

Revised Groundwater Flow Model DuPont Washington Works

Meeting with ACOE and EPA

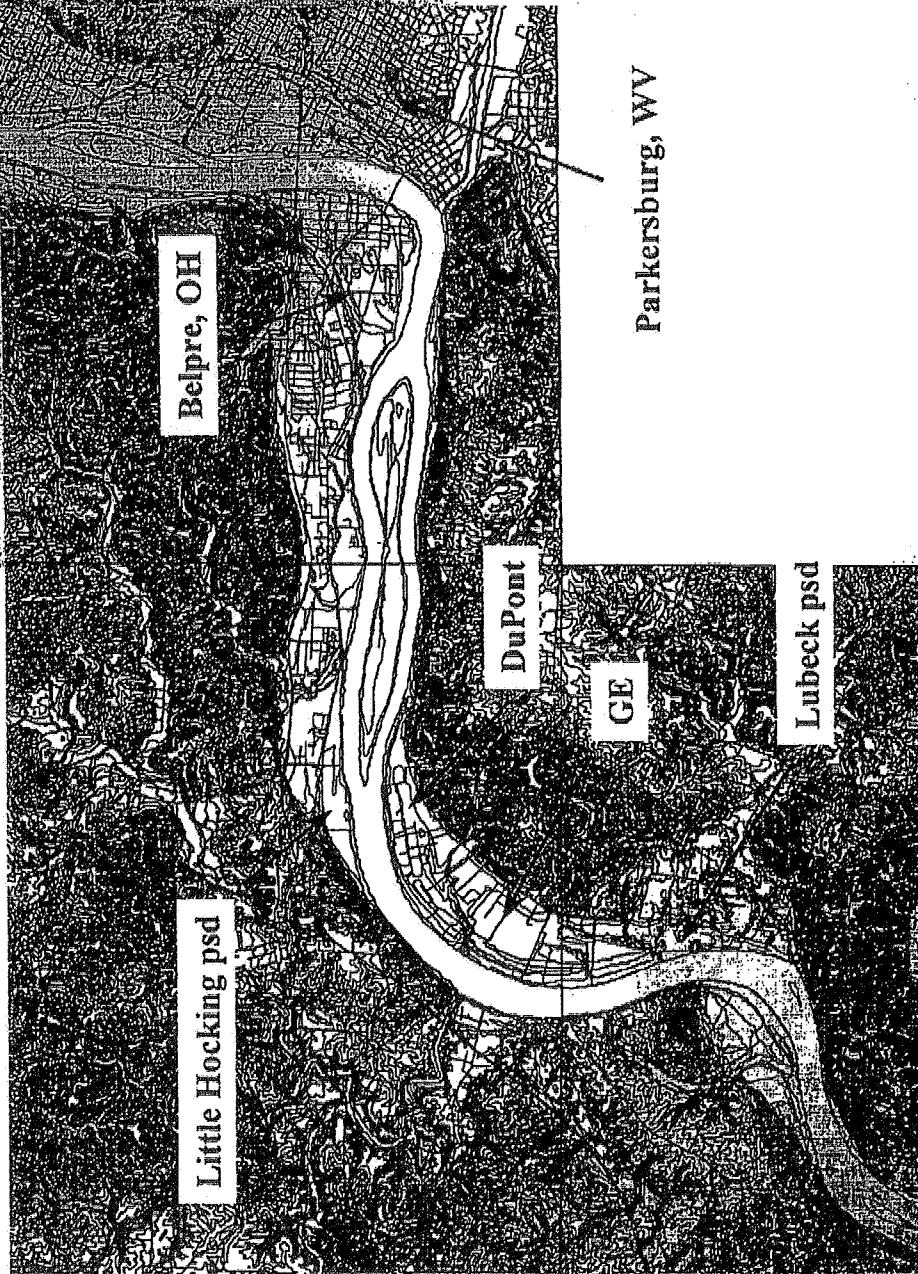
July 18, 2002

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Site Location



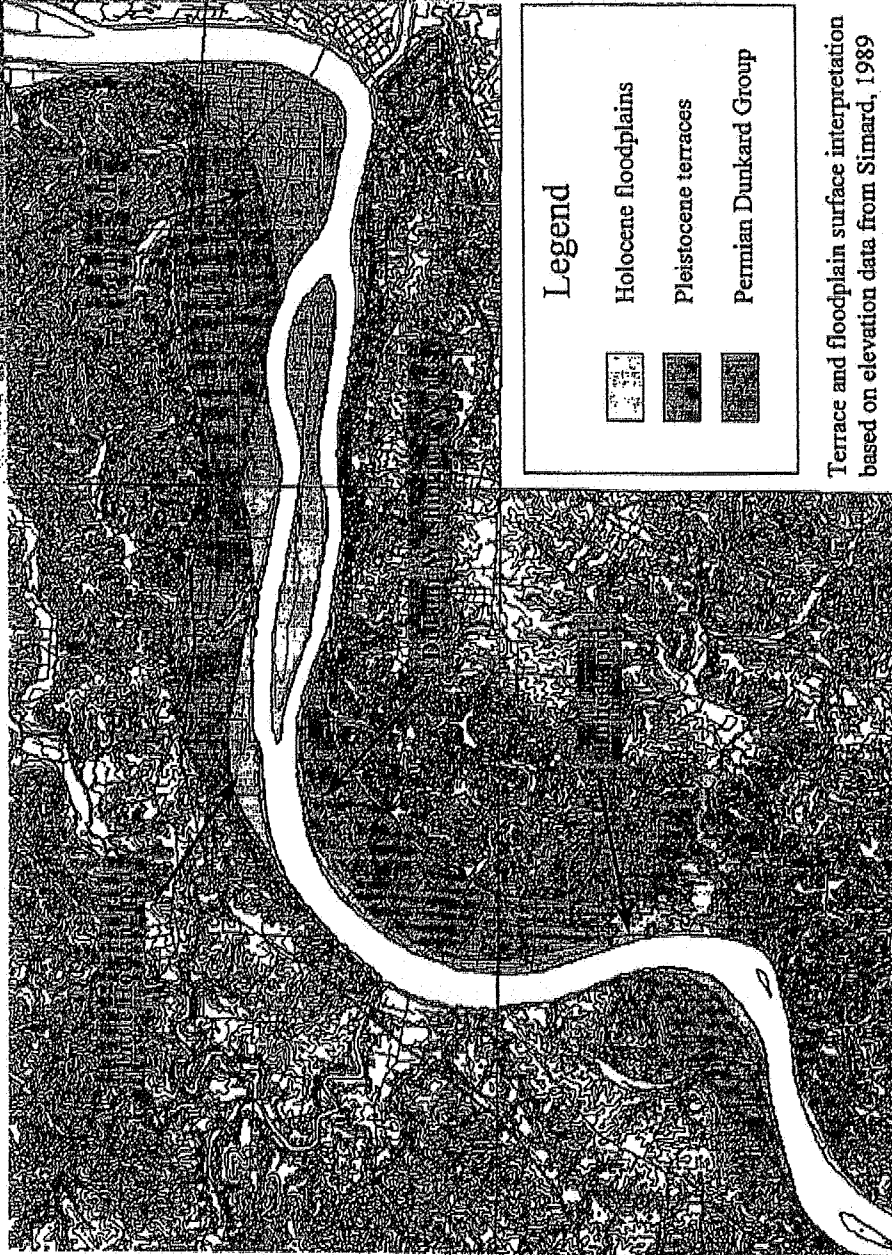
Site Geology

- Bedrock -
 - Permian Dunkard Group
 - Shales, sandstones, siltstones, minor limestones, coals
- Alluvium
 - Pleistocene
 - glacial outwash deposits
 - coarse sands and gravels
 - predominant valley fill sediments
 - higher terrace levels in the river valley
 - re-worked in the center of the river valley (more fines) during subsequent aggradation/aggradation events
 - 10 to 30 ft thick under upper terraces
 - 10 to 20 ft thick in center of river valley

Site Geology

- Alluvium (cont.)
 - Holocene
 - Ohio River overbank deposits
 - silts, clays, fine sands
 - lower terraces in river valley
 - thick (20 to 25 ft) deposits on lower terraces
 - thin mantle on upper terraces
 - lower 2 Holocene terraces now covered by Ohio River due to damming

Geologic Map



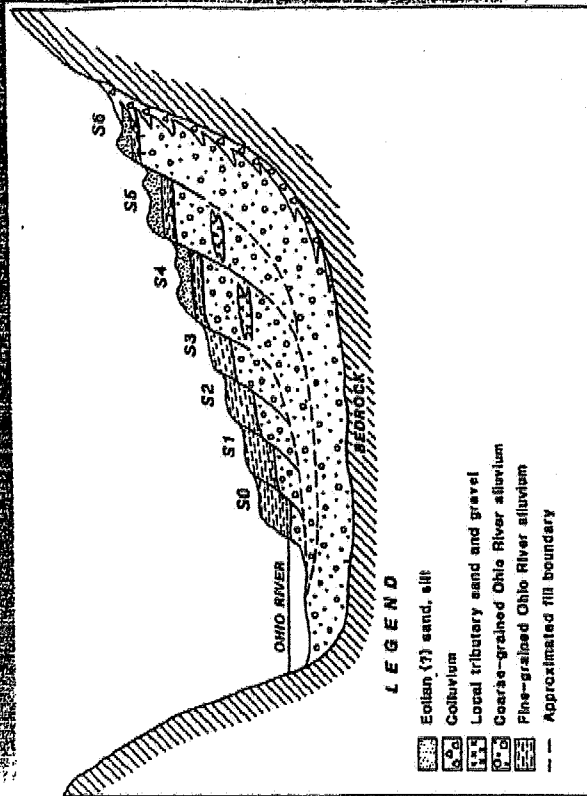
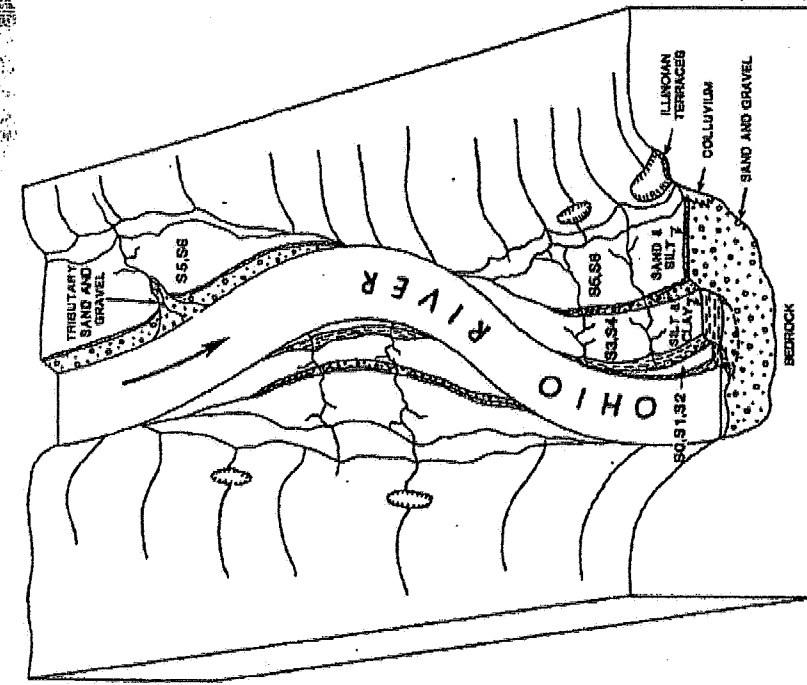
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Idealized Ohio River Valley Cross-Section and Block Diagram

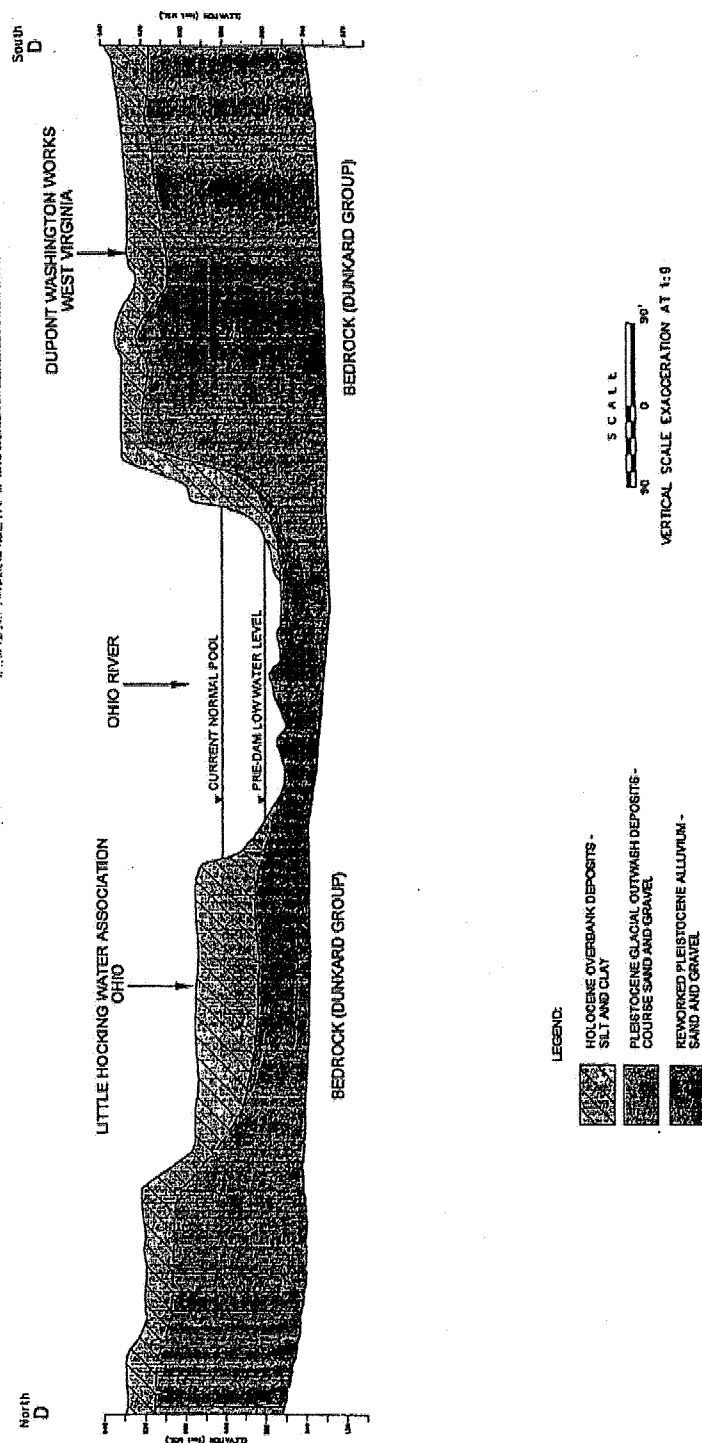


LEGEND

- Eolian (?) sand, silt
- Colluvium
- Local tributary sand and gravel
- Coarse-grained Ohio River alluvium
- Fine-grained Ohio River alluvium
- Approximated fill boundary

Simard, 1989

Schematic Cross-Section at River Mile 190



Site Hydrogeology

- Alluvial Aquifer:

- Primary groundwater source
- Coarse sands and gravels (Pleistocene sediments)
- Typically 100 to 300 ft/d
- Mostly unconfined
- Locally confined by Holocene overbank deposits

- Bedrock Aquifer:

- Minor aquifer

Sandstones, minor limestones (Dunkard Group)

Typically 0.5 to 5 ft/d

Mostly confined

Recharge to alluvial aquifer at Dupont plant site and Local Landfill

Modeling Objectives

- Evaluate potential groundwater migration pathways at the site.
- Address EPA/ACOE comments on the previous groundwater flow model.

EPA / ACOE Comment Letter, July 2004

- Modeled Stage of Ohio River

- Previous model above normal pool elevation - 584 ft. above MSL
- Revised to normal pool elevation (582 ft. above MSL)

- Recharge Rates

- Previous model - 11 in./yr. across domain
- Revised zonation based on surficial sediment distribution

- Pumping Rates

Previous model - rates were estimated and adjusted during calibration

Revised

Using metered hourly or daily pumping rates from the DuPont, Little Hocking, and Little Back Belpre

Pumping rates still estimated for GE (no data available)

EPA / ACOE Comment Letter July 2001

- Boundary Conditions

- Previous model - north edge of domain ended on ridge south of Ohio
- Revised:
 - Domain extended to cover entire Ohio River basin between Libeck and Boone
 - No-flow boundaries coincide with bedrock divides

- Ohio Riverbed Conductance

- Previous model - conductance based on very low K of riverbed
- Revised:

- Conductance based on riverbed K ~10% of expected Kv of underlying alluvial sediments

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Primary Data Sources for Groundwater Model

- RFI Report, DuPont, 1999
 - lithologic data
 - groundwater elevation data
 - aquifer testing data
- Simard, 1989, Geologic History of the Lower Terraces and Floodplains of Upper Ohio River Valley, West Virginia Geological Survey Open File Report 89-1
 - Lithology, thickness, and depositional history of the Ohio River alluvial sediments
 - Historical low water levels of the Ohio River
- Kozar and Mathes, 2001, Aquifer-Characteristics Data for West Virginia, USGS Water-Resources Investigations Report 01-4036

Aquifer hydraulic conductivity data

Estimated recharge rates

Union Island Water Supply Investigation Reports

1986
H. B. Davis & Graham

Well-Posedness in Plans: Little Hocking and Lubeck

REPORT

Primary Data Sources for Groundwater Model

- Ohio River Bathymetric Maps, ACOE, 1963
- Pumping Rate Data
 - Hourly or daily rates from DuPont, Little Hocking, Lubeck, and Belle
 - Individual well rates in most cases
- Well Logs
 - Little Hocking
 - GE
 - Shell

Geotechnical Boring Logs

New R. 892, Burgess & Niple

New R. 890, Baker

Stagnant Groundwater Levels

Little Hocking, Belle Isle, Little Hocking, Shell

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Groundwater Model Set-up

- Model Domain

- 12,700m E-W by 8,045m N-S (41,568 ft. by 26,394 ft.)
- 153 rows x 235 columns x 3 layers
- 107,865 cells (69,705 active cells)
- Grid spacing: 25m to 100m (82 ft. to 328 ft.)

- Boundary Conditions

- Recharge sources

- Ohio River

- Minor surface water features

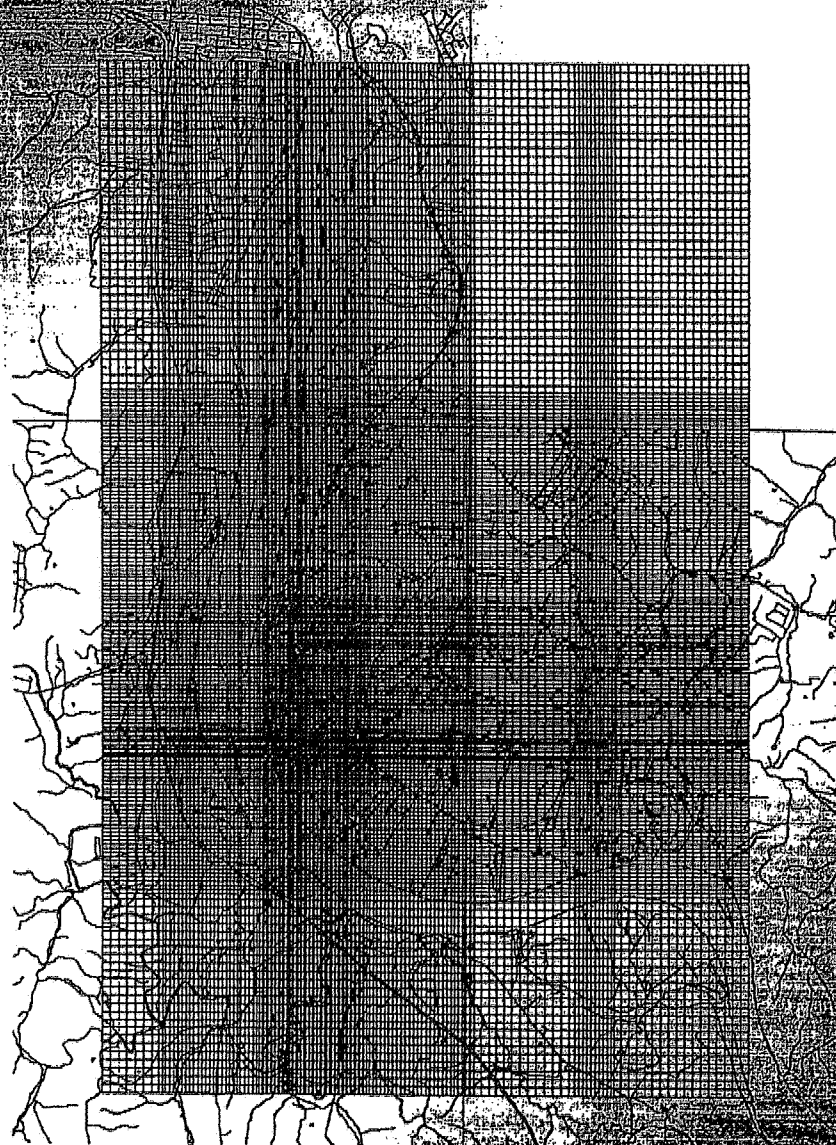
- Surface infiltration

- Bedrock aquifer

Public water supply wells

Water features on bedrock areas

Model Grid



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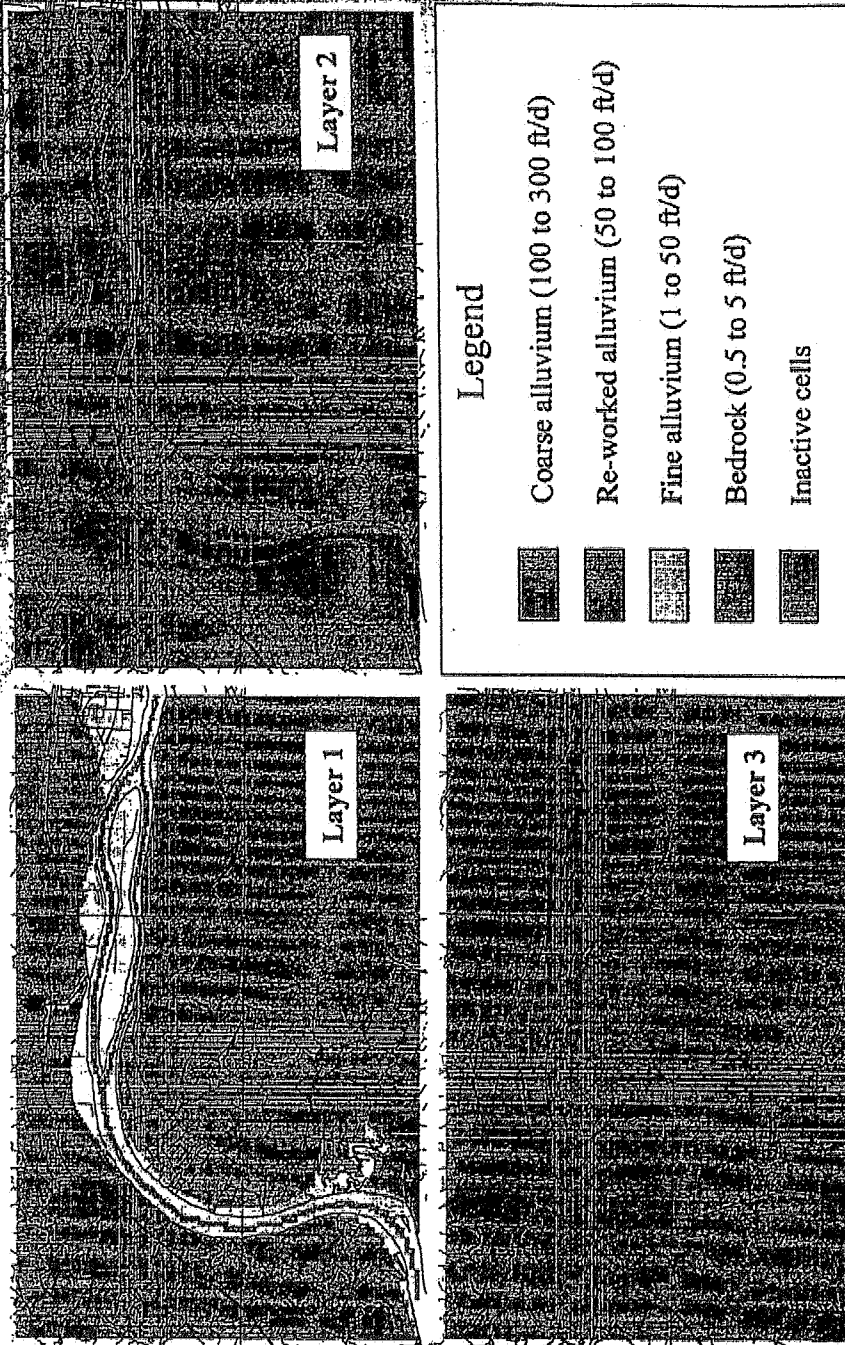
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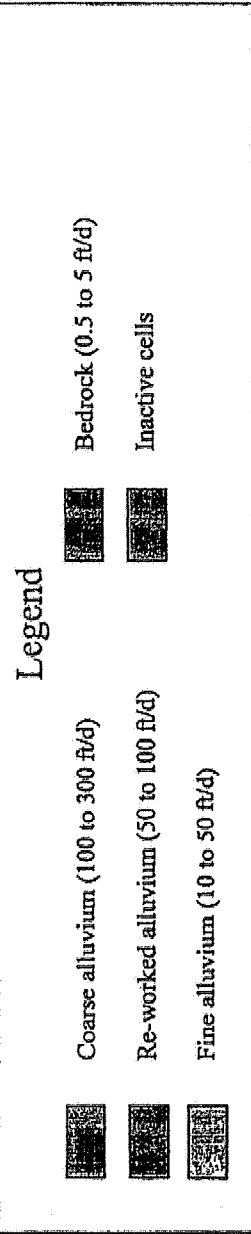
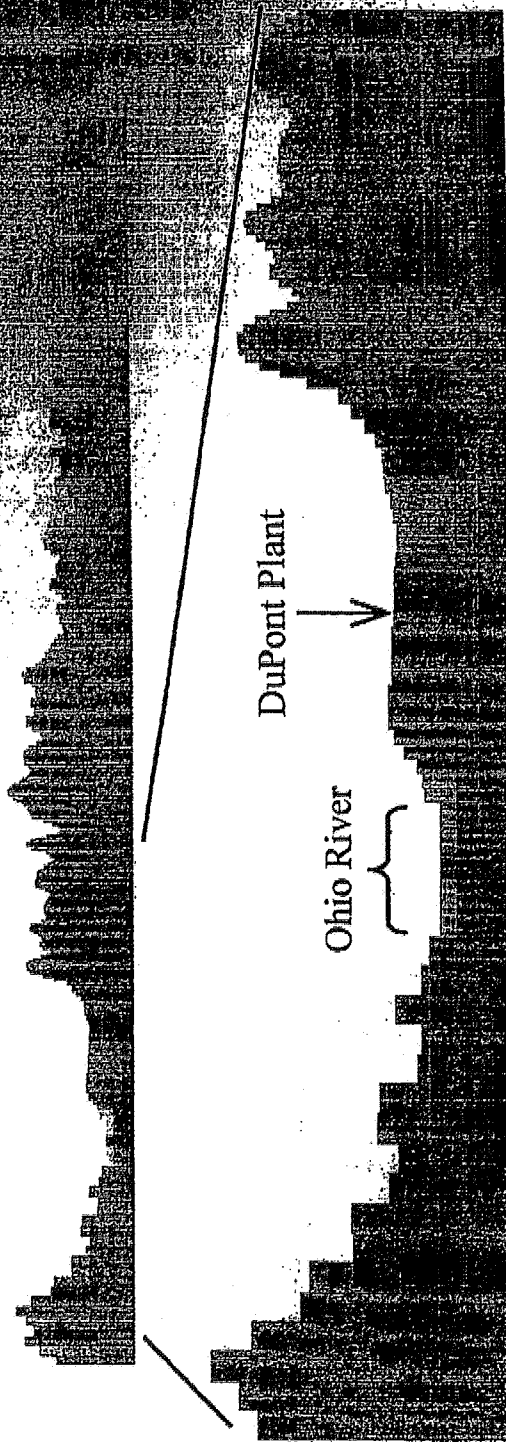
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Hydraulic Conductivity Zonation

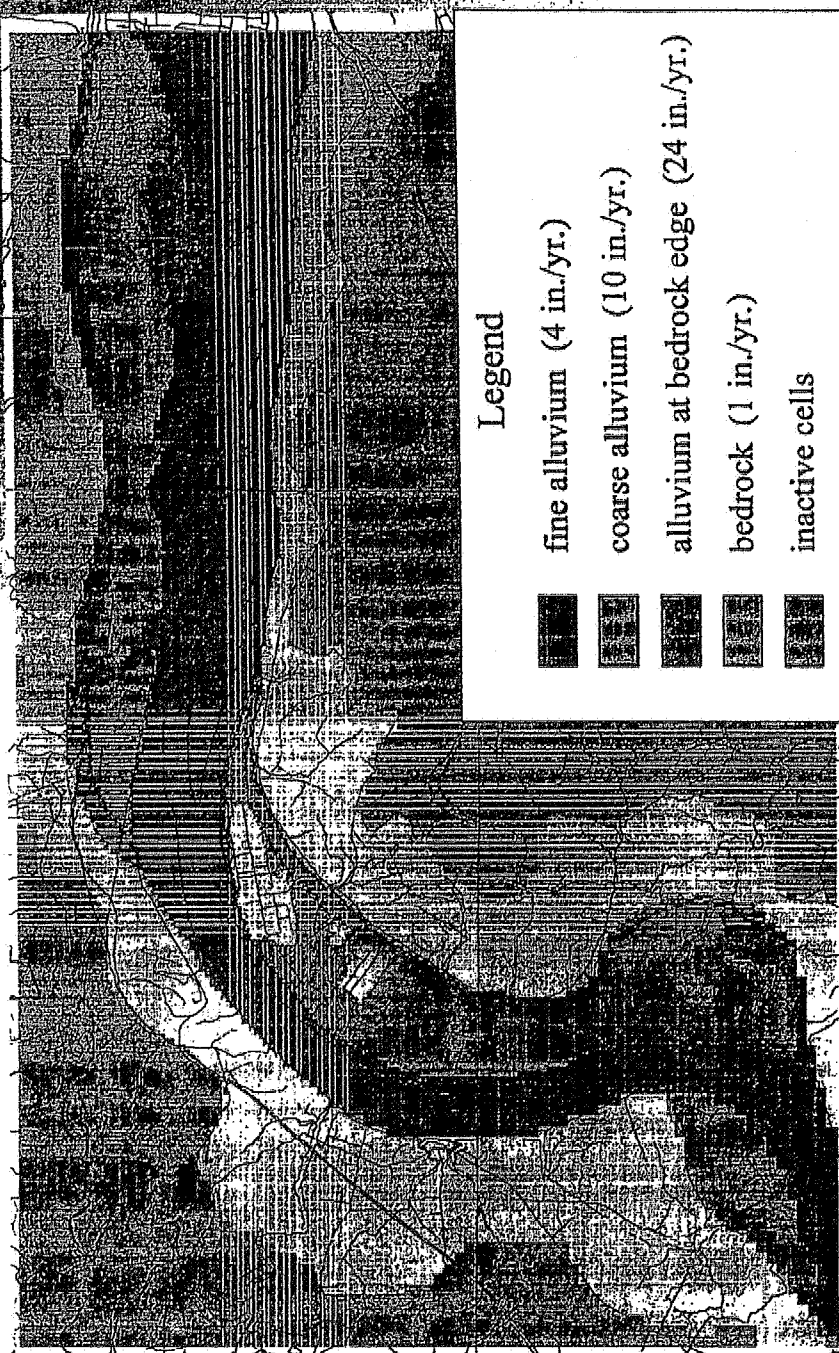


Hydraulic Conductivity Zonation

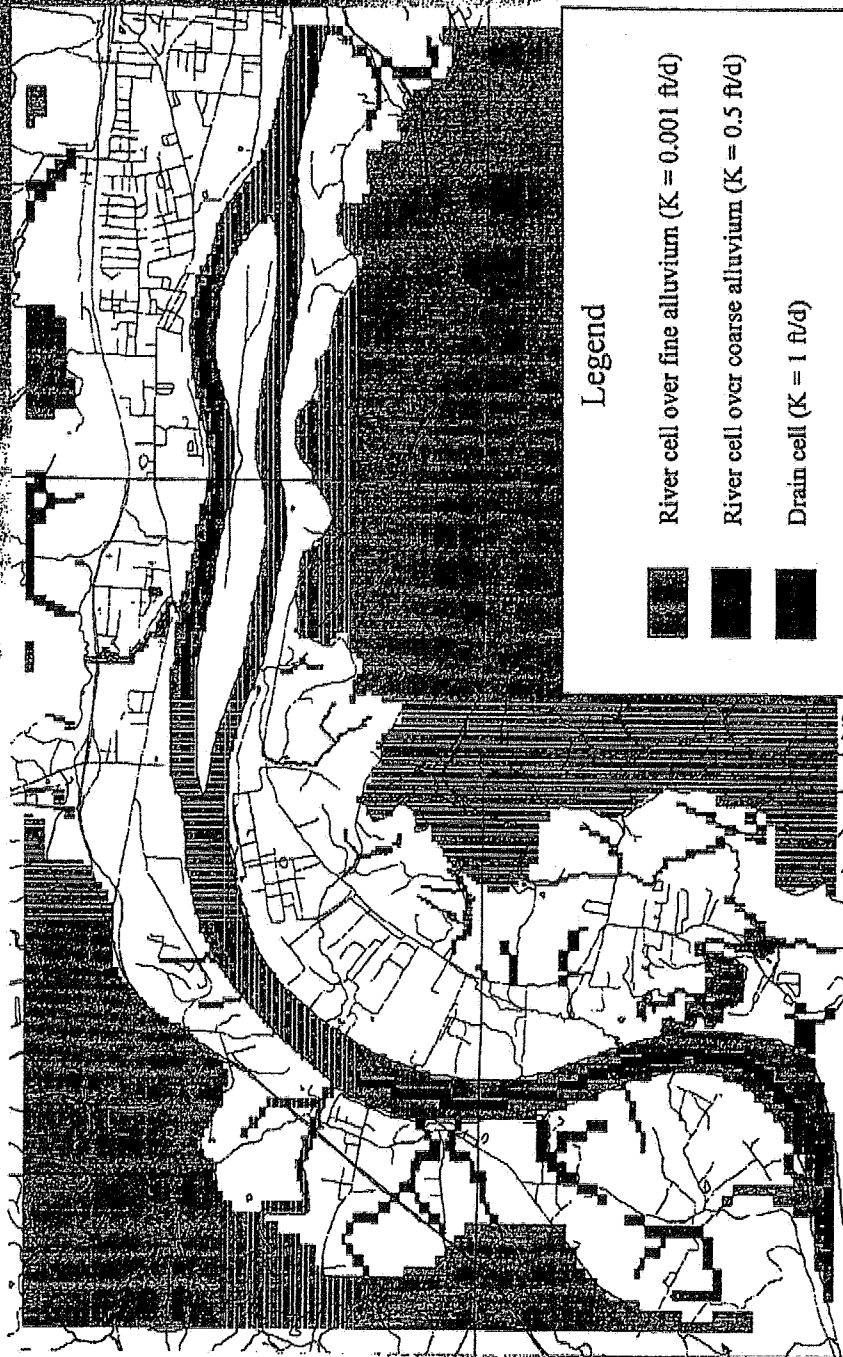
X-Section Along Row 100



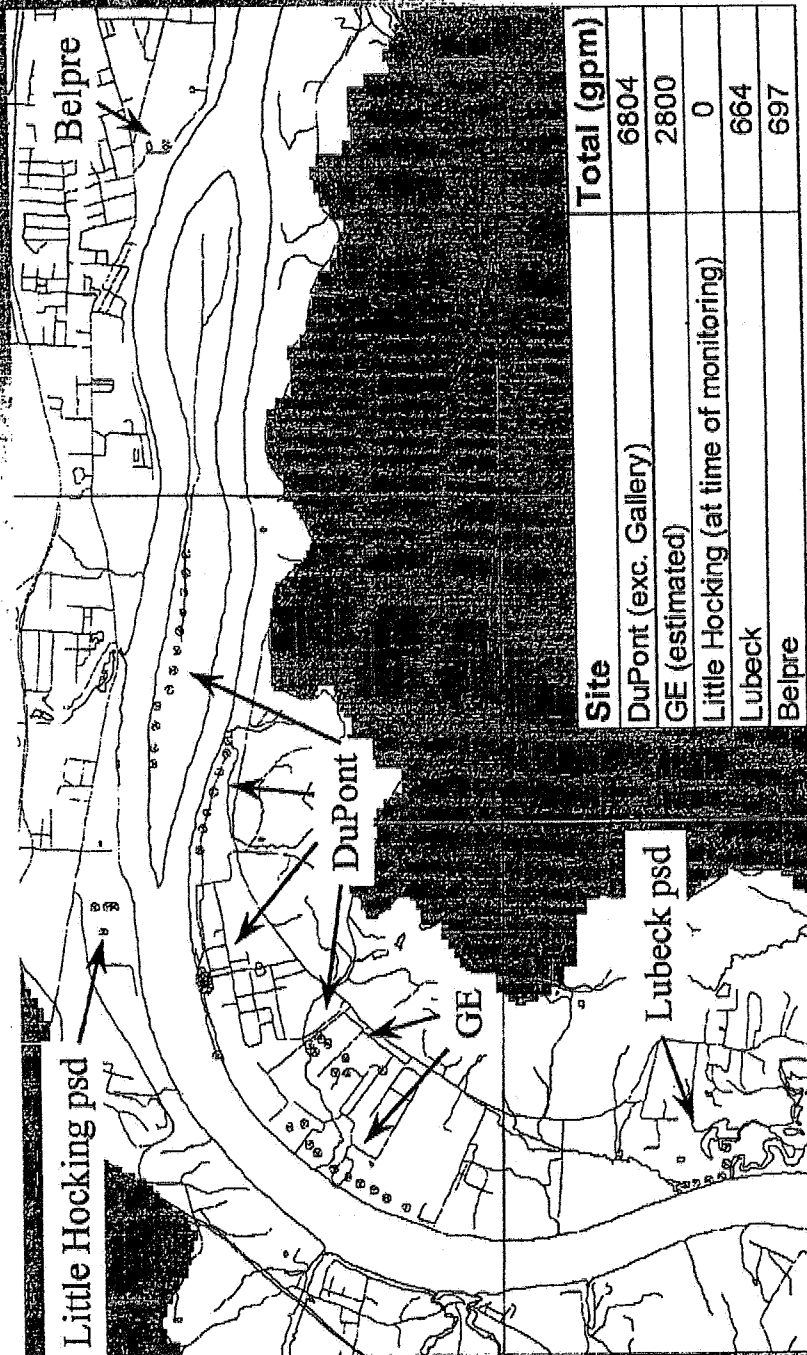
Recharge Zonation



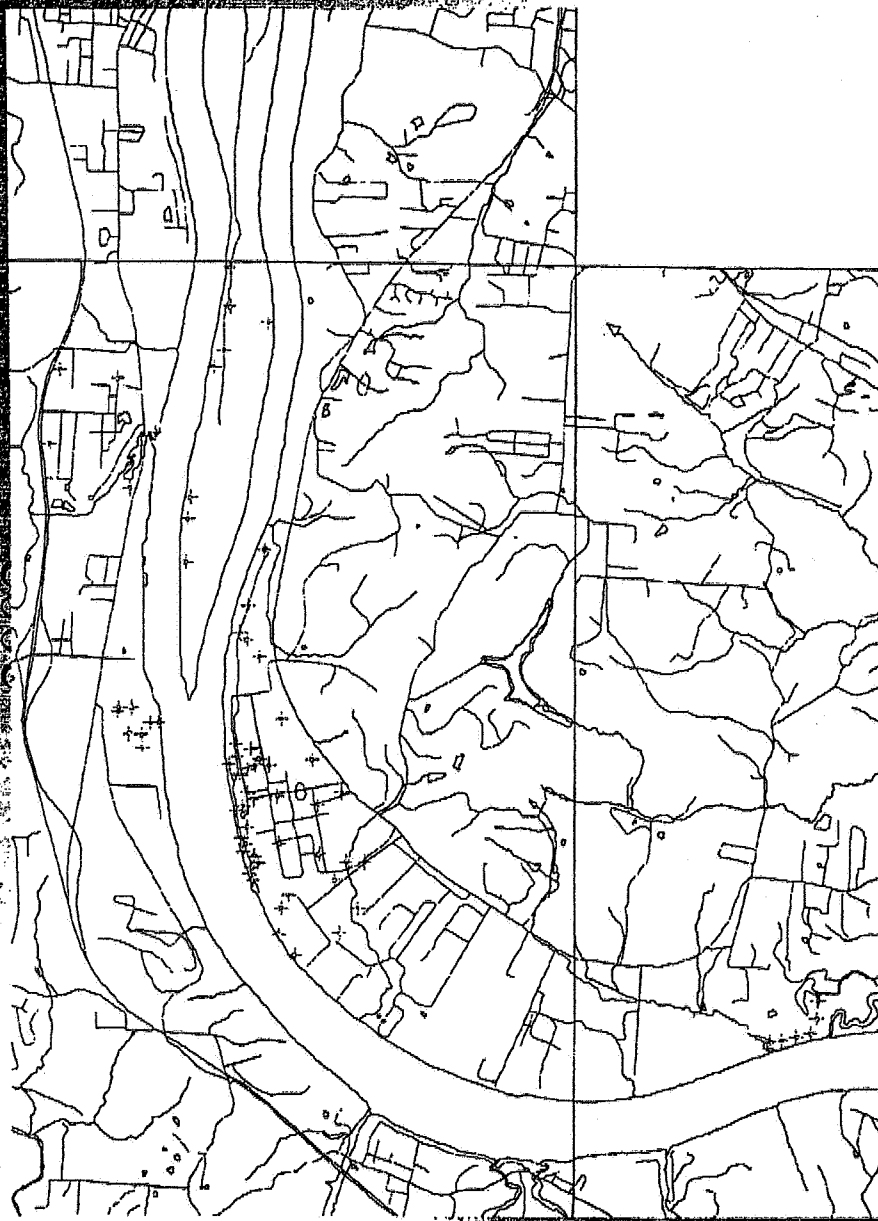
Model Boundaries - Layer II



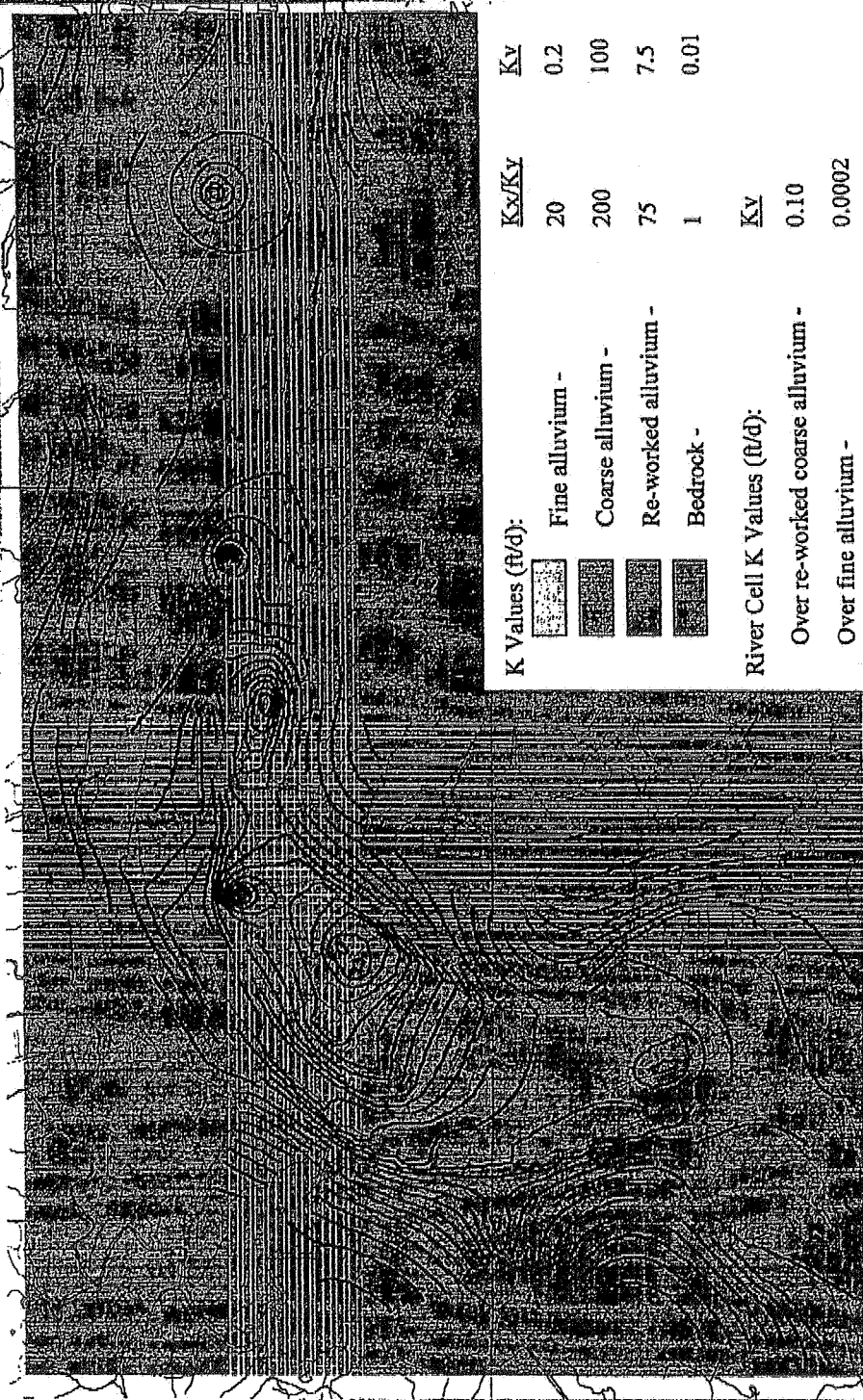
Pumping Rates, February 2, 2002 (gpm)



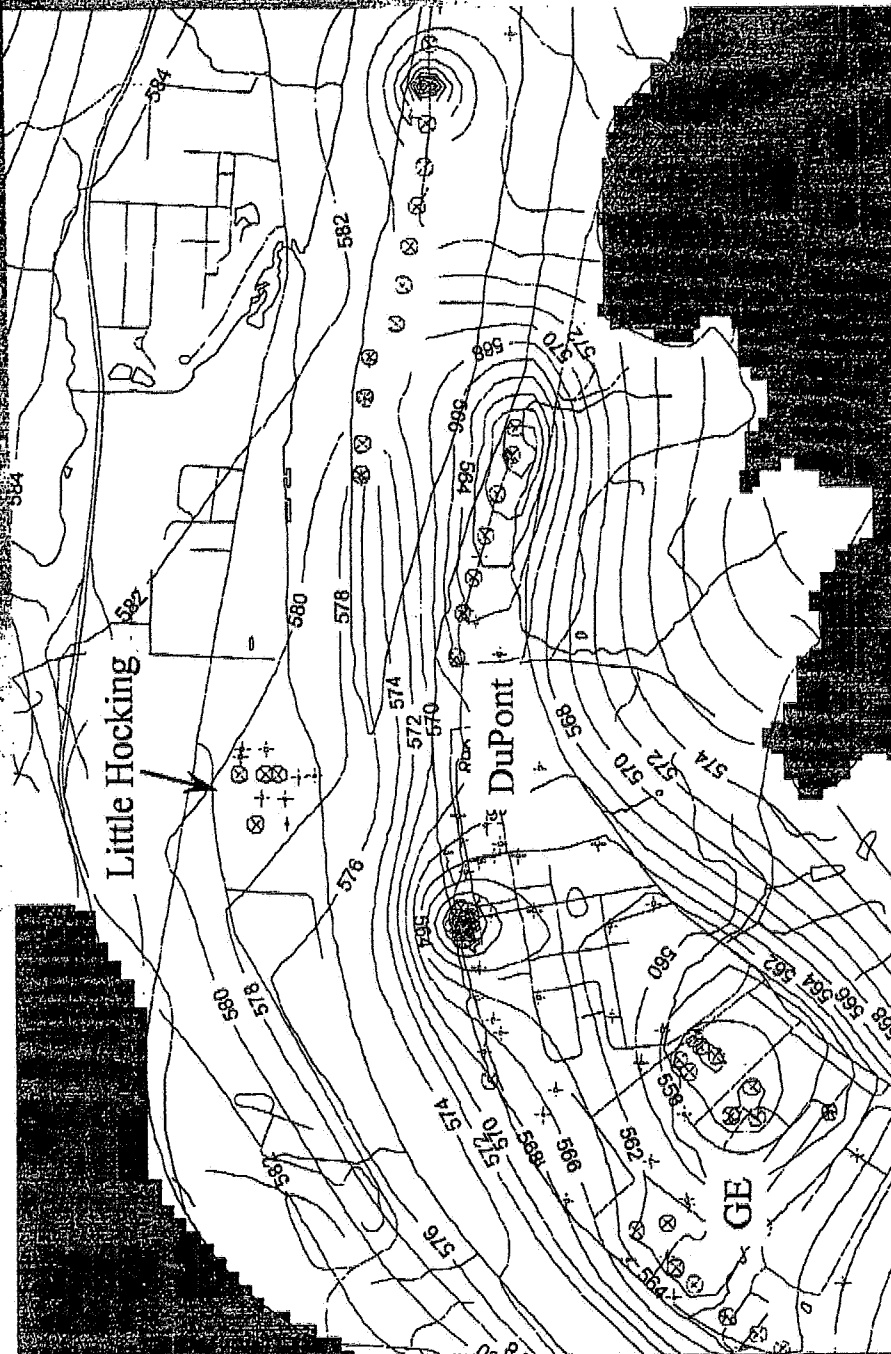
Synoptic Water Level Targets - February 25

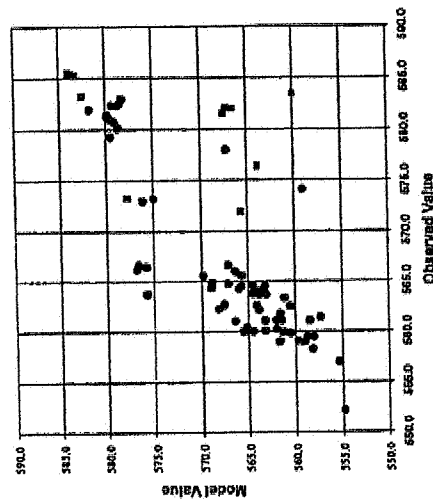


Preliminary Results - Computed Heads - Layer 2



Preliminary Results - Computed Heads - Layer 2



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ADDITIONAL QUESTIONS OR
COMMENTS?

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