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Subject: Draft Salinity and Dissolved Oxygen Longitudinal Plots

Longitudinal plots were developed in the navigation channel for salinity and dissolved oxygen (DO) using the 2015 Savannah Harbor Expansion Project (SHEP) calibrated model. The modeled results from cells in the Savannah River and Front River were used to calculate the 10th, 25th, 50th, 75th, and 90th percentiles. The model results were compared to measured data collected during the 2015 SHEP model calibration period (01/01/2013 – 04/30/2014). The long-term USGS station data were compared to modeled results for the 01/01/2013 – 04/30/2014 calibration period, while the SHEP station data, which were collected during a six week period in August and September, were compared to modeled data from 08/14/2013 – 10/01/2013.

The 2015 SHEP model longitudinal plot figures were created by replicating the general methodology used to create the 2006 SHEP model longitudinal plot figures in the 2006 SHEP Model Report, which calculated the results for the 10th, 50th, and 90th percentiles. By replicating the methodology, a general comparison between the two models could be conducted. The 2006 SHEP model was compared to SHEP data collected in 1999 (07/31/1999 – 10/13/1999) and 1997 (07/05/1997 – 10/13/1997).

The 2015 SHEP model matches the trend in measured surface salinity data at both the USGS and SHEP stations for most data percentiles (Figure 1 and Figure 2). The 2015 SHEP model under predicts salinity at the USGS stations between River Mile 12.5 and River Mile 20.5 (Figure 1). When compared to the SHEP station results, the modeled results do not show an overall negative or positive bias, although there is bias at some individual SHEP stations, such as FR-21 where the model under predicted salinity (Figure 2). However, the probe at FR-21 was installed at the opposite side of the channel as the USGS instrument, likely struck multiple times by vessels, and may have moved locations during the monitoring period. At other stations, such as FR-02, the model bias is different in the higher percentiles (75th and 90th) than the lower percentiles (25th and 50th), as the model did not capture the overall salinity dispersion at FR-02. Overall, the 2015 SHEP results are similar to the 2006 SHEP results, as the 2006 SHEP model under predicted surface salinity in the 90th percentile in both 1997 and 1999 (Figure 3 and Figure 4).

The 2015 SHEP model was able to predict the trend in bottom salinity in the navigational channel, and did not present any overall negative or positive bias (Figure 5). The 2006 SHEP model was also able to capture the overall trend in bottom salinity in 1999, although it over predicted bottom salinity in 1997 (Figure 6 and Figure 7).

The 2015 SHEP model matched the trend in measured surface DO at the USGS stations (Figure 8). While the model did not overpredict DO concentrations in the 25th percentile, it did overpredict DO concentrations at three of the five USGS stations in the 25th percentile, specifically between River Mile 16 and River Mile 21. The 2006 SHEP model was able to simulate the overall summary trends seen in both the 1999 and 1997 SHEP stations measured data sets (Figure 9 and Figure 10). The 2006 SHEP model overpredicted DO concentrations in the 10th percentile between River Mile 16 and River Mile 21, similar to the 2015 SHEP Model. Longitudinal plots were not created comparing the modeled DO to the SHEP stations due to extreme high flows during the sampling period (08/14/2013 – 10/01/2013) and potential issues in data collections. It is believed that the bottom SHEP stations were located in a "mud layer" and recorded unusually low DO. The measured DO concentrations were 2 mg/L lower (at the 10th and 25th percentiles) in 2013 compared to the 1999 and 1997 summer periods. A longitudinal profile was developed for the 08/14/2013 – 10/01/2013 period using the measured USGS DO data for a comparison, and the 2015 SHEP model overpredicted DO concentrations at most stations in the 10th and 25th percentiles (Figure 11).

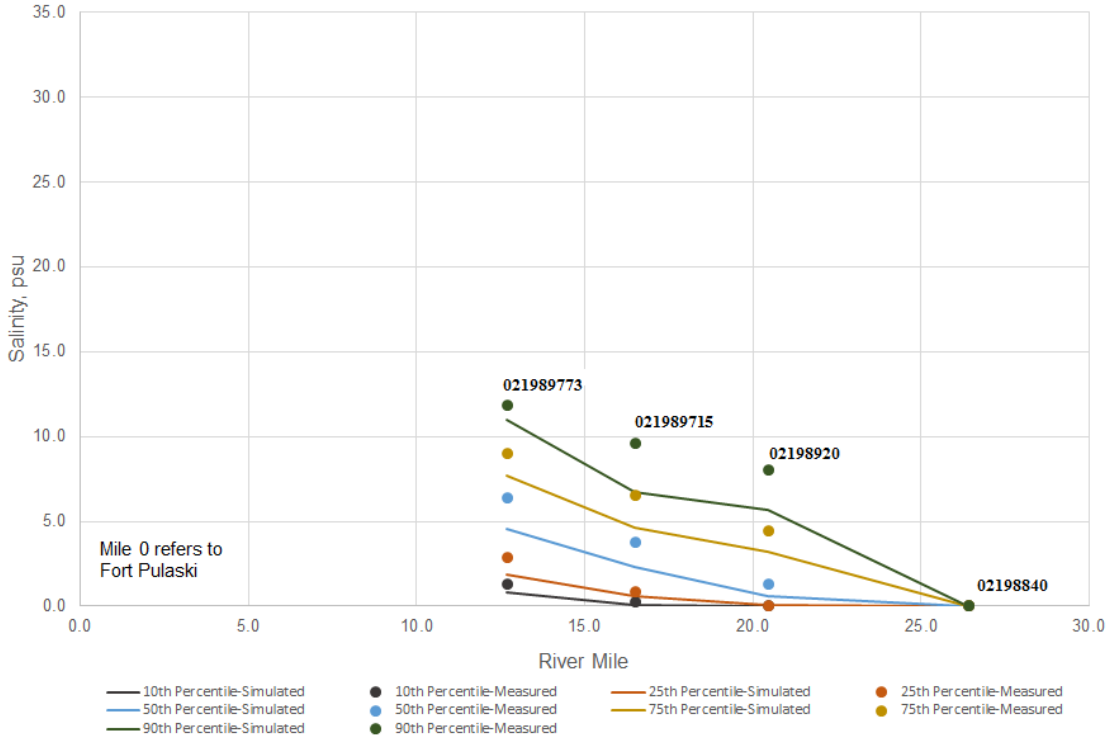

Figure 1. Longitudinal surface salinity profile of the modeled 2015 SHEP results and measured USGS data from 01/01/2013 – 04/30/2014

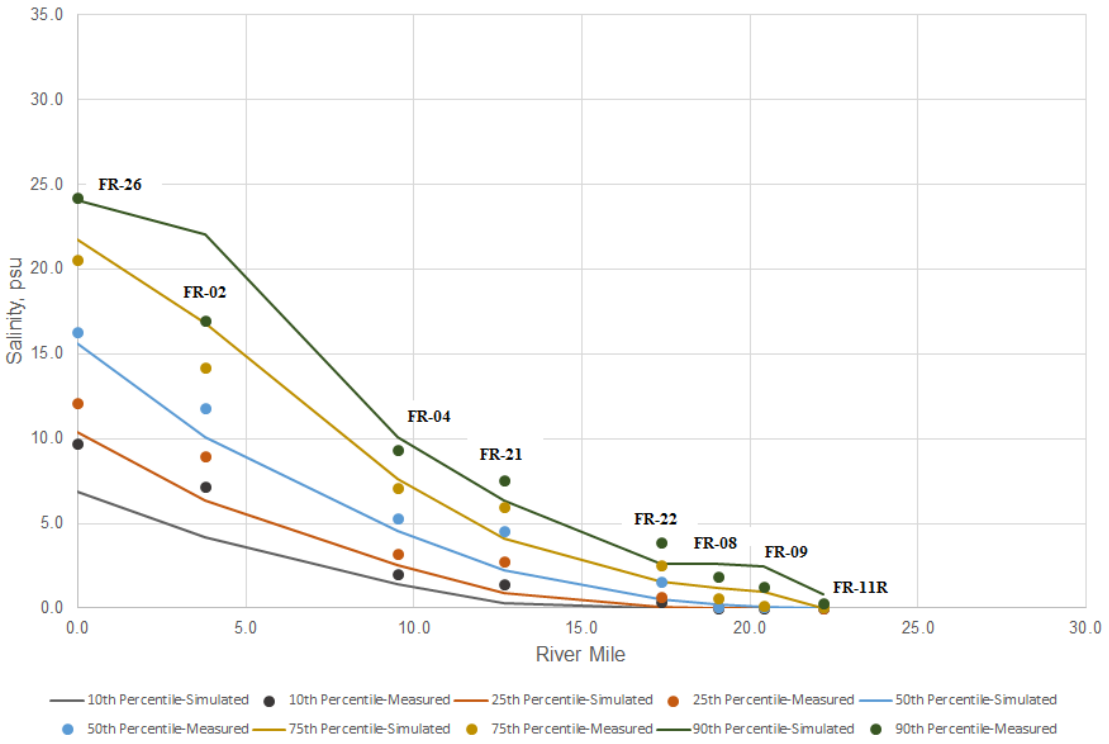

Figure 2. Longitudinal surface salinity profile of the modeled 2015 SHEP results and measured SHEP data from 08/14/2013 – 10/01/2013

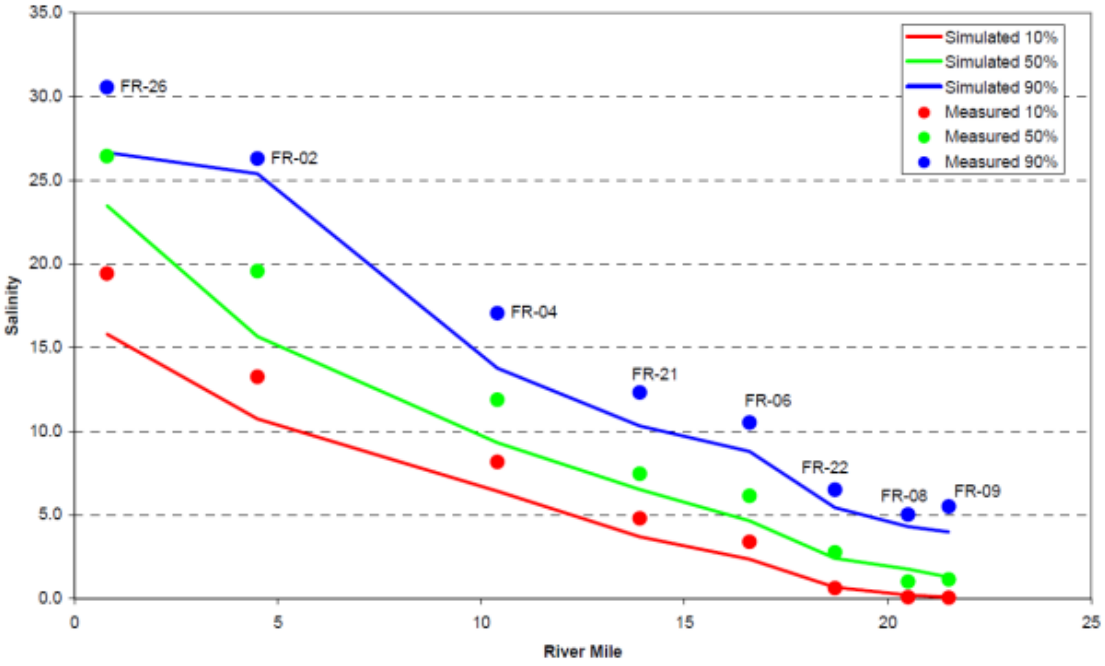

Figure 3. Longitudinal surface salinity profile of the modeled 2006 SHEP results and measured SHEP data from 07/31/1999 – 10/13/1999

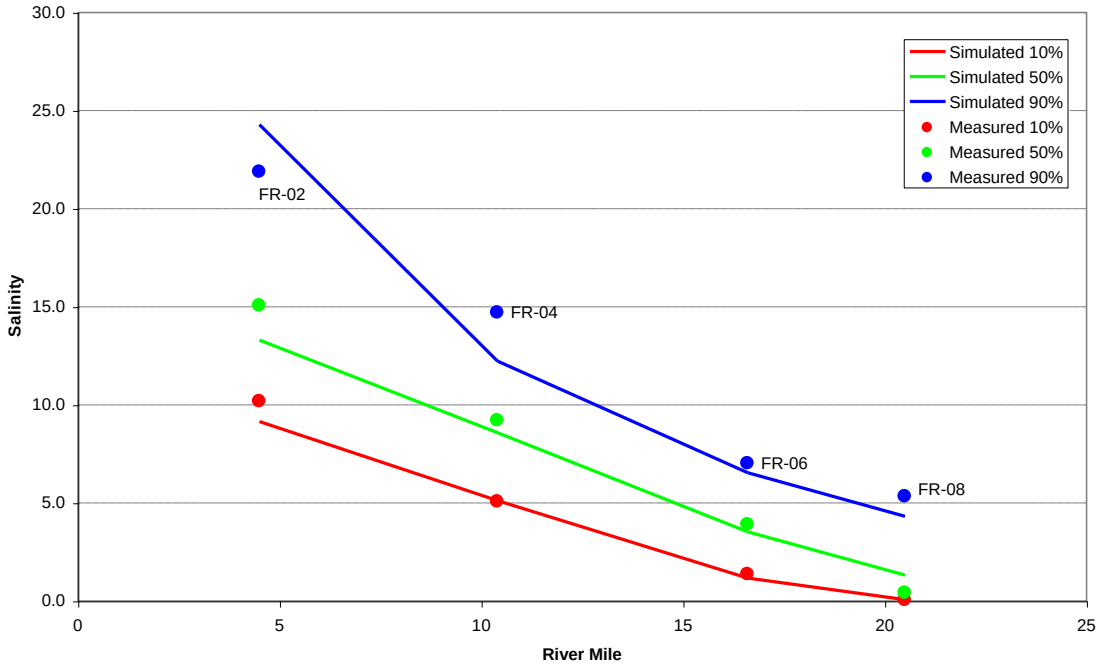

Figure 4. Longitudinal surface salinity profile of the modeled 2006 SHEP results and measured SHEP data from 07/05/1997 – 10/13/1997

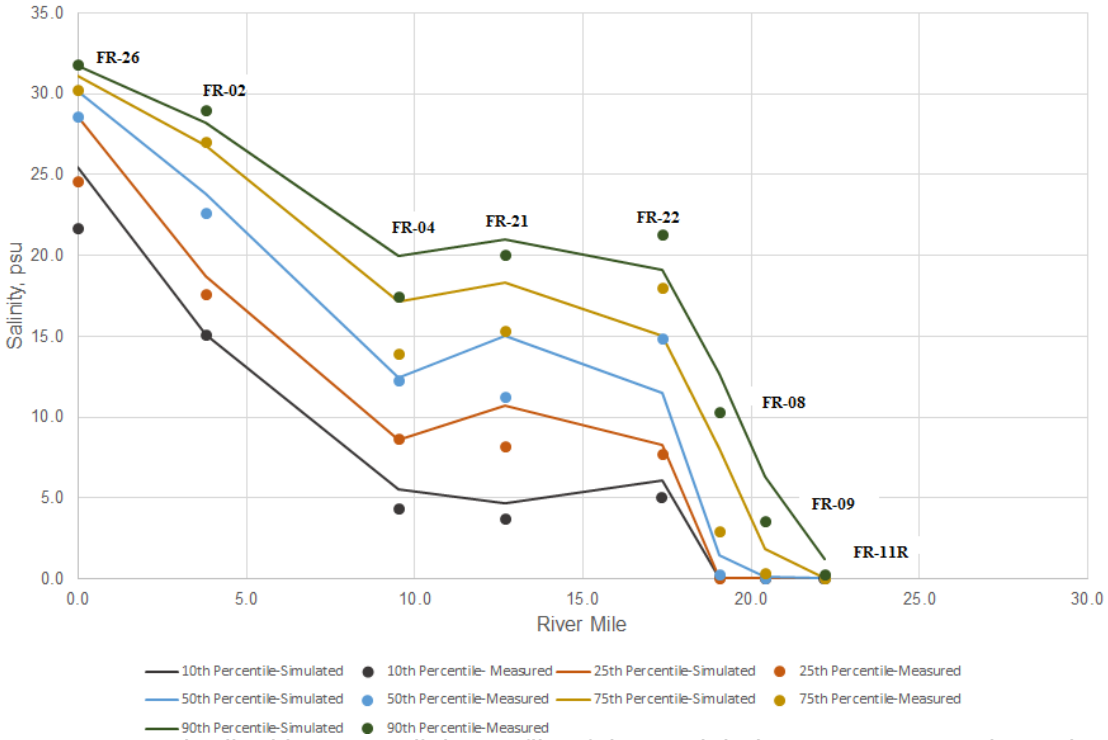

Figure 5. Longitudinal bottom salinity profile of the modeled 2015 SHEP results and measured SHEP data from 08/14/2013 – 10/01/2013

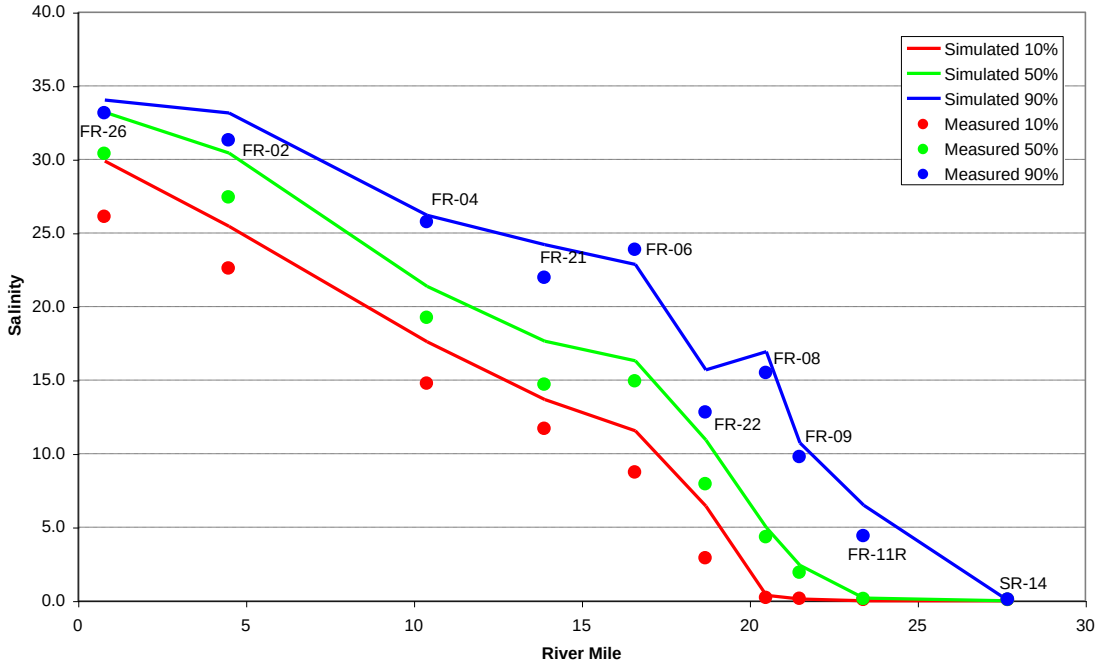

Figure 6. Longitudinal bottom salinity profile of the modeled 2006 SHEP results and measured SHEP data from 07/31/1999 – 10/13/1999

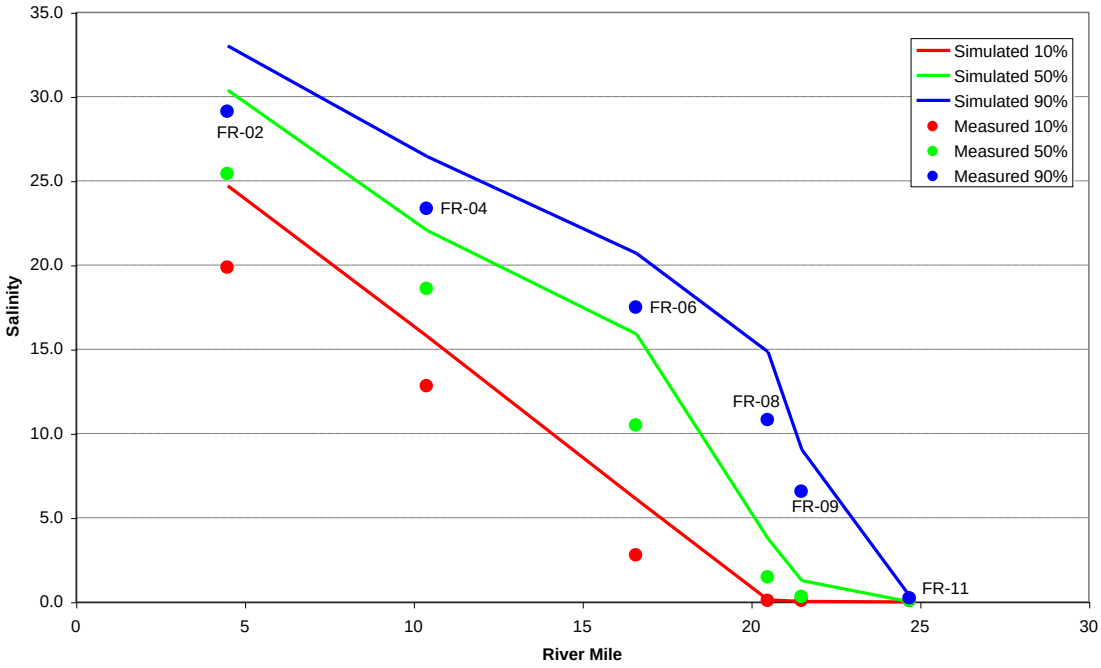

Figure 7. Longitudinal bottom salinity profile of the modeled 2006 SHEP results and measured SHEP data from 07/05/1997 – 10/13/1997

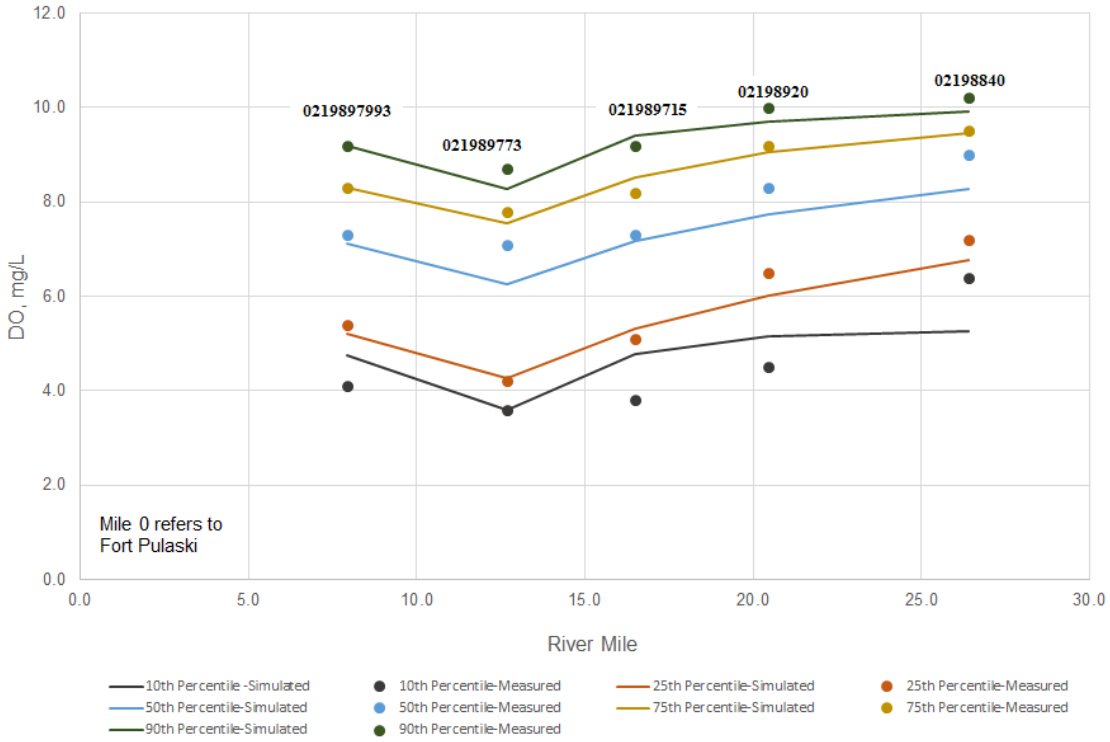

Figure 8. Longitudinal surface dissolved oxygen profile of the modeled 2015 SHEP results and measured USGS data from 01/01/2013 – 04/30/2014

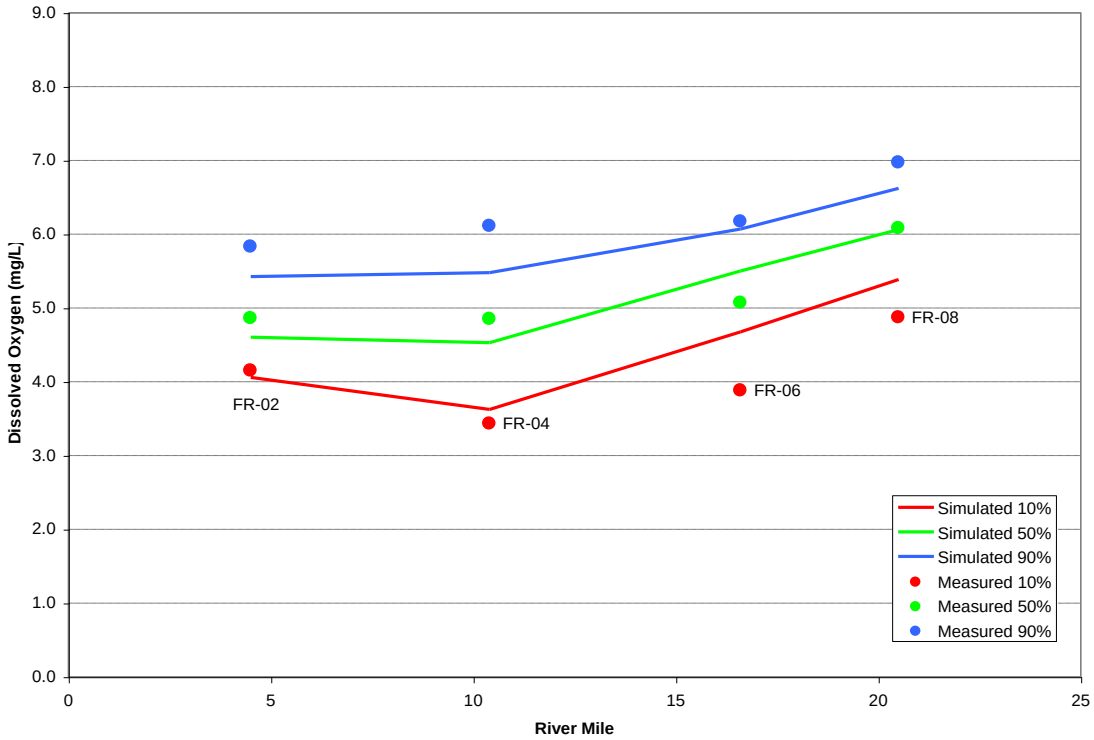

Figure 9. Longitudinal surface dissolved oxygen profile of the modeled 2006 SHEP results and measured SHEP data from 07/31/1999 – 10/13/1999

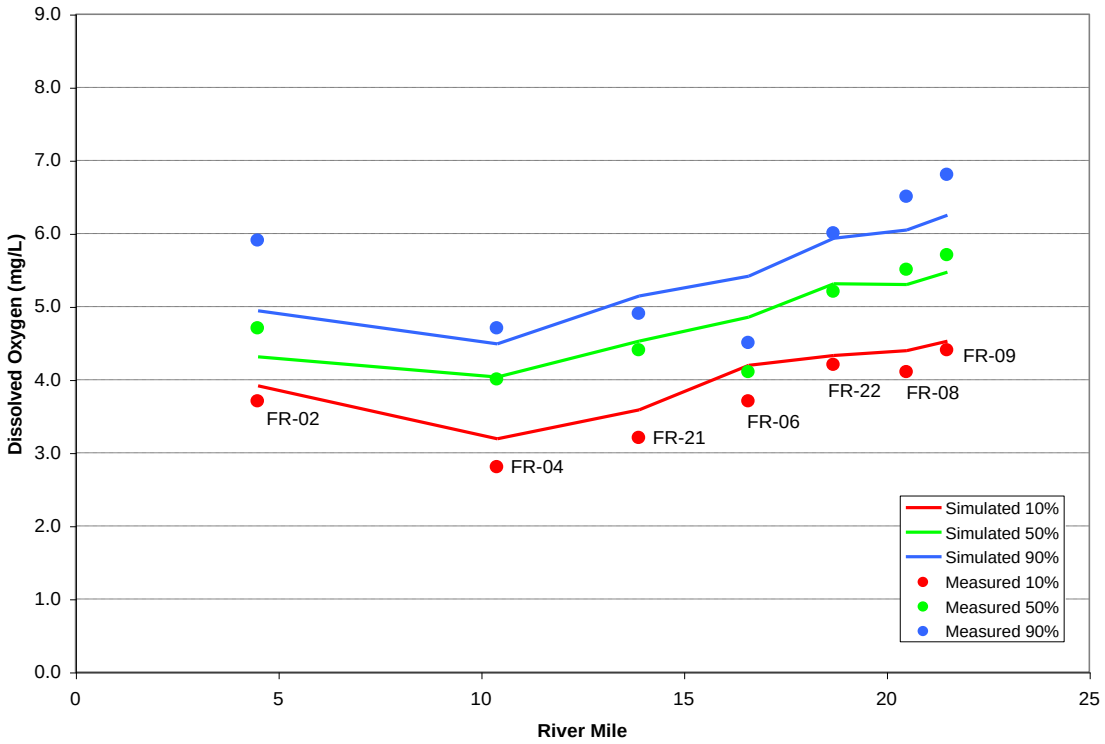

Figure 10. Longitudinal surface dissolved oxygen profile of the modeled 2006 SHEP results and measured SHEP data from 07/05/1997 – 10/13/1997

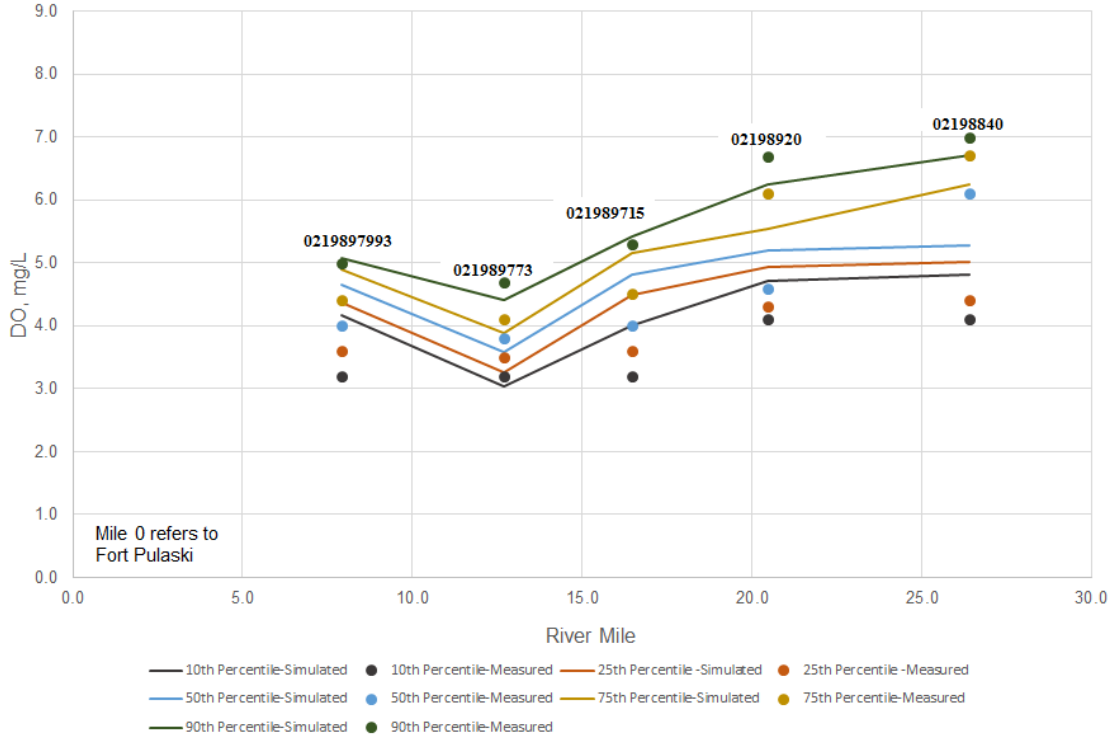

Figure 11. Longitudinal surface dissolved oxygen profile of the modeled 2015 SHEP results and measured USGS data from 08/14/2013 – 10/01/2013