overarching QUEStion:

*Can you design a scale model of the CAP system which will move water uphill?*

Concept

A net force is required to move water from the Colorado River through several elevation gains along the 336-mile long Central Arizona Project (CAP) canal system.

activate

Students work with the Engineering Design Process and to-scale images of model equipment to meet the criteria and constraints of a simulated CAP construction project which moves water against the net force of gravity.

check

Students will draw aerial and cross-sectional views of their CAP scale model and present their design to their classmates.

Objectives

* Counteract the net force of gravity to move water uphill during simulated modeling exercise.
* Use the engineering design process to create the best design to move water uphill.

resources

* PowerPoint: **Core Idea-Net Force-Pump-It-Up-Activity**
* Student Handout: **Net Force-Pump it Up Student Handout.pdf**
* Reference Material
  + ToScaleDiagrams.pdf
  + It Takes Power to Bring Water to Us.pdf
  + Net Force-Pump it Up Rubric.docx
  + Graph-paper-fourth-inch.pdf
  + Engineering Design Process Diagram.pdf

Lesson Instructions

Use the **Core Idea-Net Force-Pump-It-Up-Activity** PowerPoint presentation to lead the lesson in conjunction with the **Net Force-Pump it Up Student Handout**. To Scale diagrams are provided for students to begin drawing and designing their scale models. Encourage students to refer to the Engineering Design Process to improve their overall design. Once complete, have students showcase and peer review their designs. A Rubric is provided for student support and assessing the model design.