Proposed changes to:

Guidelines for Consideration of Overland Flow for the Extreme Event for Improvement Projects in the City of Houston, Harris County, Texas Region

Note: This document contains only the pages (9 and 10) containing proposed changes. The complete document is presented in the original TP-101 file.

The four methods to be discussed include the following:

> Method 1: Conduit Hydraulic Grade Line Analysis Method 2: Conduit and Overland Flow Analysis Method 3: Conduit and Overland Flow with Storage Analysis Method 4: Dynamic Flow Routing Analysis

The first three methods are listed in the Design Manual in Section 9.05.D.2.a. The fourth method is contained in the Design Manual in Section 9.05.D.2.b, and is included in this Technical Paper. However, Method 4 involves an in depth computer model analysis of a system, which is too complex to describe in a step-by-step fashion similar to Methods 1 through 3.

The methods become more complex in terms of the parameters that need to be determined and the equations used to perform the analyses. The analysis methods are intended to build upon each other, such that the parameters determined from one method can be used in another method. The analysis methods do not need to be performed in successive order. The analysis could consider the overland storage effects (Method 3) to show compliance with the design criteria without determining the 100-year HGL within the storm sewer (Method 1), or computing the available overland flow capacity (Method 2).

4.1 Method 1: Conduit Hydraulic Grade Line Analysis

Method 1 considers only flows within the storm sewer conduit and does not consider the overland flow conveyance and/or storage volume capacities within the roadway corridor. Since this analysis methodology does not consider these two elements, its use should be limited to preliminary calculations for sizing of storm sewer systems or in those locations where topography affords a significant amount of available HGL within the system.

It is not the intent of the 100-year calculations to contain such flows solely within the storm sewer system. Design of storm sewer systems using Method 1 will not be utilized on City of Houston Capital Improvement Projects without approval of the Senior Assistant Director of Engineering. Methods 2 through 4, applied with attention to assumptions, are preferred Methodologies for evaluating storm sewer systems for conditions exceeding pipe full.

This method computes the 100-year HGL by applying the 100-year peak flow rates to the storm sewer system without regard to the natural ground elevations that exist above the storm sewer. The acceptance trigger for this Method is if the computed 100-year HGL remains below the MPE, as defined in Section 9.05.D.4g of the Design Manual.

Deleted: Method 1 considers only flow within the storm sewer conduit. Overland flow conveyance and/or storage volume capacities are not considered. This method computes the 100-year HGL by applying the 100-year peak flow rates to the storm sewer system without regard to the natural ground elevations that exist above the storm sewer. The acceptance trigger for this Method is if the computed 100-year HGL remains below the MPE, as defined in Section 9.05.D.4.g of the Design Manual. ¶

The approach is to control the 100-year WSEL by modifying the designed storm sewer (resulting in a change in the frictional losses), thereby adjusting the position of the HGL in order to meet the criteria. Again, this method does not consider the effects of storage.

The friction loss of a given conduit can be represented by Manning's equation as follows:

$$h_l = L\left(\frac{Qn}{1.49AR^{2/3}}\right)^2$$