THE OHIO VALLEY COAL COMPANY
PERMIT D-0360, APPLICATION D-0360-12
GEOLOGY AND HYDROLOGY

COAL MINING AND RECLAMATION PERMIT

REVISED
RSS 4-20-06

Issued To: OHIO VALLEY COAL CO
56854 PLEASANT RIDGE ROAD
ALLEDONIA, OH 43902

Telephone: (740) 926-1351

Permit Number: D-360
Application Number: D-0360-12
Acreage: 0
Underground Acreage 2431.7

Effective: 08/15/2003
Expires: 06/19/2004

Type of Operation: Underground (Room and Pillar), Underground (Longwall)

CONDITIONS

CONDITION TYPE	DESCRIPTION
~~Archeology~~	~~Prior to any surface disturbance or repair, the applicant will initiate further coordination with the Division of Mineral Resources Management (DMRM) archaeologist and the Ohio Historical Preservation Office. The applicant will provide DMRM National Register eligibility evaluation for architectural properties: 116, 118, 126, 132, 134, 135 and 136 as shown on the application map six months prior to mining beneath them.~~
Various	See attached conditions

RSS 4-20-06

LOCATION IS NOT AVAILIABLE

The issuance of this permit means only that the application to conduct a coal mining operation meets the requirements of Chapter 1513 of the Revised Code, and as such DOES NOT RELIEVE the operator of any obligation to meet other federal, state or local requirements.

This permit is issued in accordance with and subject to the provisions, conditions, and limitations of Chapter 1513 of the Revised Code and Chapters 1501:13-1, 1501:13-3 through 1501:13-14 of the Administrative Code.

The water monitoring plan for this permit shall be:

Quality: See Page 26, F3 of the Permit Application
Quantity See Page 26, F3 of the Permit Application

Note: These monitoring requirements are separate from NPDES monitoring requirements.

Signature: Michael G Sponsler by [signature] **Date:** 08/15/2003
Chief, Mineral Resources Management

OPERATOR

46 Rev: 07/01/2001

D-0360-12

TOVCC 11224

COAL MINING AND RECLAMATION PERMIT

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Various	See attached conditions

LOCATION IS NOT AVAILIABLE

The issuance of this permit means only that the application to conduct a coal mining operation meets the requirements of Chapter 1513 of the Revised Code, and as such DOES NOT RELIEVE the operator of any obligation to meet other federal, state or local requirements.

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Signature:

Chief, Mineral Resources Management

Date: 08/15/2003

F46 Rev: 07/01/2001

ADDENDUM TO PART 2, PAGE 16, B(1)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

GEOLOGY DESCRIPTION

Stratigraphy of the proposed permit area is formed by the Monongahela formation of the Pennsylvania period, and the Dunkard group of Permian time. The primary strata of both sections consists of an alternating sequence of limestone, sandstone, siltstone, shale, claystone, and coal.

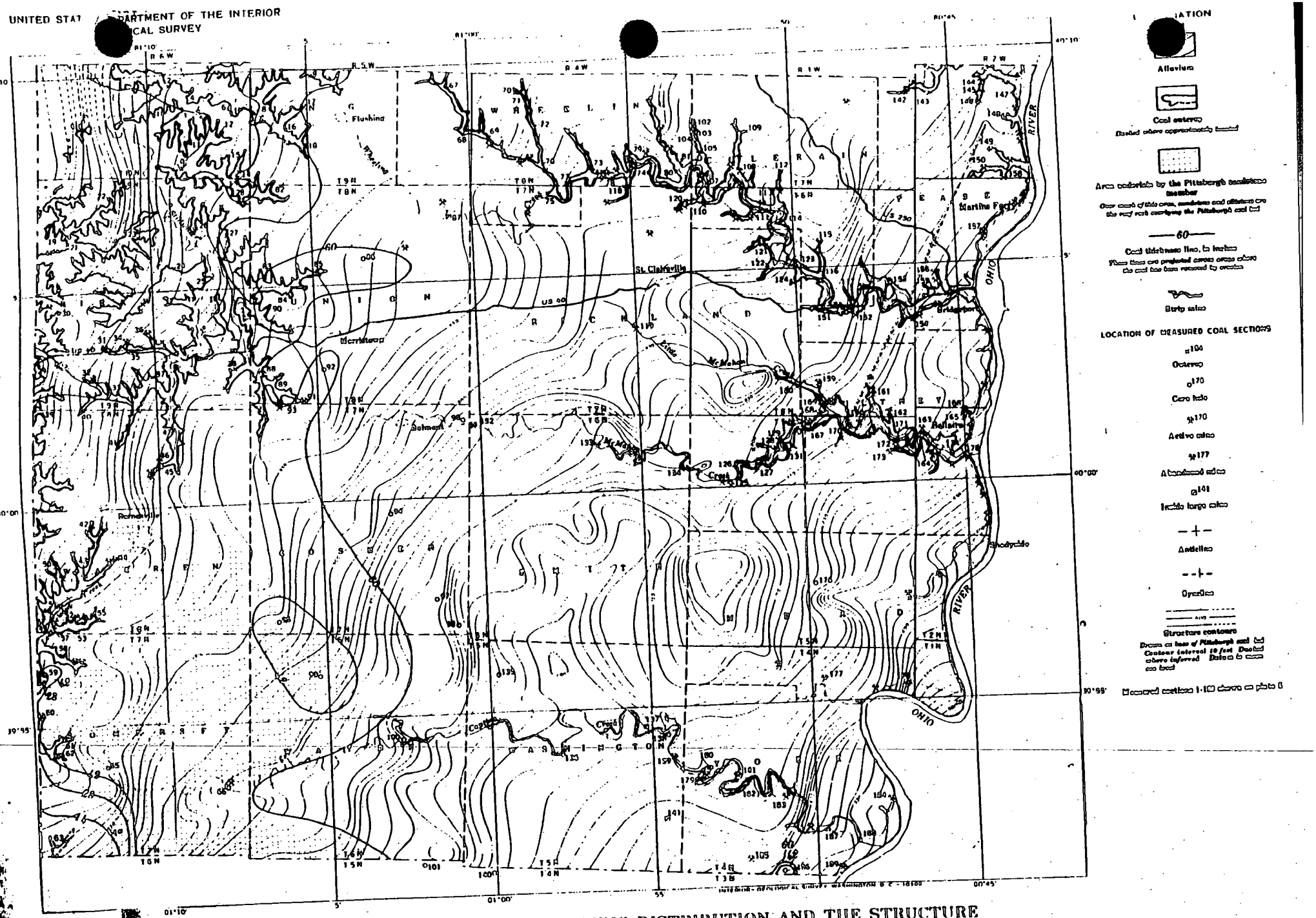
The Monongahela formation is approximately 245 feet thick. In ascending order, it occupies the interval from the Pittsburgh No. 8 to the Waynesburg No. 11 coal bed. The primary rock units are limestone, shale, and claystone. Limestone forms 44 to 68 percent of this stratigraphic interval. As a result of longwall mining, the immediate strata overlying the Pittsburgh No. 8 coal bed will cave to a height of 3 to 6 times the mining height, depending on the bulking factor of roof strata. The beds above this caved zone are provided some support by the caved rock but may sag and give rise to bed separation and may be subject to fracturing, to heights 24 to 54 times the mining height (120 to 270 feet above the mine).

The Dunkard group is 250 to 300 feet thick, occupying the interval from the Waynesburg No. 11 coal bed to the ground surface. The primary rock units here are shale and claystone. These soft units form about 85 percent of this stratigraphic interval. This strata is primarily located within the constrained zone of disturbance resulting from longwall mining. The constrained zone is defined as that interval above 24 to 54 times the mining height and below 50 feet from the ground surface. This strata is expected to be sufficiently confined to prevent development of any fractures. Rock beds here will tend to absorb most of the strain energy without fracturing.

Strata close to the surface, however, are not sufficiently confined and may move in any direction. Surface cracks may be produced from tensile strains resulting from longwall mining. The depth of these cracks is generally estimated to be less than 50 feet.

The main safety against inflow of groundwater into the Powhatan No. 6 Mine is afforded by the constrained zone. The nature and thickness of the individual beds found here are of particular importance. Through extensive core drilling, multiple beds of claystone, with total thicknesses of 79 to 108 feet, have been identified. These claystone beds are relatively impermeable and generally capable of absorbing large amounts of strain energy before fracture. In the application area, it is our opinion that sufficient claystones are in-place to provide an adequate barrier against inflow from surface water and shallow groundwater disruptions caused by longwall mining. Where stream valleys are encountered, longwall operations is generally not planned under less than about 200 feet of cover to further protect the mine and overlying groundwater resources. The rock strata of Belmont County typically form a gentle monocline that dips southeasterly at grades less than one percent (Figure 2)

OPERATOR D-0360-12



MAP OF THE PITTSBURGH (NO. 8) COAL BED SHOWING DISTRIBUTION AND THE STRUCTURE AND THICKNESS OF THE LOWER BENCH OF THE BED IN BELMONT COUNTY, OHIO

FIGURE 2

TOVCC 11227

and in the application area is southward to southeasterly. The base elevation of the No. 8 seam ranges from approximately 725 ft. in the southeast corner of the application area to approximately 800 ft. in the northwest corner.

The orientation of the major joints in rock and face cleat in coal is approximately N 75° W. The minor joints and butt cleats are generally perpendicular to these (N 15° E).

Geology and Coal Resources of Belmont County, Ohio, Geological Survey Professional Paper 380, reports that a small dome-shaped anticline lies in eastern Belmont County, primarily in Mead Township. This structure is located over three miles east of the Powhatan No. 6 Mine application area and, therefore, is not expected to have an impact on ground water flow in the application area.

In addition, there is a graben structure that passes through the Powhatan No. 6 Mine Reserve. This graben has been tracked through the adjacent Powhatan No. 3 Mine and enters the No. 6 reserve on the eastern boundary. It proceeds in a southwesterly direction, turns approximately 90 degrees, proceeds in a northwesterly direction, then turns again and proceeds in a general westerly direction off the mine property. The graben is located to the south of the application area and is not expected to have an impact on the ground water flow in the area.

The structural contours of the No. 8 Seam indicate that the graben is made up of a series of slumps in the deposit, indicated by a thickening of the seam at the bottom of the structure. This structure apparently affected the structural contours to the north of the graben, but these effects do not extend into the application area. Locally, these effects may be seen as areas where incidental water pools in the mine. This water is generally only a nuisance and does not require pumping. Most of the water found underground at the No. 6 mine is man-made during the mining cycle from water sprays (used for dust suppression) and cooling water for motors.

OHIO Department of Natural Resources

George V. Voinovich ◦ Govern
Donald C. Anderson ◦ Direct

February 9, 1999

Mr. David L. Bartsch, P.E.,
Environmental Coordinator and
Permitting Administrator
The Ohio Valley Coal Company
56854 Pleasant Ridge Road
Alledonia, Ohio 43902

RE: OVCC Permit D-0360 Test Hole Variance Request
Sections 21, 22, 27, 28, 33, and 34 in Smith Township, Belmont County

Dear Mr. Bartsch:

The above-captioned revised variance request, dated January 15, 1999, has been approved. Please submit the entire test hole variance request packet along with the permit application submittal.

If you have any questions or wish to meet, please call George Mychkovsky, geologist in the Permitting and Hydrology Section at 614-265-1024.

Sincerely,

Lisa J. Morris by R Cotton

Lisa J. Morris, Chief
Division of Mines & Reclamation

GM:GM
Cc: George Mychkovsky, Geologist, Permitting & Hydrology Section
Russ Gibson, Permitting Section Manager, DMR

RECYCLED PAPER
SOY-BASED INK

January 15, 1999

Ms. Lisa Morris, Chief
Division of Mines and Reclamation
Ohio Department of Natural Resources
1855 Fountain Square Court
Columbus, Ohio 43224

Attn: G. Mychkovsky, Geologist

Dear Ms. Morris:

The Ohio Valley Coal Company is preparing an application to add 2384 acres of underground (Pittsburgh No. 8 Seam) reserves adjacent to our currently approved underground mining area. A total of 15 test holes would be required by OAC 1501:13-4-13. There are currently 13 test holes within the proposed application area and an additional seven holes located nearby. Ten holes have the required geochemical analysis, Seven of which are located within the application boundary and since there will be no acid discharge from this area, the analysis data from the D-0360-3 area is sufficient. Furthermore, because aquifers (if any) at the level of the Pittsburgh (No. 8) seam are not being used, this is not a concern. Information from the D-0360-3 area has been used for this purpose in the past. Drilling logs, drilling data, and Attachment 13's for these test holes are included with this letter. During 1998, we installed five additional test holes, four of which are within the proposed application area and one is immediately south of the area. Two of these holes are drilled into the Pittsburgh (No. 8) Coal Seam. We respectfully request a test hole variance request in accordance with OAC 1501:13-4-13(C)(3). The following information is submitted in support of this request. Additional information for any limited extraction area will be submitted with the application for this area. Such information will be the subject of a meeting scheduled for January 22, 1999, and we cannot speculate what information will be required as a result of that meeting.

1. A map showing the existing test holes, their surface elevations, their coal elevations and the structural contours based on these holes and the surrounding test holes. The proposed mining area boundary and hydrologic boundary are also shown on the map.

2. Logs of the test holes and/or modified Attachment 13's for each hole.

3. A total of two(2) cross sections of the holes within and near the application area.

4. Logs and Attachment 13's for test holes in the D-0360-3 adjacent area found immediately to the east of the proposed area. We contend that the geology in this proposed area is identical to the geology in the D-0360-3 area, and the other

56854 PLEASANT RIDGE ROAD ○ ALLEDONIA OHIO 43902
(740) 926-1351 ● FAX (740) 926-1615

approved adjacent areas. The D-0360-3 and other adjacent area applications are on file with the Division of Mines and Reclamation and are available for your review.

5. Three of the additional test holes, N98-25, -26, and -27 were drilled to categorize the surface soil layer, as this information was not previously available.

6. A geology narrative describing the area to be included in the application.

7. A copy of the structure contour map from D-0360-3 to show the relative locations of the test holes to the proposed application area.

This information will be submitted with the application.

Based on the information available, we are confident that this test hole variance request should be approved. We would appreciate your prompt attention to this matter. Should you have any questions, please contact me as soon as possible.

Sincerely,
THE OHIO VALLEY COAL COMPANY

David L. Bartsch

David L. Bartsch, P.E.
Environmental Coordinator and
Permit Administrator

cc: J. R. Forrelli
B. A. Waite
L. C. Binon
File

GEOLOGY DESCRIPTION

The bedrock units that outcrop in the proposed application area belong to the Dunkard Group that is Upper Pennsylvanian to Permian in age. The Dunkard Group rocks consist of interbedded sandstone, siltstone, shale, mudstone, clay, fresh to brackish water limestone and coal. The Monongahela Formation (Pennsylvanian age) underlies the Dunkard Group and consists of similar rock types. The Pittsburgh (No. 8) Coal bed, which is the seam to be mined, marks the bottom of the Monongahela Formation.

The Monongahela Formation, which occupies the interval from the Pittsburgh No. 8 to the Waynesburg No. 11 coal beds, is approximately 245 feet thick. The primary rock types are limestone, shale and claystone. Limestone form 44 to 68 % of this statigraphic interval.

The Dunkard Group occupies the interval from the Waynesburg No. 11 coal bed to the surface. The Dunkard Group ranges from 50 to 330 feet thick in the application area. The primary rock types in the Dunkard Group are shales and claystones. These soft rocks make up approximately 85 % of this stratigraphic interval. This strata is primarily located within the constrained zone of disturbance resulting from mining. The constrained zone is defined as that interval above 24 to 54 times the mining height and below 50 ft from the ground surface. This strata is expected to be sufficiently confined to prevent development of any fractures. Rock beds in this interval are expected to absorb most of the strain energy without fracturing. The constrained zone is expected to prevent the inflow of groundwater into the mine

Overburden thickness above the Pittsburgh No. 8 coal bed ranges from a low of approximately 300 feet along the Williams Creek valley to a high of approximately 580 feet along the hilltops in the center of the area. Soft rocks, such as shales and clays, make up an average of 72 % of the all of the rocks overlying the No. 8 coal.

The geologic structures in the application area consist of gently folded rocks that dip to the southeast at approximately 40 feet per mile. The orientation of the major joints and face cleat in the coal is approximately N 75° W. The minor joints and butt cleat are generally perpendicular to these at N 15° E. The elevation of the Pittsburgh No. 8 coal bed ranges from 725 feet msl to 810 feet msl.

DRILL LOGS, DRILLING INFORMATION, AND ATTACHMENT 13'S PROPOSED APPLICATION AREA

ADDENDUM TO ATTACHMENT 13

Hole ID		
B&O 13	2,418,283.02	727,372.85
N86-21	2,426,586.06	727,918.73
N86-17	2,427,636.46	720,918.86
N92-03	2,430,390.76	722,252.50
N94-12	2,416,789.46	724,668.05
N86-18	2,432,596.11	725,306.13

Drill No. 6

Hole No. 13-[illegible] Coal Co.

Driller [illegible]

L. J. HUGHES & SONS

Contractors, Diamond Core Drilling

INDIANA, PA.

RICHWOOD, W. VA.

Date Started 11/[illegible]/ 1950

Date Finished 11/1[illegible]/ 1950

FOR WHOM DRILLING Baltimore and Ohio Railroad

ADDRESS Baltimore, Maryland

Property Description: Ohio, Belmont County, Goshen Township. Located on the East Bank of Joy Fork about 18,000 feet from the mouth of Joy Fork. In the farm of Harold Dunfee.

Surface Elevation: ~~[illegible]~~ 1062

No. of Strata	FORMATION	Thickness of Strata Feet	Thickness of Strata Inches	Depth from S[illegible] Feet	[illegible]
	Surface Clay	4	0	4	
	Gray Sandy Shale	7	2	11	
	Gray Shale	23	0	[illegible]	
	Shaley Fire Clay (Soft)	4	0	[illegible]	
	Gray Shale	[illegible]	[illegible]	[illegible]	
	Dark Shale with Fire Clay Streaks	0	[illegible]	[illegible]	
	Coal with Sulphur Streaks	[illegible]	[illegible]	[illegible]	
	Coal	[illegible]	[illegible]	[illegible]	
	Boney Coal	[illegible]	[illegible]	[illegible]	
	Shaley Fire Clay	11	1	[illegible]	
	Shale and Limestone	5	[illegible]	[illegible]	
	Gray Sandy Shale	5	[illegible]	[illegible]	
	Sandstone	19	7	[illegible]	
	Gray Shale	2	7	[illegible]	
	Dark Shale	0	1	[illegible]	
	Coal with Few Slate Streaks	2	0½	[illegible]	
	Gray Shale	0	1½	[illegible]	
	Boney Coal	0	1½	92	
	Gray Shale	0	3	[illegible]	
	Coal	0	1½	93	
	Gray Shale	12	5	105	
	Shale and Limestone	8	0	113	
	Sandstone	4	2	117	
	Light Gray Shale	5	0	1[illegible]	
	Limestone	8	0	1[illegible]	
	Limestone and Shale	3	10	13[illegible]	
	Gray Green Shale	2	4	137	
	Limestone and Shale	6	0	14[illegible]	
	Gray Green Shale	1	8	14[illegible]	
	Gray Shale	5	2	150	
	Limestone and Shale	23	0	173	
	Limestone	2	10	17[illegible]	
	Gray Shale	1	6	177	
	Limestone	10	6	[illegible]	
	Gray Green Shale	1	5	[illegible]	
	Limestone and Shale	10	3	[illegible]	
	Dark Shale	5	11	[illegible]	
	Coal	0	0½	[illegible]	
	Slate	0	0½	[illegible]	
	Coal	1	2½	[illegible]	
	Slate	0	4½	[illegible]	
	Coal with Few Slate Streaks	1	7½	[illegible]	
	Gray Shale	5	6	215	
	Shale and Limestone	3	0½	[illegible]	
	Limestone	2	5	[illegible]	
	Dark Shale	8	4	[illegible]	
	Limestone	1	2	[illegible]	
	Dark Shale	1	3	[illegible]	
	Limestone	14	4	[illegible]	
	Gray Shale	1	1	[illegible]	
	Limestone	8	11	[illegible]	
	Gray Green Shale	4	3	[illegible]	
	Limestone	3	0	[illegible]	
	Shaley Fire Clay (Soft)	4	3	[illegible]	
	Dark Shale	0	4	[illegible]	

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No. of Strata	FORMATION	Thickness of Strata Feet	Thickness of Strata Inches	Depth from S Feet	I
	Gray Shale	3	7	271	
	Limestone	11	5	282	
	Shaley Fire Clay with Limestone (Semi-Hard)	5	11	288	
	Shaley Fire Clay	1	4	289	
	Fire Clay (Hard)	0	7	290	
	Slate	0	2	290	
	Fire Clay (Soft)	0	8	291	
	Rocky Coal with Sulphur Streaks	0	4	291	
	Gray Shale	0	1½	291	
	Coal	1	0	292	
	Gray Shale	0	0½	292	
	Coal	0	1½	293	
#6	Gray Shale (Rays)	0	11½	293	
	Coal	1	11½	295	
	Sandy Coal with Fire Clay Streaks	0	0	295	
	Coal with four small sulphur streaks	3	0½	298	
	Gray Shale	1	4	300	
	Gray Shale and Limestone	3	7½	304	
	Total Depth			304	

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TOVCC 11236

LJ HUGHES & SONS, INC.

DIAMOND CORE DRILLING
Pressure Grouting, Foundation & Soil Borings
320 Turnpike Road, Summersville, West Virginia 26651 (304) 872-1111

DRILL HOLE NO. N-86-17

DRILLER: DANIEL HAMRICK

DRILLING FOR: THE NACCO MINING COMPANY, POWHATAN POINT, OHIO

SURFACE ELEVATION:

STARTED: DECEMBER 11, 1986
COMPLETED: DECEMBER 17, 1986

STATE PLANE COORDS
2,427,636.46
720,918.86

LOCATION: OHIO, BELMONT COUNTY
SMITH TOWNSHIP
SECTION 26
NORTHEAST 1/4.

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE
CASING	15.00	15.00 CA
GRAY CLAYSTONE	23.00	~~38.00~~
RED AND GREEN CLAYSTONE	7.00	~~45.00~~
GREEN CLAYSTONE	11.00	56.00 CY
LIMESTONE	2.00	58.00 LS
GREEN CLAYSTONE	2.00	~~60.00~~
RED AND GREEN CLAYSTONE	15.00	75.00 CY
GREEN LIMY SHALE	15.00	90.00 SL
GREEN SANDY SHALE	8.00	98.00 SY
GRAY SHALE WITH LIMESTONE	4.00	102.00 SL
GREEN CLAYSTONE	3.00	105.00 CY
GRAY SANDY SHALE	3.20	108.20 SY
GRAY CLAYSTONE	1.70	109.90 CY
COAL	0.70	110.60 CO
GRAY SHALE	5.80	WASHINGTON (NO. 12) 116.40 SH
COAL	3.70	120.10 CO WASH
GRAY SHALE WITH COAL STREAKS	5.70	125.80 CS
GRAY SHALE	5.80	131.60 SH
BONY COAL	0.60	132.20 BO
COAL	0.75	132.95 CO
GRAY SANDSTONE WITH COAL STREAKS	2.05	135.00 SS
GREEN CLAYSTONE	15.00	150.00 CY
GRAY SHALE	3.00	153.00 SH
GREEN LIMY SHALE	12.00	165.00 SL
GREEN SHALE	10.50	175.50 SH
LIMESTONE	4.50	180.00 LS
GREEN SHALE	3.80	183.80 SH

bottom of interburden depth

TOVCC 11237

LJ HUGHES & SONS, INC.

HE NACCO MINING COMPANY

CONTINUATION OF DRILL HOLE NO. N-86-17

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE
			183.80
LIMESTONE	0.80		184.60 LS
GREEN LIMY SHALE	4.70		189.30 SL
GREEN SHALE	5.30		194.60 SH
GRAY SANDSTONE	0.40		195.00 SS
GRAY SANDY SHALE	4.80		199.80 SY
COAL	1.35	WAYNESBURG (No.11)	201.15 CO wyll
GRAY SHALE	7.80		208.95 Sh
COAL	0.20		209.15 Co
GRAY LIMY SHALE	0.85		210.00 SL
GRAY CLAYSTONE	8.00		218.00 CY
GREEN SANDY SHALE WITH LIME	7.00		225.00 Sy
GRAY SANDSTONE	33.50		258.50 SS
GREEN SHALE	9.20		267.70 Sh
LIMESTONE WITH SHALE	5.80		273.50 LS
GREEN CLAYSTONE	2.60		276.10 CY
LIMESTONE (BROKEN)	2.00		278.10 LS
GREEN SHALE	4.20		282.30 Sh
LIMESTONE WITH SHALE	86.50		368.80 LS
GRAY CLAYSTONE	3.00		371.80 CY
COAL	2.75	SEWICKLEY (No.9)	374.55 Co SUNKY
GRAY CLAYSTONE	2.00		376.55 CY
LIMESTONE WITH SHALE	7.45		384.00 LS
GRAY SHALE	10.00		394.00 Sh
LIMESTONE WITH SHALE	36.00		422.15 ~~430.00~~ LS
GREEN CLAYSTONE	5.00		435.~~00~~
LIMESTONE WITH SHALE	13.70		448.70 to LOG
GREEN CLAYSTONE	5.60		454.30
GRAY CLAYSTONE	0.70		455.00
GRAY SHALE	1.65		456.65
COAL	5.10	PITTSBURGH (No.8)	461.75
GRAY LIMY SHALE	1.80		463.55
GREEN CLAYSTONE	6.45		470.00

TOTAL DEPTH: 470 FEET

18 BAGS CEMENT PLACED IN HOLE

TOVCC 11238

LJ HUGHES & SONS, INC.

DIAMOND CORE DRILLING
Pressure Grouting, Foundation & Soil Borings
320 Turnpike Road, Summersville, West Virginia 26651 (304) 872-1111

DRILL HOLE NO. N-86-18 DRILLER: DANIEL HAMRICK

DRILLING FOR: THE NACCO MINING COMPANY, POWHATAN POINT, OHIO

SURFACE ELEVATION: 1123.82

STARTED: DECEMBER 9, 1986
COMPLETED: DECEMBER 10, 1986

LOCATION: OHIO, BELMONT COUNTY
SMITH TOWNSHIP
SECTION 21
NORTHEAST 1/4.

EXCHANGE COORDS
E-61,084.35
N-15,249.64
STATE PLANE COORDS
X-2,432,596.11
Y-725,306.13

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE
CASING	25.00		25.00 CA
GREEN LIMY SHALE	10.00		35.00 SL
GRAY SANDSTONE	7.00		42.00 SS
GREEN SHALE	18.00		60.00 Sh
GRAY LIMY SHALE	4.00		~~64.00~~
GREEN LIMY SHALE	5.00		69.00 SL
GRAY SANDSTONE	4.00		73.00 SS
GREEN SHALE	12.00		85.00 Sh
LIMESTONE	1.00		86.00 LS
GREEN SANDY SHALE	6.00		92.00 Sy
GREEN CLAYSTONE	8.00		100.00 Cy
GREEN LIMY SHALE	5.00		105.00 SL
GRAY SANDSTONE	12.70		117.70 SS
GRAY SHALE	0.20		117.90 Sh
COAL	2.00	WAYNESBURG (No. 11)	119.90 Co Wy 11
GRAY CLAYSTONE	10.10		130.00 Cy
GREEN LIMY SHALE	18.00		148.00 SL
GRAY SANDSTONE	24.00		172.00 SS
GRAY CLAYSTONE	3.00		175.00 Cy
GREEN SHALE	6.00		181.00 Sh
GREEN LIMY SHALE	4.00		185.00 SL
LIMESTONE	2.00		187.00 LS
GREEN LIMY SHALE	3.00		190.00 SL
GRAY SANDSTONE	7.60		197.60 SS
LIMESTONE WITH SHALE	10.40		208.00 LS
GREEN LIMY CLAYSTONE	12.00		220.00 Cy
LIMESTONE WITH SHALE	8.00		228.00 LS
GREEN SHALE	4.00		232.00 Sh

TOVCC 11239

LJ HUGHES & SONS, INC.

THE NACCO MINING COMPANY

CONTINUATION OF DRILL HOLE NO. N-86-18

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE
			232.00
LIMESTONE WITH SHALE	51.40		283.40 LS
GRAY CLAYSTONE	2.40		285.80 CY
COAL	2.00	SEWICKLEY (No.9)	~~287.80~~
GRAY SHALE	0.15		~~287.95~~
COAL	1.45	3.6	289.40 CO SWKY
GRAY LIMY SHALE	1.60		291.00 SL
LIMESTONE WITH SHALE	7.60		298.60 LS
GRAY SHALE	10.00		308.60 Sh
LIMESTONE WITH SHALE	51.40		~~360.00~~ 344.55 LS
GREEN CLAYSTONE WITH LIME	5.00		~~365.00~~
GRAY CLAYSTONE	2.65		~~367.65~~ to log
BLACK SHALE	0.20		367.85
COAL	1.00	ROOF COAL	368.85
GRAY CLAYSTONE	0.80		369.65
COAL	5.20	PITTSBURGH (No.8)	374.85
GRAY LIMY SHALE	15.15		390.00

TOTAL DEPTH: 390 FEET

15 BAGS CEMENT PLACED IN HOLE

55% SOFT ROCK
45% HARD ROCK

TOVCC 11240

LJ HUGHES & SONS, INC.

DIAMOND CORE DRILLING
Pressure Grouting, Foundation & Soil Borings
320 Turnpike Road, Summersville, West Virginia 26651 (304) 872-1111

DRILL HOLE NO. N-86-19 DRILLER: DANIEL HAMRICK

DRILLING FOR: THE NACCO MINING COMPANY, POWHATAN POINT, OHIO

SURFACE ELEVATION:

STARTED: NOVEMBER 25, 1986
COMPLETED: DECEMBER 1, 1986

LOCATION: OHIO, BELMONT COUNTY
SMITH TOWNSHIP
SECTION 22
SOUTHWEST 1/4.

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE
CASING	23.00		23.00 CA
CHIPPED	7.00		~~30.00~~
GRAY CLAYSTONE	13.50		43.50 CY
COAL	2.10	WAYNESBURG (No.11)	45.60 CO WY11
GRAY CLAYSTONE	9.40		55.00 CY
GREEN SANDY SHALE WITH LIME	15.00		70.00 SY
GRAY SANDSTONE	15.00		85.00 SS
GRAY SHALE	1.80		86.80 SH
COAL	1.50	UNIONTOWN (No.10)	88.30 CO UNTN
GREEN CLAYSTONE	7.00		~~95.30~~
GRAY LIMY CLAYSTONE	7.10		~~102.40~~
GREEN CLAYSTONE	3.00		105.40 CY
GRAY SANDSTONE	5.80		111.20 SS
GREEN CLAYSTONE	1.20		112.40 CY
LIMESTONE	1.60		114.00 LS
GREEN CLAYSTONE	1.00		115.00 CY
LIMESTONE WITH SHALE	15.00		130.00 LS
GREEN LIMY SHALE	6.00		136.00 SL
LIMESTONE WITH SHALE	4.00		140.00 LS
GREEN CLAYSTONE WITH LIME	5.00		145.00 CY
LIMESTONE WITH SHALE	50.00		195.00 LS
GRAY CLAYSTONE	5.00		200.00 CY
COAL	2.75	SEWICKLEY (No.9)	202.75 CO SWKY
GRAY LIMY SHALE	9.25		212.00 SL
GRAY SHALE	10.00		222.00 SH
LIMESTONE WITH SHALE	34.80		256.80 LS
GREEN CLAYSTONE	6.50		~~263.30~~
LIMESTONE	1.70		~~265.00~~ TD LOG

TOVCC 11241

LJ HUGHES & SONS, INC.

THE NACCO MINING COMPANY

CONTINUATION OF DRILL HOLE NO. N-86-19

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE
			265.00
LIMESTONE WITH SHALE	16.00		281.00
GRAY CLAYSTONE	3.30		284.30
BONY COAL	0.33		284.63
GRAY SHALE	0.23		284.86
COAL	0.85	ROOF COAL	285.71
GRAY SHALE	0.86		286.57
COAL	5.10	PITTSBURGH (No.8)	291.67
GRAY LIMY SHALE	13.33		305.00

TOTAL DEPTH: 305 FEET

12 BAGS CEMENT PLACED IN HOLE

TOVCC 11242

DIAMOND DRILL HOLE N86-21

GEOLOGIST: WILLIAM SIPLIVY

ELEVATION: 1313.34

EXCHANGE COORDINATES: N -12,528.11, E -67,045.87

STATE PLANE COORDS
2,426,556.06
727,918.73

DRILLER: L. J. HUGHES & SONS, INC., DANIEL HAMRICK

TOWNSHIP: SMITH

SECTION: SE ¼ 28

COUNTY: BELMONT

SURF. OWNER: J. CORBETT

DATE STARTED: 12/3/86

DATE FINISHED: 12/5/86

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
15.00	CASING	15.00	1298.34
15.00	CLAYSTONE, GRAY/BROWN	30.00	1283.34
4.00	SANDSTONE, GRAY/BROWN	34.00	1279.34
1.00	SHALE, GRAY	35.00	1278.34
2.40	SHALE, BLACK	37.40	1275.94
3.60	LIMESTONE	41.00	1272.34
8.00	CLAYSTONE, GRAY	49.00	1264.34
6.00	SANDSTONE, GRAY	55.00	1258.34
10.00	SHALE, GREEN	65.00	1248.34
1.60	LIMESTONE	66.60	1246.74
39.40	CLAYSTONE, RED/GREEN	106.00	1207.34
9.00	CLAYSTONE, GREEN	115.00	1198.34
15.00	CLAYSTONE, GREEN, CALCAREOUS	130.00	1183.34
17.00	CLAYSTONE, GREEN	147.00	1166.34
1.30	LIMESTONE	148.30	1165.04
3.00	CLAYSTONE, GREEN, CALCAREOUS	151.30	1162.04
2.70	LIMESTONE	154.00	1159.34
6.00	SHALE, GREEN, CALCAREOUS	160.00	1153.34
9.00	CLAYSTONE, GREEN	169.00	1144.34
6.00	SHALE, GREEN	175.00	1138.34
1.60	SHALE, GRAY	176.60	1136.74
0.80	SANDSTONE, GRAY	177.40	1135.94
0.90	SHALE, GRAY	178.30	1135.04
0.60	SANDSTONE, GRAY	178.90	1134.44
5.60	SHALE, GRAY	184.50	1128.84
0.30	COAL	184.80	1128.54
2.00	SHALE, GRAY	186.80	1126.54
3.20	LIMESTONE, SHALEY	190.00	1123.34
7.00	CLAYSTONE, GRAY	197.00	1116.34
3.00	SHALE, BLACK, CARBONACEOUS	200.00	1113.34
0.90	SHALE, GRAY	200.90	1112.44
0.60	COAL	201.50	1111.84
7.00	SHALE, GRAY	208.50	1104.84
0.80	COAL (NO. 12)	209.30	1104.04
10.70	SHALE, GREEN, CALCAREOUS	220.00	1093.34
10.00	LIMESTONE, GRAY, CLAYEY	230.00	1083.34
7.00	SANDSTONE, GRAY	237.00	1076.34
8.00	SHALE, GREEN	245.00	1068.34
5.00	CLAYSTONE, GRAY	250.00	1063.34

DIAMOND DRILL HOLE N86-21

(Continued)

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
12.00	SHALE, GREEN, CALCAREOUS	262.00	1051.34
4.40	SANDSTONE, GRAY	266.40	1046.94
8.60	SHALE, GREEN, CALCAREOUS	275.00	1038.34
16.00	SHALE, GREEN	291.00	1022.34
22.20	SANDSTONE, GRAY	313.20	1000.14
0.30	SHALE, BLACK	313.50	999.84
0.50	COAL, (NO. 11)	314.00	999.34
1.70	SHALE, GRAY	315.70	997.64
0.10	COAL	315.80	997.54
1.70	SHALE, GRAY	317.50	995.84
2.50	CLAYSTONE, GREEN	320.00	993.34
15.00	CLAYSTONE, GREEN, CALCAREOUS	335.00	978.34
15.00	SHALE, GRAY, SANDY	350.00	963.34
3.40	SHALE, GRAY	353.40	959.94
2.70	COAL, (NO. 10)	356.10	957.24
6.20	SHALE, GRAY	362.30	951.04
4.70	LIMESTONE, SHALEY	367.00	946.34
11.60	CLAYSTONE, GREEN	378.60	934.74
29.00	LIMESTONE, SHALEY	407.60	905.74
3.40	SHALE, GREEN	411.00	902.34
50.80	LIMESTONE, SHALEY	461.80	851.54
3.90	CLAYSTONE, GRAY	465.70	847.64
3.15	COAL (NO. 9)	468.85	844.49
2.15	SHALE, GRAY, CALCAREOUS	471.00	842.34
8.30	LIMESTONE, SHALEY	479.30	834.04
8.50	SHALE, GRAY	487.80	825.54
35.90	LIMESTONE, SHALEY	523.70	789.64
3.40	CLAYSTONE, GREEN	527.10	786.24
2.00	CLAYSTONE, GRAY	529.10	784.24
12.70	LIMESTONE	541.80	771.54
6.20	CLAYSTONE, GREEN, CALCAREOUS	548.00	765.34
2.70	CLAYSTONE, GRAY	550.70	762.64
7.10	COAL (NO. 8)	557.80	755.54
7.20	SHALE, GRAY, CALCAREOUS	565.00	748.34

AMOUNT OF HARD ROCK ABOVE NO. 8 SEAM

HARD ROCK: 137.60 FT. (25.0%) OF CORE

SOFT ROCK: 413.10 FT. (75.0%) OF CORE

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N86-21

State Plane Coords: X Y Surface Elevation 1313.34

LITHOLOGY	H20*	THICKNESS	PHYSICAL PROPERTIES
CASING		15.00	
CLAYSTONE		15.00	COMP, EROD
SANDSTONE		4.00	HARD
SHALE		1.00	COMP, EROD
SHALE		2.40	COMP, EROD
LIMESTONE		3.60	ALK
CLAYSTONE		8.00	COMP, EROD
SANDSTONE		6.00	HARD
SHALE		10.00	COMP, EROD
LIMESTONE		1.60	ALK
CLAYSTONE		39.40	COMP, EROD
CLAYSTONE		9.00	COMP, EROD
CLAYSTONE		15.00	ALK, COMP, EROD
CLAYSTONE		17.00	COMP, EROD
LIMESTONE		1.30	ALK
CLAYSTONE		3.00	ALK, COMP, EROD
LIMESTONE		2.70	ALK
SHALE		6.00	ALK, COMP, EROD
CLAYSTONE		9.00	COMP, EROD
SHALE		6.00	COMP, EROD
SHALE		1.60	COMP, EROD
SANDSTONE		0.80	HARD
SHALE		0.90	COMP, EROD
SANDSTONE		0.60	HARD
SHALE		5.60	COMP, EROD
COAL		0.30	AC, EROD
SHALE		2.00	COMP, EROD
LIMESTONE		3.20	ALK, EROD
CLAYSTONE		7.00	COMP, EROD
SHALE		3.00	AC, COMP, EROD
SHALE		0.90	COMP, EROD
COAL		0.60	AC, EROD
SHALE		7.00	COMP, EROD
COAL (NO. 12)		0.80	AC, EROD
SHALE		10.70	ALK, COMP, EROD
LIMESTONE		10.00	ALK, EROD
SANDSTONE		7.00	HARD
SHALE		8.00	COMP, EROD
CLAYSTONE		5.00	COMP, EROD
SHALE		12.00	ALK, COMP, EROD

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N86-21

State Plane Coords: X Y Surface Elevation 1313.34

LITHOLOGY	H20*	THICKNESS	PHYSICAL PROPERTIES
SANDSTONE		4.40	HARD
SHALE		8.60	ALK, COMP, EROD
SHALE		16.00	COMP, EROD
SANDSTONE		22.20	HARD
SHALE		0.30	COMP, EROD
COAL, (NO. 11)		0.50	AC, EROD
SHALE		1.70	COMP, EROD
COAL		0.10	AC, EROD
SHALE		1.70	COMP, EROD
CLAYSTONE		2.50	COMP, EROD
CLAYSTONE		15.00	ALK, COMP, EROD
SHALE		15.00	COMP, EROD
SHALE		3.40	COMP, EROD
COAL, (NO. 10)		2.70	AC, EROD
SHALE		6.20	COMP, EROD
LIMESTONE		4.70	ALK, EROD
CLAYSTONE		11.60	COMP, EROD
LIMESTONE		29.00	ALK, EROD
SHALE		3.40	COMP, EROD
LIMESTONE		50.80	ALK, EROD
CLAYSTONE		3.90	COMP, EROD
COAL (NO. 9)		3.15	AC, EROD
SHALE		2.15	ALK, COMP, EROD
LIMESTONE		8.30	ALK, EROD
SHALE		8.50	COMP, EROD
LIMESTONE		35.90	ALK, EROD
CLAYSTONE		3.40	COMP, EROD
CLAYSTONE		2.00	COMP, EROD
LIMESTONE		12.70	ALK
CLAYSTONE		6.20	ALK, COMP, EROD
CLAYSTONE		2.70	COMP, EROD
COAL (NO. 8)		7.10	AC, EROD
SHALE		7.20	ALK, COMP, EROD

Legend:
AC = ACID PRODUCING
ALK = ALKALINE PRODUCING
COMP = COMPACTIBLE
EROD = ERODIBLE

NOTE: HOLE WAS DRILLED PRIOR TO REQUIREMENT TO NOTE WATER BEARING ZONES OR OBTAINING SAMPLES FOR CHEMICAL ANALYSES

THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360
ATTACHMENT 13 FOR TEST HOLE N86-19

STATE PLANE COORDS.
X -2,431,056.72
Y - 729,033.72
SURF. ELEV = 1055.45

FORMATION	THICKNESS	DEPTH	COMMENT	STRATA ELEV.
CASING	23.00	23.00	CASING	1032.45
CHIPPED	7.00	30.00	S, C, E	1025.45
GRAY CLAYSTONE	13.50	43.50	S, C, E	1011.95
COAL - NO. 11	**2.70**	**45.60**	**S, C, E, AC**	**1009.85**
GRAY CLAYSTONE	9.40	55.00	S, C, E	1000.45
GREEN SANDY SHALE W/LIMESTONE	15.00	70.00	S, C, E, ALK	985.45
GRAY SANDSTONE	15.00	85.00	H, NC, NE	970.45
GREEN SHALE	1.80	86.80	S, C, E	968.65
COAL - NO. 10	**1.50**	**88.30**	**S, C, E, AC**	**967.15**
GREEN CLAYSTONE	7.00	95.30	S, C, E	960.15
GRAY LIMY CLAYSTONE	7.10	102.40	S, C, E, ALK	953.05
GREEN CLAYSTONE	3.00	105.40	S, C, E	950.05
GRAY SANDSTONE	5.80	111.20	H, NC, NE	944.25
GREEN CLAYSTONE	1.20	112.40	S, C, E	943.05
LIMESTONE	1.60	114.00	H, NC, NE	941.45
GREEN CLAYSTONE	1.00	115.00	S, C, E	940.45
LIMESTONE W/ SHALE	15.00	130.00	H, NC, E, ALK	925.45
GREEN LIMY SHALE	6.00	136.00	S, C, E, ALK	919.45
LIMESTONE W/SHALE	4.00	140.00	H, NC, E, ALK	915.45
GREEN CLAYSTONE W/ LIME	5.00	145.00	S, C, E, ALK	910.45
LIMESTONE W/SHALE	50.00	195.00	H, NC, E, ALK	860.45
GRAY CLAYSTONE	5.00	200.00	S, C, E	855.45
COAL - NO. 9	**2.75**	**202.75**	**S, C, E, AC**	**852.70**
GRAY LIMY SHALE	9.25	212.00	S, C, E, ALK	843.45
GRAY SHALE	10.00	222.00	S. C. E	833.45
LIMESTONE W/SHALE	34.80	256.80	H, NC, E, ALK	798.65
GREEN CLAYSTONE	6.50	263.30	S. C. E	792.15
LIMESTONE	1.70	265.00	H, NC, NE, ALK	790.45
LIMESTONE W/SHALE	16.00	281.00	H, NC, E, ALK	774.45
GRAY CLAYSTONE	3.30	284.30	S, C, E	771.15
BONE COAL	0.33	284.63	S, C, E, AC	770.82
GRAY SHALE	0.23	284.86	S, C, E	770.59
COAL	0.85	285.71	S, C, E, AC	769.74
GRAY SHALE	0.86	286.57	S, C, E	768.88
COAL - NO. 8	**5.10**	**291.67**	**S, C, E, AC**	**763.78**
GRAY LIMY SHALE	13.30	305.00	S, C, E, ALK	750.45

PERCENT SOFT ROCK 50.90 PERCENT
PERCENT HARD ROCK 49.10 PERCENT

S = SOFT ROCK
H = HARD ROCK
C = COMPACTIBLE
NC = NON-COMPACTIBLE
E = ERODIBLE
NE = NON=ERODIBLE
AC = ACIDIC
ALK = ALKALINE

	TOT. S %	PYRITE S %	POT ACIDITY MG/L AS CACO3	NEUT. POT (/1000 TONS)	CACO3 DEF (1000 TONS
ROOF					
COAL					
BOTTOM					

TOVCC 11247

LJ HUGHES & SONS, INC.

DIAMOND CORE DRILLING
Pressure Grouting, Foundation & Soil Borings
320 Turnpike Road, Summersville, West Virginia 26651 (304) 872-1111

DRILL HOLE NO. N92-03 ~~N3-92~~ DRILLER: GEORGE RITCHIE

DRILLING FOR: THE OHIO VALLEY COAL COMPANY, ALLEDONIA, OHIO

SURFACE ELEVATION: 1205.87 STARTED: APRIL 8, 1992
SW ¼ Sec 21 COMPLETED: APRIL 14, 1992

LOCATION: OHIO, BELMONT COUNTY
W 63344.90
S 18262.64

STATE PLANE COORDS
X 2,430,390.74
Y 722,252.52

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE
CASING	21.00	21.00
GRAY LIMY SHALE	8.60	29.60
RED AND GRAY SHALE	1.00	30.60
GRAY SHALE	4.40	35.00
GRAY SANDSTONE	2.80	37.80
GRAY SANDY SHALE	0.90	38.70
RED AND GREEN SHALE	7.90	46.60
GRAY SHALE	16.10	62.70
LIMESTONE	1.30	64.00
GRAY SHALE	6.00	70.00
LIMESTONE	3.10	73.10
GRAY SHALE	6.00	79.10
GRAY SANDSTONE WITH SHALE STREAKS	5.60	84.70
GRAY SHALE	4.10	88.80
GRAY SANDSTONE WITH SHALE STREAKS	2.30	91.10
GRAY SHALE	5.10	96.20
LIMESTONE	1.00	97.20
GRAY SHALE	14.60	111.80
DARK GRAY SHALE	0.20	112.00
GRAY SHALE	4.30	116.30
DARK GRAY SHALE	1.20	117.50
COAL	0.70	118.20
BLACK SHALE WITH COAL STREAKS	10.40	128.60
GRAY LIMY SHALE	36.90	165.50
SIDERITE	0.20	165.70
GREEN AND GRAY SHALE	1.20	166.90

TOVCC 11248

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY

CONTINUATION OF DRILL HOLE NO. N-3-92

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE
		166.90
DARK GRAY SHALE	0.40	167.30
GRAY SHALE	10.10	177.40
GRAY SANDY SHALE	2.80	180.20
GRAY SANDSTONE WITH SHALE STREAKS	3.90	184.10
GRAY SHALE	8.80	192.90
GRAY SANDY SHALE	3.80	196.70
GRAY SHALE	5.40	202.10
LIMESTONE	1.10	203.20
GRAY SHALE	6.50	209.70
GRAY SANDY SHALE	4.00	213.70
GRAY SANDSTONE WITH SHALE STREAKS	3.50	217.20
GRAY SHALE	2.20	219.40
BLACK SHALE	0.10	219.50
COAL	1.20	220.70
GRAY SHALE	5.50	226.20
BONY COAL	0.20	226.40
GRAY SHALE	1.20	227.60
GRAY LIMY SHALE	11.40	239.00
GRAY SHALE	1.50	240.50
GRAY SANDSTONE	35.50	276.00
GRAY SHALE	1.70	277.70
DARK GRAY SHALE	0.40	278.10
GRAY SHALE	6.50	284.60
GRAY LIMY SHALE	10.30	294.90
GRAY SANDSTONE	4.80	299.70
LIMESTONE WITH SHALE PARTINGS	17.70	317.40
GREEN LIMY SHALE	6.00	323.40
GRAY LIMY SHALE	8.10	331.50
GREEN SHALE	3.80	335.30
LIMESTONE WITH SHALE PARTINGS	22.70	358.00
GREEN SHALE	2.50	360.50
LIMESTONE WITH SHALE PARTINGS	25.50	386.00
SOFT GRAY SHALE	2.90	388.90
DARK GRAY SHALE	0.20	389.10
COAL	1.85	390.95
DARK GRAY SHALE	0.15	391.10
COAL	1.45	392.55
DARK SHALE WITH PYRITE	0.05	392.60
COAL	0.10	392.70
DARK GRAY SHALE	0.05	392.75
GRAY SHALE	6.25	399.00
LIMESTONE WITH SHALE PARTINGS	2.60	401.60
DARK GRAY SHALE	10.40	412.00
LIMESTONE	2.60	414.60
GRAY SHALE	0.80	415.40

TOVCC 11249

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY

CONTINUATION OF DRILL HOLE NO. N-3-92

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE
		415.40
DARK GRAY SHALE	1.00	416.40
LIMESTONE WITH SHALE PARTINGS	31.30	447.70
GREEN SHALE	3.00	450.70
DARK GRAY SHALE	0.20	450.90
GRAY SHALE	1.30	452.20
LIMESTONE WITH SHALE PARTINGS	12.40	464.60
GRAY LIMY SHALE	4.90	469.50
SOFT GRAY CLAYSTONE	1.30	470.80
DARK SHALY CLAY	2.50	473.30
DARK GRAY SHALE	0.46	473.76
COAL	0.96	474.72
BLACK SHALE	0.12	474.84
GRAY SHALY FIRE CLAY	0.86	475.70
BONE	0.03	475.73
COAL	5.40	481.13
DARK GRAY SHALE	0.17	481.30
GRAY LIMY SHALE	4.60	485.90
SOFT GRAY SHALE	1.10	487.00

TOTAL DEPTH: 487 FEET

17 BAGS CEMENT PLACED IN HOLE

TOVCC 11250

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-1

State Plane Coords: X2426439.59 Y730558.99 Surface Elevation 1198.84 ~~1195~~

LITHOLOGY	H2O*	THICKNESS	PHYSICAL PROPERTIES
CASING		20.00	
SILTSTONE		5.35	ALK, COMP, EROD
SHALE		4.65	ALK, COMP, EROD
LIMESTONE	*	4.75	ALK
LIMESTONE		5.25	ALK
SHALE		5.40	COMP, EROD
SHALE	*	2.64	COMP, EROD
SHALE		1.50	COMP
SHALE		1.30	COMP
SHALE	*	1.25	COMP, EROD
SHALE		2.30	COMP
LIMESTONE		1.65	ALK
SHALE		1.52	COMP, EROD
LIMESTONE		0.32	ALK
SHALE		1.42	COMP
SHALE		0.70	COMP
LIMESTONE		2.10	ALK
SHALE		8.20	COMP
SHALE		1.10	COMP
COAL (NO. 12)		3.40	AC, EROD
SHALE		5.20	COMP, EROD
SHALE		2.85	COMP, EROD
COAL		0.82	COMP, EROD
SHALE		0.25	COMP, EROD
SHALE		6.85	ALK, COMP
SANDSTONE		5.30	ALK
SANDSTONE		3.93	HARD
SANDSTONE		14.42	ALK
LIMESTONE		2.85	ALK
LIMESTONE		0.46	ALK
CLAYSTONE		2.01	ALK, COMP, EROD
CLAYSTONE		5.19	COMP, EROD
SHALE		2.38	ALK, COMP, EROD
LIMESTONE		3.90	ALK
SHALE		4.29	ALK, COMP
SANDSTONE		0.90	HARD
SHALE		1.16	COMP
SANDSTONE		2.70	ALK
SANDSTONE		5.44	HARD
SHALE		0.92	COMP, EROD

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant: Ohio Valley Coal Company Drill Hole #: N94–1

State Plane Coords: X2426439.59 Y730558.99 Surface Elevation: 1195

LITHOLOGY	H2O*	THICKNESS	PHYSICAL PROPERTIES
SHALE		0.59	COMP, EROD
SHALE		0.50	COMP, EROD
SHALE		0.20	COMP, EROD
LIMESTONE		4.26	ALK
SANDSTONE		3.62	ALK, EROD
SHALE		1.71	COMP, EROD
CLAYSTONE		0.14	COMP, EROD
LIMESTONE		0.32	ALK
CLAYSTONE		3.45	ALK, COMP, EROD
SHALE		0.58	ALK, COMP
SANDSTONE		6.28	ALK
CLAYSTONE		0.75	ALK, COMP, EROD
SHALE		10.98	COMP, EROD
COAL (NO. 11)		3.41	AC, EROD
CLAYSTONE		11.69	ALK, COMP, EROD
LIMESTONE		4.10	ALK
SHALE		7.10	ALK, COMP, EROD
SANDSTONE		4.37	HARD
SHALE		0.98	COMP, EROD
SANDSTONE		1.57	HARD
SHALE		5.81	COMP, EROD
SHALE		2.59	COMP, EROD
COAL (NO. 10)		2.86	AC, EROD
CLAYSTONE		2.26	ALK, COMP, EROD
SANDSTONE		0.32	ALK
CLAYSTONE		3.28	COMP, EROD
CLAYSTONE		8.26	ALK, COMP, EROD
SHALE		0.34	COMP
SHALE		2.55	ALK, COMP
SANDSTONE		1.48	ALK
SHALE		2.33	ALK, COMP, EROD
CLAYSTONE		0.62	ALK, COMP, EROD
SHALE		5.40	ALK, COMP
LIMESTONE		6.20	ALK
CLAYSTONE		0.64	ALK, COMP, EROD
SHALE		0.33	ALK, COMP, ALK
SHALE		0.74	ALK, COMP, EROD
LIMESTONE		0.60	ALK
SHALE		1.98	ALK, COMP, EROD
LIMESTONE		1.83	ALK

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-1

State Plane Coords: X2426439.59 Y730558.99 Surface Elevation 1195

LITHOLOGY	H2O*	THICKNESS	PHYSICAL PROPERTIES
CLAYSTONE		2.35	ALK, COMP, EROD
LIMESTONE		0.36	ALK
CLAYSTONE		3.08	ALK, COMP, EROD
SHALE		1.62	ALK, COMP
LIMESTONE		3.11	ALK
CLAYSTONE		0.33	COMP, EROD
LIMESTONE		1.57	ALK
CLAYSTONE		0.44	COMP, EROD
LIMESTONE		0.90	ALK
SILTSTONE		1.32	COMP, EROD
SILTSTONE		0.78	COMP, EROD
LIMESTONE		4.81	ALK
SILTSTONE		1.24	COMP, EROD
LIMESTONE		13.09	ALK
LIMESTONE		2.99	ALK
CLAYSTONE		0.72	ALK, COMP, EROD
LIMESTONE		1.17	ALK
CLAYSTONE		0.58	COMP, EROD
SHALE		1.39	ALK, COMP, EROD
LIMESTONE		6.20	ALK
SHALE		0.98	ALK, COMP, EROD
LIMESTONE		4.05	ALK
SHALE		0.92	ALK, COMP
SHALE		0.19	ALK
LIMESTONE		14.10	ALK
CLAYSTONE		2.69	COMP, EROD
SHALE		0.24	COMP, EROD
COAL (NO. 9)		3.85	AC, EROD
CLAYSTONE		0.10	COMP, EROD
SHALE		1.05	COMP, EROD
LIMESTONE		4.63	ALK
LIMESTONE		1.75	ALK
LIMESTONE		3.84	ALK
SHALE		1.50	COMP, EROD
SHALE		2.96	ALK, COMP, EROD
CLAYSTONE		0.13	ALK, COMP, EROD
SILTSTONE		1.94	ALK, COMP, EROD
SHALE		0.90	COMP, EROD
LIMESTONE		0.38	ALK
CLAYSTONE		0.80	ALK, COMP, EROD

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant: Ohio Valley Coal Company Drill Hole #: N94-1

State Plane Coords: X2426439.59 Y730558.99 Surface Elevation: 1195

LITHOLOGY	H2O*	THICKNESS	PHYSICAL PROPERTIES
LIMESTONE		0.81	ALK, COMP
CLAYSTONE		0.95	COMP, EROD
COAL		0.23	AC, EROD
SHALE		0.63	ALK, COMP, EROD
LIMESTONE		3.02	ALK
SHALE		0.40	COMP, EROD
LIMESTONE		0.75	ALK
SHALE		0.05	COMP, EROD
LIMESTONE		7.45	ALK
SHALE		0.54	ALK, COMP
CLAYSTONE		0.70	COMP, EROD
LIMESTONE		2.70	ALK
SHALE		1.03	COMP, EROD
LIMESTONE		1.42	ALK
LIMESTONE		0.50	ALK
LIMESTONE		1.87	ALK
CLAYSTONE		0.65	COMP, EROD
LIMESTONE		4.39	ALK
CLAYSTONE		1.87	ALK, COMP, EROD
SHALE		0.76	ALK, COMP
LIMESTONE		2.98	ALK
CLAYSTONE		2.46	ALK, COMP, EROD
SHALE		1.17	ALK, COMP, EROD
CLAYSTONE		0.51	COMP, EROD
SHALE		1.32	COMP, EROD
SHALE		0.49	AC, COMP, EROD
LIMESTONE		11.78	ALK
CLAYSTONE		0.72	ALK, COMP, EROD
LIMESTONE		1.16	ALK
CLAYSTONE		1.30	COMP, EROD
LIMESTONE		0.42	ALK
CLAYSTONE		0.55	COMP, EROD
LIMESTONE		0.35	ALK
CLAYSTONE		0.05	COMP, EROD
LIMESTONE		0.35	ALK
CLAYSTONE		4.33	COMP, EROD
SHALE		0.55	COMP, EROD
COAL (NO. 8)		7.53	AC, EROD
SHALE		0.38	ALK, COMP, EROD
SHALE		1.39	ALK, COMP, EROD

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-1

State Plane Coords: X2426439.59 Y730558.99 Surface Elevation 1195

LITHOLOGY	H2O*	THICKNESS	PHYSICAL PROPERTIES
LIMESTONE		0.50	ALK
SHALE		0.66	COMP, EROD
CLAYSTONE		0.16	COMP, EROD
LIMESTONE		0.74	ALK
SHALE		0.64	COMP, EROD
LIMESTONE		1.60	ALK
SHALE		1.70	ALK, COMP
LIMESTONE		3.10	ALK
LIMESTONE		1.07	ALK

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam

Stratum	Total Sulfur %	Pyrite Sulfur %	Potential Acidity Mg/l as CaCO3	Neutralization Potential (/1000 Tons)	CaCO3 Deficiency (/1000 Tons)
Roof	1.55	1.08	48.4	318	-270
Coal	5.44	2.64	170	10.43	159
Bottom	1.44	0.99	45.0	647	-602

Legend:
AC = ACID PRODUCING
ALK = ALKALINE PRODUCING
COMP = COMPACTIBLE
EROD = ERODIBLE

* – Indicates water bearing stratum under column labelled H2O

Stratum thickness is measured in feet.

DIAMOND DRILL HOLE N94-1

GEOLOGIST: HOMER McEVERS

ELEVATION: ~~1195.00~~ 1198.34 (ALTIMETER)

COORDINATES: N ~~-9450.67~~ -9424.68; E ~~-62828.48~~ ~~(NOT SURVEYED)~~ -62683.61

TOWNSHIP: SMITH

SECTION: 22, NW 1/4

COUNTY: BELMONT

SURF. OWNER: R. RICE

DATE STARTED: 6/21/94

DATE FINISHED: 6/23/94

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
20.00	CASING	20.00	1175.00
5.35	SILTSTONE, LT. BROWN, CALC, SOFT, WEATHERED	25.35	1169.65
4.65	SHALE, GRAY, CALCAREOUS, SOFT	30.00	1165.00
4.75	LIMESTONE, WITH IRON STAINS, GRAY, MEDIUM	34.75	1160.25
5.25	LIMESTONE, GRAY, MEDIUM	40.00	1155.00
5.40	SHALE, GRAY, MEDIUM	45.40	1149.60
2.64	SHALE, W/IRON STAINS, MEDIUM	48.04	1146.96
1.50	SHALE, GRAY, MEDIUM	49.54	1145.46
1.30	SHALE, GRAY, MEDIUM/HARD	50.84	1144.16
1.25	SHALE, GRAY, BROKEN W/IRON STAINS, MEDIUM	52.09	1142.91
2.30	SHALE, GRAY, MEDIUM	54.39	1140.61
1.65	LIMESTONE, GRAY, HARD	56.04	1138.96
1.52	SHALE, GRAY, MEDIUM	57.56	1137.44
0.32	LIMESTONE, GRAY, HARD	57.88	1137.12
1.42	SHALE, GRAY, LAMINATED, MEDIUM	59.30	1135.70
0.70	SHALE, GRAY, MEDIUM	60.00	1135.00
2.10	LIMESTONE, GRAY, HARD	62.10	1132.90
8.20	SHALE, GRAY, MEDIUM	70.30	1124.70
1.10	SHALE, GRAY, BROKEN, MEDIUM	71.40	1123.60
3.40	0.50 BONE COAL (NO. 12)	74.80	1120.20
	2.80 COAL		
	0.10 BONE COAL		
5.20	SHALE, GRAY. LAMINATED, SOFT	80.00	1115.00
2.85	SHALE, LAMINATED, SOFT	82.85	1112.15
0.82	COAL	83.67	1111.33
0.25	SHALE, BLACK, LAMINATED, SOFT	83.92	1111.08
6.85	SHALE, CALCAREOUS, MEDIUM, GRAY	90.77	1104.23
5.30	SANDSTONE, GRAY W/LS NODULES, HARD	96.07	1098.93
3.93	SANDSTONE, GRAY, HARD	100.00	1095.00
14.42	SANDSTONE, GRAY, MEDIUM, CALCAREOUS, LAMINATED	114.42	1080.58
2.85	LIMESTONE, GRAY, HARD	117.27	1077.73
0.46	LIMESTONE, LIGHT BROWN, HARD	117.73	1077.27
2.01	CLAYSTONE, CALCAREOUS, GRAY, BROKEN, SOFT	119.74	1075.26
5.19	CLAYSTONE, GRAY, SOFT	124.93	1070.07
2.38	SHALE, CALCAREOUS, MEDIUM, GRAY	127.31	1067.69
3.90	LIMESTONE, GRAY, MEDIUM	131.21	1063.79
4.29	SHALE, GRAY, MEDIUM, W/LIMESTONE NODULES	135.50	1059.50
0.90	SANDSTONE, GRAY, HARD, LAMINATED	136.40	1058.60
1.16	SHALE, SANDY, GRAY, LAMINATED, MEDIUM	137.56	1057.44
2.70	SANDSTONE, CALCAREOUS, HARD, GRAY	140.26	1054.74
5.44	SANDSTONE, HARD, GRAY, LAMINATED	145.70	1049.30

DIAMOND DRILL HOLE N94-1

(Continued)

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
0.92	SHALE, GRAY, SOFT	146.62	1048.38
0.77	CLAYSTONE, GRAY, LAMINATED, SOFT	147.39	1047.61
0.59	SHALE, GRAY, LAMINATED, SOFT	147.98	1047.02
0.50	SHALE, BLACK, SOFT	148.48	1046.52
0.20	SHALE, GRAY, MEDIUM	148.68	1046.32
4.26	LIMESTONE, GRAY, W/SANDSTONE STREAKS, HARD	152.94	1042.06
3.62	SANDSTONE, LS NODULES, LAM. W/SHALE, GRAY, HARD	156.56	1038.44
1.71	SHALE, GRAY, LAMINATED, SOFT	158.27	1036.73
0.14	CLAYSTONE, DARK GRAY, SOFT	158.41	1036.59
0.32	LIMESTONE, LIGHT GRAY, HARD	158.73	1036.27
3.45	CLAYSTONE, GRAY, SOFT, CALCAREOUS	162.18	1032.82
0.58	SHALE, W/SANDSTONE STREAKS, CALCAREOUS, GRAY, MEDIUM	162.76	1032.24
6.28	SANDSTONE, GRAY, LAMINATED, CALCAREOUS	169.04	1025.96
0.75	CLAYSTONE, GRAY, CALCAREOUS, SOFT	169.79	1025.21
10.98	SHALE, GRAY, SOFT	180.77	1014.23
3.41	**0.18 BONE COAL (NO. 11)**	184.18	1010.82
	3.23 COAL, W/PYRITE STREAKS		
11.69	CLYSTN, GRAY, SOFT, W/COAL STREAKS, CALC, BROKEN	195.87	999.13
4.10	LIMESTONE, GREEN, HARD	199.97	995.03
7.10	SHALE, GREEN, SANDY, W/LIMESTONE NODULES, SOFT	207.07	987.93
4.37	SANDSTONE, GRAY, LAMINATED, HARD	211.44	983.56
0.98	SHALE, GRAY, LAMINATED, SOFT	212.42	982.58
1.57	SANDSTONE, GRAY, LAMINATED, HARD	213.99	981.01
5.81	SHALE, SANDY, LAMINATED	219.80	975.20
2.59	SHALE, GRAY	222.39	972.61
2.86	**2.00 COAL (NO. 10)**	225.25	969.75
	0.15 CLAYSTONE, GRAY		
	0.71 COAL		
2.26	CLAYSTONE, GRAY, CALCAREOUS, SOFT	227.51	967.49
0.32	SANDSTONE, GRAY, CALCAREOUS, HARD	227.83	967.17
3.28	CLAYSTONE, GRAY, BROKEN, SOFT	231.11	963.89
8.26	CLAYSTONE, CALCAREOUS, GRAY, SOFT	239.37	955.63
0.34	SHALE, GRAY, MEDIUM	239.71	955.29
2.55	SHALE, GREEN, MEDIUM, CALCAREOUS, LAMINATED	242.26	952.74
1.48	SAND STONE, GRAY, HARD, CALCAREOUS, LAMINATED	243.74	951.26
2.33	SHALE, GRAY, SOFT, CALCAREOUS	246.07	948.93
0.62	CLAYSTONE, GRAY, SOFT, CALCAREOUS	246.69	948.31
5.40	SHALE, GRAY, MEDIUM, CALCAREOUS	252.09	942.91
6.20	LIMESTONE, GRAY, HARD	258.29	936.71
0.64	CLAYSTONE, GRAY, SOFT, CALCAREOUS	258.93	936.07
0.33	SHALE, GRAY, LAMINATED, CALCAREOUS, SOFT	259.26	935.74
0.74	SHALE, GRAY, LAMINATED, CALCAREOUS, SOFT	260.00	935.00
0.60	LIMESTONE, GRAY, HARD	260.60	934.40
1.98	SHALE, GRAY, SOFT, LAMINATED, CALCAREOUS	262.58	932.42
1.83	LIMESTONE, GRAY, HARD	264.41	930.59
2.35	CLAYSTONE, GRAY, CALCAREOUS, SOFT	266.76	928.24

DIAMOND DRILL HOLE N94-1

(Continued)

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
0.36	LIMESTONE, GRAY, HARD	267.12	927.88
3.08	CLAYSTONE, GRAY, CALCAREOUS, SOFT	270.20	924.80
1.62	SHALE, CALCAREOUS, GRAY, MEDIUM	271.82	923.18
3.11	LIMESTONE, GRAY, JOINTED, HARD	274.93	920.07
0.33	CLAYSTONE, GRAY, SOFT	275.26	919.74
1.57	LIMESTONE, GRAY, HARD	276.83	918.17
0.44	CLAYSTONE, GREEN, SOFT	277.27	917.73
0.90	LIMESTONE, GRAY, HARD	278.17	916.83
1.32	SILTSTONE, MEDIUM, GREEN, LAMINATED	279.49	915.51
0.78	SILTSTONE, GREEN, LAMINATED, SOFT	280.27	914.73
4.81	LIMESTONE, GRAY, HARD	285.08	909.92
1.24	SILTSTONE, SOFT, GREEN	286.32	908.68
13.09	LIMESTONE, GRAY, HARD	299.41	895.59
2.99	LIMESTONE, GRAY, MEDIUM	302.40	892.60
0.72	GREEN, CLAYSTONE, SOFT, CALCAREOUS	303.12	891.88
1.17	LIMESTONE, GRAY, MEDIUM	304.29	890.71
0.58	GREEN CLAYSTONE, SOFT	304.87	890.13
1.39	SHALE, CALCAREOUS, SOFT, GRAY	306.26	888.74
6.20	LIMESTONE, GRAY, LAMINATED	312.46	882.54
0.98	SHALE, GRAY, W/ LIMESTONE NODULES	313.44	881.56
4.05	LIMESTONE, MEDIUM, GRAY, LAMINATED	317.49	877.51
0.92	GREEN SHALE, CALCAREOUS, MEDIUM	318.41	876.59
0.19	GRAY SHALE, LAMINATED, CALCAREOUS, HARD	318.60	876.40
14.10	GRAY LIMESTONE, HARD	332.70	862.30
2.69	GRAY CLAYSTONE, SOFT	335.39	859.61
0.24	GRAY SHALE, SOFT	335.63	859.37
3.85	COAL (NO. 9), SS PARTINGS W/PYRITE	339.48	855.52
0.10	GRAY CLAYSTONE, SOFT	339.58	855.42
1.05	SHALE, BLACK, SOFT	340.63	854.37
4.63	LIMESTONE, GRAY, MEDIUM, LAMINATED	345.26	849.74
1.75	LIMESTONE, WHITE, HARD	347.01	847.99
3.84	LIMESTONE, GRAY, MEDIUM, LAMINATED	350.85	844.15
1.50	SHALE, GRAY SOFT	352.35	842.65
2.96	SHALE, GRAY, SOFT, LAMINATED, CALCAREOUS	355.31	839.69
0.13	CLAYSTONE, GRAY, SOFT, CALCAREOUS	355.44	839.56
1.94	SILTSTONE, GRAY, SOFT, LAMINATED, CALCAREOUS	357.38	837.62
0.90	GRAY, SHALE, SOFT	358.28	836.72
0.38	WHITE LIMESTONE, HARD	358.66	836.34
0.80	GRAY CLAYSTONE, SOFT, CALCAREOUS,	359.46	835.54
0.81	LIMESTONE, GRAY, MEDIUM	360.27	834.73
0.95	GRAY CLAYSTONE, SOFT	361.22	833.78
0.23	COAL	361.45	833.55
0.63	SHALE, GRAY, LAMINATED, CALCAREOUS, SOFT	362.08	832.92
3.02	LIMESTONE, GRAY, HARD	365.10	829.90
0.40	SHALE, BLACK, SOFT	365.50	829.50
0.75	LIMESTONE, GRAY, HARD	366.25	828.75

DIAMOND DRILL HOLE N94-1

(Continued)

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
0.05	SHALE, BLACK, SOFT	366.30	828.70
7.45	LIMESTONE, GRAY, HARD	373.75	821.25
0.54	SHALE, CALCAREOUS, HARD, GRAY, LAMINATED	374.29	820.71
0.70	CLAYSTONE, GRAY, SOFT	374.99	820.01
2.70	LIMESTONE, LIGHT GRAY, HARD	377.69	817.31
1.03	SHALE, GREY, LAMINATED, SOFT	378.72	816.28
1.42	LIMESTONE, LIGHT GRAY, HARD	380.14	814.86
0.50	LIMESTONE, GRAY, HARD, LAMINATED	380.64	814.36
1.87	LIMESTONE, LIGHT GRAY	382.51	812.49
0.65	CLAYSTONE, GREEN, SOFT	383.16	811.84
4.39	LIMESTONE, GRAY, HARD	387.55	807.45
1.87	CLAYSTONE, GREEN, SOFT, CALCAREOUS	389.42	805.58
0.76	SHALE, CALCAREOUS, GRAY, MEDIUM	390.18	804.82
2.98	LIMESTONE, LIGHT GRAY, HARD	393.16	801.84
2.46	CLAYSTONE, GREEN, SOFT, CALCAREOUS	395.62	799.38
1.17	SHALE, BLACK, SOFT, CARBONACEOUS	396.79	798.21
0.51	CLAYSTONE, GREY, SOFT	397.30	797.70
1.32	SHALE, DARK GREY, SOFT	398.62	796.38
0.49	SHALE, CARBONACEOUS, SOFT	399.11	795.89
11.78	LIMESTONE, LIGHT GRAY, HARD	410.89	784.11
0.72	GREEN CLAYSTONE, SOFT, CALCAREOUS	411.61	783.39
1.16	LIMESTONE, LIGHT GRAY, LAMINATED	412.77	782.23
1.30	CLAYSTONE, GREEN, SOFT	414.07	780.93
0.42	LIGHT GRAY LIMESTONE, HARD	414.49	780.51
0.55	GREEN CLAYSTONE, SOFT	415.04	779.96
0.35	LIMESTONE, LIGHT GRAY, HARD	415.39	779.61
0.05	GREEN CLAYSTONE, SOFT	415.44	779.56
0.35	LIMESTONE, LIGHT GRAY, HARD	415.79	779.21
4.33	CLAYSTONE, GREEN, LAMINATED, SOFT W/SLICKENSIDES	420.12	774.88
0.55	SHALE, DARK GREY, LAMINATED, SOFT	420.67	774.33
7.53	**0.99 ROOF COAL (NO. 8) W/SULFUR STREAKS**	428.20	766.80
	0.90 CLAYSTONE, GRAY		
	5.64 COAL W/SULFUR STREAKS		
0.38	SHALE, CALCAREOUS, LAMINATED, GRAY, SOFT	428.58	766.42
1.39	SHALE, CALCAREOUS, DARK GRAY, SOFT	429.97	765.03
0.50	LIMESTONE, LIGHT GRAY, HARD	430.47	764.53
0.66	SHALE, DARK GRAY, SOFT	431.13	763.87
0.16	CLAYSTONE, GRAY, SOFT	431.29	763.71
0.74	LIMESTONE, GRAY, HARD	432.03	762.97
0.64	SHALE, GRAY, SOFT	432.67	762.33
1.60	LIMESTONE, GRAY, HARD	434.27	760.73
1.70	SHALE, W/LIMESTONE NODULES, GRAY, MEDIUM	435.97	759.03
3.10	LIMESTONE, GRAY, LAMINATED, HARD	439.07	755.93
1.07	LIMESTONE, GREEN, HARD	440.14	754.86

DIAMOND DRILL HOLE N94-1

(Continued)

AMOUNT OF HARD ROCK ABOVE NO. 8 SEAM

HARD ROCK: 205.71 FT (48.9%) OF CORE

SOFT ROCK: 214.96 FT. (51.1%) OF CORE

PROJECTED AQUIFERS:

1. 30.00 TO 34.75 (MINOR)
2. 45.40 TO 52.09 (MINOR)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-2

State Plane Coords: X2430539.19 Y731089.68 Surface Elevation 1079.26 ~~1085~~

LITHOLOGY	H20*	THICKNESS	PHYSICAL PROPERTIES
CASING		20.00	
SHALE		0.95	COMP
SANDSTONE		0.80	ALK, HARD
SHALE		1.80	COMP
LIMESTONE		1.75	ALK
SHALE		3.92	COMP
SHALE		0.31	COMP, EROD
SHALE		1.92	ALK, COMP, EROD
SHALE		1.78	COMP, EROD
(CORE LOST)		3.30	
SILTSTONE		0.65	COMP, EROD
SHALE		1.35	COMP, EROD
SANDSTONE		1.12	HARD
SHALE		0.35	COMP, EROD
SHALE		1.45	COMP
SANDSTONE		0.20	HARD
SHALE		1.88	COMP, HARD
SANDSTONE		1.20	HARD
SHALE		2.20	COMP, HARD
SANDSTONE		1.20	HARD
SHALE		2.89	COMP, HARD
SANDSTONE		0.12	HARD
SHALE		0.88	COMP, HARD
SHALE		1.10	COMP
SHALE		0.82	COMP, HARD
SHALE		0.30	COMP
COAL (NO. 11)		3.04	AC, EROD
SANDSTONE		0.05	HARD
SHALE		0.30	COMP, EROD
SHALE		2.37	COMP, EROD
SHALE		6.39	ALK, COMP
SANDSTONE		2.40	ALK, HARD
LIMESTONE		11.41	ALK
SHALE		15.07	COMP
COAL (NO. 10)		2.76	AC, EROD
SHALE		0.17	COMP
LIMESTONE		1.80	ALK
SHALE		1.70	COMP
CLAYSTONE	*	2.65	COMP, EROD
SHALE		4.62	ALK, COMP

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-2

State Plane Coords: X2430539.19 Y731089.68 Surface Elevation 1085

LITHOLOGY	H20*	THICKNESS	PHYSICAL PROPERTIES
CLAYSTONE	☆	1.50	COMP, EROD
SILTSTONE		1.30	COMP, EROD
SHALE		0.60	COMP
SANDSTONE		1.20	HARD
SHALE		6.43	COMP
CLAYSTONE		1.35	ALK, COMP, EROD
LIMESTONE		10.12	ALK
CLAYSTONE	☆	0.25	ALK, COMP, EROD
LIMESTONE		6.75	ALK
CLAYSTONE		7.23	ALK, COMP, EROD
LIMESTONE		4.00	ALK
CLAYTONE	☆	0.55	ALK, COMP, EROD
CLAYSTONE		3.70	ALK, COMP, EROD
LIMESTONE		4.85	ALK
CLAYSTONE		1.20	COMP, EROD
LIMESTONE		20.40	ALK
LIMESTONE		6.20	ALK
LIMESTONE		3.60	ALK
CLAYSTONE		1.05	ALK, COMP, EROD
LIMESTONE		8.75	ALK
LIMESTONE		3.35	ALK
LIMESTONE		0.95	ALK, COMP
LIMESTONE		0.17	ALK
SHALE		4.52	COMP, EROD
COAL (N0. 9)		3.90	AC, EROD
SHALE		1.44	COMP, EROD
LIMESTONE		1.80	ALK, COMP
LIMESTONE		3.87	ALK
LIMESTONE		1.90	ALK
SHALE		10.60	ALK, COMP, EROD
LIMESTONE		0.30	ALK
SHALE		0.67	COMP, EROD
LIMESTONE		0.95	ALK
SHALE		0.45	COMP, EROD
SHALE		0.80	AC, COMP, EROD
SHALE		0.70	ALK, COMP, EROD
LIMESTONE		14.73	ALK
CLAYSTONE		1.25	ALK, COMP, EROD
LIMESTONE		4.38	ALK
CLAYSTONE		0.62	ALK, COMP, EROD

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-2

State Plane Coords: X2430539.19 Y731089.68 Surface Elevation 1085

LITHOLOGY	H20*	THICKNESS	PHYSICAL PROPERTIES
LIMESTONE		2.65	ALK
LIMESTONE		2.95	ALK
CLAYSTONE		2.35	ALK, COMP, EROD
LIMESTONE		1.70	ALK
CLAYSTONE		1.10	ALK, COMP, EROD
CLAYSTONE		1.50	ALK, COMP, EROD
SHALE		2.40	COMP, EROD
LIMESTONE		8.00	ALK
LIMESTONE		3.15	ALK
SHALE		0.63	ALK, COMP, EROD
LIMESTONE		1.40	ALK
SHALE		0.75	ALK, COMP, EROD
LIMESTONE		0.17	ALK
CLAYSTONE		2.10	ALK, COMP, EROD
SHALE		1.80	ALK, COMP, EROD
CLAYSTONE		3.10	COMP, EROD
CLAYSTONE		0.80	COMP, EROD
COAL (NO. 8)		7.12	AC, EROD
CLAYSTONE		4.78	ALK, COMP, EROD
SHALE		2.20	ALK, COMP, EROD
CLAYSTONE		2.00	COMP, EROD

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam

Stratum	Total Sulfur %	Pyrite Sulfur %	Potential Acidity Mg/l as CaCO3	Neutralization Potential (/1000 Tons)	CaCO3 Deficiency (/1000 Tons)
Roof	1.26	0.87	39.4	351	-312
Coal	4.73	2.30	148	10.78	71.8
Bottom	1.86	1.56	58.1	451	-393

Legend:
AC = ACID PRODUCING
ALK = ALKALINE PRODUCING
COMP = COMPACTIBLE
EROD = ERODIBLE

* – Indicates water bearing stratum under column labelled H2O

Stratum thickness is measured in feet.

DIAMOND DRILL HOLE N94-2

GEOLOGIST: HOMER McEVERS

ELEVATION: ~~1085.0~~ 1079.26 (ALTIMETER)

EXCHANGE COORDINATES: N ~~-9906.55~~ -9888.61, E ~~-66938.08~~ -66964.96 (NOT SURVEYED)

DRILLER: L. J. HUGHES & SONS, INC., FUZZY SALISBURY

TOWNSHIP: SMITH

SECTION: 28, NE 1/4

COUNTY: BELMONT

SURF. OWNER: R. SAFFLE

DATE STARTED: 6/23/94

DATE FINISHED: 6/28/94

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
20.00	CASINGS	20.00	1065.00
0.95	SHALE, GRAY, MEDIUM	20.95	1064.05
0.80	SANDSTONE, GRAY, CALCAREOUS, HARD	21.75	1063.25
1.80	SHALE, GRAY, LAMINATED, MEDIUM	23.55	1061.45
1.75	LIMESTONE, GRAY, HARD	25.30	1059.70
3.92	SHALE, GRAY, MEDIUM	29.22	1055.78
0.31	SHALE, GRAY, LAMINATED, SOFT	29.53	1055.47
1.92	SHALE, GRAY, CALCAREOUS, SOFT	31.45	1053.55
1.78	SHALE, GRAY, LAMINATED, SOFT	33.23	1051.77
3.30	(CORE LOST)	36.53	1048.47
0.65	SILTSTONE, LIGHT BROWN, SOFT	37.18	1047.82
1.35	SHALE, GRAY, SOFT	38.53	1046.47
1.12	SANDSTONE, GRAY, HARD	39.65	1045.35
0.35	SHALE, GRAY, SOFT	40.00	1045.00
1.45	SHALE, GRAY, MEDIUM	41.45	1043.55
0.20	SANDSTONE, GRAY, HARD	41.65	1043.35
1.88	SHALE, SANDY, GRAY, HARD	43.53	1041.47
1.20	SANDSTONE, GRAY, HARD	44.73	1040.27
2.20	SHALE, SANDY, GRAY, HARD	46.93	1038.07
1.20	SANDSTONE, GRAY, HARD	48.13	1036.87
2.89	SHALE, SANDY, GRAY, HARD	51.02	1033.98
0.12	SANDSTONE, GRAY, HARD	51.14	1033.86
0.88	SHALE, SANDY, GRAY, HARD	52.02	1032.98
1.10	SHALE, BLACK, MEDIUM	53.12	1031.88
0.82	SHALE, SANDY, GRAY, HARD	53.94	1031.06
0.30	SHALE, BLACK, MEDIUM	54.24	1030.76
3.04	COAL W/PARTINGS (NO. 11)	57.28	1027.72
0.05	SANDSTONE, GRAY, HARD	57.33	1027.67
0.30	SHALE, BLACK	57.63	1027.37
2.37	SHALE, GRAY, SOFT	60.00	1025.00
6.39	SHALE, SANDY, W/LIMESTONE NODULES, GRAY, MEDIUM	66.39	1018.61
2.40	SANDSTONE, CALCAREOUS, GRAY, HARD	68.79	1016.21
11.41	LIMESTONE, GRAY GREEN, HARD	80.20	1004.80
15.07	SHALE, GRAY, MEDIUM	95.27	989.73
2.76	1.65 COAL (NO. 10)	98.03	986.97
	0.02 SANDSTONE, GRAY		
	0.10 COAL		
	0.06 BONE COAL		
	0.11 COAL		

DIAMOND DRILL HOLE N94-2

(Continued)

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
	0.15 SHALE, BLACK (NO. 10 COAL CONTINUED)		
	0.67 COAL		
0.17	SHALE, BLACK, MEDIUM	98.20	986.80
1.80	LIMESTONE, GRAY, HARD	100.00	985.00
1.70	SHALE, SANDY, GRAY, MEDIUM	101.70	983.30
2.65	CLAYSTONE, W/IRON STAINS, GRAY SOFT	104.35	980.65
4.62	SHALE, GRAY, W/LIMESTONE NODULES, MEDIUM	108.97	976.03
1.50	CLAYSTONE, W/IRON STAINS, GRAY, SOFT	110.47	974.53
1.30	SILTSTONE, GRAY, SOFT	111.77	973.23
0.60	SHALE, SANDSTONE, GRAY, MEDIUM	112.37	972.63
1.20	SANDSTONE, GRAY, HARD	113.57	971.43
6.43	SHALE, GRAY, MEDIUM	120.00	965.00
1.35	CLAYSTONE, CALAREOUS, GRAY, SOFT	121.35	963.65
10.12	LIMESTONE, LIGHT BROWN/GRAY, HARD	131.47	953.53
0.25	CLAYSTONE, CALCAREOUS, W/IRON STAINS, GRAY, SOFT	131.72	953.28
6.75	LIMESTONE, LIGHT BROWN/GRAY, HARD	138.47	946.53
7.23	CLAYSTONE, GREEN, CALCAREOUS, SOFT	145.70	939.30
4.00	LIMESTONE, LIGHT BROWN/GRAY, HARD	149.70	935.30
0.55	CLAYTONE, GREEN, CALCAREOUS, W/IRON STAINS, SOFT	150.25	934.75
3.70	CLAYSTONE, GREEN, CALCAREOUS, SOFT	153.95	931.05
4.85	LIMESTONE, LIGHT BROWN/GRAY, HARD	158.80	926.20
1.20	CLAYSTONE, GREEN, SOFT	160.00	925.00
20.40	LIMESTONE, LIGHT BROWN/GRAY, HARD	180.40	904.60
6.20	LIMESTONE, SANDY, GRAY, HARD	186.60	898.40
3.60	LIMESTONE, SANDY, GRAY GREEN, HARD	190.20	894.80
1.05	CLAYSTONE, GREEN, CALCAREOUS, MEDIUM	191.25	893.75
8.75	LIMESTONE, LIGHT BROWN, HARD	200.00	885.00
3.35	LIMESTONE, LIGHT BROWN, HARD	203.35	881.65
0.95	LIMESTONE, SHALEY, GRAY, MEDIUM	204.30	880.70
0.17	LIMESTONE, LIGHT BROWN, MEDIUM	204.47	880.53
4.52	SHALE, BLACK, BROKEN, SOFT	208.99	876.01
3.90	COAL (N0. 9) W/PARTINGS	212.89	872.11
1.44	SHALE, BLACK, SOFT	214.33	870.67
1.80	LIMESTONE, SHALEY, GRAY, MEDIUM	216.13	868.87
3.87	LIMESTONE, LIGHT BROWN, HARD	220.00	865.00
1.90	LIMESTONE, LIGHT BROWN, HARD	221.90	863.10
10.60	SHALE, BLACK, CALCAREOUS, SOFT	232.50	852.50
0.30	LIMESTONE, LIGHT BROWN, HARD	232.80	852.20
0.67	SHALE, GRAY, SOFT	233.47	851.53
0.95	LIMESTONE, LIGHT BROWN, HARD	234.42	850.58
0.45	SHALE, GRAY, SOFT	234.87	850.13
0.80	SHALE, BLACK W/COAL STREAKS,SOFT	235.67	849.33
0.70	SHALE, BLACK, CALCAREOUS, SOFT	236.37	848.63
14.73	LIMESTONE, LIGHT BROWN , HARD	251.10	833.90
1.25	CLAYSTONE, GREEN, CALCAREOUS, SOFT,	252.35	832.65
4.38	LIMESTONE, LIGHT BROWN, HARD	256.73	828.27

DIAMOND DRILL HOLE N94-2

(Continued)

THICK. (FT)	DESCRIPTION	DEPTH (FT)	ELEV. (FT)
0.62	CLAYSTONE, GREEN, CALCAREOUS, SOFT	257.35	827.65
2.65	LIMESTONE, LIGHT BROWN, HARD	260.00	825.00
2.95	LIMESTONE, LIGHT BROWN, HARD	262.95	822.05
2.35	CLAYSTONE, GREEN, CALCAREOUS, SOFT	265.30	819.70
1.70	LIMESTONE, LIGHT BROWN, HARD	267.00	818.00
1.10	CLAYSTONE, GREEN, CALCAREOUS, SOFT	268.10	816.90
1.50	CLAYSTONE, GRAY, CALCAREOUS, SOFT	269.60	815.40
2.40	SHALE, BLACK, SOFT	272.00	813.00
8.00	LIMESTONE, LIGHT BROWN/GRAY, HARD	280.00	805.00
3.15	LIMESTONE, LIGHT BROWN, HARD	283.15	801.85
0.63	SHALE, BLACK, CALCAREOUS, SOFT	283.78	801.22
1.40	LIMESTONE, LIGHT BROWN, HARD	285.18	799.82
0.75	SHALE, GRAY/GREEN, CALCAREOUS, SOFT	285.93	799.07
0.17	LIMESTONE, LIGHT BROWN, HARD	286.10	798.90
2.10	CLAYSTONE, GREEN, CALCAREOUS, SOFT	288.20	796.80
1.80	SHALE, GRAY/GREEN, CALCAREOUS, SOFT	290.00	795.00
3.10	CLAYSTONE, GREEN, SOFT	293.10	791.90
0.80	CLAYSTONE, GRAY/BLACK, SOFT	293.90	791.10
7.12	0.95 COAL (NO. 8)	301.02	783.98
	0.81 SHALE, GRAY		
	0.20 COAL		
	0.03 SHALE, W/PYRITE		
	5.13 COAL		
4.78	CLAYSTONE, GREEN/GRAY, CALCAREOUS, SOFT	305.80	779.20
2.20	SHALE, GRAY, CALCAREOUS, SOFT	308.00	777.00
2.00	CLAYSTONE, GREEN, SOFT	310.00	775.00

AMOUNT OF HARD ROCK ABOVE NO. 8 SEAM

HARD ROCK: 139.60 FT. (47.5%) OF CORE

SOFT ROCK: 154.30 FT. (52.5%) OF CORE

PROJECTED AQUIFERS

1. 104.35 TO 110.47 (MINOR)
2. 131.47 TO 150.25

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94–3

State Plane Coords: X2424871.42 Y723219.13 Surface Elevation 1258.17 ~~1265~~

Lithology	H20*	Thickness	Physical Properties
CASED	*	50.00	
CLAYSTONE		1.35	COMP, EROD
CLAYSTONE	*	1.40	COMP, EROD
CLAYSTONE	*	1.80	COMP, EROD
CORE LOST	*	3.35	
CLAYSTONE	*	2.20	COMP, EROD
CLAYSTONE		0.85	COMP, EROD
CLAYSTONE	*	4.65	COMP, EROD
CORE LOST	*	4.00	
CLAYSTONE	*	2.20	COMP, EROD
CLAYSTONE		2.10	ALK, COMP, EROD
CLAYSTONE	*	1.10	COMP, EROD
SHALE	*	4.20	ALK, COMP, EROD
CLAYSTONE	*	3.60	ALK, COMP, EROD
CLAYSTONE		0.90	COMP, EROD
LIMESTONE		5.00	ALK
CLAYSTONE		4.85	ALK, COMP, EROD
CLAYSTONE		1.20	ALK, COMP, EROD
CLAYSTONE		1.85	ALK, COMP, EROD
SHALE	*	5.10	ALK, COMP, EROD
CLAYSTONE		1.70	ALK, COMP, EROD
SHALE		0.50	ALK, COMP
CLAYSTONE		12.65	ALK, COMP, EROD
CLAYSTONE	*	2.05	COMP, EROD
SHALE	*	12.70	ALK, COMP, EROD
CLAYSTONE		2.15	ALK, COMP, EROD
SHALE		5.20	ALK, COMP, EROD
CLAYSTONE		0.30	ALK, COMP, EROD
CLAYSTONE		6.05	ALK, COMP, EROD
SHALE		8.10	COMP, EROD
CLAYSTONE		3.61	COMP, EROD
BONE COAL		0.74	AC, EROD
SHALE		0.65	COMP, EROD
CLAYSTONE		1.90	ALK, COMP, EROD
LIMESTONE		1.50	AL,
SHALE		2.20	COMP, EROD
CLAYSTONE		5.50	ALK, COMP, EROD
SHALE		0.85	COMP, EROD
COAL (NO. 12)		2.20	AC, EROD
SHALE		6.45	AC, COMP, EROD

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-3

State Plane Coords: X2424871.42 Y723219.13 Surface Elevation 1265

Lithology	H20*	Thickness	Physical Properties
BONE COAL		0.40	AC, EROD
SHALE		3.77	AC, COMP, EROD
SANDSTONE		1.65	AC, EROD
COAL		0.48	AC
CLAYSTONE		2.20	ALK, COMP, EROD
LIMESTONE		2.80	ALK
CLAYSTONE		2.10	ALK, COMP, EROD
SHALE		17.90	COMP, EROD
SANDSTONE		6.70	HARD
SHALE		5.55	ALK, COMP
CLAYSTONE		3.20	ALK, COMP, EROD
SHALE		4.55	COMP, EROD
SHALE		5.90	COMP, EROD
SANDSTONE		3.80	HARD
SHALE		9.20	COMP, EROD
LIMESTONE		1.10	ALK
SHALE		6.20	COMP, EROD
LIMESTONE		0.80	ALK
SHALE		6.19	COMP, EROD
SANDSTONE		2.47	HARD
SHALE		4.34	COMP, EROD
SHALE		2.35	COMP, EROD
SHALE		0.70	COMP, EROD
COAL (NO. 11)		2.20	AC, EROD
SHALE		4.70	COMP, EROD
SHALE		9.10	ALK, COMP, EROD
SHALE		0.95	COMP, EROD
CLAYSTONE		1.30	COMP, EROD
SHALE		2.30	COMP, EROD
SANDSTONE		5.30	COMP
SHALE		5.90	COMP
SANDSTONE		2.70	HARD
SHALE		0.85	COMP, EROD
SANDSTONE		1.15	COMP
SHALE		0.50	COMP, EROD
SHALE		7.40	COMP, EROD
SHALE		0.05	COMP, EROD
COAL (NO. 10)		2.75	AC, EROD
SHALE		0.62	COMP, EROD
CLAYSTONE		5.63	ALK, COMP, EROD

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94–3

State Plane Coords: X2424871.42 Y723219.13 Surface Elevation 1265

Lithology	H20*	Thickness	Physical Properties
CLAYSTONE		9.80	ALK, COMP, EROD
LIMESTONE		7.20	ALK
LIMESTONE		3.25	ALK
SHALE		1.10	ALK, COMP, EROD
LIMESTONE		1.05	ALK
SHALE		0.90	ALK, COMP, EROD
LIMESTONE		0.95	ALK
SHALE		4.35	ALK, COMP, EROD
LIMESTONE		0.87	ALK
SHALE		2.00	ALK, COMP, EROD
LIMESTONE		0.90	ALK
SHALE		1.63	ALK, COMP, EROD
LIMESTONE		3.00	ALK
SHALE		1.10	ALK, COMP, EROD
CLAYSTONE		3.55	ALK, COMP, EROD
SHALE		10.95	ALK, COMP, EROD
CLAYSTONE		0.45	ALK, COMP, EORD
SHALE		3.10	ALK, COMP, EROD
LIMESTONE		7.75	ALK
CLAYSTONE		0.90	ALK, COMP, EROD
LIMESTONE		1.02	ALK
SHALE		2.50	COMP, EROD
LIMESTONE		8.68	ALK
SHALE		1.90	ALK, COMP, EROD
SHALE		1.50	ALK, COMP, EROD
LIMESTONE		4.25	ALK
LIMESTONE		8.50	ALK
SHALE		3.85	ALK, COMP, EROD
SHALE		0.10	COMP
SHALE		1.10	COMP, EROD
CLAYSTONE		0.98	ALK, COMP, EROD
SHALE		0.09	COMP, EROD
COAL (NO. 9)		3.32	AC, EROD
SHALE		5.35	ALK, COMP, EROD
LIMESTONE		0.40	ALK
SHALE		8.66	ALK, COMP, EROD
SHALE		4.42	COMP, EROD
LIMESTONE		3.20	ALK
SHALE		0.95	ALK, COMP, EROD
LIMESTONE		1.35	ALK

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-3

State Plane Coords: X2424871.42 Y723219.13 Surface Elevation 1265

Lithology	H20*	Thickness	Physical Properties
LIMESTONE		8.86	ALK
LIMESTONE		1.90	ALK
SHALE		1.55	COMP, EROD
LIMESTONE		3.75	ALK
CLAYSTONE		0.50	ALK, COMP, EROD
SHALE		6.10	ALK, COMP, EROD
CLAYSTONE		2.75	ALK, COMP, EROD
SHALE		1.00	ALK, COMP, EROD
LIMESTONE		0.55	ALK
SHALE		1.90	ALK, COMP, EROD
CLAYSTONE		2.35	COMP, EROD
SHALE		2.10	COMP, EROD
SHALE		5.95	ALK, COMP, EROD
SHALE		9.60	ALK, COMP, EROD
CLAYSTONE		4.20	ALK, COMP, EROD
SHALE		0.50	COMP, EROD
COAL (NO. 8)		7.57	AC, EROD
SHALE		5.30	ALK, COMP, EROD
SHALE		2.43	COMP, EROD

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam

Stratum	Total Sulfur %	Pyrite Sulfur %	Potential Acidity Mg/l as CaCO3	Neutralization Potential (/1000 Tons)	CaCO3 Deficiency (/1000 Tons)
Roof	2.04	0.54	63.7	397	-333
Coal	6.15	3.39	192	10.57	181
Bottom	1.41	0.69	44.1	326	-282

Legend:
AC = ACID PRODUCING
ALK = ALKALINE PRODUCING
COMP = COMPACTIBLE
EROD = ERODIBLE

* – Indicates water bearing stratum under column labelled H2O

Stratum thickness is measured in feet.

DIAMOND DRILL HOLE N94-3

GEOLOGIST: HOMER McEVERS

ELEVATION: ~~1265.00 (ALTIMETER)~~ 1258.17

COORDINATES: ~~N -17216.63, E -68638.74 (NOT SURVEYED~~ EXCHANGE -17,118.71; -68645.64

TOWNSHIP: SMITH

SECTION: 27, SW 1/4

COUNTY: BELMONT

SURF. OWNER: OVCC

DATE STARTED: 6/29/

DATE FINISHED: 7/6/5

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
50.00	CASED – STRATA IRON STAINED, BROKEN	50.00	1215.00
1.35	CLAYSTONE, GRAY, SOFT	51.35	1213.65
1.40	CLAYSTONE, GREEN, W/IRON STAINS, SOFT	52.75	1212.25
1.80	CLAYSTONE, RED/BROWN, BROKEN, W/IRON STAINS, SOFT	54.55	1210.45
3.35	(CORE LOST) – STRATA IRON STAINED, BROKEN	57.90	1207.10
2.20	CLAYSTONE, GREEN, BROKEN, W/IRON STAINS, SOFT	60.10	1204.90
0.85	CLAYSTONE, GRAY, SOFT	60.95	1204.05
4.65	CLAYSTONE, RED/BROWN, BROKEN, W/IRON STAINS, SOFT	65.60	1199.40
4.00	(CORE LOST) – STRATA IRON STAINED, BROKEN	69.60	1195.40
2.20	CLAYSTONE, GREEN, BROKEN, W/IRON STAINS, SOFT	71.80	1193.20
2.10	CLAYSTONE, GREEN, CALCAREOUS, SOFT	73.90	1191.10
1.10	CLAYSTONE, GREEN, W/IRON STAINS, SOFT	75.00	1190.00
4.20	SHALE, GRAY, CALCAREOUS, W/IRON STAINS, SOFT	79.20	1185.80
3.60	CLAYSTONE, CALCAREOUS, GRAY, W/IRON STAINS, SOFT	82.80	1182.20
0.90	CLAYSTONE, RED/BROWN, BROKEN, SOFT	83.70	1181.30
5.00	LIMESTONE, LIGHT BROWN, HARD	88.70	1176.30
4.85	CLAYSTONE, GRAY ,CALCAREOUS, SOFT	93.55	1171.45
1.20	CLAYSTONE, RED/BROWN, CALCAREOUS, SOFT	94.75	1170.25
1.85	CLAYSTONE, GREEN/GRAY, CALCAREOUS, SOFT	96.60	1168.40
5.10	SHALE, SANDY, GRAY, CALCAREOUS, W/IRON STAINS, S/M	101.70	1163.30
1.70	CLAYSTONE, CALCAREOUS, GREEN, SOFT	103.40	1161.60
0.50	SHALE, CALCAREOUS, GRAY, MEDIUM	103.90	1161.10
12.65	CLAYSTONE, GREEN, W/LIMESTONE, FRAGMENTS, SOFT	116.55	1148.45
2.05	CLAYSTONE, RED BROWN/BLACK, W/IRON STAINS, SOFT	118.60	1146.40
12.70	SHALE, GRAY/GREEN, CALCAREOUS, W/IRON STAINS	131.30	1133.70
2.15	CLAYSTONE, RED/BROWN, CALCAREOUS, SOFT	133.45	1131.55
5.20	SHALE, GRAY, CALCAREOUS, SOFT	138.65	1126.35
0.30	CLAYSTONE, RED, CALCAREOUS, SOFT	138.95	1126.05
6.05	CLAYSTONE, GREEN, CALCAREOUS, SOFT	145.00	1120.00
8.10	SHALE, GRAY, SOFT	153.10	1111.90
3.61	CLAYSTONE, BLK/GRAY, SOFT	156.71	1108.29
0.74	BONE COAL	157.45	1107.55
0.65	SHALE, GRAY, SOFT	158.10	1106.90
1.90	CLAYSTONE, CALCAREOUS, GRAY, SOFT	160.00	1105.00
1.50	LIMESTONE, LIGHT BROWN, HARD	161.50	1103.50
2.20	SHALE, BLACK, SOFT	163.70	1101.30
5.50	CLAYSTONE,GREEN, CALCAREOUS, SOFT	169.20	1095.80
0.85	SHALE, BLACK, SOFT	170.05	1094.95
2.20	0.18 COAL (NO. 12)	172.25	1092.75
	0.45 BONE COAL		
	0.90 COAL		

DIAMOND DRILL HOLE N94-3

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
	0.27 SHALE, BLACK, SOFT (NO. 12 COAL CONTINUED)		
	0.40 COAL		
6.45	SHALE, BLACK, W/COAL STREAKS, SOFT	178.70	1086.30
0.40	BONE COAL	179.10	1085.90
3.77	SHALE, BLACK, W/COAL STREAKS, SOFT	182.87	1082.13
1.65	SANDSTONE, GRAY, W/COAL STREAKS, MEDIUM	184.52	1080.48
0.48	COAL	185.00	1080.00
2.20	CLAYSTONE, GREEN, CALCAREOUS, SOFT	187.20	1077.80
2.80	LIMESTONE, LIGHT BROWN, HARD	190.00	1075.00
2.10	CLAYSTONE, GREEN, CALCAREOUS, SOFT	192.10	1072.90
17.90	SHALE, GRAY, SOFT	210.00	1055.00
6.70	SANDSTONE, GRAY, HARD	216.70	1048.30
5.55	SHALE, GRAY, CALCAREOUS, HARD	222.25	1042.75
3.20	CLAYSTONE, RED BROWN, CALCAREOUS, SOFT	225.45	1039.55
4.55	SHALE, GRAY, SOFT	230.00	1035.00
5.90	SHALE, GRAY, SOFT	235.90	1029.10
3.80	SANDSTONE, GRAY, HARD	239.70	1025.30
9.20	SHALE, GRAY, SOFT	248.90	1016.10
1.10	LIMESTONE, GRAY, HARD	250.00	1015.00
6.20	SHALE, GRAY, SOFT	256.20	1008.80
0.80	LIMESTONE, GRAY, HARD	257.00	1008.00
6.19	SHALE, GRAY, SOFT	263.19	1001.81
2.47	SANDSTONE, GRAY, HARD	265.66	999.34
4.34	SHALE, SANDY, GRAY, SOFT	270.00	995.00
2.35	SHALE, GRAY, SOFT	272.35	992.65
0.70	SHALE, BLACK, SOFT	273.05	991.95
2.20	COAL (NO. 11)	275.25	989.75
4.70	SHALE, GRAY, SOFT	279.95	985.05
9.10	SHALE, CALCAREOUS, GRAY, SOFT	289.05	975.95
0.95	SHALE, GRAY, SOFT	290.00	975.00
1.30	CLAYSTONE, GREEN, SOFT	291.30	973.70
2.30	SHALE, GRAY, SOFT	293.60	971.40
5.30	SANDSTONE, W/SHALE STREAKS, GRAY, HARD	298.90	966.10
5.90	SHALE, GRAY, SANDSTONE, SOFT	304.80	960.20
2.70	SANDSTONE, GRAY, HARD	307.50	957.50
0.85	SHALE, SANDY, GRAY, SOFT	308.35	956.65
1.15	SANDSTONE, W/SHALE STREAKS, GRAY, HARD	309.50	955.50
0.50	SHALE, GRAY, SOFT	310.00	955.00
7.40	SHALE, GRAY, W/SANDSTONE STREAKS, SOFT	317.40	947.60
0.05	SHALE, BLACK, SOFT	317.45	947.55
2.75	1.78 COAL (NO. 10)	320.20	944.80
	0.06 SHALE		
	0.91 COAL		
0.62	SHALE, GRAY, SOFT	320.82	944.18
5.63	CLAYSTONE, GREEN, CALCAREOUS, SOFT	326.45	938.55
6.55	SHALE, GRAY, CALCAREOUS	333.00	932.00

DIAMOND DRILL HOLE N94-3

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
9.80	CLAYSTONE, GREEN, CALCAREOUS, SOFT	342.80	922.20
7.20	LIMESTONE, LIGHT BROWN, HARD	350.00	915.00
3.25	LIMESTONE, LIGHT BROWN, HARD	353.25	911.75
1.10	SHALE, GREEN, CALCAREOUS, SOFT	354.35	910.65
1.05	LIMESTONE, LIGHT BROWN, HARD	355.40	909.60
0.90	SHALE, CALCAREOUS, GRAY, SOFT	356.30	908.70
0.95	LIMESTONE, LIGHT BROWN, HARD	357.25	907.75
4.35	SHALE, CALCAREOUS, GRAY, SOFT	361.60	903.40
0.87	LIMESTONE, LIGHT BROWN, HARD	362.47	902.53
2.00	SHALE, CALCAREOUS, GREEN, SOFT	364.47	900.53
0.90	LIMESTONE, LIGHT BROWN, HARD	365.37	899.63
1.63	SHALE, GRAY, CALCAREOUS, SOFT	367.00	898.00
3.00	LIMESTONE, LIGHT BROWN, HARD	370.00	895.00
1.10	SHALE, CALCAREOUS, GRAY, SOFT	371.10	893.90
3.55	CLAYSTONE, GREEN, CALCAREOUS,SOFT	374.65	890.35
10.95	SHALE, SANDY, CALCAREOUS, SOFT	385.60	879.40
0.45	CLAYSTONE, CALCAREOUS, GREEN, SOFT	386.05	878.95
3.10	SHALE, SANDY, CALCAREOUS, SOFT	389.15	875.85
7.75	LIMESTONE, LIGHT BROWN, HARD	396.90	868.10
0.90	CLAYSTONE, CALCAREOUS, GREEN, SOFT	397.80	867.20
1.02	LIMESTONE, LIGHT BROWN, HARD	398.82	866.18
2.50	SHALE, GREEN/GRAY, SOFT	401.32	863.68
8.68	LIMESTONE, LIGHT BROWN, HARD	410.00	855.00
1.90	SHALE, CALCAREOUS, GRAY, SOFT	411.90	853.10
1.50	SHALE, GRAY/GREEN, CALCAREOUS, SOFT	413.40	851.60
4.25	LIMESTONE, SHALEY, LIGHT BROWN/GRAY, HARD	417.65	847.35
8.50	LIMESTONE, LIGHT BROWN, HARD	426.15	838.85
3.85	SHALE, GRAY/GREEN, CALCAREOUS, SOFT	430.00	835.00
0.10	SHALE, W/PYRITE, GRAY, SOFT	430.10	834.90
1.10	SHALE, GREEN/GRAY, SOFT	431.20	833.80
0.98	CLAYSTONE, GRAY, CALCAREOUS, SOFT	432.18	832.82
0.09	SHALE, BLACK, SOFT	432.27	832.73
3.32	2.82 COAL W/PARTINGS (NO. 9)	435.59	829.41
	0.02 SHALE, PYRITE		
	0.48 COAL W/PARTINGS		
5.35	SHALE, CALCAREOUS, GRAY, SOFT	440.94	824.06
0.40	LIMESTONE, LIGHT BROWN, HARD	441.34	823.66
8.66	SHALE, CALCAREOUS, GRAY, SOFT	450.00	815.00
4.42	SHALE, LAMINATED, GRAY, SOFT	454.42	810.58
3.20	LIMESTONE, LIGHT BROWN, HARD	457.62	807.38
0.95	SHALE, GREEN, CALCAREOUS, SOFT	458.57	806.43
1.22	SHALE, BLACK, SOFT	459.79	805.21
1.35	LIMESTONE, W/SHALE, LIGHT BROWN, HARD	461.14	803.86
8.86	LIMESTONE, LIGHTBROWN, HARD	470.00	795.00
1.90	LIMESTONE, LIGHT BROWN/GRAY, HARD	471.90	793.10
1.55	SHALE, GREEN, SOFT	473.45	791.55

DIAMOND DRILL HOLE N94-3

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
3.75	LIMESTONE, LIGHT BROWN, HARD	477.20	787.80
0.50	CLAYSTONE, CALCAREOUS, GREEN, SOFT	477.70	787.30
6.10	SHALE, SANDY, CALCAREOUS, GRAY, SOFT	483.80	781.20
2.75	CLAYSTONE, GREEN, CALCAREOUS, SOFT	486.55	778.45
1.00	SHALE, SANDY, CALCAREOUS, GRAY, SOFT	487.55	777.45
0.55	LIMESTONE, LIGHT BROWN, HARD	488.10	776.90
1.90	SHALE, SANDY, CALCAREOUS, GRAY, SOFT	490.00	775.00
2.35	CLAYSTONE, GRAY, SOFT	492.35	772.65
2.10	SHALE, GRAY/BLACK, SOFT	494.45	770.55
5.95	SHALE, SANDY, CALCAREOUS, GRAY, SOFT	500.40	764.60
9.60	SHALE, W/LIMESTONE NODULES, CALCAREOUS, GRAY, SOFT	510.00	755.00
4.20	CLAYSTONE, CALCAREOUS, GRAY, SOFT	514.20	750.80
0.50	SHALE, BLACK, SOFT	514.70	750.30
7.57	1.65 COAL (NO. 8)	522.27	742.73
	0.70 SHALE, BLACK		
	3.92 COAL		
	0.10 SHALE, GRAY		
	1.20 COAL		
5.30	SHALE, CALCAREOUS, GRAY, SOFT	527.57	737.43
2.43	SHALE, GRAY, SOFT	530.00	735.00

AMOUNT OF HARD ROCK ABOVE NO. 8 SEAM

HARD ROCK: 105.00 FT. (20.4%) OF CORE

SOFT ROCK: 409.70 FT. (79.6%) OF CORE

PROJECTED AQUIFERS

1. 0.00 TO 82.80
2. 96.60 TO 101.70 (MINOR)
3. 116.55 TO 131.30

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-6

State Plane Coords: X2423328.60 Y730536.33 Surface Elevation ~~1303~~ 1,299.87

Lithology	H20*	Thickness	Physical Properties
CASING		29.00	
SANDSTONE	*	4.40	HARD
SHALE	*	1.00	COMP, EROD
SHALE	*	0.65	COMP, EROD
SHALE		1.22	COMP, EROD
SHALE		0.47	COMP, EROD, ALK
SHALE	*	2.26	COMP, EROD
SHALE		3.10	COMP, EROD
SHALE		1.55	COMP, EROD, ALK
CLAYSTONE		2.20	COMP, EROD
SHALE	*	1.15	COMP, EROD
SHALE		3.90	COMP, EROD, ALK
SHALE		4.10	COMP, EROD, ALK
SHALE		3.60	COMP, EROD
CLAYSTONE		1.00	COMP, EROD
SHALE		2.10	COMP, EROD
CLAYSTONE		1.15	COMP, EROD
SHALE		1.50	COMP, EROD
SHALE	*	0.50	COMP, EROD
SHALE		1.85	COMP, EROD
CLAYSTONE		1.01	COMP, EROD
SHALE		1.20	COMP, EROD
SHALE		1.40	COMP, EROD
SHALE		1.69	COMP, EROD
SHALE		0.95	COMP, EROD
SHALE		1.91	COMP, EROD
SHALE		0.65	COMP, EROD, ALK
CLAYSTONE		0.60	COMP, EROD
SHALE		4.20	COMP, EROD, ALK
SHALE		0.95	COMP, EROD
SHALE		2.00	COMP, EROD, ALK
SANDSTONE		1.74	HARD
SHALE		4.25	COMP, EROD
SHALE		0.61	COMP, EROD
LIMESTONE		3.00	HARD, ALK
SHALE		4.15	COMP, EROD, ALK
SHALE		0.95	COMP, EROD
LIMESTONE		0.90	HARD, ALK
SHALE		6.14	COMP, EROD, ALK
SHALE		7.30	COMP, EROD, ALK

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-6

State Plane Coords: X2423328.60 Y730536.33 Surface Elevation 1303

Lithology	H20*	Thickness	Physical Properties
SHALE		1.10	COMP, EROD
SHALE		5.40	COMP, EROD, ALK
SHALE		5.00	COMP, EROD
SHALE		1.20	COMP, EROD, ALK
SHALE		0.90	COMP, EROD, ALK
SHALE		1.00	COMP, EROD, ALK
SHALE		1.25	COMP, EROD
SHALE		3.60	COMP, EROD, ALK
LIMESTONE		2.20	HARD, ALK
SHALE		4.50	COMP, EROD, ALK
SHALE		6.75	COMP, EROD, ALK
SHALE		3.10	COMP, EROD
SHALE		6.70	COMP, EROD, ALK
CLAYSTONE		3.53	COMP, EROD, ALK
SHALE		0.63	COMP, EROD, AC
SHALE		0.56	COMP, EROD
SHALE		0.33	COMP, EROD, AC
LIMESTONE		5.00	HARD, ALK
CLAYSTONE		5.05	COMP, EROD
COAL (NO. 12)		4.90	EROD, AC
SHALE		2.60	COMP, EROD
SANDSTONE		2.30	HARD
SHALE		3.80	COMP, EROD
BONE COAL		0.35	AC, EROD
SHALE		1.30	COMP, EROD
COAL		0.20	ALK, COMP, EROD
SHALE		0.68	COMP, EROD
SHALE		5.37	COMP, EROD, ALK
SHALE		3.40	COMP, EROD, ALK
SHALE		6.05	COMP, EROD, ALK
SHALE		10.45	COMP, EROD
SHALE		0.57	COMP, EROD
SHALE		0.22	COMP, EROD
SHALE		0.32	COMP, EROD
SHALE		0.45	COMP, EROD
SHALE		1.94	COMP, EROD
SHALE		0.20	COMP, EROD
SHALE		1.40	COMP, EROD
SHALE		0.50	COMP, EROD
SHALE		5.55	COMP, EROD

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-6

State Plane Coords: X2423328.60 Y730536.33 Surface Elevation 1303

Lithology	H20*	Thickness	Physical Properties
CLAYSTONE		3.00	COMP, EROD
SHALE		0.80	COMP, EROD, AC
SHALE		3.12	COMP, EROD, ALK
SHALE		1.70	COMP, EROD, ALK
SHALE		2.45	COMP, EROD, ALK
SHALE		1.28	COMP, EROD
SHALE		7.85	COMP, EROD
SHALE		1.00	COMP, EROD, ALK
SHALE		5.65	COMP, EROD
SHALE		1.35	COMP, EROD
SHALE		4.15	COMP, EROD, ALK
SHALE		0.40	COMP, EROD
SHALE		0.82	COMP, EROD, ALK
SHALE		0.73	COMP, EROD
SHALE		2.23	COMP, EROD
SHALE		3.50	COMP, EROD
SANDSTONE		1.62	HARD
SHALE		10.70	COMP, EROD
SHALE		2.13	COMP, EROD
SHALE		0.53	COMP, EROD
COAL (NO. 11)		2.85	COMP, EROD, AC
SHALE		1.35	COMP, EROD
SHALE		13.14	COMP, EROD, ALK
SHALE		10.50	COMP, EROD, ALK
SANDSTONE		1.70	HARD
SHALE		8.50	COMP, EROD
SHALE		5.70	COMP, EROD
SHALE		0.10	COMP, EROD, AC
SHALE		0.10	COMP, EROD
COAL (NO. 10)		1.85	COMP, EROD, AC
SHALE		6.40	COMP, EROD, ALK
CLAYSTONE		1.25	COMP, EROD
SHALE		3.90	COMP, EROD, ALK
SHALE		1.40	COMP, EROD, ALK
CLAYSTONE		0.65	COMP, EROD
SHALE		9.55	COMP, EROD
SANDSTONE		1.90	HARD
SHALE		1.13	COMP, EROD, ALK
LIMESTONE		2.07	HARD, ALK
SHALE		3.30	COMP, EROD, ALK

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-6

State Plane Coords: X2423328.60 Y730536.33 Surface Elevation 1303

Lithology	H20*	Thickness	Physical Properties
LIMESTONE		4.30	HARD, ALK
CLAYSTONE		0.31	COMP, EROD
SHALE		1.60	COMP, EROD, ALK
CLAYSTONE		0.22	COMP, EROD
LIMESTONE		0.70	HARD, ALK
SHALE		12.05	COMP, EROD, ALK
SHALE		0.82	COMP, EROD, ALK
SHALE		1.25	COMP, EROD, ALK
LIMESTONE		0.22	HARD, ALK
SHALE		0.60	COMP, EROD, ALK
LIMESTONE		1.78	HARD, ALK
SHALE		3.25	COMP, EROD
LIMESTONE		11.40	HARD, ALK
LIMESTONE		1.50	HARD, ALK
LIMESTONE		11.30	HARD, ALK
SHALE		1.30	COMP, EROD, ALK
LIMESTONE		7.73	HARD, ALK
SHALE		3.20	COMP, EROD, ALK
SHALE		1.25	COMP, EROD, ALK
SHALE		5.22	COMP, EROD, ALK
SHALE		1.30	COMP, EROD, ALK
LIMESTONE		2.10	HARD, ALK
SHALE		4.75	COMP, EROD, ALK
CLAYSTONE		2.40	COMP, EROD
SHALE		0.22	COMP, EROD
COAL (NO. 9)		4.24	COMP, EROD, AC
SHALE		0.25	COMP, EROD
SHALE		1.40	COMP, EROD
SHALE		3.34	COMP, EROD, ALK
SHALE		1.50	COMP, EROD, ALK
LIMESTONE		2.60	HARD, ALK
SHALE		6.90	COMP, EROD, ALK
SHALE		1.90	COMP, EROD
SHALE		3.00	COMP, EROD, ALK
SHALE		1.50	COMP, EROD
SHALE		2.60	COMP, EROD, ALK
LIMESTONE		11.95	HARD, ALK
SHALE		1.20	COMP, EROD, ALK
LIMESTONE		3.62	HARD, ALK
SHALE		0.30	COMP, EROD, ALK

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-6

State Plane Coords: X2423328.60 Y730536.33 Surface Elevation 1303

Lithology	H20*	Thickness	Physical Properties
LIMESTONE		2.93	HARD, ALK
LIMESTONE		0.85	HARD, ALK
SHALE		0.30	COMP, EROD, ALK
LIMESTONE		1.35	HARD, ALK
SHALE		0.50	COMP, EROD
CLAYSTONE		1.20	COMP, EROD
SHALE		1.35	COMP, EROD, ALK
LIMESTONE		2.52	HARD, ALK
CLAYSTONE		2.15	COMP, EROD
SHALE		2.43	COMP, EROD
LIMESTONE		12.65	HARD, ALK
CLAYSTONE		1.83	COMP, EROD, ALK
SHALE		0.82	COMP, EROD, ALK
CLAYSTONE		2.05	COMP, EROD, ALK
CLAYSTONE		1.46	COMP, EROD
SHALE		1.50	COMP, EROD
BONE COAL		0.23	COMP, EROD, AC
SHALE		0.38	COMP, EROD
COAL (NO. 8)		7.08	COMP, EROD, AC
SHALE		1.67	COMP, EROD
LIMESTONE		0.54	HARD, ALK
CLAYSTONE		1.00	COMP, EROD
SHALE		1.70	COMP, EROD, ALK
CLAYSTONE		0.80	COMP, EROD
LIMESTONE		0.70	HARD, ALK

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam

Stratum	Total Sulfur %	Pyrite Sulfur %	Potential Acidity Mg/l as CaCO3	Neutralization Potential (/1000 Tons)	CaCO3 Deficiency (/1000 Tons)
Roof	3.44	2.64	107	7.71	99.3
Coal	6.41	3.27	200	7.83	192
Bottom	2.44	1.09	76.2	254	-178

Legend:
AC = ACID PRODUCING
ALK = ALKALINE PRODUCING
COMP = COMPACTIBLE
EROD = ERODIBLE

* – Indicates water bearing stratum under column labelled H2O

Stratum thickness is measured in feet.

DIAMOND DRILL HOLE N94-6

GEOLOGIST: HOMER McEVERS

ELEVATION: ~~1303 FT. (ALTIMETER)~~ 1299.87

COORDINATES: ~~-9872.53 S, -70047.97 E (NOT SURVEYED)~~ -9854.16; -70,166.03

TOWNSHIP: SMITH

SECTION: 28, W 1/4

COUNTY: BELMONT

SURF. OWNER: HART

DATE STARTED: 9/1/94

DATE FINISHED: 9/8/94

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
29.00	CASING	29.00	1274.00
4.40	SANDSTONE, GRAY, BROKEN, IRON STAINS	33.40	1269.60
1.00	SHALE, BROKEN, IRON STAINS	34.40	1268.60
0.65	SHALE, BROKEN, IRON STAINS	35.05	1267.95
1.22	SHALE, GRAY, SANDY	36.27	1266.73
0.47	SHALE, GRAY, CALCAREOUS, SANDY	36.74	1266.26
2.26	SHALE, SANDY, BROKEN, IRON STAINS	39.00	1264.00
3.10	SHALE, GRAY	42.10	1260.90
1.55	SHALE, GRAY, CALCAREOUS	43.65	1259.35
2.20	CLAY STONE, GRAY	45.85	1257.15
1.15	SHALE, GRAY, BROKEN, IRON STAINS	47.00	1256.00
3.90	SHALE, GRAY, CALCAREOUS	50.90	1252.10
4.10	SHALE, RED/BROWN, CALCAREOUS	55.00	1248.00
3.60	SHALE, RED/GRAY	58.60	1244.40
1.00	CLAYSTONE, GRAY	59.60	1243.40
2.10	SHALE, RED	61.70	1241.30
1.15	CLAYSTONE, GRAY	62.85	1240.15
1.50	SHALE, SANDY, GRAY	64.35	1238.65
0.50	SHALE, RED, IRON STAINS	64.85	1238.15
1.85	SHALE, GRAY	66.70	1236.30
1.01	CLAYSTONE, RED/GRAY	67.71	1235.29
1.20	SHALE, GRAY	68.91	1234.09
1.40	SHALE, RED/GRAY	70.31	1232.69
1.69	SHALE, RED/BROWN, SOFT	72.00	1231.00
0.95	SHALE, RED	72.95	1230.05
1.91	SHALE, GRAY	74.86	1228.14
0.65	SHALE, CALCAREOUS, GRAY	75.51	1227.49
0.60	CLAYSTONE, GRAY	76.11	1226.89
4.20	SHALE, SANDY, CALCAREOUS, GRAY	80.31	1222.69
0.95	SHALE, SANDY, GRAY	81.26	1221.74
2.00	SHALE, SANDY, CALCAREOUS, GRAY	83.26	1219.74
1.74	SANDSTONE, SHALEY, GRAY	85.00	1218.00
4.25	SHALE, GRAY, SOFT	89.25	1213.75
0.61	SHALE, GRAY/RED	89.86	1213.14
3.00	LIMESTONE, GRAY	92.86	1210.14
4.15	SHALE, CALCAREOUS, GRAY	97.01	1205.99
0.95	SHALE, IRON STAINS, BROKEN	97.96	1205.04
0.90	LIMESTONE, GRAY	98.86	1204.14
6.14	SHALE, SANDY, CALCAREOUS, GRAY	105.00	1198.00
7.30	SHALE, W/LIMESTONE STREAKS, GRAY	112.30	1190.70
1.10	SHALE, GRAY	113.40	1189.60

DIAMOND DRILL HOLE N94-6

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
5.40	SHALE, W/LIMESTONE STREAKS, GRAY	118.80	1184.20
5.00	SHALE, RED/GRAY/RED	123.80	1179.20
1.20	SHALE, CALCAREOUS, GRAY	125.00	1178.00
0.90	SHALE, CALCAREOUS, BLACK/GRAY	125.90	1177.10
1.00	SHALE, W/LIMESTONE STREAKS, GRAY	126.90	1176.10
1.25	SHALE, GRAY	128.15	1174.85
3.60	SHALE, W/LIMESTONE STREAKS, GRAY	131.75	1171.25
2.20	LIMESTONE, W/SHALE STREAKS, GRAY	133.95	1169.05
4.50	SHALE, W/LIMESTONE STREAKS, GRAY	138.45	1164.55
6.75	SHALE, W/LIMESTONE NODULES, GRAY	145.20	1157.80
3.10	SHALE, SANDY, GRAY	148.30	1154.70
6.70	SHALE, W/LIMESTONE NODULES, GRAY	155.00	1148.00
3.53	CLAYSTONE, GRAY	158.53	1144.47
0.63	SHALE, CARBONACEOUS, BLACK	159.16	1143.84
0.56	SHALE, GRAY	159.72	1143.28
0.33	SHALE, CARBONACEOUS, BLACK	160.05	1142.95
5.00	LIMESTONE, GRAY	165.05	1137.95
5.05	CLAYSTONE, GRAY	170.10	1132.90
4.90	**SHALE, BLACK W/COAL STREAKS – NO. 12 COAL**	175.00	1128.00
	1.10 BONE COAL		
	1.85 SHALE, BLACK		
	0.35 COAL		
	1.17 SHALE, BLACK		
	0.37 BONE COAL		
	0.06 SHALE, BLACK		
2.60	SHALE, GRAY	177.60	1125.40
2.30	SANDSTONE, W/SHALE STREAKS, GRAY	179.90	1123.10
3.80	SHALE, GRAY	183.70	1119.30
0.35	BONE COAL W/PYRITE	184.05	1118.95
1.30	SHALE GRAY	185.35	1117.65
0.20	COAL	185.55	1117.45
0.68	SHALE, GRAY	186.23	1116.77
5.37	SHALE, CALCAREOUS, GRAY	191.60	1111.40
3.40	SHALE, SANDY, CALCAREOUS, GRAY	195.00	1108.00
6.05	SHALE, W/LIMESTONE NODULES, GRAY, W/SS STREAKS	201.05	1101.95
10.45	SHALE, GRAY	211.50	1091.50
0.57	SHALE, RED	212.07	1090.93
0.22	SHALE, GRAY	212.29	1090.71
0.32	SHALE, RED	212.61	1090.39
0.45	SHALE, GRAY	213.06	1089.94
1.94	SHALE, RED	215.00	1088.00
0.20	SHALE, RED, SOFT	215.20	1087.80
1.40	SHALE, GRAY	216.60	1086.40
0.50	SHALE, RED	217.10	1085.90
5.55	SHALE, GRAY	222.65	1080.35
3.00	CLAYSTONE, GRAY, SOFT	225.65	1077.35

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
0.80	SHALE, CARBONACEOUS, BLACK	226.45	1076.55
3.12	SHALE, CALCAREOUS, GRAY	229.57	1073.43
1.70	SHALE, RED, CALCAREOUS	231.27	1071.73
2.45	SHALE, GREEN W/RED STREAKS, CALCAREOUS	233.72	1069.28
1.28	SHALE, GRAY/GREEN	235.00	1068.00
7.85	SHALE, SANDY, GRAY	242.85	1060.15
1.00	SHALE, SANDY, CALCAREOUS, GRAY	243.85	1059.15
5.65	SHALE, SANDY, GRAY	249.50	1053.50
1.35	SHALE, GRAY, BROKEN, SOFT	250.85	1052.15
4.15	SHALE, SANDY, CALCAREOUS, GRAY	255.00	1048.00
0.40	SHALE, SANDY, GRAY	255.40	1047.60
0.82	SHALE, W/LIMESTONE NODULES, GRAY	256.22	1046.78
0.73	SHALE, RED	256.95	1046.05
2.23	SHALE, GRAY/BLACK/GRAY	259.18	1043.82
3.50	SHALE, SANDY, GRAY	262.68	1040.32
1.62	SANDSTONE, W/SHALE STREAKS, GRAY	264.30	1038.70
10.70	SHALE, SANDY, GRAY	275.00	1028.00
2.13	SHALE, GRAY	277.13	1025.87
0.53	SHALE, BLACK	277.66	1025.34
2.85	COAL (NO. 11)	280.51	1022.49
1.35	SHALE, GRAY	281.86	1021.14
13.14	SHALE, CALCAREOUS, GRAY	295.00	1008.00
10.50	SHALE, SANDY, W/LIMESTONE NODULES, GRAY	305.50	997.50
1.70	SANDSTONE, W/SHALE, GRAY	307.20	995.80
8.50	SHALE, GRAY	315.70	987.30
5.70	SHALE, DARK GRAY	321.40	981.60
0.10	SHALE, CARBONACEOUS, BLACK	321.50	981.50
0.10	SHALE, GRAY	321.60	981.40
1.85	COAL (NO. 10)	323.45	979.55
	1.15 COAL		
	0.20 SHALE, GRAY		
	0.50 COAL		
6.40	SHALE, CALCAREOUS, GRAY	329.85	973.15
1.25	CLAYSTONE, GRAY	331.10	971.90
3.90	SHALE, SANDY, CALCAREOUS, GRAY	335.00	968.00
1.40	SHALE, CALCAREOUS, GRAY	336.40	966.60
0.65	CLAYSTONE, GRAY	337.05	965.95
9.55	SHALE, SANDY, GRAY	346.60	956.40
1.90	SANDSTONE, GRAY	348.50	954.50
1.13	SHALE, SANDY, CALCAREOUS, GRAY	349.63	953.37
2.07	LIMESTONE, GRAY	351.70	951.30
3.30	SHALE, SANDY, CALCAREOUS, GRAY	355.00	948.00
4.30	LIMESTONE, GRAY	359.30	943.70
0.31	CLAYSTONE, GREEN	359.61	943.39
1.60	SHALE, CALCAREOUS, GRAY	361.21	941.79
0.22	CLAYSTONE, GREEN	361.43	941.57

DIAMOND DRILL HOLE N94-6

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
0.70	LIMESTONE, GRAY	362.13	940.87
12.05	SHALE, CALCAREOUS, W/LIMESTONE NODULES, GRAY	374.18	928.82
0.82	SHALE, CALCAREOUS, GRAY	375.00	928.00
1.25	SHALE, CALCAREOUS, GRAY	376.25	926.75
0.22	LIMESTONE, GRAY	376.47	926.53
0.60	SHALE, CALCAREOUS, GRAY	377.07	925.93
1.78	LIMESTONE, GRAY	378.85	924.15
3.25	SHALE, GREEN/GRAY	382.10	920.90
11.40	LIMESTONE, SHALEY, GRAY	393.50	909.50
1.50	LIMESTONE, GRAY	395.00	908.00
11.30	LIMESTONE, GRAY, HARD	406.30	896.70
1.30	SHALE, CALCAREOUS, GRAY	407.60	895.40
7.73	LIMESTONE, GRAY	415.33	887.67
3.20	SHALE, CALCAREOUS, SANDY, GRAY	418.53	884.47
1.25	SHALE, CALCAREOUS, GREEN	419.78	883.22
5.22	SHALE, CALCAREOUS, SANDY, GRAY	425.00	878.00
1.30	SHALE, CALCAREOUS, SANDY, GRAY/GREEN	426.30	876.70
2.10	LIMESTONE, SHALEY, GRAY	428.40	874.60
4.75	SHALE, SANDY, CALCAREOUS, GRAY	433.15	869.85
2.40	CLAYSTONE, GRAY	435.55	867.45
0.22	SHALE, BLACK	435.77	867.23
4.24	**COAL (NO. 9)**	**440.01**	**862.99**
	2.50 COAL		
	0.40 SHALE, GRAY		
	1.30 BONE COAL		
0.25	SHALE, BLACK	440.26	862.74
1.40	SHALE, DARK GRAY	441.66	861.34
3.34	SHALE, SANDY, CALCAREOUS, GRAY	445.00	858.00
1.50	SHALE, CALCAREOUS, GRAY	446.50	856.50
2.60	LIMESTONE, GRAY	449.10	853.90
6.90	SHALE, SANDY, CALCAREOUS, GRAY	456.00	847.00
1.90	SHALE, DARK GRAY	457.90	845.10
3.00	SHALE, CALCAREOUS, GRAY	460.90	842.10
1.50	SHALE, BLACK	462.40	840.60
2.60	SHALE, SANDY, CALCAREOUS, GRAY	465.00	838.00
11.95	LIMESTONE, GRAY	476.95	826.05
1.20	SHALE, CALCAREOUS, GRAY	478.15	824.85
3.62	LIMESTONE, GRAY	481.77	821.23
0.30	SHALE, CALCAREOUS, GRAY	482.07	820.93
2.93	LIMESTONE, GRAY	485.00	818.00
0.85	LIMESTONE, GRAY/GREEN	485.85	817.15
0.30	SHALE, BLACK, CALCAREOUS	486.15	816.85
1.35	LIMESTONE, GRAY	487.50	815.50
0.50	SHALE, GREEN	488.00	815.00
1.20	CLAYSTONE, GRAY/GREEN	489.20	813.80
1.35	SHALE, CALCAREOUS, GRAY	490.55	812.45

DIAMOND DRILL HOLE N94-6

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
2.52	LIMESTONE, GRAY	493.07	809.93
2.15	CLAYSTONE, GRAY	495.22	807.78
2.43	SHALE, BLACK	497.65	805.35
12.65	LIMESTONE, GRAY	510.30	792.70
1.83	CLAYSTONE, W/LIMESTONE NODULES, GRAY	512.13	790.87
0.82	SHALE, SANDY, CALCAREOUS, GRAY	512.95	790.05
2.05	CLAYSTONE, W/LIMESTONE NODULES, GRAY	515.00	788.00
1.46	CLAYSTONE, GRAY	516.46	786.54
1.50	SHALE, BLACK	517.96	785.04
0.23	BONE COAL	518.19	784.81
0.38	SHALE, GRAY	518.57	784.43
7.08	**COAL (NO. 8)**	**525.65**	**777.35**
	0.99 COAL		
	0.88 SHALE, GRAY		
	1.89 COAL		
	0.12 SHALE W/PYRITE		
	3.20 COAL		
1.67	SHALE, GRAY	527.32	775.68
0.54	LIMESTONE, GRAY	527.86	775.14
1.00	CLAYSTONE, GRAY	528.86	774.14
1.70	SHALE, CALCAREOUS, GRAY	530.56	772.44
0.80	CLAYSTONE, GRAY	531.36	771.64
0.70	LIMESTONE, GRAY	532.06	770.94

AMOUNT OF HARD ROCK ABOVE NO. 8 SEAM

HARD ROCK: 135.33 FT. (25.75%) OF CORE

SOFT ROCK: 390.32 FT. (74.25%) OF CORE

PROJECTED AQUIFERS

1. 0.00 TO 35.05
2. 36.74 TO 39.00 (MINOR)
3. 45.85 TO 47.00 (MINOR)
4. 64.35 TO 64.85 (MINOR)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-8

State Plane Coords: X2430000.32 Y726291.11 Surface Elevation ~~1304~~ 1309.78

Lithology	H20*	Thickness	Physical Properties
CASING	*	25.00	
SHALE	*	1.12	COMP, EROD
SHALE	*	4.88	COMP, EROD
SHALE		1.25	COMP, EROD, ALK
SHALE	*	0.55	COMP, EROD
SHALE		1.30	COMP,EROD
LIMESTONE		0.25	HARD, ALK
CLAYSTONE		5.20	COMP, EROD
SHALE		2.50	COMP, EROD
SANDSTONE		0.45	HARD
SHALE		0.95	COMP, EROD
SANDSTONE		0.58	COMP, EROD
SHALE		1.82	COMP, EROD
SHALE		2.45	COMP, EROD
LIMESTONE		3.05	HARD, ALK
SHALE	*	0.65	COMP, EROD, ALK
LIMESTONE		0.85	HARD, ALK
SHALE		4.20	COMP, EROD, ALK
SHALE	*	0.95	COMP, EROD
SHALE	*	1.95	COMP, EROD, ALK
SHALE		3.45	COMP, EROD, ALK
CLAYSTONE		2.10	COMP, EROD
SANDSTONE	*	5.13	HARD, ALK
SHALE	*	1.60	COMP, EROD
CLAYSTONE		2.77	COMP, EROD, ALK
SHALE		5.10	COMP, EROD
CLAYSTONE		2.80	COMP, EROD
LIMESTONE		0.92	HARD, ALK
SHALE		4.10	COMP, EROD, ALK
CLAYSTONE		6.85	COMP, EROD, ALK
SHALE		0.23	COMP, EROD
CLAYSTONE		1.40	COMP, EROD, ALK
SHALE	*	1.15	COMP, EROD
SHALE		4.20	COMP, EROD
CLAYSTONE		1.70	COMP, EROD
SHALE		1.55	COMP, EROD
SHALE		2.80	COMP, EROD
CLAYSTONE		1.20	COMP, EROD
SHALE		4.30	COMP, EROD, ALK
SHALE		1.70	COMP, EROD, ALK

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-8

State Plane Coords: X2430000.32 Y726291.11 Surface Elevation 1304

Lithology	H20*	Thickness	Physical Properties
SHALE		1.55	COMP, EROD
SHALE		2.80	COMP, EROD
CLAYSTONE		1.20	COMP, EROD
SHALE		4.30	COMP, EROD, ALK
SHALE		1.70	COMP, EROD, ALK
CLAYSTONE		0.72	COMP, EROD
CLAYSTONE		1.45	COMP, EROD, ALK
SHALE		5.48	COMP, EROD
SHALE		2.45	COMP, EROD
CLAYSTONE		1.70	COMP, EROD
SHALE		3.80	COMP, EROD, ALK
LIMESTONE		0.92	HARD, ALK
SHALE		4.20	COMP, EROD, ALK
CLAYSTONE		6.43	COMP, EROD, ALK
SHALE		1.25	COMP, EROD, ALK
SANDSTONE		0.30	HARD, ALK
SHALE		2.55	COMP, EROD, ALK
SHALE		8.75	COMP, EROD
SHALE		3.55	COMP, EROD
CLAYSTONE		1.10	COMP, EROD
SHALE		1.50	COMP, EROD
SHALE		4.55	COMP, EROD
SHALE		10.00	COMP, EROD, ALK
SHALE		3.80	COMP, EROD, ALK
SHALE		8.20	COMP, EROD, ALK
SHALE		4.00	COMP, EROD
SHALE		4.00	COMP, EROD, ALK
SHALE		0.20	COMP, EROD, ALK
SHALE		0.47	COMP, EROD
SHALE		4.60	COMP, EROD, ALK
SHALE		1.50	COMP, EROD
CLAYSTONE		1.80	COMP, EROD
SHALE		1.88	COMP, EROD
SHALE		4.64	COMP, EROD
COAL (NO. 12)		3.01	COMP, EROD, AC
SHALE		1.90	COMP, EROD
SANDSTONE		1.72	HARD
SHALE		1.00	COMP, EROD
SHALE		4.73	COMP, EROD
SHALE		1.05	COMP, EROD, AC

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-8

State Plane Coords: X2430000.32 Y726291.11 Surface Elevation 1304

Lithology	H20*	Thickness	Physical Properties
SHALE		0.68	COMP, EROD
SHALE		10.82	COMP, EROD, ALK
SHALE		20.35	COMP, EROD, ALK
CLAYSTONE		1.20	COMP, EROD
SHALE		4.00	COMP, EROD, ALK
SHALE		3.35	COMP, EROD
SHALE		2.60	COMP, EROD, ALK
SANDSTONE		8.07	HARD, ALK
SHALE		5.31	COMP, EROD
SHALE		1.30	COMP, EROD
CLAYSTONE		1.62	COMP, EROD
SANDSTONE		3.67	HARD
SHALE		0.95	COMP, EROD
SHALE		0.70	COMP, EROD
SHALE		4.70	COMP, EROD
SANDSTONE		1.60	HARD, ALK
SANDSTONE		4.40	HARD
SHALE		2.90	COMP, EROD
SHALE		2.10	COMP, EROD
LIMESTONE		0.55	HARD, ALK
SHALE		2.84	COMP, EROD, ALK
SHALE		3.13	COMP, EROD
SANDSTONE		0.25	HARD
SHALE		0.55	COMP, EROD
SANDSTONE		0.43	HARD
SHALE		2.38	COMP, EROD
SANDSTONE		1.25	HARD
SHALE		2.95	COMP, EROD
COAL (NO. 11)		4.77	COMP, EROD, AC
SHALE		12.80	COMP, EROD, ALK
SHALE		4.55	COMP, EROD
SHALE		2.25	COMP, EROD, ALK
SHALE		1.20	COMP, EROD
SANDSTONE		0.37	HARD
SHALE		0.85	COMP, EROD, ALK
SANDSTONE		1.24	HARD
SHALE		1.78	COMP, EROD, ALK
SANDSTONE		0.75	HARD
SHALE		4.10	COMP, EROD
SANDSTONE		0.70	HARD

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-8

State Plane Coords: X2430000.32 Y726291.11 Surface Elevation 1304

Lithology	H20*	Thickness	Physical Properties
SHALE		1.80	COMP, EROD
SANDSTONE		3.00	HARD
SHALE		1.78	COMP, EROD
COAL (NO. 10)		2.45	COMP, EROD, AC
SHALE		1.85	COMP, EROD, ALK
SHALE		4.52	COMP, EROD
SHALE		9.21	COMP, EROD, ALK
SHALE		2.22	COMP, EROD
SANDSTONE		2.50	HARD, ALK
SHALE		2.20	COMP, EROD
SHALE		9.86	COMP, EROD, ALK
LAMESTONE		0.62	HARD
SHALE		19.38	COMP, EROD, ALK
SHALE		1.20	COMP, EROD, ALK
SHALE		2.60	COMP, EROD
LIMESTONE		14.20	HARD, ALK
LIMESTONE		2.00	HARD, ALK
LIMESTONE		5.68	HARD, ALK
SHALE		0.80	COMP, EROD, ALK
LIMESTONE		0.95	HARD, ALK
SHALE		0.65	COMP, EROD, ALK
SHALE		1.50	COMP, EROD, ALK
LIMESTONE		10.48	HARD, ALK
SHALE		0.65	COMP, EROD
LIMESTONE		4.00	HARD, ALK
SHALE		1.85	COMP, EROD
LIMESTONE		1.20	HARD, ALK
SHALE		0.90	COMP, EROD, ALK
LIMESTONE		3.10	HARD, ALK
SHALE		3.55	COMP, EROD, ALK
CLAYSTONE		2.85	COMP, EROD
COAL (NO. 9)		3.20	COMP, EROD, AC
SHALE		0.78	COMP, EROD
SHALE		5.10	COMP, EROD, ALK
LIMESTONE		1.71	HARD, ALK
SHALE		1.02	COMP, EROD, ALK
SHALE		9.28	COMP, EROD, ALK
SHALE		0.47	COMP, EROD
LIMESTONE		3.12	HARD, ALK
SHALE		0.78	COMP, EROD

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-8

State Plane Coords: X2430000.32 Y726291.11 Surface Elevation 1304

Lithology	H20°	Thickness	Physical Properties
BONE COAL		0.54	COMP, EROD, AC
SHALE		8.04	COMP, EROD
BONE COAL		5.81	COMP, EROD, AC
SHALE		1.60	COMP, EROD, ALK
LIMESTONE		1.33	HARD, ALK
LIMESTONE		0.46	HARD, ALK
CLAYSTONE		1.66	COMP, EROD, ALK
LIMESTONE		0.27	HARD, ALK
LIMESTONE		1.20	HARD, ALK
LIMESTONE		1.72	HARD, ALK
CLAYSTONE		0.65	COMP, EROD
LIMESTONE		2.79	HARD, ALK
LIMESTONE		0.20	HARD, ALK
SHALE		0.35	COMP, EROD, ALK
CLAYSTONE		2.85	COMP, EROD, ALK
LIMESTONE		0.40	HARD, ALK
SHALE		3.25	COMP, EROD, ALK
LIMESTONE		2.10	HARD, ALK
SHALE		0.62	COMP, EROD, ALK
LIMESTONE		1.38	HARD, ALK
CLAYSTONE		7.42	COMP, EROD
SHALE		1.00	COMP, EROD
SHALE		1.70	COMP, EROD, ALK
LIMESTONE		0.80	HARD, ALK
LIMESTONE		1.53	HARD, ALK
SHALE		0.50	COMP, EROD, ALK
LIMESTONE		2.70	HARD, ALK
CLAYSTONE		3.40	COMP, EROD, ALK
SHALE		1.25	COMP, EROD, ALK
CLAYSTONE		1.85	COMP, EROD, ALK
CLAYSTONE		1.60	COMP, EROD
SHALE		1.70	COMP, EROD
COAL (NO. 8)		6.47	COMP, EROD, AC
SHALE		0.30	COMP, EROD, ALK
SHALE		0.13	COMP, EROD
SHALE		0.96	COMP, EROD, ALK
CLAYSTONE		0.37	COMP, EROD, ALK
SHALE		1.37	COMP, EROD, ALK
CLAYSTONE		0.35	COMP, EROD, ALK
SHALE		2.55	COMP, EROD, ALK

ATTACHMENT 13
(GEOLOGY REPORT – Underground Workings)

Applicant Ohio Valley Coal Company Drill Hole # N94-8

State Plane Coords: X2430000.32 Y726291.11 Surface Elevation 1304

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam

Stratum	Total Sulfur %	Pyrite Sulfur %	Potential Acidity (/1000 Tons)	Neutralization Potential (/1000 Tons)	CaCO3 Deficiency (/1000 Tons)
Roof	3.22	2.47	77.2	86.5	-9.34
Coal	4.13	1.84	57.5	41.8	15.7
Bottom					

Legend:
AC = ACID PRODUCING
ALK = ALKALINE PRODUCING
COMP = COMPACTIBLE
EROD = ERODIBLE

* – Indicates water bearing stratum under column labelled H2O

Stratum thickness is measured in feet.

DIAMOND DRILL HOLE N94-8

GEOLOGIST: HOMER McEVERS

ELEVATION: ~~1304~~ FT. (ALTIMETER)

EXCHANGE
COORDINATES: ~~-14238.63~~ S, -63454.71 W ~~(NOT SURVEYED)~~
14,192.05, -63,631.96

TOWNSHIP: SMITH

SECTION: 21, NW 1/4

COUNTY: BELMONT

SURF. OWNER: LUCAS

DATE STARTED: 9/9/94

DATE FINISHED: 9/14/94

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
25.00	CASING	25.00	1279.00
1.12	SHALE, GRAY W/IRON STAINS	26.12	1277.88
4.88	SHALE, SANDY, W/IRON STAINS, BROKEN, GRAY	31.00	1273.00
1.25	SHALE, GRAY, CALCAREOUS	32.25	1271.75
0.55	SHALE, GRAY, BROKEN, IRON STAINS	32.80	1271.20
1.30	SHALE, GRAY	34.10	1269.90
0.25	LIMESTONE, GRAY	34.35	1269.65
5.20	CLAYSTONE, GRAY	39.55	1264.45
2.50	SHALE, SANDY, GRAY	42.05	1261.95
0.45	SANDSTONE, GRAY	42.50	1261.50
0.95	SHALE, W/SANDSTONE STREAKS, GRAY	43.45	1260.55
0.58	SANDSTONE, GRAY	44.03	1259.97
1.82	SHALE, GRAY	45.85	1258.15
2.45	SHALE, BLACK	48.30	1255.70
3.05	LIMESTONE, SHALEY, GRAY	51.35	1252.65
0.65	SHALE, CALCAREOUS, GRAY W/IRON STAINS, BROKEN	52.00	1252.00
0.85	LIMESTONE, SHALEY, GRAY	52.85	1251.15
4.20	SHALE, GRAY, CALCAREOUS	57.05	1246.95
0.95	SHALE, SANDY, IRON STAINS, BROKEN, YELLOW/BROWN	58.00	1246.00
1.95	SHALE, SANDY, CALCAREOUS, W/IRON STAINS, BROKEN	59.95	1244.05
3.45	SHALE, SANDY, CALCAREOUS	63.40	1240.60
2.10	CLAYSTONE, GRAY	65.50	1238.50
5.13	SANDSTONE, CALCAREOUS, GRAY, W/IRON STAINS	70.63	1233.37
1.60	SHALE, SANDY, GRAY, W/IRON STAINS	72.23	1231.77
2.77	CLAYSTONE, CALCAREOUS, GRAY	75.00	1229.00
5.10	SHALE, GRAY	80.10	1223.90
2.80	CLAYSTONE, RED/BROWN, SOFT	82.90	1221.10
0.92	LIMESTONE, GRAY	83.82	1220.18
4.10	SHALE, CALCAREOUS, GRAY	87.92	1216.08
6.85	CLAYSTONE, CALCAREOUS, GRAY	94.77	1209.23
0.23	SHALE, GRAY	95.00	1209.00
1.40	CLAYSTONE, GRAY	96.40	1207.60
1.15	SHALE, BROKEN, GRAY, W/IRON STAINS	97.55	1206.45
4.20	SHALE, GRAY	101.75	1202.25
1.70	CLAYSTONE, GRAY	103.45	1200.55
1.55	SHALE, RED/GRAY	105.00	1199.00
2.80	SHALE, RED	107.80	1196.20
1.20	CLAYSTONE, GRAY	109.00	1195.00
4.30	SHALE, CALCAREOUS, GRAY	113.30	1190.70
1.70	SHALE, RED, CALCAREOUS	115.00	1189.00
0.72	CLAYSTONE, RED	115.72	1188.28

DIAMOND DRILL HOLE N94-8

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
1.45	CLAYSTONE, GRAY	117.17	1186.83
5.48	SHALE, SANDY, GRAY	122.65	1181.35
2.45	SHALE, GRAY	125.10	1178.90
1.70	CLAYSTONE, RED/BROWN	126.80	1177.20
3.80	SHALE, SANDY, CALCAREOUS, GRAY	130.60	1173.40
0.92	LIMESTONE, GRAY	131.52	1172.48
4.20	SHALE, SANDY, CALCAREOUS, GRAY	135.72	1168.28
6.43	CLAYSTONE, RED, CALCAREOUS	142.15	1161.85
1.25	SHALE, CALCAREOUS, GRAY	143.40	1160.60
0.30	SANDSTONE, SHALEY, CALCAREOUS, GRAY	143.70	1160.30
2.55	SHALE, SANDY, CALCAREOUS, GRAY	146.25	1157.75
8.75	SHALE, SANDY, GRAY	155.00	1149.00
3.55	SHALE, GRAY	158.55	1145.45
1.10	CLAYSTONE, GRAY	159.65	1144.35
1.50	SHALE, SANDY, GRAY	161.15	1142.85
4.55	SHALE, GRAY	165.70	1138.30
10.00	SHALE, SANDY, CALCAREOUS, GRAY	175.70	1128.30
3.80	SHALE, W/LIMESTONE NODULES, GRAY	179.50	1124.50
8.20	SHALE, SANDY, W/LIMESTONE NODULES, GRAY	187.70	1116.30
4.00	SHALE, GRAY	191.70	1112.30
4.00	SHALE, SANDY, CALCAREOUS, GRAY	195.70	1108.30
0.20	SHALE, CALCAREOUS, GRAY	195.90	1108.10
0.47	SHALE, SANDY, GRAY	196.37	1107.63
4.60	SHALE, CALCAREOUS, SANDY, GRAY	200.97	1103.03
1.50	SHALE, GRAY	202.47	1101.53
1.80	CLAYSTONE, RED	204.27	1099.73
1.88	SHALE, SANDY, GRAY	206.15	1097.85
4.64	SHALE, GRAY	210.79	1093.21
3.01	COAL (NO. 12)	213.80	1090.20
	.52 SHALE, BLACK		
	0.10 COAL		
	0.85 SHALE, BLACK		
	0.47 COAL		
	0.07 SHALE, BLACK		
	0.15 COAL		
	0.25 SHALE, BLACK		
	0.60 COAL		
1.90	SHALE, SANDY, GRAY	215.70	1088.30
1.72	SANDSTONE, W/SHALE STREAKS, GRAY	217.42	1086.58
1.00	SHALE, SANDY, GRAY	218.42	1085.58
4.73	SHALE, BLACK/DARK GRAY	223.15	1080.85
1.05	SHALE, W/COAL STREAKS, GRAY	224.20	1079.80
0.68	SHALE, BLACK	224.88	1079.12
10.82	SHALE, CALCAREOUS, SANDY, GRAY	235.70	1068.30
20.35	SHALE, W/LIMESTONE NODULES, GRAY	256.05	1047.95
1.20	CLAYSTONE, GRAY	257.25	1046.75

DIAMOND DRILL HOLE N94-8

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
4.00	SHALE, W/LIMESTONE NODULES, GRAY	261.25	1042.75
3.35	SHALE, GRAY	264.60	1039.40
2.60	SHALE, CALCAREOUS, GRAY	267.20	1036.80
8.07	SANDSTONE, CALCAREOUS, GRAY	275.27	1028.73
5.31	SHALE, SANDY, GRAY	280.58	1023.42
1.30	SHALE, GRAY	281.88	1022.12
1.62	CLAYSTONE, GRAY	283.50	1020.50
3.67	SANDSTONE, W/SHALE STREAKS	287.17	1016.83
0.95	SHALE, W/SANDSTONE STREAKS	288.12	1015.88
0.70	SHALE, SANDY, GRAY	288.82	1015.18
4.70	SHALE, GRAY	293.52	1010.48
1.60	SANDSTONE, W/LIMESTONE NODULES, GRAY	295.12	1008.88
4.40	SANDSTONE, GRAY	299.52	1004.48
2.90	SHALE, GRAY	302.42	1001.58
2.10	SHALE, GRAY	304.52	999.48
0.55	LIMESTONE, GRAY	305.07	998.93
2.84	SHALE, CALCAREOUS, GRAY	307.91	996.09
3.13	SHALE, GRAY	311.04	992.96
0.25	SANDSTONE, GRAY	311.29	992.71
0.55	SHALE, GRAY	311.84	992.16
0.43	SANDSTONE, GRAY	312.27	991.73
2.38	SHALE, GRAY	314.65	989.35
1.25	SANDSTONE, GRAY	315.90	988.10
2.95	SHALE, GRAY	318.85	985.15
4.77	COAL (NO. 11)	323.62	980.38
	0.32 SHALE, BLACK		
	1.80 COAL		
	2.55 SHALE, GRAY		
	0.10 COAL		
12.80	SHALE, CALCAREOUS, GRAY	336.42	967.58
4.55	SHALE, GRAY	340.97	963.03
2.25	SHALE, W/LIMESTONE STREAKS, GRAY	343.22	960.78
1.20	SHALE, SANDY, GRAY	344.42	959.58
0.37	SANDSTONE, GRAY	344.79	959.21
0.85	SHALE, W/LIMESTONE NODULES, GRAY	345.64	958.36
1.24	SANDSTONE, GRAY	346.88	957.12
1.78	SHALE, W/LIMESTONE NODULES, GRAY	348.66	955.34
0.75	SANDSTONE, GRAY	349.41	954.59
4.10	SHALE, SANDY, GRAY	353.51	950.49
0.70	SANDSTONE, SHALEY, GRAY	354.21	949.79
1.80	SHALE, GRAY	356.01	947.99
3.00	SANDSTONE, SHALEY, GRAY	359.01	944.99
1.78	SHALE, DARK GRAY	360.79	943.21

DIAMOND DRILL HOLE N94-8

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
2.45	COAL (NO. 10)	363.24	940.76
	1.75 COAL		
	0.20 SHALE, GRAY		
	0.50 COAL		
1.85	SHALE, CALCAREOUS, GRAY	365.09	938.91
4.52	SHALE, GRAY	369.61	934.39
9.21	SHALE, CALCAREOUS, GRAY	378.82	925.18
2.22	SHALE, SANDY, GRAY	381.04	922.96
2.50	SANDSTONE, CALCAREOUS, GRAY	383.54	920.46
2.20	SHALE, GRAY	385.74	918.26
9.86	SHALE, CALCAREOUS, SANDY, GRAY	395.60	908.40
0.62	LAMESTONE, GRAY	396.22	907.78
19.38	SHALE, CALCAREOUS, SANDY, GRAY	415.60	888.40
1.20	SHALE, GREEN, CALCAREOUS	416.80	887.20
2.60	SHALE, GRAY	419.40	884.60
14.20	LIMESTONE, SANDY, SHALEY, GRAY	433.60	870.40
2.00	LIMESTONE, GRAY	435.60	868.40
5.68	LIMESTONE, GRAY, VERY HARD	441.28	862.72
0.80	SHALE, CALCAREOUS, GREEN	442.08	861.92
0.95	LIMESTONE, SHALEY, GRAY	443.03	860.97
0.65	SHALE, GREEN	443.68	860.32
1.50	SHALE, SANDY, CALCAREOUS, GRAY	445.18	858.82
10.48	LIMESTONE, SHALEY, GRAY	455.66	848.34
0.65	SHALE, GRAY	456.31	847.69
4.00	LIMESTONE, SHALEY, GRAY	460.31	843.69
1.85	SHALE, SANDY, GRAY	462.16	841.84
1.20	LIMESTONE, SHALEY, GRAY	463.36	840.64
0.90	SHALE, CALCAREOUS, GRAY	464.26	839.74
3.10	LIMESTONE, SHALEY, GRAY	467.36	836.64
3.55	SHALE, CALCAREOUS, GRAY	470.91	833.09
2.85	CLAYSTONE, GRAY	473.76	830.24
3.20	COAL (NO. 9)	476.96	827.04
	1.54 COAL		
	0.24 SHALE, BLACK		
	1.42 COAL		
0.78	SHALE, GRAY	477.74	826.26
5.10	SHALE, CALCAREOUS, GRAY	482.84	821.16
1.71	LIMESTONE, GRAY	484.55	819.45
1.02	SHALE, CALCAREOUS, GRAY	485.57	818.43
9.28	SHALE, CALCAREOUS, DARK GRAY	494.85	809.15
0.47	SHALE, SANDY, GRAY	495.32	808.68
3.12	LIMESTONE, SHALEY, GRAY	498.44	805.56
0.78	SHALE, DARK GRAY	499.22	804.78
0.20	BONE COAL	499.42	804.58
0.30	SHALE, BLACK	499.72	804.28
0.15	BONE COAL	499.87	804.13

DIAMOND DRILL HOLE N94-8

(Continued)

THICK (FT.)	DESCRIPTION	DEPTH (FT.)	ELEV. (FT.)
0.54	SHALE, CALCAREOUS, GRAY	500.41	802.59
8.04	LIMESTONE, SHALEY, GRAY	508.45	794.55
5.81	LIMESTONE, GRAY	514.26	788.74
1.60	CLAYSTONE, CALCAREOUS, GRAY	515.86	787.14
1.33	LIMESTONE, GRAY	517.19	785.81
0.46	LIMESTONE, SHALEY, GRAY	517.65	785.35
1.66	LIMESTONE, GRAY	519.31	783.69
0.27	CLAYSTONE, GRAY	519.58	783.42
1.20	LIMESTONE, SHALEY, GRAY	520.78	782.22
1.72	LIMESTONE, GRAY	522.50	780.50
0.65	SHALE, CALCAREOUS, GRAY	523.15	779.85
2.79	CLAYSTONE, W/LIMESTONE NODULES, GRAY	525.94	777.06
0.20	LIMESTONE, GRAY	526.14	776.86
0.35	SHALE, CALCAREOUS, BLACK	526.49	776.51
2.85	LIMESTONE, GRAY	529.34	773.66
0.40	SHALE, CALCAROUS, GRAY	529.74	773.26
3.25	LIMESTONE, SANDY, GRAY	532.99	770.01
2.10	CLAYSTONE, GREEN	535.09	767.91
0.62	SHALE, DARK GRAY	535.71	767.29
1.38	SHALE, CALCAREOUS, GRAY	537.09	765.91
7.42	LIMESTONE, SANDY, SHALEY, GRAY	544.51	758.49
1.53	LIMESTONE, GRAY	546.04	756.96
0.50	SHALE, CALCAREOUS, DARK GRAY	546.54	756.46
2.70	LIMESTONE, GRAY	549.24	753.76
3.40	CLAYSTONE, W/LIMESTONE NODULES, GRAY	552.64	750.36
1.25	SHALE, CALCAREOUS, GRAY	553.89	749.11
1.85	CLAYSTONE, W/LIMESTONE NODULES, GRAY	555.74	747.26
1.60	CLAYSTONE, GRAY	557.34	745.66
1.70	SHALE, GRAY	559.04	743.96
6.47	**COAL (NO. 8)**	**565.51**	**737.49**
	0.42 COAL W/PYRITE		
	0.15 BONE COAL		
	0.10 SHALE, BLACK		
	0.73 SHALE, GRAY		
	5.07 COAL W/PYRITE		
0.30	SHALE, CALCAREOUS, GRAY	565.81	737.19
0.13	SHALE, GRAY	565.94	737.06
0.96	SHALE, CALCAREOUS, GRAY	566.90	736.10
0.37	CLAYSTONE, CALCAREOUS, GRAY	567.27	735.73
1.37	SHALE, CALCAREOUS, GRAY	568.64	734.36
0.35	CLAYSTONE, CALCAREOUS, GRAY	568.99	734.01
2.55	SHALE, CALCAREOUS, GRAY	571.54	731.46

DIAMOND DRILL HOLE N94-8

(Continued)

AMOUNT OF HARD ROCK ABOVE NO. 8 SEAM

HARD ROCK: 128.18 FT. (22.93%) OF CORE

SOFT ROCK: 430.86 FT. (77.07%) OF CORE

PROJECTED AQUIFERS

1. 0.00 TO 32.80
2. 51.35 TO 52.00 (MINOR)
3. 57.05 TO 59.95 (MINOR)
4. 70.63 TO 72.23 (MINOR)
5. 96.40 TO 97.55 (MINOR)

LJ HUGHES & SONS, INC.

DIAMOND CORE DRILLING
Pressure Grouting, Foundation & Soil Borings
320 Turnpike Road, Summersville, West Virginia 26651 (304) 872-1111

DRILL HOLE NO. N-94-12

DRILLER: BRIAN HANSHAW

DRILLING FOR: THE OHIO VALLEY COAL COMPANY
ALLEDONIA OHIO

SURFACE ELEVATION: 1310
SE 1/4 Sec 3 Smith Twp

STARTED: SEPTEMBER 20 1994
COMPLETED: SEPTEMBER 22 1994

LOCATION: OHIO BELMONT COUNTY

EXCHANGE COORDS
E-15,600
N-76,900

STATE PLANE COORDS

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE
CASING	20.00	20.00
WEATHERED BROWN SANDSTONE	4.00	24.00
BROWN SANDY SHALE	1.50	25.50
BROWN FIRE CLAY	0.50	26.00
BROWN SANDY SHALE	1.00	27.00
BROWN SHALY FIRE CLAY	13.00	40.00
RED AND GRAY SHALY FIRE CLAY	5.00	45.00
RED AND GRAY FIRE CLAY	3.00	48.00
GRAY SANDY SHALE	6.00	54.00
GRAY SHALY FIRE CLAY	6.00	60.00
RED AND GRAY SHALE	10.00	70.00
GRAY SHALE	5.00	75.00
RED AND GREEN SHALE	3.00	78.00
GRAY SHALE	2.00	80.00
GRAY SANDY SHALE	3.00	83.00
GRAY SHALE	9.00	92.00
GRAY LIMY SANDY SHALE	2.50	94.50
GRAY SHALE	3.00	97.50
RED SANDY SHALE	2.00	99.50
RED SHALE	5.50	105.00
GRAY SHALE	5.00	110.00
GRAY SANDY SHALE	1.00	111.00
GRAY SHALE	14.70	125.70
GRAY LIMY SHALE	2.50	128.20
GRAY LIMESTONE	0.80	129.00
GRAY SHALE	1.00	130.00

TOVCC 11297

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-12

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE
		130.00
GRAY LIMESTONE	3.00	133.00
GRAY SHALE	7.00	140.00
GRAY SANDY SHALE	1.00	141.00
GRAY SANDSTONE	9.00	150.00
GRAY LIMY SHALE	10.00	160.00
DARK GRAY SHALE	20.00	180.00
BLACK SHALE	4.00	184.00
GRAY LIMY SHALE	7.00	191.00
GREENISH GRAY SHALE	30.50	221.50
RED SHALE	1.80	223.30
DARK GRAY SHALE	4.30	227.60
RED SHALE	1.40	229.00
GRAY SHALE	16.50	245.50
GRAY SANDY SHALE	2.00	247.50
GRAY SHALE	12.00	259.50
GRAY SANDSTONE	8.60	268.10
GRAY SANDY SHALE	4.50	272.60
GRAY SHALE	2.00	274.60
BLACK SHALE	1.50	276.10
COAL	2.85	278.95
BLACK SHALE	0.15	279.10
COAL	0.10	279.20
BLACK SHALE	0.10	279.30
GRAY SHALE	7.40	286.70
GRAY SANDY SHALE	4.30	291.00
GRAY SHALE	21.00	312.00
DARK GRAY SHALE	9.20	321.20
COAL	1.80	323.00
DARK GRAY SHALE	0.30	323.30
COAL	0.50	323.80
GRAY SHALE	16.20	340.00
GRAY SANDSTONE	10.00	350.00
GRAY LIMESTONE	1.60	351.60
GRAY LIMY SHALE	1.50	353.10
GRAY LIMESTONE	8.90	362.00
GRAY SHALE WITH LIME	13.20	375.20
GRAY LIMESTONE	1.20	376.40
GRAY LIMY SHALE	6.40	382.80
GRAY LIMY SANDY SHALE	5.20	388.00
GRAY SHALE WITH LIME	5.00	393.00
GRAY LIMESTONE	5.00	398.00
GRAY SHALE WITH LIME	3.00	401.00
GRAY LIMESTONE	3.00	404.00
GREEN LIMY SHALE	6.00	410.00
GRAY LIMESTONE	3.00	413.00
GRAY SHALE WITH LIME	3.50	416.50
GREEN SHALE WITH LIME	4.50	421.00
GRAY LIMY SHALE	3.40	424.40

TOVCC 11298

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-12

FORMATION	STRATA THICKNESS	424.40 DEPTH FROM SURFACE
GRAY LIMESTONE	1.60	426.00
GRAY SHALE WITH LIME	4.00	430.00
GRAY SHALE	4.70	434.70
COAL	2.45	437.15
BONY COAL	1.85	439.00
GRAY SHALE	3.00	442.00
GRAY LIMY SHALE	3.40	445.40
GRAY SHALE	12.60	458.00
GREEN SHALY FIRE CLAY	2.00	460.00
DARK GRAY SHALE	1.50	461.50
GRAY LIMESTONE	14.30	475.80
GREENISH GRAY SHALE	1.70	477.50
GRAY LIMESTONE	8.50	486.00
GREEN SHALE	5.00	491.00
GRAY LIMESTONE	2.00	493.00
GREEN SHALE	1.00	494.00
GRAY SHALE	6.00	500.00
GRAY LIMESTONE	11.10	511.10
GRAY SHALE WITH LIME	4.90	516.00
GRAY SHALE	4.20	520.20
BLACK SHALE	0.20	520.40
COAL	0.80	521.20
BLACK SHALE	0.10	521.30
COAL	0.10	521.40
GRAY SHALE	1.05	522.45
COAL	5.25	527.70
GRAY SHALE	1.30	529.00
GRAY LIMY SHALE	1.70	530.70
GRAY SHALE	1.30	532.00
GRAY LIMESTONE	0.60	532.60
GRAY SHALE WITH LIME	5.40	538.00
GRAY SANDSTONE	1.00	539.00
GRAY SHALE	11.00	550.00

TOTAL DEPTH OF HOLE = 550.00 FEET

25 BAGS CEMENT PLACED IN HOLE

TOVCC 11299

ATTACHMENT 13

DIAMOND DRILL HOLE: N97-02

ENGINEER: W. J. SIPLIVY, PE, CPG
ELEVATION: 1304.86
STATE PLANE COORDINATES: E 2,420,421 N 731,278

DRILLER: L. J. Hughes & Sons, Inc., Dale Jarvis

TOWNSHIP: Smith
SECTION: SE ¼ Sec 34
COUNTY: Belmont

SURFACE OWNER: Simpson
DATE STARTED: 13 March 1997
DATE COMPLETED: 14 March 1997

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
20.00	20.00	Non-coring		
3.00	23.00	Shale, brown, sandy w/ Fe-stained joints	yes	CM, EM
0.30	23.30	Sandstone, l. gray w/Fe-stained joint	yes	CS, ES
4.40	27.70	Shale, brown, sandy w/ Fe-stained joints	yes	CM, EM
1.35	29.05	Sandstone, l. gray w/Fe-stained joints	yes	CS, ES
2.55	31.60	Shale, m-dk. gray w/Fe-stains	yes	CM, EM
0.60	32.20	Limestone, l. gray w/Fe-stains	yes	AK, CS, ES
2.75	34.95	Claystone, m. gray, w/Ls nodules, Fe-stained	yes	AK, CV, EV
1.55	36.50	Claystone, red, Fe-stained	yes	CV, EV
9.50	46.00	Claystone, red-gray		CV, EV
5.80	51.80	Shale, m-dk. gray-brown w/Fe-stains	yes	CM, EM
3.20	55.00	Sandstone, l. gray, silty		CS, ES
2.70	57.70	Shale, m-dk. gray w/Fe-stains	yes	CM, EM
1.50	59.20	Sandstone, l. gray-brown w/Fe-stained joints	yes	CS, ES
6.40	65.60	Shale, m. gray		CM, EM
0.20	65.80	Shale, black, carbonaceous		AC, CM, EM
2.70	68.50	Claystone, m. gray, w/Ls nodules		CV, EV
1.50	70.00	Limestone, l. gray		AK, CS, ES
2.90	72.90	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.60	74.50	Limestone, l. gray		AK, CS, ES
4.30	78.80	Claystone, m. gray-green		CV, EV
4.20	83.00	Shale, m. gray & red		CM, EM
0.75	83.75	Limestone, l. gray		AK, CS, ES
0.60	84.35	Shale, m. gray		CM, EM
1.25	85.60	Limestone, l. gray		AK, CS, ES
4.20	89.80	Claystone, m. gray		CV, EV
1.50	91.30	Limestone, l. gray		AK, CS, ES
25.25	116.55	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.50	117.05	Limestone, l. gray		AK, CS, ES
3.35	120.40	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.70	122.10	Limestone, l. gray		AK, CS, ES
1.60	123.70	Claystone, m. gray		CV, EV
1.40	125.10	Limestone, l. gray		AK, CS, ES
6.10	131.20	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.60	131.80	Sandstone, l. gray, silty		CS, ES
12.00	143.80	Shale, m. gray		CM, EM
1.60	145.40	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
1.60	147.00	Claystone, m. gray		CV, EV
0.35	147.35	Limestone, l. gray		AK, CS, ES
1.10	148.45	Claystone, m. gray, w/Ls nodules		AK, CV, EV
3.05	151.50	Limestone, l. gray		AK, CS, ES
7.60	159.10	Claystone, m-dk gray		CV, EV
0.65	159.75	Shale, black w/thin coal ptgs.		AC, CM, EM
6.25	166.00	Shale, dk. gray-black		CM, EM
1.40	167.40	Sandstone, l. gray w/Sh ptgs.		CS, ES
1.80	169.20	Shale, dk. gray-black		CM, EM
0.08	169.28	**Coal**		AC, CM, EM
0.72	170.00	Claystone, m. gray		CV, EV
4.60	174.60	Shale, m. gray, silty		CM, EM
3.00	177.60	Claystone, m. gray		CV, EV
2.45	180.05	Shale, m. gray		CM, EM
0.83	180.88	Shale, black w/thin coal ptgs.		AC, CM, EM
19.32	200.20	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.85	201.05	Shale, m. gray, silty		CM, EM
2.95	204.00	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
3.40	207.40	Shale, m. gray, silty		CM, EM

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
6.60	214.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV
2.05	216.05	Shale, m. gray, silty		CM, EM
2.45	218.50	Sandstone, l. gray		CS, ES
1.50	220.00	Claystone, m. gray		CV, EV
0.55	220.55	Shale, m. gray		CM, EM
15.75	236.30	Claystone, m. gray, w/Ls nodules		AK, CV, EV
10.10	246.40	Shale, m. gray		CM, EM
0.45	246.85	Limestone, l. gray		AK, CS, ES
3.15	250.00	Claystone, m. gray		CV, EV
4.50	254.50	0.07 bone		0
2.05	256.55	Sandstone, l. gray, silty		CS, ES
4.45	261.00	Shale, m. gray w/occ. Ss ptgs.		CM, EM
1.90	262.90	Sandstone, l. gray		CS, ES
3.15	266.05	Shale, m-dk. gray		CM, EM
0.50	266.55	Shale, black, carbonaceous		AC, CM, EM
2.61	269.16	**Coal, WAYNESBURG No. 11**		AC, CM, EM
		0.35 coal		
		0.07 bone		
		1.17 coal		
		0.06 bone		
		0.73 coal		
		0.05 bone		
		0.18 coal		
		2.61 total seam thickness		
1.44	270.60	Claystone, dk. gray		CV, EV
0.07	270.67	**Coal**		AC, CM, EM
10.53	281.20	Claystone, m. gray, w/Ls nodules		AK, CV, EV
5.90	287.10	Shale, m. gray		CM, EM
6.40	293.50	Shale, m. gray w/occ. Ss ptgs.		CM, EM
5.70	299.20	Shale, m. gray		CM, EM
2.80	302.00	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
2.80	304.80	Shale, m. gray w/occ. thin Ss ptgs.		CM, EM
0.80	305.60	Sandstone, l. gray		CS, ES
6.25	311.85	Shale, m. gray w/occ. thin Ss ptgs.		CM, EM
2.00	313.85	**Coal, UNIONTOWN No. 10**		AC, CM, EM
		0.19 bone coal		
		0.63 coal w/bone ptgs.		
		0.09 bone		
		0.24 coal w/pyrite lense		
		0.10 shale		
		0.07 bone		
		0.58 coal		
		0.10 coal w/sh ptgs.		
		2.00 total seam thickness		
2.65	316.50	Claystone, dk. gray		CV, EV
0.80	317.30	Sandstone, l. gray, silty		CS, ES
10.20	327.50	Claystone, m. gray, w/Ls nodules		AK, CV, EV
4.30	331.80	Sandstone, l. gray		CS, ES
7.60	339.40	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.60	340.00	Limestone, l. gray		AK, CS, ES
3.10	343.10	Claystone, m. gray, w/Ls nodules		AK, CV, EV
3.90	347.00	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
2.10	349.10	Claystone, m. gray-green		CV, EV
1.90	351.00	Limestone, l. gray		AK, CS, ES
7.15	358.15	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.70	358.85	Limestone, l. gray		AK, CS, ES
1.85	360.70	Shale, m. gray, calc.		AK, CM, EM
2.45	363.15	Limestone, l. gray		AK, CS, ES
0.85	364.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.45	365.45	Limestone, l. gray, nodular		AK, CS, ES
14.75	380.20	Shale, m. gray-green, calc.		AK, CM, EM
0.70	380.90	Limestone, l. gray		AK, CS, ES
8.10	389.00	Shale, m. gray-green, calc.		AK, CM, EM
1.50	390.50	Limestone, l. gray		AK, CS, ES

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
0.90	391.40	Shale, m. gray-green, calc.		AK, CM, EM
0.85	392.25	Limestone, l. gray		AK, CS, ES
0.75	393.00	Shale, m. gray-green, calc.		AK, CM, EM
1.00	394.00	Limestone, l. gray		AK, CS, ES
3.85	397.85	Shale, m. gray-green wLs ptgs.		AK, CM, EM
2.15	400.00	Limestone, l. gray		AK, CS, ES
10.40	410.40	Shale, m. gray-green, calc.		AK, CM, EM
7.00	417.40	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.75	421.15	Claystone, m. gray		CV, EV
3.58	424.73	**Coal, SEWICKLEY No. 9**		AC, CM, EM
		0.13 bone		
		1.90 coal w/bone ptgs.		
		0.84 bone		
		0.63 coal		
		0.08 bone w/coal		
		3.58 total seam thickness		
1.07	425.80	Claystone, dk. gray		CV, EV
3.55	429.35	Shale, m. gray		CM, EM
0.50	429.85	Limestone, l. gray		AK, CS, ES
2.55	432.40	Shale, m. gray, calc.		AK, CM, EM
1.00	433.40	Limestone, l. gray		AK, CS, ES
1.00	434.40	Shale, m. gray, calc.		AK, CM, EM
9.10	443.50	Shale, m. gray w/occ. thin Ss ptg		CM, EM
0.70	444.20	Limestone, l. gray		AK, CS, ES
0.70	444.90	Claystone, m. gray		CV, EV
0.60	445.50	Limestone, l. gray		AK, CS, ES
1.30	446.80	Claystone, dk. gray		CV, EV
0.50	447.30	Shale, black, carbonaceous		AC, CM, EM
0.85	448.15	Shale, m. gray, calc.		AK, CM, EM
8.55	456.70	Limestone, m. gray, silty, hard		AK, CS, ES
3.30	460.00	Flintclay, gray-tan, hard		CM,EM
3.20	463.20	Shale, m. gray-green		CM, EM
3.60	466.80	Limestone, l. gray		AK, CS, ES
1.10	467.90	Claystone, green		CV, EV
4.70	472.60	Limestone, l. gray		AK, CS, ES
4.40	477.00	Claystone, green		CV, EV
1.90	478.90	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
2.80	481.70	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.55	482.25	Shale, black, carbonaceous		AC, CM, EM
1.75	484.00	Claystone, m. gray		CV, EV
3.00	487.00	Limestone, l. gray		AK, CS, ES
1.10	488.10	Shale, m. gray		CM, EM
1.90	490.00	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.10	493.10	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.70	494.80	Limestone, l. gray		AK, CS, ES
9.50	504.30	Claystone, m. gray		CV, EV
0.16	504.46	Claystone, dk. gray, carbonaceous		AC, CV, EV
1.49	505.95	**Coal, ROOF COAL**		AC, CM, EM
	505.95	0.19 coal		
	505.95	0.17 shale		
	505.95	0.95 coal		
		0.11 shale w/coal		
		0.07 coal		
		1.49 total seam thickness		
0.85	506.80	Claystone, m. gray		CV, EV
5.06	511.86	**Coal, PITTSBURGH No. 8**		AC, CM, EM
		0.15 bone		
		2.16 coal		
		0.04 bone		
		2.46 coal		
		0.25 coal w/bone ptgs.		
		5.06 total seam thickness		
0.39	512.25	Shale, dk. gray		CM, EM
0.45	512.70	Limestone, m. gray		AK, CS, ES

DIAMOND DRILL HOLE: N97-02

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
0.60	513.30	Claystone, m. gray		CV, EV
0.30	513.60	Limestone, m. gray		AK, CS, ES
0.15	513.75	Claystone, m. gray		CV, EV
0.55	514.30	Limestone, m. gray		AK, CS, ES
0.75	515.05	Claystone, m. gray		CV, EV
1.00	516.05	Limestone, m. gray		AK, CS, ES
0.55	516.60	Claystone, m. gray		CV, EV
1.50	518.10	Limestone, m. gray		AK, CS, ES
1.90	520.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV

Amount of hard and soft rock overlying Pittsburgh No. 8 coalbed:

1. Hard rock: 95.7 feet or 18.97%
2. Soft rock: 408.76 feet or 81.02%

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 coalbed

Stratum	Neutralization Potential (/1000 tons)	Total Sulphur %	Pyritic Sulphur %	Potential Acidity Mg/l as CaCO3	CaCO3 Deficiency (/1000 tons)
Roof	86.00	3.16	1.15	98.70	12.68
Coal	6.30	4.40	2.07	137.00	131.00
Bottom	551.00	3.00	2.12	93.70	-458.00

Physical Properties Legend

AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

ATTACHMENT 13

DIAMOND DRILL HOLE: N97-04

ENGINEER: W. J. SIPLIVY, PE, CPG
ELEVATION: 1263.91
STATE PLANE COORDINATES: E 2,419,235.717 N 722,776.067

DRILLER: L. J. Hughes & Sons Inc., Dale Jarvis

TOWNSHIP: Smith
SECTION: Sec 1/4 33
COUNTY: Belmont

SURFACE OWNER: Corbett
DATE STARTED: 19 March 1997
DATE COMPLETED: 24 March 1997

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
20.00	20.00	Non-coring		
1.00	21.00	Shale, red-gray, Fe-stained	yes	CM, EM
0.20	21.20	Limestone, m. gray		AK, CS, ES
28.80	50.00	Claystone, red-gray, Fe-stained joints	yes	CV, EV
3.50	53.50	Claystone, m. gray, Fe-stained joints	yes	CV, EV
1.20	54.70	Limestone, l. gray		AK, CS, ES
4.00	58.70	Claystone, m. gray w/Ls nods.		AK,CV, EV
2.70	61.40	Limestone, l. gray, nodular w/Fe-stains	yes	AK, CS, ES
4.10	65.50	Claystone, m. gray, Fe-stained joints	yes	CV, EV
0.20	65.70	Limestone, l. gray, nodular w/Fe-stains	yes	AK, CS, ES
0.50	66.20	Shale, m. gray, calc., hard		AK, CS, ES
0.35	66.55	Claystone, brown, Fe-stained	yes	CV, EV
1.95	68.50	Limestone, l. gray, w/Fe-stained joints	yes	AK, CS, ES
2.60	71.10	Claystone, m. gray, Fe-stained joints	yes	CV, EV
7.50	78.60	Claystone, red w/Fe-stained joints	yes	CV, EV
0.50	79.10	Limestone, l. gray, w/Fe-stained joints	yes	AK, CS, ES
4.30	83.40	Shale, m. gray, w/Fe-stains @ base	yes	CM, EM
0.30	83.70	Sandstone, l. gray w/Fe-stains	yes	CS, ES
16.30	100.00	Claystone, m. gray, Fe-stains upper 1.6'	yes	CV, EV
3.00	103.00	Shale, m. gray		CM, EM
0.90	103.90	Limestone, l. gray		AK, CS, ES
6.10	110.00	Shale, m. gray w/Ls nodules		AK,CM, EM
4.10	114.10	Claystone, m. gray, w/Ls nodules		CV, EV
3.90	118.00	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
2.00	120.00	Shale, m. gray w/Ls nodules		AK,CM, EM
0.60	120.60	Claystone, m. gray		CV, EV
3.00	123.60	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
0.65	124.25	Claystone, m. gray		CV, EV
0.35	124.60	Limestone, l. gray		AK, CS, ES
4.00	128.60	Claystone, m. gray, w/Ls nodules		AK,CV, EV
0.90	129.50	Limestone, l. gray		AK, CS, ES
6.65	136.15	Claystone, m. gray, w/Ls nodules		AK,CV, EV
1.45	137.60	Limestone, l. gray		AK, CS, ES
1.35	138.95	Claystone, m. gray, w/Ls nodules		AK,CV, EV
0.30	139.25	Limestone, l. gray		AK, CS, ES
1.35	140.60	Shale, m. gray, silty		CM, EM
0.55	141.15	Limestone, m. gray, silty		AK, CS, ES
6.05	147.20	Claystone, m. gray, w/Ls nodules		AK,CV, EV
3.50	150.70	Shale, m. gray, silty		CM, EM
6.70	157.40	Claystone, m. gray, black bottom 1.4'		CV, EV
3.58	160.98	Coal, WASHINGTON No. 12		AC, CM, EM
		0.19 bone		
		0.61 coal		
		0.12 bone		
		1.20 coal		
		0.05 bone		
		0.27 coal		
		0.10 bone		
		1.04 coal w/bone		
		3.58 total seam thickness		
0.52	161.50	Shale, m. gray, silty		CM, EM
2.05	163.55	Shale, m. gray, w/ thin Ss ptgs.		CM, EM
12.35	175.90	Shale, black		CM, EM
1.42	177.32	Coal, bony upper 0.24'		AC, CM, EM
1.03	178.35	Shale, dk. gray		CM, ,EM
0.55	178.90	Sandstone, l. gray w/Sh ptgs.		CS, ES

DIAMOND DRILL HOLE: N97-94

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
5.10	184.00	Shale, dk. gray, silty		CM, EM
2.00	186.00	Sandstone, l. gray w/thin coal ptgs.		CS, ES
1.80	187.80	Shale, m. gray, silty		CM, EM
1.95	189.75	Sandstone, l. gray w/Sh ptgs.		CS, ES
0.85	190.60	Shale, m. gray w/Ss ptgs.		CM, EM
16.80	207.40	Sandstone, l. gray w/occ. thin Sh ptgs.		CS, ES
0.40	207.80	Claystone, m. gray		CV, EV
0.95	208.75	Sandstone, l. gray		CS, ES
1.05	209.80	Claystone, m. gray		CV, EV
4.50	214.30	Sandstone, l. gray		CS, ES
4.60	218.90	Shale, m. gray		CM, EM
1.40	220.30	Claystone, m. gray		CV, EV
1.05	221.35	Limestone, m. gray, silty		AK, CS, ES
7.15	228.50	Shale, m. gray w/Ls nodules		AK,CM, EM
1.40	229.90	Claystone, dk. gray		CV, EV
4.20	234.10	Shale, m. gray, silty		CM, EM
8.15	242.25	Shale, m. gray w/occ. Ss ptgs.		CM, EM
1.86	244.10	Coal, WAYNESBURG No. 11		AC, CM, EM
		0.95 bone coal		
		0.03 bone		
		0.58 coal		
		0.06 bone		
		0.23 bone coal		
		1.85 total seam thickness		
5.50	249.60	Shale, m. gray		CM, EM
0.20	249.80	Bone coal		AC, CM, EM
11.80	261.60	Claystone, m. gray, grades sandy		CV, EV
29.50	291.10	Sandstone, l. gray w/occ. thin Sh ptgs.		CS, ES
3.00	294.10	Shale, m. gray		CM, EM
1.81	295.91	Coal, UNIONTOWN No. 10		AC, CM, EM
		1.16 coal		
		0.25 shale		
		0.05 bone		
		0.35 bone coal		
		1.81 total seam thickness		
1.99	297.90	Shale, dk. gray		CM, EM
0.65	298.55	Sandstone, l. gray		CS, ES
6.85	305.40	Shale, m. gray		CM, EM
0.55	305.95	Shale, dk. gray-black		CM, EM
7.10	313.05	Claystone, m. gray, w/Ls nodules		AK,CV, EV
5.90	318.95	Sandstone, l. gray w/occ. thin Sh ptgs.		CS, ES
2.60	321.55	Shale, m. gray, silty		CM; EM
0.45	322.00	Limestone, m. gray, silty		AK, CS, ES
1.10	323.10	Claystone, m. gray		CV, EV
2.50	325.60	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.80	329.40	Shale, m. gray, calc.		AK,CM,EM
4.90	334.30	Limestone, m. gray, silty		AK, CS, ES
0.80	335.10	Claystone, m. gray		CV, EV
1.35	336.45	Limestone, m. gray, silty		AK, CS, ES
2.15	338.60	Shale, m. gray		CM, EM
1.40	340.00	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.75	343.75	Claystone, m. gray-green w/Ls nodules		AK,CV, EV
0.75	344.50	Limestone, l. gray		AK, CS, ES
1.40	345.90	Claystone, m. gray		CV, EV
0.50	346.40	Limestone, l. gray		AK, CS, ES
1.90	348.30	Shale, m. gray, calc.		AK,CM,EM
1.10	349.40	Limestone, l. gray		AK, CS, ES
0.50	349.90	Shale, m. gray, calc.		AK,CM,EM
6.35	356.25	Claystone, m. gray-green w/Ls nodules		AK,CV, EV
11.40	367.65	Shale, m. gray, calc.		AK,CM,EM
1.20	368.85	Limestone, l. gray		AK, CS, ES
6.95	375.80	Shale, m. gray w/Ls ptgs.		AK,CM,EM
2.10	377.90	Limestone, l. gray		AK, CS, ES
0.90	378.80	Shale, m. gray -green		CM, EM
0.90	379.70	Limestone, l. gray		AK, CS, ES
1.80	381.50	Shale, m. gray -green		CM, EM
1.50	383.00	Limestone, l. gray		AK, CS, ES

DIAMOND DRILL HOLE: N97-04

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
1.70	384.70	Shale, m. gray		CM, EM
3.20	387.90	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
11.40	399.30	Shale, m. gray, calc.		AK,CM,EM
7.30	406.60	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.10	409.70	Claystone, dk. gray w/Ls nodules		AK,CV, EV
3.76	413.46	Coal, SEWECKLEY No. 8		AC, CM, EM
		0.08 coal		
		0.15 bone coal		
		1.97 coal		
		0.14 shale		
		1.42 coal w/pyrite lenses		
		3.76 total seam thickness		
1.74	415.20	Shale, m. gray , grades sandy		CM, EM
0.20	415.40	Sandstone, l. gray		CS, ES
8.10	423.50	Shale, m. gray, calc.		AK,CM,EM
0.50	424.00	Limestone, l. gray		AK, CS, ES
7.50	431.50	Shale, dk. gray w/occ. thin Ss ptgs.		CM, EM
7.10	438.60	Claystone, m. gray w/Ls nodules		AK,CV, EV
6.20	444.80	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.00	447.80	Shale, m. gray, calc.		AK,CM,EM
1.50	449.30	Limestone, l. gray		AK, CS, ES
1.80	451.10	Shale, m. gray		CM, EM
4.10	455.20	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
0.60	455.80	Claystone, m. gray		CV, EV
4.20	460.00	Limestone, l. gray		AK, CS, ES
4.20	464.20	Shale, m. gray w/Ls nodules		AK,CM,EM
1.30	465.50	Limestone, l. gray		AK, CS, ES
3.40	468.90	Claystone, dk. gray		CV, EV
0.35	469.25	Shale, black, carbonaceous		AC, CM, EM
3.85	473.10	Claystone, dk. gray		CV, EV
1.40	474.50	Limestone, l. gray		AK, CS, ES
0.25	474.75	Claystone, dk. gray		CV, EV
1.15	475.90	Limestone, l. gray		AK, CS, ES
1.00	476.90	Claystone, dk. gray		CV, EV
7.30	484.20	Limestone, l. gray		AK, CS, ES
1.20	485.40	Claystone, m. gray		CV, EV
0.45	485.85	Limestone, l. gray, nodular		AK, CS, ES
5.80	491.65	Claystone, m. gray w/Ls nodules		AK,CV, EV
0.55	492.20	Limestone, l. gray, nodular		AK, CS, ES
3.60	495.80	Claystone, dk. gray		CV, EV
0.25	496.05	Shale, black, carbonaceous		AC, CM, EM
0.70	496.75	Claystone, m. gray		CV, EV
6.32	502.07	Coal, PITTSBURGH No. 8		AC, CM, EM
		0.08 bone coal		
		1.99 coal		
		0.06 shale		
		0.35 coal		
		0.04 shale		
		1.56 coal		
		0.03 bone		
		1.21 coal, bottom 0.3' bony w/pyrite		
		5.32 total seam thickness		
0.33	502.40	Shale, black		AC, CM, EM
1.00	503.40	Claystone, m. gray		CV, EV
1.00	504.40	Limestone, l. gray		AK, CS, ES
5.60	510.00	Claystone, m. gray w/Ls nodules		AK,CV, EV

Amount of hard and soft rock overlying Pittsburgh No. 8 coalbed:

1. Hard rock: 140.05 feet or 28.19%
2. Soft rock: 356.70 feet or 71.81%

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 coalbed

Stratum	Neutralization Potential (/1000 tons)	Total Sulphur %	Pyritic Sulphur %	Potential Acidity Mg/l as CaCO3	CaCO3 Deficiency (/1000 tons)
Roof	6.62	2.10	1.78	65.60	59.00
Coal	3.85	4.97	3.04	155.00	151.00
Bottom	365.00	1.88	1.78	58.70	-307.00

Physical Properties Legend

AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

ATTACHMENT 13

DIAMOND DRILL HOLE: N97-05

ENGINEER: W. J. SIPLIVY, PE, CPG
ELEVATION: 1297.64
STATE PLANE COORDINATES: E 2,422,974 N 724,867

DRILLER: L. J. Hughes & Sons, Inc., Jim Hamrick

TOWNSHIP: Smith
SECTION: 33, SE ¼
COUNTY: Belmont

SURFACE OWNER: Saunders
DATE STARTED: 20 March 1997
DATE COMPLETED: 26 March 1997

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
20.00	20.00	Non-coring		
1.20	21.20	Shale, brown-red w/ Fe-stained joints	yes	CM, EM
0.15	21.35	Limestone, l. gray w/Fe-stains	yes	AK, CS, ES
2.65	24.00	Claystone, red, Fe-stained	yes	CV, EV
1.60	25.60	Shale, m. gray-brown w/Fe-stains	yes	CM, EM
1.50	27.10	Sandstone, l. gray-brown w/Fe-stained joints	yes	CS, ES
12.90	40.00	Claystone, red, 12.6' lost		CV, EV
2.00	42.00	Limestone, l. gray, silty		AK, CS, ES
6.50	48.50	Claystone, m. gray w/Ls nods, Fe-stained	yes	AK, CV, EV
2.10	50.60	Claystone, brown-gray w/ Fe-stains	yes	CV, EV
2.30	52.90	Shale, m. gray-brown w/Fe-stains	yes	CM, EM
2.70	55.60	Sandstone, l. gray, silty		CS, ES
1.30	56.90	Shale, m. gray, sandy w/Fe-stains	yes	CM, EM
1.00	57.90	Claystone, m. gray		CV, EV
6.10	64.00	Shale, m. gray-brown w/Fe-stains	yes	CM, EM
2.25	66.25	Limestone, l. gray w/Fe-stains	yes	AK, CS, ES
2.05	68.30	Claystone, m. gray, w/Ls nodules		AK, CV, EV
6.00	74.30	Shale, m. gray w/Fe-stained joints	yes	CM, EM
2.35	76.65	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.50	80.15	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.75	80.90	Limestone, l. gray, nodular		AK, CS, ES
4.10	85.00	Claystone, dk. gray		CV, EV
3.00	88.00	Claystone, olive & red		CV, EV
15.00	103.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV
3.80	106.80	Shale, m. gray, sandy		CM, EM
4.20	111.00	Shale, m. gray		CM, EM
2.50	113.50	Claystone, m. gray		CV, EV
0.80	114.30	Limestone, l. gray		AK, CS, ES
4.00	118.30	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.50	118.80	Limestone, l. gray		AK, CS, ES
17.40	136.20	Claystone, m. gray, w/occ. Ls nodules		AK, CV, EV
2.60	138.80	Shale, m. gray, sandy		CM, EM
8.80	147.60	Claystone, m. gray		CV, EV
1.40	149.00	Limestone, l. gray, silty		AK, CS, ES
1.20	150.20	Claystone, m. gray		CV, EV
3.25	153.45	Claystone, m. gray, w/occ. Ls nodules		AK, CV, EV
3.65	157.10	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
1.80	158.90	Claystone, m. gray		CV, EV
1.70	160.60	Limestone, l. gray		AK, CS, ES
9.40	170.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV
10.05	180.05	Shale, m. gray		CM, EM
3.10	183.15	Claystone, m-dk gray		CV, EV
2.35	185.50	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.45	186.95	Limestone, l. gray, silty		AK, CS, ES
8.80	195.75	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.35	196.10	Shale, dk. gray-black		CM, EM
1.45	197.55	**Coal, WASHINGTON No. 12**		AC, CM, EM
		0.30 bone coal		
		0.11 shale		
		1.04 coal		
		1.45 total seam thickness		
1.25	198.80	Shale, black w/thin coal ptgs.		AC, CM, EM
0.80	199.60	Claystone, dk. gray		CV, EV
0.40	200.00	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
3.65	203.65	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
2.00	205.65	Shale, black w/thin coal ptgs.		AC, CM, EM

DIAMOND DRILL HOLE: N97-05

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
4.65	210.30	Shale, dk. gray-black		CM, EM
0.10	210.40	**Coal**		C, CM, EM
0.20	210.60	Shale, black w/thin coal ptgs.		AC, CM, EM
0.20	210.80	**Coal**		C, CM, EM
7.60	218.40	Claystone, m. gray		CV, EV
0.90	219.30	Limestone, l. gray, nodular		AK, CS, ES
11.70	231.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV
12.45	243.45	Shale, m. gray, grades sandy		CM, EM
1.25	244.70	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
5.30	250.00	Shale, m. gray		CM, EM
0.50	250.50	Shale, black, carbonaceous		AC, CM, EM
10.65	261.15	Claystone, m. gray, w/occ. Ls nodules		AK, CV, EV
5.15	266.30	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
0.90	267.20	Claystone, m. gray		CV, EV
9.40	276.60	Shale, m. gray, silty		CM, EM
0.50	277.10	Limestone, l. gray, nodular		AK, CS, ES
8.90	286.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV
3.10	289.10	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
5.30	294.40	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
0.95	295.35	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
1.70	297.05	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
1.85	298.90	Sandstone, l. gray w/thin Sh ptgs.		CS, ES
1.90	300.80	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
1.30	302.10	Claystone, m. gray		CV, EV
2.30	304.40	**Coal, WAYNESBURG No. 11**		C, CM, EM
		0.34 bone coal		
		0.91 coal		
		0.09 shale		
		0.77 coal w/gypsum on cleats		
		0.19 bone coal w/pyrite		
		2.30 total seam thickness		
3.00	307.40	Shale, dk. gray		CM, EM
11.85	319.25	Claystone, dk. gray		CV, EV
4.05	323.30	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.80	325.10	Sandstone, l. gray, silty		CS, ES
9.50	334.60	Shale, m. gray, silty		CM, EM
5.40	340.00	Claystone, dk. gray		CV, EV
10.00	350.00	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
11.15	361.15	Claystone, m. gray, w/Ls nodules		AK, CV, EV
2.60	363.75	Sandstone, l. gray		CS, ES
6.45	370.20	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
4.80	375.00	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
0.65	375.65	Claystone, m. gray		CV, EV
1.35	377.00	Limestone, l. gray		AK, CS, ES
1.00	378.00	Claystone, dk. gray		CV, EV
4.20	382.20	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
1.60	383.80	Claystone, m. gray		CV, EV
7.50	391.30	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.70	392.00	Limestone, l. gray		AK, CS, ES
3.30	395.30	Claystone, m. gray, w/Ls nodules		AK, CV, EV
1.70	397.00	Limestone, l. gray		AK, CS, ES
1.45	398.45	Claystone, m. gray		CV, EV
1.95	400.40	Limestone, l. gray, silty, nodular		AK, CS, ES
11.85	412.25	Shale, m. gray-green, silty		CM, EM
2.00	414.25	Claystone, m. gray		CV, EV
6.75	421.00	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
2.10	423.10	Shale, m. gray, calc.		AK, CM, EM
2.40	425.50	Limestone, l. gray, silty		AK, CS, ES
0.85	426.35	Shale, m. gray		CM, EM
0.85	427.20	Limestone, l. gray, nodular		AK, CS, ES
2.25	429.45	Claystone, green		CV, EV
1.05	430.50	Limestone, l. gray		AK, CS, ES
0.55	431.05	Shale, m. gray-green, calc.		AK, CM, EM
4.75	435.80	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES

DIAMOND DRILL HOLE: N97-05

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
11.40	447.20	Shale, m. gray-green, calc.		AK, CM, EM
4.80	452.00	Limestone, l. gray		AK, CS, ES
1.70	453.70	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
3.85	457.55	Shale, dk. gray-black		CM, EM
3.92	461.47	**Coal, SEWICKLEY No. 9**		AK, CM, EM
		1.94 coal w/bone ptgs.		
		0.55 shale		
		1.05 bone coal		
		0.08 bone		
		0.04 coal		
		0.20 shale		
		0.06 coal		
		3.92 total seam thickness		
0.33	461.80	Shale, black, carbonaceous		AC, CM, EM
1.80	463.60	Claystone, m. gray		CV, EV
5.80	469.40	Shale, m. gray		CM, EM
2.30	471.70	Limestone, l. gray		AK, CS, ES
8.90	480.60	Shale, m. gray w/ occ. thin Ss ptgs.		CM, EM
1.85	482.45	Limestone, l. gray, silty		AK, CS, ES
2.15	484.60	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.60	485.20	Shale, black, carbonaceous		AC, CM, EM
5.25	490.45	Limestone, l. gray, silty		AK, CS, ES
0.45	490.90	Shale, m. gray-green		CM, EM
2.80	493.70	Limestone, l. gray w/ Cs ptgs.		AK, CS, ES
0.80	494.50	Shale, m. gray-green		CM, EM
3.40	497.90	Limestone, l. gray, silty		AK, CS, ES
0.40	498.30	Shale, m. gray		CM, EM
0.75	499.05	Limestone, l. gray, silty		AK, CS, ES
0.95	500.00	Shale, m. gray, calc.		AK, CM, EM
3.70	503.70	Limestone, l. gray w/occ. Cs ptgs.		AK, CS, ES
3.15	506.85	Flintclay, gray-tan, hard		CM,EM
1.25	508.10	Limestone, l. gray		AK, CS, ES
0.90	509.00	Shale, m. gray-green		CM, EM
1.10	510.10	Limestone, l. gray		AK, CS, ES
3.20	513.30	Shale, m. gray-green		CM, EM
0.35	513.65	Limestone, l. gray		AK, CS, ES
0.35	514.00	Claystone, m. gray		CV, EV
0.80	514.80	Limestone, l. gray		AK, CS, ES
3.20	518.00	Claystone, m. gray-green		CV, EV
0.70	518.70	Shale, black w/thin coal ptgs.		AC, CM, EM
1.60	520.30	Shale, m. gray		CM, EM
2.10	522.40	Limestone, l. gray, silty		AK, CS, ES
0.70	523.10	Claystone, m. gray		CV, EV
8.55	531.65	Limestone, l. gray w/occ. Cs ptgs.		AK, CS, ES
3.15	534.80	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.65	535.45	Limestone, l. gray		AK, CS, ES
3.25	538.70	Claystone, m. gray		CV, EV
0.10	538.80	Shale, black, carbonaceous		AC, CM, EM
1.30	540.10	Claystone, m. gray, w/Ls nodules		AK, CV, EV
0.58	540.68	Shale, dk. gray		CM, EM
0.87	541.55	**Coal, ROOF COAL**		AC, CM, EM
		0.87 coal w/bone ptgs.		
		0.87 total seam thickness		
0.85	542.40	Claystone, m. gray		CV, EV
5.04	547.44	**Coal, PITTSBURGH No. 8**		AC, CM, EM
		0.11 bone w/coal		
		1.94 coal		
		0.02 shale		
		2.78 coal		
		0.19 bone w/coal		
		5.04 total seam thickness		
0.76	548.20	Shale, dk. gray, hard		CM, EM
0.30	548.50	Limestone, m. gray		AK, CS, ES

DIAMOND DRILL HOLE: N97-05

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
0.50	549.00	Shale, dk. gray, hard		CM, EM
0.20	549.20	Limestone, m. gray		AK, CS, ES
0.40	549.60	Shale, dk. gray, hard		CM, EM
1.30	550.90	Limestone, m. gray		AK, CS, ES
4.10	555.00	Claystone, m. gray, w/Ls nodules		AK, CV, EV

Amount of hard and soft rock overlying Pittsburgh No. 8 coalbed:

1. Hard rock: 106.85 feet or 19.70%
2. Soft rock: 435.55 feet or 80.30%

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 coalbed

Stratum	Neutralization Potential (/1000 tons)	Total Sulphur %	Pyritic Sulphur %	Potential Acidity Mg/l as CaCO3	CaCO3 Deficiency (/1000 tons)
Roof	13.80	1.75	1.49	40.90	32.70
Coal	2.49	5.40	2.84	166.00	86.20
Bottom	515.00	1.72	1.61	-461.00	-464.00

Physical Properties Legend

AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

ATTACHMENT 13

DIAMOND DRILL HOLE: N98-12

ENGINEER: Kim Cecil
ELEVATION: 1310.13
STATE PLANE COORDINATES (1927): N 722,252.87 E 2,421,961.06

DRILLER: L. J. Hughes & Sons Inc., Dan Hamrick

TOWNSHIP: Smith
SECTION: 32, NE 1/4
COUNTY: Belmont

SURFACE OWNER: OVCC
DATE STARTED: 11 February 1998
DATE COMPLETED: 17 February 1998

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties	Thickness of Hard Rock (feet)
25.00	25.00	Non-coring			
15.00	40.00	Shale, brown & green, Fe-stained 27' - 30'	yes	CM, EM	
2.20	42.20	Claystone, m. gray		CV, EV	
4.00	46.20	Sandstone, gray & brown		CS, ES	4.00
2.90	49.10	Shale, m. gray		CM, EM	
5.30	54.40	Limestone, l. gray, Fe-stained 53' - 54'	yes	AK, CS, ES	5.30
5.00	59.40	Claystone, m. gray		CV, EV	
6.30	65.70	Shale, green, calcareous		AK, CM, EM	
4.30	70.00	Shale, brown, broken, fe-stained 68' - 69'	yes	CM, EM	
15.90	85.90	Shale, green		CM, EM	
4.10	90.00	Limestone, l. gray		AK, CS, ES	4.10
2.40	92.40	Claystone, m. gray		CV, EV	
1.00	93.40	Limestone, l. gray		AK, CS, ES	1.00
4.80	98.20	Claystone, m. gray		CV, EV	
7.50	105.70	Shale, green		CM, EM	
7.00	112.70	Shale, green, calcareous		AK, CM, EM	
5.00	117.70	Sandstone, m. gray		CS, ES	5.00
4.30	122.00	Shale, m. gray		CM, EM	
8.00	130.00	Limestone, l. gray		AK, CS, ES	8.00
10.00	140.00	Shale, green, calcareous		AK, CM, EM	
21.40	161.40	Shale, green		CM, EM	
14.00	175.40	Limestone, l. gray		AK, CS, ES	14.00
4.60	180.00	Shale, green, calcareous		AK, CM, EM	
15.00	195.00	Shale, green		CM, EM	
1.50	196.50	Limestone, l. gray		AK, CS, ES	1.50
3.50	200.00	Shale, m. gray		CM, EM	
6.20	206.20	Claystone, m. gray		CV, EV	
0.50	206.70	Shale, black		AC, CM, EM	
1.70	208.40	**Coal, WASHINGTON No. 12, bony**		AC, CM, EM	
5.50	213.90	Shale, dk. gray, sandy		AC, CM, EM	
7.50	221.40	Shale, black		AC, CM, EM	
0.70	222.10	Limestone, l. gray		AK, CS, ES	0.70
9.50	231.60	Shale, gray, calcareous		AK, CM, EM	
14.60	246.20	Shale, green, calcareous		AK, CM, EM	
2.40	248.60	Shale, green & red		CM, EM	
11.40	260.00	Shale, green		CM, EM	
1.70	261.70	Claystone, m. gray		CV, EV	
0.90	262.60	Shale, dk. gray		AK, CS, ES	
5.00	267.60	Shale, green & red		CM, EM	
12.40	280.00	Shale, green, calcareous		AK, CM, EM	
24.70	304.70	Shale, m. gray		CM, EM	
1.30	306.00	Claystone, m. gray		CV, EV	
6.60	312.60	Shale, m. gray		CM, EM	
0.80	313.40	Shale,dk gray		AC, CM, EM	
0.80	314.20	**Coal, WAYNESBURG No. 11**		AC, CM, EM	
5.80	320.00	Shale, m. gray		CM, EM	
20.00	340.00	Shale, green		CM, EM	
17.00	357.00	Shale, m. gray, sandy		CM, EM	
2.90	359.90	Sandstone, m. gray		CS, ES	2.90
0.55	360.45	Shale, m. gray		CM, EM	

DIAMOND DRILL HOLE: N98-12 (continued)

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties	Thickness of Hard Rock (feet)
2.60	363.05	**Coal, UNIONTOWN No. 10**		AC, CM, EM	
		1.80 coal			
		0.30 shale			
		0.50 coal			
		2.60 total seam thickness			
12.50	375.55	Shale, m. gray		CM, EM	
2.15	377.70	Shale, m. gray, sandy		CM, EM	
3.10	380.80	Sandstone, m. gray		CS, ES	3.10
5.60	386.40	Shale, m. gray, sandy		CM, EM	
13.60	400.00	Limestone, l. gray		AK, CS, ES	13.60
17.00	417.00	Limestone, l. gray w/CS partings		AK, CS, ES	17.00
4.00	421.00	Shale, green		CM, EM	
52.90	473.90	Limestone, l. gray		AK, CS, ES	52.90
1.40	475.30	Shale, dk. gray		AC, CM, EM	
1.80	477.10	**Coal, SEWICKLEY No. 9, bony**		AC, CM, EM	
1.85	478.95	Shale, black		AC, CM, EM	
0.50	479.45	**Coal**		AC, CM, EM	
2.15	481.60	Shale, m. gray		CM, EM	
8.10	489.70	Limestone, l. gray		AK, CS, ES	8.10
7.90	497.60	Shale, m. gray w/ SS streaks		CM, EM	
2.90	500.50	Shale, green		CM, EM	
1.00	501.50	Shale, m. gray		CM, EM	
24.20	525.70	Limestone, l. gray		AK, CS, ES	24.20
2.50	528.20	Shale, green		CM, EM	
3.10	531.30	Limestone, l. gray		AK, CS, ES	3.10
2.70	534.00	Claystone, m. gray		CV, EV	
0.50	534.50	Shale, dk. gray		AC, CM, EM	
3.00	537.50	Shale, m. gray		CM, EM	
15.60	553.10	Limestone, l. gray		AK, CS, ES	15.60
2.15	555.25	Claystone, green		CV, EV	
1.65	556.90	Limestone, l. gray		AK, CS, ES	1.65
4.20	561.10	Claystone, m. gray		CV, EV	
0.23	561.33	Shale, dk. gray		AC, CM, EM	
0.25	561.58	**Coal, ROOF COAL**		AC, CM, EM	
1.02	562.60	Shale, dk. gray		AC, CM, EM	
4.58	567.18	**Coal, PITTSBURGH No. 8**		AC, CM, EM	
0.95	568.13	Shale, dk. gray		AC, CM, EM	
2.40	570.53	Limestone, l. gray		AK, CS, ES	
3.17	573.70	Claystone, m. gray		CV, EV	
3.00	576.70	Shale, m. gray		CM, EM	
3.30	580.00	Limestone, l. gray		AK, CS, ES	
		END OF LOG			
Total Thickness of Hard Rock					185.75

Thickness and Percentage of Hard and Soft Rock Overlying Pittsburgh No. 8 Coalbed				
1. Hard Rock:	185.75	Feet	32.03	Percent
2. Soft Rock:	394.25	Feet	67.97	Percent

Physical Properties Legend
AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 coalbed

Stratum	Neutralization Potential, tons/1000 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as CaCO3 (Total Sul.)	CaCO3 Deficiency, tons/1000 tons as CaC03 (Total Sul.)
Roof, 10 ft.	272.00	1.61	1.55	50.30	-221.70
Coal	7.25	4.74	2.81	148.00	140.75
Bottom, 10 ft.	171.00	2.54	2.41	79.30	-91.70

TOVCC 11312

ATTACHMENT 13

DIAMOND DRILL HOLE: N98-13

ENGINEER: Kim Cecil
ELEVATION: 1321.26
STATE PLANE COORDINATES (1927): N 722,783.03 E 2,422,257.81

DRILLER: L. J. Hughes & Sons Inc., Dan Hamrick

TOWNSHIP: Smith
SECTION: 33,SE 1/4
COUNTY: Belmont

SURFACE OWNER:
DATE STARTED: 18 February 1998
DATE COMPLETED: 20 February 1998

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties	Thickness of Hard Rock (feet)
20.00	20.00	Non-coring			
16.00	36.00	Sandstone, brown, broken, Fe-stained 30' - 32'	yes	CS, ES	16.00
4.00	40.00	Sandstone, brown & gray, Fe-stained 39' - 40'	yes	CS, ES	4.00
5.20	45.20	Sandstone, gray	yes	CS, ES	5.20
7.40	52.60	Claystone, m. gray		CV, EV	
4.50	57.10	Shale, m. gray sandy		CM, EM	
2.20	59.30	Shale, dk. gray		AC, CM, EM	
2.80	62.10	Limestone, l. gray, Fe-stained 61' - 62'	yes	AK, CS, ES	2.80
6.50	68.60	Claystone, m. gray, calcareous		AK, CV, EV	
5.00	73.60	Shale, green, sandy, broken		CM, EM	
3.00	76.60	Shale, green, sandy		CM, EM	
6.00	82.60	Shale, green, sandy, broken		CM, EM	
1.40	84.00	Limestone, l. gray		AK, CS, ES	1.40
6.00	90.00	Shale, green		CM, EM	
5.80	95.80	Shale, green, broken		CM, EM	
6.80	102.60	Limestone, l. gray w/CS partings		AK, CS, ES	6.80
7.40	110.00	Claystone, red & green		CV, EV	
4.40	114.40	Shale, red		CM, EM	
1.10	115.50	Shale, green		CM, EM	
8.00	123.50	Claystone, m. gray, calcareous		AK, CV, EV	
6.50	130.00	Shale, gray, sandy		CM, EM	
2.00	132.00	Shale, green		CM, EM	
8.00	140.00	Limestone, l. gray		AK, CS, ES	8.00
10.00	150.00	Shale, green, calcareous		AK, CM, EM	
17.00	167.00	Shale, green		CM, EM	
1.30	168.30	Limestone, l. gray		AK, CS, ES	1.30
4.70	173.00	Claystone, green		CV, EV	
7.00	180.00	Limestone, l. gray		AK, CS, ES	7.00
10.00	190.00	Shale, green, calcareous		AK, CM, EM	
10.00	200.00	Shale, green		CM, EM	
6.00	206.00	Shale, m. gray		CM, EM	
4.70	210.70	Limestone, l. gray		AK, CS, ES	4.70
6.50	217.20	Claystone, m. gray		CV, EV	
0.80	218.00	Shale, black		AC, CM, EM	
1.50	219.50	**Coal, WASHINGTON No. 12**		AC, CM, EM	
0.75	220.25	Shale, dk. gray		AC, CM, EM	
0.40	220.65	**Coal**		AC, CM, EM	
3.50	224.15	Shale, m. gray w/ SS streaks		CM, EM	
7.00	231.15	Shale, black		AC, CM, EM	
0.10	231.25	**Coal**		AC, CM, EM	
23.75	255.00	Shale, green, calcareous		AK, CM, EM	
3.00	258.00	Claystone, red & green		CV, EV	
11.50	269.50	Shale, green		CM, EM	
0.80	270.30	Claystone, m. gray		CV, EV	
0.70	271.00	Shale, black		AC, CM, EM	
0.50	271.50	Limestone, l. gray		AK, CS, ES	0.50
3.00	274.50	Claystone, green		CV, EV	
1.50	276.00	Claystone, red & green		CV, EV	
14.00	290.00	Shale, green, calcareous		AK, CM, EM	
10.00	300.00	Shale, green		CM, EM	
1.40	301.40	Limestone, l. gray		AK, CS, ES	1.40
4.70	306.10	Shale, green		CM, EM	
0.80	306.90	Limestone, l. gray		AK, CS, ES	0.80
3.10	310.00	Claystone, m. gray		CV, EV	
10.90	320.90	Shale, m. gray, sandy		CM, EM	

TOVCC 11313

DIAMOND DRILL HOLE: N98-13 (continued)

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties	Thickness of Hard Rock (feet)
2.90	323.80	Shale, m. gray		CM, EM	
0.55	324.35	Shale, dk. gray		AC, CM, EM	
1.55	325.90	**Coal, WAYNESBURG No. 11**		AC, CM, EM	
4.90	330.80	Shale, m. gray		CM, EM	
0.20	331.00	**Coal**		AC, CM, EM	
7.20	338.20	Claystone, m. gray, calcareous		AK, CV, EV	
3.60	341.80	Shale, m. gray, sandy		CM, EM	
5.80	347.60	Sandstone, l. gray		CS, ES	5.80
2.40	350.00	Shale, m. gray, sandy		CM, EM	
15.00	365.00	Sandstone, l. gray		CS, ES	15.00
5.00	370.00	Shale, m. gray, sandy		CM, EM	
1.55	371.55	Shale, m. gray		CM, EM	
1.90	373.45	**Coal, UNIONTOWN No. 10**		AC, CM, EM	
0.15	373.60	Shale, m. gray		CM, EM	
0.60	374.20	**Coal, UNIONTOWN No. 10**		AC, CM, EM	
6.65	380.85	Shale, m. gray		CM, EM	
6.10	386.95	Limestone, l. gray		AK, CS, ES	6.10
1.75	388.70	Shale, green		CM, EM	
8.30	397.00	Shale, m. gray, sandy		CM, EM	
13.00	410.00	Limestone, l. gray		AK, CS, ES	13.00
20.00	430.00	Limestone, l. gray w/CS partings		AK, CS, ES	20.00
50.50	480.50	Limestone, l. gray		AK, CS, ES	50.50
2.60	483.10	Shale, gray, calcareous		AK, CM, EM	
2.85	485.95	Claystone, m. gray		CV, EV	
0.25	486.20	Shale, dk. gray		AC, CM, EM	
1.10	487.30	**Coal, SEWICKLEY No. 9**		AC, CM, EM	
0.90	488.20	Shale, black w/ coal		AC, CM, EM	
1.25	489.45	**Coal, SEWICKLEY No. 9, bony**		AC, CM, EM	
1.65	491.10	Shale, gray, calcareous		AK, CM, EM	
8.30	499.40	Limestone, l. gray		AK, CS, ES	8.30
7.60	507.00	Shale, m. gray		CM, EM	
3.00	510.00	Limestone, l. gray		AK, CS, ES	3.00
0.50	510.50	Claystone, green		CV, EV	
1.00	511.50	Shale, dk. gray		AC, CM, EM	
30.05	541.55	Limestone, l. gray		AK, CS, ES	30.05
2.90	544.45	Claystone, green		CV, EV	
0.40	544.85	Shale, dk. gray		AC, CM, EM	
2.45	547.30	Shale, m. gray		CM, EM	
14.25	561.55	Limestone, l. gray		AK, CS, ES	14.25
6.55	568.10	Claystone, green		CV, EV	
1.35	569.45	Claystone, m. gray		CV, EV	
0.50	569.95	Shale, dk. gray		AC, CM, EM	
0.30	570.25	**Coal, ROOF COAL**		AC, CM, EM	
0.98	571.23	Shale, m. gray		CM, EM	
5.20	576.43	**Coal, PITTSBURGH No. 8**		AC, CM, EM	
0.90	577.33	Shale, gray, calcareous		AK, CM, EM	
0.82	578.15	Limestone, l. gray		AK, CS, ES	
1.80	579.95	Claystone, green		CV, EV	
5.00	584.95	Shale, green		CM, EM	
2.10	587.05	Limestone, l. gray		AK, CS, ES	
2.95	590.00	Shale, green		CM, EM	
		END OF LOG			
Total Thickness of Hard Rock Above Pittsburgh No. 8 Coalbed					211.65

Thickness and Percentage of Hard and Soft Rock Overlying Pittsburgh No. 8 Coalbed				
1. Hard Rock:	211.65	Feet	35.87	Percent
2. Soft Rock:	378.35	Feet	64.13	Percent

Physical Properties Legend
AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as CaCO3 (Total Sul.)	CaCO3 Deficiency, tons/1000 tons as CaCO3 (Total Sul.)
Roof, 10 ft.	272.00	2.57	1.49	80.30	-191.70
Coal	3.07	5.09	2.98	159.00	155.93
Bottom, 10 ft.	182.00	2.47	2.47	77.20	-104.80

TOVCC 11314

DIAMOND DRILL HOLE: N98-25

ENGINEER: W. J. Siplivy
ELEVATION: 1321
STATE PLANE COORDINATES (1927): N 722,777.23 E 2,422,261.04

DRILLER: Kerogen Resources, Kim Cecil

TOWNSHIP: Smith
SECTION: 33, SE 1/4
COUNTY: Belmont

SURFACE OWNER: H. L. & F. P. Saunders
DATE STARTED: 23 June 1998
DATE COMPLETED: 24 June 1998

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
3.25	3.25	Clay silty loam, brown, rooted to 12"		CV, EV
2.00	5.25	Sandstone, brown, weathered, broken		CS, ES
30.75	36.00	Sandstone, brown w/Fe-stained joints, brok	yes	CS, ES

END OF LOG

Physical Properties Legend
AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

DIAMOND DRILL HOLE: N98-26

ENGINEER: W. J. Siplivy
ELEVATION: 1303.00
STATE PLANE COORDINATES (1927): N 730,519.25 E 2,423,536.14

DRILLER: Kerogen Resources, Kim Cecil

TOWNSHIP: Smith
SECTION: 28, W 1/2
COUNTY: Belmont

SURFACE OWNER: Stanley W. Hart
DATE STARTED: 1 July 1998
DATE COMPLETED: 1 July 1998

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
1.30	1.30	Silty loam, brown, rooted		CV, EV
2.90	4.20	Clay loam, brown		CV, EV
1.20	5.40	Shale, sandy, brown, weathered, broken		CS, ES
28.00	33.40	Sandstone, brown w/Fe-stains, broken	yes	CS, ES

END OF LOG

Physical Properties Legend
AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

DIAMOND DRILL HOLE: N98-27

ENGINEER: W. J. Siplivy
ELEVATION: 1303.00
STATE PLANE COORDINATES (1927): N 725,345.40 E 2,429,039.49

DRILLER: Kerogen Resources, Kim Cecil

TOWNSHIP: Smith
SECTION: 21, W 1/2
COUNTY: Belmont

SURFACE OWNER: K. D. Lucas
DATE STARTED: 2 July 1998
DATE COMPLETED: 2 July 1998

Thickness (ft)	Depth (ft)	Strata	Water Bearing	Physical Properties
0.25	0.25	Silty clay loam, reddish brown, rooted		CV, EV
2.00	2.25	Silty clay, red, rooted upper 12"		CV, EV
2.75	5.00	Claystone, red, weathered		CV, EV
2.00	7.00	Sandstone, brown w/Fe-stains, broken	yes	CS, ES
5.50	12.50	Shale, brown, sandy, broken		CS, ES
3.50	16.00	Claystone, gray, broken		CV, EV
3.40	19.40	Shale, brown & gray, Fe-stained, broken	yes	CS, ES
0.60	20.00	Sandstone, brown & gray, Fe-stained	yes	CS, ES
11.00	31.00	Shale, gray, Fe-stained, broken	yes	CS, ES

END OF LOG

Physical Properties Legend
AC - Acid Producing
AK - Alkaline Producing
C - Compactible (V - very, M - moderate, S - slight)
E - Erodible (V - very, M - moderate, S- slight)

DRILL LOGS, INFORMATION, AND ATTACHMENT 13'S
APPLICATION AREA D-0360-3

GEOLOGY DESCRIPTION

Stratigraphy of the proposed permit area is formed by the Monongahela formation of the Pennsylvania period, and the Dunkard group of Permian time. The primary strata of both sections consists of an alternating sequence of limestone, sandstone, siltstone, shale, claystone, and coal.

The Monongahela formation is approximately 245 feet thick. In ascending order, it occupies the interval from the Pittsburgh No. 8 to the Waynesburg No. 11 coal bed. The primary rock units are limestone, shale, and claystone. Limestone forms 44 to 68 percent of this stratigraphic interval. As a result of longwall mining, the immediate strata overlying the Pittsburgh No. 8 coal bed will cave to a height of 3 to 6 times the mining height, depending on the bulking factor of roof strata. The beds above this caved zone are provided some support by the caved rock but may sag and give rise to bed separation and may be subject to fracturing, to heights 24 to 54 times the mining height (120 to 270 feet above the mine).

The Dunkard group is 250 to 300 feet thick, occupying the interval from the Waynesburg No. 11 coal bed to the ground surface. The primary rock units here are shale and claystone. These soft units form about 85 percent of this stratigraphic interval. This strata is primarily located within the constrained zone of disturbance resulting from longwall mining. The constrained zone is defined as that interval above 24 to 54 times the mining height and below 50 feet from the ground surface. This strata is expected to be sufficiently confined to prevent development of any fractures. Rock beds here will tend to absorb most of the strain energy without fracturing.

Strata close to the surface, however, are not sufficiently confined and may move in any direction. Surface cracks may be produced from tensile strains resulting from longwall mining. The depth of these cracks is generally estimated to be less than 50 feet.

The main safety against inflow of groundwater into the Powhatan No. 6 Mine is afforded by the constrained zone. The nature and thickness of the individual beds found here are of particular importance. Through extensive core drilling, multiple beds of claystone, with total thicknesses of 79 to 108 feet, have been identified. These claystone beds are relatively impermeable and generally capable of absorbing large amounts of strain energy

before fracture. In the application area, it is our opinion that sufficient claystones are in-place to provide an adequate barrier against inflow from surface water and shallow groundwater disruptions caused by longwall mining. Where stream valleys are encountered, longwall operations will not be conducted under less than 240 feet of cover to further protect the mine and overlying groundwater resources.

The rock strata of Belmont County typically form a gentle monocline that dip southeasterly at grades less than one percent (Figure 2), but in the application area is locally more southward to southwesterly. The base elevation of the No. 8 seam ranges from 783 ft. in the northeast corner to 720 ft. in the southwest corner, near the village of Centerville.

The orientation of the major joints in rock and face cleat in coal is approximately N 75° W. The minor joints and butt cleats are generally perpendicular to these - N 15° E.

Geology and Coal Resources of Belmont County, Ohio, Geological Survey Professional Paper 380, reports that a small dome-shaped anticline lies in eastern Belmont County, primarily in Mead Township. This structure is located over three miles east of the Powhatan No. 6 Mine application area and, therefore, is not expected to have an impact on ground water flow in the application area.

OHIO
Department of Natural Resources

George V. Voinovich • Governor
Frances S. Buchholzer • Director

December 8, 1992

Mr. David L. Bartsch, P.E.
Project Engineer
The Ohio Valley Coal Company
56854 Pleasant Ridge Road
Alledonia, Ohio 43902

RE: Test Hole Variance Request, Permit D-0360, Powhatan No. 6 Mine, Smith Township, Belmont County

Dear Mr. Bartsch:

In response to the above captioned variance request, dated June 30, 1992, approval is granted under the provisions of rule 1501:13-4-13 (C)(3). Submit a copy of this packet and letter as part of the permit application when you submit the packet for pre-initial review.

Sincerely,

Glen G. Kizer

Glen G. Kizer
Chief
Division of Reclamation

GGK/gm/ds

cc: George Mychkovsky
Vanessa Tolliver
Harry Payne

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-4

*Coordinates: S. 18,988.20 W. 62,484.14 Surface Elevation 1282.62

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CM, EM
Subsoil	—	4.0	CM, EM
Weathered Rock	—	15.0	CM, EM
Sandstone	Yes	2.0	CS, ES
Claystone	Yes	14.0	CV, EV
Shale	—	6.5	CM, EM
Shale, Black	—	2.9	AC, CM, EM
Shale, Calc.	Yes	2.8	AK, CM, EM
Claystone-Limestone	—	14.7	AK, CM, EM
Sandstone	—	2.0	CS, ES
Shale	Yes	10.7	CM, EM
Claystone w/Limestone	—	13.9	AK, CV, EV
Shale, Black	—	0.4	AC, CM, EM
Claystone	—	1.1	CV, EV
Shale, Black	—	0.2	AC, CM, EM
Claystone w/Limestone	—	16.8	AK, CV, EV
Shale w/Sandstone	—	4.4	CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-4

*Coordinates: S. 18,988.20 W. 62,484.14 Surface Elevation 1282.62

Lithology	H_2O**	Thickness	Physical Properties
Claystone w/Limestone	—	50.0	AK, CV, EV
Shale w/Sandstone	—	13.9	CM, EM
Claystone w/Limestone	—	14.3	CV, EV
Shale, Black	—	0.3	AC, CM, EM
Claystone	—	3.9	CV, EV
Shale, Black w/coal	—	4.5	AC, CM, EM
Shale & Claystone	—	4.1	CM, EM
Shale, Black	—	3.3	AC, CM, EM
Shale w/Sandstone	—	7.4	CM, EM
Limestone	—	1.0	AK, CS, ES
Shale, Black	—	0.35	AC, CM, EM
Claystone w/Limestone	—	13.6	AK, CV, EV
Shale, w/Claystone	—	27.4	AK, CM, EM
Shale, Black	—	0.7	AC, CM, EM
Claystone w/Limestone	—	8.4	AK, CV, EV
Shale w/Claystone	—	15.4	CM, EM
Limestone	—	1.8	AK, CS, ES

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11323

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-4

*Coordinates: S. 18,988.20 W. 62,484.14 Surface Elevation 1282.62

Lithology	H_2O**	Thickness	Physical Properties
Sandstone w/Shale	—	8.0	CS, ES
Shale w/CS &LS	—	17.0	CM, EM
Shale, Black w/coal	—	1.2	AC, CM, EM
Shale	—	5.7	CM, EM
Coal	—	0.2	AC, CM, EM
Shale, w/Claystone	—	44.6	CM, EM
Sandstone w/Shale	—	2.3	CS, ES
Claystone w/Limestone	—	14.6	AK, CV, EV
Sandstone	—	3.8	CS, ES
Shale/Claystone w/LS	—	88.7	AK, CM, EM
Coal w/Black Shale	—	3.9	AC, CM, EM
Claystone w/Limestone	—	23.3	AK, CV, EV
Shale, Dk. Gray-Black	—	0.6	AC, CM, EM
Limestone w/Shale	—	24.8	AK, CS, ES
Claystone w/Limestone	—	9.1	AK, CV, EV
Shale, Black	—	0.4	AC, CM, EM
Limestone w/Claystone	—	14.8	AK, CS, ES

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11324

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-4

*Coordinates: S. 18,988.20 W. 62,484.14 Surface Elevation 1282.62

Lithology	H_2O**	Thickness	Physical Properties
Claystone w/Limestone	—	8.7	AK, CV, EV
Coal w/Black Shale	—	0.7	AC, CM, EM
Claystone	—	0.9	CV, EV
Coal (Pgh. No. 8)	—	5.4	AC, CM, EM
Shale & Claystone	—	3.1	CM, EM,

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	(not analyzed)				
No. 8 Coal	(not analyzed)				
Bottom	(not analyzed)				

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11325

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-5

*Coordinates: S. 9,530.00 W. 47,390.00 Surface Elevation 1165±

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EM
Subsoil	—	4.0	CV, EM
Weathered Rock	—	25.0	CM, EM
Shale Dk. w/Coal	—	12.3	AC, CM, EM
Claystone w/Limestone	—	17.7	AK, CV, EV
Shale w/Limestone	—	17.0	AK, CM, EM
Claystone	—	10.2	AK, CV, EV
Shale w/Sandstone	Yes	7.6	CM, EM,
Sandstone	Yes	8.5	CS, ES
Shale, Sandy	—	20.7	CM, EM
Shale, Black	—	5.1	CM, EM
Shale w/LS & SS	—	11.4	AK, CM, EM
Coal w/Black Shale	—	2.5	AC, CM, EM
Claystone w/LS & Shale	—	16.7	AK, CV, EV
Sandstone w/Shale	Yes	20.0	CS, ES
Coal	—	1.7	AC, CM, EM
Claystone w/Limestone	—	16.8	AK, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-5

*Coordinates: S. 9,530.00 W. 47,390.00 Surface Elevation 1165±

Lithology	H_2O**	Thickness	Physical Properties
Shale w/Sandstone	—	8.2	CM, EM
Claystone w/Limestone	—	28.9	AK, CV, EV
Shale w/Limestone	—	52.9	AK, CM, EM
Claystone	—	7.4	CV, EV
Coal w/Black Shale	—	4.3	AC, CM, EM
Claystone w/Limestone	—	22.3	AK, CV, EV
Shale, Black	—	0.7	AC, CM, EM
Limestone	—	7.3	AK, CS, ES
Shale w/Limestone	—	8.1	AK, CM, EM
Claystone w/Limestone	—	5.3	AK, CV, EV
Shale	—	5.5	CM, EM
Limestone w/Claystone	—	5.1	AK, CS, ES
Shale & Claystone, Dk. Gray	—	2.7	AC, CV, EV
Limestone w/Shale	—	11.1	AK, CS, ES
Claystone w/Limestone	—	5.5	AK, CV, EV
Coal & Dk. Shale	—	3.0	AC, CM, EM
Claystone	—	1.0	CV, EV

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11327

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-5

Coordinates: S. 9,530.00 W. 47,390.00 Surface Elevation 1165

Lithology	H_2O**	Thickness	Physical Properties
Coal (No. 8)	—	5.3	AC, CM, EM
Shale, Dk.	—	0.2	AC, CM, EM
Claystone w/Limestone	—	3.1	AK, CV, EV

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	2.63%	2.39%	74.69	20.99	+53.70
No. 8 Coal	8.58%	6.99%	218.40	9.63	+208.80
Bottom	3.40%	3.11%	97.20	131.00	-33.80

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11328

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-6

*Coordinates: S. 8,430.00 W. 53,560.00 Surface Elevation 1261±

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	15.0	CM, EM
Shale	Yes	7.0	CM, EM
Claystone	—	14.2	CV, EV
Shale	Yes	6.4	CM, EM
Claystone w/Limestone	Yes	19.4	AK, CV, EV
Shale	—	6.1	CM, EM
Sandstone	Yes	4.8	CS, ES
Shale	—	4.0	CM, EM
Claystone w/Limestone	—	24.6	AK, CV, EV
Shale	—	2.4	CM, EM
Sandstone w/Shale	—	11.9	CS, ES
Shale, Dk. w/Coal	—	4.1	AC, CM, EM
Limestone w/Claystone	—	9.0	AK, CS, ES
Coal w/Black Shale	—	4.1	AC, CM, EM
Shale	—	7.2	CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-6

Coordinates: S. 8,430.00 W. 53,560.00 Surface Elevation 1261

Lithology	H_2O**	Thickness	Physical Properties
Coal w/Black Shale	—	2.5	AC, CM, EM
Claystone w/Limestone	—	32.7	AK, CV, EV
Claystone, Black	—	0.4	AC, CV, EV
Limestone w/Claystone	—	5.9	AK, CS, ES
Sandstone	—	6.2	CS, ES
Shale w/Sandstone	—	15.5	CS, ES
Claystone w/Limestone	—	5.5	AK, CV, EV
Sandstone	—	6.0	CS, ES
Shale	—	2.3	CM, EM
Shale, Black	—	0.1	AC, CM, EM
Claystone w/Limestone	—	4.0	AK, CV, EV
Shale	—	3.2	CM, EM
Shale, w/SS & CS	—	7.9	CM, EM
Coal w/Black Shale	—	4.2	AC, CM, EM
Claystone w/Limestone	—	11.8	AK, CV, EV
Shale w/Sandstone	—	11.5	CM, EM
Sandstone	—	25.6	CS, ES

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11330

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-6

*Coordinates: S. 8,430.00 W. 53,560.00 Surface Elevation 1261±

Lithology	H_2O**	Thickness	Physical Properties
Black Shale w/Coal	—	2.1	AC, CM, EM
Claystone w/LS & Shale	—	13.5	AK, CV, EV
Sandstone	—	4.4	CS, ES
Shale	—	5.1	CM, EM
Claystone w/Limestone	—	30.0	AK, CV, EV
Shale, w/Limestone	—	58.0	AK, CM, EM
Coal (No. 9)	—	3.2	AC, CM, EM
Claystone w/Limestone	—	22.3	AK, CV, EV
Shale, Black	—	0.5	AC, CM, EM
Limestone w/Claystone	—	17.9	AK, CS, ES
Claystone w/Shale	—	6.0	CV, EV
Limestone w/Claystone	—	18.4	AK, CS, ES
Claystone	—	3.7	CV, EV
Black Shale w/Claystone	—	1.0	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11331

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-6

*Coordinates: S. 8,430.00 W. 53,560.00 Surface Elevation 1261±

Lithology	H_2O**	Thickness	Physical Properties
Claystone	—	1.0	CV, EV
Coal (No. 8)	—	4.6	AC, CM, EM
Claystone w/Shale	—	5.0	AK, CM, EM

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	1.60%	1.47%	45.94	24.83	+21.11
No. 8 Coal	5.19%	3.27%	102.19	8.86	+93.33
Bottom	0.97%	0.79%	24.69	535.00	-510.31

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11332

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-7

*Coordinates: S. 13,306.79 W. 53,382.97 Surface Elevation 1220.10

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	15.0	CM, EM
Claystone	Yes	7.8	CV, EV
Sandstone	Yes	6.0	CS, ES
Shale	Yes	4.7	CM, EM
Claystone w/Shale & LS	—	3.8	CV, EV
Claystone	Yes	10.1	CV, EV
Sandstone w/Shale	—	4.8	CS, ES
Shale	Yes	2.7	CM, EM
Sandstone w/Shale	Yes	9.0	CS, ES
Shale	—	7.3	CM, EM
Shale w/Limestone	—	23.5	AK, CM, EM
Shale	Yes	19.2	CM, EM
Sandstone	—	3.6	CS, ES
Coal w/Dk. Shale	—	2.4	AC, CM, EM
Claystone w/Limestone	—	2.0	AK, CV, EV

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-7

*Coordinates: S. 13,306.79 W. 53,382.97 Surface Elevation 1220.10

Lithology	H_2O**	Thickness	Physical Properties
Coal		0.1	AC, CM, EM
Claystone W/Limestone		8.6	AK, CV, EV
Coal w/Black Shale		13.3	AC, CM, EM
Claystone w/Limestone		16.9	AK, CV, EV
Shale w/SS & LS		17.6	CM, EM
Claystone, Dk.-Bl.		3.9	AC, CV, EV
Sandstone		2.3	CS, ES
Claystone w/Limestone		4.6	AK, CV, EV
Shale		5.1	CM, EM
Sandstone w/Shale		17.5	CS, ES
Claystone w/Limestone		15.8	AK, CV, EV
Shale w/Sandstone		13.1	CM, EM
Coal w/Black Shale		5.4	AC, CM, EM
Claystone		5.2	CV, EV
Shale		16.5	CM, EM
Dk. Shale w/Coal		17.0	AC, CM, EM
Claystone w/Shale		3.5	CV, EV

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11334

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-7

*Coordinates: S. 13,306.79 W. 53,382.97 Surface Elevation 1220.10

Lithology	H_2O**	Thickness	Physical Properties
Shale, Dk.		3.0	AC, CM, EM
Claystone w/Limestone		7.0	AK, CV, EV
Sandstone w/Shale		9.0	CS, ES
Claystone w/Limestone		32.6	AK, CV, EV
Shale		7.6	CM, EM
Claystone w/Limestone		7.1	AK, CV, EV
Shale w/Limestone		5.8	AK, CM, EM
Limestone w/Shale		16.3	AK, CS, ES
Shale		12.7	CM, EM
Limestone w/Shale		4.6	AK, CS, ES
Claystone		4.4	CV, EV
Coal (No. 9)		3.9	AC, CM, EM
Claystone & Shale w/LS		24.0	AK, CM, EM
Coal & Dk. Shale		1.0	AC, CM, EM
Limestone w/Claystone		20.0	AK, CS, ES

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11335

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-7

*Coordinates: S. 13,306.79 W. 53,382.97 Surface Elevation 1220.10

Lithology	H_2O**	Thickness	Physical Properties
Black Shale	—	0.1	AC, CM, EM
Limestone w/Claystone	—	12.1	AK, CS, ES
Black Shale	—	0.2	AC, CM, EM
Claystone w/Limestone	—	1.7	AK, CV, EV
Black Shale	—	0.5	AC, CM, EM
Limestone w/Shale & CS	—	10.3	AK, CS, ES
Claystone w/Limestone	—	8.0	AK, CV, EV
Shale, Dk. w/Claystone	—	1.4	AC, CM, EM
Coal w/Bl. Shale	—	1.8	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11336

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-7

*Coordinates: S. 13,306.79 W. 53,382.97 Surface Elevation 1220.10

Lithology	H_2O**	Thickness	Physical Properties
Claystone	—	0.5	CV, EV
Coal (No.8)	—	5.3	AC, CM, EM
Shale w/CS & LS	—	5.4	AK, CM, EM

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	2.66%	2.51%	78.44	115.00	-36.56
No. 8 Coal	4.55%	2.14%	66.88	4.76	+62.12
Bottom	2.68%	2.51%	78.44	463.00	-384.56

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11337

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-8

*Coordinates: S. 11,436.62 W. 57,286.66 Surface Elevation 1311.67

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	15.0	CM, EM
Shale	Yes	7.5	CM, EM
Claystone, Black	Yes	2.0	AC, CV, EV
Claystone w/Limestone	—	10.5	AK, CV, EV
Limestone	Yes	1.1	AK, CS, ES
Claystone w/Limestone	—	3.7	AK, CV, EV
Limestone	Yes	2.5	AK, CS, ES
Claystone	—	5.0	CV, EV
Shale	Yes	0.7	CM, EM
Claystone	—	6.2	CV, EV
Shale	Yes	4.7	CM, EM
Claystone	—	16.3	CV, EV
Shale	Yes	15.7	CM, EM
Claystone w/Limestone	—	23.6	AK, CV, EV
Claystone, Black	—	0.4	AC, CV, EV

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-8

*Coordinates: S. 11,436.62 W. 57,286.66 Surface Elevation 1311.67

Lithology	H_2O**	Thickness	Physical Properties
Limestone	—	1.2	AK, CS, ES
Claystone w/Limestone	—	14.4	AK, CV, EV
Shale w/Limestone	—	11.0	CM, EM
Claystone w/Limestone	—	24.9	AK, CV, EV
Shale w/Sandstone	—	8.9	CM, EM
Claystone w/Limestone	—	9.8	AK, CV, EV
Shale, Black	—	0.3	AC, CM, EM
Limestone w/Shale	—	2.7	AK, CS, ES
Claystone	—	7.3	CV, EV
Black Shale w/Coal	—	13.5	AC, CM, EM
Shale w/Limestone	—	0.9	CM, EM
Claystone w/Limestone	—	7.8	AK, CV, EV
Shale w/Limestone	—	22.8	AK, CM, EM
Claystone	—	3.9	CV, EV
Claystone, Black	—	0.6	AC, CV, EV
Claystone w/Limestone	—	7.1	AK, CV, EV

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11339

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-8

*Coordinates: S. 11,436.62 W. 57,286.66 Surface Elevation 1311.67

Lithology	H_2O**	Thickness	Physical Properties
Sandstone & Shale	—	23.3	CS, ES
Claystone, Black	—	0.6	AC, CV, EV
Shale w/Sandstone	—	5.7	CM, EM
Claystone w/Limestone	—	5.4	AK, CV, EV
Shale w/Sandstone	—	11.4	CM, EM
Coal w/ Dk. Shale	—	5.0	AC, CM, EM
Claystone	—	6.3	CV, EV
Sandstone w/Shale	—	33.9	CS, ES
Coal (No. 10)	—	2.3	AC, CM, EM
Shale	—	7.7	CM, EM
Shale, Black	—	0.2	AC, CM, EM
Claystone w/Limestone	—	6.3	AK, CV, EV
Shale	—	9.9	CM, EM
Shale w/Limestone	—	24.5	AK, CM, EM
Sandstone	—	3.4	CS, ES
Limestone w/Claystone	—	6.7	AK, CS, ES

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11340

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-8

*Coordinates: S. 11,436.62 W. 57,286.66 Surface Elevation 1311.67

Lithology	H_2O**	Thickness	Physical Properties
Shale w/Limestone	—	58.2	AK, CM, EM
Coal (No. 9)	—	3.9	AC, CM, EM
Shale w/Limestone	—	22.7	AK, CM, EM
Black Shale w/Coal	—	0.2	AC, CM, EM
Shale w/Limestone	—	5.0	AK, CM, EM
Limestone w/Shale	—	22.7	AK, CS, ES
Shale w/Limestone	—	16.4	AK, CM, EM
Limestone w/Claystone	—	14.1	AK, CS, ES
Coal w/Black Shale	—	1.8	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11341

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-8

*Coordinates: S. 11,436.62 W. 57,286.66 Surface Elevation 1311.67

Lithology	H_2O**	Thickness	Physical Properties
Coal (No. 8)	—	5.6	AC, CM, EM
Shale w/LS &CS	—	4.7	AK, CM, EM

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	2.72%	2.46%	76.88	9.21	+67.67
No. 8 Coal	4.32%	1.76%	55.00	3.76	+51.24
Bottom	2.03%	1.81%	56.60	519.00	-462.40

*If other than State Plane, indicate coordinate system.**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11342

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-9

*Coordinates: S. 17,981.75 W. 49,478.10 Surface Elevation 1271.82

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	15.0	CM, EM
Shale, w/Sandstone	Yes	10.3	CM, EM
Claystone w/Limestone	—	4.2	CV, EV
Limestone	Yes	0.6	AK, CS, ES
Claystone	—	15.2	CV, EV
Shale	Yes	4.8	CM, EM
Claystone	—	10.7	CV, EV
Sandstone	Yes	4.6	CS, ES
Shale	Yes	5.7	CM, EM
Claystone w/Limestone	—	24.3	AK, CV, EV
Shale w/Sandstone	Yes	13.3	CM, EM
Claystone	—	5.0	CV, EV
Limestone	Yes	1.2	AK, CS, ES
Shale	Yes	2.5	CM, EM
Shale, Black	—	0.7	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-9

*Coordinates: S. 17,981.75 W. 49,478.10 Surface Elevation 1271.82

Lithology	H_2O**	Thickness	Physical Properties
Shale w/Limestone	—	9.7	AK, CM, EM
Claystone w/Shale	—	14.4	CV, EV
Coal w/Dk. Shale	—	1.1	AC, CM, EM
Shale w/Limestone	—	4.6	AK, CM, EM
Claystone w/Limestone	—	8.4	AK, CV, EV
Coal w/Black Shale	—	9.3	AC, CM, EM
Shale	—	11.4	CM, EM
Shale, Black	—	0.5	AC, CM, EM
Claystone w/Limestone	—	14.9	AK, CV, EV
Shale w/Sandstone	—	4.4	CM, EM
Claystone w/Limestone	—	8.9	AK, CV, EV
Shale & Claystone	—	14.0	CM, EM
Shale, Black	—	0.6	AC, CM, EM
Shale w/CS & LS	—	29.4	AK, CM, EM
Shale w/Sandstone	—	9.4	CM, EM
Claystone	—	3.1	CV, EV
Shale	—	12.9	CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11344

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-9

*Coordinates: S. 17,981.75 W. 49,478.10 Surface Elevation 1271.82

Lithology	H_2O**	Thickness	Physical Properties
Coal w/Black Shale	—	5.1	AC, CM, EM
Claystone w/Limestone	—	12.7	AK, CV, EV
Shale	—	16.3	CM, EM
Coal w/Black Shale	—	3.3	AC, CM, EM
Claystone w/LS & SS	—	17.3	AK, CV, EV
Shale	—	14.7	CM, EM
Claystone w/Limestone	—	25.1	AK, CV, EV
Shale w/Limestone	—	54.3	AK, CM, EM
Claystone w/Limestone	—	6.4	AK, CV, EV
Coal (No. 9)	—	3.8	AC, CM, EM
Claystone w/LS & Shale	—	22.4	AK, CV, EV
Coal	—	0.06	AC, CM, EM
Limestone w/Shale	—	32.7	AK, CS, ES
Shale, Black	—	0.4	AC, CM, EM
Claystone w/Limestone	—	21.0	AK, CV, EV
Coal w/Dk. Shale	—	2.9	AC, CM, EM
Coal (No. 8)	—	5.1	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11345

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N92-9

*Coordinates: S. 17,981.75 W. 49,478.10 Surface Elevation 1271.82

Lithology	H_2O**	Thickness	Physical Properties
Shale w/Claystone	—	2.3	AK, CM, EM
Claystone w/Limestone	—	2.7	AK, CM, EM

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	5.23%	4.70%	146.90	73.12	+73.78
No. 8 Coal	4.39%	1.91%	59.69	4.92	+54.77
Bottom	2.95%	2.82%	88.13	402.00	-313.87

*If other than State Plane, indicate coordinate system. **Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11346

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-18

*Coordinates: S. 15,249.64 W. 61,084.35 Surface Elevation 1123.82

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	20.0	CM, EM
Shale	—	10.0	CM, EM
Sandstone	—	7.0	CS, ES
Shale w/Limestone	—	27.0	AK, CM, EM
Sandstone	—	4.0	CS, ES
Shale w/Limestone	—	19.0	AK, CM, EM
Claystone	—	8.0	CV, EV
Shale w/Limestone	—	5.0	AK, CM, EM
Sandstone w/Shale	—	12.9	CS, ES
Coal (No. 11)	—	2.0	AC, CM, EM
Claystone	—	10.1	CV, EV
Shale w/Limestone	—	18.0	AK, CM, EM
Sandstone	—	24.0	CS, ES
Claystone	—	3.0	CV, EV
Shale w/Limestone	—	15.0	AK, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-18

*Coordinates: S. 15,249.64 W. 61,084.35 Surface Elevation 1123.82

Lithology	H_2O**	Thickness	Physical Properties
Sandstone		7.6	CS, ES
Limestone w/Shale		10.4	AK, CS, ES
Claystone w/Limestone		12.0	AK, CV, EV
Limestone w/Shale		8.0	AK, CS, ES
Shale		4.0	CM, EM,
Limestone w/Shale		51.4	AK, CS, ES
Claystone		2.4	CV, EV
Coal w/Shale		3.6	AC, CM, EM
Limestone w/Shale		9.2	AK, CS, ES
Shale		10.0	CM, EM
Limestone w/Shale		51.4	AK, CS, ES
Claystone w/Limestone		7.7	AK, CV, EV

*If other than State Plane, indicate coordinate system.**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11348

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-18

*Coordinates: S. 57,249.64 W. 61,084.35 Surface Elevation 1123.82

Lithology	H_2O**	Thickness	Physical Properties
Coal w/Black Shale	—	2.0	AC, CM, EM
Coal (No. 8)	—	5.2	AC, CM, EM
Shale, Calc.	—	15.2	AK, CS, ES

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	(not analyzed)				
No. 8 Coal	(not analyzed)				
Bottom	(not analyzed)				

*If other than State Plane, indicate coordinate system.**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11349

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-20

*Coordinates: S. 16,204.76 W. 55,804.03 Surface Elevation 987.89

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	10.0	CM, EM
Shale	—	22.2	CM, EM
Coal w/Shale	—	2.4	AC, CM, EM
Claystone	—	4.5	CV, EV
Shale	—	4.8	CM, EM
Limestone w/Shale	—	5.7	AK, CS, ES
Claystone	—	2.6	CV, EV
Limestone	—	1.9	AK, CS, ES
Shale	—	6.8	CM, EM
Limestone w/Shale	—	12.7	AK, CS, ES
Claystone	—	10.5	CV, EV
Limestone w/Shale	—	65.4	AK, CS, ES
Claystone	—	2.5	CV, EV
Coal w/Black Shale	—	3.7	AC, CM, EM
Shale, Calc.	—	18.4	AK, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-20

*Coordinates: S. 16,204.76 W. 55,804.03 Surface Elevation 987.89

Lithology	H_2O**	Thickness	Physical Properties
Limestone w/Shale		3.4	AK, CS, ES
Claystone		1.5	CV, EV
Black Shale w/Coal		0.3	AC, CM, EM
Limestone w/Shale		30.2	AK, CS, ES
Claystone		5.8	CV, EV
Limestone w/Shale		13.9	AK, CS, ES
Claystone w/Limestone		6.9	AK, CV, EV
Coal w/Claystone		2.5	AC, CM, EM
Coal		5.4	AC, CM, EM
Limestone w/Claystone		7.3	AK, CS, ES
Claystone		13.0	CV, EV

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	(not analyzed)				
No. 8 Coal	(not analyzed)				
Bottom	(not analyzed)				

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-22

*Coordinates: S. 10,293.09 W. 56,694.87 Surface Elevation 1175.46

Lithology	H_2O**	Thickness	Physical Properties
Topsoil		1.0	CV, EV
Subsoil		4.0	CM, EM
Weathered Rock		10.0	CM, EM
Claystone		16.6	CV, EV
Sandstone		5.4	CS, ES
Shale		6.5	CM, EM
Coal w/Shale		0.7	AC, CM, EM
Shale		1.6	CM, EM
Limestone		2.0	CS, ES
Claystone		8.0	CV, EV
Coal (No. 12)		2.1	AC, CM, EM
Shale		9.1	CM, EM
Coal		0.2	AC, CM, EM
Claystone		6.8	CV, EV
Shale		25.5	CM, EM
Claystone w/Limestone		12.5	AK, CV, EV
Sandstone w/Shale		17.0	CS, ES
Shale		5.0	CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-22

*Coordinates: S. 10,293.09 W. 56,694.87 Surface Elevation 1175.46

Lithology	H_2O**	Thickness	Physical Properties
Claystone	—	7.0	CV, EV
Shale	—	18.5	CM, EM
Coal w/Shale	—	3.5	AC, CM, EM
Shale, Calc.	—	9.1	AK, CM, EM
Sandstone	—	16.0	CS, ES
Shale	—	10.0	CM, EM
Claystone	—	1.4	CV, EV
Coal w/Shale	—	3.2	AC, CM, EM
Claystone	—	10.4	CV, EV
Limestone	—	1.2	AK, CS, ES
Shale, Calc.	—	15.6	AK, CM, EM
Limestone w/Shale	—	10.3	AK, CS, ES
Shale, Calc.	—	6.0	AK, CM, EM
Sandstone	—	26.0	CS, ES
Limestone w/Shale	—	45.8	AK, CS, ES
Claystone	—	4.3	CV, EV
Coal w/Shale (No. 9)	—	4.2	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11353

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N86-22

*Coordinates: S. 10,293.09 W. 56,694.87 Surface Elevation 1175.46

Lithology	H_2O**	Thickness	Physical Properties
Shale w/Limestone		21.5	AK, CM, EM
Claystone		1.1	CV, EV
Black Shale w/Coal		0.3	AC, CM, EM
Limestone w/Shale		24.9	AK, CS, ES
Claystone w/Limestone		11.5	AK, CV, EV
Limestone w/Shale		12.6	AK, CS, ES
Claystone w/Limestone		9.6	AK, CV, EV
Coal w/Claystone		2.0	AC, CM, EM
Coal (No. 8)		5.3	AC, CM, EM
Shale, Calc.		9.1	AK, CS, ES
Claystone		6.0	CV, EV

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	(not analyzed)				
No. 8 Coal	(not analyzed)				
Bottom	(not analyzed)				

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11354

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N-34

*Coordinates: S. 11,899.95 W. 52,644.96 Surface Elevation 1199.07

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	5.0	CM, EM
Shale w/Limestone	—	25.0	AK, CM, EM
Sandstone	—	8.0	CS, ES
Shale	—	5.0	CM, EM
Shale, Black	—	4.0	AC, CM, EM
Limestone & Shale	—	3.0	AK, CS
Shale, Black	—	1.2	AC, CM, EM
Limestone	—	3.8	AK, CS, ES
Shale, Calc.	—	8.1	AK, CM, EM
Sandstone	—	16.9	CS, ES
Shale	—	5.5	CM, EM
Coal	—	0.5	AC, CM, EM
Shale & Limestone	—	1.1	AK, CM, EM
Black Shale w/Coal	—	0.6	AC, CM, EM
Shale w/Limestone	—	9.9	AK, CM, EM
Coal w/Black Shale	—	12.5	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N-34

*Coordinates: S. 11,899.95 W. 52,644.96 Surface Elevation 1199.07

Lithology	H_2O**	Thickness	Physical Properties
Limestone	—	10.0	AK, CS, ES
Shale w/Limestone	—	65.0	AK, CS, ES
Sandstone	—	5.6	CS, ES
Shale w/Limestone	—	29.5	AK, CM, EM
Coal w/Black Shale	—	4.5	AC, CM, EM
Shale, Calc.	—	31.9	AK, CM, EM
Black Shale w/Coal	—	10.0	AC, CM, EM
Shale w/Limestone	—	13.1	AK, CM, EM
Sandstone	—	7.4	CS, ES
Shale w/Limestone	—	33.0	AK, CM, EM
Limestone	—	6.1	AK, CS, ES
Shale w/Limestone	—	9.5	AK, CM, EM
Limestone w/Shale	—	19.9	AK, CS, ES
Black Shale	—	1.9	AC, CM, EM
Limestone	—	8.2	AK, CS, ES
Shale, Calc.	—	19.0	AK, CM, EM
Coal w/Bl. Shale	—	4.1	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11356

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N-34

*Coordinates: S. 11,899.95 W. 52,644.96 Surface Elevation 1199.07

Lithology	H_2O**	Thickness	Physical Properties
Shale w/Limestone	—	23.3	AK, CM, EM
Coal w/Bl. Shale	—	0.6	AC, CM, EM
Limestone	—	12.4	AK, CS, ES
Limestone w/Shale	—	19.9	AK, CS, ES
Black Shale	—	0.3	AC, CM, EM
Shale w/Limestone	—	5.3	AK, CM, EM
Limestone w/Shale	—	13.4	AK, CS, ES
Shale w/Limestone	—	7.4	AK, CM, EM
Coal w/Bl. Shale	—	1.8	AC, CM, EM
Coal (No. 8)	—	5.4	AC, CM, EM
Shale, Calc.	—	10.2	AK, CM, EM
Sandstone	—	6.6	CS, ES
Shale	—	3.6	CM, EM

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	(not analyzed)				
No. 8 Coal	(not analyzed)				
Bottom	(not analyzed)				

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11357

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N-35

*Coordinates: S. 19,672.72 W. 52,492.09 Surface Elevation 1013.74

Lithology	H_2O**	Thickness	Physical Properties
Topsoil	—	1.0	CV, EV
Subsoil	—	4.0	CM, EM
Weathered Rock	—	5.0	CM, EM
Shale w/Sandstone	—	14.3	CM, EM
Black Shale	—	0.1	AC, CM, EM
Shale w/Limestone	—	10.1	AK, CM, EM
Coal	—	2.9	AC, CM, EM
Shale	—	1.8	CM, EM
Coal w/Bl. Shale	—	1.1	AC, CM, EM
Shale	—	29.4	CM, EM
Coal & Black Shale	—	3.6	AC, CM, EM
Shale w/Limestone	—	25.7	AK, CM, EM
Limestone w/Shale	—	11.1	AK, CS, ES
Black Shale	—	0.2	AC, CM, EM
Limestone w/Shale	—	11.1	AK, CS, ES
Black Shale	—	0.2	AC, CM, EM
Limestone	—	6.5	AK, CS, ES
Shale w/Limestone	—	9.2	AK, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N-35

*Coordinates: S. 19,672.72 W. 52,492.09 Surface Elevation 1013.74

Lithology	H_2O**	Thickness	Physical Properties
Limestone w/Shale		44.8	AK, CS, ES
Black Shale		3.5	AC, CM, EM
Coal (No. 9) w/Bl. Shale		3.8	AC, CM, EM
Shale w/Limestone		14.6	AK, CM, EM
Black Shale		4.2	AC, CM, EM
Limestone & Shale		1.8	AK, CM, EM
Black Shale		0.5	AC, CM, EM
Limestone w/Shale		16.6	AK, CS, ES
Black Shale		0.1	AC, CM, EM
Limestone w/Shale		7.2	AK, CS, ES
Shale w/Limestone		8.3	AK, CM, EM
Black Shale		0.8	AC, CM, EM
Shale & Limestone		20.8	AK, CM, EM
Dk. Shale		1.3	AC, CM, EM
Coal w/Dk. Shale		2.1	AC, CM, EM

**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11359

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Workings)

Applicant: THE OHIO VALLEY COAL COMPANY Drill Hole #N-35

*Coordinates: S. 19,672.72 W. 52,492.09 Surface Elevation 1013.74

Lithology	H_2O**	Thickness	Physical Properties
Coal (No. 8) w/Bl. Shale	—	6.0	AC, CM, EM
Shale w/Limestone	—	22.0	AK, CM, EM

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

Stratum	Total Sulfur	Pyrite Marcasite Sulfur	Potential Acidity	Neutral-ization Potential	$CaCO_3$ Deficiency
Roof	(not analyzed)				
No. 8 Coal	(not analyzed)				
Bottom	(not analyzed)				

*If other than State Plane, indicate coordinate system.
**Indicate water bearing stratum with an asterisk (*) under column labelled H_2O.

Physical Property Legend
AC = Acid Producing
AK = Alkaline Producing
C = Compactible (V=Very, M=Moderate, S=Slight)
E = Erodible (V=Very, M=Moderate, S=Slight)

TOVCC 11360

STATE PLANE COORDS
X 2,429,100
Y 720,118 --

DIAMOND DRILL HOLE: #91-1

Engineer: William J. Siplivy
Elevation: 1300.49
Coordinates: S 20349.77 W 64490.11

Driller: McKay and Gould, Inc. (Air Rotary)

Surface Owner: Chalmer Campbell
Township: Smith, Section 20, NW 1/4
County: Belmont

Date Started: February 11, 199
Date Finished: February 12, 19

DESCRIPTION

Thickness (Ft.)	Depth (Ft.)	Strata
10	10	Clay, brown
5	15	Shale, brown, sandy
3	18	Shale, brown-red
16	34	Shale, brown-gray
5	39	Sandstone, brown-gray
7	46	Shale, gray
2	48	Limestone
13	61	Shale, gray
2	63	Clay, dk. gray
6	69	Shale, gray, sandy
2	71	Shale, black, sandy
4	75	Shale, gray, sandy
7	82	Limestone
3	85	Claystone, gray
3	88	Shale, gray
13	101	Siltstone, gray
4	105	Shale, gray-red
3	108	Limestone
26	134	Shale, gray
10	144	Limestone, sandy
3	147	Shale, dk. gray
2	149	Limestone, sandy
13	162	Shale, red-gray
4	166	Limestone, sandy
12	178	Shale, gray
9	187	Limestone w/shale partings
35	222	Shale, gray
4	226	Limestone w/shale partings
1.5	227.5	Coal, WASHINGTON (No.12)
1.5	229	Shale, black
69	298	Shale, gray, coal @ 248', 251', & 288 No. 11A
40	338	Siltstone
1.5	339.5	Coal, WAYNESBURG (No.11)
45.5	385	Shale, gray
1.5	386.5	Coal, UNIONTOWN (No.10)
8.5	395	Shale, gray
94	489	Shale, limey
13	502	Shale, dk. gray
2.5	504.5	Coal, SEWICKLEY (No. 9)
6.5	511	Shale, dk. gray
24	535	Shale, limey
2	537	Limestone (?)
17	554	Shale, limey
7	561	Shale, gray
1	562	Limestone (?)
3	565	Shale, gray
3	568	Shale, dk. gray
19	587	Limestone w/2' claystone at 583'
5	592	Shale, dk. gray
0.5	592.5	Coal, (roof coal)
1	593.5	Shale
5.5	599	Coal, PITTSBURGH (No. 8)
21	620	Shale, dk. gray, limey

STATE PLANE COORDS
X 2429,290
Y 720,319

DIAMOND DRILL HOLE: N91-2

ENGINERR: WILLIAM J. SIPLIVY
ELEVATION: 1305.01
COORDINATES: S 20199.62 W 64279.98

DRILLER: McKay and Gould, Inc. (Air Rotary)

Surface Owner: Chalmer Campbell
Township: Smith, Section 20 NW 1/4
County: Belmont

Date Started: February 13, 1991
Date Finished: February 18, 1991

DESCRIPTION

Thickness (Ft.)	Depth (Ft.)	Strata
8	8	Clay, brown-orange
10	18	Sandstone, brown
15	33	Shale, brown-red-gray
5	38	Sandstone, brown-gray
10	48	Shale, gray
14	62	Shale, gray, sandy
3	65	Clay, soft, water 1 Gpm
3	68	Sandstone, gray
4	72	Shale, gray, sandy
2	74	Shale, black, sandy
4	78	Limestone w/shale partings
4	82	Shale, gray
73	155	Siltstone, gray w/LS partings
25	180	Shale, gray-red
50	230	Limestone, sandy w/shale partings
13	243	Shale, dk. gray, sandy
5	248	Sandstone, gray, fine gr.
8	256	Shale, dk. gray, sandy
18	274	Siltstone, gray
7	281	Shale, gray
3	284	Shale, gray, sandy
31	315	Shale, gray, coal @ 290' No. 4
23.5	338.5	Shale, gray, sandy
0.5	339	Coal, WAYNESBURG (NO. 11)
51	390	Shale, gray
2	392	Coal, UNIONTOWN (NO. 10)
3	395	Shale, gray
100	495	Shale, limy w/LS partings
3	498	Shale, dk. gray
2.5	500.5	Coal, SEWICKLEY (NO. 9)
48.5	549	Shale, limy
3	552	Shale, dk. gray
4	556	Limestone
4	560	Shale, dk. gray
18	578	Limestone, hard, 2' soft @ 574.5'
5.25	583.25	Claystone
4.75	588	Coal, PITTSBURGH (NO. 8)
1.0	589	Shale
4	593	Limestone
10	603	Shale
2	605	Limestone
9	614	Claystone

NOTE: Strata from 578' to 614' determined from "E" log.

ADDENDUM TO PART 2, PAGE 16, B(1)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

GEOLOGY DESCRIPTION

Stratigraphy of the proposed permit area is formed by the Monongahela formation of the Pennsylvania period, and the Dunkard group of Permian time. The primary strata of both sections consists of an alternating sequence of limestone, sandstone, siltstone, shale, claystone, and coal.

The Monongahela formation is approximately 245 feet thick. In ascending order, it occupies the interval from the Pittsburgh No. 8 to the Waynesburg No. 11 coal bed. The primary rock units are limestone, shale, and claystone. Limestone forms 44 to 68 percent of this stratigraphic interval. As a result of longwall mining, the immediate strata overlying the Pittsburgh No. 8 coal bed will cave to a height of 3 to 6 times the mining height, depending on the bulking factor of roof strata. The beds above this caved zone are provided some support by the caved rock but may sag and give rise to bed separation and may be subject to fracturing, to heights 24 to 54 times the mining height (120 to 270 feet above the mine).

The Dunkard group is 250 to 300 feet thick, occupying the interval from the Waynesburg No. 11 coal bed to the ground surface. The primary rock units here are shale and claystone. These soft units form about 85 percent of this stratigraphic interval. This strata is primarily located within the constrained zone of disturbance resulting from longwall mining. The constrained zone is defined as that interval above 24 to 54 times the mining height and below 50 feet from the ground surface. This strata is expected to be sufficiently confined to prevent development of any fractures. Rock beds here will tend to absorb most of the strain energy without fracturing.

Strata close to the surface, however, are not sufficiently confined and may move in any direction. Surface cracks may be produced from tensile strains resulting from longwall mining. The depth of these cracks is generally estimated to be less than 50 feet.

The main safety against inflow of groundwater into the Powhatan No. 6 Mine is afforded by the constrained zone. The nature and thickness of the individual beds found here are of particular importance. Through extensive core drilling, multiple beds of claystone, with total thicknesses of 79 to 108 feet, have been identified. These claystone beds are relatively impermeable and generally capable of absorbing large amounts of strain energy before fracture. In the application area, it is our opinion that sufficient claystones are in-place to provide an adequate barrier against inflow from surface water and shallow groundwater disruptions caused by longwall mining. Where stream valleys are encountered, longwall operations is generally not planned under less than about 200 feet of cover to further protect the mine and overlying groundwater resources. In this application area, the minimum cover is about 270 ft.

The rock strata of Belmont County typically form a gentle monocline that dips southeasterly at grades less than one percent (Figure 2) and in the application area is southward to southeasterly. The base elevation of the No. 8 seam ranges from approximately 725 ft. in the southeast corner of the application area to approximately 800 ft. in the northwest corner.

The orientation of the major joints in rock and face cleat in coal is approximately N 75° W. The minor joints and butt cleats are generally perpendicular to these (N 15° E).

Geology and Coal Resources of Belmont County, Ohio, Geological Survey Professional Paper 380, reports that a small dome-shaped anticline lies in eastern Belmont County, primarily in Mead Township. This structure is located over three miles east of the Powhatan No. 6 Mine application area and, therefore, is not expected to have an impact on ground water flow in the application area.

In addition, there is a graben structure that passes through the Powhatan No. 6 Mine Reserve. This graben has been tracked through the adjacent Powhatan No. 3 Mine and enters the No. 6 reserve on the eastern boundary. It proceeds in a southwesterly direction, turns approximately 90 degrees, proceeds in a northwesterly direction, then turns again and proceeds in a general westerly direction off the mine property. The graben is located to the south of the application area and is not expected to have an impact on the ground water flow in the area.

The structural contours of the No. 8 Seam indicate that the graben is made up of a series of slumps in the deposit, indicated by a thickening of the seam at the bottom of the structure. This structure apparently affected the structural contours to the north of the graben, but these effects do not extend into the application area. Locally, these effects may be seen as areas where incidental water pools in the mine. This water is generally only a nuisance and does not require pumping. Most of the water found underground at the No. 6 mine is man-made during the mining cycle from water sprays (used for dust suppression) and cooling water for motors.

ADDENDUM TO PAGE 16, B(2)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

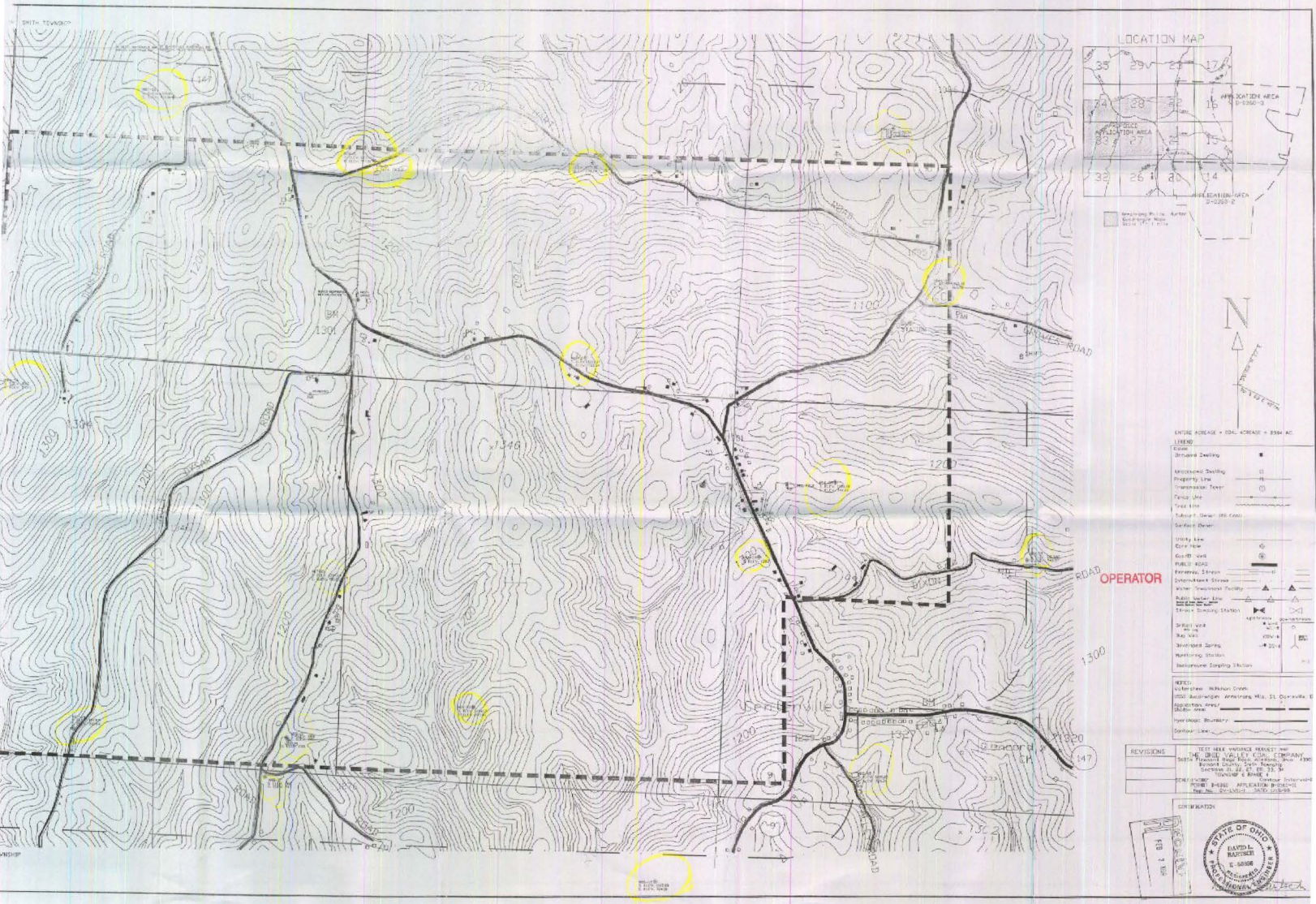
Geological Impact of Coal Removal Upon Ground Water

The geological impact of coal removal, according to the PHC, is expected to vary from short term to long term. The Pittsburgh (No. 8) coal seam will be mined, and in this area has dip of approximately 40 ft per mile to the southeast, with the strike to the northeast. Ground water occurs in this area in several disconnected saturated zones associated with the occurrence of the coal seams and underlying clay stone units that prevent downward migration of the ground water. Ground water is generally limited to within the first 100 ft of the surface. Since primary porosity in the rock units is poor, nearly all of the ground water in this area of Ohio occurs as secondary porosity in the joints, cleats, fractures, and bedding planes of the rocks.

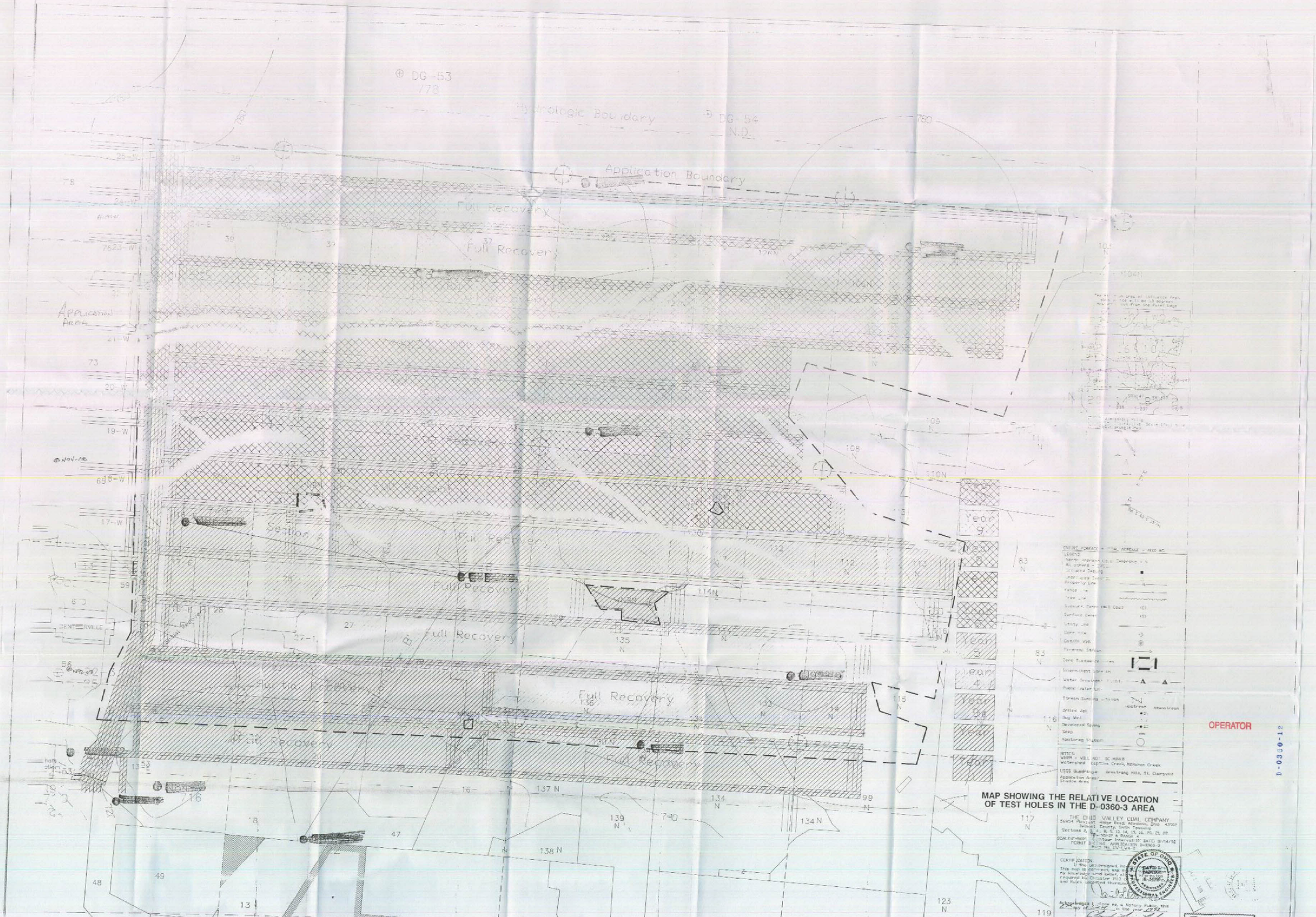
As longwall mining progresses, a caved area occurs immediately over the coal seam mined. Above this area, fractures occur in hard rocks and extend upward to about 200 ft above the coal seam. In the area above these fractures, a zone known as the continuous deformation zone develops where the rocks bend down and form the classic subsidence basin. In the center of the basin, rocks are put into compression, while there are areas of tension from the gate entries inward for a short distance and outside the basin for a short distance. As the mining occurs, the rocks may be fractured and bedding planes may open as a result of this deformation. This process provides new openings to contain additional ground water, with a lowering of the phreatic surface of the water in the area. After mining, the aquifers are more connected and provide a larger source of water for well recharge. Ground water in wells usually drops, and may be found lower in the well or even beneath the bottom of the well. Wells that are drilled deeper can be restored to their full potential usefulness.

The Powhatan No. 6 Mine is virtually a dry mine, with no pumping of water to the outside except for water from behind shaft linings. The deformation and not cracking of the soft rocks accounts for the dry conditions in the mine. Generally speaking, ground or surface water does not enter the No. 6 Mine.

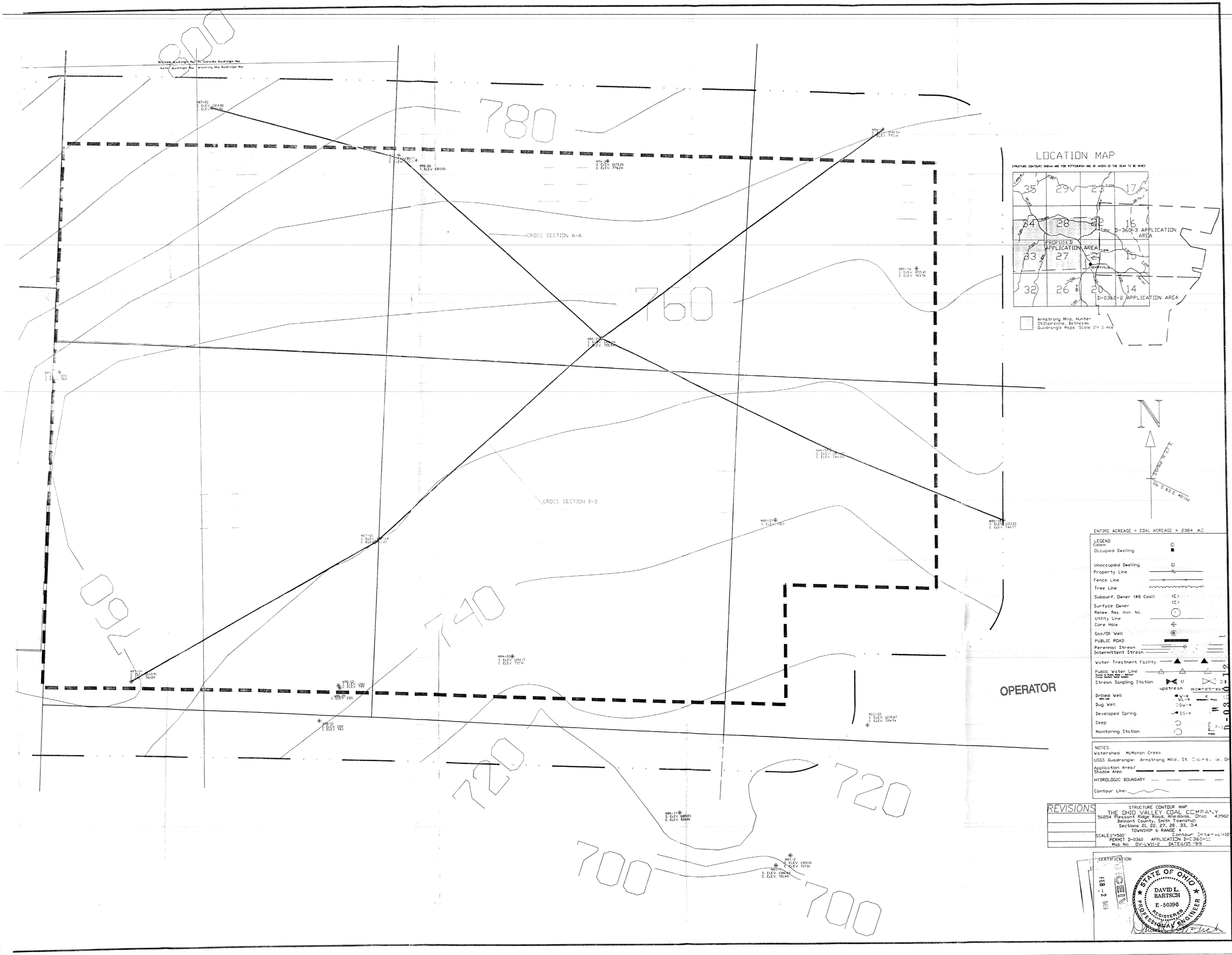
In summary, the coal removal is expected to have some impact ground water in the application area. The impacts are described in the PHC and in the Addendum to Page 18 F(1).


LOCATION MAP
APPLICATION AREA
N
OPERATOR
Centerville
DIXON
ROAD
GROVES ROAD
REVISIONS
THE OHIO VALLEY COAL COMPANY
STATE OF OHIO
DAVID L. BARTSCH
PROFESSIONAL ENGINEER

TOVCC 11366

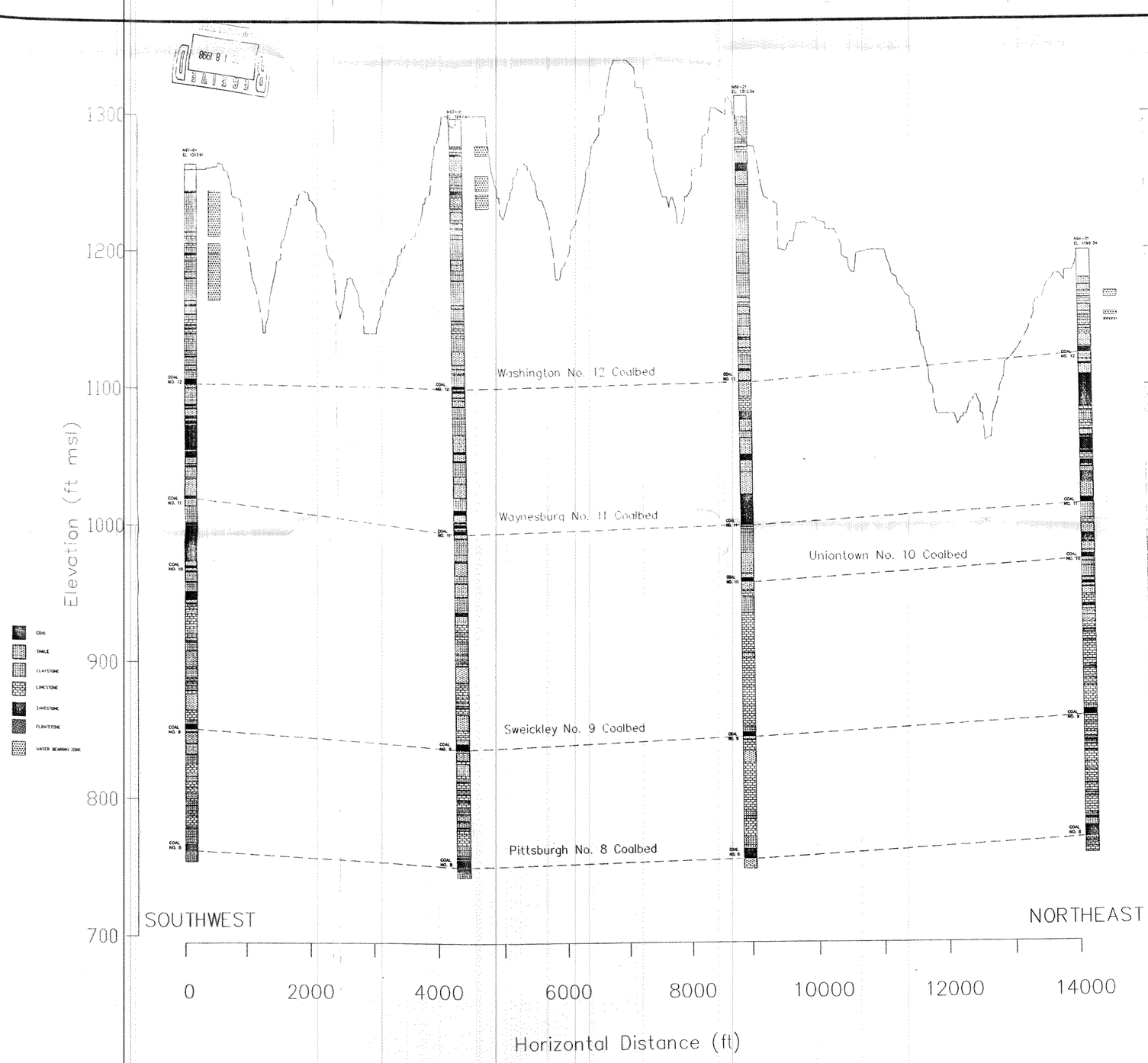

DG-53
778
Hydrologic Boundary
DG-54
N.D.
Application Boundary
Full Recovery
Full Recovery
Application Area
Section A
Full Recovery
Full Recovery
Full Recovery
Full Recovery
Full Recovery
Full Recovery
Full Recovery
Year 9
Year 5
Year 3
Year 4
Year 8a
Year 11
OPERATOR
D-0360-12
MAP SHOWING THE RELATIVE LOCATION
OF TEST HOLES IN THE D-0360-3 AREA
THE OHIO VALLEY COAL COMPANY
STATE OF OHIO
DAVID E. DAMTON
REGISTERED
PROFESSIONAL ENGINEER

TOVCC 11367



800
780
760
740
720
700
CROSS SECTION A-A
CROSS SECTION B-B
OPERATOR
LOCATION MAP
STRUCTURE CONTOURS SHOWN ARE FOR PITTSBURGH OHIO (8) WHICH IS THE SEAM TO BE MINED
35
29
23
17
34
28
22
16
D-360-3 APPLICATION AREA
PROPOSED APPLICATION AREA
33
27
21
15
32
26
20
14
D-0360-2 APPLICATION AREA
Armstrong Mills, Hunter
St.Clairsville, Bethesda
Quadrangle Maps Scale 1"= 1 mile
N
Strike N 27 E
Dip S 63 E 40'/mi
ENTIRE ACREAGE = COAL ACREAGE = 2384 AC
LEGEND
Cistern
Occupied Dwelling
Unoccupied Dwelling
Property Line
Fence Line
Tree Line
Subsurf. Owner (#8 Coal)
Surface Owner
Renew. Res. Invn. No.
Utility Line
Core Hole
Gas/Oil Well
PUBLIC ROAD
Perennial Stream
Intermittent Stream
Water Treatment Facility
Public Water Line
Stream Sampling Station
upstream
downstream
Drilled Well
Dug Well
Developed Spring
Seep
Monitoring Station
NOTES:
Watershed: McMahon Creek
USGS Quadrangle: Armstrong Mills, St. Clairsville, OH
Application Area/ Shadow Area:
HYDROLOGIC BOUNDARY
Contour Line:
REVISIONS
STRUCTURE CONTOUR MAP
THE OHIO VALLEY COAL COMPANY
56854 Pleasant Ridge Road, Alledonia, Ohio 43902
Belmont County, Smith Township
Sections 21, 22, 27, 28, 33, 34
TOWNSHIP 6 RANGE 4
SCALE:1"=500'
Contour Interval=10'
PERMIT D-0360 APPLICATION D-0360-11
Map No. OV-LW11-2 DATE:1/15/99
CERTIFICATION
RECEIVED
FEB - 2 1999
STATE OF OHIO
DAVID L. BARTSCH
E-50396
REGISTERED
PROFESSIONAL ENGINEER
D-0360-12

TOVCC 11368



OPERATOR

D-0360-12

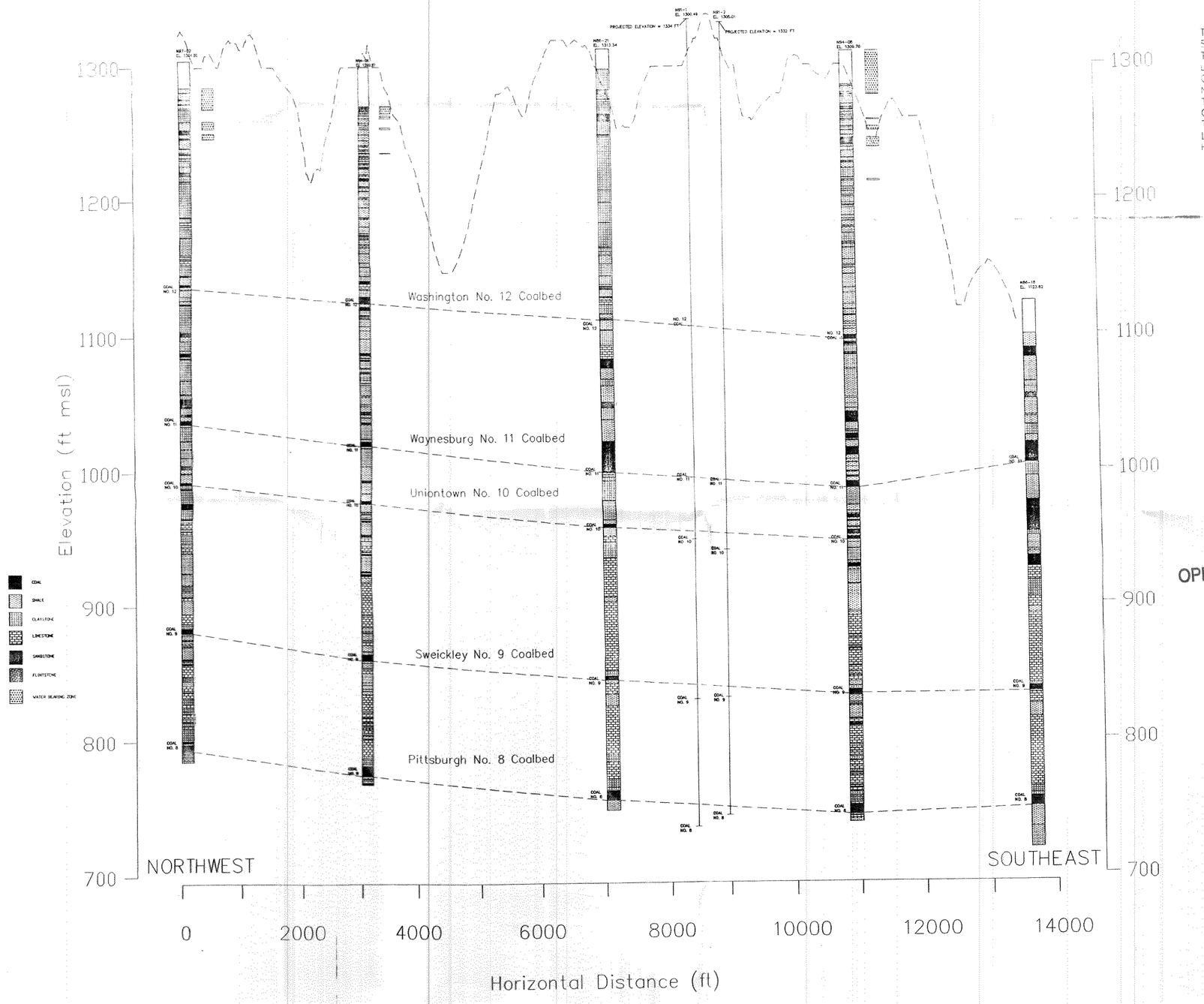
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360
APPLICATION NO. D-0360-11
CROSS SECTION B-B
DATE: 12/14/98 SCALE: AS NOTED

CERTIFICATION

STATE OF OHIO
DAVID L. BARTSCH
E-50396
REGISTERED
PROFESSIONAL ENGINEER

RECEIVED
DEC 18 1998
DIVISION OF MINES & RECLAMATION

TOVCC 11369



TEST HOLES N91-1 AND N91-2 ARE LOCATED TO THE SOUTH AND EAST OF THE PROPOSED APPLICATION AREA. THEY ARE LOCATED WITHIN THE GRABEN FAULT THAT LIES TO THE SOUTH OF THE APPLICATION AREA. FROM OUR EXPERIENCE, THE GRABEN FAULT PROJECTS TO THE NO. 9 AND 10 COAL SEAMS. IT IS NOT SEEN IN THE NO. 11 OR 12 SEAM, PERMITTING ALIGNMENT OF OTHER TEST HOLES FOR CAMPARISON PURPOSES. THESE HOLES CONTAIN DATA PERTINENT TO THE UPPER LAYERS TO ELEVATION 1334 FT. MSL. LOGS OF THE HOLES ARE ENCLOSED.

OPERATOR

PROJECTION OF TEST HOLE ALIGNED WITH THE NO. 11 COAL SEAM

D-0360-12

THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360
APPLICATION NO. D-0360-11
CROSS SECTION A-A
DATE: 1/4/99 SCALE: AS NOTED

CERTIFICATION

STATE OF OHIO
DAVID L. BARTSCH
E-50396
REGISTERED PROFESSIONAL ENGINEER

RECEIVED

TOVCC 11370

ADDENDUM TO ATTACHMENT 13

Hole ID		
B&O 13	2,418,283.02	727,372.85
N86-21	2,426,586.06	727,918.73
N86-17	2,427,636.46	720,918.86
N92-03	2,430,390.76	722,252.50
N94-12	2,416,789.46	724,668.05
N86-18	2,432,596.11	725,306.13

D360-12

HYDROLOGY

OPERATOR

D-0360-12

TOVCC 11372

OHIO Department of Natural Resources

George V. Voinovich • Gove
Donald C. Anderson • Dire

DATE August 18, 1998

ANALYSIS OF EXISTING GROUND WATER FILE DATA

PREPARED BY: Bill Haiker BH, HYDROGEOLOGIST

OPERATOR: Ohio Valley Coal Company

COUNTY: Belmont

TOWNSHIP: Smith

SECTION (S): 21, 22, 27, 28, 33, 34

NUMBER OF WATER WELL LOGS WITHIN 1,000 FOOT RADIUS OF SITE (COPIES ATTACHED) 26 : FIELD LOCATED: 26

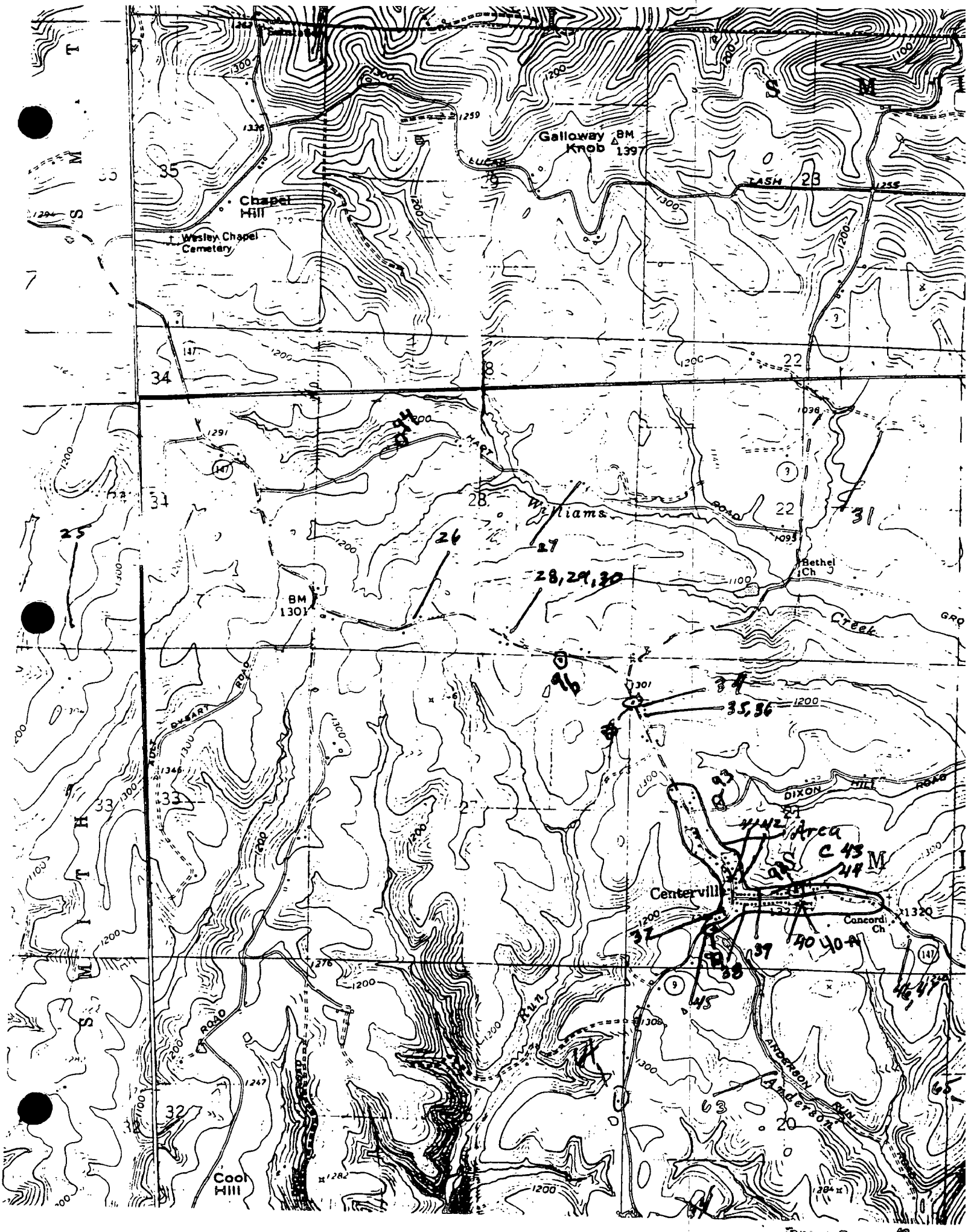
GENERAL DESCRIPTION OF LOCAL HYDROLOGY:
(USE ADDITIONAL SHEET IF NECESSARY)

Ground water is generally obtained from interbedded shale, sandstone and limestone bedrock. Well depths range from 35 to 150 feet with sustained yields of less than 2 gallons per minute.

AREAS OF PARTICULAR CONCERN:
(USE ADDITIONAL SHEET IF NECESSARY)

Longwall mining the #8 coal seam at an elevation of 718 to 800 feet M.S.L. will adversely affect wells within the permit boundary. All wells should be monitored for any quantity or quality changes.

OPERATOR


Galloway Knob
BM 1397
Chapel Hill
Wesley Chapel Cemetery
LUCAS
LASH
HART
Williams
ROAD
Bethel Ch
Creek
BM 1301
DYSART ROAD
DIXON HILL ROAD
Area
Centerville
Concordi Ch
Run
ANDERSON RUN
Anderson
Cool Hill
25
26
27
28,29,30
31
35,36
37
38
39
40
40-A
41
42
43
44
45
46
47
63
96

TOVCC 11374

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 2335

County BELMONT Township SMITH Section of Township 21

Owner CHRISTIAN CHURCH Address BELMONT, OHIO

Location of property 500' WEST OF INT RT #9 ON SR. 147

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 30'

Type of screen — Length of screen —

Type of pump DID NOT INSTALL

Capacity of pump —

Depth of pump setting —

Date of completion SEPT 1 1958

BAILING OR PUMPING TEST

Pumping rate — G.P.M. Duration of test —

Drawdown ft. Date

Developed capacity APPROX 2 G

Static level—depth to water 36

Pump installed by

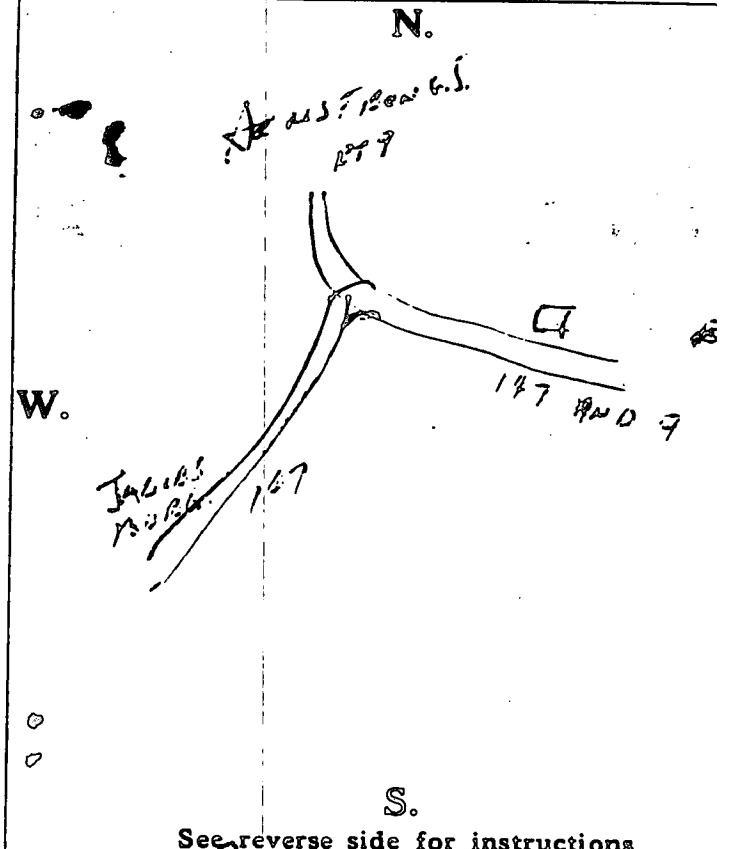
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY	0 Feet	25 Ft.
SANDSTONE	25	32
SHALE	32	36
LIME	36	39
SHALE	39	49
SANDSTONE	49	52
SHALE	52	60

6 1/4" CASING CEMENTED IN 8" HOLE

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road



See reverse side for instructions

Drilling Firm Phillips Drilling Co.

Address JACOBSBURG, OHIO

Date Apr. 1959

Signed Lowell N. Phillips

WL-151

0360-72

TOVCC 11375

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 23352

County BELMONT Township SMITH Section of Township 26

Owner CONCORD CHURCH MANSE Address BELMONT, O. R

Location of property WEST END OF CENTERVILLE

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing UNKNOWN

Type of screen ——— Length of screen ———

Type of pump JET

Capacity of pump 450 GPH

Depth of pump setting ———

Date of completion ~~Sept~~ OCT 1959

BAILING OR PUMPING TEST

Pumping rate ——— G.P.M. Duration of test ———

Drawdown ——— ft. Date ———

Developed capacity ———

Static level—depth to water ———

Pump installed by ———

WELL LOG

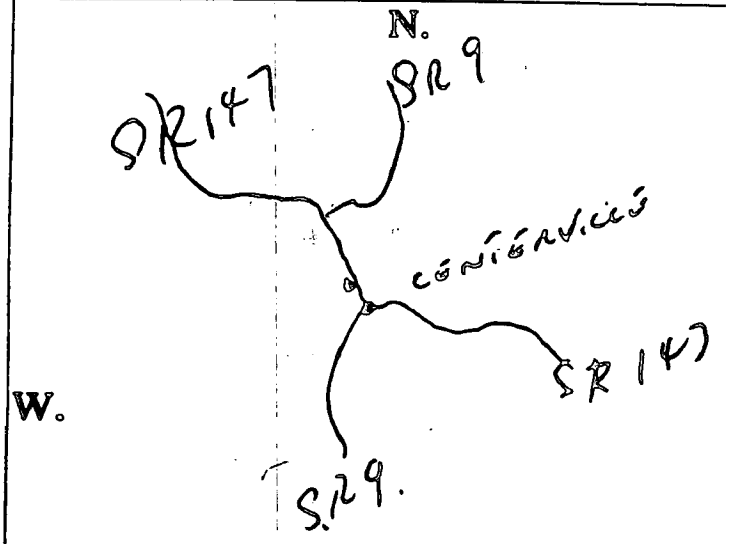
Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.

DRILLED WELL 35 FT DEEPER FOR MORE RESERVOIR

Approx 50 GAL./HR.

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



S.

See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO.

Address JACOBSBURG, OHIO

Date OCT 1959

Signed [illegible]

WL-151

TOVCC 11376

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 1762

County Belmont Township Smith Section of Township 34

Owner Harold Dunfee Address Centerville R.R.

Location of property 3 Miles north of Centerville Rt. 147

CONSTRUCTION DETAILS

Casing diameter 10" Length of casing 20'

Type of screen — Length of screen —

Type of pump —

Capacity of pump —

Depth of pump setting —

Date of completion July 20, 1956

BAILING OR PUMPING TEST

Pumping rate 3/4 G.P.M. Duration of test 2

Drawdown — ft. Date July 20,

Developed capacity —

Static level—depth to water 35

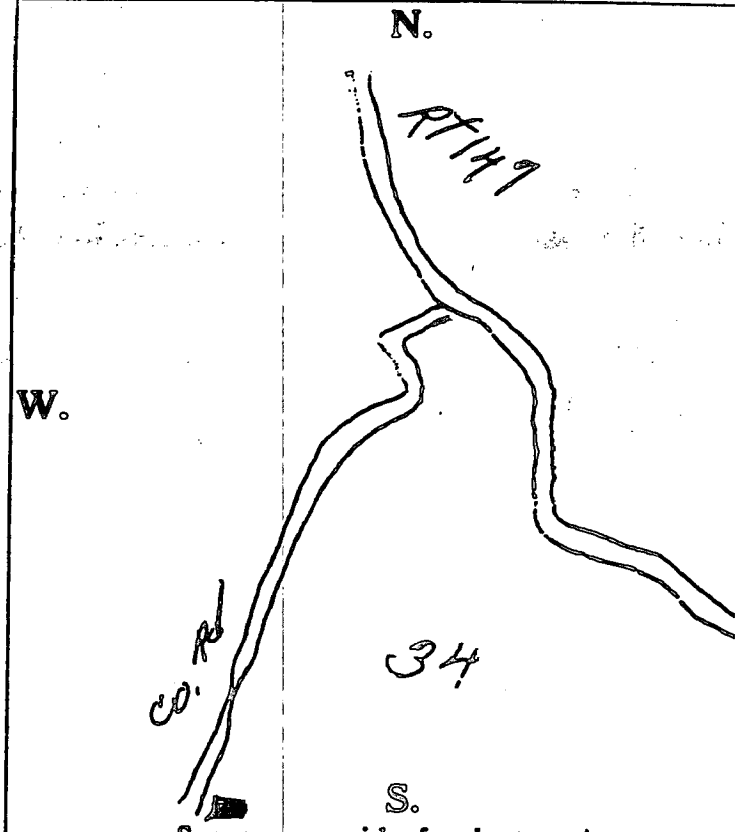
Pump installed by —

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Top soil	0 Feet	3 Ft.
yellow shale	3	18
yellow sandrock	18	25
Gray shale	25	35
Gray sandrock	35	40
Gray soapstone	40	50
Lime Rock	50	60
Red rock	60	65
Gray soapstone	65	80
Limestone	80	85
Gray shale	85	110

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads,



See reverse side for instructions

Drilling Firm E. J. Warrick & Sons Date Sept. 17, 1956

Address 769 E. Main St. Barnesville, Ohio Signed E. J. Warrick

TR 211

DL 416

TOVCC 11377

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 2335

County BELMONT Township SMITH Section of Township 28

Owner GLADYS McGAUGHY Address BELMONT, Ohio

Location of property 2 Mi. W. CENTERVILLE on 147 S.R.

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 22'

Type of screen — Length of screen —

Type of pump SUBMERSIBLE

Capacity of pump 500 GPH

Depth of pump setting 100'

Date of completion FEB 1959

BAILING OR PUMPING TEST

Pumping rate 6 G.P.M. Duration of test —

Drawdown — ft. Date —

Developed capacity —

Static level—depth to water 50'

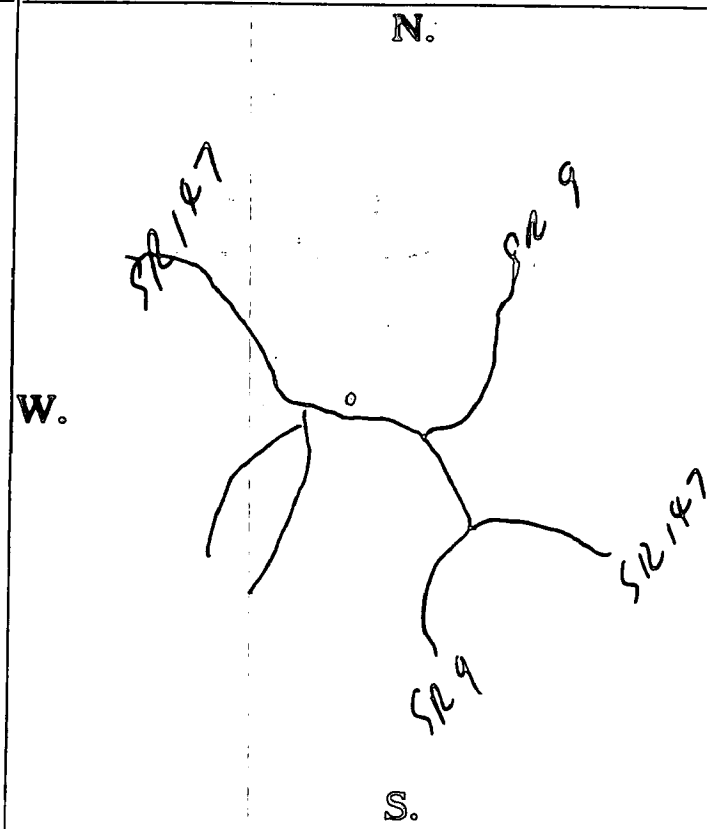
Pump installed by PHILLIPS DRILLING

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SURFACE	0 Feet	15 Ft.
SANDSTONE	15	25
SLATE	25	35
SANDSTONE	35	37
SLATE	37	42
SHALE	42	50
SANDSTONE	50	55
SLATE	55	65
SHALE	65	80
SLATE	80	95
SANDSTONE	95	100
SLATE	100	110

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road



See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO. ACOBSBURG, OHIO

Address

Date Apr 1959

Signed Robert M. Phillips

WL-219 0360-12

TOVCC 11378

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 2217

County Belmont Township Smith Section of Township 28

Owner Foster Funkhouser Address Warnock Ohio R

Location of property Farm House, on Co. Rd. off Route 9.

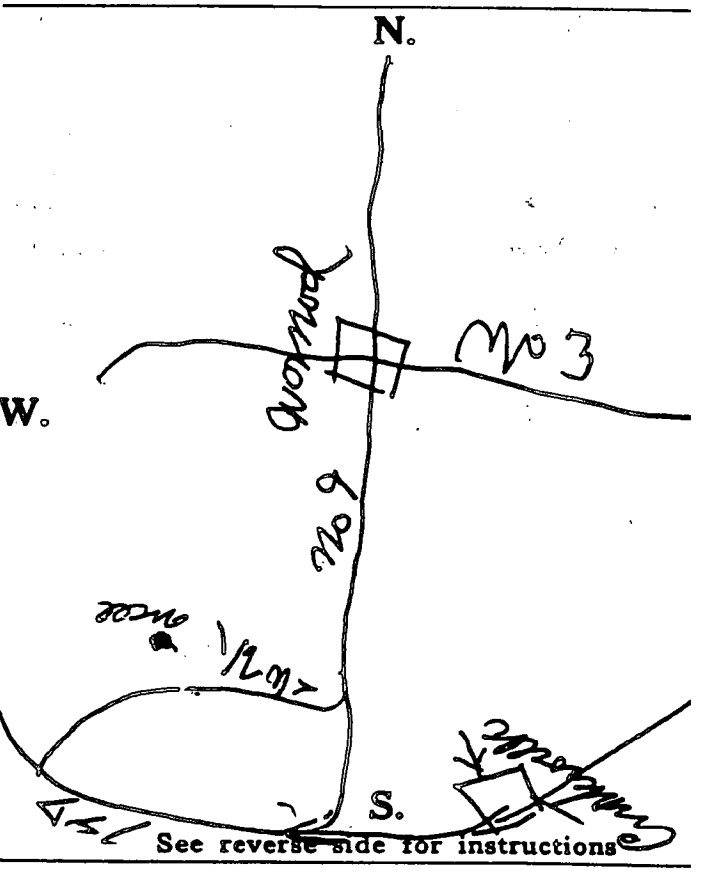
CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 10" Length of casing 20'6"	Pumping rate 1 G.P.M. Duration of test
Type of screen Length of screen	Drawdown 23 ft. Date
Type of pump	Developed capacity 1 gal per min
Capacity of pump	Static level—depth to water 37
Depth of pump setting —	Pump installed by
Date of completion	

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	3 Ft.
Sand Rock	3	10
quick sand	10	14
Sand Rock	14	18
gray slate	18	25
Coal Blossom	25	27
gray slate	27	37
Rock	37	39
gray slate	39	51
Rock	51	55
Slate Rock	55	60

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road



See reverse side for instructions

Drilling Firm McDougal & Wilhelm Date 7-23-59

Address 106 Taylor Lane Signed R. W. McDougal

St Clairsville, Ohio

TR 246

WL-294

0360-12

TOVCC 11379

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 2335(

County BELMONT Township SMITH Section of Township 28

Owner JAMES CORBET Address BELMONT, RT C

Location of property 1 3/4 M. WEST CENTERVILLE ON SR.

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 20

Type of screen — Length of screen —

Type of pump —

Capacity of pump —

Depth of pump setting —

Date of completion MARCH 1959

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test .....

Drawdown ..... ft. Date .....

Developed capacity Approx 26

Static level—depth to water 30

Pump installed by —

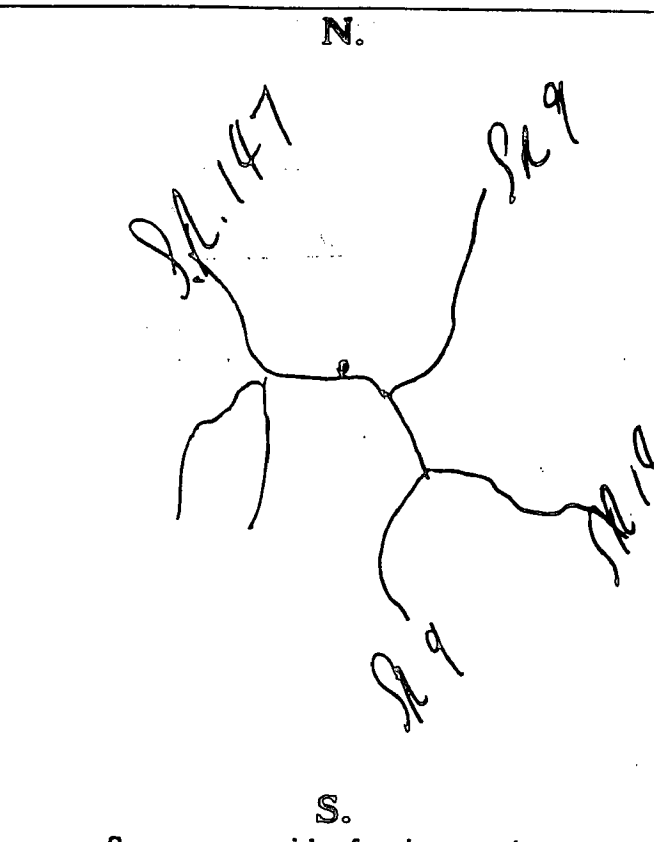
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	..... Ft.
OLD WELL		36
SANDSTONE	36	45
SLATE	45	46
SANDSTONE	46	52
SLATE	52	65

8" Casing Cemented IN 10" Hole.

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO. JACOBSBURG, OHIO

Address .....

Date Apr 1959

Signed Robert N. [illegible]

ARAN

D580-12

TOVCC 11380

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 1852

County BELMONT Township SMITH Section of Township

Owner JOHN DELANEY Address BELMONT OHIO

Location of property 4 MI NORTH OF ST RT 147 ON ST RT #9

CONSTRUCTION DETAILS

Casing diameter 8 1/4 Length of casing 20

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion SEPT 26 1956

BAILING OR PUMPING TEST

Pumping rate COULD NOT LOWER G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water

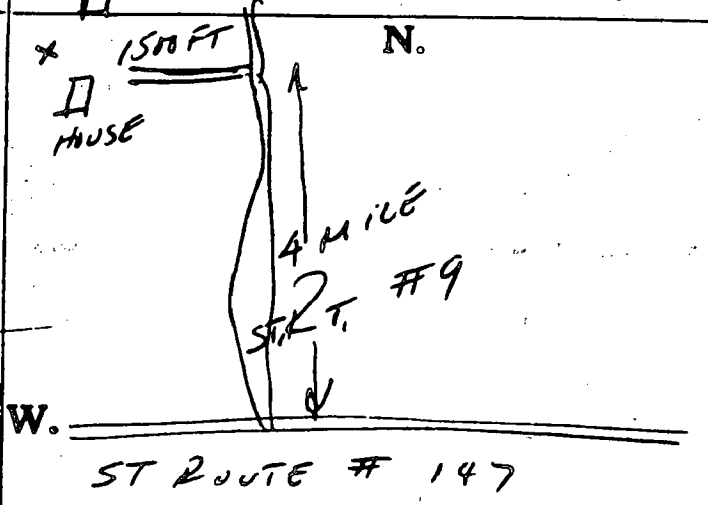
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY	0 Feet	15 Ft.
SANDSTONE	15	18
CLAY	18	20
SHALE	20	28
SANDSTONE	28	37
SLATE	37	43
SANDSTONE	43	46
SLATE	46	51
COAL	51	52
SLATE	52	58
LIME	58	61
SLATE	61	65
SHALE	65	70
SLATE	70	71

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

RECEIVED

Drilling Firm [redacted] DRILLING Co.

Address [redacted]BURG, O

Date SEPT 28 1956

Signed [signature]

OFF SITE
D350-12

TOVCC 11381

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 1852

County BELMONT Township SMITH Section of Township

Owner NEWELL DELANEY Address ARMSTRONG, MIC

Location of property 1½ MI WEST OF CENTERVILLE ON RT

CONSTRUCTION DETAILS

Casing diameter 8 1/4 Length of casing 22

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion SEPT 18 1956

BAILING OR PUMPING TEST

Pumping rate 3 G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water 26

Pump installed by — HOUSE NOT COMPLETED — NOT INSTA

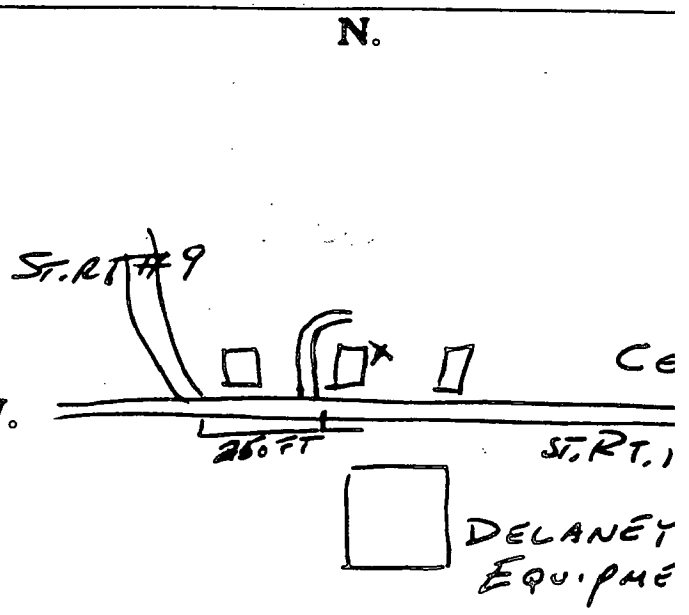
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SHALE	0 Feet	26 Ft.
SANDSTONE	26	32
SLATE	32	40
LIME	40	42
SLATE	42	51
SAND STONE	51	53
SLATE	53	59
SHALE	59	64
SLATE	64	65
SHALE	65	69
SLATE	69	71
SHALE	71	75
SLATE	75	83

22 FT 8 1/4" CASING CEMENTED IN 10" HOLE

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

Drilling Firm [redacted] DRILLING CO. Date SEPT 20 1956

Address [redacted] O. Signed [signature]

WL-267

TOVCC 11382

DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

№ 1140

County Belmont Township Smith Section of Township or Lot Number Range 2

Owner Lucas Address Centerville, Ohio

Location of property Centerville Farm.

CONSTRUCTION DETAILS

Casing diameter 5 in. Length of casing 21 ft. 10 in.

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

PUMPING TEST

Pumping rate ..... G.P.M. Duration of test .....

Drawdown 20 ft. Date .....

Developed capacity 1/4 gal per min

Static level—depth to water 45

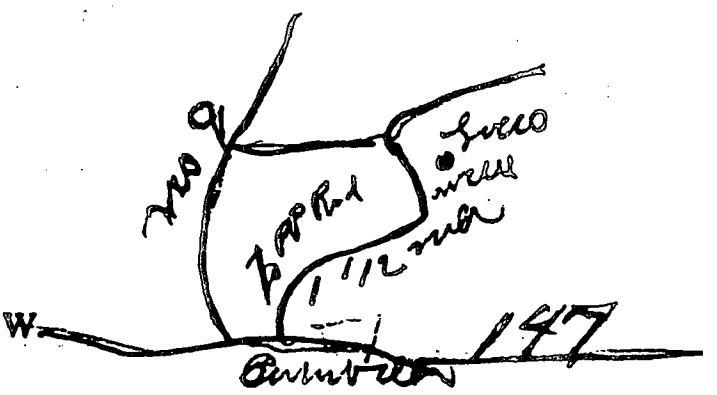
Pump installed by owner.

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
loam & clay	0 Feet	8 Ft.
quicksand	8	17
gray slate	17	21
lime	21	62

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads,



See reverse side for instructions

Drilling Firm McDougal & Wilhelm Date Nov. 15, 1956

Address 106 Taylor Lane St Clairsville, Ohio.

Signed C. W. McDougal

SR 147

TOVCC 11383

4-726000 S

OHIO WATER RESOURCES BOARD

Department of Public Works
553 E. Broad St. Columbus 15, Ohio

No 48

County Belmont Township 9 Smith ~~Washington~~ Section of Township or Lot Number 21

Owner John Mounds Address Centerville O

Location of property on 147-1 mile north of Centerville O

CONSTRUCTION DETAILS

Casing diameter 6 5/4 Length of casing 18 1/2

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate 15 G.P.M. Duration of test

Drawdown ft. Date 6/1/5

Developed capacity

Static level of completed well 36 ft.

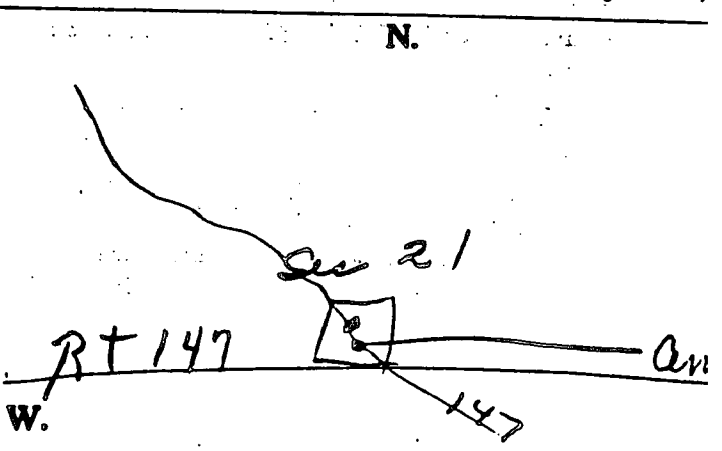
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
top Soil	0 Feet	1 Ft.
sand Shale	1	12
Soap stone	12	20
Lime Rock	20	26
Sand Rock	26	35
Soap stone	35	42
slate	42	47
Lime	47	51
Soaps	51	60
Sand Rock	60	65
soap	65	81
Lime	81	84
Soaps	84	91
Red Rock ✓	91	94

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads,



S.

See reverse side for instructions

Drilling Firm Warick & Son Date 8/5/53

Address 169 E. Main Barnesville O Signed H. W. Lucas

SR 147

WL-313
0360-12

TOVCC 11384

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 185

County BELMONT Township SMITH Section of Township

Owner DAVID HEATH Address ARMSTRONG S MILLS

Location of property ~~1/4~~ 250' S. OF JUNCTION OF RT 9 AND RT 147 IN CENTER

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 20

Type of screen Length of screen

Type of pump DEEP WELL JET

Capacity of pump

Depth of pump setting 54' -

Date of completion

BAILING OR PUMPING TEST

Pumping rate 10 G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water 30

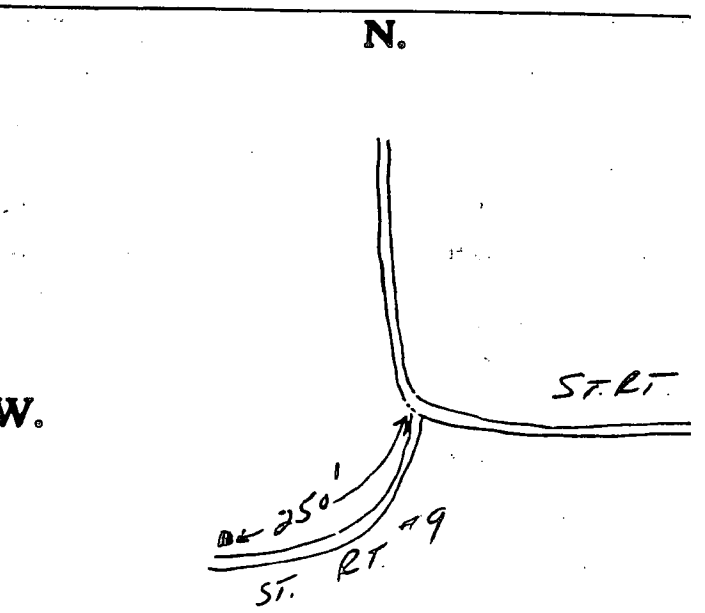
Pump installed by PHILLIPS DRILLING

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY	0 Feet	15 Ft.
SANDSTONE	15	19
SHALE	19	20
STANSTONE	20	25
SHALE	25	27
SANDSTONE	27	40
SHALE	40	45
LIME	45	46
SHALE-DARK	46	50
LIME	50	52
SHALE	52	61
WATER AT 30'		
8" CASING DRIVEN IN 8" HOLE AND CEMENTED		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road



S.

See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO. Date JULY 26 1956

Address JACOBSBURG, O. Signed Robert N. Phillips

WL-116

0360

TOVCC 11385

PLEASE USE PENCIL
OR TYPEWRITER
DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

Nº 278

County Belmont Township Smith Section of Township 21

Owner C W Foster Address Jacobsburgh RD 1

Location of property along St RT 147 opposite side of street from Christian Church in Centerville O.

CONSTRUCTION DETAILS

Casing diameter 10 Length of casing 22

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting -

Date of completion 11-15 63

BAILING OR PUMPING TEST

Pumping Rate 20 G.P.M. Duration of test .....

Drawdown ..... ft. Date .....

Static level-depth to water 67'

Quality (clear, cloudy, taste, odor) .....

Pump installed by owner.

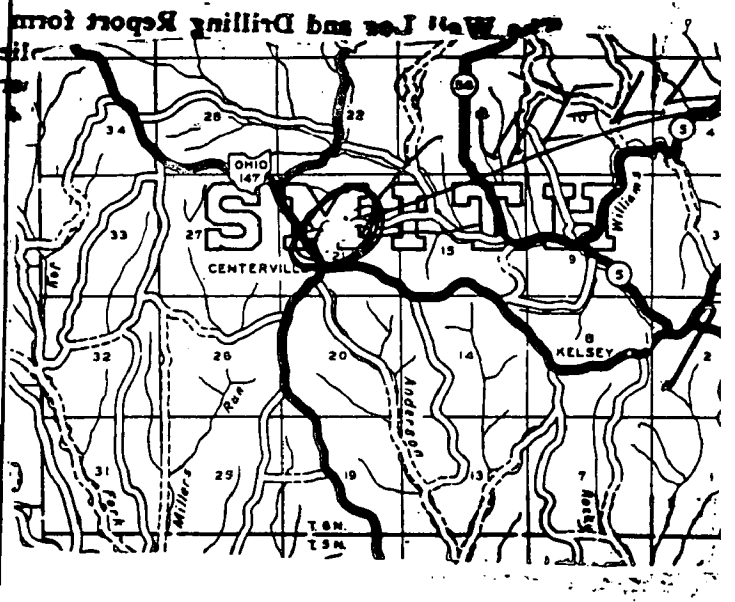
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	.....Ft.
Clay	1	3
Sandstone	3	14
Red Rock	14	21
Sand Stone	21	30
Shale	30	35
Sand Stone	35	65
Shale	65	71
Sandstone	71	89
Shale	89	97

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads,

N.



S.

See reverse side for instructions

Drilling Firm R B Ault

Address 3101 Clinton St
Belmont O

Date Nov 15 1963

Signed R B Ault

OFF SITE 4
D380-22

TOVCC 11386

STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 185

County BELMONT Township SMITH Section of Township 21

Owner OTIS STONEBRAKER Address HANSTRINGS MILLS

Location of property APPROX. - 1/2 E. OF JCT RT 9 AND 147 ON SR.

CONSTRUCTION DETAILS

Casing diameter 8" CEMENTED IN 10" HOLE Length of casing 26'

Type of screen Length of screen

Type of pump MYERS HAND PUMP

Capacity of pump

Depth of pump setting 90' -

Date of completion AUG 1 1957

BAILING OR PUMPING TEST

Pumping rate 1 1/2 G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water 36'

Pump installed by PHILLIPS DRILLING

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SURFACE	0 Feet	15 Ft.
SHALE	15	19
RED CLAY	19	22
BLACK SLATE	22	25
CASING - LIME	25	26
SLATE	26	30
LIME	30	31
SLATE	31	32
LIME	32	35
SHALE	35	44
WATER - LIME	44	46
SLATE	46	55
SHALE	55	60
SAND	60	61
SHALE	61	70
LIME	70	72
SLATE	72	88
SAND	88	88
SLATE	88	95
SHALE	95	100

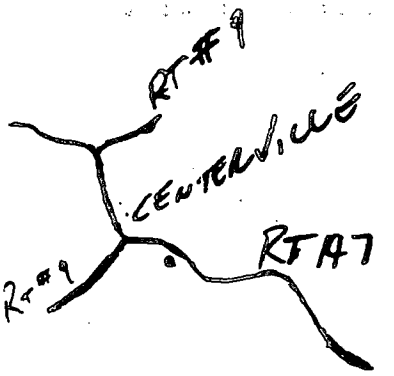
CASING CEMENTED 10" HOLE

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads

N.

W.



S.

See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO Date AUG 1 1957

Address JACOBSBURG, OHIO Signed [illegible]

OFF SITE - 12.

TOVCC 11387

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State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No 114

County Belmont 7 Township Smith 9 Section of Township or Lot Number 21

Owner Stonebraker Address Centerville, Ohio

Location of property State Rd 147 Centerville, Ohio

CONSTRUCTION DETAILS	PUMPING TEST
Casing diameter 8 Length of casing	Pumping rate / G.P.M. Duration of test
Type of screen Length of screen	Drawdown ft. Date
Type of pump	Developed capacity
Capacity of pump	Static level—depth to water 51 ft.
Depth of pump setting	Pump installed by owner

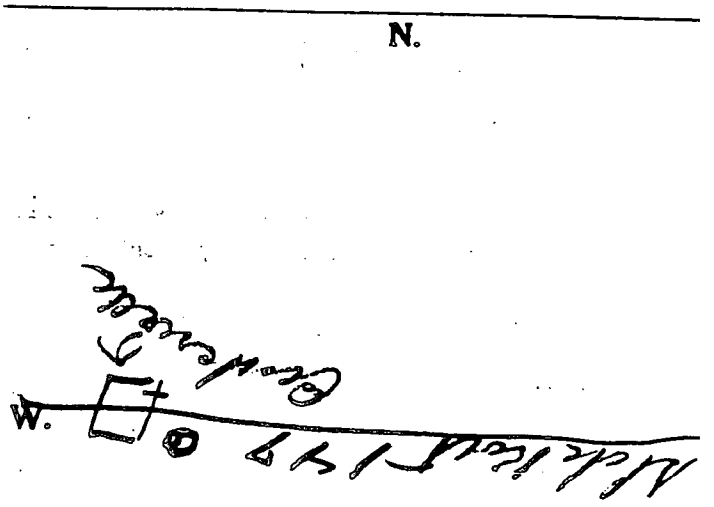
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Loam + clay	0 Feet	Ft.
and rock	0	12
clay	12	18
sand rock	18	25
dark slate	25	28
light slate	28	32
Rock	32	36
slate	36	39
Rock	39	47
slate	47	53
Rock	53	67
	67	74

2

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



S.

See reverse side for instructions

Drilling Firm McDougal & Wilhelm Inc. McDougal-Wilhe

Address 106 Taylor Lane Signed Oct. 18, 1955

OFF SITE

TOVCC 11388

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

№ 325486

County BELMONT Township SMITH Section of Township

Owner VERNON RILEY Address JACOBSBURG OHIO

Location of property ST. RT. 147 CENTERVILLE OHIO

CONSTRUCTION DETAILS

Casing diameter 10" Length of casing 20'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 6 G.P.M. Duration of test 2

Drawdown ft. Date

Static level-depth to water 70

Quality (clear, cloudy, taste, odor) CLEAR

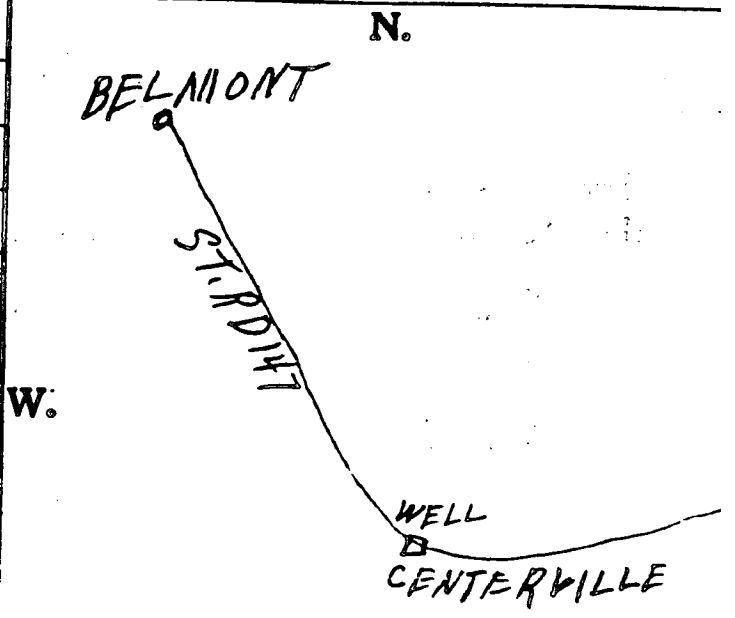
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
SHALE	0 Feet	12 Ft.
SANDSTONE	12	14
SHALE GREY	14	25
SHALE BLACK	25	40
SHALE	40	65
SHALE RED & GREY	65	100
WATER AT 65		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads,



See reverse side for instructions

Drilling Firm KRIECHBAUM Date 9/8/67

Address JACOBSBURG OHIO Signed Laverne Kriechbaum

*If additional space is needed to complete well log, use next consecutive numbered for

OFFSITE

TOVCC 11389

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 1852

County BELMONT Township SMITH Section of Township

Owner THOMAS DURBIN Address ARMSTRONGS MILLS

Location of property JUCTION OF ST RT 9 AND ST RT 147 IN CENTO

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 20

Type of screen Length of screen

Type of pump MYERS HAND PUMP

Capacity of pump

Depth of pump setting ~~38~~ FT

Date of completion

BAILING OR PUMPING TEST

Pumping rate 9 G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water 20

Pump installed by PHILLIPS DRILLING

WELL LOG

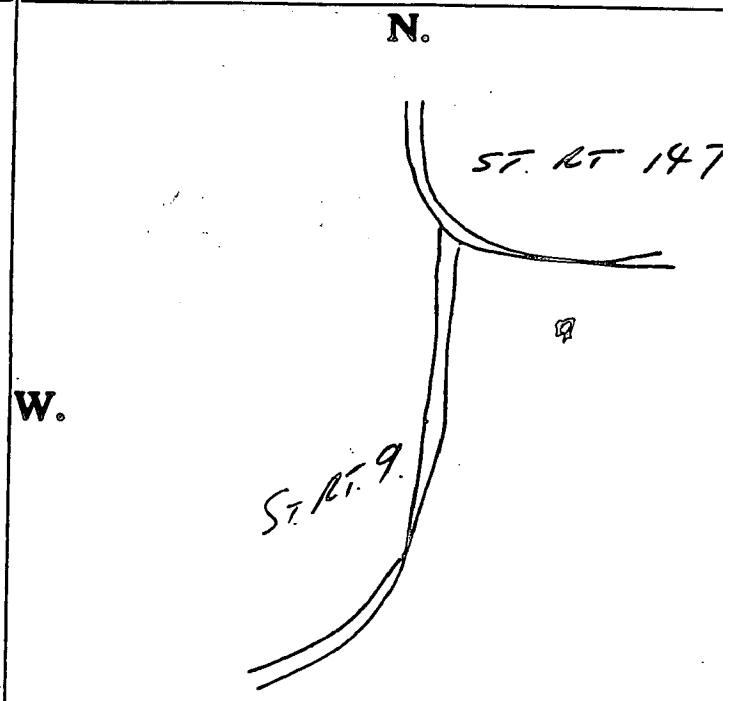
Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY	0 Feet	15 Ft.
SANDSTONE	18	25
SHALE	25	29
LIME STONE	29	32
SHALE	32	42

WATER AT 20' AND 32'

8" CASING CEMENTED IN 8" HOLE

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

Drilling Firm PHILLIPS DRILLING Co. Date JULY 26 1956

Address JACOBSBURG, O Signed Robert N. Phillips

OFF SITE

0360 12

TOVCC 11390

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 2335

County BELMONT Township SMITH Section of Township

Owner MR. ROBERT WEEKLY Address JACOBSBORG, O

Location of property APPROX 500 FT E JCT RT 9 ON 1

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 22

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion FEB 1960

BAILING OR PUMPING TEST

Pumping rate 2 G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water 55'

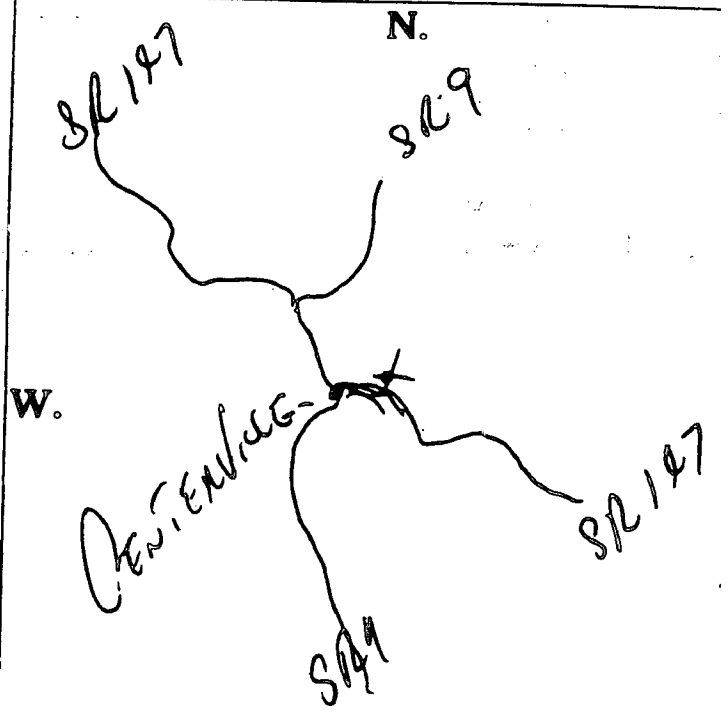
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY AND SHALE	0 Feet	14 Ft.
SANDSTONE	14	20
SHALE ?	20	36
LIME	36	39
SHALE	39	55
WATER—SANDSTONE	55	65
SLATE	65	80
SANDSTONE	80	82
SLATE	82	90

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO.

Address JACOBSBURG, OHIO

Date FEB 1960

Signed Robert N. Phillips

RECEIVED NOV 8 2001

OFFICE C

D360-12

TOVCC 11391

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OHIO WATER RESOURCES BOARD

Department of Public Works
553 E. Broad St., Columbus 15, Ohio

No. 48

County Belmont 7 Township Smith 9 Section of Township or Lot Number 27 Sec

Owner Centerville Parsonage Address Centerville Oh

Location of property Centerville

CONSTRUCTION DETAILS

Casing diameter 8 in Length of casing 36 ft

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test

Drawdown ft. Date 5/20

Developed capacity 2 gal min

Static level of completed well 28 ft

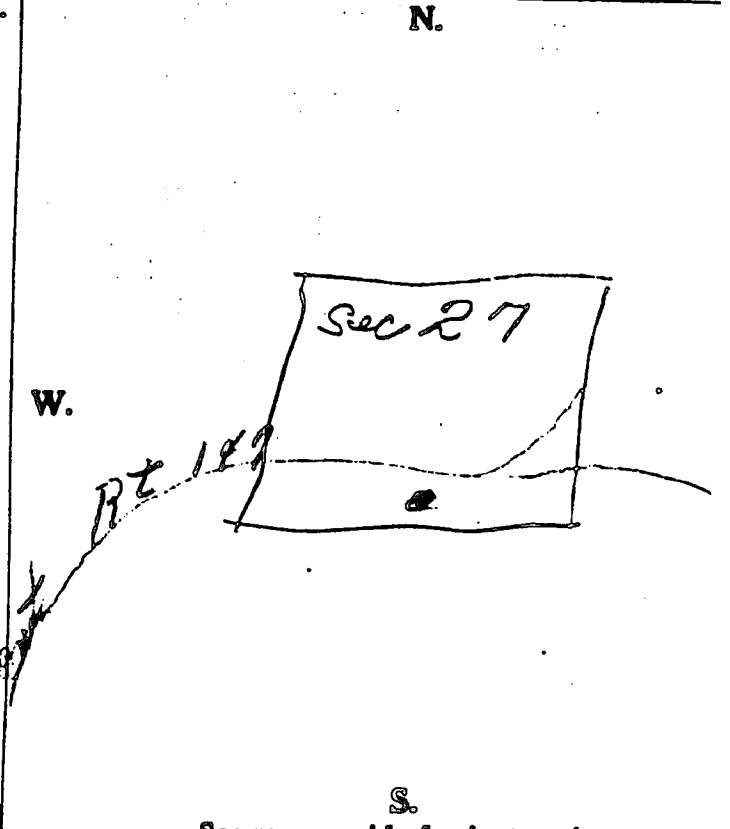
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Soil	0 Feet	2 Ft.
Soap Stone	2	34
Slate	34	37
Soap Stone	37	40
Sand Rock	40	85
4		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

Drilling Firm Warrick & Son Date 10/29/53

Address Barnesville O Signed Lucas

9R 147

UNKNOWN
D360-18

TOVCC 11392

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 2335

County BELMONT Township SMITH Section of Township 21

Owner MR. HERBERT DUNFEE Address JACOBSBURG, O.

Location of property 500' E ON SR 147 FROM INT SR 9

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 16

Type of screen — Length of screen —

Type of pump JET

Capacity of pump 500 GPH.

Depth of pump setting 85'

Date of completion DECEMBER 15-58

BAILING OR PUMPING TEST

Pumping rate 8 G.P.M. Duration of test —

Drawdown — ft. Date —

Developed capacity —

Static level—depth to water 55

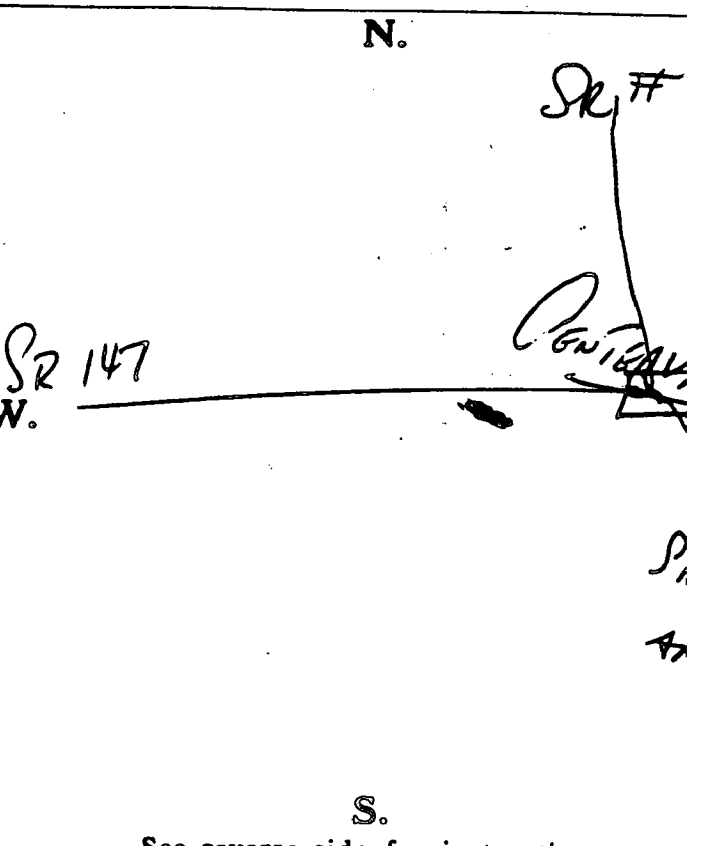
Pump installed by PHILLIPS DRILLING

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY AND SHALE	0 Feet	14 Ft.
SANDSTONE	14	20
SHALE	20	36
LIME	36	39
SHALE	39	55
SAND STONE	55	65
SLATE	65	80
SAND STONE	80	82
SLATE	82	92

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road



See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO.
JACOBSBURG, OHIO

Address

Date Apr. 1959

Signed Robert A. Phillips

UNKNOWN

TOVCC 11393

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

No. 23353

County BELMONT Township SMITH Section of Township 21

Owner LESLIE LUCAS Address JACOBSBURG, O.

Location of property 1/4 M. E OF CENTERVILLE ON S.R.

CONSTRUCTION DETAILS

Casing diameter 8 1/4 Length of casing 32'

Type of screen — Length of screen —

Type of pump —

Capacity of pump —

Depth of pump setting —

Date of completion MAY 1960

BAILING OR PUMPING TEST

Pumping rate — G.P.M. Duration of test —

Drawdown — ft. Date —

Developed capacity Approx 2 G.P.

Static level—depth to water 40

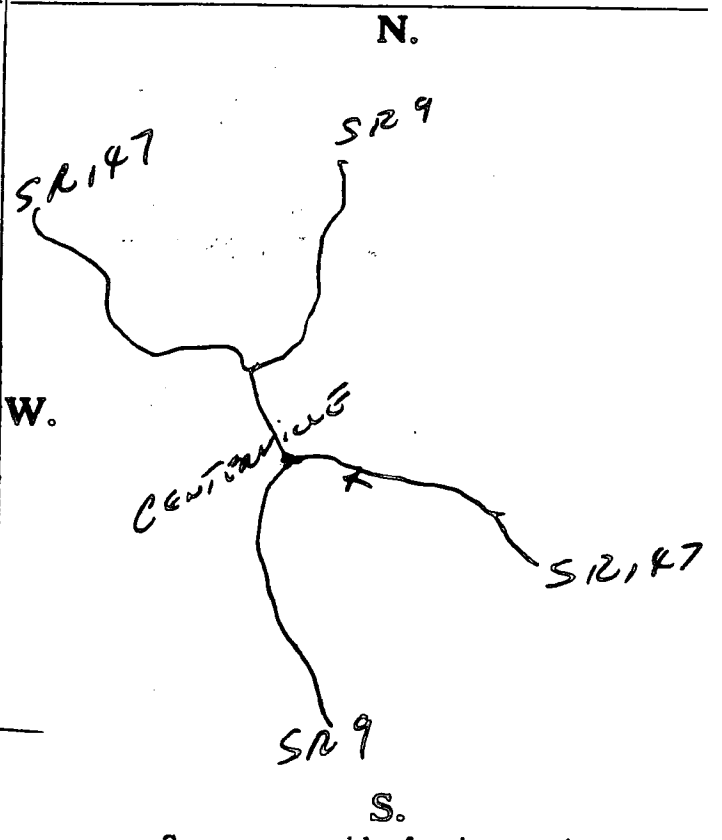
Pump installed by SELF

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY AND SHALE	0 Feet	20 Ft.
SANDSTONE	20	21
SHALE	21	29
SLATE	29	30
SANDSTONE	30	33
SLATE	33	40
SANDSTONE	40	46
SLATE	46	60
LIME	60	62
SLATE	62	80
LIME	80	81
SLATE	81	90

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads



See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO.
JACOBSBURG, OHIO

Address

Date MAY 1960

Signed Robert Phillips

OFF SITE
DEC 12

TOVCC 11394

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 1852

County BELMONT Township SMITH Section of Township 21

Owner THOMAS STICCION Address JACOBSBURG, O

Location of property 1/4 M. SOUTH CENTERVILLE ON ST ROUTE

CONSTRUCTION DETAILS

Casing diameter 8 1/4 Length of casing 21

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion DEC 10 1957

BAILING OR PUMPING TEST

Pumping rate 8 G.P.M. Duration of test .....

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 20

Pump installed by .....

WELL LOG

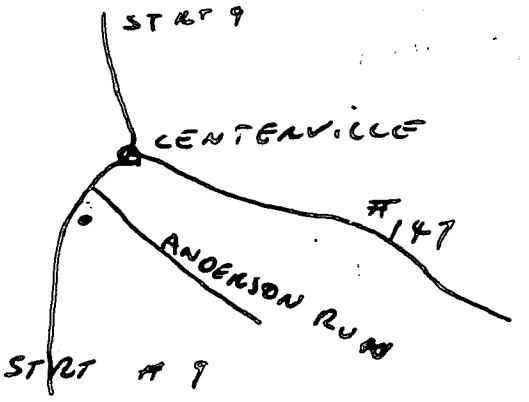
Formations Sandstone, shale, limestone, gravel and clay	From	To
SURFACE	0 Feet	18 Ft.
SANDSTONE	18	25
SHALE	25	40
SANDSTONE	40	52
SHALE	52	60
SLATE	60	70

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road

N.

W.



S.

See reverse side for instructions

Drilling Firm PHILLIPS DRILLING CO. Date DEC 11 1957

Address ~~Robert M. Phillips~~ JACOBSBURG, O. Signed Robert M. Phillips

WL-115

TOVCC 11395

DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 185

County BELMONT Township SMITH Section of Township 21

Owner CONCORD CHURCH Address JACOBSBURG OHIO

Location of property 1/2 M EAST CENTERVILLE ON ST RT #147

CONSTRUCTION DETAILS

Casing diameter 8 1/4 Length of casing 26'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion AUG 10 1957

BAILING OR PUMPING TEST

Pumping rate 5 G.P.M. Duration of test

Drawdown ft. Date

Developed capacity

Static level—depth to water 50

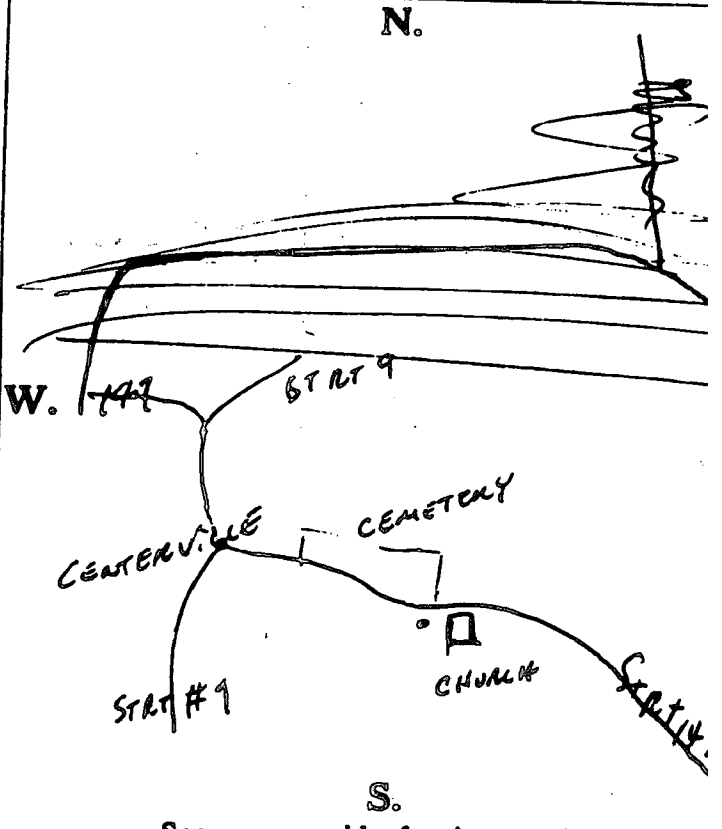
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SURFACE	0 Feet	18 Ft.
SANDSTONE	18	22
SHALE	22	40
SANDSTONE	40	48
SLATE	48	60
SANDSTONE	60	65
SLATE	65	90

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County road



See reverse side for instructions

Drilling Firm Phillips Drilling Co. Date AUG 11 1957

Address JACOBSBURG, OHIO Signed Robert M. [illegible]

OFF SITE

TOVCC 11396

PRESS HARD

Permit Number 30

COUNTY BELMONT TOWNSHIP SMITH SECTION/LOT No. (CIRCLE ONE)

OWNER/BUILDER (CIRCLE ONE OR BOTH) FRANCIS HART PROPERTY ADDRESS BELMONT-CENTERVILLE RD BELM (ADDRESS OF WELL LOCATION A)

LOCATION OF PROPERTY

CONSTRUCTION DETAILS

CASING Borehole Diameter 10 in.

[1] Diameter 8 in. Length 22 ft. Wall Thickness ____ in.

[2] Diameter ____ in. Length ____ ft. Wall Thickness ____ in.

Type: [1] Steel [2] [1] Galv. [2] [1] PVC [2] [1] [2] Other ____

Joints: [1] Threaded [2] [1] Welded [2] [1] Solvent [2] [1] [2] Other ____

Liner: Length ____ Type ____ Wall Thickness ____ in.

SCREEN

Type (wire wrapped, louvered, etc.) ____ Material ____

Length ____ ft. Diameter ____ in.

Set between ____ ft. and ____ ft. Slot ____

GROUT

Material CEMENT Volume used 960 lbs.

Method of installation POUR

Depth: placed from 22 ft. to SURFACE

GRAVEL PACK (Filter Pack)

Material ____ Volume used ____

Method of installation ____

Depth: placed from ____ ft. to ____

Pitless Device [x] Adapter [ ] Preassembled unit

Use of Well SINGLE FAMILY DWELLING

[ ] Rotary [x] Cable [ ] Augered [ ] Driven [ ] Dug [ ] Other ____

Date of Completion 1-30-92

WELL LOG*

INDICATE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Show color, texture, hardness, and formation: sandstone, shale, limestone, gravel, clay, sand, etc.

	From	To
BROWN SANDY SOIL	0	2
BROWN SANDSTONE	2	18
RED LIMESTONE	18	19
GRAY LIMESTONE MED	19	36
HARD GRAY LIMESTONE	36	39
MED GRAY LIMESTONE W/HD BANDS	39	90
WATER ENCOUNTERED 39'-72'		

*If additional space is needed to complete well log, use next consecutively numbered form.

WELL TEST

[x] Bailing [ ] Pumping* [ ] Other ____

Test rate 5.5 gpm Duration of test ____

Drawdown 8'

Measured from: [ ] top of casing [x] ground level [ ] Other ____

Static Level (depth to water) 39 ft. Date: 1-30-9

Quality (clear, cloudy, taste, odor) CLEAR - NO TASTE NO

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

PUMP

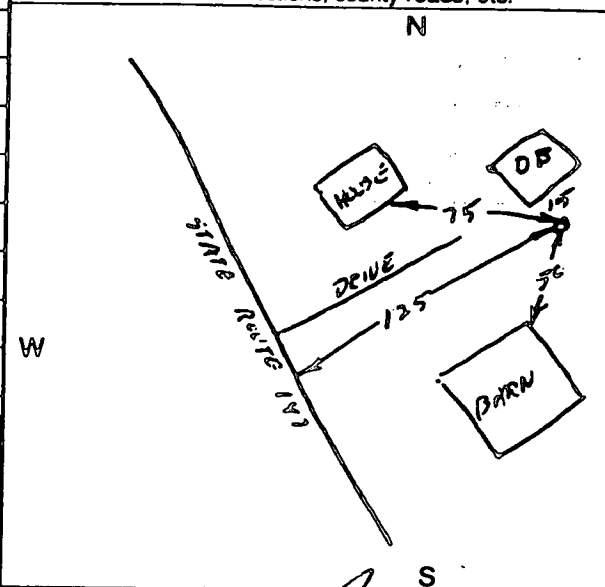
Type of pump SUBMERSIBLE Capacity 10

Pump set at 86

Pump installed by DAVE GREEN - GREEN'S WELL DR

SKETCH SHOWING WELL LOCATION

Show distances well lies from numbered state highways, street intersections, county roads, etc.



Drilling Firm GREEN'S WELL DRILLING Signed [signature]

Address 429 S. MAIN ST Date 2-11-92

City, State, Zip BETHESDA OHIO 43719 ODH Registration Number # 1572

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.

ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 1939 FOUNTAIN SQ. DRIVE, COLS., OHIO 43224

Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

WL-317

TR 231

TOVCC 11397

Permit Number _____

COUNTY Belmont TOWNSHIP Smith SECTION/LOT No. _____ (CIRCLE ONE)

OWNER/BUILDER (CIRCLE ONE OR BOTH) Scotty D Parker PROPERTY ADDRESS 45707 Bel. Cent. Rd B (ADDRESS OF WELL LOCATION A)

LOCATION OF PROPERTY 1 mile West Centerville Ohio on #147

CONSTRUCTION DETAILS

CASING Borehole Diameter 12 in.

1 Diameter 10 in. Length 25 ft. Wall Thickness 1/2 in.

2 Diameter _____ in. Length _____ ft. Wall Thickness _____ in.

Type: 1 2 Steel 1 2 Galv. ✓ 1 2 PVC 1 2 Other _____

Joints: 1 2 Threaded 1 2 Welded ✓ 1 2 Solvent 1 2 Other _____

Liner: Length _____ Type _____ Wall Thickness _____ in.

SCREEN

Type (wire wrapped, louvered, etc.) _____ Material _____

Length _____ ft. Diameter _____ in.

Set between _____ ft. and _____ ft. Slot _____

GROUT

Material Sacrete Volume used 800#

Method of installation _____

Depth: placed from 24 ft. to 4

GRAVEL PACK (Filter Pack)

Material _____ Volume used _____

Method of installation _____

Depth: placed from _____ ft. to _____

Pitless Device ☐ Adapter ☐ Preassembled unit

Use of Well _____

☐ Rotary ✓ Cable ☐ Augered ☐ Driven ☐ Dug ☐ Other _____

Date of Completion [redacted] 10-10-93

WELL LOG*

INDICATE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Show color, texture, hardness, and formation: sandstone, shale, limestone, gravel, clay, sand, etc.

	From	To
Shale rock	0	20
Sandstone	20	30
Gray shale	30	35
Sand stone	35	45
Gray clay	45	50
GRay Shale	50	60
Sandstone (white) ; gray water	60	80
Red shale	80	90
Gray Shale	90	95
Lime stone (soft)	95	105

WELL TEST

✓ Bailing ☐ Pumping* ☐ Other _____

Test rate 2 1/2 gpm Duration of test _____

Drawdown 40

Measured from: ☐ top of casing ✓ ground level ☐ Other _____

Static Level (depth to water) 65 ft. Date: 10-1

Quality (clear, cloudy, taste, odor) cloudy

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

PUMP

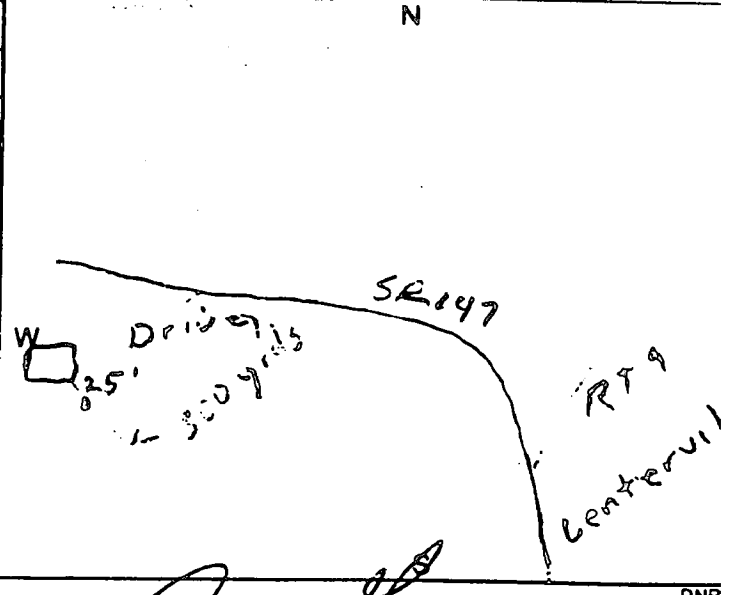
Type of pump _____ Capacity _____

Pump set at _____

Pump installed by _____

SKETCH SHOWING WELL LOCATION

Show distances well lies from numbered state highways, street intersections, county roads, etc.



*If additional space is needed to complete well log, use next consecutively numbered form.

DNR

Drilling Firm GREEN'S WELL DRILLING Signed [signature]

Address 429 S. MAIN Date 10-30-93

City, State, Zip BETHESDA OHIO 43719 ODH Registration Number 1572

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.

5242 ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 1939 FOUNTAIN SQ. DRIVE, COLS., OHIO 43224

Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

WL-310

TOVCC 11398

Y- 127,5005

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

Nº 15117

County Belmont Township Smith Section of Township or Lot Number 28

Owner James Corbett Address Centerville O.

Location of property Along State Rd. 147 - 1 mi. west of intersection of 147 with state Rt. 9.

CONSTRUCTION DETAILS	PUMPING TEST
Casing diameter 10 in Length of casing 16 1/2	Pumping rate 30 G.P.M. Duration of test
Type of screen Length of screen	Drawdown ft. Date
Type of pump	Developed capacity
Capacity of pump	Static level—depth to water 60
Depth of pump setting	Pump installed by

WELL LOG

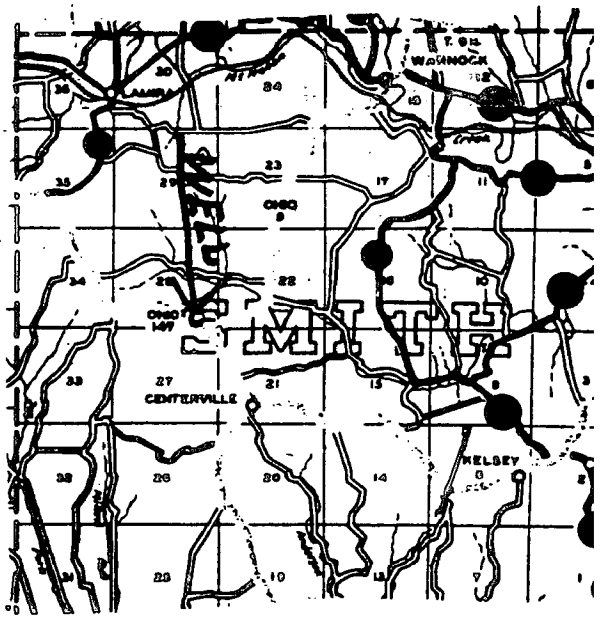
Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Clay	1	14
Sandstone	14	21
Slate	21	31
Sandstone	31	40
Slate	40	49
Limestone	49	56
Slate	56	66
Red Rock	66	74
Sandstone	74	88
Slate	88	100

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads

N.

W.



S.

See reverse side for instructions

Drilling Firm R. B. Ault Date 4-7-55

Address 3101 Clinton St. Bellaire O. Signed R. B. Ault

RECEIVED NOV 8 2001-311

SR 147

0550-12

TOVCC 11399

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

Nº 3104

County Belmont Township Smith Section of Township 25

Owner Joe Corbett Address Belmont R D #

Location of property 1 Mile West of Intersection of State Routes 147 a

CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 8 Length of casing 20	Pumping Rate 5 G.P.H. Duration of test
Type of screen Length of screen	Drawdown ft. Date
Type of pump	Static level-depth to water 40
Capacity of pump	Quality (clear, cloudy, taste, odor) Clear
Depth of pump setting	
Date of completion	Pump installed by owner

WELL LOG

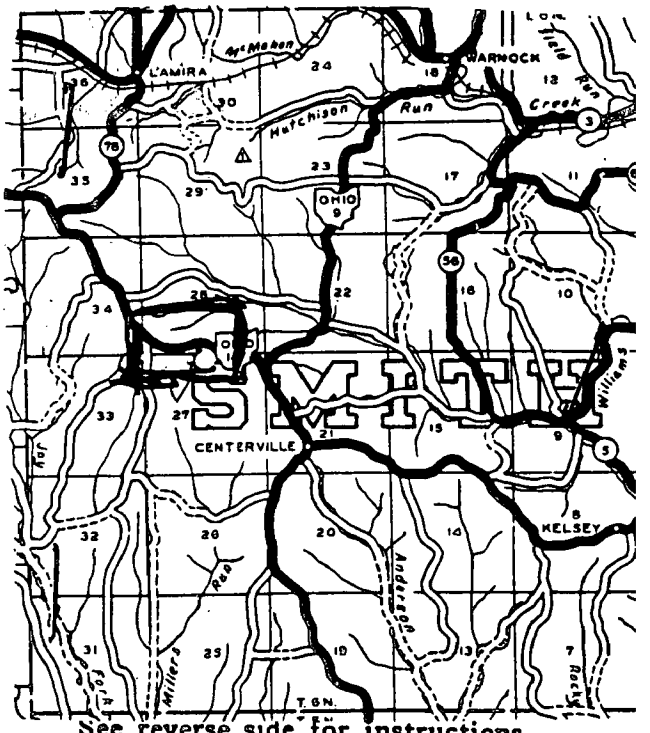
Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Clay	1	16
Sand Stone	16	31
Shale	31	40
Sand Stone	40	53
Shale	53	68
Sand Stone	68	78

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads,

N.

W.



See reverse side for instructions

Drilling Firm R B Pruitt Date Nov 3 1966

Address Bellaire O. Signed R B Pruitt

WL-321

D360-12

TOVCC 11400

WELL LOG AND DRILLING REPORT

ORIGIN.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 176221

County Belmont Township Smith Section of Township 34

Owner Harold Dunfee Address Centerville R.R.

Location of property 3 Miles north of Centerville Rt. 147

CONSTRUCTION DETAILS

Casing diameter 10" Length of casing 20'

Type of screen — Length of screen —

Type of pump —

Capacity of pump $ —

Depth of pump setting —

Date of completion July 20, 1956

BAILING OR PUMPING TEST

Pumping rate 3/4 G.P.M. Duration of test 2 hr

Drawdown — ft. Date July 20, 19

Developed capacity —

Static level—depth to water 35 f

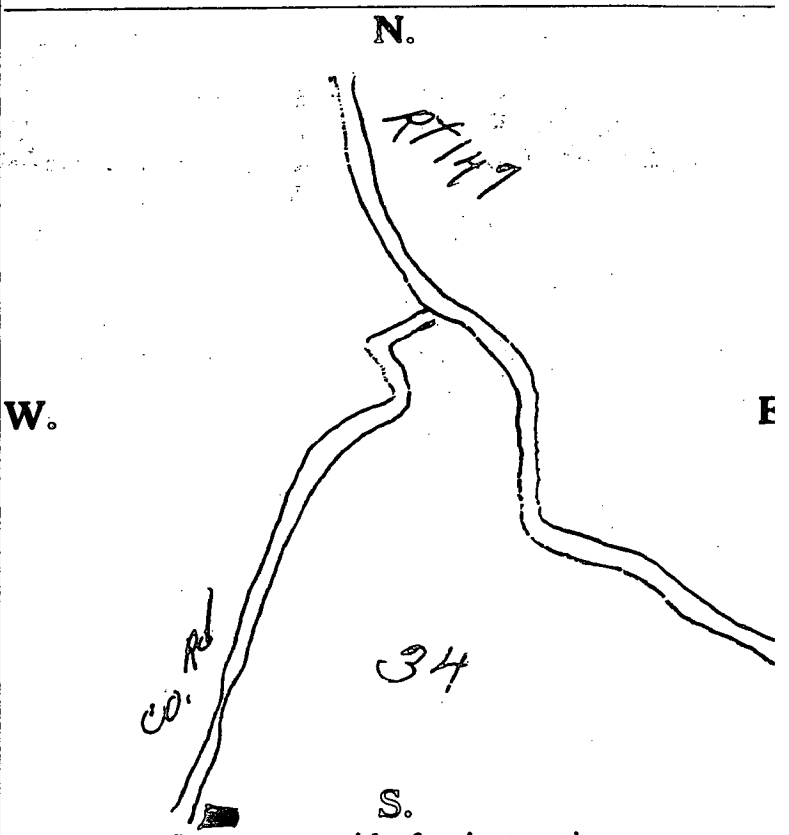
Pump installed by —

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Top soil	0 Feet	3 Ft.
yellow shale	3	18
yellow sandrock	18	25
Gray shale	25	35
Gray sandrock	35	40
Gray soapstone	40	50
Lime Rock	50	60
Red rock	60	65
Gray soapstone	65	80
Limestone	80	85
Gray shale	85	110

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm E. J. Warrick & Sons. Date Sept. 17, 1956

Address 769 E. Main St. Barnesville, Ohio Signed G. L. Warrick

TR 211 WL-419

TOVCC 11401

ADDENDUM TO PAGE 17, PART 2, D
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

SEASONAL VARIATIONS OF WATER QUALITY AND QUANTITY

Surface and groundwater data contained in the Attachment 14 forms included with this application indicate the seasonal variances of quality and quantity of the water in this area.

The water wells existing in the area give a fairly representative indication of the near surface water bearing zones that can be found in this region. The Probable Hydrologic Consequences of mining gives a detailed description of these characteristics.

Precipitation is one of the principal factors influencing water systems. Infiltration of precipitation increases soil moisture and influences groundwater chemical composition. The time required for infiltrating precipitation to reach lower water bearing zones increases with increasing depth. Depending on the morphological structure, character of surface vegetation, and intensity of precipitation the amounts of infiltration also vary greatly. Amounts of infiltration subsequently influences the dissolved solids contents of groundwater which, in most cases, become more dilute during periods of prolonged precipitation. Rainfall data collected at or near the Powhatan No. 6 Mine has been included in this application.

All the data will show that an increased water quantity and a decrease in chemical constituent levels is realized during times of increased precipitation and snow melt of winter and spring seasons; while a decrease in water quantity and increase in chemical constituent levels is realized in dry summer and early autumn seasons.

GROUNDWATER INFORMATION

Naturally occurring groundwater in the permit area is found primarily in consolidated (rock) units that are partially or wholly confined and lie within the geologic interval above the Pittsburgh No. 8 Coal.

The water bearing rock units are sandstones, limestones and coals with the shales, claystones, and siltstones acting as aquitards or confining layers. All of these rock types can contain water in the primary pore or void spaces between the grains making up the rock unit. The primary permeability of the rock units is the movement of water through the primary pore spaces. The primary permeability is generally very low. The secondary pore space is made up of openings in the rock mass due to joints, fractures or bedding plane partings. The secondary permeability is the movement of water with in the secondary pore spaces (i.e. fracture openings). Secondary permeability is much greater than the primary permeability. In order to produce sufficient water for viable water well, the well bore needs to encounter the secondary pore spaces. Due to the lithostatic pressure of the rock overburden, the fractures and other secondary pore spaces tend to become smaller and close with increasing depth. This reduces or eliminates the ability of these secondary openings to transmit water. Generally, fractures and other secondary openings are limited to with in 100 feet of the surface. Also the fractures in the "hard rock" units (i.e. sandstones, limestones and coals) tend to be larger and stay open to greater depths. The fractures in the "soft rocks" (i.e. shales, claystones and siltstones) are smaller and tend to close due to swelling of theses rock types. Most of the ground water flow with in the permit area occurs in the secondary pore spaces of the sandstone, limestones and coals that are located with in 100 feet of the surface. The shales, claystones and siltstones with in this depth range act as confining layers.

Larger openings in the rock strata saturated zones may be identified by limonitic (iron) stained or alkaline stained rocks in the test holes. The saturated zone is recharged through infiltration and percolation at outcrop zones and in some cases, by vertical flows through discontinuities and locally permeable overlying strata. The stratigraphic identified in the Geology Description section shows numerous lithologic units that are probably capable of transmitting water. However, the confining lithostatic pressures tend to keep lower strata rock discontinuities closed or "tight" so that useful aquifers are generally close to the ground surface. Wells penetrating near surface confined rock aquifers typically exhibit yields of less than one half gallon per minute. Well yield tends to be higher in the valleys than on the ridge tops due to the presence of more fractures in the valleys.

Due to the horizontally and vertically discontinuous nature of the rock units in the permit area, there are no regionally recognized "aquifers" in the area. Wells obtain water from the locally present sandstone, limestone and coal units, which the well may encounter. These units are separate by confining layers of shale, claystone and siltstone. The private water well logs for wells in the permit area indicate that the wells generally obtain water from several confined water bearing units.

Numerous aquicludes comprised of claystones, mudstones, underclays, limestones with clay lenses, and some shales and siltstones are interbedded with the more permeable water bearing units. These less permeable strata strongly influence horizontal and vertical water movements. A portion of the springs flowing from valley walls below the ridge lines probably originate in the out crop of one of the permeable water bearing units and many can probably be identified as usually above a less permeable unit.

Groundwater quality data obtained from these rock aquifer springs and the wells generally indicate pH ranges from 6.1 to 9.0, alkalinities in excess of acidities, high hardness, and low metals concentrations.

Wells and springs located within the application area are identified on the Attachment 14 forms included with this application. Their locations are shown on the Application Map. The affects of the proposed operation on the water supply wells and springs are described in the PHC section of the permit application.

ADDENDUM TO PART 2, PAGE 18, D (3)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

SEASONAL VARIATIONS OF WATER QUALITY AND QUANTITY

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In general, the data will show that an increased water quantity and a decrease in chemical constituent levels is realized during times of increased precipitation and snow melt of winter and spring seasons; while a decrease in water quantity and increase in chemical constituent levels is realized in dry summer and early autumn seasons.

ADDENDUM TO PAGE 18, PART 2, E
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

HYDROLOGIC DETERMINATION

Based on the information submitted in this application, the enclosed probable hydrologic consequences may be expected. Individual wells, springs, or streams may experience significant water loss. However, this effect is expected to be temporary in some cases. Supplies that are affected permanently will be replaced by OVCC at its own expense by connecting the water user to another supply. The cost of domestic water will be the responsibility of the water user unless otherwise agreed upon by OVCC and the water user. The quality of the surface and ground water in the application area is not expected to be changed in the long term as a result of the proposed mining activities. Specifically, the levels of pH, iron, manganese, total suspended solids, and total dissolved solids are not expected to vary from their original levels. However, these parameters may be temporarily changed.

Some temporary changes to individual ground water and surface water source availability are anticipated. Wells and springs may go dry, streams may flow less, ponds may de-water. However, the effect on sediment yield, acidity, total suspended and dissolved solids, and flooding are expected to be minimal if any.

The effects are expected to stabilize within about two years as the localized water table reaches equilibrium again. Ponds and streams with visible cracks that are draining water will be repaired. Permanent replacement supply systems will be provided if an individual source is permanently affected.

Topographic Setting

The Powhatan No. 6 Mine is located in Belmont County, Ohio which is within the Appalachian Plateau physiographic province. The topography of the county is typically hilly with broad rounded ridges and deep v-shaped valleys dissecting the terrain. Total topographic relief within the county is approximately 800 ft. However, within the application area, maximum relief is approximately 326 ft. The elevation varies between 1346 ft. (maximum) above sea level and 1020 ft. (minimum). Figure #1 is a portion of the St. Clairsville and Armstrong Mills, Ohio U.S.G.S. 7½ Minute Topographic maps showing the location of the area of interest.

Drainage within the southern portion of the application area occurs to the south through several streams that are tributaries to Millers Run. Captina Creek is the main drainage system for the southern portion of Belmont County. Captina Creek flows eastward to the Ohio River with the confluence of the two located at Powhatan Point, Ohio.

Drainage within the northern portion (north of State Route 147) of the application area occurs to the north through several streams that are tributaries to Williams Creek, a tributary of McMahon Creek. McMahon Creek is the main drainage system for the central portion of Belmont County. McMahon Creek flows eastward to the Ohio River with the confluence of the two located at Bellaire, Ohio.

Geologic Setting

The bedrock units that underlie the study area consist of Permian through Pennsylvanian in Age. The Permian Age rocks consist of Dunkard Group. This sequence covers much of the study area at the surface. Below the Dunkard Group lie the Monongahela and Conemaugh Formations of the Pennsylvania system. The Monongahela Formation is exposed only in the stream valleys with the underlying Conemaugh Formation not exposed at all. Figure #2 is a generalized stratigraphic column showing the relationship of these bedrock units.

The Monongahela Formation consists of the Pittsburgh #8 coal seam at the base through the Waynesburg #11 coal seam. Other coal seams consist of the Redstone (No. 8A), Fishpot, Sewickley (No. 9) and Uniontown (No. 10) coal seams. Other important members of the formation are the Redstone Limestone, the Fishpot Limestone and the Benwood Limestone, all of which are found above the Pittsburgh (No. 8) coal seam. The remaining portion of the Monongahela Formation consists of clay, sandstone and shale.

Above the Waynesburg #11 coal seam, the Dunkard Group consists of coal (Washington #12 seam), limestone, sandstone, shale and clay. The Dunkard Group is found at the cap of the hilltops at elevations above sea level of approximately 950 ft. and above.

Below the Pittsburgh #8 coal seam lays the Conemaugh Formation. The Conemaugh consists of sandstone, siltstone, mudstone, shale, clay and limestone. Much of the formation consists of undifferentiated strata, however, several important members lie relatively close to the Pittsburgh #8 coal seam. These members are the underclay to the Pittsburgh #8 coal seam, the Upper Pittsburgh Limestone, the Bellaire Sandstone and the Lower Pittsburgh Limestone. These units are not tapped as aquifers within the study area at present because adequate aquifers can be found at shallower depths.

Hydrology

Bedrock units within the study area are generally tight and have limited ground water development potential. Domestic well yields are generally less than 5 gallons per minute (gpm.) with transmissivities usually less than 1,000 gallons per day per foot. Ground water within the study area occurs under water table, semi-confined and confined conditions. Storage coefficients should range from 10^{-2} to 10^{-6}.

Most valuable ground water supplies developed in rock units are dependent on natural fracturing or secondary porosity and permeability. Primary porosity and permeability is relatively low in the bedrock as is noted by the relatively low yield of domestic wells and the reliance on springs for domestic water supplies. Approximately 50% of the domestic water

supplies within the study area rely on springs as the source. Most of these springs are contact springs located along the valley walls where bedrock units of lower permeability and porosity impede downward infiltration of ground water and force water to discharge as springs.

The aquifers within the study area that are tapped for domestic water supplies are local in extent. The relatively flat-lying orientation of the bedrock and the high topographic relief (i.e., deep v-shaped valleys) of the area, tends to isolate many of the aquifers to small upland areas. Therefore, the aerial extent of the unit is limited and so would be the recharge potential.

Downward migration of ground water is also controlled by naturally occurring fractures. These earth fractures, while not ubiquitous, do occur sporadically, over most of the mine plan area and have an effective depth of less than 200 ft. Below 200 ft., the fractures may still be present, but are either filled with silts and clays, or have healed due to lithostatic pressures. Therefore, the enhanced permeability of these fractures is regulated and the relatively low primary permeability of the units controls ground water flow at depth. This premise is based on the general limited hydraulic communication with the No. 6 Mine.

It is a generally accepted principal of hydrogeology that joints, cleavage, and other fractures tend to be tighter and have lower permeability with increasing depth. This premise is substantiated at the local level by the water conditions exhibited in the No. 6 Mine. To date, observations indicate that the No. 6 Mine made very little water and that water flow through fractures into the mine is rare. There is no pumping from the mine to the outside. Most areas of the mine are essentially dry with no or very little water accumulation. What water does accumulate is generally man-made, being used for dust suppression and motor cooling. This general condition (no water inflow into the mine) was reported to be true with as little as 200 feet of cover. These site specific observations coupled with the general premise of closed fractures with depth lead to the statements made in the PHC.

In a study conducted by Moody and Associates in 1980, the water make of the mine (total water inflow), was calculated to be approximately 42 gallons per day (gpd.) per acre mined or 26,880 gpd. per square mile. Most sections of the mine were essentially dry and water inflow was generally limited to areas of low cover and stream valleys or fractured zones. In the 14 years since that time, the mine has progressed to the north, away from the Captina Creek valley. Subsequently, water inflow into the mine has diminished to the point where water is no longer pumped outside.

In contrast to the mine water make, the ground water recharge potential of the area has been estimated between 100,000 and 250,000 gpd. per square mile or 155 to 400 gpd. per acre. It thus appears less than 10 to 27 percent of the ground water recharge potential is intercepted by the mine. This data clearly indicates that the majority of the subsurface flow system within the mine plan area is shallow and is unaffected by deep mining.

A number of years ago, when the Powhatan No. 6 Mine was owned and operated by The NACCO Mining Company, photo lineaments were traced over the mine area. The report from the project no longer exists, but talking to Mr. William Siplivy, who was associated with the

project was beneficial. Mr. Siplivy indicated that the photo lineaments were not associated with poor conditions in the mine, except that the lineaments defined stream channels.

Probable Hydrologic Consequences

Ohio Valley Coal Company
Powhatan No. 6 Mine
Application Area D-0360-12
Addendum to Page 18, E (1-3)

November 1, 2001
Revised April 14, 2003
Revised June 13, 2003

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INTRODUCTION

Since 1987, three partial recovery and seven full recovery application areas of the Powhatan No. 6 Mine have been evaluated relative to the Potential Hydrologic Consequences (PHC) of mining activities. These areas, which are contiguous, are illustrated on the past and future application map of the permit application and include:

Application Area	Year Prepared	Prepared By
R-0360-1	1989	William Siplivy P.E. & C.P.G. (partial recovery)
R-0360-2	1989	Moody and Associates, Inc. (full recovery)
D-0360-1	1990	Moody and Associates, Inc. (partial recovery)
D-0360-2	1991	Moody and Associates, Inc. (full recovery)
D-0360-3	1992	William Siplivy P.E. & C.P.G. (Two additional applications were prepared by OVCC using this PHC for two small areas within the D-0360-3 area. They were identified as D-0360-4 and D-0360-5). (full recovery)
D-0360-6	1996	Moody and Associates, Inc. (full recovery) (One additional application was prepared by OVCC using this PHC for one small area within the D-0360-6 area. It was identified as D-0360-10) (full recovery).
D-0360-7	1998	Moody and Associates, Inc. (full recovery)
D-0360-9	1998	Moody and Associates, Inc. (partial recovery)
D-0360-11	1999	Moody and Associates, Inc. (full recovery)

This PHC for the longwall Application Area D-0360-12 has been prepared on behalf of the Ohio Valley Coal Company by Moody and Associates, Incorporated. The information developed during the preparation of the previous PHC's has been used in the preparation of this PHC.

TOPOGRAPHIC SETTING

The Powhatan No. 6 Mine is located in Belmont County in southeastern Ohio. The topography of the entire application area is typical of the Appalachian Plateau Province and is characterized by narrow rounded ridges and deep V-shaped valleys dissecting the terrain, which is underlain by essentially horizontal sedimentary rocks. Topographic relief within the D-0360-12 application area is approximately 350 feet. The lowest elevation is approximately 1010 feet in the Joy Fork valley in the southwest corner of the application area. The highest elevation is 1360 feet on a hilltop in the center of the application area.

The surface drainage within the application area is to the south and east. The southern drainage is through unnamed tributaries to Miller's Run and Joy Fork, which are part of the Captina Creek drainage area. The eastern drainage is through Williams Creek. Williams Creek is a tributary of McMahon Creek.

Most of the developed water supplies (wells and springs) are located along the roads in the application area. There is a concentration of supplies along State Route 147 and a large group of water supplies in the Centerville area. There are large areas of the Joy Fork and Miller's Run drainage area, which are undeveloped and have no identified water supplies. All of the identified water supplies are listed on the ATTACHMENT 14C.

GEOLOGIC SETTING

A detailed discussion of the stratigraphic and structural setting of the Application Area is provided in the Geologic Section of this application. However, those properties of the geologic setting pertinent to ground water occurrence and movement are described here.

The bedrock units that outcrop in the Application Area belong to the Dunkard Group that is Upper Pennsylvanian to Permian in age. The rocks consist of interbedded sandstone, siltstone, shale, mudstone, clay, fresh to brackish water limestone and coal. The Monongahela Formation (Pennsylvanian) underlies the Dunkard Group and consists of similar rock types. The Pittsburgh (No. 8) Coal seam, which is the seam to be mined, marks the bottom of the Monongahela

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Formation. According to Mr. James M. Raab, a hydrogeologist with the Ohio Department of Natural Resources, in correspondence to Dave Bartsch of the Ohio Valley Coal Company dated January 30, 1989, water below 250 feet beneath the stream bottoms is brackish.

In addition, there is considerable horizontal and vertical variability of the rock units. Rapid facies and hydrologic property changes tend to limit the horizontal continuity of the individual rock units. With the exception of major coal seams, very few lithologic units are continuous across the proposed application area. Horizontal facies changes and corresponding changes in hydrologic properties of the rocks tend to enhance the importance of localized flow systems. In addition, most available ground water in this region is limited to the first 100 feet of the surface where enhanced secondary permeability associated with rock fracturing is present. This information is supported by the OVCC drilling records and from locally developed wells and springs. Ground water recharge in the upland or ridge top areas results in downward migration primarily within this shallow saturated zone. Because the topographic relief between ridge tops often exceeds 100 feet, there are localized flow systems under the hilltops that are not in hydrologic communication with adjacent hilltops. While the ground water under any given ridge top can be viewed as being continuous, the continuity generally does not extend to adjacent hilltops.

The geologic structures in the Application Area consist of gently folded rocks that dip to the southeast at approximately 40 feet per mile. Overburden thickness above the Pittsburgh coal seam ranges from a low of approximately 300 feet along the Williams Creek valley to a high of approximately 580 feet along the hilltops in the center of the area. Geologic structure can influence regional ground water flow patterns but local variations in hydraulic properties of the rocks tend to accentuate localized flow systems.

GENERAL HYDROLOGIC SETTING

The source of all ground and surface water in the mine plan area is precipitation. Upon reaching the land surface, water that is not part of direct surface runoff or evapotranspiration infiltrates into the subsurface and contributes to soil moisture and ground water.

Within the bedrock aquifer system, ground water occurs in primary and secondary openings. Primary openings are pore spaces between sand, silt and clay grains formed at the time of sediment depositions. Primary permeability is the ability of water to move between pore spaces. In this area, primary permeability is very low and limited ground water movement occurs in hard or soft rocks as a result of primary openings (Stoner 1983, Siplivy 1992).

Secondary porosity and permeability is formed by fractures or partings in the rock mass. Most available ground water in the application area occurs within the first 100 feet below the surface within these secondary openings and the success of a water well in terms of yield potential is dependent upon the well encountering water filled fracture zone(s) that transmit enough water to the well bore to meet the well's intended use (Schmitt et al, 1983; Waite, 1987).

Fractures are not ubiquitous in the area, however, and are not interconnected over large areas. For these reasons, it is very difficult to identify aquifers over large areas and the ground water flow system tends to be made up of small, localized fracture controlled systems. While fractures in hard rocks tend to stay open better than fractures in soft rock, the horizontal and vertical variability of even the hard rock units tend to produce hydraulically isolated areas.

In addition, fractures tend to close at increasing depths due to overlying lithostatic pressures, thereby limiting the effective depth of the ground water flow system (Stoner, 1983). This condition is evident throughout the Powhatan No. 6 Mine. The mine, in general, is very dry with very minor amounts of water inflow limited to the low cover areas (generally less than 200 feet). The overburden thickness in the application area ranges from 300 feet to 580 feet. No water inflow into the mine is expected in this application area.

Based on an evaluation of the geologic units presently supplying water to wells or springs in the Application Area, four aquifer units have been identified within the D-0360-12 hydrologic boundary. These units, which are also outlined on Form 14B of this application, are summarized below:

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During full recovery mining, where the roof is allowed to collapse, existing fractures are often reopened and new fractures are created. Typically, a rubble zone develops above the extracted coal seam with a gradually reduced fracture density pattern above the rubble zone. However, the fractures developed by subsidence are normally a poor interconnected network of cracks and are rarely continuous from the land surface to the mine void (Rauch, 1987). This condition is evidenced by the fact that recent longwall mining at the No. 6 Mine has not resulted in large volumes of water inflow in the longwall or adjacent areas (personal communication with D. Bartsch, 2003).

Based on an evaluation of the geologic units presently supplying water to wells or springs in the Application Area, four aquifer units have been identified within the D-0360-12 hydrologic boundary. These units, which are also outlined on Form 14B of this application, are summarized below:

Aquifer A: Unconsolidated Material

Includes the layer of weathered bedrock above solid bedrock and unconsolidated deposits along stream valleys.

Aquifer B: Washington No. 12 Cyclothem

Includes the rock sequence from the Washington Coal Bed to the surface of the consolidated bedrock. Occurs from approximately 350 feet to 500 feet above the No. 8 Pittsburgh Coal Bed.

Aquifer C: Waynesburg No. 11 Cyclothem

Includes the rock sequence from the Waynesburg No. 11 Coal Bed to the Washington No. 12 Coal Bed. Occurs from approximately 250 feet to 350 feet above the No. 8 Pittsburgh Coal Bed.

Aquifer D: Sewickley No. 9 Cyclothem

Includes the rock sequence from the Sewickley No. 9 Coal Bed to the Waynesburg No. 11 Coal Bed. Occurs from approximately 90 feet to 250 feet above the No. 8 Pittsburgh Coal Bed.

These units are only recognized as aquifers where they occur within 100 feet of the surface where secondary porosity and permeability is greatest.

WATER SUPPLIES

The water supplies that serve domestic and agricultural needs have been inventoried within the hydrologic boundary of the Application Area. The Application Map illustrates the location of these supplies. ATTACHMENT 14C lists both the used and unused supplies identified in the Application area. Only the used supplies are discussed in the PHC.

A summary of the pertinent data for the used wells and springs is provided on TABLE A – Wells and TABLE B – Springs which are attached as an addendum to Page 18, Part 2, F(1).

In addition, used ponds are shown on Attachment 14D.

EVALUATION OF HYDROLOGIC IMPACT IN PREVIOUSLY MINED AREAS

Literature Review

Since 1972, when the Powhatan No. 6 Mine was opened, considerable research has been conducted relative to the impacts on the ground water flow system by longwall mining in the western Pennsylvania, northern West Virginia and southeastern Ohio areas. This literature database was reviewed as a guide to selecting those variables pertinent to predicting the hydrologic consequences of mining in the application area. An annotated bibliography of this literature is provided as the end of this report.

Stoner (1983); Rauch (1984); Cifelli (1986); and Dixon et al. (1988 & 1990) explored the relationship between overburden thickness and effects on ground water levels. In general, a conclusion was drawn that there is an inverse relation between overburden thickness and detrimental impacts to water levels. Aquifers less than 200 feet above longwall mines are more likely to be partially dewatered than aquifers greater than 200 feet above the mine.

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The importance of rock fracturing was investigated by Dixon et al. (1990), Parizek (1971), Schubert (1980), and Stoner (1983). The studies concluded that secondary rock fractures have a major influence on ground water occurrence and movement. In addition, Rauch (1984), determined that rock lithology of the overburden material was important in evaluating hydrologic impacts of mining. In general, the presence of a high percentage of soft rocks such as shale, clay, and mudstones minimizes negative impacts.

Walker (1988) and Leavitt et al. (1992) indicated the position of the water supply over the longwall panel affected the degree of hydrologic impact. In general, the greatest water level declines occurred directly over the panels and decreased away from the panels. Water wells outside the angle of draw were generally unaffected.

Leavitt et al. (1992) found a strong correlation between topographic position and water level declines over longwall mines. In general, where overburden thickness exceeded 300 feet, the greatest impacts occurred in hilltop wells and springs, a lesser impact was noted in hillside wells and springs and the least impacts were noted in valley bottom wells and springs.

Leavitt et al. (1992) and Tieman et al. (1986) made a correlation between hydrologic base level and water level declines. In general, the closer the bottom of the well (or spring) is to the local hydrologic base level, the less severe and less permanent are the impacts. However, Leavitt noted that base level and topographic position are similar variables and topographic position proved to be a more reliable variable in predicting hydrologic impacts.

These variables, which include overburden thickness, local rock lithology, position over the longwall mining panel, topographic position and local hydrologic base level, are used here to evaluate the potential hydrologic impacts in the application area.

Quantity Impacts In Previously Mined Areas

The monitoring data from wells and springs in the mined sections of Areas D-0360-2, D-0360-3, D-0360-6, and D-0360-7 (analog areas) were evaluated to determine the variables that may affect the impact of mining on water supplies. Hydrographs of well water levels and spring flows in the analog areas that have been undermined and have detailed monitoring data were prepared in order

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to complete this evaluation. A total of 56 well hydrographs and 42 spring hydrographs have been evaluated. Copies of the hydrographs are attached as APPENDIX A. It has been OVCC's policy to measure water levels and flow rates on a monthly basis for one year prior to undermining until the longwall face is within 3 weeks of undermining the supply, at which point, monitoring frequency is increased to a weekly basis. Monitoring is reduced to a monthly basis 3 weeks after undermining and discontinued after one year upon approval of the "Request to Cease Monitoring" by the Division. The distance to and from the face is represented on the graphical data by positive numbers (distance from water supply to advancing face) and by negative numbers (distance in feet to face after it passes the water supply).

Each of the hydrographs includes both static water level measured in feet from the top of casing or spring flow rates in gpm and the position of the panel through time. At any point in time as the panel approaches, passes by and moves away from the supply, the flow rate or static water level can be determined. In addition, the variables that may affect the impacts of mining on the water supply are listed on the hydrograph. These include surface elevation; depth of wells; topographic position (as hilltop, hillside or valley bottom); hydrologic base level elevation; position in relation to mining (as outside mine area, over the gates or chain pillars of the panel, over the quarter panel or over the mid-panel); the overburden thickness; and the percent of soft rock in the overburden.

Based on the observed changes in water levels or flows, the water supplies were placed in one of four categories. These categories describe the impact that mining had on the water supplies. The following are the categories and the criteria that define each category:

- No Impact - Water levels for wells or flow rates for springs did not decline during mining.
- Minimal Impacts - Water levels for wells or flow rates for springs either did not decline during mining or returned to pre-mining conditions within two months of undermining.
- Moderate Impacts - Water levels for wells or flow rates for springs decline during mining but return to premining ranges within two to six months after mining.
- Severe Impacts - Water levels for wells or flow rates for springs decline during mining and do not return to premining ranges within six months (or the duration of the monitoring period) after undermining.

Of these 56 wells evaluated, 24 (43 percent) had minimal impacts as a result of mining; 7 (13 percent) were moderately impacted by mining and 25 (45 percent) were severely impacted as a result of mining. The well hydrographs are attached as APPENDIX A.

There is not a discernible correlation between the minimally impacted wells, the moderately impacted wells or the severely impacted wells and the variables of overburden thickness, overburden lithology, position over the panel or well depth. This may be attributed to the relatively narrow range of difference in these variables for the wells evaluated. There is, however, an apparent relationship between topographic position and the impacts of longwall mining on water well supplies. In general, at the Powhatan No. 6 Mine, fewer wells in a valley setting experienced significant water level declines than wells located on hillsides or hilltops. This is consistent with the investigations of Mr. Bruce Leavitt, et al., who reported a similar finding regarding the relationship between topographic position and impacts on wells in their 1992 report, "Effects of Longwall Coal Mining on Rural Water Supplies and Stress Relief Fracture Flow Systems".

The conclusion derived from this data analysis is that of the wells in Application Area D-0360-12, in which the geologic settings are similar to those in the analog areas, 43 percent may be minimally impacted by mining with no changes in water levels or water levels that recover within two months of undermining, 13 percent may be moderately impacted with water level declines that recover within six months and 45 percent may be severely affected with water level declines that do not recover within six months. Wells located on a hilltop or hillside and/or over the quarter or mid panel have a higher potential of being severely impacted by mining. Wells located in a valley bottom, over gates or outside of the panel have a higher potential of being minimally impacted by mining.

An evaluation was also performed for the developed springs that were undermined in the analog areas. Of the 42 springs evaluated, 3 (7 percent) had minimal decreases in flow rates (no decrease or recovery within two months); 1 (2 percent) had moderate decreases in flow rates (decreased flow rates with recovery within six months), and 38 (90 percent) had severe decreases in flow rates (decreased flow rates that do not recover to pre-mining levels within six months). The spring discharge graphs of the individual springs are attached as APPENDIX A.

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For developed springs there is not an apparent relationship between the minimally impacted springs, the marginally impacted springs and the severely impacted springs and the variables of overburden thickness; overburden Lithology; position over the panel; topographic position; and aquifer zone.

The conclusion based on this data analysis is that, of the springs in the D-0360-12 Application Area in which the geologic settings are similar to those in the analog areas, 7 percent of the springs may be minimally impacted by mining; 2 percent may be moderately impacted by mining with temporary decreases in flow rates that persist for less than six months and 90 percent may be severely impacted by mining with decreased flow rates that do not recover within six months. There was no apparent relationship between the physical setting of springs and the impacts of mining on springs.

Beginning in 1999, Ohio Valley examined two sets of data to determine when and where impacts to wells and springs occurred. A discussion of this data follows:

1. In the Addendum to Part 2, Page 18, F (1) entitled "Spring Impacts - Distances from Longwall Panels and Impacts to Soil Moisture and Tree Growth", it was determined that impacts to springs located off the ends of longwall panels are limited to 300 ft from the panel ends. Impacts to springs located off the sides of longwall panels are limited to 500 ft. This study addressed springs only. The study also indicates that soil moisture was not affected by longwall mining.
2. In a second addendum to Page 18, F(1) a set of wells and one spring that were monitored daily for several months is referenced. The conclusions of the second study showed that impacts to the monitored wells were limited to 111 ft to 460 ft from the side of a longwall panel. The impacts to these wells that were impacted did not occur until the longwall face was past the source. The spring in this study was not impacted by the adjacent panel and was only impacted when the longwall face was well past the spring. In an earlier analysis (done for the PHC's for D-0360-3, -6, and -7) the data showed that as the longwall face approached a source, the furthest distance that the longwall affected a well was 700 ft directly ahead of the advancing face.

Impacts to the sides of panels for wells and springs were found to occur at about 500 ft. At the end of panels, springs were impacted at a distance of about 300 ft. Wells located at the end of panels may be impacted when the longwall face is within about 700 ft.

Based on a review of the existing literature, it is expected water flow in selected sections of first order streams where overburden thickness exceeds 200 feet may be temporarily reduced over relatively short stream segments. Due to the high percentage of soft rocks in the mine overburden, the overburden thickness and the minimal amount of water that enters the mine, any stream water loss that may occur is not expected to drain into the mine.

This generalized theory for areas with 200 feet or more of cover is supported by the data generated by the OVCC in the analog areas where undermining has occurred and hydrologic changes have been monitored. These areas are in very similar hydrogeologic settings and a lowering of the water table under the hilltops and higher elevations is documented in water wells and spring flows. It is expected that any reduction in stream flows will be limited in the upper elevations primarily in the first order streams. Inspections of streams that were undermined indicate that the streams appear to have returned to normal flow conditions with in several years after mining (personal communication with D. Bartsch, 1999).

Four stream segments that were monitored in the pre- and post-mining phases in the analog areas were selected at random for detailed evaluation. Hydrographs of these four data sets are presented on APPENDIX B at the end of this report. These data verify the general predictions listed above are verbalized as follows:

Monitoring Point U34-067
This unnamed tributary to Williams Creek was monitored for flow rates on twelve separate occasions prior to undermining and 14 times post undermining. This first order stream is shown on the U.S.G.S. Topographic map as an intermittent stream and there was approximately 265 feet of overburden in the area. There was no apparent impact on stream flow as a result of undermining.

Monitoring Point U34-144
This unnamed tributary to Williams Creek was monitored for flow rates on nine separate occasions prior to undermining and 15 times post undermining. This is a first order stream and is shown as

intermittent on the U.S.G.S. Topographic map. There is approximately 288 feet of overburden in the area. There was no apparent impact on stream flow as a result of undermining.

Monitoring Point U34-038

This point on Williams Creek was monitored for flow rates on 12 occasions prior to mining and nine times post mining. Williams Creek is a third order stream and has perennial flow. There is approximately 250 feet of cover at this location. There was no apparent impact on stream flow as a result of undermining.

Monitoring Point U29-C

Flow in this first order intermittent stream was monitored on twelve occasions prior to undermining and 13 times after undermining. The overburden thickness is approximately 260 feet. No apparent impacts were noted as a result of undermining.

There were no impacts observed to a wetland on the Simpson property undermined in March 2001 (Personal Communication, D. Bartsch OVCC). See the Addendum to Page 30, K (5)(b).

Quality Impacts In Previously Mined Areas

The water quality effects of longwall mining on the ground water flow system were also reviewed. A total of 38 wells and 32 springs were evaluated. The 70 water supplies were located over the analog areas. In each case, an effect on water quantity in terms of reduced water levels or reduced flow rates was documented and water quality data was available both before and after the impacts occurred. A summary of the water quality data for those supplies is presented in TABLE 1, which presents the range of water quality in both the pre-mining and post-mining phases for pH, acidity, alkalinity, iron, manganese, hardness, sulfate, and nitrates.

This data indicates the water quality changes from the pre-mining to the post-mining phase are relatively minor. However, the following trends were noted:

For Wells:

Sixteen of the 38 wells exhibited increasing levels of iron in the post-mining phase.

Eight of the 26 wells tested for manganese exhibited increasing levels of manganese in the post-mining phase.

For Springs:

Eleven of the 32 springs exhibited increased iron levels in the post-mining phase.

Seven of the 32 springs exhibited increased manganese levels in the post-mining phase.

Eight of the 32 springs exhibited increased hardness levels in the post-mining phase.

Typically the iron and manganese increases were temporary and did not persist for more than a year. Other constituents did not change after mining.

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Surface Water

Based on information from the analog areas, minimal to no impacts are expected to streams, ponds, and wetlands in the proposed application area. For streams, minimal impacts are described as a temporary reduction in flow over relatively short segments. Ponds or wetlands have not had impacts historically at the Powhatan No. 6 Mine. Please see the Addendums to Page 30, Part 3, K (5)(b) and (d) for further information.

Ground Water

The data generated in the analog areas indicate that ground water levels may decline as mining passes under an area. Some recovery of ground water levels occurs after mining has passed.

Post Mining Water Breakouts

The area with the lowest cover is located in the southeast corner of Application Area D-0360-12, in the Joy Fork valley. The lowest surface elevation in the Application Area is approximately 1010 feet msl. The maximum coal elevation in the Application Area is approximately 810 feet msl. or 200 feet below the lowest surface elevation. The lowest surface opening elevation for the entire Powhatan No. 6 Mine is 847 feet msl. The maximum coal elevation in Application Area D-0360-12 is approximately 810 feet msl or 37 feet below the lowest surface opening. The highest coal elevation in the Powhatan No. 6 Mine is approximately 845 msl or 2 feet below the lowest surface opening in the Powhatan No. 6 Mine. The 845 foot coal elevation is located in the D-0360-7 Application Area to the north of the D-0360-12 area. No post mining water breakouts are predicted to occur due to mining in the D-0360-12 area.

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Water Supplies

The potential impacts on the used water supplies by mining have been evaluated based on monitoring of springs and wells in the analog areas and a review of pertinent literature.

Most developed water supplies that are undermined by the longwall or within several hundred feet of the longwall will most likely experience a decline in static water level or flow. The amount of this decline appears to be dependent on the topographic position of the water supply. Hilltop water supplies may be impacted more often than water supplies located in valley bottoms. Springs are generally more significantly impacted than wells. Approximately 90 percent of the springs undermined may experience decreases in lasting more than six months. Approximately 45 percent of the wells may have declines in static water levels that do not recover within six months. Some temporary quality impacts are anticipated resulting in increased levels of iron and manganese.

MEASURES TO MINIMIZE DISTURBANCES TO HYDROLOGIC BALANCE

The measures to be used to minimize disturbance hydrologic balance through out the application area are described in the Addendum to Page 26, E (1-3). Additionally no longwall mining is planned under designated old growth forest areas.

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TABLE 1

Ohio Valley Coal Company
Application Area D - 0360-12

Ground Water Quality Summary
Pre and Post Mining Water Quality
Application Areas: R-0360-2, D-0360-1, D-0360-2, D-0360-3

	pH		Acid		Alk.		Iron		Manganese		Hardness		Sulfate	
Supply No.	Pre SU	Post SU	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l
SP-21	7.3-8.26	7.2-8	3.5-47.4	7.2-30.4	39.1-90.9	74-186.77	0.03-0.08	<0.04-.28			100-106	101-218	37-41	24-47
SP-22	7.7-7.83	7.1-7.7	5.3-8.1	2-7.03	47-88.7	58.9-94.5	0.04-0.06	0.08-0.76			105-119	95-136	55.2-66	10-78
SP-23	6.3-7.1	6.86-7.9	15.3-40.47	22.6-68.4	98.42-112	150-304.6	0.11-0.97	2.04-6.2			127-357	294-778	70-81	105-220
SP-24	6.4-7.4	6.9-7.3	11.4-27.5	2.2-15.4	82.46-118	44.6-91.8	<0.04-0.18	<0.04-1.15			198-276	144-267	50-84	42-83
SP-30	6.74-7.3	6.9-7.5	3.1-61.4	0-29.83	26.5-100.5	129.6-226.67	0.01-0.18	<0.04-0.34			193-217	166-320	89-97	26-61
SP-31	6.61-7	6.2-7.1	0-81.6	11.4-34.39	70-166	38.4-224.39	<0.02-0.24	<0.04-3.95			114-263	100-319	44-89	41-50
SP-35	7.3-7.7	7.3-7.6	8.4-11.6	10.8-15	139.4-216.2	110-251.4	<0.04-0.52	0.07-0.94			176-276	180-276	24-56	36-41
SP-36	6.9-7.5	7.4	0-24.32	14.6	46.6-176	174.6	0.06-2.12	1.67			22-262	200	33-54	46
SP-38	7.3-7.9	7.5-7.8	0-24.8	2.8-13.4	136-212	142.4-178.6	0.05-0.64	0.09-0.22			100-215	151-229	12-61	20-44
SP-39	7.27-7.6	7.7-8.4	7-15.6	<1.5-8	155.8-169.6	47-190	<0.04-34.7	0.07-0.33			0.06-184	136-230	<10.0-36	17-50
SP-41	6.6-7.3	7.6	9-14	17	60-178	167	.02-.23	0.53	<0.02-.06	.03	80-216	172	20-42	32
SP-44	7.0-7.4	7.3	24-46	0	188-206	173	<0.04-.08	0.18	<0.02-.02	<0.02	235-251	301	36-43	45
SP-45	6.7-7.1	6.7-6.8	15.77-56.24	4.4-11.2	115.8-168.91	53.4-127	<0.04-4	0.09-0.24			160-236	76-120	34-49	16-43
SP-93	7.2-7.8	7.2-7.6	0-52	5.8-9.6	63.65-32.48	122.6-160	0.01-4.5	0.16-0.95			80.4-240	142-190	17-37	33-34
SP-172	7.3-7.7	7.1-7.9	7.6-19.4	7.2-16.8	165-212.4	170-200	0.09-1.27	0.04-0.24			261-280	239-310	23-42	29-42
SP-173	6.8-8.2	7.4-7.8	6-21	6-8	79-132	96-133	<0.04-.25	.04-.13	<0.02-.02	<0.02	124-168	146-182	21-44	31-49
SP-174	7.2-7.9	6.1	16-40	9	20-204	30	<0.04-.15	.26	<0.02	<0.02	186-200	182	10-38	18
SP-175	7.4-7.7	7	17-47	5-8	166-238	31	.1-7	.41	.05-2.0	.03	272-401	66	24-51	12

TOVCC 11427

TABLE 1

Ohio Valley Coal Company
Application Area D - 0360-12

Ground Water Quality Summary
Pre and Post Mining Water Quality
Application Areas: R-0360-2, D-0360-1, D-0360-2, D-0360-3

	pH		Acid		Alk.		Iron		Manganese		Hardness		Sulfate	
Supply No.	Pre SU	Post SU	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l
SP-176	7.1-7.6	6.9	11-31	4-9	150-201	131-166	<0.04-.18	.07-.15	<0.02-.04	<0.02	216-304	210-252	33-49	25-49
SP-198	7.8-7.7	6.9-7.4	5.8-31.8	7.2-20	159.6-198.6	123.6-280	<0.04-0.15	0.04-0.6			173-252	216-378	24-43	53-70
SP-216	6.8-7.7	6.7-6.8	4-74	5-10	70-119	51-53	.05-.52	.14-.17	<.02-.06	<0.02	90-147	75-81	15-38	23-27
SP-220	6.8-7.7	7.6	5.6-25.4	4.4	20.4-196.8	150	0.08-1.66	5.2			58-264	188	10-54	44
W-24	7.1-7.93	6.9-8.2	9.4-18.3	6.27-27.6	96-148	116.47-169.86	<0.02-0.09	0.08-10.5	0.02-0.04	0.02-0.69	121-163	154-200	37.6-61	39-77
W-25	6.88-7.7	7.4-7.7	4.2-67.3	10.26-38.8	83-112	114.21-166	0.04-.14	<0.04-2.78	<0.02-0.04	<0.02-0.56	139-157	188-215	76-80	30-40
W-26	7.28-7.57	7.3-7.5	16.2-37.5	22.23-51.2	186-214	204.2-229.6	0.04-0.1	0.06-0.74	0.03	<0.02-0.07	217-308	258-280	61-75.2	23-49
W-28	7.2-7.41	7-7.5	18-23.4	7.6-62.8	163-189	25.3-266.8	1.03-1.34	<0.04-7.9	0.18-0.27	<0.02-0.41	238-261	266-304	56-69	14-35
W-30	7.49-7.65	7.3-7.6	8.3-11.6	10-20.71	14-206	108-248.4	0.04-0.09	0.04-1.24	0.01-0.03	<0.02-0.07	259-289-	296-312	56-59	43-59
W-33	6.9-7.61	7.1-7.8	14.52-53.2	20.2-34.8	150.1-196	22.23-186.6	<0.04-0.17	<0.04-0.11	<0.02-0.03	<0.02-0.08	214-242	155-240	34-58	32-115
W-34	6-8.09	6.5-7.1	12.2-24.13	0-33	29.64-160.17	48.6-113	0.11-3.01	<0.02-1.41	<0.02-0.85	<0.02-10.05	136-282	155-190	49-67	52-56
W-38	7.3-7.57	6.9-7.6	9.05-17.3	11.4-43.2	19.4-231	171-223.4	0.09-8.54	0.07-5.62	<0.02-0.26	0.02-0.2	198-233	198-272	37.6-46.4	29-46
W-44	7.1-7.5	7.3-8.9	1.2-71.4	0-40.8	76-343.9	29.8-268	0.04-1.98	<0.04-2.09	<0.02-0.45	<0.02-0.07	219-371	111-264	<10-140	33-100
W-51	7.3-7.8	7.8	0-40	14	158-243	286	0.04-.65	0.77	<0.02-.23	0.05	84-277	97	26-68	44
W-52	7.4-7.8	7.4-8.2	0-28.4	4.2-20.0	141-255.6	192-213	<0.04- 0.22	0.06-0.25			91-280	256-303	31-62	47-63
W-53	7.4-7.8	7.4-7.8	0-16	8-16	96-214	171-213	<0.04-1.3	.16-.75	<0.02-.05	.06-.08	84-256	228-242	11-56	35-49
W-54	7.3-7.7	7.4	0-19.2	8.8-12	94-268	192-240	<0.04-3.06	0.91-2.7			76-232	56-120	11-71	86-109
W-55	7.3-7.6	7.7-8.3	0-54	4-11	184-214	177-221	<0.04-.24	.07-1.4	<.02-.09	<0.02-4.2	71-272	120-232	35-63	24-67

TOVCC 11428

TABLE 1

Ohio Valley Coal Company
Application Area D - 0360-12

Ground Water Quality Summary
Pre and Post Mining Water Quality
Application Areas: R-0360-2, D-0360-1, D-0360-2, D-0360-3

	pH		Acid		Alk.		Iron		Manganese		Hardness		Sulfate	
Supply No.	Pre SU	Post SU	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l	Pre mg/l	Post mg/l
W-56	7-7.6	7.5-7.8	0-86.4	10.6-13	156-300	207-250	0.02-1.73	0.10-5.8			24-403	244-313	31-84	35-72
W-57	6.8-7.8	7.3-7.8	0-22	11-17	87-261	179-208	0.04-0.45	.15-.46	<0.02-.02	.02-.06	63-184	200-252	31-46	12-77
W-58	7.2-7.8	7.7	0-15	9	150-335	215	<0.04-.08	0.08	<0.02-0.3	<0.02	72-196	112	41-61	43
W-92	6.9-7.0	7.2-7.4	16-72	32-131	66-127	.83-100	.65-2.2	<0.02-2.9	<0.02-.02	.02-11	162-239	72-250	93-100	70-819
W-214	6.4-6.8	6.6-7.6	0--37.24	7.36	116-172	33-50	0-.30	<0.02-.71			100-276	72-260	44-716	17-110
W-215	7.5-8.3	6.8-7.36	0-20.3	4.2-19	189-380	68-150	1.21-0.12	0.6-3.8			20-200	72-160	14-186	89-41
W-216	7.2-7.6	7.39-8.4	11.4-28.5	8.8-34	236-27	300-380	0.0-0.3	.48-.95			248-360	160-620	130-183	77-520
W-260	6.9-7.3	7.2-7.3	0-39.71	33-46	3315-380	310-360	0.02-.87	.07-.41			168-446	380-470	40-165	50-95
W-282	7.4-7.9	7.4-8.1	2.4-17	3.2-25	182-250	169-335	0.17-2.3	.11-5.5	<0.02-0.1	.02-.16	199-227	60-253	38-43	40-84
W-282A	7.3-7.7	7.4-8.4	12.54-30.4	9.6-17.1	154.6-225.71	176-279	0.21-0.6	0.02-1.91			189-204	115-262	37-44	30-116
W-283	7.5-7.9	7.4-7.9	2.4-32	3.2-15.4	182-191	218-334	0.17-2.27	0.11-2.38			199-216	60-253	38-43	44-80
W-285	6.8-7.7	7.3-7.8	8.8-16.6	15.8-27	185-196	170-234	0.86-10.90	0.69-21			262-320	12-160	52-120	290-430
W-288	7.2-8.3	7.2-7.57	3.3-32.6	16-17	150-240	150-180	0.15-2.55	0.07-.13			180-423	210-380	36-91	44-55
W72	7.2	7.4-7.5	21-29	11-21	120-138	120	0.17-2.82	0.06-0.22			330-400	290-300	11-92	59-100

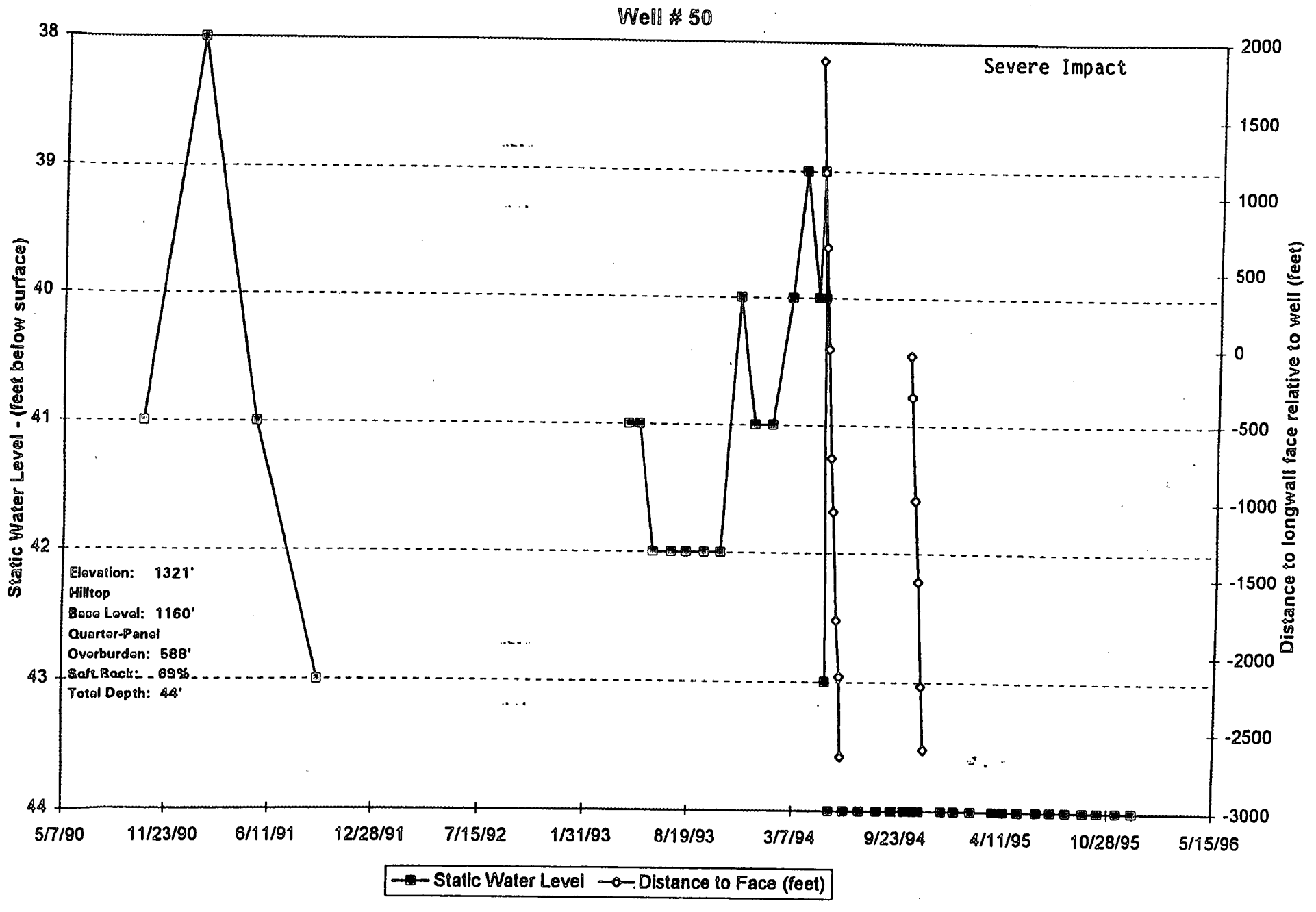
TOVCC 11429

0360-12

APPENDIX A

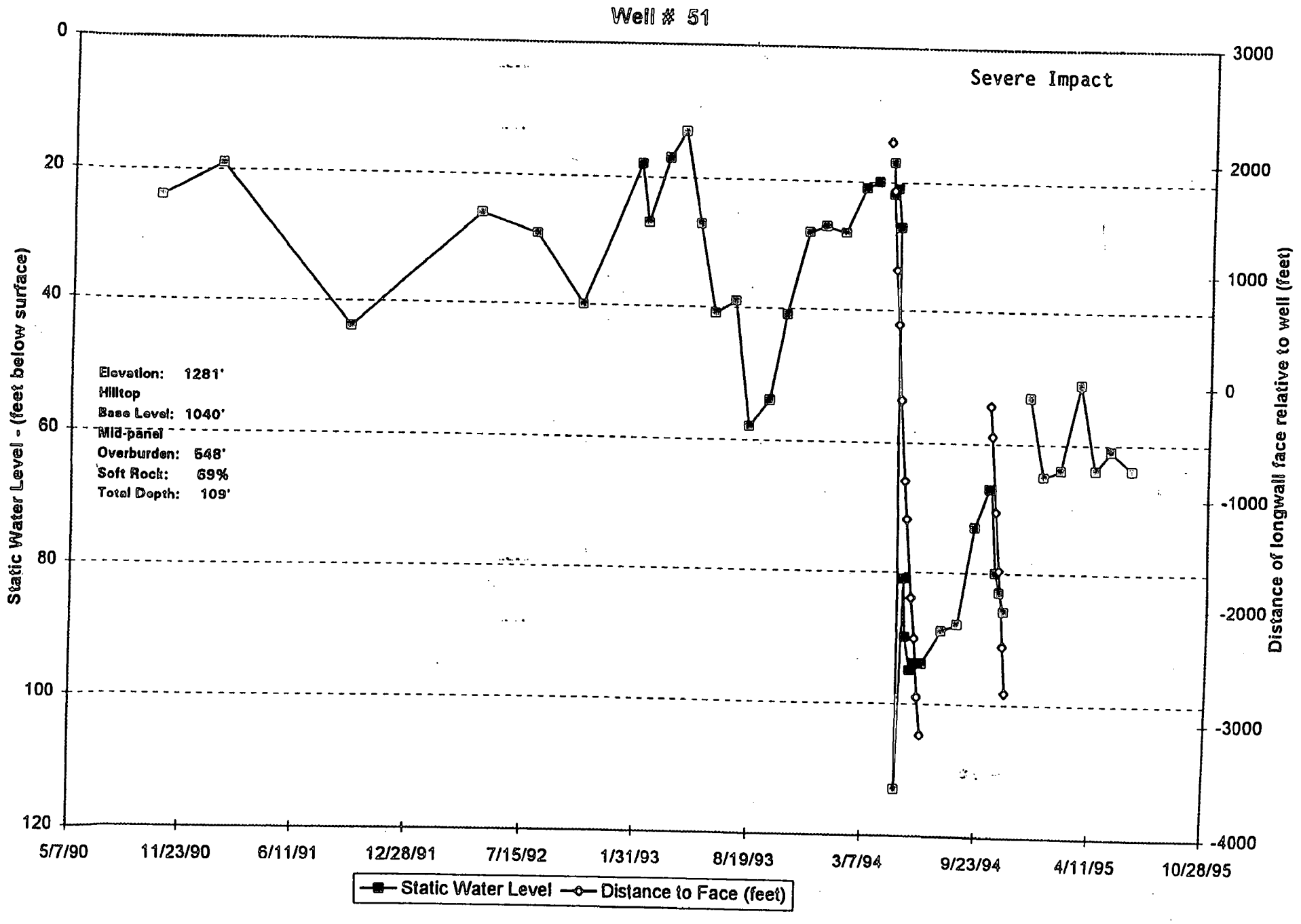
Powhatan No. 6 Mine

Well and Spring Hydrographs



Prepared by: Moody and Assoc. Inc 4/12/97

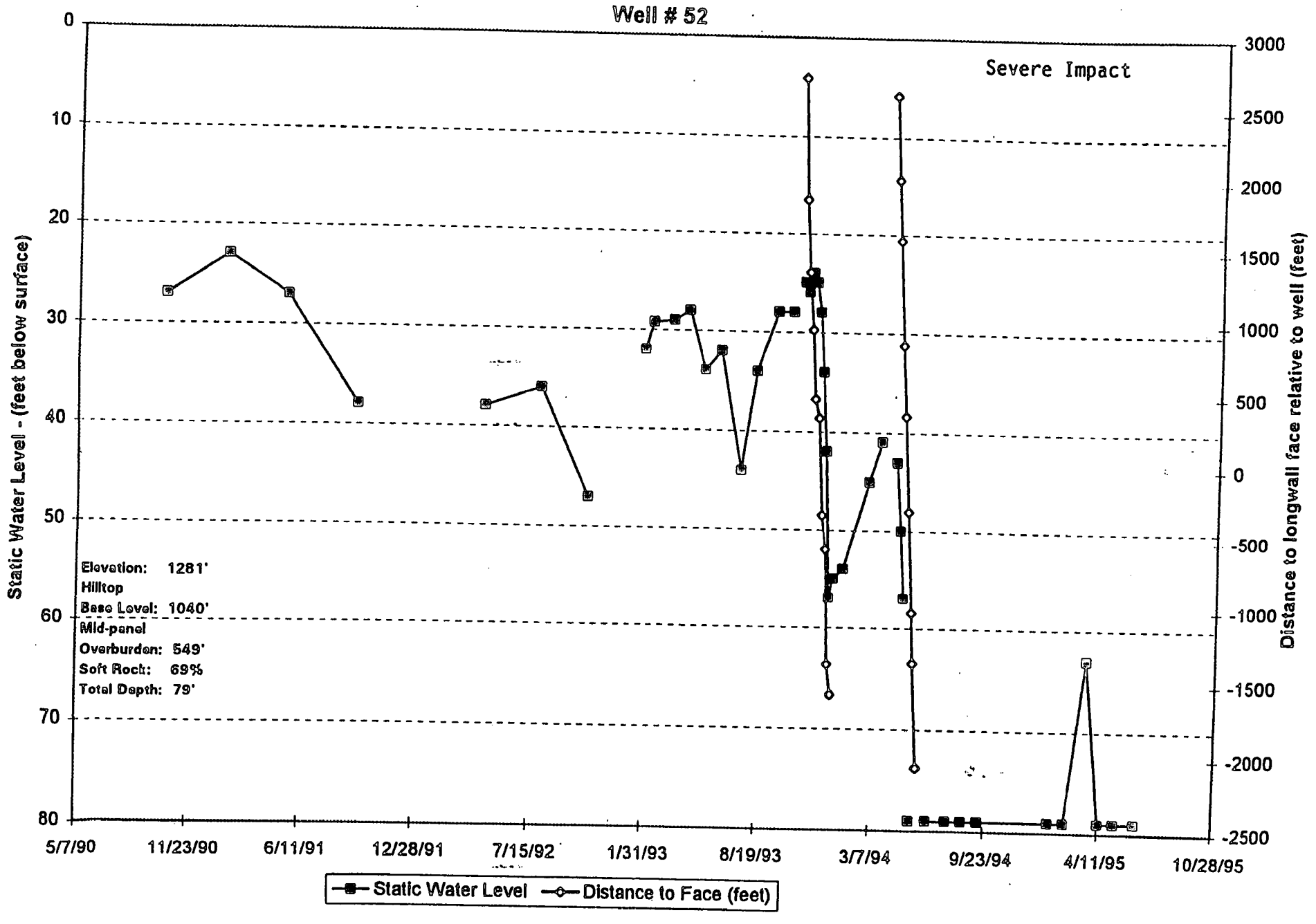
TOVCC 11431

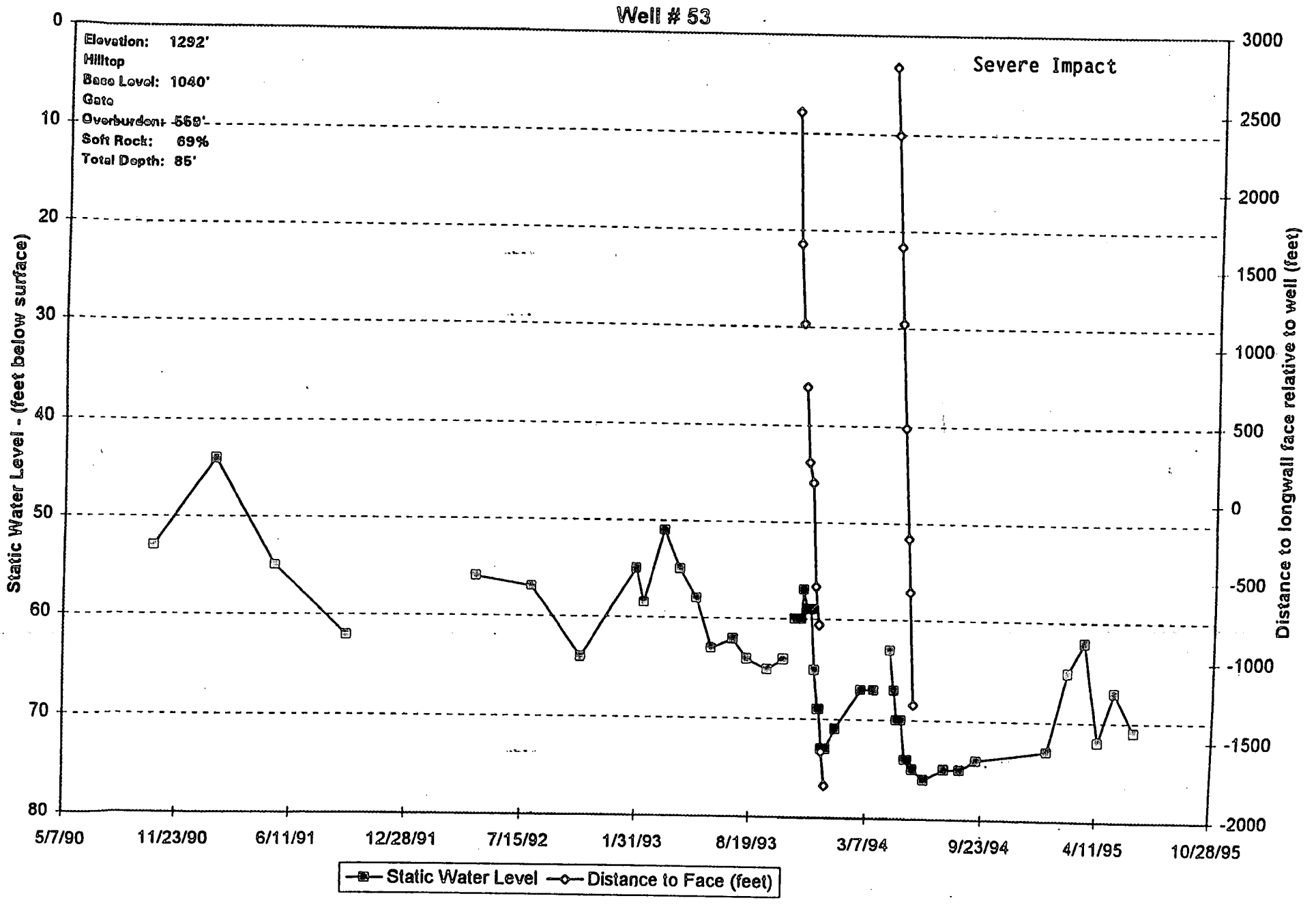


Prepared by: Moody and Assoc., Inc. 4/12/97

TOVCC 11432

0360-1

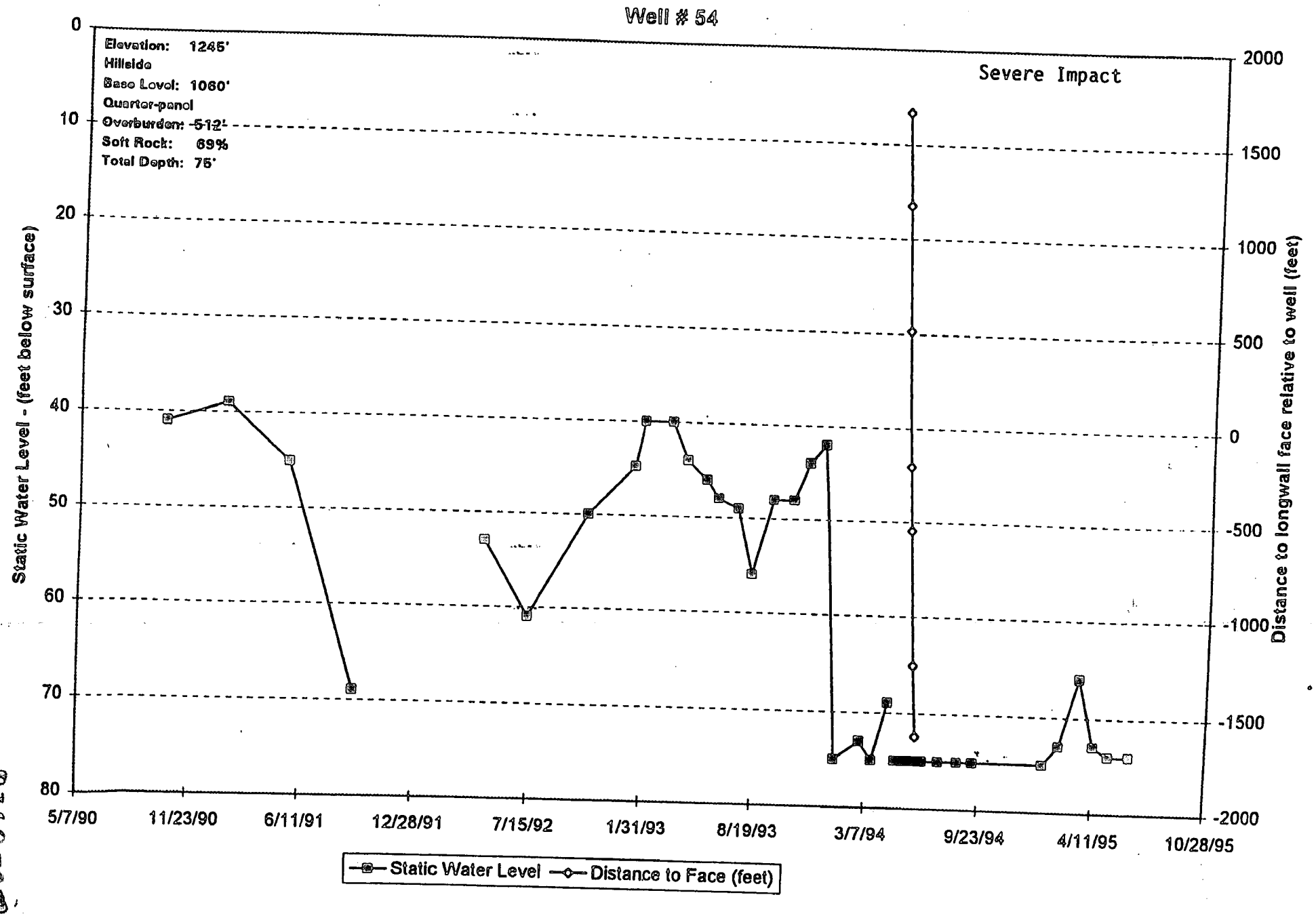

Well # 52
Severe Impact
Static Water Level - (feet below surface)
Distance to longwall face relative to well (feet)
0
10
20
30
40
50
60
70
80
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-2500
5/7/90
11/23/90
6/11/91
12/28/91
7/15/92
1/31/93
8/19/93
3/7/94
9/23/94
4/11/95
10/28/95
Elevation: 1281'
Hilltop
Base Level: 1040'
Mid-panel
Overburden: 549'
Soft Rock: 69%
Total Depth: 79'
Static Water Level
Distance to Face (feet)



Prepared by: Moody and Associates

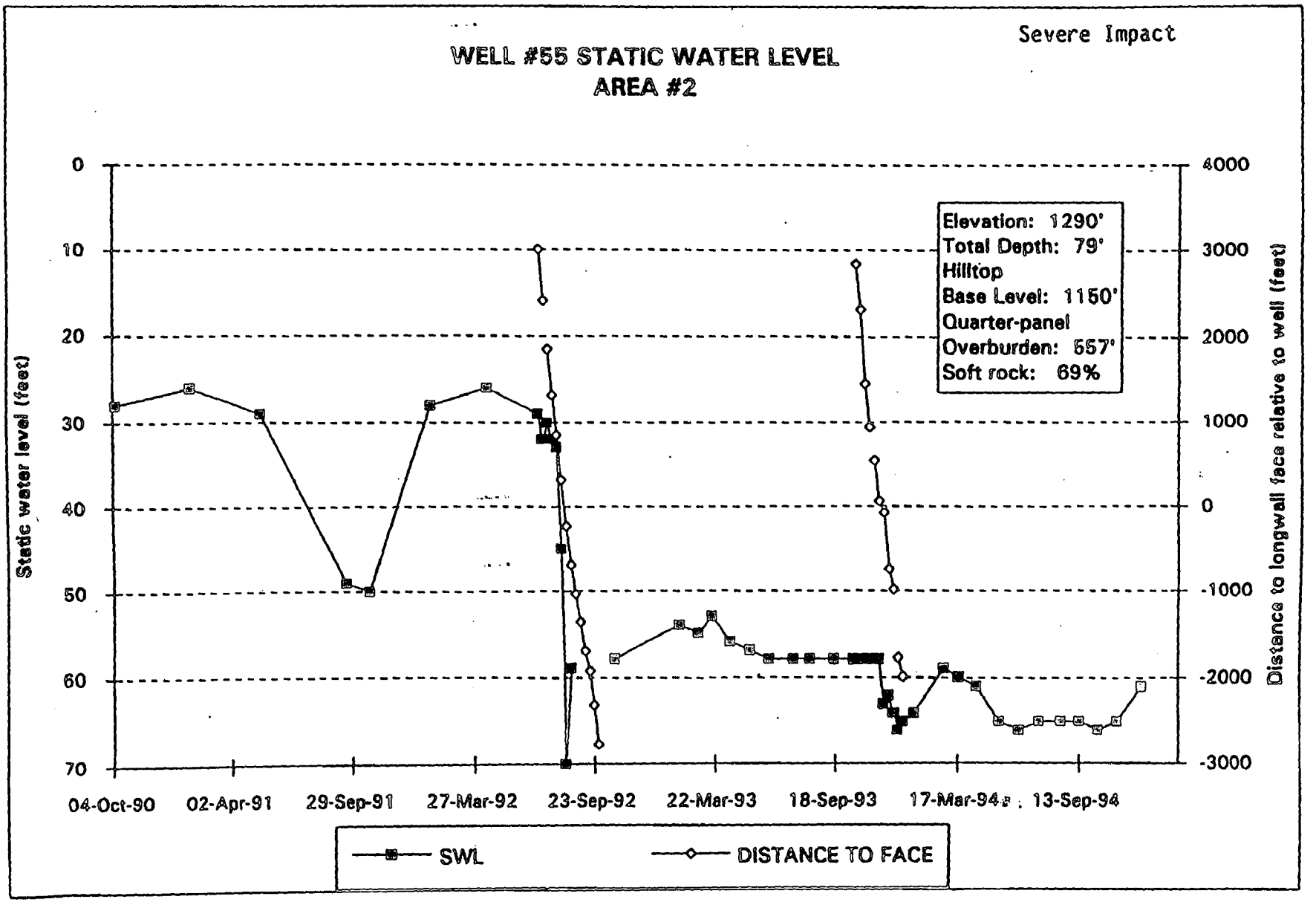
TOVCC 11434

0360-18


Well # 54
Elevation: 1245'
Hillside
Base Level: 1060'
Quarter-panel
Overburden: 512'
Soft Rock: 69%
Total Depth: 75'
Severe Impact
Static Water Level - (feet below surface)
Distance to longwall face relative to well (feet)
0
10
20
30
40
50
60
70
80
2000
1500
1000
500
0
-500
-1000
-1500
-2000
5/7/90
11/23/90
6/11/91
12/28/91
7/15/92
1/31/93
8/19/93
3/7/94
9/23/94
4/11/95
10/28/95
Static Water Level
Distance to Face (feet)

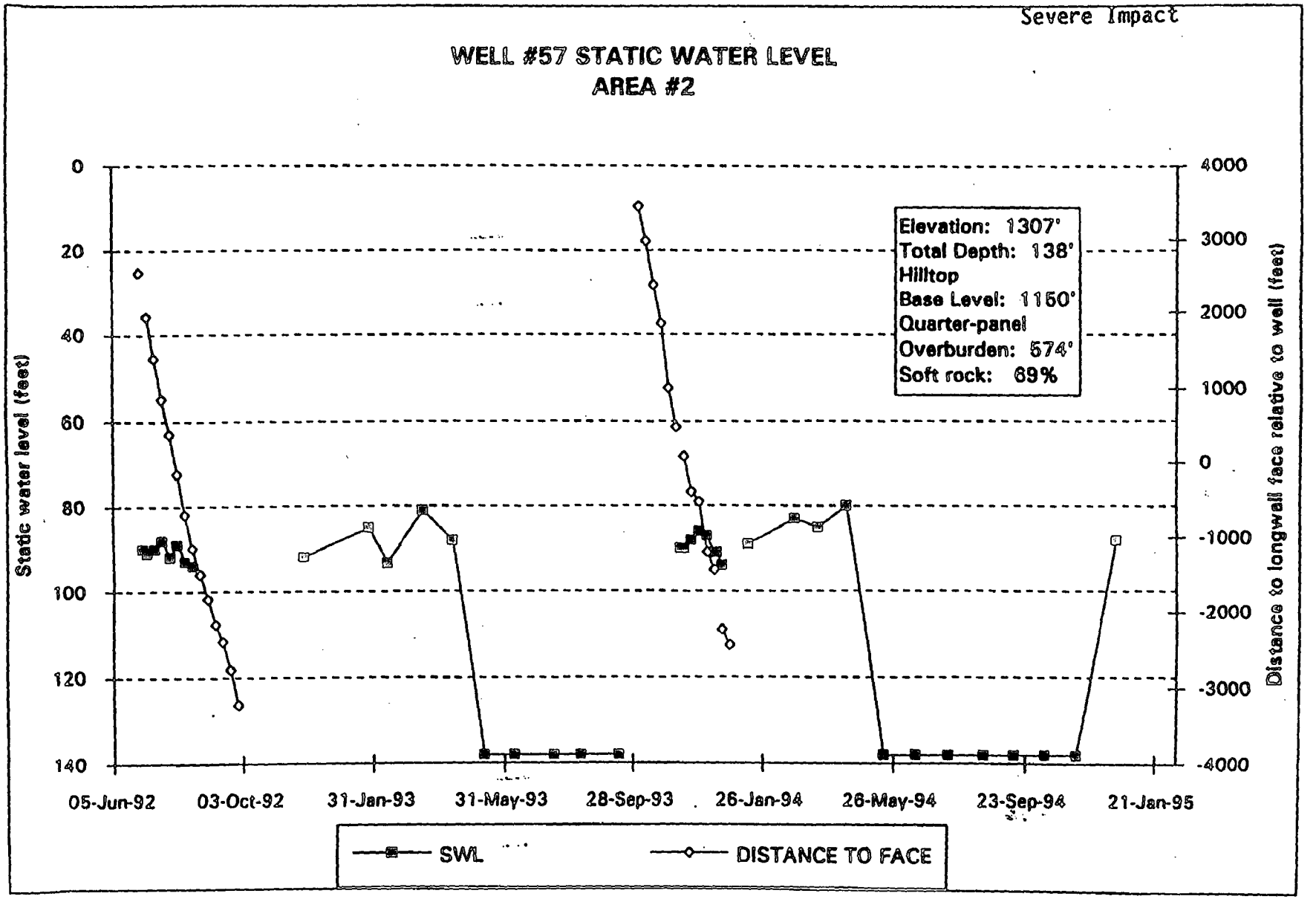
TOVCC 11435

Severe Impact

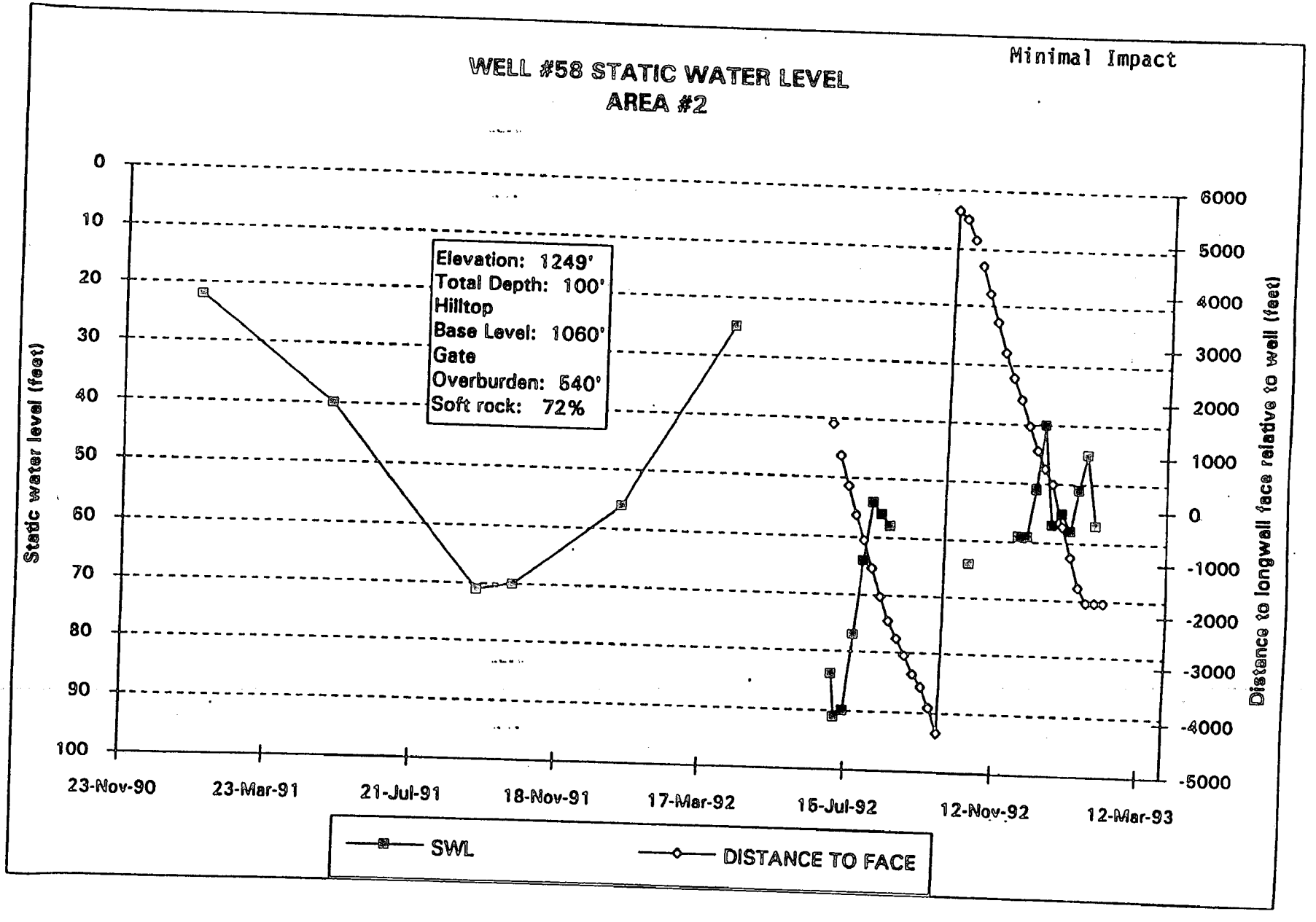


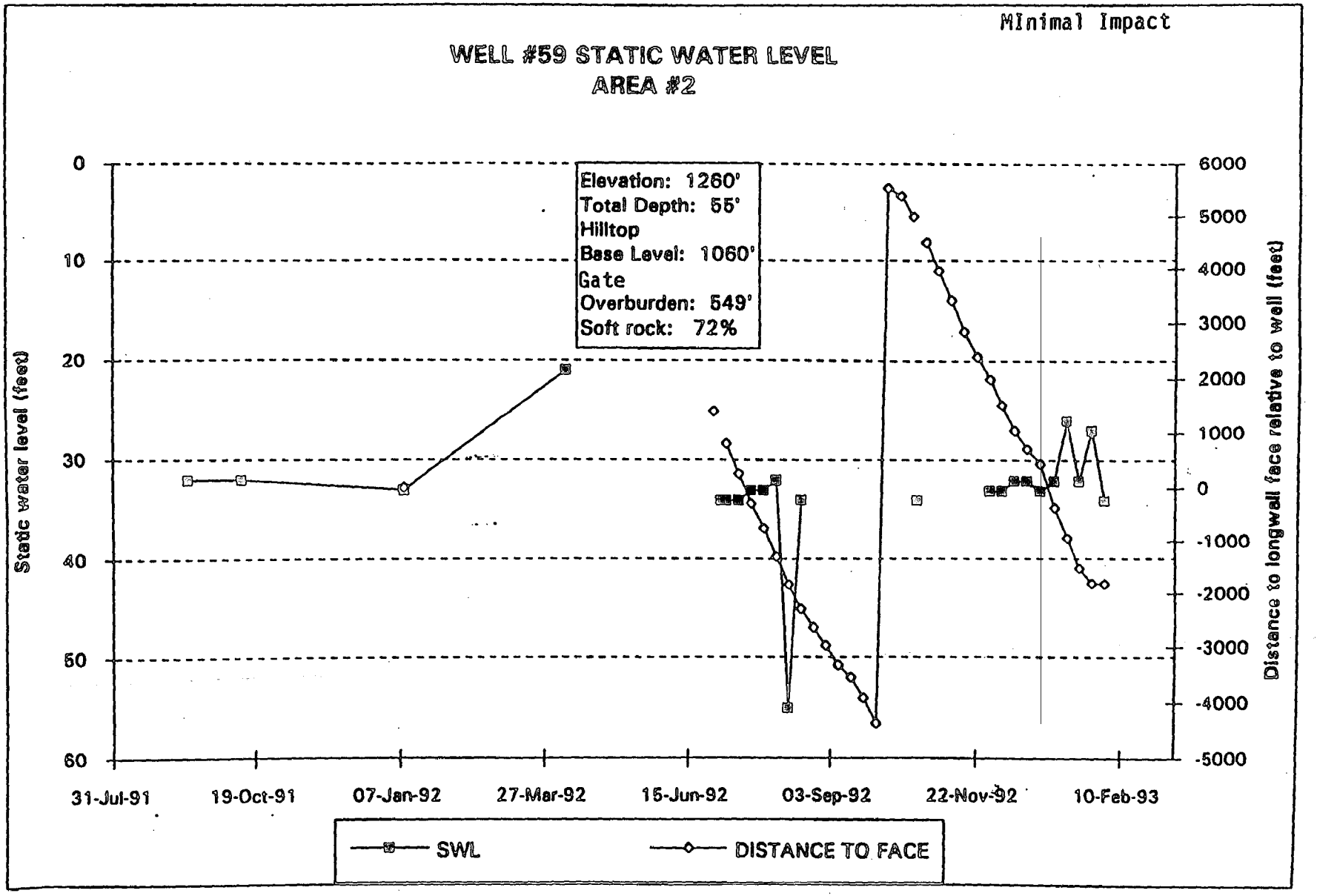
TOVCC 11436
TOVCC 11436

Severe Impact



TOVCC 11437
TOVCC 11437

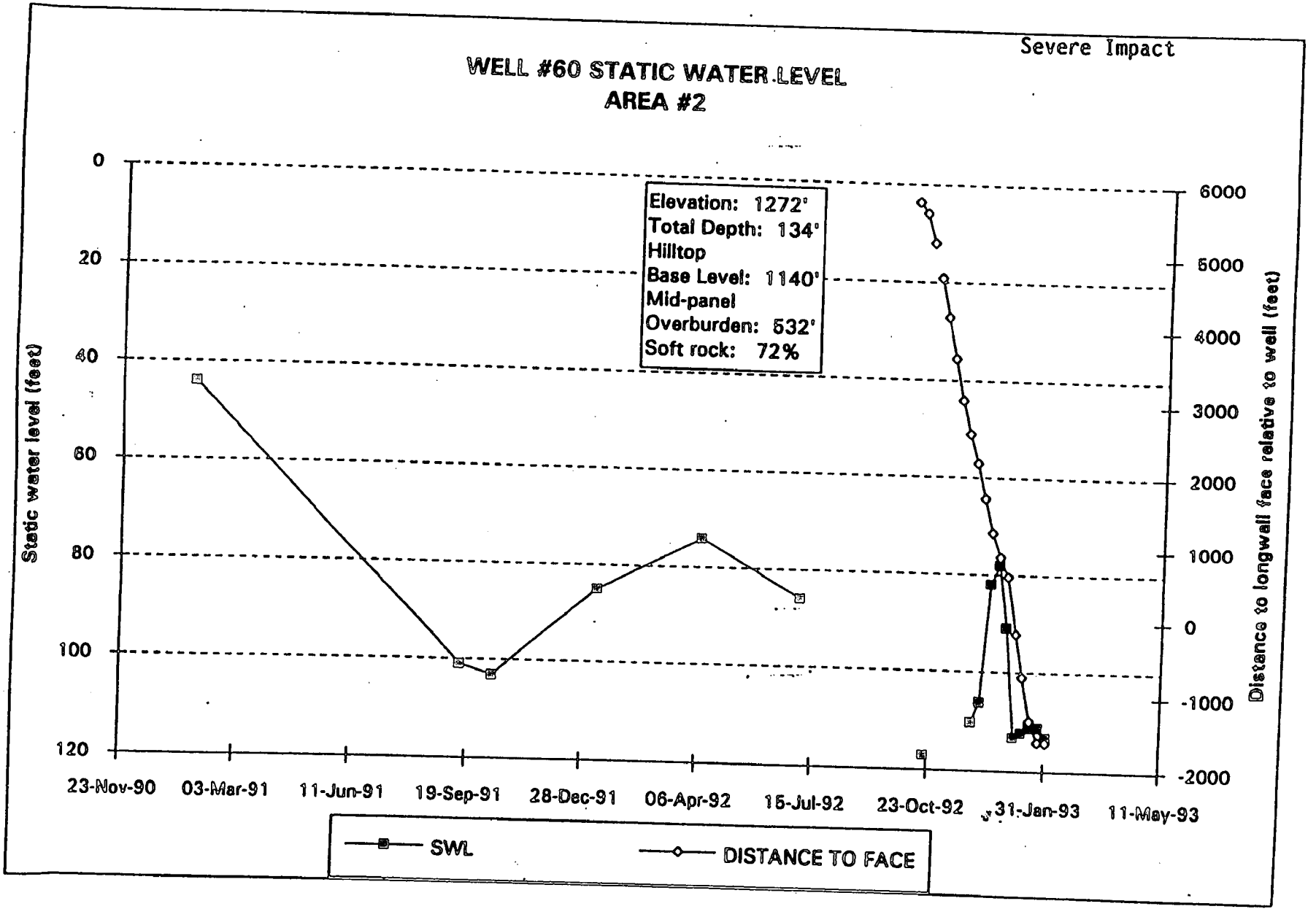

WELL #58 STATIC WATER LEVEL
AREA #2
Minimal Impact
Elevation: 1249'
Total Depth: 100'
Hilltop
Base Level: 1060'
Gate
Overburden: 540'
Soft rock: 72%
Static water level (feet)
0
10
20
30
40
50
60
70
80
90
100
Distance to longwall face relative to well (feet)
6000
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
-5000
23-Nov-90
23-Mar-91
21-Jul-91
18-Nov-91
17-Mar-92
15-Jul-92
12-Nov-92
12-Mar-93
SWL
DISTANCE TO FACE



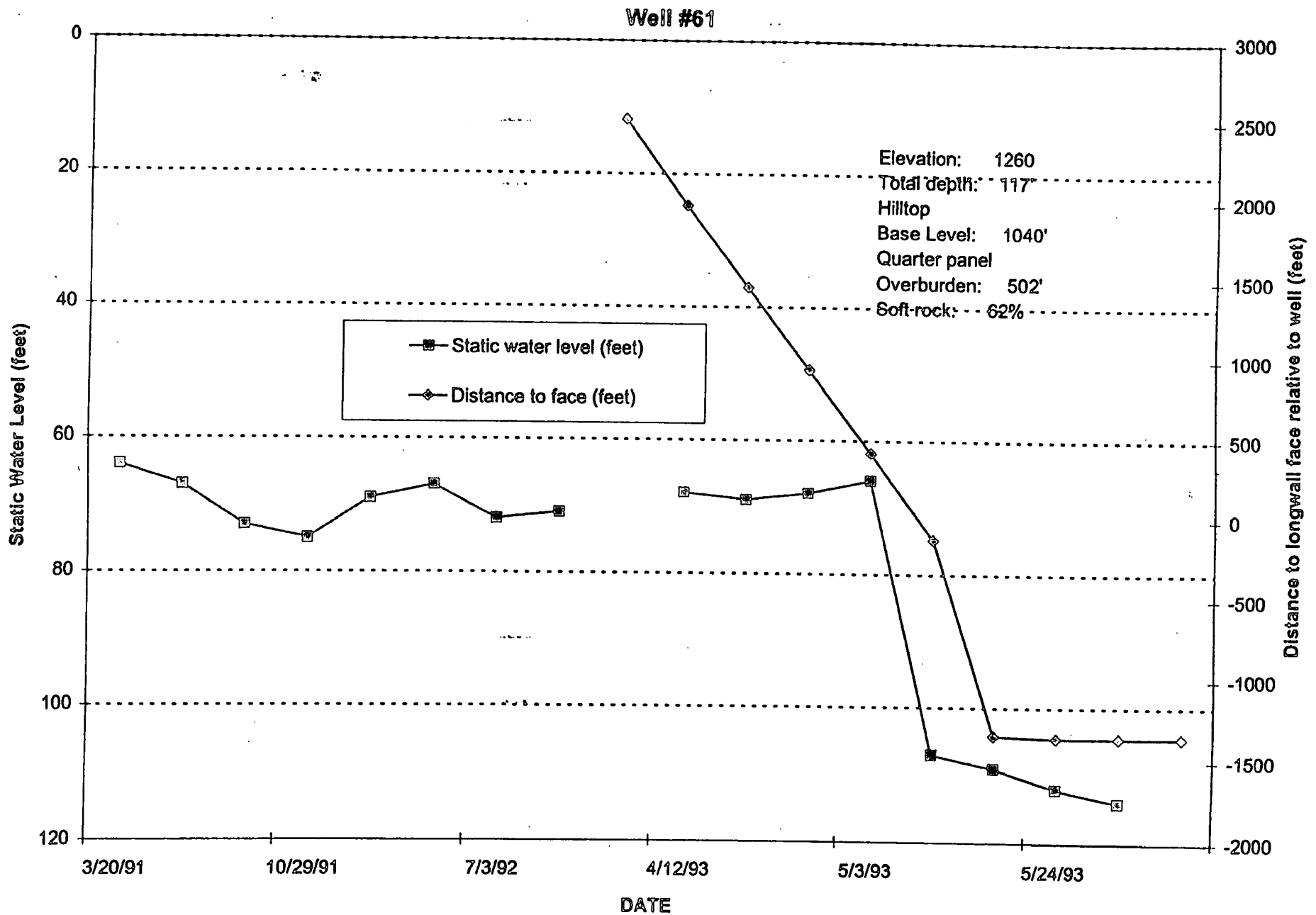
D360-1

360TOVCC 11439

Severe Impact

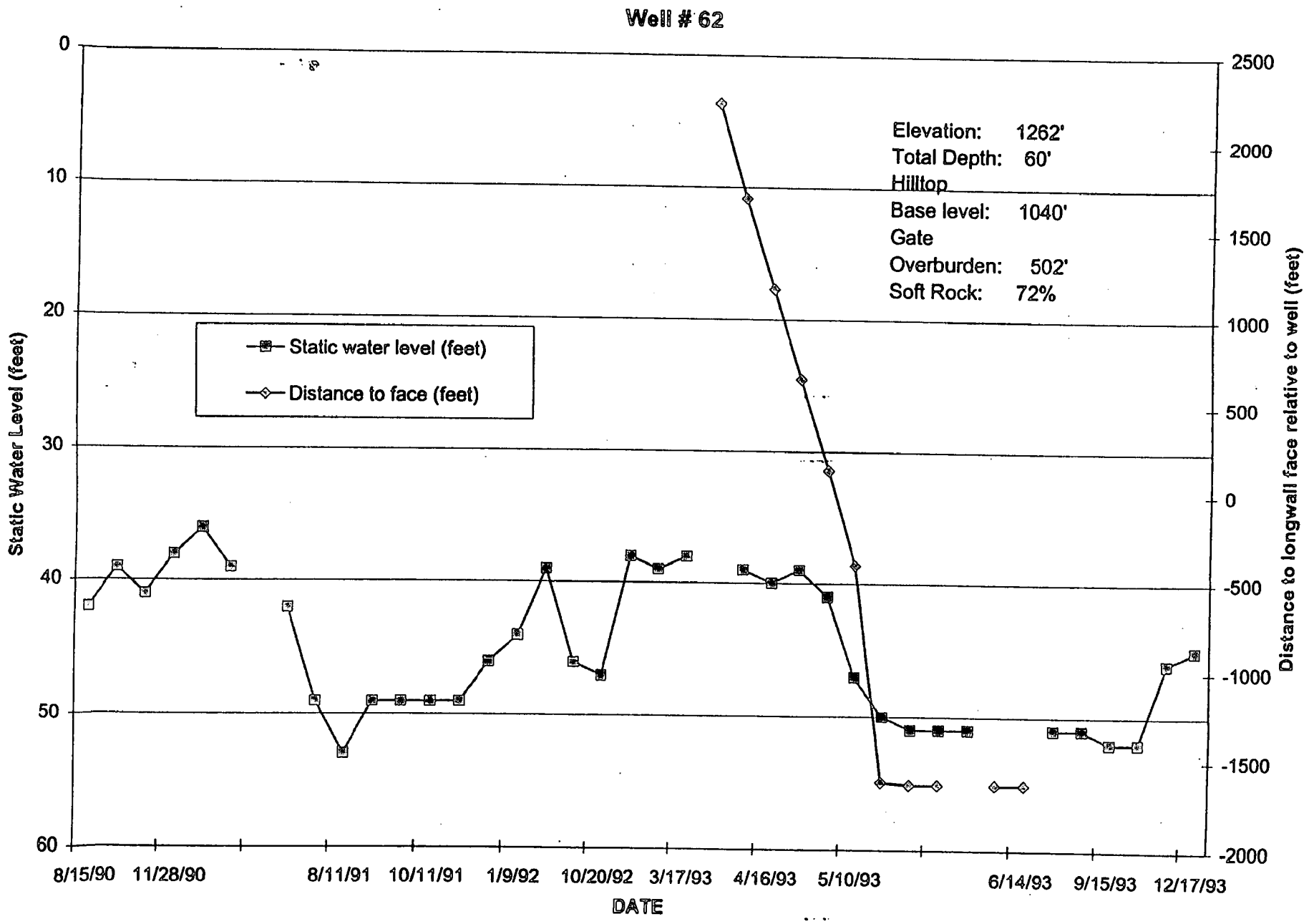


Severe Impact

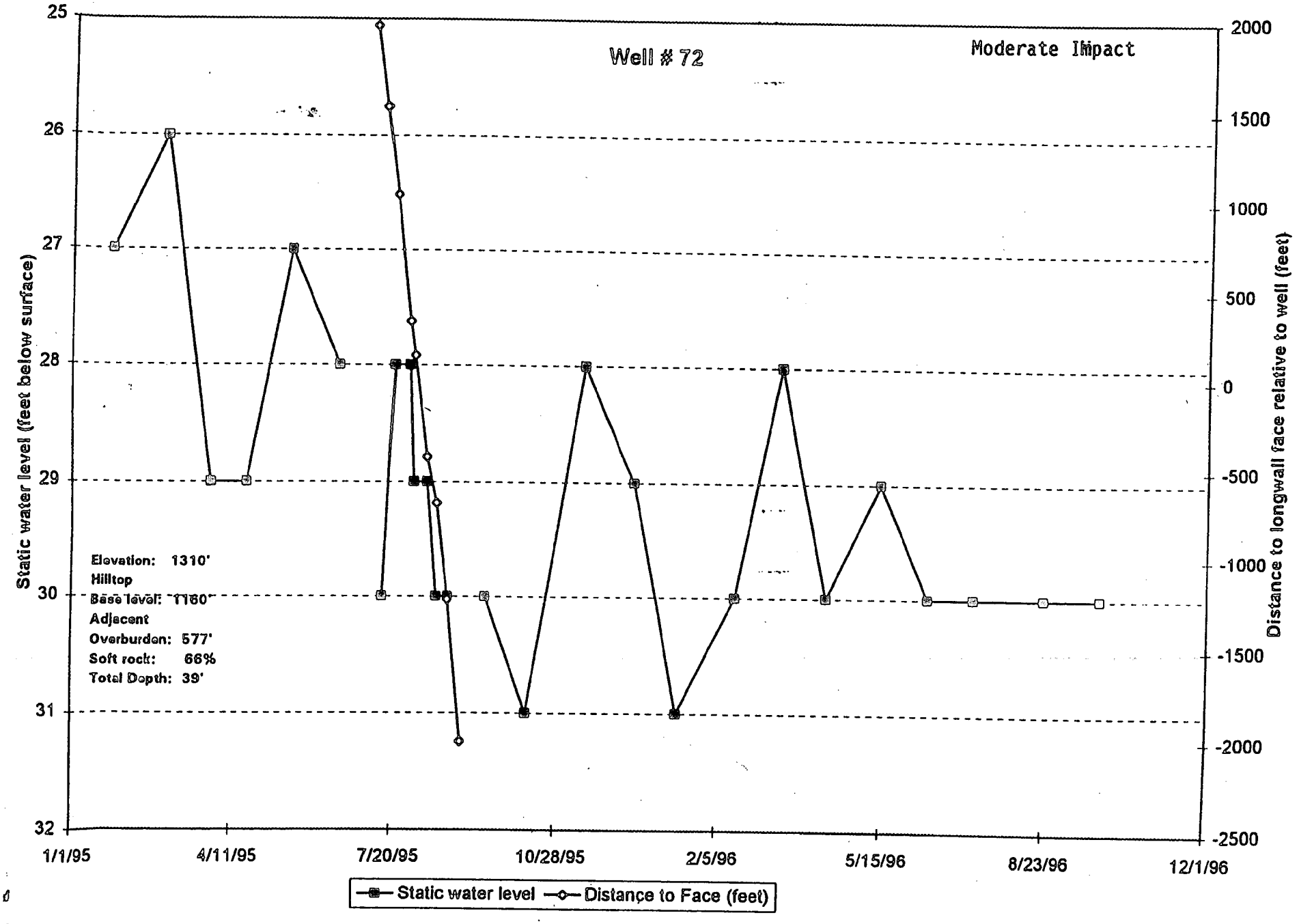


TOVCC 11441

Severe Impact

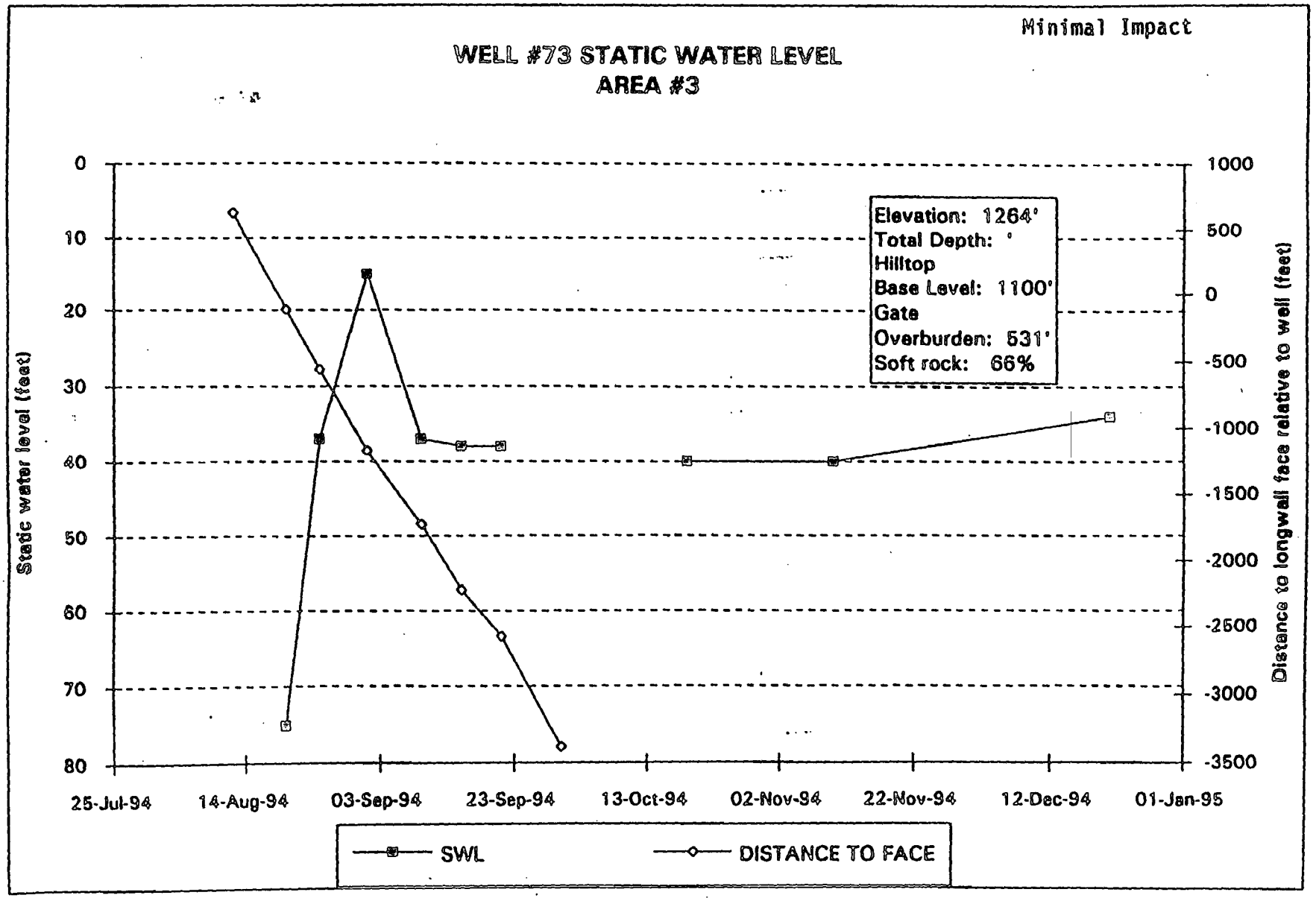


TOVCC 11442



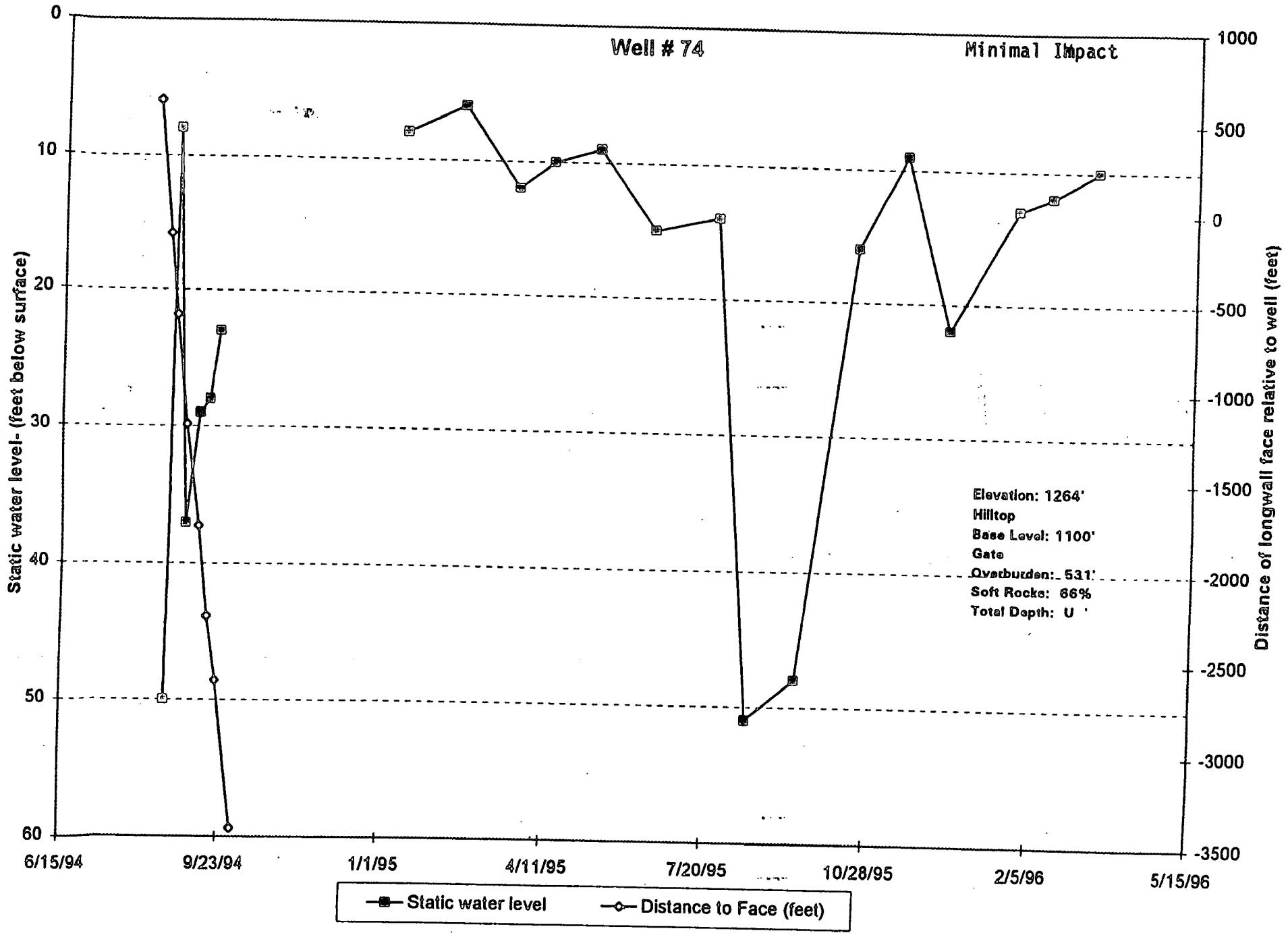
D360-1

TOVCC 11443



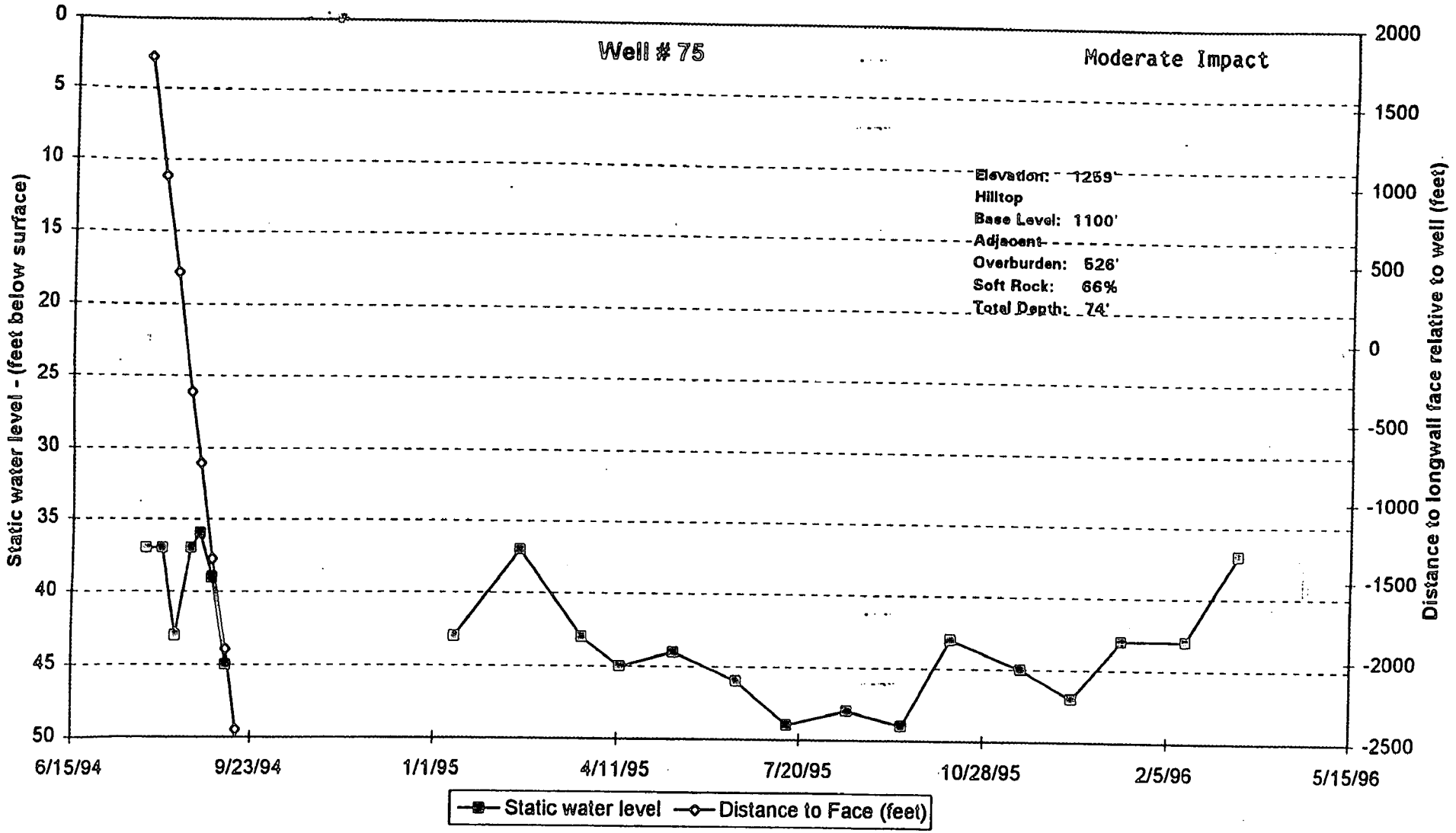
TOVCC 11444
TOVCC 11444

0360-10

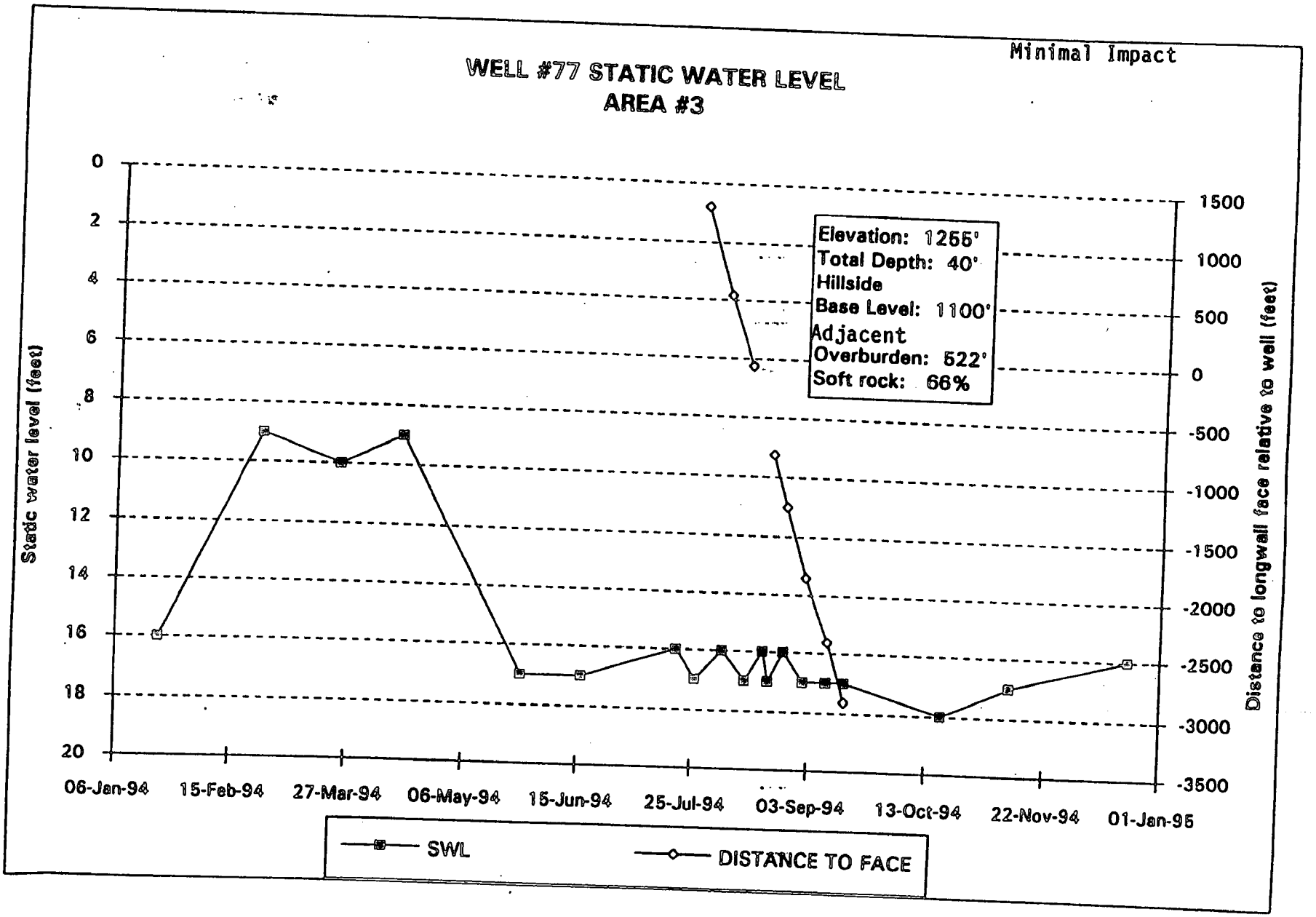


TOVCC 11445

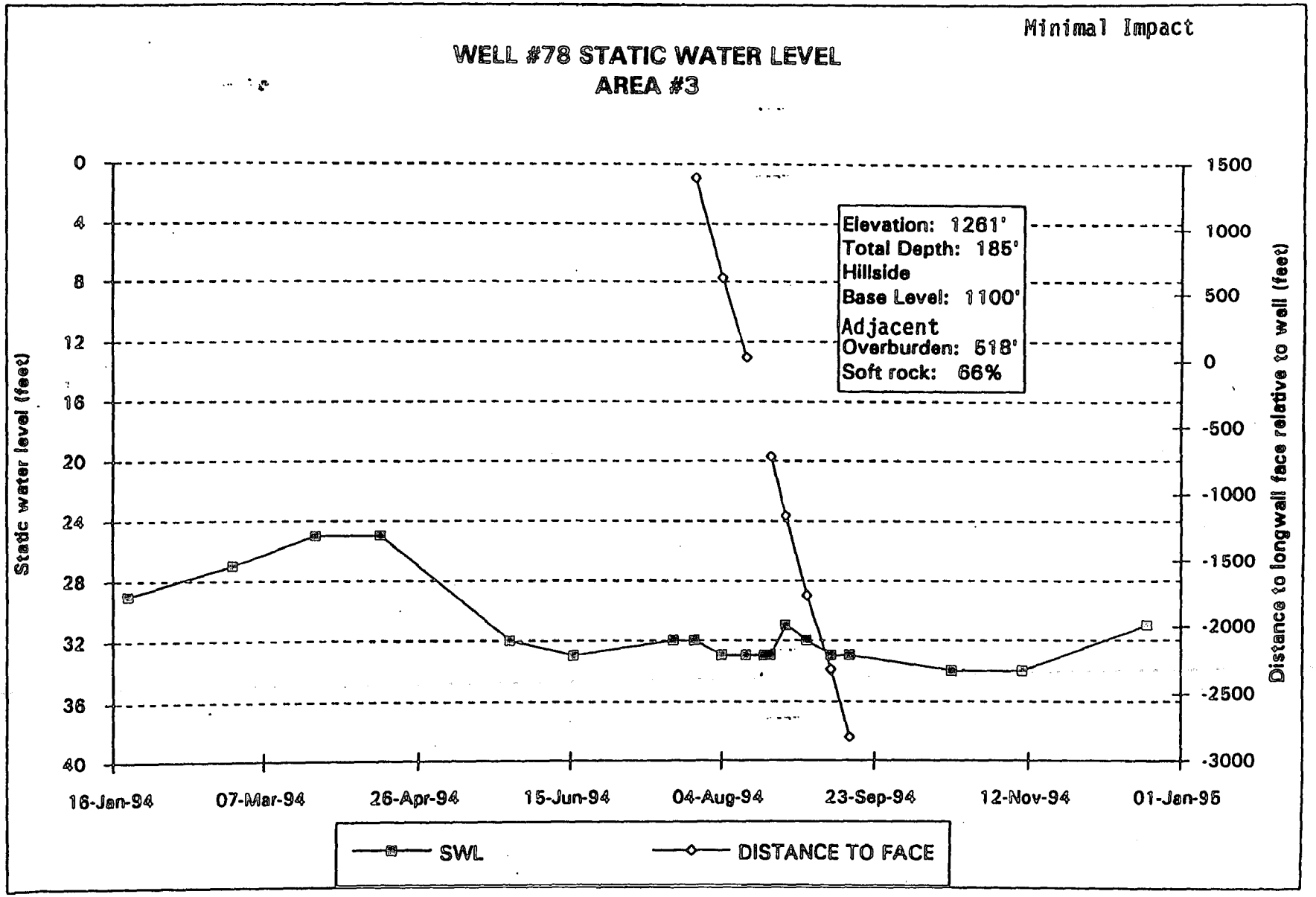
0360-1

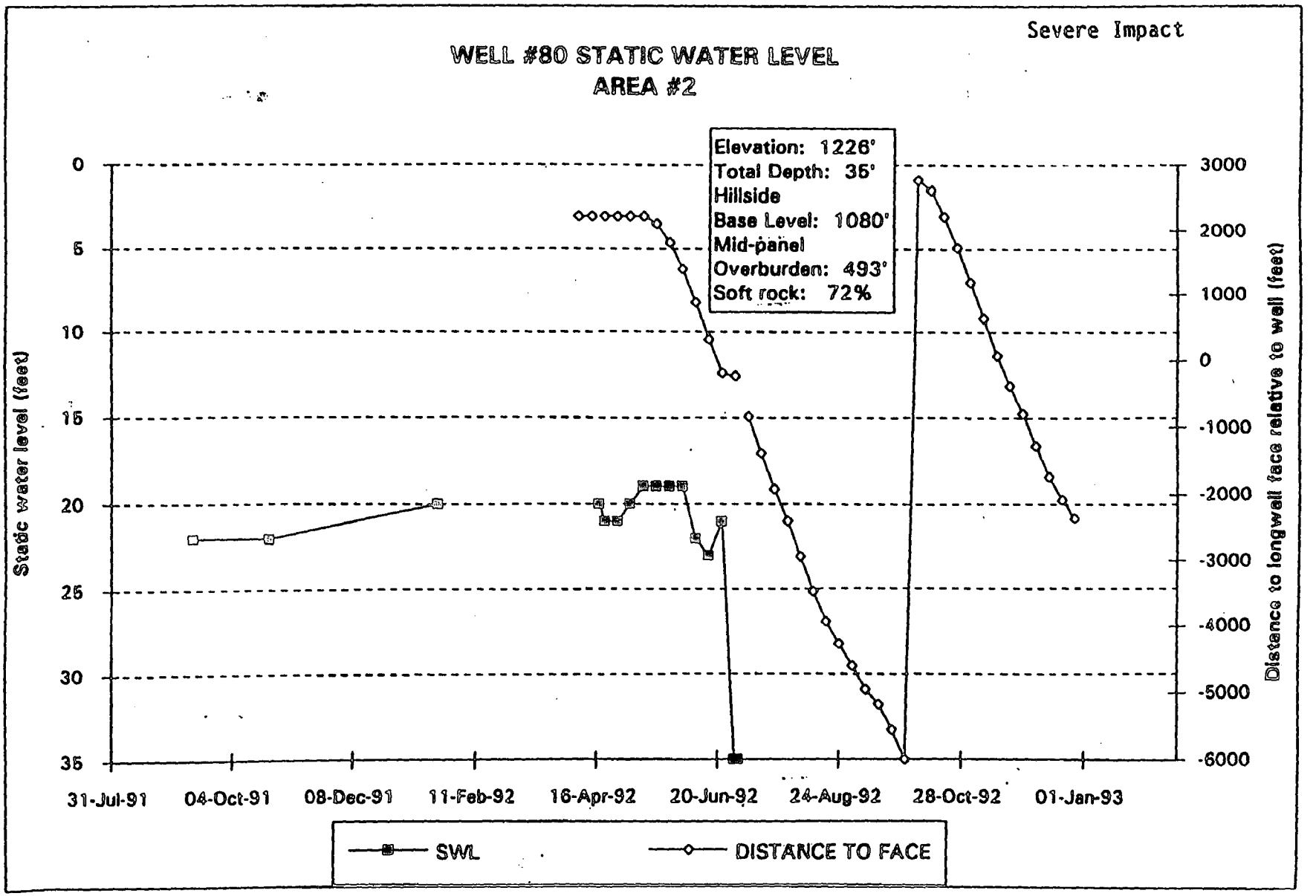

Well # 75
Moderate Impact
Elevation: 1259'
Hilltop
Base Level: 1100'
Adjacent
Overburden: 526'
Soft Rock: 66%
Total Depth: 74'
Static water level - (feet below surface)
Distance to longwall face relative to well (feet)
0
5
10
15
20
25
30
35
40
45
50
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-2500
6/15/94
9/23/94
1/1/95
4/11/95
7/20/95
10/28/95
2/5/96
5/15/96
Static water level
Distance to Face (feet)

Minimal Impact

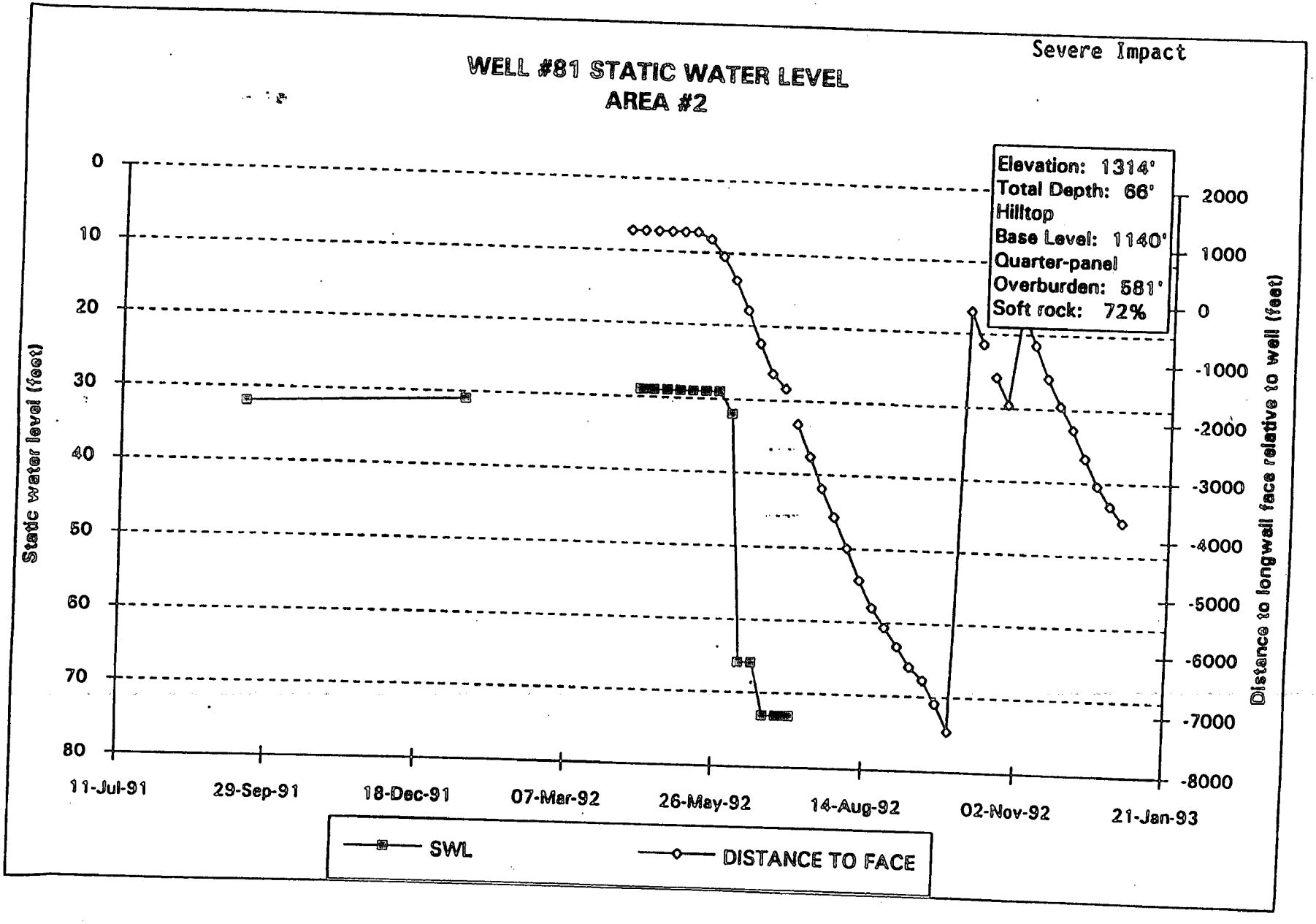


Minimal Impact




Severe Impact
WELL #80 STATIC WATER LEVEL
AREA #2
Elevation: 1226'
Total Depth: 35'
Hillside
Base Level: 1080'
Mid-panel
Overburden: 493'
Soft rock: 72%
Static water level (feet)
0
5
10
15
20
25
30
35
Distance to longwall face relative to well (feet)
3000
2000
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
31-Jul-91
04-Oct-91
08-Dec-91
11-Feb-92
16-Apr-92
20-Jun-92
24-Aug-92
28-Oct-92
01-Jan-93
SWL
DISTANCE TO FACE

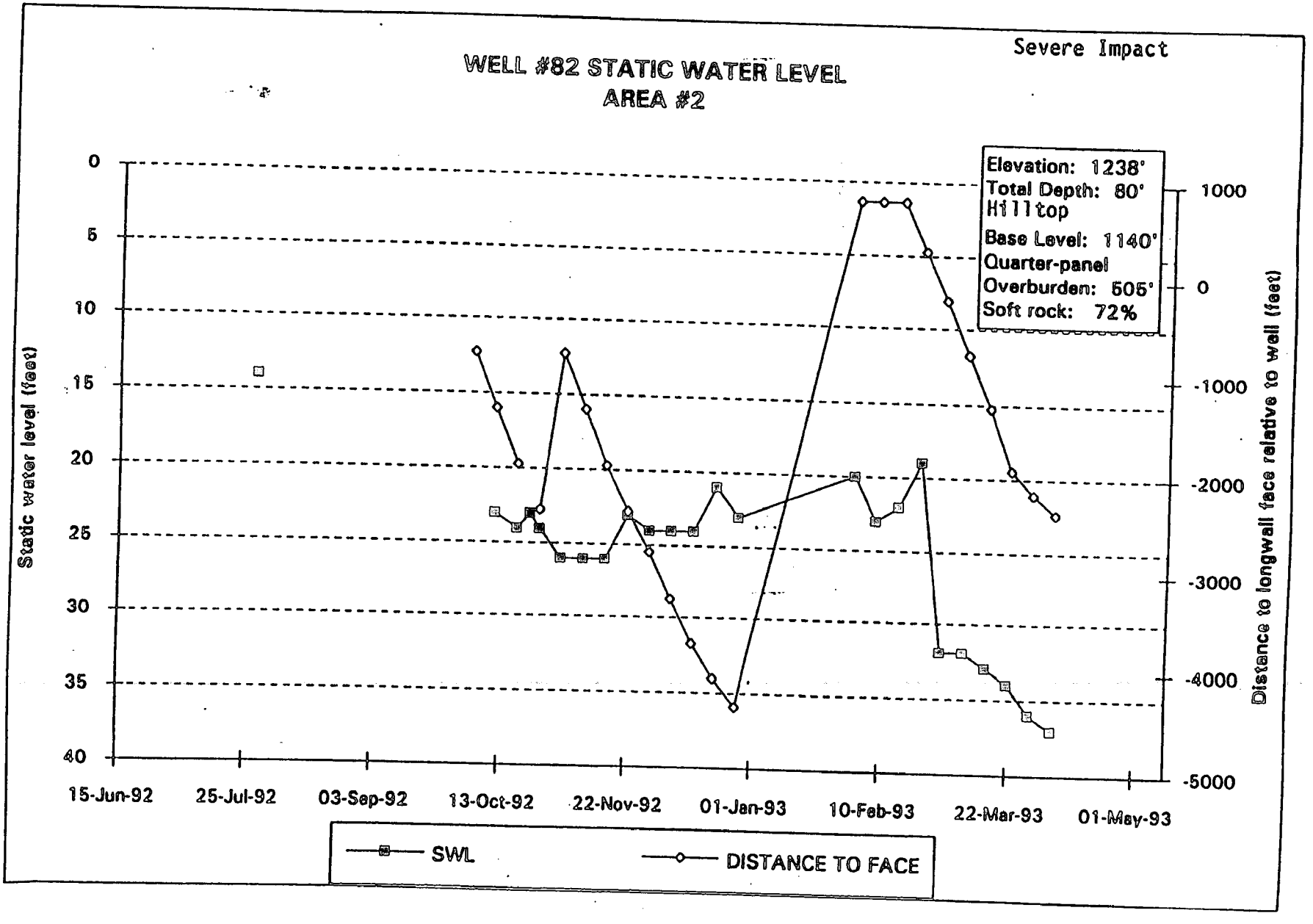
TOVCC 11449



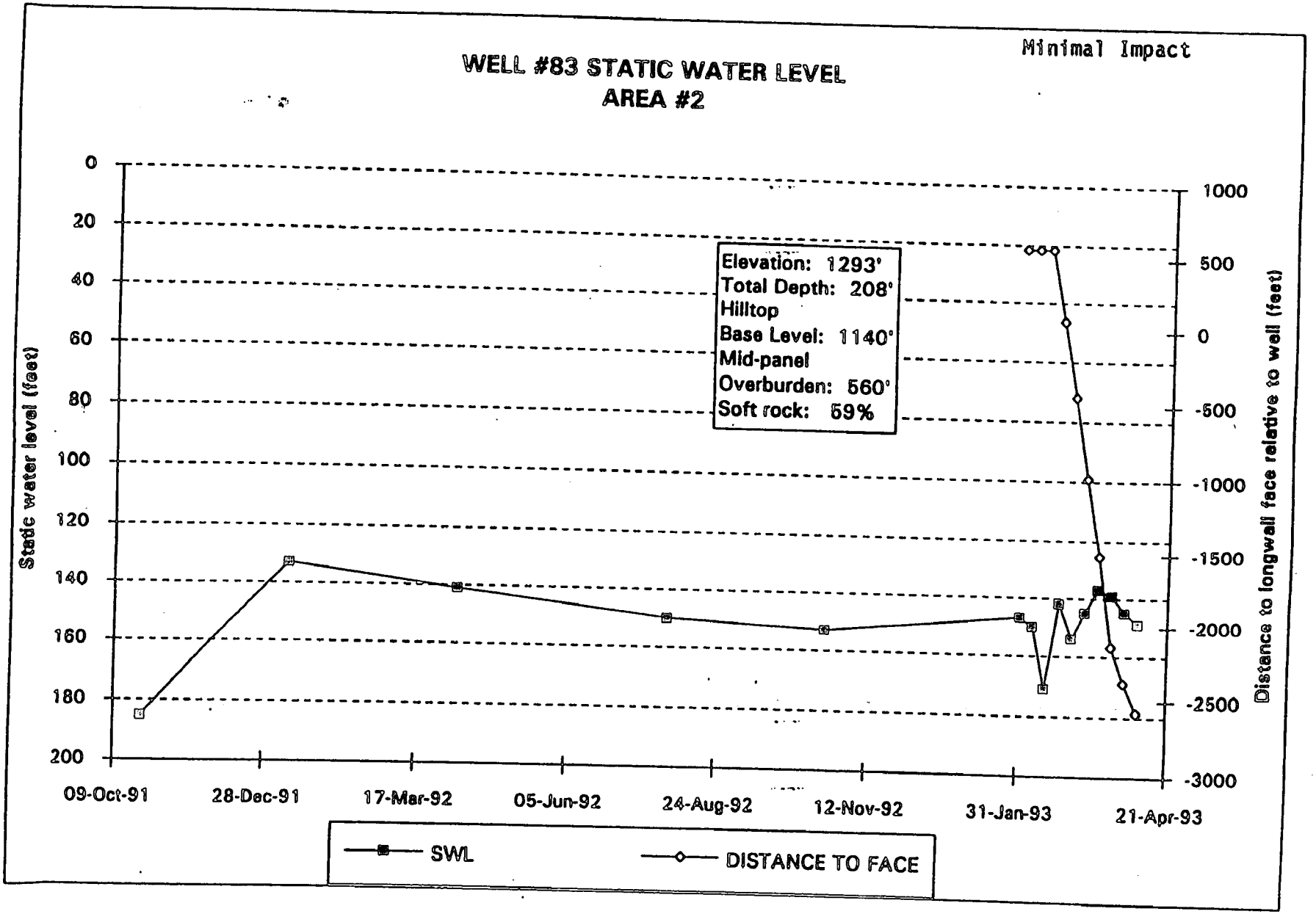
TOVCC 11450

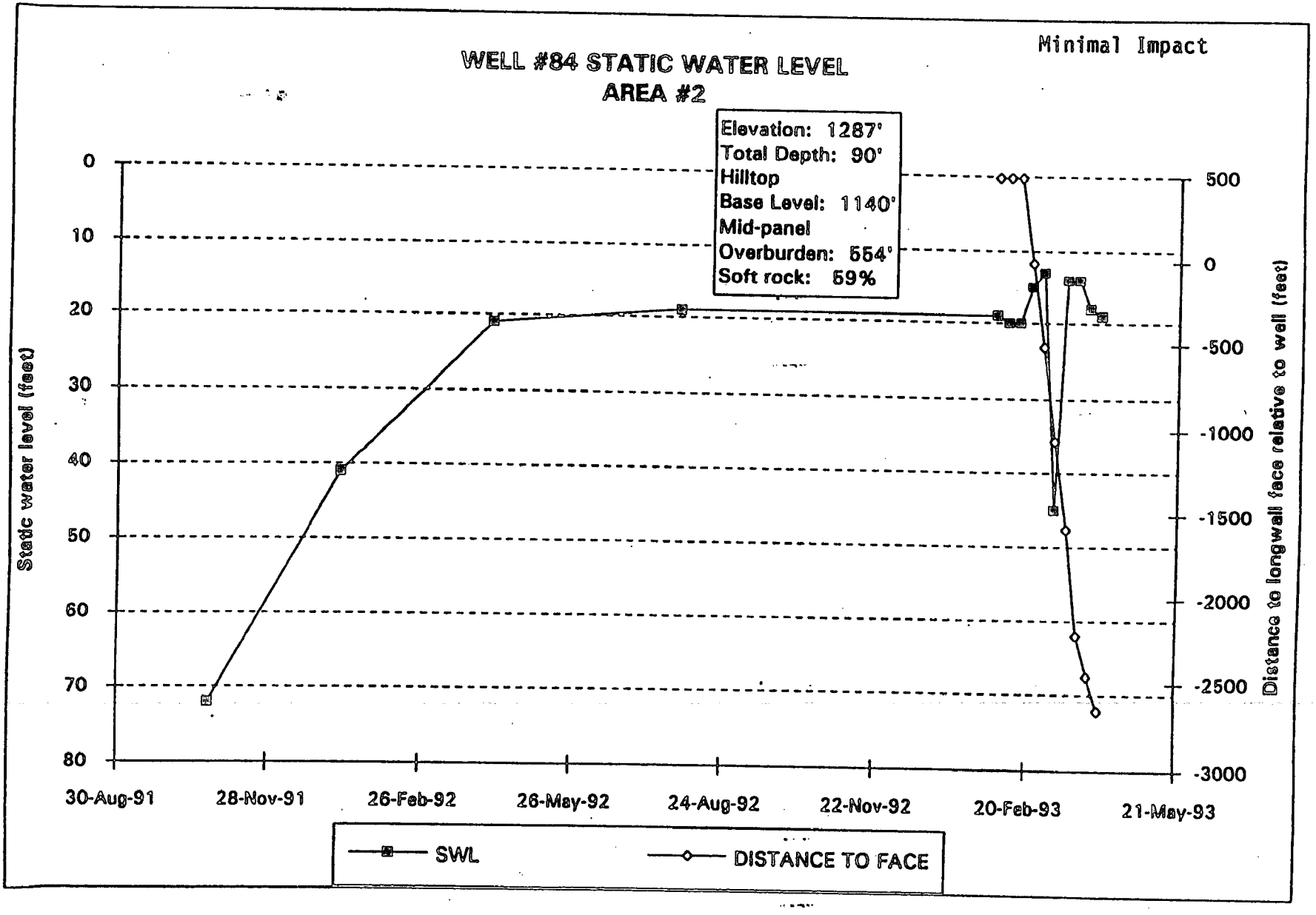
0360-1

Severe Impact



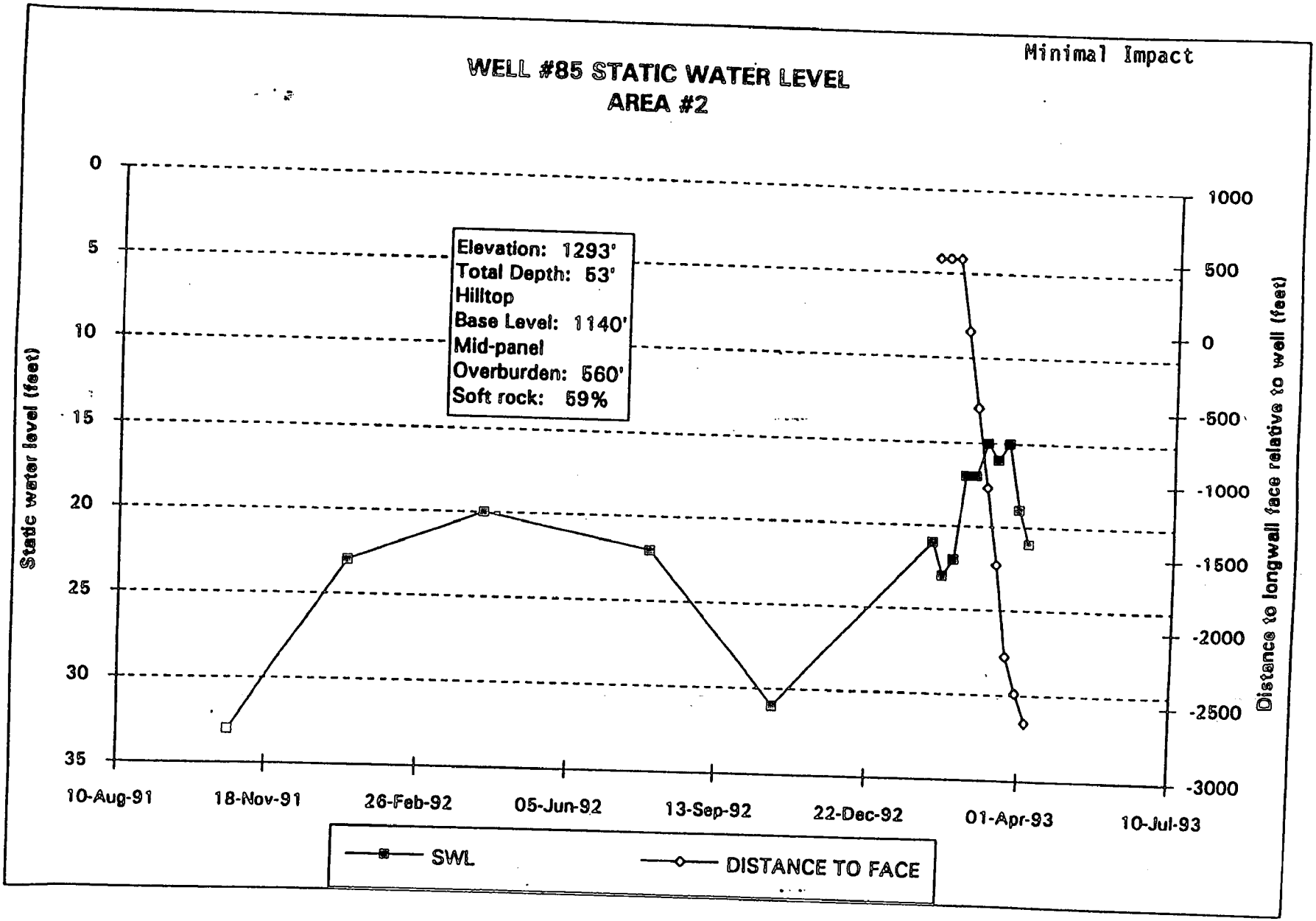
Minimal Impact



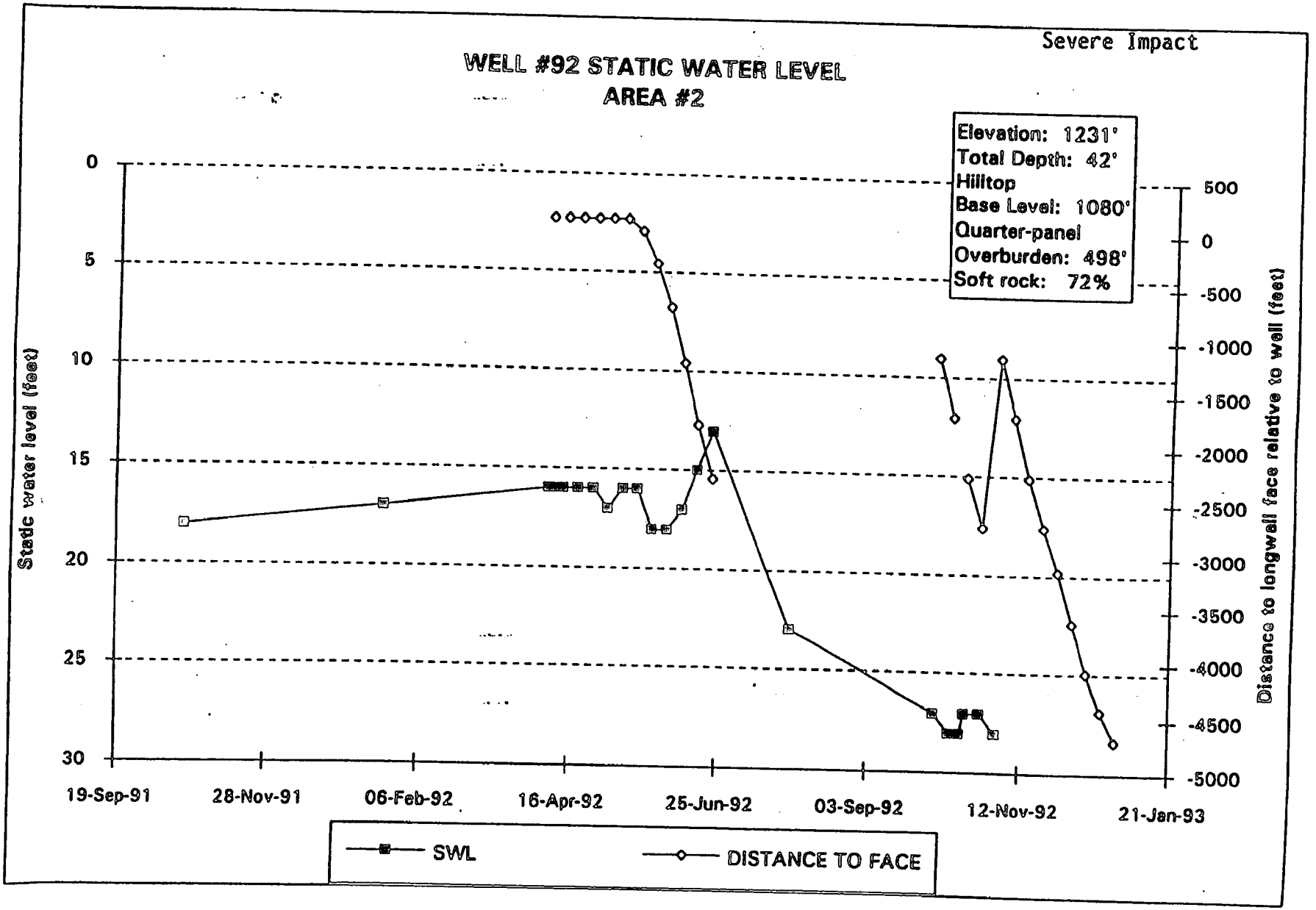


D360-1

TOVCC 11453

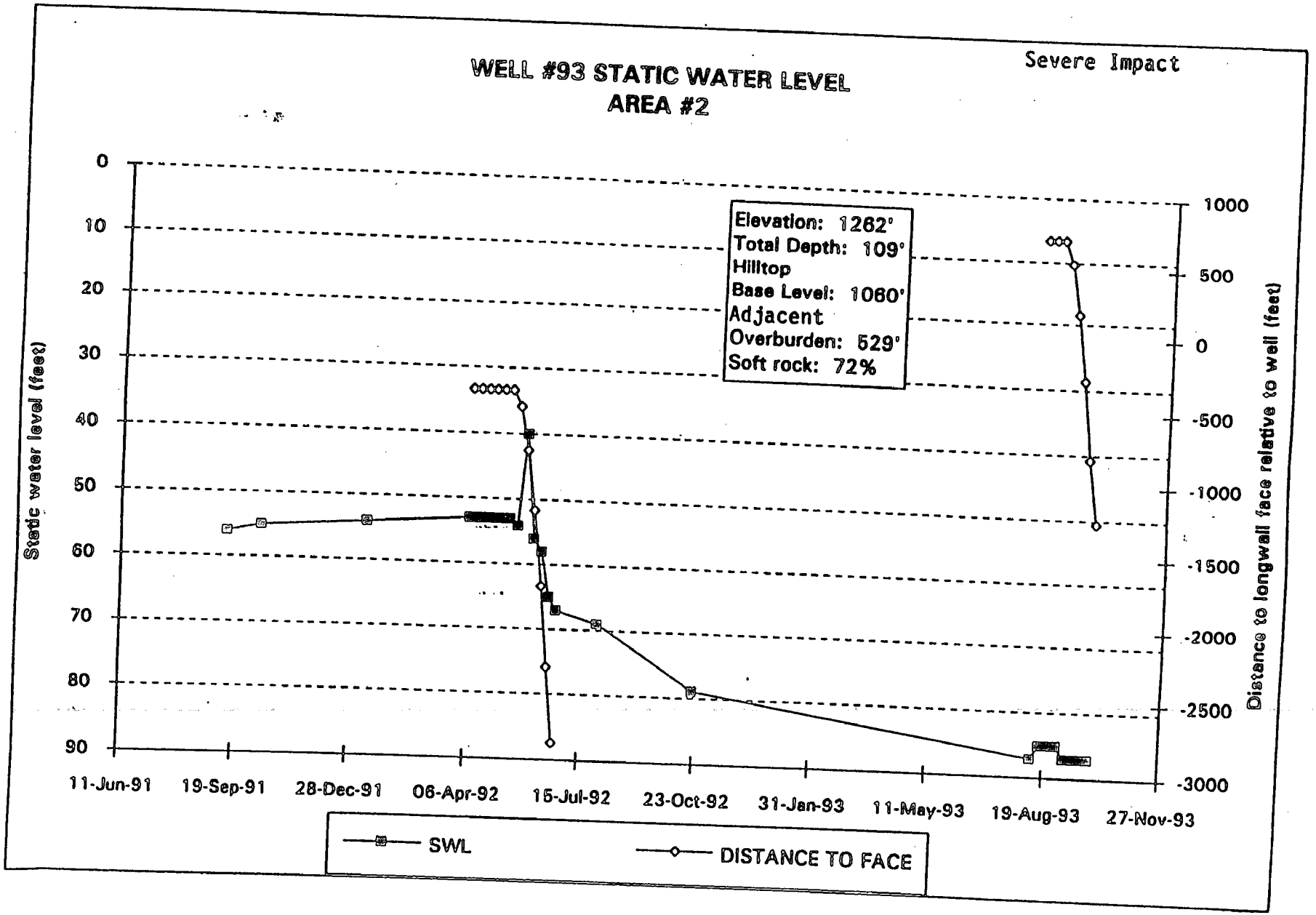

Minimal Impact
WELL #85 STATIC WATER LEVEL
AREA #2
Elevation: 1293'
Total Depth: 53'
Hilltop
Base Level: 1140'
Mid-panel
Overburden: 560'
Soft rock: 59%
Static water level (feet)
0
5
10
15
20
25
30
35
Distance to longwall face relative to well (feet)
1000
500
0
-500
-1000
-1500
-2000
-2500
-3000
10-Aug-91
18-Nov-91
26-Feb-92
05-Jun-92
13-Sep-92
22-Dec-92
01-Apr-93
10-Jul-93
SWL
DISTANCE TO FACE

Severe Impact



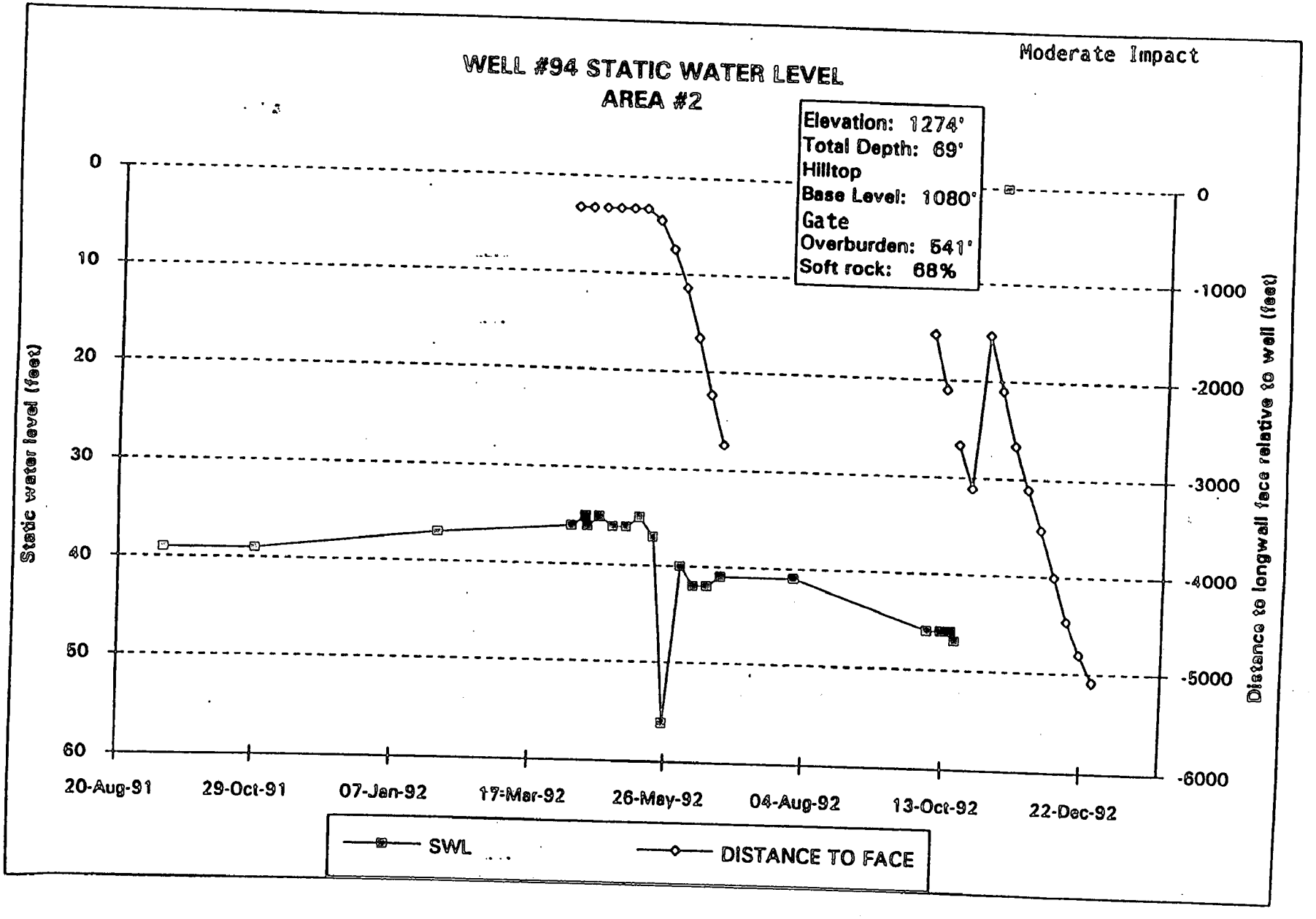
0360-11

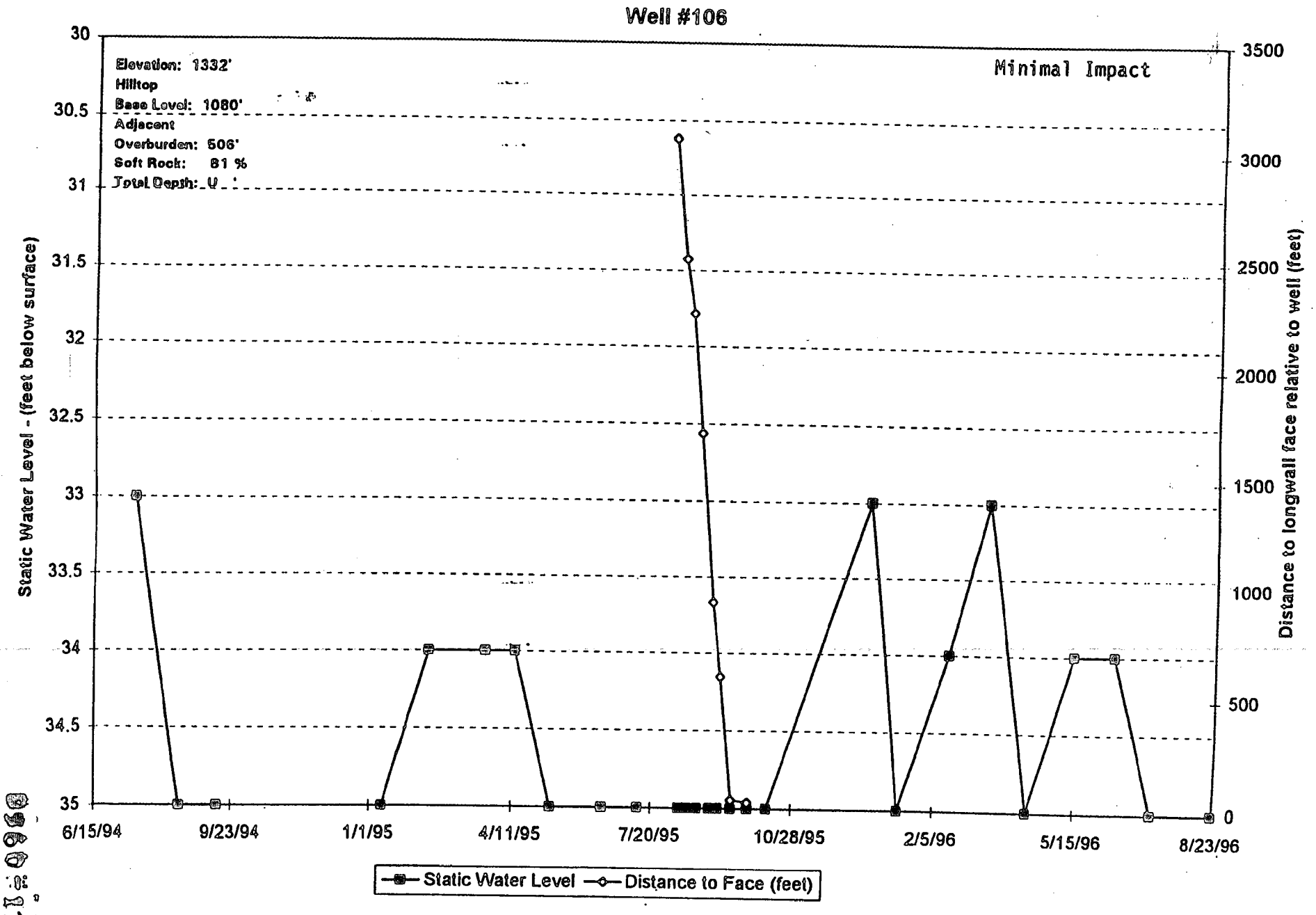
TOVCC 11455



0360-18

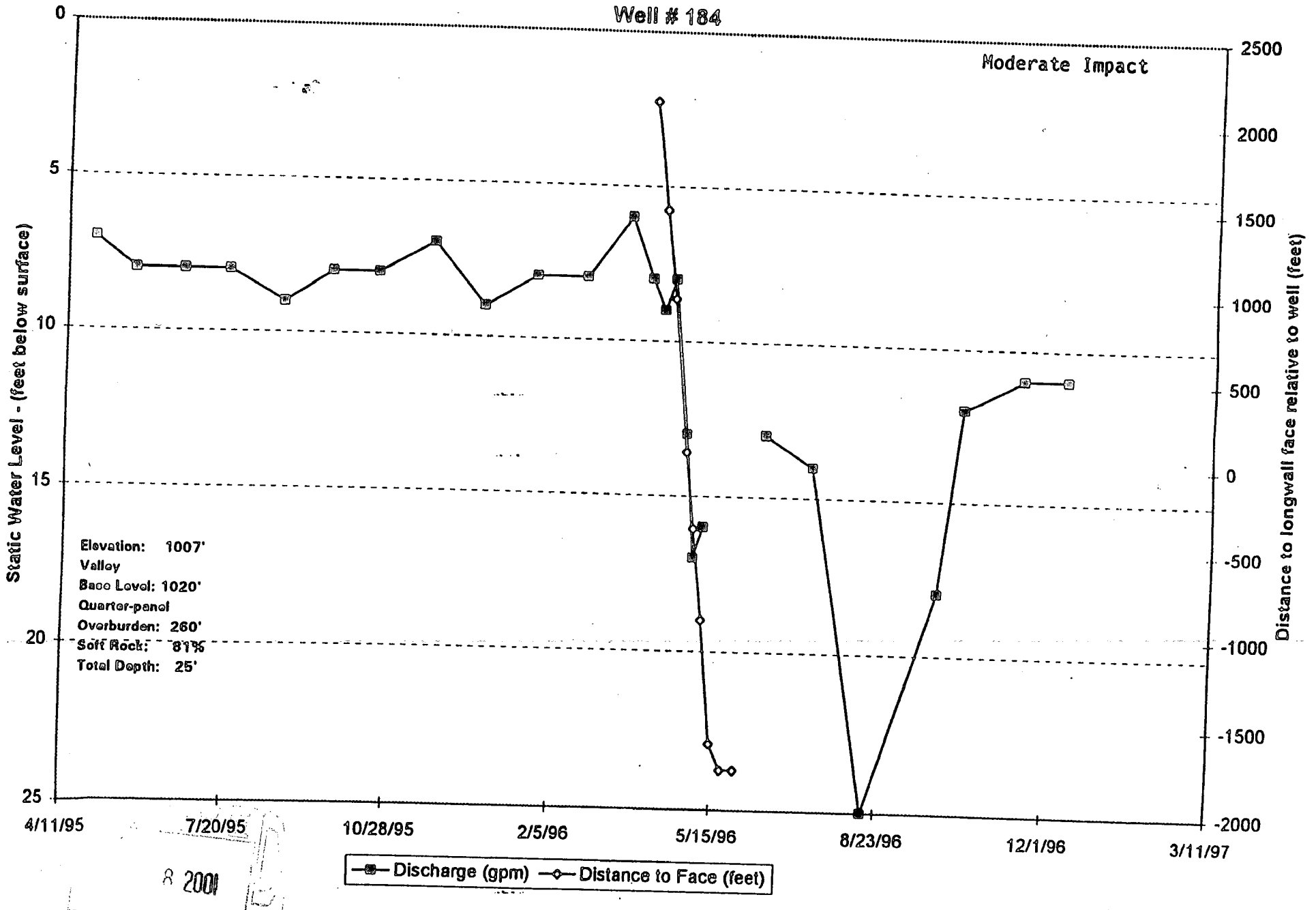
TOVCC 11456


WELL #94 STATIC WATER LEVEL
AREA #2
Moderate Impact
Elevation: 1274'
Total Depth: 69'
Hilltop
Base Level: 1080'
Gate
Overburden: 541'
Soft rock: 68%
Static water level (feet)
0
10
20
30
40
50
60
Distance to longwall face relative to well (feet)
0
-1000
-2000
-3000
-4000
-5000
-6000
20-Aug-91
29-Oct-91
07-Jan-92
17-Mar-92
26-May-92
04-Aug-92
13-Oct-92
22-Dec-92
SWL
DISTANCE TO FACE



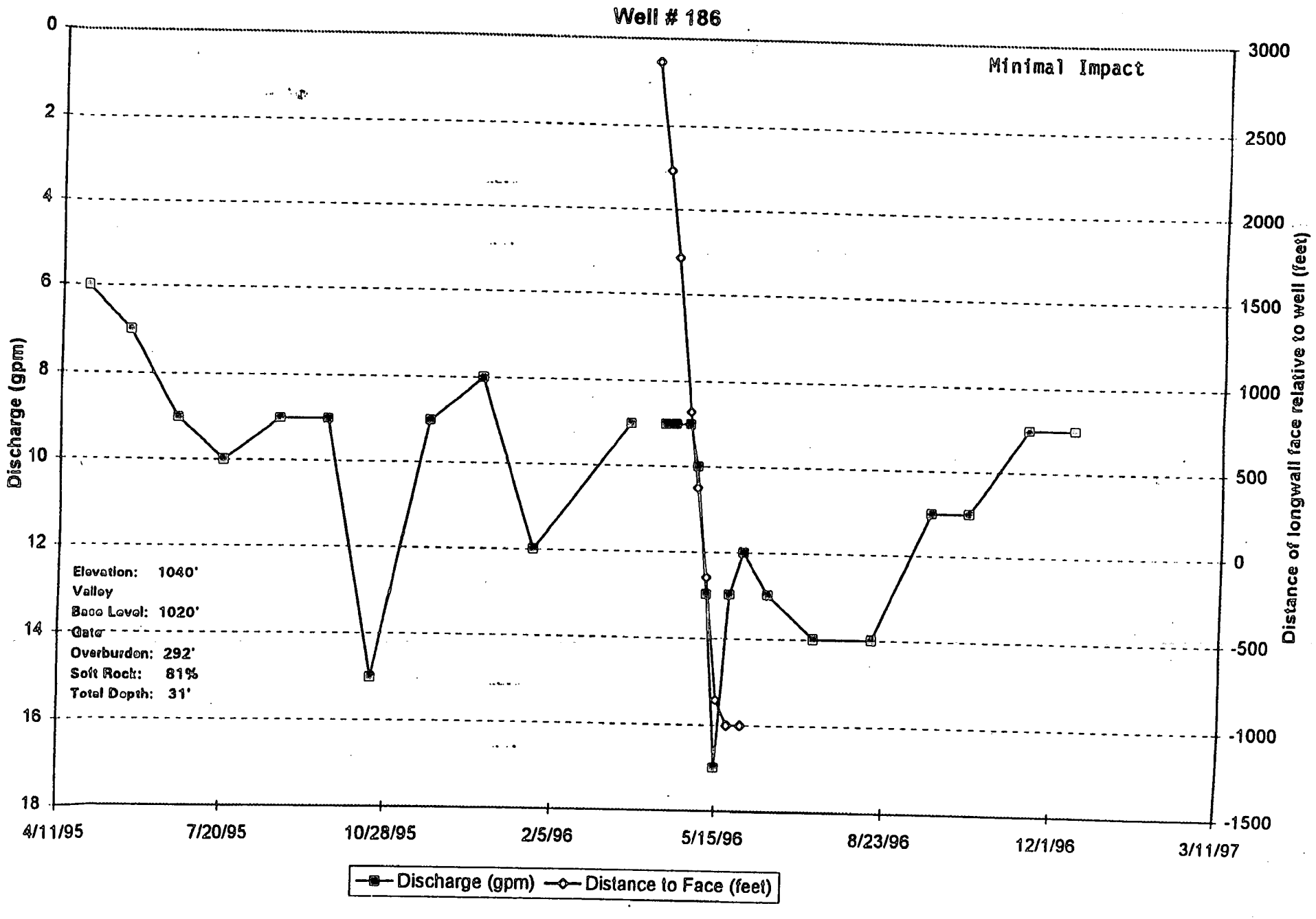
Prepared by: Moody and Assoc. Inc. 4/13/97

TOVCC 11458



Prepared by: Moody and Assoc. Inc. 4/13/97

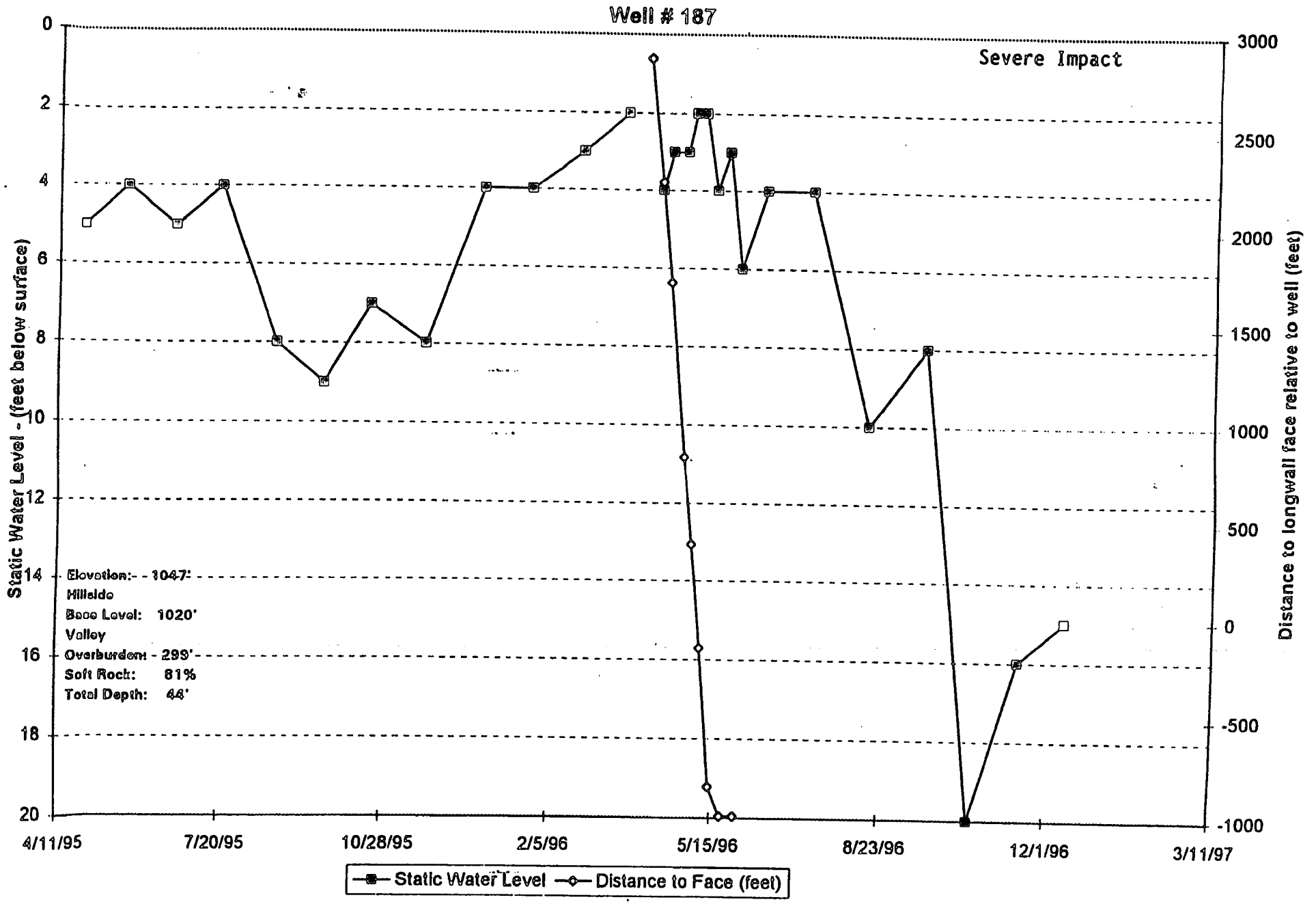
8 2001
DIVISION OF MINERAL



Prepared by: Moody and Assoc., Inc. 4/13/97

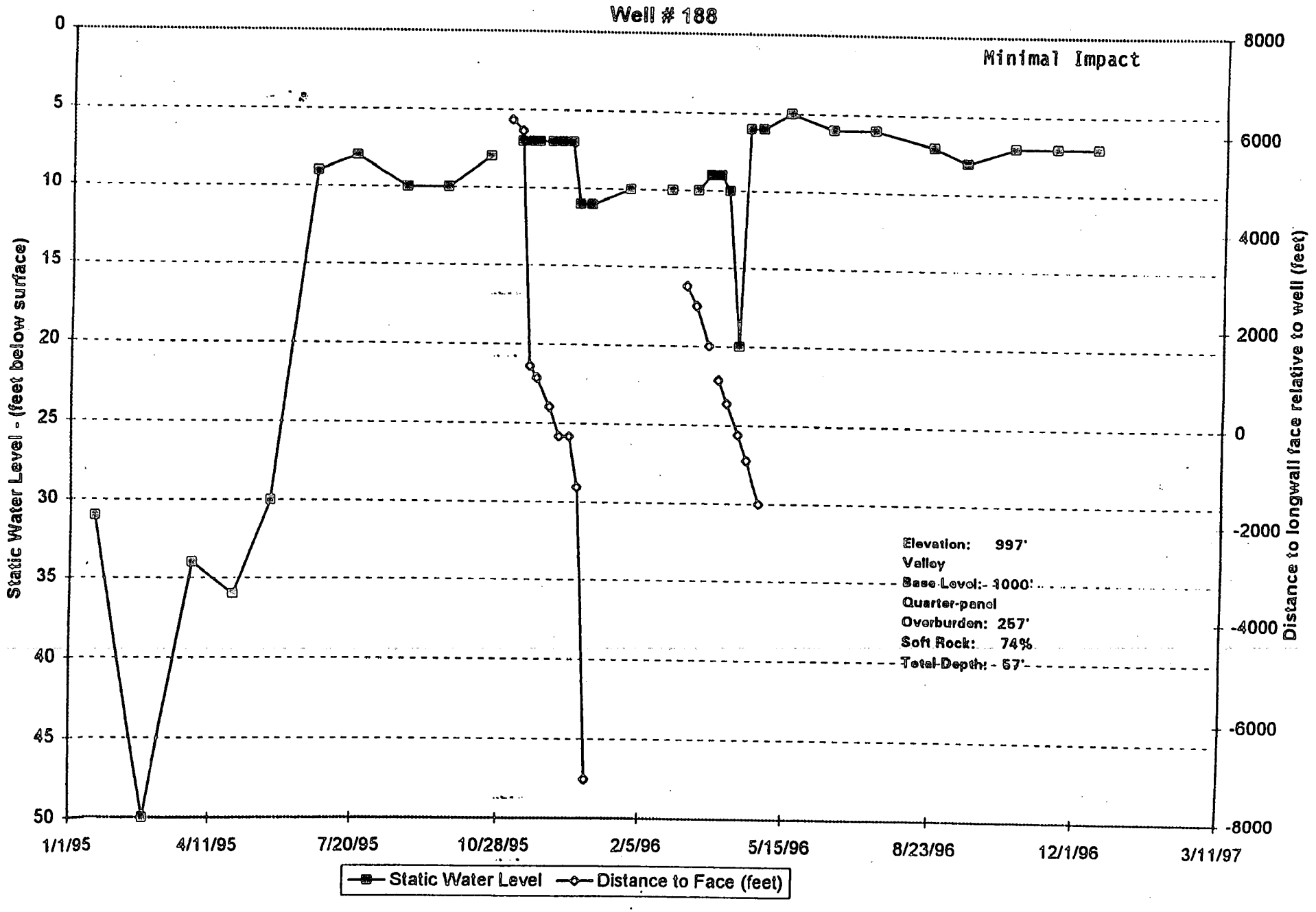
TOVCC 11460

D360-11



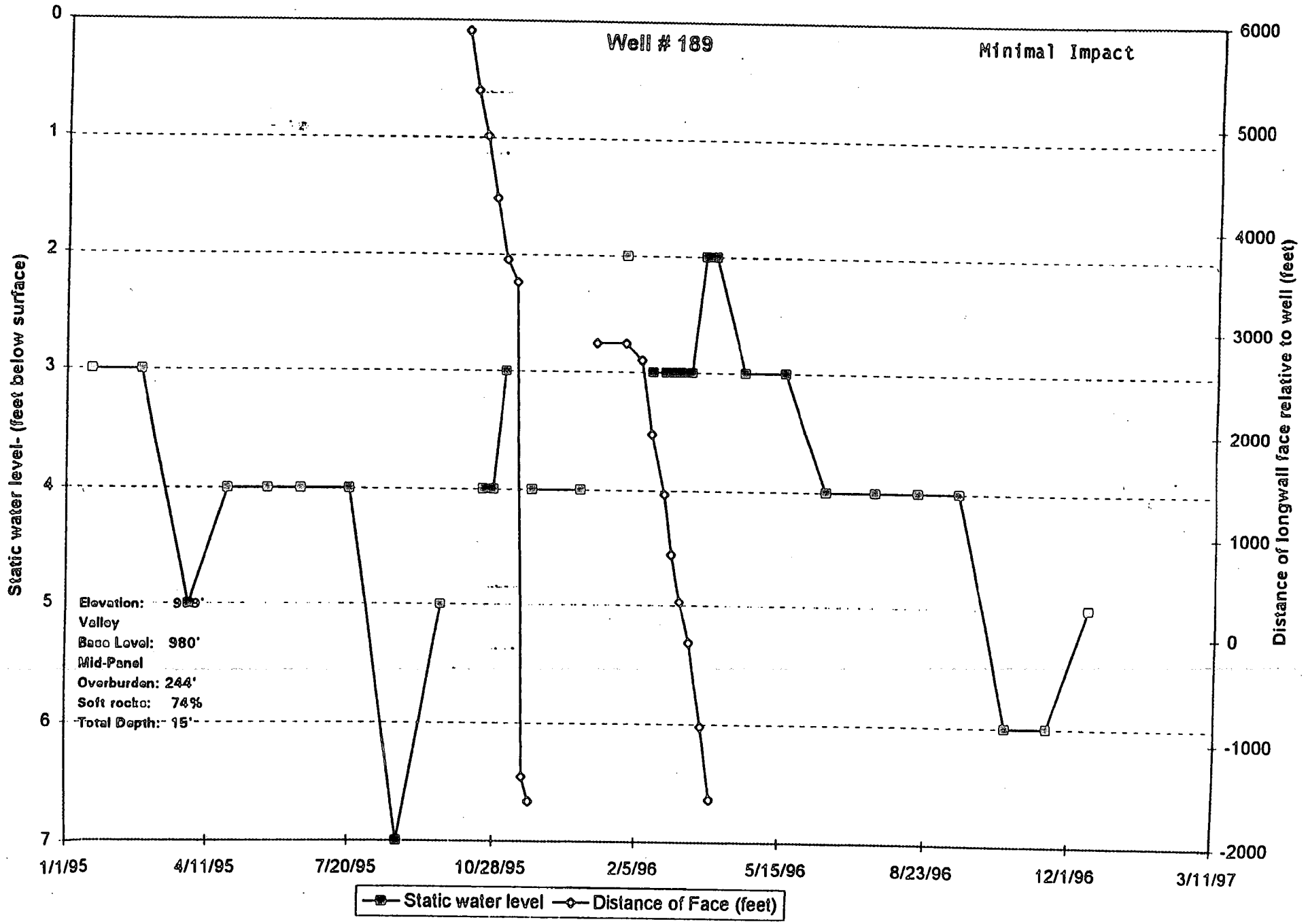
Prepared by: Woody and Assoc. Inc. 4/13/97

TOVCC 11461



Prepared by: Moody and Assoc., Inc. 4/13/97

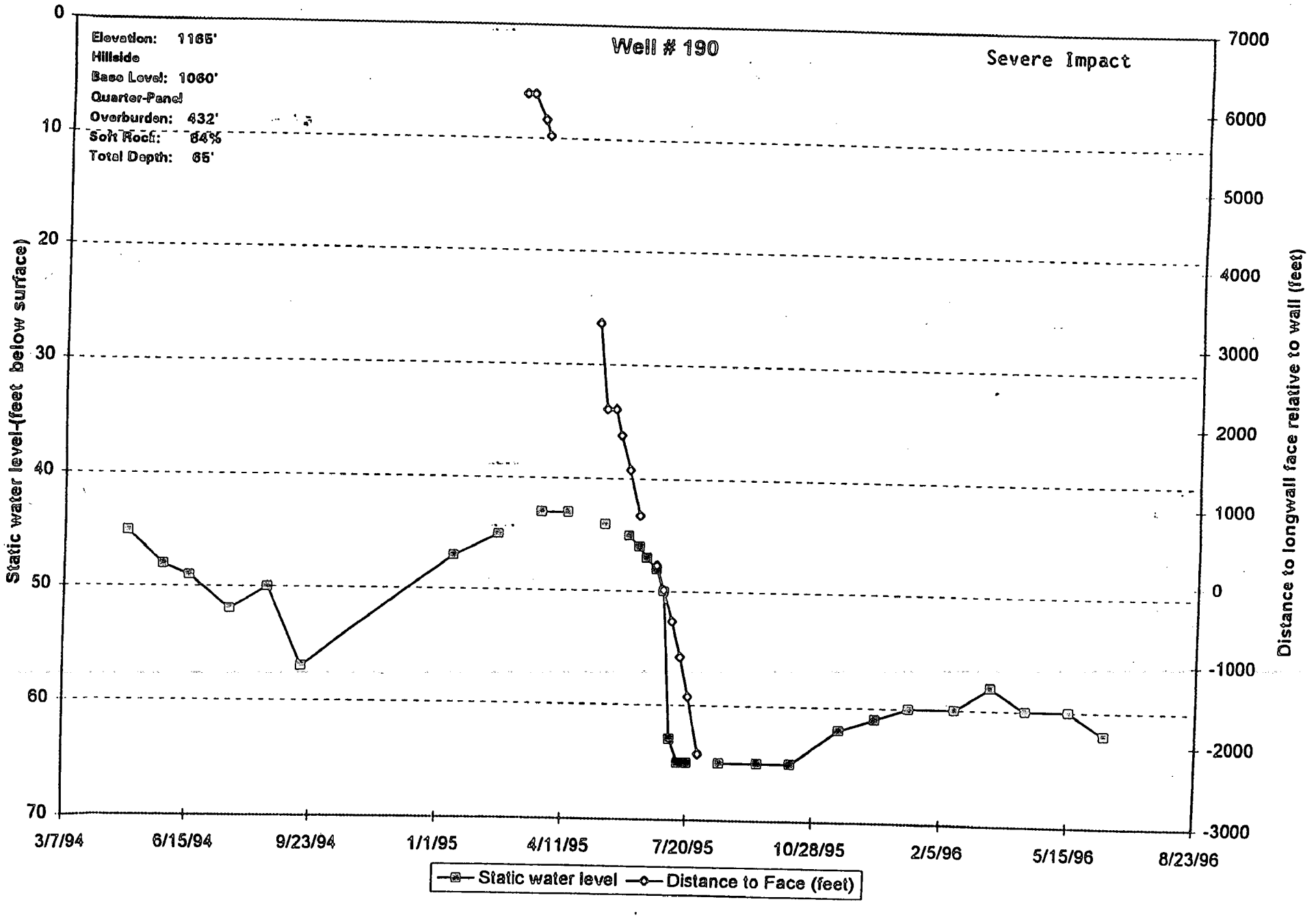
TOVCC 11462



Prepared by: Moody and Assoc., Inc.4/13/97

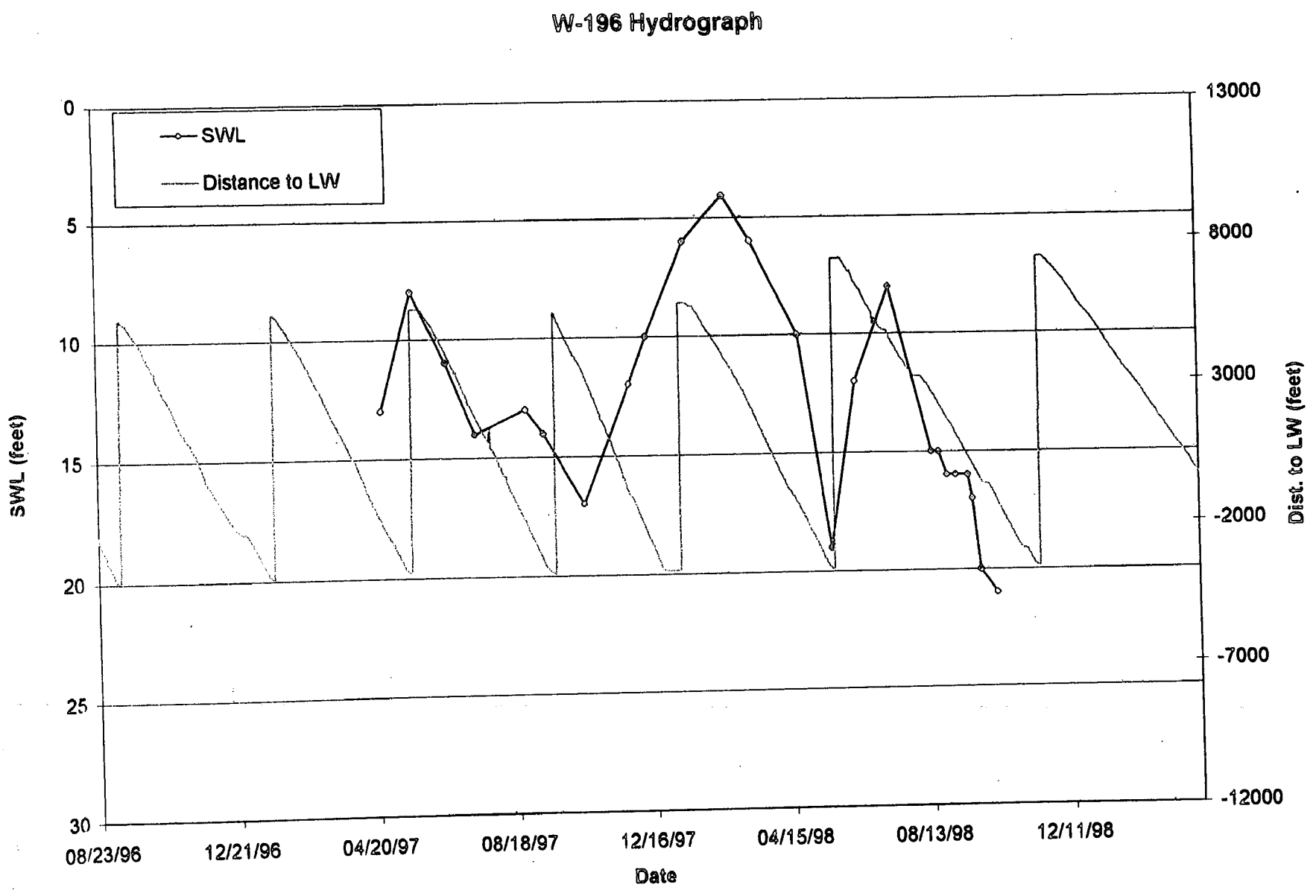
D360 [illegible]

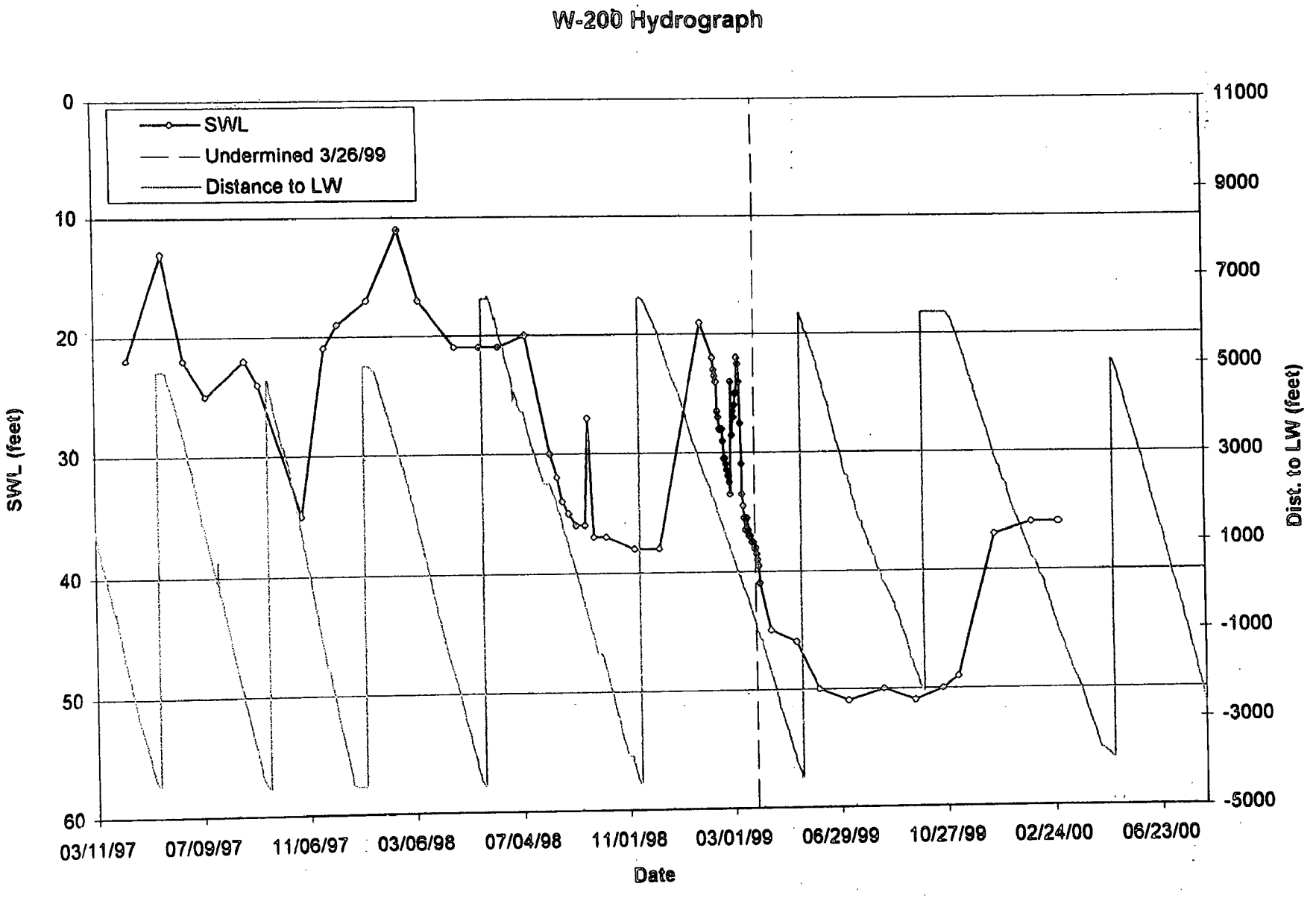
TOVCC 11463

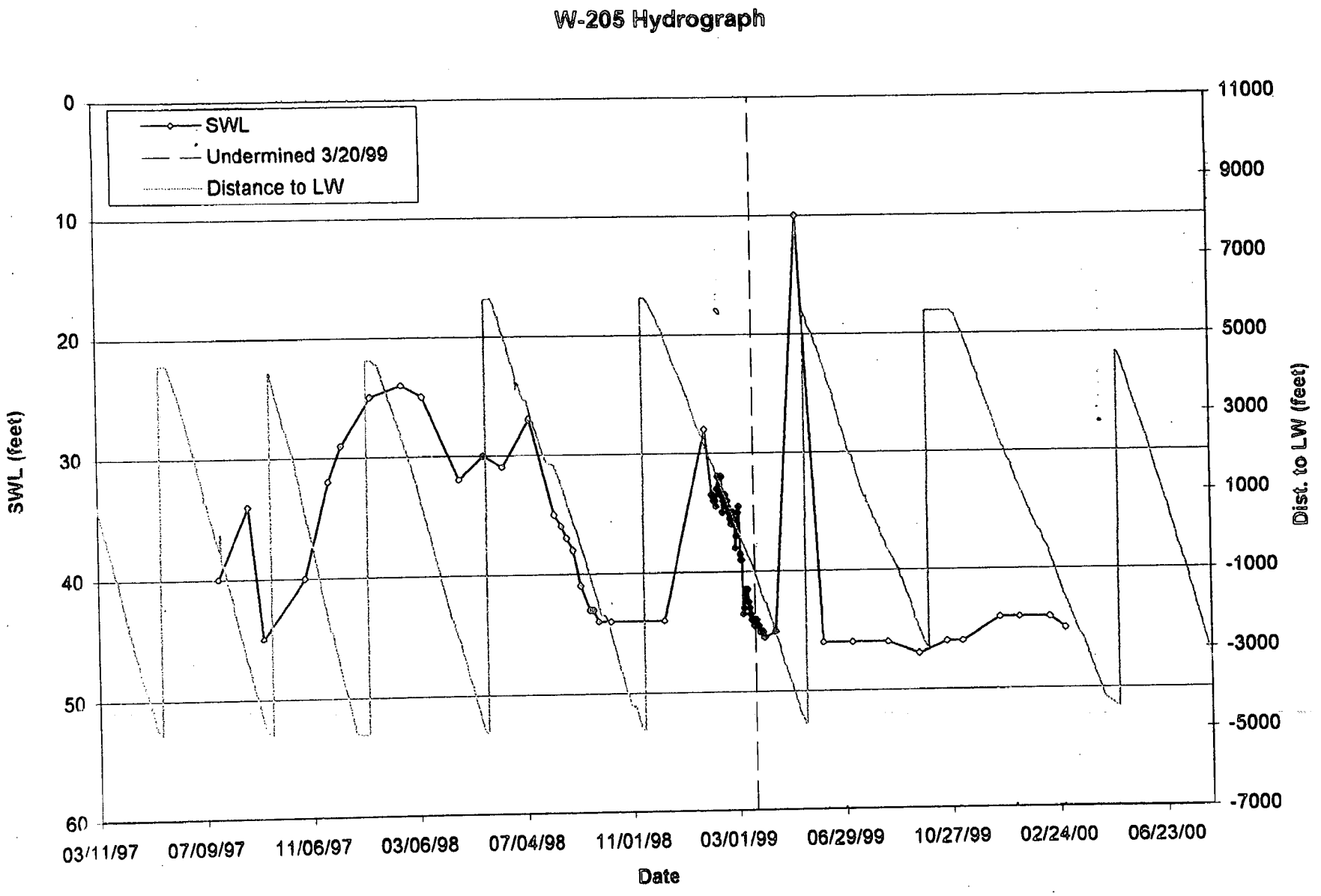


Prepared by: Moody and Assoc. Inc. 4/13/97

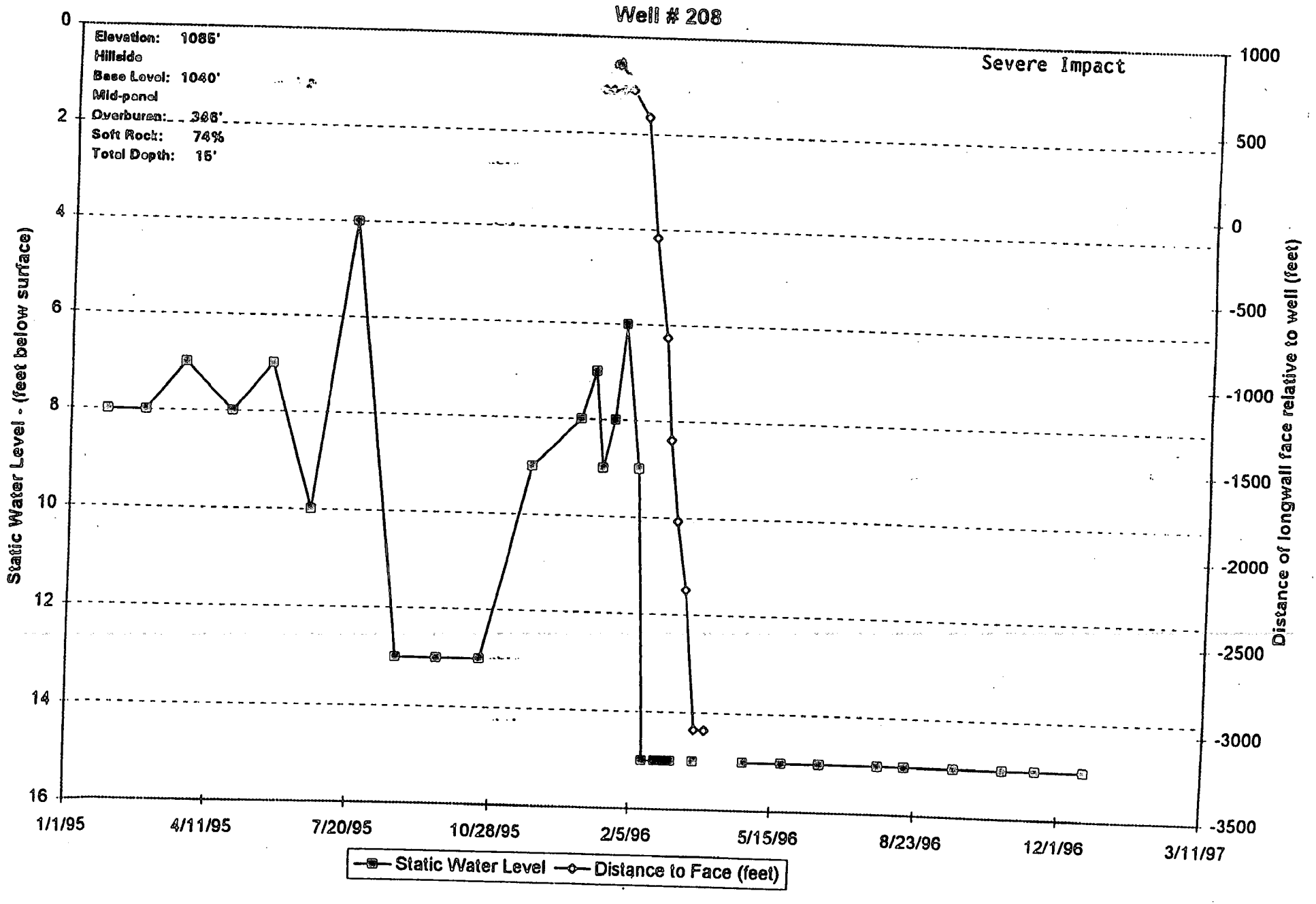
TOVCC 11464


W-196 Hydrograph
SWL
Distance to LW
SWL (feet)
0
5
10
15
20
25
30
Dist. to LW (feet)
13000
8000
3000
-2000
-7000
-12000
08/23/96
12/21/96
04/20/97
08/18/97
12/16/97
04/15/98
08/13/98
12/11/98
Date


W-200 Hydrograph
SWL
Undermined 3/26/99
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
11000
9000
7000
5000
3000
1000
-1000
-3000
-5000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00


W-205 Hydrograph
SWL
Undermined 3/20/99
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
11000
9000
7000
5000
3000
1000
-1000
-3000
-5000
-7000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00

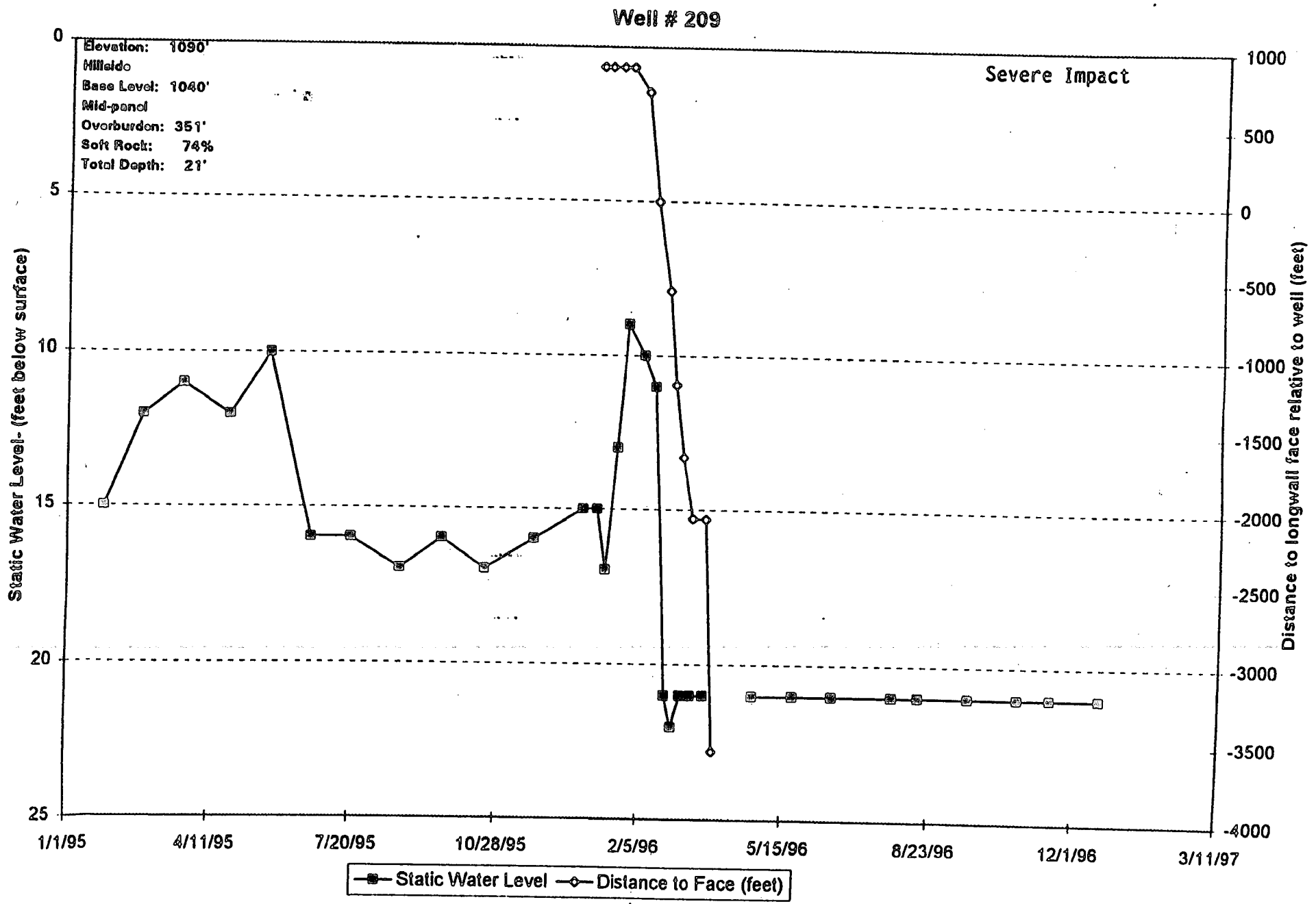
TOVCC 11467



Prepared by: Moody and Assoc. Inc. 4/13/97

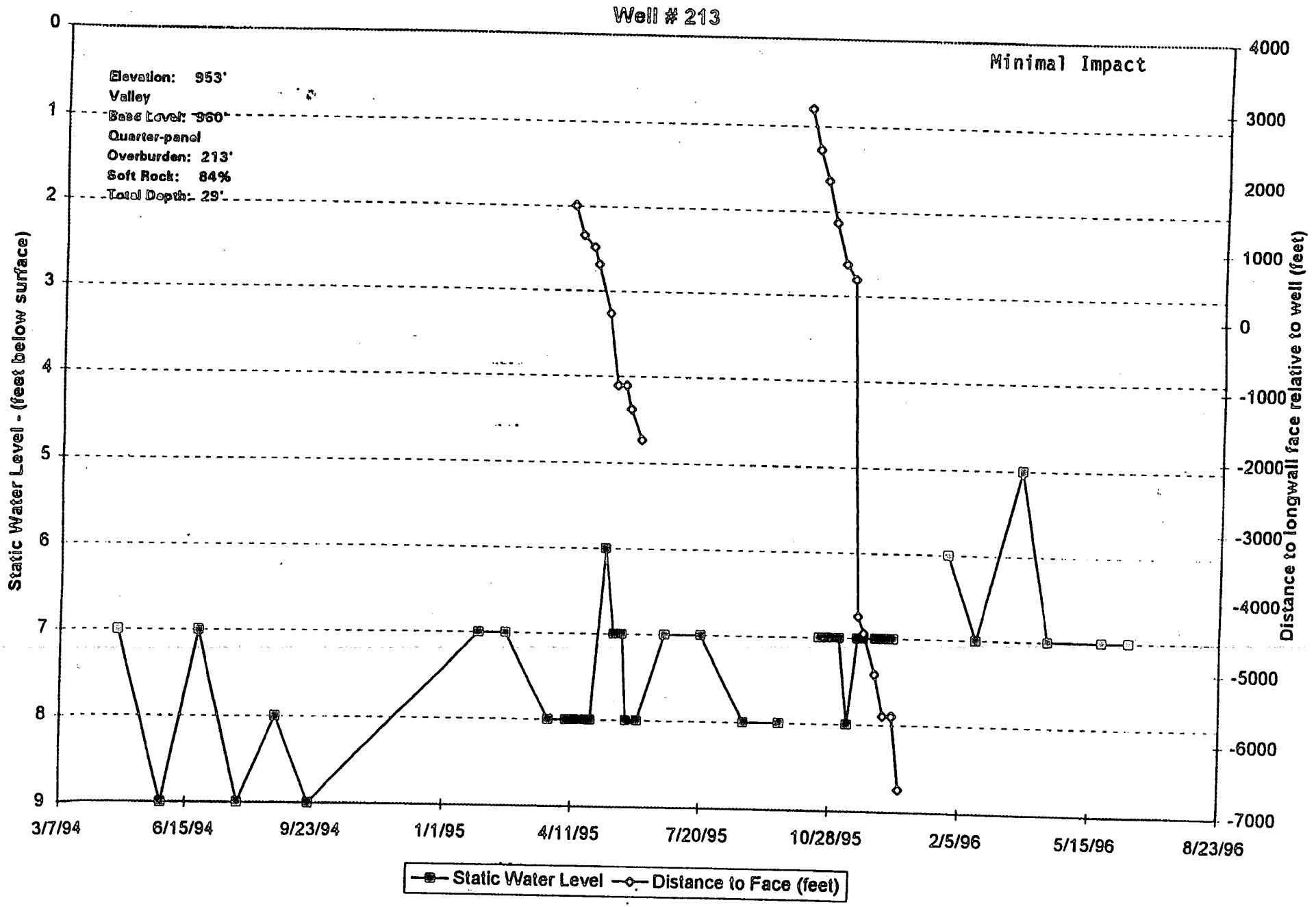
TOVCC 11468

0360-18



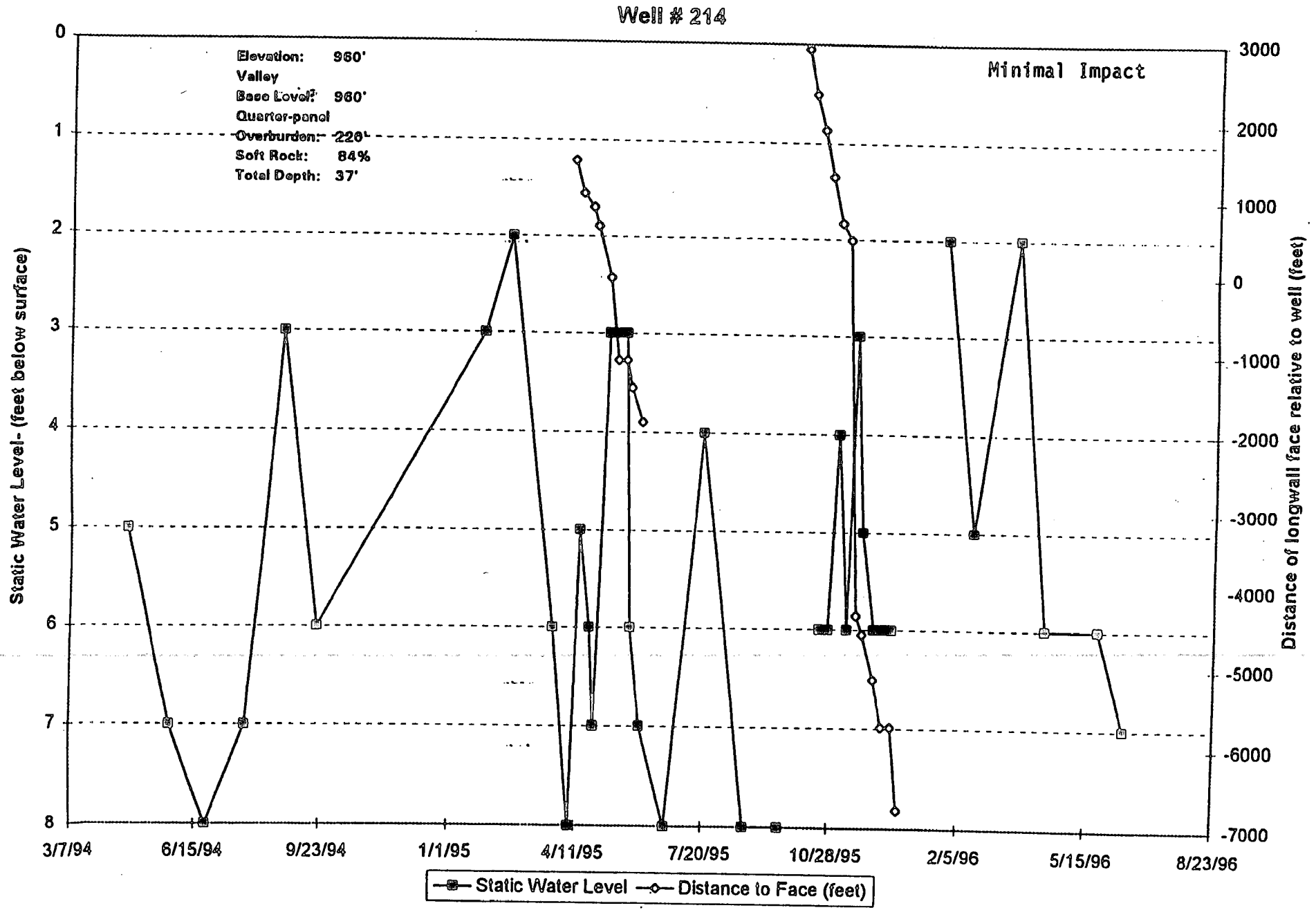
Prepared by: Moody and Assoc. Inc. 4/13/97

TOVCC 11469



Prepared by: Moody and Assoc., Inc. 4/13/97

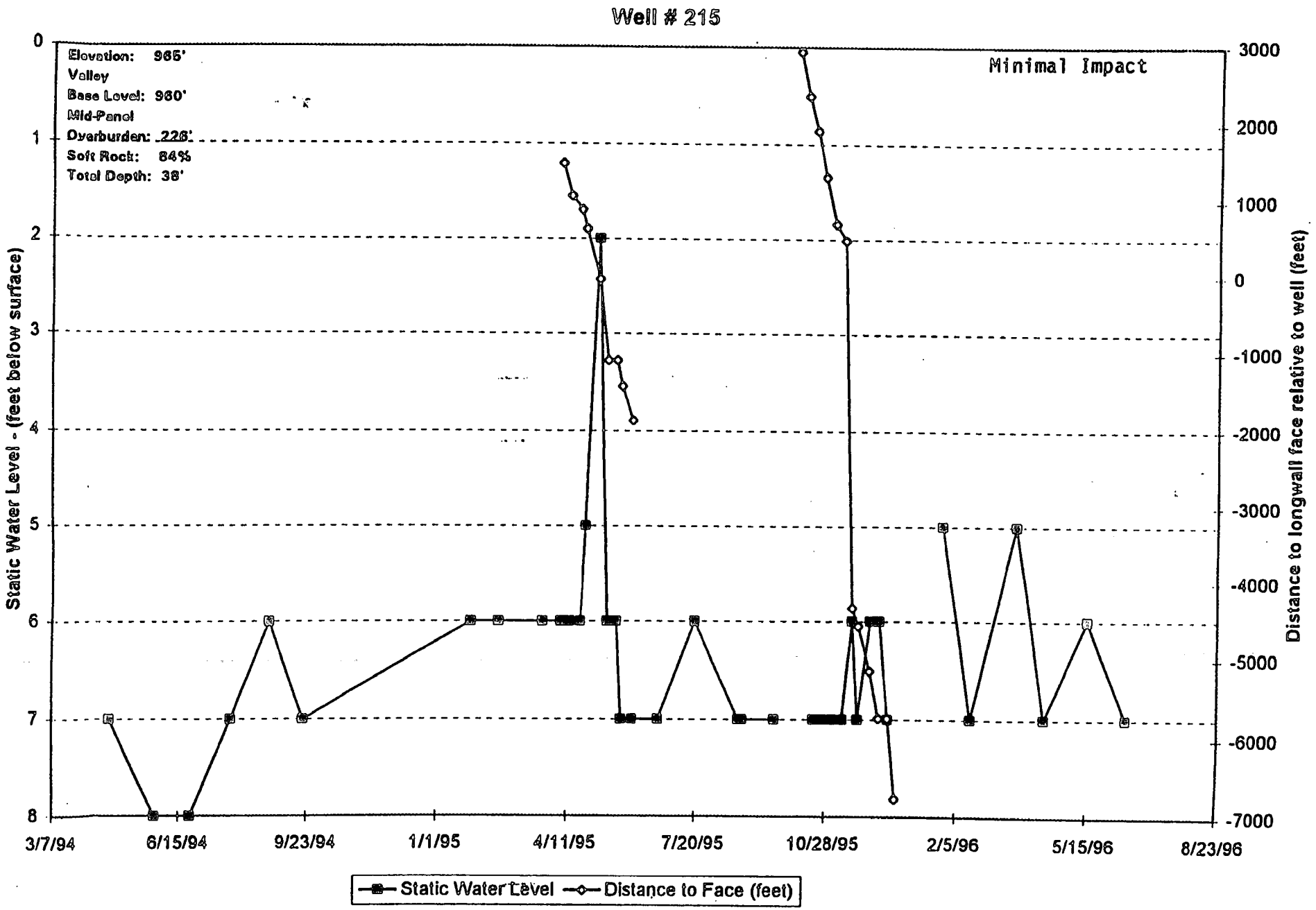
TOVCC 11470



Prepared by: Moody and Assoc. Inc. 4/13/97

D360-12

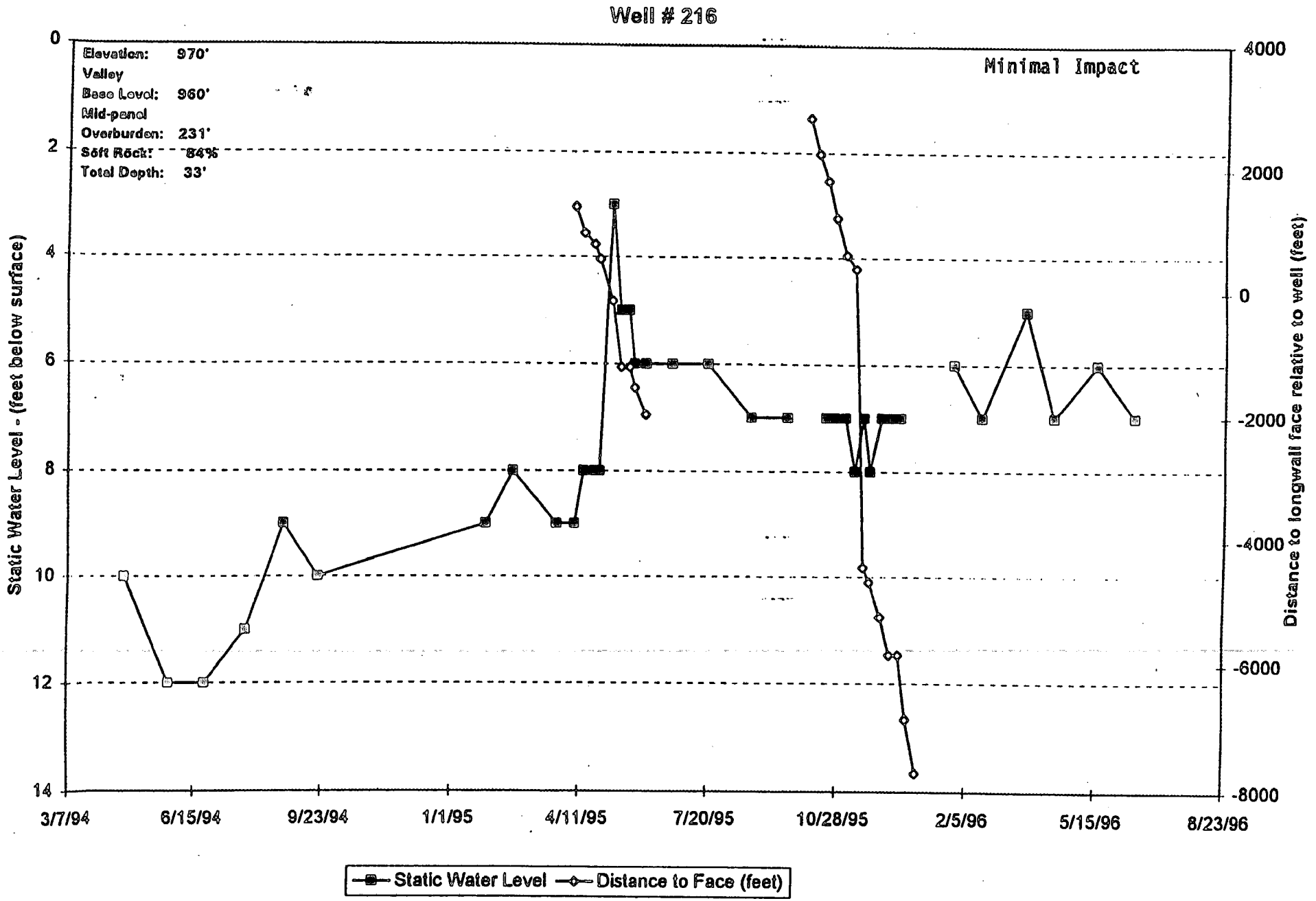
TOVCC 11471



Prepared by: Moody and Assoc., Inc. 4/13/97

U360-12

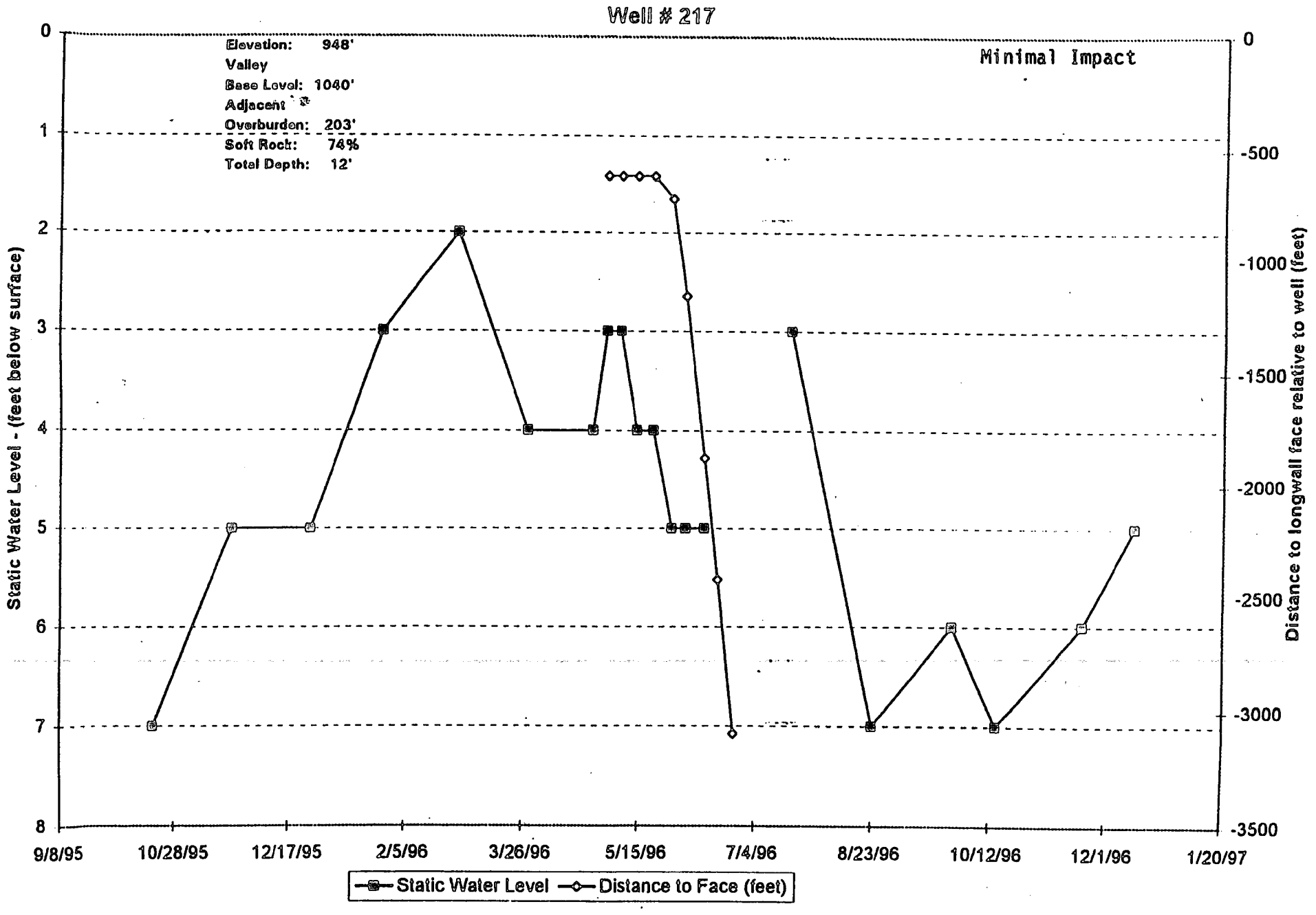
TOVCC 11472



Prepared by: Moody and Assoc. Inc. 4/13/97

TOVCC 11473

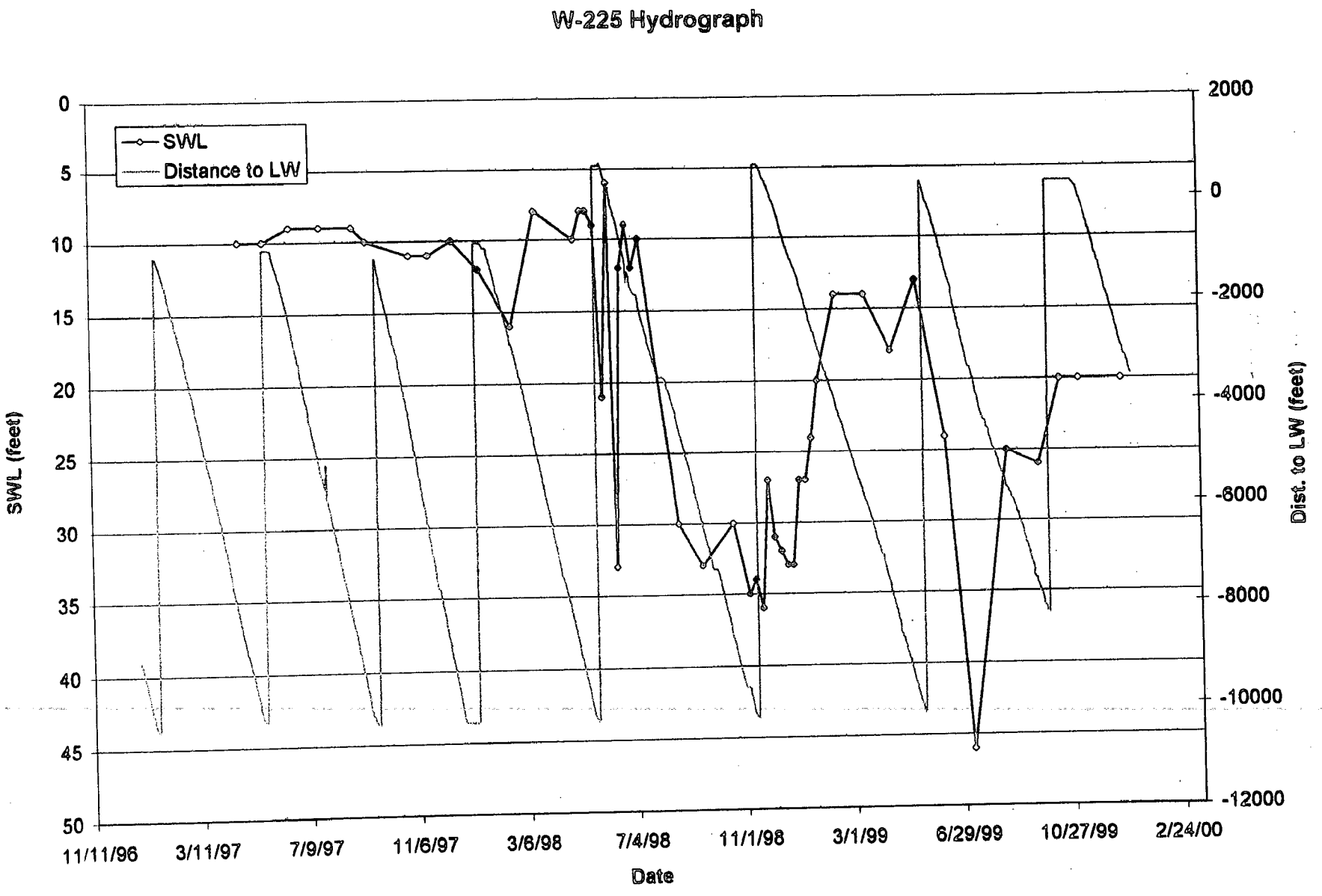
0360-12

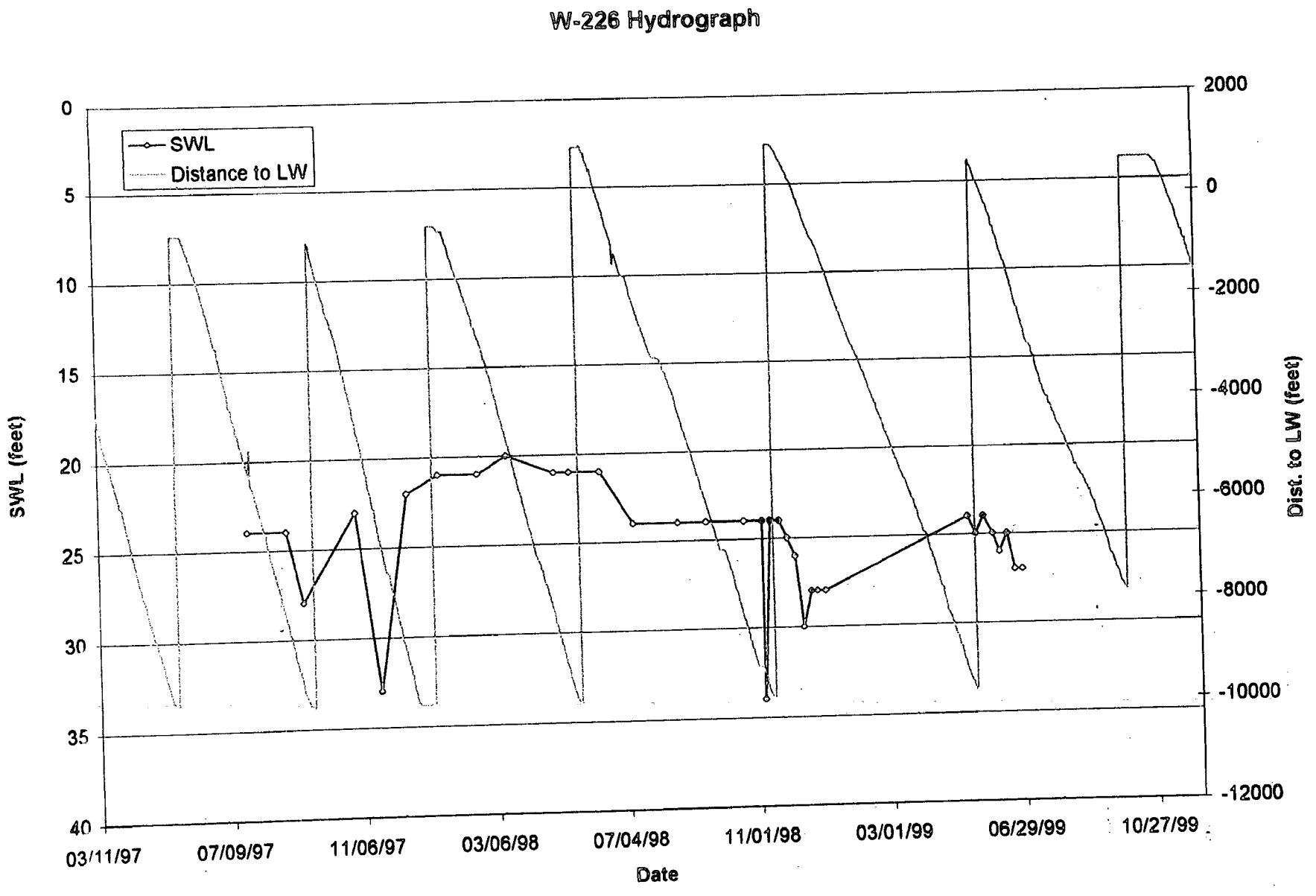


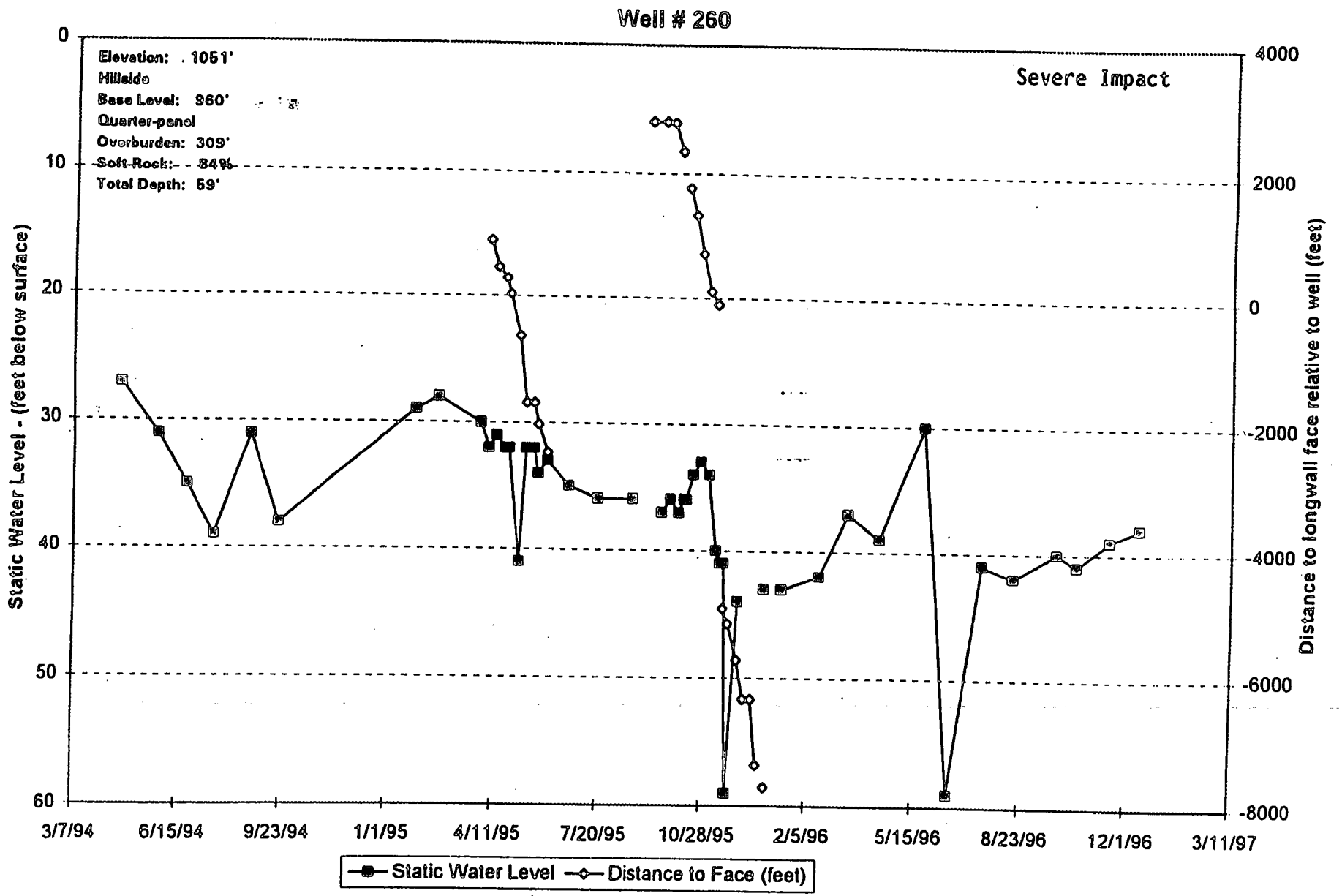
Prepared by: Moody and Assoc. Inc. 4/13/97

TOVCC 11474

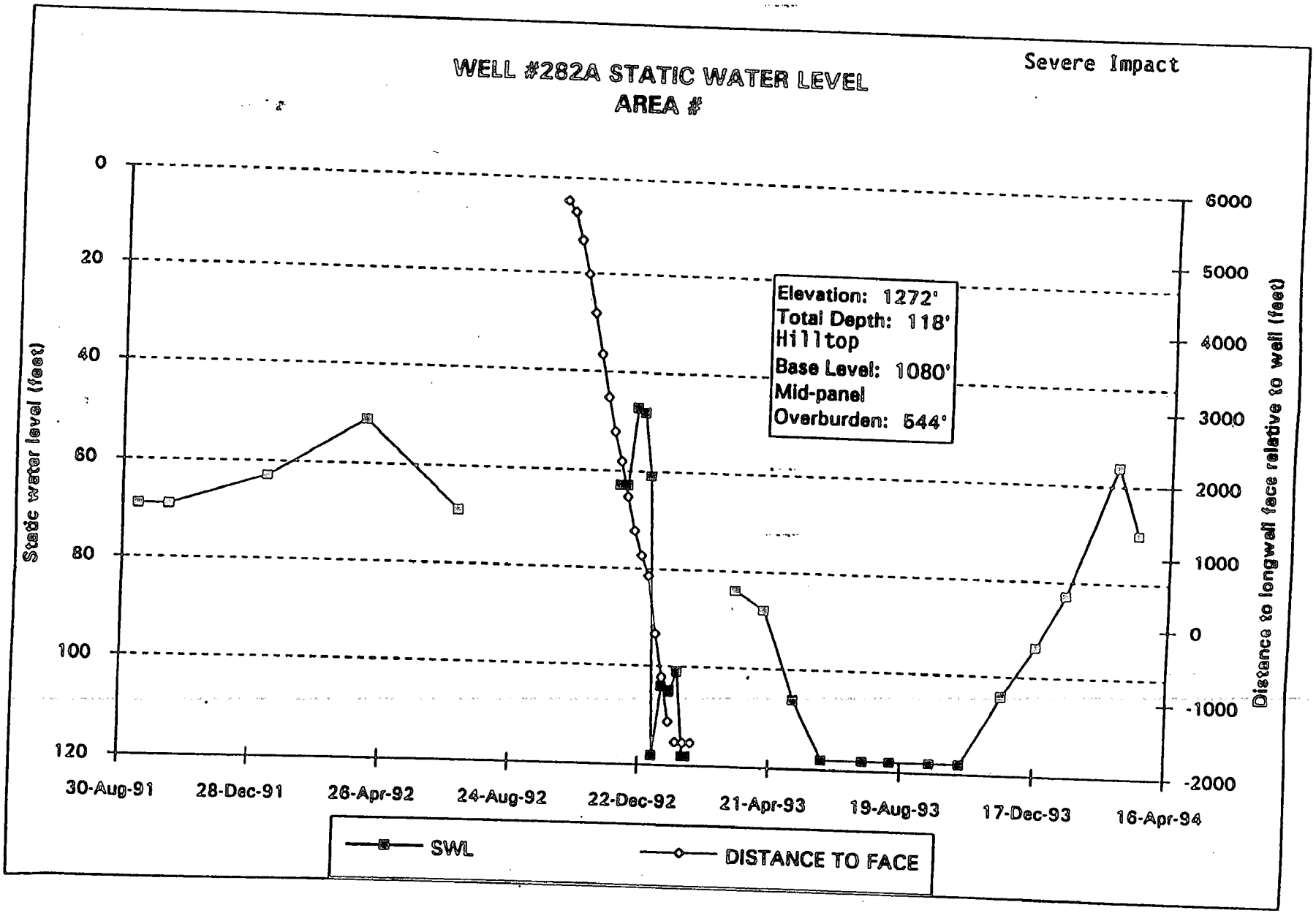
6300-12


W-225 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
5
10
15
20
25
30
35
40
45
50
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
11/11/96
3/11/97
7/9/97
11/6/97
3/6/98
7/4/98
11/1/98
3/1/99
6/29/99
10/27/99
2/24/00

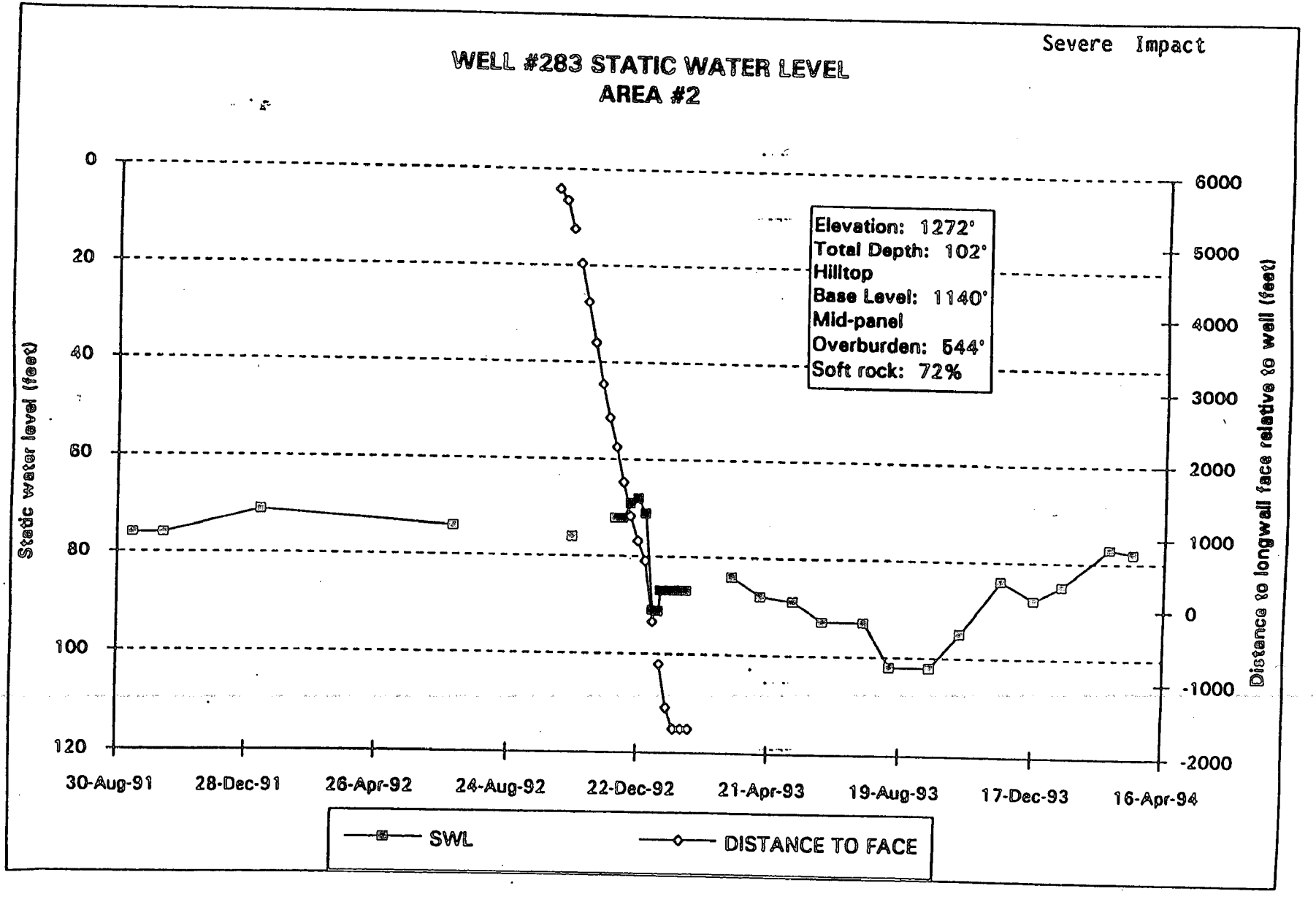

W-226 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
5
10
15
20
25
30
35
40
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99

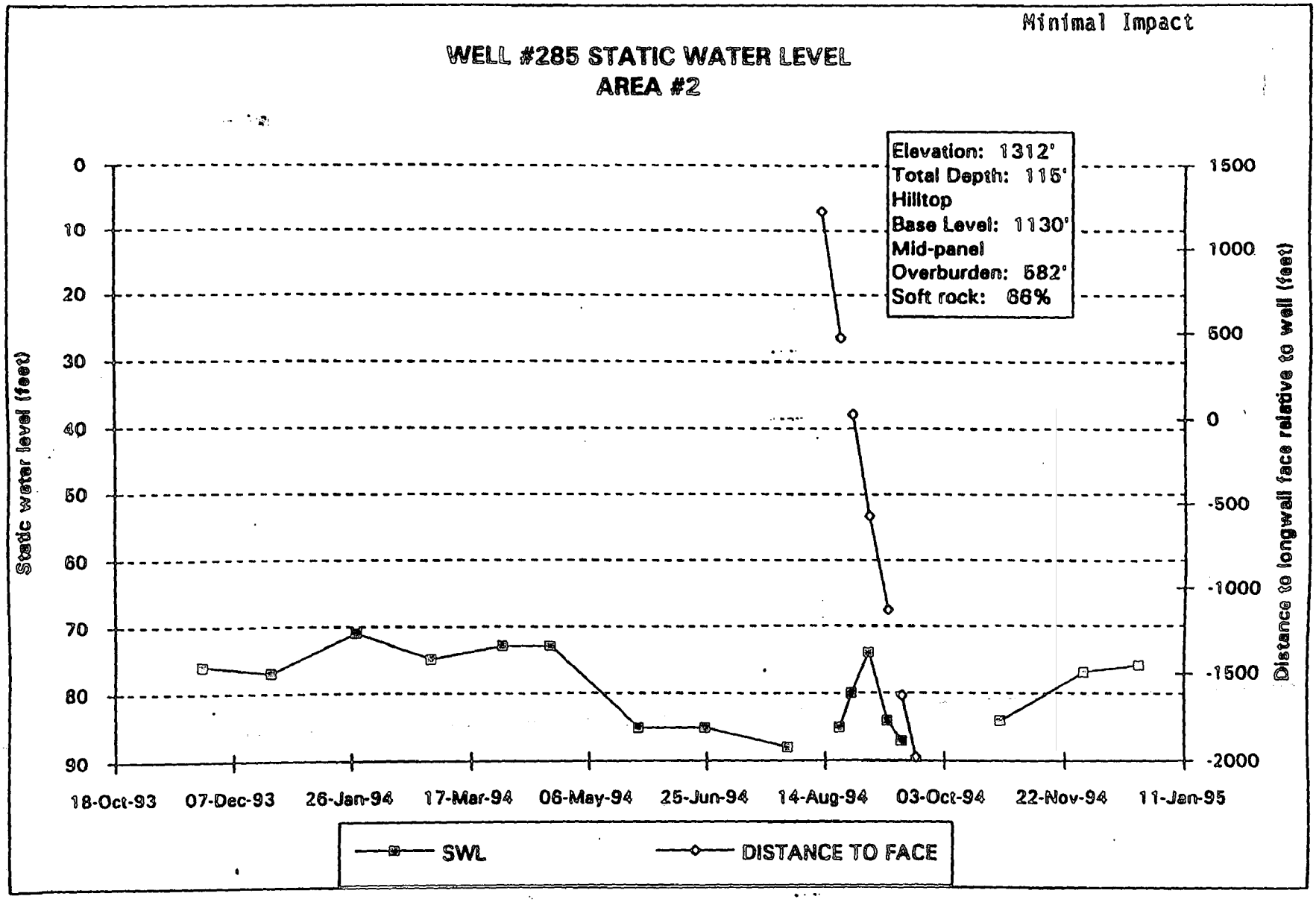


Prepared by: Moody and Assoc., Inc. 4/13/97

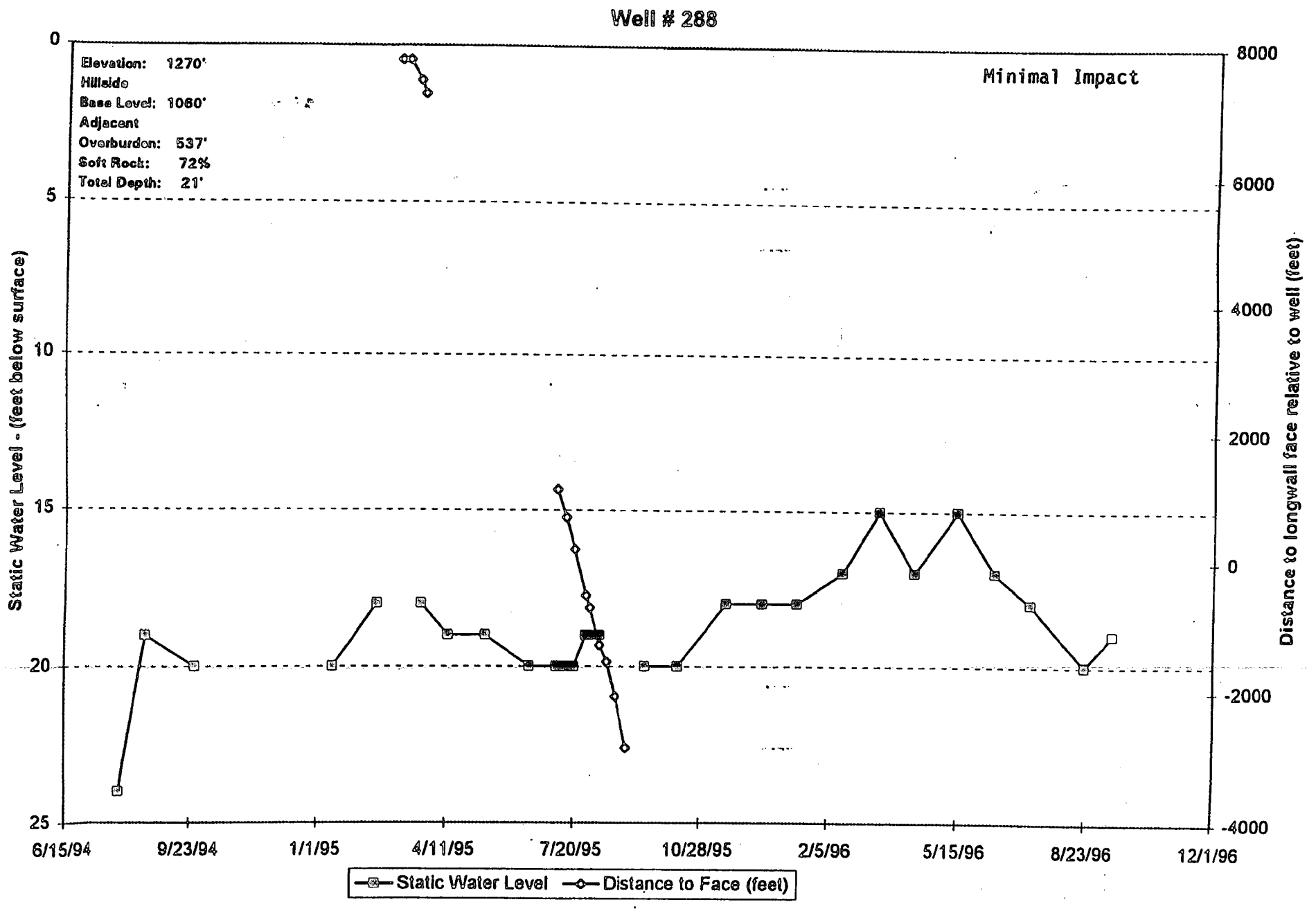

WELL #282A STATIC WATER LEVEL
AREA #
Severe Impact
Elevation: 1272'
Total Depth: 118'
Hilltop
Base Level: 1080'
Mid-panel
Overburden: 544'
Static water level (feet)
0
20
40
60
80
100
120
Distance to longwall face relative to well (feet)
6000
5000
4000
3000
2000
1000
0
-1000
-2000
30-Aug-91
28-Dec-91
26-Apr-92
24-Aug-92
22-Dec-92
21-Apr-93
19-Aug-93
17-Dec-93
16-Apr-94
SWL
DISTANCE TO FACE

Severe Impact



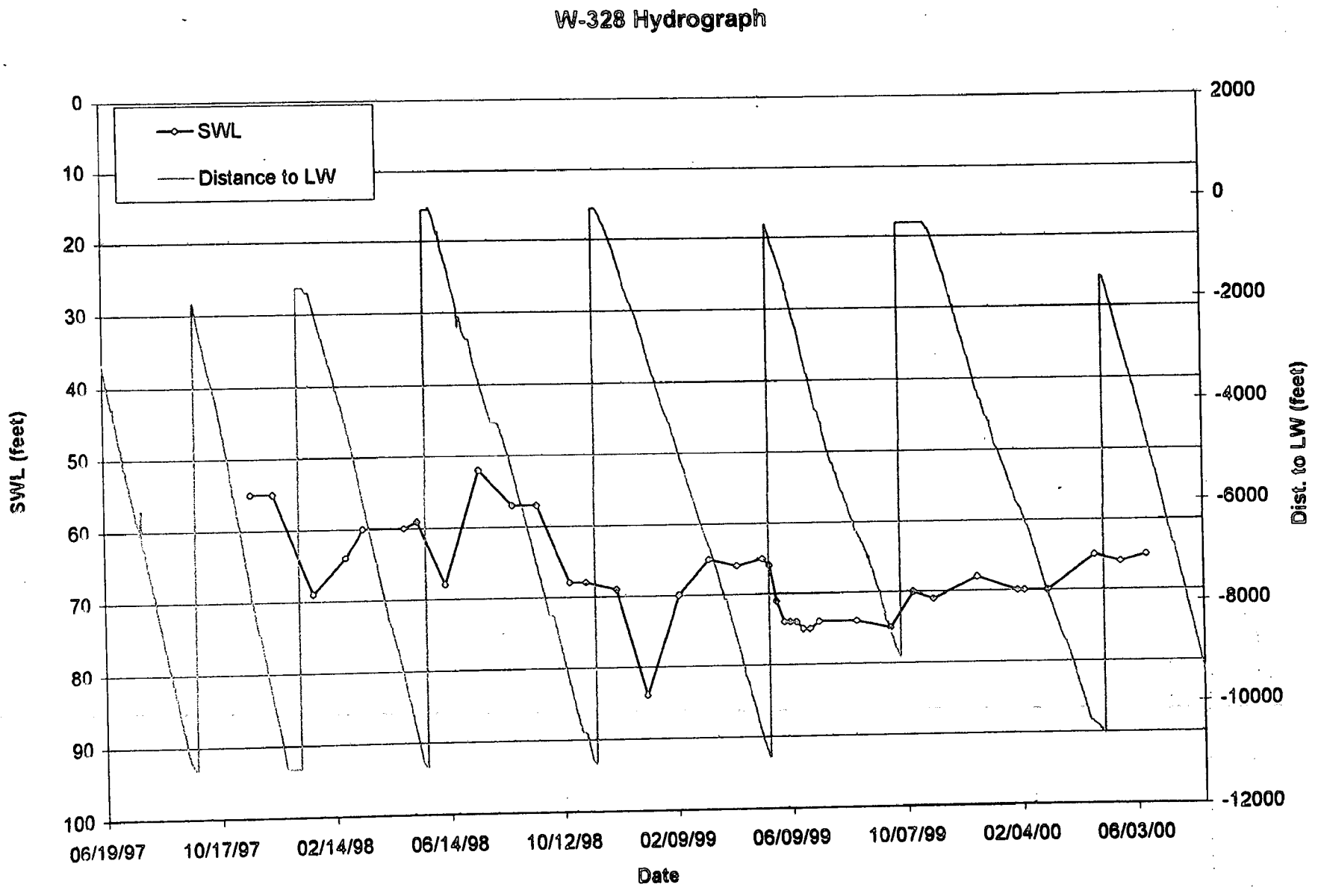


TOVCC 11480
TOVCC 11480



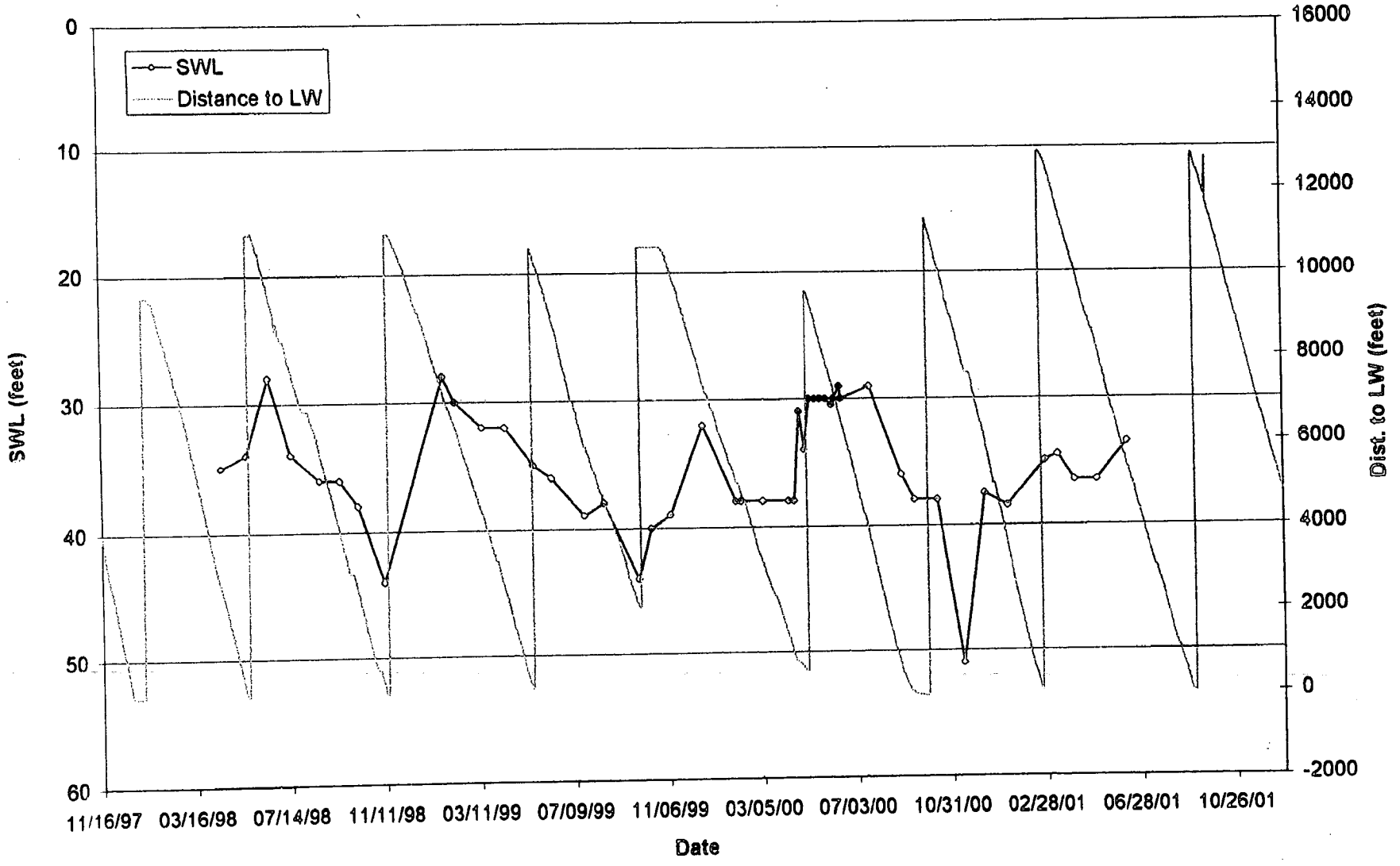
Prepared by: Moody and Assoc., Inc. 4/13/97

TOVCC 11481

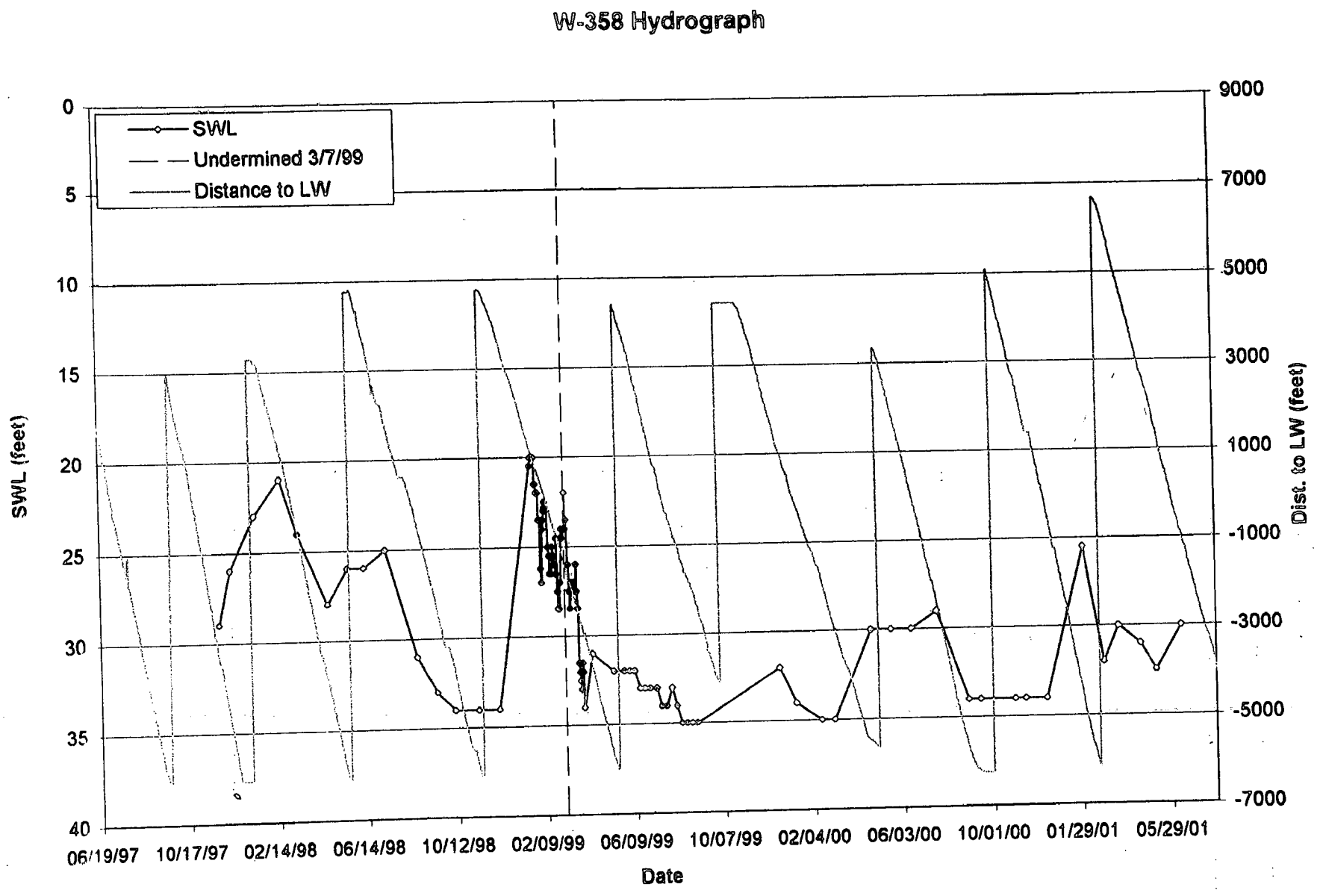

W-328 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
70
80
90
100
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
06/19/97
10/17/97
02/14/98
06/14/98
10/12/98
02/09/99
06/09/99
10/07/99
02/04/00
06/03/00

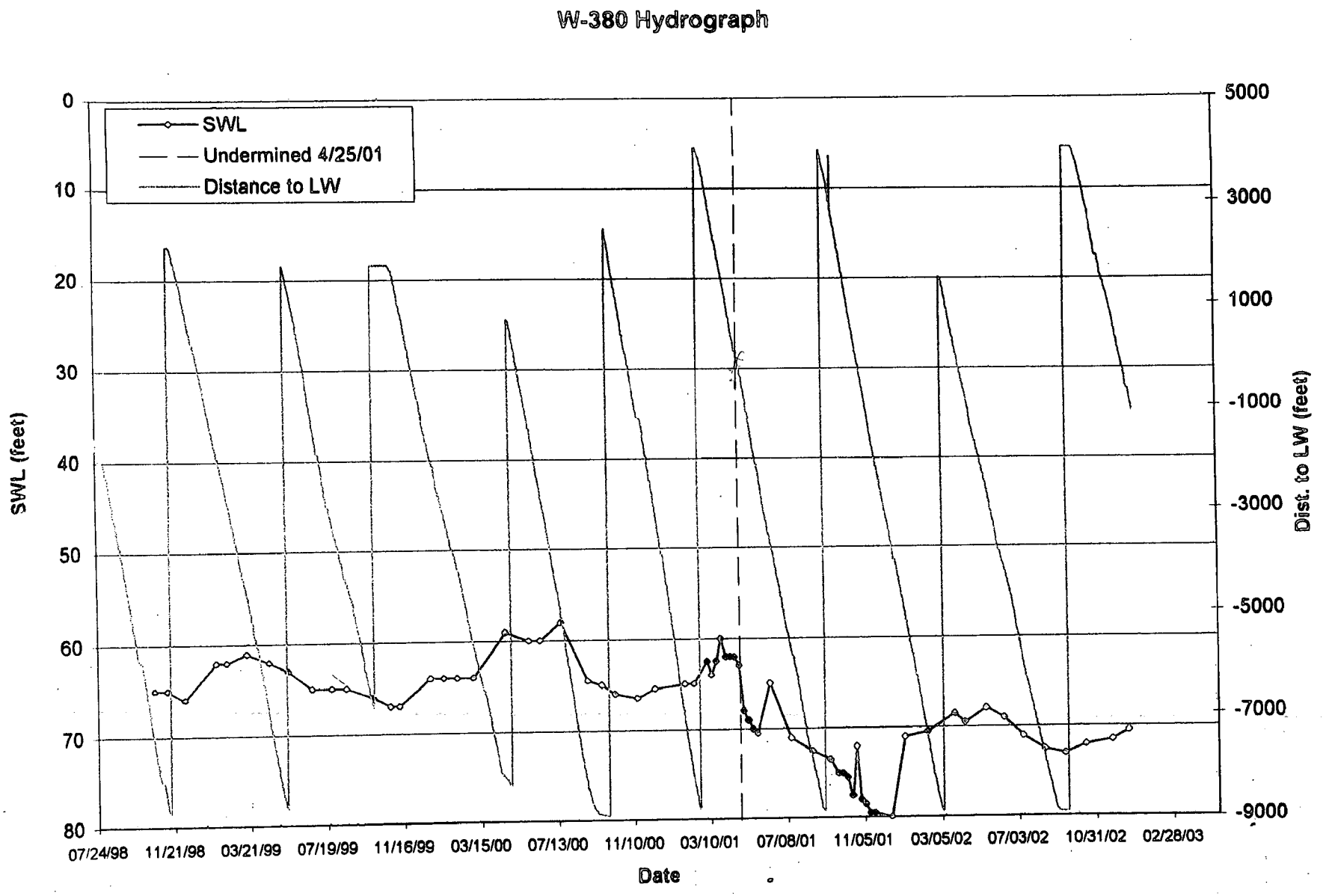
2 2003

W-345 Hydrograph



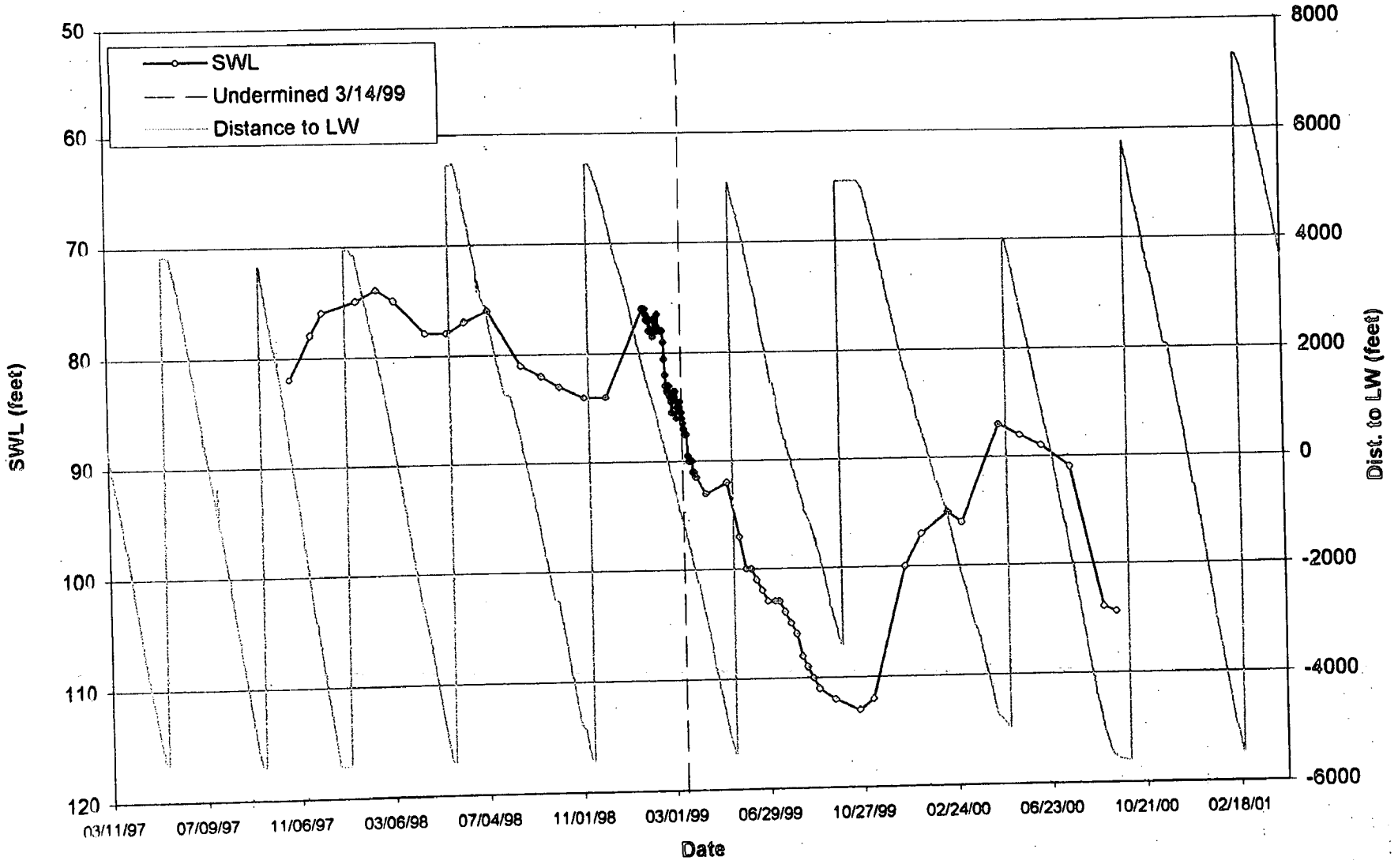
TOVCC 11483

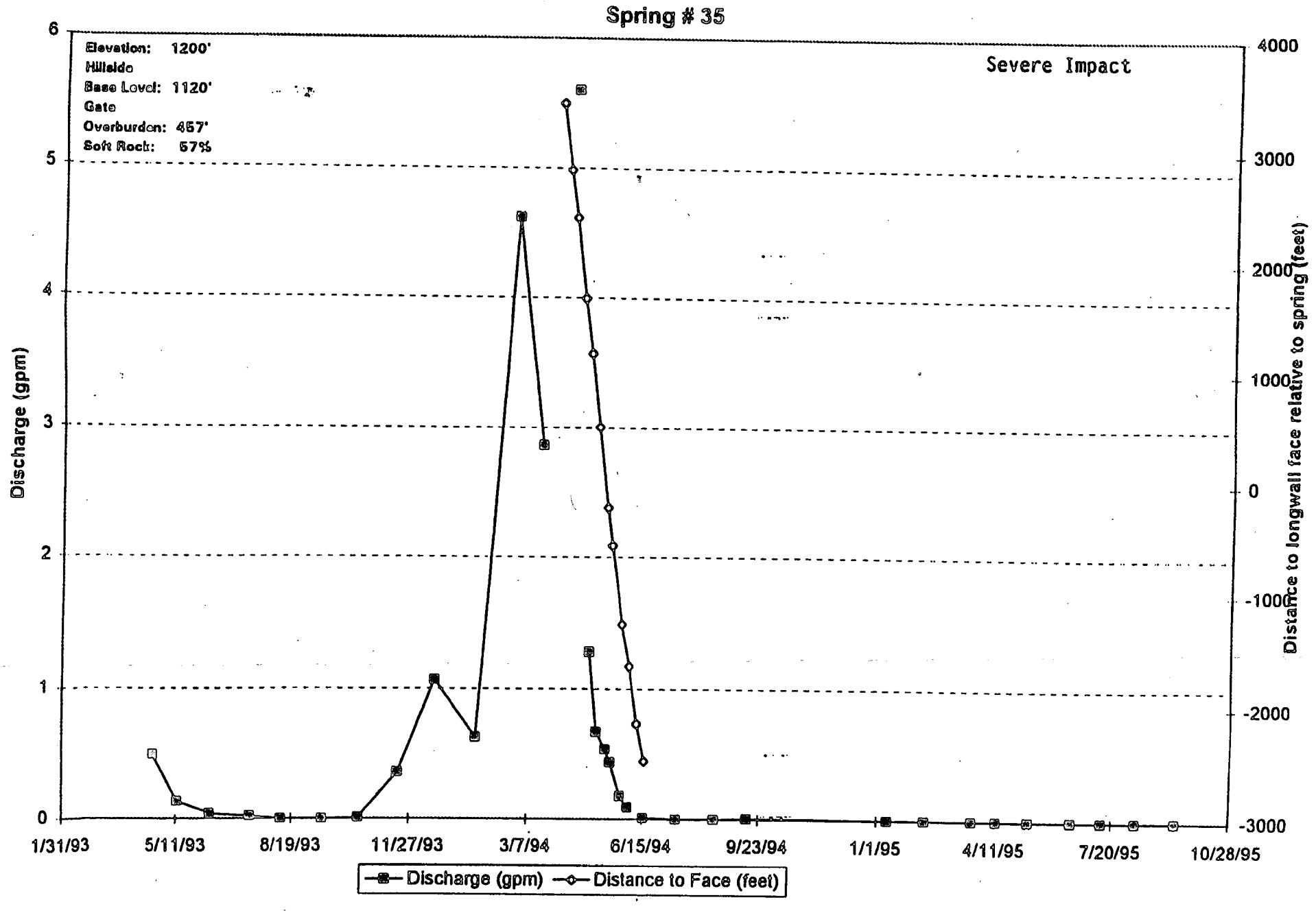

W-358 Hydrograph
SWL
Undermined 3/7/99
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
5
10
15
20
25
30
35
40
9000
7000
5000
3000
1000
-1000
-3000
-5000
-7000
06/19/97
10/17/97
02/14/98
06/14/98
10/12/98
02/09/99
06/09/99
10/07/99
02/04/00
06/03/00
10/01/00
01/29/01
05/29/01


W-380 Hydrograph
SWL
Undermined 4/25/01
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
70
80
5000
3000
1000
-1000
-3000
-5000
-7000
-9000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
03/10/01
07/08/01
11/05/01
03/05/02
07/03/02
10/31/02
02/28/03

TOVCC 11485

W-423 Hydrograph

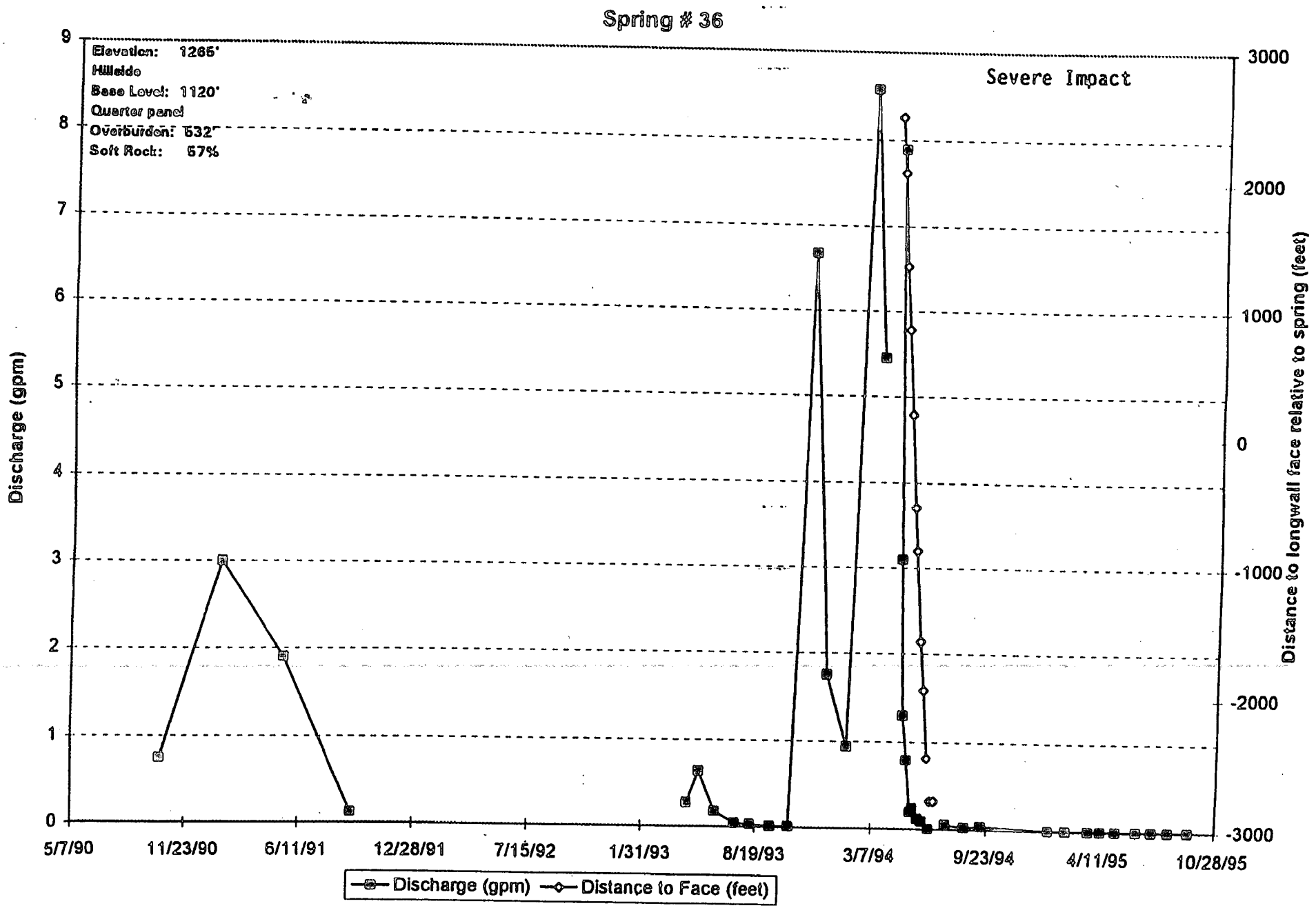




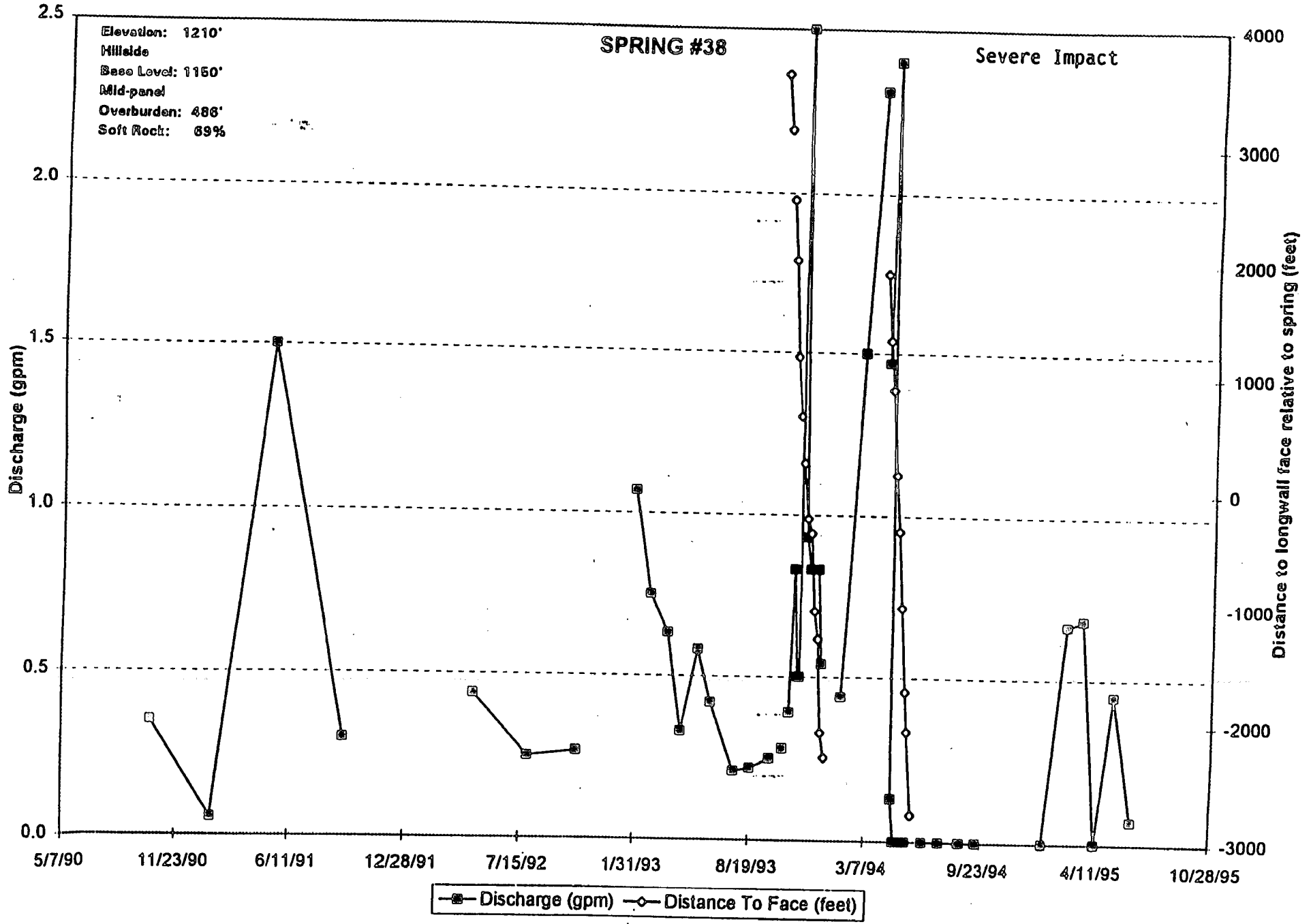
Prepared by: Moody and Assoc., Inc. 4/13/97

TOVCC 11487

0360-4



Prepared by: Moody and Assoc., Inc. 4/14/97

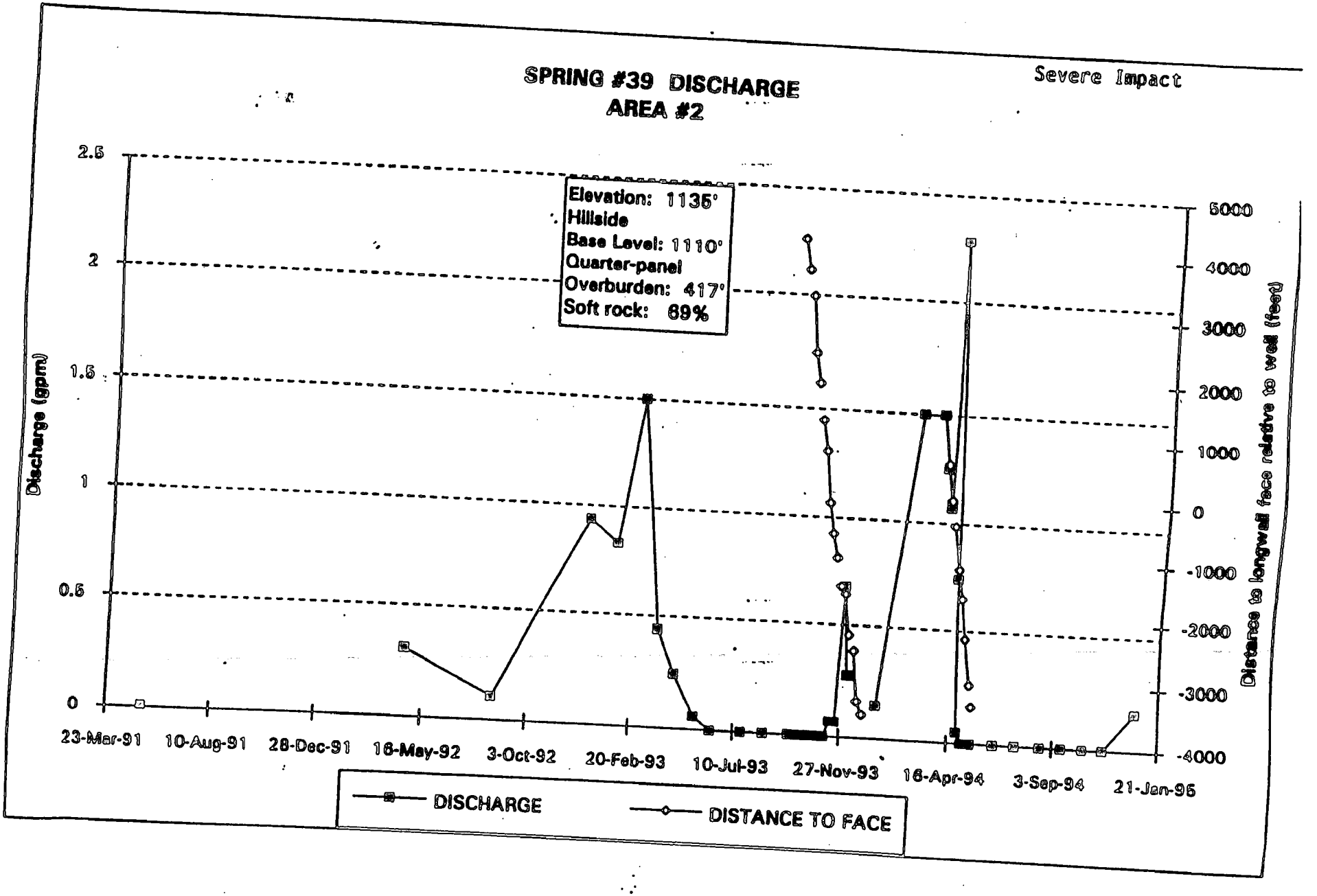


Prepared by: Moody and Assoc. Inc. 4/12/97

D360-0

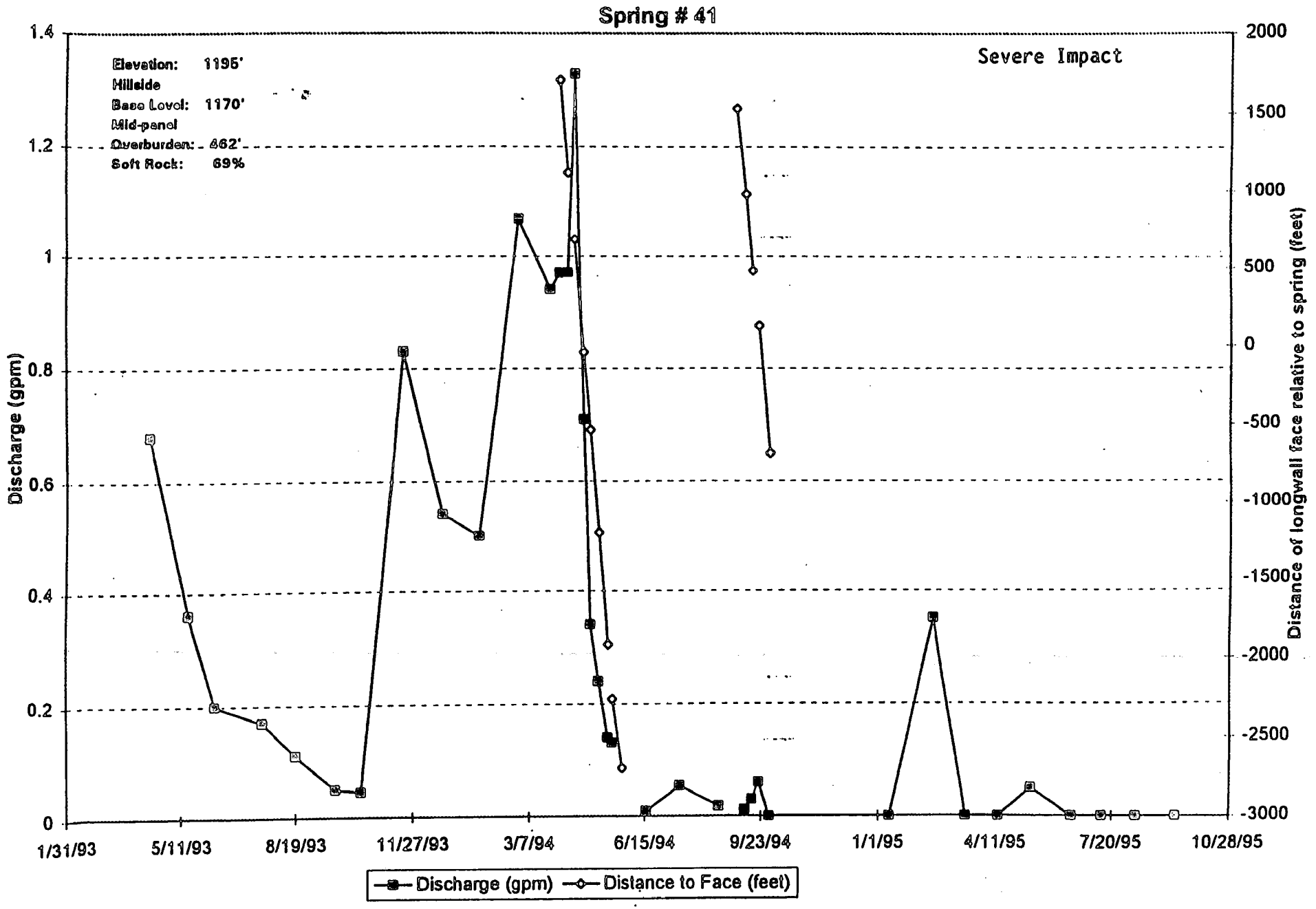
TOVCC 11489

Severe Impact



0360-11

TOVCC 11490

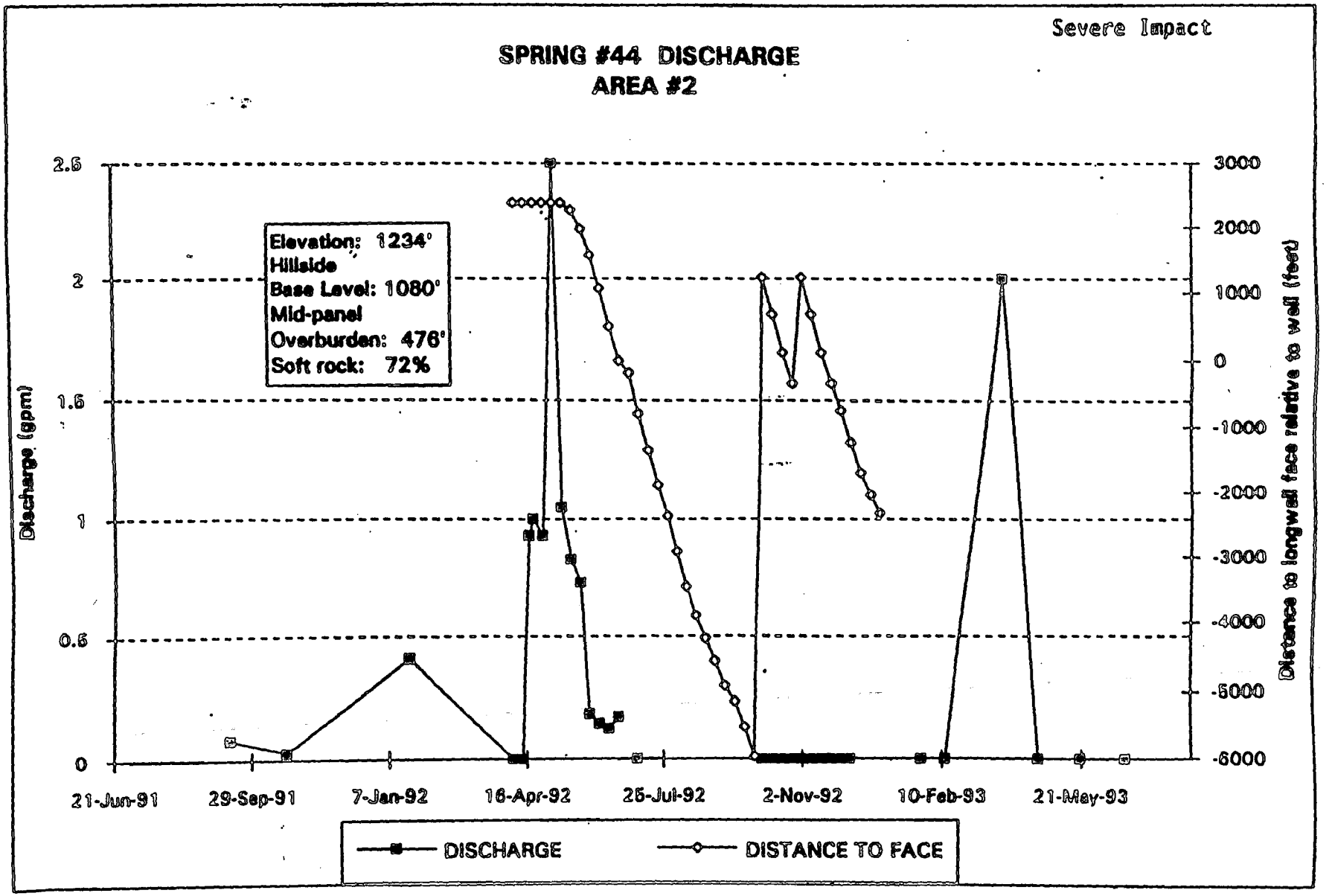


Prepared by: Moody and Assoc., Inc. 4/13/97

TOVCC 11491

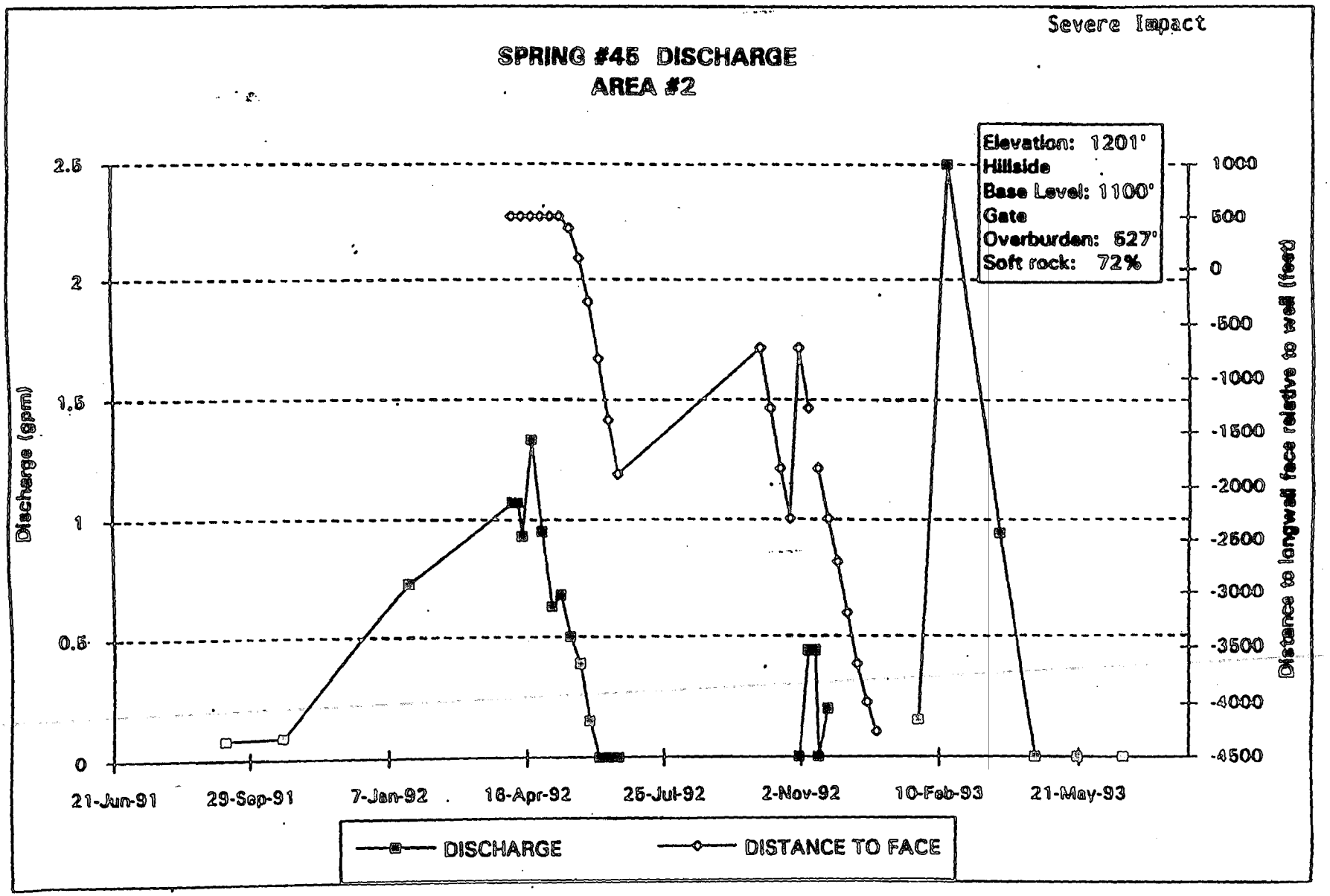
0360-13

Severe Impact



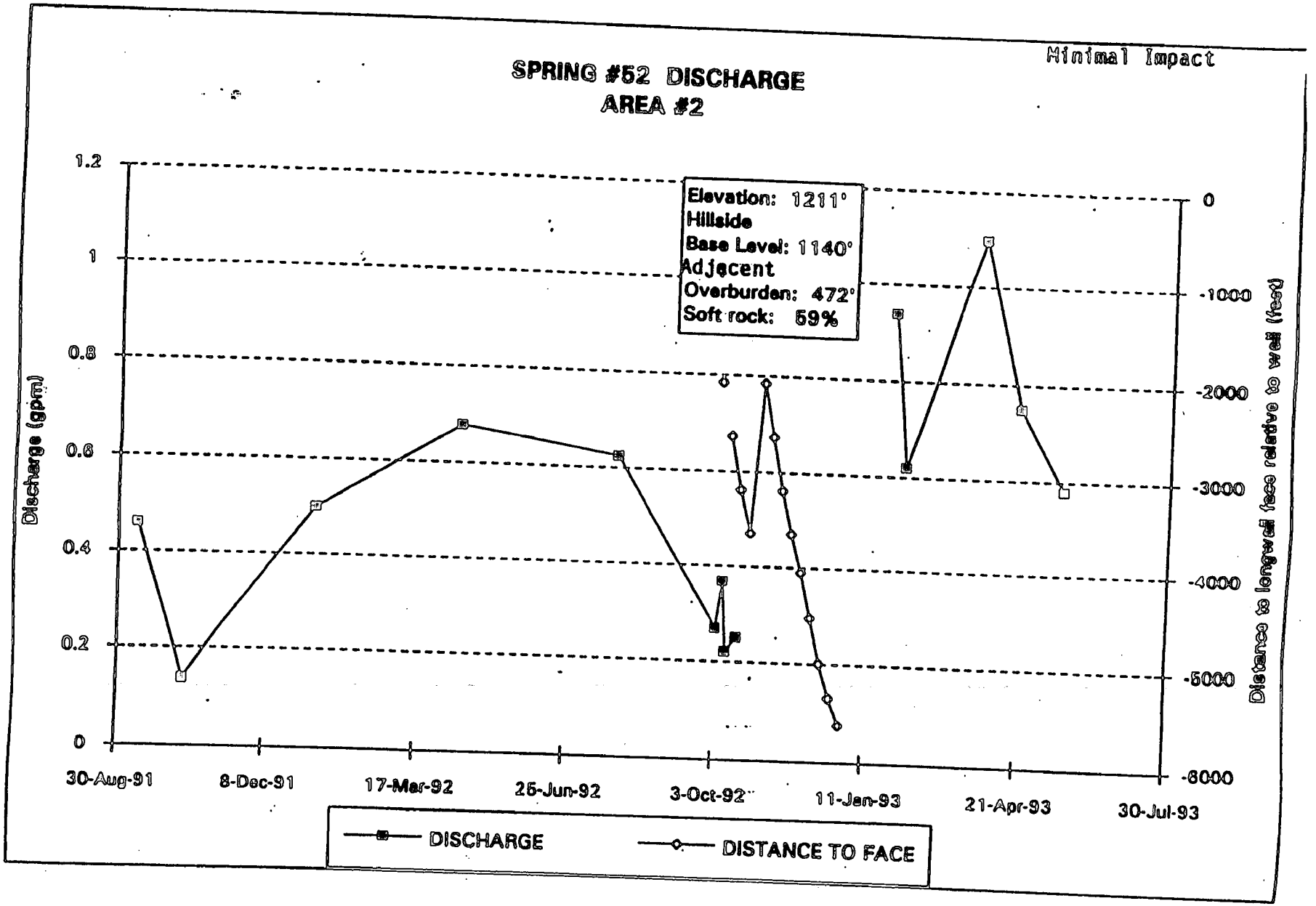
TOVCC 11492
TOVCC 11492

Severe Impact

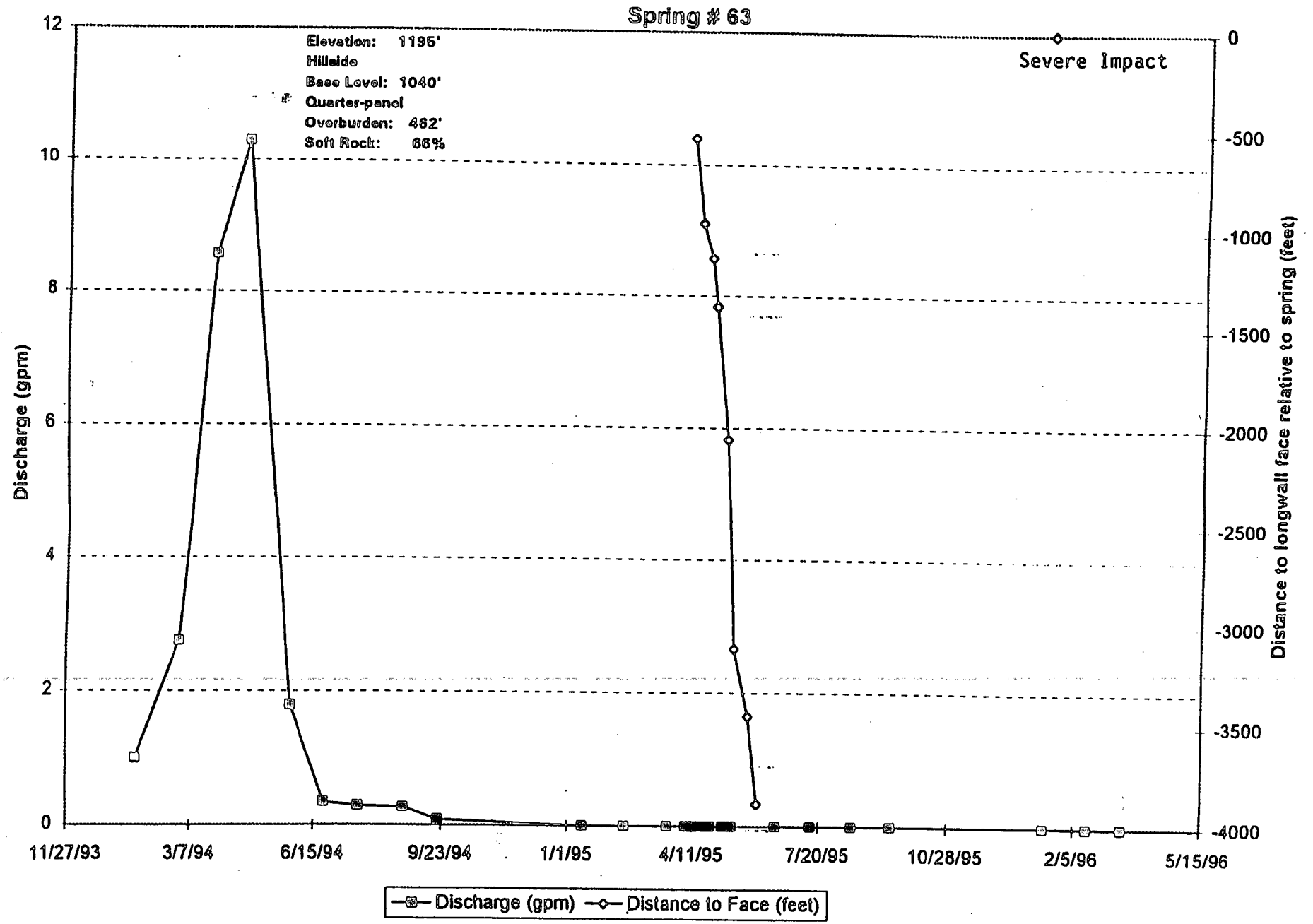


TOVCC 11493
TOVCC 11493

Minimal Impact

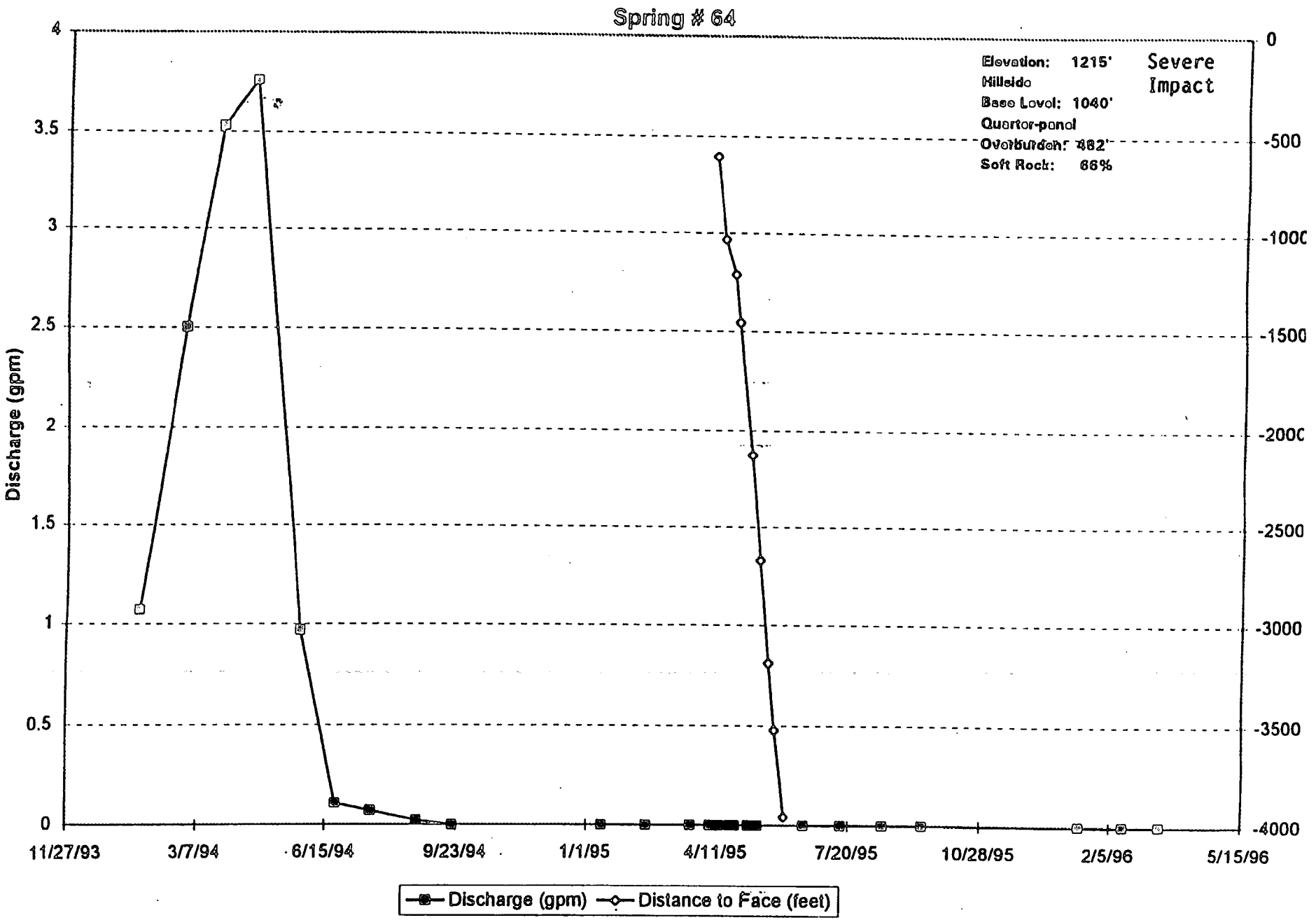


TOVCC 11494



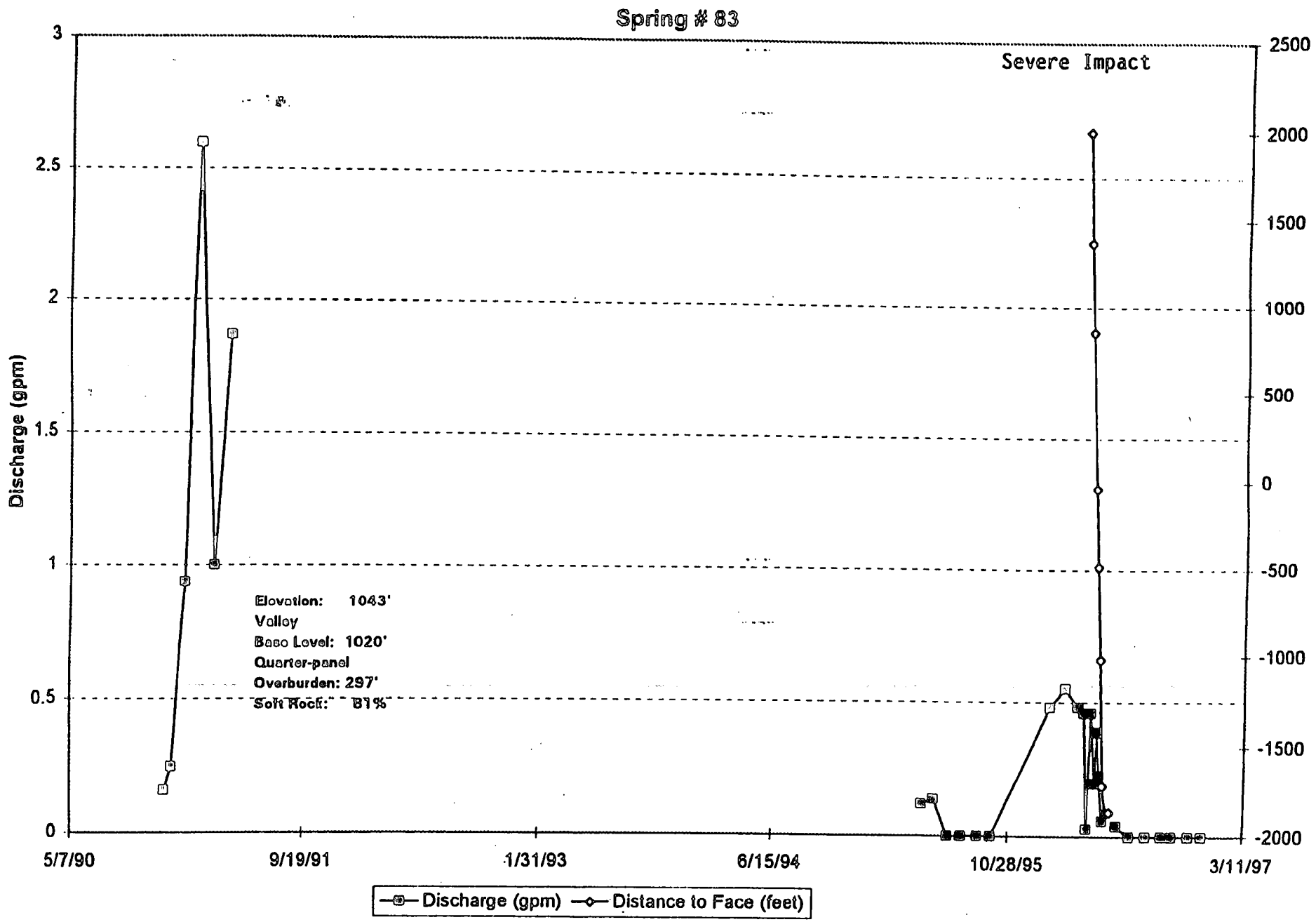
Prepared by: Moody and Assoc., Inc. 4/13/9

TOVCC 11495



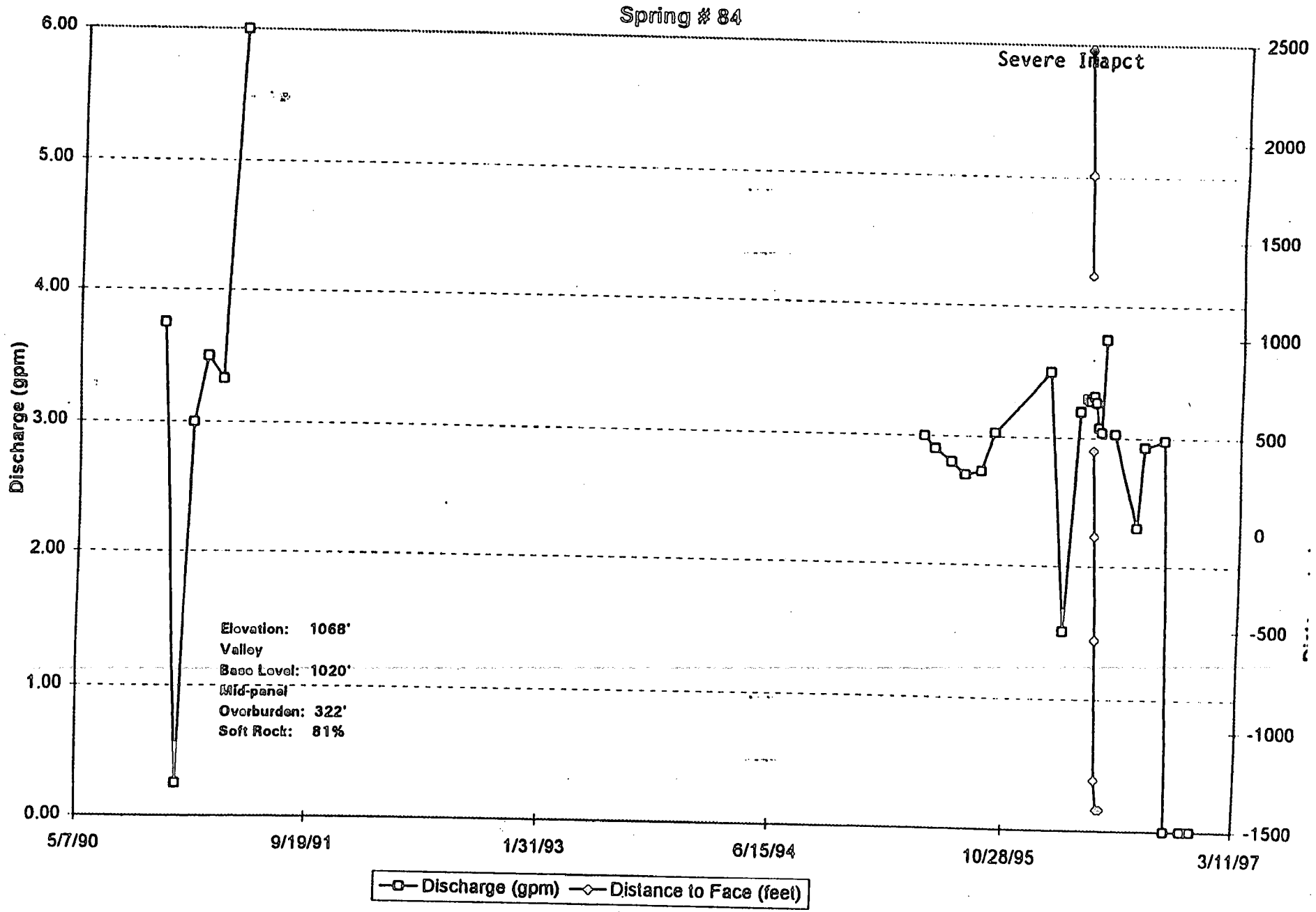
Prepared by : Moody and Assoc., Inc. 4/13/97

TOVCC 11496



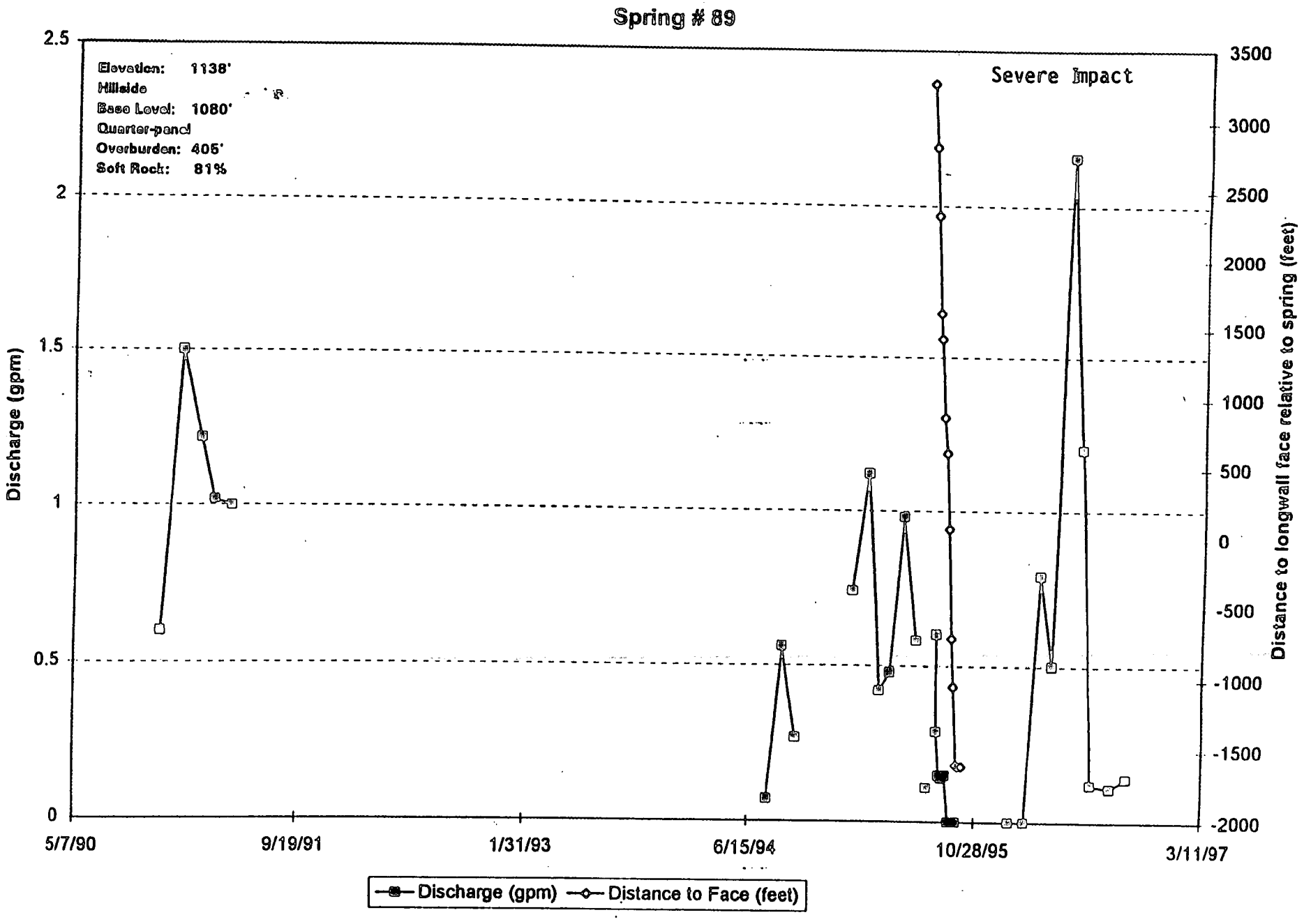
Prepared by: Moody and Assoc., Inc. 4/13/97

TOVCC 11497

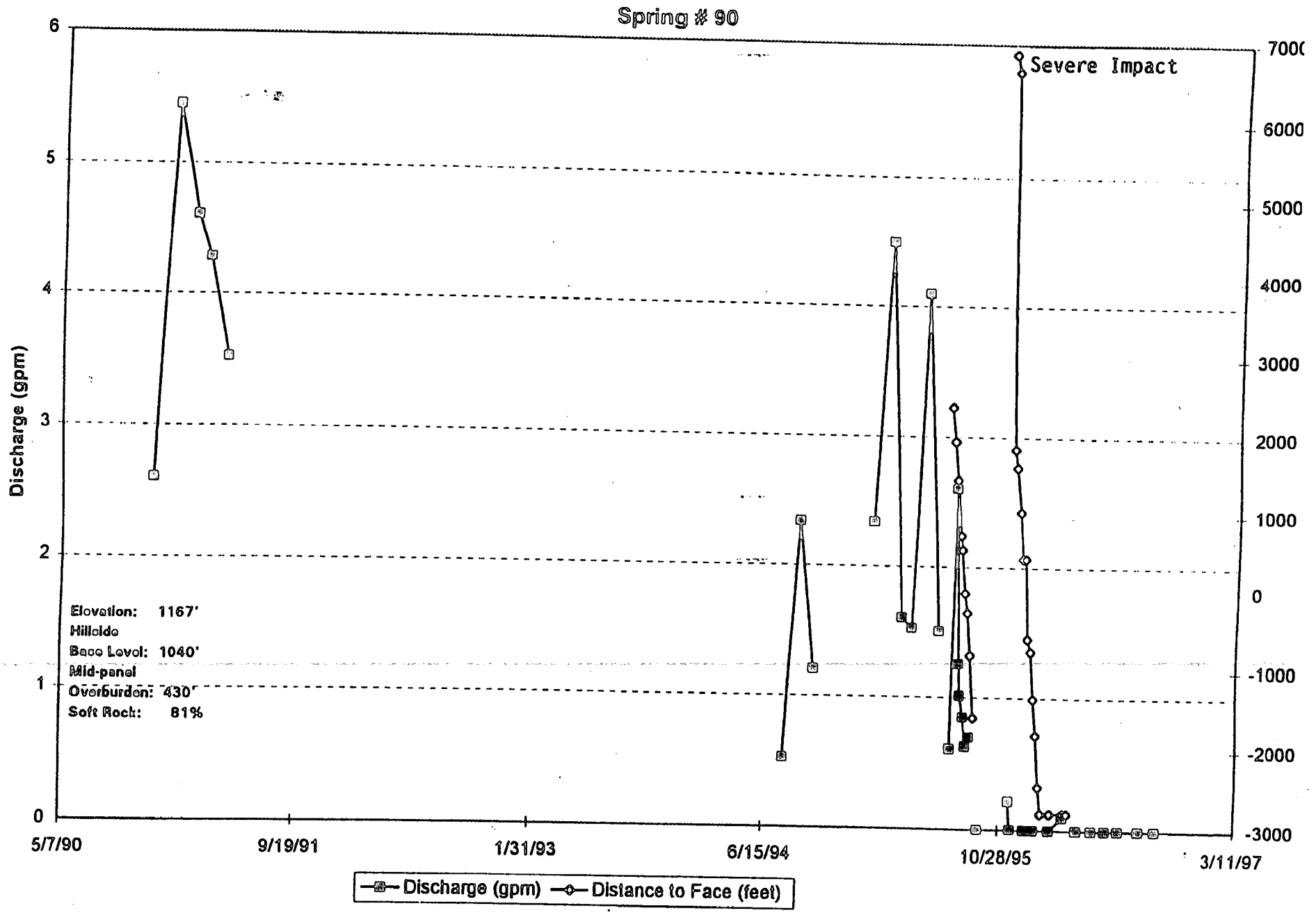


Prepared by: Moody and Assoc. Inc. 4/12/97

TOVCC 11498


Spring # 89
Elevation: 1138'
Hillside
Base Level: 1080'
Quarter-panel
Overburden: 405'
Soft Rock: 81%
Severe Impact
Discharge (gpm)
Distance to longwall face relative to spring (feet)
2.5
2
1.5
1
0.5
0
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500
-2000
5/7/90
9/19/91
1/31/93
6/15/94
10/28/95
3/11/97
Discharge (gpm)
Distance to Face (feet)

TOVCC 11499

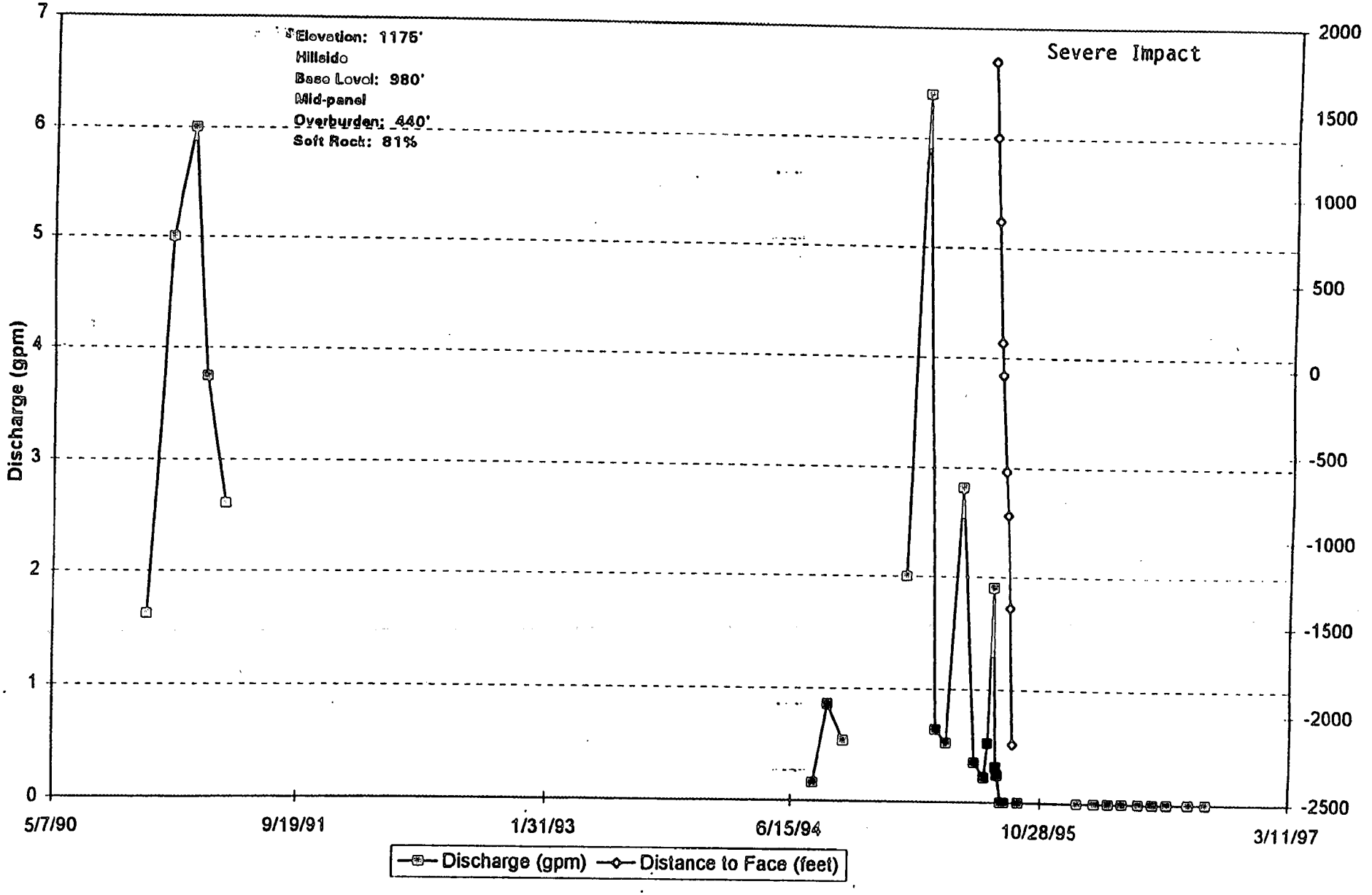


Prepared by: Moody and Assoc. Inc. 4/13/97

TOVCC 11500

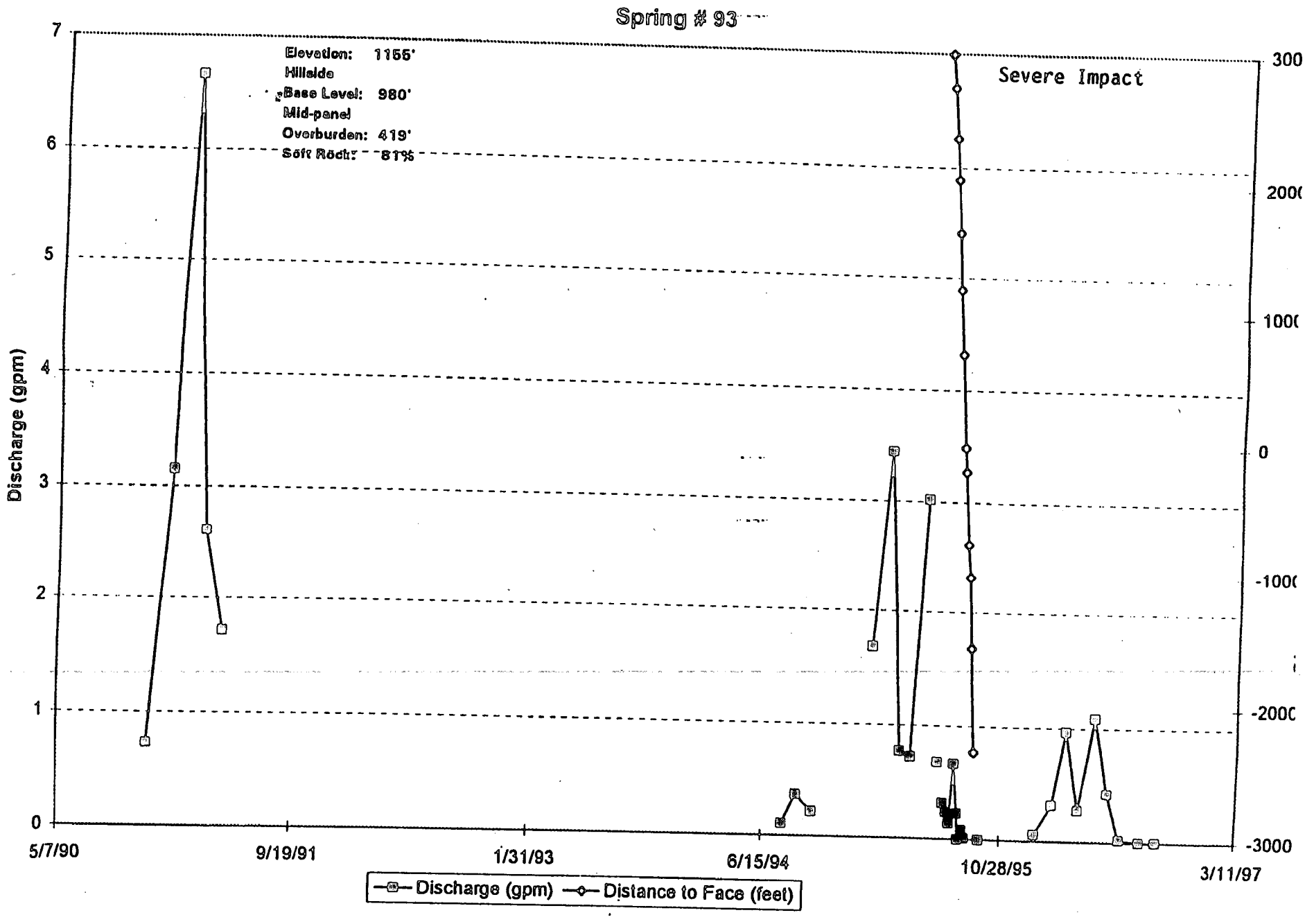
D360 [illegible]

Spring # 92



Prepared by: Moody and Assoc., Inc. 4/13/97

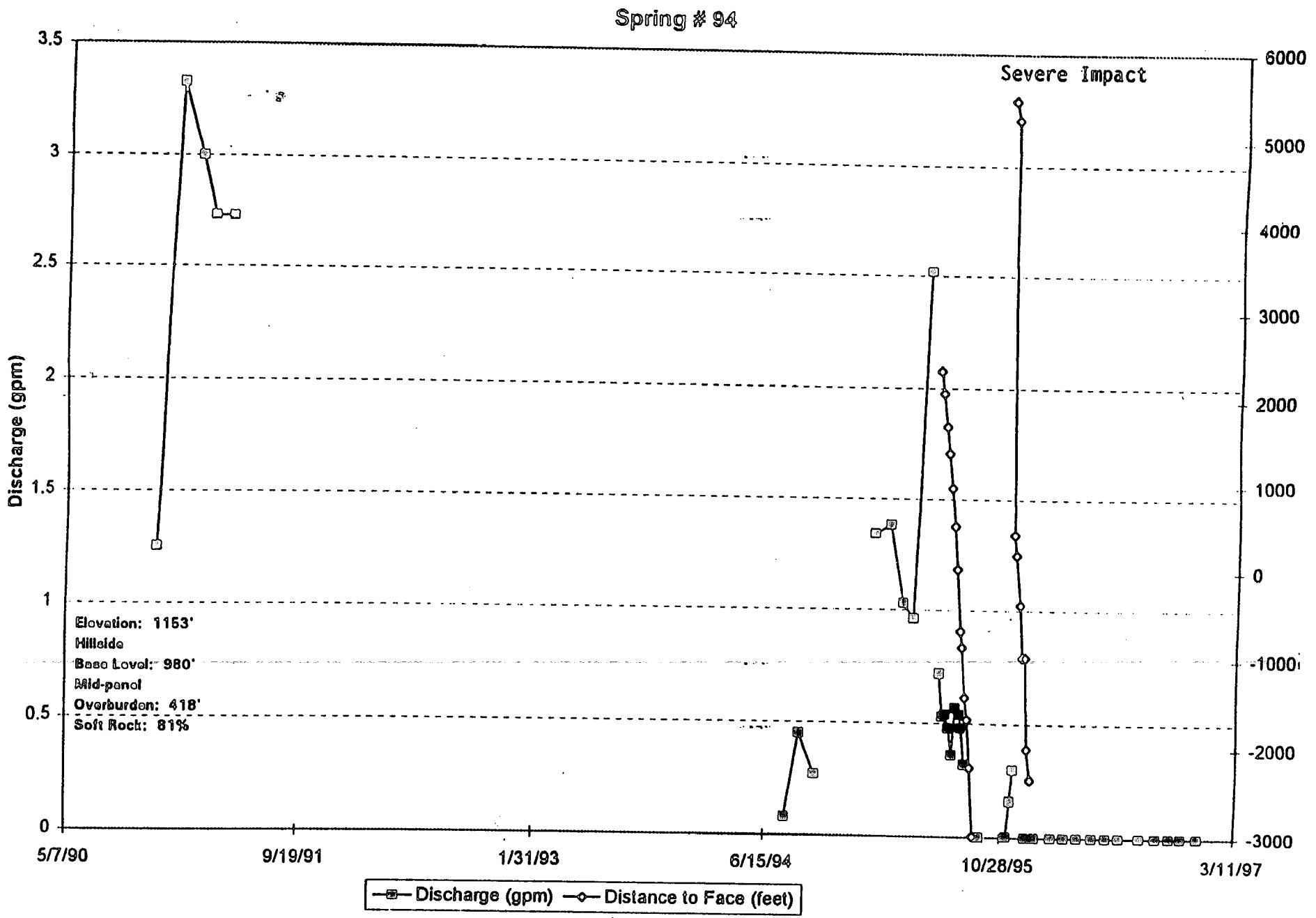
TOVCC 11501



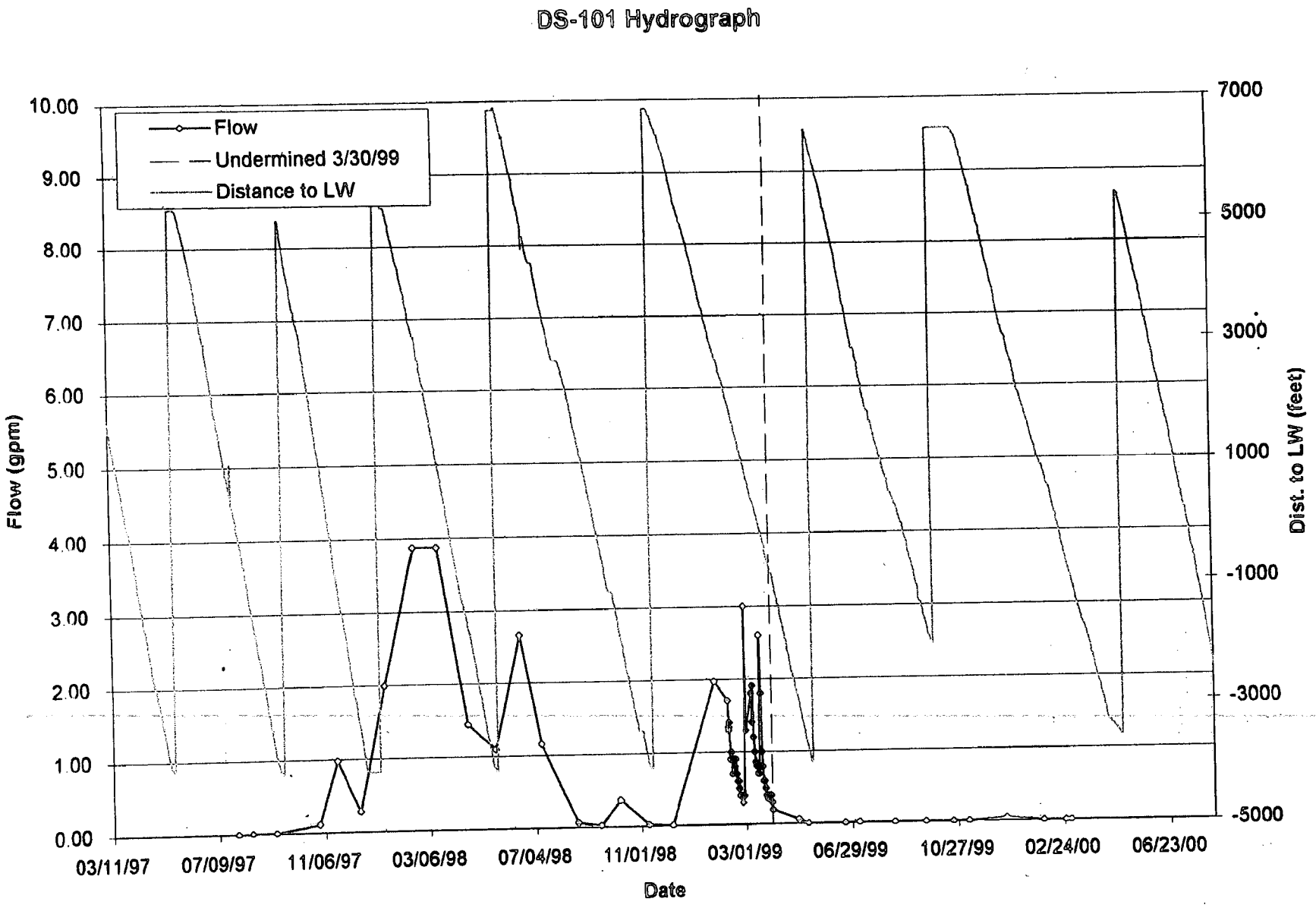
Prepared by: Moody and Assoc., Inc. 4/12/97

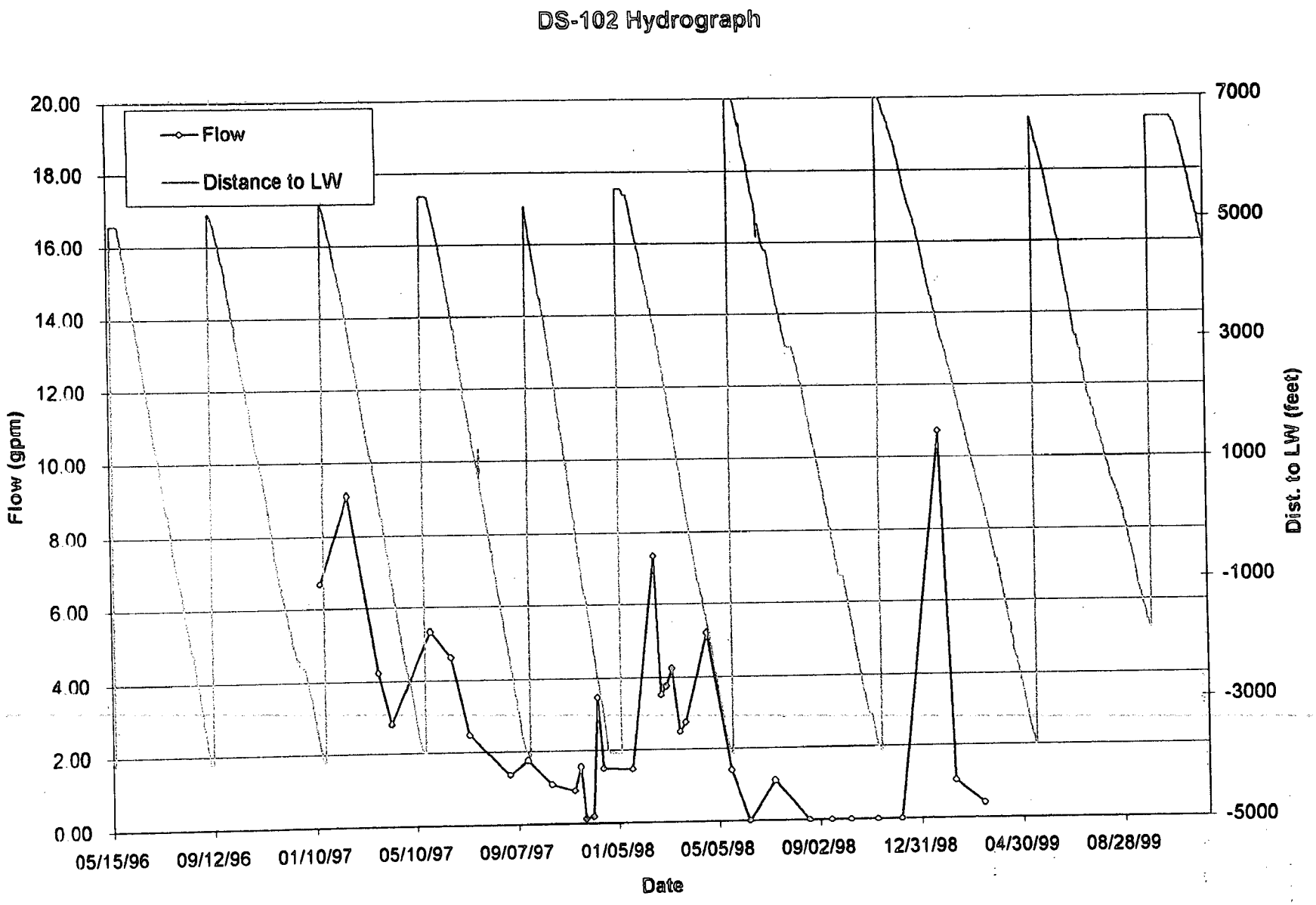
TOVCC 11502

D360-12

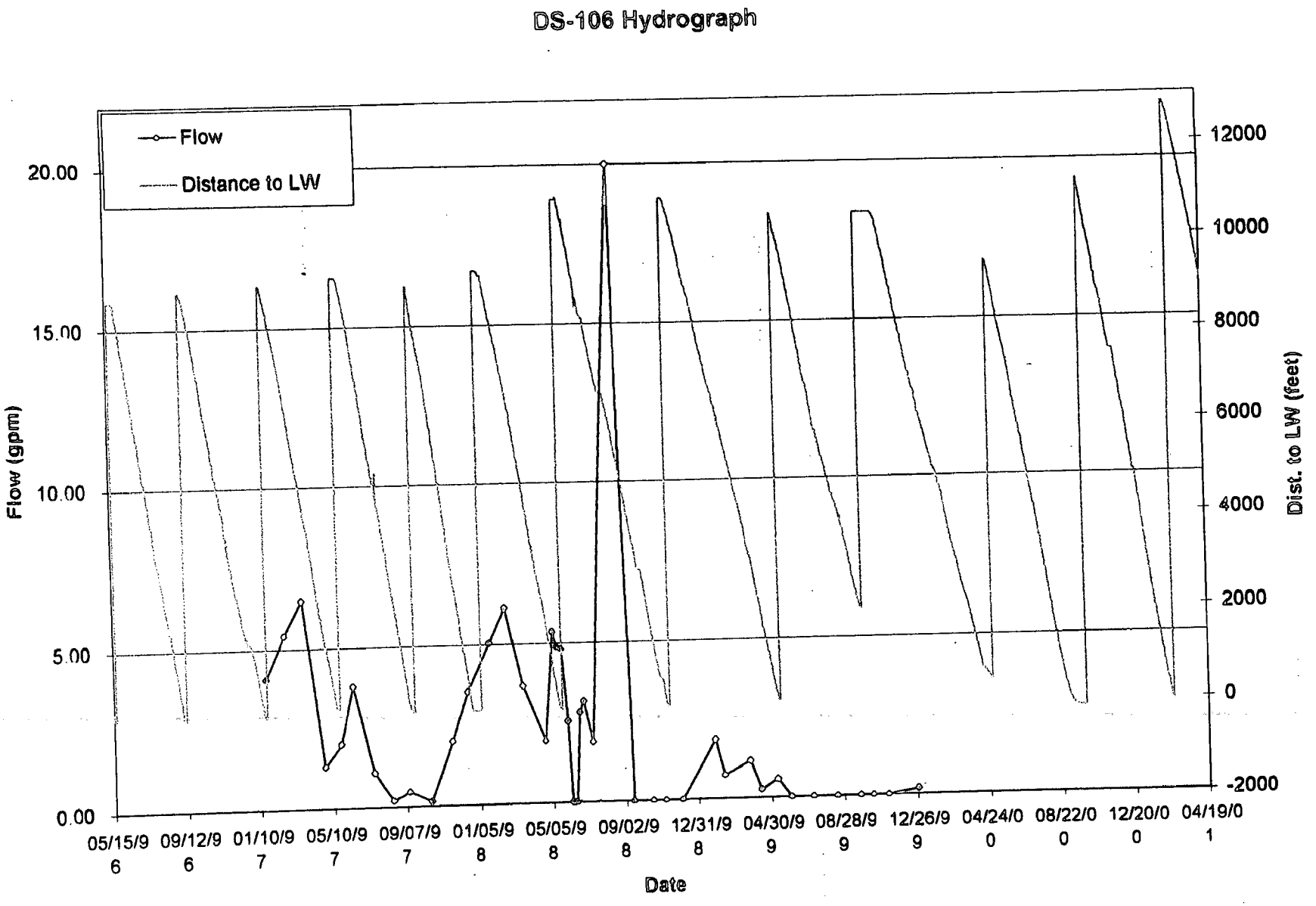

Spring # 94
Severe Impact
Discharge (gpm)
3.5
3
2.5
2
1.5
1
0.5
0
6000
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
5/7/90
9/19/91
1/31/93
6/15/94
10/28/95
3/11/97
Elevation: 1153'
Hillside
Base Level: 980'
Mid-panel
Overburden: 418'
Soft Rock: 81%
Discharge (gpm)
Distance to Face (feet)

TOVCC 11503

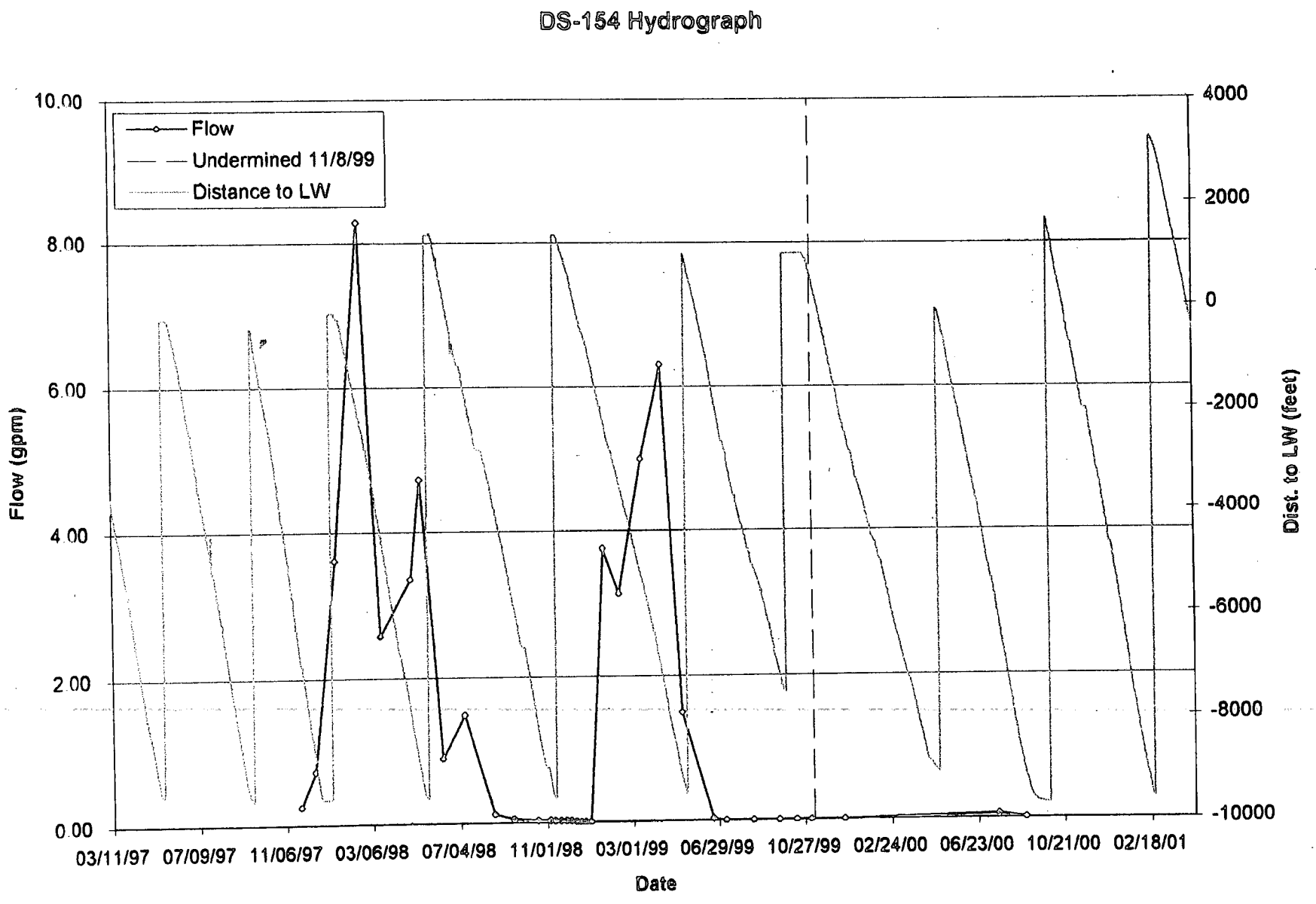

DS-101 Hydrograph
Flow
Undermined 3/30/99
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
7000
5000
3000
1000
-1000
-3000
-5000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
Date

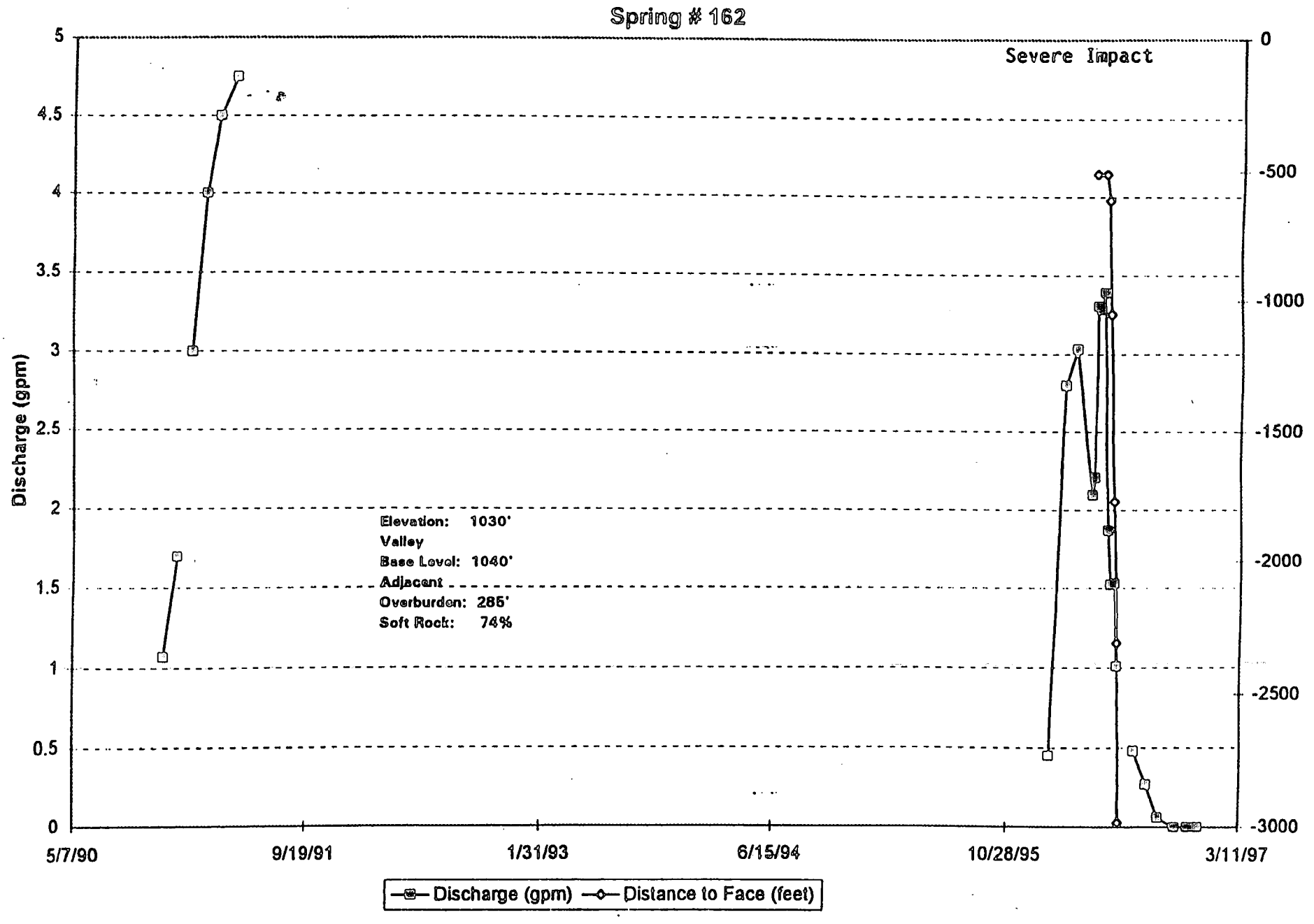

DS-102 Hydrograph
Flow
Distance to LW
Flow (gpm)
Dist. to LW (feet)
Date
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
7000
5000
3000
1000
-1000
-3000
-5000
05/15/96
09/12/96
01/10/97
05/10/97
09/07/97
01/05/98
05/05/98
09/02/98
12/31/98
04/30/99
08/28/99

DS-106 Hydrograph



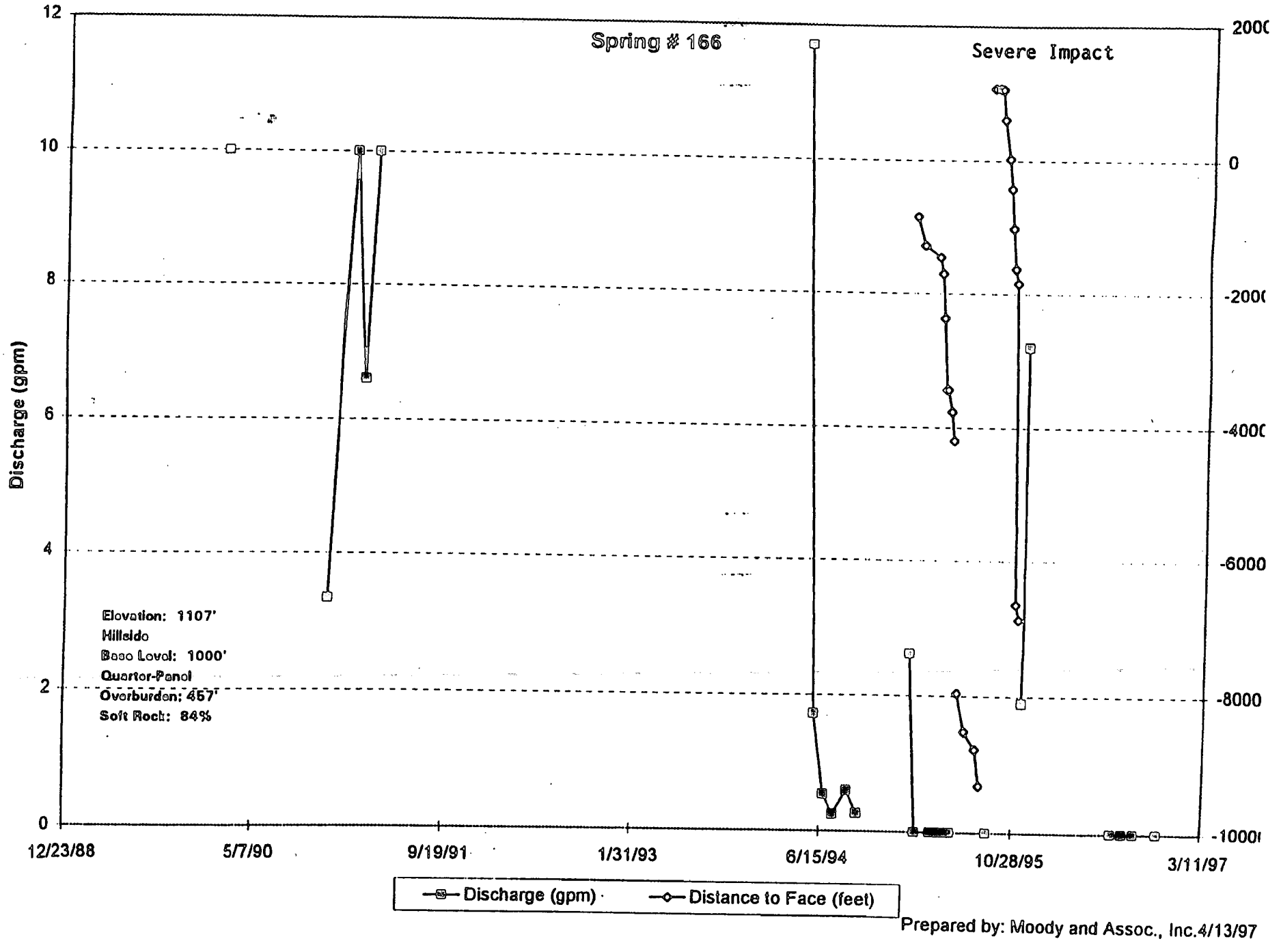
TOVCC 11506


DS-154 Hydrograph
Flow
Undermined 11/8/99
Distance to LW
Flow (gpm)
10.00
8.00
6.00
4.00
2.00
0.00
Dist. to LW (feet)
4000
2000
0
-2000
-4000
-6000
-8000
-10000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01
Date

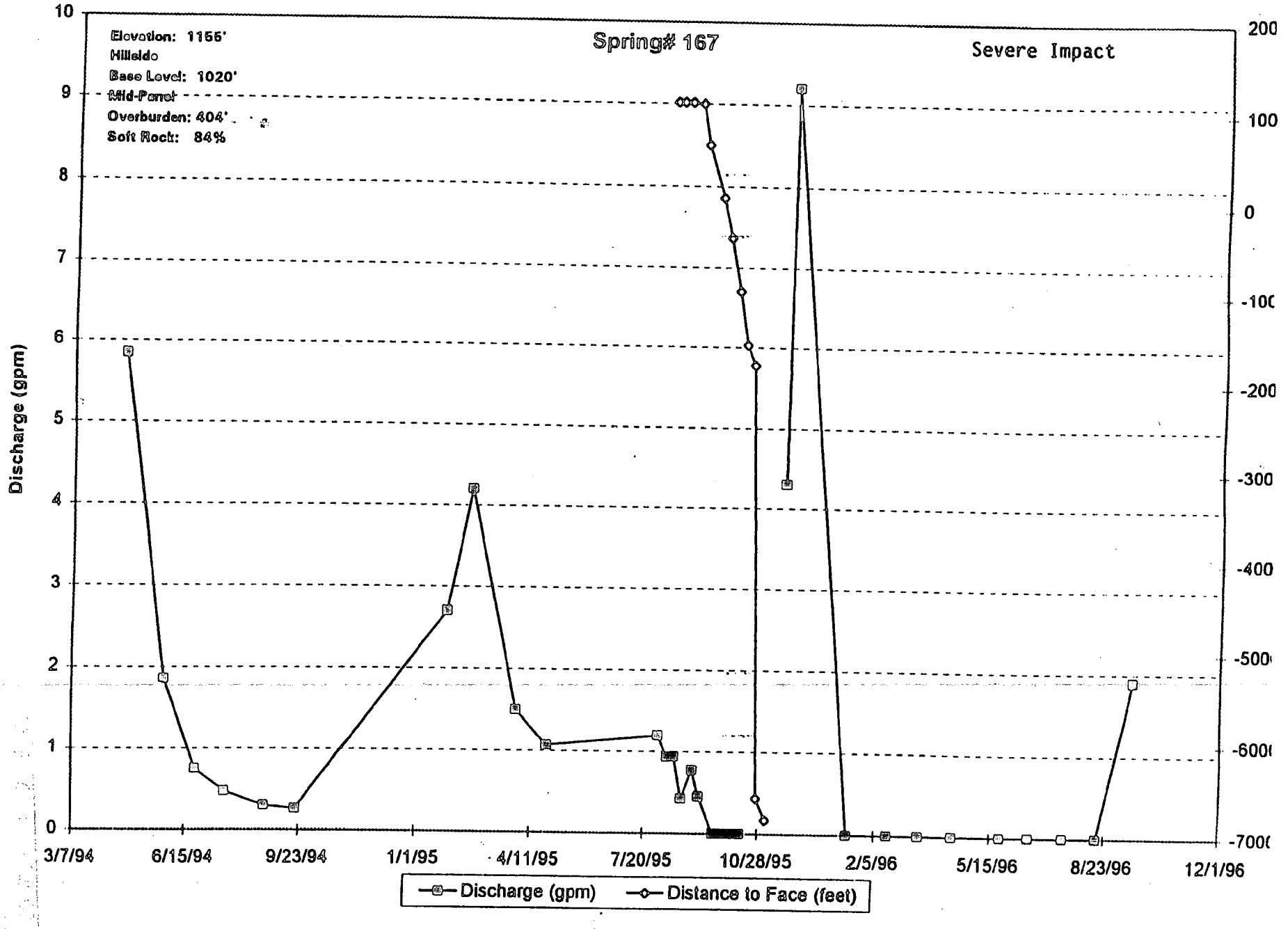


Prepared by: Moody and Assoc., Inc. 4/13/9

TOVCC 11508


Spring # 166
Severe Impact
Discharge (gpm)
12
10
8
6
4
2
0
2000
0
-2000
-4000
-6000
-8000
-10000
12/23/88
5/7/90
9/19/91
1/31/93
6/15/94
10/28/95
3/11/97
Elevation: 1107'
Hillside
Base Level: 1000'
Quarter-Panel
Overburden: 457'
Soft Rock: 84%
Discharge (gpm)
Distance to Face (feet)
Prepared by: Moody and Assoc., Inc.4/13/97

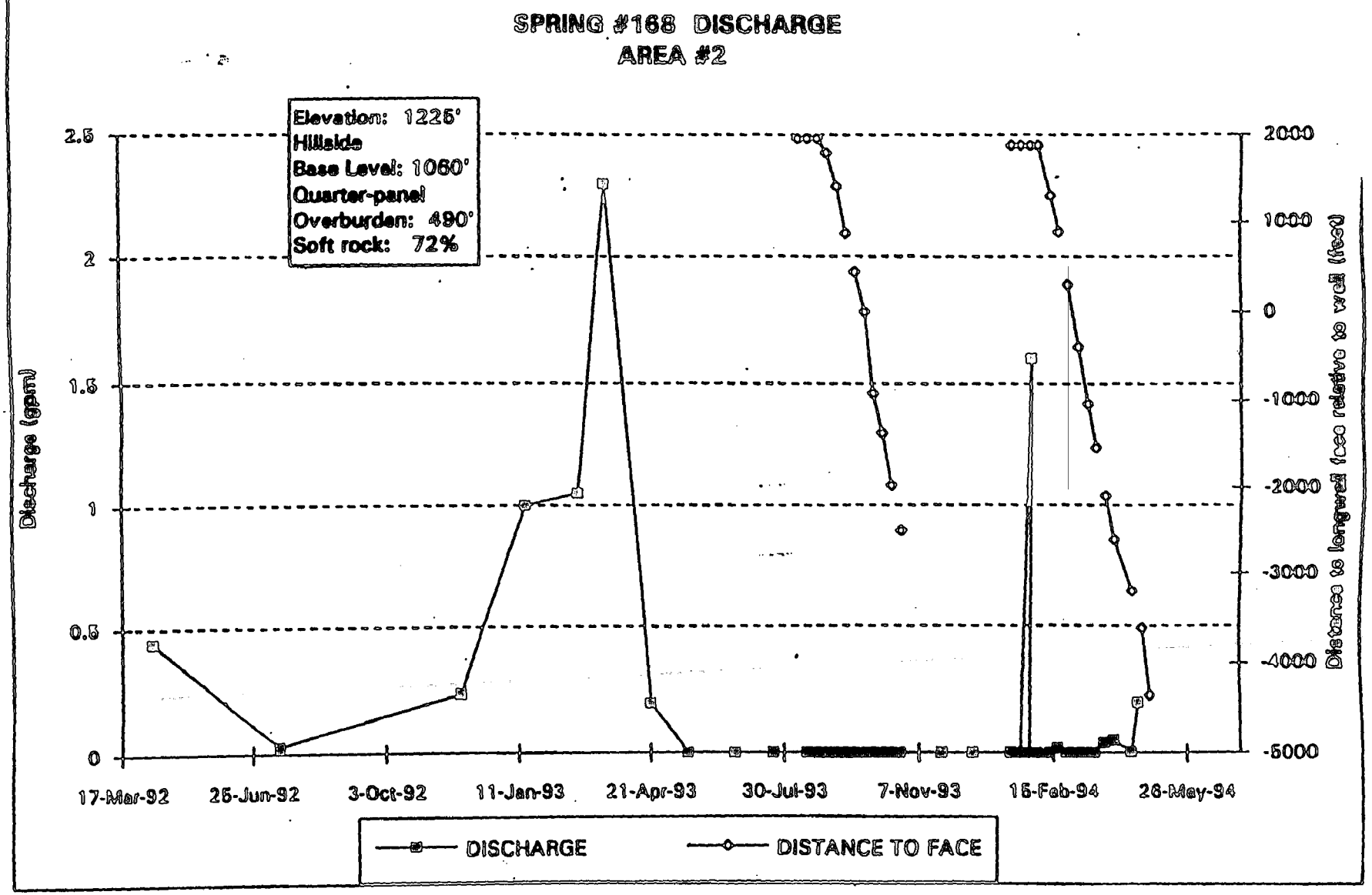
TOVCC 11509



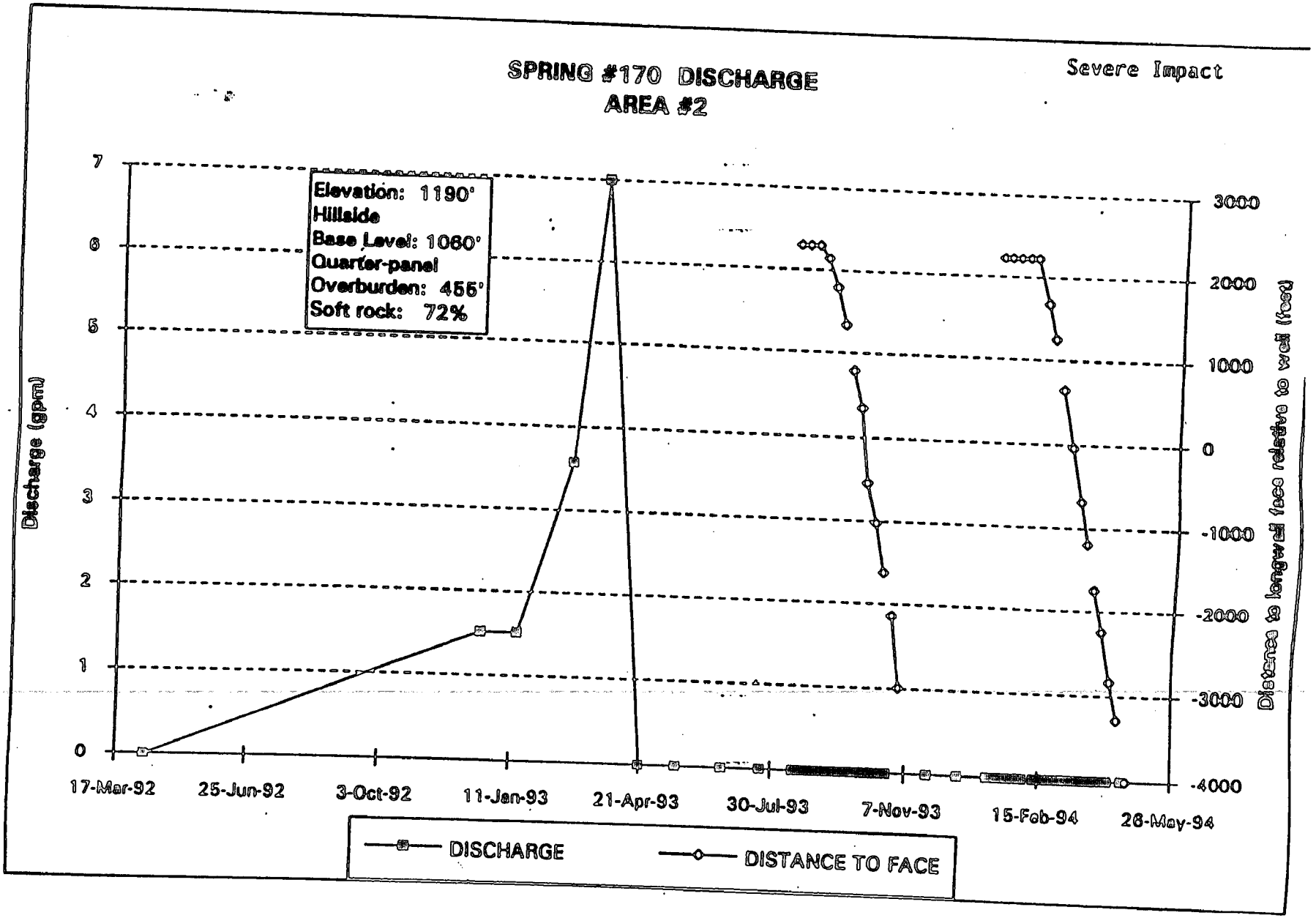
Prepared by: Moody and Assoc. Inc4/13/97

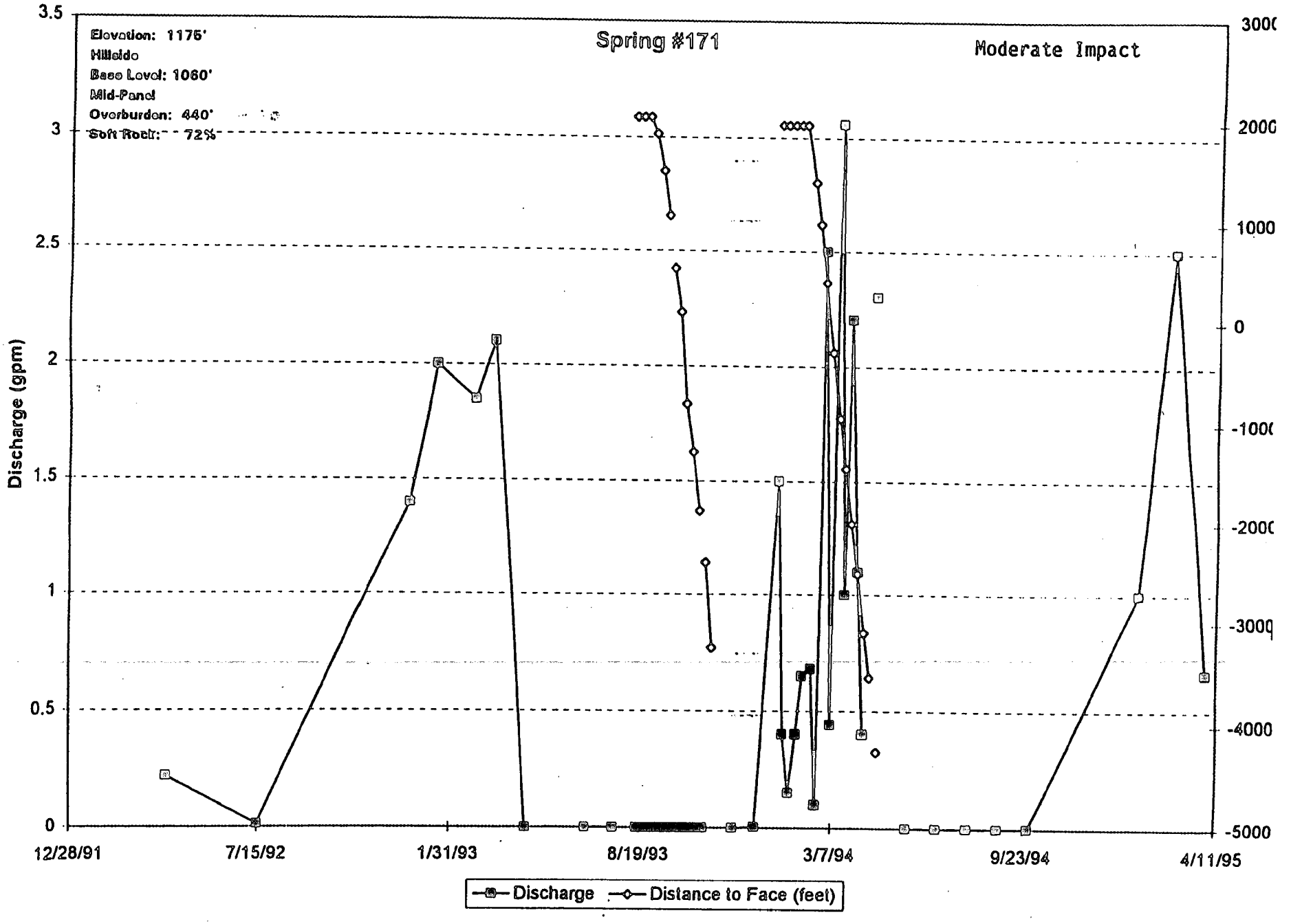
TOVCC 11510

Severe Impact



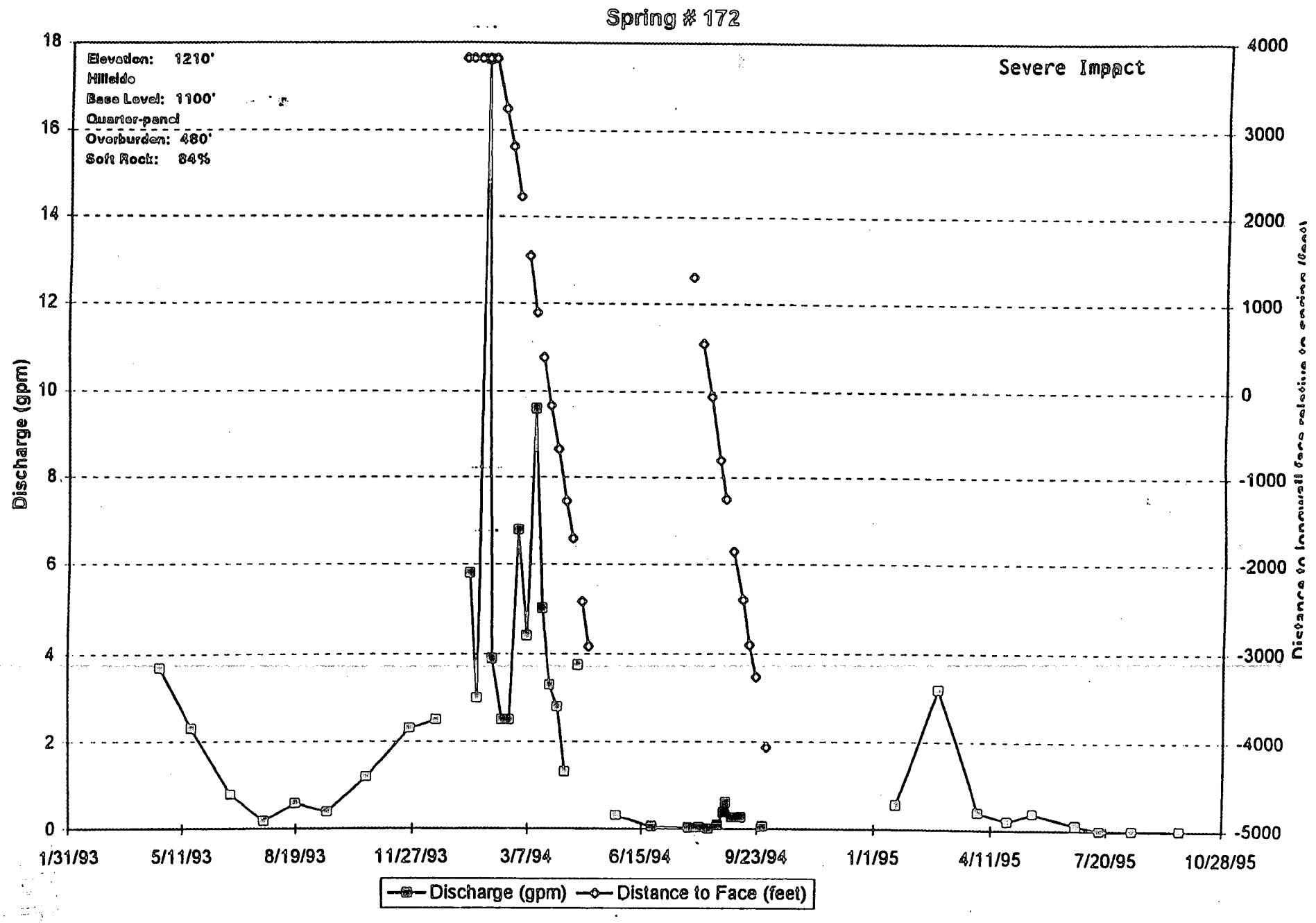
TOVCC 11511
TOVCC 11511


SPRING #170 DISCHARGE
AREA #2
Severe Impact
Elevation: 1190'
Hillside
Base Level: 1060'
Quarter-panel
Overburden: 455'
Soft rock: 72%
Discharge (gpm)
Distance to longwall face relative to well (feet)
0
1
2
3
4
5
6
7
3000
2000
1000
0
-1000
-2000
-3000
-4000
17-Mar-92
25-Jun-92
3-Oct-92
11-Jan-93
21-Apr-93
30-Jul-93
7-Nov-93
15-Feb-94
26-May-94
DISCHARGE
DISTANCE TO FACE



Prepared by: Moody and Assoc. Inc. 4/12/97

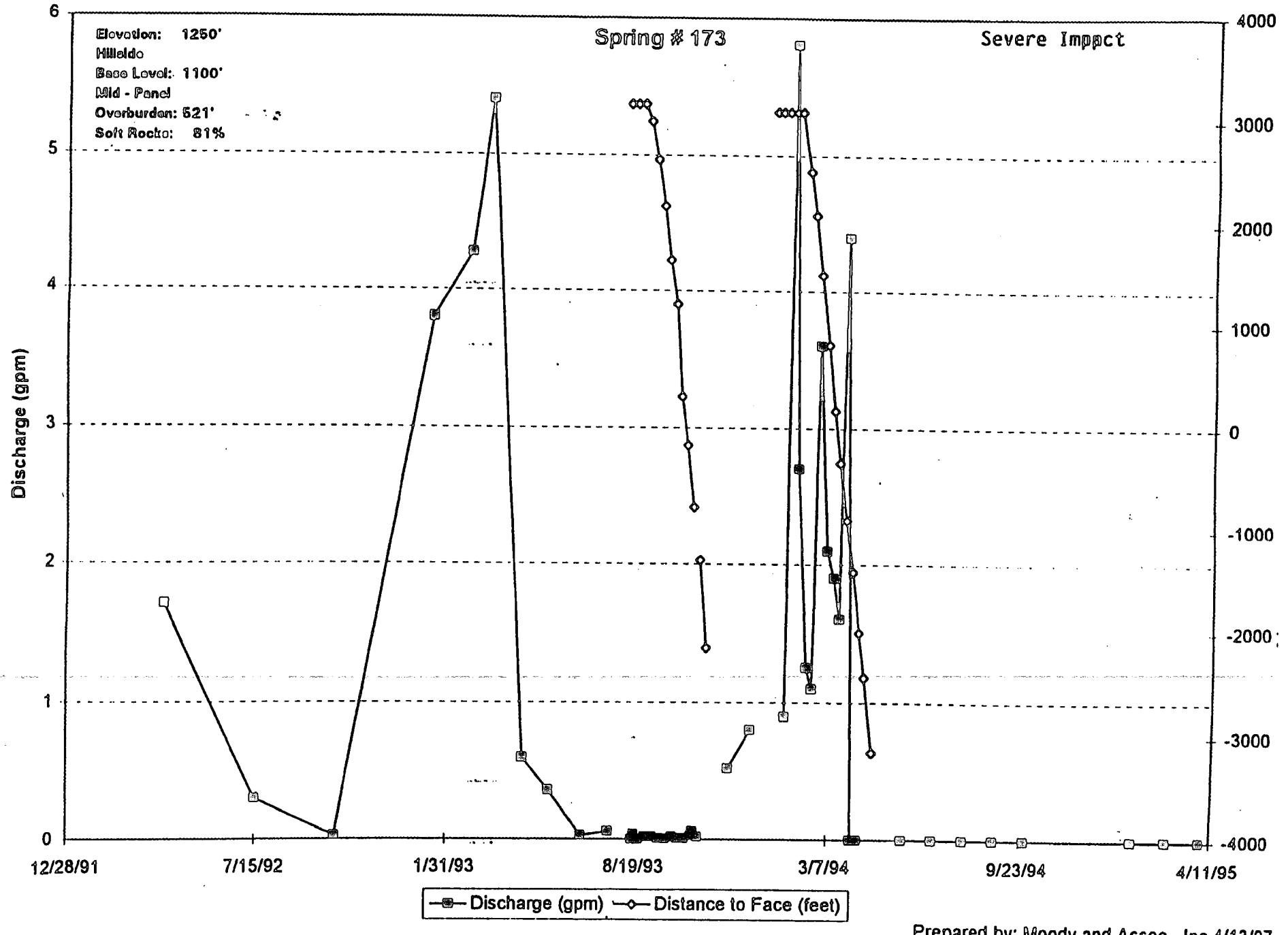
TOVCC 11513



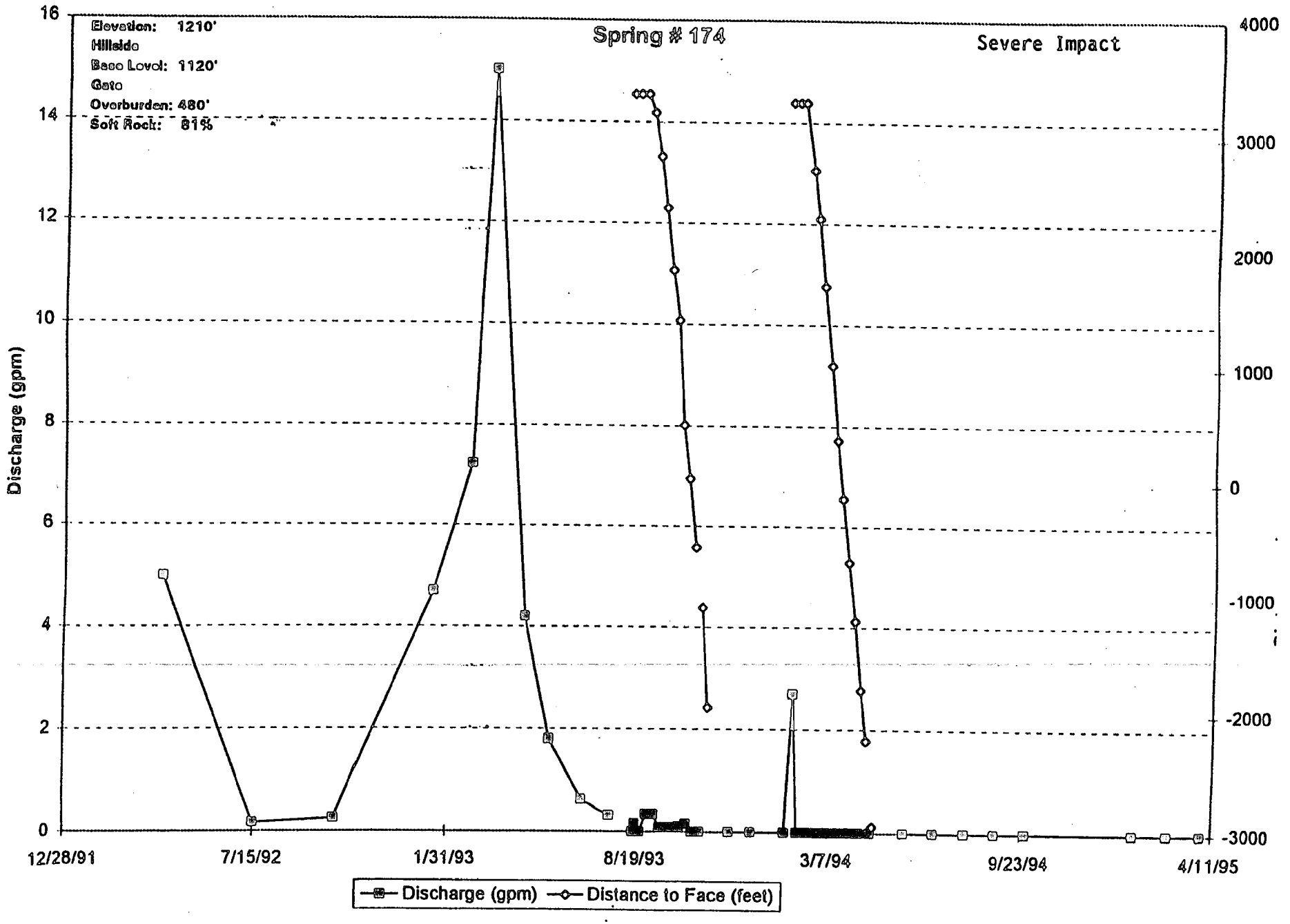
Prepared by: Moody and Assoc., Inc. 4/13/97

TOVCC 11514

0360-18

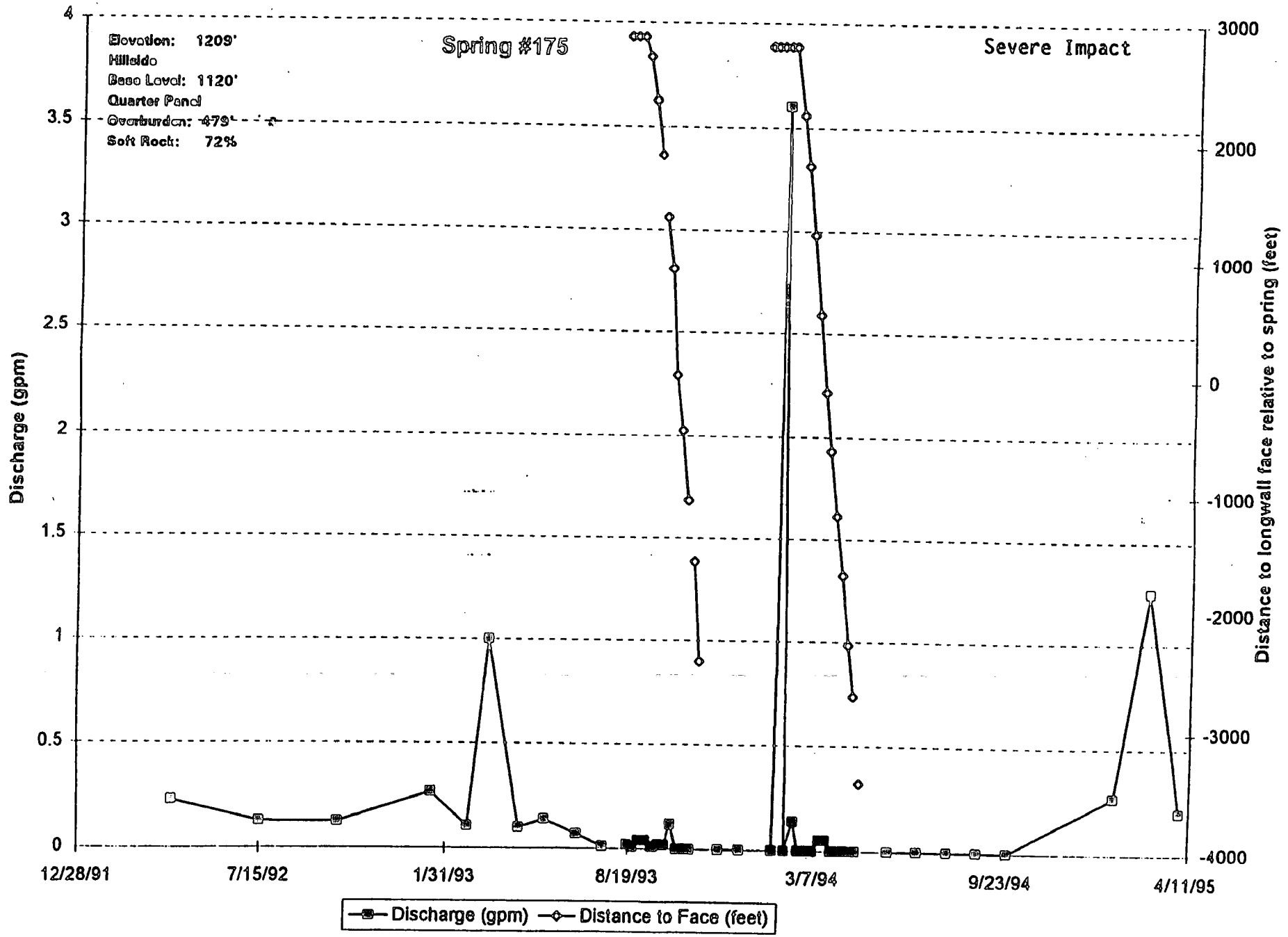


Prepared by: Moody and Assoc., Inc.4/13/97



Prepared by: Moody and Assoc., Inc. 4/13/97

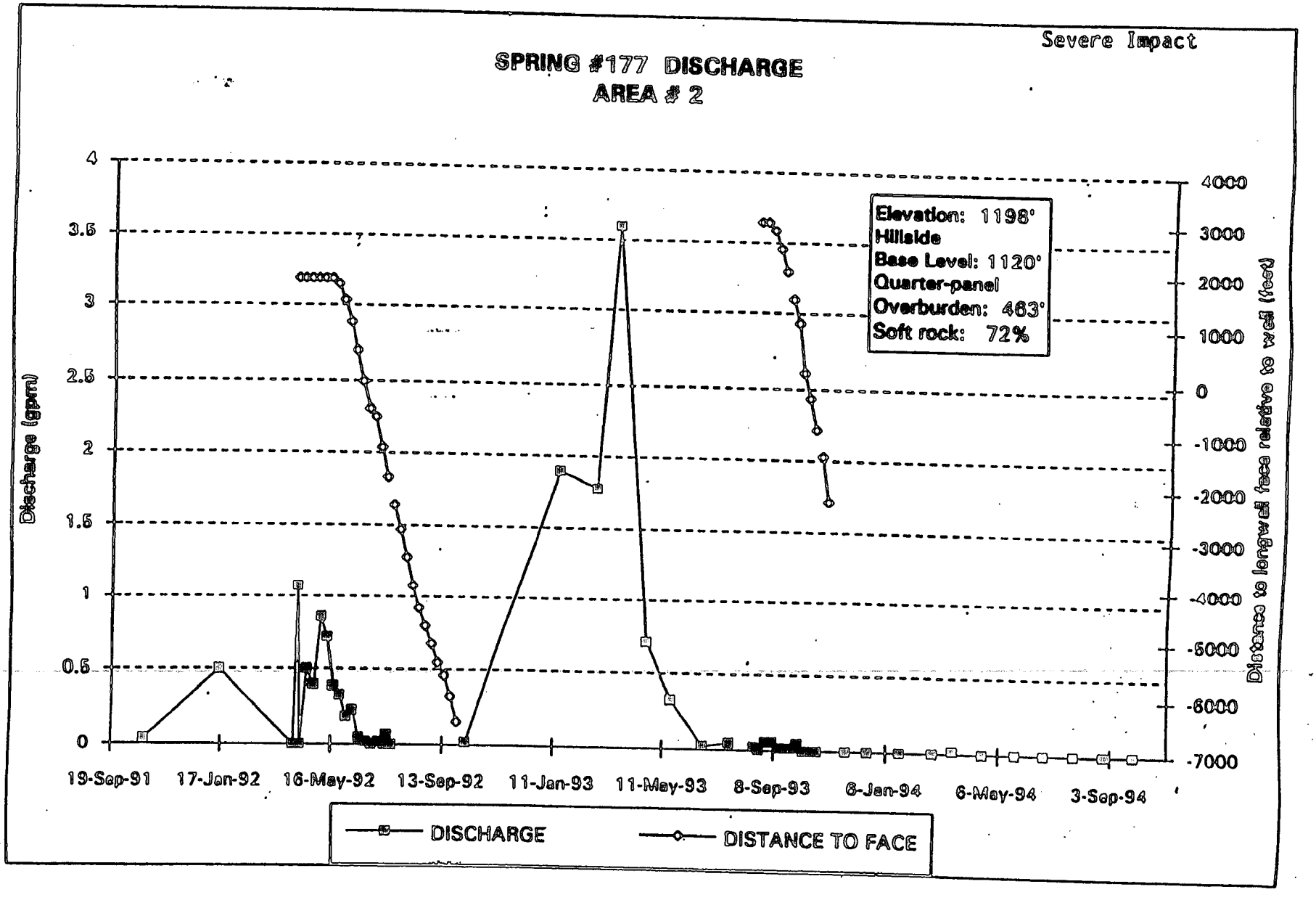
TOVCC 11516



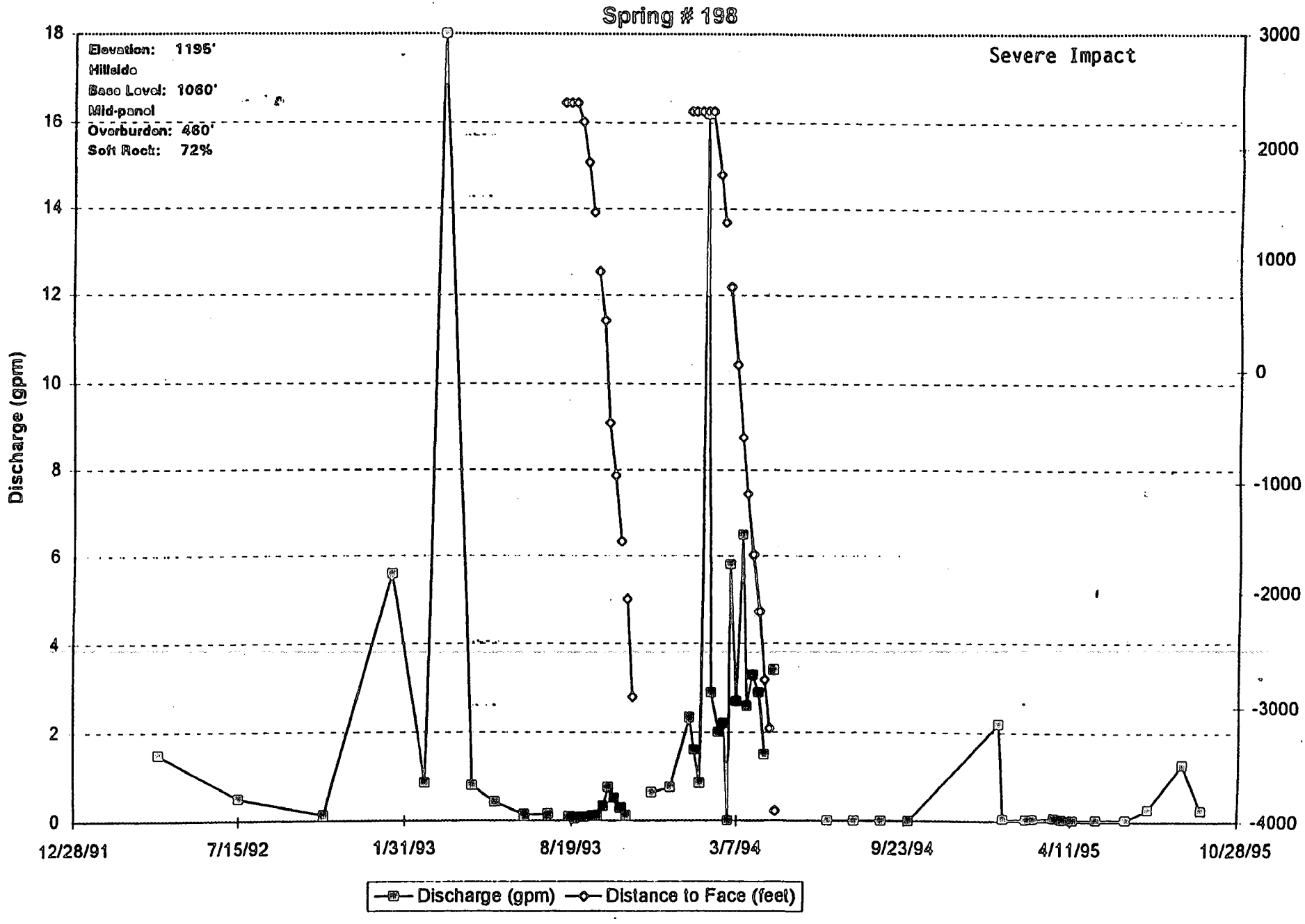
Prepared by: Moody and Assoc. Inc. 4/12/97

TOVCC 11517

Severe Impact



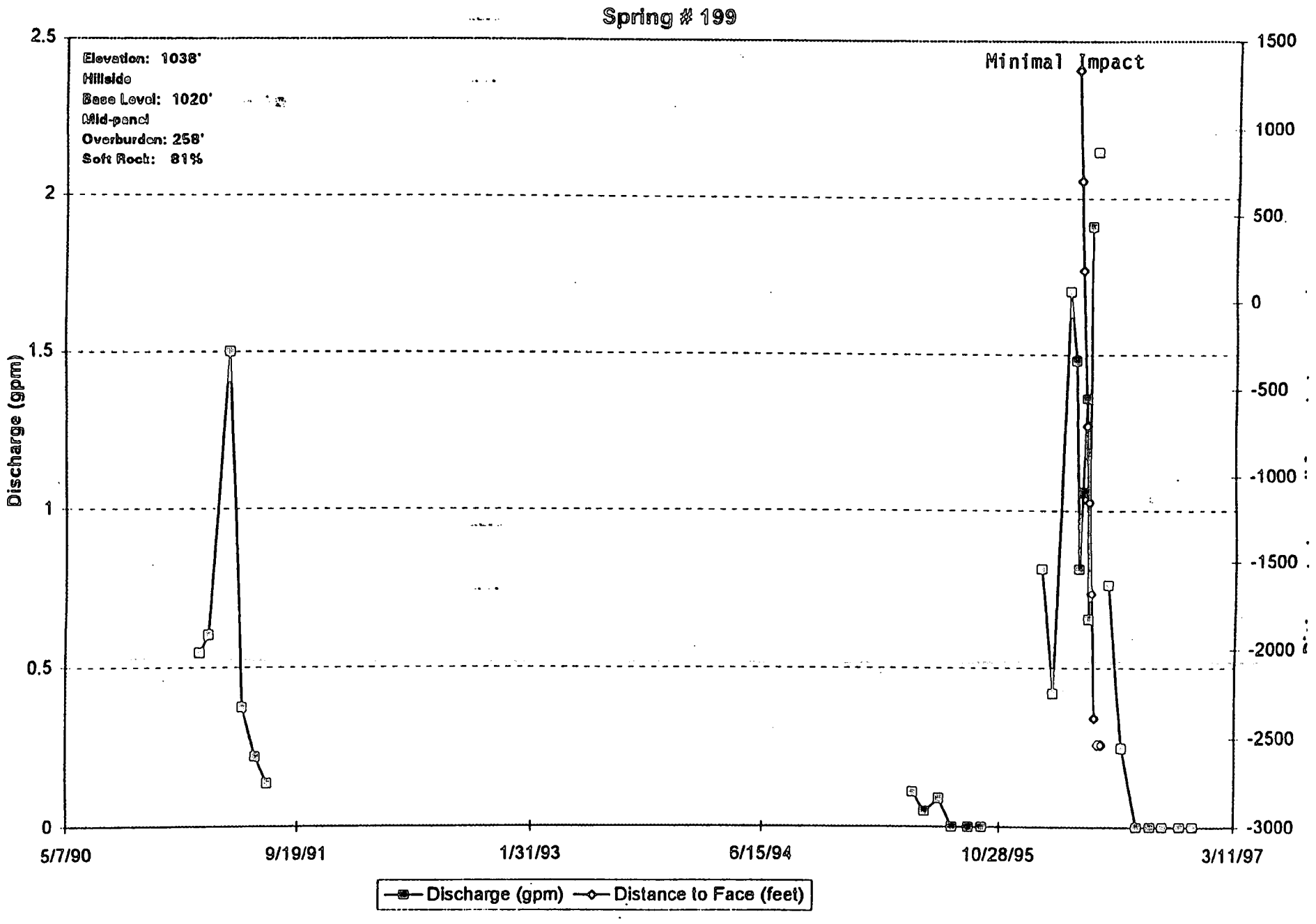
TOVCC 11518



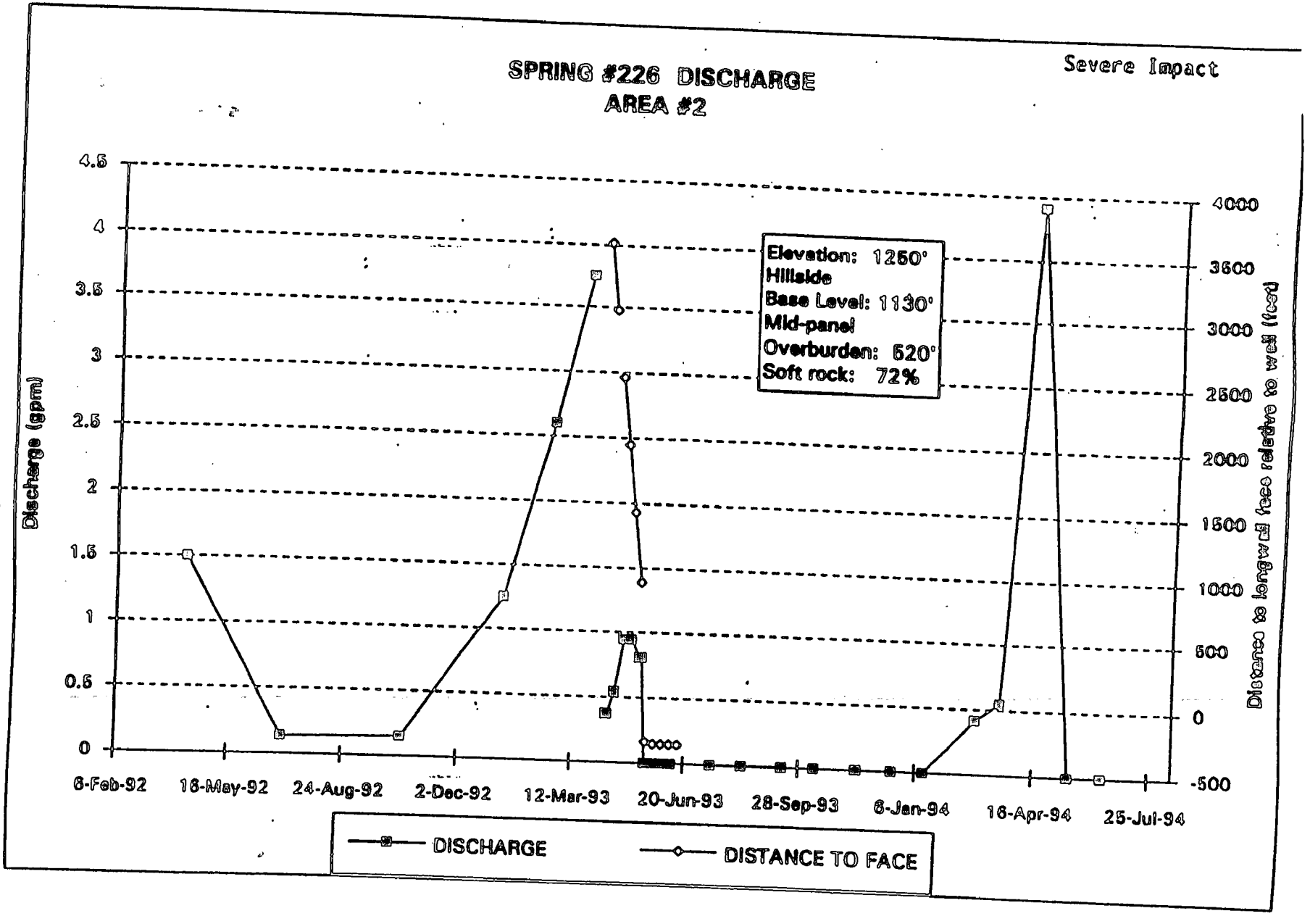
Prepared by: Moody and Assoc., Inc. 4/13/97

TOVCC 11519

0360-18

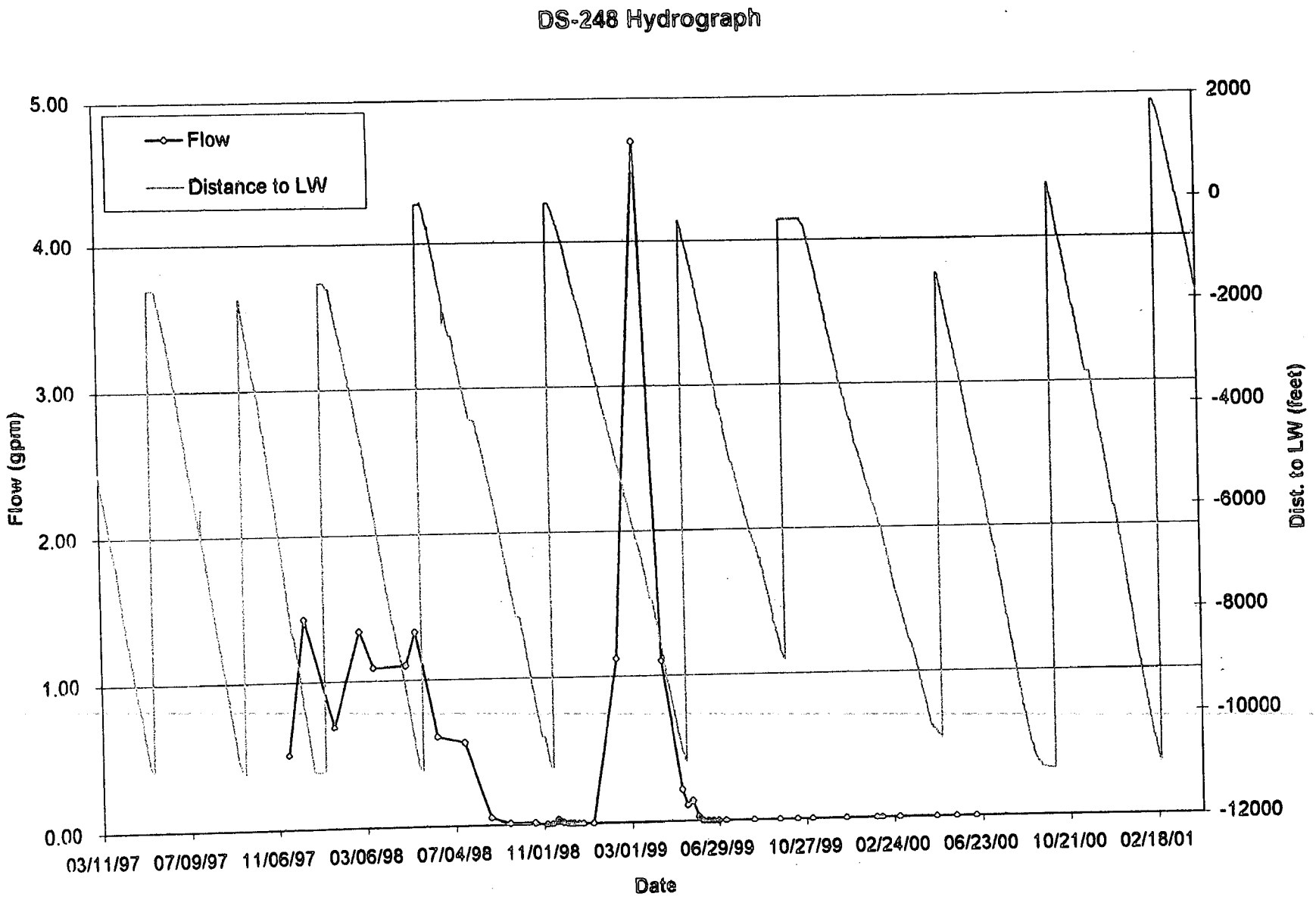


Prepared by: Moody and Assoc., Inc.4/13/97

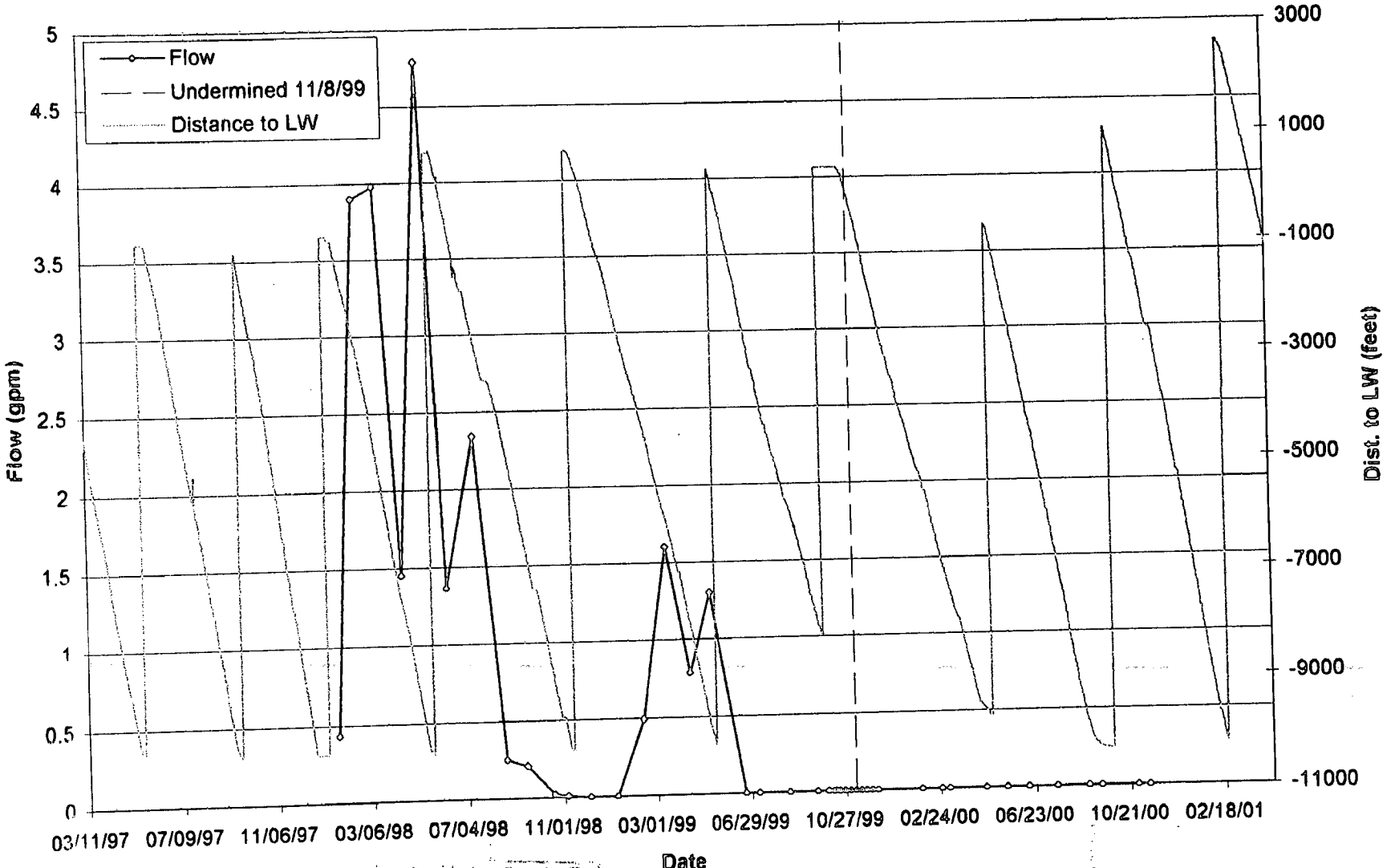


D360-18

TOVCC 11521

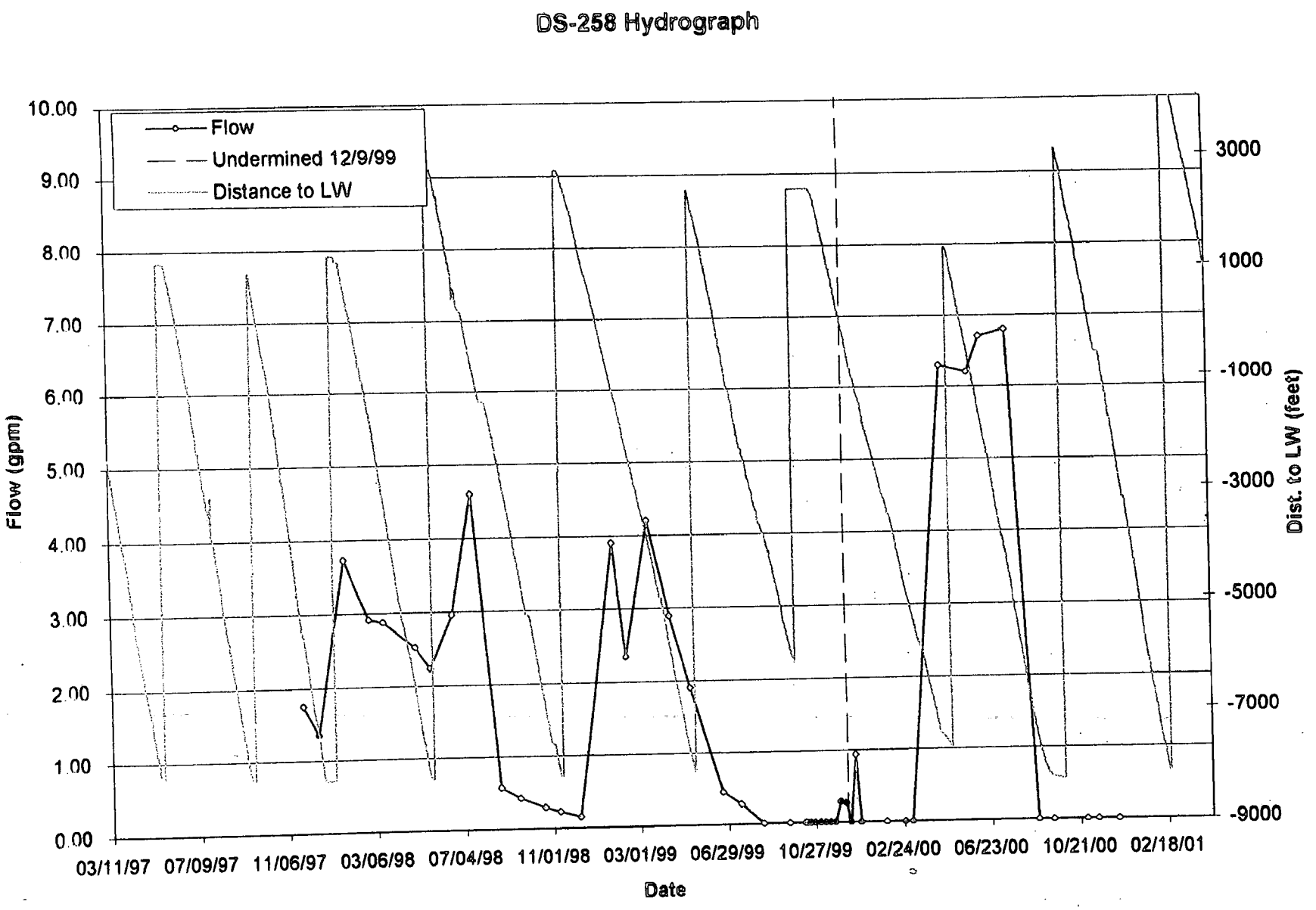

DS-248 Hydrograph
Flow
Distance to LW
Flow (gpm)
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01
Date

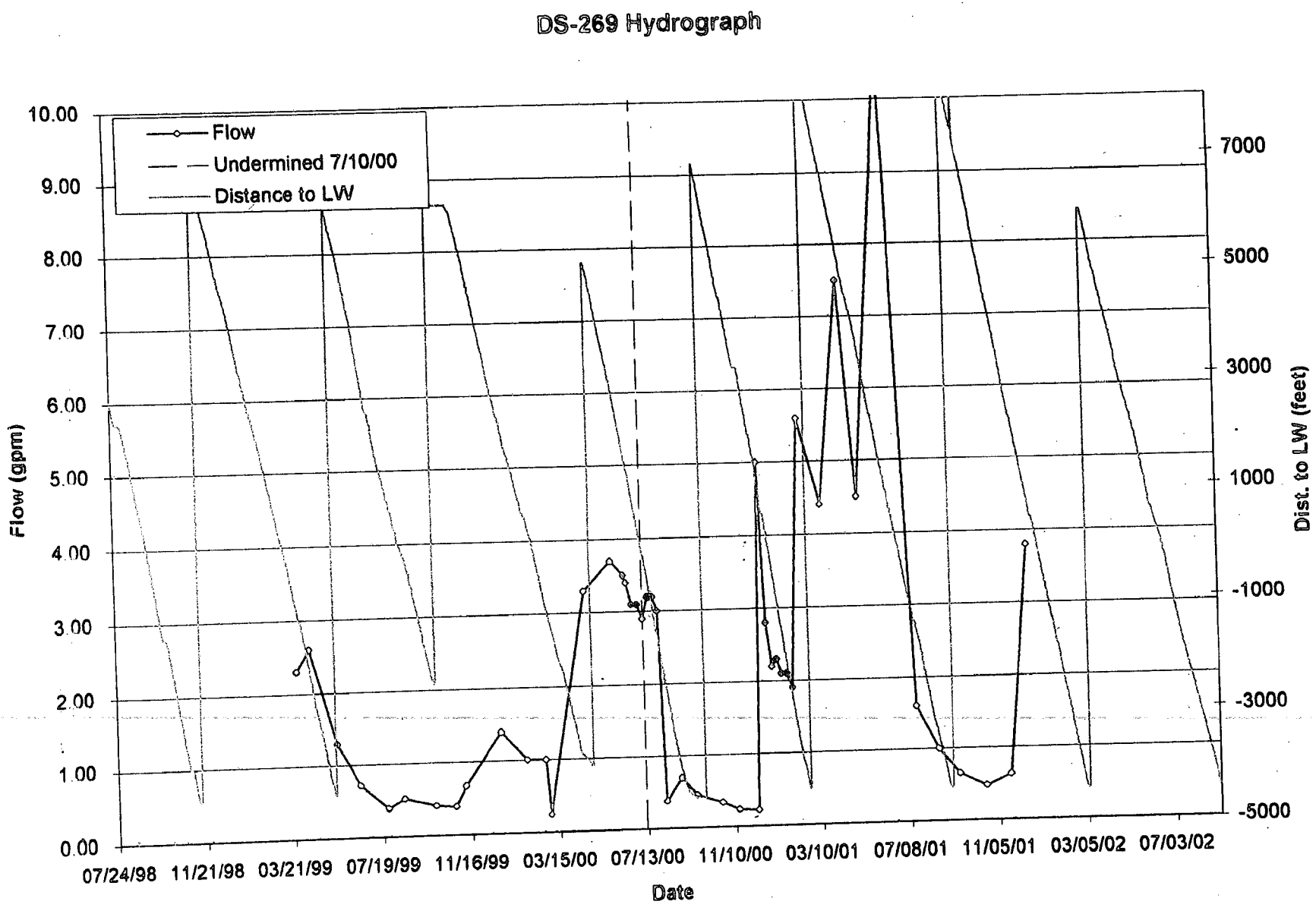
DS-254 Hydrograph

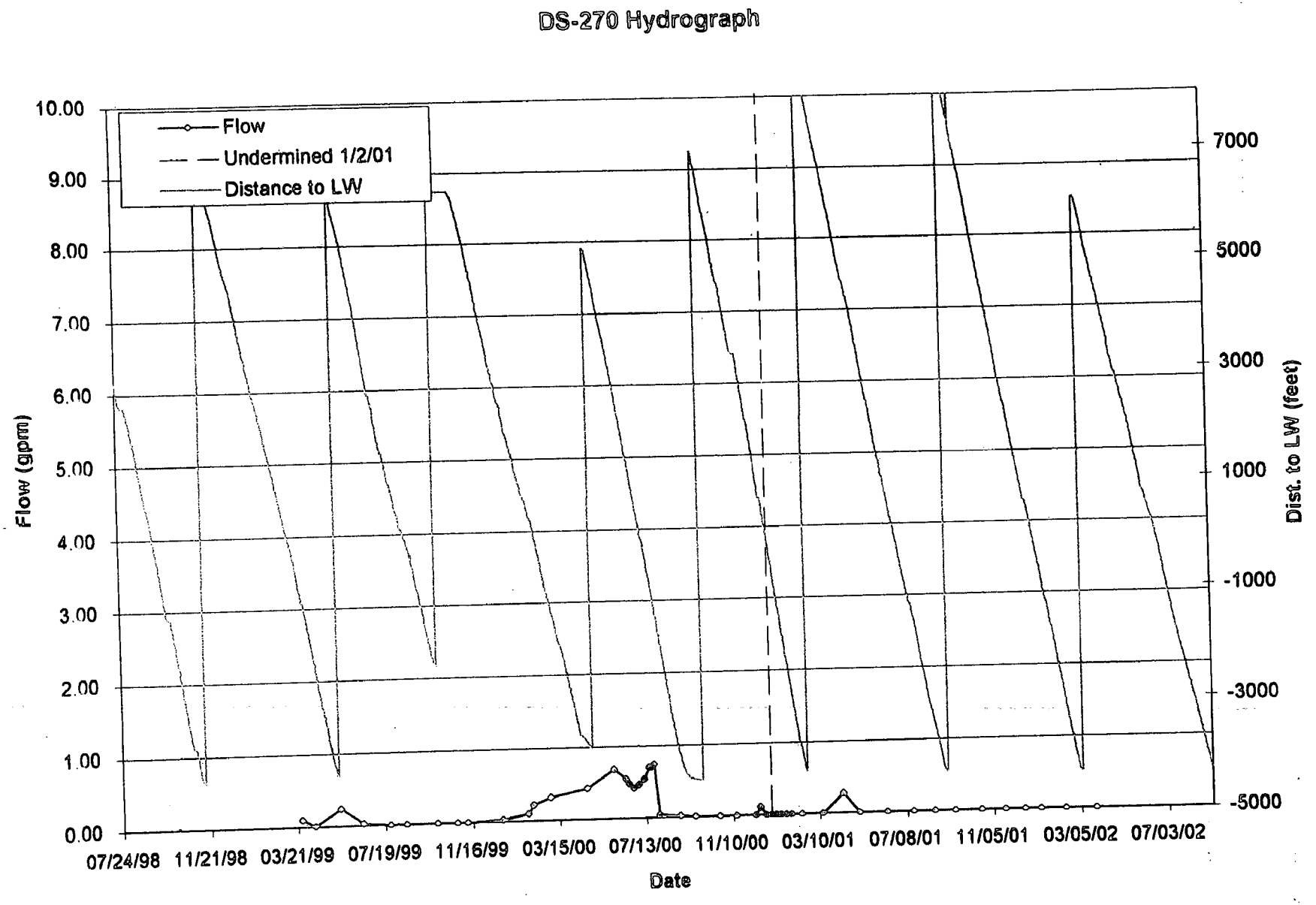


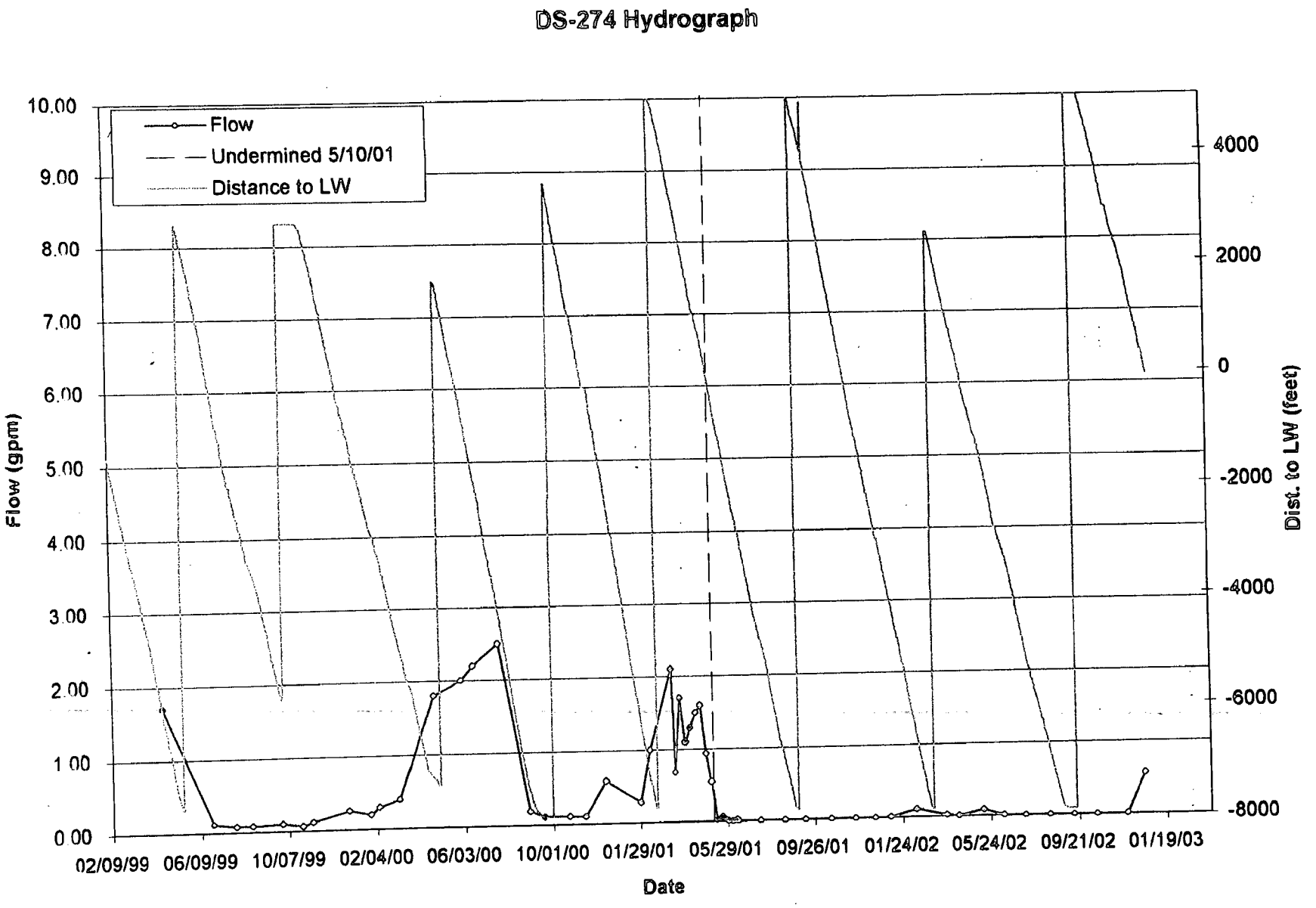
CEIVED
MAY 2 2003

TOVCC 11523


DS-258 Hydrograph
Flow
Undermined 12/9/99
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
3000
1000
-1000
-3000
-5000
-7000
-9000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01
Date


DS-269 Hydrograph
Flow
Undermined 7/10/00
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
7000
5000
3000
1000
-1000
-3000
-5000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
03/10/01
07/08/01
11/05/01
03/05/02
07/03/02
Date


DS-270 Hydrograph
Flow
Undermined 1/2/01
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
7000
5000
3000
1000
-1000
-3000
-5000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
03/10/01
07/08/01
11/05/01
03/05/02
07/03/02
Date


DS-274 Hydrograph
Flow
Undermined 5/10/01
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
4000
2000
0
-2000
-4000
-6000
-8000
02/09/99
06/09/99
10/07/99
02/04/00
06/03/00
10/01/00
01/29/01
05/29/01
09/26/01
01/24/02
05/24/02
09/21/02
01/19/03
Date

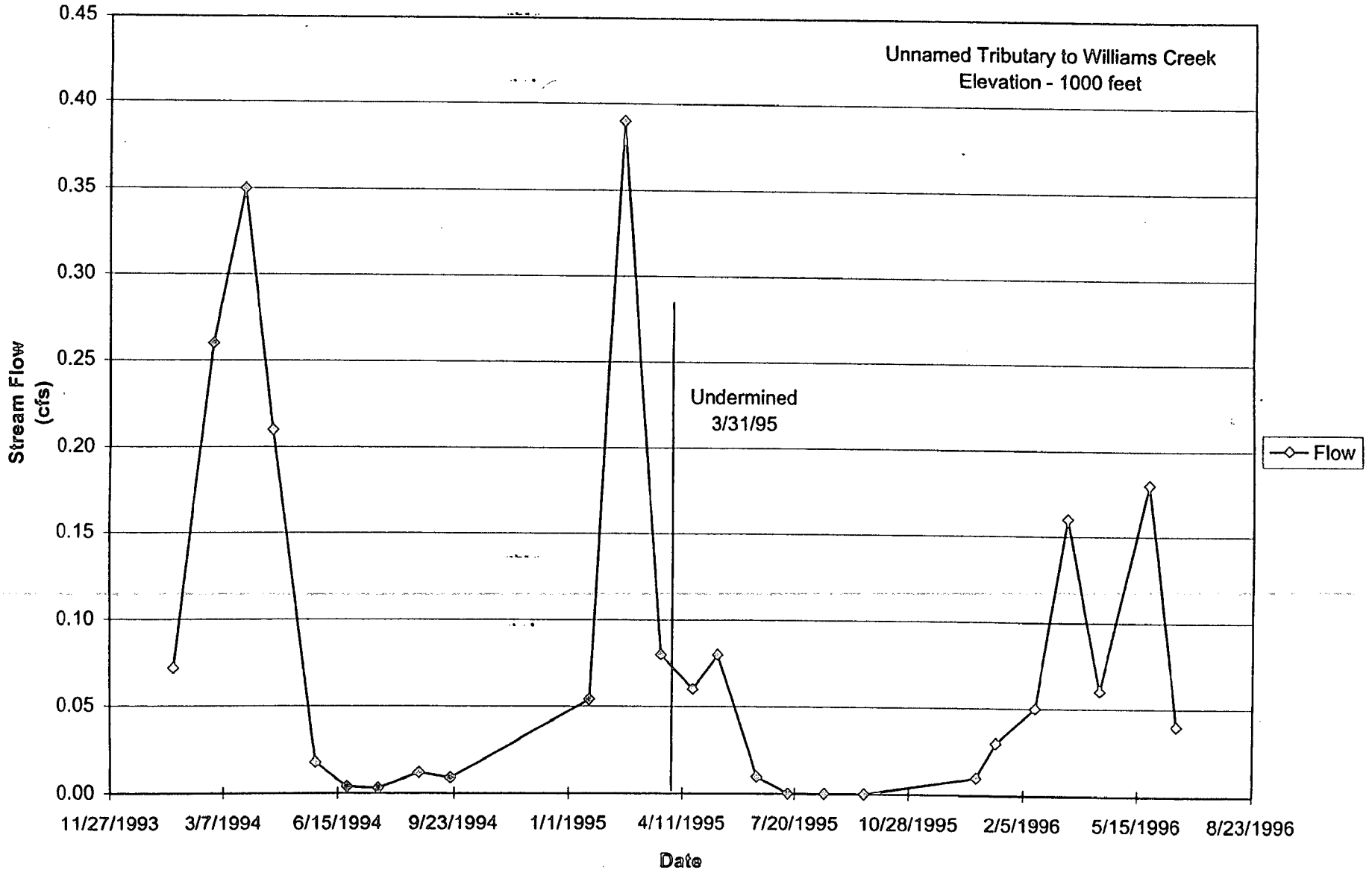
APPENDIX B

Powhatan No. 6 Mine

Stream Hydrographs

D360-1

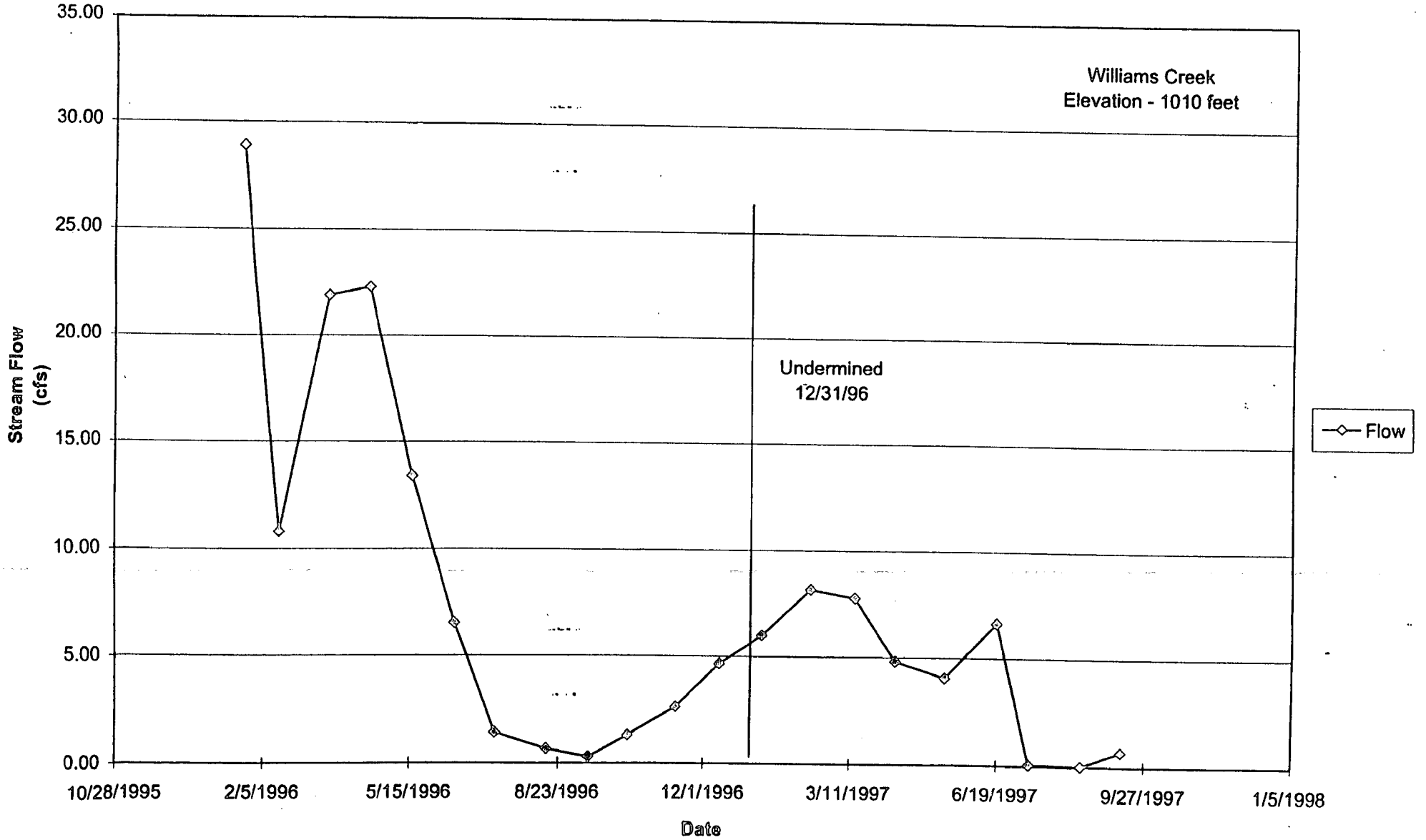
Upstream Monitoring Point
U 29 - C
Steam Flow Hydrograph



TOVCC 11529

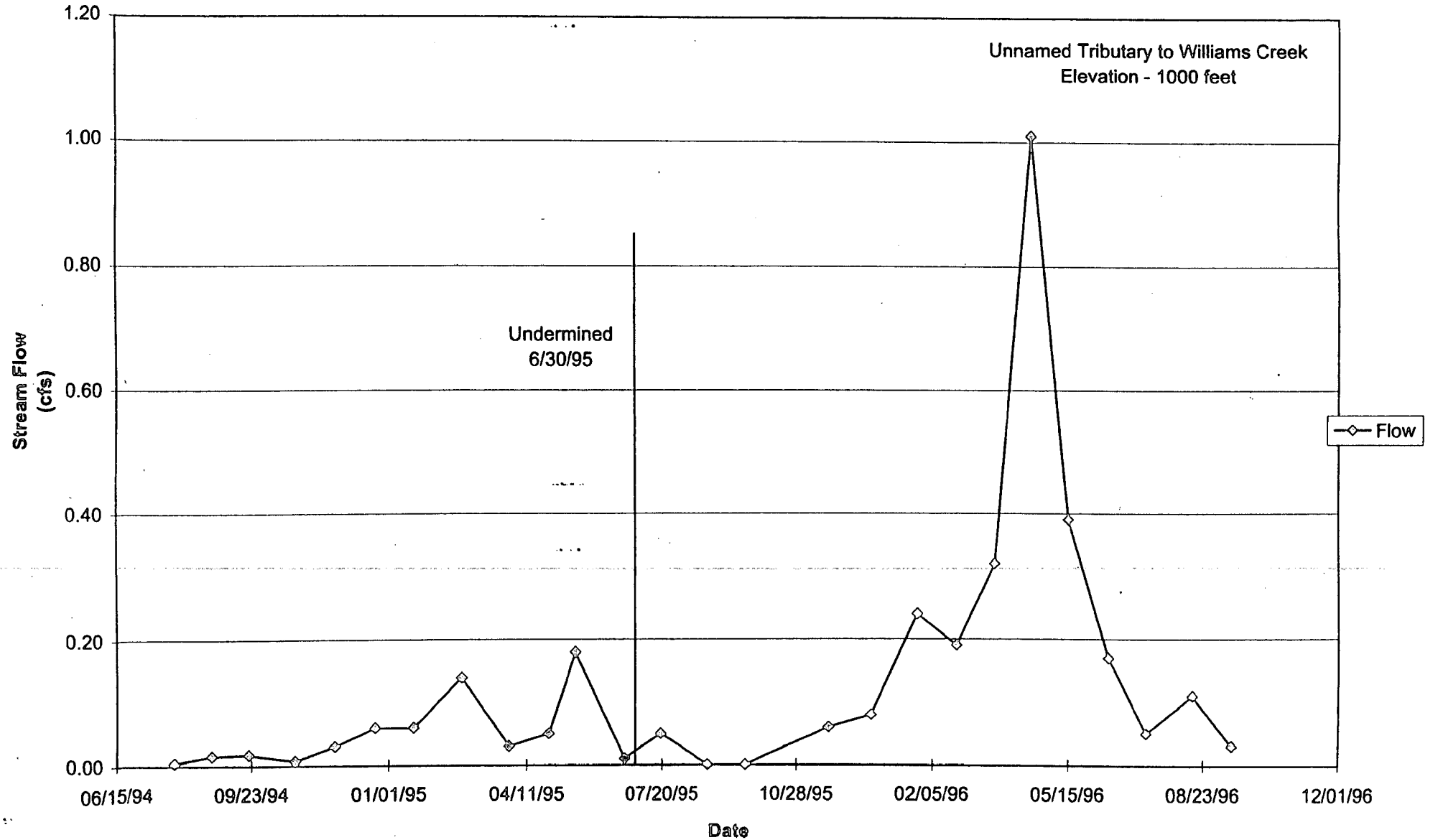
0360-18

Upstream Monitoring Point
U34 - 038
Stream Flow Hydrograph



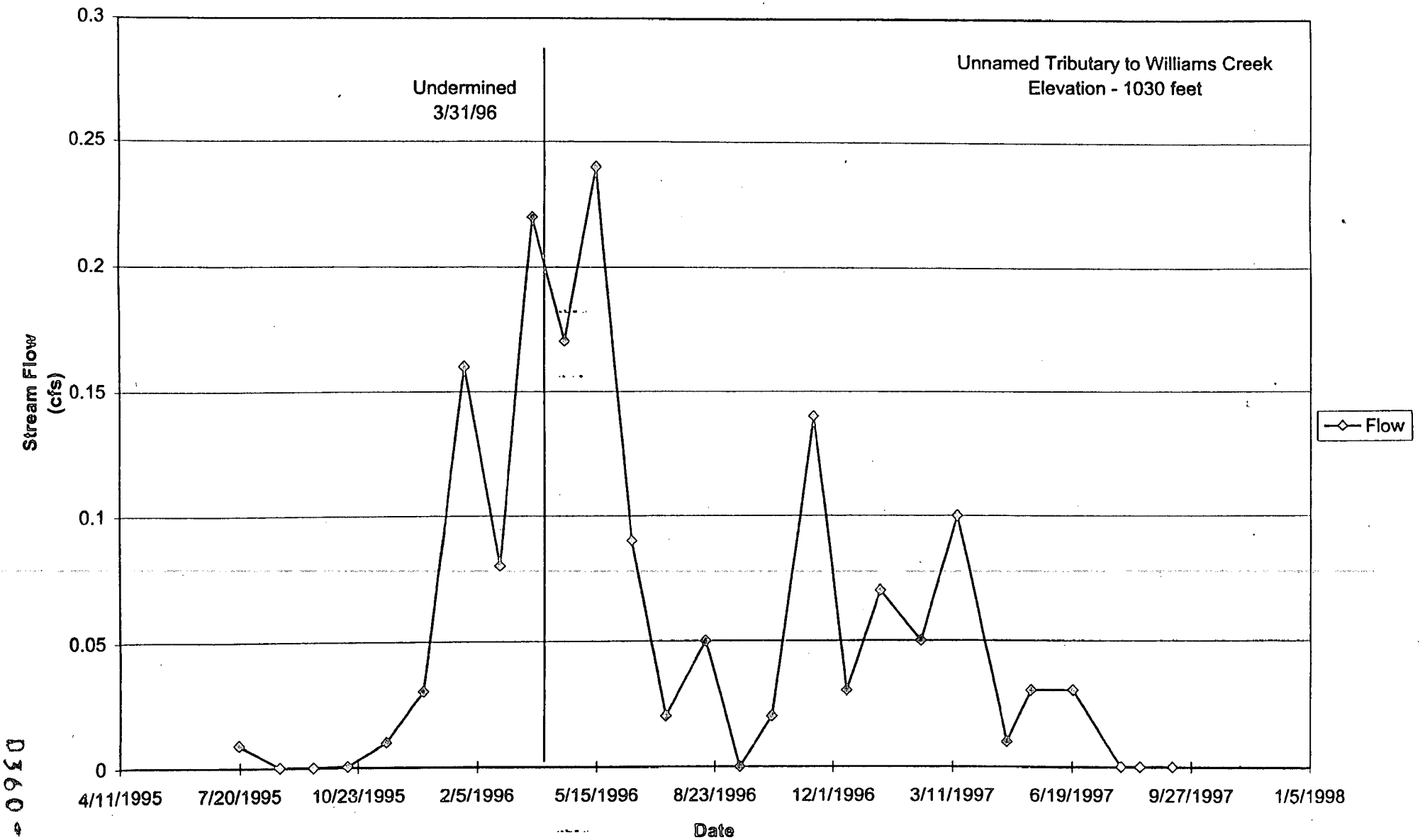
TOVCC 11530

Upstream Monitoring Point
U 34 - 067
Stream Flow Hydrograph



TOVCC 11531

Upstream Monitoring Point
U 034-144
Stream Flow Hydrograph



TOVCC 11532

D360-13

ADDENDUM TO PAGE 18, PART 2, F (1)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

DEVELOPED SUPPLIES OF GROUND AND SURFACE WATER THAT MAY BE IMPACTED AS A RESULT OF THE PROPOSED OPERATION

Of the supplies listed in Attachment 14C and 14D, impacts shown in Tables A and B are expected as a result of the proposed operation. According to the PHC, these sources may be impacted as a result of mining as shown on Tables A and B.

Ohio Valley Coal Company
Application Area D-0360-12

Well Data Predicted Hydrologic Impacts Summary

Source	Surface Elevation	Well Depth	Bottom Elevation	Coal Elevation	Overburden Depth surface	Overburden Depth well bottom	Percent soft rocks	Topo Position	Panel Position	Distance to Nearest Panel Edge	Use	Predicted Hydrologic Impact
WL 116	1260	56	1204	725	535	479	66.3	Hilltop	Outside	1170	Domestic	No impact expected
W 134A	1300	Buried		730	570		66.3	Hilltop	Outside	1490	Domestic	No impact expected
W 138	1303	26	1277	735	568	542	66.3	Hilltop	Outside	1610	Domestic	No impact expected
W 153	1269	62	1207	740	529	467	77	Hilltop	Mains	690	Domestic	Impacts as described in the PHC
W 154	1276	Buried		740	536		77	Hilltop	Mains	580	Commercial	Impacts as described in the PHC
W 156	1280	Buried		740	540		77	Hilltop	Mains	410	Domestic	Impacts as described in the PHC
W 160	1310	95	1215	755	555	460	75	Hilltop	Quarter Panel	50	Occasional Domestic	Impacts as described in the PHC
DW 161	1290	26	1264	755	535	509	75	Hilltop	Gate	40	Domestic	Impacts as described in the PHC
DW 162	1296	29	1267	755	541	512	75	Hilltop	Quarter Panel	50	Occasional Domestic	Impacts as described in the PHC
W 164	1200	65	1135	740	460	395	77	Hillside	Mains	360	Domestic	Impacts as described in the PHC
W 165	1140	71	1069	740	400	329	77	Hillside	Barrier Pillar	210	Domestic	Impacts as described in the PHC
W 166	1106	108	998	765	341	233	70.7	Hillside	Quarter Panel	175	Ag/Domestic	Impacts as described in the PHC
W 167	1105	96	1009	765	340	244	70.7	Hillside	Mid Panel	385	Domestic	Impacts as described in the PHC
W 168	1112	62	1050	775	337	275	52	Valley Bottom	Quarter Panel	160	Domestic	Impacts as described in the PHC
DW 169	1100	25	1075	775	325	300	52.5	Valley Bottom	Quarter Panel	160	Domestic	Impacts as described in the PHC
DW 173	1166	25	1141	770	396	371	51.1	Hilltop	Outside	400	Occasional Domestic	Impacts as described in the PHC
W 174	1117	101	1016	770	347	246	51	Hilltop	Outside	560	Domestic	Impacts as described in the PHC
W 229	1290	93	1197	740	550	457	80.3	Hilltop	Gate	50	Domestic	Impacts as described in the PHC
W 229A	1285	80	1205	740	545	465	80.3	Hilltop	Gate	50	Domestic	Impacts as described in the PHC
W 289	1300	54	1246	740	560	506	80.3	Hilltop	Outside	1020	Domestic	No impact expected
W 291	1275	36	1239	760	515	479	80.3	Hilltop	Mid Panel	400	Domestic	Impacts as described in the PHC
W 292	1310	94	1216	740	570	476	80.3	Hilltop	Mains	175	Domestic	Impacts as described in the PHC
WL 294	1125	57	1068	775	350	293	52.5	Valley Bottom	Quarter Panel	80	Domestic	Impacts as described in the PHC
W 295	1264	42	1222	745	519	477	80.3	Hilltop	Gate	50	Domestic	Impacts as described in the PHC
W 296	1290	88	1202	750	540	452	80.3	Hilltop	Quarter Panel	250	Domestic	Impacts as described in the PHC
W 299	1324	103	1221	745	579	476	80.3	Hilltop	Gate	10	Domestic	Impacts as described in the PHC
W 300	1321	116	1205	745	576	460	80.3	Hilltop	Quarter Panel	50	Domestic	Impacts as described in the PHC
DW 303	1267	23	1244	765	502	479	80.3	Hilltop	Gate	30	Domestic	Impacts as described in the PHC
W 305	1306	90	1216	755	551	461	80.3	Hilltop	Quarter Panel	200	Domestic	Impacts as described in the PHC
DW 306	1300	60	1240	760	540	480	74.2	Hilltop	Quarter Panel	150	Domestic	Impacts as described in the PHC
W 307	1289	75	1214	750	539	464	80.3	Hilltop	Quarter Panel	40	Domestic	Impacts as described in the PHC
W 308	1266	Buried		745	521		80.3	Hillside	Quarter Panel	60	Domestic	Impacts as described in the PHC
W 309	1284	68	1216	760	524	456	74.2	Hillside	Mid Panel	180	Domestic	Impacts as described in the PHC
WL 310	1324	100	1224	755	569	469	75	Hilltop	Gate	20	Domestic	Impacts as described in the PHC
WL 311	1309	100	1209	755	554	454	75	Hilltop	Quarter Panel	150	Domestic	Impacts as described in the PHC
W 312A	1315	95	1220	755	560	465	75	Hilltop	Quarter Panel	50	Domestic	Impacts as described in the PHC
W 314A	1270	138	1132	760	510	372	74.2	Hillside	Mid Panel	375	Domestic	Impacts as described in the PHC
WL 313	1295	90	1205	755	540	450	75	Hilltop	Quarter Panel	100	Agricultural	Impacts as described in the PHC
W 314	1265	73	1192	755	510	437	80.3	Hillside	Mid Panel	120	Domestic	Impacts as described in the PHC
W 315	1280	88	1192	775	505	417	74.2	Hilltop	Quarter Panel	40	Domestic	Impacts as described in the PHC
DW 318	1294	18	1276	775	519	501	74.2	Hilltop	Mid Panel	175	Domestic	Impacts as described in the PHC
WL 319	1325	110	1215	760	565	455	75	Hilltop	Quarter Panel	330	Domestic	Impacts as described in the PHC
WL 321	1300	79	1221	755	545	466	75	Hilltop	Gate	40	Domestic	Impacts as described in the PHC
W 322	1310	Buried		752	558		75	Hilltop	Gate	40	Domestic	Impacts as described in the PHC
W 323	1138	120	1018	775	363	243	52.5	Hillside	Quarter Panel	120	Domestic	Impacts as described in the PHC
W 374	1285	51	1234	810	475	424	81	Hilltop	Outside	1340	Domestic	No impact expected
W 396	1305	70	1235	785	520	450	81	Hilltop	Mid Panel	340	Domestic	Impacts as described in the PHC
WL 397	1310	51	1259	780	530	479	81	Hilltop	Mid Panel	400	Domestic	Impacts as described in the PHC
WL 398	1303	60	1243	780	523	463	81	Hilltop	Gate	0	Domestic	Impacts as described in the PHC
W 400	1315	70	1245	780	535	465	59.6	Hilltop	Barrier Pillar	250	Domestic	Impacts as described in the PHC
W 403	1345	119	1226	760	585	466	75	Hilltop	Mid Panel	275	Domestic	Impacts as described in the PHC
DW 408	1305	33	1272	780	525	492	81	Hilltop	Outside	100	Domestic	Impacts as described in the PHC
WL 419	1261	101	1160	775	486	385	59.6	Hilltop	Mid Panel	325	Domestic	Impacts as described in the PHC
W 452	1170	68.5	1101.5	765	405	336.5	81	Hillside	Outside	1150	Domestic	No impact expected
W 458	1070	25	1045	770	300	275	52.5	Valley Bottom	Mid Panel	350	Domestic	Impacts as described in the PHC

Total	55								
Average	1259	72	1184	758	500	424	73.0	Hillside-10	Outside-9
Median	1289	70.5	1214.5	755	530	460	75	Hilltop-41	Gate-10
Minimum	1070	18	998	725	300	233	51	Valley-4	Quarter-18
Maximum	1345	138	1277	810	585	542	81		Middle-11
									Mains-5
									Pillars-2

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TABLE B

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Ohio Valley Coal Company
Application Area D-0360-12

Spring / Stream Data Predicted Hydrologic Impacts Summary

Source	Pond	Surface Elevation (feet)	Coal Elevation (feet)	Overburden Depth (feet)	Percent soft rocks	Topo Position	Panel Position	Distance to Nearest Panel Edge (feet)	Use	Predicted Hydrologic Impact
DS- 11A		1190	740	450	80.3	Hillside	Gate	80	Agricultural	Impacts as described in the PHC
DS- 11B		1180	750	430	80.3	Hillside	Quarter Panel	20	Agricultural	Impacts as described in the PHC
DS- 11C		1180	740	440	80.3	Hillside	Gate	75	Agricultural	Impacts as described in the PHC
DS- 11D		1120	736	384	80.3	Hillside	Quarter Panel	60	Agricultural	Impacts as described in the PHC
DS- 69		1260	720	540	66.3	Hillside	Outside	2000	Agricultural	No impact expected
DS- 70		1178	725	453	66.3	Hillside	Outside	220	Agricultural	Impacts as described in the PHC
DS- 70A		1280	725	555	66.3	Hillside	Outside	425	Agricultural	Impacts as described in the PHC
DS- 71		1282	720	562	66.3	Hilltop	Outside	640	Agricultural	No impact expected
DS- 73		1173	735	438	63.3	Hillside	Outside	1360	Agricultural	No impact expected
DS- 74		1264	740	524	77	Hilltop	Gate	350	Agricultural	Impacts as described in the PHC
DS- 75		1155	740	415	77	Hillside	Gate	240	Agricultural	Impacts as described in the PHC
DS- 76		1200	740	460	77	Hillside	Quarter Panel	80	Agricultural	Impacts as described in the PHC
DS- 77		1230	745	485	77	Hillside	Quarter Panel	20	Agricultural	Impacts as described in the PHC
DS- 111		1121	770	351	52.5	Hillside	Quarter Panel	175	Domestic	Impacts as described in the PHC
DS- 118		1089	760	329	70.7	Hillside	Outside	1270	Domestic	No impact expected
DS- 223		1122	810	312	51.1	Hillside	Outside	160	Agricultural	Impacts as described in the PHC
DS- 226A		1173	770	403	51.1	Hilltop	Outside	500	Agricultural	Impacts as described in the PHC
DS- 226B		1173	770	403	51.1	Hillside	Outside	830	Agricultural	No impact expected
DS- 227		1290	765	525	74.2	Hillside	Quarter Panel	200	Ag/Domestic	Impacts as described in the PHC
DS- 228		1290	765	525	74.2	Hillside	Mid Panel	420	Agricultural	Impacts as described in the PHC
DS- 229		1215	765	450	74.2	Hillside	Quarter Panel	200	Agricultural	Impacts as described in the PHC
DS- 230		1170	770	400	74.2	Valley Bottom	Gate	50	Agricultural	Impacts as described in the PHC
DS- 231		1230	770	460	74.2	Hillside	Mid Panel	450	Agricultural	Impacts as described in the PHC
DS- 232		1237	760	477	74.2	Hillside	Gate	50	Agricultural	Impacts as described in the PHC
DS- 233		1259	760	499	74.2	Hilltop	Quarter Panel	175	Agricultural	Impacts as described in the PHC
DS- 235		1179	765	414	74.2	Valley Bottom	Mid Panel	400	Agricultural	Impacts as described in the PHC
DS- 236		1225	760	465	80.3	Valley Bottom	Mid Panel	410	Agricultural	Impacts as described in the PHC
DS- 237		1235	750	485	80.3	Hillside	Mid Panel	410	Agricultural	Impacts as described in the PHC
DS- 240		1170	780	390	74.2	Valley Bottom	Outside	640	Domestic	No impact expected
DS- 241		1200	780	420	52.5	Hilltop	Outside	500	Ag/Domestic	Impacts as described in the PHC

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TABLE B

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Ohio Valley Coal Company
Application Area D-0360-12

Spring / Stream Data Predicted Hydrologic Impacts Summary

Source	Pond	Surface Elevation (feet)	Coal Elevation (feet)	Overburden Depth (feet)	Percent soft rocks	Topo Position	Panel Position	Distance to Nearest Panel Edge (feet)	Use	Predicted Hydrologic Impact
DS- 242		1090	780	310	52.5	Valley Bottom	Outside	210	Agricultural	Impacts as described in the PHC
DS- 243		1220	765	455	74.2	Hillside	Mid Panel	380	Agricultural	Impacts as described in the PHC
DS- 244		1290	775	515	74.2	Hilltop	Quarter Panel	250	Agricultural	Impacts as described in the PHC
DS- 245		1280	760	520	74.2	Hilltop	Mid Panel	250	Agricultural	Impacts as described in the PHC
DS- 246		1284	760	524	74.2	Hilltop	Mid Panel	200	Agricultural	Impacts as described in the PHC
DS- 275		1230	775	455	81	Hillside	Mid Panel	410	Domestic	Impacts as described in the PHC
DS- 276		1260	780	480	81	Hillside	Mid Panel	450	Agricultural	Impacts as described in the PHC
DS- 278		1230	780	450	81	Hillside	Mid Panel	300	Agricultural	Impacts as described in the PHC
DS- 279		1240	775	465	81	Hillside	Mid Panel	250	Agricultural	Impacts as described in the PHC
DS- 280		1250	770	480	81	Hillside	Quarter Panel	80	Agricultural	Impacts as described in the PHC
DS- 281		1295	745	550	77	Hilltop	Quarter Panel	110	Agricultural	Impacts as described in the PHC
DS- 284		1170	775	395	81	Hillside	Quarter Panel	200	Agricultural	Impacts as described in the PHC
DS- 285		1190	800	390	81	Hillside	Outside	900	Domestic	No impact expected
DS- 289		1190	810	380	81	Hillside	Outside	940	Agricultural	No impact expected
DS- 290		1185	775	410	82	Hillside	Quarter Panel	120	Ag/Domestic	Impacts as described in the PHC
DS- 291		1155	775	380	82	Hillside	Gate	350	Ag/Domestic	Impacts as described in the PHC
DS- 292		1130	775	355	82	Valley Bottom	Gate	450	Agricultural	Impacts as described in the PHC
DS- 293		1195	770	425	82	Hillside	Mid Panel	430	Agricultural	Impacts as described in the PHC
DS- 294		1145	770	375	82	Valley Bottom	Mid Panel	230	Agricultural	Impacts as described in the PHC
DS- 295		1145	750	395	71.8	Hillside	Gate	50	Agricultural	Impacts as described in the PHC
DS- 296		1130	750	380	71.8	Hillside	Outside	860	Agricultural	No impact expected
DS- 306		1170	760	410	71.8	Hillside	Outside	1000	Agricultural	No impact expected
DS- 307		1140	760	380	71.8	Hillside	Outside	950	Agricultural	No impact expected
DS- 308		1185	760	425	71.8	Hillside	Outside	600	Agricultural	No impact expected
DS- 309		1130	770	360	71.8	Hillside	Outside	500	Agricultural	Impacts as described in the PHC
Total Springs		55								
Average		1203	763	439	73	Hillside-39	Outside-19			
Median		1195	765	438	74	Hilltop-9	Gate-9			
Maximum		1295	810	562	82		Quarter-13			
Minimum		1089	720	310	51		Middle-14			

PREDICTED FLOW IMPACTS:		NUMBER
MINIMAL	7%	4 SPRINGS
MODERATE	2%	1 SPRINGS
SEVERE	91%	50 SPRINGS

PREDICTED QUALITY IMPACTS:	IRON AND MANGANESE MAY INCREASE TEMPORARILY

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TABLE B

Addendum to Page 18, Part 2, F(1)

Ohio Valley Coal Company
Application Area D-0360-12

Spring / Stream Data Predicted Hydrologic Impacts Summary

Source	Pond	Surface Elevation (feet)	Coal Elevation (feet)	Overburden Depth (feet)	Percent soft rocks	Topo Position	Panel Position	Distance to Nearest Panel Edge (feet)	Use	Predicted Hydrologic Impact
U34- H		1100	765	335	51	Hillside	Outside	600	Agricultural	No impact expected
U34- G		1085	765	320	51	Hillside	Outside	1300	Agricultural	No impact expected
U34- 167	P-8	1220	775	445	74.2	Hillside	Quarter	40	Agricultural	Impacts as described in the PHC
U34- 166		1075	775	300	52.5	Valley	Quarter Panel	300	Agricultural	Impacts as described in the PHC
U34- 163		1115	780	335	52.5	Valley	Outside	110	Agricultural	Impacts as described in the PHC
U34- 150		1152	790	362	74.2	Valley	Outside	710	Agricultural	No impact expected
U34- 149		1190	790	400	74.2	Valley	Outside	850	Agricultural	No impact expected
U34- 148	P-9	1225	790	435	75	Valley	Quarter Panel	25	Agricultural	Impacts as described in the PHC
U34- 146		1138	765	373	70	Valley	Gate	30	Agricultural	Impacts as described in the PHC
U34- 133	P-10	1073	760	313	70.7	Hillside	Outside	850	Agricultural	No impact expected
U34- 052		1170	750	420	77	Hillside	Outside	350	Agricultural	Impacts as described in the PHC
U34- 047		1115	750	365	77	Hillside	Outside	550	Agricultural	Impacts as described in the PHC
U34- 046		1156	750	406	77	Valley	Mid Panel	375	Agricultural	Impacts as described in the PHC
U34- 028		1070	765	305	70.7	Hillside	Outside	1200	Agricultural	No impact expected
U34- 027		1038	765	273	70.7	Valley	Gate	300	Agricultural	Impacts as described in the PHC
U34- 023		1090	770	320	70.7	Hillside	Outside	850	Agricultural	No impact expected
U34- 022		1120	770	350	70.7	Hillside	Outside	950	Agricultural	No impact expected
U22- II		1120	735	385	66.3	Valley	Outside	1450	Hydrant	No impact expected

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TABLE B

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Ohio Valley Coal Company
Application Area D-0360-12

Spring / Stream Data Predicted Hydrologic Impacts Summary

Source	Pond	Surface Elevation (feet)	Coal Elevation (feet)	Overburden Depth (feet)	Percent soft rocks	Topo Position	Panel Position	Distance to Nearest Panel Edge (feet)	Use	Predicted Hydrologic Impact
U21- R		1140	725	415	66.3	Hillside	Outside	300	Agricultural	Impacts as described in the PHC
U21- M		1190	740	450	63.3	Valley	Gate	200	Agricultural	Impacts as described in the PHC
U21- L		1090	740	350	66.3	Valley	Quarter Panel	200	Agricultural	Impacts as described in the PHC
U21- K		1095	740	355	66.3	Valley	Mid Panel	250	Agricultural	Impacts as described in the PHC
U21- J		1115	740	375	66.3	Valley	Mid Panel	380	Agricultural	Impacts as described in the PHC
U21- I		1200	745	455	77	Valley	Mid Panel	300	Agricultural	Impacts as described in the PHC
U21- H		1215	745	470	77	Hillside	Quarter Panel	200	Agricultural	Impacts as described in the PHC
U21- 008		1198	750	448	77	Valley	Quarter Panel	150	Agricultural	Impacts as described in the PHC
U21- 009		1262	755	507	77	Hillside	Quarter Panel	280	Agricultural	Impacts as described in the PHC
U21- 007		1070	730	340	77	Valley	Gate	150	Agricultural	Impacts as described in the PHC
U21- 004		1173	740	433	77	Valley	Mid Panel	400	Agricultural	Impacts as described in the PHC
U21- 003		1135	745	390	80.3	Valley	Mid Panel	425	Agricultural	Impacts as described in the PHC
U21- 001		1184	730	454	80.3	Valley	Outside	350	Agricultural	Impacts as described in the PHC
U37- 002		1125	770	355	81	Valley	Mains	485	Recreation	Impacts as described in the PHC
U37- 001	P-7	1135	790	345	81	Hillside	Mid Panel	300	Agricultural	Impacts as described in the PHC
U37- 007		1100	765	335	81	Hillside	Outside	850	Agricultural	No impact expected
D37- A		1110	765	345	81	Valley	Outside	800	Agricultural	No impact expected
D37- 000		1195	790	405	81	Valley	Gate	1100	Agricultural	Impacts as described in the PHC
D19- A		1070	750	320	81	Valley	Outside	800	Agricultural	No impact expected

PREDICTED IMPACTS:
STREAM SEGMENTS OVER LONGWALL AREAS MAY EXPERIENCE DIMINISHED FLOW TEMPORARILY
STREAM SEGMENTS OVER MAINS HAVE NO IMPACT EXPECTED
PONDS OVER LONGWALL AREAS HAVE NO IMPACT EXPECTED
NO QUALITY IMPACTS ARE ANTICIPATED

TOVCC 11538

Spring Impacts – Distances From Longwall Panels And Impacts to Soil Moisture and Tree Growth

Ohio Valley studied all of the springs undermined from January 1992 through March 2003, a period of over 11 years, involving site specific data for 80 springs. The purpose of this study was to determine the distance at which springs are negatively impacted by the mining of an adjacent longwall panel and their position relative to adjacent panels at The Ohio Valley Coal Company's (OVCC's) Powhatan No. 6 Mine (the mine). Springs were considered to be impacted if their flow decreased below historic, normal ranges for an extended period of time, taking rainfall into account. Additionally, the impact of the mining on soil moisture and tree growth was examined in other studies, but will be reported here.

The Powhatan No. 6 Mine is located in eastern Belmont County, Ohio. Springs were categorized as being located to the side or off the end of an adjacent panel. The distance to the adjacent panel was measured from available mapping. OVCC's normal monitoring procedure is to monitor springs (and other water sources) if they are within 500 ft of an approaching panel, on a weekly basis for 3 weeks prior to the longwall passing the spring and for 3 weeks after the longwall has passed the spring. Monthly monitoring generally is done on all springs within 1000 ft of any longwall panel for a minimum of one year prior to the longwall passing the spring until a year after the longwall passes a spring. The same monitoring is used for wells, although wells are not discussed in this analysis. This monitoring allows OVCC to determine if an impact has occurred. This data may be found in the Quarterly Monitoring Reports for The Ohio Valley Coal Company, Powhatan No. 6 Mine, Permit D-0360, First Quarter, 1992 through the First Quarter, 2003 submitted to the Ohio Department of Natural Resources, Division of Mineral Resources Management.

Measurement Method

It is important that one understands what the measurements indicate. The longwall is monitored daily from a fixed location (the center of the main belt). The locations of the longwall are recorded daily as the "longwall plus". The sources (wells, springs, and stream monitoring points) can be related to the same datum from their relative position on the application or quarterly monitoring map as the "source plus". Subtracting the two values (longwall plus – source plus gives the relative distance between the longwall face and the source. This difference usually begins at some value above zero when each panel starts, and decreases to zero and then becomes negative until the panel is finished. The values become positive again when the next panel starts. The source positions are measured from the edges of adjacent panels to determine how far away the longwall panel impacts the source.

Spring Impacts

At the Powhatan No. 6 Mine, 80 springs have been monitored monthly and weekly due to their proximity to the longwall mining. A total of 6 springs were not monitored weekly as being adjacent to a mining panel, i.e., they were located too far away (beyond 500 ft) from an adjacent panel to warrant weekly monitoring. A total of 14 monitored (monthly) springs were located as being off the end of a longwall panel, 3 of which were too far away to warrant weekly monitoring. A few springs over 500 ft from the longwall panels were monitored weekly, primarily because they were in use at the time. A total of 63 springs, monitored monthly, were located as being off the side of an adjacent longwall panel, 19 of which were too far away to warrant weekly monitoring.

Of the 11 weekly monitored springs located off the end of panels, the furthest distance from the adjacent panel at which an impact occurred was determined to be 210 ft. Of the 40 weekly monitored springs located off the side of the panels, the furthest distance at which an impact occurred was 500 ft. This additional impact distance is believed to be due to the final configuration (subsidence trough) that develops after a panel has past a point. Since there is no subsidence trough at the ends of panels, the strata experiences different stresses than strata to the side of a panel, leading to a different spring impact distance. Based on monthly monitoring, springs located at more than 500 ft from the side of adjacent panels were not impacted by the mining of the adjacent panel. The adjacent panel did not impact springs more than 210 ft from the end of adjacent panels. However, since the number of springs located off the end of a panel is small, 300 ft will be used as the greatest distance that springs have been impacted from the ends of panels.

The accompanying table entitled Spring Impact Inventory is a summary of impact distances for each monitored spring. Only 2 of 11 monitored springs (18.2 percent) located off the end of a panel showed any impacts from adjacent panels. Of the 44 monitored springs located off the side of the panels, only 21 (47.7 percent) showed impacts from adjacent panels. Therefore impacts only occur in a limited number of cases, probably determined by topographic position.

Soil Moisture

The Soil Survey of Belmont County (U.S. Department of Agriculture, Soil Conservation Service, 1981) indicates that certain soils within Belmont County, Ohio may become perched with water at different times of the year. That is not to say that the entire soil zone becomes perched, rather, as observed in the field, seepage zones develop. The soil types in this area are primarily Lowell-Westmoreland Silt Loams that may become perched from January to May depending on rainfall and the elevation of the high water table. These zones are usually located where an intermittent stream begins.

Growing Season for Plants and Saturated Zones

The normal growing season for plants is from mid-May through mid-September in this area of Ohio. Plants receive their moisture and nutrients from the soil which receives its moisture from rainfall. Only hydrophytic plants are known to grow within permanently saturated zones (wetlands), and thrive in such conditions, while most other vegetation would "drown," being deprived of oxygen to the root zone. Trees located close to saturated areas (perched soils) have been found to be dead or dying due to oxygen deprivation. The time that soils are perched in this area is at the beginning of the growing season only, indicating that perched soils probably have little to do with tree growth.

Impact of Longwall Mining on Soil Moisture and Tree Growth

Previous studies show that soil moisture and tree diameter growth are not impacted by longwall mining located directly over such mining (Runkle, 1992. and Runkle, 2001). Tree diameter growth was not found to be impacted by panels at any distance away from longwall mining or directly over such mining (Hicks and Rentch, 2000 and Hicks and Rentch, 2001). It is apparent that longwall mining, while impacting springs at distances from 320 to 480 ft from a panel does not adversely impact soil moisture or tree growth at any distance or even directly over longwall mining panels.

Impact of Ground Water on Soil Moisture

Results of monitoring three saturated zones adjacent to locations where soil moisture and tree diameter studies indicate that it appears that the deep zone may be initially impacted by longwall operations as far away as 1800 ft, though minimally. There does not appear to be any impact to the shallow zone from operations as close as 275 ft to the nearest segment of the working face (Craig and Wallen, 2001). This information, coupled with the results of the soil moisture study and the tree growth study, indicates that there is no relationship between fluctuations in the site hydrology, soil moisture, and the growth or health of vegetation. Indeed, the study concluded at the end of 2002 with one year of data after mining indicating that there was no impact of longwall mining on soil moisture or tree growth regardless of impacts to the groundwater (Holt, 2003).

Conclusions

An analysis of OVCC's spring monitoring data has determined that impacts to springs located beyond the perimeter of longwall mining panels are limited or are rare especially when the spring is off the end of a longwall panel. In addition, impacts are limited to a distance of less than 500 ft from the side of a panel. Impacts are limited to a distance of about 300 ft for springs located off the end of a longwall panel. Some springs that overlay panels may not be impacted, although most (over 90 percent) are impacted to some degree. Existing information shows that some soils in the area may become

perched in the early spring but research shows that overall soil moisture is not impacted by longwall mining, nor is the growth or health of trees located either adjacent to or directly over longwall panels.

References

Hicks, Jr., R. R. and Rentch, J., March, 2000, "Ring Growth for 5 Species of Trees Growing Directly Above and at Varying Distances from the Edge of a Longwall Mine in Belmont County, Ohio."

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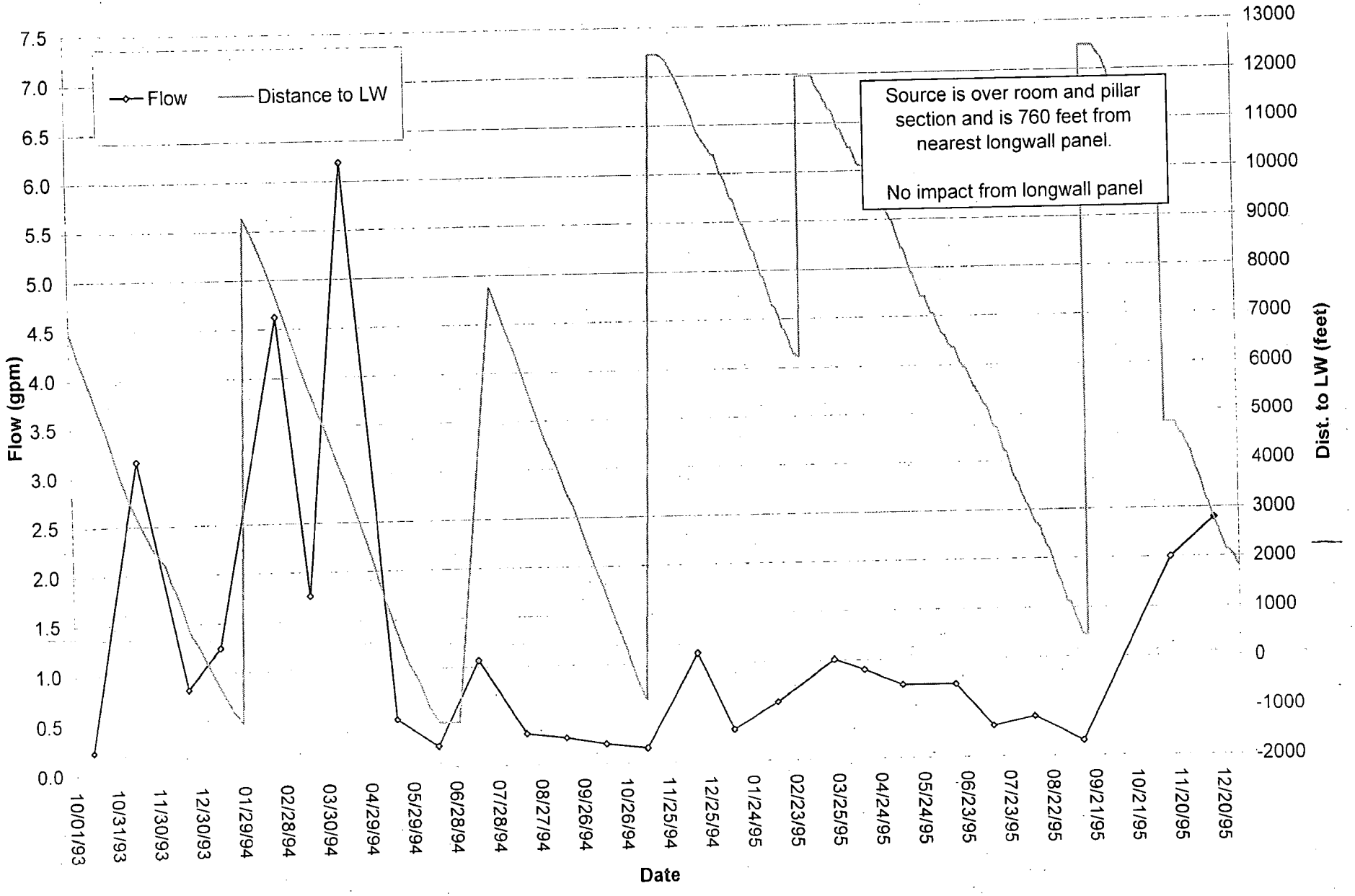
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
SPRING IMPACT INVENTORY

NUMBER	SPRING	ADJ. PANEL	DIST. FROM ADJ. PANEL (FT)	LOCATION OF SPRING	IMP. FROM ADJ. PANEL	OVER PANEL	IMP. FROM OVER PANEL	COMMENT	ADJ. IMPACT DISTANCES (FT)	IMPACT DIRECTION
1	SP-32	14E	760	From Side of Panel	No	NA	NA	Spring too far away to be monitored during adjacent panel (14E), not undermined.		
2	SP-33	14E	235	From Side of Panel	No	NA	NA	Spring not impacted by adjacent panel (14E), spring not undermined		
3	SP-35	13E	90	From Side of Panel	No	NA	NA	Spring not impacted by adjacent panel (13E), impacted by 14E panel.		
4	SP-36	13E	200	From Side of Panel	No	14E	NA	Spring impacted by adjacent panel (13E) and did not recover		
5	SP-38	12E	235	From Side of Panel	No	13E	Yes	Spring not impacted by adjacent panel (12E).		
6	SP-39	11E	860	From Side of Panel	NA	12E	Yes	Spring too far away to be monitored during adjacent panel (11E), impacted by 12E panel.	240	From Side of Panel
7	SP-41	13E	240	From Side of Panel	Yes	14E	Yes	Spring impacted by adjacent panel (13E), recovered, and was impacted by 14E panel.	140	From Side of Panel
8	SP-43	11E	140	From Side of Panel	Yes	12E	NA	Spring impacted by adjacent panel (11E) and did not recover.		
9	SP-44	NA	NA	NA	NA	11E	Yes	No adjacent panel, impacted by 11E panel.		
10	SP-52	11E	510	From End of Panel	No	NA	NA	Spring not impacted by adjacent panel (11E), not undermined.		
11	SP-54	12E	800	From End of Panel	No	NA	NA	Spring not impacted by adjacent panel (12E), not undermined.		
12	SP-63	14E	1230	From End of Panel	NA	15E	Yes	Spring too far away to be monitored during adjacent panel (14E), impacted by 15E panel.		
13	SP-64	14E	1340	From End of Panel	NA	15E	Yes	Spring too far away to be monitored during adjacent panel (14E), impacted by 15E panel.		
14	SP-78	18E	645	From End of Panel	NA	NA	NA	Too far away to be monitored during adjacent panel (18E), not undermined.		
15	SP-78	19E	610	From End of Panel	NA	NA	NA	Too far away to be monitored during adjacent panel (19E), not undermined.		
16	SP-79	18E	390	From Side of Panel	No	19E	No	Spring not impacted either panel		
17	SP-79A	18E	295	From Side of Panel	No	19E	Yes	Spring not impacted by adjacent panel (18E), impacted by 19E panel.		
18	SP-83	17E	865	From Side of Panel	NA	18E	Yes	Spring too far away to be monitored during adjacent panel (17E), impacted by 18E panel.		
19	SP-84	17E	815	From Side of Panel	NA	18E	Yes	Spring too far away to be monitored during adjacent panel (17E), impacted by 18E panel		
20	SP-90	NA	NA	NA	NA	16E	Yes	No panel to the south of this spring, impacted by 17E panel.	415	From Side of Panel
21	SP-91	16E	415	From Side of Panel	Yes	17E	NA	Spring impacted by adjacent panel (16E) and did not recover.		
22	SP-92	NA	NA	NA	NA	16E	Yes	No panel to the south of this spring, spring impacted by 16E panel.		
23	SP-93	NA	NA	NA	NA	16E	Yes	No panel to the south of this spring, spring impacted by 16E panel.	500	From Side of Panel
24	SP-94	16E	500	From Side of Panel	Yes	17E	NA	Spring impacted by adjacent panel (16E), and had little recovery.		
25	SP-97	21E	750	From Side of Panel	No	22E	Yes	Spring not impacted by adjacent panel (21E), impacted by 22E panel.		
26	SP-99	22E	800	From Side of Panel	NA	23E	Yes	Too far away to be monitored during adjacent panel (22E), impacted by 23E panel.		
27	SP-99A	22E	555	From Side of Panel	No	23E	No	Spring not impacted by either panel.		
28	DS-101	25E	585	From Side of Panel	No	26E	Yes	Spring not impacted by adjacent panel (25E), impacted by 26E panel.	370	From Side of Panel
29	SP-102	23E	370	From Side of Panel	Yes	24E	Yes	Spring impacted by adjacent panel (23E), recovered, and was impacted 24E panel.		
30	SP-102A	22E	765	From Side of Panel	No	23E	NA	Spring not impacted by adjacent panel (22E), impacted by 23E panel.	155	From End of Panel
31	SP-106	24E	155	From End of Panel	Yes	NA	NA	Spring was off end of panel (24E) and was impacted as panel approached spring, was not undermined.		
32	SP-107	24E	250	From End of Panel	No	NA	NA	Spring was off end of panel (24E), and was not impacted as panel approached spring, was not undermined.		
33	DS-118	22E	910	From End of Panel	No	NA	NA	Spring was off end of panel (22E), was not impacted as panel approached spring, and was not undermined.		
34	SP-152	14E	650	From Side of Panel	No	15E	Yes	Spring too far away to be monitored during adjacent panel (14E), was impacted by 15E panel.	325	From Side of Panel
35	DS-154	25E	325	From Side of Panel	Yes	26E	NA	Spring impacted by adjacent panel (25E) and did not recover.	480	From Side of Panel
36	DS-155	24E	480	From Side of Panel	Yes	25E	Yes	Spring impacted by adjacent panel (24E) and did not recover.	290	From Side of Panel
37	DS-157	25E	290	From Side of Panel	Yes	N/A	NA	Spring impacted by adjacent panel (25E), but was not undermined.		
38	SP-162	19E	320	From End of Panel	No	NA	NA	Spring not impacted by adjacent panel (19E).		
39	SP-162	20E	70	From End of Panel	Yes	NA	NA	Spring impacted by adjacent panel (20E).		
40	SP-165	16E	205	From Side of Panel	No	NA	NA	Spring not impacted by adjacent panel (16E).		
41	SP-165	17E	130	From End of Panel	No	NA	NA	Spring not impacted by adjacent panel (17E).		
42	SP-166	15E	920	From Side of Panel	NA	16E	Yes	Spring was Too far away to be monitored during adjacent panel (15E), was impacted by 16E panel.		
43	SP-167	16E	595	From Side of Panel	No	17E	Yes	Spring not impacted by adjacent panel (16E), impacted by 17E panel.		
44	SP-168	11E	765	From Side of Panel	NA	12E	Yes	Spring too far away to be monitored during adjacent panel (11E), impacted by 12E panel.		
45	SP-169	11E	835	From Side of Panel	NA	12E	Yes	Spring too far away to be monitored during adjacent panel (11E), impacted by 12E panel.	340	From Side of Panel
46	SP-170	12E	340	From Side of Panel	Yes	13E	NA	Spring impacted by adjacent panel (12E) and did not recover.	420	From Side of Panel
47	SP-171	12E	420	From Side of Panel	Yes	13E	NA	Spring impacted by adjacent panel (12E) and did not recover.	420	From Side of Panel
48	SP-173	12E	420	From Side of Panel	Yes	13E	Yes	Spring impacted by adjacent panel (12E), recovered, and was impacted by 13E panel.	135	From Side of Panel
49	SP-174	12E	135	From Side of Panel	Yes	13E	NA	Spring impacted by adjacent panel (12E) and did not recover.		
50	SP-175	11E	830	From Side of Panel	NA	12E	Yes	Spring too far away to be monitored during adjacent panel (11E), impacted by 12E panel.		
51	SP-176	11E	750	From Side of Panel	NA	12E	Yes	Spring too far away to be monitored during adjacent (11E), impacted by 12E panel.	290	From Side of Panel
52	SP-177	11E	290	From Side of Panel	Yes	12E	Yes	Spring impacted by adjacent panel (11E), recovered, and was impacted by 12E panel.		
53	SP-179	NA	NA	NA	NA	15E	Yes	No panel to the south of this spring, impacted by 15E panel		
54	SP-183	14E	525	From Side of Panel	No	NA	NA	Not impacted by adjacent panel (14E), spring not undermined.		
55	SP-198	12E	435	From Side of Panel	No	13E	Yes	Spring not impacted by adjacent panel (12E), impacted by 13E panel.		
56	SP-199	18E	640	From Side of Panel	No	19E	Yes	Spring not impacted by adjacent panel (18E), impacted by 19E panel.		
57	SP-215	11E	795	From Side of Panel	NA	12E	Yes	Spring too far away to be monitored during adjacent panel (11E), impacted by 12E panel		
58	SP-216	12E	20	From Side of Panel	Yes	NA	NA	Spring impacted by adjacent panel (12E) and did not recover.	20	From Side of Panel
59	SP-224	11E	450	From Side of Panel	Yes	10E	Yes	Spring impacted by adjacent panel (11E), and did not recover.	450	From Side of Panel
60	SP-226	9E	610	From Side of Panel	NA	8E	Yes	Spring too far away to be monitored by adjacent panel (9E), impacted by 8E panel.		
61	DS-248	27E	210	From End of Panel	Yes	NA	NA	Spring was off end of panel (27E), was impacted by adjacent panel, and was not undermined.	210	From End of Panel
62	DS-249	25E	1000	From Side of Panel	NA	26E	Yes	Spring too far away to be monitored during adjacent panel (25E), was impacted by 26E panel.		
63	DS-253	28E	680	From Side of Panel	No	NA	NA	Spring too far away to be monitored during adjacent panel (28E), not undermined.		
64	DS-254	27E	430	From Side of Panel	No	28E	Yes	Spring not impacted by adjacent panel (27E), impacted by 28E panel.		
65	DS-256	27E	1020	From Side of Panel	NA	28E	No	Spring too far away to be monitored during adjacent panel (27E), not impacted by 28E panel.	250	From Side of Panel
66	DS-258	27E	250	From Side of Panel	Yes	28E	NA	Spring impacted by adjacent panel (27E), and did not recover.		
67	DS-259	26E	595	From Side of Panel	NA	27E	Yes	Spring too far away to be monitored during adjacent panel (26E), impacted by 27E panel.	245	From Side of Panel
68	SP-260	22E	245	From Side of Panel	Yes	23E	Yes	Spring was impacted by adjacent panel (22E), recovered, and was impacted by 23E panel.		
69	SP-261	17E	500	From Side of Panel	NA	18E	Yes	Spring too far away to be monitored during adjacent panel (17E), impacted by 18E panel.	115	From Side of Panel
70	SP-262	19E	115	From Side of Panel	Yes	NA	NA	Spring impacted by adjacent panel (19E), did not recover		
71	DS-263	26E	635	From Side of Panel	NA	27E	Yes	Spring too far away to be monitored during adjacent panel (26E), impacted by 27E panel.		
72	DS-265	28W	65	From Side of Panel	No	N/A	NA	Spring not impacted from adjacent panel - located over gate between 28W and 29W panels.	88	From Side of Panel
73	DS-265	29W	88	From Side of Panel	Yes	N/A	NA	Spring impacted from adjacent panel - located over gate between 28W and 29 W panels.		
74	DS-267	29W	75	From Side of Panel	No	N/A	NA	Spring not impacted by adjacent panel	81	From Side of Panel
75	DS-267	30W	81	From Side of Panel	Yes	N/A	NA	Spring impacted by adjacent panel		
76	DS-268	NA	NA	NA	NA	26W	No	No panel to the south of this spring, not impacted by 26W panel.		
77	DS-269	26W	150	From Side of Panel	No	28W	No	Still being monitored for 28W longwall panel	475	From Side of Panel
78	DS-270	26W	475	From Side of Panel	Yes	28W	Yes	Still being monitored for 28W longwall panel		
79	DS-271	26W	300	From Side of Panel	No	28W	No	No impact from either panel		
80	DS-272	28W	790	From Side of Panel	No	29W	Yes	Spring not impacted from adjacent panel - impacted by 29W panel.		
81	DS-273	28W	925	From Side of Panel	No	29W	Yes	Spring not impacted from adjacent panel - impacted by 29W panel.		
82	DS-274	28W	545	From Side of Panel	No	29W	Yes	Spring not impacted from adjacent panel - impacted by 29W panel.		
83	DS-297	27E	775	From Side of Panel	NA	28E	No	Too far away to be monitored during adjacent panel (27E), not impacted by 28E panel.		
84	DS-266	31W	840	From Side of Panel	No	NA	NA	No impact from adjacent panel		

TOVCC 11543

Ohio Valley Coal Company
D-0360

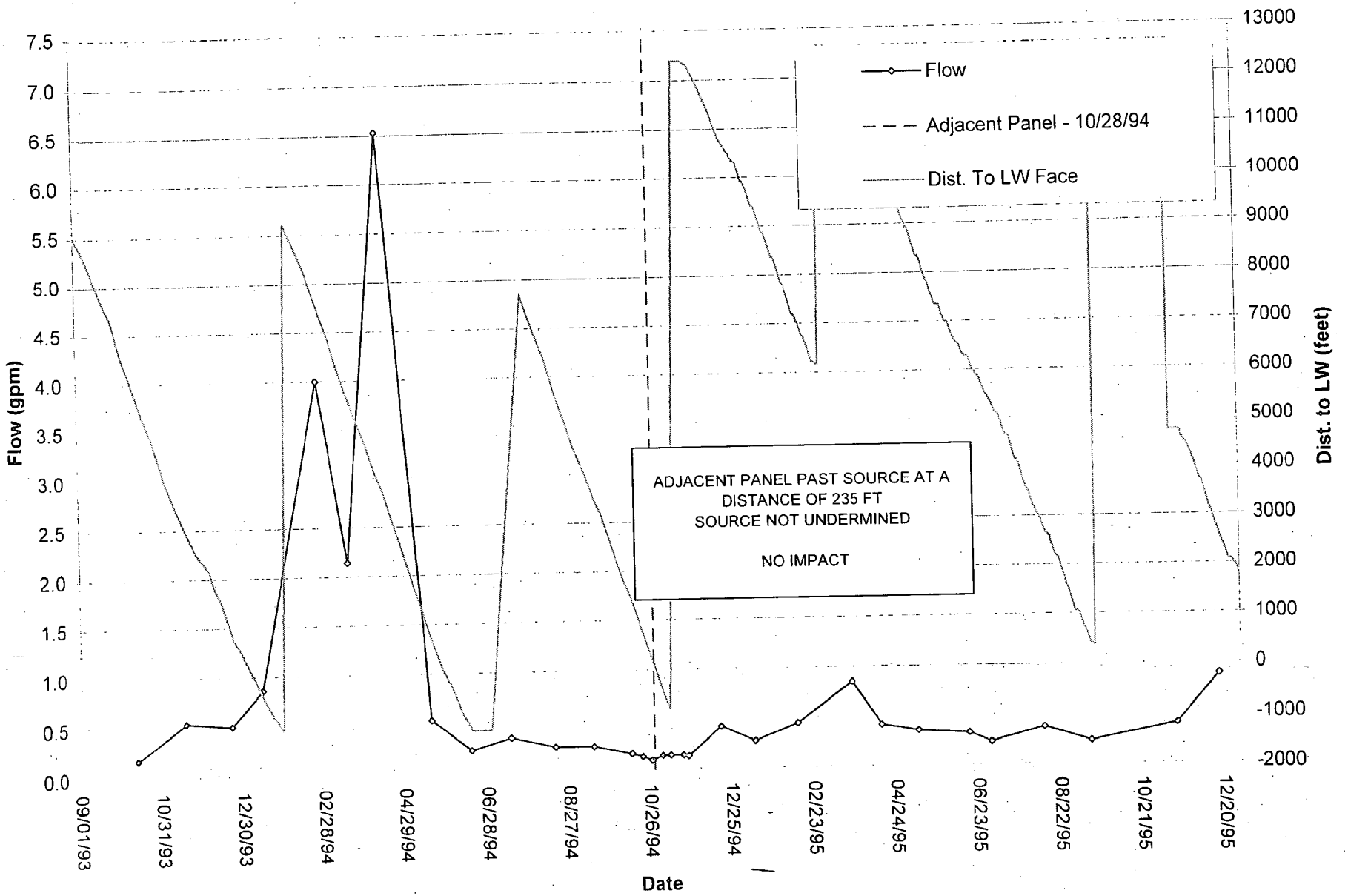
DS - 32 Hydrograph



TOVCC 11544

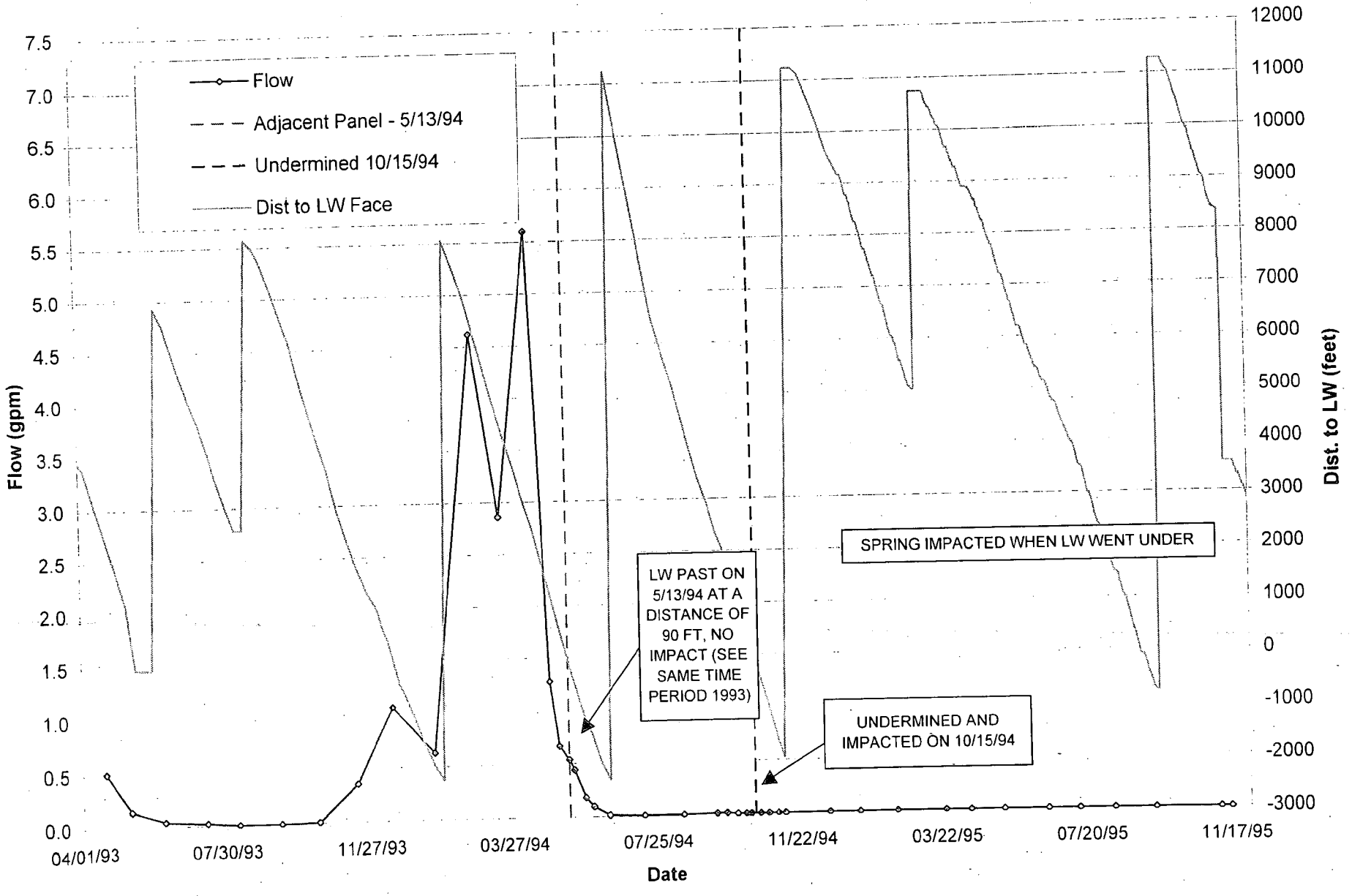
Ohio Valley Coal Company
D-0360

DS - 33 Hydrograph



Ohio Valley Coal Company
D-0360

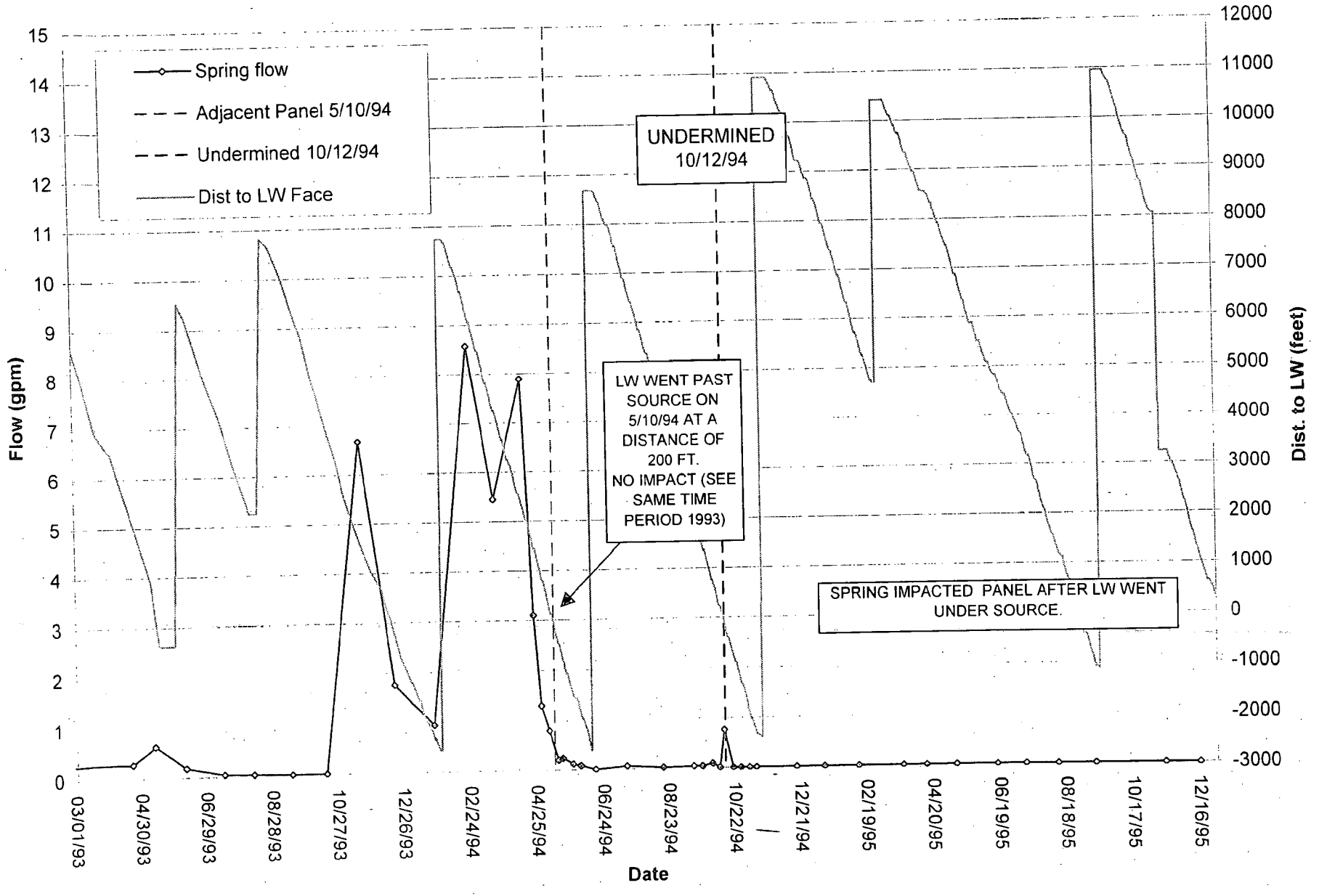
DS - 35 Hydrograph



TOVCC 11546

Ohio Valley Coal Company
D-0360

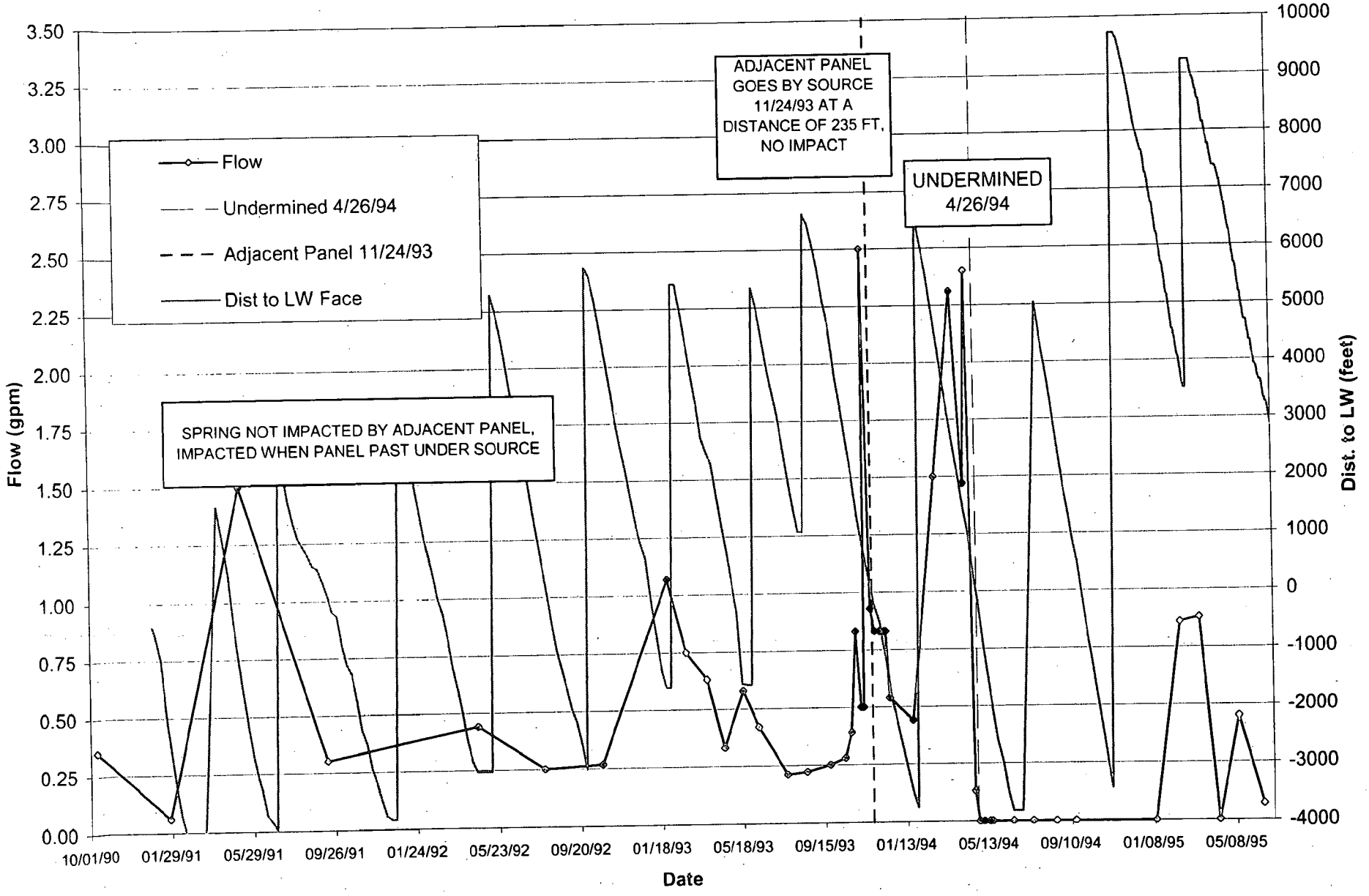
DS - 36 Hydrograph



TOVCC 11547

Ohio Valley Coal Company
D-0360

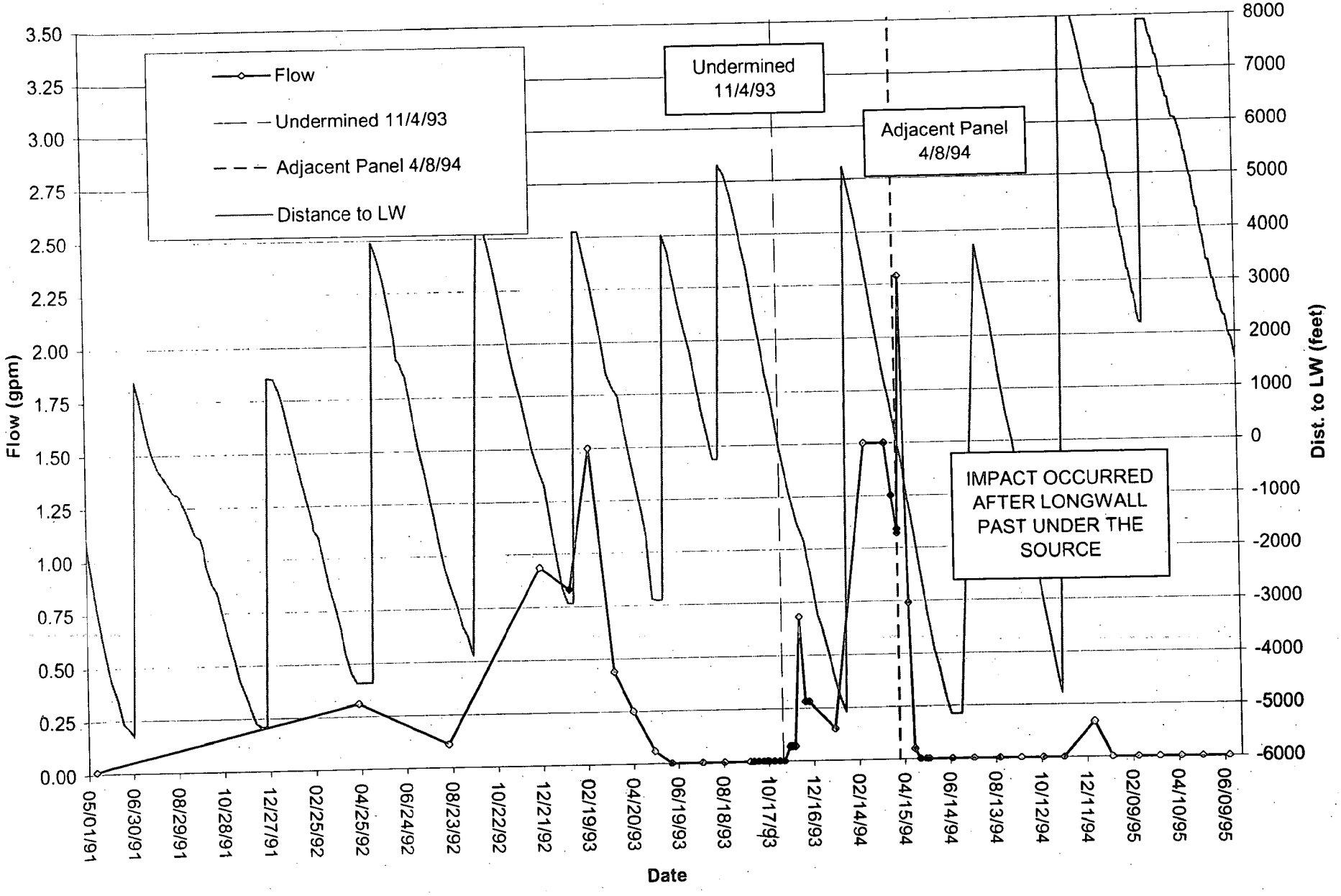
DS - 38 Hydrograph



TOVCC 11548

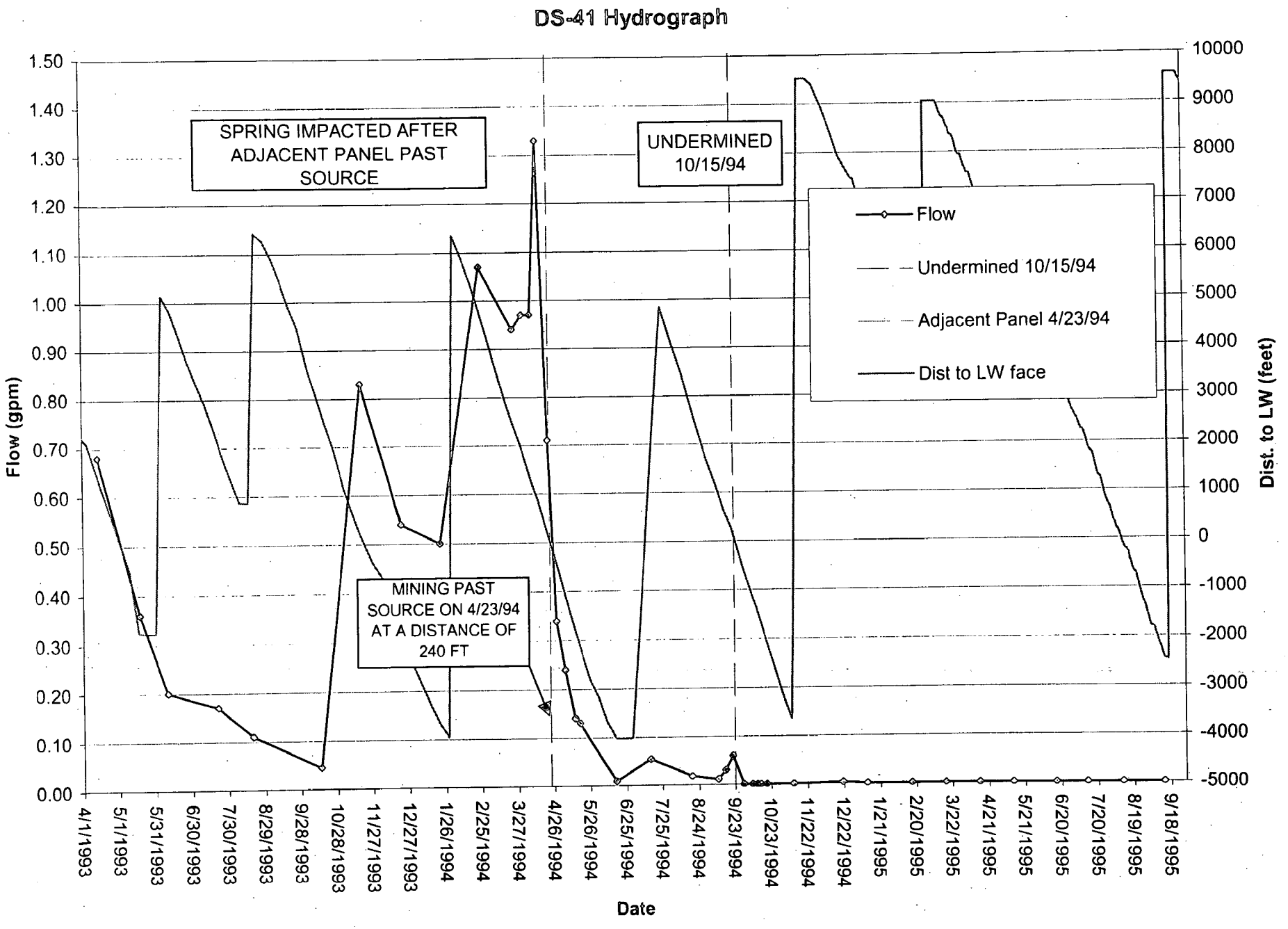
Ohio Valley Coal Company
D-0360

DS - 39 Hydrograph



TOVCC 11549

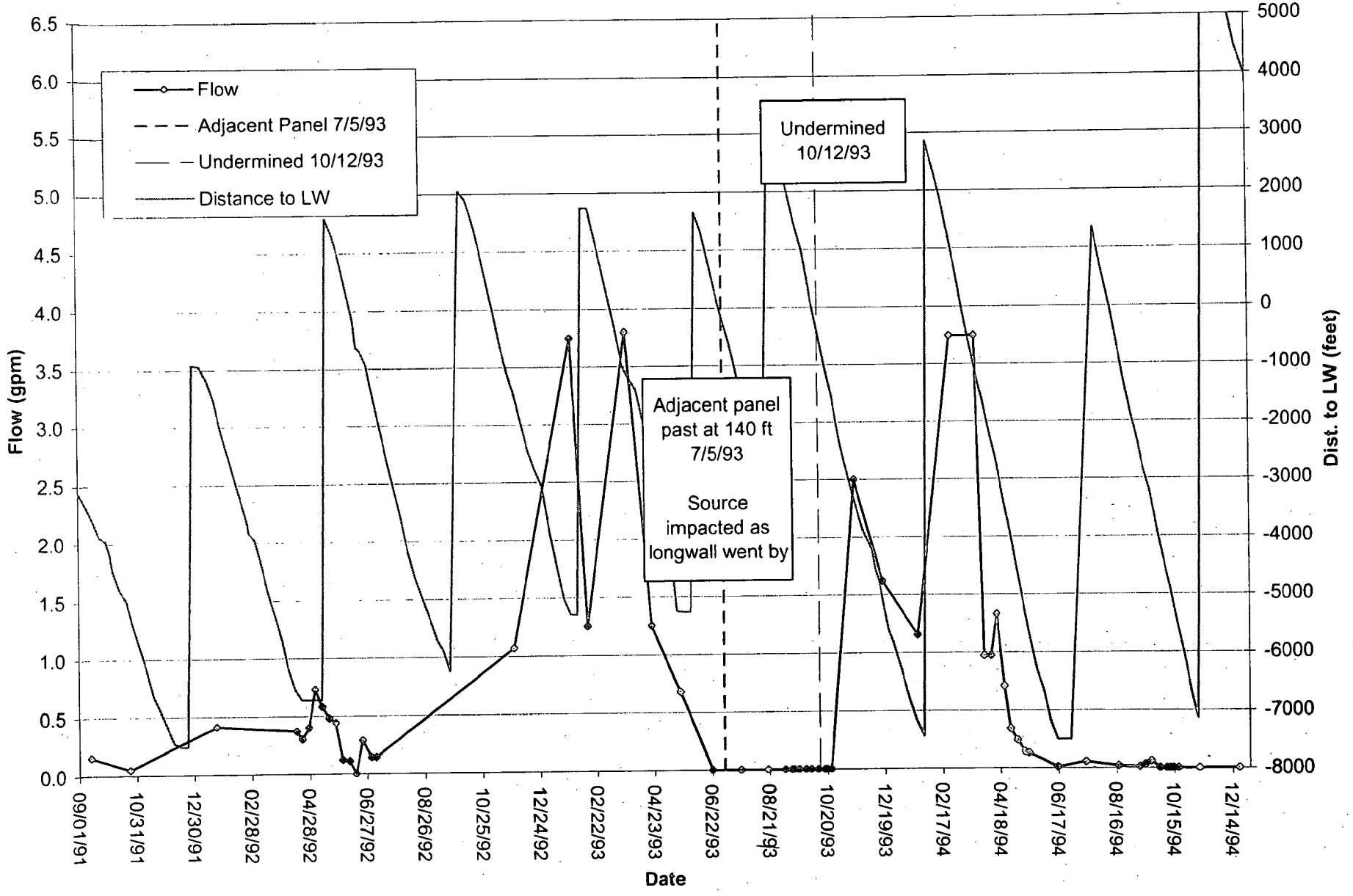
Ohio Valley Coal Company
D-0360



TOVCC 11550

Ohio Valley Coal Company
D-0360

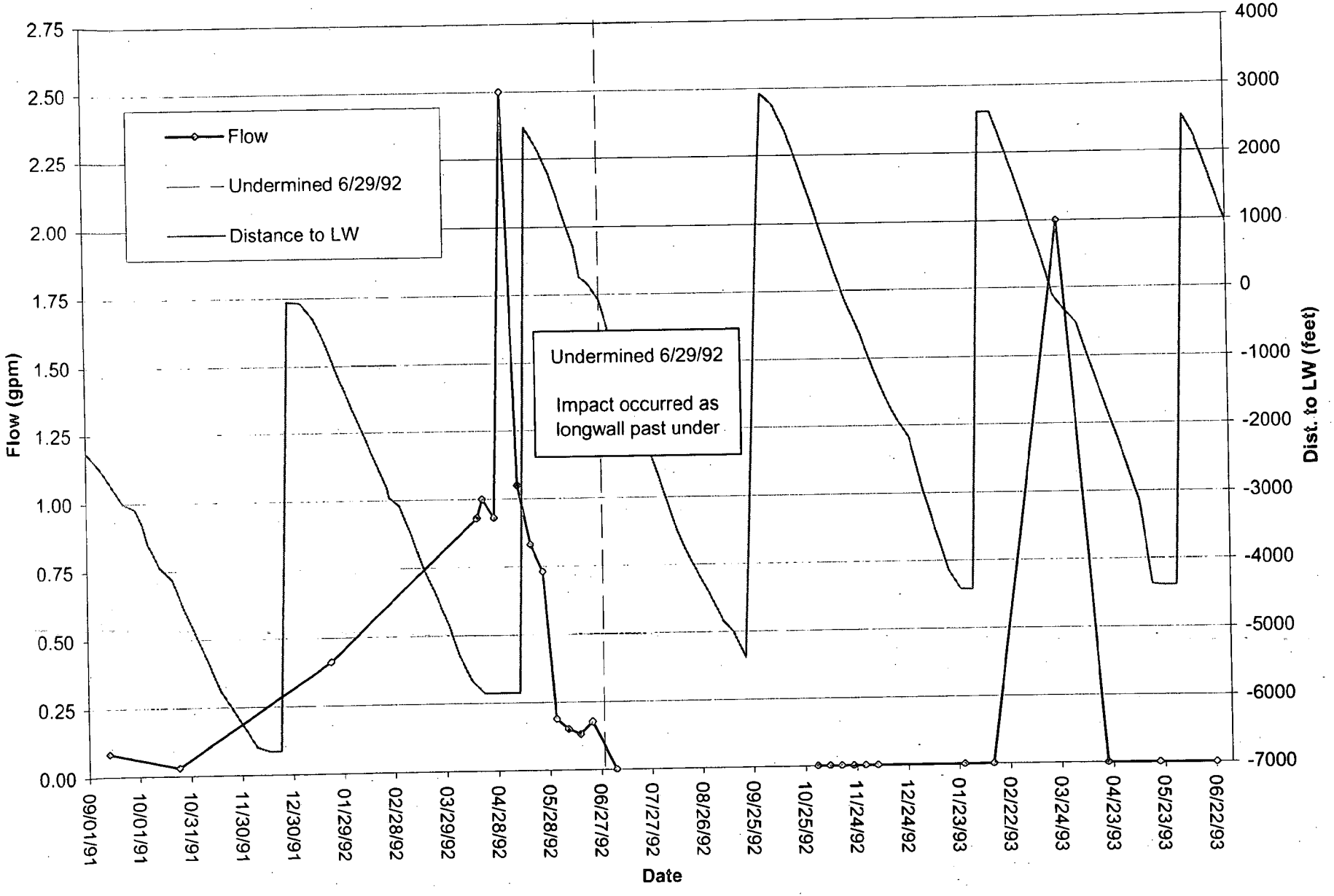
DS - 43 Hydrograph



TOVCC 11551

Ohio Valley Coal Company
D-0360

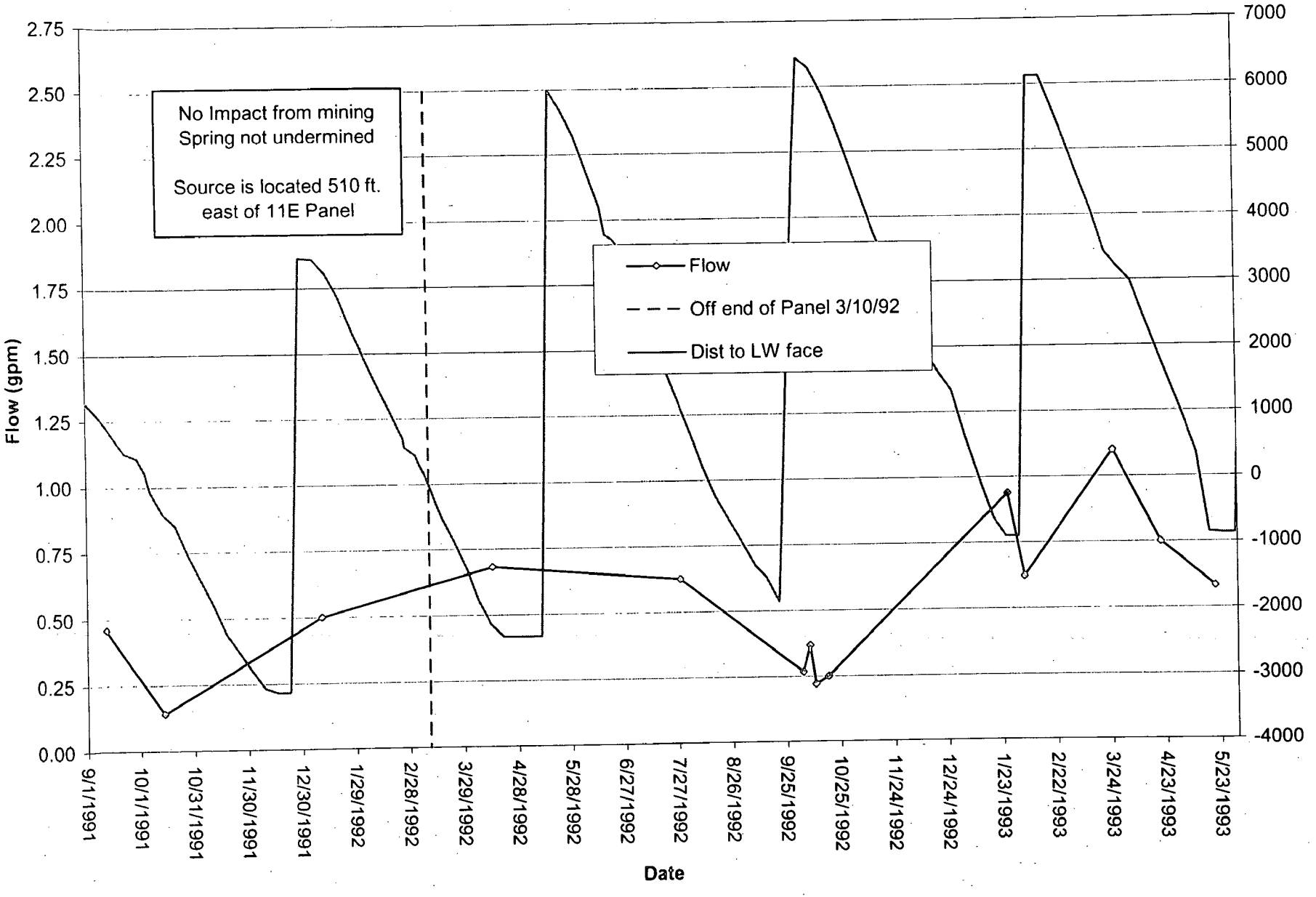
DS - 44 Hydrograph



TOVCC 11552

Ohio Valley Coal Company
D-0360

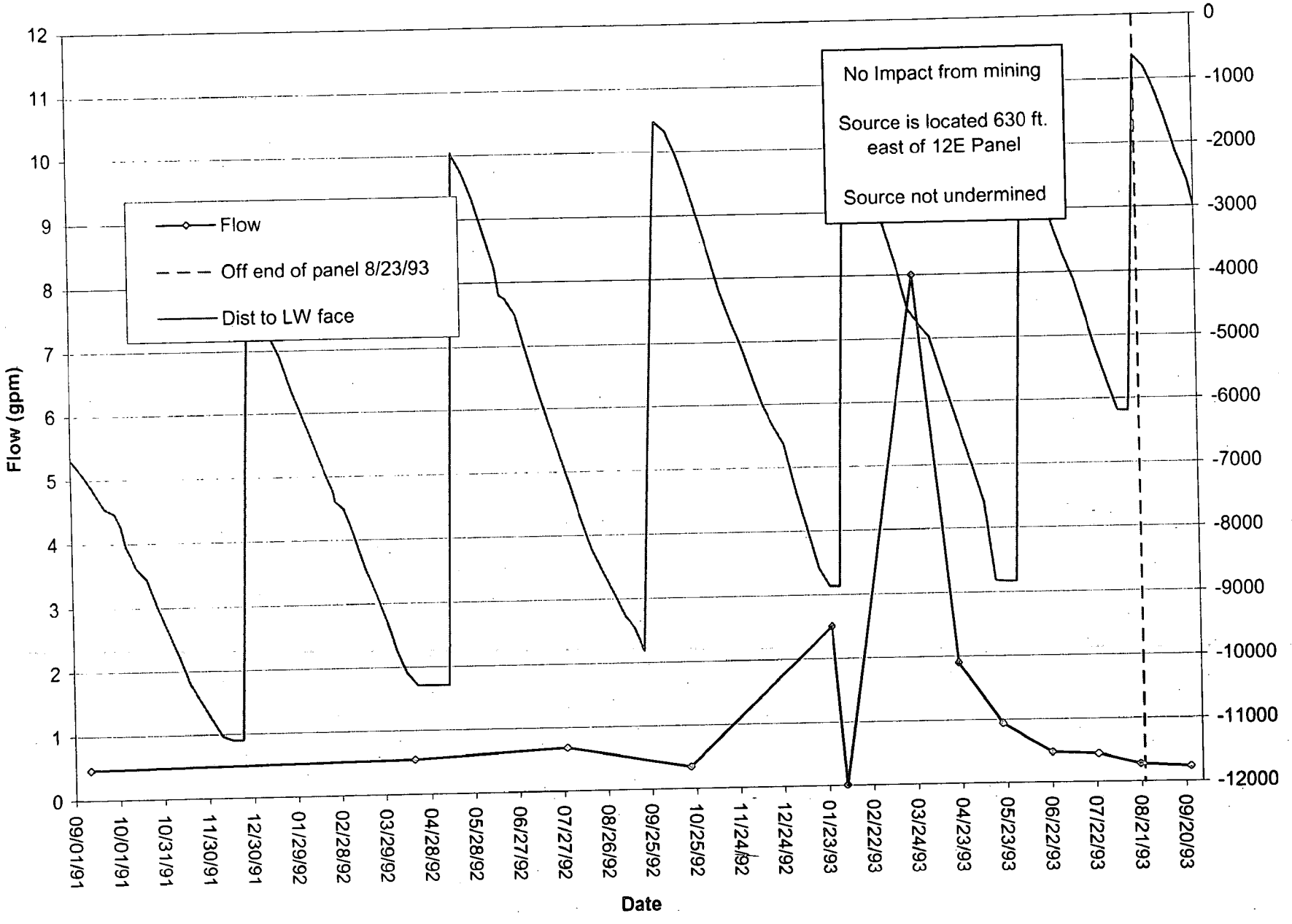
DS - 52 Hydrograph



TOVCC 11553

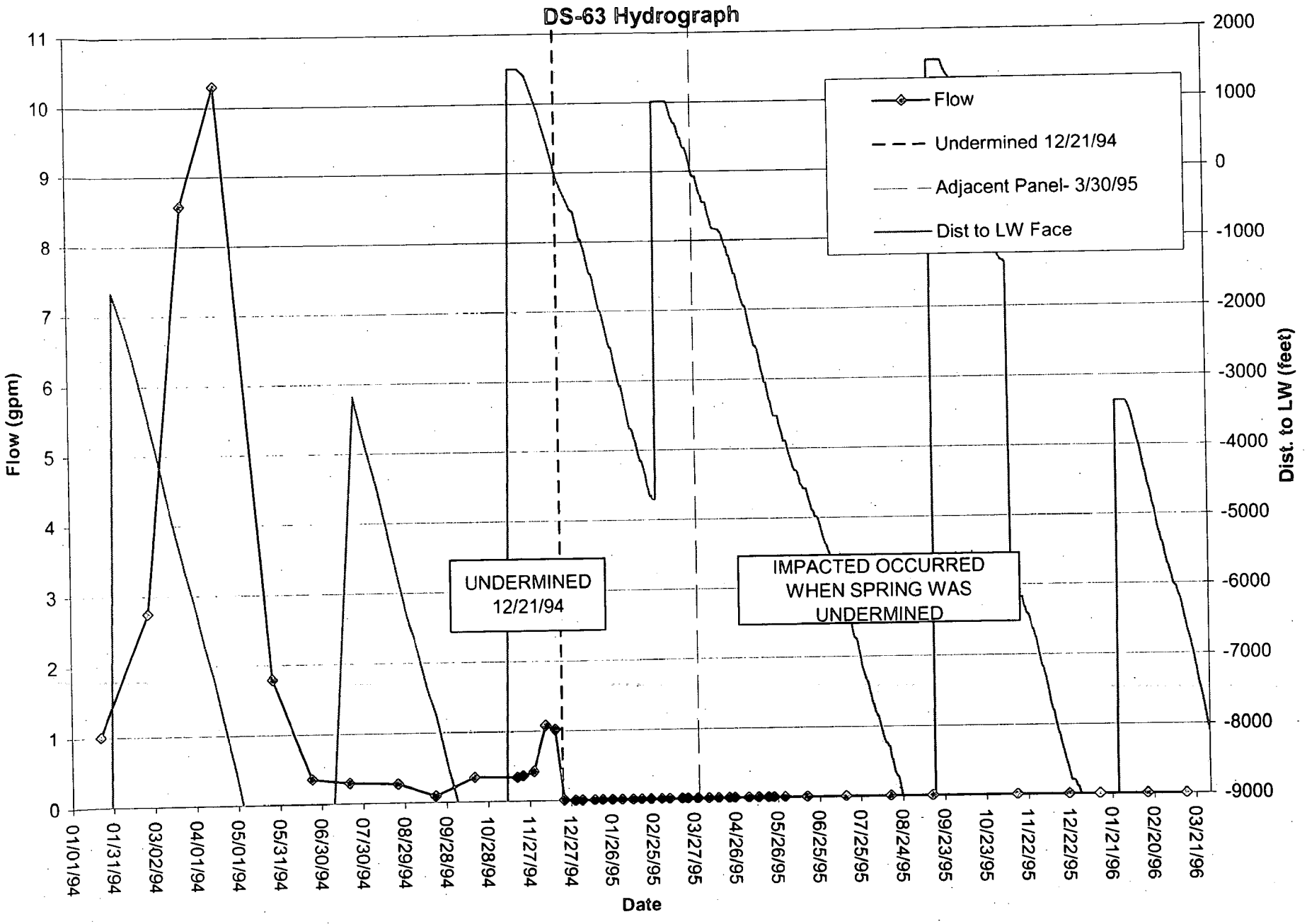
Ohio Valley Coal Company
D-0360

DS - 54 Hydrograph



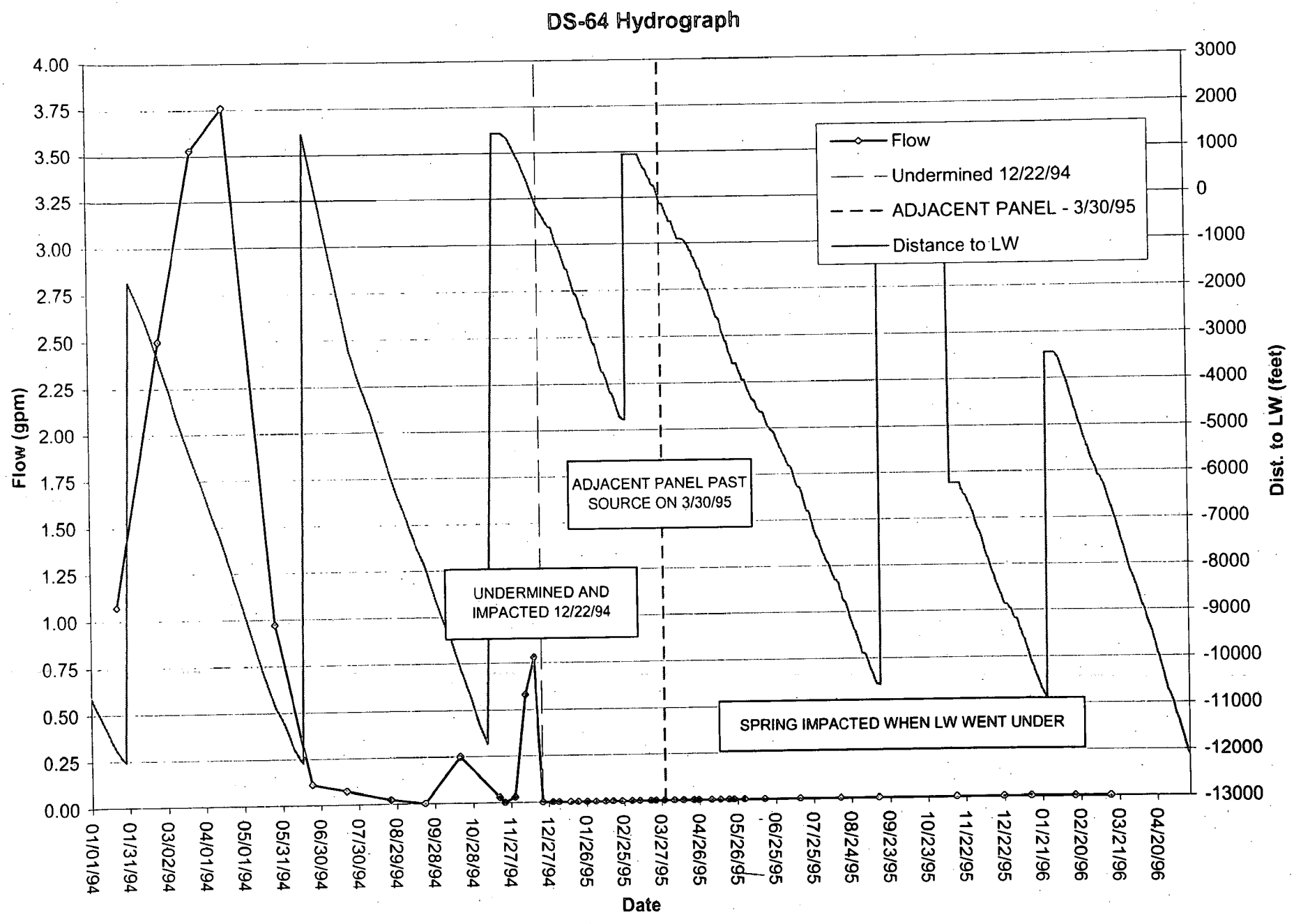
TOVCC 11554

Ohio Valley Coal Company
D-0360



TOVCC 11555

Ohio Valley Coal Company
D-0360



TOVCC 11556

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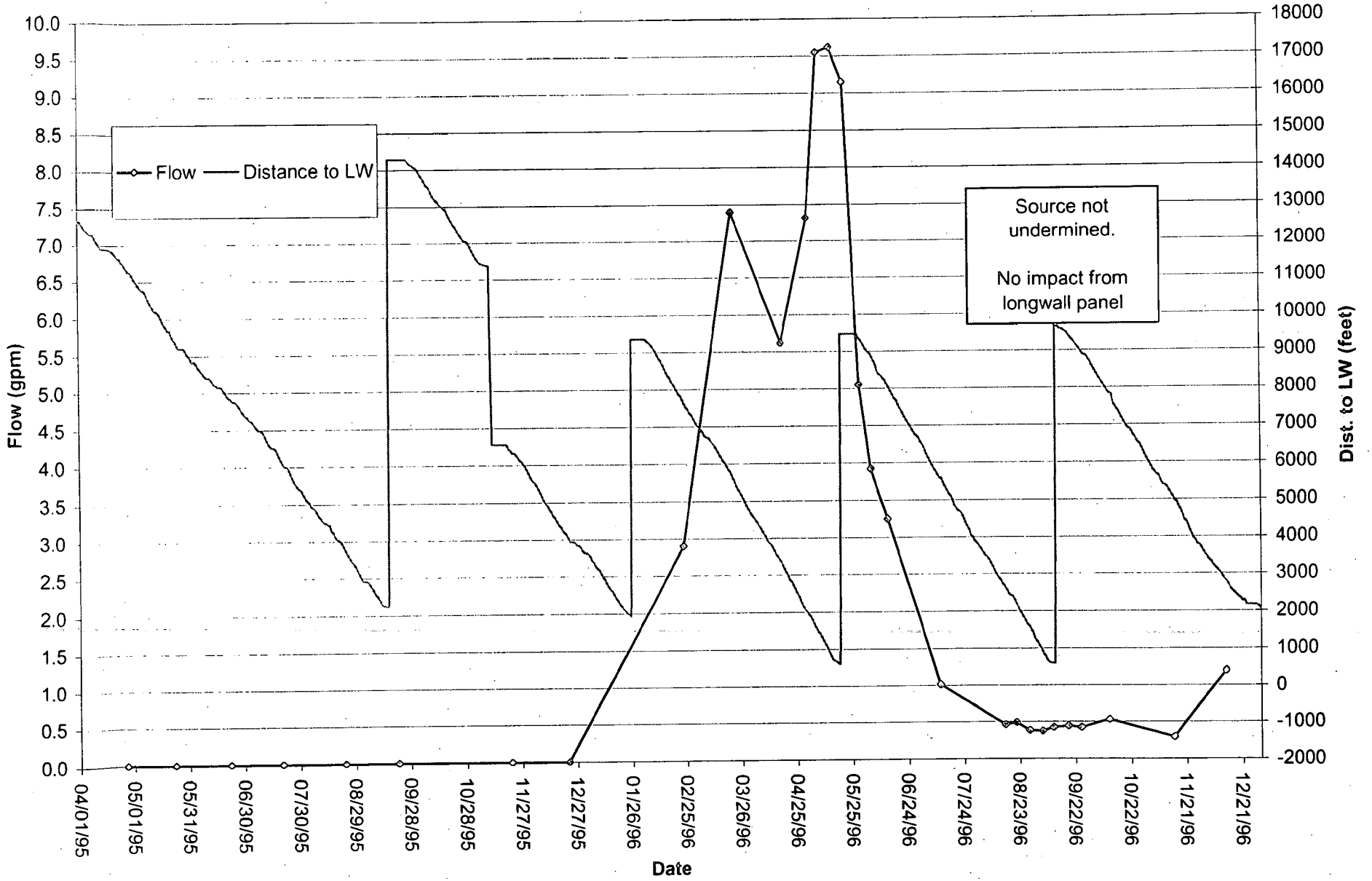
D-0360

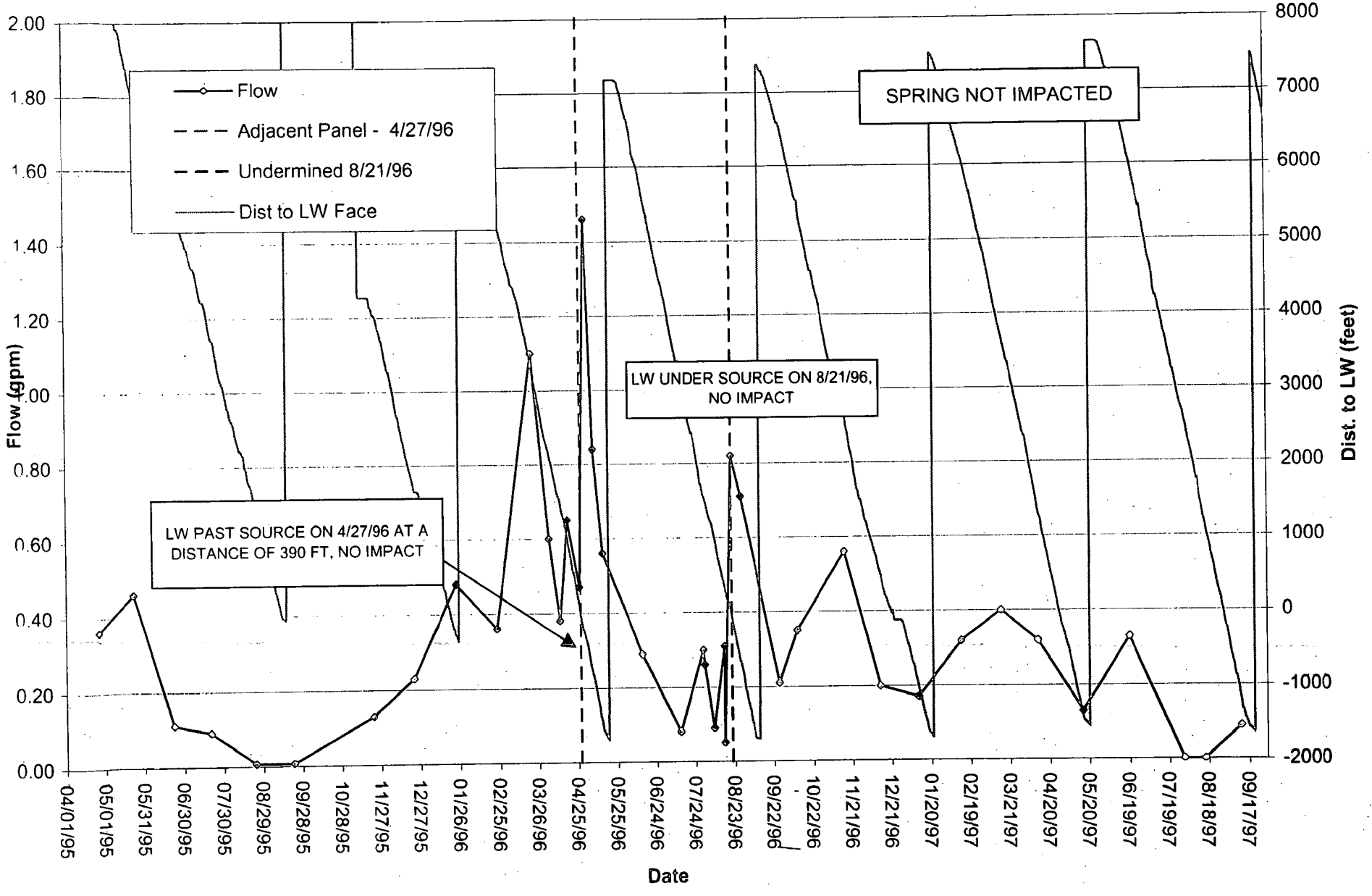
DS - 78 Hydrograph



TOVCC 11557

Ohio Valley Coal Company
D-0360

DS-79 Hydrograph



TOVCC 11558

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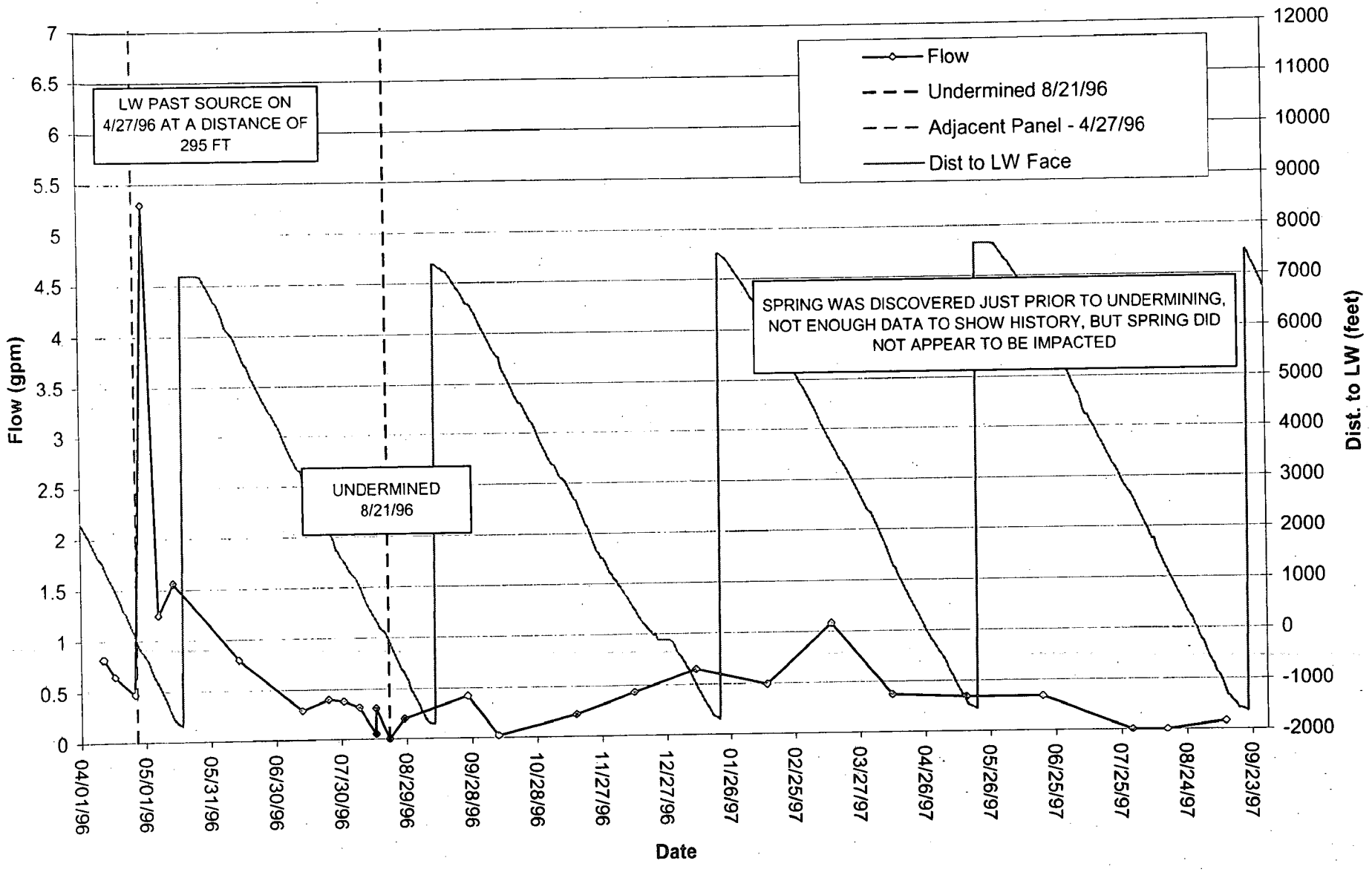
D-0360

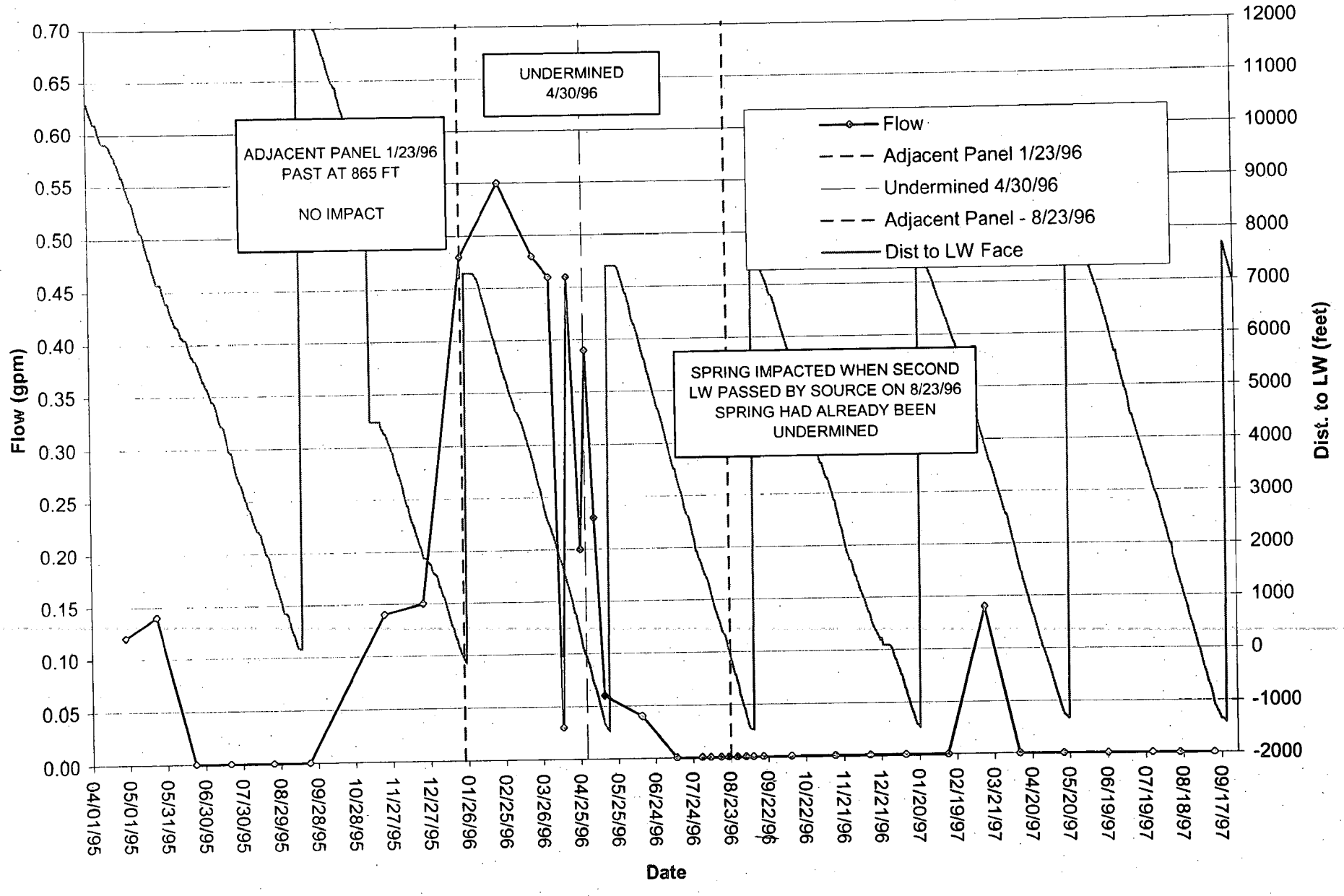
DS-79A Hydrograph



TOVCC 11559

Ohio Valley Coal Company
D-0360

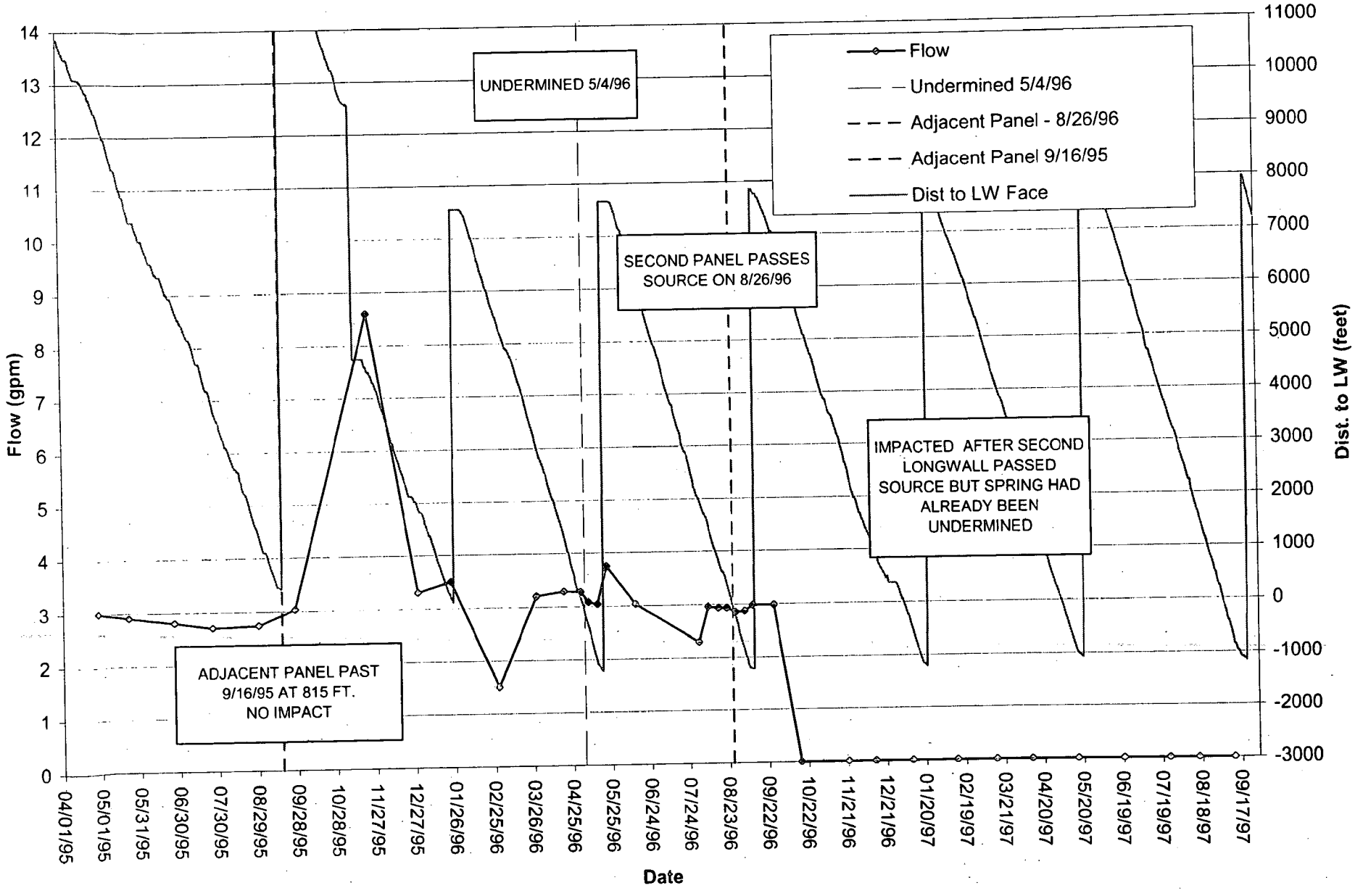
DS-83 Hydrograph



TOVCC 11560

Ohio Valley Coal Company
D-0360

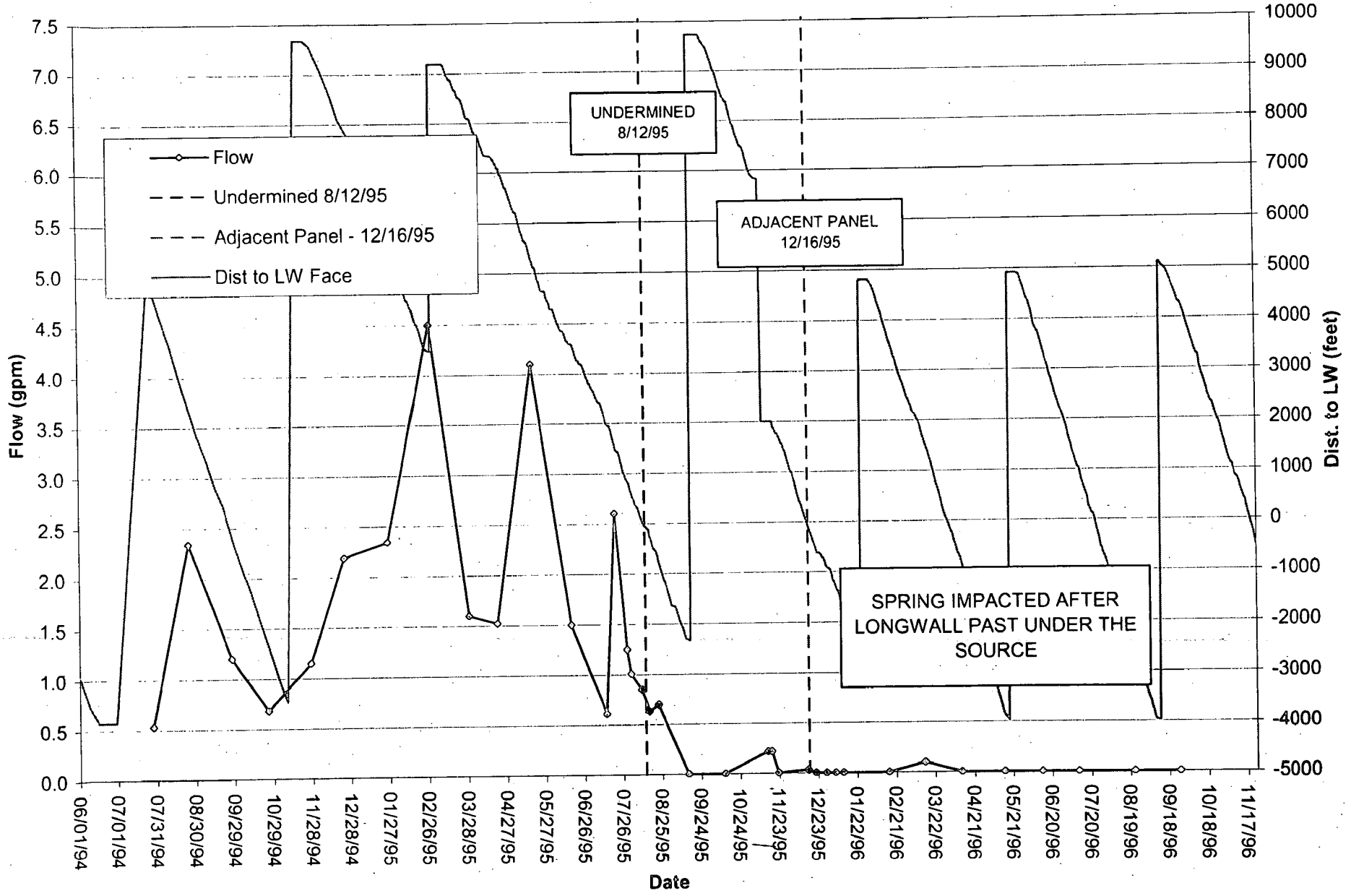
DS-84 Hydrograph



TOVCC 11561

Ohio Valley Coal Company
D-0360

DS-90 Hydrograph



TOVCC 11562

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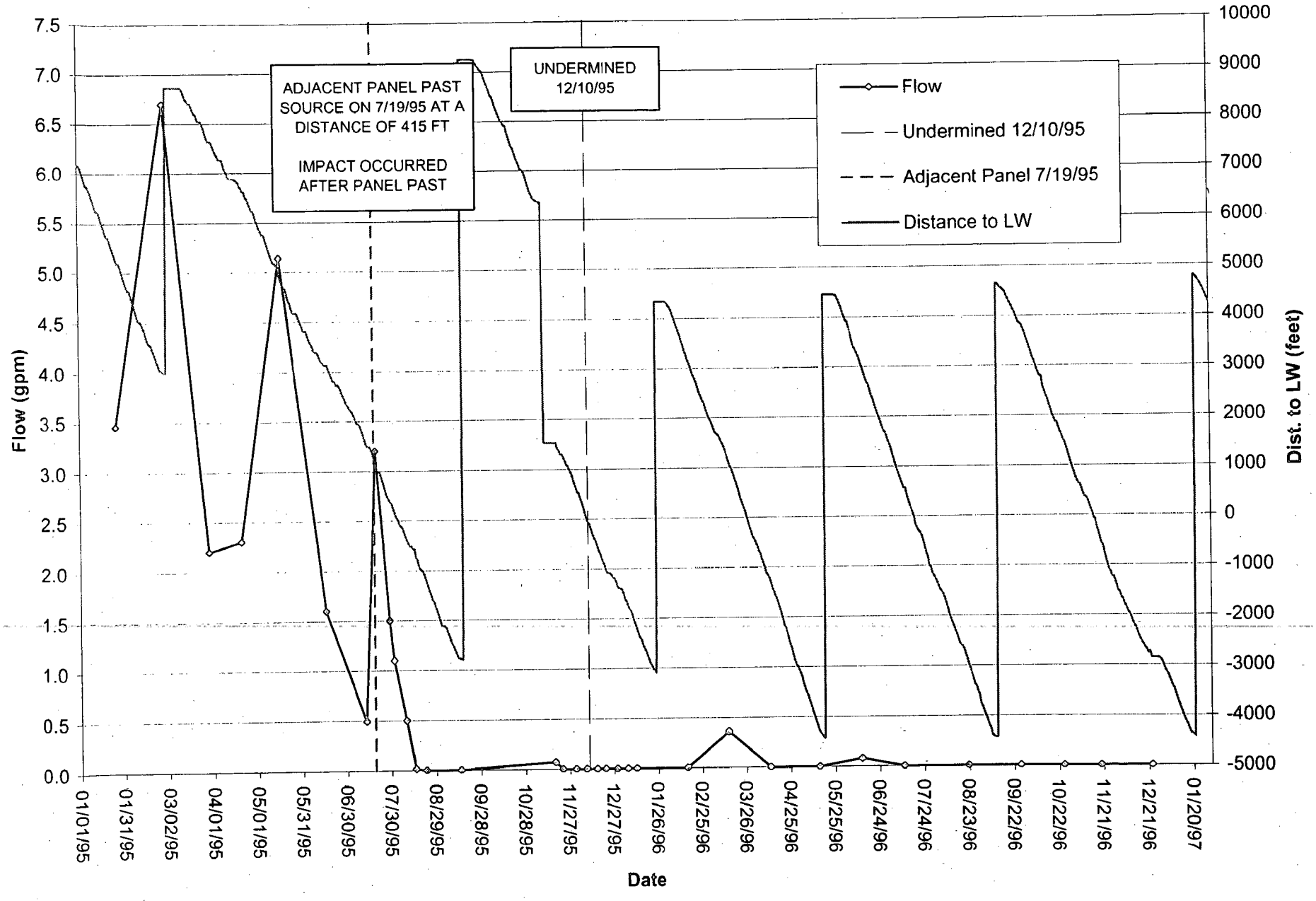
D-0360

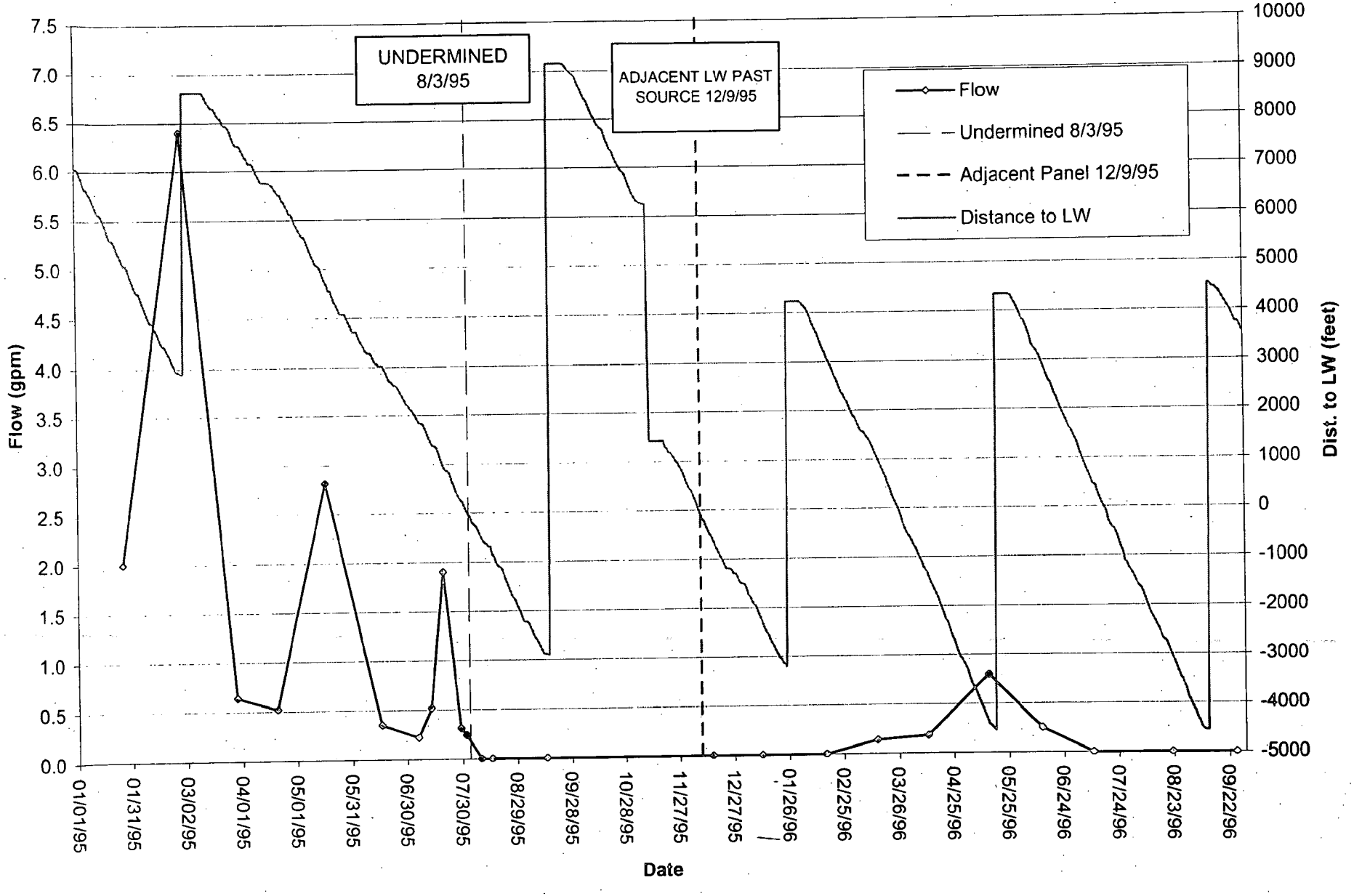
DS - 91 Hydrograph



TOVCC 11563

Ohio Valley Coal Company
D-0360

DS - 92 Hydrograph



TOVCC 11564

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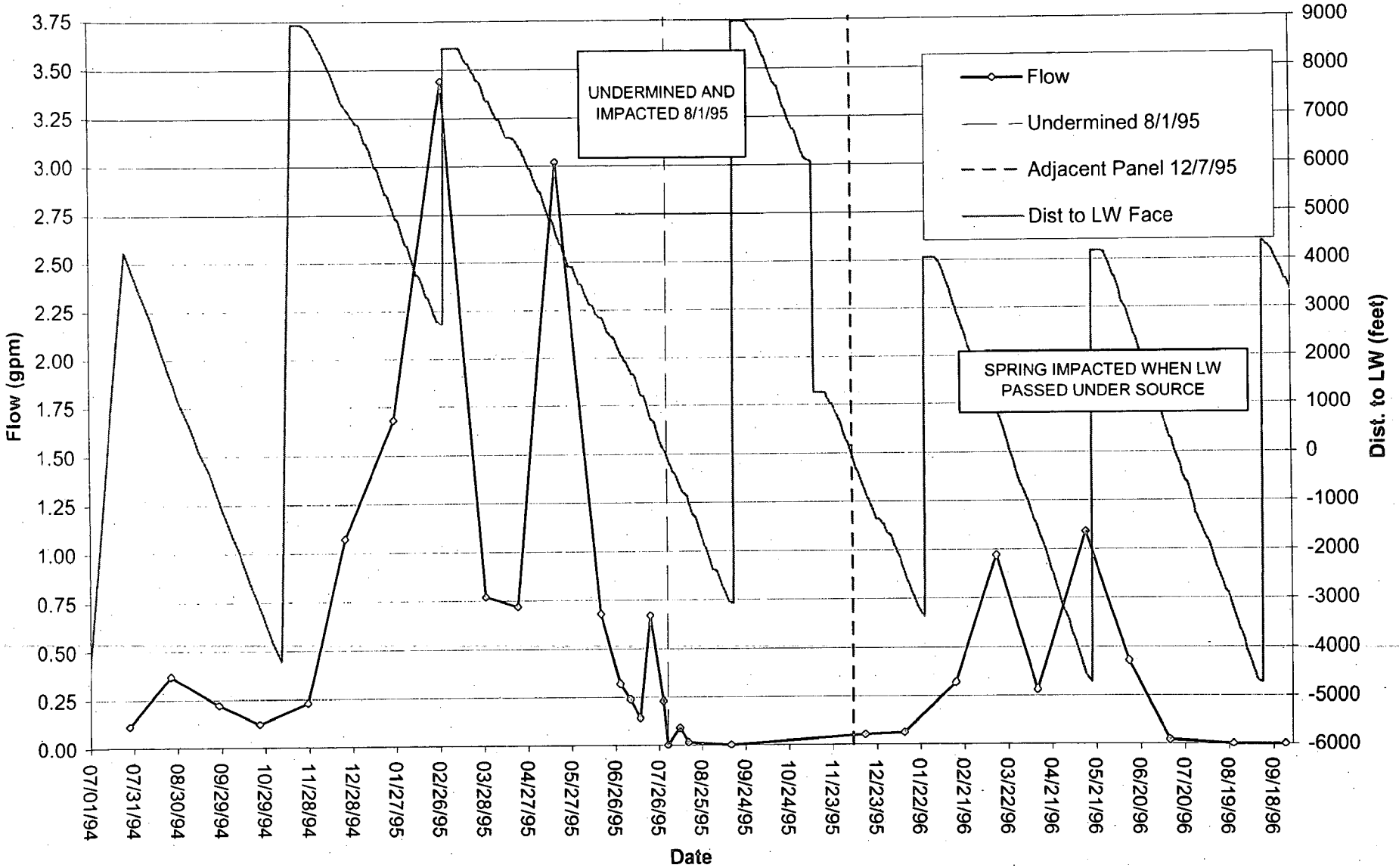
D-0360

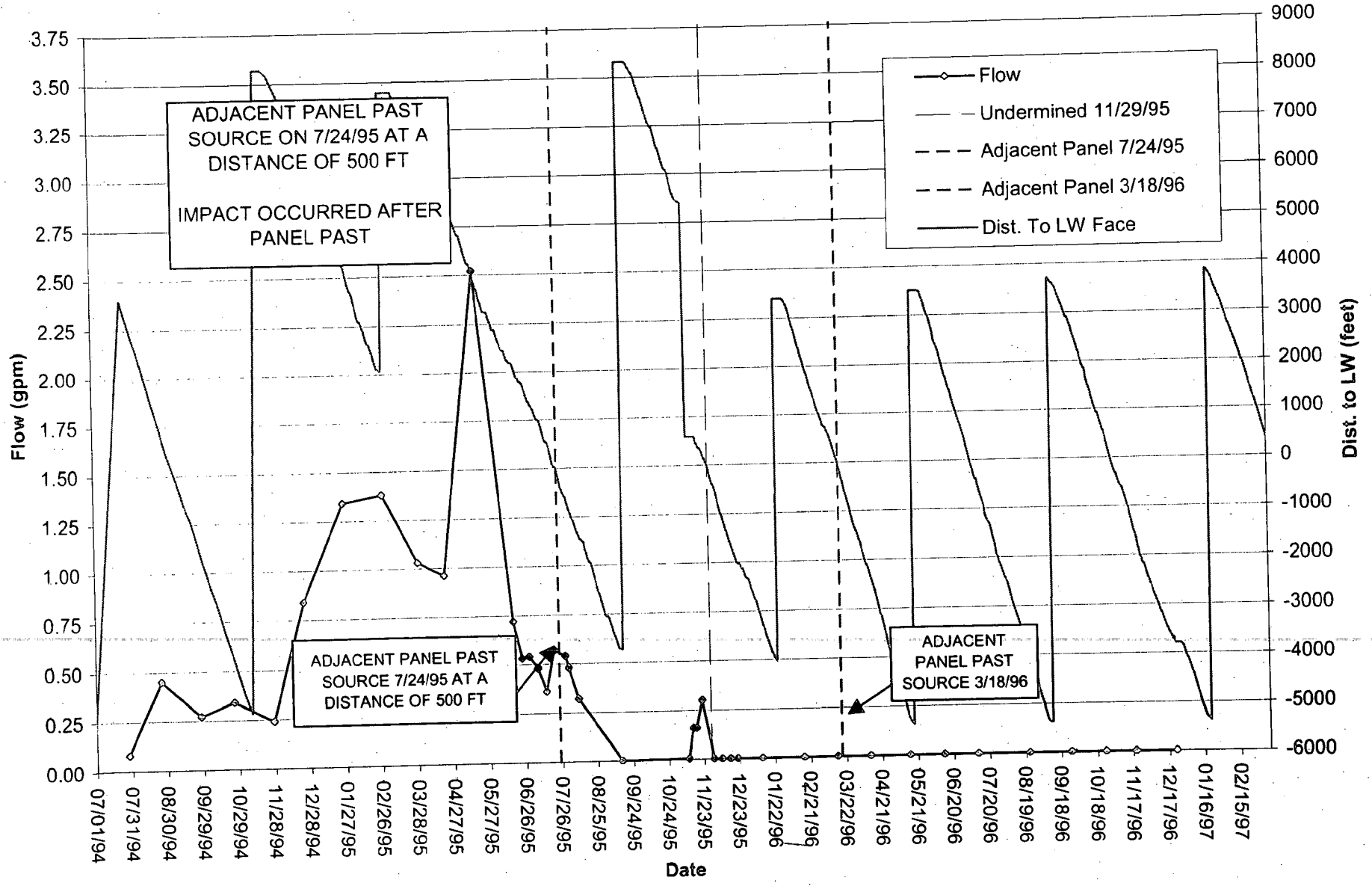
DS - 93 Hydrograph



TOVCC 11565

Ohio Valley Coal Company
D-0360

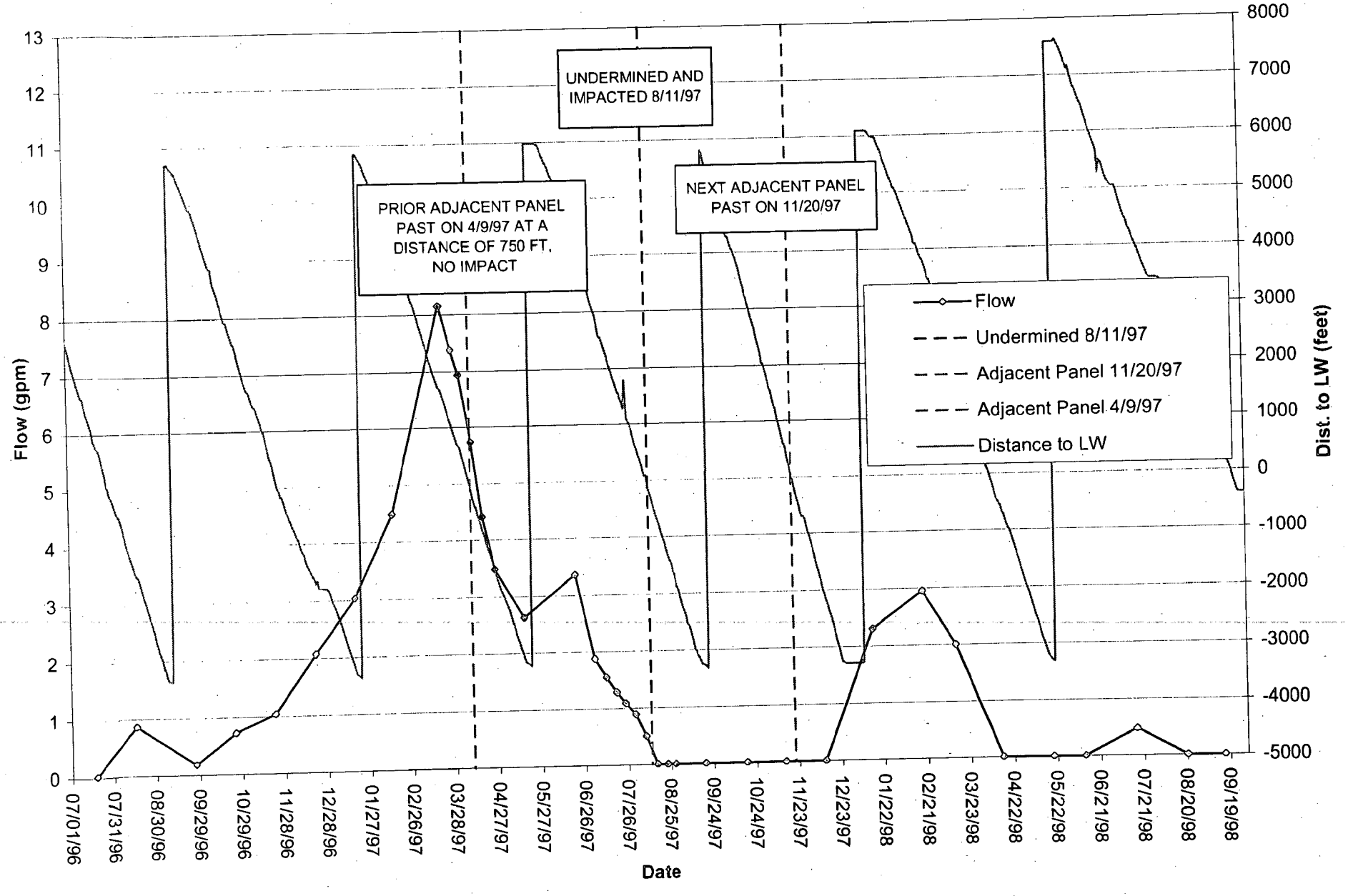
DS - 94 Hydrograph



TOVCC 11566

Ohio Valley Coal Company
D-0360

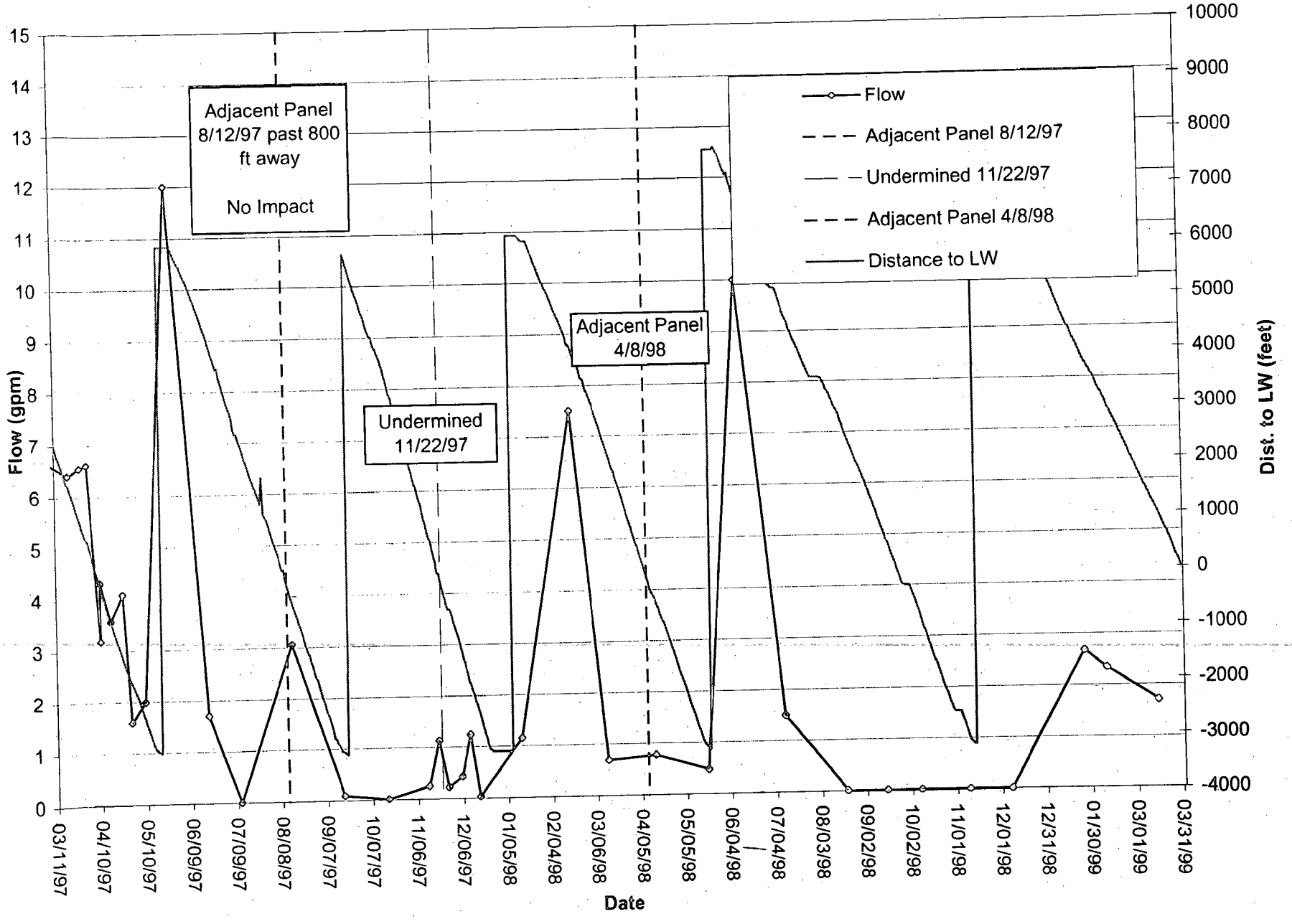
DS - 97 Hydrograph



TOVCC 11567

Ohio Valley Coal Company
D-0360

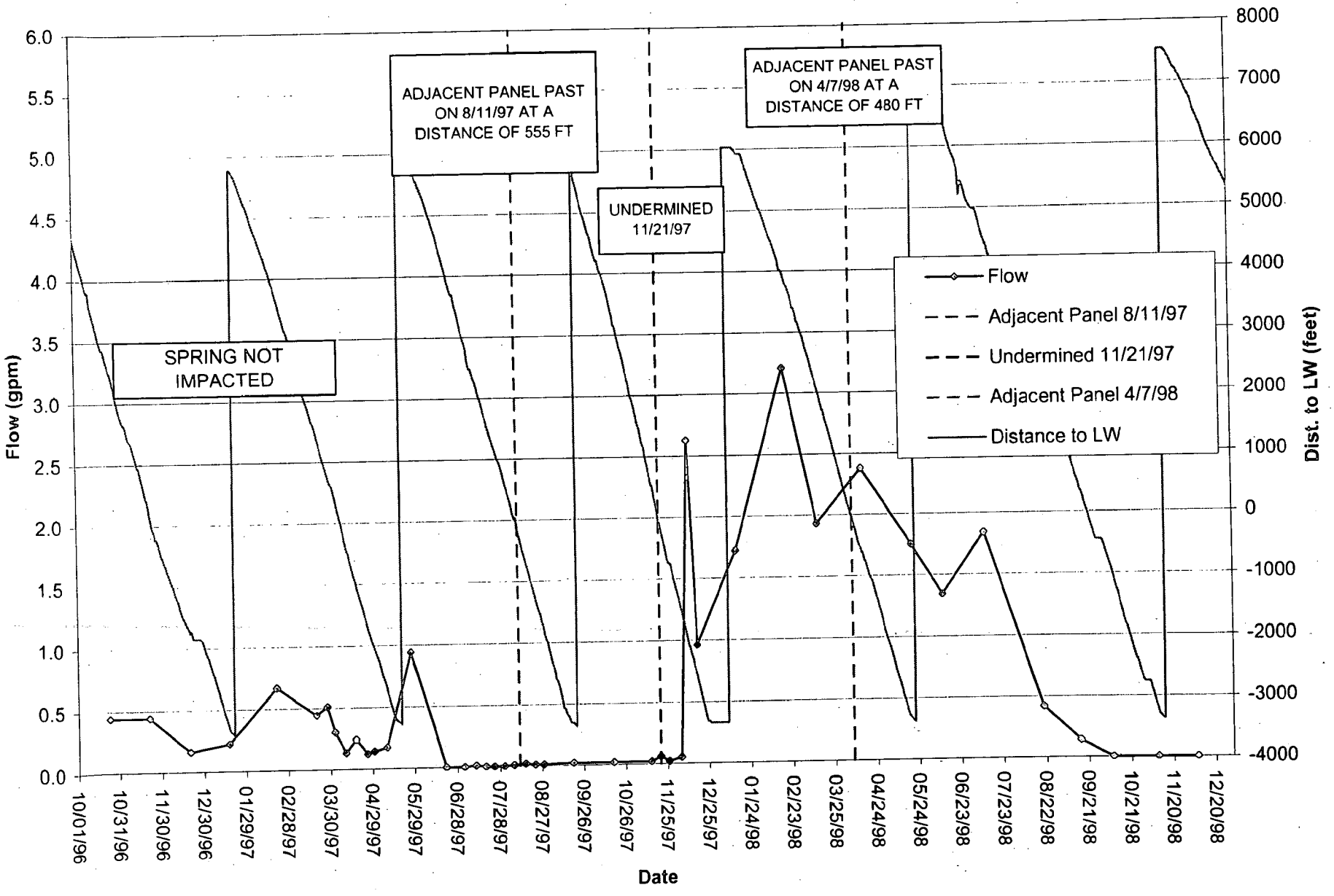
DS - 99 Hydrograph



TOVCC 11568

Ohio Valley Coal Company
D-0360

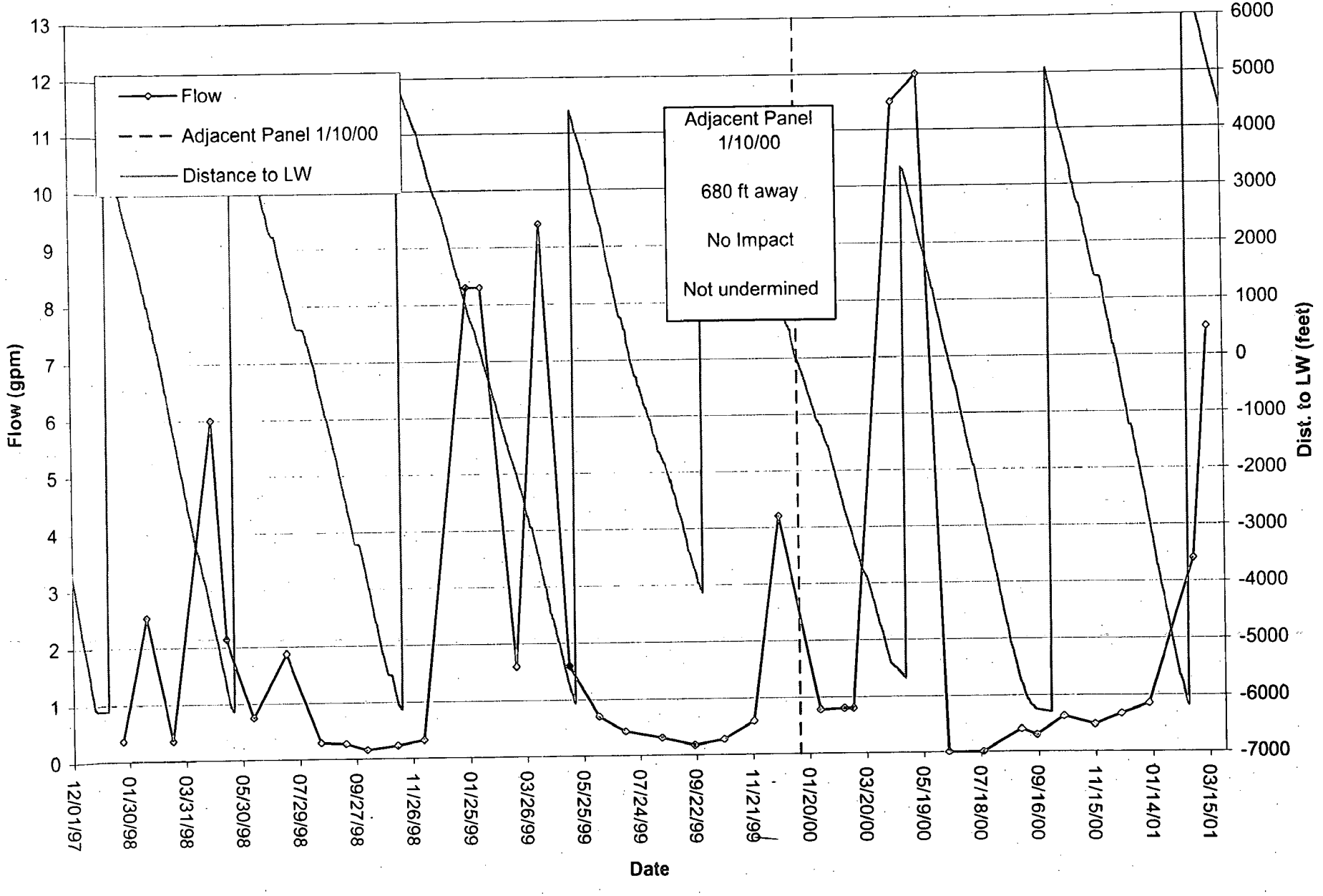
DS - 99A Hydrograph



TOVCC 11569

Ohio Valley Coal Company
D-0360

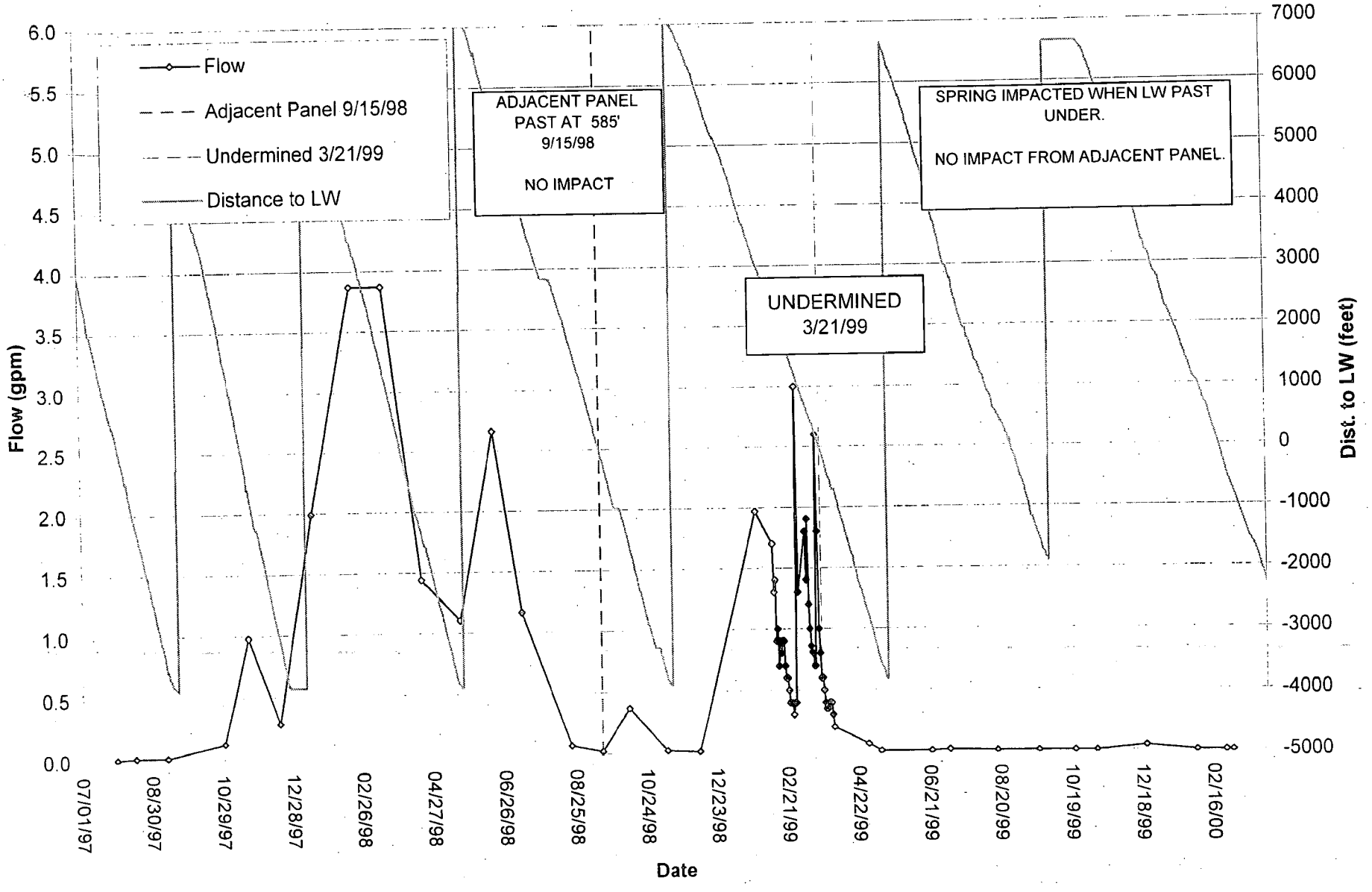
DS-253 Hydrograph



TOVCC 11570

Ohio Valley Coal Company
D-0360

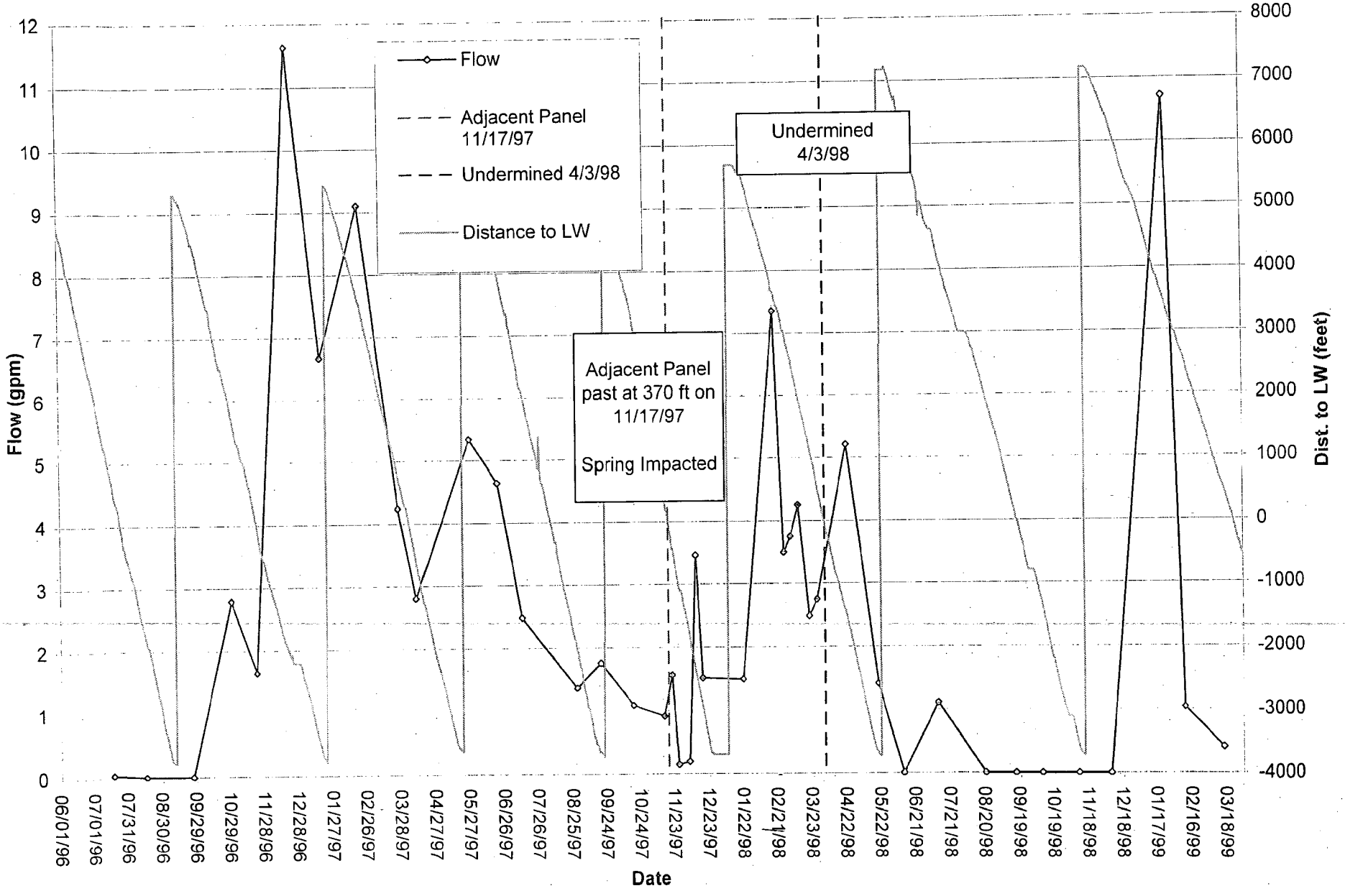
DS - 101 Hydrograph



TOVCC 11571

Ohio Valley Coal Company
D-0360

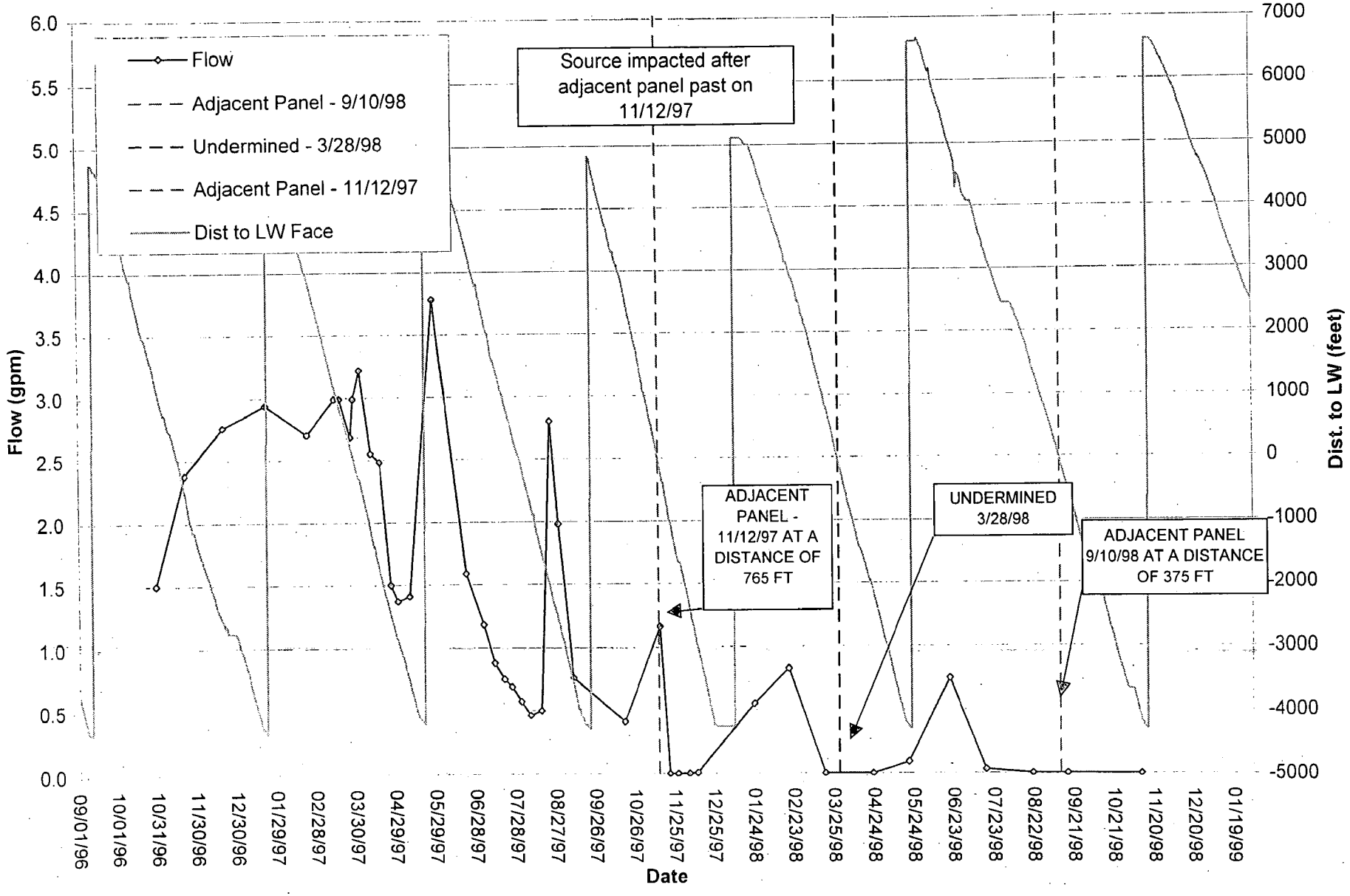
DS - 102 Hydrograph



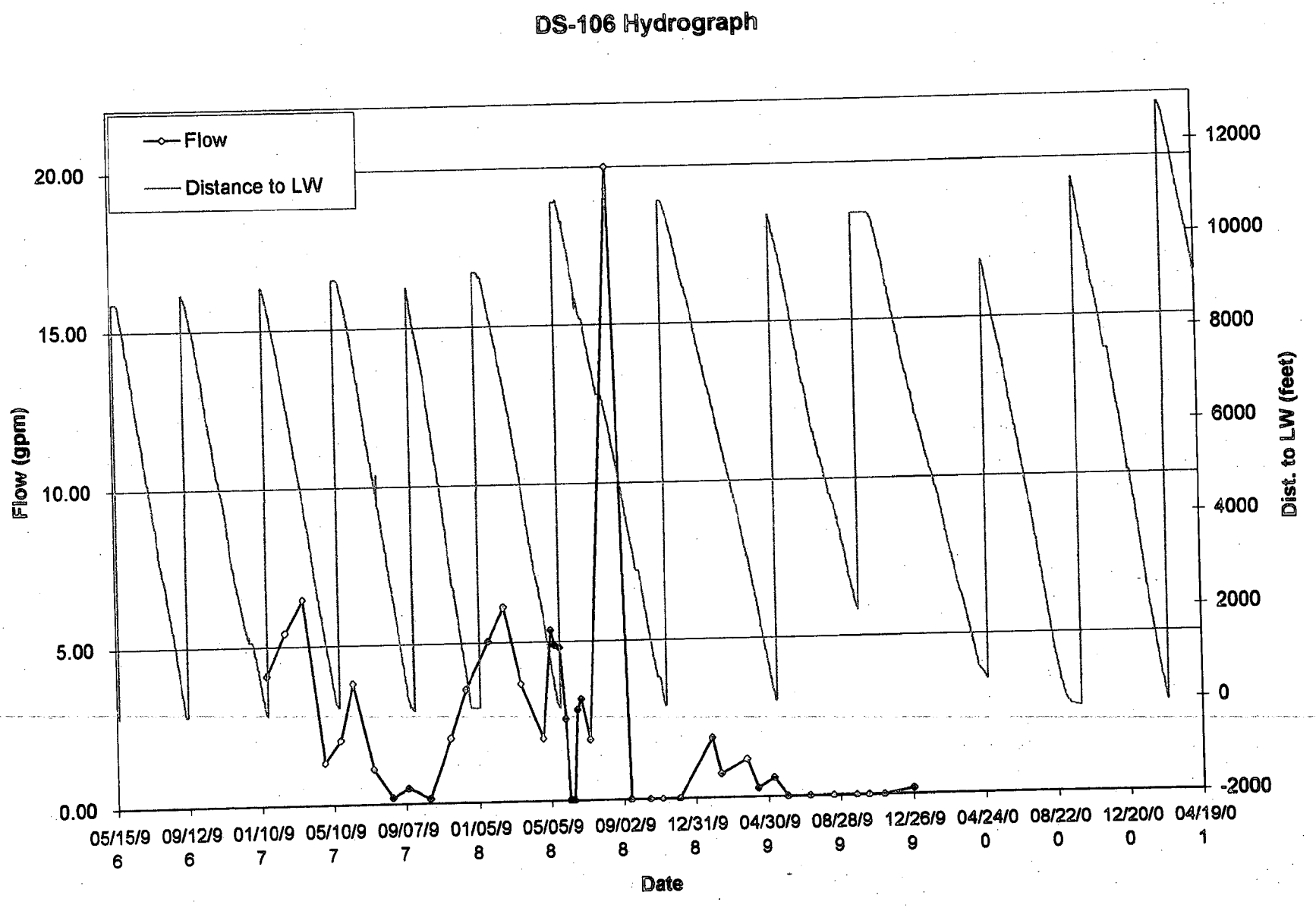
TOVCC 11572

Ohio Valley Coal Company
D-0360

DS - 102A Hydrograph

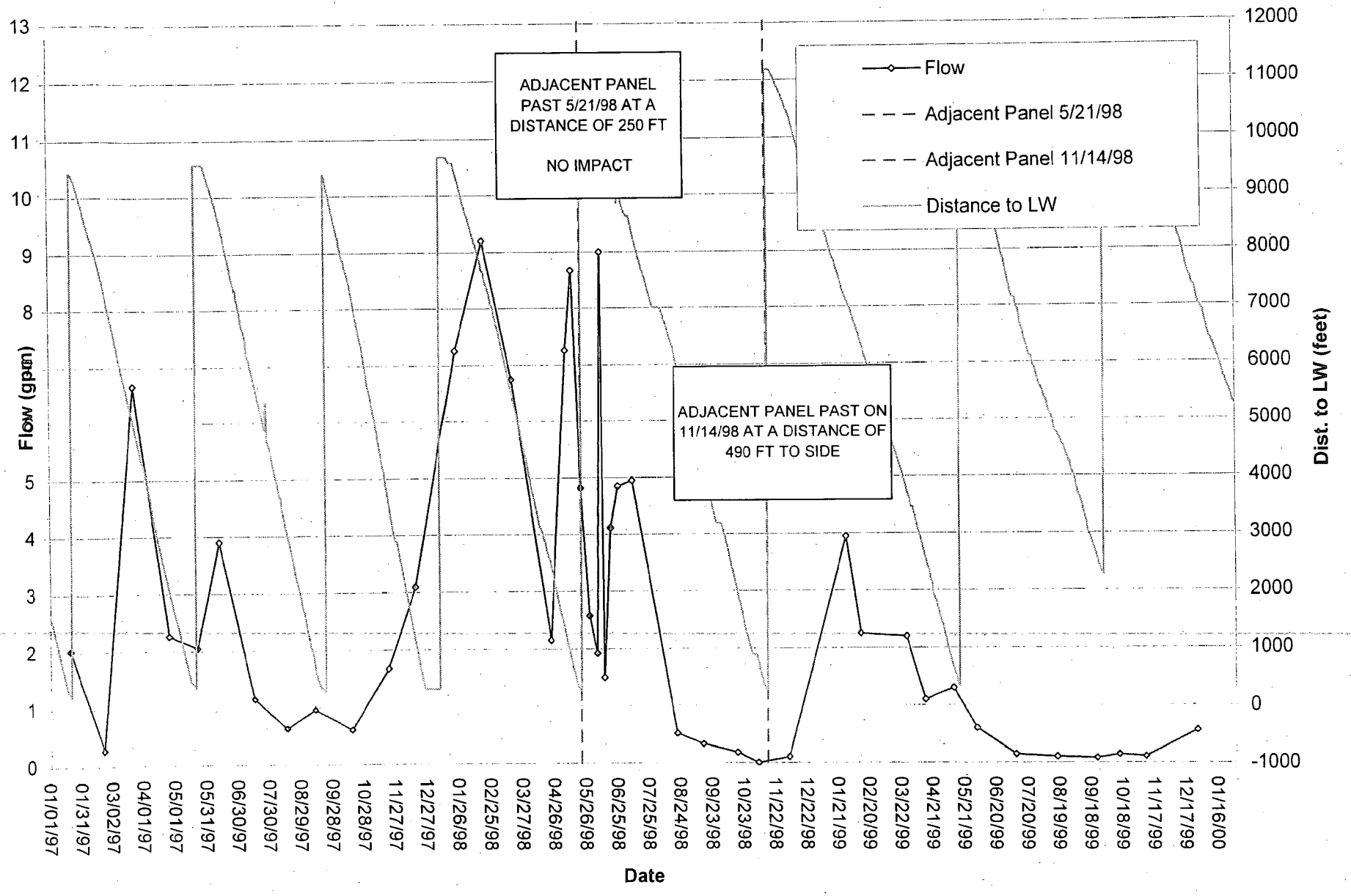


TOVCC 11573


DS-106 Hydrograph
Flow
Distance to LW
Flow (gpm)
20.00
15.00
10.00
5.00
0.00
Dist. to LW (feet)
12000
10000
8000
6000
4000
2000
0
-2000
05/15/96
09/12/96
01/10/97
05/10/97
09/07/97
01/05/98
05/05/98
09/02/98
12/31/98
04/30/99
08/28/99
12/26/99
04/24/00
08/22/00
12/20/00
04/19/01
Date

Ohio Valley Coal Company
D-0360

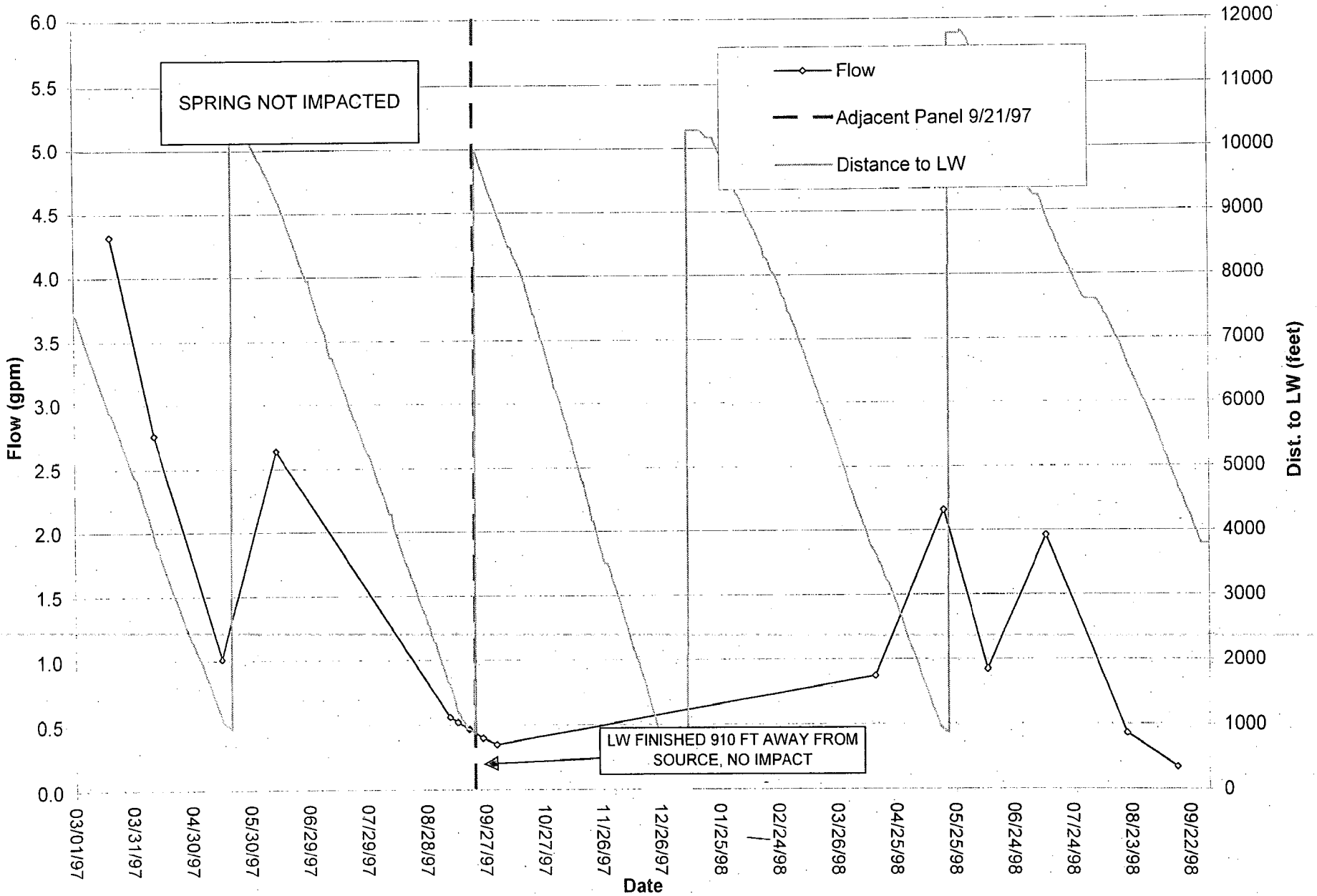
DS - 107 Hydrograph



TOVCC 11575

Ohio Valley Coal Comapny
D-0360

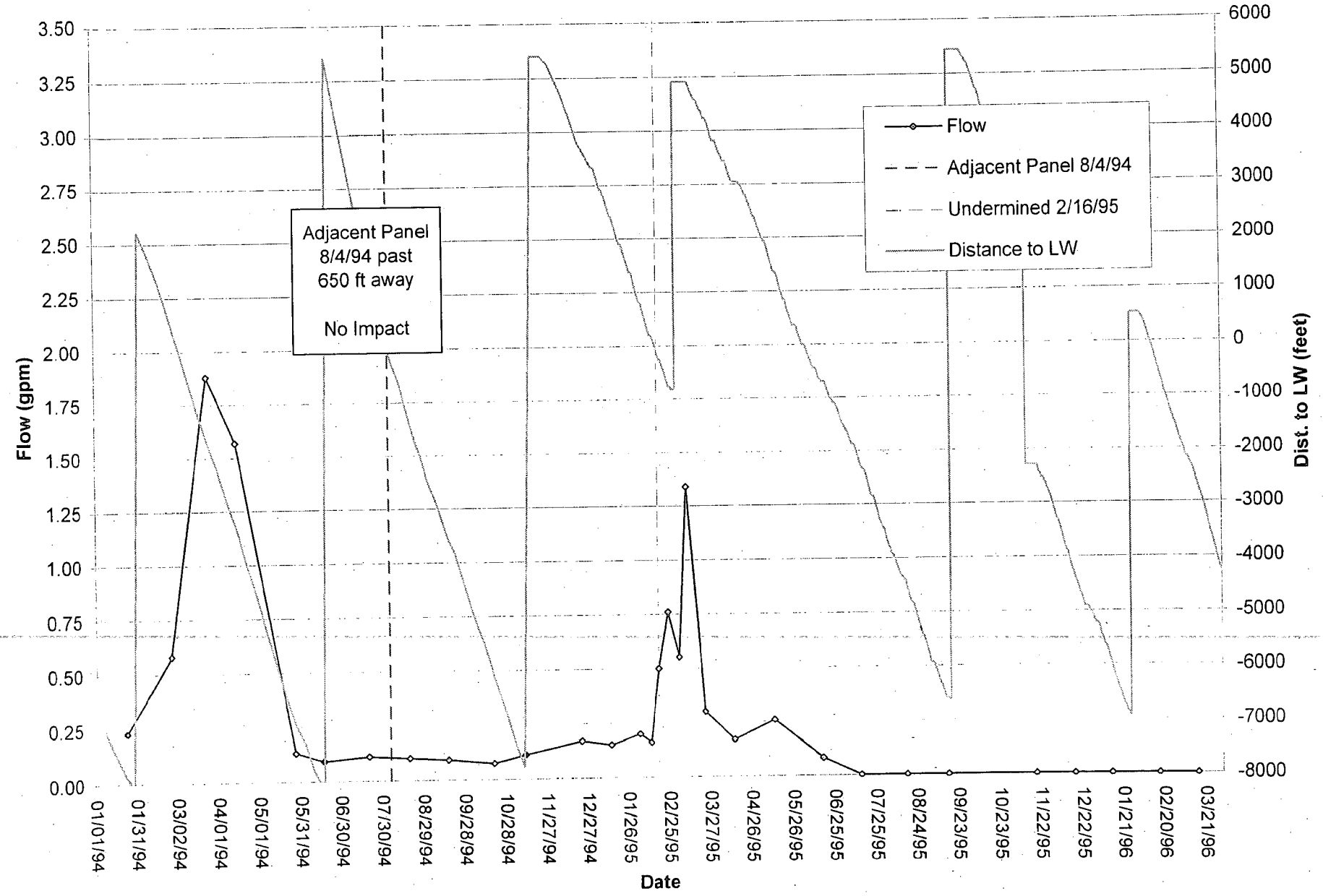
DS - 118 Hydrograph



TOVCC 11576

Ohio Valley Coal Company
D-0360

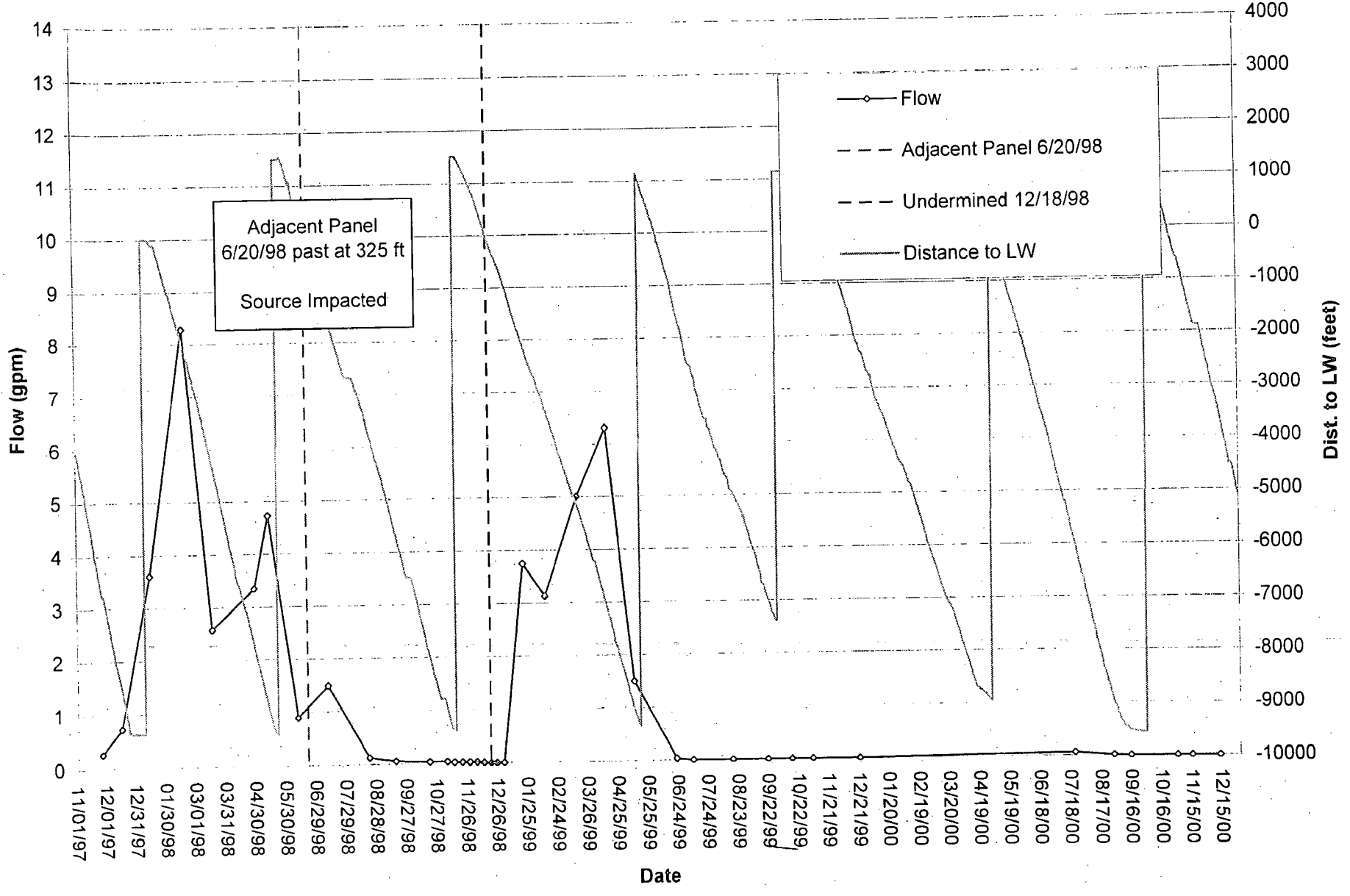
DS - 152 Hydrograph



TOVCC 11577

Ohio Valley Coal Company
D-0360

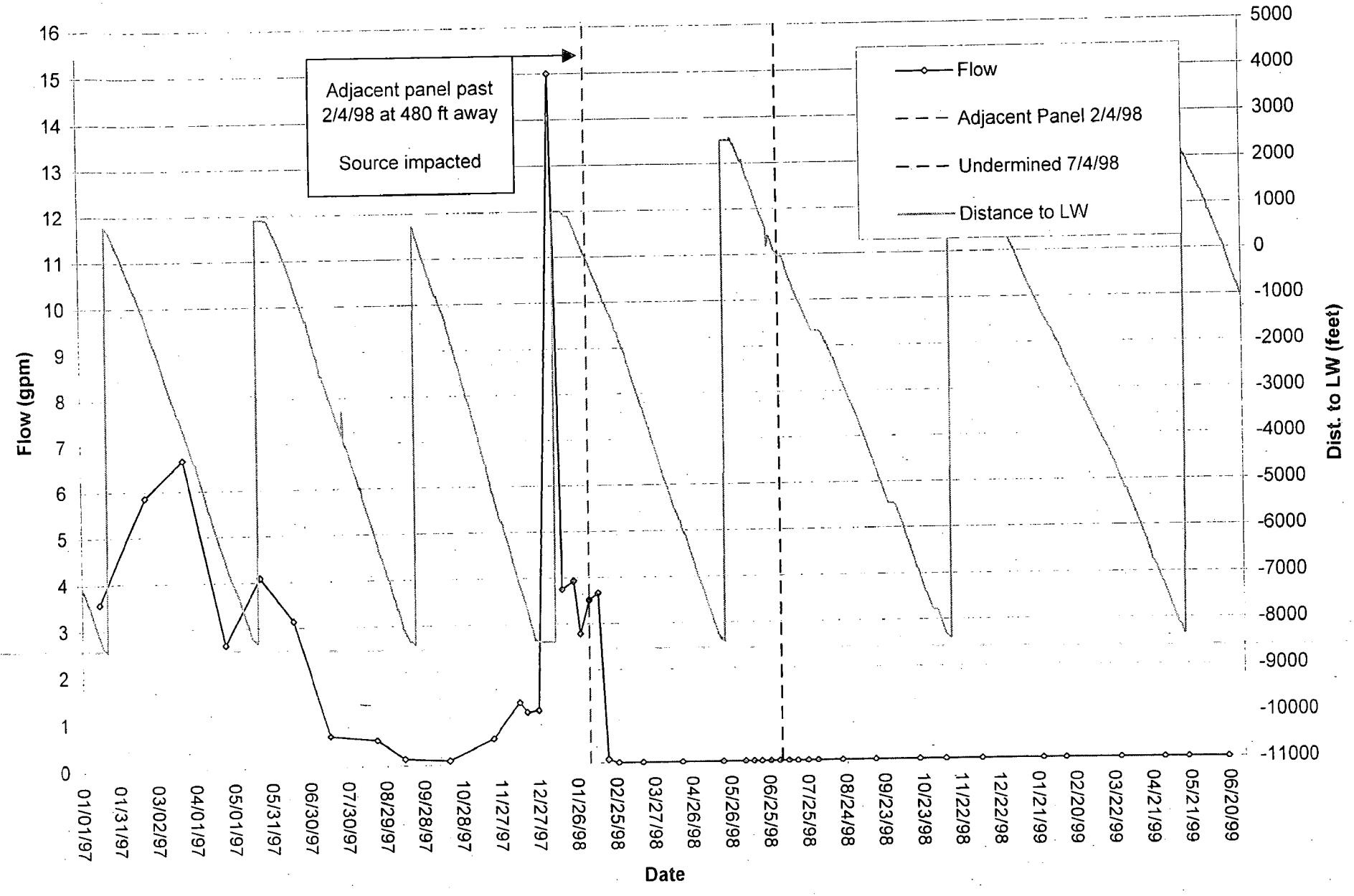
DS - 154 Hydrograph



TOVCC 11578

Ohio Valley Coal Company
D-0360

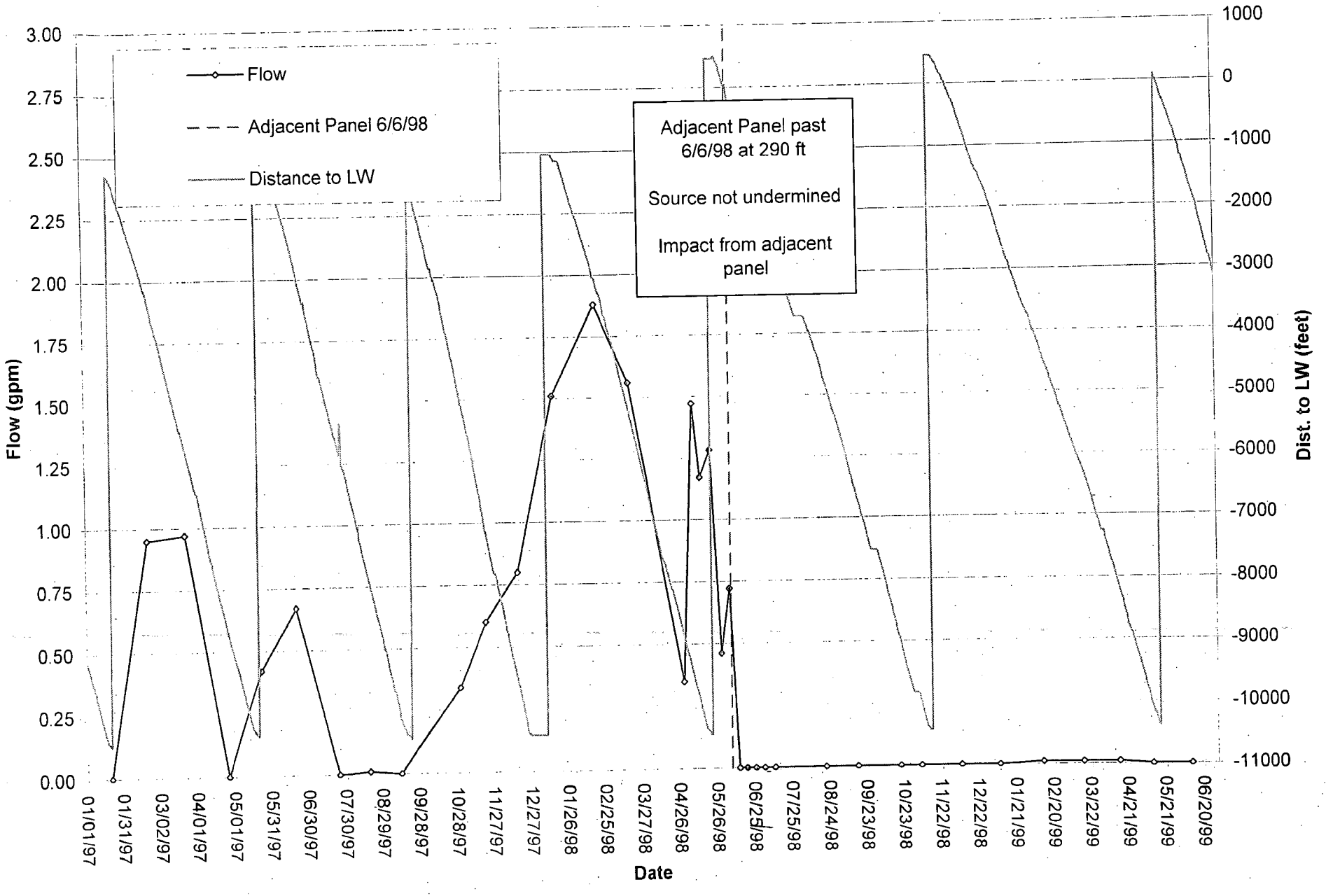
DS - 155 Hydrograph



TOVCC 11579

Ohio Valley Coal Company
D-0360

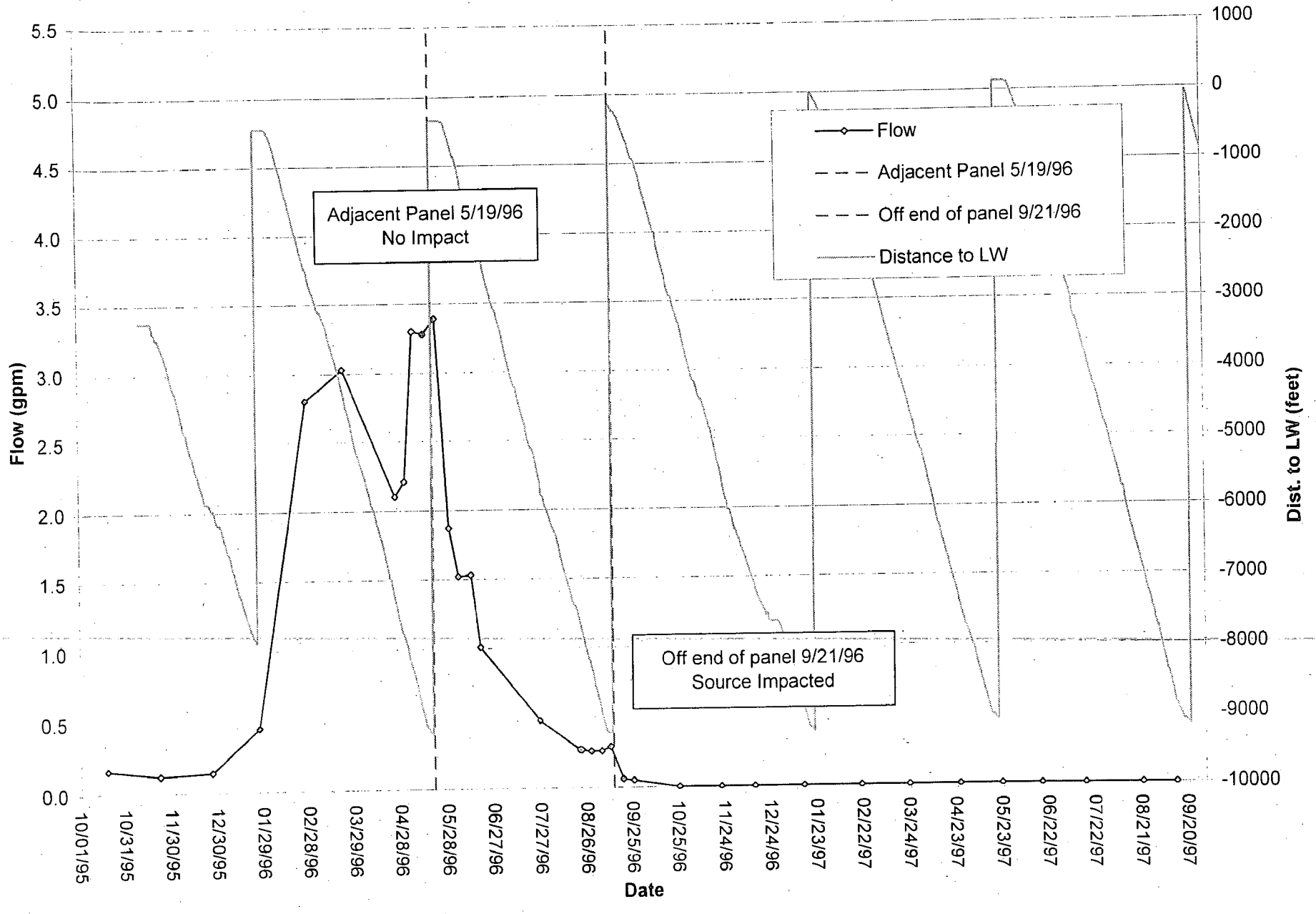
DS - 157 Hydrograph



TOVCC 11580

Ohio Valley Coal Company
D-0360

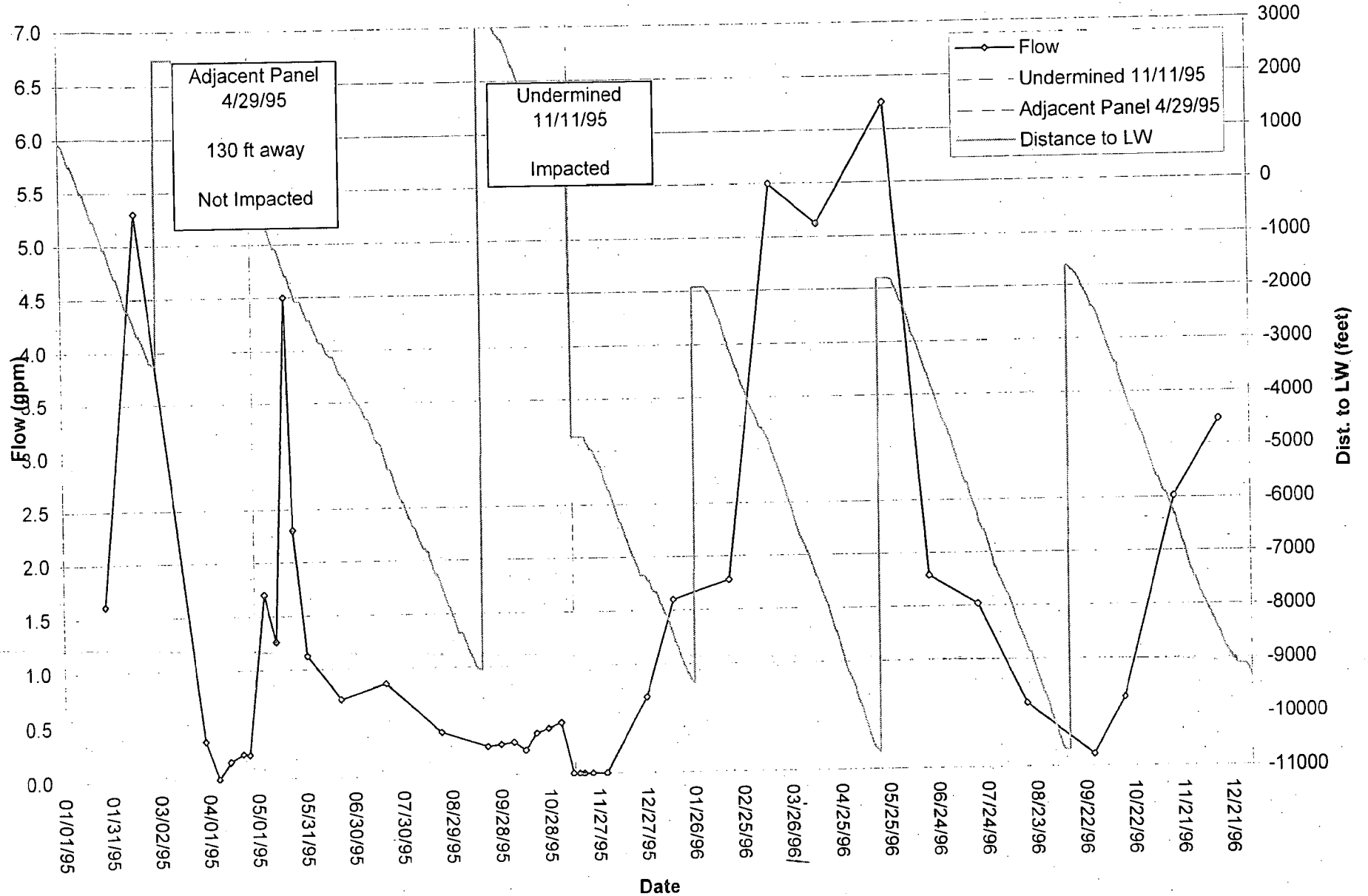
DS - 162 Hydrograph



TOVCC 11581

Ohio Valley Coal Company
D-0360

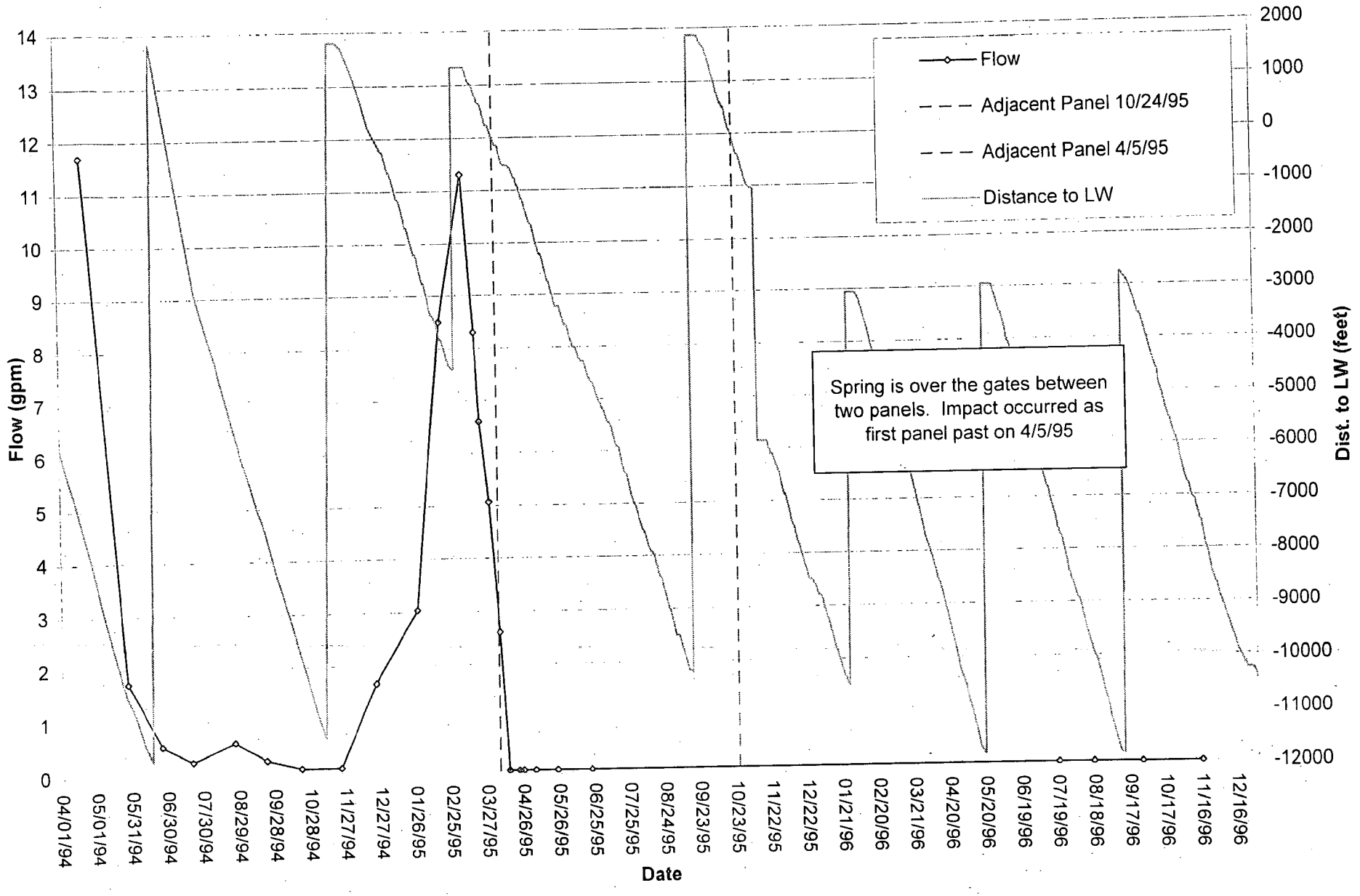
DS - 165 Hydrograph



TOVCC 11582

Ohio Valley Coal Company
D-0360

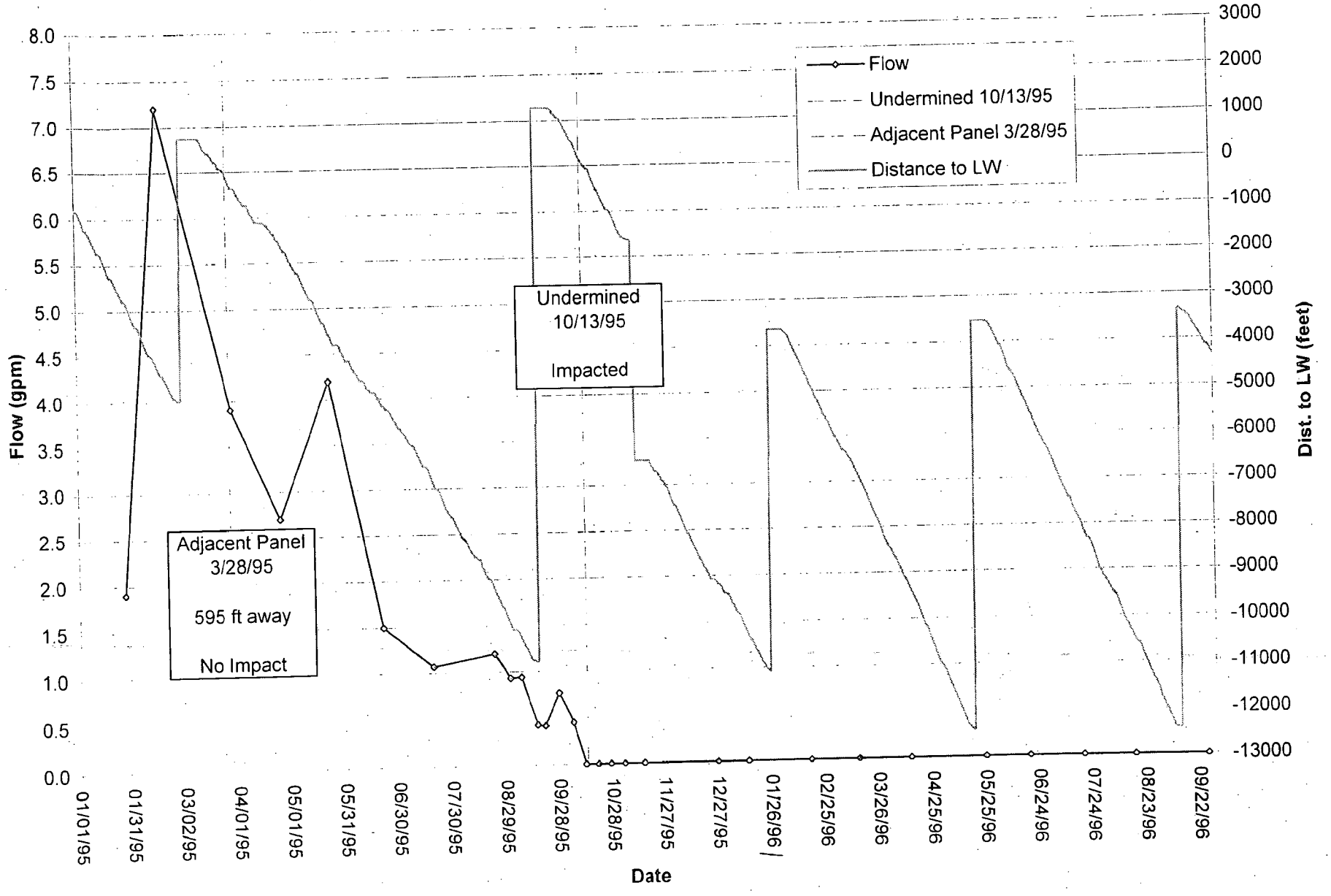
DS - 166 Hydrograph



TOVCC 11583

Ohio Valley Coal Company
D-0360

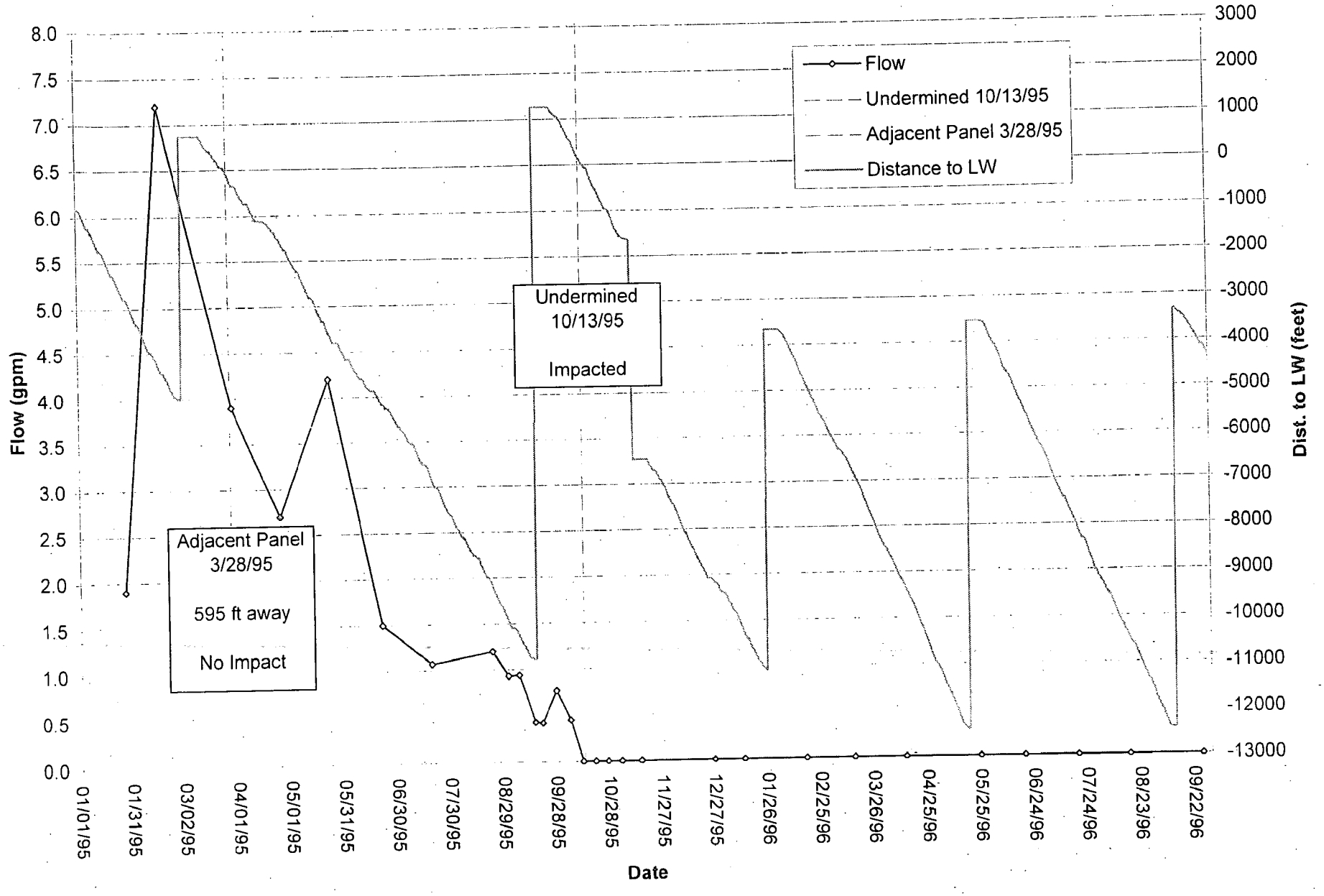
DS - 167 Hydrograph



TOVCC 11584

Ohio Valley Coal Company
D-0360

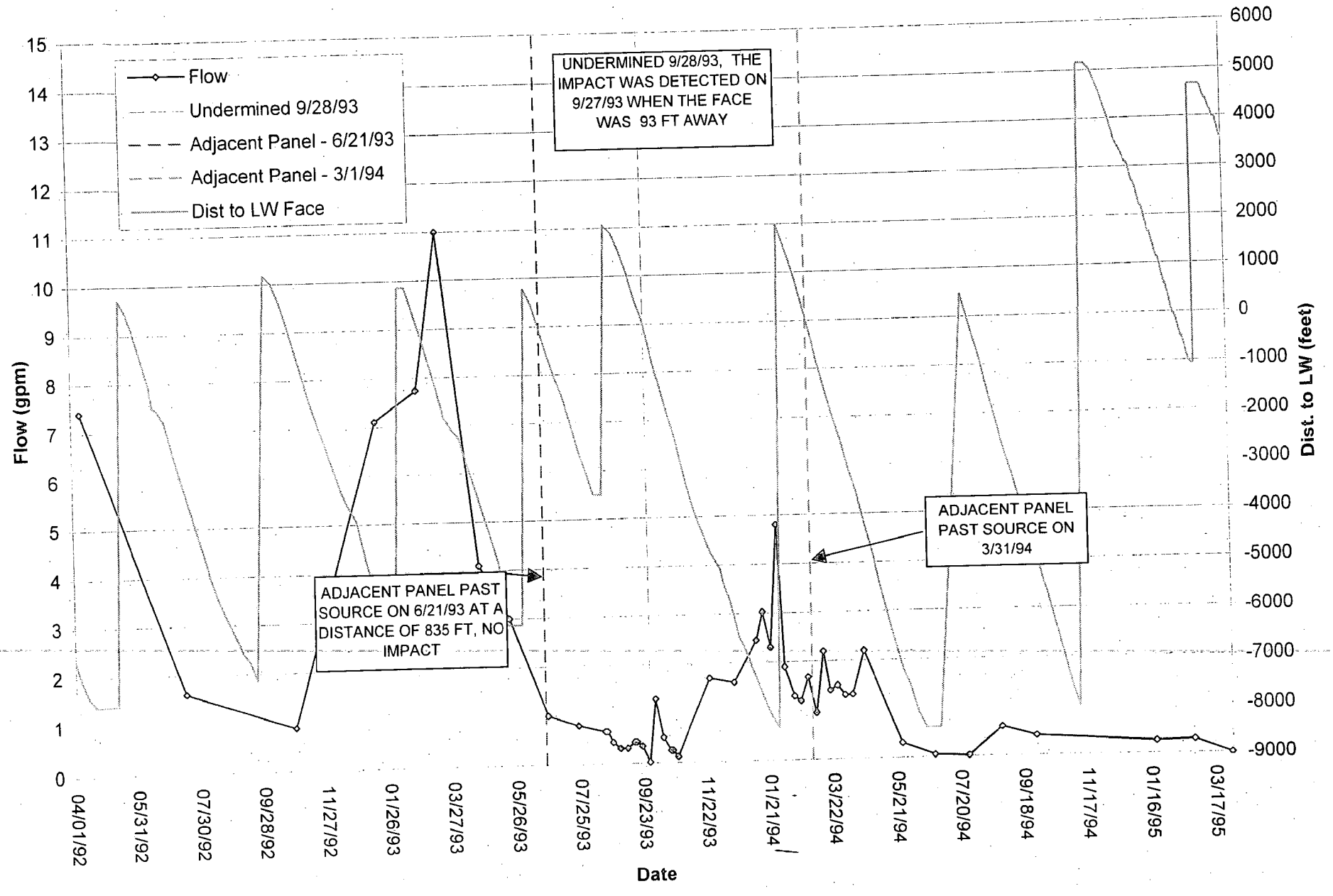
DS - 167 Hydrograph



TOVCC 11585

Ohio Valley Coal Company
D-0360

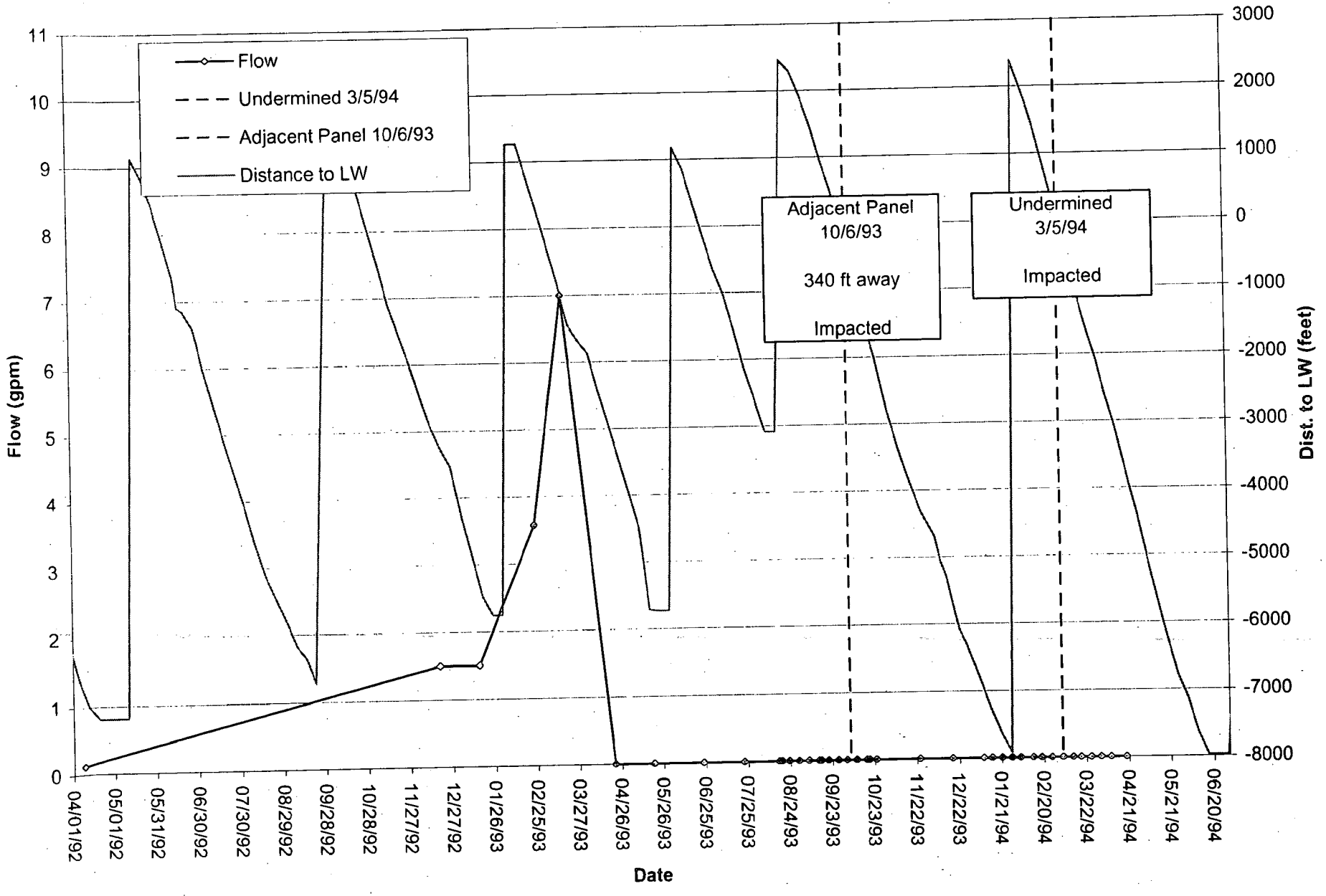
DS - 169 Hydrograph



TOVCC 11586

Ohio Valley Coal Company
D-0360

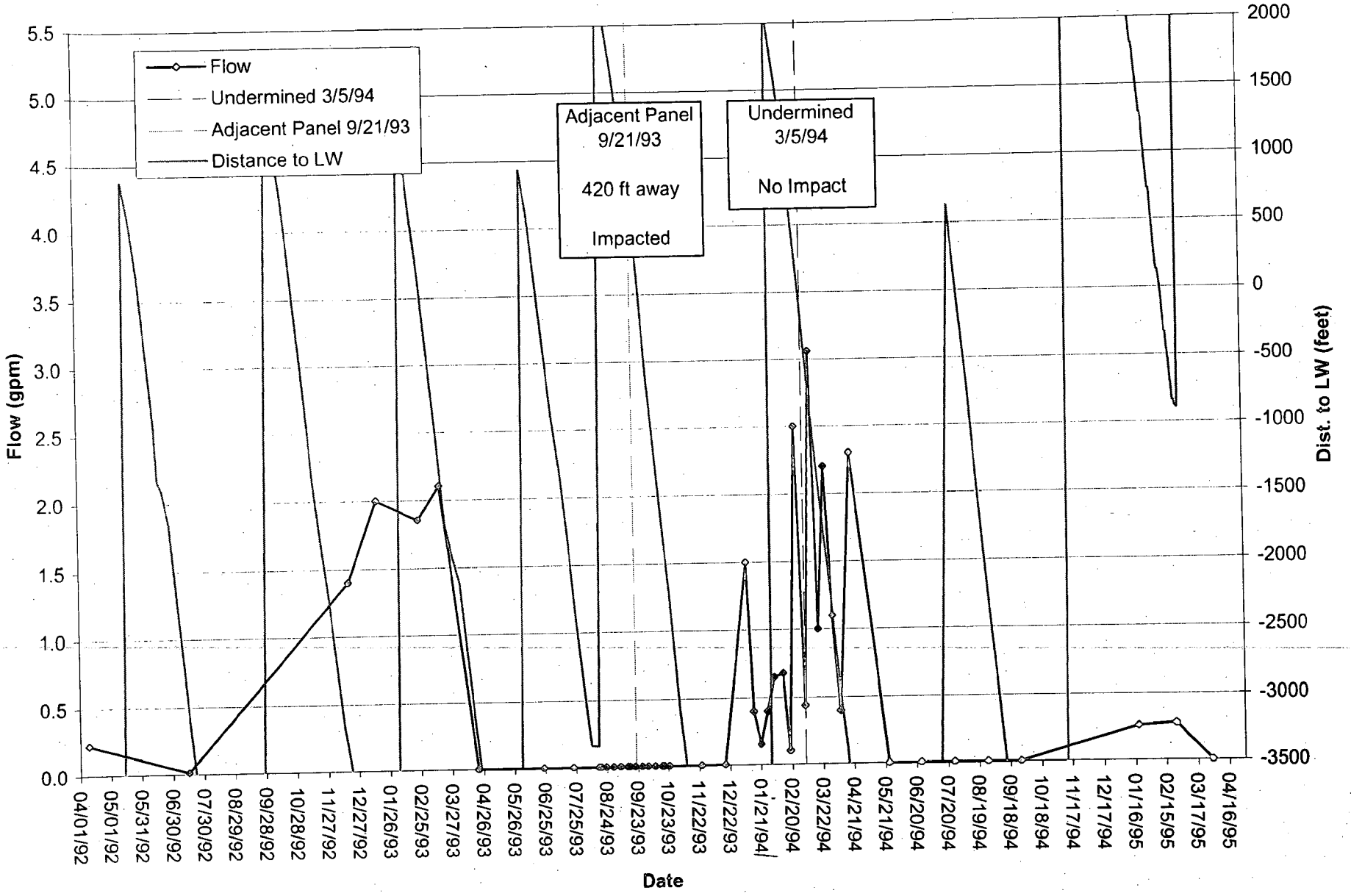
DS - 170 Hydrograph



TOVCC 11587

Ohio Valley Coal Company
D-0360

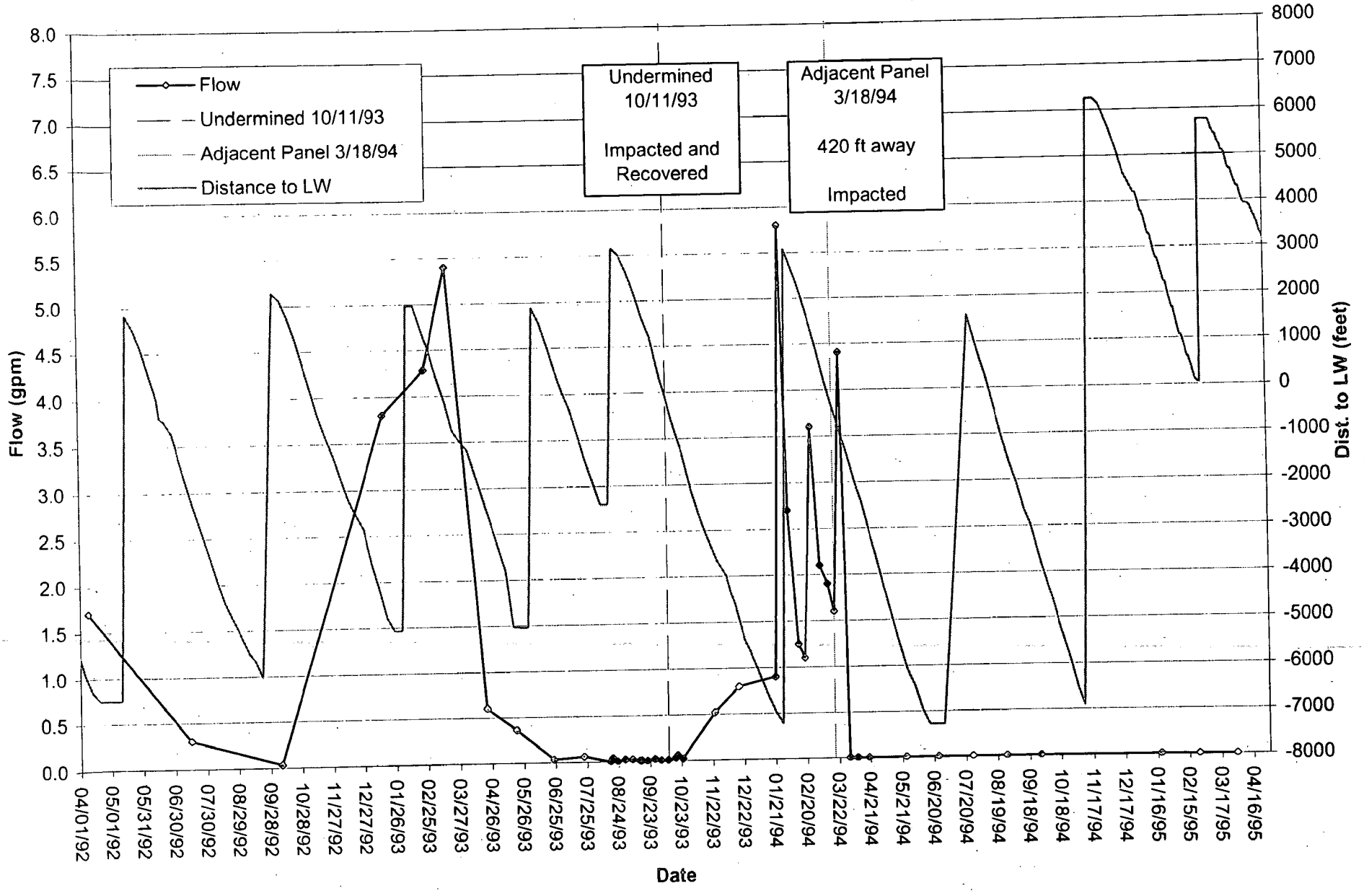
DS - 171 Hydrograph



TOVCC 11588

Ohio Valley Coal Company
D-0360

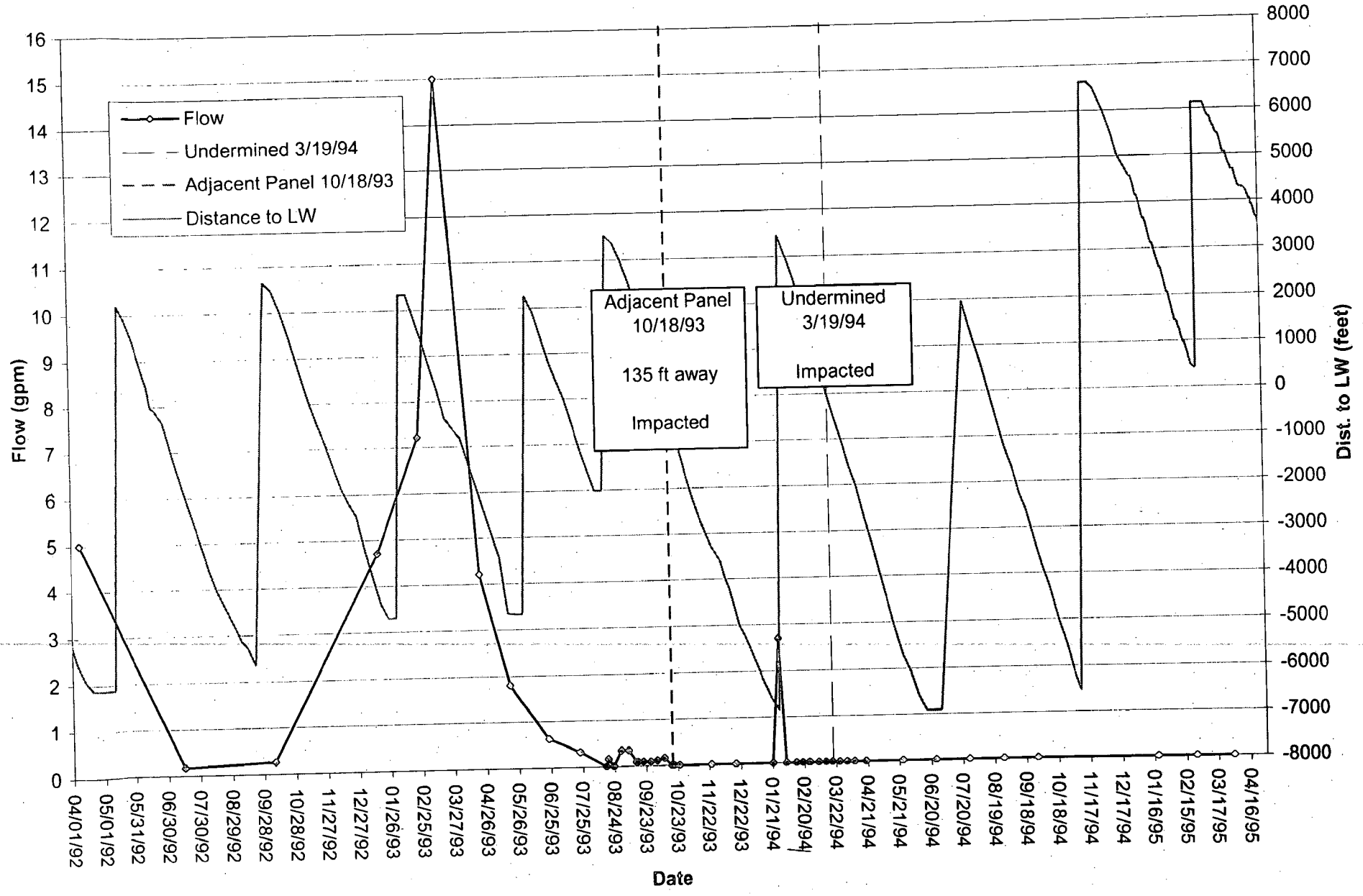
DS - 173 Hydrograph



TOVCC 11589

Ohio Valley Coal Company
D-0360

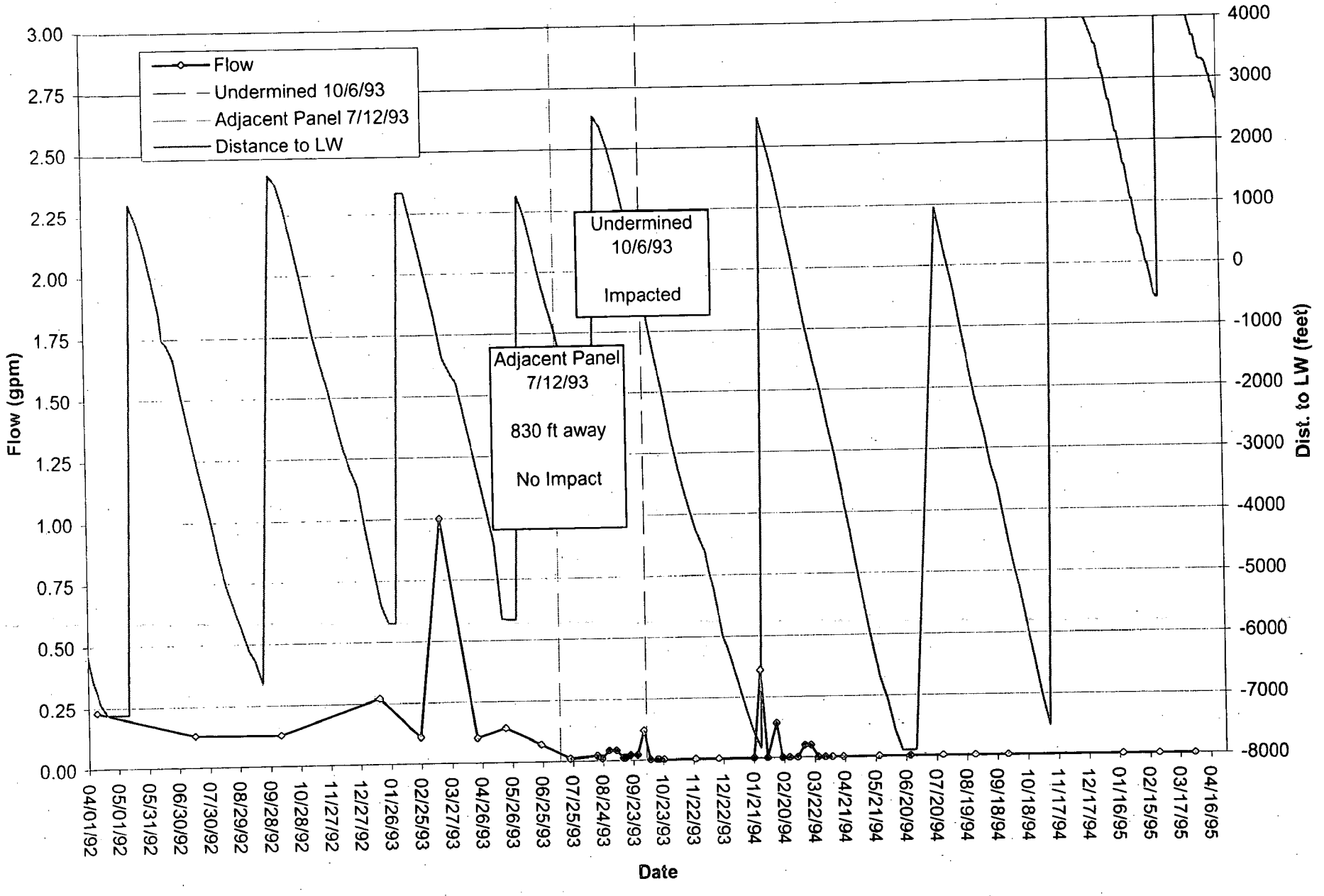
DS - 174 Hydrograph



TOVCC 11590

Ohio Valley Coal Company
D-0360

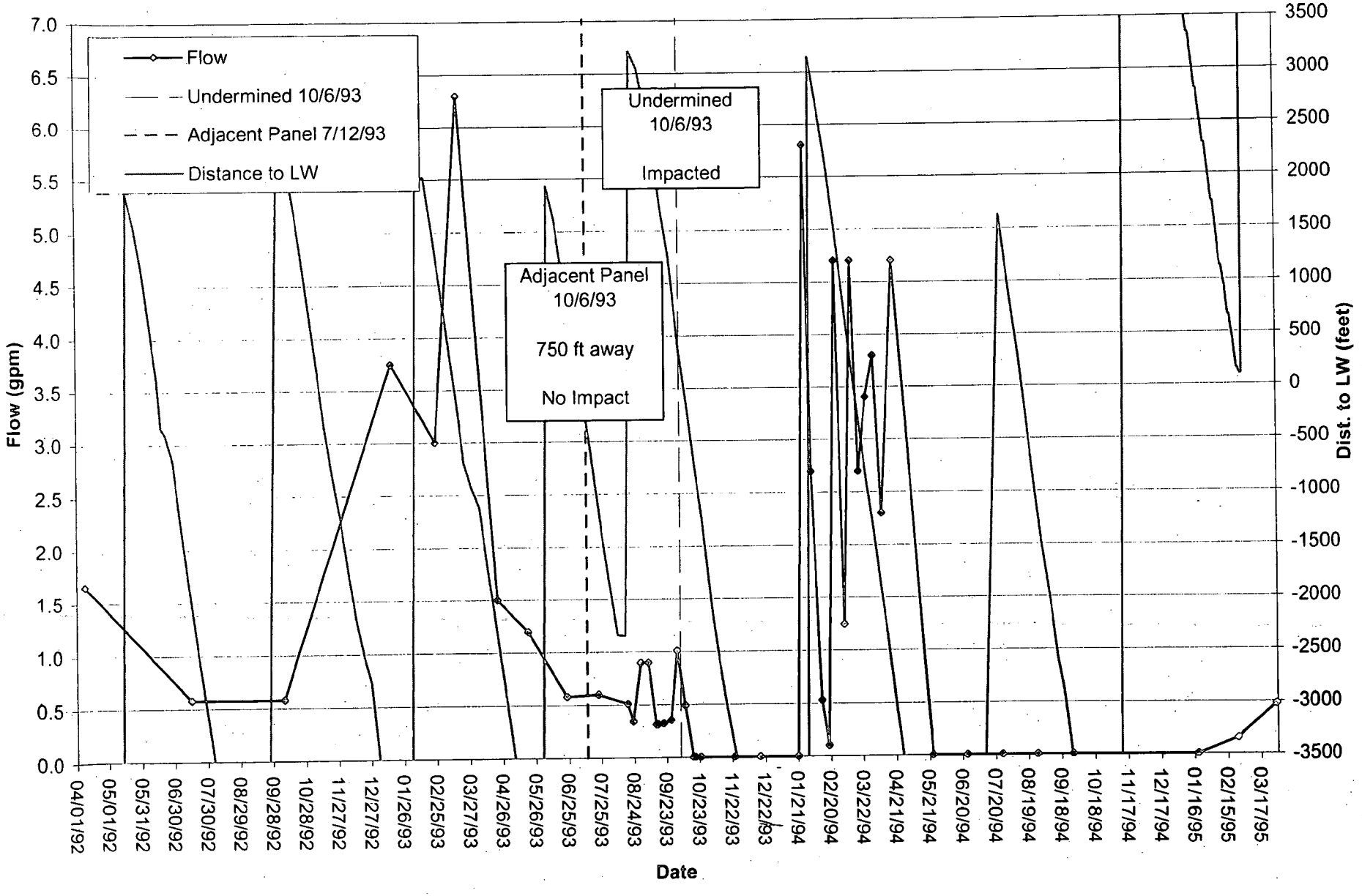
DS - 175 Hydrograph



TOVCC 11591

Ohio Valley Coal Company
D-0360

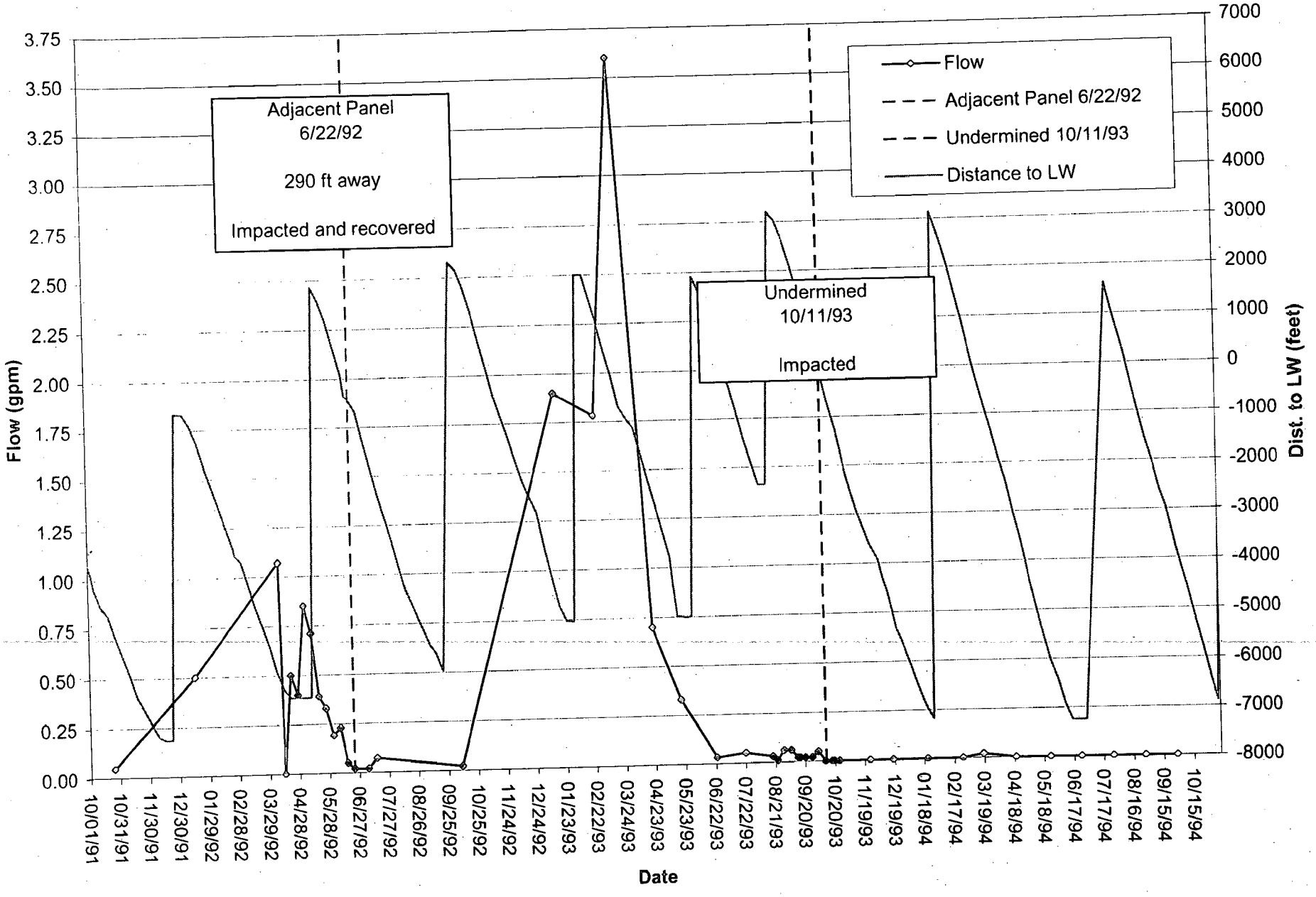
DS-176 Hydrograph



TOVCC 11592

Ohio Valley Coal Company
D-0360

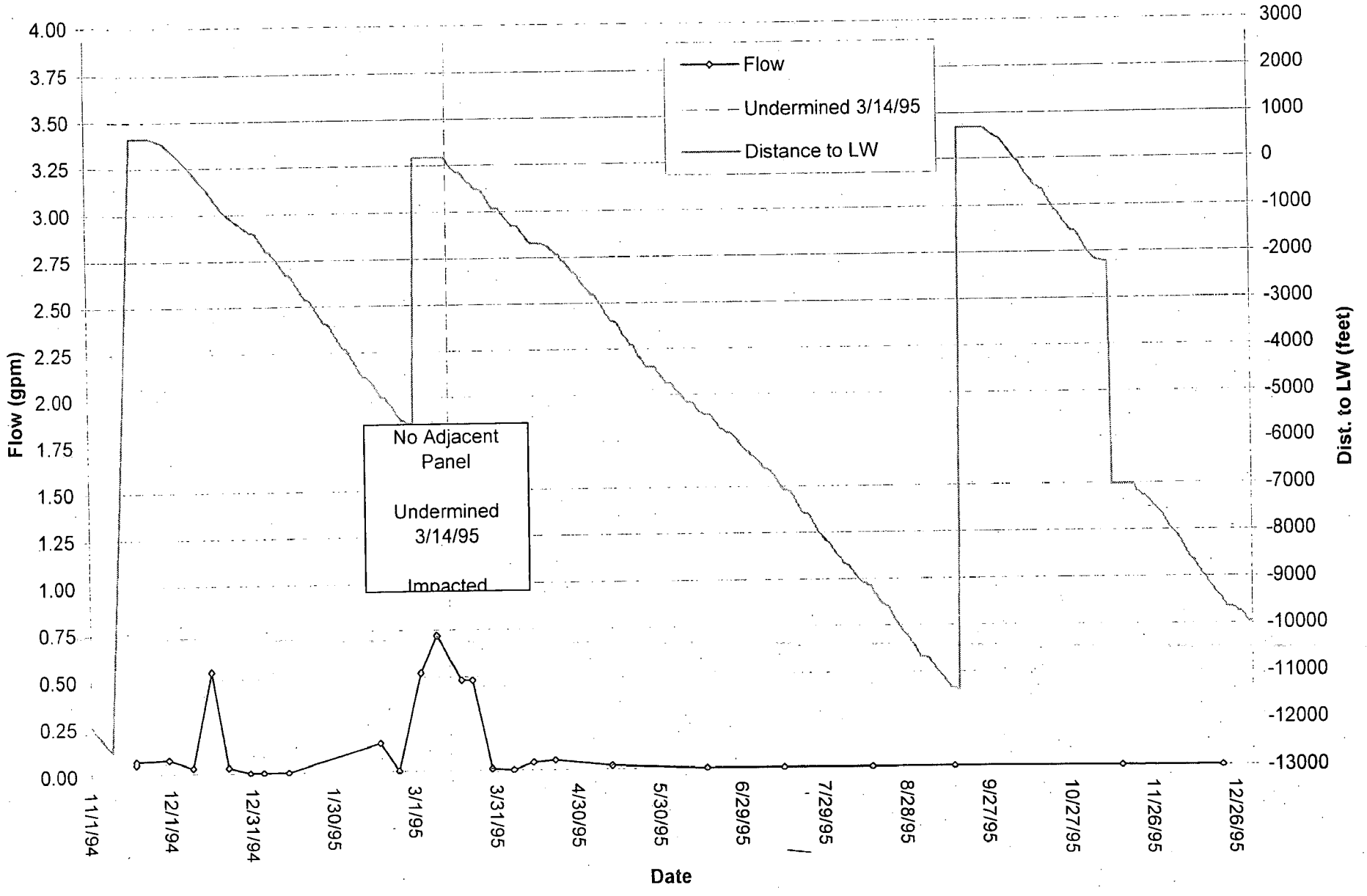
DS-177 Hydrograph



TOVCC 11593

Ohio Valley Coal Company
D-0360

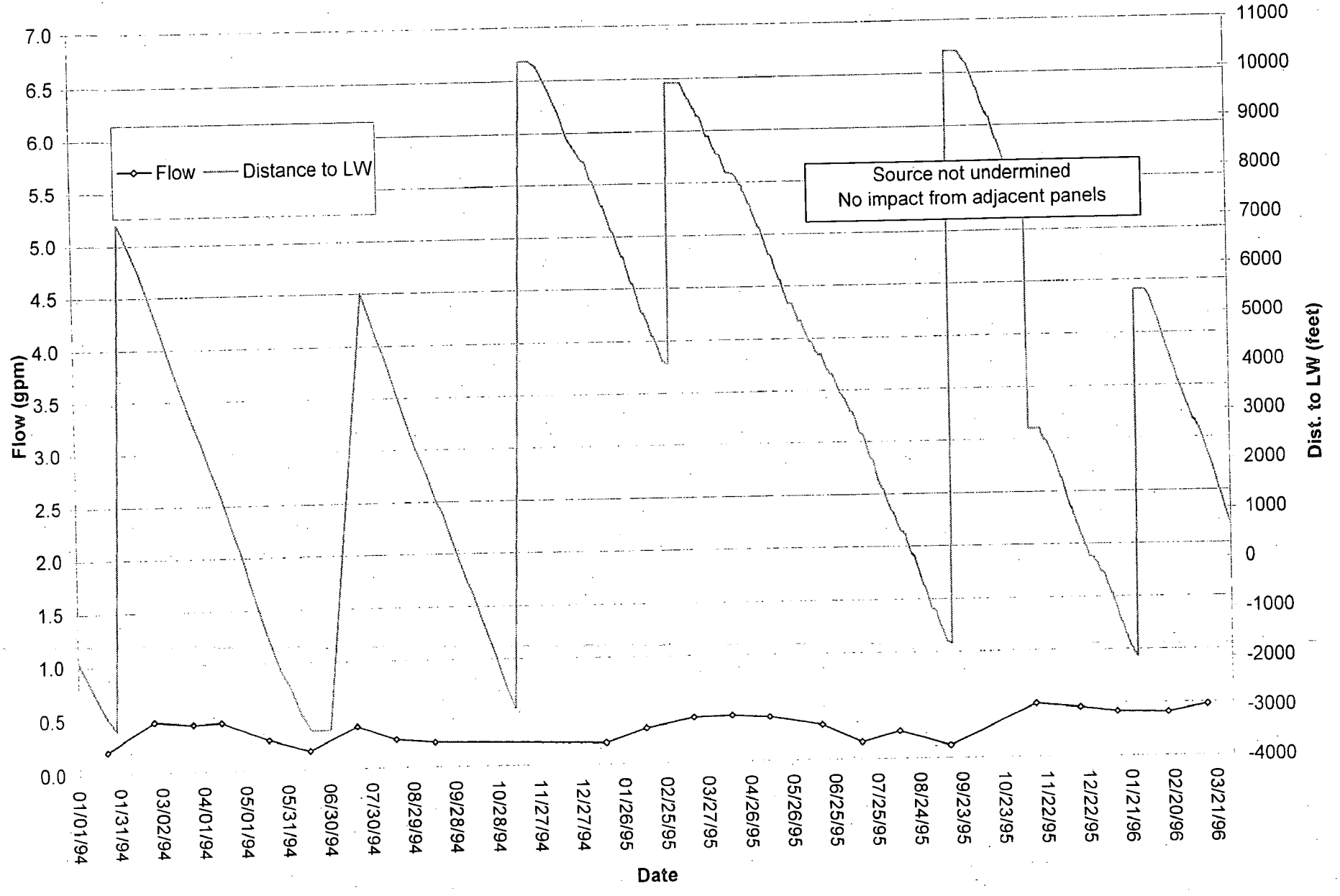
DS-179 Hydrograph



TOVCC 11594

Ohio Valley Coal Company
D-0360

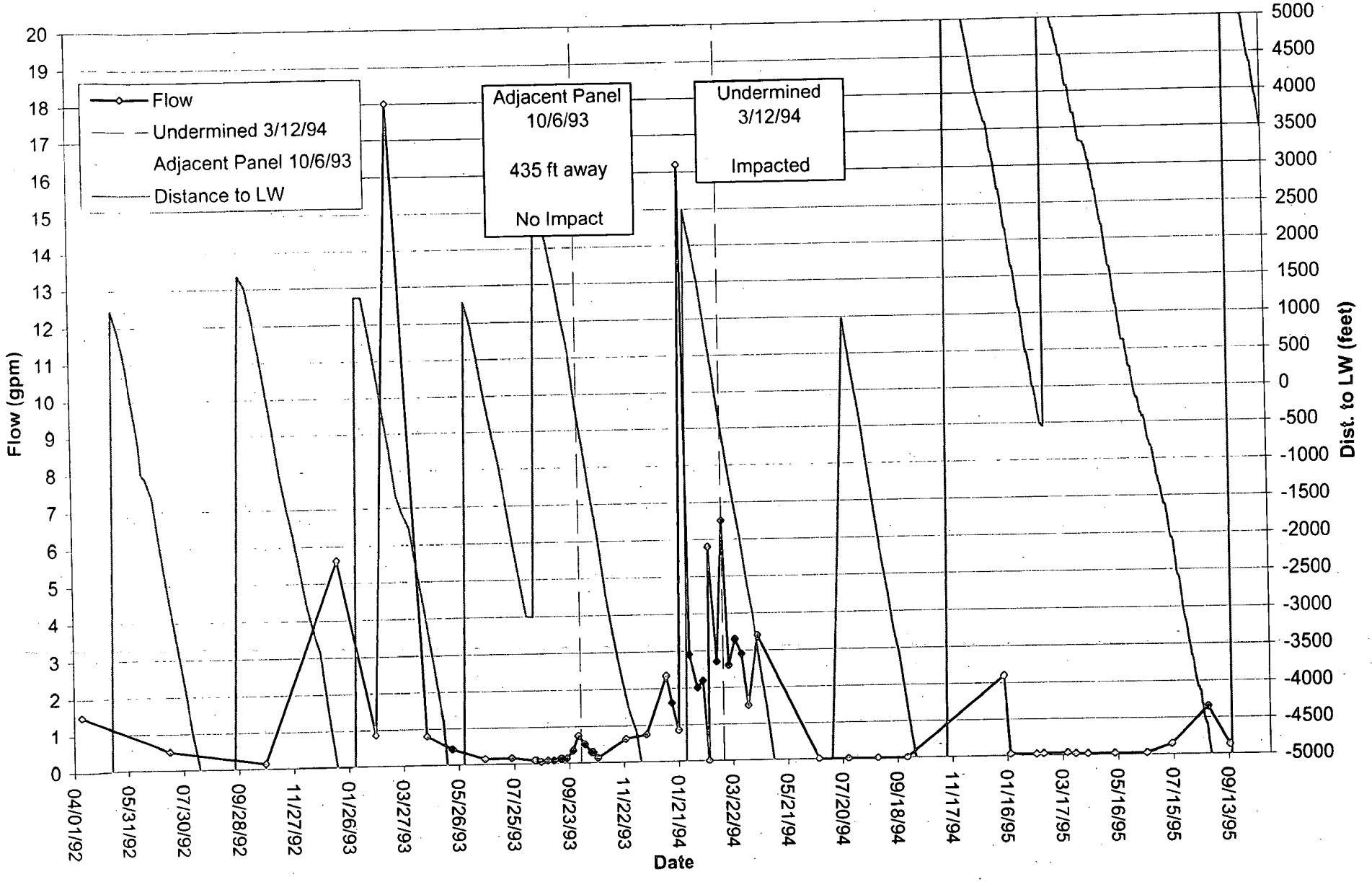
DS-183 Hydrograph



TOVCC 11595

Ohio Valley Coal Company
D-0360

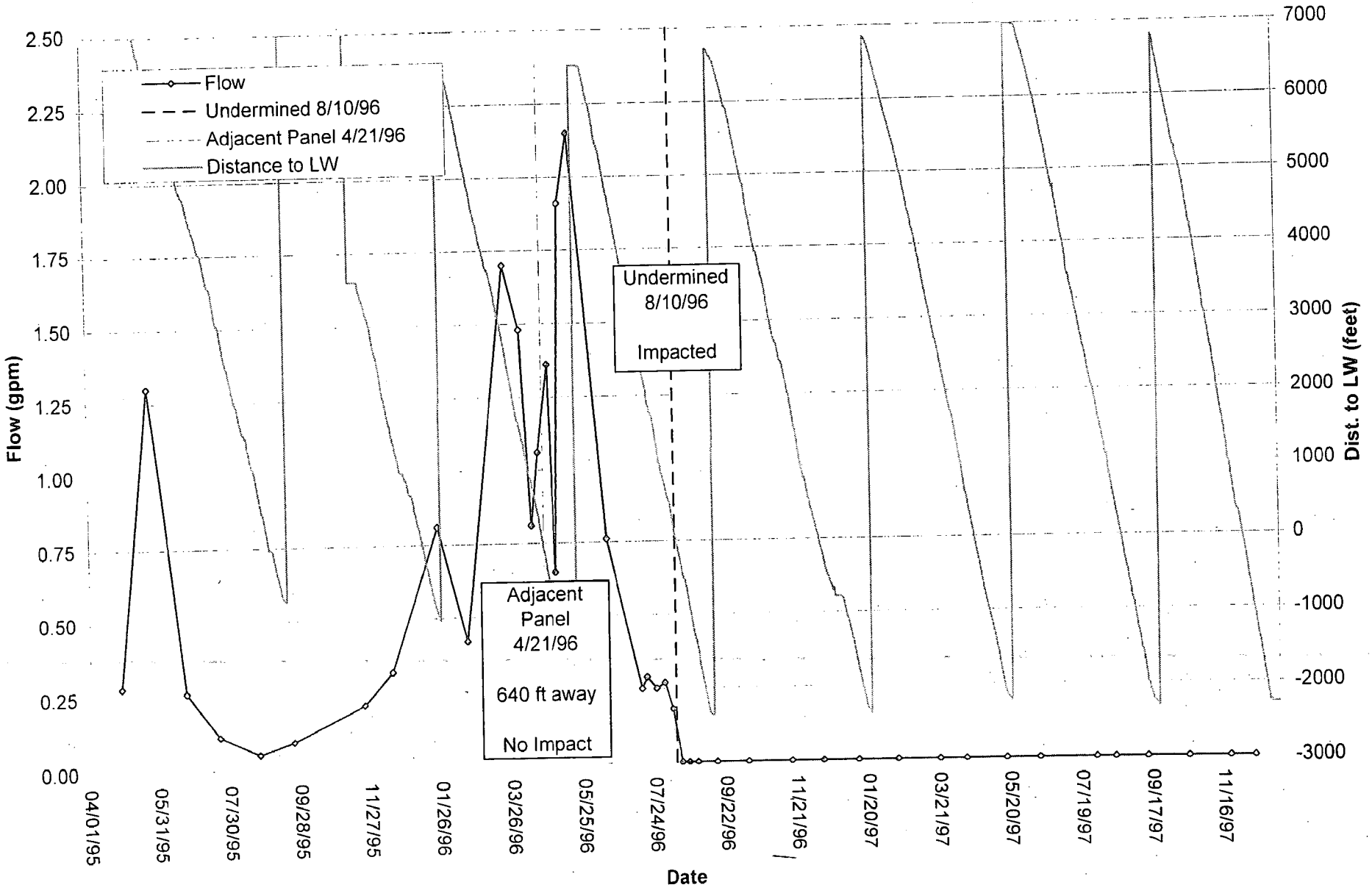
DS-198 Hydrograph



TOVCC 11596

Ohio Valley Coal Company
D-0360

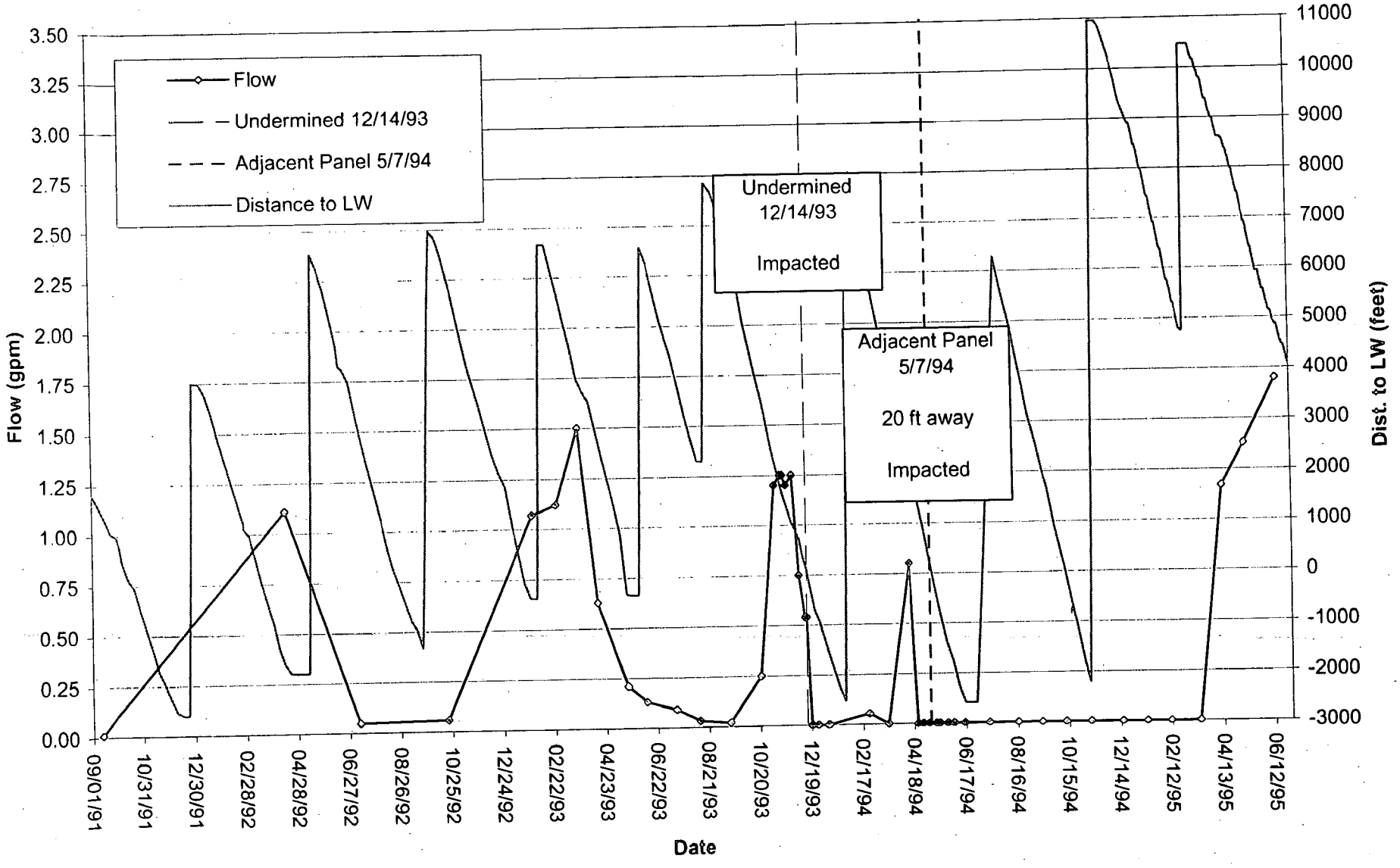
DS-199 Hydrograph



TOVCC 11597

Ohio Valley Coal Company
D-0360

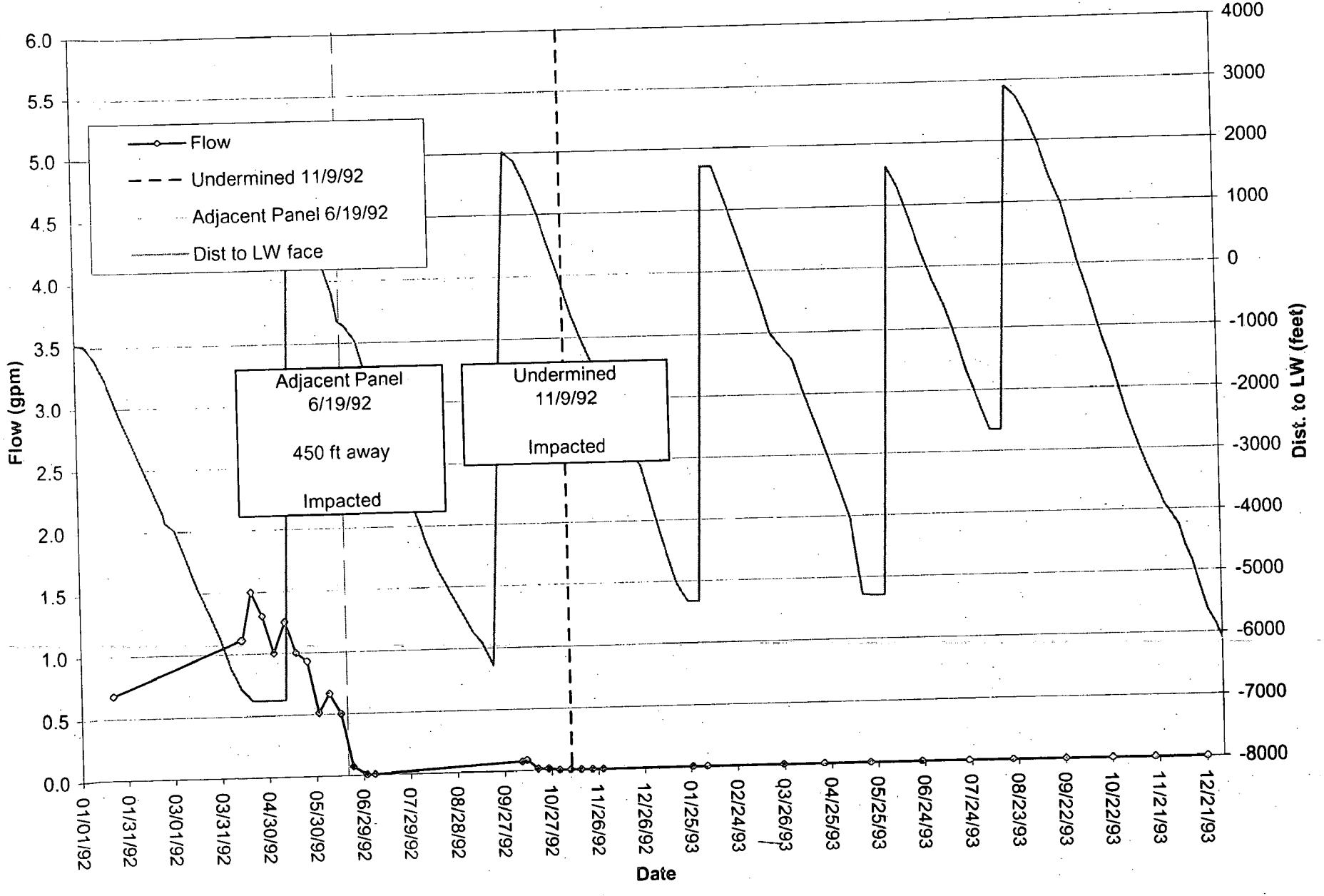
DS - 216 Hydrograph



TOVCC 11598

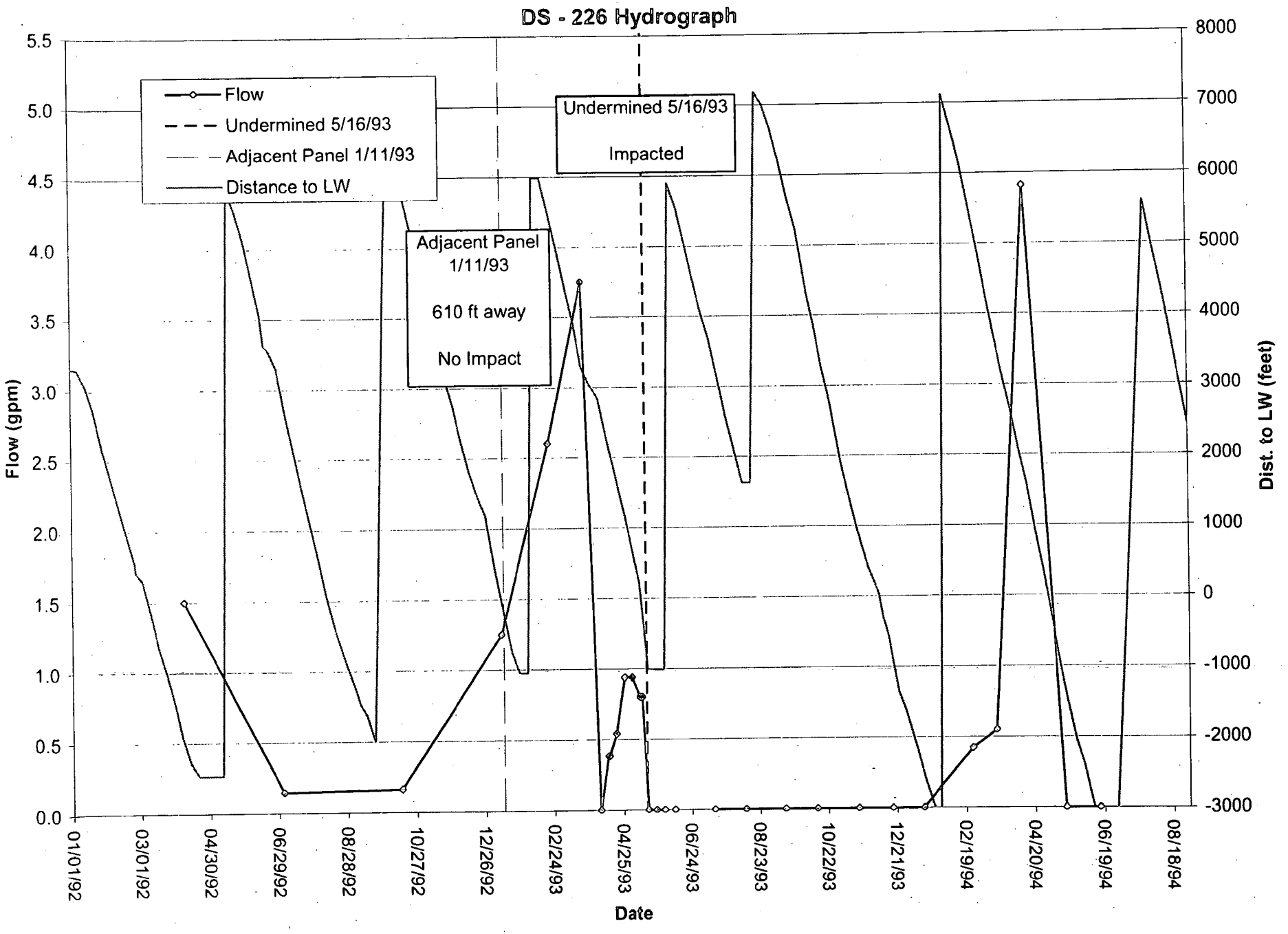
Ohio Valley Coal Company
D-0360

DS - 224 Hydrograph



TOVCC 11599

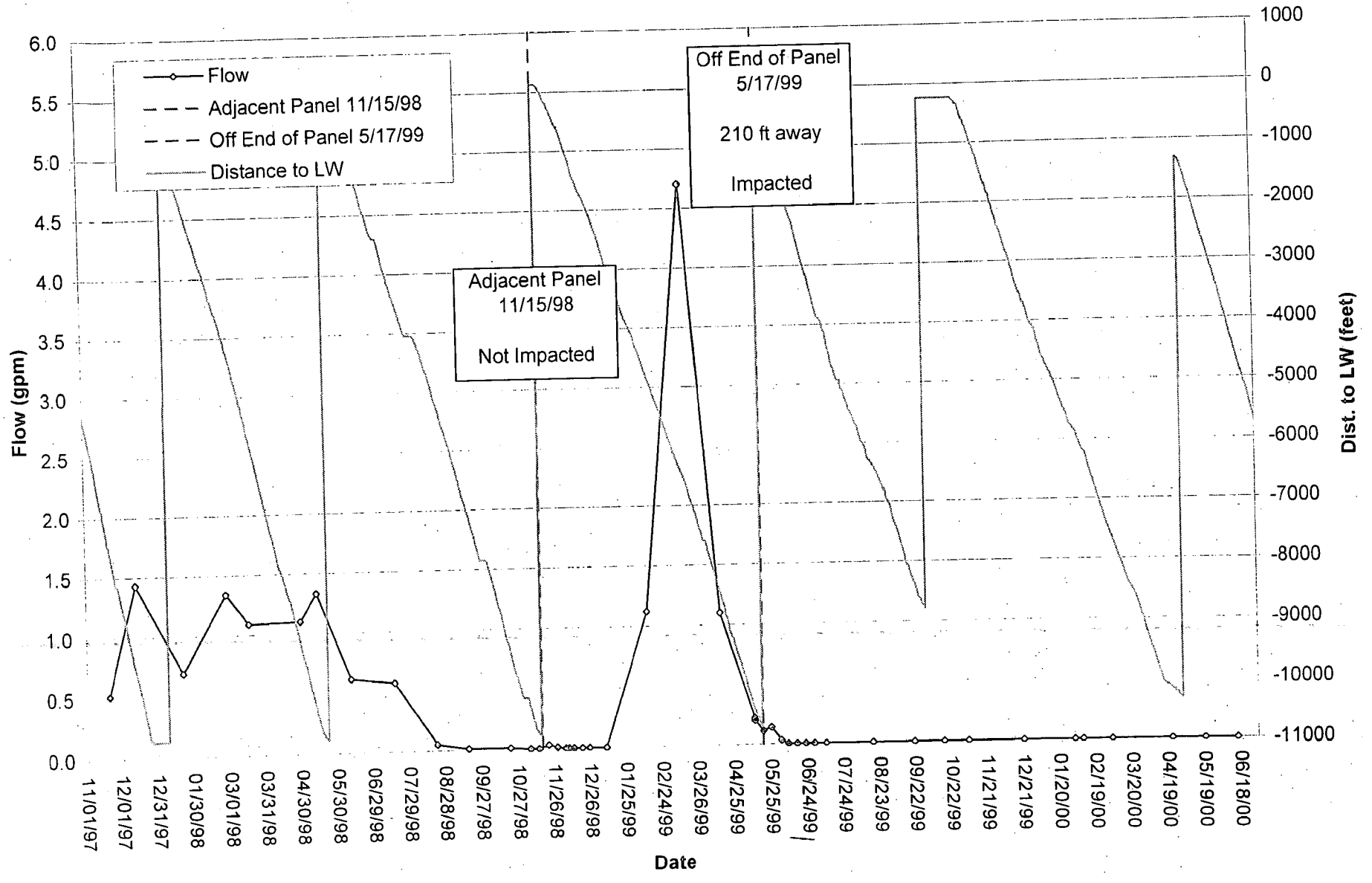
Ohio Valley Coal Company
D-0360



TOVCC 11600

Ohio Valley Coal Company
D-0360

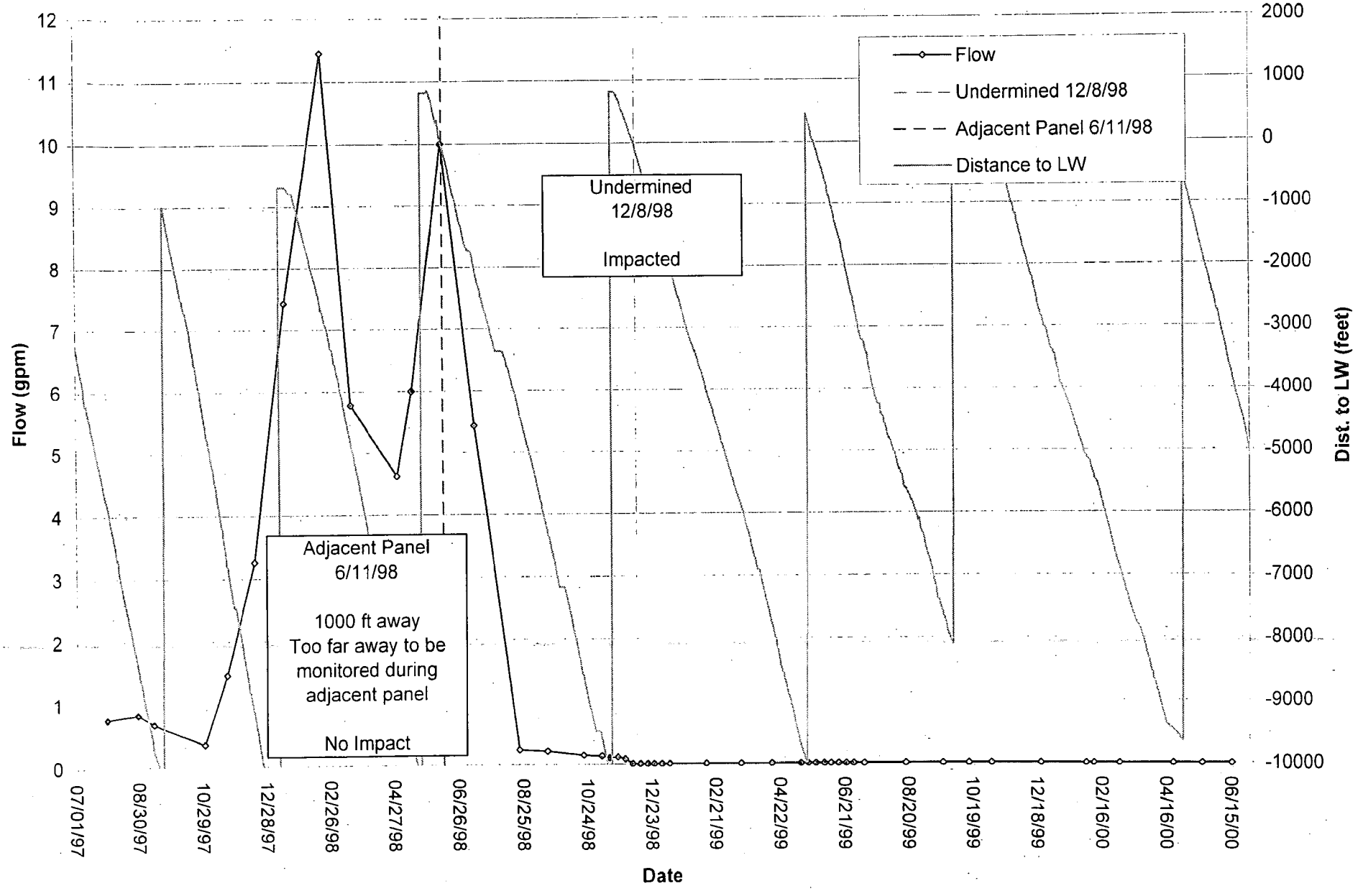
DS - 248 Hydrograph



TOVCC 11601

Ohio Valley Coal Company
D-0360

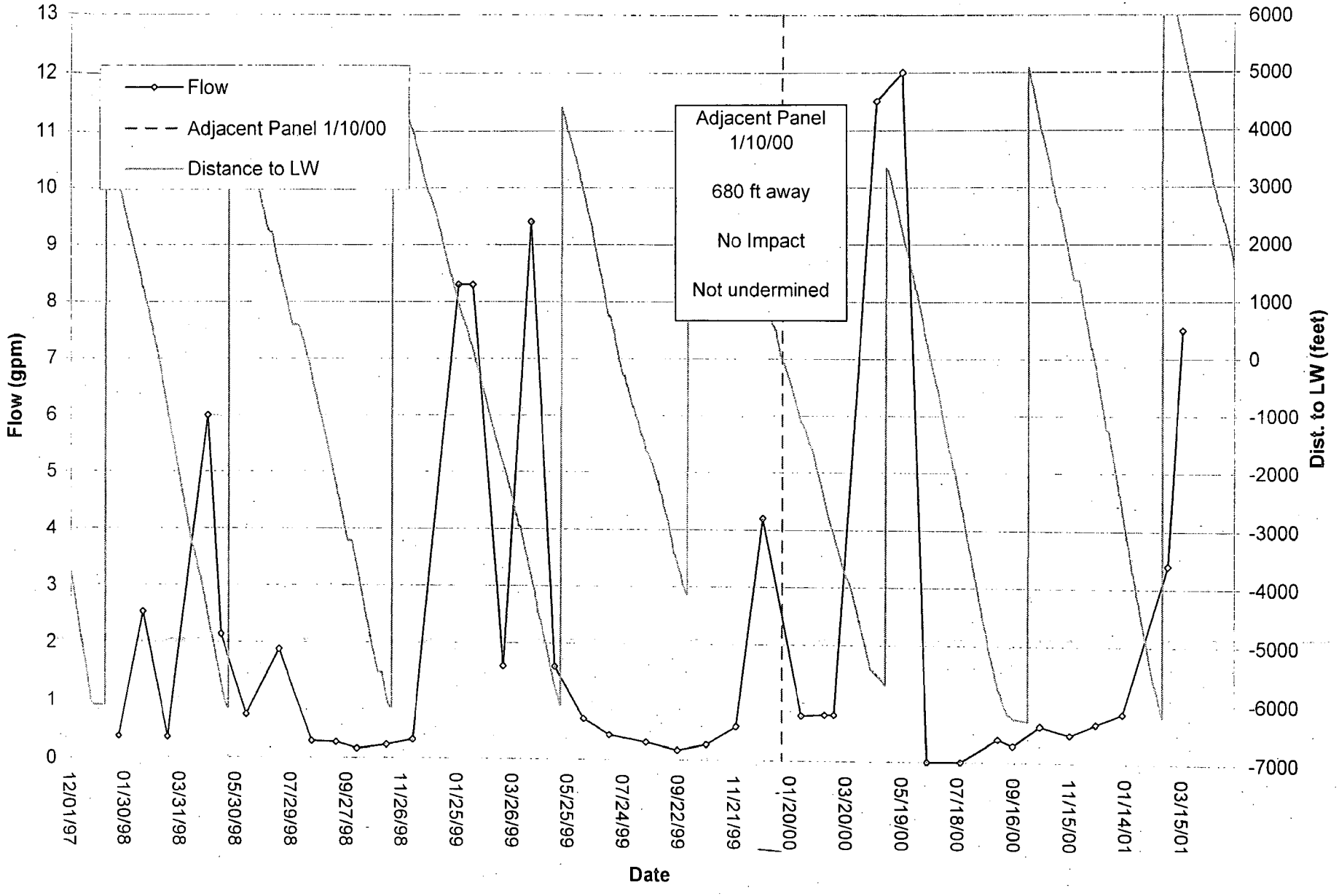
DS-249 Hydrograph



TOVCC 11602

Ohio Valley Coal Company
D-0360

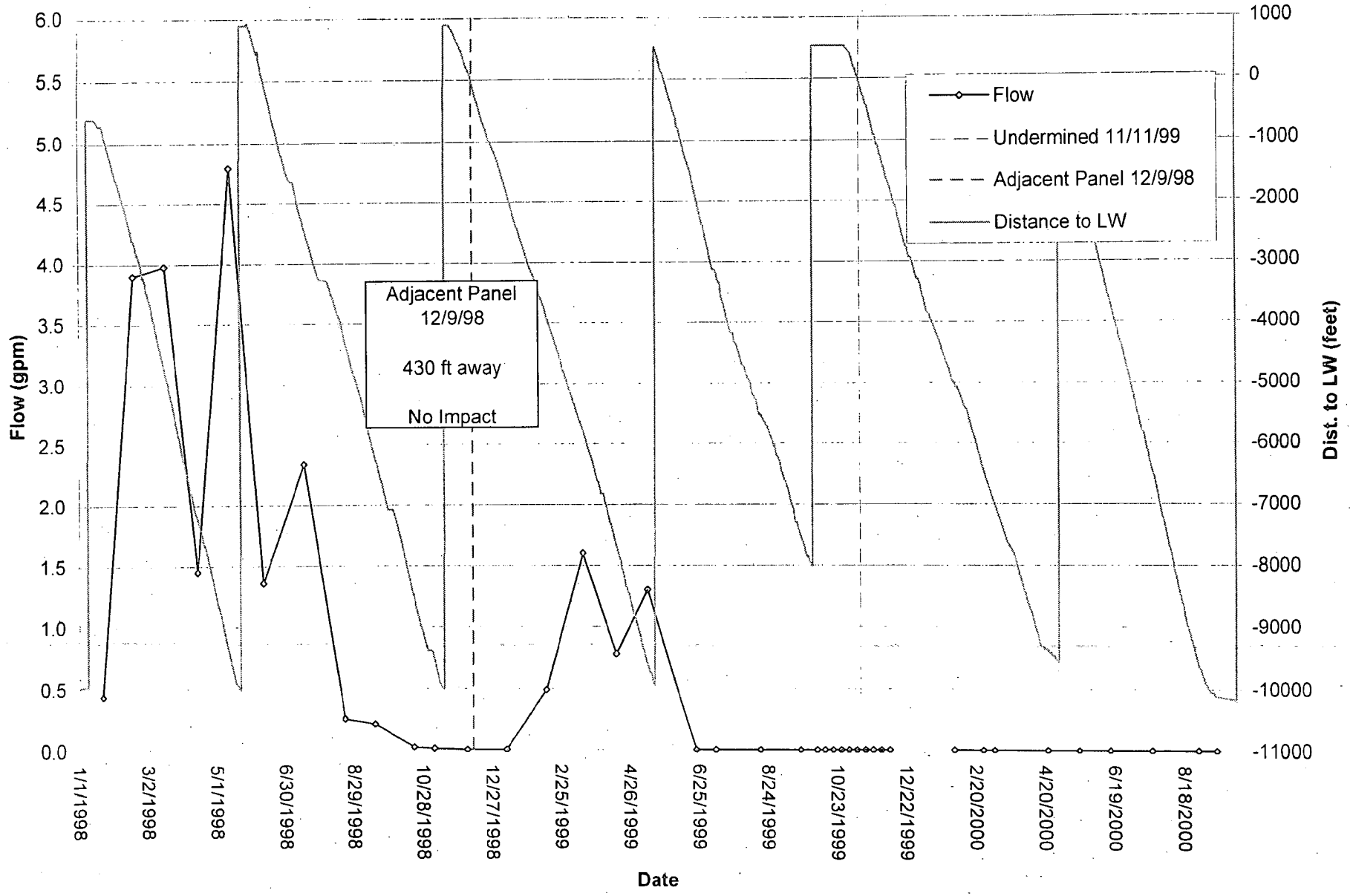
DS-253 Hydrograph



TOVCC 11603

Ohio Valley Coal Company
D-0360

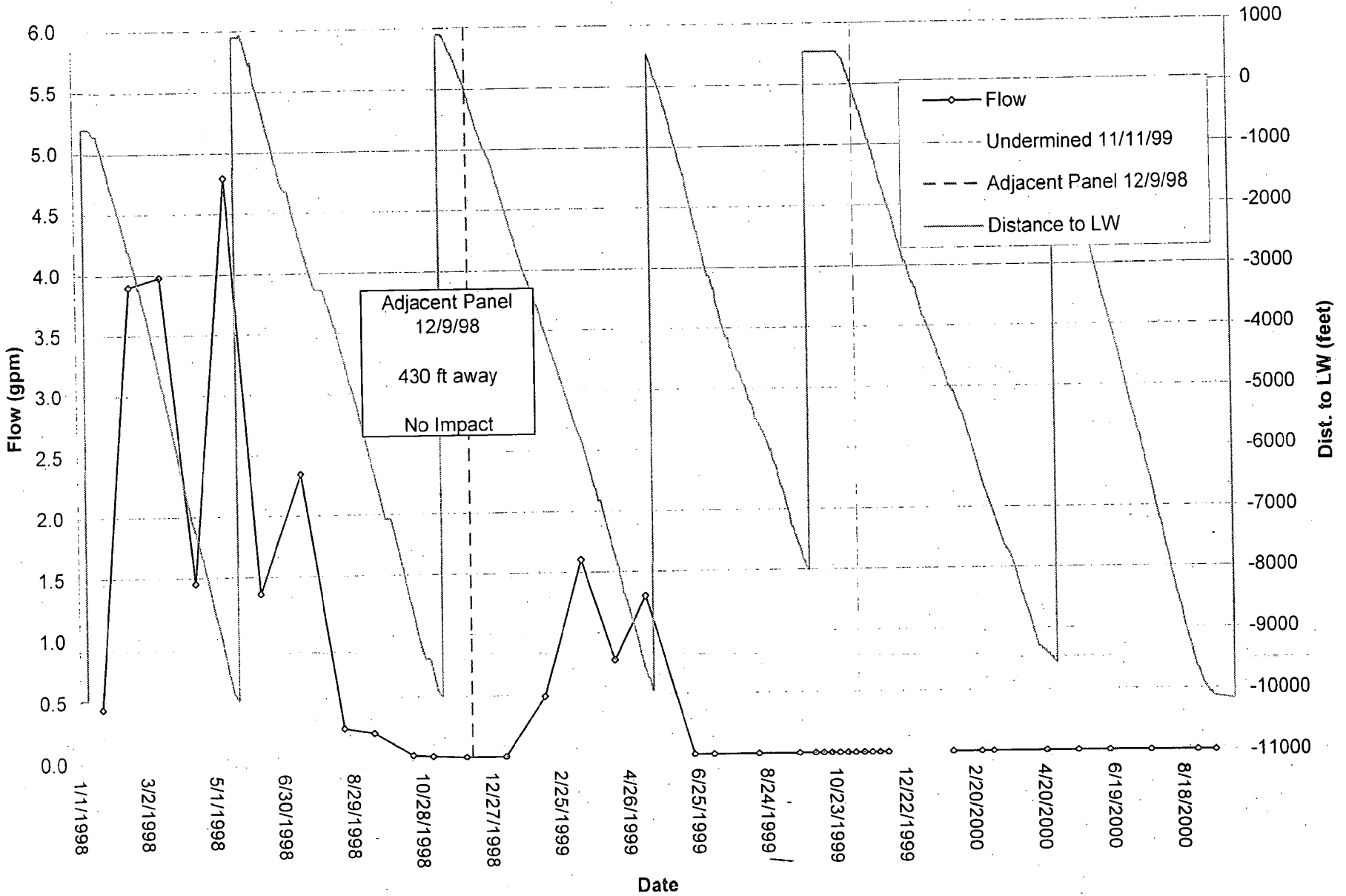
DS - 254 Hydrograph



TOVCC 11604

Ohio Valley Coal Company
D-0360

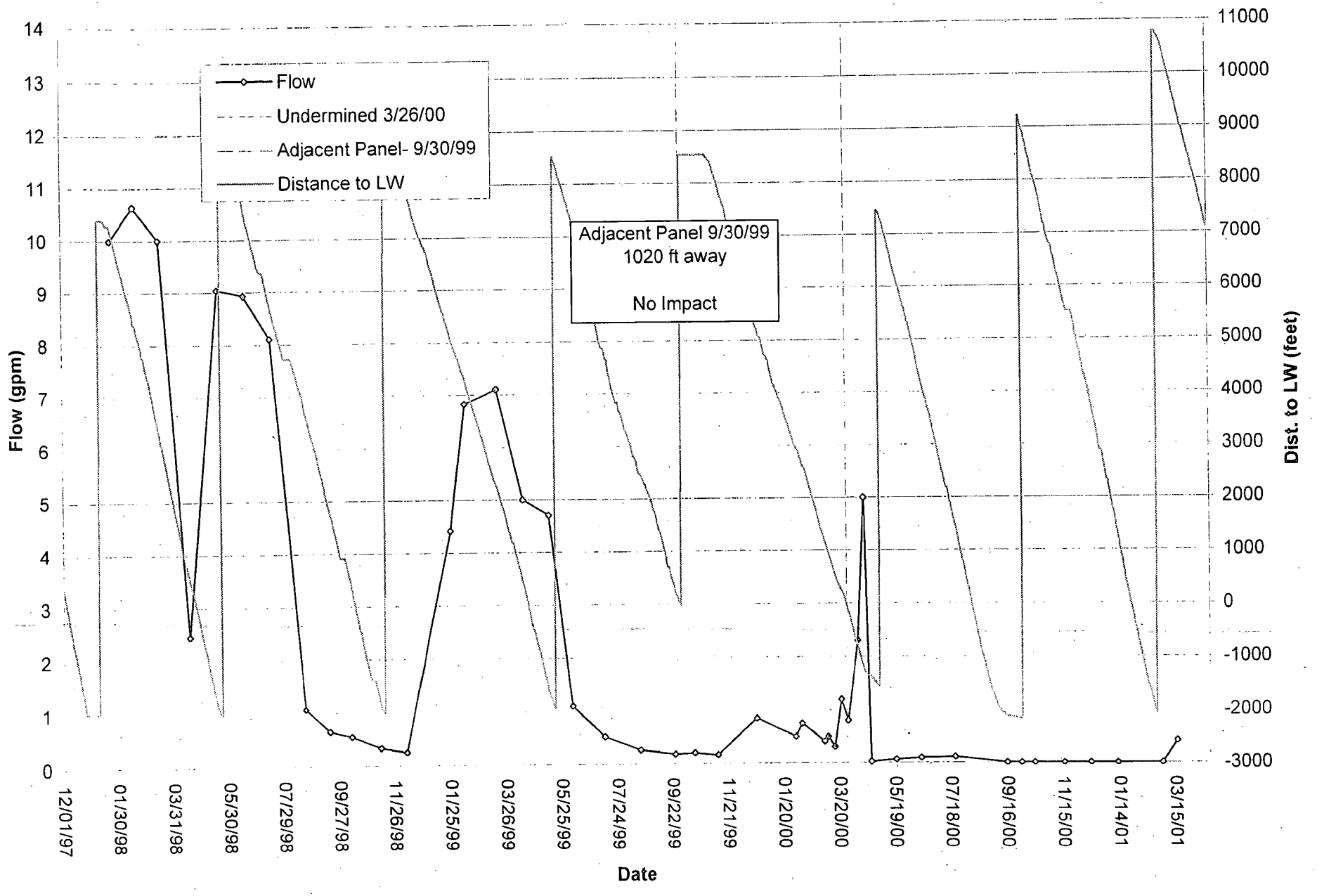
DS - 254 Hydrograph



TOVCC 11605

Ohio Valley Coal Company
D-0360

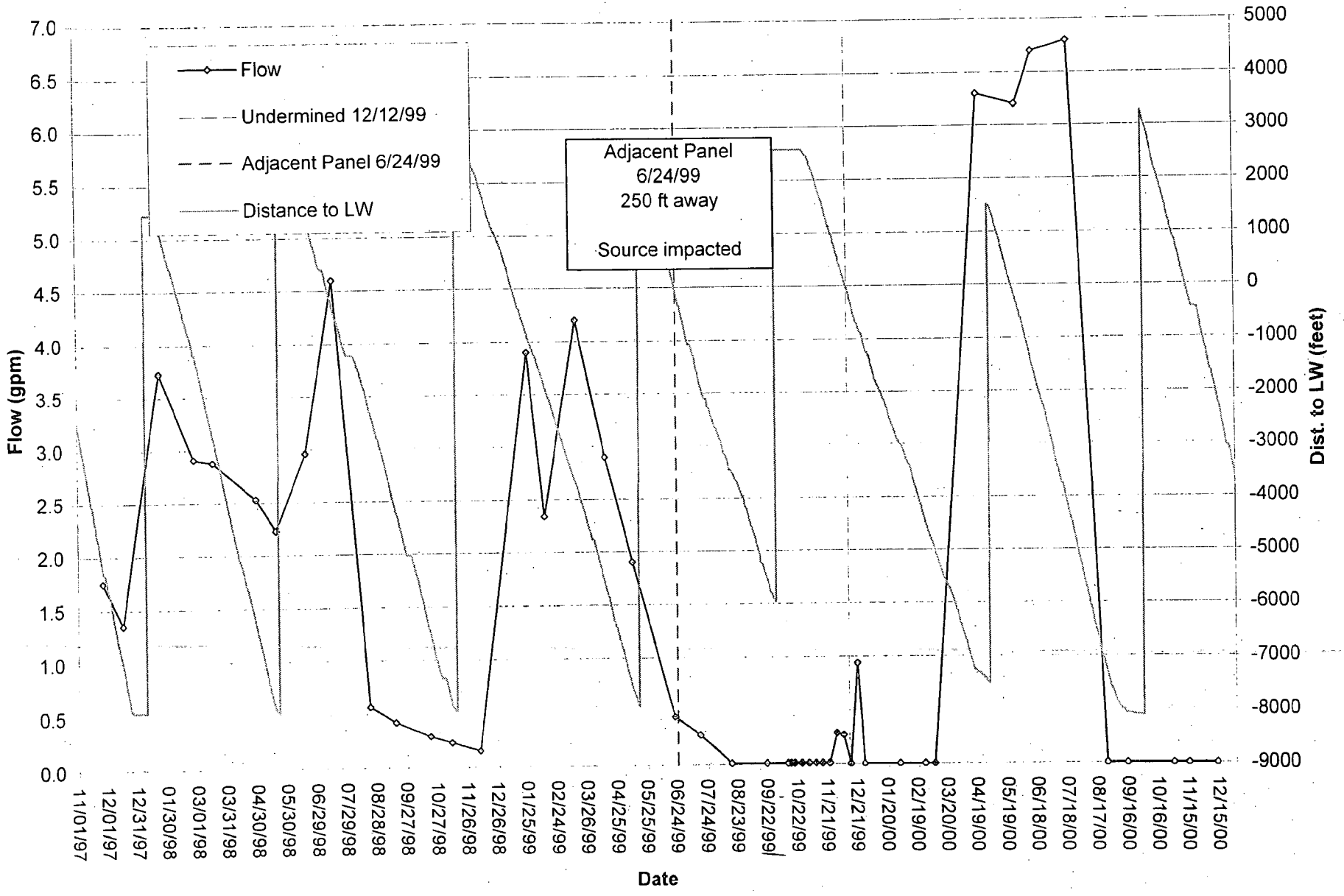
DS-256 Hydrograph



TOVCC 11606

Ohio Valley Coal Company
D-0360

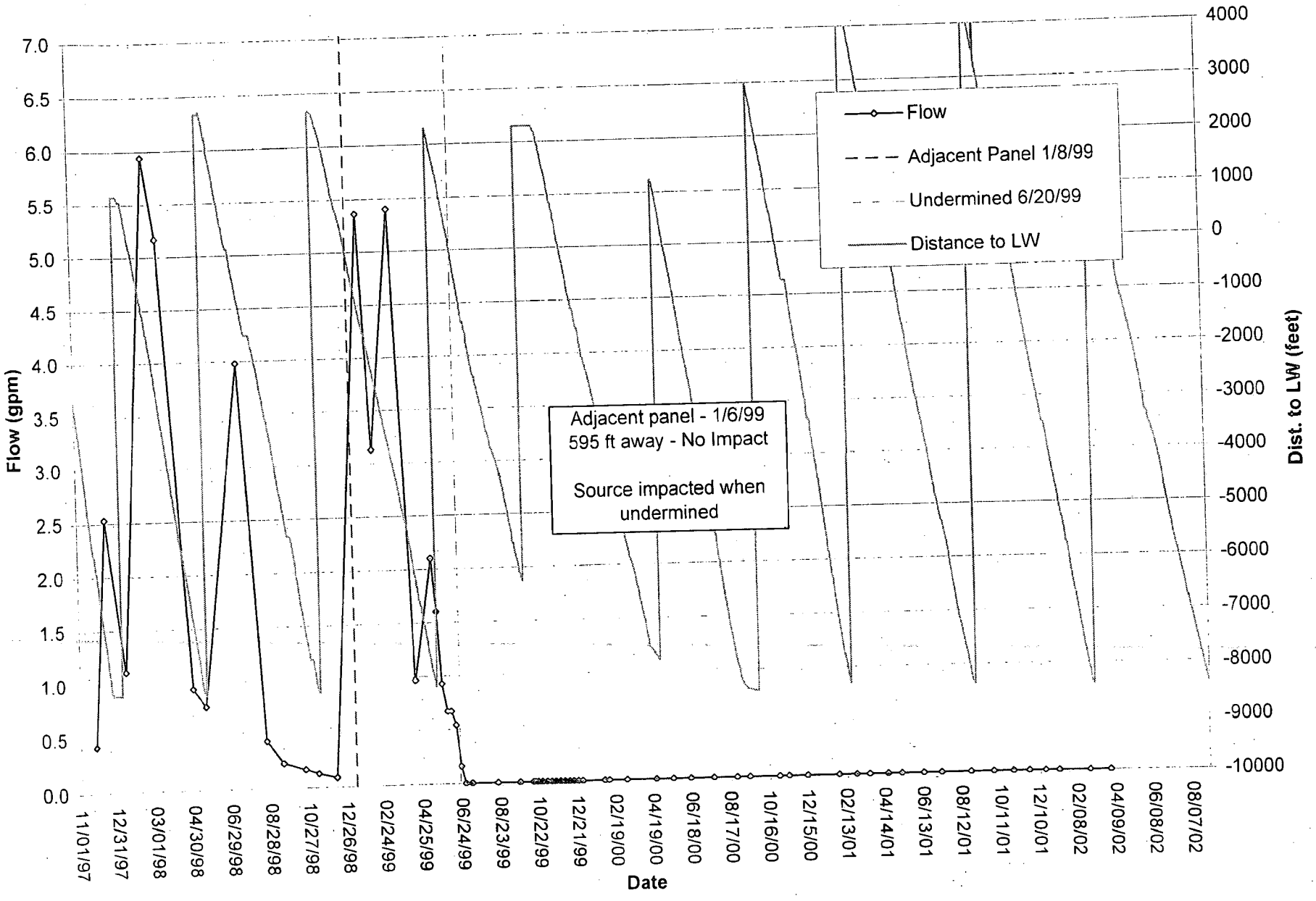
DS - 258 Hydrograph



TOVCC 11607

Ohio Valley C[illegible] Company
D-0360

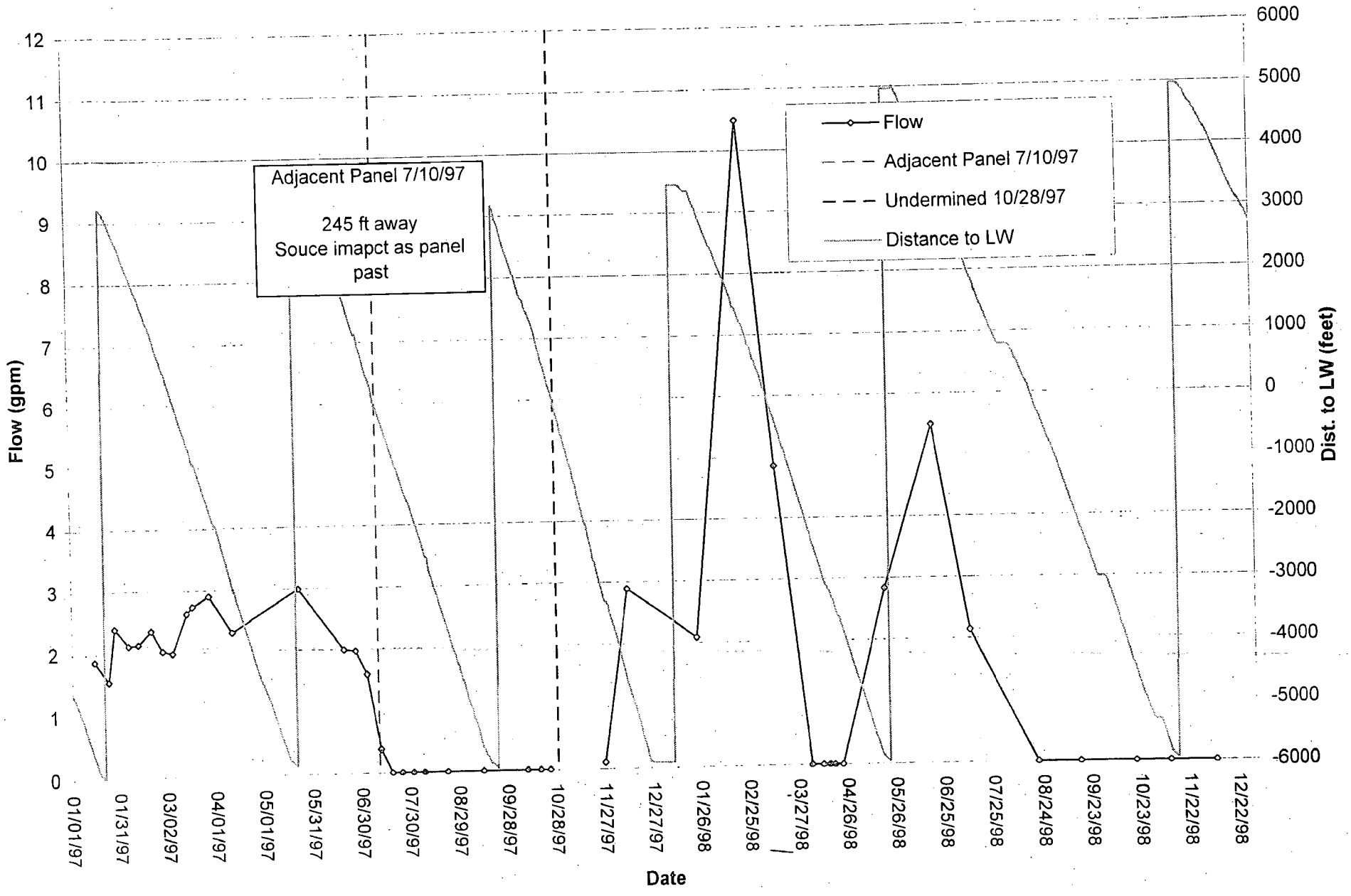
DS - 259 Hydrograph



TOVCC 11608

Ohio Valley C[illegible] Company
D-0360

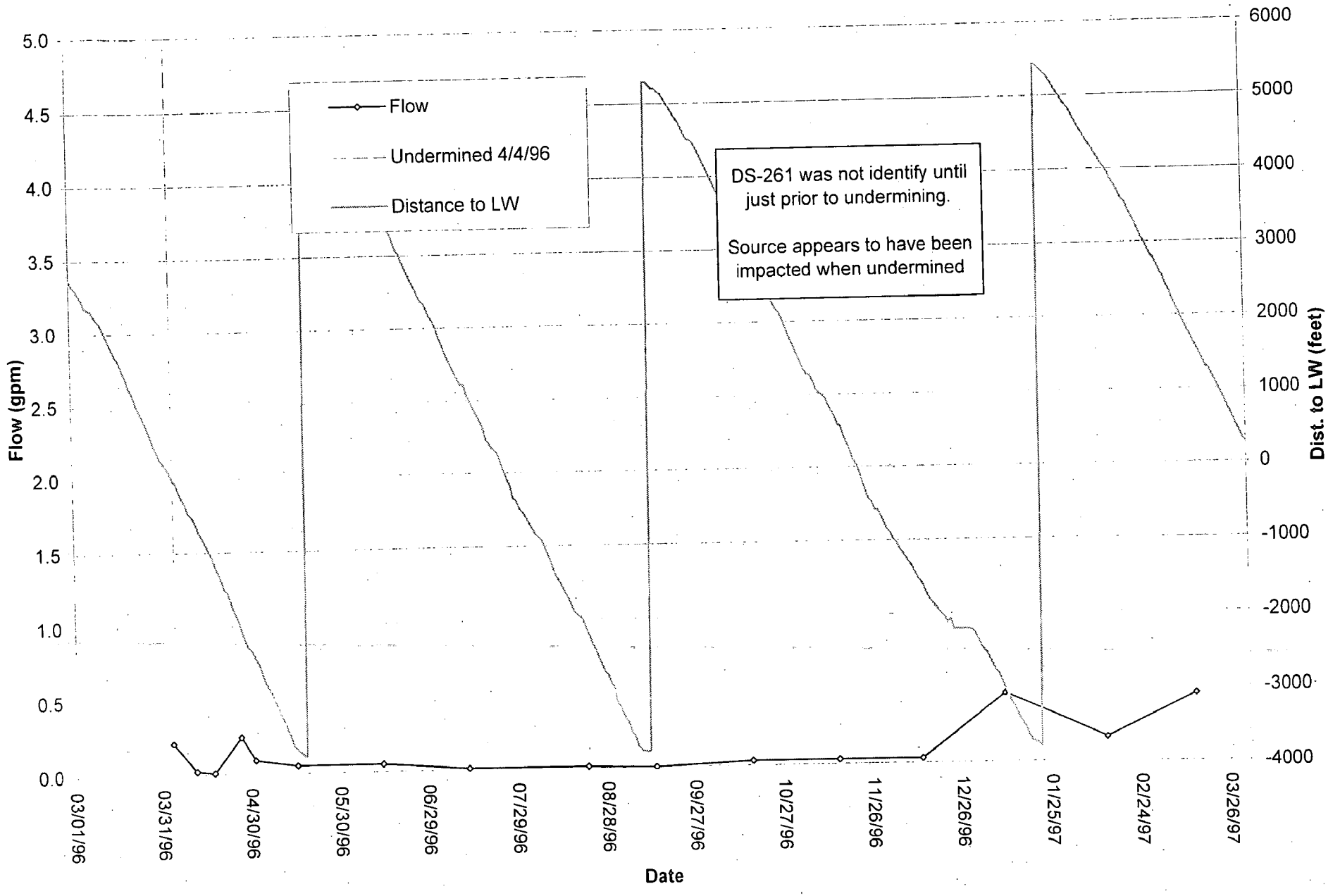
DS-260 Hydrograph



TOVCC 11609

Ohio Valley C[illegible] Company
D-0360

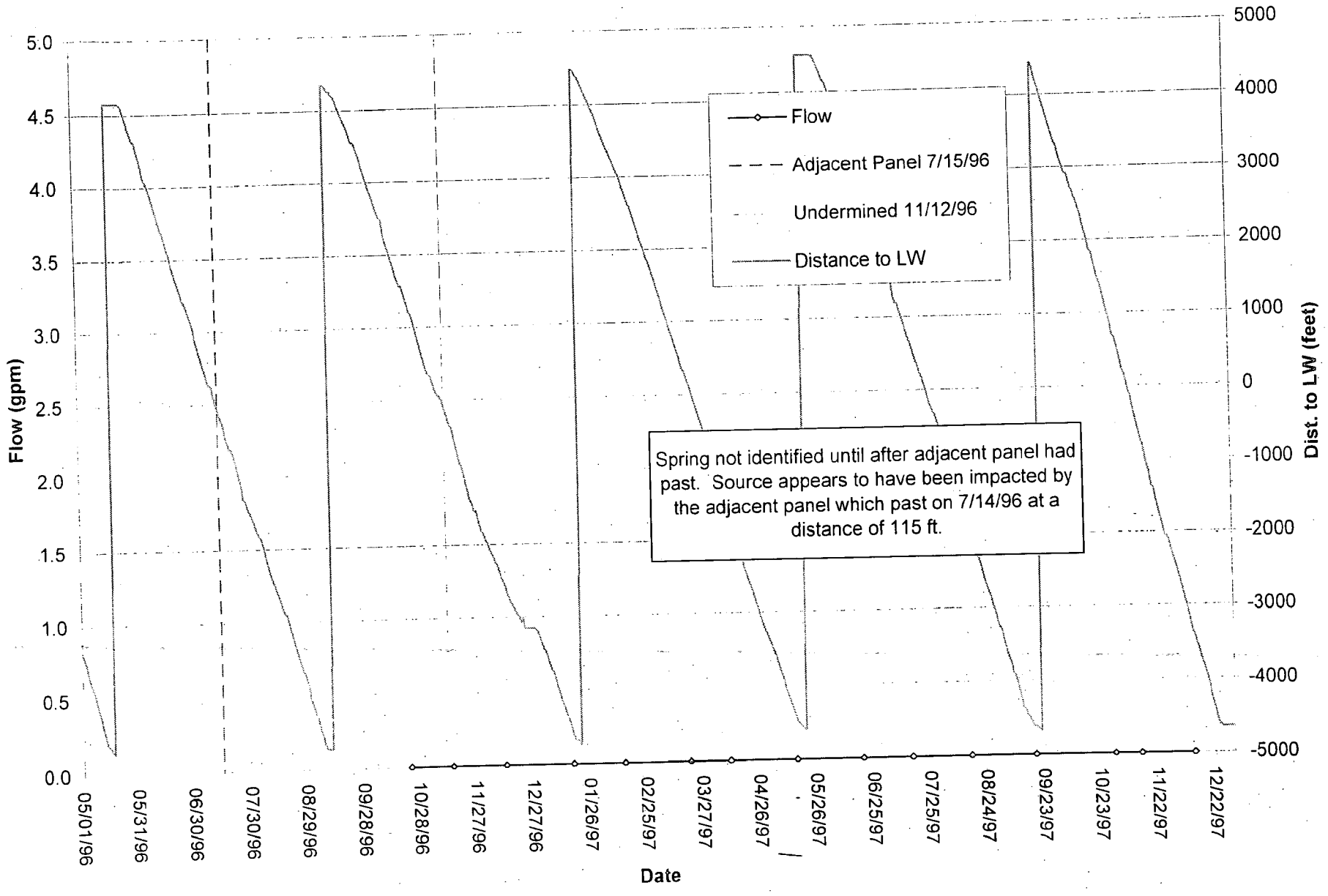
DS - 261 Hydrograph



TOVCC 11610

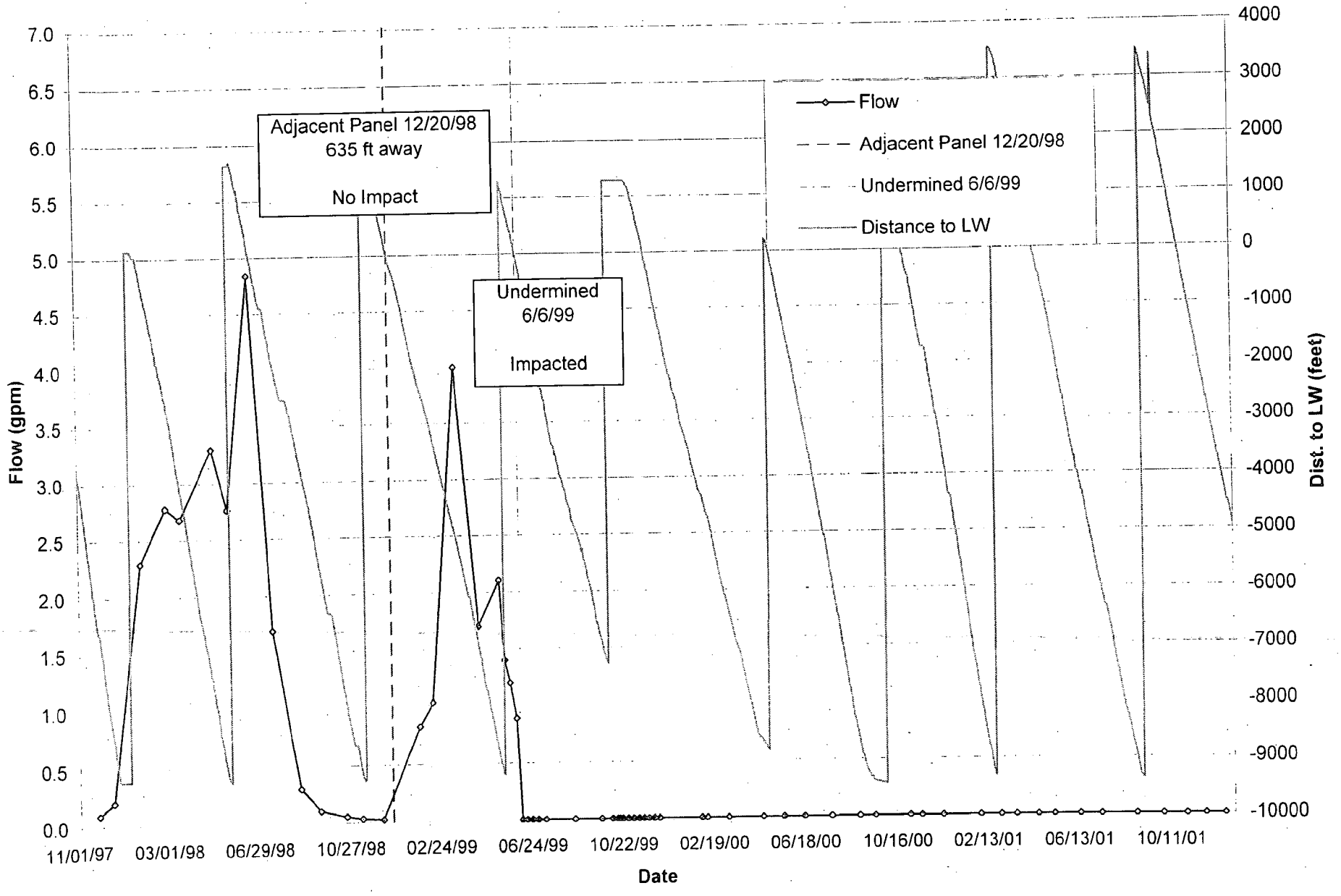
Ohio Valley Co[illegible] Company
D-0360

DS - 262 Hydrograph



Ohio Valley Coal Company
D-0360

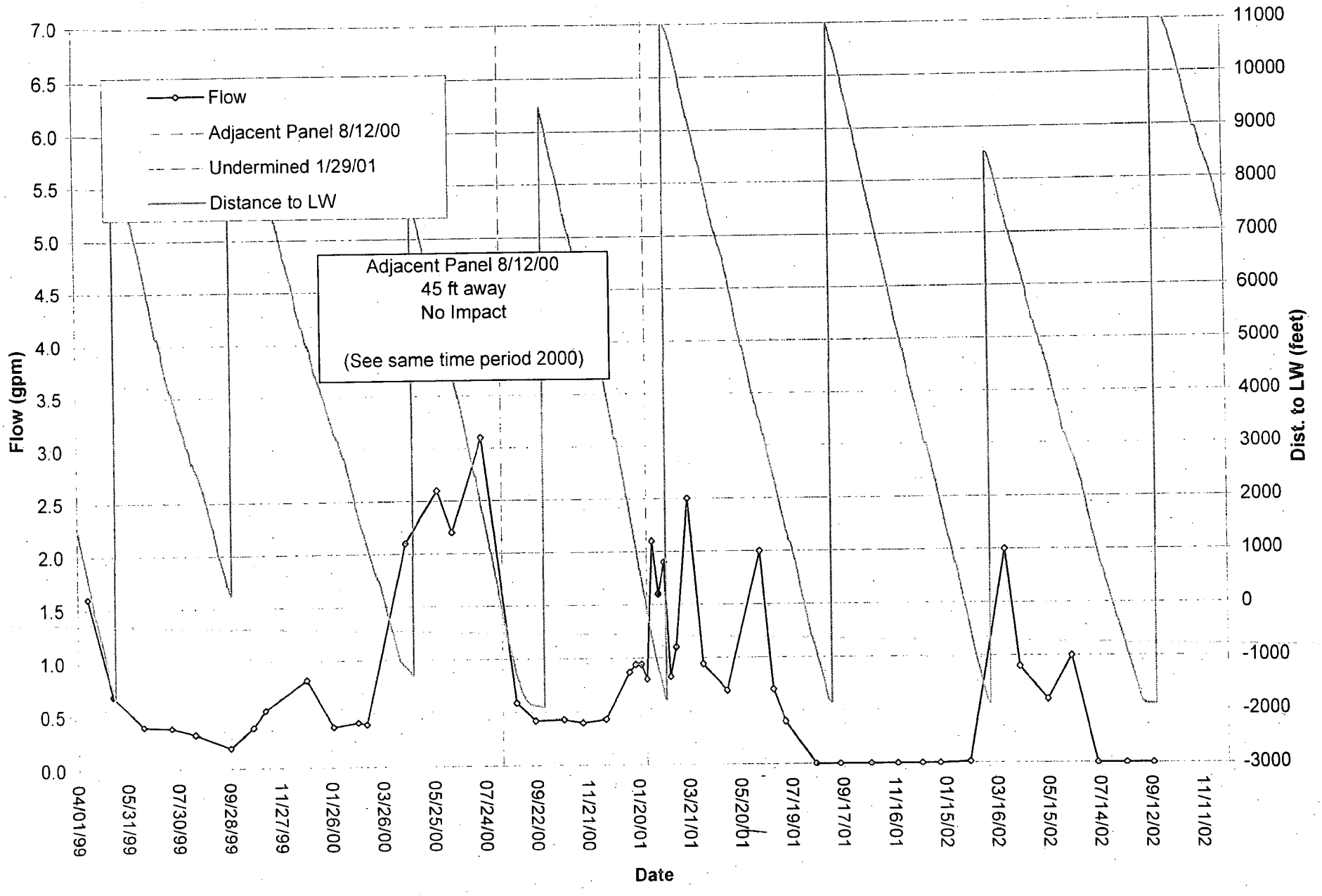
DS - 263 Hydrograph



TOVCC 11612

Ohio Valley Coal Company
D-0360

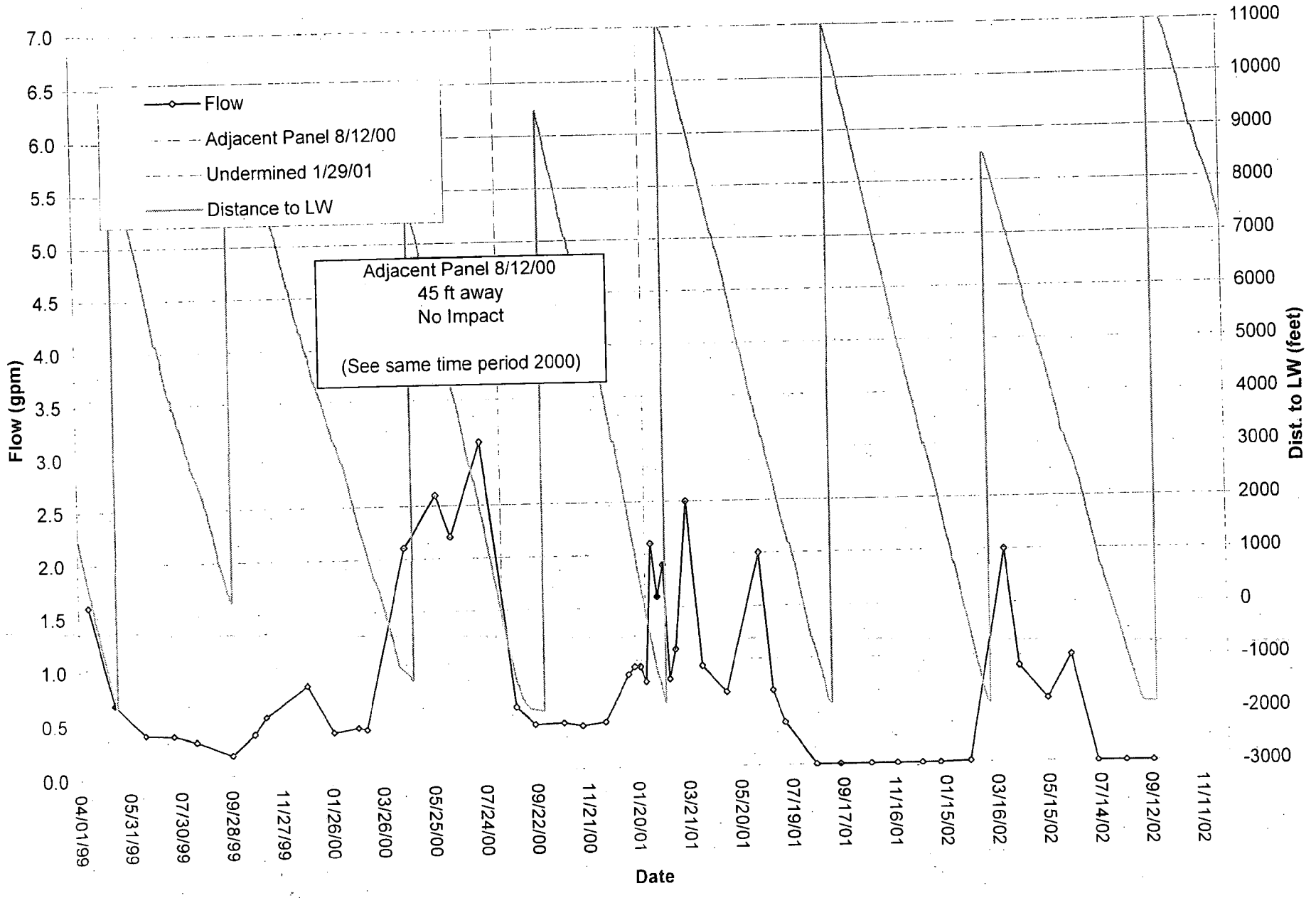
DS-265 Hydrograph



TOVCC 11613

Ohio Valley Coal Company
D-0360

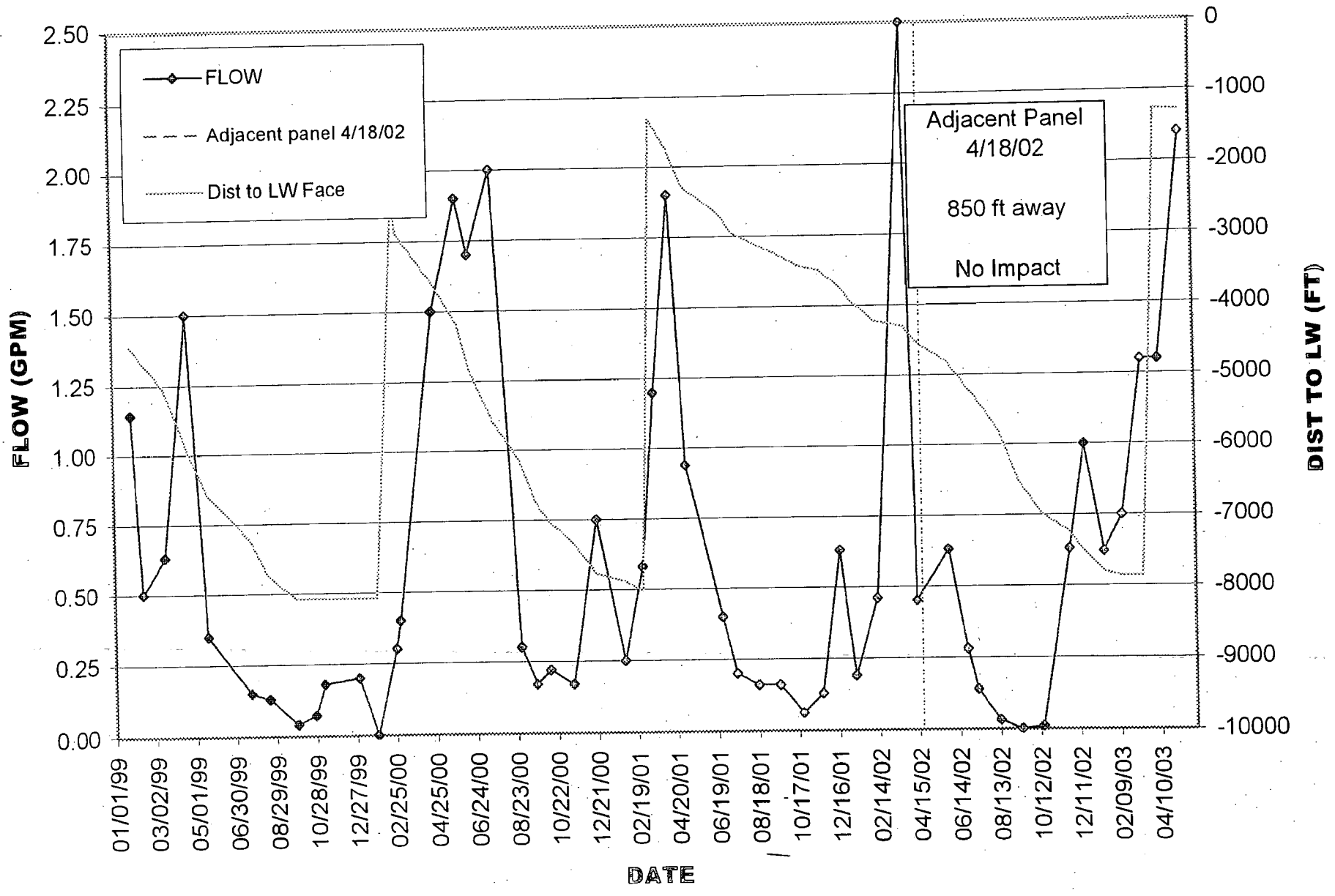
DS-265 Hydrograph



TOVCC 11614

Ohio Valley C[illegible] Company
D-0360

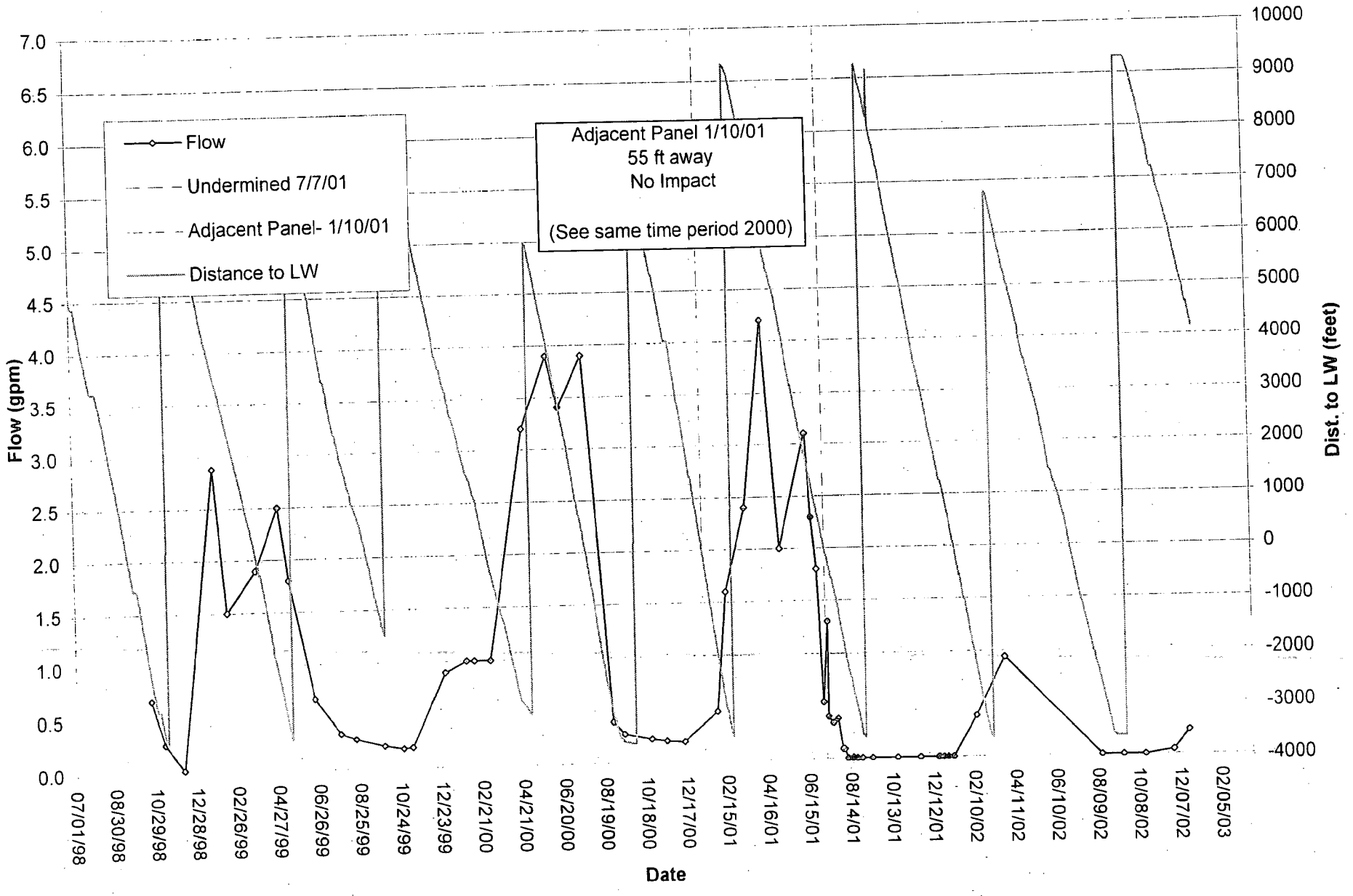
DS - 266 Hydrograph



TOVCC 11615

Ohio Valley Coal Company
D-0360

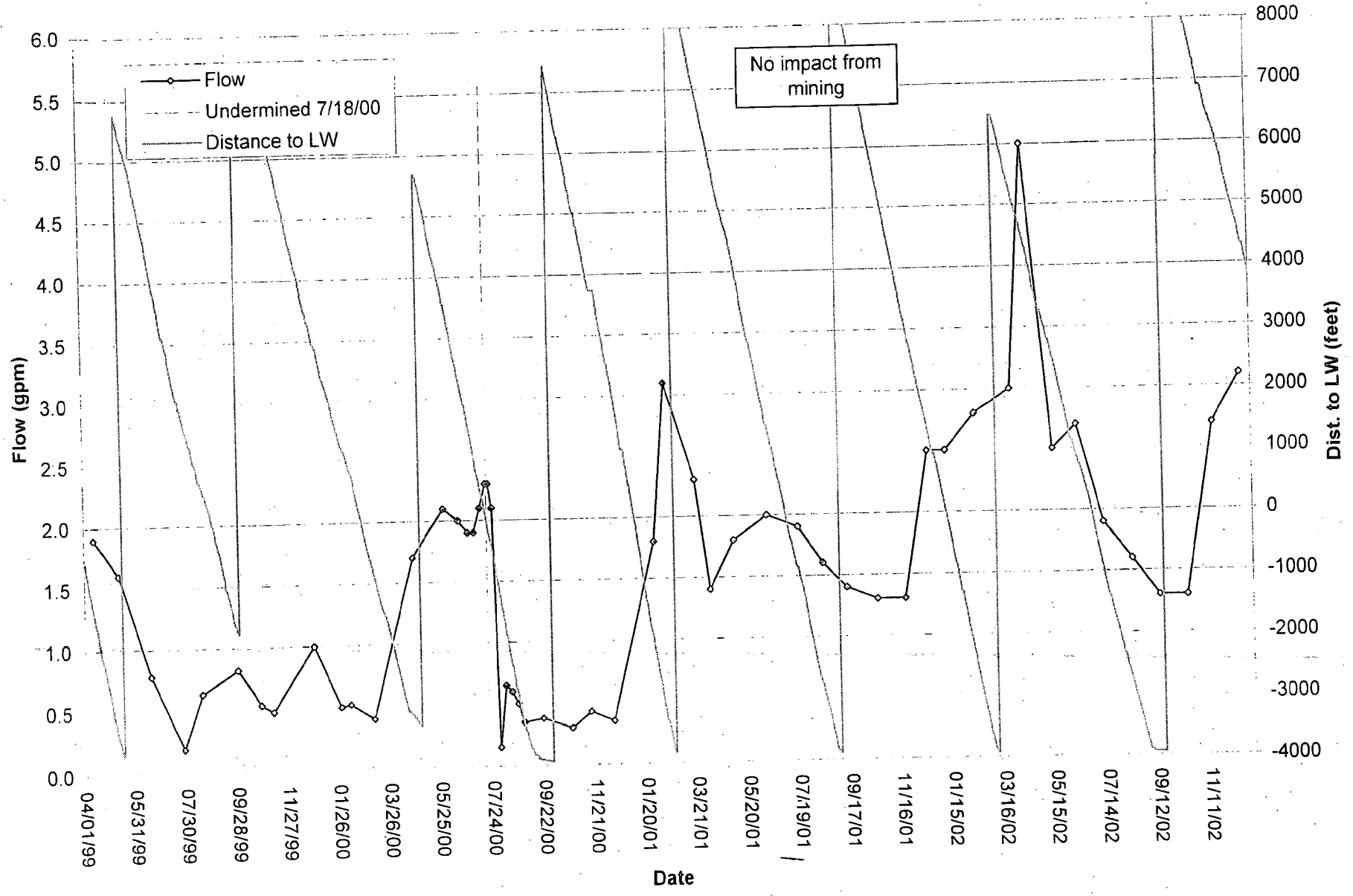
DS-267 Hydrograph



TOVCC 11616

Ohio Valley Coal Company
D-0360

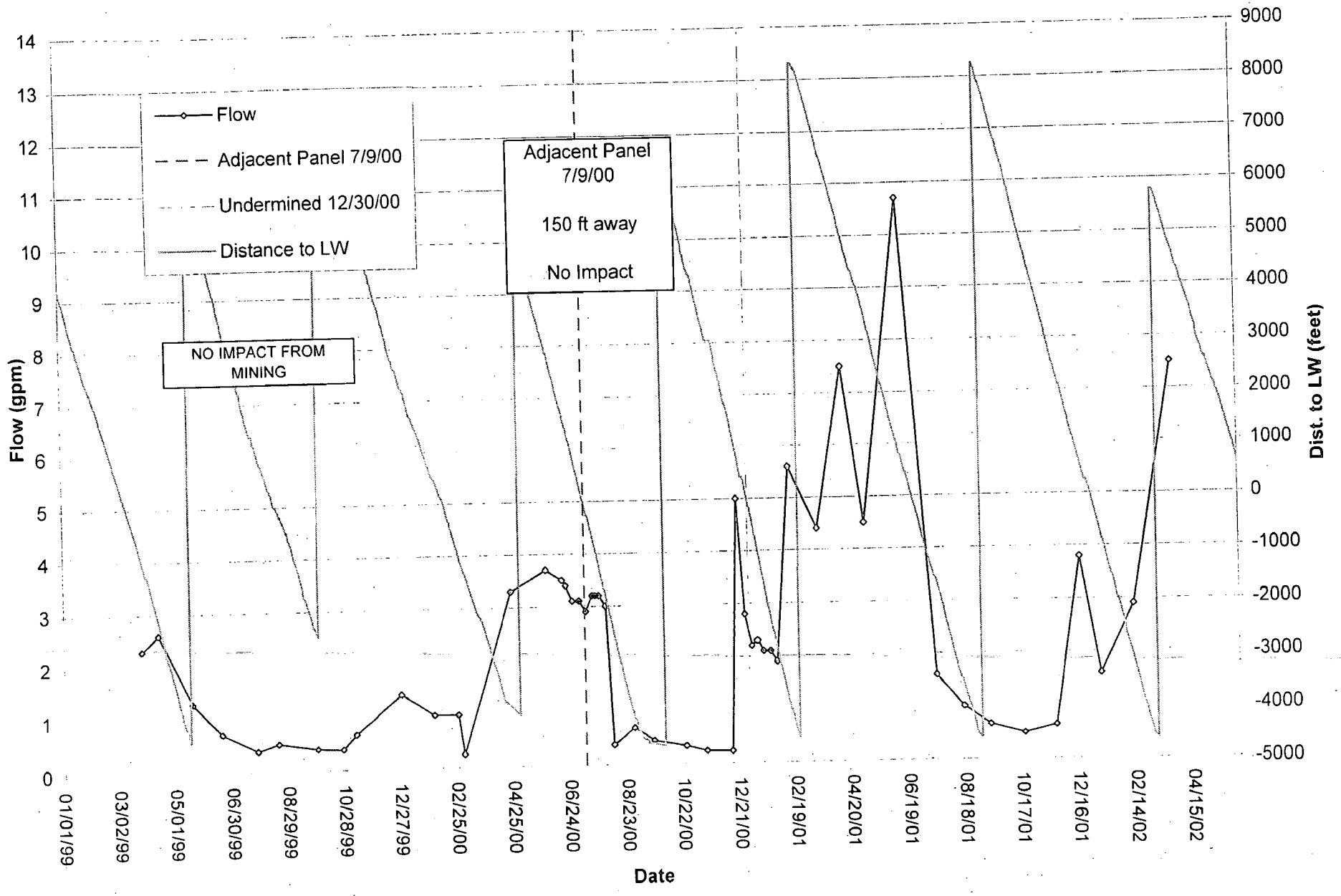
DS - 268 Hydrograph



TOVCC 11617

Ohio Valley Coal Company
D-0360

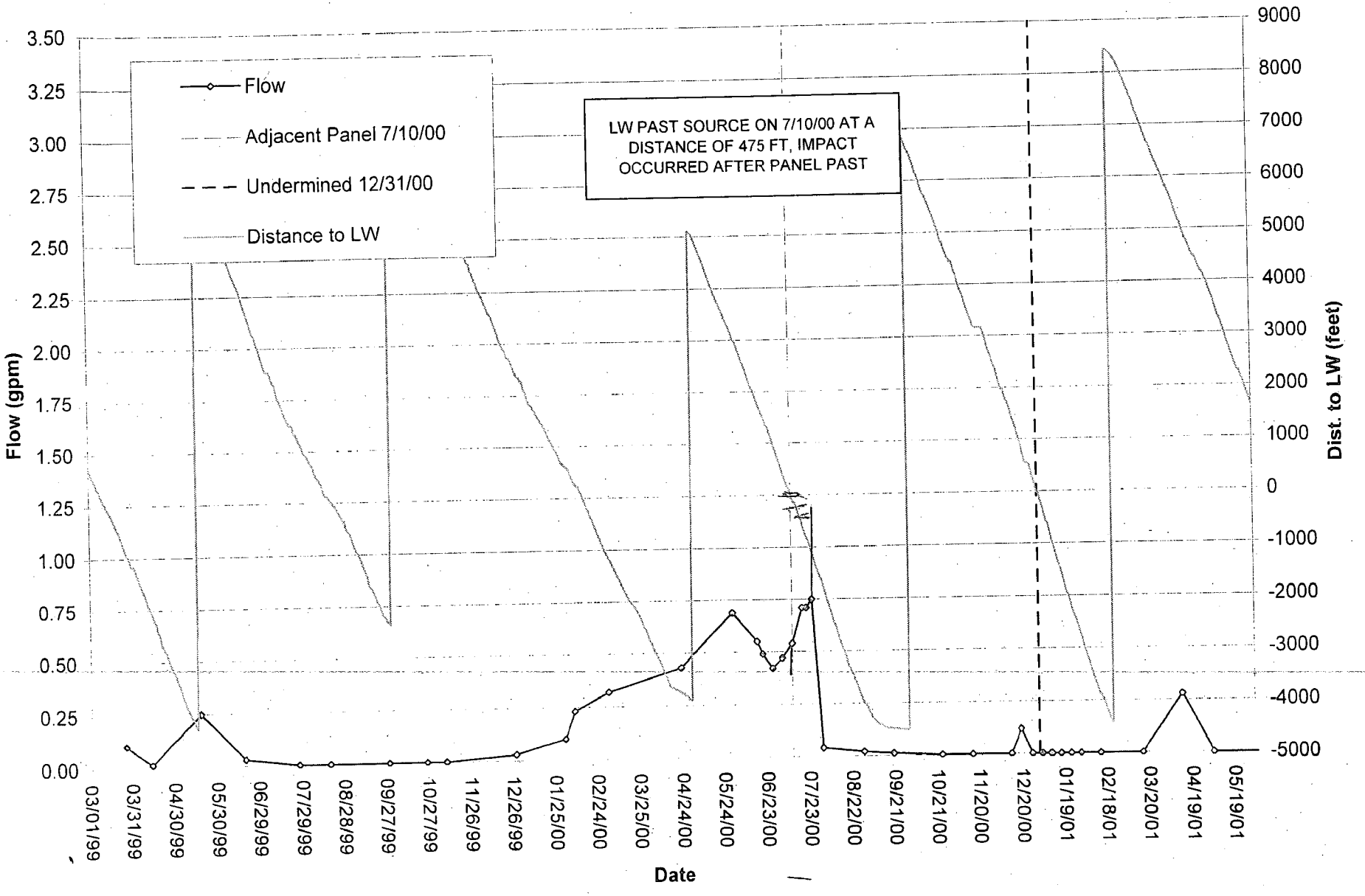
DS - 269 Hydrograph



TOVCC 11618

Ohio Valley C[illegible] Company
D-0360

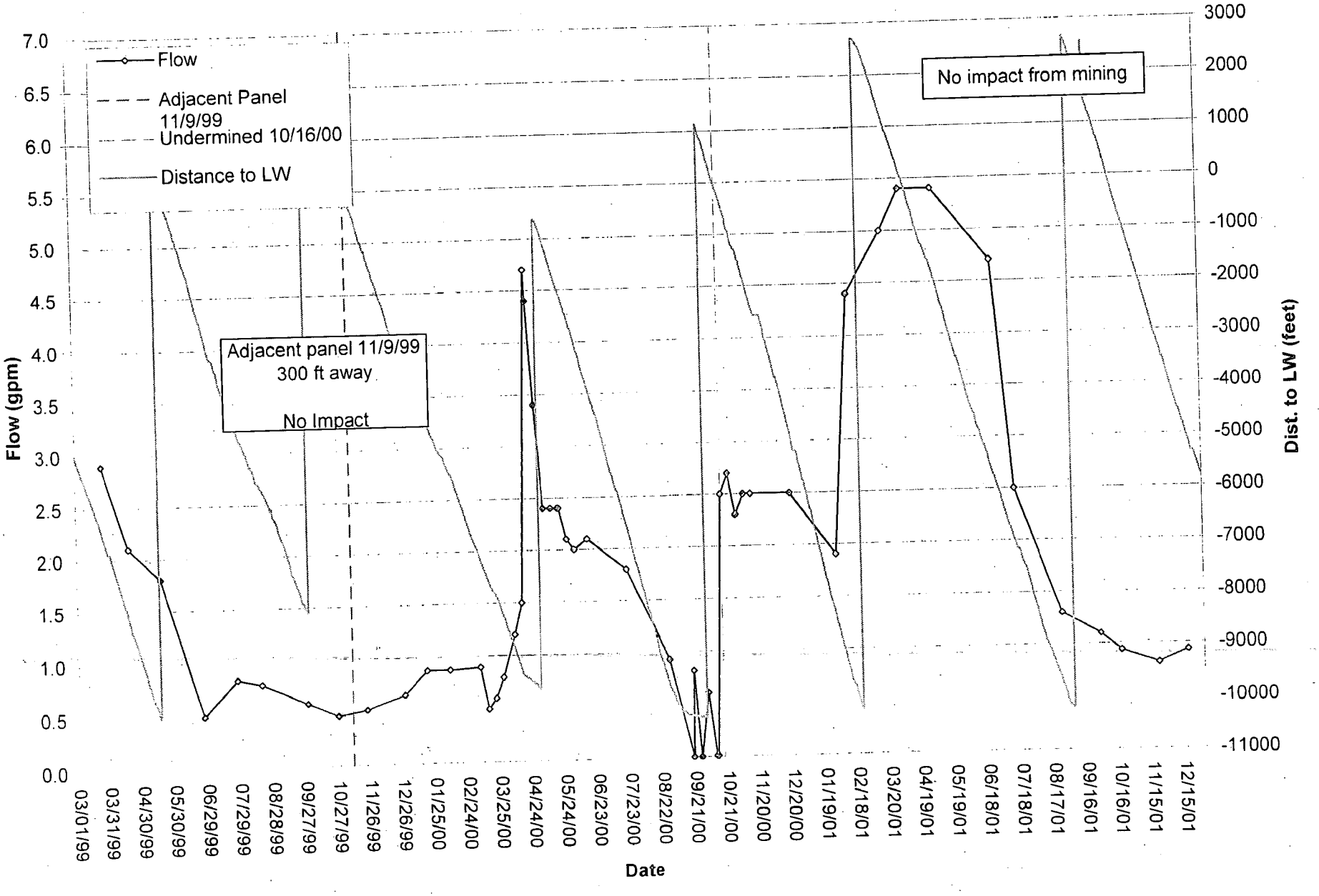
DS - 270 Hydrograph



TOVCC 11619

Ohio Valley Co[illegible] Company
D-0360

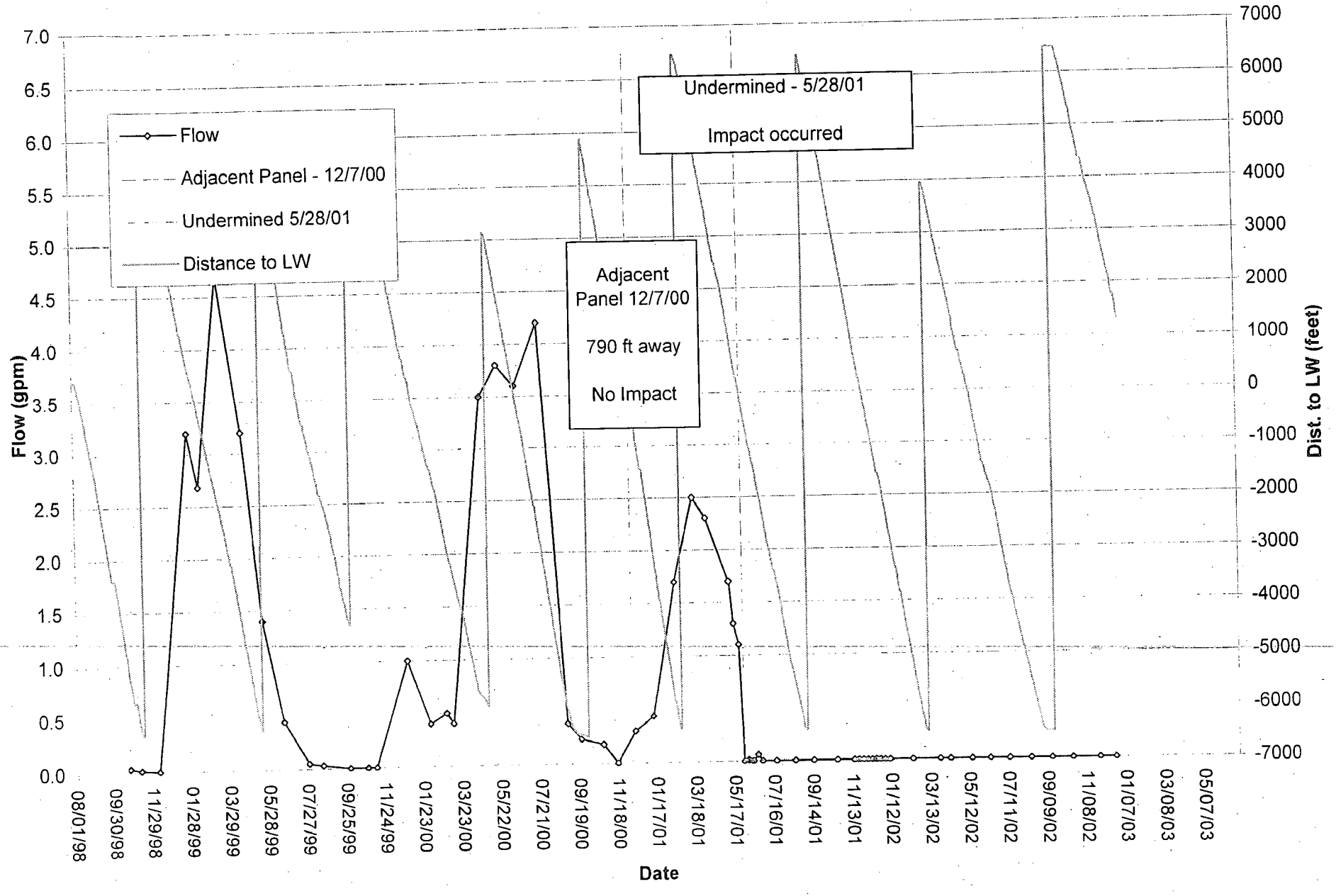
DS - 271 Hydrograph



TOVCC 11620

Ohio Valley Co[illegible] Company
D-0360

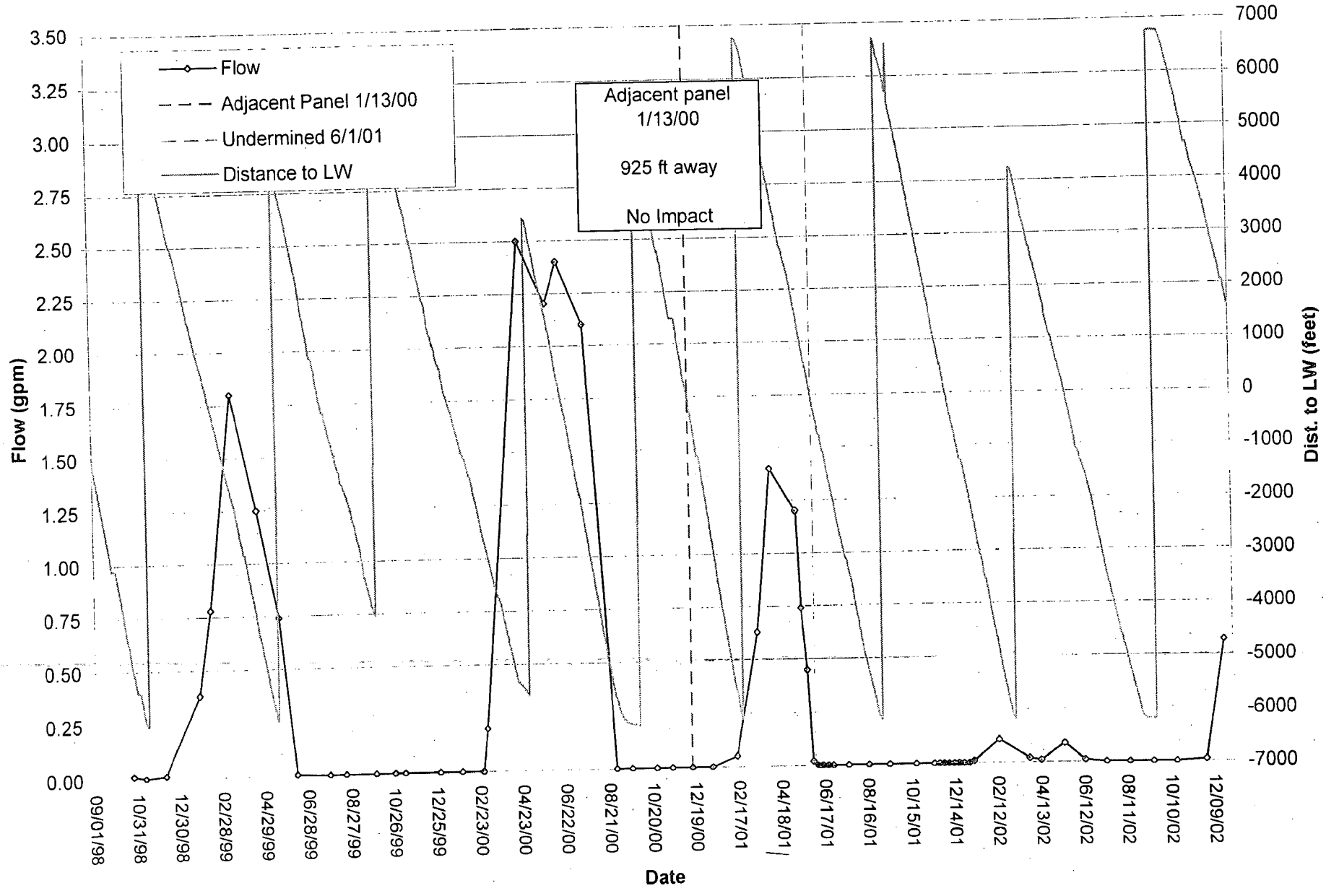
DS-272 Hydrograph



TOVCC 11621

Ohio Valley Coal Company
D-0360

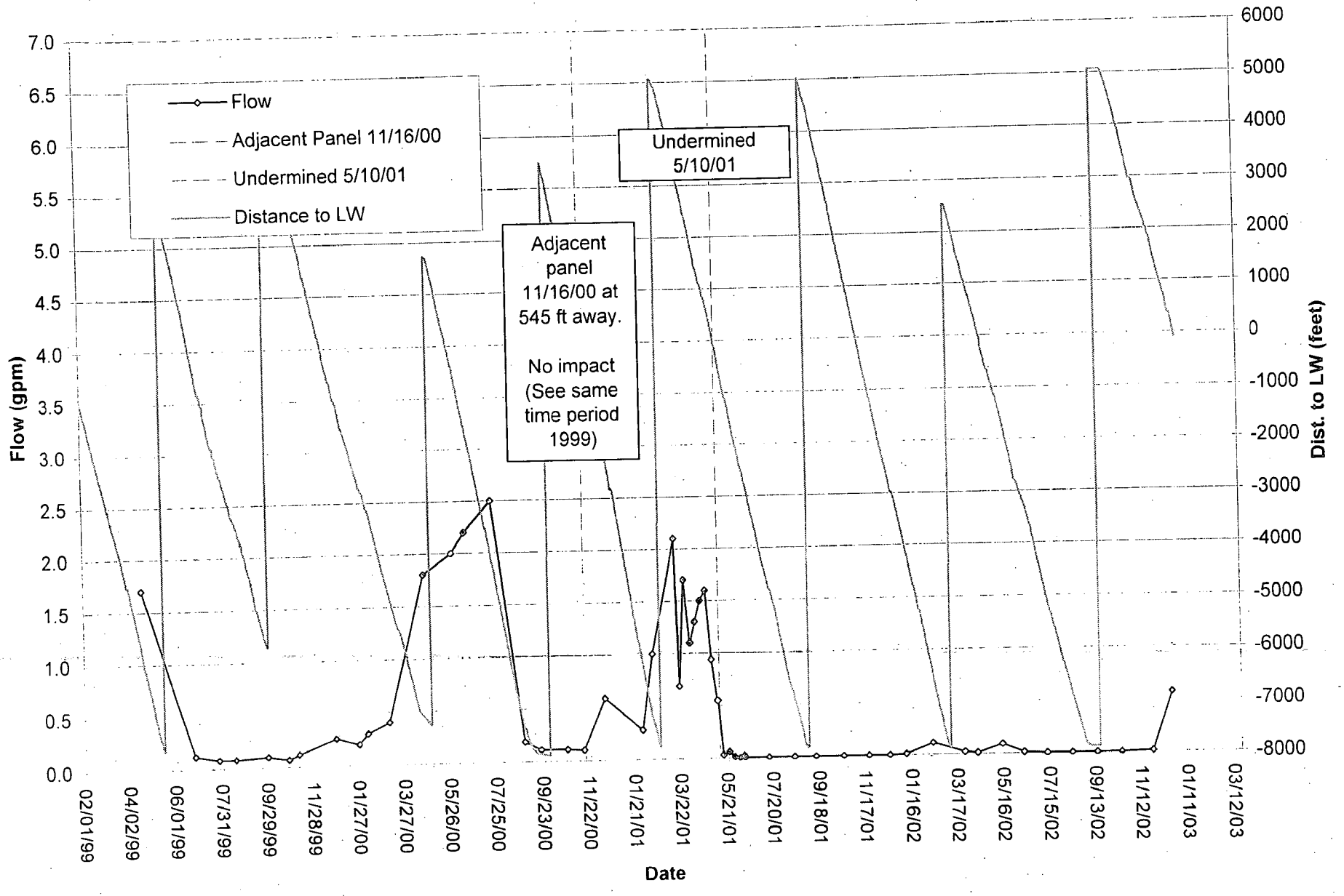
DS - 273 Hydrograph



TOVCC 11622

Ohio Valley Coal Company
D-0360

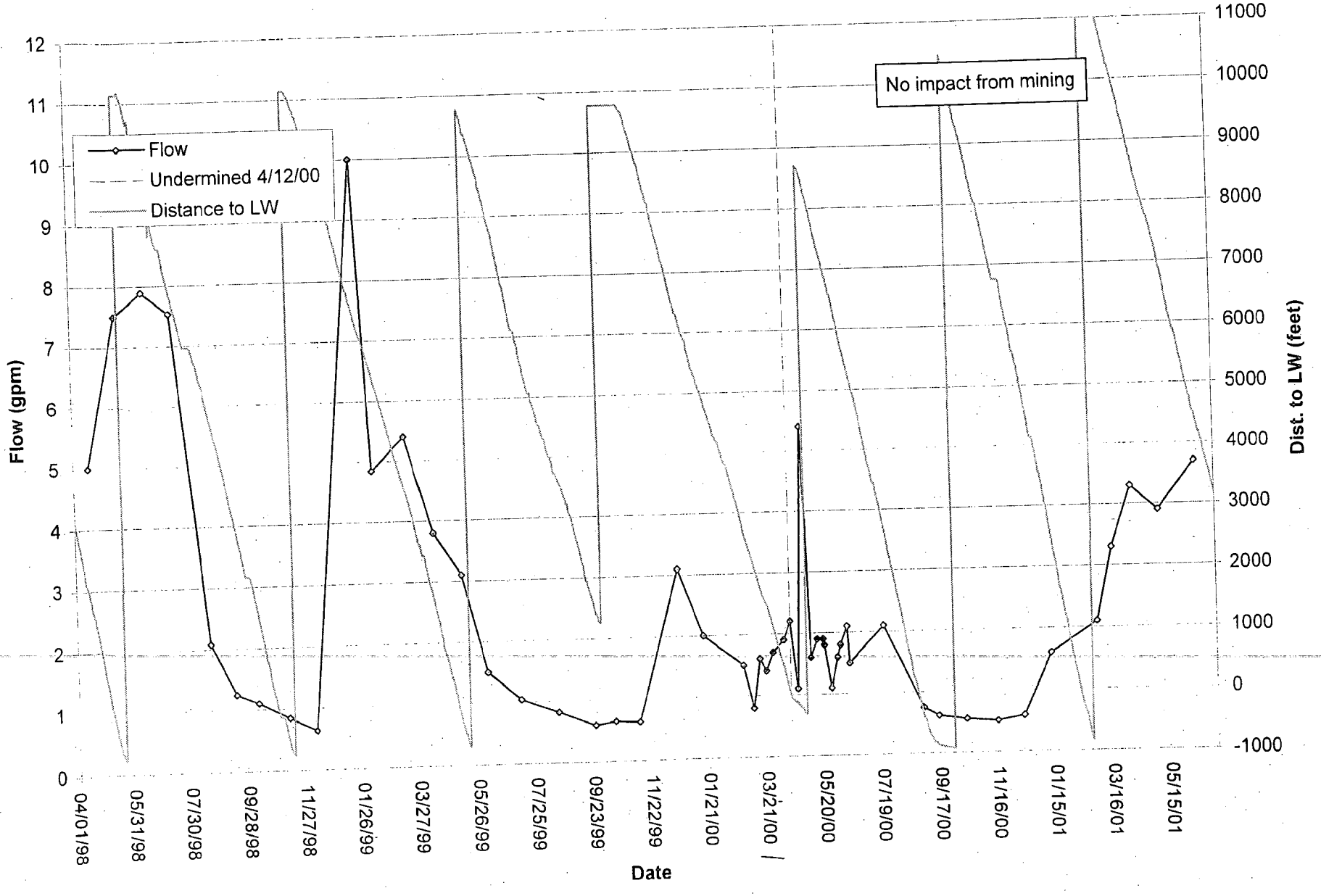
DS-274 Hydrograph



TOVCC 11623

Ohio Valley Coal Company
D-0360

DS - 297 Hydrograph



TOVCC 11624

THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360
ADDENDUM TO PAGE 18, PART 2, F(1)

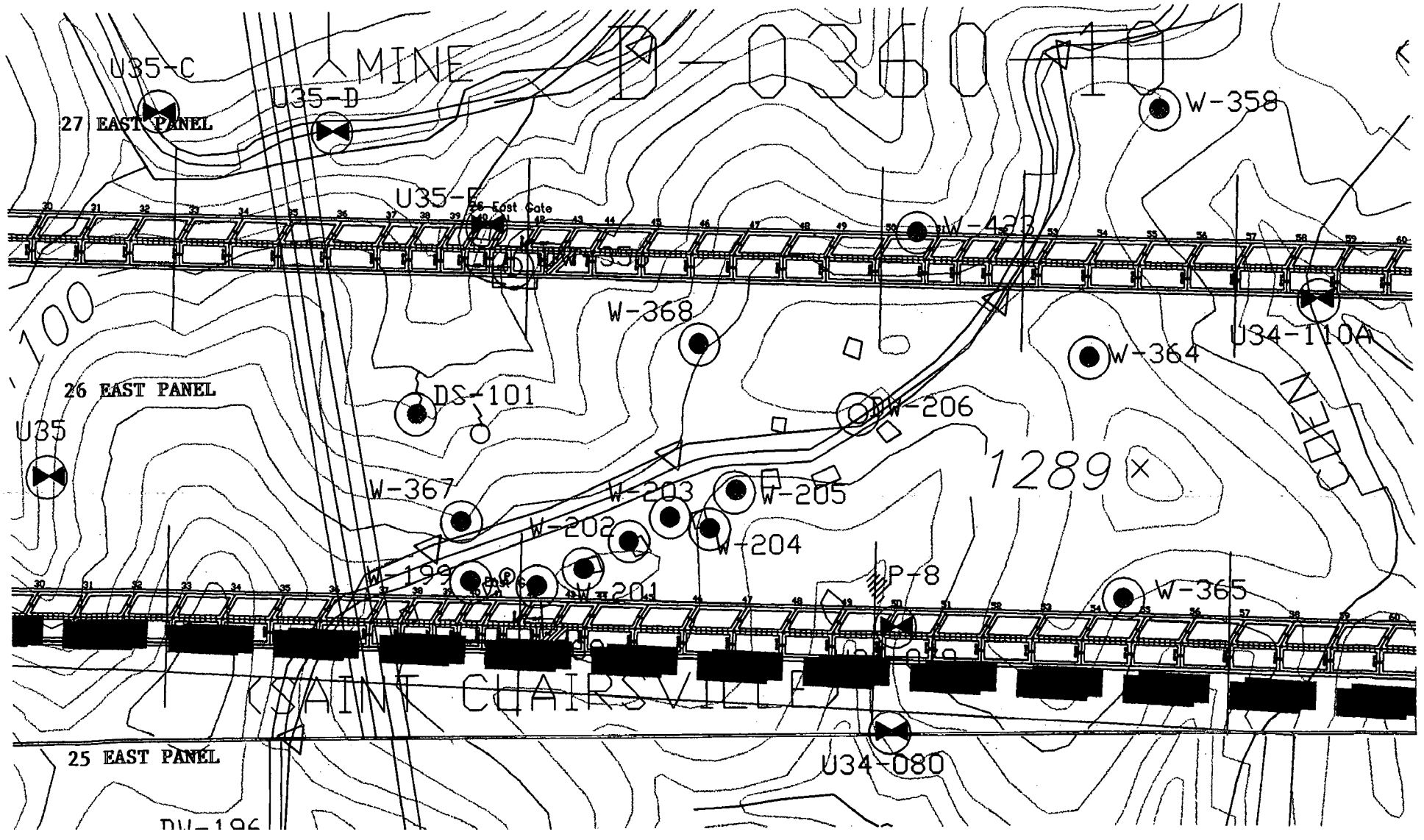
During early 1999, a group of wells and one spring in close proximity to each other were undermined giving OVCC a unique opportunity to monitor the sources on a daily basis and determine the actual impact date. The purpose of this specialized monitoring was to monitor these sources intensely to determine if and when impacts occurred in relationship to mining. The monitoring covered a portion of the D-0360-6 approved application area. It was located over the 26 East longwall panel. This monitoring was preformed in lieu of the normal weekly monitoring when the longwall gets within 3 weeks of mining beneath a source. The results varied, but are presented in Table C and D. Figure 5 shows the relative location of the sources with the longwall panels superimposed. Most of the sources were located at the top of a hill along Belmont County Highway 56.

Sources were monitored daily from January 31, 1999 until March 31, 1999. The relative location of the longwall panel is shown in Table C as a positive number as the longwall approaches the source, and as a negative number as the longwall retreats away after passing beneath a source. Impacts were said to occur when the static water level or flow exceed the pre-mining range of values (depth to water increased or flow decreased). Hydrographs of the wells and spring that were a part of that study are enclosed and show the distance that the sources were undermined.

Three of the 15 wells were not impacted during the monitoring period. The one spring also was not impacted during this period. Of the wells, six were impacted by the previous panel (25 East), and then were not impacted again by the 26 East panel. Of the 8 wells impacted by the mining in the 25 East panel alone, impacts were all observed as occurring after the mining had past the source, and for sources over the panel or the gate, the longwall was an average of 999 ft past the source when the impacts occurred. In the one instance of the source being in the adjacent longwall panel (460 ft north of the 26 East panel), impacts were not observed until the longwall was 2943 ft past the source, showing that the impacts had lagged due to their distance from the face.

There were two dug wells that were studied during this time. DW-206, located over the 26 East panel, had impacts typical to dug wells in that prior to the face reaching the source, water levels rose due to the ground being put into compression. When the ground is in compression, the fractures in the rock close from the compressive forces and the water is forced into the well bore with a corresponding rise in static water level. When the longwall was over 770 ft past the well, the static water level dropped below historic levels. In the other dug well, DW-356, located over the northern gate entries, the static water level was within or near the historic levels until the face was 570 ft from the source, when the swl rose during the remainder of the daily monitoring period. The static water level returned to normal soon after the daily monitoring had concluded. When the adjacent longwall panel (27 East) was past the source by 936 ft, the static water level had dropped below historic levels.

THE OHIO VALLEY COAL COAMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360
APPLICATION AREA D-0360-6
PANEL 26 EAST
FIGURE 5



TOVCC 11626
S:\Permmap.dwg Fri May 26 10:03:29 2000

TABLE C
THE OHIO VALLEY COAL COMPANY
DAILY MONITORING IN LIEU OF WEEKLY

							Jan-99																			
						DATE	1/21/1999		1/22/1999		1/23/1999		1/24/1999		1/25/1999		1/26/1999		1/27/1999		1/28/1999		1/29/1999		1/30/1999		1/31/1999	
						LW PLUS	8054		7999		7931		7874		7805		7735		7678		7617		7577		7522		7494	
		DIST FROM	DIST FROM	PRE MINING DATA (SWL/FLOW)		SOURCE	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)
SOURCE	DEPTH	25E PANEL	26E PANEL	LOW	HIGH	PLUS	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE
W-364	90	830	OVER	48	57.5	6480	49	1574	48	1519	48	1451	48	1394	49	1325	49	1255	49	1198	49.5	1137	50	1097	50	1042	50	1014
W-365	100	160	OVER	63	76.5	6590	69.5	1464	U	1409	U	1341	U	1284	71	1215	71	1145	70	1088	71	1027	71	987	71	932	71	904
W-423	117	1165	155	76	91.5	5990	U	2064	U	2009	U	1941	78	1884	76	1815	76	1745	78	1688	76.5	1627	77	1567	77	1532	77	1504
DW-206	27	660	OVER	2	26.5	5830	U	2224	U	2169	U	2101	2	2044	3	1975	4	1905	4	1848	5.5	1787	6.5	1747	8	1692	8	1664
W-205	57	440	OVER	32	45.5	5490	U	2564	U	2509	U	2441	U	2384	U	2315	U	2245	U	2188	U	2127	U	2087	U	2032	U	2004
W-204	64	340	OVER	14	43	5420	U	2634	U	2579	U	2511	U	2454	U	2385	U	2315	U	2258	U	2197	U	2157	U	2102	U	2074
W-368	85	850	OVER	22	68	5380	U	2674	U	2619	U	2551	U	2494	U	2425	U	2355	U	2298	U	2237	U	2197	U	2143	U	2114
W-203	66	355	OVER	38	48.5	5305	U	2749	U	2694	U	2626	U	2569	U	2500	U	2430	U	2373	U	2312	U	2272	U	2217	U	2189
W-201	62	215	OVER	53	56.5	5070	U	2984	U	2929	U	2861	U	2804	U	2735	U	2665	U	2608	U	2547	U	2507	U	2452	U	2424
W-202	78	295	OVER	57	71.5	5190	U	2864	U	2809	U	2741	U	2684	U	2615	U	2545	U	2488	U	2427	U	2387	U	2332	U	2304
W-199	67	185	OVER	14	26.5	4750	U	3304	U	3249	U	3181	U	3124	U	3055	U	2985	U	2928	U	2867	U	2827	U	2772	U	2744
W-200	53	160	OVER	22	41	4830	U	3124	U	3069	U	3001	U	2944	U	2875	U	2805	U	2748	U	2687	U	2647	U	2592	U	2564
W-367	77	335	OVER	40	57	4720	U	3334	U	3279	U	3211	U	3154	U	3085	U	3015	U	2958	U	2897	U	2857	U	2802	U	2774
DS-101*	N/A	625	OVER	0.2	8	4590	U	3464	U	3409	U	3341	U	3284	U	3215	U	3145	U	3088	U	3027	U	2987	U	2932	U	2904
DW-356	12	1040	35	1	8	4850	U	3204	U	3149	U	3081	U	3024	U	2955	U	2885	U	2828	U	2767	U	2727	U	2672	U	2644
W-358	35	1425	515	20	34	6665	20.5	1389	20	1334	20	1266	20	1209	20	1140	20	1070	21.5	1013	21.5	952	22	912	22	857	22	829

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TABLE C
THE OHIO VALLEY COAL COMPANY
DAILY MONITORING IN LIEU OF WEEKLY

							Feb-99																	
						DATE	2/1/1999		2/2/1999		2/3/1999		2/4/1999		2/5/1999		2/6/1999		2/7/1999		2/8/1999		2/9/1999		2/10/1999	
						LW PLUS	7419		7400		7349		7282		7207		7143		7106		7061		6996		6938	
		DIST FROM	DIST FROM	PRE MINING DATA (SWL/FLOW		SOURCE	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)
SOURCE	DEPTH	25E PANEL	26E PANEL	LOW	HIGH	PLUS	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE
W-364	90	830	OVER	48	57.5	6480	R	939	R	920	R	869	R	802	R	727	R	663	R	626	R	581	R	516	R	458
W-365	100	160	OVER	63	76.5	6590	73	829	73	810	74	759	73	692	73	617	73	553	71	516	70.5	471	72	406	72	348
W-423	117	1165	155	76	91.5	5990	78	1429	77	1410	78	1359	78	1292	78	1217	78.5	1153	77	1116	77	1071	78	1006	78	948
DW-206	27	660	OVER	2	26.5	5830	10	1589	10	1570	10.5	1519	11	1452	11	1377	11	1313	11	1276	10	1231	9.5	1168	10	1108
W-205	57	440	OVER	32	45.5	5490	33.5	1929	33.5	1910	34	1859	34	1792	34	1717	34.5	1653	33	1616	32	1571	33	1506	33	1448
W-204	64	340	OVER	14	43	5420	16	1999	16	1980	16.5	1929	16.5	1862	16.5	1787	16.5	1723	15.5	1686	15	1641	15.5	1576	15.5	1518
W-368	85	850	OVER	22	68	5380	47	2039	48	2020	49	1969	50.5	1902	51	1827	53	1763	52.5	1726	48.5	1681	47.5	1618	47.5	1558
W-203	66	355	OVER	38	48.5	5305	38	2114	38	2095	38.5	2044	39	1977	38.5	1902	38.5	1838	38.5	1801	38.5	1756	38	1691	38	1633
W-201	62	215	OVER	53	56.5	5070	55	2349	54	2330	54	2279	54	2212	54.5	2137	55	2073	54.5	2036	53	1991	54	1926	54	1868
W-202	78	295	OVER	57	71.5	5190	58	2229	58	2210	58	2159	58	2092	58.5	2017	58.5	1953	58.5	1916	57	1871	57.5	1806	57.5	1748
W-199	67	185	OVER	14	26.5	4750	U	2669	U	2650	U	2599	U	2532	U	2457	U	2393	U	2356	16	2311	16	2246	16	2188
W-200	53	160	OVER	22	41	4930	U	2489	U	2470	U	2419	U	2352	U	2277	U	2213	U	2176	22	2131	23	2066	23.5	2008
W-367	77	335	OVER	40	57	4720	U	2699	U	2680	U	2629	U	2562	U	2487	U	2423	U	2386	40	2341	41.5	2276	41.5	2218
DS-101'	N/A	625	OVER	0.2	8	4590	U	2829	U	2810	U	2759	U	2692	U	2617	U	2553	U	2516	1.7	2471	1.3	2406	1.4	2348
DW-356	12	1040	35	1	8	4850	U	2569	U	2550	U	2499	U	2432	U	2357	U	2293	U	2256	6	2211	6	2146	6	2088
W-358	35	1425	515	20	34	6665	23.5	754	23.5	735	26.2	684	27	617	23.5	542	24	478	23.5	441	23	396	23	331	23	273

							Feb-99																	
						DATE	2/11/1999		2/12/1999		2/13/1999		2/14/1999		2/15/1999		2/16/1999		2/17/1999		2/18/1999		2/19/1999		2/20/1999	
						LW PLUS	6865		6775		6736		6668		6603		6559		6500		6448		6355		6319	
		DIST FROM	DIST FROM	PRE MINING DATA (SWL/FLOW		SOURCE	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)
SOURCE	DEPTH	25E PANEL	26E PANEL	LOW	HIGH	PLUS	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE
W-364	90	830	OVER	48	57.5	6480	R	385	R	295	R	256	R	188	R	123	R	79	R	20	R	-32	R	-125	R	-161
W-365	100	160	OVER	63	76.5	6590	72	275	70	185	69	146	68.5	78	66	13	65	-31	64.5	-90	65	-142	69.5	-235	71.5	-271
W-423	117	1165	155	76	91.5	5990	77.5	875	76.5	785	78	746	78	678	78	613	78	569	78	510	78	458	79	365	80.5	329
DW-206	27	660	OVER	2	26.5	5830	11	1035	10.5	945	10	906	10.5	838	11.5	773	11.5	729	11.5	670	11.5	618	12	525	12.5	489
W-205	57	440	OVER	32	45.5	5490	33.5	1375	32	1285	35	1246	34	1178	34	1113	33.5	1069	34.5	1010	34	958	34.5	865	35	829
W-204	64	340	OVER	14	43	5420	15.5	1445	14	1355	16	1316	16	1248	16	1183	16	1139	16	1080	16	1028	16	935	16.5	899
W-368	85	850	OVER	22	68	5380	47	1485	46.5	1395	48	1356	49.5	1288	50.5	1223	50.5	1179	50.5	1120	50.5	1068	56	975	56.5	939
W-203	66	355	OVER	38	48.5	5305	38.5	1580	38	1470	39	1431	38.5	1363	38.5	1298	38.5	1254	38.5	1195	38.5	1143	38.5	1050	39	1014
W-201	62	215	OVER	53	56.5	5070	54	1795	54	1705	56	1666	55	1598	55	1533	55	1489	55	1430	55	1378	55	1285	55.5	1249
W-202	78	295	OVER	57	71.5	5190	57.5	1675	57.5	1585	58	1546	56	1478	58.5	1413	58.5	1369	58.5	1310	58.5	1258	58.5	1165	59	1129
W-199	67	185	OVER	14	26.5	4750	16.5	2115	16	2025	17	1986	17	1918	17.5	1853	18	1809	18	1750	18	1698	18.5	1605	18.5	1569
W-200	53	160	OVER	22	41	4930	24	1935	24	1845	26.5	1806	27	1738	28	1673	28	1629	28	1570	28	1518	29	1425	30.5	1389
W-367	77	335	OVER	40	57	4720	41.5	2145	40.5	2055	42	2016	42.5	1948	42.5	1883	42.5	1839	43	1780	42.5	1728	43	1635	43.5	1599
DS-101'	N/A	625	OVER	0.2	8	4590	0.9	2275	1	2185	0.7	2146	0.9	2078	0.8	2013	0.9	1969	0.9	1910	0.7	1858	0.6	1765	0.6	1729
DW-356	12	1040	35	1	8	4850	6.5	2015	6.5	1925	6.5	1886	7	1818	7	1753	7	1709	7	1650	7	1598	7	1505	7	1469
W-358	35	1425	515	20	34	6665	23	200	23	110	25	71	25.5	3	26.5	-62	26.5	-106	26.5	-165	25.5	-217	25	-310	25.5	-346

							Feb-99													
						DATE	2/21/1999		2/22/1999		2/23/1999		2/24/1999		2/25/1999		2/26/1999		2/27/1999		2/28/1999	
						LW PLUS	6244		6194		6140		6077		6010		5918		5889		5820	
		DIST FROM	DIST FROM	PRE MINING DATA (SWL/FLOW		SOURCE	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)	SWL (FT)	(+/-)
SOURCE	DEPTH	25E PANEL	26E PANEL	LOW	HIGH	PLUS	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE	FLOW (GPM)	D TO FACE
W-364	90	830	OVER	48	57.5	6480	R	-236	R	-286	R	-340	R	-403	R	-470	R	-562	R	-591	R	-660
W-365	100	160	OVER	63	76.5	6590	72	-346	72	-396	72	-450	72	-513	72.5	-580	73	-672	73.5	-701	74	-770
W-423	117	1165	155	76	91.5	5990	82	254	83	204	83.5	150	83.5	87	83.5	20	83	-72	84	-101	84.5	-170
DW-206	27	660	OVER	2	26.5	5830	12	414	12.5	364	12.5	310	13.5	247	14.5	180	13	88	15.5	59	15	-10
W-205	57	440	OVER	32	45.5	5490	35.5	754	36	704	36	650	35	587	35.5	520	36	428	38	399	37	330
W-204	64	340	OVER	14	43	5420	17	824	17	774	17	720	18.5	657	17.5	590	17.5	498	18	469	18	400
W-368	85	850	OVER	22	68	5380	57	864	58.5	814	58.5	760	59.5	697	60	630	61	538	62.5	509	62	440
W-203	66	355	OVER	38	48.5	5305	38.5	939	39	889	39.5	835	39.5	772	39.5	705	38	613	39.5	584	39.5	515
W-201	62	215	OVER	53	56.5	5070	55.5	1174	56	1124	56	1070	56	1007	56	940	56	848	56	819	56	750
W-202	78	295	OVER	57	71.5	5190	58.5	1054	59	1004	60.5	950	61.5	887	62	820	61	728	63.5	699	63	630
W-199	67	185	OVER	14	26.5	4750	18.5	1494	18	1444	18	1390	18.5	1327	18.5	1260	18	1168	19.5	1139	19	1070
W-200	53	160	OVER	22	41	4930	30.5	1314	31	1264	31.5	1210	32	1147	32	1080	32.5	988	33.5	959	24	890
W-367	77	335	OVER	40	57	4720	42.5	1524	42.5	1474	43	1420	43	1357	43	1290	42	1198	44.5	1169	44	1100
DS-101'	N/A	625	OVER	0.2	8	4590	0.5	1654	0.4	1604	0.4	1550	0.4	1487	0.3	1420	0.4	1328	0.4	1299	3	1230
DW-356	12	1040	35	1	8	4850	7.5	1394	7.5	1344	7.5	1290	7.5	1227	7.5	1160	6.5	1068	7.5	1039	6	970
W-358	35	1425	515	20	34	6665	26	-421	26	-471	26.5	-525	24.5	-588	27.5	-655	28.5	-747	28.5	-778	27	-845

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TABLE C
THE OHIO VALLEY COAL COMPANY
DAILY MONITORING IN LIEU OF WEEKLY

							Mar-99																	
						DATE	3/1/1999		3/2/1999		3/3/1999		3/4/1999		3/5/1999		3/6/1999		3/7/1999		3/8/1999		3/9/1999		3/10/1999	
						LW PLUS	5773		5698		5628		5580		5510		5453		5372		5347		5265		5217	
SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA (SWL/FLOW) LOW	HIGH	SOURCE PLUS	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE
W-364	90	830	OVER	48	57.5	6480	R	-707	R	-782	R	-852	R	-900	R	-970	R	-1027	R	-1108	51.5	-1133	51.5	-1215	51.5	-1263
W-365	100	160	OVER	63	76.5	6590	74.5	-817	75	-892	76	-962	75	-1010	68	-1080	67.5	-1137	63	-1218	63	-1243	64.5	-1325	67.5	-1373
W-423	117	1165	155	76	91.5	5990	85.5	-217	84	-292	84	-362	83.5	-410	84	-480	83.5	-537	86	-618	85	-643	84.5	-725	85	-773
DW-206	27	660	OVER	2	26.5	5830	14.5	-57	14.5	-132	14	-202	13.5	-250	15	-320	15	-377	16	-458	15.5	-483	14.5	-565	18	-613
W-205	57	440	OVER	32	45.5	5490	39	283	35	208	34.5	138	38.5	90	39	20	39	-37	43.5	-118	43	-143	42	-225	41.5	-273
W-204	64	340	OVER	14	43	5420	17.5	353	17	278	17	208	17	160	16	90	16	33	33	-48	32.5	-73	35.5	-155	35.5	-203
W-368	85	850	OVER	22	68	5380	61	393	60	318	60.5	248	60	200	59	130	59	73	55	-8	22	-33	45.5	-115	45.5	-163
W-203	66	355	OVER	38	48.5	5305	39.5	468	40	393	40	323	39	275	39	205	39	148	39	67	38.5	42	40	-40	41	-88
W-201	62	215	OVER	53	56.5	5070	56	703	56.5	628	56.5	558	56.5	510	54	440	54	383	54	302	54.5	277	54.5	195	56	147
W-202	78	295	OVER	57	71.5	5190	59.5	583	59	508	59	438	59	390	58	320	58	263	57	182	57.5	157	61	75	60.5	27
W-199	67	185	OVER	14	26.5	4750	18	1023	16	948	16	878	17	830	15.5	760	15.5	703	14	622	14.5	597	14.5	515	15.5	467
W-200	53	160	OVER	22	41	4930	28.5	843	26.5	768	27	698	26	650	25	580	25	523	22	442	22.5	417	24	335	27.5	287
W-367	77	335	OVER	40	57	4720	43.5	1053	44	978	44	908	44	860	40.5	790	40	733	41	652	41	627	42	545	42	497
DS-101*	N/A	625	OVER	0.2	8	4590	6	1193	8	1108	8	1038	6	990	5.5	920	5	863	4.5	782	5	757	5	675	4.5	627
DW-356	12	1040	35	1	8	4850	6	923	8	848	8	778	6	730	5.5	660	5	603	4.5	522	5	497	5	415	4.5	367
W-358	35	1425	515	20	34	6665	27	-892	24.5	-967	24	-1037	24.5	-1085	24	-1155	24	-1212	24	-1293	22	-1318	24	-1400	23.5	-1448

							Mar-99																	
						DATE	3/11/1999		3/12/1999		3/13/1999		3/14/1999		3/15/1999		3/16/1999		3/17/1999		3/18/1999		3/19/1999		3/20/1999	
						LW PLUS	5147		5094		5045		4990		4947		4892		4835		4773		4701		4640	
SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA (SWL/FLOW) LOW	HIGH	SOURCE PLUS	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE
W-364	90	830	OVER	48	57.5	6480	51.5	-1333	52.5	-1386	53	-1435	53.5	-1490	53.5	-1533	54	-1588	53.5	-1645	53	-1707	53	-1779	53	-1840
W-365	100	160	OVER	63	76.5	6590	67	-1443	67	-1496	70.5	-1545	71	-1600	71.5	-1643	74.5	-1698	71	-1755	70	-1817	70	-1889	70	-1950
W-423	117	1165	155	76	91.5	5990	85	-843	84.5	-896	85.5	-945	86	-1000	86.5	-1043	87	-1098	87.5	-1155	87.5	-1217	87.5	-1289	87.5	-1350
DW-206	27	660	OVER	2	26.5	5830	19.5	-683	21.5	-736	22.5	-785	23.5	-840	24	-883	24	-938	23.5	-995	24	-1057	24	-1129	24.5	-1190
W-205	57	440	OVER	32	45.5	5490	41.5	-343	41.5	-396	42.5	-445	43	-500	43.5	-543	44	-598	44	-655	44	-717	44.5	-789	44.5	-850
W-204	64	340	OVER	14	43	5420	37	-273	38	-326	40	-375	41	-430	41	-473	41.5	-528	40	-585	37	-647	37	-719	38	-780
W-368	85	850	OVER	22	68	5380	45	-233	0	-286	47	-335	49	-390	55.5	-433	60	-488	61.5	-545	62.5	-607	63.5	-679	63.5	-740
W-203	66	355	OVER	38	48.5	5305	40.5	-158	41	-211	41.5	-269	41.5	-315	42.5	-358	42.5	-413	42.5	-470	43	-532	43	-604	43	-665
W-201	62	215	OVER	53	56.5	5070	58	77	56	24	56	-25	56	-80	55.5	-123	56	-178	56	-235	56	-297	56	-369	56	-430
W-202	78	295	OVER	57	71.5	5190	61	-43	61.5	-96	60.5	-145	59.5	-200	59.5	-243	61	-298	62	-355	62	-417	62.5	-489	63	-550
W-199	67	185	OVER	14	26.5	4750	15.5	397	16.5	344	16.5	295	16.5	240	17	197	16.5	142	16	85	16.5	23	18	-49	19	-110
W-200	53	160	OVER	22	41	4930	31	217	33.5	164	34.5	115	35.5	60	36.5	17	36.5	-38	35.5	-95	36.5	-157	37	-229	37	-290
W-367	77	335	OVER	40	57	4720	42.5	427	43	374	43.5	325	43.5	270	43.5	227	44	172	43.5	115	44	53	45	-19	52	-80
DS-101*	N/A	625	OVER	0.2	8	4590	1	557	0.86	504	0.81	455	0.8	400	0.7	357	0.7	302	2.6	245	1.8	183	1	111	0.6	50
DW-356	12	1040	35	1	8	4850	4.5	297	3.5	244	3	195	2.5	140	1.5	97	1	42	1	-15	2	-77	2	-149	2	-210
W-358	35	1425	515	20	34	6665	26	-1518	26	-1571	27.5	-1620	28.5	-1675	27.5	-1718	27	-1773	27.5	-1830	27.5	-1892	27	-1964	27.5	-2025

							Mar-99																	
						DATE	3/21/1999		3/22/1999		3/23/1999		3/24/1999		3/25/1999		3/26/1999		3/27/1999		3/28/1999		3/29/1999		3/30/1999		3/31/1999	
						LW PLUS	4574		4529		4464		4389		4319		4233		4153		4083		4055		3966		3882	
SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA (SWL/FLOW) LOW	HIGH	SOURCE PLUS	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE	SWL (FT) FLOW (GPM)	(+/-) D TO FACE
W-364	90	830	OVER	48	57.5	6480	53	-1906	53	-1951	53.5	-2016	53.5	-2091	54.5	-2161	54.5	-2247	55	-2327	55.5	-2397	56.5	-2425	57	-2514	57.5	-2596
W-365	100	160	OVER	63	76.5	6590	70	-2016	71	-2061	71.5	-2126	72	-2201	72	-2271	73	-2357	74	-2437	75	-2507	75.5	-2535	75	-2624	76.5	-2708
W-423	117	1165	155	76	91.5	5990	89.5	-1416	90	-1461	90	-1526	90	-1601	90	-1671	90	-1757	91	-1837	91	-1907	91	-1935	91.5	-2024	91.5	-2108
DW-206	27	660	OVER	2	26.5	5830	25	-1256	25.5	-1301	25.5	-1366	25	-1441	25	-1511	25	-1597	26	-1677	26.5	-1747	26.5	-1775	26.5	-1864	26.5	-1948
W-205	57	440	OVER	32	45.5	5490	44	-918	44	-961	44.5	-1026	44.5	-1101	45	-1171	45	-1257	45	-1337	45	-1407	45	-1435	45.5	-1524	45.5	-1608
W-204	64	340	OVER	14	43	5420	38.5	-846	39	-891	39.5	-956	40.5	-1031	41	-1101	42	-1187	42.5	-1267	42.5	-1337	43	-1395	43	-1454	43	-1538
W-368	85	850	OVER	22	68	5380	63.5	-806	64	-851	64.5	-916	64.5	-991	64.5	-1061	66	-1147	66.5	-1227	67	-1297	67.5	-1325	68	-1414	68	-1498
W-203	66	355	OVER	38	48.5	5305	43	-731	43.5	-776	44.5	-841	44.5	-916	45	-986	46	-1072	47	-1152	47.5	-1222	48	-1250	48.5	-1339	48.5	-1423
W-201	62	215	OVER	53	56.5	5070	56	-496	56	-541	56	-606	56	-681	56	-751	56	-837	56	-917	56	-987	56	-1015	56	-1104	56.5	-1188
W-202	78	295	OVER	57	71.5	5190	64	-616	65	-661	66	-726	66.5	-801	67	-871	67	-957	69	-1037	69.5	-1107	70	-1135	71	-1224	71.5	-1308
W-199	67	185	OVER	14	26.5	4750	20.5	-176	21	-221	21.5	-286	21.5	-361	22	-431	22	-517	23	-597	23.5	-667	25	-695	25.5	-784	26.5	-868
W-200	53	160	OVER	22	41	4930	37	-356	37.5	-401	37.5	-466	37.5	-541	38	-611	38	-697	38	-777	38.5	-847	39	-875	39.5	-964	41	-1048
W-367	77	335	OVER	40	57	4720	54	-146	54	-191	51.5	-256	48	-331	45	-401	45	-487	45	-567	46.5	-637	53	-665	55.5	-754	57	-836
DS-101*	N/A	625	OVER	0.2	8	4590	0.6	-16	0.6	-61	0.5	-126	0.4	-201	0.35	-271	0.35	-357	0.4	-437	0.4	-507	0.4	-535	0.3	-624	0.2	-708
DW-356	12	1040	35	1	8	4850	1.5	-276	1.5	-321	1.5	-386	2	-461	2	-531	2	-617	2.5	-697	2.5	-767	3	-795	3	-884	3	-968
W-358	35	1425	515	20	34	6665	27.5	-2091	26	-2136	27.5	-2201	28.5	-2276	31.5	-2346	32	-2432	32.5	-2512	33	-2582	31.5	-2610	32	-2699	34	-2783

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TABLE D
POWHATAN NO. 6 MINE - PERMIT D-0360
WEEKLY MONITORING DATA SUPPLEMENT
JANUARY - MARCH, 1999 DAILY MONITORING IN LIEU OF WEEKLY
SUMMARY DATA - SEE TABLE C FOR DETAILS

SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA (SWL/FLOW)		MINING PAST	IMPACT DATE	DIST OF IMPACT**	LOCATION
				LOW	HIGH				
W-364	90	830	OVER	48	57.5	2/18/1999	3/12/1999	-1386	QTR PAN N
W-365	100	160	OVER	63	76.5	2/16/1999	PREV*	N/A	QTR PAN S
W-423	117	1165	111	76	91.5	2/26/1999	3/14/1999	-1000	GATE N
DW-206	27	660	OVER	2	26.5	2/28/1999	2/27/1999	-591	MID PAN N
W-205	57	440	OVER	32	45.5	3/6/1999	PREV*	N/A	MID PAN S
W-204	64	340	OVER	14	43	3/7/1999	PREV*	N/A	MID PAN S
W-368	85	850	OVER	22	68	3/7/1999	NONE	N/A	QTR PAN N
W-203	66	355	OVER	38	48.5	3/9/1999	3/16/1999	-413	MID PAN S
W-201	62	215	OVER	53	56.5	3/13/1999	PREV*	N/A	QTR PAN S
W-202	78	295	OVER	57	71.5	3/11/1999	PREV*	N/A	QTR PAN S
W-199	67	185	OVER	14	26.5	3/19/1999	3/21/1999	-176	QTR PAN S
W-200	53	160	OVER	22	41	3/16/1999	PREV*	N/A	QTR PAN S
W-367	77	335	OVER	40	57	3/19/1999	3/20/1999	-80	MID PAN S
DS-101*	N/A	625	OVER	0.2	8	3/21/1999	NONE	N/A	MID PAN N
DW-356	12	1040	OVER	1	8	3/17/1999	NONE	N/A	GATE N
W-358	35	1425	460	20	34	2/15/1999	3/25/1999	-2346	ADJ PAN N

* PREV - IMPACTED BY PREVIOUS PANEL
** DIST OF IMPACT MEASURED FROM LW FACE TO SUPPLY - NEGATIVE MEANS FACE IS PAST SUPPLY

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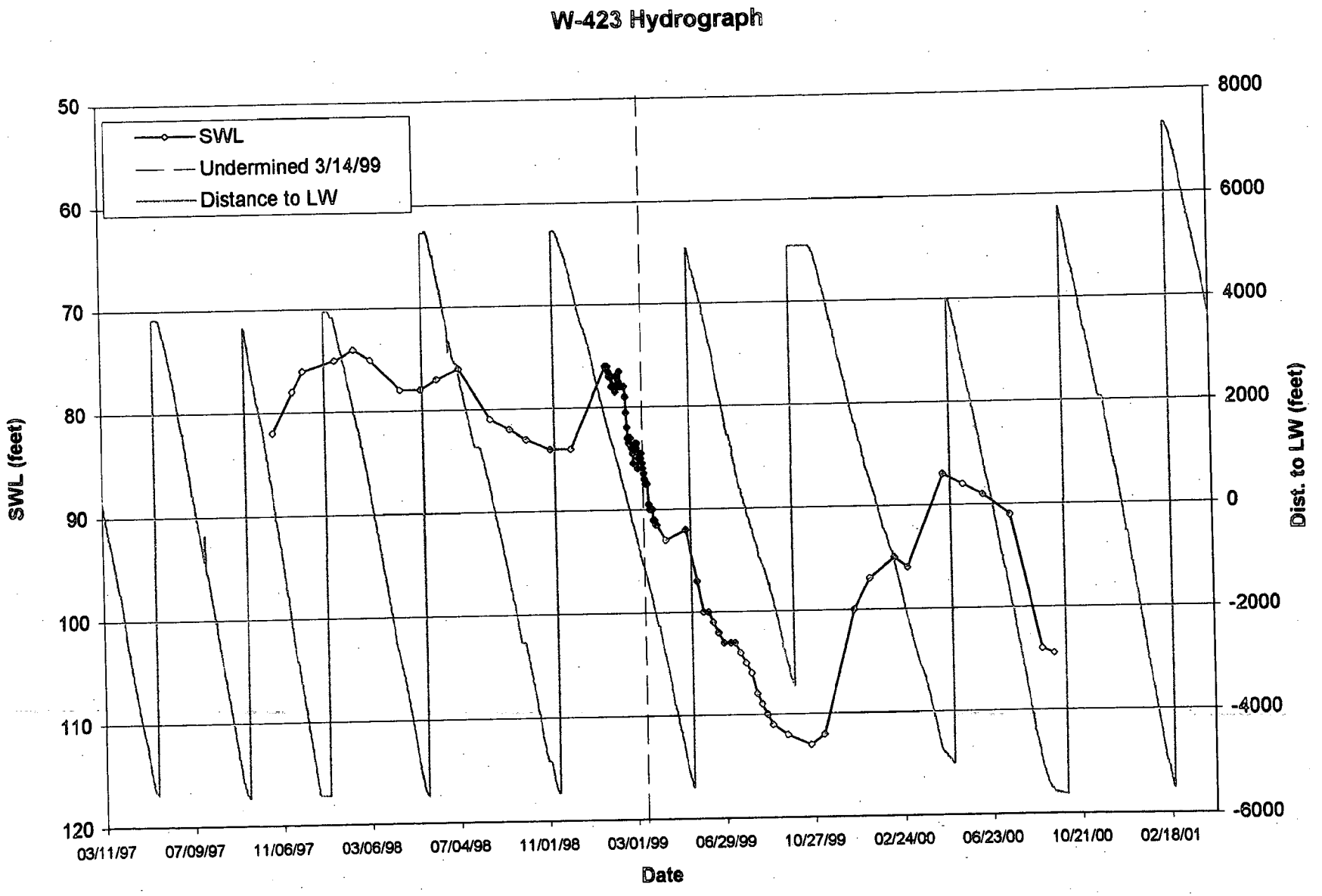
Of the 4 wells impacted by mining in the 25 East (previously mined) panel, the greatest distance to an impacted well (W-205) was 440 ft. However, there were wells closer than 440 ft that were not impacted by the 25 East panel. (W-203, 355 ft; W-199, 185 ft; and W-367 335 ft). All of these wells were impacted when the 26 East panel was mined.

The one spring (DS-101), monitored during the daily monitoring period, was not impacted by the 26 East panel until two months after the source was undermined. It is believed that rainfall probably accounted for it continuing to flow during this time. The spring still flows periodically from a rainfall event, like most springs that have been impacted.

Due to the limited nature of this study, it was not possible to determine how this area compared to the predictions made in the PHC for the D-0360-6 approved mining area.


W-423 Hydrograph
SWL
Undermined 3/14/99
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
50
60
70
80
90
100
110
120
8000
6000
4000
2000
0
-2000
-4000
-6000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
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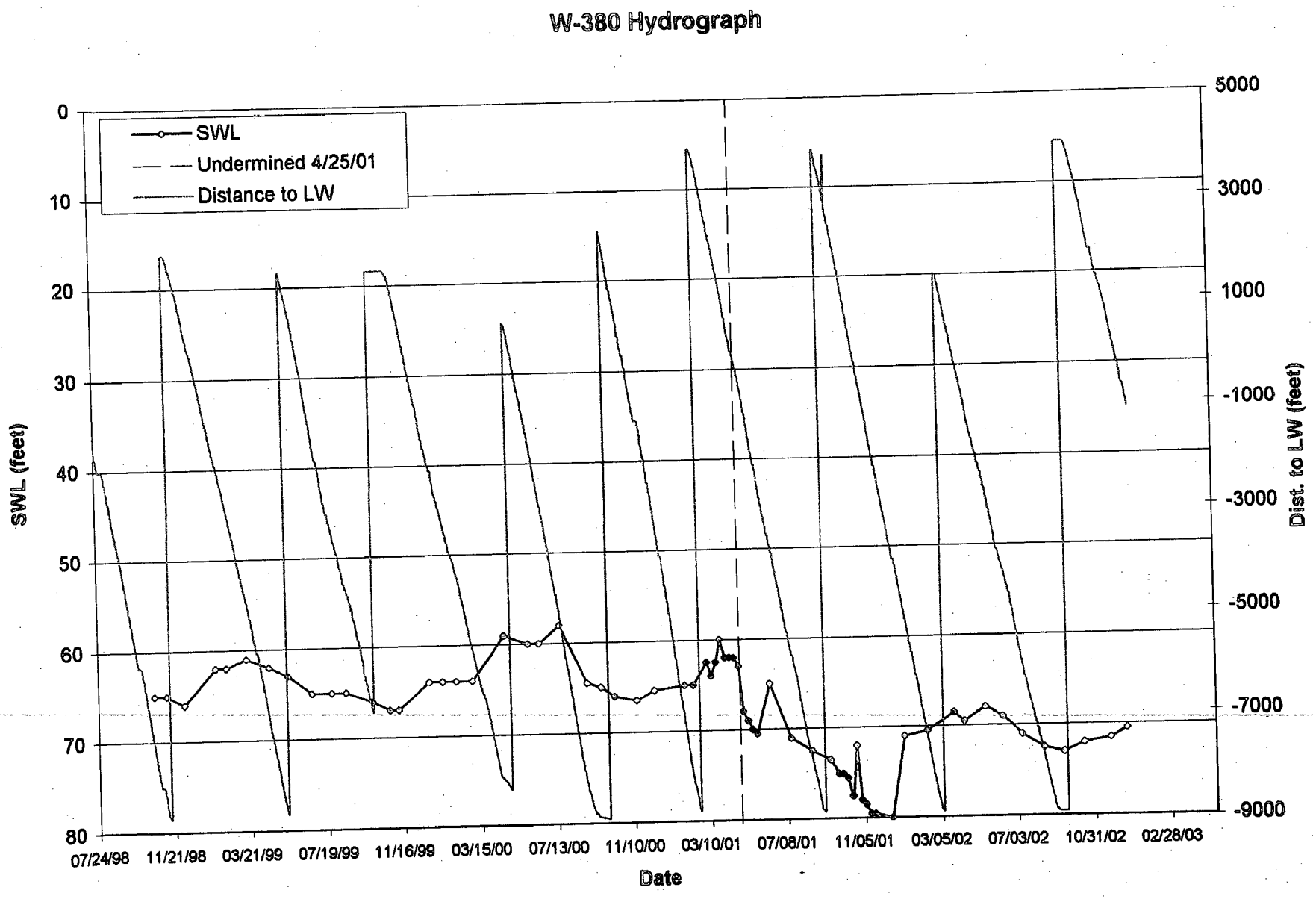
10/21/00
02/18/01


W-380 Hydrograph
SWL
Undermined 4/25/01
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
70
80
5000
3000
1000
-1000
-3000
-5000
-7000
-9000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
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07/03/02
10/31/02
02/28/03

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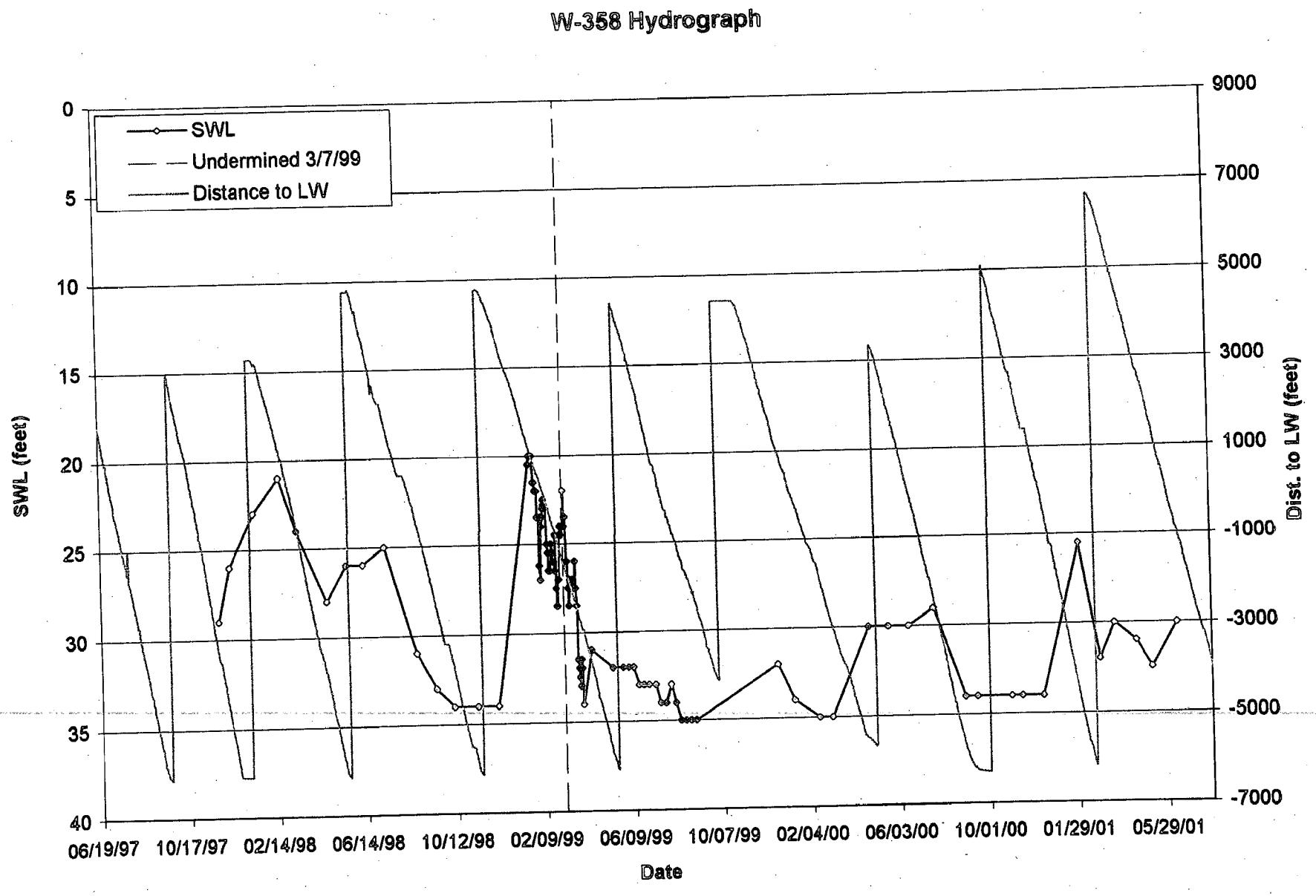
W-358 Hydrograph
SWL
Undermined 3/7/99
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
5
10
15
20
25
30
35
40
9000
7000
5000
3000
1000
-1000
-3000
-5000
-7000
06/19/97
10/17/97
02/14/98
06/14/98
10/12/98
02/09/99
06/09/99
10/07/99
02/04/00
06/03/00
10/01/00
01/29/01
05/29/01

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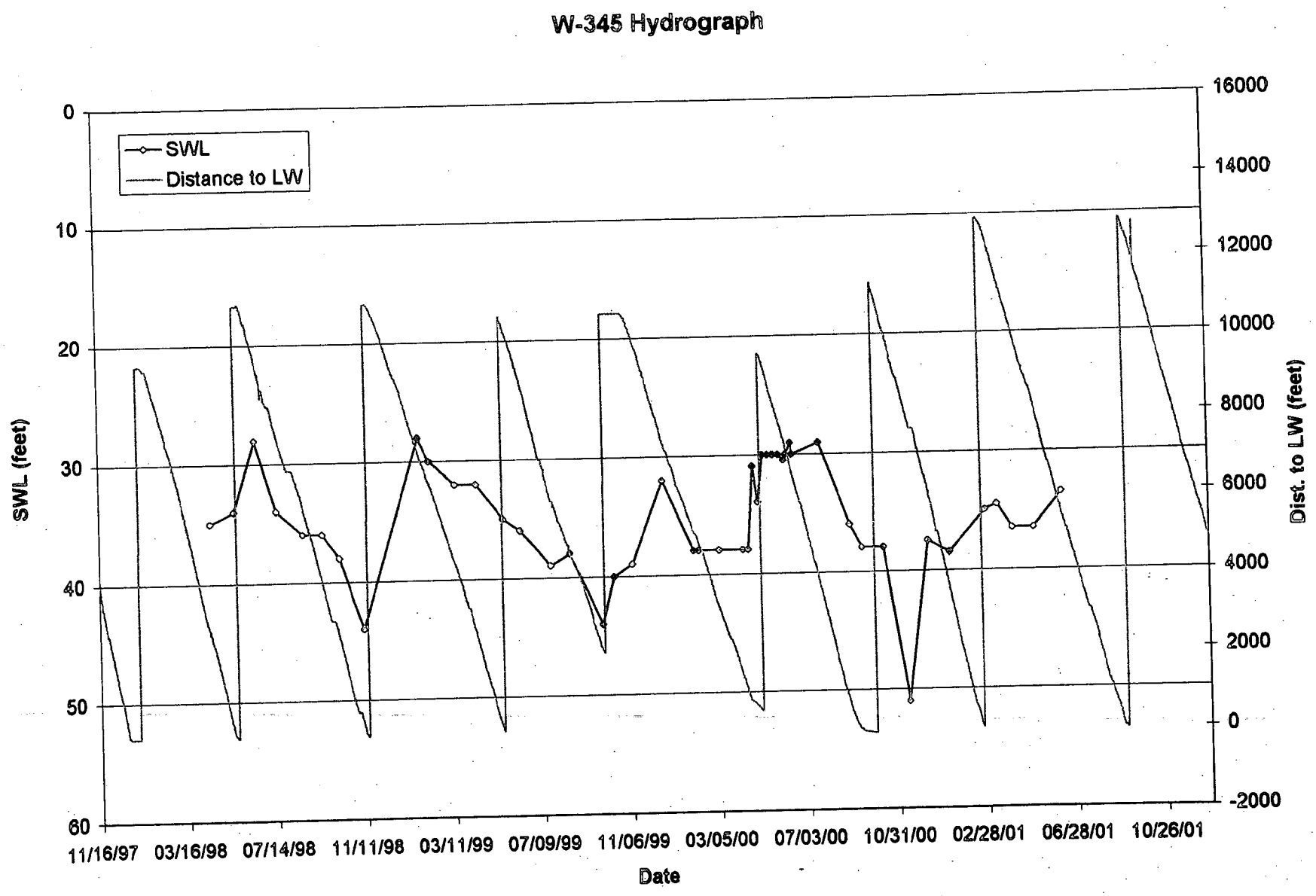
W-345 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
11/16/97
03/16/98
07/14/98
11/11/98
03/11/99
07/09/99
11/06/99
03/05/00
07/03/00
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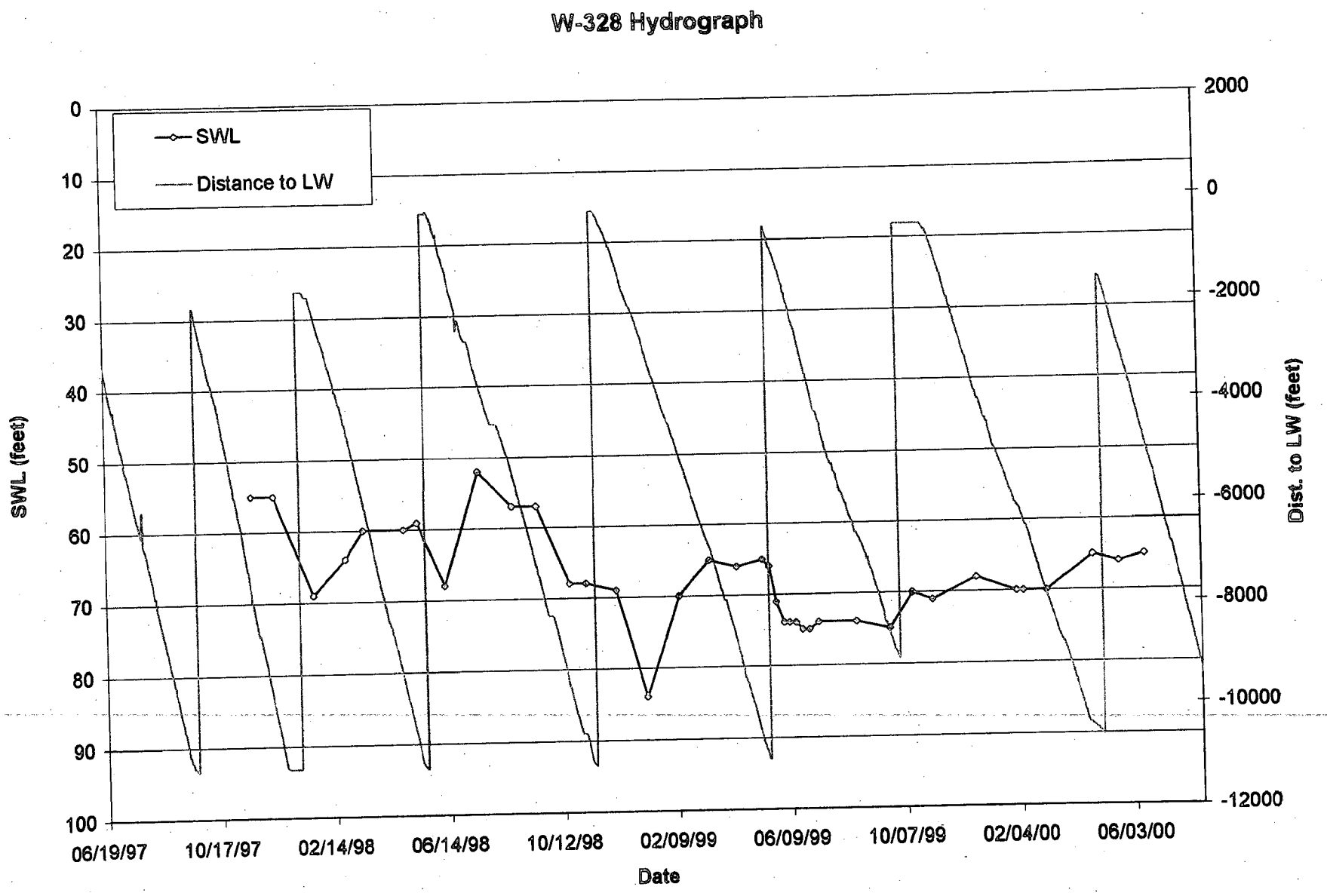
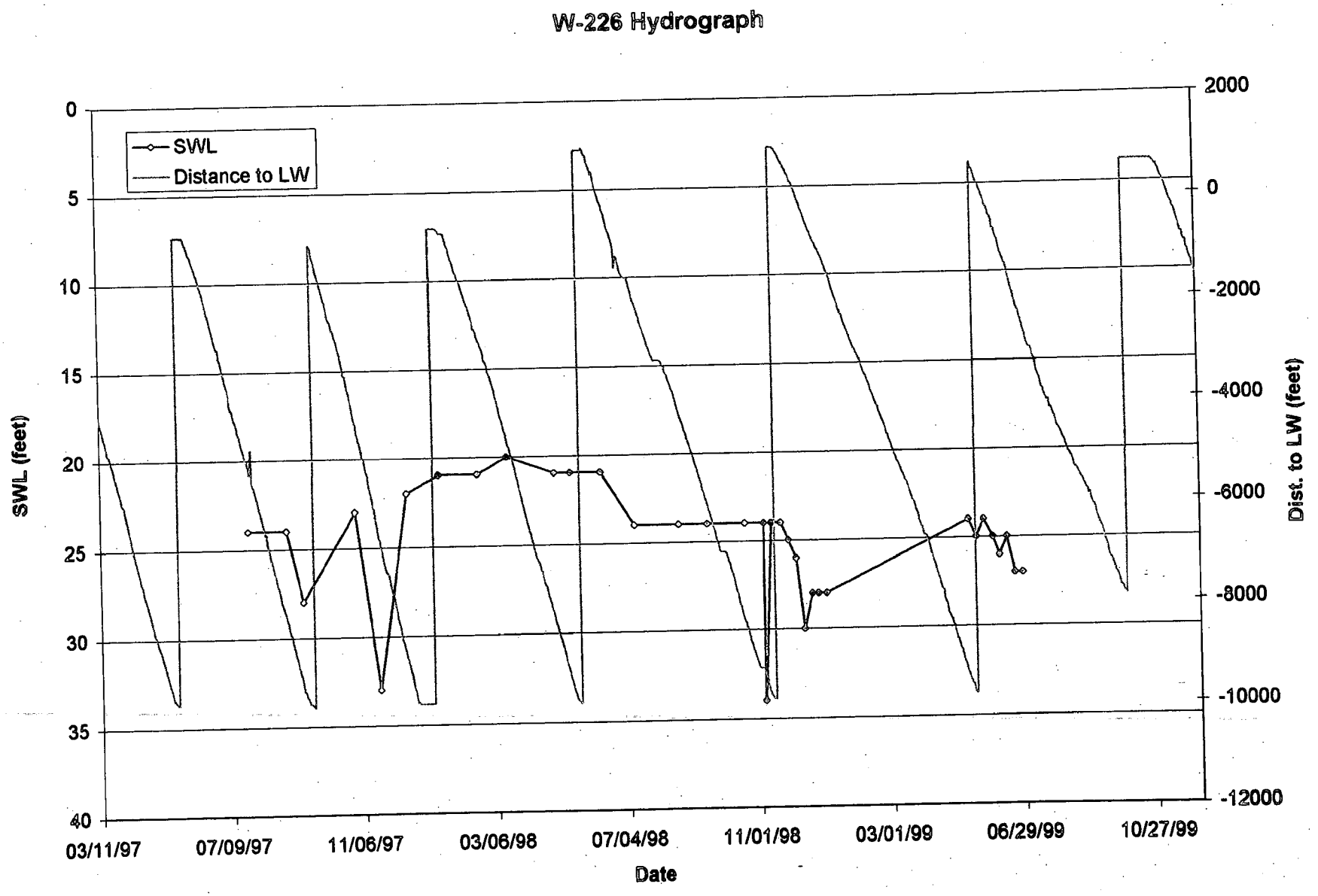
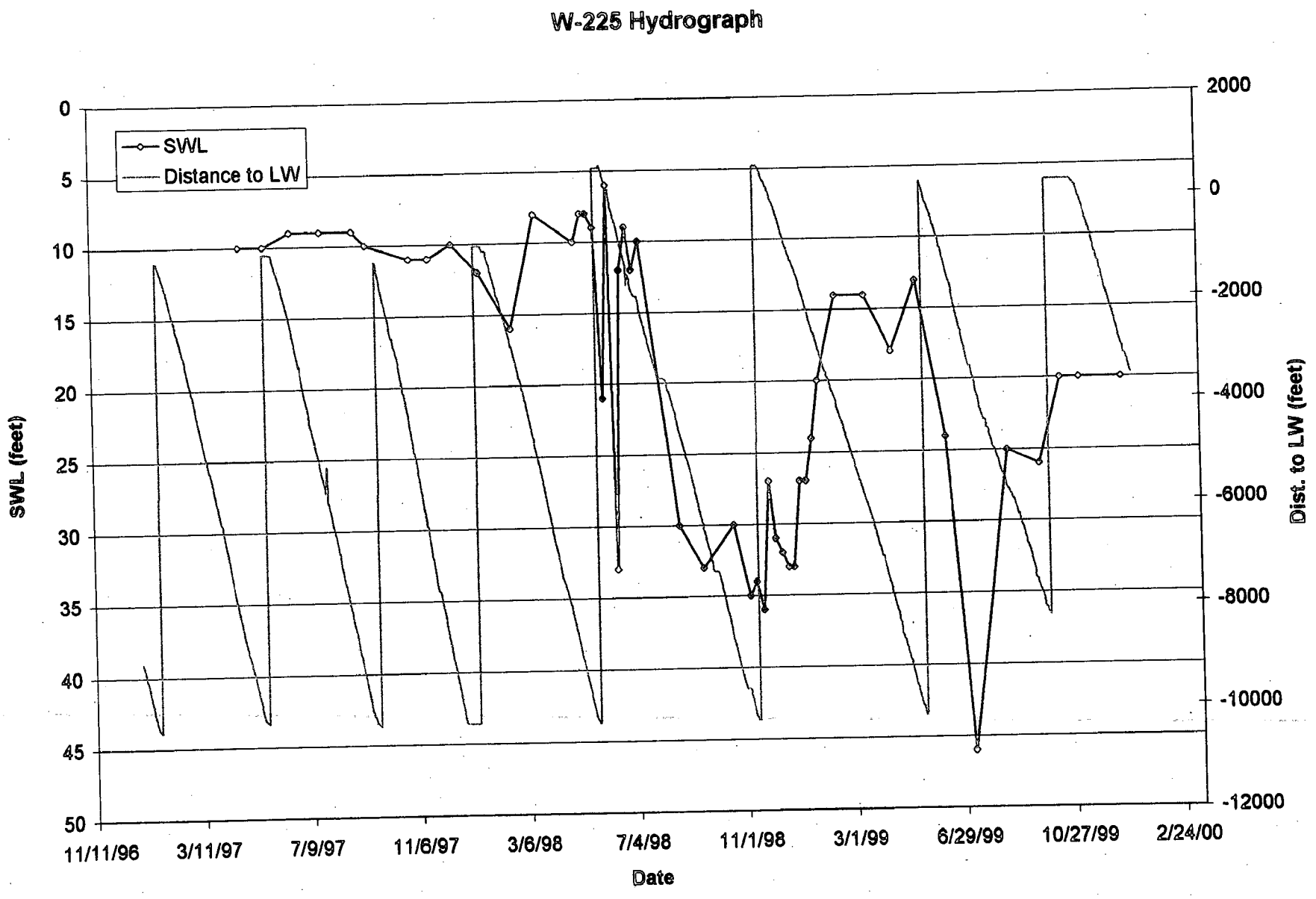
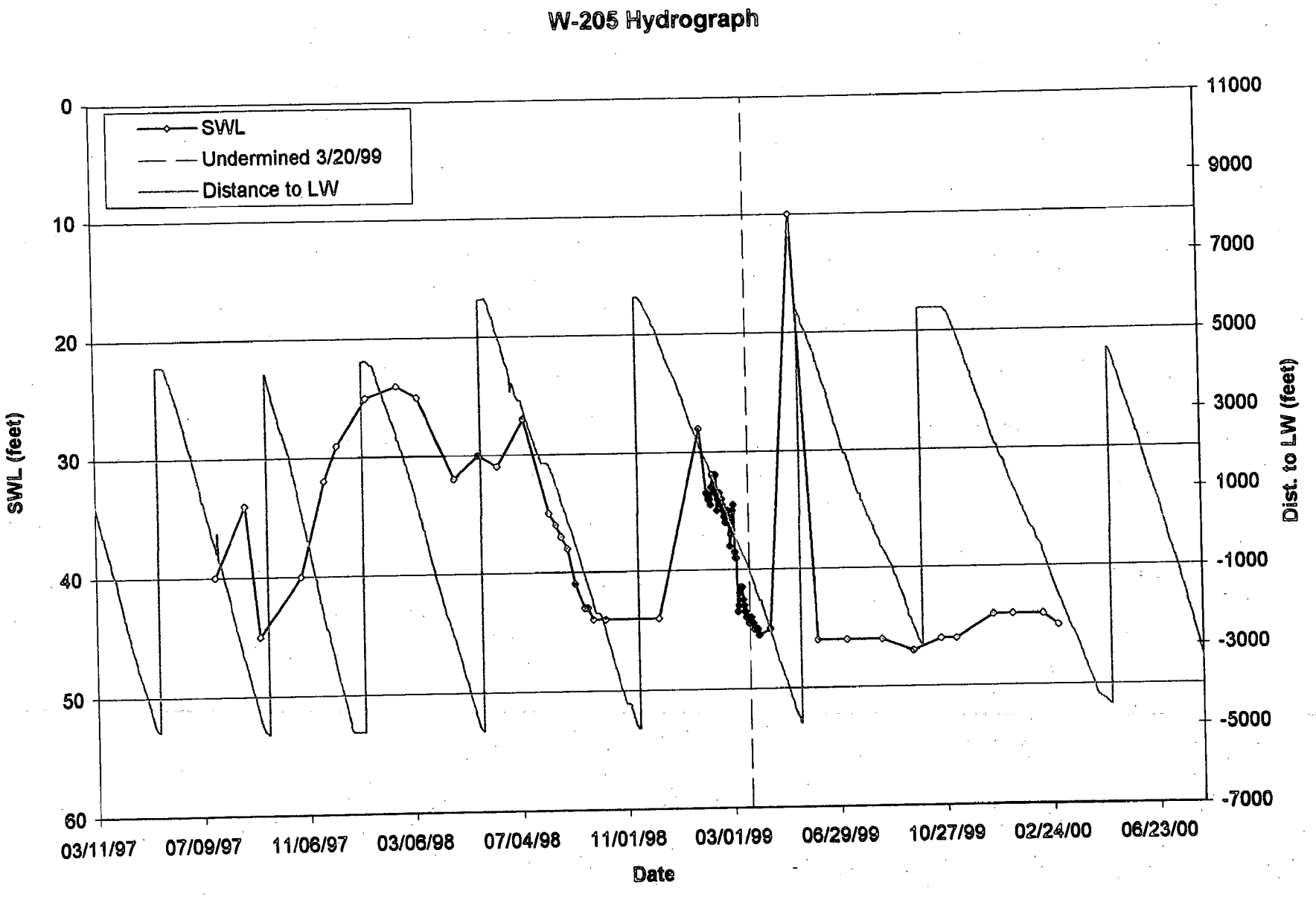
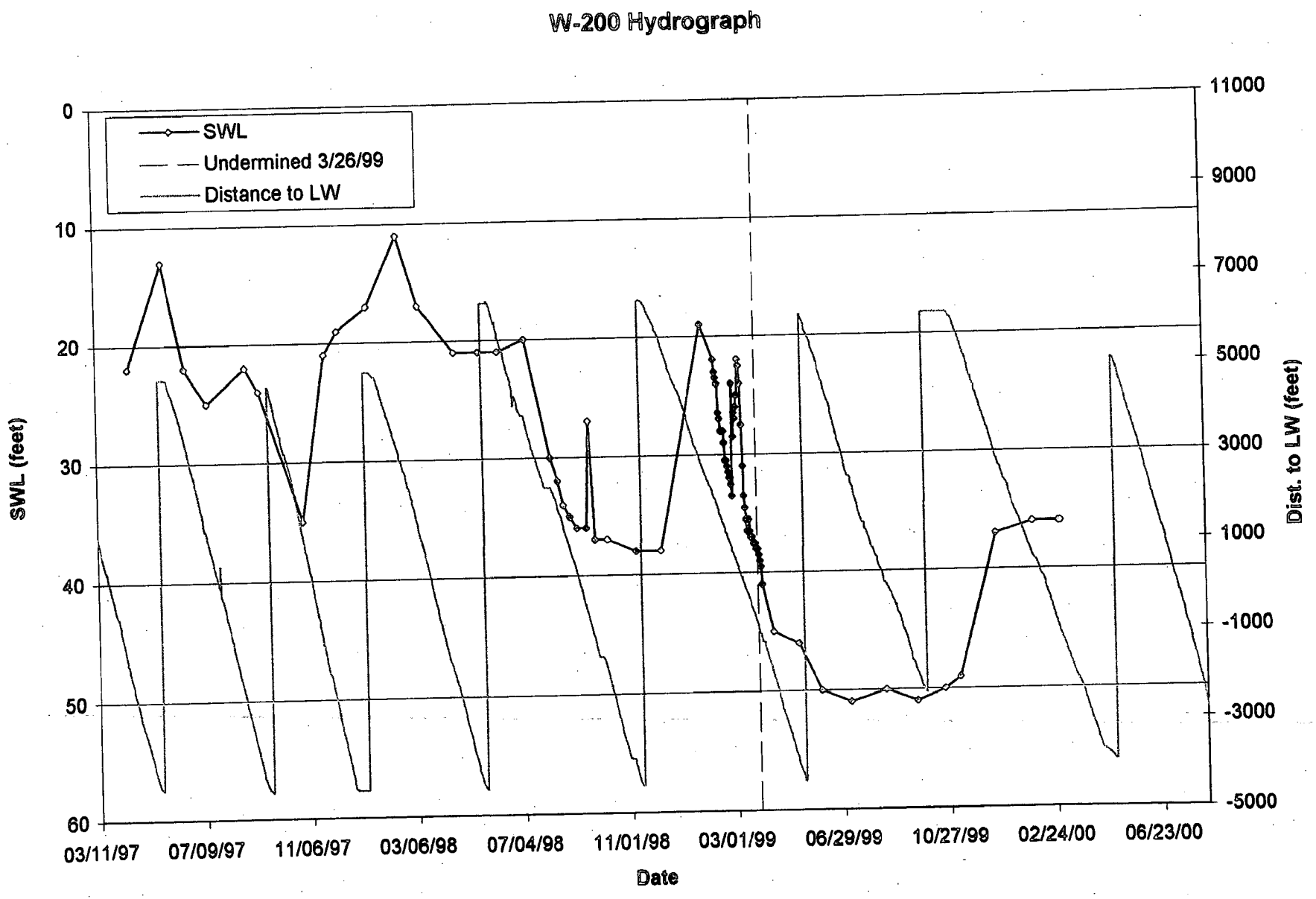
02/28/01
06/28/01
10/26/01

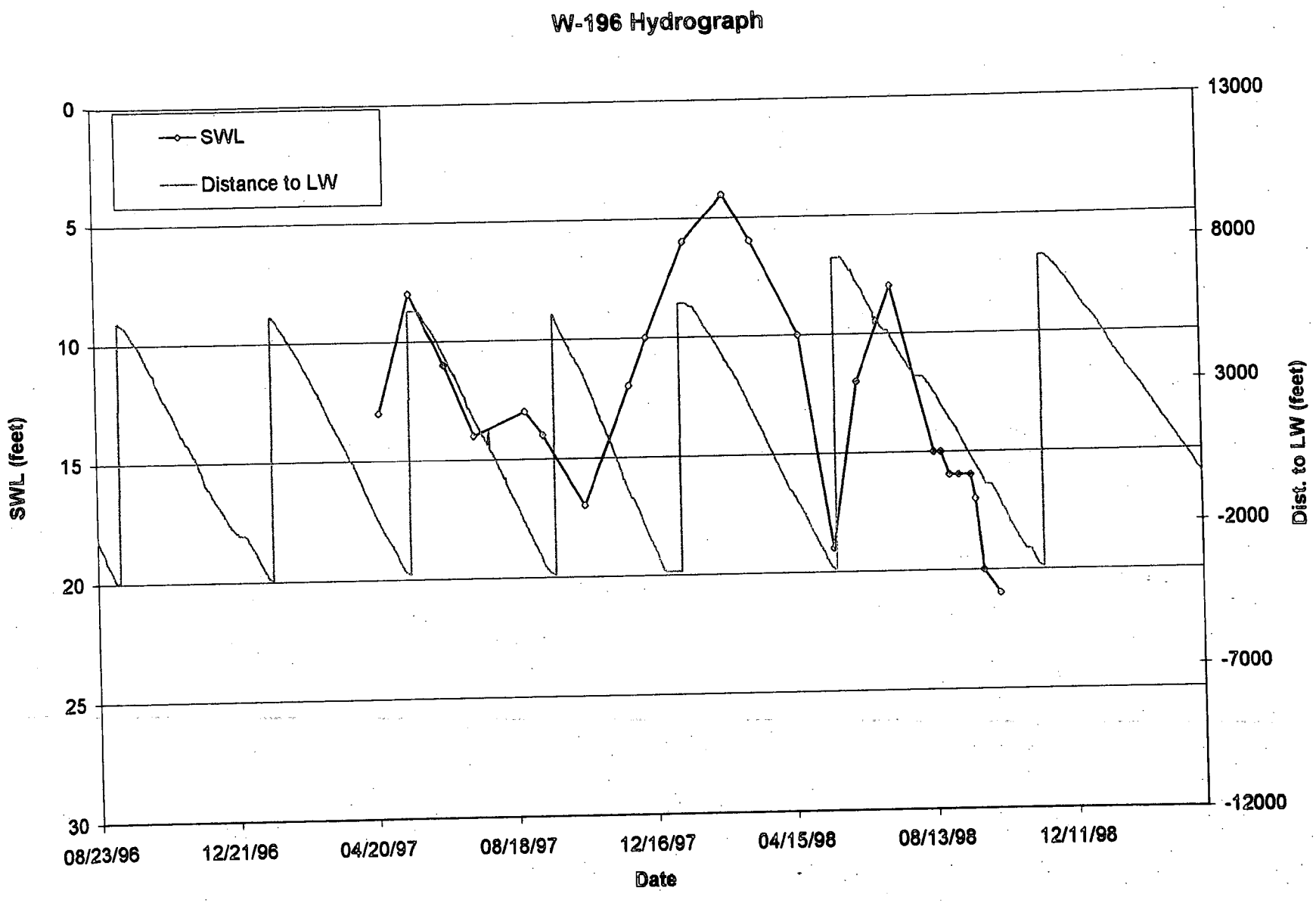

W-328 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
70
80
90
100
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
06/19/97
10/17/97
02/14/98
06/14/98
10/12/98
02/09/99
06/09/99
10/07/99
02/04/00
06/03/00

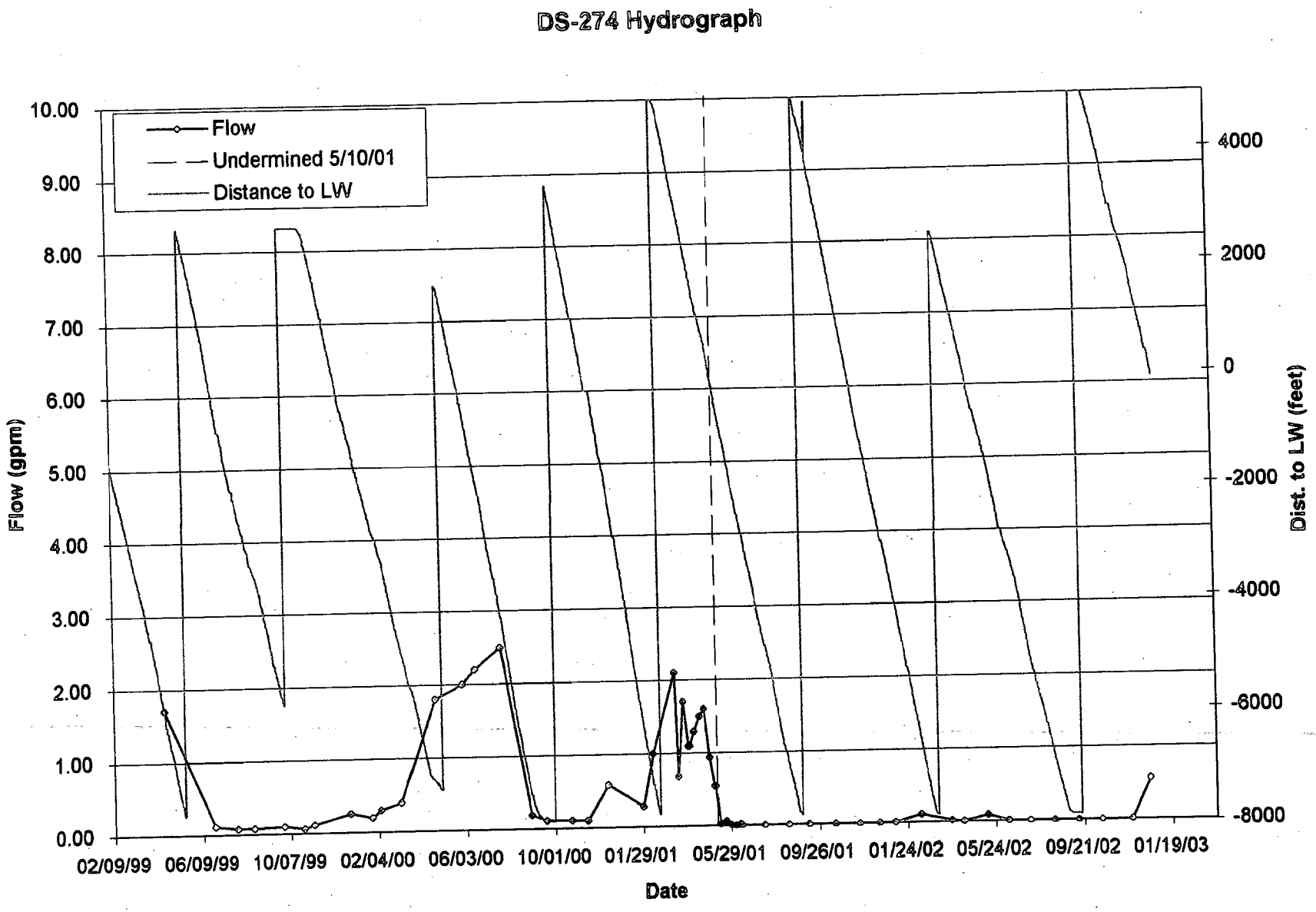

W-226 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
5
10
15
20
25
30
35
40
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99

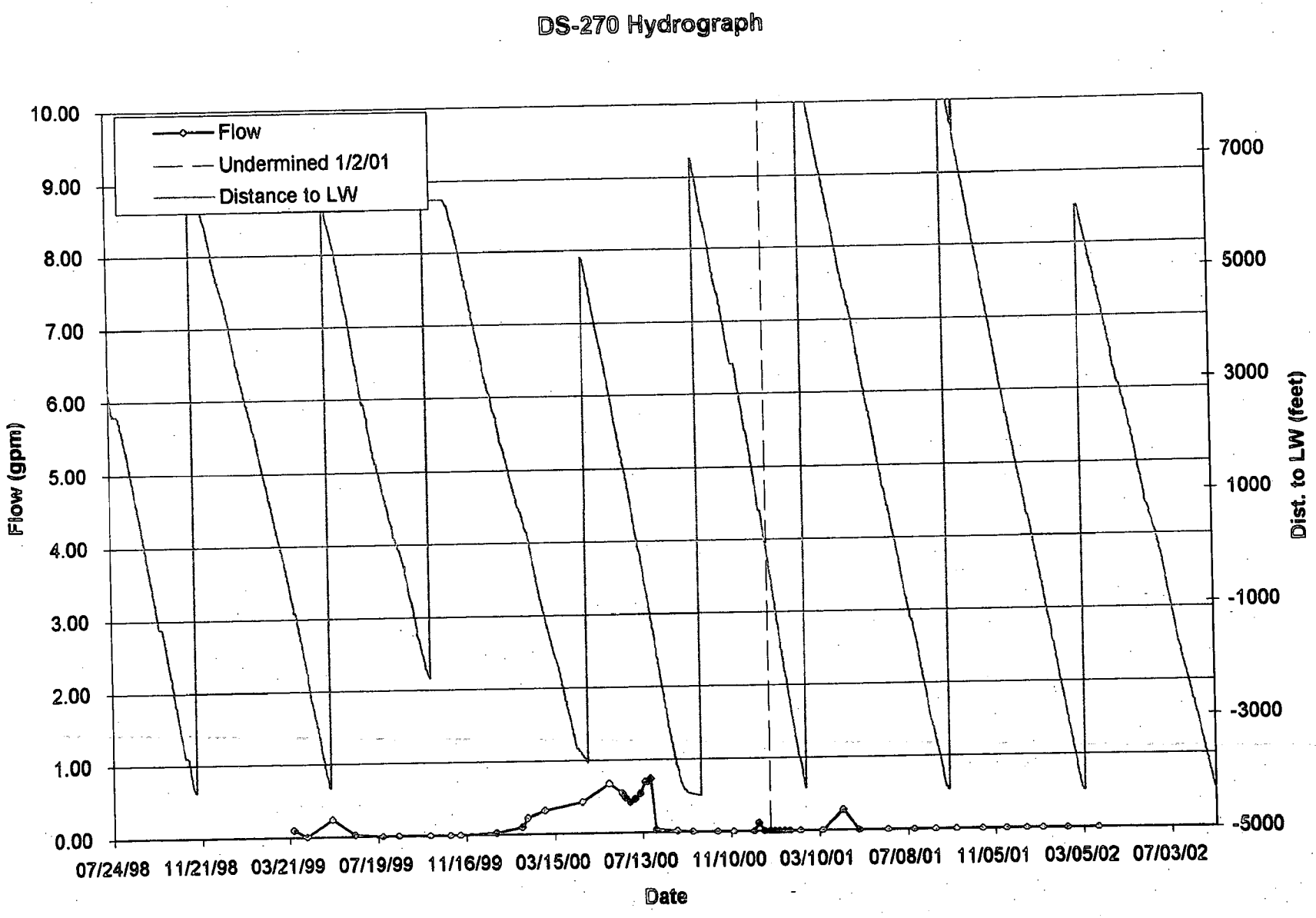

W-225 Hydrograph
SWL
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
5
10
15
20
25
30
35
40
45
50
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
11/11/96
3/11/97
7/9/97
11/6/97
3/6/98
7/4/98
11/1/98
3/1/99
6/29/99
10/27/99
2/24/00


W-205 Hydrograph
SWL
Undermined 3/20/99
Distance to LW
SWL (feet)
Dist. to LW (feet)
Date
0
10
20
30
40
50
60
11000
9000
7000
5000
3000
1000
-1000
-3000
-5000
-7000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00

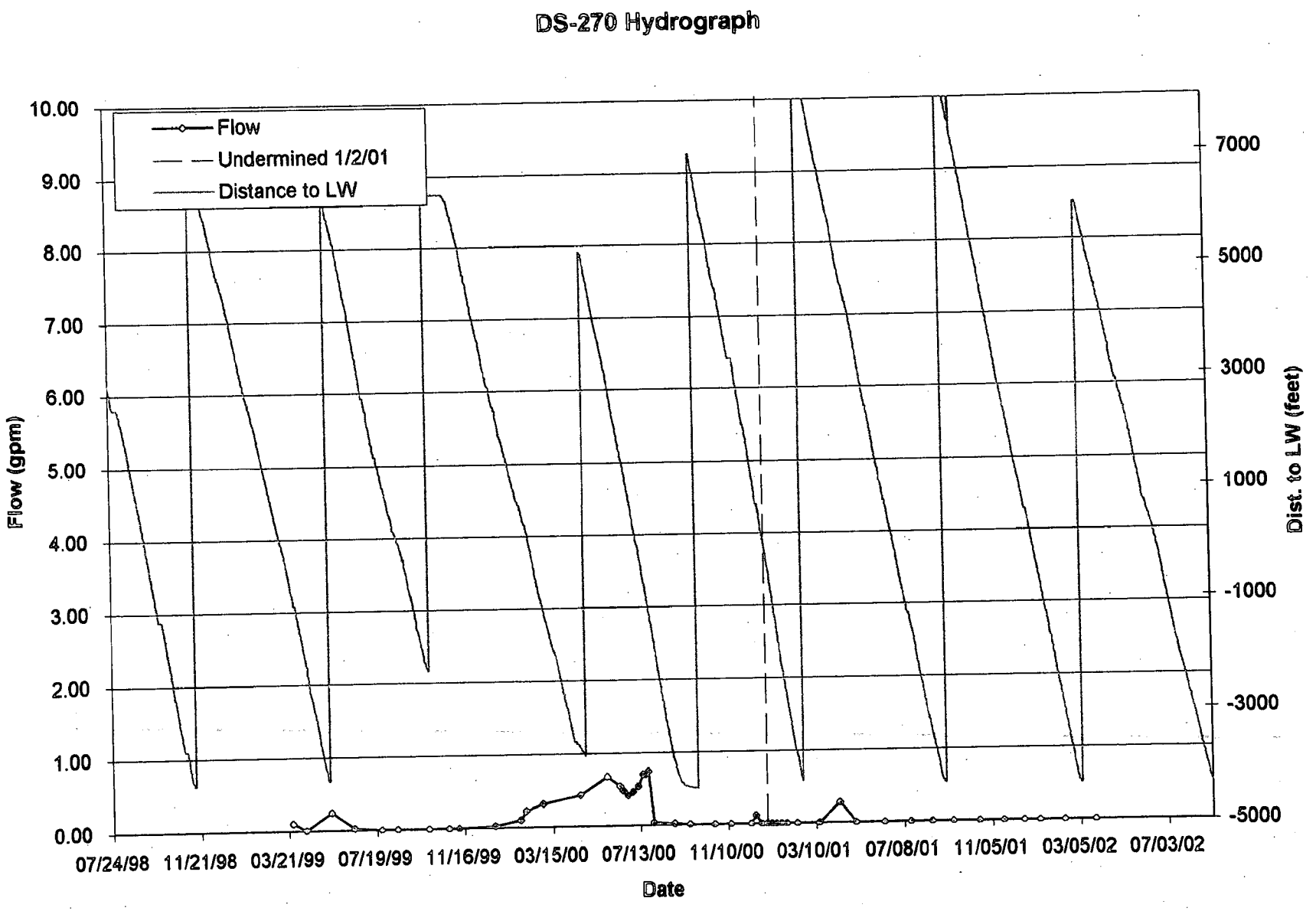

W-200 Hydrograph
SWL
Undermined 3/26/99
Distance to LW
SWL (feet)
0
10
20
30
40
50
60
Dist. to LW (feet)
11000
9000
7000
5000
3000
1000
-1000
-3000
-5000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
Date

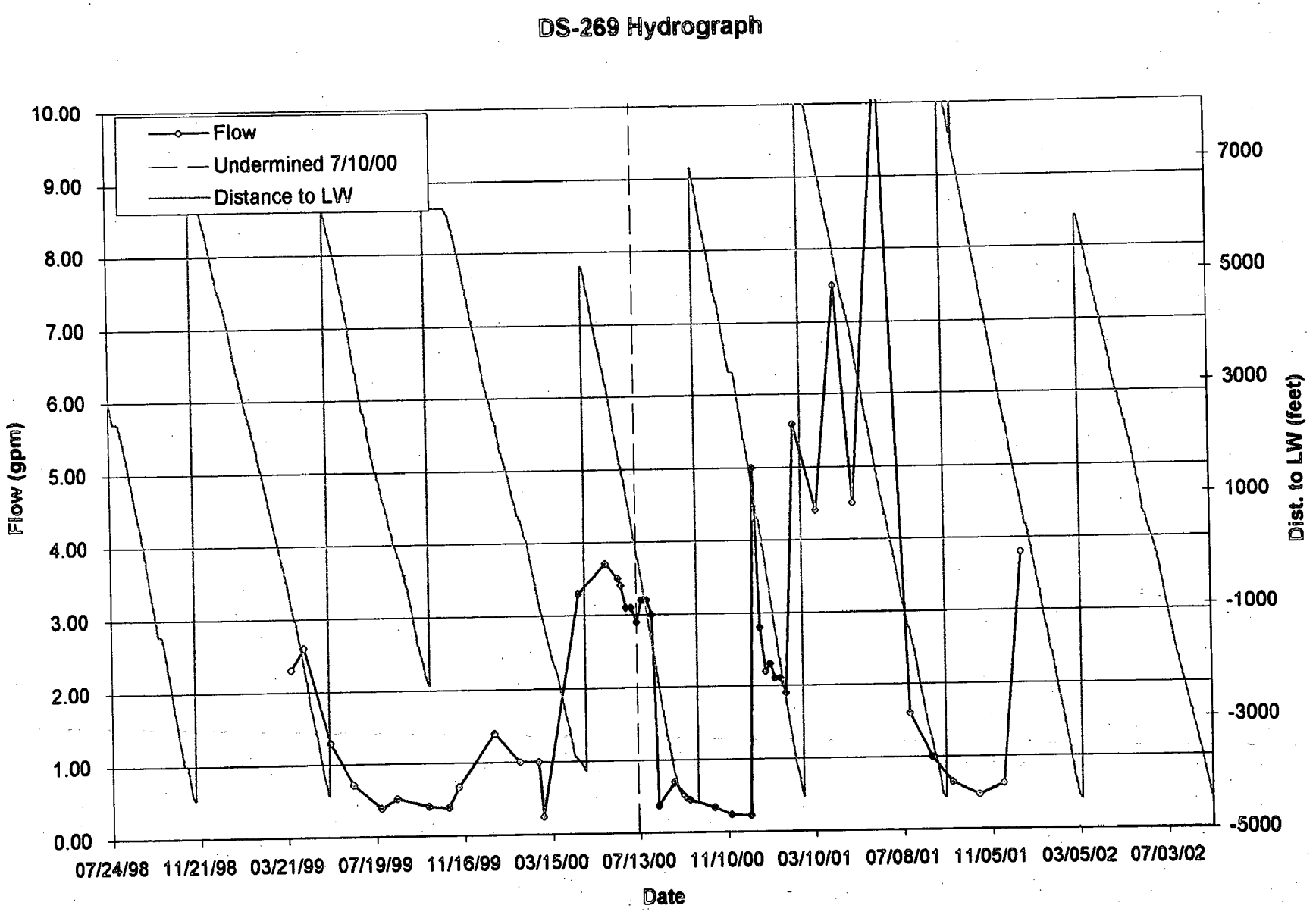

W-196 Hydrograph
SWL
Distance to LW
SWL (feet)
0
5
10
15
20
25
30
Dist. to LW (feet)
13000
8000
3000
-2000
-7000
-12000
08/23/96
12/21/96
04/20/97
08/18/97
12/16/97
04/15/98
08/13/98
12/11/98
Date

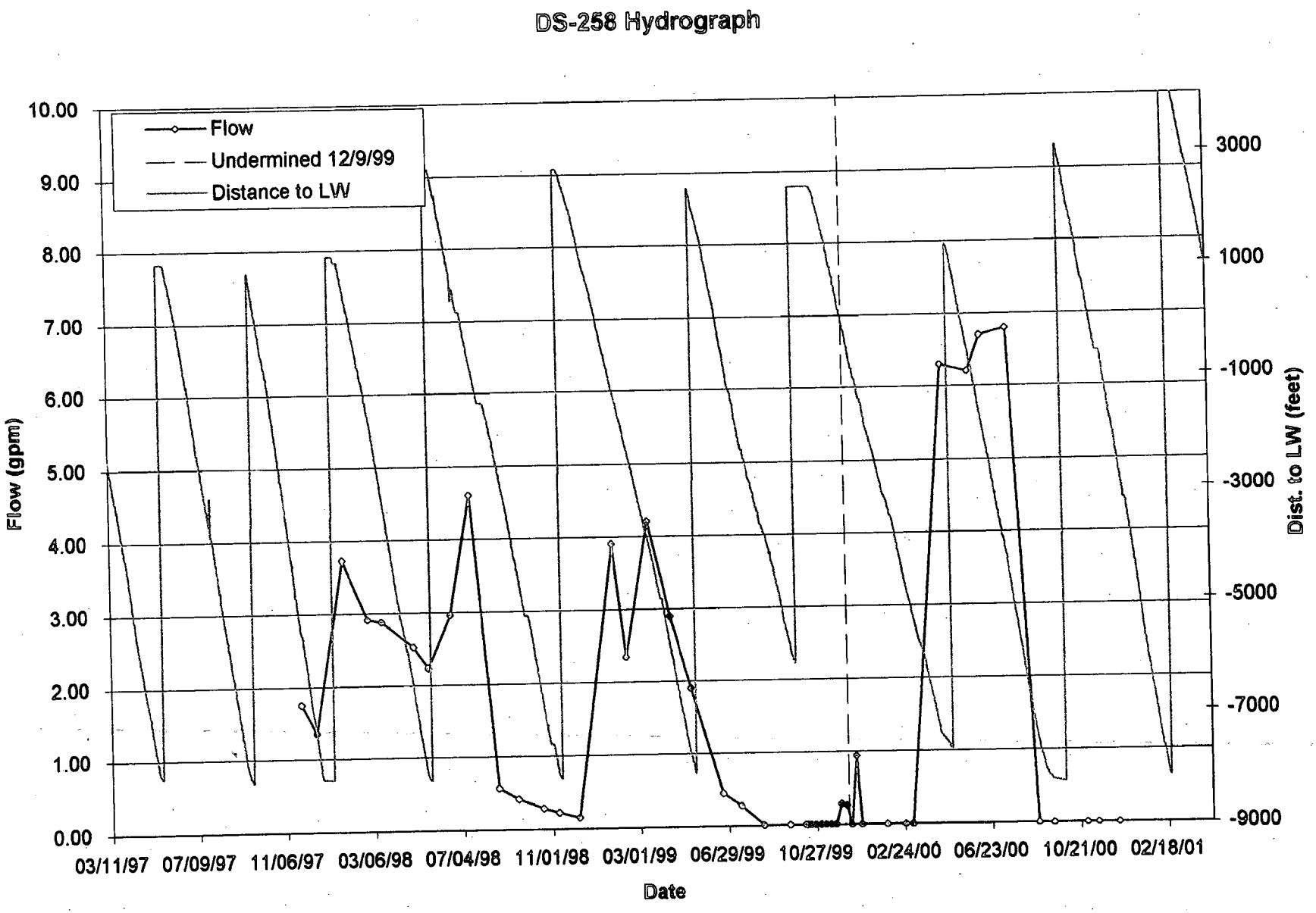

DS-274 Hydrograph
Flow
Undermined 5/10/01
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
4000
2000
0
-2000
-4000
-6000
-8000
02/09/99
06/09/99
10/07/99
02/04/00
06/03/00
10/01/00
01/29/01
05/29/01
09/26/01
01/24/02
05/24/02
09/21/02
01/19/03
Date

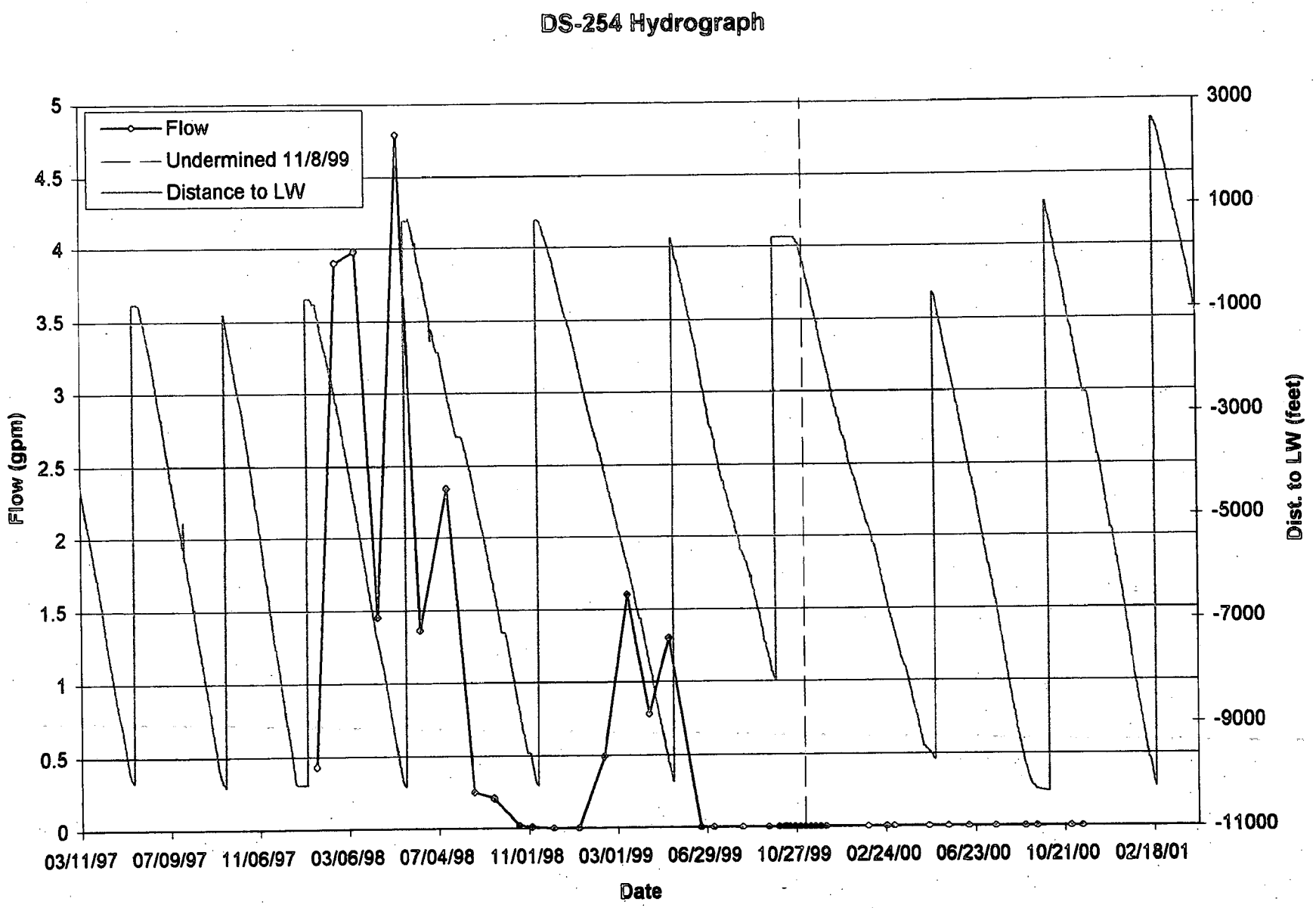

DS-270 Hydrograph
Flow
Undermined 1/2/01
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
7000
5000
3000
1000
-1000
-3000
-5000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
03/10/01
07/08/01
11/05/01
03/05/02
07/03/02
Date

TOVCC 11643


DS-270 Hydrograph
Flow
Undermined 1/2/01
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
7000
5000
3000
1000
-1000
-3000
-5000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
03/10/01
07/08/01
11/05/01
03/05/02
07/03/02
Date


DS-269 Hydrograph
Flow
Undermined 7/10/00
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
7000
5000
3000
1000
-1000
-3000
-5000
07/24/98
11/21/98
03/21/99
07/19/99
11/16/99
03/15/00
07/13/00
11/10/00
03/10/01
07/08/01
11/05/01
03/05/02
07/03/02
Date


DS-258 Hydrograph
Flow
Undermined 12/9/99
Distance to LW
Flow (gpm)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Dist. to LW (feet)
3000
1000
-1000
-3000
-5000
-7000
-9000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01
Date


DS-254 Hydrograph
Flow
Undermined 11/8/99
Distance to LW
Flow (gpm)
Dist. to LW (feet)
Date
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
3000
1000
-1000
-3000
-5000
-7000
-9000
-11000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
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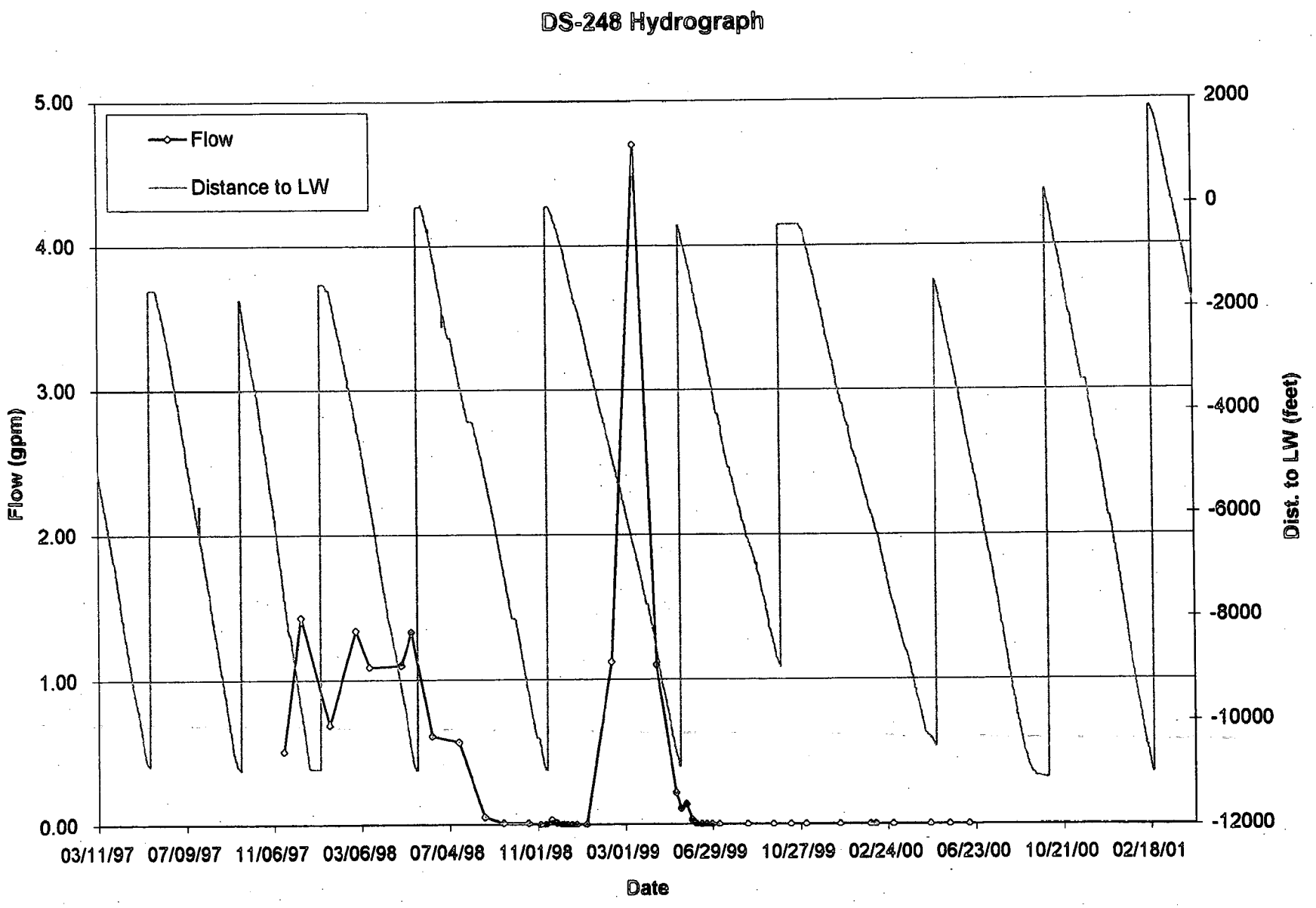
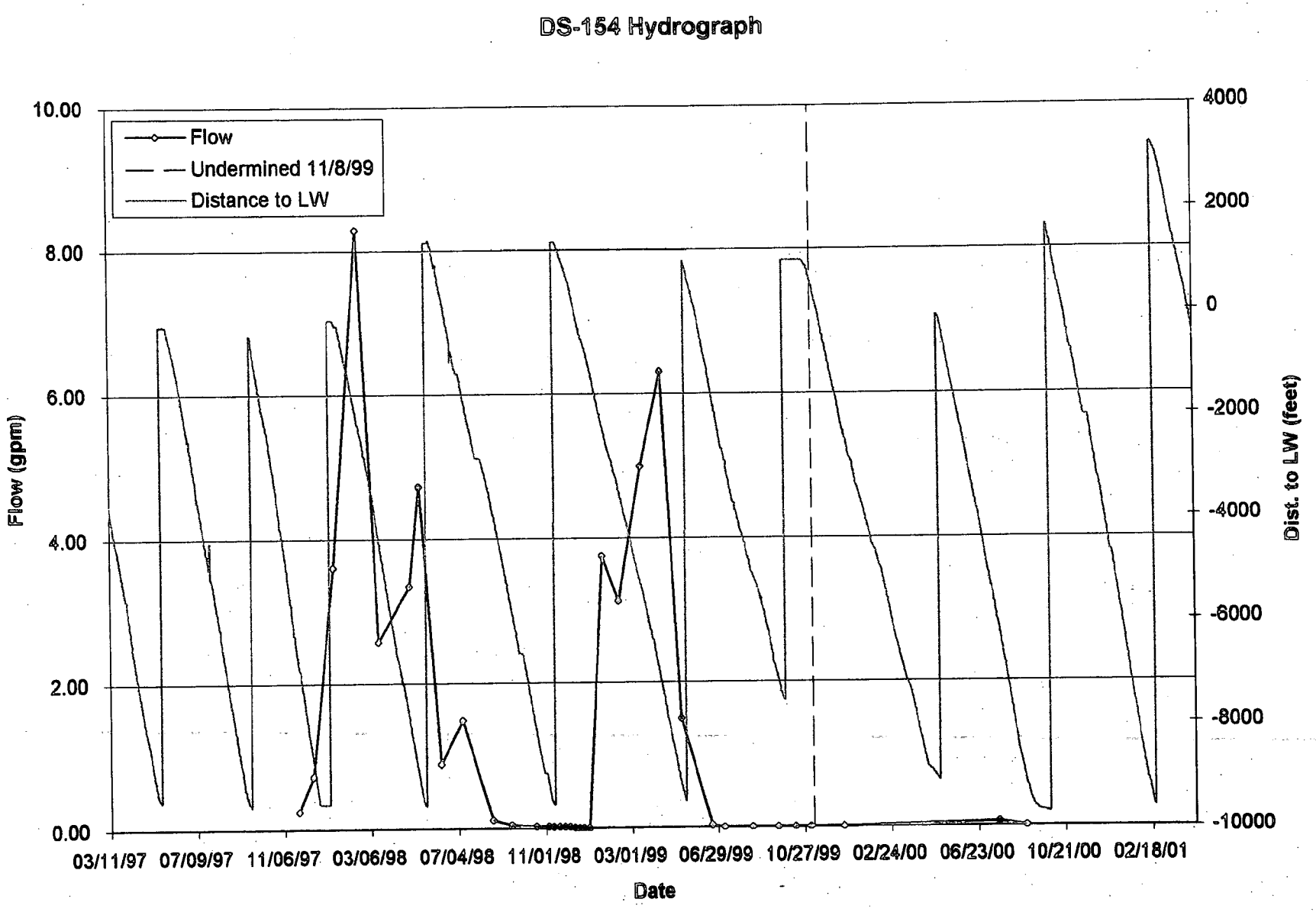
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01


DS-248 Hydrograph
Flow
Distance to LW
Flow (gpm)
Dist. to LW (feet)
Date
5.00
4.00
3.00
2.00
1.00
0.00
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01


DS-154 Hydrograph
Flow
Undermined 11/8/99
Distance to LW
Flow (gpm)
10.00
8.00
6.00
4.00
2.00
0.00
Dist. to LW (feet)
4000
2000
0
-2000
-4000
-6000
-8000
-10000
03/11/97
07/09/97
11/06/97
03/06/98
07/04/98
11/01/98
03/01/99
06/29/99
10/27/99
02/24/00
06/23/00
10/21/00
02/18/01
Date

ADDENDUM TO PAGE 21, PART 3, A(1)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

MINING METHODS

This application area will be mined by the longwall method of mining. Longwall mining is a method by which large panels of coal are surrounded by entries and are then extracted. The roof temporarily is supported by shields as the longwall machinery cuts the coal. The shields are then hydraulically moved forward, allowing the roof to collapse behind them. Subsidence of the surface occurs as the strata above the mine first collapses into the void left from the extracted coal, then the overlying strata deforms and comes to rest atop the rubble. Monitoring shows that the surface subsides approximately 60 to 69 percent of the seam thickness of about 64 inches. This mining method maximizes the recovery of the reserve by leaving coal only in the development entries (main and gate entries) and barrier pillars to protect the main entries.

The mining progresses from other approved mining areas to this application area through main entries that carry the ventilation currents and contain the haulage entries. These main entries are a series of parallel tunnels (entries) that branch down into the gate entries that surround the longwall panels. While continuous miners are used for these development entries, they are not considered production sections since only about 50 percent of the coal seam is removed in these areas. This mining is considered part of the longwall mining conducted at the Powhatan No. 6 Mine. The coal is mined and after mining, the roof is supported by the pillars and by roof bolts that support the immediate roof. In gate entries, the pillars are sized to allow crushing of the pillars once the second longwall panel has passed the pillars. If there is no longwall mining adjacent to the pillars, or if only one panel passes the pillars, they are designed to stand indefinitely with very high safety factors.

Full coal recovery (longwall mining) methods are planned for the entire application area with the exception of two areas where subsidence is not planned. One area will be used for Main Entries between two sets of longwall panels in the western portion of the application area. The second non-subsidence area is located around two small tracts where the coal seam is owned by others. Where the seam is owned by others, there will be no mining beneath the tracts. Wherever there is no subsidence, coal pillars will be sized sufficiently to maintain a high factor of safety for long-term standup (see the Addendum to Page 29, K(4). In the area surrounding the two tracts owned by others, rooms will be driven using continuous miners, but no second mining (removal) of the pillars is planned.

Mining rights will be obtained for the two tracts not owned by OVCC and an application for those areas will be submitted and approved at some later time, but these areas will not be mined under this application.

ADDENDUM TO PAGE 25, PART 3, D(12)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

PLAN FOR MINIMIZING TO THE EXTENT POSSIBLE AND USING THE BEST TECHNOLOGY CURRENTLY AVAILABLE DISTURBANCES AND ADVERSE IMPACTS OF THE CURRENT OPERATION ON FISH, WILDLIFE AND RELATED ENVIRONMENTAL VALUES AND ACHIEVING ENHANCEMENT OF SUCH RESOURCES WHERE PRACTICAL

The proposed operation, longwall mining, minimizes to the extent possible (and is the best technology currently available) impacts on fish, wildlife, and environmental values because it occurs in a planned, predictable and controlled manner. There are no impacts anticipated to fish, wildlife, and environmental values. Areas where longwall mining have occurred do not show any impacts on such resources. Streams in this application area may contain minnows that flourish during periods when there is high water conditions. But, in the dry periods, these minnows migrate downstream to deeper water. They migrate back upstream during the following year. Higher order streams undermined by the longwall are not expected to be changed greatly during mining, and any impacts are temporary, as evidenced by mining in other areas. Therefore, no impacts are anticipated to fish, wildlife, and such resources. Ponds in this area that may contain fish historically have not been impacted by longwall mining. In one instance, an abandoned gas well was located within a pond used recreationally, was plugged prior to mining, and the pond went partially dry temporarily until it healed itself. The pond is full at this time and contains fish.

Wetlands

Wetlands have been undermined by the longwall at the Powhatan No. 6 Mine. Monitoring of the wetlands shows that there have been no impacts to the wetlands from the longwall mining. The soil in the wetland continued to retain large amounts of moisture even during extremely dry periods.

ADDENDUM TO PART 3, PAGE 25, D(12)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

RECLAMATION PLAN - FISH, WILDLIFE, ENVIRONMENTAL VALUES

The proposed longwall mining operation is not expected to impact fish, wildlife, and other related environmental values. The longwall will not undermine any streams where fish live. Minnows have been found in some of the larger stream segments within the application area. However, the normal annual cycle shows that during the summer and fall months, when the stream flow is minimal, the minnows swim downstream, only to return again. Observations show that stream segments that go dry following subsidence have returned to near their normal flow, and will again support minnows. The larger streams will return to normal flow faster than smaller streams because more sediment is carried in larger streams and help fill any residual cracks that may be found. There are several ponds overlying the application area, and larger fish live in them. Our experience at the Powhatan No. 6 Mine is that ponds are not greatly influenced by subsidence due to the amount of cover. Wildlife has never been shown to be affected by longwall mining. If surface slips are caused by mining activities, over the mining area, The Ohio Valley Coal Company will restore the land to a condition equal to its original value and reasonably foreseeable use. Undeveloped springs that are found above the application area may be dewatered and usually reposition themselves downstream. Ohio Valley will replace undeveloped springs if they are legitimately used according to our water replacement plan.

ADDENDUM TO PAGE 23, PART 3, A(14)(a) AND PAGE 25, PART 3, D(8)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

Refuse from Area to be Mined

The refuse from the area to be mined will be disposed of according to the plans previously submitted and approved in the original submittal of Permit D-0360 (on file at the Division of Mines and Reclamation Office). In particular, see Addendum 20 and Appendix IV-9. See also approved application D-0360-8.

ADDENDUM TO PAGE 26, PART 3, E (1-3)
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

RECLAMATION PLAN - PROTECTION OF HYDROLOGIC BALANCE

The hydrologic balance is expected to change as shown below as a result of the proposed longwall mining operation in the long term. Temporarily, the depth below the surface of ground water will increase as a result of increasing the number of cracks in the local rock units. The static level of the ground water should re-establish itself, usually at a lower elevation, within 18 months to 2 years after mining. At that time, ground water will be available in quantity at least as great as before mining. Because of increased porosity due to the cracking caused by longwall mining, the quantity of ground water that is available to users will probably increase. Minor surface cracking over longwall areas will eventually heal or be repaired, causing the ground to capture approximately the same percentage of rainfall as before. It is anticipated that stream flow in selected sections of first order streams where overburden thickness exceeds 200 ft may be temporarily reduced over relatively short stream segments. This impact is anticipated due to the fact that the headwaters of streams occasionally relocate to lower elevations following subsidence that results in the de-watering of hillside/hilltop springs. The monitoring data obtained for the ground and surface water sources over the longwall areas at the Powhatan No. 6 Mine indicate there will be no lasting deleterious effects of the longwall mining on water quality. Therefore, the hydrologic balance outside the permit area will be protected.

The rights of present users of surface and ground water will be maintained through the water replacement plan found in the Addendum to Page 18, Part 2, (F). It is anticipated that within two years, ground water will re-establish itself so that wells and springs can be replaced. Surface water drainage is not expected to be impacted seriously by longwall mining.

Acid or toxic drainage are not expected to be a problem at the Powhatan No. 6 Mine. The No. 8 seam is entirely below drainage, and the openings to the surface are located high enough above the seam that they will not experience hydraulic pressure from the seam. The major watersheds of this area, Captina and McMahon Creeks, are at the elevation of the mining for the application area at a distance of over 5 miles from the mine. Acid or toxic drainage is not expected to enter the waters of the State.

In 1999, Ohio Valley evaluated its records to determine the distances that springs have been impacted by longwall mining and determined that springs have been impacted no more than about 300 ft from the end of longwall panels and no more than 500 ft from the edges of longwall panels. This evaluation may be found as an Addendum to Page 18, Part 2, F (1). Ohio Valley used this data to design its mining plan for the D-0360-12 area to afford the designated old-growth forest areas additional safeguards from possible impacts from mining, even though research work done to date shows that longwall mining does not disrupt soil moisture for areas

located directly over the longwall mining panels. (See Addendum to Page 30, Part 3, K (5) Consolidated Technical Research Reports - Longwall Mining Effects Upon Mature Oak-Dominated Forests by Jeffrey K. Holt, C.F., particularly the work by Dr. James Runkle, Ph.D.).

There are 10 undeveloped springs located in and around the old-growth areas. Figure S shows their locations. They are shown on the following table with their distances to the nearest longwall panels shown.

SPRING NUMBER	SPRING IN OR OUT OF DES. OGF	DISTANCE TO NEAREST LW PANEL END	DISTANCE TO NEXT NEAREST LW PANEL END	DISTANCE TO NEAREST LW PANEL SIDE
S-150	OUT	473 FT	NONE	575 FT
S-151	OUT	OVER	OVER	OVER
S-152	OUT	OVER	OVER	OVER
S-153	IN	854 FT	1016 FT	1530 FT
S-154	OUT	350 FT	898 FT	819 FT
S-155	IN	630 FT	1052 FT	1862 FT
S-156	IN	1019 FT	795 FT	2436 FT
S-157	IN	1176 FT	1113 FT	2453 FT
S-159	IN	1444 FT	1342 FT	2229 FT
S-160	IN	1247 FT	1308 FT	1917 FT

As can be seen from the table, none of the 6 undeveloped springs located within the designated old-growth forest are located within the 300 ft or 500 ft offset distances where springs may be impacted. This result is to be expected since the borders of the designated areas are located at least 300 ft from the mining panels. No impacts to these springs are anticipated, and no impacts to soil moisture at the designated old-growth forest areas are anticipated. Monitoring programs for the springs within the old-growth areas and for soil moisture between the longwall panels and the old-growth areas have been proposed (see the Addendum To Part 3, Page 26, F). Of the 4 undeveloped springs located outside the designated old-growth forest areas, only two are located within the offset distances, and actually are located over longwall panels. These two springs may be impacted from the mining beneath them, but the adverse impacts to the hydrologic balance within the designated old-growth forest areas will not occur even if the springs located outside the designated areas are impacted. The vast majority of surface water flow is from runoff from rainfall events and not from springs.

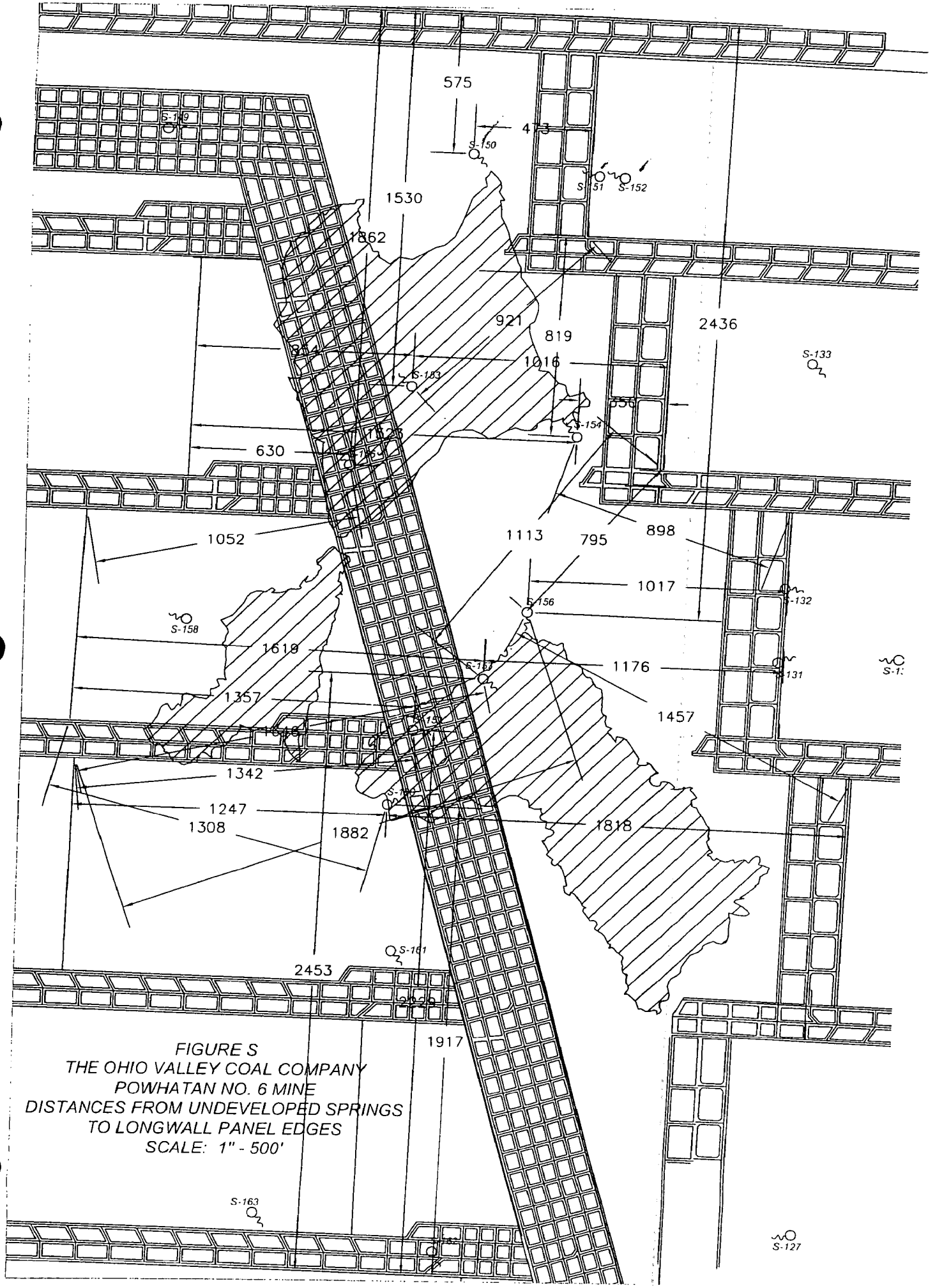


FIGURE S
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
DISTANCES FROM UNDEVELOPED SPRINGS
TO LONGWALL PANEL EDGES
SCALE: 1" - 500'

ADDENDUM TO PART 3, PAGE 26, F
THE OHIO VALLEY COAL COMPANY
POWHATAN NO. 6 MINE
PERMIT D-0360

GROUND WATER AND SURFACE WATER MONITORING PLANS

1. Ground Water Monitoring Plan

All legitimately developed, used ground water supplies will be monitored quarterly for quality and monthly for quantity for at least one year prior to full recovery mining, and at least one year subsequent to mining unless access is denied by the land owner. This monitoring will include wells and springs used for domestic purposes. Weekly quantity monitoring will be conducted whenever the longwall face is within three weeks of undermining the supply and no less than three weekly pre-mining and post-mining measurements will be made. Ground water supplies located within 500 feet (measured horizontally) of the perimeter of the active longwall panel will be monitored as if they were located on the panel. Monitoring will be continued for at least one year subsequent to full recovery mining contingent upon review by the Division of Mineral Resources Management. Daily precipitation data will be submitted quarterly to evaluate spring flow.

2. Surface Water Monitoring Plan

Various surface water locations depicted on the application/hydrology map will be sampled monthly for flow and quarterly for quality. The quality requirements of OAC 1501:13-3-14(F)(2) and the other QMR parameters as stated on the QMR report sheets will apply to the surface water analysis. Each surface monitoring station will be monitored for at least one year prior to full coal recovery mining. OVCC will continue monitoring for at least one year subsequent to full recovery mining contingent upon review by the Division of Mineral Resources Management. Daily precipitation data will be submitted quarterly to evaluate stream flow.

With each quarterly monitoring report of ground and surface water, a map depicting the progression of the longwall face will be attached to indicate the sampling points in the full recovery areas. Notes will be submitted indicating the position relative to the longwall face, with "+" indicating the station is in advance of the face and a "-" indicating a position behind the face. An attempt will be made to monitor and sample as outlined above; however, some sources may not be accessible. These locations, if encountered, will be documented in the quarterly reports. All samples will be taken as outlined to the extent that existing well construction allows. Any samples that are unobtainable will be documented as such in the quarterly report. Quarterly sampling will include analysis for nitrates.

OVCC will monitor all ground and surface locations in accordance with the quarterly monitoring plan outlined above regardless of the saturated zones that they access. All developed supplies have been identified and have been indicated on the application/hydrology map.

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3. Plan To Monitor Undeveloped Springs In Designated Old-Growth Forest Areas

There are several undeveloped springs located within the designated old-growth forest areas owned by Ohio University. These sites are shown on the Application Map. OVCC will monitor these undeveloped springs for a period of one year prior to any mining that would be located within 500 ft (measured horizontally) of the designated old-growth forest areas. This monitoring shall include measurements made for flow on a monthly basis, and reported quarterly to the Division of Mineral Resources Management. Samples of the water shall be collected and analyzed quarterly. Analyses shall include pH, Total Acidity, Total Alkalinity, Total Iron, Total Manganese, Total Sulfates, Total Dissolved Solids, Specific Conductivity, and Total Hardness. Analysis data shall be reported quarterly to the Division of Mineral Resources Management. Weekly monitoring for flow will commence when any development mining will go under the undeveloped springs located in designated old-growth areas. Weekly monitoring will begin three weeks before the mining will go under each undeveloped spring and will continue for a period of three weeks after the mining has passed the spring. This information will be submitted quarterly to the Division of Mineral Resources Management. This monitoring information shall be used to determine impacts to the undeveloped springs from mining by comparing the pre-mining flows and analyses with the post-mining flows and analyses, taking into account corresponding climatological data.

4. Plan To Monitor Soil Moisture Between Longwall Mining Panels And Designated Old-Growth Forest Areas

With the permission of the landowner (Ohio University), OVCC will locate soil moisture probes in the ground between the designated old-growth forest areas and the surface area over the closest longwall panel. These locations of the probes will be coordinated with the landowner. The soil moisture probes will be installed and monitored in the same way as probes have been monitored by Dr. James Runkle as shown in other areas of this application. Monitoring will begin at least one-year prior to the time when the longwall mining will be within 500 ft of the nearest designated area and will continue for a minimum period of one year after longwall mining is 500 ft from the nearest designated area. Monitoring of soil moisture will be discontinued after approval of a submitted application to revise a permit (ARP). Probes are routinely measured weekly during the growing season. A reference site will be established in the vicinity of the designated areas that will be instrumented and monitored during the same time periods. The reference site will be located at least 500 ft from the nearest mining. The reference site will be used to show differences caused by mining by filtering out climatological influences. The data will be submitted quarterly to the Division of Mineral Resources Management.

TABLE C
POWHATAN NO. 6 MINE - PERMIT D-8360
WEEKLY MONITORING DATA SUPPLEMENT

FEBRUARY DAILY MONITORING IN LIEU OF WEEKLY

SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA LOW	PRE MINING DATA HIGH	DATE / LW PLUS SOURCE PLUS	02/01/99 7419 SWL/FLOW	(+/-) D TO FACE	02/02/99 7400 SWL/FLOW	(+/-) D TO FACE	02/03/99 7349 SWL/FLOW	(+/-) D TO FACE	02/04/99 7282 SWL/FLOW	(+/-) D TO FACE	02/05/99 7207 SWL/FLOW	(+/-) D TO FACE	02/06/99 7143 SWL/FLOW	(+/-) D TO FACE	02/07/99 7106 SWL/FLOW	(+/-) D TO FACE	02/08/99 7061 SWL/FLOW	(+/-) D TO FACE	02/09/99 6996 SWL/FLOW	(+/-) D TO FACE	02/10/99 6938 SWL/FLOW	(+/-) D TO FACE
W-364	90	830	OVER	48	51	6640	R	797	R	760	R	709	R	642	R	567	R	503	R	467	R	421	R	358	R	298
W-365	100	160	OVER	51	61	6750	73	669	73	659	74	599	73	532	73	457	73	393	71	356	70.5	311	72	246	72	188
W-423	117	1165	155	74	84	6150	78	1169	77	1250	78	1199	78	1132	78	1057	78.5	993	79	956	77	911	78	846	78	788
W-206	27	660	OVER	10	16	5990	10	1429	10	1410	10.5	1359	11	1292	11	1217	11	1153	11	1116	10	1071	9.5	1006	10	948
W-205	57	440	OVER	20	29	5650	33.5	1769	33.5	1750	34	1699	34	1632	34	1557	34.5	1493	33	1456	32	1411	33	1346	33	1288
W-204	64	340	OVER	11	14.5	5575	16	1844	16	1825	16.5	1774	16.3	1707	16.5	1632	16.5	1568	15.5	1531	15	1486	15.5	1421	15.5	1363
W-368	85	850	OVER	45	68	5540	47	1879	48	1860	49	1809	50.5	1742	51	1667	53	1603	52.5	1566	49.5	1521	47.5	1456	47.5	1398
W-203	66	355	OVER	23	41	5460	38	1959	38	1940	38.5	1889	39	1822	38.5	1747	38.5	1683	38.5	1646	38.5	1601	38	1536	38	1478
W-201	62	215	OVER	44	53	5225	55	2194	54	2175	54	2124	54	2057	54.5	1982	55	1918	54.5	1881	53	1836	54	1771	54	1713
W-202	78	295	OVER	44	52	5358	58	2061	58	2042	58	1991	58	1924	58.5	1849	58.5	1785	58.5	1748	57	1703	57.5	1638	57.5	1580
W-199	67	185	OVER	13	20	4905		2514		2495		2444		2377		2302		2238		2201	16	2156	16	2091	16	2033
W-200	53	160	OVER	7	20.5	5050		2369		2330		2299		2232		2157		2093		2056	22	2011	23	1946	23.5	1888
W-367	77	335	OVER	37	45	4880		2539		2520		2469		2402		2327		2263		2226	40	2181	41.5	2116	41.5	2058
DS-101*	N/A	625	OVER	0	3	4745		2674		2655		2604		2537		2462		2398		2361	1.7	2316	1.3	2251	1.4	2193
DW-356	12	1040	35	7	9	5010		2409		2390		2339		2272		2197		2133		2096	6	2051	6	1986	6	1928
W-358	35	1425	515	24	35	6825	23.5	594	23.5	575	26.2	524	27	457	23.5	382	24	318	23.5	281	23	236	22.8	171	23	113

SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA LOW	PRE MINING DATA HIGH	DATE / LW PLUS SOURCE PLUS	02/11/99 6865 SWL/FLOW	(+/-) D TO FACE	02/12/99 6775 SWL/FLOW	(+/-) D TO FACE	02/13/99 6736 SWL/FLOW	(+/-) D TO FACE	02/14/99 6668 SWL/FLOW	(+/-) D TO FACE	02/15/99 6603 SWL/FLOW	(+/-) D TO FACE	02/16/99 6559 SWL/FLOW	(+/-) D TO FACE	02/17/99 6501 SWL/FLOW	(+/-) D TO FACE	02/18/99 6448 SWL/FLOW	(+/-) D TO FACE	02/19/99 6355 SWL/FLOW	(+/-) D TO FACE	02/20/99 6319 SWL/FLOW	(+/-) D TO FACE
W-364	90	830	OVER	48	51	6640	R	225	R	133	R	96	R	28	R	-37	R	-81	R	-140	R	-192	R	-285	R	346
W-365	100	160	OVER	51	61	6750	72	115	70	25	69	-14	68.5	-82	66	-147	65	-191	64.5	-250	65	-302	69.5	-393	71.5	1006
W-423	117	1165	155	74	84	6150	77.5	715	76.5	623	78	586	78	518	78	451	78	409	78	350	78	298	79	205	80.5	1346
W-206	27	660	OVER	10	16	5990	11	873	10.5	785	10	746	10.5	678	11.5	613	11.5	569	11.5	510	11.5	458	12	365	12.5	1421
W-205	57	440	OVER	20	29	5650	33.5	1215	32	1125	35	1086	34	1018	34	953	33.5	909	34.5	850	34	798	34.5	705	35	1456
W-204	64	340	OVER	11	14.5	5575	15.5	1290	14	1200	16	1161	16	1093	16	1028	16	984	16	925	16	873	16	780	16.5	1536
W-368	85	850	OVER	45	68	5540	47	1329	46.5	1355	48	1196	49.5	1128	50.5	1043	50.5	1019	50.5	960	50.5	908	56	815	56.5	1771
W-203	66	355	OVER	23	41	5460	38.5	1405	38	1315	39	1276	38.5	1208	38.5	1143	38.5	1099	38.5	1040	38.5	988	38.5	895	39	1638
W-201	62	215	OVER	44	53	5225	54	1640	54	1550	56	1511	55	1443	55	1378	55	1334	55	1275	55	1223	55	1130	55.5	2091
W-202	78	295	OVER	44	52	5358	57.5	1507	57.5	1417	58	1378	58	1310	58.5	1245	58.5	1201	58.5	1142	58.5	1090	58.5	997	59	1946
W-199	67	185	OVER	13	20	4905	16.5	1960	16	1870	17	1831	17	1763	17.5	1698	18	1654	18	1595	18	1543	18.5	1450	18.5	2116
W-200	53	160	OVER	7	20.5	5050	24	1815	24	1725	26.5	1686	27	1618	28	1553	28	1509	28	1450	28	1398	29	1305	30.5	2251
W-367	77	335	OVER	37	45	4880	41.5	1985	40.5	1895	42	1856	42.5	1788	42.5	1723	42.5	1679	43	1620	42.5	1568	43	1475	43.5	1986
DS-101*	N/A	625	OVER	0	3	4745	0.9	2120	1	2030	0.7	1991	0.9	1923	0.8	1858	0.9	1814	0.9	1755	0.7	1703	0.6	1610	0.6	171
DW-356	12	1040	35	7	9	5010	6.5	1855	6.5	1765	6.5	1726	7	1658	7	1593	7	1549	7	1490	7	1438	7	1345	7	1309
W-358	35	1425	515	24	33	6825	23	40	23	-50	23	-99	23.5	157	26.5	221	26.5	266	26.5	325	23.5	377	25	470	25.5	6996

SOURCE	DEPTH	DIST FROM 25E PANEL	DIST FROM 26E PANEL	PRE MINING DATA LOW	PRE MINING DATA HIGH	DATE / LW PLUS SOURCE PLUS	02/21/99 6244 SWL/FLOW	(+/-) D TO FACE	02/22/99 6194 SWL/FLOW	(+/-) D TO FACE	02/23/99 6140 SWL/FLOW	(+/-) D TO FACE	02/24/99 6077 SWL/FLOW	(+/-) D TO FACE	02/25/99 6010 SWL/FLOW	(+/-) D TO FACE	02/26/99 5918 SWL/FLOW	(+/-) D TO FACE	02/27/99 5889 SWL/FLOW	(+/-) D TO FACE	02/28/99 5820 SWL/FLOW	(+/-) D TO FACE
W-364	90	830	OVER	48	51	6640	R	-396	R	-446	R	-500	R	-565	R	-630	R	-722	R	-751	R	-820
W-365	100	160	OVER	51	61	6750	72	-506	72	-556	72	-610	72	-673	72.5	-740	73	-832	73.5	-861	74	-930
W-423	117	1165	155	74	84	6150	82	-94	83	-44	83.5	-10	83.5	-75	83.5	-140	83	-232	84	-261	84.5	-330
W-206	27	660	OVER	10	16	5990	12	254	12.5	204	12.5	150	13.5	87	14.5	20	15	-72	15.5	-101	15	-170
W-205	57	440	OVER	20	29	5650	35.5	594	36	544	36	490	35	427	35.5	360	36	268	38	239	37	170
W-204	64	340	OVER	11	14.5	5575	17	669	17	619	17	565	18.5	502	17.5	435	17.5	343	18	314	18	245
W-368	85	850	OVER	45	68	5540	57	704	58.5	654	58.5	600	59.5	557	60	470	61	378	62.5	349	62	280
W-203	66	355	OVER	23	41	5460	38.5	784	39	734	39.5	680	39.5	617	39.5	550	38	458	39.5	429	39.5	360
W-201	62	215	OVER	44	53	5225	55.5	1019	56	969	56	915	56	852	56	785	56	693	56	664	56	595
W-202	78	295	OVER	44	52	5358	58.5	886	59	836	60.5	782	61.5	719	62	652	61	560	63.5	531	63	462
W-199	67	185	OVER	13	20	4905	18.5	1339	18	1289	18	1235	18.5	1172	18.5	1101	18	1013	19.5	984	19	915
W-200	53	160	OVER	7	20.5	5050	30.5	1194	31	1144	31.5	1090	32	1027	32	960	32.5	868	33.5	839	24	770
W-367	77	335	OVER	37	45	4880	42.5	1364	42.5	1314	43	1260	43	1197	43	1130	42	1038	44.5	1009	44	940
DS-101*	N/A	625	OVER	0	3	4745	0.5	1499	0.4	1449	0.4	1395	0.4	1332	0.3	1265	0.4	1173	0.4	1144	3	1075
DW-356	12	1040	35	7	9	5010	7.5	1234	7.5	1184	7.5	1130	7.5	1067	7.5	1000	6.5	908	7.5	879	6	810
W-358	35	1425	515	24	33	6825	26	-581	26	-631	26.5	-683	24.5	-748	27.5	-817	28.5	-907	28.5	-936	27	-1005

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