Groundwater Data Base Capabilities and Groundwater Modeling Results for the Claremont Polychemical Superfund Site

Presentation to USACE, EPA, NYDEC, Nassau County, and Town of Oyster Bay

by

Science Applications International Corporation

February 7, 2006

Groundwater Data Base Capabilities and Groundwater Modeling Results for the Claremont Polychemical Superfund Site
February 7, 2006 Meeting

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From: "Daniels, Todd A NWK" <Todd.A.Daniels@nwk02.usace.army.mil>
To: "Maria Jon (E-mail)" <jon.maria@epamail.epa.gov>, "Rob Alvey (E-mail)" <alvey.robert@epamail.epa.gov>, "Dick Cronce (E-mail)" <RICHARD.C.CRONCE@saic.com>, "Bian, Shewen W NAN02" <Shewen.W.Bian@nan02.usace.army.mil>, "Brink, Bradley J NWK" <Bradley.J.Brink@nwk02.usace.army.mil>, "John Gerlach (E-mail)" <jgerlach@lkbinc.com>, "Mike Flaherty (E-mail)" <flaherty.mike@mail.co.nassau.ny.us>, "Jeff Trad (E-mail)" <jetrad@gw.dec.state.ny.us>, "Yavonditte Joseph (E-mail)" <jayavond@gw.dec.state.ny.us>, "Whitfield Cynthia (E-mail)" <cxwhitfi@gw.dec.state.ny.us>, <jxrider@gw.dec.state.ny.us>, <pdlong@gw.dec.state.ny.us>, <mrusso@tobays.net>, "Torgerson, Knut E." <KNUT.E.TORGERSON@saic.com>, <SHARAD.R.REGMI@saic.com>, <larry.m.deschaine@saic.com>
Date: 2/3/06 12:25PM
Subject: RE: Claremont Polychemical Meeting

All,
Attached you will find the Agenda for the Claremont meeting scheduled for Tuesday (2/7). Also, the following is the current list of attendees that I have. Please let me know if I missed anyone.

EPA:
Maria Jon
Rob Alvey

NYDEC:
Cynthia Whitfield
Joe Yavonditte
Jeff Trad
Payson Long
Jerry Ryder

Town of Oyster Bay:
John Gerlach

Nassau Co.:
Mike Flaherty

Corps of Engineers:
Todd Daniels
Brad Brink
Shewen Bian

SAIC:
Dick Cronce
Knut Torgerson
Larry Deschaine
Sharad Regmi

If you have any questions please call me at (816) 983-3584.

Todd

<<Meeting Agenda - Rev 3.doc>>

-----Original Message-----
From: Daniels, Todd A NWK
Sent: Thursday, January 26, 2006 12:17 PM
To: Maria Jon (E-mail); Rob Alvey (E-mail); Dick Cronce

(E-mail); Bian, Shewen W NAN02; Brink, Bradley J NWK; John Gerlach (E-mail); Mike Flaherty (E-mail); Jeff Trad (E-mail); Yavonditte Joseph (E-mail); Whitfield Cynthia (E-mail); 'jxrider@gw.dec.state.ny.us'; 'pdlong@gw.dec.state.ny.us'; 'mrusso@tobays.net'

Subject: Claremont Polychemical Meeting

All,

Based on the feed back we have received, the meeting to discuss the Draft Database and Groundwater Modeling Report for the Claremont site has been scheduled for Tuesday, February 7. The meeting will begin at 10:00am and be held in EPA's office in New York City. The room number will be provided later. Also, if I have not included someone on this e-mail that you know is planning to attend please forward this to them for me.

If you have a conflict please e-mail me or call me at (816) 983-3584 as soon as you can otherwise I will plan to see you there.

Todd Daniels
Project Manager
US Army Corps of Engineers
Kansas City District

>>> <Jon.Maria@epamail.epa.gov> 01/18/06 11:40 AM >>>

Good morning,

I would like to schedule a meeting in our EPA office in New York City to discuss the Draft Data Base and Groundwater Modelling report. Tentative dates are February 2, 7, 9, 14 and 16, around 10 am. Please let me know your preference. A letter will mailed to you regarding this meeting by early next week.

Thanks,

Maria Jon
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
Eastern New York Section
290 Broadway
New York, NY 10007
(212) 637-3967

Meeting Agenda

Groundwater Data Base Capabilities and Groundwater Modeling Results for the Claremont Polychemical Superfund Site

Presentation to USACE, EPA, NYDEC, Nassau County, and Town of Oyster Bay

February 7, 2006 - New York, NY

Project Background and History – Cronce (5 minutes)

Development of the data base and Website – Torgerson (20 minutes)

- **Sources of data**
- **Data base format standards**
- **Data Compilation**
- **Problems encountered**
- **Data base capabilities and limitations**
- **Demonstration of web site data base usage**

Hydrogeologic Flow Model – Regmi (20 minutes)

- **Description of Modeling Approach**
- **Approach to model development**
- **Sources of input data**
- **Data processing**
- **Hydrogeologic model capabilities and limitations**
- **Presentation of initial modeling results**

Fate and Transport Modeling – Deschaine (20 minutes)

- **Description of Modeling Approach(s)**
- **Approach to model development**
- **Sources of input data**
- **Fate and transport model capabilities and limitations**
- **Presentation of results**
    - **Particle tracking – possible source identification**
    - **Plume migration modeling**
    - **Plume Finder**
    - **Plume capture modeling**

Results of Recent Groundwater Characterization Efforts – Cronce (10 Minutes)

- **Summary of Recent Activities**
- **Review of Geologic Cross Sections and Aquifer Chemistry**
- **Results of Recent Particle Tracking**

Discussion of Maintenance and Update of Data Base and Models – All (25 minutes)

- **Data Base**
- **Hydrogeologic Flow Model**
- **Fate and Transport Model**

Future Data Base and Modeling Efforts – All (20 minutes)

Meeting Agenda

- **Project Background and History – Cronce (5 minutes)**
- **Development of the data base and Website – Torgerson (20 minutes)**
- **Hydrogeologic Flow Model – Regmi (20 minutes)**
- **Fate and Transport Modeling – Deschaine (20 minutes)**
- **Results of Recent Groundwater Characterization Efforts – Cronce 10 minutes)**
- **Discussion of Maintenance and Update of Data Base and Models – All (20 minutes)**
- **Future Data Base and Modeling Efforts – All (25 minutes)**

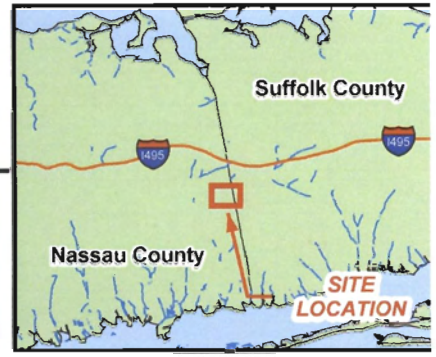
Claremont Polychemical Site History

- 1966 – 1980 – Chemical manufacturing.
- 1979 – 1997 – Identification of chlorinated solvents in site soil and groundwater, NPL listing, and completion of RI/FS.
- 1997 – 2000 – Groundwater treatment plant construction and startup under OU-4.
- 2000 – Present – Groundwater remediation and monitoring under Long Term Response Action (LTRA).

Legend

- Monitoring Wells

NAD1983 StatePlane New York Long Island FIPS 310
Projection: Lambert Conformal Conic
False Easting: 984251.968504
False Northing: 0.000000
Central Meridian: -74.000000
Standard Parallel 1: 40.666667
Standard Parallel 2: 41.033333
Latitude Of Origin: 40.166667



KEY MAP
NOT TO SCALE

N

750 375 0 750
Feet

US Army Corps of Engineers.

Fig 3-2
Monitoring Well Location

Claremnont Polychemical
Nassau County, New York

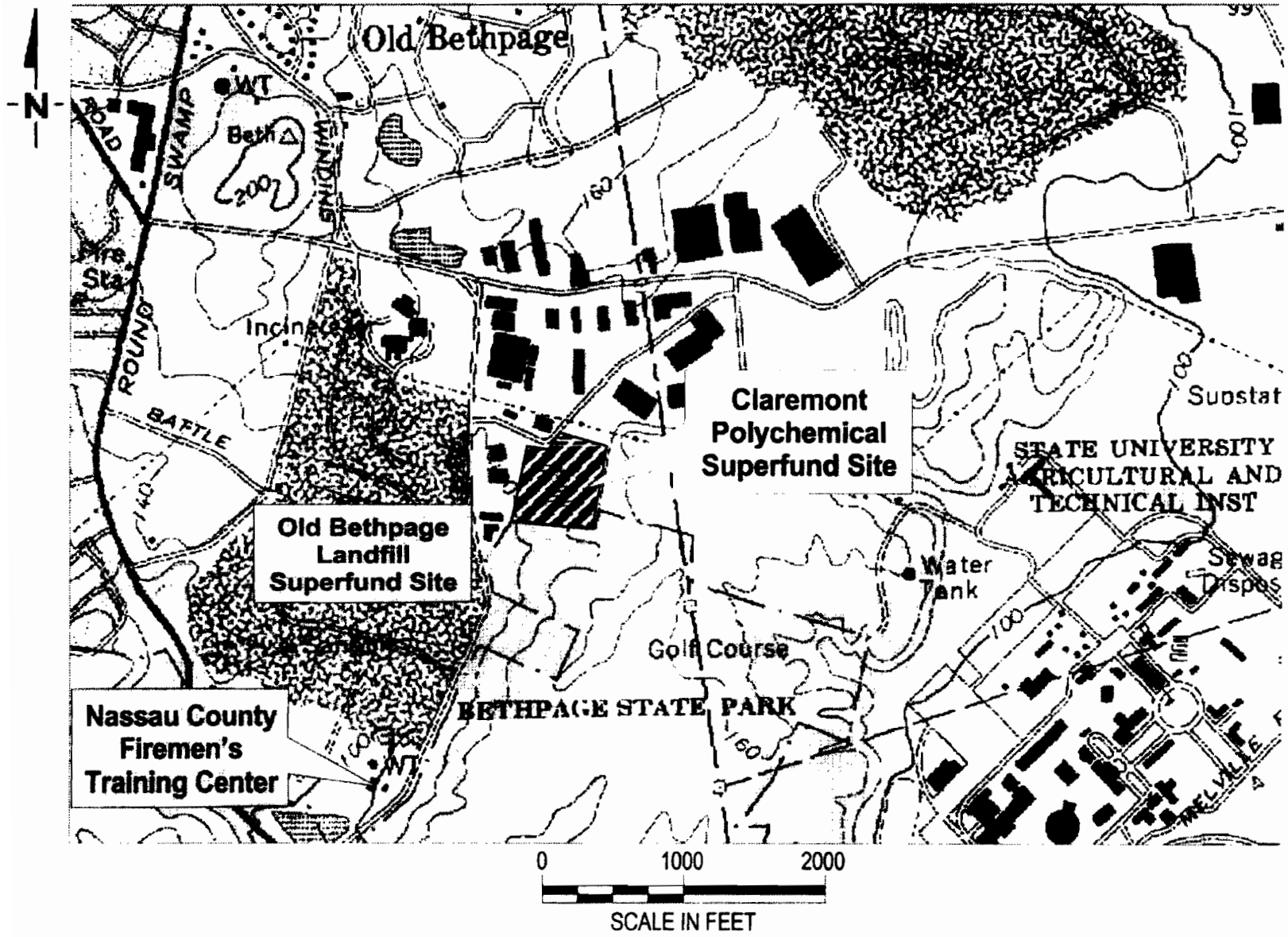
PROJECT: \GIS_DATA\CLRMNT\Projects\
Claremont Well Locations Fig 3-2.mxd

FIGURE: 3-2	DATE: 09-20-2005

Data Base/Modeling Project History

- Three regional groundwater remediation programs:
  - EPA/Claremont – 400 gpm from 3 extraction wells, re-injection into 4 injection wells.
  - Nassau Co./Fireman's Training Center – 600 gpm from 3 on-site and 450 gpm from 3 off-site extraction wells, re-injection into 3 injection wells and 1 infiltration basin.
  - TOB/Old Bethpage Landfill – 1000 gpm from 5 extraction wells, re-injection into 3 infiltrations basins.
- Claremont groundwater monitoring results indicated possibly two contaminant signatures.
- Claremont and Nassau Co. monitoring results indicated possible interrelationships between the groundwater remediation programs.
- A comprehensive regional groundwater evaluation was deemed appropriate.

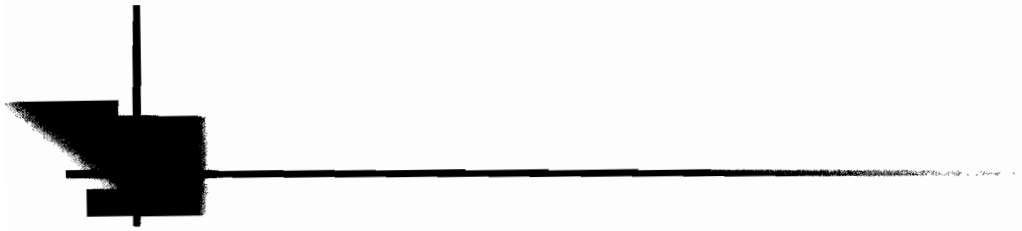
Figure 1-1: The Claremont Polychemical Superfund Site and the Surrounding Area.



(Note: This figure is adapted from the USGS topographic map, Huntington Quadrangle, 7.5 minute series

Data Base and Groundwater Modeling Project Objectives

- Compile critical Claremont Polychemical, Nassau Co., and TOB data into a comprehensive regional data base.
- Provide convenient web-based access.
- Input compiled data into a regional groundwater flow model.
- Use flow model and regional groundwater chemistry to conduct groundwater capture and contaminant fate and transport modeling.
- Provide protocols and mechanisms to support ongoing data base management and query functions.



Description and Demonstration of Data Base

By

Knut Torgerson

Claremont Polychemical Database and Website

- Sources of data
- Database format standards
- Data compilation
- Problems encountered
- Database capabilities and limitations
- Data viewer website demo

Sources of Data

- USEPA
- Nassau County
  - Fireman's Training Center (FTC)
- Town of Oyster Bay

Database Format Standards

- EPA Region 2 Multimedia Electronic Data Deliverable (MEDD)
  - Electronic submittal and review of analytical data

Data Compilation

- Conversion of historic project data
  - EPA LTM Reports 12/2001, 7/2003, 8/2004
  - NC 2000 – 2003 onsite (FTC), offsite
  - TOB 2000 – 2004 RW-1 through 5
- Assimilation of MEDD deliverables
  - EPA 1/2004 - present

Problems Encountered

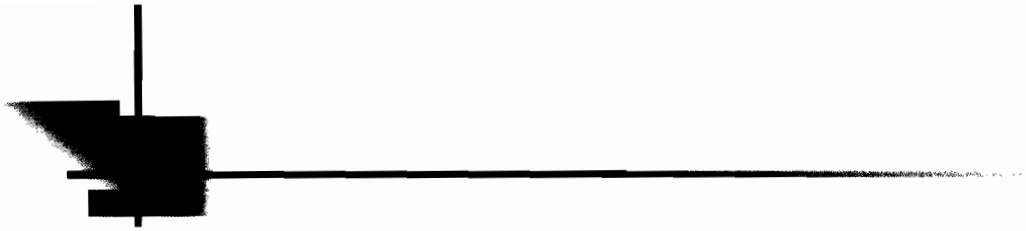
- Initial uncertainty of required standards for this project
- Many CLP labs not adhering to MEDD standards
- Standards in their infancy – common values not comprehensive
- "Detect_flag" field not updated during Validation process
- Data lacks sample depth information

Database Capabilities and Limitations

- Capability to store all data fields described in MEDD standards
- No limitation on storage capacity with SQL Server and SAN
- Currently, only analytical data has been assimilated into the database

Data Viewer Website Demo

- www.claremontpolychemical.com
- User accounts
- Functionality overview



Presentation of Hydrogeologic Flow Model

By

Sharad Regmi

Description of Modeling Approach

- Development of Conceptual Model
- Conceptual model conversion into a Numerical Model
- Calibration of the Numerical model
- Sensitivity Analysis
- Validation of the Numerical model
- Flow model simulation

Sources of Input Data

- Available Borehole data
- Available Aquifer test results
- Monitoring Wells measured water levels at Claremont site (January 2005)
- 1990 -1992 Pre-pumping water levels

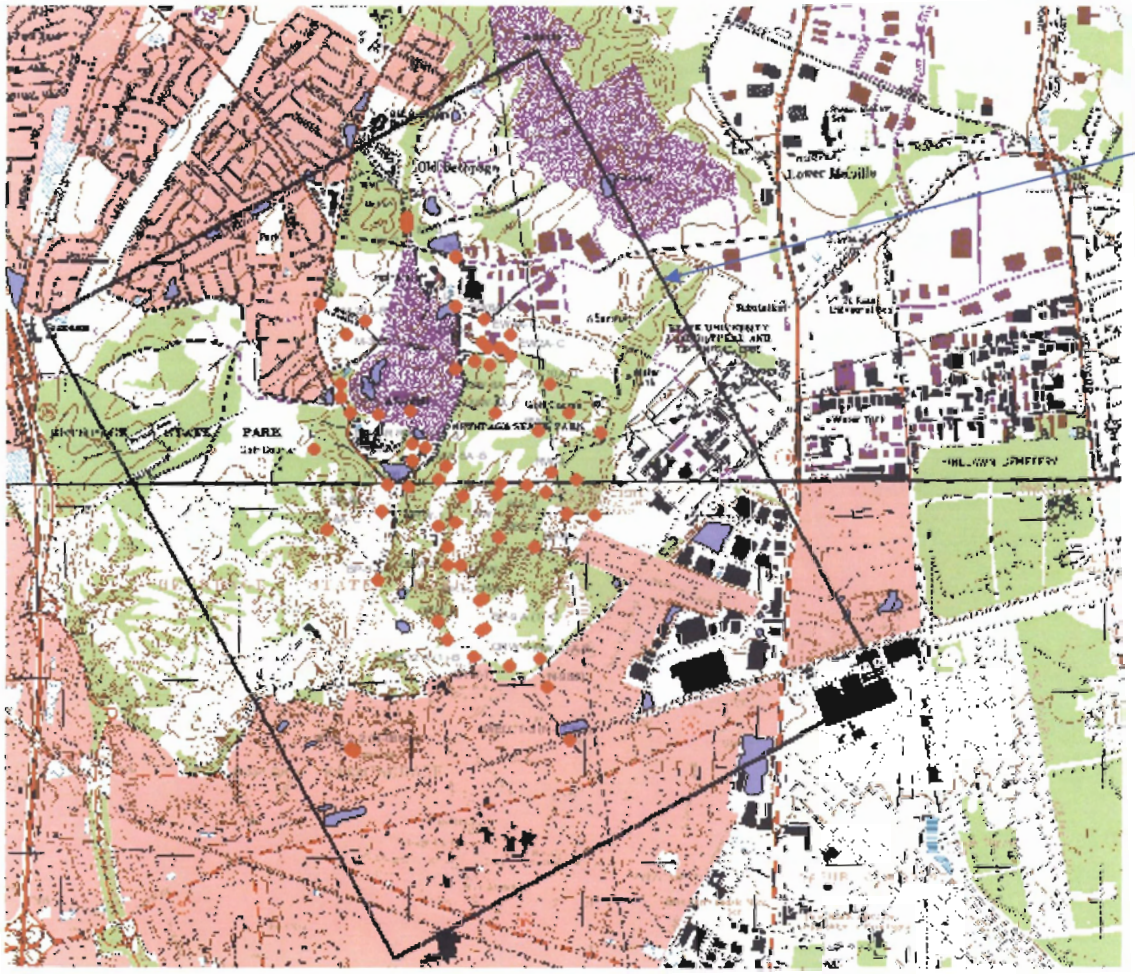
Data Processing

- Borehole data was used to develop the conceptual model
- Monitoring wells measured water levels at Claremont site (January 2005) were used to calibrate and validate the model
- 1990 -1992 Pre-pumping water levels were used to ensure that general flow directions and hydraulic gradient are matched.

Conceptual Model Development

- The horizontal local area was first sectioned out to create the model domain, or the area that the modeling takes place.
- The vertical portion of the model was divided into three layers.

Conceptual Model Development
Model Domain



Model Domain
10,400 ft by 13,350 ft

Conceptual Model Development
Vertical Discritization

Zone A
Zone B
Zone C

Typical Model X-section

Zone A = 100 ft thick
Zone B = 120 ft thick
Zone C = 130 ft thick

Conceptual Model Conversion into Numerical Model

- 3-dimentional Conceptual Model was converted into 3-dimentional numerical model.
- Finite Difference Grid was superimposed over the model domain.
- USGS MODFLOW was used to Simulate the flow within the Model Domain

Numerical Model Development
Location of Pumping and Extraction Activities in the Area

- Multiple water pumping and injection systems occur within the modeled domain:
  - Remediation wells
  - Municipal wells
  - Infiltration Basins / Ponds
  - Injection wells.
- All these are captured in the model.

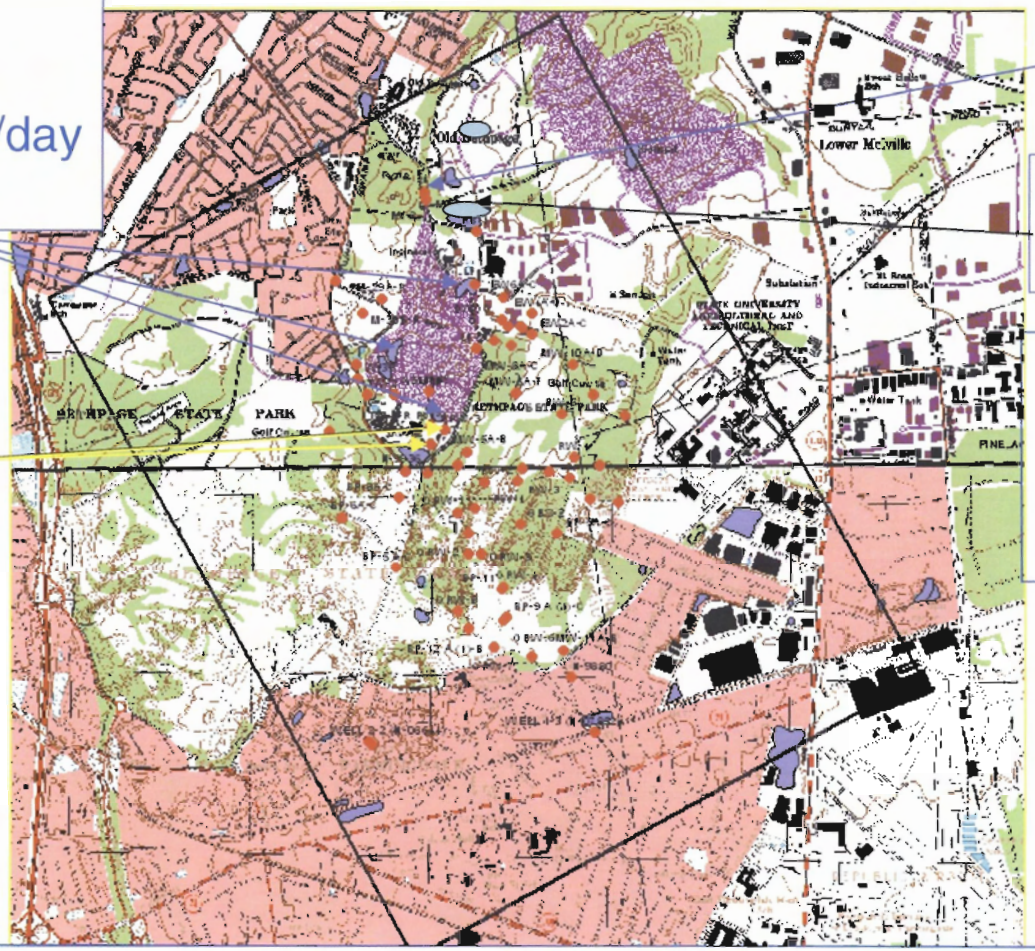
Numerical Model Development

Injection wells, Pumping wells, Infiltration basins used in the model

TOB Infiltration Basins
Total 1.35 M gal/day

County Injection 3 Wells : Each 100GPM

County infiltration Pond : 150 GPM



County RW-1, RW-2, RW-3 Each pumping 200 gal/min

Town well field RW1, RW2, RW3, RW4, RW5 : each Pumping 200 gal/min

County well field: ORW-4, ORW-6, ORW-7 : total pumping 450 gal/min

Claremont wells: EX-1, Ex-2, Ex-3 : Each pumping 167 gal/min
IW-1, IW-2, IW-3, IW-4 : Each injecting 125 gal/min

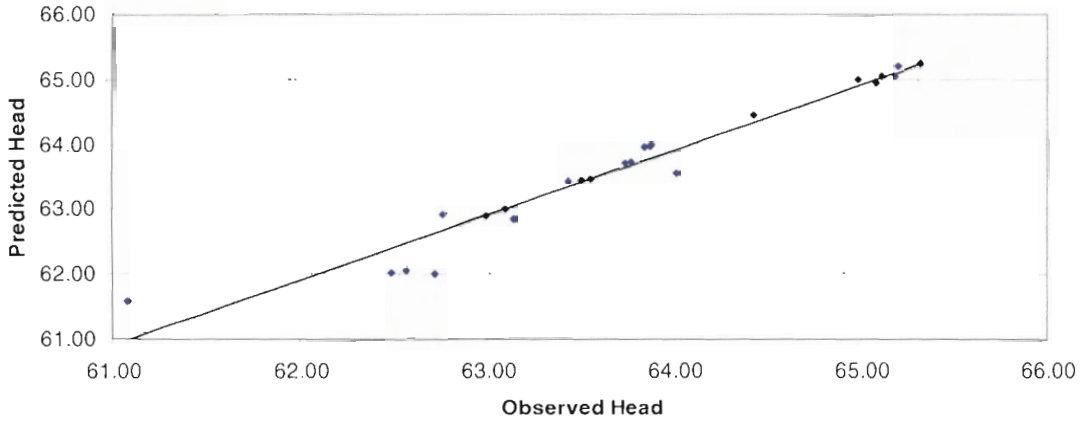
Recharge = 20.6 in/yr

Model Calibration

- Goal is to calibrate the flow system in the model with all these injection / extraction activities happening.
  - Calibrate to measured water table heads near the site.
  - Turn off the injection and extraction and assess flow gradient vs. natural flow conditions.

Model Calibration
Targets Location

Model Calibration
Observed vs. Modeled (Simulated) Head



All extraction / injection water flows active.

Steady-state simulation.

Achieved reasonable match of observed versus predicted heads in a complicated flow system with multiple injection / extraction systems active

Well	Layer	Observed (Jan 2005)	Computed	Residual
SW-1	1	63.77	63.73	0.04
DW-1	1	63.74	63.71	0.03
EW-1A	1	63.50	63.43	0.07
EW-1B	2	63.43	63.43	0.00
EW-1C	2	63.55	63.44	0.11
EW-2A	1	62.76	62.91	-0.15
EW-2B	2	62.99	62.89	0.10
EW-2C	2	63.14	62.85	0.29
EW-4A	2	63.88	64.00	-0.12
EW-4B	2	63.87	63.98	-0.11
EW-4C	2	63.84	63.95	-0.11
EW-5	2	63.09	62.99	0.10
EW-6A	1	65.32	65.22	0.10
EW-6C	2	65.20	65.20	0.00
EW-7C	2	65.18	65.05	0.13
EW-7D	3	65.11	65.03	0.08
EW-8D	3	64.98	64.97	0.01
EW-9D	3	65.08	64.93	0.15
MW-6D	2	61.08	61.58	-0.50
MW-10B	2	62.72	62.00	0.72
MW-10C	3	62.57	62.05	0.52
MW-10D	3	62.49	62.02	0.47
LF-2	3	64.01	63.55	0.46
PPW-1	3	64.42	64.44	-0.02

Model Calibration

Calibrated Hydraulic Conductivity

Horizontal Hydraulic Conductivity:
Zone A = 282.5 ft/day
Zone B = 82 ft/day , Fire Training Area = 39 ft/day
Zone C = 98 ft/day

Vertical Hydraulic Conductivity:
Zone A = 84 ft/day
Zone B = 32 ft/day , Fire Training Area = 12 ft/day
Zone C = 30 ft/day

Reasonable values of hydraulic conductivity used for type of soil materials

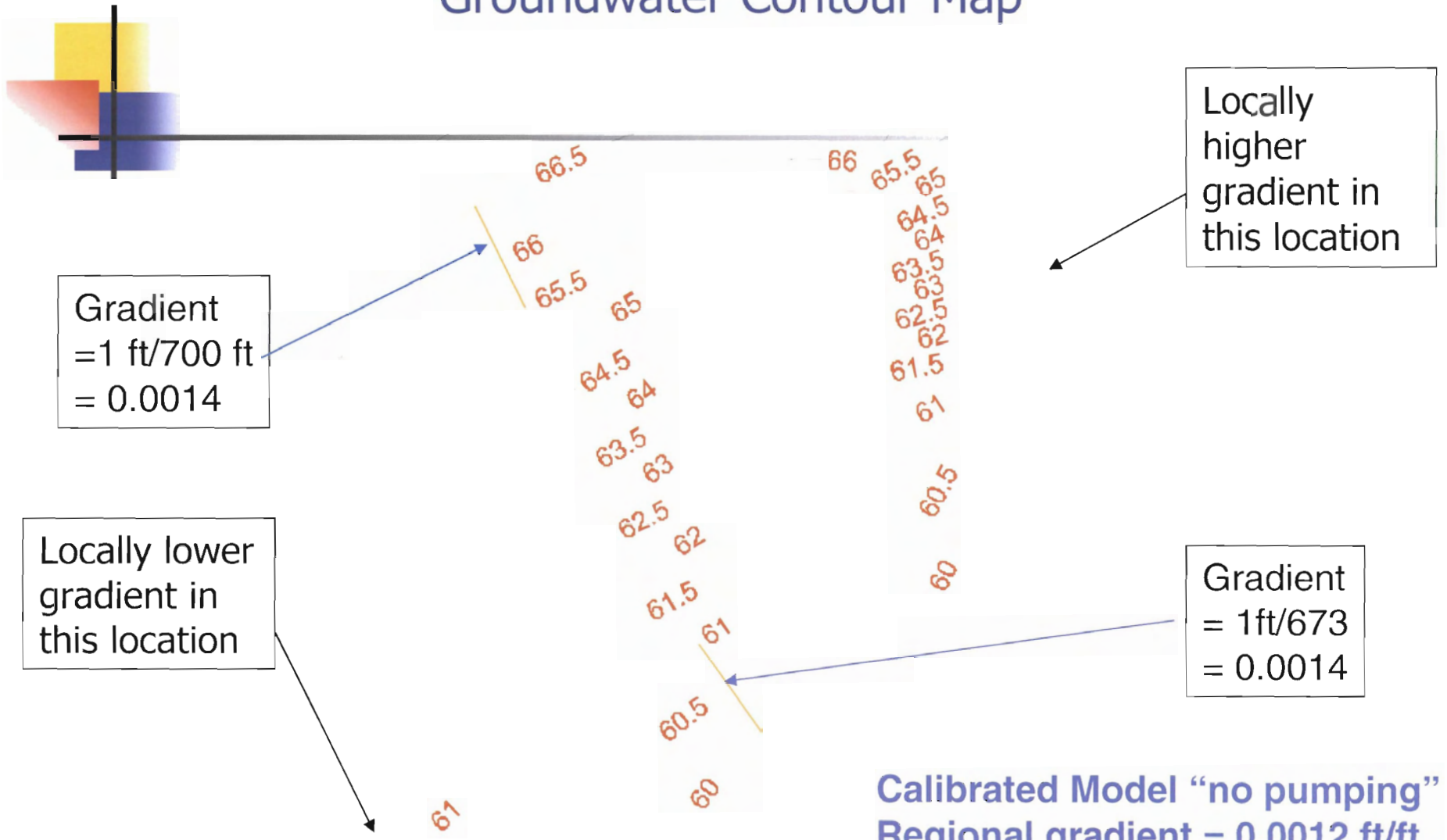
Model Calibration

Model Behavior Tested for No Pumping or Injection Scenarios

- Turned off all Sources of Extraction.
- Turned off all Sources of Injection.
  - Kept rainfall on.
- Assessed flow gradients.

Model Calibration

1990 -1992 Pre-pumping Groundwater Contour Map

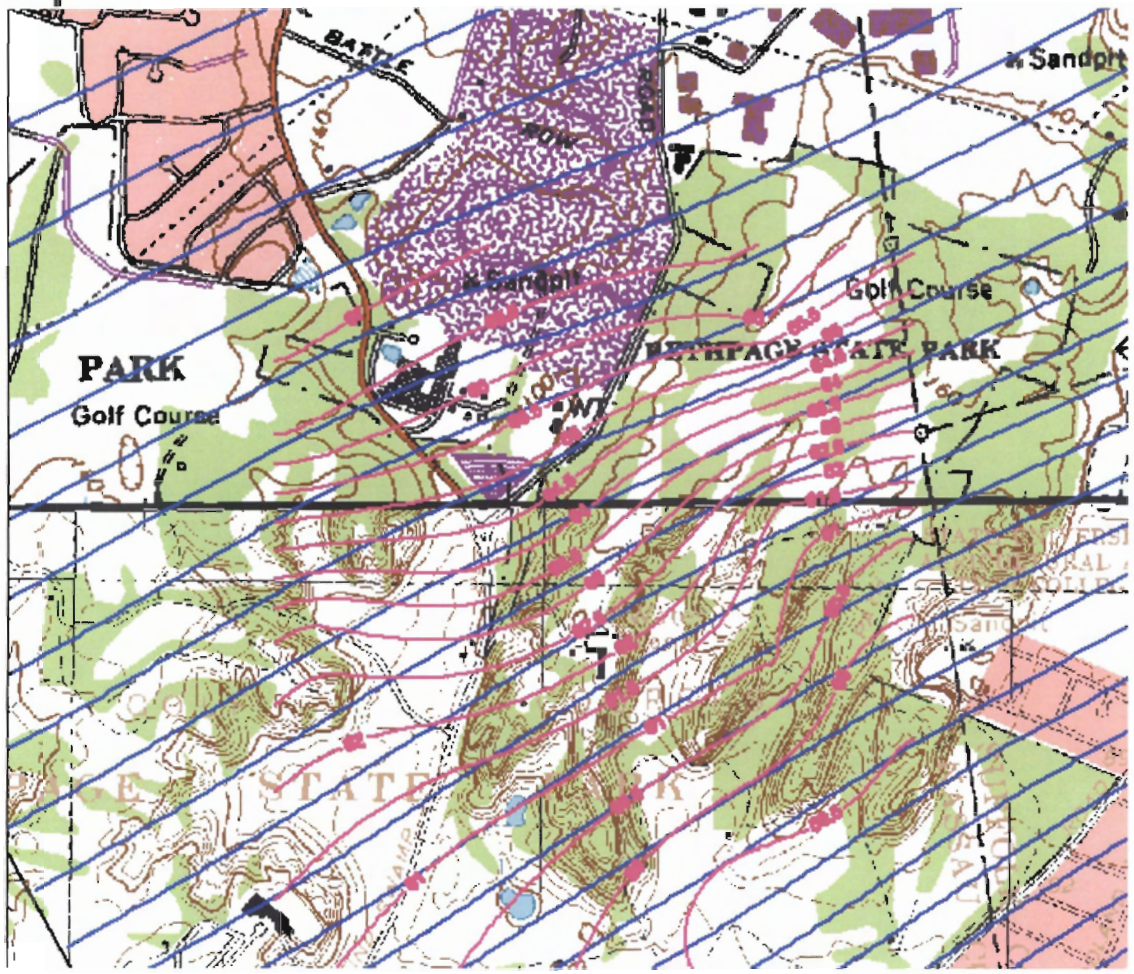


Calibrated Model "no pumping"
Regional gradient = 0.0012 ft/ft

Contour Interval = ½ ft

Model Calibration

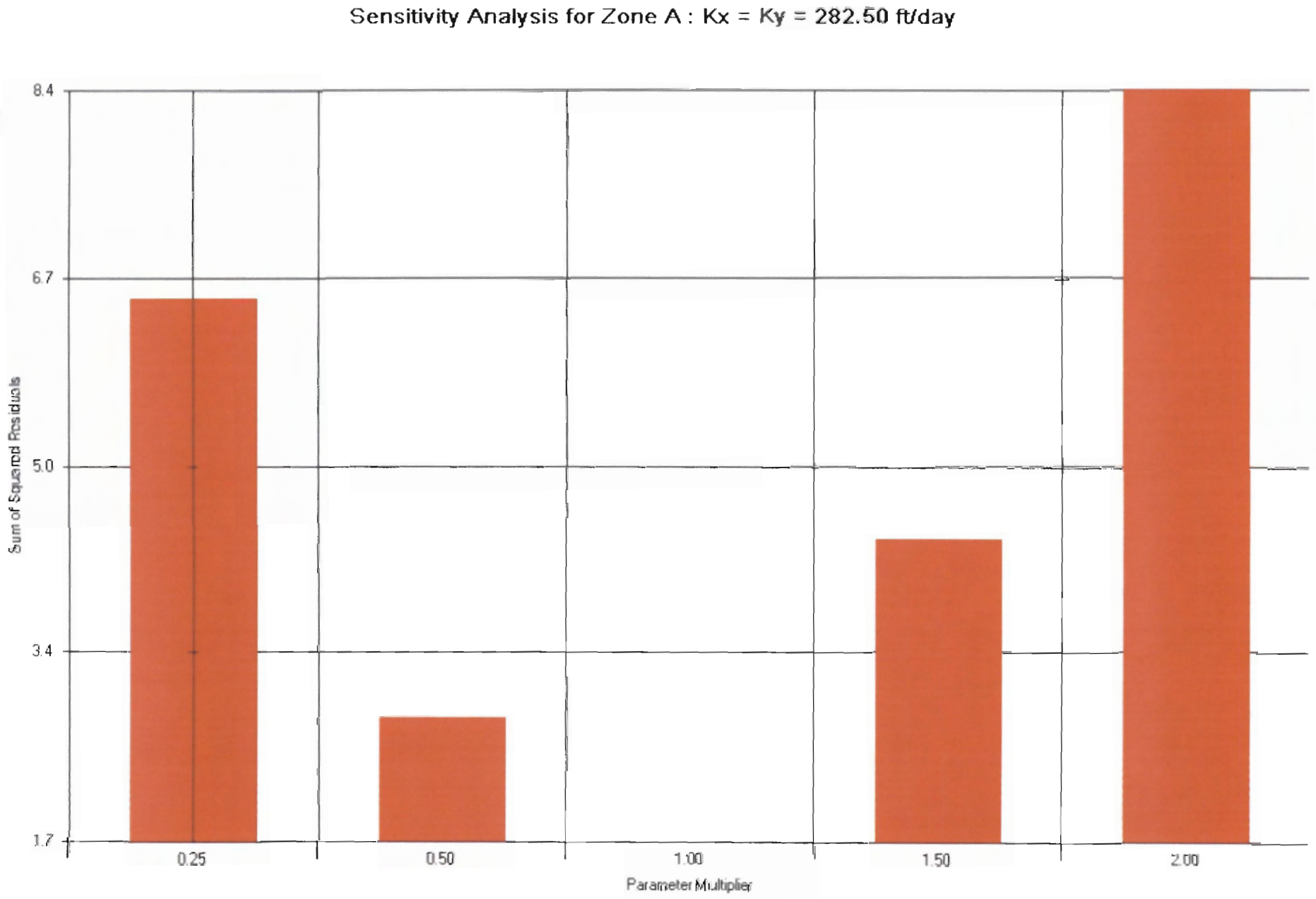
Comparison between1990 -1992 Pre-pumping Groundwater Contour map (purple lines) and Model Predicted Contour map (Blue lines) : Middle "B" Zone



Model predicted hydraulic gradient and the flow direction matches with the observed regional flow

Contour Interval = ½ ft

Sensitivity Analysis



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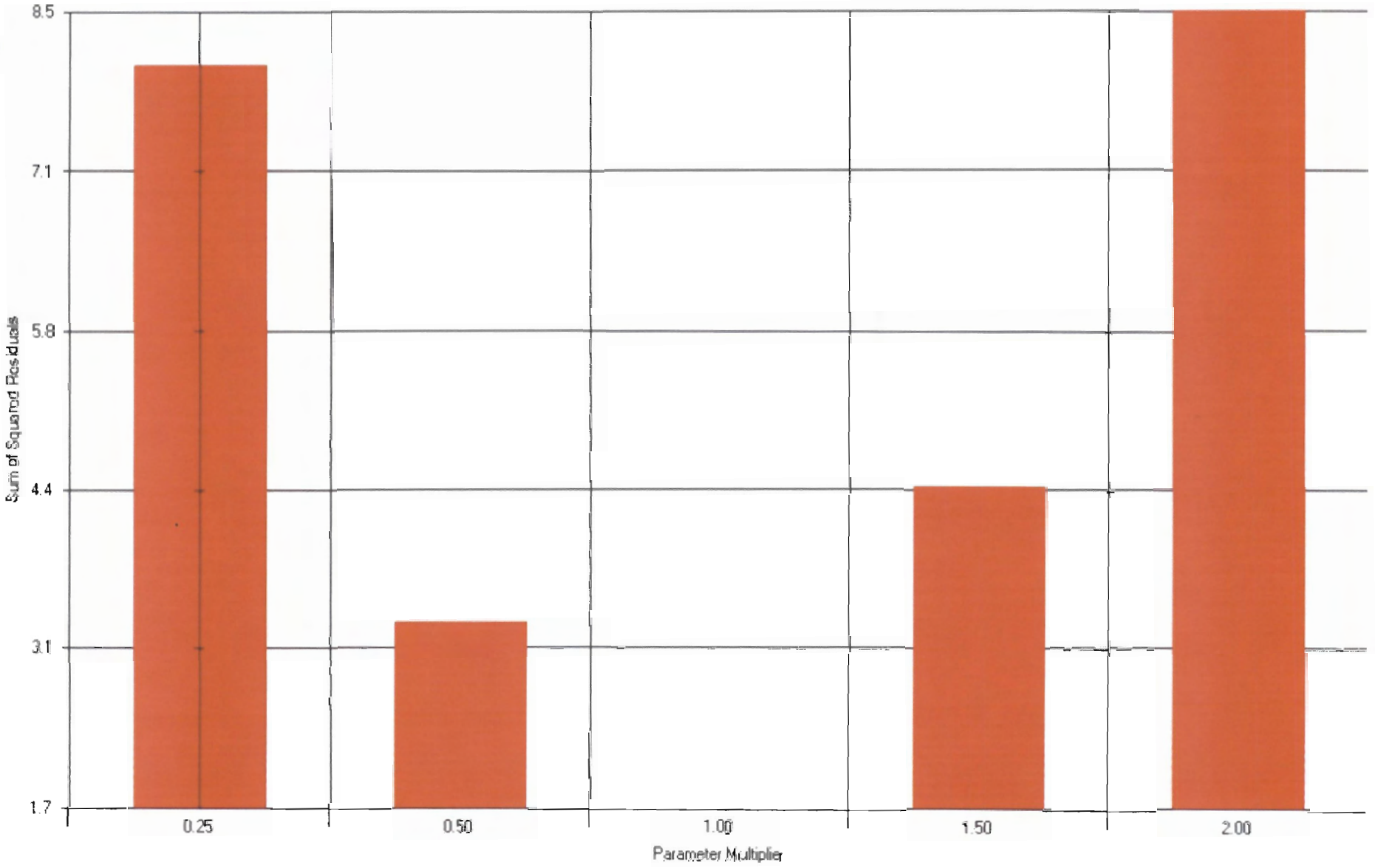
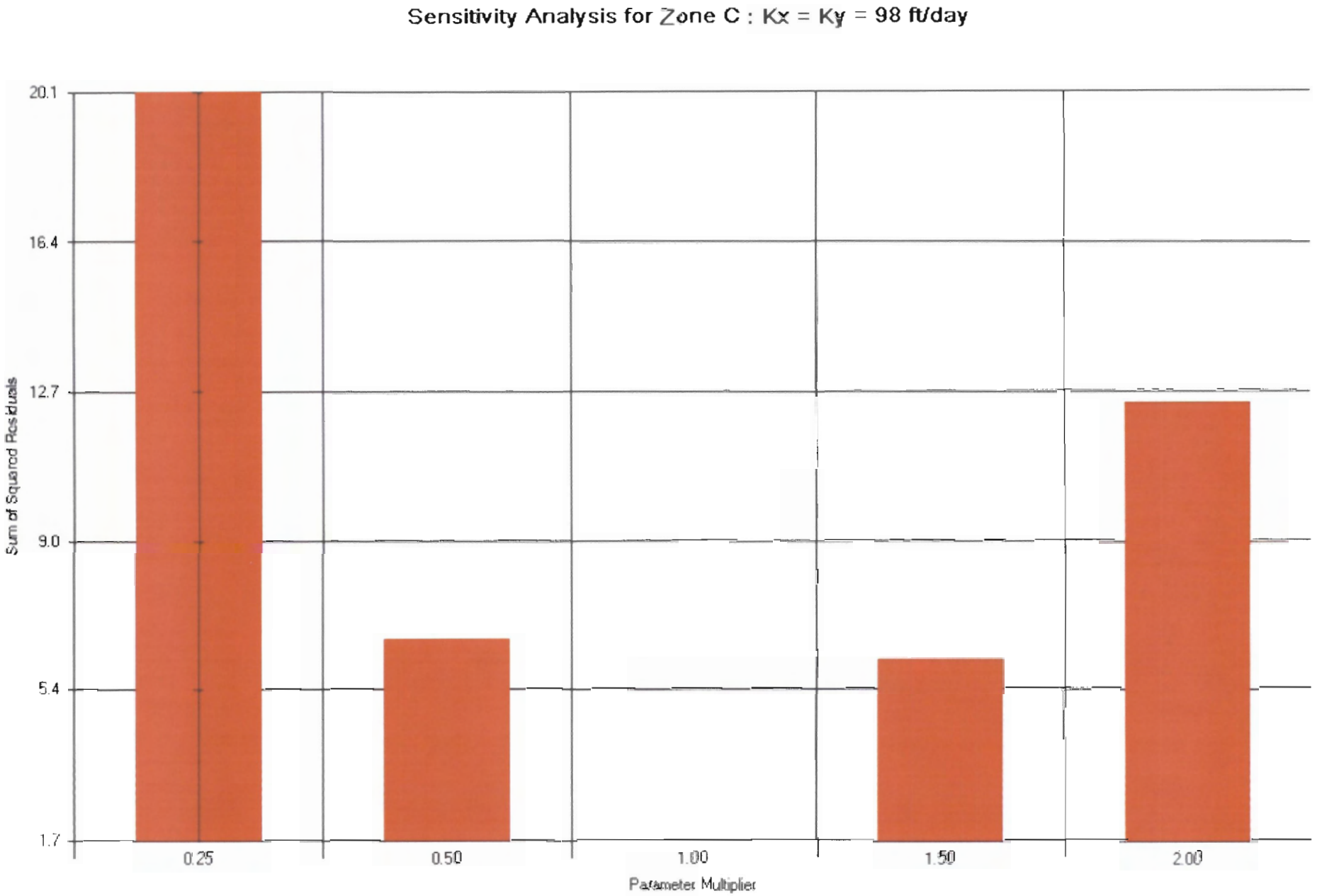
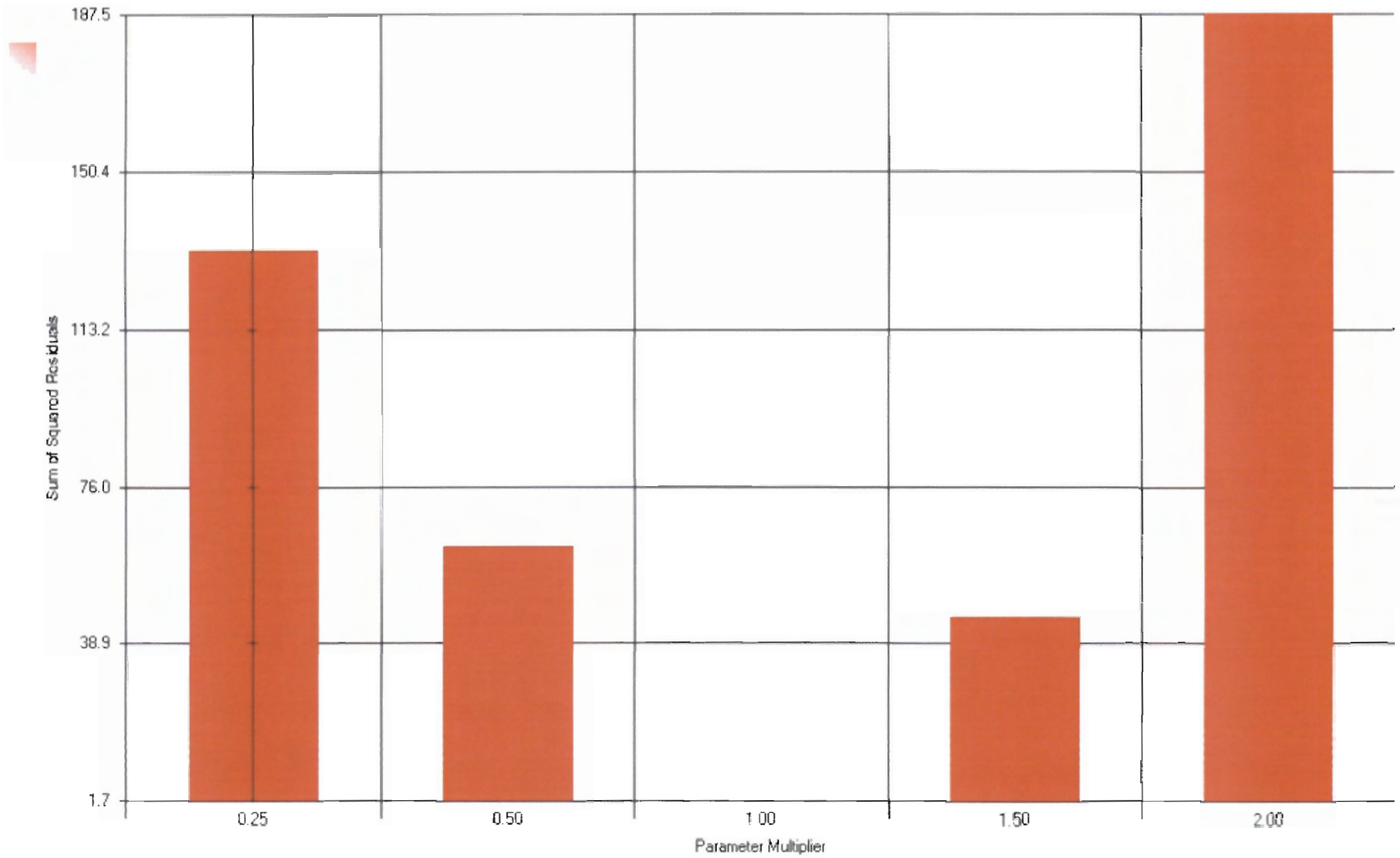


Sensitivity Analysis



Sensitivity Analysis



Model Validation

Three wells were used to verify the model predicted head. These three wells were not used in model calibration

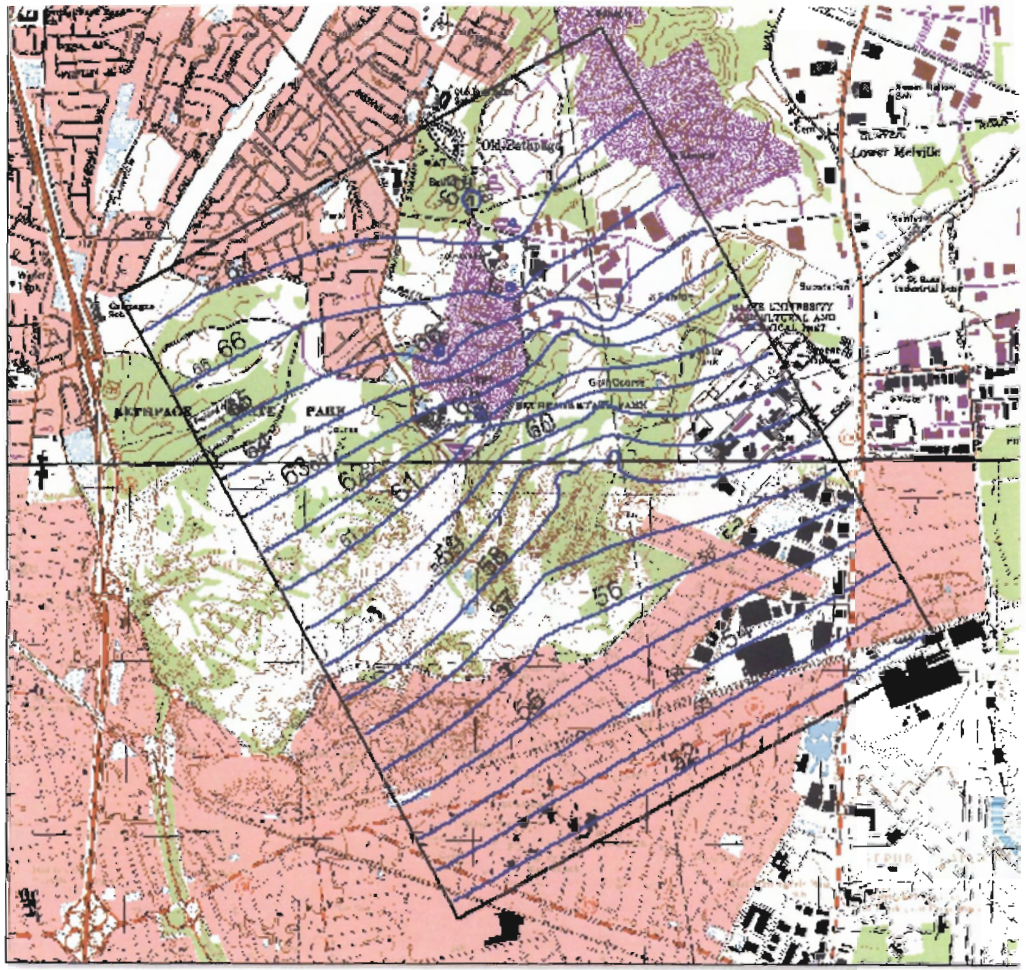
Well ID	Observed Head in 2005	Maximum Observed Head	Minimum Observed Head	Model predicted Head
MW-8C	63.55 ft	68.55 ft in Oct 2002	62.14 ft in July 2003	62.80 ft
DW-2	61.92 ft	63.12 ft in April 2004	51.61ft in Feb 2002	63.09 ft
WT-1	64.92 ft	64.92 in Jan 2005	61.38 ft in April 2003	64.93 ft

Model Capabilities and Limitations

- Model of the subsurface flow system for Claremont Site and surrounding area constructed.
  - Includes multiple water sources of injection as well as extraction.
- Model reasonably matches the observed flow conditions.
- Usable for flow, transport and optimal pumping strategy design simulations.
- The groundwater level data for areas other than Claremont site is not available at this time. Therefore, the developed model prediction will be more reliable near to the Claremont site and the confidence in the prediction decreases for areas away from the Claremont site.

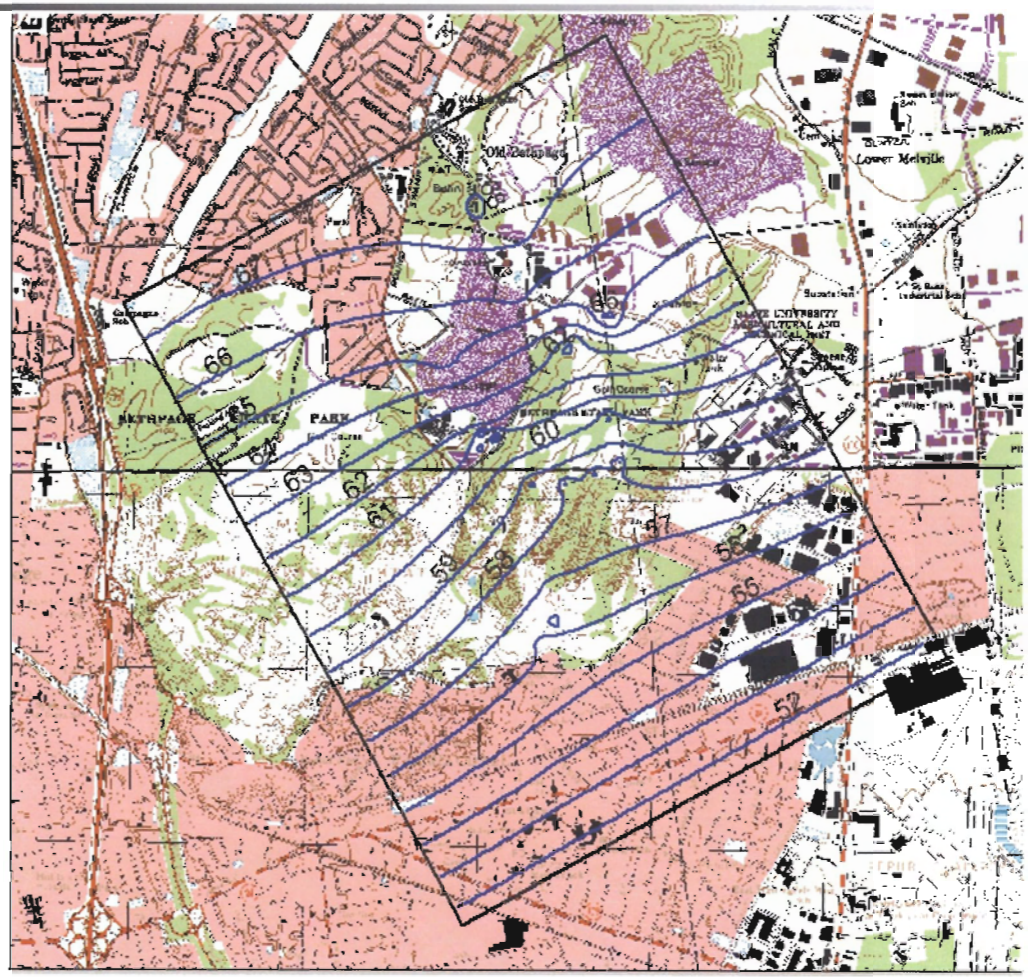
Model Results

Model Predicted Upper Zone (A) Contour



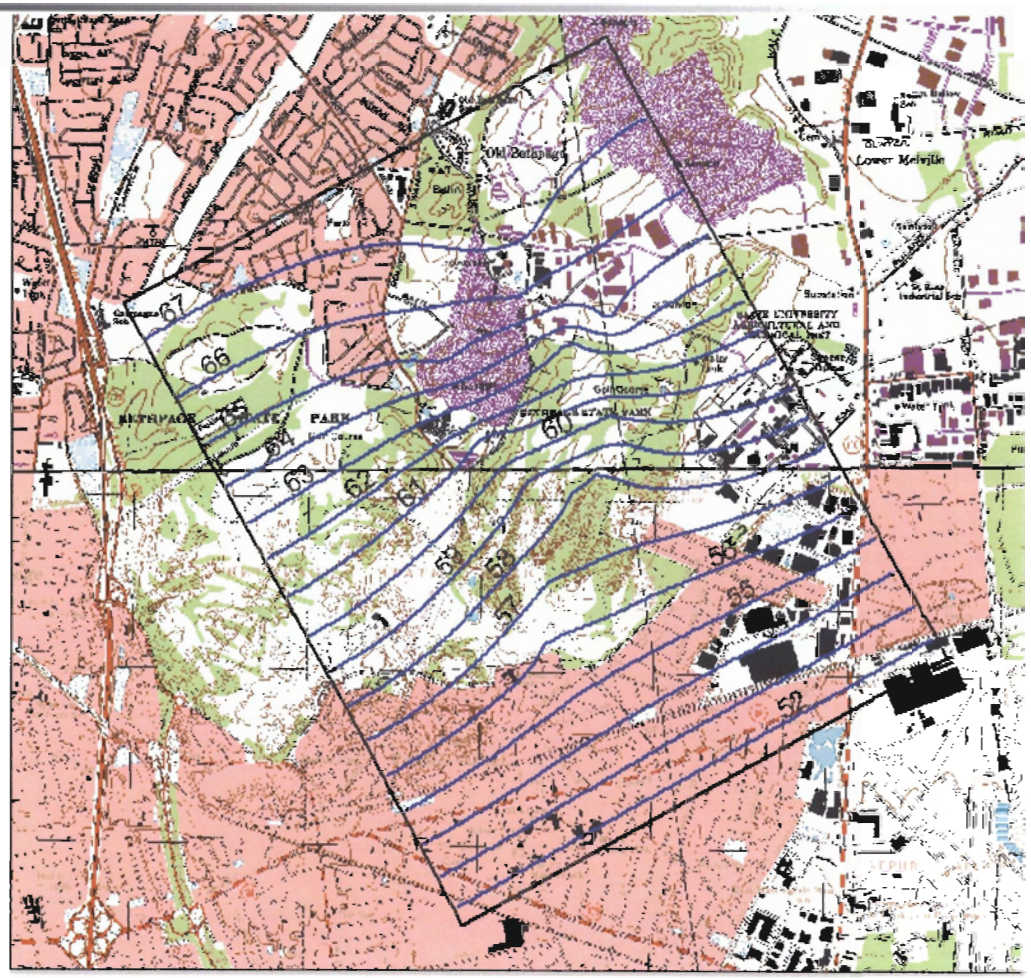
Model Results

Model Predicted Middle Zone (B) Contour



Model Results

Model Predicted Lower Zone (C) Contour



Results of Claremont Fate and Transport Modeling

by

Larry Deschaine

Description of Transport Modeling Approach

- Development of Conceptual Solute Transport Model. The Conceptual Solute transport model is a summary of the geochemistry of the site.
- Translation of Conceptual Solute Transport Model to a Numerical Model
- Numerical Transport Model Selection (MT3DMS Transport Code was selected)
- Transport Model Simulation

Transport Conceptual Model
TCE Plume map

Estimated TCE 5 ug/L line

TCE plume map was developed using maximum detected TCE concentration in the year 2004.
If the data for 2004 was not available, most recent 2003 TCE sampled value was used to develop the TCE plume map.
Red wells are the locations where TCE values are known. TCE plume map contour interval = 5, 50, 100, 500, 1000, and 1500 ug/L

Sources of Input Data

- TCE data collected in the year 2004. Maximum TCE concentration values were used if more than one value were available for the same monitoring well.
- For those monitoring wells for which TCE data were not available for 2004, most recent 2003 data were used.
- Due to the lack of TCE data, eastern, northern, and southern side of the plume were estimated.
- The developed TCE plume was used as initial dissolved source and not as a continuous source

Sources of Input Data (continued)

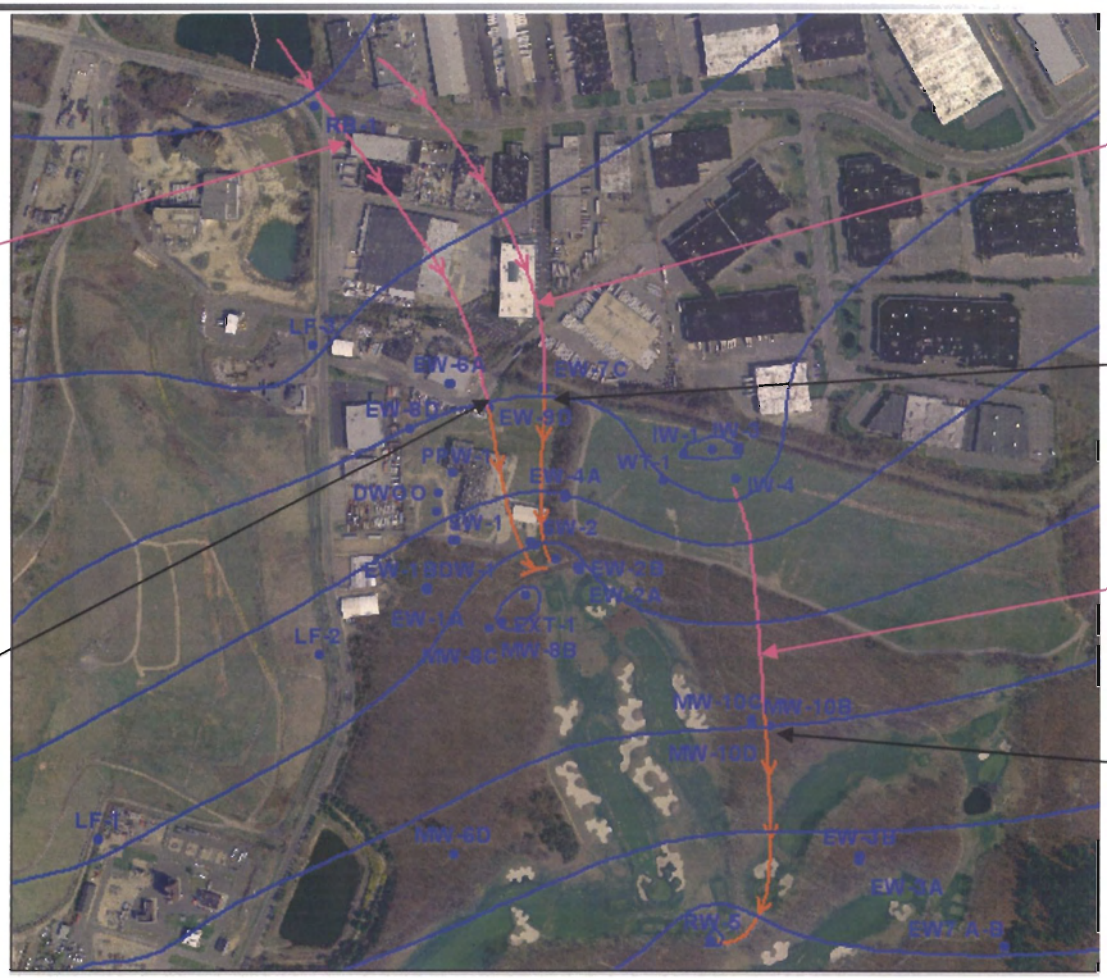
- Low Organic Carbon Content was assumed to be 0.1%.
- TCE half-life in dissolved phase was 1 year (Surez and Rafia, 1999)
- Porosity of 0.30 was assumed
- Bulk Density of 1.8 g/cm^3 was assumed
- Dispersivities were specified as 30 ft, 3 ft, and 1 ft in the longitudinal, transverse horizontal, and transverse vertical direction, respectively.

Fate and Transport Model Capabilities and limitation

- The Model reasonably matches the observed flow conditions at the Claremont Site.
- Usable for flow, transport and optimal pumping strategy design simulations.
- TCE plume is well defined on the western side and not defined on the eastern, northern, and southern side.
- The transport model prediction will be more reliable near to the Claremont site and the confidence in the prediction decreases for areas away from the Claremont site. This is because groundwater level data for areas other than Claremont site is not available at this time.

Results of Particle Tracking Middle Zone (B)

Presentation of Results
Particle Tracking at Zone B from Wells EW-9, EW-7, & MW-10



3 yr back track

4 yr back track

EW-7C

1 yr back track

EW-9D

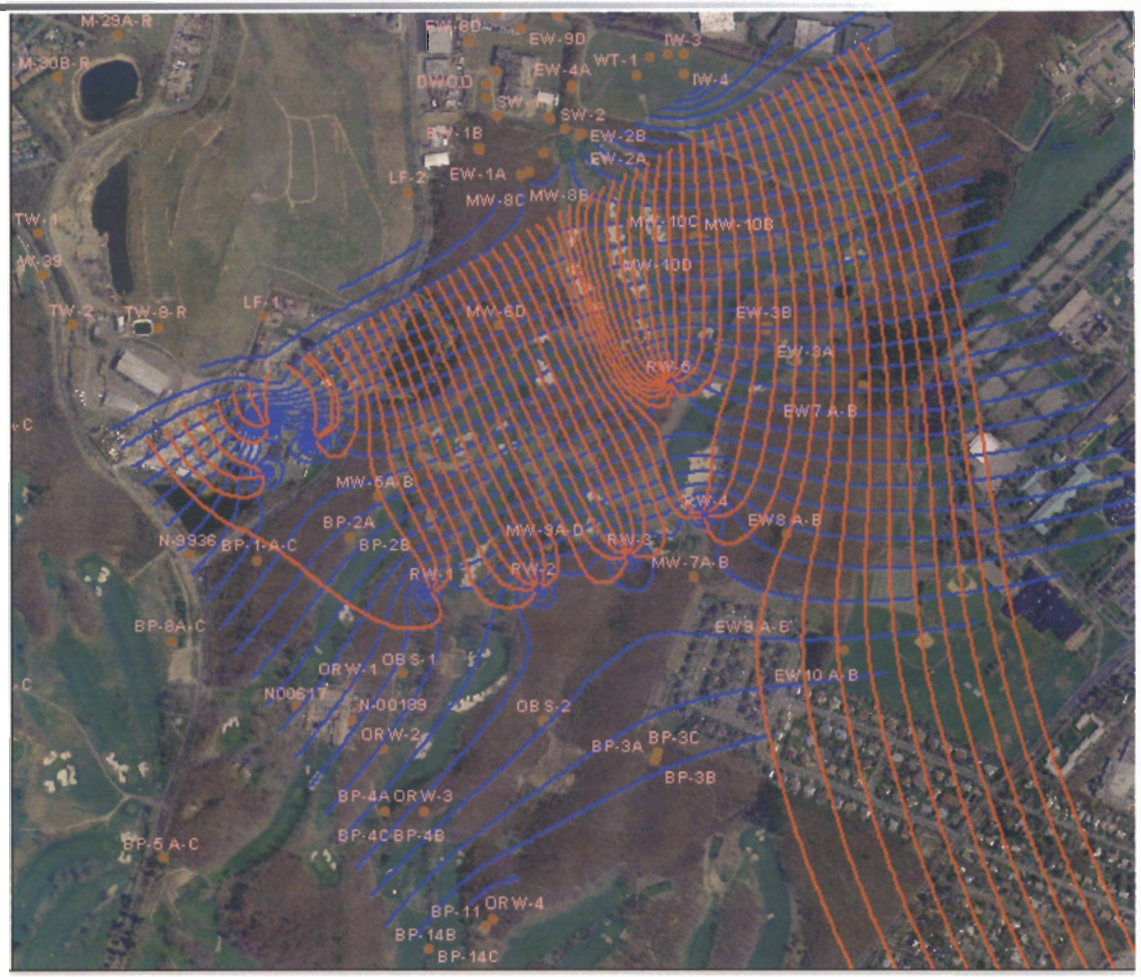
MW-10

Backward Track in Pink : Forward Track in red

Porosity = 0.3

For particle track
1 arrow = 1 yr

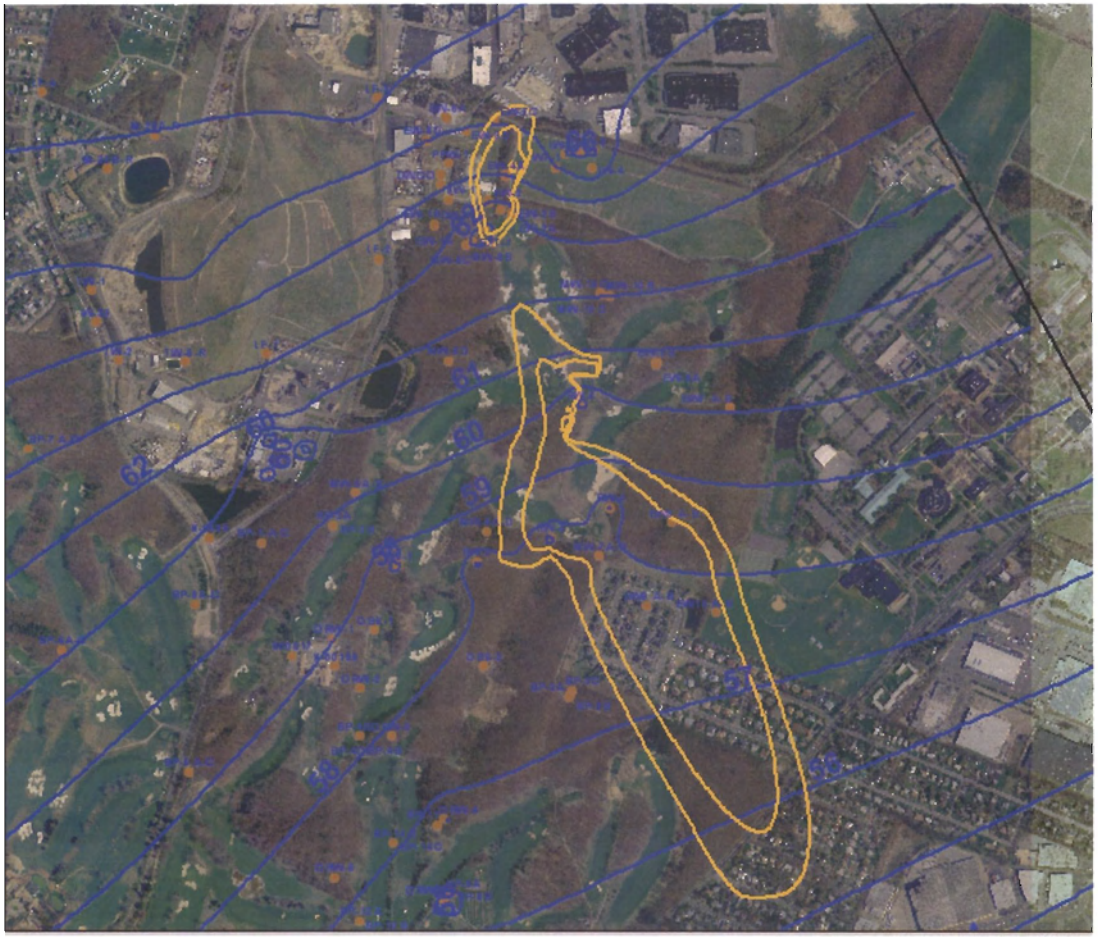
Presentation of Results
Capture Zone Analysis for RW-1,2,3,4, & 5 wells



Blue lines : Groundwater Contours (0.25 ft interval); Red lines : Groundwater flow lines

Results of TCE Transport Simulation

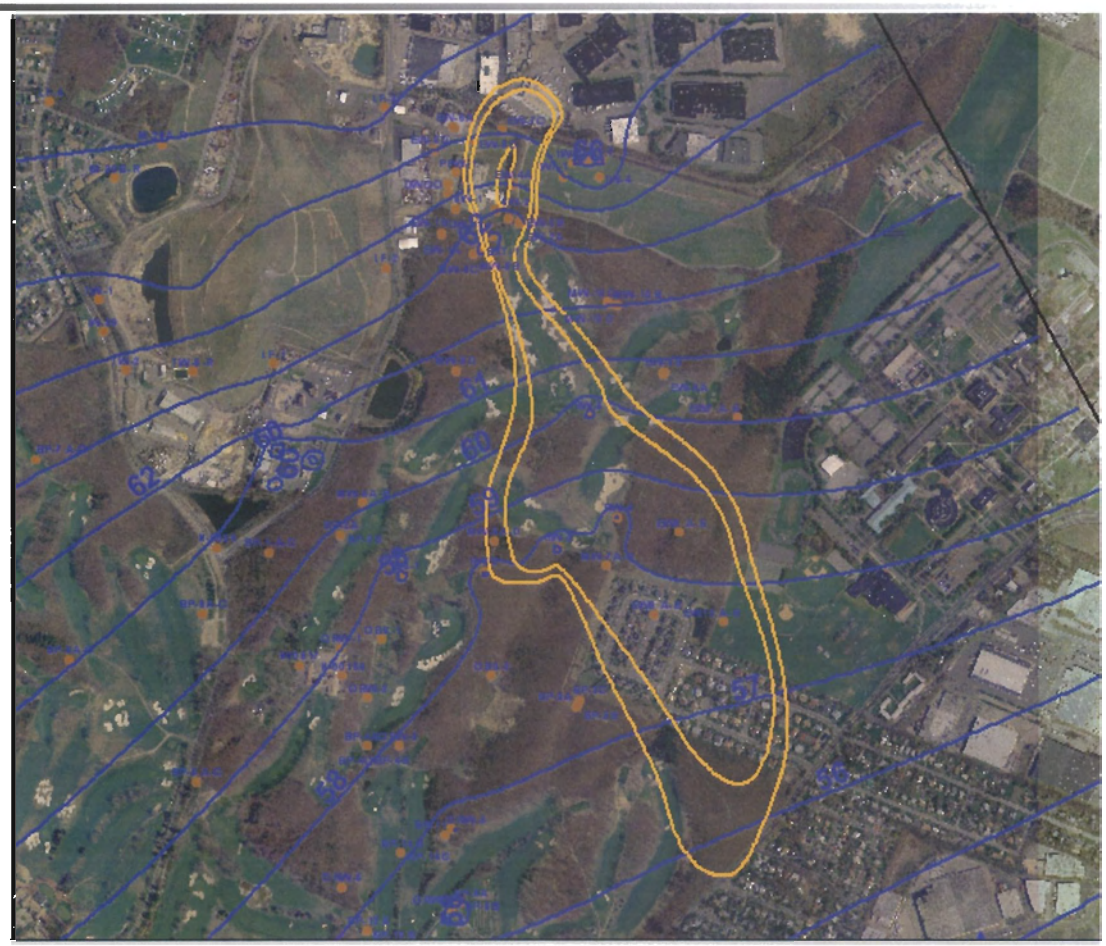
USGS MODFLOW/MT3D Predicted TCE plume in 5 years : Zone A



TCE plume map contour interval = 5, 10, and 50 ug/L

Assumed no continuous source of TCE

USGS MODFLOW/MT3D Predicted TCE plume in 5 years : Zone B



TCE plume map contour interval = 5, 10, and 50 ug/L

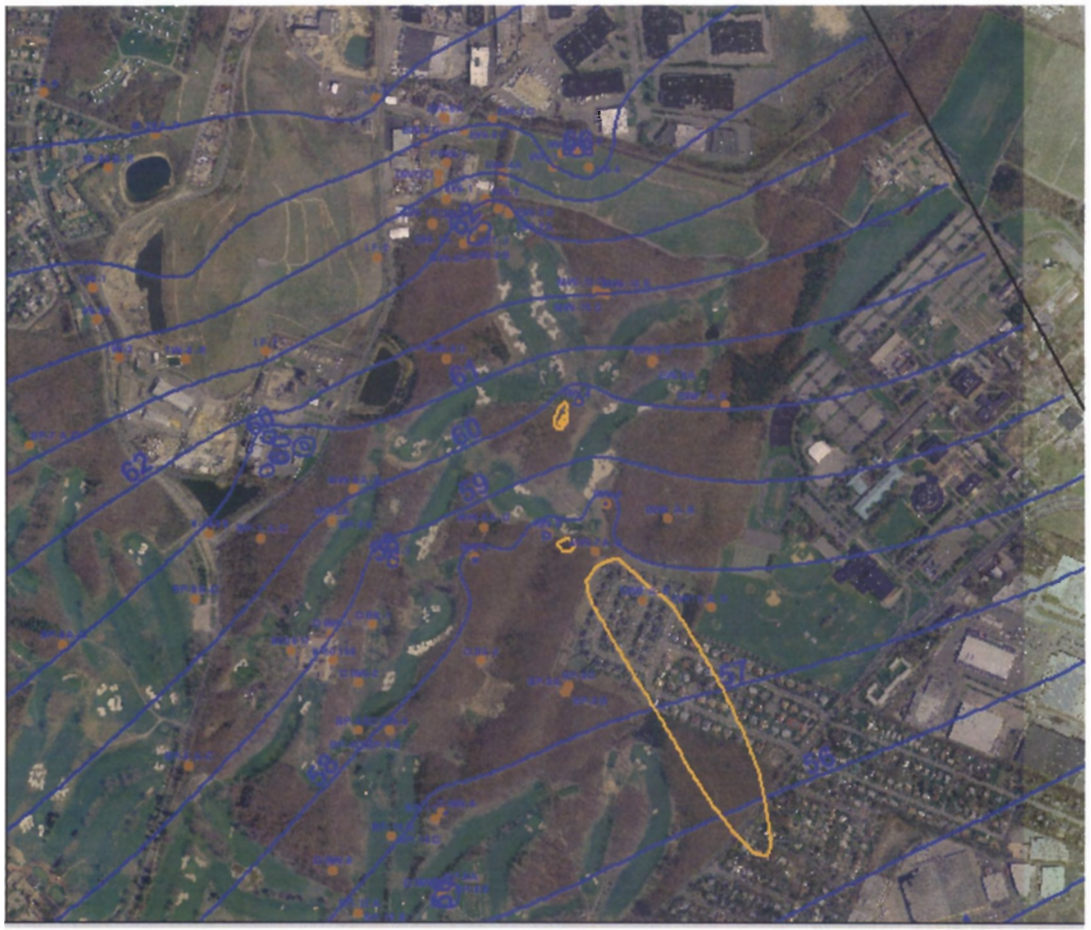
Assumed no continuous source of TCE

USGS MODFLOW/MT3D Predicted TCE plume in 5 years : Zone C

Assumed no continuous source of TCE

TCE plume map contour interval = 5, 10, and 50 ug/L

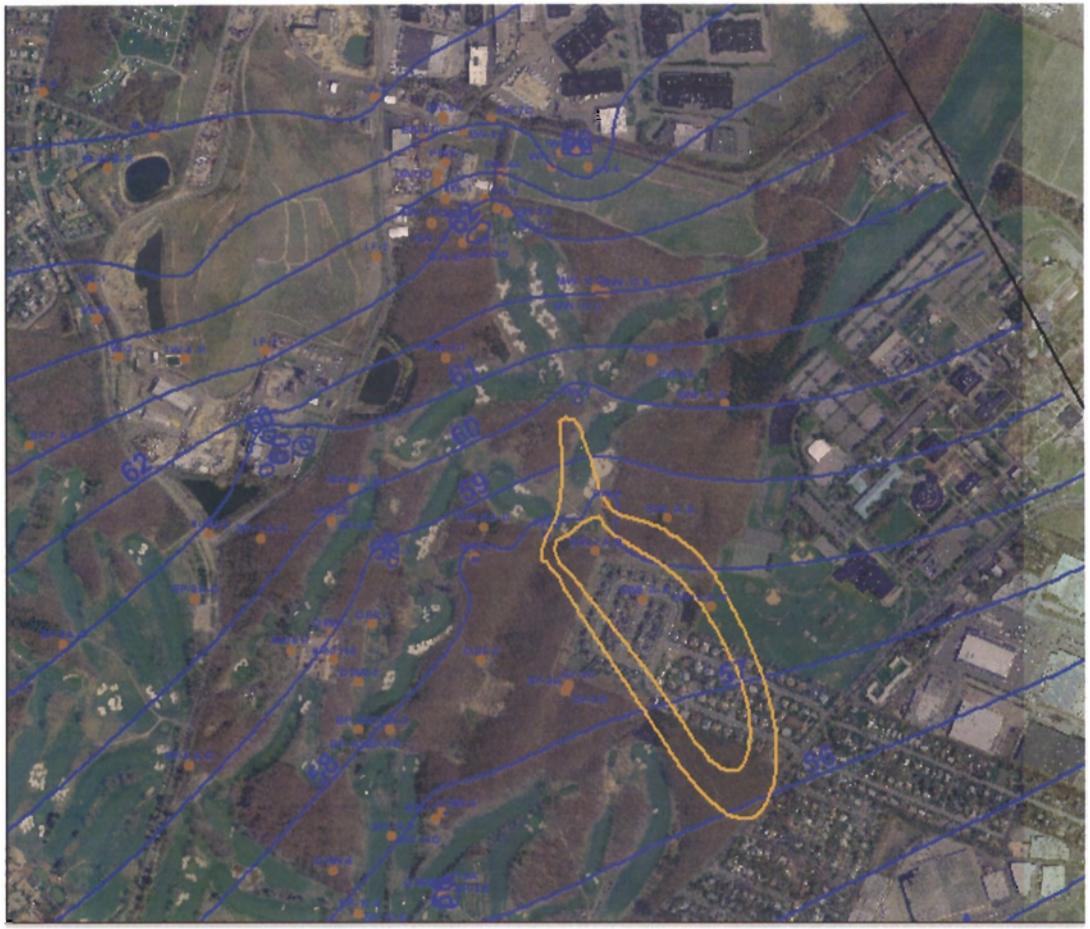
USGS MODFLOW/MT3D Predicted TCE plume in 10 years : Zone A



TCE plume map contour interval = 1, and 3 ug/L

Assumed no continuous source of TCE

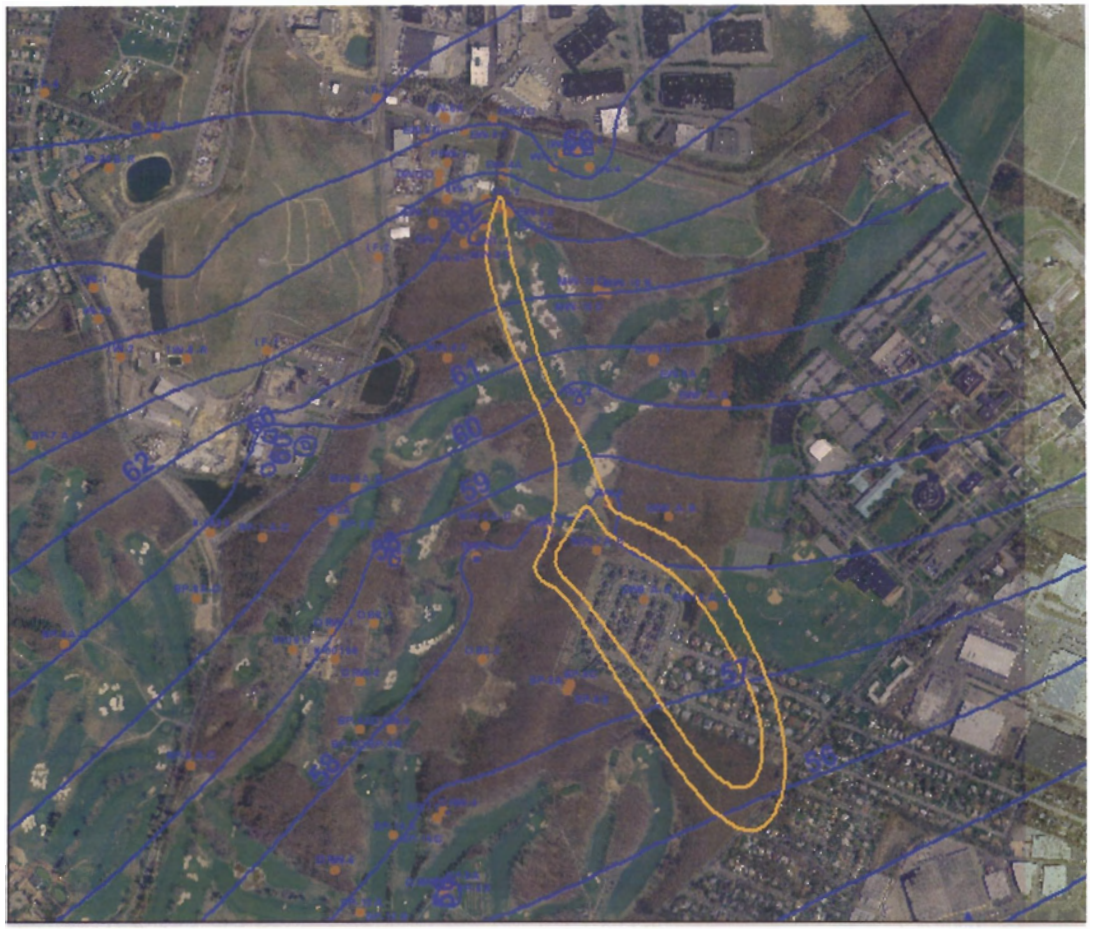
USGS MODFLOW/MT3D Predicted TCE plume in 10 years : Zone B



TCE plume map contour interval = 1, and 3 ug/L

Assumed no continuous source of TCE

USGS MODFLOW/MT3D Predicted TCE plume in 10 years : Zone C



TCE plume map contour interval = 1, and 3 ug/L

Assumed no continuous source of TCE

Results of Plume Finder Analysis

(Decision Support Tool)

by

Larry Deschaine

Plume Finding Analysis

- Determine the uncertainty surface of the knowledge of the boundary of the TCE plume.
  - Use 2D model with *no* pumping.
  - Use constant source for TCE at highest detected TCE location (Well 7C).
  - Use representative geostatistical variogram to generate 500 realizations of the aquifer.
  - Simulate flow and transport 500 times, for 50 years.
  - Use Kalman filter to include the information content of the monitoring well data.

Plume Finding Analysis

- Step 1: Determine uncertainty of the TCE MCL boundary with no well information. Scale value to 100%
- Step 2: Include the existing MW network information: Max uncertainty down to 56%.
- Step 3: Include the new well (EW-14D): Max uncertainty down to 45%.

Next series of slides show change in uncertainty surface in each step.

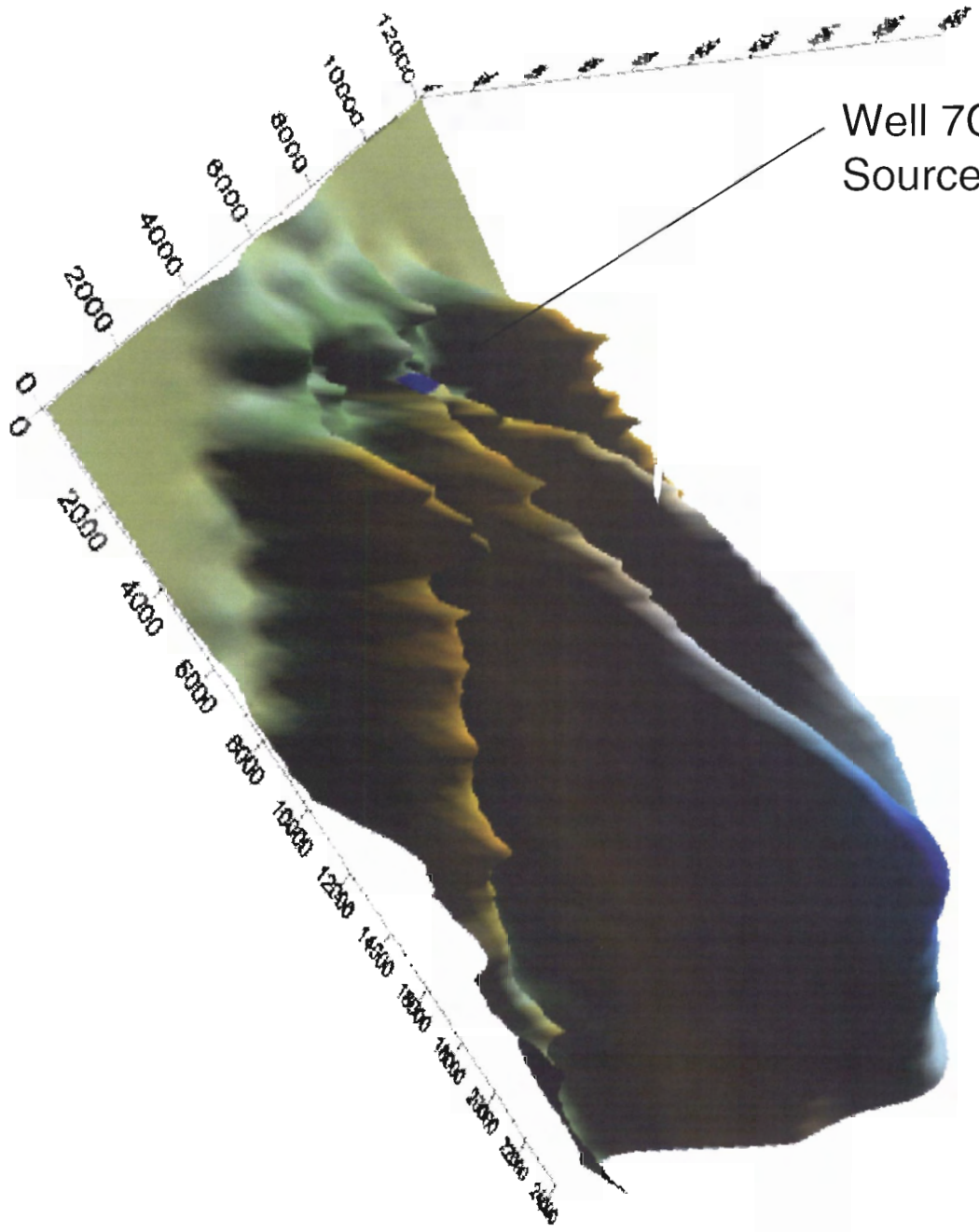


Figure 4-1

Baseline Plume Uncertainty Location Map Before any Monitoring Well Information is Added (Maximum Uncertainty = 1.0)

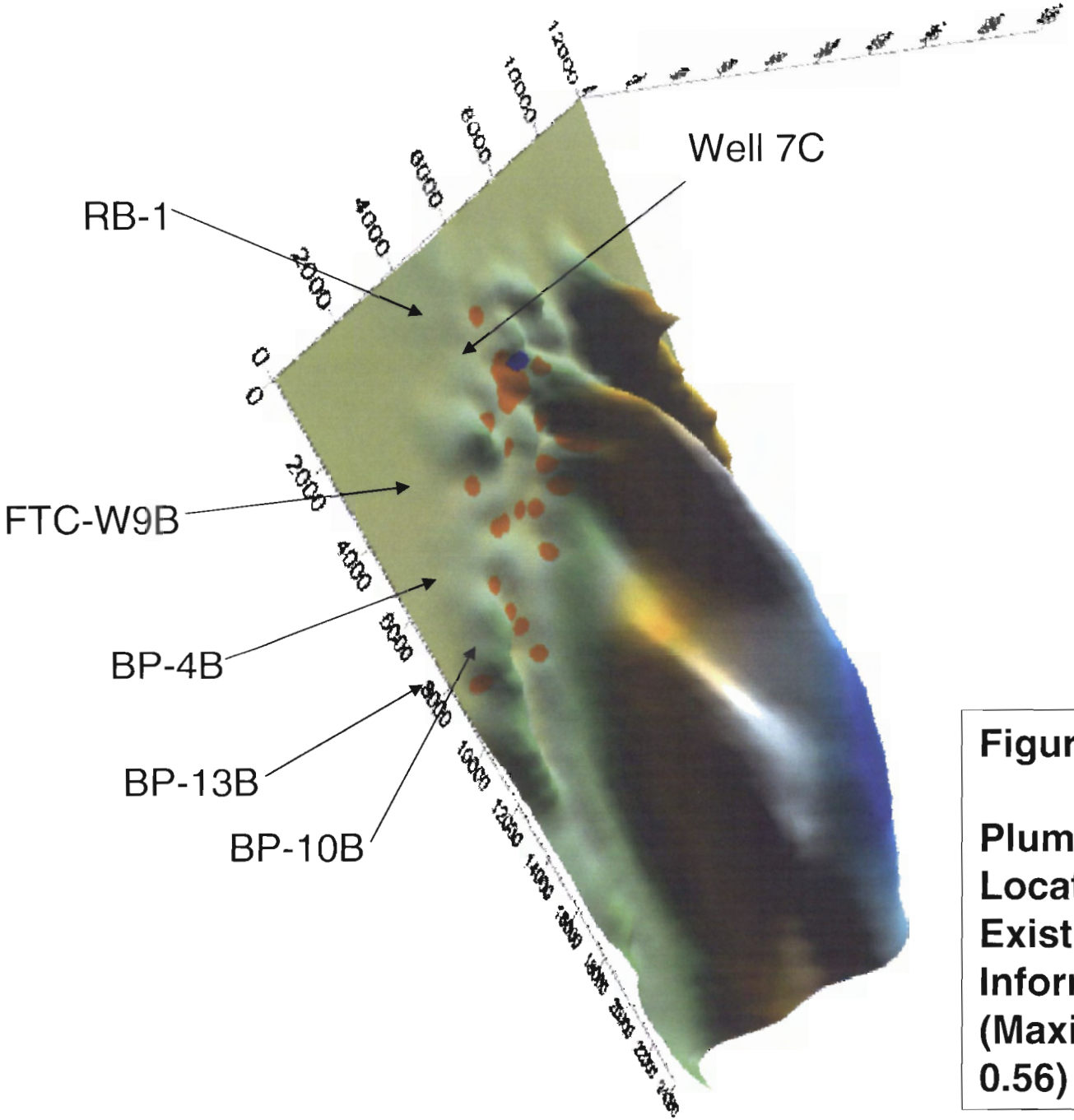


Figure 4-2

Plume Uncertainty Location Map With The Existing Monitoring Well Information Added (Maximum Uncertainty = 0.56)

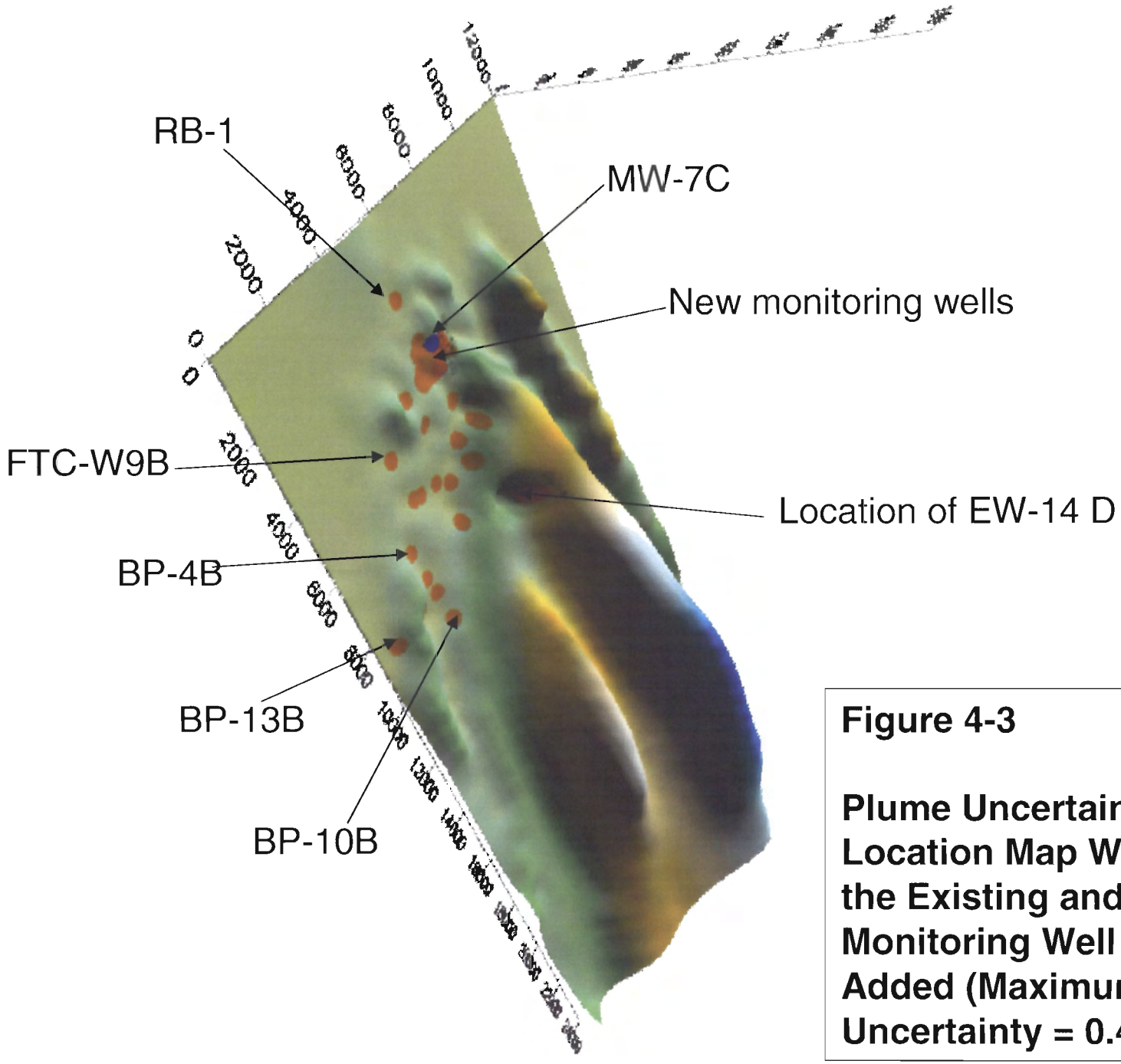


Figure 4-3

Plume Uncertainty Location Map With Both the Existing and New Monitoring Well Locations Added (Maximum Uncertainty = 0.45)

Plume Finder Summary

- Quantifies the value of the existing monitoring well network.
- Quantifies the value of the new well (EW-14D).
- Shows how the uncertainty surface changes when new wells are added / proposed.
- Screening level model for decision guiding.
- Can be extended to include 3D flow system with sources at different depths and pumping.

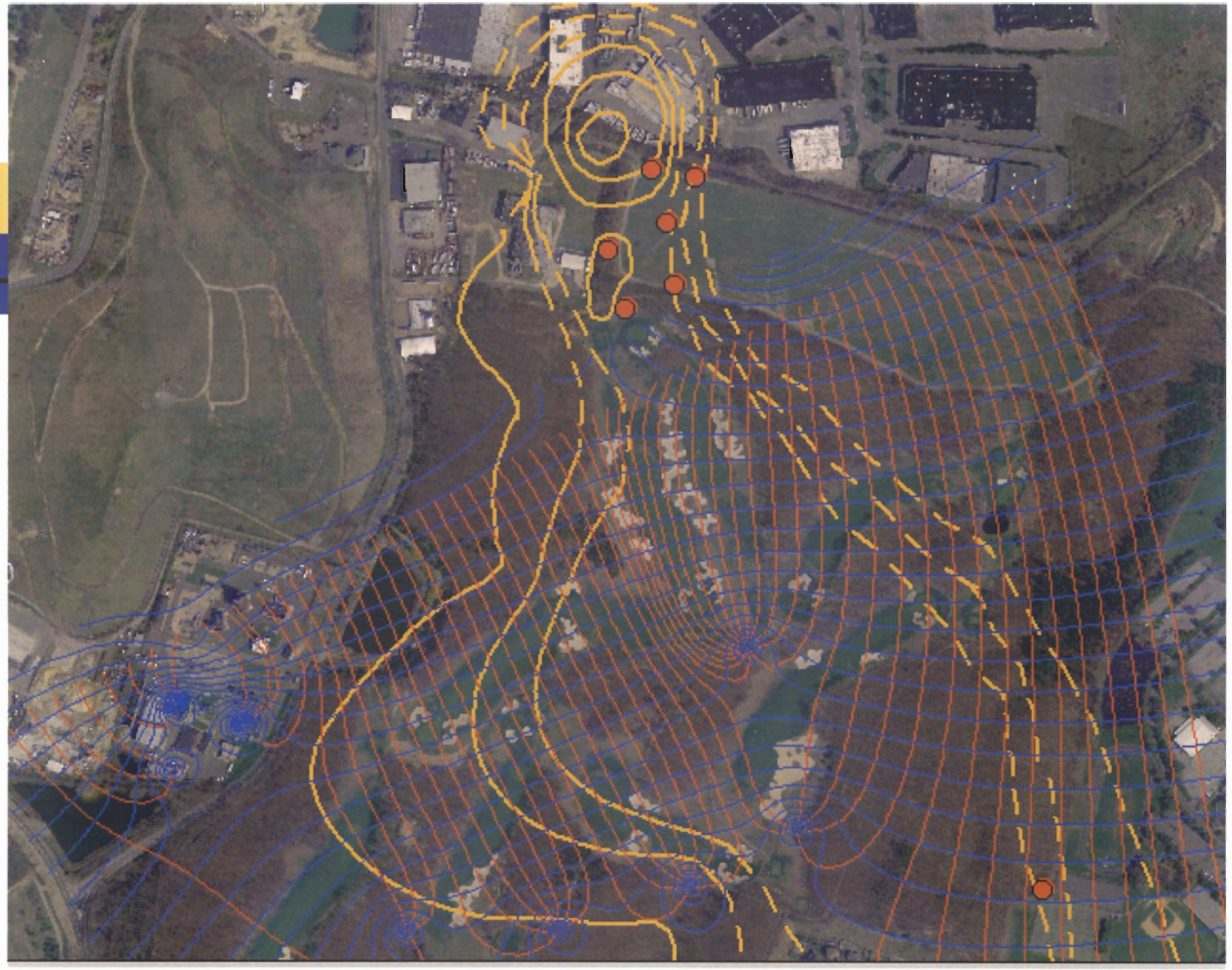
Summary

- Model of the subsurface flow system for Claremont Site and surrounding area constructed.
  - Includes multiple water sources of injection as well as extraction.
- Model reasonably matches the observed flow conditions.
- Usable for flow, transport and optimal pumping strategy design simulations.
- TCE transport was simulated and predicted that the TCE can be below 5 ug/L within 10 years, assuming that there is no source of TCE present and TCE will bio-decay with a half-life of 1 year.
- TCE sources and persistence being explored further.

Results of Recent Groundwater Characterization Efforts

by

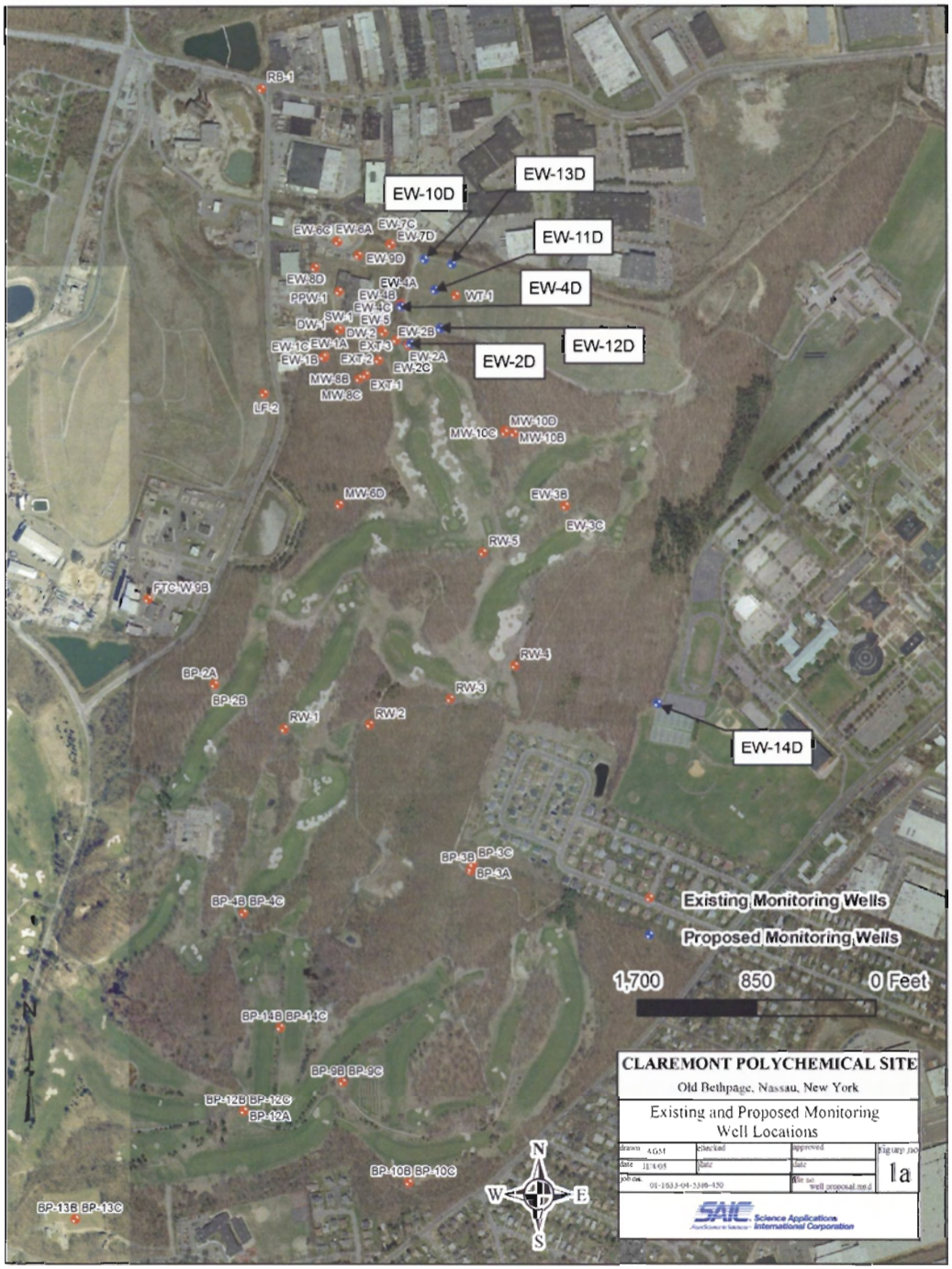
Richard Cronce



Locations of proposed Seven Monitoring Wells

(also shown are Capture zone analysis result and estimated TCE plume map)

TCE plume map contour interval = 5, 50, 100, 500, 1000, and 1500 ug/L


EW-10D
EW-13D
EW-11D
EW-4D
EW-12D
EW-2D
EW-14D
RB-1
EW-6C
EW-6A
EW-7C
EW-7D
EW-9D
EW-8D
EW-4A
PPW-1
EW-4B
EW-4C
WT-1
SW-1
EW-5
DW-1
DW-2
EW-2B
EW-1C
EW-1A
EXT-3
EW-1B
EXT-2
EW-2A
EW-2C
MW-8B
EXT-1
MW-8C
LF-2
MW-10D
MW-10C
MW-10B
MW-6D
EW-3B
EW-3C
RW-5
FTC W-9B
RW-4
BP-2A
RW-3
BP-2B
RW-1
RW-2
BP-3B
BP-3C
BP-3A
BP-4B
BP-4C
BP-14B
BP-14C
BP-9B
BP-9C
BP-12B
BP-12C
BP-12A
BP-10B
BP-10C
BP-13B
BP-13C
Existing Monitoring Wells
Proposed Monitoring Wells
1,700
850
0 Feet
N
W
E
S
CLAREMONT POLYCHEMICAL SITE
Old Bethpage, Nassau, New York
Existing and Proposed Monitoring Well Locations
drawn AGM
checked
approved
date 11/4/05
date
date
job no. 01-1633-04-3309-320
file no. well proposal.mxd
fig no. 1a
SAIC Science Applications International Corporation

DRAFT

Table 2. Phase 1 Well Construction Details
Claremont Polychemical Superfund Site

								Elevation (NGVD29) to Top of		
Well ID	Northing (NAD27)	Easting (NAD27)	Well Diameter (inches)	Depth of Screened Interval (ft bgs)	Elevation of Screened Interval (ft AMSL)	Depth to Pump (ft bgs)	Well Depth (ft bgs)	Concrete Pad (ft AMSL)	Steel Casing (ft AMSL)	Pump Cap (ft AMSL)
EW-2D	TBD	TBD	2.5	291.1 to 301.1	TBD	296	301.40	TBD	TBD	TBD
EW-10C	TBD	TBD	2.5	139.5 to 149.5	TBD	134.5	150.00	TBD	TBD	TBD
EW-12D	TBD	TBD	2.5	209.5 to 219.5	TBD	214.5	220.00	TBD	TBD	TBD
EW-13D	TBD	TBD	2.5	340.0 to 350.0	TBD	345	350.30	TBD	TBD	TBD

	Elevation (NAD29) to Top of							
Well ID	Upper Fine Sand	Bentonite Seal	Lower Fine Sand	Filter Pack	Bottom of End Cap	Fine Sand Above Abandoned Borehole	Abandoned Borehole	Bottom of Borehole
EW-2D	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
EW-10C	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
EW-12D	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
EW-13D	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Well	Top of Upper Fine Sand	Top of Bentonite Seal	Top of Lower Fine Sand	Top of Filter Pack	Top of Screen	Top Of End Cap	Bottom of End Cap	Top of Fine Sand Above Abandoned Borehole	Top of Abandoned Borehole	Bottom of Borehole
EW-2D	278	279	286	288	291.1	301.1	301.4	302	303	315
EW-10C	131.5	132.5	136.5	137.5	139.5	149.5	150	151	152	315
EW-12D	198	199	205.5	207	209.5	219.5	220	221	222	275
EW-13D	326	327	336.5	338	340	350	350.3	351	352	375

All depths are feet below grade Surface.

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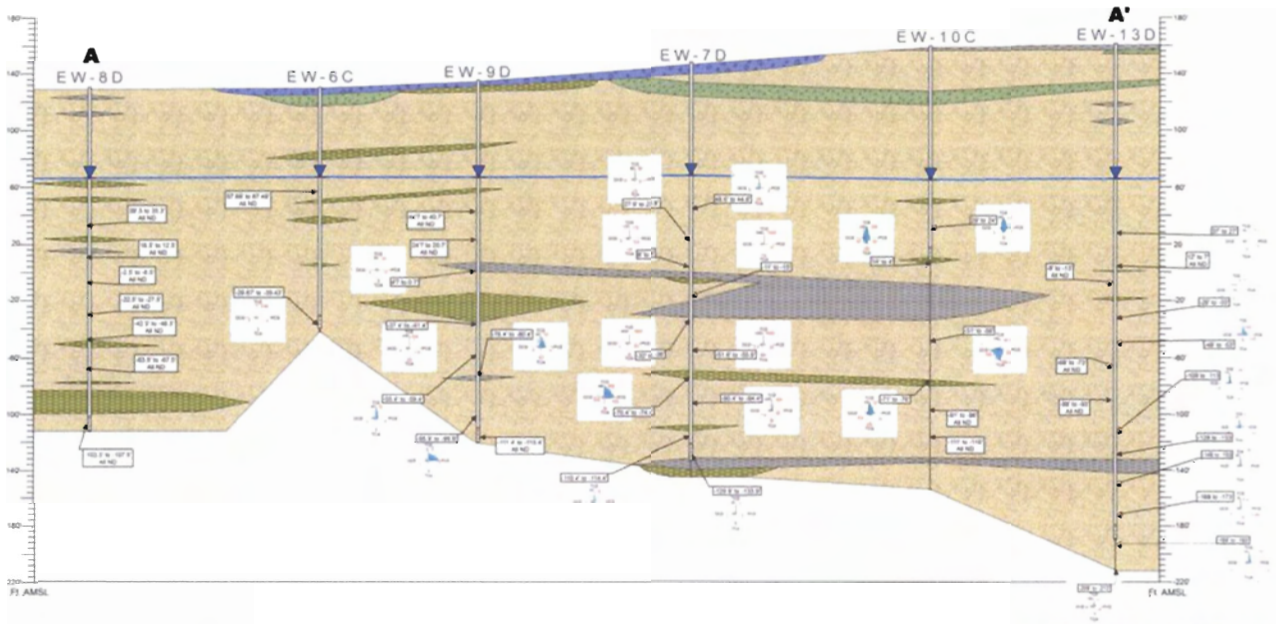
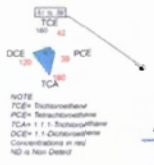
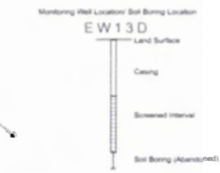


Legend

- Fill
- Gravel
- Sand
- Silt
- Clay





January 2006 Groundwater Elevation

1.) Chemistry for EW-6C,A from 10-5-05 sampling event.
2.) All other chemistry from descrete interval sampling during well drilling activities.
3.) Lithologic interpretations are based on drilling logs from SAIC and Ebasco Services, Inc.
4.) Colors are used for diagrammatic purposes only.
5.) Monitoring well widths are horizontally exaggerated for display purposes.

SCALES
Horizontal: 1"=60'
Vertical: 1"=40'
Vertical Exaggeration 1.5x

CLAREMONT POLYCHEMICAL
Old Bethpage, Nassau Co, New York

Stratigrapic Cross Section A-A'

SAIC Science Applications International Corporation

Figure No.

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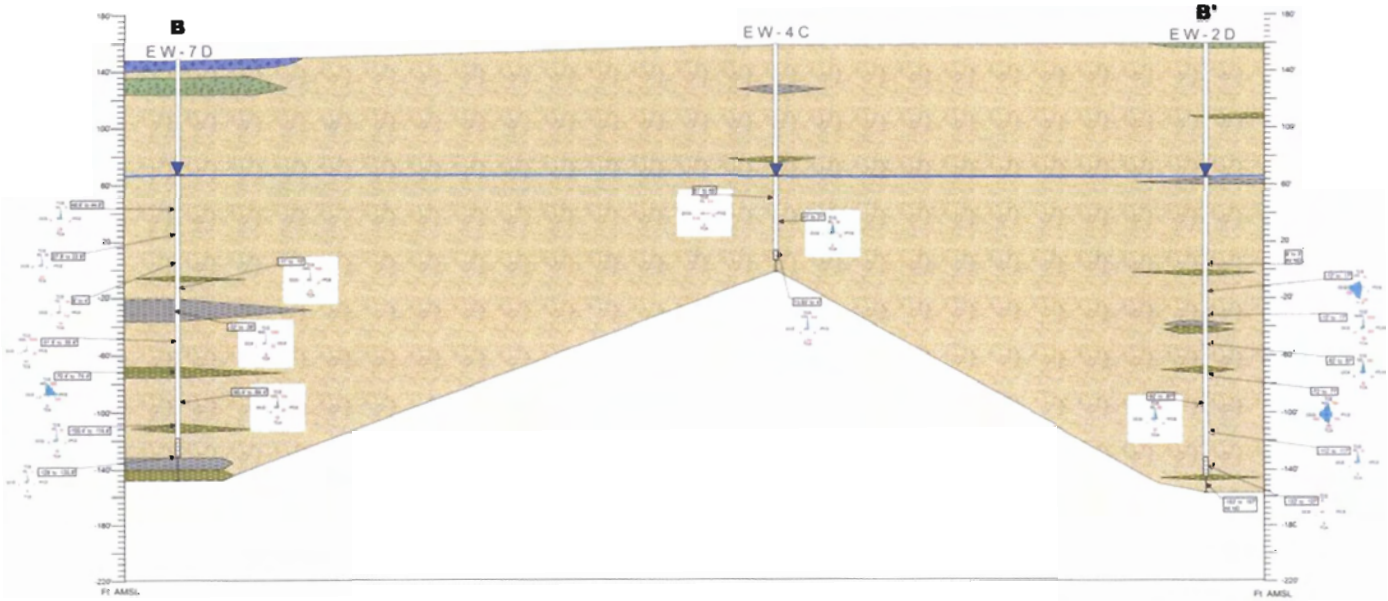


Legend

Fill
Gravel
Sand
Silt
Clay

Monitoring Well Location/ Soil Boring Location
EW13D
Land Surface
Casing
Screened Interval
Soil Boring (Abandoned)

NOTE
TCE= Trichloroethene
PCE= Tetrachloroethene
TCA= 1,1,1-Trichloroethene
DCE= 1,1-Dichloroethene
Concentrations in red
ND = Non Detect

January 2006 Groundwater Elevation

1.) Chemistry for EW-4C,A,B from 10-5-05 sampling event.
2.) All other chemistry from descrete interval sampling during well drilling activities.
3.) Lithologic interpretations are based on drilling logs from SAIC and Ebasco Services, Inc.
4.) Colors are used for diagrammatic purposes only.
5.) Monitoring well widths are horizontally exaggerated for display purposes

Feet
60
40
20
0
0 20 40 80
Feet

SCALES
Horizontal: 1"=40'
Vertical: 1"=40'
Vertical Exaggeration 1x

CLAREMONT POLYCHEMICAL
Old Bethpage, Nassau Co, New York

Stratigraphic Cross Section B-B'

Figure No.

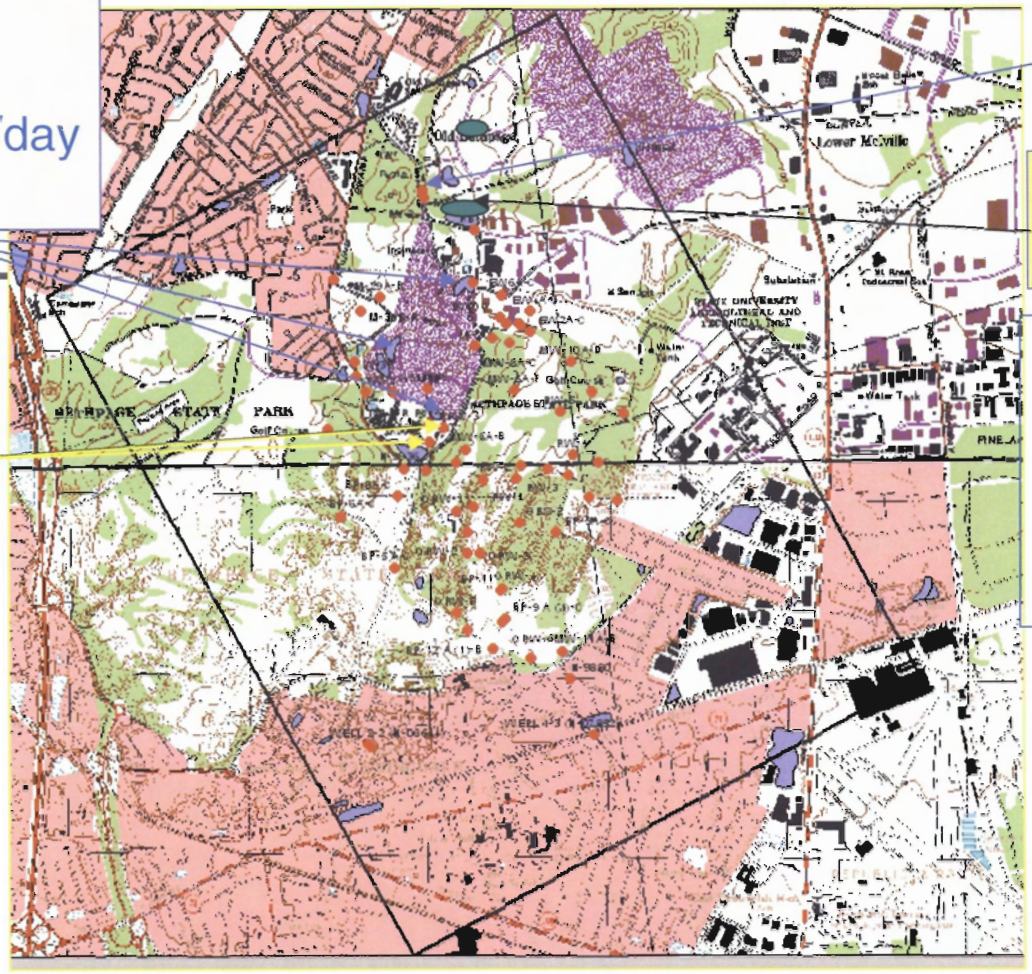
SAIC Science Applications International Corporation

TOB Infiltration Basins
Total 1.35 M gal/day

County Injection 3 Wells : Each 0 GPM

County infiltration Pond : 0 GPM

County RW-1, RW-2, RW-3 Each pumping 200 gal/min



Town well field RW1, RW2, RW3, RW4, RW5 : each Pumping 200 gal/min

County well field: ORW-4, ORW-6, ORW-7 : total pumping 450 gal/min

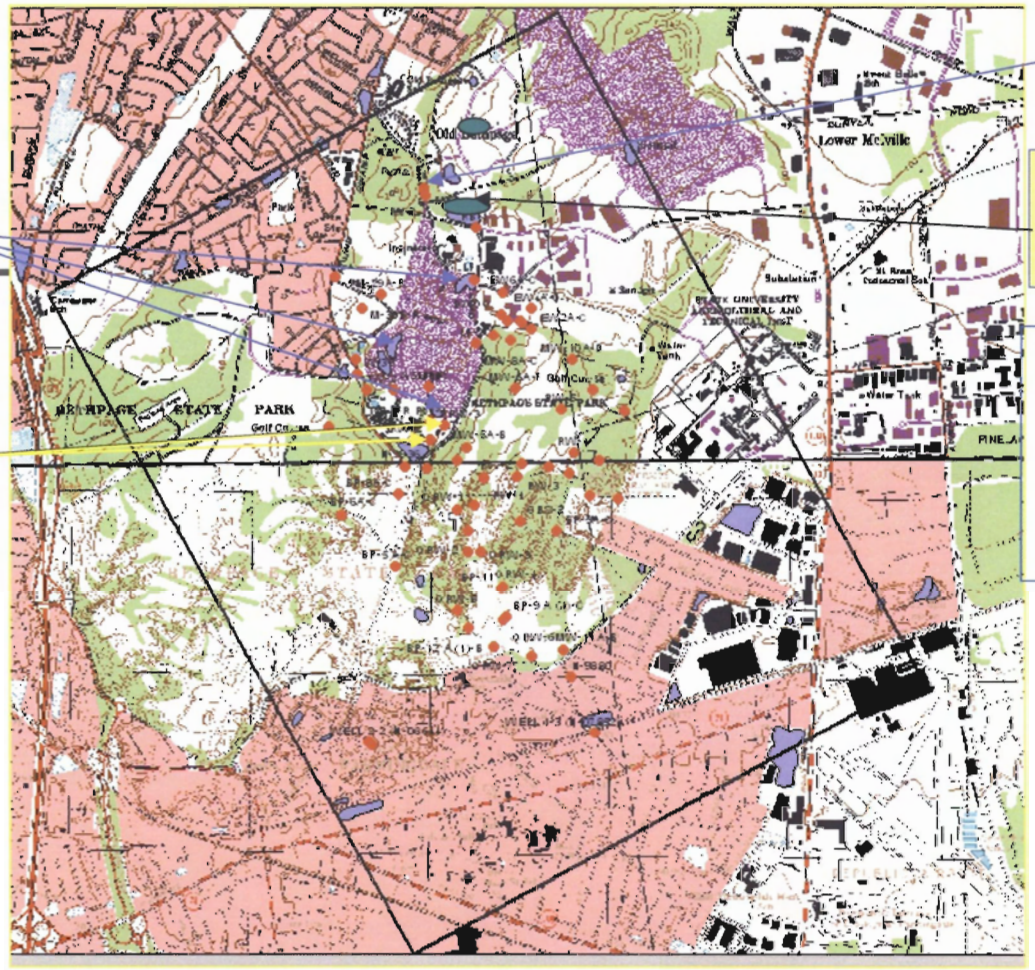
Claremont wells: EX-1, Ex-2, Ex-3 : Each pumping 0 gal/min
IW-1, IW-2, IW-3, IW-4 : Each injecting 0 gal/min

Pumping and injection wells within the model domain used for Particle Tracking analysis at EW-2D

Backward Particle Tracking at Zone C from Well EW-2D
(County injection wells, County infiltration pond, Claremont injection wells, and Claremont pumping wells turned off)

TOB Infiltration Basins
Total 0 gal/day

County RW-1, RW-2,RW-3
Each pumping 200 gal/min



County Injection 3 Wells : Each 0 GPM

County infiltration Pond : 0 GPM

Town well field RW1, RW2, RW3, RW4, RW5 : each Pumping 200 gal/min

County well field: ORW-4, ORW-6, ORW-7 : total pumping 450 gal/min

Claremont wells: EX-1, Ex-2, Ex-3 : Each pumping 0 gal/min
IW-1, IW-2, IW-3, IW-4 : Each injecting 0 gal/min

Pumping and injection wells within the model domain used for Particle Tracking analysis at EW-2D

Backward Particle Tracking at Zone C from Well EW-2D
(TOB infiltration basins, County injection wells, County infiltration pond, Claremont injection wells, and Claremont pumping wells turned off)

Summary of Recent Groundwater Investigation Efforts

- There appeared to be two different contaminant signatures in the groundwater.
- Contaminants were detected to a depth of -213 ft AMSL (375 ft bgs) up-gradient of the injection well field.
- Particle tracking indicated a potential source of groundwater contaminants located in the industrial park north of the Claremont site.
- Additional groundwater investigations will be required to fully delineate the groundwater plume(s) in the area of the Claremont Polychemical site.