT FOR COUNTIES. (a) Before beginning a project to construct, improve, or repair a building, road, or other facility under an interlocal contract, the commissioners court of a county must give specific written approval for the project.

(b) The approval must:

(1) be given in a document other than the interlocal contract;

(2) describe the type of project to be undertaken; and

(3) identify the project's location.

(c) The county may not accept and another local government may not offer payment for a project undertaken without approval required by this section.

(d) A county is liable to another local government for the amount paid by the local government to the county for a project requiring approval under this section if:

(1) the county begins the project without the approval required by this section; and

(2) the local government makes the payment before the project is begun by the county. (V.A.C.S. Art. 4413(32c), Sec. 4B.)

[Sections 791.015–791.020 reserved for expansion]

SUBCHAPTER C. SPECIFIC INTERLOCAL CONTRACTING AUTHORITY

Sec. 791.021. CONTRACTS FOR REGIONAL CORRECTIONAL FACILITIES. The parties to an interlocal contract may contract with the institutional division of the Texas Department of Criminal Justice for the construction, operation, and maintenance of a regional correctional facility if:

(1) title to the land on which the facility is to be constructed is deeded to the institutional division; and

(2) the parties execute a contract relating to the payment of costs for housing, maintenance, and rehabilitative treatment of persons held in jails who cannot otherwise be transferred under authority of existing statutes to the direct responsibility of the institutional division. (V.A.C.S. Art. 4413(32c), Sec. 4(e) (part).)

Sec. 791.022. CONTRACTS FOR REGIONAL JAIL FACILITIES. (a) In this section:

(1) "Facility" means a regional jail facility constructed or acquired under this section.

(2) "Jailer" means a person with authority to supervise the operation and maintenance of a facility as provided by this section.

(b) A political subdivision of the state, by resolution of its governing body, may contract with one or more political subdivisions of the state to participate in the ownership, construction, and operation of a regional jail facility.

(c) The facility must be located within the geographic boundaries of one of the participating political subdivisions. The facility is not required to be located in a county seat.

(d) Before acquiring and constructing the facility, the participating political subdivisions shall issue bonds to finance the facility's acquisition and construction. The bonds must be issued in the manner prescribed by law for issuance of permanent improvement bonds.

(e) To supervise the operation and maintenance of a facility, the participating political subdivisions may agree to:

(1) appoint as jailer of the facility the police chief or sheriff of the political subdivision in which the facility is located;

(2) form a committee composed of the sheriff or police chief of each participating political subdivision to appoint a jailer of the facility; or

(3) authorize the police chief or sheriff of each participating political subdivision to continue to supervise and manage those prisoners incarcerated in the facility under the authority of that officer.

(f) If participating political subdivisions provide for facility supervision under Subsection (e), the person designated to supervise operation and maintenance of the facility shall supervise the prisoners incarcerated in the facility.

(g) When a prisoner is transferred from the facility to the originating political subdivision, the appropriate law enforcement officer of the originating political subdivision shall assume supervision and responsibility for the prisoner.

(h) While a prisoner is incarcerated in a facility, a police chief or sheriff not assigned to supervise the facility is not liable for the escape of the prisoner or for any injury or damage caused by or to the prisoner unless the escape, injury, or damage is directly caused by the police chief or sheriff.

(i) The political subdivisions may employ or authorize the jailer of the facility to employ personnel necessary to operate and maintain the facility.

(j) The jailer of the facility and any assistant jailers must be commissioned peace officers. (V.A.C.S. Art. 4413(32c), Sec. 4(h).)

Sec. 791.023. CONTRACTS FOR STATE CRIMINAL JUSTICE FACILITIES. The state or an agency of the state may contract with one or more entities to finance, construct, operate, maintain, or manage a criminal justice facility provided, in the exercise of the governmental power, for the benefit of the state in accordance with this chapter and:

(1) Subchapter A, Chapter 494, Government Code;

(2) Subchapter D, Chapter 361, Local Government Code; or

(3) the Certificate of Obligation Act of 1971 (Subchapter C, Chapter 271, Local Government Code). (V.A.C.S. Art. 4413(32c), Sec. 4A(a).)

Sec. 791.024. CONTRACTS FOR COMMUNITY CORRECTIONS FACILITIES. A community supervision and corrections department established under Section 2, Article 42.131, Code of Criminal Procedure, may agree with the state, an agency of the state, or a local government to finance, construct, operate, maintain, or manage a community corrections facility under Section 3, Article 42.131, Code of Criminal Procedure, or a county correctional center under Subchapter H, Chapter 351, Local Government Code. (V.A.C.S. Art. 4413(32c), Sec. 4A(b).)

Sec. 791.025. CONTRACTS FOR PURCHASES. A local government may agree with another local government or with the state or a state agency, including the State Purchasing and General Services Commission, to purchase goods and services. (V.A.C.S. Art. 4413(32c), Sec. 4(i).)

Sec. 791.026. CONTRACTS FOR WATER SUPPLY AND WASTEWATER TREATMENT FACILITIES. (a) A municipality, district, or river authority of this state may contract with another municipality, district, or river authority of this state to obtain or provide part or all of:

(1) water supply or wastewater treatment facilities; or

(2) a lease or operation of water supply facilities or wastewater treatment facilities.

(b) The contract may provide that the municipality, district, or river authority obtaining one of the services may not obtain those services from a source other than a contracting party, except as provided by the contract.

(c) If a contract includes a term described by Subsection (b), payments made under the contract are the paying party's operating expenses for its water supply system, wastewater treatment facilities, or both.

(d) The contract may:

(1) contain terms and extend for any period on which the parties agree; and

(2) provide that it will continue in effect until bonds specified by the contract and any refunding bonds issued to pay those bonds are paid.

(e) Tax revenue may not be pledged to the payment of amounts agreed to be paid under the contract.

(f) The powers granted by this section prevail over a limitation contained in another law. (V.A.C.S. Art. 4413(32c), Secs. 5(a), (b), (c), (d).)

Sec. 791.027. EMERGENCY ASSISTANCE. (a) A local government may provide emergency assistance to another local government, whether or not the local governments have previously agreed or contracted to provide that kind of assistance, if:

(1) in the opinion of the presiding officer of the governing body of the local government desiring emergency assistance, a state of civil emergency exists in the local government that requires assistance from another local government and the presiding officer requests the assistance; and

(2) before the emergency assistance is provided, the governing body of the local government that is to provide the assistance authorizes that local government to provide the assistance by resolution or other official action.

(b) This section does not apply to emergency assistance provided by law enforcement officers under Chapter 362, Local Government Code. (V.A.C.S. Art. 4413(32c), Sec. 5A.)

Sec. 791.028. CONTRACTS FOR JOINT PAYMENT OF ROAD CONSTRUCTION AND IMPROVEMENTS. (a) In this section:

(1) "Highway project" means the acquisition, design, construction, improvement, or beautification of a state or local highway, turnpike, or road project.

(2) "Transportation corporation" means a corporation created under the Texas Transportation Corporation Act (Article 1528*l*, Vernon's Texas Civil Statutes).

(b) A local government may contract with another local government, a state agency, or a transportation corporation to pay jointly all or part of the costs of a highway project, including the cost of an easement or interest in land required for or beneficial to the project.

(c) A local government and a transportation corporation, in accordance with a contract executed under this section, may:

(1) jointly undertake a highway project;

(2) acquire an easement, land, or an interest in land, in or outside a right-of-way of a highway project, as necessary for or beneficial to a highway project; or

(3) adjust utilities for the project.

(d) If a contract under this section provides for payments over a term of years, a local government may levy ad valorem taxes in an amount necessary to make the payments required by the contract as they become due. (V.A.C.S. Art. 4413(32c), Sec. 5B, as added by Sec. 3, Chap. 982, Acts 71st Leg., R.S., 1989.)

Sec. 791.029. CONTRACTS FOR REGIONAL RECORDS CENTERS. (a) By resolution of its governing body, a political subdivision of the state may contract with another political subdivision of the state to participate in the ownership, construction, and operation of a regional records center.

(b) Before acquiring or constructing the records center, a participating political subdivision may issue bonds to finance the acquisition and construction of the records center in the manner prescribed by law for the issuance of permanent improvement bonds.

(c) The records center may not be used to store a record whose retention period is listed as permanent on a records retention schedule issued by the Texas State Library and Archives Commission under Section 441.158, unless the center meets standards for the care and storage of records of permanent value established by rules adopted by the commission under Section 203.048, Local Government Code.

(d) The Texas State Library and Archives Commission shall provide assistance and advice to local governments in the establishment and design of regional records centers. (V.A.C.S. Art. 4413(32c), Sec. 5B, as added by Sec. 4, Chap. 1248, Acts 71st Leg., R.S., 1989.)

SECTION 2. REPEALER. The following articles and acts, as compiled in Vernon's Texas Civil Statutes, are repealed: 969e, 1273b, 4413c-1, 4413d-1, 4413d-2, 4413(32), 4413(32a), 4413(32b), 4413(32c), 4413(32d), 4413(32g), 4413(34a), and 4413(201).

SECTION 3. LEGISLATIVE INTENT OF NO SUBSTANTIVE CHANGE. This Act is enacted under Article III, Section 43, of the Texas Constitution. This is intended as a recodification only, and no substantive change in the law is intended by this Act.

SECTION 4. EFFECTIVE DATE. This Act takes effect September 1, 1991.

SECTION 5. EMERGENCY. The importance of this legislation and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house be suspended, and this rule is hereby suspended.

Passed the Senate on March 18, 1991, by a viva-voce vote; passed the House on April 2, 1991, by a non-record vote.

Filed without signature April 19, 1991.

Effective September 1, 1991.

APPENDIX B

TEXAS WATER CODE

APPENDIX 2

TEXAS WATER CODE

§ 26.175. Cooperative Agreements

(a) A local government may execute cooperative agreements with the commission or other local governments:

(1) to provide for the performance of water quality management, inspection, and enforcement functions and to provide technical aid and educational services to any party to the agreement; and

(2) for the transfer of money or property from any party to the agreement to another party to the agreement for the purpose of water quality management, inspection, enforcement, technical aid and education, and the construction, ownership, purchase, maintenance, and operation of disposal systems.

(b) When in the opinion of the executive director it would facilitate and enhance the performance by a local government of its water quality management, inspection, and enforcement functions pursuant to a cooperative agreement between the local government and the commission as authorized in Subsection (a) of this section, the executive director may assign and delegate to the local government during the period of the agreement such of the pertinent powers and functions vested in the commission under this chapter as in the judgment of the executive director may be necessary or helpful to the local government in performing those management, inspection, and enforcement functions.

(c) At any time and from time to time prior to the termination of the cooperative agreement, the executive director may modify or rescind any such assignment or delegation.

(d) The executive director shall notify immediately a local government to whom it assigns or delegates any powers and functions pursuant to Subsections (b) and (c) of this section or as to when it modifies or rescinds any such assignment or delegation.

Amended by Acts 1977, 65th Leg., p. 2207, ch. 870, § 1, eff. Sept. 1, 1977; Acts 1985, 69th Leg., ch. 795, § 1.104, eff. Sept. 1, 1985.

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1.0 INTRODUCTION

1.1 BACKGROUND

On January 30, 1991, the South Texas Water Authority, the City of Corpus Christi and Nueces County authorized Camp Dresser & McKee Inc. to proceed with a Regional Stormwater Master Plan. Timely implementation of the master plan will depend primarily on the development of a continuing source of funding to assure year-to-year support of all aspects of stormwater management, including: 1) staff and equipment associated with administration, engineering and planning, operations and maintenance, inspection and enforcement; and 2) direct payment and/or debt service for capital improvement construction.

Historically, the City of Corpus Christi and Nueces County have relied upon their general funds to support the Stormwater Management Program. The City of Corpus Christi has more recently relied upon Water Fund revenues for this purpose and, in some instances, the County has utilized the Road and Bridge Funds for drainage improvements related to construction. In the annual budgeting process, however, drainage and water quality needs have had difficulty in competing successfully on a year-to-year basis with other general government programs. Fire and police protection, providing fresh water supplies, and more visible public works projects such as road improvements and public buildings generate greater public interest. The exception to these budgeting priorities may happen when hurricane or other flooding occurs which causes significant property damage or loss of human life. In such instances, funding may increase for a few years, but gradually diminish until the next natural catastrophe starts the cycle again.

Obviously, the present approach to funding the local stormwater program is not sufficient to assure adequate levels of flood protection or meet new NPDES regulations. In the past, funds have been applied to drainage related costs. Added funds will be necessary to address water quality concerns, as required by the NPDES regulations. A comprehensive, planned approach must be taken to assure that the stormwater management program will be supported even through "dry" years. With this commitment on the part of the area governmental entities, the drainage system will be in optimum condition to transport flood flows when large rainfall events do occur.

1.2 PURPOSE

A key element of the Master Plan involves a review of financing options to support development of a comprehensive stormwater management program for the Corpus Christi area. Program development will be accomplished through completion of three major tasks:

1. Development of a Regional Stormwater Master Plan which identifies and prioritizes stormwater quality management and flood control capital improvement and operations/maintenance needs.

2. Development of drainage criteria which specify the drainage policy and supporting engineering design methods and standards to assure that new land development activities are consistent with master plan, stormwater quality, flood prevention and drainage improvement objectives.

3. Development of a stable long-term source of funding to support design and construction of the master plan capital improvements and day-to-day operations/-maintenance of the drainage system.

This report presents an assessment of the funding alternatives available to the City of Corpus Christi, the South Texas Water Authority and Nueces County to support a comprehensive stormwater management program.

2.0 ALTERNATIVE FUNDING SOURCES

2.1 OVERVIEW

The funding sources available to local governmental entities are varied and can be used in combination. Provided below is a description of funding sources that can be used under Texas statutes to finance stormwater management programs. Advantages and disadvantages associated with each alternative are included, as well as an indication of special activities (e.g., administration services, operation/maintenance, infrastructure repair/replacement, capital improvements, and water quality management) for which the funding source is best suited.

2.2 GENERAL FUND

In most governmental entities, financial support of the stormwater management program is provided solely by the General Fund. The major sources of income for the General Fund are ad valorem taxes and, for municipalities, a local sales tax. Ad valorem taxation is based upon the assessed valuation of property within the governmental unit.

The principal advantage associated with utilizing the general fund is that it has been used for many years and the accounting process is well established. The major disadvantage with using the general fund is that income loses identity once placed into the fund. That is, the general fund can be used for all general government services and activities provided by the governmental entity. This means that competition for the funds is intense; history has shown that stormwater management does not compete well for general fund monies. From a point of equitability, ad valorem taxes are based on property value, which is not related to the property's stormwater runoff potential and associated impact on the City's stormwater management system. For these reasons, many government entities are looking for an alternative source of funding for stormwater management programs.

2.3 SPECIAL FUNDS

In addition to the General Fund, most governmental entities also operate other special, designated funds which are dedicated for certain purposes. The City of Corpus Christi's Water Fund is an enterprise fund used to operate the City's fresh water system. The water system has been defined to include the construction and operation of reservoirs, water treatment facilities and, more recently, stormwater controls. Revenues for the Water Fund are derived from the water rates paid by utility customers for the use of fresh water supplies.

Nueces County operates a Road and Bridge Fund, into which certain designated tax revenues are deposited. A 1.9-cent ad valorem tax is levied pursuant to Article VIII, Section 9 of the Texas Constitution for this purpose. Additionally, a $10.00 fee is assessed on each motor vehicle registration for deposit into the Fund. The purpose of the Fund is to construct roadway and bridge improvements in the County. In some instances, such public works necessarily involve flood control and the improvement of drainage courses.

The major limitation in the use of such Special Funds is that stormwater management purposes must be subordinate to the predominant use of the Fund. In the case of the City's Water Fund, the stormwater system is operated as a minor adjunct to the system, and stormwater work within the County's Road and Bridge Fund is minimal. From a point of equity, the funding from water rates in the City bears no relationship to stormwater demands, and the County's Road and Bridge Fund support from ad valorem taxes and vehicle registration fees similarly lack any relationship to stormwater.

2.4 SPECIAL TAXING/ASSESSMENT DISTRICTS

Income from a special taxing district or special assessment district is generally dedicated to that district. That is, the area that is designated as "special", for whatever reason, would pay an additional tax or have an increased assessment. The funds from the additional tax or assessment would be used for improvements within the district area.

For example, if stormwater management facilities are constructed to benefit a particular drainage basin within a city or county, then that area would be designated a special taxing district and an additional ad valorem tax levy or assessment would be applied to the properties in the district area. The advantage of special districts is that the funds for facilities construction or operation/maintenance are used in the area where the money is collected. This is the case for flood control and special improvement districts.

The main disadvantages in utilizing Special Taxing/Assessment districts relates to the fact that the taxes or assessments are not based upon drainage characteristics of the property. A parking lot would be subjected to the same tax or assessment that a landscaped area would have. Under Texas law, the taxes or assessments in each case must be based upon the value of the property or, in some instances, the property area or street frontage. Another disadvantage may be the potential for lowered property values or resale values since the property is subject to this additional tax or assessment.

Although special taxing districts under Chapters 51 and 56 of the Texas Water Code may generate substantial tax revenues, these districts have the additional disadvantages of being under the control of an independent elected or appointed board of directors. The districts are created based upon a petition to the county commissioners court and are subsequently authorized by a referendum vote within the district area. It is important to note that neither the City nor the County have any control over these districts. All revenues generated by these districts are based upon ad valorem taxation. Because of this administrative complexity and lack of equitable funding, these types of special taxing districts are not recommended. However, several districts of this type are in operation in Nueces County and provide a source of funding in unincorporated areas. Special assessment districts (Chapter 372, Texas Local Government Code) differ, in that they are under the control of the City, can be authorized by Council resolution, and assessments are based on benefits received instead of property value. The requirement that assessments be based on benefits received severely limits revenue potential because only flood-prone or creekside properties can be assessed. The upland properties which are typically responsible for generating most of the flood-causing runoff cannot be assessed. Because of this lack of equity, special assessment districts are not recommended.

2.5 FEES/LICENSES/PERMITS

Funding from this source is generally limited to the cost of permit review and the inspection of construction. Other revenue sources must be utilized to finance all other aspects of the City's or County's stormwater management program such as administration, operation/maintenance, and capital improvements.

2.6 PENALTIES AND FINES

Similar to permit fees, penalties and fines are limited in scope. Such income is typically placed in the general fund; however, such fines may be better utilized to correct the specific violation or any subsequent violations. This type of income can be combined with the other types of specific stormwater funding, including stormwater utility revenues, to finance the entire stormwater management program.

2.7 BONDS

General obligation, revenue, or special assessment bonds are normally used by governments to pay for large capital improvement programs. General obligation bonds are secured by the pledge of the full taxing authority of the governmental unit and are normally paid through the General Fund. In some instances, however, other designated funds of the governmental unit can be used to reimburse the General Fund for those debt service obligations.

Revenue bonds can be issued by the governmental entity which are secured solely by the pledge of certain designated revenues. Revenues of a water utility, gas utility, or any other enterprise which generates cash flow in excess of operations and maintenance expenses can be used for this purpose. The bonds generally involve a covenant by the issuer to charge rates sufficient to pay the debt service on the bonds, and bond buyers are specifically interested in making sure that existing and projected cash flows are more than adequate to meet operation and maintenance expenses as well as debt service. Contract revenue bonds are attractive in that they may be considered an operations cost which deletes debt coverage and reserve fund requirements.

The principal advantage associated with issuing bonds is that a large-scale capital improvement program can be initiated when the facilities are needed rather than waiting until the necessary funds are accumulated for direct payment. The disadvantage is the long-term debt incurred by the entity.

2.8 PAY-AS-YOU-GO SINKING FUND

As an adjunct to bond financing, this type of funding is most common for capital improvements. Essentially, a separate fund is formed. The fund receives revenues from numerous sources such as ad valorem taxes and/or stormwater utility income. The fund accumulates revenues until sufficient money is available for an identified project. Then the total project amount is removed from the fund to support project construction, and the growth stage starts over. Since no money is borrowed, this funding method is designated "pay-as-you-go", and since funds are periodically deposited ("sunk") into this account, it is referred to as a sinking fund. The major advantage of this funding method is that no long-term debt service is created. On the other hand, costly capital projects must be deferred until the fund is of sufficient size.

2.9 SUBDIVISION EXACTIONS

As a condition for approval of new development, the City can require the construction and dedication of stormwater management facilities to the local government. In addition, developers can be required to donate drainage easements or other types of partial rights to the local government for stormwater management purposes. The local government would be responsible for the operation/maintenance. Thus, the developer would be responsible for funding a portion of the capital program, while the local government would be responsible for funding long-term operation/maintenance of the facilities. The advantage of this type of program is the transfer of some capital burden away from the local government. However, since exactions apply only to new development, they do not address existing flooding problems or operation and maintenance needs.

2.10 IMPACT FEES

An alternative to requiring construction of stormwater management facilities in conjunction with new development is to require payment of an initial front-end impact fee for the capital improvements needed to convey stormwater runoff from the new development. The fee would be in proportion to the development's runoff demand on the regional management facilities in the watershed. Generally, drainage impact fees are assessed on a per acre and development intensity basis. Cumulative impact fees generate the funding needed for capital improvements on a watershed-wide basis. Since construction of small-scale, on-site systems is not always effective in reducing off-site flooding, in many situations it is best to construct larger regional stormwater management facilities. The fee is the developer's share of the regional facility.

The major advantage of impact fee financing is that regional stormwater management systems are promoted, rather than the small-scale individual systems. The large stormwater facilities are more effective in controlling flooding and easier to maintain and can address large-scale flooding problems. The disadvantage is that the participating development may be required to construct temporary on-site facilities until sufficient funding has accumulated for construction of the regional facility serving the development. In older developed portions of the community which have significant existing flooding problems, there would be fewer new developments to contribute to the construction of larger regional facilities. Also, impact fees can be used only for capital construction; they cannot be used to support stormwater program administration and operation. Nevertheless, the impact fee method of funding can operate in conjunction with general funds or a stormwater utility in newer portions of communities to support the implementation of regional stormwater management strategies.

Impact fees are available to cities, counties, and any other political subdivisions under Chapter 395 of the Texas Local Government Code. Imposition and administration of the impact fees, however, must comply with extensive new administrative and procedural provisions. These regulations require public hearings on land use assumptions and the proposed capital improvement plans, and they additionally specify funds management procedures. Under Section 395.013, the funds cannot be used to upgrade existing facilities in already developed areas.

2.11 <u>STORMWATER UTILITY</u>

Utilizing revenues derived through a cost-of-service user charge system to fund stormwater management programs is new in Texas. The Texas Municipal Drainage Utilities Systems Act (Chapter 402, Subchapter C of the Texas Local Government Code) was amended in 1989 to provide enabling powers to all <u>municipalities</u> for utility formation. User charges must comply with Texas Water Code Chapter 26. While all of the previously discussed funding alternatives are available to various governmental entities, the stormwater utility is only available for municipalities. The Cities of Bedford and Gainesville are in the process of implementing utilities under the Act. An amendment to the Act to allow cities to extend stormwater utility service areas into their extraterritorial jurisdiction (ETJ) is currently being considered. The stormwater utility concept was developed in the northwestern U.S. and has been used there for a number of years. Several local governments in Florida, Oklahoma and Colorado have also established stormwater utilities.

A user charge is assigned to each property parcel within the City based on an equitable share of the cost of the stormwater management program in proportion to the parcel's relative contribution to stormwater runoff which must be safely conveyed by the City's drainage system. Installation of impervious surfaces such as rooftops and paved areas increases both the rate and amount of stormwater runoff and increases runoff pollutant loadings. The relative amount of runoff from a parcel is proportional to the actual amount of impervious area on the parcel. This analog allows the utility to equitably and fairly distribute the stormwater management program costs based on the amount of impervious area on each property parcel.

Stormwater utility revenues can be used to support all aspects of a comprehensive stormwater management program (administration, operation/maintenance, infrastructure repair/replacement, capital improvements, and water quality management). The utility income can also be used to support revenue bond debt service for a large capital improvements program, thereby leveraging the utility's annual revenue.

In summary, the advantages of a stormwater utility over the other funding alternatives are:

- Creates a stable, dedicated funding source independent from the General Fund or Water Funds for support of all stormwater management activities, including revenue bond debt service for large capital improvements; and

- The billing fee schedule is based upon runoff contribution rather than property valuation and, thus, provides a fair and equitable cost of service user fee based revenue source.

3.0 EVALUATION

3.1 ALTERNATIVE COMPARISON

After reviewing the advantages and disadvantages associated with each available funding alternative, the funding sources capable of supporting a comprehensive broad-based stormwater management program are limited. Only the General Fund, a Special Fund such as the City's Water Fund, and the Stormwater Utility generate adequate cash-flow. The major distinction between these alternatives is the method of allocating the costs for stormwater management. The majority of the General Fund is made up of revenues generated from ad valorem taxation -- income based upon property value, which does not correlate the runoff characteristics of the property or cost of stormwater management services. The Water Fund is comprised of revenues from the sale of fresh water through the water distribution system -- again, it bears no relation to the runoff characteristics of the property or the cost of stormwater management services.

With a stormwater utility, the costs are allocated based on the quantity and quality of the stormwater runoff which is likely to be generated by each property. The correlation between the amount of impervious area and the quantity and quality of stormwater runoff is used by the utility to equitably allocate stormwater management costs.

<u>Therefore, the stormwater utility alternative is the most equitable means of allocating stormwater management costs</u> because rates are based on actual runoff contribution from each property parcel. Additionally, a stormwater utility provides a stable funding source for the stormwater management program independent of other general governmental activities.