Quivira Mining Company
P.O. Box 218, Grants, NM USA 87020 (505)287-8851

March 28, 2002

Certified Mail
Return Receipt Requested (7099 3400 0014 5548 6364)

40-8905

Mr. Kevin Myers
Groundwater Section
New Mexico Environment Department
P.O. Box 26110
Santa Fe, NM 87502

Re: **Discharge Plan - 169**
2001 Annual Report

Dear Mr. Myers,

Please find attached Quivira Mining Company's 2001 annual groundwater monitoring report for the Ambrosia Lake mill facility for the above referenced discharge plan. This annual report was prepared pursuant to the New Mexico Environment Department (NMED) approved plan, Discharge Plan - 169, dated November 15, 1995.

This report reviews the remediation progress on the alluvium as a result of Quivira's continued implementation of the Assurance of Discontinuance (AOD), Discharge Plan - 169, and the U.S. Nuclear Regulatory Commission approved Corrective Action Plan.

Submittal of this information does not prejudice Quivira's contention that NMED has no jurisdiction over activities associated with discharge permit DP-169 as a result of the federal Nuclear Regulatory Commission having primacy over 11e.(2) byproduct material.

NMSS01Public

Add: Jill Caverly (Paper copy)

If you have any questions or need additional information, please call me at 287-8851.

Regards,

Peter Luthiger
Supervisor, Radiation Safety
and Environmental Affairs

Attachment: As stated

xc: P. Goranson
NRC (MD) – License SUA-1473, Docket No. 40-8905
file

QUIVIRA

QUIVIRA MINING COMPANY
Ambrosia Lake Facility

DISCHARGE PERMIT
DP-169

ANNUAL REPORT
2001

March 28, 2002

QUIVIRA MINING COMPANY
AMBROSIA LAKE FACILITY
DISCHARGE PLAN - 169
2001 ANNUAL REPORT

Submittal of this information does not prejudice Quivira's contention that NMED has no jurisdiction over activities associated with discharge permit DP-169 as a result of the federal Nuclear Regulatory Commission having primacy over 11e.(2) byproduct material.

Review of Discharge Plan - 169

Progress towards remediation of the alluvium continued throughout 2001. The interceptor trench continues to function as designed and approved by the NMED in the 1983 Assurance of Discontinuance (AOD) and Discharge Plan - 169. The approved remedial action plan was designed to prevent further tailings solution seepage from entering the alluvium from the tailings impoundments. With a total length of approximately 6,200 feet and a maximum depth of 36 feet, the interceptor trench has effectively isolated the tailings impoundment and its solutions from the down dip alluvial material.

During 2001, the interceptor trench collected and pumped 39.3 million gallons of water to lined evaporation cells. The interceptor trench has been effective as a "collection and pump back system". The trench has created a reversed hydrologic gradient within the alluvium due to the dewatering action along the trench, thereby causing solutions east of the trench to flow back towards it where they are collected and pumped to lined evaporation ponds for disposal.

The collection and pump back system developed by the construction of the

interceptor trench is assisted by the recharge of fresh water along the eastern mill perimeter. During 2001, a total volume of approximately 158 million gallons of fresh water infiltrated into the alluvium along the fresh water creek and was utilized in the ground water sweep in conjunction with the interceptor trench. The ground water sweep and reversed gradient caused by the interceptor trench has resulted in solutions underlying the unlined evaporation ponds #4, #5, #6 and nearby areas to be flushed and swept to the interceptor trench for collection and removal from the alluvial system.

This reversed hydraulic gradient can be seen on the water level contour map contained in Appendix E. The water levels and groundwater flow patterns show that groundwater within the alluvium is controlled by the interceptor trench over a large area. Presented in Table 1 are the monthly concentrations for chloride, sulfate, and total dissolved solids (TDS) within the fresh water utilized for alluvial recharge.

TABLE 1

2001 ALLUVIAL RECHARGE WATER CONCENTRATION (mg/L)

Month	Chloride	Sulfate	TDS
January	560	1720	3540
February	570	1690	3560
March	530	1770	3490
April	560	1650	3370
May	540	1600	3390
June	550	1630	3340
July	580	1650	3670
August	500	1540	3420
September	500	1640	3310
October	510	1630	3260
November	407	1530	3140
December	420	1570	3100

In addition to the continued operation of the main interceptor trench, Quivira maintained and operated the three additional intercept trenches in the area southeast of tailings impoundment #1. Since pumping was initiated from these trenches in mid 1996, approximately 26.5 million gallons of ground water in the vicinity of impoundment #1 has been intercepted, collected, and disposed within lined evaporation ponds.

The 2001 monitoring results for the alluvium are contained in Appendix A. These results contain the required information as specified within the November 15, 1995 approved Discharge Plan - 169. Additionally, a computer diskette containing the 2001 data for the alluvial wells is included.

Presented within Appendix B are time versus concentration plots for the parameters chloride, sulfate, and total dissolved solids (TDS) for the alluvial monitoring wells.

Appendix C contains the monitoring well analytical results required under the Nuclear Regulatory Commission (NRC) approved Corrective Action Plan (CAP) for the Ambrosia Lake facility.

Initially, there was an increase in the concentrations of indicator parameters in the alluvium wells west of the discharge creek. However, the concentrations have subsequently continued to decrease with time as the fresh water, which is recharged into the alluvium, has flushed and transported the impacted solutions towards the interceptor trench for collection and removal. The initial higher levels were attributable to concentrated solutions from the unlined evaporation ponds #4, #5, and #6, being flushed and swept past the monitor wells on their way to collection in the interceptor trench.

Although the effect has not been to the same degree as wells located to the west of the fresh water creek; wells located to the east also have had a noticeable improvement in the indicator concentrations and remain within compliance of the established ground water standards for the alluvium. Specific requirement #10 of the approved discharge plan requires compliance with the ground water standards established in the 1983 AOD. These ground water standards are presented within Appendix D.

Contained in Appendix E is the current water level contour map for the alluvial unit. The water level map was developed using the depth to water measurements from the alluvial monitoring wells and the groundwater saturation limits. Appendix F contains the current TDS contour map for the alluvium as required by the Discharge Plan.

APPENDIX A

ANALYTICAL RESULTS - 2001
ALLUVIAL WELLS

QUIVIRA MINING COMPANY

DISCHARGE PLAN DP-169

ANALYTICAL RESULTS - 1st Half 2001

	WELL	DATE	Depth to Water (ft)	Total Depth (ft)	Spec. Cond.	Temp. (C)	pH	Chloride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
	30-03	01-Apr-01	15.21	1866	2320	10	9.3	630	0.02	250
	30-04	27-Mar-01	30.3	88.68	2775	12	9.5	510	0.03	1650
*	30-46	09-May-01		38.36						
	30-47	01-Apr-01	39.8	79.17	3575	13	6.8	510	0.02	2680
	30-48	01-Apr-01	24.98	79.82	2700	12	7	650	0.02	1800
	30-49	01-Apr-01	39.84	68.98	3210	11	7.3	200	5.6	2940
*	30-53	09-May-01		50.11						
*	30-68	09-May-01		62.56						
	31-05	01-Apr-01	24.92	74.76	3020	12.5	6.7	580	0.19	1760
	31-61	06-May-01	17.7	27.06	5500	12	6.8	550	1.64	3980
	31-61	06-May-01	17.7	27.06	5500	12	6.8	549	1.28	3720
	31-63	01-Apr-01	19.13	30.52	10090	12.5	5.5	2600	21	8440
	31-65	26-Mar-01	16.16	46.11	4390	12	6.9	760	3.95	2700
	31-70	01-Apr-01	15.03	34.67	9000	12	3.4	1500	0.57	9120
	31-71	27-Mar-01	15.5	64.06	3490	11.5	7.1	650	0.03	2170
	32-01	05-May-01	15.97	52.65	2680	11.5	8.3	500	0.12	1480
	32-02	01-Apr-01	26.3	75.93	2050	14	8.6	330	0.04	980
	32-41	05-May-01	20.41	58.45	5000	11	9.8	940	0.07	3000
	32-42	01-Apr-01	20.77	28.95	3000	14	8.2	430	0.07	10
	32-43	26-Mar-01	16.05	76.72	5000	11	7.1	460	303	3050
	32-50	27-Mar-01	32	92.38	31.4	12.5	9.6	380	0.05	2260
	32-51	05-May-01	23.25	76.49	3850	12.5	8	220	3.12	3150
	32-52	27-Mar-01	23.88	66.74	2640	13	10.3	150	0.03	2110
*	32-56	06-May-01		57.56						
	32-57	06-May-01	36.27	54.27	4680	12	7.1	700	2.75	2690
	32-58	25-Mar-01	6.96	34.48	3300	11.5	7	450	0.04	2260
	32-59	25-Mar-01	8.07	39.22	3390	12.5	7.1	400	-0.02	2320
	32-60	05-May-01	16.34	27.64	5800	11	7	570	8.3	4180
	32-69	05-May-01	19.8	66.47	3430	11	7.6	580	1.54	1960
	32-72	26-Mar-01	8.11	40.08	3800	10.5	6.9	830	25.1	2030
	5-01	25-Mar-01	16.89	45.15	3100	12	8.8	420	-0.02	2230
	5-02	25-Mar-01	14.97	17.53	2710	12	7.3	520	-0.02	1530
	5-03	25-Mar-01	10.5	40.63	2720	12.5	9.5	400	0.04	480
	5-04	25-Mar-01	6.49	65.12	1220	9	9.5	250	-0.02	550
	5-08	26-Mar-01	23.08	85.25	3000	12	8.8	510	0.02	1880
	5-73	26-Mar-01	5.9	31.53	3300	9	7	580	0.03	2230
	AW-1	27-Mar-01	30.5	81.22	3020	12	7.5	500	0.52	1830
	AW-1	06-May-01	30.78	81.22	3210	13	7.5	500	1.29	1790
	AW-2	27-Mar-01	25.58	85.77	3100	13.5	7.6	360	0.09	2500
*	C-3	10-May-01	0	12.17						
*	D-4	06-May-01	20.91	22.31						
	E-5	05-May-01	12.12	15.96	9000	10	7.2	2200	1.03	4480
*	MW-24	10-May-01	49.37	50.18						
	S-12	05-May-01	13.78	28.68	7000	10.5	6.5	1020	0.3	4790
	S-9	26-Mar-01	9.93	23.53	8100	11	9.5	2300	-0.02	4100

Notes:

* - Well was dry at time of sampling or insufficient water was present for sampling

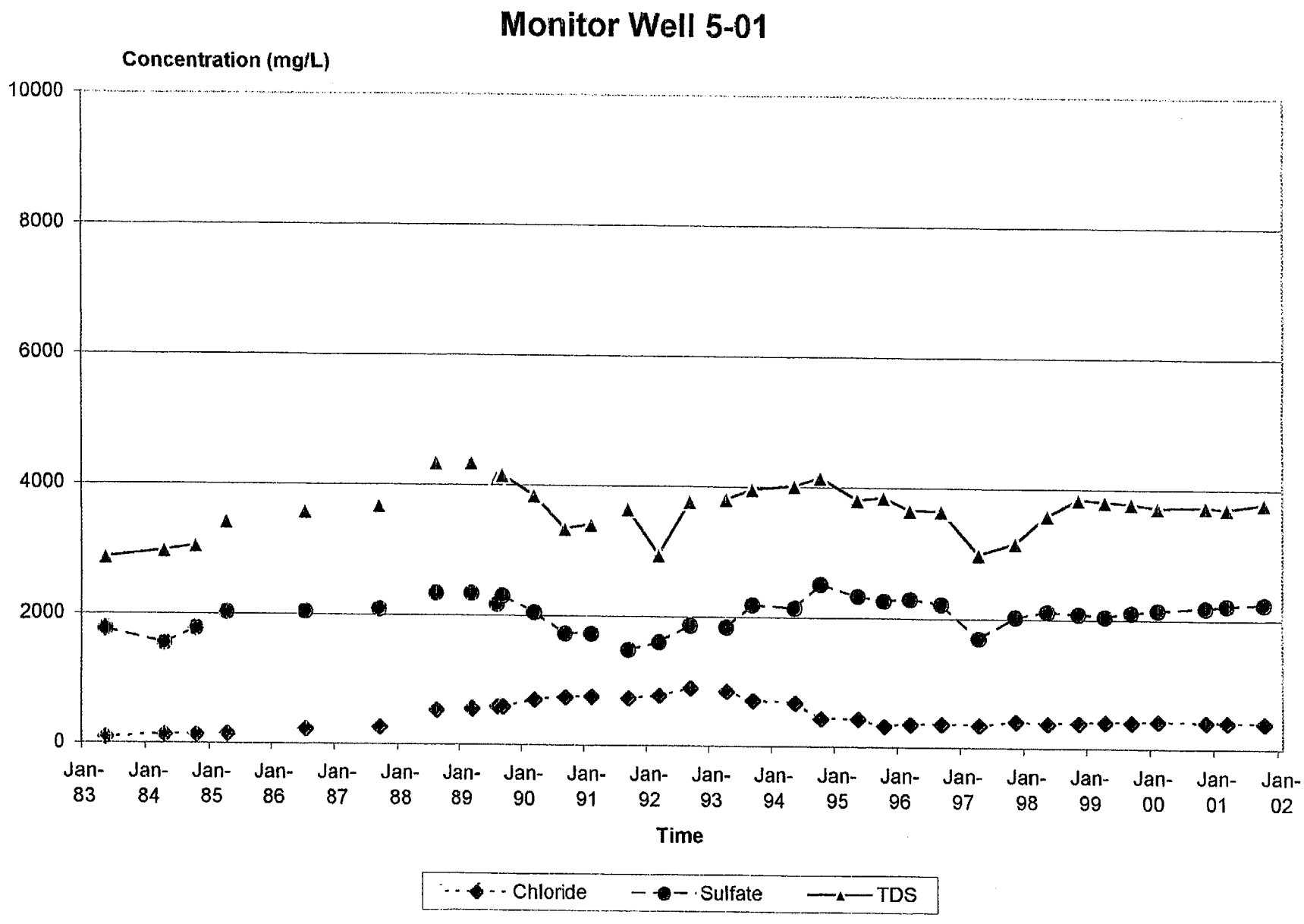
DISCHARGE PLAN DP-169
MONITORING REPORT - 2ND HALF 2001

	Well	Date	DTW	TD	Cond.	Temp (C)	pH	Cl (mg/l)	NO3 (mg/l)	SO4 (mg/l)
	30-03	22-Oct-01	17.59	18.65	3320	13.4	9.02	580	< 0.02	230
	30-04	8-Oct-01	31.68	88.7	3800	16	9.55	500	< 0.1	1510
#	30-46	24-Oct-01		38.37						
	30-47	8-Oct-01	43.46	79.09	5040	15	7.06	600	0.6	2390
	30-48	8-Oct-01	26.6	79.65	4770	16.1	7.77	680	0.1	2000
	30-49	8-Oct-01	40.88	69.09	5060	15.7	7.58	410	0.3	2670
#	30-53	24-Oct-01		50.12						
#	30-68	24-Oct-01		62.57						
	31-05	9-Oct-01	26.37	74.74	4950	15.8	7.41	630	0.2	2220
	31-61	31-Jul-01	17.57	27.05	7240	16.1	6.79	540	1.21	3890
	31-63	23-Oct-01	19.03	30.54	15920	13.8	6.05	2780	0.18	6610
	31-65	15-Oct-01	16.39	46.1	8420	15.5	6.91	940	9.5	4000
	31-70	23-Oct-01	15.52	32.94	13540	14.7	5.62	1440	0.03	7800
	31-71	22-Oct-01	16.07	63.86	5420	13.4	7.05	700	0.05	2120
	32-01	9-Oct-01	16.1	52.64	3550	15	8.58	490	0.1	1250
	32-02	9-Oct-01	28.9	77.25	4210	15.5	8.88	550	0.1	1550
	32-41	9-Oct-01	22.25	58.46	8860	14.6	7.49	1480	0.1	3440
	32-42	9-Oct-01	21	28.83	3720	14.6	8.66	430	0.2	200
	32-43	9-Oct-01	16.41	76.65	7770	15.9	7.11	470	308	3110
	32-50	15-Oct-01	32.47	92.52	4460	14.9	9.24	380	0.04	2140
	32-51	15-Oct-01	23.99	76.47	5290	14.8	8.32	230	2.51	3190
	32-52	15-Oct-01	24.88	66.7	3710	15	9.77	171	0.14	2060
#	32-56	22-Oct-01		57.55						
	32-57	22-Oct-01	36.5	54.66	6400	13.8	7.58	830	1.8	2630
	32-58	15-Oct-01	8.78	34.46	4950	17.2	6.85	480	0.02	2210
	32-59	30-Jul-01	9.9	39.32	4670	16.9	7.13			
	32-60	23-Oct-01	16.29	27.64	8060	14.1	6.75	700	8.6	3990
	32-69	9-Oct-01	20.49	66.44	4790	15	7.22	600	0.5	1850
	32-72	22-Oct-01	8.67	40.07	5830	16.3	6.96	770	11	1910
	5-01	16-Oct-01	18.48	45.25	4580	14.6	9.12	404	< 0.02	2250
	5-02	22-Oct-01	16.29	38.69	4230	15.1	7.59	590	< 0.02	1500
	5-03	30-Jul-01	12.2	40.36	3750	17.4	8.92			
	5-04	16-Oct-01	12.57	65.31	2040	15	9.08	268	0.04	570
	5-08	16-Oct-01	25.13	88.13	4470	14.5	7.27	740	0.03	1230
	5-73	16-Oct-01	8.05	31.53	5150	16.3	7.08	540	< 0.02	2170
	AW-1	8-Oct-01	31.82	81.25	4360	15.1	7.42	500	0.4	1690
	AW-2	15-Oct-01	26.66	85.97	4540	15	7.3	247	0.22	2410
	C-3	24-Oct-01		12.2						
	D-4	23-Oct-01	19.71	22.3	13740	16.2	6.19	5900	2.5	20
	E-5	23-Oct-01	11.53	15.96	13570	16.5	6.68	2190	0.03	4290
	MW-24	31-Jul-01	49.39	50.18						
	S-12	13-Oct-01	13.63	28.56	10050	15.6	6.58	1110	< 0.02	4640
	S-9	23-Oct-01	9.57	23.57	11930	16.9	8.94	2410	< 0.02	4070

- DRY WELL
* - Insufficient Water for sample collection

APPENDIX B

TIME vs CONCENTRATION PLOTS
ALLUVIAL WELLS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Jan-93
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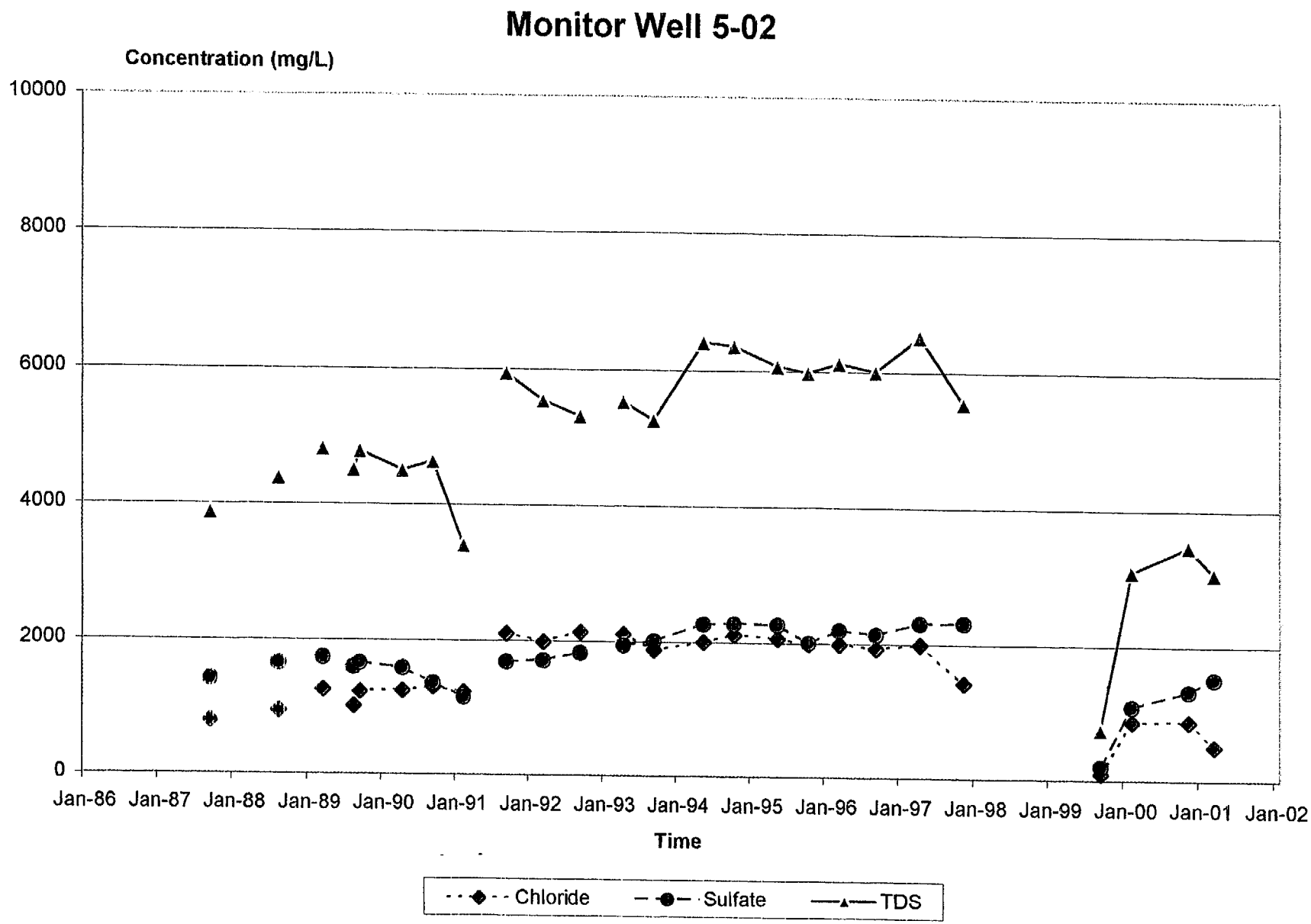
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
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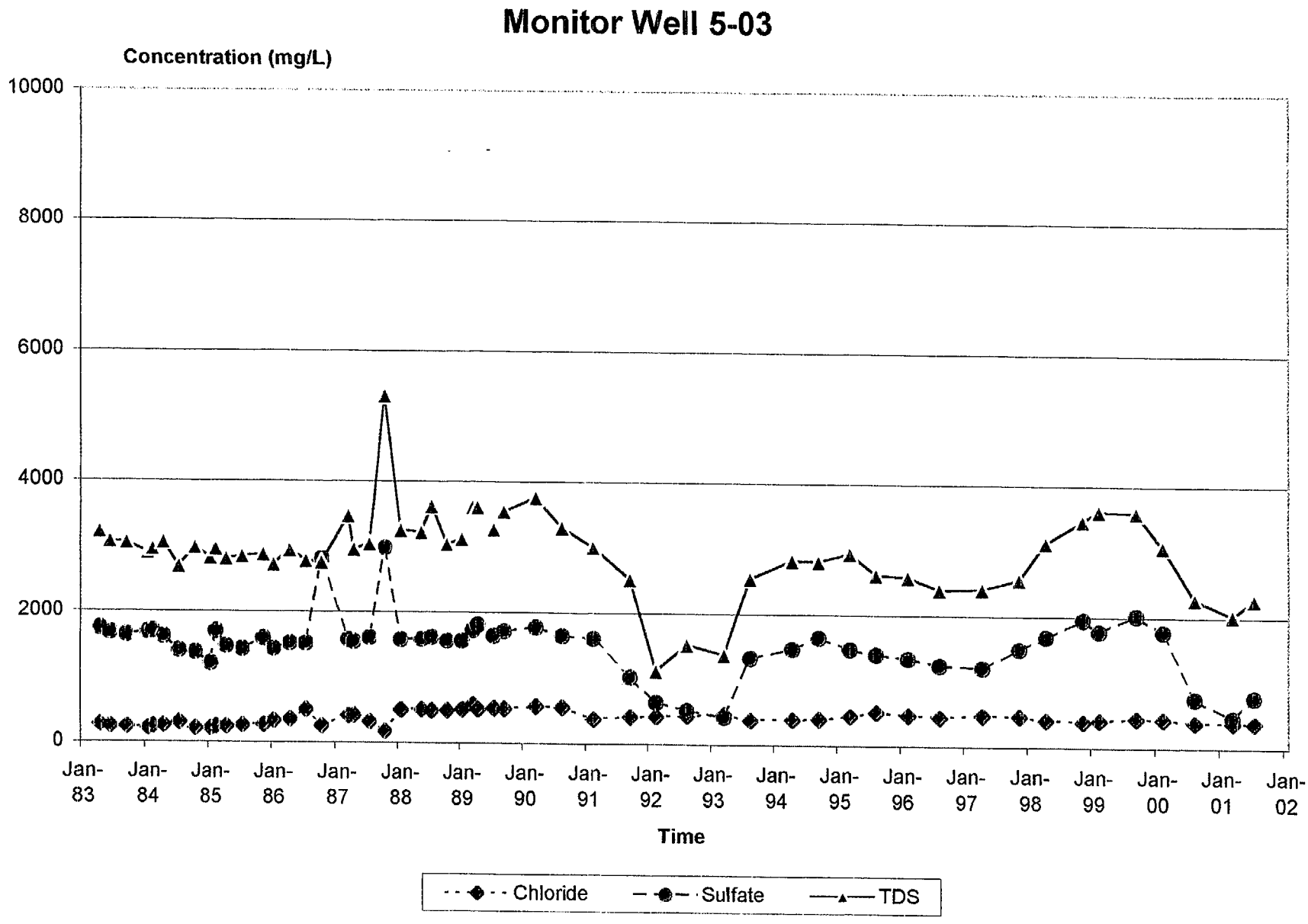
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
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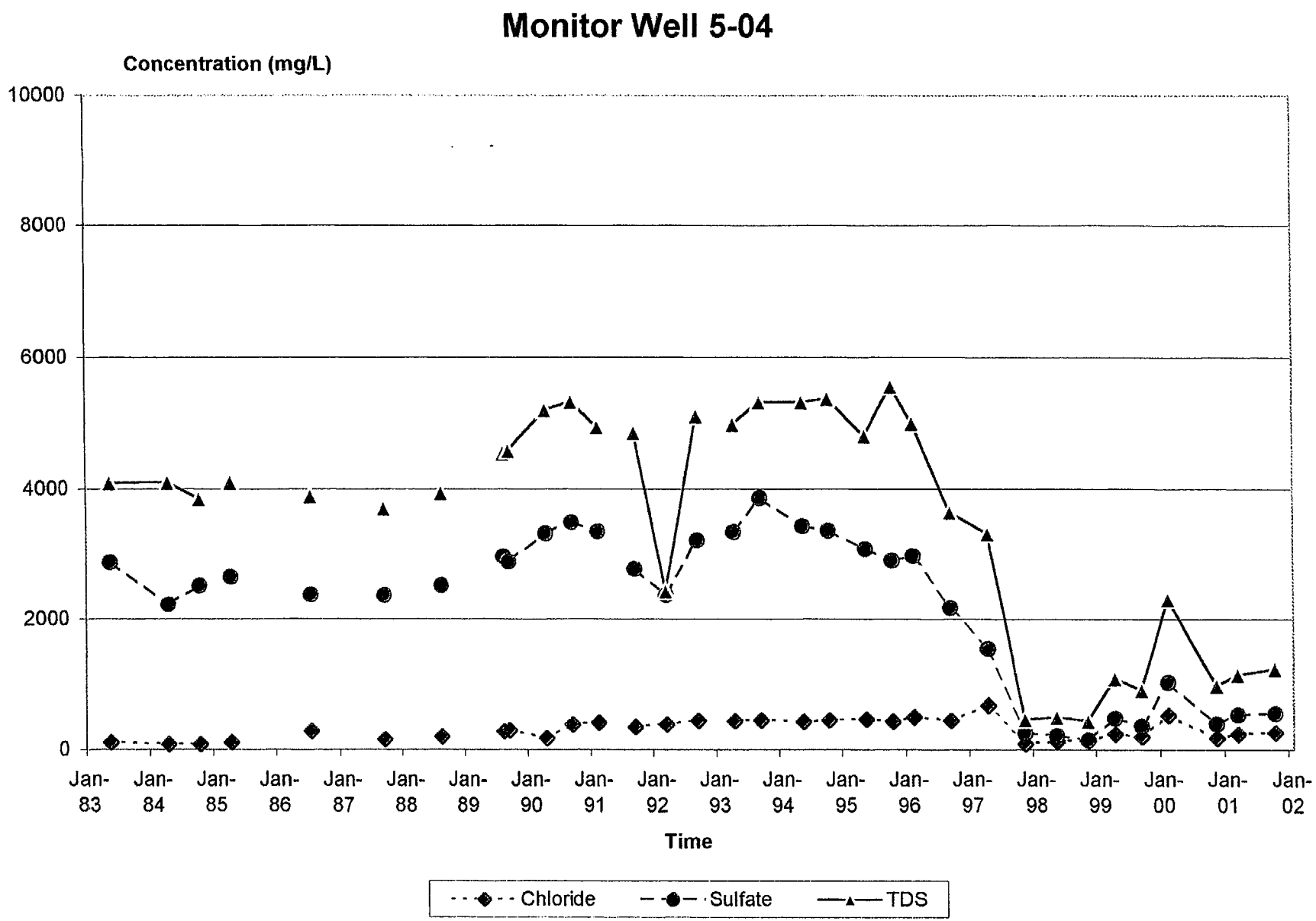
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
Jan-94
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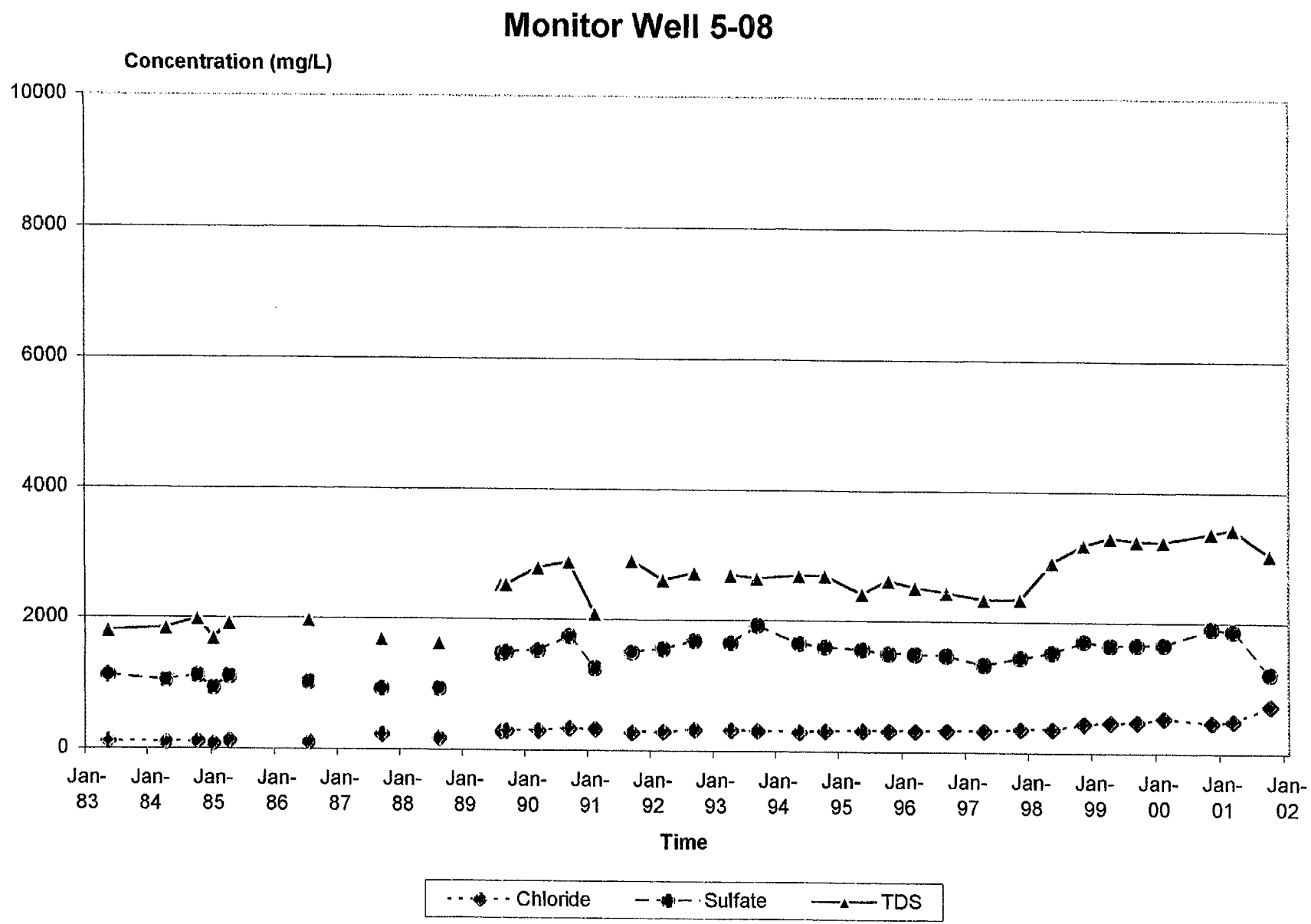
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
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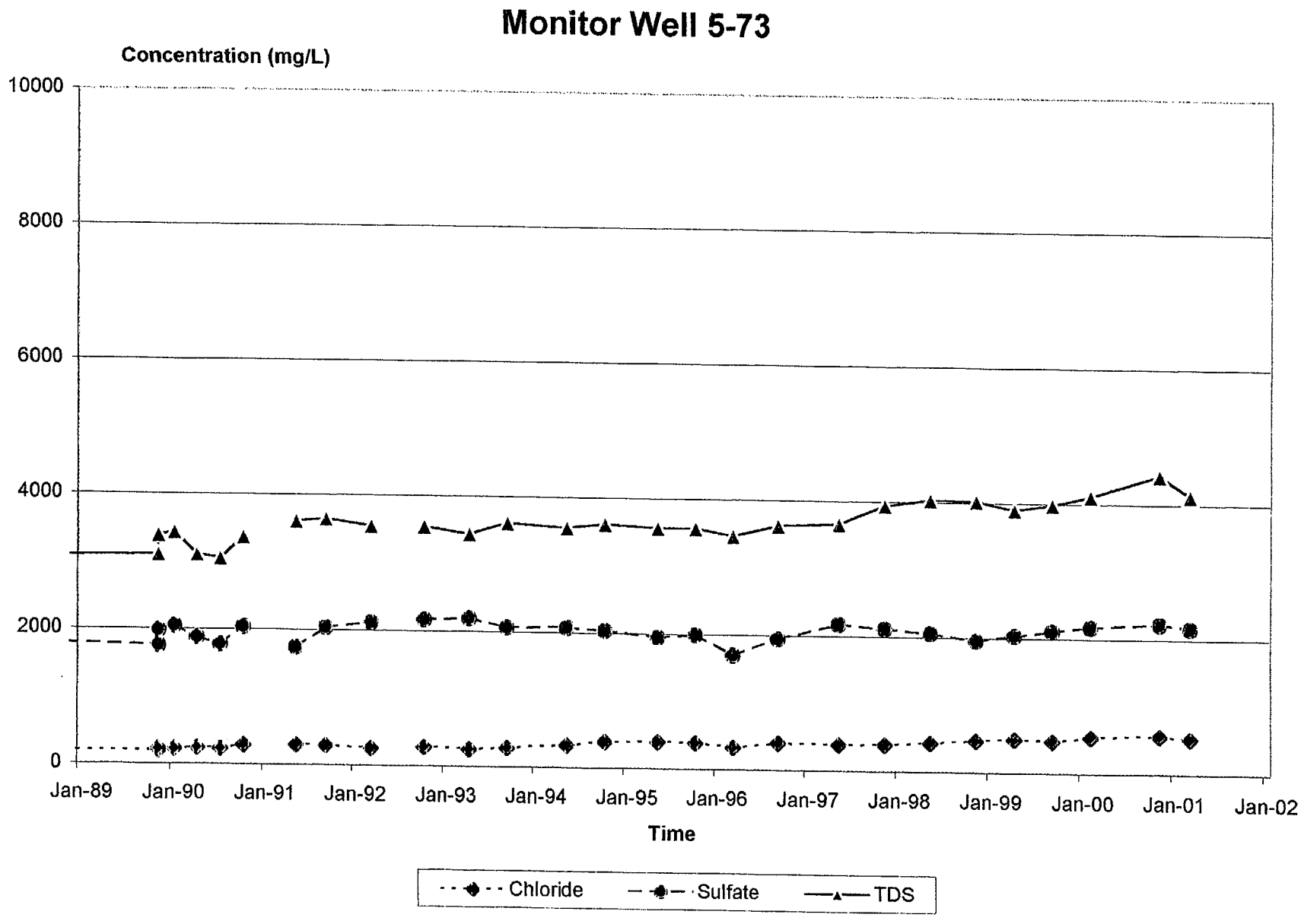
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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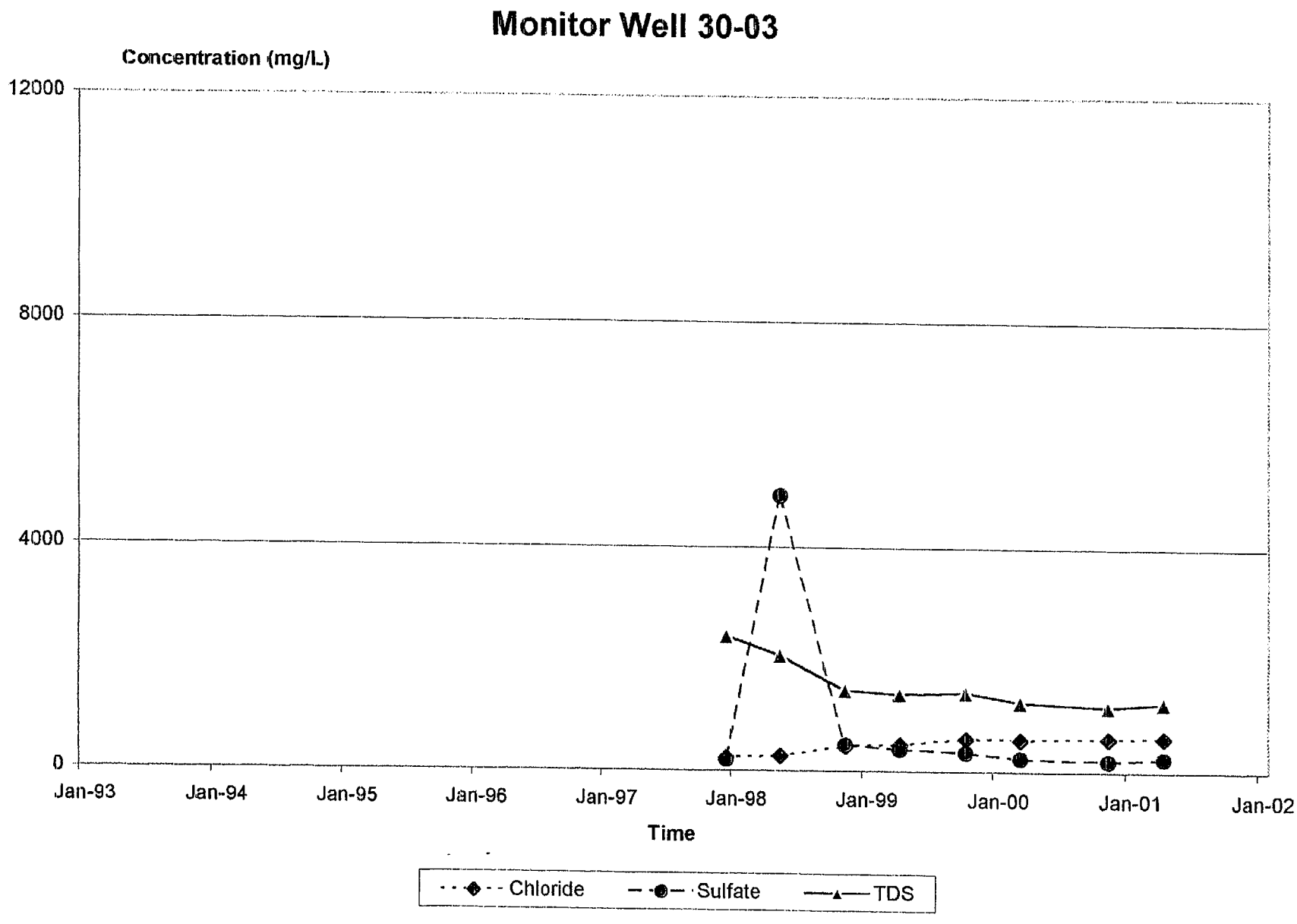
Jan-02
Time
Chloride
Sulfate
TDS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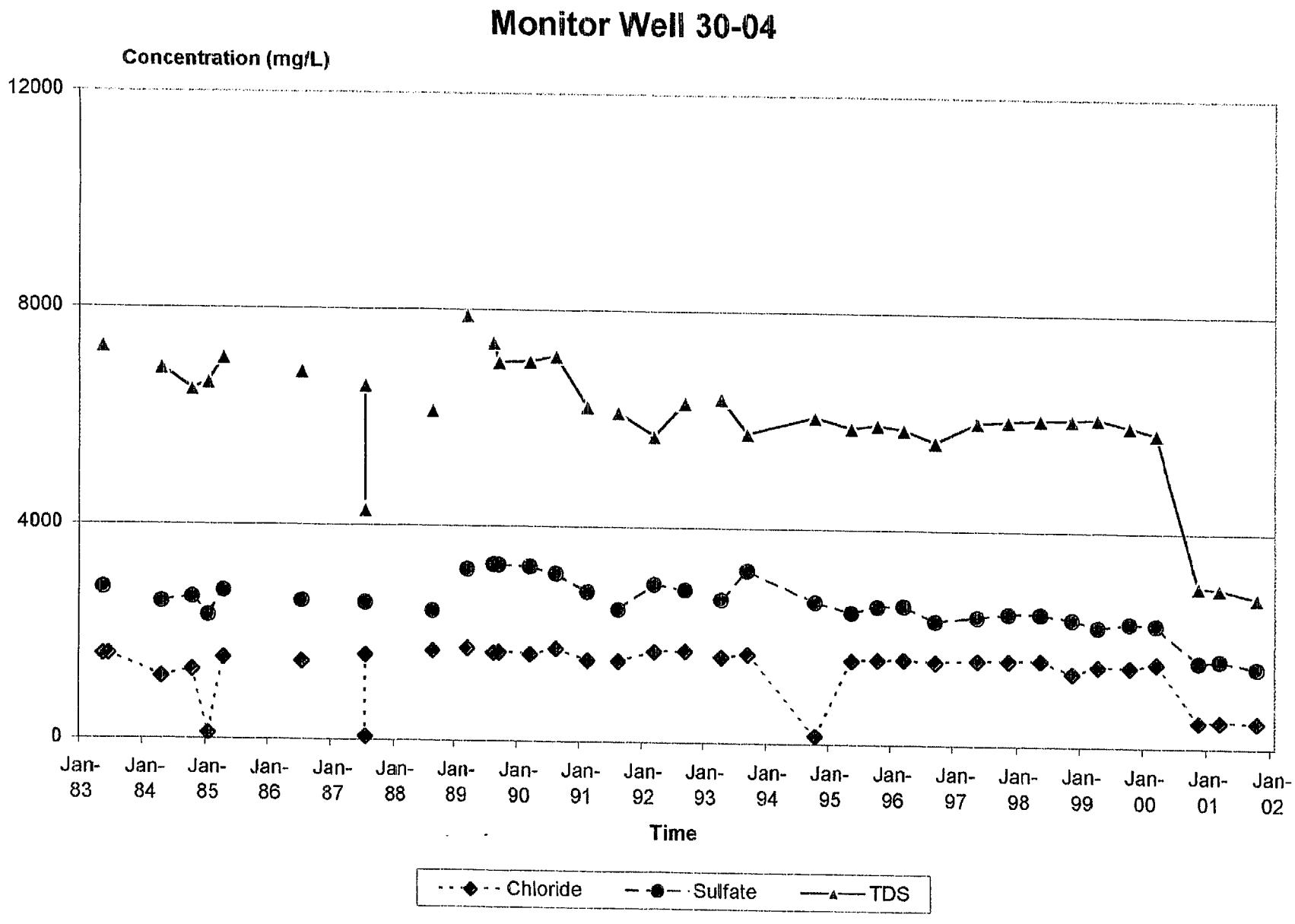
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
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Jan-97
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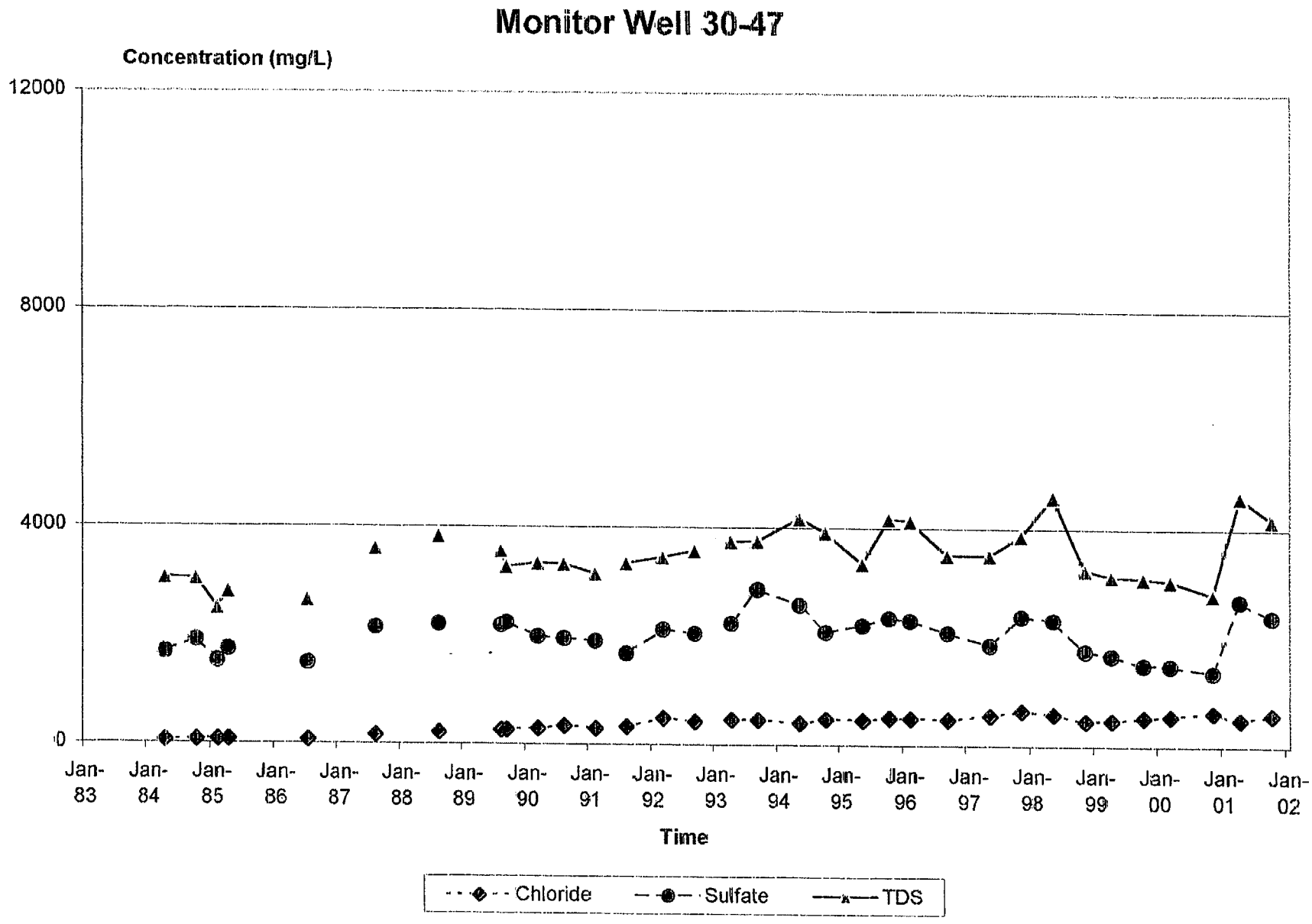
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
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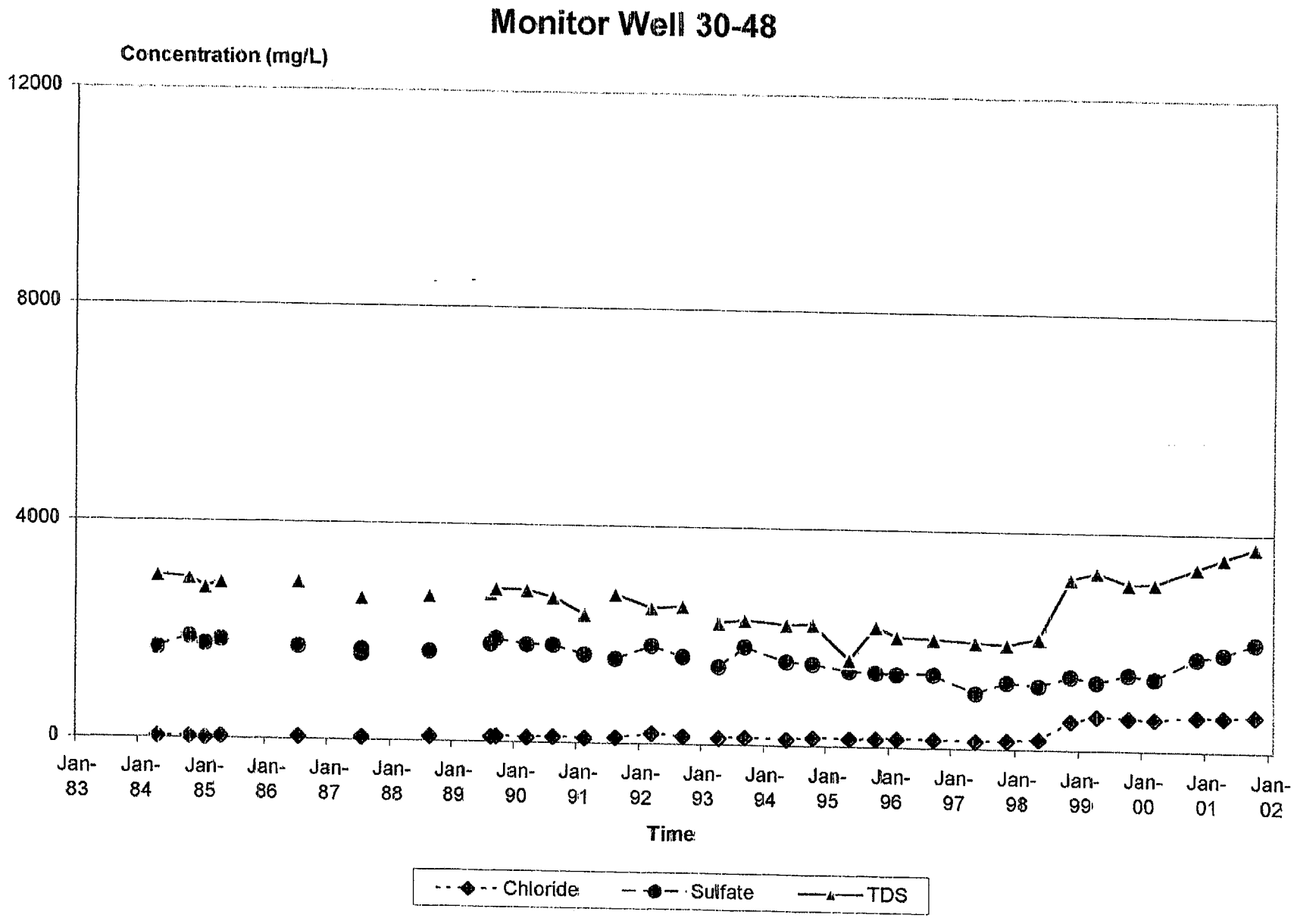
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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Jan-88
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Jan-93
Jan-94
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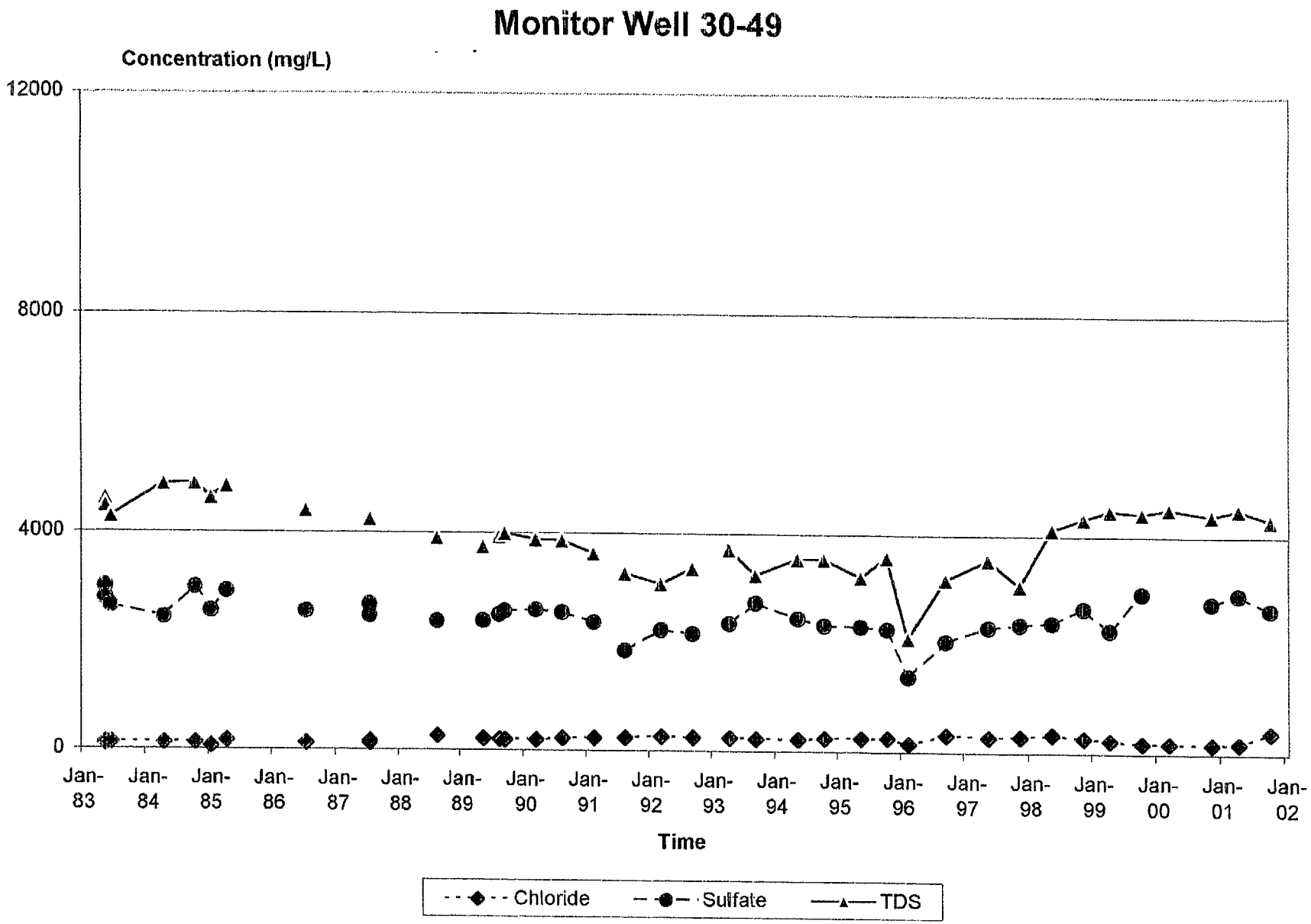
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS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Jan-93
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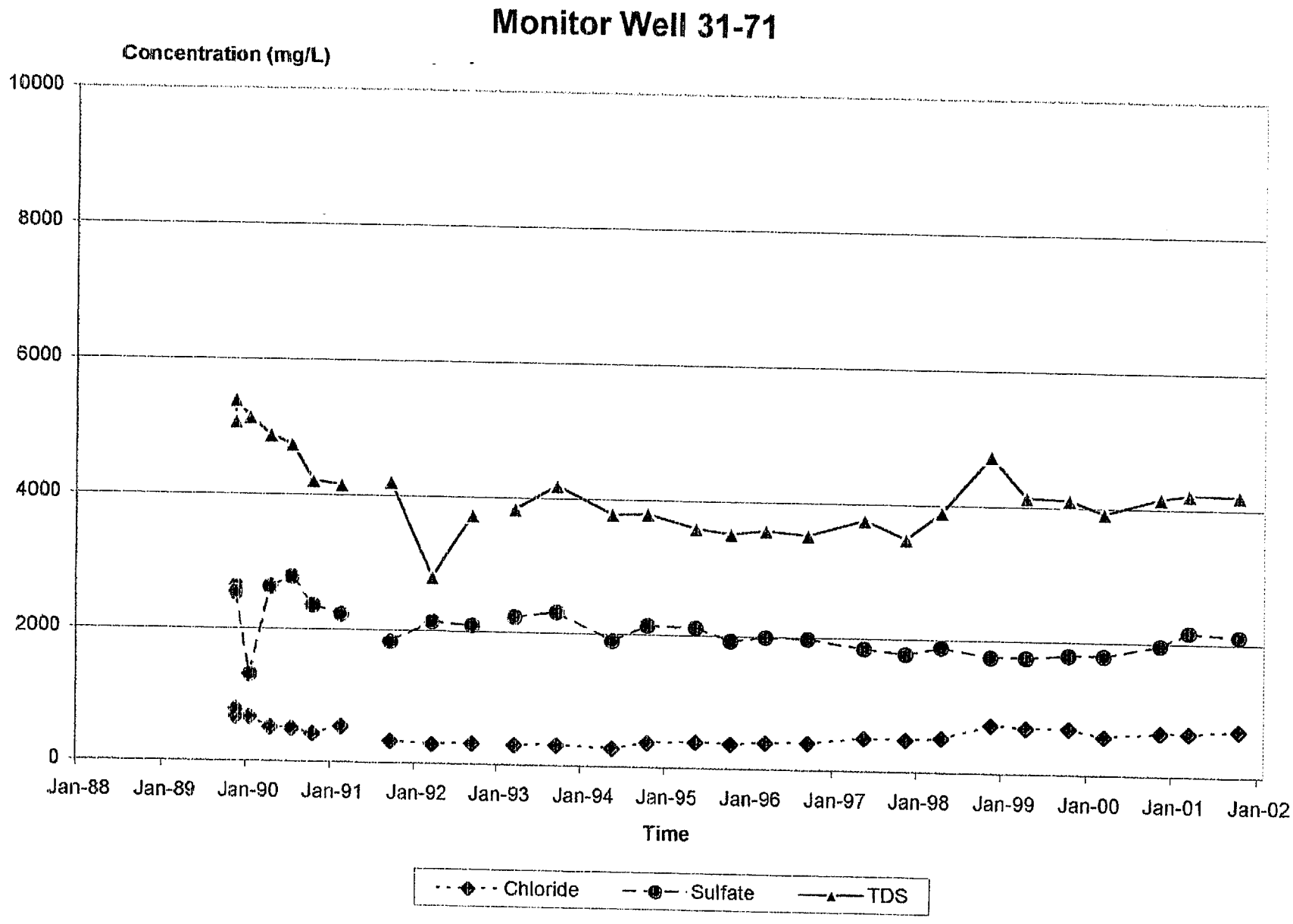
Jan-02
Time
Chloride
Sulfate
TDS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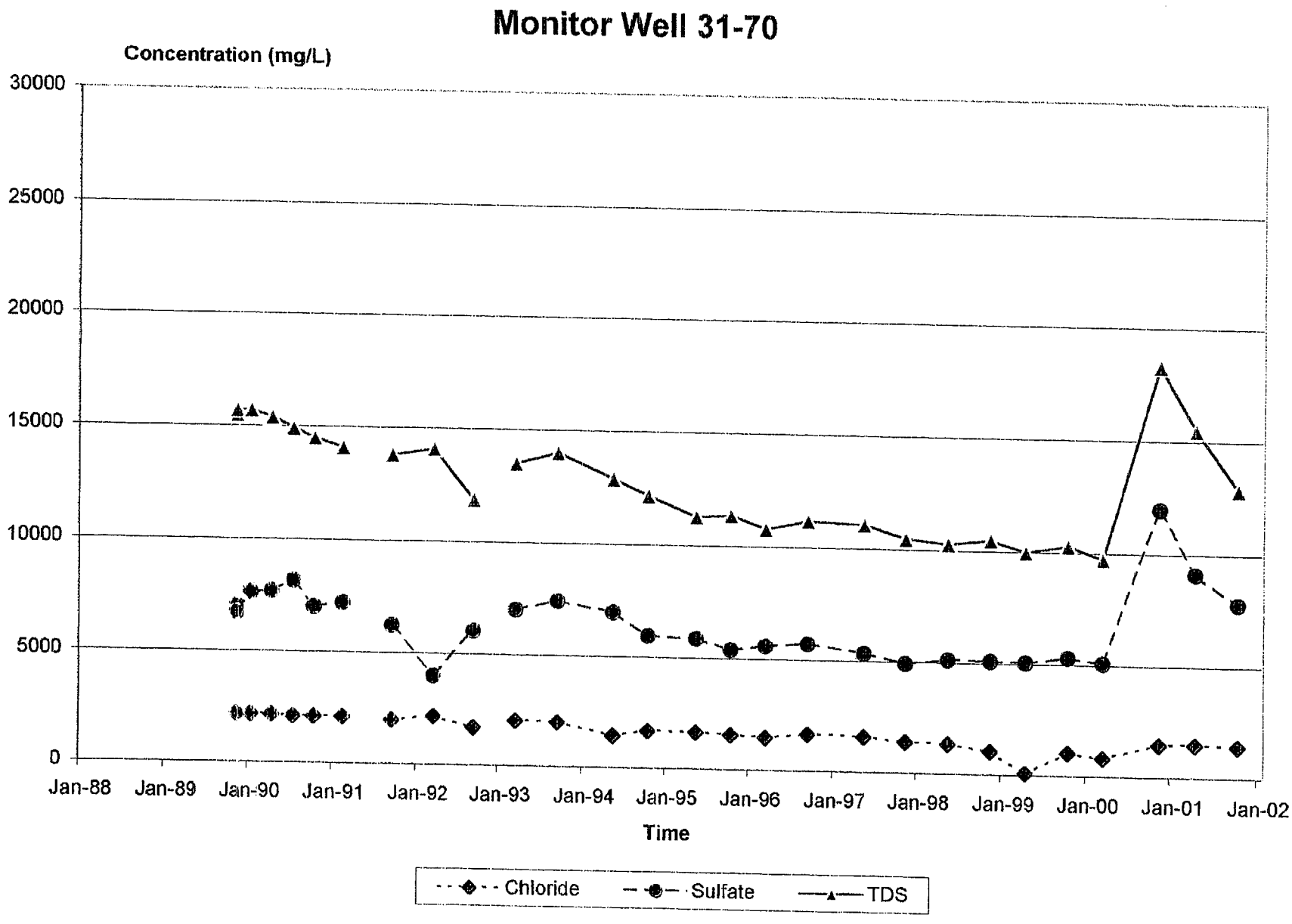
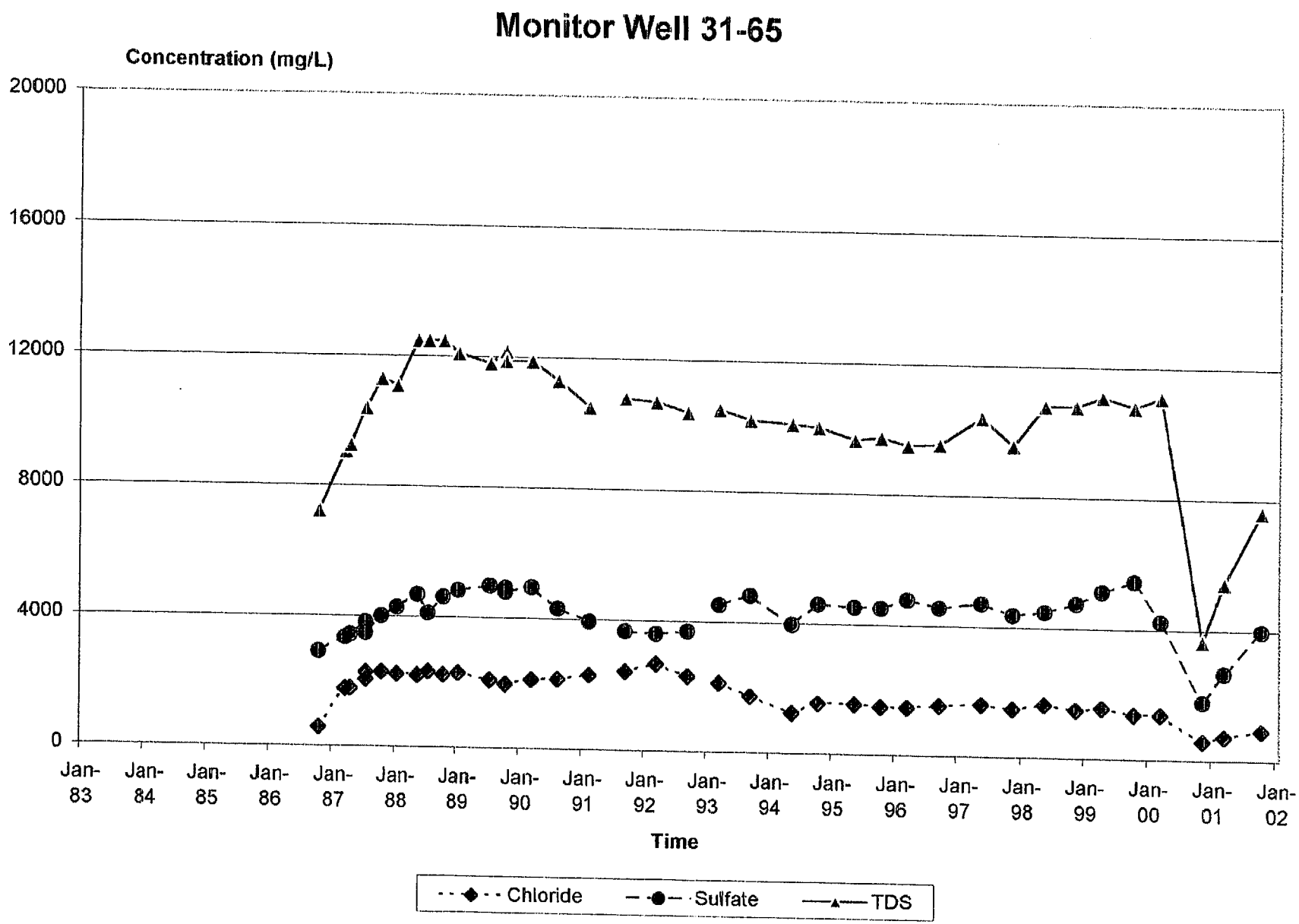
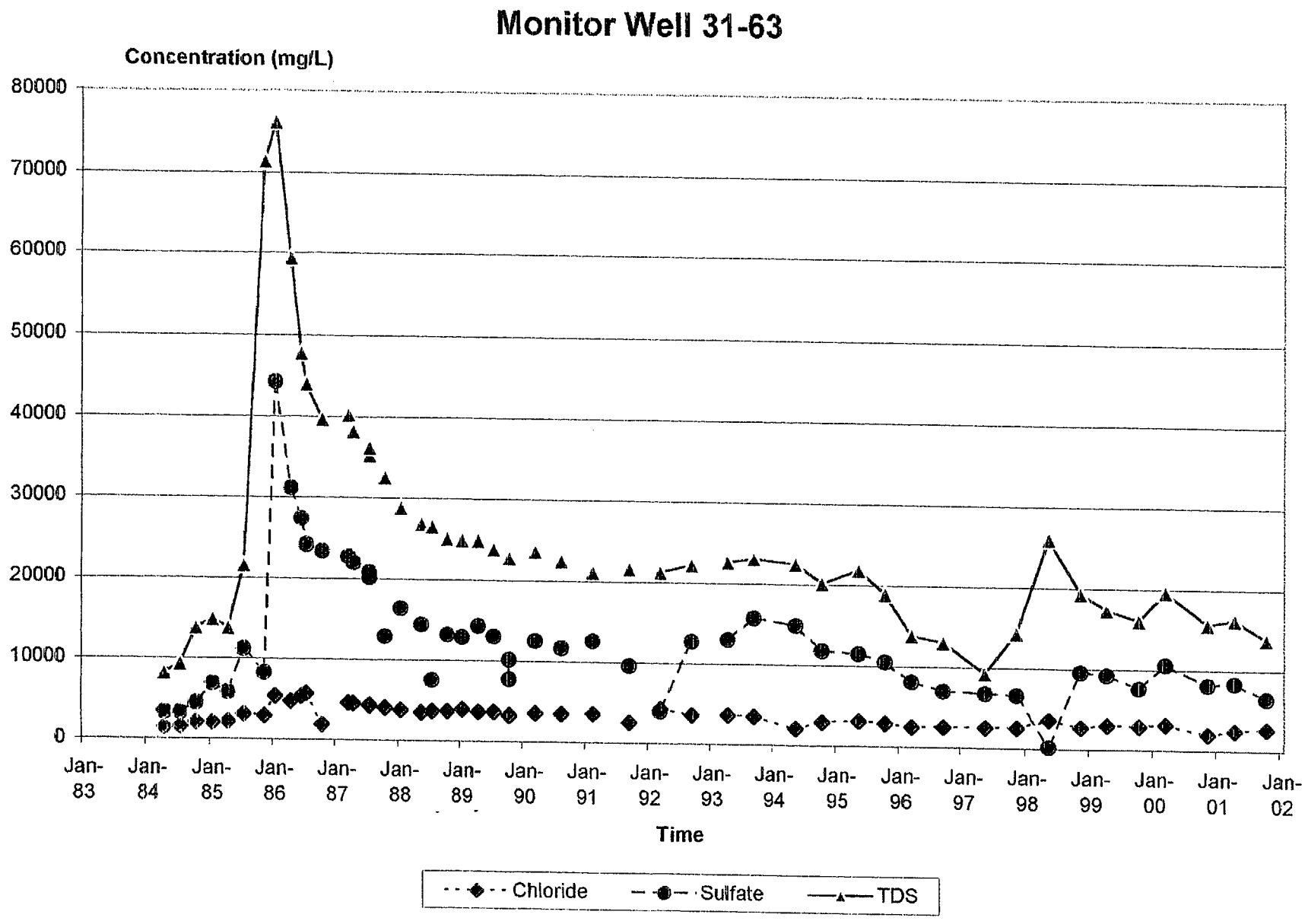
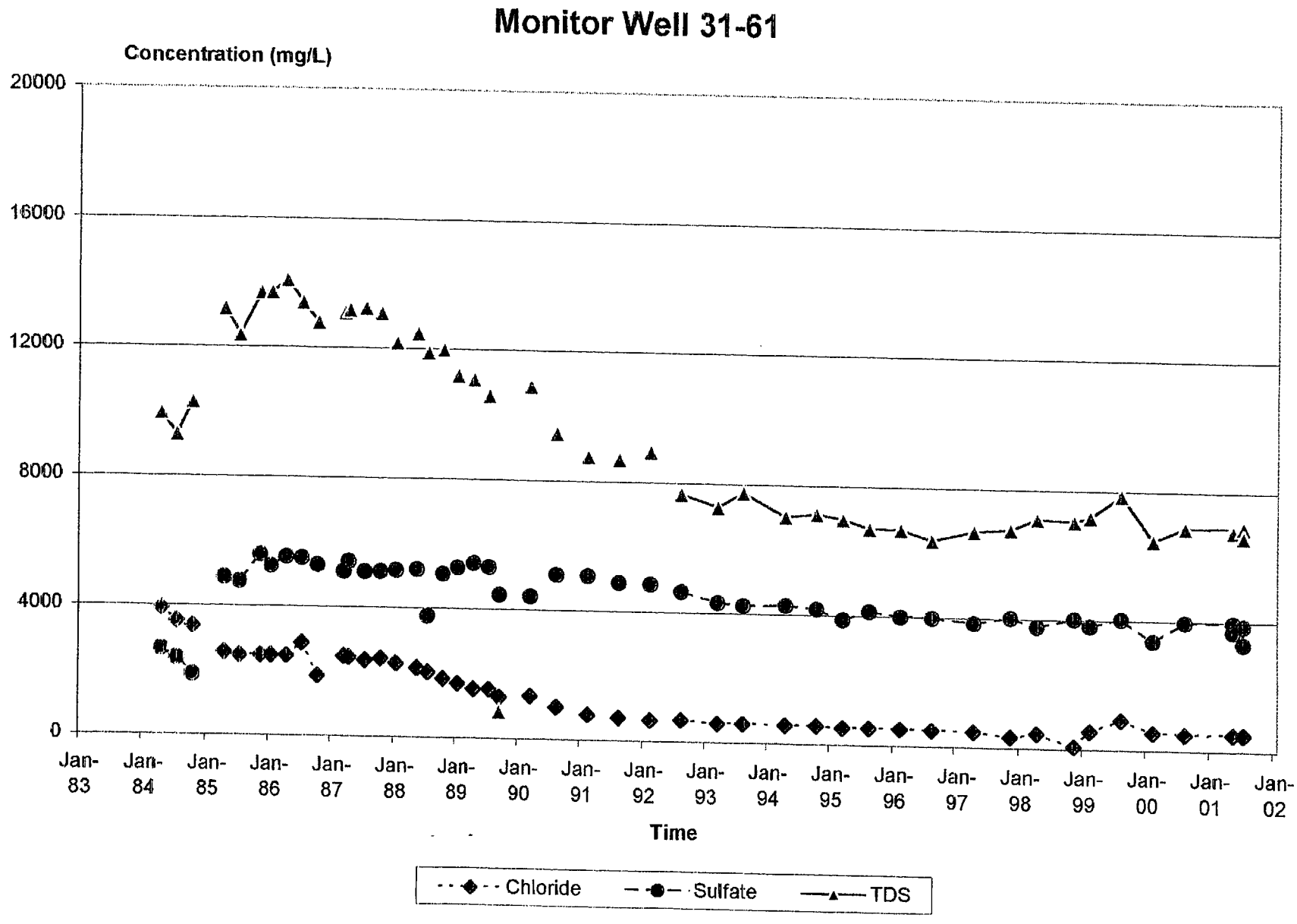
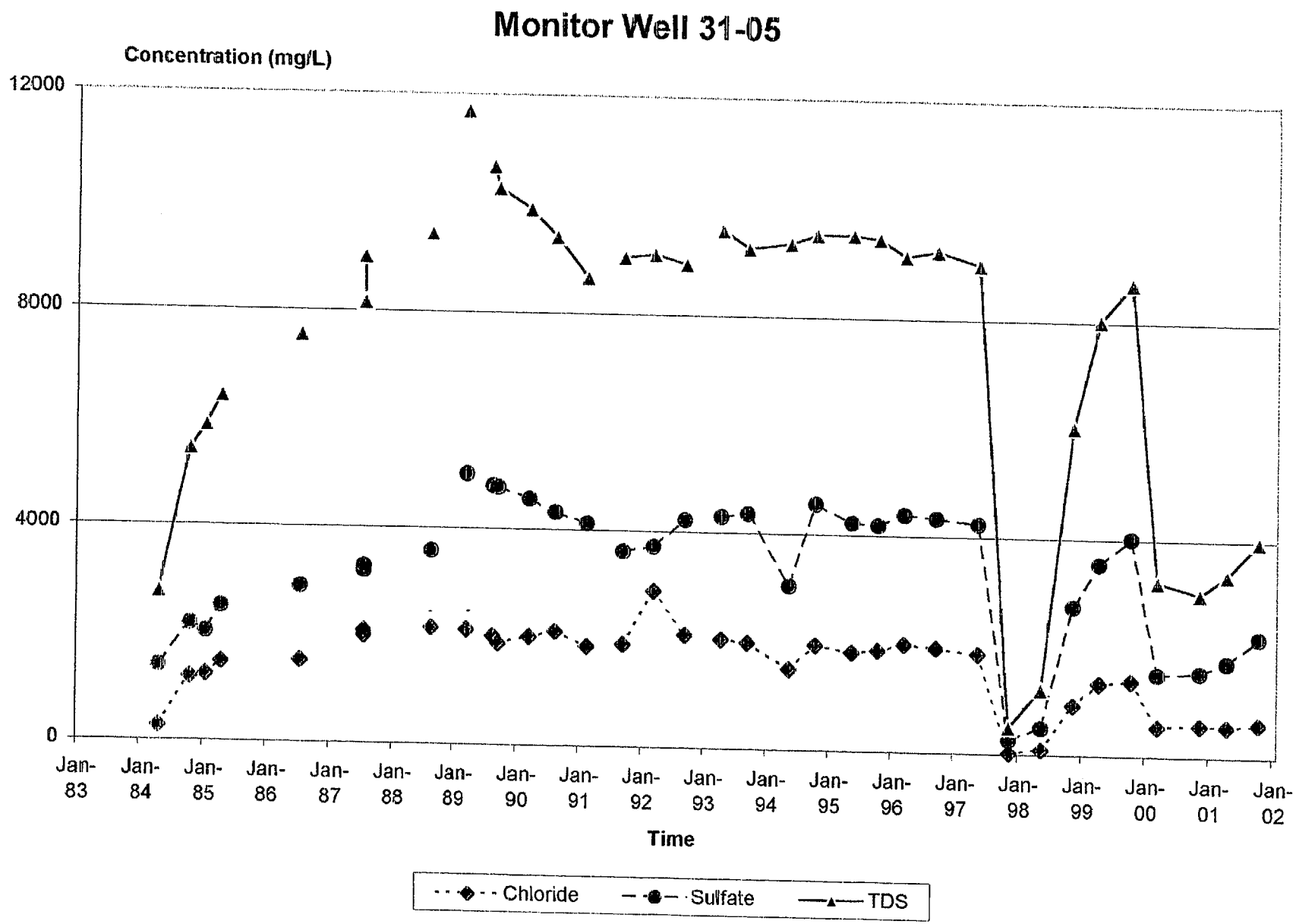
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

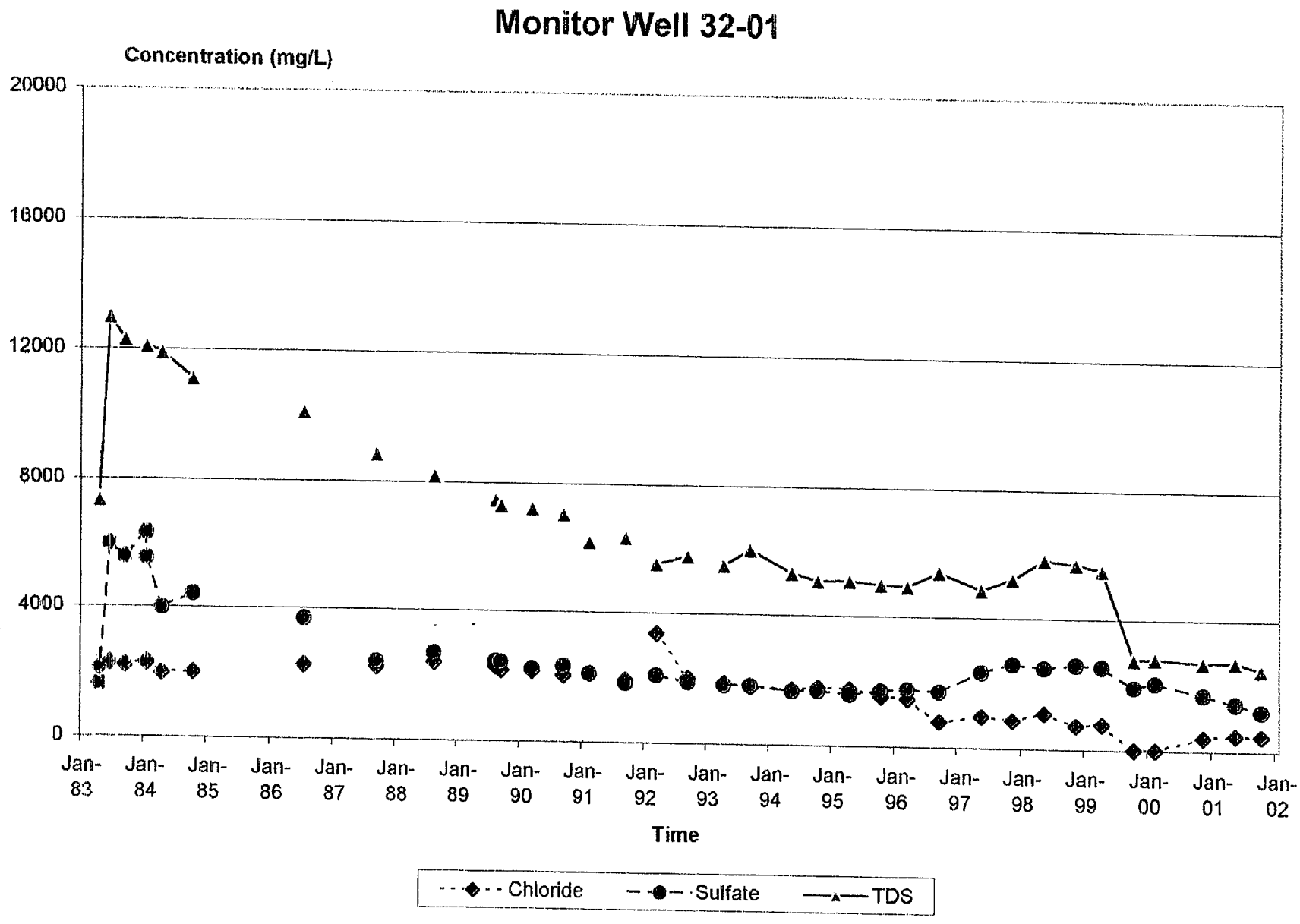

Monitor Well 31-70
Concentration (mg/L)
30000
25000
20000
15000
10000
5000
0
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

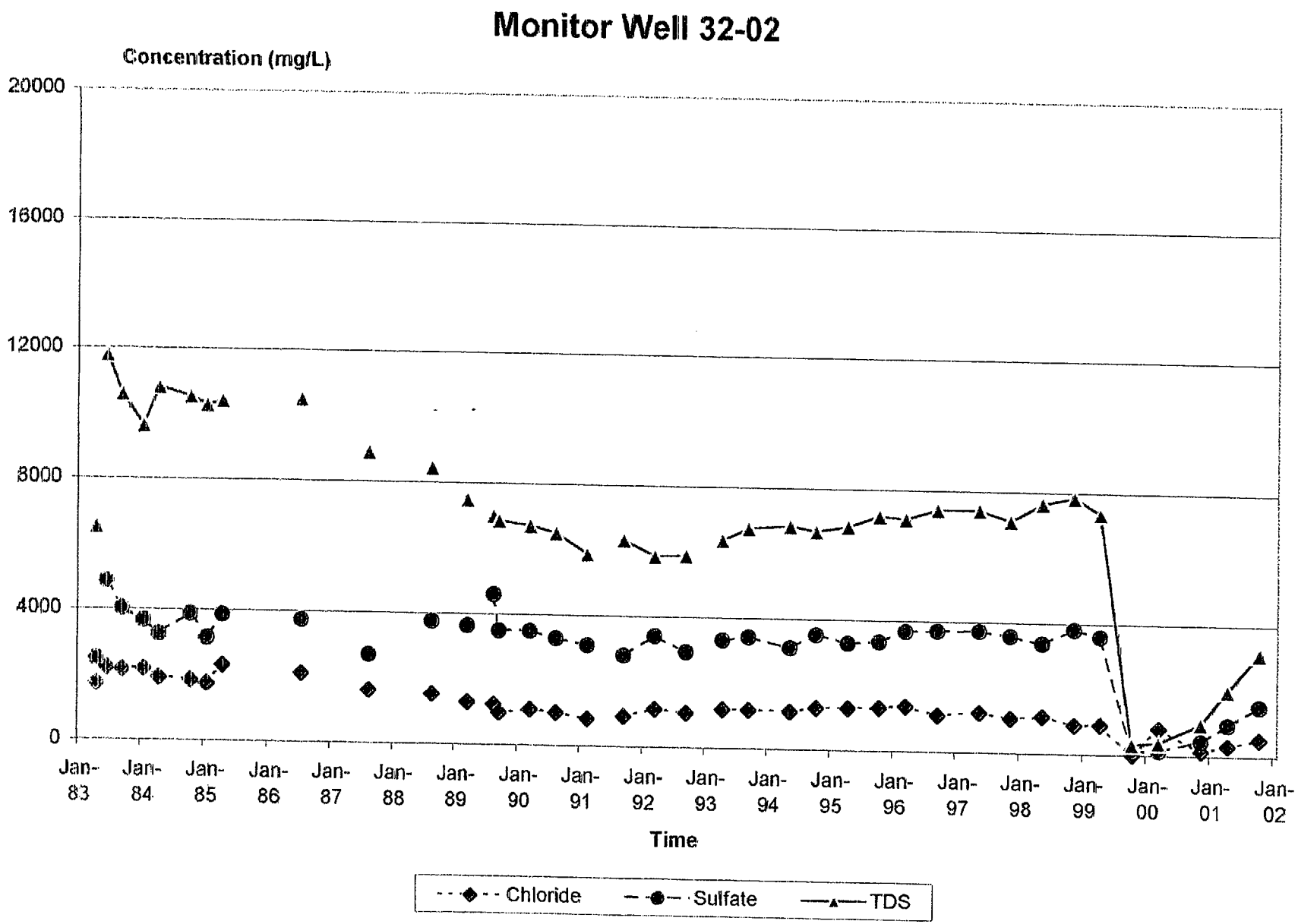

Monitor Well 31-65
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

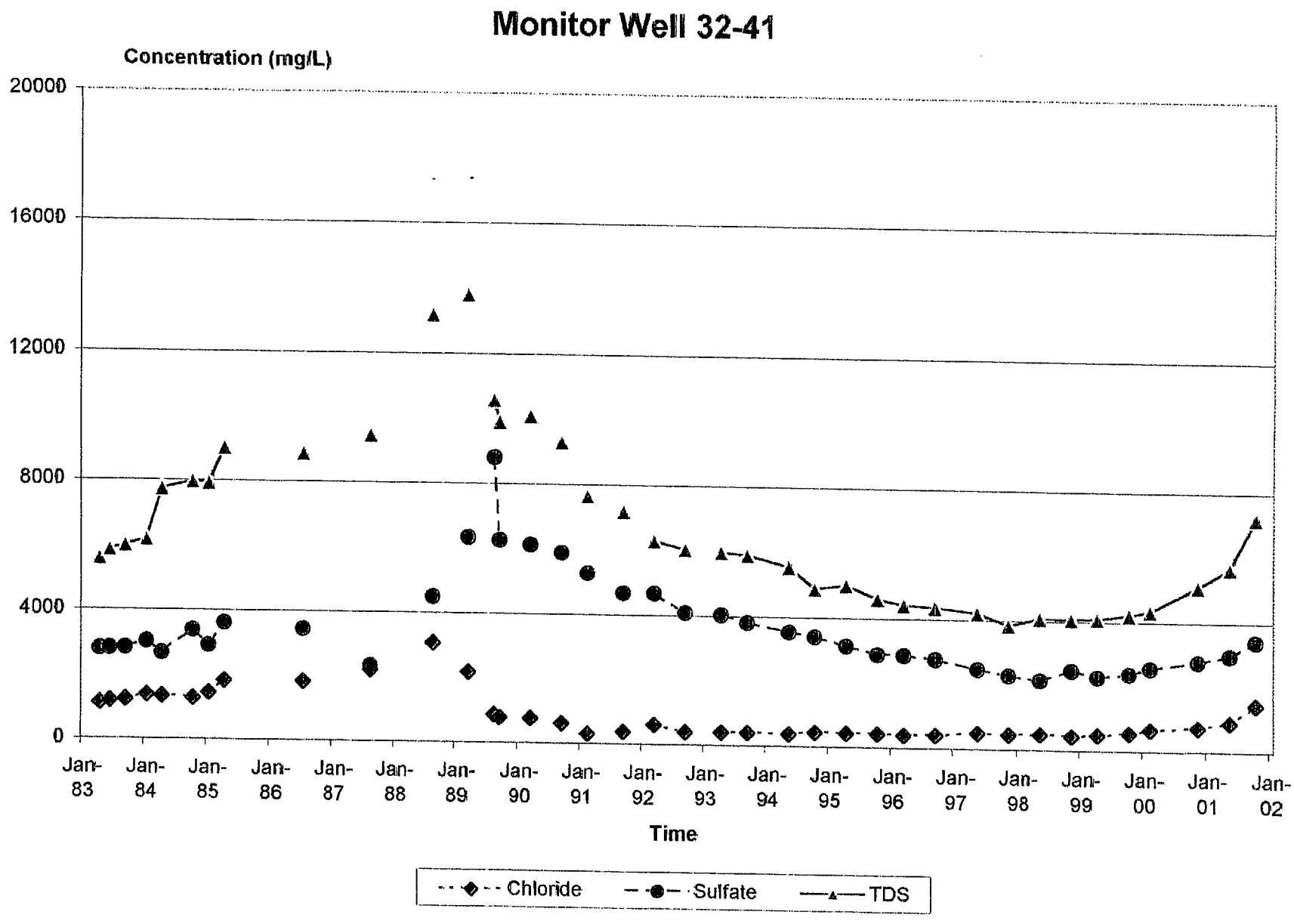

Monitor Well 31-63
Concentration (mg/L)
80000
70000
60000
50000
40000
30000
20000
10000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

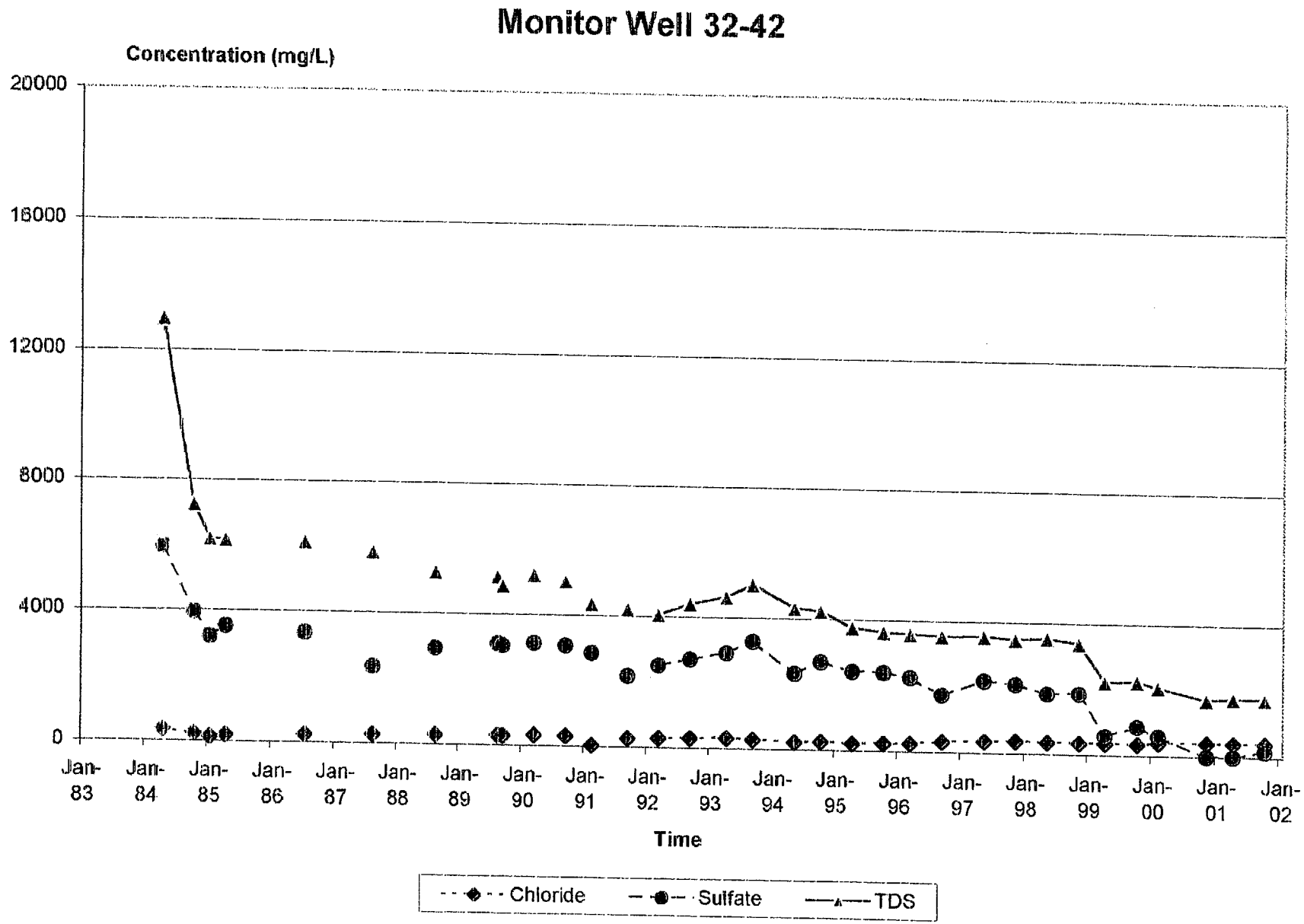

Monitor Well 31-61
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

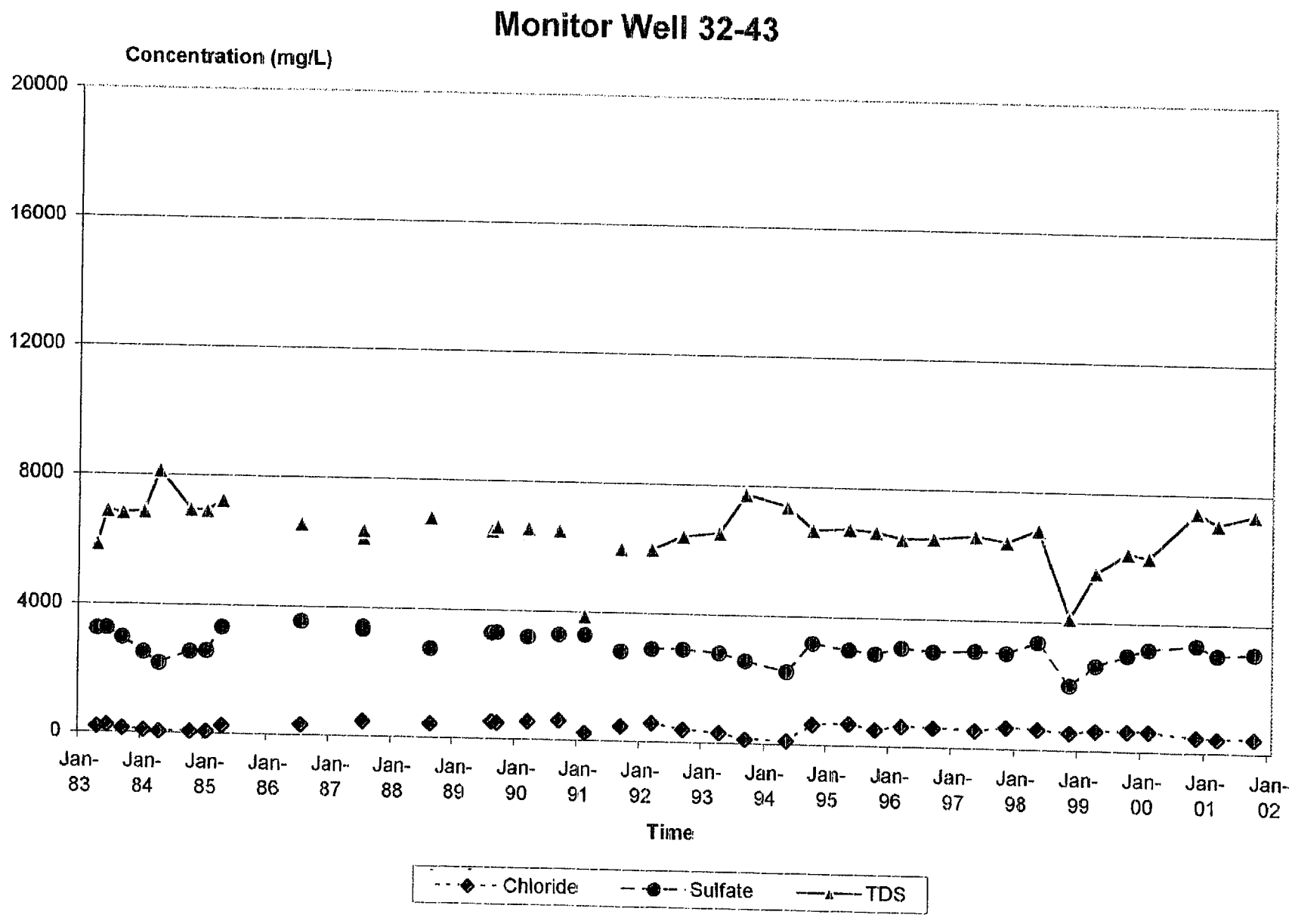

Monitor Well 31-05
Concentration (mg/L)
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

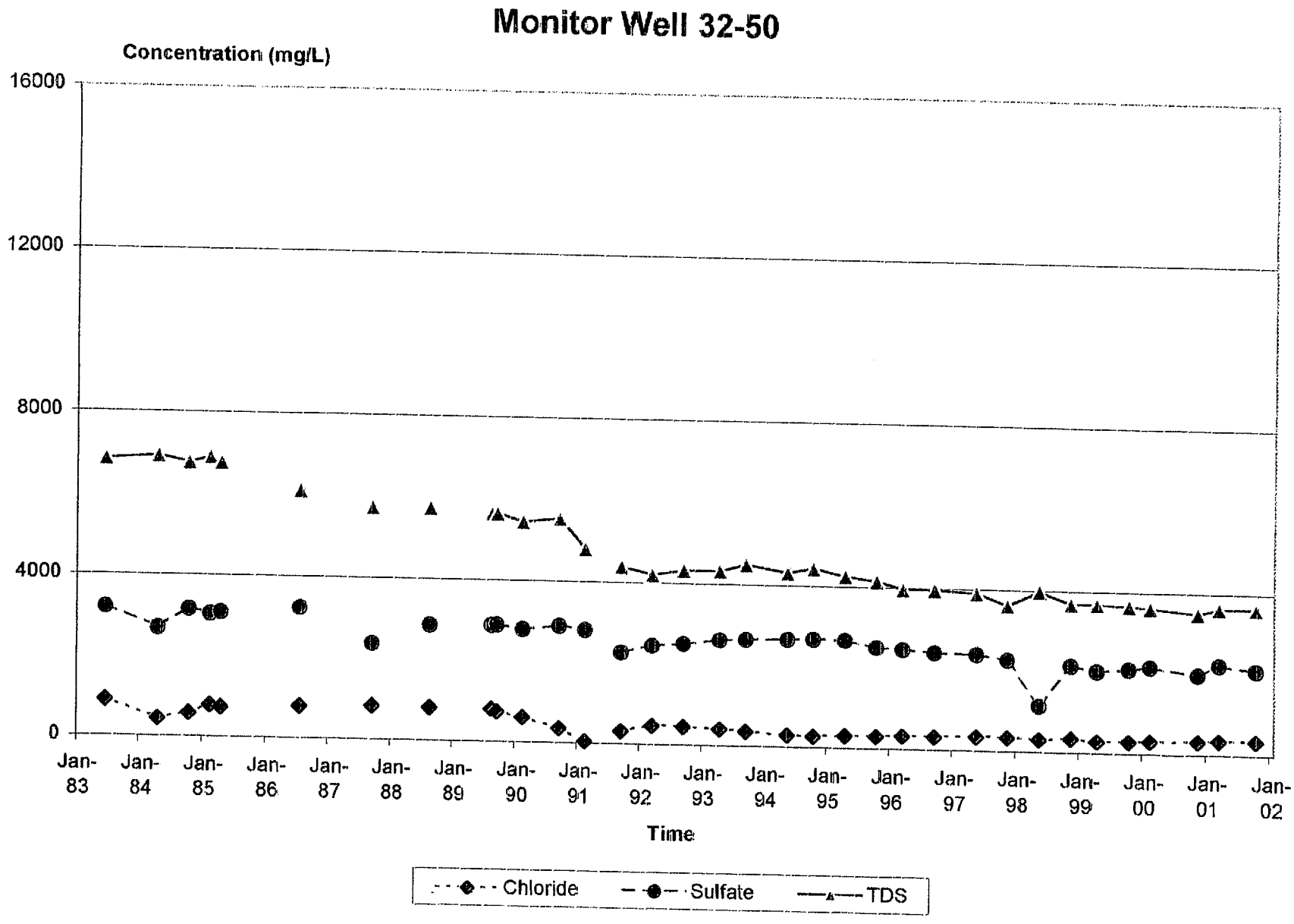

Monitor Well 32-01
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

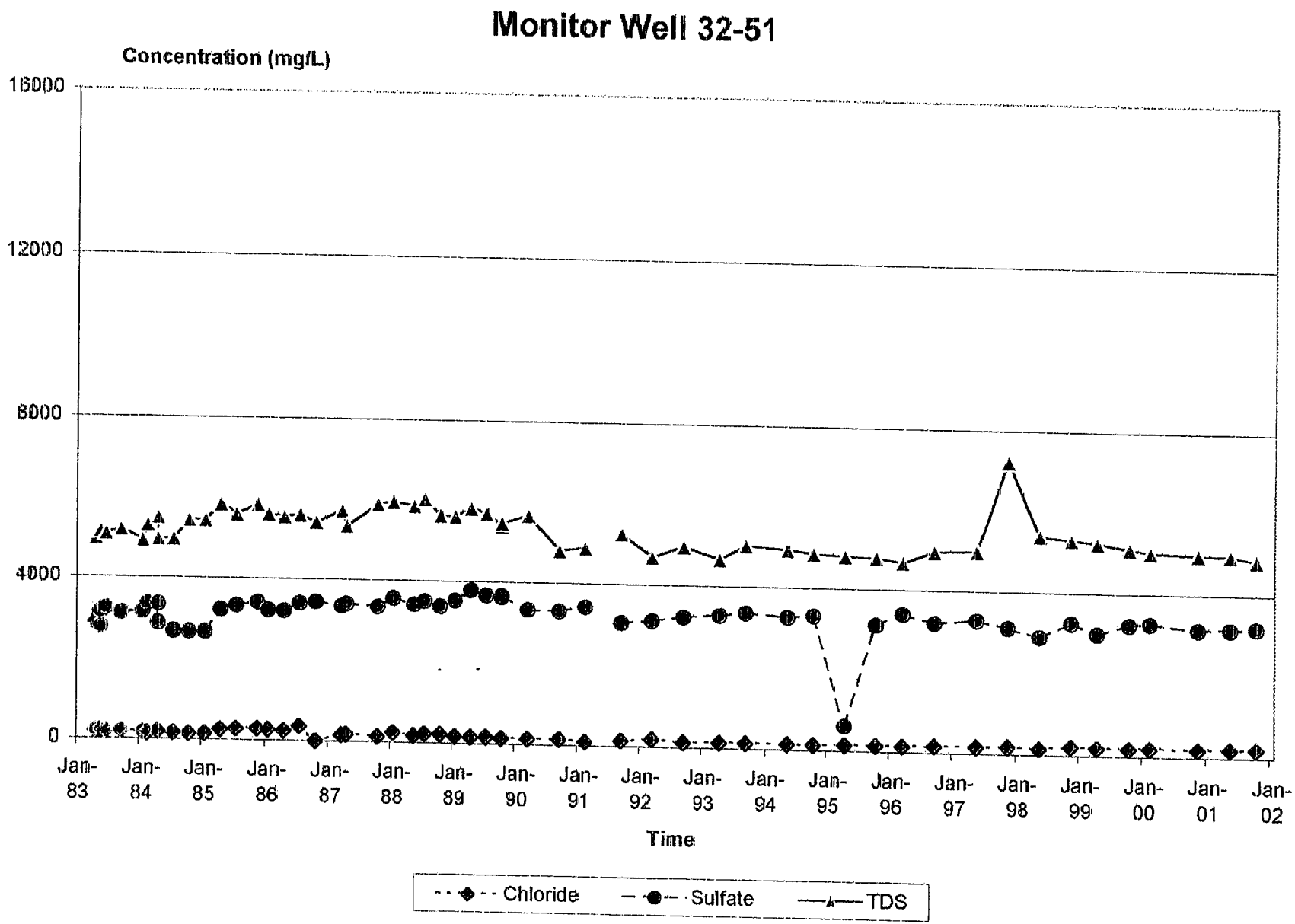

Monitor Well 32-02
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

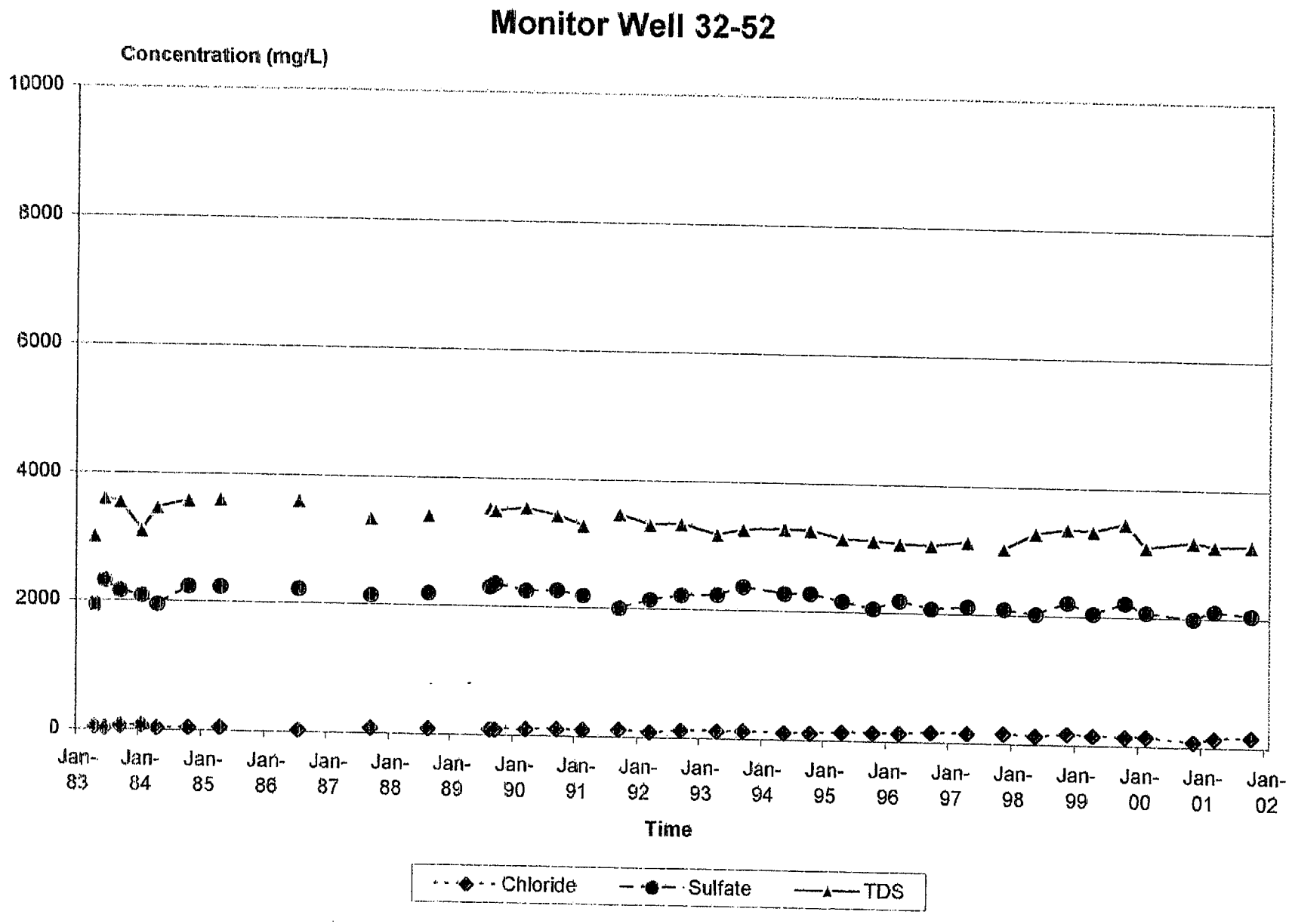

Monitor Well 32-41
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

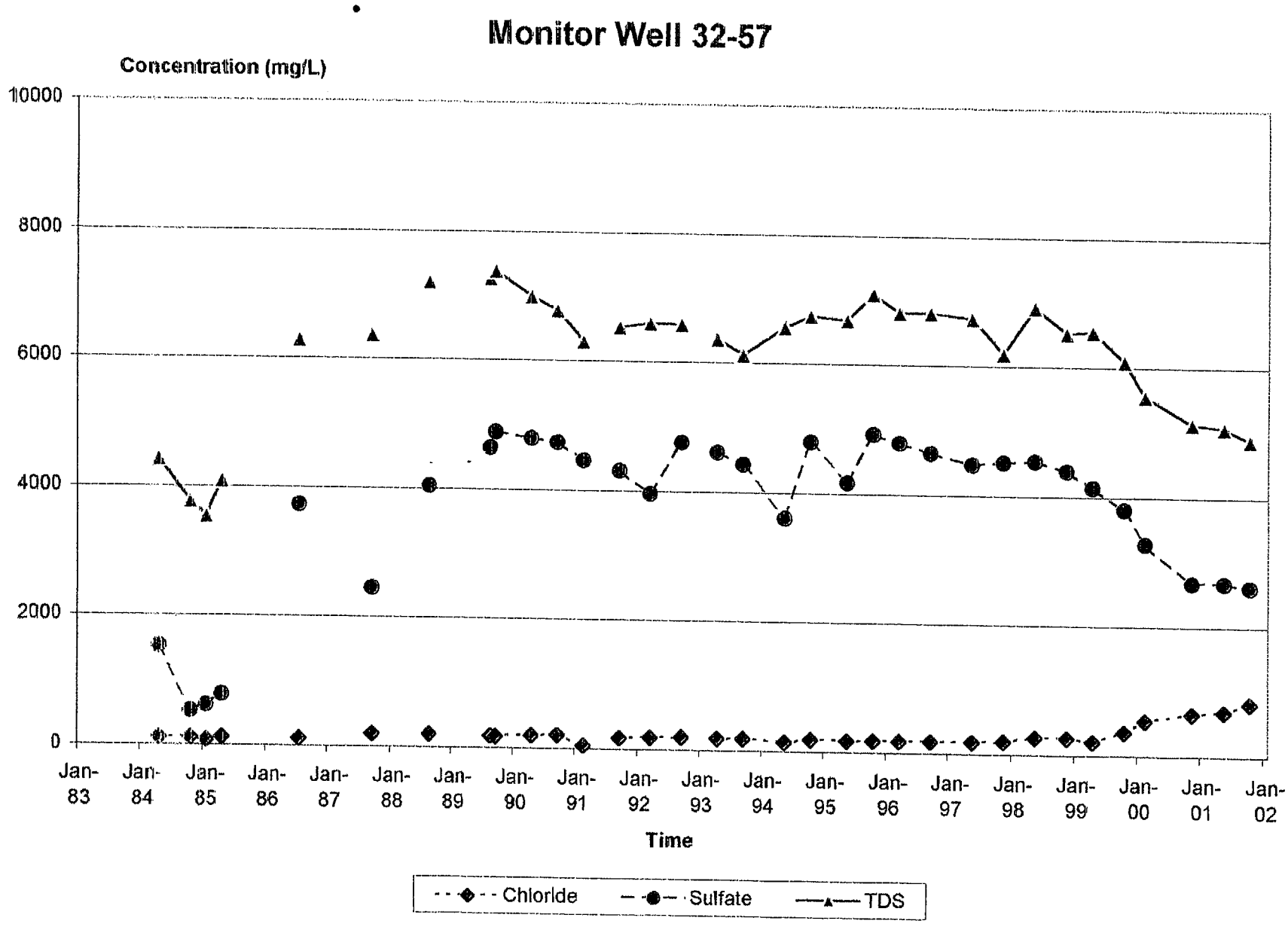

Monitor Well 32-42
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

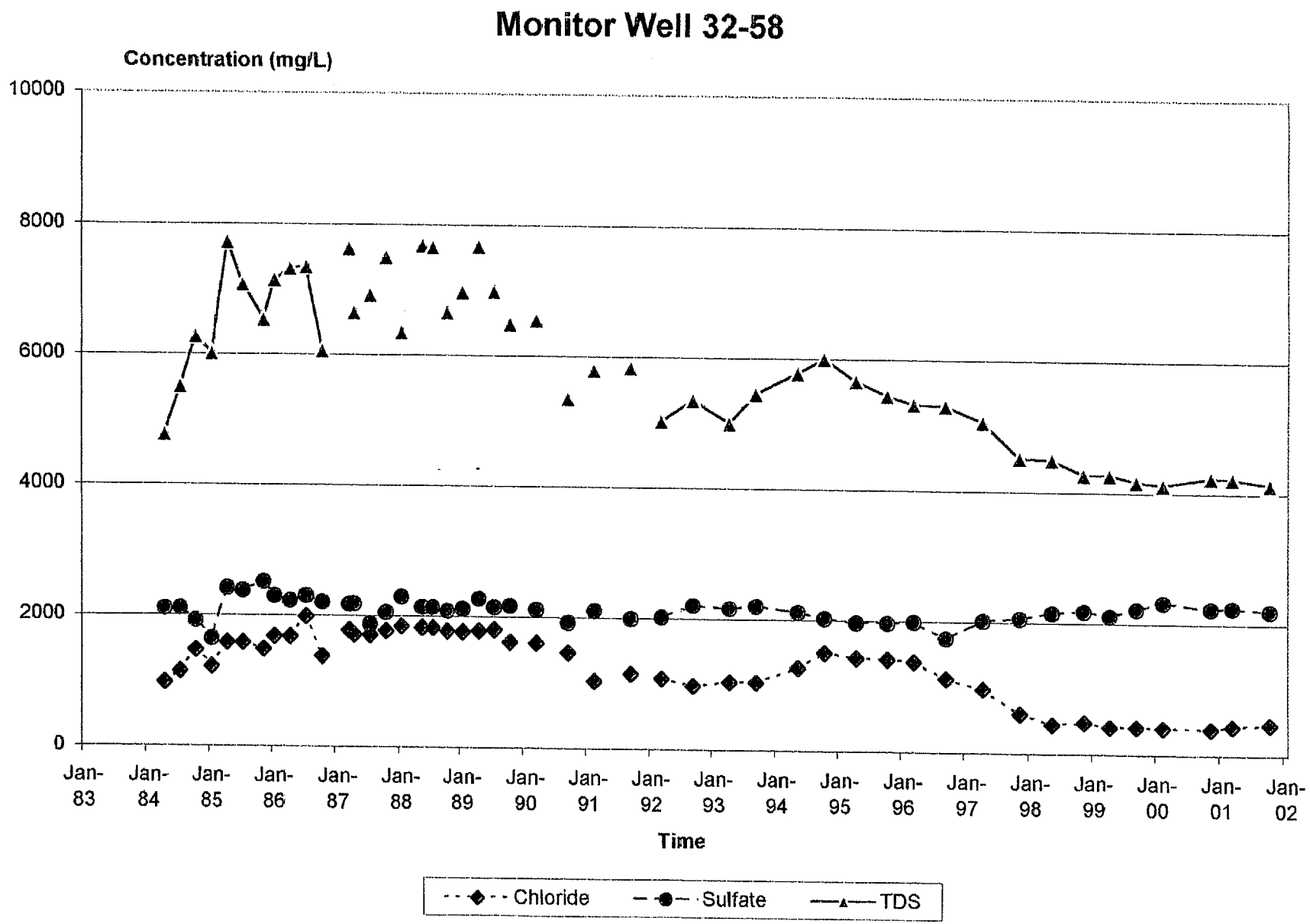

Monitor Well 32-43
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

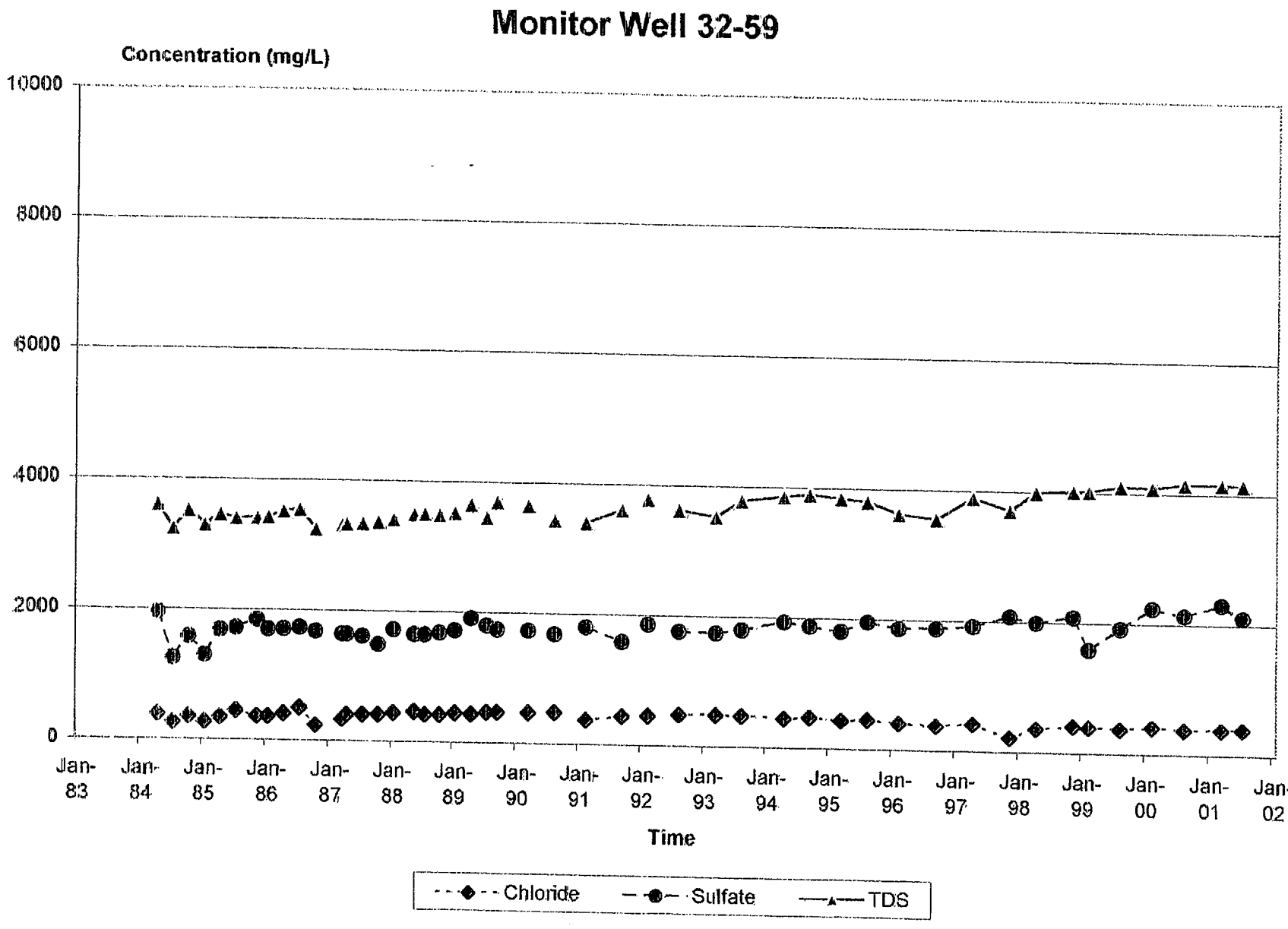

Monitor Well 32-50
Concentration (mg/L)
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

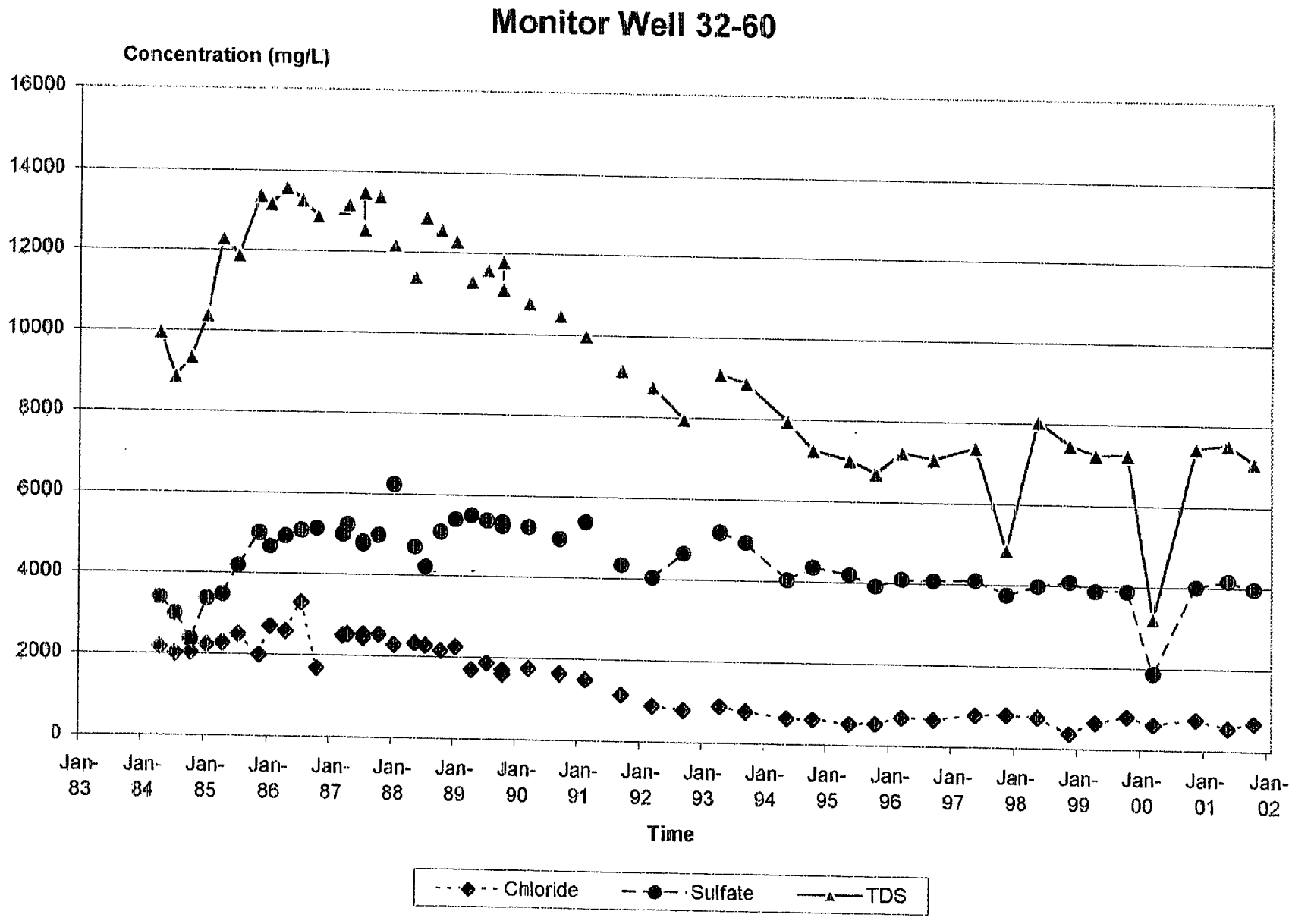

Monitor Well 32-51
Concentration (mg/L)
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

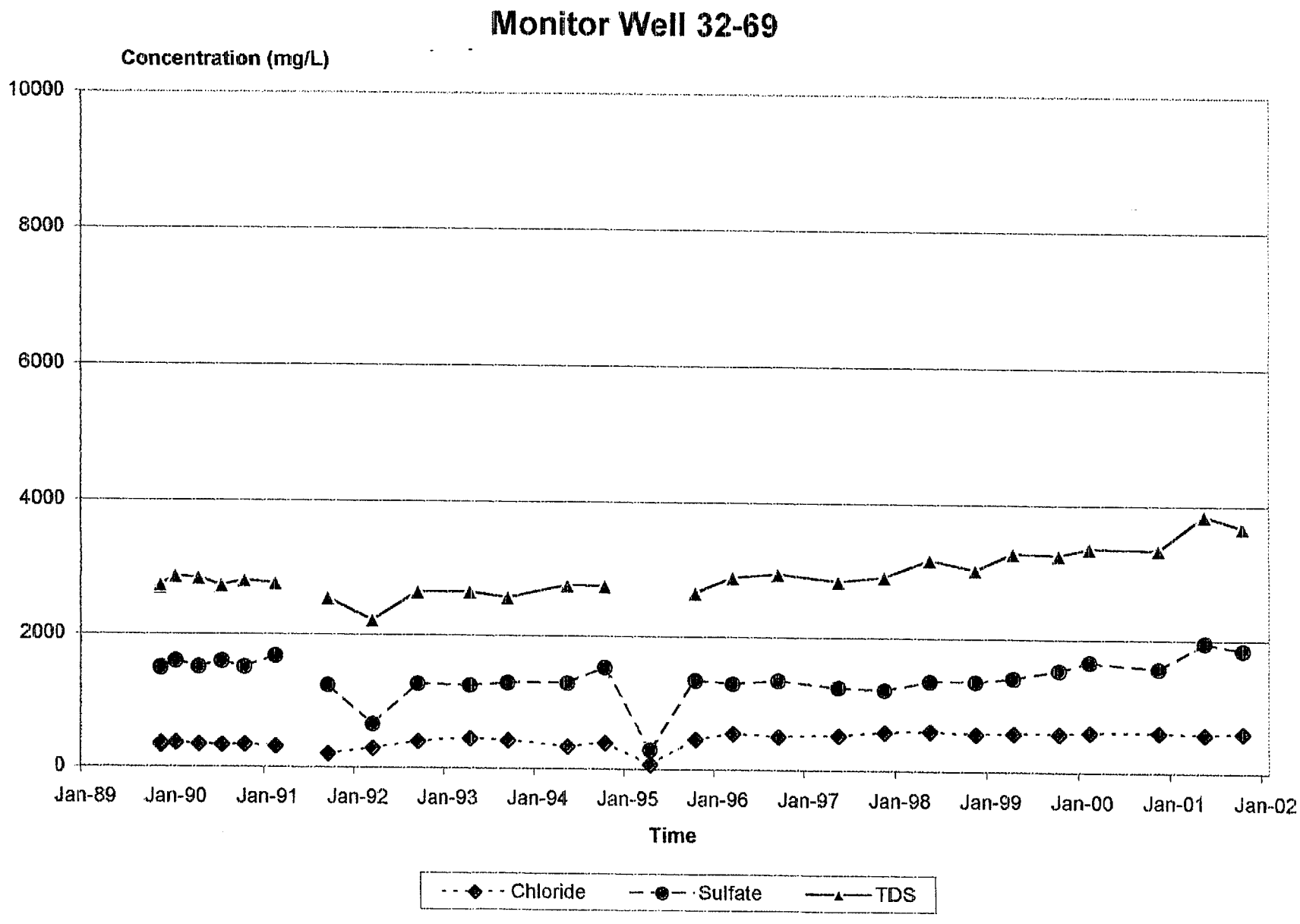

Monitor Well 32-52
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

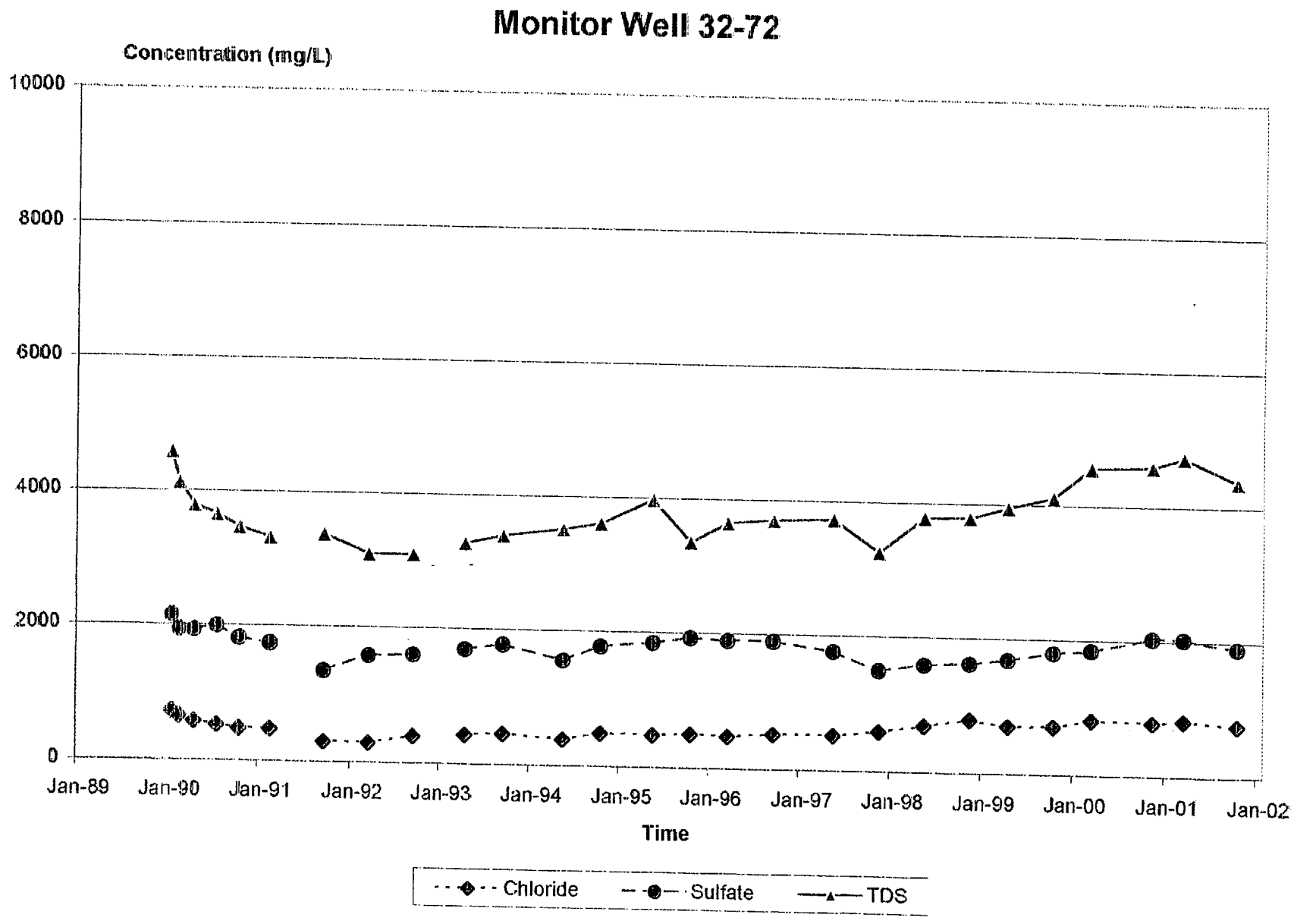

Monitor Well 32-57
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

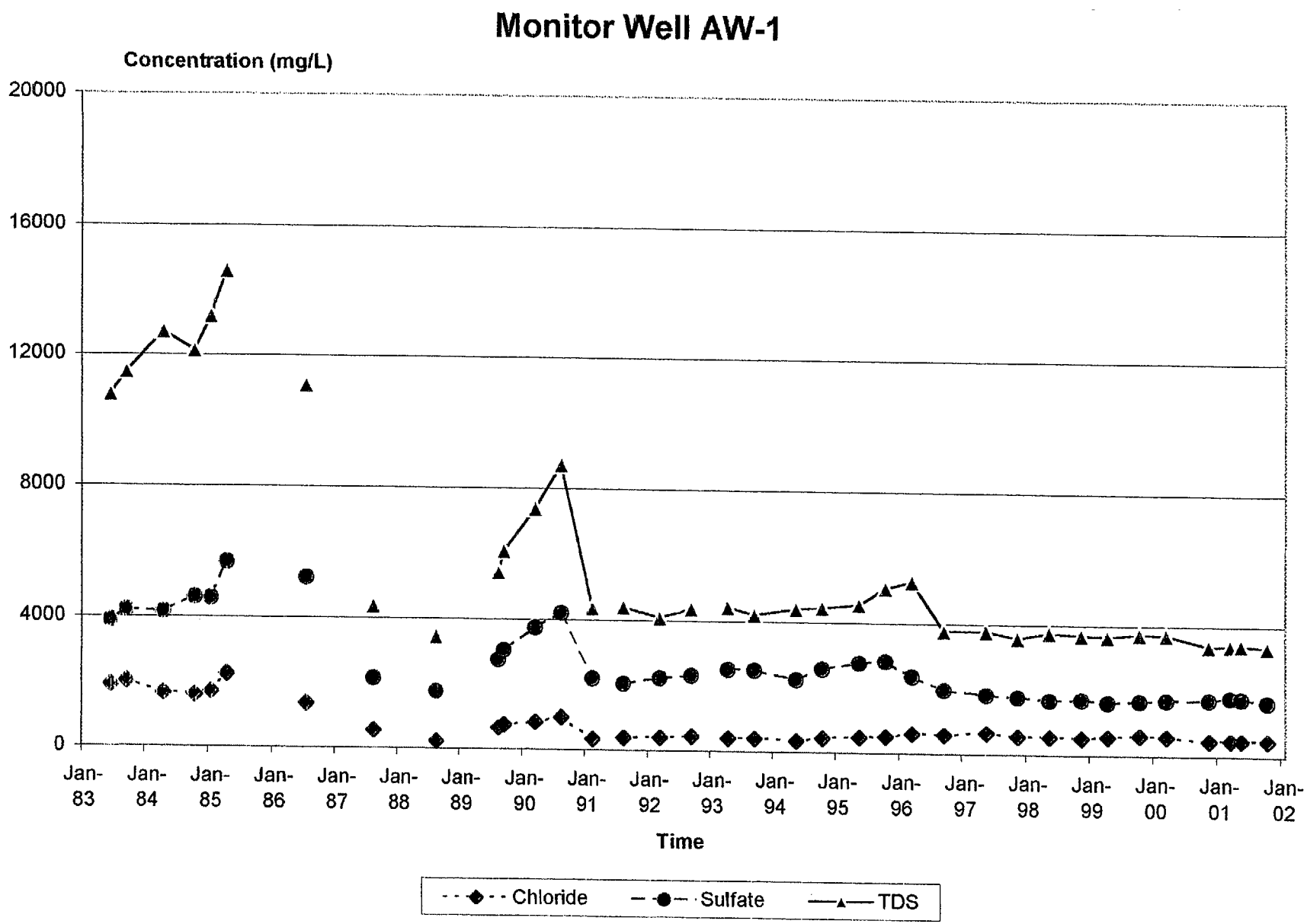

Monitor Well 32-58
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

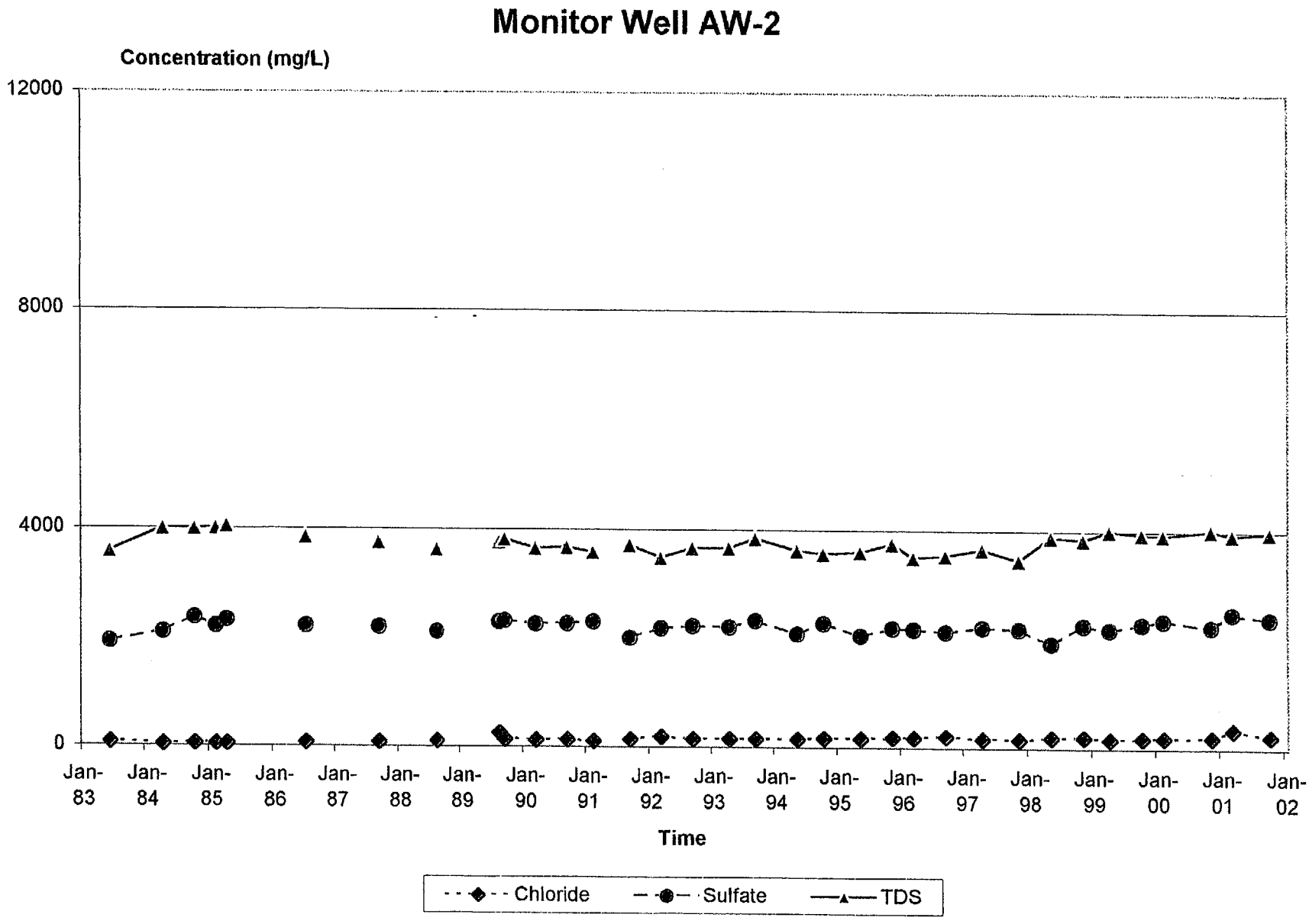

Monitor Well 32-59
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

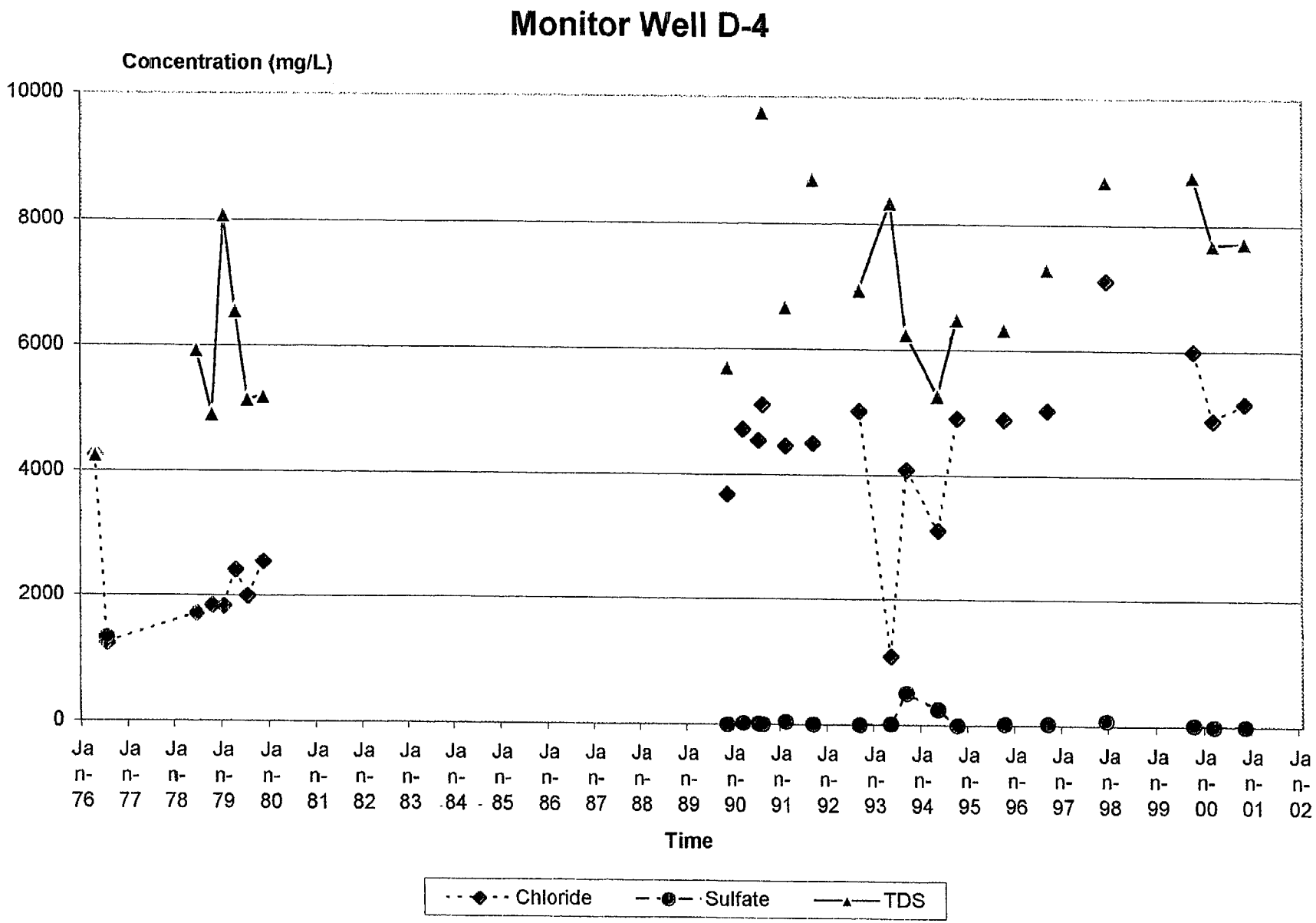

Monitor Well 32-60
Concentration (mg/L)
16000
14000
12000
10000
8000
6000
4000
2000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

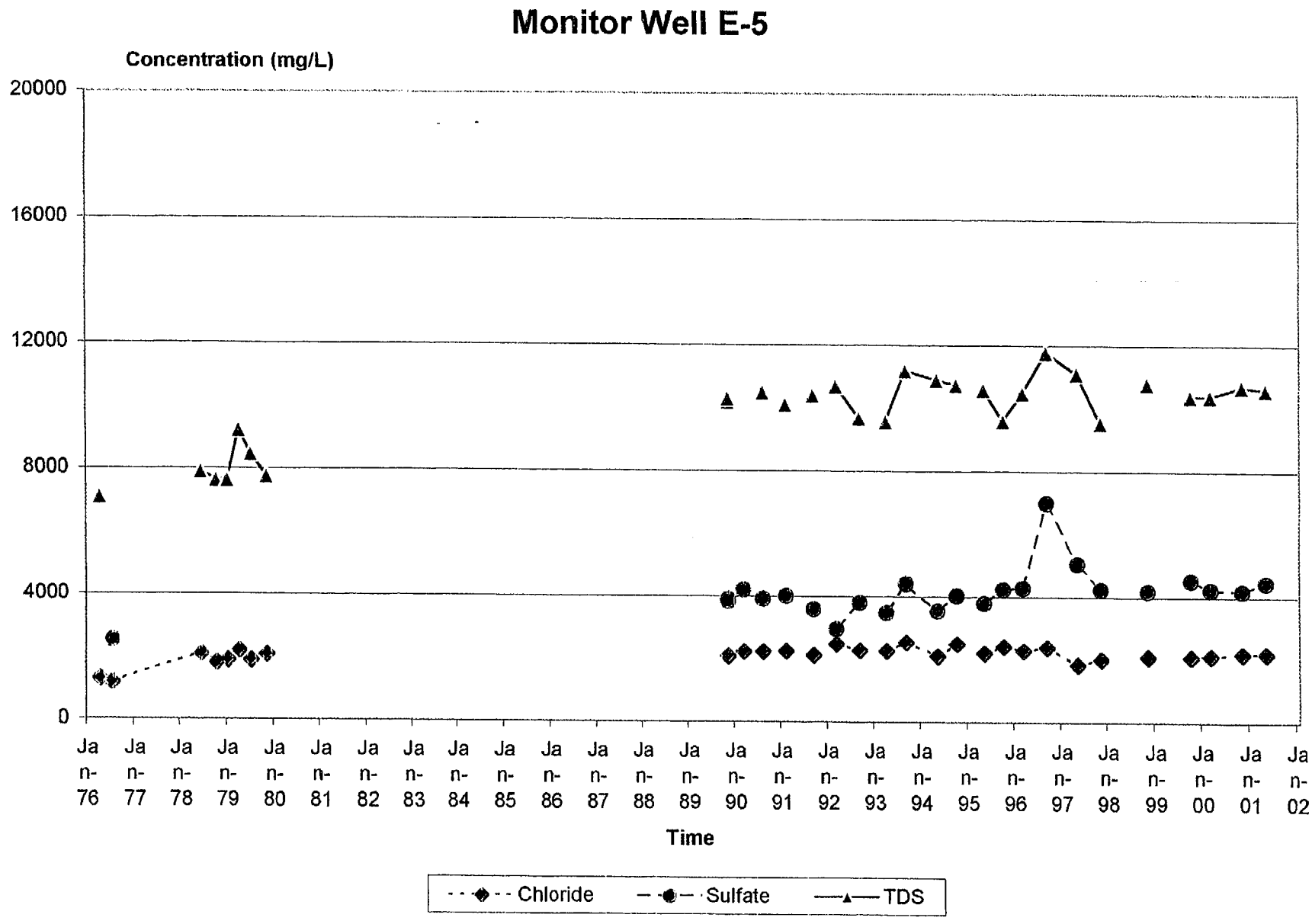

Monitor Well 32-69
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

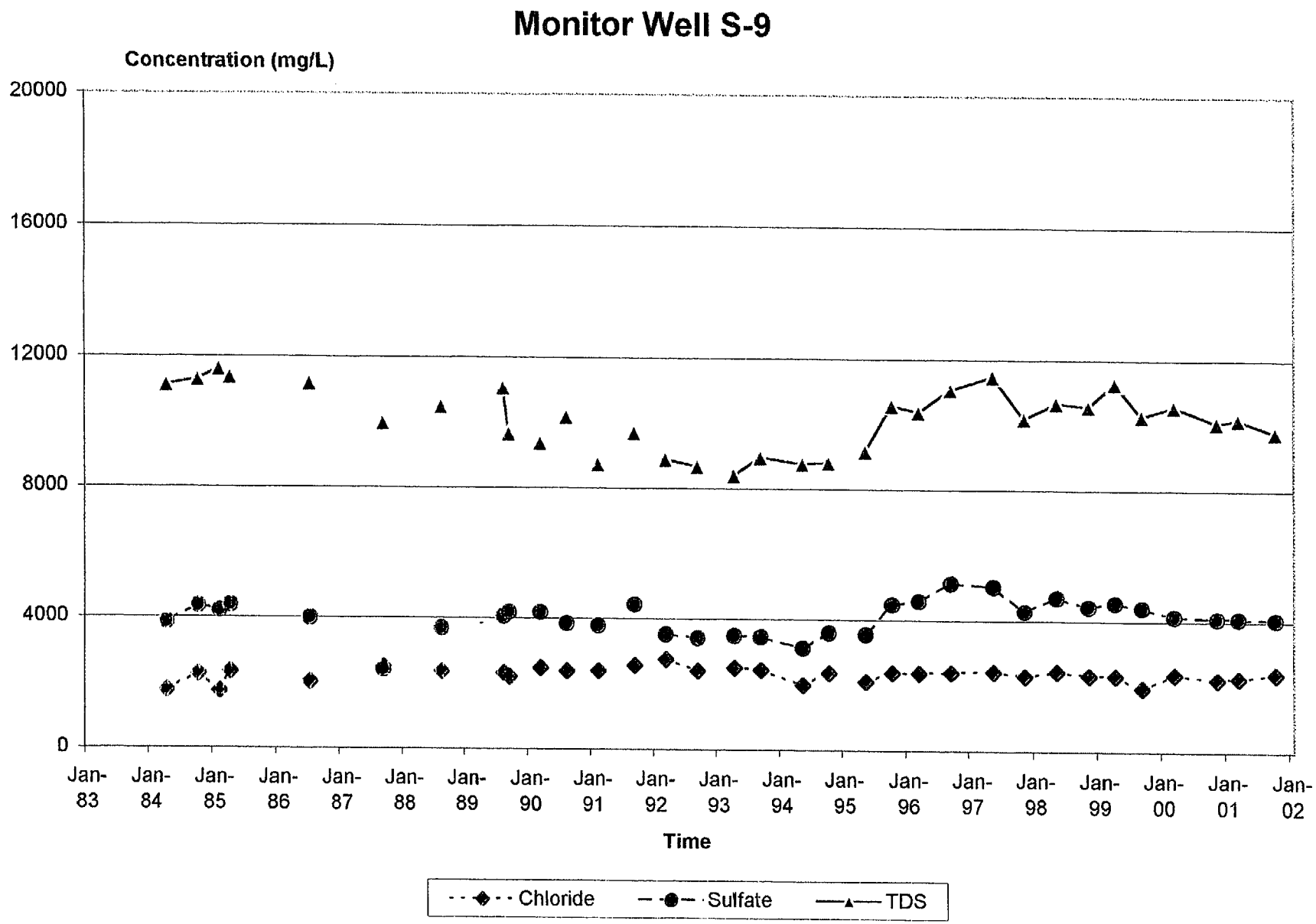

Monitor Well 32-72
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

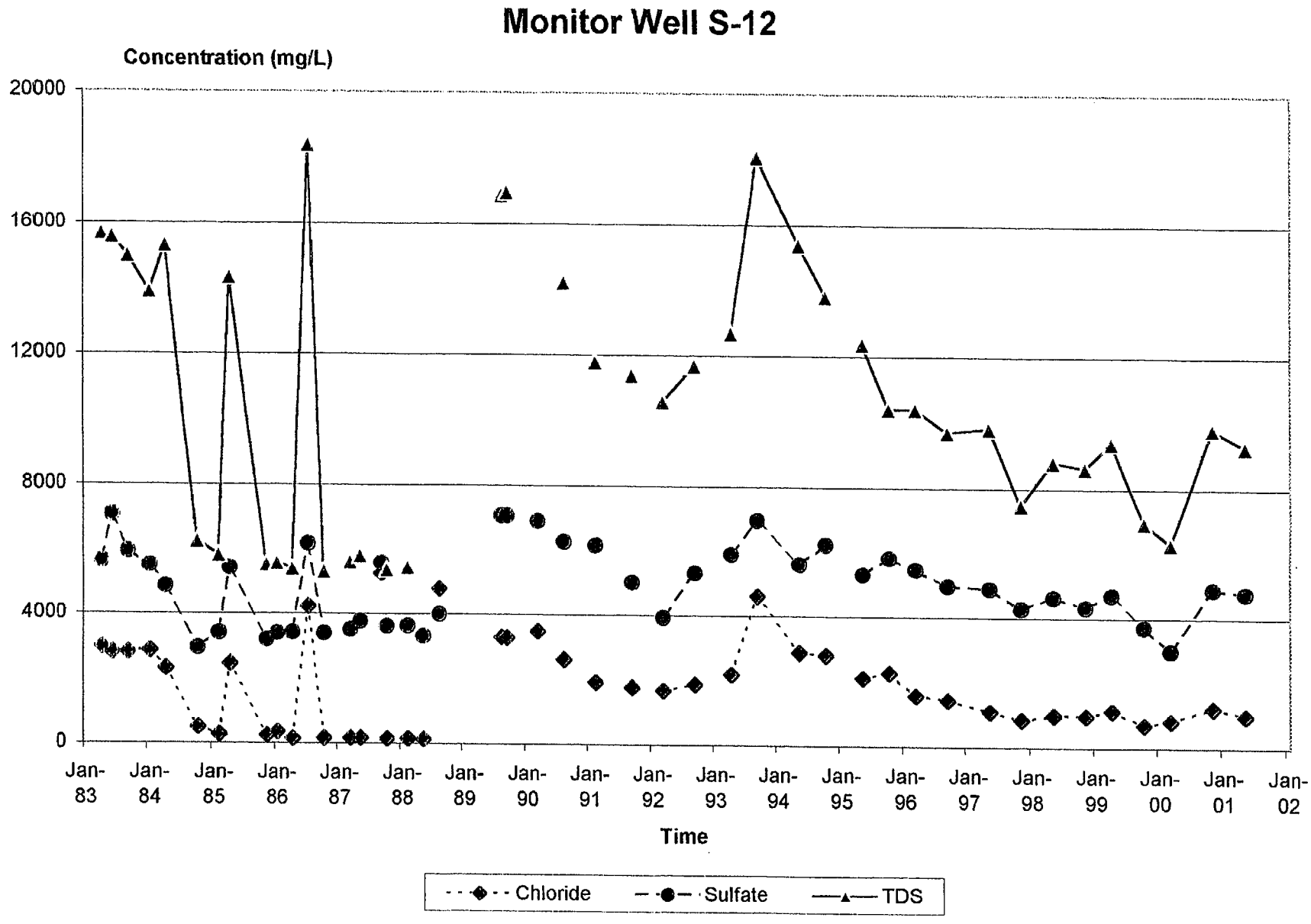

Monitor Well AW-1
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS


Monitor Well AW-2
Concentration (mg/L)
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS


Monitor Well D-4
Concentration (mg/L)
10000
8000
6000
4000
2000
0
Jan-76
Jan-77
Jan-78
Jan-79
Jan-80
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS


Monitor Well E-5
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-76
Jan-77
Jan-78
Jan-79
Jan-80
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS


Monitor Well S-9
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS


Monitor Well S-12
Concentration (mg/L)
20000
16000
12000
8000
4000
0
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Time
Chloride
Sulfate
TDS

APPENDIX C

ANALYTICAL RESULTS - 2001
NRC CORRECTIVE ACTION PLAN

QUIVIRA MINING COMPANY

ALLUVIUM

Well	Date	Depth to Water	Total Depth	Water Level	Spec. Cond.	Temp. (C)	pH	Sulfate (mg/l)	Chloride (mg/l)	Nitrate (mg/l)	Mo (mg/l)	Ni (mg/l)
31-61	31-Jul-01	17.57	27.05	6901.13	7240	16.1	6.79	3890	540	1.21	0.0011	0.021
31-61	06-May-01	17.7	27.06	6901	5500	12	6.8	3980	550	1.64	0.004	0.028
32-59	25-Mar-01	8.07	39.22	6888.13	3390	12.5	7.1	2320	400	-0.02	0.0037	0.011
32-59	30-Jul-01	9.9	39.32	6886.3	4670	16.9	7.13	2120	410	0.03	0.0071	0.01
5-03	25-Mar-01	10.5	40.63	6890.5	2720	12.5	9.5	480	400	0.04	0.0006	-0.001
5-03	30-Jul-01	12.2	40.36	6888.8	3750	17.4	8.92	790	394	0.11	0.0011	0.0009
MW-24	10-May-01	49.37	50.18	6818.63								
MW-24	31-Jul-01	49.39	50.18	6818.61								

Well	Se (mg/l)	U-nat (mg/l)	Pb-210 (pCi/l)	Ra-226 (pCi/l)	Ra-228 (pCi/l)	Th-230 (pCi/l)	Gross Alpha (pCi/l)
31-61	-0.001	0.142		0.5	0.5	0.2	0
31-61	-0.001	0.165	0.9	1.4	0.7	-0.2	0
32-59	-0.001	0.202	9.1	0.3	1.1	-0.4	43
32-59	-0.001	0.204	14.9	0.5	0.9	0.1	0
5-03	-0.001	0.0197		0.1	1.1	-0.5	4
5-03	-0.001	0.0263	28.1	0.2	0.5	-0.3	10
MW-24							
MW-24							

MW-24 contained insufficient water for sample collection in 2001.

QUIVIRA MINING COMPANY

TRES HERMANOS B FORMATION

Well	Date	Depth to Water	Total Depth	Water Level	Spec. Cond.	Temp. (C)	pH	Sulfate (mg/l)	Chloride (mg/l)	Nitrate (mg/l)	CN (mg/l)	Mo (mg/l)
19-77	17-Sep-01	277.7	288.5	6733.4	4540.0	20.2	7.2	2200	18	0.42	-0.01	0.010
19-77	22-May-01	281.7	288.6	6729.4	3710.0	18.0	7.0	200	20	0.65	-0.01	0.009
31-66	13-Aug-01	112.5	123.3	6891.6	40000.0	17.5	6.0	5410	20300	1.03	-0.01	0.002
31-66	19-Mar-01	112.2	123.3	6891.8	3280.0	13.5	5.9	5380	19900	0.89	-0.01	0.003
31-67	13-Aug-01	18.5	96.4	6909.9	6770.0	14.3	7.1	3110	700	0.50	-0.01	0.001
31-67	19-Mar-01	18.7	96.3	6909.7	4520.0	12.0	6.9	3150	730	0.25	-0.01	0.002
36-01	15-Aug-01	58.0	58.7	6907.8								
36-01	20-Mar-01	56.1	58.7	6909.7	2980.0	13.0	7.0	10	1060	0.08	-0.01	0.001
36-02	13-Aug-01	43.7	58.1	6953.8	10980.0	17.4	7.4	3880	2510	0.40	-0.01	0.005
36-02	19-Mar-01	43.4	58.1	6954.1	8100.0	13.0	7.6	-100	2400	0.74	-0.01	0.001

Well	Ni (mg/l)	Se (mg/l)	U-nat (mg/l)	Pb-210 (pCi/l)	Ra-226 (pCi/l)	Ra-228 (pCi/l)	Th-230 (pCi/l)	Gross Alpha (pCi/l)
19-77	0.006	-0.001	0.0328	0.0	1.5	3.7	-0.1	34
19-77	0.001	-0.001	0.0131	0.0	1.3	1.2	-0.1	41
31-66	0.206	0.010	0.1980	1.4	10.9	10.6	-0.1	333
31-66	0.152	0.010	0.1750	4.2	10.0	0.7	-0.2	250
31-67	0.011	-0.001	0.0110	0.0	3.0	1.9	0.0	19
31-67	0.001	-0.001	0.0060	5.3	2.5	2.4	-0.1	11
36-01								
36-01	-0.001	-0.001	0.0049	8.1	0.6	0.1	0.1	14
36-02	0.015	0.002	0.0072	0.0	0.7	0.8	0.1	11
36-02	0.007	0.003	0.0095	5.1	0.6	1.2	-0.2	53

Well 36-01 contained insufficient water for sample collection during the 2nd half of 2001.

QUIVIRA MINING COMPANY

TRES HERMANOS A FORMATION

Well	Date	Depth to Water	Total Depth	Water Level	Spec. Cond.	Temp. (C)	pH	Sulfate (mg/l)	Chloride (mg/l)	Nitrate (mg/l)	CN (mg/l)	Mo (mg/l)
31-01	17-Sep-01	202.9	251.4	6777.6	3440	17.7	7.6	1540	317	0.04	-0.01	0.002
31-01	20-Mar-01	202.9	251.2	6777.6	2290	15.0	7.4	1380	220	0.03	-0.01	0.002
33-01TRA	14-Aug-01	119.7	181.5	6798.3	3520	17.2	7.9	1880	41	0.08	-0.01	0.005
33-01TRA	07-May-01	119.9	181.5	6798.1	2720	16.0	8.5	1790	32	0.04	-0.01	0.004

Well	Ni (mg/l)	Se (mg/l)	U-nat (mg/l)	Pb-210 (pCi/l)	Ra-226 (pCi/l)	Ra-228 (pCi/l)	Th-230 (pCi/l)	Gross Alpha (pCi/l)
31-01	0.009	-0.001	0.0058	0.0	1.4	2.5	-0.1	6
31-01	0.002	-0.001	0.0056	6.6	1.0	1.0	-0.1	19
33-01TRA	0.007	-0.001	0.0201	4.2	1.8	1.6	0.2	9
33-01TRA	0.005	-0.001	0.0083	0.4	1.0	1.7	0.2	11

QUIVIRA MINING COMPANY

DAKOTA FORMATION

Well	Date	Depth to Water	Total Depth	Water Level	Spec. Cond.	Temp. (C)	pH	Sulfate (mg/l)	Chloride (mg/l)	As (mg/l)	Be (mg/l)	Cd (mg/l)	CN (mg/l)
17-01KD	21-Aug-01	685.1	810.1	6441.2	3160	24.0	11.5	220	280	-0.001	-0.001	-0.0005	0.01
17-01KD	21-May-01	684.9	810.4	6441.4	2890	22.0	12.8	520	310	0.003	-0.001	-0.0005	-0.01
30-02KD	20-Aug-01	308.8	314.2	6641.6	4920	22.0	7.5	470	1270	-0.001	-0.001	-0.0005	-0.01
30-02KD	20-May-01	307.9	314.2	6642.5	3500	15.0	7.9	290	1120	-0.001	-0.001	-0.0005	-0.01
30-48KD	20-Aug-01	337.2	341.5	6609.4	6260	24.4	7.1	2480	650	-0.001	0.001	0.0005	-0.01
30-48KD	21-May-01	337.1	341.7	6609.5	5000	16.5	7.0	240	560	-0.002	-0.001	-0.0005	-0.01
32-45KD	20-Aug-01	252.7	278.7	6665.9	2180	18.3	8.9	820	210	0.001	-0.001	-0.0005	-0.01
32-45KD	19-May-01	252.6	278.5	6666.0	1680	14.0	8.2	870	210	-0.001	-0.001	-0.0005	-0.01
36-06	18-Sep-01	176.7	198.3	6844.7	8520	15.6	4.2	4630	1120	-0.002	0.020	0.0016	-0.01
36-06	22-May-01	176.3	198.1	6845.1	6100	15.0	3.0	380	1060	-0.005	0.020	0.0017	-0.01

Well	Pb (mg/l)	Se (mg/l)	Sb (mg/l)	Mo (mg/l)	Ni (mg/l)	Nitrate (mg/l)	U-nat (mg/l)	Pb-210 (pCi/l)	Ra-226 (pCi/l)	Ra-228 (pCi/l)	Th-230 (pCi/l)	Gross Alpha (pCi/l)
17-01KD	-0.001	-0.001	-0.002	0.060	0.040	0.02	0.0004	0.0	0.2	0.9	-0.7	0
17-01KD	-0.001	-0.001	-0.002	0.108	0.049	0.02	0.0003	0.0	0.1	0.2	0.0	17
30-02KD	-0.001	-0.001	-0.002	0.006	0.026	-0.02	0.0075	0.0	0.9	0.8	-0.7	35
30-02KD	-0.001	-0.001	-0.002	0.003	0.026	0.07	0.0006	0.0	0.6	0.1	0.0	35
30-48KD	0.001	-0.001	-0.002	0.003	0.010	-0.20	0.0393	9.4	6.6	3.7	-0.6	15
30-48KD	-0.001	0.002	-0.002	0.004	0.006	-0.02	0.0418	0.0	2.6	2.6	0.1	0
32-45KD	-0.001	-0.001	0.002	0.024	0.005	0.06	0.0053	8.4	1.3	1.2	-0.9	67
32-45KD	-0.001	-0.001	-0.002	0.026	0.006	0.06	0.0011	0.0	0.7	1.0	0.2	100
36-06	-0.001	0.007	-0.002	0.001	0.189	0.25	0.7920	0.0	21.8	12.6	8.1	15
36-06	-0.001	0.005	-0.002	0.002	0.165	1.00	0.6210	0.0	38.0	7.6	8.4	6

APPENDIX D

SITE GROUND WATER STANDARDS

ALLUVIUM

AMBROSIA LAKE

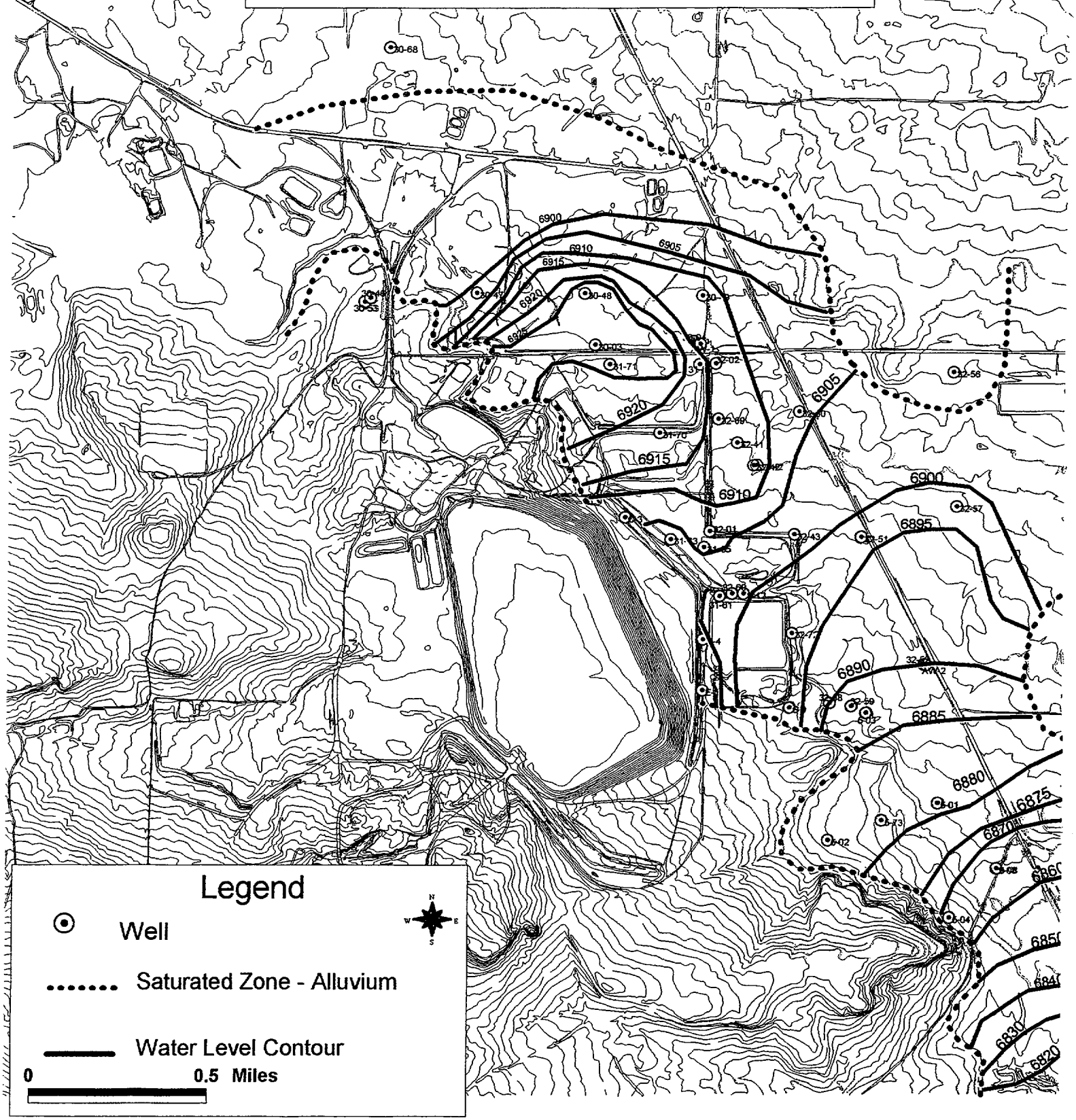
ALLUVIAL UNIT - GROUNDWATER PROTECTION STANDARDS (mg/l)

Parameter	Existing Baseline	WQCC Numeric Standard	Site GW Protection Standard
Ag	0.04	0.05	0.05
Al	0.17	5.0	5.0
As	0.18	0.1	0.18
B	0.48	0.75	0.75
Ba	0.02	1.0	1.0
Cd	0.02	0.01	0.02
CN	1	0.2	1.0
Co	0.04	0.05	0.05
Cr	0.06	0.05	0.06
Cu	0.04	1.0	1.0
Fe	40	1.0	40
Hg	0.002	0.002	0.002
Mn	2.6	0.2	2.6
Mo	0.04	1.0	1.0
Ni	0.06	0.2	0.2
Pb	0.16	0.05	0.16
Se	0.29	0.05	0.29
V	0.03	10.0	10.0
Zn	0.4	10.0	10.0
F	1.5	1.6	1.6
Cl	1343	250	1343
CN	<1	0.2	<1
NH_3	46	10.0	46
NO_3	54	10.0	54
SO_4	3865	600	3865
TDS	8322	1000	8322
pH	7.4	6-9	6-9
Ra226/228	3.2	30	30 pCi/l
U	0.09	5.0	5.0
Benzene	<0.001	0.01	0.01

APPENDIX E

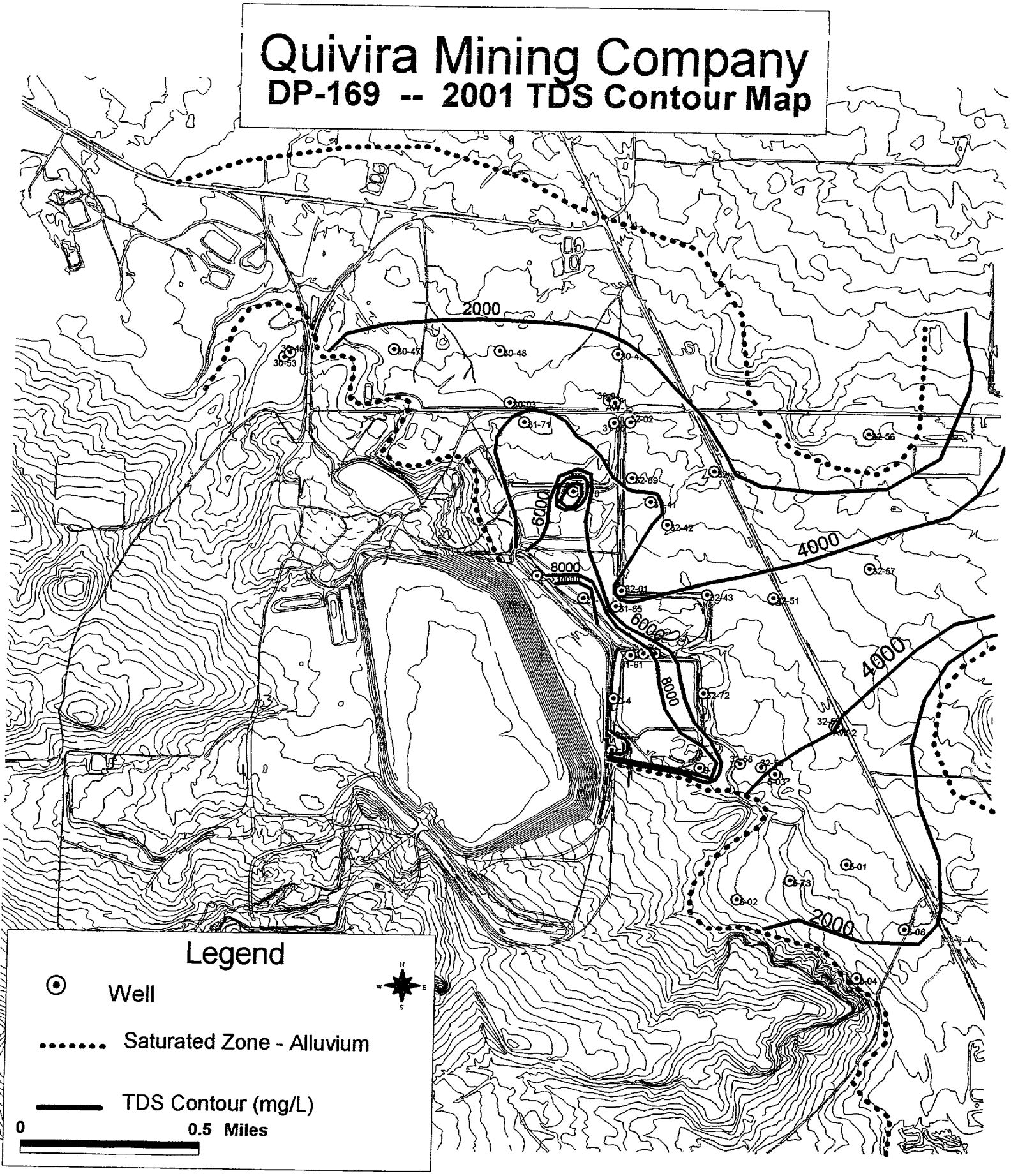
WATER LEVEL ELEVATION MAP
ALLUVIUM

Quivira Mining Company
DP-169 -- 2001 Water Level Map



APPENDIX F

TDS CONTOUR MAP

ALLUVIUM

Quivira Mining Company
DP-169 -- 2001 TDS Contour Map