

V. Geographic Information System (GIS) Development

A. Mapping/Data

M.J. Harden provided the base mapping for the City of Leavenworth which included planimetric, contour, and storm sewer maps. The storm sewer maps were converted from hard copy maps provided by the City. In addition to the storm sewer mapping, database information was provided which was linked to the storm sewer entities. This information included x, y, and z coordinates and pipe sizes.

The information provided by M.J. Harden was further developed into a GIS by adding the remaining drainage structures, i.e., open channels, connectivity information, and additional information on the conveyance system. The information added into the database on the drainage structures includes: slope, roughness, upstream/downstream nodes, length, upstream/downstream invert elevations, and loss coefficients.

The purpose of incorporating a GIS for the Stormwater Master Plan project included developing a GIS for the City, while providing a tool in which to assist in the development of stormwater modeling files. The stormwater management software utilized in the analysis of the stormwater drainage system is XP-Extran software. This software requires hydrologic and hydraulic information on the drainage areas and storm sewer system. The development of the database was patterned from the requirements of the input for the XP-Extran software. The mapping for the stormwater project is divided into three areas: watershed maps (hydrologic information), storm sewer maps (hydraulic information), and a questionnaire map.

The watershed maps contain the watershed boundary for Three Mile Creek and Five Mile Creek drainage basins, as well as the boundary of the individual subarea boundaries.

The storm sewer maps contain the conveyance system which includes the drainage structures, open channels, and cross section markers.

The questionnaire map contains location markers for return stormwater questionnaires which were distributed to residents in the watershed. The location markers are color-coded depending on the severity of the flooding problem. A detailed listing of the GIS structure is provided in Appendix M.

As the next section discusses, the GIS is not a complete, stand-alone system and several additional tasks are recommended.

B. Preliminary GIS Recommendations

The development of the Stormwater Master Plan has initiated the development of an AM/FM/GIS for the Public Works Department. With the completion and delivery of the Stormwater Master Plan, the following recommendations should be considered by and addressed by Public Works staff:

- Develop master storm sewer system Intergraph design files and relational database. Necessary information from the original storm sewer system graphic design files provided by M.J. Harden were incorporated into the Stormwater Master Plan design files. To meet the needs of the master plan project, the information obtained from the original storm sewer system design files was modified and enhanced. Additionally, the design files were linked to a relational database to provide basic AM/FM/GIS capabilities and aid in the development of the hydrologic and hydraulic models.

At this time, not all of the data from the original storm sewer system design files has been incorporated into the Stormwater Master Plan design files and relational database and changes have been made to both databases. It is recommended that before any additional work is performed on the graphic files or relational database, the information from the original storm sewer system design files and master plan database be made consistent. This requires adequate hardware, software, and personnel.

- Confirm selection of GIS software and identify GIS needs. The selection of Intergraph as the AM/FM/GIS platform was based on delivery of digital data from M.J. Harden in an Intergraph format and the CAD and plotting capabilities of Intergraph for use by Public Works staff. It is recommended that as the Public Works Department moves forward with GIS, a needs assessment be completed to verify the use of Intergraph as the AM/FM/GIS platform, or to identify the new GIS platform and to identify, plan, and budget for future GIS needs.
- Develop a map maintenance application. The completion of the Stormwater Master Plan represents a significant investment by Public Works into the storm sewer system infrastructure. Incorporation of GIS into the project represents an added value deliverable to Public Works. The GIS plan data is, and will continue to be

a valuable asset to Public Works if it is properly maintained and updated. It is recommended that Public Works invest in software to maintain, update, and enhance the storm sewer system data that exists in GIS.

- Train staff. It is recommended that Public Works train staff in the use of the GIS software and applications.
- Add GIS staff. It is recommended that the City hire a GIS specialist to maintain, update, and extend the GIS system. In addition to the items listed above, the GIS should be extended to include the sewer, water distribution, and transportation systems as time and resources allow.