

May 31, 1990

Richard Brickwedde, Esq.
Regional Attorney
New York State Department of
Environmental Conservation
615 Erie Boulevard West
Syracuse, NY 13204-2400

Re: NESCO Products Recovery Well, Conklin, NY

Dear Mr. Brickwedde:

On behalf of Savin Corporation, Malcolm Pirnie is hereby petitioning the NYSDEC for a change in status of the operation of the ground water treatment system located at Savin's facility in Conklin, New York. In accordance with the April, 1985 Order-on-Consent (No. 7-0490), the recovery well was to operate at a discharge rate of 400 gallons per minute (gpm) until the average concentrations of 1,1,1-trichloroethane (TCA) and trichloroethylene (TCE) in the aquifer are each determined to be less than 5 ppb, with the maximum concentration not to exceed 10 ppb. In January 1990, we informed you of the recovery well's limitation in providing a sustained discharge of 400 gpm, based upon analysis of a long-term pumping test conducted on the well by Malcolm Pirnie in December 1989, after well rehabilitation and redevelopment. At that time Malcolm Pirnie estimated the long-term sustainable yield of the well to be 200 to 250 gpm. As outlined in a conversation with Mr. Mario Nirchi with Malcolm Pirnie on January 4, 1990, Savin would need to provide technical documentation and justification to the NYSDEC prior to reducing the discharge of the well.

We have compiled hydrogeologic, chemical and well performance data which documents the recovery well's performance and the distribution of TCA and TCE in the aquifer since initiation of the ground water treatment system. As presented in the attached report, technical justification and supporting documentation are provided for reducing the discharge rate from 400 gpm to a sustainable discharge rate capable of capturing ground water containing five $\mu\text{g/l}$ or more, of TCA and TCE and, minimizing well shutdown and frequent rehabilitation.

We request the NYSDEC review the attached report, approve the proposed pumping test and, contingent upon the results, modify the Order-on-Consent whereby the recovery well can discharge at a rate of less than 400 gpm, until pumping is terminated. We would appreciate your review of the report at your earliest convenience, and would welcome the opportunity to discuss this matter with you and your staff.

MALCOLM
PIRNIE

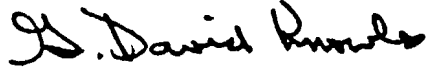
Mr. Mario Nirchi
NYSDEC

May 31, 1990
Page 2

If you have any questions or require additional information, please feel free to call me or Ken Goldstein at our Albany office at (518) 869-7257.

Very truly yours,

MALCOLM PIRNIE, INC.



G. David Knowles, P.E., L.S.
Senior Associate

ds

Enclosure

1080-11-1

cc: Joan Cleveland, Esq.
Jerry Ransford
Thomas Suozzo, NYSDEC Region 7
Mario Nirchi, NYSDEC Region 7

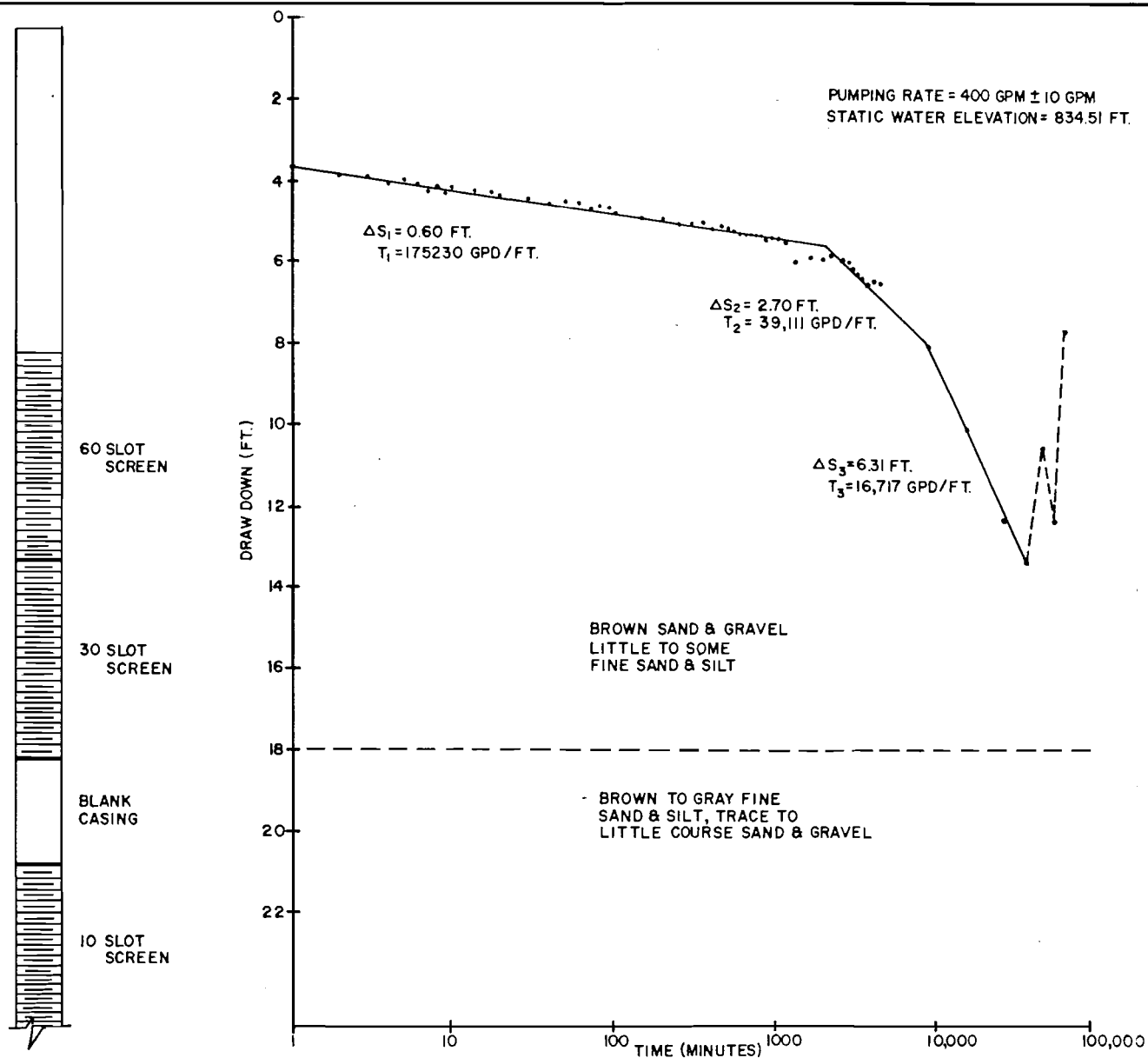
PUMPING RATE DETERMINATION

NESCO Products, Recovery Well
Conklin, New York

During 1989, the yield from the recovery well at the Nesco Products facility, now owned by Savin Corporation located in Conklin, New York decreased to a rate of less than the 400 gallons per minute (gpm). This is the rate of removal as required in the Order-on-Consent executed between Savin Corporation and New York State Department of Environmental Conservation, dated April 5, 1985. In November, 1989 the well was chemically treated and redeveloped. The pump in the well was also replaced. The well was believed to have become encrusted, due to the pumping water level being drawn into its upper screened portion. This caused higher entrance velocities, greater turbulence and in turn encrustation. The construction details of the recovery well are shown in Figure 1.

Since periodic rehabilitation of the recovery well requires the ground water treatment system to be inactive temporarily and is costly, frequent rehabilitation should be avoided, if possible. (By pumping the recovery well at a reduced rate, the need for well rehabilitation should be significantly reduced. Also, since the treatment system has been in operation since July, 1988, it may no longer be necessary to withdraw at a rate of 400 gpm from the aquifer in order to have an effective contaminant control system.

In order to determine if the recovery well could operate at less than 400 gpm and meet the requirements of the existing Order-on-Consent, two conditions were necessary in order to accomplish the objectives of the project. First, the recovery well should operate at a rate sufficient to capture trichloroethane (TCA) and trichloroethylene (TCE) from the existing ground water at concentrations of five $\mu\text{g/l}$ (ppb). The Order-on-Consent requires that the treatment system (packed column) remain in a standby operational mode until TCA and TCE concentrations individually average five $\mu\text{g/l}$ in the aquifer with the maximum concentration of an individual parameter not to exceed ten $\mu\text{g/l}$. Also, quarterly sampling and operation of the recovery well can be discontinued when TCA and TCE



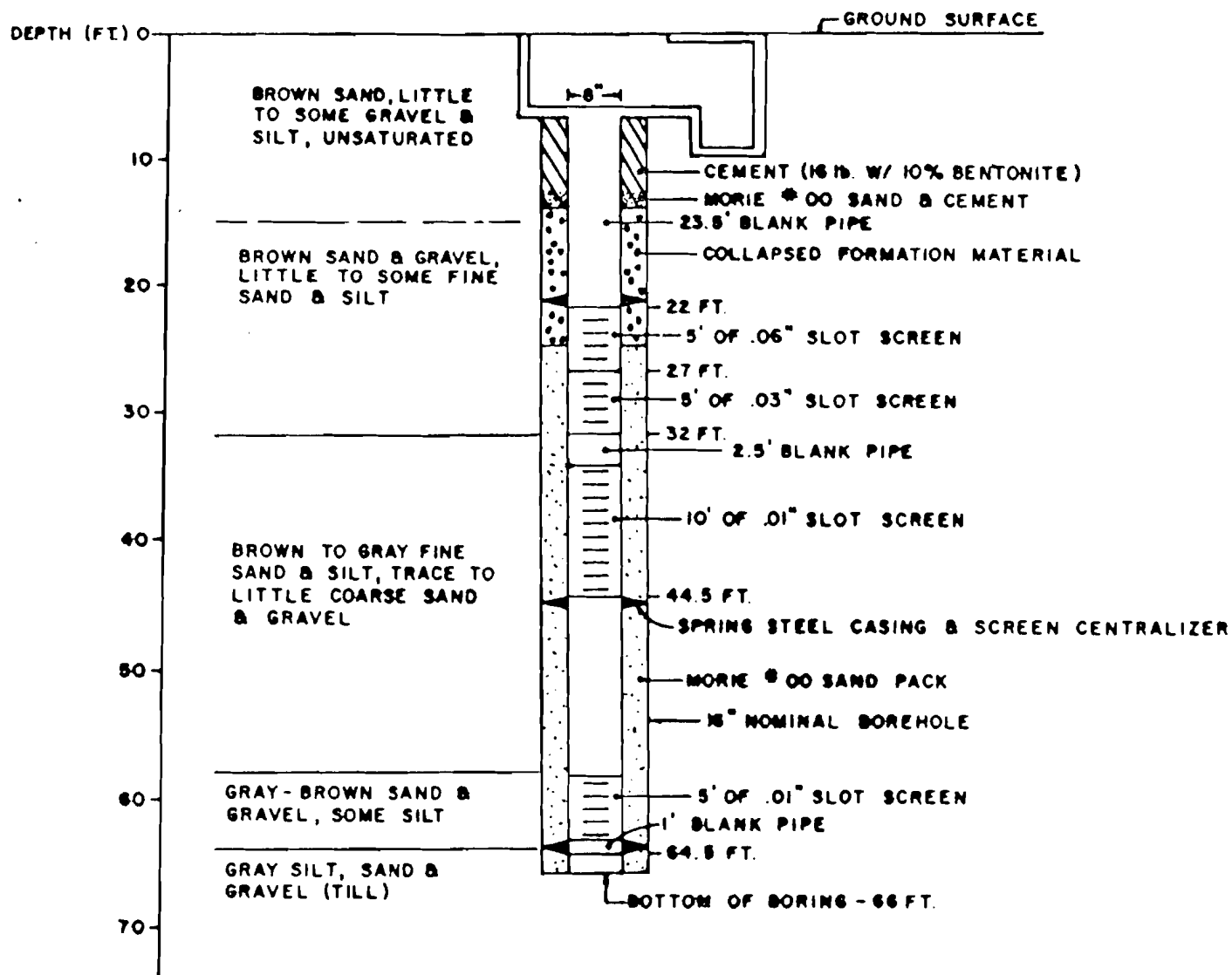
**MALCOLM
 PIRNIE**

SAVIN-NESCO RECOVERY WELL TIME-DRAWDOWN CURVE

FIGURE 2

MALCOLM PIRNIE, INC.

APRIL 1990



NO SCALE

FIGURE 1

**MALCOLM
PIRNIE**

**SAVIN-NESCO
RECOVERY WELL DETAIL**

MALCOLM PIRNIE, INC.

APRIL 1990

concentrations individually average less than five $\mu\text{g/l}$, with the maximum concentration of an individual parameter not to exceed ten $\mu\text{g/l}$. Capturing ground water, which contains approximately five $\mu\text{g/l}$ or more of TCA and TCE, will continue to clean up the aquifer so that these goals can be achieved. Second, the recovery well should operate at a rate which eliminates or minimizes drawing down the pumping water level into the well screen.

In order to determine the capture zone produced by pumping the recovery well at a specific rate, knowledge of the aquifer's characteristics was necessary. A long-term pumping test was conducted by Malcolm Pirnie to determine the aquifer's characteristics. The pumping test was conducted from December 8, 1989, when pumping was re-initiated following well redevelopment, until January 24, 1990. On January 24, 1990, the pumping system was shut down to repair the treatment system. From December 8, 1989 to January 24, 1990, the discharge from the recovery well was maintained at $400 \text{ gpm} \pm 10 \text{ gpm}$.

A time-drawdown curve for the pumping of the recovery well is presented in Figure 2. The time-drawdown curve exhibits three distinct limbs or segments. Each successive limb has a greater slope than the previous limb, indicating that the rate of drawdown increases with time. Also shown in Figure 2 is the construction of the upper portion of the recovery well and the stratigraphy of the alluvium in which the well is completed. The upper screened section (0.060 and 0.030 inch slot) of the well is open to sand and gravel with some fine sand and silt. This sand and gravel is underlain by fine sand and silt with a trace coarse sand and gravel. The lower screened section (0.010 inch slot) is set in this finer-grained material. Based on the description of these materials, the upper unit is likely to have a higher hydraulic conductivity and provide most of the water to the recovery well. Prior to activating the recovery well on December 8, 1989, the static water level was at elevation 834.51 feet above msl, which means approximately eighteen feet of the coarser-grained upper unit was saturated.

Analysis of the time-drawdown data extending from the start of the pumping test to 2,000 minutes (1.4 days) of pumping indicates a change in drawdown of 0.60 feet per log cycle and a calculated transmissivity of

approximately 175,000 gpd/ft. This transmissivity reflects the aquifer's potential when approximately twelve and one-half feet or more of the coarser-grained upper unit is saturated. During this portion of the pumping test, the saturated thickness of the coarser-grained upper unit was reduced from eighteen to twelve and one-half feet, or by 30 percent.

The time-drawdown data for the period from 2,000 minutes (1.4 days) to 15,000 minutes (10.4 days) shows a greater rate of drawdown with time, and may be due to a combination of at least two factors. The coarse-grained upper unit was significantly dewatered during this interval. During this period, its initial saturated thickness (eighteen feet) was reduced by 30 to 44 percent. Also, the southerly extent of the aquifer is believed to be limited as it pinches out where bedrock-controlled hills rise away from the Susquehanna River. The increased rate of drawdown may be related to this boundary condition.

The time-drawdown data for the period from 15,000 minutes (10.4 days) to 40,000 minutes (27.8 days) is again steeper than the previous intervals. This appears to be due to continuous pumping of the recovery well at 400 gpm, which caused the pumping water level to enter the upper, screened section of the well. Erratic water levels were recorded near the end of the test, from January 11 through January 24, 1990. The causes of this variability are uncertain, but may relate to precipitation events and changes in the discharge of the Susquehanna River. Figure 3 illustrates the daily discharge of the Susquehanna River at the Conklin, New York U.S. Geological Survey gaging station during the pumping test. The discharge of the Susquehanna River rose from 3,660 cubic feet per second (cfs) on January 17, 1990 to 11,400 cfs on January 19, 1990. The rise in the recovery well's water level may be due in part to direct recharge of precipitation which caused the higher flows in the River and an increase in bank storage from the River during this period.

In order to define the historic and present distribution of TCA, TCE and Dichloroethane (DCA) in the ground water, existing analytical data (from November 24, 1981 to January 24, 1990) were compiled in Table 1. Table 1 indicates that while short-term deviations occur, the general trend in all monitoring wells shows a reduction in TCA, TCE and DCA concentrations with time. Monitoring well locations are shown on Plate

SUSQUEHANNA RIVER DISCHARGE
AT CONKLIN STATION # 01503000
12/89 THROUGH 1/90

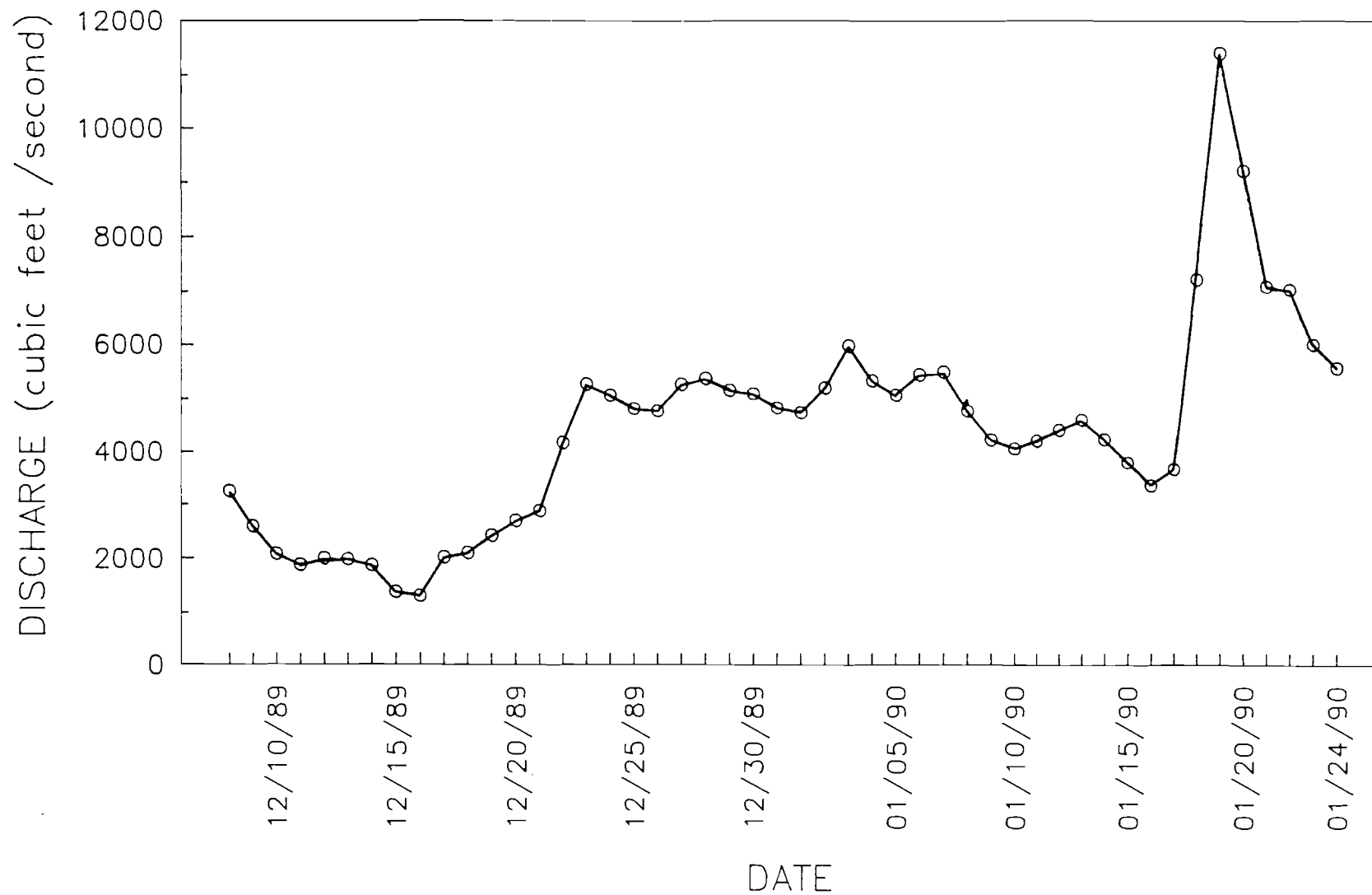


FIGURE 3

TABLE 1
GROUNDWATER QUALITY RESULTS
MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENT

NESCO Facility
Conklin, New York
Concentration (ppb)

WELL NUMBER	DATE	TCA	TCE	DCA	WELL WATER ELEV. (FT)
1	11/24/81	680	<68	---	---
1	11/30/81	790	83	---	---
1	12/02/81	340	160	---	833.08
1	12/07/81	380	160	---	834.13
1	06/03/82	350	92	250	---
1	06/28/82	680	---	---	833.58
1	06/03/83	450	---	---	---
1	12/09/83	370	76	25	---
1N	10/04/84	160	46	24	---
1	03/13/87	160/140	40/33	<20	---
1	11/17/88	61	12	8	834.28
1	12/29/88	17	3	4	830.2
1	01/26/89	11	2	3	830.99
1	02/09/89	<1	3	3	---
1	02/23/89	19	3	3	830.65
1	03/09/89	14	2	2	---
1	03/23/89	12	2	3	830.62
1	04/13/89	1	2	<1	---
1	04/27/89	8	1	2	832.37
1	05/11/89	20	6	<1	---
1	05/25/89	10	2	<1	834.3
1	06/08/89	20	5	<1	832.11
1	06/22/89	24	4	9	834.63
1	07/11/89	---	---	---	832.18
1	07/25/89	5	2	2	830.71
1	08/24/89	6	2	1	829.86
1	09/28/89	10	4	3	830.5
1	10/20/89	14	3	<1	830.98
1	11/30/89	11	1	2	833.86
1	12/27/89	9	<1	1	829.07
1	01/24/90	6	2	1	833.88
1	02/23/90	---	---	---	836.31

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENTNESCO Facility
Conklin, New York

Concentration (ppb)

WELL NUMBER	DATE	TCA	TCE	DCA	WELL WATER ELEV. (FT)
3A	12/02/81	450	57	---	833.97
3A	12/07/81	330	64	---	833.97
3A	06/03/82	460	---	---	---
3A	06/28/82	570	---	---	833.37
3A	06/03/83	350	---	---	---
3A	12/09/83	170	34	<1	---
3A	03/13/87	51	20	<20	---
3A	11/17/88	24	16	<1	833.67
3A	12/29/88	13	8	<1	828.99
3A	01/26/89	16	10	<1	829.07
3A	02/09/89	<1	10	<1	---
3A	02/23/89	12	7	<1	829.28
3A	03/09/89	14	1	<1	---
3A	03/23/89	10	6	<1	829.26
3A	04/20/89	9	7	<1	---
3A	04/27/89	6	6	<1	831.18
3A	05/11/89	10	11	<1	---
3A	05/25/89	4	1	<1	833.12
3A	06/08/89	12	12	<1	830.87
3A	06/22/89	10	6	<1	833.73
3A	07/11/89	---	---	---	830.87
3A	07/25/89	6	6	<1	829.45
3A	08/24/89	13	6	<1	828.96
3A	09/28/89	9	8	<1	830.17
3A	10/20/89	9	5	1	830.13
3A	11/30/89	6	<1	<1	834.82
3A	12/27/89	8	4	<1	827.62
3A	01/24/90	3	2	<1	832.54
3A	02/23/90	---	---	---	834.99

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENTNESCO Facility
Conklin, New York

Concentration (ppb)

WELL NUMBER	DATE	TCA	TCE	DCA	WELL WATER ELEV. (FT)
7B	05/25/82	39	<1	---	---
7B	06/04/82	17	---	---	---
7B	06/28/82	<1	---	---	833.38
7B	06/03/83	29	---	---	---
7B	12/09/83	16	3	1	---
7B	03/13/87	51	<1	1	---
7B	12/29/88	18	<1	<1	831.1
7B	01/26/89	13	<1	<1	831.88
7B	02/23/89	8	<1	<1	832.18
7B	03/23/89	11	<1	<1	830.73
7B	04/27/89	6	<1	<1	832.08
7B	05/25/89	3	<1	<1	833.84
7B	06/22/89	6	<1	<1	834.71
7B	07/11/89	---	---	---	831.83
7B	07/25/89	3	<1	<1	830.53
7B	08/24/89	8	<1	<1	829.78
7B	09/28/89	6	11	<1	830.39
7B	10/20/89	5	<1	<1	830.88
7B	11/30/89	5	<1	<1	833.62
7B	12/27/89	4	<1	<1	829.07
7B	01/24/90	2	<1	<1	834.19
7B	02/23/90	---	---	---	834.19
8A	05/24/82	180	24	---	---
8A	06/04/82	<1	---	---	---
8A	06/28/82	<1	---	---	833.27
8A	06/03/83	48	---	---	---
8A	12/09/83	2	6	2	---
8A	03/13/87	5	<1	2	---
8A	12/29/88	<1	<1	1	833.77
8A	01/26/89	<1	<1	1	832.74
8A	02/23/89	<1	<1	<1	831.55

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENTNESCO Facility
Conklin, New York

Concentration (ppb)

WELL NUMBER	DATE	TCA	TCE	DCA	WELL WATER ELEV. (FT)
8A	03/23/89	<5	<1	10	831.29
8A	04/27/89	<5	<5	<5	832.71
8A	05/25/89	<1	<1	<1	834.83
8A	06/22/89	<1	<1	<1	835.04
8A	07/11/89	---	---	---	832.32
8A	07/25/89	<1	<1	<1	831.03
8A	08/24/89	3	<1	<1	830.53
8A	09/28/89	2	1	<1	830.83
8A	10/20/89	2	<1	<1	831.24
8A	11/30/89	2	<1	1	834.42
8A	12/27/89	2	<1	1	829.72
8A	01/24/90	<1	<1	1	834.37
8A	02/23/90	---	---	---	836.13
9	12/09/83	21	<1	<1	---
9	03/13/87	19	<5	<5	---
9	12/29/89	<1	<1	<1	833.16
9	01/26/89	<1	<1	<1	831.74
9	02/23/89	<10	<10	<10	832.99
9	03/23/89	<1	<1	<1	831.6
9	04/27/89	<1	<1	<1	832.47
9	05/25/89	<1	<1	<1	833.89
9	06/22/89	<1	<1	<1	834.63
9	07/11/89	---	---	---	832.21
9	07/25/89	<1	<1	<1	831.15
9	08/24/89	5	<1	<1	830.86
9	09/28/89	2	9	<1	831.03
9	10/20/89	4	<1	<1	831.94
9	11/30/89	1	<1	<1	835.04
9	12/27/89	<1	<1	<1	829.71
9	01/24/90	<1	<1	<1	835.16
9	02/23/90	---	---	---	835.77

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENT

NESCO Facility
Conklin, New York

Concentration (ppb)

DATE	TCA	TCE	DCA
INFLUENT			
I 07/28/88	22	15	<1
I 08/25/88	22	6	<1
I 09/29/88	17	7	<1
I 10/27/88	16	5	<1
I 11/23/88	16	7	<1
I 12/29/88	<1	<1	<1
I 01/26/89	10	<1	<1
I 02/09/89	<1	4	<1
I 02/23/89	10	3	<1
I 03/09/89	9	3	<1
I 03/23/89	9	3	<1
I 04/13/89	<1	2	<1
I 04/27/89	5	<1	<1
I 05/25/89	5	<1	<1
I 06/22/89	5	2	<1
I 07/25/89	6	3	<1
I 08/24/89	10	3	<1
I 09/28/89	8	12	<1
I 10/20/89	6	3	<1
I 11/30/89	6	2	<1
I 12/27/89	6	2	<1
I 01/24/90	3	2	<1

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENT

NESCO Facility
Conklin, New York

Concentration (ppb)

DATE	TCA	TCE	DCA
EFFLUENT			
E 07/07/88	<1	<1	<1
E 07/14/88	<1	<1	<1
E 07/21/88	<1	<1	<1
E 07/28/88	<1	<1	<1
E 08/04/88	<1	<1	<1
E 08/11/88	<1	<1	<1
E 08/18/88	<1	<1	<1
E 08/25/88	<1	<1	<1
E 09/01/88	<1	<1	<1
E 09/08/88	<1	<1	<1
E 09/14/88	<1	<1	<1
E 09/22/88	<1	<1	<1
E 09/29/88	<1	<1	<1
E 10/06/88	<1	<1	<1
E 10/13/88	<1	<1	<1
E 10/20/88	<1	<1	<1
E 10/27/88	<1	<1	<1
E 11/03/88	<1	<1	<1
E 11/10/88	<1	<1	<1
E 11/17/88	<1	<1	<1
E 11/23/88	<1	<1	<1
E 12/01/88	<1	<1	<1
E 12/08/88	<1	<1	<1
E 12/15/88	<1	<1	<1
E 12/22/88	<1	<1	<1
E 12/29/88	<1	<1	<1
E 01/05/89	<1	<1	<1
E 01/12/89	<1	<1	<1
E 01/19/89	<1	<1	<1
E 01/26/89	<1	<1	<1
E 02/02/89	<1	<1	<1
E 02/09/89	<1	<1	<1

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENT

NESCO Facility
Conklin, New York

Concentration (ppb)

DATE	TCA	TCE	DCA
E 02/16/89		<1	<1
E 02/23/89		<1	<1
E 03/01/89		<1	<1
E 03/09/89		<1	<1
E 03/16/89		<1	<1
E 03/23/89		<1	<1
E 03/30/89		<1	<1
E 04/06/89		<1	<1
E 04/13/89		<1	<1
E 04/20/89		<1	<1
E 04/27/89		<1	<1
E 05/04/89		<1	<1
E 05/18/89	8	<1	<1
E 05/25/89	3	<1	<1
E 06/01/89	3	2	<1
E 06/08/89	7	4	<1
E 06/15/89	1	1	<1
E 06/20/89	3	2	<1
E 06/22/89	4	2	<1
E 06/29/89	3	2	<1
E 07/06/89	5	2	<1
E 07/13/89	6	2	<1
E 07/20/89	6	2	<1
E 07/25/89	3	2	<1
E 08/03/89	<1	<1	<1
E 08/10/89	<1	<1	<1
E 08/17/89	<1	<1	<1
E 08/24/89	<1	<1	<1
E 08/31/89	<1	<1	<1
E 09/07/89	<1	<1	<1
E 09/14/89	<1	<1	<1
E 09/21/89	<1	<1	<1
E 09/22/89	<1	<1	<1

TABLE 1 (continued)

GROUNDWATER QUALITY RESULTS

MONITORING WELLS 1, 3A, 7B, 8A & 9 AND PACKED
COLUMN INFLUENT AND EFFLUENT

NESCO Facility
Conklin, New York

Concentration (ppb)

DATE	TCA	TCE	DCA
E 09/28/89		<1	2
E 10/05/89		<1	<1
E 10/12/89		<1	<1
E 10/20/89		<1	<1
E 10/26/89		<1	<1
E 11/02/89		<1	<1
E 11/09/89		<1	<1
11/16/89 RECOVERY WELL SHUT DOWN FOR REHABILITATION.			
E 11/21/89		<1	<1
E 11/30/89		<1	<1
E 12/07/89		<1	<1
E 12/14/89		<1	<1
E 12/19/89		<1	<1
E 12/27/89		<1	<1
E 01/04/90		<1	<1
E 01/11/90		<1	<1
E 01/18/90		<1	<1
E 01/24/90		<1	<1
02/01/90 SYSTEM SHUT DOWN FOR REPAIR OF BEARINGS IN PACKED COLUMN.			
E 02/08/90		<1	<1
E 02/15/90		<1	<1
E 02/22/90		<1	<1
E 03/01/90		<1	<1
E 03/8/90		<1	<1
E 03/15/90		<1	<1

- 1 Table represents groundwater quality data obtained from those wells in the vicinity of the NESCO Facility
- 2 I and E denote influent to and effluent from packed column, respectively
- 3 --- indicates analysis not performed
- 4 N - Denotes sample obtained by NYSDEC

1. In some instances, for example MW-1, TCA concentrations have been reduced by two orders of magnitude. Figures 4 through 8 illustrate the concentrations of TCA, TCE and DCA from February 1989 through January 1990 in monitoring wells 1, 3A, 7B, 8A and 9. In general, concentrations have decreased during this period.

The current distribution of TCA, TCE and DCA were estimated by plotting their average concentrations for the previous twelve month period (February 9, 1989 to January 24, 1990). For purposes of averaging, concentrations less than the analytical method detection limits (MDL) were assumed to represent concentrations one half of the MDL. Plates 1, 2 and 3 illustrate the average distribution of TCA, TCE and DCA respectively. Of the three compounds, TCA has the highest concentrations downgradient of the recovery well and is the limiting compound in determining the extent of a capture zone. TCA concentrations of five $\mu\text{g/l}$ appear to extend downgradient to approximately monitoring well cluster 7. Therefore, the recovery well should be pumped so that its capture zone extends to approximately monitoring well cluster 7.

In order to determine the capture zone of the recovery well at a given rate, an analytical equation for determining capture zones was used. The distance along a sloping water table to the stagnation point which defines the downgradient extent of the capture zone for a pumping well can be described by the following equation (Todd, 1980):

$$X_L = \frac{Q}{2\pi Ti}, \text{ where}$$

Where X_L = Distance to down gradient stagnation point, ft

Q = Well discharge rate, ft^3/day

T = Transmissivity, ft^2/day

i = Hydraulic gradient

π = 3.1416

A pumping rate for the recovery well which results in a capture zone which encompasses monitoring well cluster 7 can be calculated by substituting known values as shown below:

X_{MW7} = Distance from recovery well to monitoring well cluster 7; 300 feet.

SAVIN - NESCO
MW -1 CONTAMINANT CONCENTRATIONS
2/89 - 1/90

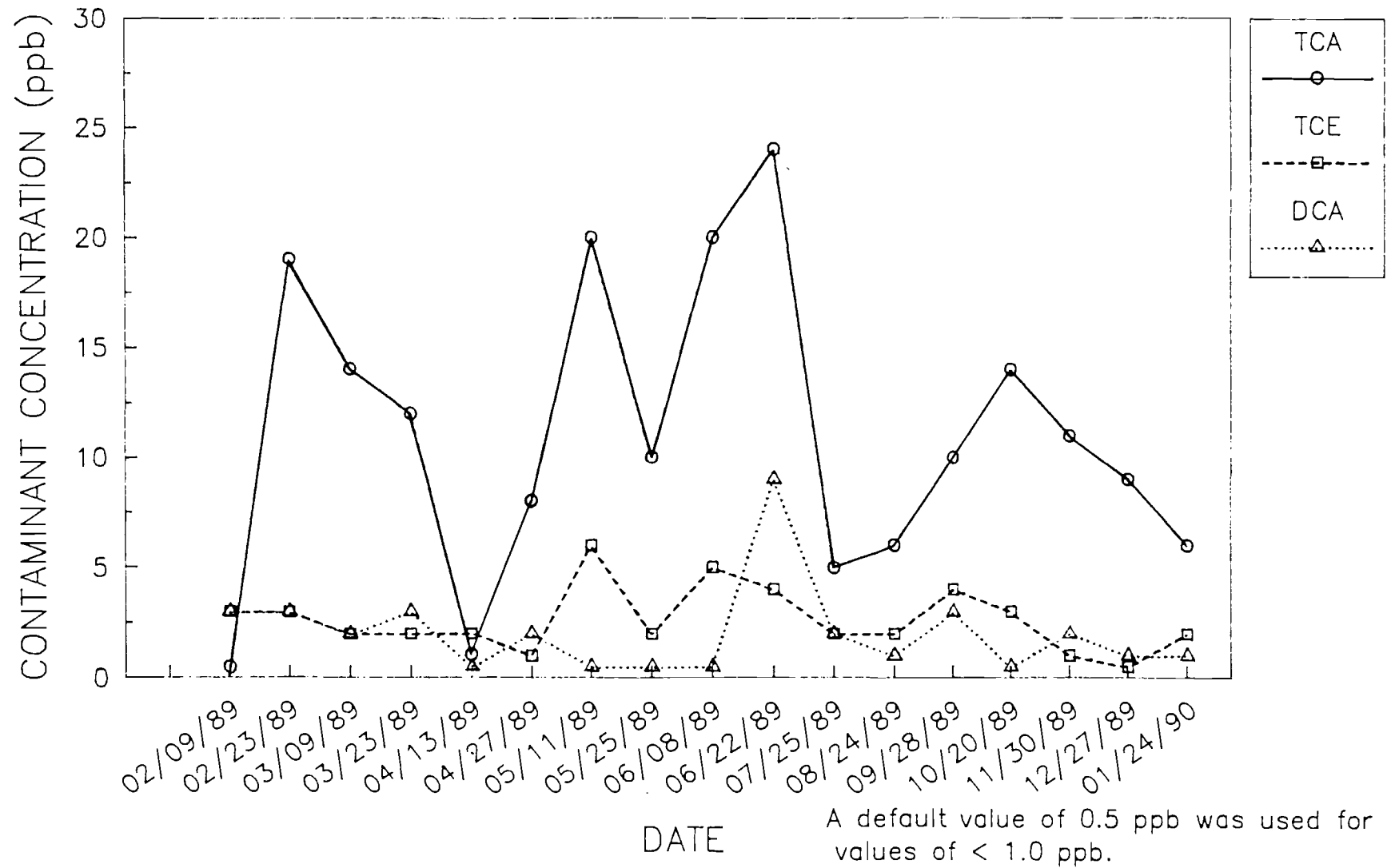


FIGURE 4

SAVIN - NESCO

MW-3A CONTAMINANT CONCENTRATIONS

2/89 - 1/90

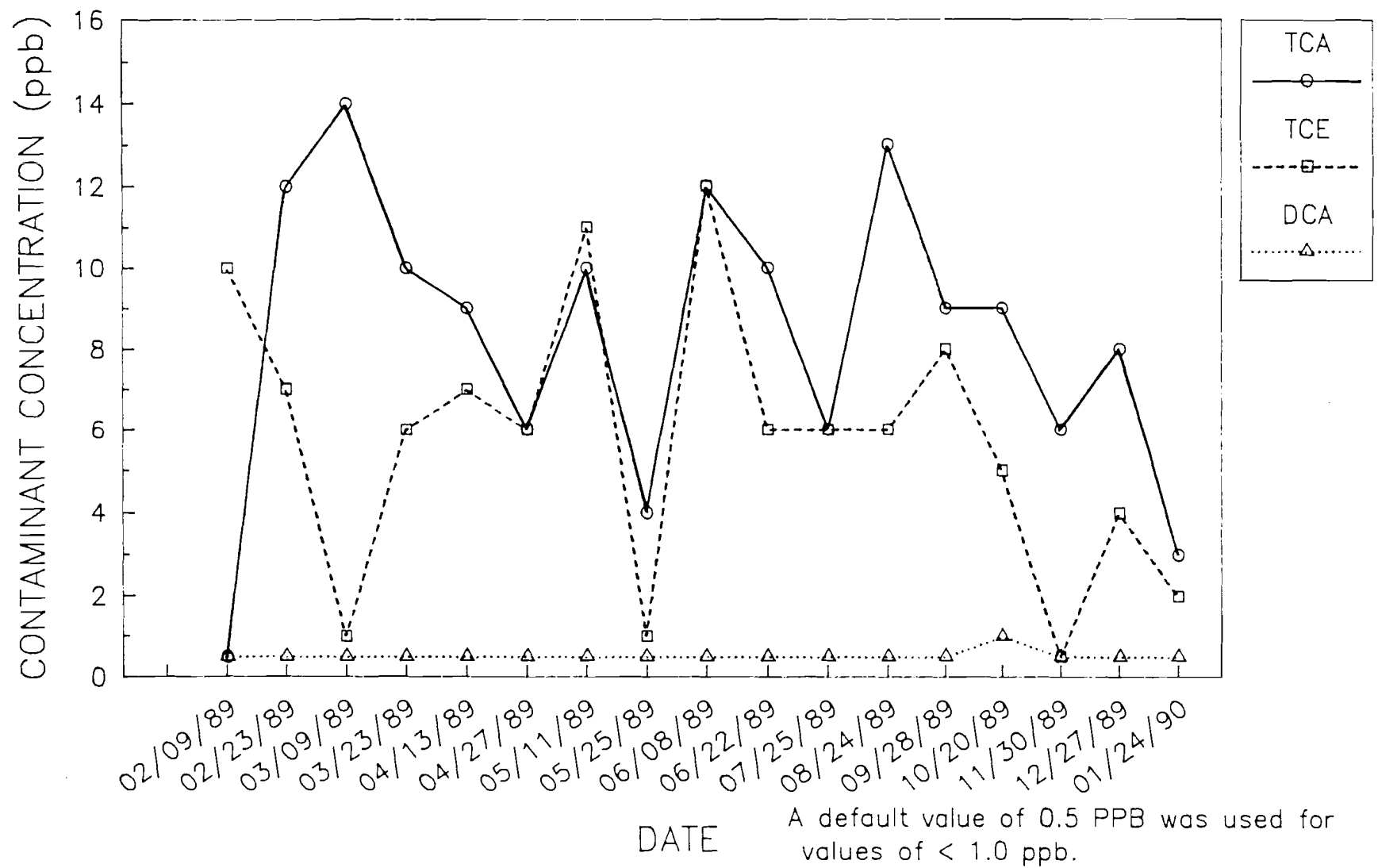


FIGURE 5

SAVIN - NESCO
MW-7B CONTAMINANT CONCENTRATIONS
2/89 - 1/90

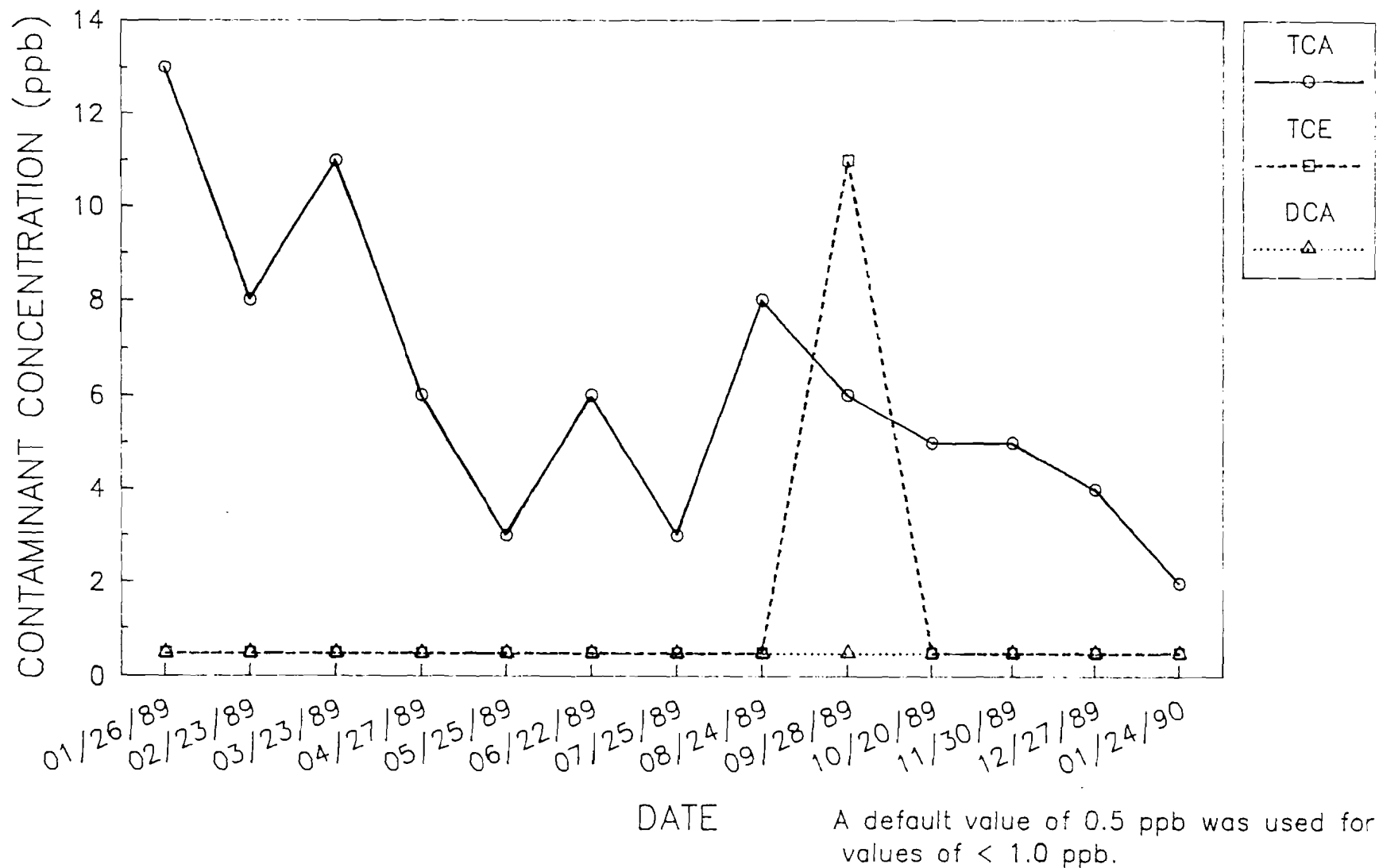
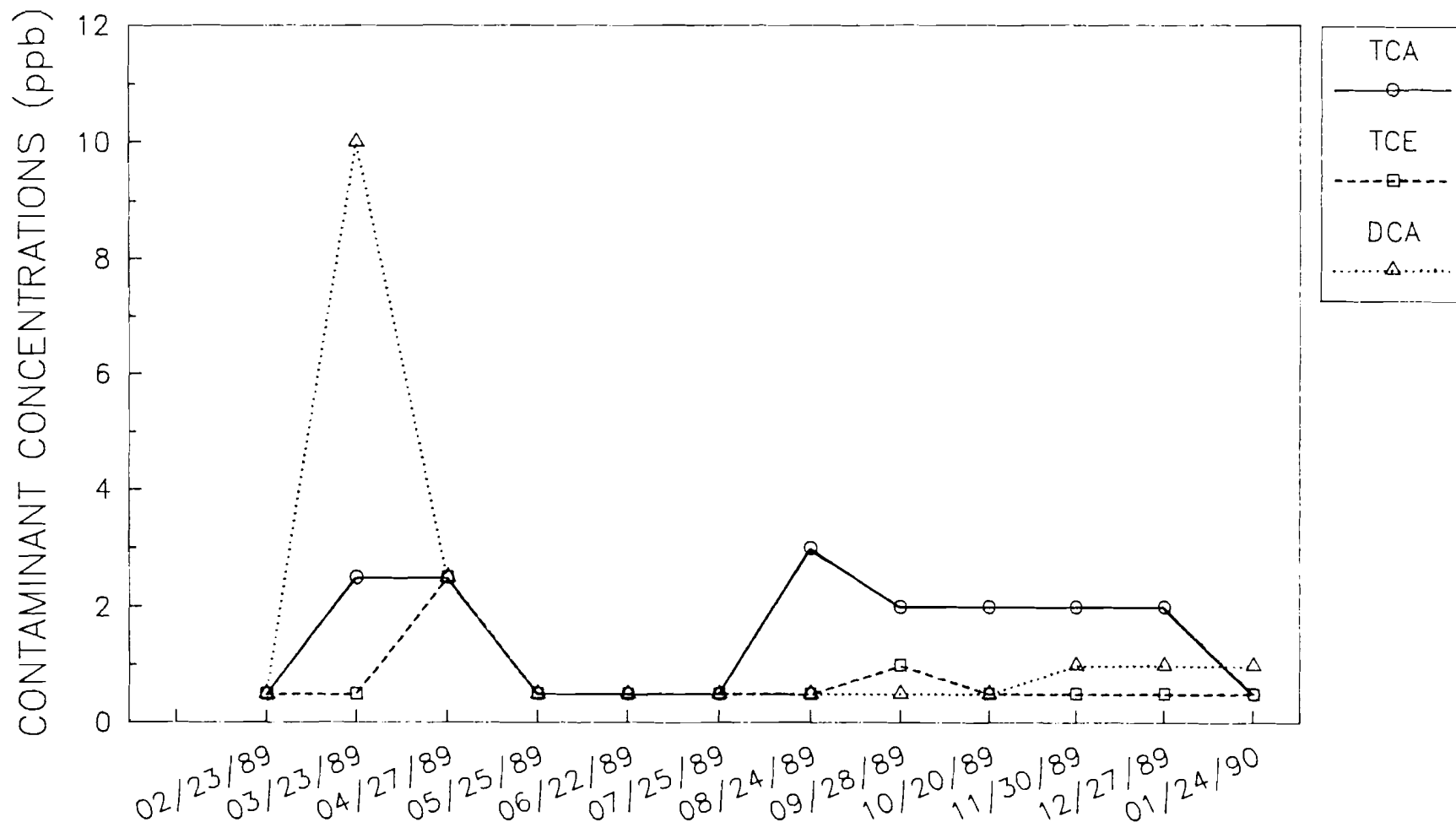


FIGURE 6

SAVIN - NESCO

MW-8A CONTAMINANT CONCENTRATIONS

2/89 - 1/90



DATE Default values of 0.5 ppb and 2.5 ppb were for values of < 1.0 ppb and < 5.0 ppb.

FIGURE 7

SAVIN - NESCO
MW-9 CONTAMINANT CONCENTRATIONS
2/89 - 1/90

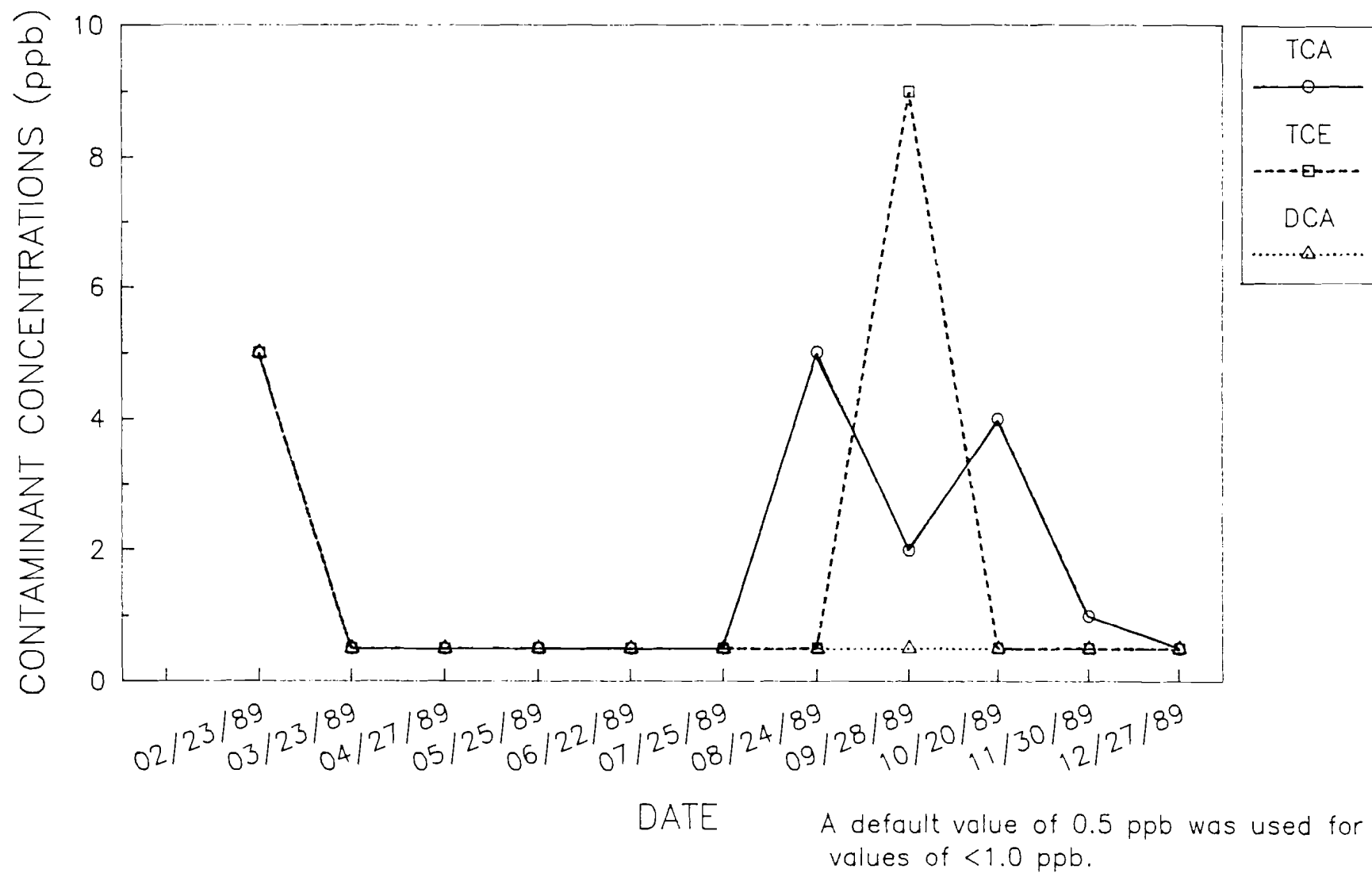


FIGURE 8

(Monitoring well cluster 7 is approximately on a flow line from the recovery well during static conditions)

$$T = 175,000 \text{ gpd/ft} = 23,000 \text{ ft}^2/\text{day}$$

$$i = 0.001 \text{ (based on static water levels in MW-3A and MW-7A on December 8, 1989)}$$

$$300 = \frac{Q}{2\pi(23,000)(0.001)}$$

Rearranging and solving for Q indicates 43,350 ft³/day or 225 gpm is the recovery well pumping rate which is necessary to capture ground water in the vicinity of monitoring well cluster 7.

To verify the reasonableness of the capture zone calculated according to Todd (1980), a semi-analytical ground water flow model (USEPA, February 1990), WHPA (Wellhead Protection Area) was used. Aquifer parameters utilized in WHPA included the following:

$$\text{Transmissivity} = 175,000 \text{ gpd/ft} = 23,000 \text{ ft}^2/\text{day}$$

$$\text{Saturated Thickness} = 50 \text{ feet (based on recovery well log, Figure 1)}$$

$$\text{Porosity} = 0.25 \text{ [Typical value for mixed sands and gravel (Fetter, 1988)]}$$

$$\text{Hydraulic gradient} = 0.001$$

A recharge boundary corresponding to the Susquehanna River was included in the model. A pumping rate of 225 gpm or 43,350 ft³/day was assumed for the recovery well.

The use of 50 feet for the saturated thickness of the aquifer is conservative. As shown in Figure 1, the well is not fully screened through the aquifer. Also, as discussed above, the aquifer is stratified; the more conductive materials are in the topmost eighteen feet. Thus, the actual productive saturated thickness is likely to be less than 50 feet by an undetermined amount. Therefore, the capture zone predicted by the model is smaller than that which is likely to occur. The model is also conservative in that it does not consider the boundary effects as the aquifer pinches out to the south. This boundary will tend to increase the size of the capture zone beyond that predicted by the model.

The capture zone predicted by the model for 365 days of pumping at 225 gpm is illustrated on Plates 1, 2 and 3. The downgradient extent of

the capture zone extends approximately to monitoring well cluster 7 and agrees with the downgradient extent determined according to Todd (1980).

Plates 1, 2 and 3 indicate that pumping at 225 gpm will capture ground water in the aquifer which contains approximately five $\mu\text{g/l}$ or more of TCA and TCE and two $\mu\text{g/l}$ or more of DCA.

Due to its proximity to the Susquehanna River, water levels at the Savin-Nesco facility are strongly influenced by the River. Comparison of Figure 9, which depicts river discharge versus time, to Figure 10, which depicts monitoring well water elevations versus time, indicates that, in general, higher River discharge correlates with higher monitoring well water elevations. Fluctuations in the discharge of the River will cause changes in the saturated thickness of the aquifer. Table 2 indicates that the lowest flows occurs in the River from July through October. During this period, the saturated thickness, and consequently the transmissivity, of the aquifer will also be lowest. Figure 10 indicates that water levels in the monitoring wells fluctuated during 1989 by approximately five feet.

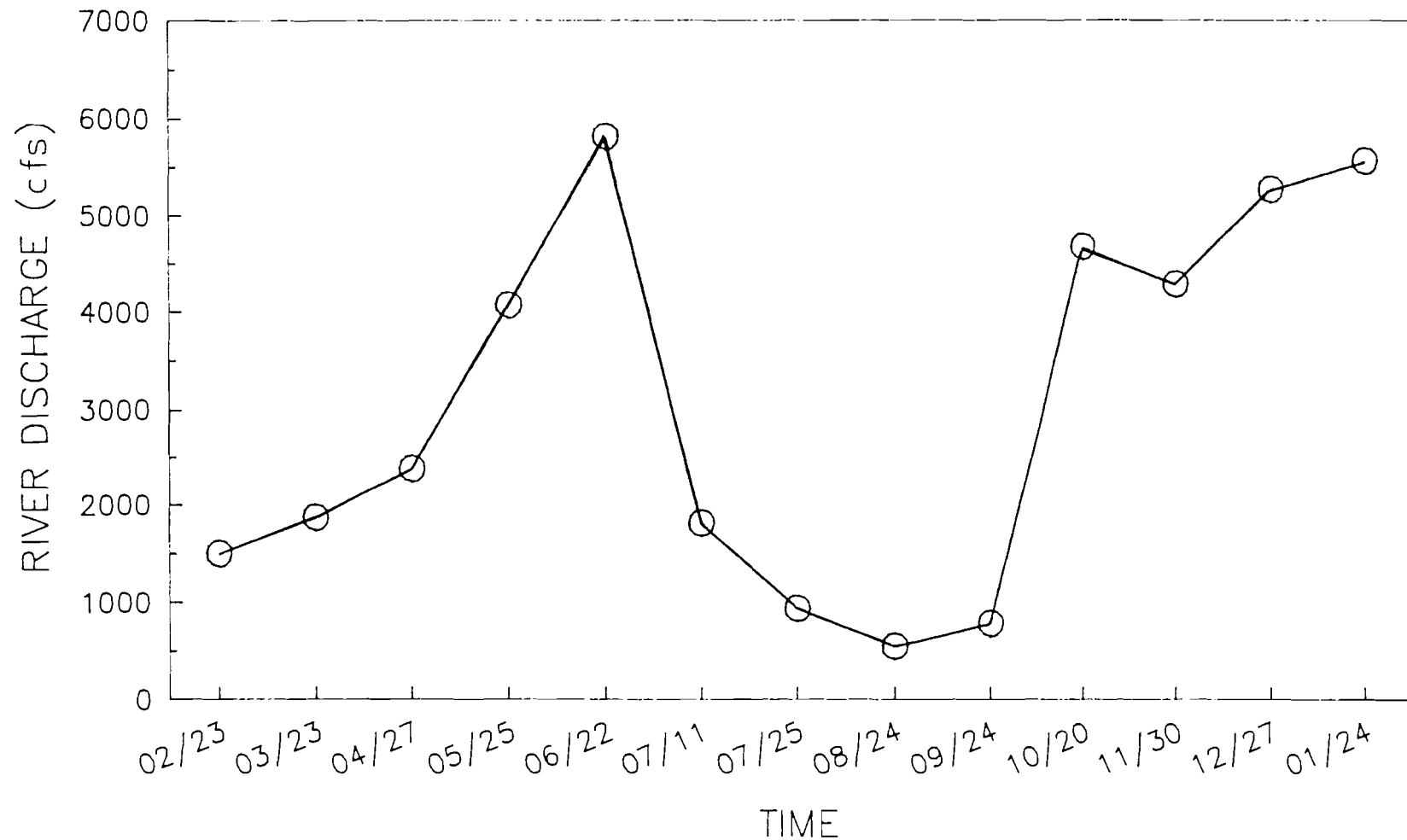
During the pumping test, December 8, 1989 through January 24, 1990, the average discharge of the Susquehanna River was 4,422 cfs. This discharge is greater than all except three average mean monthly discharges for the period from the 1979 through the 1988 water years as shown in Table 2. This indicates that the pumping test was conducted during a period when the water table was relatively high. If, for example, the saturated thickness is reduced by four feet during late summer, the aquifer's transmissivity will be reduced by eight to twenty-two percent, depending on whether a saturated thickness of 50 or eighteen feet is assumed. For a given pumping rate, a lower transmissivity will result in a larger capture zone. Therefore, during periods of lower river discharge, a lower pumping rate could produce the same capture zone.

Pumping the recovery well at a rate of less than 400 gpm, such as 225 gpm, will decrease the likelihood of drawing the pumping water level into the screen. It is not possible to predict where the water level will stabilize for a pumping rate of 225 gpm, since the pumping water level did not stabilize during the December 1989 to January 1990 pumping test.

SUSQUEHANNA RIVER DISCHARGE

CONKLIN, NEW YORK

2/23/89 – 1/24/90



Discharge for the Susquehanna River at station
01503000.

FIGURE 9

SAVIN - NESCO
MONITORING WELL WATER ELEVATIONS
2/23/89 - 1/24/90

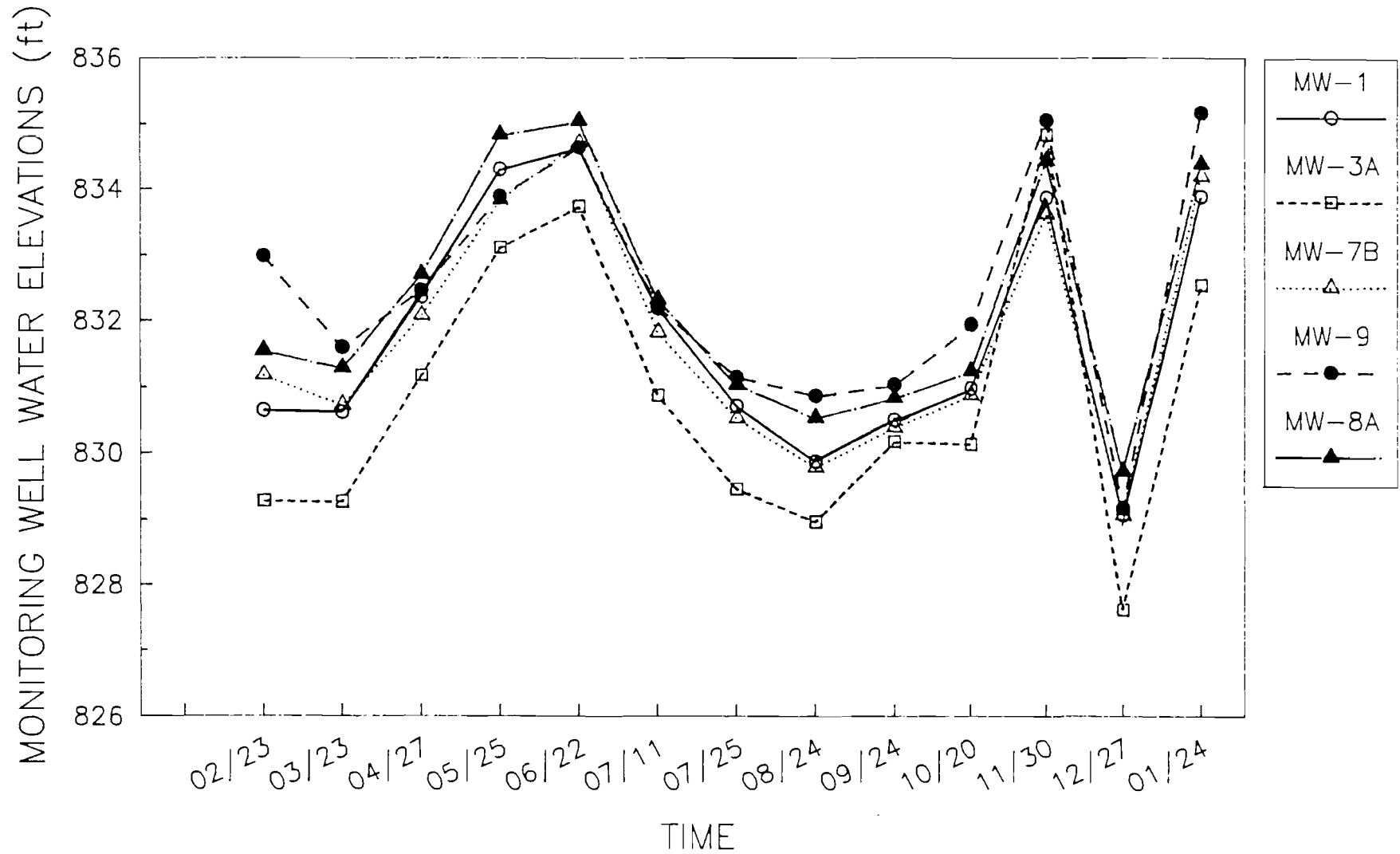


FIGURE 10

TABLE 2

SUSQUEHANNA RIVER, CONKLIN, NEW YORK
AVERAGE MEAN MONTHLY DISCHARGE,
1979 THROUGH 1988 WATER YEARS

Month	Mean Discharge (cfs)
October	1458
November	3315
December	3980
January	2182
February	4500
March	6287
April	6954
May	4315
June	2392
July	1254
August	762
September	890

Source: USGS draft data, 1990

Conclusions and Recommendations

Based on analysis of the recovery well, pumping test results and current contaminant concentrations, pumping rates required to capture ground water containing five $\mu\text{g/l}$ or more of TCA and TCE have been estimated. It appears that pumping 225 gpm will result in a capture zone which extends to approximately monitoring well cluster 7, the approximate downgradient limit of ground water containing five $\mu\text{g/l}$ of TCA.

On behalf of Savin Corporation, Malcolm Pirnie, Inc. requests that the NYSDEC approve the following pumping test to verify that a pumping rate of less than 400 gpm can effectively capture contaminated ground water, and allow restoration of the aquifer. A 90 day pumping test at a rate of 250 gpm is proposed. The rate of 250 gpm is chosen so as to exceed the estimated rate of 225 gpm by ten percent. This increase in the pumping rate is intended to provide a margin of safety in extracting ground water which contains five $\mu\text{g/l}$ or more of TCA and TCE. Prior to the initiation of the pumping test, the recovery well will be shut down for approximately 48 to 72 hours to allow water levels to return to static. During the pumping test, water levels in the recovery well and monitoring wells will be recorded during the first 24 hours and weekly thereafter. These data in comparison to static water levels, will be used to evaluate the drawdown and capture zone produced by pumping at 250 gpm. A report which summarizes the results of the pumping test will be submitted to the NYSDEC for review within 30 days of the completion of the test. Based on the results of the pumping test, the NYSDEC and Savin Corporation will negotiate a modification to the existing Order-on-Consent, which specifies the pumping rate at which the recovery well will operate following the conclusion of the pumping test.

REFERENCES

Todd, D.K., 1980, Ground Water Hydrology, John Wiley & Sons, New York, New York.

EPA, 1990, WHPA, A Modular Semi-Analytical Model for Delineation of Wellhead Protection Areas.

Fetter, C.W., 1988, Applied Hydrogeology, Second Edition, Merrill Publishing Company, Columbus, Ohio.