

# Groundwater Containment at Site OT-16B, Shaw AFB

## Site Background

This section focuses on the interim action groundwater containment system located at OT-16B, Shaw AFB. Site OT-16B is part of OU2 at Shaw AFB. A site map for OT-16B with TCE groundwater contamination is included as Figure 32.

### Contaminants in Groundwater

- The principal groundwater contaminants in the Upper Black Creek Aquifer at the site are trichloroethene (TCE), and tetrachloroethene (PCE).
- The Black Creek Aquifer contains two plumes: one plume contains PCE and TCE, the other plume contains only TCE.

### Lithology

- The Upper Black Creek Aquifer, at Site OT-16B, consists of clays, silts, silty sand, and clayey sand.

### Groundwater Containment System Details

- Hydraulic containment through active pumping.

- The interim action system consisted of one recovery well (2BEX-01).
- Following operation of this interim action system, a full-scale remedial action began in January 1998 with the installation and operation of three extraction wells located within and at the edge of the groundwater plume.

### Operation Period

- The interim action groundwater system was started in February 1995 and was operated through December 1996.

### Total Capital Costs

- The estimated capital costs for the interim action groundwater system was \$1,960,000.

### Total O&M Costs

- Total cumulative costs from February 1995 through August 1996 were \$36,000.

## Cost and Performance of Groundwater Containment at Site OT-16B

### Groundwater Containment of Dissolved Contaminants Operational Objectives

Groundwater containment systems are most often used to protect downgradient areas threatened by a containment plume. The objective of groundwater containment for dissolved phase contaminants is to operate efficiently over a relatively long period of time. The emphasis of dissolved phase groundwater containment is whether containment was cost effectively achieved, not mass removal.

Data on whether groundwater containment is being achieved at each site is not available. Therefore, this report will only present the efficiency of contaminant removal for

groundwater containment sites. However, each dissolved phase site should be evaluated to determine if the plume is cost effectively being contained.

### Cost for Operation

Figure 33 illustrates curves of the O&M costs for the interim action groundwater containment system at Site OT-16B. The monthly O&M costs range from \$0 to \$10,437. Total O&M costs after 2.5 years of operation were \$51,000.

### Contaminant Removal

Figure 34 illustrates the removal rates of dissolved PCE and TCE at the interim action groundwater containment system at

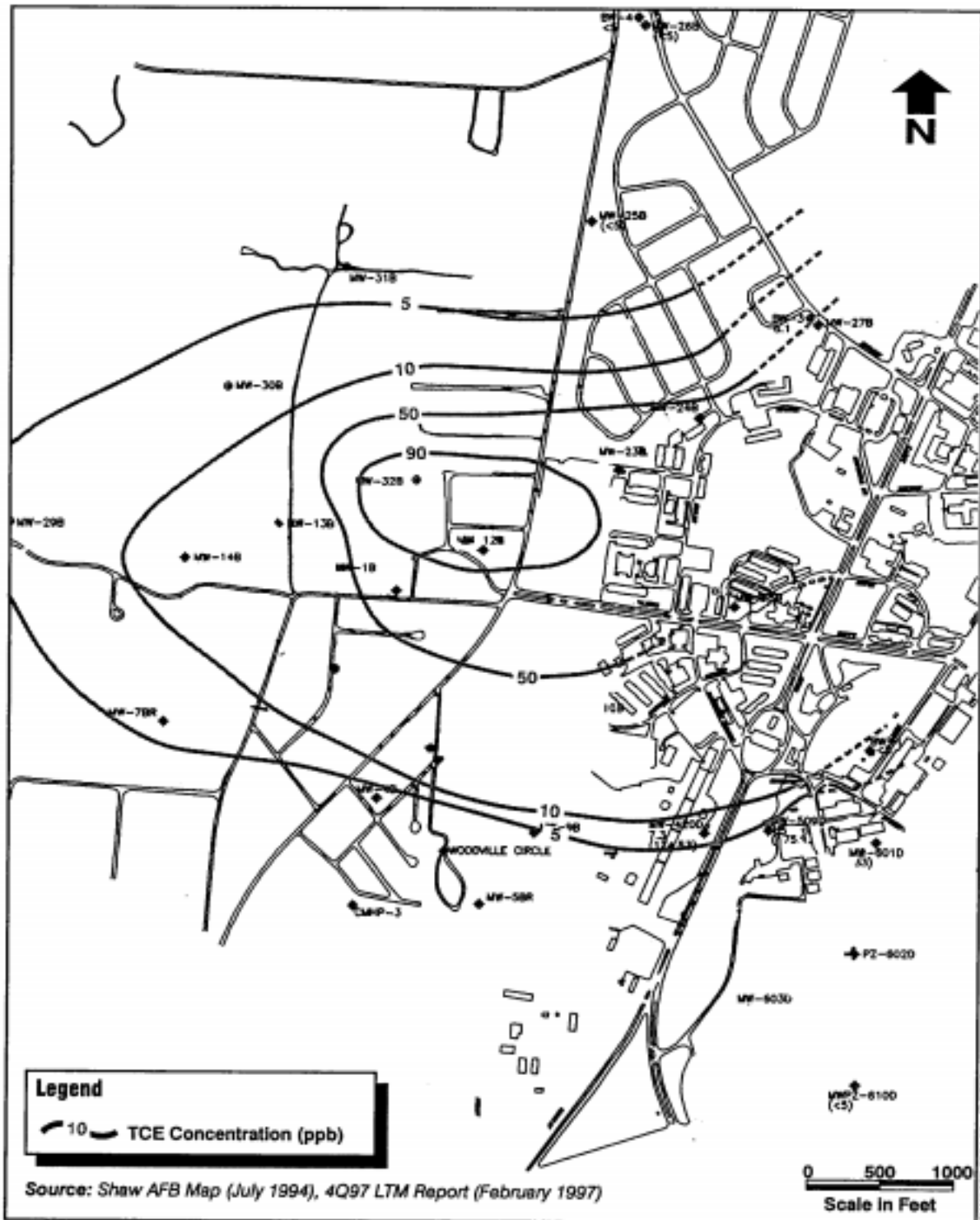
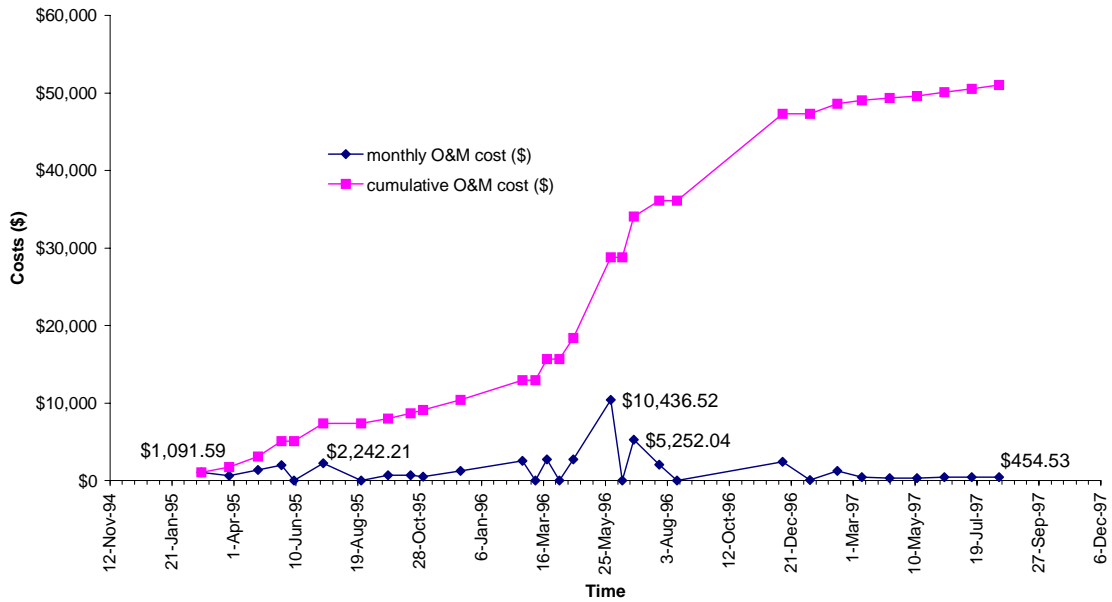


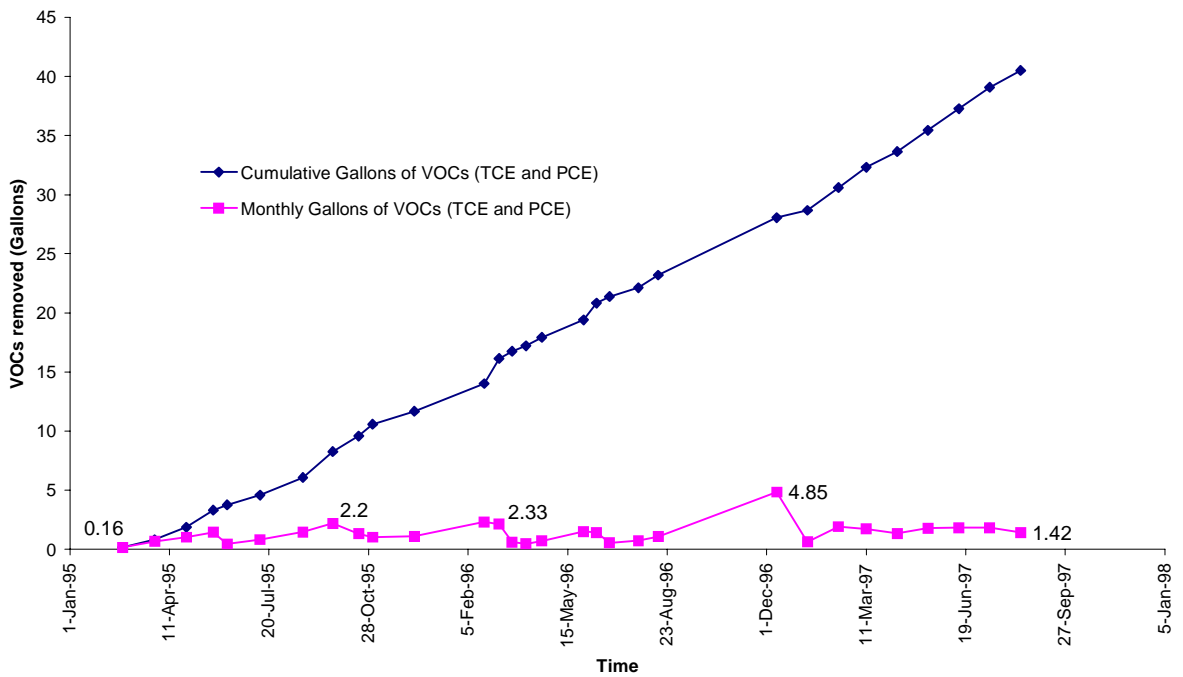
Figure 32. TCE Isoconcentrations in the Black Creek Aquifer at OU2, Site OT-16B, Shaw AFB

**Figure 33**  
**Monthly and Cumulative O&M Costs vs. Time**  
**Dissolved TCE and PCE**  
**Site OT-16B, Shaw AFB**



Rawot16b.xls; O&M costs new

**Figure 34**  
**Monthly & Cumulative VOC Removal vs. Time**  
**Dissolved TCE and PCE**  
**Site OT-16B, Shaw AFB**



Rawot16b.xls; Vol. vs. time

Site OT-16B. Monthly removal rates of dissolved PCE and TCE product ranged from 0.16 to 4.85 gallons. Total contaminant removal after 2.5 years of operation was 40.5 gallons of PCE and TCE. In August 1997, the curve representing the cumulative removal rate had not yet begun to flatten, indicating that the removal rate was still adequate for this system's performance and it was meeting its operational objectives. This system was expanded to a full-scale system in January 1998.

steepened. In August 1997, this groundwater containment system was operating efficiently for this system's performance and was meeting its operational objectives.

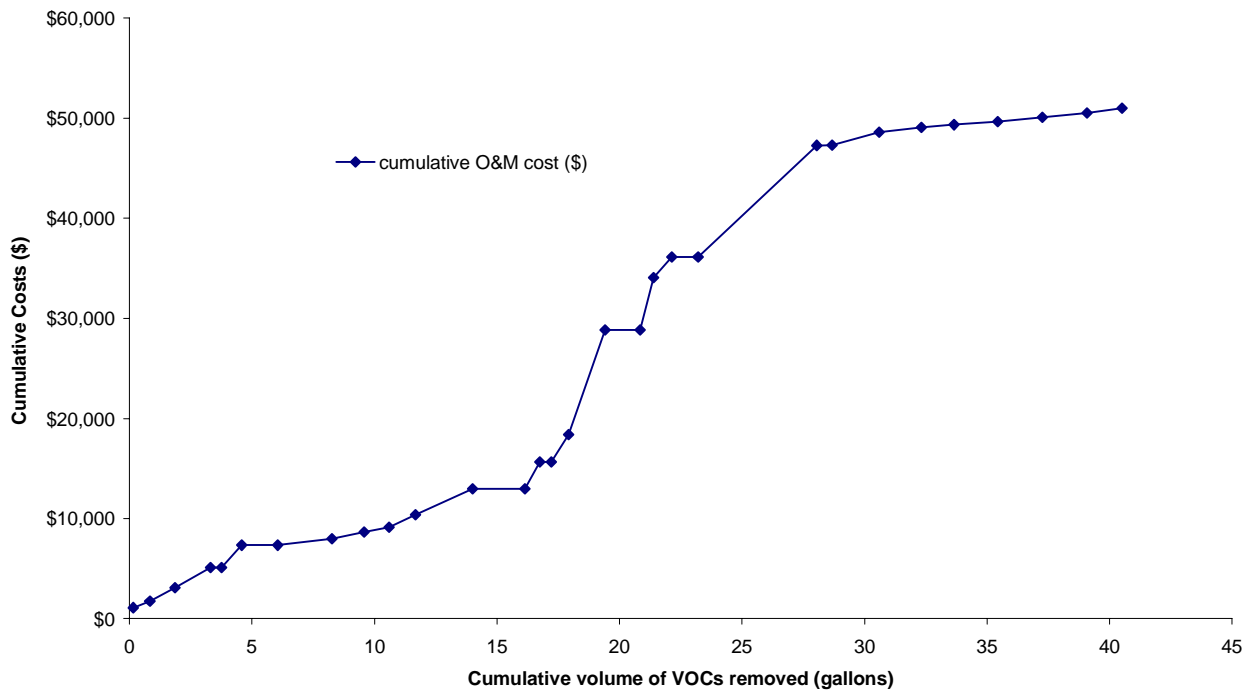
Figure 36 illustrates curves of the monthly and cumulative cost per unit of contaminant removal relative to the operation time of the technology. The monthly curve illustrates the cost per gallon of dissolved TCE and PCE removal in each month. The cumulative curve illustrates that the average cost per unit of contaminant removal was \$1,512/gallon of TCE and PCE after 2.5 years of operation time.

**Correlation of Costs and Contaminant Removal**

Figures 35 and 36 illustrate the relationship between the O&M costs and the removal rates for the interim action groundwater containment system at Site OT-16B.

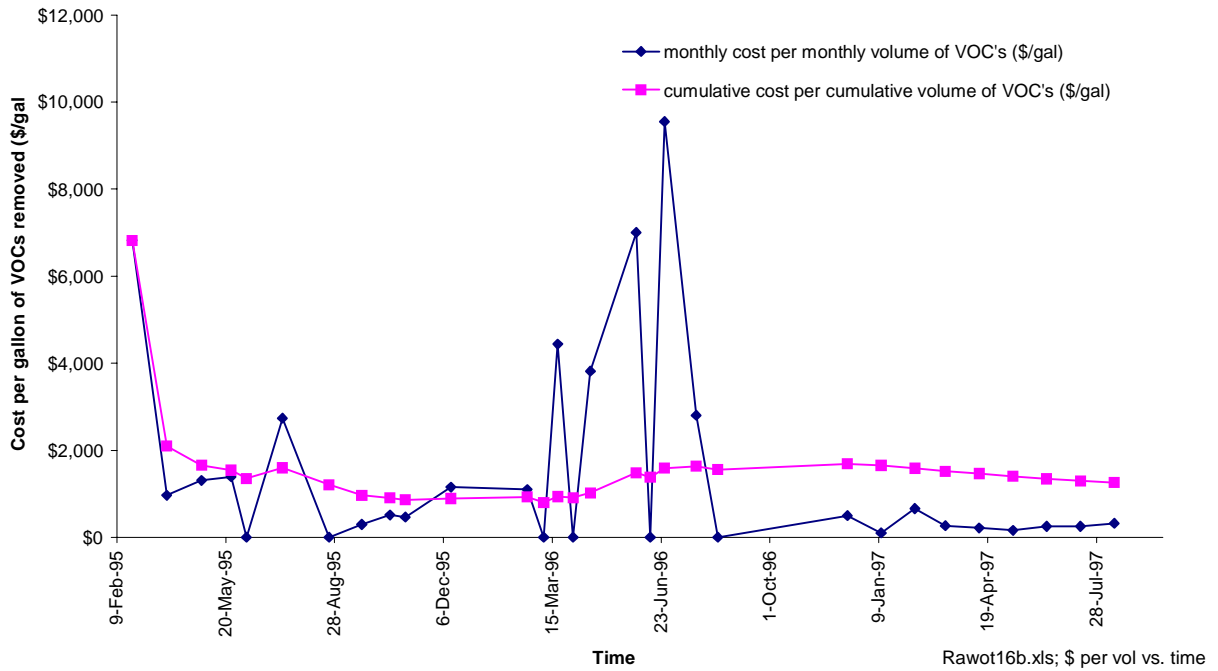
Figure 35 illustrates the cumulative O&M cost relative to the cumulative contaminant removal. As of August 1997, the curve had not

**Figure 35**  
**Cumulative O&M Costs vs. Cumulative VOCs Removed**  
**Dissolved TCE and PCE**  
**Site OT-16B, Shaw AFB**



Rawot16b.xls; \$ per vol

**Figure 36**  
**Monthly & Cumulative Cost per gallon of VOCs Removed vs. Time**  
**Dissolved TCE and PCE**  
**Site OT-16B, Shaw AFB**



**APPENDIX A**

**Detailed Cost and Performance Data Table**

Dissolved Phase VOC Recovery Pumping  
Site OT-16B  
Shaw Air Force Base

Date of Contaminant Removal	Cumulative mass of TCE removed (kg)	Cumulative mass of TCE removed (lb)	Cumulative mass of PCE removed (kg)	Cumulative mass of PCE removed (lb)	Cumulative mass of VOCs (TCE and PCE) (kg)	Cumulative mass of VOCs (TCE and PCE) (lbs)	Cumulative Gallons of TCE	Cumulative Gallons of PCE	Cumulative Gallons of VOCs (TCE and PCE)	Monthly Gallons of VOCs (TCE and PCE)	monthly O&M cost (\$)	cumulative O&M cost (\$)	monthly cost per monthly volume of VOC's (\$/gal)	cumulative cost per cumulative volume of VOC's (\$/gal)	cumulative cost per total cumulative mass (\$/kg)	cumulative cost per total cumulative mass (\$/lb)
23-Feb-95	0.25	0.551155	0.48	1.0582176	0.73	1.6093726	0.1	0.06	0.16	0.16	1,091.59	1,091.59	6,822.44	6,822.44	1,495.33	678.27053
27-Mar-95	1.17	2.5794054	1.6	3.527392	2.77	6.1067974	0.45	0.38	0.83	0.67	647.45	1,739.04	966.34	2,095.23	627.81	284.7712
28-Apr-95	2.39	5.2690418	3.46	7.6279852	5.85	12.897027	0.92	0.94	1.86	1.03	1,346.82	3,085.86	1,307.59	1,659.06	527.50	239.2691
25-May-95	3.47	7.6500314	5	11.0231	8.47	18.6731314	1.34	1.97	3.31	1.45	2,013.44	5,099.30	1,388.58	1,540.57	602.04	273.08221
8-Jun-95	4.17	9.1932654	6.18	13.624552	10.35	22.817817	1.61	2.16	3.77	0.46	0.00	5,099.30	0.00	1,352.60	492.69	223.47887
11-Jul-95	5.01	11.045146	7.56	16.666927	12.57	27.7120734	1.93	2.66	4.59	0.82	2,242.21	7,341.51	2,734.40	1,599.46	584.05	264.92099
23-Aug-95	7.28	16.049634	11.57	25.507453	18.85	41.557087	2.81	3.25	6.06	1.47	0.00	7,341.51	0.00	1,211.47	389.47	176.66084
22-Sep-95	8.52	18.783362	13.57	29.916693	22.09	48.7000558	3.28	4.98	8.26	2.2	653.01	7,994.52	296.82	967.86	361.91	164.15833
18-Oct-95	9.68	21.340722	15.45	34.061379	25.13	55.4021006	3.73	5.84	9.57	1.31	669.94	8,664.46	511.40	905.38	344.79	156.39227
1-Nov-95	10.26	22.619401	16.37	36.089629	26.63	58.7090306	3.95	6.64	10.59	1.02	473.22	9,137.68	463.94	862.86	343.13	155.64352
13-Dec-95	12.03	26.521579	19.11	42.130288	31.14	68.6518668	4.64	7.04	11.68	1.09	1,258.16	10,395.84	1,154.28	890.05	333.84	151.42837
21-Feb-96	15.01	33.091346	23.53	51.874709	38.54	84.9660548	5.79	8.22	14.01	2.33	2,563.59	12,959.43	1,100.25	925.01	336.26	152.52479
7-Mar-96	15.65	34.502303	24.49	53.991144	40.14	88.4934468	6.03	10.11	16.14	2.13	0.00	12,959.43	0.00	802.94	322.86	146.44508
20-Mar-96	16.12	35.538474	25.24	55.644609	41.36	91.1830832	6.22	10.53	16.75	0.61	2,707.48	15,666.91	4,438.49	935.34	378.79	171.81816
3-Apr-96	16.51	36.398276	25.87	57.033519	42.38	93.4317956	6.37	10.85	17.22	0.47	0.00	15,666.91	0.00	909.81	369.68	167.68285
19-Apr-96	17.65	38.911543	27.61	60.869558	45.26	99.7811012	6.81	11.12	17.93	0.71	2,712.79	18,379.70	3,820.83	1,025.08	406.09	184.20021
31-May-96	19.58	43.16646	30.4	67.020448	49.98	110.1869076	7.55	11.87	19.42	1.49	####	28,816.22	7,004.38	1,483.84	576.56	261.52127
13-Jun-96	20.15	44.423093	31.04	68.431405	51.19	112.8544978	7.77	13.07	20.84	1.42	0.00	28,816.22	0.00	1,382.74	562.93	255.33958
26-Jun-96	20.88	46.032466	31.97	70.481701	52.85	116.514167	8.05	13.34	21.39	0.55	5,252.04	34,068.26	9,549.16	1,592.72	644.62	292.39586
25-Jul-96	21.77	47.994577	33.47	73.788631	55.24	121.7832088	8.39	13.74	22.13	0.74	2,073.37	36,141.63	2,801.85	1,633.15	654.27	296.77022
14-Aug-96	22.88	50.441706	35.15	77.492393	58.03	127.9340986	8.82	14.38	23.2	1.07	0.00	36,141.63	0.00	1,557.83	622.81	282.50193
11-Dec-96	23.88	52.646326	36.45	80.358399	60.33	133.0047246	10.38	17.67	28.05	4.85	2,431.05	47,269.96	501.25	1,685.20	783.52	355.40061
11-Jan-97	24.64	54.321837	37.24	82.100049	61.88	136.4218856	10.67	18.01	28.68	0.63	62.70	47,332.66	99.52	1,650.37	764.91	346.95797
11-Feb-97	26.94	59.392463	39.62	87.347044	66.56	146.7395072	11.56	19.04	30.6	1.92	1,265.12	48,597.78	658.92	1,588.16	730.13	331.18402
11-Mar-97	28.8	63.493056	41.99	92.571994	70.79	156.0650498	12.27	20.05	32.32	1.72	458.04	49,055.82	266.30	1,517.82	692.98	314.32931
11-Apr-97	29.8	65.697676	44.17	97.378065	73.97	163.0757414	12.66	20.99	33.65	1.33	287.48	49,343.30	216.15	1,466.37	667.07	302.57903
12-May-97	30.8	67.902296	47.44	104.58717	78.24	172.4894688	13.05	22.39	35.44	1.79	287.48	49,630.78	160.60	1,400.42	634.34	287.73223
12-Jun-97	31.8	70.106916	50.77	111.92856	82.57	182.0354734	13.43	23.83	37.26	1.82	454.53	50,085.31	249.74	1,344.21	606.58	275.14038
13-Jul-97	32.8	72.311536	54.1	119.26994	86.9	191.581478	13.82	25.26	39.08	1.82	454.53	50,539.84	249.74	1,293.24	581.59	263.80337
13-Aug-97	33.8	74.516156	56.53	124.62717	90.33	199.1433246	14.2	26.3	40.5	1.42	454.53	50,994.37	320.09	1,259.12	564.53	256.06869