that reduces flow capacity. Over-widened or excessively smooth crossings increase hydraulic slope and induce scour. The scour may occur immediately downstream and undermine the structure or may, as the result of an upstream drawdown curve, induce incision. This incision migrates upstream until the stream reaches a stable bed slope.

Management activities that remove or add material to the stream also interrupt equilibrium sediment transport and may have similarly adverse consequences. Snagging, straightening, and widening a channel all disrupt the sediment balance. These and similar activities induce upstream erosion and eventual deposition at the site of disturbance. Undesigned bank armor such as dumped riprap or waste concrete disrupts sediment transport when it migrates into the bed. These large, rough particles induce deposition where they enter the bed but induce scour downstream. Dumping materials on the bed can also reset the pool and riffle sequence if the dumped material becomes the hardest point in the reach.

3.2 Methods of Geomorphic Investigation

The purpose of the geomorphic investigation was threefold: first, to evaluate the physical stability of the stream under current and past conditions; second, to make reasonable predictions about how the stream will change under the proposed future conditions; and third, to make concept-level design recommendations for managing the stream.

3.2.1 Geomorphic Background Investigation

The purpose of the background investigation is assessment of basin behavior as a whole. This provides the context in which to understand the conditions in each reach. The elements of the evaluation were a drainage basin analysis, plan form analysis, and interpretation of historical aerial photographs. The City provided aerial photographs and GIS layers for all three analyses. Both drainage basin analysis and photo interpretation were conducted in general agreement with the methods of Lueder (1959).

The drainage basin analysis provides insight on how local geology influences stream behavior and whether one or more subareas behave in ways distinct from the basin as a whole. This may be an indication that such subareas require different methods of analysis or management.

The meander patterns for Sugar Creek reveal rough guidelines for how the geometries change throughout the watershed. The measurements were conducted in general compliance with Chang (1998), Leopold and Langbein (1969), and USACE (1993). Those areas where meander geometry, particularly radius of curvature, was substantially outside the norm for alluvial streams were noted for closer examination in the field. Other photographic evidence of active channel adjustment such as