Why C Tech 3D Software

- Address Complex Technical Challenges
  - Regulatory Issues
  - Financial Issues
  - Political Issues
- Improve Communication Between
  - Regulatory Agencies
  - Consultants and other Technical Personnel
  - Public
- Defensible, Understandable Analysis
  - 3D Volumetric Geostatistics
  - True 3D Visualization & Animation
EVS Functionality

- Geologic and geophysical modeling
- Geostatistical analysis of soil, groundwater, surface water and air data
- Three-dimensional visualization and animation of models and analyses
- Well Decommission™: Justifiable approach for determining groundwater monitoring wells suitable for decommissioning
Included ArcView/ArcGIS extensions allow you build geology and chemistry data and launch C Tech’s software.

All EVS versions can import and export 2D & 3D ESRI Shapefiles for annotation.

Extrude polygons to create 3D volumetric representations of buildings and objects.

Map 2D shapefiles to geologic surfaces.
Documentation and Tutorials

- Exhaustive on-line and context sensitive help system.
- On-line interactive tutorials for intermediate level self-training in ~16 hours
- Proven algorithms in-use by major corporations, DoE, DoD, EPA, USGS and many other government agencies
Geologic and Geophysical Modeling
Texture Mapped Site Geology
Complex Geologic Fault Modeling
Modeled with Geologic Indicator Kriging
Geostatistical Analysis of Soil, Groundwater, Surface Water and Air Data
Coastal Industrial Facility
Volume Rendered Plume, Sample Data & Buildings
Groundwater Wells, Fence Diagram and Plume
The EVS Network Paradigm: Graphical Object Oriented Programming

- Libraries with well over 170 modules.
- Each module performs data analysis or visualization functions.
- Applications are collections of modules interconnected to form networks.
- Users can build their own networks, use or enhance EVS supplied applications.
Example: 6-Module Network

- Krig 3D Geology: kriges surfaces
- Krig 3D: creates a 3d grid with interpolated chemistry
- Explode and Scale: z-exaggeration & separation of layers
- External edges: display extents of domain or grid
- 3D Plume: isosurfaces and mapping of any attribute at any cutoff
Chemical and Geologic Data
Three-Dimensional Visualization and Animation
Plume Migration in Sand Channels
ASCII data files for:
- Chemistry (parameter data)
- Borehole, boring logs and surface geology data

Annotation Data
- Overlay Aerial Photography
- AutoCAD DXF files
- ArcView shapefiles

Finite difference & finite element model output
- MODFLOW, MT3D, CFEST, etc.
- GMS (MODFLOW, MT3D, Femwater)
- Groundwater Vistas and Visual Modflow

Database Connectivity
- Access,
- ODBC interface to dBase, Excel, FoxPro, etc.
EVS Output Options

- 3D Rendered Bitmap Graphic Output
  - Virtually All Image file formats
  - Animations as AVI, MPEG, HAV

- 3D Graphics Printing to:
  - Any windows printer (color & black and white)

- Vector Output
  - Shapefiles and AutoCAD DXF
  - 4D Interactive Model Animations (4DIM)
  - VRML 1 & 2 Output
DrillGuide™
Analytically Guided Site Assessment

- Determine locations within a site requiring additional sampling.
- Automatically iterates to determine “n” optimal locations.
- Focuses on high uncertainty regions where we predict contamination, but with low confidence.
DrillGuide™ Concentration

- High concentration regions are mapped to (red) peaks, low areas to (blue) valleys. Region is defined by convex hull of input data.
DrillGuide™ Confidence

- High confidence regions are mapped to (red) spots, low confidence areas are blue.
DrillGuide™ Uncertainty

- Areas of high uncertainty (red) are regions with low confidence and high predicted concentration.

- High uncertainty regions are locations where we predict contamination, but our confidence in that prediction is low.
Well Decommission™

Determine groundwater monitoring wells suitable for decommissioning
Groundwater Monitoring Challenge

- Groundwater contamination sites worldwide are engaged in regular sampling of monitoring wells.
- The typical costs are $1,500 per well per sampling event.
- Many of these wells are redundant or geostatistically insignificant and can be decommissioned.
Well Decommissioning Approach

- C Tech has developed a new module in EVS-PRO called *Well Decommission*

- *Well Decommission* analyses all available data and quantifies the impact to site assessment quality of removing each well.

- Provides area-impact and concentration-weighted area-impact of each well.
Benefits

- *Well Decommission* provides an easy to use method to determine which, if any, wells can be decommissioned.
- Provides graphical and tabular results.
- Can analyze the impact of multiple analytes.
Function and Output

- Performs baseline analysis using all data
- Determines statistical variation in plume area (red-max, green-nominal, blue-minimum)
Results

- Here we see the TCE distributions with the first well removed.
...and the 2nd through 5th.
Results (continued)

...and the 27th through 30th.

- Cycle 27 of 30 for Target Concentration 400.0
- Cycle 28 of 30 for Target Concentration 400.0
- Cycle 29 of 30 for Target Concentration 400.0
- Cycle 30 of 30 for Target Concentration 400.0
The final output screen shows each well colored by its impact on the total site evaluation.

Legend values are in square feet.
Here the wells are colored by impact on predicted site contaminant area weighted by TCE levels.

Legend values are in square feet times TCE concentration.
Significant and Insignificant Wells

Note the difference in importance between Boring 506 and Boring 509!

Boring 506 is a prime candidate for being decommissioned!
### Function and Output (continued)

Tabular output for all 8 quality measures is provided.
Well Decommission Conclusion

- Well decommission technology provides a justifiable approach for determining candidate wells for decommissioning.

- *Well Decommission* can save thousands of dollars per year for each well identified for decommission.

- *Well Decommission* is one of many capabilities in EVS-PRO