This experiment seeks to illuminate the relationship between electric potential and electric fields via equipotential maps and field distributions due to different conductor configurations. The experimental arrangement replicates a water-based analogy for observing electric field distribution around a dipole, parallel plates, and a hollow conductor arrangement. Electric field strengths and directions were evaluated from differences in the potential measured at various points, with numerical differentiation applied. The parameters were experimentally matched with the theory by performing a curve fitting and chi-square value analysis. Although the results showed a pronounced correlation with expected electrostatic principles, some deviations were due to experimental constraints, such as electrode placement or variance in water conductivity. Such results test the validity of critical electrostatics principles and provide limited examples of actual applications of electric fields and potentials.