

## **Abstract**

A high-water mark (HWM) is a horizontal mark left on a structure or vegetation after floodwaters recede. HWMs provide engineers and floodplain managers insight into flood events because they represent the highest elevation of flooding at peak river stage. Cataloging HWMs after a flood event and referencing them to a corresponding peak river stage, allows an engineer to evaluate the impacts caused by the corresponding river stage. The river stage can be determined by utilizing the national network of streamgages maintained by the United States Geological Survey (USGS). Collecting and cataloging data from a HWM and the corresponding streamgage is valuable because the data provides a reference for engineers to calibrate and validate hydraulic models, and the data provides a reference of the impact elevation for when a future flood event is forecasted to exceed or reach the same river stage.

Currently, collecting and cataloging HWM data involves a manual method where emergency management personnel and engineers fill out paper forms, and then a professional land survey crew surveys the HWM to determine the elevation of the mark. Furthermore, the attribute data collected on the HWM is not standardized, meaning that different federal agencies collect different attributes. This thesis presents a standardized method for cataloging and collecting HWM data using a mobile Geographic Information System (GIS) application for HWM data collection and a standardized digital repository for HWM cataloging and sharing. Both the application and the repository developed in this thesis provide a standardized and automated approach to HWM data collection and dissemination including direct download. Also, this thesis provides a method for the user to reference the HWM to a corresponding river stage by offering the ability to query the USGS streamgage network to find the nearest streamgage to the HWM during the field activities. The application was field tested by hydraulic

engineers and flood operation managers as part of this thesis work, followed by an online survey conducted to collect feedback from the users. The results from the field tests and online user survey will be used for future refinement of the applications, which has been offered as an enhancement to existing HWM data collection, storage, and dissemination strategies currently in use by the US Army Corps of Engineers (USACE) and the USGS.