Groundwater Containment at Sites SD-29 and ST-30, Shaw AFB

Site Background on Site SD-29

This section focuses on the interim action groundwater containment system located at Site SD-29, Shaw AFB. A site map for SD-29 is included as Figure 25.

Contaminants in Soil

- In January 1992, sixty gallons of JP-4 jet fuel was spilled when a pump failed at an oil/water separator located at the site.
- Eighty tons of contaminated soil was excavated.
- Further investigation indicated that the soil at the site was contaminated with volatile organic compounds (VOCs), with contaminant concentrations increasing with sample depth.

Contaminants in Groundwater

- Free product JP-4 jet fuel, dissolved fuel components, and dissolved chlorinated solvents have been identified in the groundwater.

Lithology/Hydogeology

- Sands and silts.
- Groundwater is found in a shallow water table aquifer and the Upper Black Creek Aquifer.

Groundwater Containment System Details

- Interim action JP-4 free product recovery system.
- Pneumatic product skimmer pumps were used from March 1995 through January 1996.
- Passive skimmer bailers were placed in wells in January 1996.
- Approximately 5 gallons of JP-4 was recovered during its year of operation.
- Contaminated groundwater was treated with an air stripper.
- An Interim Corrective Measure, consisting of three extraction wells, has been designed and is being implemented to address the mobile JP-4, dissolved fuel, and dissolved chlorinated solvent plumes. The target pump rate is 1 to 2 gpm.

Operation Period

- The interim action system began operation in March 1995 and was operated through February 1996.
- The interim action system was shut down when product recovery became negligible.

Total Capital Costs

- The estimated capital costs for the SD-29 interim action groundwater containment system was $394,000.

Total O&M Costs

- See below.

Site Background on Site ST-30

This section focuses on the interim action groundwater containment system located at Site ST-30, Shaw AFB. A site map for ST-30 is included as Figure 26.

Contaminants in Soil

- Soil was contaminated with JP-4 jet fuel by a leaking jet fuel supply line.
- TPH concentrations ranged from 87 to 592 ppm.

Contaminants in Groundwater

- Free product JP-4 jet fuel was identified on groundwater.

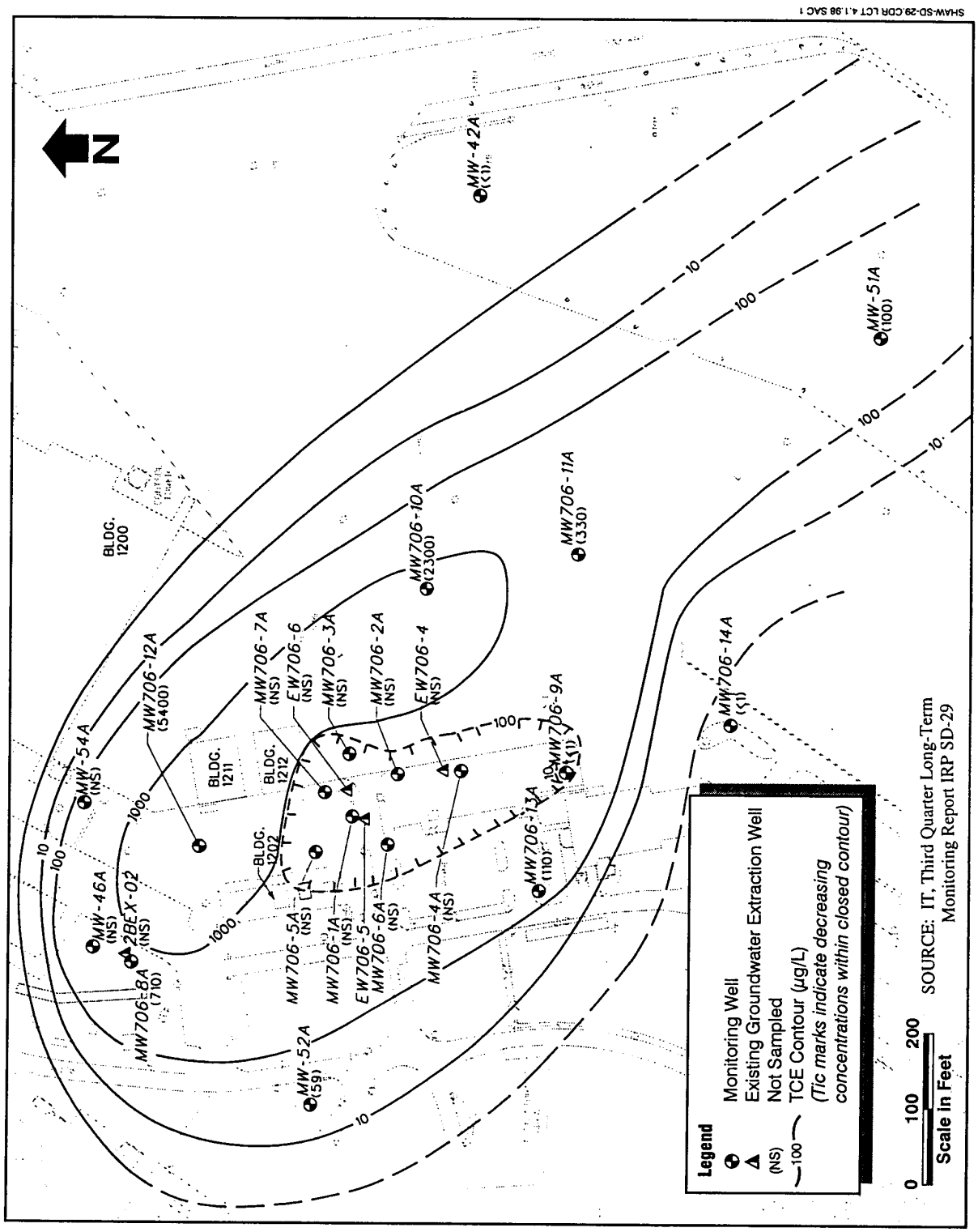


Figure 25. Location of Site SD-29 Oil/Water Separator, Shaw AFB

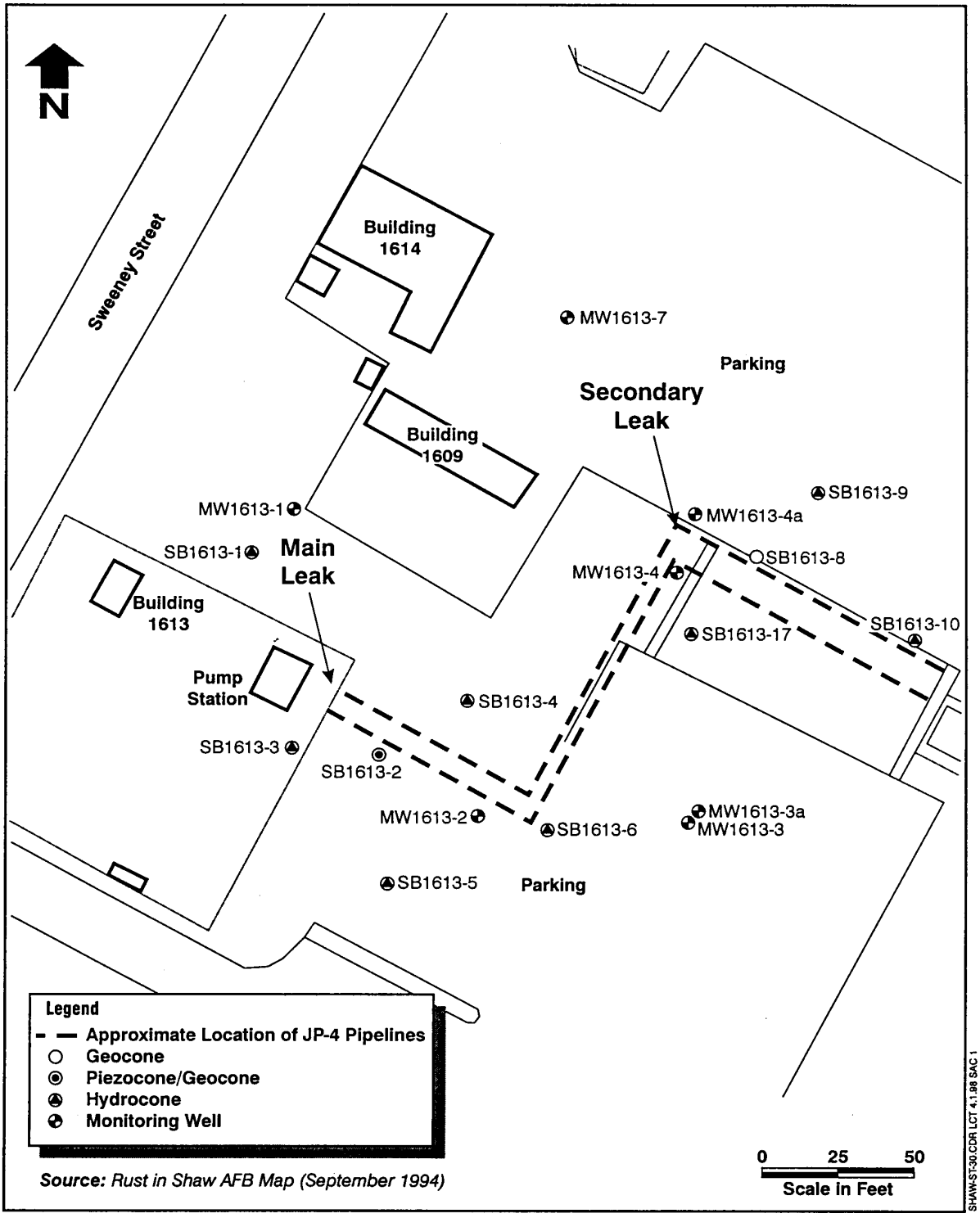


Figure 26. Location of Leaking Fuel Line, Site ST-30, Shaw AFB

Lithology

- Predominantly interlayered poorly graded, well graded, and clayey coarse to fine grain sands.

Groundwater Containment System Details

- In March 1995, an interim action free product recovery system was installed to remove free-phase JP-4.
- Contaminated groundwater was treated with an air stripper.
- Approximately 97 gallons of JP-4 was recovered during its year of operation.
- Pneumatic product skimmer pumps were used from March 1995 through January 1996.
- Passive skimmer bailers were installed in January 1996 and are checked monthly.
- There are currently no remedial activities or monitoring at ST-30.

Operation Period

- The interim action system was operated from March 1995 through February 1996.
- The interim action system was shut down when recovery of JP-4 became negligible.

Total Capital Costs

- Data not available.

Total O&M Costs – Sites SD-29 and ST-30

- Total cumulative costs for the SD-29 and ST-30 interim action free product recovery system were $17,000 from March 1995 through February 1996.

Cost and Performance of Groundwater Containment at Sites SD-29 and ST-30

Groundwater Containment with Free Product Source Removal Operational Objectives

The objective of free product source removal is typically to remove liquid-phase contamination as quickly and cost-effectively as possible to prevent continued contamination of surrounding soil and groundwater. The emphasis for free product removal is that the mass of contaminants is cost effectively removed.

Cost for Operation

Figure 27 illustrates curves of O&M costs for the interim action groundwater containment systems at Sites SD-29 and ST-30. The monthly O&M costs ranged from $0 to $6,021. Total O&M costs after one year of operation were $17,000.

Contaminant Removal

Figures 28 and 29 illustrate curves of the removal rates of JP-4 free product for the interim action groundwater containment system at Sites SD-29 and ST-30. Monthly removal rates of JP-4 free product ranged from 0 to 50 gallons. Total contaminant removal after one year of operation was 102 gallons of JP-4 free product. By October 1995, both curves representing the cumulative removal rate had flattened, indicating that the removal rates were negligible and a system evaluation for reducing operating cost was warranted. In January 1996 passive skimmer bailers were installed in the recovery wells. The interim action systems were shut down in February 1996 as recovery was negligible and the system was no longer able to meet the operation objectives.

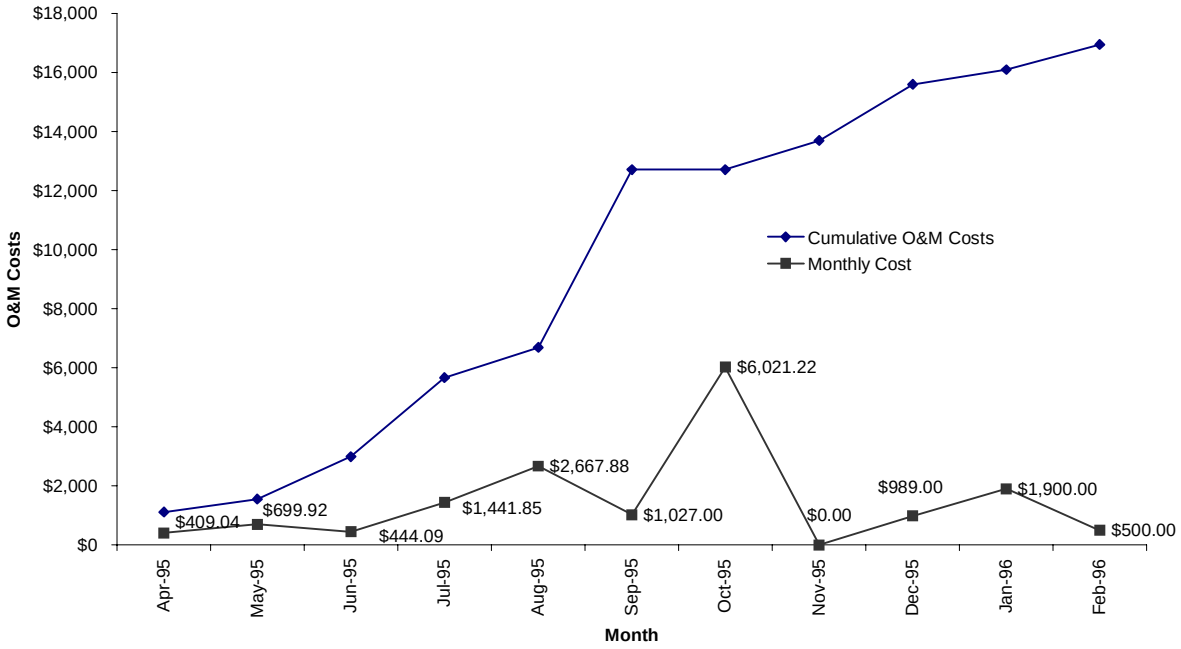
Correlation of Costs and Contaminant Removal

Figures 30 and 31 illustrate the relationship between the O&M costs and the JP-4 recovery of the interim action groundwater containment system at Sites SD-29 and ST-30.

Figure 30 illustrates the cumulative O&M cost relative to the cumulative contaminant removal. During October 1995, the curve had become vertical where the cost per unit of contaminant removal rose exponentially. In January 1996, to reduce cost, passive skimmer bailers were installed in the recovery wells. The system was shut down in February 1996 as recovery was negligible and the system was no longer able to meet the operation objectives.

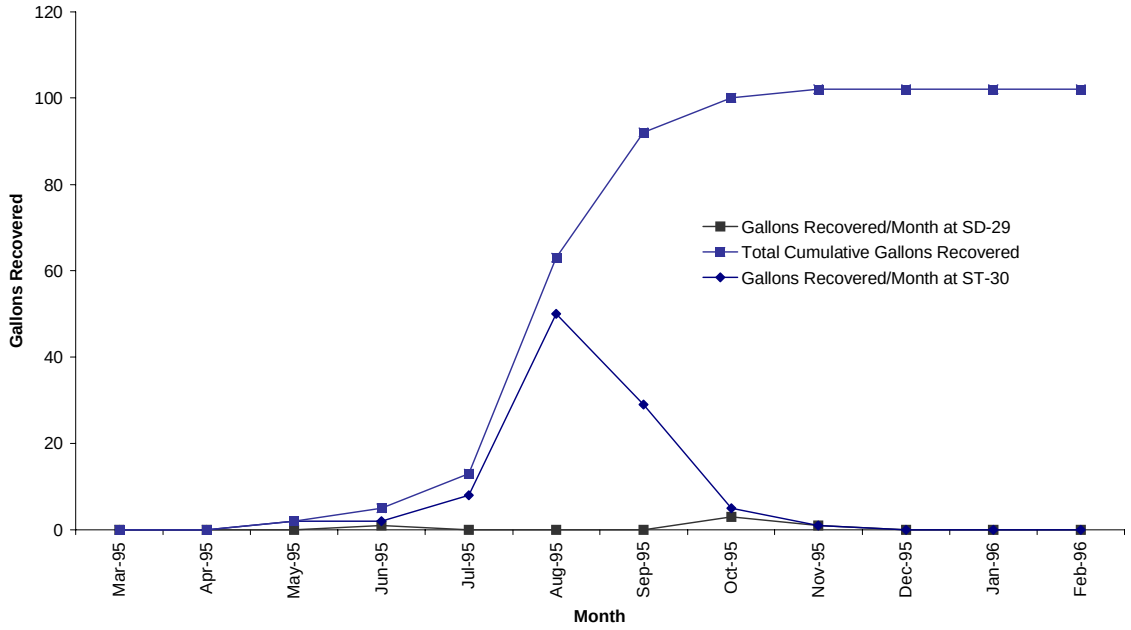
Figure 31 illustrates curves of the monthly and cumulative cost per unit of contaminant removal over the operation time of the systems. The monthly curve illustrates the cost per gallon of JP-4 removal in each month. The cumulative curve illustrates that the average cost per unit of contaminant removal was $166/gallon of JP-4 after one year of operation.

Figure 27
Cumulative and Monthy O&M Costs vs. Time
Sites SD-29 and ST-30, Shaw AFB



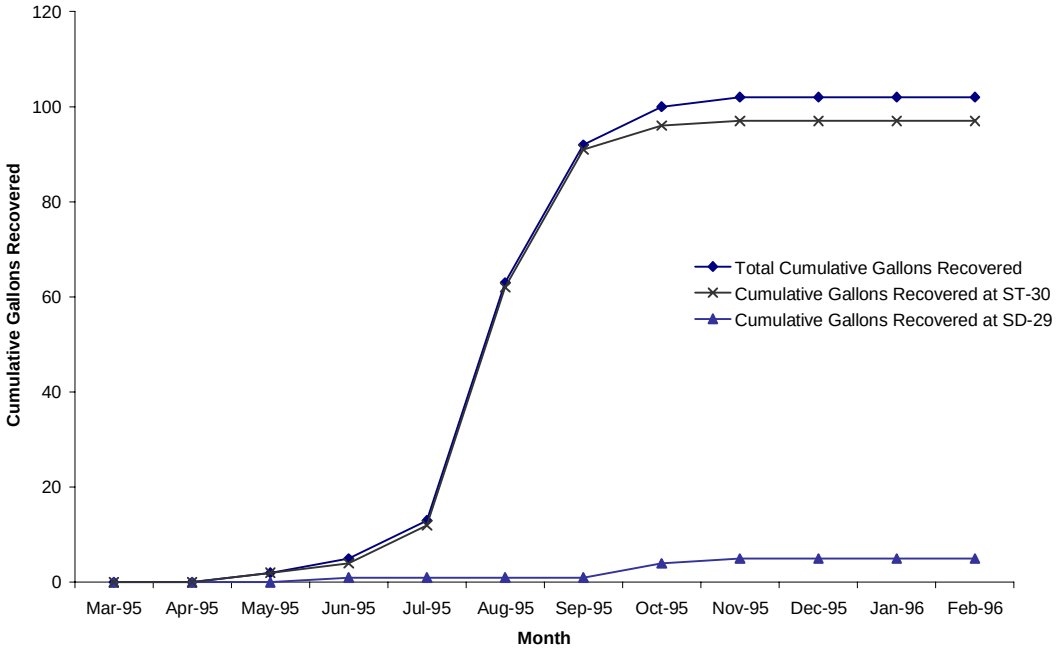
Shaw2930.xls; Cumulative and Monthly Costs

Figure 28
Monthly JP-4 Free Product Recovered at Sites SD-29 and ST-30 and Cumulative Gallons Recovered, Shaw AFB



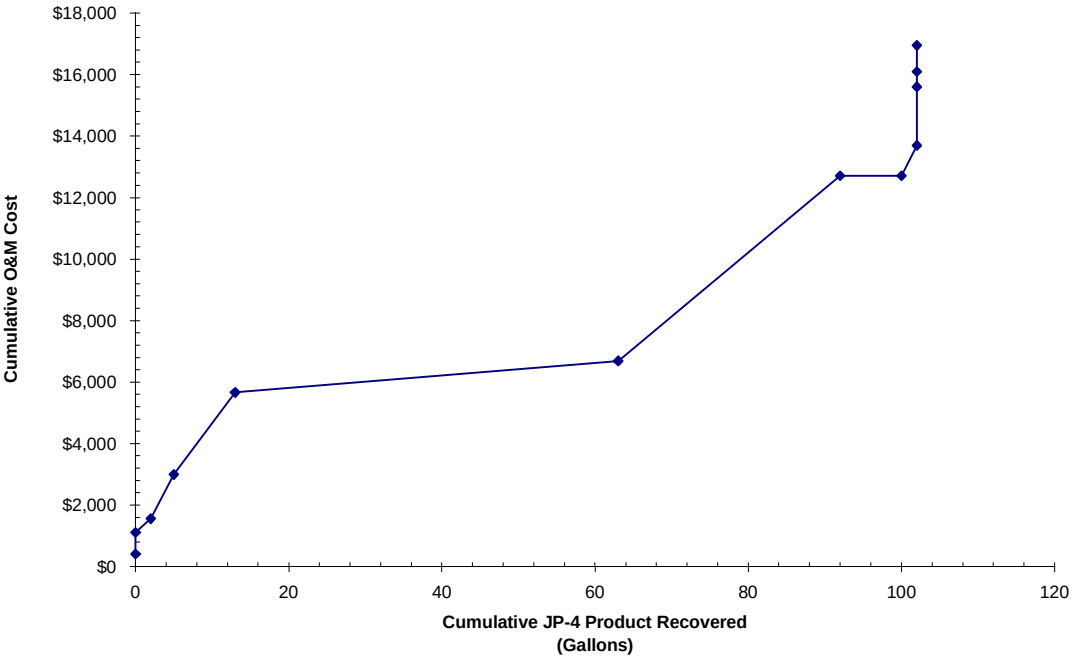
Shaw2930.xls; Monthly Gallons Recovered

Figure 29
Cumulative JP-4 Free Product Recovered
Site SD-29 and ST-30, Shaw AFB



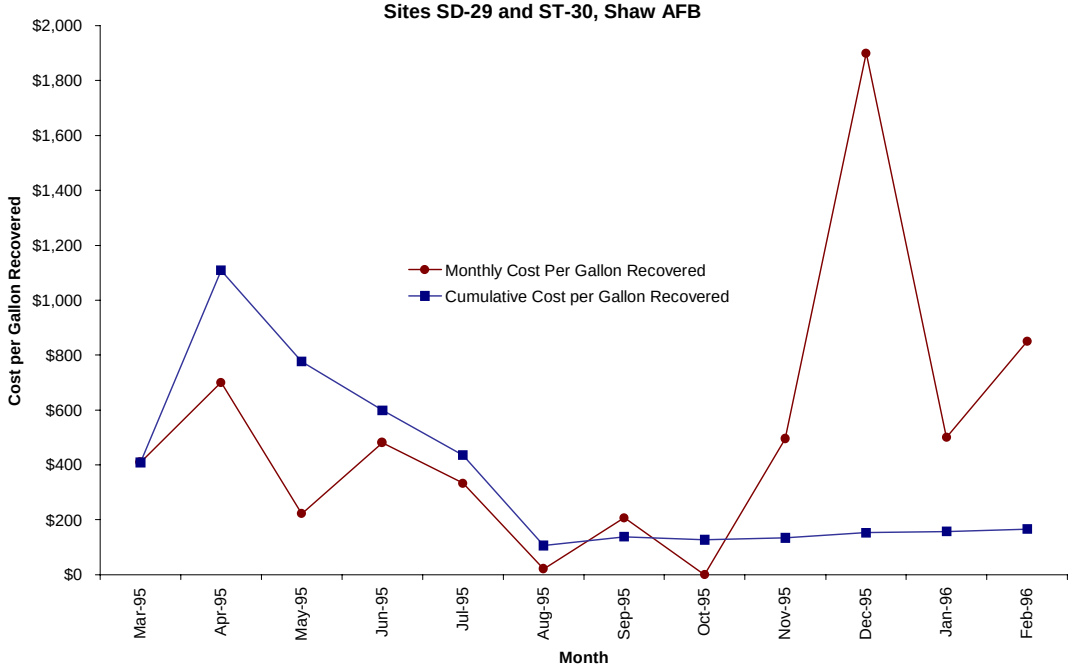
Shaw2930.xls; Cumulative Gallons Recovered

Figure 30
Cumulative O&M Costs per Cumulative JP-4 Product Recovered
Sites SD-29 and ST-30, Shaw AFB



Shaw2930.xls; Cumulative Cost & Gallons

Figure 31
Cumulative and Monthly Costs per Gallon Recovered vs. Time
Sites SD-29 and ST-30, Shaw AFB



Shaw2930.xls; Cost Per Gallon

APPENDIX A

Detailed Cost and Performance Data Tables

JP-4 Free Product Recovery
Sites SD-29 and ST-30
Shaw Air Force Base

Cost Per Gallon For Free Product Recovery Interim Remedial Action System At IRP Sites SD-29 and ST-30 O&M Cost

Month	Gallons Recovered/Month	Total Cumulative Gallons Recovered	Monthly Cost	Cumulative O&M Costs	Monthly Cost Per Gallon Recovered	Cumulative Cost per Gallon Recovered
Mar-95	0	0	$409.04	$409.04	$409.04	$409.04
Apr-95	0	0	$699.92	$1,108.96	$699.92	$1,108.96
May-95	2	2	$444.09	$1,553.05	$222.05	$776.53
Jun-95	3	5	$1,441.85	$2,994.90	$480.62	$598.98
Jul-95	8	13	$2,667.88	$5,662.78	$333.49	$435.60
Aug-95	50	63	$1,027.00	$6,689.78	$20.54	$106.19
Sep-95	29	92	$6,021.22	$12,711.00	$207.63	$138.16
Oct-95	8	100	$0.00	$12,711.00	$0.00	$127.11
Nov-95	2	102	$989.00	$13,700.00	$494.50	$134.31
Dec-95	0	102	$1,900.00	$15,600.00	$1,900.00	$152.94
Jan-96	0	102	$500.00	$16,100.00	$500.00	$157.84
Feb-96	0	102	$850.00	$16,950.00	$850.00	$166.18

Free Product Recovery
Remedial Action System
IRP Site SD-29, Building 1202

Month	Gallons Recovered/Month at SD-29	Cumulative Gallons Recovered at SD-29
Mar-95	0	0
Apr-95	0	0
May-95	0	0
Jun-95	1	1
Jul-95	0	1
Aug-95	0	1
Sep-95	0	1
Oct-95	3	4
Nov-95	1	5
Dec-95	0	5
Jan-96	0	5
Feb-96	0	5

Free Product Recovery Interim
Remedial Action System
Operable Unit 1, IRP Site ST-30

Month	Gallons Recovered/Month at ST-30	Cumulative Gallons Recovered at ST-30
Mar-95	0	0
Apr-95	0	0
May-95	2	2
Jun-95	2	4
Jul-95	8	12
Aug-95	50	62
Sep-95	29	91
Oct-95	5	96
Nov-95	1	97
Dec-95	0	97
Jan-96	0	97
Feb-96	0	97