Comparison of Flow Estimation Methods

UNRBA Monitoring Program Development and Implementation

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Cardno
Shaping the Future

1 Executive Summary

This technical memorandum (TM) describes a number of approaches that the Upper Neuse River Basin Association (UNRBA) can use to estimate tributary flows. These approaches, if sufficiently accurate, may be used as an alternative to installing additional flow gages at locations where the UNRBA may want to estimate nutrient loading throughout the Falls Lake watershed. The use of flow estimation methods provides the opportunity to secure flow information that is acceptable for load determination from un-gaged watersheds and allow the UNRBA to reduce costs as compared to the installation and maintenance of USGS flow gages. Confidence in these approaches can be increased through data collection in catchments with traits that are currently under-represented in available data sources. This will provide the UNRBA with the flexibility to use multiple methods to predict flows and minimize the number of new USGS gages that need to be installed and maintained.

Of the existing models and methods available, Cardno ENTRIX recommends that the UNRBA use the basin proration and United States Geologic Survey (USGS) Streamflow Regionalization methods for estimating flow at ungaged tributary loading and jurisdictional boundary locations throughout the watershed. These methods provide daily flow predictions whose accuracy is generally within about plus or minus 10% at most locations. When compared to the accuracy of flow data from USGS gages which ranges from between 5% to more than 15%, these estimation methods provide almost equivalent accuracy and certainly allow for the development of acceptable loading values.

The existing USGS gages on the five largest tributaries to Falls Lake (Ellerbe Creek, Eno River, Little River, Flat River, and Knap of Reeds Creek) should continue to be maintained throughout the re-examination process. It is possible that a very limited number of these could potentially be removed without impacting the UNRBA Stage II re-examination process, but most are essential as donor gages for estimating flow at upper watershed jurisdictional boundaries. Many of the upper watershed gages are needed to support existing agreements or water management activities that impact UNRBA members such as the Eno River Voluntary Capacity Use Area. In any event, it is recommended that a careful evaluation of the relationship between the existing gages and the estimation methods and the use of this data by local jurisdictions should be done before making any final decisions.

It is recommended that the UNRBA and Cardno ENTRIX work with the USGS to identify two locations for installation of new flow monitoring gages that can be used to provide further confidence in the flow predictions generated for middle and lower Falls Lake jurisdictional boundaries and tributaries. If suitable flow conditions are present and appropriate gage locations can be identified then it is our recommendation that one gage is located on a stream that is primarily in the Triassic Basin (middle lake tributaries) and one is located on a stream that is primarily in the Raleigh Belt (lower lake tributaries).