

Narrandera Fisheries Weir CFD Analysis

Background

Industry and Investment NSW had undertaken a series of experimental trials investigating injuries and mortality of native fish due to the impacts of an undershot and overshot weir system in the Murray-Darling Basin. Their results demonstrated that undershot weirs have substantial impacts on the welfare of native fish, but further study was needed to gain insight into the hydraulic characteristics of these weirs.

Project Scope

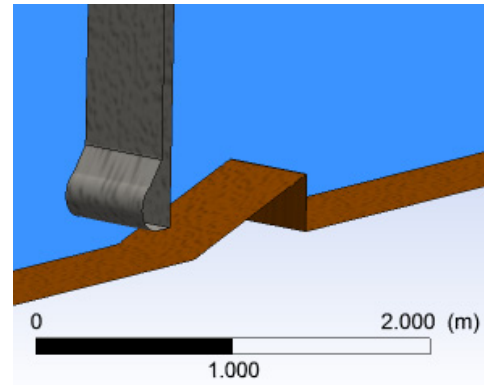
As part of this investigation Manly Hydraulics Laboratory (MHL) was invited by Industry & Investment NSW to conduct a computational fluid dynamics (CFD) analysis of the undershot and overshot weir system. The aim of the CFD analysis was to identify the hydraulic conditions in the weir system by varying the flow conditions, gate opening position and weir height, and to describe the effect of introducing a flow streamliner and flow deflector for the undershot weir type.

Our Role

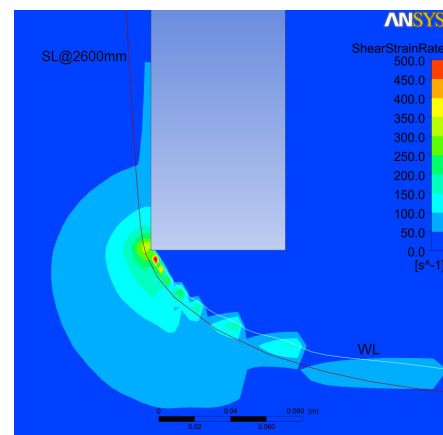
MHL created a 3D model of the weir system, and simulated a number of flow scenarios to represent the operational condition of the weir system. The effect of varying the gate opening position and weir height was investigated along with the effect of introducing a flow streamliner and flow deflector for the undershot weir.

Outcomes

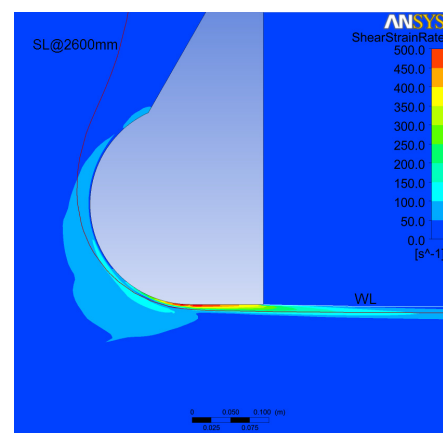
Results obtained from the CFD model clearly indicated that the undershot weir has a higher rate of change than the overshot weir. The introduction of the flow streamliner and flow deflector changed the flow condition around the gate opening, reducing the overall shear strain region. Through MHL's input, Industry and Investment NSW gained a great insight into the hydraulic behaviour of the weirs and the subsequent impact on the fish welfare.



3D view showing the flow streamliner and flow deflector for the undershot weir system



Contour plot of shear strain rate around the gate opening for the undershot weir system



Contour plot of shear strain rate around the flow streamliner for the same gate opening as above. Note the reduced shear strain region