EXECUTIVE SUMMARY

This Master Drainage Plan was prepared to provide the City of Harlingen a planning tool to guide and prioritize future capital expenditures for the City's drainage systems (open ditches and storm sewers) within its boundaries and 3 1/3 Mile ETJ. The City currently operates and maintains a network of approximately 125 miles of storm sewers and 11 miles of drainage ditches. Many of these drainage systems are in need of improvements to reduce the existing frequent flooding problems that have historically occurred throughout the City as well as to meet the City's current drainage criteria.

The existing drainage systems were evaluated to identify system inadequacies and to determine drainage improvements required to upgrade the existing systems to meet current City drainage criteria. The City's current drainage criteria consist of a 5-year design storm for evaluating and designing storm sewer systems and a 25-year conveyance capacity for drainage ditches. Flooding risk areas were identified and alternative drainage improvement solutions were analyzed and optimized to reduce the existing flooding risks. A Capital Improvement Plan (CIP) was developed to present the recommended improvements, estimated costs, and project priority. Estimated cost values were determined based on unit cost provided by the City of Harlingen and average bid values from Texas Department of Transportation (TxDOT). Project priorities were determined for the CIP projects based on a set of established prioritization criteria.

Detailed hydrologic and hydraulic modeling analyses were performed in developing the Master Drainage Plan. EPA-SWMM dynamic modeling program was used to analyze the existing and proposed storm sewer systems. US Army Corps of Engineers' HEC-HMS and HEC-RAS modeling programs were used for hydrologic and hydraulic analyses. HEC-RAS hydraulic modeling program was used to analyze water surface profiles for the existing and proposed drainage ditches. HEC-HMS hydrologic modeling program was used to determine peak flows and hydrographs for drainage ditches hydraulic modeling analyses.

Historical flooding areas were emphasized in developing the plan. The causes of historical flooding were investigated with detailed hydrologic and hydraulic modeling analyses. Other high flood risk areas were also identified with detailed analysis within the study area. Flooding risks were typically associated with the following causes: backwater from outfall or receiving ditches, insufficient storm sewer capacities, insufficient drainage ditch capacity, insufficient topographic relief, and inadequate maintenance routines with regard to siltation and vegetative growth. The Master Drainage Plan identifies such problems and presents alternative solutions to reduce or eliminate the flooding risk.

Geographic Information Systems (GIS) was extensively used to facilitate various engineering efforts throughout the project development. Specific GIS applications included digital elevation model (DEM) from the LiDAR dataset for the FEMA Cameron County Flood Map Modernization Project, base mapping, drainage basin delineations, watershed parameters extraction, channel cross-section geometric data extraction, storm catchment delineations, drainage systems (drainage ditches and storm sewers) inventory and mapping. A set of GIS layers were developed and presented as part of the Master Drainage Plan. The GIS data layers, representing a digital version of the existing systems and Capital Improvement Plan, are included to provide the City a tool to manage its drainage systems in a more efficient and effective manner.

There were a total of 49 drainage systems delineated, of which nine systems lie within the study area. The nine drainage systems analyzed using HEC-RAS hydraulic modeling are: System A – North Main Drain City Tributaries, System C – Dixieland Main, System E – Little Creek, System F – 32nd Street Drain, System G –Airport Drain, System H – Rio Hondo Road (FM 1595) Ditch, System P –Lipscomb Ditch, System S – Adams Gardens Irrigation District No. 19 Ditches, and System Z –Glasscock Ditch.

The Capital Improvement Plan was developed to define various projects consisting of storm sewer upsizing, channel improvements, hydraulic structure replacements, and detentions. The CIP projects recommend a total length of 38 miles of storm sewer pipes for replacement, 16 miles of channel improvements, one detention basin, and 42 bridge/culverts expansion or replacements. The proposed improvements will increase the capacity of the existing storm sewer systems and reduce overbank flooding risk along the existing channels.

The total cost for implementing the proposed drainage improvements was estimated as $53,181,418, which includes $8,758,430 for drainage ditch improvements (channel, hydraulic structures, and detention), $35,559,418 for storm sewer systems, and $8,863,570 for 20% contingency. As part of the CIP, financial alternatives were investigated, including grants, fees from external sources, and internal City of Harlingen revenue.

It must be realized that the Capital Improvement Plan is an ongoing planning/ implementation process. The CIP proposes modifications for conceptual designs only, and does not include sufficient details for final design nor construction. Prior to final design of the proposed improvements, a detailed analysis should be performed to verify conditions for the proposed plan. In additional, with the adoption of a “no-adverse impact” policy by the City, further analysis of the proposed improvements will be required to ensure that any impacts incurred due to the proposed projects are mitigated.