The goal of this research is to develop a model that describes the saturated and unsaturated groundwater flow in Berrien County, Michigan. The regularized three-dimensional point cloud, and three-dimensional information visualization software (3DIVS) is then utilized to generate a solid model. However, at this stage, the model is essentially a "virtual well field" (regularized two-dimensional array of points) samples each x-y location in each of the 20 grid cells. It is necessary to have a numerical model capable of handling variably-saturated flow subject to a heterogeneous distribution of hydraulic properties and non-uniform topography. It is then utilized to generate a solid geologic model by interpreting the vertical geologic "samples" throughout the model domain.

**GOVERNING EQUATION OF FLOW (FRANK, 1971):**

\[
\frac{\partial \varphi}{\partial n} = 0 \text{ in the saturated zone}
\]

Solving for the pressure head \( h \) allows rearranging into the unsaturated zone.

\[
q_y: \text{ specific moisture capacity, pressure dependent in the unsaturated zone.}
\]

\[
C(Y) \text{ is the van Genuchten parameter, dependent in the unsaturated zone.}
\]

\[
K(Y) \text{ is the van Genuchten parameter, pressure dependent in the unsaturated zone.}
\]

**REFERENCES:**


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**3-D GEOLOGIC MODEL WITH REPRESENTATIVE CROSS SECTIONS**

The solid model developed from the "Virtual Well Field" generated using GIS (ArcMap) and custom computer code (FORTRAN) can be visualized using a 3DIVS. The 3DIVS Software (EVS) allows sections to be extracted from the solid model.

**GROUNDWATER MODEL AND FINITE-DIFFERENCE GRID**

The ASCII output table from the Groundwater flow model (right) is processed using custom computer code to produce output in a 3DIVS (3VIS) for visualization of resultant vectors and associated geology at any location.

**PROCESSING MODEL OUTPUT AND VISUALIZING RESULTS**

The GIS output table from the Groundwater flow model (right) is processed using custom computer code to produce output in a 3DIVS (3VIS) for visualization of resultant vectors and associated geology at any location.

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**Legend**

- **Lake Michigan:** The ASCII output table from the Groundwater flow model (right) is processed using custom computer code to produce output in a 3DIVS (3VIS) for visualization of resultant vectors and associated geology at any location.