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Date: November 14, 1997  
 Refer to: EM/ER:97-481

1/1679/31  
 Dr. Stu Dinwiddie  
 NMED-HRMB  
 P.O. Box 26110  
 Santa Fe, NM 87502

**SUBJECT: RESPONSE TO COMMENTS REGARDING RESPONSE TO  
 ADDITIONAL INFORMATION REQUEST FOR PRS 31-001  
 IN TA-31 (FORMER OU 1079)**

Dear Dr. Dinwiddie:

Enclosed is the Los Alamos National Laboratory's Response to the New Mexico Environment Department Hazardous and Radioactive Bureau's Comments Regarding Response to Additional Information Request for Potential Release Site 31-001 in Technical Area 31.

If you have any questions, please contact Gary McMath at (505) 665-4969 or Bonnie Koch at (505) 665-7202.

Sincerely,

Julie A. Canepa, Program Manager  
 LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager  
 DOE/LAEO

JC/TT/ss

Enclosures (1) Response to Comments Regarding Response to Additional Information Request for PRS 31-001 in TA-31 (former OU 1079)



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TL

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**Response to Comments Regarding  
Response to Additional Information Request, Potential Release Site 31-001**

**INTRODUCTION**

This document responds to a letter from the New Mexico Environment Department (NMED) Hazardous and Radioactive Materials Bureau (HRMB) titled, "Comments Regarding Response to Additional Information Request, Potential Release Site 31-001, Los Alamos National Laboratory, NM0890010515." This letter is dated July 21, 1997. To facilitate review of this response, NMED's comments are included verbatim. LANL's responses follow each NMED comment.

**NMED Comment**

1. *LANL shall perform, confirmatory sampling at this PRS for semi-volatile organic compounds (SVOCs). SVOCs were indicated in the workplan as potential contaminants of concern and analyses of samples obtained during the RFI indicated elevated concentrations of SVOCs.*

**LANL Response**

The only semivolatile organic compounds (SVOCs) found during the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Technical Area (TA) 31 were polycyclic aromatic hydrocarbons (PAHs): benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo(g,h,i) perylene, chrysene, fluoranthene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene. These PAHs were not retained as chemicals of potential concern (COPCs) because there was no evidence that they were produced by Laboratory operations at the site. TA-31 was used from 1945 to 1954 as a receiving yard for Laboratory supplies delivered by the Navajo Van Line (including everything from office supplies to technical apparatus). There is no archival information indicating that PAHs were used or produced at the site.

The voluntary corrective action (VCA) at Potential Release Site (PRS) 31-001 was performed to remove the polychlorinated biphenyls (PCBs) located in the outfall area. Confirmatory samples were collected and analyzed for PCBs, and the analytical results from these samples confirmed that the PCBs had been removed.

**NMED Comment**

2. *If analytical results of the SVOC confirmatory samples indicated elevated concentrations, then LANL must conduct a quantitative human health and ecological risk screening assessment.*

**LANL Response**

Four samples collected during the RFI at PRS 31-001 contained PAHs (AAA4680, AAA4688, AAA4689, and AAA4679). Three of these samples were collected from sampling locations that were excavated during the VCA to address PCBs (AAA4680, AAA4688, and AAA4689). Therefore, the soil at these sampling locations that

contained detectable PAHs was most likely removed during the VCA. No excavation was conducted at the location of sample AAA4679 because PCBs were not detected at this location. Sample AAA4679 was collected 6.8 ft below ground surface.

In accordance with NMED's request, a risk assessment was conducted using the PAH values from sample AAA4679, where no excavation was conducted, and also from samples AAA4680, AAA4688, and AAA4689, where excavation most likely removed the detectable PAHs. The risk assessment was conducted for both residential and recreational land-use scenarios, and both a reasonable maximum exposure (RME) and a most likely exposure (MLE) were calculated for each scenario. The RME was calculated using the maximum sample value for each PAH, and the MLE was calculated using the average of the sample values for each PAH. The slope factors and reference doses used in these calculations were taken from the Environmental Protection Agency (EPA) Region 9 preliminary remediation goals (PRGs) table dated August 1, 1996. PAH results from sample AAA4679 were not included in the recreational land-use scenario because this sample was located 6.8 ft below ground surface and there would be no exposure pathway to the recreational user. Appendix A presents the results by pathway for each PAH.

For carcinogenic PAHs, a lifetime excess cancer risk was calculated as summarized in Table 1. The lifetime excess cancer risk ranges from approximately  $2 \times 10^{-7}$  for the recreational land-use scenario to  $6 \times 10^{-5}$  for the residential land-use scenario. The risk posed by these PAHs using the maximum concentrations and the average concentrations for both the residential and recreational land-use scenarios is within the EPA acceptable risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ .

For noncarcinogenic PAHs, a hazard index was calculated as summarized in Table 2. The hazard indices are several orders of magnitude less than 1 for both the residential and recreational land-use scenarios

Ecological risk at TA-31 will be addressed in LANL's ecological screening process, which is currently being developed.

**TABLE 1**

**CANCER RISK RESULTS FOR RECREATIONAL AND RESIDENTIAL LAND USE**

<b>RESIDENTIAL LAND USE</b>	
MLE Cancer Risk Scenario Total	$7 \times 10^{-7}$
RME Cancer Risk Scenario Total	$6 \times 10^{-5}$
<b>RECREATIONAL LAND USE</b>	
MLE Cancer Risk Scenario Total	$2 \times 10^{-7}$
RME Cancer Risk Scenario Total	$5 \times 10^{-5}$

**TABLE 2**

**HAZARD INDEX RESULTS FOR RECREATIONAL AND RESIDENTIAL LAND USE**

<b>RESIDENTIAL LAND USE</b>	
MLE Hazard Index	0.00004
RME Hazard Index	0.0008
<b>RECREATIONAL LAND USE</b>	
MLE Hazard Index	0.000009
RME Hazard Index	0.0006

**NMED Comment**

- LANL shall base its SALs on US Environmental Protection Agency (USEPA) Region IX residential Potential Remediation Goals (PRGs). LANL may, in addition to performing the MCE based on residential risk, present an evaluation of risk based on projected future land use. In response to this Notice of Deficiency (NOD) comment, LANL shall submit a table of revised SALs, SALs applied in the RFI report, and discuss any resulting differences which may affect the decisions made within this RFI Report.*

**LANL Response**

Table 3 shows a comparison of the 1997 screening action levels (SALs) to the May 1995 SALs applied in the RFI report. For each chemical detected at TA-31, the SAL has become more stringent. The only exception is the SAL for lead, which remained the same.

The SAL for Aroclor 1254 shows the largest change, decreasing from 1.0 mg/kg to 0.1 mg/kg, and the SALs for PAHs changed by almost 40% in some cases. However, these changes do not affect the recommendations of the RFI report. The VCA to address the elevated PCBs would not change, and no further action would still have been recommended to address PAHs (see LANL's response to Comment 2).

The multiple chemical evaluation in the TA-31 RFI report was based on residential risk because it used SALs based on residential exposure parameters. The multiple chemical evaluation has been modified to include PAHs (which were eliminated from consideration in the RFI report), and also to use the current SALs based on 1997 EPA Region 9 PRGs (which are also based on residential exposure parameters). The revised multiple chemical evaluation is presented in Table 4.

As illustrated in Tables 3 and 4, there are no resulting differences based on the revised SALs that affect the recommendations made in the RFI report.

The projected land use for this area is recreational. A recreational risk assessment is presented in the response to Comment 2. The approximate lifetime excess cancer risk is  $2 \times 10^{-7}$  for the MLE and  $5 \times 10^{-5}$  for the RME. Both of these values are within the EPA acceptable risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ . In addition, the hazard indices for noncarcinogenic PAHs were several orders of magnitude less than 1.

**TABLE 3**

**COMPARISON OF REVISED SALs TO THE SALs USED IN THE RFI REPORT FOR TA-31**

ANALYTE	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg)	SALs USED IN MAY 1995 RFI REPORT (mg/kg)	1997 REVISED SALs (mg/kg)
Aroclor 1254	AAA4689	12	1	0.1
Arsenic	AAA4680	12.5	NA <sup>a</sup>	NA <sup>a</sup>
Benzo[a]anthracene	AAA4689	1.7	1	0.61
Benzo[a]pyrene	AAA4689	2.2	0.1	0.061
Benzo[b]fluoranthene	AAA4689	3.3	1	0.61
Benzo[k]fluoranthene	AAA4689	1.1	10	6.1
Benzo(g,h,i)perylene	AAA4689	0.72	2 400 <sup>b</sup>	1 900 <sup>b</sup>
Chrysene	AAA4689	1.7	96	61
Copper	AAA4680	51	3 000	2 800
Fluoranthene	AAA4689	1.2	3 200	2 600
Indeno[1,2,3-cd]pyrene	AAA4689	0.79	1	0.61
Lead	AAA4680, AAA4688, AAA4689	330	400	400
Mercury	AAA4672	0.3	24	23
Phenanthrene	AAA4679	0.35	24 000 <sup>c</sup>	18 000 <sup>c</sup>
Pyrene	AAA4689	1.5	2 400	1 900
Tetrachloroethylene	AAA4677	0.013	5.9	5.4

<sup>a</sup> NA = Not applicable. The SAL for arsenic, 0.4 mg/kg in 1995 and 0.38 mg/kg based on the 1997 EPA Region 9 PRG, is less than the background concentration for arsenic, 7.82 mg/kg.

<sup>b</sup> Toxicity criteria are not available for benzo(g,h,i)perylene; therefore, the toxicity criteria for pyrene were used as surrogates based on similarity in chemical structure.

<sup>c</sup> Toxicity criteria are not available for phenanthrene; therefore, the toxicity criteria for anthracene were used as surrogates based on similarity in chemical structure.

TABLE 4

REVISED MULTIPLE CHEMICAL EVALUATION FOR TA-31 DATA

ANALYTE	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg)	SOIL SAL <sup>a</sup> (mg/kg)	MAXIMUM SAMPLE VALUE + SAL (NORMALIZED VALUES)
<b>BASED ON NONCARCINOGENICITY</b>				
Benzo(g,h,i)perylene	AAA4689	0.72	1 900 <sup>b</sup>	0.0004
Copper	AAA4680	51	2 800	0.02
Fluoranthene	AAA4689	1.2	2 600	0.0005
Lead	AAA4680, AAA4688, AAA4689	330	400	0.83
Mercury	AAA4672	0.3	23	0.01
Phenanthrene	AAA4679	0.35	18 000 <sup>c</sup>	0.00002
Pyrene	AAA4689	1.5	1 900	0.0008
Tetrachloroethylene	AAA4677	0.013	5.4	0.002
Total				0.87
<b>BASED ON CARCINOGENICITY</b>				
Benzo[k]fluoranthene	AAA4689	1.1	6.1	0.18
Chrysene	AAA4689	1.7	61	0.03
Lead	AAA4680, AAA4688, AAA4689	330	NA <sup>d</sup>	NA
Tetrachloroethylene	AAA4677	0.013	5.4	0.002
Total				0.21

<sup>a</sup> SAL based on 1997 EPA Region 9 PRGs.

<sup>b</sup> Toxicity criteria are not available for benzo(g,h,i)perylene; therefore, the toxicity criteria for pyrene were used as surrogates based on similarity in chemical structure.

<sup>c</sup> Toxicity criteria are not available for phenanthrene; therefore, the toxicity criteria for anthracene were used as surrogates based on similarity in chemical structure.

<sup>d</sup> NA = Not applicable. Although lead is listed as a class-B2 carcinogen in the EPA database Integrated Risk Information System (IRIS), no slope factor has been developed for lead. Therefore, no SAL can be developed for lead as a carcinogen.

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## **Appendix A Supporting Risk Calculations for the Risk Assessment Discussed in NMED Comment 2**

Polycyclic aromatic hydrocarbons (PAHs) were the only semivolatile organic compounds (SVOCs) detected at Technical Area (TA) 31. Four of the samples collected during the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) at TA-31 contained PAHs (AAA4680, AAA4688, AAA4689, and AAA4679). Samples AAA4680, AAA4688, and AAA4689 were collected from soil in the outfall of the septic tank. Sample AAA4679 was collected on the mesa top at a depth 6.8 ft below ground surface.

A risk assessment was conducted for both residential and recreational land-use scenarios, as discussed in the response to the New Mexico Environment Department's (NMED's) Comment 2. The PAH concentrations used in the risk assessment are presented in Table A-1.

As discussed in the response to Comment 2, PAH results from sample AAA4679 were not included in the recreational land-use scenario because this sample was located 6.8 ft below ground surface and there would be no exposure pathway to the recreational user. The maximum concentrations of each PAH (with the exception of phenanthrene, which was only detected in the subsurface sample) occurred in the outfall. Therefore, the result of not including the results from sample AAA4679 is that the average PAH concentrations are higher.

Table A-1 presents the average PAH values for TA-31, which were used to calculate the most likely exposure (MLE). Averages were calculated by adding all sample values for each PAH and then dividing by the number of samples used in the risk assessment.

The residential and recreational land-use scenarios include the following exposure pathways:

- inhalation of dust,
- incidental ingestion of soil, and
- dermal contact with soil.

The exposure assumptions for the MLE and the reasonable maximum exposure (RME) for both the residential and recreational land-use scenarios are summarized in Table A-2.

Table A-3 through A-6 present the results of the risk assessment for both carcinogenic and noncarcinogenic chemicals in both the residential and recreational land-use scenarios.

TABLE A-1

ANALYTE	SAMPLE ID	SAMPLE VALUES USED FOR RESIDENTIAL LAND-USE SCENARIO (mg/kg)	SAMPLE VALUES USED FOR RECREATIONAL LAND-USE SCENARIO (mg/kg)
Benzo[a]anthracene	AAA4679	0.49	—
Benzo[a]anthracene	AAA4688	0.52	0.52
Benzo[a]anthracene	AAA4689	1.7	1.7
<b>Average</b>		<b>0.90</b>	<b>1.37</b>
Benzo[a]pyrene	AAA4679	0.41	—
Benzo[a]pyrene	AAA4688	0.67	0.67
Benzo[a]pyrene	AAA4689	2.2	2.2
<b>Average</b>		<b>1.09</b>	<b>1.44</b>
Benzo[b]fluoranthene	AAA4679	0.69	—
Benzo[b]fluoranthene	AAA4680	0.56	0.56
Benzo[b]fluoranthene	AAA4681	0.47	0.47
Benzo[b]fluoranthene	AAA4688	1	1
Benzo[b]fluoranthene	AAA4689	3.3	3.3
<b>Average</b>		<b>1.20</b>	<b>2.86</b>
Benzo(g,h,i)perylene	AAA4689	0.72	0.72
<b>Average</b>		<b>0.72</b>	<b>0.72</b>
Benzo[k]fluoranthene	AAA4689	1.1	1.1
<b>Average</b>		<b>1.1</b>	<b>1.1</b>
Chrysene	AAA4679	0.63	—
Chrysene	AAA4688	0.45	0.45
Chrysene	AAA4689	1.7	1.7
<b>Average</b>		<b>0.93</b>	<b>1.08</b>
Fluoranthene	AAA4679	1.1	—
Fluoranthene	AAA4681	0.65	0.65
Fluoranthene	AAA4689	1.2	1.2
<b>Average</b>		<b>0.98</b>	<b>0.93</b>
Indeno[1,2,3-cd]pyrene	AAA4689	0.79	0.79
<b>Average</b>		<b>0.79</b>	<b>0.79</b>
Phenanthrene	AAA4679	0.35	—
<b>Average</b>		<b>0.35</b>	—
Pyrene	AAA4679	0.92	—
Pyrene	AAA4681	0.65	0.65
Pyrene	AAA4689	1.5	1.5
<b>Average</b>		<b>1.02</b>	<b>1.08</b>

**TABLE A-2****RISK ASSESSMENT PARAMETERS**

<b>PARAMETER</b>	<b>MLE</b>	<b>RME</b>
<b>RESIDENTIAL LAND USE SCENARIO</b>		
Exposure Frequency (days/yr)	40	350
Exposure Duration (yr)	9	30
Inhalation Rate (m3/hr)	0.83	1.7
Exposure Time (hr/day)	0.4	2
Soil Ingestion Rate (mg/day)	100	100
Fraction Soil Ingested from Contaminated Source	0.5	1
Skin Surface Area Available for Contact (cm2)	2 000	3 200
<b>RECREATIONAL LAND USE SCENARIO</b>		
Exposure Frequency (days/yr)	10	170
Exposure Duration (yr)	9	30
Inhalation Rate (m3/hr)	1.3	3.5
Exposure Time (hr/day)	2	2
Soil Ingestion Rate (mg/day)	100	100
Fraction Soil Ingested from Contaminated Source	0.25	0.25
Skin Surface Area Available for Contact (cm2)	2 000	5 300

**TABLE A-3**

**RESIDENTIAL RISK ASSESSMENT RESULTS FOR CARCINOGENS**

<b>ANALYTE</b>	<b>INHALATION OF FUGITIVE DUST</b>	<b>INGESTION OF SOIL</b>	<b>DERMAL CONTACT WITH SOIL</b>	<b>TOTAL</b>
<b>MLE CANCER RISK</b>				
Benzo(a)anthracene	3.5 X 10 <sup>-8</sup>	6.6 X 10 <sup>-9</sup>	1.6 X 10 <sup>-9</sup>	4.3 X 10 <sup>-8</sup>
Benzo(a)pyrene	4.2 X 10 <sup>-7</sup>	8.0 X 10 <sup>-8</sup>	1.9 X 10 <sup>-8</sup>	5.2 X 10 <sup>-7</sup>
Benzo(b)fluoranthene	4.6 X 10 <sup>-8</sup>	8.8 X 10 <sup>-9</sup>	2.1 X 10 <sup>-9</sup>	5.7 X 10 <sup>-8</sup>
Benzo(k)fluoranthene	4.2 X 10 <sup>-9</sup>	8.1 X 10 <sup>-10</sup>	1.9 X 10 <sup>-10</sup>	5.2 X 10 <sup>-9</sup>
Chrysene	3.6 X 10 <sup>-10</sup>	6.8 X 10 <sup>-11</sup>	1.6 X 10 <sup>-11</sup>	4.4 X 10 <sup>-10</sup>
Indeno(1,2,3-cd)pyrene	3.0 X 10 <sup>-8</sup>	5.8 X 10 <sup>-9</sup>	1.4 X 10 <sup>-9</sup>	3.8 X 10 <sup>-8</sup>
Total by pathway	5.36 X 10 <sup>-7</sup>	1.02 X 10 <sup>-7</sup>	2.43 X 10 <sup>-8</sup>	
Scenario Total				7 X 10 <sup>-7</sup>
<b>RME CANCER RISK</b>				
Benzo(a)anthracene	2.2 X 10 <sup>-6</sup>	7.3 X 10 <sup>-7</sup>	7.0 X 10 <sup>-7</sup>	3.7 X 10 <sup>-6</sup>
Benzo(a)pyrene	2.9 X 10 <sup>-5</sup>	9.4 X 10 <sup>-6</sup>	9.1 X 10 <sup>-6</sup>	4.7 X 10 <sup>-5</sup>
Benzo(b)fluoranthene	4.3 X 10 <sup>-6</sup>	1.4 X 10 <sup>-6</sup>	1.4 X 10 <sup>-6</sup>	7.1 X 10 <sup>-6</sup>
Benzo(k)fluoranthene	1.4 X 10 <sup>-7</sup>	4.7 X 10 <sup>-8</sup>	4.5 X 10 <sup>-8</sup>	2.4 X 10 <sup>-7</sup>
Chrysene	2.2 X 10 <sup>-8</sup>	7.3 X 10 <sup>-9</sup>	7.0 X 10 <sup>-9</sup>	3.7 X 10 <sup>-8</sup>
Indeno(1,2,3-cd)pyrene	1.0 X 10 <sup>-6</sup>	3.4 X 10 <sup>-7</sup>	3.3 X 10 <sup>-7</sup>	1.7 X 10 <sup>-6</sup>
Total by pathway	3.67 X 10 <sup>-5</sup>	1.19 X 10 <sup>-5</sup>	1.16 X 10 <sup>-5</sup>	
Scenario Total				6 X 10 <sup>-5</sup>

**TABLE A-4**

**RESIDENTIAL RISK ASSESSMENT RESULTS FOR NONCARCINOGENS**

ANALYTE	INHALATION OF FUGITIVE DUST	INGESTION OF SOIL	DERMAL CONTACT WITH SOIL	TOTAL
<b>MLE</b>				
Benzo(g,h,i)perylene <sup>a</sup>	1 X 10 <sup>-5</sup>	2 X 10 <sup>-6</sup>	4.7 X 10 <sup>-7</sup>	1.3 X 10 <sup>-5</sup>
Fluoranthene	1 X 10 <sup>-5</sup>	2 X 10 <sup>-6</sup>	4.8 X 10 <sup>-7</sup>	1.3 X 10 <sup>-5</sup>
Phenanthrene <sup>b</sup>	5 X 10 <sup>-7</sup>	9.5 X 10 <sup>-8</sup>	2.3 X 10 <sup>-8</sup>	6.2 X 10 <sup>-7</sup>
Pyrene	1.5 X 10 <sup>-5</sup>	2.8 X 10 <sup>-6</sup>	6.7 X 10 <sup>-7</sup>	1.8 X 10 <sup>-5</sup>
Hazard Index				4 X 10 <sup>-5</sup>
<b>RME</b>				
Benzo(g,h,i)perylene <sup>a</sup>	1 X 10 <sup>-4</sup>	3.4 X 10 <sup>-5</sup>	3.3 X 10 <sup>-5</sup>	1.7 X 10 <sup>-4</sup>
Fluoranthene	1.3 X 10 <sup>-4</sup>	4.3 X 10 <sup>-5</sup>	4.1 X 10 <sup>-5</sup>	2.2 X 10 <sup>-4</sup>
Phenanthrene <sup>b</sup>	5.1 X 10 <sup>-6</sup>	1.7 X 10 <sup>-6</sup>	1.6 X 10 <sup>-6</sup>	8.4 X 10 <sup>-6</sup>
Pyrene	2.2 X 10 <sup>-4</sup>	7.1 X 10 <sup>-5</sup>	6.9 X 10 <sup>-5</sup>	3.6 X 10 <sup>-4</sup>
Hazard Index				8 X 10 <sup>-4</sup>

<sup>a</sup> Toxicity criteria are not available for benzo(g,h,i)perylene; therefore, the toxicity criteria for pyrene were used as surrogates based on similarity in chemical structure.

<sup>b</sup> Toxicity criteria are not available for phenanthrene; therefore, the toxicity criteria for anthracene were used as surrogates based on similarity in chemical structure.

**TABLE A-5**

**RECREATIONAL RISK ASSESSMENT RESULTS FOR CARCINOGENS**

ANALYTE	INHALATION OF FUGITIVE DUST	INGESTION OF SOIL	DERMAL CONTACT WITH SOIL	TOTAL
<b>MLE CANCER RISK</b>				
Benzo(a)anthracene	1.2 X 10 <sup>-8</sup>	1.3 X 10 <sup>-9</sup>	6.0 X 10 <sup>-10</sup>	1.4 X 10 <sup>-8</sup>
Benzo(a)pyrene	1.2 X 10 <sup>-7</sup>	1.3 X 10 <sup>-8</sup>	6.3 X 10 <sup>-9</sup>	1.4 X 10 <sup>-7</sup>
Benzo(b)fluoranthene	2.5 X 10 <sup>-8</sup>	2.6 X 10 <sup>-9</sup>	1.3 X 10 <sup>-9</sup>	2.8 X 10 <sup>-8</sup>
Benzo(k)fluoranthene	9.5 X 10 <sup>-10</sup>	1.0 X 10 <sup>-10</sup>	4.8 X 10 <sup>-11</sup>	1.1 X 10 <sup>-9</sup>
Chrysene	9.3 X 10 <sup>-11</sup>	9.9 X 10 <sup>-12</sup>	4.8 X 10 <sup>-12</sup>	1.1 X 10 <sup>-10</sup>
Indeno(1,2,3-cd)pyrene	6.8 X 10 <sup>-9</sup>	7.3 X 10 <sup>-10</sup>	3.5 X 10 <sup>-10</sup>	7.9 X 10 <sup>-9</sup>
Total by pathway	1.7 X 10 <sup>-7</sup>	1.8 X 10 <sup>-8</sup>	8.6 X 10 <sup>-9</sup>	
Scenario Total				2 X 10 <sup>-7</sup>
<b>RME CANCER RISK</b>				
Benzo(a)anthracene	2.2 X 10 <sup>-6</sup>	8.8 X 10 <sup>-8</sup>	5.6 X 10 <sup>-7</sup>	2.9 X 10 <sup>-6</sup>
Benzo(a)pyrene	2.9 X 10 <sup>-5</sup>	1.1 X 10 <sup>-6</sup>	7.3 X 10 <sup>-6</sup>	3.7 X 10 <sup>-5</sup>
Benzo(b)fluoranthene	4.3 X 10 <sup>-6</sup>	1.7 X 10 <sup>-7</sup>	1.1 X 10 <sup>-6</sup>	5.6 X 10 <sup>-6</sup>
Benzo(k)fluoranthene	1.4 X 10 <sup>-7</sup>	5.7 X 10 <sup>-9</sup>	3.6 X 10 <sup>-8</sup>	1.9 X 10 <sup>-7</sup>
Chrysene	2.2 X 10 <sup>-8</sup>	8.8 X 10 <sup>-10</sup>	5.6 X 10 <sup>-9</sup>	2.9 X 10 <sup>-8</sup>
Indeno(1,2,3-cd)pyrene	1 X 10 <sup>-6</sup>	4.1 X 10 <sup>-8</sup>	2.6 X 10 <sup>-7</sup>	1.3 X 10 <sup>-6</sup>
Total by pathway	3.7 X 10 <sup>-5</sup>	1.5 X 10 <sup>-6</sup>	9.2 X 10 <sup>-6</sup>	
Scenario Total				5 X 10 <sup>-5</sup>

**TABLE A-6**

**RECREATIONAL RISK ASSESSMENT RESULTS FOR NONCARCINOGENS**

	INHALATION OF FUGITIVE DUST	INGESTION OF SOIL	DERMAL CONTACT WITH SOIL	TOTAL
<b>MLE</b>				
Benzo(g,h,i)perylene <sup>a</sup>	2.3 X 10 <sup>-6</sup>	2.4 X 10 <sup>-7</sup>	1.2 X 10 <sup>-7</sup>	2.7 X 10 <sup>-6</sup>
Fluoranthene	2.2 X 10 <sup>-6</sup>	2.4 X 10 <sup>-7</sup>	1.1 X 10 <sup>-7</sup>	2.6 X 10 <sup>-6</sup>
Pyrene	3.4 X 10 <sup>-6</sup>	3.7 X 10 <sup>-7</sup>	1.8 X 10 <sup>-7</sup>	4 X 10 <sup>-6</sup>
Hazard Index				9 X 10 <sup>-6</sup>
<b>RME</b>				
Benzo(g,h,i)perylene <sup>a</sup>	1 X 10 <sup>-4</sup>	4.2 X 10 <sup>-6</sup>	2.6 X 10 <sup>-5</sup>	1.4 X 10 <sup>-4</sup>
Fluoranthene	1.3 X 10 <sup>-4</sup>	5.2 X 10 <sup>-6</sup>	3.3 X 10 <sup>-5</sup>	1.7 X 10 <sup>-4</sup>
Pyrene	2.2 X 10 <sup>-4</sup>	8.7 X 10 <sup>-6</sup>	5.5 X 10 <sup>-5</sup>	2.8 X 10 <sup>-4</sup>
Hazard Index				6 X 10 <sup>-4</sup>

<sup>a</sup> Toxicity criteria are not available for benzo(g,h,i)perylene; therefore, the toxicity criteria for pyrene were used as surrogates based on similarity in chemical structure.