

Chapter 37

Cape Fear River Estuary Modeling and TMDL

37.1 Introduction

The Cape Fear Estuary from Bryants Creek to Snows Cut is Impaired for aquatic life because of dissolved oxygen standard violations. This portion of the estuary has been considered Impaired since the *1996 Cape Fear River Basinwide Water Quality Plan* and was included on the 1998 303(d) list of Impaired waters. Data used in the water quality assessment of the estuary were collected by DWQ and the LCFRP (Appendix V). Refer to Chapter 17 for current water quality assessment information.

Sources of the low dissolved oxygen levels include the many discharges of oxygen-consuming waste into this segment and to tributary streams. There is also a considerable volume of blackwater that may contribute natural sources of oxygen-consuming materials. This portion of the estuary is influenced by tides and high flows from the entire basin, and therefore, goes through many extreme changes in water column chemistry over the course of a year.

A point source management strategy was put in place in the *1996 Cape Fear River Basin Plan* in order to control oxygen-consuming wastes from wastewater discharges. The Cape Fear Estuary continues to violate the dissolved oxygen water quality standard as of this assessment cycle. Therefore, a TMDL is required for the estuary.

The DWQ obtained an EPA grant of \$253,000 in order to mount an extensive field monitoring project. This field monitoring includes the installation of continuous monitoring devices by the US Geological Survey, sediment oxygen demand measurements, dye studies, and intensive chemical monitoring. A major portion of the monitoring was completed in 2004; however, hurricanes prevented the completion of the study. The remainder of the study is scheduled to be completed in 2005.

37.2 Dissolved Oxygen and Watershed Loading Modeling

The City of Wilmington funded the development of a combined hydrodynamic and water quality model of the estuary in order to justify alternate wastewater permit limits. A combined hydrodynamic and water quality model was constructed using the EFDC modeling framework. Some additional data were collected to support the model development. The City of Wilmington has provided this model to DWQ for use in developing the TMDL. DWQ is funding the enhancement of the Cape Fear Estuary DO model to include the additional data collected specifically for that purpose. Work on this enhancement is expected to begin in 2005.

In order to further understand the input of oxygen-consuming material from the watershed, a watershed fate, transport and loading model will also be developed. The Black and Northeast Cape Fear Rivers are both tributary to the Cape Fear River below Lock and Dam #1. At this time, DWQ expects to model the Northeast Cape Fear River watershed to evaluate watershed-

based sources of oxygen-consuming materials and nutrients. DWQ expects to begin developing this model in 2005.

37.3 TMDL Development

TMDL development has not begun for the Cape Fear Estuary. Following the completion of the Cape Fear Estuary Dissolved Oxygen model, the process of determining TMDL targets will begin. Subsequent processes include the point and nonpoint allocations, and the development of an implementation strategy.

37.4 Lower Stakeholder Process

Representatives from the Lower Cape Fear River Program (LCFRP) formed an advisory group to participate in TMDL development. The advisory group is referred to as the Lower Cape Fear River Program Cape Fear Estuary TMDL Advisory Subcommittee (LCFRP CFRE TMDL AS). DWQ staff meets with this group on a quarterly basis to provide updates on project activities and to discuss project issues. The advisory group communicates the progress and implications of TMDL development to the LCFRP membership.

37.5 City of Wilmington Modeling Efforts

The City of Wilmington and new Hanover undertook a dye study and water quality modeling from 1999 to 2001. The study determined that the Wilmington discharges were influencing dissolved oxygen concentrations by less than 0.1 mg/l and that all discharges into the estuary were influencing dissolved oxygen concentrations by less than 0.5 mg/l. The study noted that sediment oxygen demand and swamp effects accounted for between 64 and 84 percent of the oxygen demand in the estuary.