

Appendix D of the Aerojet OU-5 Record of Decision

**Detailed Description and Cost Data for Soil Area Alternatives
from the Aerojet Perimeter Groundwater OU Feasibility Study, August 2008**

See Appendix C - Description and Cost Data for Groundwater Alternatives for discussion of methodology.

Table A20-1a Summary of Estimated Cost of Remedial Alternatives
FS Group A20-1
Sites 7D, 10D, 11D, and FCS
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Institutional Controls	Total Cost of Alternative
A20-1A	No Action	\$0	\$0	\$0
A20-1B	Institutional Controls	\$0	\$207,000	\$207,000

Notes and Key:

Table A20-1b *Estimated Cost of Institutional Controls*
FS Group A20-1
Sites 7D, 10D, 11D, and FCS
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
<u>Institutional Controls</u>				
Institutional Controls Plan	1	LS	\$20,000	\$20,000
Land Use Restriction/Covenant Drafting and Implementation	1	LS	\$40,000	\$40,000
5 Year Review and Reporting for 30 years	6	EA	\$20,000	\$120,000
	Subtotal - Institutional Controls			\$180,000
	General Contingency (15% of Capital Costs)			\$27,000
	Total Estimated Cost for Institutional Controls			\$207,000

Notes and Key:
EA = Each
LS = Lump sum

*Table A20-2a Summary of Estimated Cost of Remedial Alternatives
 FS Group A20-2
 Sites 7D and FCS
 Perimeter Groundwater Operable Unit RI/FS
 Aerojet Superfund Site
 Sacramento County, California*

Alternative		No Action	Institutional Controls	Vapor Barriers		Total Cost of Alternative
		Both Sites	Both Sites	7D	FCS	
A20-2A	No Action	\$0	\$0	\$0	\$0	\$0
A20-2B	Vapor Barriers with Institutional Controls	\$0	(1)	\$62,000	\$433,000	\$495,000

Notes and Key:

Table A20-2b *Estimated Cost for Vapor Barriers*
FS Group A20-2
Sites 7D and FCS
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
<u>Passive Vapor Barriers¹</u>				
<u>Site 7D</u>				
Vapor Barrier - Residential Development	18,900	sq. ft.	\$3.0	\$56,700
Vapor Barrier - Commercial Development		sq. ft.	\$2.5	\$0
			General Contingency (10% of Capital Costs)	\$5,700
	TOTAL ESTIMATED CAPITAL COST FOR VAPOR BARRIERS			\$62,000
<u>Site FCS</u>				
Vapor Barrier - Residential Development		sq. ft.	\$3.0	\$0
Vapor Barrier - Commercial Development	157,500	sq. ft.	\$2.5	\$393,750
			General Contingency (10% of Capital Costs)	\$39,375
	TOTAL ESTIMATED CAPITAL COST FOR VAPOR BARRIERS			\$433,000

Notes and Key:

EA = Each

LS = Lump sum

¹Assumptions for vapor barriers

Assumes vapor barriers required for area encompassed by site.

Residential Development - Assumes 60% building and 40% green belt/streets/parking

Commercial Development - Assumes 70% building and 30% green belt/streets/parking

7D Area: 31,500

FCS Area 225,000

Table A20-3a Summary of Estimated Cost of Remedial Alternatives
FSG Group A20-3
Sites 10D and 11D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Excavation and Disposal	Total Cost of Alternative
A20-3A	No Action	\$0	\$0	\$0
A20-3B	Institutional Controls	\$0	\$268,000	\$268,000

Notes and Key:

Table A20-3b *Estimated Cost of Soil Excavation and Landfill Disposal*
FSG Group A20-3
Sites 10D and 11D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
RD/RA Workplan	1	LS	\$20,000	\$20,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$20,000	\$20,000
		SUBTOTAL - REPORTING		\$40,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$6,000
Excavate and stockpile soil for Class II Landfill - Site 10D	1,170	TON	\$6	\$7,000
Excavate and stockpile soil for Class II Landfill - Site 11D ¹	1,350	TON	\$6	\$8,100
Soil transportation and disposal (Class II Landfill) - Site 10D	1,170	TON	\$40	\$46,800
Soil transportation and disposal (Class II Landfill) - Site 11D ¹	1,350	TON	\$40	\$54,000
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	0	TON	\$10	\$0
Water truck	4	DAY	\$500	\$2,000
Regulatory Oversight	1	LS	\$10,000	\$5,000
		SUBTOTAL - EXCAVATION AND DISPOSAL		\$131,900
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	10	EA	\$130	\$1,300
Excavation floor confirmatory sampling	6	EA	\$130	\$800
Excavation sidewall sampling	18	EA	\$130	\$2,300
		SUBTOTAL - SAMPLING		\$4,400
		SUBTOTAL - DIRECT CAPITAL COST		\$176,300
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	10	\$17,600
Construction Management (% of Direct Capital Costs)	1	%	10	\$17,600
Project Management (% of Direct Capital Costs)	1	%	6	\$10,600
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	1	Week	\$1,000	\$1,000
		SUBTOTAL - INDIRECT CAPITAL COST		\$46,800
		SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)		\$223,000
		Capital Cost Contingency (scope and cost) 20%		\$45,000
		TOTAL ESTIMATED CAPITAL COST		\$268,000

Notes and Key:

1 = Assumes the excavation and removal of soil containing PCBs at identified source area in Area 20
Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.
Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.
LS = Lump Sum
% = Percent
EA = Each
Ton = 2,000 pounds

Table A20-4a Summary of Estimated Cost of Remedial Alternatives
FS Group A20-4
Site C41
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Excavation and Disposal	Total Cost of Alternative
A20-4A	No Action	\$0	\$0	\$0
A20-4B	Excavation and Landfill Disposal	\$0	\$1,054,000	\$1,054,000

Notes and Key:

Table A20-4b *Estimated Cost of Soil Excavation and Landfill Disposal*
FS Group A20-4
Site C41
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
RD/RA Workplan	1	LS	\$20,000	\$10,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$20,000	\$10,000
			SUBTOTAL - REPORTING	\$20,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$6,000
Excavate and stockpile soil for Class II Landfill	15,825	TON	\$6	\$95,000
Soil transportation and disposal (Class II Landfill)	15,825	TON	\$40	\$633,000
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	0	TON	\$10	\$0
Water truck	2	DAY	\$500	\$1,000
Regulatory Oversight	1	LS	\$10,000	\$10,000
			SUBTOTAL - EXCAVATION AND DISPOSAL	\$748,000
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	2	EA	\$130	\$300
Excavation floor confirmatory sampling	2	EA	\$130	\$300
Excavation sidewall sampling	8	EA	\$130	\$1,000
			SUBTOTAL - SAMPLING	\$1,600
			SUBTOTAL - DIRECT CAPITAL COST	\$769,600
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	6	\$46,200
Construction Management (% of Direct Capital Costs)	1	%	4	\$30,800
Project Management (% of Direct Capital Costs)	1	%	4	\$30,800
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	1	Week	\$1,000	\$1,000
			SUBTOTAL - INDIRECT CAPITAL COST	\$108,800
			SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)	\$878,000
			Capital Cost Contingency (scope and cost) 20%	\$176,000
			TOTAL ESTIMATED CAPITAL COST	\$1,054,000

Notes and Key:

Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.

Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.

LS = Lump Sum

% = Percent

EA = Each

Ton = 2,000 pounds

Table A49-1a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-1A
Sites 32D, 34D, 35D, and 38D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Institutional Controls	Capping	Soil Vapor Extraction and Cap	Total Cost of Alternative
A49-1A	No Action	\$0	\$0	\$0	\$0	\$0
A49-1B	Capping with Institutional Controls	\$0	\$207,000	\$366,000	\$0	\$573,000
A49-1C	SVE with Capping and Institutional Controls	\$0	\$207,000	\$0	\$1,241,000	\$1,448,000

Notes and Key:

SVE = Soil vapor extraction

Area 49 - Includes Sites 32D, 34D, 35D, and 38D

Table A49-1b Estimated Cost of Institutional Controls
FS Group A49-1A
Sites 32D, 34D, 35D, and 38D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
<u>Institutional Controls</u>				
Institutional Controls Plan	1	LS	\$20,000	\$20,000
Land Use Restriction/ Covenant Drafting and Implementation	1	LS	\$40,000	\$40,000
5 Year Review and Reporting for 30 years	6	EA	\$20,000	\$120,000
	Subtotal - Institutional Controls			\$180,000
	General Contingency (15% of Capital Costs)			\$27,000
	Total Estimated Cost for Institutional Controls			\$207,000

Notes and Key:

EA = Each

LS = Lump sum

Table A49-1c *Estimated Cost of Capping
 FS Group A49-1A
 Sites 32D, 34D, 35D, and 38D
 Perimeter Groundwater Operable Unit RI/FS
 Aerojet Superfund Site
 Sacramento County, California*

DESCRIPTION	QUANTITY		COST		SOURCE
	NUMBER	UNIT	UNIT COST	TOTAL COST	
DIRECT CAPITAL COST					
- Surveying/Site Layout	1	DAY	\$1,500	\$1,500	
- Purchase and Placement of Baserock for Asphalt Surface (2 inches over approximately 8.1 acres)	2,175	CY	\$22.00	\$47,850	
- Placement of Asphalt-Concrete Surface over Baserock (2 inches)	35,000	SY	\$6.83	\$239,085	
	TOTAL DIRECT CAPITAL COSTS			\$288,435	
INDIRECT CAPITAL COST					
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	ls	10%	\$28,844	ERM, 2006
Construction Management (% of Direct Capital Costs)	1	ls	15%	\$43,265	ERM, 2006
Health and Safety Contingency (2% of Direct Capital Costs)	1	ls	2%	\$5,769	ERM, 2006
	INDIRECT CAPITAL COST			\$77,900	
	TOTAL CAPITAL COST (DIRECT AND INDIRECT)			\$366,000	

Notes and Key:

All total costs rounded to the nearest \$100.

References:

ERM, 2006: ERM-West Incorporated, Internal Quote, 2006.
 Means 2002: RS Means Site Work and Landscape Cost Data, 18th Annual Edition, 2004.
 Means 2004: RS Means Heavy Construction Cost Data, 18th Annual Edition, 2004.
 Means ECHOS 2004: RS Means Environmental Cost Data, 10th Annual Edition, 2004.

Table A49-1d Estimated Cost of Soil Vapor Extraction at Sites 32D, 34D, 35D, and 38D
FS Group A49-1A
Sites 32D, 34D, 35D, and 38D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
System Construction				
- Pilot Testing	1	LS	\$100,000	\$100,000
- Surveying/Site Layout	1	DAY	\$1,500	\$1,500
- Purchase and Placement of Baserock for Asphalt Surface (2 inches over approximately 8.1 acres)	2,175	CY	\$22.00	\$47,850
- Placement of Asphalt-Concrete Surface over Baserock (2 inches)	35,000	SY	\$6.83	\$239,085
- Construct Treatment Pad	1	LS	\$15,000	\$15,000
- Install Aboveground Conveyance Piping from Well Field to Treatment Pad	900	FT	\$12.00	\$10,800
- Purchase and Install Vacuum Blower and Moisture Knockout Vessel	1	LS	\$10,000	\$10,000
- Purchase and Install Thermal Oxidizer (500 cfm capacity unit)	1	LS	\$80,000	\$80,000
- Electrical and Controls Connection	1	LS	\$15,000	\$15,000
- Fencing Around Remediation Equipment	200	FT	\$15.00	\$3,000
			SUBTOTAL	\$522,235
Miscellaneous Costs				
- AQMD Permit-to-Construct	1	LS	\$5,000	\$5,000
- Baseline Soil Vapor Sample Analysis from each SVE Well	6	EA	\$265	\$1,590
- Regulatory Oversight	1	LS	\$10,000	\$10,000
			SUBTOTAL	\$16,590
			ESTIMATED TOTAL DIRECT CAPITAL COST	\$538,825
INDIRECT CAPITAL COST				
- Engineering Design, Procurement, Administrative, and Legal Costs (10% of Direct Capital Costs)	1	LS	\$53,883	\$53,883
- Construction Management (7% of Direct Capital Costs)	1	LS	\$37,718	\$37,718
- Health and Safety Contingency (2% of Direct Capital Costs)	1	LS	\$10,777	\$10,777
			INDIRECT CAPITAL COST	\$102,377
			TOTAL CAPITAL COST (DIRECT AND INDIRECT)	\$641,202
ANNUAL COST (5-YEAR O&M PROGRAM)				
- Engineering and Technician Labor (12.5% FTE for Engineer-level and 20% FTE for Technician-level) - Includes Progress Reporting to Agencies	1	LS	\$58,500	\$58,500
- Annual AQMD Permit-to-Operate	1	LS	\$2,500	\$2,500
- Monthly System Sampling (for compliance with AQMD permit - system influent and effluent samples each month)	24	EA	\$265	\$6,360
- Annual Soil Vapor Sample Analysis from each SVE Well	6	EA	\$265	\$1,590
- Repair and Replacement of Miscellaneous Equipment and Materials	1	LS	\$5,000	\$5,000
- Electrical Power (assumes 400 kwhr/day at 90% operation time)	131,400	KWHR	\$0.13	\$17,082
- Natural Gas (assumes 100 cf/hr at 90% operation time)	8,097	CF	\$0.77	\$6,235
			TOTAL ANNUAL COST	\$97,267
			TOTAL O&M PROGRAM COST (5 years)	\$486,333
			TOTAL CAPITAL AND ANNUAL COSTS	\$1,128,000
			General Contingency (10% of Capital and Annual Costs)	\$113,000
			TOTAL COST OF ALTERNATIVE	\$1,241,000

Notes and Key:

AQMD = Air Quality Management District
CF = Cubic feet
CFM = Cubic feet per minute
CY = Cubic Yard
EA = Each

FTE = Full Time Employee
KWHR = Kilowatt hour
LS = Lump sum
MO = Month
O&M = Operations and Maintenance

Table A49-2a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-2
Site 33D and Buildings 49007 and 49011 Septic Tanks
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Institutional Controls	Total Cost of Alternative
A49-2A	No Action	\$0	\$0	\$0
A49-2B	Institutional Controls	\$0	(1)	\$0

Notes and Key:

(1) = Assumes cost of institutional control provided in FS Group A49-1 applies to all sites in Area 49.

Table A49-3a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-3
Site 33D and Buildings 49007 and 49011 Septic Tanks
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Institutional Controls	Total Cost of Alternative
A49-3A	No Action	\$0	\$0	\$0
A49-3B	Institutional Controls	\$0	(1)	\$0

Notes and Key:

(1) = Assumes cost of institutional control provided in FS Group A49-1 applies to all sites in Area 49.

Table A49-4a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-4
Septic Tank at Building 49022
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Institutional Controls	Total Cost of Alternative
A49-4A	No Action	\$0	\$0	\$0
A49-4B	Institutional Controls	\$0	(1)	\$0

Notes and Key:

(1) = Assumes cost of institutional control provided in FS Group A49-1 applies to all sites in Area 49.

Table A49-5a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-5
Site C4
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		No Action	Excavation and Disposal	Total Cost of Alternative
A20-5A	No Action	\$0	\$0	\$0
A20-5B	Excavation and Landfill Disposal	\$0	\$64,000	\$64,000

Notes and Key:

Table A49-5b *Estimated Cost of Soil Excavation and Landfill Disposal*
FS Group A49-5
Site C4
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
RD/RA Workplan	1	LS	\$2,000	\$10,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$2,000	\$10,000
			SUBTOTAL - REPORTING	\$20,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$3,000
Excavate and stockpile soil for Class II Landfill	270	TON	\$6	\$1,600
Soil transportation and disposal (Class II Landfill)	270	TON	\$40	\$10,800
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	0	TON	\$10	\$0
Water truck	1	DAY	\$500	\$500
Regulatory Oversight	0.25	LS	\$10,000	\$2,500
			SUBTOTAL - EXCAVATION AND DISPOSAL	\$21,400
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	1	EA	\$130	\$100
Excavation floor confirmatory sampling	1	EA	\$130	\$100
Excavation sidewall sampling	1	EA	\$130	\$100
			SUBTOTAL - SAMPLING	\$300
			SUBTOTAL - DIRECT CAPITAL COST	\$41,700
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	10	\$4,200
Construction Management (% of Direct Capital Costs)	1	%	10	\$4,200
Project Management (% of Direct Capital Costs)	1	%	6	\$2,500
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	0.2	Week	\$1,000	\$200
			SUBTOTAL - INDIRECT CAPITAL COST	\$11,100
			SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)	\$53,000
			Capital Cost Contingency (scope and cost) 20%	\$11,000
			TOTAL ESTIMATED CAPITAL COST	\$64,000

Notes and Key:

Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.

Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.

LS = Lump Sum

% = Percent

EA = Each

Ton = 2,000 pounds