

To evaluate the timing for an excursion for two differing water qualities, staff developed two fate and transports models, MODFLOW/MODPATH/MT3D and PHAST/PHREEQC. The flow models supporting the transport models were both 3-dimension models using the finite-difference method.

The flow/hydraulic properties are as follows.

Grid:

Horizontal: 13806 feet by 13806 feet; cell dimensions from 6 to 500 feet

Vertical : 0 to 20 feet; 1 layer

115 by 115 cells (MODFLOW) 166 by 166 Nodes (Phast)

Hydraulic Parameters

Conductivity $K_x=K_y=1$ feet per day; $K_z=0.01$ feet per day

Storage Coefficient = 0.0001 feet^{-1}

Boundary Conditions

Constant Head for Steady State, Transient Stress periods

In cells along eastern perimeter; head = 250 feet above mean sea level

In cells along western perimeter; head = 319 feet above mean sea level

Injection Well for all transient stress periods

X	Y	Flow Rate (ft ³ /d)
6903	6903	1980
6767.5	6903	1980
6767.5	6782.5	1980
6903	6782.5	1980

Production Well for only the first transient stress period

X	Y	Flow Rate (ft ³ /d)
6833.5	6844	-8000

Simulation/Stress Periods

Steady state Simulation – no wells - establish starting heads for transient simulation

Transient Simulation - Two Stress periods each 365 days- first stress period set up balanced pattern with all wells operating – second stress period set up imbalance with only injection wells on

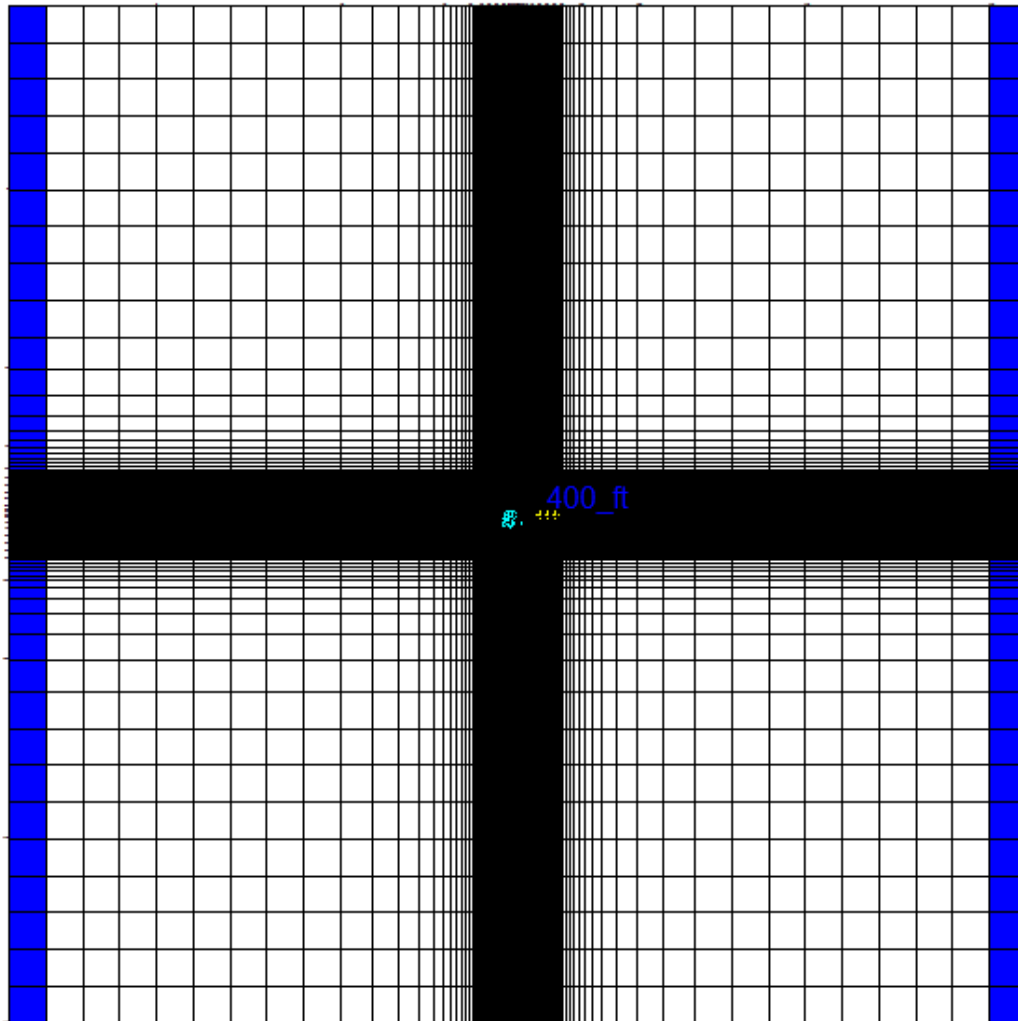
Used GUI (Groundwater Vistas for MODFLOW; PHAST for Windows)

Groundwater Vistas Model Summary:

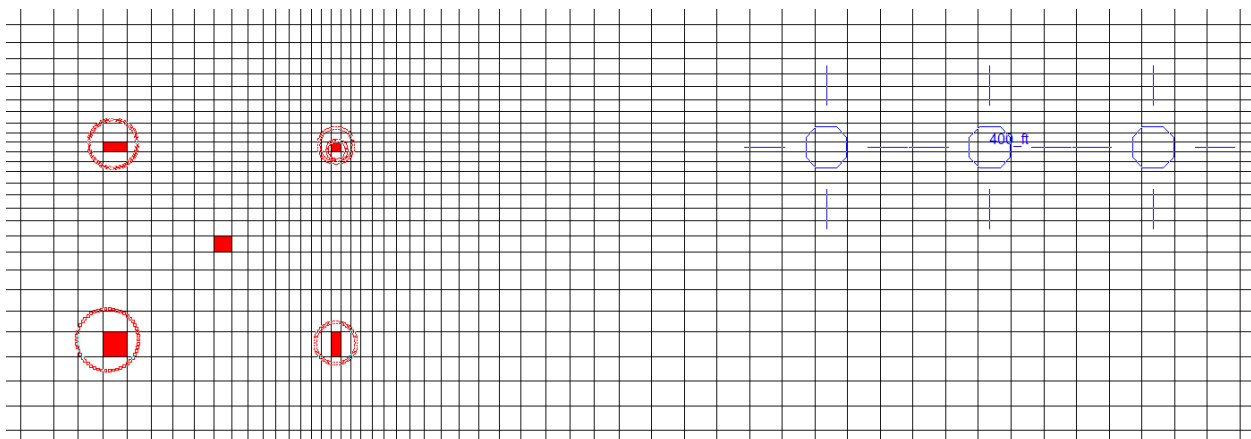
Model Summary [X]

Grid		Boundary Conditions		Target Types	
Rows	115	Constant Heads	230	Head	0
Columns	115	Wells	5	Head Difference	0
Layers	1	Rivers	0	Drawdown	1
Total Cells	13225	Drains	0	Concentration	3
Active Cells	13225	GHBs	0	Flux (node)	0
Total Area	190605636	Streams	0	Flux (reach)	0
Active Area	190605636	Walls	0	Flow Direction	0
Coordinate Transformation		Lakes	0	Subsidence	0
X Offset	0	Wetlands	0	Prior Information	0
Y Offset	0	No Flow	0	Constraints	0
Rotation	0	FHB	0	Kx Pilot Point	0
Grid Spacings		Analytic Elements			
	Minimum	Maximum	Wells	0	
Rows (Delta-Y)	6	500	Line Boundaries	0	
Columns (Delta-X)	6	500	Circle Boundaries	0	
Total Nests	0	Active Nests	0	Polylines	0
Quadtree Cells	0	Max Quadtree Level	1	Polygons	0
Original File from GV Version 6: gv692					
OK					

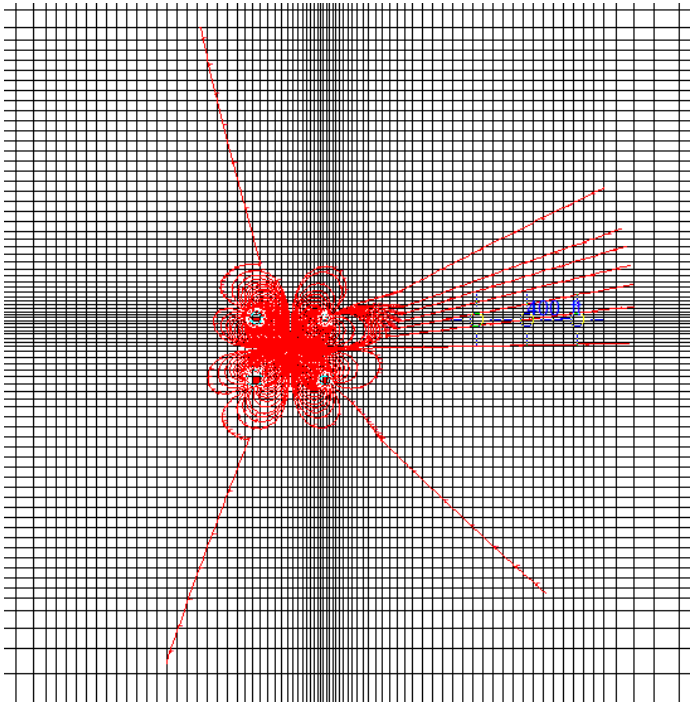
Modflow Grid:



In the area of concern:



MODPATH, 730 days



MT3D

Injection Concentration (both Ross and Nichols Ranch) 5160

Background initial concentration

Nichols Ranch 578

Ross 2225

Longitudinal Dispersivity 4 feet & 40 feet

Distribution Coefficient 0.0, 0.02, 0.05 & 0.1 cm³/gr

Bulk Density 1.56 gr/cm³

Porosity 0.05

Output: At 730 days

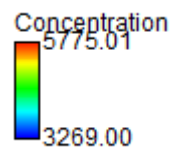
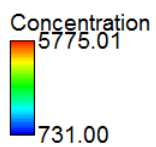
Excursion Threshold

Ross 3269

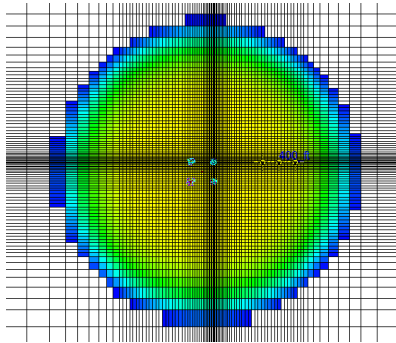
Nichols Ranch 731

Nichols Ranch

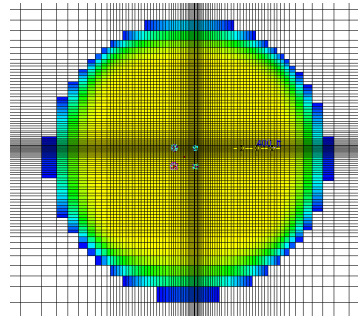
Ross



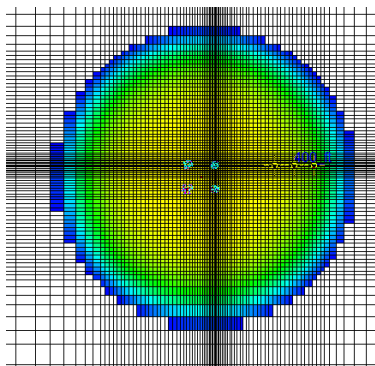
Ross $K_d=0, a=40$



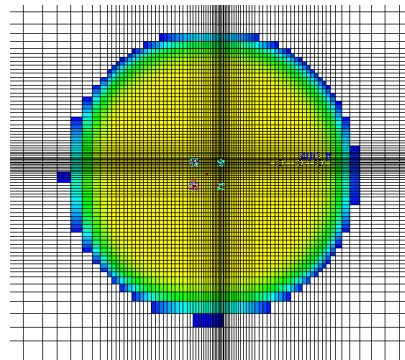
Ross $K_d=0, a=4$



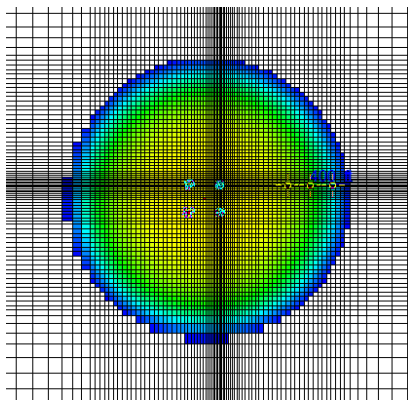
Ross $K_d=0.02, a=40$



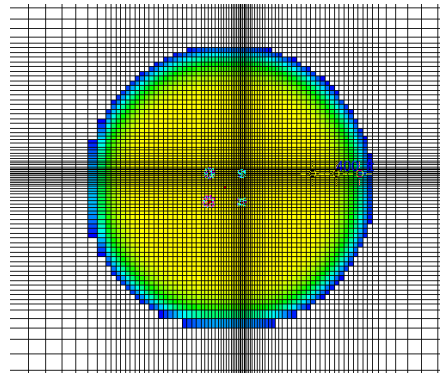
Ross $K_d=0.02, a=4$



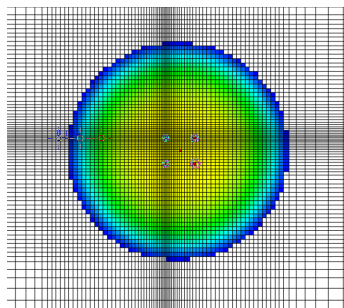
Ross $K_d=0.05, a=40$



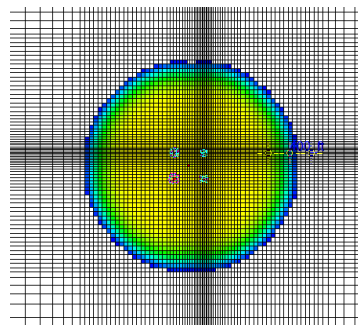
Ross $K_d=0.05, a=4$



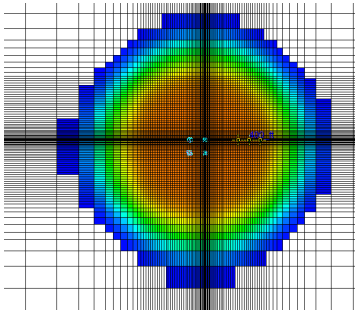
Ross $K_d=.1, a=40$



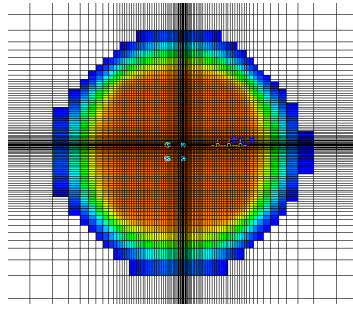
Ross $K_d=.1, a=4$



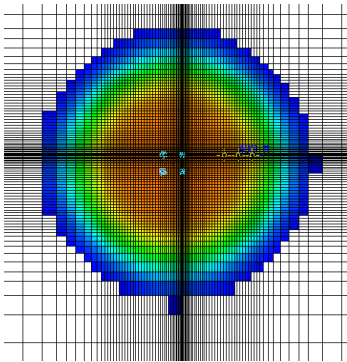
Nichols $K_d=0, a=40$



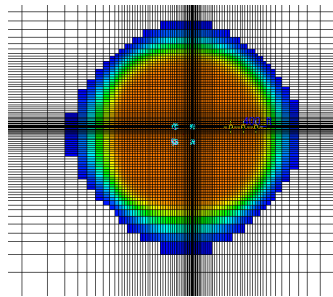
Nichols $K_d=0, a=4$



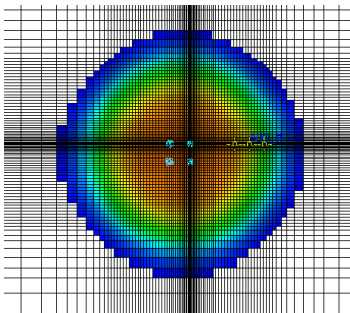
Nichols $K_d=0.02, a=40$



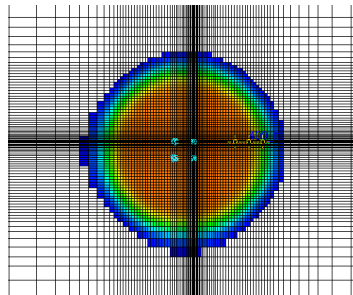
Nichols $K_d=0.02, a=4$



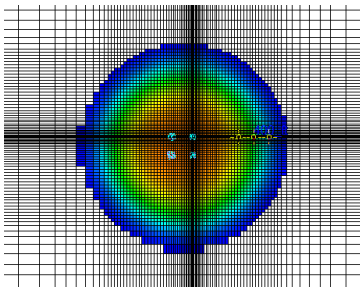
Nichols $K_d=0.05, a=40$



Nichols $K_d=0.05, a=4$



Nichols $K_d=.1, a=40$



Nichols $K_d=.1, a=4$

