

APPENDIX C –

**Provisional Inflow Data Development for the
Cape Fear and Neuse River Basins**

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The current methodology for developing model inflow data does not lend itself well to frequent updates that will be necessary for real-time position analysis. The current methodology requires a large amount of input gage data (using 35 active gages in the basins); impairments from reservoir operations, water supply, wastewater returns, and agricultural withdrawals; correction to negative inflows that could otherwise cause model infeasibility; and scaling of gains to ensure that filled-in data for gages with missing data preserves the known volume of flow at downstream gages. Obtaining impairment data alone (which are necessary to unimpair the gage flows) is the most time-intensive part of the updating process.

HydroLogics has developed a simplified, *provisional* procedure that will enable weekly or monthly updates to be made, later overridden by periodic annual updates using the current methodology. It is meant to provide a representative inflow to key points in the basin, most notably Jordan Lake and Falls Lake, which are central to real-time management of the basin. The downloading of data and calculations for the provisional update are handled automatically within the GUI from the Update Record tab.

To simplify the update as much as possible, the procedure eliminates the need for most impairments and the concern over negative inflows that could lead to model infeasibility. The assumption is that most of the net impairments (withdrawals – discharges) in the basin are small and occur within a reach and therefore are not likely to have much effect on the natural inflow.

As an example, the Neuse River gages (e.g., Clayton, Goldsboro, and Kinston) are significantly affected by the operation of Falls Lake upstream. However, by computing the gains between Falls Lake (using measured releases) and Clayton, Clayton and Goldsboro, and Goldsboro and Kinston, the effect of the Falls Lake operation is removed. Only the net impairments within those reaches affects the natural inflow, and as long as the net impairments are small, it can be assumed that the difference in gaged flows in these reaches is the natural inflow.

Inflows to Falls Lake are back-calculated from historic releases and change in storage and are occasionally negative because lake evaporation is factored in (i.e., they are as calculated as net inflows) and/or wind effects on the reservoir which impact the stage measurement. Negative inflows at other locations can also occur when the downstream gage flow is less than the upstream gage flow (which is usually due to time of travel issues). In either case, these only pose a modeling problem if there is not enough water in the river or reservoir to handle them, which is rare. As a precaution, when gains are negative, the model's OCL is used to filter them to maintain model feasibility. Negative inflows to Falls Lake are maintained since reservoir storage is always adequate to handle them.

The simplified procedure is detailed in the *update_record.lv* file contained in the basedata directory of the model application. As noted, all data acquisition and calculations are automatically done within the model from the Update Record tab. The user should do a manual QA/QC check on the downloaded data before updating the record.

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