

September 17, 1992

Mr. Loren Maas
Siemens Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

**RE: Pre-Unit Managers Meeting Minutes – August 1992
Siemens Power Corporation, Richland, Washington**

Dear Loren:

Attached are the above-referenced minutes for your use. Please contact me if you have any questions or comments.

Sincerely,

GERAGHTY & MILLER, INC.



Susan J. Keith
Principal Scientist and Associate/
Project Officer

SJK/kkj

Attachment

cc: Wendell Greenwald, U.S. Army Corps of Engineers
John Stewart, U.S. Army Corps of Engineers
Robert Stewart, U.S. Department of Energy



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MINUTES

PRE-UNIT MANAGERS MEETING

AUGUST 26, 1992

3:00 p.m. - 5:30 p.m.

1) **Applicable or Relevant and Appropriate Requirements (ARARs)**

The U.S. Army Corps of Engineers (USACE) ARARs analysis will be discussed at the August 27, 1992 Unit Managers Meeting (UMM) and a revised draft will be completed based upon comment at that meeting. U.S. Department of Energy (USDOE)/USACE received Siemens Power Corporation's (SPC's) comments and will let SPC know how they were "dispositioned."

2) **RAOs**

USACE plans to distribute draft RAOs at the August 27, 1992 UMM. If they don't, they will provide SPC an opportunity to review and comment prior to distribution.

3) **Technetium-99 (Tc⁹⁹) Results**

USACE requested that Geotech of Grand Junction, Colorado do a peer review of the Battelle Tc⁹⁹ analytical methodology and to validate the Tc⁹⁹ results for the samples collected in the vicinity of the Horn Rapids Landfill (HRL).

4) **EM-24 Group**

The work product of the effort to promote a cost-effective remedial selection process was handed out ("Hanford 1100-EM-1 Operable Unit Preliminary Decision Tree Analysis," attached). This document was developed as part of a demonstration of what could be done for USDOE at all their sites. No future use is planned for the work product.

5) **USDOE Proposed Plan (PP) and Feasibility Study (FS) Schedule**

September 21 to 25, 1992 Internal USACE review of FS

End of September 1992 Begin preparation of the PP

Early October 1992 Technical editing of FS

End of October 1992 Completion of PP

November 15, 1992 Send FS and PP to USDOE-RL and USDOE-HQ

Early December 1992 Receipt of USDOE comments

December 31, 1992

Submit FS and PP to USDOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology)

USDOE will plan to provide time for SPC review and comment prior to finalizing the document for the December 31, 1992 submittal date.

USACE is assuming that it will be at least 6 months after the issuance of the December 31, 1992 draft Remedial Investigation/Feasibility Study (RI/FS) before a Record of Decision (ROD) is developed.

6) SPC Ground-Water Level Data

SPC ground-water-level data from April 1992 on were distributed (attached).

Attachments:

- Agenda
- Attendance List
- Hanford 1100-EM-1 Operable Unit Preliminary Decision Tree Analysis
- Water-Level Elevations of Siemens Wells GM-1 through GM-16, P-1 through P-3, and PW-1

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AGENDA

Pre-Unit Manager's Meeting
Siemens Power Corporation (SPC) Facility
Conference Room No. 4
August 26, 1992
3:00 PM

1. ACE ARARs analysis
2. Status of SPC risk assessment
3. EM24 Update
 - Decision trees
4. Ground-Water Quality Sampling Schedule
 - 3rd Quarter 1992 sampling schedule - Week of September 14
 - Concurrence with ACE on 4th Quarter 1992 sampling schedule - Week of November 16
5. Ground-Water Modeling
 - Status of SPC Modeling Effort
6. Other Topics
 - 300 Area pumping test report
 - SPC water level data
7. Next meeting: September 23, 1992, 2:00 pm
8. RAOs, PRGs + PP, draft ROD
 - Can we review prior to distribution to others

SPC/ACE/DOE
Pre-Unit Managers Meeting August 26, 1999
3:00 pm

<u>Name</u>	<u>For</u>
Susan Keith	G4M for SPC
LOREN MAAS	SPC
JOHN STEWART	USACE
JAY BOWER	G4M
Bob Stewart	DOE

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Handed out by
John Stewart at
8/26/92 Pre-unit
managers meeting
Results of EM 24 group

Hanford 1100-EM-1 Operable Unit Preliminary Decision Tree Analysis

Prepared for

United States Department of Energy

REVISED

21 August 1992

Hanford 1100-EM-1 Operable Unit
Preliminary Decision Tree Analysis

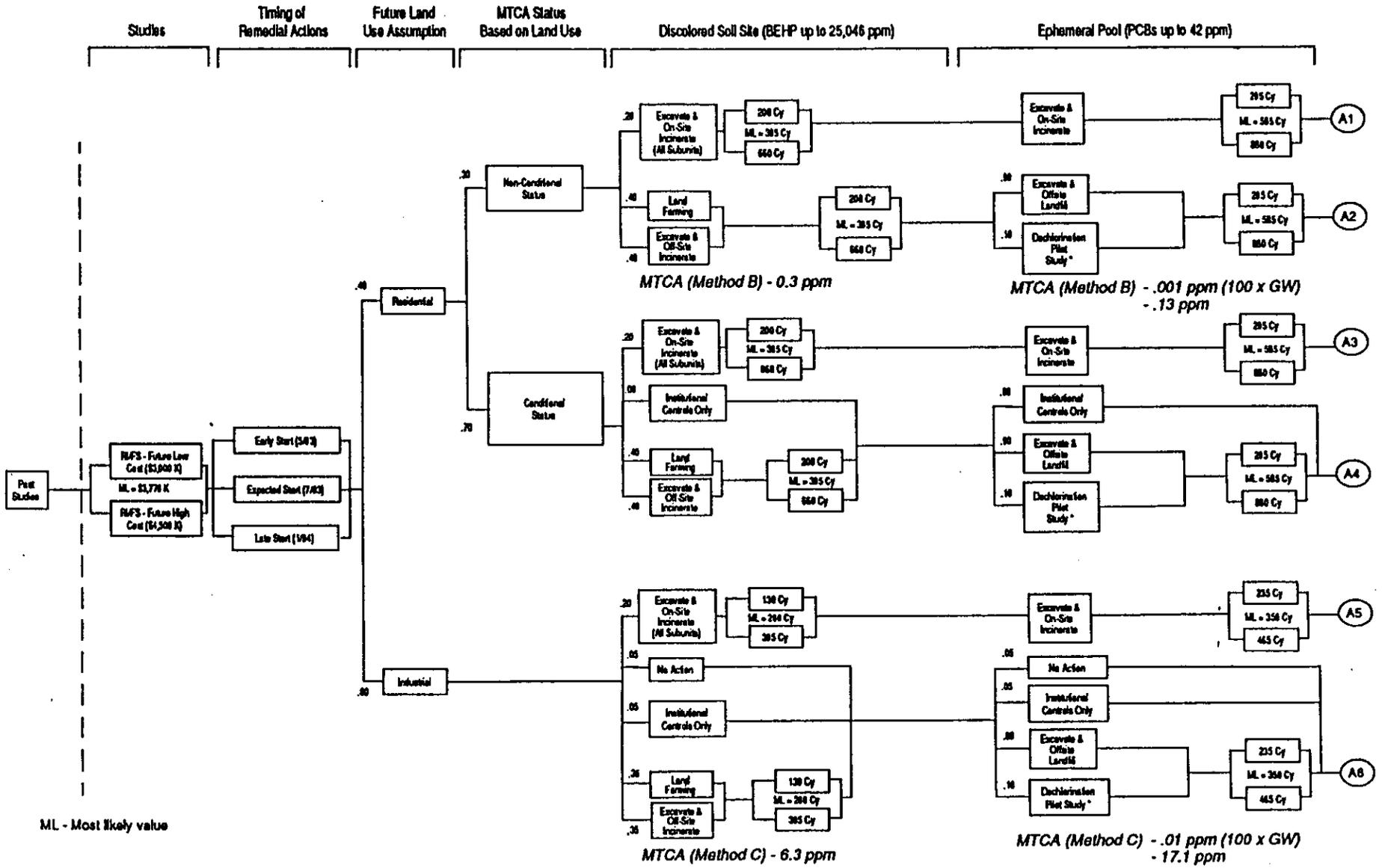
BACKGROUND

Putnam, Hayes & Bartlett, Inc. (PHB) has performed a decision tree analysis based on meetings and discussions with Hanford site personnel (see attached decision tree).

The primary goals of this analysis are to:

- Develop an assessment of the expected value cost and the range of potential site costs, and to assess the costs of alternative land use assumptions and site status (e.g., conditional v. non-conditional);
- Develop remedial scenarios for inclusion in the Feasibility Study (FS);
- Develop rationales to justify selection of cost-effective remedies that meet the relevant federal and state criteria; and
- Identify key data and assumptions that drive the results of the cost analysis.

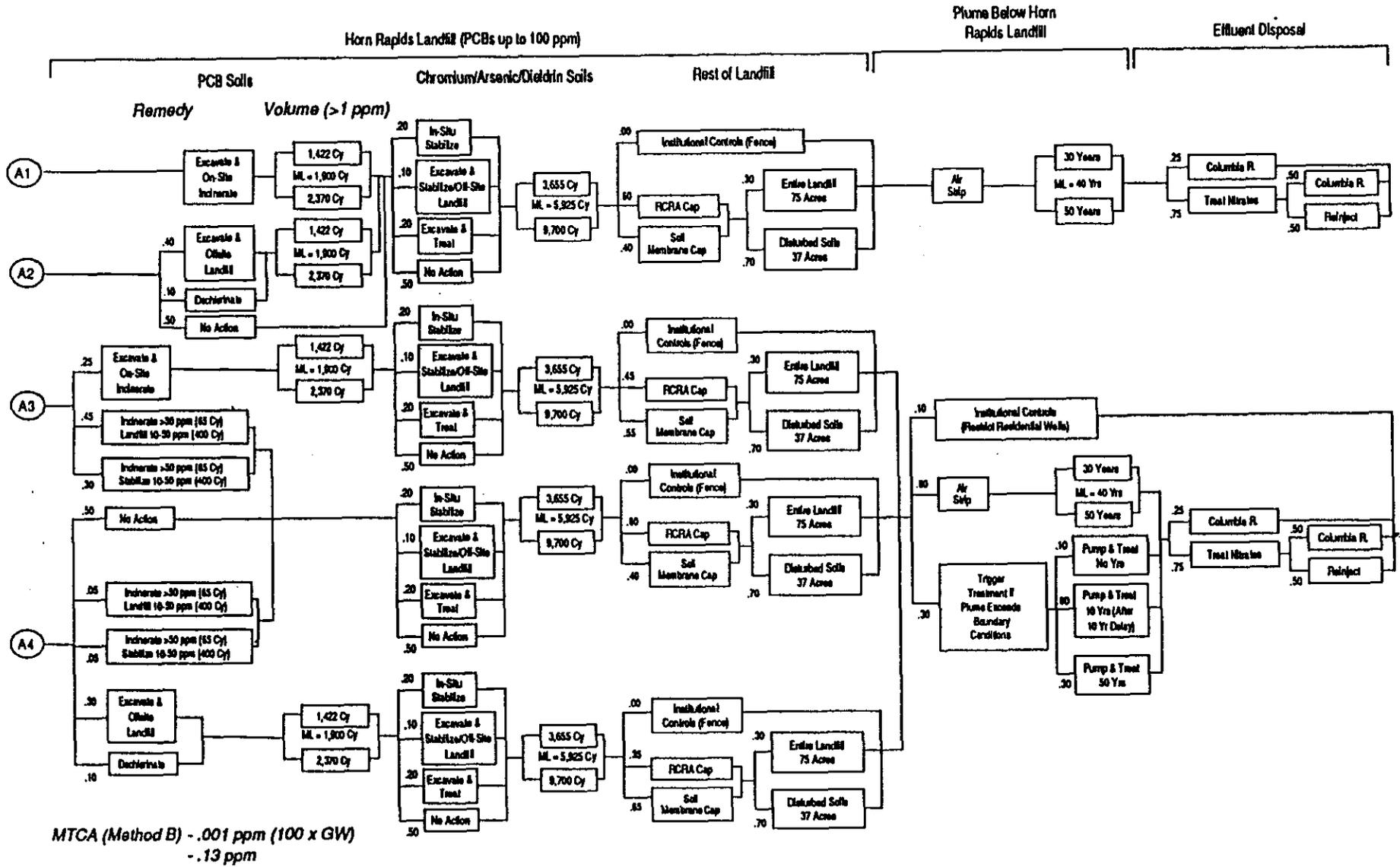
Hanford 1100-EM-1 Draft Decision Tree



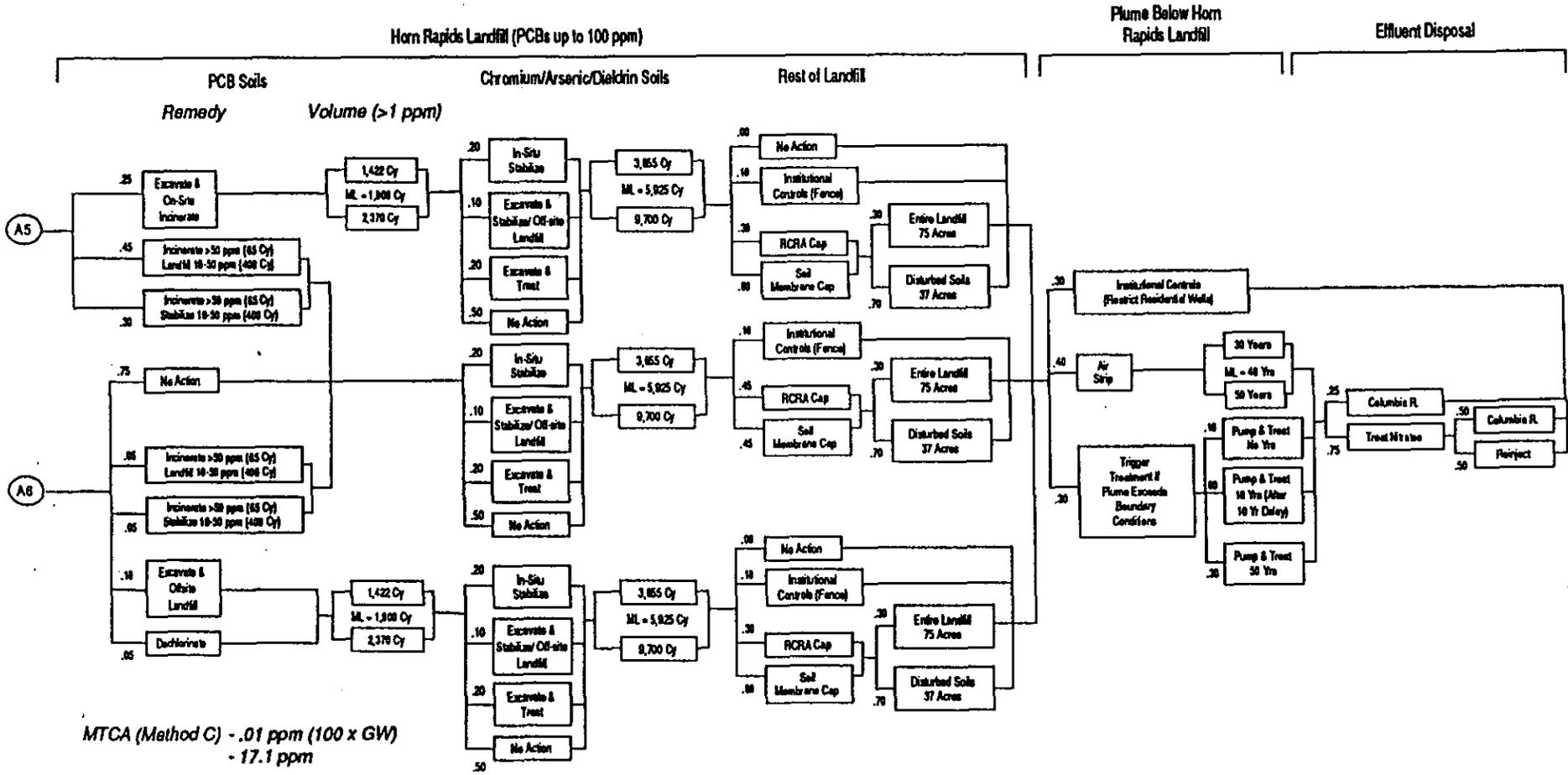
ML - Most likely value

* Included as an option if Dechlorination is the chosen option for Horn Rapids Landfill PCB Soils

Hanford 1100-EM-1 Draft Decision Tree (Cont.)



Hanford 1100-EM-1 Draft Decision Tree (Cont.)



TOTAL SITE COSTS AND EFFECTS OF LAND USE/SITE STATUS

Based on the decision tree and utilizing probability assignments provided by USACE, PHB has calculated the expected value and a range of costs for the entire set of remedial alternatives and under each of the three land use/site status assumptions. These results are summarized below and the first result is depicted graphically on the following page (dollars in millions).

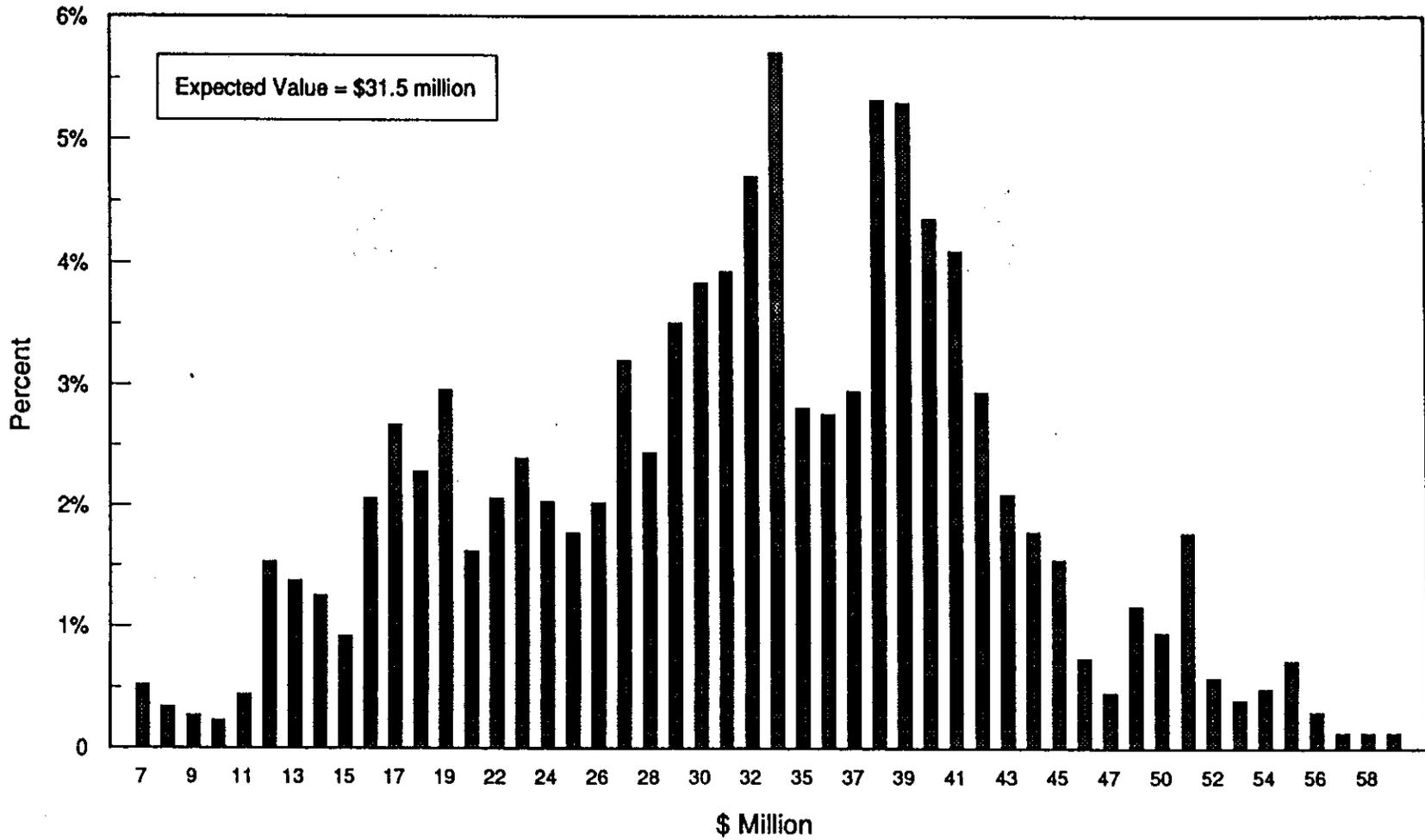
	5 Percent Limit ¹	Expected Value	95 Percent Limit ²
All Scenarios	\$14.4	\$31.5	\$50.2
Residential, Non-Conditional	26.5	39.3	53.0
Residential, Conditional	18.5	34.2	51.1
Industrial	12.7	28.7	47.7

These results are subject to several assumptions that will likely change as new information is developed or decisions are rendered by the regulatory authorities. Note that if a 70 percent probability were assigned to a residential land-use site designation rather than a 40 percent probability assignment (as is used in the baseline assumption) the expected value would increase from \$31.5 million to \$33.6 million.

¹ The 5 percent limit figure depicts the point on the distribution curve at which there exists a 5 percent probability that the total cost will be below the figure shown.

² The 95 percent limit figure depicts the point on the distribution curve at which there exists a 95 percent probability that the total cost will be below the figure shown.

Expected Value of Clean-Up Costs



TOTAL SITE COSTS AND EFFECTS OF LAND USE/SITE STATUS (Cont.)

To illustrate the range of remedies and their resulting costs, the following chart lists three remedies with costs similar to the 5 percent limit, expected value and 95 percent limit of the total cost distribution (dollars in millions).

Example of Remedies at Varying Statistic Levels								
Statistic Level	Cost at Statistic Level	Studies	Remedy					Cost of Specified Remedy
			Discolored Soil Site	Ephemeral Pool	HRL Contaminated Soils	HRL Rest of Landfill	Plume Below HRL	
5 Percent Limit	\$14.4	\$3.7	Excavate & Off-Site Incinerate 130 cy (\$0.5)	Excavate & Off-Site Landfill 235 cy (\$0.2)	Stabilize PCB Soils 10-50 ppm (400 cy) and Off-Site Incinerate > 50 ppm (400 cy) and In-Situ stabilize CR/AR/DI Soils (5,925 cy) (\$2.2)	Soil/Membrane Cap 37 Acres (\$8.3)	No Action (\$0)	\$14.9
Expected Value	\$31.5	\$3.7	Excavate & Off-Site Incinerate 260 cy (\$1.0)	Excavate & Off-Site Landfill 585 cy (\$0.5)	Off-Site Landfill PCB Soils (1,422 cy) and In-Situ Stabilize CR/AR/DI Soils (5,925 cy) (\$2.7)	RCRA Cap 37 Acres (\$14.9)	Treat TCE, and send to Columbia River 40 Years (\$9.8)	\$32.6
95 Percent Limit	\$50.2	\$3.7	Excavate & On-Site Incinerate 660 cy (\$2.2)	Excavate & On-Site Incinerate 880 cy (\$0.7)	Excavate and On-Site Incinerate PCB Soils (2,370 cy) and Excavate and Stabilize CR/AR/DI Soils (9,700 cy) (\$8.5)	RCRA Cap 37 Acres (\$14.9)	Treat TCE, NO ₃ and Reinject 50 Years (\$21.0)	\$51.0

Note: Capital cost of on-site incinerator allocated to discolored soil site.

Present Value #

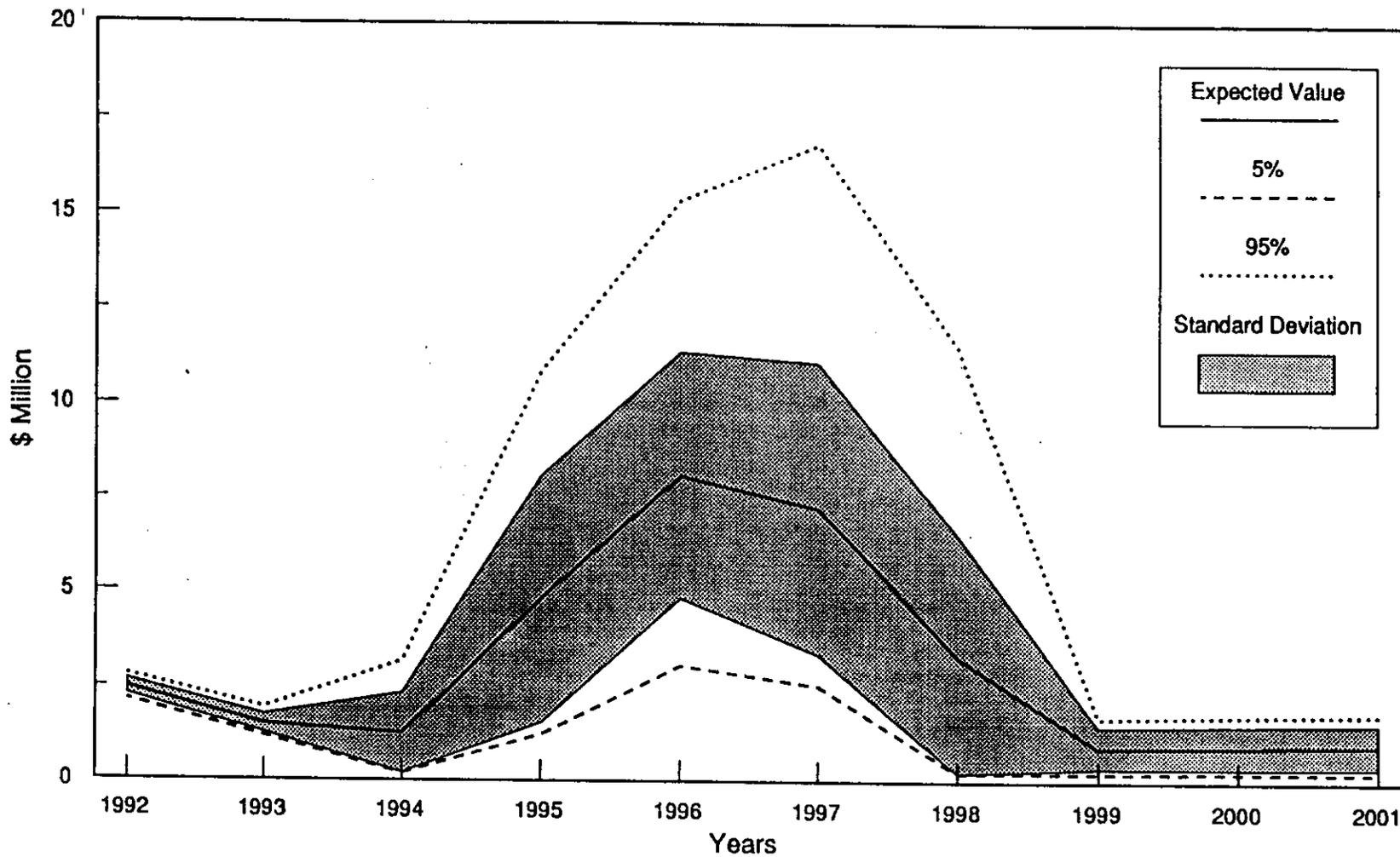
PROJECTION OF ANNUAL COSTS

In addition to present value estimates, annual cost estimates can be made which exhibit the range of physical uncertainty and remedy selection uncertainty at the site.

HANFORD 1100-EM-11: ANNUAL COST PROJECTIONS
(Millions of Nominal Dollars)

Year	Expected Value	5 Percent Limit	95 Percent Limit	Standard Deviation
1992	2.5	2.1	2.8	0.2
1993	1.5	1.2	1.9	0.2
1994	1.3	0.2	3.2	1.1
1995	4.8	1.2	10.9	3.3
1996	8.1	3.1	15.3	3.3
1997	7.2	2.5	16.8	3.9
1998	3.3	0.2	11.5	3.2
1999	0.9	0.2	1.7	0.6
2000	0.9	0.3	1.8	0.6
2001	1.0	0.3	1.8	0.6
PV of Remaining Years	9.7	2.2	15.7	4.1
PV to Clean Up All Years	32.6	14.4	50.2	10.5
Nominal Value to Clean Up All Years	90.6	42.8	136.7	30.9

Site Clean-Up Annual Cost Projections



REMEDIAL SCENARIOS

The decision tree assessment evaluates thousands of different remedial scenarios. However, several key remedial outcomes drive total cleanup cost. The table that follows lists the key alternatives that are responsible for most of the site costs (i.e., the cost drivers).

Following this table is another table that combines the driver alternatives and develops 13 options, some of which DOE might want to include in its Feasibility Study (FS) -- the list should probably be narrowed down to five or six alternatives.

For the purpose of the analysis shown on the next three tables, we have calculated the most likely value for the non-driver remedial actions (e.g., studies, the discolored soil site, and the ephemeral pool). These costs account for less than 20 percent of total site costs on an expected value basis.

REMEDIAL ALTERNATIVES THAT DRIVE 1100-EM-1 COSTS
(Present Value Dollars in Thousands)

Horn Rapids Landfill		Plume Below Horn Rapids Landfill
Contaminant Hot Spots	Cover	Treatment Alternatives
1. Treat Hot Spots (Expected Value of Treatment Alternatives = \$2,365)	1. RCRA Cap Fenced Area (\$26,243)	1. Treat groundwater for TCE and nitrates and reinject (\$19,977)
2. No Action	2. Soil/Membrane Cap Fenced Area (\$12,846)	2. Treat groundwater for TCE only and send to Columbia River (\$9,776)
	3. RCRA Cap Disturbed Soils (\$14,906)	3. Treat groundwater conditionally for TCE and nitrates and reinject (\$7,962)
	4. Membrane Cap Disturbed Soils (\$8,290)	4. Treat groundwater conditionally for TCE and send to Columbia River (\$3,891)
		5. No action (\$0)

Expected Value of Total Site Cleanup¹ = \$31.5

¹ The total site cost estimate includes \$5.0 million for the most likely activities at the discolored soil site, the ephemeral pool and the RI/FS.

POSSIBLE FS REMEDIAL ALTERNATIVES
(Present Value Dollars in Thousands)

Alternative Number	HRL Contaminated Soils	HRL Cover	HRL Plume	Total Expected Cost for Alternative ¹
1.	Treat Hot Spots	RCRA Cap Fenced Area (75 Acres)	Treat TCE, NO ₃ & Reinject	\$53,585
	\$2,365	\$26,243	\$19,977	
2.	Treat Hot Spots	RCRA Cap Disturbed Soils (37 Acres)	Treat TCE, NO ₃ & Reinject	\$42,248
	\$2,365	\$14,906	\$19,977	
3.	No Action	RCRA Cap Fenced Area (75 Acres)	Treat TCE, NO ₃ & Reinject	\$51,220
		\$26,243	\$19,977	
4.	No Action	RCRA Cap Disturbed Soils (37 Acres)	Treat TCE, NO ₃ & Reinject	\$39,883
		\$14,906	\$19,977	
5.	No Action	Soil/Membrane Cap Fenced Area (75 Acres)	Treat TCE, NO ₃ & Reinject	\$37,823
		\$12,846	\$19,977	
6.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Treat TCE, NO ₃ & Reinject	\$33,267
		\$8,290	\$19,977	
7.	Treat Hot Spots	RCRA Cap Fenced Area (75 Acres)	Conditionally Treat TCE, NO ₃ and Reinject	\$41,570
	\$2,365	\$26,243	\$7,962	

POSSIBLE FS REMEDIAL ALTERNATIVES (Cont.)
(Present Value Dollars in Thousands)

Alternative Number	HRL Contaminated Soils	HRL Cover	HRL Plume	Total Expected Cost for Alternative ¹
8.	Treat Hot Spots	RCRA Cap Disturbed Soils (37 Acres)	Conditionally Treat TCE, NO ₃ and Reinject	\$30,233
		\$2,365	\$14,906	
9.	No Action	Soil/Membrane Cap Fenced Area (75 Acres)	Conditionally Treat TCE, NO ₃ and Reinject	\$25,808
			\$12,846	
10.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Conditionally Treat TCE, NO ₃ and Reinject	\$21,252
			\$8,290	
11.	No Action	Soil/Membrane Cap Fenced Area (75 Acres)	Conditionally Treat TCE and Send to Columbia River	\$21,737
			\$12,846	
12.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Conditionally Treat TCE and Send to Columbia River	\$17,181
			\$8,290	
13.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Treat TCE only and Send to Columbia River	\$23,066
			\$8,290	

¹ Expected cost includes an expected value of \$5.0 million for studies and other operable subunits.

POTENTIAL FS ALTERNATIVES

At this point, FS alternatives can start to be evaluated. Five potential alternatives are listed below:

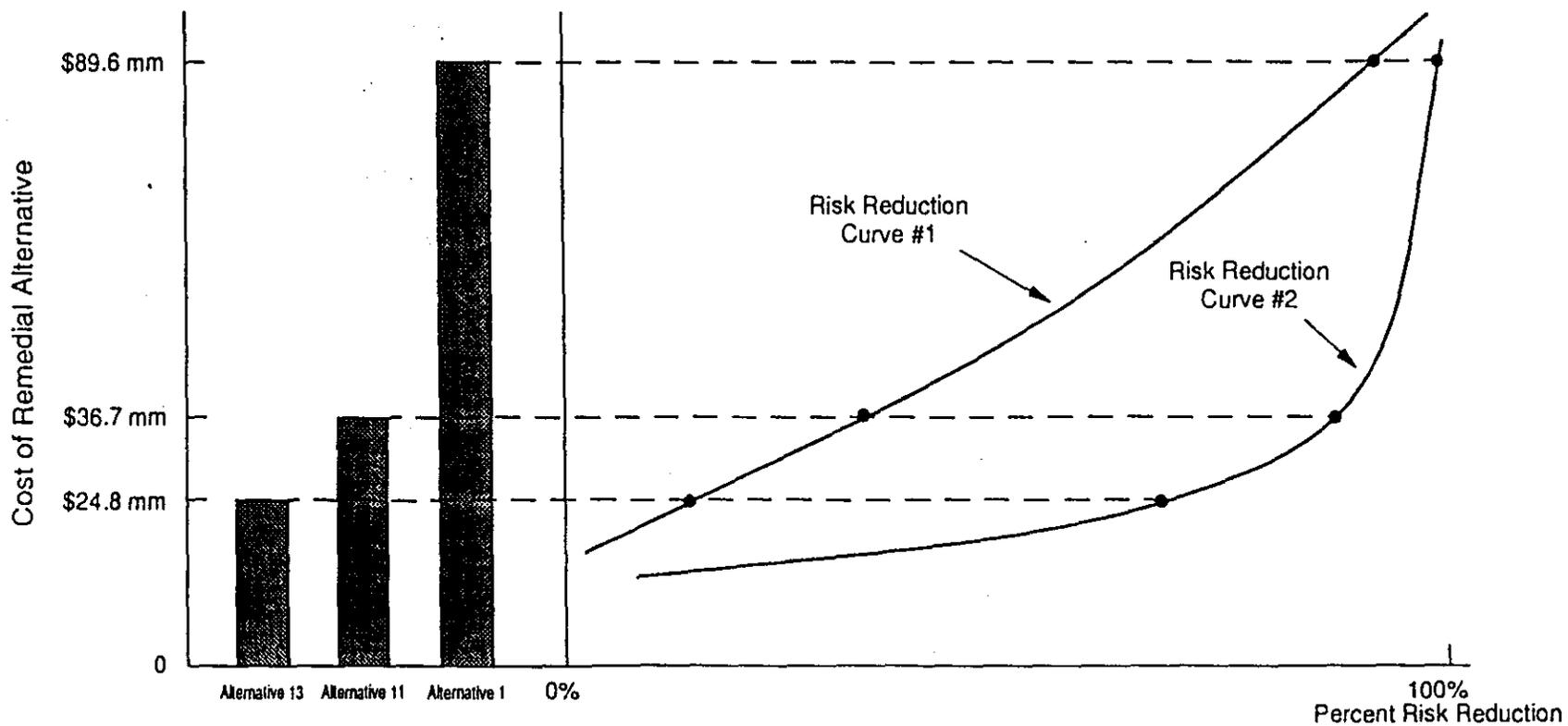
Alternative Number	HRL Contaminated Soils	HRL Cover	HRL Plume	Total Expected Cost for Alternative ¹
1.	Landfill PCBs > 1 ppm, Stabilize & Landfill Metals & Dieldrin Soils	RCRA Cap Disturbed Soils (37 Acres)	Treat TCE, NO ₃ & Reinject	\$45,433
	\$5,550	\$14,906	\$19,977	
2.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Treat TCE, NO ₃ & Reinject	\$33,267
		\$8,290	\$19,977	
3.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Treat TCE Only and Send to Columbia River	\$23,066
		\$8,290	\$19,977	
4.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Conditionally Treat TCE, NO ₃ & Reinject	\$21,252
		\$8,290	\$7,962	
5.	No Action	Soil/Membrane Cap Disturbed Soils (37 Acres)	Conditionally Treat for TCE only and Send to Columbia River	\$17,181
		\$8,290	\$3,891	

¹ Each alternative includes an expected value of \$5 million for study costs and remediation at the ephemeral pool and discolored soil site.

COST-EFFECTIVENESS OF REMEDIAL ALTERNATIVES

The Next Step

Depending on the level of risk reduction achieved by each potential FS alternative, one can argue that some responses are substantial and disproportionate in cost relative to the risk reduction achieved compared to other responses.



COST-EFFECTIVENESS OF REMEDIAL ALTERNATIVES

Comparison of Landfill Remedies

Remedies can be compared based on cost per percent risk reduction to identify the most cost effective means of reducing risks to acceptable levels (risk reduction estimates are hypothetical).

Remedy ¹	Cost Estimate	Risk Reduction Estimate	Estimated Cost Per % Risk Reduced
(1) Institutional Controls	\$3.4 MM	50%	\$68,000
(2) Soil/Membrane Cap	\$8.3 MM	95%	\$87,400
(3) RCRA Cap	\$14.9 MM	99%	\$150,500
(4) a) Soil/Membrane Cap b) Remove Hot Spots Above Cleanup Levels ²	\$8.3 MM \$3.9 MM	95% 4.0%	\$87,400 \$975,000
(5) a) RCRA Cap b) Remove Hot Spots Above Cleanup Levels ²	\$14.9 MM \$3.9 MM	99% 0.5%	\$150,500 \$7,800,000

¹ Ranked in ascending order according to MTCA's hierarchy of treatment technologies [WAC 173-340-360(4)(a)].

² Incinerate >50 ppm (65 cy) and Landfill 10-50 ppm (100 cy) for PCB soils and expected value of alternatives for Chromium/Arsenic/Dieldrin soils, excluding the no action alternative.

COST-EFFECTIVENESS OF REMEDIAL ALTERNATIVES

Comparison of Landfill Remedies (Cont.)

The preceding table illustrates how remedial alternatives can be compared based on cost effectiveness.

- Capping alone represents a fairly cost effective means of reducing risk compared to removing hot spots and capping.
 - Cost per risk reduced for hot spot removal in alternatives (4) and (5) are significantly higher than the same measure for alternatives (1), (2) and (3).

Using such a comparison might allow one to argue that capping the landfill is more preferable compared to removing hot spots based on MTCA's guidelines. That is, the cost of removing hot spots and capping is substantial and disproportionate relative to the incremental risk reduction achieved compared to capping alone. Further analysis on this issue is being conducted.

TABLE 2a. WATER-LEVEL ELEVATIONS OF SIEMENS WELLS GM-1 THROUGH GM-16, P-1 THROUGH P-3, AND PW-1
SIEMENS POWER CORPORATION, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Date of Measurement	Water-Level Elevations (ft msl)						
	20/21-Apr-92	27-Apr-92	11-May-92	26-May-92	22-Jun-92	27-Jul-92	24-Aug-92
Well Number							
GM-1	NA	354.65	354.58	354.72	354.92	354.95	355.00
GM-2	NA	354.74	354.65	354.75	354.92	355.04	355.05
GM-3	NA	354.59	354.50	354.56	354.75	353.89	354.89
GM-4	NA	354.42	354.32	354.37	354.55	354.71	354.71
GM-5	NA	354.35	354.27	354.32	354.50	354.64	354.63
GM-6	NA	354.35	354.23	354.31	354.47	354.59	354.60
GM-7	NA	354.24	354.14	354.19	354.35	354.46	354.49
GM-8	NA	354.22	354.11	354.15	354.30	354.43	354.45
GM-9	NA	354.14	354.02	354.06	354.18	354.31	354.34
GM-10	NA	353.18	353.07	353.10	353.23	353.37	353.39
GM-11	NA	353.84	353.74	353.76	353.90	353.04	354.06
GM-12	NA	353.51	353.40	353.42	353.56	353.69	353.69
GM-13	354.04	354.00	353.90	353.98	354.16	354.30	354.30
GM-14	354.70	354.66	354.56	354.63	354.82	354.93	354.93
GM-15	354.53	354.48	354.39	354.46	354.62	353.75	354.77
GM-16	354.37	354.33	354.23	354.28	354.46	354.59	354.59
P-1	366.75	366.77	366.71	366.77	366.86	367.07	367.29
P-2	354.70	354.67	354.58	354.57	354.69	354.89	354.96
P-3	361.17	361.13	361.11	361.23	361.41	361.51	361.60
PW-1	NA	354.36	354.26	354.32	354.48	354.62	354.63

ft msl Feet relative to mean sea level
 btopc Below top of casing
 NA Not available/not applicable

TABLE 2b. WATER-LEVEL ELEVATIONS OF SIEMENS TEST WELLS
SIEMENS POWER CORPORATION, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Date of Measurement	Water-Level Elevations (ft msl)						
	20/21-Apr-92	27-Apr-92	11-May-92	26-May-92	22-Jun-92	27-Jul-92	24-Aug-92
Well Number							
TW-1	NA	354.48	354.39	354.45	354.61	354.70	354.75
TW-2	NA	354.45	354.36	354.44	354.59	354.69	354.73
TW-3	NA	354.53	354.44	354.42	354.69	354.76	354.81
TW-4	NA	354.55	354.46	354.54	354.71	354.81	354.84
TW-5	NA	354.56	354.49	354.56	354.75	354.83	354.86
TW-6	NA	354.60	354.51	354.60	354.79	354.85	354.90
TW-7	NA	354.63	354.55	354.64	354.83	354.91	354.95
TW-8	NA	354.64	354.53	354.60	354.80	354.86	354.93
TW-9	NA	354.46	354.34	354.31	354.49	354.63	354.71
TW-11	NA	354.63	354.55	354.62	354.82	354.90	354.93
TW-12	NA	354.63	354.56	354.64	354.83	354.93	354.95
TW-13	NA	354.67	354.61	354.71	354.85	354.96	355.00
TW-14	NA	354.11	354.02	354.03	354.16	354.32	354.34
TW-15	NA	354.09	354.00	354.03	354.15	354.24	354.31
TW-16	NA	354.18	354.07	354.13	354.14	353.28	354.40
TW-17	NA	354.11	353.99	354.03	354.15	354.30	354.31
TW-18	NA	352.09	353.97	354.01	354.14	354.24	354.29
TW-19	NA	354.49	354.39	354.45	354.63	354.73	354.75
TW-20	NA	354.54	354.45	354.51	354.67	354.79	354.82
TW-21	NA	354.61	354.52	354.60	354.77	354.87	354.89
TW-22	NA	354.57	354.49	354.61	354.81	354.85	354.70
TW-23	NA	354.87	354.77	354.76	354.95	354.72	355.18
TW-24	NA	354.80	354.70	354.65	354.85	NA	NA
TW-25	NA	354.89	354.79	354.73	354.91	355.05	355.21
TW-26	NA	354.44	354.35	354.29	354.44	354.53	354.71

ft msl Feet relative to mean sea level
 btopc Below top of casing
 NA Not available/not applicable