Geologic Setting 20-5702-425

Iterative Performance Assessment 20-5702-723

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Project title: Nuclear Materials Safety + Safeguards (NMSS)
20-5702-425
PI: ~~David Ferrill~~ 8/4/94 Gerry Stirewalt

Project title: IPA 20-5702-723
PI: Randy Manteufel

Objective: Create a computer model of local Yucca Mountain area to be used modeling and analysis of hydrology. 3D model will be used as controlled database for simulations.

Original 3D model was created by Steve Young, Gerry Stirewalt, Alan Morris (consultant from VTSA), and Joe Bangs in 1992.

Model was built from geologic model (geoset) cross section diagrams. Scattered data for faults and subsurface layers was input into DGI EarthVision system on SGI 240/VGX. Geologic structure builder in EarthVision was used to create a 3D model. Model range is:

UTM: East 545010 m – 550480 m
North 4074000 m – 4083000 m
Geo: 116° 25' 40" W – 116° 29' 43" W
36° 48' 44" N – 36° 53' 37" N

B Henderson
8-4-94

Short term task: Rezone 3D model based on hydrologic data. George Rice (consultant) has been providing data compiled from various sources that I am reformatting to enable visualization of this data. Data will be used to interpret the major zones in a revised 3D model.

As of today George has given me data on 17 wells. 13 of 17 wells have location data. 10 of 13 wells are within range of current 3D model.

The process I use to reformat the data is as follows:

1. Load ASCII text files from 3.5" floppy disk to PC.
2. ftp files from PC to SGI Onyx/RE2 (performer) workstation.
3. move files to subdirectory ~/ipa/10_<date>
4. cd to subdirectory ~/ipa/30cleanSitCond
5. run script file to remove blank lines from text files: ~~run00NoBlankLines~~ BH 10-3-94
6. use text editor to add tabs, "—" where data is not given in a column, and check file format against printouts of files.

B. Hinkelman 8-4-94

Process (continued)

7. cd ~/ipa/20evDat directory.
8. use text editor to enter XY locations of holes from file printout from G. Rice.
9. run script file ~~run00frogat~~ 10-3-94 BH to convert coordinates to lng-lat, creates file ~~04toc.dat~~ 10-3-94 BH
10. cd ~/ipa/40dat
11. run script files (~~runTOTGH-3.~~ 10-3-94 BH) to extract data from text files and output in a format readable by EarthVision. ~~run01tdat~~ 10-3-94 BH runs all script files; output file is boreholes.pdat
12. view ~~boreholes.pdat~~ 10-3-94 BH in EarthVision, review boreholes.pdat &

Brett Hinkelman 8-4-94

3D Model Sat Conductivity

Use EarthVision 3D Grid modeling to build 3D model of saturated conductivity:

Source file is ~~borehole.dat~~ 10-3-94 B10, gives XYZ and various parameters such as SatCond and log(SatCond).

Used log(SatCond) for 3D model:

```
ev_3grid
    -o satcond.3grd
    -F EV-GMX/SVP
    -r '545957, 551195, 4074345, 4080288, -618, 1563'
    -s 21, 12, 24
    -d borehole.dat
    -f 'LogSHCond'
```

Output file /usr3/brent/ipa/50satcond/satcond.3grd

Brent Henderson
8-17-94

3D Model Sat Conductivity by layers Met w/George Rice 9AM–11AM

cd /usr3/brent/723ipa/hydrobdtc/satcond on Perform

1. geol. layers → only grid within layers → 3D grid
   sat. cond → only grid within layers → 3D grid

   assumption is that sat. cond. is discontinuous at geologic boundaries.

2. OFR data — geology vs. 3D Model Problem: how do you know
   17 unit classes 6 units
   sort sat. cond. by unit types
   grid only for a particular unit type.

   hydro-stratigraphic map ≠ stratigraphic map

3. for all layers run 3grd → focus
   then focus merge

4. check with Steve on layers – top or bottoms?

Brent Henderson 8-24-94

Creating faces files

1. dat files for horizons → 2grds

00README Page 1

```
00README 8-24-94

TASK:
Create 3D model from horizon files and hydro data.

1.  Create 2grds from horizon.dats defining top and bottom
    of geologic layer.

          run_tptw_2grd.sh
          #!/bin/sh -e

          FEATURE=EV-GMX/SVP
          ev_2grid \
             -o tptwtsw1.2grd \
             -F $FEATURE \
             -r 546000.000000,551000.000000,4074000.000000,4081000.000000 \
             -s 19,11 \
             -d /usr3/brent/723ipa/3DModel/94jun/20_subsurface/data/tptwtsw1.dat
\
             -f 'Z' \
             -G tptwtsw1.2grpt \
             -m 4 \
             -x

2.  Create 3grd from horizon.2grds and hydro data (boreholes.pdat)
    using log(sat. cond.) as property value.

          run_tptw_logsat_3grd.sh
          #!/bin/sh -e

          FEATURE=EV-GMX/SVP
          ev_3grid \
             -o tptw_logsat.3grd \
             -F $FEATURE \
             -r '546000.0000,551000.00,4074000.00,4081000.00,-517,1464.4000244' \
             -s 19,11,23 \
             -d boreholes.pdat \
             -f 'LogSHCond' \
             -G tptw_logsat.3grpt \
             -T tptwtsw1.2grd \
             -B ohnln2.2grd \
             -S tptw_kept.pdat

3. Create faces from 3grd and horizon.2grds to clip faces file.

          run_tptw_logsat_faces.sh
          #!/bin/sh -e

          FEATURE=EV-GMX/SVP
          ev_faces \
             -o tptw.faces \
             -F $FEATURE \
             -i '-28,-24,-20,-16,-12,-8,-4,0,4,8,12,16,20,24,28' \
             -m "tptw_logsat.3grd" \
             -T tptwtsw1.2grd \
             -t 4.915124 \
             -B ohnln2.2grd \
             -b 6.597435 tptw_logsat.3grd

4. Merge faces files into single 3D model faces file.

          run_n3ptn_tptw_faces.sh
          #!/bin/sh -e

          FEATURE=EV-GMX/SVP
          ev_merge -o 2layers.faces -F $FEATURE << EOF
```

BH 8-24-94

00README Page 2

```
          tptw.faces        0        0
          n3ptn_satcond.faces       0        0
          EOF
```

Brit Hartman 8-24-94

Creating log(sat. hyd. cond.) 3D model:

run050mkFaces Page 1

```
#!/bin/sh -e

data=LogSHCond

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1500.0

if (test $1 -eq "all")
then
   for horizon in layer0
   do
      echo Gridding horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010$horizon.2grd \
         -d /usr3/brent/723ipa/3DModel/94jun/10_topo/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'Z' \
         -m 4 \
         -x
   done

   layer=1
   for horizon in n3ptn tptwtsw1 tsw23 ohnln2 ppw cfun
   do
      echo Gridding horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010layer$layer.2grd \
         -d /usr3/brent/723ipa/3DModel/94jun/20_subsurface/data/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'Z' \
         -m 4 \
         -x
      layer=`expr $layer + 1`
   done
fi

if (test $1 -eq "all")
then
   layer=0
   for horizon in layer0 layer1 layer2 layer3 layer4 layer5
   do
      bottomlayer=`expr $layer + 1`

      echo Gridding 3grd $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -o 020layer${layer}_${data}.3grd \
         -F $FEATURE \
         -r $rangez \
         -s 20,15,25 \
         -d boreholes.pdat \
         -f $data \
         -T 010layer$layer.2grd \
         -B 010layer$bottomlayer.2grd \
         -S 030layer${layer}_${data}.pdat

      echo Making faces $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_faces \
         -o 040layer${layer}_${data}.faces \
```

output file:
060merged_layers.faces

BH 8-24-94

run050mkFaces Page 2

```
         -F $FEATURE \
         -i '-28,-24,-20,-16,-12,-8,-4,0,4,8,12,16,20,24,28' \
         -t 4.915124 \
         -T 010layer$layer.2grd \
         -b 6.597435 \
         -B 010layer$bottomlayer.2grd \
         020layer${layer}_${data}.3grd

      layer=`expr $layer + 1`
   done
fi


FEATURE=EV-GMX/SVP
ev_merge -o 060merged_layers.faces -F $FEATURE << EOF
040layer0_LogSHCond.faces       1       1
040layer1_LogSHCond.faces       2       2
040layer2_LogSHCond.faces       3       3
040layer3_LogSHCond.faces       4       4
040layer4_LogSHCond.faces       5       5
040layer5_LogSHCond.faces       6       6
EOF


echo "Finished, created 060merged_layers.faces  \007"
```

Brit Hartman 8-24-94

Additional borehole location data supplied by Ron Martin
taken from various reports:

UE-25 a4	-116.446°W	36.860°N
UE-25 a6	-116.446°W	36.854°N
UE-25 c2	-116.429°W	36.829°N
UZ-6	-116°28'01" W	36°50'13" N

Meet w/ Steve Young, Gerry Stuart 9-12-94 1230PM

Fig. 3.2-1 3D view — title, show faults.

Fig 3.1-1 Map view — repository outline, Jet wash,
West wash, 5km circle, 3D Model

Current 3D model was built from Scott + Bonk
cross section diagrams & 8 boreholes.

1. Modeled faults with Geosoc program (D. Morris)
2. Find layer horizon postings along Scott + Bonk
   cross sections.
3. Steve Young hand derived contours from postings.
4. Created scattered data files from horizon contours.
5. Grid scattered data files in EarthVision
6. Generate faces file (3D Model) in EarthVision.

Brent Hanchar
9-12-94

Enhancements to model

1. Add fatigue wash fault, Wendy wash fault
2. Add abandon wash faults
3. Expand boundaries of 3D Model
4. Rezone model based on hydrologic data
5. Build model so that fault blocks can be removed individually.
6. Image overlays — aerial photos, Landsat TM, color contours.
7. Show repository footprint

92 Model — used Sandia Thermo/mechanical Report for horizon layer
names.

Need to find + archive data used to construct 92
3D Model.

George Rice dropped off porosity data file.

Brent Hanchar
9-13-94

Met with Gerry Stroudt, George Rice, Ross 8:30 am

- Lynx will be purchased by CVWRA. (has options for kriging etc...)
- Can DGI + Lynx share data? Gerry doesn't think they will share data.
- Permeability orientation would be helpful to know. Ash flow units.
- Grid properties; 2 approaches, (A) Grid block w/no regard to geologic layers (B) Grid by horizon
- Does permeability cross lithologic layers?
- Action: model by geo layer
- After 3D model bounding — increase N-S bounding to intersect 5 km confining boundary.
- Action: add porosity data 3D model both ways
- Next mtg — week of Oct 10th.
- Flag for matrix vs fractured ~~porosity~~/permeability (JLD 9/19/94)
- Block model — clip top/bottom by geologyes.
- Boreholes:
  - 2 Tiva Canyon
  - 7 Bedded Tuff
  - 3 Topopah Spring (thick)
  - 1 Calico hills
  - 4 Prow pass
  - 5 Bullfrog
- Boreholes — approx 3 holes intersect 3D model with unit type data.

Brent Hedlund
9-19-94

DGI Questions

1. 3D Grid — (3DG - 10 page) gridding algorithm details for Ross. 3D Kriging Option
2. Terminating faults — how modeled?
3. Property 3D grid — pull out high
4. Method to set max value for a grid?
5. Take type of hydro dir

Compare block hydro model vs. model with stratigraphy

✓ Action: add new borehole location data.

Action: IPA archive library

Action: Block hydro model — slice by units from geo model stratigraphy on block hydro

Viewgraphs/prints — hydro/strat
1. borehole location
2. block model
3. zone model hydro/strat.

- May have new locations for holes outside rapture — George

Brent Hedlund
9-19-94

Met with George Rice

✓1. Templates for file formats

2. May need to max grid values LogSatCond −3 to −15
(Restrict grid values)

−3 ← min(24, −3) Porosity pref: dry bulk > pychnomt

−15 ← min(−15, −8) vertical > horizontal

Layer0 LogSat −11.7 to −5.6

3. Extract property min/max for each layer pdat, use that to restrict 3grd property ranges ev_3grid −P.

4. Run 3D models for SAT COND, POROSITY block + layer models.

5. Permeability type — use only metric values or fracture values.

Burt Hotchkiss
9-22-94

Log Sat Hyd. Cond.

- Block model, limit property values to those within pdat file.
- evview — view isovalues within ranges such as −4.5 to −8.0

- Zoned model — DGI ERROR in DGI3DPOLY_IOR 51 3
  Warning ~~gaps~~ may appear in struct. surfaces).

Burt 9-23-94

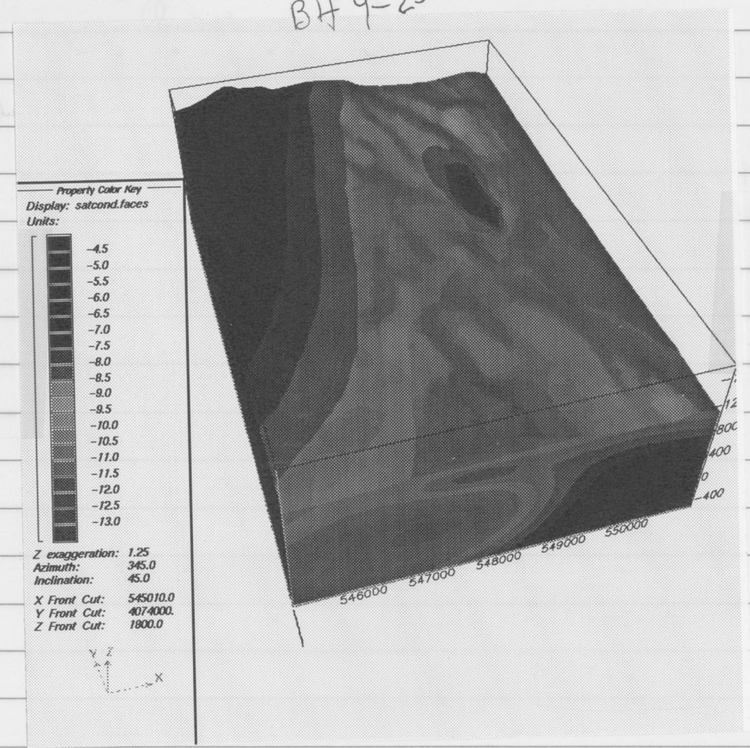
run000LSatCondBlock Page 1

```
#!/bin/sh -e

echo "\n\nCreating 3grid from pdat..."

echo "Find min/max of property..."
prng=`nawk 'BEGIN {minV = 999999
                   maxV = -999999}
      {
         if ((length($0) > 64) &&
             (substr($0,1,1) != "#")  &&
             (substr($0,68,11) != "          ")) {
            data = substr($0,68,11) + 0.0
            if (data < minV) minV = data
            if (data > maxV) maxV = data
         }
      }
      END {print minV","maxV} ' boreholes.pdat `

echo "Property range (min,max): " $prng

range=545010.000000,550980.000000,4074000.000000,4083000.000000
ranges=$range,-500.0,1800.0

FEATURE=EV-GMX/SVP
ev_3grid \
   -d boreholes.pdat \
   -f 'LogSHCond' \
   -F $FEATURE \
   -P $prng \
   -o satcond.3grd \
   -r $ranges \
   -s 21,12,24 \

echo "Created satcond.3grd\n\n"

echo "Creating faces file..."
FEATURE=EV-GMX/SVP
ev_faces \
   -o satcond.faces \
   -F $FEATURE \
   -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-5.5,-5
,-4.5' \
   -T 010layer0.2grd \
   -t 6.167437 \
   satcond.3grd


echo "Finished, created satcond.faces \n\007"
```

Burt Hotchkiss
9-23-94

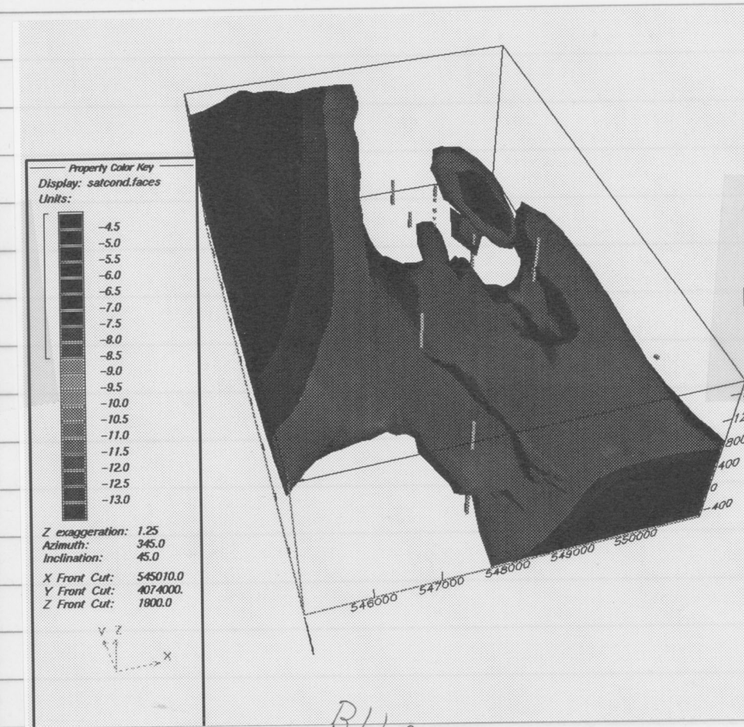
Log Sat Cond Block Model

BH 9-23-94



Brett Weber
9-23-94

Block Model Isosurfaces Displ



BH 9-23-94

Brett Weber 9-23-94

Script file to create sat cond zoned model:

run020LSatCondZoned **Page 1**

```
#!/bin/sh -e

echo "\n\nCreating log sat cond zoned model...\n"

data=LogSHCond

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

if (test $1 -eq "all")
then
   for horizon in layer0
   do
      echo Gridding 2grd topo horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010$horizon.2grd \
         -d /pscr0/brent/723ipa/3DModel/94jun/10_topo/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'z' \
         -m 4 \
         -x
   done

   layer=1
   for horizon in n3ptn tptwtsw1 tsw23 chnln2 ppw cfun
   do
      echo Gridding 2grd horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010layer$layer.2grd \
         -d /pscr0/brent/723ipa/3DModel/94jun/20_subsurface/data/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'z' \
         -m 4 \
         -x
      layer=`expr $layer + 1`
   done
fi

if (test $1 -eq "all")
then
   layer=0
   for horizon in layer0 layer1 layer2 layer3 layer4 layer5
   do
      bottomlayer=`expr $layer + 1`

      echo Creating pdat for $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -B 010layer$bottomlayer.2grd \
         -d boreholes.pdat \
         -f $data \
         -F $FEATURE \
         -o 020layer${layer}_${data}.3grd \
         -r $rangez \
         -s 20,15,25 \
         -S 030layer${layer}_${data}.pdat \
         -T 010layer$layer.2grd

      echo "Find min/max of property..."
      prng=`nawk 'BEGIN {minV = 999999
```

BH 9-23-94

Brent Hahn 9-23-94

Script file continued...

run020LSatCondZoned **Page 2**

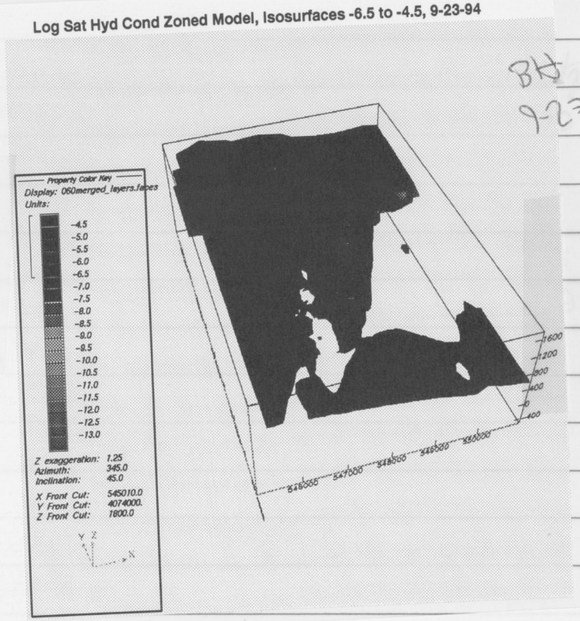
```
                  maxV = -999999}
            {
               if ({length($0) > 73) &&
                   (substr($0,1,1) != "#")  &&
                   (substr($0,60,15) != "          ")) {
                  data = substr($0,60,15) + 0.0
                  if (data < minV) minV = data
                  if (data > maxV) maxV = data
               }
            }
            END {print minV",maxV} ' 030layer${layer}_${data}.pdat `

      echo "Property range (min,max): " $prng

      echo Gridding 3grd $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -B 010layer$bottomlayer.2grd \
         -d boreholes.pdat \
         -f $data \
         -F $FEATURE \
         -o 020layer${layer}_${data}.3grd \
         -P $prng \
         -r $rangez \
         -s 20,15,25 \
         -S 030layer${layer}_${data}.pdat \
         -T 010layer$layer.2grd

      echo Making faces $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_faces \
         -o 040layer${layer}_${data}.faces \
         -F $FEATURE \
         -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-
5.5,-5,-4.5' \
         -t 4.915124 \
         -T 010layer$layer.2grd \
         -b 6.597435 \
         -B 010layer$bottomlayer.2grd \
         020layer${layer}_${data}.3grd

      layer=`expr $layer + 1`
   done
fi


FEATURE=EV-GMX/SVP
ev_merge -o 060merged_layers.faces -F $FEATURE << EOF
040layer0_LogSHCond.faces       1       1
040layer1_LogSHCond.faces       2       2
040layer2_LogSHCond.faces       3       3
040layer3_LogSHCond.faces       4       4
040layer4_LogSHCond.faces       5       5
040layer5_LogSHCond.faces       6       6
EOF


echo "Finished, created 060merged_layers.faces  \007"
```

BH 9-23-94

Brent Hahn 9-23-94

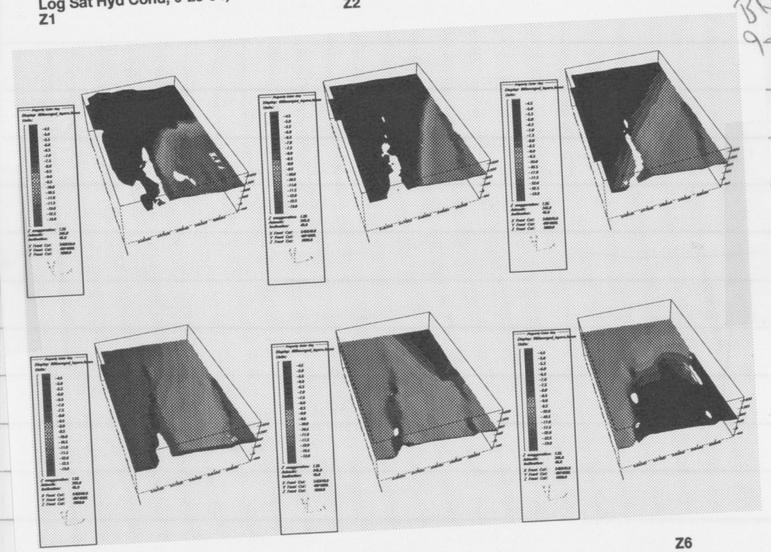
Log Sat Hyd Cond Zoned Model, Isosurfaces -6.5 to -4.5, 9-23-94

BH 9-23-94



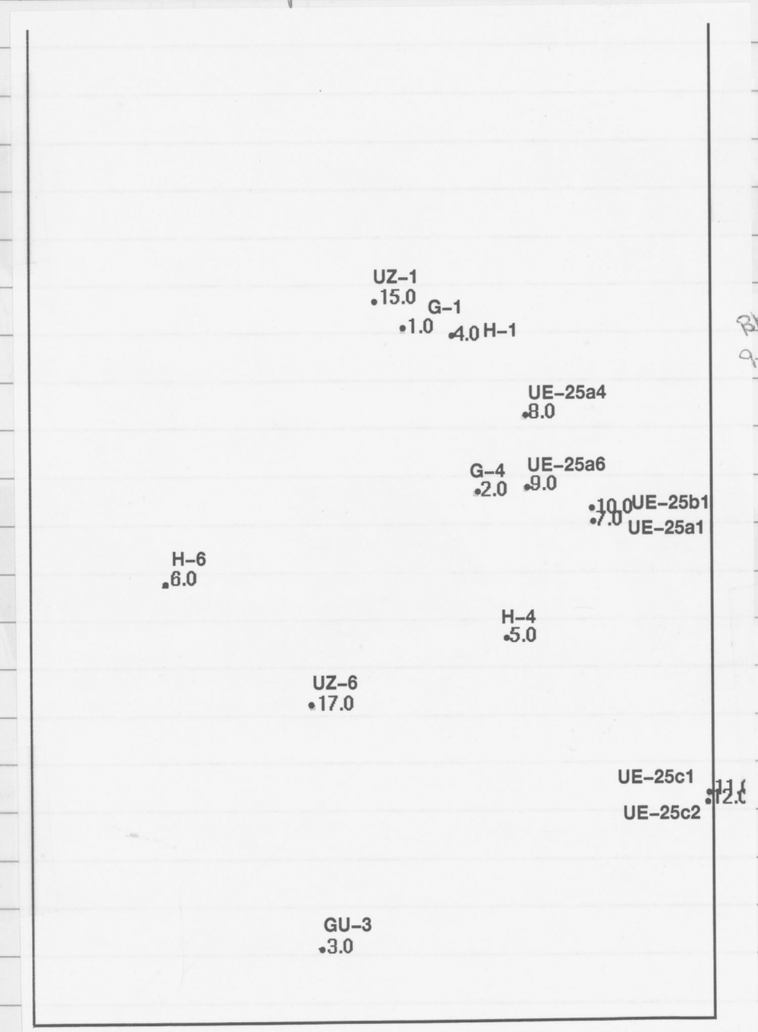
Log Sat Hyd Cond, 9-23-94, Zoned Model

BH 9-23-94



Bruce Hohn 9-23-94

Borehole locations plot:



BH 9-23-94

Bruce Hohn 9-23-94

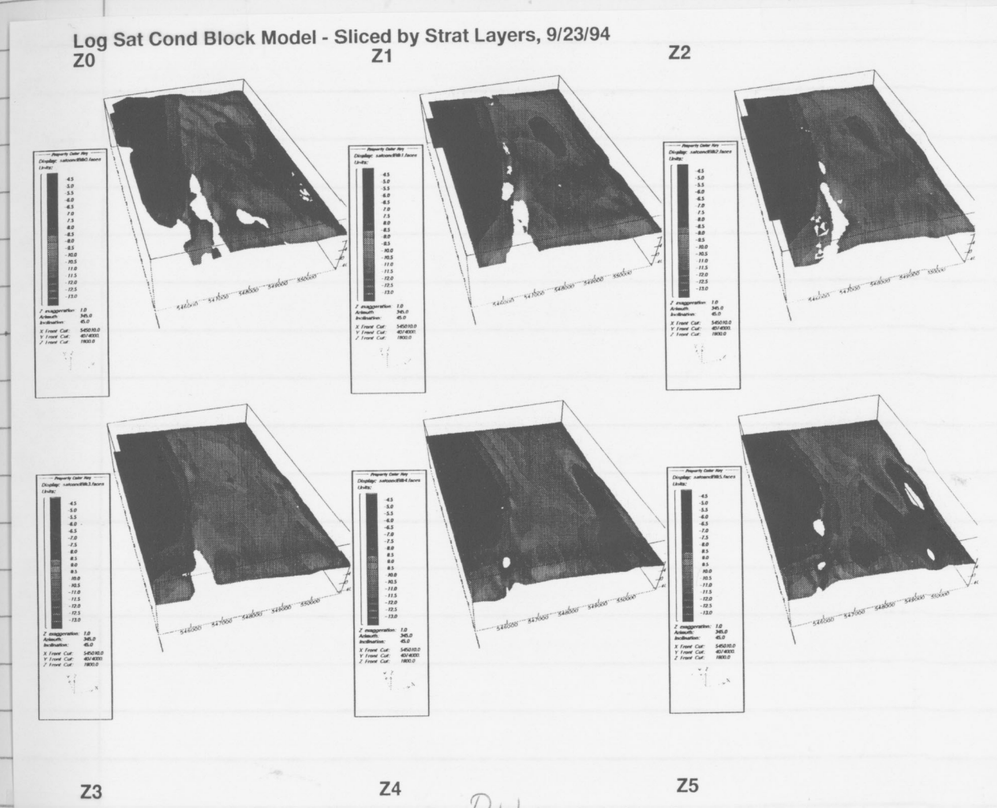
Slice 3Grid Block Model by existing geo horizon layers
script file:

run010LSatCondBlocksSliced Page 1

```
#!/bin/sh -e

echo "\n\nSlice satcond 3grid into layers..."

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

for topLayer in 0 1 2 3 4 5
do
   botLayer=`expr $topLayer + 1`
   echo "\nSlicing 3grid file from $topLayer to $botLayer..."
   FEATURE=EV-GMX/SVP
   ev_faces \
       -O satcondBlk${topLayer}.faces \
       -P $FEATURE \
       -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-5.5
,-5,-4.5' \
       -B 010layer${botLayer}.2grd \
       -T 010layer${topLayer}.2grd \
       -t 6.167437 \
       satcond.3grd

   echo "Created satcondBlk${topLayer}.faces \n\007"
done

echo "Finished \007"
```

BH
9-23-94

Bruce Hohn 9-23-94

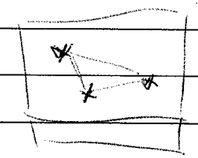


BH
9-23-94

Bruce Hohn
9-23-94

Met with Mark Gaylord, DGI Bethesda

Min Tension Grid based on optimized algorithm



Mark@dgi.com

Mark@wdc-dgi.com

Files delivered to NRC September 30, 1994.

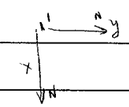
Order of layers:
yuccasub.dat
n3ptn.dat
tptwtsw1.dat
tsw23.dat
chn1n2.dat
ppw.dat
cfun.dat

Bruce Hinchman 9-29-94

Delivered 3D Model to NRC

Matlab XYZ interpolation

```
fid = fopen( ~~fid~~ '9_7min.z', 'r');
elev = fscanf( fid, '%g', [1393,1124]);
fclose(fid);
clear fid;
mesh(elev);                    1393 by 1124

x = (533370: 30 : 567060)';(1124)      1124 by 1
y = (4053150: 30 : 4094910); (1393)    1 by 1393
[x y]
(rows cols)
```




```
mesh( x,y,elev);
view(45,-45);
```

Bruce Hinchman
10-17-94

SUBJECT: Trip Report: Consultation with DGI, September 29, 1994, and Demonstration of 3D Geological Framework Model to NRC, September 30, 1994

Consultation with DGI

On the afternoon of September 29, 1994, I met with Mark Gaylord, Dynamic Graphics Inc. (DGI) at the DGI Bethesda offices. We discussed features of DGI's next release of EarthVision (EV) and alternative methods of creating our 3D geological framework model. Below are notes from our conversation:

1. Next release of EV will be January, 1995. New features include: 3grd property grids can be applied for each fault block in the Geologic Structure Builder (GSB), kriging will be added as another method of generating grids, faces files will be smaller in size and faster to display, grid operation for specifying and area (polygon) with a constant value will be added, and automatic fault block sequence generation will be added. It is possible that we could receive some of these features prior to the general release date by becoming a beta site.

2. Water level can be modeled as a fault surface with the GSB to enable model to be viewed from above and below the surface.

3. Using the GSB-Model Def-Property Def menu, a property distribution can be modeled. This could be used for modeling hydrologic properties. Procedure is to create a 3grd from scattered data; use ev_export to create a pdat file from 3grd, use GSB to model property zone by zone from pdat file.

4. Mark showed me a demonstration of a new capability for EV and ESRI's ARCView to communicate. Mark could click on a data point in the EV 3DViewer window and the data point would highlight in the ARCView window. This is enabled by adding some script files. Capability to go from ARCView to EV is being developed.

5. For modeling fault surfaces, Mark suggests using the 2D trend gridder to generate a correction grid that can be used with the 2D minimum tension gridder. This creates smoother fault grid surfaces and removes the problem we've been having with grid surfaces "bending" back up toward the top surface.

6. Mark suggested a method for rezoning our geologic model based on hydrologic properties. Using the 3DViewer, isosurfaces can be displayed. The data capture file feature can be used to save isosurface polygons. Mark gave me a script file to convert the isosurface file to a wireframe file. The wireframe file can be used as a dat file to clip the zone into two zones. Another option is to use the polygon file to clip the 2grd or faces file.

7. Mark showed me some examples of using EV to model tunnels from Cornelle and Drotze. He thinks they treated the tunnel surfaces as faults.

Bruce Hetrick
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8. Mark was very interested in our application that views hypocenters as 3D spheres and plays back animations of events in chronological order using EV.

3D Geologic Framework Model Demonstration to NRC Staff

On September 30, 1994, Gerry Stirewalt and I demonstrated the 3D Geologic Framework model to about 14 NRC staff. Below are notes from our demonstration and discussions:

1. 3D model is currently installed on NRC SGI Crimson/RE workstation (nmss10.nrc.gov 148.184.223.44) is the /data1/usr/dlc1 subdirectory.

2. At the request of John Trap and Phil Justice, we also installed the horizon scattered data files used to generate the 3D model in a subdirectory, ymtn9409_rawdata, below the subdirectory mentioned above.

3. A problem was noted while viewing the model in the 3DViewer. A rectangular hole appears in the subsurface layers of the model near the northern end of the model. I will consult with DGI to find out the solution to this problem.

4. Gerry requested that I find out if the 3D model layers can be labeled by EV in chronological order.

5. A request was made to find out if exposed stratigraphy can be displayed at the surface.

6. Someone mentioned that the Office of Surface Mining (OSM) is using DGI to model subsurface tunnels.

7. Several attendees asked if our 3D model boundaries could be extended. We responded that the boundaries could be extended and requested for written requests to be sent to us as soon as possible.

8. Someone requested that we continue to add borehole and measured data as they become available. We responded that we agreed.

9. Someone requested the DOE tunnel (ESF) be added to our model.

10. Someone requested that the proposed repository structure be added to our model.

11. Neil Coleman requested that we model water table in our model.

12. Someone requested that we consult with the engineering designers to find out if the model will be useful to them. Gerry responded that consultations with engineering is already begun.

13. Phil Justice requested that quality assurance procedures for 3D model construction be reviewed and asked for a plan ~~for configuration management~~.

Action items

1. Find solution to hole in the model problem noted at NRC demonstration.

2. Find out if EV will permit layers to ordered chronologically.

3. Find out if exposed stratigraphy can be displayed at the surface.

4. Respond to requests for modeling ESF tunnel and proposed repository in 3D model.

5. Respond to request for configuration management plan.

6. Discuss possibility of becoming a EV beta site with Karen Hoffman, DGI.

7. Request additional information regarding tunneling from Karen Hoffman, DGI.

8. Request contact name from Karen Hoffman, DGI, of someone at the Office of Surface Mining, Denver, who is using EV to model tunnels.

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10-17-94

Bruce Hetrick 10-17-94

Matlab Script Files

zToMat.m

```
fid = fopen('9_7min.z', 'r');
elev = fscanf(fid,'%g',[1393,1124]);
fclose(fid);
clear fid;
save 9_7min.mat elev;
```

matToDat.m

```
load 9_7min.mat;

x = (533370:30:567060)';
y = 4053150:30:4094910;

fid=fopen('9_7min.dat','w');

[xs,ys]=size(elev);

for xi=1:xs
   for yi=1:ys
      fprintf(fid,'%10.2f  %10.2f  %10.2f\n', x(xi), y(yi), elev(xi,yi));
   end
end

fclose(fid);
```

interpolate.m

```
load 9_7min

x = (533370:30:567060)';
y = 4053150:30:4094910;

z = interp2(x,y,elev,553368.11,4074007.04)
```

proposedFindElev.m

```
load 9_7min

x = (533370:30:567060)';
y = 4053150:30:4094910;

fid = fopen('proposed.utm','r');
xy = fscanf(fid,'%g %g',[2 inf]);
fclose(fid);

[xs,ys]=size(xy);

fid=fopen('proposed_utm.z','w');

for i=1:ys
   z = interp2(x,y,elev,xy(1,i),xy(2,i));
   fprintf(fid,'%10.2f  %10.2f  %10.2f\n', xy(1,i), xy(2,i), z);
end

fclose(fid);
```

elevationFind.m

```
load 9_7min

x = (533370:30:567060)';
y = 4053150:30:4094910;

fid = fopen('elevation.dat','r');
xy = fscanf(fid,'%g %g',[2 inf]);
fclose(fid);

[xs,ys]=size(xy);

fid=fopen('elevation_utm.z','w');

for i=1:ys
   z = interp2(x,y,elev,xy(1,i),xy(2,i));
   fprintf(fid,'%10.2f  %10.2f  %10.2f\n', xy(1,i), xy(2,i), z);
end

fclose(fid);
```

sandiaFindElev.m

```
load 9_7min

x = (533370:30:567060)';
y = 4053150:30:4094910;

fid = fopen('sandia_elev.utm','r');
xy = fscanf(fid,'%g %g',[2 inf]);
fclose(fid);

[xs,ys]=size(xy);

fid=fopen('sandia_elev_utm.z','w');

for i=1:ys
   z = interp2(x,y,elev,xy(1,i),xy(2,i));
   fprintf(fid,'%10.2f  %10.2f  %10.2f\n', xy(1,i), xy(2,i), z);
end

fclose(fid);
```

Bert Hartman
10-17-94

Matlab Script Files

subsampleMat.m

```
load 9_7min.mat;

whos

[xs,ys] = size(elev);

step=20;

x = [];
for ind=1:xs
   if rem(ind,step)-=0
      [tx,ty]=size(x);
      x(ty+1)=ind;
   end
end

y = [];
for ind=1:ys
   if rem(ind,step)-=0
      [tx,ty]=size(y);
      y(ty+1)=ind;
   end
end

elev(x,:) = [];
elev(:,y) = [];

xt=533370:30*step:567060-(30*step);
yt=4053150:30*step:4094910-(30*step);

whos

save 9_7min_sub20.mat elev;


fid=fopen('9_7min_sub20.dat','w');

[ys,xs]=size(elev);

for xi=1:xs
   for yi=1:ys
      fprintf(fid,'%10.2f  %10.2f  %10.2f\n', xt(xi), yt(yi), elev(yi,xi));
   end
end

fclose(fid);
```

runDatToGrd.sh

Page 1

```
#!/bin/sh -e

FEATURE=EV-GHX/SVP
ev_2grid -o 9_7min_sub20.2grd -F $FEATURE -r 533370.000000,566370.000000,4053150
.000000,4093950.000000 -s 127,157 -d 9_7min_sub20.dat -f 'z' -m 4 -x
```

Bert Hartman
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Project from SP to UTM:

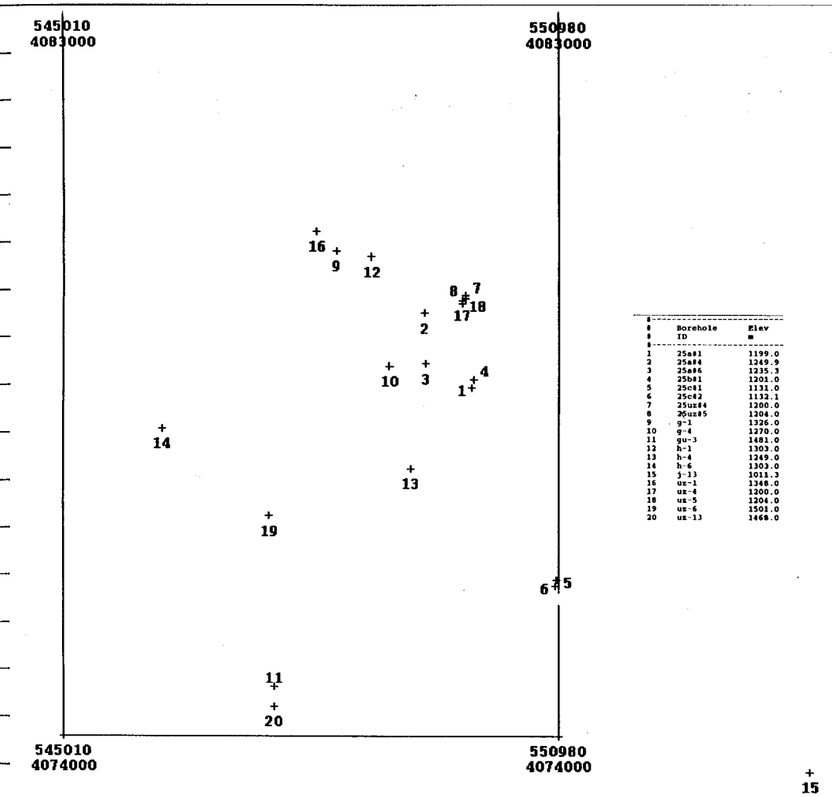
0/17/94
4:22:06

runSPtoUTM

```
#!/bin/sh

if [ $# -lt 1 ]
then
   echo "\n\nError, not enough args, cnt: $#."
   echo "\n\nUsage: runSPtoUTM file.spcs\007\n\n"
   exit
fi

PROJ_LIB=/usr3/brent/geoview/lib_proj/PROJ.4/nad
export PROJ_LIB
PROJ_BIN=/usr3/brent/geoview/lib_proj/PROJ.4/bin
export PROJ_BIN

file=`echo $1 | nawk -F "." '{print $1}'`

$PROJ_BIN/nad2nad -i 27,spcs=2702,feet -o 27,utm=11 $file.dat > $file.utm

$PROJ_BIN/nad2nad -i 27,spcs=2702,feet -o 27,utm=11 $file.dat | $PROJ_BIN/invproj +proj=utm +zone=11 -f '%10.4f' > $file.deg

echo "\n\nFinished, created $file.utm and $file.deg \007\n\n"


# proj +proj=utm +zone=11 -E <<EOF
# -119.00 35.000
# -118.00 35.000
# -117.00 35.000
# -116.00 35.000
# -115.00 35.000
# EOF

#  invproj +proj=utm +zone=11 -E <<EOF
#  567060.50        4053333.38
#  EOF

# Convert from meters to feet:   multiply meters times 3.2808
#  200308.0000  263068.0000 meters
#  657170.4864  863073.4944 feet

# echo "\n\nspsc 2702, feet:"
# Convert from SPCS to UTM to GEO
# nad2nad -i 27,spcs=2702,feet -o 27,utm=11 <<EOF | invproj +proj=utm +zone=11 -f '%10.4f' -E
# 657170.4864  863073.4944
# EOF
```

Brent Hahn
10-17-94

Model Porosity Data



#	Borehole ID	Elev m
1	25a#1	1199.0
2	25a#4	1249.9
3	25a#6	1235.3
4	25b#1	1201.0
5	25c#1	1131.0
6	25c#2	1132.1
7	25ux#4	1200.0
8	25ux#5	1204.0
9	g-1	1326.0
10	g-4	1270.0
11	gu-3	1481.0
12	h-1	1303.0
13	h-4	1249.0
14	h-6	1303.0
15	j-13	1011.3
16	ux-1	1348.0
17	ux-4	1200.0
18	ux-5	1204.0
19	ux-6	1501.0
20	ux-13	1468.0

holes_all.ps Wed Oct 19 18:42:45 CDT 1994

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#	Borehole ID	Elev m	Geographic Lng	Lat	NSCS E-ft	N-ft	Zone	UTM E	N
1	25a#1	1199.0	116 26 24	36 51 05	566350	764900	C	549934.739712	4078317.206618
2	25a#4	1249.9	116 26 46	36 51 36	564472	767972	C	549359.218238	4079251.294362
3	25a#6	1235.3	116 26 46	36 51 14	564501	765899	C	549370.259342	4078619.650992
4	25b#1	1201.0	116 26 23	36 51 08	566417	765244	C	549954.789870	4078422.099863
5	25c#1	1131.0	116 25 43	36 49 47	569680	757095	C	550957.737973	4075942.443783
6	25c#2	1132.1	116 25 44	36 49 44	569634	756849	C	550943.982490	4075867.434920
7	25uz#4	1200.0	117 45 55	35 23 20	566105	768668	C	549856.077758	4079465.112684
8	25uz#5	1204.0	117 46 55	35 23 19	566102	768543	C	549855.296548	4079427.020104
9	g-1	1326.0	116 27 29	36 52 00	561000	770500	C	548298.559560	4080017.921028
10	g-4	1270.0	116 27 04	36 51 14	563082	765807	C	548937.966638	4078590.108397
11	gu-3	1481.0	116 28 01	36 49 05	558483	752780	C	547550.429199	4074615.701189
12	h-1	1303.0	116 27 12	36 51 57	562388	770254	C	548721.765368	4079944.437465
13	h-4	1249.0	116 26 54	36 50 32	563911	761643	C	549195.002290	4077322.156738
14	h-6	1303.0	116 28 55	36 50 49	554075	763299	C	546196.068704	4077816.307873
15	j-13	1011.3	116 23 40	36 48 29	579651	749209	C	554004.436696	4073550.049309
16	uz-1	1348.0	116 27 39	36 52 08	560221	771276	C	548060.361395	4080253.551092
17	uz-4	1200.0	116 26 28	36 51 40	565967	768481	C	549814.225944	4079407.984197
18	uz-5	1204.0	116 26 28	36 51 39	565964	768356	C	549813.444733	4079369.891619
19	uz-6	1501.0	116 28 01	36 50 13	558325	759731	C	547494.897874	4076733.604470
20	uz-13	1468.0	117 46 22	35 22 29	558480	751942	C	547550.405327	4074360.347162

run00Project

```
#!/bin/sh

PROJ_LIB="/usr3/brent/geoview/lib_proj/PROJ.4/nad"
export PROJ_LIB

PROJ_BIN="/usr3/brent/geoview/lib_proj/PROJ.4/bin"
export PROJ_BIN

echo "Extract NSCS locations..."
nawk '{
        ein = $10 + 0.0
        nin = $11 + 0.0
        if ((ein != 0.0) && (nin != 0.0)) {
          print ein, nin
        } else {
          print "        "
        }
      }' 01locations.txt > tmp0.dat

echo "Project from Nv State Coord System to UTM..."
$PROJ_BIN/nad2nad -E -i 27,spcs=2702,feet -o 27,utm=11 tmp0.dat -f '%12.6f'

$PROJ_BIN/nad2nad -i 27,spcs=2702,feet -o 27,utm=11 tmp0.dat | $PROJ_BIN/invproj
 -E +proj=utm +zone=11 -f '%12.6f'

$PROJ_BIN/nad2nad -i 27,spcs=2702,feet -o 27,utm=11 tmp0.dat -f '%12.6f' > tmp1.
dat

nawk '{
        if (doFirst == 0) {
           eskip = $1 + 0.0
           nskip = $2 + 0.0
           doFirst = 1
        }
        ein = $1 + 0.0
        nin = $2 + 0.0
        if ((ein == eskip) && (nin == nskip)) {
           print ""
        } else {
           print $0
        }
      }' tmp1.dat > tmp0.dat

echo "Paste to location file..."
paste -d" " 01locations.txt tmp0.dat > 02projLoc.txt

echo "Extract wells with UTM coords..."
nawk '{
        eutm = $13 + 0.0
        nutm = $14 + 0.0
        z    = $3  + 0.0
        if ((eutm != 0.0) && (nutm != 0.0)) {
           printf "%16.6f %16.6f %16.6f %s\n", eutm, nutm, z, $2
        }
      }' 02projLoc.txt > tmp0.dat

cat 03top.dat tmp0.dat > 04loc.dat

rm tmp?.dat

echo "Finished, created: 02projLoc.txt \007"
echo "                   04loc.dat"
```

Brent Hahn 10-19-94


```
 582 data records in borehole_satcond.pdat

 239 data records in borehole_water.pdat

 509 data records in borehole_porosity.pdat

1330 data records in boreholes.pdat

  41 data records in 030layer1_LogSHCond.pdat

  27 data records in 030layer2_LogSHCond.pdat

  26 data records in 030layer3_LogSHCond.pdat

  53 data records in 030layer4_LogSHCond.pdat

  27 data records in 030layer5_LogSHCond.pdat


  30 data records in 030layer1_Porosity.pdat

  41 data records in 030layer2_Porosity.pdat

  54 data records in 030layer3_Porosity.pdat

  51 data records in 030layer4_Porosity.pdat

  24 data records in 030layer5_Porosity.pdat


  41 data records in 030layer1_LogSHCond.pdat, -13.013200 to -5.638300.

  27 data records in 030layer2_LogSHCond.pdat, -10.769600 to -5.795900.

  26 data records in 030layer3_LogSHCond.pdat, -11.017700 to -7.200700.

  53 data records in 030layer4_LogSHCond.pdat, -13.013200 to -8.113500.

  27 data records in 030layer5_LogSHCond.pdat, -10.017700 to -4.958600.


  30 data records in 030layer1_Porosity.pdat, 0.133000 to 0.482000.

  41 data records in 030layer2_Porosity.pdat, 0.075000 to 0.280000.

  54 data records in 030layer3_Porosity.pdat, 0.062800 to 0.303000.

  51 data records in 030layer4_Porosity.pdat, 0.022000 to 0.470000.

  24 data records in 030layer5_Porosity.pdat, 0.133000 to 0.364000.
```

Brent Hahn 10-19-94

run000makeAll Page 1

```
echo "\n\nrun000makeAll\n\n"
run100satcond
run200water
run300porosity

run500cntUniqIds  borehole_satcond.pdat
run500cntUniqIds  borehole_water.pdat
run500cntUniqIds  borehole_porosity.pdat

cat 01top.dat \
    borehole_satcond.pdat \
    > borehole_satcond_top.pdat

cat 01top.dat \
    borehole_water.pdat \
    > borehole_water_top.pdat

cat 01top.dat \
    borehole_porosity.pdat \
    > borehole_porosity_top.pdat

cat 01top.dat \
    borehole_satcond.pdat \
    borehole_water.pdat \
    borehole_porosity.pdat \
    > boreholes.pdat

cp borehole*.pdat ../50evFaces

echo "\nFinished, created boreholes.pdat \007\n"
```

Bruce Hohn
10-19-94

run100satcond Page 1

```
#!/bin/sh

echo "\n\nBegin $0\n"

echo "# BEGIN BOREHOLE SATCOND DATA" > borehole_satcond.pdat

for inHoleId in 25a#1_1 \
                25a#1_2 \
                25a#4 \
                25a#6 \
                25b#1 \
                25c#1 \
                25c#2 \
                25uz#4 \
                25uz#5 \
                g-1 \
                g-4 \
                gu-3 \
                h-1 \
                h-4 \
                h-6
do

   holeId=`echo $inHoleId | nawk -F"_" '{print $1}'`

   idNum=`nawk '{ if ($3 == hId) print $2}' hId=$holeId ./01top.dat`
   x=`nawk '{ if ($4 == hId) print $1}' hId=$holeId ../20locations/04loc.dat`
   y=`nawk '{ if ($4 == hId) print $2}' hId=$holeId ../20locations/04loc.dat`
   z0=`nawk '{ if ($4 == hId) print $3}' hId=$holeId ../20locations/04loc.dat`


   echo "Processing $holeId $inHoleId $x $y $z0..."

   nawk 'BEGIN {
            idx = 0
            while (getline <"01top.dat") {
               unitNo[idx]=$2 + 0
               unitKey[idx] = $3
               idx++
            }
            idxLast = idx
            close("01top.dat")
         }
         {
            if ((NF > 1) &&
                (substr($1,1,1) != "#")) {

               if ($4 != "NAN") {
                  depth=$4+0.0
               } else {
                  depth=$2+0.0
               }
               depth=ztop-depth

               shc=$5+0.0
               intype=$6
               if (intype == "average") {
                  shcType = 1
               } else {
                  if (intype == "vertical") {
                     shcType = 2
                  } else {
                     if (intype == "horizontal") {
                        shcType = 3
                     } else {
                        shcType = 4
```

run100satcond Page 2

```
                     }
                  }
               }

               unitStr = $9
               for (idx = 0; idx < idxLast; idx++) {
                  if (unitStr == unitKey[idx]) break;
               }
               if (idx == idxLast)
                  unitId = 0
               else
                  unitId = unitNo[idx]

               residSat   = 0.0
               alpha      = 0.0
               beta       = 0.0
               percentSat = 0.0
               porosity   = 0.0
               kSat       = 0.0

               printf "%16.6f %16.6f %16.6f %3d ",
                  xh, yh, depth, hId
               printf "%10.3e %d %10.4f %2d ",
                  shc, shcType, log(shc)/2.30258509, unitId

#              printf "%10.4f %10.4f %10.4f ",
#                 residSat, alpha, beta
#              printf "%10.4f %10.4f %10.4f\n",
#                 percentSat, porosity, kSat
               printf "\n"
            }
         }' xh=$x yh=$y ztop=$z0 hId=$idNum ../10_941017_rawData/satcond/$inHole
Id.txt >> borehole_satcond.pdat

done

echo "\nFinished, created borehole_satcond.pdat \007\n\n"
```

Bruce Hohn 10-19-94

run200water Page 1

```
#!/bin/sh

echo "\n\nBegin $0\n"

echo "# BEGIN BOREHOLE WATER CONTENT DATA" > borehole_water.pdat

for inHoleId in 25a#1 \
                25b#1 \
                g-4 \
                gu-3 \
                h-1 \
                uz-1 \
                uz-13 \
                uz-4 \
                uz-5 \
                uz-6
do

   holeId=`echo $inHoleId | nawk -F"_" '{print $1}'`

   idNum=`nawk '{ if ($3 == hId) print $2}' hId=$holeId ../01top.dat`
   x=`nawk '{ if ($4 == hId) print $1}' hId=$holeId ../20locations/04loc.dat`
   y=`nawk '{ if ($4 == hId) print $2}' hId=$holeId ../20locations/04loc.dat`
   z0=`nawk '{ if ($4 == hId) print $3}' hId=$holeId ../20locations/04loc.dat`


   echo "Processing $holeId $inHoleId $x $y $z0..."

   nawk 'BEGIN {
            idx = 0
            while (getline <"01top.dat") {
               unitNo[idx]=$2 + 0
               unitKey[idx] = $3
               idx++
            }
            idxLast = idx
            close("01top.dat")
         }
         {
            if ((NF > 1) &&
                (substr($1,1,1) != "#") &&
                ($6 != "NAN")) {

               if ($4 != "NAN") {
                  depth=$4+0.0
               } else {
                  depth=$2+0.0
               }
               depth=ztop-depth

               shc=0.0
               logShc=0.0
               shcType=0

               unitStr = $8
               for (idx = 0; idx < idxLast; idx++) {
                  if (unitStr == unitKey[idx]) break;
               }
               if (idx == idxLast)
                  unitId = 0
               else
                  unitId = unitNo[idx]

               residSat   = 0.0
               alpha      = 0.0
               beta       = 0.0
```

run200water Page 2

```
               percentSat = $6 + 0.0
               porosity   = 0.0
               kSat       = 0.0

               printf "%16.6f %16.6f %16.6f %3d ",
                  xh, yh, depth, hId

               printf "                                    "
               printf "%10.3e %d %10.4f ",
                  shc, shcType, log(shc)/2.30258509

               printf "%2d ",
                  unitId

               printf "                                    "
               printf "%10.4f %10.4f %10.4f ",
                  residSat, alpha, beta

               printf "%10.4f ",
                  percentSat

               printf "%10.4f %10.4f",
                  porosity, kSat

               printf "\n"
            }
         }' xh=$x yh=$y ztop=$z0 hId=$idNum ../10_941017_rawData/water/$inHoleId
.txt >> borehole_water.pdat

done

echo "\nFinished, created borehole_water.pdat \007\n\n"
```

Bruce Hebner 10-19-94

run300porosity Page 1

```
#!/bin/sh

echo "\n\nBegin $0\n"

echo "# BEGIN BOREHOLE POROSITY DATA" > borehole_porosity.pdat

for inHoleId in 25a#1 \
                25a#4 \
                25a#6 \
                25b#1 \
                25c#1 \
                25c#2 \
                25uz#4 \
                25uz#5 \
                g-1 \
                g-4_v \
                g-4_h \
                gu-3_v \
                gu-3_h \
                h-1 \
                j-13
do

   holeId=`echo $inHoleId | nawk -F"_" '{print $1}'`

   idNum=`nawk '{ if ($3 == hId) print $2}' hId=$holeId ../01top.dat`
   x=`nawk '{ if ($4 == hId) print $1}' hId=$holeId ../20locations/04loc.dat`
   y=`nawk '{ if ($4 == hId) print $2}' hId=$holeId ../20locations/04loc.dat`
   z0=`nawk '{ if ($4 == hId) print $3}' hId=$holeId ../20locations/04loc.dat`

   echo "Processing $holeId $inHoleId $x $y $z0..."

   nawk 'BEGIN {
            idx = 0
            while (getline <"01top.dat") {
               unitNo[idx]=$2 + 0
               unitKey[idx] = $3
               idx++
            }
            idxLast = idx
            close("01top.dat")
         }
         {
            if ((NF > 1) &&
                (substr($1,1,1) != "#")) {

               if ($4 != "NAN") {
                  depth=$4+0.0
               } else {
                  depth=$2+0.0
               }
               depth=ztop-depth

               shc=0.0
               shcType=0

               unitStr = $8
               for (idx = 0; idx < idxLast; idx++) {
                  if (unitStr == unitKey[idx]) break;
               }
               if (idx == idxLast)
                  unitId = 0
               else
                  unitId = unitNo[idx]
```

run300porosity Page 2

```
               residSat   = 0.0
               alpha      = 0.0
               beta       = 0.0
               percentSat = 0.0
               porosity   = $5 + 0.0
               kSat       = 0.0

               printf "%16.6f %16.6f %16.6f %3d ",
                  xh, yh, depth, hId

               printf "                                    "
               printf "%10.3e %d %10.4f ",
                  shc, shcType, log(shc)/2.30258509

               printf "%2d ",
                  unitId

               printf "                                    "
               printf "%10.4f %10.4f %10.4f ",
                  residSat, alpha, beta

               printf "                                    "
               printf "%10.4f ",
                  percentSat

               printf "%10.4f ",
                  porosity

               printf "%10.4f",
                  kSat

               printf "\n"
            }
         }' xh=$x yh=$y ztop=$z0 hId=$idNum ../10_941017_rawData/porosity/$inHol
eId.txt >> borehole_porosity.pdat

done

echo "\nFinished, created borehole_porosity.pdat \007\n\n"
```

Bruce Hebner 10-19-94

run500cntUniqIds


```
#!/bin/sh

# Usage: run500cntIds filename

if [ $# -lt 1 ]
then
   echo "\n\nUsage: run500cntIds filename\n\n"
   exit
fi

echo "\nFile: $1"

nawk 'BEGIN {
         idcnt=0
         idx = 0
         while (getline <"01top.dat") {
               unitNo[idx]=$2 + 0
               unitKey[idx] = $3
               idx++
         }
         idxLast = idx
         close("01top.dat")
      }
      {
         id = $4 + 0
         cnt[id]++
         if (id > idcnt) idcnt = id
      }
      END {
         for (ind=1; ind<=idcnt; ind++) {
            if (cnt[ind] > 0) {
               for (uid=0; uid<idxLast; uid++) {
                  if (unitNo[uid] == ind) break;
               }
               printf "ID: %2d  CNT: %5d  %s\n", ind, cnt[ind], unitKey[uid]
               cntIds++
               total += cnt[ind]
            }
         }
         print "Unique IDs:", cntIds, "  Total cnts:", total
      }' $1

echo ""
```

runtops

```
#!/bin/sh

date > tmp.date
cat tmp.date

mytops vb1.rgb -rgb > vb1.ps
mytops vb2.rgb -rgb > vb2.ps
mytops vb3.rgb -rgb > vb3.ps
mytops vb4.rgb -rgb > vb4.ps
mytops vb5.rgb -rgb > vb5.ps
mytops vb6.rgb -rgb > vb6.ps

for infile in vb?.ps
do
   mv $infile tmp.ps
   nawk '{
            if ($1 == "/scmul") {
               print "/scmul [1.00 mul] def"
            } else if ($1 == showpage) {
               print " "
               print "/Helvetica-Bold findfont"
               print " 16.0 scalefont"
               print " setfont"
               print "50.0 50.0 moveto"
               print "90.0 rotate"
               print "("fn") show"
               print "(  ) show"
               getline x <"tmp.date"
               print "("x") show"
               print $0
            } else {
               print $0
            }
         }' fn="$infile tmp.ps > $infile
   lpr -Pphaser -s $infile
done

rm tmp.date
rm tmp.ps

echo "Finished \007"
```

Bill Dhan 10-21-94

run120PorosityZoned

```
#!/bin/sh -e

echo "\n\nCreating porosity zoned model...\n"

data=Porosity

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

if (test $1 -eq "all")
then
   for horizon in layer0
   do
      echo Gridding 2grd topo horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010$horizon.2grd \
         -d /usr3/brent/723ipa/3DModel/94jun/10_topo/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'z' \
         -m 4 \
         -x
   done

   layer=1
   for horizon in n3ptn tptwtsw1 tsw23 chnln2 ppw cfun
   do
      echo Gridding 2grd horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010layer$layer.2grd \
         -d /usr3/brent/723ipa/3DModel/94jun/20_subsurface/data/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'z' \
         -m 4 \
         -x
      layer=`expr $layer + 1`
   done
fi

if (test $1 -eq "all")
then
   layer=0
   for horizon in layer0 layer1 layer2 layer3 layer4 layer5
   do
      bottomlayer=`expr $layer + 1`

      echo Creating pdat for $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -B 010layer$bottomlayer.2grd \
         -d boreholes.pdat \
         -f $data \
         -F $FEATURE \
         -o 020layer${layer}_${data}.3grd \
         -r $rangez \
         -s 20,15,25 \
         -S 030layer${layer}_${data}.pdat \
         -T 010layer$layer.2grd

      echo "Find min/max of property..."
      prng=`nawk 'BEGIN {minV = 999999
```

run120PorosityZoned


```
                  maxV = -999999}
            {
               if ((length($0) > 73) &&
                   (substr($0,1,1) != "#")  &&
                   (substr($0,60,15) != "          ")) {
                  data = substr($0,60,15) + 0.0
                  if (data < minV) minV = data
                  if (data > maxV) maxV = data
               }
            }
            END {print minV","maxV} ' 030layer${layer}_${data}.pdat `

      echo "Property range (min,max): " $prng

      echo Gridding 3grd $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -B 010layer$bottomlayer.2grd \
         -d boreholes.pdat \
         -f $data \
         -F $FEATURE \
         -o 020layer${layer}_${data}.3grd \
         -P $prng \
         -r $rangez \
         -s 20,15,25 \
         -S 030layer${layer}_${data}.pdat \
         -T 010layer$layer.2grd

      echo Making faces $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_faces \
         -o 040layer${layer}_${data}.faces \
         -F $FEATURE \
         -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-
5.5,-5,-4.5' \
         -t 4.915124 \
         -T 010layer$layer.2grd \
         -b 6.597435 \
         -B 010layer$bottomlayer.2grd \
         020layer${layer}_${data}.3grd

      layer=`expr $layer + 1`
   done
fi
```

```
FEATURE=EV-GMX/SVP
ev_merge -o 060merged_layers_porosity.faces -F $FEATURE << EOF
040layer0_Porosity.faces        1       1
040layer1_Porosity.faces        2       2
040layer2_Porosity.faces        3       3
040layer3_Porosity.faces        4       4
040layer4_Porosity.faces        5       5
040layer5_Porosity.faces        6       6
EOF

echo "Finished, created 060merged_layers.faces  \007"
```

Bill Dhan 10-21-94

run110PorosityBlockSliced

Page 1

```
#!/bin/sh -e

echo "\n\nSlice porosity 3grid into layers..."

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

for topLayer in 0 1 2 3 4 5
do
   botLayer=`expr $topLayer + 1`
   echo "\nSlicing 3grid file from $topLayer to $botLayer..."
   FEATURE=EV-GMX/SVP
   ev_faces \
      -o porosityBlk${topLayer}.faces \
      -F $FEATURE \
      -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-5.5
,-5,-4.5' \
      -B 010layer${botLayer}.2grd \
      -T 010layer${topLayer}.2grd \
      -t 6.167437 \
      porosity.3grd

   echo "Created porosityBlk${topLayer}.faces \n\007"
done

echo "Finished \007"
```

run100PorosityBlock

```
#!/bin/sh -e

echo "\n\nCreating 3grid from pdat..."

echo "Find min/max of property..."
prng=`nawk 'BEGIN {minV = 999999
                   maxV = -999999}
        {
           if ((length($0) > 135) &&
               (substr($0,1,1) != "#")  &&
               (substr($0,126,11) != "          ")) {
              data = substr($0,126,11) + 0.0
              if (data < minV) minV = data
              if (data > maxV) maxV = data
           }
        }
        END {print minV","maxV} ' boreholes.pdat `

echo "Property range (min,max): " $prng

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

FEATURE=EV-GMX/SVP
ev_3grid \
   -d boreholes.pdat \
   -f 'Porosity' \
   -P $FEATURE \
   -P $prng \
   -o porosity.3grd \
   -r $rangez \
   -s 21,12,24 \

echo "Created porosity.3grd\n\n"

echo "Creating faces file..."
FEATURE=EV-GMX/SVP
ev_faces \
   -o porosity.faces \
   -P $FEATURE \
   -i '0.0,0.1,0.2,0.3,0.4,0.5,0.6' \
   -T 010layer0.2grd \
   -t 6.167437 \
   porosity.3grd


echo "Finished, created porosity.faces \n\007"
```

run040LSatCondGetDat

```
ev_export 020layer0_LogSHCond.3grd > 070layer0_LogSHCond.txt
ev_export 020layer1_LogSHCond.3grd > 070layer1_LogSHCond.txt
ev_export 020layer2_LogSHCond.3grd > 070layer2_LogSHCond.txt
ev_export 020layer3_LogSHCond.3grd > 070layer3_LogSHCond.txt
ev_export 020layer4_LogSHCond.3grd > 070layer4_LogSHCond.txt
ev_export 020layer5_LogSHCond.3grd > 070layer5_LogSHCond.txt

lpQmsTxtLand 070layer0_LogSHCond.txt
lpQmsTxtLand 070layer1_LogSHCond.txt
lpQmsTxtLand 070layer2_LogSHCond.txt
lpQmsTxtLand 070layer3_LogSHCond.txt
lpQmsTxtLand 070layer4_LogSHCond.txt
lpQmsTxtLand 070layer5_LogSHCond.txt

lpQmsTxtLand 030layer0_LogSHCond.pdat
lpQmsTxtLand 030layer1_LogSHCond.pdat
lpQmsTxtLand 030layer2_LogSHCond.pdat
lpQmsTxtLand 030layer3_LogSHCond.pdat
lpQmsTxtLand 030layer4_LogSHCond.pdat
lpQmsTxtLand 030layer5_LogSHCond.pdat

lpQmsTxtLand boreholes.pdat
```

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run020LSatCondZoned

Page

```
#!/bin/sh -e

echo "\n\nCreating log sat cond zoned model...\n"

data=LogSHCond

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

if (test $1 -eq "all")
then
   for horizon in layer0
   do
      echo Gridding 2grd topo horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010$horizon.2grd \
         -d /usr3/brent/723ipa/3DModel/94jun/10_topo/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'z' \
         -m 4 \
         -x
   done

   layer=1
   for horizon in n3ptn tptwtsw1 taw23 chnln2 ppw cfun
   do
      echo Gridding 2grd horizon $horizon...
      FEATURE=EV-GMX/SVP
      ev_2grid \
         -o 010layer$layer.2grd \
         -d /usr3/brent/723ipa/3DModel/94jun/20_subsurface/data/$horizon.dat \
         -F $FEATURE \
         -r $range \
         -s 20,15 \
         -f 'z' \
         -m 4 \
         -x
      layer=`expr $layer + 1`
   done
fi

if (test $1 -eq "all")
then
   layer=0
   for horizon in layer0 layer1 layer2 layer3 layer4 layer5
   do
      bottomlayer=`expr $layer + 1`

      echo Creating pdat for $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -B 010layer$bottomlayer.2grd \
         -d boreholes.pdat \
         -f $data \
         -F $FEATURE \
         -o 020layer${layer}_${data}.3grd \
         -r $rangez \
         -s 20,15,25 \
         -S 030layer${layer}_${data}.pdat \
         -T 010layer$layer.2grd

      echo "Find min/max of property..."
      prng=`nawk 'BEGIN {minV = 999999
```

run020LSatCondZoned

```
                   maxV = -999999}
         {
            if ((length($0) > 73) &&
                (substr($0,1,1) != "#")  &&
                (substr($0,60,15) != "          ")) {
               data = substr($0,60,15) + 0.0
               if (data < minV) minV = data
               if (data > maxV) maxV = data
            }
         }
         END {print minV","maxV} ' 030layer${layer}_${data}.pdat `

      echo "Property range (min,max): " $prng

      echo Gridding 3grd $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_3grid \
         -B 010layer$bottomlayer.2grd \
         -d boreholes.pdat \
         -f $data \
         -F $FEATURE \
         -o 020layer${layer}_${data}.3grd \
         -P $prng \
         -r $rangez \
         -s 20,15,25 \
         -S 030layer${layer}_${data}.pdat \
         -T 010layer$layer.2grd

      echo Making faces $data within $layer and $bottomlayer...
      FEATURE=EV-GMX/SVP
      ev_faces \
         -o 040layer${layer}_${data}.faces \
         -F $FEATURE \
         -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-
5.5,-5,-4.5' \
         -t 4.915124 \
         -T 010layer$layer.2grd \
         -b 6.597435 \
         -B 010layer$bottomlayer.2grd \
         020layer${layer}_${data}.3grd

      layer=`expr $layer + 1`
   done
fi
```

```
FEATURE=EV-GMX/SVP
ev_merge -o 060merged_layers_LogSHCond.faces -F $FEATURE << EOF
040layer0_LogSHCond.faces      1      1
040layer1_LogSHCond.faces      2      2
040layer2_LogSHCond.faces      3      3
040layer3_LogSHCond.faces      4      4
040layer4_LogSHCond.faces      5      5
040layer5_LogSHCond.faces      6      6
EOF

echo "Finished, created 060merged_layers.faces  \007"
```

10-21-94

run010LSatCondBlockSliced

Page 1

```
#!/bin/sh -e

echo "\n\nSlice satcond 3grid into layers..."

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

for topLayer in 0 1 2 3 4 5
do
   botLayer=`expr $topLayer + 1`
   echo "\nSlicing 3grid file from $topLayer to $botLayer..."
   FEATURE=EV-GMX/SVP
   ev_faces \
      -o satcondBlk${topLayer}.faces \
      -F $FEATURE \
      -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-5.5
,-5,-4.5' \
      -B 010layer${botLayer}.2grd \
      -T 010layer${topLayer}.2grd \
      -t 6.167437 \
      satcond.3grd

   echo "Created satcondBlk${topLayer}.faces \n\007"
done

echo "Finished \007"
```

run000LSatCondBlock

Page 1

```
#!/bin/sh -e

echo "\n\nCreating 3grid from pdat..."

echo "Find min/max of property..."
prng=`nawk 'BEGIN {minV = 999999
                   maxV = -999999}

      {
         if ((length($0) > 64) &&
             (substr($0,1,1) != "#")  &&
             (substr($0,68,11) != "          ")) {
            data = substr($0,68,11) + 0.0
            if (data < minV) minV = data
            if (data > maxV) maxV = data
         }
      }
      END {print minV","maxV} ' boreholes.pdat `

echo "Property range (min,max): " $prng

range=545010.000000,550980.000000,4074000.000000,4083000.000000
rangez=$range,-500.0,1800.0

FEATURE=EV-GMX/SVP
ev_3grid \
   -d boreholes.pdat \
   -f 'LogSHCond' \
   -F $FEATURE \
   -P $prng \
   -o satcond.3grd \
   -r $rangez \
   -s 21,12,24 \

echo "Created satcond.3grd\n\n"

echo "Creating faces file..."
FEATURE=EV-GMX/SVP
ev_faces \
   -o satcond.faces \
   -F $FEATURE \
   -i '-13,-12.5,-12,-11.5,-11,-10.5,-10,-9.5,-9,-8.5,-8,-7.5,-7,-6.5,-6,-5.5,-5
,-4.5' \
   -T 010layer0.2grd \
   -t 6.167437 \
   satcond.3grd

echo "Finished, created satcond.faces \n\007"
```

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Borehole ID	General	Porosity	SatCond	%Sat
25a#1.txt	X	X	X	X
25a#4.txt	X	X	X	
25a#6.txt	X	X	X	
25b#1.txt	X	X	X	X
25c#1.txt	X	X	X	
25c#2.txt	X	X	X	
25uz#4.txt	X	X	X	
25uz#5.txt	X	X	X	
g-1.txt	X	X	X	
g-4.txt	X	X	X	X
gu-3.txt	X	X	X	X
h-1.txt	X	X	X	X
h-4.txt	X		X	
h-6.txt	X		X	
j-13.txt	X	X		
uz-13.txt	X			
uz-1.txt	X			
uz-4.txt	X			
uz-5.txt	X			
uz-6.txt	X			
	20	13	14	5

NOTE: gu-4 and g-4 are the same hole.

```
File: borehole_satcond.pdat
ID:  1  CNT:    41  25a#1
ID:  2  CNT:     3  25a#4
ID:  3  CNT:     2  25a#6
ID:  4  CNT:    48  25b#1
ID:  5  CNT:     3  25c#1
ID:  6  CNT:     3  25c#2
ID:  7  CNT:    12  25uz#4
ID:  8  CNT:    10  25uz#5
ID:  9  CNT:    16  g-1
ID: 10  CNT:   106  g-4
ID: 11  CNT:   247  gu-3
ID: 12  CNT:    63  h-1
ID: 13  CNT:    19  h-4
ID: 14  CNT:     9  h-6
Unique IDs: 14   Total cnts: 582


File: borehole_water.pdat
ID:  1  CNT:    56  25a#1
ID:  4  CNT:    13  25b#1
ID: 10  CNT:    40  g-4
ID: 11  CNT:    86  gu-3
ID: 12  CNT:    44  h-1
Unique IDs: 5   Total cnts: 239


File: borehole_porosity.pdat
ID:  1  CNT:    58  25a#1
ID:  2  CNT:    14  25a#4
ID:  3  CNT:     6  25a#6
ID:  4  CNT:    26  25b#1
ID:  5  CNT:     4  25c#1
ID:  6  CNT:     6  25c#2
ID:  7  CNT:    12  25uz#4
ID:  8  CNT:    13  25uz#5
ID:  9  CNT:    32  g-1
ID: 10  CNT:    68  g-4
ID: 11  CNT:   158  gu-3
ID: 12  CNT:    82  h-1
ID: 15  CNT:    30  j-13
Unique IDs: 13   Total cnts: 509
```

Brit Hahn 10-21-94

Learning about EarthVision modeling

Current approach:

1. Take 3 cross sections (from 8 boreholes)
2. Hand contour tops of geo surfaces (also map faults)
3. Create 3D model

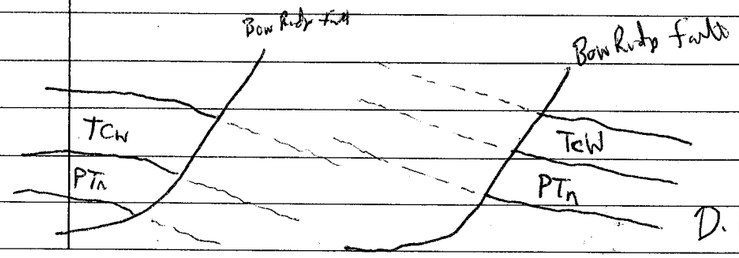
Recommended approach:

1. Use known data:
   1. Fault map of surface (Scott + Bonk 84)
   2. Cross section maps of faults @ depth (GeoSoft)
      (extrapolate above + below model)

1.1 Model fault surfaces

2. Use known data:
   1. Cross sections of subsurface geology.
   2. Boreholes of subsurface units

3. Model blocks of geo units
   Extrapolate beyond fault intersections



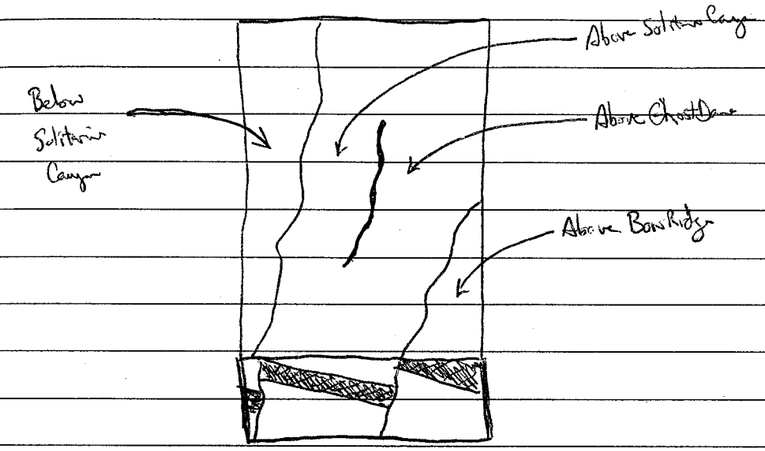
D. Brent Hutchinson 10-26-94

Demonstration:

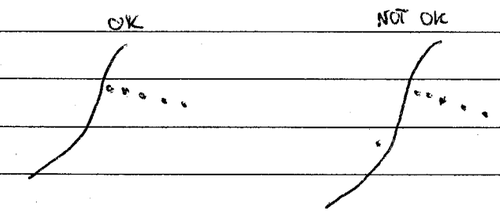
Edit current model

1. Fault surfaces extrapolated

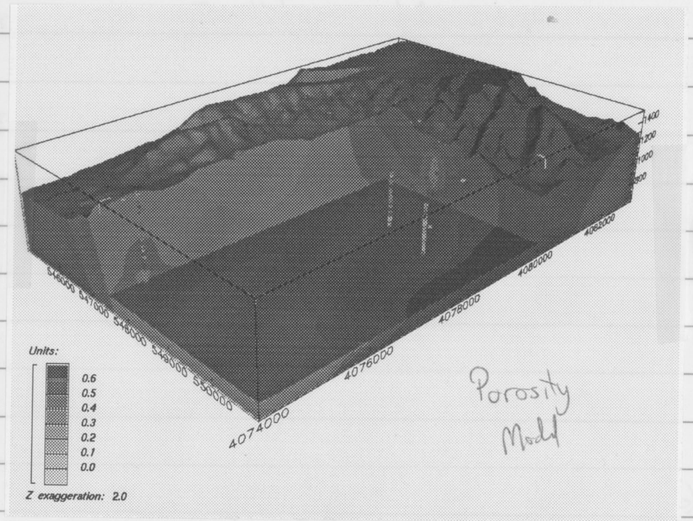
2. Geologic horizons for each fault block,

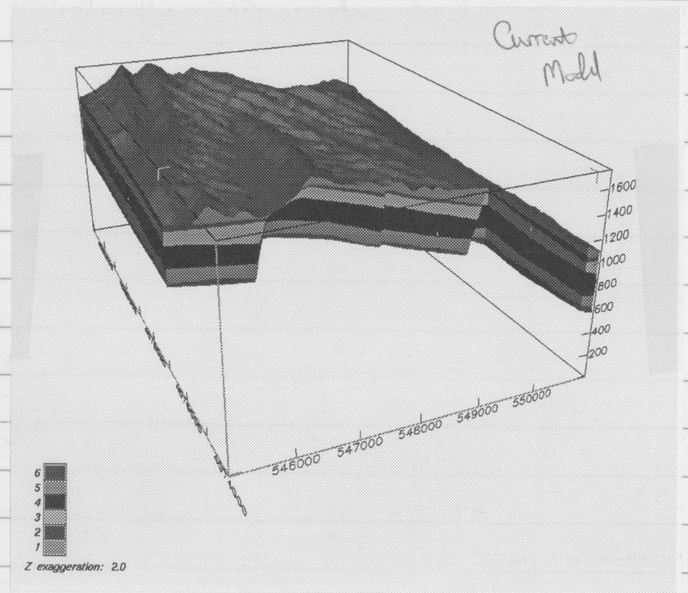


make sure scattered data is on correct side of faults:

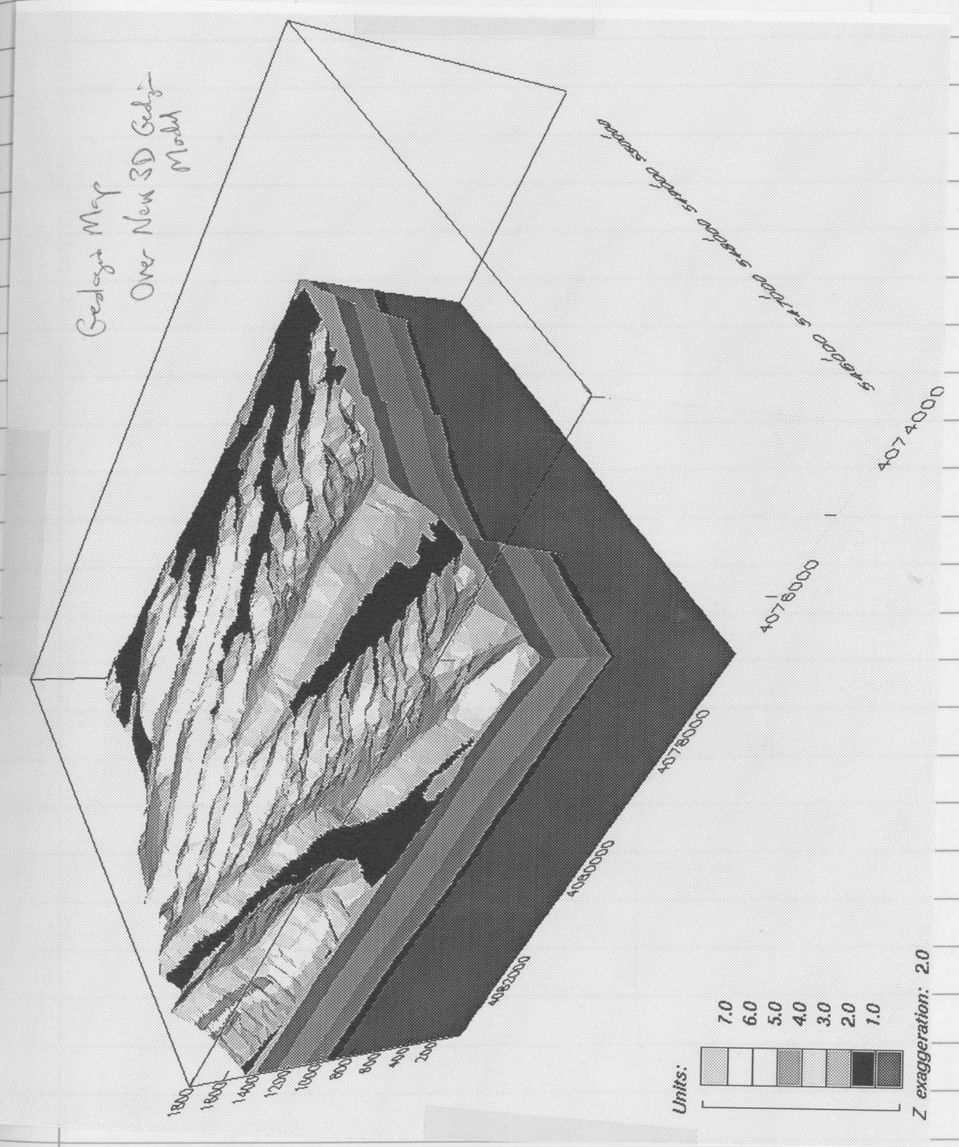


Brent Hutchinson 10-26-94





Brett Hilton 11-3-94



Brett Hilton 11-3-94

November 2, 1994

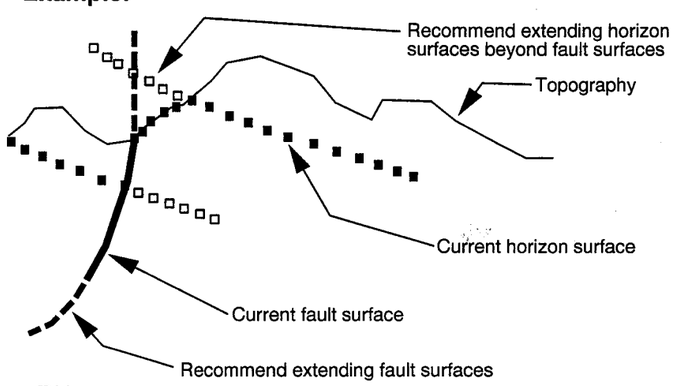
TO: Gerry Stirewalt

FROM: Brent Henderson

Gerry:

New 3D model is looking better, however, it's going to need considerable work on revising fault and geologic horizon surfaces.

One problem I've found is the horizon surfaces follow the topography where they intersect. This causes the horizons to follow the slope of the faults rather than be cut by the faults. Example:



–BH

Brent Henderson
11-3-94

To create image draped faces files:

```
3DModel_new/10_topo:

::::::::::::::
run100_datToGrd.sh
::::::::::::::
#!/bin/sh -e

echo "\nCreating 2grd...\n"

FEATURE=EV-GMX/SVP
ev_2grid \
   -o topo020.2grd \
   -F $FEATURE \
   -r 545009.000000,550981.000000,4073999.000000,4083001.000000 \
   -s 100,150 \
   -d topo010.dat \
   -f 'Z' \
   -m 4

echo "\nFinished, created topo020.2grd \n\007"
::::::::::::::
run200_GrdToImgFaces_Med_aerialPhoto.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_image \
   -o topo030M_aerial.faces \
   -F $FEATURE \
   -s 40,60,11  \
   -r '545010,550980,4074000,4083000,0,1800' \
   -a 25000.000000 \
   -g 6.453236 \
   -G topo020.2grd \
   photo1.imreg


::::::::::::::
run300_GrdToImgFaces_Med_tm.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_image \
   -o topo030M_tm.faces \
   -F $FEATURE \
   -s 40,60,11  \
   -r '545010,550980,4074000,4083000,0,1800' \
   -a 25000.000000 \
   -g 6.453236 \
   -G topo020.2grd \
   tm4.imreg


::::::::::::::
run400_GrdToImgFaces_geo_dig.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_image \
   -o topo030M_geo_dig.faces \
   -F $FEATURE \
   -s 40,60,11  \
   -r '545010,550980,4074000,4083000,0,1800' \
   -a 25000.000000 \
   -g 6.453236 \
   -G topo020.2grd \
   geology_dig.imreg


::::::::::::::
run500_GrdToImgFaces_geo_scan.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_image \
   -o topo030M_geo_scan.faces \
   -F $FEATURE \
   -s 40,60,11  \
   -r '545010,550980,4074000,4083000,0,1800' \
   -a 25000.000000 \
   -g 6.453236 \
   -G topo020.2grd \
   geology_scan.imreg
```

Brent Henderson
11-3-94

To create 3D model:

```
3DModel_new/21_subsurface/030_allSurfaces:

::::::::::::::
run010_getDats
::::::::::::::


echo "Retrieving dats... "

cp ../../10_topo/010topo.dat .

cp ../010_digitizedData/hrz*.dat .

cp ../020_faultSurfaces/flt*010new.dat .

cp ../020_faultSurfaces/flt*.ply .

echo "Finished retrieving dats. \007"

::::::::::::::
run020_mkGrds.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
resolution="100,150"
range="545009.000000,550981.000000,4073999.000000,4083001.000000"
fltDir="."
horDir="."

echo "\n-------------------------------------------------------------"
echo "Make fault grid bowRidge..."
echo "-------------------------------------------------------------"
  ev_2grid \
   -o $fltDir/flt010_bowRidge020.2grd \
   -F $FEATURE \
   -r $range \
   -s $resolution \
   -d $fltDir/flt010_bowRidge010new.dat \
   -f 'Z' \
   -m 4

echo "\n-------------------------------------------------------------"
echo "Make fault grid ghostDance..."
echo "-------------------------------------------------------------"
 ev_2grid \
   -o $fltDir/flt020_ghostDance020.2grd \
   -F $FEATURE \
   -r $range \
   -s $resolution \
   -d $fltDir/flt020_ghostDance010new.dat \
   -f 'Z' \
   -m 4

echo "\n-------------------------------------------------------------"
echo "Make fault grid solCanyon..."
echo "-------------------------------------------------------------"
  ev_2grid \
     -o $fltDir/flt030_solCanyon020.2grd \
     -F $FEATURE \
     -r $range \
     -s $resolution \
     -d $fltDir/flt030_solCanyon010new.dat \
     -f 'Z' \
     -m 4

exit

echo "\n-------------------------------------------------------------"
echo "Make topo grid..."
echo "-------------------------------------------------------------"
  ev_2grid \
     -o $fltDir/020topo.2grd \
     -F $FEATURE \
     -r $range \
     -s $resolution \
     -d $fltDir/010topo.dat \
     -f 'Z' \
     -m 4
```

Brett Hedges
11-3-94

3D Model cont...

```
echo "\n-------------------------------------------------------------"
echo "Process layers... "
echo "-------------------------------------------------------------"
for horizon in hrz010_n3ptn \
               hrz020_tptwtsw1 \
               hrz030_tsw23 \
               hrz040_chnln2 \
               hrz050_ppw \
               hrz060_cfun

do
   echo "\n  -------------------------------------------------------------"
   echo "   Starting horizon $horizon..."
   echo "   -------------------------------------------------------------"
   echo "      Sorting scattered data by fault block, sort_$horizon.dat..."
   ev_fbsort -d $horDir/$horizon.dat \
             -f 'Z' \
             -F $FEATURE \
             -o FaultBlock \
             -t 0.001 \
             3faults.seq \
             > sort_$horizon.dat
   for fb in "1 below bowRidge" \
             "2 below ghostDance" \
             "3 below solCanyon" \
             "4 above solCanyon"
   do
      echo "      Selecting horizon: $horizon and fault block: $fb..."
      ev_field -i sort_$horizon.dat \
               -o temp.dat \
               -r FaultBlock \
               -s "$fb"
      numpts=`grep -v '#' temp.dat | wc -l`
      if [ $numpts -eq 0 ]; then
         echo "      ***>>> Horizon: $horizon,"
         echo "      ***>>> no points in fault block: $fb."
      else
         fbnum=`echo $fb | nawk '{print $1}'`
         grid="$horDir/${horizon}_$fbnum.2grd"
         echo "        Gridding horizon: $horizon,"
         echo "          in fault block: $fb,"
         echo "          output grid: $grid..."
         ev_2grid -r $range \
                  -F $FEATURE \
                  -s $resolution \
                  -d temp.dat \
                  -f 'Z' \
                  -m 4 \
                  -o $horDir/$grid
      fi
   done
   rm temp.dat
   echo "   Done with horizon $horizon."
done
echo "\n-------------------------------------------------------------"
echo "Finished \007"
echo "-------------------------------------------------------------"

::::::::::::::
run025_processDats.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP

resolution="80,120"
range="545009.000000,550981.000000,4073999.000000,4083001.000000"
fltDir="."
horDir="."

echo "\n-------------------------------------------------------------"
echo "Process layers... "
echo "-------------------------------------------------------------"
for horizon in hrz010_n3ptn \
               hrz020_tptwtsw1 \
               hrz030_tsw23 \
               hrz040_chnln2 \
               hrz050_ppw \
               hrz060_cfun
```

Brett Hedges
11-3-94

3D model cont...

```
do
   echo "\n   ------------------------------------------------------------"
   echo "   Starting horizon $horizon..."
   echo "   ------------------------------------------------------------"
   echo "      Sorting scattered data by fault block, sort_$horizon.dat..."
   ev_fbsort -d $horDir/$horizon.dat \
             -f 'Z' \
             -F $FEATURE \
             -o FaultBlock \
             -t 65.00 \
             3faults.seq \
             > sort_$horizon.dat
   for fb in "1 below bowRidge" \
             "2 below ghostDance" \
             "3 below solCanyon" \
             "4 above solCanyon"
   do
      echo "      Selecting horizon: $horizon and fault block: $fb..."
      ev_field -i sort_$horizon.dat \
               -o temp.dat \
               -r FaultBlock \
               -s "$fb"
      numpts=`grep -v '#' temp.dat | wc -l`
      if [ $numpts -eq 0 ]; then
         echo "      ***>>> Horizon: $horizon,"
         echo "      ***>>> no points in fault block: $fb."
      else
         fbnum=`echo $fb | nawk '{print $1}'`
         grid="$horDir/${horizon}_$fbnum.2grd"
         echo "      Gridding horizon: $horizon,"
         echo "         in fault block: $fb,"
         echo "         output grid: $grid..."
         ev_2grid -r $range \
                  -F $FEATURE \
                  -s $resolution \
                  -d temp.dat \
                  -f 'Z' \
                  -m 4 \
                  -o $horDir/$grid
      fi
   done
   rm temp.dat
   echo "   Done with horizon $horizon."
done
echo "\n------------------------------------------------------------"
echo "Finished \007"
echo "------------------------------------------------------------"

::::::::::::::
run030_mkVolumes.sh
::::::::::::::
#!/bin/sh -e

SEQFILE=3faults.seq
FEATURE=EV-GMX/SVP
CHECKPOINT=run030_mkvolumes.cp

ev_seq -F $FEATURE $SEQFILE $CHECKPOINT
ev_seqfaces -o 3fltsFaultZoneVolumes.faces -F $FEATURE $SEQFILE $CHECKPOINT
rm -f $CHECKPOINT
rm 4_above_solCanyon.strc 3_below_solCanyon.strc 2_below_ghostDance.strc 1_below_bowRidge.strc
::::::::::::::
run050_facesMerge.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP

ev_merge -o tmp_Nov2_aerial.faces -F $FEATURE << EOF
topo030M_aerial.faces
tmp_Nov2_1.faces        0       0
EOF


ev_merge -o tmp_Nov2_tm.faces -F $FEATURE << EOF
topo030M_tm.faces
tmp_Nov2_1.faces        0       0
EOF
```

Brad Johnson 11-3-94

3D model cont...

```
ev_merge -o tmp_Nov2_geo_dig.faces -F $FEATURE << EOF
topo030M_geo_dig.faces
tmp_Nov2_1.faces        0       0
EOF

ev_merge -o tmp_Nov2_geo_scan.faces -F $FEATURE << EOF
topo030M_geo_scan.faces
tmp_Nov2_1.faces        0       0
EOF



::::::::::::::
run_mkAllFaultsFaces.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_merge -o allFaults.faces -F $FEATURE << EOF
flt010_bowRidge020new.faces     1       1
flt020_ghostDance020new.faces   2       2
flt030_solCanyon020new.faces    3       3
EOF
::::::::::::::
run_mkFaces.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP

resolution=80,120,15

ev_faces \
   -F $FEATURE \
   -r '545010,550980,4074000,4083000,0,1800' \
   -s $resolution \
   -i '0' \
   -t 6.487501 \
   -o flt010_bowRidge020new.faces \
   flt010_bowRidge020new.2grd


ev_faces \
   -F $FEATURE \
   -r '545010,550980,4074000,4083000,0,1800' \
   -s $resolution \
   -i '0' \
   -t 6.487501 \
   -o flt020_ghostDance020new.faces \
   flt020_ghostDance020new.2grd


ev_faces \
   -F $FEATURE \
   -r '545010,550980,4074000,4083000,0,1800' \
   -s $resolution \
   -i '0' \
   -t 6.487501 \
   -o flt030_solCanyon020new.faces \
   flt030_solCanyon020new.2grd


ev_merge -o tmp.faces -F $FEATURE << EOF
flt010_bowRidge020new.faces     1       1
flt020_ghostDance20new.faces    2       2
flt030_solCanyon020new.faces    3       3
EOF


::::::::::::::
runtops
::::::::::::::
#!/bin/sh

date > tmp.date
cat tmp.date
```

Brad Johnson 11-3-94

3D model cont...

```
# invert snap.rgb tmp.rgb
# mytops tmp.rgb -rgb > holes_all.ps
# rm tmp.rgb


for rgbfile in t_*.rgb
do
   infile=`echo $rgbfile | nawk -F"." '{print $1}'`
   echo $rgbfile $infile

   mytops $rgbfile > $infile.tmp

   nawk '{
            if ($1 == "/scmul") {
               print "/scmul {1.00 mul} def"
            } else if ($1 == showpage) {
               print " "
               print "/Helvetica-Bold findfont"
               print " 16.0 scalefont"
               print " setfont"
               print "50.0 610.0 moveto"
               print "% 90.0 rotate"
               print "("fn") show"
               print "(  ) show"
               getline x <"tmp.date"
               print "("x") show"
               print $0
            } else {
               print $0
            }
         }' fn=$infile $infile.tmp > $infile.ps

rm $infile.tmp

#  lpr -Pphaser -s $infile.ps
#  lpr -Pps1700 -s $infile.ps
done

rm tmp.date

echo "Finished \007"
::::::::::::::
runtry
::::::::::::::
#!/bin/sh

dt=1

while [ $dt -lt 1800 ]
do

   t1=`date | nawk '{ print $4 }' | nawk -F":" '{ print ($1*3600)+($2*60)+$3 }'`

   tmp_Nov2_run.sh

   t2=`date | nawk '{ print $4 }' | nawk -F":" '{ print ($1*3600)+($2*60)+$3 }'`

   dt=`expr $t2 - $t1`

   echo $dt

   sleep 60

done


::::::::::::::
tmp_Nov2_run.sh
::::::::::::::
#!/bin/sh -e

date > tmp_Nov2.timing

SEQFILE=3faults.seq
FEATURE=EV-GMX/SVP
CHECKPOINT=tmp_28_run.cp

ev_seq -F $FEATURE $SEQFILE $CHECKPOINT
```

Bob Hu
11-3-94

3D model cont...cnd

```
ev_seqfaces -o tmp_Nov2_1.faces -F $FEATURE $SEQFILE $CHECKPOINT
rm -f $CHECKPOINT
rm 4_above_solCanyon.strc 3_below_solCanyon.strc 2_below_ghostDance.strc 1_below_bowRidge.strc

date >> tmp_Nov2.timing


::::::::::::::
tmp_Nov2_run.sh
::::::::::::::
#!/bin/sh -e

date > tmp_Nov2.timing

SEQFILE=3faults.seq
FEATURE=EV-GMX/SVP
CHECKPOINT=tmp_28_run.cp

ev_seq -F $FEATURE $SEQFILE $CHECKPOINT
ev_seqfaces -o tmp_Nov2_1.faces -F $FEATURE $SEQFILE $CHECKPOINT
rm -f $CHECKPOINT
rm 4_above_solCanyon.strc 3_below_solCanyon.strc 2_below_ghostDance.strc 1_below_bowRidge.strc

date >> tmp_Nov2.timing
```

Bob Hu
11-3-94

Examined borehole data and digitized horizon layer data.

Unit name from borehole data at depths doesn't agree with unit as shown by horizon data. This leads us to think horizon data needs to be refined with borehole + cross sections data.

High porosity ~ non-welded
Low porosity ~ welded

Idea: (revising model based on new data).
1. Plot new raw data.
2. Modify horizon contour lines
3. Digitize new contour lines.
4. Build model
5. Check boreholes vs. new model.

Action Items
1. Digitize main contacts of Scott + Bonk. Gerry indicate which lines to digitize.
2. Plot 2 borehole contacts from data from George Rice.

Burt Hahn 11-11-94

Pages 1 through 54 of this Scientific Notebook were reviewed for compliance with QAP-001 in response to Corrective Action Request 94-02. Corrections and clarifications were made as appropriate. In some cases, the date of a change will reflect the date of this review rather than the date of the original Scientific Notebook entry.

Randy Folck
SWRI-QA
12/2/94

Nov 21, 1994

TO: Gerry Stirewalt
David Ferrill
Gordon Wittmeyer
Ross Bagtzoglou

FROM: Brent Henderson

SUBJECT: Trip report, DGI EarthVision Geologic Structure Builder training class, Nov 14-18, 1994, Houston

Here are some notes from the training class I attended Nov 14-18th.

1. We used EarthVision Beta Version 2.9. This version contains significant improvements in property modeling and fault modeling. We are scheduled to receive the beta release when it ships in early December. EarthVision version 3.0 is scheduled to ship in spring '95.

2. Property gridding may now be performed independently for each zone of the model. Options include conformal gridding, vertical influence control, and continuous property modeling across faults.

3. Trend grids can be used to model steeply dipping faults. Listric faults can be modeled with 2 trend grids.

4. New features of GSB include automatic fault tree builder and automatic horizon gridding per fault block. Previously, these steps required shell script programming and could be very time consuming.

5. For importing cross sections a new tool is available called evtieline.

6. 3D models built by the GSB can be exported to ASCII grid files using ev_recast. We did not try this in class but they told us how to do this.

7. Tunnels can be modeled as overturned faults (3grds) and the interiors can be displayed. I built a tunnel in class to verify the tools work.

8. Water tables can be modeled as faults in the GSB.

9. Repository can be built in GSB as a faulted surface.

10. Dying faults can be modeled in GSB by using polygons to control their range.

11. Horizon gridding can now be controlled with 2 new categories of data: helper and additional data.

12. Property values can be set to constants for geologic zones in the new GSB.

13. Cross sections along traverse lines can be extracted from 3D models as well as horizon surface displays.

14. A seismic viewer is being developed by DGI.

15. Intermediate horizon surfaces can be computed as offsets from top or bottom horizons in the new GSB.

16. Property models are limited to 20 user selected isoshells.

17. A couple of class attendees are Stratamodel users or have evaluated Stratamodel. If you would like to contact them I have their names and numbers.

In summary, class was very instructive regarding new features of the software that will be useful for completing the framework model.

Brent Henderson 1-24-95

TO: Gerry Stirewalt

FROM: Brent Henderson

SUBJECT: Progress Report through 11-21-94

TASKS COMPLETED THIS PERIOD

1. Attended DGI EarthVision Geologic Structure Builder class in Houston Nov 14-18, 1994. See trip report for additional details.

2. Draped image files over new 3D model. Image files used included Landsat TM, aerial photo, and geologic map (Frizzell).

3. Consulted with Gerry Stirewalt and George Rice concerning geologic layers of 3D model (11/11/94). We concluded that inclusion of borehole contact data would be useful for revising 3D model. Revised 3D model could then be used for analyzing property distributions.

TASKS PLANNED FOR NEXT PERIOD

1. Plot borehole contact data to be overlaid with horizon contour data. Contact data may be used to modify horizon contour data.

2. Digitize modified horizon contour data.

3. Used digitized modified horizon contour data to create new horizon grids for 3D model.

4. Save 3D model surface geology data for comparison with surface geology maps (Scott & Bonk).

Brent Henderson 1-24-95

941212.txt

TO: Gerry Stirewalt

FROM: Brent Henderson

SUBJECT: Progress Report through 12-12-94

TASKS COMPLETED THIS PERIOD

From November 21 through December 12 I was preparing two computer poster presentations for the AGU '94 meeting.

I am waiting on the following data before preparing the next revision of the 3D model:

a. prioritized list of modifications to 3D model
b. correlation of borehole contact data and 3D model stratigraphy

TASKS PLANNED FOR NEXT PERIOD

1. Plot borehole contact data to be overlaid with horizon contour data. Contact data may be used to modify horizon contour data.

2. Digitize modified horizon contour data.

3. Used digitized modified horizon contour data to create new horizon grids for 3D model.

4. Save 3D model surface geology data for comparison with surface geology maps (Scott & Bonk).

Brent Henderson 1-24-95

941230.txt

TO: Gerry Stirewalt

FROM: Brent Henderson

SUBJECT: Progress Report through 12-30-94

TASKS COMPLETED THIS PERIOD

1. Submitted paper work for Craig Fenrich, SwRI PL1 staff member, to Larry McKague. Craig is available to work part time on Geologic Framework Model project.

2. Gave instructions to Hannah Castell on how to digitize top and bottom contour maps for Bull Frog unit.

3. Monitored Dynamic Graphics progress on fixing a problem that prevents EV Beta 2.9 from installing on Onyx. DGI is actively seeking a solution to this problem.

I still have not received a correlation of borehole contact units with 3D model stratigraphy or a prioritized list of modifications to 3D model. These items are critical in revising the 3D model.

TASKS PLANNED FOR NEXT PERIOD

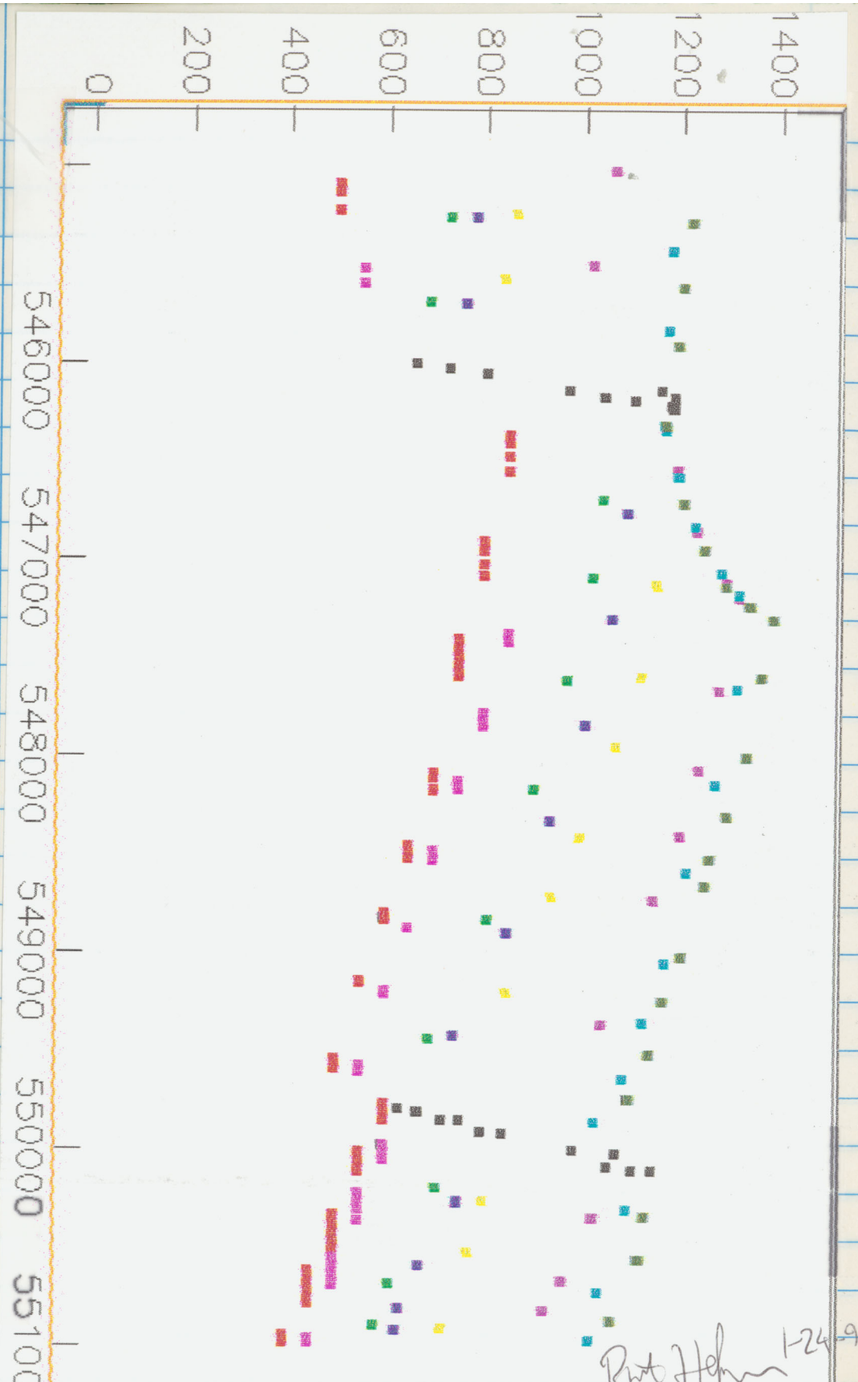
1. Plot borehole contact data to be overlaid with horizon contour data. Contact data may be used to modify horizon contour data. [Waiting on correlation of borehole contact units and 3D model stratigraphy]

2. Digitize modified horizon contour data.

3. Used digitized modified horizon contour data to create new horizon grids for 3D model.

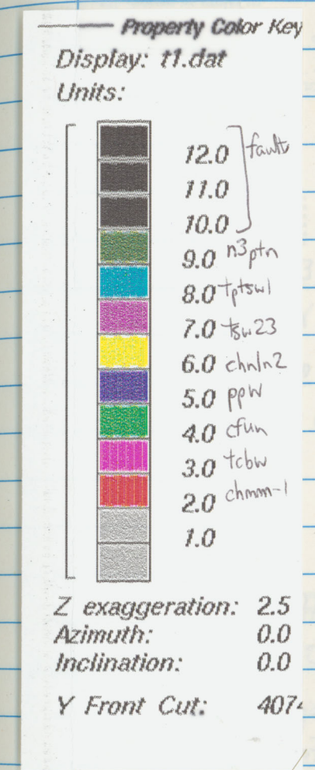
4. Save 3D model surface geology data for comparison with surface geology maps (Scott & Bonk).

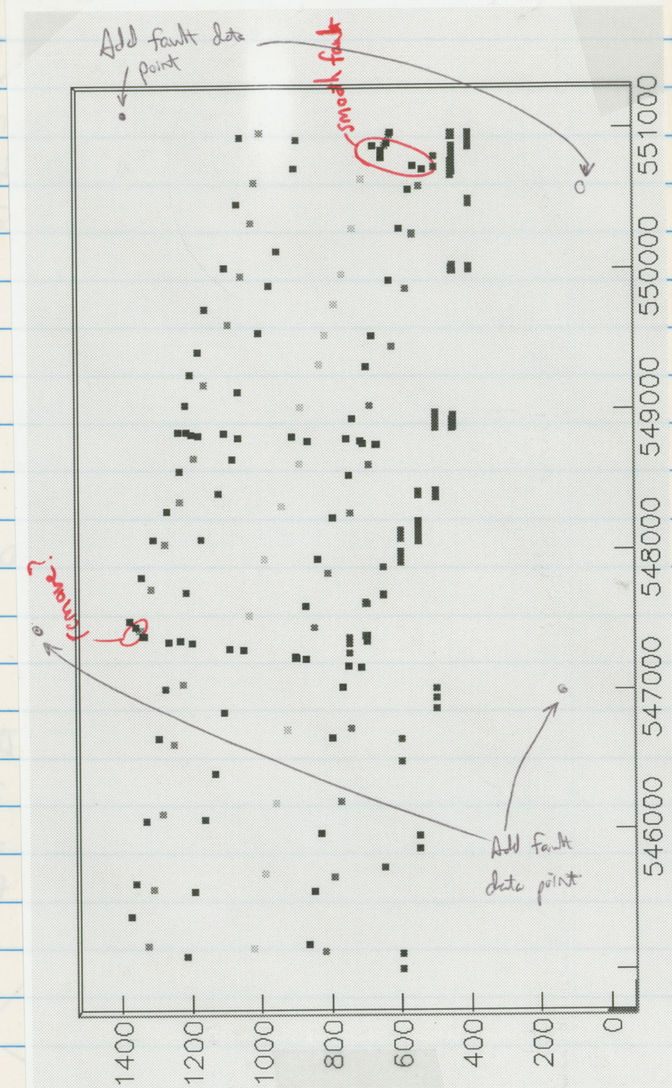
Brent Henderson 1-24-95



Brit Hefner 1-24-95

Remove data points to smooth faults and not bend horizons near surface.





Repeated this for 18 slices in model

Brit Hefner 1-24-95

runCatDats

```
#!/bin/sh

rm t.dat
cnt=1
for f in flt010_bowRidge010.dat \
../010_digitizedData/hrz080_cfmnn-1.dat \
../010_digitizedData/hrz070_tcbw.dat \
../010_digitizedData/hrz060_cfun.dat \
../010_digitizedData/hrz050_ppw.dat \
../010_digitizedData/hrz040_chnln2.dat \
../010_digitizedData/hrz030_tsw23.dat \
../010_digitizedData/hrz020_tptwtsw1.dat \
../010_digitizedData/hrz010_n3ptn.dat \
flt010_bowRidge010.dat \
flt020_ghostDance010.dat \
flt030_solCanyon010.dat
do
    nawk '{ if (substr($1,1,1) != "#") {
                print $0, p
            }
        }' p=$cnt $f >> t.dat
    cnt=`expr $cnt + 1`
done

echo "Created t.dat \007\n\n"
```

Combine scattered data files into single file to do editing in 3D viewer of EarthVision Beta 2.9

runMKDvues

```
#!/bin/sh

cnt=1
while [ $cnt -lt 19 ]
do

   echo $cnt

   p1=`echo $cnt* * 5 + 3* | bc`
   p2=`echo $cnt* * 5 + 8* | bc`
   p3=`echo $cnt* * 510 + 4073583* | bc`
   p4=`echo $cnt* * 510 + 4074093* | bc`
   p5=`echo $cnt* * 510 + 4073838* | bc`

   echo "s/ZZZ1/*$p1*/g* >  dtmp.script
   echo "s/ZZZ2/*$p2*/g* >> dtmp.script
   echo "s/ZZZ3/*$p3*/g* >> dtmp.script
   echo "s/ZZZ4/*$p4*/g* >> dtmp.script
   echo "s/ZZZ5/*$p5*/g* >> dtmp.script

   sed -f dtmp.script dtemp.dvue > d_$cnt.dvue

   cnt=`expr $cnt + 1`
done

rm dtmp.script
```

Make EV view files to show Y-slices of scattered data and perform editing in 3D viewer.

runUnCatDats

```
#!/bin/sh

ext=jan23

cnt=1
for f in flt010_bowRidge010_$ext.dat \
../010_digitizedData/hrz080_cfmnn-1_$ext.dat \
../010_digitizedData/hrz070_tcbw_$ext.dat \
../010_digitizedData/hrz060_cfun_$ext.dat \
../010_digitizedData/hrz050_ppw_$ext.dat \
../010_digitizedData/hrz040_chnln2_$ext.dat \
../010_digitizedData/hrz030_tsw23_$ext.dat \
../010_digitizedData/hrz020_tptwtsw1_$ext.dat \
../010_digitizedData/hrz010_n3ptn_$ext.dat \
flt010_bowRidge010_$ext.dat \
flt020_ghostDance010_$ext.dat \
flt030_solCanyon010_$ext.dat
do
    echo $cnt $f...
    nawk '{ if ((NF > 1) && (substr($1,1,1) != "#")) {
                if ($4 == p) print $1, $2, $3
            }
        }' p=$cnt tnew2.dat > $f
    cnt=`expr $cnt + 1`
done

cat flt010_bowRidge000_corners.dat flt010_bowRidge010_$ext.dat > tmp
mv tmp flt010_bowRidge010_$ext.dat

cat flt020_ghostDance000_corners.dat flt020_ghostDance010_$ext.dat > tmp
mv tmp flt020_ghostDance010_$ext.dat

echo "Created $ext \007\n\n"
```

After editing data in 3D viewer of EV, split into horizon and fault data files for gridding.

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runDiffInt

```
#!/bin/sh

if [ $# -lt 2 ]
then
   echo "\n\nUsage: runDiff <file1> <file2>"
   exit
fi

f1=$1
f2=$2

echo "\n\nLines not found in $f2"

nawk 'BEGIN {
        i=0
        while (getline <file2) {
            if ((substr($1,1,1) != "#") &&
                (NF > 1)) {
                x2[i] = $1 + 0.0
                y2[i] = $2 + 0.0
                z2[i] = $3 + 0.0
                i++
            }
        }
        iLast = i
    }
    {
        if ((substr($1,1,1) != "#") &&
            (NF > 1)) {
            x1 = $1 + 0.0
            y1 = $2 + 0.0
            z1 = $3 + 0.0
            for (i=0; i<iLast; i++) {
                if ((x1 - x2[i] <  1.0) &&
                    (x1 - x2[i] > -1.0) &&
                    (y1 - y2[i] <  1.0) &&
                    (y1 - y2[i] > -1.0) &&
                    (z1 - z2[i] <  1.0) &&
                    (z1 - z2[i] > -1.0)) {
                    break;
                }
            }
            if (i == iLast) {
                printf "%s %16.4f %16.4f %16.4f\n", FILENAME, x1, y1, z1
            }
        }
    }' file2=$f2 $f1

echo "\n\nLines not found in $f1"

nawk 'BEGIN {
        i=0
        while (getline <file2) {
            if ((substr($1,1,1) != "#") &&
                (NF > 1)) {
                x2[i] = $1 + 0.0
                y2[i] = $2 + 0.0
                z2[i] = $3 + 0.0
                i++
            }
        }
        iLast = i
    }
    {
        if ((substr($1,1,1) != "#") &&
            (NF > 1)) {
            x1 = $1 + 0.0
            y1 = $2 + 0.0
            z1 = $3 + 0.0
            for (i=0; i<iLast; i++) {
                if ((x1 == x2[i]) &&
                    (y1 == y2[i]) &&
                    (z1 == z2[i])) {
                    break;
                }
            }
            if (i == iLast) {
                printf "%s %16.4f %16.4f %16.4f\n", FILENAME, x1, y1, z1
            }
        }
    }' file2=$f1 $f2
```

Script file to compare previous scattered data file and edited version of file.

Results are shown on following pages.

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Comparison of orig'l electronic files and edited files.

diffs.jan23

new file →

Lines not found in ../010_digitizedData/hrz010_n3ptn_jan23.dat

../010_digitizedData/hrz010_n3ptn.dat	546094.3000	4074049.0000	1180.0000
../010_digitizedData/hrz010_n3ptn.dat	546148.3000	4074045.0000	1158.9000
../010_digitizedData/hrz010_n3ptn.dat	546552.0000	4074050.0000	1197.1000
../010_digitizedData/hrz010_n3ptn.dat	546773.0000	4074050.0000	1240.7000
../010_digitizedData/hrz010_n3ptn.dat	546928.4000	4074050.0000	1280.3000
../010_digitizedData/hrz010_n3ptn.dat	547086.8000	4074050.0000	1299.1000
../010_digitizedData/hrz010_n3ptn.dat	547196.6000	4074050.0000	1348.3000
../010_digitizedData/hrz010_n3ptn.dat	550114.6000	4074042.0000	1066.5000
../010_digitizedData/hrz010_n3ptn.dat	546174.6000	4074500.0000	1186.0000
../010_digitizedData/hrz010_n3ptn.dat	546228.3000	4074500.0000	1184.5000
../010_digitizedData/hrz010_n3ptn.dat	546706.4000	4074500.0000	1205.9000
../010_digitizedData/hrz010_n3ptn.dat	546942.2000	4074500.0000	1250.4000
../010_digitizedData/hrz010_n3ptn.dat	547129.2000	4074500.0000	1296.1000
../010_digitizedData/hrz010_n3ptn.dat	547227.4000	4074500.0000	1343.8000
../010_digitizedData/hrz010_n3ptn.dat	550017.4000	4074500.0000	1075.0000
../010_digitizedData/hrz010_n3ptn.dat	550100.4000	4074490.0000	1150.0000
../010_digitizedData/hrz010_n3ptn.dat	546372.9000	4075000.0000	1190.0000
../010_digitizedData/hrz010_n3ptn.dat	546451.9000	4075000.0000	1204.1000
../010_digitizedData/hrz010_n3ptn.dat	546593.8000	4075000.0000	1192.1000
../010_digitizedData/hrz010_n3ptn.dat	546911.1000	4075000.0000	1220.8000
../010_digitizedData/hrz010_n3ptn.dat	547115.7000	4075000.0000	1250.6000
../010_digitizedData/hrz010_n3ptn.dat	547339.2000	4075000.0000	1333.5000
../010_digitizedData/hrz010_n3ptn.dat	550148.4000	4075000.0000	1024.7000
../010_digitizedData/hrz010_n3ptn.dat	546513.8000	4075500.0000	1195.0000
../010_digitizedData/hrz010_n3ptn.dat	546863.6000	4075500.0000	1236.0000
../010_digitizedData/hrz010_n3ptn.dat	547065.9000	4075500.0000	1276.9000
../010_digitizedData/hrz010_n3ptn.dat	547190.7000	4075500.0000	1293.5000
../010_digitizedData/hrz010_n3ptn.dat	547304.0000	4075500.0000	1333.9000
../010_digitizedData/hrz010_n3ptn.dat	550318.6000	4075500.0000	1007.0000
../010_digitizedData/hrz010_n3ptn.dat	550391.9000	4075500.0000	1137.0000
../010_digitizedData/hrz010_n3ptn.dat	546578.9000	4076000.0000	1200.0000
../010_digitizedData/hrz010_n3ptn.dat	546884.3000	4076000.0000	1264.1000
../010_digitizedData/hrz010_n3ptn.dat	547109.3000	4076000.0000	1304.7000
../010_digitizedData/hrz010_n3ptn.dat	547235.6000	4076000.0000	1347.8000
../010_digitizedData/hrz010_n3ptn.dat	547330.5000	4076000.0000	1404.6000
../010_digitizedData/hrz010_n3ptn.dat	550490.6000	4076000.0000	1018.0000
../010_digitizedData/hrz010_n3ptn.dat	550574.5000	4076000.0000	1129.0000
../010_digitizedData/hrz010_n3ptn.dat	546579.4000	4076498.0000	1215.0000
../010_digitizedData/hrz010_n3ptn.dat	546650.1000	4076500.0000	1233.1000
../010_digitizedData/hrz010_n3ptn.dat	546793.4000	4076500.0000	1257.4000
../010_digitizedData/hrz010_n3ptn.dat	546879.1000	4076500.0000	1278.5000
../010_digitizedData/hrz010_n3ptn.dat	546969.3000	4076500.0000	1315.6000
../010_digitizedData/hrz010_n3ptn.dat	547087.7000	4076500.0000	1342.4000
../010_digitizedData/hrz010_n3ptn.dat	547169.2000	4076500.0000	1384.0000
../010_digitizedData/hrz010_n3ptn.dat	547234.7000	4076500.0000	1425.9000
../010_digitizedData/hrz010_n3ptn.dat	548757.0000	4076500.0000	1250.0000
../010_digitizedData/hrz010_n3ptn.dat	550582.9000	4076500.0000	1009.0000
../010_digitizedData/hrz010_n3ptn.dat	546648.7000	4077002.0000	1235.0000
../010_digitizedData/hrz010_n3ptn.dat	546720.8000	4076997.0000	1242.9000
../010_digitizedData/hrz010_n3ptn.dat	547017.6000	4077000.0000	1292.6000
../010_digitizedData/hrz010_n3ptn.dat	547140.9000	4077000.0000	1332.6000
../010_digitizedData/hrz010_n3ptn.dat	547279.7000	4077000.0000	1388.0000
../010_digitizedData/hrz010_n3ptn.dat	550660.6000	4077008.0000	1011.0000
../010_digitizedData/hrz010_n3ptn.dat	550743.3000	4076993.0000	1135.0000
../010_digitizedData/hrz010_n3ptn.dat	546862.2000	4077499.0000	1235.0000
../010_digitizedData/hrz010_n3ptn.dat	546917.3000	4077498.0000	1257.8000
../010_digitizedData/hrz010_n3ptn.dat	547045.7000	4077500.0000	1279.1000
../010_digitizedData/hrz010_n3ptn.dat	547167.0000	4077500.0000	1302.3000
../010_digitizedData/hrz010_n3ptn.dat	547299.1000	4077500.0000	1348.9000
../010_digitizedData/hrz010_n3ptn.dat	547113.6000	4078000.0000	1287.7000
../010_digitizedData/hrz010_n3ptn.dat	547258.6000	4078000.0000	1309.1000
../010_digitizedData/hrz010_n3ptn.dat	547408.1000	4078000.0000	1350.4000
../010_digitizedData/hrz010_n3ptn.dat	547485.9000	4078000.0000	1385.9000
../010_digitizedData/hrz010_n3ptn.dat	547402.2000	4078500.0000	1343.5000
../010_digitizedData/hrz010_n3ptn.dat	547489.7000	4078500.0000	1381.2000
../010_digitizedData/hrz010_n3ptn.dat	548778.5000	4078486.0000	1207.0000
../010_digitizedData/hrz010_n3ptn.dat	548789.1000	4078486.0000	1240.0000
../010_digitizedData/hrz010_n3ptn.dat	547456.1000	4079000.0000	1362.8000
../010_digitizedData/hrz010_n3ptn.dat	548835.8000	4079001.0000	1202.0000
../010_digitizedData/hrz010_n3ptn.dat	548848.5000	4079001.0000	1240.0000
../010_digitizedData/hrz010_n3ptn.dat	547376.9000	4079500.0000	1244.9000
../010_digitizedData/hrz010_n3ptn.dat	549035.1000	4079487.0000	1165.0000
../010_digitizedData/hrz010_n3ptn.dat	549050.0000	4079489.0000	1200.0000
../010_digitizedData/hrz010_n3ptn.dat	547694.1000	4082500.0000	1312.2000

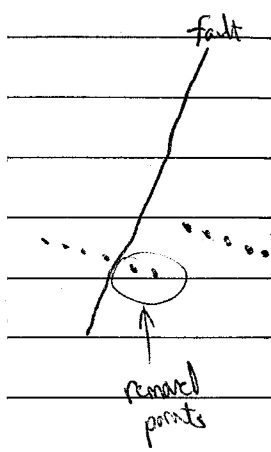
orig'l file →

Lines not found in ../010_digitizedData/hrz010_n3ptn.dat

Lines not found in ../010_digitizedData/hrz020_tptwtsw1_jan23.dat

../010_digitizedData/hrz020_tptwtsw1.dat	546083.7000	4074040.0000	1180.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546509.8000	4074050.0000	1193.3000
../010_digitizedData/hrz020_tptwtsw1.dat	546508.6000	4074050.0000	1196.3000
../010_digitizedData/hrz020_tptwtsw1.dat	546682.7000	4074050.0000	1237.7000
../010_digitizedData/hrz020_tptwtsw1.dat	546790.2000	4074050.0000	1252.6000
../010_digitizedData/hrz020_tptwtsw1.dat	546887.6000	4074050.0000	1281.5000
../010_digitizedData/hrz020_tptwtsw1.dat	546888.1000	4074050.0000	1280.3000
../010_digitizedData/hrz020_tptwtsw1.dat	547084.1000	4074050.0000	1298.8000
../010_digitizedData/hrz020_tptwtsw1.dat	550080.3000	4074050.0000	1004.7000
../010_digitizedData/hrz020_tptwtsw1.dat	550125.3000	4074050.0000	1075.1000
../010_digitizedData/hrz020_tptwtsw1.dat	546139.3000	4074493.0000	1160.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546229.5000	4074490.0000	1182.8000
../010_digitizedData/hrz020_tptwtsw1.dat	546317.2000	4074500.0000	1167.8000
../010_digitizedData/hrz020_tptwtsw1.dat	546339.0000	4074500.0000	1169.4000
../010_digitizedData/hrz020_tptwtsw1.dat	546311.0000	4074500.0000	1168.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546572.7000	4074500.0000	1195.7000
../010_digitizedData/hrz020_tptwtsw1.dat	546829.7000	4074500.0000	1231.2000
../010_digitizedData/hrz020_tptwtsw1.dat	547063.6000	4074500.0000	1284.4000
../010_digitizedData/hrz020_tptwtsw1.dat	547171.7000	4074500.0000	1321.5000
../010_digitizedData/hrz020_tptwtsw1.dat	547227.4000	4074500.0000	1346.9000
../010_digitizedData/hrz020_tptwtsw1.dat	550002.3000	4074491.0000	990.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546342.7000	4075005.0000	1162.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546457.1000	4075002.0000	1205.4000
../010_digitizedData/hrz020_tptwtsw1.dat	546590.5000	4075000.0000	1197.1000
../010_digitizedData/hrz020_tptwtsw1.dat	546860.7000	4075000.0000	1216.2000
../010_digitizedData/hrz020_tptwtsw1.dat	547123.2000	4075000.0000	1257.2000
../010_digitizedData/hrz020_tptwtsw1.dat	547274.5000	4075000.0000	1306.3000
../010_digitizedData/hrz020_tptwtsw1.dat	546482.6000	4075501.0000	1176.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546873.6000	4075500.0000	1235.0000
../010_digitizedData/hrz020_tptwtsw1.dat	547026.2000	4075500.0000	1265.1000
../010_digitizedData/hrz020_tptwtsw1.dat	547091.5000	4075500.0000	1284.8000
../010_digitizedData/hrz020_tptwtsw1.dat	547181.4000	4075500.0000	1290.2000
../010_digitizedData/hrz020_tptwtsw1.dat	547264.8000	4075500.0000	1313.8000
../010_digitizedData/hrz020_tptwtsw1.dat	550308.1000	4075495.0000	980.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546570.7000	4076000.0000	1172.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546886.6000	4076000.0000	1265.6000

Removed points to make sure horizons did not bend in places before the faults



Brent [signature] 1-24-95

cont...

../010_digitizedData/hrz020_tptwtsw1.dat	547088.5000	4076000.0000	1299.4000
../010_digitizedData/hrz020_tptwtsw1.dat	547199.9000	4076000.0000	1330.2000
../010_digitizedData/hrz020_tptwtsw1.dat	547294.2000	4076000.0000	1385.3000
../010_digitizedData/hrz020_tptwtsw1.dat	546645.0000	4076496.0000	1233.1000
../010_digitizedData/hrz020_tptwtsw1.dat	546789.4000	4076500.0000	1256.1000
../010_digitizedData/hrz020_tptwtsw1.dat	546875.7000	4076500.0000	1278.5000
../010_digitizedData/hrz020_tptwtsw1.dat	546974.0000	4076500.0000	1316.9000
../010_digitizedData/hrz020_tptwtsw1.dat	547088.4000	4076500.0000	1340.7000
../010_digitizedData/hrz020_tptwtsw1.dat	547196.0000	4076500.0000	1396.3000
../010_digitizedData/hrz020_tptwtsw1.dat	548732.6000	4076497.0000	1233.1000
../010_digitizedData/hrz020_tptwtsw1.dat	546721.0000	4076998.0000	1242.9000
../010_digitizedData/hrz020_tptwtsw1.dat	546891.0000	4077000.0000	1269.9000
../010_digitizedData/hrz020_tptwtsw1.dat	547054.1000	4077000.0000	1301.3000
../010_digitizedData/hrz020_tptwtsw1.dat	547233.5000	4077000.0000	1367.9000
../010_digitizedData/hrz020_tptwtsw1.dat	548691.4000	4076999.0000	1211.0000
../010_digitizedData/hrz020_tptwtsw1.dat	548739.1000	4076999.0000	1240.3000
../010_digitizedData/hrz020_tptwtsw1.dat	546860.6000	4077500.0000	1195.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546907.0000	4077500.0000	1259.3000
../010_digitizedData/hrz020_tptwtsw1.dat	547016.9000	4077500.0000	1271.9000
../010_digitizedData/hrz020_tptwtsw1.dat	547165.6000	4077500.0000	1299.3000
../010_digitizedData/hrz020_tptwtsw1.dat	547266.2000	4077500.0000	1333.1000
../010_digitizedData/hrz020_tptwtsw1.dat	547368.1000	4077500.0000	1386.8000
../010_digitizedData/hrz020_tptwtsw1.dat	547416.4000	4077500.0000	1413.1000
../010_digitizedData/hrz020_tptwtsw1.dat	548730.5000	4077494.0000	1232.0000
../010_digitizedData/hrz020_tptwtsw1.dat	547116.9000	4078000.0000	1288.7000
../010_digitizedData/hrz020_tptwtsw1.dat	547216.6000	4078000.0000	1301.4000
../010_digitizedData/hrz020_tptwtsw1.dat	547350.0000	4078000.0000	1335.4000
../010_digitizedData/hrz020_tptwtsw1.dat	547458.0000	4078000.0000	1374.0000
../010_digitizedData/hrz020_tptwtsw1.dat	548778.3000	4077996.0000	1230.0000
../010_digitizedData/hrz020_tptwtsw1.dat	547402.1000	4078500.0000	1340.4000
../010_digitizedData/hrz020_tptwtsw1.dat	547490.4000	4078500.0000	1382.3000
../010_digitizedData/hrz020_tptwtsw1.dat	548760.6000	4078492.0000	1175.0000
../010_digitizedData/hrz020_tptwtsw1.dat	548788.1000	4078488.0000	1215.0000
../010_digitizedData/hrz020_tptwtsw1.dat	548824.1000	4078996.0000	1182.5000
../010_digitizedData/hrz020_tptwtsw1.dat	547367.7000	4079466.0000	1216.5000
../010_digitizedData/hrz020_tptwtsw1.dat	549052.0000	4079493.0000	1157.0000
../010_digitizedData/hrz020_tptwtsw1.dat	547660.2000	4082504.0000	1262.0000
../010_digitizedData/hrz020_tptwtsw1.dat	547707.8000	4082501.0000	1314.5000
../010_digitizedData/hrz020_tptwtsw1.dat	547717.4000	4082997.0000	1261.0000
../010_digitizedData/hrz020_tptwtsw1.dat	550481.0000	4075960.0000	980.0000
../010_digitizedData/hrz020_tptwtsw1.dat	546576.9000	4076496.0000	1200.0000

Lines not found in ../010_digitizedData/hrz020_tptwtsw1.dat

Lines not found in ../010_digitizedData/hrz030_tsw23_jan23.dat

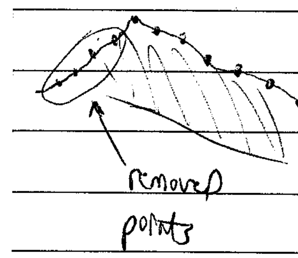
../010_digitizedData/hrz030_tsw23.dat	546148.2000	4074050.0000	1158.7000
../010_digitizedData/hrz030_tsw23.dat	546577.4000	4074050.0000	1199.3000
../010_digitizedData/hrz030_tsw23.dat	546890.4000	4074050.0000	1276.2000
../010_digitizedData/hrz030_tsw23.dat	547049.5000	4074050.0000	1284.9000
../010_digitizedData/hrz030_tsw23.dat	546229.0000	4074500.0000	1186.2000
../010_digitizedData/hrz030_tsw23.dat	546315.1000	4074500.0000	1172.0000
../010_digitizedData/hrz030_tsw23.dat	546541.2000	4074500.0000	1193.1000
../010_digitizedData/hrz030_tsw23.dat	546854.5000	4074500.0000	1234.2000
../010_digitizedData/hrz030_tsw23.dat	547109.9000	4074500.0000	1295.8000
../010_digitizedData/hrz030_tsw23.dat	547185.7000	4074500.0000	1322.5000
../010_digitizedData/hrz030_tsw23.dat	549998.8000	4074503.0000	989.6000
../010_digitizedData/hrz030_tsw23.dat	546450.5000	4075000.0000	1207.1000
../010_digitizedData/hrz030_tsw23.dat	546600.6000	4075000.0000	1196.4000
../010_digitizedData/hrz030_tsw23.dat	546983.6000	4075000.0000	1233.4000
../010_digitizedData/hrz030_tsw23.dat	547129.9000	4075000.0000	1257.2000
../010_digitizedData/hrz030_tsw23.dat	547269.8000	4075000.0000	1304.6000
../010_digitizedData/hrz030_tsw23.dat	546804.5000	4075500.0000	1225.6000
../010_digitizedData/hrz030_tsw23.dat	547060.6000	4075500.0000	1275.9000
../010_digitizedData/hrz030_tsw23.dat	547120.3000	4075500.0000	1285.7000
../010_digitizedData/hrz030_tsw23.dat	546873.2000	4076000.0000	1264.0000
../010_digitizedData/hrz030_tsw23.dat	547061.0000	4076000.0000	1295.2000
../010_digitizedData/hrz030_tsw23.dat	547183.2000	4076000.0000	1329.9000
../010_digitizedData/hrz030_tsw23.dat	546626.4000	4076500.0000	1234.2000
../010_digitizedData/hrz030_tsw23.dat	546782.7000	4076500.0000	1255.8000
../010_digitizedData/hrz030_tsw23.dat	546869.0000	4076500.0000	1276.2000
../010_digitizedData/hrz030_tsw23.dat	546967.9000	4076500.0000	1316.5000
../010_digitizedData/hrz030_tsw23.dat	547093.7000	4076500.0000	1341.1000
../010_digitizedData/hrz030_tsw23.dat	548719.7000	4076500.0000	1135.8000
../010_digitizedData/hrz030_tsw23.dat	546907.1000	4077000.0000	1269.7000
../010_digitizedData/hrz030_tsw23.dat	547068.0000	4077000.0000	1307.4000
../010_digitizedData/hrz030_tsw23.dat	547143.5000	4077000.0000	1333.6000
../010_digitizedData/hrz030_tsw23.dat	548676.5000	4077000.0000	1112.0000
../010_digitizedData/hrz030_tsw23.dat	550684.3000	4077001.0000	989.0000
../010_digitizedData/hrz030_tsw23.dat	546907.5000	4077500.0000	1257.8000
../010_digitizedData/hrz030_tsw23.dat	547090.6000	4077500.0000	1286.3000
../010_digitizedData/hrz030_tsw23.dat	547219.9000	4077500.0000	1314.3000
../010_digitizedData/hrz030_tsw23.dat	547268.2000	4077500.0000	1332.7000
../010_digitizedData/hrz030_tsw23.dat	548673.4000	4077506.0000	1085.0000
../010_digitizedData/hrz030_tsw23.dat	550693.9000	4077498.0000	975.5000
../010_digitizedData/hrz030_tsw23.dat	547116.2000	4078000.0000	1292.0000
../010_digitizedData/hrz030_tsw23.dat	547244.6000	4078000.0000	1308.4000
../010_digitizedData/hrz030_tsw23.dat	548754.9000	4078000.0000	1127.6000
../010_digitizedData/hrz030_tsw23.dat	550642.4000	4078000.0000	878.0000
../010_digitizedData/hrz030_tsw23.dat	550757.1000	4078005.0000	985.0000
../010_digitizedData/hrz030_tsw23.dat	547263.8000	4078500.0000	1310.0000
../010_digitizedData/hrz030_tsw23.dat	548774.0000	4078496.0000	1105.0000
../010_digitizedData/hrz030_tsw23.dat	550849.2000	4078502.0000	955.0000
../010_digitizedData/hrz030_tsw23.dat	548809.9000	4079000.0000	1066.2000
../010_digitizedData/hrz030_tsw23.dat	547683.6000	4082999.0000	1139.0000

Lines not found in ../010_digitizedData/hrz030_tsw23.dat

Lines not found in ../010_digitizedData/hrz040_chnln2_jan23.dat

../010_digitizedData/hrz040_chnln2.dat	545974.7000	4074050.0000	799.0000
../010_digitizedData/hrz040_chnln2.dat	546150.3000	4074050.0000	1175.0000
../010_digitizedData/hrz040_chnln2.dat	546209.9000	4074500.0000	1180.0000
../010_digitizedData/hrz040_chnln2.dat	549915.6000	4074496.0000	844.0000
../010_digitizedData/hrz040_chnln2.dat	546416.2000	4075000.0000	1182.0000
../010_digitizedData/hrz040_chnln2.dat	550197.5000	4075500.0000	693.4000
../010_digitizedData/hrz040_chnln2.dat	550349.1000	4076004.0000	682.0000
../010_digitizedData/hrz040_chnln2.dat	548676.1000	4076480.0000	952.3000
../010_digitizedData/hrz040_chnln2.dat	550433.9000	4076502.0000	689.8000
../010_digitizedData/hrz040_chnln2.dat	548632.9000	4077000.0000	900.4000
../010_digitizedData/hrz040_chnln2.dat	546879.4000	4077500.0000	1190.0000
../010_digitizedData/hrz040_chnln2.dat	548643.1000	4077494.0000	886.9000
../010_digitizedData/hrz040_chnln2.dat	550464.4000	4077486.0000	684.4000
../010_digitizedData/hrz040_chnln2.dat	548693.4000	4078000.0000	874.0000
../010_digitizedData/hrz040_chnln2.dat	548721.1000	4078500.0000	870.0000
../010_digitizedData/hrz040_chnln2.dat	550641.3000	4078491.0000	687.0000
../010_digitizedData/hrz040_chnln2.dat	547228.2000	4079000.0000	901.0000

Removed points where horizons bend at surface.



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../010_digitizedData/hrz040_chnln2.dat	548786.2000	4079000.0000	866.0000
../010_digitizedData/hrz040_chnln2.dat	550897.6000	4079001.0000	675.0000
../010_digitizedData/hrz040_chnln2.dat	547537.4000	4082500.0000	968.0000
../010_digitizedData/hrz040_chnln2.dat	547616.2000	4083000.0000	965.3000
../010_digitizedData/hrz040_chnln2.dat	550730.3000	4078491.0000	781.0000

Lines not found in ../010_digitizedData/hrz040_chnln2.dat

Lines not found in ../010_digitizedData/hrz050_ppw_jan23.dat

../010_digitizedData/hrz050_ppw.dat	550064.0000	4074988.0000	789.5000
../010_digitizedData/hrz050_ppw.dat	548684.3000	4076498.0000	852.0000
../010_digitizedData/hrz050_ppw.dat	548599.6000	4077000.0000	795.7000
../010_digitizedData/hrz050_ppw.dat	548603.9000	4077500.0000	764.9000
../010_digitizedData/hrz050_ppw.dat	548664.8000	4078005.0000	750.0000
../010_digitizedData/hrz050_ppw.dat	548693.0000	4078500.0000	688.0000
../010_digitizedData/hrz050_ppw.dat	550525.9000	4078500.0000	540.0000
../010_digitizedData/hrz050_ppw.dat	547232.7000	4079000.0000	905.5000
../010_digitizedData/hrz050_ppw.dat	548764.8000	4079000.0000	709.2000
../010_digitizedData/hrz050_ppw.dat	548933.3000	4079491.0000	683.5000
../010_digitizedData/hrz050_ppw.dat	547569.1000	4083000.0000	829.0000

Lines not found in ../010_digitizedData/hrz050_ppw.dat

Lines not found in ../010_digitizedData/hrz060_cfun_jan23.dat

../010_digitizedData/hrz060_cfun.dat	549844.6000	4074500.0000	755.0000
../010_digitizedData/hrz060_cfun.dat	549994.6000	4075000.0000	750.0000
../010_digitizedData/hrz060_cfun.dat	550208.0000	4075491.0000	679.9000
../010_digitizedData/hrz060_cfun.dat	548612.7000	4077000.0000	789.6000
../010_digitizedData/hrz060_cfun.dat	550386.0000	4077000.0000	535.3000
../010_digitizedData/hrz060_cfun.dat	550468.2000	4077000.0000	650.0000
../010_digitizedData/hrz060_cfun.dat	548590.5000	4077496.0000	728.4000
../010_digitizedData/hrz060_cfun.dat	550372.1000	4077500.0000	535.0000
../010_digitizedData/hrz060_cfun.dat	550432.1000	4078000.0000	530.0000
../010_digitizedData/hrz060_cfun.dat	547120.4000	4078500.0000	930.0000
../010_digitizedData/hrz060_cfun.dat	548701.2000	4078500.0000	680.0000
../010_digitizedData/hrz060_cfun.dat	550508.7000	4078500.0000	533.0000
../010_digitizedData/hrz060_cfun.dat	550809.3000	4079000.0000	651.0000
../010_digitizedData/hrz060_cfun.dat	548922.9000	4079500.0000	631.3000
../010_digitizedData/hrz060_cfun.dat	547498.9000	4082496.0000	795.3000
../010_digitizedData/hrz060_cfun.dat	547548.7000	4083000.0000	767.8000
../010_digitizedData/hrz060_cfun.dat	548727.6000	4078497.0000	0.0000
../010_digitizedData/hrz060_cfun.dat	548727.6000	4078497.0000	0.0000

Lines not found in ../010_digitizedData/hrz060_cfun.dat

Lines not found in ../010_digitizedData/hrz070_tcbw_jan23.dat

../010_digitizedData/hrz070_tcbw.dat	547116.9000	4079732.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	547078.4000	4079674.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	546452.7000	4077004.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	546398.9000	4076941.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	546354.1000	4076834.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	546705.7000	4077174.0000	900.0000
../010_digitizedData/hrz070_tcbw.dat	546646.7000	4077302.0000	900.0000
../010_digitizedData/hrz070_tcbw.dat	546883.6000	4077935.0000	850.0000
../010_digitizedData/hrz070_tcbw.dat	546897.2000	4077905.0000	850.0000
../010_digitizedData/hrz070_tcbw.dat	546904.5000	4077825.0000	850.0000
../010_digitizedData/hrz070_tcbw.dat	546939.1000	4077711.0000	850.0000
../010_digitizedData/hrz070_tcbw.dat	547034.8000	4078545.0000	800.0000
../010_digitizedData/hrz070_tcbw.dat	547045.4000	4078513.0000	800.0000
../010_digitizedData/hrz070_tcbw.dat	547072.6000	4078441.0000	800.0000
../010_digitizedData/hrz070_tcbw.dat	547107.2000	4078334.0000	800.0000
../010_digitizedData/hrz070_tcbw.dat	547203.1000	4079209.0000	750.0000
../010_digitizedData/hrz070_tcbw.dat	547212.1000	4079189.0000	750.0000
../010_digitizedData/hrz070_tcbw.dat	547227.2000	4079145.0000	750.0000
../010_digitizedData/hrz070_tcbw.dat	547261.8000	4079032.0000	750.0000
../010_digitizedData/hrz070_tcbw.dat	547311.6000	4081455.0000	700.0000
../010_digitizedData/hrz070_tcbw.dat	547316.1000	4081440.0000	700.0000
../010_digitizedData/hrz070_tcbw.dat	547320.4000	4081390.0000	700.0000
../010_digitizedData/hrz070_tcbw.dat	547327.9000	4081342.0000	700.0000
../010_digitizedData/hrz070_tcbw.dat	547336.7000	4081272.0000	700.0000
../010_digitizedData/hrz070_tcbw.dat	548573.6000	4077467.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	548585.6000	4077427.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	548608.1000	4077328.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	548667.5000	4078241.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	548679.6000	4078208.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	549751.4000	4075061.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	549763.1000	4074953.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	549785.6000	4074864.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	549793.2000	4074848.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	549919.1000	4075614.0000	450.0000
../010_digitizedData/hrz070_tcbw.dat	549944.5000	4075485.0000	450.0000
../010_digitizedData/hrz070_tcbw.dat	549971.6000	4075384.0000	450.0000
../010_digitizedData/hrz070_tcbw.dat	549977.6000	4075369.0000	450.0000
../010_digitizedData/hrz070_tcbw.dat	550516.1000	4078981.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550439.1000	4078542.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550406.2000	4078376.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550373.2000	4078199.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550346.4000	4078024.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550302.4000	4077778.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550283.5000	4077658.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550264.4000	4077504.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550244.0000	4077381.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550221.9000	4077234.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550193.4000	4077033.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550141.6000	4076733.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550117.9000	4076596.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550092.8000	4076447.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550083.2000	4076361.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550075.1000	4076254.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550068.5000	4076158.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550067.9000	4076029.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550067.5000	4075948.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550077.7000	4075845.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550087.9000	4075747.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550096.8000	4075686.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550105.9000	4075660.0000	400.0000
../010_digitizedData/hrz070_tcbw.dat	550741.5000	4078812.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	550589.9000	4078431.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	550553.8000	4078249.0000	500.0000
../010_digitizedData/hrz070_tcbw.dat	550261.9000	4076004.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	550261.6000	4075952.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	550255.2000	4075876.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	550241.0000	4075788.0000	550.0000

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../010_digitizedData/hrz070_tcbw.dat	550229.9000	4075718.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	550217.4000	4075642.0000	550.0000
../010_digitizedData/hrz070_tcbw.dat	549950.7000	4075176.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	549955.2000	4075153.0000	600.0000
../010_digitizedData/hrz070_tcbw.dat	549956.4000	4075095.0000	600.0000

Lines not found in ../010_digitizedData/hrz070_tcbw.dat

Lines not found in ../010_digitizedData/hrz080_cfmnn-1_jan23.dat

../010_digitizedData/hrz080_cfmnn-1.dat	547433.6000	4082998.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547432.4000	4082970.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547410.9000	4082829.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547382.1000	4082666.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547335.7000	4082430.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547296.7000	4082219.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547269.2000	4082079.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547227.1000	4081864.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547173.6000	4081584.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547136.1000	4081378.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547093.5000	4081213.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547061.0000	4081106.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547024.1000	4080981.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546984.1000	4080862.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547175.5000	4079403.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547164.9000	4079394.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547141.3000	4079313.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547069.4000	4079174.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547008.0000	4079059.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546586.9000	4077271.0000	850.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546602.4000	4077242.0000	850.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546623.0000	4077182.0000	850.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546835.4000	4077898.0000	800.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546857.3000	4077854.0000	800.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546877.7000	4077804.0000	800.0000
../010_digitizedData/hrz080_cfmnn-1.dat	546915.2000	4077726.0000	800.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547033.9000	4078636.0000	750.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547052.7000	4078597.0000	750.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547070.1000	4078544.0000	750.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547175.1000	4080295.0000	700.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547186.4000	4080239.0000	700.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547193.1000	4080193.0000	700.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547211.2000	4080061.0000	700.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547223.3000	4079936.0000	700.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547395.1000	4081884.0000	650.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547403.2000	4081837.0000	650.0000
../010_digitizedData/hrz080_cfmnn-1.dat	547411.7000	4081761.0000	650.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549572.1000	4074292.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549585.3000	4074196.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549808.1000	4075086.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549816.2000	4075040.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549969.2000	4075603.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549972.6000	4075579.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549972.8000	4075556.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549977.7000	4075520.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549979.5000	4075500.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549984.3000	4075479.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549990.7000	4075450.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549998.6000	4075433.0000	400.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549762.7000	4074475.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549777.1000	4074413.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549788.4000	4074354.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549799.7000	4074296.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549807.9000	4074257.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549817.4000	4074216.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549831.7000	4074167.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549850.6000	4074115.0000	600.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549959.1000	4075264.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549959.5000	4075227.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	549963.2000	4075167.0000	550.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550263.7000	4076081.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550273.4000	4076034.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550277.0000	4075982.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550279.1000	4075932.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550279.7000	4075874.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550280.4000	4075813.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550280.9000	4075760.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550275.4000	4075705.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550275.9000	4075660.0000	500.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550746.4000	4078827.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550709.0000	4078756.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550685.1000	4078697.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550623.2000	4078489.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550608.6000	4078422.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550594.1000	4078352.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550579.6000	4078279.0000	450.0000
../010_digitizedData/hrz080_cfmnn-1.dat	550566.5000	4078212.0000	450.0000

Lines not found in ../010_digitizedData/hrz080_cfmnn-1.dat

Lines not found in flt010_bowRidge010_jan23.dat

flt010_bowRidge010.dat	549844.6000	4074500.0000	755.0000
flt010_bowRidge010.dat	549994.6000	4075000.0000	750.0000
flt010_bowRidge010.dat	550386.0000	4077000.0000	535.3000
flt010_bowRidge010.dat	550468.2000	4077000.0000	650.0000
flt010_bowRidge010.dat	550372.1000	4077500.0000	535.0000
flt010_bowRidge010.dat	550432.1000	4078000.0000	530.0000
flt010_bowRidge010.dat	550508.7000	4078500.0000	533.0000
flt010_bowRidge010.dat	550809.3000	4079000.0000	651.0000
flt010_bowRidge010.dat	549915.6000	4074496.0000	844.0000
flt010_bowRidge010.dat	550197.5000	4075500.0000	693.4000
flt010_bowRidge010.dat	550349.1000	4076004.0000	682.0000
flt010_bowRidge010.dat	550433.9000	4076502.0000	689.8000
flt010_bowRidge010.dat	550464.4000	4077486.0000	684.4000
flt010_bowRidge010.dat	550641.3000	4078491.0000	687.0000
flt010_bowRidge010.dat	550730.3000	4078491.0000	781.0000
flt010_bowRidge010.dat	550017.4000	4074500.0000	1075.0000
flt010_bowRidge010.dat	550148.4000	4075000.0000	1024.7000
flt010_bowRidge010.dat	550318.6000	4075500.0000	1007.0000
flt010_bowRidge010.dat	550490.6000	4076000.0000	1018.0000
flt010_bowRidge010.dat	550582.9000	4076500.0000	1009.0000
flt010_bowRidge010.dat	550660.6000	4077008.0000	1011.0000
flt010_bowRidge010.dat	550743.3000	4076993.0000	1135.0000
flt010_bowRidge010.dat	550064.0000	4074988.0000	789.5000
flt010_bowRidge010.dat	550525.9000	4078500.0000	540.0000
flt010_bowRidge010.dat	550002.3000	4074491.0000	990.0000

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Cont. . .

flt010_bowRidge010.dat	550308.1000	4075495.0000	980.0000
flt010_bowRidge010.dat	550481.0000	4075960.0000	980.0000
flt010_bowRidge010.dat	549998.8000	4074503.0000	989.6000
flt010_bowRidge010.dat	550684.3000	4077001.0000	989.0000
flt010_bowRidge010.dat	550693.9000	4077498.0000	975.5000
flt010_bowRidge010.dat	550642.4000	4078000.0000	878.0000
flt010_bowRidge010.dat	550757.1000	4078005.0000	985.0000
flt010_bowRidge010.dat	550849.2000	4078502.0000	955.0000

Lines not found in flt010_bowRidge010.dat

flt010_bowRidge010_jan23.dat	545010.0000	4074000.0000	-7000.0000
flt010_bowRidge010_jan23.dat	545010.0000	4083000.0000	-7000.0000
flt010_bowRidge010_jan23.dat	550980.0000	4083000.0000	-7000.0000
flt010_bowRidge010_jan23.dat	550980.0000	4074000.0000	4000.0000
flt010_bowRidge010_jan23.dat	550338.0000	4074350.0000	1693.8000
flt010_bowRidge010_jan23.dat	549502.0000	4074350.0000	61.9000
flt010_bowRidge010_jan23.dat	550592.0000	4075370.0000	1679.5000
flt010_bowRidge010_jan23.dat	549968.0000	4075370.0000	76.9000
flt010_bowRidge010_jan23.dat	550960.0000	4076390.0000	1705.3000
flt010_bowRidge010_jan23.dat	550213.0000	4076390.0000	70.6000
flt010_bowRidge010_jan23.dat	550979.0000	4077410.0000	1648.2000
flt010_bowRidge010_jan23.dat	550375.0000	4077410.0000	63.8000
flt010_bowRidge010_jan23.dat	550936.0000	4078430.0000	1597.5000
flt010_bowRidge010_jan23.dat	550394.0000	4078430.0000	81.7000

removed points

Lines not found in flt020_ghostDance010_jan23.dat

flt020_ghostDance010.dat	548612.7000	4077000.0000	789.6000
flt020_ghostDance010.dat	548590.5000	4077496.0000	728.4000
flt020_ghostDance010.dat	548922.9000	4079500.0000	631.3000
flt020_ghostDance010.dat	548676.1000	4076489.0000	952.3000
flt020_ghostDance010.dat	548632.9000	4077000.0000	900.4000
flt020_ghostDance010.dat	548643.1000	4077494.0000	886.9000
flt020_ghostDance010.dat	548693.4000	4078000.0000	874.0000
flt020_ghostDance010.dat	548721.1000	4078500.0000	870.0000
flt020_ghostDance010.dat	548786.2000	4079008.0000	866.0000
flt020_ghostDance010.dat	548757.0000	4076500.0000	1250.0000
flt020_ghostDance010.dat	548778.5000	4078485.0000	1207.0000
flt020_ghostDance010.dat	548835.8000	4079001.0000	1202.0000
flt020_ghostDance010.dat	549035.1000	4079487.0000	1165.0000
flt020_ghostDance010.dat	548684.3000	4076498.0000	852.0000
flt020_ghostDance010.dat	548599.6000	4077000.0000	795.7000
flt020_ghostDance010.dat	548603.9000	4077500.0000	764.9000
flt020_ghostDance010.dat	548664.8000	4078005.0000	750.0000
flt020_ghostDance010.dat	548693.0000	4078500.0000	688.0000
flt020_ghostDance010.dat	548764.8000	4079000.0000	709.2000
flt020_ghostDance010.dat	548933.3000	4079491.0000	683.5000
flt020_ghostDance010.dat	548732.6000	4076497.0000	1233.1000
flt020_ghostDance010.dat	548691.4000	4076999.0000	1211.0000
flt020_ghostDance010.dat	548739.1000	4076999.0000	1240.3000
flt020_ghostDance010.dat	548730.5000	4077494.0000	1232.0000
flt020_ghostDance010.dat	548778.3000	4077996.0000	1230.0000
flt020_ghostDance010.dat	548760.6000	4078492.0000	1175.0000
flt020_ghostDance010.dat	548824.1000	4078996.0000	1182.5000
flt020_ghostDance010.dat	549052.0000	4079493.0000	1157.0000
flt020_ghostDance010.dat	548719.7000	4076500.0000	1135.8000
flt020_ghostDance010.dat	548676.5000	4077000.0000	1112.0000
flt020_ghostDance010.dat	548673.4000	4077506.0000	1085.0000
flt020_ghostDance010.dat	548754.9000	4078000.0000	1127.6000
flt020_ghostDance010.dat	548774.0000	4078496.0000	1105.0000
flt020_ghostDance010.dat	548809.9000	4079000.0000	1066.2000

Removed points from faults that appeared non-planar.

Lines not found in flt020_ghostDance010.dat

flt020_ghostDance010_jan23.dat	545010.0000	4074000.0000	-20000.0000
flt020_ghostDance010_jan23.dat	545010.0000	4083000.0000	-20000.0000
flt020_ghostDance010_jan23.dat	550980.0000	4083000.0000	12000.0000
flt020_ghostDance010_jan23.dat	550980.0000	4074000.0000	12000.0000
flt020_ghostDance010_jan23.dat	548475.0000	4076390.0000	70.6000
flt020_ghostDance010_jan23.dat	548963.0000	4076390.0000	1671.6000
flt020_ghostDance010_jan23.dat	548559.0000	4077410.0000	63.8000
flt020_ghostDance010_jan23.dat	548781.0000	4077410.0000	1703.3000
flt020_ghostDance010_jan23.dat	548897.0000	4078430.0000	1597.5000
flt020_ghostDance010_jan23.dat	548645.0000	4078430.0000	81.7000
flt020_ghostDance010_jan23.dat	549181.0000	4079450.0000	1595.6000
flt020_ghostDance010_jan23.dat	548875.0000	4079450.0000	93.5000

added points to faults to extend their heights

Lines not found in flt030_solCanyon010_jan23.dat

flt030_solCanyon010.dat	547120.4000	4078500.0000	930.0000
flt030_solCanyon010.dat	547498.9000	4082496.0000	795.3000
flt030_solCanyon010.dat	547548.7000	4083000.0000	767.8000
flt030_solCanyon010.dat	546209.5000	4074500.0000	1180.0000
flt030_solCanyon010.dat	547228.2000	4079000.0000	901.0000
flt030_solCanyon010.dat	547537.4000	4082500.0000	968.0000
flt030_solCanyon010.dat	547616.2000	4083000.0000	965.3000
flt030_solCanyon010.dat	546174.6000	4074500.0000	1186.0000
flt030_solCanyon010.dat	546228.3000	4074500.0000	1184.5000
flt030_solCanyon010.dat	546372.9000	4075000.0000	1190.0000
flt030_solCanyon010.dat	546451.9000	4075000.0000	1204.1000
flt030_solCanyon010.dat	546513.8000	4075500.0000	1195.0000
flt030_solCanyon010.dat	546578.9000	4076000.0000	1200.0000
flt030_solCanyon010.dat	546579.4000	4076498.0000	1215.0000
flt030_solCanyon010.dat	546650.1000	4076500.0000	1233.1000
flt030_solCanyon010.dat	546648.7000	4077002.0000	1235.0000
flt030_solCanyon010.dat	546720.8000	4076997.0000	1242.9000
flt030_solCanyon010.dat	546862.2000	4077499.0000	1235.0000
flt030_solCanyon010.dat	546917.3000	4077498.0000	1257.8000
flt030_solCanyon010.dat	547113.6000	4078000.0000	1287.7000
flt030_solCanyon010.dat	547376.9000	4079500.0000	1244.9000
flt030_solCanyon010.dat	547694.1000	4082500.0000	1312.2000
flt030_solCanyon010.dat	545949.2000	4074050.0000	726.3000
flt030_solCanyon010.dat	547569.1000	4083000.0000	829.0000
flt030_solCanyon010.dat	546139.3000	4074493.0000	1160.0000
flt030_solCanyon010.dat	546229.5000	4074490.0000	1182.8000
flt030_solCanyon010.dat	546342.7000	4075005.0000	1162.0000
flt030_solCanyon010.dat	546482.6000	4075501.0000	1176.0000
flt030_solCanyon010.dat	546570.7000	4076000.0000	1172.0000
flt030_solCanyon010.dat	546645.0000	4076496.0000	1233.1000
flt030_solCanyon010.dat	546721.0000	4076998.0000	1242.9000
flt030_solCanyon010.dat	546860.6000	4077500.0000	1195.0000
flt030_solCanyon010.dat	547116.9000	4078000.0000	1288.7000
flt030_solCanyon010.dat	547367.7000	4079466.0000	1216.5000
flt030_solCanyon010.dat	547660.2000	4082504.0000	1262.0000
flt030_solCanyon010.dat	547717.4000	4082997.0000	1261.0000
flt030_solCanyon010.dat	546576.9000	4076496.0000	1200.0000
flt030_solCanyon010.dat	546058.3000	4074050.0000	969.0000
flt030_solCanyon010.dat	546141.0000	4074050.0000	1157.8000

Add points

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flt030_solCanyon010.dat	547116.2000	4078000.0000	1292.0000
flt030_solCanyon010.dat	547683.6000	4082999.0000	1139.0000

Lines not found in flt030_solCanyon010.dat

flt030_solCanyon010_jan23.dat	545779.0000	4074350.0000	61.9000
flt030_solCanyon010_jan23.dat	546426.0000	4074350.0000	1666.5000
flt030_solCanyon010_jan23.dat	546204.0000	4075370.0000	76.9000
flt030_solCanyon010_jan23.dat	546738.0000	4075370.0000	1688.6000
flt030_solCanyon010_jan23.dat	546767.0000	4076390.0000	1671.6000
flt030_solCanyon010_jan23.dat	546272.0000	4076390.0000	46.0000
flt030_solCanyon010_jan23.dat	547086.0000	4077410.0000	1703.3000
flt030_solCanyon010_jan23.dat	546606.0000	4077410.0000	63.8000
flt030_solCanyon010_jan23.dat	547369.0000	4078430.0000	1597.5000
flt030_solCanyon010_jan23.dat	546880.0000	4078430.0000	81.7000
flt030_solCanyon010_jan23.dat	547506.0000	4079450.0000	1595.6000
flt030_solCanyon010_jan23.dat	547016.0000	4079450.0000	93.5000

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EarthVision Rtx 2.9 Geologic Sequence File

3faults Horz.seq

```
Geometry {
        x 545010.000000 550980.000000 40
        y 4074000.000000 4083000.000000 60
        z 0.000000 1800.000000 11
        2DGridSize 40 60
}

Zone "below tcbw" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz080_cfmnn-1_jan23.dat
                        Field z
                }
        }
}

Zone "tcbw" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz070_tcbw_jan23.dat
                        Field z
                }
        }
}

Zone "cfun" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz060_cfun_jan23.dat
                        Field z
                }
        }
}

Zone "ppw" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz050_ppw_jan23.dat
                        Field z
                }
        }
}

Zone "chnln2" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz040_chnln2_jan23.dat
                        Field z
                }
        }
}

Zone "taw23" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz030_taw23_jan23.dat
                        Field z
                }
        }
}

Zone "tptwtsw1" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz020_tptwtsw1_jan23.dat
                        Field z
                }
        }
}

Zone "n3ptn" {
        Operation "Depositional Surface"
        Horizon {
                Reference {
                        Use Yes
                        File hrz010_n3ptn_jan23.dat
                        Field z
                }
        }
}

Zone "tcw" {
        Operation "Unconformity"
}

FaultBlock "ALL" {
        Fault "bowRidge"
        FaultFile flt010_bowRidge020.2grd
        AboveBlock "above bowRidge"
        BelowBlock "1 below bowRidge"
}

FaultBlock "above bowRidge" {
        Fault "ghostDance"
        FaultFile flt020_ghostDance020.2grd
        BoundingPolygon flt020_ghostDance030.ply
        AboveBlock "above ghostDance"
        BelowBlock "2 below ghostDance"
}

FaultBlock "above ghostDance" {
        Fault "solCanyon"
        FaultFile flt030_solCanyon020.2grd
        AboveBlock "4 above solCanyon"
        BelowBlock "3 below solCanyon"
}

FaultBlock "4 above solCanyon" {
        Sequence {
                "below tcbw" hrz080_cfmnn-1_4.2grd
                "tcbw" hrz070_tcbw_4.2grd
                "cfun" hrz060_cfun_4.2grd
                "ppw" hrz050_ppw_4.2grd
                "chnln2" hrz040_chnln2_4.2grd
                "taw23" hrz030_taw23_4.2grd
                "tptwtsw1" hrz020_tptwtsw1_4.2grd
                "n3ptn" hrz010_n3ptn_4.2grd
                "tcw" 020topo.2grd
        }
}

FaultBlock "3 below solCanyon" {
        Sequence {
                "below tcbw" hrz080_cfmnn-1_3.2grd
                "tcbw" hrz070_tcbw_3.2grd
                "cfun" hrz060_cfun_3.2grd
                "ppw" hrz050_ppw_3.2grd
                "chnln2" hrz040_chnln2_3.2grd
                "taw23" hrz030_taw23_3.2grd
                "tptwtsw1" hrz020_tptwtsw1_3.2grd
                "n3ptn" hrz010_n3ptn_3.2grd
                "tcw" 020topo.2grd
        }
}

FaultBlock "2 below ghostDance" {
        Sequence {
                "below tcbw" hrz080_cfmnn-1_2.2grd
                "tcbw" hrz070_tcbw_2.2grd
                "cfun" hrz060_cfun_2.2grd
                "ppw" hrz050_ppw_2.2grd
                "chnln2" hrz040_chnln2_2.2grd
                "taw23" hrz030_taw23_2.2grd
                "tptwtsw1" hrz020_tptwtsw1_2.2grd
                "n3ptn" hrz010_n3ptn_2.2grd
                "tcw" 020topo.2grd
        }
}

FaultBlock "1 below bowRidge" {
        Sequence {
                "below tcbw" hrz080_cfmnn-1_1.2grd
                "tcbw" hrz070_tcbw_1.2grd
                "cfun" hrz060_cfun_1.2grd
                "ppw" hrz050_ppw_1.2grd
                "chnln2" hrz040_chnln2_1.2grd
                "taw23" hrz030_taw23_1.2grd
                "tptwtsw1" hrz020_tptwtsw1_1.2grd
                "n3ptn" hrz010_n3ptn_1.2grd
                "tcw" 020topo.2grd
        }
}
```

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run020_mkGrds.sh

```
#!/bin/sh -e

FEATURE=EV-GMX/SVP
resolution="100,150"
range="545009.000000,550981.000000,4073999.000000,4083001.000000"
fltDir="."
horDir="."

echo "\n-----------------------------------------------------------*
echo "Make fault grid bowRidge..."
echo "-----------------------------------------------------------*
  ev_2grid \
    -o $fltDir/flt010_bowRidge020.2grd \
    -F $FEATURE \
    -r $range \
    -s $resolution \
    -d $fltDir/flt010_bowRidge010_jan23.dat \
    -f 'z' \
    -m 4

echo "\n-----------------------------------------------------------*
echo "Make fault grid ghostDance..."
echo "-----------------------------------------------------------*
  ev_2grid \
    -o $fltDir/flt020_ghostDance020.2grd \
    -F $FEATURE \
    -r $range \
    -s $resolution \
    -d $fltDir/flt020_ghostDance010_jan23.dat \
    -f 'z' \
    -m 4

echo "\n-----------------------------------------------------------*
echo "Make fault grid solCanyon..."
echo "-----------------------------------------------------------*
  ev_2grid \
    -o $fltDir/flt030_solCanyon020.2grd \
    -F $FEATURE \
    -r $range \
    -s $resolution \
    -d $fltDir/flt030_solCanyon010_jan23.dat \
    -f 'z' \
    -m 4

echo "\n-----------------------------------------------------------*
echo "Make topo grid..."
echo "-----------------------------------------------------------*
  ev_2grid \
    -o $fltDir/020topo.2grd \
    -F $FEATURE \
    -r $range \
    -s $resolution \
    -d $fltDir/010topo.dat \
    -f 'z' \
    -m 4
```

1. Build fault grids.

run060 mkHorzGrids.sh

```
#!/bin/sh -e

SEQFILE=3faultsHorz.seq
FEATURE=EV-GMX/SVP

ev_seqgrid -F $FEATURE -o ev6.seq -l ev1.log -z 'n3ptn' $SEQFILE

ev_seqgrid -F $FEATURE -o ev7.seq -l ev1.log -z 'tptwtsw1' ev6.seq

ev_seqgrid -F $FEATURE -o ev8.seq -l ev1.log -z 'taw23' ev7.seq

ev_seqgrid -F $FEATURE -o ev9.seq -l ev1.log -z 'chnln2' ev8.seq

ev_seqgrid -F $FEATURE -o ev10.seq -l ev1.log -z 'ppw' ev9.seq

ev_seqgrid -F $FEATURE -o ev11.seq -l ev1.log -z 'cfun' ev10.seq

ev_seqgrid -F $FEATURE -o ev12.seq -l ev1.log -z 'tcbw' ev11.seq

ev_seqgrid -F $FEATURE -o 3faultsNewH.seq -l ev1.log -z 'below tcbw' ev12.seq
```

2. Build horizon grids for each horizon in each fault block using Geologic Stratum Builder.

run010 MkZoneVolumes.sh

```
#!/bin/sh -e

SEQFILE=3faultsNewH.seq
FEATURE=EV-GMX/SVP
CHECKPOINT=run010MkZoneVolumes.cp

ev_seq3 -F $FEATURE $SEQFILE $CHECKPOINT
ev_seqfaces -o model_jan23a.faces -F $FEATURE $SEQFILE $CHECKPOINT
rm -f $CHECKPOINT
rm 4_above_solCanyon.strc 3_below_solCanyon.strc 2_below_ghostDance.strc 1_below_bowRidge.strc
```

3. Build faulted zone volume model.

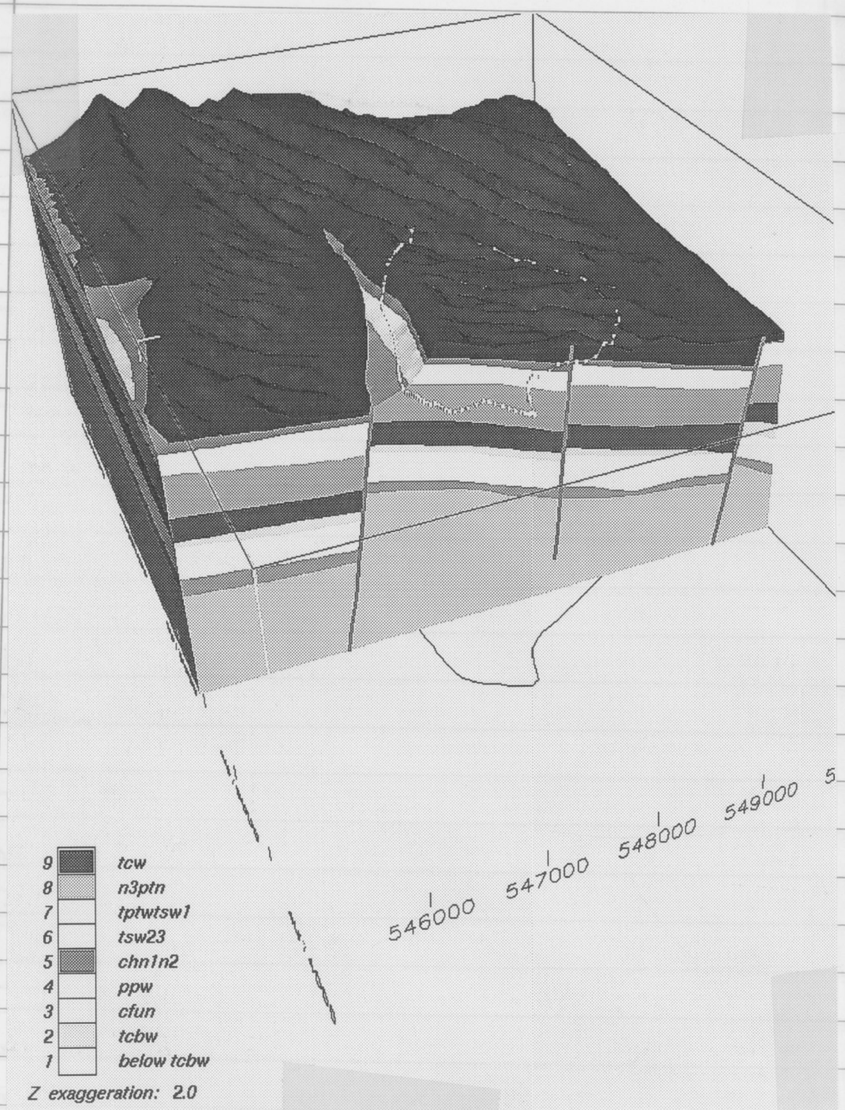
run030MergeFaces.sh

```
#!/bin/sh -e

FEATURE=EV-GMX/SVP

ev_merge -o model_jan23_geo_dig.faces -F $FEATURE << EOF
model_jan20a.faces        0        0
/pscr0/brent/426geoframe/3DModel/010_topoData/topo030M_geo_dig.faces
EOF


ev_merge -o model_jan23_tm.faces -F $FEATURE << EOF
model_jan20a.faces        0        0
/pscr0/brent/426geoframe/3DModel/010_topoData/topo030M_tm.faces
EOF
```

4. Drape image faces file over zone volume model.

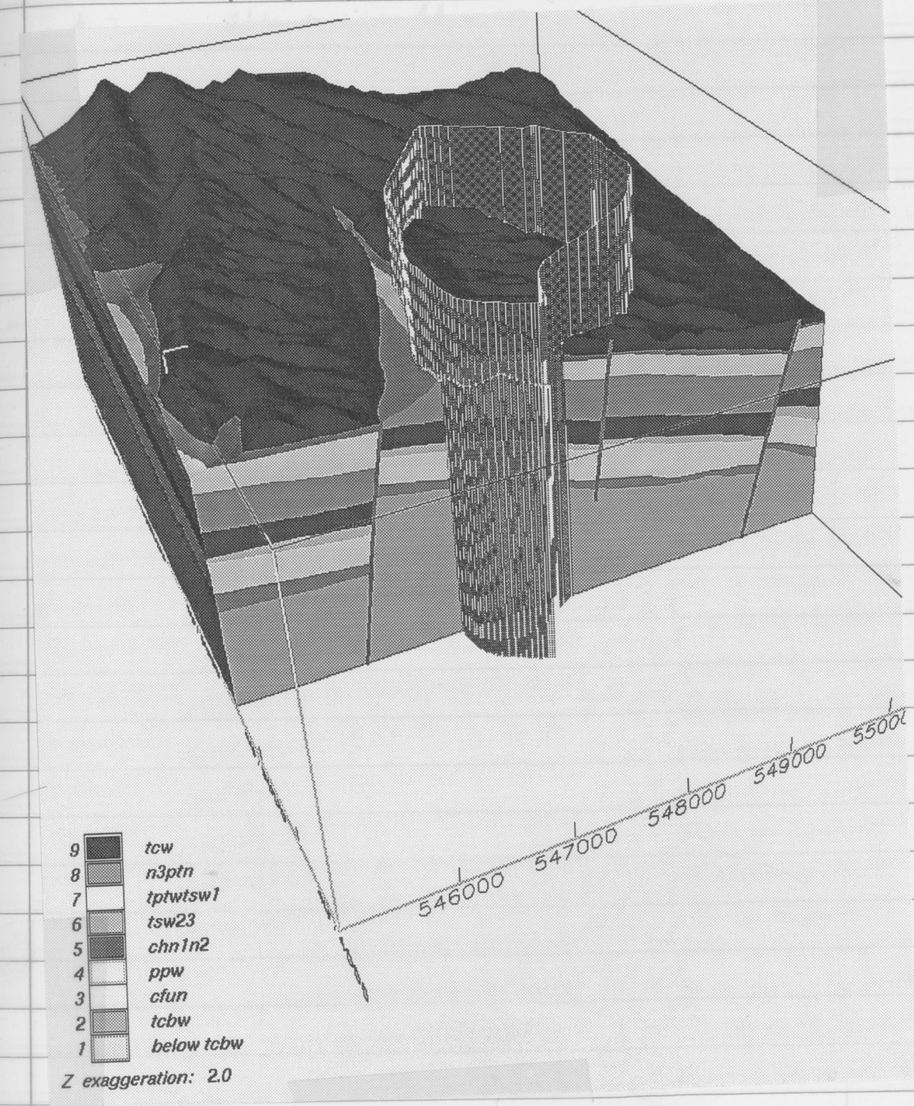
Brett Hahn 1-24-95

Repository footprints + Jan 23rd model:



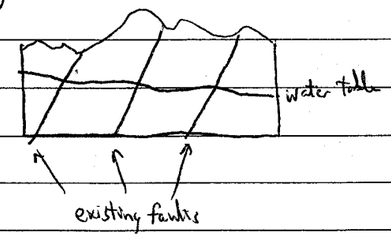
Brett Whitney 1-24-95

Repository + polygon curtains:



Brett Whitney 1-24-95

Difficulty building 3D model with water table as a fault.



Karen Hoffman, DGI Houston, 713-952-2611, 713-952-1832 fax,
Karenh@dgi.com

Karen found that using shorter filenames for horizons works better — bug in EV (Earth Vision).

Also, properties can be entered as constants in Geologic Structure Builder for EV Beta 2.9

1-25-95 BH
Brent Hohn ~~1-25-94~~ BH

CONVERT SCATTERED DATA TO TRAVERSE

To convert an XYZ .dat file to a traverse .trv file copy the header info from a previous .trv file, then cut and paste the XYZ points from the .dat file to the .trv file. Once the points have been copied the Z values must be changed to a traverse number. The format for the two file types is as follows:

XYZ data file	Traverse file
Header info	Header info
X Y Z	X Y T
X Y Z	X Y T
X Y Z	X Y T
.	.
.	.
.	.

EDIT SCATTERED DATA SO THAT THERE IS ONLY 1 TRAVERSE LINE

Where T is the traverse number.

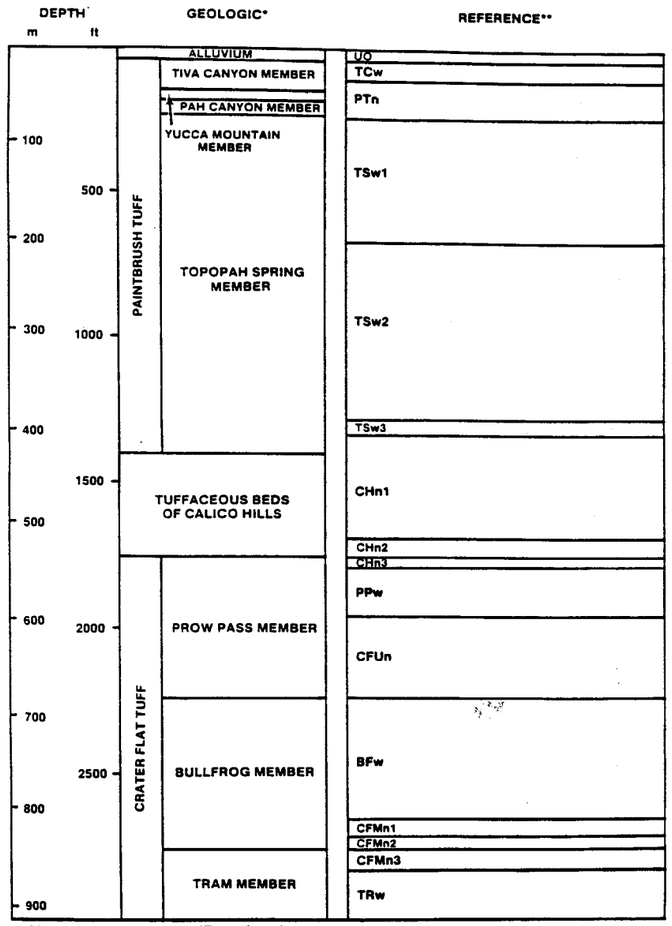
The Z value is meaningless in a traverse file since the traverse is seen in a map view or from overhead.

CONVERT FACES AND TRAVERSE TO ANNOTATION

To create an annotation file from a faces file and a traverse (.trv) file invoke the Earth Vision program evfaces2xsec located in the ev2.9beta directory, load the two files (.faces and .trv), change the color and fill data for each horizon and then select the calculate option from the menu.

Craig Fenwick 3-1-95

REFERENCE AND GEOLOGIC STRATIGRAPHIES IN DRILL HOLE USW G-4



*DEPTHS FROM SPENGLER ET. AL. (1984).
**SEE TABLE 1 FOR DESCRIPTION OF UNITS.

Figure B-1. Correlation between the Reference Stratigraphy and the Geologic Stratigraphy.

ty et al, SAND84-1076)

Brit Hahn 5-19-95

Table 1 1-26-95

YUCCA MOUNTAIN REPRESENTATIVE HYDRAULIC PROPERTIES From Literature Review

Lithologic Unit	Hydrostratigraphic Unit	Saturated Hydraulic Conductivity (matrix, m/s)	Saturated Hydraulic Conductivity (bulk, m/s)	Porosity (matrix)
Tiva Canyon	Tpcw	1.5E-10		0.15
Yucca Mountain	PTn	1.7E-07		0.42
Pah Canyon	PTn	5.4E-08		0.45
Topopah Spring	Tptw/TSw1/TSw2/TSw3			
undifferentiated		2.4E-10		0.16
welded		8.5E-11		0.14
nonwelded		6.8E-08*		0.27*
Calico Hills	CHn1v/CHn1z/Chn2v/Chn2z	4.8E-10		0.30
Prow Pass	PPw	1.4E-09	7.5E-06	0.26
Bullfrog		1.1E-09	3.4E-06	0.21
Tram		3.5E-10	1.6E-06	0.20
Lithic Ridge		1.2E-10	4.0E-07	0.22
older tuffs		2.0E-10		0.14

* single sample

Brit Hahn 5-19-95

May 19, 1995

Objective: Test EV tunnel tools.

Strategy: Test tools using a simple "fake" dataset, then attempt with a more complex dataset.

Rick Johnson 5-19-95

Table 1 ≡ Summary for

welded tuffs in ... "w" units based on borehole data ??? that is w CAN/SHOULD we refine model beyond these "representative values" ???.. 12 Jan 95 JJ

YUCCA MOUNTAIN
"REPRESENTATIVE" HYDRAULIC PROPERTIES
From Literature Review

Lithologic Unit	Hydrostratigraphic Unit	Saturated Hydraulic Conductivity (matrix, m/s)	Saturated Hydraulic Conductivity (bulk, m/s)	Porosity (matrix)
Tiva Canyon	Tpcw "Tpcw"	1.5E-10		0.15
Yucca Mountain	PTn "n2-PTn"	1.7E-07 ← Highest "matrix"		0.42 ← which but to use??
Pah Canyon	PTn	5.4E-08		0.45
Topopah Spring	Tptw/TSw1/TSw2/TSw3			
• undifferentiated	"Tptw-TSw1" (*) and	• 2.4E-10	UNSAT (?)	• 0.16
• welded	"TSw2+3" repository horizon	• 8.5E-11 ← Lowest "matrix"		• 0.14
X nonwelded		X 6.8E-08*		X 0.27*
Calico Hills	CHn1v/CHn1z/Chn2v/Chn2z "CHn1..3-n2"	3.8E-10		0.30
Prow Pass	PPw "PPw"	2.0E-09 <-- NOTE	--> 7.5E-06 ← Highest "bulk"	0.25
Bullfrog	BFw "BFw"	1.1E-09 <-- NOTE	--> 3.4E-06	0.20
Tram		3.5E-10	1.6E-06	0.20
Lithic Ridge		1.2E-10	4.0E-07	0.22
older tuffs		2.0E-10		0.14

* single sample

Rumbaugh Tuff

Crater Flat Tuff

(*) Can the 2 units be distinguished in logs???

"CFTn" ???

Specific model terminology in Sept '94 report

Need hydro. parameters for this non-welded "CF" unit

Rick Johnson 5-19-95

TEST TUNNEL DIRECTORY

May 19, 1995

Objective: Build a test tunnel in EarthVision.

Procedure:

---

1. Decided on volume bounds, 0-1000 m along each axis.

2. Created strat.pdat file with 8 corners of volume with property values of 1.0.

   Note: When using a 3grd as a fault in the Geologic Structure Builder, 1.0 = outside of fault
   0.0 = surface of fault
   -1.0 = inside of fault

   Tunnel cross section:

```
  +1 +1  +1
  +1 0 0 +1
+1 0     0 +1
+1 0 -1  0 +1
+1 0     0 +1
  +1 0 0 +1
  +1 +1  +1
```

3. Created script file, runMkTunnelDat, to create tunnel.pdat file.

4. Created 3grd file from tunnel.pdat (see run030tunnelPdatTo3grd.sh)
   Key: use range of final model 0 1000 0 1000 0 1000
   and 68 x 68 x 68

5. Created script file, runMkHorz, to create horizon dat file.

6. Created 2grd file from horizon.dat (see run010horzDatTo2grd.sh)
   Key: use range of final model 0 1000 0 1000 0 1000

7. Created script file, runMkFault, to create fault dat file.

8. Created 2grd file from fault.dat (see run000faultDatTo2grd.sh)
   Key: use range of final model 0 1000 0 1000 0 1000

9. Brought up Geologic Structure Builder (GSB) in EarthVision.

   a. Defined model range using 0 1000 0 1000 0 1000
   68 x 68 x 68 size

   b. Defined fault sequence using fault1=tunnel.3grd as fault

   c. Defined block sequence as 'below horizon' and 'above horizon' using horizon.2grd as a depositional surface

   d. Saved seq file as model_may19.seq

   e. Calculated faulted zone volume model, model_may19.faces

---

File Listings

```
::::::::::::::
strat.pdat
::::::::::::::
     0.0000000000        0.0000000000        0.0000000000 1.0
  1000.0000000000        0.0000000000        0.0000000000 1.0
     0.0000000000     1000.0000000000        0.0000000000 1.0
  1000.0000000000     1000.0000000000        0.0000000000 1.0
     0.0000000000        0.0000000000     1000.0000000000 1.0
  1000.0000000000        0.0000000000     1000.0000000000 1.0
     0.0000000000     1000.0000000000     1000.0000000000 1.0
  1000.0000000000     1000.0000000000     1000.0000000000 1.0

::::::::::::::
```

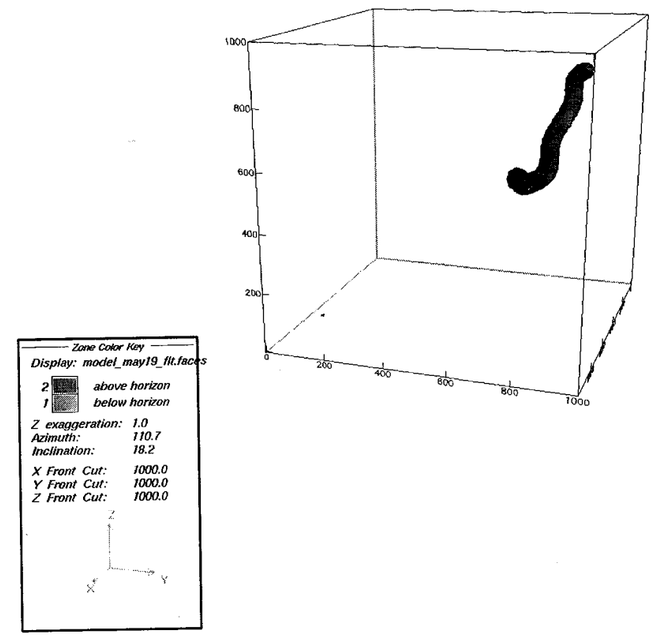
Brit Hokanson 5-19-95


```
::::::::::::::
runMkTunnelDat
::::::::::::::
#!/bin/sh

nawk 'BEGIN {
        dtr = 0.01745
        rad = 30
        y = 800
        z = 800
        yd = 2
        zd = 5
        for (x = 0; x<=1000; x+=10) {
           printf "%20.10f %20.10f %20.10f -1.0\n",
                 x, y, z
           for (a=0; a<360; a+=15) {
              dy = (rad-10) * cos(a*dtr)
              dz = (rad-10) * sin(a*dtr)
              printf "%20.10f %20.10f %20.10f -1.0\n",
                 x, y+dy, z+dz
              dy = rad * cos(a*dtr)
              dz = rad * sin(a*dtr)
              printf "%20.10f %20.10f %20.10f 0.0\n",
                 x, y+dy, z+dz
              dy = (rad+10) * cos(a*dtr)
              dz = (rad+10) * sin(a*dtr)
              printf "%20.10f %20.10f %20.10f 1.0\n",
                 x, y+dy, z+dz
              dy = (rad+30) * cos(a*dtr)
              dz = (rad+30) * sin(a*dtr)
              printf "%20.10f %20.10f %20.10f 1.0\n",
                 x, y+dy, z+dz
           }
           y -=  yd * cos(x * dtr)
           z -=  zd * sin(x * dtr / 4.0)
        }

     }
     {
        print $0
     }' strat.pdat > tunnel.pdat

::::::::::::::
run030tunnelPdatTo3grd.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_3grid -o tunnel.3grd -F $FEATURE -r '0,1000,0,1000,0,1000' -s 68,68,68 -d tunnel.pdat -f 'p' -G tu

::::::::::::::
runMkHorz
::::::::::::::
#!/bin/sh

nawk 'BEGIN {
        z = 550
        for (x = 0; x<=1000; x+=50) {
           dz = 0
           for (y=0; y<=1000; y+=50) {
              printf "%20.10f %20.10f %20.10f\n",
                 x,y,z+dz
           }
           z += 16 * cos(z)
        }
     }'


::::::::::::::
run010horzDatTo2grd.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_2grid -o horizon.2grd -F $FEATURE -r 0.000000,1000.000000,0.000000,1000.000000 -s 118,169 -d horiz

::::::::::::::
runMkFault
::::::::::::::
```

Brit Hokanson 5-19-95

```
#!/bin/sh

nawk 'BEGIN {
        z = 1000
        for (x = 50; x<=750; x+=10) {
           for (y=0; y<=1000; y+=20) {
              printf "%20.10f %20.10f %20.10f\n",
                 x,y,z
           }
           z -= 16
        }
     }'


::::::::::::::
run000faultDatTo2grd.sh
::::::::::::::
#!/bin/sh -e

FEATURE=EV-GMX/SVP
ev_2grid -o fault.2grd -F $FEATURE -r 0.000000,1000.000000,0.000000,1000.000000 -s 118,169 -d fault.d

::::::::::::::
model_may19.seq
::::::::::::::

Geometry {
        x 0.000000 1000.000000 68
        y 0.000000 1000.000000 68
        z 0.000000 1000.000000 68
}

Zone "below horizon" {
        Operation "Depositional Surface"
}

Zone "above horizon" {
        Operation "Fill"
}

FaultBlock "fault1" {
        Fault "fault1"
        FaultFile tunnel.3grd
        AboveBlock "Block1"
        BelowBlock "Block2"
}

FaultBlock "Block1" {
        Sequence {
                "below horizon" horizon.2grd
                "above horizon" ""
        }
}

FaultBlock "Block2" {
        Sequence {
                "below horizon" horizon.2grd
                "above horizon" ""
        }
}
```

Brit Hakes 5-19-95



Tpcw	Tiva Canyon Formation of the Paintbrush Tuff (moderately to densely welded ashflow tuffs)
n3–PTn	undifferentiated formations of the Upper PaintbrushTuff, including the lower Tiva Canyon, Yucca Mountain, Pah Canyon, and Topopah Spring units (nonwelded to partially welded tuffs);
Tptw–TSw1	Topopah Spring Member of the Paintbrush Tuff (lithophysae–rich, moderately to densely welded ashflow tuffs);
TSw2+3	Topopah Spring Member of the Paintbrush Tuff (proposed repository horizon comprised of lithophysae–poor, moderately to densely welded ashflow tuffs with basal vitrophyre);
CHn1..3–n2	undifferentiated Calico Hills, Lower Paintbrush Tuff, and Upper Crater Flat Tuff (zeolitic, nonwelded ashflow tuffs and bedded tuffs);
PPw	Prow Pass Member of the Crater Flat Tuff (moderately welded ashflow tuffs);
CFUn	undifferentiated Upper Crater Flat Tuff, including the Lower Prow Pass and Upper Bullfrog units (zeolitic, nonwelded to partially welded ashflow tuffs and bedded tuffs);
BFw	Bullfrog Member of the Crater Flat Tuff (moderately to densely welded ashflow tuffs).

Brit Hakes 5-19-95

'9/95

in USGS 30 meter resolution map

runExtractArea with dem9.xyz as input

new_area.xyz as output

with East range 542900 — 554100

North range 4069900 — 4085100

create rgb file from ~~xv with~~ runNewArea.xyz2rgb

new_area.xyz as input

new_area.rgb as output

create 2d grid file with Earth vision - modeling → 2-D minimum tension gridding

files generated:

new_area.2grd

new_area.2grpt

new_area.sh

How to use EarthVision to make nicely clipped color contour maps rather than jagged edge contour maps.

1

runDatToPly.sh

11/09/95 11:52:03

```
#!/bin/sh -e
FEATURE=SV-OHX/SVP
ev_ftoxyz -o \
    tmp.2grd \
    -f SPEAKER \
    -s 525000,516258,250000,4068692,350000,4070248,650000 \
    -n 144,120 \
    -o allpts.dat \
    -c allpts.ply \
    -f 1 \
    -f 2 \
    -x \
    -y \
rm tmp.2grd
```

1

runMkAllptsPlt2.sh

11/09/95 11:51:29

```
#!/bin/sh -e
RANGE=-534455,400000,536172,400000,4068754,000000,4069987,000000
SCALE=100
COLORTABLE=ts.clt
TEXTURE=SV-OHX/SVP
FONTDIR=/usr/dg151/rv2.2beta/rle
ev_ftc -r $RANGE -s $SCALE -e -C $COLORTABLE -F $FEATURE -n 9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55
ev_contour -r $RANGE -s $SCALE -C $COLORTABLE -F $FEATURE -i 500 -I 2000 -p 1,2 -v 0.03 -t 0.1 -S 0.06,0.06 -B allpts.ply allpts.2grd
rv_shaderlist -r $RANGE -s $SCALE -C $COLORTABLE -F $FEATURE -f $FONTDIR -p 1 -y 100 -x 200
```

Bob Hitz
12-20-95

3D · Model Refinements for FY96:

3D Model Task Group Needs List for FY96 — 15-Nov-95

Priority	Item	Est Manhrs
1	Add faults: Paintbrush, Sundance	120
2	Add units below Bullfrog: especially units in contact with watertble	40
3	Extend model boundaries: N-hydro grad,S-FFA dose modeling	160
4	Construct/incorporate new cross sections	120
5	Refine picks of strata boundaries using new BH and xsecs	80
6	Add data from USGA/Geotrans Dbase for NTS-ER program	?
7	Show stepped geometric relationships of faults and watertable	40
8	Saturated zone: to evaluate DOE's model of SZ as big sand aquifer	?
9	Identify biosphere, including withdrawl water wells for dose modeling	?
10	Add prop to units: engr rock-mass RQDs, geochem/mineral, hydro	
11	Compare/contrast with LBLs (Bovardsson's) 3D hydro model	120
12	Illustrate scaling factor problems, such as porosity from core	?
13	Add alluvium: Quaternary alluvium and covermass recharge zones	120
14	Add ESF tunnel: use new geol maps, geotech data, surveys	160
15	Explore limitations of modeling 1000s of joints/fractures in 3D	? 120
16	Illustrate Allan diagrams across faults	120
17	Create slope hazard model DOE sources?	?
	Zones of perched water	
	GIS magnetic/gravity data	

c:\brent\div20\3dmodel\fy96tsks.xls

1200 (3 dys/wk)

• Plot of Wholes ☐ (David)

Brent Hilmes
12-20-95

FAX from P. Justice, NRC, 11-14-95 on refinements:

DWM TEL:301-415-5398 Nov 14'95 12:19 No.005 P.04

Stee

3-D MODELING/GIS TASK-GROUP NEEDS LIST FOR FY96

[List combines CNWRA proposals and Participants' ideas from 11/2/95 Demonstration meeting]

(3)* Extend model boundaries: northward to capture hydraulic gradient anomaly; southward to include FFA for dose modeling; below Lathrop Wells, Wahmonie, Beatty

(4)* Construct/incorporate cross sections: two E-W geologic sections to supplement Scott and Bonk's

(1)* Add faults: consider Paintbrush, Sundance

(13)* Add alluvium: Quaternary alluvium and covermass are recharge zones

(5)* Refine picks of strata boundaries and fault-strata intersections using new BH and crossection controls

(19)* Add ESF tunnel: use new geologic maps, geotechnical data, tunnel surveys

(10)* Add properties to units: e.g., engineering rock-mass characteristics (RQDs), geochemical/mineralogical distributions (zeolites), hydrologic properties

(9)* Identify biosphere, including withdrawal water wells, for dose modeling

(8)* Saturated zone: to evaluate DOE's model of SZ as big sand aquifer

(6)* Add data from USGS/Geotrans Dbase for NTS-ER program: use to extend model boundary and establish boundary conditions

(11)* Compare/contrast with LBLs (Bovardsson's) 3-D Hydro Model

(2)* Add units below the Bullfrog: especially add units in contact with watertable

(17)* Create slope hazard model

(7)* Show stepped geometric relationships of faults and watertable

(12)* Illustrate scaling-factor problems, such as porosity from core to repository scale

(16)* Illustrate utility of Allen diagrams with regard to flow across faults

(15)* Explore limitations of modeling thousands of joints and faults in 3-D

* Zones of perched water
* GIS mag. grav. geol

Brent Hilmes
12-20-95

TRIP REPORT :

TRIP REPORT

SUBJECT: Demonstration of 3D Geologic Framework Model with Hydrologic Application to NRC Staff (20-5702-425)

DATE/PLACE: November 2, 1995
Nuclear Regulatory Commission
TWFN-Rockville, Maryland

AUTHOR: Brent Henderson

PERSONS PRESENT: Brent Henderson, CNWRA
Gerry Stirewalt, CNWRA
Approximately 20 NRC Staff

BACKGROUND AND PURPOSE OF TRIP:

The CNWRA has constructed a 3D geological framework model of Yucca Mountain, Nevada, with hydrologic application for the Nuclear Regulatory Commission (NRC) under Contract No. NRC-02-93-005. An updated version of the 3D geological model was delivered to the NRC on September, 1995, along with a report presenting a summary of the new features of the updated model. In conjunction with the release of the updated model, a demonstration of the 3D geological model was given on November 2, 1995 at the TWFN-Rockville, Maryland, NRC facilities. The purpose of the demonstration was to familiarize NRC staff with the new features and capabilities of the updated 3D model. In addition, the demonstration was an opportunity for CNWRA staff to present a list of future refinements to the 3D model and to request input from NRC staff on their desires for refinements to the 3D model.

SUMMARY OF PERTINENT POINTS:

Gerry Stirewalt and Brent Henderson presented a summary of new features and capabilities of the 3D geological framework model to approximately 20 NRC staff members. The demonstration was conducted on a Silicon Graphics computer workstation using the EarthVision visualization software system from Dynamic Graphics, Inc.

Gerry Stirewalt presented the significant new features and capabilities of the updated 3D model which included:

- Added two new lithostratigraphic units (CFUn and BFw)
- Refined fault and lithostratigraphic horizon intersections
- Added Landsat and aerial photograph draped imagery
- Refined surface outcrop representations
- Added water table representation
- Added fault block removal capability

A preliminary 3D hydrostratigraphic model was also presented as an example of an application of the 3D geological framework model. In addition, Gerry Stirewalt presented a

12-20-95

trip report continued:

list of planned refinements to the 3D model for FY96. The list of planned refinements to the 3D model for FY96 included:

- Extend model boundaries
- Construct and incorporate two new cross sections
- Add more faults
- Add alluvium
- Refine horizons and faults using additional borehole and cross section control data
- ESF tunnel modeling
- Representation of engineering, geochemical, and hydrologic properties

During the discussions NRC staff commented on some other desired refinements to the 3D model for FY96:

- Measure thickness of overburden relative to water table
- Extend boundaries further south and across Fortymile Wash
- Measure alluvium thicknesses
- Incorporate cross section from Amargosa Valley
- Model water table with surface discontinuities at faults
- Investigate scalability of hydrologic properties
- Produce Allan diagrams at fault surfaces
- Model nuclide plumes in 3D
- Investigate methods of modeling fractures data

CONCLUSIONS:

The 3D model demonstration was an effective way of familiarizing NRC staff with the updated 3D model. In addition, the demonstration meeting was an excellent opportunity for CNWRA staff to hear from several NRC groups on their desires for refinements to the 3D model for FY96.

PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

None.

RECOMMENDATIONS:

Modify and prioritize the list of refinements to the 3D geological framework model for FY96 according to comments from the demonstration meeting.

12-20-95

Sources of data on boreholes

12/20/95 15:00:05 **borehole.txt** 1

```
For Lithologic Units:
Listing of Boreholes and sources of data for each:

borehole ID                    data sorurces
                        physical                electronic
-------------------------------------------------------------
USW   G1                note book               boreholes.pdat
      G2                note book                     "
  G3/GU3                note book                     "
      G4                note book                     "
      H1                note book                     "
      H4                note book               boreholes.pdat
      H5                note book
      H6                note book               boreholes.pdat
     UZ1                note book                     "
     UZ4                note book                     "
     UZ5                note book                     "
     UZ6                note book                     "
    UZ13                note book               boreholes.pdat

     J13                note book               boreholes.pdat

UE25  a1                                        boreholes.pdat
UE25  a4                note book               boreholes.pdat
      a5                note book
      a6                note book               boreholes.pdat
      a7                note book
      b1                note book               boreholes.pdat
      c1                                        boreholes.pdat
      c2                                        boreholes.pdat
      p1                note book
```

12/21/95 / David Allen

Earthvision SWRI Utilities
required lines in user's .evrc file

Earthvision's .evrc file only neccessary sections are printed

```
# Default EarthVision main menu specification
```

The main menu

```
Menu EarthVision
{
    File                _F    f.menu File
    Edit                _E    f.menu Edit
    Modeling            _M    f.menu Modeling
    Visualization       _V    f.menu Visualization
    Utilities           _U    f.menu Utilities
    Help                _H    f.menu Help
}
```

Select Utilities

The utilities menu

```
Menu Utilities
{
    "Volumetrics"                _V    f.menu Volumetrics
    "Formula processor"          _F    f.checkexec "evfp"
    "Well database operations"   _W    f.checkexec "evdbm"
    "Coordinate transformation"  _C    f.checkexec "evct"
    "Data import"                _D    f.menu DataImport
    "Grid Operations"            _G    f.menu GridOps
    "Slope Analysis"             _S    f.menu SlopeAnalysis
    "SwRI Utilities"                   f.menu Swri
}
```

select Swri

The SWRI menu

```
Menu Swri
{
    "Surface area"                     f.checkexec "surfareaMacro.sh"
    "XYZ to XY"                        f.checkexec "xyzToxyMacro.sh"
    "Difference of Two 2D-Grids"       f.checkexec "diff2Macro.sh"
    "Line of Intersection 2D-Grids"    f.checkexec "line_interMacro.sh"
    "Create Fault Property File"       f.checkexec "flt_propMacro.sh"
    "Find Difference of Unit Tops"     f.checkexec "PPw_DiffMacro.sh"
}
```

Choose the Macro you want to run

12/21/95 / David Allen

Swvi macro available to all Earthvision users

12/20/95 14:54:33 **xyzToxyMacro.sh** 1

```
#!/bin/sh

evmacro \
   -geom 500x250 \
   -title "Convert XYZ to XY" \
   -file pdat -variable 'input' -label "Input xyz.pdat file" \
   -number -variable 'x' -label "Constant X value" \
   -file pdat -variable 'output' -label "Output xy.pdat file" \
   -exec "xyzToxy.sh \$input \$output \$x"
```

12/21/95 / David Allen

12/20/95 14:54:45 **xyzToxy.sh** 1

```
#!/bin/sh

input=$1
output=$2
x=$3

echo "\nCopying $input to $output using $x..."
cp $input $output

echo "\nModifying $output..."

echo "${output}<x> = ${x};" > tmp.fml
echo "${output}<y> = ${input}<z>;" >> tmp.fml
echo "${output}<z> = ${input}<p>;" >> tmp.fml
echo "${output}<x_old> = ${input}<x>;" >> tmp.fml
echo "${output}<y_old> = ${input}<y>;" >> tmp.fml

ev_fpfp -u -F EV-GMX/SVP < tmp.fml

rm tmp.fml

echo "\nFinished, created", ${output}
```

Takes .pdat file as input
returns pdat file as output.
In output file:
- x - is a constant value
- y - is the input z value
- z - is the input p value
- x_old - the orginal x value
- y_old - the orginal y value

12/21/95 / David W. Allen

Swvi macro available to all Earthvision users.

12/20/95 14:49:13 **surfareaMacro.sh** 1

```
#!/bin/sh

evmacro \
   -geom 500x250 \
   -title "Surface Area" \
   -grid2 -variable 'input' -label "Input grid" \
   -file dat -variable 'output' -label "Output data file" \
   -exec "surfarea.sh \$input \$output"
```

12/20/95 / David Allen

Script executed by "Surfacearea Macro"

12/20/95 14:49:24 **surfarea.sh** 1

```
#!/bin/sh

inputgrid=$1
output=$2

echo "Exporting 2grd file..."
ev_export -o tmp.dat $inputgrid


echo "Computing surface area..."
/usr/bin/nawk '

function abs(value) {
  return (value > 0 ? value : -value);
}

BEGIN {
  xcol = 0;
  yrow = 0;
  GridNullValue = 1.0e20;
  Epsilon = 1.0e15;
}

$2 ~ /Grid_size:/ && NF == 5 { xcol = $3;
          yrow = $5;
          for (i=0; i<xcol*yrow; i++)
     z[i] = GridNullValue;
        }

$1 ~ /#/ { next; }

NF == 5 { ix = $4;
   iy = $5;
#          Wasteful, but works!
   x[ix] = $1;
   y[iy] = $2;
   z[iy * xcol + ix] = $3;
 }

END {
  if (!xcol || !yrow) {
    print "No Grid_size found!";
    exit 1;
  }

  area = 0;
  nullCount = 0;

  for (j=1; j<yrow; j++) {
    y1 = y[j];
    y2 = y[j+1];
    for (i=1; i<xcol; i++) {
      x1 = x[i];
      x2 = x[i+1];

      z1 = z[j * xcol + i];
      z2 = z[j * xcol + i + 1];
      z3 = z[(j+1) * xcol + i];
      z4 = z[(j+1) * xcol + i + 1];

      if (abs(z1 - GridNullValue) < Epsilon ||
   abs(z2 - GridNullValue) < Epsilon ||
   abs(z3 - GridNullValue) < Epsilon ||
   abs(z4 - GridNullValue) < Epsilon)
 nullCount++;
```

12/21/95 / David W. Allen

cont

12/20/95
14:49:24

surfarea.sh **2**

```
      else {
 a = sqrt ((y1-y2)*(y1-y2) + (z1-z3)*(z1-z3));
 b = sqrt ((x1-x2)*(x1-x2) + (z1-z2)*(z1-z2));
 c = sqrt ((x1-x2)*(x1-x2) + (y1-y2)*(y1-y2) + (z2-z3)*(z2-z3));
 d = sqrt ((x1-x2)*(x1-x2) + (z3-z4)*(z3-z4));
 e = sqrt ((y1-y2)*(y1-y2) + (z2-z4)*(z2-z4));

 s = (a + b + c) * 0.5;
 area += sqrt (s * (s-a) * (s-b) * (s-c));

 s = (c + d + e) * 0.5;
 area += sqrt (s * (s-c) * (s-d) * (s-e));
      }
    }
  }

  printf "%s", area;
  if (nullCount)
    printf "  %s\n", nullCount;
}

' tmp.dat > $output

echo "Area is: \c"
cat $output
echo " "
echo "Done"
rm tmp.dat
```

12/21/95 David Allen

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Sori utility macro not currently available to all users.

12/20/95 13:41:26 **flt_propMacro.sh** 1

```
#!/bin/sh

evmacro \
        -geom 500x250 \
        -title "Create Fault Property Data File" \
        -grid2 -variable 'input1' -label "Input fault 2-d grid file name" \
        -grid3 -variable 'input2' -label "Input property 3-d grid file name" \
        -file pdat -variable 'output' -label "Output fault p-dat file name" \
        -exec "flt_prop.sh \$input1 \$input2 \$output"
```

12/21/95 / David Allen

script for flt_prop Macro

12/20/95 13:42:04 **flt_prop.sh** 1

```
#!/bin/sh -e


# Script called from flt_propMacro.sh
# Creates a property data file for a fault by
# taking the properties from a surrounding 3grid
# file and building pdat file for the fault.
# input1 = fault 2-D grid file
# input2 = surrounding 3-D grid file
# output = fault pdat file


echo "flt_prop.sh goes here"

input1=$1
input2=$2
output=$3

echo "Input and output files"
echo $1
echo $2
echo $3


echo "Bakint3 formula"
echo "tmp.2grd=bakint3d(($2),($1))"
echo "tmp.2grd=bakint3d(($2),($1))">tmp.fml
ev_fpfp -u -i tmp.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Done with bakint3"

echo "Converting to .dat file"
ev_export -o tmp.dat tmp.2grd
echo "Finished conversion"

echo "Adding property field"
echo "tmp.dat<p>=tmp.dat<z>"
echo "tmp.dat<p>=tmp.dat<z>">tmp.fml
ev_fpfp -u -i tmp.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Done adding property field"

echo "Calculating new Z value"
echo "Bakint formula"
echo "tmp.dat<z>=bakint(($1),tmp.dat<x>,tmp.dat<y>)"
echo "tmp.dat<z>=bakint(($1),tmp.dat<x>,tmp.dat<y>)">tmp.fml
ev_fpfp -u -i tmp.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Done with bakint."

echo "Copy to output file"
cp tmp.dat $3
echo "Finished"
rm tmp.dat
rm tmp.fml
rm tmp.2grd
```

12/21/95 / David Allen

Swri utility macro not currently available to all Earthvision users

12/20/95 13:48:26 **PPw_DiffMacro.sh** 1

```
#!/bin/sh

evmacro \
        -geom 500x350 \
        -title "Lithographic Difference Between BHoles and 2DGrid" \
        -grid2 -variable 'input1' -label "Horiz. Flt_Block 2DGrid File" \
        -file pdat -variable 'input2' -label "Borehole Pdat File" \
        -exec "PPw_Diff.sh \$input1 \$input2 \$output"
```

This macro is user specific require specific input file format for pdat file.

12/21/95 / Daniel W. Allen

script for PPw_DiffMacro

12/20/95 13:48:39 **PPw_Diff.sh** 1

```
#!/bin/sh

#  Called from PPw_DiffMacro.sh
#  Takes a horizon 2dgrid file and borehole pdat file
#  and returns difference of unit top and horizon grid value.
#  input1 is the horizon 2d-grid file
#  input2 is the borehole pdat file

input1=$1
input2=$2

outFile=`echo $2 | nawk -F "." '{print $1}'`.dat

nawk 'BEGIN{
        }
        {
          if ((NF > 0)&&($4 == 3.1)){
             printf "%10.4f\t%10.4f\t%10.4f\n",$1,$2,$3
          }
      }
      END{  }' $2 > $outFile

echo "Finished extracting lithographic unit top value. \007"
echo "Difference Formula"
echo "$outFile<d>=$outFile<z>-bakint(($1),($outFile<x>),($outFile<y>))"
echo "$outFile<d>=$outFile<z>-bakint(($1),($outFile<x>),($outFile<y>))">tmp.fml
echo "Calculating difference between horizon file and unit top value."
ev_fpfp -u -v -i tmp.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Calculation Complete"
echo "Output is in file \"$outFile\"."
rm tmp.fml
echo "# Calculations made from:">>$outFile
echo "# \"$1\" unit top horizon file">>$outFile
echo "# and \"$2\" lithographic borehole data file.">>$outFile

nawk 'BEGIN {
        rmfile = 1
      }
      {
        if (substr($0,1,1) != "#") rmfile = 0
      }
      END {
        if (rmfile) {
           printf "rm %s", FILENAME
        }
      }' $outFile  > tmp789.sh

chmod +x tmp789.sh

tmp789.sh

rm tmp789.sh

echo "Finished"
```

12/21/95 / Daniel Allen

Swri utility macro not currently available to all Earthvision users

12/20/95 13:49:01 **line_interMacro.sh** 1

```
#!/bin/sh

evmacro \
        -geom 500x250 \
        -title "Calculate the Line of Intersection" \
        -grid2 -variable 'input1' -label "Topographical Grid" \
        -grid2 -variable 'input2' -label "INtersecting Grid"\
        -file dat -variable 'output' -label "Intersecting Line Data File" \
        -exec "line_inter.sh \$input1 \$input2 \$output"
```

12/21/95 David W. Allen

script for "line_inter Macro"

12/20/95 13:49:13 **line_inter.sh** 1

```
#!/bin/sh -e

# Script called from "line_interMacro.sh"
# Calculates the line of intersection from
# topo 2-d grid and flt 2-d grid
# input1 = topo grid
# input2 = flt grid
# output = data file for line of intersection

input1=$1
input2=$2
output=$3

echo "Inputs and Output Files"
echo $1
echo $2
echo $3

echo "Difference Formula"
echo "tmp.2grd = $1 - $2"
echo "tmp.2grd=($1)-($2)" >diff.fml
echo "Calculating difference"
ev_fpfp -u -i diff.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Done with difference"

echo "Calculating contour"
RANGE=`ev_dump -r tmp.2grd`
SCALE=500
ev_contour -r $RANGE -s $SCALE -F EV-GMX/SVP -o $3 -x '0,1,1,0.01,1' -X tmp.2grd > /dev/null
echo "Done with contour."

echo "Bakint Formula"
echo "$3<z>=bakint($2,$3<x>,$3<y>)"
echo "$3<z>=bakint(($2),($3<x>),($3<y>))">line.fml
echo "Calculating bakint"
ev_fpfp -u -i line.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Done with bakint"
rm tmp.2grd
rm diff.fml
rm line.fml
```

12/21/95 / David Allen

Swvi utility macro not currently available to all Earthvision users

12/20/95 13:49:40 **diff2Macro.sh** 1

```
#!/bin/sh

evmacro \
        -geom 500x250 \
        -title "Difference of Two 2D Grids" \
        -grid2 -variable 'input1' -label "Input Grid 1" \
        -grid2 -variable 'input2' -label "Input Grid 2" \
        -file dat -variable 'output' -label "Output data file" \
        -exec "diff2.sh \$input1 \$input2 \$output"
```

12/21/95 / Daniel Allen

script for "diff2Macro"

12/20/95 13:50:00 **diff2.sh** 1

```
#!/bin/sh -e

#  Called from diff2Macro.sh
#  Takes 2 2-D grid files and returns difference
#     of "z" values as a .DAT file

input1=$1
input2=$2
output=$3

echo "tmp.2grd= $input1-$input2" >diff.fml

ev_fpfp -u -i diff.fml -F EV-GMX/SVP << 'EOF'
EOF

ev_export -o $3 tmp.2grd > /dev/null
rm tmp.2grd
rm diff.fml
```

12/21/95 / Daniel Allen

12/20/95
15:49:07

runGoodHoles

1

```
#!/bin/sh

 # Script to extract borehole locations from file
 # "EXTBHUTM.TTAB" that are greater than 30 meters
 # in depth.
 # Creates an annotation file as output.
 # Output file name is fixed.

 outfile="goodholes.ann"
 echo "$outfile"

 nawk 'BEGIN{
                goit = 0
                depth = 0
                activity = 0
            printf "# Type: annotation data\n"
            printf "# Version: 1\n"
            printf "# Format: free\n"
            printf "# Field 1 x\n"
            printf "# Field 2 y\n"
            printf "# Projection: Local Rectangular\n"
            printf "# Units: unknown\n"
            printf "# End:\n"
            printf "# Version_of_attributes: 2.1\n"
            printf "# Ploting_units: inches\n"
            printf "# Scale: 1000\n"
            printf "# Attributes: \"Text 1\"\n"
            printf "     type: label\n"
            printf "     kind: symbol\n"
            printf "     anchor: 5\n"
            printf "# Attributes: \"Symbol 1\"\n"
            printf "#    type: symbol\n"
            printf "#    size: 0.03\n"
            printf "#    pattern: 24\n"
            printf "# End_attributes:\n"
            printf "version 2.1\n"
            }
            {
            if(NF > 0) {
               if($1 == "DESIG") {
                  desig = $3
               }
               else if($1 == "ACTIVITY_ID") {
                  id = $3
                  rid = $4
               }
               else if (($1 == "DEPTH")&&($3 > 100)) {
                  depth = 1
               }
               else if($1 == "EASTING_UTM") {
                  east = $3
               }
               else if($1 == "NORTHING_UTM") {
                  north = $3
                  goit = 1
               }
               else if($1 == "ACTIVITY_TYPE") {
                  if(($3 == "Exploratory")||($3 == "Hydrologic")||
                     ($3 == "Exploratory-Volcanic/Hydrologi")||
                     ($3 == "Exploritory")) {
                      type = $3
                      activity = 1
                  }
               }
               if((depth == 1)&&(goit == 1)&&(activity == 1)) {
```

12/21/95 / David Allen

12/20/95
15:49:07

runGoodHoles

2

```
                  printf "setatr \"Symboll\"\n"
                  printf "group\n"
                  printf "srfsym\n"
                  printf "%f\t%f\n",east,north
                  printf "setatr \"Text 1\"\n"
                  printf "label %d\n",x++
                  printf "%f\t%f\t\"%s %s%s\"\t\"%s\"\n",east,north,desig,id,rid,type
                  printf "endgrp\n"
                  goit = 0
                  activity = 0
                  depth = 0
               }
            }
            }
         END{  }' $1 > $outfile
echo "Finished. \007"
```

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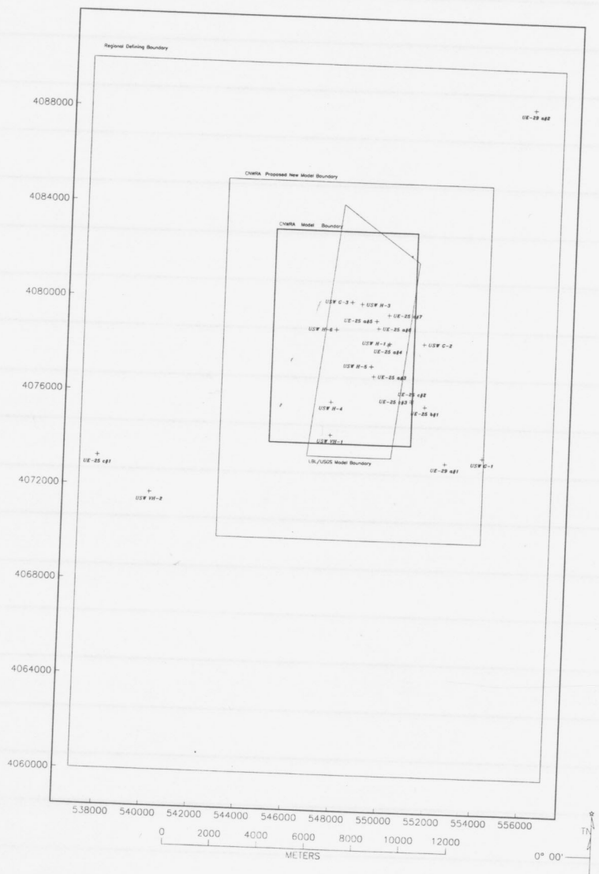
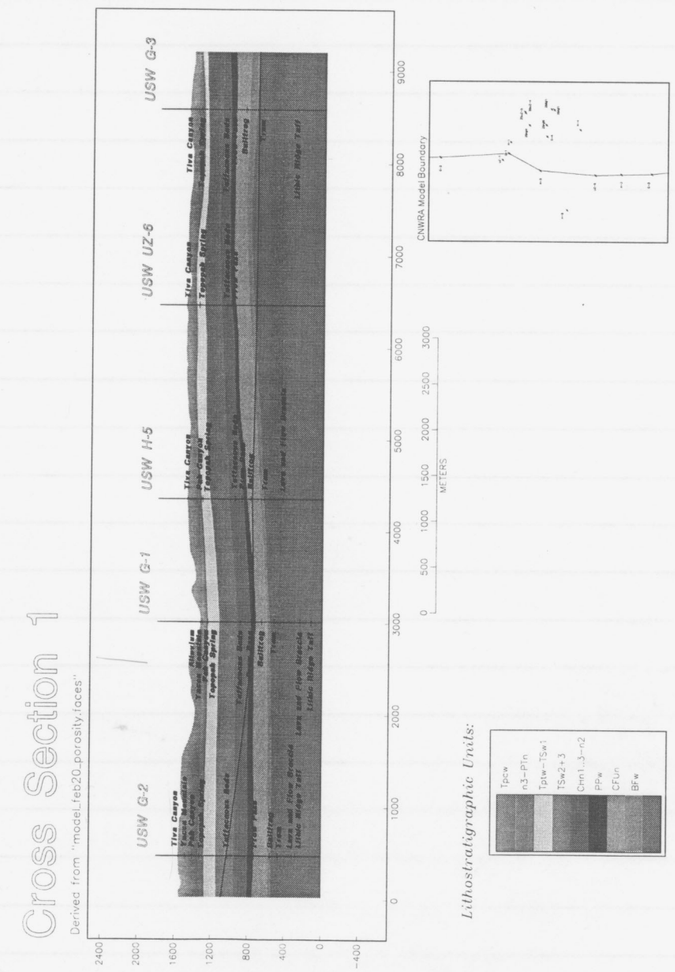
This drawing was derived from data contained in file "EXTBHUTM.TTAB"



Plot of Boreholes with Depth Greater Than 30 Meters

12/21/95 / David Allen

Cross Section created from file "MODEL_FEB20_POROSITY.FACES"
Borehole Unit Tops derived from files created from "UNITTOPS.TXT"
Plot filename: "XSEC1.PS"



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Files used in xsection comparison of model and lithographic borehole data.

Lithographic borehole data files:

```
g_1.pdat
g_2.pdat
g_3.pdat
g_4.pdat
h_1.pdat
h_4.pdat
h_5.pdat
h_6.pdat
ue25_a4.pdat
ue25_a6.pdat
ue25_b1.pdat
ue25_uz_4.pdat
ue25_uz_5.pdat
uz_1.pdat
uz_13.pdat
uz_6.pdat
```

Property values assigned to unit tops in Lithographic borehole data files:

List of lithologic properties for cross sections:

Lithologic Unit	Property Value
Alluvium	0
Paintbrush Tuff	
Tiva Canyon	1.1
Bedded Tuff_1	1.2
Yucca Mountain	1.3
Bedded Tuff_2	1.4
Pah Canyon	1.5
Bedded Tuff_3	1.6
Topopah Spring	1.7
Bedded Tuff_4	1.8
Calico Hills	
Tuffaceous Beds	2.1
Bedded Tuff_5	2.2
Crater Flat Tuff	
Prow Pass	3.1
Bedded Tuff_6	3.2
Bullfrog	3.3
Bedded Tuff_7	3.4
Tram	3.5
Bedded Tuff_8	3.6
Lava and Flow Breccia	4
Lithic Ridge Tuff	5

Files for each xsection comparision:

XSEC1

```
g_1x.ann
g_1x.pdat
g_2x.ann
g_2x.pdat
g_3x.ann
g_3x.pdat
h_5x.ann
h_5x.pdat
uz_6x.ann
uz_6x.pdat
xsec1.ann
xsec1.iplt
xsec1.ps
xsec1.trv
```

XSEC2B

```
g_4x2b.ann
g_4x2b.pdat
h_5x2b.ann
h_5x2b.pdat
ue25_a6x2b.ann
ue25_a6x2b.pdat
ue25_b1x2b.ann
ue25_b1x2b.pdat
xsec2b.ann
xsec2b.iplt
xsec2b.ps
xsec2b.trv
```

XSEC3

```
h_4x3.ann
h_4x3.pdat
h_5x3.ann
h_5x3.pdat
xsec3.ann
xsec3.iplt
xsec3.ps
xsec3.trv
```

XSEC4

```
g_1x4.ann
g_1x4.pdat
h_1x4.ann
h_1x4.pdat
ue25_uz_5x4.ann
ue25_uz_5x4.pdat
uz_1x4.ann
uz_1x4.pdat
xsec4.ann
xsec4.iplt
xsec4.ps
xsec4.trv
```

XSEC5

```
h_6x5.ann
h_6x5.pdat
ue25_a4x5.ann
ue25_a4x5.pdat
ue25_uz_4x5.ann
ue25_uz_4x5.pdat
xsec5.ann
xsec5.iplt
xsec5.ps
xsec5.trv
```

12/21/95 David Allen

Revised 4/29/96
See page 140

To plot files on HP plotter:
From Earthvision main menu selected Visualization
From visualization select base & contour map
From base & contour maps:
chose contour map if grid file available.
choose base map if annotation file
select plot size close to plot paper size
select calculate and edit from calculate
This will put you in the graphic editor
where you can edit or rotate the plot
while maintaining ticks and scale of plot.
When finished editing save as "dgi plot file"
and exit.
From unix prompt run "plotev" to convert
dgi plot file to hpgl format.
plotev will prompt for plot file name
Ask for a plot scaling method, choose
2) by desired x,y frame size.
Enter size close to plot paper size (32,24)
returns a file named "junk.file" which
is in hpgl format.
To plot:
lpr -P plotter junk.file

12/21/95 David W. Allen

To create cross sections that display outcrop data points derived from FRIZZEL outcrop polygons:

1) Convert ARCINFO ".lin" of Frizzel surface polygons to Earthvision "*.ply" files with script file "runLinToPly <fname.lin>".*

2) Using "evedit" create traverse line (.trv file) thur borehole and extending to boundry edges. Generally endpoints and a controling borehole.

3) Find the intersection points.
Run program "testPly fname.ply fname.trv outfile.dat" "outfile.dat" contains end points, and intersection points of traverse line and surface polygon.

4) Using "evedit" create new traverse line to include end points, borehole location, and intersection points.

5) Run "evfaces2xsec" to create cross section using "model_feb20_porosity.faces" and the traverse line (.trv) file created in step 4.

6)Import borehole data:
a) Using "evedit" find X location of borehole on cross section. Snap to borehole crease line and record X value.
b) Using SWRI utility "XYZ to XY" create ".pdat" file with this X value as the constant argument, and the original borehole ".pdat" file as the input file argument. The output file also ".pdat" contains the borehole information relative to the cross section crease line.
c) Using script "runPdatToAnn <fname.pdat>" an annotation file is created with stratographic layer names for posting the borehole information in the cross section.

7) The intersection points are represented as crease lines and can be edited or manipulated as any other line would be.

Note: This process is cross section specific.

1/23/96 / David Allen


```
#!/bin/sh

# Usage:  runLinToPly <infile.lin>

#   David W. Allen
#   01-23-96
#   Convert ARCINFO .lin file to Earthvision .ply file.
#   checks to insure that X value of .lin file > 500000
#   in order to remove invalid data points.

outFile=`echo $1 | nawk -F "." '{print $1}'`.ply

echo "Convert from Lin to PLY, $1, $outFile..."
nawk 'BEGIN {
        print "# Type: polygon data"
        print "# Version: 1"
        print "# Format: free"
        print "# Field: 1 x"
        print "# Field: 2 y"
        print "# Projection: Local Rectangular"
        print "# Units: unknown"
        print "# End:"
        print "# Version_of_attributes: 2.1"
        print "# Plotting_units: inches"
        print "# Scale: 200"
        print "# Attributes: "Line 1""
        print "#        type: line"
        print "#        kind: polygon"
        print "#       color: 4"
        print "# Attributes: "Polygon 1""
        print "#        type: polygon"
        print "# End_attributes:"
    }
    {
        if(NF == 3) {
            printf "POLYGON\n"
        }
        else if(NF == 1){ }
        else if($1 > 500000) {
            printf "%10.4f\t%10.4f\n", $1, $2
        }
    }' $1 > $outFile

echo "Finished, created $outFile \007"
```

1/23/96 / David Allen

```
# Makefile for testPly
CC      = cc
# CC    = gcc

CFLAGS  = -O

OBJS    = trav_pts.o int_pt.o

#-----------------------------------------------------

testPly:        testPly.c trav_pts.o int_pt.o
        $(CC) $(CFLAGS) testPly.c -o testPly $(OBJS)

trav_pts.o:     trav_pts.c
        $(CC) -c trav_pts.c

int_pt.o:       int_pt.c
        $(CC) -c int_pt.c

#-----------------------------------------------------


/*-----------------------------------
**   Filename:  testPly.c
**
**   1-5-96
**
**   cc testPly.c -o testPly intersect.o
**
**-----------------------------------*/

#include "intersect.h"


void main (int argc, char *argv[])
{

    extern int int_pt(char *fname, float *a, float *b, float *c, float *d);
    extern int trav_pts(char *fname, float *a, float *b);
    void print_usage(char *);

    int             i;
    char            str[80];
    char            *polygonFname;
    FILE            *polygonFile;
    int             polygonVCnt;
    float           *polygonV;
    float           plyXMax;
    float           plyYMax;

    int             last;
    int             t1;

    float           px, py;
    int             setFirst=1;

    char            *travFname;

    char            *outFname;
    FILE            *outFile;

    float           pa1[2];
    float           pa2[2];
    float           pa3[2];
    float           pb1[2];
    float           pb2[2];

   /* Begin */

   /* Read command line args */
    if (argc < 4) {
        print_usage(argv[0]);
        exit(-1);
    }
    else{
        polygonFname = argv[1];
        travFname = argv[2];
        outFname = argv[3];
    }
```

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```
    /* End of ARGC */

   /*----------------------------*/
   /* Read boundary polygon file */
   /*----------------------------*/
   /*                            */
   /* x   y                      */
   /* .   .                      */
   /* .   .                      */
   /* .   .                      */
   /* x   y                      */
   /*                            */
   /*----------------------------*/
    polygonFile = fopen (polygonFname, "r");
    if (polygonFile == NULL) {
        fprintf(stderr, "Could not open polygonFile %s.", polygonFname);
        exit(-1);
    }
    /* Find min/max and vcnt */
    i = 0;
    while (!feof(polygonFile)) {
        fgets(str, 80, polygonFile);
        if (!feof(polygonFile))
            if ((str[0] != '#')||(str[0] != 'P')){
                sscanf(str, "%f%f", &px, &py);
                if (setFirst) {
                    setFirst = 0;
                    plyXMax = px;
                    plyYMax = py;
                }
                if (px > plyXMax) plyXMax = px;
                if (py > plyYMax) plyYMax = py;
                i++;
            }
    }
    rewind(polygonFile);
    polygonVCnt = i+1;

   /* Allocate memory */
    polygonV = (float *) malloc(sizeof(float) * 2 * polygonVCnt);
    if (polygonV == NULL){
        fprintf(stderr,
                "Could not allocate memory for polygonVs %d.",
                polygonVCnt);
        exit(-1);
    }

   /* Read xy values */
    i = 0;
    while (!feof(polygonFile)) {
        fgets(str, 80, polygonFile);
        if (!feof(polygonFile))
            if ((str[0] != '#')||(str[0] != 'P')){
                sscanf(str, "%f%f", &px, &py);
                *(polygonV+i) = px;
                i++;
                *(polygonV+i) = py;
                i++;
            }
    }
    *(polygonV+i) = *(polygonV);
    i++;
    *(polygonV+i) = *(polygonV+1);
    fclose(polygonFile);

   /*----------------------------*/
   /* Read traverse points file  */
   /*----------------------------*/
   /*      x   y                 */
   /*      .   .                 */
   /*      x   y                 */
   /*----------------------------*/

    if (trav_pts(travFname, &pal, &pa2) == -1){
        fprintf(stderr, "Error from TRAV_PTS.\n");
        exit(-1);
    }
```

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```
    if((outFile = fopen(outFname, "w")) == NULL){
        fprintf(stderr, "Unable to open output file.\n");
        exit(-1);
    }
    fprintf(outFile, "%f\t%f\n", pa1[0], pa1[1]);
    fclose(outFile);
            /* Check each line segment of the polygon */
    last = (2*polygonVCnt);
    for (i=2; i<last; i+=2) {
        pb1[0] = *(polygonV+i-2);
        pb1[1] = *(polygonV+i-1);
        pb2[0] = *(polygonV+i);
        pb2[1] = *(polygonV+i+1);
    /* Find XY of intersection */
        t1 = int_pt(outFname, pa1, pa2, pb1, pb2);
    }
    if((outFile = fopen(outFname, "a")) == NULL){
        fprintf(stderr, "Unable to open output file.\n");
        exit(-1);
    }
    fprintf(outFile, "%f\t%f\n", pa2[0], pa2[1]);
    fclose(outFile);

}  /* End */


void print_usage(char *s) {
   /* Begin */
   fprintf(stderr, "Usage: %s \n", s);
   fprintf(stderr, "       -inPolygon <filename> \n");
   fprintf(stderr, "       -inPoints  <filename> \n");
   fprintf(stderr, "       -outFile   <filename> \n");
   fprintf(stderr, " \n");
   fprintf(stderr, "       Where inPolygon file format is:\n");
   fprintf(stderr, "           x y \n");
   fprintf(stderr, "           . . \n");
   fprintf(stderr, "           . . \n");
   fprintf(stderr, "           . . \n");
   fprintf(stderr, "           x y \n");
   fprintf(stderr, " \n");
   fprintf(stderr, "       Where inPoints file format is:\n");
   fprintf(stderr, "           x y \n");
   fprintf(stderr, "           . . \n");
   fprintf(stderr, "           . . \n");
   fprintf(stderr, "           . . \n");
   fprintf(stderr, "           x y \n");
}  /* End */


/*-----------------------------------------
**   Filename:  intersect.h
**
**   01/15/96
**
**   David W. Allen
**
**-----------------------------------------*/

#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>


/*-----------------------------------------
**   Filename:  travc_pts.c
**
**   01/15/96
**
**   David W. Allen
**
**-----------------------------------------*/

#include "intersect.h"

/* David W. Allen
** January 15, 1996
```

1/23/96 / David Allen


```
** file name: TRAV_PTS.C
**
** Extracts end pts of a traverse line file.
** function called from "TESTPLY.C"
*/

int trav_pts(char *fname, float *a,  float *b)
{
    FILE *fptr;
    char in_str[80];
    int lin_cnt = 0;
    int cnt = 0;
    int first = 0;
    int i;

    if ((fptr = fopen(fname, "r")) == NULL) {
        fprintf(stderr, "Could not open File %s.", fname);
        return(-1);
    }
    else{
        while(!feof(fptr)){
            fgets(in_str, 80, fptr);
            if(!feof(fptr))
                lin_cnt++;
        }
        rewind(fptr);
        while(!feof(fptr)){
            fgets(in_str, 80, fptr);
            cnt++;
            if(!feof(fptr)){
                if((in_str[0] != '#')&&(cnt != lin_cnt)&&(first == 0)){
                    sscanf(in_str, "%f%f%d", &a[0], &a[1], &i);
                    first = 1;
                }
                else if((in_str[0] != '#')&&(cnt == lin_cnt))
                    sscanf(in_str, "%f%f%d", &b[0], &b[1], &i);
            }
        }
    return(0);
    }
}


/*-----------------------------------------
**   Filename:  int_pt.c
**
**   01/15/96
**
**   David W. Allen
**
**-----------------------------------------*/

#include <stdio.h>
#include <stdlib.h>

/* Program takes vertices(pts on line) of two line segments
 * and computes point of intersection.
 * 2-D ONLY
 * Vertices are inputed as command line arguments, 8 required.
 */

int int_pt(char *fname, float *a, float *b, float *c,  float *d)
{
    FILE *fptr;
    float x1a, y1a, x2a, y2a;
    float x1b, y1b, x2b, y2b;
    float s1, s2;
    float x, y;

    if ((fptr = fopen(fname, "a")) == NULL) {
        fprintf(stderr, "Could not open File %s.", fname);
        return(-1);
    }
    else{
        x1a = a[0];
        y1a = a[1];
        x2a = b[0];
        y2a = b[1];
        x1b = c[0];
```

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```
        y1b = c[1];
        x2b = d[0];
        y2b = d[1];
        s1 = (y1a-y2a)/(x1a-x2a);
        s2 = (y1b-y2b)/(x1b-x2b);

        if(((s1-s2) == 0)||((s1+s2) == 0))
            fprintf(stderr, "Line segments are parallel.\n");
        else{
            x = ((s1*x1a)-y1a-(s2*x1b)+y1b)/(s1-s2);
            y = (s1*(x-x1a)+y1a);
            if (((x <= x1b)&&(x >= x2b))||((x >= x1b)&&(x <= x2b)))
                if (((y <= y1b)&&(y >= y2b))||((y >= y1b)&&(y <= y2b))){
                    fprintf(fptr, "%f\t%f\n", x, y);
                }
        }
        fclose(fptr);
        return(0);
    }
}
```

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```
#!/bin/sh

# Usage: runPdatToAnn <inFile.pdat>

# David W. Allen
# 10-26-95
# Convert borehole PDAT files with numeric property values
# into corresponding lithologic titles.
# Numeric values are listed in file "PROP_LIST.TXT"

outFile=`echo $1 | nawk -F "." '{print $1}'`.ann
outFile1=`echo $1 | nawk -F "." '{print $1}'`.ann1

echo "Convert from PDAT to ANN, $1, $outFile..."
nawk 'BEGIN{
        printf "# Type: annotation data\n"
        printf "# Version: 1\n"
        printf "# Format: free\n"
        printf "# Field: 1 x\n"
        printf "# Field: 2 y\n"
        printf "# Projection: Local Rectangular\n"
        printf "# Units: unknown\n"
        printf "# End:"
        printf "# Version_of_attributes: 2.1\n"
        printf "# Plotting_units: inches\n"
        printf "# Scale: 500\n"
        printf "# Attributes: \"Text 1\"\n"
        printf "#       type: text\n"
        printf "#       size: 0.1"
        printf "# Attributes: \"Symbol 1\"\n"
        printf "#       type: symbol\n"
        printf "#       size: 0.2\n"
        printf "# End_attributes:\n"
        printf "version 2.1\n"
        printf "setatr \"Text 1\"\n"
        }
        {
          if ((NF > 0)&&(substr($1,1,1) != "#")) {
            printf "srftxt 0\n"
            if($4 == 0.0) {
               printf "%10.4f\t%10.4f\t\"Alluvium\"\n",$1,$2
            }
            else if($4 == 1.1) {
               printf "%10.4f\t%10.4f\t\"Tiva Canyon\"\n",$1,$2
            }
            else if($4 == 1.2) {
               printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
            }
            else if($4 == 1.3) {
               printf "%10.4f\t%10.4f\t\"Yucca Mountain\"\n",$1,$2
            }
            else if($4 == 1.4) {
               printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
            }
            else if($4 == 1.5) {
               printf "%10.4f\t%10.4f\t\"Pah Canyon\"\n",$1,$2
            }
            else if($4 == 1.6) {
               printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
            }
            else if($4 == 1.7) {
               printf "%10.4f\t%10.4f\t\"Topopah Spring\"\n",$1,$2
            }
            else if($4 == 1.8) {
               printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
            }
            else if($4 == 2.1) {
               printf "%10.4f\t%10.4f\t\"Tuffaceous Beds\"\n",$1,$2
            }
            else if($4 == 2.2) {
               printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
            }
            else if($4 == 3.1) {
               printf "%10.4f\t%10.4f\t\"Prow Pass\"\n",$1,$2
            }
            else if($4 == 3.2) {
               printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
            }
            else if($4 == 3.3) {
```

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```
            printf "%10.4f\t%10.4f\t\"Bullfrog\"\n",$1,$2
         }
         else if($4 == 3.4) {
            printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
         }
         else if($4 == 3.5) {
            printf "%10.4f\t%10.4f\t\"Tram\"\n",$1,$2
         }
         else if($4 == 3.6) {
            printf "%10.4f\t%10.4f\t\"Bedded Tuff\"\n",$1,$2
         }
         else if($4 == 4) {
            printf "%10.4f\t%10.4f\t\"Lava and Flow Breccia\"\n",$1,$2
         }
         else if($4 == 5) {
            printf "%10.4f\t%10.4f\t\"Lithic Ridge Tuff\"\n",$1,$2
         }
         else {
            printf "%10.4f\t%10.4f\t\"%2.1f\"\n",$1,$2,$4
         }
      }
      END{  }' $1 > $outFile1

outFile2=`echo $1 | nawk -F "." '{print $1}'`.ann2

nawk 'BEGIN{
      printf "setatr \"Symbol 1\"\n"
      }
      {
        if ((NF > 0)&&(substr($1,1,1) != "#")) {
           printf "srfsym\n"
           printf "%10.4f\t%10.4f\n",$1,$2
        }
      }
      END{  }' $1 > $outFile2
cat $outFile1 $outFile2 > $outFile
rm $outFile1
rm $outFile2
echo "Finished. \007"
```

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Difference between Unit top and Lithological Borehole Data:

*To calculate the difference between a specific unit top and the lithological borehole data, use Earthvision swri utility "Find Difference of Unit Tops".(**This utility not cuurently available to all Earthvision users**)*

The utility takes a 2D grid file of the unit top horizon and the borehole .pdat file of lithological data with numeric property value as listed in "PROP_LIST.TXT". The value is hard coded into the macro for a specfic unit top.

The output file is also a .dat file and contains the X, Y location in UPN, lithological unit top elevation in meters, and the difference value in meters.

The .dat file can be viewed in evedit, but you must choose scattered/set Z display and select "z" and "d" to view the data. After values are displayed save file as a .ann file. Open the .ann file just created into evedit and add borehole ID label.

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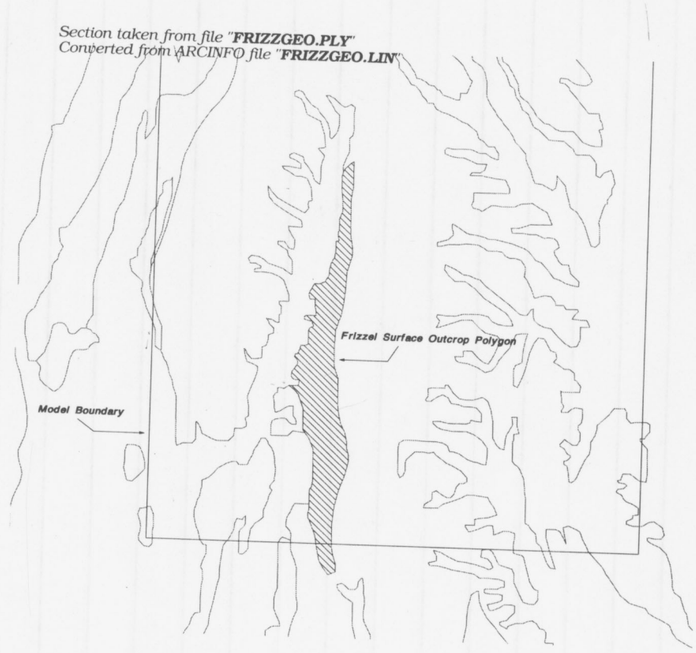
2/1/96 Darrell Allen



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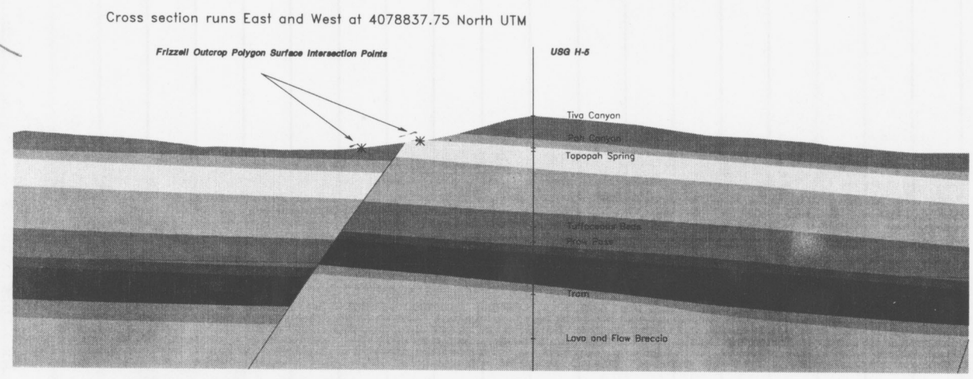

Section taken from file sbonk_1.ann
Converted from ARCINFO file sbonkutm.lin

The traverse line passes thur USW H-5

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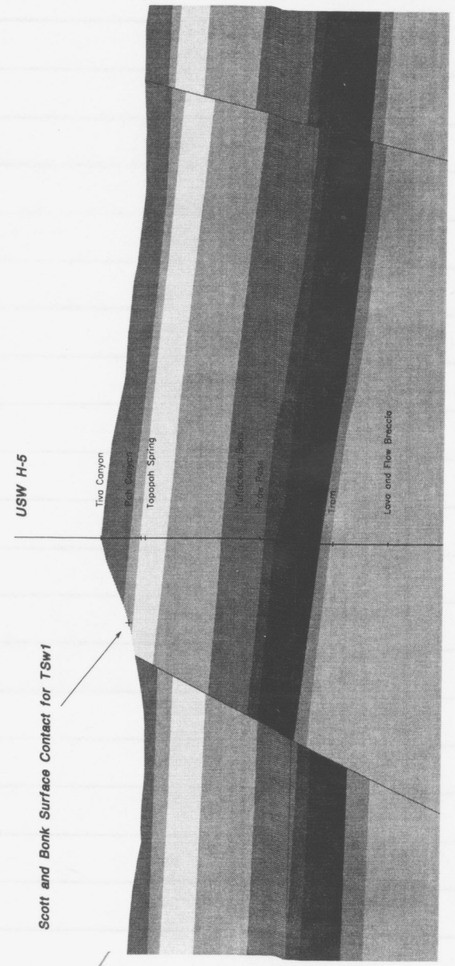

Cross section runs East and West at 4078837.750 North UTM

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To create cross sections that display outcrop data points derived from FRIZZEL outcrop polygons:

1) Convert ARCINFO ".lin" of Frizzel surface polygons to Earthvision "*.ply" files with script file "runLinToPly <fname.lin>".*

2) Using "evedit" create traverse line (.trv file) thur borehole and extending to boundry edges. Generally endpoints and a controling borehole.

3) Find the intersection points.
Run program "testPly fname.ply fname.trv outfile.dat" "outfile.dat" contains end points, and intersection points of traverse line and surface polygon.

4) Using "evedit" create new traverse line to include end points, borehole location, and intersection points.

5) Run "evfaces2xsec" to create cross section using "model_feb20_porosity.faces" and the traverse line (.trv) file created in step 4.

6)Import borehole data:
a) Using "evedit" find X location of borehole on cross section. Snap to borehole crease line and record X value.
b) Using SWRI utility "XYZ to XY" create ".pdat" file with this X value as the constant argument, and the original borehole ".pdat" file as the input file argument. The output file also ".pdat" contains the borehole information relative to the cross section crease line.
c) Using script "runPdatToAnn <fname.pdat>" an annotation file is created with stratographic layer names for posting the borehole information in the cross section.

7) The intersection points are represented as crease lines and can be edited or manipulated as any other line would be.

Note: This process is cross section specific.

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Using control points to refine horizon grid:

A. To refine a horizon within a specified fault block:

1) Control points are contained in a ".DAT" file and should be well known data, such as bore hole statographic data, limited to a specfic fault block.

2) In Earthvision, under Modeling, select "2-D Minimum Tension Gridding". The scattered data is the control points file. The correction source grid is the horizon grid that is targeted for refinement. Under range, select range from another grid and use the correction source grid for the range. Under calculate, choose correction grid. The correction grid is the interpolated difference between the target horizon and the control points.

3) The refined horizon is formed by adding the correction ".2grd" file to the horizon ".2grd" file in Earthvision's formula processor.

4) The model can now be rebuilt in Geologic Structure Builder with the revised horizon.

B. To refine a horizon grid to cover the entire model:

1) Control points are contained in a ".DAT" file with coverage of the entire model and should be well known data, such as bore hole statographic data.

2) In Earthvision, go to Modeling, and select the Geologic Structure Builder. Under File select open and choose the sequence file for the model to be refined. Under Model Definition, choose Horizon gridding and under adjustment data select the control points ".DAT" file for the horizon to be refined. Going back to the Structure Builder's main menu, go to Calculate and perform the neccessary calculation to rebuild the model.

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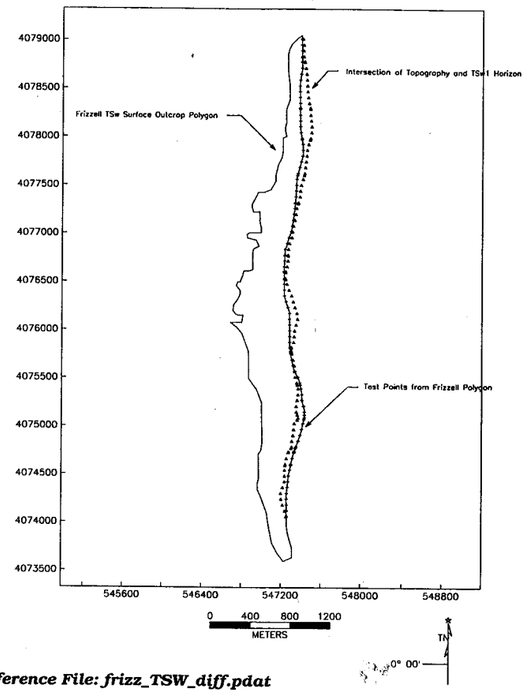

Difference File: frizz_TSW_diff.pdat

Difference Between Frizzell surface outcrop and 3D model at TSw1 Horizon. Intersection points on the Frizzell line where found that coincided with points in the TSW_topo_int.dat file. This included points to represent the four boreholes to be used in testing. H–5, UZ–6, H–3, and G–3.
Frizzell points where interpolated back to the topography using formula processor.

frizz<z> = bakint(topo.2grd,frixx<x>,frizz<y>)

The difference was calculated by subtractinhg "z" values of the two files with results returned to the frizzell file:

frizz<d> = TSw_intersect<z> – frizz<z>

The d column represents the difference between the 3D model surface outcrop line and the upper boundary of the Frizzell polygon projected onto the topography.

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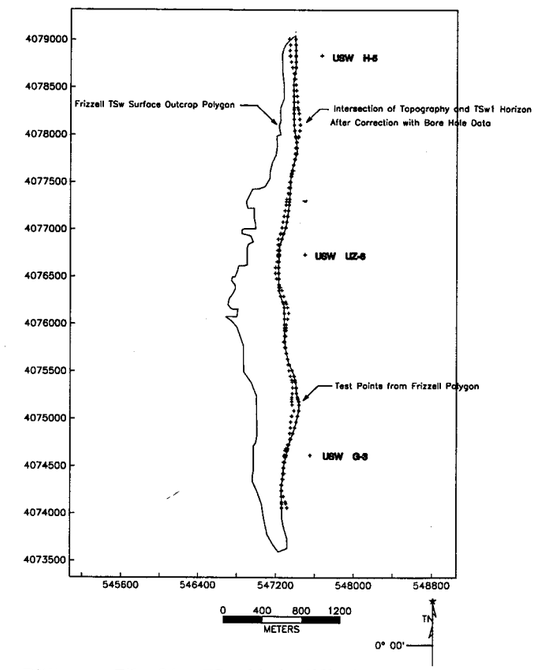

Difference File: frizz_TSw–bhole_diff.pdat

Difference between Frizzell surface outcrop and 3D model at TSw1 horizon, after horizon was revised using bore hole data for correction to the horizon grid.
Difference calculations performered in the same manner as base line.

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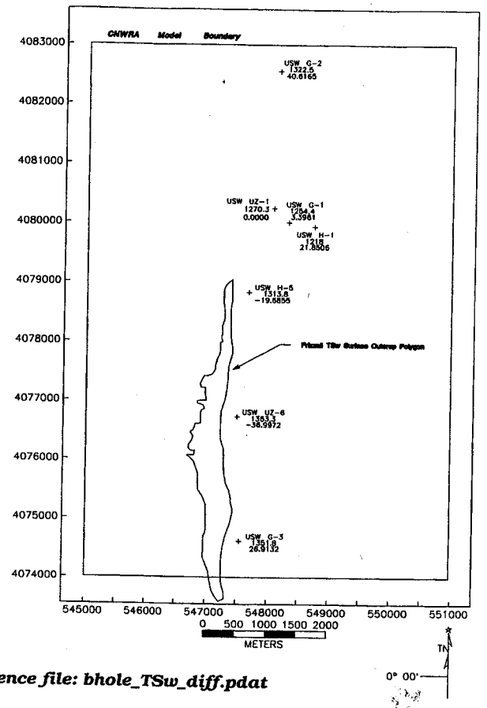

Difference file: bhole_TSw_diff.pdat

Differnce between borehole data and TSw1 horizon, base line calculation.
The difference at each borehole location was calculated using Earthvision SWRI utility: "Find Difference of Unit Tops"

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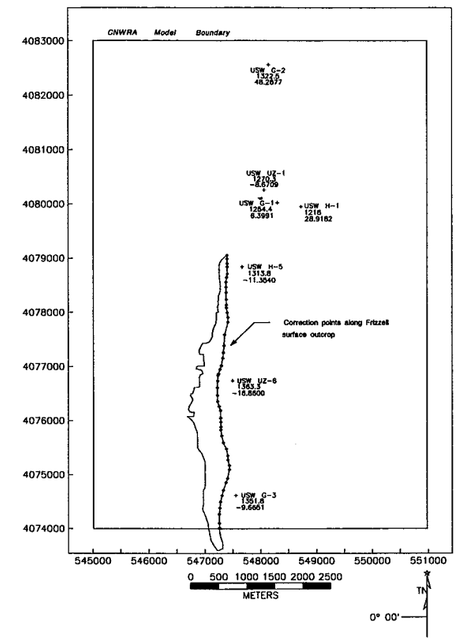
Done



Difference File: bhole_TSw-frizz_diff.pdat

Difference between bore hole data and TSw1 horizon after correction was made to TSw1 horizon using Frizzell surface outcrop as correction data.
Frizzell points where interpolated back to the topography using Earthvision's formula processor.
frizz<z> = bakint(topo.2grd, frizz<x>, frizz<y>)
The difference at each borehole location was calculated using Earthvision SWRI utility: "Find Difference of Unit Tops"

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11:12:01 1

```
Statistics for difference of unit tops at TSw1 horizon

File name: bhole_TSW_diff.pdat
Comparision of boreholes vs model
Average error:        21.3477
Standard deviation:   16.3712

File name: bhole_TSw-frizz_diff.pdat
Comparision of borehole vs model corrected using frizzell
control points.
Average error:        17.3508
Standard deviation:   14.7843

File name: frizz_TSW_diff.pdat
Comparision of frizzell vs model.
Average error:        20.9815
Standard deviation:   13.7381

File name: frizz_TSw-bhole_diff.pdat
Comparision of frizzell vs model corrected using borehole
control points.
Average error:        11.1989
Standard deviation:    9.7214
```

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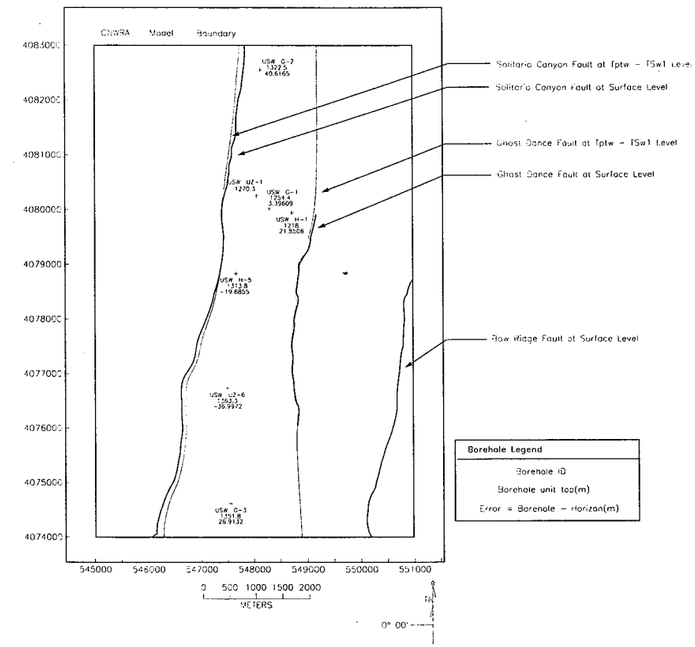

Difference of Lithographic Borehole Data and Tptw - TSw1 Horizon
Fault Block 3 Only

Files included in plot:
diff_Tptw.iplt
a07_3dmodel.ann
g_1.ann
g_2.ann
g_3.ann
h_1.ann
h_5.ann
solCanyon_Tptw.dat
uz_1.ann
uz_6.ann
ghostDance_Tptw.dat
a31_3faults.ann
diff_leg.ann

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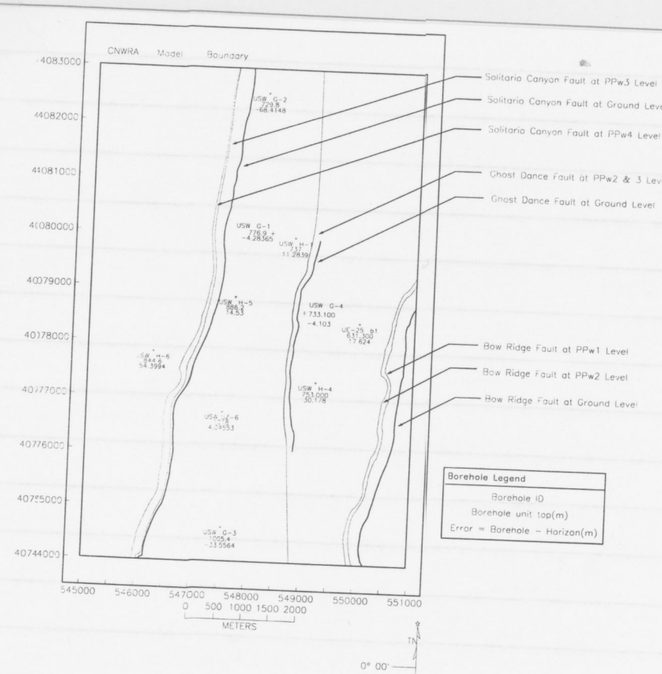

Difference of Lithographic Borehole Data and PPw Horizons

Files included in plot:

diff_PPw_bholes.iplt	ghostDance_PPw.dat
bowRidge_PPw.dat	bowRidge_PPw1.dat
ghostDance_PPw3.dat	solCanyon_PPw3.dat
solCanyon_PPw4.dat	g_1.ann
g_2.ann	g_3.ann
g_4.ann	h_1.ann
h_4.ann	h_5.ann
h_6.ann	ue25_b1.ann
uz_6.ann	a07_3dmodel.ann
a31_3faults.ann	

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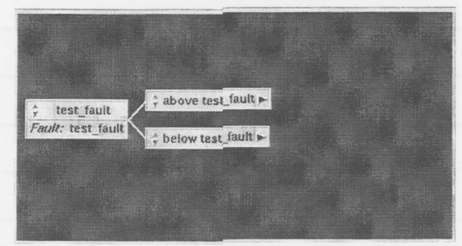
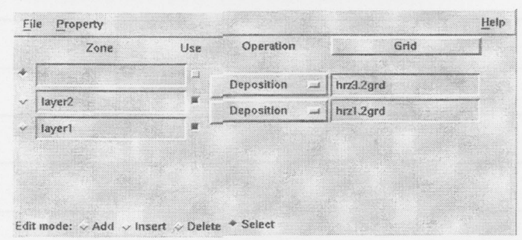
Thrust Fault Creation:

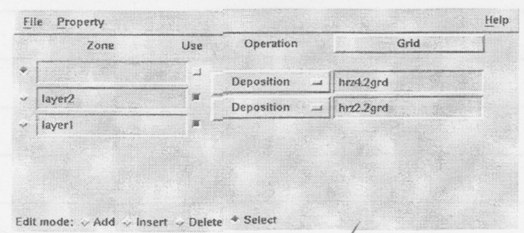
Horizon grid .dat files where divided into block data files (data was confined to a particular fault block) the ones above test fault and the ones below test fault.
These where gridded to the range of the model. In the Structure Builder when building the fault tree in order to maintain properties in the fault blocks name remains the same while the horizon .2grd file changes. After defining fault tree in this manner building the structure remains the same.



Test Fault Tree



Above Test_Fault Sequence

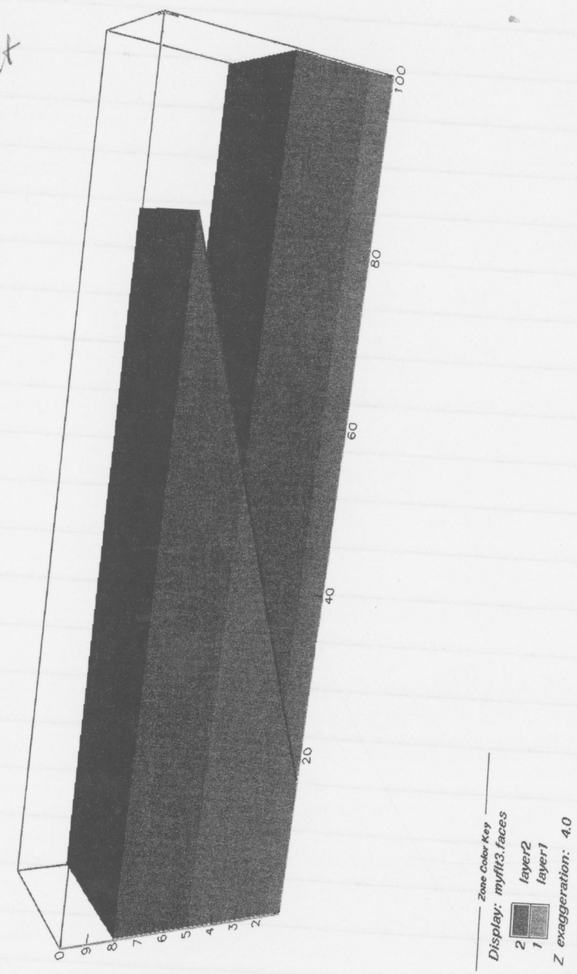


Below Test_Fault Sequence

Note:
Layer name remain the same between sequences while the grid names change.

3/12/96 Daniel Allen

Generated Thrust fault from test



Example of Thrust Fault Modeling

3/12/96 David Allen

myfaults.seq


```
History {
        "Edited with evseq 3.0.1 (dallen, 03/08/96)"
        "Edited with evseq 3.0.1 (dallen, 03/08/96)"
        "Edited with evseq 3.0.1 (dallen, 03/08/96)"
        "Edited with evseq 3.0.1 (dallen, 03/08/96)"
        "Edited with evseq 3.0.1 (dallen, 03/08/96)"
        "Edited with evseq 3.0.1 (dallen, 03/08/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
        "Edited with evseq 3.0.1 (dallen, 03/11/96)"
}

Geometry {
        x 0.000000 100.000000 12
        y 0.000000 20.000000 10
        z 1.000000 10.000000 14
}

Zone "layer1" {
        Operation "Depositional"
}

Zone "layer2" {
        Operation "Depositional"
}

PropertySummary {
        Property "" {
        }
        Property "number 1" {
                Use No
                DefaultFile flt_test.3grd
                IsovalueInterval 0.2
                IsovaluePRange -1.00269 1.65105
                Isovalues {
                        -1
                        -0.8
                        -0.6
                        -0.4
                        -0.2
                        -1.49012e-08
                        0.2
                        0.4
                        0.6
                        0.8
                        1
                        1.2
                        1.4
                        1.6
                }
        }
}

FaultBlock "test_fault" {
        Fault "test_fault"
        FaultFile /usr4r4/dallen/Flt_Test/test_fault.2grd
        AboveBlock "above test_fault"
        BelowBlock "below test_fault"
}

FaultBlock "above test_fault" {
        Sequence {
                "layer1:1" hrz1.2grd
                "layer2:2" hrz3.2grd
        }
}

FaultBlock "below test_fault" {
        Sequence {
                "layer1:1" hrz2.2grd
                "layer2:2" hrz4.2grd
        }
}
```

Thrust faults test sequence file

3/12/96 David Allen

Earthvision SURE utility
not currently available to all users

Find Difference of Unit Tops

Revised on 3-19-96
by David Allen
Can now find difference at any unit top
Units are no longer hard coded.

```
::::::::::::
PPw_Diff.sh
::::::::::::
#!/bin/sh

#  Called from PPw_DiffMacro.sh
#  Takes a horizon 2dgrid file and borehole pdat file
#  and returns difference of unit top and horizon grid value.
#  Pdat file must be of a specfic format.
#  input1 is the horizon 2d-grid file
#  input2 is the borehole pdat file
#  input3 is the unit top name for comparision
#  input4 is a flag to print to a file or not
#  outFile will have the same name as the PDAT file only with a DAT extension
#  outFiles are not written if calculation are not completed
#  meaning no value for the difference could be determined

input1=$1
input2=$2
input3=$3
input4=$4
echo "$3"

outFile=`echo $2 | nawk -F "." '{print $1}'`.dat

nawk -v TOP=$3 'BEGIN{
            }
            {
             if ((NF > 0)&&($4 == TOP)){
               printf "%10.4f\t%10.4f\t%10.4f\n",$1,$2,$3
             }
      }
      END{  }' $2 > $outFile

echo "Finished extracting lithographic unit top value. \007"
echo "Difference Formula"
echo "$outFile<d>=$outFile<z>-bakint(($1),($outFile<x>),($outFile<y>))"
echo "$outFile<d>=$outFile<z>-bakint(($1),($outFile<x>),($outFile<y>))">tmp.fml
echo "Calculating difference between horizon file and unit top value."
ev_fpfp -u -v -i tmp.fml -F EV-GMX/SVP << 'EOF'
EOF
echo "Calculation Complete"
if (test $4 = 1)
   then echo "Output is in file \"$outFile\"."
fi
rm tmp.fml
echo "# Calculations made from:">>$outFile
echo "# \"$1\" unit top horizon file">>$outFile
echo "# and \"$2\" lithographic borehole data file.">>$outFile

nawk -v PRT=$4 'BEGIN {
      }
      {
        if ((NF > 0)&&(substr($0,1,1) != "#")) {
          printf "The Difference is: %10.4f\n",$4
        }
      }
      END { }' $outFile
```

3/20/96 David W. Allen

Find Difference of Unit Tops Con't

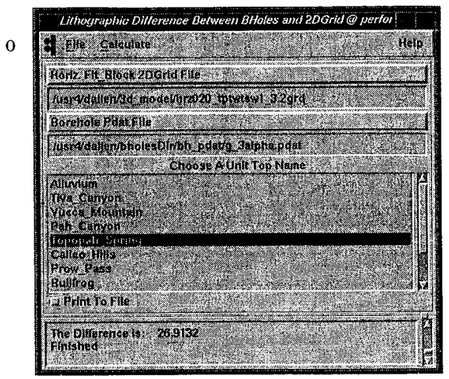
```
nawk -v PRT=$4 'BEGIN {
      rmfile = 1
      }
      {
        if (substr($0,1,1) != "#") rmfile = 0
      }
      END {
        if ((rmfile) || (!PRT)) {
          printf "rm %s", FILENAME
        }
      }' $outFile  > tmp789.sh

chmod +x tmp789.sh

tmp789.sh

rm tmp789.sh

echo "Finished"
```




```
::::::::::::
PPw_DiffMacro.sh
::::::::::::
#!/bin/sh

evmacro \
        -geom 500x450 \
        -title "Lithographic Difference Between BHoles and 2DGrid" \
        -grid2 -variable 'input1' -label "Horiz. Flt_Block 2DGrid File" \
    -file pdat -variable 'input2' -label "Borehole Pdat File" \
        -list "Alluvium Tiva_Canyon Yucca_Mountain Pah_Canyon
                Topopah_Spring Calico_Hills Prow_Pass Bullfrog
                Tram Lava_and_Flow_Breccia Lithic_Ridge_Tuff" \
                -variable "input3" -label "Choose A Unit Top Name" \
        -toggle -onValue "1" -offValue "0" \
                -variable "input4" -label "Print To File" \
        -exec "PPw_Diff.sh \$input1 \$input2 \$input3 \$input4 \$output"
```

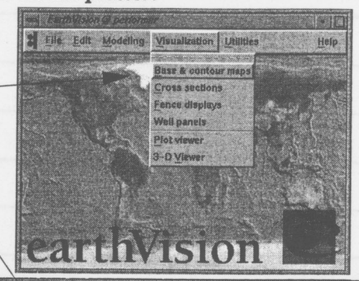
3/20/96 David W. Allen

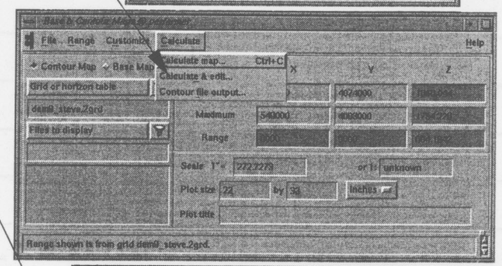
Revised
See page 141 4/30/96

Revision to plotting EV contour maps on the plotter:

1) Under Visualization in main EV window choose Base & Contour map.

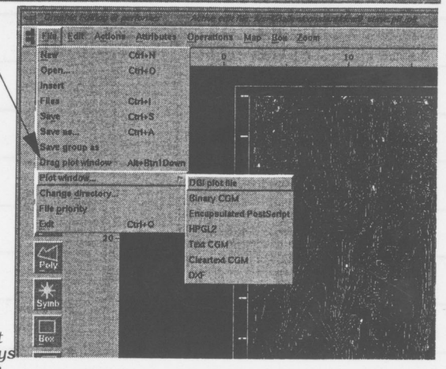
a) choose contour map
b) enter grid
c) enter plot size close to plotter paper size
d) choose Calculate & edit from the Calculate menu.
e) this will put the contour map into the graphic editor for viewing and editting which should be done without changing the box range & scale
f) drag plot window and save as DGI plot file
g) exit.





2) After save the ".plt" file must be converted to HPGL format.

a) run program "plotev"
b) enter DGI plot file name
c) plot scaling method:
choose 1
enter scaling factor:
choose a scaling factor to fit plot to plot paper. Plotev does not appear to make a direct conversion from the base & contour map plot size. Try starting with 0.9 as the scaling factor.
d) plotev output file is called "junk.file" which is the HPGL file.



3) Before sending to plotter, go to plotter find the menu that displays rotation press f1. Will display another menu that says rotation: on/off, press f4 until it says on then press enter (the button with the black dot on it)
To send to plotter:
lpr –Pplotter junk.file

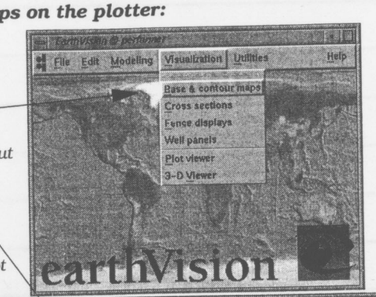
revised: 4–29–96

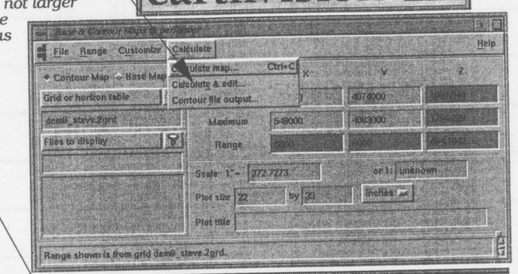
4/29/96 David V. Allen

Revision to plotting EV contour maps on the plotter:

1) Under Visualization in main EV window choose Base & Contour map.

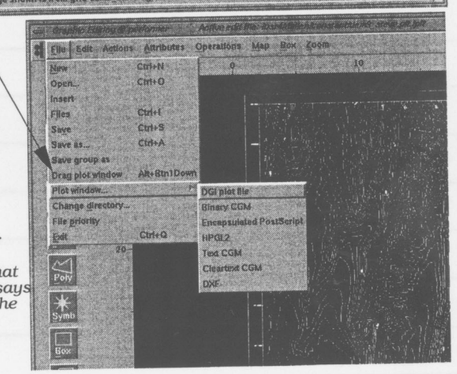
a) choose contour map
b) enter grid
c) enter plot size close to plotter paper size, but at least 2 inches less in all directions
d) choose Calculate & edit from the Calculate menu.
e) this will put the contour map into the graphic editor for viewing and editting which should be done without changing the box range & scale, also check total plot size to make sure the plot is not larger than intended plot paper size
f) drag plot window and save as DGI plot file
g) exit.





2) After save the ".plt" file must be converted to HPGL format.

a) run program "plotev"
b) enter DGI plot file name
c) plot scaling method:
choose 2
then entered the desired x,y frame size to be the same as the plot size used in EV contour map
d) plotev output file is called "junk.file" which is the HPGL file.

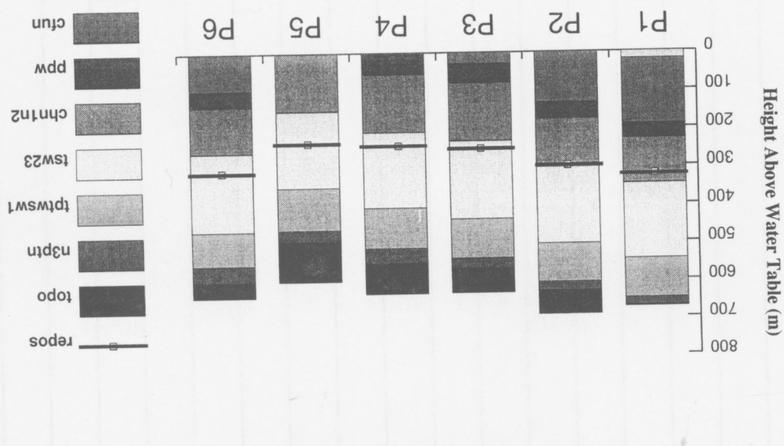


3) Before sending to plotter, go to plotter find the menu that displays rotation press f1. Will display another menu that says rotation: on/off, press f4 until it says on then press enter (the button with the black dot on it)
To send to plotter:
lpr –Pplotter junk.file

revised: 4–30–96

4/30/96 David Allen

Stratigraphic columns produced from CNWRA 3D model at TSPA93 column locations



Columns extracted from CNWRA 3-D Model "m01_porosity.faces"

graph_93 6/9/96

7/8/96 Daniel D. Allen

EV digitizer set-up information

05/16/96 14:03:47 **digitizer.txt** 1

```
-----------------------------------------------
EV Digitizer Setup
-----------------------------------------------
4-25-94

1.  /dev/ttyd2      9600 baud
                       7 data bits
                       1 stop bit
                       N parity
                    Point mode
                    ASCII format

   contents of inittab:
   t2:23:off:/sbin/getty -N ttyd2 co_9600          # port 2

   use ps -ef make sure getty isn't running on ttyd2

2. Verify ttyd2 port.

   Sample "cat < /dev/ttyd2" output:

   cat < /dev/ttyd2          Actual button hit
   ----------------          -----------------
   02425,02960,AP0                  1
   02424,02961,AP1                  2
   02410,02969,AP2                  3
   02405,02970,AP3                  C
   02405,02970,AP4                  4
   02405,02970,AP5                  5
   02404,02970,AP6                  6
   02404,02970,AP7                  D
   02401,02969,AP8                  7
   02401,02969,AP9                  8
   02401,02969,APA                  9
   02398,02969,APB                  E
   02400,02968,APC                  A
   02400,02968,APD                  0
   02400,02967,APE                  B
   02400,02967,APF                  F
   ----------------          -----------------
   123456789012345           -----------------
   ----------------          -----------------

3. /usr/dgi51/ev1.2/etc/digtab.cfg file

   # Digitizer configuration format:
   # Separate all of these by spaces:
   # Name -- Digitizer name
   # Line -- "SAME" for same line digitizing, or assignable line
   #         number (VMS) or device file (Unix).
   # Xcols -- Starting and Ending columns for X-coordinate.
   # Ycols -- Starting and Ending columns for Y-coordinate.
   # KeyPos -- Starting and Ending colums indicating which key or button on
   #           cursor was pressed.
   #
   # From here up to initStr each values should enclosed in double quotes.
   # If you don't want to supply a string for any of the following up to but
   # not including InitStr, enter "".
   #
   # String for send by digitizer for:
   #    Digitize mode buttons
   # 1. digitize a point, 2. snap and digitize a point
   # 3. snap and highlight, 4. popup "Display Coordinates" box.
   # 5. Location Only, 6. delete  7. end line, 8. start line over
   # 9. switch to number entry mode, 10. begin drag of picking box
   # 11. digitize window 12. move, 13. ctrl, 14. shift
   # 15. move point 16. rotate
   #    Number entry mode buttons
   # 0-9. digit buttons  (10 buttons)
   # 11. negative sign. 12. decimal point. 13. delete last character
   # 14. delete whole string, 15. tab
   # 16. return

   # InitStr -- Initialization string to be sent to digitizer.
   #            Enclose in quotes and denote control characters by prefixing
   #            with tilde (e.g., "~X" for Control-X or "~[" for Escape).
   #            If there is no initialization string, and commands past
   #            this position are needed, use "-" as a place-holder.
   # SCALE=UpInch -- Tablet scale factor (optional).  If the digitizer
   #                 to be used has native units other than thousandths of
   #                 inches, use the SCALE command to pass the number of
   #                 digitizer units per inch.  The default is 1000.
   # The following are examples from DGI:
   "microgrid3" "/dev/ttyd2" 1.5 7,11 15,15 "0" "1" "2" "3" "4" "5" "6" "7"
                                            "8" "9" "A" "B" "C" "D" "E" "F"
                                            "D" "0" "1" "2" "4" "5" "6" "8"
                                            "9" "A" "3" "7" "B" "C" "E" "F"

4. Summagraphics Microgrid III DIP switch settings:

   Switch Bank  Sw   Attribute          Value
   -----------  --   ---------          -----
       1        1    Baud 9600            1
                2    Baud 9600            0
                3    Baud 9600            0
                4    Parity Odd           0
                5    Parity Yes           1
                6    Stop bits No         0
                7    Data bits 7          0
                8    Format ASCII         1

       2        1    ASCII Cnts           1
                2    Decimal No           0
                3    Return CR            0
                4    Units Inches         0
                5    Res 200 lpi          1
                6    Res 200 lpi          0
                7    Format Calcomp       1
                8    Format Calcomp       0

       3        1    Report mode Pnt      1
                2    Report mode Pnt      0
                3    Echo Off             0
                4    Out of Prox No       0
                5    Out of Margin No     0
                6    Dual input Select    1
                7    Input Select Curs    1
                8    Custom opt Off       0

4. Summagraphics Microgrid III Serial Port A
      Pin 2 - Tx
      Pin 3 - Rx
```

5/22/96 Daniel D. Allen

Data for column graph on pg 143

06/20/96 15:08:49 **out_93.txt** 1

TEST POINT	UTM-E	UTM-N	ELEV (to top of unit in meters)	THICKNESS (in meters)	ABOVE/BELOW WATER TABLE
topo020.dat					
P1	547468.12	4077702.43	1428.005737	2.749267	672.8613278
P2	547818.53	4077703.66	1440.492187	61.658203	691.5272822
P3	548029.07	4078496.65	1389.100342	64.679688	632.7627566
P4	548102.69	4079228.22	1388.682739	80.100708	634.0374143
P5	548636.79	4078986.31	1334.152222	105.10315	599.9100955
P6	548186.63	4077004.10	1375.307495	41.726196	641.1841429
hrz010_n3ptn_3.dat					
P1	547468.12	4077702.43	1425.25647	20.22937	670.1120608
P2	547818.53	4077703.66	1378.833984	23.694824	629.8690792
P3	548029.07	4078496.65	1324.420654	26.161499	568.0830686
P4	548102.69	4079228.22	1308.582031	39.306885	553.9367063
P5	548636.79	4078986.31	1229.049072	29.565551	494.8069455
P6	548186.63	4077004.10	1333.581299	41.573364	599.4579469
hrz020_tptwsw1_3.dat					
P1	547468.12	4077702.43	1405.0271	104.220093	649.8826908
P2	547818.53	4077703.66	1355.13916	101.360473	606.1742552
P3	548029.07	4078496.65	1298.259155	103.844604	541.9215696
P4	548102.69	4079228.22	1269.275146	107.694702	514.6298213
P5	548636.79	4078986.31	1199.483521	111.974976	465.2413945
P6	548186.63	4077004.10	1292.007935	89.8219	557.8845829
hrz030_tsw23_3.dat					
P1	547468.12	4077702.43	1300.807007	198.074585	545.6625978
P2	547818.53	4077703.66	1253.778687	204.788819	504.8137822
P3	548029.07	4078496.65	1194.414551	205.0440066	438.0769656
P4	548102.69	4079228.22	1161.580444	198.1115719	406.9351193
P5	548636.79	4078986.31	1087.508545	200.5338136	353.2664185
P6	548186.63	4077004.10	1202.186035	205.7269896	468.0626829
hrz040_chnln2_3.dat					
P1	547468.12	4077702.43	1102.732422	118.0734254	347.5880128
P2	547818.53	4077703.66	1048.989868	123.3108519	300.0249632
P3	548029.07	4078496.65	989.3705444	151.7729492	233.032959
P4	548102.69	4079228.22	963.4688721	151.3753662	208.8235474
P5	548636.79	4078986.31	886.9747314	156.0549316	152.7326049
P6	548186.63	4077004.10	996.4590454	122.7337646	262.3356933
hrz050_ppw_3.dat					
P1	547468.12	4077702.43	984.6589966	37.7963867	229.5145874
P2	547818.53	4077703.66	925.6790161	43.0731201	176.7141113
P3	548029.07	4078496.65	837.5975952	50.9119263	81.2600098
P4	548102.69	4079228.22	812.0935059	53.0705567	57.4481812
P5	548636.79	4078986.31	730.9197998	42.6191406	-3.3223267
P6	548186.63	4077004.10	873.7252808	42.8428955	139.6019287
hrz060_cfun_3.dat					
P1	547468.12	4077702.43	946.8626099	171.6174927	191.7182007
P2	547818.53	4077703.66	882.605896	179.8037109	133.6409912
P3	548029.07	4078496.65	786.6856689	165.8461303	30.3480835
P4	548102.69	4079228.22	759.0229492	143.6213989	4.3776245
P5	548636.79	4078986.31	688.3006592	166.3944702	-45.9414673
P6	548186.63	4077004.10	830.8823853	158.6104126	96.7590332
hrz070_tcbw_3.dat					
P1	547468.12	4077702.43	775.2451172	44.8048096	20.100708
P2	547818.53	4077703.66	702.8021851	41.055542	-46.1627197
P3	548029.07	4078496.65	620.8395386	57.6617432	-135.4980468
P4	548102.69	4079228.22	615.4015503	25.9591065	-139.2437744
P5	548636.79	4078986.31	521.906189	54.4561463	-212.3359375

7/8/96 / David W. Allen

Data for column graph on pg 143

06/20/96 15:08:49 **out_93.txt** 2

P6	548186.63	4077004.10	672.2719727	47.6183472	-61.8513794
hrz080_cfmnn_1_3.dat					
P1	547468.12	4077702.43	730.4403076	44.8048096	-24.7041016
P2	547818.53	4077703.66	661.7466431	41.055542	-87.2182617
P3	548029.07	4078496.65	563.1777954	57.6617432	-193.15979
P4	548102.69	4079228.22	589.4424438	25.9591065	-165.2028809
P5	548636.79	4078986.31	467.4500427	54.4561463	-266.7920838
P6	548186.63	4077004.1	624.6536255	47.6183472	-109.4697266
hrz_repos_93.dat					
P1	547468.12	4077702.43	1076.36853		321.2241208
P2	547818.53	4077703.66	1048.014282		299.0493772
P3	548029.07	4078496.65	1009.440918		253.1033326
P4	548102.69	4079228.22	999.6292114		244.9838867
P5	548636.79	4078986.31	971.7229614		237.4808349
P6	548186.63	4077004.10	1046.872314		312.7489619
water.dat					
P1	547468.12	4077702.43	755.1444092		
P2	547818.53	4077703.66	748.9649048		
P3	548029.07	4078496.65	756.3375854		
P4	548102.69	4079228.22	754.6453247		
P5	548636.79	4078986.31	734.2421265		
P6	548186.63	4077004.1	734.1233521		

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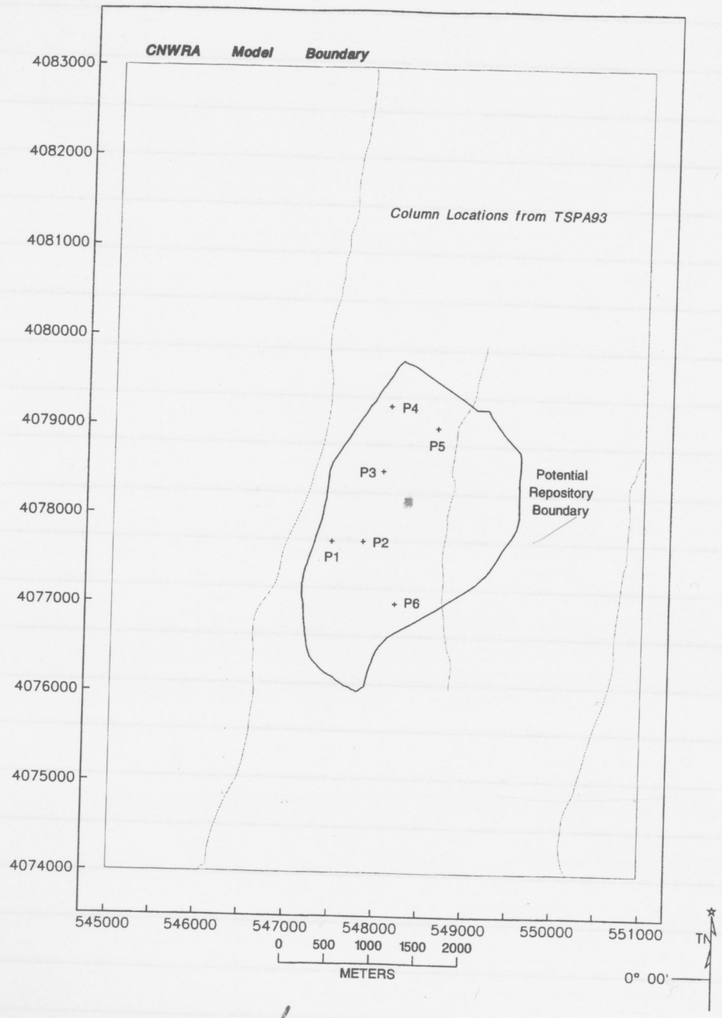
Map of test locations to produce graph pg 143.



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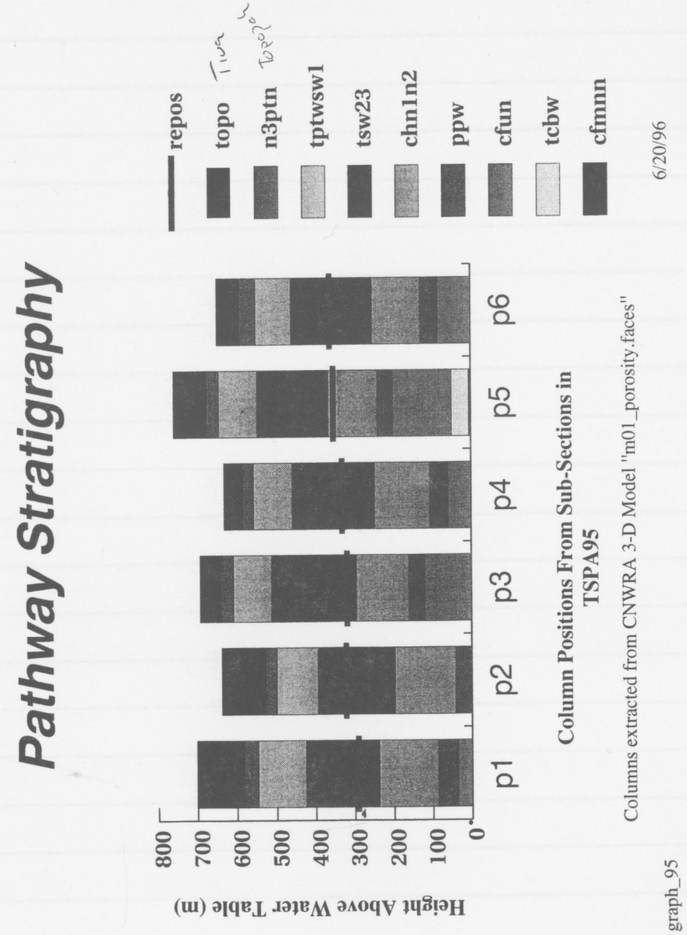
Stratigraphic columns produced from CNWRA 3D model at TSPA95 column locations



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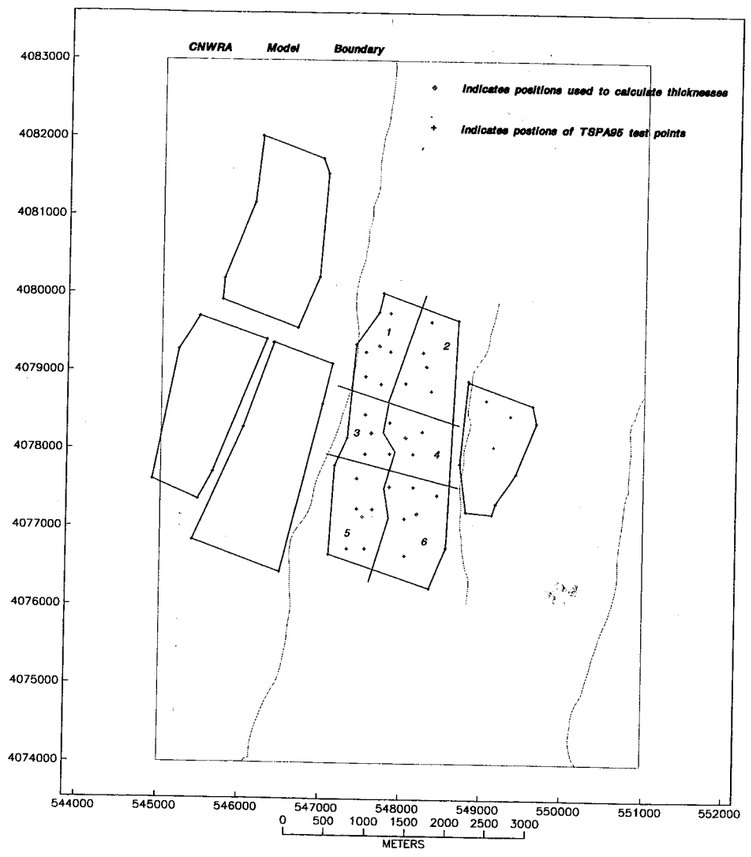
Map of test locations
for graph pg 147

Map of locations in 3-D model to be used in calculations



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Data for column graph
pg. 147

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Test Point	UTM-E	UTM-N	ELEV (to top of unit in meters)	THICKNESS (in meters)	ABOVE/BELOW WATER TABLE
topo020.dat					
P1	547696.4267843	4079342.711549	1475.034912	118.875732	701.007141
P2	548282.4298599	4079080.322113	1384.200806	110.041504	637.3020023
P3	547608.9636387	4078223.183286	1455.61377	51.959473	692.2944951
P4	548037.5330522	4078170.705398	1382.546753	46.889038	630.7459107
P5	547512.7541786	4077147.386595	1504.076172	84.426758	758.5473634
P6	548186.2203997	4077191.118168	1384.126587	56.105103	648.0930177
hrz010_n3ptn_95.dat					
P1	547696.4267843	4079342.711549	1356.15918	34.801026	582.131409
P2	548282.4298599	4079080.322113	1274.159302	27.970948	527.2604983
P3	547608.9636387	4078223.183286	1403.654297	32.483521	640.3350221
P4	548037.5330522	4078170.705398	1335.657715	26.634278	583.8568727
P5	547512.7541786	4077147.386595	1419.649414	29.932007	674.1206054
P6	548186.2203997	4077191.118168	1328.021484	41.301757	591.9879147
hrz020_tptwsw1_95.dat					
P1	547696.4267843	4079342.711549	1321.358154	121.905517	547.330383
P2	548282.4298599	4079080.322113	1246.188354	104.964111	499.2895503
P3	547608.9636387	4078223.183286	1371.170776	96.149414	607.8515011
P4	548037.5330522	4078170.705398	1309.023437	98.431518	557.2225947
P5	547512.7541786	4077147.386595	1389.717407	97.045288	644.1885984
P6	548186.2203997	4077191.118168	1286.719727	90.979493	550.6861577
hrz030_tsw23_95.dat					
P1	547696.4267843	4079342.711549	1199.452637	187.327149	425.424866
P2	548282.4298599	4079080.322113	1141.224243	197.2205809	394.3254393
P3	547608.9636387	4078223.183286	1275.021362	216.662597	511.7020871
P4	548037.5330522	4078170.705398	1210.591919	211.1652222	458.7910767
P5	547512.7541786	4077147.386595	1292.672119	181.528931	547.1433104
P6	548186.2203997	4077191.118168	1195.740234	206.9345089	459.7066647
hrz040_chnln2_95.dat					
P1	547696.4267843	4079342.711549	1012.125488	151.4201657	238.097717
P2	548282.4298599	4079080.322113	944.0036621	156.02948	197.1048584
P3	547608.9636387	4078223.183286	1058.358765	134.5808109	295.0394901
P4	548037.5330522	4078170.705398	999.4266968	142.1864014	247.6258545
P5	547512.7541786	4077147.386595	1111.143188	126.8534541	365.6143794
P6	548186.2203997	4077191.118168	988.8057251	123.9029541	252.7721558
hrz050_ppw_95.dat					
P1	547696.4267843	4079342.711549	860.7053223	51.5300293	86.6775513
P2	548282.4298599	4079080.322113	787.9741821	49.3638916	41.0753784
P3	547608.9636387	4078223.183286	923.7779541	40.5430908	160.4586792
P4	548037.5330522	4078170.705398	857.2402954	45.8812256	105.4394531
P5	547512.7541786	4077147.386595	984.2897339	38.2687988	238.7609253
P6	548186.2203997	4077191.118168	864.902771	44.3768921	128.8692017
hrz060_cfun_95.dat					
P1	547696.4267843	4079342.711549	809.175293	122.9051514	35.147522
P2	548282.4298599	4079080.322113	738.6102905	160.8579712	-8.2885132
P3	547608.9636387	4078223.183286	883.2348633	156.9749146	119.9155884
P4	548037.5330522	4078170.705398	811.3590698	175.1444702	59.5582275
P5	547512.7541786	4077147.386595	946.0209351	151.1366578	200.4921265
P6	548186.2203997	4077191.118168	820.5258789	158.461792	84.4923096

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data for graph pg 147
con't

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```
   hrz070_tcbw_95.dat
P1      547696.4267843  4079342.711549  686.2701416     34.8439331      -87.7576294
P2      548282.4298599  4079080.322113  577.7523193     41.4620361      -169.1464844
P3      547608.9636387  4078223.183286  726.2599487     43.4026489      -37.0593262
P4      548037.5330522  4078170.705398  636.2145996     56.7959595      -115.5862427
P5      547512.7541786  4077147.386595  794.8842773     44.592041       49.3554687
P6      548186.2203997  4077191.118168  662.0640869     47.7784424      -73.9694824

   hrz080_cfmnn_95.dat
P1      547696.4267843  4079342.711549  651.4262085                     -122.6015625
P2      548282.4298599  4079080.322113  536.2902832                     -210.6085205
P3      547608.9636387  4078223.183286  682.8572998                     -80.4619751
P4      548037.5330522  4078170.705398  579.4186401                     -172.3822022
P5      547512.7541786  4077147.386595  750.2922363                     4.7634277
P6      548186.2203997  4077191.118168  614.2856445                     -121.7479248

   new_repos.dat
P1      547696.4267843  4079342.711549  1063.916504                     289.888733
P2      548282.4298599  4079080.322113  1067.812378                     320.9135743
P3      547608.9636387  4078223.183286  1081.149536                     317.8302611
P4      548037.5330522  4078170.705398  1081.85437                      330.0535277
P5      547512.7541786  4077147.386595  1097.712158                     352.1833494
P6      548186.2203997  4077191.118168  1096.882324                     360.8487547

   water.dat
P1      547696.4267843  4079342.711549  774.027771
P2      548282.4298599  4079080.322113  746.8988037
P3      547608.9636387  4078223.183286  763.3192749
P4      548037.5330522  4078170.705398  751.8008423
P5      547512.7541786  4077147.386595  745.5288086
P6      548186.2203997  4077191.118168  736.0335693
```

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09/06/96 10:29:39 **stu_proced.txt** 1

```
Procedure used to extracted 30 meter data points from
3D model.

1. Find intersecting line of horizon and fault block.
        ex: Find intersecting line SWRI Utility with
            args: hrz.2grd
                  fault.2grd
                  outfile.dat

2. Remove header from outfile.dat
        ex: runRemoveHeader <outfile.dat>

3. Make vertical fault file from outfile
        ex: runMakeVfault <outfile.dat> <outfile.vflt> <faultnumber>

4. Make polygons from outfile.dat.
        ex: runDatToPly <outfile.dat>
        Result file name: outfile.ply
   Edit polygon in graphic editor to include excluded area of model, if
   fault block is bounded by two faults need to create and edit two polygons
   one for east side and one for west side.

5. Combine vertical fault files if more than one constrains fault block.
        ex: cat fname1.vflt fname2.vflt > combined.vflt

6. Take raw horizon data (hrz010_n3ptn_jan23.dat) and trim the data
   to one of the fault blocks and save to different file (n3ptn_1.dat =
   n3ptn horizon data in fault block 1) File will contain data for fault
   block one only.

7. Grid data to a 30 x 30 meter grid using minimum tension grider using
   combined.vflt in vertical faults and get the range from topo.2grd
   Result 2 grid file name example n3ptn_1.2grd.

8. Under Utilities in Earthvision choose grid operations and poygon filling
   Arguments for Polygon Filling:
                Input grid - 2 grid form step 7
                Filling polygon - one of polygons created in step 4
                Polygon fill value - 1800
   Need to do this twice to same input grid if fault block is bounded
   by two faults. Use the input file name as the output file name and
   select yes to overwrite.

9. Convert 2 Grid back to Data points.
        ev_export -o <fname.dat> <fname.2grd>

10. Remove all data points not in fault block.
        ex: runExtractFltBlk <exported file.dat> <stu_fname.dat>


11. After creating data file for all four fault blocks, combine into
    a single data file.
        ex: cat <fname1.dat> <fname2.dat> <fname3.dat> <fname4.dat> > hrz.dat


Repeat procedure for all horizons.
```

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Alluvium Modeling Procedure:

1. Sellect an alluvium outline both as a polygon and a data file.
   This will either be from some surface polygon coverage or determined directly from model data and contour maps.

2. Convert the outline polygon to a vertical fault file.
   Several scripts available to do this -
   Just need to change the header on the polygon file to that of a vertical fault.

3. Back interpolate the data file to the topography.
   In Earthvision formula processor - use the bakint fuction :
   data.dat<z> = bakint(topo.2grd, data.dat<x>,data.dat<y>)

4. Combine outline data and depth information into a single data file.
   The depth information will probably be from bore hole information and interpedation by user.

5. Created an alluvium grid.
   Earthvision minimum tension grid of the combined data file, also including the outline vertical fault file in the griding operation.

6. In the Earthvision Utilities choose grid operations, and use polygon filling to change the value of the grid nodes outside the outline polygon to a value larger than any elevation in model.

7. Edit model sequence file to include the alluvium grid just below the topography ~~either~~ Dt as an unconformity ~~or channel erosion~~ Pt.

8. Rebuild model under a different file name.

David W. Allen 9/12/96

This is the end of this notebook, it is now closed and no further entries will be made in it.

Brent Herbert 9/25/96