

**FLOOD PROTECTION PLANNING STUDY**

for

**CITY OF EAGLE PASS**

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GRANTS MANAGEMENT

**MAVERICK COUNTY, TEXAS**

funded in part by a  
Flood Protection Planning Grant

from

**Texas Water Development Board**

by

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## **EAGLE PASS FLOOD STUDY**

### **Executive Summary**

**Project Background** – This Flood Study is co-sponsored by the City of Eagle Pass and the Texas Water Development Board under contract No. 98-483-242. The study presents data collected, the hydrologic analysis, hydraulic analysis, flood reduction alternatives considered and an economic analysis of the flood reduction alternatives. Conclusions reached as a result of the flood study are described below:

- 1. Data Collection and Aerial Mapping along Rio Grande River and for the City of Eagle Pass** - The International Boundary and Waterway Commission is the governing authority to regulate the use of water and the quality of water entering the Rio Grande River. *The City of Eagle Pass may want to combine its dollars with the IBWC to map new areas as they develop.*
- 2. Flood Insurance Study Validation** – An effort to validate the existing HEC-2 models from the 1979 Flood Insurance Study for Eagle Pass was conducted. This work then served as a basis for modeling the existing and future condition streams. The hydrology and hydraulics of the existing FIS were analyzed and new flows and flood plains determined for planning purposes. Although only the 100-year event was depicted in this study, a full range of flows was determined in the stream models. The models created by this Flood Protection Study could serve as a basis to revise the existing FIS study. *The City of Eagle Pass may chose to apply for updating its existing flood insurance study with the Federal Emergency Management Administration to redefine new flood plains, to redefine more streams studied and to identify improvements which have occurred on existing streams since 1979 when the older study was completed.*
- 3. Flood Damage Reduction Alternatives** - A list of suggested alternatives for flood damage reduction is summarized in the study. These alternatives will provide a 25- to 100-year level of protection to the City of Eagle Pass. These alternatives could be phased in over a period of years in a Capital Improvement Program. Recent development along Loop 431 and Highway 277 will add significant areas of impervious cover in the upper watersheds of Tributary 2 and 3 and the Unnamed Tributary. This fact will increase future flood levels in these watersheds. *The City of Eagle Pass should phase these drainage improvements in over time and finance them through a drainage fee, a bond program or some other type of public funding.*
- 4. Flooded properties along the Rio Grande River** - The flood-prone properties along the Rio Grande River could be purchased to alleviate future flood damages. This would be a one-time compensation to property owners along the river. This alternative appears to be less expensive in the long run for the City of Eagle Pass than flood proofing. *The City of Eagle Pass would have to borrow or obtain a grant from FEMA to assist with this option.*
- 5. Proposed Storm water and Drainage Ordinance** - Appendix E contains a draft Drainage Ordinance modified to fit flooding issues in Eagle Pass. *The City of Eagle Pass may want to consider adoption of this ordinance to allow for orderly development of the upper watersheds along Loop 431 and US Highway 277, and to assure the City that as development occurs, property owners will bear their proportionate share of the cost of drainage improvements.*
- 6. Storm Water Regulations as Proposed by the Environmental Protection Agency** - As the Environmental Protection Agency expands the storm water program for Phase II, this is scheduled to go into effect by the year 2000. The State of Texas, TNRCC, will take over the monitoring and compliance part of the NPDES program. *The City of Eagle Pass may choose to participate and use this planning study to identify all existing storm water discharges into waters of the United States and later to develop a sampling and testing program to periodically monitor storm water discharges associated with industrial activities.*
- 7. Public Involvement and Eagle Pass Web Site** - Additions to the City of Eagle Pass web site may be made with links to FEMA, TNRCC, TWDB and others to provide information on flooding. The City could expand this site to include information on activities by the Public Works department, such as water rates, wastewater rates, street closures and repair, flooding, solid waste collection, and complaints. The posting of flooded area maps could aid homeowners or insurance agents, regarding which properties might be in the 100-year flood plain. *The City of Eagle Pass may want to allocate part of its existing WEB site to be dedicated to Public Works updates.*

## Eagle Pass Flood Protection Planning Study

### I. Introduction

The first section of the report covers the project background, purpose, and previous studies. The second section describes the data collection effort. The third section describes the hydrologic methods and assumptions used in determining the peak discharges used for different storm events. The fourth section describes the hydraulic methods and assumptions used in modeling the streams in Eagle Pass. The fifth section describes the flood reduction alternatives considered and the economic analysis of these flood reduction alternatives.

#### A. Project Background

Eagle Pass is located in Maverick County in South Central Texas along the border with Mexico. Eagle Pass is situated about 60 miles south of Del Rio and 70 miles north of Laredo, Texas on the Rio Grande, River. Figure 1 shows the location of Eagle Pass, Texas.

Major flooding events have occurred in Eagle Pass in 1954, 1963, 1964, 1967, 1969, 1970, 1983, and 1998. Streams generally flow from east to west towards the Rio Grande through Eagle Pass. Streams located along the south City limit of Eagle Pass generally flow south to agricultural areas. A major irrigation ditch identified as the Maverick County Canal and owned by the Maverick County Irrigation and Drainage District No. 1 carries irrigation water to large parts of the county located to the south of Eagle Pass. Topography in the Eagle Pass area is hilly with stream slopes varying in grade from 0.4 % to 2.0 %.

An excerpt on flooding along the Rio Grande in Eagle Pass as reported in the Flood Insurance Study states:

“Damaging floods have occurred in Eagle Pass in 1954, 1963, 1964, 1967, 1969, 1970, and 1983. Flooding on the Rio Grande is fed by a drainage basin of approximately 127,000 square miles, which is enhanced by tropical storms that occasionally move inland along the Rio Grande or through northern Mexico. In June of 1954, Hurricane Alice moved inland up the Rio Grande from the Gulf of Mexico south of Brownsville. Rainfalls of as much as 27.1 inches in 48 hours resulted in the greatest flood on the middle Rio Grande since June, 1865. Rises of 50 to 60 feet, or 30 to 40 feet above flood stage, occurred at Eagle Pass within 48 hours. The construction of Amistad Dam (completed in 1969) on the Rio Grande 73 miles upstream of Eagle Pass has reduced but not eliminated flood damages from the Rio Grande.

Flooding potential from the Main Arroyo and its tributaries has increased in recent years due to a combination of urbanization and inadequate bridge and culvert openings. The most recent floods in Eagle Pass, according to local residents, were those of 1954, 1963, 1964, 1967, 1969, 1970, and 1983. There are no stream gauging records and no adequate high water marks to estimate flows for the Main Arroyo for any of these periods.”

The climate of Eagle Pass is dry to semi-arid with an average annual rainfall of about 19 inches per year. Tropical storms have triggered significant amounts of rainfall in recent years as evidenced most recently by Hurricane Charley in August, 1998. Rainfall approaching 20

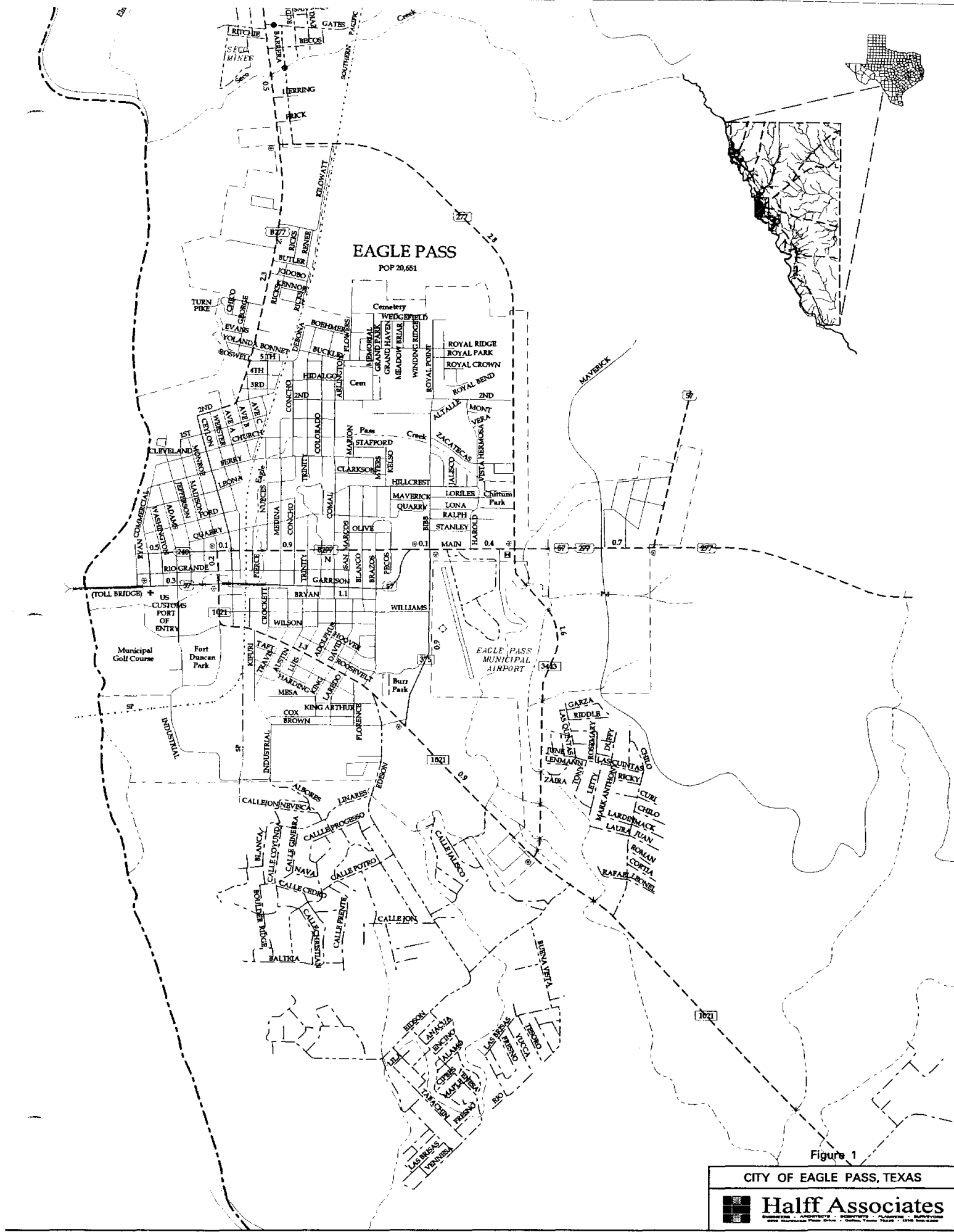


Figure 1

CITY OF EAGLE PASS, TEXAS

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inches in a 24-hour period was recorded in nearby Del Rio, Texas resulting from Hurricane Charley.

The City of Eagle Pass, Texas and the Texas Water Development Board under Contract No. 98-483-242 provided funding for this study.

## **B. Purpose of Study**

The purpose of the Eagle Pass Flood Protection Planning Study is to provide the City and the Texas Water Development Board with technical data for decision-making in two areas: 1) solving the existing flooding problems; and 2) prevention of flooding problems from future development with prudent flood plain management. To accomplish these goals an information base comprised of field surveys, engineering plans, previous studies, photos, personal communication and other sources was developed. This report documents the results of the investigation, and presents the methods, analysis, and flood protection alternatives considered. An economic analysis is also presented.

The City of Eagle Pass needs to update its comprehensive drainage plan since development is occurring in the north and west parts of the City. Previous flooding in 1983 caused damage to some downtown businesses and homes. During storm events in 1990, culverts were damaged near Loop 431. Also, due to the recent rains and flooding along the Rio Grande during August 23-24, 1998, some homes along Ryan Street were damaged as a result of high river levels. As a result of the 1998 flood event, the scope of this study was expanded to include mapping and analysis of the Rio Grande River. Seventeen homes and one business were condemned, and the City is presently considering a buyout of these properties.

Four public meetings were held during the course of the study, March 16, 1998, May 21, 1998, July 16, 1998, and March 16, 1999.

## **C. Previous Studies**

Previous studies by various consultants have been completed over the past 36 years in Eagle Pass. Turner and Collie Consulting Engineers completed the first comprehensive drainage study in 1964. This study proposed drainage improvements to the Main Arroyo and provided aerial mapping with 5' contours for a large part of the downtown area. Hunter and Associates in 1965 completed a comprehensive plan, which included an inventory of existing drainage structures in Eagle Pass. This study recommended drainage improvements and associated costs. Southwest Planning Associates in 1972 completed a plan for the Central Business District, including a storm drainage system map showing existing storm sewers and manholes.

URS/Forrest & Cotton, Inc. in 1981 completed a flood insurance study for Eagle Pass which delineated the 10, 50, 100, and 500-year flood plain limits for the Rio Grande River, Main Arroyo, and a major tributary. Flood Insurance Rate Maps were prepared and flood insurance hazard factors were determined for insurance purposes.

In 1993 the Governor's Working Group addressed border issues. One of the issues presented was the joint cooperation with Mexico in solving storm drainage problems. Several common flooding problems were identified.



In 1996 a flood study was performed for the proposed Second International Bridge built in Eagle Pass. Grove & Associates, Inc. performed this study for the bridge design. The flood study consisted of four cross-sections supplemented by information from the International Boundary and Waterway Commission.

## **II. Data Collection**

Data collection efforts conducted during the course of this study included:

1. Meetings with City Staff to obtain available plans, flood photos, maps, previous studies, other pertinent data, and to confirm limits of detailed study.
2. Contacts with other agencies such as Soil Conservation Service (County soil survey maps, flood control studies, aerial photos, computer models), Texas Department of Transportation (TxDOT) (Highway plans, topographic, drainage calculations, digital topographic maps), Corps of Engineers, International Water and Boundary Commission (IBWC), Federal Emergency Management Agency (FEMA), (Flood data, topographic mapping, hydrologic/hydraulic computer models, and other related data).
3. Field trips to visit project sites for field (visual) inspection of existing drainage features and flooding problems. Flooding pictures taken in past storm events are shown at the end of this report. A collection of over 200 photos was taken of all drainage structures in Eagle Pass.
4. Field surveys, as needed to supplement the topographic maps, field surveys of existing drainage features such as culverts, and the dimensions and flow lines of affected underground storm sewers.
5. Aerial topographic mapping at 2-foot contour intervals of the stream flood plains were obtained under subcontract from Landata-Geosource for the purposes of this report. These maps were provided in hard copy and digital format to the City of Eagle Pass and were used to delineate the existing and fully developed 100-year flood plain in this report.
6. Several articles which document the history of Eagle Pass and its ties to water supply and the role irrigation played in developing large land tracts into productive agricultural areas.
7. A structure inventory of stream crossings and channel improvements was performed for each stream studied in detail.

From these resources the hydrologic and hydraulic analyses were performed and several flood reduction alternatives evaluated.

## **III. Hydrologic Analysis**

The hydrologic method used to estimate storm water runoff in Eagle Pass was based on the Soil Conservation Service (SCS) method. This method is widely used by engineers for the analysis of urban watersheds. URS/Forrest & Cotton, Inc also used the SCS method in the original Eagle Pass Flood Insurance Study completed in 1979. For these reasons the SCS method was chosen for use in this study. The following discussion presents a brief explanation of the methodology, hydrologic parameters calculated, and peak discharges used in the study.

## A. Methods

The Soil Conservation Service (SCS) method for computing runoff from storm rainfall is based on the theory of abstractions. The SCS method uses a 24-hour storm duration, which is considered acceptable for the Eagle Pass area. It should be noted that when using this method a Type I antecedent moisture condition (AMC) should be used for the Eagle Pass area. A more complete discussion of the SCS method is presented in Appendix B. Also, an excellent discussion of the SCS method is presented in NEH-4: "Hydrology" Section 4, National Engineering Handbook by the Soil Conservation Service.

The SCS developed an index, called the runoff curve number, to represent the combined hydrologic effect of soil type, land use, agricultural land treatment class, hydrologic condition, and antecedent soil moisture. These watershed factors were found to have the most significant impact on estimating the volume of runoff, and can be assessed from soil surveys, site investigations, and land use maps.

The curve number is an indication of the runoff producing potential of the drainage area for a given antecedent soil moisture condition, and can range in value from 0 to 100. The SCS runoff curve numbers are grouped into three (3) antecedent soil moisture conditions:

AMC I	Dry soil condition
AMC II	Average soil condition
AMC III	Wet soil condition

Values of runoff curve numbers for all three conditions may be computed following guidelines in the SCS "Hydrology" Section 4, National Engineering Handbook. Studies of hydrologic data indicate that Antecedent Moisture Condition (AMC) II is not the average throughout Texas. Instead, investigations have shown that the average condition ranges from AMC I in west Texas to between AMC II and AMC III in east Texas. Typical values are given in Appendix B for AMC II. Adjustments for the State of Texas were made to these curve numbers using Figure 2, which accounts for the variation in dry to wet conditions. Figure 2 was obtained from the National Resource Conservation Commission (formerly Soil Conservation Service) in Temple.

The SCS also classified surficial soils into four (4) hydrologic soil groups, and identified them by letters A, B, C, and D, to represent watershed characteristics.

Group A: (low runoff potential) Soils having a high infiltration rate even when thoroughly wetted and consisting chiefly of deep well-drained to excessively drained sands or gravels.

Group B: Soils having a moderate infiltration rate when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately coarse texture.

Group C: Soils having a slow infiltration rate when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water or soil with moderately fine to fine texture.

Group D: (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.

A list of soils in Maverick County along with their hydrologic soil classification is given in the Soil Conservation Service publication Soil Survey of Maverick County, Texas. Typical values for curve numbers for the four (4) soil groups are listed in Appendix B. Typical curve numbers calculated for this flood study appear in the next section.

Flows for streams studied in detail were calculated using the SCS method in the U.S. Army Corps of Engineers - Hydrologic Engineering Center - Hydrologic Modeling System (HEC-HMS) program. HEC-HMS is a Windows driven program, which serves as a platform to organize and calculate runoff using various runoff methods. HEC-HMS models a watershed basin as separate hydrologic elements connected by reaches and junctions at which input and output information can be displayed. A basin schematic represents the hydrologic elements chosen, the connecting reaches, and type of output desired.

Figure 3 shows the major drainage areas used in this study. No areas were delineated for the Rio Grande River. Natural drainage boundaries were altered to some extent by construction of the Maverick County Irrigation Canal and the new Loop 431 in the northeast part of Eagle Pass. Flows for the Rio Grande River were obtained from the IBWC.

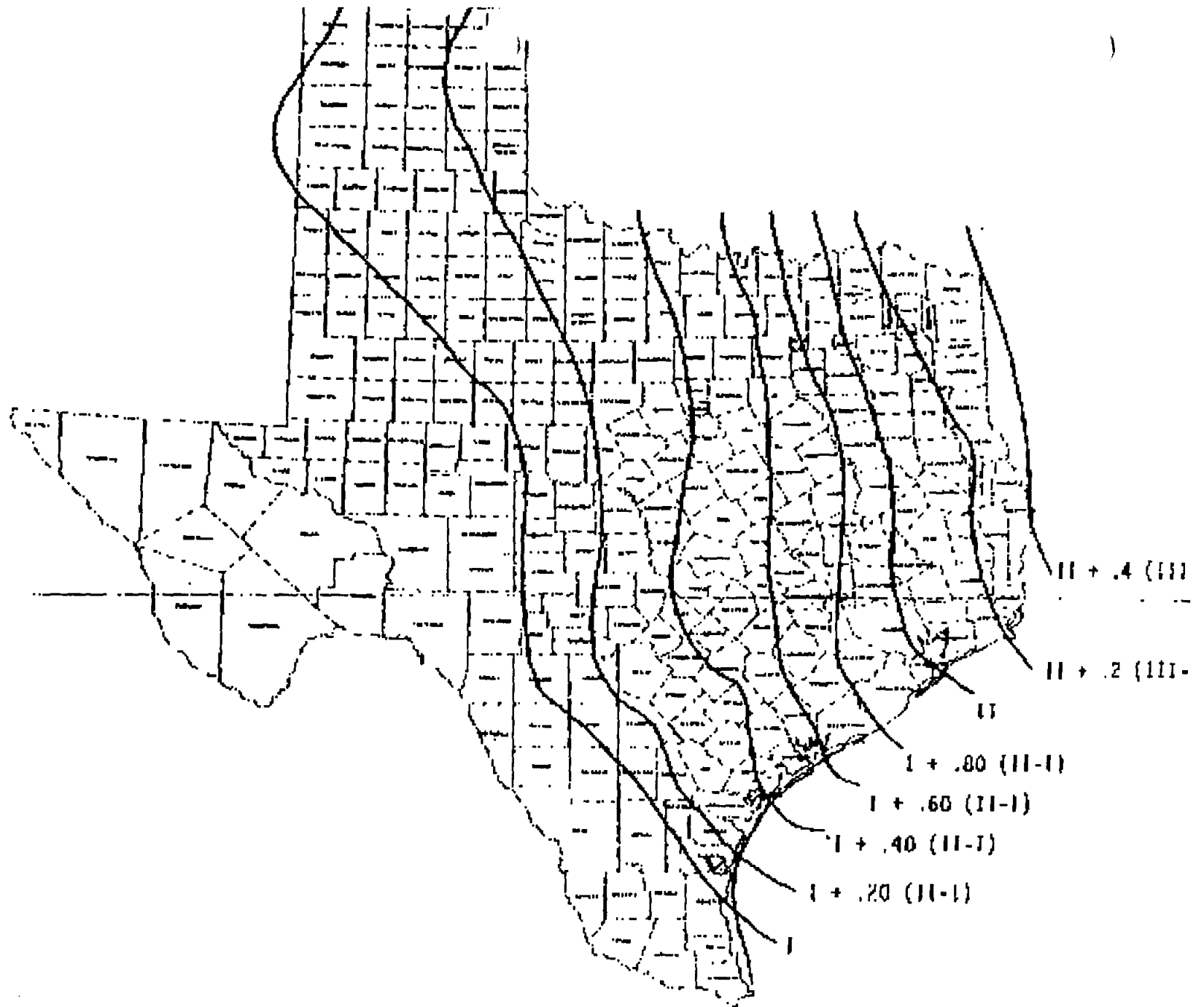


Figure 2 - Adjustments to Average Condition Runoff Curve Numbers for Antecedent Moisture Conditions I, II, & III for Texas.



SCALE IN FEET

NOTE:  
TOPOGRAPHIC MAPPING BASED ON  
USGS 7.5 MINUTE SERIES QUADS  
DIGITIZED BY OTHERS

### LEGEND

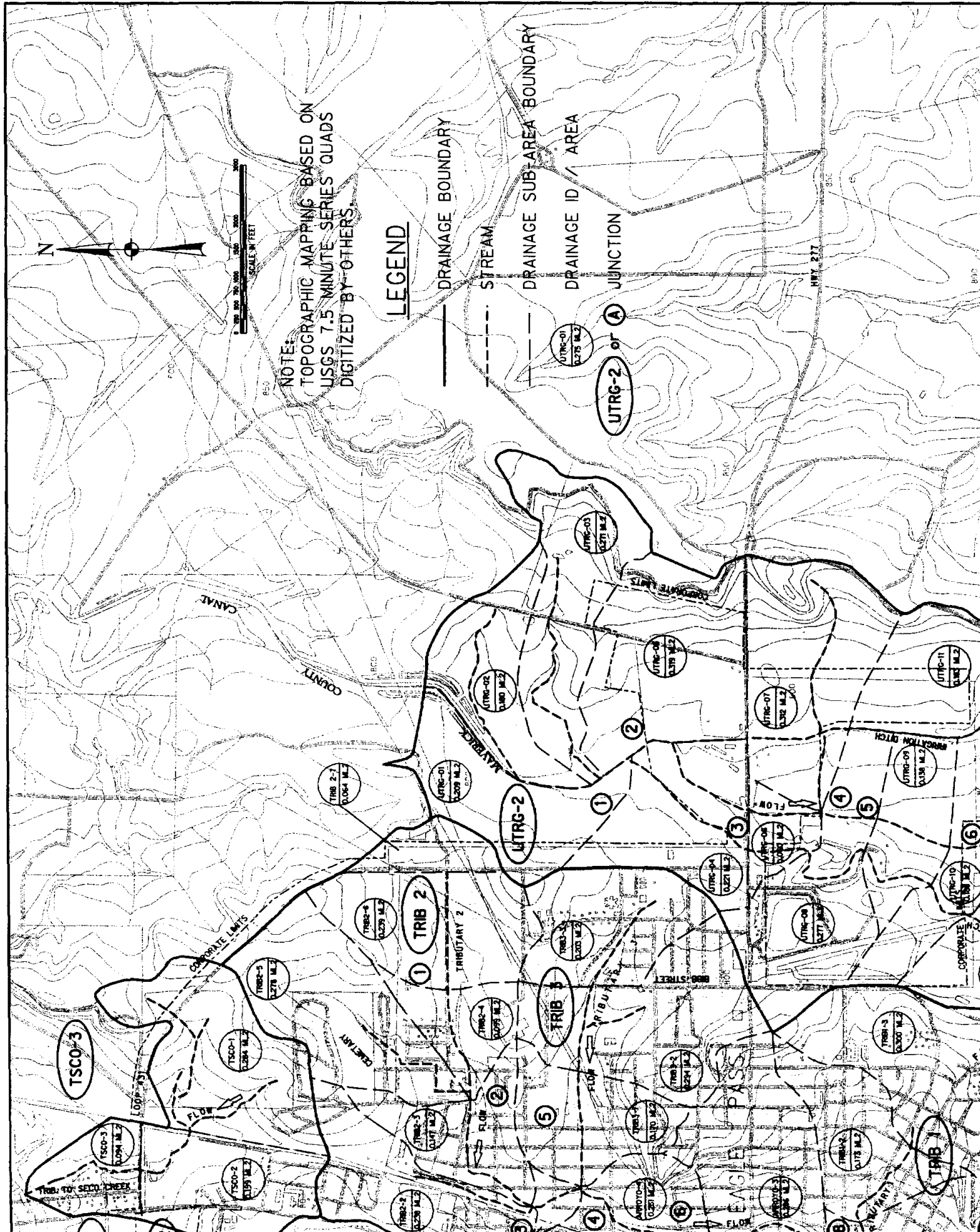
— DRAINAGE BOUNDARY

- - - STREAM

- - - DRAINAGE SUB-AREA BOUNDARY

- - - DRAINAGE ID / AREA

○ UTRG-2 or A JUNCTION

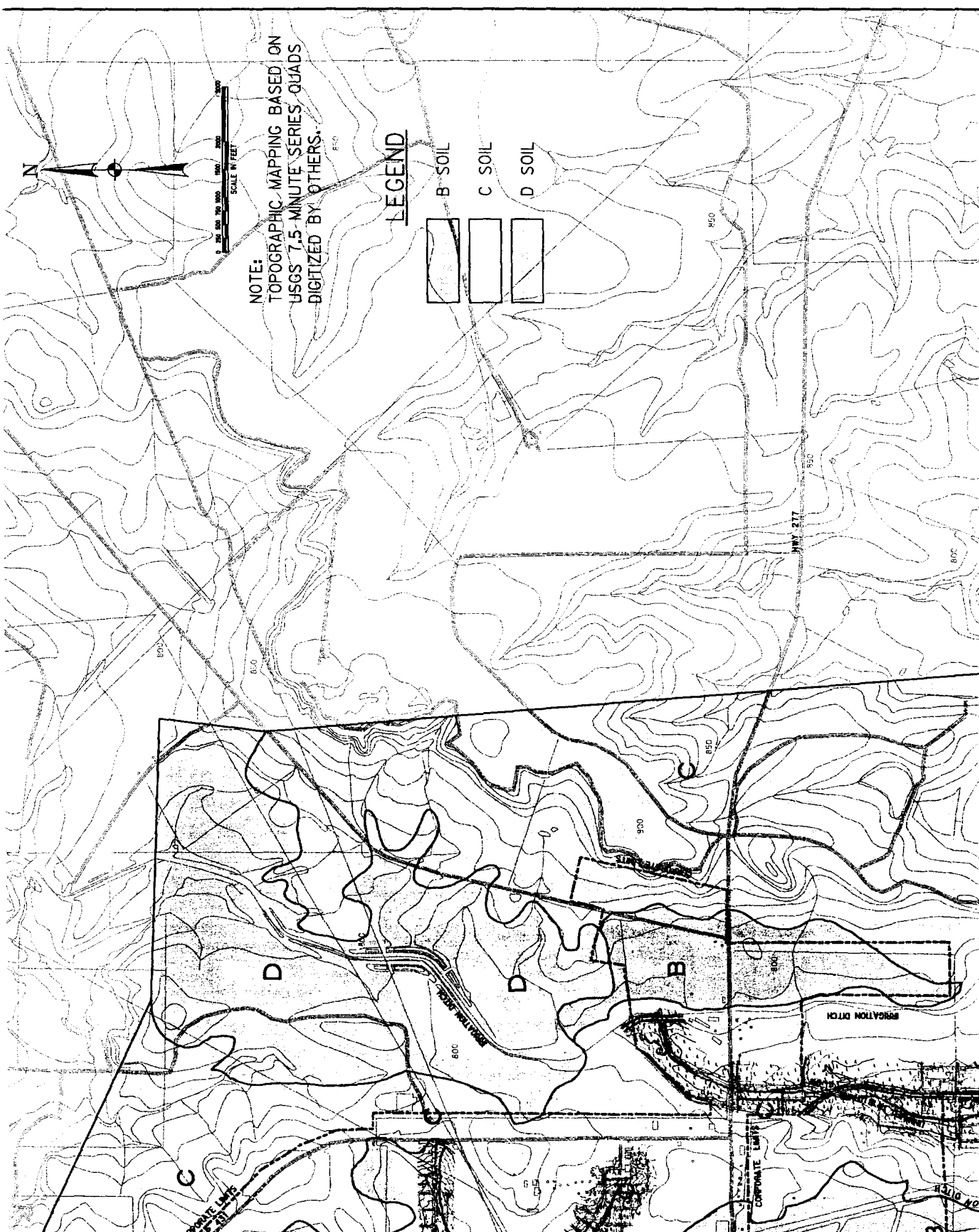


NOTE:  
TOPOGRAPHIC MAPPING BASED ON  
USGS 7.5-MINUTE SERIES QUADS  
DIGITIZED BY OTHERS.



**LEGEND**

- B SOIL
- C SOIL
- D SOIL





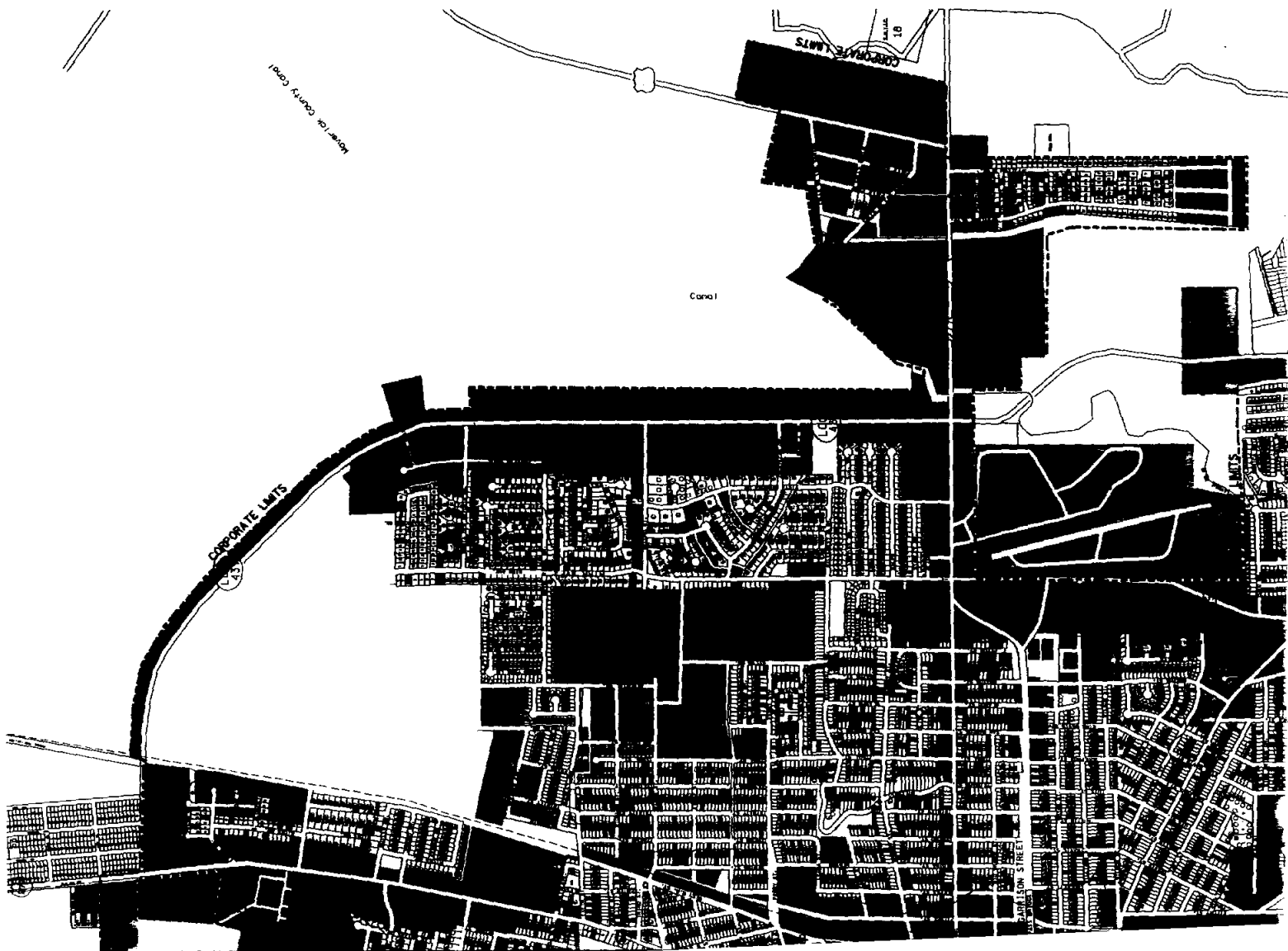
Water for County Canal

Canal

CORPORATE LIMITS

CORPORATE LIMITS

PARIA 18



## B. Hydrologic Parameters

Figure 3 shows the drainage areas used for this study. The *drainage areas* for each stream were determined from digital U.S. Geological Survey quadrangle sheets obtained from Geographic Information Systems of McAllen, Texas. Figure 4 shows the *soils types* used for this study, compiled from the Soil Survey for Maverick County, Texas. Soil types in the Eagle Pass area consist of B, C, and D soils, with B and C being equally dominant within the study area. Figure 5 shows *existing land use* taken from a planning map developed by Hejl, Lee, and Associates. Sub-areas were broken up into the following: agricultural, commercial, industrial, residential, public (cemeteries), public (housing, schools, city offices, etc), roads, and open spaces (parks). A *future land use* map was used to determine new SCS curve numbers and recalculate flows for future conditions.

Table 1 shows the curve numbers used in the study based on land use and soil types. Composite curve numbers for each drainage area, taking into account land use and soil types, which are tabulated in Appendix B.

**Table 1 - SCS Curve numbers used for the Eagle Pass Flood Study**

Land use	Curve Numbers		
	Soil Type B	Soil Type C	Soil Type D
Agriculture (Brush-Poor Cond.)	67	77	83
Commercial	92	94	95
Industrial	88	91	93
Residential (1/4 acre lots)	75	83	87
Public (Cemeteries-Poor Cond)	79	86	89
Public (Housing, schools, etc)	92	94	95
Roads	98	98	98
Open Space (Parks-Poor Cond.)	79	86	89

*Initial rainfall losses* used in the study were calculated based on the curve number (CN) and the initial surface moisture storage capacity (IA) in units of depth. The curve number and initial surface moisture are related to a total runoff depth for a storm by the following relationship:

$$S = \frac{1000 - (10 * CN)}{CN}$$

(Use AMC II curve numbers in equation). S is the currently available soil moisture storage deficit in inches. The initial surface moisture IA is related to S by the relationship:

$$IA = 0.2 * S$$

This relation is based on empirical evidence established by the SCS. Initial rainfall losses were calculated for each subarea and are tabulated in Appendix B.

It should be noted, that the percentage imperviousness for a sub-area was not accounted for intentionally. The SCS curve numbers already generally account for the percentage of



imperviousness based on the soil type, land use and infiltration potential. Therefore, an over estimation of discharges could result if the impervious factor were applied.

*Rainfall data* was developed from two sources: 1) Rainfall data from the National Weather Service HYDRO-35, and 2) the U.S. Weather Bureau Technical Paper No. 40. These publications were used for determining runoff for storm return periods of 2 years through 100 years. Figure 6 is an intensity-duration-frequency curve for the Eagle Pass area. Log-normal graph paper was used to plot each duration storm and to estimate the 500-year storm event. Rainfall intensities were then input to HEC-HMS.

A *stream network or model* is constructed for each area studied in detail. This network is the model to which rainfall values are applied and peak discharges are determined as flows are routed and combined progressively downstream. Flood hydrographs were routed based on a Muskingum-Cunge method, which uses an eight-point cross-section taken from topography of the stream. Figure 7 shows a typical stream network used for the Main Arroyo. This figure was produced from HEC-HMS.

### **C. Peak Discharges**

The original FIS flood study lists peak discharges in a Summary of Discharges table. A 6-hour storm duration was used in the FIS study with a 5-minute time step. For the purposes of this study a 24-hour storm duration was chosen with a 5 minute time step.

Table 2 presents a comparison of flows between the original Flood Insurance Study and the calculated Flood Study flows using the Soil Conservation Service method. The calculated Flood Study Flows are higher for a few reasons:

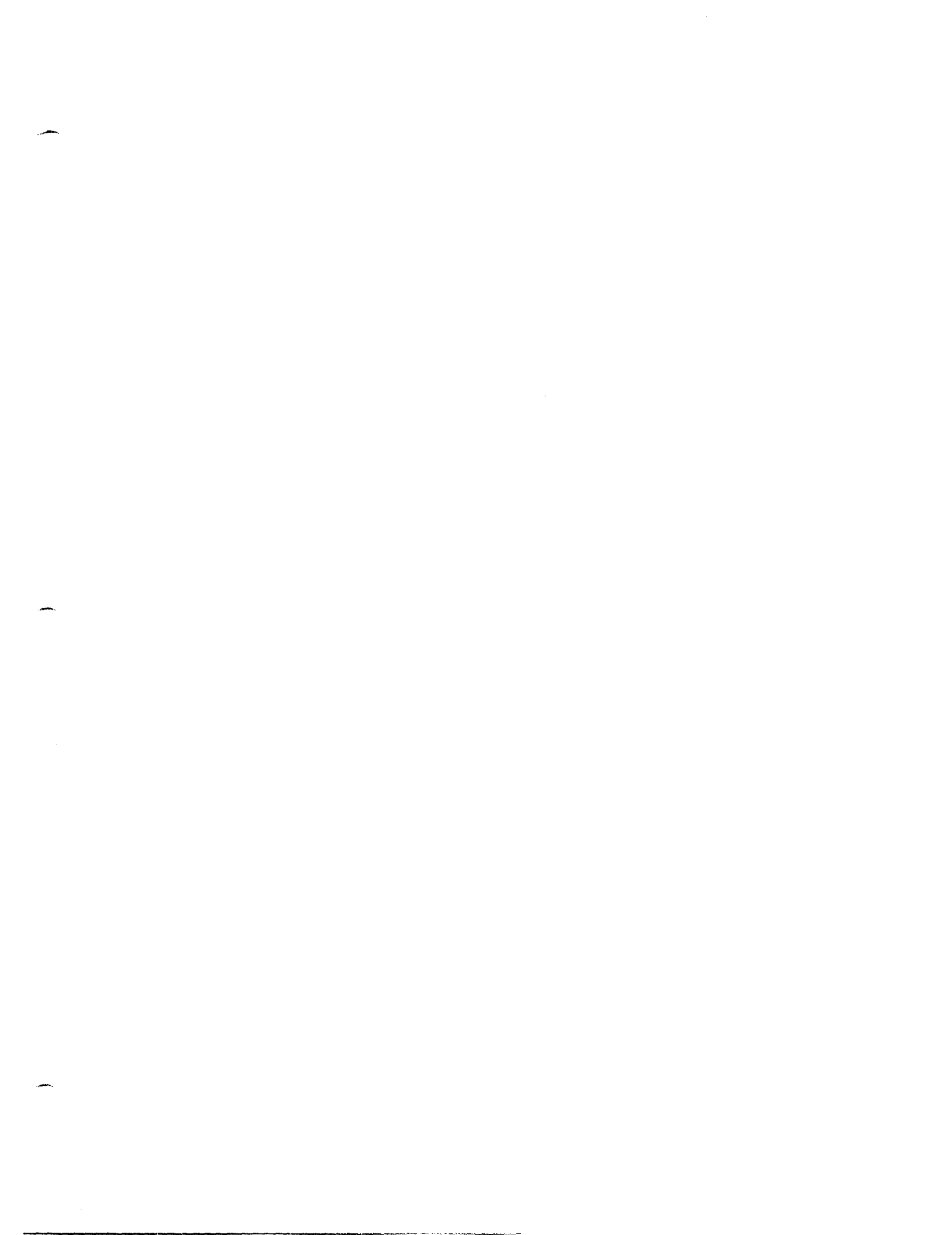
1. It was difficult to determine how the initial soil loss rates for the Original Flood Insurance Study were calculated. For the purposes of this study the SCS calculation of the initial soil loss rate was used. Generally, the calculated soil loss rates were lower than the Original FIS rates.
2. As development has occurred more impervious cover has been added to upstream areas of the Main Arroyo and Unnamed Tributary. Land use has become more intense increasing developed condition curve numbers.
3. Times of concentration have been reduced as new areas have developed with more efficient conveyance systems.
4. The SCS office in Temple uses an adjustment in calculating the antecedent moisture condition for Texas. (See Figure 1) This factor reduces the runoff for dryer regions of the state.

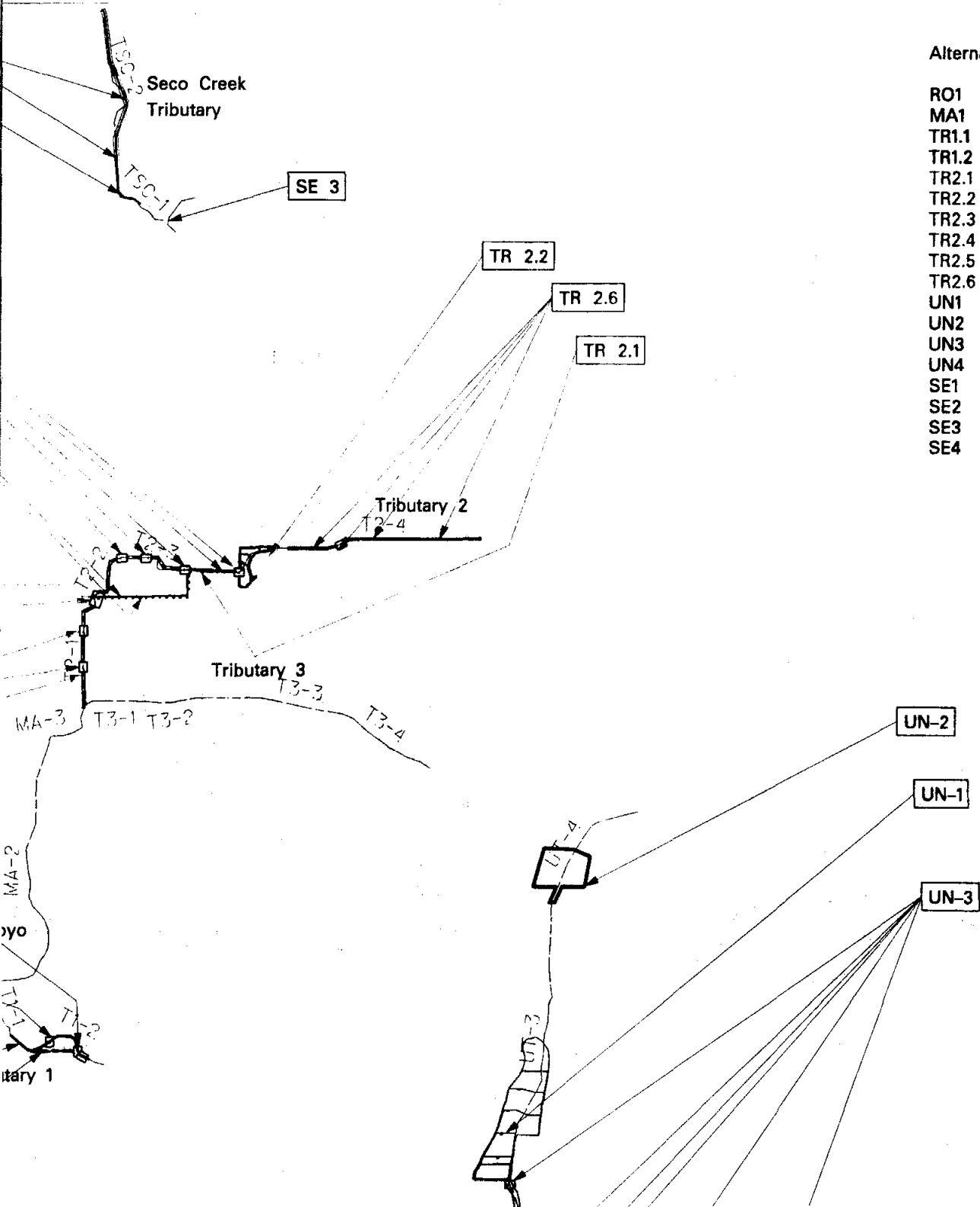
Table 3 shows existing and future peak flows for the full range of storm events at various locations in the study area.

**Table 2 – Comparison of Original Flood Insurance Study and Calculated Flood Study Flows**

LOCATION	Selected Points	DRAINAGE AREA (sq. miles)	6 Hour FEMA Q's	DRAINAGE AREA (sq. miles)	24 Hour HEC-FIMS Q's
<b>Main Arroyo</b>					
Above Limit of Study on Trib 2	I	0.61	1220	0.68	1382
Trib 2 @ Confluence with Arroyo	H	0.94	1670	1.09	1973
<b>Arroyo</b>					
Above Limit of Study on Arroyo	O	0.41	920	0.20	840
Arroyo @ Confluence with Trib 2	E	0.69	1330	0.67	2230
Arroyo and Trib 2 Confluence	E	1.63	2480	1.76	3614
Arroyo Just Above Con. w/ Trib 1	C	2.20	2765	2.29	5080
<b>Trib 1</b>					
Above Limit of Study on Trib 1		0.53	1110		
Trib 1 @ Confluence w/ Trib 1	C	0.74	1400	0.65	2076
Arroyo Just Below Con. w/ Trib 1	C	2.94	3050	2.94	7019
Arroyo @ Con. w/ Rio Grande R.	A	3.44	4220	3.26	7812
<b>Unnamed Creek</b>					
Unnamed Creek - Above Hwy 1021	A	3.21	3000	3.27	5732
Unnamed Creek - Above Hwy 277	H	1.31	1980	1.20	2851

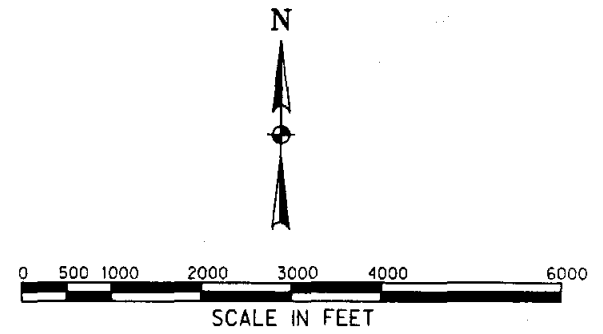
\* For location of selected points see drainage area map.





**Alternative Description**

- RO1 Rio Grande River – House buyout
- MA1 Main Arroyo – Diversion of 800 cfs to River
- TR1.1 Diversion in 72" RCP
- TR1.2 Channel Deepen & Culvert Imp.
- TR2.1 Diversion of 800 cfs to River
- TR2.2 Detention @ Sports Field
- TR2.3 Diversion of 500 cfs
- TR2.4 Channelization & Culvert Improvements
- TR2.5 Combination of 2.3 & 2.4
- TR2.6 Upstream Channelization parallel to Royal Ridge
- UN1 Detention @ Learning Center
- UN2 Detention @ above US Hwy 277
- UN3 Channelization & Culvert Improvements
- UN4 Combination of UN2 & UN3
- SE1 Channel 20' US Hwy 277 to mouth w/Seco Cr.
- SE2 Channel 8' wide above US Hwy 277
- SE3 Detention above Southern Pacific RR
- SE4 Combination of SE1, SE2, & SE3



**ALTERNATE UN-4**  
Combination of UN 2 & UN 3



### Rainfall Intensity-Duration-Frequency for Eagle Pass, Texas

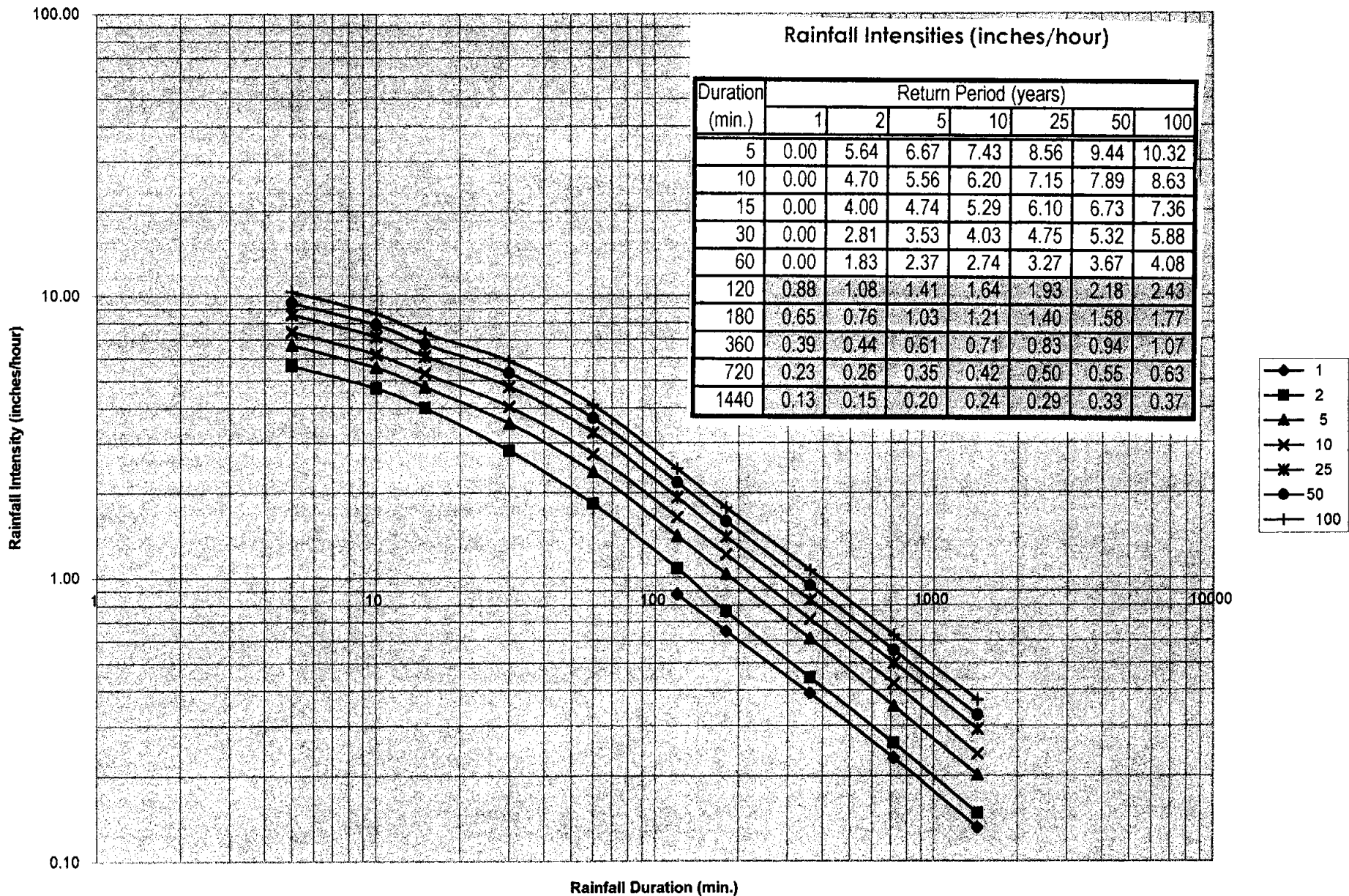


Figure 6 - Eagle Pass I-D-F Curves

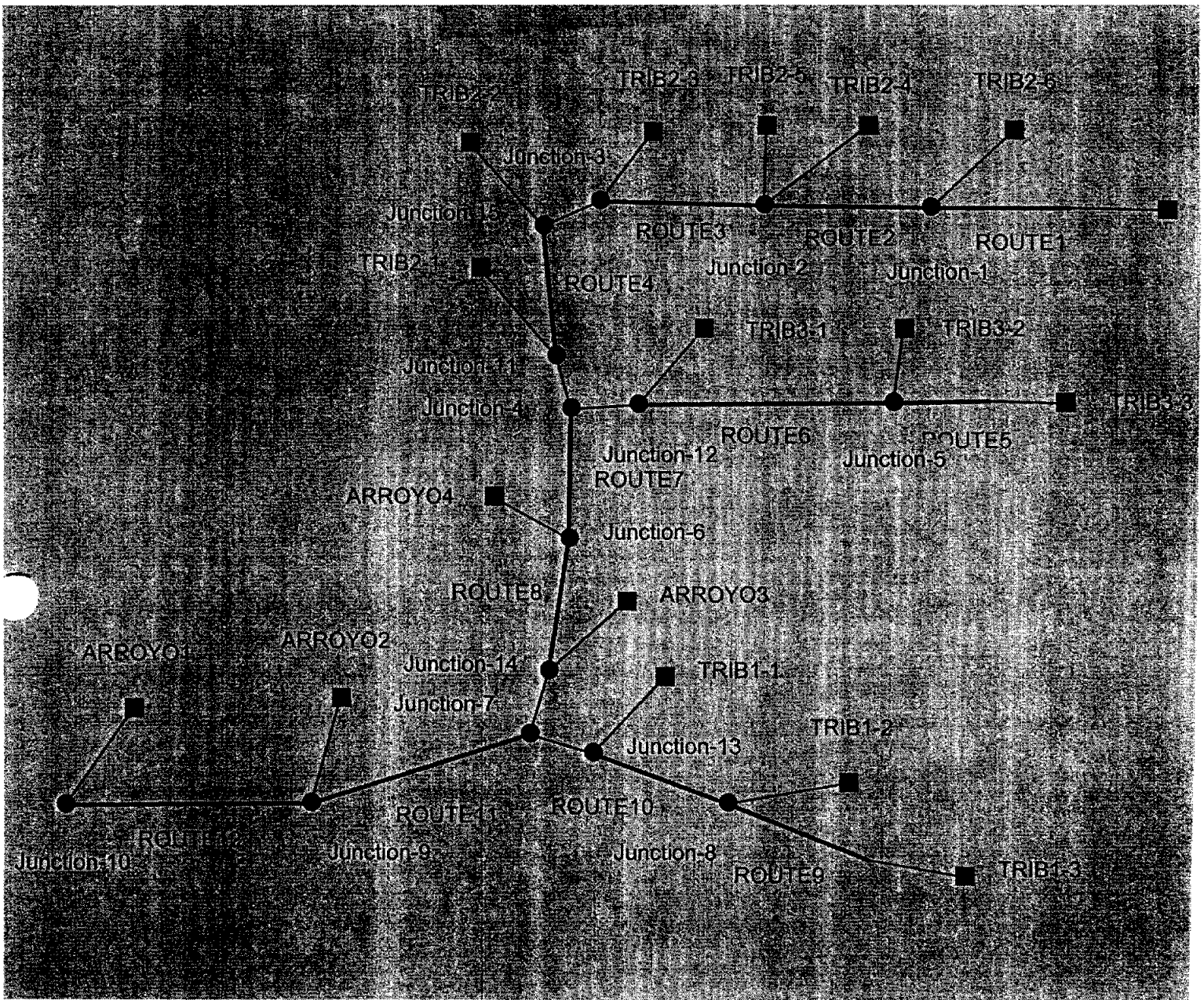


Figure 7 - Stream Network for Main Arroyo from HEC-HMS – Generated from HECHMS]

**Table 3 – Summary of Peak Discharges**

Discharge Point (1)	Description (2)	Stream Sq. Ft. (3)	Drainage Area sq. mi. (4)	25yr CFS (5)	50yr CFS (6)	100yr CFS (7)	250yr CFS (8)	500yr CFS (9)	1000yr CFS (10)	5000yr CFS (11)
<b>Rio Grande River</b>										
<i>Existing Conditions</i>										
						90,000		180,000	230,000	350,000
<i>Future Conditions</i>										
						90,000		180,000	230,000	350,000
<b>Main Arroyo</b>										
<i>Existing Conditions</i>										
E	Junction 4	9551	1.76	286	791	1216	1706	2081	2489	3264
D	Junction 6	7149	2.01	322	942	1446	2028	2464	2965	3897
	Junction 14	5279	2.29	420	1166	1770	2471	2982	3572	4698
C	Junction 7	4658	2.94	696	1744	2569	3536	4233	5027	6596
B	Junction 9	3026	3.13	802	1949	2850	3898	4654	5510	7202
A	Junction 10	1623	3.26	854	2045	2967	4046	4826	5704	7451
<i>Future Conditions</i>										
E	Junction 4	9551	1.76	336	891	1322	1826	2197	2577	3349
D	Junction 6	7149	2.01	375	1043	1548	2134	2581	3059	3963
	Junction 14	5279	2.29	465	1265	1868	2568	3091	3672	4756
C	Junction 7	4658	2.94	728	1836	2664	3625	4332	5129	6652
B	Junction 9	3026	3.13	829	2043	2944	3985	4749	5611	7260
A	Junction 10	1623	3.26	882	2136	3061	4136	4927	5808	7510
<b>Tributary 1</b>										
<i>Existing Conditions</i>										
G	Trib. 1-3	2508	0.30	178	334	442	568	662	764	965
F	Junction 8	1588	0.47	223	451	616	809	955	1114	1434
	Junction 13	873	0.65	298	611	834	1105	1305	1524	1971
<i>Future Conditions</i>										
G	Trib. 1-3	2508	0.30	178	334	442	568	662	764	965
F	Junction 8	1588	0.47	223	451	616	809	955	1114	1434
	Junction 13	873	0.65	298	611	834	1105	1305	1524	1971
<b>Tributary 2</b>										
<i>Existing Conditions</i>										
M	Trib. 2-7	8155	0.07	35	67	88	114	133	153	193
L	Junction 1	6235	0.30	114	237	326	429	507	594	764
I	Junction 2	3984	0.68	149	353	516	716	870	1047	1406
H	Junction 3	638	1.07	187	483	728	1012	1232	1474	1942
	Junction 11	465	1.09	189	489	737	1025	1247	1491	1962
<i>Future Conditions</i>										
M	Trib. 2-7	8155	0.07	46	80	102	127	147	167	205
L	Junction 1	6235	0.30	124	250	339	443	521	608	776
I	Junction 2	3984	0.68	181	411	587	799	960	1145	1507
H	Junction 3	638	1.07	231	567	832	1126	1340	1614	2127
	Junction 11	465	1.09	233	573	842	1138	1354	1631	2145
<b>Tributary 3</b>										
<i>Existing Conditions</i>										
O	Trib 3-3	15040	0.20	73	174	249	339	407	428	644
N	Junction 5	11787	0.50	155	373	536	731	879	1044	1399



Discharge Point (1)	Description (2)	Stream Sta. (3)	Drainage Area sq. mi.	2-yr CF	5-yr CF	10-yr CF	25-yr CF	50-yr CF	100-yr CF	500-yr CF
	Junction 12	9933	0.67	184	462	676	937	1134	1356	1827
<b>Tributary 3</b>										
<i>Future Conditions</i>										
O	Trib 3-3	15040	0.20	73	174	249	339	407	428	644
N	Junction 5	11787	0.50	155	373	536	731	879	1044	1399
	Junction 12	9933	0.67	184	462	676	937	1134	1356	1827
<b>Unnamed Tributary</b>										
<i>Existing Conditions</i>										
J	Junction 2	13371	0.98	263	633	920	1264	1524	1817	2419
H	Junction 3	11519	1.20	333	755	1092	1534	1859	2221	2945
G	Junction 4	10339	1.57	376	874	1281	1809	2213	2669	3488
F	Junction 5	9195	1.85	430	1006	1487	2107	2586	3128	4100
E	Junction 6	7837	1.99	445	1043	1539	2199	2708	3290	4346
D	Junction 7	6342	2.39	514	1213	1786	2567	3173	3863	5127
C	Junction 8	3687	2.81	562	1339	1928	2696	3344	4139	5604
B	Junction 9	2368	3.07	595	1382	2009	2804	3465	4297	5853
A	Junction 10	1242	3.27	610	1428	2076	2893	3576	4439	6074
<i>Future Conditions</i>										
J	Junction 2	13371	0.98	484	950	1272	1645	1923	2225	2821
H	Junction 3	11519	1.20	550	1083	1499	1958	2295	2664	3370
G	Junction 4	10339	1.57	617	1265	1763	2338	2768	3156	4030
F	Junction 5	9195	1.85	686	1442	2023	2702	3208	3678	4712
E	Junction 6	7837	1.99	710	1488	2109	2834	3377	3906	4994
D	Junction 7	6342	2.39	784	1665	2384	3241	3878	4520	5799
C	Junction 8	3687	2.81	850	1787	2502	3410	4138	4901	6367
B	Junction 9	2368	3.07	859	1846	2587	3518	4278	5088	6640
A	Junction 10	1242	3.27	882	1901	2658	3617	4411	5262	6895
<b>Tributary to Seco Creek</b>										
<i>Existing Conditions</i>										
A	TSCO-1	4544	0.28	29	111	185	278	354	435	623
B	Junction 1	2590	0.48	150	317	453	618	751	874	1133
C	Junction 2	1760	0.60	188	384	545	724	876	1013	1285
<i>Future Conditions</i>										
A	TSCO-1	4544	0.28	105	254	363	495	603	704	941
B	Junction 1	2590	0.48	212	452	622	813	975	1097	1437
C	Junction 2	1760	0.60	246	517	694	901	1069	1190	1539
(1) Discharge Points shown on Drainage Area Map										
(2) Description taken from HEC-HMS models										
(3) Stream Stations taken from HEC-RAS models										

## **IV. Hydraulic Analysis**

### **A. Watershed Changes since FIS Study**

The 1978 Flood Insurance Study completed for Eagle Pass by FEMA served as a starting point for defining the existing floodplains for Eagle Pass. Original data files used in this study were obtained from the Federal Emergency Management Agency. The Corps of Engineers HEC-2 Water Surface Profiles program was used to rerun the data files. Discrepancies between the published study and data files were resolved. These models served as a basis for developing existing and future condition models for this study. Stream stationing was preserved to the extent possible in modeling the existing streams and for comparison to the original FIS study. Several changes between the original model and current models for the Rio Grande River, Main Arroyo and its tributaries and the Unnamed Tributary have occurred in the last 20 years. New growth and increased impervious cover have changed runoff patterns and flows. As these areas have developed, new storm sewers and channels have been extended, and culverts and bridges built. A structure inventory and photo inventory for each stream was studied in detail. Table 4 summarizes the results of this structure inventory. Structure locations are tied to the hydraulic models by channel stations in column 2. Photos of typical structures appear at the end of this study.

#### ***Rio Grande River***

A new International Bridge for Eagle Pass is presently under construction on the Rio Grande River. This structure has been added to the existing FIS model. The International Boundary and Water Commission (IBWC) was contacted regarding published flows for the Rio Grande River. These flows have remained unchanged since the original Flood Insurance Study was completed and the same flows were used for this study. Reasons for modeling the Rio Grande River were to use the flood elevations as a starting point for the Main Arroyo model and to account for construction of the new International Bridge in Eagle Pass. Elevations for the Mexico side of the Rio Grande were obtained photogrammetrically by Landata-Geoservices to maintain the accuracy of the hydraulic models. Stationing for the Rio Grande River starts at Sta. 21+90 downstream from the existing Southern Pacific Railroad Bridge and extends upstream to Sta. 205+00 just below the confluence with Seco Creek. The Rio Grande River is shown on Sheets 14-20.

#### ***Main Arroyo***

Changes to the Main Arroyo, and accounted for since the original FIS in the updated stream model, include:

- Concrete lining of the Main Arroyo has been extended west across part of the Rio Grande flood plain. Historically, there have been limitations imposed due to 404 permit requirements and disturbances to wetland areas as to the length of main channel improvements allowed. The concrete channel extension occurs below station 0+00 and it appears on sheet 1.
- The City of Eagle Pass added a golf cart crossing for the municipal golf course near the downstream end of the watershed. This crossing occurs at station 14+58 and appears on sheet 1.

- The Main Arroyo drains most of the developed areas of old Eagle Pass. The channel for the most part is lined either with mortared rock or concrete. The FIS study included three channel dams, which were built with the main channel improvements in 1979-80. The three channel dams have been removed since that time for maintenance reasons and occurred at channel stations 15+80, 27+45 and 33+76. The previous location of these structures appears on Sheets 1 and 2.
- At Garrison street (US Highway 277) a new bridge structure was built, and bridge bents were added at station 35+80 to the model. This structure is shown on Sheet 2.
- A new culvert at Pierce Street was added since 1978 at station 50+44.5 and appears on sheet 3.

The Main Arroyo branches off into three tributaries as identified on Figure 3. For purposes of this study, two of the three tributaries were modeled separately, i.e., Tributary 1 and Tributary 2. Tributary 3 was included at the end of the Main Arroyo model. Starting water surfaces elevations for all storm events were taken from the Main Arroyo model. Photos of the Main Arroyo appear in Appendix 1.

### ***Tributary 1***

Tributary 1 drains areas from the original Eagle Pass Airport, and a shopping mall, on the east boundary, to FM 1021 along most of the south boundary, to the RR tracks on the west boundary. Most of this area is developed with residential, commercial and parkland use. The existing channel begins at the Main Arroyo and is concrete lined throughout most of its length. Photos of Tributary 1 appear in Appendix 1. A new hydraulic model was developed from the new topography, and construction plans were obtained from the City. Tributary 1 begins at station 0+00 at its confluence with the Main Arroyo and extends to Station 25+08 near the intersection of Austin and Roosevelt Streets. Tributary 1 appears on Sheet 4.

### ***Tributary 2***

Tributary 2 drains areas from Loop 431 on the east and RR tracks on the west, to the confluence with Tributary 3 forming the upper end of the Main Arroyo. Most of this area is undergoing rapid development as commercial sites are developed along Loop 431 and the new high school is completed. Photos of Tributary 2 appear in Appendix 1. A new hydraulic model was developed from the new topography, and construction plans obtained from the City. Stationing for Tributary 2 begins at the Main Arroyo near Sta. 0+00 and extends upstream to Sta. 81+55. Tributary 2 appears on Sheets 3, 5 and 6.

### ***Tributary 3***

Tributary 3 drains areas from Loop 431 on the east boundary and RR tracks to the west, to the confluence with Tributary 2 forming the upper end of the Main Arroyo. Most of this area is gradually being developed as residential subdivisions and as commercial sites along Loop 431 are completed. Photos of Tributary 3 appear in Appendix 1. The Tributary 3 hydraulic model was included in the Main Arroyo hydraulic model, and was developed from the new topography. Stationing for Tributary 3 begins at Sta. 95+51 in Main Arroyo model and extends upstream to Sta. 150+40. Tributary 3 appears on Sheets 3, 7, and 8.

Table 4 - Drainage Structure Inventory

Location	Channel Station	Structure Size	Stream Bed Elevation	Low Chord Elev.	Top of Bridge Elev.	Material	Channel U. S.	Channel D. S.	Comments
<b>Rio Grande River</b>									
RR Bridge	4215.00	Bridge	679.00	724.50	729.00	Concrete	Natural	Natural	Existing RR Bridge
New International bridge	4245.00	Bridge	678.00	725.00	729.50	Concrete	Natural	Natural	New International Bridge
Old International bridge	7643.00	Bridge	674.00	725.00	727.00	Concrete	Natural	Natural	Old International Bridge
<b>Main Arroyo</b>									
Golf Cart Crossing	1458.00	5-4'x5' RBC	689.79	693.79	698.50	Concrete	Concrete	Concrete	at Eagle Pass Golf Course
Former Dam No. 1	1580.00	Dam No. 1	692.75	0.00	0.00	Concrete	Concrete	Concrete	Dam No. 1 removed
Adam's Street	2547.00	Arch Bridge	695.90	618.50	618.50	Concrete	Concrete	Concrete	Adam's Street
Former Dam No. 2	2745.00	Dam No. 2	696.00	0.00	0.00	Concrete	Concrete	Concrete	Dam No. 2 removed
Former Dam No. 3	3376.00	Dam No. 3	700.46	0.00	0.00	Concrete	Concrete	Concrete	Dam No. 3 removed
Garrison St. (Hwy 277)	3580.00	Bridge	702.23	720.00	722.10	Concrete	Concrete	Concrete	Garrison St. (Hwy. 277)
Monroe St.	4093.50	Bridge	705.40	721.60	723.30	Concrete	Concrete	Concrete	Monroe St.
Ceylon St.	4591.00	Bridge	709.60	720.00	721.60	Concrete	Concrete	Concrete	Ceylon St.
Southern-Pacific RR	4920.50	Bridge	710.80	728.70	730.70	Concrete	Concrete	Concrete	RR Bridge
Pierce St.	5044.50	7- 6'x10' RBC	711.30	717.40	720.80	Concrete	Concrete	Concrete	Pierce St.
Rio Grande St.	5733.50	Bridge	714.20	723.70	725.70	Concrete	Concrete	Concrete	Rio Grande St.
Main St.	6291.00	2-12'x15' RBC	716.90	728.90	729.40	Concrete	Concrete	Concrete	Main St.
Quarry St.	6987.00	2-7.5 'x17' RBC	720.30	727.80	729.70	Concrete	Concrete	Concrete	Quarry St.
Ferry St.	8807.00	Bridge	726.50	737.20	739.90	Concrete	Concrete	Concrete	Ferry St;
Medina St.	9156.00	3-7'x10' RBC	728.05	735.05	735.90	Concrete	Concrete	Concrete	Medina St.
Concho St.	9860.00	1-5.5'x20' RBC	733.25	739.00	740.90	Concrete	Concrete	Concrete	Concho St.
<b>Tributary #3</b>									
Trinity St.	10218.50	1-6.4'x29' RBC	736.80	743.20	746.10	Concrete	Concrete	Concrete	Trinity St.
Colorado St.	10575.50	1-6'15' RBC	739.60	745.83	747.30	Concrete	Concrete	Concrete	Colorado St.
North Comal St.	10935.00	7-4' Dia. RCP	742.35	746.35	752.80	Concrete	Concrete	Concrete	North Comal St.
Kelso Dr.	12244.00	3-3'x5' RBC	757.20	760.20	761.80	Concrete	Concrete	Concrete	Kelso St.
Bibb St.	13434.00	1-5'x20.5'	765.66	750.50	772.80	Concrete	Concrete	Concrete	Bibb St.
Vista Hermosa Dr.	14873.00	4-18" RCP	782.15	783.65	787.60	Concrete	Concrete	Concrete	Vista Hermosa Dr.

Table 4 - Drainage Structure Inventory

Location	Channel Station	Structure Size	Stream Bed Elevation	Low Chord Elev.	Top of Bridge Elev.	Material	Channel U. S.	Channel D. S.	Comments
<b>Tributary #1</b>									
Williams St.	618.00	2-8'x11' RBC	716.49	724.49	730.20	Concrete	Concrete	Concrete	Williams St.
Private	709.00	Bridge	717.70	729.40	732.00	Concrete	Concrete	Concrete	Private
Pierce St.	917.00	1-6.5'x20' RBC	721.28	727.78	729.70	Concrete	Concrete	Concrete	Pierce St.
Crockett St.	1514.00	1-5.8'x16' RBC	726.54	732.30	733.00	Concrete	Concrete	Concrete	Crockett St.
Wilson St.	2102.50	1-5'x20' RBC	731.90	737.00	738.60	Concrete	Concrete	Concrete	Wilson St.
Travis St	2176.00	1-6'x18' RBC	731.40	737.40	738.10	Concrete	Concrete	Concrete	Travis St.
<b>Tributary #2</b>									
First St.	564.00	2-4'x10' RBC	739.83	743.83	745.00	Concrete	Concrete	Concrete	First St.
Second St.	1077.00	2-4'x10' RBC	742.40	746.40	747.10	Concrete	Concrete	Concrete	Second St.
Concho/Hidalgo St.	1662.00	2-4'x8' RBC	744.80	748.80	750.80	Concrete	Concrete	Concrete	Concho/Hidalgo St.
Trinity St.	2491.00	2-3.5'x8' RBC	749.80	753.30	753.90	Concrete	Concrete	Concrete	Trinity St.
Colorado St.	2853.00	2-4.5'x6' RBC	751.48	755.98	756.30	Concrete	Concrete	Concrete	Colorado St.
Arlington St.	3583.00	2-4.5'x6' RBC	754.76	759.26	759.70	Concrete	Concrete	Concrete	Arlington St.
Memorial Dr.	4354.00	2-4'x6' RBC	760.55	764.55	767.70	Concrete	Concrete	Concrete	Memorial Dr.
North Bibb St.	6042.00	3-2.5'x5' RBC	775.32	777.82	778.60	Concrete	Natural	Natural	North Bibb St.
Royal Haven Dr.	6331.00	Concrete Dip	778.00	0.00	0.00	Concrete	Natural	Natural	Royal Haven Dr.
<b>Unnamed Tributary</b>									
El Indio Hwy. FM 1021	1208.50	5-7'x7' RBC	724.50	731.50	733.20	Concrete	Natural	Natural	El Indio Hwy. FM 1021
FM 3443	5258.50	6-8'x8' RBC	736.39	744.39	746.00	Concrete	Natural	Natural	FM 3443
Dell Crest Drive	6075.00	4-5'x8' RBC	739.70	744.70	746.70	Concrete	Natural	Natural	Dell Crest Drive
Cherry Leaf Drive	7536.50	8-4'x4' RBC	744.42	748.42	749.00	Concrete	Natural	Natural	Near Language Dev. Center
FM 3443	10050.00	16-3'x10' RBC	756.03	759.03	760.70	Concrete	Natural	Natural	FM 3443
FM 277 - Main Street	11742.00	9-5'x5' RBC	763.20	768.30	770.90	Concrete	Natural	Natural	FM 277 - Main Street
<b>Seco Creek Tributary</b>									
Loop 431	3362.50	3-4'6' RBC	731.50	735.50	738.50	Concrete	Concrete	Natural	Loop 431
RR Tracks	4544.00	2-96" Steel Pipes	742.50	750.50	752.60	Steel	Natural	Natural	RR tracks

### ***Unnamed Tributary***

The unnamed tributary has undergone extensive development in the last 20 years. Much of the middle portion of the watershed is for residential use. Commercial sites have been developed along FM 3443 and US 277. The upper portion of the watershed is mostly undeveloped. The lower portion is developed partially with mobile home parks and residential structures. Channel changes since 1978 are:

- The southern extension of FM 3443 from US 57 to FM 1021 and two new culverts were added.
- Three new culverts have been added from the child development center downstream to the junior high school.
- The existing channel has been straightened out and deepened in places.

Stationing for the unnamed tributary begins at Sta. 0+00 South of the El Indio Highway FM 1021 and continues upstream to Sta. 133+71 and areas north of US 277.

These changes were modeled in the new hydraulic model along with the newer topography. Photos of the Unnamed Tributary appear in Appendix 1. The unnamed tributary is shown on Sheets 9-12.

### ***Seco Creek Tributary***

The Seco Creek Tributary starts in the northern part of Eagle Pass as shown on the drainage area map and flows north to Seco creek. New development has occurred. Within the watershed three primary businesses exist which affect stormwater runoff in the upper and middle part of the watershed. A recycling metal operation exists in the middle part of the basin. New developments along Loop 431 include a Freightliner distributorship and an old Grainary downstream of the railroad tracks. Both of these developments have added impervious cover to the watershed. Most of the upper parts of the watershed are residential in nature. Areas from the east side of US 277 (Del Rio highway) drain into the watershed above Loop 431. New roadway improvements on US 277 and Loop 431 have occurred in the last three years. A new hydraulic model was developed for the Seco Creek tributary. Photos of the Seco Creek tributary appear in Appendix 1. Stationing for the Seco Creek tributary begins at Sta. 10+00 near the confluence with Seco Creek and ends at Sta. 45+44 below an existing railroad embankment. The Seco Creek tributary is shown on Sheet 13.

## **B. Methods**

The U.S. Army Corps of Engineers Hydrologic Engineering Center - River Analysis System (HECRAS) Version 2.2 was used to "model" reaches within selected watersheds for the purposes of this flood study. HECRAS is an integrated system of software, designed for interactive use in a multi-tasking, multi-used network environment. The system is comprised of a graphical user interface (GUI), separate hydraulic analysis components, data storage and management capabilities, graphics, and reporting facilities. HECRAS is designed to perform one-dimensional hydraulic calculations for a full network of natural and constructed channels.

*Starting water surface elevations* for the Rio Grande River, Seco Creek and the Unnamed tributary were computed using the slope area method. Starting water surface elevations for the

Main Arroyo were input from computations on the Rio Grande River. Starting water surface elevations for Tributaries 1, 2, and 3 were taken from backwater computations on the Main Arroyo. A more complete explanation of methods to begin backwater computations is presented in the HECRAS User's manual, 1998.

*Bridges* on the Rio Grande River were modeled using the normal bridge routine. Bridge structures on the Main Arroyo were also modeled using the normal bridge routine. Some stream crossings with culverts in the original FIS study had been modeled with the normal bridge routine. Some of the culverts were changed to the special culvert routine used in the 1990 version of HEC-2 and now used in Version 2.2 of HECRAS. A more complete explanation of bridge and culvert modeling techniques is presented in the HECRAS User's manual, 1998.

*Stream roughness coefficients* or Manning's "n" values for streams were selected based on a photo reconnaissance of all streams studied in detail. Over 200 photos were taken of all stream crossings and inventoried for use in Table 4 - Summary of Structures. From these observations stream "n" values were chosen. The n-values for channel varied from 0.035 to 0.060. N-values for overbank areas varied from 0.050 to 0.090. In a few instances, on the Rio Grande River and the Unnamed Tributary, n-values were varied horizontally for variations in stream overbank areas.

Two hydrologic data sets, existing and future condition, were applied to the stream models to determine water surface elevations. The next two sections present the results of this work effort.

### **C. Existing Conditions**

As previously mentioned, the Federal Emergency Management Administration (FEMA) was contacted to obtain back-up information used in the preparation of the original Flood Insurance Study prepared by URS/Forrest & Cotton, Inc. in 1978. The original FIS study modeled the Main Arroyo, three tributaries and unnamed tributary and a portion of the Rio Grande River. For purposes of this flood protection study, these streams were re-run with HEC-2 to determine any known discrepancies between the existing stream models and the re-typed models. Appendix A summarizes the differences between the original model and the re-typed models, along with the output from the re-typed models.

Once these differences were resolved the original models were modified to include changes to the stream models identified in Section B and rerun using the HEC-RAS software. This flood study extended the area studied in detail on the Rio Grande River and added the Seco Creek Tributary to the study.

Existing and future peak discharges summarized in Table 2 were used to compute water surface elevations for the streams studied in detail. The 100-year flood plain was delineated for both conditions from the computed water surface elevations and is shown on sheets 1-20.

### **D. Future Conditions**

Property addresses and finished floor elevations are shown for most permanent structures located in or near the future 100-year flood plain on sheets 1-20. A summary of all affected properties appears in Appendix D. The City of Eagle Pass was most helpful in providing property information for flood prone areas.

A summary by study reach of the number of residences and businesses located within the future 100-year floodplain is shown in Table 5.

**Table 5 - Number of Residences and Businesses Located in Future 100-year Floodplain**

Stream	Sections	No. of Residences	No. of Businesses	Other
Rio Grande	2190 to 20500	22	1	Sewage Lift Sta.
Main Arroyo	212 to 9551	23	6	Golf Course
Tributary 1	0 to 2508	12	-	-
Tributary 2	150 to 8155	113	-	Cemetery & Sports Field
Tributary 3	9791 to 15040	3	-	-
Unnamed Trib.	0 to 13371	257	19	Sports Field & Language Center
Seco Creek Trib.	1000 to 4544	2	2	Church
<b>Totals</b>		414	28	-

Table 5 shows approximately 414 residences and 28 businesses to be located in the future 100-year floodplain. Measures to protect these structures are presented in the next section as flood reduction alternatives.

## V. Economic Considerations of Flood Reduction Alternatives

### A. Alternatives Considered

Several alternatives were considered for flood damage reduction:

- Culvert or Bridge modifications
- Channel improvements - including deepening, widening, or realignment
- Detention ponds
- Regulatory measures, including floodplain zoning and floodway ordinances
- Flood Insurance
- Permanent evacuation or relocation
- Temporary evacuation

For the streams studied in detail, alternative flood damage reduction plans were formulated. Table 6 presents the alternative flood damage reduction plans considered. Appendix D includes more details on the alternative plans considered and sheets 21-25 show these plans. The costs and value of protected structures are calculated based on March 1999 price levels and subject to change.

### **Main Arroyo**

#### **Alternative MA1 & TR2.1**

This alternative consists of two phases. Phase one is to divert approximately 800 cfs of flood flows away from the downtown area near the confluence of Tributary 2 and the Main Arroyo near



Hidalgo Street to the Rio Grande River. The second phase (identified as TR 2.1) is to extend this 800 cfs diversion to the Sports complex near the High School. Overall, the alternative would include:

- Phase one - A tunnel/conduit 96" in diameter and about 3000 feet long extending from the Rio Grande River to Hidalgo Street (near Trib 2 - Section 1568).
- Phase two – A 96" pipe about 2700 feet long extending from the intersection of Concho Street and Hidalgo Street along Hidalgo Street to the Sports Field near the High School.

This diversion could be constructed for the most part in public right-of-way and would alleviate severe flooding in the downtown area.

Flood reduction to properties downstream of this diversion would occur. From the routings for this alternative, the diversion would keep flood flows in the existing channel. Flood reduction improvements would occur for about 128 residences and businesses. The structures are identified on sheets 2, 3 and 5. The proposed alternative is shown on sheet 21 and 22 at the end of this study.

Improvements from Phase one would be to reduce the 100-year flood levels in Tributary 2 and the Main Arroyo to a 10-year level of flood protection for properties from Hidalgo Street (Section 1756) to Commerce Street (Main Arroyo - Section 4929) and a 25-year level of flood protection for properties from Commerce Street (Section 4929) to the Golf Course (Section 1473). Improvements from Phase two would be to reduce the 100-year flood levels in Tributary 2 from Church Street (Section 150) to Memorial Street (Section 4338).

### ***Tributary 1***

#### **Alternative TR1.1**

This alternative consists of diverting higher flood flows through a 72" diameter conduit from the Travis and Wilson Street intersection (Section 2725) down Wilson Street to Crockett Street (Section 1208). This diversion would take higher flood flows away from flooded homes and discharge it below the affected area.

Approximately 10 residences would be protected from flooding for the 100-yr event. Existing right-of-way constrictions limit channel widening. Sheet 21 shows the proposed alignment of the 72" RCP.

#### **Alternative TR1.2**

This alternative consists of channel widening and deepening in some areas and culvert replacement at three locations. The proposed improvements would consist of:

- Channel improvements are widening to 10' and deepening to 4' with a concrete lining from Pierce (Section 893) to Wilson Streets (Section 2427) for approximately 1,500 feet.
- Culvert replacement at Crockett Street (Section 1490 to 1538) from 1-5.8'x16' to 2-9'x10' box culverts.
- Culvert replacement at Wilson Street (Section 2080 to 2125) From 1-5'x20' to 2-9'x10' box culverts.
- Culvert replacement at Travis Streets (Section 2155 to 2197) From 1-6'x18' to 2-8'x8' box culverts.

About 12 residences would be protected from flooding for the 100-year event. Existing right-of-way constrictions limit channel widening. Sheet 21 shows the proposed channel widening and deepening.

## ***Tributary 2***

### **Alternative TR2.1**

This alternative is Phase Two of MA1 above. Costs associated with it are included with MA1. Essentially, this alternative is to divert most of the excess flood flows away from an existing channel and restore the flood carrying capacity of the channel, thereby, adding additional flood protection to structures located in the area. Sheet 22 and 23 show the limits of Phase Two.

### **Alternative TR2.2**

This alternative consists of providing a detention pond at a sports field complex behind the existing High School above Memorial Street. The outlet from the detention pond would discharge above Memorial Street and would provide limited flood protection from Memorial (Section 4338) to Trinity Streets (Section 2521). An 1100' long pilot channel would convey low flows to the outlet around the sports field. Sheet 23 shows the limits of this alternative.

Flood reduction improvements would be to reduce flooding in a cemetery immediately downstream of the detention pond west of Memorial and flooding to homes east of Colorado Street. Approximately, 15 homes would be protected for a 25-year flood event.

### **Alternative TR2.3**

This alternative consists of diverting approximately 500 cfs in culvert from Arlington Street (Section 3562) to Hidalgo Street (Section 1756). This diversion would be a 72" concrete pipe approximately 1800' long. The culvert would extend from the intersection of Concho and Hidalgo to the intersection of Arlington and Hidalgo. It would then turn west along Arlington and continue north along the existing channel to the sports field. A new headwall would be constructed at the sports field to accept storm water runoff. Sheet 22 and 23 show the limits of the proposed culvert.

Flood reduction improvements would provide increased flood protection to residences from Memorial Street downstream to Hidalgo Street. Approximately 52 structures would receive increased flood protection from the 100-year storm event.

### **Alternative TR2.4**

This alternative consists of channel widening and culvert improvements at seven locations along Tributary 2 from Church Street (Section 150) upstream to Memorial Street (Section 4338). The proposed improvements would consist of:

- Channel improvements are to increase the channel width 10' for approximately 4200 feet providing enough capacity to carry most of the 100-year flow.
- Culvert improvements at First Street (Section 540 to 564) are to add 1 - 4'x10' box culvert to the existing 2- 4'x10' box culverts.
- Culvert improvements at Second Street (Section 1051 to 1103) are to add 1 - 4'x10' box culvert to the existing 2-4'x10' box culverts.

- Culvert improvements at Hidalgo Street (Section 1568 to 1756) are to add 1 – 4'x8' box culvert to the existing 2-4'x8' box culverts.
- Culvert improvements at Trinity Street (Section 2461 to 2521) are to add 1 – 3.5x8' box culvert to the existing 2-3.5'x8' box culverts.
- Culvert improvements at Colorado Street (Section 2821 to 2845) are to add 1 – 4.5'x6' box culvert to the existing 2-4.5'x6' box culverts.
- Culvert improvements at Arlington Street (Section 3562 to 3604) are to add 1 – 4.5'x6' box culvert to the existing 2-4.5'x6' box culverts.
- Culvert improvements at Memorial Street (Section 4338 to 4370) are to add 1 – 4.5'x6' box culvert to the existing 2-4.5'x6' box culverts.

Flood reduction improvements would be to provide a 100-year level of protection to approximately 84 homes located between Church and Memorial Streets.

### **Alternative TR2.5**

This alternative consists of a combination of TR2.3 and TR2.4.

Flood reduction improvements would to provide a higher level of flood protection to 52 homes located between Hidalgo and Memorial Streets. It would provide a 100-year level or protection to 32 homes located between Hidalgo and First Streets.

### **Alternative TR2.6**

This alternative consists of channelizing approximately 2700 feet of the upper end of Tributary 2 from Bibb Street (Section 6076) to just below Loop 431 or US Highway 277 (Section 8155) and make culvert improvements at North Bibb Street and Royal Haven Drive. Proposed improvements would consist of:

- Construct a concrete channel 15' wide with 2:1 side slopes from the Sports Field (Section 5037) to North Bibb Street (Section 6008). The channel would be approximately 970' long.
- Construct a box culvert at North Bibb Street (Section 6008 to Section 6076) as a 5'x9' box culvert.
- Construct a concrete channel 15' wide with 2:1 side slopes approximately from North Bibb Street (Section 6076) to Royal Haven Drive (Section 6331). The channel would be approximately 250' long.
- Construct a new box culvert at Royal Haven Drive (Section 6331 to 6391) as a 4'x8' box culvert.
- Construct an earthen channel approximately 15' with 4:1 side slopes from Royal Haven (Section 6391) to US Highway 277 (Section 8155). The channel would be approximately 1760' long.

Flood reduction improvements would be to protect approximately 12 homes in the 100-year floodplain. This alternative is shown on sheet 23.

### ***Unnamed Tributary***

### **Alternative UN1**

This alternative consists of providing upstream detention above Cherry Leaf Drive (Section 7554) adjacent to the Learning Center. The outlet from the detention pond would discharge below Cherry Leaf Drive. Some flood protection would be provided to residences downstream of Cherry Leaf Drive and above FM 3443 (Section 5290). Limited flood protection would be provided for storm occurrences between the 25-year and 100-year flood events.

Flood reduction improvements would be to protect approximately 41 homes and 3 businesses presently located in the 100-year floodplain.

### **Alternative UN2**

This alternative consists of providing upstream detention above US Highway 277 (Section 11814). The outlet from the detention would discharge below US Highway 277. A higher level of flood protection would be provided to properties downstream of US Highway 277 (Section 11814) to FM 1021 El Indio Highway (Section 1242).

Flood reduction improvements would be to provide limited flood protection to approximately 46 homes and 5 businesses presently located in the 100-year floodplain.

### **Alternative UN3**

This alternative consists of culvert and channel improvements along the lower portion of the Unnamed Tributary from El Indio Highway (Section 1242) to Cherry Leaf Drive (Section 7554). Culvert improvements are proposed at FM 1021, FM 3443, Dell Crest Drive and Cherry Leaf Drive. Proposed improvements would consist of:

- Construct culvert improvements at FM 1021 (Section 1242) by adding 2 -7'x6' concrete box culverts to the existing 5-7'x7' concrete box culverts
- Widen concrete channel from El Indio Highway (Section 1242) to FM 3443 (Section 5227) to a 70' wide channel with 2:1 side slopes. The channel would be approximately 4000' long.
- Construct culvert improvements at FM 3443 (Section 5227 to Section 5290) by adding 2-8'x8' box culverts to the existing 6-8'x8' concrete box culverts.
- Widen concrete channel from FM 3443 (Section 5290) to Dell Crest (Section 6048) to a 70' wide channel with 2:1 side slopes. The channel would be approximately 750' long.
- Construct culvert improvements at Dell Crest Drive (Section 6048 to Section 6102) by adding 2-5'x10' box culverts to the existing 1-4.5x8 concrete box culvert.
- Widen concrete channel from Dell Crest Drive (Section 6102) to Cherry Leaf Drive (Section 7507) to a 60' wide channel with 2:1 side slopes. The channel would be approximately 1400' long.
- Construct culvert improvements at Cherry Leaf Drive (Section 7507 to Section 7554) by adding 3-4'x8' box culverts to the existing 8-4'x4' concrete box culverts.

Flood reduction improvements would be to provide a 100-year level of protection to 213 residences and 15 businesses from FM 1021 to Cherry Leaf Drive.

### **Alternative UN4**

This alternative consists of a combination of UN2 and UN3. As explained above a combination of upstream detention and downstream channel and culvert improvements would provide for a

higher level of flood protection along most of Unnamed Tributary from FM 1021 (Section 1226) to US Highway 277 (Section 11814).

Flood reduction improvements would be to provide a higher level of flood protection to the 213 residences and 15 businesses identified above and protect the Language Development Center and 6 businesses along US Highway 277.

### ***Seco Creek Tributary***

#### **Alternative SE1**

This alternative consists of constructing an earthen channel from Seco Creek (Section 1000) to US Highway 277 (Section 3311). The earthen channel would be approximately 20' wide with 4:1 side slopes. It would be approximately 2300' long. This alternative is shown on Sheet 25.

Flood reduction improvements would be to provide flood protection to 2 homes and one church downstream of Loop 431.

#### **Alternative SE2**

This alternative consists of constructing a concrete lined channel upstream of US Highway 277 approximately 850 feet. The concrete channel would have to be 8' wide with 2:1 side slopes. This alternative is shown on Sheet 25.

Flood reduction improvements would be to protect 2 businesses and 3 houses located adjacent to the channel.

#### **Alternative SE3**

This alternative consists of constructing upstream detention at the Southern Pacific Railroad embankment (Section 4544). Currently, 2-96" steel pipes discharge storm water at this location. Closing off one of the pipes would provide some detention upstream of the old railroad embankment. Land above the railroad embankment is undeveloped and could easily be used as a detention area.

Flood reduction improvements would be to provide increased flood protection to 2 businesses and 2 homes.

#### **Alternative SE4**

This alternative consists of combining SE1 and SE2, essentially channelizing the Seco Creek Tributary from above US Highway 277 (Section 4044) to its confluence with the main channel of Seco Creek (Section 1000).

Flood reduction improvements would be to provide a 100-year level of flood protection to 2 businesses, 3 homes, a church, and a recycling yard downstream of US Highway 277.

### ***Rio Grande River***

## **Alternative RO1**

This alternative consists of a buyout of approximately 24 houses and businesses along Ryan Street. Many of these residences were flooded by the storm of August 23-25, 1998 from rainfall resulting from Hurricane Charley. A buyout would involve a displacement and demolition of structures in the flood plain. Sheet 16 shows the structures affected which fall between station 80+00 and 96+00 in the model study. These structures are also located upstream of the International Bridge (US Hwy 57) Structures and land values were estimated at \$40,000 per property in March, 1999 price levels.

### **B. Flood Reduction Alternative Costs**

For the alternatives formulated (Table 6) to reduce flooding in Eagle Pass, costs for each alternative were computed based on personal communication with local city officials, consultants and Texas Department of Transportation average unit prices for the Laredo District. These cost estimates are summarized in Appendix D and the flood reduction alternatives are shown on sheets 21-25 in this report. March, 1999 price levels were used in the cost estimates.

### **C. Value of Protected Structures**

The value of protecting existing structures from a 100-year flood is presented. The methods used for determining these values for residences and businesses included:

- Flood protection from the occurrence of a 100-year flood event.
- Costs and structure values attributable to a given flood reduction alternative were determined in present dollars. The average project life for most drainage structures in Eagle Pass is considered to be about 50 years or greater.
- The value of structures was determined from an average of the appraised value of existing structures protected in a stream reach. Only 50% of the value of the structures was considered salvageable. Contents were assigned a value of 25% of the average structure value.
- A property buyout alternative was considered for the Rio Grande River.

### **D. Recommended Flood Reduction Plan and Implementation Plan**

A flood reduction plan is discussed, and a plan for implementation is proposed. Available funding sources and additional funding options are discussed. The Federal government uses a tangible value analysis based on existing land use to evaluate flood control projects. This analysis consists of identifying costs and benefits with the objective of maximizing national economic development. Benefits divided by cost are expressed as a ratio. A ratio of 1.0 represents benefits equal to project costs and is the dividing point between an economically feasible and an infeasible project. Projects with benefit-cost ratios that are less than one are deemed economically not feasible. This method of rating alternatives does not take into account intangible factors such as citizen desires, environmental quality, ecological enhancement, neighborhood enhancement and aesthetics. Preservation of the flood plain to minimize future flooding resulting from urban development of the watershed is also not taken into consideration. Previous flood protection studies have indicated that benefit-cost ratios on municipal flood plain management projects rarely exceed 1.0. In fact, the requirement of a benefit-cost ratio exceeding 1.0 would exclude consideration of most alternatives. In light of this, and because the flood reduction alternatives presented herein provide significant non-quantifiable benefits to both the residents of the City of

Eagle Pass and the environment, benefit-cost ratios were not calculated. Instead, flood reduction costs were determined and the value of structures protected was calculated for the six streams studied in detail. Table 7 presents the recommended flood reduction alternatives chosen for each stream with a proposed plan for implementation. Figure 8 shows the Recommended Implementation Plan.

Rio Grande River - Alternative RO1 consists of a buyout of flooded structures along the Rio Grande River. After the August, 1998 storm event several of these structures were purchased, and families relocated to non-flood prone areas.

Main Arroyo - Alternative MA1 in combination with Alternative 2.1 provides a diversion of floodwaters away from the downtown area. This alternative is expensive costing over \$3,181,000 and would require some additional ROW. This alternative would have a significant impact on flood reduction for any historic structures located in downtown Eagle Pass. About 70 structures would be protected by this upstream diversion. Alternatives MA1 and 2.1 together would reduce 100-yr water surface elevations about 0.5 feet to 2.0 feet throughout much of the lower reaches of the Main Arroyo from Station 10+92 to Station 92+31 and on Tributary 2 from Sta. 1+50 to Sta. 43+07.

Tributary 1 - Alternative TR1.2 consists of channel widening and culvert improvements at three road crossings in the upper part of the watershed. This alternative would cost about \$636,000 and may require some additional ROW for the culvert improvements. Alternative TR1.2 would reduce 100-yr water surface elevations about 1.20 feet to almost 4.0 feet from Sta. 8+93 to Sta. 24+27.

Tributary 2 - Alternative TR2.6 is a channelization project in the upstream reaches of Tributary 2. The land and right-of-way for the channel improvement already exist, and there are no known utilities to be relocated. Alternative TR2.6 is relatively low in cost at about \$137,000 making it an attractive alternative for consideration. Alternative TR2.6 would reduce the 100-yr water surface elevations about 0.45 feet to as much as 2.87 feet from Sta. 52+71 to Sta. 80+91.

Unnamed Tributary - Alternative UN4 is a combination of UN2 & UN3. Consisting of channel and culvert improvements in the lower part of the Unnamed Tributary and a dry detention pond in the upper part of the watershed. This is an expensive alternative at over \$2,000,000, and would require Federal funding and support. Alternative UN4 would have the greatest impact from a flood protection standpoint, since 276 structures would be protected. Alternative UN4 would reduce the 100-yr water surface elevations about 0.50 feet to as much as 5.13 feet from Sta. 0+00 to Sta. 133+71, or basically the entire length of the Unnamed Tributary.

Seco Creek Tributary - Alternative SE4 would widen and deepen the existing channel below US 277, widen and line the existing channel above US 277 and call for the construction of a detention pond above an existing Railroad embankment. The cost of this combination of improvements would be in excess of \$400,000. Three businesses, one house and a church would be protected by these improvements. Alternative SE4 would reduce the 100-yr water surface elevations about 0.49 feet to as much as 3.45 feet from Sta. 16+00 to Sta. 45+44.

A more complete comparison of 100-yr water surface elevations appears in Appendix D. Table 8 is an example of the information collected for a particular watershed to determine the average value of structures. Based on the number of structures protected for a flood event a value was computed.

Should the City of Eagle Pass plan to use federal funds for construction of flood control facilities, the use of these funds will undoubtedly require preparation of environmental assessments to address impacts of the alternative or other mitigative measures, which might be determined necessary, as an additional cost of the alternative. Furthermore, federal permitting required for implementation of the flood management alternatives involving earthmoving (channelization, new or enlarged culverts, detention ponds, diversion structures, etc.) would require surveys for particular impacts to cultural resources and federally protected species. The City of Eagle Pass should budget additional funds if federal money is sought for these flood reduction alternatives.

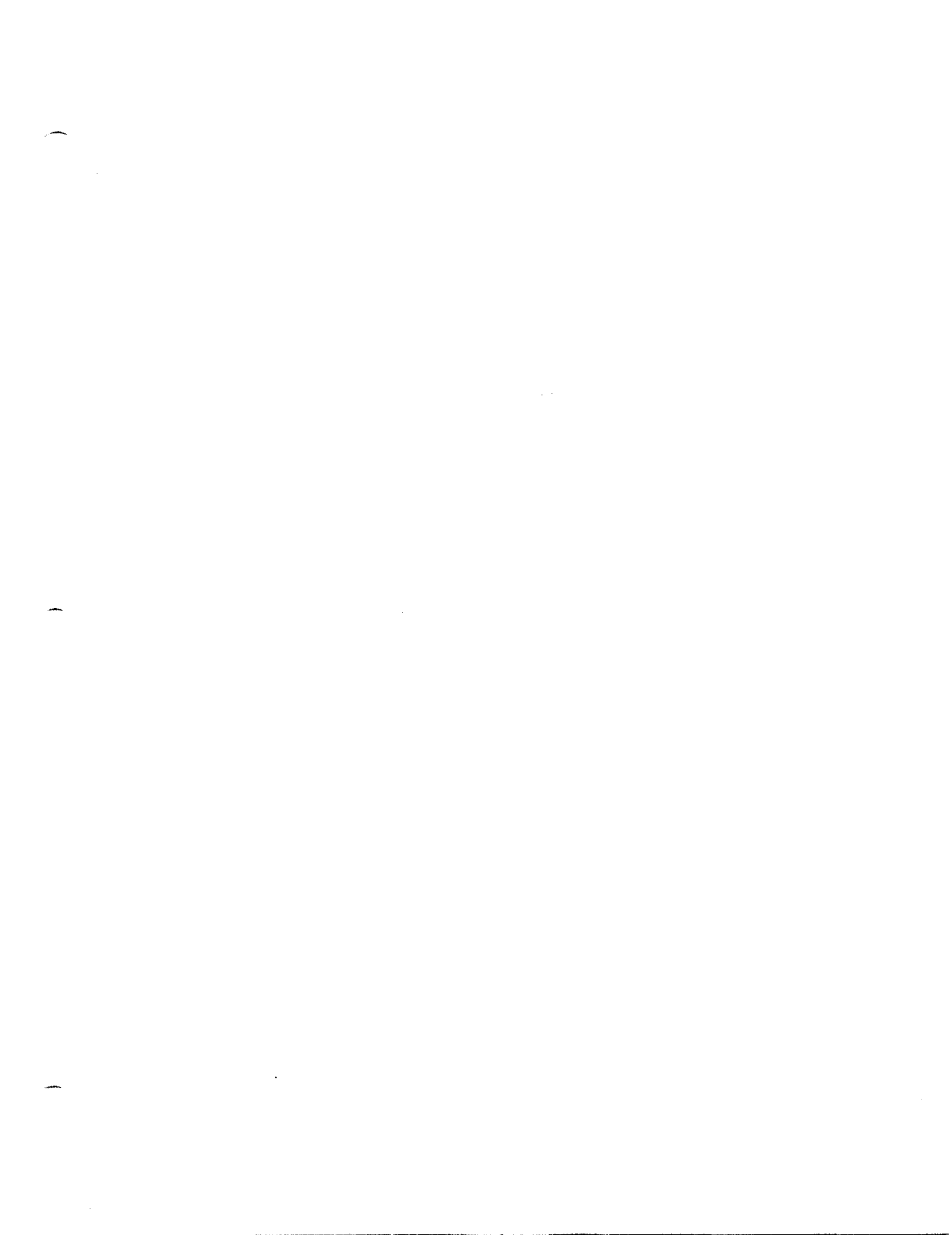


**Table 6 - Alternative Improvement Plans Considered**

Stream	Problem		Alternative	Description	Cost
Rio Grande River	<ul style="list-style-type: none"> <li>Periodic Flooding from rise in river levels...usually during storms induced by tropical disturbances.</li> <li>Minor flooding along Ryan Street.</li> <li>Lift station closed during high flooding</li> </ul>	RO1	Existing House Buyout	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Buyout of existing homes and businesses along Ryan Street.</li> <li>Shut down lift station periodically</li> </ul>	\$ 940,000
Main Arroyo	<ul style="list-style-type: none"> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of properties adjacent to creek during heavy storm events.</li> </ul>	MA1	Existing MA1 - Diversion of 800 cfs to River  Regular Maintenance	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Diversion of flood flows away from Downtown area near confluence of Tributary 2 and Main Arroyo down Church St. or 1<sup>st</sup> Street. Conduit 8' diameter. About 4000' long.</li> <li>Routine channel clean up and mowing</li> </ul>	\$ 3,181,000
Tributary 1	<ul style="list-style-type: none"> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of structures adjacent to creek.</li> <li>Minor flooding of structures adjacent to creek and traffic disruption during heavy storm events.</li> </ul>	TR1.1	Existing Diversion in 72" RCP	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Diversion thru 72" diameter conduit, from Travis &amp; Wilson intersection to Crockett St.,</li> </ul>	\$ 388,000
		TR1.2	Channel widening & culvert improvement	<ul style="list-style-type: none"> <li>Channel widening and deepening in same area.</li> <li>Routine channel clean up and mowing.</li> </ul>	\$ 636,200
Tributary 2	<ul style="list-style-type: none"> <li>Significant flooding of homes in lower watershed</li> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of structures adjacent to creek in upper watershed.</li> </ul>	TR2.1	Existing Diversion of 800 cfs to River away from Downtown area	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Diversion of flood flows away from Downtown area. Conduit 8' diameter. About 4000' long.</li> </ul>	see MA1
		TR2.2	Detention	<ul style="list-style-type: none"> <li>Construct dry detention pond at Sports Field to reduce flows below Memorial Drive</li> </ul>	\$ 167,860
		TR2.3	Diversion of 500 cfs	<ul style="list-style-type: none"> <li>Diversion of 500 cfs down Hildalgo Street</li> </ul>	\$ 964,100
		TR2.4	Channelization and culvert improvements	<ul style="list-style-type: none"> <li>Channel widening and Culvert improvements</li> </ul>	\$ 1,163,150
		TR2.5	Combination of 2.3 & 2.4	<ul style="list-style-type: none"> <li>Combination</li> </ul>	\$ 2,127,250
		TR2.6	Upstream Channelization	<ul style="list-style-type: none"> <li>Widening and deepening channel parallel to Royal Crown Drive w/ culvert improvement</li> <li>Routine channel clean up and mowing.</li> </ul>	\$ 137,000
Tributary 3	<ul style="list-style-type: none"> <li>Disruption of traffic at low water crossings</li> </ul>		Existing	<ul style="list-style-type: none"> <li>Do nothing</li> </ul>	
Unnamed Tributary	<ul style="list-style-type: none"> <li>Significant flooding of homes in lower portion of watershed</li> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of structures adjacent to creek in upper watershed.</li> </ul>	UN1	Existing Detention Pond @ Learning Center	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Dry Detention at Learning Center above Cherry Leaf Drive</li> </ul>	\$ 707,950
		UN2	Detention Pond above US 277	<ul style="list-style-type: none"> <li>Dry Detention above US Hwy 277</li> </ul>	\$ 410,800
		UN3	Channelization and Culvert Improvement	<ul style="list-style-type: none"> <li>Widen and deepen channel between FM 1021 and FM 3443 to Cherry Leaf, add culvert capacity @ 4 locations.</li> </ul>	\$ 1,507,000
		UN4	Combination of UN2 & UN3	<ul style="list-style-type: none"> <li>Combine pond and culvert improvements</li> </ul>	\$ 1,917,800
Seco Creek	<ul style="list-style-type: none"> <li>Minor flooding in lower reaches</li> </ul>	SE1	Existing Channel 20' wide below US 277	<ul style="list-style-type: none"> <li>Do Nothing</li> <li>Widen and deepen existing channel below US 277.</li> </ul>	\$ 120,933
		SE2	Channel 8' wide above US 277	<ul style="list-style-type: none"> <li>Widen channel upstream of US Hwy 277</li> </ul>	\$ 106,200
		SE3	Detention above RR tracks	<ul style="list-style-type: none"> <li>Construct Detention Pond upstream of Railroad embankment</li> </ul>	\$ 235,831
		SE4	Combination of projects	<ul style="list-style-type: none"> <li>Combination of SE1, SE2, SE3, SE4</li> </ul>	\$ 342,031

**Table 7 – Recommended Implementation Plan**

<b>Stream</b>		<b>Alternative</b>	<b>Description</b>	<b>Cost</b>
<b>Rio Grande River</b>	RO1	Existing House Buyout	<ul style="list-style-type: none"> <li>Buyout of existing homes and businesses along Ryan Street.</li> </ul>	\$ 940,000
<b>Main Arroyo</b>	MA1	MA1 - Diversion of 800 cfs to River	<ul style="list-style-type: none"> <li>Diversion of flood flows away from Downtown area near confluence of Tributary 2 and Main Arroyo down Church St. or 1<sup>st</sup> Street. Conduit 8' diameter. About 4000' long.</li> </ul>	\$ 3,181,000
<b>Tributary 1</b>	TR1.2	Channel widening & culvert improvement	<ul style="list-style-type: none"> <li>Channel widening and deepening in same area.</li> </ul>	\$ 636,200
<b>Tributary 2</b>	TR2.1	Diversion of 800 cfs to River away from Downtown area	<ul style="list-style-type: none"> <li>Diversion of flood flows away from Downtown area. Conduit 8' diameter. About 4000' long.</li> </ul>	see MA1
	TR2.4	Channelization and culvert improvements	<ul style="list-style-type: none"> <li>Channel widening and Culvert improvements</li> </ul>	\$ 1,163,150
	TR2.6	Upstream Channelization	<ul style="list-style-type: none"> <li>Widening and deepening channel parallel to Royal Crown Drive w/ culvert improvement</li> </ul>	\$ 137,000
<b>Tributary 3</b>		Existing	<ul style="list-style-type: none"> <li>Do nothing</li> </ul>	
<b>Unnamed Tributary</b>	UN4	Combination of UN2 & UN3	<ul style="list-style-type: none"> <li>Dry Detention above US Hwy 277 Widen and deepen channel between FM 1021 and FM 3443 to Cherry Leaf, add culvert capacity @ 4 locations.</li> </ul>	\$ 1,917,800
<b>Seco Creek Tributary</b>	SE4	Combination of projects SE1, SE2, and SE3	<ul style="list-style-type: none"> <li>Widen and deepen existing channel below US 277, Widen channel upstream of US Hwy 277 Construct Detention Pond upstream of Railroad embankment</li> </ul>	\$ 342,031



State	Zip	Station	LEFT (assumed) or RIGHT	Year Built (assume missing)	1st Floor Stage (FIR-ELEV)	Stage (GIRD-ELEV)	Found GIRD Elev.	SID Reach Name	Struct Value (K) (Ave. for all bldgs)	Content Value (K) (=20% Struct)	Other Value (K)	No. of Struct	Resiz/Gen Data Estimate	No. of Struct Estimated for last Tax Yr	Tax Esti \$/SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes
X	78852	4307	Right	1996	720.16	719.16		MA-1	5.0	1.0	0.0	1		0			5,100	
X	78852	4307	Right	1996	720.36	719.36		MA-1	25.0	5.0	0.0	1		0	24.77	1392	24,980	
X	78852	4267	Right	1996	719.99	718.99		MA-1	15.7	3.1	0.0	1		0			45,740	
X	78852	3735	Left	1996	720.84	719.84		MA-1	11.2	2.2	0.0	1		0			11,170	
X	78852	3735	Left	1996	719.20	718.20		MA-1	17.9	3.6	0.0	1		0	22.03	1458	17,920	
X	78852	3735	Left	1996	719.31	718.31		MA-1	3.1	0.6	0.0	1		0			13,130	
X	78852	3735	Left	1996	720.33	719.33		MA-1	15.2	3.0	0.0	1		0			15,220	
X	78852	4049	Right	1996	720.87	719.87		MA-1	16.2	3.2	0.0	1		0			16,240	
X	78852	4049	Right	1996	724.09	723.09		MA-1	8.3	1.7	0.0	1		0			8,300	
X	78852	9369	Right	1996	722.89	721.89	722.89	MA-3	15.4	3.1	0.0	1		1	9.64	826	15,400	
X	78852	9369	Right	1996	723.89	722.89	722.89	MA-3	14.0	2.8	0.0	1	21,098	1	10.42	1100	14,030	
X	78852	9369	Right	1996	723.89	722.89	722.89	MA-3	21.1	4.2	0.0	1	21,098	0				
X	78852	9369	Right	1996	723.89	722.89	722.89	MA-3	21.1	4.2	0.0	1	21,098	0				
K	78852	9551	Left	1996	742.23	741.23		MA-3	25.0	5.0	0.0	1		0			24,960	
K	78852	9551	Left	1996	741.92	740.92		MA-3	21.6	4.3	0.0	1		0			21,630	
K	78852	9551	Left	1996	742.11	741.11		MA-3	24.4	4.9	0.0	1		0			24,360	
K	78852	9791	Left	1996	741.40	740.40		MA-3	24.7	4.9	0.0	1		0			24,740	
K	78852	9837	Left	1996	740.55	739.55		MA-3	33.6	6.7	0.0	1		0			33,630	
K	78852	9837	Left	1996	742.09	741.09		MA-3	33.6	6.7	0.0	1		1	29.69	925	33,630	
K	78852	9883	Left	1996	743.82	742.82		MA-3	20.7	4.1	0.0	1		1	22.09	782	20,710	
K	78852	9837	Left	1996	742.26	741.26		MA-3	23.0	4.6	0.0	1		0			23,010	
K	78852	9837	Left	1996	742.46	741.46		MA-3	34.9	7.0	0.0	1		0			34,930	
K	78852	9933	Left	1996	742.79	741.79		MA-3	34.2	6.8	0.0	1		0			34,230	
K	78852	9933	Right	1996	738.71	737.71		MA-3	31.3	6.3	0.0	1		1	26.17	999	31,250	
K	78852	9933	Right	1996	738.31	737.31		MA-3	24.1	4.8	0.0	1		1	25.67	648	24,110	
K	78852	9933	Right	1996	729.63	728.63		MA-3	43.4	8.7	0.0	1		1	28.91	1270	43,360	
K	78852	9933	Right	1996	729.89	728.89		MA-3	29.4	5.9	0.0	1		1	25.96	939	29,350	
K	78852	1538	Left	1996	735.23	734.23		T1-2	26.3	5.3	0.0	1		0			26,330	
K	78852	1538	Left	1996	734.33	733.33		T1-2	22.6	4.5	0.0	1		0			22,630	
K	78852	1670	Left	1996	736.03	735.03		T1-2	33.0	6.6	0.0	1		0			33,020	
K	78852	1670	Left	1996	738.84	737.84		T1-2	22.1	4.4	0.0	1		0			22,120	
K	78852	1819	Left	1996	737.74	736.74		T1-2	39.4	7.9	0.0	1		0			39,380	
K	78852	1819	Left	1996	737.95	736.95		T1-2	49.2	9.8	0.0	1		0			49,150	
K	78852	1955	Left	1996	738.14	737.14		T1-2	24.5	4.9	0.0	1		0			24,490	
K	78852	2227	Right	1996	739.59	738.59		T1-2	26.6	5.3	0.0	1		0			26,630	
K	78852	2227	Right	1996	739.68	738.68		T1-2	21.1	4.2	0.0	1	21,098	0				
K	78852	564	Left	1996	745.61	744.61		T2-1	23.7	4.7	0.0	1		1	24.92	680	23,650	
K	78852	465	Left	1996	745.37	744.37		T2-1	29.5	5.9	0.0	1		0			29,460	
K	78852	430	Left	1996	744.00	743.00		T2-1	19.4	3.9	0.0	1		0			19,360	
K	78852	540	Left	1996	745.50	744.50		T2-1	32.9	6.6	0.0	1		1	30.36	736	32,940	
K	78852	465	Left	1996	745.11	744.11		T2-1	65.2	13.0	0.0	1		1				

## VI. Conclusions and Recommendations

The following conclusions and recommendations are made to improve flood protection planning for the City of Eagle Pass. These measures could be adopted by the City Council in the form of a Capital Improvement Program. Funding for these measures could be by means of a bond program, a drainage fee assessment, for application of a low interest loan through the Texas Water Development Board.

- **Alternatives for Flood Damage Reduction** – A recommended plan for flood damage reduction is presented in Table 7. This plan will provide a 25- to 100-year level of protection to the City of Eagle Pass. These alternatives could be phased in over a period of years in a Capital Improvement Program. Recent development along Loop 431 and Highway 277 will add significant areas of impervious cover in the upper watersheds of Tributary 2 and 3 and the Unnamed Tributary. This development will increase future flood levels in these watersheds. *The City of Eagle Pass should phase these drainage improvements in over time and finance them through a drainage fee, a bond program or some other type of public funding.*
- **Buy Out of Properties** - The flooded properties along the Rio Grande River could be purchased to alleviate claims from future flood damages. This would be a one-time compensation to property owners along the river. This alternative appears to be less expensive in the long run for the City of Eagle Pass than flood proofing. *The City of Eagle Pass could borrow or seek a grant from FEMA to assist with this option.*
- **FIS Study Update** - A major part of this work effort involved reconstruction and validation of the existing HEC-2 models from the 1979 Flood Insurance Study for Eagle Pass. This work served as a basis for modeling the existing and future condition streams. The hydrology and hydraulics of the existing FIS were analyzed and new flows and flood plains determined for planning purposes. Although only the 100-year event was depicted in this study, a full range of flows was determined in the stream models. The models created by this Flood Protection Study would well serve as a basis to revise the existing FIS study. *The City of Eagle Pass may chose to apply for updating their existing flood insurance study with the Federal Emergency Management Administration to redefine new flood plains, including more streams studied and improvements which have occurred on existing streams since 1979.*
- **Draft Drainage Ordinance** - Appendix E contains a draft Drainage Ordinance modified to fit flooding issues in Eagle Pass. *The City of Eagle Pass may want to consider adoption of this ordinance to allow for orderly development of the upper watersheds along Loop 431 and US Highway 277, and to assure the City that property owners will bear their proportionate share of drainage improvements as development occurs.*
- **NPDES - Phase II Storm Water Regulations** - As the Environmental Protection Agency expands the storm water program; Phase II is scheduled to go into effect by the year 2000. The State of Texas, TNRCC, has taken over the monitoring and compliance part of the NPDES program. *The City of Eagle Pass may choose to participate and use this planning study to identify all existing storm water discharges into waters of the United States and later to develop a sampling and testing program periodically to monitor storm water discharges associated with industrial activities.*

- **Create WEB site for Public Works Department** - The site could be a part of the City of Eagle Pass current web site or a stand alone site. It could provide information concerning various activities of the Public Works department such as water rates, wastewater rates, street closures and repair, flooding, solid waste collection, and complaints. The posting of flooded area maps could aid homeowners or insurance agents regarding which properties might be in the 100-year flood plain. *The City of Eagle Pass may want to allocate part of its existing WEB site to be dedicated to Public Works updates.*
- **Aerial Mapping along Rio Grande River and City of Eagle Pass** - The International Boundary and Waterway Commission is the governing authority to regulate the use of water and the quality of water entering the Rio Grande River. *The City of Eagle Pass may want to combine its dollars with the IBWC to map new areas as they develop.*

## VII. References

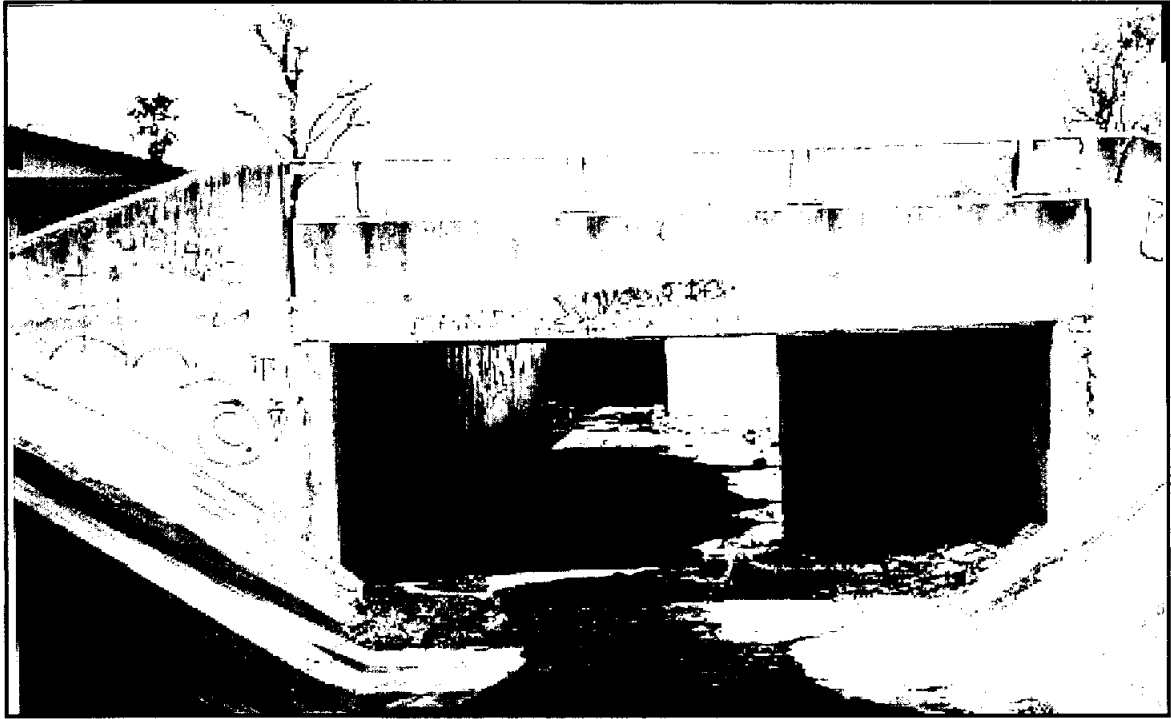
1. City of Eagle Pass, Texas - Flood Insurance Study, Federal Insurance Administration now Federal Emergency Management Agency, August 1979.
2. Personal Communication with Federal Emergency Management Agency, Concerning backup material used in the preparation of the Flood Insurance Study by URS/Forrest & Cotton, Inc. 1978 and 1979.
3. HEC-HMS, Hydrologic Modeling System User's Manual Version 1.0, March, 1998, U. S. Army Corps of Engineers Hydrologic Engineering Center, CPD-74.
4. HEC-RAS, River Analysis System, User's Manual Version 2.2, September, 1998, U.S. Army Corps of Engineers Hydrologic Engineering Center, CPD-68.
5. HEC-FDA, Flood Damage Reduction Analysis, User's Manual Version 1.0, January, 1998, U.S. Army Corps of Engineers Hydrologic Engineering Center, CPD-72.
6. EM 1110-2-1619 Risk-Based Analysis for Flood Damage Reduction Studies, U.S. Army Corps of Engineers, 1 August 1996.
7. EM 1110-2-1419 Hydrologic Engineering Requirements for Flood Damage Reduction Studies, U.S. Army Corps of Engineers, 31 January 1995.
8. Personal Communication with the International Boundary and Water Commission. Fall, 1997 concerning flows for Rio Grande River.
9. Technical Paper No. 40 Precipitation-Frequency Values for durations from 5 minutes to 24 hours over the Eastern United States, U.S. Weather Bureau, Hershfield, 1961.
10. Hydro-35, 5 to 60 minute Precipitation Frequency for the Eastern and Central United States NOAA Technical Memorandum NWS HYDRO-35, Office of Hydrology, June, 1977.
11. U. S. Geological Survey 7.5 degree Quadrangle Sheets covering Eagle Pass, Texas. These included:
  - Quemado SE
  - Deadmans Hill
  - Indian Tank
  - Eagle Pass West
  - Eagle Pass NE
  - Eagle Pass SW
  - Indio Creek
12. Texas Department of Transportation plans for:
  - US 277 from US 277 Business to 0.8 miles east of US 57
  - US 277 to Main Street - Length 3.576 km
13. Construction Plans for New International Bridge from Groves and Associates Fall, 1997. Also, personal communication regarding modeling used to set low chord elevation of bridge.
14. City of Eagle Pass Plans for various subdivisions and Street and Drainage Improvements by various developers
15. Construction plans for Main Arroyo extension beyond 21" sanitary sewer line to Rio Grande River by Richard Lane and Associates, 1985.
16. Planning Studies for Eagle Pass, Texas by Hejl, Lee & Associates for Land Use, Storm Drainage and Street Layout. Personal communication regarding electronic information on plans prepared.
17. Soil Survey of Maverick County, US Department of Agriculture Soil Conservation Service, November, 1977.

18. *Aerial mapping of Eagle Pass and Rio Grande River* performed under this contract by Landata - Geosource, Inc. 1997 and 1998. The flood plains of streams studied in detail were flown and mapped to an accuracy of 2 feet. Additional point elevations were obtained photogrammetrically for the Mexico side of the Rio Grande River to maintain the accuracy of flood prediction models.
19. *Photographic file of most drainage structures* taken during the course of this drainage study were compiled by stream with descriptions of their condition, type and size.
20. *City of Eagle Pass, Public Works Department Construction Specifications Manual*, Fall, 1997. Storm Drainage Requirements pp. 118-124.
21. *Storm water and Drainage ordinances*, City of Coppell, City of Allen, City of Plano, and others.
22. *Personal Correspondence* with various local, regional, state, and federal agencies regarding plans and studies for City of Eagle Pass and Maverick County.
23. *Study procedures* published by the Texas Water Development Board concerning Flood Protection Studies, 1997.
24. *Maverick County Water Control and Improvement District Number 1*, plans for irrigation canal layout.
25. *History of Eagle Pass and Piedras Negras* from the Lower Rio Grande Valley Planning Authority obtained from the Internet.
26. *Maverick County Appraisal District property values* for structures identified to be in the future 100-year flood plain.



**Attachment 1 - Selected Photos of Existing Streams in Eagle Pass, Texas**

The following pages contain photos of typical stream reaches in Eagle Pass. Some of the photos show past flooding events.



**Tributary 1 Looking Downstream at Bridge at Travis Street**



**Tributary 1 Looking Downstream at Bridge at Crockett Street**



**Tributary 2 Flooding at Eagle Pass High School**



**Tributary 2 Flooding at Loop 431 and Royal Ridge**



**Tributary 3 Looking Downstream from Bridge at Colorado Street**



**Tributary 3 Looking Downstream from Bridge at Bibb Street**



**Unnamed Tributary Flooding at Katy Street and Cherry Leaf**



**Unnamed Tributary Flooding at Katy Street and Cherry Leaf**



**Seco Tributary Looking Upstream at Loop 431**



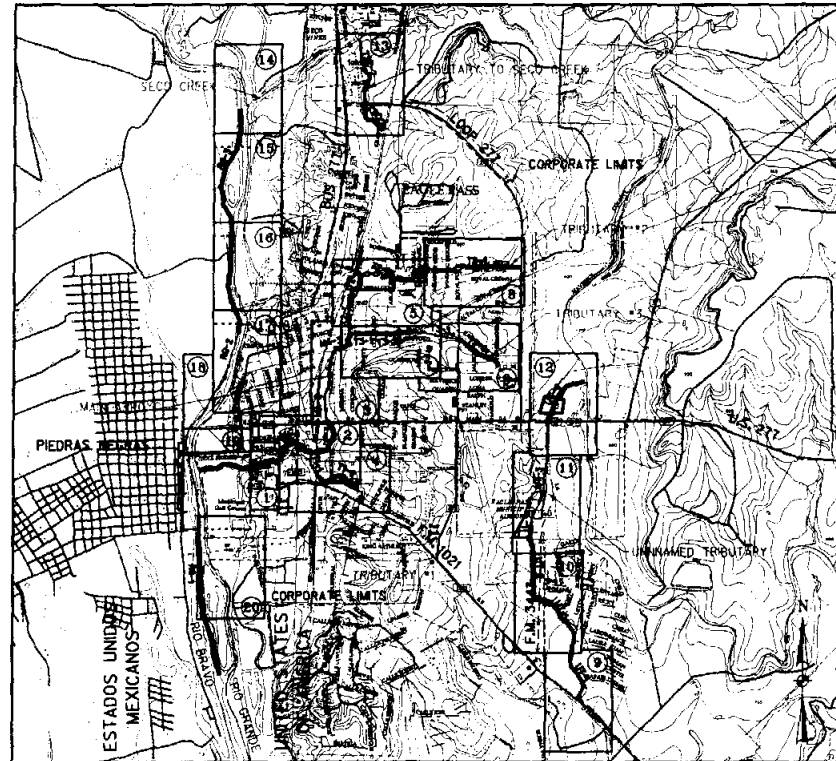
**Seco Creek Tributary Looking Upstream from End of Diaz Street**

# THE CITY OF EAGLE PASS, TEXAS

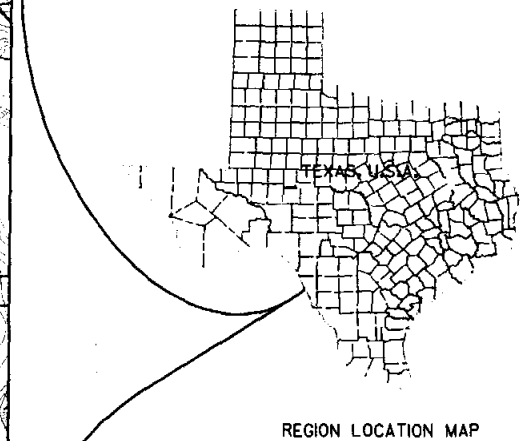
## EAGLE PASS FLOOD STUDY

### SHEET INDEX

- SHEET 1 - MAIN ARROYO - FLOODED AREA MAP
- SHEET 2 - MAIN ARROYO - FLOODED AREA MAP
- SHEET 3 - MAIN ARROYO - FLOODED AREA MAP
- SHEET 4 - TRIBUTARY 1 - FLOODED AREA MAP
- SHEET 5 - TRIBUTARY 2 - FLOODED AREA MAP
- SHEET 6 - TRIBUTARY 2 - FLOODED AREA MAP
- SHEET 7 - TRIBUTARY 3 - FLOODED AREA MAP
- SHEET 8 - TRIBUTARY 3 - FLOODED AREA MAP
- SHEET 9 - UNNAMED TRIBUTARY - FLOODED AREA MAP
- SHEET 10 - UNNAMED TRIBUTARY - FLOODED AREA MAP
- SHEET 11 - UNNAMED TRIBUTARY - FLOODED AREA MAP
- SHEET 12 - UNNAMED TRIBUTARY - FLOODED AREA MAP
- SHEET 13 - SECO CREEK TRIBUTARY - FLOODED AREA MAP
- SHEET 14 - RIO GRANDE - FLOODED AREA MAP
- SHEET 15 - RIO GRANDE - FLOODED AREA MAP
- SHEET 16 - RIO GRANDE - FLOODED AREA MAP
- SHEET 17 - RIO GRANDE - FLOODED AREA MAP
- SHEET 18 - RIO GRANDE - FLOODED AREA MAP
- SHEET 19 - RIO GRANDE - FLOODED AREA MAP
- SHEET 20 - RIO GRANDE - FLOODED AREA MAP
- SHEET 21 - ALTERNATIVE IMPROVEMENT PLANS CONSIDERED
- SHEET 22 - RIO GRANDE RIVER, MAIN ARROYO & TRIB. 1 - PROPOSED IMP.
- SHEET 23 - TRIBUTARIES 2 & 3 - PROPOSED IMPROVEMENTS
- SHEET 24 - TRIBUTARIES 2 & 3 - PROPOSED IMPROVEMENTS
- SHEET 25 - UNNAMED TRIBUTARY - PROPOSED IMPROVEMENTS
- SHEET 26 - TRIBUTARY TO SECO CREEK - PROPOSED IMPROVEMENTS



SITE LOCATION MAP  
N.T.S.



REGION LOCATION MAP  
N.T.S.



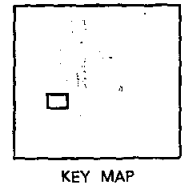
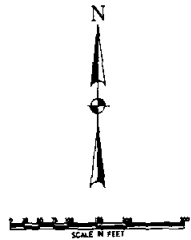
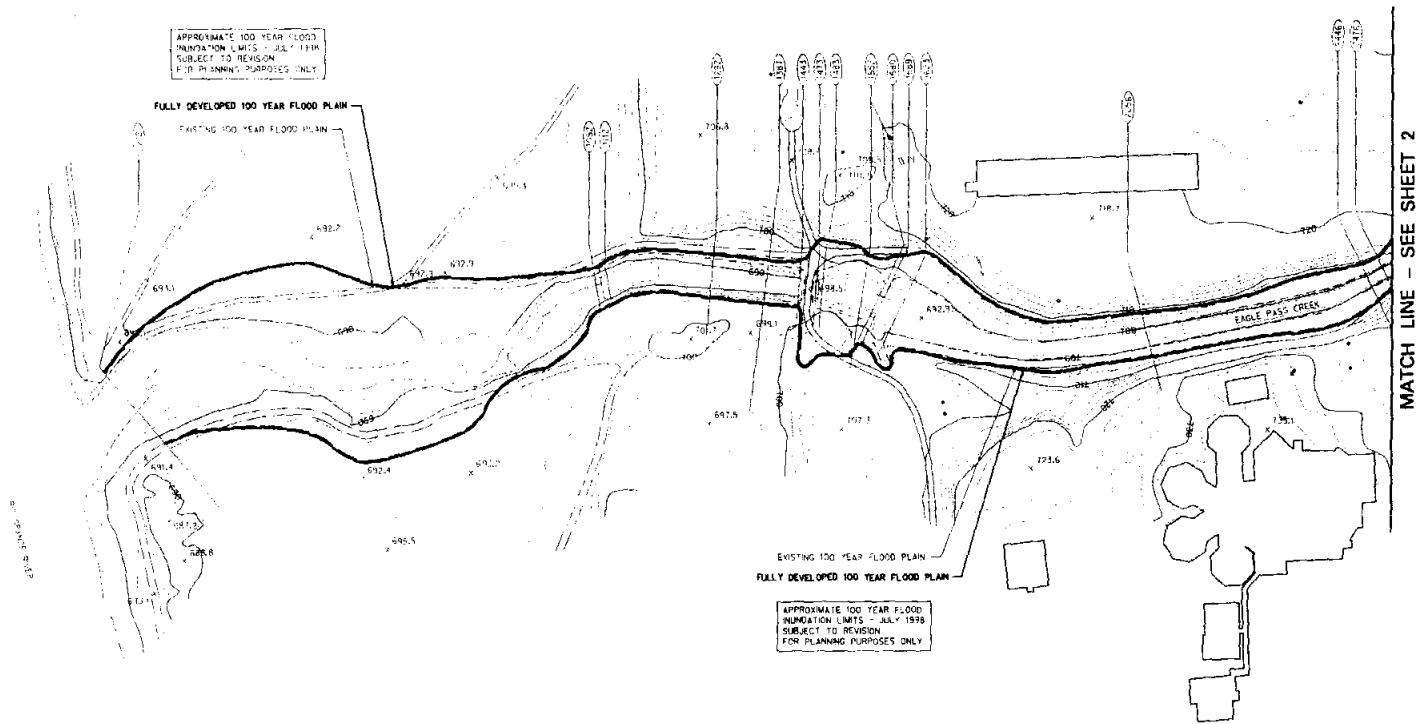
**Halff Associates**

ENGINEERS · ARCHITECTS · SCIENTISTS · PLANNERS · SURVEYORS

8616 NORTHWEST PLAZA DRIVE DALLAS, TEXAS (214) 346-6200

AVO 16739 NOVEMBER, 2000





**LEGEND**

	EXISTING 100 YEAR FLOOD PLAN
	FULLY DEVELOPED 100 YEAR FLOOD PLAN
	CENTER LINE OF TRIBUTARY
	STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
	HIGHWAY
	SOUTHERN PACIFIC RAILROAD
	LIMITS OF NECRAS CROSS-SECTIONS USED IN HYDRAULIC MODEL

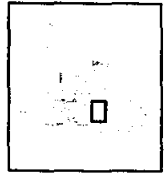
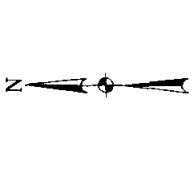
- GENERAL NOTES:
1. TOPO BARS/LANDATA AERIAL TOPO FLOORN 1998
  2. FLOORS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 11"x17" SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
**MAIN ARROYO**  
**EAGLE PASS, TEXAS**  
**FLOODED AREA MAP**

**Half Associates**  
INCORPORATED IN TEXAS

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
JAN.	LAA	MAY 1998	1" = 100'	470	225AEX	1-87

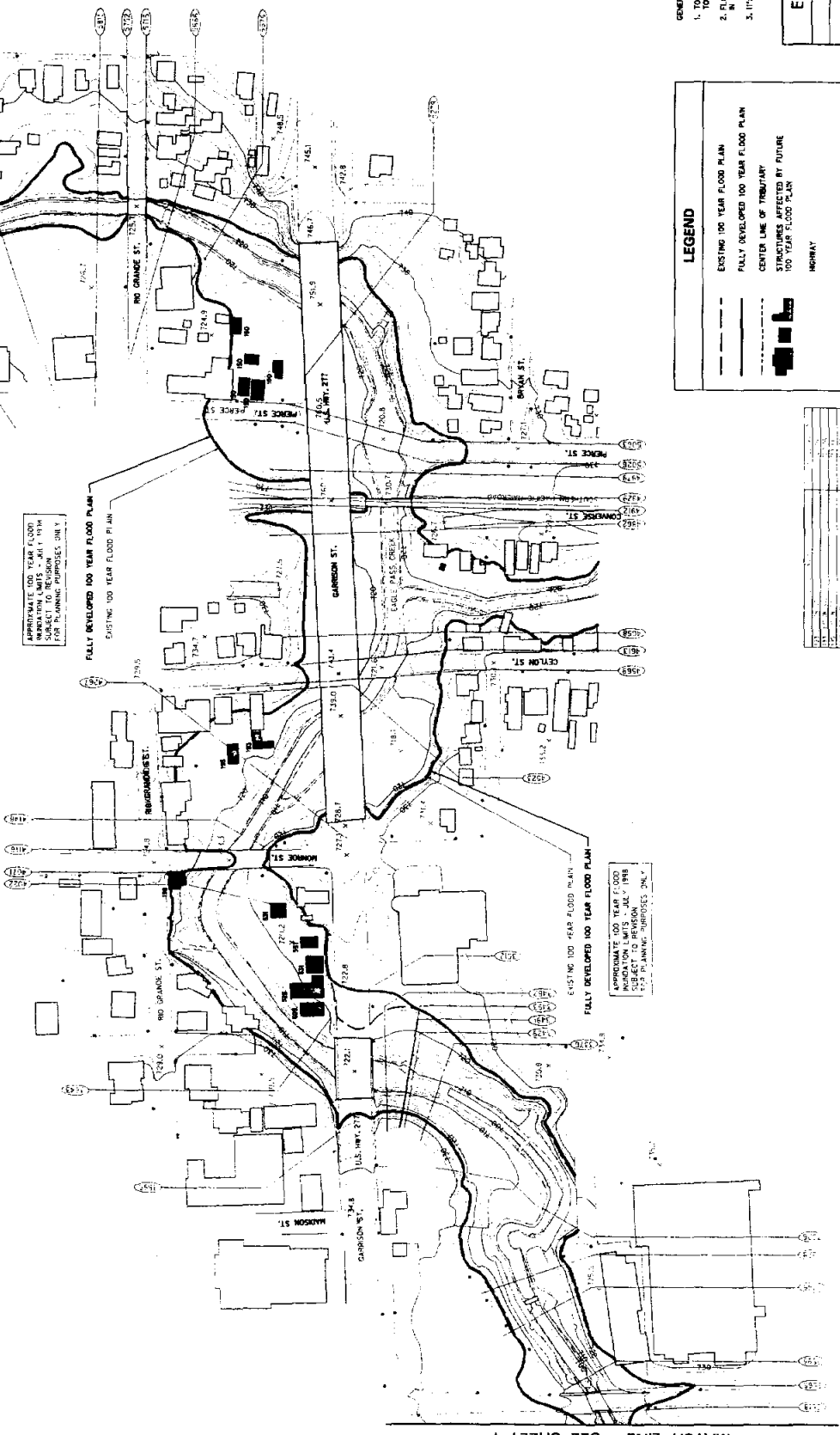




KEY MAP

MATCH LINE - SEE SHEET 3

MATCH LINE - SEE SHEET 1



APPROXIMATE 100 YEAR FLOOD  
ELEVATIONS DETERMINED AT 1974  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY

APPROXIMATE 100 YEAR FLOOD  
ELEVATIONS DETERMINED AT 1974  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY

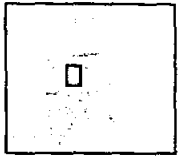
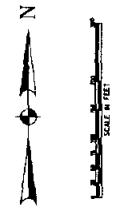
**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STREET LINE AS SHOWN BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHWEST PACIFIC RAILROAD
- LIMITS OF SCALE CROSS SECTIONS USED IN HYDRAULIC MODEL

STATION	ELEVATION	SECTION
1+00	72.0	1
1+10	72.0	1
1+20	72.0	1
1+30	72.0	1
1+40	72.0	1
1+50	72.0	1
1+60	72.0	1
1+70	72.0	1
1+80	72.0	1
1+90	72.0	1
2+00	72.0	1
2+10	72.0	1
2+20	72.0	1
2+30	72.0	1
2+40	72.0	1
2+50	72.0	1
2+60	72.0	1
2+70	72.0	1
2+80	72.0	1
2+90	72.0	1
3+00	72.0	1
3+10	72.0	1
3+20	72.0	1
3+30	72.0	1
3+40	72.0	1
3+50	72.0	1
3+60	72.0	1
3+70	72.0	1
3+80	72.0	1
3+90	72.0	1
4+00	72.0	1
4+10	72.0	1
4+20	72.0	1
4+30	72.0	1
4+40	72.0	1
4+50	72.0	1
4+60	72.0	1
4+70	72.0	1
4+80	72.0	1
4+90	72.0	1
5+00	72.0	1
5+10	72.0	1
5+20	72.0	1
5+30	72.0	1
5+40	72.0	1
5+50	72.0	1
5+60	72.0	1
5+70	72.0	1
5+80	72.0	1
5+90	72.0	1
6+00	72.0	1
6+10	72.0	1
6+20	72.0	1
6+30	72.0	1
6+40	72.0	1
6+50	72.0	1
6+60	72.0	1
6+70	72.0	1
6+80	72.0	1
6+90	72.0	1
7+00	72.0	1
7+10	72.0	1
7+20	72.0	1
7+30	72.0	1
7+40	72.0	1
7+50	72.0	1
7+60	72.0	1
7+70	72.0	1
7+80	72.0	1
7+90	72.0	1
8+00	72.0	1
8+10	72.0	1
8+20	72.0	1
8+30	72.0	1
8+40	72.0	1
8+50	72.0	1
8+60	72.0	1
8+70	72.0	1
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9+10	72.0	1
9+20	72.0	1
9+30	72.0	1
9+40	72.0	1
9+50	72.0	1
9+60	72.0	1
9+70	72.0	1
9+80	72.0	1
9+90	72.0	1
10+00	72.0	1

GENERAL NOTES:  
 1. THIS IS A PRELIMINARY STUDY.  
 2. PLANS DEVELOPED BY HALF ASSOCIATES, INC. IN 1974 FLOOD STUDY REPORT.  
 3. 1974 SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
 MAIN ARROYO  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP  
**Half Associates**  
 ENGINEERS AND ARCHITECTS  
 1000 WEST 10TH STREET  
 DENVER, COLORADO 80202  
 PHONE: 303-733-1111  
 FAX: 303-733-1112  
 DRAWN: [ ] DATE: [ ] SCALE: [ ] NOTES: [ ]  
 CHECKED: [ ] DATE: [ ]  
 APPROVED: [ ] DATE: [ ]  
 SHEET 1 OF 1



KEY MAP

MATCH LINE - SEE SHEET 5

MATCH LINE - SEE SHEET 7

APPROXIMATE 100 YEAR FLOOD  
INUNDATION LIMITS - JULY 1998  
BASED ON 1998 FLOOD STUDY REPORT  
FOR PLANNING PURPOSES ONLY

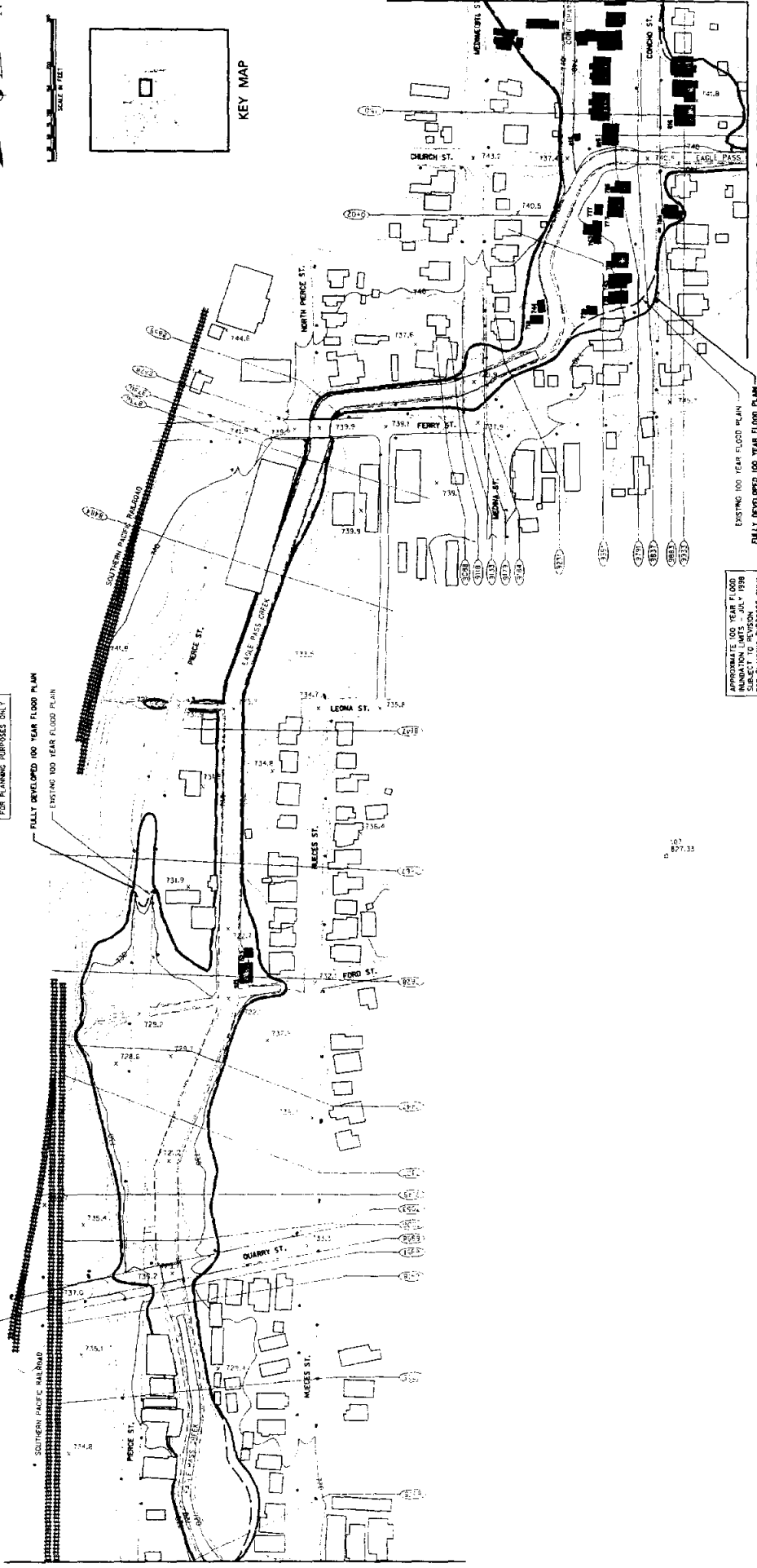
FULLY DEVELOPED 100 YEAR FLOOD PLAN

EXISTING 100 YEAR FLOOD PLAN

APPROXIMATE 100 YEAR FLOOD  
INUNDATION LIMITS - JULY 1998  
BASED ON 1998 FLOOD STUDY REPORT  
FOR PLANNING PURPOSES ONLY

EXISTING 100 YEAR FLOOD PLAN

FULLY DEVELOPED 100 YEAR FLOOD PLAN



**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF RECORD CROSS-SECTIONS USED IN HYDRAULIC MODEL

NO.	STATION	DATE	BY	CHKD.
1	1+00	7/98	JHM	JHM
2	2+00	7/98	JHM	JHM
3	3+00	7/98	JHM	JHM
4	4+00	7/98	JHM	JHM
5	5+00	7/98	JHM	JHM
6	6+00	7/98	JHM	JHM
7	7+00	7/98	JHM	JHM
8	8+00	7/98	JHM	JHM
9	9+00	7/98	JHM	JHM
10	10+00	7/98	JHM	JHM
11	11+00	7/98	JHM	JHM
12	12+00	7/98	JHM	JHM
13	13+00	7/98	JHM	JHM
14	14+00	7/98	JHM	JHM
15	15+00	7/98	JHM	JHM
16	16+00	7/98	JHM	JHM
17	17+00	7/98	JHM	JHM
18	18+00	7/98	JHM	JHM
19	19+00	7/98	JHM	JHM
20	20+00	7/98	JHM	JHM

- GENERAL NOTES:
1. TOPO BASED LANDATA AERIAL PHOTO FROM 1998
  2. FLOODS DEVELOPED BY HALF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 11'11" SUBMITTALS ARE NOT TO SCALE.

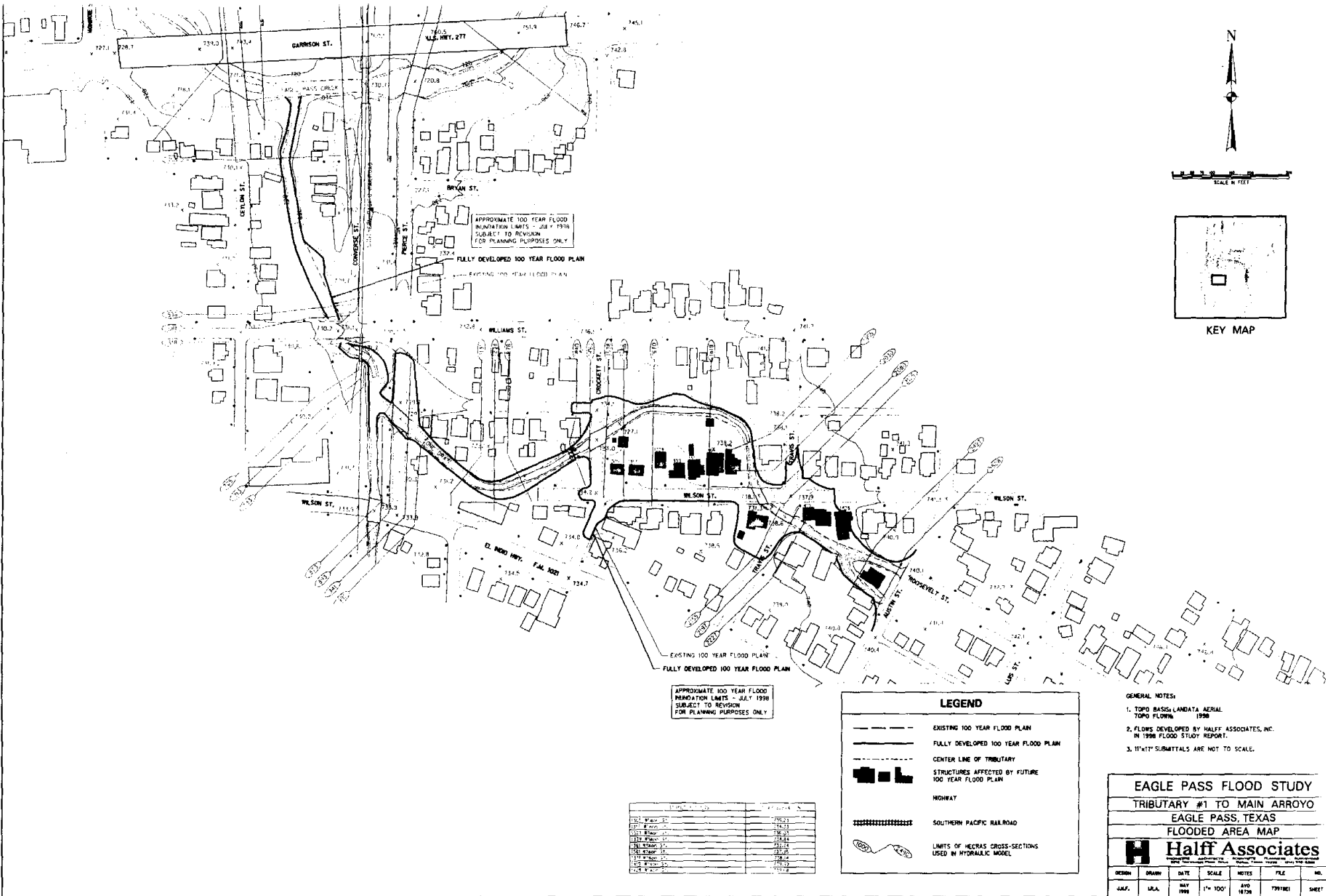
**EAGLE PASS FLOOD STUDY**

MAIN ARROYO  
EAGLE PASS, TEXAS  
FLOODED AREA MAP

**Half Associates**  
10000 W. 10th St., Suite 100, Eagle Pass, TX 78841  
Tel: 361-222-1111 Fax: 361-222-1112

NO.	DATE	SCALE	WORKS	FILE	NO.
1	7/98	1" = 100'	100' FLOOD	100' FLOOD	1
2	7/98	1" = 100'	100' FLOOD	100' FLOOD	2

MATCH LINE - SEE SHEET EF-2



APPROXIMATE 100 YEAR FLOOD  
INUNDATION LIMITS - JULY 1998  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY

APPROXIMATE 100 YEAR FLOOD  
INUNDATION LIMITS - JULY 1998  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY

STATION	ELEVATION
100+0	756.23
101+0	756.23
102+0	756.23
103+0	756.23
104+0	756.23
105+0	756.23
106+0	756.23
107+0	756.23
108+0	756.23
109+0	756.23
110+0	756.23
111+0	756.23
112+0	756.23
113+0	756.23
114+0	756.23
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119+0	756.23
120+0	756.23

**LEGEND**

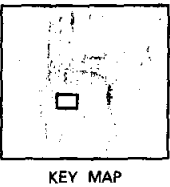
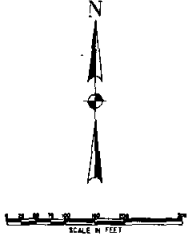
- - - - - EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- ■ ■ ■ ■ STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- ○ ○ ○ ○ LIMITS OF CROSS-SECTIONS USED IN HYDRAULIC MODEL

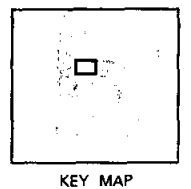
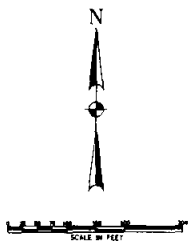
- GENERAL NOTES:**
1. TOPO BASIS: LANDATA AERIAL TOPO FLOWING.
  2. FLOWS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 11"X17" SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
**TRIBUTARY #1 TO MAIN ARROYO**  
**EAGLE PASS, TEXAS**  
**FLOODED AREA MAP**

**Half Associates**  
INCORPORATED IN TEXAS

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
JALF	L.A.A.	MAY 1998	1" = 100'	AVD 18798	799181	SHEET 4





KEY MAP

APPROXIMATE 100 YEAR FLOOD  
 FLOODATION LIMITS - JULY 1998  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

FULLY DEVELOPED 100 YEAR FLOOD PLAN

EXISTING 100 YEAR FLOOD PLAN

EXISTING 100 YEAR FLOOD PLAN

FULLY DEVELOPED 100 YEAR FLOOD PLAN

APPROXIMATE 100 YEAR FLOOD  
 FLOODATION LIMITS - JULY 1998  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

Structure No.	Structure Name	Area (sq. ft.)	Volume (cu. ft.)	Notes
101	101	100	100	
102	102	100	100	
103	103	100	100	
104	104	100	100	
105	105	100	100	
106	106	100	100	
107	107	100	100	
108	108	100	100	
109	109	100	100	
110	110	100	100	
111	111	100	100	
112	112	100	100	
113	113	100	100	
114	114	100	100	
115	115	100	100	
116	116	100	100	
117	117	100	100	
118	118	100	100	
119	119	100	100	
120	120	100	100	

Structure No.	Structure Name	Area (sq. ft.)	Volume (cu. ft.)	Notes
121	121	100	100	
122	122	100	100	
123	123	100	100	
124	124	100	100	
125	125	100	100	
126	126	100	100	
127	127	100	100	
128	128	100	100	
129	129	100	100	
130	130	100	100	
131	131	100	100	
132	132	100	100	
133	133	100	100	
134	134	100	100	
135	135	100	100	
136	136	100	100	
137	137	100	100	
138	138	100	100	
139	139	100	100	
140	140	100	100	

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF MUDRAS CROSS-SECTIONS USED IN HYDRAULIC MODEL

- GENERAL NOTES:
1. TOPO BASIS: LANDATA AERIAL TOPO FLOWS - 1986
  2. FLOWS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 1/4" = 100' SUBMITTALS ARE NOT TO SCALE.

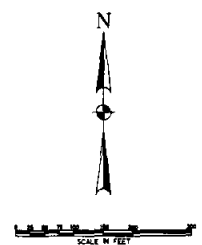
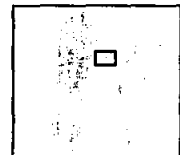
EAGLE PASS FLOOD STUDY  
 TRIBUTARY #2 TO MAIN ARROYO  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP



DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
AMF	LAL	MAY 1999	1" = 100'	410	1717A	SHEET 1

MATCH LINE - SEE SHEET 6

MATCH LINE - SEE SHEET 3



APPROXIMATE 100 YEAR FLOOD  
INDICATION LIMITS - JULY 1998  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY.



MATCH LINE - SEE SHEET 5

APPROXIMATE 100 YEAR FLOOD  
INDICATION LIMITS - JULY 1998  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY.

NO.	DATE	DESCRIPTION
1	7/23/98	PRELIMINARY
2	8/11/98	REVISED
3	8/11/98	REVISED
4	8/11/98	REVISED
5	8/11/98	REVISED
6	8/11/98	REVISED
7	8/11/98	REVISED
8	8/11/98	REVISED
9	8/11/98	REVISED
10	8/11/98	REVISED
11	8/11/98	REVISED
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**LEGEND**

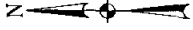
- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- - - CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- ==== SOUTHERN PACIFIC RAILROAD
- ~ ~ ~ LIMITS OF MECHAS CROSS-SECTIONS USED IN HYDRAULIC MODEL

- GENERAL NOTES:
1. TOPO BASIS: LANDATA AERIAL TOPO FLOWN 1998
  2. FLOWS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 11"x17" SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
**TRIBUTARY #2 TO MAIN ARROYO**  
**EAGLE PASS, TEXAS**  
**FLOODED AREA MAP**

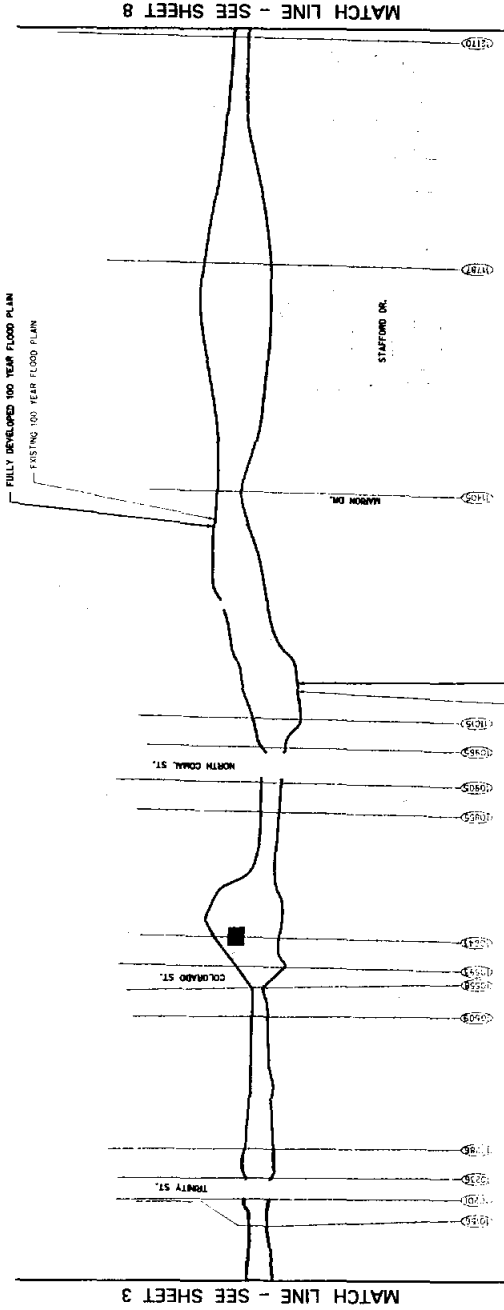
**Half Associates**  
 10000 Katy Freeway, Suite 100, Houston, TX 77055  
 Telephone: 281-416-1100 Fax: 281-416-1101  
 E-mail: info@halfassoc.com Website: www.halfassoc.com

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
LAN	U.A.	MAY 1998	1" = 100'	4129	7797028	SHEET 4



KEY MAP

APPROXIMATE 100 YEAR FLOOD  
AND FLOOD DAMAGE POTENTIAL 1958  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY



APPROXIMATE 100 YEAR FLOOD  
AND FLOOD DAMAGE POTENTIAL 1958  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- WAGNER
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF MEASUREMENT CROSS-SECTIONS USED IN HYDRAULIC MODEL

GENERAL NOTES  
1. TOPO BASES: LANDATA, AERIAL, 1958  
2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1958 FLOOD STUDY REPORT.  
3. TRIBUTARY SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
**TRIBUTARY #3 TO MAIN ARROYO**  
**EAGLE PASS, TEXAS**  
**FLOODED AREA MAP**



NO.	DATE	BY	SCALE	SHEET	TITLE
1	11/11/58	WMS	1" = 100'	1	FLOOD STUDY

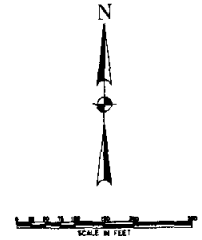


MATCH LINE - SEE SHEET 7

ARROYO MAP, 1998 (SCALE 1"=100')  
 INUNDATION MAPS, 11/11/1998  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY



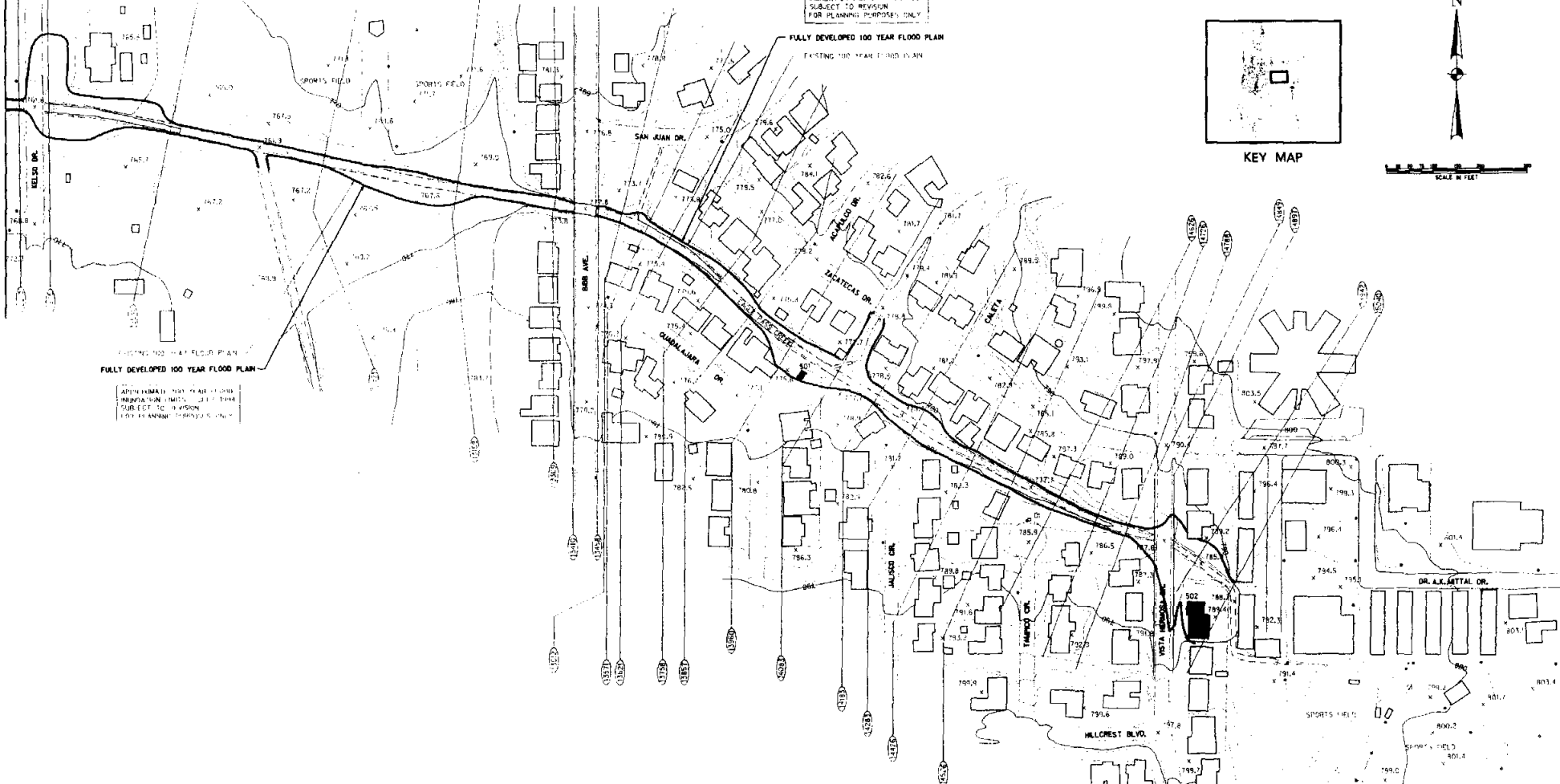
KEY MAP



EXISTING 100 YEAR FLOOD PLAN  
 FULLY DEVELOPED 100 YEAR FLOOD PLAN

ARROYO MAP, 1998 (SCALE 1"=100')  
 INUNDATION MAPS, 11/11/1998  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

FULLY DEVELOPED 100 YEAR FLOOD PLAN  
 EXISTING 100 YEAR FLOOD PLAN



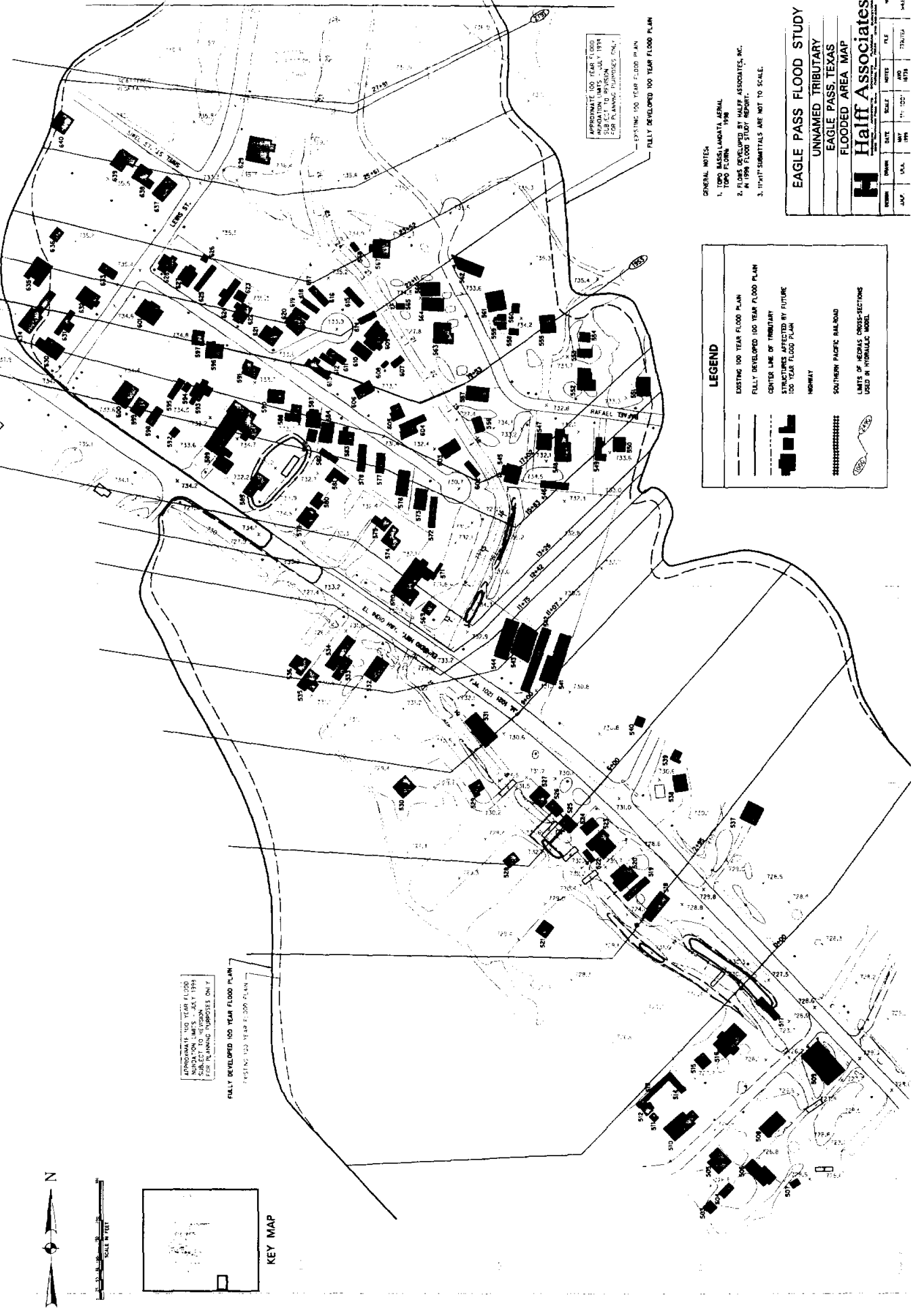
**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF HECRAS CROSS-SECTIONS USED IN HYDRAULIC MODEL

- GENERAL NOTES:
1. TOPO BASIS: LANDATA AERIAL TOPO FLOODING 1998
  2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 11"x17" SUBMITTALS ARE NOT TO SCALE.

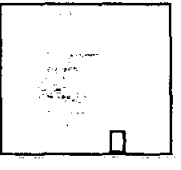
**EAGLE PASS FLOOD STUDY**  
 TRIBUTARY #3 TO MAIN ARROYO  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
JAN.	M.A.	04/1998	1"=100'	11/16759	7317828	5417



APPROXIMATE 100 YEAR FLOOD  
LIMITS - JULY 1999  
FOR PLANNING PURPOSES ONLY

EXISTING 100 YEAR FLOOD PLAN  
FULLY DEVELOPED 100 YEAR FLOOD PLAN



KEY MAP

APPROXIMATE 100 YEAR FLOOD  
LIMITS - JULY 1999  
FOR PLANNING PURPOSES ONLY

EXISTING 100 YEAR FLOOD PLAN  
FULLY DEVELOPED 100 YEAR FLOOD PLAN

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES ASSUMED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF SPECIAL CROSS-SECTIONS USED IN HYDRAULIC MODEL

- GENERAL NOTES**
1. 100 YEAR FLOOD LIMITS, APRIL 1998
  2. FLOODS DEVELOPED BY HALF ASSOCIATES, INC. AT 1998 FLOOD STUDY REPORT.
  3. 100-YR SUBMITTALS ARE NOT TO SCALE.

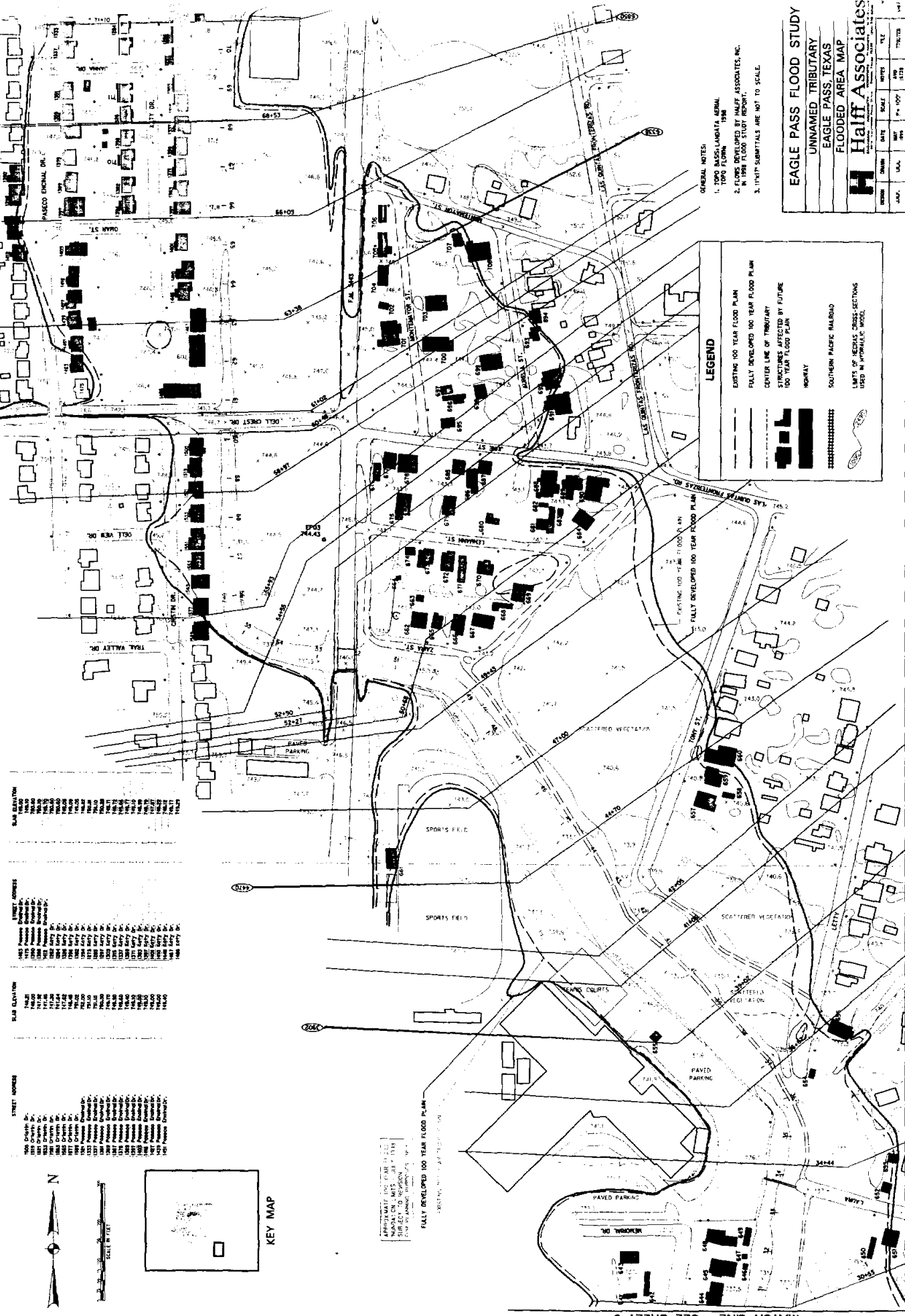
**EAGLE PASS FLOOD STUDY**

UNNAMED TRIBUTARY  
EAGLE PASS, TEXAS  
FLOODED AREA MAP

**Half Associates**  
INCORPORATED  
10000 W. 10TH ST., SUITE 100  
DALLAS, TEXAS 75243  
PHONE: (214) 343-1111  
FAX: (214) 343-1112  
WWW: WWW.HALF.COM

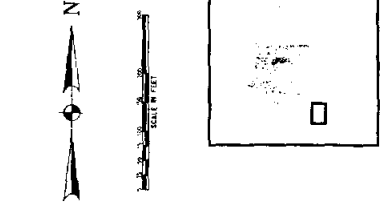
DATE	SCALE	NOTES	FILE	NO.
JAN 99	1" = 100'		750715	041





**STREET ADDRESSES**

1452	1453	1454	1455	1456	1457	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467	1468	1469	1470	1471	1472	1473	1474	1475	1476	1477	1478	1479	1480	1481	1482	1483	1484	1485	1486	1487	1488	1489	1490	1491	1492	1493	1494	1495	1496	1497	1498	1499	1500	1501	1502	1503	1504	1505	1506	1507	1508	1509	1510	1511	1512	1513	1514	1515	1516	1517	1518	1519	1520	1521	1522	1523	1524	1525	1526	1527	1528	1529	1530	1531	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541	1542	1543	1544	1545	1546	1547	1548	1549	1550	1551	1552	1553	1554	1555	1556	1557	1558	1559	1560	1561	1562	1563	1564	1565	1566	1567	1568	1569	1570	1571	1572	1573	1574	1575	1576	1577	1578	1579	1580	1581	1582	1583	1584	1585	1586	1587	1588	1589	1590	1591	1592	1593	1594	1595	1596	1597	1598	1599	1600	1601	1602	1603	1604	1605	1606	1607	1608	1609	1610	1611	1612	1613	1614	1615	1616	1617	1618	1619	1620	1621	1622	1623	1624	1625	1626	1627	1628	1629	1630	1631	1632	1633	1634	1635	1636	1637	1638	1639	1640	1641	1642	1643	1644	1645	1646	1647	1648	1649	1650	1651	1652	1653	1654	1655	1656	1657	1658	1659	1660	1661	1662	1663	1664	1665	1666	1667	1668	1669	1670	1671	1672	1673	1674	1675	1676	1677	1678	1679	1680	1681	1682	1683	1684	1685	1686	1687	1688	1689	1690	1691	1692	1693	1694	1695	1696	1697	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707	1708	1709	1710	1711	1712	1713	1714	1715	1716	1717	1718	1719	1720	1721	1722	1723	1724	1725	1726	1727	1728	1729	1730	1731	1732	1733	1734	1735	1736	1737	1738	1739	1740	1741	1742	1743	1744	1745	1746	1747	1748	1749	1750	1751	1752	1753	1754	1755	1756	1757	1758	1759	1760	1761	1762	1763	1764	1765	1766	1767	1768	1769	1770	1771	1772	1773	1774	1775	1776	1777	1778	1779	1780	1781	1782	1783	1784	1785	1786	1787	1788	1789	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835	1836	1837	1838	1839	1840	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
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**GENERAL NOTES:**

1. 1990 BASE LAMBERT AERIAL PHOTO FLOOD PLAN
2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
3. 1/4"=1" SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**

UNNAMED TRIBUTARY  
EAGLE PASS, TEXAS  
FLOODED AREA MAP

**H** Halff Associates

OWNER	DATE	SCALE	BY	DATE
CLIENT	DATE	SCALE	BY	DATE
DATE	SCALE	BY	DATE	SCALE
DATE	SCALE	BY	DATE	SCALE

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAIN
- FULLY DEVELOPED 100 YEAR FLOOD PLAIN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAIN
- ROADWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF METEORIC CROSS SECTIONS USED IN HYDRAULIC MODEL

MATCH LINE - SEE SHEET 9



KEY MAP

APPROXIMATE 100 YEAR FLOOD  
INUNDATION LIMITS - JULY 1999  
SUBJECT TO REVISION, JULY 1999  
FOR PLANNING PURPOSES ONLY

— FULLY DEVELOPED 100 YEAR FLOOD PLAN  
— EXISTING 100 YEAR FLOOD PLAN

— FULLY DEVELOPED 100 YEAR FLOOD PLAN  
— EXISTING 100 YEAR FLOOD PLAN

APPROXIMATE 100 YEAR FLOOD  
INUNDATION LIMITS - JULY 1999  
SUBJECT TO REVISION, JULY 1999  
FOR PLANNING PURPOSES ONLY

MATCH LINE - SEE SHEET 10

GENERAL NOTES

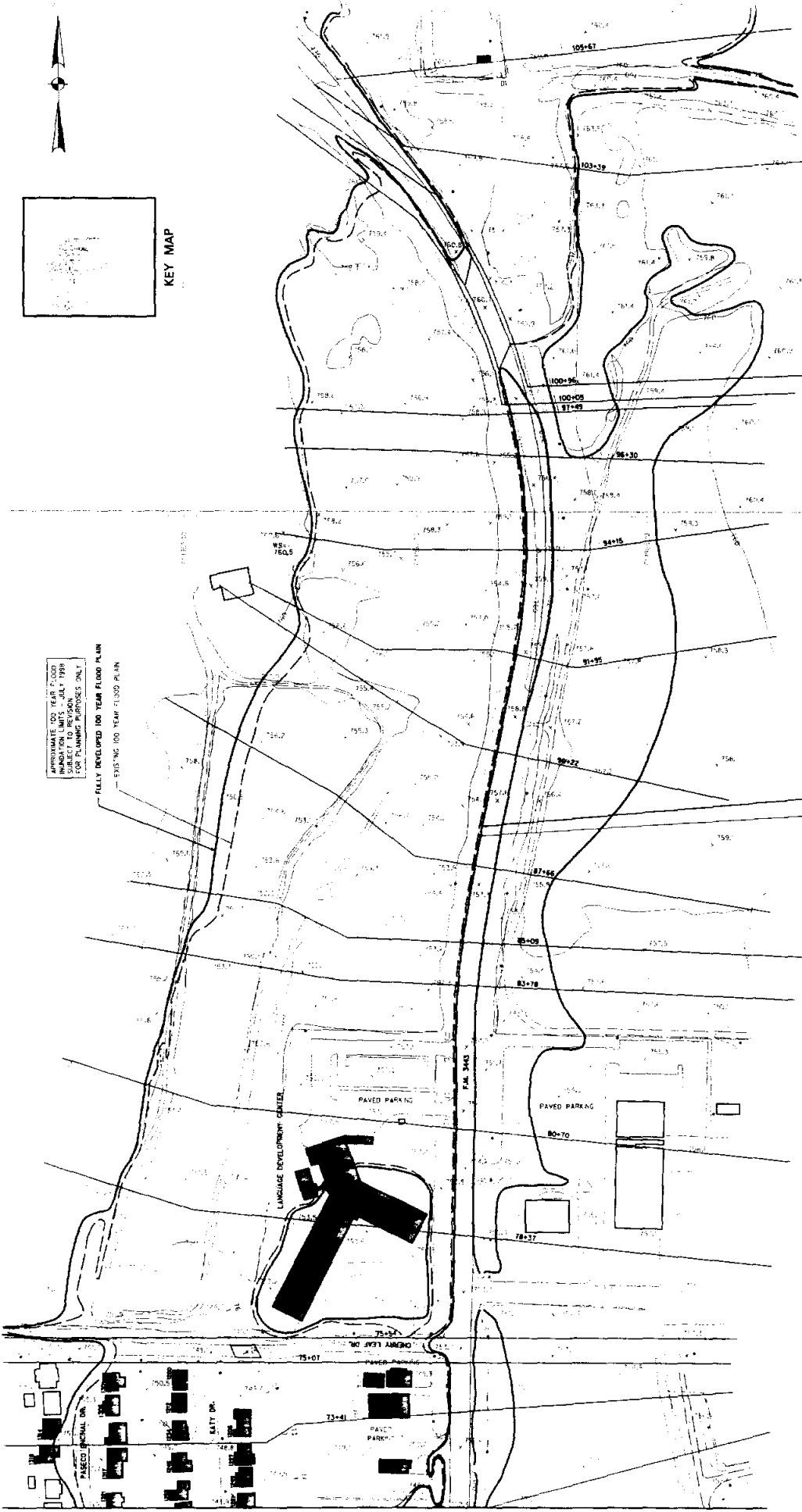
1. 100 BASE LAMBERTA SERIAL  
1976 FLOOD
2. FLOODS DEVELOPED BY HALL ASSOCIATES, INC.  
IN 1999 FLOOD STUDY REPORT.
3. TYPICAL SUBMITTALS ARE NOT TO SCALE.

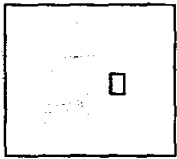
LEGEND

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE  
100 YEAR FLOOD PLAN
- ROADWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF INDIAN CROSS-SECTIONS  
USED IN HYDRAULIC MODEL

DATE	BY	SCALE	NOTES	FILE
JULY 1999	...	1" = 100'	...	TRIBUTE

EAGLE PASS FLOOD STUDY  
UNNAMED TRIBUTARY  
EAGLE PASS, TEXAS  
FLOODED AREA MAP  
Hall Associates





KEY MAP

**EAGLE PASS FLOOD STUDY**  
 UNNAMED TRIBUTARY  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

**H** Half Associates  
INCORPORATED

DATE	SCALE	INSTRUMENT	FILE
JAN. 1998	1" = 100'	GPS	
U.S.A.	DATE	SCALE	INSTRUMENT

SHEET 12

APPROXIMATE 100 YEAR FLOOD  
 FLOOD LIMITS - JULY 1998  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

FULLY DEVELOPED 100 YEAR FLOOD PLAIN

EXISTING 100 YEAR FLOOD PLAIN

FULLY DEVELOPED 100 YEAR FLOOD PLAIN

APPROXIMATE 100 YEAR FLOOD  
 FLOOD LIMITS - JULY 1998  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

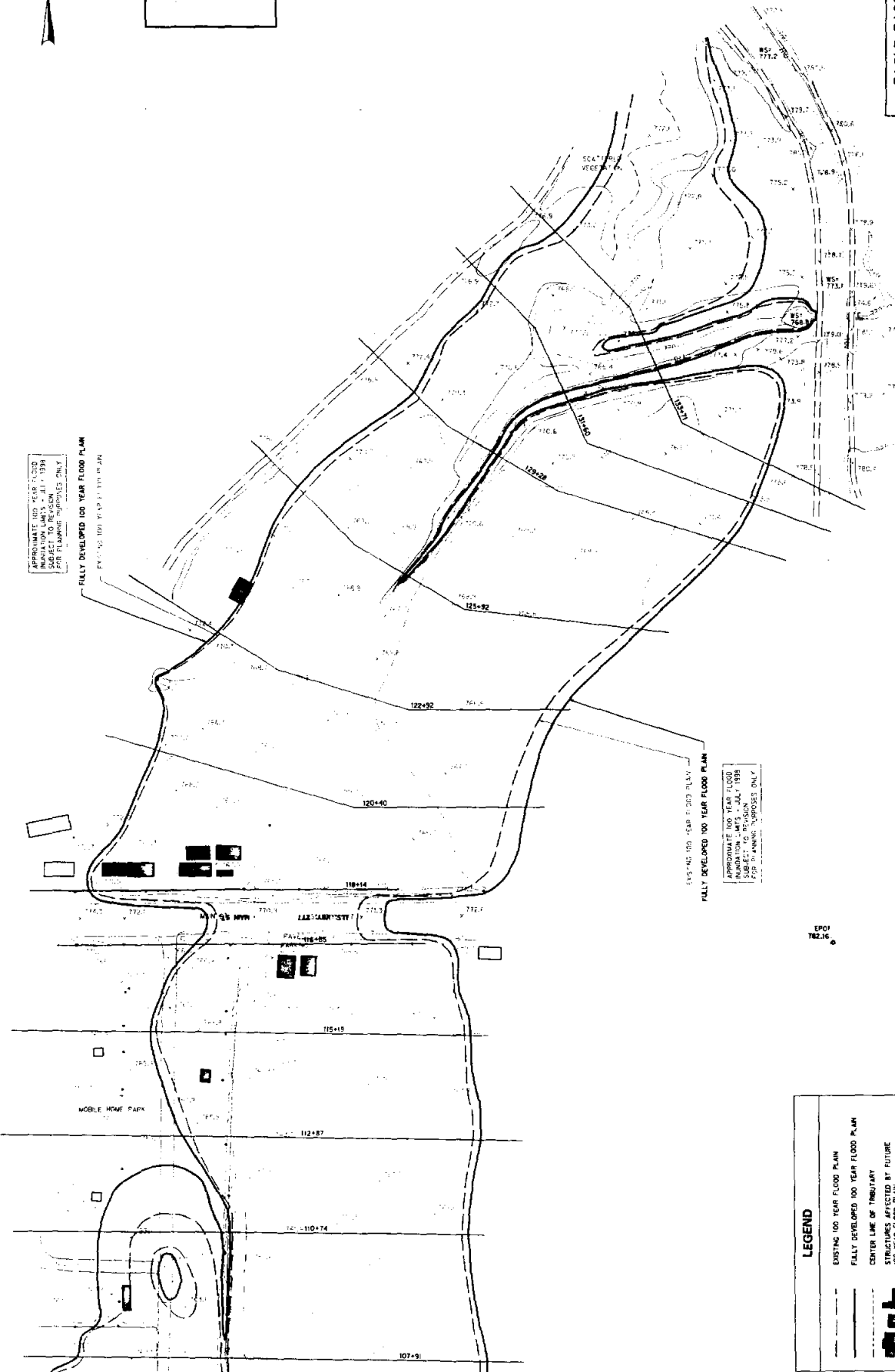
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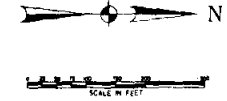
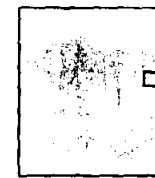
GENERAL NOTES  
 1. TOPO BASED, LANDSAT AERIAL  
 1998  
 2. FLOODS DEVELOPED BY HALF ASSOCIATES, INC.  
 3. IN 1998 FLOOD STUDY REPORT.

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAIN
- FULLY DEVELOPED 100 YEAR FLOOD PLAIN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAIN
- ROADWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF NEGRAS CROSS-SECTIONS USED IN HYDRAULIC MODEL

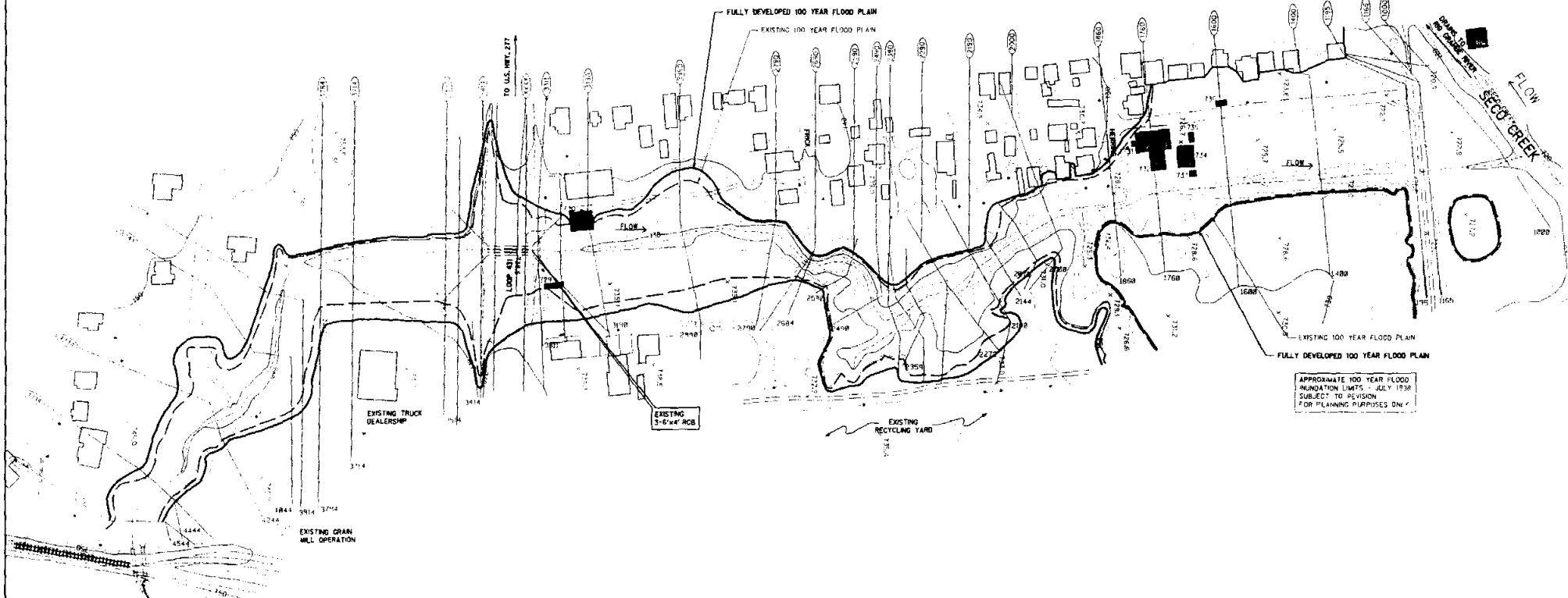
MATCH LINE - SEE SHEET 11





APPROXIMATE 100 YEAR FLOOD  
 INUNDATION LIMITS - JULY 1938  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

KEY MAP



APPROXIMATE 100 YEAR FLOOD  
 INUNDATION LIMITS - JULY 1938  
 SUBJECT TO REVISION  
 FOR PLANNING PURPOSES ONLY

LEGEND	
	EXISTING 100 YEAR FLOOD PLAN
	FULLY DEVELOPED 100 YEAR FLOOD PLAN
	CENTER LINE OF TRIBUTARY
	STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
	HIGHWAY
	SOUTHERN PACIFIC RAILROAD
	LIMITS OF MECRAS CROSS-SECTIONS USED IN HYDRAULIC MODEL

- GENERAL NOTES:
1. TOPO BASIS: LANDATA AERIAL TOPO. FLOORN. 1958
  2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1998 FLOOD STUDY REPORT.
  3. 11"x17" SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
 TRIBUTARY TO SECO CREEK  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
JALP.	L.A.L.	MAY 1998	1" = 100'	470	739A00E	SHEET 13



MATCH LINE - SEE SHEET 15

NEW INTERNATIONAL BRIDGE

RIO GRANDE

END OF FLOOD STUDY (1999)

FULLY DEVELOPED 100 YEAR FLOOD PLAN 1999  
 APPROXIMATE 100 YEAR FLOOD  
 IMAGINATION LIMITS - MARCH 1994  
 SUBJECT TO REVISION  
 SEE PLANNING OFFICES ONLY

GENERAL NOTES:  
 1. 1990 BASE LINES DATA AERIAL  
 TOPO FROM 1988  
 2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC.  
 IN 1999 FLOOD STUDY REPORT.  
 3. 11/4"=1' SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**  
 RIO GRANDE  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

**Halff Associates**  
INCORPORATED

DESIGN	DATE	SCALE	SHEET	FILE	NO.
HAL	CHD	1" = 100'	070	7900007	SHEET 14

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF METALS CROSS-SECTIONS USED IN HYDRAULIC MODEL



KEY MAP

GENERAL NOTES

1. TOPG BASSLAND DATA AERIAL PHOTO FROM 1988
2. FLOODS DEVELOPED BY HALF ASSOCIATES, INC. IN 1999 FLOOD STUDY REPORT.
3. 100-YR SUBMITTALS ARE NOT TO SCALE.

**EAGLE PASS FLOOD STUDY**

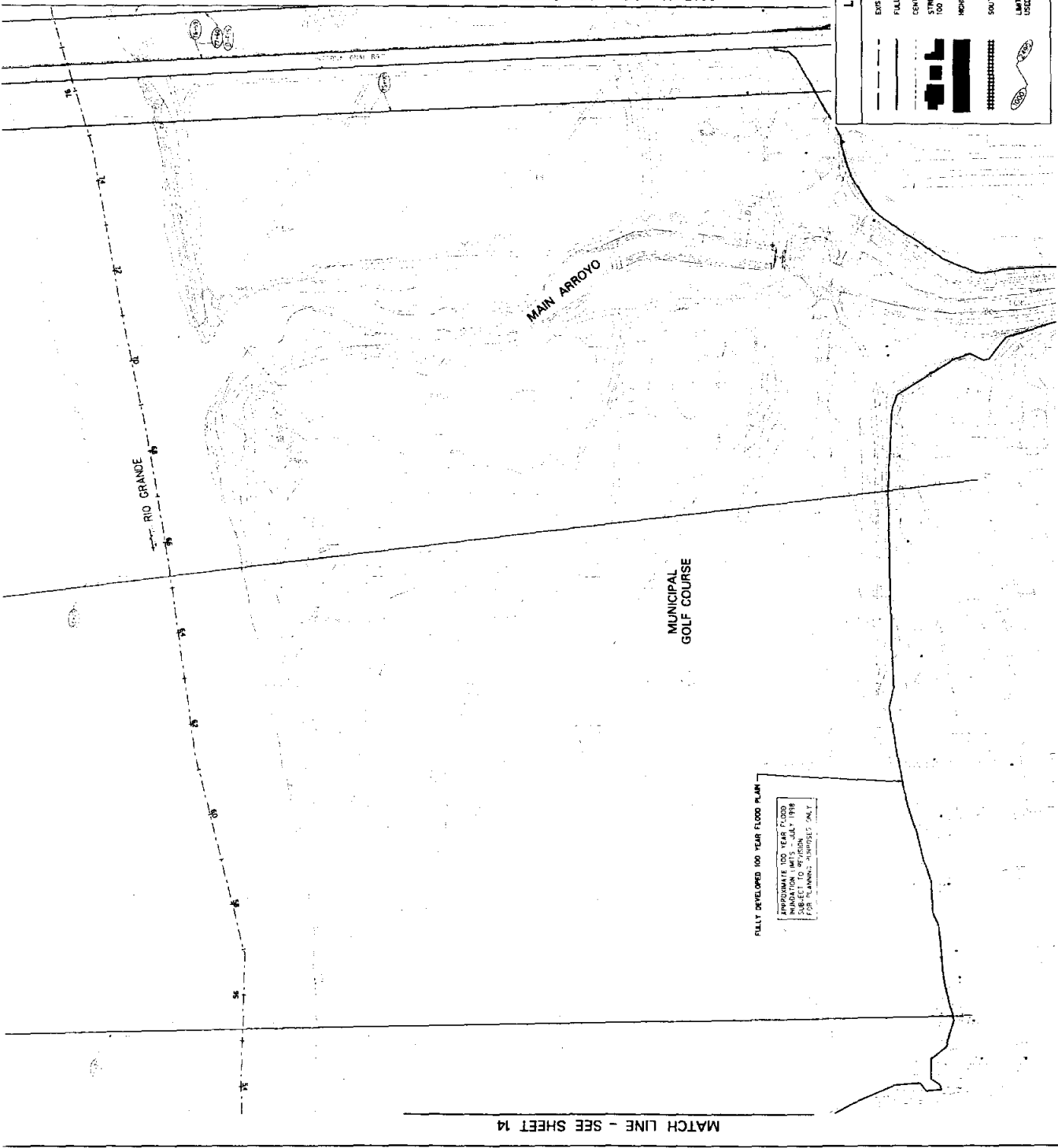
RIO GRANDE  
EAGLE PASS, TEXAS  
FLOODED AREA MAP

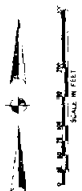
**Half Associates**  
INCORPORATED  
10000 W. HIGHTWAY 179  
SUITE 100  
DALLAS, TEXAS 75244

NO.	DATE	SCALE	NOTES	FILE	NO.
1000	10/99	1" = 100'	100 YR FLOOD STUDY		1000
1001	11/99	1" = 100'	100 YR FLOOD STUDY		1001

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TERTIARY
- STRAIGHTENED BY FUTURE 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LOCUS OF WETLAND BUFFER SECTIONS USED IN MITIGABLE MODEL





KEY MAP

GENERAL NOTES:  
 1. TOPO BASS, LAND DATA AERIAL, 1959  
 2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1959 FLOOD STUDY REPORT.  
 3. 1959 SUBMITTALS ARE NOT TO SCALE.

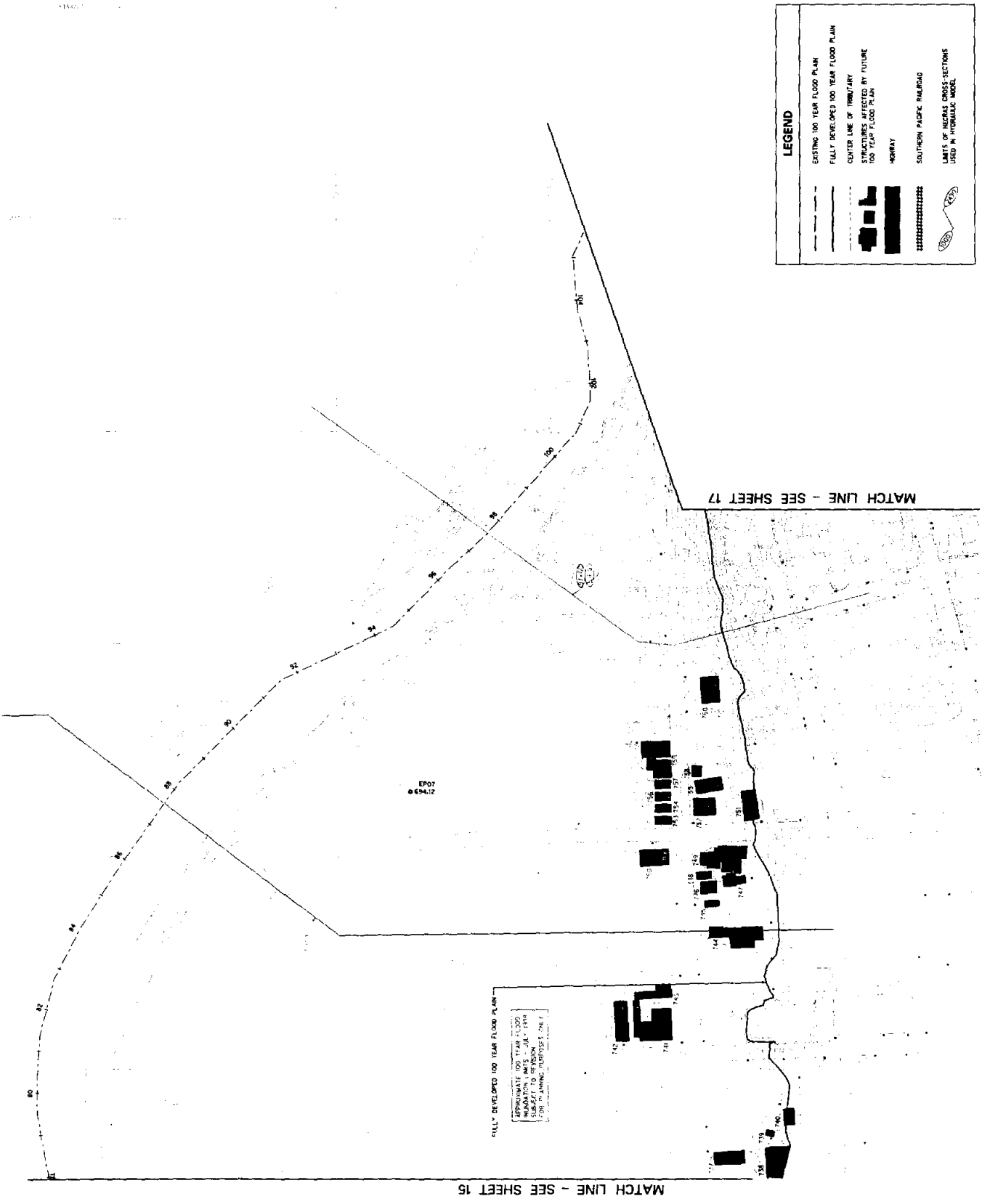
**EAGLE PASS FLOOD STUDY**  
 RIO GRANDE  
 EAGLE PASS, TEXAS  
 FLOODED AREA, MAP

**Halff Associates**  
 ENGINEERS, ARCHITECTS, PLANNERS  
 1000 WEST 10TH AVENUE, SUITE 100  
 DENVER, COLORADO 80202

DESIGN	DATE	SCALE	NO.	FILE	NO.
DRAWN	DATE	SCALE	NO.	FILE	NO.
CHECK	DATE	SCALE	NO.	FILE	NO.
DATE	SCALE	NO.	FILE	NO.	NO.

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAIN
- FULLY DEVELOPED 100 YEAR FLOOD PLAIN
- CENTER LINE OF HIGHWAY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAIN
- RAILROAD
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF NEURAL CROSS SECTIONS USED IN HYDRAULIC MODEL



FULLY DEVELOPED 100 YEAR FLOOD PLAIN—  
 THIS FLOOD PLAIN IS BASED ON THE  
 ASSUMPTIONS OF THE FLOOD STUDY REPORT  
 AND IS SUBJECT TO REVISION  
 FOR FUTURE DEVELOPMENT.

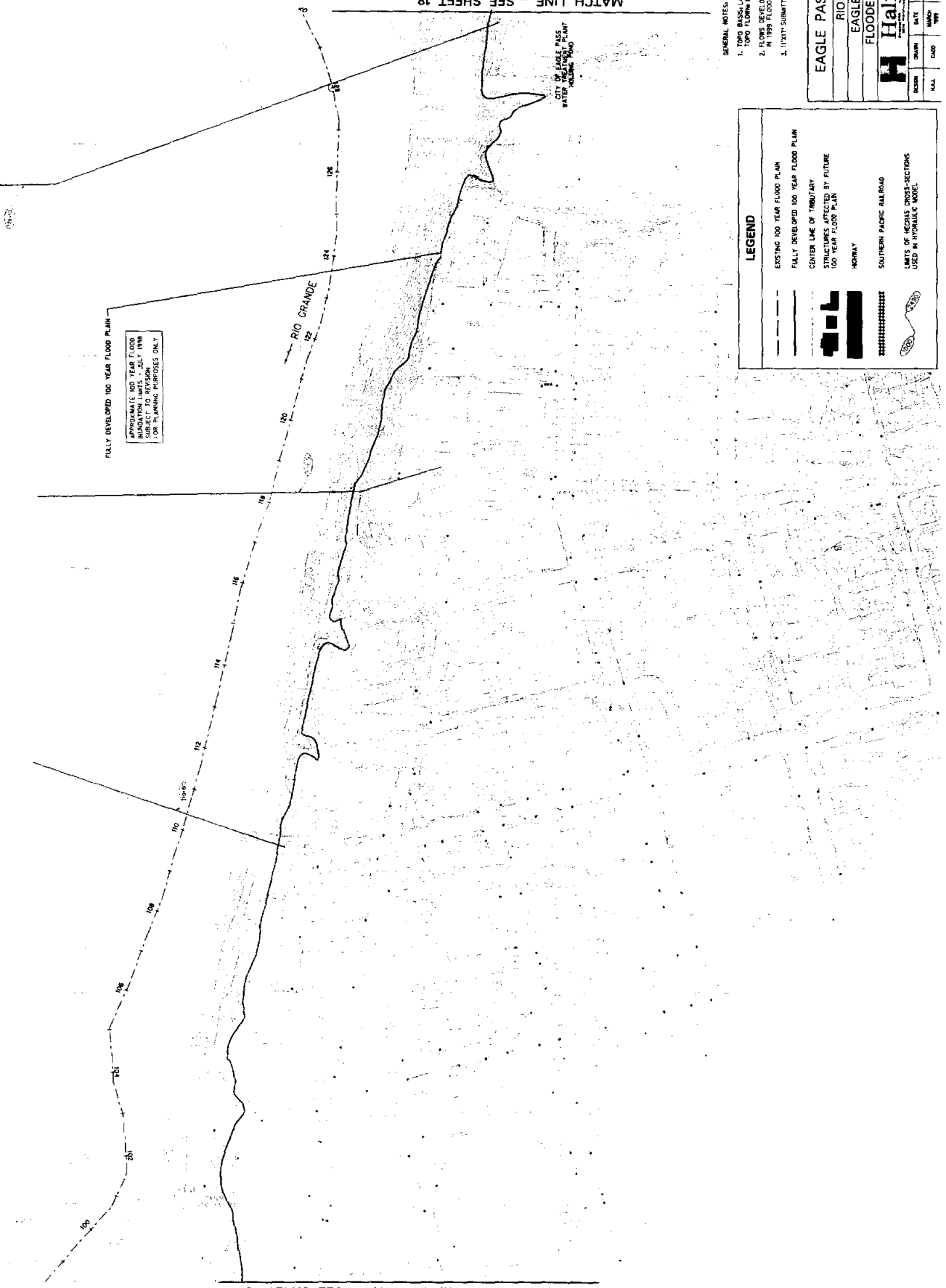


KEY MAP

FULLY DEVELOPED 100 YEAR FLOOD PLAIN  
APPROXIMATE 100 YEAR FLOOD  
PLAIN FOR JULY 1998  
BASED ON 1989 FLOOD STUDY  
SUBJECT TO REVISION  
FOR PLANNING PURPOSES ONLY

MATCH LINE - SEE SHEET 16

MATCH LINE - SEE SHEET 18



FOR THE FUTURE FLOOD PLAIN  
BASED ON 1989 FLOOD STUDY  
BASED ON 1989 FLOOD STUDY

- GENERAL NOTES:
1. TOPO BASED ON DATA FROM 1989 FLOOD STUDY.
  2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC. IN 1989 FLOOD STUDY REPORT.
  3. 1989 SUBMITTALS ARE NOT TO SCALE.

**LEGEND**

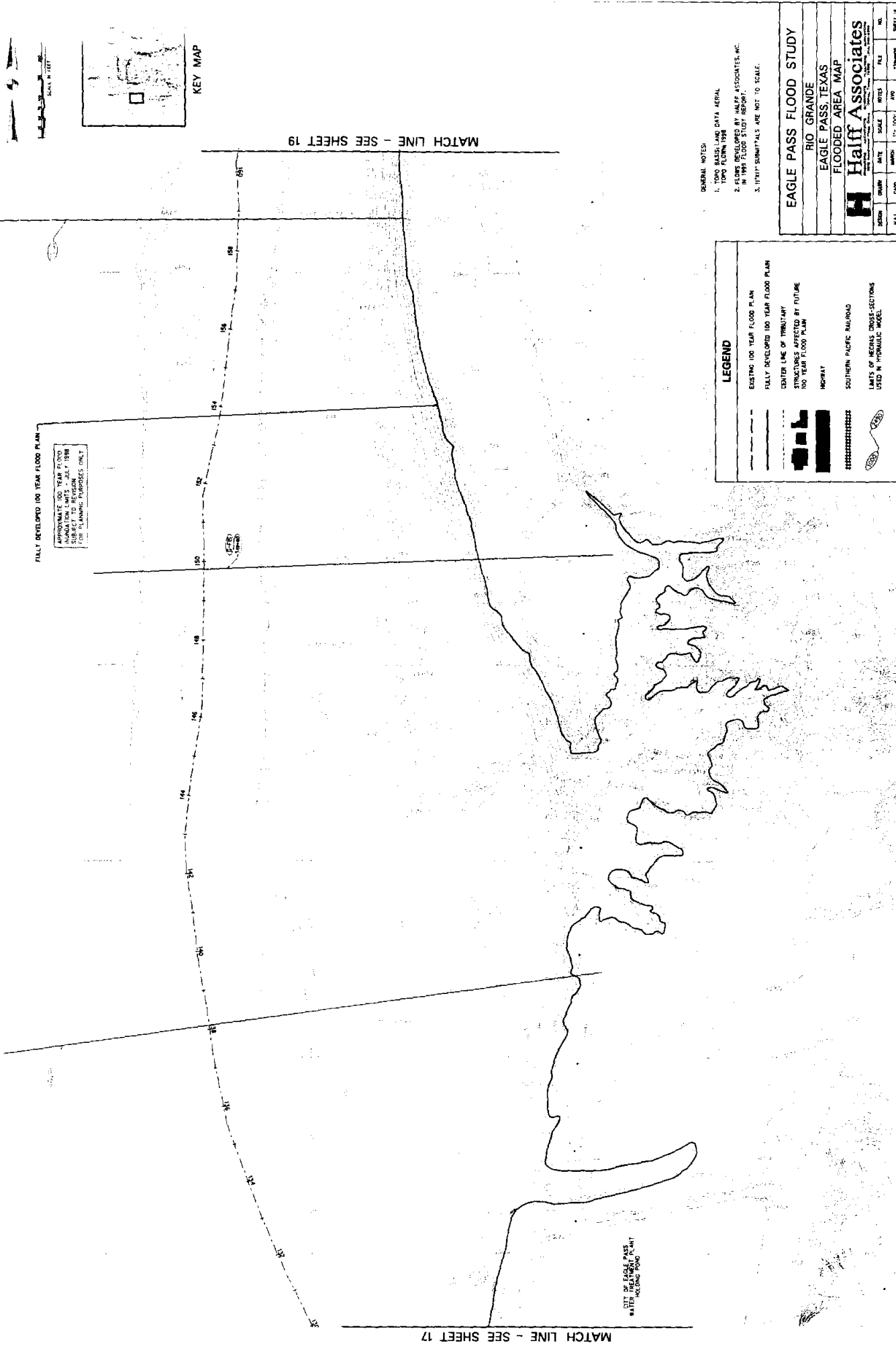
- EXISTING 100 YEAR FLOOD PLAIN
- FULLY DEVELOPED 100 YEAR FLOOD PLAIN
- CENTER LINE OF TRIUNFANT
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAIN
- HOORWAY
- SOUTHERN PACIFIC MAIN ROAD
- LIMITS OF RECORD CROSS-SECTIONS USED IN HYDRAULIC MODEL

**EAGLE PASS FLOOD STUDY**  
**RIO GRANDE**  
**EAGLE PASS, TEXAS**  
**FLOODED AREA MAP**

**Halff Associates**  
 10000 W. 10th Street, Suite 100  
 Fort Worth, Texas 76132  
 Phone: (817) 339-1111  
 Fax: (817) 339-1112

DATE	DESCRIPTION	SCALE	FILE
NOV 89	INITIAL STUDY	1" = 100'	17M00A
JAN 90	REVISED STUDY	1" = 100'	17M00B
MAY 90	REVISED STUDY	1" = 100'	17M00C
AUG 90	REVISED STUDY	1" = 100'	17M00D
NOV 90	REVISED STUDY	1" = 100'	17M00E
FEB 91	REVISED STUDY	1" = 100'	17M00F
MAY 91	REVISED STUDY	1" = 100'	17M00G
AUG 91	REVISED STUDY	1" = 100'	17M00H
NOV 91	REVISED STUDY	1" = 100'	17M00I
FEB 92	REVISED STUDY	1" = 100'	17M00J
MAY 92	REVISED STUDY	1" = 100'	17M00K
AUG 92	REVISED STUDY	1" = 100'	17M00L
NOV 92	REVISED STUDY	1" = 100'	17M00M
FEB 93	REVISED STUDY	1" = 100'	17M00N
MAY 93	REVISED STUDY	1" = 100'	17M00O
AUG 93	REVISED STUDY	1" = 100'	17M00P
NOV 93	REVISED STUDY	1" = 100'	17M00Q
FEB 94	REVISED STUDY	1" = 100'	17M00R
MAY 94	REVISED STUDY	1" = 100'	17M00S
AUG 94	REVISED STUDY	1" = 100'	17M00T
NOV 94	REVISED STUDY	1" = 100'	17M00U
FEB 95	REVISED STUDY	1" = 100'	17M00V
MAY 95	REVISED STUDY	1" = 100'	17M00W
AUG 95	REVISED STUDY	1" = 100'	17M00X
NOV 95	REVISED STUDY	1" = 100'	17M00Y
FEB 96	REVISED STUDY	1" = 100'	17M00Z
MAY 96	REVISED STUDY	1" = 100'	17M010
AUG 96	REVISED STUDY	1" = 100'	17M011
NOV 96	REVISED STUDY	1" = 100'	17M012
FEB 97	REVISED STUDY	1" = 100'	17M013
MAY 97	REVISED STUDY	1" = 100'	17M014
AUG 97	REVISED STUDY	1" = 100'	17M015
NOV 97	REVISED STUDY	1" = 100'	17M016
FEB 98	REVISED STUDY	1" = 100'	17M017
MAY 98	REVISED STUDY	1" = 100'	17M018
AUG 98	REVISED STUDY	1" = 100'	17M019
NOV 98	REVISED STUDY	1" = 100'	17M020
FEB 99	REVISED STUDY	1" = 100'	17M021
MAY 99	REVISED STUDY	1" = 100'	17M022
AUG 99	REVISED STUDY	1" = 100'	17M023
NOV 99	REVISED STUDY	1" = 100'	17M024
FEB 00	REVISED STUDY	1" = 100'	17M025
MAY 00	REVISED STUDY	1" = 100'	17M026
AUG 00	REVISED STUDY	1" = 100'	17M027
NOV 00	REVISED STUDY	1" = 100'	17M028
FEB 01	REVISED STUDY	1" = 100'	17M029
MAY 01	REVISED STUDY	1" = 100'	17M030
AUG 01	REVISED STUDY	1" = 100'	17M031
NOV 01	REVISED STUDY	1" = 100'	17M032
FEB 02	REVISED STUDY	1" = 100'	17M033
MAY 02	REVISED STUDY	1" = 100'	17M034
AUG 02	REVISED STUDY	1" = 100'	17M035
NOV 02	REVISED STUDY	1" = 100'	17M036
FEB 03	REVISED STUDY	1" = 100'	17M037
MAY 03	REVISED STUDY	1" = 100'	17M038
AUG 03	REVISED STUDY	1" = 100'	17M039
NOV 03	REVISED STUDY	1" = 100'	17M040
FEB 04	REVISED STUDY	1" = 100'	17M041
MAY 04	REVISED STUDY	1" = 100'	17M042
AUG 04	REVISED STUDY	1" = 100'	17M043
NOV 04	REVISED STUDY	1" = 100'	17M044
FEB 05	REVISED STUDY	1" = 100'	17M045
MAY 05	REVISED STUDY	1" = 100'	17M046
AUG 05	REVISED STUDY	1" = 100'	17M047
NOV 05	REVISED STUDY	1" = 100'	17M048
FEB 06	REVISED STUDY	1" = 100'	17M049
MAY 06	REVISED STUDY	1" = 100'	17M050
AUG 06	REVISED STUDY	1" = 100'	17M051
NOV 06	REVISED STUDY	1" = 100'	17M052
FEB 07	REVISED STUDY	1" = 100'	17M053
MAY 07	REVISED STUDY	1" = 100'	17M054
AUG 07	REVISED STUDY	1" = 100'	17M055
NOV 07	REVISED STUDY	1" = 100'	17M056
FEB 08	REVISED STUDY	1" = 100'	17M057
MAY 08	REVISED STUDY	1" = 100'	17M058
AUG 08	REVISED STUDY	1" = 100'	17M059
NOV 08	REVISED STUDY	1" = 100'	17M060
FEB 09	REVISED STUDY	1" = 100'	17M061
MAY 09	REVISED STUDY	1" = 100'	17M062
AUG 09	REVISED STUDY	1" = 100'	17M063
NOV 09	REVISED STUDY	1" = 100'	17M064
FEB 10	REVISED STUDY	1" = 100'	17M065
MAY 10	REVISED STUDY	1" = 100'	17M066
AUG 10	REVISED STUDY	1" = 100'	17M067
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FEB 11	REVISED STUDY	1" = 100'	17M069
MAY 11	REVISED STUDY	1" = 100'	17M070
AUG 11	REVISED STUDY	1" = 100'	17M071
NOV 11	REVISED STUDY	1" = 100'	17M072
FEB 12	REVISED STUDY	1" = 100'	17M073
MAY 12	REVISED STUDY	1" = 100'	17M074
AUG 12	REVISED STUDY	1" = 100'	17M075
NOV 12	REVISED STUDY	1" = 100'	17M076
FEB 13	REVISED STUDY	1" = 100'	17M077
MAY 13	REVISED STUDY	1" = 100'	17M078
AUG 13	REVISED STUDY	1" = 100'	17M079
NOV 13	REVISED STUDY	1" = 100'	17M080
FEB 14	REVISED STUDY	1" = 100'	17M081
MAY 14	REVISED STUDY	1" = 100'	17M082
AUG 14	REVISED STUDY	1" = 100'	17M083
NOV 14	REVISED STUDY	1" = 100'	17M084
FEB 15	REVISED STUDY	1" = 100'	17M085
MAY 15	REVISED STUDY	1" = 100'	17M086
AUG 15	REVISED STUDY	1" = 100'	17M087
NOV 15	REVISED STUDY	1" = 100'	17M088
FEB 16	REVISED STUDY	1" = 100'	17M089
MAY 16	REVISED STUDY	1" = 100'	17M090
AUG 16	REVISED STUDY	1" = 100'	17M091
NOV 16	REVISED STUDY	1" = 100'	17M092
FEB 17	REVISED STUDY	1" = 100'	17M093
MAY 17	REVISED STUDY	1" = 100'	17M094
AUG 17	REVISED STUDY	1" = 100'	17M095
NOV 17	REVISED STUDY	1" = 100'	17M096
FEB 18	REVISED STUDY	1" = 100'	17M097
MAY 18	REVISED STUDY	1" = 100'	17M098
AUG 18	REVISED STUDY	1" = 100'	17M099
NOV 18	REVISED STUDY	1" = 100'	17M100





FULLY DEVELOPED 100 YEAR FLOOD PLAN  
 APPROXIMATE 100 YEAR FLOOD  
 SIMULATED WITH JULY 1981  
 DATA. THIS MAP IS NOT  
 TO BE USED FOR PLANNING PURPOSES ONLY

MATCH LINE - SEE SHEET 19

MATCH LINE - SEE SHEET 17

CITY OF EAGLE PASS  
 WATER CONTROL DISTRICT

GENERAL NOTES:  
 1. TOPO BASED LAND DATA AERIAL  
 2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC.  
 IN 1981 FLOOD STUDY REPORT.  
 3. HYDRA-SUBPAPALS ARE NOT TO SCALE.

**LEGEND**

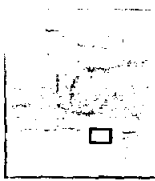
- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIUNFANT  
 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF CROSS-SECTIONS  
 USED IN HYDRAULIC MODEL

**EAGLE PASS FLOOD STUDY**  
 RIO GRANDE  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

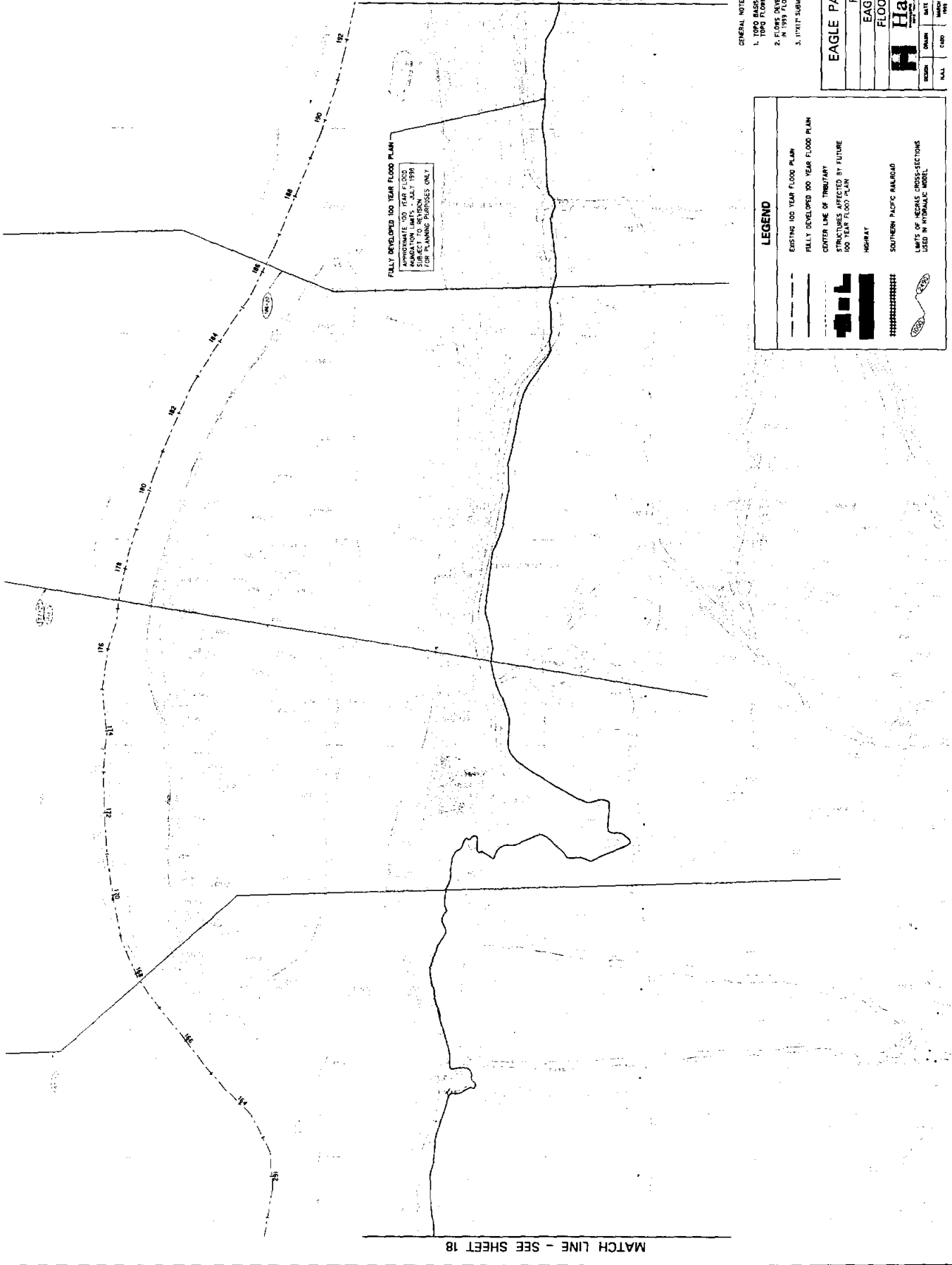
**Halff Associates**  
 ENGINEERS AND ARCHITECTS  
 1000 WEST 10TH STREET  
 DALLAS, TEXAS 75201

DESIGN	DATE	SCALE	REVISED	FILE	NO.
DRAWN	DATE	SCALE	REVISED	FILE	NO.
CHECKED	DATE	SCALE	REVISED	FILE	NO.
APPROVED	DATE	SCALE	REVISED	FILE	NO.





KEY MAP



GENERAL NOTES:  
 1. 1990 BASIN/LAND DATA AERIAL  
 1990 FLOODING  
 2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC.  
 IN 1993 FLOOD STUDY REPORT.  
 3. HYDRA-SUBROUTALS ARE NOT TO SCALE.

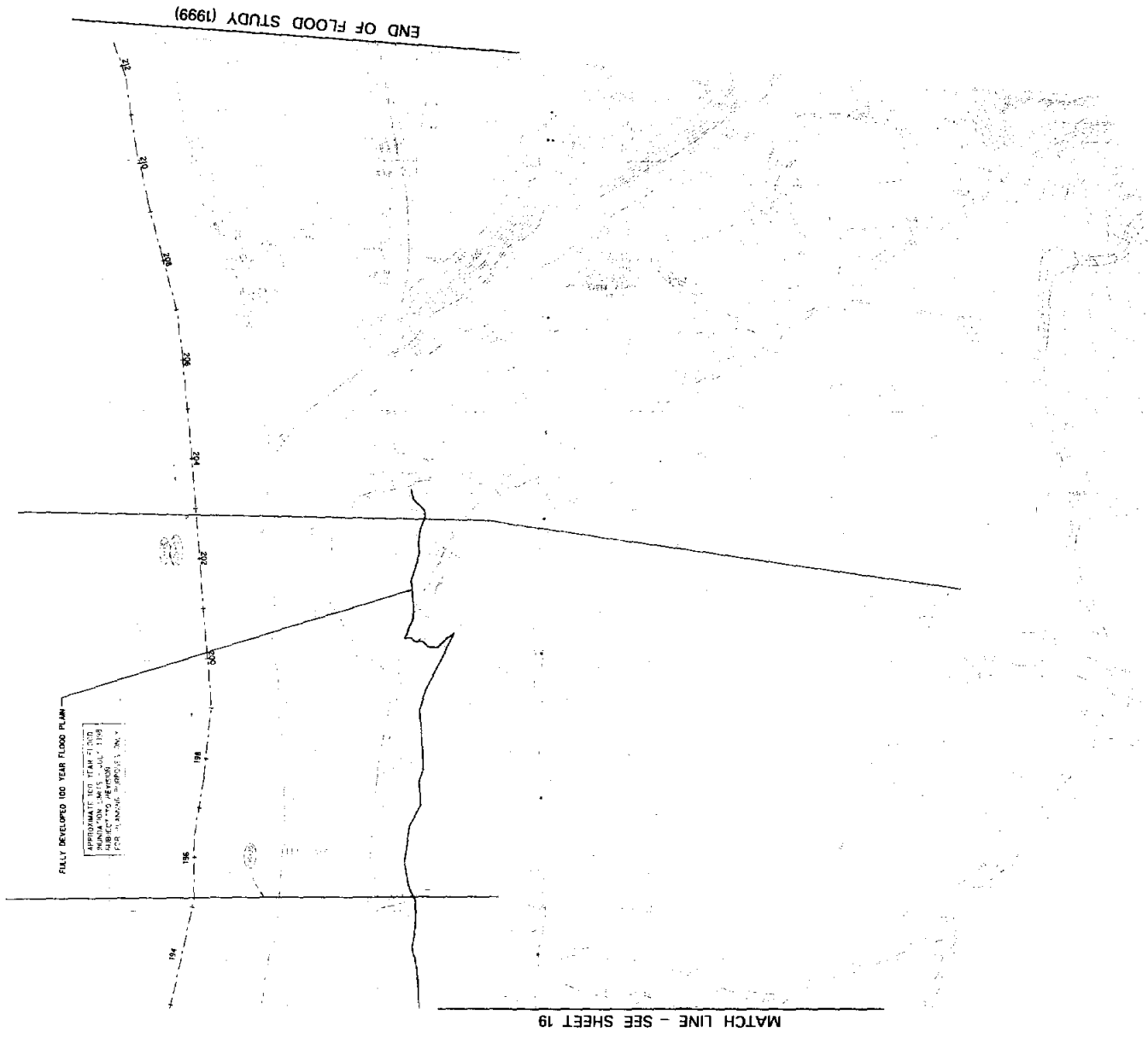
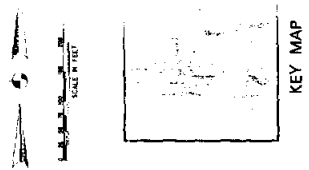
**LEGEND**

- EXISTING 100 YEAR FLOOD PLAN
- FULLY DEVELOPED 100 YEAR FLOOD PLAN
- CENTER LINE OF TRIBUTARY
- 100 YEAR FLOOD PLAN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF STUDY CROSS-SECTIONS USED IN AUTOMATED MODEL

**EAGLE PASS FLOOD STUDY**  
 RIO GRANDE  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

**Half Associates**  
 10000 W. LOOP WEST, SUITE 100  
 DALLAS, TEXAS 75243  
 TEL: 972-241-1179  
 FAX: 972-241-1179

NO.	DATE	SCALE	NOTES	FILE	NO.
1	1993	1" = 100'			1
2	1993	1" = 100'			2
3	1993	1" = 100'			3



GENERAL NOTES:  
 1. TOPO BASKINLAND DATA AERIAL  
 TOPO FROM 1988  
 2. FLOODS DEVELOPED BY HALFF ASSOCIATES, INC.  
 IN 1999 FLOOD STUDY REPORT.  
 3. 1999 FLOOD STUDY REPORTS ARE NOT TO SCALE.

DESIGN	DATE	SCALE	FILE	NO.
N/A	MARCH 1999	1" = 100'	1700	1700

**LEGEND**

- EXISTING 100 YEAR FLOOD PLAIN
- FULLY DEVELOPED 100 YEAR FLOOD PLAIN
- CENTER LINE OF TRIBUTARY
- STRUCTURES AFFECTED BY FUTURE 100 YEAR FLOOD PLAIN
- HIGHWAY
- SOUTHERN PACIFIC RAILROAD
- LIMITS OF METEOROLOGICAL SECTIONS USED IN HYDRAULIC MODEL

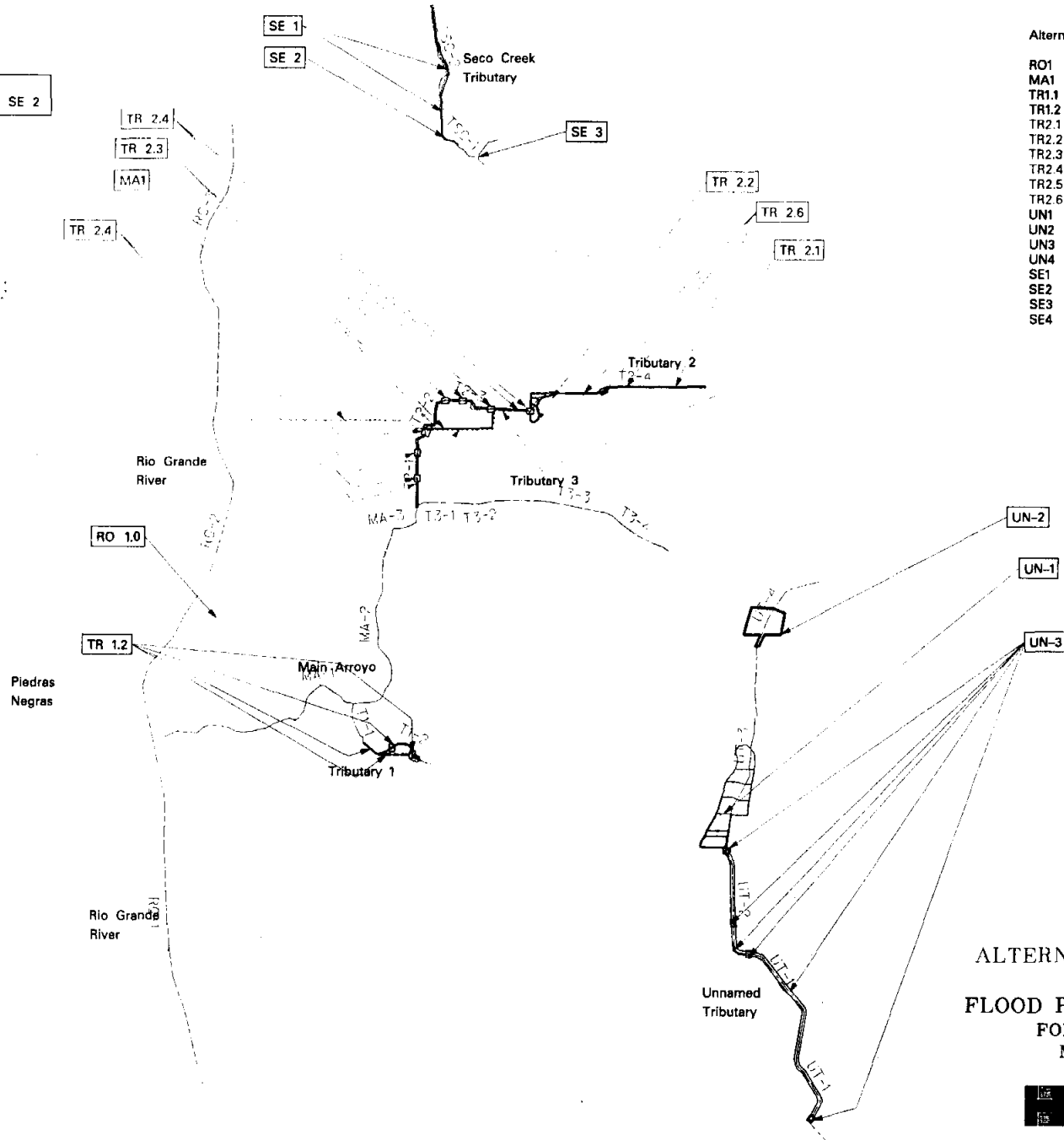
**EAGLE PASS FLOOD STUDY**

RIO GRANDE  
 EAGLE PASS, TEXAS  
 FLOODED AREA MAP

**Halff Associates**  
 ENGINEERS, ARCHITECTS, PLANNERS  
 10000 WEST 10TH AVENUE, SUITE 100  
 DENVER, COLORADO 80202  
 TEL: 303.751.1000 FAX: 303.751.1001  
 WWW.HALFF.COM

ALTERNATE SE 4  
Combination of SE 1 & SE 2

ALTERNATE TR 2.5  
Combination of TR 2.3 and TR-2.4



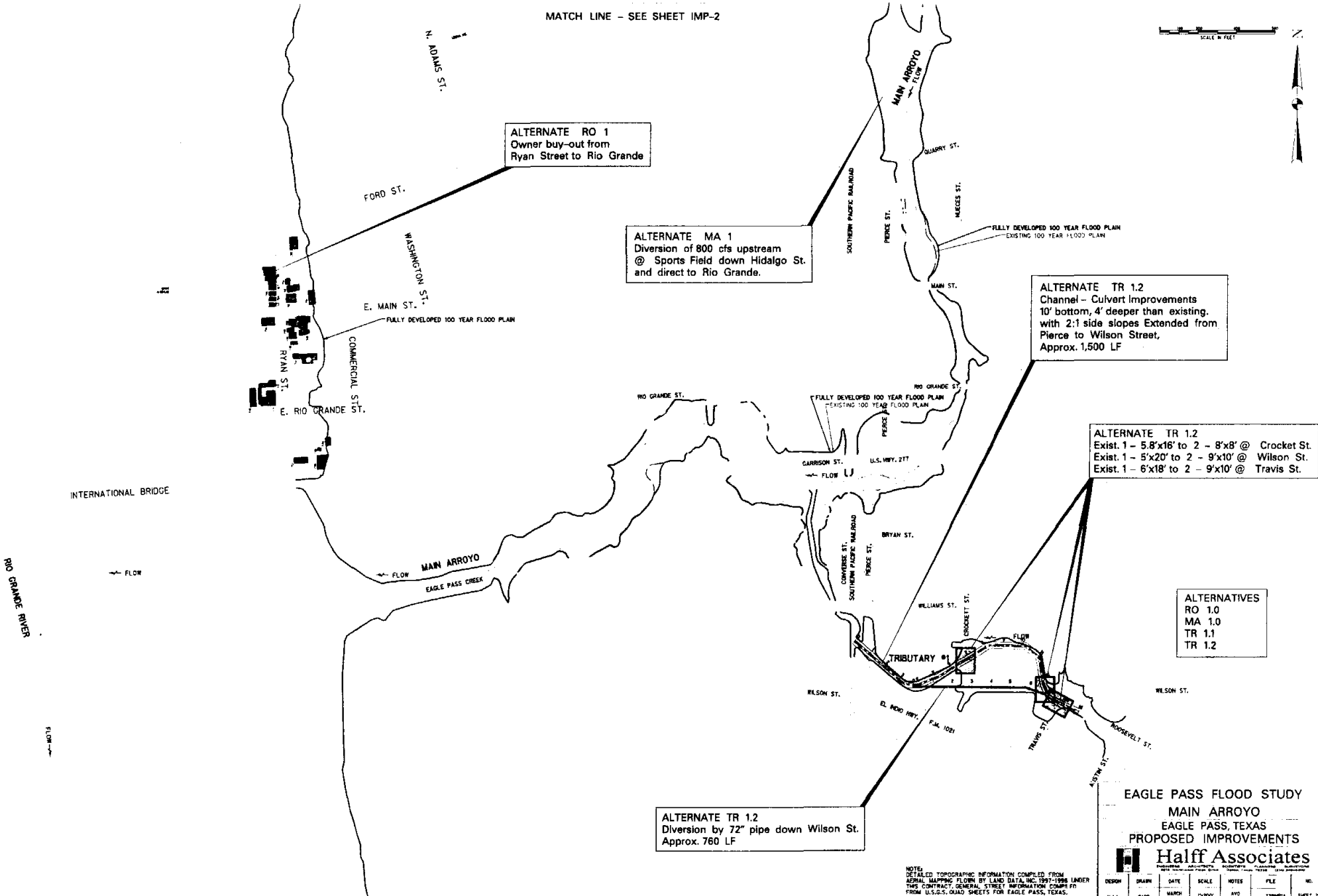
Alternative Description

- RO1 Rio Grande River - House buyout
- MA1 Main Arroyo - Diversion of 800 cfs to River
- TR1.1 Diversion in 72" RCP
- TR1.2 Channel Deepen & Culvert Imp.
- TR2.1 Diversion of 800 cfs to River
- TR2.2 Detention @ Sports Field
- TR2.3 Diversion of 500 cfs
- TR2.4 Channelization & Culvert Improvements
- TR2.5 Combination of 2.3 & 2.4
- TR2.6 Upstream Channelization parallel to Royal Ridge
- UN1 Detention @ Learning Center
- UN2 Detention @ above US Hwy 277
- UN3 Channelization & Culvert Improvements
- UN4 Combination of UN2 & UN3
- SE1 Channel 20' US Hwy 277 to mouth w/Seco Cr.
- SE2 Channel 8' wide above US Hwy 277
- SE3 Detention above Southern Pacific RR
- SE4 Combination of SE1, SE2, & SE3

ALTERNATE UN-4  
Combination of UN 2 & UN 3

ALTERNATIVE IMPROVEMENT PLANS  
CONSIDERED  
FLOOD PROTECTION PLANNING STUDY  
FOR THE CITY OF EAGLE PASS,  
MAVERICK COUNTY, TEXAS

**Half Associates**  
ENGINEERS - ARCHITECTS - SCIENTISTS - PLANNERS - SURVEYORS  
5610 Northmead Plaza Drive - Dallas, Texas 75246 - (214) 348-6900



ALTERNATE TR 1.2  
 Exist. 1 - 5.8'x16' to 2 - 8'x8' @ Crocket St.  
 Exist. 1 - 5'x20' to 2 - 9'x10' @ Wilson St.  
 Exist. 1 - 6'x18' to 2 - 9'x10' @ Travis St.

- ALTERNATIVES  
 RO 1.0  
 MA 1.0  
 TR 1.1  
 TR 1.2

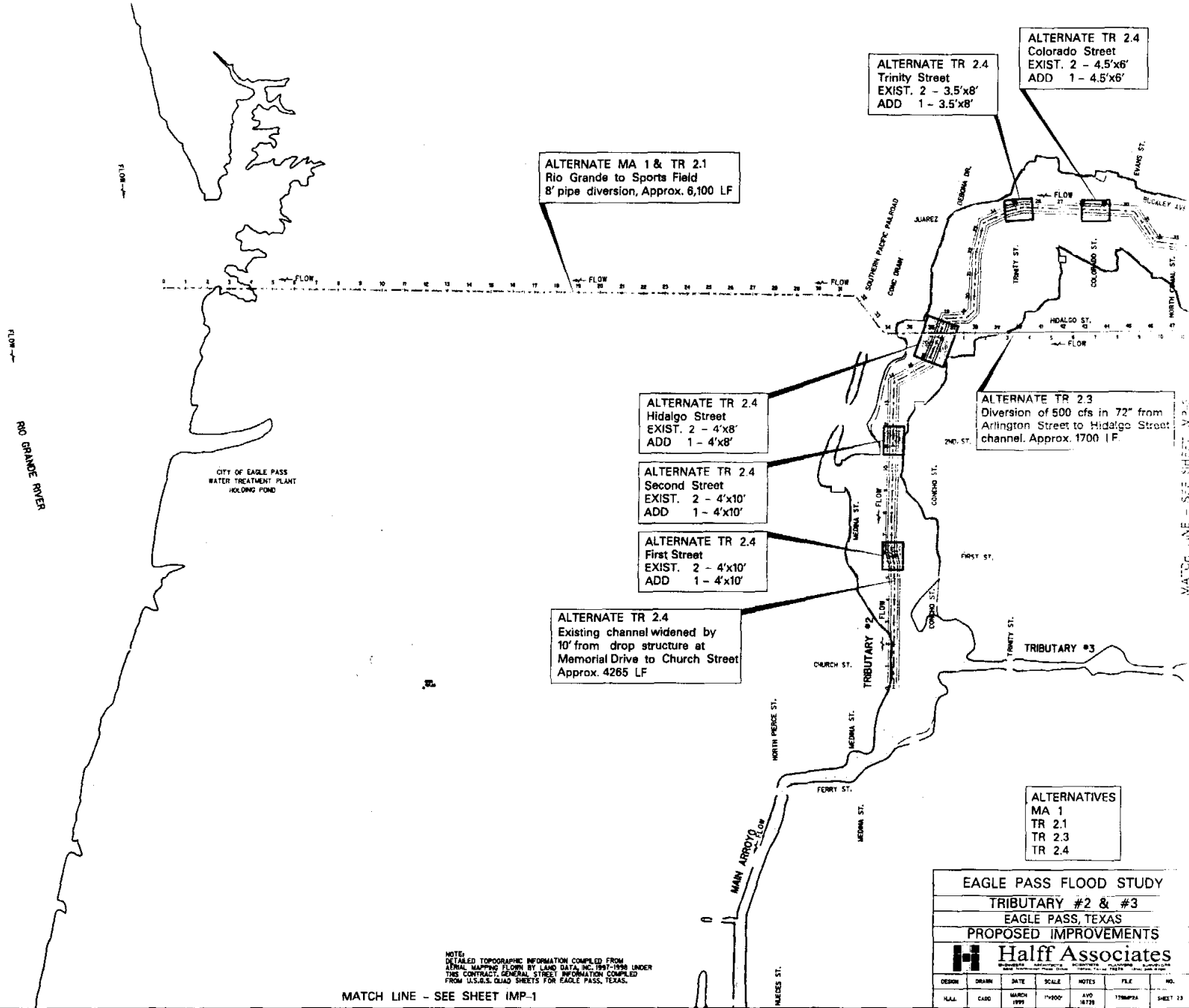
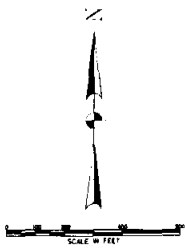
ALTERNATE TR 1.2  
 Diversion by 72" pipe down Wilson St.  
 Approx. 760 LF

EAGLE PASS FLOOD STUDY  
 MAIN ARROYO  
 EAGLE PASS, TEXAS  
 PROPOSED IMPROVEMENTS

**Half Associates**

NOTES: DETAILED TOPOGRAPHIC INFORMATION COMPILED FROM AERIAL MAPPING FLOW BY LAND DATA, INC. 1997-1998 UNDER THIS CONTRACT. GENERAL STREET INFORMATION COMPILED FROM U.S.G.S. QUAD SHEETS FOR EAGLE PASS, TEXAS.

DESIGNER	DRAWN	DATE	SCALE	NOTES	FILE	NO.
H.A.F.	P.A.W.	MARCH	1"=50'	A.V.C.	178601A	SHEET 22



ALTERNATE MA 1 & TR 2.1  
Rio Grande to Sports Field  
8' pipe diversion, Approx. 6,100 LF

ALTERNATE TR 2.4  
Trinity Street  
EXIST. 2 - 3.5'x8'  
ADD 1 - 3.5'x8'

ALTERNATE TR 2.4  
Colorado Street  
EXIST. 2 - 4.5'x6'  
ADD 1 - 4.5'x6'

ALTERNATE TR 2.4  
Hidalgo Street  
EXIST. 2 - 4'x8'  
ADD 1 - 4'x8'

ALTERNATE TR 2.3  
Diversion of 500 cfs in 72" from  
Arlington Street to Hidalgo Street  
channel. Approx. 1700 LF.

ALTERNATE TR 2.4  
Second Street  
EXIST. 2 - 4'x10'  
ADD 1 - 4'x10'

ALTERNATE TR 2.4  
First Street  
EXIST. 2 - 4'x10'  
ADD 1 - 4'x10'

ALTERNATE TR 2.4  
Existing channel widened by  
10' from drop structure at  
Memorial Drive to Church Street  
Approx. 4265 LF

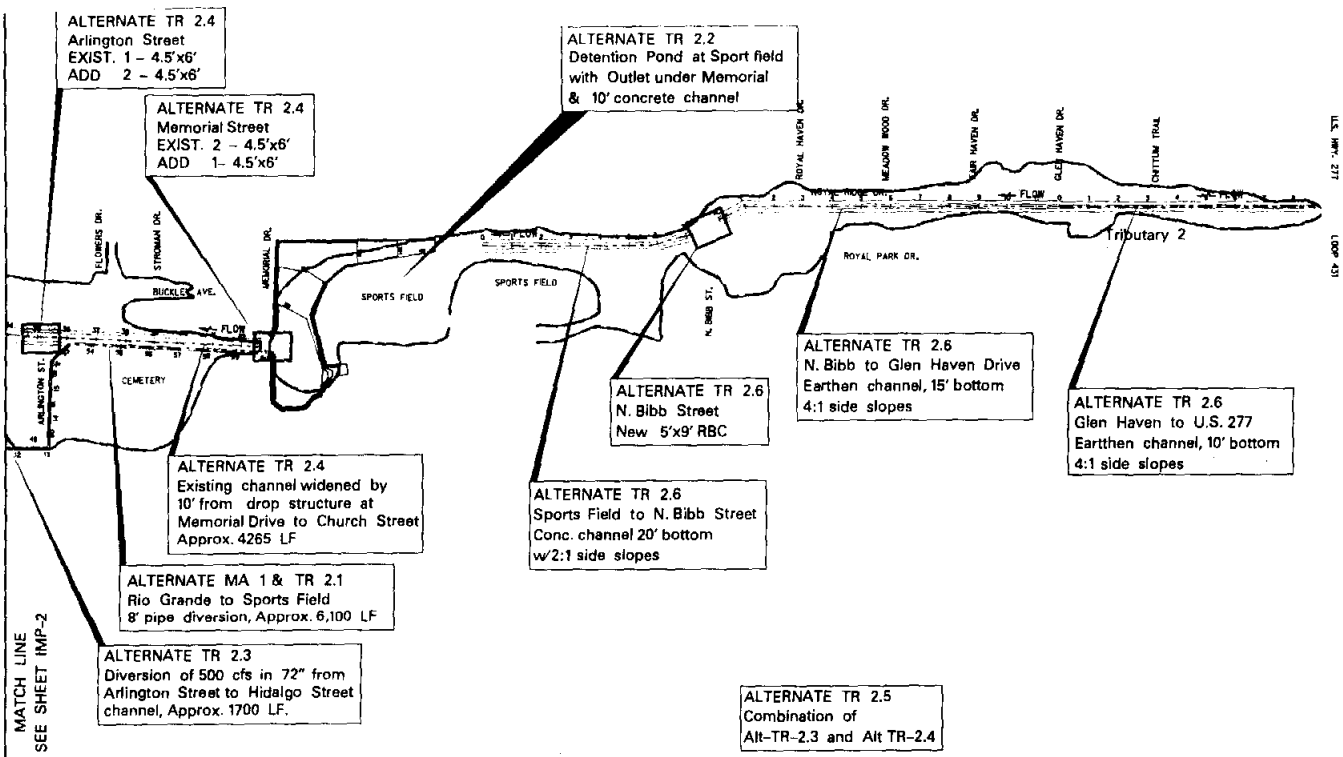
ALTERNATIVES  
MA 1  
TR 2.1  
TR 2.3  
TR 2.4

NOTE:  
DETAILED TOPOGRAPHIC INFORMATION COMPILED FROM  
AERIAL MAPPING FLOW BY LAND DATA, INC. 1987-1998 UNDER  
THIS CONTRACT. GENERAL STREET INFORMATION COMPILED  
FROM U.S.G.S. QUAD SHEETS FOR EAGLE PASS, TEXAS.

MATCH LINE - SEE SHEET IMP-1

EAGLE PASS FLOOD STUDY  
 TRIBUTARY #2 & #3  
 EAGLE PASS, TEXAS  
 PROPOSED IMPROVEMENTS

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
H.A.L.	C.A.D.	MARCH 1999	1"=100'	AVO 1878	178692A	SHEET 13



MATCH LINE  
SEE SHEET IMP-2

U.S. HWY. 277  
(Loop 43)

FULLY DEVELOPED 100 YEAR FLOOD PLAN  
EXISTING 100 YEAR FLOOD PLAN

- ALTERNATIVES**
- MA 1.0
  - TR 2.1
  - TR 2.2
  - TR 2.3
  - TR 2.4
  - TR 2.5
  - TR-2.6

**EAGLE PASS FLOOD STUDY**  
**TRIBUTARY #2 & #3**  
 EAGLE PASS, TEXAS  
**PROPOSED IMPROVEMENTS**

**Half Associates**

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
HAL	CAO	MARCH 1999	1"=200'	410 16139	139MP3A	SHEET 24

NOTE: DETAILED TOPOGRAPHIC INFORMATION COMPILED FROM AERIAL MAPPING FLOREN BY LAND DATA, INC. 1997-1998 UNDER THIS CONTRACT. GENERAL STREET INFORMATION COMPILED FROM U.S.G.S. QUAD SHEETS FOR EAGLE PASS, TEXAS.



ALTERNATE UN 3  
Dell Crest Dr.  
EXIST. 1 - 4.5'x8'  
ADD 2 - 5'x10'

ALTERNATE UN 3  
Dell Crest Dr. to Cherry Leaf Drive,  
Conc. channel 60' bottom with  
2:1 side slopes, Approx. 1,500 LF

ALTERNATE UN 1  
Detention at Learning Center

ALTERNATE UN 3  
F.M. 3443 to Cherry Leaf Drive  
Conc. channel transition 70' bottom to  
60' with 2:1 side slopes, Approx. 800 LF

ALTERNATE UN 3  
F.M. 3443  
EXIST. 6 - 8'x8'  
ADD 2 - 8'x8'

ALTERNATE UN 3  
Cherry Leaf Drive  
EXIST. 8 - 4'x4'  
ADD 3 - 4'x8'

ALTERNATE UN-2  
US Highway 277, US 57  
Detention above US Highway 277

ALTERNATE UN 3  
F.M. 1021 to F.M. 3443  
Conc. channel 70' bottom  
with 2:1 side slopes from  
Approx. 4,000 LF

ALTERNATE UN-4  
Combination of UN 2 & UN 3

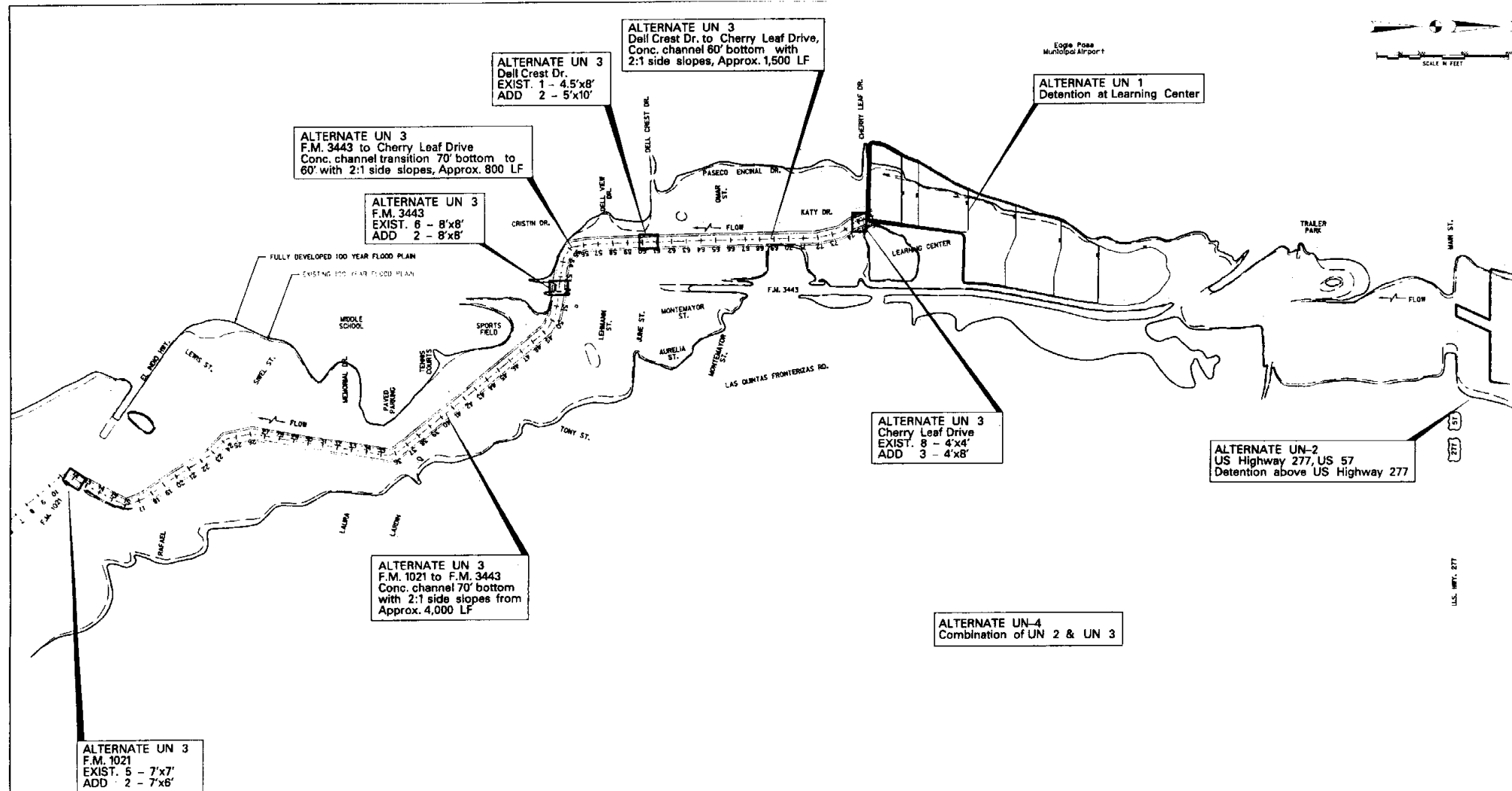
ALTERNATE UN 3  
F.M. 1021  
EXIST. 5 - 7'x7'  
ADD 2 - 7'x6'

- ALTERNATIVES
- UN-1
  - UN-2
  - UN-3
  - UN-4

EAGLE PASS FLOOD STUDY  
UNNAMED TRIBUTARY  
EAGLE PASS, TEXAS  
PROPOSED IMPROVEMENTS

NOTE:  
DETAILED TOPOGRAPHIC INFORMATION COMPILED FROM  
AERIAL MAPPING FLOWN BY LAND DATA, INC. 1997-1998 UNDER  
THIS CONTRACT. GENERAL STREET INFORMATION COMPILED  
FROM U.S.G.S. QUAD SHEETS FOR EAGLE PASS, TEXAS.

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
K.A.A.	C.A.D.	MARCH 1999	1"=100'	8/10	7394P/41	5411

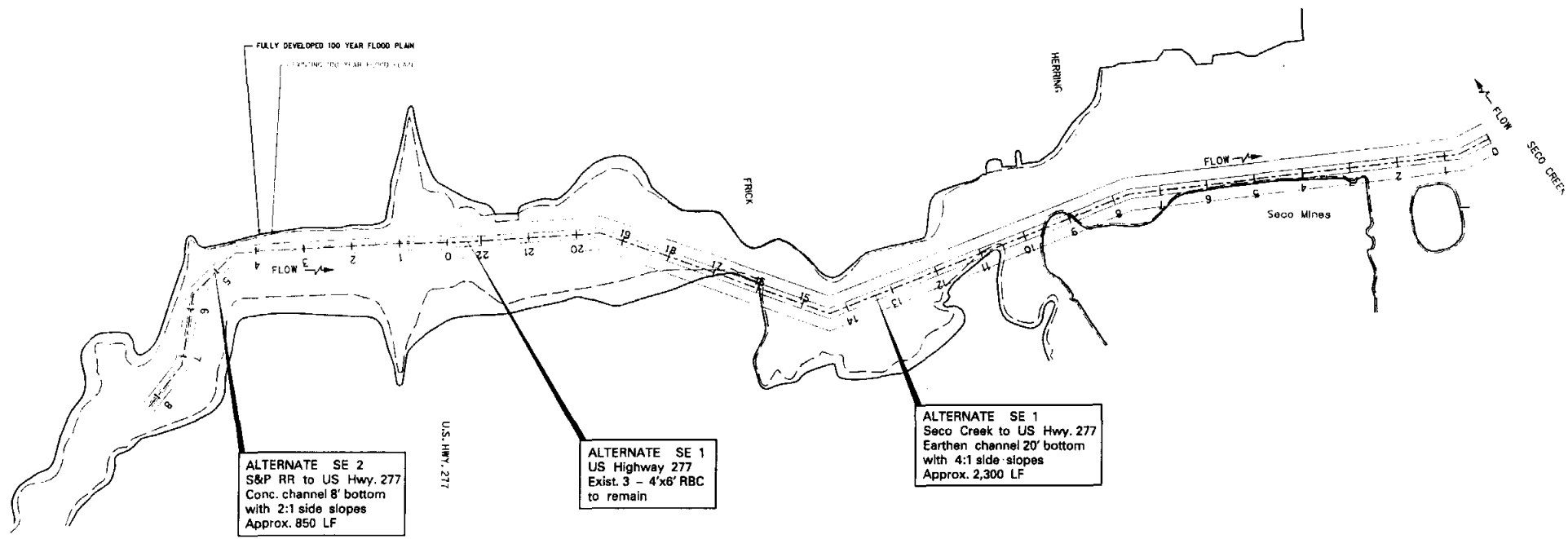






B277

FULLY DEVELOPED 100 YEAR FLOOD PLAN  
EXISTING 100 YEAR FLOOD PLAN

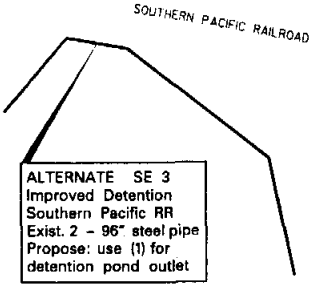


ALTERNATE SE 2  
S&P RR to US Hwy. 277  
Conc. channel 8' bottom  
with 2:1 side slopes  
Approx. 850 LF

ALTERNATE SE 1  
US Highway 277  
Exist. 3 - 4'x8' RBC  
to remain

ALTERNATE SE 1  
Seco Creek to US Hwy. 277  
Earthen channel 20' bottom  
with 4:1 side slopes  
Approx. 2,300 LF

ALTERNATE SE 4  
Combination of Alternate SE 1 & SE 2



ALTERNATE SE 3  
Improved Detention  
Southern Pacific RR  
Exist. 2 - 96" steel pipe  
Propose: use (1) for  
detention pond outlet

- ALTERNATIVES
- SE 1
  - SE 2
  - SE 3
  - SE 4

EAGLE PASS FLOOD STUDY  
TRIBUTARY TO SECO CREEK  
EAGLE PASS, TEXAS  
PROPOSED IMPROVEMENTS

**Half Associates**

DESIGN	DRAWN	DATE	SCALE	NOTES	FILE	NO.
H.A.L.	C.A.D.	MARCH 1999	1"=100'	410	18729	11/16/99

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**Response to Comments Received from**

**Texas Water Development Board  
Contract No. 98-483-242  
City of Eagle Pass**

1. Executive summary is not really a summary. It does not describe project background, tasks performed or overall project structure. The Executive summary must orient reader and give concise and thorough overview of project and conclusions. It appears that this Executive Summary is merely a reprint of your conclusion section.

*The Executive Summary has been rewritten to describe the project background, the tasks performed and the overall project structure used for the study. Specific recommendations regarding flooding issues are presented. The draft Executive Summary was a reprint of the conclusion section...*

2. The report does not appear to have been edited even for draft-level review.

*The initial draft report has been extensively edited.*

3. Table of Contents has numerous errors, some of which are:
  - Many figures are not listed in the Table of Contents properly,
  - Match titles of Figures and Tables to the Tale of Contents,
  - Some Figures and Tables are not included in the Table of Contents, please include,
  - Please provide page numbers,
  - Include drawings (over 20 listed in the Table of Contents). Better titles are needed for these.
  - References to Figures in text and Tables of Contents need to be consistent. (Sometimes they are referred to as Figures, Sheets, Drawings, or Sketches). Please correct.

*The Table of Contents has been corrected. Figures are now consecutive. The figures and table numbers have been corrected. Pages are numbered. The drawings have been included. The references are now consistent throughout the report.*

4. Report does not include any Benefit-Cost analyses (5E of scope). Assumptions for estimating costs are detailed, some cost estimates are provided in the Appendix- but there is no discussion or summary of costs for alternative or alternative combinations. Economic analysis needs to be provided to compare alternatives. As stated in the Scope of Work, this analysis should be used to help determine the most feasible project.

*A Benefit-Cost analysis has been developed to compare the alternatives for flood damage reduction. A discussion of cost development for the alternatives and combination of alternatives is presented. The Benefit-Cost analysis was used to help determine the most feasible project.*

5. Cost descriptions are confusing or entirely missing from report. There is no comparison of any of the alternatives. While the report lists over \$10,000,000 dollars worth of alternatives, none are compared in the body of the report. Compare alternatives and justify recommendations (Correct mathematical errors in cost estimates). Also, the report fails to include all required costs, e.g. grading the buyout areas for a future park (scope of work item 5D2). Summarize options regarding the benefits and costs of the various alternatives.

*Cost descriptions have been included in the report. A comparison of alternatives is included. These are now more completely described in the report with justification. Other required costs noted have been added to the cost estimates. A summary of the benefits and costs associated with the flood damage alternatives considered has been included.*

6. Page 5,B. Purpose of Study, last sentence; refers to an economic analysis performed leading to the selection of the best alternative. This was not presented.

*The economic analysis has been included.*

7. The report lacks any description of methodology employed in creating cost estimates. Explain in the text of the report, data sources used, cost estimating methodology and reliability of numbers. The report does not describe the types of costs (e.g. third party) that are NOT included in cost estimates. Explain what type shares of costs were included in "land acquisition" costs. Cost estimates did not address, in general terms, the existing gap between appraised and market property values.

*A methodology employed in creating the cost estimates is included. The data sources used, the cost estimating methodology used and the reliability is stated. Third party costs were not included in the cost estimates. No shared costs were included in the "land acquisition" costs, unless the land was publicly owned. The cost estimates were based on an average of the appraised property values.*

8. Page 23 refers to appendix D "sketch[es] of each option considered." The sketches in Appendix D are not included.

*Proposed improvements for the flood reduction alternatives are presented on sheets 21-25 in the report.*

9. Appendix D tables are not labeled with clear references. (e.g. "Table number...")

*Appendix D tables are labeled.*

10. The two table columns in tale D-2 are empty. (Why is B/C Ratio even listed? Benefit Cost comparisons were not performed in this study? Table D-2 has inappropriate headings. For example, "Actual cost less 15%". What does this mean if the Table title is "Estimate of Probable Construction Cost" Actual suggests that projects were actually completed as opposed to estimated. Explain why it is "less 15%"? Does this mean that an estimate was made then the authors subtracted 15% from the cost (suggesting that these estimates are, in effect, 30% lower than other estimates which added 15% to the initial estimates?).

*The other columns in Table D-2 have been completed. Reference to "Actual cost less 15%" has been removed.*

11. Row heading "...I All.." in D-2 is cut off and confusing. Explain what "(less Combos)" means and why "Total all " is blank.

*Agree. This row has been removed.*

12. Table 5 shows up twice. The version at the beginning of Appendix D has costs left out. Table 5 and conclusion- are all the alternatives considered "being recommended"?

*Table 5 and Appendix Table D-1 have been completed. All alternatives are not recommended at the same time.*

13. Include a list of the structures and the appraised values that are included in the "buyout" alternative. (Provide all data such as this if available; an appendix would suffice)

*The buyout of structures along the Rio Grande River is recommended. The appraised value of all structures within the 100-year flood plain as identified by the flooded area maps is included in tabular form in Appendix D. The appraised value of these structures was used in determining project benefits for each of the flood damage alternatives considered.*

14. Report contains mathematical errors, particularly in cost tables of Appendix D.

*The mathematical errors have been corrected.*

15. Rework entire cost estimate section to assure consistency and accuracy in terminology, cost adjustments and dollar totals.

*The cost estimates have been reworked for consistency and accuracy.*

16. Please include a section addressing social impacts of resident relocation. Please state what sort of relocations/buyouts was considered. What demographic group is impacted by relocations? These issues fall under the cost and benefits portion of report scope.

*A brief section addressing the social impacts of resident relocation has been added. The only relocation/buyouts considered were along Ryan Street for the Rio Grande River flood damage alternative RO-1. The demographic group affected would be the Mexican-American families living along Ryan Street.*

17. Table 5, Page 27, the heading is missing over third column. Costs are confusing. For example, MA1 does not include cost of routine channel clean up and mowing. RO1 fails to include cost of shutting down lift station. Explain reference of table to "see MA1" instead of listing dollar amount. Alternatives cannot be compared until all costs are included and analyzed. Complete table.

*Table 5, Column 3 heading has been added. Costs for routine channel clean up and maintenance are annual incidental costs. Costs for shutting down the lift station are included. References to other alternatives are explained in further detail in the report.*

18. The report should note the potential of several alternatives of disturbing partially developed and undeveloped landforms, which appear to have moderate to high probably for occurrence of buried archeological deposits. Sensitive habitat areas required prior to construction, to address these concerns should be given. (Are these associated costs in the 15%? If so, state.)

*A brief discussion addressing the disturbed area for the developed and undeveloped landforms is presented. Sensitive habitat areas have not been identified. These areas would have to be evaluated prior to any construction activities.*

19. Any plans to use federal funds for such flood control facilities will undoubtedly require preparation of environmental assessment to address other impacts of the alternative, and other mitigative measures might be determined necessary at additional cost of the alternative. Furthermore, federal permitting required for implementation of the flood management alternatives involving earthmoving (channelization, new or enlarge culverts, detention ponds, diversion structures, etc.) would require surveys for particular impacts to cultural resources and federally protected species. Eagle Pass should be made aware of the potential added costs of such assessments, even if they do not lead to recommendations for

mitigative measures to be taken, in the city's consideration of the different alternatives.

*The potential added costs for performing environmental assessments has been added to the discussion of the flood damage alternatives to keep the City of Eagle Pass aware of the added costs for these studies.*

20. The report indicates that the Corps of Engineers has been consulted as part of the flood management study. Did the Corps provide comments on project alternatives?

*The Corps of Engineers was contacted as part of the initial data collection effort to obtain past studies and any available flow information on the Rio Grande River. No, the Corps did not provide comments on the project alternatives.*

21. The report effectively directs attention to the possibility that the City of Eagle Pass might participate in the NPDES program for monitoring and possible treatment of storm water discharges to area watercourses.

*Agreed.*

22. The report, although not specifically as part of the project, manages to incorporate into the Appendix E – “Proposed Drainage Ordinance” some Best Management Practices, which would be prudent, if not required by federal permits, for appropriate environmental management of construction in and along different streams and drainages.

*The City Council of Eagle Pass is in the process of adopting the drainage ordinance.*

**REVIEW COMMENTS OFFERED BY THE  
DIVISION OF EMERGENCY MANAGEMENT**

In Reference to Page 30, Paragraph "Buy Out of Properties," the following is offered:

The Hazard Mitigation Grant Program (HMGP) administered by this office is designed to procure and remove substantially damaged properties from floodplains and floodways after a disaster is declared by the President. Both Maverick County and the City of Eagle Pass are presently involved in acquisition grants generated by the FEMA 1179-DR Presidential Declared Disaster. These two jurisdictions are purchasing properties to be demolished and returned to green space. (Are any of the properties being acquired by HMGP on the proposed buyout list?)

*Not to our knowledge.*

Should there be another Presidential Declared Disaster, the Hazard Mitigation Grant Program at DEM will be prepared to assist in application of the procurement of qualified properties for removal from floodway/floodplain.

Many jurisdictions are becoming very aggressive in floodplain administration to prevent the loss of lives and property. Jurisdictions are beginning to extract flood management fees in the permitting process and requiring flood retention measures be addressed and accomplished by the developer. For example, some jurisdictions are requiring commercial parking lots to be constructed below grade for water retention.

*Noted.*

**REVIEW COMMENTS OFFERED BY THE  
TEXAS NATURAL RESOURCE CONSERVATION COMMISSION**

Our findings indicate the following:

1. An Application for Approval of Reclamation Project need not be filed with the Texas Natural Resource Conservation Commission for the referenced proposal. It was determined from our review that the proposed project, since it is in the City of Eagle Pass, needs to be permitted by the City. The City of Eagle Pass by virtue of its participation in the National Flood Insurance Program, and in accordance with Section 16.236 (d) (3&4) of the Texas Water Code, has approval authority for the project. If the City has not already done so, they should insure that the proposed construction is documented and permitted in accordance with their Flood Hazard Prevention Ordinance. This documentation should also be submitted by the City to the Federal Emergency Management Agency to obtain a Letter of Map Revision (LOMR) of Eagle Pass's Flood Insurance Rate Map.

*Noted.*

2. The technical content of the referenced report is based on acceptable hydrological and hydrological and hydraulic methods and is complete. Therefore, the merits of the proposed project can be evaluated from the report.

*Noted.*



**REVIEW COMMENTS OFFERED BY THE  
TEXAS DEPARTMENT OF TRANSPORTATION**

1. Task 5.A, Items 2 and 3 downstream impacts of detention ponds or improved flood plain delineation's were not included.

*Downstream impacts of the detention ponds would be to reduce the peak discharges. These impacts are addressed by showing the reduction in peak discharges for a given pond location, size, and outlet structure. The flood plain delineation was not included.*

2. Task 5. B, Items 2 and 3 The HEC-RAS models with improved channel/ culvert conditions of flood plain delineations were not included.

*HEC-RAS models for the improved channel/culvert conditions are now included in Appendix D. The flood plain delineations were not included.*

3. Task 5.C, Item 3 No flood profiles were included with improved diversion channel conditions. These analysis need to be included in the report.

*The flood profile for the improved diversion channel conditions has been included in Appendix D.*

4. Appendix B: Given the limited output capability of HEC-HMS, it is recommended that drainage area maps be included.

*This map has been included in Appendix B.*

5. Appendix C: The output for Tributary 3 is missing. Also, 3 out of 6 HEC-RAS outputs were not labeled which channel was analyzed. It was necessary to compare cross-section numbering with the maps to determine which channel the output was for. Additional labeling of the output should be added.

*Tributary 3 was added to the upstream end of the Main Arroyo. The HEC-RAS outputs have been labeled with the appropriate channel being analyzed. Additional labeling of the output has been added to the Appendix B.*



**Addendum to  
Final Report**

**Flood Study for the City of Eagle Pass,  
Maverick County, Texas  
And  
Flood Study,  
Appendices A-E for the City of Eagle Pass,  
Maverick County, Texas**

p. 33, second paragraph – entitled Rio Grande River, replace discussion with the following:

As a result of flooding from the August 23-25, 1998 storm event on the Rio Grande River, the Federal Emergency Management Agency by Executive Order DR-1239-TX declared public assistance available to individuals affected by this storm event. Approximately, 14 properties and one business along Ryan Street were affected by this flood event in Eagle Pass, Texas. Flood disaster assistance was provided to purchase and remove these fourteen properties and one business from the flood plain of the Rio Grande River. The flood disaster assistance amounted to \$500,221.00. The flood disaster assistance was split 75/25% between FEMA and TDHCA. This storm event and resulting flood disaster assistance occurred during the course of the Flood Protection Study for the City of Eagle Pass.

p. 35, Table 6 – Remove reference to Rio Grande River and Alternative RO-1.

p. 36, Table 7 – Remove reference to Rio Grande River and Alternative RO-1.

Figure 8 – Remove reference to Alternative RO-1.

This addendum was added at the request of the City of Eagle Pass, Texas in the final draft review of the Flood Protection Study.

## **Appendices Table of Contents**

- Appendix A – Existing Flood Insurance Study data – Reconstruction and Comparison
- Appendix B – Existing and Future Peak Flows – Development and Comparison
- Appendix C – Existing and Future Water Surface Elevations and Structure Inventory
- Appendix D – Alternatives for Flood Damage Reduction and Properties Affected
- Appendix E – Proposed Drainage Ordinance

APPROVED  
DATE: 11/11/01  
CITY OF WASHINGTON

## Flood Protection Study for Eagle Pass, Texas Appendix A

### Duplicate Effective Models

Appendix A documents the results of models obtained via letter request from the Federal Emergency Management Agency in May, 1998. The HEC-2 data and back-up material were obtained, modeled and re-run to determine any elevation differences. A summary of differences is included. No printouts for the *Rio Grande River* or the *Unnamed Tributary* were obtained to compare against, other than a copy of the model furnished with the backup study data.

### Summary of Elevation Differences – Differences between the FEMA Input/Output printouts and Re-typed HEC-2 models

#### *Main Arroyo and Tributary 3*

From the original data files, "*dpmain out*" was used for the "Main Arroyo" and "Tributary 3" on FEMA's input/output printouts. Differences in water surface elevation varied from -0.79' to +2.53' for the 100-year flood. There were no differences in input data at those cross-sections where the elevation differences occurred. The discrepancies may be explained in part by the fact that the earlier output (by FEMA) dated from March, 1979 was run on a previous version of HEC-2 dated August, 1977. The Halff Associates, Inc. version of HEC-2 is based on the May, 1991 version 4.6.2. To emulate the earlier version of HEC-2, a negative sign was inserted in front of the weir coefficients on the various Special Bridge records. Differences in water surface elevations still varied from -0.79' to +2.53'.

#### *Tributary 1*

From the original data files, "*dptrib1.out*" was used for "Tributary 1" on FEMA's input/output printouts. Differences in water surface elevation varied from 0.23' to +0.66'. Again, there were no differences in the input data at those cross-sections where the differences occur. To emulate the earlier version of HEC-2, a negative sign was inserted in front of the weir coefficient on the various Special Bridge records and differences in water surface elevations still varied from -0.23' to +0.66'.

#### *Tributary 2*

From the original data files, "*10trb2.out*" called "*Trib 2 Main Arroyo – 10-year only*" appears on the FEMA's input/output printouts. Differences in water surface elevations vary from -0.20' to +0.04' for the 100-year flood. There are no differences in input data at those cross-sections where the differences occurred. If only the 10-year event elevations were used, a question arose as to "Why were the other flows and elevations computed?" To emulate the earlier version of HEC-2, a negative sign was inserted in front of the weir

coefficients on the various Special Bridge records, and no differences in water surface elevation were found for the 100-year flood event.

From the original data files, "*Trib 2 Main Arroyo – 50, 100, 500-year only*" appears on FEMA's input/output printouts. Differences in water surface elevations vary from  $-0.10'$  to  $+0.02'$  for the 100-year flood. There were no differences in input data at those cross-sections where the water surface elevations differences occur. The discrepancies could be explained by the use of different versions of HEC-2 software. To emulate the earlier version of the HEC-2, a negative sign was inserted in front of the weir coefficients on the various Special Bridge records and the differences in water surface elevations varied a little less from  $-0.03'$  to  $+0.02'$  for the 100-year flood.

# Appendix A Flood Protection Study for Eagle Pass, Texas

Elevation Differences between Currently Effective FIS  
and Duplicate Effective model

**MAIN ARROYO**  
MODEL = DPMAIN

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
212	10-yr	687.96	687.96	0.00	
212	50-yr	688.89	688.89	0.00	
212	100-yr	689.37	689.37	0.00	
212	500-yr	690.16	690.16	0.00	
1280	10-yr	693.19	693.19	0.00	
1280	50-yr	694.18	694.18	0.00	
1280	100-yr	694.78	694.78	0.00	
1280	500-yr	696.54	696.54	0.00	
1375	10-yr	695.45	695.45	0.00	
1375	50-yr	697.68	697.68	0.00	
1375	100-yr	698.37	698.37	0.00	
1375	500-yr	698.89	698.89	0.00	
1540	10-yr	697.20	697.20	0.00	
1540	50-yr	698.34	698.34	0.00	
1540	100-yr	698.50	698.50	0.00	
1540	500-yr	698.88	698.88	0.00	
1567	10-yr	702.53	702.53	0.00	
1567	50-yr	703.04	703.04	0.00	
1567	100-yr	703.33	703.33	0.00	
1567	500-yr	703.85	703.85	0.00	
1575	10-yr	702.90	702.90	0.00	
1575	50-yr	703.44	703.44	0.00	
1575	100-yr	703.78	703.78	0.00	
1575	500-yr	704.34	704.34	0.00	
1608	10-yr	703.63	703.63	0.00	
1608	50-yr	704.33	704.33	0.00	
1608	100-yr	704.75	704.75	0.00	
1608	500-yr	705.39	705.39	0.00	
2058	10-yr	703.11	703.12	-0.01	
2058	50-yr	704.46	704.46	0.00	
2058	100-yr	705.05	705.05	0.00	
2058	500-yr	706.12	706.12	0.00	

2448	10-yr	706.99	706.99	0.00	
2448	50-yr	708.43	708.43	0.00	
2448	100-yr	709.11	709.11	0.00	
2448	500-yr	710.07	710.07	0.00	
2478	10-yr	706.91	706.91	0.00	
2478	50-yr	708.27	708.27	0.00	
2478	100-yr	708.88	708.88	0.00	
2478	500-yr	709.72	709.72	0.00	
2528	10-yr	709.33	709.33	0.00	
2528	50-yr	711.30	711.30	0.00	
2528	100-yr	712.50	712.50	0.00	
2528	500-yr	714.43	714.43	0.00	
2566	10-yr	712.99	713.08	-0.09	????
2566	50-yr	715.10	715.54	-0.44	????
2566	100-yr	716.07	716.74	-0.67	????
2566	500-yr	721.03	721.03	0.00	????
2596	10-yr	715.52	715.56	-0.04	
2596	50-yr	718.89	718.93	-0.04	
2596	100-yr	720.92	721.01	-0.09	
2596	500-yr	720.97	721.04	-0.07	
2745	10-yr	715.69	715.73	-0.04	
2745	50-yr	719.03	719.07	-0.04	
2745	100-yr	721.06	721.14	-0.08	
2745	500-yr	721.19	721.17	0.02	
2776	10-yr	715.66	715.70	-0.04	
2776	50-yr	719.00	719.05	-0.05	
2776	100-yr	721.04	721.12	-0.08	
2776	500-yr	721.15	721.13	0.02	
2784	10-yr	715.67	715.71	-0.04	
2784	50-yr	719.01	719.05	-0.04	
2784	100-yr	721.04	721.12	-0.08	
2784	500-yr	721.15	721.13	0.02	
2786	10-yr	715.73	715.77	-0.04	
2786	50-yr	719.07	719.11	-0.04	
2786	100-yr	721.09	721.17	-0.08	
2786	500-yr	721.23	721.21	0.02	
3430	10-yr	715.88	715.92	-0.04	
3430	50-yr	719.20	719.24	-0.04	
3430	100-yr	721.20	721.28	-0.08	
3430	500-yr	721.40	721.39	0.01	
3483	10-yr	715.65	715.65	0.00	
3483	50-yr	719.11	719.15	-0.04	
3483	100-yr	721.17	721.25	-0.08	
3483	500-yr	721.36	721.34	0.02	
3491	10-yr	716.33	716.32	0.01	
3491	50-yr	719.13	719.17	-0.04	



3491	100-yr	721.18	721.26	-0.08	
3491	500-yr	721.37	721.35	0.02	
3493	10-yr	717.15	717.14	0.01	
3493	50-yr	719.30	719.34	-0.04	
3493	100-yr	721.24	721.31	-0.07	
3493	500-yr	721.46	721.44	0.02	
3535	10-yr	717.41	717.41	0.00	
3535	50-yr	719.54	719.57	-0.03	
3535	100-yr	721.41	721.48	-0.07	
3535	500-yr	721.72	721.70	0.02	
3565	10-yr	717.41	717.41	0.00	
3565	50-yr	719.53	719.56	-0.03	
3565	100-yr	721.40	721.47	-0.07	
3565	500-yr	721.70	721.68	0.02	
3595	10-yr	717.42	717.42	0.00	
3595	50-yr	719.54	719.57	-0.03	
3595	100-yr	721.53	721.60	-0.07	
3595	500-yr	721.91	721.89	0.02	
3625	10-yr	717.45	717.45	0.00	
3625	50-yr	719.58	719.61	-0.03	
3625	100-yr	721.57	721.64	-0.07	
3625	500-yr	721.98	721.96	0.02	
4035	10-yr	717.46	717.46	0.00	
4035	50-yr	719.59	719.62	-0.03	
4035	100-yr	721.59	721.66	-0.07	
4035	500-yr	722.01	721.99	0.02	
4085	10-yr	717.64	717.64	0.00	
4085	50-yr	719.74	719.77	-0.03	
4085	100-yr	721.67	721.75	-0.08	
4085	500-yr	722.11	722.10	0.01	
4150	10-yr	717.64	717.67	-0.03	
4150	50-yr	719.74	719.79	-0.05	
4150	100-yr	721.88	721.94	-0.06	
4150	500-yr	722.46	722.44	0.02	
4180	10-yr	717.61	717.63	-0.02	
4180	50-yr	719.71	719.75	-0.04	
4180	100-yr	721.86	721.93	-0.07	
4180	500-yr	722.44	722.41	0.03	
4740	10-yr	718.13	718.15	-0.02	
4740	50-yr	720.06	720.10	-0.04	
4740	100-yr	722.07	722.13	-0.06	
4740	500-yr	722.69	722.67	0.02	
4790	10-yr	717.41	717.43	-0.02	
4790	50-yr	719.29	719.35	-0.06	
4790	100-yr	721.59	721.66	-0.07	
4790	500-yr	721.99	721.97	0.02	

4820	10-yr	718.45	718.44	0.01	
4820	50-yr	719.70	715.82	3.88	
4820	100-yr	723.45	723.52	-0.07	
4820	500-yr	724.77	724.75	0.02	
4870	10-yr	720.26	720.26	0.00	
4870	50-yr	722.05	722.08	-0.03	
4870	100-yr	724.15	724.19	-0.04	
4870	500-yr	725.25	725.23	0.02	
5140	10-yr	720.23	720.23	0.00	
5140	50-yr	722.00	722.02	-0.02	
5140	100-yr	724.09	724.10	-0.01	
5140	500-yr	725.14	725.09	0.05	
5190	10-yr	720.73	720.72	0.01	
5190	50-yr	722.41	722.44	-0.03	
5190	100-yr	724.31	724.35	-0.04	
5190	500-yr	725.36	725.39	-0.03	
5207	10-yr	720.76	720.76	0.00	
5207	50-yr	722.44	722.47	-0.03	
5207	100-yr	724.33	724.39	-0.06	
5207	500-yr	725.39	725.42	-0.03	
5257	10-yr	720.71	720.70	0.01	
5257	50-yr	722.39	722.42	-0.03	
5257	100-yr	724.29	724.35	-0.06	
5257	500-yr	725.34	725.37	-0.03	
6018	10-yr	723.06	723.06	0.00	
6018	50-yr	724.92	724.92	0.00	
6018	100-yr	725.40	725.38	0.02	
6018	500-yr	726.22	726.18	0.04	
6068	10-yr	724.81	724.82	-0.01	
6068	50-yr	725.32	725.33	-0.01	
6068	100-yr	725.43	725.43	0.00	
6068	500-yr	725.85	725.84	0.01	
6108	10-yr	724.87	724.88	-0.01	
6108	50-yr	726.11	726.12	-0.01	
6108	100-yr	726.50	726.50	0.00	
6108	500-yr	726.17	726.32	-0.15	726.90 Handwritten Value
6170	10-yr	724.86	724.87	-0.01	
6170	50-yr	726.81	726.83	-0.02	
6170	100-yr	727.64	727.65	-0.01	
6170	500-yr	728.87	728.94	-0.07	

6560	10-yr	726.12	726.35	-0.23	
6560	50-yr	727.76	727.77	-0.01	
6560	100-yr	728.52	728.52	0.00	
6560	500-yr	729.60	729.64	-0.04	
6610	10-yr	725.98	726.25	-0.27	
6610	50-yr	727.52	727.54	-0.02	
6610	100-yr	728.19	728.20	-0.01	
6610	500-yr	729.12	729.16	-0.04	
6685	10-yr	726.64	726.83	-0.19	
6685	50-yr	728.75	728.77	-0.02	
6685	100-yr	724.52	724.52	0.00	729.50 Handwritten Value
6685	500-yr	729.79	729.81	-0.02	
6735	10-yr	727.26	727.45	-0.19	
6735	50-yr	730.45	730.47	-0.02	
6735	100-yr	732.33	732.33	0.00	
6735	500-yr	733.30	733.31	-0.01	
7060	10-yr	727.37	727.51	-0.14	
7060	50-yr	729.85	729.87	-0.02	
7060	100-yr	732.08	732.08	0.00	
7060	500-yr	733.10	733.12	-0.02	
7270	10-yr	728.52	728.48	0.04	
7270	50-yr	730.17	730.18	-0.01	
7270	100-yr	732.10	732.10	0.00	
7270	500-yr	733.16	733.17	-0.01	
7303	10-yr	730.31	730.31	0.00	
7303	50-yr	732.02	732.02	0.00	
7303	100-yr	732.71	732.71	0.00	
7303	500-yr	733.42	733.43	-0.01	
7320	10-yr	729.17	729.18	-0.01	
7320	50-yr	733.21	733.21	0.00	
7320	100-yr	733.40	733.40	0.00	
7320	500-yr	733.76	733.76	0.00	
7355	10-yr	729.32	729.43	-0.11	
7355	50-yr	733.89	733.90	-0.01	
7355	100-yr	734.14	734.14	0.00	
7355	500-yr	734.42	734.42	0.00	
7405	10-yr	732.25	732.27	-0.02	
7405	50-yr	734.05	734.05	0.00	
7405	100-yr	734.26	734.26	0.00	
7405	500-yr	734.50	734.50	0.00	
8605	10-yr	733.33	733.34	-0.01	
8605	50-yr	734.56	734.57	-0.01	
8605	100-yr	734.87	734.86	0.01	
8605	500-yr	735.33	735.30	0.03	

9195	10-yr	734.02	734.02	0.00	
9195	50-yr	734.91	734.91	0.00	
9195	100-yr	735.16	735.16	0.00	
9195	500-yr	735.48	735.44	0.04	
9245	10-yr	733.83	733.83	0.00	
9245	50-yr	734.65	734.65	0.00	
9245	100-yr	734.80	734.80	0.00	
9245	500-yr	735.35	734.90	0.45	
9275	10-yr	733.98	733.98	0.00	
9275	50-yr	734.87	734.87	0.00	
9275	100-yr	735.23	735.24	-0.01	
9275	500-yr	737.02	736.49	0.53	
9305	10-yr	734.67	734.68	-0.01	
9305	50-yr	735.84	735.84	0.00	
9305	100-yr	736.48	736.48	0.00	
9305	500-yr	738.46	737.81	0.65	
9540	10-yr	734.58	734.58	0.00	
9540	50-yr	735.72	735.73	-0.01	
9540	100-yr	736.37	736.37	0.00	
9540	500-yr	738.63	737.80	0.83	
9570	10-yr	735.24	735.24	0.00	????
9570	50-yr	736.56	736.57	-0.01	????
9570	100-yr	737.31	737.32	-0.01	????
9570	500-yr	739.07	738.61	0.46	????
9590	10-yr	734.90	734.90	0.00	????
9590	50-yr	739.43	739.46	-0.03	????
9590	100-yr	739.77	739.81	-0.04	????
9590	500-yr	740.44	740.11	0.33	????
9622	10-yr	735.28	735.65	-0.37	????
9622	50-yr	740.40	740.43	-0.03	????
9622	100-yr	740.70	740.63	0.07	????
9622	500-yr	741.36	741.04	0.32	????
9627	10-yr	739.46	739.25	0.21	????
9627	50-yr	740.31	740.29	0.02	????
9627	100-yr	740.54	740.43	0.11	????
9627	500-yr	740.98	740.69	0.29	????
9675	10-yr	739.45	739.24	0.21	????
9675	50-yr	740.29	740.27	0.02	????
9675	100-yr	740.51	740.40	0.11	????
9675	500-yr	740.92	740.64	0.28	????
10235	10-yr	739.55	739.42	0.13	
10235	50-yr	740.43	740.48	-0.05	
10235	100-yr	740.71	740.71	0.00	
10235	500-yr	741.62	741.15	0.47	
10285	10-yr	739.47	739.34	0.13	
10285	50-yr	740.22	740.27	-0.05	

10285	100-yr	740.38	740.39	-0.01	
10285	500-yr	741.13	743.65	-2.52	
10330	10-yr	739.63	739.54	0.09	
10330	50-yr	740.50	740.56	-0.06	
10330	100-yr	740.93	740.99	-0.06	
10330	500-yr	741.48	744.27	-2.79	
10380	10-yr	739.50	739.50	0.00	
10380	50-yr	740.42	740.47	-0.05	
10380	100-yr	740.94	740.99	-0.05	
10380	500-yr	744.41	743.90	0.51	
10605	10-yr	741.55	742.18	-0.63	????
10605	50-yr	742.55	743.12	-0.57	????
10605	100-yr	742.91	743.65	-0.74	????
10605	500-yr	743.77	744.52	-0.75	????
10655	10-yr	743.60	744.26	-0.66	????
10655	50-yr	744.82	745.57	-0.75	????
10655	100-yr	745.57	746.30	-0.73	????
10655	500-yr	746.62	747.37	-0.75	????
10690	10-yr	743.62	744.27	-0.65	????
10690	50-yr	744.84	745.57	-0.73	????
10690	100-yr	745.90	746.69	-0.79	????
10690	500-yr	747.27	747.91	-0.64	????
10740	10-yr	744.42	743.95	0.47	????
10740	50-yr	746.23	745.24	0.99	????
10740	100-yr	747.35	746.37	0.98	????
10740	500-yr	748.35	747.67	0.68	????
10965	10-yr	747.08	744.42	2.66	????
10965	50-yr	748.62	745.65	2.97	????
10965	100-yr	749.16	746.63	2.53	????
10965	500-yr	749.91	747.73	2.18	????
11015	10-yr	747.05	744.47	2.58	????
11015	50-yr	748.57	745.63	2.94	????
11015	100-yr	749.10	746.57	2.53	????
11015	500-yr	749.87	747.59	2.28	????
11050	10-yr	747.67	744.69	2.98	????
11050	50-yr	749.15	746.57	2.58	????
11050	100-yr	749.86	748.11	1.75	????
11050	500-yr	750.94	750.87	0.07	????
11100	10-yr	747.96	744.81	3.15	????
11100	50-yr	749.40	747.41	1.99	????
11100	100-yr	749.86	749.05	0.81	????
11100	500-yr	750.82	750.74	0.08	????
11315	10-yr	747.76	747.04	0.72	????
11315	50-yr	749.29	747.91	1.38	????
11315	100-yr	749.73	748.77	0.96	????
11315	500-yr	750.63	750.56	0.07	????

11365	10-yr	749.07	749.06	0.01	????
11365	50-yr	749.96	749.92	0.04	????
11365	100-yr	749.92	750.20	-0.28	????
11365	500-yr	750.66	751.26	-0.60	????
11366	10-yr	754.49	754.66	-0.17	
11366	50-yr	754.63	754.61	0.02	754, 68 Handwritten Value
11366	100-yr	754.70	754.69	0.01	
11366	500-yr	754.77	754.77	0.00	
11424	10-yr	755.05	755.01	0.04	
11424	50-yr	755.25	755.28	-0.03	
11424	100-yr	755.37	755.39	-0.02	
11424	500-yr	755.58	755.60	-0.02	
11425	10-yr	755.04	755.01	0.03	
11425	50-yr	755.24	755.27	-0.03	
11425	100-yr	755.35	755.38	-0.03	
11425	500-yr	755.56	755.58	-0.02	
11475	10-yr	755.07	755.04	0.03	
11475	50-yr	755.28	755.31	-0.03	
11475	100-yr	755.40	755.42	-0.02	
11475	500-yr	755.61	755.62	-0.01	
12640	10-yr	759.42	759.42	0.00	
12640	50-yr	759.85	759.85	0.00	
12640	100-yr	759.94	759.94	0.00	
12640	500-yr	760.23	760.23	0.00	
12690	10-yr	760.59	760.88	-0.29	????
12690	50-yr	761.04	761.39	-0.35	????
12690	100-yr	761.12	761.49	-0.37	????
12690	500-yr	761.41	761.82	-0.41	????
12697	10-yr	760.87	760.87	0.00	
12697	50-yr	761.29	761.29	0.00	
12697	100-yr	761.38	761.38	0.00	
12697	500-yr	761.66	761.66	0.00	
12700	10-yr	760.98	760.98	0.00	
12700	50-yr	761.41	761.41	0.00	
12700	100-yr	761.49	761.49	0.00	
12700	500-yr	762.58	762.58	0.00	
12740	10-yr	762.81	762.61	0.20	????
12740	50-yr	763.36	763.29	0.07	????
12740	100-yr	763.46	763.34	0.12	????
12740	500-yr	763.82	763.58	0.24	????
13350	10-yr	765.55	766.25	-0.70	????
13350	50-yr	765.80	766.45	-0.65	????
13350	100-yr	766.06	766.71	-0.65	????
13350	500-yr	766.33	766.95	-0.62	????
13850	10-yr	769.19	768.54	0.65	????

13850	50-yr	769.93	769.16	0.77	????
13850	100-yr	770.08	769.55	0.53	????
13850	500-yr	770.22	770.05	0.17	????
13900	10-yr	769.53	769.68	-0.15	????
13900	50-yr	770.24	770.16	0.08	????
13900	100-yr	770.45	770.23	0.22	????
13900	500-yr	770.73	771.67	-0.94	????
					????
13955	10-yr	769.94	770.04	-0.10	????
13955	50-yr	770.78	770.30	0.48	????
13955	100-yr	771.32	770.30	1.02	????
13955	500-yr	771.69	773.31	-1.62	????
14005	10-yr	770.83	770.20	0.63	
14005	50-yr	772.00	770.58	1.42	
14005	100-yr	772.92	772.95	-0.03	
14005	500-yr	774.25	773.26	0.99	
			MAX =	3.88	
			MIN =	-2.79	

# Appendix A Flood Protection Study for Eagle Pass, Texas

Elevation Differences between Currently Effective FIS  
and Duplicate Effective model

TRIBUTARY 1  
MODEL = DPTRIB1

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
0	10-yr	715.22	715.22	0.00	
0	50-yr	716.17	716.16	0.01	
0	100-yr	716.71	716.73	-0.02	
0	500-yr	717.58	717.53	0.05	
158	10-yr	716.92	716.92	0.00	
158	50-yr	717.87	717.87	0.00	
158	100-yr	718.42	718.42	0.00	
158	500-yr	719.27	719.28	-0.01	
556	10-yr	721.07	721.07	0.00	
556	50-yr	722.00	722.00	0.00	
556	100-yr	722.54	722.54	0.00	
556	500-yr	723.38	723.37	0.01	
606	10-yr	721.85	721.85	0.00	
606	50-yr	722.79	722.79	0.00	
606	100-yr	723.35	723.35	0.00	
606	500-yr	724.11	724.11	0.00	
643	10-yr	723.17	723.17	0.00	
643	50-yr	724.24	724.24	0.00	
643	100-yr	724.84	724.84	0.00	
643	500-yr	725.85	725.85	0.00	
705	10-yr	723.89	723.89	0.00	
705	50-yr	725.08	725.08	0.00	
705	100-yr	725.77	725.77	0.00	
705	500-yr	726.85	726.85	0.00	
713	10-yr	723.91	723.91	0.00	
713	50-yr	725.10	725.10	0.00	
713	100-yr	725.79	725.79	0.00	
713	500-yr	726.87	726.86	0.01	
733	10-yr	725.33	725.32	0.01	
733	50-yr	726.22	726.22	0.00	
733	100-yr	726.72	726.71	0.01	
733	500-yr	727.47	727.47	0.00	



Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
873	10-yr	726.77	726.77	0.00	
873	50-yr	727.68	727.68	0.00	
873	100-yr	728.21	728.21	0.00	
873	500-yr	728.99	728.99	0.00	
893	10-yr	727.16	727.16	0.00	
893	50-yr	728.10	728.10	0.00	
893	100-yr	728.61	728.61	0.00	
893	500-yr	728.94	728.95	-0.01	
941	10-yr	728.39	728.40	-0.01	
941	50-yr	728.29	728.35	-0.06	
941	100-yr	730.68	730.69	-0.01	728.40 handwritten value
941	500-yr	730.74	730.76	-0.02	
991	10-yr	729.60	729.61	-0.01	
991	50-yr	731.09	731.07	0.02	
991	100-yr	730.87	730.88	-0.01	731.88 handwritten value
991	500-yr	731.09	731.10	-0.01	
1440	10-yr	730.86	730.78	0.08	
1440	50-yr	731.70	731.59	0.11	
1440	100-yr	732.21	732.09	0.12	
1440	500-yr	732.99	732.81	0.18	
1490	10-yr	731.09	731.10	-0.01	
1490	50-yr	732.04	732.02	0.02	
1490	100-yr	732.63	732.61	0.02	
1490	500-yr	733.73	736.71	-2.98	
1538	10-yr	732.28	732.28	0.00	
1538	50-yr	733.42	733.48	-0.06	
1538	100-yr	734.29	734.29	0.00	
1538	500-yr	734.65	735.14	-0.49	
1588	10-yr	732.53	738.54	-6.01	
1588	50-yr	734.52	734.53	-0.01	
1588	100-yr	734.31	734.31	0.00	734.73 handwritten value
1588	500-yr	734.66	735.09	-0.43	
2030	10-yr	734.83	735.05	-0.22	
2030	50-yr	735.69	735.93	-0.24	
2030	100-yr	736.23	736.46	-0.23	
2030	500-yr	737.00	737.23	-0.23	
2080	10-yr	735.01	735.76	-0.75	
2080	50-yr	735.86	735.08	0.78	
2080	100-yr	736.40	736.49	-0.09	
2080	500-yr	738.02	737.21	0.81	
2125	10-yr	736.06	736.08	-0.02	
2125	50-yr	737.10	736.99	0.11	
2125	100-yr	737.68	737.02	0.66	
2125	500-yr	738.00	737.34	0.66	

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
2155	10-yr	735.99	735.99	0.00	
2155	50-yr	736.84	736.84	0.00	
2155	100-yr	737.42	737.39	0.03	
2155	500-yr	739.49	738.22	1.27	
2197	10-yr	736.69	736.69	0.00	
2197	50-yr	737.54	737.54	0.00	
2197	100-yr	738.09	738.09	0.00	
2197	500-yr	739.03	739.01	0.02	
2227	10-yr	737.73	737.73	0.00	
2227	50-yr	738.51	738.51	0.00	
2227	100-yr	739.34	739.36	-0.02	
2227	500-yr	741.04	741.05	-0.01	
2427	10-yr	739.34	738.92	0.42	
2427	50-yr	740.23	739.81	0.42	
2427	100-yr	740.66	740.27	0.39	
2427	500-yr	741.96	741.96	0.00	
2557	10-yr	742.71	742.72	-0.01	
2557	50-yr	742.83	742.87	-0.04	
2557	100-yr	742.95	742.92	0.03	
2557	500-yr	743.01	743.02	-0.01	
			MAX =	1.27	
			MIN =	-6.01	

**Appendix A**  
**Flood Protection Study**  
**for Eagle Pass, Texas**  
Elevation Differences between Currently Effective FIS  
and Duplicate Effective model

TRIBUTARY 2 (10-yr only applicable)  
MODEL = 10TRB2

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
2	10-yr	742.11	742.11	0.00	
2	50-yr	743.42	743.44	-0.02	N/A
2	100-yr	744.29	744.29	0.00	N/A
2	500-yr	744.89	744.87	0.02	N/A
150	10-yr	743.54	743.55	-0.01	
150	50-yr	744.93	744.92	0.01	N/A
150	100-yr	745.79	745.79	0.00	N/A
150	500-yr	746.39	746.39	0.00	N/A
465	10-yr	745.85	?	0.00	
465	50-yr	746.91	746.92	-0.01	N/A
465	100-yr	747.23	747.23	0.00	N/A
465	500-yr	747.61	747.62	-0.01	N/A
540	10-yr	746.91	746.90	0.01	
540	50-yr	747.77	747.75	0.02	N/A
540	100-yr	748.04	748.04	0.00	N/A
540	500-yr	748.40	748.41	-0.01	N/A
588	10-yr	748.41	748.41	0.00	
588	50-yr	749.50	749.49	0.01	N/A
588	100-yr	750.08	750.08	0.00	N/A
588	500-yr	750.89	750.89	0.00	N/A
638	10-yr	748.32	748.32	0.00	
638	50-yr	749.46	749.45	0.01	N/A
638	100-yr	750.05	750.05	0.00	N/A
638	500-yr	750.87	750.87	0.00	N/A
1543	10-yr	750.03	750.02	0.01	
1543	50-yr	751.46	751.46	0.00	N/A
1543	100-yr	751.76	751.76	0.00	N/A
1543	500-yr	751.99	751.99	0.00	N/A
1583	10-yr	752.56	752.56	0.00	
1583	50-yr	752.89	752.89	0.00	N/A
1583	100-yr	753.03	753.03	0.00	N/A
1583	500-yr	753.23	753.23	0.00	N/A

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
1771	10-yr	754.18	754.18	0.00	
1771	50-yr	754.95	754.95	0.00	N/A
1771	100-yr	755.41	755.41	0.00	N/A
1771	500-yr	756.11	756.11	0.00	N/A
1821	10-yr	754.13	754.13	0.00	
1821	50-yr	754.92	754.92	0.00	N/A
1821	100-yr	755.39	755.39	0.00	N/A
1821	500-yr	756.09	756.09	0.00	N/A
2425	10-yr	755.41	755.41	0.00	
2425	50-yr	755.93	755.93	0.00	N/A
2425	100-yr	756.07	756.07	0.00	N/A
2425	500-yr	756.27	756.27	0.00	N/A
2475	10-yr	755.81	755.81	0.00	
2475	50-yr	756.11	756.11	0.00	N/A
2475	100-yr	756.56	756.56	0.00	N/A
2475	500-yr	756.89	756.89	0.00	N/A
2535	10-yr	756.72	756.72	0.00	
2535	50-yr	757.39	757.38	0.01	N/A
2535	100-yr	757.92	???	0.00	N/A
2535	500-yr	758.58	758.58	0.00	N/A
2575	10-yr	756.59	756.59	0.00	
2575	50-yr	757.35	757.35	0.00	N/A
2575	100-yr	757.89	757.89	0.00	N/A
2575	500-yr	758.57	758.57	0.00	N/A
2810	10-yr	757.23	757.23	0.00	
2810	50-yr	757.56	757.56	0.00	N/A
2810	100-yr	757.70	757.70	0.00	N/A
2810	500-yr	758.50	758.50	0.00	N/A
2840	10-yr	757.80	757.80	0.00	
2840	50-yr	758.26	758.26	0.00	N/A
2840	100-yr	758.52	758.52	0.00	N/A
2840	500-yr	758.83	758.82	0.01	N/A
2880	10-yr	758.04	758.04	0.00	
2880	50-yr	758.41	758.41	0.00	N/A
2880	100-yr	758.65	758.65	0.00	N/A
2880	500-yr	759.73	759.73	0.00	N/A
2910	10-yr	757.95	757.95	0.00	
2910	50-yr	758.32	758.32	0.00	N/A
2910	100-yr	758.56	758.56	0.00	N/A
2910	500-yr	759.70	759.70	0.00	N/A
3545	10-yr	759.86	759.86	0.00	
3545	50-yr	760.31	760.31	0.00	N/A
3545	100-yr	760.52	760.52	0.00	N/A
3545	500-yr	760.80	760.80	0.00	N/A

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
3585	10-yr	760.47	760.48	-0.01	
3585	50-yr	760.78	760.78	0.00	N/A
3585	100-yr	761.00	761.00	0.00	N/A
3585	500-yr	761.20	761.20	0.00	N/A
3625	10-yr	760.60	760.59	0.01	
3625	50-yr	761.02	761.02	0.00	N/A
3625	100-yr	761.32	761.32	0.00	N/A
3625	500-yr	761.66	761.66	0.00	N/A
3665	10-yr	760.65	760.64	0.01	
3665	50-yr	761.04	761.04	0.00	N/A
3665	100-yr	761.33	761.33	0.00	N/A
3665	500-yr	761.66	761.66	0.00	N/A
4335	10-yr	764.74	764.75	-0.01	
4335	50-yr	765.12	765.12	0.00	N/A
4335	100-yr	765.31	765.31	0.00	N/A
4335	500-yr	765.51	765.51	0.00	N/A
4365	10-yr	765.45	765.45	0.00	
4365	50-yr	767.30	767.30	0.00	N/A
4365	100-yr	767.56	767.56	0.00	N/A
4365	500-yr	767.81	767.81	0.00	N/A
4381	10-yr	765.58	765.58	0.00	
4381	50-yr	767.85	767.85	0.00	N/A
4381	100-yr	768.10	768.10	0.00	N/A
4381	500-yr	768.46	768.46	0.00	N/A
4411	10-yr	767.93	767.93	0.00	
4411	50-yr	767.96	767.96	0.00	N/A
4411	100-yr	768.19	768.19	0.00	N/A
4411	500-yr	768.54	768.54	0.00	N/A
			MAX =	0.02	
			MIN =	-0.02	

# Appendix A

## Flood Protection Study for Eagle Pass, Texas

Elevation Differences between Currently Effective FIS  
and Duplicate Effective model

TRIBUTARY 2 (50yr, 100-yr, and 500-yr only applicable)  
MODEL = 50TRB2

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
2	10-yr	742.28	742.27	0.01	N/A
2	50-yr	742.55	742.57	-0.02	
2	100-yr	742.72	742.75	-0.03	
2	500-yr	742.94	743.01	-0.07	
150	10-yr	743.68	743.68	0.00	N/A
150	50-yr	744.06	744.04	0.02	
150	100-yr	744.24	744.22	0.02	
150	500-yr	744.48	744.44	0.04	
465	10-yr	744.92	744.92	0.00	N/A
465	50-yr	746.90	746.90	0.00	
465	100-yr	747.16	747.16	0.00	
465	500-yr	747.52	747.49	0.03	
540	10-yr	747.12	747.12	0.00	N/A
540	50-yr	747.77	747.77	0.00	
540	100-yr	748.09	748.09	0.00	
540	500-yr	748.49	748.53	-0.04	
588	10-yr	748.51	748.51	0.00	N/A
588	50-yr	749.50	749.50	0.00	
588	100-yr	750.10	750.09	0.01	
588	500-yr	750.92	750.93	-0.01	
638	10-yr	748.44	748.44	0.00	N/A
638	50-yr	749.46	749.46	0.00	
638	100-yr	750.07	750.07	0.00	
638	500-yr	750.90	750.94	-0.04	
1543	10-yr	750.01	750.01	0.00	N/A
1543	50-yr	751.46	751.46	0.00	
1543	100-yr	751.76	751.76	0.00	
1543	500-yr	751.99	751.99	0.00	
1583	10-yr	752.56	752.56	0.00	N/A
1583	50-yr	752.89	752.89	0.00	
1583	100-yr	753.03	753.03	0.00	
1583	500-yr	753.23	753.23	0.00	

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
1771	10-yr	754.18	754.18	0.00	N/A
1771	50-yr	754.95	754.95	0.00	
1771	100-yr	755.41	755.41	0.00	
1771	500-yr	756.11	756.11	0.00	
1821	10-yr	754.13	754.13	0.00	N/A
1821	50-yr	754.92	754.92	0.00	
1821	100-yr	755.39	755.39	0.00	
1821	500-yr	756.09	756.09	0.00	
2425	10-yr	755.41	755.41	0.00	N/A
2425	50-yr	755.93	755.93	0.00	
2425	100-yr	756.07	756.07	0.00	
2425	500-yr	756.27	756.27	0.00	
2475	10-yr	755.81	755.81	0.00	N/A
2475	50-yr	756.11	756.11	0.00	
2475	100-yr	756.56	-	0.00	
2475	500-yr	756.89	756.89	0.00	
2535	10-yr	756.72	756.72	0.00	N/A
2535	50-yr	757.39	757.39	0.00	
2535	100-yr	757.92	757.92	0.00	
2535	500-yr	758.58	758.58	0.00	
2575	10-yr	756.59	756.59	0.00	N/A
2575	50-yr	757.35	757.35	0.00	
2575	100-yr	757.89	757.89	0.00	
2575	500-yr	758.57	758.57	0.00	
2810	10-yr	757.24	757.24	0.00	N/A
2810	50-yr	757.46	757.46	0.00	
2810	100-yr	757.87	757.87	0.00	
2810	500-yr	758.59	758.59	0.00	
2840	10-yr	757.38	757.38	0.00	N/A
2840	50-yr	758.18	758.18	0.00	
2840	100-yr	758.25	758.25	0.00	
2840	500-yr	758.72	758.72	0.00	
2880	10-yr	757.99	757.99	0.00	N/A
2880	50-yr	758.32	758.32	0.00	
2880	100-yr	758.41	758.41	0.00	
2880	500-yr	759.69	759.69	0.00	
2910	10-yr	757.92	757.92	0.00	N/A
2910	50-yr	758.24	758.24	0.00	
2910	100-yr	758.33	758.33	0.00	
2910	500-yr	759.69	759.69	0.00	
3545	10-yr	759.83	759.83	0.00	N/A
3545	50-yr	760.31	760.31	0.00	
3545	100-yr	760.54	760.54	0.00	
3545	500-yr	760.80	760.80	0.00	

Section Number	Storm Event	From Duplicate Run	From Currently Effective FIS	Elevation Differences	Comments
3585	10-yr	760.60	760.60	0.00	N/A
3585	50-yr	760.79	760.79	0.00	
3585	100-yr	761.00	761.00	0.00	
3585	500-yr	761.20	761.20	0.00	
3625	10-yr	760.71	760.71	0.00	N/A
3625	50-yr	761.02	761.02	0.00	
3625	100-yr	761.32	761.32	0.00	
3625	500-yr	761.66	761.66	0.00	
3665	10-yr	760.75	760.75	0.00	N/A
3665	50-yr	761.05	761.05	0.00	
3665	100-yr	761.34	761.34	0.00	
3665	500-yr	761.68	761.68	0.00	
4335	10-yr	764.84	764.84	0.00	N/A
4335	50-yr	765.13	765.13	0.00	
4335	100-yr	765.32	765.32	0.00	
4335	500-yr	765.51	765.51	0.00	
4365	10-yr	765.44	765.44	0.00	N/A
4365	50-yr	767.30	767.30	0.00	
4365	100-yr	767.56	767.56	0.00	
4365	500-yr	767.81	767.81	0.00	
4381	10-yr	765.58	765.58	0.00	N/A
4381	50-yr	767.85	767.85	0.00	
4381	100-yr	768.10	768.10	0.00	
4381	500-yr	768.46	768.46	0.00	
4411	10-yr	767.93	767.93	0.00	N/A
4411	50-yr	767.96	767.96	0.00	
4411	100-yr	768.19	768.19	0.00	
4411	500-yr	768.54	768.54	0.00	
			MAX =	0.04	
			MIN =	-0.07	



**Flood Protection Study for Eagle Pass, Texas  
Appendix B**

Appendix B presents how the SCS method was applied, hydrologic parameters used, rainfall rates applied, flows determined, and a comparison to the Original Flood Insurance Study flows.

**The Soil Conservation Service Method as applied in this Flood Protection Study.**

The Soil Conservation Service (SCS) method for computing runoff from storm rainfall is based on the theory of abstractions. The SCS method uses a 24-hour storm duration, which is considered acceptable for the Eagle Pass area. It should be noted that when using this method a Type I antecedent moisture condition (AMC) should be used for the Eagle Pass area. A more complete discussion of the SCS method is presented in NEH-4: "Hydrology" Section 4, National Engineering Handbook by the Soil Conservation Service. The SCS method is described in Modern Sewer Design, by the American Iron and Steel Institute.

The SCS developed an index, called the runoff curve number, to represent the combined hydrologic effect of soil type, land use, agricultural land treatment class, hydrologic condition, and antecedent soil moisture. These watershed factors were found to have the most significant impact on estimating the volume of runoff, and can be assessed from soil surveys, site investigations, and land use maps.

The curve number is an indication of the runoff producing potential of the drainage area for a given antecedent soil moisture condition, and can range in value from 0 to 100. The SCS runoff curve numbers are grouped into three (3) antecedent soil moisture conditions:

AMC I	Dry soil condition
AMC II	Average soil condition
AMC III	Wet soil condition

Values of runoff curve numbers for all three conditions may be computed following guidelines in the SCS "Hydrology" Section 4, National Engineering Handbook. Studies of hydrologic data indicate that Antecedent Moisture Condition (AMC) II is not the average throughout Texas. Instead, investigations have shown that the average condition ranges from AMC I in west Texas to between AMC II and AMC III in east Texas. Typical values are given in Figure 1 for AMC II. Adjustments for the State of Texas were made to these curve numbers using Figure 1, which accounts for the variation in dry to wet conditions. Figure 1 was obtained from the Natural Resource Conservation Commission (formerly Soil Conservation Service) in Temple.

The SCS also classified surficial soils into four (4) hydrologic soil groups, and identified them by letters A, B, C, and D, to represent watershed characteristics.

Group A: (low runoff potential) Soils having a high infiltration rate even when thoroughly wetted and consisting chiefly of deep well-drained to excessively drained sands or gravels.

Group B: Soils having a moderate infiltration rate when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately coarse texture.

Group C: Soils having a slow infiltration rate when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water or soil with moderately fine to fine texture.

Group D: (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.

A list of soils in Maverick County along with their hydrologic soil classification is given in the Soil Conservation Service publication Soil Survey of Maverick County, Texas. Typical values for curve numbers for the four (4) soil groups are listed in Appendix B. Typical curve numbers calculated for this flood study appear in the next section.

Flows for streams studied in detail were calculated using the SCS method in the U.S. Army Corps of Engineers - Hydrologic Engineering Center - Hydrologic Modeling System (HEC-HMS) program. HEC-HMS is a Windows driven program, which serves as a platform to organize and calculate runoff using various runoff methods. HEC-HMS models a watershed basin as separate hydrologic elements connected by reaches and junctions at which input and output information can be displayed. A basin schematic represents the hydrologic elements chosen, the connecting reaches, and type of output desired.

Figure 2 shows the major drainage areas used in this study. No areas were delineated for the Rio Grande River. Natural drainage boundaries were altered to some extent by construction of the Maverick County Irrigation Canal and the new Loop 431 in the northeast part of Eagle Pass. Flows for the Rio Grande River were obtained from the IBWC.

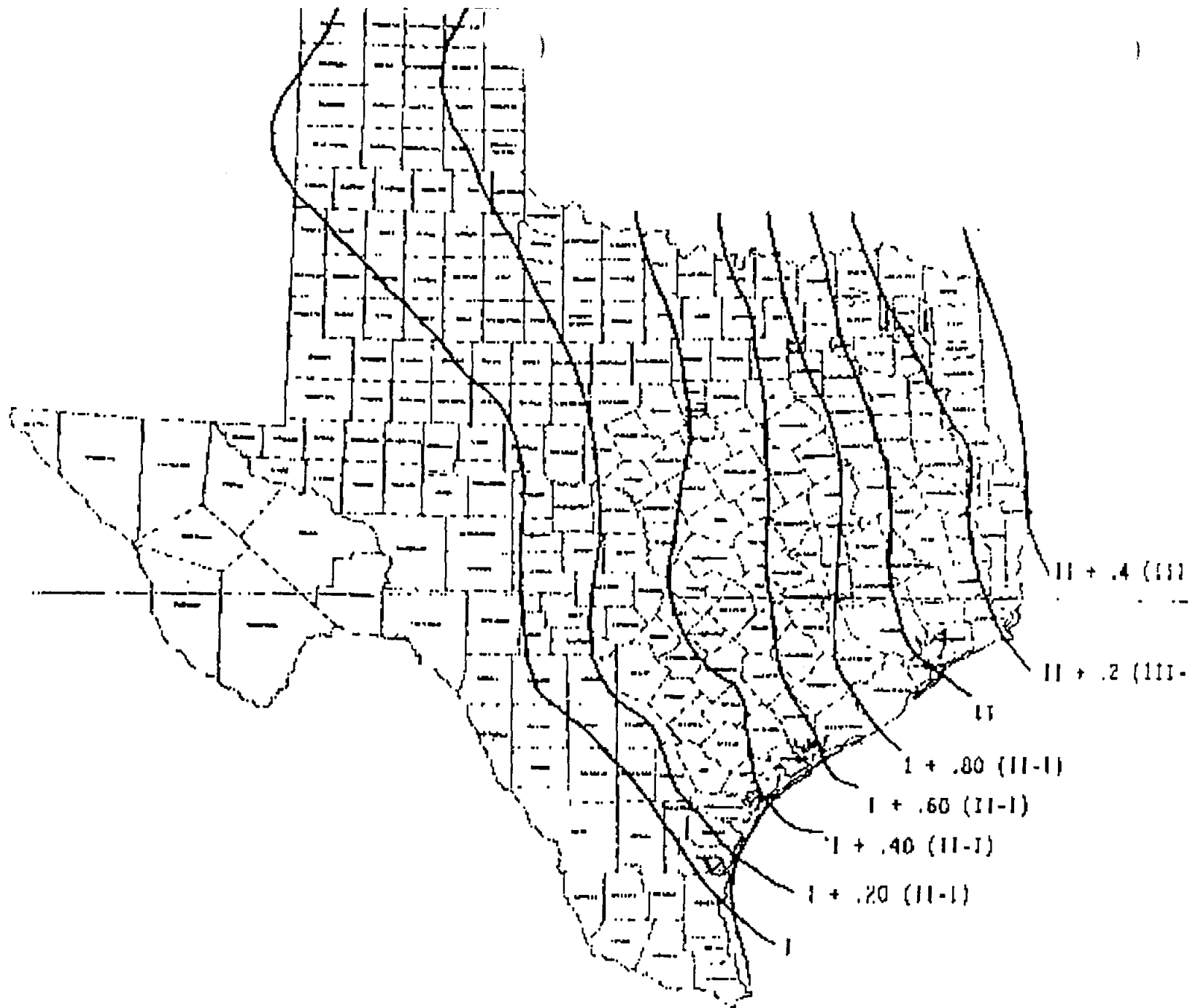
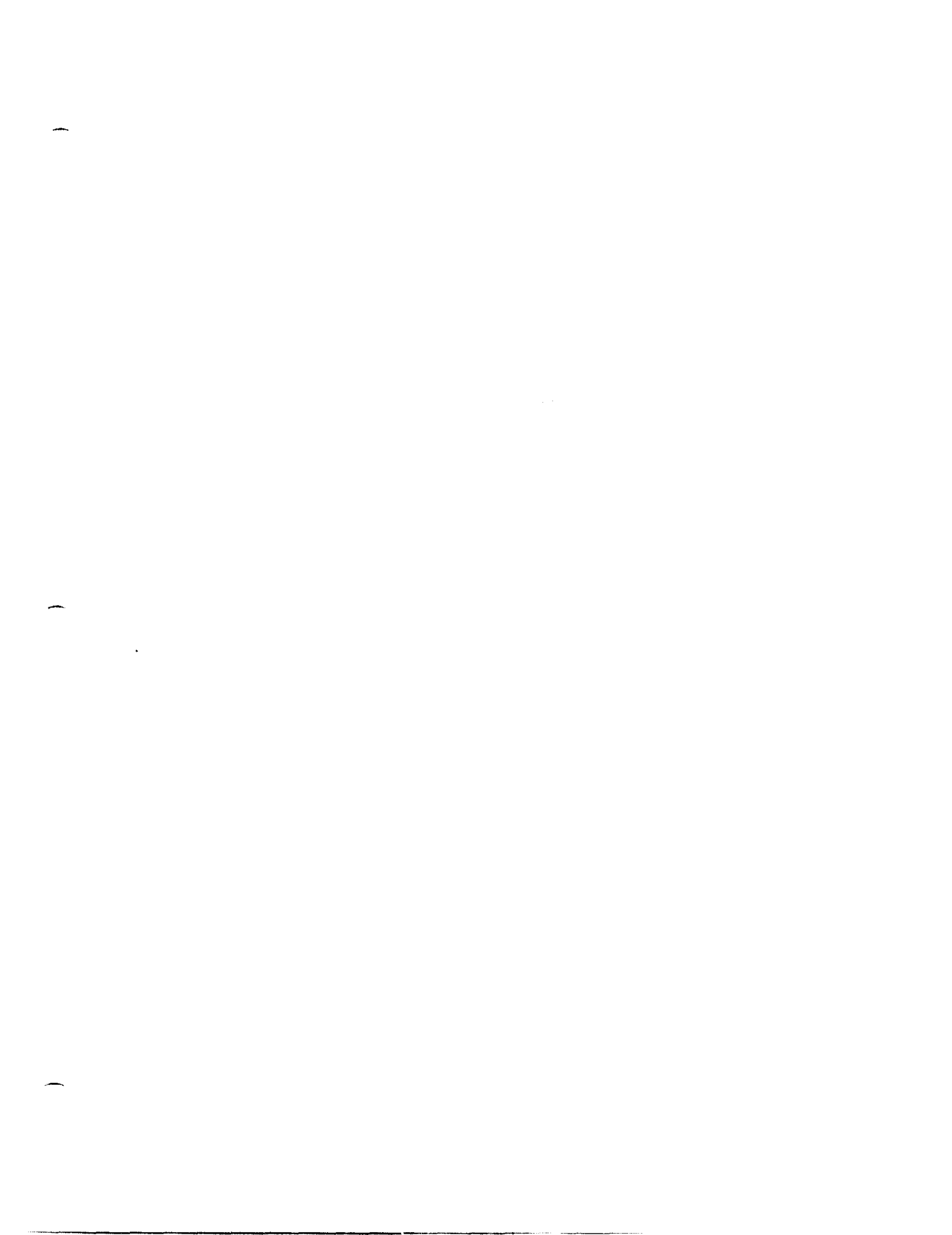


Figure 2 - Adjustments to Average Condition Runoff Curve Numbers for Antecedent Moisture Conditions I, II, & III for Texas.



## Hydrologic Parameters

Figure 2 shows the drainage areas used for this study. The *drainage areas* for each stream were determined from digital U.S. Geological Survey quadrangle sheets obtained from Geographic Information Systems of McAllen, Texas. Figure 3 shows the *soils types* used for this study, compiled from the Soil Survey for Maverick County, Texas. Soil types in the Eagle Pass area consist of B, C, and D soils, with B and C being equally dominant within the study area. Figure 4 shows *existing land use* taken from a planning map developed by Hejl, Lee, and Associates. Sub-areas were broken up into the following: agricultural, commercial, industrial, residential, public (cemeteries), public (housing, schools, city offices, etc), roads, and open spaces (parks). A *future land use* map was used to determine new SCS curve numbers and recalculate flows for future conditions.

Table 1 shows the curve numbers used in the study based on land use and soil types. Composite curve numbers for each drainage area, taking into account land use and soil types, which are tabulated in the following spreadsheets for existing AMC 1, future AMC 1, existing AMC 2, and future AMC 2 conditions.

**Table 1 - SCS Curve numbers used for the Eagle Pass Flood Study**

Land use	Curve Numbers		
	Soil Type B	Soil Type C	Soil Type D
Agriculture (Brush-Poor Cond.)	67	77	83
Commercial	92	94	95
Industrial	88	91	93
Residential (1/4 acre lots)	75	83	87
Public (Cemeteries-Poor Cond)	79	86	89
Public (Housing, schools, etc)	92	94	95
Roads	98	98	98
Open Space (Parks-Poor Cond.)	79	86	89

*Initial rainfall losses* used in the study were calculated based on the curve number (CN) and the initial surface moisture storage capacity (IA) in units of depth. The curve number and initial surface moisture are related to a total runoff depth for a storm by the following relationship:

$$S = \frac{1000 - (10 * CN)}{CN}$$

(Use AMC II curve numbers in equation). S is the currently available soil moisture storage deficit in inches. The initial surface moisture IA is related to S by the relationship:

$$IA = 0.2 * S$$

This relation is based on empirical evidence established by the SCS. Initial rainfall losses were calculated for each subarea and are tabulated.

It should be noted, that the percentage imperviousness for a sub-area was not accounted for intentionally. The SCS curve numbers already generally account for the percentage of

imperviousness based on the soil type, land use and infiltration potential. Therefore, an over estimation of discharges could result if the impervious factor were applied.

*Rainfall data* was developed from two sources: 1) Rainfall data from the National Weather Service HYDRO-35, and 2) the U.S. Weather Bureau Technical Paper No. 40. These publications were used for determining runoff for storm return periods of 2 years through 100 years. Figure 5 is an intensity-duration-frequency curve for the Eagle Pass area. Log-normal graph paper was used to plot each duration storm and to estimate the 500-year storm event. Rainfall intensities were then input to HEC-HMS.

A *stream network or model* is constructed for each area studied in detail. This network is the model to which rainfall values are applied and peak discharges are determined as flows are routed and combined progressively downstream. Flood hydrographs were routed based on a Muskingum-Cunge method, which uses an eight-point cross-section taken from topography of the stream.

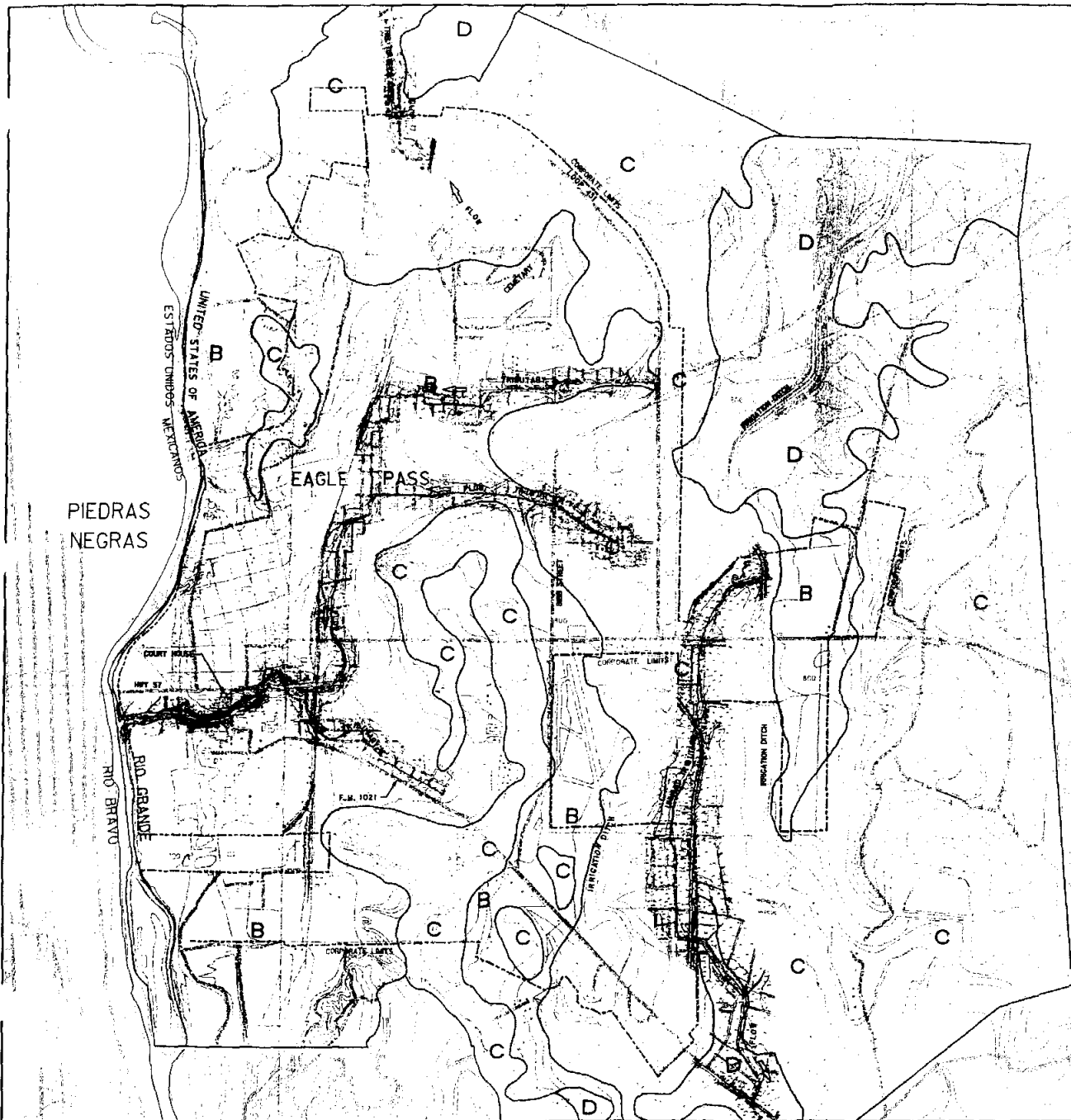
### **Peak Discharges Summary**

The original FIS flood study lists peak discharges in a Table entitled Summary of Discharges table. A 6-hour storm duration was used in the FIS study with a 5-minute time step. For the purposes of this study a 24-hour storm duration was chosen with a 5 minute time step. Table 2 shows existing and future peak flows for the full range of storm events at various locations in the study area. Summary tables from the HEC-HMS program are included in this Appendix.

### **Flow Comparison – Original Flood Insurance Study and Calculated Flood Study Flows**

Table 3 presents a comparison of flows between the original Flood Insurance Study and the calculated Flood Study flows using the Soil Conservation Service method. The calculated Flood Study Flows are higher for a few reasons:

1. It was difficult to determine how the initial soil loss rates for the Original Flood Insurance Study were calculated. For the purposes of this study the SCS calculation of the initial soil loss rate was used. Generally, the calculated soil loss rates were lower than the Original FIS rates.
2. As development has occurred more impervious cover has been added to upstream areas of the Main Arroyo and Unnamed Tributary. Land use has become more intense increasing developed condition curve numbers.
3. Times of concentration have been reduced as new areas have developed with more efficient conveyance systems.
4. The SCS office in Temple uses an adjustment in calculating the antecedent moisture condition for Texas. (See Figure 1) This factor reduces the runoff for dryer regions of the state.



NOTE:  
 TOPOGRAPHIC MAPPING BASED ON  
 USGS 7.5 MINUTE SERIES QUADS  
 DIGITIZED BY OTHERS.

**LEGEND**

- B SOIL
- C SOIL
- D SOIL

PIEDRAS NEGRAS

EAGLE PASS

**SOIL TYPES MAP**  
**FLOOD PROTECTION PLANNING STUDY**  
**FOR THE CITY OF EAGLE PASS,**  
**MAVERICK COUNTY, TEXAS**

**Half Associates**  
 ENGINEERS ARCHITECTS SCIENTISTS PLANNERS SURVEYORS  
 8010 Macomber Plaza, Dallas, Texas 75225 (214) 346-6200

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ST-1

**EDUCATIONAL INSTITUTIONS**

1. EAGLE PASS HIGH SCHOOL
2. EAGLE PASS JUNIOR HIGH
3. MEMORIAL JUNIOR HIGH
4. AUSTIN ELEMENTARY
5. BENAVIDES ELEMENTARY
6. BAY N. DARR ELEMENTARY
7. DAY CARE CENTER
8. RODOLFO DE LEON CENTER
9. EARLY CHILDHOOD CENTER
10. GLASS ELEMENTARY
11. GRAVES ELEMENTARY
12. LANGUAGE DEVELOPMENT CENTER
13. ROBERT E. LEE ELEMENTARY
14. SAN LUIS ELEMENTARY
15. DISTRICT SERVICE CENTER
16. MULTIPLEX
17. EAGLE PASS REGIONAL TECHNICAL CENTER
18. SOUTHWEST TEXAS JUNIOR COLLEGE & SUL ROSS STATE UNIVERSITY

**PARKS & RECREATIONAL**

30. ELM CREEK PARK
31. SVESTA PARK
32. VALERIE PARK
33. AQUATICS PARK
34. NELSO PARK
35. SAN JUAN PLAZA
36. VEGA PARK
37. GOLF COURSE
38. ARROYO PARK WEST
39. ARCH M. MARCHI MEMORIAL PARK
40. ARROYO PARK EAST
41. BLISS STREET PARK
42. R.E. LEE PARK
43. LITTLE OPPER PARK
44. BURR PARK
45. CARTHAGE PARK
46. LAGO VISTA PARK
47. MAVERICK COUNTY LAKE PARK
48. CHITTM PARK

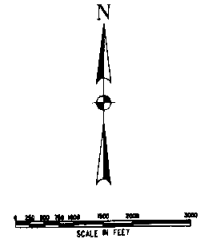
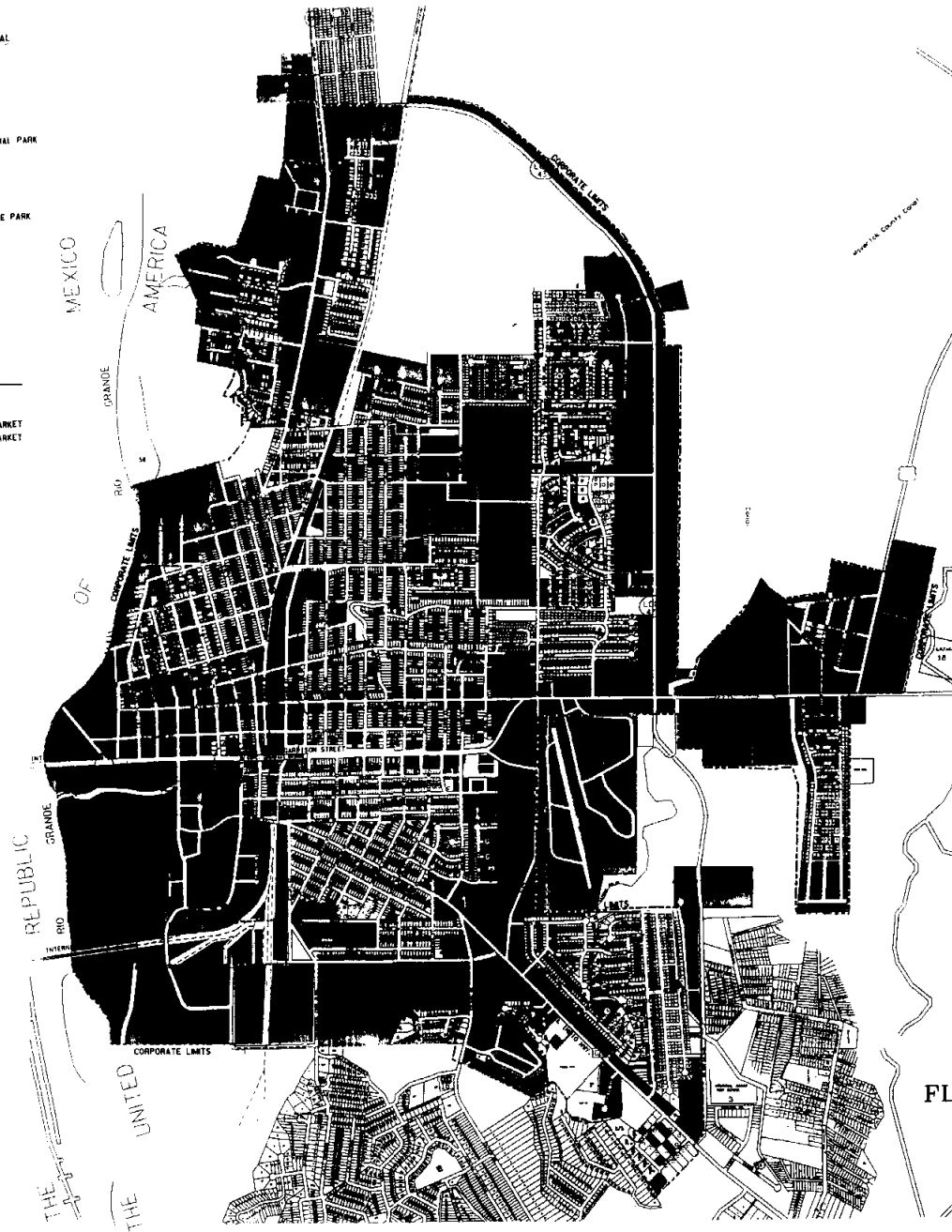
- VACANT DEVELOPED
- VACANT UNDEVELOPED
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PUBLIC AND SEMI-PUBLIC
- AGRICULTURE

**LEGEND**

- CITY LIMITS
- RAILROAD

**ROADWAY SIGNS**

- U.S. NUMBERED HIGHWAY
- STATE HIGHWAY
- FARM OR RANCH TO MARKET
- FARM OR RANCH TO MARKET



**EXISTING LAND USE MAP**  
**FLOOD PROTECTION PLANNING STUDY**  
**FOR THE CITY OF EAGLE PASS,**  
**MAVERICK COUNTY, TEXAS**

PREP. BY: H.E. LEE & ASSOC., INC., CONSULTING ENGINEERS  
 2207 HAMMOCK DRIVE AUSTIN, TEXAS 78756  
**Half Associates**  
 ENGINEERS - ARCHITECTS - PLANNERS - LANDSCAPE ARCHITECTS  
 2016 Northmead Plaza, Suite 1000 - Dallas, Texas 75226 (214) 546-8300



### Rainfall Intensity-Duration-Frequency for Eagle Pass, Texas

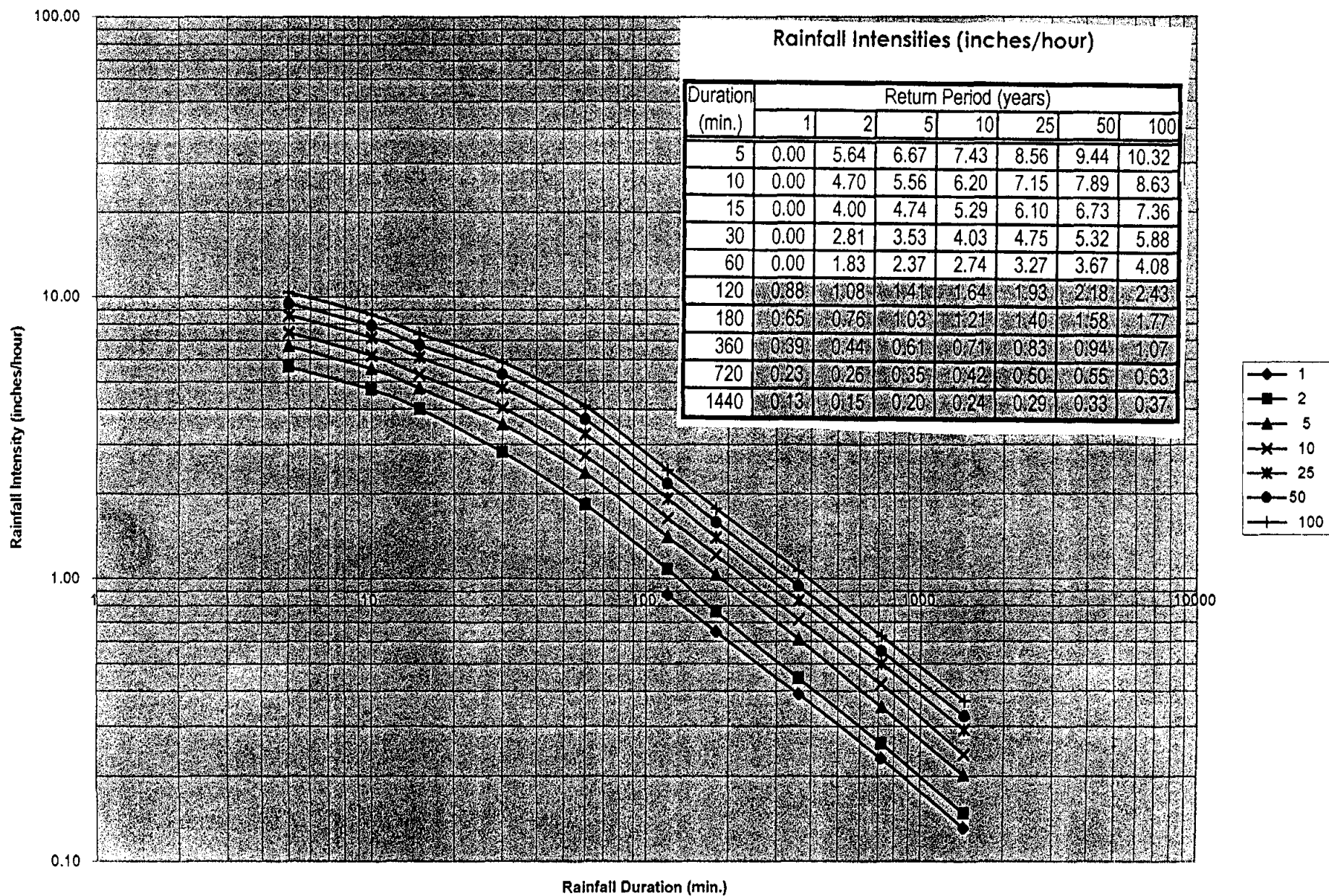


Figure 6 - Eagle Pass I-D-F Curves

**Table 3 – Summary of Peak Discharges**

Discharge Point (1)	Description (2)	Stream Sta. (3)	Drainage Area sq. mi.	25yr cfs	50yr cfs	100yr cfs	250yr cfs	500yr cfs	1000-yr cfs	5000-yr cfs
<b>Rio Grande River</b>										
<i>Existing Conditions</i>						90,000		180,000	230,000	350,000
<i>Future Conditions</i>						90,000		180,000	230,000	350,000
<b>Main Arroyo</b>										
<i>Existing Conditions</i>										
E	Junction 4	9551	1.76	286	791	1216	1706	2081	2489	3264
D	Junction 6	7149	2.01	322	942	1446	2028	2464	2965	3897
	Junction 14	5279	2.29	420	1166	1770	2471	2982	3572	4698
C	Junction 7	4658	2.94	696	1744	2569	3536	4233	5027	6596
B	Junction 9	3026	3.13	802	1949	2850	3898	4654	5510	7202
A	Junction 10	1623	3.26	854	2045	2967	4046	4826	5704	7451
<i>Future Conditions</i>										
E	Junction 4	9551	1.76	336	891	1322	1826	2197	2577	3349
D	Junction 6	7149	2.01	375	1043	1548	2134	2581	3059	3963
	Junction 14	5279	2.29	465	1265	1868	2568	3091	3672	4756
C	Junction 7	4658	2.94	728	1836	2664	3625	4332	5129	6652
B	Junction 9	3026	3.13	829	2043	2944	3985	4749	5611	7260
A	Junction 10	1623	3.26	882	2136	3061	4136	4927	5808	7510
<b>Tributary 1</b>										
<i>Existing Conditions</i>										
G	Trib. 1-3	2508	0.30	178	334	442	568	662	764	965
F	Junction 8	1588	0.47	223	451	616	809	955	1114	1434
	Junction 13	873	0.65	298	611	834	1105	1305	1524	1971
<i>Future Conditions</i>										
G	Trib. 1-3	2508	0.30	178	334	442	568	662	764	965
F	Junction 8	1588	0.47	223	451	616	809	955	1114	1434
	Junction 13	873	0.65	298	611	834	1105	1305	1524	1971
<b>Tributary 2</b>										
<i>Existing Conditions</i>										
M	Trib. 2-7	8155	0.07	35	67	88	114	133	153	193
L	Junction 1	6235	0.30	114	237	326	429	507	594	764
I	Junction 2	3984	0.68	149	353	516	716	870	1047	1406
H	Junction 3	638	1.07	187	483	728	1012	1232	1474	1942
	Junction 11	465	1.09	189	489	737	1025	1247	1491	1962
<i>Future Conditions</i>										
M	Trib. 2-7	8155	0.07	46	80	102	127	147	167	205
L	Junction 1	6235	0.30	124	250	339	443	521	608	776
I	Junction 2	3984	0.68	181	411	587	799	960	1145	1507
H	Junction 3	638	1.07	231	567	832	1126	1340	1614	2127
	Junction 11	465	1.09	233	573	842	1138	1354	1631	2145
<b>Tributary 3</b>										
<i>Existing Conditions</i>										
O	Trib 3-3	15040	0.20	73	174	249	339	407	428	644
N	Junction 5	11787	0.50	155	373	536	731	879	1044	1399

Discharge Point (1)	Description (2)	Stream Sta. (3)	Drainage Area sq. mi.	2-yr Q5	5-yr Q5	10-yr Q5	25-yr Q5	50-yr Q5	100-yr Q5	500-yr Q5
	Junction 12	9933	0.67	184	462	676	937	1134	1356	1827
<b>Tributary 3</b>										
<i>Future Conditions</i>										
O	Trib 3-3	15040	0.20	73	174	249	339	407	428	644
N	Junction 5	11787	0.50	155	373	536	731	879	1044	1399
	Junction 12	9933	0.67	184	462	676	937	1134	1356	1827
<b>Unnamed Trib.</b>										
<i>Existing Conditions</i>										
J	Junction 2	13371	0.98	263	633	920	1264	1524	1817	2419
H	Junction 3	11519	1.20	333	755	1092	1534	1859	2221	2945
G	Junction 4	10339	1.57	376	874	1281	1809	2213	2669	3488
F	Junction 5	9195	1.85	430	1006	1487	2107	2586	3128	4100
E	Junction 6	7837	1.99	445	1043	1539	2199	2708	3290	4346
D	Junction 7	6342	2.39	514	1213	1786	2567	3173	3863	5127
C	Junction 8	3687	2.81	562	1339	1928	2696	3344	4139	5604
B	Junction 9	2368	3.07	595	1382	2009	2804	3465	4297	5853
A	Junction 10	1242	3.27	610	1428	2076	2893	3576	4439	6074
<i>Future Conditions</i>										
J	Junction 2	13371	0.98	484	950	1272	1645	1923	2225	2821
H	Junction 3	11519	1.20	550	1083	1499	1958	2295	2664	3370
G	Junction 4	10339	1.57	617	1265	1763	2338	2768	3156	4030
F	Junction 5	9195	1.85	686	1442	2023	2702	3208	3678	4712
E	Junction 6	7837	1.99	710	1488	2109	2834	3377	3906	4994
D	Junction 7	6342	2.39	784	1665	2384	3241	3878	4520	5799
C	Junction 8	3687	2.81	850	1787	2502	3410	4138	4901	6367
B	Junction 9	2368	3.07	859	1846	2587	3518	4278	5088	6640
A	Junction 10	1242	3.27	882	1901	2658	3617	4411	5262	6895
<b>Tributary to Seco Creek</b>										
<i>Existing Conditions</i>										
A	TSCO-1	4544	0.28	29	111	185	278	354	435	623
B	Junction 1	2590	0.48	150	317	453	618	751	874	1133
C	Junction 2	1760	0.60	188	384	545	724	876	1013	1285
<i>Future Conditions</i>										
A	TSCO-1	4544	0.28	105	254	363	495	603	704	941
B	Junction 1	2590	0.48	212	452	622	813	975	1097	1437
C	Junction 2	1760	0.60	246	517	694	901	1069	1190	1539
(1) Discharge Points shown on Drainage Area Map										
(2) Description taken from HEC-HMS models										
(3) Stream Stations taken from HEC-RAS models										

**Table 3 - Comparison of Peak Discharges at Selected Points between Original FIS and Flood Study.  
Eagle Pass Flood Study**

LOCATION	Selected Points	Original FIS Study		Flood Study	
		DRAINAGE AREA (sq. miles)	6 Hour FEMA Q's	DRAINAGE AREA (sq. miles)	24 Hour HEC-HMS Q's
<b>Main Arroyo</b>					
Above Limit of Study on Trib 2	I	0.61	1220	0.68	1382
Trib 2 @ Confluence with Arroyo	H	0.94	1670	1.09	1973
Above Limit of Study on Arroyo	O	0.41	920	0.20	840
Arroyo @ Confluence with Trib 2	E	0.69	1330	0.67	2230
Arroyo and Trib 2 Confluence	E	1.63	2480	1.76	3614
Arroyo Just Above Con. w/ Trib 1	C	2.20	2765	2.29	5080
Above Limit of Study on Trib 1		0.53	1110		
Trib 1 @ Confluence w/ Trib 1	C	0.74	1400	0.65	2076
Arroyo Just Below Con. w/ Trib 1	C	2.94	3050	2.94	7019
Arroyo @ Con. w/ Rio Grande R.	A	3.44	4220	3.26	7812
<b>Unnamed Creek</b>					
Unnamed Creek - Above Hwy 1021	A	3.21	3000	3.27	5732
Unnamed Creek - Above Hwy 277	H	1.31	1980	1.20	2851

\* For location of selected points see drainage area map.

**Appendix B**  
**Existing AMC 1**  
**Sub-Watershed Work Sheets**

EXISTING AMC1

use Table:  
Curve Number LookUp Table

	Soil Type Curve Numbers			
AMC1	21	41	55	63
AMC1	21	41	55	63
AMCII	38	61	74	80
AMCIII	65	75	85	90

CN for Impervious Area

98

Area for Trib TSC03	Area A	Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
		Area B	Area C	Area D	A		B	C	D			
Residential	0	0	36.21	4.87	38%	21	41	55	63	71.93	49.20	
Commercial	0	0	5.28	7.15	85%	21	41	55	63	92.24	19.09	
Roads	0	0	4.78	1.77	98%	94	94	94	94	97.92	10.68	
<b>Total Area</b>	<b>60.06</b>										<b>78.97</b>	

Area for Trib TSC02	Area A	Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
		Area B	Area C	Area D	A		B	C	D			
Industrial	0	0	6.08	0	72%	21	41	55	63	85.96	4.09	
Commercial	0	0	41.88	0	85%	21	41	55	63	91.55	30.04	
Public (other)	0	0	6.98	0	85%	21	41	55	63	91.55	5.01	
Residential	0	0.05	60.03	0	38%	21	41	55	63	71.33	33.58	
Roads	0	0.26	12.35	0	98%	94	94	94	94	97.92	9.67	
<b>Total Area</b>	<b>127.63</b>										<b>82.40</b>	

Area for Trib TSC03	Area A	Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
		Area B	Area C	Area D	A		B	C	D			
Commercial	0	0	4.81	0	85%	21	41	55	63	91.55	2.42	
Agricultural	0	1.99	175.13	0	2%	28	46	59	67	59.64	58.06	
<b>Total Area</b>	<b>181.93</b>										<b>60.48</b>	

B-13

EXISTING AMC1

Area for UTRG1		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	0	16.05	1.07	85%	21	41	55	63	91.63	11.70		
Industry	0	0	0.25	0	72%	21	41	55	63	85.96	0.16		
Agricultural	0	0	30.35	86.35	2%	28	46	59	67	65.58	57.08		
<b>Total Area</b>	<b>134.07</b>												<b>68.94</b>
Area for UTRG2		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Agricultural	0	0	21.34	94.14	2%	28	46	59	67	66.17	66.17		
<b>Total Area</b>	<b>115.48</b>												<b>66.17</b>
Area for UTRG3		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	0	4.27	0	72%	21	41	55	63	85.96	2.12		
Agricultural	0	2.31	116.29	50.5	2%	28	46	59	67	61.95	60.42		
<b>Total Area</b>	<b>173.37</b>												<b>62.54</b>
Area for UTRG4		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	0	42.98	0	85%	21	41	55	63	91.55	27.77		
Residential	0	0	0.93	0	38%	21	41	55	63	71.34	0.47		
Industry	0	0	52.36	0	72%	21	41	55	63	85.96	31.76		
Agricultural	0	0	45.43	0	2%	28	46	59	67	59.78	19.17		
<b>Total Area</b>	<b>141.7</b>												<b>79.17</b>
Area for UTRG5		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	48	17.28	18.3	85%	21	41	55	63	90.61	37.08		
Residential	0	28.19	2.89	2.43	38%	21	41	55	63	64.40	10.57		
Industry	0	1.81	24.19	0	72%	21	41	55	63	85.69	10.91		
Agricultural	0	12.61	45.51	0	2%	28	46	59	67	57.02	16.22		
Roads	0	3.04	0	0	98%	94	94	94	94	97.92	1.46		
<b>Total Area</b>	<b>204.25</b>												<b>76.23</b>

B-14

EXISTING MC1

Area for UTRG6		Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Industry	0	0	22.9	0	72%	21	41	55	63	85.96	51.00	
Commercial	0	0	4.67	0	85%	21	41	55	63	91.55	11.08	
Agricultural	0	0	11.03	0	2%	28	46	59	67	59.78	17.08	
<b>Total Area</b>	<b>38.6</b>										<b>79.16</b>	
Area for UTRG7		Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Industry	0	1.3	21.23	0	72%	21	41	55	63	85.73	9.67	
Commercial	0	9.07	11.59	0	85%	21	41	55	63	90.63	9.38	
Residential	0	33.71	0	0	38%	21	41	55	63	62.66	10.58	
Agricultural	0	24.01	96.45	0	2%	28	46	59	67	57.24	34.53	
Roads	0	2.32	0	0	98%	94	94	94	94	97.92	1.14	
<b>Total Area</b>	<b>199.68</b>										<b>65.30</b>	
Area for UTRG8		Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Commercial	0	16.12	18.41	0	85%	21	41	55	63	90.57	17.62	
Public (Airport)	0	19.79	0	0	20%	21	41	55	63	52.40	5.84	
Industry	0	0	0.55	0	72%	21	41	55	63	85.96	0.27	
Agricultural	0	0	65.87	0	2%	28	46	59	67	59.78	22.19	
Park	0	16.21	31.41	0	5%	46	60	70	76	68.17	18.29	
Roads	0	8.41	0.71	0	98%	94	94	94	94	97.92	5.03	
<b>Total Area</b>	<b>177.48</b>										<b>69.24</b>	
Area for UTRG9		Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Public	0	0	17.48	0	85%	21	41	55	63	91.55	18.11	
Agricultural	0	0	62.76	0	2%	28	46	59	67	59.78	42.46	
Park	0	4.03	4.1	0	5%	46	60	70	76	66.69	6.14	
<b>Total Area</b>	<b>88.37</b>										<b>66.70</b>	
Area for UTRG10		Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Public (Airport)	0	23.53	7.1	0	20%	21	41	55	63	55.00	13.92	
Public (School)	0	0	7.35	0	20%	21	41	55	63	63.60	3.86	
Commercial	0	0	2.03	0	85%	21	41	55	63	91.55	1.54	
Residential	0	0	47.98	0	38%	21	41	55	63	71.34	28.28	
Agricultural	0	0	25.85	0	2%	28	46	59	67	59.78	12.77	
Roads	0	5.29	1.91	0	98%	94	94	94	94	97.92	5.82	
<b>Total Area</b>	<b>121.04</b>										<b>66.19</b>	

B-15



EXISTING, MC1

Area for UTRG11		Areas in each Soil Group				Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	22.56	14.76	0	38%	21	41	55	63	66.09	21.05	
Agricultural	0	6.75	73.13	0	2%	28	46	59	67	58.70	40.01	
<b>Total Area</b>	<b>117.2</b>										<b>61.06</b>	
Area for UTRG12		Areas in each Soil Group				Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	20.71	69.73	0	38%	21	41	55	63	69.35	46.00	
Commercial	0	15.62	4.41	0	85%	21	41	55	63	89.91	13.21	
Public (Airport)	0	19.45	0.72	0	20%	21	41	55	63	52.80	7.81	
Park	0	0	0.94	0	5%	46	60	70	76	71.40	0.49	
Agricultural	0	0	0.56	0	2%	28	46	59	67	59.78	0.25	
Roads	0	2.93	1.29	0	98%	94	94	94	94	97.92	3.03	
<b>Total Area</b>	<b>136.36</b>										<b>70.78</b>	
Area for UTRG13		Areas in each Soil Group				Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	8.03	0.16	85%	21	41	55	63	91.57	4.89	
Residential	0	0	103.52	8.02	38%	21	41	55	63	71.70	52.18	
Public (School)	0	0	0.95	9.9	20%	21	41	55	63	69.44	4.92	
Agricultural	0	0	14.32	3.69	2%	28	46	59	67	61.39	7.21	
Roads	0	0	3.39	1.29	98%	94	94	94	94	97.92	2.99	
<b>Total Area</b>	<b>153.27</b>										<b>72.19</b>	
Area for UTRG14		Areas in each Soil Group				Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	0	92.5	6.3	38%	21	41	55	63	71.66	43.11	
Commercial	0	0	20.68	0	85%	21	41	55	63	91.55	11.53	
Public (School)	0	0	0.6	2.81	20%	21	41	55	63	68.87	1.43	
Agricultural	0	0	26.47	6.96	2%	28	46	59	67	61.41	12.50	
Roads	0	0	5.98	1.93	98%	94	94	94	94	97.92	4.72	
<b>Total Area</b>	<b>164.23</b>										<b>73.28</b>	
Area for UTRG15		Areas in each Soil Group				Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	0	69.98	5.99	38%	21	41	55	63	71.73	42.65	
Agricultural	0	0	26.6	25.19	2%	28	46	59	67	63.59	25.78	
<b>Total Area</b>	<b>127.76</b>										<b>68.43</b>	

B-16

EXISTING AMC1

Area for ARROYO1		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (Golf)	0	15.09	0	0	20%	21	41	55	63	52.40	10.17		
Public (School)	0	2.04	0	0	20%	21	41	55	63	52.40	1.37		
Public	0	31.24	0	0	85%	21	41	55	63	89.45	35.94		
Commercial	0	24.21	0	0	85%	21	41	55	63	89.45	27.85		
Industry	0	5.17	0	0	72%	21	41	55	63	82.04	5.46		
Total Area	77.75											80.79	
Area for ARROYO2		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	19.19	0	0	85%	21	41	55	63	89.45	13.90		
Public (School)	0	4.65	0	0	20%	21	41	55	63	52.40	1.97		
Commercial	0	51.8	0	0	85%	21	41	55	63	89.45	37.51		
Industry	0	1.92	0	0	72%	21	41	55	63	82.04	1.28		
Residential	0	39.6	0	0	38%	21	41	55	63	62.66	20.09		
Roads	0	6.37	0	0	98%	94	94	94	94	97.92	5.05		
Total Area	123.53											79.79	
Area for ARROYO3		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	19.14	0	0	72%	21	41	55	63	82.04	8.63		
Commercial	0	18.24	8.49	0	85%	21	41	55	63	90.12	13.24		
Residential	0	77.38	37.9	0	38%	21	41	55	63	65.51	41.50		
Public	0	5.11	2.75	0	85%	21	41	55	63	90.18	3.89		
Roads	0	11.44	1.55	0	98%	94	94	94	94	97.92	6.99		
Total Area	182											74.24	
Area for ARROYO4		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	109.86	11.96	0	38%	21	41	55	63	63.51	48.21		
Industry	0	26.93	0	0	72%	21	41	55	63	82.04	13.77		
Commercial	0	7.21	0	0	85%	21	41	55	63	89.45	4.02		
Public	0	1.88	0	0	85%	21	41	55	63	89.45	1.05		
Roads	0	2.65	0	0	98%	94	94	94	94	97.92	1.62		
Total Area	160.49											68.66	

B-17

EXISTING . . . MC1

Area for TRIB1-1		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	35.06	1.11	0	72%	21	41	55	63	82.16	26.89
Public	0	11.75	1.52	0	85%	21	41	55	63	89.69	10.77
Commercial	0	2.73	0	0	85%	21	41	55	63	89.45	2.21
Residential	0	40.36	15.28	0	38%	21	41	55	63	65.04	32.75
Roads	0	2.7	0	0	98%	94	94	94	94	97.92	2.39
<b>Total Area</b>	<b>110.51</b>										<b>75.01</b>
Area for TRIB1-2		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	0.73	0.63	0	85%	21	41	55	63	90.42	1.11
Residential	0	81.75	13.9	0	38%	21	41	55	63	63.92	55.30
Commercial	0	9.16	1.26	0	85%	21	41	55	63	89.70	8.45
Roads	0	3.14	0	0	98%	94	94	94	94	97.92	2.78
<b>Total Area</b>	<b>110.57</b>										<b>67.64</b>
Area for TRIB1-3		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	14.76	18.71	0	85%	21	41	55	63	90.62	15.75
Public (School)	0	4.88	2.25	0	20%	21	41	55	63	55.93	2.07
Residential	0	48.8	36.76	0	38%	21	41	55	63	66.39	29.49
Commercial	0	16.4	47.54	0	85%	21	41	55	63	91.01	30.21
Industry	0	0	0.54	0	72%	21	41	55	63	85.96	0.24
Roads	0	1.97	0	0	98%	94	94	94	94	97.92	1.00
<b>Total Area</b>	<b>192.61</b>										<b>78.76</b>

B-18

EXISTING MC1

Area for TRIB2-1		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	3.78	0	0	72%	21	41	55	63	82.04	19.44
Residential	0	12.17	0	0	38%	21	41	55	63	62.66	47.81
<b>Total Area</b>	<b>15.95</b>										<b>67.25</b>
Area for TRIB2-2		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	57.4	13.72	0	38%	21	41	55	63	64.33	30.02
Industry	0	3.81	0	0	72%	21	41	55	63	82.04	2.05
Public	0	7.53	0	0	85%	21	41	55	63	89.45	4.42
Public (School)	0	30	0	0	20%	21	41	55	63	52.40	10.31
Commercial	0	7.18	0	0	85%	21	41	55	63	89.45	4.20
Agricultural	0	32.79	0	0	2%	28	46	59	67	47.04	10.12
<b>Total Area</b>	<b>152.41</b>										<b>61.13</b>
Area for TRIB2-3		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	10.75	0	0	85%	21	41	55	63	89.45	10.23
Public (School)	0	7.96	2.02	0	20%	21	41	55	63	54.67	5.81
Residential	0	48.86	0	0	38%	21	41	55	63	62.66	32.58
Commercial	0	0.44	0	0	85%	21	41	55	63	89.45	0.42
Public (Cemetery)	0	15.35	0	0	20%	46	60	70	76	67.60	11.04
Agricultural	0	8.6	0	0	2%	28	46	59	67	47.04	4.30
<b>Total Area</b>	<b>93.98</b>										<b>64.38</b>
Area for TRIB2-4		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (School)	0	16.76	15.34	0	20%	21	41	55	63	57.75	29.16
Residential	0	25.98	4.06	0	38%	21	41	55	63	63.83	30.16
Public (Cemetery)	0	1.44	0	0	20%	46	60	70	76	67.60	1.53
<b>Total Area</b>	<b>63.58</b>										<b>60.85</b>
Area for TRIB2-5		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (School)	0	0.48	0	0	20%	21	41	55	63	52.40	0.14
Residential	0	30.56	10.1	0	38%	21	41	55	63	64.82	14.78
Commercial	0	0	8.78	0	85%	21	41	55	63	91.55	4.51
Public (Cemetery)	0	46.98	0	0	20%	46	60	70	76	67.60	17.81
Agricultural	0	41.49	39.94	0	2%	28	46	59	67	53.29	24.33
<b>Total Area</b>	<b>178.33</b>										<b>61.57</b>

R-19

EXISTING MC1

Area for TRIB2-6	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Commercial	0	7.84	26.93	0	85%	21	41	55	63	91.08	20.70	
Residential	0	46.2	69.03	0	38%	21	41	55	63	67.86	51.12	
Public	0	1.73	1.23	0	85%	21	41	55	63	90.32	1.75	
Total Area	152.96										73.57	

Area for TRIB2-7	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Commercial	0	1.43	23.79	0	85%	21	41	55	63	91.43	55.85	
Agricultural	0	0	16.07	0	2%	28	46	59	67	59.78	23.27	
Total Area	41.29										79.11	

Area for TRIB3-1	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Public (School)	0	26.96	3.42	0	20%	21	41	55	63	53.66	14.96	
Commercial	0	1.21	1.72	0	85%	21	41	55	63	90.68	2.44	
Residential	0	42.69	30.49	0	38%	21	41	55	63	66.28	44.52	
Public (Cemetery)	0	2.45	0	0	20%	46	60	70	76	67.60	1.52	
Total Area	108.94										63.44	

Area for TRIB3-2	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Commercial	0	14.26	15.33	0	85%	21	41	55	63	90.54	14.17	
Public	0	3.82	0	0	85%	21	41	55	63	89.45	1.81	
Public (School)	0	16.84	32.23	0	20%	21	41	55	63	59.76	15.51	
Residential	0	41.24	65.32	0	38%	21	41	55	63	67.98	38.32	
Total Area	189.04										69.81	

Area for TRIB3-3	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Public	0	0.22	0	0	85%	21	41	55	63	89.45	0.15	
Commercial	0	37.22	0	0	85%	21	41	55	63	89.45	25.64	
Residential	0	92.42	0	0	38%	21	41	55	63	62.66	44.59	
Total Area	129.86										70.38	

B-20

**Appendix B**  
**Future AMC 1**  
**Sub-watershed Work Sheets**

use Table:  
Curve Number LookUp Table

Soil Type Curve Numbers				
AMC1	21	41	55	63
AMC1	21	41	55	63
AMCII	38	61	74	80
AMCIII	65	75	85	90

CN for Impervious Area

98

Area for Trib TSC03	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Residential	0	0	36.21	4.87	38.00%	21	41	55	63	71.93	49.20	
Commercial	0	0	5.28	7.15	85.00%	21	41	55	63	92.24	19.09	
Roads	0	0	4.78	1.77	98.00%	94	94	94	94	97.92	10.68	
Total Area	60.06										78.97	
Area for Trib TSC02	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Industrial	0	0	6.08	0	72.00%	21	41	55	63	85.96	4.09	
Commercial	0	0	41.88	0	85.00%	21	41	55	63	91.55	30.04	
Public (other)	0	0	6.98	0	85.00%	21	41	55	63	91.55	5.01	
Residential	0	0.05	60.03	0	38.00%	21	41	55	63	71.33	33.58	
Roads	0	0.26	12.35	0	98.00%	94	94	94	94	97.92	9.67	
Total Area	127.63										82.40	
Area for Trib TSC03	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Commercial	0	0	4.81	0	85.00%	21	41	55	63	91.55	2.42	
Residential	0	1.99	144.92	0	38.00%	21	41	55	63	71.22	57.51	
Agricultural	0	0	30.21	0	2.00%	28	46	59	67	59.78	9.93	
Total Area	181.93										69.86	

FutAMC1

Area for UTRG1		Areas in each Soil Group					Soil Type Curve Numbers			
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D	
Commercial	0	0	16.05	1.07	85.00%	21	41	55	63	
Industry	0	0	0.25	0	72.00%	21	41	55	63	
Residential	0	0	30.35	86.35	38.00%	21	41	55	63	
Total Area	134.07									
Area for UTRG2		Areas in each Soil Group					Soil Type Curve Numbers			
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D	
Commercial	0	0	13.95	5.64	85.00%	21	41	55	63	
Residential	0	0	7.39	88.5	38.00%	21	41	55	63	
Total Area	115.48									
Area for UTRG3		Areas in each Soil Group					Soil Type Curve Numbers			
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D	
Commercial	0	0	23.45	0.52	85.00%	21	41	55	63	
Industry	0	0	4.27	0	72.00%	21	41	55	63	
Residential	0	2.31	92.84	49.98	38.00%	21	41	55	63	
Total Area	173.37									
Area for UTRG4		Areas in each Soil Group					Soil Type Curve Numbers			
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D	
Commercial	0	0	42.98	0	85.00%	21	41	55	63	
Residential	0	0	46.36	0	38.00%	21	41	55	63	
Industry	0	0	52.36	0	72.00%	21	41	55	63	
Total Area	141.7									
Area for UTRG5		Areas in each Soil Group					Soil Type Curve Numbers			
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D	
Commercial	0	48	20.06	18.3	85.00%	21	41	55	63	
Residential	0	40.8	45.62	2.43	38.00%	21	41	55	63	
Industry	0	1.81	24.19	0	72.00%	21	41	55	63	
Roads	0	3.04	0	0	98.00%	94	94	94	94	
Total Area	204.25									



Area for UTRG6		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	0	22.9	0	72.00%	21	41	55	63	85.96	51.00
Commercial	0	0	4.67	0	85.00%	21	41	55	63	91.55	11.08
Residential	0	0	11.03	0	38.00%	21	41	55	63	71.34	20.39
Total Area	38.6										82.46
Area for UTRG7		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	1.3	21.23	0	72.00%	21	41	55	63	85.73	9.67
Commercial	0	12.66	29.32	0	85.00%	21	41	55	63	90.92	19.11
Residential	0	54.13	78.72	0	38.00%	21	41	55	63	67.80	45.11
Roads	0	2.32	0	0	98.00%	94	94	94	94	97.92	1.14
Total Area	199.68										75.04
Area for UTRG8		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	16.12	18.41	0	85.00%	21	41	55	63	90.57	17.62
Public (Airport)	0	19.79	0	0	20.00%	21	41	55	63	52.40	5.84
Industry	0	0	0.55	0	72.00%	21	41	55	63	85.96	0.27
Residential	0	0	65.87	0	38.00%	21	41	55	63	71.34	26.48
Park	0	16.21	31.41	0	5.00%	46	60	70	76	68.17	18.29
Roads	0	8.41	0.71	0	98.00%	94	94	94	94	97.92	5.03
Total Area	177.48										73.53
Area for UTRG9		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	0	17.48	0	85.00%	21	41	55	63	91.55	18.11
Residential	0	0	62.76	0	38.00%	21	41	55	63	71.34	50.67
Park	0	4.03	4.1	0	5.00%	46	60	70	76	66.69	6.14
Total Area	88.37										74.91
Area for UTRG10		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (Airport)	0	23.53	7.1	0	20.00%	21	41	55	63	55.00	13.92
Public (School)	0	0	7.35	0	20.00%	21	41	55	63	63.60	3.86
Commercial	0	0	2.03	0	85.00%	21	41	55	63	91.55	1.54
Residential	0	0	73.83	0	38.00%	21	41	55	63	71.34	43.51
Roads	0	5.29	1.91	0	98.00%	94	94	94	94	97.92	5.82
Total Area	121.04										68.65

Area for UTRG11		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	29.31	87.89	0	38.00%	21	41	55	63	69.17	69.17
<b>Total Area</b>	<b>117.2</b>										<b>69.17</b>
Area for UTRG12		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	20.71	70.29	0	38.00%	21	41	55	63	69.36	46.29
Commercial	0	15.62	4.41	0	85.00%	21	41	55	63	89.91	13.21
Public (Airport)	0	19.45	0.72	0	20.00%	21	41	55	63	52.80	7.81
Park	0	0	0.94	0	5.00%	46	60	70	76	71.40	0.49
Roads	0	2.93	1.29	0	98.00%	94	94	94	94	97.92	3.03
<b>Total Area</b>	<b>136.36</b>										<b>70.83</b>
Area for UTRG13		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	0	8.03	0.16	85.00%	21	41	55	63	91.57	4.89
Residential	0	0	117.84	11.71	38.00%	21	41	55	63	71.79	60.68
Public (School)	0	0	0.95	9.9	20.00%	21	41	55	63	69.44	4.92
Roads	0	0	3.39	1.29	98.00%	94	94	94	94	97.92	2.99
<b>Total Area</b>	<b>153.27</b>										<b>73.48</b>
Area for UTRG14		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	0	118.97	13.26	38.00%	21	41	55	63	71.84	57.84
Commercial	0	0	20.68	0	85.00%	21	41	55	63	91.55	11.53
Public (School)	0	0	0.6	2.81	20.00%	21	41	55	63	68.87	1.43
Roads	0	0	5.98	1.93	98.00%	94	94	94	94	97.92	4.72
<b>Total Area</b>	<b>164.23</b>										<b>75.51</b>
Area for UTRG15		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	0	96.58	31.18	38.00%	21	41	55	63	72.55	72.55
<b>Total Area</b>	<b>127.76</b>										<b>72.55</b>

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Area for ARROYO1		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (Golf)	0	15.09	0	0	20.00%	21	41	55	63	52.40	10.17
Public (School)	0	2.04	0	0	20.00%	21	41	55	63	52.40	1.37
Public	0	31.24	0	0	85.00%	21	41	55	63	89.45	35.94
Commercial	0	24.21	0	0	85.00%	21	41	55	63	89.45	27.85
Industry	0	5.17	0	0	72.00%	21	41	55	63	82.04	5.46
<b>Total Area</b>	<b>77.75</b>										<b>80.79</b>
Area for ARROYO2		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	19.19	0	0	85.00%	21	41	55	63	89.45	13.90
Public (School)	0	4.65	0	0	20.00%	21	41	55	63	52.40	1.97
Commercial	0	51.8	0	0	85.00%	21	41	55	63	89.45	37.51
Industry	0	1.92	0	0	72.00%	21	41	55	63	82.04	1.28
Residential	0	39.6	0	0	38.00%	21	41	55	63	62.66	20.09
Roads	0	6.37	0	0	98.00%	94	94	94	94	97.92	5.05
<b>Total Area</b>	<b>123.53</b>										<b>79.79</b>
Area for ARROYO3		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	19.14	0	0	72.00%	21	41	55	63	82.04	8.63
Commercial	0	18.24	8.49	0	85.00%	21	41	55	63	90.12	13.24
Residential	0	77.38	37.9	0	38.00%	21	41	55	63	65.51	41.50
Public	0	5.11	2.75	0	85.00%	21	41	55	63	90.18	3.89
Roads	0	11.44	1.55	0	98.00%	94	94	94	94	97.92	6.99
<b>Total Area</b>	<b>182</b>										<b>74.24</b>
Area for ARROYO4		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	109.86	11.96	0	38.00%	21	41	55	63	63.51	48.21
Industry	0	26.93	0	0	72.00%	21	41	55	63	82.04	13.77
Commercial	0	7.21	0	0	85.00%	21	41	55	63	89.45	4.02
Public	0	1.88	0	0	85.00%	21	41	55	63	89.45	1.05
Roads	0	2.65	0	0	98.00%	94	94	94	94	97.92	1.62
<b>Total Area</b>	<b>160.49</b>										<b>68.66</b>

R.25



Area for TRIB2-1		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	3.78	0	0	72.00%	21	41	55	63	82.04	19.44		
Residential	0	12.17	0	0	38.00%	21	41	55	63	62.66	47.81		
<b>Total Area</b>	<b>15.95</b>										<b>67.25</b>		
Area for TRIB2-2		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	90.19	13.72	0	38.00%	21	41	55	63	63.81	43.50		
Industry	0	3.81	0	0	72.00%	21	41	55	63	82.04	2.05		
Public	0	7.53	0	0	85.00%	21	41	55	63	89.45	4.42		
Public (School)	0	30	0	0	20.00%	21	41	55	63	52.40	10.31		
Commercial	0	7.16	0	0	85.00%	21	41	55	63	89.45	4.20		
<b>Total Area</b>	<b>152.41</b>										<b>64.49</b>		
Area for TRIB2-3		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	10.75	0	0	85.00%	21	41	55	63	89.45	10.23		
Public (School)	0	7.96	2.02	0	20.00%	21	41	55	63	54.67	5.81		
Residential	0	57.46	0	0	38.00%	21	41	55	63	62.66	38.31		
Commercial	0	0.44	0	0	85.00%	21	41	55	63	89.45	0.42		
Public (Cemetery)	0	15.35	0	0	20.00%	46	60	70	76	67.60	11.04		
<b>Total Area</b>	<b>93.98</b>										<b>65.81</b>		
Area for TRIB2-4		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (School)	0	16.76	15.34	0	20.00%	21	41	55	63	57.75	29.16		
Residential	0	25.98	4.06	0	38.00%	21	41	55	63	63.83	30.16		
Public (Cemetery)	0	1.44	0	0	20.00%	46	60	70	76	67.60	1.53		
<b>Total Area</b>	<b>63.58</b>										<b>60.85</b>		
Area for TRIB2-5		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (School)	0	0.48	0	0	20.00%	21	41	55	63	52.40	0.14		
Residential	0	72.05	42.13	0	38.00%	21	41	55	63	65.86	42.17		
Commercial	0	0	16.69	0	85.00%	21	41	55	63	91.55	8.57		
Public (Cemetery)	0	46.98	0	0	20.00%	46	60	70	76	67.60	17.81		
<b>Total Area</b>	<b>178.33</b>										<b>68.69</b>		

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Area for TRIB2-6		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	7.84	26.93	0	85.00%	21	41	55	63	91.08	20.70
Residential	0	46.2	69.03	0	38.00%	21	41	55	63	67.86	51.12
Public	0	1.73	1.23	0	85.00%	21	41	55	63	90.32	1.75
<b>Total Area</b>	<b>152.96</b>										<b>73.57</b>

Area for TRIB2-7		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	1.43	23.79	0	85.00%	21	41	55	63	91.43	55.85
Residential	0	0	16.07	0	38.00%	21	41	55	63	71.34	27.77
<b>Total Area</b>	<b>41.29</b>										<b>83.61</b>

Area for TRIB3-1		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (School)	0	26.96	3.42	0	20.00%	21	41	55	63	53.66	14.96
Commercial	0	1.21	1.72	0	85.00%	21	41	55	63	90.68	2.44
Residential	0	42.69	30.49	0	38.00%	21	41	55	63	66.28	44.52
Public (Cemetery)	0	2.45	0	0	20.00%	46	60	70	76	67.60	1.52
<b>Total Area</b>	<b>108.94</b>										<b>63.44</b>

Area for TRIB3-2		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	14.26	15.33	0	85.00%	21	41	55	63	90.54	14.17
Public	0	3.82	0	0	85.00%	21	41	55	63	89.45	1.81
Public (School)	0	16.84	32.23	0	20.00%	21	41	55	63	59.76	15.51
Residential	0	41.24	65.32	0	38.00%	21	41	55	63	67.98	38.32
<b>Total Area</b>	<b>189.04</b>										<b>69.81</b>

Area for TRIB3-3		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	0.22	0	0	85.00%	21	41	55	63	89.45	0.15
Commercial	0	37.22	0	0	85.00%	21	41	55	63	89.45	25.64
Residential	0	92.42	0	0	38.00%	21	41	55	63	62.66	44.59
<b>Total Area</b>	<b>129.86</b>										<b>70.38</b>

**Appendix B**  
**Existing AMC 2**  
**Sub-watershed Work Sheets**

ExAMC2

use Table:  
Curve Number LookUp Table

	Soil Type Curve Numbers			
AMCII	38	61	74	80
AMC1	21	41	55	63
AMCII	38	61	74	80
AMCIII	65	75	85	90

CN for Impervious Area

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Area for Trib TSC03	Area A	Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
		Area B	Area C	Area D	A		B	C	D			
Residential	0	0	36.21	4.87	38.00%	38	61	74	80	83.56	57.15	
Commercial	0	0	5.28	7.15	85.00%	38	61	74	80	94.92	19.64	
Roads	0	0	4.78	1.77	98.00%	98	98	98	98	98.00	10.69	
Total Area	60.06										87.49	

Area for Trib TSC02	Area A	Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
		Area B	Area C	Area D	A		B	C	D			
Industrial	0	0	6.08	0	72.00%	38	61	74	80	91.28	4.35	
Commercial	0	0	41.88	0	85.00%	38	61	74	80	94.40	30.98	
Public (other)	0	0	6.98	0	85.00%	38	61	74	80	94.40	5.16	
Residential	0	0.05	60.03	0	38.00%	38	61	74	80	83.11	39.12	
Roads	0	0.26	12.35	0	98.00%	98	98	98	98	98.00	9.68	
Total Area	127.63										89.29	

Area for Trib TSC03	Area A	Areas in each Soil Group				Per. Imp	Soil Type Curve Numbers					
		Area B	Area C	Area D	A		B	C	D			
Commercial	0	0	4.81	0	85.00%	38	61	74	80	94.40	2.50	
Agricultural	0	1.99	175.13	0	2.00%	47	66	77	83	77.30	75.26	
Total Area	181.93										77.75	

0.00



Area for UTRG1		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	16.05	1.07	85.00%	38	61	74	80	94.46	12.06	
Industry	0	0	0.25	0	72.00%	38	61	74	80	91.28	0.17	
Agricultural	0	0	30.35	86.35	2.00%	47	66	77	83	81.77	71.18	
<b>Total Area</b>	<b>134.07</b>										<b>83.41</b>	
Area for UTRG2		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Agricultural	0	0	21.34	94.14	2.00%	47	66	77	83	82.21	82.21	
<b>Total Area</b>	<b>115.48</b>										<b>82.21</b>	
Area for UTRG3		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Industry	0	0	4.27	0	72.00%	38	61	74	80	91.28	2.25	
Agricultural	0	2.31	116.29	50.5	2.00%	47	66	77	83	79.03	77.08	
<b>Total Area</b>	<b>173.37</b>										<b>79.33</b>	
Area for UTRG4		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	42.98	0	85.00%	38	61	74	80	94.40	28.63	
Residential	0	0	0.93	0	38.00%	38	61	74	80	83.12	0.55	
Industry	0	0	52.36	0	72.00%	38	61	74	80	91.28	33.73	
Agricultural	0	0	45.43	0	2.00%	47	66	77	83	77.42	24.82	
<b>Total Area</b>	<b>141.7</b>										<b>87.73</b>	
Area for UTRG5		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	48	17.28	18.3	85.00%	38	61	74	80	93.48	38.25	
Residential	0	28.19	2.89	2.43	38.00%	38	61	74	80	76.61	12.57	
Industry	0	1.81	24.19	0	72.00%	38	61	74	80	91.03	11.59	
Agricultural	0	12.61	45.51	0	2.00%	47	66	77	83	75.08	21.36	
Roads	0	3.04	0	0	98.00%	98	98	98	98	98.00	1.46	
<b>Total Area</b>	<b>204.25</b>										<b>85.23</b>	

Area for UTRG6		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	0	22.9	0	72.00%	38	61	74	80	91.28	54.15		
Commercial	0	0	4.67	0	85.00%	38	61	74	80	94.40	11.42		
Agricultural	0	0	11.03	0	2.00%	47	66	77	83	77.42	22.12		
Total Area	38.6										87.70		
Area for UTRG7		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	1.3	21.23	0	72.00%	38	61	74	80	91.07	10.28		
Commercial	0	9.07	11.59	0	85.00%	38	61	74	80	93.54	9.68		
Residential	0	33.71	0	0	38.00%	38	61	74	80	75.06	12.67		
Agricultural	0	24.01	96.45	0	2.00%	47	66	77	83	75.27	45.41		
Roads	0	2.32	0	0	98.00%	98	98	98	98	98.00	1.14		
Total Area	199.68										79.17		
Area for UTRG8		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	16.12	18.41	0	85.00%	38	61	74	80	93.49	18.19		
Public (Airport)	0	19.79	0	0	20.00%	38	61	74	80	68.40	7.63		
Industry	0	0	0.55	0	72.00%	38	61	74	80	91.28	0.28		
Agricultural	0	0	65.87	0	2.00%	47	66	77	83	77.42	28.73		
Park	0	16.21	31.41	0	5.00%	66	78	85	89	83.39	22.37		
Roads	0	8.41	0.71	0	98.00%	98	98	98	98	98.00	5.04		
Total Area	177.48										82.24		
Area for UTRG9		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	0	17.48	0	85.00%	38	61	74	80	94.40	18.67		
Agricultural	0	0	62.76	0	2.00%	47	66	77	83	77.42	54.98		
Park	0	4.03	4.1	0	5.00%	66	78	85	89	82.35	7.58		
Total Area	88.37										81.23		
Area for UTRG10		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (Airport)	0	23.53	7.1	0	20.00%	38	61	74	80	70.81	17.92		
Public (School)	0	0	7.35	0	20.00%	38	61	74	80	78.80	4.79		
Commercial	0	0	2.03	0	85.00%	38	61	74	80	94.40	1.58		
Residential	0	0	47.98	0	38.00%	38	61	74	80	83.12	32.95		
Agricultural	0	0	25.85	0	2.00%	47	66	77	83	77.42	16.53		
Roads	0	5.29	1.91	0	98.00%	98	98	98	98	98.00	5.83		
Total Area	121.04										79.60		

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Area for UTRG11		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	22.56	14.76	0	38.00%	38	61	74	80	78.25	24.92		
Agricultural	0	6.75	73.13	0	2.00%	47	66	77	83	76.51	52.15		
<b>Total Area</b>	<b>117.2</b>										<b>77.06</b>		
Area for UTRG12		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	20.71	69.73	0	38.00%	38	61	74	80	81.27	53.90		
Commercial	0	15.62	4.41	0	85.00%	38	61	74	80	92.88	13.64		
Public (Airport)	0	19.45	0.72	0	20.00%	38	61	74	80	68.77	10.17		
Park	0	0	0.94	0	5.00%	66	78	85	89	85.65	0.59		
Agricultural	0	0	0.56	0	2.00%	47	66	77	83	77.42	0.32		
Roads	0	2.93	1.29	0	98.00%	98	98	98	98	98.00	3.03		
<b>Total Area</b>	<b>136.36</b>										<b>81.66</b>		
Area for UTRG13		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	0	8.03	0.16	85.00%	38	61	74	80	94.42	5.05		
Residential	0	0	103.52	8.02	38.00%	38	61	74	80	83.39	60.68		
Public (School)	0	0	0.95	9.9	20.00%	38	61	74	80	83.18	5.89		
Agricultural	0	0	14.32	3.69	2.00%	47	66	77	83	78.62	9.24		
Roads	0	0	3.39	1.29	98.00%	98	98	98	98	98.00	2.99		
<b>Total Area</b>	<b>153.27</b>										<b>83.85</b>		
Area for UTRG14		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	0	92.5	6.3	38.00%	38	61	74	80	83.36	50.15		
Commercial	0	0	20.68	0	85.00%	38	61	74	80	94.40	11.89		
Public (School)	0	0	0.6	2.81	20.00%	38	61	74	80	82.76	1.72		
Agricultural	0	0	26.47	6.96	2.00%	47	66	77	83	78.64	16.01		
Roads	0	0	5.98	1.93	98.00%	98	98	98	98	98.00	4.72		
<b>Total Area</b>	<b>164.23</b>										<b>84.48</b>		
Area for UTRG15		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	0	69.98	5.99	38.00%	38	61	74	80	83.41	49.60		
Agricultural	0	0	26.6	25.19	2.00%	47	66	77	83	80.28	32.54		
<b>Total Area</b>	<b>127.76</b>										<b>82.14</b>		

Area for ARROYO1		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (Golf)	0	15.09	0	0	20.00%	38	61	74	80	68.40	13.28
Public (School)	0	2.04	0	0	20.00%	38	61	74	80	68.40	1.79
Public	0	31.24	0	0	85.00%	38	61	74	80	92.45	37.15
Commercial	0	24.21	0	0	85.00%	38	61	74	80	92.45	28.79
Industry	0	5.17	0	0	72.00%	38	61	74	80	87.64	5.83
<b>Total Area</b>	<b>77.75</b>										<b>86.83</b>
Area for ARROYO2		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	19.19	0	0	85.00%	38	61	74	80	92.45	14.36
Public (School)	0	4.65	0	0	20.00%	38	61	74	80	68.40	2.57
Commercial	0	51.8	0	0	85.00%	38	61	74	80	92.45	38.77
Industry	0	1.92	0	0	72.00%	38	61	74	80	87.64	1.36
Residential	0	39.6	0	0	38.00%	38	61	74	80	75.06	24.06
Roads	0	6.37	0	0	98.00%	98	98	98	98	98.00	5.05
<b>Total Area</b>	<b>123.53</b>										<b>86.18</b>
Area for ARROYO3		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	19.14	0	0	72.00%	38	61	74	80	87.64	9.22
Commercial	0	18.24	8.49	0	85.00%	38	61	74	80	93.07	13.67
Residential	0	77.38	37.9	0	38.00%	38	61	74	80	77.71	49.22
Public	0	5.11	2.75	0	85.00%	38	61	74	80	93.13	4.02
Roads	0	11.44	1.55	0	98.00%	98	98	98	98	98.00	6.99
<b>Total Area</b>	<b>182</b>										<b>83.12</b>
Area for ARROYO4		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	109.86	11.96	0	38.00%	38	61	74	80	75.85	57.57
Industry	0	26.93	0	0	72.00%	38	61	74	80	87.64	14.71
Commercial	0	7.21	0	0	85.00%	38	61	74	80	92.45	4.15
Public	0	1.88	0	0	85.00%	38	61	74	80	92.45	1.08
Roads	0	2.65	0	0	98.00%	98	98	98	98	98.00	1.62
<b>Total Area</b>	<b>160.49</b>										<b>79.14</b>

Area for TRIB1-1		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Industry	0	35.06	1.11	0	72.00%	38	61	74	80	87.75	28.72	
Public	0	11.75	1.52	0	85.00%	38	61	74	80	92.67	11.13	
Commercial	0	2.73	0	0	85.00%	38	61	74	80	92.45	2.28	
Residential	0	40.36	15.28	0	38.00%	38	61	74	80	77.27	38.91	
Roads	0	2.7	0	0	98.00%	98	98	98	98	98.00	2.39	
<b>Total Area</b>	<b>110.51</b>										<b>83.43</b>	
Area for TRIB1-2		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Public	0	0.73	0.63	0	85.00%	38	61	74	80	93.35	1.15	
Residential	0	81.75	13.9	0	38.00%	38	61	74	80	76.23	65.94	
Commercial	0	9.16	1.26	0	85.00%	38	61	74	80	92.69	8.73	
Roads	0	3.14	0	0	98.00%	98	98	98	98	98.00	2.78	
<b>Total Area</b>	<b>110.57</b>										<b>78.61</b>	
Area for TRIB1-3		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Public	0	14.76	18.71	0	85.00%	38	61	74	80	93.54	16.25	
Public (School)	0	4.88	2.25	0	20.00%	38	61	74	80	71.68	2.65	
Residential	0	48.8	36.76	0	38.00%	38	61	74	80	78.52	34.88	
Commercial	0	16.4	47.54	0	85.00%	38	61	74	80	93.90	31.17	
Industry	0	0	0.54	0	72.00%	38	61	74	80	91.28	0.26	
Roads	0	1.97	0	0	98.00%	98	98	98	98	98.00	1.00	
<b>Total Area</b>	<b>192.61</b>										<b>86.22</b>	

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Area for TRIB2-1		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Industry	0	3.78	0	0	72.00%	38	61	74	80	87.64	20.77
Residential	0	12.17	0	0	38.00%	38	61	74	80	75.06	57.27
<b>Total Area</b>	<b>15.95</b>										<b>78.04</b>
Area for TRIB2-2		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Residential	0	57.4	13.72	0	38.00%	38	61	74	80	76.61	35.75
Industry	0	3.81	0	0	72.00%	38	61	74	80	87.64	2.19
Public	0	7.53	0	0	85.00%	38	61	74	80	92.45	4.57
Public (School)	0	30	0	0	20.00%	38	61	74	80	68.40	13.46
Commercial	0	7.16	0	0	85.00%	38	61	74	80	92.45	4.34
Agricultural	0	32.79	0	0	2.00%	47	66	77	83	66.64	14.34
<b>Total Area</b>	<b>152.41</b>										<b>74.65</b>
Area for TRIB2-3		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	10.75	0	0	85.00%	38	61	74	80	92.45	10.57
Public (School)	0	7.96	2.02	0	20.00%	38	61	74	80	70.51	7.49
Residential	0	48.86	0	0	38.00%	38	61	74	80	75.06	39.02
Commercial	0	0.44	0	0	85.00%	38	61	74	80	92.45	0.43
Public (Cemetery)	0	15.35	0	0	20.00%	66	78	85	89	82.00	13.39
Agricultural	0	8.6	0	0	2.00%	47	66	77	83	66.64	6.10
<b>Total Area</b>	<b>93.98</b>										<b>77.01</b>
Area for TRIB2-4		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (School)	0	16.76	15.34	0	20.00%	38	61	74	80	73.37	37.04
Residential	0	25.98	4.06	0	38.00%	38	61	74	80	76.15	35.98
Public (Cemetery)	0	1.44	0	0	20.00%	66	78	85	89	82.00	1.86
<b>Total Area</b>	<b>63.58</b>										<b>74.88</b>
Area for TRIB2-5		Areas in each Soil Group					Soil Type Curve Numbers				
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (School)	0	0.48	0	0	20.00%	38	61	74	80	68.40	0.18
Residential	0	30.56	10.1	0	38.00%	38	61	74	80	77.06	17.57
Commercial	0	0	8.78	0	85.00%	38	61	74	80	94.40	4.65
Public (Cemetery)	0	46.98	0	0	20.00%	66	78	85	89	82.00	21.60
Agricultural	0	41.49	39.94	0	2.00%	47	66	77	83	71.93	32.84
<b>Total Area</b>	<b>178.33</b>										<b>76.85</b>

Area for TRIB2-6		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	7.84	26.93	0	85.00%	38	61	74	80	93.96	21.36
Residential	0	46.2	69.03	0	38.00%	38	61	74	80	79.89	60.18
Public	0	1.73	1.23	0	85.00%	38	61	74	80	93.26	1.80
Total Area	152.96										83.35
Area for TRIB2-7		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	1.43	23.79	0	85.00%	38	61	74	80	94.29	57.59
Agricultural	0	0	16.07	0	2.00%	47	66	77	83	77.42	30.13
Total Area	41.29										87.72
Area for TRIB3-1		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public (School)	0	26.96	3.42	0	20.00%	38	61	74	80	69.57	19.40
Commercial	0	1.21	1.72	0	85.00%	38	61	74	80	93.59	2.52
Residential	0	42.69	30.49	0	38.00%	38	61	74	80	78.42	52.68
Public (Cemetery)	0	2.45	0	0	20.00%	66	78	85	89	82.00	1.84
Total Area	108.94										76.44
Area for TRIB3-2		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Commercial	0	14.26	15.33	0	85.00%	38	61	74	80	93.46	14.63
Public	0	3.82	0	0	85.00%	38	61	74	80	92.45	1.87
Public (School)	0	16.84	32.23	0	20.00%	38	61	74	80	75.23	19.53
Residential	0	41.24	65.32	0	38.00%	38	61	74	80	80.00	45.10
Total Area	189.04										81.12
Area for TRIB3-3		Areas in each Soil Group				Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D		
Public	0	0.22	0	0	85.00%	38	61	74	80	92.45	0.16
Commercial	0	37.22	0	0	85.00%	38	61	74	80	92.45	26.50
Residential	0	92.42	0	0	38.00%	38	61	74	80	75.06	53.42
Total Area	129.86										80.07

**Appendix B**  
**Future AMC 2**  
**Sub-watershed Work Sheets**



use Table:  
Curve Number LookUp Table

Soil Type Curve Numbers				
AMCII	38	61	74	80
AMC1	21	41	55	63
AMCII	38	61	74	80
AMCIII	65	75	85	90

CN for Impervious Area

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Area for Trib TSC03	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Residential	0	0	36.21	4.87	38.00%	38	61	74	80	83.56	57.15	
Commercial	0	0	5.28	7.15	85.00%	38	61	74	80	94.92	19.64	
Roads	0	0	4.78	1.77	98.00%	98	98	98	98	98.00	10.69	
<b>Total Area</b>	<b>60.06</b>										<b>87.49</b>	

Area for Trib TSC02	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Industrial	0	0	6.08	0	72.00%	38	61	74	80	91.28	4.35	
Commercial	0	0	41.88	0	85.00%	38	61	74	80	94.40	30.98	
Public (other)	0	0	6.98	0	85.00%	38	61	74	80	94.40	5.16	
Residential	0	0.05	60.03	0	38.00%	38	61	74	80	83.11	39.12	
Roads	0	0.26	12.35	0	98.00%	98	98	98	98	98.00	9.68	
<b>Total Area</b>	<b>127.63</b>										<b>89.29</b>	

Area for Trib TSC03	Areas in each Soil Group					Per. Imp	Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	A		B	C	D			
Commercial	0	0	4.81	0	85.00%	38	61	74	80	94.40	2.50	
Residential	0	1.99	144.92	0	38.00%	38	61	74	80	83.01	67.03	
Agricultural	0	0	30.21	0	2.00%	47	66	77	83	77.42	12.86	
<b>Total Area</b>	<b>181.93</b>										<b>82.38</b>	

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Area for UTRG1		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	16.05	1.07	85.00%	38	61	74	80	94.46	12.06	
Industry	0	0	0.25	0	72.00%	38	61	74	80	91.28	0.17	
Residential	0	0	30.35	86.35	38.00%	38	61	74	80	85.87	74.75	
Total Area	134.07										86.98	
Area for UTRG2		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	13.95	5.64	85.00%	38	61	74	80	94.66	16.06	
Residential	0	0	7.39	88.5	38.00%	38	61	74	80	86.55	71.87	
Total Area	115.48										87.93	
Area for UTRG3		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	23.45	0.52	85.00%	38	61	74	80	94.42	13.05	
Industry	0	0	4.27	0	72.00%	38	61	74	80	91.28	2.25	
Residential	0	2.31	92.84	49.98	38.00%	38	61	74	80	84.27	70.55	
Total Area	173.37										85.85	
Area for UTRG4		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	42.98	0	85.00%	38	61	74	80	94.40	28.63	
Residential	0	0	46.36	0	38.00%	38	61	74	80	83.12	27.19	
Industry	0	0	52.36	0	72.00%	38	61	74	80	91.28	33.73	
Total Area	141.7										89.56	
Area for UTRG5		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	48	20.06	18.3	85.00%	38	61	74	80	93.51	39.54	
Residential	0	40.8	45.62	2.43	38.00%	38	61	74	80	79.52	34.59	
Industry	0	1.81	24.19	0	72.00%	38	61	74	80	91.03	11.59	
Roads	0	3.04	0	0	98.00%	98	98	98	98	98.00	1.46	
Total Area	204.25										87.17	

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Area for UTRG6		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Industry	0	0	22.9	0	72.00%	38	61	74	80	91.28	54.15	
Commercial	0	0	4.67	0	85.00%	38	61	74	80	94.40	11.42	
Residential	0	0	11.03	0	38.00%	38	61	74	80	83.12	23.75	
Total Area	38.6										89.33	
Area for UTRG7		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Industry	0	1.3	21.23	0	72.00%	38	61	74	80	91.07	10.28	
Commercial	0	12.66	29.32	0	85.00%	38	61	74	80	93.81	19.72	
Residential	0	54.13	78.72	0	38.00%	38	61	74	80	79.84	53.12	
Roads	0	2.32	0	0	98.00%	98	98	98	98	98.00	1.14	
Total Area	199.68										84.25	
Area for UTRG8		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	16.12	18.41	0	85.00%	38	61	74	80	93.49	18.19	
Public (Airport)	0	19.79	0	0	20.00%	38	61	74	80	68.40	7.63	
Industry	0	0	0.55	0	72.00%	38	61	74	80	91.28	0.28	
Residential	0	0	65.87	0	38.00%	38	61	74	80	83.12	30.85	
Park	0	16.21	31.41	0	5.00%	66	78	85	89	83.39	22.37	
Roads	0	8.41	0.71	0	98.00%	98	98	98	98	98.00	5.04	
Total Area	177.48										84.36	
Area for UTRG9		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Public	0	0	17.48	0	85.00%	38	61	74	80	94.40	18.67	
Residential	0	0	62.76	0	38.00%	38	61	74	80	83.12	59.03	
Park	0	4.03	4.1	0	5.00%	66	78	85	89	82.35	7.58	
Total Area	88.37										85.28	
Area for UTRG10		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Public (Airport)	0	23.53	7.1	0	20.00%	38	61	74	80	70.81	17.92	
Public (School)	0	0	7.35	0	20.00%	38	61	74	80	78.80	4.79	
Commercial	0	0	2.03	0	85.00%	38	61	74	80	94.40	1.58	
Residential	0	0	73.83	0	38.00%	38	61	74	80	83.12	50.70	
Roads	0	5.29	1.91	0	98.00%	98	98	98	98	98.00	5.83	
Total Area	121.04										80.82	

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Area for UTRG11		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	29.31	87.89	0	38.00%	38	61	74	80	81.10	81.10	
Total Area	117.2										81.10	
Area for UTRG12		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	20.71	70.29	0	38.00%	38	61	74	80	81.29	54.25	
Commercial	0	15.62	4.41	0	85.00%	38	61	74	80	92.88	13.64	
Public (Airport)	0	19.45	0.72	0	20.00%	38	61	74	80	68.77	10.17	
Park	0	0	0.94	0	5.00%	66	78	85	89	85.65	0.59	
Roads	0	2.93	1.29	0	98.00%	98	98	98	98	98.00	3.03	
Total Area	136.38										81.68	
Area for UTRG13		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Commercial	0	0	8.03	0.16	85.00%	38	61	74	80	94.42	5.05	
Residential	0	0	117.84	11.71	38.00%	38	61	74	80	83.46	70.54	
Public (School)	0	0	0.95	9.9	20.00%	38	61	74	80	83.18	5.89	
Roads	0	0	3.39	1.29	98.00%	98	98	98	98	98.00	2.99	
Total Area	153.27										84.47	
Area for UTRG14		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	0	118.97	13.26	38.00%	38	61	74	80	83.49	67.22	
Commercial	0	0	20.68	0	85.00%	38	61	74	80	94.40	11.89	
Public (School)	0	0	0.6	2.81	20.00%	38	61	74	80	82.76	1.72	
Roads	0	0	5.98	1.93	98.00%	98	98	98	98	98.00	4.72	
Total Area	164.23										85.55	
Area for UTRG15		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	0	96.58	31.18	38.00%	38	61	74	80	84.03	84.03	
Total Area	127.76										84.03	

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Area for ARROYO1		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Public (Golf)	0	15.09	0	0	20.00%	38	61	74	80	68.40	13.28	
Public (School)	0	2.04	0	0	20.00%	38	61	74	80	68.40	1.79	
Public	0	31.24	0	0	85.00%	38	61	74	80	92.45	37.15	
Commercial	0	24.21	0	0	85.00%	38	61	74	80	92.45	28.79	
Industry	0	5.17	0	0	72.00%	38	61	74	80	87.64	5.83	
Total Area	77.75										86.83	
Area for ARROYO2		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Public	0	19.19	0	0	85.00%	38	61	74	80	92.45	14.36	
Public (School)	0	4.65	0	0	20.00%	38	61	74	80	68.40	2.57	
Commercial	0	51.8	0	0	85.00%	38	61	74	80	92.45	38.77	
Industry	0	1.92	0	0	72.00%	38	61	74	80	87.64	1.36	
Residential	0	39.6	0	0	38.00%	38	61	74	80	75.06	24.06	
Roads	0	6.37	0	0	98.00%	98	98	98	98	98.00	5.05	
Total Area	123.53										86.18	
Area for ARROYO3		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Industry	0	19.14	0	0	72.00%	38	61	74	80	87.64	9.22	
Commercial	0	18.24	8.49	0	85.00%	38	61	74	80	93.07	13.67	
Residential	0	77.38	37.9	0	38.00%	38	61	74	80	77.71	49.22	
Public	0	5.11	2.75	0	85.00%	38	61	74	80	93.13	4.02	
Roads	0	11.44	1.55	0	98.00%	98	98	98	98	98.00	6.99	
Total Area	182										83.12	
Area for ARROYO4		Areas in each Soil Group					Soil Type Curve Numbers					
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D			
Residential	0	109.86	11.96	0	38.00%	38	61	74	80	75.85	57.57	
Industry	0	26.93	0	0	72.00%	38	61	74	80	87.64	14.71	
Commercial	0	7.21	0	0	85.00%	38	61	74	80	92.45	4.15	
Public	0	1.88	0	0	85.00%	38	61	74	80	92.45	1.08	
Roads	0	2.65	0	0	98.00%	98	98	98	98	98.00	1.62	
Total Area	160.49										79.14	

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Area for TRIB1-1		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	35.06	1.11	0	72.00%	38	61	74	80	87.75	28.72		
Public	0	11.75	1.52	0	85.00%	38	61	74	80	92.67	11.13		
Commercial	0	2.73	0	0	85.00%	38	61	74	80	92.45	2.28		
Residential	0	40.36	15.28	0	38.00%	38	61	74	80	77.27	38.91		
Roads	0	2.7	0	0	98.00%	98	98	98	98	98.00	2.39		
<b>Total Area</b>	<b>110.51</b>										<b>83.43</b>		
Area for TRIB1-2		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	0.73	0.63	0	85.00%	38	61	74	80	93.35	1.15		
Residential	0	81.75	13.9	0	38.00%	38	61	74	80	76.23	65.94		
Commercial	0	9.16	1.26	0	85.00%	38	61	74	80	92.69	8.73		
Roads	0	3.14	0	0	98.00%	98	98	98	98	98.00	2.78		
<b>Total Area</b>	<b>110.57</b>										<b>78.61</b>		
Area for TRIB1-3		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	14.76	18.71	0	85.00%	38	61	74	80	93.54	16.25		
Public (School)	0	4.88	2.25	0	20.00%	38	61	74	80	71.68	2.65		
Residential	0	48.8	36.76	0	38.00%	38	61	74	80	78.52	34.88		
Commercial	0	16.4	47.54	0	85.00%	38	61	74	80	93.90	31.17		
Industry	0	0	0.54	0	72.00%	38	61	74	80	91.28	0.26		
Roads	0	1.97	0	0	98.00%	98	98	98	98	98.00	1.00		
<b>Total Area</b>	<b>192.61</b>										<b>86.22</b>		

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Area for TRIB2-1		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Industry	0	3.78	0	0	72.00%	38	61	74	80	87.64	20.77		
Residential	0	12.17	0	0	38.00%	38	61	74	80	75.06	57.27		
<b>Total Area</b>	<b>15.95</b>											<b>78.04</b>	
Area for TRIB2-2		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Residential	0	90.19	13.72	0	38.00%	38	61	74	80	76.12	51.90		
Industry	0	3.81	0	0	72.00%	38	61	74	80	87.64	2.19		
Public	0	7.53	0	0	85.00%	38	61	74	80	92.45	4.57		
Public (School)	0	30	0	0	20.00%	38	61	74	80	68.40	13.46		
Commercial	0	7.16	0	0	85.00%	38	61	74	80	92.45	4.34		
<b>Total Area</b>	<b>152.41</b>											<b>76.47</b>	
Area for TRIB2-3		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	10.75	0	0	85.00%	38	61	74	80	92.45	10.57		
Public (School)	0	7.96	2.02	0	20.00%	38	61	74	80	70.51	7.49		
Residential	0	57.46	0	0	38.00%	38	61	74	80	75.06	45.89		
Commercial	0	0.44	0	0	85.00%	38	61	74	80	92.45	0.43		
Public (Cemetery)	0	15.35	0	0	20.00%	66	78	85	89	82.00	13.39		
<b>Total Area</b>	<b>93.98</b>											<b>77.78</b>	
Area for TRIB2-4		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (School)	0	16.76	15.34	0	20.00%	38	61	74	80	73.37	37.04		
Residential	0	25.98	4.06	0	38.00%	38	61	74	80	76.15	35.98		
Public (Cemetery)	0	1.44	0	0	20.00%	66	78	85	89	82.00	1.86		
<b>Total Area</b>	<b>63.58</b>											<b>74.88</b>	
Area for TRIB2-5		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (School)	0	0.48	0	0	20.00%	38	61	74	80	68.40	0.18		
Residential	0	72.05	42.13	0	38.00%	38	61	74	80	78.03	49.96		
Commercial	0	0	16.69	0	85.00%	38	61	74	80	94.40	8.83		
Public (Cemetery)	0	46.98	0	0	20.00%	66	78	85	89	82.00	21.60		
<b>Total Area</b>	<b>178.33</b>											<b>80.58</b>	

Area for TRIB2-6		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	7.84	26.93	0	85.00%	38	61	74	80	93.96	21.36		
Residential	0	46.2	69.03	0	38.00%	38	61	74	80	79.89	60.18		
Public	0	1.73	1.23	0	85.00%	38	61	74	80	93.26	1.80		
<b>Total Area</b>	<b>152.96</b>										<b>83.35</b>		

Area for TRIB2-7		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	1.43	23.79	0	85.00%	38	61	74	80	94.29	57.59		
Residential	0	0	16.07	0	38.00%	38	61	74	80	83.12	32.35		
<b>Total Area</b>	<b>41.29</b>										<b>89.94</b>		

Area for TRIB3-1		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public (School)	0	26.96	3.42	0	20.00%	38	61	74	80	69.57	19.40		
Commercial	0	1.21	1.72	0	85.00%	38	61	74	80	93.59	2.52		
Residential	0	42.69	30.49	0	38.00%	38	61	74	80	78.42	52.68		
Public (Cemetery)	0	2.45	0	0	20.00%	66	78	85	89	82.00	1.84		
<b>Total Area</b>	<b>108.94</b>										<b>76.44</b>		

Area for TRIB3-2		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Commercial	0	14.26	15.33	0	85.00%	38	61	74	80	93.46	14.63		
Public	0	3.82	0	0	85.00%	38	61	74	80	92.45	1.87		
Public (School)	0	16.84	32.23	0	20.00%	38	61	74	80	75.23	19.53		
Residential	0	41.24	65.32	0	38.00%	38	61	74	80	80.00	45.10		
<b>Total Area</b>	<b>189.04</b>										<b>81.12</b>		

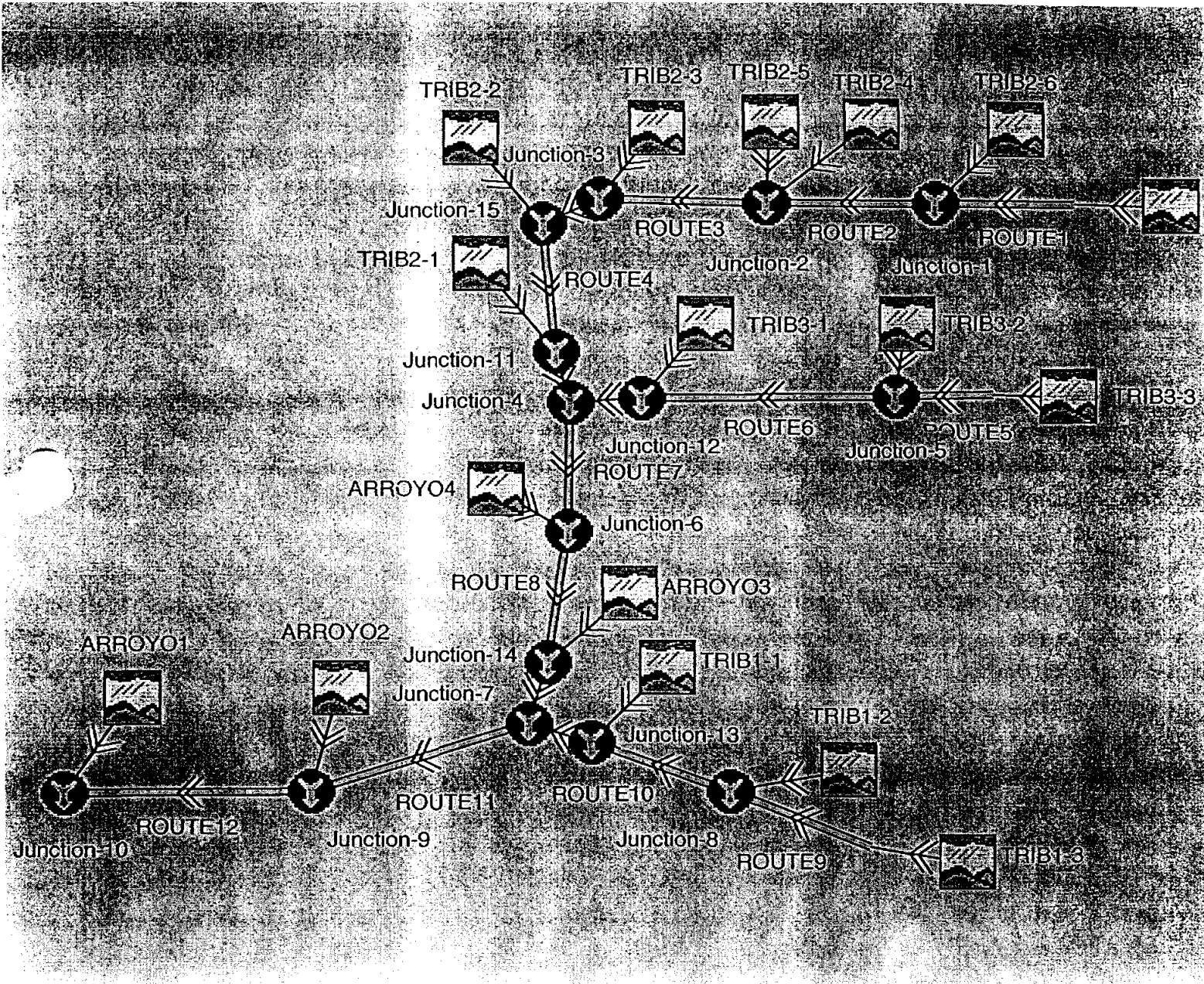
  

Area for TRIB3-3		Areas in each Soil Group					Soil Type Curve Numbers						
	Area A	Area B	Area C	Area D	Per. Imp	A	B	C	D				
Public	0	0.22	0	0	85.00%	38	61	74	80	92.45	0.16		
Commercial	0	37.22	0	0	85.00%	38	61	74	80	92.45	26.50		
Residential	0	92.42	0	0	38.00%	38	61	74	80	75.06	53.42		
<b>Total Area</b>	<b>129.86</b>										<b>80.07</b>		

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**Appendix B**  
**Main Arroyo, Tributary 1, Tributary 2, and Tributary 3**  
**HEC-HMS Summary Printouts**  
**Existing and Future Conditions**  
**2, 5, 10, 25, 50, 100, and 500-year Storm Events**



## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 2 YEAR

Start of Simulation : 10Jun98 1134 Basin Model : EPCREEK  
 End of Simulation : 11Jun98 1800 Precip Model : 2 YEAR STORM  
 Execution Time : 30Jun98 1906 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	35.172	11 Jun 98 0006	3.9109	0.065
ROUTE1	34.990	11 Jun 98 0022	3.9106	0.065
TRIB2-6	79.643	11 Jun 98 0016	10.921	0.239
Junction-1	114.02	11 Jun 98 0018	14.832	0.304
ROUTE2	113.72	11 Jun 98 0036	14.837	0.304
TRIB2-5	33.933	11 Jun 98 0016	5.4125	0.279
TRIB2-4	13.224	10 Jun 98 2400	1.7601	0.099
Junction-2	148.82	11 Jun 98 0034	22.010	0.682
ROUTE3	148.38	11 Jun 98 0040	22.011	0.682
TRIB2-2	23.825	11 Jun 98 0024	4.2314	0.238
TRIB2-3	23.102	11 Jun 98 0014	3.4075	0.147
Junction-3	186.56	11 Jun 98 0038	29.650	1.067
ROUTE4	186.35	11 Jun 98 0038	29.650	1.067
TRIB2-1	7.4900	10 Jun 98 2354	0.72823	0.025
Junction-11	188.82	11 Jun 98 0038	30.378	1.092
TRIB3-3	72.771	10 Jun 98 2356	7.2149	0.203
ROUTE5	72.694	10 Jun 98 2400	7.2184	0.203
TRIB3-2	86.395	11 Jun 98 0006	10.449	0.294
Junction-5	155.35	11 Jun 98 0002	17.668	0.497
ROUTE6	155.02	11 Jun 98 0004	17.669	0.497
TRIB3-1	30.719	10 Jun 98 2358	3.6276	0.170
Junction-12	183.57	11 Jun 98 0004	21.297	0.667
Junction-4	286.05	11 Jun 98 0034	51.675	1.759
ROUTE7	285.23	11 Jun 98 0038	51.677	1.759
ARROYO4	78.216	10 Jun 98 2400	8.3572	0.251
Junction-6	322.59	11 Jun 98 0012	60.034	2.010
ROUTE8	321.84	11 Jun 98 0016	60.031	2.010
ARROYO3	126.89	10 Jun 98 2400	12.978	0.284
Junction-14	420.05	11 Jun 98 0012	73.008	2.294
TRIB1-3	177.62	10 Jun 98 2400	18.110	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9 ✓	177.37	11 Jun 98 0002	18.113	0.301
TRIB1-2	46.130	11 Jun 98 0004	5.3906	0.173
Junction-8 ✓	223.43	11 Jun 98 0002	23.504	0.474
ROUTE10	223.12	11 Jun 98 0004	23.502	0.474
TRIB1-1	98.392	10 Jun 98 2352	8.3393	0.173
Junction-13 ✓	298.11	11 Jun 98 0002	31.842	0.647
Junction-7	696.13	11 Jun 98 0008	104.85	2.941
ROUTE11	694.13	11 Jun 98 0010	104.85	2.941
ARROYO2	124.23	10 Jun 98 2400	12.217	0.193
Junction-9	802.36	11 Jun 98 0008	117.06	3.134
ROUTE12	798.90	11 Jun 98 0012	117.06	3.134
ARROYO1	57.625	11 Jun 98 0020	8.0540	0.121
Junction-10	854.11	11 Jun 98 0012	125.12	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 5 YEAR

Start of Simulation : 10Jun98 1134    Basin Model : EPCREEK  
 End of Simulation : 11Jun98 1800    Precip Model : 5 YEAR STORM  
 Execution Time : 30Jun98 1906    Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	66.580	11 Jun 98 0004	7.8278	0.065
ROUTE1	66.312	11 Jun 98 0016	7.8279	0.065
TRIB2-6	170.95	11 Jun 98 0014	23.772	0.239
Junction-1	236.84	11 Jun 98 0014	31.600	0.304
ROUTE2	236.31	11 Jun 98 0028	31.603	0.304
TRIB2-5	114.04	11 Jun 98 0010	15.724	0.279
TRIB2-4	49.167	10 Jun 98 2356	5.2802	0.099
Junction-2	353.43	11 Jun 98 0024	52.607	0.682
ROUTE3	352.64	11 Jun 98 0028	52.607	0.682
RIB2-2	83.109	11 Jun 98 0016	12.694	0.238
IB2-3	69.774	11 Jun 98 0008	9.2716	0.147
Junction-3	483.20	11 Jun 98 0026	74.572	1.067
ROUTE4	482.39	11 Jun 98 0028	74.572	1.067
TRIB2-1	19.960	10 Jun 98 2352	1.8317	0.025
Junction-11	489.29	11 Jun 98 0028	76.404	1.092
TRIB3-3	173.51	10 Jun 98 2354	17.013	0.203
ROUTE5	172.94	10 Jun 98 2358	17.013	0.203
TRIB3-2	207.75	11 Jun 98 0004	24.639	0.294
Junction-5	372.52	10 Jun 98 2400	41.652	0.497
ROUTE6	371.91	11 Jun 98 0002	41.653	0.497
TRIB3-1	100.42	10 Jun 98 2354	10.167	0.170
Junction-12	461.78	10 Jun 98 2400	51.819	0.667
Junction-4	790.62	11 Jun 98 0008	128.22	1.759
ROUTE7	789.80	11 Jun 98 0012	128.22	1.759
ARROYO4	193.60	10 Jun 98 2358	20.125	0.251
Junction-6	942.08	11 Jun 98 0008	148.34	2.010
ROUTE8	940.64	11 Jun 98 0010	148.32	2.010
RROYO3	267.90	10 Jun 98 2358	28.248	0.284
Junction-14	1166.2	11 Jun 98 0008	176.57	2.294
TRIB1-3	334.15	10 Jun 98 2400	36.249	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	333.26	11 Jun 98 0002	36.249	0.301
TRIB1-2	118.73	10 Jun 98 2400	13.264	0.173
Junction-8	451.48	11 Jun 98 0002	49.513	0.474
ROUTE10	451.48	11 Jun 98 0002	49.513	0.474
TRIB1-1	200.49	10 Jun 98 2352	17.865	0.173
Junction-13	611.44	10 Jun 98 2400	67.379	0.647
Junction-7	1744.0	11 Jun 98 0004	243.95	2.941
ROUTE11	1741.5	11 Jun 98 0006	243.94	2.941
ARROYO2	228.47	10 Jun 98 2358	24.084	0.193
Junction-9	1949.0	11 Jun 98 0004	268.02	3.134
ROUTE12	1946.0	11 Jun 98 0008	267.99	3.134
ARROYO1	106.32	11 Jun 98 0018	15.641	0.121
Junction-10	2044.6	11 Jun 98 0008	283.63	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 10 YEAR

Start of Simulation : 10Jun98 1134    Basin Model    : EPCREEK  
 End of Simulation    : 11Jun98 1800    Precip Model    : 10 YEAR STORM  
 Execution Time        : 30Jun98 1906    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	88.424	11 Jun 98 0004	10.812	0.065
ROUTE1	88.080	11 Jun 98 0016	10.813	0.065
TRIB2-6	237.99	11 Jun 98 0014	33.911	0.239
Junction-1	325.78	11 Jun 98 0014	44.725	0.304
ROUTE2	324.91	11 Jun 98 0026	44.725	0.304
TRIB2-5	183.36	11 Jun 98 0008	24.789	0.279
TRIB2-4	80.112	10 Jun 98 2354	8.4092	0.099
Junction-2	516.05	11 Jun 98 0020	77.923	0.682
ROUTE3	514.45	11 Jun 98 0026	77.904	0.682
TRIB2-2	135.85	11 Jun 98 0014	20.216	0.238
TRIB2-3	108.58	11 Jun 98 0008	14.314	0.147
Junction-3	727.60	11 Jun 98 0022	112.43	1.067
ROUTE4	725.91	11 Jun 98 0024	112.42	1.067
TRIB2-1	29.415	10 Jun 98 2352	2.7535	0.025
Junction-11	736.82	11 Jun 98 0024	115.18	1.092
TRIB3-3	248.88	10 Jun 98 2354	24.993	0.203
ROUTE5	248.00	10 Jun 98 2356	24.993	0.203
TRIB3-2	299.28	11 Jun 98 0004	36.196	0.294
Junction-5	535.55	10 Jun 98 2400	61.189	0.497
ROUTE6	534.06	11 Jun 98 0002	61.189	0.497
TRIB3-1	157.54	10 Jun 98 2354	15.848	0.170
Junction-12	675.49	10 Jun 98 2400	77.037	0.667
Junction-4	1216.4	11 Jun 98 0006	192.22	1.759
ROUTE7	1213.9	11 Jun 98 0010	192.20	1.759
ARROYO4	281.22	10 Jun 98 2356	29.790	0.251
Junction-6	1446.1	11 Jun 98 0006	221.99	2.010
ROUTE8	1443.3	11 Jun 98 0008	221.96	2.010
ARROYO3	369.74	10 Jun 98 2358	40.296	0.284
Junction-14	1770.2	11 Jun 98 0006	262.25	2.294
TRIB1-3	442.41	10 Jun 98 2400	50.070	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	441.61	10 Jun 98 2400	50.069	0.301
TRIB1-2	174.63	10 Jun 98 2400	19.785	0.173
Junction-8	616.24	10 Jun 98 2400	69.854	0.474
ROUTE10	615.45	11 Jun 98 0002	69.852	0.474
TRIB1-1	272.21	10 Jun 98 2352	25.328	0.173
Junction-13	838.63	10 Jun 98 2358	95.180	0.647
Junction-7	2568.9	11 Jun 98 0004	357.43	2.941
ROUTE11	2567.6	11 Jun 98 0004	357.42	2.941
ARROYO2	300.14	10 Jun 98 2358	33.070	0.193
Junction-9	2850.3	11 Jun 98 0004	390.49	3.134
ROUTE12	2839.9	11 Jun 98 0006	390.46	3.134
ARROYO1	140.16	11 Jun 98 0018	21.349	0.121
Junction-10	2967.1	11 Jun 98 0006	411.81	3.255



## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 25 YEAR

Start of Simulation : 10Jun98 1134 Basin Model : EPCREEK  
 End of Simulation : 11Jun98 1800 Precip Model : 25 YEAR STORM EVENT  
 Execution Time : 30Jun98 1907 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	113.59	11 Jun 98 0002	14.394	0.065
ROUTE1	113.12	11 Jun 98 0014	14.395	0.065
TRIB2-6	316.83	11 Jun 98 0012	46.302	0.239
Junction-1	429.46	11 Jun 98 0014	60.697	0.304
ROUTE2	428.55	11 Jun 98 0024	60.695	0.304
TRIB2-5	270.44	11 Jun 98 0008	36.517	0.279
TRIB2-4	119.46	10 Jun 98 2354	12.480	0.099
Junction-2	715.78	11 Jun 98 0018	109.69	0.682
ROUTE3	708.42	11 Jun 98 0028	109.59	0.682
TRIB2-2	202.72	11 Jun 98 0014	30.002	0.238
TRIB2-3	156.61	11 Jun 98 0006	20.763	0.147
Junction-3	1011.5	11 Jun 98 0022	160.36	1.067
ROUTE4	1010.6	11 Jun 98 0024	160.34	1.067
TRIB2-1	41.087	10 Jun 98 2350	3.9149	0.025
Junction-11	1025.2	11 Jun 98 0024	164.25	1.092
TRIB3-3	339.34	10 Jun 98 2354	34.911	0.203
ROUTE5	338.33	10 Jun 98 2356	34.915	0.203
TRIB3-2	409.52	11 Jun 98 0002	50.560	0.294
Junction-5	730.94	10 Jun 98 2358	85.475	0.497
ROUTE6	730.74	10 Jun 98 2400	85.473	0.497
TRIB3-1	228.67	10 Jun 98 2352	23.154	0.170
Junction-12	937.09	10 Jun 98 2358	108.63	0.667
Junction-4	1706.1	11 Jun 98 0006	272.88	1.759
ROUTE7	1704.5	11 Jun 98 0008	272.87	1.759
ARROYO4	386.99	10 Jun 98 2356	41.856	0.251
Junction-6	2027.7	11 Jun 98 0004	314.73	2.010
ROUTE8	2024.5	11 Jun 98 0006	314.70	2.010
ARROYO3	489.69	10 Jun 98 2358	55.020	0.284
Junction-14	2471.0	11 Jun 98 0004	369.72	2.294
TRIB1-3	567.52	10 Jun 98 2400	66.654	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	567.48	10 Jun 98 2400	66.653	0.301
TRIB1-2	242.01	10 Jun 98 2358	27.962	0.173
Junction-8	809.43	10 Jun 98 2400	94.615	0.474
ROUTE10	806.96	11 Jun 98 0002	94.612	0.474
TRIB1-1	357.38	10 Jun 98 2350	34.415	0.173
Junction-13	1104.6	10 Jun 98 2358	129.03	0.647
Junction-7	3535.8	11 Jun 98 0002	498.75	2.941
ROUTE11	3527.2	11 Jun 98 0002	498.74	2.941
ARROYO2	382.91	10 Jun 98 2358	43.816	0.193
Junction-9	3898.1	11 Jun 98 0002	542.56	3.134
ROUTE12	3882.0	11 Jun 98 0006	542.54	3.134
ARROYO1	178.84	11 Jun 98 0016	28.155	0.121
Junction-10	4046.0	11 Jun 98 0006	570.70	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 50 YEAR

Start of Simulation : 10Jun98 1134 Basin Model : EPCREEK  
 End of Simulation : 11Jun98 1800 Precip Model : 50 YEAR STORM EVENT  
 Execution Time : 30Jun98 1907 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	132.68	11 Jun 98 0002	16.781	0.065
ROUTE1	132.17	11 Jun 98 0014	16.786	0.065
TRIB2-6	376.20	11 Jun 98 0012	54.655	0.239
Junction-1	507.47	11 Jun 98 0014	71.441	0.304
ROUTE2	506.21	11 Jun 98 0024	71.439	0.304
TRIB2-5	336.75	11 Jun 98 0006	44.709	0.279
TRIB2-4	149.14	10 Jun 98 2354	15.334	0.099
Junction-2	869.77	11 Jun 98 0016	131.48	0.682
ROUTE3	858.25	11 Jun 98 0026	131.31	0.682
TRIB2-2	253.96	11 Jun 98 0012	36.862	0.238
TRIB2-3	193.06	11 Jun 98 0006	25.236	0.147
Junction-3	1232.3	11 Jun 98 0022	193.41	1.067
ROUTE4	1229.5	11 Jun 98 0026	193.38	1.067
TRIB2-1	49.844	10 Jun 98 2350	4.7128	0.025
Junction-11	1246.5	11 Jun 98 0024	198.10	1.092
TRIB3-3	407.10	10 Jun 98 2354	41.667	0.203
ROUTE5	406.29	10 Jun 98 2356	41.667	0.203
TRIB3-2	492.48	11 Jun 98 0002	60.346	0.294
Junction-5	879.08	10 Jun 98 2358	102.01	0.497
ROUTE6	878.12	10 Jun 98 2400	102.01	0.497
TRIB3-1	282.68	10 Jun 98 2352	28.239	0.170
Junction-12	1134.2	10 Jun 98 2358	130.25	0.667
Junction-4	2081.2	11 Jun 98 0006	328.35	1.759
ROUTE7	2078.7	11 Jun 98 0008	328.33	1.759
ARROYO4	466.31	10 Jun 98 2356	50.099	0.251
Junction-6	2463.5	11 Jun 98 0004	378.43	2.010
ROUTE8	2458.4	11 Jun 98 0006	378.40	2.010
ARROYO3	579.75	10 Jun 98 2358	64.946	0.284
Junction-14	2982.3	11 Jun 98 0004	443.35	2.294
TRIB1-3	662.34	10 Jun 98 2358	77.709	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainag Area (sq mi)
ROUTE9	662.10	10 Jun 98 2400	77.707	0.301
TRIB1-2	293.14	10 Jun 98 2358	33.564	0.173
Junction-8	954.73	10 Jun 98 2400	111.27	0.474
ROUTE10	952.36	10 Jun 98 2400	111.27	0.474
TRIB1-1	421.38	10 Jun 98 2350	40.526	0.173
Junction-13	1305.3	10 Jun 98 2358	151.80	0.647
Junction-7	4233.2	11 Jun 98 0002	595.15	2.941
ROUTE11	4223.1	11 Jun 98 0002	595.12	2.941
ARROYO2	445.29	10 Jun 98 2358	50.965	0.193
Junction-9	4653.9	11 Jun 98 0002	646.09	3.134
ROUTE12	4634.7	11 Jun 98 0006	645.98	3.134
ARROYO1	208.07	11 Jun 98 0016	32.673	0.121
Junction-10	4826.3	11 Jun 98 0006	678.65	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 100 YEAR

Start of Simulation : 10Jun98 1134    Basin Model : EPCREEK  
 End of Simulation : 11Jun98 1800    Precip Model : 100 YEAR STORM  
 Execution Time : 30Jun98 1907    Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	153.30	11 Jun 98 0002	19.845	0.065
ROUTE1	152.77	11 Jun 98 0014	19.843	0.065
TRIB2-6	442.54	11 Jun 98 0012	65.459	0.239
Junction-1	594.31	11 Jun 98 0012	85.302	0.304
ROUTE2	593.20	11 Jun 98 0022	85.300	0.304
TRIB2-5	415.06	11 Jun 98 0006	55.561	0.279
TRIB2-4	183.58	10 Jun 98 2354	19.123	0.099
Junction-2	1047.3	11 Jun 98 0016	159.98	0.682
ROUTE3	1030.9	11 Jun 98 0028	159.74	0.682
TRIB2-2	314.86	11 Jun 98 0012	45.972	0.238
TRIB2-3	235.38	11 Jun 98 0006	31.134	0.147
Junction-3	1473.9	11 Jun 98 0024	236.84	1.067
ROUTE4	1471.0	11 Jun 98 0026	236.81	1.067
TRIB2-1	59.663	10 Jun 98 2350	5.7581	0.025
Junction-11	1490.7	11 Jun 98 0026	242.57	1.092
TRIB3-3	482.23	10 Jun 98 2354	50.468	0.203
ROUTE5	480.67	10 Jun 98 2356	50.467	0.203
TRIB3-2	585.78	11 Jun 98 0002	73.091	0.294
Junction-5	1044.8	10 Jun 98 2358	123.56	0.497
ROUTE6	1042.6	10 Jun 98 2400	123.56	0.497
TRIB3-1	344.73	10 Jun 98 2352	34.958	0.170
Junction-12	1355.5	10 Jun 98 2358	158.51	0.667
Junction-4	2489.4	11 Jun 98 0004	401.08	1.759
ROUTE7	2484.9	11 Jun 98 0006	401.08	1.759
ARROYO4	555.04	10 Jun 98 2356	60.855	0.251
Junction-6	2964.6	11 Jun 98 0004	461.93	2.010
ROUTE8	2955.3	11 Jun 98 0006	461.87	2.010
ARROYO3	678.29	10 Jun 98 2358	77.784	0.284
Junction-14	3572.1	11 Jun 98 0004	539.66	2.294
TRIB1-3	764.20	10 Jun 98 2358	91.899	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainag Area (sq mi)
ROUTE9	763.79	10 Jun 98 2400	91.897	0.301
TRIB1-2	350.97	10 Jun 98 2358	40.889	0.173
Junction-8	1113.5	10 Jun 98 2400	132.79	0.474
ROUTE10	1111.5	10 Jun 98 2400	132.79	0.474
TRIB1-1	490.38	10 Jun 98 2350	48.418	0.173
Junction-13	1523.6	10 Jun 98 2358	181.20	0.647
Junction-7	5027.2	11 Jun 98 0002	720.86	2.941
ROUTE11	5015.3	11 Jun 98 0002	720.87	2.941
ARROYO2	511.71	10 Jun 98 2358	60.129	0.193
Junction-9	5509.9	11 Jun 98 0002	781.00	3.134
ROUTE12	5488.1	11 Jun 98 0004	780.87	3.134
ARROYO1	239.90	11 Jun 98 0016	38.457	0.121
Junction-10	5706.7	11 Jun 98 0006	819.33	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EXISTING 500 YEAR

Start of Simulation : 10Jun98 1134 Basin Model : EPCREEK  
 End of Simulation : 11Jun98 1800 Precip Model : 500 YEAR STORM  
 Execution Time : 30Jun98 1907 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	193.21	11 Jun 98 0002	27.886	0.065
ROUTE1	192.12	11 Jun 98 0014	27.882	0.065
TRIB2-6	571.91	11 Jun 98 0012	94.100	0.239
Junction-1	763.89	11 Jun 98 0012	121.98	0.304
ROUTE2	761.82	11 Jun 98 0020	121.98	0.304
TRIB2-5	583.84	11 Jun 98 0004	85.324	0.279
TRIB2-4	262.64	10 Jun 98 2352	29.551	0.099
Junction-2	1406.2	11 Jun 98 0012	236.85	0.682
ROUTE3	1378.4	11 Jun 98 0032	236.60	0.682
TRIB2-2	446.52	11 Jun 98 0010	71.041	0.238
TRIB2-3	325.98	11 Jun 98 0004	47.200	0.147
Junction-3	1941.5	11 Jun 98 0026	354.85	1.067
ROUTE4	1938.7	11 Jun 98 0028	354.82	1.067
TRIB2-1	81.651	10 Jun 98 2350	8.5799	0.025
Junction-11	1962.2	11 Jun 98 0028	363.40	1.092
TRIB3-3	643.88	10 Jun 98 2352	74.030	0.203
ROUTE5	641.74	10 Jun 98 2356	74.016	0.203
TRIB3-2	777.60	11 Jun 98 0002	107.22	0.294
Junction-5	1398.5	10 Jun 98 2358	181.23	0.497
ROUTE6	1393.5	10 Jun 98 2400	181.23	0.497
TRIB3-1	484.91	10 Jun 98 2352	53.322	0.170
Junction-12	1827.4	10 Jun 98 2356	234.55	0.667
Junction-4	3264.2	11 Jun 98 0002	597.95	1.759
ROUTE7	3254.0	11 Jun 98 0006	597.88	1.759
ARROYO4	744.37	10 Jun 98 2354	89.729	0.251
Junction-6	3897.3	11 Jun 98 0002	687.61	2.010
ROUTE8	3883.8	11 Jun 98 0004	687.52	2.010
ARROYO3	881.68	10 Jun 98 2356	111.82	0.284
Junction-14	4698.0	11 Jun 98 0002	799.33	2.294
TRIB1-3	964.93	10 Jun 98 2358	129.13	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	962.68	10 Jun 98 2400	129.13	0.301
TRIB1-2	473.58	10 Jun 98 2358	60.606	0.173
Junction-8	1433.6	10 Jun 98 2358	189.74	0.474
ROUTE10	1432.5	10 Jun 98 2400	189.73	0.474
TRIB1-1	638.04	10 Jun 98 2350	69.295	0.173
Junction-13	1971.2	10 Jun 98 2356	259.02	0.647
Junction-7	6596.0	10 Jun 98 2400	1058.4	2.941
ROUTE11	6581.7	11 Jun 98 0002	1058.3	2.941
ARROYO2	641.85	10 Jun 98 2356	84.130	0.193
Junction-9	7202.0	10 Jun 98 2400	1142.5	3.134
ROUTE12	7181.5	11 Jun 98 0004	1142.4	3.134
ARROYO1	298.47	11 Jun 98 0016	53.581	0.121
Junction-10	7451.8	11 Jun 98 0004	1195.9	3.255



## HMS \* Summary of Results

Project : EPCREEK

Run Name : EPCRFUT 2 YR

Start of Simulation : 10Jun98 1134 Basin Model : EPCRFUT  
 End of Simulation : 11Jun98 1800 Precip Model : 2 YEAR STORM  
 Execution Time : 01Jul98 1848 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	45.899	11 Jun 98 0004	5.0046	0.065
ROUTE1	45.612	11 Jun 98 0018	5.0038	0.065
TRIB2-6	78.642	11 Jun 98 0016	10.883	0.239
Junction-1	124.13	11 Jun 98 0018	15.887	0.304
ROUTE2	123.68	11 Jun 98 0034	15.890	0.304
TRIB2-5	69.682	11 Jun 98 0010	9.2524	0.279
TRIB2-4	12.940	10 Jun 98 2400	1.7509	0.099
Junction-2	181.09	11 Jun 98 0032	26.894	0.682
ROUTE3	180.78	11 Jun 98 0036	26.895	0.682
RIB2-2	33.680	11 Jun 98 0020	5.4912	0.238
RIB2-3	27.920	11 Jun 98 0012	3.9447	0.147
Junction-3	230.69	11 Jun 98 0034	36.330	1.067
ROUTE4	230.35	11 Jun 98 0036	36.331	1.067
TRIB2-1	7.3642	10 Jun 98 2354	0.72515	0.025
Junction-11	232.91	11 Jun 98 0036	37.056	1.092
TRIB3-3	71.663	10 Jun 98 2356	7.1869	0.203
ROUTE5	71.487	10 Jun 98 2400	7.1870	0.203
TRIB3-2	85.149	11 Jun 98 0006	10.409	0.294
Junction-5	153.01	11 Jun 98 0002	17.596	0.497
ROUTE6	152.68	11 Jun 98 0004	17.597	0.497
TRIB3-1	30.125	10 Jun 98 2358	3.6101	0.170
Junction-12	180.72	11 Jun 98 0004	21.207	0.667
Junction-4	336.11	11 Jun 98 0032	58.263	1.759
ROUTE7	335.27	11 Jun 98 0036	58.267	1.759
ARROYO4	77.019	10 Jun 98 2400	8.3238	0.251
Junction-6	374.90	11 Jun 98 0014	66.591	2.010
ROUTE8	374.16	11 Jun 98 0018	66.590	2.010
ARROYO3	125.15	10 Jun 98 2400	12.933	0.284
Junction-14	465.84	11 Jun 98 0014	79.522	2.294
TRIB1-3	175.36	10 Jun 98 2400	18.055	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	175.12	11 Jun 98 0002	18.058	0.301
TRIB1-2	45.419	11 Jun 98 0004	5.3684	0.173
Junction-8	220.46	11 Jun 98 0002	23.426	0.474
ROUTE10	220.16	11 Jun 98 0004	23.425	0.474
TRIB1-1	96.991	10 Jun 98 2352	8.3110	0.173
Junction-13	294.14	11 Jun 98 0002	31.736	0.647
Junction-7	728.29	11 Jun 98 0008	111.26	2.941
ROUTE11	727.61	11 Jun 98 0010	111.26	2.941
ARROYO2	122.65	10 Jun 98 2400	12.180	0.193
Junction-9	829.13	11 Jun 98 0010	123.44	3.134
ROUTE12	827.82	11 Jun 98 0012	123.44	3.134
ARROYO1	56.980	11 Jun 98 0020	8.0306	0.121
Junction-10	882.42	11 Jun 98 0012	131.47	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EPCRFUT 5 YR

Start of Simulation : 10Jun98 1134 Basin Model : EPCRFUT  
 End of Simulation : 11Jun98 1800 Precip Model : 5 YEAR STORM  
 Execution Time : 01Jul98 1848 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	79.487	11 Jun 98 0004	9.3199	0.065
ROUTE1	79.185	11 Jun 98 0016	9.3225	0.065
TRIB2-6	170.95	11 Jun 98 0014	23.772	0.239
Junction-1	250.01	11 Jun 98 0014	33.095	0.304
ROUTE2	249.32	11 Jun 98 0028	33.095	0.304
TRIB2-5	176.00	11 Jun 98 0008	22.371	0.279
TRIB2-4	49.167	10 Jun 98 2356	5.2802	0.099
Junction-2	411.43	11 Jun 98 0022	60.746	0.682
ROUTE3	410.14	11 Jun 98 0026	60.743	0.682
TRIB2-2	102.75	11 Jun 98 0016	15.011	0.238
TRIB2-3	78.897	11 Jun 98 0008	10.237	0.147
Junction-3	566.86	11 Jun 98 0024	85.991	1.067
ROUTE4	565.93	11 Jun 98 0026	85.988	1.067
TRIB2-1	19.960	10 Jun 98 2352	1.8317	0.025
Junction-11	573.18	11 Jun 98 0026	87.820	1.092
TRIB3-3	173.51	10 Jun 98 2354	17.013	0.203
ROUTE5	172.94	10 Jun 98 2358	17.013	0.203
TRIB3-2	207.75	11 Jun 98 0004	24.639	0.294
Junction-5	372.52	10 Jun 98 2400	41.652	0.497
ROUTE6	371.91	11 Jun 98 0002	41.653	0.497
TRIB3-1	100.42	10 Jun 98 2354	10.167	0.170
Junction-12	461.78	10 Jun 98 2400	51.819	0.667
Junction-4	891.03	11 Jun 98 0008	139.64	1.759
ROUTE7	889.78	11 Jun 98 0012	139.63	1.759
ARROYO4	193.60	10 Jun 98 2358	20.125	0.251
Junction-6	1042.8	11 Jun 98 0008	159.76	2.010
ROUTE8	1040.5	11 Jun 98 0010	159.74	2.010
ARROYO3	267.90	10 Jun 98 2358	28.248	0.284
Junction-14	1264.7	11 Jun 98 0008	187.99	2.294
TRIB1-3	334.15	10 Jun 98 2400	36.249	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	333.26	11 Jun 98 0002	36.249	0.301
TRIB1-2	118.73	10 Jun 98 2400	13.264	0.173
Junction-8	451.48	11 Jun 98 0002	49.513	0.474
ROUTE10	451.48	11 Jun 98 0002	49.513	0.474
TRIB1-1	200.49	10 Jun 98 2352	17.865	0.173
Junction-13	611.44	10 Jun 98 2400	67.379	0.647
Junction-7	1835.7	11 Jun 98 0006	255.37	2.941
ROUTE11	1835.4	11 Jun 98 0006	255.35	2.941
ARROYO2	228.47	10 Jun 98 2358	24.084	0.193
Junction-9	2042.6	11 Jun 98 0006	279.44	3.134
ROUTE12	2037.7	11 Jun 98 0008	279.41	3.134
ARROYO1	106.32	11 Jun 98 0018	15.641	0.121
Junction-10	2136.3	11 Jun 98 0008	295.05	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EPCRFUT 10 YR

Start of Simulation : 10Jun98 1134 Basin Model : EPCRFUT  
 End of Simulation : 11Jun98 1800 Precip Model : 10 YEAR STORM  
 Execution Time : 01Jul98 1848 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	101.80	11 Jun 98 0002	12.500	0.065
ROUTE1	101.39	11 Jun 98 0014	12.500	0.065
TRIB2-6	237.99	11 Jun 98 0014	33.911	0.239
Junction-1	339.38	11 Jun 98 0014	46.411	0.304
ROUTE2	338.36	11 Jun 98 0026	46.410	0.304
TRIB2-5	256.93	11 Jun 98 0006	33.114	0.279
TRIB2-4	80.112	10 Jun 98 2354	8.4092	0.099
Junction-2	587.09	11 Jun 98 0018	87.933	0.682
ROUTE3	584.87	11 Jun 98 0024	87.908	0.682
RIB2-2	160.07	11 Jun 98 0014	23.175	0.238
RIB2-3	119.35	11 Jun 98 0006	15.530	0.147
Junction-3	832.23	11 Jun 98 0020	126.61	1.067
ROUTE4	830.51	11 Jun 98 0024	126.60	1.067
TRIB2-1	29.415	10 Jun 98 2352	2.7535	0.025
Junction-11	841.54	11 Jun 98 0022	129.35	1.092
TRIB3-3	248.88	10 Jun 98 2354	24.993	0.203
ROUTE5	248.00	10 Jun 98 2356	24.993	0.203
TRIB3-2	299.28	11 Jun 98 0004	36.196	0.294
Junction-5	535.55	10 Jun 98 2400	61.189	0.497
ROUTE6	534.06	11 Jun 98 0002	61.189	0.497
TRIB3-1	157.54	10 Jun 98 2354	15.848	0.170
Junction-12	675.49	10 Jun 98 2400	77.037	0.667
Junction-4	1322.4	11 Jun 98 0008	206.39	1.759
ROUTE7	1321.6	11 Jun 98 0010	206.37	1.759
ARROYO4	281.22	10 Jun 98 2356	29.790	0.251
Junction-6	1547.7	11 Jun 98 0006	236.16	2.010
ROUTE8	1544.4	11 Jun 98 0008	236.13	2.010
RROYO3	369.74	10 Jun 98 2358	40.296	0.284
Junction-14	1868.0	11 Jun 98 0006	276.42	2.294
TRIB1-3	442.41	10 Jun 98 2400	50.070	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	441.61	10 Jun 98 2400	50.069	0.301
TRIB1-2	174.63	10 Jun 98 2400	19.785	0.173
Junction-8	616.24	10 Jun 98 2400	69.854	0.474
ROUTE10	615.45	11 Jun 98 0002	69.852	0.474
TRIB1-1	272.21	10 Jun 98 2352	25.328	0.173
Junction-13	838.63	10 Jun 98 2358	95.180	0.647
Junction-7	2663.8	11 Jun 98 0004	371.60	2.941
ROUTE11	2661.4	11 Jun 98 0004	371.58	2.941
ARROYO2	300.14	10 Jun 98 2358	33.070	0.193
Junction-9	2944.1	11 Jun 98 0004	404.65	3.134
ROUTE12	2933.9	11 Jun 98 0006	404.65	3.134
ARROYO1	140.16	11 Jun 98 0018	21.349	0.121
Junction-10	3061.0	11 Jun 98 0006	426.00	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EPCRFUT 25 YR

Start of Simulation : 10Jun98 1134    Basin Model    : EPCRFUT  
 End of Simulation    : 11Jun98 1800    Precip Model    : 25 YEAR STORM EVENT  
 Execution Time        : 01Jul98 1848    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	127.25	11 Jun 98 0002	16.256	0.065
ROUTE1	126.70	11 Jun 98 0014	16.257	0.065
TRIB2-6	316.83	11 Jun 98 0012	46.302	0.239
Junction-1	443.04	11 Jun 98 0014	62.559	0.304
ROUTE2	442.06	11 Jun 98 0024	62.555	0.304
TRIB2-5	354.65	11 Jun 98 0006	46.525	0.279
TRIB2-4	119.46	10 Jun 98 2354	12.480	0.099
Junction-2	798.69	11 Jun 98 0016	121.56	0.682
ROUTE3	788.95	11 Jun 98 0026	121.41	0.682
TRIB2-2	231.07	11 Jun 98 0012	33.616	0.238
TRIB2-3	169.11	11 Jun 98 0006	22.233	0.147
Junction-3	1125.6	11 Jun 98 0022	177.26	1.067
ROUTE4	1123.4	11 Jun 98 0024	177.24	1.067
TRIB2-1	41.087	10 Jun 98 2350	3.9149	0.025
Junction-11	1138.0	11 Jun 98 0024	181.15	1.092
TRIB3-3	339.34	10 Jun 98 2354	34.911	0.203
ROUTE5	338.33	10 Jun 98 2356	34.915	0.203
TRIB3-2	409.52	11 Jun 98 0002	50.560	0.294
Junction-5	730.94	10 Jun 98 2358	85.475	0.497
ROUTE6	730.74	10 Jun 98 2400	85.473	0.497
TRIB3-1	228.67	10 Jun 98 2352	23.154	0.170
Junction-12	937.09	10 Jun 98 2358	108.63	0.667
Junction-4	1825.5	11 Jun 98 0008	289.78	1.759
ROUTE7	1824.3	11 Jun 98 0010	289.78	1.759
ARROYO4	386.99	10 Jun 98 2356	41.856	0.251
Junction-6	2134.7	11 Jun 98 0006	331.64	2.010
ROUTE8	2131.6	11 Jun 98 0008	331.60	2.010
ARROYO3	489.69	10 Jun 98 2358	55.020	0.284
Junction-14	2568.2	11 Jun 98 0004	386.62	2.294
TRIB1-3	567.52	10 Jun 98 2400	66.654	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	567.48	10 Jun 98 2400	66.653	0.301
TRIB1-2	242.01	10 Jun 98 2358	27.962	0.173
Junction-8	809.43	10 Jun 98 2400	94.615	0.474
ROUTE10	806.96	11 Jun 98 0002	94.612	0.474
TRIB1-1	357.38	10 Jun 98 2350	34.415	0.173
Junction-13	1104.6	10 Jun 98 2358	129.03	0.647
Junction-7	3625.1	11 Jun 98 0002	515.65	2.941
ROUTE11	3618.2	11 Jun 98 0004	515.66	2.941
ARROYO2	382.91	10 Jun 98 2358	43.816	0.193
Junction-9	3984.6	11 Jun 98 0002	559.47	3.134
ROUTE12	3972.4	11 Jun 98 0006	559.40	3.134
ARROYO1	178.84	11 Jun 98 0016	28.155	0.121
Junction-10	4136.4	11 Jun 98 0006	587.56	3.255



## HMS \* Summary of Results

Project : EPCREEK

Run Name : EPCRPUT 50 YR

Start of Simulation : 10Jun98 1134    Basin Model    : EPCRPUT  
 End of Simulation    : 11Jun98 1800    Precip Model    : 50 YEAR STORM EVENT  
 Execution Time        : 01Jul98 1848    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	146.57	11 Jun 98 0002	18.736	0.065
ROUTE1	145.97	11 Jun 98 0014	18.736	0.065
TRIB2-6	376.20	11 Jun 98 0012	54.655	0.239
Junction-1	521.47	11 Jun 98 0012	73.391	0.304
ROUTE2	520.08	11 Jun 98 0022	73.388	0.304
TRIB2-5	428.15	11 Jun 98 0006	55.687	0.279
TRIB2-4	149.14	10 Jun 98 2354	15.334	0.099
Junction-2	960.02	11 Jun 98 0016	144.41	0.682
ROUTE3	944.83	11 Jun 98 0028	144.16	0.682
RIB2-2	285.02	11 Jun 98 0012	40.859	0.238
RIB2-3	206.62	11 Jun 98 0006	26.852	0.147
Junction-3	1340.0	11 Jun 98 0024	211.87	1.067
ROUTE4	1337.8	11 Jun 98 0026	211.84	1.067
TRIB2-1	49.844	10 Jun 98 2350	4.7128	0.025
Junction-11	1354.3	11 Jun 98 0026	216.55	1.092
TRIB3-3	407.10	10 Jun 98 2354	41.667	0.203
ROUTE5	406.29	10 Jun 98 2356	41.667	0.203
TRIB3-2	492.48	11 Jun 98 0002	60.346	0.294
Junction-5	879.08	10 Jun 98 2358	102.01	0.497
ROUTE6	878.12	10 Jun 98 2400	102.01	0.497
TRIB3-1	282.68	10 Jun 98 2352	28.239	0.170
Junction-12	1134.2	10 Jun 98 2358	130.25	0.667
Junction-4	2196.6	11 Jun 98 0004	346.81	1.759
ROUTE7	2192.7	11 Jun 98 0008	346.80	1.759
ARROYO4	466.31	10 Jun 98 2356	50.099	0.251
Junction-6	2580.9	11 Jun 98 0004	396.90	2.010
ROUTE8	2573.2	11 Jun 98 0008	396.86	2.010
RROYO3	579.75	10 Jun 98 2358	64.946	0.284
Junction-14	3091.3	11 Jun 98 0004	461.81	2.294
TRIB1-3	662.34	10 Jun 98 2358	77.709	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	662.10	10 Jun 98 2400	77.707	0.301
TRIB1-2	293.14	10 Jun 98 2358	33.564	0.173
Junction-8	954.73	10 Jun 98 2400	111.27	0.474
ROUTE10	952.36	10 Jun 98 2400	111.27	0.474
TRIB1-1	421.38	10 Jun 98 2350	40.526	0.173
Junction-13	1305.3	10 Jun 98 2358	151.80	0.647
Junction-7	4332.3	11 Jun 98 0002	613.60	2.941
ROUTE11	4324.9	11 Jun 98 0004	613.57	2.941
ARROYO2	445.29	10 Jun 98 2358	50.965	0.193
Junction-9	4749.4	11 Jun 98 0002	664.53	3.134
ROUTE12	4735.0	11 Jun 98 0006	664.42	3.134
ARROYO1	208.07	11 Jun 98 0016	32.673	0.121
Junction-10	4926.5	11 Jun 98 0006	697.09	3.255

## HMS \* Summary of Results

Project : EPCREEK

Run Name : EPCRPUT 100 YR

Start of Simulation : 10Jun98 1134    Basin Model    : EPCRPUT  
 End of Simulation    : 11Jun98 1800    Precip Model    : 100 YEAR STORM  
 Execution Time        : 01Jul98 1849    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	166.96	11 Jun 98 0002	21.900	0.065
ROUTE1	166.26	11 Jun 98 0014	21.899	0.065
TRIB2-6	442.54	11 Jun 98 0012	65.459	0.239
Junction-1	608.23	11 Jun 98 0012	87.358	0.304
ROUTE2	606.84	11 Jun 98 0022	87.355	0.304
TRIB2-5	511.48	11 Jun 98 0006	67.643	0.279
TRIB2-4	183.58	10 Jun 98 2354	19.123	0.099
Junction-2	1144.8	11 Jun 98 0014	174.12	0.682
ROUTE3	1125.9	11 Jun 98 0028	173.88	0.682
RIB2-2	348.02	11 Jun 98 0012	50.407	0.238
RIB2-3	249.74	11 Jun 98 0006	32.917	0.147
Junction-3	1614.4	11 Jun 98 0022	257.21	1.067
ROUTE4	1610.8	11 Jun 98 0026	257.18	1.067
TRIB2-1	59.663	10 Jun 98 2350	5.7581	0.025
Junction-11	1630.6	11 Jun 98 0024	262.94	1.092
TRIB3-3	482.23	10 Jun 98 2354	50.468	0.203
ROUTE5	480.67	10 Jun 98 2356	50.467	0.203
TRIB3-2	585.78	11 Jun 98 0002	73.091	0.294
Junction-5	1044.8	10 Jun 98 2358	123.56	0.497
ROUTE6	1042.6	10 Jun 98 2400	123.56	0.497
TRIB3-1	344.73	10 Jun 98 2352	34.958	0.170
Junction-12	1355.5	10 Jun 98 2358	158.51	0.667
Junction-4	2576.8	11 Jun 98 0004	421.45	1.759
ROUTE7	2574.9	11 Jun 98 0006	421.45	1.759
ARROYO4	555.04	10 Jun 98 2356	60.855	0.251
Junction-6	3058.8	11 Jun 98 0002	482.31	2.010
ROUTE8	3049.3	11 Jun 98 0006	482.27	2.010
RROYO3	678.29	10 Jun 98 2358	77.784	0.284
Junction-14	3671.8	11 Jun 98 0004	560.05	2.294
TRIB1-3	764.20	10 Jun 98 2358	91.899	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	763.79	10 Jun 98 2400	91.897	0.301
TRIB1-2	350.97	10 Jun 98 2358	40.889	0.173
Junction-8	1113.5	10 Jun 98 2400	132.79	0.474
ROUTE10	1111.5	10 Jun 98 2400	132.79	0.474
TRIB1-1	490.38	10 Jun 98 2350	48.418	0.173
Junction-13	1523.6	10 Jun 98 2358	181.20	0.647
Junction-7	5129.0	11 Jun 98 0002	741.25	2.941
ROUTE11	5116.2	11 Jun 98 0002	741.25	2.941
ARROYO2	511.71	10 Jun 98 2358	60.129	0.193
Junction-9	5610.9	11 Jun 98 0002	801.38	3.134
ROUTE12	5585.7	11 Jun 98 0006	801.34	3.134
ARROYO1	239.90	11 Jun 98 0016	38.457	0.121
Junction-10	5807.6	11 Jun 98 0006	839.79	3.255

## HMS \* Summary of Results

Project : EPCREEK

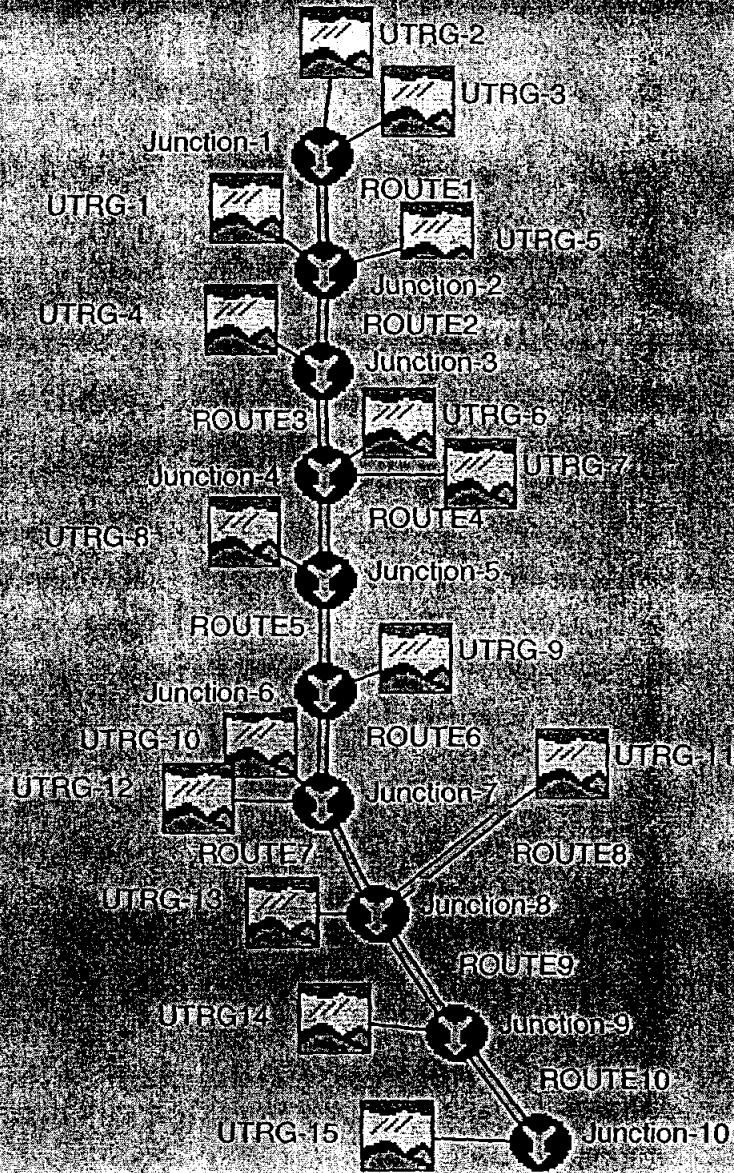
Run Name : EPCRFUT 500 YR

Start of Simulation : 10Jun98 1134    Basin Model : EPCRFUT  
 End of Simulation : 11Jun98 1800    Precip Model : 500 YEAR STORM  
 Execution Time : 01Jul98 1849    Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TRIB2-7	205.10	11 Jun 98 0002	30.134	0.065
ROUTE1	203.96	11 Jun 98 0012	30.129	0.065
TRIB2-6	571.91	11 Jun 98 0012	94.100	0.239
Junction-1	775.87	11 Jun 98 0012	124.23	0.304
ROUTE2	773.89	11 Jun 98 0020	124.22	0.304
TRIB2-5	683.85	11 Jun 98 0004	99.739	0.279
TRIB2-4	262.64	10 Jun 98 2352	29.551	0.099
Junction-2	1506.9	11 Jun 98 0012	253.51	0.682
ROUTE3	1486.1	11 Jun 98 0028	253.49	0.682
TRIB2-2	481.61	11 Jun 98 0010	76.420	0.238
TRIB2-3	341.00	11 Jun 98 0004	49.338	0.147
Junction-3	2127.2	11 Jun 98 0024	379.24	1.067
ROUTE4	2120.6	11 Jun 98 0026	379.21	1.067
TRIB2-1	81.651	10 Jun 98 2350	8.5799	0.025
Junction-11	2145.3	11 Jun 98 0026	387.79	1.092
TRIB3-3	643.88	10 Jun 98 2352	74.030	0.203
ROUTE5	641.74	10 Jun 98 2356	74.016	0.203
TRIB3-2	777.60	11 Jun 98 0002	107.22	0.294
Junction-5	1398.5	10 Jun 98 2358	181.23	0.497
ROUTE6	1393.5	10 Jun 98 2400	181.23	0.497
TRIB3-1	484.91	10 Jun 98 2352	53.322	0.170
Junction-12	1827.4	10 Jun 98 2356	234.55	0.667
Junction-4	3348.9	11 Jun 98 0002	622.34	1.759
ROUTE7	3338.4	11 Jun 98 0006	622.25	1.759
ARROYO4	744.37	10 Jun 98 2354	89.729	0.251
Junction-6	3963.3	11 Jun 98 0002	711.98	2.010
ROUTE8	3951.4	11 Jun 98 0006	711.88	2.010
ARROYO3	881.68	10 Jun 98 2356	111.82	0.284
Junction-14	4756.1	11 Jun 98 0002	823.69	2.294
TRIB1-3	964.93	10 Jun 98 2358	129.13	0.301

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
ROUTE9	962.68	10 Jun 98 2400	129.13	0.301
TRIB1-2	473.58	10 Jun 98 2358	60.606	0.173
Junction-8	1433.6	10 Jun 98 2358	189.74	0.474
ROUTE10	1432.5	10 Jun 98 2400	189.73	0.474
TRIB1-1	638.04	10 Jun 98 2350	69.295	0.173
Junction-13	1971.2	10 Jun 98 2356	259.02	0.647
Junction-7	6651.9	10 Jun 98 2400	1082.7	2.941
ROUTE11	6638.9	11 Jun 98 0002	1082.7	2.941
ARROYO2	641.85	10 Jun 98 2356	84.130	0.193
Junction-9	7260.3	10 Jun 98 2400	1166.8	3.134
ROUTE12	7239.5	11 Jun 98 0004	1166.7	3.134
ARROYO1	298.47	11 Jun 98 0016	53.581	0.121
Junction-10	7509.8	11 Jun 98 0004	1220.3	3.255

**Appendix B**  
**Unnamed Tributary**  
**HEC-HMS Summary Printouts**  
**Existing and Future Conditions**  
**2, 5, 10, 25, 50, 100, and 500-year Storm Events**





## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 2 YEAR

Start of Simulation : 03Jun98 1100 Basin Model : UNMDTRIB  
 End of Simulation : 04Jun98 1200 Precip Model : 2 YEAR STORM  
 Execution Time : 01Jul98 1337 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	36.550	03 Jun 98 2334	4.8500	0.180
UTRG-3	35.484	03 Jun 98 2346	5.7801	0.271
Junction-1	69.403	03 Jun 98 2340	10.630	0.451
ROUTE1	69.284	03 Jun 98 2344	10.631	0.451
UTRG-1	56.347	03 Jun 98 2334	6.9567	0.209
UTRG-5	157.12	03 Jun 98 2328	16.321	0.319
Junction-2	263.11	03 Jun 98 2332	33.908	0.979
ROUTE2	241.96	03 Jun 98 2348	33.641	0.979
UTRG-4	125.93	03 Jun 98 2328	13.293	0.221
Junction-3	333.48	03 Jun 98 2342	46.934	1.200
ROUTE3	324.76	03 Jun 98 2356	46.845	1.200
UTRG-6	42.703	03 Jun 98 2320	3.6091	0.06
UTRG-7	65.334	03 Jun 98 2326	7.7655	0.312
Junction-4	376.30	03 Jun 98 2354	58.220	1.572
ROUTE4	375.64	03 Jun 98 2358	58.212	1.572
UTRG-8	68.212	03 Jun 98 2338	9.2194	0.277
Junction-5	429.51	03 Jun 98 2356	67.431	1.849
ROUTE5	424.40	04 Jun 98 0004	67.283	1.849
UTRG-9	28.150	03 Jun 98 2340	4.0182	0.138
Junction-6	444.97	04 Jun 98 0004	71.301	1.987
ROUTE6	444.19	04 Jun 98 0008	71.267	1.987
UTRG-12	55.597	03 Jun 98 2346	8.0686	0.213
UTRG-10	30.813	03 Jun 98 2352	5.0908	0.189
Junction-7	513.97	04 Jun 98 0006	84.426	2.389
ROUTE7	510.47	04 Jun 98 0014	84.252	2.389
UTRG-11	22.109	03 Jun 98 2334	3.2526	0.183
ROUTE8	21.926	04 Jun 98 0008	3.2517	0.183
UTRG-13	94.970	03 Jun 98 2324	9.6474	0.239
Junction-8	561.86	04 Jun 98 0012	97.151	2.811
ROUTE9	558.40	04 Jun 98 0016	96.993	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	99.587	03 Jun 98 2330	11.041	0.257
Junction-9	594.78	04 Jun 98 0014	108.03	3.068
ROUTE10	588.55	04 Jun 98 0024	107.93	3.068
UTRG-15	46.818	03 Jun 98 2336	6.2297	0.20
Junction-10	609.61	04 Jun 98 0022	114.16	3.268

# HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 5 YEAR

Start of Simulation : 03Jun98 1100 Basin Model : UNMDTRIB  
 End of Simulation : 04Jun98 1200 Precip Model : 5 YEAR STORM  
 Execution Time : 01Jul98 1337 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	101.79	03 Jun 98 2330	12.531	0.180
UTRG-3	111.62	03 Jun 98 2340	16.199	0.271
Junction-1	208.22	03 Jun 98 2336	28.730	0.451
ROUTE1	207.66	03 Jun 98 2340	28.728	0.451
UTRG-1	140.20	03 Jun 98 2330	16.752	0.209
UTRG-5	316.57	03 Jun 98 2326	34.312	0.319
Junction-2	633.27	03 Jun 98 2330	79.792	0.979
ROUTE2	579.23	03 Jun 98 2346	79.413	0.979
UTRG-4	237.19	03 Jun 98 2328	26.606	0.221
Junction-3	755.40	03 Jun 98 2342	106.02	1.200
ROUTE3	740.89	03 Jun 98 2352	105.98	1.200
UTRG-6	79.321	03 Jun 98 2318	7.2237	0.06
UTRG-7	192.51	03 Jun 98 2324	20.628	0.312
Junction-4	874.40	03 Jun 98 2348	133.83	1.572
ROUTE4	871.75	03 Jun 98 2354	133.81	1.572
UTRG-8	169.73	03 Jun 98 2336	22.201	0.277
Junction-5	1006.1	03 Jun 98 2352	156.01	1.849
ROUTE5	989.91	03 Jun 98 2400	155.70	1.849
UTRG-9	74.878	03 Jun 98 2336	10.107	0.138
Junction-6	1042.9	03 Jun 98 2400	165.81	1.987
ROUTE6	1039.7	04 Jun 98 0004	165.73	1.987
UTRG-12	130.19	03 Jun 98 2342	18.637	0.213
UTRG-10	85.084	03 Jun 98 2346	13.153	0.189
Junction-7	1213.3	04 Jun 98 0002	197.52	2.389
ROUTE7	1203.4	04 Jun 98 0008	197.21	2.389
UTRG-11	80.238	03 Jun 98 2328	9.7574	0.183
ROUTE8	79.471	03 Jun 98 2354	9.7554	0.183
UTRG-13	212.48	03 Jun 98 2324	21.839	0.239
Junction-8	1338.9	04 Jun 98 0006	228.80	2.811
ROUTE9	1308.2	04 Jun 98 0016	228.31	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	217.59	03 Jun 98 2328	24.504	0.257
Junction-9	1382.3	04 Jun 98 0014	252.81	3.068
ROUTE10	1376.2	04 Jun 98 0020	252.71	3.068
UTRG-15	120.50	03 Jun 98 2334	15.328	0.20
Junction-10	1427.6	04 Jun 98 0018	268.04	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 10 YEAR

Start of Simulation : 03Jun98 1100    Basin Model    : UNMDTRIB  
 End of Simulation    : 04Jun98 1200    Precip Model    : 10 YEAR STORM  
 Execution Time        : 01Jul98 1337    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	154.15	03 Jun 98 2330	19.010	0.180
UTRG-3	176.36	03 Jun 98 2338	25.252	0.271
Junction-1	323.51	03 Jun 98 2334	44.262	0.451
ROUTE1	322.78	03 Jun 98 2338	44.260	0.451
UTRG-1	204.26	03 Jun 98 2330	24.797	0.209
UTRG-5	429.40	03 Jun 98 2326	48.303	0.319
Junction-2	919.85	03 Jun 98 2330	117.36	0.979
ROUTE2	847.90	03 Jun 98 2344	117.05	0.979
UTRG-4	314.33	03 Jun 98 2326	36.751	0.221
Junction-3	1091.7	03 Jun 98 2340	153.81	1.200
ROUTE3	1073.0	03 Jun 98 2348	153.87	1.200
UTRG-6	104.40	03 Jun 98 2318	9.9780	0.06
UTRG-7	294.00	03 Jun 98 2322	31.588	0.312
Junction-4	1280.8	03 Jun 98 2346	195.43	1.572
ROUTE4	1277.8	03 Jun 98 2350	195.33	1.572
UTRG-8	248.17	03 Jun 98 2334	32.863	0.277
Junction-5	1487.2	03 Jun 98 2348	228.19	1.849
ROUTE5	1458.8	03 Jun 98 2358	227.94	1.849
UTRG-9	112.07	03 Jun 98 2336	15.193	0.138
Junction-6	1539.1	03 Jun 98 2356	243.13	1.987
ROUTE6	1531.2	04 Jun 98 0002	242.97	1.987
UTRG-12	186.81	03 Jun 98 2340	27.174	0.213
UTRG-10	129.27	03 Jun 98 2344	19.954	0.189
Junction-7	1785.5	03 Jun 98 2400	290.10	2.389
ROUTE7	1747.0	04 Jun 98 0012	289.35	2.389
UTRG-11	130.99	03 Jun 98 2326	15.540	0.183
ROUTE8	129.90	03 Jun 98 2350	15.535	0.183
UTRG-13	299.10	03 Jun 98 2322	31.609	0.239
Junction-8	1928.4	04 Jun 98 0010	336.49	2.811
ROUTE9	1907.8	04 Jun 98 0016	336.59	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	303.49	03 Jun 98 2326	35.208	0.257
Junction-9	2009.3	04 Jun 98 0014	371.80	3.068
ROUTE10	2001.9	04 Jun 98 0018	371.69	3.068
UTRG-15	177.94	03 Jun 98 2332	22.864	0.20
Junction-10	2076.0	04 Jun 98 0018	394.56	3.268

HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 25 YEAR

Start of Simulation : 03Jun98 1100 Basin Model : UNMDTRIB  
 End of Simulation : 04Jun98 1200 Precip Model : 25 YEAR STORM  
 Execution Time : 01Jul98 1338 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	217.74	03 Jun 98 2330	27.214	0.180
UTRG-3	257.14	03 Jun 98 2338	36.892	0.271
Junction-1	465.71	03 Jun 98 2334	64.106	0.451
ROUTE1	465.05	03 Jun 98 2336	64.102	0.451
UTRG-1	281.54	03 Jun 98 2328	34.841	0.209
UTRG-5	561.52	03 Jun 98 2324	65.271	0.319
Junction-2	1264.3	03 Jun 98 2330	164.21	0.979
ROUTE2	1199.2	03 Jun 98 2340	164.52	0.979
UTRG-4	404.25	03 Jun 98 2326	48.924	0.221
Junction-3	1534.4	03 Jun 98 2338	213.45	1.200
ROUTE3	1500.7	03 Jun 98 2344	213.46	1.200
UTRG-6	133.67	03 Jun 98 2318	13.283	0.06
UTRG-7	419.64	03 Jun 98 2322	45.537	0.312
Junction-4	1809.2	03 Jun 98 2342	272.28	1.572
ROUTE4	1804.3	03 Jun 98 2346	272.17	1.572
UTRG-8	342.49	03 Jun 98 2334	46.172	0.277
Junction-5	2107.0	03 Jun 98 2344	318.35	1.849
ROUTE5	2074.6	03 Jun 98 2352	318.57	1.849
UTRG-9	157.10	03 Jun 98 2334	21.600	0.138
Junction-6	2199.1	03 Jun 98 2352	340.17	1.987
ROUTE6	2185.0	03 Jun 98 2356	339.97	1.987
UTRG-12	254.37	03 Jun 98 2340	37.738	0.213
UTRG-10	183.38	03 Jun 98 2344	28.564	0.189
Junction-7	2566.5	03 Jun 98 2356	406.27	2.389
ROUTE7	2450.3	04 Jun 98 0010	404.53	2.389
UTRG-11	195.35	03 Jun 98 2326	23.062	0.183
ROUTE8	193.61	03 Jun 98 2346	23.051	0.183
UTRG-13	402.23	03 Jun 98 2322	43.647	0.239
Junction-8	2696.4	04 Jun 98 0008	471.23	2.811
ROUTE9	2668.6	04 Jun 98 0014	471.38	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	405.98	03 Jun 98 2326	48.342	0.257
Junction-9	2804.3	04 Jun 98 0014	519.72	3.068
ROUTE10	2791.5	04 Jun 98 0018	519.79	3.068
UTRG-15	247.44	03 Jun 98 2332	32.314	0.20
Junction-10	2892.9	04 Jun 98 0016	552.11	3.268



## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 50 YEAR

Start of Simulation : 03Jun98 1100 Basin Model : UNMDTRIB  
 End of Simulation : 04Jun98 1200 Precip Model : 50 YEAR STORM  
 Execution Time : 01Jul98 1338 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	266.06	03 Jun 98 2328	32.870	0.180
UTRG-3	318.53	03 Jun 98 2336	44.995	0.271
Junction-1	573.62	03 Jun 98 2332	77.864	0.451
ROUTE1	572.85	03 Jun 98 2336	77.859	0.451
UTRG-1	339.87	03 Jun 98 2328	41.702	0.209
UTRG-5	661.29	03 Jun 98 2324	76.656	0.319
Junction-2	1523.5	03 Jun 98 2330	196.22	0.979
ROUTE2	1453.9	03 Jun 98 2338	196.72	0.979
UTRG-4	471.89	03 Jun 98 2326	57.038	0.221
Junction-3	1859.2	03 Jun 98 2336	253.76	1.200
ROUTE3	1819.7	03 Jun 98 2342	253.74	1.200
UTRG-6	155.62	03 Jun 98 2318	15.486	0.06
UTRG-7	514.10	03 Jun 98 2322	55.183	0.312
Junction-4	2213.0	03 Jun 98 2340	324.41	1.572
ROUTE4	2207.1	03 Jun 98 2344	324.38	1.572
UTRG-8	413.47	03 Jun 98 2334	55.266	0.277
Junction-5	2585.7	03 Jun 98 2342	379.64	1.849
ROUTE5	2548.1	03 Jun 98 2350	379.50	1.849
UTRG-9	191.27	03 Jun 98 2334	26.004	0.138
Junction-6	2707.8	03 Jun 98 2348	405.50	1.987
ROUTE6	2692.3	03 Jun 98 2354	405.32	1.987
UTRG-12	305.15	03 Jun 98 2340	44.918	0.213
UTRG-10	224.24	03 Jun 98 2344	34.502	0.189
Junction-7	3173.3	03 Jun 98 2352	484.74	2.389
ROUTE7	3033.8	04 Jun 98 0008	483.50	2.389
UTRG-11	244.09	03 Jun 98 2326	28.335	0.183
ROUTE8	241.77	03 Jun 98 2344	28.323	0.183
UTRG-13	479.48	03 Jun 98 2322	51.805	0.239
Junction-8	3344.1	04 Jun 98 0006	563.63	2.811
ROUTE9	3297.1	04 Jun 98 0012	563.98	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	482.84	03 Jun 98 2326	57.220	0.257
Junction-9	3464.8	04 Jun 98 0010	621.20	3.068
ROUTE10	3447.3	04 Jun 98 0014	621.16	3.068
UTRG-15	299.77	03 Jun 98 2332	38.789	0.20
Junction-10	3575.8	04 Jun 98 0014	659.94	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 100 YEAR

Start of Simulation : 03Jun98 1100 Basin Model : UNMDTRIB  
 End of Simulation : 04Jun98 1200 Precip Model : 100 YEAR STORM  
 Execution Time : 01Jul98 1338 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	321.59	03 Jun 98 2328	40.293	0.180
UTRG-3	390.93	03 Jun 98 2336	55.701	0.271
Junction-1	699.76	03 Jun 98 2332	95.994	0.451
ROUTE1	698.28	03 Jun 98 2336	95.991	0.451
UTRG-1	405.79	03 Jun 98 2328	50.655	0.209
UTRG-5	769.90	03 Jun 98 2324	91.335	0.319
Junction-2	1816.7	03 Jun 98 2328	237.98	0.979
ROUTE2	1743.7	03 Jun 98 2338	238.56	0.979
UTRG-4	544.67	03 Jun 98 2326	67.454	0.221
Junction-3	2220.9	03 Jun 98 2336	306.01	1.200
ROUTE3	2179.9	03 Jun 98 2342	305.89	1.200
UTRG-6	178.83	03 Jun 98 2318	18.314	0.06
UTRG-7	621.88	03 Jun 98 2322	67.874	0.312
Junction-4	2669.3	03 Jun 98 2338	392.08	1.572
ROUTE4	2663.6	03 Jun 98 2342	392.03	1.572
UTRG-8	494.08	03 Jun 98 2334	67.132	0.277
Junction-5	3128.0	03 Jun 98 2340	459.16	1.849
ROUTE5	3086.5	03 Jun 98 2346	459.37	1.849
UTRG-9	230.52	03 Jun 98 2334	31.772	0.138
Junction-6	3290.4	03 Jun 98 2346	491.15	1.987
ROUTE6	3268.3	03 Jun 98 2352	490.96	1.987
UTRG-12	362.70	03 Jun 98 2340	54.250	0.213
UTRG-10	272.06	03 Jun 98 2342	42.294	0.189
Junction-7	3862.8	03 Jun 98 2350	587.51	2.389
ROUTE7	3727.6	04 Jun 98 0004	587.39	2.389
UTRG-11	301.21	03 Jun 98 2324	35.338	0.183
ROUTE8	299.10	03 Jun 98 2344	35.322	0.183
UTRG-13	564.70	03 Jun 98 2322	62.392	0.239
Junction-8	4139.1	04 Jun 98 0002	685.10	2.811
ROUTE9	4071.6	04 Jun 98 0006	685.72	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	567.84	03 Jun 98 2326	68.720	0.257
Junction-9	4296.6	04 Jun 98 0006	754.44	3.068
ROUTE10	4271.8	04 Jun 98 0010	754.28	3.068
UTRG-15	359.34	03 Jun 98 2332	47.254	0.20
Junction-10	4438.8	04 Jun 98 0010	801.53	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : EXISTING 500 YEAR

Start of Simulation : 03Jun98 1100

Basin Model : UNMDTRIB

End of Simulation : 04Jun98 1200

Precip Model : 500 YEAR STORM EVENT

Execution Time : 01Jul98 1338

Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	439.16	03 Jun 98 2328	60.390	0.180
UTRG-3	544.80	03 Jun 98 2334	84.945	0.271
Junction-1	967.34	03 Jun 98 2332	145.34	0.451
ROUTE1	965.33	03 Jun 98 2334	145.31	0.451
UTRG-1	542.31	03 Jun 98 2328	74.686	0.209
UTRG-5	988.14	03 Jun 98 2324	130.08	0.319
Junction-2	2419.2	03 Jun 98 2328	350.07	0.979
ROUTE2	2329.1	03 Jun 98 2336	350.52	0.979
UTRG-4	686.66	03 Jun 98 2326	94.778	0.221
Junction-3	2944.9	03 Jun 98 2334	445.30	1.200
ROUTE3	2855.7	03 Jun 98 2342	444.51	1.200
UTRG-6	226.58	03 Jun 98 2318	25.734	0.06
UTRG-7	858.89	03 Jun 98 2320	102.34	0.312
Junction-4	3488.4	03 Jun 98 2338	572.59	1.572
ROUTE4	3480.5	03 Jun 98 2340	572.45	1.572
UTRG-8	660.84	03 Jun 98 2332	98.972	0.277
Junction-5	4100.6	03 Jun 98 2340	671.42	1.849
ROUTE5	4066.5	03 Jun 98 2344	671.39	1.849
UTRG-9	311.80	03 Jun 98 2332	47.334	0.138
Junction-6	4345.9	03 Jun 98 2344	718.72	1.987
ROUTE6	4321.3	03 Jun 98 2348	718.28	1.987
UTRG-12	478.22	03 Jun 98 2338	79.150	0.213
UTRG-10	370.65	03 Jun 98 2342	63.370	0.189
Junction-7	5126.7	03 Jun 98 2348	860.80	2.389
ROUTE7	5015.4	03 Jun 98 2358	860.77	2.389
UTRG-11	429.49	03 Jun 98 2324	54.607	0.183
ROUTE8	425.03	03 Jun 98 2342	54.572	0.183
UTRG-13	742.01	03 Jun 98 2322	90.591	0.239
Junction-8	5603.7	03 Jun 98 2356	1005.9	2.811
ROUTE9	5530.5	04 Jun 98 0002	1006.0	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	740.42	03 Jun 98 2326	99.277	0.257
Junction-9	5852.6	03 Jun 98 2400	1105.3	3.068
ROUTE10	5823.3	04 Jun 98 0004	1104.7	3.068
UTRG-15	484.00	03 Jun 98 2330	70.033	0.20
Junction-10	6073.5	04 Jun 98 0002	1174.8	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : FUTURE 2 YR.

Start of Simulation : 03Jun98 1100 Basin Model : UNMDFUT  
 End of Simulation : 04Jun98 1200 Precip Model : 2 YEAR STORM  
 Execution Time : 01Jul98 1735 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	99.534	03 Jun 98 2330	10.794	0.180
UTRG-3	107.89	03 Jun 98 2338	13.817	0.271
Junction-1	202.49	03 Jun 98 2334	24.611	0.451
ROUTE1	201.91	03 Jun 98 2338	24.609	0.451
UTRG-1	101.78	03 Jun 98 2330	11.230	0.209
UTRG-5	198.98	03 Jun 98 2326	20.126	0.319
Junction-2	483.55	03 Jun 98 2332	55.966	0.979
ROUTE2	440.19	03 Jun 98 2346	55.572	0.979
UTRG-4	155.62	03 Jun 98 2328	16.196	0.221
Junction-3	549.57	03 Jun 98 2344	71.768	1.200
ROUTE3	533.76	03 Jun 98 2356	71.605	1.200
UTRG-6	50.003	03 Jun 98 2318	4.1848	0.06
UTRG-7	155.62	03 Jun 98 2322	14.985	0.312
Junction-4	616.86	03 Jun 98 2352	90.774	1.572
ROUTE4	615.05	03 Jun 98 2358	90.727	1.572
UTRG-8	100.45	03 Jun 98 2336	12.609	0.277
Junction-5	686.18	03 Jun 98 2356	103.34	1.849
ROUTE5	677.41	04 Jun 98 0006	103.08	1.849
UTRG-9	52.578	03 Jun 98 2336	6.6269	0.138
Junction-6	710.31	04 Jun 98 0004	109.71	1.987
ROUTE6	708.88	04 Jun 98 0008	109.66	1.987
UTRG-12	54.855	03 Jun 98 2346	8.0377	0.213
UTRG-10	39.858	03 Jun 98 2350	6.2636	0.189
Junction-7	783.62	04 Jun 98 0006	123.97	2.389
ROUTE7	777.81	04 Jun 98 0014	123.72	2.389
UTRG-11	53.050	03 Jun 98 2328	6.0669	0.183
ROUTE8	52.504	03 Jun 98 2356	6.0661	0.183
UTRG-13	101.44	03 Jun 98 2324	10.231	0.239
Junction-8	849.56	04 Jun 98 0012	140.02	2.811
ROUTE9	823.18	04 Jun 98 0024	139.37	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	121.78	03 Jun 98 2328	13.105	0.257
Junction-9	858.85	04 Jun 98 0022	152.47	3.068
ROUTE10	856.15	04 Jun 98 0028	152.62	3.068
UTRG-15	69.799	03 Jun 98 2334	8.5609	0.20
Junction-10	881.49	04 Jun 98 0026	161.18	3.268



## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : FUTURE 5 YR.

Start of Simulation : 03Jun98 1100 Basin Model : UNMDFUT  
 End of Simulation : 04Jun98 1200 Precip Model : 5 YEAR STORM  
 Execution Time : 01Jul98 1735 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	190.25	03 Jun 98 2328	21.670	0.180
UTRG-3	222.54	03 Jun 98 2336	29.145	0.271
Junction-1	404.64	03 Jun 98 2332	50.815	0.451
ROUTE1	403.54	03 Jun 98 2336	50.813	0.451
UTRG-1	203.66	03 Jun 98 2328	23.320	0.209
UTRG-5	370.38	03 Jun 98 2326	39.796	0.319
Junction-2	949.64	03 Jun 98 2330	113.93	0.979
ROUTE2	873.12	03 Jun 98 2344	113.63	0.979
UTRG-4	273.90	03 Jun 98 2326	30.612	0.221
Junction-3	1083.4	03 Jun 98 2340	144.24	1.200
ROUTE3	1064.0	03 Jun 98 2348	144.25	1.200
UTRG-6	88.479	03 Jun 98 2318	8.0290	0.06
UTRG-7	324.95	03 Jun 98 2322	32.210	0.312
Junction-4	1264.5	03 Jun 98 2346	184.49	1.572
ROUTE4	1261.0	03 Jun 98 2350	184.42	1.572
UTRG-8	217.38	03 Jun 98 2334	27.542	0.277
Junction-5	1441.8	03 Jun 98 2348	211.96	1.849
ROUTE5	1411.9	03 Jun 98 2358	211.83	1.849
UTRG-9	111.27	03 Jun 98 2334	14.245	0.138
Junction-6	1488.0	03 Jun 98 2358	226.08	1.987
ROUTE6	1479.2	04 Jun 98 0002	225.93	1.987
UTRG-12	130.19	03 Jun 98 2342	18.637	0.213
UTRG-10	100.57	03 Jun 98 2346	15.144	0.189
Junction-7	1665.7	04 Jun 98 0002	259.71	2.389
ROUTE7	1632.7	04 Jun 98 0012	259.09	2.389
UTRG-11	133.63	03 Jun 98 2326	14.669	0.183
ROUTE8	132.35	03 Jun 98 2348	14.664	0.183
UTRG-13	223.05	03 Jun 98 2322	22.788	0.239
Junction-8	1787.1	04 Jun 98 0010	296.54	2.811
ROUTE9	1766.4	04 Jun 98 0016	296.59	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	248.37	03 Jun 98 2328	27.643	0.257
Junction-9	1845.8	04 Jun 98 0016	324.24	3.068
ROUTE10	1840.2	04 Jun 98 0020	324.05	3.068
UTRG-15	155.25	03 Jun 98 2332	19.068	0.20
Junction-10	1901.0	04 Jun 98 0018	343.12	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : FUTURE 10 YR.

Start of Simulation : 03Jun98 1100    Basin Model : UNMDFUT  
 End of Simulation : 04Jun98 1200    Precip Model : 10 YEAR STORM  
 Execution Time : 01Jul98 1736    Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	252.48	03 Jun 98 2328	29.933	0.180
UTRG-3	304.05	03 Jun 98 2336	41.029	0.271
Junction-1	546.40	03 Jun 98 2332	70.962	0.451
ROUTE1	545.23	03 Jun 98 2334	70.957	0.451
UTRG-1	274.96	03 Jun 98 2328	32.630	0.209
UTRG-5	486.78	03 Jun 98 2324	54.643	0.319
Junction-2	1272.0	03 Jun 98 2330	158.23	0.979
ROUTE2	1207.1	03 Jun 98 2340	158.58	0.979
UTRG-4	352.83	03 Jun 98 2326	41.296	0.221
Junction-3	1498.5	03 Jun 98 2338	199.88	1.200
ROUTE3	1464.6	03 Jun 98 2344	199.92	1.200
UTRG-6	113.80	03 Jun 98 2318	10.895	0.06
UTRG-7	443.31	03 Jun 98 2322	45.666	0.312
Junction-4	1763.0	03 Jun 98 2342	256.48	1.572
ROUTE4	1758.2	03 Jun 98 2346	256.43	1.572
UTRG-8	301.77	03 Jun 98 2334	39.288	0.277
Junction-5	2022.9	03 Jun 98 2344	295.72	1.849
ROUTE5	1990.0	03 Jun 98 2352	295.78	1.849
UTRG-9	153.44	03 Jun 98 2334	20.196	0.138
Junction-6	2108.6	03 Jun 98 2352	315.98	1.987
ROUTE6	2092.0	03 Jun 98 2358	315.76	1.987
UTRG-12	186.81	03 Jun 98 2340	27.174	0.213
UTRG-10	147.64	03 Jun 98 2344	22.417	0.189
Junction-7	2383.9	03 Jun 98 2356	365.35	2.389
ROUTE7	2285.2	04 Jun 98 0010	363.97	2.389
UTRG-11	193.96	03 Jun 98 2326	21.713	0.183
ROUTE8	192.49	03 Jun 98 2346	21.704	0.183
UTRG-13	310.78	03 Jun 98 2322	32.743	0.239
Junction-8	2501.7	04 Jun 98 0008	418.42	2.811
ROUTE9	2475.1	04 Jun 98 0014	418.78	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	337.83	03 Jun 98 2326	38.914	0.257
Junction-9	2586.9	04 Jun 98 0014	457.70	3.068
ROUTE10	2573.1	04 Jun 98 0018	457.74	3.068
UTRG-15	217.41	03 Jun 98 2332	27.398	0.20
Junction-10	2658.1	04 Jun 98 0018	485.14	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : FUTURE 25 YR.

Start of Simulation : 03Jun98 1100    Basin Model    : UNMDFUT  
 End of Simulation    : 04Jun98 1200    Precip Model    : 25 YEAR STORM  
 Execution Time        : 01Jul98 1736    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	324.31	03 Jun 98 2328	39.847	0.180
UTRG-3	398.69	03 Jun 98 2334	55.441	0.271
Junction-1	710.62	03 Jun 98 2332	95.288	0.451
ROUTE1	709.59	03 Jun 98 2334	95.278	0.451
UTRG-1	357.81	03 Jun 98 2328	43.881	0.209
UTRG-5	621.83	03 Jun 98 2324	72.400	0.319
Junction-2	1645.0	03 Jun 98 2328	211.56	0.979
ROUTE2	1575.3	03 Jun 98 2338	212.14	0.979
UTRG-4	443.08	03 Jun 98 2326	53.955	0.221
Junction-3	1958.2	03 Jun 98 2336	266.10	1.200
ROUTE3	1919.9	03 Jun 98 2342	266.03	1.200
UTRG-6	143.14	03 Jun 98 2318	14.301	0.06
UTRG-7	582.58	03 Jun 98 2320	62.050	0.312
Junction-4	2338.1	03 Jun 98 2340	342.38	1.572
ROUTE4	2331.7	03 Jun 98 2342	342.36	1.572
UTRG-8	400.87	03 Jun 98 2332	53.642	0.277
Junction-5	2702.1	03 Jun 98 2342	396.00	1.849
ROUTE5	2665.2	03 Jun 98 2348	395.85	1.849
UTRG-9	202.65	03 Jun 98 2334	27.441	0.138
Junction-6	2834.3	03 Jun 98 2348	423.29	1.987
ROUTE6	2816.6	03 Jun 98 2352	423.14	1.987
UTRG-12	254.37	03 Jun 98 2340	37.738	0.213
UTRG-10	204.09	03 Jun 98 2342	31.495	0.189
Junction-7	3240.6	03 Jun 98 2352	492.37	2.389
ROUTE7	3105.1	04 Jun 98 0006	491.40	2.389
UTRG-11	267.31	03 Jun 98 2324	30.508	0.183
ROUTE8	265.05	03 Jun 98 2344	30.492	0.183
UTRG-13	414.74	03 Jun 98 2322	44.958	0.239
Junction-8	3410.0	04 Jun 98 0004	566.84	2.811
ROUTE9	3360.8	04 Jun 98 0010	567.42	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	442.39	03 Jun 98 2326	52.585	0.257
Junction-9	3517.9	04 Jun 98 0010	620.00	3.068
ROUTE10	3496.2	04 Jun 98 0014	619.96	3.068
UTRG-15	290.63	03 Jun 98 2330	37.618	0.20
Junction-10	3616.9	04 Jun 98 0014	657.58	3.268

HMS \* Summary of Results

Project : UNMDTRIB

Run Name : FUTURE 50 YR.

Start of Simulation : 03Jun98 1100 Basin Model : UNMDFUT  
 End of Simulation : 04Jun98 1200 Precip Model : 50 YEAR STORM  
 Execution Time : 01Jul98 1736 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	378.46	03 Jun 98 2328	46.456	0.180
UTRG-3	470.32	03 Jun 98 2334	65.113	0.271
Junction-1	834.27	03 Jun 98 2332	111.57	0.451
ROUTE1	833.16	03 Jun 98 2334	111.55	0.451
UTRG-1	420.12	03 Jun 98 2328	51.414	0.209
UTRG-5	723.48	03 Jun 98 2324	84.213	0.319
Junction-2	1922.5	03 Jun 98 2328	247.18	0.979
ROUTE2	1846.8	03 Jun 98 2338	247.79	0.979
UTRG-4	511.43	03 Jun 98 2326	62.328	0.221
Junction-3	2295.4	03 Jun 98 2336	310.12	1.200
ROUTE3	2253.6	03 Jun 98 2342	310.00	1.200
UTRG-6	165.24	03 Jun 98 2318	16.558	0.06
UTRG-7	687.79	03 Jun 98 2320	73.068	0.312
Junction-4	2767.5	03 Jun 98 2338	399.63	1.572
ROUTE4	2757.5	03 Jun 98 2342	399.60	1.572
UTRG-8	475.73	03 Jun 98 2332	63.321	0.277
Junction-5	3208.1	03 Jun 98 2340	462.93	1.849
ROUTE5	3169.4	03 Jun 98 2346	463.39	1.849
UTRG-9	239.65	03 Jun 98 2334	32.315	0.138
Junction-6	3377.4	03 Jun 98 2346	495.70	1.987
ROUTE6	3356.5	03 Jun 98 2350	495.56	1.987
UTRG-12	305.15	03 Jun 98 2340	44.918	0.213
UTRG-10	246.79	03 Jun 98 2342	37.700	0.189
Junction-7	3877.8	03 Jun 98 2350	578.18	2.389
ROUTE7	3746.5	04 Jun 98 0002	578.08	2.389
UTRG-11	322.41	03 Jun 98 2324	36.516	0.183
ROUTE8	319.33	03 Jun 98 2342	36.498	0.183
UTRG-13	492.63	03 Jun 98 2322	53.214	0.239
Junction-8	4138.2	03 Jun 98 2400	667.79	2.811
ROUTE9	4075.9	04 Jun 98 0006	668.31	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	520.91	03 Jun 98 2326	61.757	0.257
Junction-9	4277.7	04 Jun 98 0006	730.06	3.068
ROUTE10	4251.3	04 Jun 98 0010	729.97	3.068
UTRG-15	346.02	03 Jun 98 2330	44.527	0.20
Junction-10	4411.1	04 Jun 98 0008	774.50	3.268



## HMS \* Summary of Results

Project : UNMDTRIB

Run Name : FUTURE 100 YR.

Start of Simulation : 03Jun98 1100 Basin Model : UNMDFUT  
 End of Simulation : 04Jun98 1200 Precip Model : 100 YEAR STORM  
 Execution Time : 01Jul98 1736 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	436.73	03 Jun 98 2328	54.939	0.180
UTRG-3	549.37	03 Jun 98 2334	77.581	0.271
Junction-1	970.05	03 Jun 98 2330	132.52	0.451
ROUTE1	968.37	03 Jun 98 2334	132.50	0.451
UTRG-1	487.83	03 Jun 98 2328	61.111	0.209
UTRG-5	831.98	03 Jun 98 2324	99.356	0.319
Junction-2	2224.8	03 Jun 98 2328	292.97	0.979
ROUTE2	2144.4	03 Jun 98 2336	293.44	0.979
UTRG-4	583.59	03 Jun 98 2326	73.023	0.221
Junction-3	2664.4	03 Jun 98 2334	366.46	1.200
ROUTE3	2584.2	03 Jun 98 2342	365.90	1.200
UTRG-6	188.27	03 Jun 98 2318	19.444	0.06
UTRG-7	802.12	03 Jun 98 2320	87.297	0.312
Junction-4	3156.0	03 Jun 98 2338	472.64	1.572
ROUTE4	3151.3	03 Jun 98 2342	472.60	1.572
UTRG-8	558.86	03 Jun 98 2332	75.837	0.277
Junction-5	3678.4	03 Jun 98 2340	548.43	1.849
ROUTE5	3653.5	03 Jun 98 2344	548.85	1.849
UTRG-9	280.54	03 Jun 98 2334	38.607	0.138
Junction-6	3906.1	03 Jun 98 2344	587.46	1.987
ROUTE6	3887.2	03 Jun 98 2348	587.35	1.987
UTRG-12	362.70	03 Jun 98 2340	54.250	0.213
UTRG-10	295.78	03 Jun 98 2342	45.794	0.189
Junction-7	4520.2	03 Jun 98 2348	687.39	2.389
ROUTE7	4407.6	03 Jun 98 2400	687.79	2.389
UTRG-11	384.33	03 Jun 98 2324	44.355	0.183
ROUTE8	381.03	03 Jun 98 2342	44.336	0.183
UTRG-13	578.10	03 Jun 98 2322	63.909	0.239
Junction-8	4900.9	03 Jun 98 2358	796.03	2.811
ROUTE9	4830.8	04 Jun 98 0004	796.79	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
JTRG14	606.45	03 Jun 98 2326	73.583	0.257
Junction-9	5088.0	04 Jun 98 0002	870.37	3.068
ROUTE10	5062.0	04 Jun 98 0006	870.15	3.068
UTRG-15	407.67	03 Jun 98 2330	53.476	0.20
Junction-10	5262.1	04 Jun 98 0006	923.63	3.268

## HMS \* Summary of Results

Project : UNMDTRIB

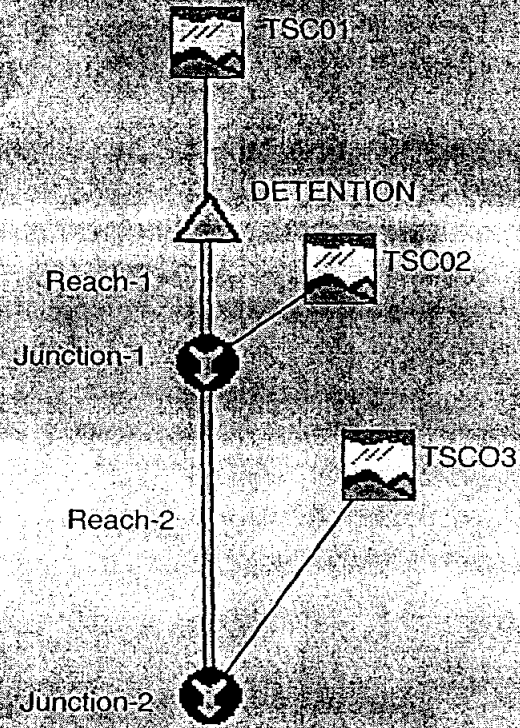
Run Name : FUTURE 500 YR.

Start of Simulation : 03Jun98 1100    Basin Model : UNMDFUT  
 End of Simulation : 04Jun98 1200    Precip Model : 500 YEAR STORM EVENT  
 Execution Time : 01Jul98 1736    Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG-2	550.77	03 Jun 98 2326	77.194	0.180
UTRG-3	702.75	03 Jun 98 2334	110.47	0.271
Junction-1	1234.3	03 Jun 98 2330	187.67	0.451
ROUTE1	1230.3	03 Jun 98 2334	187.63	0.451
UTRG-1	621.65	03 Jun 98 2326	86.650	0.209
UTRG-5	1044.4	03 Jun 98 2324	139.01	0.319
Junction-2	2820.6	03 Jun 98 2328	413.29	0.979
ROUTE2	2717.0	03 Jun 98 2336	413.55	0.979
UTRG-4	720.78	03 Jun 98 2326	100.89	0.221
Junction-3	3369.9	03 Jun 98 2334	514.44	1.200
JTE3	3282.6	03 Jun 98 2340	514.18	1.200
UTRG-6	234.95	03 Jun 98 2318	26.977	0.06
UTRG-7	1039.0	03 Jun 98 2320	124.94	0.312
Junction-4	4030.3	03 Jun 98 2338	666.09	1.572
ROUTE4	4023.3	03 Jun 98 2340	665.99	1.572
UTRG-8	723.27	03 Jun 98 2332	109.01	0.277
Junction-5	4711.5	03 Jun 98 2338	774.99	1.849
ROUTE5	4664.3	03 Jun 98 2344	775.07	1.849
UTRG-9	361.34	03 Jun 98 2332	55.246	0.138
Junction-6	4994.4	03 Jun 98 2342	830.32	1.987
ROUTE6	4963.5	03 Jun 98 2348	829.87	1.987
UTRG-12	478.22	03 Jun 98 2338	79.150	0.213
UTRG-10	394.75	03 Jun 98 2340	67.499	0.189
Junction-7	5798.7	03 Jun 98 2346	976.52	2.389
ROUTE7	5692.1	03 Jun 98 2356	976.88	2.389
UTRG-11	514.49	03 Jun 98 2324	65.400	0.183
ROUTE8	510.51	03 Jun 98 2340	65.364	0.183
UTRG-13	754.92	03 Jun 98 2320	92.329	0.239
Junction-8	6367.2	03 Jun 98 2354	1134.6	2.811
ROUTE9	6286.4	03 Jun 98 2358	1134.3	2.811

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
UTRG14	776.58	03 Jun 98 2326	104.79	0.257
Junction-9	6639.5	03 Jun 98 2358	1239.1	3.068
ROUTE10	6607.1	03 Jun 98 2400	1238.5	3.068
UTRG-15	531.23	03 Jun 98 2330	77.251	0.20
Junction-10	6895.0	03 Jun 98 2400	1315.7	3.268

**Appendix B**  
**Seco Creek Tributary**  
**HEC-HMS Summary Printouts**  
**Existing and Future Conditions**  
**2, 5, 10, 25, 50, 100, and 500-year Storm Events**



# HMS \* Summary of Results

Project : TRBSECO

Run Name : 2 YEAR STORM

Start of Simulation : 14May98 1700    Basin Model    : TRIBSECO  
 End of Simulation    : 15May98 1700    Precip Model    : 2-YEAR STORM  
 Execution Time        : 26Jun98 1114    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	29.067	15 May 98 0538	4.6167	0.284
DETENTION	28.171	15 May 98 0544	4.6164	0.284
Reach-1	28.069	15 May 98 0552	4.6119	0.284
TSC02	147.13	15 May 98 0524	13.923	0.199
Junction-1	150.25	15 May 98 0526	18.535	0.483
Reach-2	145.70	15 May 98 0540	18.464	0.483
TSC03	61.689	15 May 98 0522	5.6566	0.094
Junction-2	188.09	15 May 98 0536	24.120	0.577

HMS \* Summary of Results

Project : TRBSECO

Run Name : 5 YEAR STORM

Start of Simulation : 14May98 1700

Basin Model : TRIBSECO

End of Simulation : 15May98 1700

Precip Model : 5-YEAR STORM

Execution Time : 26Jun98 1114

Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	111.32	15 May 98 0532	14.360	0.284
DETENTION	106.87	15 May 98 0538	14.359	0.284
Reach-1	106.50	15 May 98 0544	14.346	0.284
TSC02	261.74	15 May 98 0524	26.683	0.199
Junction-1	316.64	15 May 98 0530	41.029	0.483
Reach-2	309.03	15 May 98 0540	40.917	0.483
TSC03	116.31	15 May 98 0522	11.343	0.094
Junction-2	384.32	15 May 98 0538	52.259	0.577



## HMS \* Summary of Results

Project : TRBSECO

Run Name : 10 YEAR STORM

Start of Simulation : 14May98 1700    Basin Model    : TRIBSECO  
 End of Simulation    : 15May98 1700    Precip Model   : 10-YEAR STORM  
 Execution Time        : 26Jun98 1114    Control Specs   : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	184.81	15 May 98 0530	23.093	0.284
DETENTION	176.67	15 May 98 0536	23.092	0.284
Reach-1	175.86	15 May 98 0542	23.073	0.284
TSC02	338.08	15 May 98 0524	36.198	0.199
Junction-1	452.46	15 May 98 0530	59.271	0.483
Reach-2	442.88	15 May 98 0540	59.150	0.483
TSC03	153.40	15 May 98 0522	15.663	0.094
Junction-2	544.46	15 May 98 0536	74.813	0.577

# HMS \* Summary of Results

Project : TRBSECO

Run Name : 25 YEAR STORM

Start of Simulation : 14May98 1700    Basin Model    : TRIBSECO  
 End of Simulation    : 15May98 1700    Precip Model    : 25-YEAR STORM  
 Execution Time        : 26Jun98 1115    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	278.31	15 May 98 0528	34.507	0.284
DETENTION	264.88	15 May 98 0534	34.504	0.284
Reach-1	264.20	15 May 98 0540	34.470	0.284
TSC02	426.53	15 May 98 0522	47.495	0.199
Junction-1	617.97	15 May 98 0530	81.965	0.483
Reach-2	600.49	15 May 98 0540	81.754	0.483
TSC03	196.44	15 May 98 0522	20.843	0.094
Junction-2	724.06	15 May 98 0538	102.60	0.577

## HMS \* Summary of Results

Project : TRBSECO

Run Name : 50 YEAR STORM

Start of Simulation : 14May98 1700    Basin Model    : TRIBSECO  
 End of Simulation    : 15May98 1700    Precip Model    : 50-YEAR STORM  
 Execution Time        : 26Jun98 1115    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	353.51	15 May 98 0528	41.014	0.284
DETENTION	333.37	15 May 98 0536	41.013	0.284
Reach-1	332.20	15 May 98 0540	40.994	0.284
TSC02	504.86	15 May 98 0522	53.575	0.199
Junction-1	751.37	15 May 98 0528	94.569	0.483
Reach-2	729.49	15 May 98 0542	94.366	0.483
TSC03	233.96	15 May 98 0522	23.643	0.094
Junction-2	875.50	15 May 98 0538	118.01	0.577

## HMS \* Summary of Results

Project : TRBSECO

Run Name : 100 YEAR STORM

Start of Simulation : 14May98 1700 Basin Model : TRIBSECO  
 End of Simulation : 15May98 1700 Precip Model : 100-YEAR STORM  
 Execution Time : 26Jun98 1115 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	434.95	15 May 98 0528	53.253	0.284
DETENTION	408.18	15 May 98 0534	53.246	0.284
Reach-1	406.95	15 May 98 0540	53.209	0.284
TSC02	563.77	15 May 98 0522	64.579	0.199
Junction-1	874.03	15 May 98 0530	117.79	0.483
Reach-2	849.44	15 May 98 0542	117.48	0.483
TSC03	263.75	15 May 98 0520	28.737	0.094
Junction-2	1012.6	15 May 98 0538	146.21	0.577

## HMS \* Summary of Results

Project : TRBSECO

Run Name : 500 YEAR STORM

Start of Simulation : 14May98 1700    Basin Model    : TRIBSECO  
 End of Simulation    : 15May98 1700    Precip Model    : 500-YEAR STORM  
 Execution Time        : 26Jun98 1115    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	622.97	15 May 98 0526	82.601	0.284
DETENTION	537.36	15 May 98 0538	82.559	0.284
Reach-1	536.25	15 May 98 0540	82.461	0.284
TSC02	701.77	15 May 98 0522	89.447	0.199
Junction-1	1133.3	15 May 98 0526	171.91	0.483
Reach-2	1089.8	15 May 98 0542	171.28	0.483
TSC03	334.02	15 May 98 0520	40.316	0.094
Junction-2	1285.4	15 May 98 0538	211.59	0.577

HMS \* Summary of Results

Project : TRBSECO

Run Name : FUTURE 2 YR.

Start of Simulation : 14May98 1700 Basin Model : TRBSCFUT  
 End of Simulation : 15May98 1700 Precip Model : 2-YEAR STORM  
 Execution Time : 01Jul98 1504 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	105.23	15 May 98 0522	10.092	0.284
DETENTION	97.681	15 May 98 0526	10.091	0.284
Reach-1	96.822	15 May 98 0534	10.084	0.284
TSC02	195.90	15 May 98 0514	13.923	0.199
Junction-1	212.08	15 May 98 0516	24.008	0.483
Reach-2	207.74	15 May 98 0532	23.905	0.483
TSC03	81.826	15 May 98 0512	5.6566	0.094
Junction-2	245.77	15 May 98 0530	29.562	0.577

HMS \* Summary of Results

Project : TRBSECO

Run Name : FUTURE 10 YR.

Start of Simulation : 14May98 1700 Basin Model : TRBSCFUT  
 End of Simulation : 15May98 1700 Precip Model : 10-YEAR STORM  
 Execution Time : 01Jul98 1504 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	363.05	15 May 98 0520	35.046	0.284
DETENTION	329.70	15 May 98 0526	35.044	0.284
Reach-1	328.17	15 May 98 0530	35.016	0.284
TSC02	436.50	15 May 98 0514	36.221	0.199
Junction-1	621.68	15 May 98 0520	71.237	0.483
Reach-2	602.01	15 May 98 0532	71.046	0.483
TSC03	198.25	15 May 98 0512	15.673	0.094
Junction-2	694.18	15 May 98 0530	86.719	0.577

HMS \* Summary of Results

Project : TRBSECO

Run Name : FUTURE 25 YR.

Start of Simulation : 14May98 1700 Basin Model : TRBSCFUT  
 End of Simulation : 15May98 1700 Precip Model : 25-YEAR STORM  
 Execution Time : 01Jul98 1504 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	494.85	15 May 98 0518	48.931	0.284
DETENTION	442.36	15 May 98 0526	48.926	0.284
Reach-1	441.13	15 May 98 0530	48.891	0.284
TSC02	547.47	15 May 98 0514	47.531	0.199
Junction-1	813.20	15 May 98 0518	96.422	0.483
Reach-2	785.52	15 May 98 0532	96.102	0.483
TSC03	253.19	15 May 98 0512	20.858	0.094
Junction-2	900.77	15 May 98 0530	116.96	0.577



HMS \* Summary of Results

Project : TRBSECO

Run Name : FUTURE 50 YR.

Start of Simulation : 14May98 1700 Basin Model : TRBSCFUT  
 End of Simulation : 15May98 1700 Precip Model : 50-YEAR STORM  
 Execution Time : 01Jul98 1506 Control Specs : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	603.48	15 May 98 0518	56.609	0.284
DETENTION	504.60	15 May 98 0528	56.608	0.284
Reach-1	503.40	15 May 98 0532	56.593	0.284
TSC02	644.54	15 May 98 0514	53.611	0.199
Junction-1	975.32	15 May 98 0518	110.20	0.483
Reach-2	928.87	15 May 98 0532	109.93	0.483
TSC03	299.33	15 May 98 0512	23.659	0.094
Junction-2	1069.3	15 May 98 0528	133.59	0.577

## HMS \* Summary of Results

Project : TRBSECO

Run Name : FUTURE 500 YR

Start of Simulation : 14May98 1700    Basin Model    : TRBSCFUT  
 End of Simulation    : 15May98 1700    Precip Model    : 500-YEAR STORM  
 Execution Time        : 01Jul98 1507    Control Specs    : HYPO 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
TSC01	941.37	15 May 98 0518	103.59	0.284
DETENTION	883.15	15 May 98 0522	103.54	0.284
Reach-1	869.92	15 May 98 0528	103.45	0.284
TSC02	900.41	15 May 98 0512	89.568	0.199
Junction-1	1436.6	15 May 98 0524	193.01	0.483
Reach-2	1375.3	15 May 98 0534	192.26	0.483
TSC03	430.82	15 May 98 0512	40.368	0.094
Junction-2	1538.5	15 May 98 0532	232.63	0.577

**Flood Protection Study for Eagle Pass, Texas  
Appendix C**

Appendix C presents a compilation of structures and watersheds modeled with HECRAS. Existing and future condition flows determined in Appendix B were applied to all stream models for the 2, 5, 10, 25, 50, 100, and 500-year storm events except for the Rio Grande River. The Rio Grande River flows remained unchanged for existing and future conditions and only the 10, 50, 100, and 500-year flows were applied. Plotted water surface profiles are shown for all streams studied in detail. Appendix C has been organized as follows:

**Structure Inventory**

<b>Rio Grande River –</b>	<b>Existing Conditions</b>
<b>Main Arroyo &amp; Tributary 3 -</b>	<b>Existing and Future Conditions</b>
<b>Tributary 1 -</b>	<b>Existing and Future Conditions</b>
<b>Tributary 2 -</b>	<b>Existing and Future Conditions</b>
<b>Unnamed Tributary -</b>	<b>Existing and Future Conditions</b>
<b>Seco Creek Tributary -</b>	<b>Existing and Future Conditions</b>

Table 4 - Drainage Structure Inventory

Location	Channel Station	Structure Size	Stream Bed Elevation	Low Chord Elev.	Top of Bridge Elev.	Material	Channel U. S.	Channel D. S.	Comments
<b>Rio Grande River</b>									
RR Bridge	4215.00	Bridge	679.00	724.50	729.00	Concrete	Natural	Natural	Existing RR Bridge
New International bridge	4245.00	Bridge	678.00	725.00	729.50	Concrete	Natural	Natural	New International Bridge
Old International bridge	7643.00	Bridge	674.00	725.00	727.00	Concrete	Natural	Natural	Old International Bridge
<b>Main Arroyo</b>									
Golf Cart Crossing	1458.00	5-4'x5' RBC	689.79	693.79	698.50	Concrete	Concrete	Concrete	at Eagle Pass Golf Course
Former Dam No. 1	1580.00	Dam No. 1	692.75	0.00	0.00	Concrete	Concrete	Concrete	Dam No. 1 removed
Adam's Street	2547.00	Arch Bridge	695.90	618.50	618.50	Concrete	Concrete	Concrete	Adam's Street
Former Dam No. 2	2745.00	Dam No. 2	696.00	0.00	0.00	Concrete	Concrete	Concrete	Dam No. 2 removed
Former Dam No. 3	3376.00	Dam No. 3	700.46	0.00	0.00	Concrete	Concrete	Concrete	Dam No. 3 removed
Garrison St. (Hwy 277)	3580.00	Bridge	702.23	720.00	722.10	Concrete	Concrete	Concrete	Garrison St. (Hwy. 277)
Monroe St.	4093.50	Bridge	705.40	721.60	723.30	Concrete	Concrete	Concrete	Monroe St.
Ceylon St.	4591.00	Bridge	709.60	720.00	721.60	Concrete	Concrete	Concrete	Ceylon St.
Southern-Pacific RR	4920.50	Bridge	710.80	728.70	730.70	Concrete	Concrete	Concrete	RR Bridge
Pierce St.	5044.50	7- 6'x10' RBC	711.30	717.40	720.80	Concrete	Concrete	Concrete	Pierce St.
Rio Grande St.	5733.50	Bridge	714.20	723.70	725.70	Concrete	Concrete	Concrete	Rio Grande St.
Main St.	6291.00	2-12'x15' RBC	716.90	728.90	729.40	Concrete	Concrete	Concrete	Main St.
Quarry St.	6987.00	2-7.5 'x17' RBC	720.30	727.80	729.70	Concrete	Concrete	Concrete	Quarry St.
Ferry St.	8807.00	Bridge	726.50	737.20	739.90	Concrete	Concrete	Concrete	Ferry St;
Medina St.	9156.00	3-7'x10' RBC	728.05	735.05	735.90	Concrete	Concrete	Concrete	Medina St.
Concho St.	9860.00	1-5.5'x20' RBC	733.25	739.00	740.90	Concrete	Concrete	Concrete	Concho St.
<b>Tributary #3</b>									
Trinity St.	10218.50	1-6.4'x29' RBC	736.80	743.20	746.10	Concrete	Concrete	Concrete	Trinity St.
Colorado St.	10575.50	1-6'15' RBC	739.60	745.83	747.30	Concrete	Concrete	Concrete	Colorado St.
North Comal St.	10935.00	7-4' Dia. RCP	742.35	746.35	752.80	Concrete	Concrete	Concrete	North Comal St.
Kelso Dr.	12244.00	3-3'x5' RBC	757.20	760.20	761.80	Concrete	Concrete	Concrete	Kelso St.
Bibb St.	13434.00	1-5'x20.5'	765.66	750.50	772.80	Concrete	Concrete	Concrete	Bibb St.
Vista Hermosa Dr.	14873.00	4-18" RCP	782.15	783.65	787.60	Concrete	Concrete	Concrete	Vista Hermosa Dr.

C-2

Table 4 - Drainage Structure Inventory

Location	Channel Station	Structure Size	Stream Bed Elevation	Low Chord Elev.	Top of Bridge Elev.	Material	Channel U. S.	Channel D. S.	Comments
<b>Tributary #1</b>									
Williams St.	618.00	2-8'x11' RBC	716.49	724.49	730.20	Concrete	Concrete	Concrete	Williams St.
Private	709.00	Bridge	717.70	729.40	732.00	Concrete	Concrete	Concrete	Private
Pierce St.	917.00	1-6.5'x20' RBC	721.28	727.78	729.70	Concrete	Concrete	Concrete	Pierce St.
Crockett St.	1514.00	1-5.8'x16' RBC	726.54	732.30	733.00	Concrete	Concrete	Concrete	Crockett St.
Wilson St.	2102.50	1-5'x20' RBC	731.90	737.00	738.60	Concrete	Concrete	Concrete	Wilson St.
Travis St	2176.00	1-6'x18' RBC	731.40	737.40	738.10	Concrete	Concrete	Concrete	Travis St.
<b>Tributary #2</b>									
First St.	564.00	2-4'x10' RBC	739.83	743.83	745.00	Concrete	Concrete	Concrete	First St.
Second St.	1077.00	2-4'x10' RBC	742.40	746.40	747.10	Concrete	Concrete	Concrete	Second St.
Concho/Hidalgo St.	1662.00	2-4'x8' RBC	744.80	748.80	750.80	Concrete	Concrete	Concrete	Concho/Hidalgo St.
Trinity St.	2491.00	2-3.5'x8' RBC	749.80	753.30	753.90	Concrete	Concrete	Concrete	Trinity St.
Colorado St.	2853.00	2-4.5'x6' RBC	751.48	755.98	756.30	Concrete	Concrete	Concrete	Colorado St.
Arlington St.	3583.00	2-4.5'x6' RBC	754.76	759.26	759.70	Concrete	Concrete	Concrete	Arlington St.
Memorial Dr.	4354.00	2-4'x6' RBC	760.55	764.55	767.70	Concrete	Concrete	Concrete	Memorial Dr.
North Bibb St.	6042.00	3-2.5'x5' RBC	775.32	777.82	778.60	Concrete	Natural	Natural	North Bibb St.
Royal Haven Dr.	6331.00	Concrete Dip	778.00	0.00	0.00	Concrete	Natural	Natural	Royal Haven Dr.
<b>Unnamed Tributary</b>									
El Indio Hwy. FM 1021	1208.50	5-7'x7' RBC	724.50	731.50	733.20	Concrete	Natural	Natural	El Indio Hwy. FM 1021
FM 3443	5258.50	6-8'x8' RBC	736.39	744.39	746.00	Concrete	Natural	Natural	FM 3443
Dell Crest Drive	6075.00	4-5'x8' RBC	739.70	744.70	746.70	Concrete	Natural	Natural	Dell Crest Drive
Cherry Leaf Drive	7536.50	8-4'x4' RBC	744.42	748.42	749.00	Concrete	Natural	Natural	Near Language Dev. Center
FM 3443	10050.00	16-3'x10' RBC	756.03	759.03	760.70	Concrete	Natural	Natural	FM 3443
FM 277 - Main Street	11742.00	9-5'x5' RBC	763.20	768.30	770.90	Concrete	Natural	Natural	FM 277 - Main Street
<b>Seco Creek Tributary</b>									
Loop 431	3362.50	3-4'6' RBC	731.50	735.50	738.50	Concrete	Concrete	Natural	Loop 431
RR Tracks	4544.00	2-96" Steel Pipes	742.50	750.50	752.60	Steel	Natural	Natural	RR tracks

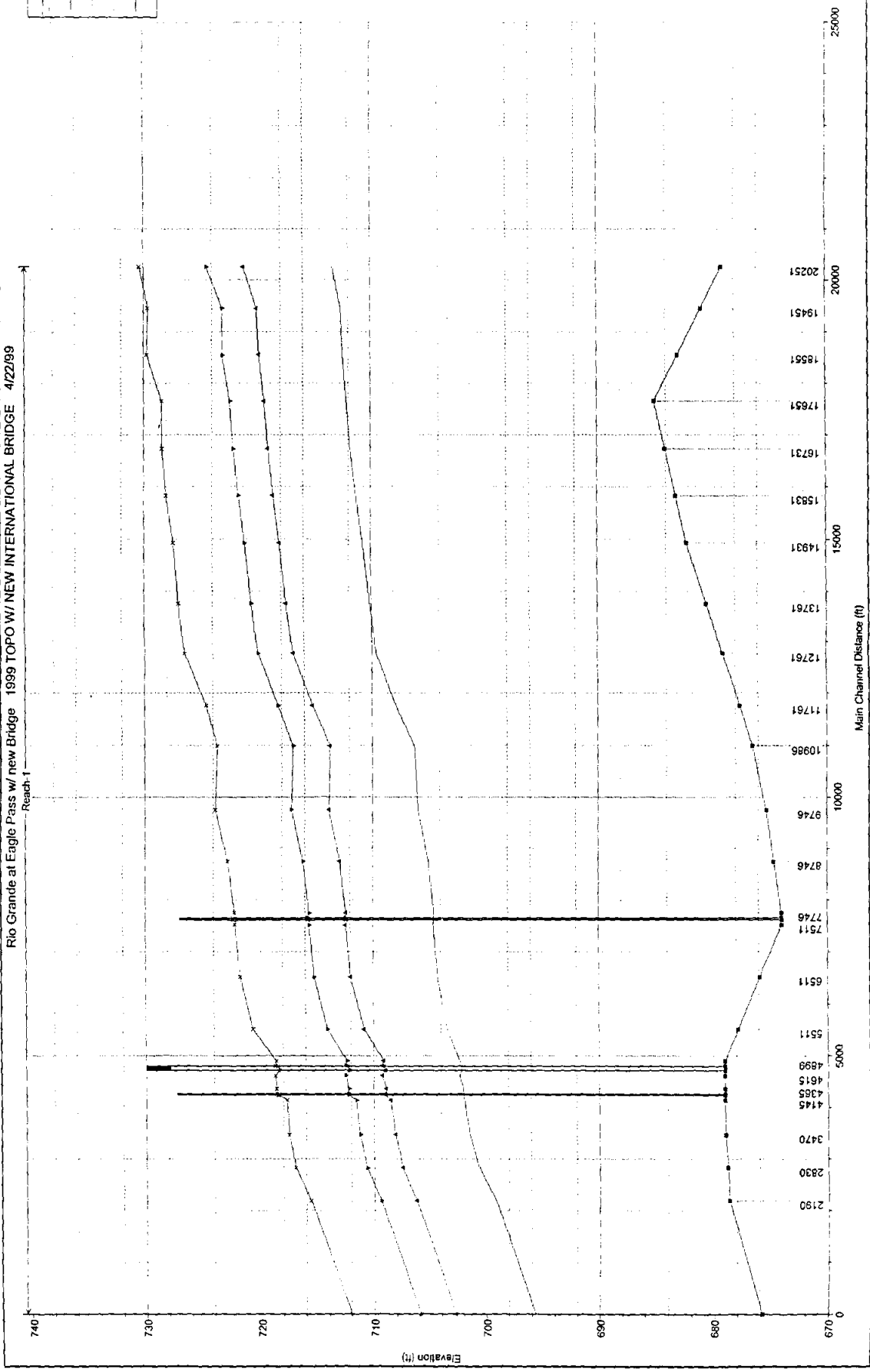
C3

**Rio Grande River  
Existing and Future Conditions  
Water Surface Profile and HECRAS Summary Printouts  
10, 50, 100, & 500-year Storm Events**

Rio Grande at Eagle Pass w/ new Bridge 1999 TOPO W/ NEW INTERNATIONAL BRIDGE 4/22/99

500-14  
 500-14  
 500-14  
 500-14  
 500-14

Legend	
WS PF 8	Ground
WS PF 5	
WS PF 3	



Reach	River Sta	Total (CS)	Min Ch E (ft)	W/S Elev (ft)	Min W/S (ft)	E/S Elev (ft)	E/S Slope (ft/ft)	Grain (ft)	Flow Area (CS)	Top Width (ft)	Ch (ft)
Reach-1	0	90000.00	675.80	695.65	688.84	696.84	0.000950	8.74	10403.05	858.93	0.42
Reach-1	0	180000.00	675.80	702.70	693.93	704.61	0.000951	11.19	17134.05	1012.92	0.44
Reach-1	0	230000.00	675.80	705.83	696.44	708.09	0.000951	12.25	20598.66	1313.02	0.45
Reach-1	0	350000.00	675.80	711.96	701.19	714.80	0.000951	13.98	30685.85	1837.32	0.47
Reach-1	2190	90000.00	678.67	699.13		700.02	0.002444	7.58	11866.96	1137.12	0.41
Reach-1	2190	180000.00	678.67	706.19		707.43	0.001734	8.96	20341.62	1268.96	0.38
Reach-1	2190	230000.00	678.67	709.41		710.82	0.001579	9.58	24472.22	1291.71	0.37
Reach-1	2190	350000.00	678.67	715.61		717.46	0.001469	11.01	32899.12	1443.37	0.37
Reach-1	2830	90000.00	678.78	700.63		701.26	0.001497	6.34	14198.31	1218.92	0.33
Reach-1	2830	180000.00	678.78	707.44		708.40	0.001266	7.89	23485.83	1508.62	0.32
Reach-1	2830	230000.00	678.78	710.63		711.72	0.001175	8.46	28404.55	1559.21	0.32
Reach-1	2830	350000.00	678.78	716.92		718.31	0.001093	9.68	38378.82	1694.58	0.32
Reach-1	3470	90000.00	679.00	701.43		702.18	0.001287	6.94	12967.28	886.21	0.32
Reach-1	3470	180000.00	679.00	708.10		709.34	0.001421	9.07	21614.49	1558.67	0.35
Reach-1	3470	230000.00	679.00	711.24		712.60	0.001338	9.68	26626.74	1628.27	0.35
Reach-1	3470	350000.00	679.00	717.48		719.12	0.001233	10.87	37072.84	1712.17	0.35
Reach-1	4145	90000.00	679.00	701.93	691.62	702.95	0.000837	8.38	12586.94	971.37	0.33
Reach-1	4145	180000.00	679.00	708.51	698.33	710.37	0.001124	11.71	20161.96	1368.07	0.40
Reach-1	4145	230000.00	679.00	711.54	701.35	713.67	0.001160	12.78	24619.66	1536.75	0.41
Reach-1	4145	350000.00	679.00	717.68	706.83	720.18	0.001160	14.47	35124.66	1741.76	0.42
Reach-1	4245	90000.00	679.00	702.00	691.91	703.05	0.000881	8.55	12963.57	1225.90	0.33
Reach-1	4245	180000.00	679.00	708.97	698.99	710.51	0.000986	11.01	23293.83	1692.07	0.37
Reach-1	4245	230000.00	679.00	712.21	701.79	713.82	0.000944	11.61	28833.06	1722.48	0.37
Reach-1	4245	350000.00	679.00	718.50	707.53	720.35	0.000912	12.93	39791.29	1760.71	0.38
Reach-1	4246	90000.00	679.00	701.99	691.91	703.06	0.000737	8.61	12953.92	1224.88	0.34
Reach-1	4246	180000.00	679.00	708.93	699.00	710.56	0.000848	11.24	23236.52	1691.52	0.38
Reach-1	4246	230000.00	679.00	712.16	701.71	713.89	0.000822	11.93	28756.22	1722.21	0.38
Reach-1	4246	350000.00	679.00	718.43	707.66	720.45	0.000808	13.40	39681.25	1760.33	0.39
Reach-1	4255	Bridge									
Reach-1	4264	90000.00	679.00	702.00	692.05	703.09	0.000755	8.71	12937.07	1236.33	0.34
Reach-1	4264	180000.00	679.00	708.97	699.09	710.59	0.000853	11.27	23359.90	1689.09	0.38
Reach-1	4264	230000.00	679.00	712.25	702.54	713.95	0.000819	11.92	28958.57	1717.83	0.38
Reach-1	4264	350000.00	679.00	718.62	708.11	720.59	0.000796	13.33	40015.35	1753.98	0.39
Reach-1	4265	90000.00	679.00	702.00	692.05	703.09	0.000754	8.70	12937.97	1236.36	0.34
Reach-1	4265	180000.00	679.00	708.97	699.09	710.59	0.000853	11.27	23361.34	1689.10	0.38
Reach-1	4265	230000.00	679.00	712.25	702.54	713.95	0.000819	11.92	28959.93	1717.84	0.38
Reach-1	4265	350000.00	679.00	718.62	708.11	720.59	0.000796	13.33	40016.74	1753.99	0.39
Reach-1	4365	90000.00	679.00	702.00	692.52	703.22	0.001008	9.14	11400.25	889.05	0.36
Reach-1	4365	180000.00	679.00	708.92	699.44	710.75	0.001143	11.86	21374.01	1716.64	0.40
Reach-1	4365	230000.00	679.00	712.21	701.49	714.10	0.001079	12.44	26669.49	1732.55	0.40
Reach-1	4365	350000.00	679.00	718.59	709.04	720.73	0.001026	13.78	37032.86	1759.82	0.40
Reach-1	4615	90000.00	679.00	702.33	692.61	703.46	0.000819	8.79	11978.11	1040.79	0.35
Reach-1	4615	180000.00	679.00	709.29	699.45	711.02	0.000934	11.45	20468.04	1309.94	0.39
Reach-1	4615	230000.00	679.00	712.45	701.55	714.36	0.000927	12.29	24619.46	1337.99	0.39
Reach-1	4615	350000.00	679.00	718.70	708.42	721.03	0.000933	13.98	32859.13	1406.68	0.41
Reach-1	4715	90000.00	679.00	702.16	693.53	703.64	0.000768	10.34	11603.71	1017.76	0.39
Reach-1	4715	180000.00	679.00	709.02	701.57	711.27	0.000916	13.57	19640.00	1292.53	0.45
Reach-1	4715	230000.00	679.00	712.18	703.97	714.61	0.000907	14.49	23730.64	1297.26	0.45
Reach-1	4715	350000.00	679.00	718.40	709.84	721.29	0.000910	16.35	31838.02	1306.61	0.47
Reach-1	4757	Bridge									
Reach-1	4769	90000.00	679.00	702.33	693.53	703.76	0.000744	10.23	11768.14	1022.44	0.39
Reach-1	4769	180000.00	679.00	709.27	701.57	711.44	0.000878	13.37	19967.28	1292.91	0.44
Reach-1	4769	230000.00	679.00	712.45	703.97	714.80	0.000871	14.27	24088.59	1297.68	0.45
Reach-1	4769	350000.00	679.00	718.71	709.84	721.51	0.000877	16.14	32233.32	1307.06	0.46
Reach-1	4899	90000.00	679.00	702.29	694.00	703.89	0.000868	10.81	10609.80	960.29	0.41
Reach-1	4899	180000.00	679.00	709.13	702.22	711.64	0.001051	14.29	17989.00	1299.69	0.47



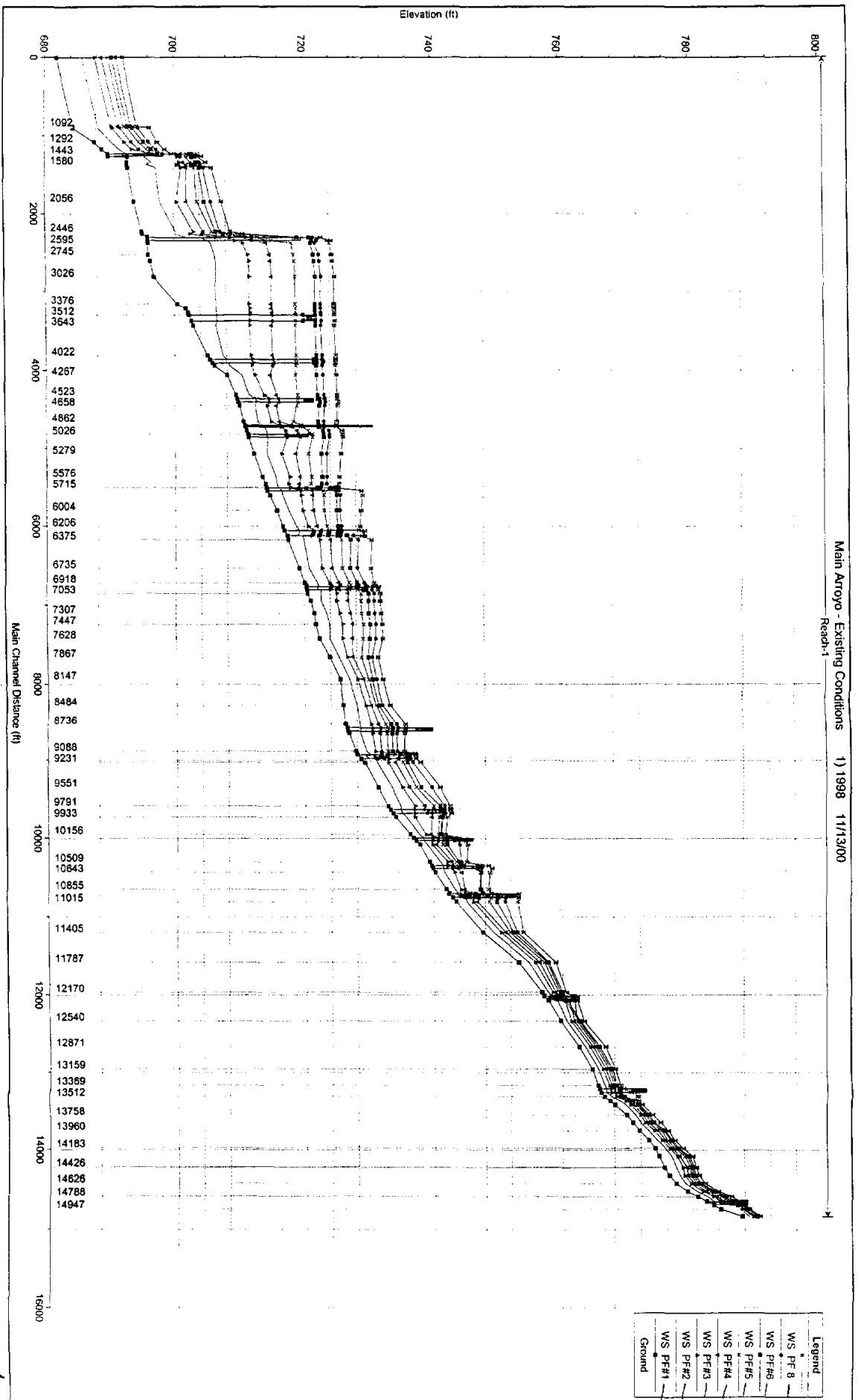
HFC-RAS Plan: 1999 TOPO River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Cr. Dia (CS)	Min. Ch. E. (ft)	WS Elev. (ft)	Ch. WS (ft)	E.G. Elev. (ft)	E.G. Slope (ft/m)	Flow Vel. (ft/s)	Flow Area (Sq. Ft)	Flow Wght (ft)	Friction Sfr
Reach-1	4899	230000.00	679.00	712.33	704.92	714.99	0.001020	15.12	22162.25	1304.50	0.47
Reach-1	4899	350000.00	679.00	718.63	710.87	721.68	0.000993	16.83	30401.85	1313.94	0.48
Reach-1	551	90000.00	677.83	703.42	692.48	704.37	0.000523	8.34	13768.82	1117.96	0.31
Reach-1	551	180000.00	677.83	710.80	700.19	712.22	0.000608	10.86	24043.32	1728.09	0.35
Reach-1	551	230000.00	677.83	714.08	702.96	715.56	0.000588	11.44	29914.27	1951.55	0.35
Reach-1	551	350000.00	677.83	720.65	707.77	722.25	0.000545	12.42	41852.78	1990.50	0.35
Reach-1	651	90000.00	675.92	704.27		704.80	0.000297	6.72	19438.43	1429.67	0.24
Reach-1	651	180000.00	675.92	711.98		712.74	0.000333	8.56	32635.93	1892.17	0.27
Reach-1	651	230000.00	675.92	715.23		716.08	0.000338	9.19	38822.77	1910.57	0.27
Reach-1	651	350000.00	675.92	721.72		722.76	0.000349	10.46	51327.97	1943.63	0.29
Reach-1	751	90000.00	674.00	704.62	691.67	705.07	0.000253	6.40	20563.13	1476.64	0.22
Reach-1	751	180000.00	674.00	712.39	699.69	713.05	0.000287	8.14	33843.68	1822.82	0.25
Reach-1	751	230000.00	674.00	715.65	701.45	716.39	0.000291	8.74	39798.23	1829.65	0.26
Reach-1	751	350000.00	674.00	722.14	704.99	723.08	0.000306	9.99	51719.44	1845.23	0.27
Reach-1	761	90000.00	674.00	704.57	692.28	705.14	0.000326	7.08	20010.89	1500.86	0.25
Reach-1	761	180000.00	674.00	712.31	700.26	713.13	0.000368	9.01	32990.41	1741.00	0.28
Reach-1	761	230000.00	674.00	715.55	702.14	716.48	0.000382	9.78	38631.23	1741.00	0.29
Reach-1	761	350000.00	674.00	722.00	705.76	723.19	0.000415	11.38	49854.01	1741.00	0.31
Reach-1	7612	90000.00	674.00	704.57	692.28	705.14	0.000326	7.08	20011.34	1500.87	0.25
Reach-1	7612	180000.00	674.00	712.31	700.26	713.13	0.000368	9.01	32991.04	1741.00	0.28
Reach-1	7612	230000.00	674.00	715.55	702.14	716.48	0.000382	9.78	38631.87	1741.00	0.29
Reach-1	7612	350000.00	674.00	722.00	705.76	723.19	0.000415	11.38	49854.75	1741.00	0.31
Reach-1	7628.5	Bridge									
Reach-1	7645	90000.00	674.00	704.63	692.28	705.20	0.000322	7.05	20107.42	1503.11	0.25
Reach-1	7645	180000.00	674.00	712.43	700.26	713.23	0.000362	8.96	33188.48	1741.00	0.28
Reach-1	7645	230000.00	674.00	715.68	702.14	716.59	0.000376	9.72	38847.37	1741.00	0.29
Reach-1	7645	350000.00	674.00	722.15	705.76	723.33	0.000408	11.31	50111.90	1741.00	0.31
Reach-1	7646	90000.00	674.00	704.63	692.28	705.20	0.000322	7.05	20107.88	1503.12	0.25
Reach-1	7646	180000.00	674.00	712.43	700.26	713.23	0.000362	8.96	33189.12	1741.00	0.28
Reach-1	7646	230000.00	674.00	715.68	702.14	716.59	0.000376	9.72	38848.00	1741.00	0.29
Reach-1	7646	350000.00	674.00	722.15	705.76	723.33	0.000408	11.31	50112.65	1741.00	0.31
Reach-1	7746	90000.00	674.00	704.56	693.82	705.28	0.000426	8.05	18509.47	1556.93	0.29
Reach-1	7746	180000.00	674.00	712.38	701.96	713.31	0.000443	9.87	32113.89	1899.87	0.31
Reach-1	7746	230000.00	674.00	715.66	703.81	716.66	0.000440	10.49	38292.17	1946.81	0.31
Reach-1	7746	350000.00	674.00	722.18	706.99	723.38	0.000447	11.83	50643.71	2040.15	0.32
Reach-1	8746	90000.00	674.65	705.02		705.77	0.000746	7.97	17721.18	1709.24	0.29
Reach-1	8746	180000.00	674.65	712.89		713.78	0.000709	9.44	32424.99	2071.67	0.30
Reach-1	8746	230000.00	674.65	716.18		717.11	0.000688	9.94	39399.98	2141.58	0.30
Reach-1	8746	350000.00	674.65	722.76		723.82	0.000664	10.97	53804.88	2243.51	0.30
Reach-1	9746	90000.00	675.30	705.91		706.38	0.000502	6.13	21447.14	2554.41	0.23
Reach-1	9746	180000.00	675.30	713.87		714.27	0.000351	6.30	42298.12	2677.86	0.20
Reach-1	9746	230000.00	675.30	717.16		717.58	0.000329	6.54	51173.19	2714.68	0.20
Reach-1	9746	350000.00	675.30	723.78		724.27	0.000306	7.12	69343.08	2778.87	0.20
Reach-1	10986	90000.00	676.50	706.20		707.66	0.001467	9.73	9467.20	565.14	0.37
Reach-1	10986	180000.00	676.50	713.72		715.41	0.001378	11.56	24093.93	2114.95	0.38
Reach-1	10986	230000.00	676.50	717.01		718.64	0.001255	11.86	31079.97	2128.06	0.37
Reach-1	10986	350000.00	676.50	723.61		725.24	0.001094	12.55	45217.20	2154.34	0.36
Reach-1	1176	90000.00	677.60	707.83		709.03	0.002051	8.87	11244.49	1373.07	0.37
Reach-1	1176	180000.00	677.60	715.27		716.62	0.001721	10.25	23461.37	1704.12	0.36
Reach-1	1176	230000.00	677.60	718.31		719.75	0.001663	10.86	28704.38	1745.95	0.36
Reach-1	1176	350000.00	677.60	724.57		726.23	0.001562	12.02	39927.71	1841.70	0.36
Reach-1	1276	90000.00	679.05	709.57		709.97	0.000474	5.10	19510.38	2351.86	0.20
Reach-1	1276	180000.00	679.05	717.00		717.49	0.000463	6.16	40966.26	3211.79	0.20
Reach-1	1276	230000.00	679.05	720.09		720.60	0.000451	6.52	51273.45	3463.50	0.21
Reach-1	1276	350000.00	679.05	726.49		727.01	0.000402	6.97	74248.50	3618.40	0.20
Reach-1	1376	90000.00	680.50	710.15		710.48	0.000547	4.66	20463.60	1900.15	0.19

HFC-RAS Plan: 1999 TOPO River: RIVER-1 Reach: Reach-1 (Continued)

Reach	Stn	Initial (FS)	Final (m)	W/S Elev (m)	W/S (m)	Elev (m)	Elev Slope (m)	Bottom (m)	Flow Area (m <sup>2</sup> )	Top Width (m)	Bottom (m)
		180000.00	680.50	717.56		717.99	0.000528	5.71	41218.63	3307.42	0.20
		230000.00	680.50	720.64		721.09	0.000509	6.03	51957.52	3669.03	0.20
		350000.00	680.50	726.99		727.45	0.000436	6.36	76095.95	3827.84	0.19
		90000.00	682.20	710.78	697.48	711.26	0.000712	5.73	18594.52	2158.59	0.23
		180000.00	682.20	718.15	703.30	718.72	0.000655	6.79	35398.70	2442.59	0.23
		230000.00	682.20	721.19	705.55	721.82	0.000652	7.27	42852.31	2559.08	0.23
		350000.00	682.20	727.40	712.16	728.15	0.000638	8.15	58991.21	2941.35	0.24
		90000.00	683.13	711.34		711.76	0.000446	5.29	19286.37	1917.49	0.21
		180000.00	683.13	718.67		719.24	0.000501	6.59	37131.07	2993.11	0.22
		230000.00	683.13	721.71		722.34	0.000522	7.14	47169.32	3477.53	0.23
		350000.00	683.13	728.03		728.65	0.000463	7.49	69224.14	3495.05	0.22
		90000.00	684.05	711.84		712.14	0.000385	4.49	21201.19	1392.12	0.18
		180000.00	684.05	719.10		719.68	0.000507	6.29	34493.02	2854.44	0.21
		230000.00	684.05	722.15		722.80	0.000519	6.84	44536.86	3746.67	0.22
		350000.00	684.05	728.40		729.03	0.000451	7.24	70903.25	4305.30	0.21
		90000.00	685.00	712.16		712.60	0.000547	5.34	16959.36	970.56	0.22
		180000.00	685.00	719.45		720.31	0.000699	7.51	25921.09	1561.74	0.26
		230000.00	685.00	722.44		723.50	0.000757	8.41	30845.71	1733.25	0.28
		350000.00	685.00	728.41		729.84	0.000841	10.04	42414.66	2173.57	0.30
		90000.00	682.96	712.49		713.01	0.000338	6.01	17501.73	1216.33	0.22
		180000.00	682.96	719.88		720.85	0.000464	8.47	32350.20	3772.56	0.27
		230000.00	682.96	723.09		724.01	0.000430	8.72	46235.59	4908.71	0.26
		350000.00	682.96	729.70		730.34	0.000302	8.23	85841.42	6585.37	0.23
		90000.00	680.91	712.66		713.39	0.000387	7.53	16980.30	1396.30	0.27
		180000.00	680.91	720.11		721.36	0.000514	10.36	29084.90	2525.26	0.32
		230000.00	680.91	723.10		724.62	0.000580	11.68	38121.21	3501.02	0.35
		350000.00	680.91	729.63		730.80	0.000443	11.44	65588.38	4454.60	0.31
		90000.00	679.10	713.38		713.66	0.000217	4.56	24122.11	1626.04	0.16
		180000.00	679.10	721.26		721.73	0.000273	6.14	38941.45	2122.93	0.19
		230000.00	679.10	724.48		725.04	0.000295	6.80	46075.79	2308.10	0.20
		350000.00	679.10	730.38		731.16	0.000352	8.22	60885.64	2923.46	0.22

**Main Arroyo & Tributary 3  
Existing and Future Conditions  
Water Surface Profile and HECRAS Summary Printouts  
2, 5, 10, 25, 50, 100, & 500-year Storm Events**



C-8

Main Arroyo  
 ↑  
 T-16.3

Main  
Arroyo  
Existing  
Q's

Reach	Reach ID	850.00	681.80	685.70	684.15	685.87	0.002846	3.28	259.53	101.13	0.36
Reach-1	212	850.00	681.80	685.70	684.15	685.87	0.002846	3.28	259.53	101.13	0.36
Reach-1	212	2044.00	681.80	687.67	685.43	687.94	0.002845	4.20	486.36	129.94	0.38
Reach-1	212	2970.00	681.80	688.73	686.18	689.07	0.002843	4.70	631.80	142.35	0.39
Reach-1	212	4050.00	681.80	689.70	686.90	690.12	0.002845	5.25	772.09	147.27	0.40
Reach-1	212	4830.00	681.80	690.33	687.38	690.81	0.002844	5.58	866.20	150.48	0.41
Reach-1	212	5710.00	681.80	690.99	687.84	691.53	0.002843	5.90	973.29	222.48	0.42
Reach-1	212	7450.00	681.80	692.08	688.67	692.71	0.002844	6.42	1308.82	392.26	0.42
Reach-1	1092	850.00	684.30	688.26		688.75	0.003538	5.60	151.76	42.79	0.52
Reach-1	1092	2044.00	684.30	690.35		691.41	0.004939	8.25	247.70	49.40	0.65
Reach-1	1092	2970.00	684.30	691.43		692.92	0.005964	9.80	303.09	53.70	0.73
Reach-1	1092	4050.00	684.30	692.35		694.38	0.007184	11.44	354.10	57.04	0.81
Reach-1	1092	4830.00	684.30	692.89		695.33	0.008009	12.52	385.77	58.68	0.86
Reach-1	1092	5710.00	684.30	693.43		696.33	0.008944	13.67	417.58	60.28	0.92
Reach-1	1092	7450.00	684.30	694.34	694.34	698.18	0.010485	15.72	474.12	64.05	1.00
Reach-1	1112	850.00	684.36	688.27		688.79	0.000737	5.74	148.15	45.70	0.56
Reach-1	1112	2044.00	684.36	690.48		691.45	0.000853	7.89	258.93	54.56	0.64
Reach-1	1112	2970.00	684.36	691.71		692.98	0.000915	9.02	329.12	59.50	0.68
Reach-1	1112	4050.00	684.36	692.88		694.46	0.000979	10.10	401.03	64.16	0.71
Reach-1	1112	4830.00	684.36	693.68		695.44	0.000989	10.65	453.49	67.36	0.72
Reach-1	1112	5710.00	684.36	694.55		696.47	0.000970	11.11	514.28	72.03	0.72
Reach-1	1112	7450.00	684.36	696.32		698.40	0.000840	11.58	656.50	87.05	0.69
Reach-1	1292	850.00	687.67	690.40	690.40	691.60	0.002597	8.78	96.81	40.92	1.01
Reach-1	1292	2044.00	687.67	692.36	692.36	694.26	0.002237	11.06	184.87	48.77	1.00
Reach-1	1292	2970.00	687.67	693.51	693.51	695.82	0.002139	12.19	243.64	53.38	1.01
Reach-1	1292	4050.00	687.67	694.67	694.67	697.35	0.002043	13.14	308.27	58.02	1.00
Reach-1	1292	4830.00	687.67	695.41	695.41	698.33	0.001999	13.71	352.19	60.97	1.01
Reach-1	1292	5710.00	687.67	696.18	696.18	699.34	0.001955	14.27	400.18	64.04	1.01
Reach-1	1292	7450.00	687.67	697.53	697.53	701.12	0.001892	15.19	490.51	69.46	1.01
Reach-1	1387	850.00	688.84	691.57	691.57	692.77	0.002589	8.77	96.92	40.93	1.00
Reach-1	1387	2044.00	688.84	693.52	693.52	695.43	0.002261	11.10	184.18	48.72	1.01
Reach-1	1387	2970.00	688.84	694.69	694.69	696.99	0.002136	12.18	243.75	53.39	1.00
Reach-1	1387	4050.00	688.84	695.84	695.84	698.52	0.002047	13.15	308.04	58.00	1.01
Reach-1	1387	4830.00	688.84	696.58	696.58	699.50	0.001998	13.71	352.24	60.97	1.01
Reach-1	1387	5710.00	688.84	697.37	697.37	700.51	0.001936	14.22	401.57	64.13	1.00
Reach-1	1387	7450.00	688.84	698.70	698.70	702.29	0.001892	15.19	490.51	69.46	1.01
Reach-1	1443	850.00	689.79	692.71	692.71	694.17	0.002299	9.70	87.60	41.68	1.00
Reach-1	1443	2044.00	689.79	696.15	696.15	697.03	0.000743	7.52	271.71	55.44	0.60
Reach-1	1443	2970.00	689.79	696.16	696.16	698.01	0.001563	10.91	272.12	55.47	0.87
Reach-1	1443	4050.00	689.79	696.81	696.81	699.47	0.002025	13.10	309.21	58.08	1.00
Reach-1	1443	4830.00	689.79	697.56	697.56	700.45	0.001975	13.66	353.69	61.07	1.00
Reach-1	1443	5710.00	689.79	698.33	698.33	701.46	0.001931	14.20	401.98	64.16	1.00
Reach-1	1443	7450.00	689.79	699.71	699.71	703.24	0.001853	15.08	494.17	69.67	1.00
Reach-1	1581		Culvert								
Reach-1	1713	850.00	689.84	695.82	692.75	698.17	0.000210	4.73	179.54	55.27	0.34
Reach-1	1713	2044.00	689.84	700.68	695.07	700.88	0.000091	3.54	602.60	123.92	0.23
Reach-1	1713	2970.00	689.84	701.18	696.57	701.54	0.000154	4.80	669.01	141.43	0.30
Reach-1	1713	4050.00	689.84	702.24	697.92	702.73	0.000184	5.69	837.87	177.22	0.33
Reach-1	1713	4830.00	689.84	703.06	698.51	703.62	0.000190	6.11	993.27	201.82	0.34
Reach-1	1713	5710.00	689.84	703.52	698.51	704.21	0.000222	6.82	1090.12	215.73	0.37
Reach-1	1713	7450.00	689.84	704.33	699.67	705.26	0.000282	8.07	1271.11	230.98	0.42
Reach-1	1813	850.00	692.84	695.50	695.50	696.62	0.002618	8.50	100.05	45.20	1.01
Reach-1	1813	2044.00	692.84	700.54		700.94	0.000273	5.11	414.12	106.16	0.38
Reach-1	1813	2970.00	692.84	700.92		701.66	0.000462	6.93	457.04	120.37	0.50
Reach-1	1813	4050.00	692.84	701.92		702.88	0.000498	7.97	595.93	157.81	0.53
Reach-1	1813	4830.00	692.84	702.74		703.76	0.000467	8.30	734.05	176.15	0.52
Reach-1	1813	5710.00	692.84	703.14		704.38	0.000540	9.23	805.76	184.31	0.56
Reach-1	1813	7450.00	692.84	703.79		705.50	0.000686	10.93	929.69	197.61	0.64
Reach-1	1913	850.00	692.75	696.58		696.77	0.000436	3.55	239.16	79.92	0.36
Reach-1	1913	2044.00	692.75	700.83		700.98	0.000135	3.15	653.68	118.98	0.23
Reach-1	1913	2970.00	692.75	701.46		701.73	0.000203	4.13	732.16	128.18	0.28
Reach-1	1913	4050.00	692.75	702.61		702.96	0.000220	4.78	887.82	142.07	0.30
Reach-1	1913	4830.00	692.75	703.44		703.84	0.000221	5.12	1009.93	150.42	0.31
Reach-1	1913	5710.00	692.75	704.00		704.48	0.000248	5.66	1094.59	155.95	0.33
Reach-1	1913	7450.00	692.75	704.97		705.63	0.000298	6.62	1258.09	180.20	0.37

2  
5  
10  
25  
50  
100  
500

HEC-RAS Plan: 1998 River: RIVER-1 Reach: Reach-1 (Continued)

Reach 1	1580	850.00	692.75	695.80	695.76	697.15	0.003809	9.34	91.00	32.65	0.99
Reach 1	1580	2044.00	692.75	700.46		701.15	0.000680	6.87	383.79	122.33	0.47
Reach 1	1580	2970.00	692.75	700.80		702.03	0.001168	9.30	425.66	128.32	0.62
Reach 1	1580	4050.00	692.75	701.89		703.29	0.001181	10.23	576.27	147.90	0.64
Reach 1	1580	4830.00	692.75	702.79		704.14	0.001021	10.30	712.95	152.32	0.61
Reach 1	1580	5710.00	692.75	703.26		704.82	0.001137	11.25	783.54	153.73	0.65
Reach 1	1580	7450.00	692.75	703.99		706.02	0.001386	13.05	896.85	155.96	0.72
Reach 1	1589	850.00	692.75	696.09		697.20	0.002821	8.43	100.86	33.49	0.86
Reach 1	1589	2044.00	692.75	700.47		701.15	0.000677	6.86	384.54	122.43	0.47
Reach 1	1589	2970.00	692.75	700.81		702.03	0.001157	9.27	427.60	128.59	0.62
Reach 1	1589	4050.00	692.75	701.90		703.29	0.001152	10.20	578.53	148.17	0.64
Reach 1	1589	4830.00	692.75	702.80		704.14	0.001016	10.28	714.36	152.35	0.61
Reach 1	1589	5710.00	692.75	703.27		704.82	0.001129	11.22	785.85	153.78	0.65
Reach 1	1589	7450.00	692.75	704.01		706.10	0.001408	13.18	900.26	169.25	0.73
Reach 1	1623	850.00	692.90	697.23		697.31	0.000116	2.23	381.44	92.47	0.19
Reach 1	1623	2044.00	692.90	701.10		701.21	0.000077	2.71	766.81	123.83	0.17
Reach 1	1623	2970.00	692.90	701.95		702.15	0.000113	3.53	881.17	143.91	0.21
Reach 1	1623	4050.00	692.90	703.15		703.41	0.000132	4.15	1089.54	181.83	0.23
Reach 1	1623	4830.00	692.90	703.95		704.26	0.000140	4.51	1238.47	191.41	0.24
Reach 1	1623	5710.00	692.90	704.59		704.96	0.000157	4.96	1362.65	196.33	0.26
Reach 1	1623	7450.00	692.90	705.80		706.28	0.000180	5.70	1606.15	205.23	0.29
Reach 1	2056	800.00	693.86	697.91	697.91	699.48	0.006574	10.04	79.71	25.74	1.01
Reach 1	2056	1950.00	693.86	700.48	700.48	702.93	0.005797	12.56	155.78	34.10	1.00
Reach 1	2056	2850.00	693.86	701.97	701.97	704.98	0.005018	13.97	211.45	40.63	0.98
Reach 1	2056	3900.00	693.86	703.65	703.65	706.99	0.004136	14.83	296.68	61.03	0.92
Reach 1	2056	4650.00	693.86	704.71	704.71	708.18	0.003716	15.27	367.08	70.09	0.89
Reach 1	2056	5510.00	693.86	705.70	705.70	709.39	0.003522	15.93	439.76	76.69	0.88
Reach 1	2056	7200.00	693.86	707.34	707.34	711.43	0.003338	17.14	571.53	84.12	0.88
Reach 1	2446	800.00	695.02	700.28		701.07	0.002573	7.16	111.85	29.30	0.64
Reach 1	2446	1950.00	695.02	703.00		704.53	0.002775	9.98	202.26	37.13	0.71
Reach 1	2446	2850.00	695.02	704.52		706.54	0.002893	11.54	262.62	44.40	0.74
Reach 1	2446	3900.00	695.02	705.83		708.44	0.003074	13.23	327.96	55.51	0.78
Reach 1	2446	4650.00	695.02	706.45		709.59	0.003401	14.56	363.95	58.81	0.83
Reach 1	2446	5510.00	695.02	707.09	706.95	710.82	0.003748	15.97	402.20	61.35	0.88
Reach 1	2446	7200.00	695.02	708.68	708.68	713.00	0.003676	17.43	505.04	67.73	0.90
Reach 1	2476	800.00	695.12	700.15		701.39	0.004066	8.95	89.37	20.80	0.76
Reach 1	2476	1950.00	695.12	702.47	702.47	705.48	0.006258	13.95	143.19	25.51	0.98
Reach 1	2476	2850.00	695.12	704.37	704.37	707.97	0.005748	15.37	195.61	31.17	0.96
Reach 1	2476	3900.00	695.12	706.46	706.46	710.32	0.004633	16.13	275.46	43.86	0.90
Reach 1	2476	4650.00	695.12	707.61	707.61	711.71	0.004365	16.83	327.67	47.46	0.89
Reach 1	2476	5510.00	695.12	708.79	708.79	713.14	0.004147	17.54	385.98	51.19	0.88
Reach 1	2476	7200.00	695.12	710.63	710.63	715.64	0.004104	19.15	485.93	58.30	0.90
Reach 1	2518	800.00	695.90	701.82	701.82	704.77	0.035702	13.79	58.00	9.80	1.00
Reach 1	2518	1950.00	695.90	706.50	706.50	710.08	0.023501	15.17	128.53	44.58	1.00
Reach 1	2518	2850.00	695.90	708.57	708.57	713.16	0.021476	17.19	165.82	49.57	1.00
Reach 1	2518	3900.00	695.90	710.71	710.71	716.37	0.020055	19.09	204.31	64.72	1.00
Reach 1	2518	4650.00	695.90	712.11	712.11	718.49	0.019353	20.26	229.49	79.06	1.00
Reach 1	2518	5510.00	695.90	719.11	719.11	719.48	0.001003	6.17	1208.86	152.59	0.24
Reach 1	2518	7200.00	695.90	719.11	719.11	719.75	0.001713	8.07	1208.86	152.59	0.32
Reach 1	2547	Bridge									
Reach 1	2568	800.00	695.90	705.22	701.80	706.12	0.007644	7.58	105.48	42.81	0.55
Reach 1	2568	1950.00	695.90	709.42	708.49	711.22	0.007504	10.77	181.03	53.98	0.60
Reach 1	2568	2850.00	695.90	712.13	708.53	714.52	0.007241	12.40	229.76	79.13	0.61
Reach 1	2568	3900.00	695.90	715.08	710.67	718.03	0.006781	13.79	282.85	93.61	0.61
Reach 1	2568	4650.00	695.90	721.41	712.07	721.57	0.000445	4.43	1680.59	273.23	0.17
Reach 1	2568	5510.00	695.90	722.15	713.61	722.33	0.000504	4.82	1902.52	321.90	0.18
Reach 1	2568	7200.00	695.90	724.36	718.36	724.51	0.000392	4.52	2755.18	448.47	0.16
Reach 1	2598	800.00	696.00	705.67		706.28	0.001230	6.27	133.76	24.78	0.41
Reach 1	2598	1950.00	696.00	710.63		711.55	0.001054	8.17	308.31	49.03	0.41
Reach 1	2598	2850.00	696.00	714.34		715.06	0.000672	7.77	545.05	69.51	0.34
Reach 1	2598	3900.00	696.00	718.18		718.77	0.000457	7.39	843.59	85.98	0.29
Reach 1	2598	4650.00	696.00	721.18		721.83	0.000421	7.79	1153.16	189.36	0.29
Reach 1	2598	5510.00	696.00	721.84		722.68	0.000536	8.96	1291.83	237.14	0.33
Reach 1	2598	7200.00	696.00	724.10		724.80	0.000470	8.92	2013.90	386.06	0.31

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Reach-1	4022	420.00	705.03	707.45		708.12	0.004275	6.59	63.71	28.53	0.78
Reach-1	4022	1170.00	705.03	711.81		712.30	0.001070	5.63	207.68	39.33	0.43
Reach-1	4022	1770.00	705.03	715.17		715.53	0.000431	4.93	413.37	80.17	0.30
Reach-1	4022	2470.00	705.03	718.85		719.10	0.000204	4.31	759.68	110.58	0.22
Reach-1	4022	2980.00	705.03	721.97		722.14	0.000113	3.73	1225.03	202.45	0.17
Reach-1	4022	3570.00	705.03	722.87		723.06	0.000123	4.04	1411.51	212.01	0.18
Reach-1	4022	4700.00	705.03	724.98		725.17	0.000115	4.24	1967.00	379.47	0.17
Reach-1	4071	420.00	705.40	707.98	707.19	708.37	0.000875	5.03	83.48	34.80	0.57
Reach-1	4071	1170.00	705.40	712.05	708.88	712.41	0.000287	4.81	243.45	45.67	0.36
Reach-1	4071	1770.00	705.40	715.29	709.92	715.58	0.000131	4.43	459.66	82.13	0.27
Reach-1	4071	2470.00	705.40	718.86	711.02	719.11	0.000072	4.13	796.53	105.98	0.21
Reach-1	4071	2980.00	705.40	721.97	711.74	722.16	0.000044	3.77	1152.06	144.49	0.17
Reach-1	4071	3570.00	705.40	722.86	712.46	723.11	0.000052	4.24	1310.30	155.77	0.19
Reach-1	4071	4700.00	705.40	724.96	713.76	725.25	0.000055	4.78	1750.65	337.51	0.20
Reach-1	4093.0										
Reach-1	4116	420.00	705.76	708.33	707.45	708.66	0.000746	4.65	90.24	37.85	0.53
Reach-1	4116	1170.00	705.76	712.23	709.05	712.55	0.000257	4.53	258.25	50.20	0.35
Reach-1	4116	1770.00	705.76	715.40	710.06	715.68	0.000120	4.24	448.87	73.87	0.26
Reach-1	4116	2470.00	705.76	718.93	711.10	719.17	0.000067	4.01	762.24	101.33	0.20
Reach-1	4116	2980.00	705.76	722.01	711.79	722.21	0.000042	3.69	1099.81	117.47	0.17
Reach-1	4116	3570.00	705.76	722.97	712.44	723.21	0.000048	4.09	1210.07	157.19	0.18
Reach-1	4116	4700.00	705.76	724.93	713.57	725.26	0.000057	4.84	1652.83	310.48	0.20
Reach-1	4148	420.00	706.08	708.38	708.38	709.45	0.002935	8.31	50.56	23.86	1.01
Reach-1	4148	1170.00	706.08	711.93		712.88	0.000971	7.83	149.36	31.84	0.64
Reach-1	4148	1770.00	706.08	715.18		715.91	0.000375	6.90	283.66	56.18	0.43
Reach-1	4148	2470.00	706.08	718.77		719.34	0.000187	6.25	551.36	92.97	0.32
Reach-1	4148	2980.00	706.08	721.90		722.32	0.000108	5.56	961.50	184.85	0.26
Reach-1	4148	3570.00	706.08	722.85		723.32	0.000115	6.01	1139.46	189.26	0.27
Reach-1	4148	4700.00	706.08	724.84		725.35	0.000114	6.47	1527.90	210.79	0.27
Reach-1	4267	420.00	708.00	710.29	710.29	711.32	0.002824	8.15	51.54	24.97	1.00
Reach-1	4267	1170.00	708.00	712.37	712.37	714.19	0.002446	10.83	108.06	29.47	1.00
Reach-1	4267	1770.00	708.00	714.77	713.61	716.19	0.001166	9.57	186.57	44.97	0.72
Reach-1	4267	2470.00	708.00	718.70	714.83	719.41	0.000321	7.06	548.21	140.21	0.41
Reach-1	4267	2980.00	708.00	721.98	715.65	722.34	0.000125	5.41	1161.49	245.92	0.27
Reach-1	4267	3570.00	708.00	722.96	716.78	723.35	0.000126	5.71	1408.02	251.89	0.27
Reach-1	4267	4700.00	708.00	724.99	718.11	725.37	0.000113	5.94	1925.46	257.49	0.27
Reach-1	4523	420.00	709.47	711.54	711.54	712.42	0.002881	7.50	56.01	32.45	1.01
Reach-1	4523	1170.00	709.47	713.97		714.91	0.001312	7.75	151.04	45.76	0.75
Reach-1	4523	1770.00	709.47	715.80		716.62	0.000796	7.26	243.88	55.77	0.61
Reach-1	4523	2470.00	709.47	719.12		719.56	0.000263	5.37	497.14	142.29	0.37
Reach-1	4523	2980.00	709.47	722.18		722.41	0.000089	3.98	1180.62	283.23	0.23
Reach-1	4523	3570.00	709.47	723.18		723.42	0.000084	4.14	1471.85	300.80	0.23
Reach-1	4523	4700.00	709.47	725.21		725.44	0.000069	4.24	2133.11	359.22	0.21
Reach-1	4569	420.00	709.60	712.61	711.35	712.84	0.000454	3.89	108.09	41.86	0.43
Reach-1	4569	1170.00	709.60	714.68	712.93	715.19	0.000556	5.76	203.05	50.01	0.50
Reach-1	4569	1770.00	709.60	716.16	713.91	716.77	0.000501	6.29	281.62	55.86	0.49
Reach-1	4569	2470.00	709.60	719.15	714.87	719.58	0.000238	5.30	465.94	67.63	0.36
Reach-1	4569	2980.00	709.60	722.18	715.48	722.47	0.000103	4.34	779.31	164.41	0.25
Reach-1	4569	3570.00	709.60	723.17	716.14	723.50	0.000104	4.64	971.96	223.08	0.25
Reach-1	4569	4700.00	709.60	725.19	717.26	725.54	0.000091	4.90	1539.29	334.94	0.24
Reach-1	4613										
Reach-1	4613	420.00	709.80	712.62	711.54	712.89	0.000555	4.12	101.93	42.18	0.47
Reach-1	4613	1170.00	709.80	714.70	713.13	715.24	0.000612	5.89	198.61	51.12	0.53
Reach-1	4613	1770.00	709.80	716.18	714.06	716.80	0.000531	6.34	279.23	57.52	0.51
Reach-1	4613	2470.00	709.80	719.17	715.00	719.60	0.000241	5.25	470.39	70.41	0.36
Reach-1	4613	2980.00	709.80	722.51	715.60	722.77	0.000089	4.08	874.07	208.01	0.23
Reach-1	4613	3570.00	709.80	723.38	716.24	723.67	0.000092	4.39	1081.42	268.11	0.24
Reach-1	4613	4700.00	709.80	725.36	717.34	725.65	0.000078	4.52	1729.20	376.03	0.23
Reach-1	4651										
Reach-1	4651	420.00	710.00	712.49		713.10	0.001465	6.25	67.20	29.92	0.74
Reach-1	4651	1170.00	710.00	714.35		715.67	0.001709	9.23	126.82	34.33	0.85
Reach-1	4651	1770.00	710.00	715.76		717.30	0.001475	9.87	177.60	37.68	0.81
Reach-1	4651	2470.00	710.00	718.90		719.90	0.000568	8.03	321.63	76.27	0.53
Reach-1	4651	2980.00	710.00	722.39		722.89	0.000182	5.93	828.43	215.01	0.32
Reach-1	4651	3570.00	710.00	723.28		723.80	0.000186	6.32	1029.09	250.71	0.33

HEC-RAS Plan: 1998 River RIVER-1 Reach: Reach-1 (Continued)

Reach	Length	Start	End	Start	End	Start	End	Start	End	Start	End
Reach 4868	4700.00	710.00	725.24		725.78	0.000163	6.57	1618.63	347.70		0.32
Reach 4862	420.00	710.60	712.89	712.89	713.93	0.002862	8.20	51.24	24.81		1.01
Reach 4862	1170.00	710.60	714.95	714.95	716.81	0.002502	10.93	107.00	29.16		1.01
Reach 4862	1770.00	710.60	716.22	716.22	718.51	0.002364	12.16	145.62	31.83		1.00
Reach 4862	2470.00	710.60	718.41		720.36	0.001410	11.21	220.94	42.77		0.80
Reach 4862	2980.00	710.60	722.23		723.03	0.000335	7.55	662.74	198.85		0.42
Reach 4862	3570.00	710.60	723.09		723.95	0.000334	7.97	839.20	211.53		0.43
Reach 4862	4700.00	710.60	725.10		725.90	0.000272	8.06	1306.05	261.82		0.40
Reach 4912	420.00	710.80	713.54	713.04	714.15	0.001393	6.26	67.09	28.90		0.72
Reach 4912	1170.00	710.80	716.39	714.99	717.19	0.000853	7.21	162.35	38.12		0.62
Reach 4912	1770.00	710.80	718.09	716.15	718.99	0.000723	7.64	231.77	43.63		0.58
Reach 4912	2470.00	710.80	719.63	717.29	720.68	0.000601	8.21	313.46	63.09		0.55
Reach 4912	2980.00	710.80	722.35	718.00	723.07	0.000271	6.90	513.27	80.29		0.39
Reach 4912	3570.00	710.80	723.10	718.72	723.96	0.000297	7.60	573.84	81.97		0.42
Reach 4912	4700.00	710.80	725.01	720.02	726.02	0.000280	8.27	734.60	85.86		0.42
Reach 4920		Bridge									
Reach 4929	420.00	710.90	713.87	712.95	714.30	0.000840	5.25	80.01	29.88		0.57
Reach 4929	1170.00	710.90	716.55	714.85	717.31	0.000749	7.00	167.17	35.68		0.57
Reach 4929	1770.00	710.90	718.22	716.03	719.14	0.000663	7.67	234.36	46.58		0.58
Reach 4929	2470.00	710.90	719.80	717.21	720.87	0.000575	8.36	321.89	64.67		0.54
Reach 4929	2980.00	710.90	722.38	718.00	723.15	0.000288	7.21	511.62	79.86		0.40
Reach 4929	3570.00	710.90	723.11	718.76	724.03	0.000319	7.95	570.46	81.12		0.43
Reach 4929	4700.00	710.90	725.00	720.22	726.06	0.000305	8.65	726.40	84.37		0.43
Reach 4979	420.00	711.10	714.23		714.35	0.000189	2.70	155.52	53.27		0.28
Reach 4979	1170.00	711.10	717.17		717.38	0.000156	3.63	322.02	60.08		0.28
Reach 4979	1770.00	711.10	718.96		719.21	0.000143	4.09	441.62	82.53		0.27
Reach 4979	2470.00	711.10	720.64		720.96	0.000132	4.55	625.00	159.60		0.27
Reach 4979	2980.00	711.10	722.98		723.21	0.000075	4.03	1206.37	299.34		0.21
Reach 4979	3570.00	711.10	723.85		724.11	0.000078	4.32	1474.24	314.82		0.22
Reach 4979	4700.00	711.10	725.88		726.15	0.000069	4.52	2204.11	407.38		0.21
Reach 5028	420.00	711.30	714.32	712.30	714.37	0.000092	1.88	223.12	74.00		0.19
Reach 5028	1170.00	711.30	717.30	713.27	717.41	0.000079	2.63	444.22	74.00		0.19
Reach 5028	1770.00	711.30	719.11	713.90	719.25	0.000080	3.06	577.83	74.00		0.19
Reach 5028	2470.00	711.30	720.81	714.55	721.00	0.000082	3.50	732.74	145.36		0.20
Reach 5028	2980.00	711.30	723.07	714.98	723.23	0.000054	3.28	1290.74	351.93		0.17
Reach 5028	3570.00	711.30	723.95	715.45	724.13	0.000058	3.55	1636.56	435.39		0.18
Reach 5028	4700.00	711.30	726.00	716.30	726.17	0.000050	3.67	2773.19	677.54		0.17
Reach 5044.5		Culvert									
Reach 5063	420.00	711.40	714.36	712.41	714.42	0.000096	1.95	215.82	73.00		0.20
Reach 5063	1170.00	711.40	717.38	713.39	717.50	0.000075	2.68	436.79	73.00		0.19
Reach 5063	1770.00	711.40	719.41	714.03	719.55	0.000067	3.03	584.51	73.01		0.19
Reach 5063	2470.00	711.40	721.32	714.68	721.50	0.000073	3.39	804.23	193.49		0.19
Reach 5063	2980.00	711.40	723.11	715.12	723.27	0.000056	3.33	1288.72	347.31		0.17
Reach 5063	3570.00	711.40	723.94	715.59	724.13	0.000061	3.62	1609.17	417.30		0.18
Reach 5063	4700.00	711.40	725.99	716.43	726.17	0.000053	3.75	2747.40	700.92		0.17
Reach 5270	420.00	712.20	714.25	714.25	715.21	0.002896	7.87	53.40	28.10		1.01
Reach 5270	1170.00	712.20	716.51		717.94	0.001877	9.59	122.00	32.97		0.88
Reach 5270	1770.00	712.20	718.71		719.90	0.001056	8.74	202.44	39.94		0.68
Reach 5270	2470.00	712.20	720.68		721.83	0.000742	8.60	300.47	84.43		0.59
Reach 5270	2980.00	712.20	722.66		723.50	0.000399	7.53	598.15	225.15		0.46
Reach 5270	3570.00	712.20	723.49		724.36	0.000386	7.88	813.54	296.21		0.45
Reach 5270	4700.00	712.20	725.69		726.33	0.000245	7.23	1630.31	434.67		0.38
Reach 5570	320.00	713.50	715.60		716.12	0.002894	5.75	55.69	35.99		0.81
Reach 5570	940.00	713.50	717.73		718.52	0.001582	7.10	132.56	37.30		0.65
Reach 5570	1450.00	713.50	719.37		720.25	0.001094	7.54	200.59	45.71		0.58
Reach 5570	2030.00	713.50	721.14		722.08	0.000805	7.84	289.32	54.65		0.52
Reach 5570	2460.00	713.50	722.77		723.65	0.000575	7.61	387.97	69.45		0.45
Reach 5570	2960.00	713.50	723.51		724.58	0.000626	8.38	442.64	79.37		0.48
Reach 5570	3900.00	713.50	725.43		726.59	0.000555	8.92	630.97	120.97		0.47
Reach 5570	320.00	714.00	715.75		716.48	0.003788	6.82	46.94	28.51		0.94
Reach 5570	940.00	714.00	717.53		718.88	0.003134	9.32	100.86	32.07		0.93
Reach 5570	1450.00	714.00	719.19		720.52	0.002041	9.26	156.55	35.37		0.78
Reach 5570	2030.00	714.00	721.00		722.27	0.001438	9.05	224.42	39.67		0.67



HEC-RAS Plan: 1998 River: RIVER-1 Reach: Reach-1 (Continued)

Reach	566	2460.00	714.00	722.70		723.78	0.000976	8.33	295.36	43.50	0.56
Reach	568	2960.00	714.00	723.43		724.70	0.001052	9.04	327.59	44.72	0.59
Reach	568	3900.00	714.00	725.35		726.71	0.000927	9.36	416.58	47.92	0.56
Reach	571										
Reach	571	320.00	714.20	716.05	716.05	716.95	0.004484	7.62	42.02	23.41	1.00
Reach	571	940.00	714.20	717.96	717.96	719.73	0.003975	10.66	88.21	24.88	1.00
Reach	571	1450.00	714.20	719.19	719.19	721.48	0.003879	12.17	119.19	25.81	1.00
Reach	571	2030.00	714.20	720.39	720.39	723.20	0.003836	13.45	150.88	26.73	1.00
Reach	571	2460.00	714.20	722.11	721.19	724.51	0.002598	12.42	198.05	28.05	0.82
Reach	571	2960.00	714.20	722.85	722.04	725.64	0.003059	13.88	213.19	28.46	0.89
Reach	571	3900.00	714.20	724.42	723.55	727.79	0.002869	14.73	264.78	35.30	0.87
Reach	573										
Reach	573	Bridge									
Reach	575										
Reach	575	320.00	714.30	716.60	715.99	717.02	0.002842	5.23	61.16	28.28	0.63
Reach	575	940.00	714.30	719.57	717.70	720.16	0.001587	6.21	151.45	32.52	0.51
Reach	575	1450.00	714.30	721.29	718.80	722.03	0.001471	6.92	209.67	34.99	0.50
Reach	575	2030.00	714.30	723.00	719.87	723.86	0.001383	7.48	271.42	37.42	0.49
Reach	575	2460.00	714.30	724.94	720.59	725.73	0.000951	7.11	345.76	68.83	0.42
Reach	575	2960.00	714.30	725.41	721.36	726.44	0.001163	8.14	363.72	87.36	0.47
Reach	575	3900.00	714.30	728.90	722.66	729.36	0.000439	6.10	1109.33	297.31	0.30
Reach	581										
Reach	581	320.00	714.70	716.69		717.29	0.004721	6.17	51.83	27.99	0.80
Reach	581	940.00	714.70	719.61		720.29	0.001964	6.62	141.99	33.82	0.57
Reach	581	1450.00	714.70	721.35		722.14	0.001646	7.11	203.91	37.30	0.54
Reach	581	2030.00	714.70	723.08		723.95	0.001399	7.49	272.17	45.67	0.51
Reach	581	2460.00	714.70	725.07		725.79	0.000836	6.87	392.34	74.73	0.41
Reach	581	2960.00	714.70	725.62		726.51	0.000963	7.69	436.14	82.65	0.44
Reach	581	3900.00	714.70	729.09		729.39	0.000298	5.28	1572.96	497.59	0.26
Reach	600										
Reach	600	320.00	715.80	717.65		718.36	0.006204	6.78	47.21	27.08	0.90
Reach	600	940.00	715.80	719.82		720.96	0.004056	8.55	109.99	30.70	0.80
Reach	600	1450.00	715.80	721.46		722.70	0.003066	8.92	162.57	33.43	0.71
Reach	600	2030.00	715.80	723.12		724.44	0.002494	9.22	220.20	36.81	0.66
Reach	600	2460.00	715.80	725.01		726.11	0.001467	8.46	303.39	52.07	0.53
Reach	600	2960.00	715.80	725.52		726.91	0.001709	9.52	331.10	56.65	0.57
Reach	600	3900.00	715.80	728.82		729.63	0.000738	7.79	760.27	189.91	0.40
Reach	620										
Reach	620	320.00	716.70	718.83		719.35	0.003841	5.80	55.18	27.79	0.73
Reach	620	940.00	716.70	720.64		721.81	0.004283	8.68	108.30	31.01	0.82
Reach	620	1450.00	716.70	722.03		723.42	0.003683	9.47	153.12	33.49	0.78
Reach	620	2030.00	716.70	723.54		725.05	0.003082	9.87	205.77	36.18	0.73
Reach	620	2460.00	716.70	725.22		726.50	0.001920	9.11	280.58	50.73	0.60
Reach	620	2960.00	716.70	725.78		727.35	0.002145	10.11	309.64	53.79	0.64
Reach	620	3900.00	716.70	728.66		729.98	0.001223	9.42	515.61	146.67	0.51
Reach	625										
Reach	625	320.00	716.90	719.27	718.39	719.56	0.001905	4.36	73.33	31.00	0.50
Reach	625	940.00	716.90	721.40	719.95	722.11	0.002239	6.74	139.52	31.00	0.56
Reach	625	1450.00	716.90	722.67	720.98	723.69	0.002525	8.11	178.90	31.00	0.59
Reach	625	2030.00	716.90	723.89	722.01	725.25	0.002817	9.37	216.60	31.00	0.62
Reach	625	2460.00	716.90	725.28	722.69	726.67	0.002445	9.47	259.79	31.00	0.58
Reach	625	2960.00	716.90	725.80	723.46	727.59	0.002979	10.73	275.96	31.00	0.63
Reach	625	3900.00	716.90	728.49	724.79	730.32	0.002406	10.85	359.39	117.09	0.56
Reach	632										
Reach	632	Culvert									
Reach	632										
Reach	632	320.00	717.40	719.77	718.89	720.07	0.001891	4.35	73.49	31.00	0.50
Reach	632	940.00	717.40	722.15	720.45	722.78	0.001903	6.38	147.22	31.00	0.52
Reach	632	1450.00	717.40	723.74	721.47	724.58	0.001914	7.38	196.44	31.00	0.52
Reach	632	2030.00	717.40	725.32	722.49	726.38	0.001961	8.27	245.41	31.00	0.52
Reach	632	2460.00	717.40	726.59	723.19	727.75	0.001878	8.63	284.98	31.00	0.50
Reach	632	2960.00	717.40	727.61	723.95	728.97	0.002021	9.35	316.58	31.00	0.52
Reach	632	3900.00	717.40	729.01	725.28	730.83	0.002456	10.84	359.88	31.00	0.56
Reach	637										
Reach	637	320.00	717.50	719.94		720.15	0.001334	3.75	85.26	35.00	0.42
Reach	637	940.00	717.50	722.42		722.88	0.001295	5.46	172.09	35.00	0.43
Reach	637	1450.00	717.50	724.07		724.69	0.001285	6.31	229.96	36.14	0.43
Reach	637	2030.00	717.50	725.75		726.49	0.001143	6.93	314.29	63.95	0.42
Reach	637	2460.00	717.50	727.16		727.86	0.000922	6.91	420.28	87.10	0.39
Reach	637	2960.00	717.50	728.37		729.10	0.000837	7.12	543.27	133.72	0.38
Reach	637	3900.00	717.50	730.49		731.02	0.000567	6.60	977.92	289.44	0.32
Reach	675										
Reach	675	320.00	719.20	720.71	720.71	721.47	0.008315	7.00	45.68	30.43	1.01
Reach	675	940.00	719.20	722.72	722.30	723.91	0.004857	8.76	107.32	30.89	0.83

HFC-RAS Plan: 1998 River RIVER-1 Reach: Reach-1 (Continued)

Reach 1	6735	1450.00	719.20	724.30	723.33	725.63	0.003656	9.26	156.66	31.44	0.73
Reach 1	6735	2030.00	719.20	725.86	724.36	727.36	0.003185	9.86	205.91	31.87	0.68
Reach 1	6735	2460.00	719.20	727.09	725.08	728.64	0.002670	10.01	249.79	43.16	0.64
Reach 1	6735	2960.00	719.20	728.19	725.84	729.86	0.002430	10.44	306.79	71.66	0.62
Reach 1	6735	3900.00	719.20	730.31	727.37	731.55	0.001543	9.61	632.54	232.75	0.51
Reach 1	6918	320.00	720.00	721.98		722.35	0.002923	4.92	64.98	34.71	0.63
Reach 1	6918	940.00	720.00	723.83		724.61	0.002788	7.09	132.58	38.19	0.67
Reach 1	6918	1450.00	720.00	725.29		726.19	0.002254	7.63	190.14	40.92	0.62
Reach 1	6918	2030.00	720.00	726.89		727.85	0.001804	7.87	258.07	43.92	0.57
Reach 1	6918	2460.00	720.00	728.10		729.06	0.001512	7.87	312.92	50.33	0.53
Reach 1	6918	2960.00	720.00	729.26		730.24	0.001268	8.00	399.51	99.37	0.50
Reach 1	6918	3900.00	720.00	730.78		731.80	0.001098	8.37	608.78	185.03	0.48
Reach 1	6931	320.00	720.20	722.12		722.45	0.002655	4.63	69.18	38.11	0.61
Reach 1	6931	940.00	720.20	724.09		724.71	0.002162	6.34	148.29	42.33	0.60
Reach 1	6931	1450.00	720.20	725.55		726.27	0.001745	6.82	212.69	45.47	0.56
Reach 1	6931	2030.00	720.20	727.15		727.92	0.001403	7.05	288.07	48.89	0.51
Reach 1	6931	2460.00	720.20	728.35		729.12	0.001102	7.06	358.92	69.60	0.47
Reach 1	6931	2960.00	720.20	729.51		730.30	0.000933	7.18	451.48	90.28	0.44
Reach 1	6931	3900.00	720.20	731.06		731.86	0.000801	7.47	670.47	189.65	0.42
Reach 1	6968	320.00	720.30	722.12	721.71	722.54	0.003180	5.21	61.41	35.56	0.68
Reach 1	6968	940.00	720.30	724.00	723.18	724.88	0.002605	7.55	124.46	37.17	0.69
Reach 1	6968	1450.00	720.30	725.39	724.15	726.50	0.002129	8.46	171.48	38.36	0.66
Reach 1	6968	2030.00	720.30	726.92	725.13	728.21	0.001741	9.11	222.93	39.67	0.62
Reach 1	6968	2460.00	720.30	728.08	725.78	729.45	0.001494	9.39	261.90	63.00	0.59
Reach 1	6968	2960.00	720.30	729.40	726.49	730.45	0.001372	8.38	408.04	102.14	0.50
Reach 1	6968	3900.00	720.30	730.98	727.76	731.97	0.001120	8.46	646.79	209.72	0.47
Reach 1	6987		Culvert								
Reach 1	7004	320.00	720.40	722.62	721.80	722.90	0.000934	4.29	74.62	36.33	0.51
Reach 1	7004	940.00	720.40	725.03	723.28	725.59	0.000692	6.03	155.89	38.87	0.49
Reach 1	7004	1450.00	720.40	726.62	724.25	727.37	0.000613	6.92	209.60	40.55	0.49
Reach 1	7004	2030.00	720.40	728.29	725.22	729.20	0.000544	7.63	265.90	56.70	0.48
Reach 1	7004	2460.00	720.40	729.18	725.88	730.26	0.000560	8.32	295.84	101.04	0.49
Reach 1	7004	2960.00	720.40	730.53	726.61	731.19	0.000451	6.85	602.98	217.83	0.39
Reach 1	7004	3900.00	720.40	731.53	727.84	732.22	0.000453	7.34	852.69	280.47	0.40
Reach 1	7053	320.00	720.50	722.57		723.01	0.001864	5.27	60.68	32.52	0.68
Reach 1	7053	940.00	720.50	725.04		725.65	0.001077	6.25	150.40	40.27	0.57
Reach 1	7053	1450.00	720.50	726.76		727.41	0.000813	6.46	224.36	45.68	0.51
Reach 1	7053	2030.00	720.50	728.80		729.27	0.000423	5.72	433.23	139.06	0.39
Reach 1	7053	2460.00	720.50	729.97		730.35	0.000299	5.35	605.17	156.51	0.34
Reach 1	7053	2960.00	720.50	730.87		731.24	0.000263	5.39	760.10	187.05	0.32
Reach 1	7053	3900.00	720.50	731.84		732.27	0.000280	5.96	956.93	220.39	0.34
Reach 1	7148	320.00	721.00	722.62	722.61	723.36	0.004338	6.94	46.14	31.08	1.00
Reach 1	7148	940.00	721.00	725.02		725.83	0.001647	7.23	129.99	38.64	0.69
Reach 1	7148	1450.00	721.00	726.74		727.55	0.001111	7.21	201.07	44.04	0.59
Reach 1	7148	2030.00	721.00	728.76		729.35	0.000590	6.38	370.80	133.69	0.45
Reach 1	7148	2460.00	721.00	729.94		730.40	0.000395	5.87	548.97	168.74	0.38
Reach 1	7148	2960.00	721.00	730.85		731.29	0.000333	5.82	715.61	196.33	0.36
Reach 1	7148	3900.00	721.00	731.82		732.32	0.000344	6.37	920.06	225.64	0.37
Reach 1	7230	290.00	721.53	723.43		723.86	0.002064	5.27	55.06	31.97	0.71
Reach 1	7230	790.00	721.53	725.49		726.06	0.001233	6.20	127.43	38.43	0.60
Reach 1	7230	1220.00	721.53	727.11		727.72	0.000871	6.29	194.06	43.54	0.52
Reach 1	7230	1710.00	721.53	728.85		729.45	0.000621	6.23	279.10	73.07	0.46
Reach 1	7230	2080.00	721.53	729.97		730.49	0.000452	5.98	446.42	220.19	0.40
Reach 1	7230	2490.00	721.53	730.91		731.35	0.000346	5.70	668.26	246.37	0.36
Reach 1	7230	3260.00	721.53	731.96		732.38	0.000311	5.89	939.90	271.05	0.35
Reach 1	7275	290.00	721.75	723.87	722.93	724.04	0.000698	3.38	85.92	41.74	0.41
Reach 1	7275	790.00	721.75	725.90	724.03	726.22	0.000577	4.57	173.04	43.89	0.41
Reach 1	7275	1220.00	721.75	727.45	724.79	727.84	0.000501	4.99	244.47	48.35	0.39
Reach 1	7275	1710.00	721.75	729.12	725.54	729.54	0.000385	5.19	350.27	130.28	0.36
Reach 1	7275	2080.00	721.75	730.19	726.08	730.56	0.000297	5.04	613.98	292.91	0.32
Reach 1	7275	2490.00	721.75	731.09	726.64	731.40	0.000237	4.86	881.66	301.91	0.29
Reach 1	7275	3260.00	721.75	732.13	727.61	732.43	0.000219	5.04	1201.30	315.85	0.29
Reach 1	7628	290.00	722.29	723.88	723.84	724.35	0.002859	5.49	52.84	34.77	0.78
Reach 1	7628	790.00	722.29	725.84	724.89	726.47	0.001357	6.33	124.90	38.69	0.62

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Reach 1	762b	1220.00	722.29	727.38	725.74	728.04	0.000967	6.53	186.74	41.76	0.54
Reach 1	762b	1710.00	722.29	729.05	726.57	729.72	0.000944	6.60	259.25	45.61	0.49
Reach 1	762b	2080.00	722.29	730.07	727.13	730.74	0.000980	6.63	341.14	308.38	0.46
Reach 1	762b	2490.00	722.29	731.04	727.72	731.52	0.000676	6.00	652.96	345.15	0.39
Reach 1	762b	3260.00	722.29	732.15	728.72	732.50	0.000502	5.62	1067.01	455.16	0.34
Reach 1	765c	290.00	723.86	725.27	725.27	725.95	0.004523	6.62	43.84	32.54	1.00
Reach 1	765c	790.00	723.86	726.56	726.56	727.82	0.003825	9.01	87.65	35.13	1.01
Reach 1	765c	1220.00	723.86	727.43	727.43	729.07	0.003586	10.25	118.98	36.87	1.01
Reach 1	765c	1710.00	723.86	728.75		730.34	0.002444	10.09	169.42	39.51	0.86
Reach 1	765c	2080.00	723.86	729.81		731.30	0.001866	9.80	212.18	41.62	0.77
Reach 1	765c	2490.00	723.86	730.44	729.47	732.13	0.001829	10.42	242.07	56.85	0.77
Reach 1	765c	3260.00	723.86	731.38	731.38	733.24	0.001718	11.18	348.30	160.76	0.77
Reach 1	814f	290.00	725.43	726.85	726.85	727.53	0.004492	6.62	43.84	32.37	1.00
Reach 1	814f	790.00	725.43	728.15	728.15	729.41	0.003817	9.00	87.76	35.22	1.00
Reach 1	814f	1220.00	725.43	729.02	729.02	730.65	0.003577	10.22	119.33	37.13	1.01
Reach 1	814f	1710.00	725.43	729.88	729.88	731.85	0.003412	11.25	151.94	39.00	1.00
Reach 1	814f	2080.00	725.43	730.47	730.47	732.66	0.003184	11.88	176.72	46.52	0.99
Reach 1	814f	2490.00	725.43	731.09	731.09	733.48	0.002931	12.44	208.66	56.15	0.97
Reach 1	814f	3260.00	725.43	732.12	732.12	734.85	0.002654	13.38	269.29	61.44	0.95
Reach 1	848d	290.00	725.88	728.02		728.41	0.001591	5.00	58.04	29.28	0.63
Reach 1	848d	790.00	725.88	729.45		730.38	0.002121	7.74	102.02	32.14	0.77
Reach 1	848d	1220.00	725.88	730.30		731.67	0.002468	9.39	129.92	33.83	0.84
Reach 1	848d	1710.00	725.88	731.03		732.91	0.002877	11.02	155.24	35.30	0.93
Reach 1	848d	2080.00	725.88	731.47	731.41	733.77	0.003211	12.16	171.06	36.18	0.99
Reach 1	848d	2490.00	725.88	732.05	732.05	734.65	0.003281	12.95	192.34	37.34	1.01
Reach 1	848d	3260.00	725.88	733.24	733.24	736.15	0.002967	13.69	243.35	69.05	0.98
Reach 1	873e	290.00	726.20	728.46		728.74	0.001054	4.24	68.41	32.50	0.51
Reach 1	873e	790.00	726.20	730.22		730.80	0.001158	6.14	128.57	36.43	0.58
Reach 1	873e	1220.00	726.20	731.38		732.15	0.001204	7.02	173.84	41.37	0.60
Reach 1	873e	1710.00	726.20	732.56		733.45	0.001164	7.59	225.40	46.37	0.61
Reach 1	873e	2080.00	726.20	733.39		734.34	0.001104	7.83	265.55	49.91	0.60
Reach 1	873e	2490.00	726.20	734.24		735.24	0.001047	8.05	309.25	53.50	0.59
Reach 1	873e	3260.00	726.20	735.62		736.72	0.000975	8.41	387.61	59.40	0.58
Reach 1	878e	290.00	726.50	728.59	727.76	728.81	0.000852	3.70	78.33	39.12	0.46
Reach 1	878e	790.00	726.50	730.51	728.92	730.91	0.000739	5.07	155.70	41.74	0.46
Reach 1	878e	1220.00	726.50	731.72	729.71	732.26	0.000736	5.88	207.45	43.40	0.47
Reach 1	878e	1710.00	726.50	732.88	730.51	733.56	0.000749	6.62	258.48	44.99	0.49
Reach 1	878e	2080.00	726.50	733.67	731.05	734.44	0.000753	7.06	294.53	46.07	0.49
Reach 1	878e	2490.00	726.50	734.44	731.61	735.33	0.000769	7.53	330.59	47.13	0.50
Reach 1	878e	3260.00	726.50	735.69	732.58	736.77	0.000814	8.35	390.30	48.83	0.52
Reach 1	880f		Bridge								
Reach 1	882b	290.00	726.60	728.59	727.98	728.90	0.001378	4.52	64.22	33.94	0.58
Reach 1	882b	790.00	726.60	730.46	729.26	731.03	0.001134	6.05	130.66	36.94	0.57
Reach 1	882b	1220.00	726.60	731.66	730.13	732.40	0.001106	6.94	175.92	38.85	0.57
Reach 1	882b	1710.00	726.60	732.79	730.99	733.72	0.001106	7.74	221.05	40.67	0.58
Reach 1	882b	2080.00	726.60	733.57	731.57	734.62	0.001100	8.21	253.26	41.92	0.59
Reach 1	882b	2490.00	726.60	734.33	732.18	735.51	0.001113	8.72	285.64	43.13	0.60
Reach 1	882b	3260.00	726.60	735.56	733.21	736.99	0.001162	9.60	339.54	45.09	0.62
Reach 1	885d	290.00	726.80	728.59		729.00	0.003620	5.15	56.34	32.93	0.69
Reach 1	885d	790.00	726.80	730.44		731.11	0.002559	6.58	120.01	35.80	0.63
Reach 1	885d	1220.00	726.80	731.62		732.49	0.002403	7.46	163.45	37.63	0.63
Reach 1	885d	1710.00	726.80	732.75		733.81	0.002353	8.27	206.75	39.39	0.64
Reach 1	885d	2080.00	726.80	733.52		734.71	0.002315	8.75	237.69	40.59	0.64
Reach 1	885d	2490.00	726.80	734.27		735.61	0.002324	9.27	268.73	41.77	0.64
Reach 1	885d	3260.00	726.80	735.48		737.09	0.002411	10.17	320.41	43.85	0.66
Reach 1	900a	290.00	727.81	729.50	729.43	730.19	0.006783	6.66	43.52	28.00	0.94
Reach 1	900a	790.00	727.81	730.87	730.87	732.24	0.006687	9.40	84.04	31.00	1.01
Reach 1	900a	1220.00	727.81	731.85	731.84	733.59	0.006147	10.57	115.46	32.88	0.99
Reach 1	900a	1710.00	727.81	732.88	732.77	734.89	0.005569	11.39	150.17	34.85	0.97
Reach 1	900a	2080.00	727.81	733.60	733.41	735.77	0.005206	11.83	175.87	36.23	0.95
Reach 1	900a	2490.00	727.81	734.30	734.03	736.67	0.004902	12.35	202.15	40.46	0.93
Reach 1	900a	3260.00	727.81	735.43	735.18	738.16	0.004431	13.31	255.14	53.44	0.91
Reach 1	900b	290.00	727.90	730.01		730.34	0.002368	4.58	63.38	32.08	0.57
Reach 1	900b	790.00	727.90	731.79		732.42	0.002293	6.40	123.38	35.57	0.61

HEC-RAS Plan: 1998 River: RIVER-1 Reach: Reach-1 (Continued)

Reach 9118	1220.00	727.90	732.94		733.78	0.002281	7.37	165.60	37.84	0.62
Reach 9119	1710.00	727.90	734.05		735.09	0.002321	8.17	209.35	41.08	0.64
Reach 9120	2080.00	727.90	734.83		735.97	0.002333	8.57	242.70	44.41	0.65
Reach 9121	2490.00	727.90	735.65		736.88	0.002285	8.88	280.54	47.91	0.65
Reach 9122	3260.00	727.90	737.04		738.38	0.001989	9.32	355.67	65.75	0.62
Reach 9123	290.00	728.05	730.04	729.44	730.38	0.002266	4.67	62.15	34.04	0.58
Reach 9124	790.00	728.05	731.79	730.75	732.50	0.002063	6.77	116.61	35.79	0.62
Reach 9125	1220.00	728.05	732.90	731.66	733.91	0.002063	8.06	151.36	36.90	0.64
Reach 9126	1710.00	728.05	733.97	732.57	735.30	0.002091	9.26	184.61	37.97	0.67
Reach 9127	2080.00	728.05	734.70	733.20	736.26	0.002099	10.03	207.38	49.18	0.69
Reach 9128	2490.00	728.05	735.67	733.86	736.94	0.001962	9.08	293.23	64.69	0.60
Reach 9129	3260.00	728.05	737.06	735.48	738.43	0.001735	9.62	428.15	143.35	0.58
Reach 9130										
Reach 9131	Culvert									
Reach 9132	290.00	728.60	730.82	729.99	731.10	0.001599	4.21	68.83	33.20	0.50
Reach 9133	790.00	728.60	732.93	731.32	733.47	0.001280	5.88	134.25	35.31	0.50
Reach 9134	1220.00	728.60	734.39	732.23	735.10	0.001162	6.80	179.36	39.20	0.50
Reach 9135	1710.00	728.60	735.38	733.14	736.41	0.001344	8.13	210.29	48.49	0.55
Reach 9136	2080.00	728.60	735.98	733.79	736.98	0.001724	8.06	268.24	50.85	0.55
Reach 9137	2490.00	728.60	736.37	734.45	737.64	0.002041	8.10	299.84	104.15	0.60
Reach 9138	3260.00	728.60	737.22	735.91	738.73	0.002179	10.15	425.63	189.39	0.63
Reach 9139										
Reach 9140	290.00	728.60	730.86		731.11	0.001650	4.00	72.54	33.24	0.48
Reach 9141	790.00	728.60	733.04		733.48	0.001372	5.36	147.35	35.42	0.46
Reach 9142	1220.00	728.60	734.56		735.13	0.001242	6.02	203.53	40.49	0.45
Reach 9143	1710.00	728.60	735.70		736.45	0.001335	6.94	254.45	48.83	0.48
Reach 9144	2080.00	728.60	735.99		736.99	0.001723	8.07	268.58	50.90	0.55
Reach 9145	2490.00	728.60	736.37		737.65	0.002040	9.11	300.53	104.80	0.60
Reach 9146	3260.00	728.60	737.21		738.76	0.002219	10.23	423.90	188.48	0.64
Reach 9221	290.00	729.19	731.15	731.15	732.05	0.007791	7.63	38.02	21.29	1.01
Reach 9222	790.00	729.19	732.89	732.89	734.48	0.006803	10.12	78.06	24.77	1.00
Reach 9223	1220.00	729.19	734.02	734.02	736.02	0.006468	11.35	107.46	27.07	1.00
Reach 9224	1710.00	729.19	735.17	735.17	737.46	0.006215	12.14	140.89	31.10	1.00
Reach 9225	2080.00	729.19	735.90	735.90	738.38	0.006113	12.65	164.42	33.64	1.01
Reach 9226	2490.00	729.19	736.73	736.73	739.30	0.005190	12.87	199.55	51.93	0.95
Reach 9227	3260.00	729.19	737.93	737.93	740.73	0.004484	13.59	267.30	67.28	0.91
Reach 9551	290.00	731.28	733.43		734.17	0.005629	6.88	42.13	21.39	0.86
Reach 9552	790.00	731.28	735.04	734.98	736.61	0.006508	10.05	78.63	24.07	0.98
Reach 9553	1220.00	731.28	736.13	736.13	738.19	0.006580	11.53	105.79	25.88	1.01
Reach 9554	1710.00	731.28	737.24	737.24	739.71	0.006385	12.61	135.59	27.73	1.01
Reach 9555	2080.00	731.28	737.95	737.95	740.72	0.006387	13.35	155.86	28.92	1.01
Reach 9556	2490.00	731.28	739.63	739.63	741.56	0.003302	11.48	291.04	135.07	0.76
Reach 9557	3260.00	731.28	740.98	740.98	742.45	0.002308	10.78	560.13	253.41	0.66
Reach 9791	180.00	732.86	734.85		735.12	0.002242	4.18	43.10	23.69	0.55
Reach 9792	460.00	732.86	737.10		737.42	0.001139	4.53	101.49	28.19	0.42
Reach 9793	680.00	732.86	738.61		738.94	0.000821	4.66	147.41	34.84	0.37
Reach 9794	940.00	732.86	740.04		740.41	0.000648	4.91	205.96	55.20	0.34
Reach 9795	1130.00	732.86	741.06		741.38	0.000501	4.77	371.57	271.59	0.31
Reach 9796	1360.00	732.86	741.74		742.02	0.000425	4.66	607.27	417.62	0.29
Reach 9797	1830.00	732.86	742.57		742.79	0.000370	4.65	1025.19	596.56	0.28
Reach 9831	180.00	733.25	734.87	734.63	735.37	0.004433	5.69	31.63	22.31	0.79
Reach 9832	460.00	733.25	737.02	735.83	737.63	0.001747	6.26	73.44	25.52	0.57
Reach 9833	680.00	733.25	738.47	736.60	739.17	0.001282	6.67	101.88	27.71	0.51
Reach 9834	940.00	733.25	740.03	737.40	740.51	0.001052	5.56	169.03	35.81	0.41
Reach 9835	1130.00	733.25	741.05	737.96	741.45	0.000763	5.29	323.96	268.11	0.36
Reach 9836	1360.00	733.25	741.74	738.56	742.06	0.000601	5.02	575.91	481.32	0.33
Reach 9837	1830.00	733.25	742.61	739.96	742.82	0.000445	4.65	1064.82	656.10	0.29
Reach 9838										
Reach 9839	Bridge									
Reach 9840	180.00	733.64	735.11	735.01	735.71	0.005990	6.20	29.03	22.67	0.90
Reach 9841	460.00	733.64	737.11	736.20	737.81	0.002250	6.73	68.38	25.66	0.64
Reach 9842	680.00	733.64	739.73	736.96	740.23	0.000751	5.66	120.13	29.60	0.40
Reach 9843	940.00	733.64	741.04	737.76	741.34	0.000604	4.62	286.24	212.65	0.32
Reach 9844	1130.00	733.64	741.52	738.30	741.82	0.000575	4.73	401.82	269.43	0.32
Reach 9845	1360.00	733.64	741.82	738.93	742.15	0.000635	5.11	489.85	321.84	0.34
Reach 9846	1830.00	733.64	742.76	740.06	743.00	0.000472	4.79	901.81	563.23	0.30

HFC-RAS Plan 1998 River RIVER-1 Reach: Reach-1 (Continued)

Reach 1	0933	180.00	734.08	735.72	735.72	736.47	0.004634	6.96	25.88	17.44	1.01
Reach 1	0933	460.00	734.08	737.05	737.05	738.31	0.004072	8.99	51.19	20.63	1.01
Reach 1	0933	680.00	734.08	739.74		740.28	0.000744	5.95	129.26	43.00	0.48
Reach 1	0933	940.00	734.08	740.88		741.46	0.000641	6.36	209.60	91.91	0.46
Reach 1	0933	1130.00	734.08	741.29		741.96	0.000692	6.91	249.93	101.27	0.48
Reach 1	0933	1360.00	734.08	741.47		742.35	0.000887	7.97	268.14	101.99	0.55
Reach 1	0933	1830.00	734.08	742.21		743.28	0.000998	9.07	360.72	168.10	0.59
Reach 1	0115	160.00	736.30	737.73	737.73	738.40	0.004727	6.56	24.40	18.47	1.01
Reach 1	0115	370.00	736.30	738.75	738.75	739.84	0.004177	8.37	44.23	20.50	1.00
Reach 1	0115	540.00	736.30	739.57		740.78	0.003358	8.77	61.61	22.13	0.93
Reach 1	0115	730.00	736.30	740.78		741.81	0.001888	8.16	90.32	25.35	0.73
Reach 1	0115	880.00	736.30	741.11		742.38	0.002096	9.07	98.71	26.32	0.78
Reach 1	0115	1040.00	736.30	741.19		742.90	0.002740	10.50	100.92	26.57	0.89
Reach 1	0115	1400.00	736.30	741.79	741.79	744.15	0.003191	12.37	117.41	28.37	0.99
Reach 1	0201	160.00	736.80	738.44	737.79	738.62	0.000901	3.45	46.42	32.11	0.47
Reach 1	0201	370.00	736.80	739.85	738.54	740.13	0.000610	4.29	86.29	36.29	0.43
Reach 1	0201	540.00	736.80	740.68	739.04	741.06	0.000582	4.92	109.81	37.77	0.44
Reach 1	0201	730.00	736.80	741.58	739.54	742.03	0.000531	5.40	135.22	39.13	0.44
Reach 1	0201	880.00	736.80	742.12	739.90	742.65	0.000541	5.85	150.43	39.87	0.45
Reach 1	0201	1040.00	736.80	742.67	740.26	743.28	0.000544	6.26	166.03	40.38	0.46
Reach 1	0201	1400.00	736.80	743.94	741.03	744.69	0.000512	6.93	202.09	41.55	0.46
Reach 1	0218										
Reach 1	0224	160.00	737.20	738.41	738.20	738.76	0.002576	4.75	33.68	30.31	0.76
Reach 1	0236	370.00	737.20	739.82	738.96	740.22	0.001040	5.06	73.12	32.76	0.55
Reach 1	0236	540.00	737.20	740.65	739.46	741.14	0.000887	5.61	96.22	34.19	0.53
Reach 1	0236	730.00	737.20	741.54	739.96	742.11	0.000751	6.02	121.22	35.74	0.51
Reach 1	0236	880.00	737.20	742.08	740.33	742.73	0.000741	6.46	136.12	36.67	0.52
Reach 1	0236	1040.00	737.20	743.86	740.70	744.34	0.000367	5.60	185.75	39.75	0.38
Reach 1	0236	1400.00	737.20	744.99	741.46	745.64	0.000394	6.44	217.43	109.02	0.41
Reach 1	0285	160.00	737.80	738.96	738.96	739.49	0.004844	5.86	27.31	25.90	1.01
Reach 1	0286	370.00	737.80	739.77	739.77	740.63	0.004159	7.43	49.79	29.16	1.00
Reach 1	0286	540.00	737.80	740.40		741.35	0.003370	7.83	68.96	31.67	0.94
Reach 1	0286	730.00	737.80	741.47		742.22	0.001820	6.96	104.92	35.91	0.72
Reach 1	0286	880.00	737.80	742.06		742.81	0.001531	6.93	127.04	38.28	0.67
Reach 1	0286	1040.00	737.80	743.99		744.38	0.000534	5.00	208.17	45.96	0.41
Reach 1	0286	1400.00	737.80	745.28		745.68	0.000401	5.12	319.63	115.48	0.37
Reach 1	0509	160.00	739.30	741.01	741.01	741.73	0.004653	6.81	23.49	16.53	1.01
Reach 1	0509	370.00	739.30	742.13	742.13	743.22	0.004119	8.36	44.23	20.58	1.01
Reach 1	0509	540.00	739.30	742.82	742.82	744.10	0.003931	9.06	59.58	23.70	1.01
Reach 1	0509	730.00	739.30	743.46	743.46	744.91	0.003776	9.85	75.68	26.58	1.01
Reach 1	0509	880.00	739.30	743.91	743.91	745.46	0.003673	10.01	87.90	28.58	1.01
Reach 1	0509	1040.00	739.30	744.29	744.29	746.00	0.003532	10.51	99.37	32.42	1.00
Reach 1	0509	1400.00	739.30	745.11	745.11	747.09	0.003076	11.33	130.10	42.29	0.97
Reach 1	0534	160.00	739.60	741.45	741.05	741.90	0.001890	5.37	29.82	16.34	0.70
Reach 1	0534	370.00	739.60	742.25	742.13	743.41	0.003057	8.67	42.69	16.44	0.94
Reach 1	0534	540.00	739.60	742.87	742.87	744.50	0.003226	10.25	52.71	16.51	1.00
Reach 1	0534	730.00	739.60	743.60	743.60	745.59	0.003007	11.32	64.51	16.60	1.00
Reach 1	0534	880.00	739.60	744.13	744.13	746.38	0.002890	12.05	73.02	16.66	1.00
Reach 1	0534	1040.00	739.60	744.66	744.66	747.18	0.002783	12.74	81.64	16.73	1.00
Reach 1	0534	1400.00	739.60	747.47	747.47	748.79	0.001864	9.69	252.80	194.87	0.61
Reach 1	0575										
Reach 1	0583	160.00	739.83	741.45	741.29	742.05	0.002981	6.22	25.73	18.27	0.86
Reach 1	0583	370.00	739.83	742.88	742.39	743.79	0.001948	7.65	48.34	20.38	0.77
Reach 1	0583	540.00	739.83	743.68	743.12	744.89	0.001907	8.85	61.03	21.56	0.80
Reach 1	0583	730.00	739.83	746.76	743.85	747.44	0.000490	8.64	109.92	125.63	0.44
Reach 1	0583	880.00	739.83	746.73	744.39	747.73	0.000723	8.04	109.43	121.45	0.54
Reach 1	0583	1040.00	739.83	747.36	744.94	747.87	0.000592	5.96	282.82	205.71	0.42
Reach 1	0583	1400.00	739.83	748.96	746.04	749.20	0.000265	4.63	769.15	379.74	0.29
Reach 1	0625	160.00	740.18	741.65	741.65	742.33	0.004720	6.62	24.16	17.93	1.01
Reach 1	0625	370.00	740.18	743.19		743.91	0.002240	6.82	54.24	21.02	0.75
Reach 1	0625	540.00	740.18	744.29		745.03	0.001608	6.87	78.68	23.94	0.65
Reach 1	0625	730.00	740.18	747.13		747.49	0.000370	4.93	194.01	80.69	0.35
Reach 1	0625	880.00	740.18	747.32		747.81	0.000481	5.73	210.53	92.96	0.40
Reach 1	0625	1040.00	740.18	747.25		747.96	0.000699	6.86	204.55	88.72	0.48

HEC-RAS Plan: 1998 River RIVER-1 Reach: Reach-1 (Continued)

Reach 10643	1400.00	740.18	748.66		749.36	0.000567	7.06	387.75	155.00	0.45
Reach 10652	160.00	741.89	743.20	743.20	743.82	0.004771	6.32	25.32	20.82	1.00
Reach 10653	370.00	741.89	744.14	744.14	745.16	0.004199	8.12	45.57	22.50	1.01
Reach 10655	540.00	741.89	744.75	744.75	746.02	0.003994	9.05	59.64	23.72	1.01
Reach 10656	730.00	741.89	747.09		747.67	0.000842	6.11	122.26	31.12	0.50
Reach 10655	880.00	741.89	747.26		748.04	0.001081	7.09	127.68	31.88	0.57
Reach 10655	1040.00	741.89	747.17		748.30	0.001617	8.55	124.66	31.46	0.70
Reach 10655	1400.00	741.89	748.47		748.69	0.001270	8.93	171.95	48.68	0.64
Reach 10900	160.00	742.35	743.72	743.35	743.99	0.001686	4.18	38.30	29.61	0.63
Reach 10900	370.00	742.35	744.91	744.10	745.32	0.001120	5.17	71.62	31.01	0.57
Reach 10900	540.00	742.35	745.66	744.60	746.19	0.001012	5.83	92.63	31.89	0.56
Reach 10900	730.00	742.35	747.28	745.10	747.72	0.000488	5.29	138.12	33.80	0.42
Reach 10900	880.00	742.35	747.53	745.47	748.10	0.000602	6.07	145.09	34.10	0.47
Reach 10900	1040.00	742.35	747.63	745.84	748.39	0.000792	7.04	147.70	34.21	0.54
Reach 10900	1400.00	742.35	748.85	746.60	749.77	0.000714	7.69	182.12	35.65	0.53
Reach 10900	Culvert									
Reach 10905	160.00	742.98	745.03	744.01	745.16	0.000469	2.89	55.41	30.51	0.36
Reach 10905	370.00	742.98	746.20	744.77	746.49	0.000556	4.25	87.07	32.51	0.42
Reach 10905	540.00	742.98	747.02	745.29	747.40	0.000559	4.95	109.08	33.91	0.43
Reach 10905	730.00	742.98	748.88	745.80	749.20	0.000290	4.59	159.20	37.08	0.33
Reach 10905	880.00	742.98	749.98	746.18	750.31	0.000238	4.66	188.87	38.96	0.31
Reach 10905	1040.00	742.98	751.17	746.55	751.51	0.000197	4.70	221.13	48.36	0.29
Reach 10905	1400.00	742.98	753.27	747.34	753.45	0.000148	3.45	506.57	230.12	0.23
Reach 11015	160.00	743.50	745.11	745.11	745.79	0.004600	6.62	24.17	17.99	1.01
Reach 11015	370.00	743.50	746.16	746.16	747.21	0.004073	8.20	45.12	21.89	1.01
Reach 11015	540.00	743.50	746.82	746.82	748.06	0.003845	8.96	60.24	24.32	1.00
Reach 11015	730.00	743.50	748.61		749.35	0.001131	8.91	111.77	39.74	0.59
Reach 11015	880.00	743.50	749.81		750.41	0.000673	6.30	173.61	63.34	0.48
Reach 11015	1040.00	743.50	751.10		751.56	0.000411	5.68	265.77	78.03	0.39
Reach 11015	1400.00	743.50	753.13		753.52	0.000270	5.48	541.72	272.06	0.33
Reach 11105	160.00	747.60	749.28	749.28	750.04	0.004712	7.00	22.85	15.18	1.01
Reach 11105	370.00	747.60	750.44	750.44	751.66	0.004259	8.85	41.79	17.38	1.01
Reach 11405	540.00	747.60	751.19	751.19	752.67	0.004075	9.77	55.26	18.79	1.00
Reach 11705	730.00	747.60	751.88	751.88	753.64	0.003716	10.66	69.61	23.15	0.99
Reach 11405	880.00	747.60	752.43	752.43	754.33	0.003319	11.08	84.90	33.56	0.96
Reach 11405	1040.00	747.60	753.05	753.05	754.96	0.002824	11.21	109.87	47.17	0.90
Reach 11705	1400.00	747.60	753.98	753.98	756.11	0.002591	12.10	163.33	67.65	0.89
Reach 11787	160.00	753.20	754.80	754.80	755.47	0.004590	6.56	24.37	18.41	1.01
Reach 11787	370.00	753.20	755.84	755.84	756.86	0.004059	8.11	45.61	22.56	1.01
Reach 11787	540.00	753.20	756.49	756.49	757.70	0.003569	8.84	63.07	38.38	0.98
Reach 11787	730.00	753.20	757.21	757.21	758.43	0.002665	9.02	103.44	73.92	0.88
Reach 11787	880.00	753.20	757.69	757.69	758.88	0.002268	9.11	144.20	97.45	0.83
Reach 11787	1040.00	753.20	757.93	757.93	759.30	0.002444	9.86	169.34	109.46	0.87
Reach 11787	1400.00	753.20	759.01	759.01	759.99	0.001464	8.97	396.67	319.46	0.70
Reach 12170	70.00	756.80	757.78	757.78	758.22	0.005273	5.37	13.02	14.71	1.01
Reach 12170	170.00	756.80	758.51	758.51	759.25	0.004576	6.91	24.59	16.78	1.01
Reach 12170	250.00	756.80	758.97	758.97	759.88	0.004338	7.67	32.58	18.03	1.01
Reach 12170	340.00	756.80	759.41	759.41	760.49	0.004168	8.32	40.87	19.27	1.01
Reach 12170	410.00	756.80	759.72	759.72	760.91	0.004067	8.73	48.98	20.13	1.01
Reach 12170	480.00	756.80	760.01	760.01	761.29	0.003983	9.08	52.88	20.93	1.01
Reach 12170	640.00	756.80	760.60	760.60	762.08	0.003736	9.77	65.75	23.82	1.00
Reach 12218	70.00	757.20	758.24	758.00	758.48	0.002194	3.96	17.65	18.08	0.69
Reach 12218	170.00	757.20	759.15	758.66	759.56	0.001575	5.12	33.20	19.03	0.65
Reach 12218	250.00	757.20	759.61	759.08	760.19	0.001681	6.09	41.05	19.52	0.69
Reach 12218	340.00	757.20	759.81	759.51	760.72	0.002390	7.66	44.41	19.72	0.83
Reach 12218	410.00	757.20	759.86	759.82	761.14	0.003264	9.06	45.26	19.77	0.98
Reach 12218	480.00	757.20	760.13	760.10	761.57	0.003235	9.62	49.88	20.06	0.99
Reach 12218	640.00	757.20	761.77	761.00	762.58	0.001598	7.23	88.53	21.76	0.63
Reach 12218	Culvert									
Reach 12278	70.00	757.90	759.29	758.70	759.43	0.000827	2.96	23.66	19.78	0.44
Reach 12278	170.00	757.90	760.43	759.35	760.68	0.000662	3.95	43.07	22.07	0.44
Reach 12278	250.00	757.90	761.18	759.78	761.49	0.000608	4.49	55.69	26.26	0.44
Reach 12278	340.00	757.90	761.96	760.21	762.21	0.000473	3.99	91.19	35.58	0.37

HEC-RAS Plan: 1998 River: RIVER-1 Reach: Reach-1 (Continued)

Reach 1	12275	410.00	757.90	760.52	760.52	761.84	0.003461	9.22	44.47	22.23	1.00
Reach 1	12276	480.00	757.90	760.80	760.80	762.27	0.003345	9.72	49.38	22.81	1.00
Reach 1	12275	640.00	757.90	762.39	761.80	763.04	0.001112	6.58	132.93	127.98	0.57
Reach 1	12540	70.00	759.80	760.76	760.76	761.19	0.005246	5.25	13.32	15.70	1.01
Reach 1	12541	170.00	759.80	761.47	761.47	762.16	0.004547	6.70	25.39	18.43	1.01
Reach 1	12540	250.00	759.80	761.91	761.91	762.75	0.004278	7.39	33.84	20.12	1.00
Reach 1	12540	340.00	759.80	762.32	762.32	763.32	0.004094	7.99	42.58	21.81	1.00
Reach 1	12540	410.00	759.80	762.60	762.60	763.70	0.003936	8.45	48.74	23.76	1.00
Reach 1	12540	480.00	759.80	762.85	762.85	764.07	0.003751	8.87	54.97	25.60	1.00
Reach 1	12540	640.00	759.80	763.39	763.39	764.82	0.003387	9.63	69.97	29.56	0.98
Reach 1	12871	70.00	762.60	763.57	763.57	764.02	0.005272	5.37	13.04	14.77	1.01
Reach 1	12871	170.00	762.60	764.31	764.31	765.05	0.004577	6.90	24.65	16.86	1.01
Reach 1	12871	250.00	762.60	764.77	764.77	765.68	0.004338	7.65	32.66	18.16	1.01
Reach 1	12871	340.00	762.60	765.21	765.21	766.28	0.004168	8.29	41.03	19.49	1.01
Reach 1	12871	410.00	762.60	765.52	765.52	766.69	0.004063	8.67	47.28	20.49	1.01
Reach 1	12871	480.00	762.60	765.82	765.82	767.07	0.003939	8.97	53.49	21.43	1.00
Reach 1	12871	640.00	762.60	766.68	766.68	767.80	0.002509	8.59	97.26	95.15	0.84
Reach 1	13159	70.00	764.60	765.56	765.56	765.99	0.005275	5.24	13.37	15.87	1.01
Reach 1	13159	170.00	764.60	766.26	766.26	766.95	0.004407	6.69	25.90	22.10	0.99
Reach 1	13159	250.00	764.60	766.71	766.71	767.53	0.003829	7.34	37.59	29.83	0.96
Reach 1	13159	340.00	764.60	767.14	767.14	768.07	0.003459	7.87	51.99	37.21	0.94
Reach 1	13159	410.00	764.60	767.43	767.43	768.42	0.003296	8.23	63.43	42.16	0.93
Reach 1	13159	480.00	764.60	767.69	767.69	768.74	0.003155	8.52	75.28	46.74	0.92
Reach 1	13159	640.00	764.60	768.14	768.14	769.40	0.003231	9.44	98.91	66.18	0.95
Reach 1	13369	70.00	765.48	766.52		766.78	0.002771	4.12	17.00	17.72	0.74
Reach 1	13369	170.00	765.48	767.21		767.71	0.002895	5.68	29.94	19.54	0.81
Reach 1	13369	250.00	765.48	767.59		768.28	0.003207	6.67	37.45	20.52	0.87
Reach 1	13369	340.00	765.48	767.89	767.81	768.83	0.003763	7.78	43.69	21.30	0.96
Reach 1	13369	410.00	765.48	768.11	768.10	769.22	0.004023	8.45	48.53	21.88	1.00
Reach 1	13369	480.00	765.48	768.37	768.37	769.58	0.003994	8.85	54.21	22.55	1.01
Reach 1	13369	640.00	765.48	768.92	768.92	770.33	0.003839	9.54	67.09	24.00	1.01
Reach 1	13410	70.00	765.66	766.71	766.37	766.87	0.001472	3.26	21.45	23.77	0.56
Reach 1	13410	170.00	765.66	767.49	766.94	767.81	0.001338	4.52	37.58	26.24	0.59
Reach 1	13410	250.00	765.66	767.95	767.32	768.39	0.001378	5.32	46.96	27.67	0.62
Reach 1	13410	340.00	765.66	768.37	767.70	768.95	0.001449	6.11	55.62	28.99	0.65
Reach 1	13410	410.00	765.66	768.67	767.97	769.35	0.001494	6.65	61.66	29.91	0.68
Reach 1	13410	480.00	765.66	768.92	768.22	769.72	0.001568	7.19	66.80	30.70	0.70
Reach 1	13410	640.00	765.66	769.36	768.76	770.47	0.001819	8.43	75.93	32.09	0.77
Reach 1	13431		Bridge								
Reach 1	13458	70.00	765.89	766.75	766.60	767.00	0.002798	3.96	17.69	23.47	0.75
Reach 1	13458	170.00	765.89	767.52	767.17	767.92	0.001988	5.09	33.37	25.93	0.70
Reach 1	13458	250.00	765.89	767.97	767.55	768.50	0.001897	5.86	42.66	27.39	0.72
Reach 1	13458	340.00	765.89	768.39	767.93	769.07	0.001907	6.64	51.22	28.73	0.74
Reach 1	13458	410.00	765.89	768.68	768.20	769.48	0.001915	7.16	57.24	29.68	0.76
Reach 1	13458	480.00	765.89	768.93	768.46	769.85	0.001975	7.70	62.33	30.47	0.78
Reach 1	13458	640.00	765.89	771.38	769.00	771.89	0.000489	5.68	112.62	38.36	0.43
Reach 1	13512	70.00	766.40	767.52	767.52	767.94	0.005274	5.19	13.48	16.37	1.01
Reach 1	13512	170.00	766.40	768.22	768.22	768.85	0.004806	6.39	26.62	21.28	1.01
Reach 1	13512	250.00	766.40	768.61	768.61	769.39	0.004348	7.08	35.33	23.07	1.01
Reach 1	13512	340.00	766.40	768.98	768.98	769.90	0.004156	7.69	44.23	24.53	1.01
Reach 1	13512	410.00	766.40	769.24	769.24	770.26	0.004042	8.07	50.79	25.55	1.01
Reach 1	13512	480.00	766.40	769.49	769.49	770.58	0.003948	8.40	57.11	26.50	1.01
Reach 1	13512	640.00	766.40	771.46		771.93	0.000921	5.46	117.12	34.23	0.52
Reach 1	13571	70.00	767.31	768.93	768.93	769.42	0.005174	5.60	12.50	13.10	1.01
Reach 1	13571	170.00	767.31	769.74	769.74	770.45	0.004556	6.72	25.30	18.28	1.01
Reach 1	13571	250.00	767.31	770.21	770.21	771.02	0.004353	7.25	34.48	21.46	1.01
Reach 1	13571	340.00	767.31	770.84	770.64	771.55	0.004185	7.63	44.56	24.94	1.01
Reach 1	13571	410.00	767.31	770.94	770.94	771.89	0.004148	7.83	52.37	28.07	1.01
Reach 1	13571	480.00	767.31	771.21	771.21	772.19	0.004005	7.96	60.31	30.75	1.00
Reach 1	13571	640.00	767.31	771.69	771.69	772.78	0.003947	8.40	76.21	35.51	1.01
Reach 1	13572	70.00	768.07	769.71	769.71	770.15	0.005275	5.31	13.17	15.38	1.01
Reach 1	13572	170.00	768.07	770.43	770.43	771.08	0.004647	6.46	26.31	20.75	1.01
Reach 1	13572	250.00	768.07	770.85	770.85	771.62	0.004408	7.05	35.48	23.56	1.01
Reach 1	13572	340.00	768.07	771.25	771.25	772.12	0.004130	7.47	45.49	26.29	1.00

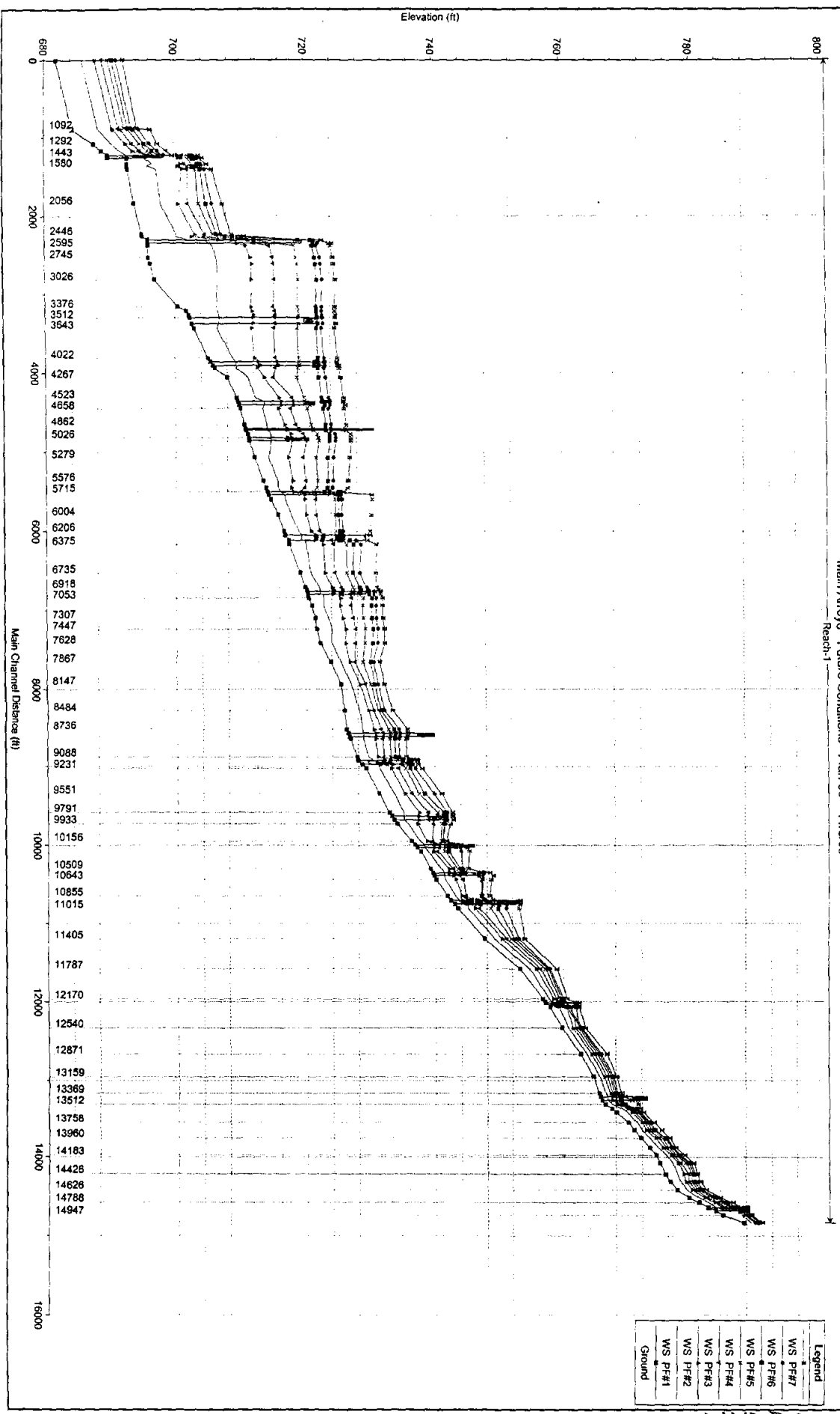
HEC-RAS Plan 1998 River RIVER-1 Reach Reach-1 (Continued)

Reach 1	1362	410.00	768.07	771.50	771.50	772.46	0.004106	7.84	52.30	27.99	1.01
Reach 1	1362	480.00	768.07	771.76	771.76	772.76	0.003928	8.04	59.70	29.73	1.00
Reach 1	1362	640.00	768.07	772.23	772.23	773.38	0.003633	8.62	75.40	41.80	0.99
Reach 1	1375	70.00	769.89	771.24	771.24	771.89	0.005177	5.39	12.99	14.66	1.01
Reach 1	1375	170.00	769.89	771.99	771.99	772.65	0.004583	6.52	26.09	20.13	1.01
Reach 1	1375	250.00	769.89	772.39	772.39	773.21	0.004035	7.30	35.31	26.13	0.99
Reach 1	1375	340.00	769.89	772.80	772.80	773.75	0.003505	7.88	47.51	32.50	0.96
Reach 1	1375	410.00	769.89	773.08	773.08	774.13	0.003309	8.31	57.06	36.66	0.95
Reach 1	1375	480.00	769.89	773.34	773.34	774.46	0.003142	8.67	67.01	40.41	0.94
Reach 1	1375	640.00	769.89	773.87	773.87	775.15	0.002859	9.35	90.65	48.15	0.92
Reach 1	1385	70.00	770.86	772.03	772.03	772.44	0.005245	5.16	13.56	16.61	1.00
Reach 1	1385	170.00	770.86	772.71	772.71	773.43	0.004147	6.85	25.82	20.40	0.99
Reach 1	1385	250.00	770.86	773.15	773.15	774.05	0.003717	7.70	35.49	23.52	0.98
Reach 1	1385	340.00	770.86	773.58	773.58	774.66	0.003408	8.44	46.37	26.46	0.97
Reach 1	1385	410.00	770.86	773.87	773.87	775.08	0.003317	8.99	54.25	28.34	0.97
Reach 1	1385	480.00	770.86	774.09	774.09	775.48	0.003470	9.69	60.84	35.81	1.01
Reach 1	1385	640.00	770.86	775.08	775.08	776.12	0.001910	8.76	127.88	83.00	0.78
Reach 1	1396	70.00	771.83	773.22	773.22	773.75	0.005153	5.84	11.99	11.47	1.01
Reach 1	1396	170.00	771.83	774.09	774.09	774.91	0.004507	7.25	23.62	18.20	1.00
Reach 1	1396	250.00	771.83	774.87	774.87	775.56	0.003348	7.65	39.85	36.92	0.90
Reach 1	1396	340.00	771.83	775.21	775.21	776.11	0.002697	7.93	65.87	62.68	0.84
Reach 1	1396	410.00	771.83	775.62	775.62	776.42	0.002133	7.74	85.58	77.10	0.77
Reach 1	1396	480.00	771.83	775.82	775.82	776.68	0.002210	8.20	110.70	78.39	0.79
Reach 1	1396	640.00	771.83	776.33	776.33	777.19	0.001994	8.57	168.46	141.65	0.77
Reach 1	1408	70.00	773.24	774.55	774.55	775.00	0.004424	5.45	14.74	20.75	0.96
Reach 1	1408	170.00	773.24	775.30	775.30	775.99	0.003445	7.00	34.68	32.12	0.93
Reach 1	1408	250.00	773.24	775.83	775.83	776.57	0.002738	7.45	54.59	41.94	0.87
Reach 1	1408	340.00	773.24	776.17	776.17	777.09	0.002955	8.48	69.17	46.96	0.92
Reach 1	1408	410.00	773.24	776.70	776.70	777.42	0.001969	7.83	112.84	134.00	0.78
Reach 1	1408	480.00	773.24	776.94	776.94	777.65	0.001862	7.99	145.75	142.70	0.76
Reach 1	1408	640.00	773.24	777.29	777.29	778.06	0.001952	8.74	197.85	154.27	0.80
Reach 1	1418	70.00	774.20	775.82	775.82	776.24	0.005382	5.22	13.41	16.37	1.02
Reach 1	1418	170.00	774.20	776.49	776.49	777.18	0.004258	6.69	26.61	23.32	0.99
Reach 1	1418	250.00	774.20	776.91	776.91	777.76	0.003734	7.46	37.55	28.12	0.97
Reach 1	1418	340.00	774.20	777.33	777.33	778.32	0.003403	8.15	50.08	32.76	0.96
Reach 1	1418	410.00	774.20	777.62	777.62	778.70	0.003203	8.57	60.13	36.04	0.95
Reach 1	1418	480.00	774.20	777.87	777.87	779.05	0.003121	9.01	69.59	38.87	0.95
Reach 1	1418	640.00	774.20	778.58	778.58	779.78	0.002423	9.23	107.30	66.08	0.87
Reach 1	1428	70.00	774.79	776.77	776.77	777.30	0.004386	5.92	14.15	16.51	0.96
Reach 1	1428	170.00	774.79	777.65	777.65	778.47	0.003538	7.69	31.71	23.80	0.95
Reach 1	1428	250.00	774.79	778.00	778.00	779.18	0.004206	9.34	40.78	26.70	1.06
Reach 1	1428	340.00	774.79	778.81	778.81	779.84	0.002660	9.00	71.09	48.68	0.88
Reach 1	1428	410.00	774.79	779.19	779.19	780.23	0.002403	9.22	91.86	59.20	0.86
Reach 1	1428	480.00	774.79	779.48	779.48	780.56	0.002369	9.63	109.80	67.59	0.86
Reach 1	1428	640.00	774.79	780.00	780.00	781.19	0.002358	10.46	149.17	82.49	0.88
Reach 1	1442	70.00	775.62	777.47	777.47	777.66	0.001466	3.55	19.73	15.97	0.56
Reach 1	1442	170.00	775.62	778.48	778.48	778.79	0.001208	4.47	38.82	22.26	0.55
Reach 1	1442	250.00	775.62	779.15	779.15	779.52	0.000990	4.89	55.35	27.19	0.52
Reach 1	1442	340.00	775.62	779.65	779.65	780.12	0.001015	5.55	69.78	30.56	0.55
Reach 1	1442	410.00	775.62	779.94	779.94	780.50	0.001089	6.09	78.90	32.50	0.57
Reach 1	1442	480.00	775.62	780.18	780.18	780.84	0.001186	6.64	87.04	36.32	0.61
Reach 1	1442	640.00	775.62	780.53	780.53	781.48	0.001528	8.01	101.09	43.11	0.70
Reach 1	1452	70.00	776.37	778.00	778.00	778.46	0.005199	5.44	12.87	14.29	1.01
Reach 1	1452	170.00	776.37	778.75	778.75	779.53	0.004006	7.14	25.57	19.73	0.98
Reach 1	1452	250.00	776.37	779.23	779.23	780.19	0.003575	8.00	35.94	23.49	0.97
Reach 1	1452	340.00	776.37	779.70	779.70	780.83	0.003251	8.72	47.96	27.23	0.95
Reach 1	1452	410.00	776.37	780.02	780.02	781.26	0.003108	9.22	57.17	29.85	0.95
Reach 1	1452	480.00	776.37	780.33	780.33	781.67	0.002969	9.63	66.93	33.35	0.94
Reach 1	1452	640.00	776.37	780.98	780.98	782.49	0.002692	10.36	91.13	41.53	0.93
Reach 1	1462	70.00	777.42	778.88	778.88	779.37	0.005014	5.64	12.41	12.59	1.00
Reach 1	1462	170.00	777.42	779.70	779.70	780.48	0.004487	7.10	23.94	15.53	1.01
Reach 1	1462	250.00	777.42	780.18	780.18	781.14	0.004126	7.85	31.98	17.99	1.00
Reach 1	1462	340.00	777.42	780.65	780.65	781.78	0.003662	8.55	41.22	21.57	0.98
Reach 1	1462	410.00	777.42	780.97	780.97	782.23	0.003442	9.03	48.64	24.07	0.97
Reach 1	1462	480.00	777.42	781.28	781.28	782.64	0.003259	9.43	56.36	26.41	0.96



HEC-RAS Plan: 1998 River: RIVER-1 Reach: Reach-1 (Continued)

640.00	777.42	781.91	781.91	783.48	0.002973	10.22	74.53	31.37	0.94
70.00	779.14	780.61	780.61	781.18	0.004508	6.09	12.31	12.59	0.99
170.00	779.14	781.55	781.55	782.48	0.003553	7.96	26.05	16.84	0.96
250.00	779.14	782.09	782.09	783.29	0.003427	9.11	35.91	19.76	0.98
340.00	779.14	782.74	782.74	784.06	0.002907	9.70	50.66	25.94	0.94
410.00	779.14	783.16	783.16	784.57	0.002702	10.13	62.43	29.96	0.92
480.00	779.14	783.54	783.54	785.02	0.002555	10.51	74.47	33.52	0.91
640.00	779.14	783.99	783.99	785.95	0.003007	12.23	90.72	37.73	1.01
70.00	780.72	782.26	782.26	782.81	0.004851	5.93	11.94	11.96	1.00
170.00	780.72	783.15	783.15	784.07	0.003781	7.79	24.30	15.86	0.98
250.00	780.72	783.73	783.73	784.86	0.003364	8.71	34.16	18.39	0.96
340.00	780.72	784.37	784.37	785.65	0.002852	9.32	49.08	32.74	0.92
410.00	780.72	784.92	784.92	786.11	0.002245	9.18	72.26	52.11	0.84
480.00	780.72	785.22	785.22	786.48	0.002220	9.61	89.55	62.79	0.84
640.00	780.72	785.99	785.99	787.09	0.001729	9.53	146.29	77.75	0.77
70.00	782.15	783.30	783.30	783.88	0.005934	6.08	11.51	10.00	1.00
170.00	782.15	784.23	784.23	785.27	0.005591	8.16	20.83	13.96	1.00
250.00	782.15	784.84	784.84	786.18	0.005165	9.30	26.88	24.25	1.00
340.00	782.15	785.64	785.64	786.72	0.003260	8.79	57.67	37.84	0.83
410.00	782.15	786.00	786.00	787.14	0.003140	9.21	72.37	43.95	0.83
480.00	782.15	786.48	786.48	787.58	0.002678	9.20	102.48	80.39	0.78
640.00	782.15	787.24	787.24	788.12	0.002028	8.92	185.08	137.61	0.70
Culvert									
70.00	783.29	787.29	784.44	787.34	0.000071	1.75	40.01	37.72	0.15
170.00	783.29	787.76	785.36	787.84	0.000141	2.38	109.73	101.77	0.21
250.00	783.29	788.16	785.97	788.29	0.000203	3.04	174.19	201.65	0.25
340.00	783.29	788.20	786.58	788.42	0.000356	4.05	182.27	203.67	0.34
410.00	783.29	787.01	787.01	788.90	0.003080	11.01	37.25	34.35	1.01
480.00	783.29	788.21	787.60	788.65	0.000699	5.69	184.69	203.94	0.47
640.00	783.29	788.22	788.22	788.99	0.001231	7.56	186.19	204.11	0.62
70.00	784.39	787.29		787.35	0.000207	2.07	53.86	42.24	0.24
170.00	784.39	787.67		787.90	0.000682	4.16	71.81	52.84	0.44
250.00	784.39	787.99		788.33	0.000925	5.21	92.39	107.83	0.53
340.00	784.39	787.91		788.60	0.001944	7.41	84.81	66.71	0.76
410.00	784.39	788.75		789.12	0.000862	5.84	186.43	135.80	0.53
480.00	784.39	788.52	788.52	789.22	0.001672	7.80	155.96	128.36	0.73
640.00	784.39	788.87	788.87	789.63	0.001787	8.57	201.89	139.43	0.76
70.00	787.67	788.76	788.76	789.09	0.003876	5.06	24.82	48.97	0.90
170.00	787.67	789.37	789.37	789.76	0.002933	6.09	65.86	83.63	0.85
250.00	787.67	789.61	789.61	790.09	0.003277	7.06	85.47	83.88	0.92
340.00	787.67	789.84	789.84	790.40	0.003467	7.86	105.14	84.13	0.96
410.00	787.67	789.99	789.99	790.62	0.003716	8.52	117.45	89.24	1.01
480.00	787.67	790.14	790.14	790.82	0.003804	9.00	131.39	94.66	1.03
640.00	787.67	790.45	790.45	791.23	0.003896	9.90	162.20	101.37	1.07



Legend	
WS PF#7	500
WS PF#6	100
WS PF#5	50
WS PF#4	25
WS PF#3	10
WS PF#2	5
WS PF#1	2
Ground	

Future  
Q3  
2  
5  
10  
25  
50  
100  
500

Reach	River Sta	Q=2	Q=5	Q=10	Q=25	Q=50	Q=100	Q=500	Q=1000	Q=2000	Q=5000
Reach-1	212	880.00	681.80	685.77	684.19	685.94	0.002845	3.31	266.00	102.07	0.36
Reach-1	212	2140.00	681.80	687.79	685.52	688.08	0.002841	4.25	503.05	131.81	0.38
Reach-1	212	3060.00	681.80	688.81	686.23	689.16	0.002843	4.75	644.11	142.79	0.39
Reach-1	212	4140.00	681.80	689.77	686.95	690.21	0.002844	5.29	783.33	147.66	0.40
Reach-1	212	4930.00	681.80	690.41	687.44	690.89	0.002844	5.62	877.87	150.87	0.41
Reach-1	212	5810.00	681.80	691.06	687.90	691.61	0.002843	5.94	989.51	233.82	0.42
Reach-1	212	7510.00	681.80	692.11	688.71	692.74	0.002844	6.44	1321.20	392.38	0.42
Reach-1	1062	880.00	684.30	688.33		688.84	0.003579	5.69	154.77	43.00	0.53
Reach-1	1062	2140.00	684.30	690.48		691.58	0.005042	8.42	254.14	49.92	0.66
Reach-1	1062	3060.00	684.30	691.51		693.05	0.006073	9.94	307.70	54.04	0.73
Reach-1	1062	4140.00	684.30	692.41		694.49	0.007281	11.57	357.92	57.24	0.82
Reach-1	1062	4930.00	684.30	692.96		695.44	0.008114	12.65	389.59	58.87	0.87
Reach-1	1062	5810.00	684.30	693.48		696.44	0.009057	13.81	420.86	60.44	0.92
Reach-1	1062	7510.00	684.30	694.38	694.38	698.24	0.010467	15.76	476.85	64.30	1.00
Reach-1	1112	880.00	684.36	688.35		688.87	0.000741	5.81	151.43	45.99	0.56
Reach-1	1112	2140.00	684.36	690.63		691.63	0.000859	8.02	266.82	55.14	0.64
Reach-1	1112	3060.00	684.36	691.82		693.11	0.000921	9.12	335.35	59.92	0.68
Reach-1	1112	4140.00	684.36	692.97		694.58	0.000982	10.17	406.94	64.53	0.71
Reach-1	1112	4930.00	684.36	693.78		695.56	0.000989	10.71	460.30	67.77	0.72
Reach-1	1112	5810.00	684.36	694.67		696.59	0.000958	11.13	522.40	73.14	0.72
Reach-1	1112	7510.00	684.36	696.38		698.46	0.000837	11.60	661.57	87.16	0.69
Reach-1	1292	880.00	687.67	690.46	690.46	691.68	0.002582	8.66	99.27	41.16	1.01
Reach-1	1292	2140.00	687.67	692.49	692.49	694.44	0.002223	11.19	191.25	49.29	1.00
Reach-1	1292	3060.00	687.67	693.62	693.62	695.96	0.002129	12.28	249.20	53.79	1.01
Reach-1	1292	4140.00	687.67	694.76	694.76	697.47	0.002037	13.21	313.44	58.37	1.00
Reach-1	1292	4930.00	687.67	695.50	695.50	698.45	0.001994	13.78	357.69	61.33	1.01
Reach-1	1292	5810.00	687.67	696.26	696.26	699.45	0.001951	14.33	405.53	64.38	1.01
Reach-1	1292	7510.00	687.67	697.56	697.56	701.17	0.001901	15.25	492.46	69.57	1.01
Reach-1	1387	880.00	688.84	691.63	691.63	692.85	0.002573	8.85	99.39	41.17	1.00
Reach-1	1387	2140.00	688.84	693.65	693.65	695.61	0.002246	11.23	190.57	49.24	1.01
Reach-1	1387	3060.00	688.84	694.79	694.79	697.13	0.002128	12.28	249.27	53.80	1.01
Reach-1	1387	4140.00	688.84	695.93	695.93	698.64	0.002040	13.22	313.24	58.36	1.01
Reach-1	1387	4930.00	688.84	696.67	696.67	699.62	0.001992	13.78	357.81	61.34	1.01
Reach-1	1387	5810.00	688.84	697.45	697.45	700.62	0.001935	14.28	406.72	64.45	1.00
Reach-1	1387	7510.00	688.84	698.73	698.73	702.34	0.001899	15.24	492.64	69.58	1.01
Reach-1	1443	880.00	689.79	692.78	692.78	694.27	0.002266	9.80	89.83	41.98	1.00
Reach-1	1443	2140.00	689.79	696.15	696.15	697.11	0.000815	7.88	271.71	55.44	0.63
Reach-1	1443	3060.00	689.79	696.16	696.16	698.12	0.001659	11.25	272.12	55.47	0.89
Reach-1	1443	4140.00	689.79	696.90	696.90	699.59	0.002020	13.17	314.35	58.44	1.00
Reach-1	1443	4930.00	689.79	697.64	697.64	700.57	0.001977	13.74	358.74	61.40	1.00
Reach-1	1443	5810.00	689.79	698.42	698.42	701.57	0.001918	14.24	408.00	64.53	1.00
Reach-1	1443	7510.00	689.79	699.75	699.75	703.29	0.001849	15.10	497.43	69.85	1.00
Reach-1	1456		Cutvert								
Reach-1	1473	880.00	689.84	696.05	692.82	696.39	0.000200	4.73	186.16	56.20	0.33
Reach-1	1473	2140.00	689.84	700.90	695.23	701.10	0.000090	3.59	630.60	131.59	0.23
Reach-1	1473	3060.00	689.84	702.86	696.70	703.09	0.000082	3.97	953.13	195.76	0.22
Reach-1	1473	4140.00	689.84	702.63	698.51	703.09	0.000165	5.54	908.54	188.80	0.31
Reach-1	1473	4930.00	689.84	703.13	698.51	703.70	0.000192	6.19	1007.48	203.92	0.34
Reach-1	1473	5810.00	689.84	703.58	698.51	704.28	0.000225	6.89	1102.80	217.49	0.37
Reach-1	1473	7510.00	689.84	704.35	699.73	705.29	0.000284	8.11	1277.18	231.06	0.42
Reach-1	1483	880.00	692.84	695.56	695.56	696.70	0.002603	8.57	102.63	45.53	1.01
Reach-1	1483	2140.00	692.84	700.76		701.17	0.000263	5.14	438.45	114.43	0.37
Reach-1	1483	3060.00	692.84	702.74		703.15	0.000188	5.26	733.90	176.13	0.33
Reach-1	1483	4140.00	692.84	702.35		703.21	0.000416	7.58	667.18	168.19	0.49
Reach-1	1483	4930.00	692.84	702.80		703.84	0.000472	8.39	745.60	177.49	0.52
Reach-1	1483	5810.00	692.84	703.19		704.45	0.000546	9.31	815.53	185.39	0.57
Reach-1	1483	7510.00	692.84	703.81		705.53	0.000690	10.99	933.80	196.04	0.65
Reach-1	1552	880.00	692.75	696.65		696.85	0.000435	3.59	245.20	80.56	0.36
Reach-1	1552	2140.00	692.75	701.05		701.20	0.000131	3.18	680.32	122.18	0.22
Reach-1	1552	3060.00	692.75	703.00		703.18	0.000106	3.43	944.31	146.00	0.21
Reach-1	1552	4140.00	692.75	702.95		703.28	0.000199	4.67	936.53	145.46	0.29
Reach-1	1552	4930.00	692.75	703.52		703.93	0.000223	5.17	1021.54	151.19	0.31
Reach-1	1552	5810.00	692.75	704.06		704.56	0.000251	5.71	1104.73	157.49	0.33
Reach-1	1552	7510.00	692.75	705.00		706.67	0.000300	6.66	1263.91	181.01	0.37



HEC-RAS Plan: 1998 Future River RIVER\_1 Reach: Reach\_1 (Continued)

Reach	River Sta	Ch. Top	Top of Bank	Top of Embankment	Channel Bottom	Bed Elev	EG Slope	Channel Width	Flow Area	Velocity	Energy Loss
Reach_1	1580	890.00	692.75	695.83	695.82	697.25	0.003926	9.55	92.19	32.72	1.00
Reach_1	1580	2140.00	692.75	700.70		701.37	0.000646	6.85	412.61	126.48	0.46
Reach_1	1580	3060.00	692.75	702.75		703.30	0.000420	6.58	705.66	152.18	0.39
Reach_1	1580	4140.00	692.75	702.36		703.55	0.000938	9.55	647.50	151.01	0.58
Reach_1	1580	4930.00	692.75	702.87		704.23	0.001026	10.38	723.95	152.54	0.61
Reach_1	1580	5810.00	692.75	703.31		704.90	0.001145	11.33	792.55	153.91	0.65
Reach_1	1580	7510.00	692.75	703.99		706.06	0.001404	13.14	898.00	155.98	0.73
Reach_1	1589	880.00	692.75	696.19		697.30	0.002776	8.46	104.06	33.92	0.85
Reach_1	1589	2140.00	692.75	700.70		701.37	0.000643	6.84	413.34	126.59	0.46
Reach_1	1589	3060.00	692.75	702.75		703.30	0.000419	6.58	706.24	152.19	0.39
Reach_1	1589	4140.00	692.75	702.37		703.55	0.000934	9.54	648.77	151.03	0.58
Reach_1	1589	4930.00	692.75	702.88		704.23	0.001021	10.36	725.96	152.57	0.61
Reach_1	1589	5810.00	692.75	703.33		704.90	0.001137	11.30	794.87	153.95	0.65
Reach_1	1589	7510.00	692.75	704.01		706.13	0.001430	13.28	900.66	169.31	0.74
Reach_1	1623	880.00	692.90	697.34		697.41	0.000115	2.25	390.83	92.67	0.19
Reach_1	1623	2140.00	692.90	701.31		701.43	0.000077	2.76	793.71	128.84	0.17
Reach_1	1623	3060.00	692.90	703.20		703.34	0.000074	3.12	1097.56	182.36	0.18
Reach_1	1623	4140.00	692.90	703.40		703.65	0.000126	4.12	1134.02	184.75	0.23
Reach_1	1623	4930.00	692.90	704.03		704.34	0.000141	4.56	1254.30	192.24	0.25
Reach_1	1623	5810.00	692.90	704.66		705.04	0.000158	5.01	1376.97	196.87	0.26
Reach_1	1623	7510.00	692.90	705.84		706.31	0.000181	5.73	1613.02	205.47	0.29
Reach_1	2056	830.00	693.86	698.00	698.00	699.59	0.006547	10.13	81.95	26.00	1.01
Reach_1	2056	2040.00	693.86	700.63	700.63	703.15	0.005713	12.73	161.10	34.78	1.00
Reach_1	2056	2940.00	693.86	702.11	702.11	705.17	0.004964	14.09	217.11	42.08	0.98
Reach_1	2056	3980.00	693.86	703.76	703.76	707.12	0.004096	14.90	303.62	62.42	0.92
Reach_1	2056	4750.00	693.86	704.84	704.84	708.32	0.003687	15.35	375.70	70.90	0.89
Reach_1	2056	5610.00	693.86	705.83	705.83	709.52	0.003475	15.96	449.82	77.56	0.88
Reach_1	2056	7260.00	693.86	707.39	707.39	711.50	0.003336	17.19	575.85	84.33	0.88
Reach_1	2446	830.00	695.02	700.37		701.19	0.002573	7.25	114.57	29.57	0.64
Reach_1	2446	2040.00	695.02	703.17		704.75	0.002794	10.15	208.53	37.61	0.71
Reach_1	2446	2940.00	695.02	704.65		706.72	0.002893	11.67	268.73	45.55	0.74
Reach_1	2446	3980.00	695.02	705.91		708.58	0.003089	13.35	332.91	56.27	0.79
Reach_1	2446	4750.00	695.02	706.52		709.74	0.003457	14.75	367.92	59.08	0.84
Reach_1	2446	5610.00	695.02	707.18	707.07	710.96	0.003759	16.08	407.73	61.71	0.89
Reach_1	2446	7260.00	695.02	708.74	708.74	713.07	0.003666	17.47	509.00	67.96	0.90
Reach_1	2478	830.00	695.12	700.23		701.52	0.004136	9.12	91.05	20.97	0.77
Reach_1	2478	2040.00	695.12	702.68	702.68	705.75	0.006216	14.12	148.39	25.92	0.98
Reach_1	2478	2940.00	695.12	704.56	704.56	708.20	0.005643	15.46	201.52	32.45	0.96
Reach_1	2478	3980.00	695.12	706.59	706.59	710.48	0.004596	16.21	281.19	44.27	0.90
Reach_1	2478	4750.00	695.12	707.75	707.75	711.89	0.004337	16.92	334.50	47.91	0.89
Reach_1	2478	5610.00	695.12	708.89	708.89	713.30	0.004164	17.68	391.15	51.50	0.88
Reach_1	2478	7260.00	695.12	710.71	710.71	715.72	0.004081	19.17	490.59	58.72	0.90
Reach_1	2518	830.00	695.90	701.97	701.97	704.99	0.036278	13.95	59.49	9.80	1.00
Reach_1	2518	2040.00	695.90	706.73	706.73	710.40	0.023171	15.38	132.62	44.89	1.00
Reach_1	2518	2940.00	695.90	708.76	708.76	713.45	0.021404	17.38	189.11	50.74	1.00
Reach_1	2518	3980.00	695.90	710.87	710.87	716.60	0.019956	19.22	207.12	66.44	1.00
Reach_1	2518	4750.00	695.90	712.31	712.31	718.76	0.019184	20.38	233.05	80.03	1.00
Reach_1	2518	5610.00	695.90	719.11	719.11	719.50	0.001040	6.29	1208.86	152.59	0.25
Reach_1	2518	7260.00	695.90	719.11	719.11	719.76	0.001741	8.14	1208.86	152.59	0.32
Reach_1	2547	Bridge									
Reach_1	2565	830.00	695.90	705.42	701.94	706.32	0.007359	7.61	109.07	43.08	0.54
Reach_1	2565	2040.00	695.90	709.68	706.71	711.56	0.007535	10.98	185.77	55.28	0.60
Reach_1	2565	2940.00	695.90	712.39	708.73	714.83	0.007203	12.54	234.46	80.41	0.61
Reach_1	2565	3980.00	695.90	715.31	710.84	718.30	0.006719	13.86	287.12	94.77	0.61
Reach_1	2565	4750.00	695.90	721.48	712.26	721.64	0.000457	4.49	1698.85	277.69	0.17
Reach_1	2565	5610.00	695.90	722.19	713.80	722.38	0.000518	4.89	1912.61	323.93	0.18
Reach_1	2565	7260.00	695.90	724.38	716.45	724.53	0.000396	4.54	2765.11	447.70	0.16
Reach_1	2595	830.00	696.00	705.87		706.48	0.001207	6.32	138.64	25.25	0.40
Reach_1	2595	2040.00	696.00	710.98		711.90	0.001029	8.22	325.93	51.83	0.41
Reach_1	2595	2940.00	696.00	714.68		715.40	0.000646	7.73	569.45	70.80	0.34
Reach_1	2595	3980.00	696.00	718.48		719.05	0.000444	7.36	868.77	87.13	0.29
Reach_1	2595	4750.00	696.00	721.24		721.91	0.000436	7.94	1163.91	192.19	0.29
Reach_1	2595	5610.00	696.00	721.86		722.73	0.000554	9.11	1296.61	239.00	0.33
Reach_1	2595	7260.00	696.00	724.12		724.82	0.000475	8.97	2021.56	387.02	0.31

HFC-BAS Plan 1998 Future River RIVER-1 Reach Reach-1 (Continued)

Reach	River Sta	Flow (cfs)	Water Surface Elevation (ft)	Channel Bottom Elevation (ft)	Bank Top Elevation (ft)	Bank Slope (ft)	Velocity (ft/s)	Water Surface Elevation (ft)	Channel Bottom Elevation (ft)	Bank Top Elevation (ft)	Flow (cfs)
Reach-1	2745	830.00	696.00	706.40		706.62	0.000414	3.79	218.75	34.86	0.27
Reach-1	2745	2040.00	696.00	711.70		712.04	0.000305	4.72	481.26	71.25	0.25
Reach-1	2745	2940.00	696.00	715.16		715.49	0.000220	4.81	759.67	84.44	0.22
Reach-1	2745	3980.00	696.00	718.80		719.12	0.000169	4.90	1126.54	118.42	0.20
Reach-1	2745	4750.00	696.00	721.71		721.98	0.000126	4.67	1499.02	135.27	0.18
Reach-1	2745	5610.00	696.00	722.49		722.82	0.000149	5.21	1606.47	138.94	0.20
Reach-1	2745	7260.00	696.00	724.48		724.89	0.000171	5.91	1897.33	154.56	0.21
Reach-1	2828	830.00	696.32	706.56		706.65	0.000094	2.45	387.61	49.00	0.14
Reach-1	2828	2040.00	696.32	711.87		712.07	0.000118	3.71	681.38	61.87	0.17
Reach-1	2828	2940.00	696.32	715.26		715.51	0.000116	4.23	914.05	92.96	0.18
Reach-1	2828	3980.00	696.32	718.88		719.13	0.000100	4.43	1326.51	123.96	0.17
Reach-1	2828	4750.00	696.32	721.75		721.99	0.000084	4.41	1705.95	142.57	0.16
Reach-1	2828	5610.00	696.32	722.54		722.84	0.000102	4.97	1820.41	148.40	0.17
Reach-1	2828	7260.00	696.32	724.53		724.91	0.000122	5.71	2130.16	162.44	0.19
Reach-1	3028	830.00	696.86	706.55		706.69	0.000194	3.16	320.40	60.01	0.19
Reach-1	3028	2040.00	696.86	711.92		712.10	0.000152	3.88	664.02	162.03	0.18
Reach-1	3028	2940.00	696.86	715.41		715.54	0.000098	3.63	1511.27	204.83	0.15
Reach-1	3028	3980.00	696.86	719.07		719.17	0.000063	3.30	2309.15	229.92	0.13
Reach-1	3028	4750.00	696.86	721.95		722.02	0.000045	3.05	2996.67	248.75	0.11
Reach-1	3028	5610.00	696.86	722.78		722.87	0.000053	3.36	3206.79	252.16	0.12
Reach-1	3028	7260.00	696.86	724.85		724.95	0.000058	3.73	3735.78	260.19	0.13
Reach-1	3376	730.00	700.46	706.46		706.92	0.001239	5.42	134.75	29.22	0.44
Reach-1	3376	1840.00	700.46	711.78		712.28	0.000597	5.77	347.73	55.56	0.34
Reach-1	3376	2660.00	700.46	715.25		715.68	0.000357	5.54	620.85	96.56	0.28
Reach-1	3376	3630.00	700.46	718.93		719.27	0.000221	5.17	1029.32	129.79	0.23
Reach-1	3376	4330.00	700.46	721.84		722.10	0.000150	4.74	1462.02	168.42	0.19
Reach-1	3376	5130.00	700.46	722.65		722.96	0.000172	5.23	1603.86	177.99	0.21
Reach-1	3376	6650.00	700.46	724.71		725.05	0.000181	5.72	1993.63	203.99	0.21
Reach-1	3429	730.00	701.75	706.53		706.96	0.000527	5.24	139.24	36.67	0.47
Reach-1	3429	1840.00	701.75	712.00		712.32	0.000160	4.54	414.18	63.98	0.29
Reach-1	3429	2660.00	701.75	715.40		715.70	0.000093	4.44	667.28	92.39	0.24
Reach-1	3429	3630.00	701.75	719.00		719.28	0.000062	4.38	1082.15	140.15	0.20
Reach-1	3429	4330.00	701.75	721.86		722.10	0.000044	4.18	1551.81	190.17	0.18
Reach-1	3429	5130.00	701.75	722.67		722.97	0.000052	4.66	1712.17	205.10	0.19
Reach-1	3429	6650.00	701.75	724.70		725.06	0.000056	5.21	2165.36	237.59	0.20
Reach-1	3482	730.00	702.09	706.78		707.01	0.000671	3.83	190.80	49.28	0.34
Reach-1	3482	1840.00	702.09	712.12		712.34	0.000238	3.72	500.66	67.23	0.23
Reach-1	3482	2660.00	702.09	715.51		715.72	0.000151	3.72	786.15	101.84	0.19
Reach-1	3482	3630.00	702.09	719.10		719.29	0.000103	3.68	1204.15	131.44	0.17
Reach-1	3482	4330.00	702.09	721.94		722.11	0.000076	3.55	1642.07	185.73	0.15
Reach-1	3482	5130.00	702.09	722.76		722.98	0.000090	3.98	1810.07	222.05	0.16
Reach-1	3482	6650.00	702.09	724.83		725.08	0.000095	4.38	2354.43	289.66	0.17
Reach-1	3512	730.00	702.23	706.83	704.42	707.04	0.000584	3.65	200.09	49.08	0.32
Reach-1	3512	1840.00	702.23	712.13	706.22	712.35	0.000238	3.75	495.65	63.51	0.23
Reach-1	3512	2660.00	702.23	715.51	707.27	715.73	0.000158	3.81	756.58	88.39	0.19
Reach-1	3512	3630.00	702.23	719.09	708.35	719.31	0.000113	3.84	1118.35	112.77	0.17
Reach-1	3512	4330.00	702.23	721.93	709.06	722.13	0.000084	3.72	1463.42	131.12	0.15
Reach-1	3512	5130.00	702.23	722.74	709.82	723.01	0.000108	4.32	1608.47	234.59	0.17
Reach-1	3512	6650.00	702.23	724.81	711.06	725.10	0.000112	4.71	2358.22	444.97	0.18
Reach-1	3590	Bridge									
Reach-1	3590	730.00	702.57	706.81	705.23	707.19	0.001315	4.91	148.64	43.72	0.47
Reach-1	3590	1840.00	702.57	712.13	707.24	712.41	0.000347	4.25	445.22	70.88	0.27
Reach-1	3590	2660.00	702.57	715.52	708.37	715.77	0.000197	4.11	723.16	93.01	0.22
Reach-1	3590	3630.00	702.57	719.11	709.52	719.34	0.000129	4.01	1098.57	117.40	0.19
Reach-1	3590	4330.00	702.57	722.06	710.19	722.25	0.000089	3.77	1442.45	213.96	0.16
Reach-1	3590	5130.00	702.57	722.86	710.92	723.11	0.000108	4.28	1750.58	277.48	0.18
Reach-1	3590	6650.00	702.57	724.91	712.18	725.18	0.000109	4.62	2477.72	428.57	0.18
Reach-1	3593	730.00	702.85	706.43	706.43	707.82	0.006705	9.49	76.91	27.49	1.00
Reach-1	3593	1840.00	702.85	711.86		712.57	0.001073	6.75	277.29	45.64	0.46
Reach-1	3593	2660.00	702.85	715.28		715.90	0.000555	6.36	451.08	55.98	0.35
Reach-1	3593	3630.00	702.85	718.87		719.46	0.000359	6.26	677.30	79.85	0.30
Reach-1	3593	4330.00	702.85	721.86		722.34	0.000240	5.82	978.70	114.73	0.25
Reach-1	3593	5130.00	702.85	722.62		723.23	0.000289	6.59	1081.25	165.23	0.28
Reach-1	3593	6650.00	702.85	724.64		725.30	0.000291	7.11	1565.81	285.80	0.28

HFC-BAS Plan: 1998 Future River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	CS	US	US	US	US	US	US	US	US	US
Reach-1	4022	730.00	705.03	708.85		709.59	0.002813	6.93	105.37	30.98	0.66
Reach-1	4022	1840.00	705.03	712.25		713.28	0.002069	8.17	225.59	43.70	0.61
Reach-1	4022	2660.00	705.03	715.48		716.22	0.000852	7.10	438.27	82.82	0.42
Reach-1	4022	3630.00	705.03	719.12		719.62	0.000404	6.15	790.01	113.96	0.31
Reach-1	4022	4330.00	705.03	722.12		722.47	0.000228	5.33	1256.30	204.86	0.24
Reach-1	4022	5130.00	705.03	723.01		723.40	0.000243	5.71	1442.14	215.31	0.25
Reach-1	4022	6650.00	705.03	725.11		725.48	0.000222	5.91	2019.28	398.95	0.24
Reach-1	4071	730.00	705.40	709.35	707.96	709.82	0.000641	5.50	132.74	37.41	0.51
Reach-1	4071	1840.00	705.40	712.89	710.04	713.55	0.000438	6.53	286.83	57.58	0.46
Reach-1	4071	2660.00	705.40	715.73	711.29	716.33	0.000246	6.29	497.08	85.18	0.37
Reach-1	4071	3630.00	705.40	719.14	712.53	719.64	0.000142	5.91	826.17	107.71	0.29
Reach-1	4071	4330.00	705.40	722.12	713.34	722.52	0.000090	5.41	1170.93	149.07	0.24
Reach-1	4071	5130.00	705.40	723.00	714.26	723.49	0.000103	6.02	1331.55	157.00	0.26
Reach-1	4071	6650.00	705.40	725.08	715.68	725.66	0.000108	6.67	1791.30	356.14	0.27
Reach-1	4083.5										
Reach-1	4118	730.00	705.76	709.63	708.19	710.04	0.000569	5.16	141.40	40.56	0.49
Reach-1	4118	1840.00	705.76	713.28	710.17	713.83	0.000346	5.94	313.96	55.73	0.42
Reach-1	4118	2660.00	705.76	715.99	711.36	716.53	0.000214	5.92	494.13	79.91	0.35
Reach-1	4118	3630.00	705.76	719.30	712.51	719.78	0.000131	5.69	799.86	103.63	0.29
Reach-1	4118	4330.00	705.76	722.22	713.22	722.62	0.000084	5.27	1123.81	126.12	0.24
Reach-1	4118	5130.00	705.76	723.21	713.99	723.68	0.000093	5.77	1238.28	167.36	0.25
Reach-1	4118	6650.00	705.76	725.43	715.40	726.03	0.000102	6.59	1823.10	370.03	0.27
Reach-1	4148	730.00	706.08	709.37	709.37	710.83	0.002713	9.69	75.30	26.09	1.01
Reach-1	4148	1840.00	706.08	712.71		714.44	0.001442	10.54	175.69	35.56	0.80
Reach-1	4148	2660.00	706.08	715.52		717.02	0.000730	9.90	303.56	60.28	0.61
Reach-1	4148	3630.00	706.08	718.96		720.13	0.000380	9.00	569.05	95.27	0.46
Reach-1	4148	4330.00	706.08	721.99		722.86	0.000221	8.00	977.50	184.98	0.37
Reach-1	4148	5130.00	706.08	722.98		723.92	0.000229	8.52	1163.29	189.89	0.38
Reach-1	4148	6650.00	706.08	725.28		726.19	0.000203	8.78	1623.36	229.23	0.36
Reach-1	4267	730.00	708.00	711.25	711.25	712.67	0.002610	9.54	76.55	27.05	1.00
Reach-1	4267	1840.00	708.00	713.75	713.75	716.06	0.002327	12.20	150.81	32.46	1.00
Reach-1	4267	2660.00	708.00	715.13	715.13	717.95	0.002159	13.48	200.89	50.57	0.99
Reach-1	4267	3630.00	708.00	718.80	716.84	720.29	0.000663	10.22	562.74	143.03	0.59
Reach-1	4267	4330.00	708.00	722.18	717.68	722.90	0.000246	7.65	1211.72	249.54	0.38
Reach-1	4267	5130.00	708.00	723.24	718.69	723.97	0.000237	7.92	1478.34	252.73	0.38
Reach-1	4267	6650.00	708.00	725.59	720.13	726.24	0.000191	7.90	2078.10	258.96	0.35
Reach-1	4523	730.00	709.47	712.37	712.37	713.52	0.002640	8.64	84.52	36.95	1.01
Reach-1	4523	1840.00	709.47	716.02		716.82	0.000750	7.18	256.40	56.99	0.60
Reach-1	4523	2660.00	709.47	718.07		718.81	0.000517	6.92	384.45	72.37	0.51
Reach-1	4523	3630.00	709.47	719.91		720.64	0.000389	6.92	631.40	195.27	0.46
Reach-1	4523	4330.00	709.47	722.63		723.04	0.000155	5.42	1307.77	290.11	0.31
Reach-1	4523	5130.00	709.47	723.70		724.11	0.000142	5.56	1629.07	310.70	0.30
Reach-1	4523	6650.00	709.47	725.98		726.36	0.000107	5.51	2421.08	386.45	0.27
Reach-1	4569	730.00	709.60	713.72	712.09	714.06	0.000454	4.64	157.28	46.26	0.44
Reach-1	4569	1840.00	709.60	716.35	714.01	716.96	0.000488	6.30	292.15	56.60	0.49
Reach-1	4569	2660.00	709.60	718.20	715.10	718.87	0.000411	6.59	403.87	63.91	0.46
Reach-1	4569	3630.00	709.60	719.93	716.20	720.68	0.000380	6.98	520.02	70.71	0.45
Reach-1	4569	4330.00	709.60	722.61	716.91	723.16	0.000186	6.00	856.11	189.98	0.33
Reach-1	4569	5130.00	709.60	723.67	717.63	724.27	0.000180	6.31	1090.79	252.56	0.33
Reach-1	4569	6650.00	709.60	725.95	718.92	726.53	0.000144	6.40	1808.53	374.95	0.31
Reach-1	4581										
Reach-1	4581	730.00	709.80	713.74	712.27	714.10	0.000519	4.81	151.73	47.00	0.47
Reach-1	4581	1840.00	709.80	716.37	714.17	716.99	0.000515	6.34	290.07	58.33	0.50
Reach-1	4581	2660.00	709.80	718.23	715.23	718.90	0.000419	6.55	406.40	66.38	0.47
Reach-1	4581	3630.00	709.80	720.80	716.31	721.39	0.000263	6.16	589.60	113.60	0.38
Reach-1	4581	4330.00	709.80	723.09	717.00	723.55	0.000150	5.51	1007.97	248.49	0.30
Reach-1	4581	5130.00	709.80	723.89	717.72	724.41	0.000157	5.92	1227.52	303.39	0.31
Reach-1	4581	6650.00	709.80	726.27	718.97	726.71	0.000114	5.75	2089.18	424.22	0.28
Reach-1	4583	730.00	710.00	713.54		714.37	0.001341	7.30	99.97	32.42	0.73
Reach-1	4583	1840.00	710.00	715.95		717.49	0.001425	9.96	184.68	38.12	0.80
Reach-1	4583	2660.00	710.00	717.77		719.42	0.001150	10.29	258.38	42.47	0.74
Reach-1	4583	3630.00	710.00	720.43		721.80	0.000613	9.50	482.40	136.23	0.57
Reach-1	4583	4330.00	710.00	722.88		723.78	0.000316	8.05	938.69	234.02	0.43
Reach-1	4583	5130.00	710.00	723.66		724.65	0.000329	8.60	1134.78	268.92	0.44

HFC-BAS Plan 1998 Future River RIVER-1 Reach Reach-1 (Continued)

Reach-1	Reach-2	Reach-3	Reach-4	Reach-5	Reach-6	Reach-7	Reach-8	Reach-9	Reach-10	Reach-11	Reach-12
4858	4858	6650.00	710.00	726.06		726.93	0.000247	8.43	1923.32	387.31	0.39
4862	4862	470.00	710.60	714.14		714.83	0.000816	5.59	84.08	27.46	0.56
4862	4862	1260.00	710.60	716.91		717.78	0.000798	7.50	168.08	33.28	0.59
4862	4862	1870.00	710.60	718.63		719.67	0.000715	8.18	231.44	50.18	0.57
4862	4862	2570.00	710.60	721.05		721.95	0.000421	7.78	456.44	144.89	0.46
4862	4862	3090.00	710.60	723.26		723.87	0.000233	6.73	875.78	214.07	0.36
4862	4862	3670.00	710.60	724.09		724.74	0.000238	7.14	1058.10	227.90	0.37
4862	4862	4760.00	710.60	726.43		727.00	0.000179	6.99	1686.43	318.38	0.33
4912	4912	470.00	710.80	714.24	713.20	714.68	0.000792	5.35	87.92	31.15	0.56
4912	4912	1260.00	710.80	717.25	715.19	717.89	0.000581	6.42	196.29	40.91	0.52
4912	4912	1870.00	710.80	719.09	716.32	719.80	0.000456	6.77	281.17	55.85	0.48
4912	4912	2570.00	710.80	721.33	717.44	722.03	0.000300	6.74	433.31	75.66	0.41
4912	4912	3090.00	710.80	723.26	718.14	723.89	0.000211	6.46	587.14	82.34	0.35
4912	4912	3670.00	710.80	724.06	718.84	724.80	0.000229	7.07	653.35	84.10	0.37
4912	4912	4760.00	710.80	726.32	720.09	727.13	0.000200	7.47	848.32	88.25	0.36
4920.5		Bridge									
4929	4929	470.00	710.90	714.39	713.11	714.76	0.000613	4.91	95.74	30.91	0.49
4929	4929	1260.00	710.90	717.32	715.04	717.96	0.000556	6.44	195.80	39.22	0.50
4929	4929	1870.00	710.90	719.17	716.20	719.92	0.000446	6.95	283.72	57.49	0.47
4929	4929	2570.00	710.90	721.38	717.38	722.12	0.000314	7.02	433.55	75.42	0.41
4929	4929	3090.00	710.90	723.26	718.14	723.93	0.000227	6.77	582.69	81.38	0.36
4929	4929	3670.00	710.90	724.04	718.91	724.83	0.000248	7.41	646.70	82.72	0.38
4929	4929	4760.00	710.90	726.33	720.29	727.18	0.000216	7.79	840.44	86.67	0.37
4979	4979	470.00	711.10	714.70		714.80	0.000149	2.60	180.44	54.34	0.25
4979	4979	1260.00	711.10	717.83		718.02	0.000129	3.48	362.19	61.61	0.25
4979	4979	1870.00	711.10	719.75		719.98	0.000110	3.87	513.77	99.57	0.24
4979	4979	2570.00	711.10	721.94		722.18	0.000084	3.98	906.65	276.67	0.22
4979	4979	3090.00	711.10	723.78		723.98	0.000060	3.77	1453.81	313.67	0.19
4979	4979	3670.00	711.10	724.68		724.89	0.000062	4.03	1747.43	349.78	0.20
4979	4979	4760.00	711.10	727.04		727.25	0.000050	4.06	2713.19	471.84	0.18
5026	5026	470.00	711.30	714.77	712.37	714.82	0.000073	1.83	256.83	74.00	0.17
5026	5026	1260.00	711.30	717.95	713.37	718.05	0.000067	2.56	491.93	74.00	0.18
5026	5026	1870.00	711.30	719.88	714.00	720.01	0.000067	2.95	634.69	74.00	0.18
5026	5026	2570.00	711.30	722.05	714.64	722.21	0.000057	3.18	981.15	255.02	0.17
5026	5026	3090.00	711.30	723.86	715.07	724.00	0.000045	3.10	1597.65	426.81	0.15
5026	5026	3670.00	711.30	724.76	715.53	724.92	0.000046	3.32	2027.77	530.71	0.16
5026	5026	4760.00	711.30	727.15	716.34	727.27	0.000035	3.19	3589.04	741.04	0.14
5044.5		Culvert									
5063	5063	470.00	711.40	714.81	712.49	714.86	0.000075	1.89	248.86	73.00	0.18
5063	5063	1260.00	711.40	718.07	713.49	718.17	0.000061	2.59	486.66	73.01	0.18
5063	5063	1870.00	711.40	720.24	714.12	720.37	0.000054	2.90	646.25	94.82	0.17
5063	5063	2570.00	711.40	722.23	714.77	722.38	0.000057	3.18	1016.11	274.04	0.17
5063	5063	3090.00	711.40	723.86	715.21	724.00	0.000047	3.16	1573.09	410.01	0.16
5063	5063	3670.00	711.40	724.75	715.67	724.92	0.000049	3.39	1990.89	527.92	0.16
5063	5063	4760.00	711.40	727.14	716.48	727.27	0.000036	3.23	3561.56	703.00	0.14
5279	5279	470.00	712.20	714.40	714.40	715.43	0.002844	8.13	57.78	28.41	1.01
5279	5279	1260.00	712.20	717.45		718.49	0.001125	8.15	154.62	35.96	0.69
5279	5279	1870.00	712.20	719.72		720.63	0.000705	7.65	244.34	43.13	0.57
5279	5279	2570.00	712.20	721.76		722.62	0.000461	7.51	429.70	151.92	0.48
5279	5279	3090.00	712.20	723.53		724.17	0.000284	6.78	824.03	299.24	0.39
5279	5279	3670.00	712.20	724.44		725.08	0.000261	6.92	1131.64	364.81	0.38
5279	5279	4760.00	712.20	726.96		727.37	0.000147	6.01	2214.08	473.71	0.30
5576	5576	370.00	713.50	715.76		716.32	0.002848	6.04	61.26	35.99	0.82
5576	5576	1040.00	713.50	718.06		718.88	0.001432	7.17	145.86	39.19	0.63
5576	5576	1550.00	713.50	720.10		720.87	0.000807	7.06	235.34	49.40	0.51
5576	5576	2130.00	713.50	721.97		722.78	0.000605	7.32	336.20	58.82	0.46
5576	5576	2580.00	713.50	723.53		724.32	0.000472	7.29	444.07	79.61	0.42
5576	5576	3060.00	713.50	724.35		725.26	0.000493	7.87	514.55	94.50	0.43
5576	5576	3960.00	713.50	726.68		727.58	0.000385	7.96	807.40	156.47	0.40
5588	5588	370.00	714.00	715.87	715.84	716.71	0.004083	7.37	50.21	28.74	0.98
5588	5588	1040.00	714.00	717.88		719.22	0.002798	9.27	112.14	32.77	0.88
5588	5588	1550.00	714.00	719.97		721.06	0.001441	8.38	184.91	36.94	0.66
5588	5588	2130.00	714.00	721.88		722.92	0.001051	8.19	260.19	42.01	0.58

HFC-BAS Plan: 1998 Future River: RIVER-1 Beach: Beach-1 (Continued)

Reach #	Reach ID	Flow (cfs)	Water Surface Elevation (ft)	Channel Bottom Elevation (ft)	Bank Top Elevation (ft)	Bank Slope (H:V)	Bank Protection Type	Bank Protection Cost (\$/ft)	Bank Protection Length (ft)	Bank Protection Area (sq ft)	Bank Protection Volume (cu ft)
Reach-1	5655	2580.00	714.00	723.47				7.83	329.42	44.79	0.51
Reach-1	5656	3060.00	714.00	724.29				8.35	366.62	46.15	0.52
Reach-1	5656	3960.00	714.00	726.61				8.28	487.67	80.79	0.47
Reach-1	5715	370.00	714.20	716.24	716.24	717.22	0.004408	7.98	46.36	23.56	1.00
Reach-1	5715	1040.00	714.20	718.21	718.21	720.10	0.003971	11.01	94.42	25.07	1.00
Reach-1	5715	1550.00	714.20	719.45	719.38	721.80	0.003763	12.30	126.08	26.01	0.98
Reach-1	5715	2130.00	714.20	721.35	720.56	723.60	0.002683	12.04	176.84	27.47	0.84
Reach-1	5715	2580.00	714.20	722.96	721.39	725.06	0.002074	11.62	222.08	28.70	0.74
Reach-1	5715	3060.00	714.20	723.65	722.21	726.13	0.002294	12.64	242.13	29.23	0.77
Reach-1	5715	3960.00	714.20	725.95	723.64	728.43	0.001804	12.68	336.06	56.34	0.69
Reach-1	5733B										
Reach-1	5752	370.00	714.30	717.16	716.16	717.51	0.001844	4.78	77.33	29.09	0.52
Reach-1	5752	1040.00	714.30	719.93	717.93	720.56	0.001556	6.37	163.39	33.04	0.50
Reach-1	5752	1550.00	714.30	721.58	719.00	722.35	0.001466	7.05	219.90	35.40	0.50
Reach-1	5752	2130.00	714.30	724.57	720.05	725.21	0.000819	6.42	331.67	54.30	0.39
Reach-1	5752	2580.00	714.30	725.07	720.78	725.91	0.000996	7.35	350.86	74.09	0.43
Reach-1	5752	3060.00	714.30	725.47	721.51	726.56	0.001216	8.36	366.11	89.83	0.48
Reach-1	5752	3960.00	714.30	730.29	722.72	730.54	0.000237	4.80	1537.35	316.49	0.22
Reach-1	5811	370.00	714.70	717.21		717.69	0.002933	5.56	66.49	28.02	0.65
Reach-1	5811	1040.00	714.70	719.98		720.68	0.001881	6.73	154.51	34.56	0.56
Reach-1	5811	1550.00	714.70	721.65		722.45	0.001618	7.21	214.99	37.89	0.53
Reach-1	5811	2130.00	714.70	724.66		725.26	0.000745	6.29	363.00	68.91	0.38
Reach-1	5811	2580.00	714.70	725.22		725.98	0.000864	7.06	403.82	76.88	0.42
Reach-1	5811	3060.00	714.70	725.71		726.64	0.000996	7.86	443.12	83.84	0.45
Reach-1	5811	3960.00	714.70	730.42		730.56	0.000145	3.93	2246.70	513.82	0.18
Reach-1	6004	370.00	715.80	717.78		718.60	0.006566	7.27	50.89	27.31	0.94
Reach-1	6004	1040.00	715.80	720.16		721.32	0.003789	8.63	120.49	31.27	0.77
Reach-1	6004	1550.00	715.80	721.74		723.00	0.002971	9.01	172.10	33.91	0.70
Reach-1	6004	2130.00	715.80	724.62		725.55	0.001304	7.72	284.07	48.61	0.49
Reach-1	6004	2580.00	715.80	725.15		726.32	0.001518	8.71	310.82	53.34	0.54
Reach-1	6004	3060.00	715.80	725.59		727.04	0.001771	9.75	335.27	57.31	0.59
Reach-1	6004	3960.00	715.80	730.23		730.71	0.000414	6.28	1042.40	211.04	0.30
Reach-1	6206	370.00	716.70	719.04		719.61	0.003748	6.05	61.12	28.17	0.72
Reach-1	6206	1040.00	716.70	720.91		722.14	0.004181	8.90	116.89	31.50	0.81
Reach-1	6206	1550.00	716.70	722.26		723.71	0.003585	9.58	161.81	33.95	0.77
Reach-1	6206	2130.00	716.70	724.81		725.90	0.001765	8.40	260.06	48.45	0.57
Reach-1	6206	2580.00	716.70	725.37		726.72	0.001966	9.34	288.27	51.55	0.61
Reach-1	6206	3060.00	716.70	725.87		727.50	0.002205	10.33	314.29	54.26	0.65
Reach-1	6206	3960.00	716.70	730.12		730.91	0.000678	7.64	827.17	302.71	0.39
Reach-1	6259	370.00	716.90	719.49	718.54	719.82	0.001903	4.60	80.43	31.00	0.50
Reach-1	6259	1040.00	716.90	721.67	720.16	722.44	0.002295	7.03	147.93	31.00	0.57
Reach-1	6259	1550.00	716.90	722.89	721.17	723.97	0.002582	8.35	185.72	31.00	0.60
Reach-1	6259	2130.00	716.90	724.88	722.17	726.03	0.002109	8.61	247.42	31.00	0.54
Reach-1	6259	2580.00	716.90	725.42	722.89	726.90	0.002563	9.76	264.21	31.00	0.59
Reach-1	6259	3060.00	716.90	725.88	723.59	727.76	0.003105	10.99	278.41	31.00	0.65
Reach-1	6259	3960.00	716.90	730.07	724.87	731.05	0.001231	8.45	783.54	385.27	0.41
Reach-1	6301										
Reach-1	6323	370.00	717.40	719.94	719.04	720.28	0.002033	4.70	78.77	31.00	0.52
Reach-1	6323	1040.00	717.40	722.48	720.66	723.16	0.001900	6.60	157.52	31.00	0.52
Reach-1	6323	1550.00	717.40	724.02	721.65	724.91	0.001922	7.55	205.28	31.00	0.52
Reach-1	6323	2130.00	717.40	725.92	722.66	726.93	0.001751	8.07	263.98	31.00	0.49
Reach-1	6323	2580.00	717.40	726.84	723.37	728.05	0.001916	8.82	292.68	31.00	0.51
Reach-1	6323	3060.00	717.40	727.81	724.10	729.21	0.002045	9.48	322.86	31.00	0.52
Reach-1	6323	3960.00	717.40	729.63	725.36	731.29	0.002150	10.39	397.89	153.67	0.52
Reach-1	6375	370.00	717.50	720.13		720.38	0.001402	4.02	92.00	35.00	0.44
Reach-1	6375	1040.00	717.50	722.76		723.26	0.001291	5.65	184.17	35.00	0.43
Reach-1	6375	1550.00	717.50	724.37		725.01	0.001266	6.45	241.43	41.04	0.43
Reach-1	6375	2130.00	717.50	726.35		727.03	0.000971	6.69	355.36	73.79	0.40
Reach-1	6375	2580.00	717.50	727.46		728.16	0.000897	6.95	447.18	92.06	0.39
Reach-1	6375	3060.00	717.50	728.62		729.34	0.000816	7.14	578.62	155.18	0.38
Reach-1	6375	3960.00	717.50	731.06		731.47	0.000437	5.96	1154.90	321.53	0.29
Reach-1	6735	370.00	719.20	720.88	720.88	721.70	0.007974	7.30	50.67	30.47	1.00
Reach-1	6735	1040.00	719.20	723.05	722.51	724.26	0.004506	8.85	117.45	31.08	0.80



HFC-BAS Plan 1998 Future River RIVER-1 Reach Reach-1 (Continued)

Reach	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
Reach-1	6735	1550.00	719.20	724.58	723.52	725.94	0.003548	9.37	165.44	31.52	0.72
Reach-1	6735	2130.00	719.20	726.38	724.53	727.80	0.002775	9.56	222.75	33.15	0.64
Reach-1	6735	2580.00	719.20	727.35	725.26	728.94	0.002615	10.13	261.65	46.87	0.63
Reach-1	6735	3060.00	719.20	728.41	725.98	730.09	0.002370	10.48	324.94	90.48	0.62
Reach-1	6735	3960.00	719.20	730.98	727.47	731.83	0.001073	8.34	809.42	290.88	0.43
Reach-1	6918	370.00	720.00	722.16		722.58	0.002929	5.19	71.23	35.04	0.64
Reach-1	6918	1040.00	720.00	724.11		724.93	0.002691	7.25	143.42	38.71	0.66
Reach-1	6918	1550.00	720.00	725.57		726.49	0.002162	7.68	201.73	41.44	0.61
Reach-1	6918	2130.00	720.00	727.31		728.23	0.001620	7.69	276.89	44.71	0.54
Reach-1	6918	2580.00	720.00	728.38		729.35	0.001454	7.92	328.45	62.05	0.53
Reach-1	6918	3060.00	720.00	729.49		730.47	0.001218	7.99	423.59	109.16	0.49
Reach-1	6918	3960.00	720.00	731.11		732.04	0.000972	8.06	673.30	207.65	0.45
Reach-1	6951	370.00	720.20	722.31		722.67	0.002590	4.84	76.47	38.52	0.61
Reach-1	6951	1040.00	720.20	724.37		725.03	0.002080	6.48	160.59	42.94	0.59
Reach-1	6951	1550.00	720.20	725.83		726.57	0.001675	6.87	225.56	46.07	0.55
Reach-1	6951	2130.00	720.20	727.55		728.30	0.001241	6.92	308.99	55.33	0.49
Reach-1	6951	2580.00	720.20	728.64		729.41	0.001058	7.10	379.26	74.64	0.46
Reach-1	6951	3060.00	720.20	729.73		730.52	0.000904	7.20	471.97	94.25	0.44
Reach-1	6951	3960.00	720.20	731.38		732.09	0.000700	7.13	734.28	207.84	0.40
Reach-1	6968	370.00	720.30	722.31	721.85	722.77	0.003092	5.48	67.56	35.72	0.68
Reach-1	6968	1040.00	720.30	724.27	723.38	725.21	0.002513	7.78	133.67	37.40	0.69
Reach-1	6968	1550.00	720.30	725.66	724.32	726.80	0.002050	8.59	180.52	38.59	0.65
Reach-1	6968	2130.00	720.30	727.32	725.29	728.58	0.001575	9.01	236.42	40.58	0.60
Reach-1	6968	2580.00	720.30	728.51	725.97	729.58	0.001567	8.31	329.43	75.99	0.53
Reach-1	6968	3060.00	720.30	729.62	726.63	730.67	0.001323	8.36	432.14	112.25	0.50
Reach-1	6968	3960.00	720.30	731.32	727.84	732.18	0.000966	8.03	721.93	235.86	0.44
Reach-1	6987	Culvert									
Reach-1	7006	370.00	720.40	722.85	721.95	723.16	0.000897	4.49	82.42	36.58	0.51
Reach-1	7006	1040.00	720.40	725.36	723.48	725.96	0.000673	6.23	167.03	39.22	0.49
Reach-1	7006	1550.00	720.40	726.91	724.43	727.69	0.000602	7.07	219.37	40.86	0.49
Reach-1	7006	2130.00	720.40	728.35	725.37	729.33	0.000586	7.96	267.61	59.23	0.50
Reach-1	7006	2580.00	720.40	729.92	726.05	730.59	0.000474	6.72	482.23	182.35	0.40
Reach-1	7006	3060.00	720.40	730.65	726.75	731.32	0.000450	6.90	631.36	225.82	0.39
Reach-1	7006	3960.00	720.40	731.72	727.92	732.37	0.000420	7.15	906.32	292.60	0.39
Reach-1	7053	370.00	720.50	722.80		723.26	0.001742	5.42	68.26	33.24	0.67
Reach-1	7053	1040.00	720.50	725.38		726.01	0.001017	6.32	164.49	41.35	0.56
Reach-1	7053	1550.00	720.50	727.08		727.73	0.000775	6.48	239.38	52.33	0.50
Reach-1	7053	2130.00	720.50	728.92		729.40	0.000430	5.83	449.90	140.85	0.39
Reach-1	7053	2580.00	720.50	730.28		730.64	0.000276	5.27	655.40	166.63	0.32
Reach-1	7053	3060.00	720.50	731.00		731.37	0.000263	5.44	783.68	191.35	0.32
Reach-1	7053	3960.00	720.50	731.99		732.41	0.000268	5.89	991.69	225.76	0.33
Reach-1	7149	370.00	721.00	722.83	722.78	723.59	0.003806	7.00	52.87	31.75	0.96
Reach-1	7149	1040.00	721.00	725.37		726.18	0.001507	7.24	143.60	39.73	0.67
Reach-1	7149	1550.00	721.00	727.06		727.87	0.001045	7.20	215.30	45.05	0.58
Reach-1	7149	2130.00	721.00	728.88		729.49	0.000598	6.50	386.73	137.19	0.46
Reach-1	7149	2580.00	721.00	730.26		730.69	0.000358	5.74	603.83	178.28	0.37
Reach-1	7149	3060.00	721.00	730.98		731.42	0.000331	5.87	740.43	200.12	0.36
Reach-1	7149	3960.00	721.00	731.98		732.46	0.000327	6.29	955.80	230.38	0.36
Reach-1	7207	340.00	721.53	723.57		724.08	0.002229	5.71	59.56	32.41	0.74
Reach-1	7207	890.00	721.53	725.78		726.42	0.001218	6.41	138.84	39.35	0.60
Reach-1	7207	1320.00	721.53	727.40		728.03	0.000850	6.38	206.76	44.45	0.52
Reach-1	7207	1830.00	721.53	728.94		729.61	0.000674	6.56	286.00	79.01	0.48
Reach-1	7207	2200.00	721.53	730.28		730.77	0.000409	5.86	518.24	231.62	0.39
Reach-1	7207	2580.00	721.53	731.04		731.47	0.000341	5.73	700.70	249.45	0.36
Reach-1	7207	3350.00	721.53	732.10		732.52	0.000303	5.87	979.51	277.88	0.35
Reach-1	7217	340.00	721.75	724.07		724.27	0.000712	3.60	94.37	41.95	0.42
Reach-1	7217	890.00	721.75	726.21		726.56	0.000585	4.77	186.59	44.62	0.41
Reach-1	7217	1320.00	721.75	727.74		728.15	0.000499	5.11	258.57	49.22	0.39
Reach-1	7217	1830.00	721.75	729.25		729.70	0.000410	5.43	379.93	181.52	0.37
Reach-1	7217	2200.00	721.75	730.49		730.83	0.000272	4.95	702.90	295.93	0.31
Reach-1	7217	2580.00	721.75	731.22		731.53	0.000235	4.88	920.99	303.21	0.29
Reach-1	7217	3350.00	721.75	732.27		732.57	0.000214	5.03	1246.20	321.07	0.28
Reach-1	7229	340.00	722.29	724.07	723.79	724.58	0.002511	5.72	59.48	35.15	0.77
Reach-1	7229	890.00	722.29	726.14	725.10	726.80	0.001313	6.52	136.59	39.29	0.62

HEC-BAS Plan 1998 Future River RIVER-1 Reach-1 (Continued)

Reach-1	River Sta	CB	EB	EB	EB	EB	EB	EB	EB	EB	EB
Reach-1	7828	1320.00	722.29	727.67	725.91	728.35	0.000942	6.64	198.66	42.33	0.54
Reach-1	7828	1830.00	722.29	729.16	726.77	729.90	0.001045	6.92	264.41	45.90	0.51
Reach-1	7828	2200.00	722.29	730.38	727.31	731.00	0.000675	6.45	438.60	311.69	0.44
Reach-1	7828	2580.00	722.29	731.18	727.85	731.64	0.000649	5.95	702.72	352.46	0.38
Reach-1	7828	3350.00	722.29	732.29	728.85	732.63	0.000477	5.54	1126.98	464.97	0.33
Reach-1	7857	340.00	723.86	725.43	725.43	726.17	0.004375	6.94	48.97	32.85	1.00
Reach-1	7857	890.00	723.86	726.78	726.78	728.13	0.003757	9.34	95.27	35.56	1.01
Reach-1	7857	1320.00	723.86	727.62	727.62	729.33	0.003547	10.49	125.80	37.24	1.01
Reach-1	7857	1830.00	723.86	728.83		730.58	0.002651	10.60	172.58	39.67	0.90
Reach-1	7857	2200.00	723.86	730.03		731.56	0.001833	9.93	221.66	43.16	0.76
Reach-1	7857	2580.00	723.86	730.51	729.62	732.28	0.001884	10.66	246.60	94.20	0.78
Reach-1	7857	3350.00	723.86	731.51	731.51	733.34	0.001664	11.15	370.31	177.84	0.76
Reach-1	8147	340.00	725.43	727.01	727.01	727.76	0.004377	6.96	48.87	32.71	1.00
Reach-1	8147	890.00	725.43	728.37	728.37	729.72	0.003749	9.33	95.43	35.68	1.01
Reach-1	8147	1320.00	725.43	729.22	729.22	730.91	0.003501	10.42	126.65	37.56	1.00
Reach-1	8147	1830.00	725.43	730.07	730.07	732.12	0.003381	11.49	159.26	40.31	1.01
Reach-1	8147	2200.00	725.43	730.66	730.66	732.91	0.003105	12.05	185.61	49.39	0.99
Reach-1	8147	2580.00	725.43	731.24	731.24	733.65	0.002853	12.50	217.12	58.21	0.96
Reach-1	8147	3350.00	725.43	732.23	732.23	735.00	0.002631	13.48	276.19	62.56	0.95
Reach-1	8484	340.00	725.88	728.20		728.65	0.001665	5.36	63.40	29.64	0.65
Reach-1	8484	890.00	725.88	729.67		730.70	0.002202	8.16	109.12	32.58	0.79
Reach-1	8484	1320.00	725.88	730.45		731.93	0.002569	9.76	135.20	34.14	0.86
Reach-1	8484	1830.00	725.88	731.18	730.98	733.20	0.002980	11.39	160.68	35.61	0.94
Reach-1	8484	2200.00	725.88	731.62	731.60	734.03	0.003292	12.48	176.30	36.47	1.00
Reach-1	8484	2580.00	725.88	732.19	732.19	734.84	0.003261	13.06	197.57	37.62	1.00
Reach-1	8484	3350.00	725.88	733.44	733.44	736.30	0.002795	13.58	259.36	86.35	0.95
Reach-1	8736	340.00	726.20	728.68		728.99	0.001068	4.50	75.49	32.92	0.52
Reach-1	8736	890.00	726.20	730.50		731.14	0.001180	6.39	139.19	37.64	0.59
Reach-1	8736	1320.00	726.20	731.63		732.43	0.001203	7.16	184.23	42.43	0.61
Reach-1	8736	1830.00	726.20	732.83		733.75	0.001147	7.68	236.25	47.53	0.60
Reach-1	8736	2200.00	726.20	733.65		734.62	0.001083	7.89	278.72	51.02	0.60
Reach-1	8736	2580.00	726.20	734.41		735.43	0.001037	8.10	318.58	54.24	0.59
Reach-1	8736	3350.00	726.20	735.75		736.87	0.000978	8.48	395.03	59.93	0.58
Reach-1	8786	340.00	726.50	728.83	727.90	729.06	0.000823	3.88	87.55	39.44	0.46
Reach-1	8786	890.00	726.50	730.81	729.12	731.24	0.000738	5.29	168.37	42.15	0.47
Reach-1	8786	1320.00	726.50	731.97	729.88	732.54	0.000738	6.04	218.38	43.75	0.48
Reach-1	8786	1830.00	726.50	733.14	730.69	733.85	0.000752	6.77	270.25	45.34	0.49
Reach-1	8786	2200.00	726.50	733.91	731.22	734.71	0.000757	7.20	305.50	46.40	0.49
Reach-1	8786	2580.00	726.50	734.60	731.73	735.51	0.000774	7.63	338.04	47.35	0.50
Reach-1	8786	3350.00	726.50	735.80	732.68	736.91	0.000826	8.47	395.69	48.99	0.52
Reach-1	8807	Bridge									
Reach-1	8828	340.00	726.60	728.82	728.14	729.16	0.001320	4.72	72.03	34.31	0.57
Reach-1	8828	890.00	726.60	730.76	729.48	731.37	0.001126	6.28	141.68	37.41	0.57
Reach-1	8828	1320.00	726.60	731.90	730.32	732.69	0.001105	7.11	185.54	39.24	0.58
Reach-1	8828	1830.00	726.60	733.05	731.18	734.02	0.001106	7.90	231.53	41.08	0.59
Reach-1	8828	2200.00	726.60	733.81	731.76	734.89	0.001102	8.36	263.10	42.29	0.59
Reach-1	8828	2580.00	726.60	734.49	732.30	735.70	0.001118	8.83	292.35	43.38	0.60
Reach-1	8828	3350.00	726.60	735.66	733.32	737.13	0.001179	9.73	344.35	45.26	0.62
Reach-1	8858	340.00	726.80	728.81		729.25	0.003360	5.33	63.60	33.28	0.68
Reach-1	8858	890.00	726.80	730.73		731.45	0.002513	6.82	130.58	36.25	0.63
Reach-1	8858	1320.00	726.80	731.87		732.77	0.002389	7.64	172.68	38.02	0.63
Reach-1	8858	1830.00	726.80	733.00		734.11	0.002344	8.44	216.81	39.78	0.64
Reach-1	8858	2200.00	726.80	733.75		734.98	0.002313	8.90	247.12	40.95	0.64
Reach-1	8858	2580.00	726.80	734.43		735.79	0.002330	9.38	275.15	42.01	0.65
Reach-1	8858	3350.00	726.80	735.59		737.24	0.002446	10.31	324.99	44.04	0.67
Reach-1	9028	340.00	727.81	729.65	729.61	730.44	0.007036	7.13	47.67	28.39	0.97
Reach-1	9028	890.00	727.81	731.11	731.11	732.58	0.006579	9.73	91.42	31.45	1.01
Reach-1	9028	1320.00	727.81	732.07	732.04	733.87	0.006008	10.76	122.71	33.30	0.99
Reach-1	9028	1830.00	727.81	733.11	732.98	735.18	0.005454	11.55	158.45	35.30	0.96
Reach-1	9028	2200.00	727.81	733.82	733.60	736.04	0.005123	11.97	183.86	36.65	0.94
Reach-1	9028	2580.00	727.81	734.44	734.16	736.85	0.004833	12.47	207.93	42.07	0.93
Reach-1	9028	3350.00	727.81	735.53	735.34	738.32	0.004442	13.46	260.52	54.58	0.92
Reach-1	9138	340.00	727.90	730.23		730.59	0.002351	4.83	70.39	32.51	0.58
Reach-1	9138	890.00	727.90	732.07		732.76	0.002287	6.66	133.73	36.14	0.61

HCC-BAS Plan: 1998 Future River RIVER-1 Reach: Reach-1 (Continued)

Reach	Reach ID	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS8	CS9	CS10
Reach-1	9118	1320.00	727.90	733.18		734.06	0.002281	7.55	174.74	38.31	0.62
Reach-1	9118	1830.00	727.90	734.31		735.39	0.002333	8.31	220.09	42.18	0.64
Reach-1	9118	2200.00	727.90	735.06		736.25	0.002323	8.67	253.69	45.46	0.65
Reach-1	9118	2580.00	727.90	735.83		737.07	0.002270	8.93	288.95	48.65	0.65
Reach-1	9118	3350.00	727.90	737.19		738.55	0.001956	9.37	365.61	68.71	0.62
Reach-1	9133	340.00	728.05	730.26	729.59	730.64	0.002213	4.94	68.85	34.26	0.59
Reach-1	9133	890.00	728.05	732.07	730.98	732.85	0.002057	7.10	125.37	36.07	0.62
Reach-1	9133	1320.00	728.05	733.13	731.85	734.21	0.002069	8.33	158.54	37.13	0.65
Reach-1	9133	1830.00	728.05	734.21	732.78	735.62	0.002094	9.52	192.17	41.38	0.68
Reach-1	9133	2200.00	728.05	734.93	733.40	736.56	0.002100	10.26	214.45	52.81	0.69
Reach-1	9133	2580.00	728.05	735.84	734.00	737.13	0.001936	9.17	304.49	67.42	0.60
Reach-1	9133	3350.00	728.05	737.21	735.49	738.58	0.001697	9.63	451.52	154.26	0.58
Reach-1	9156	Culvert									
Reach-1	9179	340.00	728.60	731.07	730.15	731.38	0.001544	4.44	76.53	33.45	0.50
Reach-1	9179	890.00	728.60	733.29	731.54	733.87	0.001247	6.12	145.35	35.67	0.50
Reach-1	9179	1320.00	728.60	734.70	732.42	735.45	0.001142	6.98	189.03	41.48	0.50
Reach-1	9179	1830.00	728.60	735.44	733.35	736.60	0.001496	8.63	212.09	46.92	0.58
Reach-1	9179	2200.00	728.60	736.19	733.97	737.25	0.001744	8.28	283.38	87.01	0.55
Reach-1	9179	2580.00	728.60	736.48	734.59	737.79	0.002066	9.25	312.06	115.23	0.61
Reach-1	9179	3350.00	728.60	737.33	735.91	738.84	0.002163	10.20	446.37	199.99	0.63
Reach-1	9184	340.00	728.60	731.11		731.39	0.001603	4.20	81.02	33.50	0.48
Reach-1	9184	890.00	728.60	733.41		733.89	0.001342	5.54	160.65	35.79	0.46
Reach-1	9184	1320.00	728.60	734.89		735.48	0.001209	6.14	217.32	42.91	0.45
Reach-1	9184	1830.00	728.60	735.82		736.64	0.001443	7.28	260.31	49.70	0.50
Reach-1	9184	2200.00	728.60	736.20		737.26	0.001741	8.28	283.97	87.69	0.55
Reach-1	9184	2580.00	728.60	736.48		737.80	0.002067	9.26	312.70	115.77	0.61
Reach-1	9184	3350.00	728.60	737.31		738.87	0.002216	10.31	443.08	198.35	0.64
Reach-1	9231	340.00	729.19	731.36	731.36	732.35	0.007602	7.99	42.57	21.72	1.01
Reach-1	9231	890.00	729.19	733.17	733.17	734.87	0.006711	10.45	85.14	25.34	1.00
Reach-1	9231	1320.00	729.19	734.28	734.28	736.34	0.006410	11.53	114.47	27.96	1.00
Reach-1	9231	1830.00	729.19	735.42	735.42	737.77	0.006172	12.31	148.70	31.96	1.01
Reach-1	9231	2200.00	729.19	736.10	736.10	738.66	0.006044	12.84	171.50	36.55	1.01
Reach-1	9231	2580.00	729.19	736.89	736.89	739.48	0.005077	12.96	207.54	52.54	0.95
Reach-1	9231	3350.00	729.19	737.99	737.99	740.88	0.004586	13.83	271.36	68.78	0.93
Reach-1	9551	340.00	731.28	733.64		734.47	0.005733	7.31	46.52	21.73	0.88
Reach-1	9551	890.00	731.28	735.29	735.27	737.00	0.006626	10.49	84.81	24.49	0.99
Reach-1	9551	1320.00	731.28	736.37	736.37	738.52	0.006523	11.77	112.13	26.28	1.00
Reach-1	9551	1830.00	731.28	737.50	737.50	740.05	0.006294	12.80	143.01	28.17	1.00
Reach-1	9551	2200.00	731.28	738.40	738.40	741.02	0.005495	13.02	173.77	54.76	0.95
Reach-1	9551	2580.00	731.28	739.86	739.86	741.69	0.003066	11.29	323.55	149.90	0.74
Reach-1	9551	3350.00	731.28	741.06	741.06	742.53	0.002313	10.86	579.34	262.66	0.66
Reach-1	9791	180.00	732.86	735.10		735.30	0.001507	3.67	49.10	24.19	0.45
Reach-1	9791	460.00	732.86	737.50		737.76	0.000835	4.07	113.00	29.00	0.36
Reach-1	9791	680.00	732.86	738.94		739.23	0.000657	4.35	159.42	37.50	0.34
Reach-1	9791	940.00	732.86	740.40		740.72	0.000535	4.63	238.61	130.34	0.32
Reach-1	9791	1130.00	732.86	741.35		741.62	0.000402	4.39	460.57	334.31	0.28
Reach-1	9791	1360.00	732.86	741.87		742.12	0.000379	4.46	664.89	446.10	0.28
Reach-1	9791	1830.00	732.86	742.66		742.87	0.000340	4.48	1082.31	617.12	0.26
Reach-1	9837	180.00	733.25	735.10	734.63	735.49	0.002853	4.99	36.10	22.65	0.65
Reach-1	9837	460.00	733.25	737.43	735.83	737.92	0.001237	5.65	81.44	26.14	0.49
Reach-1	9837	680.00	733.25	738.82	736.59	739.43	0.001037	6.26	108.56	28.23	0.47
Reach-1	9837	940.00	733.25	740.38	737.40	740.80	0.000849	5.21	196.02	116.55	0.37
Reach-1	9837	1130.00	733.25	741.34	737.96	741.67	0.000596	4.82	415.24	345.53	0.32
Reach-1	9837	1360.00	733.25	741.88	738.56	742.16	0.000527	4.76	641.49	500.95	0.31
Reach-1	9837	1830.00	733.25	742.70	739.96	742.89	0.000404	4.46	1127.00	674.71	0.27
Reach-1	9850	Bridge									
Reach-1	9853	180.00	733.64	735.25	735.01	735.75	0.004481	5.68	31.67	22.87	0.79
Reach-1	9853	460.00	733.64	737.49	736.20	738.06	0.001586	6.06	75.94	25.24	0.54
Reach-1	9853	680.00	733.64	739.73	736.97	740.23	0.000752	5.66	120.09	29.59	0.40
Reach-1	9853	940.00	733.64	741.17	737.76	741.45	0.000541	4.43	315.34	228.73	0.31
Reach-1	9853	1130.00	733.64	741.63	738.30	741.91	0.000520	4.55	432.66	288.87	0.30
Reach-1	9853	1360.00	733.64	741.88	738.93	742.19	0.000601	5.00	509.50	332.41	0.33
Reach-1	9853	1830.00	733.64	742.84	740.06	743.05	0.000439	4.64	944.29	583.53	0.29

HFC-BAS Plan: 1998 Future River RIVER-1 Reach: Reach-1 (Continued)

Reach	Five Sta	CS	100%	100%	100%	100%	100%	100%	100%	100%	100%
Reach-1	9933	180.00	734.08	735.72	735.72	736.47	0.004634	6.96	25.88	17.44	1.01
Reach-1	9933	460.00	734.08	737.25		738.32	0.003251	8.31	55.38	21.13	0.90
Reach-1	9933	680.00	734.08	739.74		740.28	0.000745	5.95	129.18	42.98	0.48
Reach-1	9933	940.00	734.08	741.02		741.56	0.000581	6.15	222.30	94.22	0.44
Reach-1	9933	1130.00	734.08	741.41		742.04	0.000639	6.72	261.87	101.74	0.46
Reach-1	9933	1360.00	734.08	741.54		742.39	0.000848	7.84	275.07	102.26	0.54
Reach-1	9933	1830.00	734.08	742.31		743.32	0.000931	8.84	378.59	175.70	0.57
Reach-1	10156	150.00	736.30	737.67	737.67	738.32	0.004781	6.43	23.32	18.35	1.01
Reach-1	10156	370.00	736.30	738.75	738.75	739.84	0.004191	8.37	44.18	20.50	1.01
Reach-1	10156	540.00	736.30	739.56		740.76	0.003367	8.77	61.55	22.13	0.93
Reach-1	10156	730.00	736.30	740.92		741.88	0.001688	7.88	93.72	25.75	0.69
Reach-1	10156	880.00	736.30	741.22		742.43	0.001911	8.82	101.80	26.67	0.75
Reach-1	10156	1040.00	736.30	741.26		742.91	0.002594	10.33	102.79	26.78	0.87
Reach-1	10156	1400.00	736.30	741.79	741.79	744.15	0.003191	12.37	117.41	28.37	0.99
Reach-1	10201	150.00	736.80	738.36	737.75	738.54	0.000942	3.40	44.07	31.86	0.48
Reach-1	10201	370.00	736.80	739.85	738.54	740.14	0.000610	4.29	86.32	36.29	0.43
Reach-1	10201	540.00	736.80	740.68	739.04	741.06	0.000582	4.92	109.83	37.77	0.44
Reach-1	10201	730.00	736.80	741.63	739.54	742.07	0.000512	5.34	136.76	39.21	0.43
Reach-1	10201	880.00	736.80	742.15	739.90	742.68	0.000529	5.81	151.43	39.91	0.44
Reach-1	10201	1040.00	736.80	742.66	740.26	743.27	0.000545	6.27	165.91	40.37	0.46
Reach-1	10201	1400.00	736.80	743.94	741.03	744.69	0.000512	6.93	202.09	41.55	0.46
Reach-1	10218.5	Bridge									
Reach-1	10236	150.00	737.20	738.32	738.16	738.68	0.002883	4.79	31.33	30.16	0.80
Reach-1	10236	370.00	737.20	739.82	738.96	740.22	0.001038	5.06	73.15	32.76	0.55
Reach-1	10236	540.00	737.20	740.65	739.46	741.14	0.000887	5.61	96.23	34.19	0.53
Reach-1	10236	730.00	737.20	741.60	739.96	742.15	0.000719	5.95	122.78	35.84	0.50
Reach-1	10236	880.00	737.20	742.12	740.33	742.75	0.000723	6.42	137.13	36.73	0.51
Reach-1	10236	1040.00	737.20	743.86	740.70	744.34	0.000367	5.60	185.76	39.75	0.38
Reach-1	10236	1400.00	737.20	744.99	741.46	745.64	0.000394	6.44	217.43	109.02	0.41
Reach-1	10286	150.00	737.80	738.91	738.91	739.42	0.004905	5.75	26.09	25.72	1.01
Reach-1	10286	370.00	737.80	739.77	739.77	740.63	0.004159	7.43	49.79	29.16	1.00
Reach-1	10286	540.00	737.80	740.40		741.35	0.003367	7.83	68.98	31.67	0.93
Reach-1	10286	730.00	737.80	741.53		742.25	0.001708	6.81	107.27	36.17	0.70
Reach-1	10286	880.00	737.80	742.10		742.83	0.001483	6.85	128.47	38.43	0.66
Reach-1	10286	1040.00	737.80	743.99		744.38	0.000533	5.00	208.18	45.96	0.41
Reach-1	10286	1400.00	737.80	745.28		745.68	0.000401	5.12	319.63	115.48	0.37
Reach-1	10509	150.00	739.30	740.94	740.94	741.64	0.004692	6.70	22.40	16.30	1.01
Reach-1	10509	370.00	739.30	742.13	742.13	743.22	0.004119	8.36	44.23	20.58	1.01
Reach-1	10509	540.00	739.30	742.82	742.82	744.10	0.003931	9.06	59.58	23.70	1.01
Reach-1	10509	730.00	739.30	743.46	743.46	744.91	0.003776	9.65	75.68	26.58	1.01
Reach-1	10509	880.00	739.30	743.91	743.91	745.46	0.003673	10.01	87.90	28.58	1.01
Reach-1	10509	1040.00	739.30	744.29	744.29	746.00	0.003532	10.51	99.37	32.42	1.00
Reach-1	10509	1400.00	739.30	745.11	745.11	747.09	0.003076	11.33	130.10	42.29	0.97
Reach-1	10558	150.00	739.60	741.38	740.99	741.81	0.001877	5.22	28.75	16.33	0.69
Reach-1	10558	370.00	739.60	742.25	742.13	743.41	0.003057	8.67	42.69	16.44	0.94
Reach-1	10558	540.00	739.60	742.87	742.87	744.50	0.003226	10.25	52.71	16.51	1.00
Reach-1	10558	730.00	739.60	743.60	743.60	745.59	0.003007	11.32	64.51	16.60	1.00
Reach-1	10558	880.00	739.60	744.13	744.13	746.38	0.002890	12.05	73.02	16.66	1.00
Reach-1	10558	1040.00	739.60	744.66	744.66	747.18	0.002783	12.74	81.64	16.73	1.00
Reach-1	10558	1400.00	739.60	747.47	747.47	748.79	0.001864	9.69	252.80	194.87	0.61
Reach-1	10575.5	Bridge									
Reach-1	10593	150.00	739.83	741.39	741.23	741.96	0.003005	6.08	24.69	18.17	0.86
Reach-1	10593	370.00	739.83	742.88	742.39	743.79	0.001948	7.65	48.34	20.38	0.77
Reach-1	10593	540.00	739.83	743.68	743.12	744.89	0.001907	8.85	61.03	21.56	0.80
Reach-1	10593	730.00	739.83	746.77	743.85	747.45	0.000488	6.63	110.07	126.88	0.44
Reach-1	10593	880.00	739.83	746.73	744.39	747.74	0.000720	8.03	109.56	122.55	0.54
Reach-1	10593	1040.00	739.83	746.50	744.94	748.00	0.001129	9.83	105.82	91.20	0.67
Reach-1	10593	1400.00	739.83	748.97	746.04	749.20	0.000265	4.63	768.82	379.67	0.29
Reach-1	10643	150.00	740.18	741.59	741.59	742.24	0.004770	6.50	23.09	17.81	1.01
Reach-1	10643	370.00	740.18	743.19		743.91	0.002240	6.82	54.25	21.02	0.75
Reach-1	10643	540.00	740.18	744.29		745.03	0.001608	6.87	78.68	23.94	0.65
Reach-1	10643	730.00	740.18	747.14		747.50	0.000369	4.92	194.72	81.26	0.35
Reach-1	10643	880.00	740.18	747.32		747.82	0.000480	5.73	211.19	93.42	0.40
Reach-1	10643	1040.00	740.18	747.48		748.12	0.000612	6.57	226.52	103.47	0.45

HFC-BAS Plan: 1998 Future River RIVER-1 Reach: Reach-1 (Continued)

Reach	Flow SE	100	200	300	400	500	600	700	800	900	1000
Reach-1	10643	1400.00	740.18	748.66		749.36	0.000567	7.06	387.61	155.00	0.45
Reach-1	10655	150.00	741.89	743.15	743.15	743.74	0.004832	6.20	24.20	20.51	1.01
Reach-1	10655	370.00	741.89	744.14	744.14	745.16	0.004199	8.12	45.57	22.50	1.01
Reach-1	10655	540.00	741.89	744.75	744.75	746.02	0.003994	9.05	59.64	23.72	1.01
Reach-1	10655	730.00	741.89	747.10		747.68	0.000837	6.09	122.54	31.16	0.50
Reach-1	10655	880.00	741.89	747.27		748.05	0.001076	7.08	127.90	31.91	0.57
Reach-1	10655	1040.00	741.89	747.40		748.43	0.001373	8.14	132.03	32.47	0.65
Reach-1	10655	1400.00	741.89	748.47		749.69	0.001271	8.93	171.91	48.65	0.64
Reach-1	10905	150.00	742.35	743.65	743.31	743.91	0.001758	4.12	36.39	29.53	0.64
Reach-1	10905	370.00	742.35	744.91	744.10	745.32	0.001120	5.17	71.62	31.01	0.57
Reach-1	10905	540.00	742.35	745.66	744.60	746.19	0.001012	5.83	92.63	31.89	0.56
Reach-1	10905	730.00	742.35	747.29	745.10	747.72	0.000486	5.28	138.33	33.81	0.42
Reach-1	10905	880.00	742.35	747.54	745.47	748.11	0.000600	6.06	145.25	34.10	0.47
Reach-1	10905	1040.00	742.35	747.78	745.84	748.50	0.000721	6.85	151.92	34.38	0.52
Reach-1	10905	1400.00	742.35	748.85	746.60	749.77	0.000714	7.69	182.10	35.65	0.53
Reach-1	10935	Culvert									
Reach-1	10965	150.00	742.98	744.97	743.96	745.09	0.000460	2.80	53.60	30.39	0.35
Reach-1	10965	370.00	742.98	746.20	744.77	746.49	0.000556	4.25	87.07	32.51	0.42
Reach-1	10965	540.00	742.98	747.02	745.29	747.40	0.000559	4.95	109.08	33.91	0.43
Reach-1	10965	730.00	742.98	748.88	745.80	749.21	0.000288	4.58	159.42	37.09	0.33
Reach-1	10965	880.00	742.98	749.98	746.18	750.32	0.000237	4.66	189.03	38.97	0.31
Reach-1	10965	1040.00	742.98	751.34	746.55	751.67	0.000184	4.61	225.59	49.68	0.28
Reach-1	10965	1400.00	742.98	753.26	747.34	753.44	0.000149	3.45	505.37	229.40	0.23
Reach-1	11015	150.00	743.50	745.05	745.05	745.71	0.004652	6.51	23.04	17.75	1.01
Reach-1	11015	370.00	743.50	746.16	746.16	747.21	0.004073	8.20	45.12	21.89	1.01
Reach-1	11015	540.00	743.50	746.82	746.82	748.06	0.003845	8.96	60.24	24.32	1.00
Reach-1	11015	730.00	743.50	748.62		749.36	0.001122	6.89	112.19	39.95	0.59
Reach-1	11015	880.00	743.50	749.82		750.42	0.000669	6.29	174.06	63.48	0.48
Reach-1	11015	1040.00	743.50	751.28		751.71	0.000370	5.49	279.84	79.82	0.37
Reach-1	11015	1400.00	743.50	753.12		753.52	0.000270	5.49	540.20	271.14	0.33
Reach-1	11405	150.00	747.60	749.21	749.21	749.95	0.004750	6.87	21.83	15.05	1.01
Reach-1	11405	370.00	747.60	750.44	750.44	751.66	0.004259	8.85	41.79	17.38	1.01
Reach-1	11405	540.00	747.60	751.19	751.19	752.67	0.004075	9.77	55.26	18.79	1.00
Reach-1	11405	730.00	747.60	751.88	751.88	753.64	0.003716	10.66	69.61	23.15	0.99
Reach-1	11405	880.00	747.60	752.43	752.43	754.33	0.003319	11.08	84.90	33.56	0.96
Reach-1	11405	1040.00	747.60	753.05	753.05	754.96	0.002824	11.21	109.87	47.17	0.90
Reach-1	11405	1400.00	747.60	753.98	753.98	756.11	0.002591	12.10	163.33	67.65	0.89
Reach-1	11787	150.00	753.20	754.74	754.74	755.39	0.004631	6.45	23.25	18.17	1.00
Reach-1	11787	370.00	753.20	755.84	755.84	756.86	0.004059	8.11	45.61	22.56	1.01
Reach-1	11787	540.00	753.20	756.49	756.49	757.70	0.003569	8.84	63.07	38.38	0.98
Reach-1	11787	730.00	753.20	757.21	757.21	758.43	0.002665	9.02	103.44	73.92	0.88
Reach-1	11787	880.00	753.20	757.69	757.69	758.88	0.002268	9.11	144.20	97.45	0.83
Reach-1	11787	1040.00	753.20	757.93	757.93	759.30	0.002444	9.86	169.34	109.46	0.87
Reach-1	11787	1400.00	753.20	759.02	759.02	759.99	0.001463	8.96	396.82	319.56	0.70
Reach-1	12170	70.00	756.80	757.78	757.78	758.22	0.005274	5.38	13.02	14.71	1.01
Reach-1	12170	170.00	756.80	758.51	758.51	759.25	0.004576	6.91	24.59	16.76	1.01
Reach-1	12170	250.00	756.80	758.97	758.97	759.88	0.004338	7.67	32.58	18.03	1.01
Reach-1	12170	340.00	756.80	759.41	759.41	760.49	0.004168	8.32	40.87	19.27	1.01
Reach-1	12170	410.00	756.80	759.72	759.72	760.91	0.004067	8.73	46.98	20.13	1.01
Reach-1	12170	480.00	756.80	760.01	760.01	761.29	0.003983	9.08	52.88	20.93	1.01
Reach-1	12170	640.00	756.80	760.60	760.60	762.08	0.003736	9.77	65.75	23.82	1.00
Reach-1	12213	70.00	757.20	758.24	758.00	758.48	0.002193	3.96	17.66	18.08	0.69
Reach-1	12213	170.00	757.20	759.15	758.66	759.56	0.001575	5.12	33.20	19.03	0.65
Reach-1	12213	250.00	757.20	759.61	759.08	760.19	0.001681	6.09	41.05	19.52	0.69
Reach-1	12213	340.00	757.20	759.81	759.51	760.72	0.002390	7.66	44.41	19.72	0.83
Reach-1	12213	410.00	757.20	759.86	759.82	761.14	0.003264	9.06	45.26	19.77	0.98
Reach-1	12213	480.00	757.20	760.13	760.10	761.57	0.003235	9.62	49.88	20.06	0.99
Reach-1	12213	640.00	757.20	761.77	761.00	762.58	0.001598	7.23	88.53	21.76	0.63
Reach-1	12217	Culvert									
Reach-1	12275	70.00	757.90	759.29	758.70	759.43	0.000827	2.96	23.66	19.78	0.44
Reach-1	12275	170.00	757.90	760.43	759.35	760.68	0.000662	3.95	43.07	22.07	0.44
Reach-1	12275	250.00	757.90	761.18	759.78	761.49	0.000608	4.49	55.69	26.26	0.44
Reach-1	12275	340.00	757.90	761.95	760.21	762.20	0.000478	4.00	90.78	35.45	0.37

HEC-RAS Plan 1998 Future River RIVER-1 Reach: Reach-1 (Continued)

Reach	Reach ID	Flow (cfs)	Water Surface Elevation (ft)	Channel Bottom Elevation (ft)	Bank Full Elevation (ft)	Bank Top Elevation (ft)	Bank Slope (ft)	Bank Angle (deg)	Bank Protection	Bank Material	Bank Erosion	Bank Stability
Reach-1	12275	410.00	757.90	762.80	760.52	762.99	0.000297	3.63	196.49	178.30	0.30	
Reach-1	12275	480.00	757.90	763.11	760.80	763.30	0.000293	3.77	257.46	215.82	0.30	
Reach-1	12275	640.00	757.90	762.37	761.80	763.03	0.001137	6.63	130.20	125.36	0.58	
Reach-1	12540	70.00	759.80	760.76	760.76	761.19	0.005246	5.25	13.32	15.70	1.01	
Reach-1	12540	170.00	759.80	761.47	761.47	762.16	0.004547	6.70	25.39	18.43	1.01	
Reach-1	12540	250.00	759.80	761.91	761.91	762.75	0.004278	7.39	33.84	20.12	1.00	
Reach-1	12540	340.00	759.80	762.32	762.32	763.32	0.004094	7.99	42.58	21.81	1.00	
Reach-1	12540	410.00	759.80	762.59	762.59	763.70	0.003952	8.46	48.68	23.74	1.00	
Reach-1	12540	480.00	759.80	762.85	762.85	764.07	0.003751	8.87	54.97	25.60	1.00	
Reach-1	12540	640.00	759.80	763.39	763.39	764.82	0.003386	9.63	69.98	29.57	0.98	
Reach-1	12871	70.00	762.60	763.57	763.57	764.02	0.005272	5.37	13.04	14.77	1.01	
Reach-1	12871	170.00	762.60	764.31	764.31	765.05	0.004577	6.90	24.65	16.86	1.01	
Reach-1	12871	250.00	762.60	764.77	764.77	765.68	0.004338	7.65	32.66	18.16	1.01	
Reach-1	12871	340.00	762.60	765.21	765.21	766.28	0.004168	8.29	41.03	19.49	1.01	
Reach-1	12871	410.00	762.60	765.52	765.52	766.69	0.004063	8.67	47.28	20.49	1.01	
Reach-1	12871	480.00	762.60	765.82	765.82	767.07	0.003939	8.97	53.49	21.43	1.00	
Reach-1	12871	640.00	762.60	766.68	766.68	767.80	0.002509	8.59	97.26	95.15	0.84	
Reach-1	13159	70.00	764.60	765.56	765.56	765.99	0.005289	5.24	13.36	15.87	1.01	
Reach-1	13159	170.00	764.60	766.26	766.26	766.95	0.004407	6.69	25.90	22.10	0.99	
Reach-1	13159	250.00	764.60	766.71	766.71	767.53	0.003829	7.34	37.59	29.83	0.96	
Reach-1	13159	340.00	764.60	767.14	767.14	768.07	0.003459	7.87	51.99	37.21	0.94	
Reach-1	13159	410.00	764.60	767.43	767.43	768.42	0.003296	8.23	63.43	42.16	0.93	
Reach-1	13159	480.00	764.60	767.69	767.69	768.74	0.003152	8.52	75.31	46.75	0.92	
Reach-1	13159	640.00	764.60	768.14	768.14	769.40	0.003231	9.44	98.91	66.18	0.95	
Reach-1	13369	70.00	765.48	766.52	766.52	766.78	0.002766	4.12	17.01	17.72	0.74	
Reach-1	13369	170.00	765.48	767.21	767.21	767.71	0.002895	5.68	29.94	19.54	0.81	
Reach-1	13369	250.00	765.48	767.59	767.59	768.28	0.003207	6.67	37.45	20.52	0.87	
Reach-1	13369	340.00	765.48	767.89	767.81	768.83	0.003763	7.78	43.69	21.30	0.96	
Reach-1	13369	410.00	765.48	768.11	768.10	769.22	0.004023	8.45	48.53	21.88	1.00	
Reach-1	13369	480.00	765.48	768.37	768.37	769.58	0.003992	8.85	54.22	22.55	1.01	
Reach-1	13369	640.00	765.48	768.92	768.92	770.33	0.003839	9.54	67.09	24.00	1.01	
Reach-1	13410	70.00	765.66	766.71	766.37	766.87	0.001471	3.26	21.45	23.78	0.56	
Reach-1	13410	170.00	765.66	767.49	766.94	767.81	0.001338	4.52	37.58	26.24	0.59	
Reach-1	13410	250.00	765.66	767.95	767.32	768.39	0.001378	5.32	46.96	27.67	0.62	
Reach-1	13410	340.00	765.66	768.37	767.70	768.95	0.001449	6.11	55.62	28.99	0.65	
Reach-1	13410	410.00	765.66	768.67	767.97	769.35	0.001494	6.65	61.66	29.91	0.68	
Reach-1	13410	480.00	765.66	768.92	768.22	769.72	0.001568	7.19	66.80	30.70	0.70	
Reach-1	13410	640.00	765.66	769.36	768.76	770.47	0.001819	8.43	75.93	32.09	0.77	
Reach-1	13434	Bridge										
Reach-1	13458	70.00	765.89	766.75	766.60	767.00	0.002796	3.96	17.69	23.47	0.75	
Reach-1	13458	170.00	765.89	767.52	767.17	767.92	0.001988	5.09	33.37	25.93	0.70	
Reach-1	13458	250.00	765.89	767.97	767.55	768.50	0.001897	5.86	42.66	27.39	0.72	
Reach-1	13458	340.00	765.89	768.39	767.93	769.07	0.001907	6.64	51.22	28.73	0.74	
Reach-1	13458	410.00	765.89	768.68	768.20	769.48	0.001915	7.16	57.24	29.68	0.76	
Reach-1	13458	480.00	765.89	768.93	768.46	769.85	0.001975	7.70	62.33	30.47	0.78	
Reach-1	13458	640.00	765.89	771.38	769.00	771.89	0.000489	5.68	112.62	38.36	0.43	
Reach-1	13512	70.00	766.40	767.52	767.52	767.94	0.005274	5.19	13.48	16.37	1.01	
Reach-1	13512	170.00	766.40	768.22	768.22	768.85	0.004606	6.39	26.62	21.28	1.01	
Reach-1	13512	250.00	766.40	768.61	768.61	769.39	0.004348	7.08	35.33	23.07	1.01	
Reach-1	13512	340.00	766.40	768.98	768.98	769.90	0.004156	7.69	44.23	24.53	1.01	
Reach-1	13512	410.00	766.40	769.24	769.24	770.26	0.004042	8.07	50.79	25.55	1.01	
Reach-1	13512	480.00	766.40	769.49	769.49	770.58	0.003948	8.40	57.11	26.50	1.01	
Reach-1	13512	640.00	766.40	771.46	771.46	771.93	0.000921	5.46	117.12	34.23	0.52	
Reach-1	13571	70.00	767.31	768.93	768.93	769.42	0.005174	5.60	12.50	13.10	1.01	
Reach-1	13571	170.00	767.31	769.74	769.74	770.45	0.004556	6.72	25.30	18.28	1.01	
Reach-1	13571	250.00	767.31	770.21	770.21	771.02	0.004353	7.25	34.48	21.46	1.01	
Reach-1	13571	340.00	767.31	770.64	770.64	771.55	0.004185	7.63	44.56	24.94	1.01	
Reach-1	13571	410.00	767.31	770.94	770.94	771.89	0.004148	7.83	52.37	28.07	1.01	
Reach-1	13571	480.00	767.31	771.21	771.21	772.19	0.004005	7.96	60.31	30.75	1.00	
Reach-1	13571	640.00	767.31	771.69	771.69	772.78	0.003947	8.40	76.21	35.51	1.01	
Reach-1	13621	70.00	768.07	769.71	769.71	770.15	0.005275	5.31	13.17	15.38	1.01	
Reach-1	13621	170.00	768.07	770.43	770.43	771.08	0.004647	6.46	26.31	20.75	1.01	
Reach-1	13621	250.00	768.07	770.85	770.85	771.62	0.004408	7.05	35.48	23.56	1.01	
Reach-1	13621	340.00	768.07	771.25	771.25	772.12	0.004130	7.47	45.49	26.29	1.00	

HFC-BAS Plan 1998 Future River RIVER-1 Reach: Reach-1 (Continued)

Reach	Flow	CS	W	W	W	W	W	W	W	W	W	W	W
Reach-1	1362	410.00	768.07	771.50	771.50	772.46	0.004106	7.84	52.30	27.99		1.01	
Reach-1	1362	480.00	768.07	771.76	771.76	772.76	0.003928	8.04	59.70	29.73		1.00	
Reach-1	1362	640.00	768.07	772.23	772.23	773.38	0.003633	8.62	75.40	41.80		0.99	
Reach-1	1375	70.00	769.89	771.24	771.24	771.69	0.005177	5.39	12.99	14.66		1.01	
Reach-1	1375	170.00	769.89	771.99	771.99	772.65	0.004583	6.52	26.09	20.13		1.01	
Reach-1	1375	250.00	769.89	772.39	772.39	773.21	0.004035	7.30	35.31	26.13		0.99	
Reach-1	1375	340.00	769.89	772.80	772.80	773.75	0.003505	7.88	47.51	32.50		0.96	
Reach-1	1375	410.00	769.89	773.08	773.08	774.13	0.003308	8.31	57.07	36.66		0.95	
Reach-1	1375	480.00	769.89	773.34	773.34	774.46	0.003142	8.67	67.01	40.41		0.94	
Reach-1	1375	640.00	769.89	773.87	773.87	775.15	0.002859	9.35	90.65	48.15		0.92	
Reach-1	1385	70.00	770.86	772.03	772.03	772.44	0.005239	5.16	13.56	16.61		1.00	
Reach-1	1385	170.00	770.86	772.71	772.71	773.43	0.004147	6.85	25.82	20.40		0.99	
Reach-1	1385	250.00	770.86	773.15	773.15	774.05	0.003717	7.70	35.49	23.52		0.98	
Reach-1	1385	340.00	770.86	773.58	773.58	774.66	0.003408	8.44	46.37	26.46		0.97	
Reach-1	1385	410.00	770.86	773.87	773.87	775.08	0.003317	8.99	54.25	28.34		0.97	
Reach-1	1385	480.00	770.86	774.09	774.09	775.48	0.003464	9.68	60.89	35.92		1.01	
Reach-1	1385	640.00	770.86	775.08	775.08	776.12	0.001910	8.76	127.88	83.00		0.78	
Reach-1	1390	70.00	771.83	773.22	773.22	773.75	0.005159	5.84	11.98	11.47		1.01	
Reach-1	1390	170.00	771.83	774.09	774.09	774.91	0.004507	7.25	23.62	18.20		1.00	
Reach-1	1390	250.00	771.83	774.67	774.67	775.56	0.003346	7.65	39.85	36.92		0.90	
Reach-1	1390	340.00	771.83	775.21	775.21	776.11	0.002697	7.93	65.87	62.68		0.84	
Reach-1	1390	410.00	771.83	775.62	775.62	776.42	0.002133	7.74	95.58	77.10		0.77	
Reach-1	1390	480.00	771.83	775.82	775.82	776.68	0.002210	8.20	110.70	78.39		0.79	
Reach-1	1390	640.00	771.83	776.33	776.33	777.19	0.001994	8.57	168.46	141.65		0.77	
Reach-1	1403	70.00	773.24	774.55	774.55	775.00	0.004424	5.45	14.74	20.75		0.96	
Reach-1	1403	170.00	773.24	775.30	775.30	775.99	0.003445	7.00	34.68	32.12		0.93	
Reach-1	1403	250.00	773.24	775.83	775.83	776.57	0.002738	7.45	54.59	41.94		0.87	
Reach-1	1403	340.00	773.24	776.17	776.17	777.09	0.002958	8.49	69.14	46.94		0.92	
Reach-1	1403	410.00	773.24	776.70	776.70	777.42	0.001969	7.83	112.84	134.00		0.78	
Reach-1	1403	480.00	773.24	776.94	776.94	777.65	0.001862	7.99	145.75	142.70		0.76	
Reach-1	1403	640.00	773.24	777.29	777.29	778.06	0.001952	8.74	197.85	154.27		0.80	
Reach-1	1418	70.00	774.20	775.82	775.82	776.24	0.005382	5.22	13.41	16.37		1.02	
Reach-1	1418	170.00	774.20	776.49	776.49	777.18	0.004258	6.69	26.61	23.32		0.99	
Reach-1	1418	250.00	774.20	776.91	776.91	777.76	0.003734	7.46	37.55	28.12		0.97	
Reach-1	1418	340.00	774.20	777.33	777.33	778.32	0.003403	8.15	50.08	32.76		0.96	
Reach-1	1418	410.00	774.20	777.62	777.62	778.70	0.003203	8.57	60.14	36.04		0.95	
Reach-1	1418	480.00	774.20	777.87	777.87	779.05	0.003121	9.01	69.58	38.87		0.95	
Reach-1	1418	640.00	774.20	778.58	778.58	779.78	0.002423	9.23	107.30	66.08		0.87	
Reach-1	1423	70.00	774.79	776.77	776.77	777.30	0.004386	5.92	14.15	16.51		0.96	
Reach-1	1423	170.00	774.79	777.65	777.65	778.47	0.003538	7.69	31.71	23.80		0.95	
Reach-1	1423	250.00	774.79	778.00	778.00	779.18	0.004206	9.34	40.78	26.70		1.06	
Reach-1	1423	340.00	774.79	778.81	778.81	779.84	0.002660	9.00	71.09	48.68		0.88	
Reach-1	1423	410.00	774.79	779.19	779.19	780.23	0.002403	9.22	91.86	59.20		0.86	
Reach-1	1423	480.00	774.79	779.48	779.48	780.56	0.002369	9.63	109.80	67.59		0.86	
Reach-1	1423	640.00	774.79	780.00	780.00	781.19	0.002358	10.46	149.17	82.49		0.88	
Reach-1	1426	70.00	775.62	777.47		777.66	0.001466	3.55	19.73	15.97		0.56	
Reach-1	1426	170.00	775.62	778.48		778.79	0.001208	4.47	38.82	22.26		0.55	
Reach-1	1426	250.00	775.62	779.15		779.52	0.000990	4.89	55.35	27.19		0.52	
Reach-1	1426	340.00	775.62	779.65		780.12	0.001015	5.55	69.78	30.56		0.55	
Reach-1	1426	410.00	775.62	779.94		780.50	0.001089	6.09	78.90	32.50		0.57	
Reach-1	1426	480.00	775.62	780.18		780.84	0.001186	6.64	87.04	36.32		0.61	
Reach-1	1426	640.00	775.62	780.53		781.48	0.001528	8.01	101.09	43.11		0.70	
Reach-1	1526	70.00	776.37	778.00	778.00	778.46	0.005199	5.44	12.87	14.29		1.01	
Reach-1	1526	170.00	776.37	778.75	778.75	779.53	0.004006	7.14	25.57	19.73		0.98	
Reach-1	1526	250.00	776.37	779.23	779.23	780.19	0.003575	8.00	35.94	23.49		0.97	
Reach-1	1526	340.00	776.37	779.70	779.70	780.83	0.003251	8.72	47.96	27.23		0.95	
Reach-1	1526	410.00	776.37	780.02	780.02	781.26	0.003108	9.22	57.17	29.85		0.95	
Reach-1	1526	480.00	776.37	780.33	780.33	781.67	0.002969	9.63	66.93	33.35		0.94	
Reach-1	1526	640.00	776.37	780.98	780.98	782.49	0.002692	10.36	91.13	41.53		0.93	
Reach-1	1626	70.00	777.42	778.88	778.88	779.37	0.005014	5.64	12.41	12.59		1.00	
Reach-1	1626	170.00	777.42	779.70	779.70	780.48	0.004487	7.10	23.94	15.53		1.01	
Reach-1	1626	250.00	777.42	780.18	780.18	781.14	0.004126	7.85	31.98	17.99		1.00	
Reach-1	1626	340.00	777.42	780.65	780.65	781.78	0.003662	8.55	41.22	21.57		0.98	
Reach-1	1626	410.00	777.42	780.97	780.97	782.23	0.003442	9.03	48.64	24.07		0.97	
Reach-1	1626	480.00	777.42	781.28	781.28	782.64	0.003259	9.43	56.36	26.41		0.96	

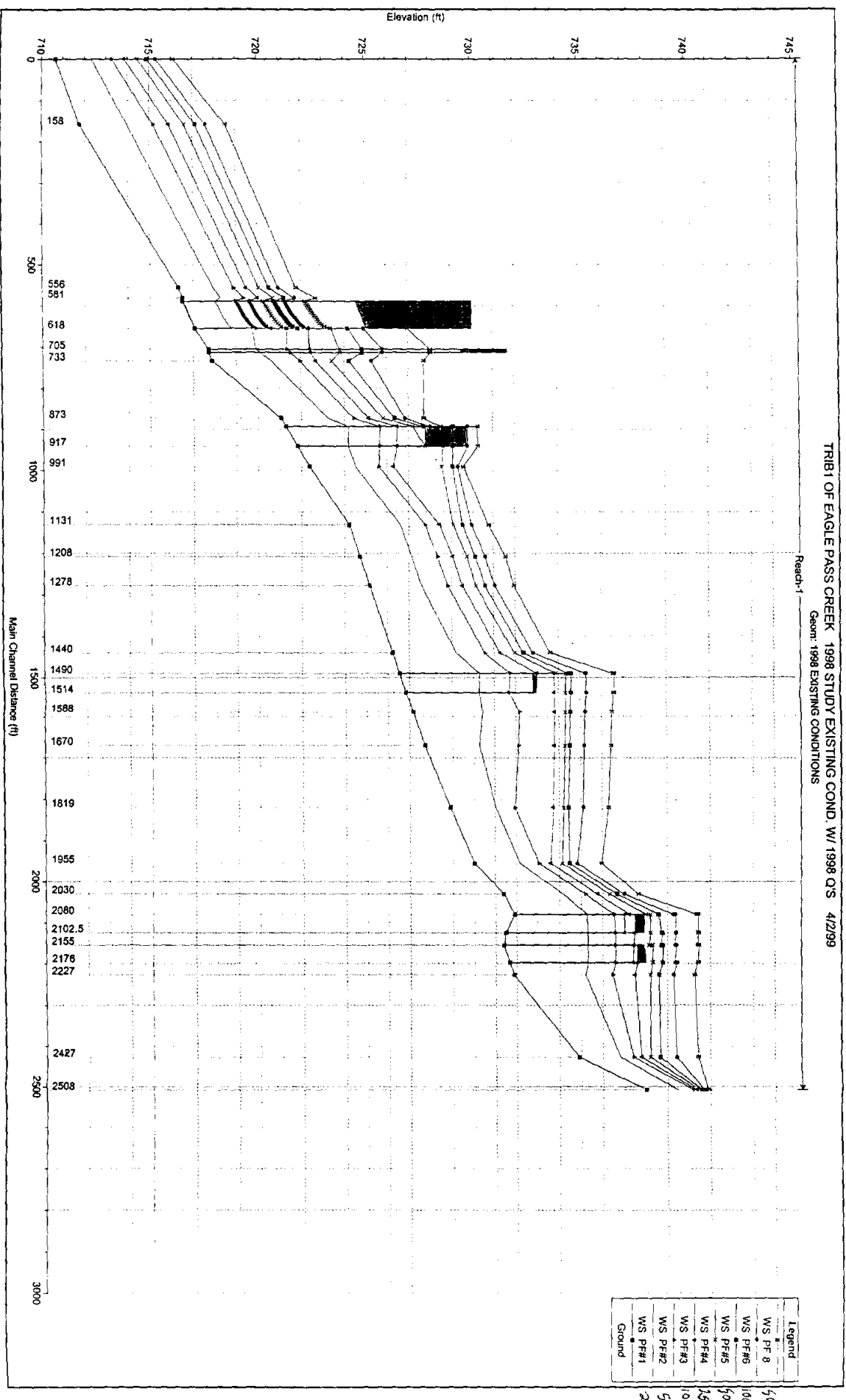
HFC-BAS Plan 1998 Future River RIVER-1 Reach-Reach-1 (Continued)

Reach	Flow (cfs)	Water Surface Elevation (ft)	Water Surface Elevation (ft)	Water Surface Elevation (ft)	Water Surface Elevation (ft)	Velocity (ft/s)	Velocity (ft/s)	Velocity (ft/s)	Velocity (ft/s)	Velocity (ft/s)	Velocity (ft/s)
	640.00	777.42	781.91	781.91	783.48	0.002973	10.22	74.53	31.37		0.94
Reach 15000	70.00	779.14	780.61	780.61	781.18	0.004508	6.09	12.31	12.59		0.99
Reach 15000	170.00	779.14	781.55	781.55	782.48	0.003553	7.96	26.05	16.84		0.96
Reach 15000	250.00	779.14	782.09	782.09	783.29	0.003427	9.11	35.91	19.76		0.98
Reach 15000	340.00	779.14	782.74	782.74	784.06	0.002907	9.70	50.66	25.94		0.94
Reach 15000	410.00	779.14	783.16	783.16	784.57	0.002702	10.13	62.43	29.96		0.92
Reach 15000	480.00	779.14	783.54	783.54	785.02	0.002555	10.51	74.47	33.52		0.91
Reach 15000	640.00	779.14	783.99	783.99	785.95	0.003007	12.23	90.72	37.73		1.01
Reach 15000	70.00	780.72	782.26	782.26	782.81	0.004851	5.93	11.94	11.96		1.00
Reach 15000	170.00	780.72	783.15	783.15	784.07	0.003781	7.79	24.30	15.86		0.98
Reach 15000	250.00	780.72	783.73	783.73	784.86	0.003364	8.71	34.16	18.39		0.96
Reach 15000	340.00	780.72	784.37	784.37	785.65	0.002852	9.32	49.08	32.74		0.92
Reach 15000	410.00	780.72	784.92	784.92	786.11	0.002245	9.18	72.26	52.11		0.84
Reach 15000	480.00	780.72	785.22	785.22	786.48	0.002220	9.61	89.55	62.79		0.84
Reach 15000	640.00	780.72	785.99	785.99	787.09	0.001729	9.53	146.31	77.75		0.76
Reach 15000	70.00	782.15	783.30	783.30	783.88	0.005934	6.08	11.51	10.00		1.00
Reach 15000	170.00	782.15	784.23	784.23	785.27	0.005591	8.16	20.83	13.96		1.00
Reach 15000	250.00	782.15	784.84	784.84	786.18	0.005165	9.30	26.88	24.25		1.00
Reach 15000	340.00	782.15	785.64	785.64	786.72	0.003260	8.79	57.67	37.84		0.83
Reach 15000	410.00	782.15	786.00	786.00	787.14	0.003140	9.21	72.37	43.95		0.83
Reach 15000	480.00	782.15	786.48	786.48	787.58	0.002678	9.20	102.48	80.39		0.78
Reach 15000	640.00	782.15	787.24	787.24	788.12	0.002028	8.92	185.06	137.61		0.70
Reach 15000	Culvert										
Reach 15000	70.00	783.29	787.29	784.44	787.34	0.000071	1.75	40.01	37.72		0.15
Reach 15000	170.00	783.29	787.99	785.36	788.07	0.000117	2.25	140.99	168.14		0.19
Reach 15000	250.00	783.29	788.13	785.97	788.26	0.000212	3.09	167.74	200.30		0.26
Reach 15000	340.00	783.29	788.19	786.58	788.42	0.000363	4.08	179.56	202.77		0.34
Reach 15000	410.00	783.29	787.01	787.01	788.90	0.003080	11.01	37.25	34.35		1.01
Reach 15000	480.00	783.29	788.16	787.60	788.63	0.000752	5.85	173.67	201.54		0.49
Reach 15000	640.00	783.29	788.22	788.22	788.99	0.001231	7.56	186.19	204.11		0.62
Reach 15000	70.00	784.39	787.29		787.35	0.000207	2.07	53.86	42.24		0.24
Reach 15000	170.00	784.39	787.94		788.11	0.000463	3.64	87.30	82.48		0.37
Reach 15000	250.00	784.39	788.01		788.40	0.001019	5.49	93.98	111.71		0.55
Reach 15000	340.00	784.39	787.88		788.60	0.002015	7.51	83.35	57.18		0.77
Reach 15000	410.00	784.39	788.75		789.12	0.000862	5.84	186.43	135.80		0.53
Reach 15000	480.00	784.39	788.52	788.52	789.22	0.001672	7.80	155.96	128.36		0.73
Reach 15000	640.00	784.39	788.87	788.87	789.63	0.001787	8.57	201.89	139.43		0.76
Reach 15000	70.00	787.67	788.76	788.76	789.09	0.003876	5.06	24.82	48.97		0.90
Reach 15000	170.00	787.67	789.37	789.37	789.76	0.002933	6.09	65.86	83.63		0.85
Reach 15000	250.00	787.67	789.61	789.61	790.09	0.003277	7.06	85.47	83.88		0.92
Reach 15000	340.00	787.67	789.84	789.84	790.40	0.003467	7.86	105.14	84.13		0.96
Reach 15000	410.00	787.67	789.99	789.99	790.62	0.003716	8.52	117.45	89.24		1.01
Reach 15000	480.00	787.67	790.14	790.14	790.82	0.003804	9.00	131.39	94.66		1.03
Reach 15000	640.00	787.67	790.45	790.45	791.23	0.003896	9.90	162.20	101.37		1.07



**Tributary 1**  
**Existing and Future Conditions**  
**Water Surface Profile and HECRAS Summary Printouts**  
**2, 5, 10, 25, 50, 100, & 500-year Storm Events**

TRIBUTARY OF EAGLE PASS CREEK 1998 STUDY EXISTING COND. W/ 1998 Q.S. 4/2/99  
 Geom: 1998 EXISTING CONDITIONS



Reach	Flow	300.00	710.65	712.31	712.31	713.09	0.003042	7.07	42.41	27.62	1.01
Reach 0	610.00	710.65	713.26	713.26	714.45	0.002712	8.76	69.66	29.53	1.00	
Reach 0	840.00	710.65	713.85	713.85	715.29	0.002593	9.62	87.32	30.70	1.01	
Reach 0	1100.00	710.65	714.45	714.45	716.12	0.002474	10.36	106.23	31.91	1.00	
Reach 0	1310.00	710.65	714.88	714.88	716.73	0.002446	10.92	119.97	32.76	1.01	
Reach 0	1520.00	710.65	715.29	715.29	717.30	0.002397	11.37	133.67	33.58	1.00	
Reach 0	1970.00	710.65	716.10	716.10	718.41	0.002299	12.20	161.62	37.63	1.00	
Reach 0	300.00	711.76	713.97	713.97	714.93	0.004269	7.85	38.20	20.17	1.01	
Reach 0	610.00	711.76	715.17	715.17	716.57	0.003889	9.48	64.34	23.33	1.01	
Reach 0	840.00	711.76	715.89	715.89	717.53	0.003742	10.28	81.69	25.20	1.01	
Reach 0	1100.00	711.76	716.61	716.61	718.47	0.003578	10.94	100.58	27.10	1.00	
Reach 0	1310.00	711.76	717.12	717.12	719.14	0.003506	11.41	114.86	28.45	1.00	
Reach 0	1520.00	711.76	717.60	717.60	719.77	0.003446	11.81	128.65	29.70	1.00	
Reach 0	1970.00	711.76	718.53	718.53	720.96	0.003342	12.51	157.46	32.40	1.00	
Reach 0	300.00	716.32	717.94	717.94	718.71	0.004409	7.04	42.59	27.88	1.00	
Reach 0	610.00	716.32	718.89	718.89	720.07	0.003943	8.74	69.81	29.77	1.01	
Reach 0	840.00	716.32	719.47	719.47	720.90	0.003762	9.60	87.53	30.94	1.01	
Reach 0	1100.00	716.32	720.06	720.06	721.73	0.003765	10.35	106.26	32.25	1.01	
Reach 0	1310.00	716.32	720.53	720.53	722.33	0.004658	10.77	121.62	34.11	1.01	
Reach 0	1520.00	716.32	720.97	720.97	722.88	0.005369	11.09	137.02	35.87	1.00	
Reach 0	1970.00	716.32	721.78	721.78	723.93	0.006584	11.75	167.67	39.14	1.00	
Reach 0	300.00	716.49	718.26	718.26	719.15	0.003947	7.54	39.80	25.53	1.00	
Reach 0	610.00	716.49	719.33	719.33	720.75	0.003382	9.56	63.81	27.66	1.00	
Reach 0	840.00	716.49	720.01	720.01	721.76	0.003139	10.62	79.07	29.02	1.00	
Reach 0	1100.00	716.49	720.71	720.71	722.80	0.002946	11.61	94.74	30.38	1.00	
Reach 0	1310.00	716.49	721.22	721.22	723.58	0.002853	12.33	106.23	31.37	1.00	
Reach 0	1520.00	716.49	721.71	721.71	724.32	0.002766	12.97	117.21	32.32	1.00	
Reach 0	1970.00	716.49	722.70	722.70	725.79	0.002594	14.11	139.61	33.62	1.00	
Reach 0											
Reach 0	610	Culvert									
Reach 0	300.00	717.07	719.73	718.83	720.12	0.001002	5.01	59.82	22.54	0.54	
Reach 0	610.00	717.07	721.34	719.90	721.96	0.000856	6.35	96.01	22.57	0.54	
Reach 0	840.00	717.07	722.35	720.57	723.13	0.000797	7.07	118.84	22.58	0.54	
Reach 0	1100.00	717.07	723.39	721.26	724.32	0.000751	7.73	142.24	22.60	0.54	
Reach 0	1310.00	717.07	724.17	721.78	725.22	0.000722	8.20	159.81	22.61	0.54	
Reach 0	1520.00	717.07	724.91	722.27	726.07	0.000699	8.61	176.47	22.62	0.54	
Reach 0	1970.00	717.07	726.97	723.25	728.18	0.000540	8.85	222.68	22.65	0.50	
Reach 0	300.00	717.70	719.92	719.92	720.73	0.005645	7.22	41.57	25.63	1.00	
Reach 0	610.00	717.70	721.34	720.94	722.22	0.003685	7.52	81.11	30.12	0.81	
Reach 0	840.00	717.70	722.40	721.54	723.23	0.002748	7.31	114.94	33.49	0.70	
Reach 0	1100.00	717.70	723.81	722.17	724.50	0.001812	6.66	165.14	37.94	0.56	
Reach 0	1310.00	717.70	724.85	722.61	725.47	0.001436	6.35	206.30	41.24	0.50	
Reach 0	1520.00	717.70	725.81	723.02	726.39	0.001198	6.15	247.08	44.32	0.45	
Reach 0	1970.00	717.70	728.06	723.81	728.57	0.000820	5.71	344.85	48.10	0.36	
Reach 0											
Reach 0	70	Bridge									
Reach 0	300.00	717.70	720.13	719.91	720.76	0.003984	6.38	47.05	26.30	0.84	
Reach 0	610.00	717.70	721.52	720.93	722.29	0.003081	7.04	86.68	30.70	0.74	
Reach 0	840.00	717.70	722.46	721.54	723.26	0.002636	7.20	116.74	33.66	0.68	
Reach 0	1100.00	717.70	723.83	722.15	724.51	0.001791	6.63	165.87	38.00	0.56	
Reach 0	1310.00	717.70	724.86	722.60	725.49	0.001425	6.33	206.89	41.28	0.50	
Reach 0	1520.00	717.70	725.82	723.01	726.40	0.001193	6.14	247.50	44.33	0.45	
Reach 0	1970.00	717.70	728.07	723.81	728.58	0.000818	5.71	345.13	48.11	0.36	
Reach 0											
Reach 0	300.00	717.87	720.62	720.62	721.66	0.004261	8.19	36.63	17.86	1.01	
Reach 0	610.00	717.87	721.94	721.94	723.40	0.003893	9.70	62.88	21.83	1.01	
Reach 0	840.00	717.87	722.67	722.67	724.42	0.003487	10.63	80.30	26.03	0.99	
Reach 0	1100.00	717.87	723.42	723.42	725.44	0.003152	11.45	101.32	30.49	0.97	
Reach 0	1310.00	717.87	724.23	723.95	726.20	0.002467	11.36	128.12	36.16	0.88	
Reach 0	1520.00	717.87	725.28		726.99	0.001713	10.72	171.38	46.14	0.76	
Reach 0	1970.00	717.87	727.75		728.93	0.000904	9.19	306.99	60.89	0.55	
Reach 0											
Reach 0	300.00	721.06	723.24	723.24	724.18	0.004290	7.78	38.54	20.73	1.01	
Reach 0	610.00	721.06	724.43	724.43	725.78	0.003893	9.33	65.39	24.52	1.01	
Reach 0	840.00	721.06	725.15	725.15	726.71	0.003681	10.00	83.96	27.04	1.00	
Reach 0	1100.00	721.06	725.82	725.82	727.60	0.003600	10.69	102.89	29.39	1.01	
Reach 0	1310.00	721.06	726.36	726.36	728.23	0.003509	10.88	119.27	32.16	1.01	
Reach 0	1520.00	721.06	726.84	726.84	728.80	0.003448	11.22	135.50	35.05	1.01	

Reach	72	1970.00	721.06	727.74	727.74	729.84	0.003314	11.64	169.26	40.42	1.00
Reach	893	220.00	721.28	724.20	722.88	724.42	0.000526	3.81	57.74	29.00	0.40
Reach	893	450.00	721.28	725.68	723.81	726.09	0.000554	5.15	87.34	36.40	0.43
Reach	893	620.00	721.28	726.47	724.40	727.03	0.000603	6.01	103.23	40.96	0.47
Reach	893	810.00	721.28	727.21	725.01	727.94	0.000660	6.87	117.93	45.56	0.50
Reach	893	950.00	721.28	727.71	725.43	728.57	0.000690	7.42	128.02	48.71	0.52
Reach	893	1110.00	721.28	728.04	725.88	729.10	0.000798	8.25	134.60	53.53	0.56
Reach	893	1430.00	721.28	728.52	726.73	730.05	0.001053	9.92	144.16	87.82	0.65
Reach		Bridge									
Reach	94	220.00	721.81	724.18	723.41	724.53	0.001082	4.74	46.46	29.10	0.55
Reach	94	450.00	721.81	725.66	724.36	726.21	0.000875	5.92	76.05	37.98	0.53
Reach	94	620.00	721.81	726.46	724.95	727.16	0.000883	6.74	91.93	40.94	0.55
Reach	94	810.00	721.81	728.62	725.56	729.18	0.000416	5.99	135.26	53.03	0.41
Reach	94	950.00	721.81	729.08	725.97	729.75	0.000461	6.58	144.36	59.55	0.43
Reach	94	1110.00	721.81	729.76	726.42	729.98	0.000240	3.87	303.14	98.35	0.28
Reach	94	1430.00	721.81	730.27	727.26	730.57	0.000291	4.47	378.58	244.46	0.32
Reach	99	220.00	722.37	724.52	724.52	725.39	0.004371	7.46	29.49	17.31	1.01
Reach	99	450.00	722.37	725.62	725.62	726.88	0.003996	9.02	49.91	20.04	1.01
Reach	99	620.00	722.37	726.29	726.29	727.75	0.003794	9.69	63.98	21.94	1.00
Reach	99	810.00	722.37	728.57	728.57	729.25	0.001121	6.62	122.44	29.35	0.57
Reach	99	950.00	722.37	729.06		729.81	0.001131	6.91	137.39	30.96	0.58
Reach	99	1110.00	722.37	729.31		730.22	0.001334	7.65	145.11	31.76	0.63
Reach	99	1430.00	722.37	729.57		730.92	0.001902	9.31	153.57	32.62	0.76
Reach	113	220.00	724.21	726.61	726.61	727.51	0.004357	7.64	28.80	16.01	1.00
Reach	113	450.00	724.21	727.78	727.78	729.05	0.003998	9.03	49.84	19.92	1.01
Reach	113	620.00	724.21	728.45	728.45	729.91	0.003852	9.70	63.89	22.16	1.01
Reach	113	810.00	724.21	729.09	729.09	730.73	0.003732	10.29	78.71	24.29	1.01
Reach	113	950.00	724.21	729.52	729.52	731.27	0.003623	10.61	89.53	25.73	1.00
Reach	113	1110.00	724.21	729.94	729.94	731.83	0.003603	11.03	100.67	27.14	1.01
Reach	113	1430.00	724.21	730.77	730.77	732.83	0.003033	11.53	136.83	61.99	0.96
Reach	120	220.00	724.71	727.14	727.14	728.08	0.004404	7.77	28.32	15.30	1.01
Reach	120	450.00	724.71	728.35	728.35	729.66	0.004043	9.19	48.95	18.92	1.01
Reach	120	620.00	724.71	729.05	729.05	730.55	0.003839	9.83	63.07	21.04	1.00
Reach	120	810.00	724.71	729.72	729.72	731.41	0.003711	10.42	77.74	23.04	1.00
Reach	120	950.00	724.71	730.11	730.11	731.96	0.003687	10.92	87.25	27.74	1.01
Reach	120	1110.00	724.71	730.61	730.61	732.55	0.003283	11.21	105.02	44.50	0.97
Reach	120	1430.00	724.71	731.57	731.57	733.57	0.002605	11.48	163.66	76.39	0.90
Reach	127	220.00	725.17	727.60	727.60	728.54	0.004390	7.76	28.35	15.30	1.00
Reach	127	450.00	725.17	728.81	728.81	730.12	0.004028	9.18	49.02	18.93	1.01
Reach	127	620.00	725.17	729.50	729.50	731.01	0.003894	9.88	62.74	20.99	1.01
Reach	127	810.00	725.17	730.14	730.14	731.87	0.003743	10.55	77.01	26.06	1.01
Reach	127	950.00	725.17	730.59	730.59	732.43	0.003380	10.90	91.51	37.76	0.98
Reach	127	1110.00	725.17	731.06	731.06	733.02	0.003115	11.29	111.96	49.79	0.96
Reach	127	1430.00	725.17	731.95	731.95	734.05	0.002646	11.79	166.75	72.81	0.91
Reach	140	220.00	726.23	729.20	729.20	730.22	0.004504	8.09	27.19	13.61	1.01
Reach	140	450.00	726.23	730.55	730.55	731.90	0.004073	9.33	48.25	17.91	1.00
Reach	140	620.00	726.23	731.28	731.28	732.82	0.003924	9.93	62.45	20.50	1.00
Reach	140	810.00	726.23	731.96	731.96	733.67	0.003844	10.51	77.08	22.86	1.01
Reach	140	950.00	726.23	732.37	732.37	734.24	0.003618	10.97	87.53	28.21	1.00
Reach	140	1110.00	726.23	732.82	732.82	734.84	0.003379	11.43	101.61	34.50	0.98
Reach	140	1430.00	726.23	733.64	733.64	735.93	0.003049	12.22	134.55	45.96	0.96
Reach	149	220.00	726.54	730.28	728.42	730.50	0.000383	3.76	58.51	26.28	0.35
Reach	149	450.00	726.54	731.75	729.52	732.22	0.000521	5.49	81.95	32.87	0.43
Reach	149	620.00	726.54	733.01	730.21	733.24	0.000315	3.89	172.10	60.24	0.32
Reach	149	810.00	726.54	733.87	730.91	734.14	0.000299	4.24	233.48	82.59	0.32
Reach	149	950.00	726.54	734.45	731.40	734.75	0.000285	4.42	313.25	282.36	0.32
Reach	149	1110.00	726.54	735.24	731.92	735.42	0.000177	3.78	598.62	387.36	0.25
Reach	149	1430.00	726.54	736.53	732.69	736.61	0.000086	2.95	1129.00	424.00	0.18
Reach		Bridge									
Reach	153	220.00	726.83	730.27	728.81	730.59	0.000609	4.59	47.91	24.06	0.44
Reach	153	450.00	726.83	731.70	730.01	732.38	0.000794	6.62	67.98	29.80	0.53
Reach	153	620.00	726.83	733.82	730.76	734.00	0.000216	3.53	223.25	91.18	0.27
Reach	153	810.00	726.83	734.33	731.53	734.58	0.000263	4.14	285.52	182.69	0.30

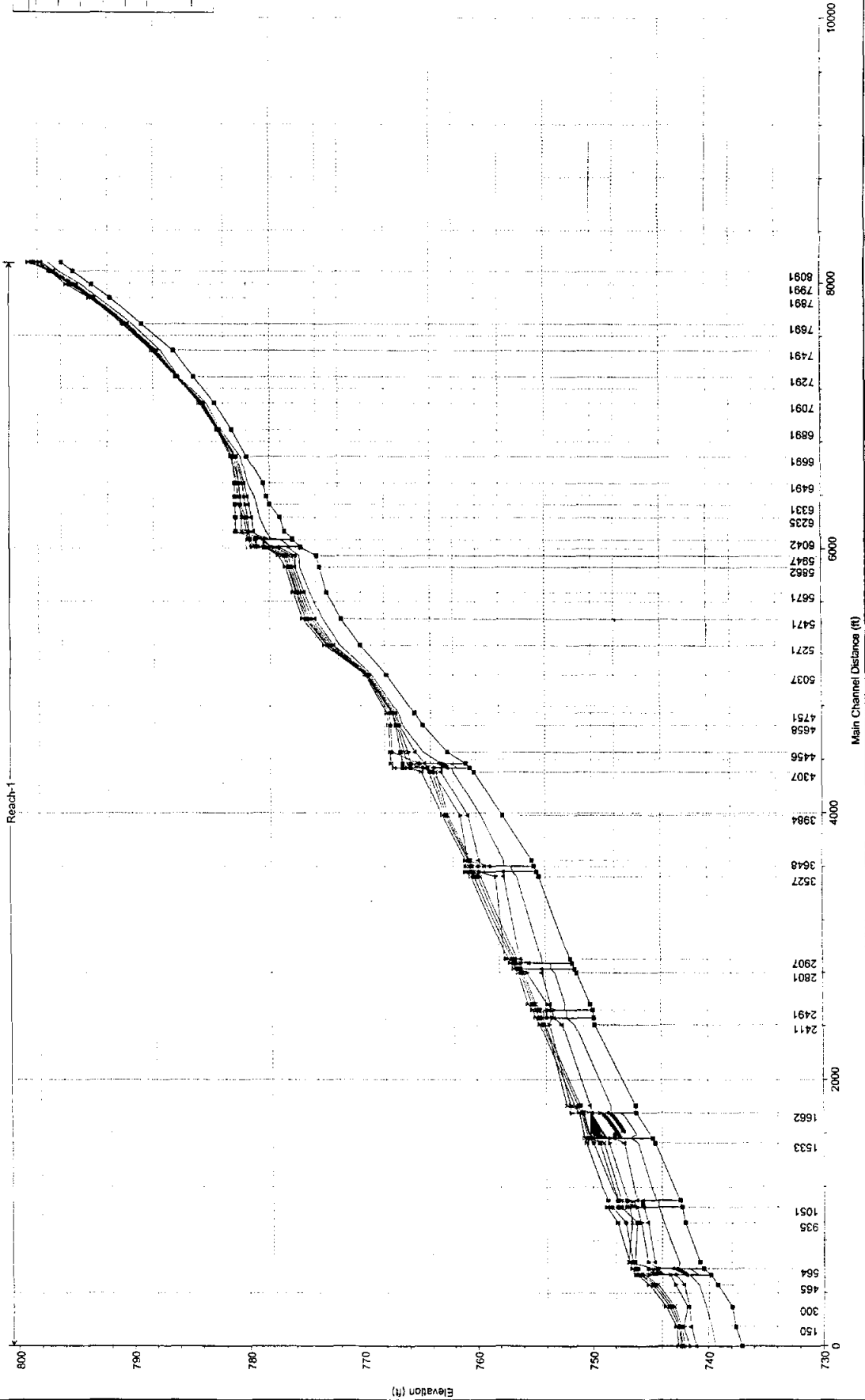
Reach	1534	950.00	726.83	734.58	732.06	734.88	0.000300	4.55	335.66	222.57	0.32
Reach	1535	1110.00	726.83	735.31	732.64	735.53	0.000219	4.18	530.17	309.02	0.28
Reach	1536	1430.00	726.83	736.55	733.01	736.67	0.000123	3.50	961.56	361.00	0.22
Reach	1568	220.00	727.17	730.41		730.64	0.000717	3.82	57.60	23.64	0.43
Reach	1569	450.00	727.17	732.17		732.45	0.000558	4.27	105.71	34.73	0.40
Reach	1584	620.00	727.17	733.80		734.04	0.000281	3.91	189.58	58.22	0.30
Reach	1585	810.00	727.17	734.30		734.62	0.000345	4.61	224.76	96.62	0.34
Reach	1586	950.00	727.17	734.53		734.92	0.000409	5.16	249.56	117.50	0.38
Reach	1587	1110.00	727.17	735.22		735.58	0.000346	5.11	365.06	204.35	0.35
Reach	1588	1430.00	727.17	736.46		736.73	0.000234	4.71	644.48	235.00	0.30
Reach	1670	180.00	727.71	730.25		730.84	0.002626	6.16	29.24	14.99	0.78
Reach	1671	330.00	727.71	732.12		732.56	0.001107	5.32	62.04	20.13	0.53
Reach	1672	440.00	727.71	733.78		734.09	0.000550	4.43	99.30	24.70	0.39
Reach	1673	570.00	727.71	734.28		734.68	0.000643	5.10	113.23	35.71	0.43
Reach	1674	660.00	727.71	734.51		734.99	0.000727	5.60	122.33	44.22	0.46
Reach	1675	760.00	727.71	735.18		735.65	0.000600	5.57	160.37	69.26	0.43
Reach	1676	960.00	727.71	736.40		736.78	0.000404	5.25	352.50	311.26	0.36
Reach	1813	180.00	728.88	731.04	731.04	731.89	0.004516	7.40	24.33	14.49	1.01
Reach	1814	330.00	728.88	731.94	731.94	733.08	0.004200	8.56	38.54	17.18	1.01
Reach	1815	440.00	728.88	733.73		734.28	0.001246	5.94	74.12	22.56	0.58
Reach	1816	570.00	728.88	734.22		734.91	0.001454	6.67	85.42	24.33	0.63
Reach	1817	660.00	728.88	734.43		735.25	0.001685	7.27	90.76	25.31	0.68
Reach	1818	760.00	728.88	735.11		735.87	0.001428	6.96	109.12	28.40	0.63
Reach	1819	960.00	728.88	736.29		736.96	0.001057	6.60	148.30	50.21	0.55
Reach	1953	180.00	730.00	732.17	732.17	733.01	0.004503	7.39	24.36	14.50	1.00
Reach	1954	330.00	730.00	733.06	733.06	734.20	0.004180	8.55	38.61	17.19	1.01
Reach	1955	440.00	730.00	733.61	733.61	734.89	0.003995	9.10	48.36	18.82	1.00
Reach	1956	570.00	730.00	734.14	734.14	735.60	0.003928	9.69	58.79	20.42	1.01
Reach	1957	660.00	730.00	734.48	734.48	736.04	0.003856	10.01	65.92	21.44	1.01
Reach	1958	760.00	730.00	734.83	734.83	736.48	0.003771	10.31	73.73	22.50	1.00
Reach	1959	960.00	730.00	735.96		737.40	0.002286	9.65	99.98	24.05	0.82
Reach	2030	180.00	731.40	734.17	734.17	735.11	0.004625	7.78	23.14	12.51	1.01
Reach	2031	330.00	731.40	735.19	735.19	736.39	0.004237	8.80	37.48	15.57	1.00
Reach	2032	440.00	731.40	735.76	735.76	737.13	0.004141	9.39	46.84	17.28	1.01
Reach	2033	570.00	731.40	736.31	736.31	737.88	0.003907	10.06	56.86	19.55	1.00
Reach	2034	660.00	731.40	736.65	736.65	738.36	0.003720	10.51	63.77	21.24	0.99
Reach	2035	760.00	731.40	736.99	736.99	738.87	0.003610	11.02	71.25	22.93	0.99
Reach	2036	960.00	731.40	737.64	737.64	739.80	0.003374	11.83	87.28	26.20	0.99
Reach	2081	180.00	731.90	735.28	733.26	735.39	0.000206	2.67	67.52	20.69	0.26
Reach	2082	330.00	731.90	736.53	733.93	736.73	0.000241	3.56	92.62	23.39	0.29
Reach	2083	440.00	731.90	737.23	734.36	737.50	0.000268	4.13	106.65	26.55	0.31
Reach	2084	570.00	731.90	737.99	734.82	738.31	0.000415	4.52	134.03	64.89	0.33
Reach	2085	660.00	731.90	738.58	735.12	738.84	0.000329	4.29	290.87	318.13	0.30
Reach	2086	760.00	731.90	739.26	735.44	739.41	0.000210	3.66	520.99	362.42	0.24
Reach	2087	960.00	731.90	740.37	736.04	740.44	0.000110	2.92	958.12	411.00	0.18
Reach	2102		Bridge								
Reach	2121	180.00	731.50	735.32	732.86	735.40	0.000174	2.37	76.05	23.12	0.21
Reach	2122	330.00	731.50	736.59	733.54	736.75	0.000240	3.25	101.41	23.16	0.25
Reach	2123	440.00	731.50	737.45	733.97	737.67	0.000265	3.71	118.62	23.18	0.27
Reach	2124	570.00	731.50	738.20	734.44	738.40	0.000281	3.66	179.20	196.71	0.25
Reach	2125	660.00	731.50	738.75	734.74	738.92	0.000224	3.45	318.02	262.18	0.23
Reach	2126	760.00	731.50	739.36	735.05	739.48	0.000165	3.12	502.02	341.07	0.20
Reach	2127	960.00	731.50	740.42	735.65	740.48	0.000097	2.61	921.17	423.20	0.15
Reach	2153	180.00	731.40	735.32	732.86	735.42	0.000248	2.55	70.71	18.12	0.23
Reach	2154	330.00	731.40	736.58	733.58	736.77	0.000371	3.52	93.66	18.16	0.27
Reach	2155	440.00	731.40	737.44	734.04	737.69	0.000426	4.03	109.24	18.18	0.29
Reach	2156	570.00	731.40	738.15	734.53	738.49	0.000516	4.66	125.72	109.70	0.32
Reach	2157	660.00	731.40	738.72	734.85	738.97	0.000404	4.35	252.33	310.77	0.28
Reach	2158	760.00	731.40	739.35	735.19	739.50	0.000257	3.67	482.89	402.55	0.23
Reach	2159	960.00	731.40	740.42	735.83	740.48	0.000124	2.77	975.14	486.10	0.16
Reach	2170		Bridge								
Reach	2197	180.00	731.66	735.32	733.11	735.44	0.000194	2.73	65.87	20.40	0.25
Reach	2198	330.00	731.66	736.59	733.84	736.80	0.000242	3.72	88.68	21.16	0.30

440.00	731.66	737.59	734.30	737.86	0.000233	4.12	106.71	21.76	0.30
570.00	731.66	738.31	734.80	738.67	0.000265	4.76	119.79	102.08	0.33
660.00	731.66	738.78	735.12	739.07	0.000373	4.42	214.92	162.92	0.30
760.00	731.66	739.44	735.46	739.70	0.000311	4.30	351.35	249.30	0.28
960.00	731.66	740.39	736.10	740.59	0.000234	4.05	637.58	322.00	0.25
180.00	731.88	735.20		735.50	0.000982	4.39	41.00	15.94	0.48
330.00	731.88	736.45		736.88	0.001029	5.28	62.53	18.64	0.51
440.00	731.88	737.48		737.92	0.000848	5.31	82.91	20.87	0.47
570.00	731.88	738.21		738.73	0.000857	5.78	102.61	52.74	0.48
660.00	731.88	738.61		739.17	0.000848	6.06	130.58	89.02	0.48
760.00	731.88	739.29		739.79	0.000660	5.84	212.58	151.67	0.44
960.00	731.88	740.27		740.66	0.000476	5.52	401.50	217.00	0.38
180.00	734.90	738.81	736.81	737.40	0.003294	6.15	29.26	25.27	1.01
330.00	734.90	737.42	737.42	738.22	0.003370	7.18	45.94	29.25	1.01
440.00	734.90	737.79	737.79	738.71	0.003336	7.69	57.19	31.65	1.01
570.00	734.90	738.21	738.21	739.21	0.003070	8.01	71.12	36.14	1.01
660.00	734.90	738.67		739.52	0.002258	7.37	89.52	43.10	0.90
760.00	734.90	739.43		739.99	0.001322	6.02	126.30	54.42	0.70
960.00	734.90	740.44		740.79	0.000835	4.73	203.00	98.00	0.58
180.00	738.00	739.47	739.47	739.96	0.007609	5.57	32.32	34.22	1.01
330.00	738.00	740.18	740.18	740.52	0.008139	4.63	71.31	106.00	0.99
440.00	738.00	740.33	740.33	740.73	0.007699	5.10	86.26	106.00	1.00
570.00	738.00	740.47	740.47	740.96	0.007578	5.62	101.34	106.00	1.01
660.00	738.00	740.57	740.57	741.11	0.007214	5.87	112.40	106.00	1.00
760.00	738.00	740.68	740.68	741.26	0.006893	6.12	124.11	106.00	1.00
960.00	738.00	740.87	740.87	741.56	0.006658	6.64	144.48	106.00	1.00

**Tributary 2**  
**Existing and Future Conditions**  
**Water Surface Profile and HECRAS Summary Printouts**  
**2, 5, 10, 25, 50, 100, & 500-year Storm Events**

TRIB2 OF EAGLE PASS CREEK (EXISTING) Existing 1998 Conditions 7/29/98

Geom: 1998 EXISTING





Existing

HEC-RAS Plan: 1998 River: RIVER-1 Reach: Reach-1

Reach	Flow	Water Surface Elevation	Channel Bottom Elevation	Water Surface Elevation	Channel Bottom Elevation	Velocity	Velocity	Water Surface Elevation	Channel Bottom Elevation	Velocity
Reach 1	190.00	737.06	739.38	738.67	739.68	0.002283	4.43	42.86	21.96	0.56
Reach 2	490.00	737.06	741.02	739.95	741.56	0.002283	5.92	82.80	26.87	0.59
Reach 3	740.00	737.06	741.58	740.77	742.17	0.002282	6.60	211.89	336.92	0.61
Reach 4	1030.00	737.06	742.01	742.01	742.47	0.001883	6.46	416.84	648.67	0.56
Reach 5	1250.00	737.06	742.20	742.20	742.63	0.001856	6.61	540.97	656.27	0.56
Reach 6	1490.00	737.06	742.30	742.30	742.78	0.002159	7.24	605.53	660.19	0.61
Reach 7	1960.00	737.06	742.56	742.51	743.03	0.002282	7.74	778.37	670.45	0.63
Reach 8	190.00	737.63	739.72		740.11	0.003270	5.01	37.93	21.27	0.66
Reach 9	490.00	737.63	741.46		741.88	0.001986	5.43	99.61	73.37	0.55
Reach 10	740.00	737.63	742.14		742.45	0.001472	5.29	249.75	417.73	0.49
Reach 11	1030.00	737.63	742.28		742.75	0.002197	6.63	310.47	430.79	0.60
Reach 12	1250.00	737.63	742.42		742.95	0.002525	7.28	371.22	443.47	0.65
Reach 13	1490.00	737.63	742.55		743.14	0.002874	7.94	429.00	455.20	0.70
Reach 14	1960.00	737.63	742.75		743.48	0.003557	9.13	523.23	473.71	0.78
Reach 15	190.00	737.97	740.22		740.55	0.002539	4.60	41.33	21.75	0.59
Reach 16	490.00	737.97	741.66		742.31	0.002935	6.47	75.77	26.07	0.67
Reach 17	740.00	737.97	741.82	741.68	743.15	0.005762	9.26	79.88	26.54	0.94
Reach 18	1030.00	737.97	742.94	742.94	743.58	0.002379	7.28	265.29	282.57	0.64
Reach 19	1250.00	737.97	743.16	743.16	743.89	0.002480	7.70	332.71	315.48	0.65
Reach 20	1490.00	737.97	743.37	743.37	744.07	0.002602	8.14	400.65	345.48	0.68
Reach 21	1960.00	737.97	743.69	743.69	744.46	0.002856	8.93	520.79	392.98	0.72
Reach 22	190.00	739.24	740.85	740.85	741.55	0.008063	6.76	28.10	20.02	1.01
Reach 23	490.00	739.24	742.12	742.12	743.30	0.007025	8.74	56.09	23.99	1.01
Reach 24	740.00	739.24	742.92	742.92	744.38	0.006658	9.70	76.25	26.49	1.01
Reach 25	1030.00	739.24	744.40	744.40	745.04	0.002129	7.10	319.26	335.40	0.61
Reach 26	1250.00	739.24	744.64	744.64	745.28	0.002197	7.47	401.71	376.51	0.62
Reach 27	1490.00	739.24	744.84	744.84	745.51	0.002312	7.90	480.82	412.12	0.64
Reach 28	1960.00	739.24	745.16	745.16	745.88	0.002514	8.61	624.08	469.79	0.68
Reach 29	180.00	739.83	741.66	741.16	742.01	0.003030	4.81	37.43	20.54	0.63
Reach 30	480.00	739.83	742.86	742.39	743.79	0.004253	7.72	62.19	20.57	0.78
Reach 31	730.00	739.83	743.33	743.22	744.94	0.006288	10.18	71.68	20.58	0.96
Reach 32	1010.00	739.83	745.51	745.51	746.03	0.001763	6.61	373.91	386.65	0.49
Reach 33	1230.00	739.83	745.73	745.73	746.24	0.001803	6.86	462.47	411.52	0.50
Reach 34	1470.00	739.83	745.90	745.90	746.42	0.001966	7.29	530.28	428.85	0.52
Reach 35	1940.00	739.83	746.16	746.16	746.72	0.002260	8.04	644.84	454.30	0.56
Reach 36		Culvert								
Reach 37	180.00	740.40	742.51	741.73	742.78	0.001899	4.16	43.28	20.56	0.50
Reach 38	480.00	740.40	744.46	742.97	744.98	0.001663	5.77	83.22	87.25	0.50
Reach 39	730.00	740.40	744.28	743.79	745.59	0.004469	9.18	79.55	61.29	0.82
Reach 40	1010.00	740.40	744.61	744.61	746.74	0.006524	11.70	86.29	108.96	1.01
Reach 41	1230.00	740.40	746.11	746.11	746.67	0.001998	7.25	474.94	404.92	0.53
Reach 42	1470.00	740.40	746.29	746.29	746.87	0.002116	7.62	553.01	423.43	0.55
Reach 43	1940.00	740.40	746.56	746.56	747.18	0.002416	8.39	671.06	447.60	0.60
Reach 44	180.00	740.72	742.52		742.98	0.004703	5.47	32.90	21.58	0.78
Reach 45	480.00	740.72	744.61		745.07	0.001858	5.52	106.37	103.18	0.55
Reach 46	730.00	740.72	745.17		745.81	0.002170	6.66	187.25	174.52	0.61
Reach 47	1010.00	740.72	746.87	745.37	746.99	0.000418	3.75	729.21	425.06	0.28
Reach 48	1230.00	740.72	746.33		746.78	0.001420	6.45	506.75	394.55	0.51
Reach 49	1470.00	740.72	746.50		746.98	0.001541	6.87	576.97	406.95	0.54
Reach 50	1940.00	740.72	746.78		747.30	0.001747	7.59	693.15	420.84	0.58
Reach 51	160.00	742.00	743.84	743.43	744.20	0.003453	4.76	33.60	21.45	0.67
Reach 52	410.00	742.00	745.20	744.56	745.80	0.003105	6.23	66.28	30.62	0.68
Reach 53	600.00	742.00	745.80	745.20	746.63	0.003227	7.32	89.68	46.42	0.72
Reach 54	820.00	742.00	746.59	745.93	747.44	0.002613	7.62	168.49	184.67	0.67
Reach 55	1000.00	742.00	746.15	746.15	747.95	0.006250	10.89	107.09	63.19	1.02
Reach 56	1190.00	742.00	747.13	747.13	748.20	0.003040	8.95	253.93	224.63	0.74
Reach 57	1580.00	742.00	747.85	747.85	748.82	0.002531	9.02	389.64	315.07	0.69
Reach 58	160.00	742.28	744.29	743.51	744.53	0.001950	3.87	41.33	20.55	0.48
Reach 59	410.00	742.28	745.59	744.59	746.15	0.002795	6.04	67.91	20.58	0.59
Reach 60	600.00	742.28	746.18	745.25	747.05	0.003653	7.49	80.11	20.60	0.67
Reach 61	820.00	742.28	746.80	745.94	747.99	0.004150	8.77	103.69	62.03	0.73
Reach 62	1000.00	742.28	747.53	746.59	748.67	0.003437	8.81	169.73	119.87	0.68
Reach 63	1190.00	742.28	748.34	748.34	749.11	0.002212	7.79	318.33	238.21	0.56
Reach 64	1580.00	742.28	748.80	748.80	749.52	0.002195	8.14	432.11	261.50	0.56

Reach 1	107	Culvert										
Reach 1	1105	160.00	742.43	744.52	743.66	744.74	0.001739	3.73	42.88	20.55		0.46
Reach 1	1103	410.00	742.43	746.14	744.74	746.59	0.001984	5.38	76.14	20.59		0.49
Reach 1	1105	600.00	742.43	746.94	745.41	747.58	0.002244	6.44	102.37	59.09		0.53
Reach 1	1106	820.00	742.43	747.48	746.09	748.35	0.002687	7.60	148.08	100.70		0.60
Reach 1	1108	1000.00	742.43	747.80	746.77	748.84	0.003080	8.47	181.42	124.56		0.65
Reach 1	1103	1190.00	742.43	747.86	747.86	749.27	0.004130	9.89	189.71	129.52		0.75
Reach 1	1103	1580.00	742.43	748.74	748.74	750.01	0.003445	9.98	328.86	186.18		0.70
Reach 1	1533	160.00	744.57	746.04	746.04	746.72	0.008722	6.62	24.18	17.97		1.01
Reach 1	1533	410.00	744.57	747.24	747.24	748.41	0.007803	8.68	47.24	20.40		1.01
Reach 1	1533	600.00	744.57	748.58	748.58	749.29	0.003411	7.07	84.83	70.41		0.69
Reach 1	1533	820.00	744.57	749.03	749.03	749.75	0.003119	7.36	141.02	143.92		0.67
Reach 1	1533	1000.00	744.57	749.40		750.03	0.002613	7.17	209.85	227.69		0.62
Reach 1	1533	1190.00	744.57	749.95		750.35	0.001635	6.17	370.92	353.12		0.50
Reach 1	1533	1580.00	744.57	750.55		750.85	0.001253	5.85	601.30	405.02		0.45
Reach 1	1568	150.00	744.80	746.61	746.16	747.00	0.003866	5.01	29.91	16.55		0.66
Reach 1	1568	350.00	744.80	748.11	747.20	748.75	0.003375	6.39	54.77	16.58		0.62
Reach 1	1568	520.00	744.80	748.53	747.93	749.63	0.005240	8.42	61.74	16.59		0.77
Reach 1	1568	720.00	744.80	750.05	750.05	750.57	0.002047	6.51	246.00	315.08		0.50
Reach 1	1568	870.00	744.80	750.23	750.23	750.77	0.002179	6.88	306.84	335.65		0.52
Reach 1	1568	1050.00	744.80	750.42	750.42	750.96	0.002342	7.29	369.80	355.68		0.54
Reach 1	1568	1410.00	744.80	750.72	750.72	751.29	0.002593	7.95	483.61	389.29		0.58
Reach 1	1602	Culvert										
Reach 1	1750	150.00	746.20	748.37	747.57	748.65	0.001075	4.18	35.87	16.55		0.50
Reach 1	1750	350.00	746.20	750.02	748.60	750.50	0.000997	5.55	63.10	96.59		0.50
Reach 1	1750	520.00	746.20	751.90	749.33	751.91	0.000066	1.63	537.95	350.41		0.12
Reach 1	1750	720.00	746.20	750.09	750.09	752.04	0.004009	11.22	64.15	96.61		1.00
Reach 1	1750	870.00	746.20	750.86	750.86	751.26	0.001331	6.36	223.21	255.24		0.52
Reach 1	1750	1050.00	746.20	750.98	750.98	751.41	0.001478	6.82	254.41	266.20		0.55
Reach 1	1750	1410.00	746.20	751.19	751.19	751.68	0.001679	7.49	314.54	286.13		0.59
Reach 1	1811	150.00	746.20	748.39		748.74	0.001789	4.76	31.51	18.76		0.65
Reach 1	1811	350.00	746.20	750.20	748.96	750.57	0.000977	4.86	72.17	108.27		0.51
Reach 1	1811	520.00	746.20	751.89		751.92	0.000094	2.06	543.94	417.52		0.17
Reach 1	1811	720.00	746.20	752.21	750.82	752.25	0.000108	2.32	681.45	435.28		0.19
Reach 1	1811	870.00	746.20	751.04	751.04	751.56	0.001287	6.65	225.52	312.58		0.62
Reach 1	1811	1050.00	746.20	751.24	751.24	751.75	0.001262	6.83	291.39	347.03		0.62
Reach 1	1811	1410.00	746.20	751.51	751.51	752.04	0.001362	7.42	389.51	392.13		0.65
Reach 1	2411	150.00	749.80	751.49	751.49	752.17	0.004612	6.64	22.61	16.76		1.01
Reach 1	2411	350.00	749.80	752.57	752.57	753.60	0.004078	8.15	42.97	21.07		1.01
Reach 1	2411	520.00	749.80	753.71	753.71	754.16	0.001502	5.95	115.58	226.65		0.64
Reach 1	2411	720.00	749.80	753.99	753.99	754.44	0.001566	6.43	209.85	377.19		0.66
Reach 1	2411	870.00	749.80	754.15	754.15	754.61	0.001599	6.73	285.49	483.36		0.67
Reach 1	2411	1050.00	749.80	754.30	754.30	754.78	0.001709	7.17	356.79	505.45		0.70
Reach 1	2411	1410.00	749.80	754.52	754.52	755.06	0.001952	8.01	475.31	540.17		0.76
Reach 1	2461	150.00	749.80	752.16	751.16	752.39	0.000828	3.85	38.94	16.57		0.44
Reach 1	2461	350.00	749.80	753.25	752.20	753.84	0.001367	6.14	56.97	16.60		0.58
Reach 1	2461	520.00	749.80	753.45	752.93	754.61	0.002509	8.83	60.27	112.19		0.80
Reach 1	2461	720.00	749.80	754.30	754.30	754.74	0.001307	6.45	326.67	502.73		0.54
Reach 1	2461	870.00	749.80	754.47	754.47	754.90	0.001361	6.74	414.07	534.10		0.55
Reach 1	2461	1050.00	749.80	754.61	754.61	755.07	0.001510	7.24	491.08	580.28		0.58
Reach 1	2461	1410.00	749.80	754.87	754.87	755.35	0.001695	7.95	644.66	645.34		0.62
Reach 1	2461	Culvert										
Reach 1	2521	150.00	749.90	752.39	751.26	752.59	0.000816	3.64	41.19	16.64		0.41
Reach 1	2521	350.00	749.90	753.63	752.30	754.13	0.001287	5.65	61.94	93.13		0.52
Reach 1	2521	520.00	749.90	753.29	753.02	754.62	0.003851	9.23	56.33	16.69		0.89
Reach 1	2521	720.00	749.90	754.41	754.41	754.77	0.001124	6.00	301.02	478.69		0.50
Reach 1	2521	870.00	749.90	754.54	754.54	754.91	0.001200	6.32	366.44	502.80		0.52
Reach 1	2521	1050.00	749.90	754.79	754.67	755.07	0.001002	5.97	494.55	546.95		0.48
Reach 1	2521	1410.00	749.90	755.12	754.85	755.35	0.000893	5.90	685.61	606.84		0.46
Reach 1	2521	150.00	750.13	752.31		752.79	0.002810	5.57	26.92	16.70		0.77
Reach 1	2521	350.00	750.13	753.60		754.31	0.002335	6.76	51.79	21.85		0.77
Reach 1	2521	520.00	750.13	753.87	753.87	755.13	0.003732	9.01	58.08	25.82		0.99
Reach 1	2521	720.00	750.13	754.85	754.85	755.35	0.001311	6.59	230.77	281.10		0.62

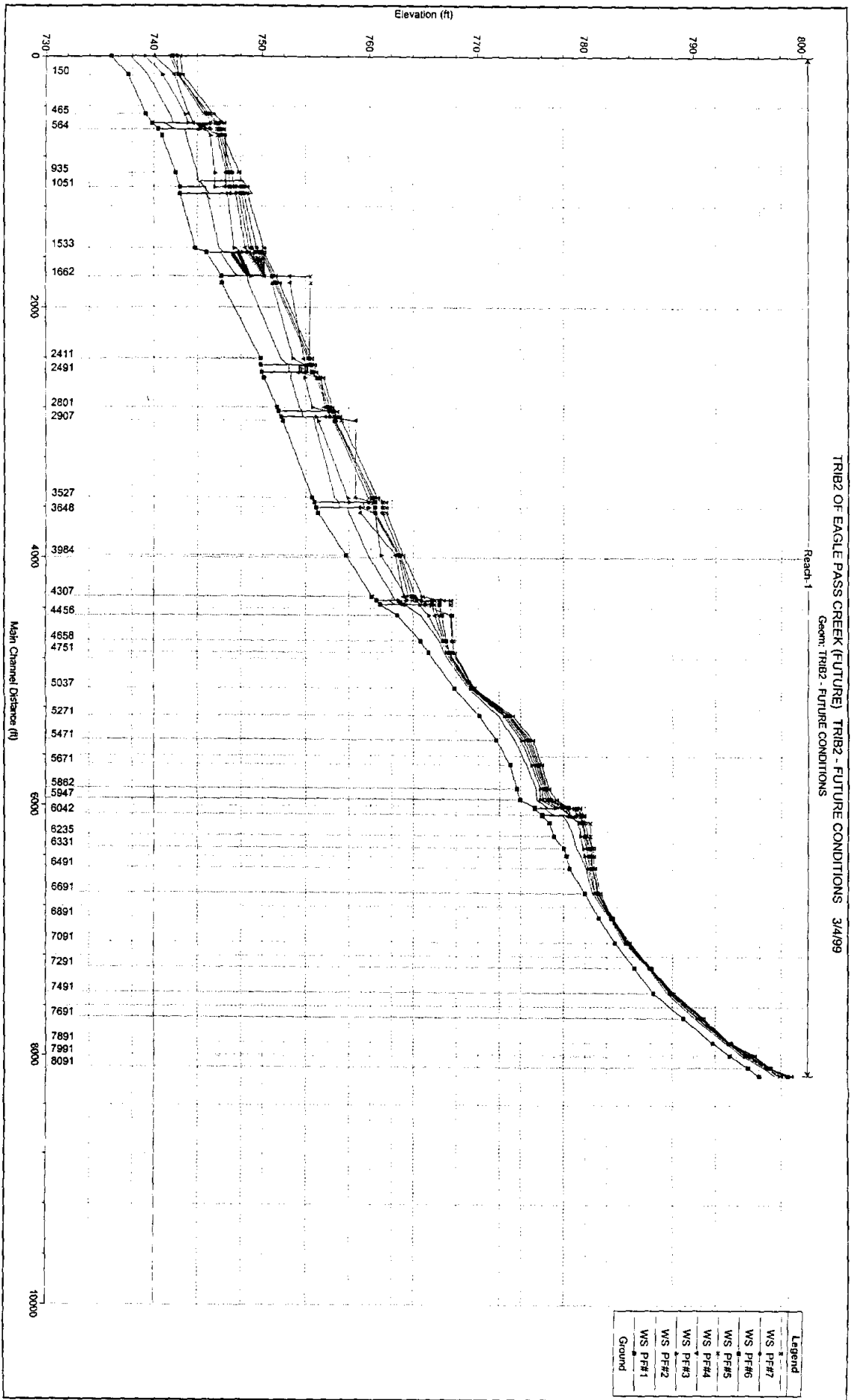
Reach	2568	870.00	750.13	754.99	754.99	755.54	0.001453	7.12	273.33	318.41	0.66
Reach	2568	1050.00	750.13	755.19	755.19	755.73	0.001473	7.42	341.74	391.01	0.67
Reach	2568	1410.00	750.13	755.52	755.52	756.04	0.001448	7.78	503.08	591.18	0.67
Reach	2601	150.00	751.32	753.20	753.20	753.91	0.004568	6.80	22.06	15.51	1.00
Reach	2601	350.00	751.32	754.34	754.34	755.40	0.004071	8.27	42.30	20.06	1.00
Reach	2601	520.00	751.32	755.65	755.65	756.05	0.001199	5.65	137.80	242.63	0.58
Reach	2601	720.00	751.32	755.90	755.90	756.30	0.001261	6.11	217.26	401.93	0.60
Reach	2601	870.00	751.32	756.03	756.03	756.45	0.001344	6.48	272.12	439.69	0.62
Reach	2601	1050.00	751.32	756.16	756.16	756.60	0.001447	6.89	331.87	479.10	0.65
Reach	2601	1410.00	751.32	756.38	756.38	756.85	0.001634	7.62	440.93	543.72	0.70
Reach	2831	150.00	751.48	753.57	753.12	754.08	0.002631	5.72	26.20	12.60	0.70
Reach	2831	350.00	751.48	754.37	754.37	755.81	0.005466	9.64	36.29	12.84	1.00
Reach	2831	520.00	751.48	756.14	756.14	756.27	0.000574	3.99	266.71	381.78	0.33
Reach	2831	720.00	751.48	756.15	756.15	756.39	0.001081	5.48	269.56	383.90	0.45
Reach	2831	870.00	751.48	756.28	756.15	756.53	0.001159	5.78	321.05	420.26	0.47
Reach	2831	1050.00	751.48	756.47	756.26	756.69	0.001094	5.77	407.13	474.88	0.46
Reach	2831	1410.00	751.48	756.74	756.46	756.96	0.001125	6.06	547.80	552.64	0.47
Reach	2833	Culvert									
Reach	2875	150.00	751.71	754.29	753.35	754.62	0.001400	4.63	32.40	12.61	0.51
Reach	2875	350.00	751.71	755.42	754.60	756.30	0.002641	7.49	46.74	56.66	0.69
Reach	2875	520.00	751.71	755.46	755.46	757.35	0.005666	11.02	47.21	56.67	1.01
Reach	2875	720.00	751.71	756.45	756.45	756.93	0.001777	6.89	212.67	333.47	0.56
Reach	2875	870.00	751.71	756.63	756.63	757.12	0.001868	7.23	274.22	365.10	0.58
Reach	2875	1050.00	751.71	756.80	756.80	757.31	0.002010	7.68	338.00	395.21	0.60
Reach	2875	1410.00	751.71	757.04	757.04	757.62	0.002376	8.62	441.09	441.59	0.66
Reach	2907	150.00	751.87	754.33		754.67	0.001650	4.72	31.76	17.83	0.62
Reach	2907	350.00	751.87	756.17		756.40	0.000643	4.11	115.53	182.57	0.42
Reach	2907	520.00	751.87	757.48	755.98	757.54	0.000160	2.62	598.32	503.44	0.22
Reach	2907	720.00	751.87	756.44	756.44	757.05	0.001698	7.07	177.30	280.26	0.69
Reach	2907	870.00	751.87	756.68	756.68	757.27	0.001615	7.24	256.02	353.82	0.68
Reach	2907	1050.00	751.87	756.87	756.87	757.49	0.001690	7.68	327.20	387.09	0.71
Reach	2907	1410.00	751.87	757.19	757.19	757.86	0.001836	8.45	457.44	445.50	0.75
Reach	3527	150.00	754.58	756.46	756.46	757.17	0.004580	6.81	22.04	15.50	1.01
Reach	3527	350.00	754.58	757.59	757.59	758.66	0.004106	8.30	42.17	20.03	1.01
Reach	3527	520.00	754.58	758.31	758.31	759.57	0.003841	9.01	57.71	22.93	1.00
Reach	3527	720.00	754.58	759.62	759.62	760.28	0.001375	6.97	235.74	291.62	0.64
Reach	3527	870.00	754.58	759.88	759.88	760.52	0.001334	7.19	319.67	359.02	0.64
Reach	3527	1050.00	754.58	760.21	760.21	760.76	0.001164	7.08	475.62	581.40	0.60
Reach	3527	1410.00	754.58	760.49	760.49	761.07	0.001311	7.83	636.45	582.31	0.65
Reach	3562	150.00	754.76	756.84	756.40	757.35	0.002649	5.74	26.15	12.60	0.70
Reach	3562	350.00	754.76	757.64	757.64	759.08	0.005487	9.66	36.25	12.84	1.01
Reach	3562	520.00	754.76	759.74	759.74	760.23	0.001337	6.37	229.44	332.83	0.50
Reach	3562	720.00	754.76	760.15	760.15	760.54	0.001204	6.37	406.72	550.15	0.49
Reach	3562	870.00	754.76	760.27	760.27	760.69	0.001348	6.85	477.01	554.62	0.52
Reach	3562	1050.00	754.76	760.60	760.42	760.88	0.001032	6.23	661.99	568.21	0.46
Reach	3562	1410.00	754.76	760.98	760.64	761.22	0.000976	6.32	878.10	579.45	0.45
Reach	3563	Culvert									
Reach	3604	150.00	754.94	757.51	756.58	757.85	0.001411	4.64	32.32	12.63	0.51
Reach	3604	350.00	754.94	759.21	757.82	759.87	0.001707	6.50	53.88	109.77	0.56
Reach	3604	520.00	754.94	758.69	758.69	760.57	0.005654	11.01	47.24	12.69	1.01
Reach	3604	720.00	754.94	760.24	760.24	760.63	0.001222	6.35	392.02	545.28	0.49
Reach	3604	870.00	754.94	760.38	760.38	760.77	0.001325	6.73	468.44	550.57	0.51
Reach	3604	1050.00	754.94	760.49	760.49	760.93	0.001540	7.38	529.02	554.74	0.55
Reach	3604	1410.00	754.94	760.88	760.72	761.21	0.001352	7.21	744.89	569.34	0.52
Reach	3646	150.00	755.12	757.57		757.92	0.001679	4.75	31.56	17.79	0.63
Reach	3646	350.00	755.12	759.72		759.95	0.000552	4.06	147.01	242.12	0.40
Reach	3646	520.00	755.12	760.71		760.78	0.000190	2.84	591.41	528.44	0.24
Reach	3646	720.00	755.12	760.43		760.67	0.000609	4.86	448.52	517.42	0.43
Reach	3646	870.00	755.12	760.56		760.83	0.000696	5.31	514.76	522.56	0.46
Reach	3646	1050.00	755.12	760.68		760.99	0.000819	5.87	575.44	527.22	0.50
Reach	3646	1410.00	755.12	760.91		761.27	0.000983	6.67	700.08	536.66	0.56
Reach	3684	150.00	757.70	759.58	759.58	760.29	0.008142	6.81	22.04	15.50	1.01
Reach	3684	350.00	757.70	760.71	760.71	761.78	0.007299	8.30	42.17	20.03	1.01

Reach	Reach	Reach	Reach	Reach	Reach	Reach	Reach	Reach	Reach	Reach
Reach 360	520.00	757.70	761.41	761.41	762.69	0.006960	9.07	57.31	22.86	1.01
Reach 364	720.00	757.70	762.48	762.48	762.90	0.002063	6.11	302.38	401.24	0.58
Reach 364	870.00	757.70	762.63	762.63	763.04	0.002176	6.44	360.58	424.75	0.60
Reach 364	1050.00	757.70	762.76	762.76	763.19	0.002310	6.81	421.31	447.96	0.62
Reach 364	1410.00	757.70	762.98	762.98	763.44	0.002578	7.47	522.45	485.58	0.66
Reach 430	110.00	760.15	761.98		762.39	0.004803	5.16	21.33	15.32	0.77
Reach 430	240.00	760.15	763.06		763.61	0.003901	5.96	40.25	19.65	0.73
Reach 430	330.00	760.15	763.78		764.33	0.003063	5.95	55.47	22.53	0.67
Reach 430	430.00	760.15	763.51	763.51	764.68	0.007107	8.69	49.48	21.44	1.01
Reach 430	510.00	760.15	763.83	763.83	765.09	0.006943	9.02	56.55	22.72	1.01
Reach 430	590.00	760.15	764.11	764.11	765.47	0.006890	9.34	63.14	23.96	1.01
Reach 430	760.00	760.15	764.82	764.82	766.16	0.005088	9.37	92.20	60.71	0.90
Reach 433	110.00	760.55	762.11	761.88	762.60	0.006151	5.63	19.52	12.58	0.60
Reach 433	240.00	760.55	763.04	762.79	763.95	0.007069	7.67	31.28	12.62	0.86
Reach 433	330.00	760.55	763.64	763.32	764.76	0.007113	8.50	38.81	12.65	0.86
Reach 433	430.00	760.55	763.86	763.86	765.52	0.009854	10.33	41.64	12.67	1.00
Reach 433	510.00	760.55	764.27	764.27	766.11	0.009907	10.89	46.83	12.69	1.00
Reach 433	590.00	760.55	764.65	764.65	766.67	0.009897	11.41	51.70	16.82	1.00
Reach 433	760.00	760.55	765.99	765.99	767.50	0.005439	10.23	110.70	70.78	0.77
Reach 434	Culvert									
Reach 437	110.00	760.90	763.05	762.24	763.31	0.004907	4.10	26.86	18.58	0.49
Reach 437	240.00	760.90	764.51	763.15	764.95	0.004125	5.31	45.18	34.12	0.49
Reach 437	330.00	760.90	765.74	763.68	765.87	0.001624	3.08	128.83	74.53	0.30
Reach 437	430.00	760.90	766.01	764.21	766.18	0.002060	3.57	151.58	252.81	0.34
Reach 437	510.00	760.90	766.43	764.61	766.55	0.001443	3.24	267.12	296.48	0.29
Reach 437	590.00	760.90	764.99	764.99	767.06	0.016488	11.54	51.15	46.24	1.00
Reach 437	760.00	760.90	767.45	765.71	767.50	0.000573	2.39	667.68	493.88	0.19
Reach 445	110.00	762.50	764.67	764.67	764.97	0.029080	4.40	25.02	42.48	1.01
Reach 445	240.00	762.50	765.34		765.55	0.012772	3.67	65.43	79.28	0.71
Reach 445	330.00	762.50	765.97		766.08	0.004245	2.64	127.78	170.55	0.43
Reach 445	430.00	762.50	766.30		766.39	0.002662	2.42	214.79	288.41	0.36
Reach 445	510.00	762.50	766.63		766.69	0.001515	2.10	311.75	309.51	0.28
Reach 445	590.00	762.50	767.36		767.38	0.000438	1.42	560.23	372.94	0.16
Reach 445	760.00	762.50	767.52		767.55	0.000548	1.66	622.03	383.56	0.18
Reach 465	110.00	764.70	766.43		766.48	0.003493	2.54	88.02	236.96	0.40
Reach 465	240.00	764.70	766.72		766.78	0.003736	3.02	169.17	320.70	0.42
Reach 465	330.00	764.70	766.83		766.90	0.004159	3.33	205.57	331.97	0.45
Reach 465	430.00	764.70	766.95		767.02	0.004220	3.51	246.03	339.26	0.46
Reach 465	510.00	764.70	767.06		767.14	0.003911	3.52	284.28	347.75	0.45
Reach 465	590.00	764.70	767.49		767.53	0.001464	2.47	441.89	387.89	0.28
Reach 465	760.00	764.70	767.68		767.72	0.001543	2.67	516.84	405.20	0.30
Reach 475	110.00	765.43	766.81		766.85	0.006296	2.15	84.81	284.46	0.48
Reach 475	240.00	765.43	767.06		767.10	0.005122	2.29	167.06	352.71	0.45
Reach 475	330.00	765.43	767.18		767.23	0.004841	2.43	210.97	365.28	0.45
Reach 475	430.00	765.43	767.29		767.35	0.004696	2.58	252.24	368.80	0.45
Reach 475	510.00	765.43	767.38		767.44	0.004568	2.69	285.06	377.04	0.45
Reach 475	590.00	765.43	767.62		767.66	0.002575	2.30	376.12	388.22	0.35
Reach 475	760.00	765.43	767.81		767.86	0.002441	2.44	450.22	397.13	0.35
Reach 503	110.00	767.82	769.11	768.91	769.25	0.011107	3.06	45.25	260.66	0.65
Reach 503	240.00	767.82	769.28		769.48	0.015303	4.11	93.30	299.41	0.79
Reach 503	330.00	767.82	769.39	769.39	769.58	0.013913	4.22	128.23	316.76	0.76
Reach 503	430.00	767.82	769.47	769.47	769.68	0.014725	4.56	154.98	328.87	0.80
Reach 503	510.00	767.82	769.52	769.52	769.75	0.016452	4.94	169.41	334.82	0.85
Reach 503	590.00	767.82	769.57	769.57	769.81	0.016410	5.08	188.37	336.30	0.85
Reach 503	760.00	767.82	769.67	769.67	769.94	0.017673	5.53	220.01	342.77	0.89
Reach 527	110.00	770.10	771.85	771.63	772.06	0.012740	3.64	30.25	37.27	0.71
Reach 527	240.00	770.10	772.42	772.18	772.70	0.012594	4.18	57.41	59.29	0.73
Reach 527	330.00	770.10	772.58	772.43	772.96	0.014805	4.95	67.33	65.71	0.81
Reach 527	430.00	770.10	772.76	772.64	773.24	0.015353	5.55	79.85	75.75	0.85
Reach 527	510.00	770.10	772.91	772.81	773.44	0.014749	5.85	92.07	83.97	0.85
Reach 527	590.00	770.10	773.02	772.96	773.61	0.015527	6.27	100.89	88.71	0.88
Reach 527	760.00	770.10	773.24	773.24	773.95	0.015940	6.94	122.13	106.40	0.91
Reach 541	110.00	771.71	773.41		773.50	0.004648	2.39	46.03	50.08	0.44
Reach 541	240.00	771.71	774.03		774.16	0.004702	2.91	82.47	68.98	0.46

Reach 542	330.00	771.71	774.31		774.47	0.004429	3.24	105.95	110.55	0.47
Reach 543	430.00	771.71	774.55		774.74	0.004274	3.52	138.46	153.85	0.47
Reach 544	510.00	771.71	774.71		774.91	0.004245	3.72	165.33	188.90	0.47
Reach 545	590.00	771.71	774.87		775.07	0.004022	3.81	197.62	217.72	0.47
Reach 546	760.00	771.71	775.15		775.36	0.003703	3.99	268.23	278.61	0.46
Reach 547										
Reach 548	110.00	773.02	774.52		774.65	0.007163	3.17	45.76	99.02	0.55
Reach 549	240.00	773.02	775.00		775.13	0.005050	3.46	112.23	174.19	0.50
Reach 550	330.00	773.02	775.24		775.36	0.004444	3.57	157.15	210.28	0.48
Reach 551	430.00	773.02	775.45		775.57	0.003988	3.66	205.48	239.95	0.46
Reach 552	510.00	773.02	775.61		775.73	0.003815	3.77	245.10	275.43	0.46
Reach 553	590.00	773.02	775.72		775.84	0.003656	3.82	276.72	278.89	0.45
Reach 554	760.00	773.02	775.95		776.07	0.003328	3.89	341.99	285.67	0.44
Reach 555										
Reach 556	110.00	773.66	775.42		775.48	0.002763	1.92	57.29	61.08	0.34
Reach 557	240.00	773.66	775.84		775.97	0.003859	2.86	87.96	84.80	0.43
Reach 558	330.00	773.66	776.05		776.22	0.004440	3.37	114.14	213.88	0.47
Reach 559	430.00	773.66	776.22		776.42	0.004690	3.71	151.99	232.97	0.49
Reach 560	510.00	773.66	776.35		776.55	0.004627	3.86	184.45	270.46	0.49
Reach 561	590.00	773.66	776.45		776.66	0.004760	4.05	212.06	295.30	0.51
Reach 562	760.00	773.66	776.64		776.87	0.004928	4.38	273.42	341.10	0.52
Reach 563										
Reach 564	110.00	773.93	775.46		775.65	0.001014	3.54	31.04	25.57	0.57
Reach 565	240.00	773.93	775.80		776.35	0.002344	5.93	40.47	28.83	0.88
Reach 566	330.00	773.93	776.02	776.02	776.79	0.002946	7.03	47.00	33.59	1.00
Reach 567	430.00	773.93	776.36	776.36	777.21	0.002619	7.43	61.36	51.35	0.97
Reach 568	510.00	773.93	776.62	776.62	777.51	0.002382	7.62	76.25	63.12	0.94
Reach 569	590.00	773.93	776.84	776.84	777.77	0.002269	7.85	90.90	71.59	0.93
Reach 570	760.00	773.93	777.26	777.26	778.26	0.002064	8.22	128.03	93.53	0.91
Reach 571										
Reach 6006	110.00	775.32	776.46	776.46	777.02	0.003145	6.05	18.18	50.44	1.00
Reach 6007	240.00	775.32	777.23	777.23	778.19	0.002645	7.85	30.58	60.64	1.00
Reach 6008	330.00	775.32	777.69	777.69	778.87	0.002454	8.71	37.87	65.98	1.00
Reach 6009	430.00	775.32	778.14	778.14	779.55	0.002331	9.54	45.07	134.60	1.00
Reach 6010	510.00	775.32	778.47	778.47	778.60	0.002285	2.98	209.16	170.60	0.34
Reach 6011	590.00	775.32	778.47	778.47	778.65	0.000381	3.45	209.16	170.60	0.39
Reach 6012	760.00	775.32	778.47	778.47	778.77	0.000633	4.44	209.16	170.60	0.50
Reach 6042		Culvert								
Reach 6076	110.00	776.00	777.87	777.13	778.08	0.004288	3.69	29.84	54.13	0.48
Reach 6077	240.00	776.00	778.76	777.90	779.22	0.005513	5.43	44.20	176.80	0.58
Reach 6078	330.00	776.00	778.36	778.36	779.55	0.017713	8.75	37.70	110.27	1.01
Reach 6079	430.00	776.00	778.82	778.82	780.23	0.016443	9.52	45.18	195.55	1.00
Reach 6080	510.00	776.00	779.17	779.17	780.74	0.015771	10.06	50.68	221.85	1.00
Reach 6081	590.00	776.00	779.69	779.22	779.76	0.001081	2.51	360.62	253.28	0.26
Reach 6082	760.00	776.00	779.84	779.32	779.94	0.001416	2.98	402.22	278.72	0.30
Reach 6130	110.00	776.70	778.30		778.43	0.010658	2.90	37.98	57.73	0.63
Reach 6131	240.00	776.70	779.38		779.41	0.001638	1.46	181.24	250.66	0.26
Reach 6132	330.00	776.70	779.77		779.79	0.000917	1.29	302.53	340.27	0.21
Reach 6133	430.00	776.70	780.41		780.42	0.000303	0.97	540.66	402.87	0.13
Reach 6134	510.00	776.70	780.92		780.93	0.000163	0.83	754.66	439.35	0.10
Reach 6135	590.00	776.70	779.77		779.85	0.002922	2.31	302.95	340.33	0.37
Reach 6136	760.00	776.70	779.96		780.04	0.002814	2.45	369.00	358.41	0.37
Reach 6235	110.00	777.10	778.85		778.91	0.002499	1.93	56.93	53.46	0.33
Reach 6236	240.00	777.10	779.55		779.63	0.002338	2.34	115.73	138.97	0.34
Reach 6237	330.00	777.10	779.87		779.95	0.002159	2.44	165.08	168.64	0.33
Reach 6238	430.00	777.10	780.43		780.49	0.001114	2.09	293.41	319.51	0.25
Reach 6239	510.00	777.10	780.93		780.96	0.000548	1.68	483.08	418.61	0.18
Reach 6240	590.00	777.10	780.06		780.25	0.004528	3.72	200.19	199.29	0.49
Reach 6241	760.00	777.10	780.24		780.47	0.005196	4.23	239.07	251.65	0.53
Reach 6331	30.00	778.00	779.12		779.14	0.002028	1.30	23.15	33.84	0.28
Reach 6332	70.00	778.00	779.80		779.83	0.001298	1.34	52.19	51.88	0.24
Reach 6333	90.00	778.00	780.10		780.13	0.000953	1.27	76.44	157.92	0.21
Reach 6334	110.00	778.00	780.56		780.57	0.000297	0.89	188.80	313.45	0.12
Reach 6335	130.00	778.00	780.99		781.00	0.000111	0.63	339.08	377.55	0.08
Reach 6336	150.00	778.00	780.50		780.52	0.000682	1.31	169.85	303.48	0.18
Reach 6337	190.00	778.00	780.72		780.74	0.000519	1.25	242.20	337.79	0.16
Reach 6338										
Reach 6339	30.00	778.28	779.31	779.31	779.52	0.032929	3.69	8.14	19.93	1.02
Reach 6340	70.00	778.28	779.92		779.97	0.004861	2.00	41.69	95.89	0.43

Reach 6381	90.00	778.28	780.18		780.21	0.002150	1.65	72.03	133.48	0.30
Reach 6381	110.00	778.28	780.58		780.59	0.000528	1.04	174.31	302.72	0.16
Reach 6391	130.00	778.28	781.00		781.00	0.000166	0.70	311.82	351.75	0.09
Reach 6391	150.00	778.28	780.55		780.57	0.001129	1.49	164.28	298.61	0.23
Reach 6391	190.00	778.28	780.76		780.78	0.000783	1.37	230.58	323.60	0.20
Reach 6491	30.00	778.54	779.87		779.89	0.001248	1.02	29.28	42.32	0.22
Reach 6491	70.00	778.54	780.21		780.25	0.001787	1.54	48.87	80.53	0.28
Reach 6491	90.00	778.54	780.36		780.40	0.001704	1.66	62.46	100.55	0.28
Reach 6491	110.00	778.54	780.64		780.67	0.001036	1.50	93.47	126.71	0.22
Reach 6491	130.00	778.54	781.02		781.04	0.000501	1.22	148.48	162.73	0.16
Reach 6491	150.00	778.54	780.66		780.72	0.001776	1.99	96.92	129.56	0.29
Reach 6491	190.00	778.54	780.84		780.90	0.001707	2.10	121.53	147.62	0.29
Reach 6591	30.00	779.97	780.49		780.56	0.022143	2.06	14.54	63.73	0.76
Reach 6591	70.00	779.97	780.81		780.86	0.006330	1.75	40.07	88.62	0.46
Reach 6591	90.00	779.97	780.92		780.97	0.005426	1.81	50.18	100.06	0.43
Reach 6591	110.00	779.97	781.01		781.06	0.004899	1.86	60.12	110.47	0.42
Reach 6591	130.00	779.97	781.20		781.24	0.002880	1.63	83.18	130.78	0.33
Reach 6591	150.00	779.97	781.18		781.24	0.004106	1.93	81.07	129.46	0.40
Reach 6591	190.00	779.97	781.33		781.39	0.003733	2.00	101.04	149.88	0.39
Reach 6891	30.00	781.25	782.18	781.88	782.19	0.004119	1.03	29.06	101.92	0.34
Reach 6891	70.00	781.25	782.27		782.32	0.008642	1.79	39.20	105.36	0.52
Reach 6891	90.00	781.25	782.34		782.39	0.009341	1.96	45.96	114.01	0.54
Reach 6891	110.00	781.25	782.38		782.45	0.009908	2.13	51.54	117.42	0.57
Reach 6891	130.00	781.25	782.34		782.46	0.018488	2.78	46.77	114.51	0.77
Reach 6891	150.00	781.25	782.45		782.55	0.011796	2.50	59.88	122.34	0.63
Reach 6891	190.00	781.25	782.52		782.64	0.012631	2.77	68.70	127.34	0.66
Reach 7091	30.00	782.72	783.40	783.30	783.44	0.010035	1.59	18.96	111.95	0.53
Reach 7091	70.00	782.72	783.64		783.68	0.005134	1.71	47.39	121.23	0.42
Reach 7091	90.00	782.72	783.72		783.76	0.005116	1.86	56.32	123.02	0.43
Reach 7091	110.00	782.72	783.79		783.84	0.004904	1.96	65.37	124.49	0.43
Reach 7091	130.00	782.72	783.89		783.94	0.004081	1.95	78.55	132.56	0.40
Reach 7091	150.00	782.72	783.92		783.98	0.004772	2.15	82.18	133.99	0.43
Reach 7091	190.00	782.72	784.02		784.10	0.004837	2.34	96.82	142.31	0.44
Reach 7291	30.00	784.47	785.77	785.73	785.81	0.014114	1.72	21.67	151.57	0.61
Reach 7291	70.00	784.47	785.85	785.85	785.93	0.027510	2.63	33.19	166.19	0.87
Reach 7291	90.00	784.47	785.88	785.88	785.98	0.028490	2.83	39.52	173.17	0.90
Reach 7291	110.00	784.47	785.92	785.92	786.03	0.030900	3.09	45.47	197.07	0.95
Reach 7291	130.00	784.47	785.94	785.94	786.07	0.033241	3.32	49.98	201.58	0.99
Reach 7291	150.00	784.47	785.97	785.97	786.11	0.032531	3.43	55.84	207.29	0.99
Reach 7291	190.00	784.47	786.02	786.02	786.17	0.031651	3.65	67.14	223.17	1.00
Reach 7491	30.00	786.25	787.34		787.37	0.004956	1.41	21.32	53.85	0.39
Reach 7491	70.00	786.25	787.66		787.71	0.004306	1.74	40.34	66.95	0.39
Reach 7491	90.00	786.25	787.77		787.82	0.004535	1.87	48.02	73.84	0.41
Reach 7491	110.00	786.25	787.87		787.93	0.004512	1.97	55.78	79.18	0.41
Reach 7491	130.00	786.25	787.96		788.02	0.004527	2.07	62.76	82.97	0.42
Reach 7491	150.00	786.25	788.02		788.09	0.004732	2.20	68.17	88.87	0.43
Reach 7491	190.00	786.25	788.13		788.22	0.004906	2.45	78.50	96.70	0.45
Reach 7691	30.00	789.02	789.84	789.84	790.08	0.031479	3.90	7.70	16.80	1.02
Reach 7691	70.00	789.02	790.25	790.25	790.52	0.024402	4.25	17.37	38.26	0.94
Reach 7691	90.00	789.02	790.38	790.38	790.66	0.020030	4.37	23.12	48.87	0.88
Reach 7691	110.00	789.02	790.43	790.43	790.78	0.023073	4.91	25.88	53.98	0.96
Reach 7691	130.00	789.02	790.61	790.61	790.88	0.014759	4.46	37.76	84.21	0.79
Reach 7691	150.00	789.02	790.68	790.68	790.96	0.014068	4.58	44.38	92.55	0.78
Reach 7691	190.00	789.02	790.72	790.72	791.11	0.019082	5.47	48.53	109.02	0.92
Reach 7891	30.00	791.76	792.80		792.89	0.007806	2.34	13.53	38.46	0.53
Reach 7891	70.00	791.76	793.13		793.24	0.008516	2.88	30.65	73.45	0.58
Reach 7891	90.00	791.76	793.20		793.34	0.009710	3.21	36.84	88.43	0.62
Reach 7891	110.00	791.76	793.31		793.44	0.008458	3.18	47.43	103.17	0.59
Reach 7891	130.00	791.76	793.32		793.49	0.011638	3.74	47.73	103.37	0.69
Reach 7891	150.00	791.76	793.37		793.55	0.012062	3.95	53.02	106.78	0.71
Reach 7891	190.00	791.76	793.53		793.70	0.009255	3.85	71.54	118.62	0.64
Reach 7991	30.00	793.37	794.25	794.25	794.50	0.030233	4.03	7.45	15.03	1.01
Reach 7991	70.00	793.37	794.65	794.65	795.03	0.026816	4.96	14.12	18.99	1.01
Reach 7991	90.00	793.37	794.80	794.80	795.23	0.025691	5.25	17.15	20.51	1.01
Reach 7991	110.00	793.37	794.94	794.94	795.40	0.024708	5.47	20.09	21.87	1.01

130.00	793.37	795.06	795.06	795.56	0.024470	5.72	22.74	23.03	1.01
150.00	793.37	795.22	795.22	795.70	0.020849	5.58	27.92	39.84	0.95
190.00	793.37	795.56	795.56	795.88	0.012066	4.75	52.69	108.47	0.74
30.00	795.00	796.24		796.35	0.012040	2.61	11.49	22.22	0.64
70.00	795.00	796.63		796.78	0.011989	3.05	22.92	34.98	0.67
90.00	795.00	796.78		796.93	0.011916	3.19	28.26	40.34	0.67
110.00	795.00	796.89		797.06	0.011582	3.31	33.22	43.79	0.67
130.00	795.00	796.99		797.17	0.011056	3.47	38.04	53.71	0.67
150.00	795.00	797.05		797.26	0.011773	3.73	41.29	60.72	0.69
190.00	795.00	797.04	796.98	797.39	0.019283	4.76	40.97	60.14	0.89
30.00	796.00	797.15	797.13	797.51	0.025550	4.78	6.28	8.23	0.96
70.00	796.00	797.73	797.73	798.27	0.025057	5.94	11.79	10.91	1.01
90.00	796.00	797.95	797.95	798.56	0.024295	6.27	14.37	11.95	1.01
110.00	796.00	798.17	798.17	798.81	0.023774	6.43	17.10	13.47	1.01
130.00	796.00	798.40	798.40	799.03	0.021771	6.38	20.36	15.23	0.97
150.00	796.00	798.58	798.58	799.20	0.023665	6.34	23.67	19.28	1.01
190.00	796.00	798.84	798.84	799.50	0.023311	6.51	29.17	22.67	1.01





Future

Reach	Flow	230.00	736.00	737.82	737.82	738.61	0.007770	7.14	32.23	20.45	1.00
Reach-1	230	230.00	736.00	737.82	737.82	738.61	0.007770	7.14	32.23	20.45	1.00
Reach-1	570	570.00	736.00	739.16	739.16	740.46	0.006888	9.12	62.48	24.49	1.01
Reach-1	840	840.00	736.00	739.98	739.98	741.55	0.006530	10.05	83.59	26.95	1.01
Reach-1	1140	1140.00	738.00	741.38	741.38	742.19	0.002433	7.85	322.49	279.05	0.65
Reach-1	1350	1350.00	736.00	741.69	741.69	742.45	0.002291	7.96	414.49	352.81	0.64
Reach-1	1630	1630.00	736.00	742.08	742.08	742.71	0.001948	7.74	601.53	569.83	0.60
Reach-1	2150	2150.00	736.00	742.39	742.39	743.04	0.002131	8.41	780.89	579.66	0.63
Reach-1	230	230.00	737.60	739.41	739.41	740.21	0.007825	7.15	32.15	20.44	1.01
Reach-1	570	570.00	737.60	740.75	740.75	742.06	0.006988	9.17	62.16	24.45	1.01
Reach-1	840	840.00	737.60	741.86	741.86	742.39	0.002662	6.78	231.26	303.23	0.64
Reach-1	1140	1140.00	737.60	742.16	742.16	742.72	0.002866	7.39	327.94	338.04	0.67
Reach-1	1350	1350.00	737.60	742.31	742.31	742.91	0.003123	7.89	378.60	349.27	0.70
Reach-1	1630	1630.00	737.60	742.20	742.20	743.26	0.005422	10.23	343.08	341.44	0.93
Reach-1	2150	2150.00	737.60	742.61	742.61	743.54	0.004884	10.30	488.23	372.40	0.89
Reach-1	230	230.00	739.24	741.44	741.44	741.94	0.003951	5.66	40.64	21.89	0.73
Reach-1	570	570.00	739.24	742.87	742.87	743.76	0.004150	7.61	74.94	26.33	0.79
Reach-1	840	840.00	739.24	743.20	743.20	744.76	0.006556	10.02	83.86	27.37	1.01
Reach-1	1140	1140.00	739.24	744.59	744.59	745.34	0.002336	7.65	279.06	251.71	0.64
Reach-1	1350	1350.00	739.24	744.81	744.81	745.60	0.002410	8.04	338.49	271.37	0.66
Reach-1	1630	1630.00	739.24	745.07	745.07	745.89	0.002530	8.53	409.65	293.17	0.68
Reach-1	2150	2150.00	739.24	745.48	745.46	746.36	0.002717	9.30	532.49	338.70	0.71
Reach-1	230	230.00	739.83	741.75	741.40	742.28	0.004674	5.84	39.41	20.50	0.74
Reach-1	570	570.00	739.83	743.14	742.70	744.24	0.005411	8.40	67.89	20.50	0.81
Reach-1	830	830.00	739.83	743.65	743.53	745.39	0.007497	10.60	78.28	20.50	0.96
Reach-1	1130	1130.00	739.83	745.57	745.57	746.03	0.001702	6.52	397.14	393.61	0.48
Reach-1	1340	1340.00	739.83	745.73	745.73	746.19	0.001785	6.80	460.74	411.13	0.49
Reach-1	1610	1610.00	739.83	745.88	745.88	746.36	0.001962	7.25	523.16	427.12	0.52
Reach-1	2130	2130.00	739.83	746.46	746.12	746.75	0.001313	6.31	789.19	482.69	0.43
Reach-1	564	Culvert									
Reach-1	568	230.00	740.40	742.89	741.97	743.20	0.002108	4.51	50.96	20.50	0.50
Reach-1	568	570.00	740.40	744.75	743.28	745.39	0.002235	6.39	89.26	129.92	0.54
Reach-1	568	830.00	740.40	744.09	744.09	745.96	0.008196	10.96	75.73	34.18	1.00
Reach-1	568	1130.00	740.40	745.81	745.81	746.39	0.002131	7.21	362.84	351.96	0.55
Reach-1	568	1340.00	740.40	746.05	746.05	746.57	0.002023	7.23	453.35	399.23	0.54
Reach-1	568	1610.00	740.40	746.25	746.25	746.76	0.002068	7.48	535.19	419.70	0.55
Reach-1	568	2130.00	740.40	746.47	746.47	747.05	0.002484	8.40	629.64	439.31	0.60
Reach-1	636	230.00	740.72	742.97	742.97	743.41	0.003508	5.35	42.98	23.23	0.69
Reach-1	636	570.00	740.72	745.20	745.20	745.57	0.001289	5.15	191.13	177.32	0.47
Reach-1	636	830.00	740.72	746.58	744.89	746.71	0.000436	3.69	559.15	357.65	0.29
Reach-1	636	1130.00	740.72	745.86	745.86	746.58	0.002242	7.58	328.42	250.70	0.64
Reach-1	636	1340.00	740.72	746.06	746.06	746.83	0.002412	8.09	385.43	306.81	0.66
Reach-1	636	1610.00	740.72	746.23	746.23	747.09	0.002732	8.82	438.40	327.78	0.71
Reach-1	636	2130.00	740.72	746.38	746.38	747.57	0.003809	10.64	490.72	347.14	0.84
Reach-1	835	230.00	742.00	744.02	744.02	744.29	0.002435	4.20	54.62	41.11	0.57
Reach-1	835	570.00	742.00	745.63	745.63	745.93	0.001098	4.05	130.69	53.21	0.41
Reach-1	835	830.00	742.00	746.66	746.66	746.91	0.000750	3.97	208.40	117.21	0.35
Reach-1	835	1130.00	742.00	746.64	746.64	747.13	0.001415	5.44	206.34	115.74	0.48
Reach-1	835	1340.00	742.00	746.92	746.92	747.42	0.001511	5.84	241.51	138.61	0.50
Reach-1	835	1610.00	742.00	747.22	747.22	747.74	0.001630	6.30	287.73	163.88	0.52
Reach-1	835	2130.00	742.00	747.87	747.87	748.34	0.001578	6.67	420.23	253.22	0.51
Reach-1	105	230.00	742.40	744.20	743.97	744.80	0.005738	6.23	36.92	36.50	0.82
Reach-1	105	570.00	742.40	745.59	745.20	746.25	0.003496	6.62	87.66	36.50	0.65
Reach-1	105	830.00	742.40	746.53	745.72	747.18	0.002607	6.66	131.82	73.56	0.58
Reach-1	105	1130.00	742.40	746.65	746.65	747.72	0.004298	8.71	140.97	81.78	0.74
Reach-1	105	1340.00	742.40	746.97	746.97	748.10	0.004432	9.29	171.11	104.38	0.77
Reach-1	105	1610.00	742.40	747.33	747.33	748.52	0.004597	9.95	213.34	127.02	0.79
Reach-1	105	2130.00	742.40	748.30	748.30	749.21	0.003338	9.55	370.02	245.70	0.69
Reach-1	107	Culvert									
Reach-1	108	230.00	742.40	744.87	743.97	745.19	0.002158	4.55	50.57	20.50	0.51
Reach-1	108	570.00	742.40	746.77	745.61	747.13	0.001479	5.11	121.23	63.91	0.43
Reach-1	108	830.00	742.40	747.51	746.21	747.91	0.001514	5.74	189.15	119.29	0.45
Reach-1	108	1130.00	742.40	747.79	747.11	748.38	0.002155	7.09	225.33	140.13	0.54
Reach-1	108	1340.00	742.40	748.04	747.41	748.71	0.002385	7.69	263.81	158.78	0.57
Reach-1	108	1610.00	742.40	748.28	747.82	749.06	0.002767	8.52	302.86	173.46	0.62

Reach 1	1503	2130.00	742.40	748.61	748.42	749.65	0.003806	10.08	362.78	193.85	0.71
Reach 1	1533	230.00	743.80	746.01		746.58	0.004718	6.10	37.71	19.20	0.77
Reach 1	1533	570.00	743.80	747.36	747.36	748.35	0.005106	8.15	74.38	38.42	0.83
Reach 1	1533	830.00	743.80	748.41	748.41	749.05	0.002762	7.01	143.35	137.15	0.63
Reach 1	1533	1130.00	743.80	748.77	748.77	749.44	0.002910	7.63	199.00	176.07	0.65
Reach 1	1533	1340.00	743.80	749.03		749.66	0.002707	7.66	249.11	203.82	0.64
Reach 1	1533	1610.00	743.80	749.48		749.96	0.002037	7.08	352.71	266.39	0.56
Reach 1	1533	2130.00	743.80	750.14		750.50	0.001498	6.60	553.50	328.56	0.49
Reach 1	1568	180.00	744.80	746.35	746.35	747.12	0.009104	7.05	25.54	16.50	1.00
Reach 1	1568	411.00	744.80	748.13	747.74	748.63	0.002951	5.98	74.47	40.53	0.58
Reach 1	1568	590.00	744.80	748.50	748.26	749.18	0.003595	6.94	89.97	43.49	0.64
Reach 1	1568	800.00	744.80	748.72	748.67	749.73	0.004934	8.35	99.91	45.28	0.74
Reach 1	1568	960.00	744.80	749.32	749.32	750.01	0.003329	7.50	151.96	141.20	0.62
Reach 1	1568	1140.00	744.80	749.63	749.63	750.24	0.003135	7.61	208.58	230.99	0.61
Reach 1	1568	1510.00	744.80	750.16	750.01	750.60	0.002466	7.24	365.82	344.12	0.55
Reach 1	1662	Culvert									
Reach 1	1768	180.00	746.20	748.65	747.74	748.96	0.001239	4.44	40.50	16.50	0.50
Reach 1	1768	411.00	746.20	750.92	748.87	751.00	0.000258	2.82	239.62	261.08	0.23
Reach 1	1768	590.00	746.20	752.56	749.60	752.57	0.000034	1.26	781.21	375.37	0.09
Reach 1	1768	800.00	746.20	754.47	750.81	754.48	0.000010	0.82	1586.14	452.21	0.05
Reach 1	1768	960.00	746.20	750.92	750.92	751.34	0.001407	6.59	239.66	261.10	0.53
Reach 1	1768	1140.00	746.20	751.04	751.04	751.48	0.001510	6.94	272.53	272.39	0.56
Reach 1	1768	1510.00	746.20	751.25	751.25	751.74	0.001742	7.66	329.57	290.95	0.60
Reach 1	1811	180.00	746.20	748.71		749.06	0.001563	4.78	37.64	20.03	0.61
Reach 1	1811	411.00	746.20	750.90		751.05	0.000377	3.51	180.73	187.47	0.33
Reach 1	1811	590.00	746.20	752.56		752.58	0.000047	1.61	720.54	372.38	0.13
Reach 1	1811	800.00	746.20	754.47		754.48	0.000013	1.04	1519.73	455.02	0.07
Reach 1	1811	960.00	746.20	751.15	751.15	751.67	0.001280	6.76	240.69	274.77	0.62
Reach 1	1811	1140.00	746.20	751.31	751.31	751.84	0.001320	7.07	265.67	291.16	0.63
Reach 1	1811	1510.00	746.20	751.59	751.59	752.13	0.001368	7.54	374.35	330.26	0.65
Reach 1	2411	180.00	749.80	751.68	751.68	752.43	0.004493	6.95	25.91	17.53	1.01
Reach 1	2411	411.00	749.80	752.82	752.82	753.94	0.004041	8.49	48.38	22.07	1.01
Reach 1	2411	590.00	749.80	753.82	753.82	754.27	0.001523	6.10	143.90	311.36	0.64
Reach 1	2411	800.00	749.80	754.31		754.58	0.000935	5.32	332.36	439.77	0.52
Reach 1	2411	960.00	749.80	754.22	754.22	754.69	0.001635	6.91	293.02	425.85	0.68
Reach 1	2411	1140.00	749.80	754.38	754.38	754.84	0.001659	7.18	360.99	449.63	0.69
Reach 1	2411	1510.00	749.80	754.58	754.58	755.12	0.001965	8.12	453.02	479.96	0.76
Reach 1	2461	180.00	749.80	752.39	751.34	752.67	0.001049	4.21	42.79	16.50	0.46
Reach 1	2461	411.00	749.80	754.06	752.47	754.27	0.000640	4.33	205.17	444.36	0.37
Reach 1	2461	590.00	749.80	754.13	754.13	754.50	0.001111	5.77	238.95	456.28	0.49
Reach 1	2461	800.00	749.80	754.35	754.35	754.73	0.001253	6.33	341.94	498.34	0.52
Reach 1	2461	960.00	749.80	754.46	754.46	754.87	0.001390	6.79	402.76	520.55	0.55
Reach 1	2461	1140.00	749.80	754.59	754.59	755.01	0.001492	7.16	471.69	541.36	0.58
Reach 1	2461	1510.00	749.80	754.80	754.80	755.25	0.001744	7.96	583.66	557.79	0.63
Reach 1	2501	Culvert									
Reach 1	2521	180.00	749.90	752.66	751.44	752.90	0.000855	3.93	45.78	16.66	0.42
Reach 1	2521	411.00	749.90	754.08	752.57	754.37	0.000785	4.77	149.30	370.49	0.41
Reach 1	2521	590.00	749.90	753.29	753.29	755.00	0.004958	10.47	56.33	16.69	1.00
Reach 1	2521	800.00	749.90	754.49	754.49	754.86	0.001184	6.23	313.87	440.77	0.51
Reach 1	2521	960.00	749.90	754.57	754.57	755.00	0.001406	6.87	351.77	456.06	0.56
Reach 1	2521	1140.00	749.90	754.71	754.71	755.14	0.001457	7.13	416.11	480.90	0.57
Reach 1	2521	1510.00	749.90	754.91	754.91	755.37	0.001655	7.81	516.33	517.22	0.62
Reach 1	2566	180.00	750.13	752.59		753.09	0.002358	5.65	31.83	17.83	0.75
Reach 1	2566	411.00	750.13	753.90	753.43	754.66	0.002229	7.01	59.49	28.80	0.77
Reach 1	2566	590.00	750.13	755.39	754.66	755.51	0.000326	3.61	404.28	445.66	0.32
Reach 1	2566	800.00	750.13	754.95	754.95	755.46	0.001335	6.77	249.78	266.60	0.63
Reach 1	2566	960.00	750.13	755.09	755.09	755.64	0.001483	7.32	290.03	310.86	0.66
Reach 1	2566	1140.00	750.13	755.27	755.27	755.83	0.001504	7.61	354.08	390.50	0.68
Reach 1	2566	1510.00	750.13	755.61	755.61	756.12	0.001434	7.85	522.61	588.45	0.67
Reach 1	2901	180.00	751.32	753.40	753.40	754.19	0.004459	7.10	25.33	16.33	1.01
Reach 1	2901	411.00	751.32	754.60	754.60	755.75	0.004015	8.60	47.80	21.13	1.01
Reach 1	2901	590.00	751.32	755.75	755.75	756.15	0.001217	5.82	162.87	270.40	0.58
Reach 1	2901	800.00	751.32	755.97	755.97	756.39	0.001309	6.32	236.32	377.92	0.81



Reach 4307											
Reach 4307	340.00	760.15	763.11	763.11	764.17	0.007325	8.25	41.24	19.85	1.01	
Reach 4307	440.00	760.15	763.55	763.55	764.74	0.007080	8.73	50.39	21.61	1.01	
Reach 4307	520.00	760.15	763.88	763.88	765.14	0.006820	9.01	57.74	22.93	1.00	
Reach 4307	610.00	760.15	764.19	764.19	765.56	0.006753	9.39	64.98	26.16	1.01	
Reach 4307	780.00	760.15	764.90	764.90	766.23	0.004895	9.34	97.42	65.27	0.89	
Reach 4338	120.00	760.55	762.25	761.97	762.74	0.005593	5.63	21.32	12.58	0.78	
Reach 4338	250.00	760.55	763.32	762.85	764.12	0.005617	7.19	34.77	12.64	0.76	
Reach 4338	340.00	760.55	763.38	763.38	764.80	0.009679	9.54	35.63	12.64	1.00	
Reach 4338	440.00	760.55	763.93	763.93	765.59	0.009733	10.35	42.49	12.67	1.00	
Reach 4338	520.00	760.55	764.31	764.31	766.18	0.009950	10.97	47.41	12.69	1.00	
Reach 4338	610.00	760.55	764.74	764.74	766.81	0.009839	11.54	52.84	20.43	1.00	
Reach 4338	780.00	760.55	766.80	766.80	767.54	0.002604	7.76	245.75	265.19	0.55	
Reach 4353											
Reach 4353	Culvert										
Reach 4370	120.00	760.90	763.18	762.32	763.45	0.004812	4.22	28.46	19.03	0.49	
Reach 4370	250.00	760.90	764.61	763.21	765.06	0.004088	5.38	46.43	36.42	0.49	
Reach 4370	340.00	760.90	765.81	763.73	765.95	0.001595	3.08	134.54	78.88	0.30	
Reach 4370	440.00	760.90	766.04	764.26	766.22	0.002057	3.59	160.07	255.56	0.34	
Reach 4370	520.00	760.90	766.47	764.66	766.59	0.001383	3.19	280.50	300.69	0.29	
Reach 4370	610.00	760.90	765.08	765.08	767.20	0.016368	11.66	52.29	48.11	1.01	
Reach 4370	780.00	760.90	767.49	765.71	767.54	0.000563	2.39	688.11	499.35	0.19	
Reach 4456	120.00	762.50	764.72	764.72	765.02	0.028452	4.42	27.12	44.92	1.00	
Reach 4456	250.00	762.50	765.44		765.62	0.010285	3.41	73.34	84.38	0.64	
Reach 4456	340.00	762.50	766.04		766.14	0.003721	2.54	144.02	260.08	0.41	
Reach 4456	440.00	762.50	766.34		766.42	0.002524	2.39	224.25	287.90	0.35	
Reach 4456	520.00	762.50	766.67		766.72	0.001442	2.07	322.71	311.41	0.27	
Reach 4456	610.00	762.50	767.49		767.51	0.000374	1.36	608.89	381.32	0.15	
Reach 4456	780.00	762.50	767.56		767.59	0.000541	1.66	637.14	386.11	0.18	
Reach 4658	120.00	764.70	766.46		766.51	0.003406	2.55	95.57	239.10	0.39	
Reach 4658	250.00	764.70	766.72		766.79	0.003879	3.08	171.99	321.61	0.43	
Reach 4658	340.00	764.70	766.84		766.91	0.004178	3.35	209.54	332.39	0.46	
Reach 4658	440.00	764.70	766.96		767.04	0.004239	3.54	249.51	339.61	0.46	
Reach 4658	520.00	764.70	767.08		767.15	0.003820	3.50	290.47	349.27	0.44	
Reach 4658	610.00	764.70	767.60		767.63	0.001200	2.30	484.51	398.21	0.26	
Reach 4658	780.00	764.70	767.71		767.76	0.001497	2.65	531.64	408.74	0.29	
Reach 4751	120.00	765.43	766.83		766.87	0.006237	2.16	91.40	292.80	0.48	
Reach 4751	250.00	765.43	767.07		767.12	0.005072	2.30	172.30	354.24	0.45	
Reach 4751	340.00	765.43	767.19		767.24	0.004853	2.45	215.05	366.43	0.45	
Reach 4751	440.00	765.43	767.30		767.36	0.004708	2.60	256.72	373.17	0.45	
Reach 4751	520.00	765.43	767.39		767.45	0.004535	2.70	289.32	377.62	0.45	
Reach 4751	610.00	765.43	767.70		767.74	0.002120	2.17	408.83	391.73	0.32	
Reach 4751	780.00	765.43	767.84		767.89	0.002359	2.43	462.94	398.84	0.34	
Reach 5037	120.00	767.82	769.13	769.01	769.27	0.011490	3.17	50.30	262.60	0.66	
Reach 5037	250.00	767.82	769.29		769.49	0.015362	4.15	96.59	299.61	0.79	
Reach 5037	340.00	767.82	769.40	769.40	769.59	0.014343	4.30	129.74	317.12	0.78	
Reach 5037	440.00	767.82	769.48	769.48	769.69	0.014890	4.60	157.01	329.06	0.80	
Reach 5037	520.00	767.82	769.53	769.53	769.76	0.016157	4.92	172.97	335.10	0.84	
Reach 5037	610.00	767.82	769.59	769.59	769.83	0.016464	5.12	192.67	336.84	0.85	
Reach 5037	780.00	767.82	769.68	769.68	769.96	0.017829	5.58	223.30	342.90	0.90	
Reach 5277	120.00	770.10	771.91	771.69	772.12	0.012611	3.69	32.51	38.87	0.71	
Reach 5277	250.00	770.10	772.45	772.21	772.73	0.012729	4.26	58.83	60.14	0.74	
Reach 5277	340.00	770.10	772.61	772.46	772.99	0.014564	4.98	69.06	66.86	0.81	
Reach 5277	440.00	770.10	772.78	772.66	773.26	0.015319	5.60	81.28	77.21	0.85	
Reach 5277	520.00	770.10	772.92	772.83	773.46	0.015074	5.93	92.66	84.30	0.86	
Reach 5277	610.00	770.10	773.04	772.99	773.66	0.015664	6.37	103.17	89.93	0.88	
Reach 5277	780.00	770.10	773.28	773.28	773.99	0.015468	6.94	126.54	112.42	0.90	
Reach 5473	120.00	771.71	773.47		773.56	0.004665	2.45	49.06	51.69	0.44	
Reach 5473	250.00	771.71	774.06		774.20	0.004639	2.95	84.95	71.09	0.46	
Reach 5473	340.00	771.71	774.33		774.50	0.004452	3.28	108.56	114.89	0.47	
Reach 5473	440.00	771.71	774.57		774.76	0.004265	3.54	141.79	157.83	0.47	
Reach 5473	520.00	771.71	774.73		774.93	0.004186	3.72	169.85	192.52	0.47	
Reach 5473	610.00	771.71	774.91		775.11	0.003984	3.84	205.72	226.05	0.47	
Reach 5473	780.00	771.71	775.18		775.39	0.003723	4.03	274.68	283.48	0.46	
Reach 5578	120.00	773.02	774.56		774.70	0.006929	3.22	50.63	106.36	0.55	
Reach 5578	250.00	773.02	775.03		775.16	0.004989	3.48	117.03	178.40	0.50	

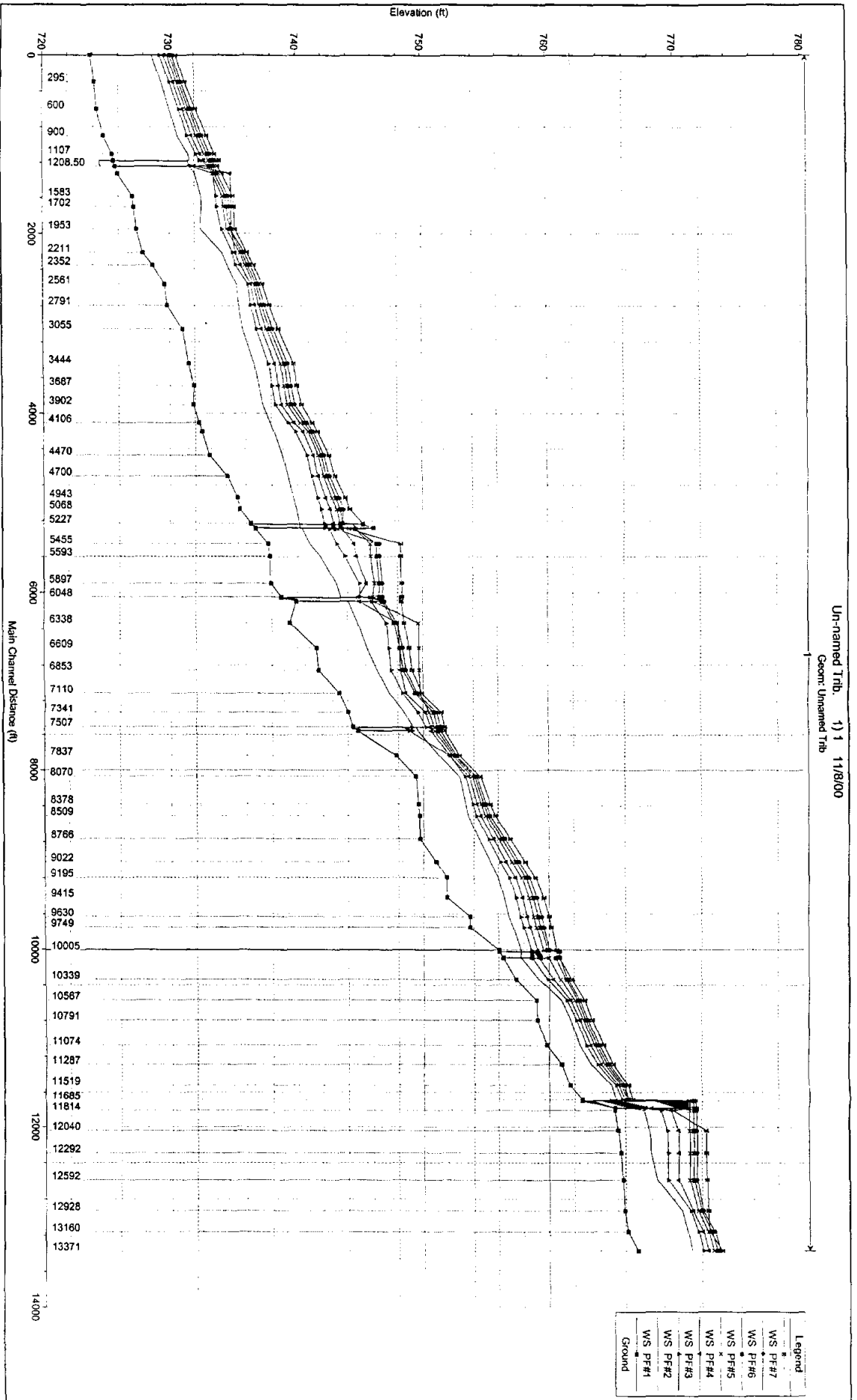
Reach	Flow	773.02	775.26	775.38	0.004381	3.58	162.26	214.00	0.48
Reach 567	340.00	773.02	775.26	775.38	0.004381	3.58	162.26	214.00	0.48
Reach 567	440.00	773.02	775.47	775.59	0.003953	3.67	210.18	242.52	0.46
Reach 567	520.00	773.02	775.62	775.74	0.003796	3.78	249.07	275.87	0.46
Reach 567	610.00	773.02	775.75	775.87	0.003597	3.82	285.04	279.79	0.45
Reach 567	780.00	773.02	775.98	776.10	0.003304	3.91	349.06	286.31	0.44
Reach 582	120.00	773.66	775.46	775.53	0.002846	2.00	60.07	63.30	0.35
Reach 582	250.00	773.66	775.87	776.00	0.003922	2.92	90.17	86.05	0.43
Reach 582	340.00	773.66	776.07	776.25	0.004475	3.41	118.15	215.99	0.47
Reach 582	440.00	773.66	776.24	776.43	0.004704	3.73	155.60	234.75	0.49
Reach 582	520.00	773.66	776.37	776.57	0.004647	3.89	187.92	272.93	0.50
Reach 582	610.00	773.66	776.47	776.69	0.004789	4.09	218.91	302.12	0.51
Reach 582	780.00	773.66	776.66	776.89	0.004920	4.40	280.11	341.68	0.52
Reach 597	120.00	773.93	775.50	775.71	0.001100	3.74	32.11	25.96	0.59
Reach 597	250.00	773.93	775.82	776.40	0.002471	6.11	40.90	28.97	0.91
Reach 597	340.00	773.93	776.05	776.05	0.002929	7.09	48.10	34.92	1.00
Reach 597	440.00	773.93	776.39	776.39	0.002631	7.49	62.58	52.39	0.98
Reach 597	520.00	773.93	776.65	776.65	0.002362	7.64	78.13	64.18	0.94
Reach 597	610.00	773.93	776.88	776.88	0.002287	7.96	93.79	73.62	0.94
Reach 597	780.00	773.93	777.34	777.34	0.001969	8.15	133.15	97.35	0.89
Reach 600	120.00	775.32	776.53	776.53	0.003055	6.21	19.32	53.74	1.00
Reach 600	250.00	775.32	777.27	777.27	0.002678	8.01	31.23	60.99	1.01
Reach 600	340.00	775.32	777.74	777.74	0.002430	8.79	38.67	67.77	1.00
Reach 600	440.00	775.32	778.19	778.19	0.002302	9.59	45.87	140.03	1.00
Reach 600	520.00	775.32	778.47	778.47	0.002296	3.04	209.16	170.60	0.34
Reach 600	610.00	775.32	778.47	778.47	0.000408	3.56	209.16	170.60	0.40
Reach 600	780.00	775.32	778.47	778.47	0.000666	4.56	209.16	170.60	0.52
Reach 604		Culvert							
Reach 608	120.00	776.00	777.98	777.20	0.004206	3.79	31.63	61.43	0.48
Reach 608	250.00	776.00	778.72	777.96	0.006267	5.74	43.58	168.68	0.61
Reach 608	340.00	776.00	778.40	778.40	0.017581	8.84	38.46	115.82	1.00
Reach 608	440.00	776.00	778.87	778.87	0.016324	9.58	45.91	200.49	1.00
Reach 608	520.00	776.00	779.62	779.22	0.000940	2.31	344.31	249.32	0.24
Reach 608	610.00	776.00	779.71	779.22	0.001120	2.57	365.35	254.67	0.26
Reach 608	780.00	776.00	779.88	779.32	0.001417	3.00	411.21	281.83	0.30
Reach 610	120.00	776.70	778.41	778.52	0.008452	2.68	44.74	64.16	0.57
Reach 610	250.00	776.70	779.41	779.44	0.001681	1.49	188.28	272.67	0.27
Reach 610	340.00	776.70	779.83	779.85	0.000811	1.25	323.37	343.27	0.19
Reach 610	440.00	776.70	780.47	780.48	0.000277	0.94	566.63	407.47	0.12
Reach 610	520.00	776.70	779.70	779.76	0.002854	2.21	277.17	329.97	0.36
Reach 610	610.00	776.70	779.79	779.87	0.002924	2.33	310.34	341.39	0.37
Reach 610	780.00	776.70	780.00	780.07	0.002720	2.44	380.61	358.43	0.36
Reach 624	120.00	777.10	778.91	778.97	0.002545	2.00	60.11	54.49	0.33
Reach 624	250.00	777.10	779.58	779.66	0.002363	2.38	120.06	141.39	0.34
Reach 624	340.00	777.10	779.92	780.00	0.002061	2.41	173.48	172.44	0.32
Reach 624	440.00	777.10	780.49	780.54	0.001012	2.02	313.61	333.96	0.24
Reach 624	520.00	777.10	779.98	780.15	0.004204	3.49	184.67	176.61	0.46
Reach 624	610.00	777.10	780.09	780.28	0.004612	3.78	204.53	203.88	0.49
Reach 624	780.00	777.10	780.26	780.50	0.005192	4.26	244.78	254.85	0.53
Reach 633	50.00	778.00	779.19	779.25	0.004190	1.93	25.88	35.82	0.40
Reach 633	80.00	778.00	779.84	779.87	0.001561	1.48	54.29	59.76	0.26
Reach 633	100.00	778.00	780.14	780.17	0.001032	1.35	82.88	168.73	0.22
Reach 633	130.00	778.00	780.61	780.62	0.000349	0.98	205.28	321.16	0.13
Reach 633	150.00	778.00	780.39	780.42	0.000970	1.49	140.27	272.30	0.22
Reach 633	170.00	778.00	780.53	780.55	0.000786	1.42	179.61	309.07	0.20
Reach 633	210.00	778.00	780.75	780.77	0.000585	1.34	251.08	341.67	0.17
Reach 636	50.00	778.28	779.61	779.73	0.018518	2.87	18.44	54.52	0.77
Reach 636	80.00	778.28	779.97	780.03	0.004720	2.07	47.01	101.87	0.43
Reach 636	100.00	778.28	780.22	780.26	0.002257	1.75	78.92	178.42	0.31
Reach 636	130.00	778.28	780.64	780.65	0.000587	1.12	191.31	309.29	0.17
Reach 636	150.00	778.28	780.47	780.50	0.001620	1.71	140.60	290.81	0.27
Reach 636	170.00	778.28	780.59	780.61	0.001227	1.59	176.26	303.51	0.24
Reach 636	210.00	778.28	780.79	780.81	0.000857	1.46	240.61	327.16	0.21
Reach 649	50.00	778.54	780.08	780.11	0.001494	1.29	39.70	64.84	0.25
Reach 649	80.00	778.54	780.27	780.31	0.001876	1.64	53.64	83.43	0.28

Reach-1	649	100.00	778.54	780.41		780.46	0.001765	1.74	67.61	104.88	0.28
Reach-1	649	130.00	778.54	780.70		780.74	0.001203	1.66	101.48	133.23	0.24
Reach-1	649	150.00	778.54	780.63		780.68	0.001994	2.07	92.04	125.51	0.31
Reach-1	649	170.00	778.54	780.71		780.78	0.001968	2.14	103.46	134.40	0.31
Reach-1	649	210.00	778.54	780.88		780.94	0.001875	2.24	127.19	150.50	0.31
Reach-1	669	50.00	779.97	780.67		780.72	0.009071	1.75	28.58	82.16	0.52
Reach-1	669	80.00	779.97	780.87		780.92	0.005711	1.77	45.41	84.84	0.44
Reach-1	669	100.00	779.97	780.97		781.02	0.005076	1.83	55.39	105.48	0.42
Reach-1	669	130.00	779.97	781.10		781.16	0.004416	1.89	70.82	122.81	0.41
Reach-1	669	150.00	779.97	781.18		781.24	0.004169	1.94	80.60	129.16	0.40
Reach-1	669	170.00	779.97	781.26		781.31	0.003917	1.97	90.96	139.40	0.39
Reach-1	669	210.00	779.97	781.39		781.45	0.003557	2.05	110.10	153.94	0.38
Reach-1	689	50.00	781.25	782.22		782.26	0.007033	1.47	33.96	104.49	0.46
Reach-1	689	80.00	781.25	782.30		782.36	0.009366	1.88	42.45	111.81	0.54
Reach-1	689	100.00	781.25	782.35		782.42	0.010294	2.10	47.73	115.10	0.57
Reach-1	689	130.00	781.25	782.41		782.50	0.011569	2.38	54.73	119.33	0.62
Reach-1	689	150.00	781.25	782.46		782.55	0.011603	2.49	60.22	122.54	0.63
Reach-1	689	170.00	781.25	782.49		782.60	0.012203	2.64	64.44	124.95	0.65
Reach-1	689	210.00	781.25	782.55		782.68	0.013119	2.89	72.61	129.49	0.68
Reach-1	709	50.00	782.72	783.55		783.58	0.005768	1.59	35.90	120.18	0.43
Reach-1	709	80.00	782.72	783.69		783.73	0.004936	1.76	52.58	121.66	0.42
Reach-1	709	100.00	782.72	783.76		783.80	0.004944	1.90	61.16	123.81	0.42
Reach-1	709	130.00	782.72	783.85		783.91	0.004916	2.08	73.66	130.78	0.43
Reach-1	709	150.00	782.72	783.92		783.98	0.004821	2.16	81.89	133.87	0.43
Reach-1	709	170.00	782.72	783.97		784.04	0.004822	2.25	89.36	136.91	0.44
Reach-1	709	210.00	782.72	784.09		784.16	0.004595	2.38	105.68	146.09	0.44
Reach-1	729	50.00	784.47	785.79	785.78	785.88	0.032212	2.65	23.53	153.04	0.93
Reach-1	729	80.00	784.47	785.85	785.85	785.96	0.036429	3.03	33.02	166.00	1.00
Reach-1	729	100.00	784.47	785.88	785.88	786.01	0.035817	3.17	39.25	172.88	1.01
Reach-1	729	130.00	784.47	785.94	785.94	786.07	0.033241	3.32	49.98	201.58	0.99
Reach-1	729	150.00	784.47	785.97	785.97	786.11	0.032531	3.43	55.84	207.29	0.99
Reach-1	729	170.00	784.47	786.00	786.00	786.14	0.030307	3.46	62.67	213.74	0.97
Reach-1	729	210.00	784.47	786.04	786.04	786.20	0.030579	3.72	72.65	225.60	0.99
Reach-1	749	50.00	786.25	787.54		787.58	0.003904	1.52	32.84	61.60	0.37
Reach-1	749	80.00	786.25	787.74		787.78	0.004068	1.75	45.62	71.43	0.39
Reach-1	749	100.00	786.25	787.84		787.89	0.004205	1.87	53.45	77.87	0.40
Reach-1	749	130.00	786.25	787.96		788.02	0.004527	2.07	62.76	82.97	0.42
Reach-1	749	150.00	786.25	788.02		788.09	0.004732	2.20	68.17	88.87	0.43
Reach-1	749	170.00	786.25	788.07		788.16	0.004964	2.35	72.71	92.39	0.45
Reach-1	749	210.00	786.25	788.17		788.28	0.005113	2.58	82.79	99.77	0.46
Reach-1	769	50.00	789.02	790.06	790.06	790.35	0.028631	4.28	11.73	22.25	1.00
Reach-1	769	80.00	789.02	790.32	790.32	790.60	0.021641	4.30	20.28	44.04	0.90
Reach-1	769	100.00	789.02	790.41	790.41	790.72	0.020896	4.60	24.85	51.95	0.91
Reach-1	769	130.00	789.02	790.61	790.61	790.88	0.014759	4.46	37.76	84.21	0.79
Reach-1	769	150.00	789.02	790.68	790.68	790.96	0.014068	4.58	44.38	92.55	0.78
Reach-1	769	170.00	789.02	790.75	790.75	791.03	0.013621	4.69	51.39	111.91	0.78
Reach-1	769	210.00	789.02	790.90	790.90	791.15	0.011306	4.65	71.12	143.52	0.72
Reach-1	789	50.00	791.76	793.00		793.10	0.008008	2.63	22.80	55.15	0.55
Reach-1	789	80.00	791.76	793.17		793.29	0.009171	3.06	33.71	81.03	0.60
Reach-1	789	100.00	791.76	793.26		793.39	0.009184	3.21	41.80	94.92	0.61
Reach-1	789	130.00	791.76	793.32		793.49	0.011638	3.74	47.73	103.37	0.69
Reach-1	789	150.00	791.76	793.37		793.55	0.012062	3.95	53.02	106.78	0.71
Reach-1	789	170.00	791.76	793.41		793.61	0.012535	4.15	57.85	109.80	0.73
Reach-1	789	210.00	791.76	793.47		793.72	0.014816	4.68	64.16	113.63	0.80
Reach-1	799	50.00	793.37	794.47	794.47	794.79	0.028174	4.59	10.89	17.09	1.01
Reach-1	799	80.00	793.37	794.73	794.73	795.13	0.026198	5.11	15.66	19.78	1.01
Reach-1	799	100.00	793.37	794.87	794.87	795.32	0.025247	5.37	18.62	21.20	1.01
Reach-1	799	130.00	793.37	795.06	795.06	795.56	0.024470	5.72	22.74	23.03	1.01
Reach-1	799	150.00	793.37	795.22	795.22	795.70	0.020863	5.58	27.91	39.81	0.95
Reach-1	799	170.00	793.37	795.46	795.46	795.80	0.013488	4.85	42.57	90.15	0.78
Reach-1	799	210.00	793.37	795.62	795.62	795.94	0.011987	4.85	59.34	116.14	0.74
Reach-1	809	50.00	795.00	796.47		796.60	0.012418	2.85	17.57	30.61	0.66
Reach-1	809	80.00	795.00	796.71		796.86	0.012300	3.13	25.55	38.32	0.68
Reach-1	809	100.00	795.00	796.84		797.00	0.011766	3.25	30.74	42.10	0.67
Reach-1	809	130.00	795.00	796.99		797.17	0.011056	3.47	38.04	53.71	0.67

150.00	795.00	797.05		797.28	0.011765	3.73	41.31	60.74	0.69
170.00	795.00	797.01		797.31	0.017183	4.40	39.38	57.12	0.83
210.00	795.00	797.09	797.06	797.47	0.019675	4.98	43.93	65.35	0.90
50.00	796.00	797.46	797.46	797.93	0.026196	5.52	9.05	9.68	1.01
80.00	796.00	797.84	797.84	798.42	0.024581	6.10	13.11	11.45	1.01
100.00	796.00	798.06	798.06	798.69	0.023978	6.36	15.72	12.65	1.01
130.00	796.00	798.40	798.40	799.03	0.021771	6.38	20.36	15.23	0.97
150.00	796.00	798.58	798.58	799.20	0.023665	6.34	23.67	19.28	1.01
170.00	796.00	798.72	798.72	799.36	0.023570	6.42	26.49	21.19	1.01
210.00	796.00	798.95	798.95	799.63	0.023158	6.62	31.74	24.01	1.01

**Unnamed Tributary  
Existing and Future Conditions  
Water Surface Profile and HECRAS Summary Printouts  
2, 5, 10, 25, 50, 100, & 500-year Storm Events**





C-59

Legend	
WS PF #7	.....
WS PF #6	.....
WS PF #5	.....
WS PF #4	.....
WS PF #3	.....
WS PF #2	.....
WS PF #1	.....
Ground	.....

10  
5  
2

Exist.

HEC-RAS Plan River: Unnamed Trib Reach: 1

Reach	Flow	Water Surface Elevation	Bank Full Elevation	Channel Bottom Elevation	Channel Top Elevation	Channel Slope	Channel Width	Channel Depth	Channel Area	Channel Velocity	Channel Discharge	Channel Capacity
0000	610.00	723.80	728.37	726.64	728.44	0.002372	2.66	498.20	770.49	0.25		
0000	1430.00	723.80	729.03	728.43	729.09	0.002373	2.88	1167.73	1255.85	0.26		
0000	2080.00	723.80	729.36	728.63	729.40	0.002373	2.98	1618.04	1522.44	0.26		
0000	2890.00	723.80	729.66	728.86	729.70	0.002374	3.07	2106.45	1735.06	0.26		
0000	3580.00	723.80	729.87	728.96	729.92	0.002370	3.13	2493.04	1886.43	0.26		
0000	4440.00	723.80	730.09	729.16	730.14	0.002371	3.21	2916.06	1993.61	0.26		
0000	6070.00	723.80	730.41	729.37	730.47	0.002371	3.36	3575.04	2030.00	0.27		
295	610.00	724.10	729.10		729.18	0.002718	2.78	435.17	575.42	0.27		
295	1430.00	724.10	729.79		729.87	0.003139	3.25	942.15	889.47	0.30		
295	2080.00	724.10	730.12		730.19	0.003159	3.41	1342.90	1606.81	0.30		
285	2890.00	724.10	730.39		730.45	0.002898	3.41	1786.85	1641.15	0.29		
285	3580.00	724.10	730.58		730.65	0.002759	3.42	2105.31	1665.34	0.29		
295	4440.00	724.10	730.79		730.85	0.002673	3.47	2451.75	1691.26	0.29		
295	6070.00	724.10	731.11		731.19	0.002646	3.61	3005.74	1731.92	0.28		
600	610.00	724.30	729.72		729.75	0.001349	2.06	568.93	494.93	0.19		
600	1430.00	724.30	730.52		730.56	0.001644	2.55	1115.00	985.12	0.22		
600	2080.00	724.30	730.87		730.92	0.001829	2.83	1510.17	1182.66	0.23		
600	2890.00	724.30	731.16		731.22	0.002145	3.19	1865.13	1257.83	0.25		
600	3580.00	724.30	731.36		731.43	0.002384	3.45	2124.76	1310.07	0.27		
600	4440.00	724.30	731.59		731.67	0.002506	3.72	2430.29	1369.01	0.28		
600	6070.00	724.30	731.96		732.05	0.002943	4.12	2948.88	1463.62	0.30		
900	610.00	724.80	730.29		730.48	0.004151	3.84	239.89	430.75	0.33		
900	1430.00	724.80	731.13		731.23	0.002664	3.48	717.55	716.49	0.28		
900	2080.00	724.80	731.52		731.61	0.002497	3.55	1017.82	836.85	0.27		
900	2890.00	724.80	731.87		731.97	0.002517	3.72	1332.86	942.42	0.28		
900	3580.00	724.80	732.12		732.23	0.002548	3.85	1582.45	1068.85	0.28		
900	4440.00	724.80	732.38		732.50	0.002556	3.97	1872.98	1128.72	0.28		
900	6070.00	724.80	732.80		732.93	0.002577	4.18	2365.57	1223.55	0.29		
1107	610.00	725.50	731.31		731.39	0.004358	2.49	311.34	398.31	0.32		
1107	1430.00	725.50	731.90		732.00	0.005024	3.03	589.24	549.77	0.35		
1107	2080.00	725.50	732.23		732.35	0.004821	3.23	810.01	765.02	0.35		
1107	2890.00	725.50	732.56		732.69	0.004527	3.39	1093.86	939.76	0.35		
1107	3580.00	725.50	732.80		732.93	0.004322	3.49	1333.47	1039.86	0.34		
1107	4440.00	725.50	733.06		733.19	0.004221	3.63	1609.19	1167.40	0.35		
1107	6070.00	725.50	733.45		733.60	0.003967	3.78	2089.30	1260.02	0.34		
1175	610.00	725.60	731.41	727.97	731.52	0.000744	2.70	226.26	398.09	0.21		
1175	1430.00	725.60	731.97	729.39	732.47	0.002918	5.71	250.37	537.22	0.42		
1175	2080.00	725.60	732.54	730.30	732.60	0.001084	2.73	1405.18	1094.54	0.24		
1175	2890.00	725.60	732.89	731.32	732.96	0.001090	2.89	1812.77	1199.60	0.24		
1175	3580.00	725.60	733.15	732.39	733.22	0.001105	3.02	2130.86	1318.08	0.25		
1175	4440.00	725.60	733.41	732.39	733.49	0.001118	3.16	2492.53	1385.79	0.25		
1175	6070.00	725.60	733.83	732.56	733.91	0.001169	3.41	3086.12	1490.25	0.26		
1208.50		Culvert										
1242	610.00	725.75	731.48	728.53	731.65	0.001451	3.29	185.19	145.73	0.28		
1242	1430.00	725.75	732.09	730.36	732.80	0.005182	6.78	210.76	371.59	0.53		
1242	2080.00	725.75	731.31	731.31	733.43	0.019299	11.69	177.88	137.93	1.00		
1242	2890.00	725.75	732.34	732.34	734.99	0.017961	13.05	221.40	586.74	1.00		
1242	3580.00	725.75	733.21	733.21	733.40	0.003307	4.51	1388.83	1127.17	0.41		
1242	4440.00	725.75	733.35	733.21	733.59	0.004063	5.13	1557.77	1196.76	0.46		
1242	6070.00	725.75	733.72	733.21	733.98	0.004410	5.67	2023.68	1365.95	0.48		
1326	590.00	725.90	731.68	728.52	731.79	0.001887	2.73	216.02	79.58	0.29		
1326	1380.00	725.90	732.97	730.58	733.09	0.001706	3.22	744.07	848.90	0.29		
1326	2010.00	725.90	733.77	731.64	733.84	0.000920	2.69	1486.91	1117.83	0.22		
1326	2800.00	725.90	735.29	732.88	735.30	0.000186	1.47	3976.20	1858.79	0.11		
1326	3460.00	725.90	733.40	733.14	733.76	0.004927	5.88	1125.31	982.23	0.51		
1326	4300.00	725.90	733.60	733.34	734.00	0.005471	6.40	1317.68	1056.09	0.54		
1326	5850.00	725.90	733.99	733.67	734.40	0.005652	6.88	1715.40	1193.87	0.56		
1583	590.00	727.10	732.04		732.09	0.000742	2.14	390.35	221.45	0.19		
1583	1380.00	727.10	733.30		733.35	0.000658	2.44	918.20	664.74	0.19		
1583	2010.00	727.10	733.96		734.01	0.000567	2.46	1454.46	946.78	0.18		
1583	2800.00	727.10	735.33		735.34	0.000206	1.71	3381.80	1751.91	0.11		
1583	3460.00	727.10	734.21		734.30	0.001218	3.70	1733.92	1269.47	0.27		
1583	4300.00	727.10	734.48		734.58	0.001291	3.92	2087.81	1341.14	0.28		
1583	5850.00	727.10	734.89		735.00	0.001382	4.24	2658.38	1415.21	0.29		

1702	590.00	727.20	732.11		732.17	0.000931	2.17	280.66	412.75	0.21
1702	1380.00	727.20	733.35		733.39	0.000281	1.48	967.64	710.63	0.12
1702	2010.00	727.20	734.01		734.04	0.000211	1.40	1481.41	980.51	0.11
1702	2800.00	727.20	735.34		735.36	0.000077	0.98	3253.19	1487.84	0.07
1702	3460.00	727.20	734.30		734.37	0.000419	2.05	1786.45	1130.40	0.15
1702	4300.00	727.20	734.57		734.64	0.000450	2.19	2151.50	1386.07	0.16
1702	5850.00	727.20	734.99		735.07	0.000497	2.41	2741.04	1430.79	0.17
1953	590.00	727.40	732.33	730.78	732.68	0.004865	4.72	125.12	41.16	0.48
1953	1380.00	727.40	732.61	732.61	734.19	0.021027	10.10	136.59	42.93	1.00
1953	2010.00	727.40	734.23	734.23	734.56	0.004563	5.60	563.86	768.54	0.49
1953	2800.00	727.40	735.35	734.42	735.40	0.000747	2.66	1719.52	1295.29	0.20
1953	3460.00	727.40	734.54	734.54	734.97	0.006217	6.86	809.26	792.29	0.57
1953	4300.00	727.40	734.81	734.81	735.17	0.005303	6.58	1059.51	1122.86	0.53
1953	5850.00	727.40	735.00	734.95	735.44	0.006445	7.46	1285.66	1182.28	0.59
2211	590.00	727.90	733.42		733.70	0.003243	4.24	139.17	38.81	0.39
2211	1380.00	727.90	735.01		735.11	0.001330	3.34	886.45	865.47	0.27
2211	2010.00	727.90	735.09		735.26	0.002461	4.58	950.43	900.63	0.36
2211	2800.00	727.90	735.51		735.65	0.002211	4.59	1370.36	1098.89	0.35
2211	3460.00	727.90	735.60		735.79	0.002868	5.28	1474.65	1140.40	0.40
2211	4300.00	727.90	735.75		735.97	0.003396	5.85	1654.04	1200.49	0.44
2211	5850.00	727.90	736.08		736.31	0.003564	6.23	2076.70	1351.25	0.45
2352	590.00	728.70	733.90		734.26	0.004561	4.86	121.38	39.31	0.46
2352	1380.00	728.70	735.05		735.57	0.005611	6.51	370.19	461.77	0.54
2352	2010.00	728.70	735.31		735.94	0.007274	7.69	507.11	699.25	0.62
2352	2800.00	728.70	735.79		736.14	0.004873	6.71	1005.60	1164.92	0.52
2352	3460.00	728.70	736.00		736.32	0.004711	6.77	1260.40	1293.72	0.51
2352	4300.00	728.70	736.23		736.51	0.004375	6.71	1561.69	1321.77	0.50
2352	5850.00	728.70	736.58		736.83	0.004124	6.78	2029.92	1361.47	0.49
2561	590.00	729.60	734.63		734.70	0.001109	1.55	307.36	262.35	0.15
2561	1380.00	729.60	735.86		735.93	0.000739	1.45	827.74	786.56	0.13
2561	2010.00	729.60	736.29		736.36	0.000812	1.61	1219.33	1014.12	0.13
2561	2800.00	729.60	736.48		736.58	0.001168	1.99	1423.65	1067.72	0.16
2561	3460.00	729.60	736.67		736.78	0.001345	2.19	1623.03	1090.61	0.18
2561	4300.00	729.60	736.86		736.99	0.001568	2.43	1837.99	1114.76	0.19
2561	5850.00	729.60	737.19		737.35	0.001878	2.77	2209.25	1155.29	0.21
2791	590.00	729.80	734.88		734.94	0.000911	1.60	336.78	135.77	0.14
2791	1380.00	729.80	736.05		736.18	0.001391	2.19	522.24	355.44	0.18
2791	2010.00	729.80	736.52		736.63	0.001670	2.56	803.94	847.80	0.20
2791	2800.00	729.80	736.81		736.95	0.002113	2.98	1078.21	1001.95	0.22
2791	3460.00	729.80	737.05		737.19	0.002306	3.20	1322.09	1064.04	0.23
2791	4300.00	729.80	737.30		737.45	0.002471	3.41	1594.01	1105.95	0.24
2791	5850.00	729.80	737.70		737.87	0.002663	3.70	2049.65	1172.84	0.26
3055	590.00	731.00	735.20		735.30	0.002168	2.14	245.00	118.66	0.21
3055	1380.00	731.00	736.43		736.64	0.002059	2.50	429.47	246.18	0.21
3055	2010.00	731.00	736.96		737.15	0.002263	2.83	595.47	381.47	0.23
3055	2800.00	731.00	737.36		737.58	0.002683	3.25	790.40	672.01	0.25
3055	3460.00	731.00	737.64		737.87	0.002845	3.47	981.95	718.14	0.26
3055	4300.00	731.00	737.92		738.17	0.003024	3.70	1195.97	766.41	0.27
3055	5850.00	731.00	738.37		738.64	0.003254	4.03	1552.06	839.21	0.28
3444	590.00	731.50	736.16		736.27	0.002872	2.65	237.13	209.96	0.24
3444	1380.00	731.50	737.38		737.50	0.002343	2.90	530.25	269.80	0.23
3444	2010.00	731.50	737.93		738.08	0.002474	3.19	685.12	344.71	0.24
3444	2800.00	731.50	738.42		738.60	0.002595	3.46	883.92	428.83	0.25
3444	3460.00	731.50	738.72		738.94	0.002749	3.69	1019.66	453.17	0.26
3444	4300.00	731.50	739.06		739.32	0.002935	3.95	1175.10	479.64	0.27
3444	5850.00	731.50	739.57		739.90	0.003255	4.37	1431.93	528.94	0.29
3687	560.00	731.90	736.60		736.65	0.001042	1.67	330.75	226.10	0.15
3687	1340.00	731.90	737.64		737.76	0.000820	1.74	581.86	257.27	0.14
3687	1930.00	731.90	738.17		738.34	0.000826	1.86	721.88	281.66	0.14
3687	2700.00	731.90	738.65		738.90	0.000928	2.09	866.50	320.79	0.15
3687	3340.00	731.90	738.95		739.28	0.001022	2.27	963.85	345.82	0.16
3687	4140.00	731.90	739.29		739.69	0.001128	2.47	1088.25	372.90	0.17
3687	5600.00	731.90	739.78		740.36	0.001343	2.82	1297.27	485.02	0.19
3902	510.00	731.85	736.87		736.94	0.001753	2.04	249.65	70.12	0.19
3902	1210.00	731.85	737.92		738.11	0.004328	3.59	346.85	205.06	0.31

3902	1790.00	731.85	738.45		738.67	0.003707	3.58	480.99	276.19	0.29
3902	2570.00	731.85	738.92		739.25	0.003209	3.55	621.48	314.41	0.27
3902	3170.00	731.85	739.23		739.64	0.002924	3.52	719.11	331.87	0.26
3902	3860.00	731.85	739.56		740.07	0.002641	3.47	857.75	526.16	0.25
3902	5130.00	731.85	740.12		740.71	0.002098	3.29	1180.27	616.49	0.23
4106	510.00	732.30	737.26		737.34	0.002152	2.17	234.68	70.47	0.21
4106	1210.00	732.30	738.88		739.04	0.004791	3.27	370.36	110.23	0.31
4106	1790.00	732.30	739.41		739.67	0.006597	4.10	455.49	231.09	0.37
4106	2570.00	732.30	739.90		740.25	0.008150	4.90	600.04	366.81	0.42
4106	3170.00	732.30	740.23		740.55	0.007479	4.94	781.16	635.74	0.41
4106	3860.00	732.30	740.57		740.85	0.005613	4.49	1009.72	685.39	0.36
4106	5130.00	732.30	741.03		741.33	0.004242	4.15	1337.63	750.91	0.32
4205	510.00	732.50	737.47		737.54	0.001981	2.22	230.04	62.13	0.20
4205	1210.00	732.50	739.29		739.47	0.003832	3.35	360.82	86.00	0.29
4205	1790.00	732.50	740.00		740.26	0.005404	4.16	464.64	406.36	0.35
4205	2570.00	732.50	740.61		740.82	0.004178	3.98	607.61	621.79	0.31
4205	3170.00	732.50	740.87		741.09	0.003977	4.02	976.25	657.38	0.31
4205	3860.00	732.50	741.08		741.33	0.004132	4.20	1115.45	681.17	0.31
4205	5130.00	732.50	741.45		741.74	0.004011	4.32	1375.57	711.85	0.31
4470	510.00	733.10	737.97	735.10	738.04	0.001772	2.11	241.71	64.86	0.19
4470	1210.00	733.10	740.08	736.25	740.21	0.002129	3.01	450.86	257.49	0.22
4470	1790.00	733.10	740.94	737.00	741.06	0.001873	3.10	793.10	547.77	0.22
4470	2570.00	733.10	741.42	737.88	741.54	0.001927	3.30	1062.56	572.77	0.22
4470	3170.00	733.10	741.69	738.59	741.82	0.002027	3.48	1217.33	586.64	0.23
4470	3860.00	733.10	741.94	739.40	742.09	0.002146	3.66	1370.52	600.06	0.24
4470	5130.00	733.10	742.35	741.20	742.52	0.002323	3.95	1623.75	714.00	0.25
4700	510.00	734.50	738.36	736.63	738.47	0.001874	2.76	184.88	68.02	0.29
4700	1210.00	734.50	740.47	737.69	740.66	0.001646	3.47	361.79	144.61	0.30
4700	1790.00	734.50	741.28	738.42	741.52	0.001830	4.11	532.84	337.45	0.32
4700	2570.00	734.50	741.76	739.23	742.10	0.002336	4.93	742.77	495.17	0.37
4700	3170.00	734.50	742.05	739.80	742.43	0.002617	5.40	893.72	554.90	0.39
4700	3860.00	734.50	742.34	740.69	742.74	0.002831	5.80	1054.98	598.41	0.41
4700	5130.00	734.50	742.78	742.11	743.23	0.003119	6.38	1322.91	666.54	0.44
4943	510.00	735.30	738.82	737.11	738.95	0.001992	2.89	176.19	62.68	0.30
4943	1210.00	735.30	740.91	738.21	741.13	0.002203	3.76	322.16	83.01	0.34
4943	1790.00	735.30	741.78	738.95	742.09	0.002874	4.46	401.12	97.44	0.39
4943	2570.00	735.30	742.38	739.79	742.86	0.003856	5.54	481.37	208.65	0.46
4943	3170.00	735.30	742.73	740.45	743.26	0.004123	6.02	682.04	670.81	0.48
4943	3860.00	735.30	743.07	741.13	743.59	0.003993	6.19	927.03	768.16	0.48
4943	5130.00	735.30	743.60	743.19	744.05	0.003582	6.25	1355.74	890.84	0.46
5068	510.00	735.50	739.06	737.17	739.17	0.001606	2.71	188.35	62.70	0.28
5068	1210.00	735.50	741.16	738.25	741.37	0.001701	3.68	328.56	71.22	0.30
5068	1790.00	735.50	742.09	738.67	742.40	0.002138	4.51	396.85	95.14	0.35
5068	2570.00	735.50	742.78	739.81	743.28	0.002866	5.67	470.60	151.66	0.41
5068	3170.00	735.50	743.13	740.40	743.78	0.003500	6.51	530.39	351.53	0.46
5068	3860.00	735.50	743.43	741.03	744.20	0.004117	7.28	702.05	763.61	0.50
5068	5130.00	735.50	743.95	742.02	744.70	0.004153	7.69	1138.80	946.17	0.51
5227	510.00	736.39	739.33	737.84	739.51	0.002527	3.40	149.79	58.34	0.35
5227	1210.00	736.39	741.38	738.98	741.73	0.002429	4.75	254.55	74.90	0.37
5227	1790.00	736.39	742.33	739.75	742.87	0.002981	5.91	302.77	109.99	0.43
5227	2570.00	736.39	743.05	740.67	743.94	0.004188	7.57	339.70	249.20	0.52
5227	3170.00	736.39	743.41	741.32	744.63	0.005345	8.85	358.08	533.97	0.59
5227	3860.00	736.39	743.63	742.00	745.33	0.007150	10.45	369.30	612.43	0.68
5227	5130.00	736.39	743.35	743.19	746.59	0.014396	14.45	355.08	512.97	0.96
5235										
5235	Culvert									
5250	510.00	736.71	739.47	738.17	739.67	0.003158	3.65	139.78	57.36	0.39
5250	1210.00	736.71	741.64	739.31	742.01	0.002555	4.84	250.15	104.49	0.38
5250	1790.00	736.71	742.75	740.08	743.28	0.002850	5.85	306.20	205.25	0.42
5250	2570.00	736.71	743.81	741.00	744.60	0.003431	7.14	358.82	598.95	0.47
5250	3170.00	736.71	744.53	741.66	745.53	0.003772	7.99	396.64	828.44	0.50
5250	3860.00	736.71	744.66	742.34	746.09	0.005295	9.57	403.21	844.59	0.60
5250	5130.00	736.71	743.53	743.53	746.95	0.015574	14.83	346.00	504.90	1.00
5455	510.00	737.70	740.17		740.51	0.008161	4.68	109.05	54.91	0.58
5455	1210.00	737.70	742.17		742.60	0.004918	5.26	229.89	65.67	0.50

Rec'd	741.5									
5456	1790.00	737.70	743.34		743.86	0.004414	5.78	311.40	139.54	0.49
5456	2570.00	737.70	744.84		744.97	0.001266	3.68	1245.90	949.62	0.27
5456	3170.00	737.70	745.73		745.79	0.000528	2.62	2106.85	964.20	0.18
5456	3860.00	737.70	746.33		746.37	0.000398	2.41	2711.24	1088.16	0.16
5456	5130.00	737.70	747.37		747.40	0.000250	2.09	3877.63	1149.16	0.13
5593	510.00	737.85	741.14		741.39	0.005098	4.07	125.38	54.24	0.47
5593	1210.00	737.85	742.86		743.30	0.005201	5.29	228.90	67.62	0.51
5593	1790.00	737.85	744.03		744.47	0.004461	5.45	369.31	288.12	0.48
5593	2570.00	737.85	744.95		745.19	0.002416	4.61	887.10	823.02	0.37
5593	3170.00	737.85	745.77		745.87	0.001047	3.37	1606.27	930.77	0.25
5593	3860.00	737.85	746.35		746.43	0.000731	3.00	2179.42	1050.19	0.21
5593	5130.00	737.85	747.39		747.43	0.000431	2.55	3338.48	1221.87	0.17
5897	510.00	737.90	742.28		742.46	0.002532	3.42	149.15	49.25	0.35
5897	1210.00	737.90	744.15		744.51	0.003152	4.84	255.36	130.03	0.41
5897	1790.00	737.90	745.12		745.33	0.001891	4.28	748.46	739.41	0.33
5897	2570.00	737.90	745.62		745.79	0.001652	4.25	1137.81	809.14	0.31
5897	3170.00	737.90	746.09		746.21	0.001234	3.87	1534.54	875.44	0.27
5897	3860.00	737.90	746.58		746.67	0.000933	3.54	1984.53	980.87	0.24
5897	5130.00	737.90	747.52		747.56	0.000536	2.92	2927.93	1021.83	0.19
6048	510.00	738.71	742.60	740.55	742.80	0.001991	3.64	139.99	46.36	0.33
6048	1210.00	738.71	744.50	741.97	745.02	0.002970	5.80	208.50	121.98	0.42
6048	1790.00	738.71	745.02	742.95	745.98	0.004889	7.88	227.08	250.96	0.55
6048	2570.00	738.71	744.73	744.10	746.91	0.011804	11.87	216.57	210.29	0.85
6048	3170.00	738.71	745.94	744.91	746.72	0.004621	8.39	689.72	464.26	0.55
6048	3860.00	738.71	746.53	746.30	747.02	0.003236	7.40	1081.58	791.06	0.47
6048	5130.00	738.71	747.55	746.74	747.72	0.001304	5.10	2034.15	975.19	0.30
6075										
6102	510.00	739.90	743.05	741.72	743.35	0.002367	4.44	114.93	43.87	0.44
6102	1210.00	739.90	745.41	743.13	745.98	0.002058	6.01	201.28	328.46	0.45
6102	1790.00	739.90	745.71	744.10	746.82	0.003784	8.44	212.08	431.29	0.62
6102	2570.00	739.90	745.26	745.26	747.94	0.010235	13.15	195.48	273.19	1.00
6102	3170.00	739.90	746.05	746.05	749.15	0.009846	14.13	224.29	581.29	1.00
6102	3860.00	739.90	746.83	746.83	747.37	0.002683	7.99	1242.32	999.57	0.54
6102	5130.00	739.90	747.36	747.10	747.77	0.002268	7.72	1806.54	1113.24	0.50
6338	510.00	739.40	743.79	742.05	743.98	0.002895	3.51	145.41	51.44	0.37
6338	1210.00	739.40	746.25	743.50	746.35	0.000979	2.87	603.16	362.25	0.23
6338	1790.00	739.40	747.16	744.87	747.23	0.000660	2.65	937.59	489.49	0.20
6338	2570.00	739.40	748.39	745.69	748.43	0.000332	2.15	1687.27	1034.35	0.14
6338	3170.00	739.40	749.53	746.17	749.55	0.000123	1.45	3295.09	1344.73	0.09
6338	3860.00	739.40	747.70	746.42	747.90	0.001673	4.49	1209.52	819.32	0.32
6338	5130.00	739.40	748.04	746.72	748.29	0.001989	5.07	1435.75	969.86	0.35
6606	510.00	741.50	744.71	743.51	744.96	0.004401	3.98	128.21	51.27	0.44
6606	1210.00	741.50	746.57	745.21	746.71	0.001769	3.41	448.72	503.78	0.30
6606	1790.00	741.50	747.36	745.86	747.43	0.000815	2.61	939.39	691.02	0.21
6606	2570.00	741.50	748.48	746.68	748.52	0.000295	1.81	1790.51	867.76	0.13
6606	3170.00	741.50	749.56	746.86	749.59	0.000136	1.38	2703.32	1053.98	0.09
6606	3860.00	741.50	748.15	747.04	748.26	0.001049	3.29	1527.87	827.84	0.25
6606	5130.00	741.50	748.55	747.30	748.69	0.001073	3.48	1847.87	876.38	0.25
6853	510.00	741.70	745.67	744.14	745.85	0.003051	3.44	148.40	56.49	0.37
6853	1210.00	741.70	747.03	745.42	747.36	0.003590	4.83	303.52	285.98	0.43
6853	1790.00	741.70	747.56	746.43	747.84	0.003134	4.91	529.04	491.45	0.41
6853	2570.00	741.70	748.55	747.58	748.66	0.001119	3.36	1088.98	614.24	0.26
6853	3170.00	741.70	749.60	747.79	749.65	0.000448	2.39	1853.08	833.40	0.17
6853	3860.00	741.70	748.43	747.98	748.72	0.003067	5.48	1014.20	602.44	0.42
6853	5130.00	741.70	748.84	748.28	749.15	0.002940	5.64	1265.88	641.27	0.42
7410	510.00	743.30	746.57	745.41	746.80	0.004415	3.90	130.76	54.39	0.44
7410	1210.00	743.30	748.02	746.64	748.37	0.004181	4.79	255.05	123.46	0.46
7410	1790.00	743.30	748.43	747.76	748.92	0.005168	5.75	320.05	178.03	0.52
7410	2570.00	743.30	748.69	748.50	749.46	0.007424	7.20	368.20	198.20	0.63
7410	3170.00	743.30	749.62	749.11	749.99	0.003131	5.38	677.09	441.69	0.42
7410	3860.00	743.30	749.35	749.35	750.11	0.006818	7.62	567.81	387.44	0.62
7410	5130.00	743.30	749.72	749.72	750.57	0.007092	8.17	722.10	450.62	0.64
7410										
7410	510.00	744.02	747.80	747.02	748.20	0.008113	5.06	100.79	44.63	0.59
7410	1210.00	744.02	749.11	749.09	749.70	0.007552	6.53	229.22	227.22	0.62

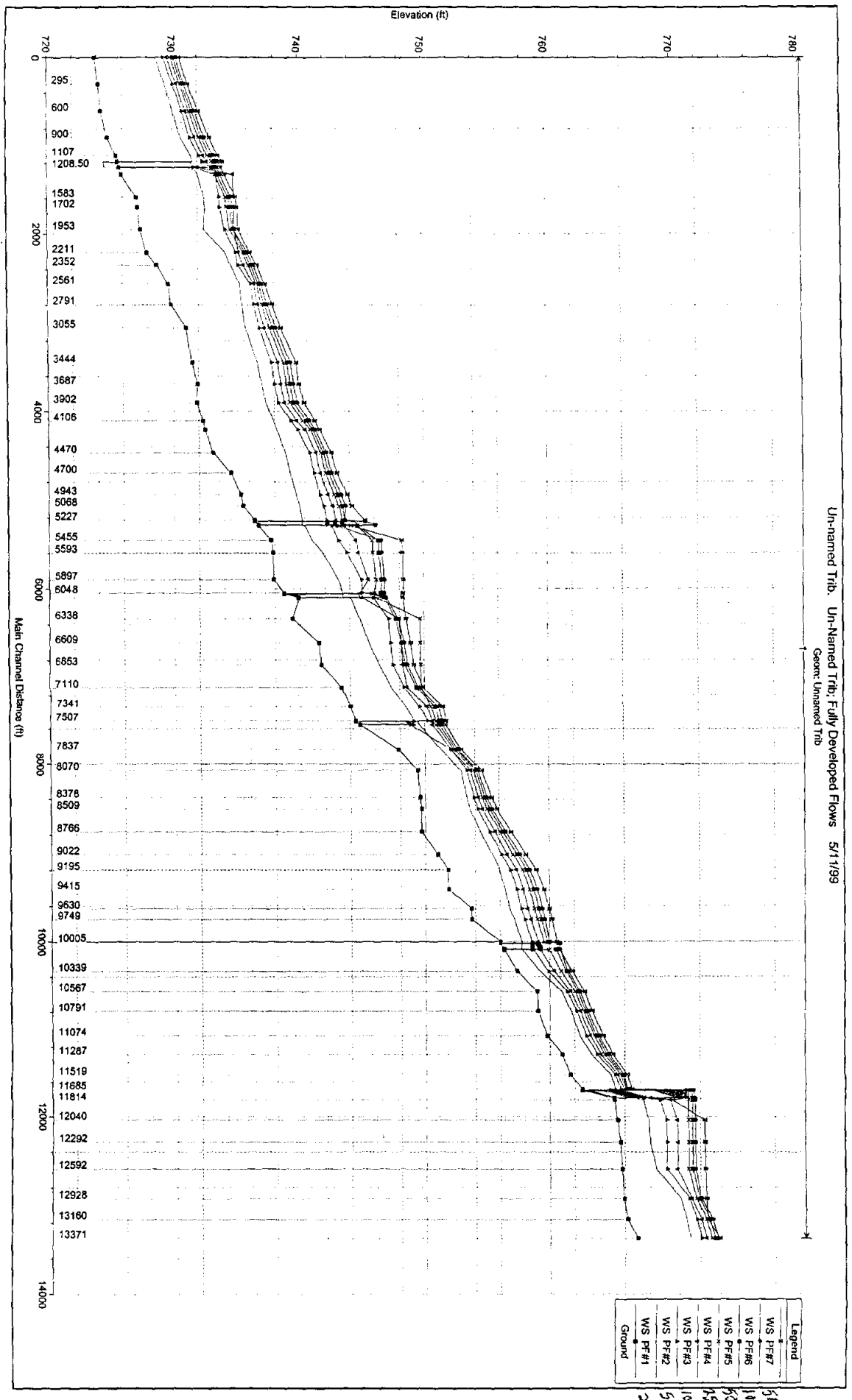
7341	1790.00	744.02	749.71	749.63	750.12	0.005332	6.10	426.35	424.19	0.53
7341	2570.00	744.02	750.31	749.99	750.55	0.003133	5.12	758.77	690.06	0.42
7341	3170.00	744.02	750.46	750.20	750.73	0.003479	5.51	855.25	713.06	0.44
7341	3860.00	744.02	750.83	750.31	751.05	0.002551	4.95	1107.96	776.71	0.38
7341	5130.00	744.02	751.26	750.56	751.48	0.002323	4.98	1457.38	968.48	0.37
7507	510.00	744.42	748.42	746.28	748.62	0.001143	3.62	141.01	177.48	0.32
7507	1210.00	744.42	749.90	747.73	750.00	0.000639	2.98	609.88	370.09	0.24
7507	1790.00	744.42	750.30	748.97	750.41	0.000766	3.44	838.19	694.64	0.26
7507	2570.00	744.42	750.68	749.42	750.80	0.000842	3.77	1093.97	747.31	0.28
7507	3170.00	744.42	750.87	749.69	751.01	0.000943	4.08	1231.29	774.49	0.30
7507	3860.00	744.42	751.14	750.25	751.28	0.000937	4.19	1429.52	812.52	0.30
7507	5130.00	744.42	751.54	750.52	751.71	0.000961	4.43	1739.25	867.64	0.31
7536.5	Culvert									
7554	510.00	744.78	748.60	746.63	748.82	0.000240	3.76	135.75	201.65	0.34
7554	1210.00	744.78	750.01	748.07	750.07	0.000073	2.56	814.11	497.12	0.20
7554	1790.00	744.78	750.36	749.10	750.44	0.000113	3.32	1006.81	655.10	0.25
7554	2570.00	744.78	750.69	749.11	750.82	0.000164	4.15	1238.11	762.83	0.30
7554	3170.00	744.78	750.86	749.11	751.02	0.000207	4.75	1362.93	781.09	0.34
7554	3860.00	744.78	751.12	749.36	751.29	0.000234	5.19	1553.61	807.31	0.36
7554	5130.00	744.78	751.49	749.99	751.71	0.000285	5.95	1840.49	845.72	0.40
7837	440.00	747.85	750.86	750.86	751.26	0.035051	5.70	120.59	185.12	0.69
7837	1040.00	747.85	751.52	751.52	751.94	0.034990	6.81	276.76	308.31	0.72
7837	1540.00	747.85	751.79	751.79	752.29	0.040164	7.77	361.85	349.68	0.78
7837	2200.00	747.85	752.12	752.12	752.66	0.040884	8.39	476.49	402.50	0.80
7837	2710.00	747.85	752.32	752.32	752.88	0.041100	8.74	553.03	428.12	0.81
7837	3290.00	747.85	752.48	752.48	753.12	0.044003	9.31	617.14	441.87	0.85
7837	4350.00	747.85	752.75	752.75	753.51	0.046995	10.09	729.28	465.18	0.89
8070	430.00	749.40	752.53	751.05	752.56	0.002058	1.31	336.98	388.15	0.17
8070	1010.00	749.40	753.13	751.73	753.18	0.001891	1.50	622.92	680.82	0.17
8070	1490.00	749.40	753.39	752.24	753.47	0.001742	1.54	784.64	716.53	0.16
8070	2110.00	749.40	753.67	752.59	753.79	0.001653	1.60	961.87	755.80	0.16
8070	2590.00	749.40	753.85	752.88	754.01	0.001621	1.64	1083.84	778.85	0.16
8070	3130.00	749.40	754.05	753.00	754.24	0.001576	1.68	1214.97	799.95	0.16
8070	4100.00	749.40	754.37	753.11	754.61	0.001515	1.75	1432.82	897.43	0.16
8378	430.00	749.60	753.01	751.41	753.02	0.001170	1.17	485.05	500.82	0.13
8378	1010.00	749.60	753.66	752.54	753.69	0.001502	1.55	809.11	574.24	0.15
8378	1490.00	749.60	753.98	752.72	754.03	0.001873	1.84	981.85	609.20	0.17
8378	2110.00	749.60	754.32	752.91	754.38	0.002241	2.14	1171.94	656.72	0.19
8378	2590.00	749.60	754.55	753.05	754.62	0.002479	2.34	1302.00	691.27	0.21
8378	3130.00	749.60	754.78	753.18	754.87	0.002709	2.54	1436.84	727.74	0.22
8378	4100.00	749.60	755.15	753.41	755.26	0.003045	2.85	1658.29	785.17	0.23
8509	430.00	749.70	753.19	751.44	753.24	0.002575	1.97	327.42	317.17	0.20
8509	1010.00	749.70	753.90	752.84	753.97	0.003545	2.66	588.59	464.00	0.24
8509	1490.00	749.70	754.27	753.21	754.35	0.003960	2.99	761.03	538.74	0.26
8509	2110.00	749.70	754.65	753.51	754.75	0.004240	3.28	953.32	585.06	0.27
8509	2590.00	749.70	754.90	753.71	755.01	0.004370	3.45	1085.75	607.38	0.28
8509	3130.00	749.70	755.15	753.91	755.28	0.004493	3.62	1221.88	633.26	0.28
8509	4100.00	749.70	755.56	754.20	755.71	0.004686	3.89	1443.35	712.40	0.29
8756	430.00	749.70	753.97	752.73	754.02	0.003835	2.02	257.06	287.18	0.23
8756	1010.00	749.70	754.81	753.52	754.87	0.003619	2.39	580.59	458.99	0.23
8756	1490.00	749.70	755.23	754.00	755.31	0.003694	2.62	762.88	482.95	0.24
8756	2110.00	749.70	755.67	754.43	755.77	0.003888	2.90	955.68	507.31	0.25
8756	2590.00	749.70	755.96	754.60	756.07	0.004036	3.09	1086.69	552.47	0.26
8756	3130.00	749.70	756.26	754.72	756.39	0.004398	3.37	1238.58	666.33	0.28
8756	4100.00	749.70	756.71	755.01	756.87	0.004574	3.66	1489.30	743.92	0.29
9022	430.00	751.00	754.91	753.47	754.96	0.003484	1.89	263.10	223.85	0.22
9022	1010.00	751.00	755.75	754.53	755.84	0.003883	2.46	479.64	310.86	0.25
9022	1490.00	751.00	756.21	754.90	756.33	0.004168	2.79	631.13	374.73	0.26
9022	2110.00	751.00	756.70	755.20	756.84	0.004419	3.13	804.80	425.79	0.27
9022	2590.00	751.00	757.02	755.44	757.20	0.004618	3.37	933.54	529.33	0.28
9022	3130.00	751.00	757.39	755.67	757.58	0.004671	3.57	1093.96	671.69	0.29
9022	4100.00	751.00	757.89	756.10	758.11	0.004978	3.94	1345.19	865.55	0.30
9193	430.00	751.80	755.54	754.59	755.59	0.003411	2.22	273.07	236.84	0.23
9193	1010.00	751.80	756.44	755.23	756.53	0.003612	2.72	538.54	411.63	0.24

9195	1490.00	751.80	756.94	755.58	757.04	0.003606	2.95	747.40	478.24	0.25
9195	2110.00	751.80	757.44	755.90	757.56	0.003603	3.17	981.53	518.10	0.25
9195	2590.00	751.80	757.79	756.02	757.92	0.003575	3.31	1151.47	659.26	0.25
9195	3130.00	751.80	758.16	756.43	758.29	0.003503	3.42	1335.53	787.32	0.26
9195	4100.00	751.80	758.69	756.88	758.85	0.003518	3.65	1613.28	857.22	0.26
9415	380.00	751.85	755.97	754.56	755.99	0.001066	1.33	336.96	323.19	0.13
9415	870.00	751.85	756.93	755.12	756.97	0.001140	1.63	676.98	378.47	0.14
9415	1280.00	751.85	757.45	755.38	757.50	0.001261	1.85	880.98	413.96	0.15
9415	1810.00	751.85	757.99	755.75	758.05	0.001396	2.09	1104.71	455.87	0.16
9415	2210.00	751.85	758.35	756.05	758.43	0.001472	2.25	1265.20	582.66	0.17
9415	2670.00	751.85	758.72	756.27	758.81	0.001543	2.40	1432.16	644.77	0.17
9415	3490.00	751.85	759.28	756.63	759.38	0.001675	2.65	1691.80	738.74	0.18
9630	380.00	753.70	756.35	755.24	756.39	0.003785	1.81	271.16	340.01	0.23
9630	870.00	753.70	757.27	756.18	757.31	0.002386	1.85	600.79	387.29	0.19
9630	1280.00	753.70	757.80	756.42	757.85	0.002213	1.99	822.44	446.09	0.19
9630	1810.00	753.70	758.36	756.64	758.41	0.002041	2.11	1073.53	493.33	0.19
9630	2210.00	753.70	758.73	756.78	758.79	0.001942	2.19	1244.88	511.11	0.18
9630	2670.00	753.70	759.11	756.95	759.17	0.001887	2.28	1421.53	529.24	0.18
9630	3490.00	753.70	759.69	757.16	759.76	0.001866	2.45	1696.42	794.50	0.19
9749	380.00	753.70	756.77	755.88	756.83	0.004394	2.26	216.32	220.04	0.25
9749	870.00	753.70	757.55	756.58	757.63	0.004207	2.64	454.72	365.22	0.26
9749	1280.00	753.70	758.05	756.88	758.13	0.003683	2.72	646.68	420.33	0.25
9749	1810.00	753.70	758.58	757.28	758.66	0.003391	2.84	867.79	454.11	0.24
9749	2210.00	753.70	758.93	757.46	759.02	0.003132	2.88	1021.30	470.02	0.23
9749	2670.00	753.70	759.30	757.63	759.40	0.002948	2.94	1184.70	513.61	0.23
9749	3490.00	753.70	759.87	757.93	759.98	0.002779	3.06	1447.78	693.47	0.23
10005	380.00	756.03	757.35	756.55	757.39	0.001702	1.64	231.47	229.19	0.25
10005	870.00	756.03	758.13	756.94	758.22	0.001899	2.36	368.15	532.33	0.29
10005	1280.00	756.03	758.62	757.21	758.75	0.002051	2.82	453.56	562.60	0.31
10005	1810.00	756.03	759.14	757.52	759.31	0.002228	3.32	544.67	594.89	0.33
10005	2210.00	756.03	759.48	757.73	759.68	0.002367	3.67	602.94	672.74	0.35
10005	2670.00	756.03	759.82	757.96	760.07	0.002511	4.02	663.53	806.51	0.36
10005	3490.00	756.03	760.27	758.33	760.36	0.001049	2.80	1715.46	933.02	0.24
10050	Culvert									
10099	380.00	756.37	757.40	756.90	757.47	0.003980	2.12	179.28	188.10	0.37
10099	870.00	756.37	758.21	757.29	758.32	0.002996	2.71	320.89	219.35	0.35
10099	1280.00	756.37	758.72	757.55	758.87	0.002847	3.12	410.79	230.16	0.36
10099	1810.00	756.37	759.32	757.86	759.51	0.002679	3.51	515.03	242.69	0.36
10099	2210.00	756.37	759.82	758.07	760.03	0.002370	3.67	602.32	424.68	0.35
10099	2670.00	756.37	760.41	758.30	760.63	0.002043	3.79	705.40	710.85	0.33
10099	3490.00	756.37	760.80	758.68	761.01	0.001874	3.85	1011.70	811.47	0.32
10339	380.00	757.40	758.95		759.01	0.012194	2.11	193.14	241.24	0.36
10339	870.00	757.40	759.50		759.61	0.012436	2.83	353.99	340.18	0.39
10339	1280.00	757.40	759.91		760.02	0.010021	2.96	497.89	355.41	0.37
10339	1810.00	757.40	760.40		760.52	0.007881	3.04	675.17	364.84	0.34
10339	2210.00	757.40	760.78		760.90	0.006553	3.04	814.52	372.22	0.32
10339	2670.00	757.40	761.25		761.36	0.005202	3.00	989.77	381.29	0.29
10339	3490.00	757.40	761.59		761.74	0.006030	3.44	1120.42	387.91	0.32
10567	330.00	759.00	760.67		760.69	0.004801	1.43	268.17	437.32	0.23
10567	760.00	759.00	761.15		761.19	0.004231	1.69	526.63	601.84	0.23
10567	1090.00	759.00	761.41		761.45	0.004146	1.84	685.04	653.22	0.23
10567	1530.00	759.00	761.71		761.76	0.003891	1.96	889.55	714.10	0.23
10567	1860.00	759.00	761.93		761.98	0.003556	2.00	1053.96	759.52	0.23
10567	2220.00	759.00	762.19		762.25	0.002962	1.96	1259.10	785.45	0.21
10567	2940.00	759.00	762.57		762.63	0.002677	2.03	1559.59	807.81	0.20
1079	330.00	759.10	761.38	760.68	761.41	0.002389	1.90	248.61	281.27	0.25
1079	760.00	759.10	761.91	761.10	761.97	0.002928	2.47	437.11	467.04	0.29
1079	1090.00	759.10	762.18	761.33	762.24	0.003131	2.75	571.52	799.31	0.31
1079	1530.00	759.10	762.47	761.62	762.54	0.003306	3.04	723.04	824.29	0.32
1079	1860.00	759.10	762.66	761.79	762.75	0.003380	3.21	826.29	840.94	0.33
1079	2220.00	759.10	762.85	761.91	762.95	0.003431	3.38	932.21	857.72	0.34
1079	2940.00	759.10	763.19	762.13	763.31	0.003526	3.67	1124.04	887.41	0.35
107	330.00	759.80	762.06	761.10	762.10	0.002448	1.70	255.34	352.95	0.25
107	760.00	759.80	762.66	761.87	762.71	0.002345	2.08	506.67	455.56	0.26

1072	1090.00	759.80	762.96	762.06	763.02	0.002411	2.31	646.59	470.68	0.27
1072	1530.00	759.80	763.29	762.30	763.36	0.002521	2.57	803.94	487.12	0.28
1072	1860.00	759.80	763.50	762.47	763.58	0.002596	2.74	909.26	497.83	0.29
1072	2220.00	759.80	763.72	762.59	763.80	0.002669	2.91	1015.88	517.50	0.29
1072	2940.00	759.80	764.09	762.79	764.19	0.002749	3.18	1267.71	634.66	0.30
1282	330.00	761.00	763.02		763.25	0.016812	3.79	87.32	91.15	0.63
1282	760.00	761.00	763.56		763.79	0.015174	4.40	259.53	489.95	0.63
1282	1090.00	761.00	763.83		764.02	0.011171	4.18	396.66	503.09	0.55
1282	1530.00	761.00	764.14		764.30	0.008855	4.12	552.76	536.30	0.50
1282	1860.00	761.00	764.34		764.50	0.007847	4.13	664.21	573.71	0.48
1282	2220.00	761.00	764.54		764.70	0.007081	4.15	783.02	611.07	0.46
1282	2940.00	761.00	764.89		765.05	0.006168	4.23	1008.66	676.38	0.44
1510	330.00	761.65	764.56	763.30	764.64	0.002939	2.47	164.70	427.90	0.29
1510	760.00	761.65	765.05	764.69	765.13	0.002953	2.83	402.86	510.62	0.30
1510	1090.00	761.65	765.24	764.84	765.34	0.003419	3.19	506.31	529.20	0.33
1510	1530.00	761.65	765.47	765.01	765.59	0.003781	3.53	629.20	550.44	0.35
1510	1860.00	761.65	765.62	765.12	765.75	0.003958	3.73	713.80	624.76	0.36
1510	2220.00	761.65	765.78	765.22	765.92	0.004069	3.90	802.95	677.11	0.37
1510	2940.00	761.65	766.06	765.41	766.22	0.004138	4.14	1014.98	719.64	0.38
1685	260.00	762.59	764.85	763.39	764.90	0.000806	1.81	143.29	81.04	0.21
1685	630.00	762.59	765.42	764.04	765.61	0.002218	3.50	179.90	85.51	0.37
1685	920.00	762.59	765.69	764.45	766.03	0.003507	4.67	196.79	87.58	0.47
1685	1260.00	762.59	765.94	764.88	766.48	0.005071	5.92	212.76	89.53	0.57
1685	1520.00	762.59	766.07	765.19	766.81	0.006471	6.87	221.32	524.24	0.65
1685	1820.00	762.59	766.17	765.52	767.16	0.008481	8.00	227.36	529.65	0.75
1685	2420.00	762.59	766.14	766.14	767.93	0.015384	10.73	225.62	528.09	1.00
1172	Culvert									
1181	260.00	765.15	766.69	766.09	766.87	0.004635	3.38	76.98	83.18	0.48
1181	630.00	765.15	767.93	766.85	768.25	0.003808	4.54	138.87	254.85	0.48
1181	920.00	765.15	768.73	767.34	769.14	0.003500	5.15	178.75	344.83	0.48
1181	1260.00	765.15	769.57	767.85	770.08	0.003264	5.72	220.45	589.60	0.48
1181	1520.00	765.15	770.16	768.21	770.73	0.003131	6.08	249.82	772.65	0.48
1181	1820.00	765.15	771.27	768.60	771.29	0.000127	1.37	2225.76	903.86	0.10
1181	2420.00	765.15	771.73	769.32	771.74	0.000144	1.53	2649.33	957.46	0.11
12040	260.00	765.43	767.19		767.20	0.000704	1.27	299.51	411.23	0.19
12040	630.00	765.43	768.38		768.39	0.000180	0.96	902.96	599.10	0.10
12040	920.00	765.43	769.24		769.24	0.000092	0.82	1443.89	662.65	0.08
12040	1260.00	765.43	770.16		770.17	0.000057	0.76	2086.76	730.59	0.06
12040	1520.00	765.43	770.81		770.82	0.000044	0.73	2581.15	777.39	0.06
12040	1820.00	765.43	771.30		771.30	0.000042	0.76	2962.65	811.66	0.06
12040	2420.00	765.43	771.75		771.76	0.000053	0.89	3342.35	844.39	0.06
12262	260.00	765.64	767.41		767.44	0.001310	1.51	232.49	309.43	0.24
12262	630.00	765.64	768.45		768.46	0.000568	1.34	618.30	431.85	0.17
12262	920.00	765.64	769.27		769.28	0.000280	1.17	1043.30	573.44	0.13
12262	1260.00	765.64	770.18		770.19	0.000156	1.07	1600.65	676.87	0.10
12262	1520.00	765.64	770.83		770.84	0.000111	1.01	2067.61	738.68	0.09
12262	1820.00	765.64	771.31		771.32	0.000099	1.03	2428.39	766.95	0.08
12262	2420.00	765.64	771.77		771.78	0.000117	1.19	2788.41	794.15	0.09
12592	260.00	765.77	768.02	767.63	768.40	0.010691	4.94	52.67	61.53	0.71
12592	630.00	765.77	768.83	768.63	769.44	0.022269	6.26	100.59	421.60	1.00
12592	920.00	765.77	769.33	769.33	769.82	0.012705	5.86	177.57	580.65	0.80
12592	1260.00	765.77	770.15	769.57	770.39	0.004097	4.30	343.27	708.38	0.48
12592	1520.00	765.77	770.81	769.75	770.97	0.002083	3.59	503.04	767.92	0.36
12592	1820.00	765.77	771.29	769.92	771.43	0.001580	3.44	634.42	811.07	0.32
12592	2420.00	765.77	771.75	770.23	771.92	0.001636	3.79	771.51	852.09	0.33
1282	280.00	765.91	769.47	767.74	769.58	0.001676	2.73	95.29	70.86	0.31
1282	630.00	765.91	770.76	768.93	770.92	0.001743	3.53	230.64	544.01	0.33
1282	920.00	765.91	771.10	769.61	771.31	0.002194	4.21	292.00	596.78	0.38
1282	1260.00	765.91	771.29	770.74	771.61	0.003094	5.16	329.49	627.02	0.45
1282	1520.00	765.91	771.54	770.95	771.88	0.003168	5.43	380.70	666.29	0.46
1282	1820.00	765.91	771.87	771.17	772.20	0.002972	5.52	451.14	717.06	0.45
1282	2420.00	765.91	772.22	771.54	772.28	0.000782	2.98	1532.91	772.07	0.23
1310	260.00	766.20	769.95	768.81	770.05	0.002300	2.76	132.87	310.44	0.35
1310	630.00	766.20	771.22	770.03	771.30	0.001289	2.87	370.27	586.99	0.28



920.00	766.20	771.67	770.37	771.78	0.001474	3.35	475.44	651.78	0.31
1260.00	766.20	772.07	770.66	772.20	0.001703	3.85	576.58	704.84	0.34
1520.00	766.20	772.35	770.89	772.50	0.001797	4.14	655.42	729.98	0.35
1820.00	766.20	772.66	771.11	772.82	0.001865	4.42	745.39	756.93	0.36
2420.00	766.20	772.36	771.47	772.74	0.004501	6.57	658.53	730.94	0.55
260.00	767.00	770.44	769.28	770.58	0.002750	3.16	104.89	228.51	0.38
630.00	767.00	771.54	770.56	771.70	0.002917	3.75	258.64	396.93	0.41
920.00	767.00	772.03	771.07	772.22	0.003164	4.16	368.05	502.24	0.43
1260.00	767.00	772.46	771.49	772.66	0.003006	4.45	486.56	557.81	0.43
1520.00	767.00	772.76	771.81	772.96	0.002880	4.61	576.65	596.14	0.43
1820.00	767.00	773.07	772.01	773.28	0.002756	4.76	678.82	636.35	0.42
2420.00	767.00	773.27	772.37	773.56	0.003855	5.82	745.59	660.87	0.51



C-68

# Unnamed Trib. - Fully Dev. -

HEC-RAS Plan: Adjusted River: Unnamed Trib Reach: 1

Reach	Flow Sta	OTW Elev (E)	Wing Elev (W)	WS Elev (W)	PIV Elev (W)	EB Elev (W)	EB Spill (W)	Vel (ft/s)	Bed Elev (E)	Total Haul (ft)	Spill Depth (ft)
	0000	880.00	723.80	728.65	727.26	728.71	0.002372	2.75	737.88	972.49	0.25
	0000	1900.00	723.80	729.28	728.58	729.33	0.002374	2.95	1501.53	1467.18	0.26
	0000	2660.00	723.80	729.58	728.77	729.63	0.002371	3.04	1973.57	1679.88	0.26
	0000	3620.00	723.80	729.88	728.98	729.93	0.002370	3.13	2514.73	1894.57	0.26
	0000	4410.00	723.80	730.08	729.09	730.13	0.002371	3.20	2901.86	1989.91	0.26
	0000	5320.00	723.80	730.27	729.26	730.32	0.002373	3.29	3280.84	2015.69	0.26
	0000	6900.00	723.80	730.56	729.41	730.62	0.002371	3.42	3872.05	2030.00	0.27
	255	880.00	724.10	729.39		729.47	0.002914	2.99	623.48	724.46	0.28
	255	1900.00	724.10	730.05		730.12	0.003242	3.41	1258.80	1674.92	0.30
	255	2660.00	724.10	730.32		730.38	0.002943	3.40	1723.86	1710.76	0.29
	255	3620.00	724.10	730.59		730.65	0.002734	3.41	2191.83	1746.09	0.28
	255	4410.00	724.10	730.78		730.84	0.002647	3.45	2523.25	1770.69	0.28
	255	5320.00	724.10	730.97		731.03	0.002619	3.53	2857.33	1795.14	0.28
	255	6900.00	724.10	731.26		731.33	0.002600	3.65	3383.14	1832.85	0.28
	600	880.00	724.30	730.06		730.10	0.001507	2.27	767.55	625.83	0.20
	600	1900.00	724.30	730.79		730.84	0.001725	2.72	1456.44	1209.20	0.22
	600	2660.00	724.30	731.08		731.13	0.002020	3.06	1814.11	1283.35	0.24
	600	3620.00	724.30	731.37		731.43	0.002334	3.42	2193.96	1357.68	0.26
	600	4410.00	724.30	731.57		731.64	0.002546	3.66	2474.39	1410.04	0.28
	600	5320.00	724.30	731.78		731.86	0.002745	3.90	2777.39	1464.51	0.29
	600	6900.00	724.30	732.10		732.20	0.003017	4.25	3269.23	1604.17	0.31
	900	880.00	724.80	730.67		730.79	0.003156	3.55	430.95	581.66	0.30
	900	1900.00	724.80	731.41		731.51	0.002499	3.50	971.83	857.68	0.27
	900	2660.00	724.80	731.76		731.86	0.002489	3.65	1291.02	969.56	0.27
	900	3620.00	724.80	732.11		732.22	0.002533	3.83	1658.00	1155.07	0.28
	900	4410.00	724.80	732.35		732.46	0.002537	3.94	1939.14	1208.93	0.28
	900	5320.00	724.80	732.59		732.71	0.002540	4.04	2237.80	1263.62	0.28
	900	6900.00	724.80	732.95		733.08	0.002556	4.21	2712.04	1345.92	0.29
	1107	880.00	725.50	731.54		731.64	0.004955	2.80	420.38	487.70	0.34
	1107	1900.00	725.50	732.16		732.28	0.005387	3.35	798.90	873.06	0.37
	1107	2660.00	725.50	732.49		732.61	0.005021	3.50	1117.38	1042.54	0.37
	1107	3620.00	725.50	732.82		732.95	0.004645	3.63	1480.26	1136.44	0.36
	1107	4410.00	725.50	733.05		733.18	0.004564	3.76	1747.79	1258.45	0.36
	1107	5320.00	725.50	733.27		733.41	0.004391	3.85	2040.74	1313.11	0.36
	1107	6900.00	725.50	733.62		733.76	0.004170	3.99	2507.66	1395.81	0.35
	1175	880.00	725.60	731.70	728.13	731.80	0.001012	2.53	347.70	205.48	0.23
	1175	1900.00	725.60	732.44	729.54	732.59	0.001591	3.47	797.97	829.00	0.29
	1175	2660.00	725.60	732.81	730.48	732.95	0.001596	3.66	1132.52	998.97	0.30
	1175	3620.00	725.60	733.16	731.49	733.31	0.001596	3.84	1516.55	1157.60	0.30
	1175	4410.00	725.60	733.41	732.65	733.55	0.001599	3.97	1810.42	1264.03	0.30
	1175	5320.00	725.60	733.64	732.81	733.80	0.001617	4.11	2125.93	1375.38	0.31
	1175	6900.00	725.60	734.00	733.09	734.16	0.001638	4.31	2646.42	1541.38	0.31
	1203.50	Culvert									
	1212	880.00	725.75	732.10	728.19	732.16	0.000668	2.14	537.39	504.31	0.19
	1212	1900.00	725.75	732.62	729.60	732.79	0.001607	3.60	875.95	790.93	0.30
	1212	2660.00	725.75	732.95	730.53	733.16	0.002042	4.25	1157.78	917.45	0.34
	1212	3620.00	725.75	733.25	732.36	733.50	0.002468	4.86	1455.36	1020.05	0.38
	1212	4410.00	725.75	733.44	732.70	733.73	0.002855	5.35	1650.45	1082.04	0.41
	1212	5320.00	725.75	733.63	733.07	733.95	0.003265	5.85	1856.27	1143.81	0.44
	1212	6900.00	725.75	733.92	733.39	734.30	0.003806	6.54	2206.23	1241.81	0.48
	1226	860.00	725.90	732.15		732.27	0.001981	2.96	420.48	477.83	0.30
	1226	1850.00	725.90	732.75		732.98	0.003475	4.44	858.33	857.14	0.42
	1226	2590.00	725.90	733.13		733.37	0.003560	4.81	1198.08	937.61	0.43
	1226	3520.00	725.90	733.48		733.73	0.003841	5.29	1536.40	1011.39	0.45
	1226	4280.00	725.90	733.71		733.98	0.004115	5.66	1770.48	1059.44	0.47
	1226	5140.00	725.90	733.94		734.23	0.004364	6.03	2020.39	1148.10	0.49
	1226	6640.00	725.90	734.30		734.60	0.004512	6.44	2478.08	1322.83	0.50
	1236	860.00	727.10	732.50		732.55	0.000745	2.31	571.66	571.00	0.20
	1236	1850.00	727.10	733.28		733.33	0.000786	2.66	1155.34	866.96	0.21
	1236	2590.00	727.10	733.65		733.71	0.000808	2.82	1497.29	959.15	0.21
	1236	3520.00	727.10	734.02		734.09	0.000853	3.03	1867.39	1103.92	0.22
	1236	4280.00	727.10	734.27		734.35	0.000888	3.16	2155.19	1180.15	0.23
	1236	5140.00	727.10	734.52		734.61	0.000921	3.33	2461.19	1241.22	0.23
	1236	6640.00	727.10	734.89		734.99	0.000984	3.58	2939.73	1331.13	0.24

2  
5  
10  
25  
50  
100  
500

HEC-RAS Plan Adjusted River Unnamed Trib Reach 1 (Continued)

Station	Flow (cfs)	Water Surface Elevation (ft)	Channel Bottom Elevation (ft)	Bank Elevation (ft)	Velocity (ft/s)	Shear Stress (lb/ft²)	Hydraulic Radius (ft)	Wetted Perimeter (ft)	Cross-sectional Area (ft²)	Hydraulic Depth (ft)	Velocity Head (ft)	Energy Head (ft)
702	860.00	727.20	732.57		732.62	0.000594	1.89	501.79	545.62	0.17		
702	1850.00	727.20	733.33		733.40	0.000604	2.16	1006.16	815.85	0.18		
702	2590.00	727.20	733.71		733.78	0.000651	2.37	1361.00	1045.05	0.19		
702	3520.00	727.20	734.08		734.16	0.000714	2.60	1795.76	1312.39	0.20		
702	4280.00	727.20	734.34		734.42	0.000740	2.73	2143.59	1386.38	0.20		
702	5140.00	727.20	734.60		734.69	0.000765	2.86	2506.87	1430.23	0.21		
702	6640.00	727.20	734.98		735.08	0.000812	3.08	3058.56	1471.05	0.22		
953	860.00	727.40	732.48		733.15	0.009086	6.55	131.27	42.12	0.65		
953	1850.00	727.40	734.19	734.19	734.58	0.005267	5.97	674.13	1149.73	0.52		
953	2590.00	727.40	734.46	734.46	734.79	0.005141	6.15	1004.02	1318.25	0.52		
953	3520.00	727.40	734.62	734.62	735.01	0.006366	7.02	1227.04	1420.89	0.58		
953	4280.00	727.40	734.75	734.75	735.16	0.006918	7.46	1420.12	1504.11	0.61		
953	5140.00	727.40	734.82	734.82	735.32	0.008440	8.32	1532.77	1538.67	0.67		
953	6640.00	727.40	735.15		735.54	0.007017	7.94	2046.20	1584.41	0.62		
221	860.00	727.90	734.18		734.49	0.003298	4.64	304.94	640.80	0.41		
221	1850.00	727.90	735.14		735.30	0.002216	4.38	1141.18	1084.43	0.34		
221	2590.00	727.90	735.38		735.57	0.002849	5.12	1414.96	1212.17	0.39		
221	3520.00	727.90	735.68		735.88	0.003140	5.58	1801.94	1346.96	0.42		
221	4280.00	727.90	735.87		736.09	0.003443	5.98	2074.60	1474.62	0.44		
221	5140.00	727.90	736.10		736.31	0.003453	6.15	2427.72	1570.54	0.44		
221	6640.00	727.90	736.29		736.54	0.004319	7.01	2716.40	1588.99	0.50		
232	860.00	728.70	734.62		735.07	0.004609	5.53	214.80	291.02	0.48		
232	1850.00	728.70	735.35		735.89	0.006154	7.12	584.05	900.65	0.57		
232	2590.00	728.70	735.74		736.17	0.005546	7.12	1025.36	1217.54	0.55		
232	3520.00	728.70	736.12		736.43	0.004708	6.87	1518.82	1388.18	0.51		
232	4280.00	728.70	736.35		736.63	0.004379	6.81	1853.00	1415.30	0.50		
232	5140.00	728.70	736.58		736.84	0.004214	6.86	2181.67	1441.47	0.49		
232	6640.00	728.70	736.87		737.13	0.004464	7.28	2600.22	1474.13	0.51		
256	860.00	729.60	735.36		735.40	0.000679	1.32	561.54	429.42	0.12		
256	1850.00	729.60	736.24		736.29	0.000836	1.62	1264.73	1069.90	0.14		
256	2590.00	729.60	736.54		736.60	0.001040	1.89	1595.78	1147.66	0.15		
256	3520.00	729.60	736.81		736.88	0.001294	2.19	1907.31	1180.81	0.17		
256	4280.00	729.60	737.01		737.09	0.001456	2.38	2145.89	1205.58	0.18		
256	5140.00	729.60	737.22		737.32	0.001600	2.57	2403.77	1231.80	0.19		
256	6640.00	729.60	737.54		737.66	0.001826	2.85	2804.61	1271.48	0.21		
279	860.00	729.80	735.52		735.60	0.000923	1.71	428.84	153.58	0.14		
279	1850.00	729.80	736.46		736.57	0.001583	2.47	759.17	798.00	0.19		
279	2590.00	729.80	736.82		736.94	0.001939	2.86	1087.83	1005.79	0.21		
279	3520.00	729.80	737.16		737.29	0.002279	3.23	1444.30	1083.08	0.23		
279	4280.00	729.80	737.40		737.54	0.002456	3.44	1711.30	1123.55	0.24		
279	5140.00	729.80	737.65		737.79	0.002604	3.64	1995.36	1165.07	0.25		
279	6640.00	729.80	738.03		738.19	0.002814	3.93	2445.06	1227.20	0.27		
305	860.00	731.00	735.79		735.95	0.001849	2.15	319.50	132.22	0.20		
305	1850.00	731.00	736.88		737.07	0.002168	2.74	568.01	362.60	0.22		
305	2590.00	731.00	737.33		737.53	0.002525	3.14	770.71	667.08	0.24		
305	3520.00	731.00	737.75		737.96	0.002821	3.50	1061.94	736.56	0.26		
305	4280.00	731.00	738.03		738.25	0.003006	3.73	1276.39	783.68	0.27		
305	5140.00	731.00	738.31		738.55	0.003175	3.95	1503.52	829.70	0.28		
305	6640.00	731.00	738.73		739.00	0.003416	4.29	1869.30	898.89	0.29		
344	860.00	731.50	736.70		736.80	0.002652	2.79	356.62	236.20	0.24		
344	1850.00	731.50	737.82		737.96	0.002453	3.14	652.49	291.14	0.24		
344	2590.00	731.50	738.34		738.52	0.002626	3.45	851.80	422.87	0.25		
344	3520.00	731.50	738.82		739.06	0.002843	3.79	1066.01	461.19	0.27		
344	4280.00	731.50	739.15		739.43	0.003016	4.04	1222.85	489.18	0.28		
344	5140.00	731.50	739.48		739.80	0.003204	4.30	1388.01	520.84	0.29		
344	6640.00	731.50	739.97		740.36	0.003506	4.70	1653.66	568.08	0.30		
387	850.00	731.90	737.05		737.13	0.000984	1.75	434.28	239.44	0.15		
387	1790.00	731.90	738.07		738.24	0.000877	1.90	694.48	273.62	0.14		
387	2500.00	731.90	738.58		738.82	0.000941	2.09	845.36	315.38	0.15		
387	3410.00	731.90	739.07		739.40	0.001061	2.34	1007.44	354.80	0.16		
387	4140.00	731.90	739.40		739.80	0.001146	2.51	1129.32	381.77	0.17		
387	4950.00	731.90	739.72		740.21	0.001253	2.71	1266.60	467.76	0.18		
387	6370.00	731.90	740.22		740.82	0.001393	2.99	1530.27	583.56	0.19		
392	780.00	731.85	737.35		737.47	0.002851	2.75	283.79	73.45	0.25		
392	1670.00	731.85	738.37		738.58	0.003754	3.56	459.48	269.67	0.29		

HEC-RAS Plan: Adjusted River Unnamed Trib Reach: 1 (Continued)

Reach	Flow	Depth	Velocity	Area	Wet Perim	Energy	Loss Coef	Velocity	Area	Wet Perim	Energy	Loss Coef	Velocity	Area	Wet Perim	Energy	Loss Coef
3502	2380.00	731.85	738.87			739.16	0.003063	3.44	603.81	310.84							0.27
3502	3240.00	731.85	739.35			739.75	0.002616	3.37	762.58	350.58							0.25
3502	3880.00	731.85	739.69			740.14	0.002308	3.30	935.96	567.45							0.24
3502	4570.00	731.85	740.05			740.53	0.001948	3.15	1155.17	644.39							0.22
3502	5800.00	731.85	740.65			741.13	0.001448	2.89	1569.39	732.78							0.19
4106	780.00	732.30	737.94			738.06	0.002928	2.75	284.04	75.54							0.25
4106	1670.00	732.30	739.32			739.56	0.006302	3.95	435.88	205.81							0.36
4106	2380.00	732.30	739.79			740.14	0.008188	4.84	562.23	336.75							0.42
4106	3240.00	732.30	740.25			740.62	0.008321	5.22	794.50	638.74							0.43
4106	3880.00	732.30	740.56			740.80	0.006652	4.88	1001.74	683.72							0.39
4106	4570.00	732.30	740.83			741.17	0.005673	4.67	1187.49	721.65							0.37
4106	5800.00	732.30	741.23			741.63	0.004587	4.43	1493.36	780.11							0.33
4205	780.00	732.50	738.22			738.34	0.002771	2.80	278.08	67.70							0.24
4205	1670.00	732.50	739.88			740.13	0.005227	4.03	424.30	295.88							0.34
4205	2380.00	732.50	740.51			740.75	0.004681	4.16	747.81	603.26							0.33
4205	3240.00	732.50	740.95			741.21	0.004242	4.19	1030.95	668.52							0.32
4205	3880.00	732.50	741.14			741.44	0.004516	4.43	1162.23	694.53							0.33
4205	4570.00	732.50	741.35			741.68	0.004621	4.59	1307.86	722.28							0.33
4205	5800.00	732.50	741.70			742.08	0.004589	4.75	1568.39	769.44							0.34
4470	780.00	733.10	738.67			738.97	0.002053	2.58	311.20	90.22							0.21
4470	1670.00	733.10	740.83			740.97	0.002106	3.26	736.10	541.76							0.23
4470	2380.00	733.10	741.41			741.54	0.002050	3.40	1055.51	572.13							0.23
4470	3240.00	733.10	741.84			741.98	0.002190	3.67	1311.11	594.89							0.24
4470	3880.00	733.10	742.11			742.26	0.002293	3.84	1476.16	664.12							0.25
4470	4570.00	733.10	742.37			742.52	0.002372	3.99	1654.03	718.33							0.25
4470	5800.00	733.10	742.77			742.94	0.002473	4.22	1961.96	803.58							0.26
4700	780.00	734.50	739.28			739.43	0.001821	3.10	251.55	75.90							0.30
4700	1670.00	734.50	741.21			741.44	0.001713	3.94	510.92	307.23							0.31
4700	2380.00	734.50	741.77			742.07	0.002077	4.65	744.65	496.01							0.35
4700	3240.00	734.50	742.23			742.58	0.002400	5.28	996.47	582.43							0.38
4700	3880.00	734.50	742.52			742.90	0.002567	5.63	1169.82	626.18							0.40
4700	4570.00	734.50	742.79			743.19	0.002712	5.96	1347.44	668.04							0.41
4700	5800.00	734.50	743.22			743.64	0.002865	6.39	1705.48	984.71							0.43
4943	780.00	735.30	739.73			739.90	0.001956	3.32	235.01	66.76							0.31
4943	1670.00	735.30	741.68			741.97	0.002653	4.27	391.46	95.80							0.37
4943	2380.00	735.30	742.33			742.75	0.003463	5.21	470.46	192.63							0.43
4943	3240.00	735.30	742.86			743.35	0.003775	5.85	771.47	708.59							0.46
4943	3880.00	735.30	743.19			743.66	0.003614	5.98	1022.88	795.44							0.45
4943	4570.00	735.30	743.51			743.94	0.003401	6.02	1284.31	869.16							0.45
4943	5800.00	735.30	743.98			744.37	0.003097	6.06	1727.01	995.43							0.43
5068	780.00	735.50	739.97			740.12	0.001643	3.16	246.81	65.88							0.29
5068	1670.00	735.50	741.97			742.26	0.002001	4.31	389.76	86.80							0.33
5068	2380.00	735.50	742.69			743.12	0.002573	5.32	472.22	143.92							0.39
5068	3240.00	735.50	743.22	740.48		743.84	0.003369	6.45	604.25	626.99							0.45
5068	3880.00	735.50	743.52			744.22	0.003759	7.02	831.16	900.19							0.48
5068	4570.00	735.50	743.82			744.52	0.003789	7.26	1116.69	958.02							0.48
5068	5800.00	735.50	744.32			744.93	0.003528	7.33	1641.32	1112.88							0.47
5227	780.00	736.39	740.24			740.45	0.002187	3.79	214.94	62.14							0.34
5227	1670.00	736.39	742.26			742.64	0.002246	5.09	372.95	107.81							0.37
5227	2380.00	736.39	743.07			743.59	0.002760	6.15	475.87	269.91							0.42
5227	3240.00	736.39	743.90			744.35	0.002395	6.20	959.87	770.33							0.40
5227	3880.00	736.39	744.46			744.75	0.001757	5.57	1492.75	1044.84							0.35
5227	4570.00	736.39	744.80			745.05	0.001593	5.45	1857.97	1103.74							0.33
5227	5800.00	736.39	745.20			745.44	0.001580	5.60	2318.34	1157.36							0.33
	Culvert																
5250	780.00	736.71	740.45	738.61		740.68	0.002400	3.90	210.01	67.40							0.36
5250	1670.00	736.71	742.73	739.85		743.00	0.001702	4.51	495.67	205.08							0.32
5250	2380.00	736.71	743.57	740.74		743.84	0.001614	4.79	763.32	580.14							0.32
5250	3240.00	736.71	744.26	741.89		744.47	0.001336	4.65	1272.11	874.81							0.30
5250	3880.00	736.71	744.64	741.78		744.82	0.001194	4.54	1618.07	949.85							0.28
5250	4570.00	736.71	744.93	743.70		745.10	0.001174	4.61	1899.12	1005.90							0.28
5250	5800.00	736.71	745.31	744.18		745.49	0.001231	4.86	2292.67	1064.72							0.29
5455	780.00	737.70	740.96			741.35	0.006701	5.06	154.16	59.26							0.55
5455	1670.00	737.70	743.00			743.53	0.004872	5.84	285.97	69.00							0.51

HFC-BAS Plan: Adjusted River Unnamed Trib. Reach: 1 (Continued)

Reach	Structure	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	
5455		2380.00	737.70	743.72	742.10	744.44	0.005836	6.91	418.00	409.86	0.56
5455		3240.00	737.70	744.36		744.97	0.004971	6.88	819.38	825.93	0.53
5455		3880.00	737.70	744.76		745.22	0.003982	6.47	1174.10	946.21	0.48
5455		4570.00	737.70	745.07		745.46	0.003508	6.29	1467.95	960.08	0.45
5455		5800.00	737.70	745.47		745.82	0.003258	6.33	1860.38	978.31	0.44
5593		780.00	737.85	741.83		742.18	0.005307	4.74	164.46	58.07	0.50
5593		1670.00	737.85	743.72		744.23	0.005243	5.74	300.36	259.57	0.52
5593		2380.00	737.85	744.70		745.01	0.003085	5.04	783.96	765.16	0.41
5593		3240.00	737.85	745.15		745.43	0.002812	5.11	1197.76	951.06	0.40
5593		3880.00	737.85	745.32		745.62	0.003115	5.50	1358.95	973.07	0.42
5593		4570.00	737.85	745.51		745.82	0.003285	5.78	1541.95	997.48	0.44
5593		5800.00	737.85	745.83		746.15	0.003380	6.09	1872.76	1040.14	0.45
5897		780.00	737.90	743.09		743.35	0.002889	4.09	190.80	52.92	0.38
5897		1670.00	737.90	744.98		745.27	0.002365	4.71	652.31	721.15	0.36
5897		2380.00	737.90	745.54		745.77	0.002076	4.72	1074.93	798.29	0.35
5897		3240.00	737.90	745.93		746.17	0.002221	5.10	1400.15	852.91	0.36
5897		3880.00	737.90	746.18		746.42	0.002331	5.36	1610.73	893.25	0.37
5897		4570.00	737.90	746.40		746.66	0.002439	5.62	1819.77	984.70	0.38
5897		5800.00	737.90	746.76		747.02	0.002554	5.95	2174.81	1029.58	0.40
6048		780.00	738.71	743.48		743.72	0.002041	4.21	199.66	50.06	0.34
6048		1670.00	738.71	745.26		745.74	0.002679	5.99	448.46	344.63	0.41
6048		2380.00	738.71	745.73		746.37	0.003597	7.26	635.65	460.58	0.48
6048		3240.00	738.71	746.10		746.91	0.004623	8.52	836.49	686.32	0.55
6048		3880.00	738.71	746.36		747.18	0.004914	8.99	1022.65	752.05	0.57
6048		4570.00	738.71	746.62		747.42	0.005009	9.27	1233.05	891.66	0.58
6048		5800.00	738.71	747.03		747.70	0.004616	9.21	1633.57	993.37	0.56
6075	Culvert										
6102		780.00	738.86	743.84	741.24	744.08	0.001058	4.03	205.71	46.07	0.32
6102		1670.00	738.86	745.71	742.78	746.15	0.001382	5.69	522.10	432.90	0.38
6102		2380.00	738.86	745.93	743.79	746.67	0.002373	7.62	621.67	506.57	0.50
6102		3240.00	738.86	746.25	746.25	747.29	0.003324	9.28	811.38	676.04	0.60
6102		3880.00	738.86	746.79	746.79	747.63	0.002819	8.96	1245.40	931.31	0.56
6102		4570.00	738.86	747.11	747.11	747.88	0.002730	9.06	1579.59	1069.31	0.56
6102		5800.00	738.86	747.47	747.47	748.24	0.002889	9.59	1980.91	1133.79	0.58
6338		780.00	739.40	744.23		744.56	0.004388	4.62	171.48	80.04	0.46
6338		1670.00	739.40	746.36		746.55	0.001841	4.00	644.25	373.76	0.32
6338		2380.00	739.40	747.02		747.20	0.001661	4.14	926.40	497.91	0.31
6338		3240.00	739.40	747.71		747.87	0.001432	4.16	1392.13	915.31	0.29
6338		3880.00	739.40	748.00		748.16	0.001466	4.34	1672.66	1046.21	0.30
6338		4570.00	739.40	748.25		748.41	0.001525	4.54	1944.93	1130.43	0.31
6338		5800.00	739.40	748.62		748.79	0.001585	4.79	2376.68	1196.91	0.32
6609		780.00	741.50	745.44		745.73	0.004208	4.39	182.36	97.24	0.45
6609		1670.00	741.50	746.92		747.09	0.002173	4.00	650.08	622.03	0.34
6609		2380.00	741.50	747.52		747.65	0.001852	3.80	1054.34	713.83	0.30
6609		3240.00	741.50	748.13		748.24	0.001288	3.63	1523.51	836.94	0.27
6609		3880.00	741.50	748.43		748.54	0.001267	3.73	1778.47	885.25	0.27
6609		4570.00	741.50	748.69		748.80	0.001298	3.89	2011.32	927.18	0.28
6609		5800.00	741.50	749.07		749.20	0.001384	4.18	2373.19	975.49	0.29
6853		780.00	741.70	746.38		746.64	0.003285	4.08	197.92	100.64	0.40
6853		1670.00	741.70	747.47		747.82	0.003667	5.24	520.45	574.86	0.44
6853		2380.00	741.70	747.96		748.26	0.003350	5.38	826.51	679.39	0.43
6853		3240.00	741.70	748.48		748.72	0.002688	5.14	1196.68	726.53	0.39
6853		3880.00	741.70	748.78		749.00	0.002524	5.18	1412.77	754.53	0.39
6853		4570.00	741.70	749.04		749.26	0.002473	5.29	1615.82	779.92	0.38
6853		5800.00	741.70	749.44		749.67	0.002468	5.52	1936.18	818.38	0.39
7010		780.00	743.30	747.32		747.62	0.004342	4.42	180.15	93.89	0.45
7010		1670.00	743.30	748.47		748.88	0.004486	5.39	335.31	227.45	0.48
7010		2380.00	743.30	748.89		749.40	0.005432	6.35	449.67	322.06	0.54
7010		3240.00	743.30	749.23		749.85	0.006528	7.33	606.76	520.47	0.60
7010		3880.00	743.30	749.48		750.12	0.006679	7.68	736.09	534.30	0.61
7010		4570.00	743.30	749.72		750.37	0.006710	7.95	876.66	616.97	0.62
7010		5800.00	743.30	750.12		750.76	0.006528	8.24	1158.97	826.38	0.62
7241		780.00	744.02	748.48		749.01	0.007912	5.85	141.47	86.29	0.61
7241		1670.00	744.02	749.62		750.17	0.006848	6.81	389.41	394.59	0.60

HEC-RAS Plan Adjusted River Unnamed Trib. Reach 1 (Continued)

Reach	Flow	Depth	Velocity	Area	Wetted Perim.	Hydraulic Radius	Friction Coef.	Energy Loss	Water Surface Elev.	Channel Bottom Elev.	Water Surface Slope
7341	2380.00	744.02	750.21					6.37	708.94	764.34	0.52
7341	3240.00	744.02	750.72					5.99	1131.54	900.06	0.47
7341	3880.00	744.02	750.98					6.00	1369.28	929.97	0.46
7341	4570.00	744.02	751.22					6.06	1601.85	963.24	0.45
7341	5800.00	744.02	751.59					6.24	1964.68	1011.70	0.45
7507	780.00	744.42	749.31	746.89	749.40	0.000669		2.80	413.15	292.94	0.24
7507	1670.00	744.42	750.46	748.89	750.56	0.000673		3.29	961.49	717.68	0.25
7507	2380.00	744.42	750.82	749.37	750.95	0.000663		3.89	1229.22	768.27	0.28
7507	3240.00	744.42	751.17	749.84	751.32	0.001064		4.49	1502.46	816.68	0.32
7507	3880.00	744.42	751.39	750.25	751.56	0.001193		4.86	1686.95	847.80	0.34
7507	4570.00	744.42	751.61	750.47	751.80	0.001306		5.20	1877.88	874.50	0.36
7507	5800.00	744.42	751.96	750.79	752.18	0.001472		5.72	2186.81	909.84	0.38
7536											
7536		Culvert									
7554	780.00	744.78	749.60	747.24	749.63	0.000048		1.96	631.55	394.25	0.16
7554	1670.00	744.78	750.49	749.10	750.57	0.000093		3.14	1104.08	716.11	0.23
7554	2380.00	744.78	750.83	749.11	750.95	0.000149		4.01	1361.48	777.89	0.29
7554	3240.00	744.78	751.15	749.11	751.32	0.000212		4.95	1611.02	810.16	0.35
7554	3880.00	744.78	751.36	749.35	751.56	0.000257		5.57	1783.48	831.72	0.38
7554	4570.00	744.78	751.55	749.67	751.80	0.000305		6.19	1949.40	851.96	0.42
7554	5800.00	744.78	751.85	750.19	752.18	0.000391		7.22	2209.92	882.79	0.48
7637	710.00	747.85	751.30	751.30	751.71	0.018716		6.30	225.37	276.16	0.69
7637	1490.00	747.85	751.87	751.87	752.37	0.022048		7.82	407.82	361.88	0.78
7637	2110.00	747.85	752.18	752.18	752.72	0.023091		8.52	528.47	414.24	0.81
7637	2830.00	747.85	752.44	752.44	753.04	0.025249		9.35	640.98	460.65	0.86
7637	3380.00	747.85	752.61	752.61	753.25	0.026515		9.87	722.19	491.42	0.88
7637	3950.00	747.85	752.77	752.77	753.45	0.027789		10.37	800.79	519.48	0.91
7637	4990.00	747.85	753.04	753.04	753.78	0.028867		11.03	947.09	568.02	0.94
8070	690.00	749.40	752.71		752.76	0.001848		1.76	437.91	464.76	0.21
8070	1440.00	749.40	753.27		753.33	0.001576		1.89	785.35	700.54	0.20
8070	2020.00	749.40	753.56		753.64	0.001431		1.93	989.57	739.98	0.20
8070	2700.00	749.40	753.84		753.94	0.001341		1.99	1202.65	777.60	0.19
8070	3210.00	749.40	754.02		754.14	0.001307		2.03	1346.14	794.68	0.19
8070	3720.00	749.40	754.20		754.33	0.001257		2.06	1492.21	828.99	0.19
8070	4710.00	749.40	754.49		754.65	0.001227		2.15	1748.01	816.45	0.19
8376	690.00	749.60	753.22		753.25	0.001400		1.55	622.51	525.13	0.16
8376	1440.00	749.60	753.81		753.86	0.001860		2.03	952.36	590.48	0.20
8376	2020.00	749.60	754.11		754.17	0.002219		2.35	1136.21	627.22	0.22
8376	2700.00	749.60	754.41		754.49	0.002540		2.65	1329.73	669.75	0.24
8376	3210.00	749.60	754.61		754.70	0.002742		2.85	1464.93	701.01	0.25
8376	3720.00	749.60	754.79		754.89	0.002909		3.02	1595.99	730.04	0.26
8376	4710.00	749.60	755.10		755.22	0.003216		3.32	1829.45	778.36	0.27
8509	690.00	749.70	753.44		753.52	0.003623		2.82	411.59	363.48	0.27
8509	1440.00	749.70	754.10		754.22	0.004812		3.66	699.80	518.15	0.32
8509	2020.00	749.70	754.45		754.58	0.005177		4.02	888.26	560.70	0.34
8509	2700.00	749.70	754.79		754.93	0.005431		4.33	1084.33	598.24	0.35
8509	3210.00	749.70	755.01		755.17	0.005545		4.51	1218.21	616.01	0.36
8509	3720.00	749.70	755.21		755.38	0.006625		4.67	1344.36	643.31	0.36
8509	4710.00	749.70	755.55		755.74	0.005780		4.94	1575.73	711.41	0.37
8766	690.00	749.70	754.41		754.47	0.003870		2.58	435.82	436.81	0.27
8766	1440.00	749.70	755.18		755.25	0.003539		2.90	790.33	480.03	0.27
8766	2020.00	749.70	755.59		755.67	0.003685		3.18	990.14	502.76	0.28
8766	2700.00	749.70	755.98		756.08	0.003871		3.47	1192.57	557.33	0.29
8766	3210.00	749.70	756.25		756.36	0.004154		3.74	1358.14	664.07	0.31
8766	3720.00	749.70	756.47		756.59	0.004255		3.91	1508.43	703.88	0.31
8766	4710.00	749.70	756.85		756.99	0.004374		4.16	1791.09	767.17	0.32
9022	690.00	751.00	755.31		755.38	0.003275		2.33	356.67	253.06	0.25
9022	1440.00	751.00	756.10		756.22	0.003919		3.03	599.82	362.97	0.29
9022	2020.00	751.00	756.55		756.70	0.004152		3.38	772.22	410.17	0.30
9022	2700.00	751.00	756.98		757.16	0.004360		3.72	966.68	514.29	0.31
9022	3210.00	751.00	757.30		757.48	0.004327		3.88	1148.53	638.50	0.32
9022	3720.00	751.00	757.55		757.73	0.004417		4.06	1318.25	734.33	0.32
9022	4710.00	751.00	757.96		758.15	0.004504		4.33	1654.83	894.51	0.33
9195	690.00	751.80	755.94		756.02	0.003719		2.88	376.98	286.31	0.28
9195	1440.00	751.80	756.83		756.93	0.003802		3.40	722.93	469.83	0.29

HFC-BAS Plan Adjusted River Unnamed Trib. Reach 1 (Continued)

Reach	River Sta	Q (cfs)	U (ft)	V (ft)	U (ft)	U (ft)	U (ft)	U (ft)	U (ft)	U (ft)	U (ft)
9155		2020.00	751.80	757.30		757.41	0.003753	3.62	952.38	506.44	0.29
9155		2700.00	751.80	757.76		757.88	0.003721	3.84	1201.88	635.54	0.30
9155		3210.00	751.80	758.07		758.19	0.003611	3.93	1423.67	775.68	0.30
9155		3720.00	751.80	758.32		758.44	0.003553	4.02	1625.86	808.95	0.30
9155		4710.00	751.80	758.74		758.86	0.003524	4.19	1976.37	863.61	0.30
9415		620.00	751.85	756.43		756.47	0.001208	1.77	495.52	354.71	0.16
9415		1270.00	751.85	757.37		757.42	0.001365	2.18	849.27	407.60	0.18
9415		1760.00	751.85	757.86		757.93	0.001499	2.44	1059.77	446.06	0.19
9415		2340.00	751.85	758.35		758.42	0.001621	2.69	1314.52	582.01	0.20
9415		2770.00	751.85	758.65		758.73	0.001685	2.84	1499.90	633.14	0.20
9415		3190.00	751.85	758.91		758.99	0.001752	2.98	1668.66	676.34	0.21
9415		4030.00	751.85	759.34		759.43	0.001886	3.23	1978.57	750.44	0.22
9630		620.00	753.70	756.79		756.83	0.002537	1.94	424.71	357.61	0.22
9630		1270.00	753.70	757.72		757.77	0.001982	2.12	786.79	433.22	0.20
9630		1760.00	753.70	758.23		758.28	0.001833	2.24	1023.66	487.34	0.20
9630		2340.00	753.70	758.72		758.78	0.001729	2.35	1269.52	510.75	0.20
9630		2770.00	753.70	759.03		759.09	0.001709	2.45	1429.54	525.54	0.20
9630		3190.00	753.70	759.29		759.36	0.001721	2.55	1571.47	583.18	0.20
9630		4030.00	753.70	759.75		759.82	0.001754	2.73	1890.31	806.01	0.21
9749		620.00	753.70	757.12		757.21	0.005165	3.04	306.01	303.73	0.32
9749		1270.00	753.70	757.96		758.05	0.004044	3.20	612.22	409.79	0.29
9749		1760.00	753.70	758.44		758.53	0.003676	3.31	820.78	447.89	0.29
9749		2340.00	753.70	758.91		759.01	0.003306	3.37	1037.07	469.12	0.28
9749		2770.00	753.70	759.22		759.31	0.003172	3.44	1180.72	486.88	0.27
9749		3190.00	753.70	759.48		759.58	0.003108	3.53	1318.58	569.13	0.27
9749		4030.00	753.70	759.93		760.04	0.003036	3.68	1607.77	711.41	0.27
10005		620.00	756.03	757.78	756.76	757.85	0.001770	2.02	307.06	252.16	0.27
10005		1270.00	756.03	758.59	757.20	758.71	0.002057	2.80	463.85	560.50	0.31
10005		1760.00	756.03	759.06	757.49	759.22	0.002195	3.24	560.74	589.91	0.33
10005		2340.00	756.03	759.51	757.80	759.72	0.002392	3.71	662.99	687.40	0.35
10005		2770.00	756.03	759.81	758.03	760.04	0.002506	4.01	759.36	799.74	0.36
10005		3190.00	756.03	759.92	758.24	760.01	0.001136	2.75	1629.89	845.43	0.25
10005		4030.00	756.03	760.36	758.60	760.45	0.001100	2.91	2024.80	952.63	0.25
10050		Culvert									
10096		620.00	756.37	757.84	757.10	757.93	0.003198	2.41	256.79	206.83	0.35
10096		1270.00	756.37	758.69	757.55	758.84	0.002935	3.13	405.17	229.48	0.36
10096		1760.00	756.37	759.21	757.83	759.41	0.002857	3.54	496.78	240.50	0.37
10096		2340.00	756.37	759.84	758.14	760.07	0.002565	3.83	646.08	434.39	0.36
10096		2770.00	756.37	760.19	758.35	760.44	0.002488	4.03	790.75	655.41	0.36
10096		3190.00	756.37	760.39	758.54	760.67	0.002690	4.33	877.83	707.02	0.38
10096		4030.00	756.37	760.80	758.91	760.99	0.001947	3.93	1417.68	811.71	0.33
10330		620.00	757.40	759.17		759.28	0.012079	2.74	251.85	281.42	0.43
10330		1270.00	757.40	759.84		759.97	0.008977	3.13	474.72	354.27	0.40
10330		1760.00	757.40	760.29		760.42	0.007173	3.22	635.45	362.71	0.37
10330		2340.00	757.40	760.80		760.94	0.005714	3.27	823.73	372.70	0.34
10330		2770.00	757.40	761.13		761.27	0.005208	3.35	946.67	379.06	0.33
10330		3190.00	757.40	761.39		761.54	0.005085	3.48	1045.05	384.10	0.33
10330		4030.00	757.40	761.59		761.81	0.006488	4.08	1123.43	388.06	0.37
10567		550.00	759.00	760.90		760.94	0.004713	1.82	398.03	556.98	0.27
10567		1080.00	759.00	761.34		761.38	0.004424	2.12	667.87	665.93	0.28
10567		1500.00	759.00	761.61		761.66	0.004231	2.27	855.72	721.06	0.28
10567		1960.00	759.00	761.92		761.97	0.003666	2.31	1087.64	783.80	0.26
10567		2300.00	759.00	762.14		762.20	0.003205	2.30	1267.70	809.33	0.25
10567		2700.00	759.00	762.35		762.41	0.002975	2.33	1442.14	822.00	0.24
10567		3370.00	759.00	762.68		762.74	0.002740	2.40	1711.05	841.18	0.24
1079		550.00	759.10	761.68		761.73	0.002858	2.29	342.26	355.81	0.28
1079		1080.00	759.10	762.15		762.22	0.003217	2.76	589.40	797.01	0.31
1079		1500.00	759.10	762.41		762.48	0.003276	2.98	796.86	819.26	0.32
1079		1960.00	759.10	762.65		762.73	0.003237	3.14	999.51	840.41	0.32
1079		2300.00	759.10	762.82		762.90	0.003193	3.23	1138.55	854.63	0.32
1079		2700.00	759.10	763.00		763.08	0.003120	3.32	1296.70	870.51	0.32
1079		3370.00	759.10	763.28		763.38	0.002998	3.44	1548.90	895.26	0.32
11074		550.00	759.80	762.44		762.48	0.002478	1.99	406.18	444.38	0.26
11074		1080.00	759.80	762.98		763.04	0.002636	2.43	653.78	471.44	0.28



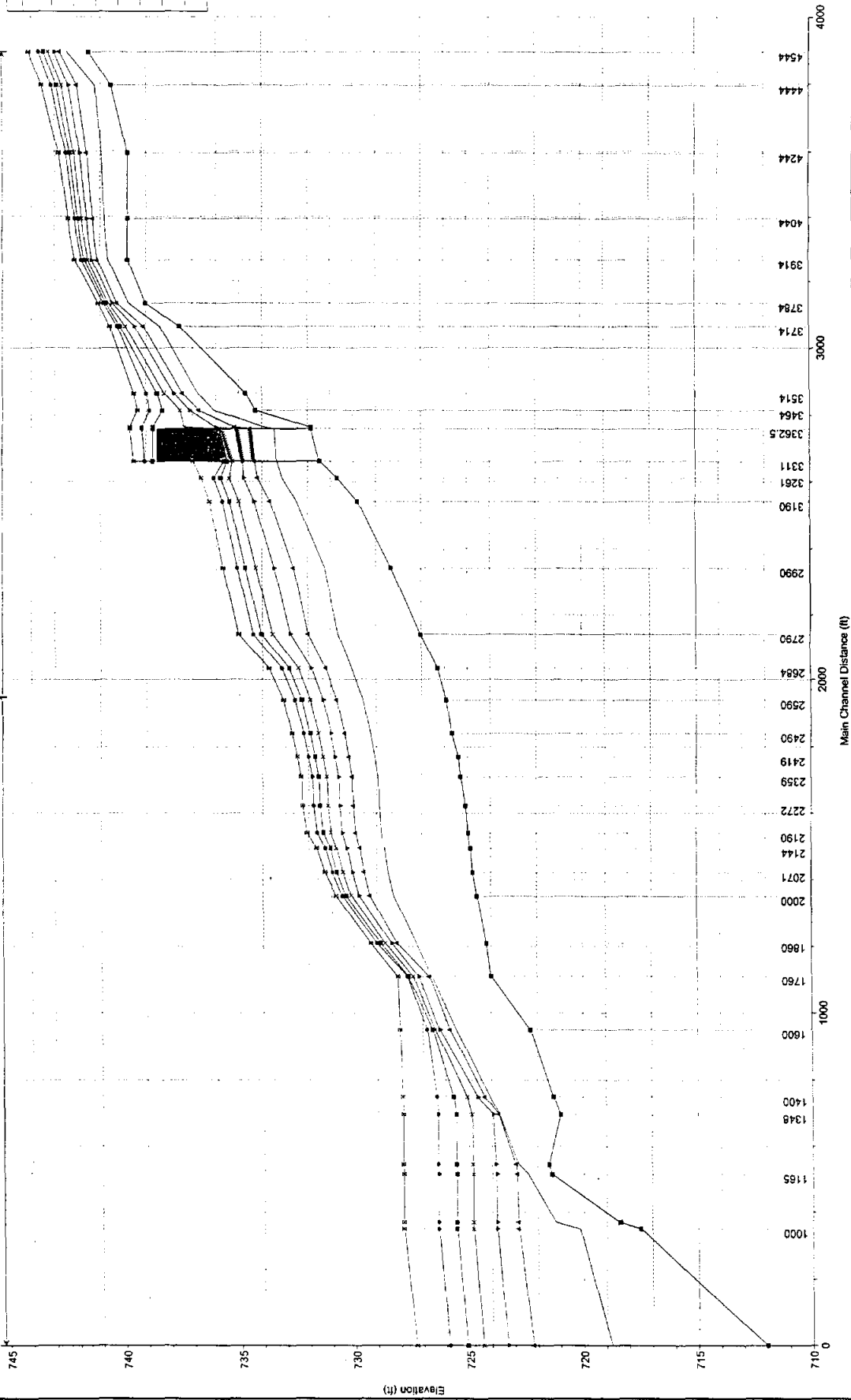


HEC-BAS Plan: Adjusted River Unnamed Trib. Reach: 1 (Continued)

Reach	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
3150	1270.00	766.20	771.31		771.37	0.001458	3.11	829.21	599.32	0.30
3150	1650.00	766.20	771.64		771.71	0.001351	3.19	1039.33	647.76	0.29
3150	1920.00	766.20	771.89		771.95	0.001238	3.19	1202.71	683.06	0.29
3150	2250.00	766.20	772.12		772.18	0.001199	3.26	1364.21	709.59	0.28
3150	2820.00	766.20	772.46		772.53	0.001166	3.39	1612.41	739.68	0.28
3371	480.00	767.00	770.82		770.93	0.002749	3.33	254.55	286.13	0.39
3371	950.00	767.00	771.35		771.48	0.003400	3.96	428.43	367.65	0.44
3371	1270.00	767.00	771.61		771.76	0.003655	4.24	531.88	409.64	0.46
3371	1650.00	767.00	771.92		772.08	0.003657	4.40	669.89	480.79	0.46
3371	1920.00	767.00	772.14		772.29	0.003393	4.41	778.16	516.20	0.45
3371	2250.00	767.00	772.36		772.51	0.003237	4.51	892.90	544.12	0.44
3371	2820.00	767.00	772.68		772.84	0.003089	4.70	1077.78	586.32	0.44

**Seco Creek Tributary  
Existing and Future Conditions  
Water Surface Profile and HECRAS Summary Printouts  
2, 5, 10, 25, 50, 100, & 500-year Storm Events**

Seco Existing Conditions Existing 4/5/99  
 Geom: Existing conditions and Q's



Legend	
.....	WS PF#8
-----	WS PF#6
- . - . -	WS PF#5
▲	WS PF#4
■	WS PF#3
●	WS PF#2
◆	WS PF#1
—	Ground

600  
 100  
 50  
 25  
 10  
 5  
 2

HEC-RAS Plan: Existing River: Seco Creek Trib. Reach: 1

Reach	River Sta	Flow (cfs)	Depth (ft)	Velocity (ft/s)	EC10 (ft)	EC50 (ft)	EC90 (ft)	EC100 (ft)	EC1000 (ft)	EC10000 (ft)	EC100000 (ft)
650		480.00	712.00	718.76	715.33	718.88	0.002944	2.83	169.34	41.11	0.25
650		1820.00	712.00	722.20	718.53	722.40	0.002943	4.02	593.53	290.00	0.27
650		3070.00	712.00	723.30	721.30	723.52	0.002941	4.43	912.63	290.00	0.27
650		4690.00	712.00	724.37	722.43	724.63	0.002942	4.81	1223.02	290.00	0.28
650		5950.00	712.00	725.08	722.86	725.37	0.002940	5.06	1428.91	290.00	0.28
650		7480.00	712.00	725.86	723.27	726.19	0.002941	5.32	1653.36	290.00	0.29
650		10800.00	712.00	727.33	724.02	727.75	0.002946	5.80	2079.69	290.00	0.29
1000		190.00	717.50	720.15	720.07	720.71	0.060236	5.99	31.71	41.70	0.94
1000		380.00	717.50	722.84	720.89	722.85	0.000326	0.76	661.16	490.03	0.08
1000		540.00	717.50	723.79	721.37	723.79	0.000120	0.56	1131.35	504.69	0.05
1000		720.00	717.50	724.82	721.80	724.82	0.000060	0.47	1749.15	621.00	0.04
1000		880.00	717.50	725.54	722.00	725.54	0.000045	0.44	2194.55	621.00	0.03
1000		1010.00	717.50	726.34	722.00	726.34	0.000032	0.40	2690.24	621.00	0.03
1000		1290.00	717.50	727.88	722.01	727.89	0.000020	0.37	3651.11	621.00	0.02
1020		190.00	718.40	721.22	720.78	721.55	0.029427	4.63	41.01	65.21	0.67
1020		380.00	718.40	722.84	721.59	722.85	0.000679	1.06	515.75	469.28	0.11
1020		540.00	718.40	723.79	722.01	723.79	0.000187	0.68	963.23	479.66	0.06
1020		720.00	718.40	724.82	722.17	724.82	0.000085	0.54	1461.22	482.00	0.04
1020		880.00	718.40	725.54	722.27	725.54	0.000063	0.51	1806.84	482.00	0.04
1020		1010.00	718.40	726.34	722.33	726.34	0.000044	0.47	2191.46	482.00	0.03
1020		1290.00	718.40	727.88	722.40	727.89	0.000027	0.43	2937.20	482.00	0.03
1165		190.00	721.40	722.43	722.43	722.74	0.035299	4.54	47.04	322.52	0.93
1165		380.00	721.40	722.91	722.90	722.93	0.001362	1.25	373.36	389.99	0.20
1165		540.00	721.40	723.80	722.90	723.81	0.000346	0.91	774.09	495.00	0.11
1165		720.00	721.40	724.83	722.90	724.83	0.000126	0.71	1280.75	495.00	0.07
1165		880.00	721.40	725.54	722.90	725.55	0.000086	0.67	1634.72	495.00	0.06
1165		1010.00	721.40	726.34	722.90	726.34	0.000056	0.62	2028.90	495.00	0.05
1165		1290.00	721.40	727.88	722.91	727.89	0.000032	0.57	2794.12	495.00	0.04
1195		190.00	721.50	722.85	722.46	722.93	0.012534	2.53	87.01	315.06	0.43
1195		380.00	721.50	722.96	722.85	722.99	0.002725	1.26	286.22	325.46	0.20
1195		540.00	721.50	723.81	722.85	723.83	0.000589	0.84	621.41	458.00	0.10
1195		720.00	721.50	724.83	722.85	724.84	0.000186	0.61	1086.98	458.00	0.06
1195		880.00	721.50	725.54	722.85	725.55	0.000119	0.56	1413.91	458.00	0.05
1195		1010.00	721.50	726.34	722.86	726.35	0.000075	0.51	1778.26	458.00	0.04
1195		1290.00	721.50	727.89	722.88	727.89	0.000041	0.45	2485.97	458.00	0.03
1348		190.00	721.00	723.66	722.66	723.76	0.007680	2.51	75.60	114.21	0.35
1348		380.00	721.00	723.70	723.27	723.82	0.010274	2.93	135.01	116.14	0.41
1348		540.00	721.00	723.95	723.68	724.11	0.011960	3.35	165.86	129.33	0.45
1348		720.00	721.00	724.86	723.69	724.94	0.003677	2.44	321.34	215.52	0.27
1348		880.00	721.00	725.56	723.77	725.61	0.001891	2.05	496.94	278.46	0.20
1348		1010.00	721.00	726.35	723.90	726.38	0.000764	1.50	718.46	286.45	0.13
1348		1290.00	721.00	727.89	724.17	727.91	0.000261	1.08	1181.25	314.92	0.08
1400		190.00	721.30	724.07	723.04	724.19	0.008530	2.78	68.52	79.42	0.38
1400		380.00	721.30	724.29	723.73	724.57	0.018404	4.43	97.59	108.41	0.56
1400		540.00	721.30	724.60	724.35	724.90	0.017589	4.79	137.70	149.16	0.56
1400		720.00	721.30	725.07	724.63	725.28	0.010477	4.20	222.65	210.90	0.45
1400		880.00	721.30	725.67	724.83	725.77	0.004341	3.08	369.84	267.67	0.30
1400		1010.00	721.30	726.39	724.96	726.44	0.001542	2.10	563.84	269.97	0.18
1400		1290.00	721.30	727.90	725.17	727.93	0.000427	1.36	974.42	273.75	0.10
1600		190.00	722.30	725.53	724.28	725.62	0.006100	2.50	75.86	129.50	0.32
1600		380.00	722.30	725.80	724.95	725.85	0.003205	1.92	203.05	142.40	0.24
1600		540.00	722.30	726.27	725.39	726.33	0.003691	2.32	297.43	285.64	0.26
1600		720.00	722.30	726.45	725.60	726.52	0.004062	2.55	347.80	286.70	0.28
1600		880.00	722.30	726.57	725.61	726.66	0.004526	2.77	381.98	287.41	0.29
1600		1010.00	722.30	726.81	725.61	726.89	0.003470	2.57	452.96	288.89	0.26
1600		1290.00	722.30	728.01	725.74	728.05	0.000889	1.62	802.28	296.82	0.14
1760		190.00	724.00	726.60	725.73	726.70	0.007476	2.67	79.32	83.46	0.35
1760		380.00	724.00	726.70	726.52	727.03	0.023162	4.86	88.24	87.52	0.63
1760		540.00	724.00	727.18	726.81	727.46	0.015192	4.60	135.51	107.73	0.53
1760		720.00	724.00	727.42	727.06	727.76	0.016499	5.12	163.10	117.94	0.56
1760		880.00	724.00	727.62	727.25	728.00	0.017044	5.46	187.31	126.22	0.58
1760		1010.00	724.00	727.66	727.40	728.14	0.021056	6.12	191.88	127.72	0.64
1760		1290.00	724.00	728.10	727.68	728.55	0.017699	6.18	257.16	199.49	0.60
1860		150.00	724.20	727.27		727.49	0.007588	3.74	40.10	22.08	0.49
1860		310.00	724.20	728.13		728.52	0.009544	5.06	62.50	50.42	0.57

1850	440.00	724.20	728.38	727.79	728.89	0.011924	6.00	75.96	68.75	0.65
1850	600.00	724.20	728.64	728.64	729.23	0.010814	6.11	98.88	91.90	0.63
1860	730.00	724.20	728.84	728.84	729.46	0.009568	6.00	118.24	107.64	0.60
1860	850.00	724.20	729.01	729.01	729.65	0.008274	5.78	137.77	121.47	0.56
1860	1090.00	724.20	729.29	729.29	729.98	0.006673	5.48	175.05	144.24	0.51
2000	150.00	724.60	728.26		728.32	0.004619	1.92	78.56	46.81	0.25
2000	310.00	724.60	729.31		729.39	0.004019	2.31	141.73	74.00	0.24
2000	440.00	724.60	729.79		729.88	0.004297	2.61	180.12	86.44	0.26
2000	600.00	724.60	730.16		730.28	0.005034	3.01	214.90	110.03	0.28
2000	730.00	724.60	730.38		730.53	0.005654	3.33	242.25	135.83	0.30
2000	850.00	724.60	730.53		730.71	0.006237	3.59	264.91	151.54	0.32
2000	1090.00	724.60	730.79		731.02	0.007307	4.05	306.17	173.62	0.35
2070	150.00	724.80	728.51		728.54	0.002116	1.36	110.46	54.58	0.17
2070	310.00	724.80	729.57		729.62	0.002555	1.78	174.42	66.23	0.19
2070	440.00	724.80	730.08		730.14	0.003061	2.10	209.84	76.73	0.22
2070	600.00	724.80	730.50		730.59	0.003598	2.49	248.60	108.17	0.24
2070	730.00	724.80	730.76		730.88	0.004022	2.76	279.92	128.06	0.26
2070	850.00	724.80	730.96		731.09	0.004431	3.01	306.78	142.93	0.27
2070	1090.00	724.80	731.29		731.46	0.005162	3.43	358.50	167.89	0.30
2170	150.00	724.90	728.67		728.71	0.002539	1.60	93.96	41.34	0.19
2170	310.00	724.90	729.78		729.83	0.003258	2.18	142.00	46.79	0.22
2170	440.00	724.90	730.30		730.41	0.003965	2.61	169.51	57.86	0.25
2170	600.00	724.90	730.76		730.91	0.004925	3.11	199.55	72.80	0.28
2170	730.00	724.90	731.06		731.24	0.005674	3.47	222.51	82.42	0.30
2170	850.00	724.90	731.29		731.50	0.006370	3.78	242.08	89.81	0.33
2170	1090.00	724.90	731.67		731.95	0.007670	4.34	278.87	102.26	0.36
2190	150.00	724.98	728.79		728.82	0.002116	1.33	113.02	57.76	0.17
2190	310.00	724.98	729.92		729.96	0.002421	1.62	191.50	80.47	0.18
2190	440.00	724.98	730.50		730.56	0.002440	1.83	242.25	94.84	0.19
2190	600.00	724.98	731.01		731.08	0.002642	2.10	294.04	107.87	0.20
2190	730.00	724.98	731.35		731.43	0.002825	2.29	331.83	116.46	0.21
2190	850.00	724.98	731.62		731.71	0.003007	2.46	363.66	123.24	0.22
2190	1090.00	724.98	732.07		732.19	0.003444	2.81	426.11	194.35	0.24
2270	150.00	725.10	728.88		728.88	0.000429	0.73	214.97	108.96	0.08
2270	310.00	725.10	730.03		730.04	0.000444	0.94	364.32	150.71	0.09
2270	440.00	725.10	730.62		730.63	0.000480	1.08	458.69	167.61	0.09
2270	600.00	725.10	731.15		731.17	0.000542	1.24	551.81	182.76	0.10
2270	730.00	725.10	731.50		731.53	0.000591	1.36	618.15	192.83	0.10
2270	850.00	725.10	731.78		731.81	0.000636	1.46	673.34	200.82	0.11
2270	1090.00	725.10	732.27		732.31	0.000718	1.64	775.00	213.96	0.12
2350	150.00	725.30	728.93		728.96	0.001966	1.37	109.19	49.98	0.16
2350	310.00	725.30	730.07		730.12	0.002300	1.81	171.34	62.55	0.19
2350	440.00	725.30	730.66		730.73	0.002458	2.11	219.03	99.37	0.20
2350	600.00	725.30	731.19		731.28	0.002657	2.41	280.72	132.61	0.21
2350	730.00	725.30	731.55		731.65	0.002765	2.60	331.79	154.82	0.22
2350	850.00	725.30	731.83		731.94	0.002848	2.75	378.15	172.52	0.22
2350	1090.00	725.30	732.33		732.45	0.002884	2.96	470.46	195.71	0.23
2430	150.00	725.40	729.07		729.10	0.002659	1.45	103.72	54.45	0.18
2430	310.00	725.40	730.22		730.27	0.002511	1.81	172.00	70.87	0.19
2430	440.00	725.40	730.81		730.88	0.002567	2.08	222.46	98.05	0.20
2430	600.00	725.40	731.36		731.44	0.002714	2.37	282.31	122.72	0.21
2430	730.00	725.40	731.72		731.81	0.002818	2.55	329.43	139.10	0.22
2430	850.00	725.40	732.00		732.11	0.002911	2.71	371.07	152.10	0.22
2430	1090.00	725.40	732.50		732.62	0.003030	2.96	451.34	172.15	0.23
2480	150.00	725.69	729.26		729.30	0.003057	1.64	91.26	44.13	0.20
2480	310.00	725.69	730.41		730.47	0.003237	2.07	152.56	71.55	0.22
2480	440.00	725.69	731.01		731.09	0.003215	2.35	203.61	98.82	0.22
2480	600.00	725.69	731.56		731.66	0.003272	2.62	265.12	123.95	0.23
2480	730.00	725.69	731.93		732.04	0.003312	2.80	313.78	140.68	0.24
2480	850.00	725.69	732.22		732.34	0.003358	2.94	356.81	151.62	0.24
2480	1090.00	725.69	732.73		732.86	0.003367	3.16	438.01	169.09	0.25
2560	150.00	725.92	729.58		729.63	0.003436	1.74	86.08	41.39	0.21
2560	310.00	725.92	730.74		730.82	0.003582	2.21	142.21	56.01	0.23
2560	440.00	725.92	731.35		731.45	0.003877	2.55	178.52	64.17	0.24
2560	600.00	725.92	731.91		732.04	0.004314	2.92	216.69	71.75	0.26

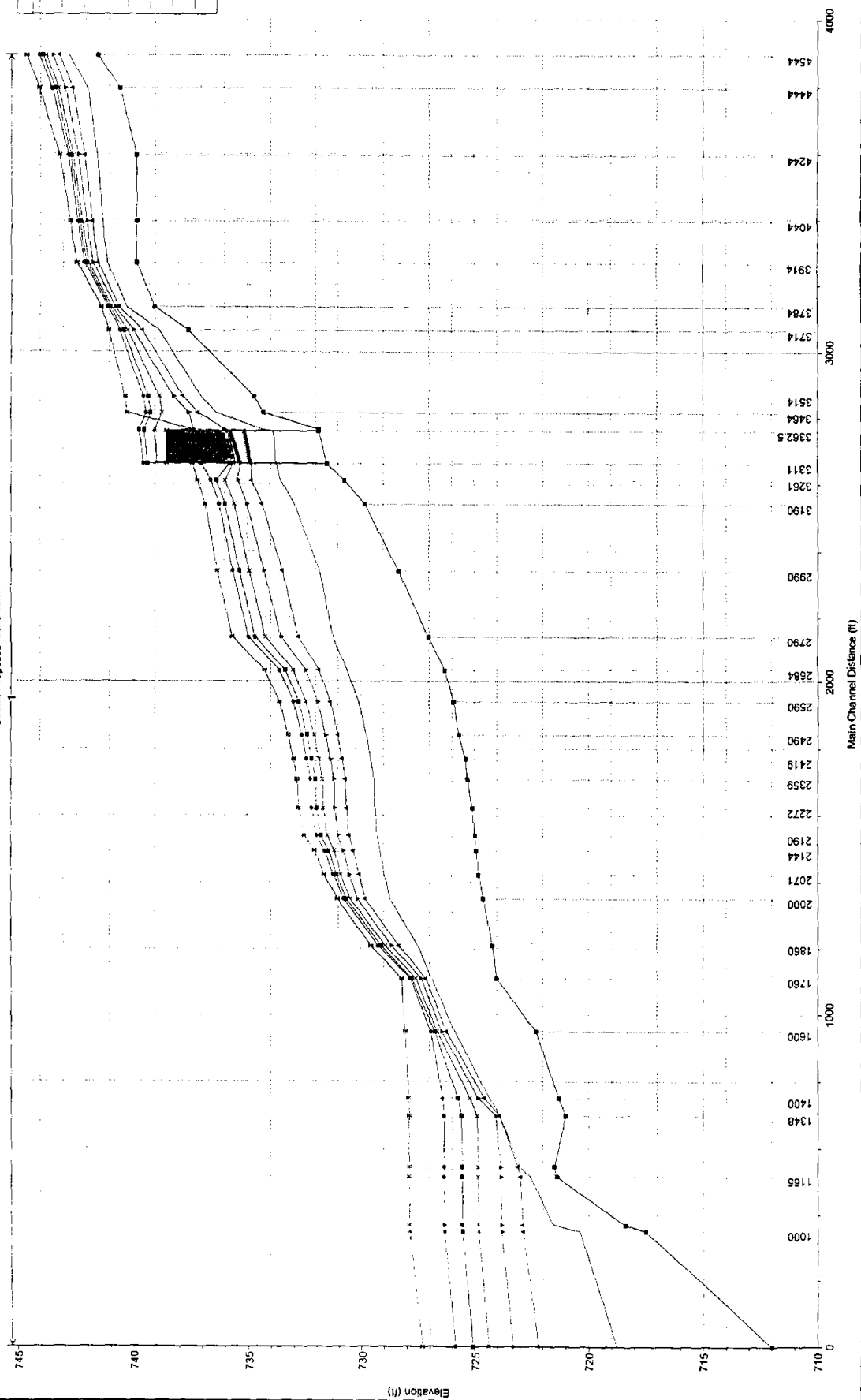
2500	730.00	725.92	732.28		732.43	0.004731	3.20	245.12	81.17	0.28
2500	850.00	725.92	732.58		732.75	0.005100	3.42	270.55	89.80	0.29
2500	1090.00	725.92	733.09		733.30	0.005720	3.81	319.91	104.53	0.31
2684	150.00	726.30	730.09		730.27	0.015679	3.36	44.70	24.54	0.44
2684	320.00	726.30	731.24		731.51	0.016357	4.17	76.80	31.43	0.47
2684	450.00	726.30	731.86		732.19	0.017024	4.62	97.37	35.13	0.49
2684	620.00	726.30	732.44		732.86	0.018224	5.21	119.91	42.44	0.52
2684	750.00	726.30	732.85		733.32	0.018497	5.54	138.16	48.27	0.53
2684	870.00	726.30	733.17		733.69	0.018821	5.82	154.53	52.96	0.54
2684	1130.00	726.30	733.72		734.34	0.020213	6.42	185.89	60.95	0.57
2790	150.00	727.04	730.87		730.71	0.001804	1.49	100.75	37.35	0.16
2790	320.00	727.04	731.99		732.06	0.002411	2.09	153.19	41.98	0.19
2790	450.00	727.04	732.78		732.86	0.003145	2.36	190.48	53.27	0.22
2790	620.00	727.04	733.54		733.65	0.003768	2.63	235.51	64.37	0.24
2790	750.00	727.04	734.03		734.15	0.004050	2.79	268.52	73.30	0.25
2790	870.00	727.04	734.39		734.52	0.004010	2.95	299.87	101.93	0.26
2790	1130.00	727.04	735.03		735.19	0.003960	3.23	382.44	153.63	0.26
2900	150.00	728.34	731.26		731.32	0.005991	2.00	75.01	45.18	0.27
2900	320.00	728.34	732.63		732.70	0.004455	2.15	148.56	64.06	0.25
2900	450.00	728.34	733.48		733.55	0.003725	2.15	208.94	78.85	0.23
2900	620.00	728.34	734.27		734.35	0.003208	2.24	280.72	119.96	0.22
2900	750.00	728.34	734.74		734.82	0.002822	2.31	350.71	175.81	0.21
2900	870.00	728.34	735.09		735.17	0.002643	2.37	418.05	216.34	0.21
2900	1130.00	728.34	735.71		735.79	0.002336	2.46	575.78	289.87	0.20
3190	150.00	729.81	732.50	731.25	732.57	0.006621	2.17	69.21	39.76	0.29
3190	320.00	729.81	733.66	731.94	733.77	0.006282	2.66	120.12	48.42	0.30
3190	450.00	729.81	734.35	732.31	734.48	0.005672	2.89	158.59	72.30	0.29
3190	620.00	729.81	735.02	732.73	735.17	0.005085	3.13	221.29	113.75	0.29
3190	750.00	729.81	735.42	733.03	735.57	0.004846	3.27	271.61	138.31	0.28
3190	870.00	729.81	735.73	733.28	735.89	0.004724	3.39	316.94	157.18	0.28
3190	1130.00	729.81	736.28	733.75	736.45	0.004476	3.57	412.15	181.50	0.28
3261	150.00	730.70	733.13	732.36	733.27	0.015012	3.01	49.88	32.23	0.43
3261	320.00	730.70	734.20	733.02	734.41	0.012729	3.65	88.71	49.52	0.42
3261	450.00	730.70	734.82	733.42	735.04	0.010596	3.89	130.72	87.29	0.40
3261	620.00	730.70	735.44	733.88	735.65	0.008597	3.97	189.06	115.30	0.37
3261	750.00	730.70	735.81	734.24	736.03	0.007912	4.07	226.39	138.39	0.36
3261	870.00	730.70	736.10	734.64	736.33	0.007675	4.20	256.80	156.06	0.36
3261	1130.00	730.70	736.63	735.20	736.89	0.007558	4.51	317.59	186.72	0.36
3311	150.00	731.50	733.36	732.73	733.63	0.003086	4.16	36.02	68.29	0.54
3311	320.00	731.50	734.34	733.53	734.87	0.003435	5.82	54.95	89.51	0.61
3311	450.00	731.50	734.86	734.05	735.60	0.003888	6.93	64.97	100.90	0.67
3311	620.00	731.50	735.31	734.67	736.41	0.004850	8.41	73.69	110.82	0.76
3311	750.00	731.50	735.54	735.09	736.97	0.005822	9.59	78.19	115.95	0.84
3311	870.00	731.50	735.69	735.46	737.48	0.006968	10.74	80.99	119.13	0.93
3311	1130.00	731.50	737.00	737.00	737.11	0.000400	2.75	514.85	216.51	0.23
3414										
3414	150.00	731.86	733.86	733.09	734.09	0.002441	3.88	38.64	44.23	0.48
3414	320.00	731.86	735.17	733.89	735.56	0.002064	5.00	64.03	95.16	0.48
3414	450.00	731.86	736.00	734.41	736.49	0.001940	5.62	80.03	129.91	0.49
3414	620.00	731.86	737.33	735.02	737.87	0.001450	5.86	105.84	228.14	0.44
3414	750.00	731.86	738.71	735.45	738.74	0.000099	1.66	884.76	359.11	0.12
3414	870.00	731.86	739.18	735.82	739.20	0.000092	1.68	1067.30	420.03	0.11
3414	1130.00	731.86	739.70	736.58	739.73	0.000104	1.88	1305.29	488.16	0.12
3464	150.00	734.29	736.08	736.08	736.55	0.014094	5.51	27.22	29.78	1.02
3464	320.00	734.29	736.73	736.73	737.41	0.012168	6.62	48.34	35.89	1.01
3464	450.00	734.29	737.12	737.12	737.91	0.011287	7.13	63.14	39.62	0.99
3464	620.00	734.29	737.53	737.53	738.46	0.010859	7.71	80.46	43.57	1.00
3464	750.00	734.29	738.30	737.81	738.94	0.005481	6.43	120.07	75.52	0.74
3464	870.00	734.29	738.86	738.06	739.36	0.003501	5.76	173.39	128.34	0.61
3464	1130.00	734.29	739.38	738.69	739.89	0.003213	6.01	225.21	176.03	0.58
3514	150.00	734.71	738.75	736.50	737.05	0.007035	4.42	33.93	30.63	0.74
3514	320.00	734.71	737.41	737.17	737.91	0.007782	5.64	56.70	38.23	0.82
3514	450.00	734.71	737.79	737.56	738.40	0.008036	6.25	71.95	42.57	0.85
3514	620.00	734.71	738.21	737.98	738.93	0.007715	6.83	92.36	62.29	0.85

750.00	734.71	738.51	738.32	739.28	0.006973	7.06	115.29	87.67	0.83
870.00	734.71	738.98	738.60	739.60	0.004715	6.48	165.21	126.42	0.70
1130.00	734.71	739.51	739.14	740.08	0.003793	6.44	231.45	170.72	0.64
30.00	737.55	738.39	738.25	738.48	0.007261	2.36	12.71	30.35	0.64
110.00	737.55	739.10		739.20	0.003710	2.54	43.39	56.22	0.51
180.00	737.55	739.49		739.60	0.003013	2.65	67.89	70.35	0.48
260.00	737.55	739.88		739.99	0.002327	2.64	98.56	84.78	0.43
330.00	737.55	740.12		740.24	0.002131	2.76	120.30	104.26	0.42
410.00	737.55	740.24		740.39	0.002484	3.14	133.65	119.30	0.46
600.00	737.55	740.58		740.78	0.002604	3.64	180.87	161.66	0.49
30.00	739.03	739.76	739.76	739.94	0.018871	3.46	8.68	23.93	1.01
110.00	739.03	740.27	740.27	740.50	0.017768	3.89	28.29	62.54	1.02
180.00	739.03	740.48	740.48	740.74	0.017126	4.12	43.65	85.91	1.02
260.00	739.03	740.64	740.64	740.94	0.016758	4.39	59.22	104.40	1.03
330.00	739.03	740.76	740.76	741.08	0.016298	4.57	72.28	117.69	1.03
410.00	739.03	740.87	740.87	741.22	0.015946	4.75	86.38	130.53	1.03
600.00	739.03	741.09	741.09	741.49	0.015169	5.07	118.23	155.68	1.03
30.00	739.80	740.66		740.67	0.002508	0.95	31.72	87.46	0.28
110.00	739.80	741.14		741.17	0.002202	1.24	88.48	146.82	0.28
180.00	739.80	741.38		741.41	0.002277	1.42	126.47	175.68	0.30
260.00	739.80	741.58		741.62	0.002345	1.58	164.84	200.66	0.31
330.00	739.80	741.73		741.77	0.002409	1.69	195.13	218.37	0.32
410.00	739.80	741.87		741.92	0.002477	1.80	227.30	235.72	0.32
600.00	739.80	742.13		742.19	0.002505	2.05	294.83	279.03	0.34
30.00	739.80	740.83		740.83	0.000761	0.67	44.79	84.73	0.16
110.00	739.80	741.35		741.37	0.001188	1.10	100.33	126.54	0.22
180.00	739.80	741.61		741.64	0.001417	1.33	135.82	147.15	0.24
260.00	739.80	741.83		741.87	0.001612	1.52	170.51	164.83	0.26
330.00	739.80	741.99		742.04	0.001753	1.67	197.54	177.39	0.28
410.00	739.80	742.14		742.19	0.001798	1.83	224.53	191.92	0.29
600.00	739.80	742.41		742.48	0.001978	2.19	280.51	219.29	0.31
30.00	739.80	740.95		740.96	0.000550	0.77	38.75	46.17	0.15
110.00	739.80	741.59		741.62	0.001284	1.54	71.60	57.57	0.24
180.00	739.80	741.90		741.97	0.001771	1.98	90.76	63.28	0.29
260.00	739.80	742.17		742.26	0.002155	2.41	108.86	78.04	0.33
330.00	739.80	742.35		742.47	0.002418	2.74	124.52	92.37	0.36
410.00	739.80	742.51		742.66	0.002766	3.10	140.52	105.02	0.39
600.00	739.80	742.82		743.04	0.003469	3.62	176.85	129.22	0.44
30.00	740.52	741.20		741.34	0.025993	2.93	10.26	30.02	0.88
110.00	740.52	742.02		742.10	0.005202	2.23	49.41	65.15	0.45
180.00	740.52	742.39		742.48	0.003876	2.44	73.78	67.90	0.41
260.00	740.52	742.70		742.81	0.003625	2.73	95.18	70.22	0.41
330.00	740.52	742.92		743.06	0.003618	2.97	110.96	71.89	0.42
410.00	740.52	743.14		743.30	0.003696	3.23	126.77	73.52	0.43
600.00	740.52	743.56		743.78	0.003973	3.78	158.64	76.70	0.46
30.00	741.49	742.43		742.48	0.006358	1.76	17.06	37.24	0.46
110.00	741.49	742.78		742.96	0.015412	3.38	32.56	51.85	0.75
180.00	741.49	743.00		743.25	0.017824	4.03	44.66	60.67	0.83
260.00	741.49	743.25		743.53	0.016069	4.25	61.22	71.39	0.81
330.00	741.49	743.45		743.74	0.014203	4.30	76.71	79.99	0.77
410.00	741.49	743.67		743.96	0.012492	4.33	94.75	88.96	0.74
600.00	741.49	744.10		744.39	0.009572	4.39	137.44	117.82	0.67



Seco Fully Developed Conditions 1) Future 7/9/98  
 Geom: Proposed conditions

Legend	
WS PF#7	500
WS PF#6	100
WS PF#5	50
WS PF#4	25
WS PF#3	10
WS PF#2	5
WS PF#1	2
Ground	



Reach	Flow	Water Surface Elevation	Water Surface Elevation	Water Surface Elevation	Water Surface Elevation	Water Surface Elevation	Velocity	Velocity	Velocity	Velocity	Velocity
650	480.00	712.00	718.78	715.33	718.88	0.002944	2.83	169.34	41.11	0.25	
650	1820.00	712.00	722.20	718.53	722.40	0.002943	4.02	593.53	290.00	0.27	
650	3070.00	712.00	723.30	721.30	723.52	0.002941	4.43	912.63	290.00	0.27	
650	4690.00	712.00	724.37	722.43	724.63	0.002942	4.81	1223.02	290.00	0.28	
650	5950.00	712.00	725.08	722.86	725.37	0.002940	5.06	1428.91	290.00	0.28	
650	7480.00	712.00	725.86	723.27	726.19	0.002941	5.32	1653.36	290.00	0.29	
650	10800.00	712.00	727.33	724.02	727.75	0.002946	5.80	2079.69	290.00	0.29	
1000	250.00	717.50	720.39	720.39	721.06	0.066689	6.58	38.02	58.11	1.00	
1000	520.00	717.50	722.86	721.31	722.87	0.000579	1.02	672.53	490.39	0.11	
1000	690.00	717.50	723.80	721.74	723.80	0.000193	0.71	1136.25	504.84	0.06	
1000	900.00	717.50	724.83	722.00	724.83	0.000094	0.58	1752.56	621.00	0.05	
1000	1070.00	717.50	725.54	722.00	725.55	0.000067	0.54	2196.94	621.00	0.04	
1000	1190.00	717.50	726.34	722.01	726.34	0.000044	0.48	2691.79	621.00	0.03	
1000	1540.00	717.50	727.89	722.09	727.89	0.000028	0.44	3652.25	621.00	0.03	
1020	250.00	718.40	721.55	721.08	721.93	0.028604	4.92	50.79	124.63	0.68	
1020	520.00	718.40	722.87	722.01	722.89	0.001184	1.41	527.73	469.56	0.15	
1020	690.00	718.40	723.80	722.15	723.81	0.000300	0.86	968.12	479.77	0.08	
1020	900.00	718.40	724.83	722.27	724.83	0.000133	0.68	1463.90	482.00	0.05	
1020	1070.00	718.40	725.54	722.36	725.55	0.000093	0.62	1808.66	482.00	0.05	
1020	1190.00	718.40	726.34	722.34	726.34	0.000061	0.55	2192.64	482.00	0.04	
1020	1540.00	718.40	727.88	722.57	727.89	0.000039	0.51	2938.00	482.00	0.03	
1150	250.00	721.40	722.57	722.57	722.91	0.032318	4.87	60.01	341.81	0.92	
1150	520.00	721.40	722.99	722.90	723.02	0.002071	1.60	402.00	400.13	0.25	
1150	690.00	721.40	723.82	722.90	723.84	0.000543	1.14	784.12	495.00	0.14	
1150	900.00	721.40	724.84	722.90	724.85	0.000194	0.89	1285.34	495.00	0.09	
1150	1070.00	721.40	725.55	722.91	725.56	0.000126	0.82	1637.68	495.00	0.07	
1150	1190.00	721.40	726.34	722.91	726.35	0.000077	0.73	2030.74	495.00	0.06	
1150	1540.00	721.40	727.89	722.91	727.89	0.000046	0.68	2795.33	495.00	0.05	
1195	250.00	721.50	723.00	722.59	723.11	0.012646	2.77	106.23	329.23	0.44	
1195	520.00	721.50	723.10	723.10	723.14	0.003257	1.48	332.20	345.61	0.22	
1195	690.00	721.50	723.84	723.10	723.86	0.000909	1.05	633.37	458.00	0.13	
1195	900.00	721.50	724.84	723.10	724.85	0.000287	0.76	1092.02	458.00	0.08	
1195	1070.00	721.50	725.55	723.10	725.56	0.000175	0.68	1417.07	458.00	0.06	
1195	1190.00	721.50	726.34	723.10	726.35	0.000103	0.60	1780.13	458.00	0.05	
1195	1540.00	721.50	727.89	723.11	727.89	0.000058	0.54	2487.18	458.00	0.04	
1348	250.00	721.00	723.86	722.88	724.00	0.009428	2.92	85.58	124.90	0.39	
1348	520.00	721.00	723.89	723.61	724.06	0.012633	3.40	157.99	126.10	0.46	
1348	690.00	721.00	724.05	723.89	724.28	0.015594	3.95	179.89	137.35	0.51	
1348	900.00	721.00	724.88	723.89	725.00	0.005503	3.01	326.80	217.97	0.32	
1348	1070.00	721.00	725.57	723.95	725.65	0.002725	2.47	501.02	278.51	0.24	
1348	1190.00	721.00	726.36	724.07	726.40	0.001051	1.76	720.55	286.58	0.15	
1348	1540.00	721.00	727.89	724.39	727.92	0.000371	1.29	1182.38	314.99	0.10	
1400	250.00	721.30	724.33	723.28	724.48	0.008982	3.14	81.79	113.89	0.39	
1400	520.00	721.30	724.57	724.13	724.86	0.017666	4.75	132.79	144.79	0.56	
1400	690.00	721.30	724.83	724.61	725.14	0.016481	4.95	176.43	179.95	0.55	
1400	900.00	721.30	725.20	724.86	725.45	0.012248	4.68	251.71	228.22	0.49	
1400	1070.00	721.30	725.73	724.99	725.86	0.005631	3.56	386.25	267.91	0.34	
1400	1190.00	721.30	726.41	725.10	726.48	0.002068	2.44	569.91	270.03	0.21	
1400	1540.00	721.30	727.91	725.32	727.95	0.000604	1.62	976.71	273.77	0.12	
1600	250.00	722.30	725.88	724.52	726.00	0.006444	2.76	90.42	146.13	0.34	
1600	520.00	722.30	726.24	725.33	726.30	0.003769	2.32	288.03	285.44	0.26	
1600	690.00	722.30	726.45	725.77	726.52	0.003695	2.43	348.89	286.72	0.26	
1600	900.00	722.30	726.65	726.00	726.73	0.003906	2.62	405.95	287.91	0.27	
1600	1070.00	722.30	726.76	726.00	726.86	0.004366	2.84	437.03	288.56	0.29	
1600	1190.00	722.30	726.94	726.01	727.04	0.003755	2.74	489.51	289.65	0.27	
1600	1540.00	722.30	728.06	726.01	728.12	0.001193	1.90	817.71	301.48	0.16	
1760	250.00	724.00	726.90	725.98	727.00	0.006252	2.71	103.09	96.04	0.33	
1760	520.00	724.00	727.16	726.76	727.42	0.014728	4.50	133.26	106.85	0.52	
1760	690.00	724.00	727.36	727.03	727.70	0.017096	5.13	155.87	115.35	0.57	
1760	900.00	724.00	727.59	727.30	728.01	0.018739	5.69	183.84	125.07	0.60	
1760	1070.00	724.00	727.78	727.46	728.24	0.018994	5.99	208.28	132.97	0.61	
1760	1190.00	724.00	727.83	727.57	728.36	0.021619	6.46	214.88	135.03	0.66	
1760	1540.00	724.00	728.21	727.91	728.76	0.020770	6.85	279.63	206.85	0.66	
1860	210.00	724.20	727.51		727.84	0.010313	4.61	45.59	23.05	0.58	
1860	440.00	724.20	728.33	727.80	728.89	0.012767	6.16	73.97	66.36	0.67	

Row	Code	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS
1860	600.00	724.20	728.65	728.65	729.23	0.010731	6.09	99.15	92.14	0.63	
1860	790.00	724.20	728.92	728.92	729.56	0.008892	5.89	127.94	114.72	0.58	
1860	930.00	724.20	729.10	729.10	729.77	0.007764	5.71	149.55	129.10	0.55	
1860	1040.00	724.20	729.23	729.23	729.91	0.006970	5.55	167.16	139.73	0.52	
1860	1380.00	724.20	729.56	729.56	730.30	0.005587	5.27	217.61	166.47	0.47	
2000	210.00	724.60	728.71		728.78	0.004417	2.13	101.95	58.37	0.25	
2000	440.00	724.60	729.80		729.90	0.004204	2.59	181.62	86.89	0.25	
2000	600.00	724.60	730.15		730.28	0.005048	3.02	214.66	109.78	0.28	
2000	790.00	724.60	730.46		730.63	0.005947	3.46	254.22	145.28	0.31	
2000	930.00	724.60	730.63		730.82	0.006556	3.74	279.87	159.90	0.33	
2000	1040.00	724.60	730.74		730.96	0.007071	3.96	298.19	169.58	0.34	
2000	1380.00	724.60	731.03		731.32	0.008536	4.55	351.53	194.44	0.38	
2070	210.00	724.80	728.96		729.00	0.002306	1.54	136.47	59.59	0.18	
2070	440.00	724.80	730.09		730.16	0.003021	2.09	210.74	77.61	0.21	
2070	600.00	724.80	730.49		730.59	0.003603	2.49	248.45	108.07	0.24	
2070	790.00	724.80	730.87		730.99	0.004218	2.89	293.80	135.95	0.26	
2070	930.00	724.80	731.08		731.23	0.004681	3.15	324.51	151.95	0.28	
2070	1040.00	724.80	731.23		731.39	0.005018	3.35	347.96	163.11	0.29	
2070	1380.00	724.80	731.63		731.84	0.005855	3.85	419.66	193.29	0.32	
2110	210.00	724.90	729.14		729.19	0.002831	1.84	113.91	43.69	0.20	
2110	440.00	724.90	730.31		730.42	0.003934	2.61	170.03	58.15	0.25	
2110	600.00	724.90	730.76		730.91	0.004929	3.11	199.48	72.77	0.28	
2110	790.00	724.90	731.18		731.38	0.006017	3.63	232.57	86.29	0.32	
2110	930.00	724.90	731.42		731.66	0.006812	3.97	254.75	94.28	0.34	
2110	1040.00	724.90	731.60		731.86	0.007407	4.23	271.46	99.87	0.35	
2110	1380.00	724.90	732.05		732.40	0.009021	4.90	320.46	113.00	0.40	
2190	210.00	724.98	729.28		729.31	0.002297	1.46	143.59	67.52	0.18	
2190	440.00	724.98	730.51		730.56	0.002420	1.83	242.96	95.03	0.19	
2190	600.00	724.98	731.01		731.08	0.002644	2.10	293.95	107.85	0.20	
2190	790.00	724.98	731.49		731.58	0.002913	2.38	348.16	119.99	0.22	
2190	930.00	724.98	731.78		731.88	0.003122	2.56	383.99	127.37	0.23	
2190	1040.00	724.98	731.98		732.09	0.003277	2.70	410.70	132.61	0.24	
2190	1380.00	724.98	732.53		732.67	0.003568	3.06	535.63	280.59	0.25	
2270	210.00	725.10	729.37		729.38	0.000437	0.82	273.36	127.02	0.08	
2270	440.00	725.10	730.62		730.64	0.000477	1.08	459.81	167.80	0.09	
2270	600.00	725.10	731.15		731.17	0.000543	1.24	551.68	182.74	0.10	
2270	790.00	725.10	731.65		731.67	0.000613	1.41	646.48	196.97	0.11	
2270	930.00	725.10	731.96		731.99	0.000664	1.52	708.28	205.72	0.11	
2270	1040.00	725.10	732.18		732.21	0.000726	1.63	755.75	229.16	0.12	
2270	1380.00	725.10	732.76		732.80	0.000874	1.91	910.76	302.87	0.13	
2350	210.00	725.30	729.42		729.46	0.002109	1.56	134.73	53.67	0.17	
2350	440.00	725.30	730.67		730.74	0.002442	2.11	219.65	99.76	0.20	
2350	600.00	725.30	731.19		731.28	0.002659	2.41	280.64	132.57	0.21	
2350	790.00	725.30	731.70		731.80	0.002807	2.68	355.16	163.98	0.22	
2350	930.00	725.30	732.01		732.12	0.002887	2.84	409.11	183.53	0.23	
2350	1040.00	725.30	732.23		732.35	0.002925	2.95	452.83	202.44	0.23	
2350	1380.00	725.30	732.83		732.96	0.002966	3.19	589.05	252.45	0.24	
2410	210.00	725.40	729.56		729.60	0.002569	1.60	131.59	57.93	0.19	
2410	440.00	725.40	730.82		730.89	0.002552	2.08	222.98	98.29	0.20	
2410	600.00	725.40	731.36		731.44	0.002716	2.37	282.24	122.70	0.21	
2410	790.00	725.40	731.86		731.96	0.002864	2.63	350.52	145.83	0.22	
2410	930.00	725.40	732.18		732.29	0.002991	2.82	398.91	167.03	0.23	
2410	1040.00	725.40	732.40		732.52	0.003062	2.94	439.02	186.33	0.23	
2410	1380.00	725.40	733.00		733.14	0.003189	3.23	565.36	237.06	0.24	
2490	210.00	725.69	729.76		729.81	0.003309	1.83	114.71	50.10	0.21	
2490	440.00	725.69	731.01		731.09	0.003200	2.35	204.03	99.01	0.22	
2490	600.00	725.69	731.56		731.66	0.003274	2.62	265.07	123.93	0.23	
2490	790.00	725.69	732.08		732.19	0.003326	2.87	335.64	146.72	0.24	
2490	930.00	725.69	732.40		732.52	0.003343	3.01	384.79	157.86	0.24	
2490	1040.00	725.69	732.63		732.76	0.003344	3.11	422.48	165.89	0.24	
2490	1380.00	725.69	733.24		733.38	0.003403	3.39	529.45	186.82	0.25	
2560	210.00	725.92	730.10		730.16	0.003569	1.93	108.97	47.32	0.22	
2560	440.00	725.92	731.35		731.45	0.003866	2.55	178.70	64.20	0.24	
2560	600.00	725.92	731.91		732.04	0.004315	2.92	216.67	71.75	0.26	
2560	790.00	725.92	732.44		732.60	0.004918	3.31	257.97	85.64	0.29	



980.00	734.71	739.29	738.87	739.83	0.003854	6.23	203.28	151.94	0.64
1100.00	734.71	739.50	739.10	740.04	0.003684	6.33	229.08	169.14	0.63
1440.00	734.71	740.30	739.49	740.75	0.002443	5.92	331.58	244.79	0.53
100.00	737.55	738.82		739.00	0.009035	3.46	28.92	45.88	0.77
230.00	737.55	739.54		739.70	0.004225	3.20	71.88	72.39	0.57
330.00	737.55	739.94		740.08	0.003340	3.21	102.92	86.64	0.52
440.00	737.55	740.18		740.38	0.003256	3.51	127.17	112.26	0.53
500.00	737.55	740.37		740.58	0.002786	3.50	149.85	135.33	0.49
570.00	737.55	740.53		740.73	0.002570	3.57	173.79	156.04	0.48
880.00	737.55	741.02		741.26	0.002481	4.05	265.12	217.63	0.49
100.00	739.03	740.24	740.24	740.46	0.017266	3.80	26.30	58.83	1.00
230.00	739.03	740.58	740.58	740.87	0.016942	4.30	53.46	97.98	1.03
330.00	739.03	740.76	740.76	741.08	0.016298	4.57	72.28	117.69	1.03
440.00	739.03	740.91	740.91	741.27	0.015607	4.78	92.02	135.32	1.02
500.00	739.03	740.98	740.98	741.36	0.015516	4.91	101.83	143.28	1.03
570.00	739.03	741.06	741.06	741.46	0.015259	5.03	113.40	152.13	1.03
880.00	739.03	741.37	741.37	741.81	0.013785	5.35	164.49	188.26	1.00
100.00	739.80	741.10		741.12	0.002226	1.22	82.03	141.34	0.28
230.00	739.80	741.51		741.55	0.002317	1.52	151.02	192.04	0.30
330.00	739.80	741.73		741.77	0.002409	1.69	195.13	218.37	0.32
440.00	739.80	741.91		741.97	0.002514	1.85	238.33	241.39	0.33
500.00	739.80	742.01		742.06	0.002527	1.91	261.49	267.63	0.33
570.00	739.80	742.09		742.16	0.002509	2.01	285.04	275.73	0.33
880.00	739.80	742.41		742.50	0.002569	2.40	376.93	305.30	0.35
100.00	739.80	741.30		741.32	0.001156	1.06	94.36	122.73	0.21
230.00	739.80	741.76		741.79	0.001543	1.45	158.08	158.73	0.26
330.00	739.80	741.99		742.04	0.001753	1.67	197.54	177.39	0.28
440.00	739.80	742.19		742.24	0.001819	1.89	234.11	196.88	0.29
500.00	739.80	742.28		742.34	0.001853	2.00	253.25	206.42	0.30
570.00	739.80	742.37		742.44	0.001942	2.14	272.45	215.56	0.31
880.00	739.80	742.71		742.82	0.002277	2.65	350.72	249.40	0.35
100.00	739.80	741.53		741.56	0.001209	1.46	68.36	58.55	0.23
230.00	739.80	742.08		742.16	0.002034	2.26	102.17	71.05	0.32
330.00	739.80	742.35		742.47	0.002418	2.74	124.52	92.37	0.36
440.00	739.80	742.57		742.73	0.002888	3.22	146.42	109.31	0.40
500.00	739.80	742.67		742.85	0.003113	3.46	158.13	117.38	0.41
570.00	739.80	742.78		742.99	0.003367	3.71	171.29	125.81	0.43
880.00	739.80	743.17		743.49	0.004278	4.66	226.92	156.55	0.50
100.00	740.52	741.95		742.03	0.005601	2.22	44.99	62.86	0.46
230.00	740.52	742.59		742.70	0.003657	2.62	87.79	69.43	0.41
330.00	740.52	742.92		743.06	0.003618	2.97	110.96	71.89	0.42
440.00	740.52	743.21		743.38	0.003733	3.33	132.28	74.08	0.44
500.00	740.52	743.35		743.54	0.003816	3.50	142.70	75.13	0.45
570.00	740.52	743.50		743.71	0.003924	3.70	154.03	78.25	0.46
880.00	740.52	744.04		744.35	0.004431	4.48	196.71	85.24	0.50
100.00	741.49	742.75		742.91	0.014794	3.25	30.77	50.39	0.73
230.00	741.49	743.15		743.43	0.016917	4.20	54.76	67.48	0.82
330.00	741.49	743.45		743.74	0.014203	4.30	76.71	79.99	0.77
440.00	741.49	743.74		744.03	0.011964	4.33	101.55	82.11	0.73
500.00	741.49	743.88		744.18	0.011052	4.34	115.16	98.12	0.71
570.00	741.49	744.04		744.33	0.010040	4.36	130.84	108.83	0.68
880.00	741.49	744.59		744.90	0.006769	4.55	213.72	193.53	0.59

## **Flood Protection Study for Eagle Pass, Texas Appendix D**

Appendix D presents the Alternatives considered for flood damage reduction. Each of these alternatives are described below. Costs and the value of structures protected are presented in spreadsheets. Costs were computed using March, 1999 price levels. Hydraulic calculations, showing the differences in water surface elevations for the different alternatives for the 100-yr flood event are also included. Sheets showing each Alternative, appear at the end of this Appendix. Appendix D is organized as follows:

### **Alternatives Considered**

### **Alternative Costs and Value of Structures Protected**

### **Comparison of 100-yr Water Surface Elevations for Alternatives Considered**

### **Value of Structures to be protected**

## **Alternatives Considered**

### ***Rio Grande River***

#### **Alternative RO1**

This alternative consists of a buyout of approximately 24 houses and businesses along Ryan Street. Many of these residences were flooded by the storm of August 23-25, 1998 from rainfall resulting from Hurricane Charley. A buyout would involve a displacement and demolition of structures in the flood plain. Sheet 16 shows the structures affected which fall between station 80+00 and 96+00 in the model study. These structures are also located upstream of the International Bridge (US Hwy 57). Structures and land values were estimated at \$40,000 per property in March, 1999 price levels.

### ***Main Arroyo***

#### **Alternative MA1 & TR2.1**

This alternative consists of two phases. Phase one is to divert approximately 800 cfs of flood flows away from the downtown area near the confluence of Tributary 2 and the Main Arroyo near Hidalgo Street to the Rio Grande River. The second phase (identified as TR 2.1) is to extend this 800 cfs diversion to the Sports complex near the High School. Overall, the alternative would include:

- Phase one - A tunnel/conduit 96" in diameter and about 3000 feet long extending from the Rio Grande River to Hidalgo Street (near Trib 2 - Section 1568).
- Phase two - A 96" pipe about 2700 feet long extending from the intersection of Concho Street and Hidalgo Street along Hidalgo Street to the Sports Field near the High School.

This diversion could be constructed for the most part in public right-of-way and would alleviate severe flooding in the downtown area.

Flood reduction to properties downstream of this diversion would occur. From the routings for this alternative, the diversion would keep flood flows in the existing channel. Flood reduction improvements would occur for about 128 residences and businesses. The structures are identified on sheets 2, 3 and 5. The proposed alternative is shown on sheet 21 and 22 at the end of this study.

Improvements from Phase one would be to reduce the 100-year flood levels in Tributary 2 and the Main Arroyo to a 10-year level of flood protection for properties from Hidalgo Street (Section 1756) to Commerce Street (Main Arroyo - Section 4929) and a 25-year level of flood protection for properties from Commerce Street (Section 4929) to the Golf Course (Section 1473). Improvements from Phase two would be to reduce the 100-year flood levels in Tributary 2 from Church Street (Section 150) to Memorial Street (Section 4338).

### ***Tributary 1***

#### **Alternative TR1.1**

This alternative consists of diverting higher flood flows through a 72" diameter conduit from the Travis and Wilson Street intersection (Section 2725) down Wilson Street to Crockett Street (Section 1208). This diversion would take higher flood flows away from flooded homes and discharge it below the affected area.

Approximately 10 residences would be protected from flooding for the 100-yr event. Existing right-of-way constrictions limit channel widening. Sheet 21 shows the proposed alignment of the 72" RCP.

### **Alternative TR1.2**

This alternative consists of channel widening and deepening in some areas and culvert replacement at three locations. The proposed improvements would consist of:

- Channel improvements are widening to 10' and deepening to 4' with a concrete lining from Pierce (Section 893) to Wilson Streets (Section 2427) for approximately 1,500 feet.
- Culvert replacement at Crockett Street (Section 1490 to 1538) from 1-5.8'x16' to 2-9'x10' box culverts.
- Culvert replacement at Wilson Street (Section 2080 to 2125) From 1-5'x20' to 2-9'x10' box culverts.
- Culvert replacement at Travis Streets (Section 2155 to 2197) From 1-6'x18' to 2-8'x8' box culverts.

About 12 residences would be protected from flooding for the 100-year event. Existing right-of-way constrictions limit channel widening. Sheet 21 shows the proposed channel widening and deepening.

### ***Tributary 2***

#### **Alternative TR2.1**

This alternative is Phase Two of MA1 above. Costs associated with it are included with MA1. Essentially, this alternative is to divert most of the excess flood flows away from an existing channel and restore the flood carrying capacity of the channel, thereby, adding additional flood protection to structures located in the area. Sheet 22 and 23 show the limits of Phase Two.

#### **Alternative TR2.2**

This alternative consists of providing a detention pond at a sports field complex behind the existing High School above Memorial Street. The outlet from the detention pond would discharge above Memorial Street and would provide limited flood protection from Memorial (Section 4338) to Trinity Streets (Section 2521). An 1100' long pilot channel would convey low flows to the outlet around the sports field. Sheet 23 shows the limits of this alternative.

Flood reduction improvements would be to reduce flooding in a cemetery immediately downstream of the detention pond west of Memorial and flooding to homes east of Colorado Street. Approximately, 15 homes would be protected for a 25-year flood event.

#### **Alternative TR2.3**

This alternative consists of diverting approximately 500 cfs in culvert from Arlington Street (Section 3562) to Hidalgo Street (Section 1756). This diversion would be a 72" concrete pipe approximately 1800' long. The culvert would extend from the intersection of Concho and Hidalgo to the intersection of Arlington and Hidalgo. It would then turn west along Arlington and continue north along the existing channel to the sports field. A new headwall would be constructed at the sports field to accept storm water runoff. Sheet 22 and 23 show the limits of the proposed culvert.



Flood reduction improvements would provide increased flood protection to residences from Memorial Street downstream to Hidalgo Street. Approximately 52 structures would receive increased flood protection from the 100-year storm event.

#### **Alternative TR2.4**

This alternative consists of channel widening and culvert improvements at seven locations along Tributary 2 from Church Street (Section 150) upstream to Memorial Street (Section 4338). The proposed improvements would consist of:

- Channel improvements are to increase the channel width 10' for approximately 4200 feet providing enough capacity to carry most of the 100-year flow.
- Culvert improvements at First Street (Section 540 to 564) are to add 1 - 4'x10' box culvert to the existing 2- 4'x10' box culverts.
- Culvert improvements at Second Street (Section 1051 to 1103) are to add 1 – 4'x10' box culvert to the existing 2-4'x10' box culverts.
- Culvert improvements at Hidalgo Street (Section 1568 to 1756) are to add 1 – 4'x8' box culvert to the existing 2-4'x8' box culverts.
- Culvert improvements at Trinity Street (Section 2461 to 2521) are to add 1 – 3.5x8' box culvert to the existing 2-3.5'x8' box culverts.
- Culvert improvements at Colorado Street (Section 2821 to 2845) are to add 1 – 4.5'x6' box culvert to the existing 2-4.5'x6' box culverts.
- Culvert improvements at Arlington Street (Section 3562 to 3604) are to add 1 – 4.5'x6' box culvert to the existing 2-4.5'x6' box culverts.
- Culvert improvements at Memorial Street (Section 4338 to 4370) are to add 1 – 4.5'x6' box culvert to the existing 2-4.5'x6' box culverts.

Flood reduction improvements would be to provide a 100-year level of protection to approximately 84 homes located between Church and Memorial Streets.

#### **Alternative TR2.5**

This alternative consists of a combination of TR2.3 and TR2.4.

Flood reduction improvements would provide a higher level of flood protection to 52 homes located between Hidalgo and Memorial Streets. It would provide a 100-year level of protection to 32 homes located between Hidalgo and First Streets.

#### **Alternative TR2.6**

This alternative consists of channelizing approximately 2700 feet of the upper end of Tributary 2 from Bibb Street (Section 6076) to just below Loop 431 or US Highway 277 (Section 8155) and make culvert improvements at North Bibb Street and Royal Haven Drive. Proposed improvements would consist of:

- Construct a concrete channel 15' wide with 2:1 side slopes from the Sports Field (Section 5037) to North Bibb Street (Section 6008). The channel would be approximately 970' long.
- Construct a box culvert at North Bibb Street (Section 6008 to Section 6076) as a 5'x9' box culvert.

- Construct a concrete channel 15' wide with 2:1 side slopes approximately from North Bibb Street (Section 6076) to Royal Haven Drive (Section 6331). The channel would be approximately 250' long.
- Construct a new box culvert at Royal Haven Drive (Section 6331 to 6391) as a 4'x8' box culvert.
- Construct an earthen channel approximately 15' with 4:1 side slopes from Royal Haven (Section 6391) to US Highway 277 (Section 8155). The channel would be approximately 1760' long.

Flood reduction improvements would be to protect approximately 12 homes in the 100-year floodplain. This alternative is shown on sheet 23.

### *Unnamed Tributary*

#### **Alternative UN1**

This alternative consists of providing upstream detention above Cherry Leaf Drive (Section 7554) adjacent to the Learning Center. The outlet from the detention pond would discharge below Cherry Leaf Drive. Some flood protection would be provided to residences downstream of Cherry Leaf Drive and above FM 3443 (Section 5290). Limited flood protection would be provided for storm occurrences between the 25-year and 100-year flood events.

Flood reduction improvements would be to protect approximately 41 homes and 3 businesses presently located in the 100-year floodplain.

#### **Alternative UN2**

This alternative consists of providing upstream detention above US Highway 277 (Section 11814). The outlet from the detention would discharge below US Highway 277. A higher level of flood protection would be provided to properties downstream of US Highway 277 (Section 11814) to FM 1021 El Indio Highway (Section 1242).

Flood reduction improvements would be to provide limited flood protection to approximately 46 homes and 5 businesses presently located in the 100-year floodplain.

#### **Alternative UN3**

This alternative consists of culvert and channel improvements along the lower portion of the Unnamed Tributary from El Indio Highway (Section 1242) to Cherry Leaf Drive (Section 7554). Culvert improvements are proposed at FM 1021, FM 3443, Dell Crest Drive and Cherry Leaf Drive. Proposed improvements would consist of:

- Construct culvert improvements at FM 1021 (Section 1242) by adding 2 -7'x6' concrete box culverts to the existing 5-7'x7' concrete box culverts
- Widen concrete channel from El Indio Highway (Section 1242) to FM 3443 (Section 5227) to a 70' wide channel with 2:1 side slopes. The channel would be approximately 4000' long.
- Construct culvert improvements at FM 3443 (Section 5227 to Section 5290) by adding 2-8'x8' box culverts to the existing 6-8'x8' concrete box culverts.
- Widen concrete channel from FM 3443 (Section 5290) to Dell Crest (Section 6048) to a 70' wide channel with 2:1 side slopes. The channel would be approximately 750' long.

- Construct culvert improvements at Dell Crest Drive (Section 6048 to Section 6102) by adding 2-5'x10' box culverts to the existing 1-4.5x8 concrete box culvert.
- Widen concrete channel from Dell Crest Drive (Section 6102) to Cherry Leaf Drive (Section 7507) to a 60' wide channel with 2:1 side slopes. The channel would be approximately 1400' long.
- Construct culvert improvements at Cherry Leaf Drive (Section 7507 to Section 7554) by adding 3-4'x8' box culverts to the existing 8-4'x4' concrete box culverts.

Flood reduction improvements would be to provide a 100-year level of protection to 213 residences and 15 businesses from FM 1021 to Cherry Leaf Drive.

#### **Alternative UN4**

This alternative consists of a combination of UN2 and UN3. As explained above a combination of upstream detention and downstream channel and culvert improvements would provide for a higher level of flood protection along most of Unnamed Tributary from FM 1021 (Section 1226) to US Highway 277 (Section 11814).

Flood reduction improvements would be to provide a higher level of flood protection to the 213 residences and 15 businesses identified above and protect the Language Development Center and 6 businesses along US Highway 277.

#### ***Seco Creek Tributary***

#### **Alternative SE1**

This alternative consists of constructing an earthen channel from Seco Creek (Section 1000) to US Highway 277 (Section 3311). The earthen channel would be approximately 20' wide with 4:1 side slopes. It would be approximately 2300' long. This alternative is shown on Sheet 25.

Flood reduction improvements would be to provide flood protection to 2 homes and one church downstream of Loop 431.

#### **Alternative SE2**

This alternative consists of constructing a concrete lined channel upstream of US Highway 277 approximately 850 feet. The concrete channel would have to be 8' wide with 2:1 side slopes. This alternative is shown on Sheet 25.

Flood reduction improvements would be to protect 2 businesses and 3 houses located adjacent to the channel.

#### **Alternative SE3**

This alternative consists of constructing upstream detention at the Southern Pacific Railroad embankment (Section 4544). Currently, 2-96" steel pipes discharge storm water at this location. Closing off one of the pipes would provide some detention upstream of the old railroad embankment. Land above the railroad embankment is undeveloped and could easily be used as a detention area.

Flood reduction improvements would be to provide increased flood protection to 2 businesses and 2 homes.

**Alternative SE4**

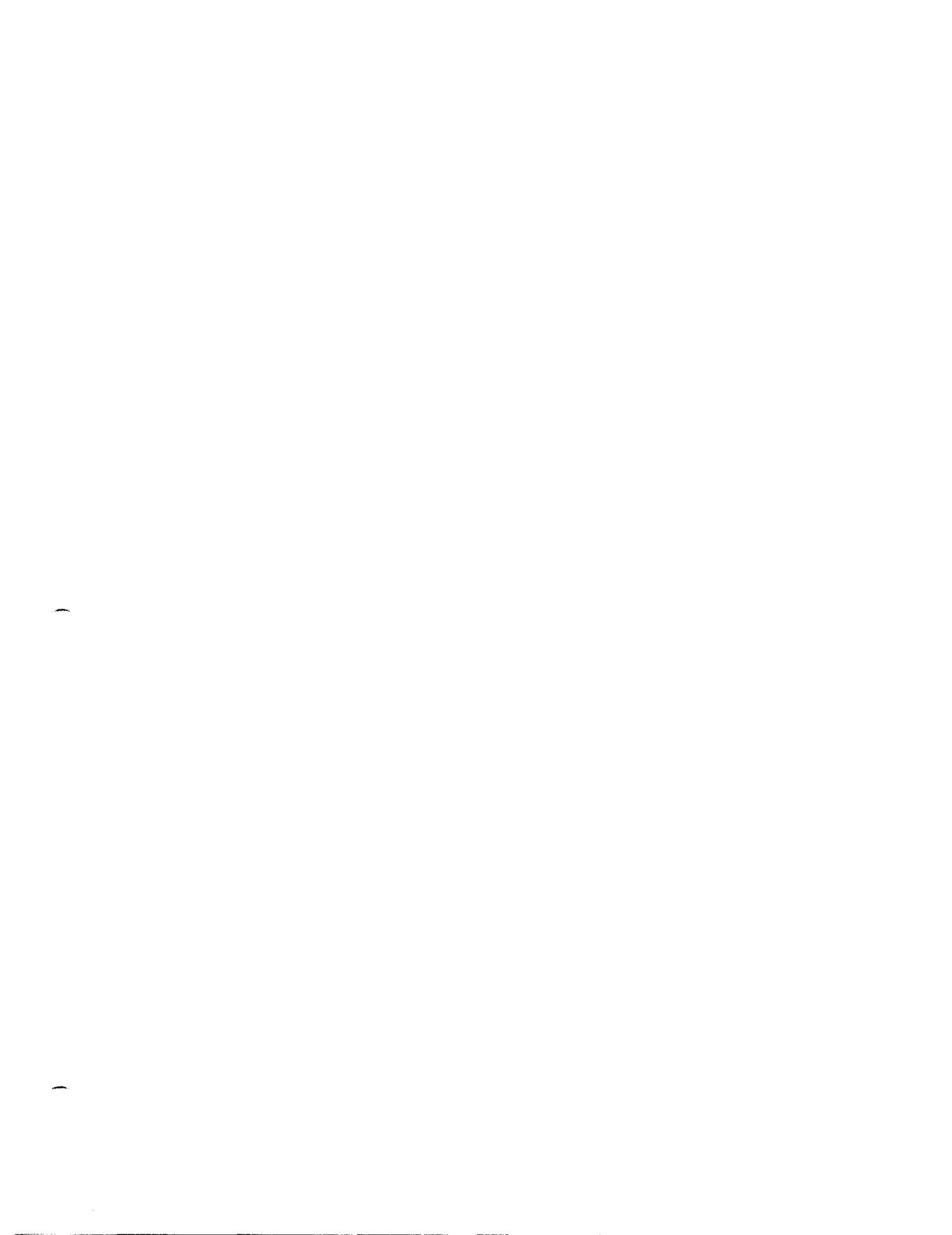
This alternative consists of combining SE1 and SE2, essentially channelizing the Seco Creek Tributary from above US Highway 277 (Section 4044) to its confluence with the main channel of Seco Creek (Section 1000).

Flood reduction improvements would be to provide a 100-year level of flood protection to 2 businesses, 3 homes, a church, and a recycling yard downstream of US Highway 277.

Table 7 – Recommended Implementation Plan

Stream		Alternative	Description	Cost
Rio Grande River	RO1	Existing House Buyout	<ul style="list-style-type: none"> <li>Buyout of existing homes and businesses along Ryan Street.</li> </ul>	\$ 940,000
Main Arroyo	MA1	MA1 - Diversion of 800 cfs to River	<ul style="list-style-type: none"> <li>Diversion of flood flows away from Downtown area near confluence of Tributary 2 and Main Arroyo down Church St. or 1<sup>st</sup> Street. Conduit 8' diameter. About 4000' long.</li> </ul>	\$ 3,181,000
Tributary 1	TR1.2	Channel widening & culvert improvement	<ul style="list-style-type: none"> <li>Channel widening and deepening in same area.</li> </ul>	\$ 636,200
Tributary 2	TR2.1	Diversion of 800 cfs to River away from Downtown area	<ul style="list-style-type: none"> <li>Diversion of flood flows away from Downtown area. Conduit 8' diameter. About 4000' long.</li> </ul>	see MA1
	TR2.4	Channelization and culvert improvements	<ul style="list-style-type: none"> <li>Channel widening and Culvert improvements</li> </ul>	\$ 1,163,150
	TR2.6	Upstream Channelization	<ul style="list-style-type: none"> <li>Widening and deepening channel parallel to Royal Crown Drive w/ culvert improvement</li> </ul>	\$ 137,000
Tributary 3		Existing	<ul style="list-style-type: none"> <li>Do nothing</li> </ul>	
Unnamed Tributary	UN4	Combination of UN2 & UN3	<ul style="list-style-type: none"> <li>Dry Detention above US Hwy 277 Widen and deepen channel between FM 1021 and FM 3443 to Cherry Leaf, add culvert capacity @ 4 locations.</li> </ul>	\$ 1,917,800
Seco Creek Tributary	SE4	Combination of projects SE1, SE2, and SE3	<ul style="list-style-type: none"> <li>Widen and deepen existing channel below US 277, Widen channel upstream of US Hwy 277 Construct Detention Pond upstream of Railroad embankment</li> </ul>	\$ 342,031

**Alternative Costs and  
Value of Protected Structures**



Summary  
**ALBERT H. HALFF ASSOCIATES, INC.**  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 346-6200

CLIENT: City of Eagle Pass FILE: Summary  
 PROJECT: Flood Reduction Alternative DATE: November, 2000  
 AVO: 16739 BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Alternative	Description	Costs	Value of Protected Structures
RO1	Rio Grande River - House buyout	\$ 940,000.00	\$ 780,000.00
MA1	Main Arroyo - Diversion of 800 cfs to River	\$ 3,181,000.00	\$ 4,560,000.00
TR1.1	Diversion in 72" RCP	\$ 388,000.00	\$ 300,000.00
TR1.2	Channel Deepen & Culvert Imp.	\$ 636,200.00	\$ 360,000.00
TR2.1	Diversion of 800 cfs to River	see MA1 above	
TR2.2	Detention @ Sports Field	\$ 167,860.00	\$ 450,000.00
TR2.3	Diversion of 500 cfs	\$ 964,100.00	\$ 1,560,000.00
TR2.4	Channelization & Culvert Improvements	\$ 1,163,150.00	\$ 2,310,000.00
TR2.5	Combination of 2.3 & 2.4	\$ 2,127,250.00	\$ 2,520,000.00
TR2.6	Upstream Channelization parallel to Royal Ridge	\$ 137,000.00	\$ 360,000.00
UN1	Detention @ Learning Center	\$ 707,950.00	\$ 1,680,000.00
UN2	Detention @ above US Hwy 277	\$ 410,800.00	\$ 2,130,000.00
UN3	Channelization & Culvert Improvements	\$ 1,507,000.00	\$ 8,640,000.00
UN4	Combination of UN2 & UN3	\$ 1,917,800.00	\$ 9,660,000.00
SE1	Channel 20' US Hwy 277 to mouth w/ Seco Cr.	\$ 120,933.00	\$ 210,000.00
SE2	Channel 8' wide above US Hwy 277	\$ 106,200.00	\$ 390,000.00
SE3	Detention above Southern Pacific RR	\$ 235,831.00	\$ 360,000.00
SE4	Combination of SE1, SE2, & SE3	\$ 342,031.00	\$ 390,000.00
	Subtotals less all Combinations of Alternatives	\$ 10,666,024.00	\$ 24,090,000.00

Costs and Values are linked to other spreadsheets in file  
 This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

D-10



**Table 6 - Alternative Improvement Plans Considered**

Stream	Problem		Alternative	Description	Cost
Rio Grande River	<ul style="list-style-type: none"> <li>Periodic Flooding from rise in river levels...usually during storms induced by tropical disturbances.</li> <li>Minor flooding along Ryan Street.</li> <li>Lift station closed during high flooding</li> </ul>	RO1	Existing House Buyout	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Buyout of existing homes and businesses along Ryan Street.</li> <li>Shut down lift station periodically</li> </ul>	\$ 940,000
Main Arroyo	<ul style="list-style-type: none"> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of properties adjacent to creek during heavy storm events.</li> </ul>	MA1	Existing MA1 - Diversion of 800 cfs to River  Regular Maintenance	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Diversion of flood flows away from Downtown area near confluence of Tributary 2 and Main Arroyo down Church St. or 1<sup>st</sup> Street. Conduit 8' diameter. About 4000' long.</li> <li>Routine channel clean up and mowing</li> </ul>	\$ 3,181,000
Tributary 1	<ul style="list-style-type: none"> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of structures adjacent to creek.</li> <li>Minor flooding of structures adjacent to creek and traffic disruption during heavy storm events.</li> </ul>	TR1.1	Existing Diversion in 72" RCP	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Diversion thru 72" diameter conduit, from Travis &amp; Wilson intersection to Crockett St.,</li> </ul>	\$ 388,000
		TR1.2	Channel widening & culvert improvement	<ul style="list-style-type: none"> <li>Channel widening and deepening in same area.</li> <li>Routine channel clean up and mowing.</li> </ul>	\$ 636,200
Tributary 2	<ul style="list-style-type: none"> <li>Significant flooding of homes in lower watershed</li> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of structures adjacent to creek in upper watershed.</li> </ul>	TR2.1	Existing Diversion of 800 cfs to River away from Downtown area	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Diversion of flood flows away from Downtown area. Conduit 8' diameter. About 4000' long.</li> </ul>	see MA1
		TR2.2	Detention	<ul style="list-style-type: none"> <li>Construct dry detention pond at Sports Field to reduce flows below Memorial Drive</li> </ul>	\$ 167,860
		TR2.3	Diversion of 500 cfs	<ul style="list-style-type: none"> <li>Diversion of 500 cfs down Hildalgo Street</li> </ul>	\$ 964,100
		TR2.4	Channelization and culvert improvements	<ul style="list-style-type: none"> <li>Channel widening and Culvert improvements</li> </ul>	\$ 1,163,150
		TR2.5	Combination of 2.3 & 2.4	<ul style="list-style-type: none"> <li>Combination</li> </ul>	\$ 2,127,250
		TR2.6	Upstream Channelization	<ul style="list-style-type: none"> <li>Widening and deepening channel parallel to Royal Crown Drive w/ culvert improvement</li> <li>Routine channel clean up and mowing.</li> </ul>	\$ 137,000
Tributary 3	<ul style="list-style-type: none"> <li>Disruption of traffic at low water crossings</li> </ul>		Existing	<ul style="list-style-type: none"> <li>Do nothing</li> </ul>	
Unnamed Tributary	<ul style="list-style-type: none"> <li>Significant flooding of homes in lower portion of watershed</li> <li>Disruption of traffic at low water crossings.</li> <li>Minor flooding of structures adjacent to creek in upper watershed.</li> </ul>	UN1	Existing Detention Pond @ Learning Center	<ul style="list-style-type: none"> <li>Do nothing</li> <li>Dry Detention at Learning Center above Cherry Leaf Drive</li> </ul>	\$ 707,950
		UN2	Detention Pond above US 277	<ul style="list-style-type: none"> <li>Dry Detention above US Hwy 277</li> </ul>	\$ 410,800
		UN3	Channelization and Culvert Improvement	<ul style="list-style-type: none"> <li>Widen and deepen channel between FM 1021 and FM 3443 to Cherry Leaf, add culvert capacity @ 4 locations.</li> </ul>	\$ 1,507,000
		UN4	Combination of UN2 & UN3	<ul style="list-style-type: none"> <li>Combine pond and culvert improvements</li> </ul>	\$ 1,917,800
Seco Creek	<ul style="list-style-type: none"> <li>Minor flooding in lower reaches</li> </ul>	SE1	Existing Channel 20' wide below US 277	<ul style="list-style-type: none"> <li>Do Nothing</li> <li>Widen and deepen existing channel below US 277.</li> </ul>	\$ 120,933
		SE2	Channel 8' wide above US 277	<ul style="list-style-type: none"> <li>Widen channel upstream of US Hwy 277</li> </ul>	\$ 106,200
		SE3	Detention above RR tracks	<ul style="list-style-type: none"> <li>Construct Detention Pond upstream of Railroad embankment</li> </ul>	\$ 235,831
		SE4	Combination of projects	<ul style="list-style-type: none"> <li>Combination of SE1, SE2, SE3, SE4</li> </ul>	\$ 342,031

ALBERT H. HALFF ASSOCIATES, INC.  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: Rio Grande River - RO1 - House Buyout

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Price	Amount
1	Residences	21	Each	\$ 40,000.00	\$ 840,000.00
2	Businesses	1	Each	\$ 100,000.00	\$ 100,000.00
3					
4					
			Subtotal		\$ 940,000.00
			Total		\$ 940,000.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	21	Each	\$ 20,000.00	\$ 420,000.00
2	Residential contents	21	L.S.	\$ 10,000.00	\$ 210,000.00
3	Businesses	1	Each	\$ 100,000.00	\$ 100,000.00
4	Business contents	1	L.S.	\$ 50,000.00	\$ 50,000.00
5	Other	0	Each	\$ -	\$ -
			Total		\$ 780,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 Values for structures were computed at 50% of the structure value protected  
 Values for residential contents were computed at 25% of average structure value  
 Values for business contents were computed at 50% of average structure value

ALBERT H. HALFF ASSOCIATES, INC.  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

CLIENT: City of Eagle Pass FILE: Estimate  
 PROJECT: MA1 - Diverslon of 800 cfs to River November, 2000  
 AVO: 16739 BY: Halff Associates

ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES  
 (Based on March 1999 Price Levels)

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 20,000.00	\$ 25,000.00
2	96" RCP	464	2700	L.F.	\$ 280.00	\$ 756,000.00
3	Street Repair		3200	S.Y.	\$ 40.00	\$ 128,000.00
4	Cement Stabilized Backfill	276	8000	C.Y.	\$ 25.00	\$ 200,000.00
5	Select Fill	134	5000	C.Y.	\$ 3.00	\$ 15,000.00
6	Tunnel and Liner for 96" diameter conduit		3000	L.F.	\$ 500.00	\$ 1,500,000.00
7	Utility Relocations		1	L.S.	\$ 50,000.00	\$ 50,000.00
8	Erosion Controls		1	L.S.	\$ 15,000.00	\$ 15,000.00
9	Traffic Control		1	L.S.	\$ 20,000.00	\$ 20,000.00
10	Jack & Bore under RR tracks	476	150	Ft	\$ 1,200.00	\$ 180,000.00
11	Manholes & Drop Structures		2	Each	\$ 25,000.00	\$ 50,000.00
12	Inlet Structure		1	Each	\$ 25,000.00	\$ 25,000.00
13	Outlet Structure		1	Each	\$ 25,000.00	\$ 25,000.00
14	Land Acquisition		3	Acre	\$ 50,000.00	\$ 150,000.00
15	Drainage Easements		5	Each	\$ 5,000.00	\$ 25,000.00
16	Seeding for Erosion Control		14,000	S.Y.	\$ 0.50	\$ 7,000.00
17	Lift Station restart		1	L.S.	\$ 10,000.00	\$ 10,000.00
			Subtotal			\$ 3,181,000.00
			Total			\$ 3,181,000.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

VALUE OF PROTECTED STRUCTURES  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	122	Each	\$ 20,000.00	\$ 2,440,000.00
2	Residential contents	122	L.S.	\$ 10,000.00	\$ 1,220,000.00
3	Businesses	6	Each	\$ 100,000.00	\$ 600,000.00
4	Business contents	6	L.S.	\$ 50,000.00	\$ 300,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 4,560,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 Values for structures were computed at 50% of the structure value protected  
 Values for residential contents were computed at 25% of average structure value  
 Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

**CLIENT:** City of Eagle Pass **FILE:** Estimate  
**PROJECT:** TR1.1 - Diversion in 72" RCP from Travis to Crockett St. November, 2000  
**AVO:** 16739 **BY:** Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 15,000.00	\$ 15,000.00
2	72" RCP	464	760	L.F.	\$ 240.00	\$ 182,400.00
3	Street Repair		1300	S.Y.	\$ 40.00	\$ 52,000.00
4	Cement Stabilized Backfill	276	1450	CY	\$ 30.00	\$ 43,500.00
5	Utility Relocations		1	L.S.	\$ 20,000.00	\$ 20,000.00
6	Erosion Controls		1	L.S.	\$ 5,000.00	\$ 5,000.00
7	Traffic Control		1	L.S.	\$ 20,000.00	\$ 20,000.00
8	Manholes & Drop Structures		4	Each	\$ 5,000.00	\$ 20,000.00
9	Inlet Structure		1	Each	\$ 7,500.00	\$ 7,500.00
10	Outlet Structure		1	Each	\$ 7,500.00	\$ 7,500.00
11	Land Acquisition		1	Acre	\$ 5,000.00	\$ 5,000.00
12	Drainage Easements		4	Each	\$ 2,500.00	\$ 10,000.00
13	Seeding for Erosion Control		100	S.Y.	\$ 1.00	\$ 100.00
			Subtotal			\$ 388,000.00
			Total			\$ 388,000.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	10	Each	\$ 20,000.00	\$ 200,000.00
2	Residential contents	10	L.S.	\$ 10,000.00	\$ 100,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
		Total			\$ 300,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: TR1.2 - Channel Widen and Culvert replacement

November, 2000

AVO: 16739

BY: Half Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 12,000.00	\$ 12,000.00
2	Select Fill	134	3000	C.Y.	\$ 4.00	\$ 12,000.00
3	Concrete Channel 10' wide rectangular 4' deep		1400	L.F.	\$ 250.00	\$ 350,000.00
4	Culvert Improvement - Crockett - 2 - 8'x8' RBC		1	L.S.	\$ 50,000.00	\$ 50,000.00
5	Culvert Improvement - Wilson - 2 - 9'x10' RBC		1	L.S.	\$ 60,000.00	\$ 60,000.00
6	Culvert Improvement - Travis - 2 - 9'x10' RBC		1	L.S.	\$ 60,000.00	\$ 60,000.00
7	Street Repair		600	S.Y.	\$ 40.00	\$ 24,000.00
8	Cement Stabilized Backfill		100	C.Y.	\$ 30.00	\$ 3,000.00
9	Utility Relocations		1	L.S.	\$ 10,000.00	\$ 10,000.00
10	Erosion Controls		1	L.S.	\$ 5,000.00	\$ 5,000.00
11	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
12	Land Acquisition		1	Acre	\$ 5,000.00	\$ 5,000.00
13	Drainage Easements		20	Each	\$ 2,000.00	\$ 40,000.00
14	Seeding for Erosion Control		200	S.Y.	\$ 1.00	\$ 200.00
						\$ -
			Subtotal			\$ 636,200.00
			Total			\$ 636,200.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	12	Each	\$ 20,000.00	\$ 240,000.00
2	Residential contents	12	L.S.	\$ 10,000.00	\$ 120,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
		Total			\$ 360,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: TR2.2 -Detention @ Sports Field near School

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 10,000.00	\$ 10,000.00
2	Unclassified Excavation	134	5000	C.Y.	\$ 3.00	\$ 15,000.00
3	Compacted Fill		1000	C.Y.	\$ 4.00	\$ 4,000.00
4	10' Low Flow Channel		1100	L.F.	\$ 18.00	\$ 19,800.00
5	Inlet Structure		1	L.S.	\$ 25,000.00	\$ 25,000.00
6	Outlet Structure		1	L.S.	\$ 50,000.00	\$ 50,000.00
7	Street Repair		170	S.Y.	\$ 40.00	\$ 6,800.00
8	Cement Stabilized Backfill		100	C.Y.	\$ 30.00	\$ 3,000.00
9	Utility Relocations		1	L.S.	\$ 5,000.00	\$ 5,000.00
10	Erosion Controls		1	L.S.	\$ 8,000.00	\$ 8,000.00
11	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
12	Land Acquisition		0.20	Acre	\$ 5,000.00	\$ 1,000.00
13	Drainage Easements		2	Each	\$ 4,000.00	\$ 8,000.00
14	Seeding for Erosion Control		14,520	S.Y.	\$ 0.50	\$ 7,260.00
						\$ -
			Subtotal			\$ 167,860.00
			Total			\$ 167,860.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	15	Each	\$ 20,000.00	\$ 300,000.00
2	Residential contents	15	L.S.	\$ 10,000.00	\$ 150,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
		Total			\$ 450,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

ALBERT H. HALFF ASSOCIATES, INC.  
8616 Northwest Plaza Drive  
Dallas, Texas 75225  
(214) 739-0094

CLIENT: City of Eagle Pass FILE: Estimate  
PROJECT: TR2.3 - Diversion of 500 cfs November, 2000  
AVO: 16739 BY: Half Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
(Based on March 1999 Price Levels)

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 10,000.00	\$ 15,000.00
2	72" RCP		2200	L.F.	\$ 240.00	\$ 528,000.00
3	Street Repair		5500	S.Y.	\$ 40.00	\$ 220,000.00
4	Cement Stabilized Backfill		4200	CY	\$ 25.00	\$ 105,000.00
5	Utility Relocations		1	L.S.	\$ 20,000.00	\$ 20,000.00
6	Erosion Controls		1	L.S.	\$ 10,000.00	\$ 10,000.00
7	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
8	Manholes & Drop Structures		4	Each	\$ 3,000.00	\$ 12,000.00
9	Inlet Structure		1	Each	\$ 15,000.00	\$ 15,000.00
10	Outlet Structure		1	Each	\$ 15,000.00	\$ 15,000.00
11	Land Acquisition		2	Acre	\$ 5,000.00	\$ 10,000.00
12	Drainage Easements		2	Each	\$ 4,000.00	\$ 8,000.00
13	Seeding for Erosion Control		2,200	S.Y.	\$ 0.50	\$ 1,100.00
						\$ -
						\$ -
			Subtotal			\$ 964,100.00
			Total			\$ 964,100.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
(Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	52	Each	\$ 20,000.00	\$ 1,040,000.00
2	Residential contents	52	L.S.	\$ 10,000.00	\$ 520,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
		Total			\$ 1,560,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values benefits for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

ALBERT H. HALFF ASSOCIATES, INC.  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

City of Eagle Pass

FILE: Estimate

CT: TR2.4 - Channelization & Culvert Improvements

November, 2000

16739

BY: Half Associates

ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES  
 (Based on March 1999 Price Levels)

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No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
	Mobilization		1	L.S.	\$ 20,000.00	\$ 20,000.00
	Concrete Channel - 10' Nominal width increase	134	4200	L.F.	\$ 150.00	\$ 630,000.00
	Culvert Improvement - First Street		1	L.S.	\$ 20,000.00	\$ 20,000.00
	Culvert Improvement - Second Street		1	L.S.	\$ 20,000.00	\$ 20,000.00
	Culvert Improvement - Hidalgo Street		1	L.S.	\$ 20,000.00	\$ 20,000.00
	Culvert Improvement - Trinity Street		1	L.S.	\$ 20,000.00	\$ 20,000.00
	Culvert Improvement - Colorado Street		1	L.S.	\$ 20,000.00	\$ 20,000.00
	Culvert Improvement - Arlington Street		1	L.S.	\$ 25,000.00	\$ 25,000.00
	Culvert Improvement - Memorial Street		1	L.S.	\$ 25,000.00	\$ 25,000.00
	Street Repair		700	S.Y.	\$ 40.00	\$ 28,000.00
1	Cement Stabilized Backfill		400	CY	\$ 30.00	\$ 12,000.00
2	Utility Relocations		1	L.S.	\$ 50,000.00	\$ 50,000.00
3	Erosion Controls		1	L.S.	\$ 15,000.00	\$ 15,000.00
4	Traffic Control		1	L.S.	\$ 20,000.00	\$ 20,000.00
5	Transitions		3	Each	\$ 20,000.00	\$ 60,000.00
6	Land Acquisition		1.83	Acre	\$ 5,000.00	\$ 9,150.00
7	Drainage Easements		40	Each	\$ 1,000.00	\$ 40,000.00
8	Seeding for Erosion Control		9,000	S.Y.	\$ 1.00	\$ 9,000.00
9	Fence Repair		6,000	L.F.	\$ 20.00	\$ 120,000.00
			Subtotal			\$ 1,163,150.00
			Total			\$ 1,163,150.00

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atement was prepared utilizing standard cost estimate practices. It is understood and I that this is an estimate only, and that Engineer shall not be liable to Owner or to a arty for any failure to accurately estimate the cost of the project, or any part thereof.

VALUE OF PROTECTED STRUCTURES  
 (Based on March 1999 Price Levels)

n No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	77	Each	\$ 20,000.00	\$ 1,540,000.00
2	Residential contents	77	L.S.	\$ 10,000.00	\$ 770,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
		Total			\$ 2,310,000.00

s attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 s for structures were computed at 50% of the structure value protected  
 s for residential contents were computed at 25% of average structure value  
 s for business contents were computed at 50% of average structure value



ALBERT H. HALFF ASSOCIATES, INC.  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: TR2.5 - Combination of 2.3 &amp; 2.4

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Alternative 2.3		1	L.S.	\$ 959,100.00	\$ 964,100.00
2	Alternative 2.4		1	L.S.	\$ 1,163,150.00	\$ 1,163,150.00
3						
				Subtotal		\$ 2,127,250.00
				Total		\$ 2,127,250.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	84	Each	\$ 20,000.00	\$ 1,680,000.00
2	Residential contents	84	L.S.	\$ 10,000.00	\$ 840,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
			Total		\$ 2,520,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 Values for structures were computed at 50% of the structure value protected  
 Values for residential contents were computed at 25% of average structure value  
 Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: TR2.6 - Upstream Channel parallel to Royal Ridge

November, 2000

AVO: 16739

BY: Half Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 10,000.00	\$ 10,000.00
2	Unclassified Excavation	134	5800	L.F.	\$ 5.00	\$ 29,000.00
3	Culvert Improvement - North Bibb Ave.		1	L.S.	\$ 20,000.00	\$ 20,000.00
4	Culvert Improvement - Royal Haven Drive		1	L.S.	\$ 25,000.00	\$ 25,000.00
5	Street Repair		200	S.Y.	\$ 40.00	\$ 8,000.00
6	Cement Stabilized Backfill		100	CY	\$ 30.00	\$ 3,000.00
7	Utility Relocations		1	L.S.	\$ 10,000.00	\$ 10,000.00
8	Erosion Controls		1	L.S.	\$ 5,000.00	\$ 5,000.00
9	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
10	Drainage Easements		10	Each	\$ 1,000.00	\$ 10,000.00
11	Seeding for Erosion Control		12,000	S.Y.	\$ 1.00	\$ 12,000.00
						\$ -
				Subtotal		\$ 137,000.00
				Total		\$ 137,000.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	12	Each	\$ 20,000.00	\$ 240,000.00
2	Residential contents	12	L.S.	\$ 10,000.00	\$ 120,000.00
3	Businesses	0	Each	\$ 100,000.00	\$ -
4	Business contents	0	L.S.	\$ 50,000.00	\$ -
5	Other	0	Each	\$ -	\$ -
			Total		\$ 360,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: UN1 - Detention Pond @ Learning Center

November, 2000

AVO: 16739

BY: Half Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 10,000.00	\$ 10,000.00
2	Unclassified Excavation	134	134000	C.Y.	\$ 3.00	\$ 402,000.00
3	Compacted Fill		650	C.Y.	\$ 3.00	\$ 1,950.00
4	Inlet Structure		1	L.S.	\$ 20,000.00	\$ 20,000.00
5	Outlet Structure		1	L.S.	\$ 25,000.00	\$ 25,000.00
6	10' Concrete Channel		1800	L.F.	\$ 25.00	\$ 45,000.00
7	Street Repair		100	S.Y.	\$ 40.00	\$ 4,000.00
8	Utility Relocations		1	L.S.	\$ 25,000.00	\$ 25,000.00
9	Erosion Controls		1	L.S.	\$ 10,000.00	\$ 10,000.00
10	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
11	Land Acquisition		21	Acre	\$ 5,000.00	\$ 105,000.00
12	Drainage Easements		2	Each	\$ 2,500.00	\$ 5,000.00
13	Seeding for Erosion Control		100,000	S.Y.	\$ 0.50	\$ 50,000.00
						\$ -
			Subtotal			\$ 707,950.00
			Total			\$ 707,950.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	41	Each	\$ 20,000.00	\$ 820,000.00
2	Residential contents	41	L.S.	\$ 10,000.00	\$ 410,000.00
3	Businesses	3	Each	\$ 100,000.00	\$ 300,000.00
4	Business contents	3	L.S.	\$ 50,000.00	\$ 150,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 1,680,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 Values for structures were computed at 50% of the structure value protected  
 Values for residential contents were computed at 25% of average structure value  
 Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: UN2 - Detention Pond above US 277

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 15,000.00	\$ 15,000.00
2	Unclassified Excavation		65000	C.Y.	\$ 3.00	\$ 195,000.00
3	Compacted Fill		100	C.Y.	\$ 3.00	\$ 300.00
4	Inlet Structure		1	L.S.	\$ 20,000.00	\$ 20,000.00
5	Outlet Structure		1	L.S.	\$ 25,000.00	\$ 25,000.00
6	10' Concrete Channel		740	L.F.	\$ 25.00	\$ 18,500.00
8	Utility Relocations		1	L.S.	\$ 30,000.00	\$ 30,000.00
9	Erosion Controls		1	L.S.	\$ 5,000.00	\$ 5,000.00
10	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
11	Land Acquisition		10	Acre	\$ 5,000.00	\$ 50,000.00
12	Drainage Easements		4	Each	\$ 2,000.00	\$ 8,000.00
13	Seeding for Erosion Control		39,000	S.Y.	\$ 1.00	\$ 39,000.00
						\$ -
			Subtotal			\$ 410,800.00
			Total			\$ 410,800.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	46	Each	\$ 20,000.00	\$ 920,000.00
2	Residential contents	46	L.S.	\$ 10,000.00	\$ 460,000.00
3	Businesses	5	Each	\$ 100,000.00	\$ 500,000.00
4	Business contents	5	L.S.	\$ 50,000.00	\$ 250,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 2,130,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties

Values for structures were computed at 50% of the structure value protected

Values for residential contents were computed at 25% of average structure value

Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
 8616 Northwest Plaza Drive  
 Dallas, Texas 75225  
 (214) 739-0094

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT UN3 - Channel &amp; Culvert Improvements

November, 2000

AVO: 16739

BY: Half Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 12,000.00	\$ 12,000.00
2	Unclassified Excavation		22000	C.Y.	\$ 3.00	\$ 66,000.00
3	70' Concrete Channel		3900	L.F.	\$ 200.00	\$ 780,000.00
4	70' to 50' Concrete Channel Transition		700	L.F.	\$ 100.00	\$ 70,000.00
5	50' Concrete Channel - 20' Nominal width increase		1700	L.F.	\$ 50.00	\$ 85,000.00
6	Culvert Improvement - FM 1021		1	L.S.	\$ 60,000.00	\$ 60,000.00
7	Culvert Improvement - FM 3443		1	L.S.	\$ 75,000.00	\$ 75,000.00
8	Culvert Improvement - Del Robles		1	L.S.	\$ 50,000.00	\$ 50,000.00
9	Culvert Improvement - Cherry Leaf		1	L.S.	\$ 50,000.00	\$ 50,000.00
10	Street Repair		2000	S.Y.	\$ 40.00	\$ 80,000.00
11	Cement Stabilized Backfill		2000	CY	\$ 30.00	\$ 60,000.00
12	Utility Relocations		1	L.S.	\$ 25,000.00	\$ 25,000.00
13	Erosion Controls		1	L.S.	\$ 10,000.00	\$ 10,000.00
14	Traffic Control		1	L.S.	\$ 10,000.00	\$ 10,000.00
15	Land Acquisition		4	Acre	\$ 5,000.00	\$ 20,000.00
16	Drainage Easements		20	Each	\$ 2,000.00	\$ 40,000.00
17	Seeding for Erosion Control		14,000	S.Y.	\$ 1.00	\$ 14,000.00
						\$ -
			Subtotal			\$ 1,507,000.00
			Total			\$ 1,507,000.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
 (Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	213	Each	\$ 20,000.00	\$ 4,260,000.00
2	Residential contents	213	L.S.	\$ 10,000.00	\$ 2,130,000.00
3	Businesses	15	Each	\$ 100,000.00	\$ 1,500,000.00
4	Business contents	15	L.S.	\$ 50,000.00	\$ 750,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 8,640,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 Values for structures were computed at 50% of the structure value protected  
 Values for residential contents were computed at 25% of average structure value  
 Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT UN4 - Combination of UN2 &amp; UN3

November, 2000

AVO: 16739

BY: Half Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Price	Amount
1	UN2				\$ 410,800.00
2	UN3				\$ 1,507,000.00
3					
4					
			Subtotal		\$ 1,917,800.00
			Total		\$ 1,917,800.00

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**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	217	Each	\$ 20,000.00	\$ 4,340,000.00
2	Residential contents	217	L.S.	\$ 10,000.00	\$ 2,170,000.00
3	Businesses	21	Each	\$ 100,000.00	\$ 2,100,000.00
4	Business contents	21	L.S.	\$ 50,000.00	\$ 1,050,000.00
5	Other	0	Each	\$ -	\$ -
			Total		\$ 9,660,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT SE1 - Channel 20' wide below US 277 to mouth

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 10,000.00	\$ 10,000.00
2	Demolition		1	L.S.	\$ 25,000.00	\$ 25,000.00
3	Unclassified Exc. - 20' Channel w/ 4:1 side slopes	134	8200	C.Y.	\$ 3.00	\$ 24,600.00
4	Utility Relocations		1	L.S.	\$ 15,000.00	\$ 15,000.00
5	Erosion Controls		1	L.S.	\$ 5,000.00	\$ 5,000.00
6	Land Acquisition		3.20	Acre	\$ 5,000.00	\$ 16,000.00
7	Drainage Easements		5	Each	\$ 2,000.00	\$ 10,000.00
8	Seeding for Erosion Control		15,333	S.Y.	\$ 1.00	\$ 15,333.00
						\$ -
			Subtotal			\$ 120,933.00
			Total			\$ 120,933.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	2	Each	\$ 20,000.00	\$ 40,000.00
2	Residential contents	2	L.S.	\$ 10,000.00	\$ 20,000.00
3	Businesses	1	Each	\$ 100,000.00	\$ 100,000.00
4	Business contents	1	L.S.	\$ 50,000.00	\$ 50,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 210,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
 Values for structures were computed at 50% of the structure value protected  
 Values for residential contents were computed at 25% of average structure value  
 Values for business contents were computed at 50% of average structure value

**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT: SE2 - Channel widening 8' above US 277

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 7,500.00	\$ 7,500.00
2	Unclassified Excavation	134	1000	C.Y.	\$ 5.00	\$ 5,000.00
3	Concrete Channel - 8' Nominal Width		820	L.F.	\$ 40.00	\$ 32,800.00
4	Concrete Transition		1	L.S.	\$ 15,000.00	\$ 15,000.00
5	Utility Relocations		1	L.S.	\$ 20,000.00	\$ 20,000.00
6	Erosion Controls		1	L.S.	\$ 5,000.00	\$ 5,000.00
7	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
8	Land Acquisition		0.38	Acre	\$ 5,000.00	\$ 1,900.00
9	Drainage Easements		6	Each	\$ 2,000.00	\$ 12,000.00
10	Seeding for Erosion Control		2,000	S.Y.	\$ 1.00	\$ 2,000.00
						\$ -
			Subtotal			\$ 106,200.00
			Total			\$ 106,200.00

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**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	3	Each	\$ 20,000.00	\$ 60,000.00
2	Residential contents	3	L.S.	\$ 10,000.00	\$ 30,000.00
3	Businesses	2	Each	\$ 100,000.00	\$ 200,000.00
4	Business contents	2	L.S.	\$ 50,000.00	\$ 100,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 390,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value



**ALBERT H. HALFF ASSOCIATES, INC.**  
**8616 Northwest Plaza Drive**  
**Dallas, Texas 75225**  
**(214) 739-0094**

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT SE3 - Detention Pond above RR tracks

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	TxDOT	Quantity	Units	Unit Price	Amount
1	Mobilization		1	L.S.	\$ 10,000.00	\$ 10,000.00
2	Unclassified Excavation	134	26,666	C.Y.	\$ 3.00	\$ 79,998.00
3	Compacted Fill		2700	C.Y.	\$ 5.00	\$ 13,500.00
4	Inlet Structure		1	L.S.	\$ 20,000.00	\$ 20,000.00
5	Outlet Structure		1	L.S.	\$ 50,000.00	\$ 50,000.00
6	Utility Relocations		1	L.S.	\$ 10,000.00	\$ 10,000.00
7	Erosion Controls		1	L.S.	\$ 10,000.00	\$ 10,000.00
8	Traffic Control		1	L.S.	\$ 5,000.00	\$ 5,000.00
9	Land Acquisition		4	Acre	\$ 5,000.00	\$ 20,000.00
10	Drainage Easements		2	Each	\$ 2,000.00	\$ 4,000.00
11	Seeding for Erosion Control		13,333	S.Y.	\$ 1.00	\$ 13,333.00
						\$ -
			Subtotal			\$ 235,831.00
			Total			\$ 235,831.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
**(Based on March 1999 Price Levels)**

Item No.	Description	Quantity	Units	Unit Values	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	2	Each	\$ 20,000.00	\$ 40,000.00
2	Residential contents	2	L.S.	\$ 10,000.00	\$ 20,000.00
3	Businesses	2	Each	\$ 100,000.00	\$ 200,000.00
4	Business contents	2	L.S.	\$ 50,000.00	\$ 100,000.00
5	Other	0	Each	\$ -	\$ -
		Total			\$ 360,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties

Values for structures were computed at 50% of the structure value protected

Values for residential contents were computed at 25% of average structure value

Values for business contents were computed at 50% of average structure value

ALBERT H. HALFF ASSOCIATES, INC.  
8616 Northwest Plaza Drive  
Dallas, Texas 75225  
(214) 739-0094

CLIENT: City of Eagle Pass

FILE: Estimate

PROJECT SE4 - Combination of SE2 &amp; SE3

November, 2000

AVO: 16739

BY: Halff Associates

**ESTIMATE OF PROBABLE COSTS AND VALUE OF PROTECTED STRUCTURES**  
(Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Price	Amount
1	SE2				\$ 106,200.00
2	SE3				\$ 235,831.00
3					
4					
			Subtotal		\$ 342,031.00
			Total		\$ 342,031.00

This statement was prepared utilizing standard cost estimate practices. It is understood and agreed that this is an estimate only, and that Engineer shall not be liable to Owner or to a third party for any failure to accurately estimate the cost of the project, or any part thereof.

**VALUE OF PROTECTED STRUCTURES**  
(Based on March 1999 Price Levels)

Item No.	Description	Quantity	Units	Unit Benefits	Amount
	Average residential structure value		Each	\$ 40,000.00	\$ -
	Average business structure value		Each	\$ 100,000.00	\$ -
1	Residences	3	Each	\$ 20,000.00	\$ 60,000.00
2	Residential contents	3	L.S.	\$ 10,000.00	\$ 30,000.00
3	Businesses	2	Each	\$ 100,000.00	\$ 200,000.00
4	Business contents	2	L.S.	\$ 50,000.00	\$ 100,000.00
5	Other	0	Each	\$ -	\$ -
			Total		\$ 390,000.00

Values attributable to this alternative depend to a large extent on the level of protection afforded to flooded properties  
Values for structures were computed at 50% of the structure value protected  
Values for residential contents were computed at 25% of average structure value  
Values for business contents were computed at 50% of average structure value

**Comparison of 100-yr Water Surface Elevations  
For Different Alternatives**

Eagle Pass Flood Study  
Main Arroyo & Trib. 3  
Comparison of 100 WSEL - Alt. MA 1 and Existing

XS Section	Existing	Diversion of 100 cfs Alt. MA 1 & 2	Difference
212	691.06	690.70	-0.36
1092	693.48	693.19	-0.29
1112	694.67	694.16	-0.51
1292	696.26	695.84	-0.42
1387	697.45	697.03	-0.42
1443	698.42	698.00	-0.42
1458			
1473	703.61	703.33	-0.28
1483	703.22	702.98	-0.24
1552	704.08	703.76	-0.32
1580	703.34	703.07	-0.27
1589	703.36	703.08	-0.28
1623	704.67	704.31	-0.36
2056	705.83	705.23	-0.60
2446	707.18	706.83	-0.35
2476	708.89	708.24	-0.65
2518	719.11	719.10	-0.01
2547			
2565	722.19	721.97	-0.22
2595	721.87	721.70	-0.17
2745	722.5	722.22	-0.28
2828	722.54	722.26	-0.28
3026	722.79	722.48	-0.31
3376	722.66	722.37	-0.29
3429	722.67	722.38	-0.29
3482	722.77	722.46	-0.31
3512	722.75	722.45	-0.30
3580			
3590	722.86	722.56	-0.30
3643	722.62	722.36	-0.26
4022	723.02	722.67	-0.35
4071	723	722.66	-0.34
4093.5			
4116	723.22	722.84	-0.38
4148	722.98	722.62	-0.36
4267	723.25	722.84	-0.41
4523	723.7	723.25	-0.45
4569	723.67	723.22	-0.45
4591			
4613	723.89	723.56	-0.33
4658	723.67	723.36	-0.31
4862	724.09	723.81	-0.28
4912	724.06	723.80	-0.26
4920.5			
4929	724.04	723.79	-0.25
4979	724.68	724.26	-0.42
5026	724.76	724.33	-0.43
5044.5			
5063	724.76	724.32	-0.44
5279	724.45	724.06	-0.39
5576	724.35	724.07	-0.28
5666	724.29	724.03	-0.26

Eagle Pass Flood Study Main Arroyo & Trib. 3 Comparison of 100 WSEL - Alt. MA 1 and Existing			
Section	Existing	Division of 800 cfs	Difference
5715	723.66	723.64	-0.02
5733.5			
5752	725.47	724.94	-0.53
5811	725.71	725.07	-0.64
6004	725.59	725.01	-0.58
6206	725.87	725.22	-0.65
6259	725.88	725.28	-0.60
6291			
6323	727.82	726.59	-1.23
6375	728.62	727.16	-1.46
6735	728.41	727.09	-1.32
6918	729.49	728.10	-1.39
6951	729.73	728.35	-1.38
6968	729.62	728.08	-1.54
6987			
7006	730.66	729.19	-1.47
7053	731	729.97	-1.03
7149	730.99	729.94	-1.05
7307	731.05	730.00	-1.05
7447	731.23	730.20	-1.03
7628	731.19	730.09	-1.10
7867	730.52	729.86	-0.66
8147	731.24	730.34	-0.90
8484	732.19	731.37	-0.82
8736	734.41	733.21	-1.20
8786	734.6	733.51	-1.09
8807			
8828	734.49	733.41	-1.08
8858	734.43	733.36	-1.07
9088	734.44	733.45	-0.99
9118	735.83	734.67	-1.16
9133	735.84	734.55	-1.29
9156			
9179	736.49	735.96	-0.53
9184	736.5	735.97	-0.53
9231	736.89	735.77	-1.12
9551	739.86	737.84	-2.02
9791	741.87	740.68	-1.19
9837	741.88	740.65	-1.23
9860			
9883	741.88	741.41	-0.47
9933	741.55	741.00	-0.55
10156	741.27	740.89	-0.38
10201	742.66	742.74	0.08
10218.5			
10236	743.86	743.86	0
10286	743.99	743.99	0
10509	744.29	744.29	0
10558	744.66	744.66	0
10575.5			
10593	747.36	747.36	0
10643	747.25	747.25	0
10855	747.17	747.17	0

Eagle Pass Flood Study Main Arroyo & Trib. 3 Comparison of 100 WSEL - Alt. MA 1 and Existing			
WSEL	Existing	Division of 300 cfs	Difference
10905	747.63	747.63	0
10935			
10965	751.17	751.17	0
11015	751.1	751.10	0
11405	753.05	753.05	0
11787	757.93	757.93	0
12170	760.01	760.01	0
12213	760.13	760.13	0
12244			
12275	760.8	760.80	0
12540	762.85	762.85	0
12871	765.82	765.82	0
13159	767.69	767.69	0
13369	768.37	768.37	0
13410	768.92	768.92	0
13434			
13458	768.93	768.93	0
13512	769.49	769.49	0
13571	771.21	771.21	0
13621	771.76	771.76	0
13758	773.34	773.34	0
13857	774.09	774.09	0
13960	775.82	775.82	0
14083	776.94	776.94	0
14183	777.87	777.87	0
14283	779.48	779.48	0
14426	780.18	780.18	0
14526	780.33	780.33	0
14626	781.28	781.28	0
14726	783.54	783.54	0
14788	785.22	785.22	0
14849	786.48	786.48	0
14873			
14897	788.21	788.21	0
14947	788.52	788.52	0
15040	790.14	790.14	0

**Eagle Pass Flood Study  
Tributary 1  
100 Year Water Surface Elevations**

X-Sections	Existing	500 cfs Diversion	Difference	Channelization	Difference
		All 2 S		All 2 S	
0	715.29	715.29	0.00	715.29	0.00
158	717.6	717.60	0.00	717.6	0.00
556	720.97	720.97	0.00	720.97	0.00
581	721.71	721.71	0.00	721.71	0.00
618			0.00		0.00
655	724.91	724.91	0.00	724.91	0.00
705	725.81	725.81	0.00	725.81	0.00
709			0.00		0.00
713	725.82	725.82	0.00	725.82	0.00
733	725.28	725.28	0.00	725.28	0.00
873	726.84	726.84	0.00	725.64	-1.20
893	728.04	728.04	0.00	727.55	-0.49
917			0.00		0.00
941	729.76	729.76	0.00	728.69	-1.07
991	729.31	729.31	0.00	728.69	-0.62
1131	729.94	729.82	-0.12	727.9	-2.04
1208	730.61	729.69	-0.92	728.36	-2.25
1278	731.06	729.60	-1.46	728.8	-2.26
1440	732.82	731.25	-1.57	730.12	-2.70
1490	735.24	732.96	-2.28	732.1	-3.14
1514			0.00		0.00
1538	735.31	733.78	-1.53	733.67	-1.64
1588	735.22	733.76	-1.46	733.64	-1.58
1670	735.18	733.92	-1.26	733.74	-1.44
1819	735.11	733.91	-1.20	733.73	-1.38
1955	734.83	733.85	-0.98	733.68	-1.15
2030	736.99	734.76	-2.23	733.04	-3.95
2080	739.26	736.00	-3.26	735.83	-3.43
2102.5			0.00		0.00
2125	739.36	737.69	-1.67	735.87	-3.49
2155	739.35	737.67	-1.68	735.87	-3.48
2176			0.00		0.00
2197	739.44	737.97	-1.47	735.76	-3.68
2227	739.29	737.64	-1.65	736.21	-3.08
2427	739.43	738.74	-0.69	738.74	-0.69
2508	740.68	740.68	0.00	740.68	0.00

Eagle Pass Flood Study  
Tributary 2

100 - Year Water Surface Elevations

X-Section#	Existing	Detention	Difference	Diversion	Difference	Channelization	Difference	Diversion and Channelization	Difference	800 CFS	Diversion	Difference	UIS Channelization	Difference
	Alt 2.0	Alt 2.0		Alt 2.0		Alt 2.0		Alt 2.0		Alt 2.0	Alt 2.0		Alt 2.0	
2	742.08	741.90	-0.18	742.08	0.00	741.28	-0.80	741.28	-0.80	739.94	-2.14	742.08	0.00	
150	742.20	742.40	0.20	742.21	0.01	742.25	0.05	742.25	0.05	741.85	-0.35	742.20	0.00	
465	745.07	744.93	-0.14	745.07	0.00	744.52	-0.55	744.52	-0.55	743.17	-1.90	745.07	0.00	
540	745.88	745.79	-0.09	745.88	0.00	745.54	-0.34	745.54	-0.34	743.64	-2.24	745.88	0.00	
564			0.00		0.00		0.00		0.00		0.00		0.00	
588	746.25	746.13	-0.12	746.25	0.00	745.47	-0.78	745.47	-0.78	744.04	-2.21	746.25	0.00	
638	746.23	746.13	-0.10	746.23	0.00	745.60	-0.63	745.60	-0.63	746.45	0.22	746.23	0.00	
935	747.22	747.05	-0.17	747.22	0.00	746.87	-0.35	746.87	-0.35	746.55	-0.67	747.22	0.00	
1051	747.33	747.13	-0.20	747.33	0.00	746.65	-0.68	746.65	-0.68	746.42	-0.91	747.33	0.00	
1077			0.00		0.00		0.00		0.00		0.00		0.00	
1103	748.28	748.14	-0.14	748.28	0.00	747.91	-0.37	747.90	-0.38	747.43	-0.85	748.28	0.00	
1533	749.48	749.23	-0.25	749.48	0.00	748.82	-0.66	748.82	-0.66	748.34	-1.14	749.48	0.00	
1568	749.63	749.63	0.00	749.63	0.00	748.86	-0.77	748.86	-0.77	749.13	-0.50	749.63	0.00	
1662			0.00		0.00		0.00		0.00		0.00		0.00	
1756	751.04	751.04	0.00	753.26	2.22	753.98	2.94	750.16	-0.88	749.85	-1.19	751.04	0.00	
1811	751.31	751.31	0.00	753.25	1.94	753.97	2.66	750.47	-0.84	750.06	-1.25	751.31	0.00	
2411	754.38	754.38	0.00	753.91	-0.47	754.11	-0.27	752.66	-1.72	752.52	-1.86	754.38	0.00	
2461	754.59	754.59	0.00	754.19	-0.40	754.40	-0.19	753.17	-1.42	753.24	-1.35	754.59	0.00	
2491			0.00		0.00		0.00		0.00		0.00		0.00	
2521	754.71	754.71	0.00	754.33	-0.38	754.54	-0.17	753.62	-1.09	753.64	-1.07	754.71	0.00	
2566	755.27	755.27	0.00	754.73	-0.54	754.86	-0.41	753.67	-1.60	753.61	-1.66	755.27	0.00	
2801	756.22	756.12	-0.10	755.81	-0.41	755.98	-0.24	754.33	-1.89	754.28	-1.94	756.22	0.00	
2831	756.66	756.53	-0.13	756.15	-0.51	756.22	-0.44	756.14	-0.52	754.31	-2.35	756.66	0.00	
2853			0.00		0.00		0.00		0.00		0.00		0.00	
2875	756.82	756.72	-0.10	756.35	-0.47	756.65	-0.17	754.98	-1.84	755.51	-1.31	756.82	0.00	
2907	756.75	756.68	-0.07	756.37	-0.38	756.84	0.09	757.12	0.37	756.44	-0.31	756.75	0.00	
3527	760.33	760.19	-0.14	758.77	-1.56	758.86	-1.47	757.59	-2.74	757.54	-2.79	760.33	0.00	
3562	761.09	760.90	-0.19	760.69	-0.40	760.99	-0.10	758.03	-3.06	757.60	-3.49	761.09	0.00	
3583			0.00		0.00		0.00		0.00		0.00		0.00	
3604	761.11	760.92	-0.19	759.24	-1.87	761.02	-0.09	759.08	-2.03	759.21	-1.90	761.11	0.00	
3648	761.10	760.99	-0.11	762.43	1.33	761.02	-0.08	759.98	-1.12	760.51	-0.59	761.10	0.00	
3984	762.82	762.38	-0.44	762.85	0.03	762.56	-0.26	762.56	-0.26	762.85	0.03	762.82	0.00	
4307	764.19	764.31	0.12	764.19	0.00	763.07	-1.12	763.07	-1.12	764.19	0.00	764.19	0.00	
4338	764.74	765.29	0.55	764.74	0.00	764.74	0.00	764.74	0.00	764.74	0.00	764.74	0.00	
4354			0.00		0.00		0.00		0.00		0.00		0.00	
4370	765.08	766.90	1.82	765.08	0.00	765.08	0.00	765.08	0.00	765.08	0.00	765.08	0.00	
4456	767.49	767.04	-0.45	767.49	0.00	767.49	0.00	767.49	0.00	767.49	0.00	767.49	0.00	
4658	767.60	767.30	-0.30	767.60	0.00	767.60	0.00	767.60	0.00	767.60	0.00	767.60	0.00	
4751	767.70	767.53	-0.17	767.70	0.00	767.70	0.00	767.70	0.00	767.70	0.00	767.70	0.00	
5037	769.59	769.59	0.00	769.59	0.00	769.59	0.00	769.59	0.00	769.59	0.00	769.59	0.00	
5271	773.04	773.06	0.02	773.04	0.00	773.04	0.00	773.04	0.00	773.04	0.00	772.59	-0.45	
5471	774.91	774.92	0.01	774.91	0.00	774.91	0.00	774.91	0.00	774.91	0.00	774.13	-0.78	
5671	775.75	775.77	0.02	775.75	0.00	775.75	0.00	775.75	0.00	775.75	0.00	774.79	-0.96	
5862	776.47	776.49	0.02	776.47	0.00	776.47	0.00	776.47	0.00	776.47	0.00	775.45	-1.02	
5947	776.88	776.91	0.03	776.88	0.00	776.88	0.00	776.88	0.00	776.88	0.00	775.43	-1.45	
6038	778.47	778.47	0.00	778.47	0.00	778.47	0.00	778.47	0.00	778.47	0.00	775.60	-2.87	
6042			0.00		0.00		0.00		0.00		0.00		0.00	
6076	779.71	779.73	0.02	779.71	0.00	779.71	0.00	779.71	0.00	779.71	0.00	777.96	-1.75	
6130	779.80	779.82	0.02	779.79	-0.01	779.79	-0.01	779.79	-0.01	779.80	0.00	778.48	-1.32	
6235	780.09	780.10	0.01	780.09	0.00	780.09	0.00	780.09	0.00	780.09	0.00	778.63	-1.46	
6331	780.53	780.54	0.01	780.53	0.00	780.53	0.00	780.53	0.00	780.53	0.00	779.05	-1.48	
6391	780.59	780.60	0.01	780.59	0.00	780.59	0.00	780.59	0.00	780.59	0.00	779.07	-1.52	
6491	780.71	780.72	0.01	780.71	0.00	780.71	0.00	780.71	0.00	780.71	0.00	779.14	-1.57	

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Eagle Pass Flood Study

Tributary 2

100 - Year Water Surface Elevations

Section	Existing	Detention	Difference	Diversion	Difference	Channelization	Difference	Diversion and Channelization	Difference	900-CFS Diversion	Difference	U/S Channelization	Difference
6691	781.26	781.25	-0.01	781.26	0.00	781.26	0.00	781.26	0.00	781.26	0.00	779.94	-1.32
6891	782.49	782.49	0.00	782.49	0.00	782.49	0.00	782.49	0.00	782.49	0.00	782.14	-0.35
7091	783.97	783.97	0.00	783.97	0.00	783.97	0.00	783.97	0.00	783.97	0.00	783.76	-0.21
7291	786.00	786.00	0.00	786.00	0.00	786.00	0.00	786.00	0.00	786.00	0.00	786.03	0.03
7491	788.07	788.07	0.00	788.07	0.00	788.07	0.00	788.07	0.00	788.07	0.00	788.13	0.06
7691	790.75	790.75	0.00	790.75	0.00	790.75	0.00	790.75	0.00	790.75	0.00	790.60	-0.15
7891	793.41	793.41	0.00	793.41	0.00	793.41	0.00	793.41	0.00	793.41	0.00	792.94	-0.47
7991	795.46	795.46	0.00	795.46	0.00	795.46	0.00	795.46	0.00	795.46	0.00	794.09	-1.37
8091	797.01	797.01	0.00	797.01	0.00	797.01	0.00	797.01	0.00	797.01	0.00	795.19	-1.82
8155	798.72	798.72	0.00	798.72	0.00	798.72	0.00	798.72	0.00	798.72	0.00	798.72	0.00

Eagle Pass Flood Study  
 Unnamed Tributary to the Rio Grande  
 100-Year Water Surface Elevations

Station	50' Channel		Difference	Ult. Det.		Difference	50' Channel		Difference	50' Channel		Difference	Ult. Det.		Difference
	Elev.	Alt. Elev.		Elev.	Alt. Elev.		Elev.	Alt. Elev.		Elev.	Alt. Elev.				
0	730.27	730.18	-0.09	729.81	-0.46	730.25	-0.02	730.25	-0.02	729.81	-0.46	729.81	-0.46		
295	730.97	730.88	-0.09	730.52	-0.45	730.95	-0.02	730.95	-0.02	730.52	-0.45	730.52	-0.45		
600	731.78	731.68	-0.10	731.30	-0.48	731.77	-0.01	731.77	-0.01	731.30	-0.48	731.30	-0.48		
900	732.59	732.48	-0.11	732.03	-0.56	732.57	-0.02	732.57	-0.02	732.03	-0.56	732.03	-0.56		
1107	733.27	733.17	-0.10	732.74	-0.53	733.26	-0.01	733.26	-0.01	732.74	-0.53	732.74	-0.53		
1175	733.64	733.54	-0.10	733.08	-0.56	733.63	-0.01	733.47	-0.17	733.08	-0.56	732.91	-0.73		
1208.5			0.00		0.00		0.00		0.00		0.00		0.00		
1242	733.62	733.55	-0.07	731.73	-1.89	733.21	-0.41	732.95	-0.67	732.73	-0.89	732.93	-0.69		
1326	733.93	733.83	-0.10	734.99	1.06	733.16	-0.77	732.96	-0.97	732.86	-1.07	732.96	-0.97		
1583	734.52	734.41	-0.11	735.05	0.53	734.55	0.03	733.83	-0.69	733.43	-1.09	733.23	-1.29		
1702	734.60	734.49	-0.11	735.07	0.47	734.49	-0.11	733.73	-0.87	733.36	-1.24	733.18	-1.42		
1953	734.82	734.79	-0.03	735.09	0.27	734.83	0.01	732.60	-2.22	732.66	-2.16	732.92	-1.90		
2211	736.10	736.01	-0.09	735.46	-0.64	735.28	-0.82	733.18	-2.92	732.69	-3.41	732.94	-3.16		
2352	736.58	736.49	-0.09	735.95	-0.63	736.04	-0.54	733.88	-2.70	733.33	-3.25	732.78	-3.80		
2561	737.22	737.13	-0.09	736.70	-0.52	736.86	-0.36	735.60	-1.62	734.56	-2.66	733.72	-3.50		
2791	737.65	737.54	-0.11	737.03	-0.62	736.49	-1.16	735.55	-2.10	734.75	-2.90	734.37	-3.28		
3055	738.31	738.19	-0.12	737.59	-0.72	737.37	-0.94	736.32	-1.99	735.77	-2.54	735.04	-3.27		
3444	739.48	739.34	-0.14	738.63	-0.85	737.88	-1.60	737.06	-2.42	736.60	-2.88	735.66	-3.82		
3687	739.72	739.58	-0.14	738.88	-0.84	739.32	-0.40	738.40	-1.32	737.91	-1.81	736.69	-3.03		
3902	740.05	739.89	-0.16	739.15	-0.90	739.17	-0.88	738.26	-1.79	737.86	-2.19	737.06	-2.99		
4106	740.83	740.77	-0.06	739.79	-1.04	738.51	-2.32	738.22	-2.61	737.89	-2.94	737.09	-3.74		
4205	741.35	741.31	-0.04	740.51	-0.84	738.63	-2.72	738.27	-3.08	737.92	-3.43	737.12	-4.23		
4470	742.37	742.32	-0.05	741.41	-0.96	738.97	-3.40	738.33	-4.04	737.96	-4.41	737.18	-5.19		
4700	742.79	742.74	-0.05	741.77	-1.02	740.36	-2.43	739.31	-3.48	738.42	-4.37	737.69	-5.10		
4943	743.51	743.45	-0.06	742.33	-1.18	741.11	-2.40	740.11	-3.40	739.21	-4.30	738.50	-5.01		
5068	743.82	743.76	-0.06	742.69	-1.13	741.81	-2.01	740.77	-3.05	739.86	-3.96	739.12	-4.70		
5227	743.97	743.95	-0.02	743.01	-0.96	745.27	1.30	741.40	-2.57	740.48	-3.49	739.67	-4.30		
5258.5			0.00		0.00		0.00		0.00		0.00		0.00		
5290	743.01	743.55	0.54	743.65	0.64	742.96	-0.05	744.57	1.66	743.14	0.13	742.30	-0.71		
5455	746.67	746.51	-0.16	744.57	-2.10	746.11	-0.56	744.33	-2.34	743.18	-3.49	742.12	-4.55		
5593	746.72	746.58	-0.16	744.82	-1.90	746.04	-0.68	744.28	-2.44	743.23	-3.49	742.19	-4.53		
5897	746.95	746.82	-0.13	745.55	-1.40	745.84	-1.11	744.45	-2.50	743.48	-3.47	742.49	-4.46		
6048	747.07	746.95	-0.12	745.42	-1.65	746.32	-0.75	745.76	-1.31	745.76	-1.31	742.46	-4.61		
6075			0.00		0.00		0.00		0.00		0.00		0.00		
6102	747.13	747.09	-0.04	745.44	-1.69	746.83	-0.30	744.59	-2.54	745.09	-2.04	745.66	-1.47		
6338	748.24	748.19	-0.05	747.45	-0.79	746.98	-1.26	747.14	-1.10	746.61	-1.63	745.94	-2.30		
6609	748.68	748.63	-0.05	747.77	-0.91	747.88	-0.80	747.25	-1.43	746.58	-2.10	745.49	-3.19		
6853	749.04	748.99	-0.05	748.08	-0.96	748.66	-0.38	747.83	-1.21	746.50	-2.54	745.98	-3.06		
7110	749.72	749.68	-0.04	748.86	-0.86	750.06	0.34	748.86	-0.86	748.10	-1.62	746.86	-2.86		
7341	751.22	751.17	-0.05	750.22	-1.00	751.00	-0.22	750.09	-1.13	748.63	-2.59	747.60	-3.62		
7507	751.61	751.57	-0.04	750.83	-0.78	751.94	0.33	751.41	-0.20	750.72	-0.89	749.10	-2.51		
7536.5			0.00		0.00		0.00		0.00		0.00		0.00		
7554	751.55	751.52	-0.03	750.84	-0.71	752.21	0.66	751.62	0.07	750.95	-0.60	750.00	-1.55		
7837	752.77	752.74	-0.03	752.01	-0.76	752.75	-0.02	752.75	-0.02	752.01	-0.76	752.01	-0.76		

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Eagle Pass Flood Study  
 Unnamed Tributary to the Rio Grande  
 100-Year Water Surface Elevations

X-Section	Existing	Detention	Difference	Ult. Detention	Difference	50% Channel	Difference	70% Channel	Difference	50% Chan.	Ult. Det.	Difference	70% Chan.	Ult. Det.	Difference
8070	754.20	754.18	-0.02	753.38	-0.82	754.19	-0.01	754.19	-0.01		753.38	-0.82		753.38	-0.82
8378	754.79	754.79	0.00	753.87	-0.92	754.78	-0.01	754.78	-0.01		753.87	-0.92		753.87	-0.92
8509	755.21	755.21	0.00	754.16	-1.05	755.19	-0.02	755.19	-0.02		754.16	-1.05		754.16	-1.05
8766	756.47	756.47	0.00	755.25	-1.22	756.45	-0.02	756.45	-0.02		755.25	-1.22		755.25	-1.22
9022	757.55	757.55	0.00	756.18	-1.37	757.53	-0.02	757.53	-0.02		756.18	-1.37		756.18	-1.37
9195	758.32	758.32	0.00	756.91	-1.41	758.30	-0.02	758.30	-0.02		756.91	-1.41		756.91	-1.41
9415	758.91	758.91	0.00	757.38	-1.53	758.89	-0.02	758.89	-0.02		757.38	-1.53		757.38	-1.53
9630	759.29	759.29	0.00	757.61	-1.68	759.27	-0.02	759.27	-0.02		757.61	-1.68		757.61	-1.68
9749	759.48	759.48	0.00	757.79	-1.69	759.46	-0.02	759.46	-0.02		757.79	-1.69		757.79	-1.69
10005	759.92	759.92	0.00	758.34	-1.58	759.90	-0.02	759.90	-0.02		758.34	-1.58		758.34	-1.58
10050			0.00		0.00		0.00		0.00			0.00			0.00
10096	760.39	760.39	0.00	758.41	-1.98	760.37	-0.02	760.37	-0.02		758.41	-1.98		758.41	-1.98
10339	761.39	761.39	0.00	759.57	-1.82	761.37	-0.02	761.37	-0.02		759.57	-1.82		759.57	-1.82
10567	762.35	762.35	0.00	760.84	-1.51	762.34	-0.01	762.34	-0.01		760.84	-1.51		760.84	-1.51
10791	763.00	763.00	0.00	761.09	-1.91	762.98	-0.02	762.98	-0.02		761.09	-1.91		761.09	-1.91
11074	763.91	763.91	0.00	761.75	-2.16	763.90	-0.01	763.90	-0.01		761.75	-2.16		761.75	-2.16
11287	764.88	764.88	0.00	762.73	-2.15	764.86	-0.02	764.86	-0.02		762.73	-2.15		762.73	-2.15
11519	766.06	766.06	0.00	764.10	-1.96	766.04	-0.02	766.04	-0.02		764.10	-1.96		764.10	-1.96
11685	766.52	766.52	0.00	764.34	-2.18	766.50	-0.02	766.50	-0.02		764.34	-2.18		764.34	-2.18
11742			0.00		0.00		0.00		0.00			0.00			0.00
11814	771.63	771.63	0.00	766.50	-5.13	771.62	-0.01	771.62	-0.01		766.50	-5.13		766.50	-5.13
12040	771.66	771.66	0.00	767.01	-4.65	771.65	-0.01	771.65	-0.01		767.01	-4.65		767.01	-4.65
12292	771.67	771.67	0.00	767.27	-4.40	771.66	-0.01	771.66	-0.01		767.27	-4.40		767.27	-4.40
12592	771.72	771.72	0.00	767.88	-3.84	771.71	-0.01	771.71	-0.01		767.88	-3.84		767.88	-3.84
12928	771.84	771.84	0.00	769.08	-2.76	771.83	-0.01	771.83	-0.01		769.08	-2.76		769.08	-2.76
13160	772.12	772.12	0.00	769.56	-2.56	772.11	-0.01	772.11	-0.01		769.56	-2.56		769.56	-2.56
13371	772.36	772.36	0.00	770.14	-2.22	772.35	-0.01	772.35	-0.01		770.14	-2.22		770.14	-2.22

D-36

Eagle Pass Flood Study  
Tributary to Seco Creek  
100-Year Water Surface Elevations

Section	Existing	20' Channel	Difference	8' Channel	Difference	Detention	Difference	Combination	Difference
		Air SE1		Air SE2		Air SE3		Air SE4	
650	725.86	725.86	0.00	725.86	0.00	725.86	0.00	725.86	0.00
1000	726.34	726.32	-0.02	726.34	0.00	726.34	0.00	726.32	-0.02
1020	726.34	726.32	-0.02	726.34	0.00	726.34	0.00	726.32	-0.02
1165	726.34	726.32	-0.02	726.34	0.00	726.34	0.00	726.32	-0.02
1195	726.34	726.32	-0.02	726.34	0.00	726.34	0.00	726.32	-0.02
1348	726.36	726.31	-0.05	726.36	0.00	726.35	-0.01	726.31	-0.05
1400	726.41	726.32	-0.09	726.41	0.00	726.39	-0.02	726.32	-0.09
1600	726.94	726.49	-0.45	726.94	0.00	726.85	-0.09	726.45	-0.49
1760	727.83	726.71	-1.12	727.83	0.00	727.71	-0.12	726.64	-1.19
1860	729.23	727.85	-1.38	729.23	0.00	729.02	-0.21	727.64	-1.59
2000	730.74	728.59	-2.15	730.74	0.00	730.55	-0.19	728.28	-2.46
2071	731.23	728.92	-2.31	731.23	0.00	730.97	-0.26	728.61	-2.62
2144	731.60	729.44	-2.16	731.60	0.00	731.30	-0.30	729.07	-2.53
2190	731.98	729.70	-2.28	731.98	0.00	731.64	-0.34	729.32	-2.66
2272	732.18	730.11	-2.07	732.18	0.00	731.81	-0.37	729.70	-2.48
2359	732.23	730.49	-1.74	732.23	0.00	731.85	-0.38	730.07	-2.16
2419	732.40	730.71	-1.69	732.40	0.00	732.02	-0.38	730.29	-2.11
2490	732.63	730.95	-1.68	732.63	0.00	732.24	-0.39	730.54	-2.09
2590	732.99	731.30	-1.69	732.99	0.00	732.60	-0.39	730.87	-2.12
2684	733.62	731.51	-2.11	733.62	0.00	733.20	-0.42	731.10	-2.52
2790	734.95	732.02	-2.93	734.95	0.00	734.52	-0.43	731.50	-3.45
2990	735.64	732.82	-2.82	735.64	0.00	735.23	-0.41	732.28	-3.36
3190	736.22	734.42	-1.80	736.22	0.00	735.86	-0.36	734.14	-2.08
3261	736.58	735.17	-1.41	736.58	0.00	736.23	-0.35	734.88	-1.70
3311	737.00	737.00	0.00	737.00	0.00	735.73	-1.27	737.00	0.00
3362.5			0.00		0.00		0.00		0.00
3414	739.68	739.69	0.01	739.66	-0.02	739.35	-0.33	739.49	-0.19
3464	739.37	739.39	0.02	739.00	-0.37	739.06	-0.31	739.03	-0.34
3514	739.50	739.51	0.01	738.94	-0.56	739.17	-0.33	738.78	-0.72
3714	740.53	740.53	0.00	739.76	-0.77	740.31	-0.22	739.67	-0.86
3784	741.06	741.06	0.00	740.67	-0.39	741.03	-0.03	740.58	-0.48
3914	742.09	742.09	0.00	741.69	-0.40	742.06	-0.03	741.59	-0.50
4044	742.37	742.37	0.00	743.53	1.16	742.34	-0.03	743.44	1.07
4244	742.78	742.78	0.00	744.26	1.48	742.73	-0.05	744.20	1.42
4444	743.50	743.50	0.00	744.35	0.85	743.44	-0.06	744.28	0.78
4544	744.04	744.04	0.00	744.51	0.47	743.97	-0.07	744.44	0.40

**Value of Structures to be Protected  
From Maverick County Appraisal Records  
And Information provided by the City of Eagle Pass**

STRUCTURE DATA

EAGLE PASS, Tx

This table is for data entry only. DoNOT delete or move columns, they may be hidden or unhidden if required. Data below row 15 may be altered as required. GREY cells are calculated and should not be changed. YELLOW cells are global changes to the column data. Content data is linked to this table to file IMPORT2A.XLS which is renamed, edited, then exported to Tab delimited text. That is then imported to the HEC FDA. Content area column 1, row 1, MUST begin @ Struc\_Name (below)

BLUE is for hydraulic data

GREEN is for Cost data and calculation

Report requires RED columns only, or all if known. Columns which are unused in IMPORT2A.xls should be deleted after SAVING it AS a new name (also use TOOLS / UNPROTECT) Also See Import table IMPORT1a.xls for occupancy type and global value adjustments (linked to OCC\_NAME.XLS)

GRAND TOTAL 18,641,085

TOTAL TOTAL TOTAL 15,150,071 3,030,014 461,000

\$96.79 \$1,970,580

Table with columns: Unique Struct. Name, Drawing #, Stream Name, Street Address, Occupancy Code, Damage Category, City, State, Zip, Station, Bank, Year Built, 1st Floor Stage, Grand Stage, Found Grnd. Elev., SID Reach Name, Struc. Value, Cont. Value, Other Value, No. of Struct., Tax Est. \$/SF, Living Area SF, All Tax Appr. Value, Notes. Rows include Main Arroyo, Trib. #1, and Trib. #2 entries.

										EP	TX	78852				1996	32.9	3.0	1.0	461	6,481,516	47	\$28.13	53556	6,668,555	
Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Stage (Fir. Elev.)	Stage (Grnd. Elev.)	Found Grnd. Elev.	SID Reach Name	Struct Value (1k) Ave. \$ per all bids	Content Value (1k) (= 20% Struct)	Other Value (1k)	No. of Struct.	Real-2 Gen Data Estimate	No. of Struct Estimated for Real Tax \$ / SF	Tax Est. \$/SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes	
Struc. Name	Stream Name	Street	Occ. Name	Cat. Name	City	State	Zip	Station	Bank	Year	If Stage	Grnd. Stage		SID Rech	Struc. Val	Cont. Val	Other Val	Num. Stuct							Notes	
48	EF-5	Trib. #2	935 Medina St.	SF-1	Resi-1	EP	TX	78852	935	Left	1996	748.77	747.77		T2-1	67.3	13.5	1.0				30.77	1770	67,330		
49	EF-5	Trib. #2	935 Medina St.	SF-1	Resi-1	EP	TX	78852	935	Left	1996	747.04	746.04		T2-1	21.1	4.2	1.0		21,098	0				93,330	
50	EF-5	Trib. #2	951 Medina St.	SF-1	Resi-1	EP	TX	78852	980	Left	1996	749.47	748.47		T2-1	93.3	18.7	1.0			0				45,160	
51	EF-5	Trib. #2	949 Medina St.	SF-1	Resi-1	EP	TX	78852	1020	Left	1996	746.97	745.97		T2-1	46.2	9.2	1.0			0	26.48	1279			
52	EF-5	Trib. #2	903 Concho St.	SF-1	Resi-1	EP	TX	78852	638	Left	1996	745.56	744.56		T2-1	21.1	4.2	1.0		21,098	0					
53	EF-5	Trib. #2	903 Concho St.	SF-1	Resi-1	EP	TX	78852	638	Left	1996	747.05	746.05		T2-1	21.1	4.2	1.0		21,098	0					
54	EF-5	Trib. #2	903 Concho St.	SF-1	Resi-1	EP	TX	78852	638	Left	1996	746.11	745.11		T2-1	21.1	4.2	1.0		21,098	0					
55	EF-5	Trib. #2	903 Concho St.	SF-1	Resi-1	EP	TX	78852	638	Left	1996	746.11	745.11		T2-1	21.1	4.2	1.0		21,098	0					
56	EF-5	Trib. #2	903 Concho St.	SF-1	Resi-1	EP	TX	78852	638	Left	1996	746.62	745.62		T2-1	21.1	4.2	1.0		21,098	0					
57	EF-5	Trib. #2	905 Concho St.	SF-1	Resi-1	EP	TX	78852	943	Left	1996	747.55	746.55		T2-1	28.9	5.8	1.0			0				28,920	
58	EF-5	Trib. #2	905 Concho St.	SF-1	Resi-1	EP	TX	78852	943	Left	1996	747.55	746.55		T2-1	20.1	4.0	1.0			0				20,070	
59	EF-5	Trib. #2	969 Concho St.	SF-1	Resi-1	EP	TX	78852	993	Left	1996	747.40	746.40		T2-1	21.1	4.2	1.0		21,098	0					
60	EF-5	Trib. #2	979 Concho St.	SF-1	Resi-1	EP	TX	78852	993	Left	1996	747.65	746.65		T2-1	39.1	7.8	1.0			0				39,050	
61	EF-5	Trib. #2	1013 Concho St.	SF-1	Resi-1	EP	TX	78852	1471	Left	1996	749.16	748.16		T2-2	32.5	6.5	1.0			0				32,450	
62	EF-5	Trib. #2	1015 Concho St.	SF-1	Resi-1	EP	TX	78852	1471	Left	1996	749.07	748.07		T2-2	33.6	7.9	1.0			0	24.98	780		39,640	
63	EF-5	Trib. #2	1017 Concho St.	SF-1	Resi-1	EP	TX	78852	1471	Left	1996	748.75	747.75		T2-2	37.4	7.5	1.0			0				37,360	
64	EF-5	Trib. #2	1346 Hidalgo St.	SF-1	Resi-1	EP	TX	78852	1533	Left	1996	751.83	750.83		T2-2	49.2	9.8	1.0			0				49,170	
65	EF-5	Trib. #2	1344 Hidalgo St.	SF-1	Resi-1	EP	TX	78852	1533	Left	1996	750.46	749.46		T2-2	36.6	7.3	1.0			0				36,610	
66	EF-5	Trib. #2	1444 Hidalgo St.	SF-1	Resi-1	EP	TX	78852	1756	Left	1996	752.19	751.19		T2-2	25.9	5.2	1.0			0				25,930	
67	EF-5	Trib. #2	1448 Hidalgo St.	SF-1	Resi-1	EP	TX	78852	1756	Left	1996	750.97	749.97		T2-2	38.2	7.6	1.0			0				38,190	
68	EF-5	Trib. #2	1110 Concho St.	SF-1	Resi-1	EP	TX	78852	1811	Left	1996	752.76	751.76		T2-2	21.1	4.2	1.0		21,098	0					
69	EF-5	Trib. #2	1140 Concho St.	SF-1	Resi-1	EP	TX	78852	1811	Left	1996	751.84	750.84		T2-2	54.9	11.0	1.0			0	29.02	1484		54,890	
70	EF-5	Trib. #2	1140 Concho St.	SF-1	Resi-1	EP	TX	78852	1811	Left	1996	752.04	751.04		T2-2	21.1	4.2	1.0		21,098	0					
71	EF-5	Trib. #2	1150 Concho St.	SF-1	Resi-1	EP	TX	78852	1850	Left	1996	753.19	752.19		T2-2	25.1	5.0	1.0			0				25,100	
72	EF-5	Trib. #2	1156 Concho St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	752.99	751.99		T2-2	41.0	8.2	1.0			0	24.15	1462		49,950	
73	EF-5	Trib. #2	1162 Concho St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	753.27	752.27		T2-2	66.1	13.2	1.0			0	30.77	1657		66,080	
74	EF-5	Trib. #2	1162 Concho St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	752.89	751.89		T2-2	21.1	4.2	1.0		21,098	0					
75	EF-5	Trib. #2	1105 Trinity St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	753.40	752.40		T2-2	37.7	7.5	1.0			0				37,710	
76	EF-5	Trib. #2	1115 Trinity St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	752.56	751.56		T2-2	31.5	6.3	1.0			0				31,500	
77	EF-5	Trib. #2	1127 Trinity St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	751.80	750.80		T2-2	28.4	5.7	1.0			0				28,380	
78	EF-5	Trib. #2	1127 Trinity St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	752.36	751.36		T2-2	21.1	4.2	1.0		21,098	0					
79	EF-5	Trib. #2	1106 Trinity St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	755.00	754.00	754.00	T2-2	21.1	4.2	1.0		21,098	0					
80	EF-5	Trib. #2	1116 Trinity St.	SF-1	Resi-1	EP	TX	78852	2024	Left	1996	754.89	753.89		T2-2	30.6	6.1	1.0			0	26.76	864		30,640	
81	EF-5	Trib. #2	1135 Trinity St.	SF-1	Resi-1	EP	TX	78852	2390	Left	1996	753.78	752.78		T2-2	31.2	6.2	1.0			0	24.88	1224		31,210	
82	EF-5	Trib. #2	1142 Trinity St.	SF-1	Resi-1	EP	TX	78852	2390	Left	1996	753.94	752.94		T2-2	21.1	4.2	1.0		21,098	0					
83	EF-5	Trib. #2	1173 Trinity St.	SF-1	Resi-1	EP	TX	78852	2411	Left	1996	754.94	753.94		T2-2	30.0	6.0	1.0			0				29,950	
84	EF-5	Trib. #2	1128 Trinity St.	SF-1	Resi-1	EP	TX	78852	2400	Left	1996	754.96	753.96		T2-2	28.6	5.7	1.0			0				28,580	
85	EF-5	Trib. #2	1138 Trinity St.	SF-1	Resi-1	EP	TX	78852	2411	Left	1996	755.44	754.44		T2-2	22.2	4.4	1.0			0				22,180	
86	EF-5	Trib. #2	1162 Trinity St.	SF-1	Resi-1	EP	TX	78852	2461	Left	1996	754.23	753.23		T2-2	28.1	5.6	1.0			0	25.37	888		28,090	
87	EF-5	Trib. #2	1172 Trinity St.	SF-1	Resi-1	EP	TX	78852	2491	Left	1996	755.56	754.56		T2-2	28.4	5.7	1.0			0				28,350	
88	EF-5	Trib. #2	1182 Trinity St.	SF-1	Resi-1	EP	TX	78852	2521	Left	1996	755.16	754.16		T2-2	78.4	15.7	1.0			0	29.12	1064		78,420	
89	EF-5	Trib. #2	1590 Hidalgo St.	SF-1	Resi-1	EP	TX	78852	2521	Left	1996	758.00	757.00		T2-2	38.8	8.0	1.0			0				38,820	
90	EF-5	Trib. #2	1133 Colorado St.	SF-1	Resi-1	EP	TX	78852	2521	Left	1996	756.55	755.55		T2-3	59.3	11.9	1.0			0				59,250	
91	EF-5	Trib. #2	1147 Colorado St.	SF-1	Resi-1	EP	TX	78852	2521	Left	1996	757.38	756.38		T2-3	42.2	8.4	1.0		42,167	0					
92	EF-5	Trib. #2	1194 Trinity St.	SF-1	Resi-1	EP	TX	78852	2566	Left	1996	755.69	754.69		T2-3	35.7	7.1	1.0			0				35,680	
93	EF-5	Trib. #2	1155 Colorado St.	SF-1	Resi-1	EP	TX	78852	2566	Left	1996	756.85	755.85		T2-3	47.4	9.5	1.0			0				47,420	
94	EF-5	Trib. #2	1173 Colorado St.	SF-1	Resi-1	EP	TX	78852	2566	Left	1996	756.85	755.85		T2-3	50.0	10.0	1.0			0				50,000	
95	EF-5	Trib. #2	1400 Juarez St.	SF-1	Resi-1	EP	TX	78852	2576	Left	1996	754.59	753.59		T2-3	44.5	8.9	1.0			0				44,450	
96	EF-5	Trib. #2	1505 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2580	Left	1996	756.51	755.51		T2-3	37.9	7.5	1.0			0	36.17	1400		37,910	
97	EF-5	Trib. #2	1417 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2739	Left	1996	756.55	755.55		T2-3	24.8	5.0	1.0			0	25.96	980		24,810	
98	EF-5	Trib. #2	1531 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2739	Left	1996	756.73	755.73		T2-3	30.2	6.0	1.0			0	26.46	875		30,170	
99	EF-5	Trib. #2	1543 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2739	Left	1996	756.51	755.51		T2-3	32.4	6.5	1.0			0	25.96	936		32,350	
100	EF-5	Trib. #2	1555 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2831	Left	1996	757.31	756.31		T2-3	43.6	8.7	1.0			0				43,570	
101	EF-5	Trib. #2	1569 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2845	Left	1996	757.11	756.11		T2-3	42.2	8.4	1.0			0					
102	EF-5	Trib. #2	1581 Buckley Ave.	SF-1	Resi-1	EP	TX	78852	2907	Left	1996	757.89	756.89		T2-3	35.5	7.1	1.0			0				35,525	
103	EF-5	Trib. #2	1185 Colorado St.	SF-1	Resi-1	EP	TX	78852	2801	Left	1996	757.10	756.10		T2-3	49.8	10.0	1.0			0				49,800	
104	EF-5	Trib. #2	1195 Colorado St.	SF-1	Resi-1																					

Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Stage (Ftr. Elev.)	Stage (Grnd. Elev.)	Found Grnd. Elev.	SID Reach Name	Struct Value (1k Ave. \$ per all bldgs)	Content Value (1k) (= 20% Struct)	Other Value (1k)	No. of Struct.	Resi-2 Gen Data Estimate	No. of Struct. Estimated for Res Tax \$ / SF	Tax Est \$/SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes
107	EF-5	Trib. #2	1162 Colorado St.	SF-1	Rest-1	EP	TX	78852	2831	Left	1996	757.46	756.46		T2-3	33.4	6.7	1.0	1		0			33,400	
108	EF-5	Trib. #2	1172 Colorado St.	SF-1	Rest-1	EP	TX	78852	2845	Left	1996	758.54	757.54		T2-3	30.3	6.1	1.0	1		0			30,260	
109	EF-5	Trib. #2	1182 Colorado St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	757.06	756.06		T2-3	40.6	8.1	1.0	1		30.78		1100	40,570	
110	EF-5	Trib. #2	1192 Colorado St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	758.05	757.05		T2-3	88.0	13.6	1.0	1		0			68,000	
111	EF-5	Trib. #2	1192 Colorado St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	758.86	755.86		T2-3	42.2	8.4	1.0	1		0				
112	EF-5	Trib. #2	1151 North Comal St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	758.64	758.64		T2-3	55.8	11.1	1.0	1		42.197			55,580	
113	EF-5	Trib. #2	1175 North Comal St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	760.04	759.04		T2-3	54.4	10.9	1.0	1		0			54,390	
114	EF-5	Trib. #2	1112 North Comal St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	759.31	758.31		T2-3	29.0	5.8	1.0	1		0			28,970	
115	EF-5	Trib. #2	1108 North Comal St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	759.06	758.06		T2-3	33.6	6.7	1.0	1		0			33,640	
116	EF-5	Trib. #2	1102 North Comal St.	SF-1	Rest-1	EP	TX	78852	2907	Left	1996	759.39	758.39		T2-3	31.9	6.4	1.0	1		0			31,920	
117	EF-5	Trib. #2	1101 Arlington St.	SF-1	Rest-1	EP	TX	78852	3527	Left	1996	760.32	759.32		T2-3	57.9	11.6	1.0	1		0			57,920	
118	EF-5	Trib. #2	1111 Arlington St.	SF-1	Rest-1	EP	TX	78852	3527	Left	1996	759.89	758.89		T2-3	35.9	7.2	1.0	1		0			35,920	
119	EF-5	Trib. #2	1181 Arlington St.	SF-1	Rest-1	EP	TX	78852	3527	Left	1996	759.92	758.92		T2-3	41.4	8.3	1.0	1		0			41,360	
120	EF-5	Trib. #2	1495 Buckley Ave.	SF-1	Rest-1	EP	TX	78852	3038	Left	1996	757.63	756.63		T2-3	41.1	8.2	1.0	1		29.12		1159	41,080	
121	EF-5	Trib. #2	1670 Buckley Ave.	SF-1	Rest-1	EP	TX	78852	3648	Left	1996	761.12	760.12		T2-3	50.1	10.0	1.0	1		0			50,090	
122	EF-5	Trib. #2	1684 Buckley Ave.	SF-1	Rest-1	EP	TX	78852	3908	Left	1996	761.80	760.80		T2-4	43.0	8.6	1.0	1		0			42,970	
123	EF-5	Trib. #2	1690 Buckley Ave.	SF-1	Rest-1	EP	TX	78852	3908	Left	1996	761.76	760.76		T2-4	42.2	8.4	1.0	1		42.197				
124	EF-5	Trib. #2	1704 Buckley Ave.	SF-1	Rest-1	EP	TX	78852	3908	Left	1996	763.23	762.23		T2-4	44.9	9.0	1.0	1		0			44,880	
125	EF-5	Trib. #2	1205 Stroman Dr.	SF-1	Rest-1	EP	TX	78852	3868	Left	1996	763.90	762.90		T2-4	64.9	13.0	1.0	1		0			64,900	
126	EF-6	Trib. #3	1160 North Bibb Ave	SF-1	Rest-1	EP	TX	78852	6130	Left	1996	779.40	778.40	778.40	T3-1	42.2	8.4	1.0	1		42.197				
127	EF-6	Trib. #3	1170 North Bibb Ave.	SF-1	Rest-1	EP	TX	78852	6130	Left	1996	779.40	778.40	778.40	T3-1	42.2	8.4	1.0	1		42.197				
128	EF-6	Trib. #3	2211 Royal Park Dr.	SF-1	Rest-1	EP	TX	78852	6235	Left	1996	782.20	781.20	781.20	T3-1	42.2	8.4	1.0	1		42.197				
129	EF-6	Trib. #3	2214 Royal Park Dr.	SF-1	Rest-1	EP	TX	78852	6235	Left	1996	779.40	778.40	778.40	T3-1	42.2	8.4	1.0	1		42.197				
130	EF-6	Trib. #3	2215 Royal Park Dr.	SF-1	Rest-1	EP	TX	78852	6331	Left	1996	782.20	781.20	781.20	T3-1	42.2	8.4	1.0	1		42.197				
131	EF-6	Trib. #3	2218 Royal Park Dr.	SF-1	Rest-1	EP	TX	78852	6331	Left	1996	782.10	781.10	781.10	T3-1	42.2	8.4	1.0	1		42.197				
132	EF-6	Trib. #3	2301 Royal Park Dr.	SF-1	Rest-1	EP	TX	78852	6391	Left	1996	782.00	781.00	781.00	T3-1	42.2	8.4	1.0	1		42.197				
133	EF-6	Trib. #3	2305 Royal Park Dr.	SF-1	Rest-1	EP	TX	78852	6491	Left	1996	782.00	781.00	781.00	T3-1	42.2	8.4	1.0	1		42.197				
134	EF-6	Trib. #3	1204 Fair Haven Dr.	SF-1	Rest-1	EP	TX	78852	7091	Right	1996	783.60	782.60	782.60	T3-1	42.2	8.4	1.0	1		42.197				
135	EF-6	Trib. #3	1203 Glen Haven Dr.	SF-1	Rest-1	EP	TX	78852	7091	Right	1996	786.20	785.20	785.20	T3-1	42.2	8.4	1.0	1		42.197				
136	EF-6	Trib. #3	1204 Glen Haven Dr.	SF-1	Rest-1	EP	TX	78852	7291	Right	1996	786.20	785.20	785.20	T3-1	42.2	8.4	1.0	1		42.197				
137	EF-7	Trib. #3	824 Colorado St.	SF-1	Rest-1	EP	TX	78852	10643	Right	1996	747.30	746.30		T3-2	42.2	8.4	1.0	1		0			42,197	
138	EF-8	Trib. #3	501	SF-2	Rest-2	EP	TX	78852	13970	Left	1996	776.80	775.80	775.80	T3-3	42.2	8.4	1.0	1		0			42,197	
139	EF-8	Trib. #3	502	SF-2	Rest-2	EP	TX	78852	15040	Left	1996	780.40	779.40	779.40	T3-4	42.2	8.4	1.0	1		0			42,197	
140	EF-9	Unnamed	503	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.60	726.60	726.60	UT-1	21.1	4.2	1.0	1		21.098				
141	EF-9	Unnamed	504	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.60	726.60	726.60	UT-1	21.1	4.2	1.0	1		21.098				
142	EF-9	Unnamed	505	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.60	726.60	726.60	UT-1	21.1	4.2	1.0	1		21.098				
143	EF-9	Unnamed	506	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.80	726.80	726.80	UT-1	21.1	4.2	1.0	1		21.098				
144	EF-9	Unnamed	507	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.60	726.60	726.60	UT-1	21.1	4.2	1.0	1		21.098				
145	EF-9	Unnamed	508	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.80	726.80	726.80	UT-1	21.1	4.2	1.0	1		21.098				
146	EF-9	Unnamed	509	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.20	726.20	726.20	UT-1	21.1	4.2	1.0	1		21.098				
147	EF-9	Unnamed	510	SF-2	Rest-2	EP	TX	78852	0	Right	1996	727.90	726.90	726.90	UT-1	21.1	4.2	1.0	1		21.098				
148	EF-9	Unnamed	511	SF-2	Rest-2	EP	TX	78852	0	Right	1996	728.00	727.00	727.00	UT-1	21.1	4.2	1.0	1		21.098				
149	EF-9	Unnamed	512	SF-2	Rest-2	EP	TX	78852	0	Right	1996	728.00	727.00	727.00	UT-1	21.1	4.2	1.0	1		21.098				
150	EF-9	Unnamed	513	SF-2	Rest-2	EP	TX	78852	0	Right	1996	728.00	727.00	727.00	UT-1	21.1	4.2	1.0	1		21.098				
151	EF-9	Unnamed	514	SF-2	Rest-2	EP	TX	78852	0	Right	1996	728.00	727.00	727.00	UT-1	21.1	4.2	1.0	1		21.098				
152	EF-9	Unnamed	515	SF-2	Rest-2	EP	TX	78852	0	Right	1996	728.00	727.00	727.00	UT-1	21.1	4.2	1.0	1		21.098				
153	EF-9	Unnamed	516	SF-2	Rest-2	EP	TX	78852	0	Right	1996	728.00	727.00	727.00	UT-1	21.1	4.2	1.0	1		21.098				
154	EF-9	Unnamed	517	SF-2	Rest-2	EP	TX	78852	0	Right	1996	729.00	728.00	728.00	UT-1	21.1	4.2	1.0	1		21.098				
155	EF-9	Unnamed	518	SF-2	Rest-2	EP	TX	78852	253	Right	1996	729.50	728.50	728.50	UT-1	21.1	4.2	1.0	1		21.098				
156	EF-9	Unnamed	519	SF-2	Rest-2	EP	TX	78852	353	Right	1996	725.00	724.00	724.00	UT-1	21.1	4.2	1.0	1		21.098				
157	EF-9	Unnamed	520	SF-2	Rest-2	EP	TX	78852	353	Right	1996	731.70	730.70	730.70	UT-1	21.1	4.2	1.0	1		21.098				
158	EF-9	Unnamed	521	SF-2	Rest-2	EP	TX	78852	453	Right	1996	730.00	729.00	729.00	UT-1	21.1	4.2	1.0	1		21.098				



Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	Bank	Year Built (assume missing)	1st Floor Stage (Flr. Elev.)	Stage (Grnd. Elev.)	Found Grnd. Elev.	S/D Reach Name	Struct Value (1k Ave. \$ per all blgds)	Cont. Value (1k) (= 20% Struct)	Other Value (1k)	No. of Struct.	Res-2 Gen Data Estimate	No. of Struct. Estimated for West Tax \$ / SF	Tax Est \$/SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes
Struc. Name	Stream Name	Street	Occ. Name	Cat. Name	City	State	Zip	Station	Bank	Year	Flr. Stage	Grnd. Stage		S/D_Rch	Struc_Val	Cont_Val	Other_Val	Num Struct							
165	EF-9	Unnamed	528	SF-2	Resi-2	EP	TX	78852	553	Right	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
166	EF-9	Unnamed	529	SF-2	Resi-2	EP	TX	78852	753	Right	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1					21,098	
167	EF-9	Unnamed	530	SF-2	Resi-2	EP	TX	78852	853	Right	1996	730.00	729.00	729.00	UT-1	21.1	4.2	1.0	1					21,098	
168	EF-9	Unnamed	531	SF-2	Resi-2	EP	TX	78852	853	Right	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
169	EF-9	Unnamed	532	SF-2	Resi-2	EP	TX	78852	1053	Right	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
170	EF-9	Unnamed	533	SF-2	Resi-2	EP	TX	78852	1053	Right	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
171	EF-9	Unnamed	534	SF-2	Resi-2	EP	TX	78852	1053	Right	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
172	EF-9	Unnamed	535	SF-2	Resi-2	EP	TX	78852	1053	Right	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
173	EF-9	Unnamed	536	SF-2	Resi-2	EP	TX	78852	1053	Right	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
174	EF-9	Unnamed	537	SF-2	Resi-2	EP	TX	78852	253	Left	1996	730.00	729.00	729.00	UT-1	21.1	4.2	1.0	1					21,098	
175	EF-9	Unnamed	538	SF-2	Resi-2	EP	TX	78852	453	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1					21,098	
176	EF-9	Unnamed	539	SF-2	Resi-2	EP	TX	78852	553	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1					21,098	
177	EF-9	Unnamed	540	SF-2	Resi-2	EP	TX	78852	653	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1					21,098	
178	EF-9	Unnamed	541	SF-2	Resi-2	EP	TX	78852	853	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
179	EF-9	Unnamed	542	SF-2	Resi-2	EP	TX	78852	953	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
180	EF-9	Unnamed	543	SF-2	Resi-2	EP	TX	78852	953	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
181	EF-9	Unnamed	544	SF-2	Resi-2	EP	TX	78852	953	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
182	EF-9	Unnamed	545	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
183	EF-9	Unnamed	546	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
184	EF-9	Unnamed	547	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
185	EF-9	Unnamed	548	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
186	EF-9	Unnamed	549	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
187	EF-9	Unnamed	550	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
188	EF-9	Unnamed	551	SF-2	Resi-2	EP	TX	78852	1753	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
189	EF-9	Unnamed	552	SF-2	Resi-2	EP	TX	78852	1753	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
190	EF-9	Unnamed	553	SF-2	Resi-2	EP	TX	78852	1853	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
191	EF-9	Unnamed	554	SF-2	Resi-2	EP	TX	78852	1853	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
192	EF-9	Unnamed	555	SF-2	Resi-2	EP	TX	78852	1953	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
193	EF-9	Unnamed	556	SF-2	Resi-2	EP	TX	78852	1753	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
194	EF-9	Unnamed	557	SF-2	Resi-2	EP	TX	78852	1853	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
195	EF-9	Unnamed	558	SF-2	Resi-2	EP	TX	78852	2053	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
196	EF-9	Unnamed	559	SF-2	Resi-2	EP	TX	78852	2053	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
197	EF-9	Unnamed	560	SF-2	Resi-2	EP	TX	78852	2053	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
198	EF-9	Unnamed	561	SF-2	Resi-2	EP	TX	78852	2153	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
199	EF-9	Unnamed	562	SF-2	Resi-2	EP	TX	78852	2253	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1					21,098	
200	EF-9	Unnamed	563	SF-2	Resi-2	EP	TX	78852	2153	Left	1996	729.00	727.00	727.00	UT-1	21.1	4.2	1.0	1					21,098	
201	EF-9	Unnamed	564	SF-2	Resi-2	EP	TX	78852	2153	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
202	EF-9	Unnamed	565	SF-2	Resi-2	EP	TX	78852	2253	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
203	EF-9	Unnamed	566	SF-2	Resi-2	EP	TX	78852	2253	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
204	EF-9	Unnamed	567	SF-2	Resi-2	EP	TX	78852	2453	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
205	EF-9	Unnamed	568	SF-2	Resi-2	EP	TX	78852	2453	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
206	EF-9	Unnamed	569	SF-2	Resi-2	EP	TX	78852	1453	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
207	EF-9	Unnamed	570	SF-2	Resi-2	EP	TX	78852	1453	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
208	EF-9	Unnamed	571	SF-2	Resi-2	EP	TX	78852	1453	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
209	EF-9	Unnamed	572	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1					21,098	
210	EF-9	Unnamed	573	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1					21,098	
211	EF-9	Unnamed	574	SF-2	Resi-2	EP	TX	78852	1553	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
212	EF-9	Unnamed	575	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
213	EF-9	Unnamed	576	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
214	EF-9	Unnamed	577	SF-2	Resi-2	EP	TX	78852	1753	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
215	EF-9	Unnamed	578	SF-2	Resi-2	EP	TX	78852	1753	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	
216	EF-9	Unnamed	579	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
217	EF-9	Unnamed	580	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1					21,098	
218	EF-9	Unnamed	581	SF-2	Resi-2	EP	TX	78852	1653	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
219	EF-9	Unnamed	582	SF-2	Resi-2	EP	TX	78852	1753	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1					21,098	
220	EF-9	Unnamed	583	SF-2	Resi-2	EP	TX	78852	1853	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1					21,098	

Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Stage (Flr. Elev.)	Stage (Grnd. Elev.)	Found Grnd. Elev.	SID Reach Name	Struct Value (\$ per all bldgs)	Content Value (\$ 20% Struct)	Other Value (\$)	No. of Struct.	Res-2 Gen Data Estimate	No. of Struct. Estimated for Res Tax \$ / SF	Tax Est \$ / SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes
Struc. Name	Stream Name	Street	Occ. Name	Cat. Name	City	State	Zip	Station	Bank	Year	1st Stage	Grnd. Stage	SID_Rch	Struc_Val	Cont_Val	Other_Val	No. of Struct.	Res-2 Gen Data Estimate	No. of Struct. Estimated for Res Tax \$ / SF	Tax Est \$ / SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes		
221	EF-9	Unnamed	584	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1	21,098					
222	EF-9	Unnamed	585	SF-2	Rest-2	EP	TX	78852	1553	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1	21,098					
223	EF-9	Unnamed	586	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
224	EF-9	Unnamed	587	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
225	EF-9	Unnamed	588	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
226	EF-9	Unnamed	589	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
227	EF-9	Unnamed	590	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
228	EF-9	Unnamed	591	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
229	EF-9	Unnamed	592	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
230	EF-9	Unnamed	593	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
231	EF-9	Unnamed	594	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
232	EF-9	Unnamed	595	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
233	EF-9	Unnamed	596	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
234	EF-9	Unnamed	597	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
235	EF-9	Unnamed	598	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
236	EF-9	Unnamed	599	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
237	EF-9	Unnamed	600	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
238	EF-9	Unnamed	601	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	735.00	734.00	734.00	UT-1	21.1	4.2	1.0	1	21,098					
239	EF-9	Unnamed	602	SF-2	Rest-2	EP	TX	78852	1753	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1	21,098					
240	EF-9	Unnamed	603	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	731.00	730.00	730.00	UT-1	21.1	4.2	1.0	1	21,098					
241	EF-9	Unnamed	604	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	733.00	732.00	732.00	UT-1	21.1	4.2	1.0	1	21,098					
242	EF-9	Unnamed	605	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	732.00	731.00	731.00	UT-1	21.1	4.2	1.0	1	21,098					
243	EF-9	Unnamed	606	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
244	EF-9	Unnamed	607	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
245	EF-9	Unnamed	608	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
246	EF-9	Unnamed	609	SF-2	Rest-2	EP	TX	78852	2153	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
247	EF-9	Unnamed	610	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
248	EF-9	Unnamed	611	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
249	EF-9	Unnamed	612	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
250	EF-9	Unnamed	613	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
251	EF-9	Unnamed	614	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
252	EF-9	Unnamed	615	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
253	EF-9	Unnamed	616	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
254	EF-9	Unnamed	617	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
255	EF-9	Unnamed	618	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
256	EF-9	Unnamed	619	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
257	EF-9	Unnamed	620	SF-2	Rest-2	EP	TX	78852	2153	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
258	EF-9	Unnamed	621	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	734.00	733.00	733.00	UT-1	21.1	4.2	1.0	1	21,098					
259	EF-9	Unnamed	622	SF-2	Rest-2	EP	TX	78852	2153	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
260	EF-9	Unnamed	623	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
261	EF-9	Unnamed	624	SF-2	Rest-2	EP	TX	78852	2153	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
262	EF-9	Unnamed	625	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
263	EF-9	Unnamed	626	SF-2	Rest-2	EP	TX	78852	2353	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
264	EF-9	Unnamed	627	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
265	EF-9	Unnamed	628	SF-2	Rest-2	EP	TX	78852	2253	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
266	EF-9	Unnamed	629	SF-2	Rest-2	EP	TX	78852	2653	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
267	EF-9	Unnamed	630	SF-2	Rest-2	EP	TX	78852	1853	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
268	EF-9	Unnamed	631	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
269	EF-9	Unnamed	632	SF-2	Rest-2	EP	TX	78852	2053	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
270	EF-9	Unnamed	633	SF-2	Rest-2	EP	TX	78852	2153	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
271	EF-9	Unnamed	634	SF-2	Rest-2	EP	TX	78852	1953	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
272	EF-9	Unnamed	635	SF-2	Rest-2	EP	TX	78852	2153	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
273	EF-9	Unnamed	636	SF-2	Rest-2	EP	TX	78852	2453	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
274	EF-9	Unnamed	637	SF-2	Rest-2	EP	TX	78852	2553	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
275	EF-9	Unnamed	638	SF-2	Rest-2	EP	TX	78852	2553	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
276	EF-9	Unnamed	639	SF-2	Rest-2	EP	TX	78852	2653	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					

Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Stage (Ftr. Elev.)	Stage (Grnd. Elev.)	Found Grnd. Elev.	S/D Reach Name	Struct Value (\$ per 1k) Ave. \$ per all bldgs	Content Value (\$ per 1k) (= 20% Struct)	Other Value (\$ per 1k)	No. of Struct.	Real-2 Gen Data Estimate	No. of Struct. Estimated for least Tax \$ / SF	Tax Est \$/SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes
Struct. Name	Stream Name	Street	Occ. Name	Cat. Name	City	State	Zip	Station	Bank	Year	1st Floor Stage	Grnd. Stage	Found Elev.	S/D_Rch	Struc. Val	Cont. Val	Other Val	Num. Struct.						Notes	
277	EF-9	Unnamed	640	SF-2	Resi-2	EP	TX	78852	2653	Left	1996	736.00	735.00	735.00	UT-1	21.1	4.2	1.0	1	21,098					
278	EF-10	Unnamed	641	SF-2	Resi-2	EP	TX	78852	3200	Right	1996	738.10	737.10	737.10	UT-1	28.1	5.6	1.0	1	28,131					
279	EF-10	Unnamed	642	SF-2	Resi-2	EP	TX	78852	3200	Right	1996	738.10	737.10	737.10	UT-1	28.1	5.6	1.0	1	28,131					
280	EF-10	Unnamed	643	SF-2	Resi-2	EP	TX	78852	3200	Right	1996	738.10	737.10	737.10	UT-1	28.1	5.6	1.0	1	28,131					
281	EF-10	Unnamed	644	SF-2	Resi-2	EP	TX	78852	3200	Right	1996	738.50	737.50	737.50	UT-1	28.1	5.6	1.0	1	28,131					
282	EF-10	Unnamed	645	SF-2	Resi-2	EP	TX	78852	3200	Right	1996	738.50	737.50	737.50	UT-1	28.1	5.6	1.0	1	28,131					
283	EF-10	Unnamed	646	SF-2	Resi-2	EP	TX	78852	3200	Right	1996	738.50	737.50	737.50	UT-1	28.1	5.6	1.0	1	28,131					
284	EF-10	Unnamed	647	SF-2	Resi-2	EP	TX	78852	3300	Right	1996	738.50	737.50	737.50	UT-1	28.1	5.6	1.0	1	28,131					
285	EF-10	Unnamed	648	SF-2	Resi-2	EP	TX	78852	3300	Right	1996	738.50	737.50	737.50	UT-1	28.1	5.6	1.0	1	28,131					
286	EF-10	Unnamed	649	SF-2	Resi-2	EP	TX	78852	3300	Right	1996	738.50	737.50	737.50	UT-1	28.1	5.6	1.0	1	28,131					
287	EF-10	Unnamed	650	SF-2	Resi-2	EP	TX	78852	3300	Left	1996	738.60	737.60	737.60	UT-1	28.1	5.6	1.0	1	28,131					
288	EF-10	Unnamed	651	SF-2	Resi-2	EP	TX	78852	3300	Left	1996	738.60	737.60	737.60	UT-1	28.1	5.6	1.0	1	28,131					
289	EF-10	Unnamed	652	SF-2	Resi-2	EP	TX	78852	3400	Left	1996	738.90	737.90	737.90	UT-1	28.1	5.6	1.0	1	28,131					
290	EF-10	Unnamed	653	SF-2	Resi-2	EP	TX	78852	3500	Left	1996	738.90	737.90	737.90	UT-1	28.1	5.6	1.0	1	28,131					
291	EF-10	Unnamed	654	SF-2	Resi-2	EP	TX	78852	3700	Left	1996	738.70	737.70	737.70	UT-1	28.1	5.6	1.0	1	28,131					
292	EF-10	Unnamed	655	SF-2	Resi-2	EP	TX	78852	3900	Left	1996	739.40	738.40	738.40	UT-1	28.1	5.6	1.0	1	28,131					
293	EF-10	Unnamed	656	SF-2	Resi-2	EP	TX	78852	3800	Left	1996	740.30	739.30	739.30	UT-1	28.1	5.6	1.0	1	28,131					
294	EF-10	Unnamed	657	SF-2	Resi-2	EP	TX	78852	4400	Left	1996	741.00	740.00	740.00	UT-1	42.2	8.4	1.0	1	42,197					
295	EF-10	Unnamed	658	SF-2	Resi-2	EP	TX	78852	4400	Left	1996	741.00	740.00	740.00	UT-1	42.2	8.4	1.0	1	42,197					
296	EF-10	Unnamed	659	SF-2	Resi-2	EP	TX	78852	4500	Left	1996	741.00	740.00	740.00	UT-1	42.2	8.4	1.0	1	42,197					
297	EF-10	Unnamed	660	SF-2	Resi-2	EP	TX	78852	4500	Left	1996	741.00	740.00	740.00	UT-1	42.2	8.4	1.0	1	42,197					
298	EF-10	Unnamed	661	SF-2	Resi-2	EP	TX	78852	4500	Left	1996	744.00	743.00	743.00	UT-1	42.2	8.4	1.0	1	42,197					
299	EF-10	Unnamed	662	SF-2	Resi-2	EP	TX	78852	5600	Left	1996	744.40	743.40	743.40	UT-2	42.2	8.4	1.0	1	42,197					
300	EF-10	Unnamed	663	SF-2	Resi-2	EP	TX	78852	5700	Left	1996	744.40	743.40	743.40	UT-2	42.2	8.4	1.0	1	42,197					
301	EF-10	Unnamed	664	SF-2	Resi-2	EP	TX	78852	5800	Left	1996	744.20	743.20	743.20	UT-2	42.2	8.4	1.0	1	42,197					
302	EF-10	Unnamed	665	SF-2	Resi-2	EP	TX	78852	5600	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
303	EF-10	Unnamed	666	SF-2	Resi-2	EP	TX	78852	5600	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
304	EF-10	Unnamed	667	SF-2	Resi-2	EP	TX	78852	5600	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
305	EF-10	Unnamed	668	SF-2	Resi-2	EP	TX	78852	5700	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
306	EF-10	Unnamed	669	SF-2	Resi-2	EP	TX	78852	5700	Left	1996	744.70	743.70	743.70	UT-2	42.2	8.4	1.0	1	42,197					
307	EF-10	Unnamed	670	SF-2	Resi-2	EP	TX	78852	5800	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
308	EF-10	Unnamed	671	SF-2	Resi-2	EP	TX	78852	5800	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
309	EF-10	Unnamed	672	SF-2	Resi-2	EP	TX	78852	5800	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
310	EF-10	Unnamed	673	SF-2	Resi-2	EP	TX	78852	5800	Left	1996	744.00	743.00	743.00	UT-2	42.2	8.4	1.0	1	42,197					
311	EF-10	Unnamed	674	SF-2	Resi-2	EP	TX	78852	5800	Left	1996	744.20	743.20	743.20	UT-2	42.2	8.4	1.0	1	42,197					
312	EF-10	Unnamed	675	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	744.60	743.60	743.60	UT-2	42.2	8.4	1.0	1	42,197					
313	EF-10	Unnamed	676	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.60	743.60	743.60	UT-2	42.2	8.4	1.0	1	42,197					
314	EF-10	Unnamed	677	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.60	743.60	743.60	UT-2	42.2	8.4	1.0	1	42,197					
315	EF-10	Unnamed	678	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.60	743.60	743.60	UT-2	42.2	8.4	1.0	1	42,197					
316	EF-10	Unnamed	679	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	744.30	743.30	743.30	UT-2	42.2	8.4	1.0	1	42,197					
317	EF-10	Unnamed	680	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	744.20	743.20	743.20	UT-2	42.2	8.4	1.0	1	42,197					
318	EF-10	Unnamed	681	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	743.70	742.70	742.70	UT-2	42.2	8.4	1.0	1	42,197					
319	EF-10	Unnamed	682	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	744.10	743.10	743.10	UT-2	42.2	8.4	1.0	1	42,197					
320	EF-10	Unnamed	683	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	744.10	743.10	743.10	UT-2	42.2	8.4	1.0	1	42,197					
321	EF-10	Unnamed	684	SF-2	Resi-2	EP	TX	78852	5900	Left	1996	744.10	743.10	743.10	UT-2	42.2	8.4	1.0	1	42,197					
322	EF-10	Unnamed	685	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.30	743.30	743.30	UT-2	42.2	8.4	1.0	1	42,197					
323	EF-10	Unnamed	686	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.30	743.30	743.30	UT-2	42.2	8.4	1.0	1	42,197					
324	EF-10	Unnamed	687	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.30	743.30	743.30	UT-2	42.2	8.4	1.0	1	42,197					
325	EF-10	Unnamed	688	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.10	743.10	743.10	UT-2	42.2	8.4	1.0	1	42,197					
326	EF-10	Unnamed	689	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.10	743.10	743.10	UT-2	42.2	8.4	1.0	1	42,197					
327	EF-10	Unnamed	690	SF-2	Resi-2	EP	TX	78852	6000	Left	1996	744.10	743.10	743.10	UT-2	42.2	8.4	1.0	1	42,197					
328	EF-10	Unnamed	691	SF-2	Resi-2	EP	TX	78852	6200	Left	1996	744.90	743.90	743.90	UT-2	42.2	8.4	1.0	1	42,197					
329	EF-10	Unnamed	692	SF-2	Resi-2	EP	TX	78852	6200	Left	1996	745.00	744.00	744.00	UT-2	42.2	8.4	1.0	1	42,197					
330	EF-10	Unnamed	693	SF-2	Resi-2	EP	TX	78852	6400	Left	1996	745.50	744.50	744.50	UT-2	42.2	8.4	1.0	1	42,197					
331	EF-10	Unnamed	694	SF-2	Resi-2	EP	TX	78852	6400	Left	1996	745.50	744.50	744.50	UT-2	42.2	8.4	1.0	1	42,197					
332	EF-10	Unnamed	695	SF-2	Resi-2	EP	TX	78852	6100	Left	1996	744.70	743.70	743.70	UT-2	42.2	8.4	1.0	1	42,197					

Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Stage (Fir. Elev.)	Stage (Grnd. Elev.)	Found Grnd. Elev.	SID Reach Name	Struct Value (1k) Ave. \$ per all bldgs	Content Value (1k) (= 20% Struct)	Other Value (1k)	No. of Struct.	Resi-2 Gen Data Estimate	No. of Struct. Estimated for test Tax \$ / SF	Tax Est \$/SF for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes	
461						EP	TX	78852			1996					32.9	3.0	1.0	461	8,481,516	47	\$28.13	53556	6,668,555 <sup>N</sup>		
333	EF-10	Unnamed	696	SF-2	Resi-2	EP	TX	78852	6200	Left	1996	744.70	743.70	743.70	UT-2	42.2	8.4	1.0	1							
334	EF-10	Unnamed	697	SF-2	Resi-2	EP	TX	78852	6200	Left	1996	745.00	744.00	744.00	UT-2	42.2	8.4	1.0	1							
335	EF-10	Unnamed	698	SF-2	Resi-2	EP	TX	78852	6200	Left	1996	745.50	744.50	744.50	UT-2	42.2	8.4	1.0	1							
336	EF-10	Unnamed	699	SF-2	Resi-2	EP	TX	78852	6300	Left	1996	745.50	744.50	744.50	UT-2	42.2	8.4	1.0	1							
337	EF-10	Unnamed	700	SF-2	Resi-2	EP	TX	78852	6300	Left	1996	745.60	744.40	744.40	UT-2	42.2	8.4	1.0	1							
338	EF-10	Unnamed	701	SF-2	Resi-2	EP	TX	78852	6400	Left	1996	746.00	745.00	745.00	UT-2	42.2	8.4	1.0	1							
339	EF-10	Unnamed	702	SF-2	Resi-2	EP	TX	78852	6400	Left	1996	747.40	746.40	746.40	UT-2	42.2	8.4	1.0	1							
340	EF-10	Unnamed	703	SF-2	Resi-2	EP	TX	78852	6400	Left	1996	747.40	746.40	746.40	UT-2	42.2	8.4	1.0	1							
341	EF-10	Unnamed	704	SF-2	Resi-2	EP	TX	78852	6500	Left	1996	747.40	746.40	746.40	UT-2	42.2	8.4	1.0	1							
342	EF-10	Unnamed	705	SF-2	Resi-2	EP	TX	78852	6600	Left	1996	749.60	748.60	748.60	UT-2	42.2	8.4	1.0	1							
343	EF-10	Unnamed	706	SF-2	Resi-2	EP	TX	78852	6600	Left	1996	749.80	748.60	748.60	UT-2	42.2	8.4	1.0	1							
344	EF-10	Unnamed	707	SF-2	Resi-2	EP	TX	78852	6600	Left	1996	747.30	746.30	746.30	UT-2	42.2	8.4	1.0	1							
345	EF-10	Unnamed	708	SF-2	Resi-2	EP	TX	78852	6600	Left	1996	747.30	746.30	746.30	UT-2	42.2	8.4	1.0	1							
346	EF-10	Unnamed	709	SF-2	Resi-2	EP	TX	78852	6300	Right	1996	748.40	747.40	747.40	UT-2	42.2	8.4	1.0	1							
347	EF-10	Unnamed	710	SF-2	Resi-2	EP	TX	78852	6800	Right	1996	747.80	746.80	746.80	UT-2	42.2	8.4	1.0	1							
348	EF-10	Unnamed	711	SF-2	Resi-2	EP	TX	78852	7000	Right	1996	748.70	747.70	747.70	UT-2	42.2	8.4	1.0	1							
349	EF-10	Unnamed	1505 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	6100	Right	1996	748.21	747.21		UT-2	9.5	1.9		1						9,500	
350	EF-10	Unnamed	1519 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	6000	Right	1996	748.00	747.00		UT-2	46.0	9.2	1.0	1						45,950	
351	EF-10	Unnamed	1521 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5900	Right	1996	747.92	746.92		UT-2	47.9	9.6	1.0	1						47,870	
352	EF-10	Unnamed	1533 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5900	Right	1996	747.45	746.45		UT-2	43.1	8.6	1.0	1			30.78	1100		43,060	
353	EF-10	Unnamed	1551 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5800	Right	1996	747.30	746.30		UT-2	42.2	8.4	1.0	1	42,197						
354	EF-10	Unnamed	1553 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5800	Right	1996	747.64	746.64		UT-2	40.7	8.1	1.0	1					31.35	1000	40,650
355	EF-10	Unnamed	1565 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5700	Right	1996	747.62	746.62		UT-2	46.1	9.2	1.0	1			33.33	1078		46,070	
356	EF-10	Unnamed	1577 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5700	Right	1996	748.45	747.45		UT-2	50.4	10.1	1.0	1						50,400	
357	EF-10	Unnamed	1589 Cristin Dr.	SF-1	Resi-1	EP	TX	78852	5600	Right	1996	751.02	750.02		UT-2	56.0	11.2	1.0	1						55,980	
358	EF-10	Unnamed	1321 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	752.00	751.00		UT-2	49.0	9.8	1.0	1						48,950	
359	EF-10	Unnamed	1333 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7100	Right	1996	751.10	750.10		UT-2	47.2	9.4	1.0	1						47,240	
360	EF-10	Unnamed	1337 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7100	Right	1996	751.10	750.10		UT-2	47.2	9.4	1.0	1						47,170	
361	EF-10	Unnamed	1351 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7000	Right	1996	750.30	749.30		UT-2	43.2	8.6	1.0	1						43,240	
362	EF-10	Unnamed	1359 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6900	Right	1996	749.70	748.70		UT-2	40.4	8.1	1.0	1						40,430	
363	EF-10	Unnamed	1367 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6900	Right	1996	749.90	748.90		UT-2	46.8	9.3	1.0	1						46,590	
364	EF-10	Unnamed	1375 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6800	Right	1996	749.60	748.60		UT-2	46.0	9.2	1.0	1						46,040	
365	EF-10	Unnamed	1389 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	749.40	748.40		UT-2	46.0	9.6	1.0	1						47,990	
366	EF-10	Unnamed	1397 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	749.10	748.10		UT-2	52.9	12.6	1.0	1						62,940	
367	EF-10	Unnamed	1403 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6600	Right	1996	749.00	748.00		UT-2	50.8	10.2	1.0	1						50,800	
368	EF-10	Unnamed	1415 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6500	Right	1996	749.10	748.10		UT-2	49.4	9.9	1.0	1			33.33	1116		49,440	
369	EF-10	Unnamed	1427 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6500	Right	1996	749.00	748.00		UT-2	44.0	8.8	1.0	1					31.25	960	44,010
370	EF-10	Unnamed	1439 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6400	Right	1996	749.00	748.00		UT-2	52.9	10.6	1.0	1					29.83	1301	52,920
371	EF-10	Unnamed	1451 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6300	Right	1996	749.40	748.40		UT-2	46.9	9.4	1.0	1					33.33	1127	46,930
372	EF-10	Unnamed	1463 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6300	Right	1996	749.00	748.00		UT-2	41.1	8.2	1.0	1					31.35	1000	41,060
373	EF-10	Unnamed	1475 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6200	Right	1996	749.10	748.10		UT-2	43.0	8.6	1.0	1					30.78	1118	47,950
374	EF-10	Unnamed	1390 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6800	Right	1996	750.60	749.60		UT-2	47.2	9.4	1.0	1						47,160	
375	EF-10	Unnamed	1398 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	750.10	749.10		UT-2	46.2	9.2	1.0	1						62,280	
376	EF-10	Unnamed	1412 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	6600	Right	1996	749.70	748.70		UT-2	45.7	9.1	1.0	1						45,650	
377	EF-10	Unnamed	1262 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	750.60	749.60		UT-2	45.0	9.0	1.0	1						44,990	
378	EF-10	Unnamed	1284 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7100	Right	1996	750.60	749.60		UT-2	44.0	8.8	1.0	1						54,040	
379	EF-10	Unnamed	1326 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6900	Right	1996	749.10	748.05		UT-2	43.0	8.6	1.0	1						46,110	
380	EF-10	Unnamed	1398 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6800	Right	1996	749.09	748.09		UT-2	42.2	8.4	1.0	1						42,197	
381	EF-10	Unnamed	1382 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	749.05	748.05		UT-2	45.3	9.1	1.0	1						45,310	
382	EF-10	Unnamed	1394 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	748.82	747.82		UT-2	51.8	10.4	1.0	1						51,840	
383	EF-10	Unnamed	1273 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	750.60	749.60		UT-2	60.9	12.2	1.0	1						60,910	
384	EF-10	Unnamed	1285 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7100	Right	1996	751.10	750.10		UT-2	42.2	8.4	1.0	1						42,197	
385	EF-10	Unnamed	1297 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7100	Right	1996	751.10	749.28		UT-2	41.1	8.2	1.0	1						41,570	
386	EF-10	Unnamed	1303 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7000	Right	1996	749.70	748.71		UT-2	41.1	8.2	1.0	1						47,340	
387	EF-10	Unnamed	1315 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6900	Right	1996	749.72	748.72		UT-2	41.1	8.2	1.0	1						47,130	
388	EF-10	Unnamed	1337 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6800	Right	1996	749.68	748.66		UT-2	41.1	8.2	1.0	1						56,780	
389	EF-10	Unnamed	1359 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6800	Right	1996	749.72	748.72		UT-2	52.6	10.5	1.0	1						52,640	
390	EF-10	Unnamed	1371 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6800	Right	1996	749.10	748.10		UT-2	44.6	8.9	1.0	1						44,590	

Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Stage (Flr. Elev.)	Stage (Gnd. Elev.)	Found Gnd. Elev.	SID Reach Name	Struct Value (1k) Ave. \$ per all bids	Content Value (1k) (= 20% Struct)	Other Value (1k)	No. of Struct.	Real-2 Gen Data Estimate	No. of Struct. Estimated for test Tax \$ / SF	Tax Est \$ / SF for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes
Struc. Name	Stream Name	Street	Occ. Name	Cat. Name	City	State	Zip	Station	Bank	Year	IF Stage	Gnd. Stage	SID_Rch	Struc_Val	Cont_Val	Other_Val	Num Struct								
391	EF-10	Unnamed	1383 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	748.99	747.99		UT-2	46.6	9.3	1.0			0			46,620	
392	EF-10	Unnamed	1397 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6700	Right	1996	748.79	747.79		UT-2	46.8	8.4	1.0			1		33.33	1075	46,840
393	EF-10	Unnamed	1401 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6600	Right	1996	747.87	746.87		UT-2	43.4	8.7	1.0			1		31.35	1000	43,350
394	EF-10	Unnamed	1410 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6500	Right	1996	748.22	747.22		UT-2	42.2	8.4	1.0			1				
395	EF-10	Unnamed	1445 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6500	Right	1996	748.12	747.12		UT-2	26.5	5.9	1.0			1		28.91	1227	29,530
396	EF-10	Unnamed	1467 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6400	Right	1996	749.77	748.77		UT-2	101.0	20.2	1.0			1		27.83	2040	100,950
397	EF-10	Unnamed	1486 Katy Dr.	SF-1	Resi-1	EP	TX	78852	6200	Right	1996	749.29	748.29		UT-2	42.2	8.4	1.0			1				
398	EF-11	Unnamed	1205 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7300	Right	1996	751.30	750.30		UT-2	60.2	12.0	1.0			1				60,240
399	EF-11	Unnamed	1227 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7300	Right	1996	751.20	750.20		UT-2	52.0	10.4	1.0			1				52,010
400	EF-11	Unnamed	1249 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	751.20	750.20		UT-2	40.9	8.2	1.0			1				40,880
401	EF-11	Unnamed	1251 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	750.80	749.80		UT-2	54.2	10.8	1.0			1				54,240
402	EF-11	Unnamed	1200 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7500	Right	1996	751.70	750.70		UT-2	49.8	10.0	1.0			1				49,800
403	EF-11	Unnamed	1212 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7400	Right	1996	751.60	750.60		UT-2	44.4	8.9	1.0			1				44,360
404	EF-11	Unnamed	1234 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7300	Right	1996	751.40	750.40		UT-2	48.6	8.7	1.0			1				48,550
405	EF-11	Unnamed	1246 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7300	Right	1996	751.00	750.00		UT-2	52.4	10.5	1.0			1				52,350
406	EF-11	Unnamed	1258 Katy Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	751.10	750.10		UT-2	75.2	10.1	1.0			1				52,120
407	EF-11	Unnamed	1301 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7400	Right	1996	753.60	752.60		UT-2	53.3	11.1	1.0			1		29.83	1384	55,270
408	EF-11	Unnamed	1305 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7400	Right	1996	752.70	751.70		UT-2	52.6	10.5	1.0			1		36.17	1400	52,640
409	EF-11	Unnamed	1317 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	752.30	751.30		UT-2	68.4	13.7	1.0			1				68,420
410	EF-11	Unnamed	1321 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7200	Right	1996	752.00	751.00		UT-2	49.0	9.8	1.0			1				48,950
411	EF-11	Unnamed	1314 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7300	Right	1996	753.98	752.98		UT-2	49.8	10.0	1.0			1		32.32	1231	49,820
412	EF-11	Unnamed	1318 Paseco Encinal Dr.	SF-1	Resi-1	EP	TX	78852	7300	Right	1996	753.22	752.22		UT-2	46.4	9.3	1.0			1		33.91	986	46,380
413	EF-11	Unnamed	712	SF-2	Resi-2	EP	TX	78852	7300	Right	1996	751.00	750.00	750.00	UT-2	42.2	8.4	1.0			1				
414	EF-11	Unnamed	713	SF-2	Resi-2	EP	TX	78852	7200	Left	1996	751.20	750.20	750.20	UT-2	42.2	8.4	1.0			1				
415	EF-11	Unnamed	714	SF-2	Resi-2	EP	TX	78852	7400	Left	1996	751.00	750.00	750.00	UT-2	42.2	8.4	1.0			1				
416	EF-11	Unnamed	715	SF-2	Resi-2	EP	TX	78852	7400	Left	1996	751.00	750.00	750.00	UT-2	42.2	8.4	1.0			1				
417	EF-11	Unnamed	716	SF-2	Resi-2	EP	TX	78852	7400	Left	1996	750.90	749.90	749.90	UT-2	42.2	8.4	1.0			1				
418	EF-11	Unnamed	717	SF-2	Resi-2	EP	TX	78852	7387	Left	1996	754.20	753.20	753.20	UT-2	42.2	8.4	1.0			1				
419	EF-12	Unnamed	718	SF-2	Resi-2	EP	TX	78852	10999	Right	1996	764.50	763.50	763.50	UT-3	42.2	8.4	1.0			1				
420	EF-12	Unnamed	719	SF-2	Resi-2	EP	TX	78852	11499	Right	1996	765.90	764.90	764.90	UT-3	42.2	8.4	1.0			1				
421	EF-12	Unnamed	720	SF-2	Resi-2	EP	TX	78852	11742	Left	1996	766.90	765.90	765.90	UT-3	42.2	8.4	1.0			1				
422	EF-12	Unnamed	721	SF-2	Resi-2	EP	TX	78852	11999	Right	1996	768.90	767.90	767.90	UT-4	42.2	8.4	1.0			1				
423	EF-12	Unnamed	722	SF-2	Resi-2	EP	TX	78852	12000	Right	1996	768.90	767.90	767.90	UT-4	42.2	8.4	1.0			1				
424	EF-12	Unnamed	723	SF-2	Resi-2	EP	TX	78852	11999	Right	1996	768.90	767.90	767.90	UT-4	42.2	8.4	1.0			1				
425	EF-12	Unnamed	724	SF-2	Resi-2	EP	TX	78852	12000	Right	1996	768.90	767.90	767.90	UT-4	42.2	8.4	1.0			1				
426	EF-12	Unnamed	725	SF-2	Resi-2	EP	TX	78852	11999	Right	1996	768.90	767.90	767.90	UT-4	42.2	8.4	1.0			1				
427	EF-12	Unnamed	726	SF-2	Resi-2	EP	TX	78852	11999	Right	1996	772.00	771.00	771.00	UT-4	42.2	8.4	1.0			1				
428	EF-12	Unnamed	727	SF-2	Resi-2	EP	TX	78852	11999	Right	1996	772.00	771.00	771.00	UT-4	42.2	8.4	1.0			1				
429	EF-12	Unnamed	728	SF-2	Resi-2	EP	TX	78852	18000	Right	1996	773.60	772.60	772.60	UT-4	42.2	8.4	1.0			1				
430	EF-13	Rio Grande	729	SF-2	Resi-2	EP	TX	78852	3311	Right	1996	736.00	735.00	735.00	TSC-2	28.1	5.6	1.0			1				
431	EF-13	Rio Grande	730	SF-2	Resi-2	EP	TX	78852	3190	Left	1996	731.00	730.00	730.00	TSC-1	28.1	5.6	1.0			1				
432	EF-13	Rio Grande	731	SF-2	Resi-2	EP	TX	78852	1760	Left	1996	727.70	726.70	726.70	TSC-1	28.1	5.6	1.0			1				
433	EF-13	Rio Grande	732	SF-2	Resi-2	EP	TX	78852	1700	Left	1996	727.70	726.70	726.70	TSC-1	28.1	5.6	1.0			1				
434	EF-13	Rio Grande	733	SF-2	Resi-2	EP	TX	78852	1700	Left	1996	727.70	726.70	726.70	TSC-1	28.1	5.6	1.0			1				
435	EF-13	Rio Grande	734	SF-2	Resi-2	EP	TX	78852	1600	Left	1996	727.70	726.70	726.70	TSC-1	28.1	5.6	1.0			1				
436	EF-13	Rio Grande	735	SF-2	Resi-2	EP	TX	78852	1600	Left	1996	727.70	726.70	726.70	TSC-1	28.1	5.6	1.0			1				
437	EF-13	Rio Grande	736	SF-2	Resi-2	EP	TX	78852	1600	Left	1996	727.70	726.70	726.70	TSC-1	28.1	5.6	1.0			1				
438	EF-13	Rio Grande	737	SF-2	Resi-2	EP	TX	78852	8260	Left	1996	708.60	707.60	707.60	RG-2	21.1	4.2	1.0			1				
439	EF-13	Rio Grande	738	SF-2	Resi-2	EP	TX	78852	8260	Left	1996	708.60	707.60	707.60	RG-2	21.1	4.2	1.0			1				
440	EF-13	Rio Grande	739	SF-2	Resi-2	EP	TX	78852	8260	Left	1996	708.60	707.60	707.60	RG-2	21.1	4.2	1.0			1				
441	EF-13	Rio Grande	740	SF-2	Resi-2	EP	TX	78852	8360	Left	1996	708.60	707.60	707.60	RG-2	21.1	4.2	1.0			1				
442	EF-13	Rio Grande	741	SF-2	Resi-2	EP	TX	78852	8560	Left	1996	707.10	706.10	706.10	RG-2	21.1	4.2	1.0			1				
443	EF-13	Rio Grande	742	SF-2	Resi-2	EP	TX	78852	8560	Left	1996	708.10	707.10	707.10	RG-2	21.1	4.2	1.0			1				
444	EF-13	Rio Grande	743	SF-2	Resi-2	EP	TX	78852	8660	Left	1996	708.10	707.10	707.10	RG-2	21.1	4.2	1.0			1				
445	EF-13	Rio Grande	744	SF-2	Resi-2	EP	TX	78852	8760	Left	1996	711.30	710.30	710.30	RG-2	21.1	4.2	1.0			1				
446	EF-13	Rio Grande	745	SF-2	Resi-2	EP	TX	78852	8860	Left	1996	711.30	710.30	710.30	RG-2	21.1	4.2	1.0			1				
447	EF-16	Rio Grande	746	SF-2	Resi-2	EP	TX	78852	8860	Left	1996	711.30	710.30	710.30	RG-2	21.1	4.2	1.0			1				

Unique Struct. Name	Drawing #	Stream Name	Street Address	Occupancy Code	Damage Category	City	State	Zip	Station	LEFT (assumed) or Right	Year Built (assume missing)	1st Floor Story (partial)	2nd Floor Story (partial)	Found Grnd. Elev.	Subreach Name	Stratovolc (Kilauea)	Continuity (13' E2007) (SAB)	Other/Uncl. (13)	No. of Struct.	RODZ Corp. Estimate	No. of Struct. Estimated for Damage	Tax Est. \$/SF. for Main Area	Living Area SF (partial)	All Tax Appr. Value (1998)	Notes		
448	EF-16	Rio Grande	747	SF-2	Resi-2	EP	TX	78852	8860	Left	1996	711.30	710.30	710.30	EP-2	210	10	1	21068	0							
449	EF-16	Rio Grande	748	SF-2	Resi-2	EP	TX	78852	8860	Left	1996	711.30	710.30	710.30	EP-2	210	10	1	21068	0							
450	EF-16	Rio Grande	749	SF-2	Resi-2	EP	TX	78852	8960	Left	1996	711.30	710.30	710.30	EP-2	210	10	1	21068	0							
451	EF-16	Rio Grande	750	SF-2	Resi-2	EP	TX	78852	8960	Left	1996	709.50	708.50	708.80	EP-2	210	10	1	21068	0							
452	EF-16	Rio Grande	751	SF-2	Resi-2	EP	TX	78852	9060	Left	1996	709.50	708.50	708.60	EP-2	210	10	1	21068	0							
453	EF-16	Rio Grande	752	SF-2	Resi-2	EP	TX	78852	9060	Left	1996	709.50	708.50	708.80	EP-2	210	10	1	21068	0							
454	EF-16	Rio Grande	753	SF-2	Resi-2	EP	TX	78852	9060	Left	1996	709.50	708.50	708.50	EP-2	210	10	1	21068	0							
455	EF-16	Rio Grande	754	SF-2	Resi-2	EP	TX	78852	9060	Left	1996	709.50	708.50	708.50	EP-2	210	10	1	21068	0							
456	EF-16	Rio Grande	755	SF-2	Resi-2	EP	TX	78852	9060	Left	1996	713.50	712.50	712.90	EP-2	210	10	1	21068	0							
457	EF-16	Rio Grande	756	SF-2	Resi-2	EP	TX	78852	9060	Left	1996	709.50	708.50	708.50	EP-2	210	10	1	21068	0							
458	EF-16	Rio Grande	757	SF-2	Resi-2	EP	TX	78852	9160	Left	1996	709.50	708.50	708.50	EP-2	210	10	1	21068	0							
459	EF-16	Rio Grande	758	SF-2	Resi-2	EP	TX	78852	9160	Left	1996	713.50	712.50	712.90	EP-2	210	10	1	21068	0							
460	EF-16	Rio Grande	759	SF-2	Resi-2	EP	TX	78852	9160	Left	1996	713.50	712.50	710.40	EP-2	210	10	1	21068	0							
461	EF-16	Rio Grande	760	SF-2	Resi-2	EP	TX	78852	9360	Left	1996	715.50	714.50	714.60	EP-2	210	10	1	21068	0							
												0.00	1.00														
												0.00	1.00														
												0.00	1.00														
												0.00	1.00														
												0.00	1.00														

## **Appendix E**

Appendix E is a proposed drainage and stormwater ordinance for the City of Eagle Pass. The City may want to consider implementing this proposed ordinance if one does not exist.

Organization:      Proposed Drainage Ordinance  
                                 Tables and Figures

**CITY OF EAGLE PASS, TEXAS  
PROPOSED STORM DRAINAGE AND SEDIMENT CONTROL ORDINANCE**

**PERTAINING TO STORM DRAINAGE AND SEDIMENT CONTROL**

**WHEREAS**, certain technological advances have occurred in the area of Storm Drainage And Sediment Control which are contained in a new code prepared for the City of Eagle Pass; and

**WHEREAS**, the new code has been drafted to coordinate with the drainage ordinances of Maverick County, Texas.

**NOW THEREFORE, BE IT ORDAINED**, that the entire Exhibit "A" attached hereto and shall become effective upon passage.

**ADOPTED AND PASSED** by at the CITY COUNCIL of the City of Eagle Pass, Texas, on this \_\_\_\_\_ day of \_\_\_\_\_, 1999.

\_\_\_\_\_  
**ATTEST:**

\_\_\_\_\_

Presented by me to the Mayor of the City of Eagle Pass, Texas, this \_\_\_\_\_ day of \_\_\_\_\_, 1999.

\_\_\_\_\_

Approved and signed by the Mayor of the City of Eagle Pass, Texas, this \_\_\_\_\_ day of \_\_\_\_\_, 1999.

\_\_\_\_\_

**ATTEST:**  
\_\_\_\_\_



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## EAGLE PASS, TEXAS

### A General Ordinance Establishing Storm Drainage and Sediment Control

#### 1. Purpose

The purpose of this Ordinance is to reduce the hazard to public health and safety caused by excessive storm water runoff, to enhance economic objectives, and to protect, conserve and promote the orderly development of land and water resources within the regulatory area. This ordinance regulates:

- a. Storm water drainage improvements related to development of lands located within Eagle Pass.
- b. Drainage control systems installed during new construction and grading of lots and other parcels of land.
- c. Erosion and sediment control systems installed during new construction of grading of lots and other parcels of land.
- d. The design, construction and maintenance of storm water drainage facilities and systems.
- e. Existing storm water drainage systems where the inclusion of improvements is feasible.

It is recognized that drainage systems serving the City of Eagle Pass may not have sufficient capacity to receive and convey storm water runoff resulting when land changes from open or agricultural use to a more urbanized use. It is further recognized that deposit of sediment from developments during and after construction can reduce capacities of storm sewer and drainage systems and result in damages to receiving lakes and streams. Therefore, it shall be the policy of the City of Eagle Pass that the storage and controlled release of storm water runoff shall be required of all new development, any redevelopment and other new construction in the City of Eagle Pass as stipulated elsewhere in this ordinance. The release rate of storm water from developed lands shall not exceed the release rate from the land area in its present land use.

Because topography and the availability and adequacy of outlets for storm runoff vary with almost every site, the requirements for storm drainage tend to be an individual matter for any project. It is recommended that each proposed project be discussed with the Engineer's office at the earliest practical time in the planning stage.

#### 2. Conflicting Ordinances

The provisions of this Ordinance shall be deemed as additional requirements to minimum standards required by other ordinances of the City. In the case of conflicting requirements, the most restrictive shall apply.

### 3. Compliance with Other Ordinances

In addition to the requirements of this Ordinance, compliance with the requirements set forth in any other applicable ordinances with respect to submission and approval of preliminary and final subdivision plats, improvement plans, building and zoning permits, construction inspections, appeals, and similar matters, and compliance with applicable State of Texas statutes and regulations shall be required.

### 4. Definitions

For the purpose of this Ordinance, the following definitions shall apply:

City - The City of Eagle Pass, Maverick County, Texas, and any subordinate employee or agent to whom they shall specifically delegate a responsibility authorized by this Ordinance.

Capacity of a Storm Drainage Facility - The maximum flow that can be conveyed or stored by a storm drainage facility without causing damage to public or private property.

Channel - A natural or artificial watercourse which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. It has a defined bed and banks which serve to confine the water.

Compensatory storage - An artificial volume of storage within a flood plain used to balance the loss of natural flood storage capacity when artificial fill or structures are placed within the flood plain.

Contiguous - Adjoining or in actual contact with.

Critical Duration Storm - The storm duration which requires the greatest detention storage. In the Rational Method, the critical duration storm is equal to the time of concentration being analyzed. For computer modeling, the critical duration storm is equal to or greater than the time of concentration of the watershed being modeled.

Culvert - A closed conduit used for the passage of surface drainage water under a roadway, railroad, canal, or other impediment.

Detention Basin - A facility constructed or modified to restrict the flow of storm water to a prescribed maximum rate, and to detain concurrently the excess waters that accumulate behind the outlet.

Drainage Area - The area from which water is carried off by a drainage system; a watershed or catchment area.

Drop manhole - A manhole having a vertical drop greater than two feet between the inlet pipe and the outlet pipe. A vertical drop pipe shall be located immediately outside the manhole.

Dry Bottom Detention Basin - A basin designed to be completely dewatered after having provided its planned detention of runoff during a storm event.

Duration - The time period of a rainfall event.

Engineer - A subordinate or agent of the City to whom the City has delegated responsibility.

Erosion - Wearing away of the land by running water, waves, temperature changes, ice or wind.

FEMA - Federal Emergency Management Administration - delegated with administering the Flood Insurance program and response after natural disasters. Successor to the former Flood Insurance Administration.

Flood Elevation - The elevation at all locations delineating the maximum level of high waters for a flood of given return period and rainfall duration.

Flood or Flood Waters - The water of any watercourse which is above the banks of the watercourse. Is also means the water of any lake which is above and outside the banks thereof.

Flood Hazard Area - Those flood plains which have not been adequately protected from flooding caused by the regulatory flood, and are shown on the Flood Hazard or Floodway-Flood Boundary Maps of the Federal Insurance Administration or maps provided to the City by the Texas Natural Resources Conservation Commission.

Flood Plain - The area adjoining the river or stream which has been or may hereafter be covered by flood water from regulatory floodway and floodway fringe.

Floodway - see Regulatory Floodway.

Floodway Fringe - That portion of the flood plain lying outside the floodway which is inundated by the regulatory flood.

Footing Drain - A drain pipe installed around the exterior of a basement wall foundation to relieve water pressure caused by high groundwater elevation.

Grade - The inclination or slope of a channel, canal, conduit, etc., or natural ground surface usually expressed in terms of the percentage the vertical rise (or fall) bears to the corresponding horizontal distance.

IBWC - International Boundary and Waterway Commission - delegated with administering the use and care of water resources along the common border between the United States and Mexico.

Impact Areas - Areas defined and mapped by the City which are unlikely to be easily drained because of one or more factors including but not limited to any of the following: soil type, topography, land where there is not adequate outlet, a floodway or flood plain.

Impervious - A term applied to material through which water cannot pass, or through which water passes with difficulty.

Inlet - An opening into a storm sewer for the entrance of surface storm water runoff, more completely described as a storm sewer inlet.

Junction Chamber - A converging section of conduit, usually large enough for a person to enter, used to facilitate the flow from one or more conduits into a main conduit.

Lateral Storm Sewer - A sewer that has inlets connected to it but has no other storm sewer connected.

Manhole - Storm sewer structure through which a person may enter to gain access to an underground storm sewer or enclosed structure.

Major Drainage Area - Drainage system carrying runoff from an area of more than fifty square miles Rural classification or one square mile Urban classification. Designs shall be in accordance with the Texas Department of Transportation.

Maverick County Water Control & Improvement District No. 1 - delegated with the development of water resources and irrigation for citizens in Maverick County, Texas. Responsible for care and maintenance of irrigation network in Maverick County, Texas.

Minor Drainage System - Drainage system carrying runoff from an area of less than fifty square miles Rural classification or one square mile Urban classification.

Off Site - Everything not on site.

On Site - Located within the controlled or Urbanized area where runoff originates.

Outfall - The point or location where storm runoff discharges from a sewer or drain. Also applies to the outfall sewer or channel which carries the storm runoff to the point of outfall.

Peak Flow - The maximum rate of flow of water at a given point in a channel or conduit resulting from a predetermined storm or flood.

Radius of Curvature - Length of radius of a circle used to define a curve.

Rainfall Intensity - The cumulative depth of rainfall occurring over a given duration, normally expressed in inches per hour.

Reach - Any length of river, channel or storm sewer.

Regulated Area - All of the land under the jurisdiction of the City of Eagle Pass.

Regulated Drain - An open drain, a tile drain or a combination of the two whose description and limits are established by law.

Regulatory Flood - That flood having a peak discharge which can be equaled or exceed on the average of once in a one hundred (100) year period, as calculated by a method and procedure which is acceptable to the City. If a permit from FEMA for construction in the floodway is required (see Section 6), then the regulatory flood peak discharge should be calculated by a

method acceptable to the City. This regulatory flood is equivalent to a flood having a probability of occurrence of one percent (1%) in any given year.

Regulatory Floodway - The channel of a river or stream and those portions of the flood plains adjoining the channel which are reasonably required to carry and discharge efficiently the peak flow of the regulatory flood of any river or stream.

Release Rate - The amount of storm water released from a storm water control facility per unit of time.

Return Period - The average interval of time within which a given rainfall event will be equaled or exceeded once. A flood having a return period of 100 years has a one percent probability of being equaled or exceeded in any one year.

Sediment - Material of soil or rock origin, transported, carried or deposited by water.

Siphon - A closed conduit or portion of which lies above the hydraulic grade line, resulting in a pressure less than atmospheric and requiring a vacuum within the conduit to start flow. A siphon utilizes atmospheric pressure to effect or increase the flow of water through a conduit. An inverted siphon is used to carry storm water flow under an obstruction such as a sanitary sewer.

Stilling Basin - A basin used to slow water down or dissipate its energy.

Storage Duration - The length of time that water may be stored in any storm water control facility, computed from the time water first begins to be stored.

Storm Sewer - A closed conduit for conveying collected storm water.

Storm Water Drainage System - All means, natural or man-made, used for conducting storm water to, through or from a drainage area to any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, street and pumping stations.

Storm Water Runoff - The water derived from rains falling within a tributary basin, flowing over the surface of the ground or collected in channels or conduits.

Tributary - Contributing storm water from upstream land areas.

Urbanization - The development, change or improvement of any parcel of land consisting of one or more lots for residential, commercial, industrial, institutional, recreational or public utility purposes.

Watercourse - Any river, stream, creek, brook, branch natural or man-made drainageway in or into which storm water runoff or floodwaters flow wither regularly or intermittently.

Watershed - see Drainage Area.

Wet Bottom Detention Basin (Retention Basin) - A basin designed to retain a permanent pool of water after having provided its planned detention of runoff during a storm event.

## 5. Storm Water Control Policy

It is recognized that the smaller streams and drainage channels serving the City of Eagle Pass may not have sufficient capacity to receive and convey storm water runoff resulting from continued urbanization. Accordingly, the storage and controlled release rate of excess storm water runoff shall be required for any development, redevelopment and new construction located within the City of Eagle Pass not exempt under this Ordinance. No improvement location permit shall be issued for the construction or extension of any proposed or existing building in Eagle Pass until the required drainage plans have been approved in writing by the City, except for the following exemptions:

- (a) Construction or extension of a single family dwelling house or an extension of a single family dwelling house or an accessory use building thereto;
- (b) Construction or extension of a duplex dwelling house or an accessory use building thereto;
- (c) Construction or extension in that area of the City zoned Central Business District (CB);  
or
- (d) Construction, extension or replacement of a building or buildings on a site of 30,000 square feet or less.
- (e) Extension or replacement of any existing building that does not increase the existing rate of runoff.

The exceptions (a) through (e) above, however, shall not be applicable to a project if located in a previously designated Impact Area as established per Section 18 of this Ordinance.

The release rate of storm water from development, redevelopment, and new construction, as stipulated above, may not exceed the peak rate of runoff from the land area in its present state of development for a ten (10) year storm event. The developer must submit to the City, detailed computations of runoff before and after development, redevelopment or new construction. These computations must show the peak runoff rate after development, redevelopment or new construction, for the 100 year return period of critical duration must not exceed the 10 year return period predevelopment peak runoff rate. The computation method used in determining storm water runoff for land areas up to and including 5 acres may be the "Rational Method." Other proven hydrograph techniques and/or computer drainage modeling methods may be used for determining storm water runoff of both areas smaller and larger than 100 acres.

## 6. Permits for Construction in the Floodway

Permits for construction in a floodway require FEMA approval and of any works for flood control. This includes bridges, dams, levees, dikes, floodwalls, wharves, piers, dolphins, booms, weirs, bulkheads, jetties, groins, excavations, fills or deposits of any kind, utility lines, or other building, structure or obstruction. Also, any ditch work (new construction, deepening or modification) within one half mile of a public freshwater lake of 10 acres or more in area.



The approval of FEMA, in writing, must be obtained before beginning construction.

## **7. Information Requirements**

The following information and data provided by a Texas licensed professional engineer or land surveyor engaged in storm drainage design shall be submitted to the City at the time of application for 1) each proposed major subdivision or planned development lying within the Regulated Area prior to Final Plat approval by the Planning Commission, or 2) a building permit for any development, redevelopment or new construction on real estate which lies within the Regulated Area which has not previously received drainage approval or is not exempt from the requirements of this Ordinance.

### **A. Topographic and Soils Maps**

A topographic map of the land to be developed and such adjoining land whose topography may affect the layout or drainage of the development. The contour intervals shall be one foot when slopes are less than four percent and shall be two feet when the slope exceeds 10 percent and shall be five feet when the slope exceeds 10 percent. On this map, the following shall be shown:

- (1) The locations of streams and other flood water runoff channels, the extent of the flood plains at the established 100 year flood elevation where available (regulatory floodway), and the limits of the floodway, all properly identified.
- (2) The normal shoreline of lakes, ponds, swamps and detention basins, their flood plains, lines of inflow and outflow if any.
- (3) The location of regulated drains, farm drains, inlets and outfall, if any of record.
- (4) Storm sewers and outfall, if any of record.
- (5) Septic tank systems and outlets, if any of record.
- (6) Seeps, springs, flowing and other wells, that are visible or of record.
- (7) Provide soils map of proposed development indicating soil name and their hydrologic classification when Soils Conservation Service (SCS) hydrologic methods are used.

### **B. Preliminary Drainage Plan**

A comprehensive plan, in preliminary form (or in combined preliminary and final form), designed to handle safely the storm water runoff and to detain the increased storm water runoff must be submitted to the City. The plan shall provide or be accompanied by maps or other descriptive materials indicating the feasibility of the drainage plan and showing the following:

- (1) The extent and area of each watershed affecting the design of detention facilities as shown on USGS Quadrangle Maps or other more detailed maps as required by the City.

- (2) The preliminary layout and design of proposed storm sewers, the outfall and outlet locations and approximate elevations, the receiving stream of channel and its 100 year return period water elevation.
- (3) The location and design of the proposed street system, especially including depressed pavements used to convey or temporarily store overflow from the heavier rainstorms, and the outlets for such overflow.
- (4) The locations, cross sections and profiles of existing streams and flood plains to be maintained, and new channels to be constructed.
- (5) The materials, elevations, waterway openings and the basis for design of proposed culverts and bridges.
- (6) Existing detention ponds and basins to be maintained, enlarged or otherwise altered and new ponds or basins to be built and the basis of their design.
- (7) The estimated depth and amount of storage required in the new ponds or basins.
- (8) The estimated location and percentage of impervious surfaces existing and expected to be constructed when the development is completed.
- (9) Any interim plan which is to be incorporated into the development pending completion of the development and the final drainage plan.

### **C. Valley Cross Section**

One or more typical cross sections must be provided showing all existing and proposed channels or other open drainage facilities carried to a point above the 100 year high water elevation; showing the elevation of the existing land and the proposed changes thereto, together with the high water elevations expected from the 100 year storm under the controlled conditions called for by this Ordinance; and showing the relationship of structures, streets and other facilities.

### **D. Site Plan**

A plan drawn to scale showing dimensions of the site with existing and proposed facilities must be provided. All plan views shall include, but may not be limited to, the following information when applicable:

1. A North arrow;
2. The scale used;
3. Site location map;
4. Property boundaries with bearing and distance;
5. Property owner/developer;
6. Building setback lines;
7. Location of all existing and proposed facilities/utilities;
8. Topography in the area affected by construction.

### **E. Final Drainage Plans**

Upon approval of the preliminary drainage plans by the City, final drainage plans shall be submitted to the City. The final plans shall provide or be accompanied by calculations, maps and/or other descriptive material showing the following:

- (1) The extent and area of each watershed tributary to the drainage channels in the development.
- (2) The street storm sewers and other storm drains to be built, the basis of their design, outfall and outlet locations and elevations, the receiving stream or channel and its high water elevation, and the functioning of the drains during high water conditions,
- (3) The parts of the proposed street system where pavements are planned to be depressed sufficiently to convey or temporarily store overflow from storm sewers and over the curb runoff resulting from the heavier rainstorms and the outlets for such overflow.
- (4) Existing streams and flood plains to be maintained, and new channels to be constructed, their locations, cross sections and profiles.
- (5) Proposed culverts and bridges to be built, their materials, elevations, waterway openings and basis of their design.
- (6) Existing detention basins and ponds to be maintained, enlarged or otherwise altered and new basins or ponds to be built and the basis of their design.
- (7) The estimated location and percentage of impervious surfaces existing and expected to be constructed when the development is completed.
- (8) The slope, type and size of all sewers and other waterways.
- (9) For all detention basins, a plot or tabulation of storage volumes with corresponding water surface elevations and a plot or tabulation of the basin outflow rates for those water surface elevations.

A written report must be included with each preliminary and final drainage plan. The report will contain a summary description of: (a) the significant drainage problems associated with the project; (b) the analysis procedure used to evaluate these problems and to propose solutions; (c) any assumptions or special conditions associated with the use of these procedures; (d) the proposed design of the drainage control system; and (e) the result of the analysis of the proposed drainage control system showing that it does solve the project's drainage problems.

The following additional documents should be submitted with all applications submitted for approval:

- (1) A hydraulic report detailing existing and proposed drainage patterns on the subject site. The report should include a description of the present land use as well as proposed land use. Any off-site drainage entering the site should also be addressed. This report

should be comprehensive and detail all the design steps which the design engineer took during the design.

- (2) All hydrologic and hydraulic computations should be included in the submittal. These calculations should include, but not be limited to: runoff curve members or runoff coefficients; runoff calculation; stage-discharge relationships; times of concentration; and storage volume.
- (3) Copies of all computer runs. These computer runs should include both the input and outputs. A floppy diskette with input files will expedite the review process.
- (4) A set of plan drawings stamped by a Registered Professional Engineer or Registered Land Surveyor showing all proposed detention areas, storm sewers, inlets, outfall structures, open ditches, culverts and bridges.
- (5) A set of exhibits should be included showing the drainage subareas and a schematic detailing of how any computer model inputs were set up.
- (6) A conclusion report summarizing the hydraulic design and detailing how this design satisfies the Eagle Pass Storm Water and Sediment Control Ordinance.

#### **F. Submittal and Consideration of Plans**

The City and/or its Engineer shall approve or disapprove any preliminary plans, final plans and/or construction plans within sixty (60) days of receipt of a complete submittal unless applicant consents to a time extension. All approvals and disapproval's shall be in writing.

The Engineer is authorized to review engineering summaries of projects and based upon the same grant exemption from any and all requirements of this Ordinance and/or waive any requirements of this Ordinance. Any applicant may appeal the decision of the Engineer to the City which shall also be authorized to grant exemptions from any and all requirements of this Ordinance and/or waive any requirements of this Ordinance at its discretion.

#### **G. Engineering Review Fees**

As a condition of and prior to approval of final drainage plans by the City, the applicant shall pay to the City of Eagle Pass the actual costs incurred by the City in respect to the review of all preliminary plans, final plans and/or construction plans by a licensed professional engineer in excess of the first ten (10) hours of such review and consultation.

The City shall furnish to the applicant in writing prior to the approval of the applicant's final drainage plan a written statement specifying the total cost of professional engineering fees incurred by the City in connection with the review of applicant's plans, including the total hours expended by such professional engineer, and the amount required to be paid by applicant prior to approval of final drainage plans by the City. As a condition of and prior to approval of final drainage plans, applicant shall pay to the City of Eagle Pass Clerk the sum set forth in said statement representing the cost of professional engineering services in excess of the following number of hours thereof incurred by the City in connection with the review of applicant's preliminary and final drainage plans and accompanying information and data:

- a. Ten (10) hours of individual site plans, minor subdivisions, other projects that involve storm water drainage plans and/or calculations;
- b. Fifteen (15) hours for major subdivisions.

## 8. Determination of Runoff Quantities

Runoff quantities shall be computed for the area of the parcel under development plus the area of the watershed flowing into the parcel under development. The quantity of runoff which is generated as the result of a given rainfall intensity may be calculated as follows:

### A. Areas up to and Including 100 Acres

For areas up to and including one hundred (100) acres and for sites with no depression storage, the Rational Method may be used. In the Rational Method, the peak rate of runoff,  $Q$ , in cubic feet per second is computed as:

$$Q = CIA, \text{ where}$$

$C$  = runoff coefficient, representing the characteristics of the drainage area and defined as the ratio of runoff to rainfall.

$I$  = average intensity of rainfall in inches per hour for a duration equal to the time of concentration ( $t_c$ ) for a selected rainfall frequency.

$A$  = tributary drainage area in acres.

Guidance to the selection of the runoff coefficient "C" is provided by Table 1 which show values for different types of surface and local soil characteristics. The composite "C" value used for a given drainage area with various surface types shall be the weighted average value for the total area calculated from a breakdown of individual area having different surface types.

Table 2 provides runoff coefficients and inlet times for different land use classifications. In the instance of undeveloped land situated in an upstream area, a coefficient or coefficients shall be used for this area in its present or existing state of development.

Rainfall intensity shall be determined from the rainfall frequency curves shown in Figure 1 or from data shown in Table 5. The time of concentration ( $t_c$ ) to be used shall be the sum of the inlet time and flow time in the drainage facility from the most remote part of the drainage area to the point under consideration. The flow time in the storm sewers may be estimated by the distance in feet divided by velocity of flow in feet per second. The velocity shall be determined by the Manning formula.

Inlet time is the combined time required for the runoff to reach the inlet of the storm sewer. It includes overland flow time and flow time through established surface drainage channels such as swales, ditches and sheet flow across such areas as lawns, fields and other graded surfaces. It may be computed by using Figure 2.

### B. Areas in Excess of 100 acres

The runoff rate for area in excess of 100 acres shall be determined by methods described in Section 15, Subsection G.

### **9. Amount of Runoff to be Accommodated by Various Parts of Drainage Facility**

Various parts of a drainage facility must accommodate runoff water as follow:

#### **A. Minor Drainage System**

The minor drainage system such as inlets, catch basins, street gutters, swales, sewers and small channels which collect storm water (runoff) must accommodate peak runoff from a 10-year return frequency storm.

Duration, for sizing these conveyance using the rational method shall be equal to the time of concentration. The Rational Method is acceptable for storm sewer design, as long as the TR-55 time of concentration methodology is used. Determination of hydraulic capacity for storm sewers sized by Rational Method analysis should be done using Manning's Equation.

These minimum requirements must be satisfied:

- (1) The allowable spread of water on Collector Streets is limited to maintaining two clear 10 foot moving lanes of traffic. One lane is to be maintained on Local Roads, while Places can have a water spread equal to one-half of their width.
- (2) Open channels carrying peak flows greater than 30 cubic feet per second shall be capable of accommodating peak runoff for a 50-year return period storm within the drainage easement.
- (3) Culverts shall be capable of accommodating peak runoff from a 50-year return frequency storm when crossing under roads which are part of the functional classification and are classified as primary or secondary arterial streets.

#### **B. Major Drainage Systems**

Major drainage systems are defined in Section 4, and shall be designed in accordance with Texas Department of Transportation Hydraulic Manual as described in Section 6.

### **10. Level of Protection for Urban Areas**

First floor elevations of all buildings shall be such that all floors including basements shall have one foot of free board above the 100 year flood elevation or at the flood protection grade.

### **11. Storm Sewer Design Standards**

All storm sewers, whether private or public, and whether constructed on private or public property shall conform to the design standards and other requirements contained herein.

### A. Manning Equation

The hydraulic capacity of storm sewers shall be determined using Manning's Equation:

$$V = (1.489/n)(R^{2/3})(s^{1/2}), \text{ where}$$

V = mean velocity of flow in feet per second

R = the hydraulic radius in feet, A/P, cross sectional area / wetted perimeter

s = the slope of the energy grade line in feet per foot

n = roughness coefficient

The hydraulic radius, R, is defined as the cross sectional area of flow divided by the wetted flow surface or wetted perimeter. Typical "n" values for storm sewer materials are listed in Table 3. Roughness coefficients (n) values for other sewer materials can be found in standard hydraulics texts and references.

### B. Minimum Size

The minimum size of all storm sewers shall be 12 inches. Rate of release for detention storage shall be controlled by an orifice plate or other devices, subject to approval of the City, where the 12 inch pipe will not limit rate of release as required.

### C. Grade

Sewer grade shall be such that, in general, a minimum to two feet of cover is maintained over the top of the pipe. Pipe cover less than the minimum may be used only upon approval of the City. Uniform slopes shall be maintained between inlets, manholes and inlets to manholes. A minimum drop of 0.1 foot through manholes and inlets should be provided. Final grade shall be set with full consideration of the capacity required, sedimentation problems and other design parameters. Minimum and maximum allowable slopes shall be those capable of producing velocities of two and one-half and 15 feet per second, respectively, when the sewer is flowing full.

### D. Alignment

Storm sewers shall be straight between manholes insofar as possible. Where long radius curves are necessary to conform to street layout, the minimum radius of curvature shall be no less than 100 feet for sewers 42 inches and larger in diameter. Deflection of pipe sections shall not exceed the maximum deflection recommended by the pipe manufacturer. The deflection shall be uniform and finished installation shall follow a smooth curve.

### E. Manholes

Manholes shall be installed to provide access to continuous underground storm sewers for the purpose of inspection and maintenance. Manholes may be used as inlet or drainage structures and shall be provided at the following locations:

- (1) Where one or more storm sewers converge.
- (2) At the point of beginning or at the end of a curve, and at the point of reverse curvature (PC, PT, PRC).
- (3) Where the pipe size changes.
- (4) Where an abrupt change in alignment occurs.
- (5) Where a change in grade occurs.
- (6) At suitable intervals in straight sections of sewer.

The maximum distance between storm sewer manholes, unless otherwise approved by the City, shall be as follows:

#### Size of Pipe Maximum Distance

<u>(inches)</u>	<u>(feet)</u>
12 through 24	400
48 and larger	600

### F. Inlets

Inlets or drainage structures shall be utilized to collect surface water through grated openings and convey it to storm sewers, channels or culverts. Inlet design and spacing shall be in accordance with the Hydraulic Design Manual of the Texas Department of Transportation or other approved design procedure. The inlet grate opening provided must be adequate to pass the design 10 year flow with 50% of the sag inlet areas clogged. An overflow channel from sag inlets to the overflow channel or basin shall be provided at sag inlets, so that the maximum depth of water that might be ponded in the street sag shall not exceed 7 inches. Inlets may be used as manholes at locations where the pipe sizes do not exceed eighteen (18) inches in diameter.

Inlet design and spacing may be done using the Rational Method. Use of the HEC-12 computer program is also an acceptable method. Gutter spread on continuous grades may be determined using the modified Manning's equation, or by using Table 6 - Storm Drainage Street Velocities and Capacities flowing curb full for Maverick County, Texas.

## 12. Workmanship and Materials

### A. Workmanship

The specifications for the construction of storm sewer shall not be less stringent than those set forth in the latest edition of the Texas Department of Transportation "Texas Standard Specifications".



## B. Materials

Storm sewer manholes, inlets, pipe and fittings used in storm sewer construction shall conform to the materials shown in the most recent "City of Eagle Pass Typical Construction Guidelines and Details".

## C. Special Hydraulic Structures

Special hydraulic structures required to control the flow of water in storm runoff drainage system include junction chambers, drop manholes, inverted siphons, stilling basins or other special structures. The use of these structures shall be limited to those locations justified by prudent planning and by careful and thorough hydraulic engineering analysis.

## 13. Open Channel Design Standards

All open channels, whether private or public, and whether constructed on private or public land, shall conform to the design standards and other design requirements contained herein.

### A. Manning Equation

The waterway for channels shall be determined using Manning's Equation.

$$Q = AV = A (1.486/n)(R^{2/3})(s^{1/2}), \text{ where}$$

A = waterway area of channel in square feet

Q = discharge in cubic feet per second, cfs

V, R, s and n are explained above

### B. Channel Cross Section and Grade

The required channel cross section and grade are determined by the design capacity, the material in which the channel is to be constructed, and the requirements for maintenance. A minimum depth may be required to provide adequate outlets for subsurface drains, tributary ditches or streams. The channel grade shall be such that the velocity in the channel is high enough to prevent siltation, but low enough to prevent erosion. Velocities less than 1.5 feet per second should be avoided because siltation will take place and ultimately reduce the channel cross section. The maximum permissible velocities in vegetal-lined channel are shown in Table 4. Developments through which the channel is to be constructed must be considered in the design of the channel section.

### C. Side Slopes

Earthen channel side slopes shall be no steeper than 3 to 1. Flatter slopes may be required to prevent erosion and for ease of maintenance. Where channels will be lined, side slopes shall be no steeper than 1-1/2 to 1 with adequate provisions made for weep holes. Side slopes steeper than 1-1/2 to 1 may be used for lined channels providing that the side lining and

structural retaining wall are designed and constructed with provisions for live and dead load surcharge.

#### **D. Channel Stability**

- (1) Characteristics of a stable channel are:
  - (a) It neither aggrades nor degrades beyond tolerable limits.
  - (b) The channel banks do not erode to the extent that the channel cross section is changed appreciably.
  - (c) Excessive sediment bars do not develop.
  - (d) Excessive erosion does not occur around culverts, bridges or elsewhere.
  - (e) Gullies do not form or enlarge due to the entry of uncontrolled surface flow to the channel.
- (2) Channel stability shall be determined for an aged condition and the velocity shall be based on the design flow or the bank full flow, whichever is greater, using "n" values for various channel linings as shown in Table 3. In no case is it necessary to check channel stability for discharges greater than that from a 100-year return period storm.
- (3) Channel stability must be checked for conditions immediately after construction. For this stability analysis, the velocity shall be calculated for the expected flow from a ten-year return period storm on the watershed, or the bank full flow, whichever is smaller. The "n" value for newly constructed channels in fine-grained soils and sands may be determined in accordance with the National Engineering Handbook 5, Supplement B, Soil Conservation Service and shall not exceed 0.025. The allowable velocity in the newly constructed channel may be increased by a maximum of 20 percent to reflect the effects of vegetation to be established under the following conditions:
  - (a) The soil and site in which the channel is to be constructed are suitable for rapid establishment and support of erosion controlling vegetation.
  - (b) Species of erosion controlling vegetation adapted to the area, and proven methods of establishment are shown.
  - (c) The channel design includes detailed plans for establishment of vegetation on the channel side slopes.

#### **E. Appurtenant Structures**

The design of channels will provide all structures required for the proper functioning of the channel and the laterals thereto and travelways for operation and maintenance. Recessed inlets and structures needed for entry of surface and subsurface flow into channels without significant erosion or degradation shall be included in the design of channel improvements.

The design is also to provide the necessary flood gates, water level control devices and any other appurtenance affecting the functioning of the channels and the attainment of the purpose for which they are built.

The effect of channel improvements on existing culverts, bridges, buried cables, pipelines and inlet structures for surface and subsurface drainage on the channel being improved and laterals thereto shall be evaluated to determine the need for modification or replacement. Culverts and bridges which are modified or added as part of channel improvement projects shall meet reasonable standards for the type of structure and shall have a minimum capacity equal to the design discharge or governmental agency design requirements, whichever is greater.

#### **F. Disposition of Spoil**

Spoil material resulting from clearing, grubbing and channel excavation shall be disposed in such a manner which will:

- (1) Minimize overbank wash.
- (2) Provide for the free flow of water between the channel and flood plain unless the valley routing and water surface profile are based on continuous dikes being installed.
- (3) Not hinder the development of travelways for maintenance.
- (4) Leave the right-of-way in the best condition feasible, consistent with the project purposes, for productive use by the owner,
- (5) Improve the aesthetic appearance of the site to the extent feasible.
- (6) Be approved by FEMA or US Army Corps of Engineers (whichever is applicable) if deposited in the floodway.

### **14. Construction and Materials**

#### **A. Construction**

Specifications shall be in keeping with the proceeding standards and shall describe the requirements for proper installation of the project to achieve its intended purpose.

#### **B. Materials**

Materials acceptable for use as channel lining are:

- (1) Grass
- (2) Revetment riprap
- (3) Concrete
- (4) Hand-laid riprap

(5) Precast cement concrete riprap

(6) Grouted riprap

(7) Gabions

Other lining materials may be used with prior approval of the City. Materials shall comply with the latest edition of the Texas Department of Transportation "Texas Standard Specifications".

## **15. Storm Water Detention**

The following shall govern the design of any improvement with respect to the detention of storm water runoff.

### **A. Acceptable Detention Methods**

The increased storm water runoff (peak rate) resulting from a proposed development should be detained on-site by the provisions of appropriate wet or dry bottom reservoirs, by storage on flat roofs, parking lots, streets, lawns or other acceptable techniques. Measures which retard the rate of overland flow and the velocity in runoff channels shall also be used to control the runoff rate partially. Detention basins shall be sized to store excess flows from storms with a one hundred (100) year return period. Control devices shall limit the discharge to a rate no greater than that prescribed by this Ordinance (see Sections 15F and 15G).

### **B. Time of Concentration**

All storm water management projects within the City of Eagle Pass must be done using the time-of-concentration methodology outlined in the SCS TR-55 manual. The TR-55 method examines the factors which affect time of concentration including surface roughness, channel shape and flow patterns along with watershed slope. Through the examination of sheet, shallow, concentrated and open channel flows, a more refined time of concentration may be determined. The methodology represents the best attempt of a Federal Agency to standardize times of concentration procedures.

### **C. Design Storm**

Design of storm water detention facilities shall be based on a return period of once in 100 years. The storage volume and outflow rate shall be sufficient to handle storm water runoff from a critical duration storm, as defined in Sections 15F and 15G. Rainfall depth-duration-frequency relationships and intensity-duration-frequency relationships shall be those given in Tables 5 and 5A.

### **D. Allowable Release Rate**

Design of storm water detention facilities shall be based on the allowable release rate of storm water originating from a proposed development and shall not exceed the amount specified in Section 5 - Storm Water Control Policy, and as described in Section 15F and 15G.

In the event the natural downstream channel or storm sewer system is inadequate to accommodate the release rate provided in Table 5A, then the allowable release rate shall be reduced to that rate permitted by the capacity of the receiving downstream channel or storm sewer system and additional detention as determined by the City shall be required to store that portion of the runoff exceeding the capacity of the receiving sewers or waterways. The area will be considered an impact drainage area subject to the provisions of Section 18 of this Ordinance.

If more than one detention basin is involved in the development of the area upstream of the limiting restriction, the allowable release rate from any one detention basin shall be in direct proportion to the ratio of its drainage area to the drainage area of the entire watershed upstream of the restriction.

### E. Drainage System Overflow Design

Drainage systems shall have adequate capacity to convey the storm water runoff from all upstream tributary areas through the development under consideration for a storm of 100 year design return period calculated on the basis of upstream land in its present state of development. An allowance, equivalent to the reduction in flow rate provided, shall be made for upstream detention when such upstream detention and release rate have previously been approved by the City and evidence of its construction can be shown.

### F. Determination of Storage Volume - Rational Method

The Rational Method may be used to determine the 10-year return period pre-development release rate for sites of less than five (5) acres of commonly owned contiguous property where no depression storage exists.

#### Step Procedure

1. Determine total drainage area in acres "A".
2. Determine composite runoff coefficient "C<sub>U</sub>" based on existing land use (undeveloped).
3. Determine time of concentration "T<sub>C</sub>" in minutes based on existing conditions.
4. Determine rainfall intensity "I<sub>U</sub>" in inches per hour, based on time of concentration and using Figure 1 or from data given in Table 5A for the ten (10) year return period.
5. Compute runoff based on existing land use (undeveloped), and ten (10) year return period:  

$$Q_U = C_U I_U A$$
6. Determine composite runoff coefficient "C<sub>D</sub>" based on developed conditions and a one hundred (100) year return period.
7. Determine the one hundred (100) year return period rainfall intensity "I<sub>D</sub>" for various storm duration's "t<sub>D</sub>" up through the time of concentration for the developed area using Table 5A.
8. Determine developed inflow rates "Q<sub>D</sub>" for various storm duration's "t<sub>D</sub>" measured in hours.

$$Q_D = C_D I_D A$$

9. Compute a storage rate "S<sub>td</sub>" for various storm duration's "t<sub>D</sub>" up through the time of concentration of the developed area.

$$S_{td} = Q_D - Q_U$$

10. Compute required storage volume " $S_R$ " in acre-feet for each storm duration " $t_d$ ". This assumes a triangular hydrograph of duration ( $2t_d$ ) hours with the peak flow of  $S_{td}$  and  $t_d$  hours.

$$S_R = S_{td} (t_d/12)$$

11. Select the largest storage volume computed in step 10 for detention basin design.

### G. Determination of Storage Volume - Hydrographic Methods

Methods other than the rational method for determining runoff and routing of storm water may be used to determine the storage volume required to control storm water runoff. The SCS TR-20 computer model with the SCS TR-55 time of concentration and curve number calculation methodologies, may be used to determine the 10-year return period pre-development release rate for sites of five (5) acres or more and for sites with existing depression storage. The SCS TR-20 and SCS TR-55 models are accepted by the City for appropriate use in analysis of the runoff and routing of storm water. The use of these models or other approved procedures can be defined in an eight step procedure to determine the required storage volume of the detention basin.

#### Step Procedure

1. Calibrate the hydrologic/hydraulic model that is to be used for prediction of runoff and routing of storm water.
2. Determine the critical storm duration. The critical duration storm for computer modeling shall be equal to or greater than the time of concentration for the watershed being modeled.
3. Determine the ten (10) year, undeveloped peak flow. Denote this flow by  $Q_U^{10}$ .
4. Determine the one hundred (100) year runoff hydrograph ( $H_D^{100}$ ) for developed conditions.
5. Determine the hydrograph that must be stored ( $H_S^{100}$ ) by subtracting a flow up to  $Q_U^{10}$  from the hydrograph ( $H_D^{100}$ ) found in step 4.
6. Determine the volume of water ( $V_S$ ) to be stored by calculating the area under the hydrograph  $H_S^{100}$ .
7. The detention basin must be designed to store the largest volume ( $V_S$ ) found for any storm duration analyzed in step 6.
8. Approved routing techniques may be used to determine the final detention storage required.

### H. General Detention Basin Design Requirements

Basins shall be constructed to detain temporarily the storm water runoff which exceeds the maximum peak flow rate authorized by this Ordinance. The volume of such storage provided in these basins, together with such storage as may be authorized in other on-site facilities shall be sufficient to control excess runoff from the one hundred (100) year storm.

The following design principles shall be observed:

- (1) The maximum volume of water stored and subsequently released at the design release rate shall not result in a storage duration in excess of 48 hours unless additional storms occur within the period.
- (2) The maximum planned depth of storm water stored (without a permanent pool) shall not exceed four feet.
- (3) All storm water detention facilities shall be separated by not less than 25 feet from any building or structure to be occupied.
- (4) All excavated excess spoil may be spread so as to provide for aesthetic and recreational features such as sliding hills, sports fields, etc. Detention pond side slopes no steeper than 6 horizontal to 1 vertical for safety, erosion control, stability and ease of maintenance shall be permitted.
- (5) Safety screens having a maximum opening of 4 inches shall be provided for any pipe or opening to prevent children or large animals from crawling into the structures.
- (6) Danger signs shall be mounted at appropriate locations to warn of deep water, possible flooding conditions during storm periods and other dangers that exist. Fencing shall be provided if deemed necessary by the City.
- (7) Outlet control structures shall be designed to operate as simply as possible and shall require little or no maintenance and/or attention for proper operation. They shall limit discharges into existing or planned downstream channels or conduits so as not to exceed the predetermined maximum authorized peak flow rate.
- (8) Emergency overflow facilities such as a weir or spillway shall be provided for the release of exceptional storm runoffs or in emergency conditions should the normal discharge devices become totally or partially inoperative. The overflow facility shall be of such design that its operation is automatic and does not require manual attention.
- (9) Grass or other suitable vegetative cover shall be provided throughout the entire basin area. Grass should be cut regularly at approximately monthly intervals during the growing season or as required.
- (10) Debris and trash removal and other necessary maintenance shall be performed on a regular basis to assure continued operation in conformance to design.
- (11) Hydraulic calculations shall be submitted to substantiate all design features.



- (12) No residential lot or any parts thereof shall be used for the storage of water, either temporary or permanent, without approval of the City.

### **I. Dry Bottom Design Requirements**

Detention basins which will not contain a permanent pool of water shall comply with the following requirements:

- (1) Provisions shall be incorporated to facilitate complete interior drainage of dry bottom basins, to include the provisions of natural grades to outlet structures, longitudinal and transverse grades to perimeter drainage facilities, paved gutters, or the installation of subsurface drains.
- (2) The detention basin shall, whenever possible, be designed to serve a secondary or multipurpose function. Recreational facilities, aesthetic qualities (open spaces) or other types of use shall be considered in planning the detention facility.

### **J. Wet Bottom Basin Design Requirements**

Where a part of a detention basin will contain a permanent pool of water, all the items required for detention storage shall apply except that the system of drains without a positive gravity outlet required to maintain a dry bottom basin will not be required. A controlled positive outlet will be required to maintain the design water level in the wet bottom basin and provide required detention storage above the design water level. However, the following additional conditions shall apply:

- (1) Basins designed with permanent pools or containing permanent ponds shall have a water area of at least one-half acre. If fish are to be maintained in the pond, a minimum depth of approximately 10 feet shall be maintained over at least 25 percent of the pond area. The remaining pond area shall have no extensive shallow areas, except as required by subsection (3) below.
- (2) In excavated lakes the underwater side slopes in the lake shall be stable. In the case of valley storage, natural slopes may be considered to be stable.
- (3) A safety ledge four to six feet in width is required and must be installed in all ponds approximately 30 to 36 inches below the permanent water level. In addition, a similar maintenance ledge 12 to 18 inches above the permanent water line shall be provided.
- (4) A safety ramp exit from the pond is required in all cases and shall have a minimum width of 20 feet and exit slope of 6 horizontal to 1 vertical. The ramp shall be of a material that will prevent its deterioration due to vehicle use and/or wave action.
- (5) Periodic maintenance is required in ponds to control weed growth and larval growth. The pond shall also be designed to provide for the easy removal of sediment which will accumulate during periods of pond operation. A means of maintaining the designed water level of the pond during prolonged periods of dry weather is also required.

- (6) For emergency use, basin cleaning, or shoreline maintenance, facilities shall be provided or plan prepared for auxiliary equipment to permit emptying and drainage.
- (7) Aeration facilities to prevent pond stagnation shall be provided, if required. Design calculations to substantiate the effectiveness of these aeration facilities shall be submitted with final engineering plans. Agreements for the perpetual operation and maintenance of aeration facilities shall be prepared to the satisfaction of the City.
- (8) The perimeter of wet bottom detention basins, defined by the high water contour which represents the high water elevation, shall be a minimum horizontal distance of 10 feet from high voltage electric lines.

#### **K. Roof Top Storage**

Detention storage requirements may be met in total or in part by detention on flat roofs. Details of such designs are to be included in the building permit application and shall include the depth and volume of storage, details of outlet devices and downdrains and elevations of emergency overflow provisions.

#### **L. Parking Lot Storage**

Paved parking lots may be designed to provide detention storage of storm waters on all or a portion of their surfaces. Depths of storage must be limited to a maximum depth of seven (7) inches so as to prevent damage to parked vehicles and so that access to parked vehicles is not impaired. Locate the deepest ponding zones at remote and least used portions of the parking lot.

#### **M. Facility Financial Responsibilities**

The construction cost of storm water detention systems and facilities as required by this Ordinance shall be part of the cost of land development. If general public use of the facility can be demonstrated, negotiations for public participation in the cost of such development may be considered.

#### **N. Facility Maintenance Responsibility**

Maintenance of detention/retention facilities during construction and thereafter shall be the responsibility of the land developer/owner. Assignment of responsibility for maintaining facilities serving more than one lot or holding shall be documented by appropriate covenants to property deeds, unless responsibility is formally accepted by a public body. This determination shall be made before the final drainage plans are approved.

Storm water detention and retention basins may be donated to the City of Eagle Pass or other unit of government approved by the City, for ownership and permanent maintenance providing:

- (1) The City or other governmental unit is willing to accept responsibility.

- (2) The facility has been designed and constructed according to all applicable provisions of this Ordinance.
- (3) All improvements have been constructed, approved and accepted by the City for the land area served by the basin.
- (4) Retention ponds containing a permanent pool of water have all slopes between the permanent pool and high water line sodded and the remaining land area hydroseeded using a method approved by the City; are equipped with electrically driven aeration devices, if required to maintain proper aerobic conditions and sustain aquatic life; provide suitable access acceptable to the responsible government agency; and have the high water line not closer than 25 feet to any property line.
- (5) Dry detention ponds shall have all slopes, bottom of the basin and areas above the high water line hydroseeded; and shall have the high water line not closer than 25 feet to any development boundary.

All public and privately owned detention storage facilities will be inspected by representatives of the City not less often than once every 2 years. A certified inspection report covering physical conditions, available storage capacity and operational condition of key facility elements will be provided to the owner.

#### **P. Corrective Measures**

If deficiencies are found by the inspector, the owner of the detention/retention facility will be required to take the necessary measures to correct such deficiencies. If the owner fails to do so, the City will undertake the work and collect from the owner using lien rights, if necessary.

#### **Q. Joint Development of Control Systems**

Storm water control systems may be planned and constructed jointly by two or more developers as long as compliance with this Ordinance is maintained. Developers are encouraged to plan and construct these systems on a joint or regional basis.

#### **R. Installation of Control Systems**

Runoff and erosion control systems shall be installed as soon as possible during the course of site development. Detention/retention basins shall be designed with an additional 6 (six) percent of available capacity to allow for sediment accumulation resulting from development and to permit the pond to function for reasonable periods between cleanings. Basins should be designed to collect sediment and debris in specific locations so that removal cost are kept to a minimum. The City will require temporary and permanent erosion control plans to be submitted as a part of the construction plans.

#### **S. Detention Facilities in Flood Plains**

If detention storage is provided within a flood plain, only the net increase in storage volume above that which naturally existed on the flood plain shall be credited to the development. No credit will be granted for volumes below the elevation of the regulatory flood at the location unless compensatory storage is also provided.

#### **T. Off site Drainage Provision**

When the allowable runoff is released in an area that is susceptible to flooding, the developer may be required to construct appropriate storm drains through such area to avert increased flood hazard caused by the concentration of allowable runoff at one point instead of the natural overland distribution. The requirement of off-site drains shall be at the discretion of the City.

#### **U. Erosion Control**

Erosion control plans shall be submitted as part of the construction plans and specifications and shall include the following:

- (1) A complete copy of the Erosion and Sediment Control Plan filed with the City. The Texas Department of Transportation Guidelines for Erosion Control may be used as a reference guide in developing the erosion control plan.
- (2) Temporary erosion control measures necessary during the initial construction and establishment phases up to final site grading and seeding.
- (3) A permanent erosion control plan of all the graded and non-hard surface areas within the proposed development, as planned for completion, up to and including seeding of the final lot on which business or residential dwellings are to be placed.
- (4) Details concerning removal of temporary erosion control devices after the initial establishment of adequate vegetative cover.
- (5) Maintenance procedures, as part of the continuing plan, to keep all of the land under adequate cover and erosion at an acceptable minimum.

#### **16. Certifications Required**

After completion of the project and before final approval and acceptance can be made, a professionally prepared and certified "As Built" set of plans shall be submitted to the City for review. These plans shall include all pertinent data relevant to the completed storm drainage system and shall include:

- (1) Pipe size and pipe material.
- (2) Invert elevations.
- (3) Top rim elevations.
- (4) Lengths of all pipe structures.

- (5) Data and calculations showing detention basin storage volume.
- (6) Certified statement on plans stating the completed storm drainage system substantially complies with construction plans as approved by the City.

All such submitted plans shall be reviewed for compliance within 30 days after submission to the City or Engineer. If notice of non-compliance is not given within 30 days of submission of the plans, the plans shall be construed as approved and accepted.

### **17. Changes in Plan**

Any revision to, and/or significant change or deviation from the detailed plans and specifications after formal approval by the City shall be filed in duplicate with and approved by the City prior to implementation of the revision or change. Copies of the revisions or changes, if approved, shall be attached to the original plans and specifications.

### **18. Determination of Impact Drainage Areas**

The City is authorized, but is not required to classify certain geographical areas as Impact Drainage Areas and to enact and promulgate regulations which are generally applied. In determining Impact Drainage Areas, the City shall consider such factors as topography, soil type, capacity of existing regulated drains and distance from adequate drainage facility. The following areas shall be designated as Impact Drainage Areas, unless good reason for not including them is presented to the City:

- A. A floodway or flood plain as designated by FEMA.
- B. Land within 75 feet of each bank of any regulated drain.
- C. Land subject to flooding and/or areas that have previously exhibited drainage deficiencies.

Land where there is not adequate outlet, taking into consideration the capacity and depth of the outlet, may be designated as an Impact Drainage Area by resolution of the City. Special requirements for development within any Impact Drainage Area shall be included in the resolution.

### **19. Other Requirements**

#### **A. Sump Pumps**

Sump pumps installed to receive and discharge groundwaters or other storm waters shall be connected to the storm sewer where possible or discharged into a designated storm drainage channel. Sump pumps installed to receive and discharge floor drain flow or other sanitary sewage shall be connected to the sanitary sewers. A sump pump shall be used for one function only, either the discharge of storm waters or the discharge of sanitary sewage.

### **B. Down Spouts**

All down spouts or roof drains shall discharge onto the ground or be connected to the storm sewer. No down spouts or roof drains shall be connected to the sanitary sewer.

### **C. Footing Drains**

Footing drains shall be connected to storm sewers where possible or designated storm drainage channels. No footing drains shall be connected to the sanitary sewer.

## **20. Regional Drainage Plans**

The City may establish a regional drainage plan or Interim Regional Drainage Plan which controls drainage requirements within a specified drainage area.

### **A. Regional Drainage Plan or Interim Drainage Plan shall specify:**

1. A description of the region;
2. The basis for the region having a Regional Drainage Plan;
3. Potential areas of ground water discharge and recharge;
4. What modifications or waivers of this Ordinance apply in the region; and
5. What additional drainage or drainage plan requirements, beyond those in this Ordinance, apply in the region.

### **B. A Regional Drainage Plan or Interim Drainage Plan may provide:**

1. For regional detention and/or storage of storm water;
2. For design or performance standards to ensure water quality;
3. For design requirements to ensure compatibility with the plan for regional detention and storage; and
4. For a charge, in land or dollars, based upon the size and nature of the development, for the use of regional storm water detention and/or storage facilities for new development.

## **21. Disclaimer of Liability**

The degree of protection required by this Ordinance is considered reasonable for regulatory purposes and is based on historical records engineering and specific methods of study. Larger storms may occur or storm water runoff depths may be increased by man-made or natural causes. This Ordinance does not imply that land uses permitted will be free from storm water damage. This Ordinance shall not create liability on the part of the City of Eagle Pass or any officer or employee thereof for any damage which may result from reliance on this Ordinance or on any administrative decision lawfully made thereunder.

## **22. Corrective Action**

Nothing herein contained shall prevent the City of Eagle Pass from taking such lawful action as may be necessary to prevent or remedy any violation. All costs connected therewith shall accrue to the person or persons responsible.

### **23. Repealer**

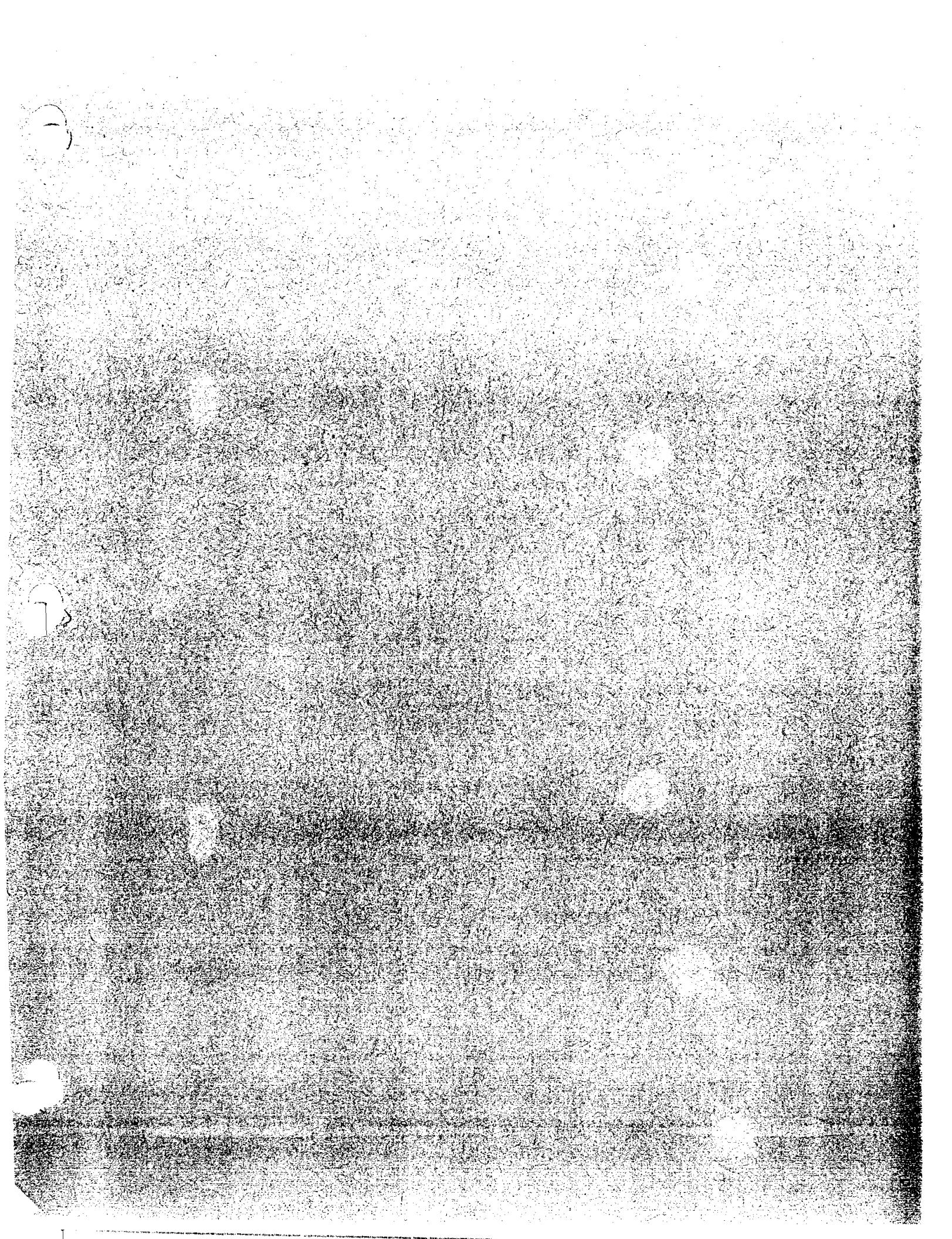
All ordinances or parts thereof in conflict with the provisions of this Ordinance are repealed.

### **24. When Effective**

This Ordinance shall become effective after its final passage, approval and publication as required by law.

### **25. Exempt Projects**

Any residential, commercial or industrial subdivision (major or minor) or construction project thereon, which has had its drainage plan approved by the City prior to the effective date of this Ordinance shall be exempt from all of the requirements of this Ordinance.





## Appendix - Tables and Figures

Table 1 - Runoff Coefficients

Type of Drainage Area	Runoff Coefficient, C
Lawns:	
Sandy Soil, flat, less than 2%	0.05-0.10
Sandy Soil, average, 2-7%	0.10-0.15
Sandy Soil, steep, greater than 7%	0.15-0.20
Lawns:	
Clay Soil, flat, less than 2%	0.13-0.17
Clay Soil, average, 2-7%	0.18-0.22
Clay Soil, steep, greater than 7%	0.25-0.35
Business:	
Downtown areas	0.70-0.95
Neighborhood areas	0.50-0.70
Residential:	
Single-family areas	0.30-0.60
Multi-family, detached	0.40-0.80
Multi-family, attached	0.60-0.90
Industrial:	
Light areas	0.50-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.40
Playgrounds	0.20-0.35
Railroad yard areas	0.20-0.40
Unimproved areas	0.10-0.30
Streets:	
Asphaltic	0.70-0.95
Concrete	0.80-0.95
Brick	0.70-0.85
Drives and walks	0.75-0.85
Roofs	0.75-0.95

## Note:

1. These runoff coefficients were taken from, "Handbook of Applied Hydrology" by Ven Te Chow, 1964, McGraw-Hill, Chapter 14, Runoff, p. 14-8.
2. The coefficients of this tabulation are applicable to storms up to a 10-year frequency.
3. Coefficients for less frequent higher intensity storms shall be modified as follows:

<u>Return Period (yrs)</u>	<u>Multiply "C" by</u>
25	1.1
50	1.2
100	1.25

### Appendix - Tables and Figures

**Table 2 - Runoff Coefficients by Land Use and  
Maximum recommended Inlet Times**

Zone Designation	Name	Runoff Coefficient	Max. Recommended Inlet Time (minutes)
AG	Agricultural, 1ac, 2000 SF home	Variable	15
SF or RE	Single Family Residential	0.60	15
D	Duplex	0.60	15
A-1	Multifamily, 12 units/acre	0.80	10
A-2	Multifamily, 18 units/acre	0.85	10
A-3	Multifamily, 24 units/acre	0.90	10
PD	Planned Development	Variable	10
O	Office	0.85	10
GR	General Retail	0.85	10
SS	Service Station	0.95	10
MU	Mixed Use	Variable	10
CBD	Central Business District	0.90	10
LC	Light Commercial	0.90	10
C	Commercial	0.90	10
I	Industrial	0.90	10
FP	Flood Plain	1.00	10
H	Historical Landmark	0.40	15
R/PC	Restaurant/Private Club	0.90	10
*	Parking Lots	1.00	10
*	Church	0.90 Varies	10
*	School	0.75 Varies	15
*	Park	0.40 Varies	15
*	Road & Interstate Hwy.	0.90	10

Note:

1. (\*) = Indicates non-zoned usage
2. The coefficients of this tabulation are applicable to storms up to a 10-year frequency.
3. Coefficients for less frequent higher intensity storms shall be modified as follows:

<u>Return Period (yrs)</u>	<u>Multiply "C" by</u>
25	1.1
50	1.2
100	1.25

Table 3 - Typical Values of Manning's n

Boundary	Manning roughness, n, ft <sup>1/6</sup>
Very smooth surfaces such as glass, plastic, or brass	0.010
Very smooth concrete and planed timber	0.011
Smooth concrete	0.012
Ordinary concrete lining	0.013
Good wood	0.014
Vitrified Clay	0.015
Shot concrete, untroweled, and earth channels in best condition	0.017
Straight unlined earth channels in good condition	0.020
Rivers and earth channels in fair condition - some growth	0.025
Winding natural streams and channels in poor condition - considerable moss growth	0.035
Mountain streams with rocky beds and rivers with variable sections and some vegetation along banks	0.040-0.050
Alluvial channels, sand beds, no vegetation	
1. Lower regime	
Ripples	
Dunes	0.017-0.028
2. Washed-out dunes or transition	0.018-0.035
3. Upper regime	0.014-0.024
Plane bed	
Standing waves	0.011-0.015
Antidunes	0.012-0.016
	0.012-0.020

Note:

1. Values taken from "Handbook of Applied Hydrology" by Ven Te Chow, 1964, McGraw-Hill publishers, Chapter 7, p. 7-25.

Table 4 - Maximum Permissible Velocities for Channels Lined With Grass

Cover	Slope, Range, *	Permissible Velocity, fps
Bermuda Grass	0-5	6
	5-10	5
	>10	4
Buffalo Grass, Kentucky bluegrass, smooth brome, blue grama	0-5	5
	5-10	4
	>10	3
Grass mixture	0-5	4
	5	3
Do not use on slopes steeper than 10%.	5-10	
Lespedeza sericea, weeping love grass, ischaemum (yellow blue stem), kudzu, alfalfa, crabgrass	0-5	2.5
	Do not use on slopes steeper than 5%, except for side slopes in a combination channel.	
Annuals - used on mild slopes or as temporary protection until permanant covers are established, common lespedeza Sudan grass	0-5	2.5
	Use on slopes steeper than 5% is not recommended.	

Remarks: The values apply to average, uniform stands of each type of cover. Use velocities exceeding 5 fps only where good covers and proper maintenance can be obtained. Based on past experience, all soils within the city of Eagle Pass have been found to be easily eroded soils.

\* Longitudinal bed slopes of the channel bottom.

**Table 5 - Rainfall Depths for Various Return Periods and Storm Durations**

Duration (min.)	Return Period (years)						
	1	2	5	10	25	50	100
5		0.47	0.56	0.62	0.71	0.79	0.86
10		0.78	0.93	1.03	1.19	1.32	1.44
15		1.00	1.19	1.32	1.52	1.68	1.84
30		1.41	1.76	2.02	2.38	2.66	2.94
60		1.83	2.37	2.74	3.27	3.67	4.08
120	1.75	2.16	2.81	3.28	3.85	4.35	4.86
180	1.94	2.28	3.09	3.68	4.19	4.75	5.32
360	2.34	2.86	3.65	4.28	5.00	5.63	6.29
720	2.77	3.19	4.21	5.08	6.00	6.65	7.50
1440	3.14	3.54	4.83	5.71	7.00	7.89	8.88

Values taken from HYDRO-35 for shorter duration storms

Values taken from TP-40 for longer duration storms.

**Table 5A - Rainfall Intensities for Various Return Periods and Storm Durations**

Duration (min.)	Return Period (years)						
	1	2	5	10	25	50	100
5	0.00	5.64	6.67	7.43	8.56	9.44	10.32
10	0.00	4.70	5.56	6.20	7.15	7.89	8.63
15	0.00	4.00	4.74	5.29	6.10	6.73	7.36
30	0.00	2.81	3.53	4.03	4.75	5.32	5.88
60	0.00	1.83	2.37	2.74	3.27	3.67	4.08
120	0.38	1.03	1.41	1.64	1.98	2.18	2.43
180	0.55	0.76	1.03	1.22	1.40	1.58	1.77
360	0.39	0.44	0.57	0.71	0.83	0.94	1.07
720	0.23	0.26	0.35	0.42	0.50	0.55	0.63
1440	0.15	0.15	0.20	0.24	0.29	0.33	0.37

Values taken from HYDRO-35 for shorter duration storms

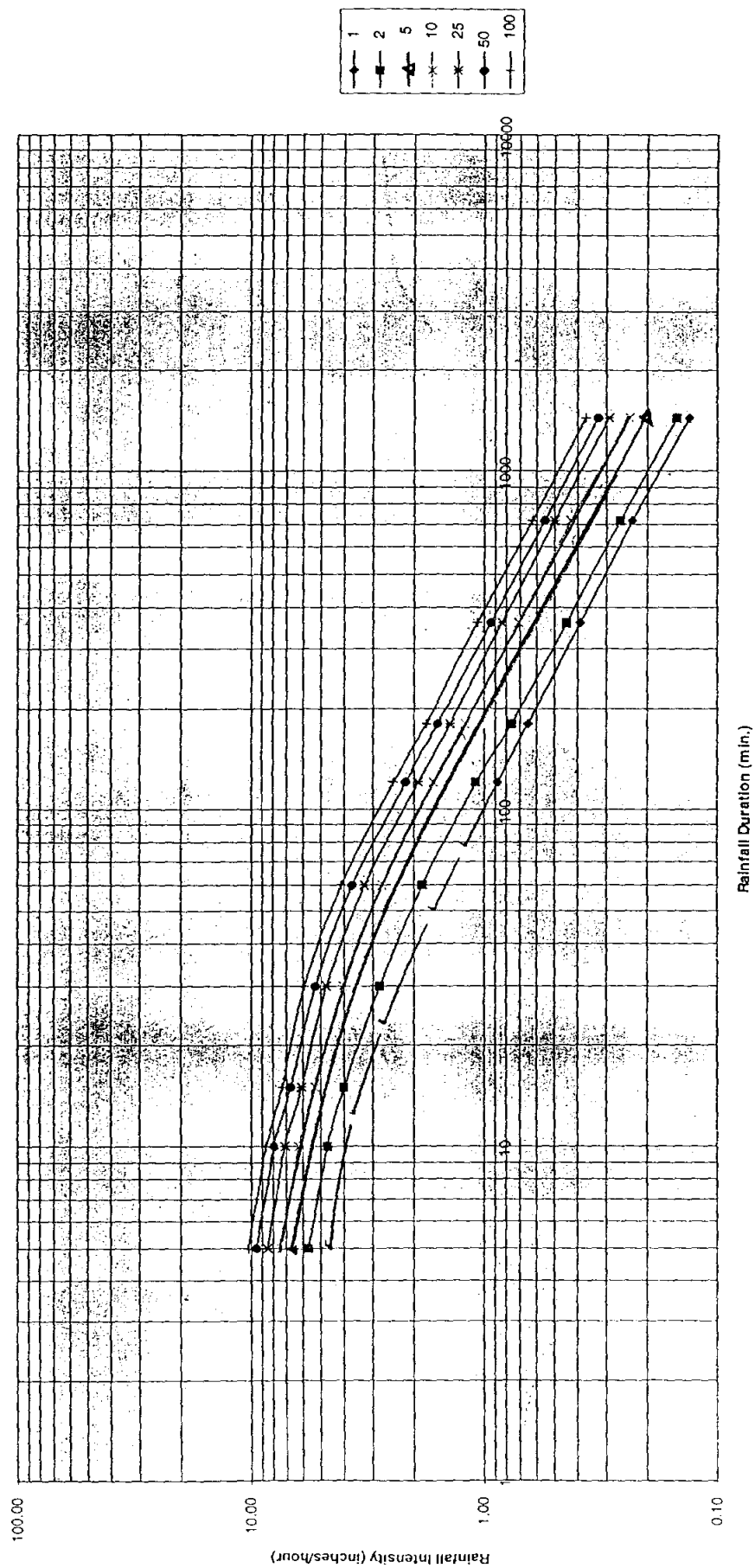
Values taken from TP-40 for longer duration storms.

TABLE 6 - STORM DRAINAGE

Street velocities and capacities  
 Flowing curb full  
 Manning's N=0.018

CROWN-SECTION						CROSS-SLOPE		
	MINOR STREET		COLLECTOR STREET		MARGINAL ACCESS STREET		ARTERIAL STREET 1-SIDE	
	w = 30'		w = 42'		w = 24'		w = 24'	
Slope	c=4" wp=31.01 A=10 r2/3=.47		c=5" wp=43.01 A=12.25 r2/3=.43		c=3" wp=25.01 A=9.00 r2/3=.51		c=6" wp=24.51 A=6.00 r2/3=.39	
	V f/s	Q cfs	V f/s	Q cfs	V f/s	Q cfs	V f/S	Q cfs
.0010	1.22	12.28	1.13	13.84	1.32	11.89	1.02	6.13
.0015	1.50	15.04	1.38	16.96	1.61	14.56	1.25	7.51
.0020	1.73	17.36	1.59	19.58	1.86	16.81	1.44	8.67
.0025	1.94	19.42	1.78	21.89	2.08	18.80	1.61	9.69
.0030	2.12	21.27	1.95	23.98	2.28	20.59	1.77	10.62
.0035	2.29	22.97	2.11	25.90	2.47	22.24	1.91	11.47
.0040	2.45	24.56	2.26	27.69	2.64	23.78	2.04	12.26
.0045	2.60	26.05	2.39	29.37	2.80	25.22	2.16	13.00
.0050	2.74	27.46	2.52	30.96	2.95	26.59	2.28	13.71
.0055	2.87	28.80	2.65	32.47	3.09	27.89	2.39	14.38
.0060	3.00	30.08	2.76	33.92	3.23	29.13	2.50	15.02
.0065	3.13	31.31	2.88	35.30	3.36	30.32	2.60	15.63
.0070	3.24	32.49	2.99	36.64	3.49	31.46	2.70	16.22
.0075	3.36	33.63	3.09	37.92	3.61	32.57	2.79	16.79
.0080	3.47	34.73	3.19	39.17	3.73	33.63	2.89	17.34
.0085	3.58	35.80	3.29	40.37	3.85	34.67	2.97	17.87
.0090	3.68	36.84	3.39	41.54	3.96	35.67	3.06	18.39
.0095	3.78	37.85	3.48	42.68	4.07	36.65	3.14	18.90
.0100	3.88	38.84	3.57	43.79	4.17	37.60	3.23	19.39
.0150	4.75	47.56	4.37	53.63	5.11	46.06	3.95	23.75
.0200	5.49	54.92	5.05	61.93	5.90	53.18	4.57	27.42
.0250	6.13	61.41	5.65	69.24	6.60	59.46	5.10	30.66
.0300	6.72	67.27	6.19	75.85	7.23	65.14	5.59	33.59
.0350	7.26	72.66	6.68	81.93	7.81	70.35	6.04	36.28
.0400	7.76	77.68	7.14	87.58	8.35	75.21	6.46	38.78
.0450	8.23	82.39	7.58	92.90	8.86	79.77	6.85	41.13
.0500	8.68	86.84	7.99	97.92	9.34	84.09	7.22	43.36
.0550	9.10	91.08	8.38	102.70	9.79	88.20	7.57	45.48
.0600	9.51	95.13	8.75	107.27	10.23	92.21	7.91	47.50
.0650	9.89	99.02	9.11	111.65	10.65	95.88	8.23	49.44
.0700	10.27	102.76	9.45	115.86	11.05	99.50	8.54	51.30
.0750	10.63	106.36	9.78	119.93	11.44	102.99	8.84	53.11
.0800	10.98	109.85	10.10	123.86	11.81	106.37	9.14	54.85
.0850	11.32	113.23	10.42	127.68	12.18	109.64	9.42	56.54
.0900	11.64	116.52	10.72	131.38	12.53	112.82	9.69	58.17
.0950	11.96	119.71	11.01	134.98	12.87	115.91	9.96	59.77
.1000	12.27	122.82	11.30	138.48	13.21	118.92	10.21	61.32

Figure 1 - Rainfall Intensity-Duration-Frequency for Eagle Pass, Texas



Appendix - Tables and Figures

Figure 2 - Average Channel Velocities used to Calculate Time of Concentration

