N00236.001656
ALAMEDA POINT
SSIC No. 5090.3

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
Contract No. N62474-94-D-7609
Contract Task Order No. 0168

Prepared for:
U.S. DEPARTMENT OF THE NAVY
Patricia McFadden, Remedial Project Manager
Engineering Field Activity West
Naval Facilities Engineering Command
San Bruno, California

OU-3 REMEDIAL INVESTIGATION REPORT
FINAL

VOLUME III OF III
(Appendices)

ALAMEDA POINT
ALAMEDA, CALIFORNIA

August 9, 1999

Prepared by
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Project Manager

DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, WEST
NAVAL FACILITIES ENGINEERING COMMAND
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SAN BRUNO, CALIFORNIA 94066-5006

IN REPLY REFER TO:

5090
Ser 612.3/9192
9 Aug 1999

From: Commanding Officer, Engineering Field Activity West, Naval Facilities Engineering Command

To: Distribution

Subj: TRANSMITTAL OF THE FINAL REMEDIAL INVESTIGATION (RI) REPORT FOR OPERABLE UNIT (OU) 3 FOR NAVAL AIR STATION ALAMEDA, ALAMEDA, CALIFORNIA

Encl: (1) Final Remedial Investigation (RI) Report for Operable Unit (OU) 3 at Naval Air Station Alameda, Alameda, California Volumes I, II, and Inserts for Volume III

1. Enclosure (1) is forwarded for your information and use. In accordance with agreements made with the BCT on July 28, 1999, an amendment containing additional groundwater information will be issued. Enclosure (2) is a list of changes made for the Final OU-3 RI Report.

2. If you have any questions regarding this matter, please contact me at (650) 244-3599, FAX (650) 244-2774.

WILLIAM KAKTIS
By direction

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N00236.001656
ALAMEDA POINT
SSIC NO. 5090.3

FINAL
OU-3 REMEDIAL INVESTIGATION REPORT

DATED 09 AUGUST 1999

THIS RECORD CONTAINS MULTIPLE VOLUMES
WHICH HAVE BEEN ENTERED SEPARATELY

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FINAL OU-3 REMEDIAL INVESTIGATION REPORT
ALAMEDA POINT

MASTER TABLE OF CONTENTS
VOLUME I

EXECUTIVE SUMMARY

Chapter

1.0 INTRODUCTION
2.0 INSTALLATION-WIDE SITE DESCRIPTION
3.0 INSTALLATION-WIDE REMEDIAL INVESTIGATION ACTIVITIES
4.0 PRELIMINARY IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
5.0 RISK ASSESSMENT FATE AND TRANSPORT MODELING METHODOLOGIES
6.0 SUMMARY OF REMEDIAL INVESTIGATION AND RISK ASSESSMENT FINDINGS

TABLES FOR CHAPTERS 1 THROUGH 6
FIGURES FOR CHAPTERS 1 THROUGH 5
REFERENCES

VOLUME II

FIGURES FOR CHAPTER 6

VOLUME III

Appendix

A SOIL BORING, CPT LOGS, AND REGIONAL GEOLOGIC CROSS SECTIONS
B BACKGROUND DETERMINATION DOCUMENTATION
C HUMAN HEALTH RISK ASSESSMENT RESULTS
D INVESTIGATION TECHNIQUES
E LANDFILL PRESUMPTIVE REMEDY TECHNICAL MEMO
F ENVIRONMENTAL BASELINE SURVEY SAMPLE LOCATION MAPS AND ANALYTICAL RESULTS
G GEOTECHNICAL RESULTS AND IN SITU PERMIABILTIY (SLUG) TEST RESULTS
H HISTORICAL GROUNDWATER ELEVATIONS
I SOIL AND GROUNDWATER ANALYTICAL RESULTS
J RADIATION SURVEY DATA
K FUNNEL-AND-GATE SUMMARY
L EXAMPLE TPH CHROMATOGRAMS
M RESPONSE TO COMMENTS FOR THE DRAFT AND DRAFT FINAL OU-3 RI REPORT
N VLEACH MODELING

VOLUME III

LIST OF APPENDICES

Appendix

A	SOIL BORING, CPT LOGS, AND REGIONAL GEOLOGIC CROSS SECTIONS
B	BACKGROUND DETERMINATION DOCUMENTATION
C	HUMAN HEALTH RISK ASSESSMENT RESULTS
D	INVESTIGATION TECHNIQUES
E	LANDFILL PRESUMPTIVE REMEDY TECHNICAL MEMO
F	ENVIRONMENTAL BASELINE SURVEY SAMPLE LOCATION MAPS AND ANALYTICAL RESULTS
G	GEOTECHNICAL RESULTS AND IN SITU PERMIABILTIY (SLUG) TEST RESULTS
H	HISTORICAL GROUNDWATER ELEVATIONS
I	SOIL AND GROUNDWATER ANALYTICAL RESULTS
J	RADIATION SURVEY DATA
K	FUNNEL-AND-GATE SUMMARY
L	EXAMPLE TPH CHROMATOGRAMS
M	RESPONSE TO COMMENTS FOR THE DRAFT AND DRAFT FINAL OU-3 RI REPORT
N	VLEACH MODELING

APPENDIX A

SOIL BORING LOGS, CPT LOGS, AND REGIONAL CROSS SECTIONS

Soil Boring Log

PROJECT No. 86-018-1701
BORING No. DA-1
LOGGED BY Bill Johnston

PROJECT NAME: NAS Alameda - Phase 1 Exploratory Borings
BORING LOCATION: NW Corner of 1943-1956 Disposal Area SURFACE ELEV. 110.9 Feet
DRILLER: Beylik Drilling - Alex Bashta DATE: START 5/16/90 FINISH 5/17/90

DEPTH	SAMPLE No.	TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0"-6"	6"-12"	12"-18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
	1	SS	0.0	2.0	5	9	14	20	GP	3			Medium dense brown sandy gravel, moist, occasional layers of gravelly sand, some concrete debris (fill). OVA readings 200 - 500 ppm between 0 and 4 feet inside borehole.	
5	2	CR	5.0	10.0				12	GP			5.5	Medium dense blackish gray sandy gravel, saturated, abundant metal and wood debris, slight odor (fill), free water encountered at 7 feet.	
10	3	CR	10.0	15.0				12	SM			11.0		
									SM				Medium dense, black to brown silty sand, saturated, fine to medium grained, oily discoloration (fill), becomes very fine to fine grained below 13 feet, occasional wood debris, no odor.	
15	4	CR	15.0	20.0				4	SM					
20	5	CR	20.0	25.0				2	SM			20.0	Loose gray silty sand, saturated, fine grained, trace of shell debris at 20 feet.	Fill
25	6	SS	25.0	27.0	P			2	CL	39.4	>0.25	25.0	Very soft dark gray silty clay, saturated, abundant shell layers (Bay Mud). Trace of fine grained sand at 28 feet.	BS
	7	SS	27.0	29.0	P			24	CL		>0.25			
30	8	SS	30.0	32.0	P			24	CL	48	>0.25		abundant shells between 30 and 30.5 feet, no odor.	
	9	SS	32.0	35.0				36	CL		>0.25		abundant shells between 32 and 33 feet.	
35	10	SS	35.0	40.0				42	CL		>0.25		abundant shells below 37 feet. abundant shells from 39 to 39.3 feet.	
40	11	CR	40.0	45.0				6	SM		>0.25	40.0	Medium dense gray clayey silty sand, saturated, fine grained.	

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45	12	CR	45.0	50.0				12	SM			45.0	Medium dense to dense gray silty sand, saturated, fine grained, abundant shells, no odor.	BS
												46.0		MS
50	13	SS	50.0	52.0	3	4	5	12	SM				Medium dense to dense light brown silty sand, saturated, fine grained, no odor (Merritt Sand).	
					12									
	14	SS	52.0	54.0	7	5	11	6	SM					
					19									
55	15	SS	54.0	56.0	7	11	11	6	SM					
					20									
60														
65	16	CR	65.0	70.0				24	SM					
70	17	CR	70.0	75.0				2	SM					
75	18	CR	75.0	80.0				16	SM					MS
									SM			77.0	Dense gray silty sand, saturated, no odor.	SA
80	19	A	80.0	85.0					SM					

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DEPTH	SAMPLE No.	SAMPLE TYPE	SAMPLE INTERVAL FROM	SAMPLE INTERVAL TO	BLOW COUNT 0"-6"	BLOW COUNT 6"-12"	BLOW COUNT 12"-18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
85	20	A	85.0	90.0					CL			84.0	Very stiff gray green silty clay, saturated (Observed on augers after auger removal).	
90												90.0	Bottom of boring at 90.0 feet.	
95														
100														
105														
110														
115														
120														

Notes:

1. Boring was advanced using 8-inch-diameter hollow stem augers.
2. Boring was backfilled with cement/bentonite grout upon completion of drilling.
3. Ground water was encountered at 7 feet during drilling.
4. Sampler type:
   California sampler (SS)
   O.D.: 2.5 inches
   I.D.: 2.0 inches
   Dry core sampler (CR)
   O.D.: 3.0 inches
   I.D.: 2.5 inches
5. Abbreviation legend:
   A - Drill cuttings
   P - Push (Sampler advanced downward by the weight of the downhole hammer.)

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DEPTH	SAMPLE No.	SAMPLE TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0"-6"	BLOW COUNT 6"-12"	BLOW COUNT 12"-18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER	DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
125														Notes: (Continued)	
														6. Boring elevations are referenced to a Navy datum point using the Mean Lower Low Water (MLLW) datum.	
														7. Moisture content (%) was obtained from geotechnical laboratory test data.	
130															
135															
140															
145															
150															
155															
160															

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Soil Boring Log

PROJECT No. 86-018-1701
BORING No. DA-2
LOGGED BY Bill Johnston

PROJECT NAME: NAS Alameda - Phase 1 Exploratory Borings
BORING LOCATION: NE Corner of 1943-1956 Disposal Area SURFACE ELEV. 110.8 Feet
DRILLER: Beylik Drilling -Alex Bashta DATE: START 5/18/90 FINISH 5/18/90

DEPTH	SAMPLE No.	TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0"-6"	6"-12"	12"-18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
	1	SS	0.0	2.0	2	2	4	18	SM	12.5		0.20	Gravel parking area (fill)	
					4					7.7			Loose brown silty sand, dry, fine grained, no odor (fill).	
	2	SS	2.0	4.0	4	3	3	12	SM					
					4				CL			3.0		
5													Medium stiff brown silty clay, moist, no odor (fill).	
	3	CR	5.0	10.0				6	SM			5.0		
													Loose light brown to gray silty sand, saturated, fine grained (fill), color change to gray green at 7 feet.	
10														
	4	SS	10.0	12.0	P			5	CL	62		10.0	Soft gray silty clay, saturated (fill).	
	5	SS	12.0	14.0	P			18	CL					
									SM			13.0	Loose gray silty sand, saturated, fine grained, some shells, trace of clay (fill).	
15	6	SS	14.0	16.0	P			24	SM					
	7	CR	16.0	20.0				48	SM				becomes more sandy below 18 feet.	
20														
	8	CR	20.0	25.0				48	SM				increase in shells and less sandy below 20 feet.	Fill
									ML			21.5	Soft to medium stiff gray clayey silt, saturated, interfingering layers of clayey sand, abundant shells below 22 feet (Bay Mud).	BS
25														
	9	SS	25.0	27.0	P			18	SM			25.0	Loose to medium dense gray silty sand, saturated, fine grained, some shells, heaving sands encountered at 25 feet.	
	10	SS	27.0	29.0	P			18	SM	17.9				
30	11	CR	29.0	34.0				0	SM					
35	12	CR	34.0	38.0				48	SM					BS
									SM			36.5	Dense orange brown silty sand, saturated, fine grained, trace of clay (Merritt Sand).	MS
40	13	SS	39.0	41.0	32	50	65	24	SM				becomes more clayey between 36 and 37 feet.	
					60									

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DRILLER: Beylik Drilling -Alex Bashta DATE: START 5/18/90 FINISH 5/18/90

DEPTH	SAMPLE No.	TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0"-6"	6"-12"	12"-18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER	DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
	14	SS	41.0	43.0	8	21	18	18	SM	18.7					
45	15	CR	45.0	50.0				24	SM					thin zone of iron oxidation at 46 feet. color change to yellow brown below 46.5 feet.	
50	16	CR	50.0	55.0				24	SM					becomes less silty and more sandy below 50 feet.	
55														heaving sands encountered between 55 and 60 feet.	
60	17	CR	60.0	65.0				12	SM					becomes silty below 60 feet color change to light brown.	
65	18	CR	65.0	70.0			8	8	SM						
70	19	CR	70.0	75.0				36	SM					Slight increase in grain size below 70 feet.	
75	20	CR	75.0	80.0				0	SM						
80		CR	80.0	85.0				36	SP	19.6		80.0			

MS
SA
ISTC

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DRILLER: Beylik Drilling -Alex Bashta DATE: START 5/18/90 FINISH 5/18/90

DEPTH	SAMPLE No.	TYPE	INTERVAL FROM	TO	BLOW COUNT 0" 6"	6" 12"	12" 18"	REC (in)	USCS SOIL TYPE	WC (%)	qu (TSF)	LAYER DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
	21	CR	80.0	85.0				36	SP	19.6			Dense gray sand, saturated, fine grained, trace of silt.	
85	22	CR	85.0	90.0				24	SP					SA TSF
									CL			86.5	Stiff gray green silty clay, saturated.	YB Mus
90	23	CR	90.0	92.0	0	3	4	24	CL				color change to brown gray below 90 feet.	
					8							92.0		
95													Bottom of boring at 92 feet.	
100														
105														
110														
115														
120														

Notes:

1. Boring was advanced using 8-inch-diameter hollow stem augers
2. Boring was backfilled using cement bentonite grout upon completion of drilling.
3. Ground water was encountered at 10 feet during drilling.
4. Sampler type:
   California Sampler (SS)
   O.D. = 2.5 inches
   I.D. = 2.0 inches
   Dry core sampler (CR)
   O.D. = 3.0 inches
   I.D. = 2.5 inches
5. Abbreviation Legend:
   A- Drill cuttings
   P - Push (Sampler was advanced downward by the weight of the downhole hammer.)

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125														Notes: (Continued)	
														6. Boring elevations are referenced to a Navy datum point using a Mean Lower Low Water (MLLW) datum.	
														7. Moisture content (%) was obtained from geotechnical laboratory test data.	
130															
135															
140															
145															
150															
155															
160															

Canonie Environmental

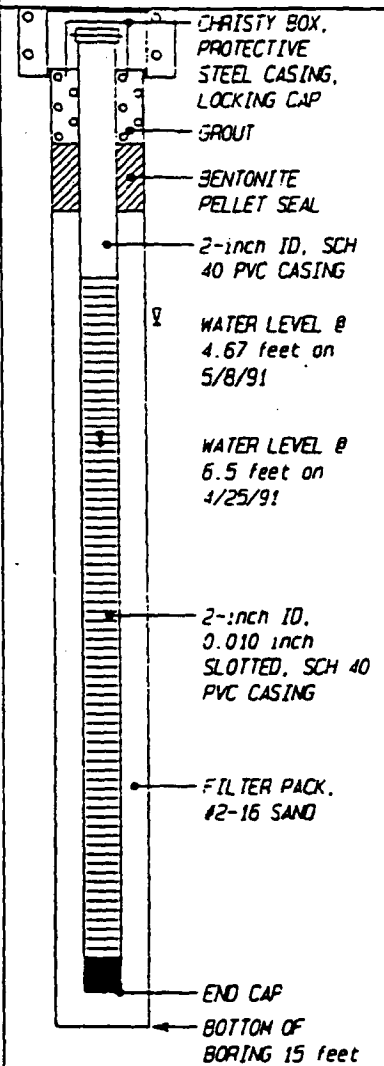
JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-001A
CLIENT PRC/US NAVY
DATE STARTED 4/25/91 COMPLETED 4/26/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 7.25 SURFACE ELEVATION
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						GW	sandy GRAVEL (GW), light brown (7.5YR 6/3), loose, dry to moist, medium sand, granule to pebble clasts, fill
2							sandy GRAVEL (GW), black (7.5YR 2/0), loose, medium sand, granule to cobble clasts, high est K, broken glass, wood and metal fragments, fill
4						SP	SAND (SP), brownish yellow (10YR 6/6), medium dense, very coarse, angular sand, high est K, fill, (cuttings)
6				0		GW SW	SAND and GRAVEL (SW/GW), black (7.5YR 2/0), very loose, trace of fines, medium to very coarse sand, broken glass and metal fragments (up to 2-3"), fill
						CL	CLAY (CL), grey (2.5YR 5/0), (cuttings)
10		GEO-TECH	11 6 13			GW SW	SAND and GRAVEL (SW/GW), black (7.5YR 2/0), loose, trace fines, medium to very coarse sand, broken glass and metal fragments (up to 2-3"), moderate est K, fill
12							
14							@ 13 feet-same as above, nails also in debris, fill
							TOTAL DEPTH 15 feet
16							
18							

Note: All samples were screened with a Geiger-Mueller meter: no radiation was detected.



DRILLING METHOD/RIG TYPE AUGER/CME 750
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
HOLE DIAMETER 8.0 INCHES
BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 15 FEET
WELL COMPLETION DEPTH 14.5

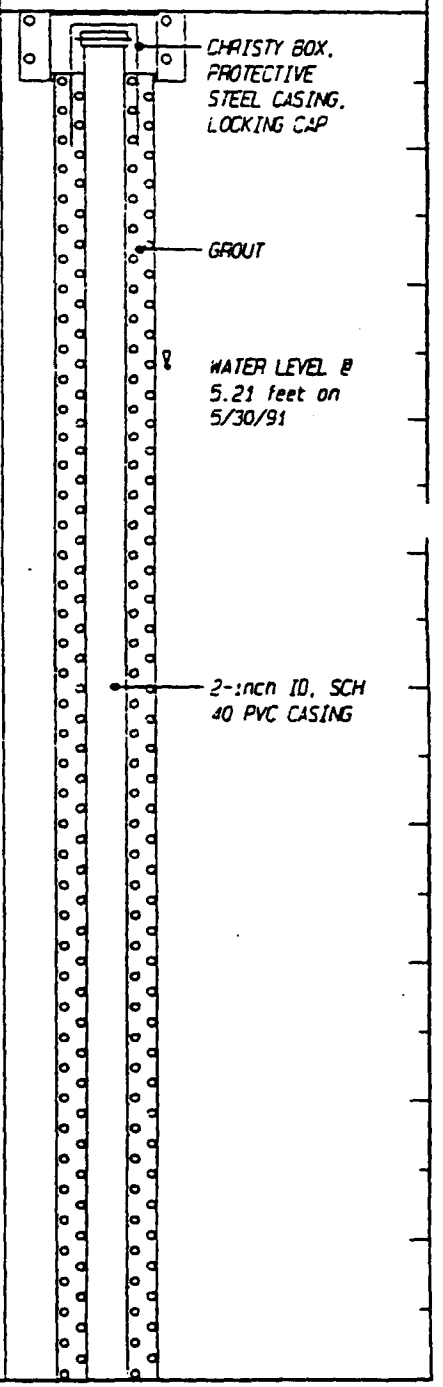
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

DRING/WELL NUMBER M-001B
TE STARTED 5/09/91 COMPLETED 5/13/91
EF. ELEVATION 7.79 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST D. KRAMER/R. HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
				0		SM	silty SAND (SM), dark olive brown (2.5Y 3/3), loose, dry, medium sand, gravel up to 1.5 inches in diameter, moderate est K, contains nails, glass, wire, metal fragments, fill
2						SC	clayey SAND (SC), black (7.5YR N2/0), loose, dry, 30% fines, fine sand, trace gravel, low est K, nails, glass, wood, brick, fill
4				0			
6							@ 6 feet-same as above, wet
8						SM	silty SAND (SM), black (7.5YR N2/0), medium dense, wet, 20 to 25% fines, medium sand, <10% gravel, moderate est K, nails and wire, fill
10			>50	8			@ 10 feet-same as above, dense
12			11 12 4 5 6 1	34.5		SW	SAND (SW), very dark gray (2.5YR N3/0), loose, wet, trace fines, medium to coarse sand, <10% gravel, moderate est K, glass, wire, wood, brick, paper, fill
14							
16						SM	silty SAND (SM), black (7.5YR N2/0), loose, wet, 20 to 30% fines, fine sand, moderate est K, plant material and brick fragments, glass
18			1 1 for 18"				@ 17.5 feet-same as above, very loose

COMMENTS



NG METHOD/RIG TYPE SS-15-II/ARCH
DIAMETER 7.25 INCHES
OTAL DEPTH OF BORING 77 FEET

DRILLING CONTRACTOR/DRILLER WATER DEV./K. CHIVRELLE
BIT TYPE 7" TRICONE AIR ROTARY CASING HAMMER
WELL COMPLETION DEPTH 72.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

·ING/WELL NUMBER M-001B
DATE STARTED 5/09/91 COMPLETED 5/13/91
REF. ELEVATION 7.79 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST D. KRAMER/R. HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 5, 5, 1, 2, 3, 2, 2, 2, 2, 6, 2, 2, 2, 2, 2, 3, 2, 2, 3, 6, 4, 11, 3, 6, 9, 19	0, 0, 0, 0		SC, CL, ML, SP	clayey SAND (SC), very dark gray (2.5Y 3/0), loose, wet, 30 to 40% fines, fine sand, low est K, nails, asphalt, fill CLAY to silty CLAY (CL), dark gray (2.5Y N4/0), soft, damp to wet, medium to coarse shell fragments, low est K, possible burn zone at 21 feet (black color, ash) @ 22 feet-same as above, 22 to 23 feet, fill ash, 23 to 23.5 feet, medium to coarse shell fragments @ 24 feet-same as above, 24 to 25 feet, fill ash, 25.5 to 26 feet, shell fragments CLAY to silty CLAY (CL), dark gray (2.5Y N4/0), soft, wet, low est K @ 27 feet-same as above, increasing silt, medium stiff to stiff @ 28 feet-same as above, oyster shell fragments, low est K @ 30 feet-same as above, approximately 10 to 20% shell fragments @ 31 feet-same as above, kerosene odor silty CLAY (CL), dark gray (2.5Y N4/0), soft to medium stiff, moist to wet, coarse to medium shell fragments (1 to 5%), low est K, kerosene odor sandy SILT (ML), olive gray (5Y 3/1), medium dense, 20 to 30% fine sand, 5 to 10% coarse shell fragments, low est K, kerosene odor SAND (SP), dark olive gray (5Y 3/2), medium dense, wet, trace fines, fine sand, high est K, quartz and feldspar grains	GROUT 2-inch ID, SCH 40 PVC CASING

LOG OF SOIL BORINGM-001B (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-001B
DATE STARTED 5/09/91 COMPLETED 5/13/91
REF. ELEVATION 7.79 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST D. KRAMER/R. HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
				0		SP		
							SAND (SP), dark olive gray (5Y 3.2), medium dense, wet, trace fines, fine sand, high est K, quartz and feldspar grains	
42								GROUT
44								
				0				
46								
							@ 47 feet-same as above (cuttings)	2-inch ID, SCH 40 PVC CASING
48								
50				0				
52							@ 52 feet-same as above (cuttings)	
								BENTONITE PELLET SEAL
54						SM	silty SAND (SM), olive yellow (2.5Y 6/6), loose, wet, 15 to 25% fines, very fine to fine sand, moderate est K	
56		CHEM	14	0				
			17					
		CHEM	14				@ 57 feet-same as above, medium dense, 5 to 10% fines, moderate to high est K	FILTER PACK, #2-16 SAND
			12					
58			7					
			25					
			17					
			41					

LOG OF SOIL BORINGM-001B (continued)

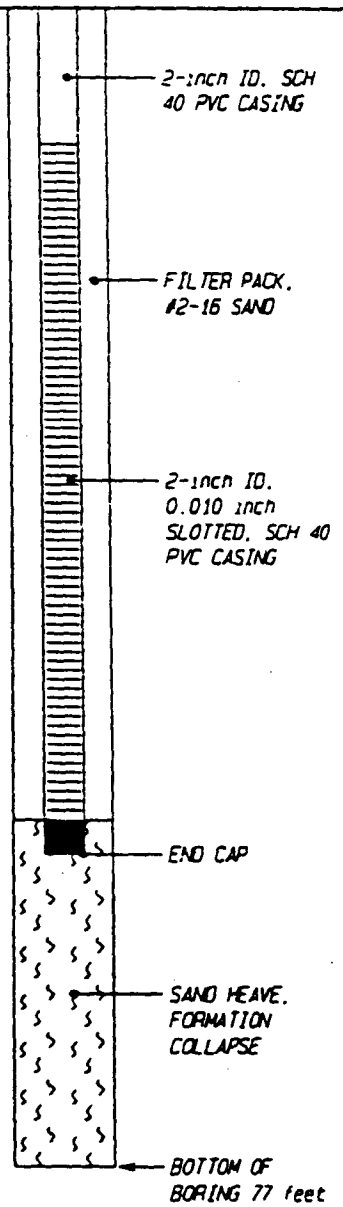
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-001B
DATE STARTED 5/09/91 COMPLETED 5/13/91
REF. ELEVATION 7.79 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST D. KRAMER/R. HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		GEO-TECH	7 14 21 31	0		SM	silty SAND (SM), olive yellow (2.5Y 6/6), loose, wet, 15 to 25% fines, very fine to fine sand, moderate est K, kerosene odor
62							
64							
66			6 12 20 50	38			@ 66 feet-same as above
68							
70							
72							
74							@ 75 feet-same as above (cuttings)
76							
							TOTAL DEPTH 77 feet
78							
							Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS

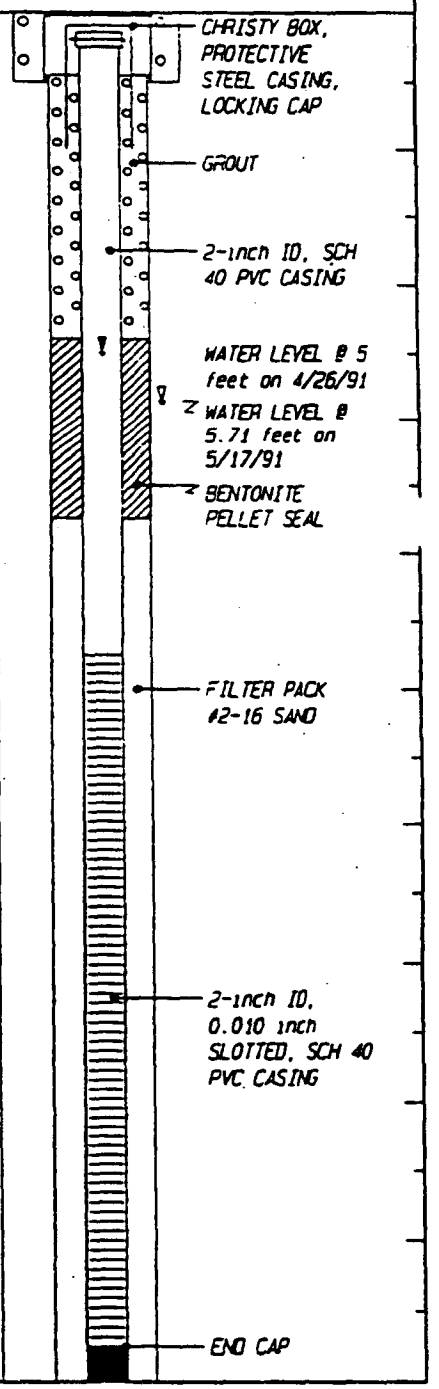


LOG OF SOIL BORINGM-001B (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-001E
CLIENT PRC/US NAVY
DATE STARTED 4/26/91 COMPLETED 4/26/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 7.97 SURFACE ELEVATION
GEOLOGIST DONNA COURINGTON

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
				0		SM	silty SAND (SM), dark olive brown (2.5Y 3/3), loose, dry, medium sand, gravel up to 1.5 inches in diameter, moderate est K, contains nails, glass, wire, metal fragments, fill
2						SC	clayey SAND (SC), black (7.5YR N2/0), loose, dry, 30% fines, fine sand, trace gravel, low est K, nails, glass, wood, brick, fill
4		CHEM		0			
6							@ 6 feet-same as above, wet
8						SM	silty SAND (SM), black (7.5YR N2/0), medium dense, wet, 20 to 25% fines, medium sand, <10% gravel, moderate est K, nails and wire, fill
10			>50	8			@ 10 feet-same as above, very dense
12							
14			11 12 4 5 6 1	34.5		SW	SAND (SW), very dark gray (2.5YR N3/0), loose, wet, trace fines, medium to coarse sand, <10% gravel, moderate to high est K, glass, wire, wood, brick, paper, fill, sheen on water from split spoon sampler
16						SM	silty SAND (SM), black (7.5YR N2/0), wet, fine sand, 20 to 30% fines, moderate est K, plant material, brick and glass fragments
18			1 1 for 18"				@ 17.5 feet-same as above, very loose



DRILLING METHOD/RIG TYPE AUGER/CME 750
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
HOLE DIAMETER 8.0 INCHES
BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 29 FEET
WELL COMPLETION DEPTH 20

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-001E
DATE STARTED 4/26/91 COMPLETED 4/26/91
REF. ELEVATION 7.97 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DONNA COURINGTON

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			8 1			SC	clayey SAND (SC), very dark gray (2.5Y 3/0), loose, wet, 30 to 40% fines, fine sand, nails, asphalt, fill	
22			1 1 2 0	0		CL	silty CLAY (CL), very dark gray (2.5Y N3/0), very soft, wet, fines, shell fragments, trace plant material @ 23 feet-same as above, one inch of shell hash with silty fine sand and gravel	
24								1/4 inch BENTONITE PELLETS FOR SEAL
26			0 0 0				silty CLAY (CL), very dark gray (7.5YR 4/0), very soft, wet, fines @ 26 feet-same as above, abundant large shell fragments	
28		GEO-TECH	0 0 0				@ 28 feet-same as above, permeability sample	
							TOTAL DEPTH 29 feet	BOTTOM OF BORING 29 feet
30								
32								
34								
36								
38								

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

LOG OF SOIL BORINGM-001E (continued)

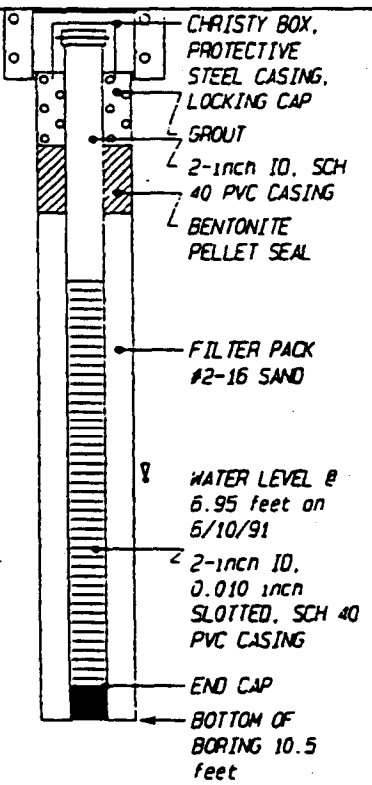
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-002A
CLIENT PRC/US NAVY
DATE STARTED 6/4/91 COMPLETED 6/4/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 9.17 SURFACE ELEVATION
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 3.5'			SP	SAND (SP), grayish brown (2.5Y 5/2), loose, dry, <5% fines, fine to medium sand, 10% gravel up to 1/2 inch, fill, (cuttings)
2							
4		CHEM	3				gravelly SAND (SP), olive brown (2.5Y 4/3), loose, dry, trace of silt, 10% gravel, shell fragments, fill
			5	0			
			3			ML	clayey SILT (ML), very dark grayish brown (2.5Y 3/2), loose, dry, 55 to 65% fines, 25 to 35% fine sand, roots, fill
		GEO-TECH	2				
			1	0		SP	
6			3				SAND (SP), reddish brown (5Y 4/3), loose, moist, trace fines, fine to medium sand, high est K
			3				
			4	0			@ 6.5 feet-same as above, wet
8			6				
			1				
			0			CL	CLAY (CL), dark gray (5Y 1/1), very soft, wet
			1				
10							TOTAL DEPTH 10.5 feet
12							
14							
16							
18							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS



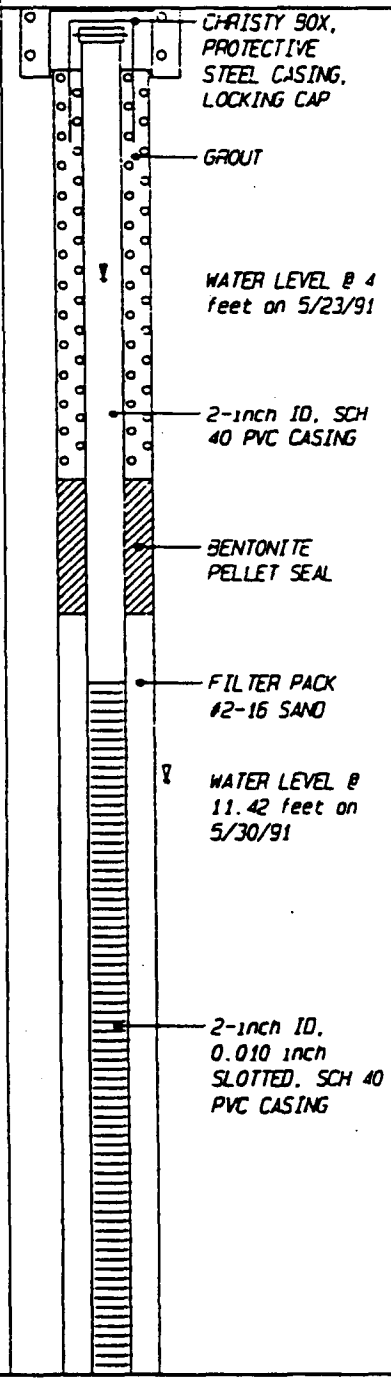
DRILLING METHOD/RIG TYPE AUGER/CME 750
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
HOLE DIAMETER 3.0 INCHES
BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 10.5 FEET
WELL COMPLETION DEPTH 10.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-002E
CLIENT PRC/US NAVY
DATE STARTED 5/23/91 COMPLETED 5/23/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 8.98 SURFACE ELEVATION
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			4 7 7			SP	SAND (SP), loose, dry, very fine to fine sand, 10% gravel, fill
2							@ 2 feet-same as above, shell fragments
			3 3 3 2 1 1	0		ML	sandy SILT (ML), very dark grayish brown (10YR 3/2), medium stiff, moist, trace clay, very fine to medium sand, low est K, rootlets, shell fragments, fill
4							
6			2 2 3				@ 5.5 feet-same as above, very dark gray (2.5Y 3/2), increasing percent clay to 20%
						SP	SAND (SP), olive brown (2.5Y 4/3), loose, wet, trace fines, fine to medium sand, fill
			3			ML	clayey SILT (ML), very dark gray (2.4Y N3/0), trace very fine sand
8			4 5 1 0 1 1 5 10			SP	SAND (SP), olive (5Y 4/3), loose, wet, fine to medium sand, color change to dark gray (5Y 4/1) at 8 feet, shell fragments, fill
						CL	
10				0			CLAY (CL), dark gray (5Y 4/1), soft, wet, 10 to 20% silt, fill
12			3 5 10				@ 12 feet-same as above, 1/2 inch angular rock fragments, fill
14			16 20 50				
16			4 8 55 16 5 6	0			@ 15 feet-same as above, increasing percent gravel to 15%, shell fragments, fill
18			25 12 10	0			@ 18 feet-same as above, rock, shell and woodchip fragments, fill

COMMENTS



DRILLING METHOD/RIG TYPE AUGER/CME 750
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
HOLE DIAMETER 8.0 INCHES
BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 23 FEET
WELL COMPLETION DEPTH 20.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-002E
DATE STARTED 5/23/91 COMPLETED 5/23/91
REF. ELEVATION 8.98 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	2			CL		FILTER PACK #2-16 SAND
			6				CLAY (CL), dark gray (5Y 4/1), soft, wet, 10 to 20% silt, fill	END CAP
			27					
22		GEO-TECH	25					BENTONITE PELLET SEAL
			12					
			1				TOTAL DEPTH 23 feet	BOTTOM OF BORING 23 feet
24								
26								
28								
30								
32								
34								
36								
38								

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

LOG OF SOIL BORINGM-002E (continued)

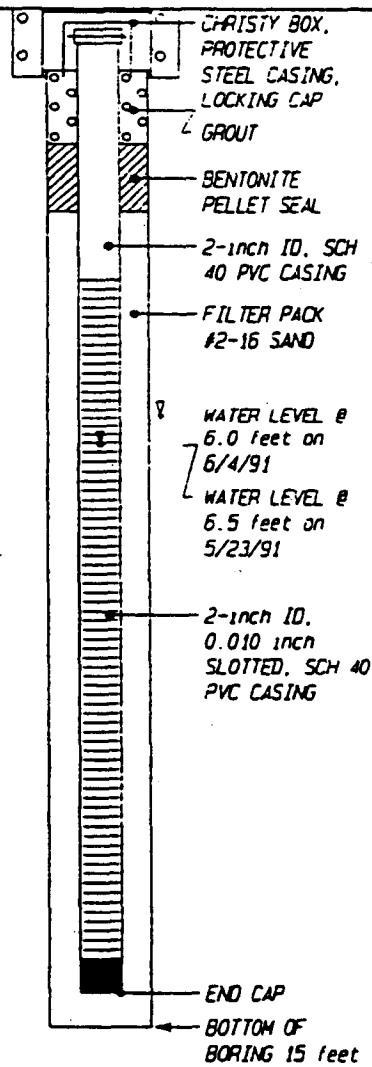
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-003A
DATE STARTED 5/23/91 COMPLETED 5/23/91
REF. ELEVATION 9.03 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			11	0		SP	gravelly SAND (SP), dark grayish brown (2.5Y 4/2), loose, dry, trace silt, fine to medium sand, pebble to cobble gravel clasts, fill
			10				
			4				
2		CHEM	2	0			@ 2 feet-asphalt and sand, fill
			1				
			2				
4		CHEM	2	0			SAND (SP), very dark grayish brown (2.5Y 3/2), loose, moist, trace fines, medium sand, high est K, shell fragments, fill
			2				
			4				
			4	0			@ 5 feet-same as above, wet
6			5				
			6				
			4	0			SAND (SP), very dark gray (5Y 3/1), loose, wet, trace fines, medium sand, high est K
			3				
			7				
8			4	0			
			8				
			6				
10		GEO-TECH	4	0			
			5				
			4				@ 11 feet-same as above, silty SAND (SP), lens, olive (5Y 4/3), shell fragments, high est K
12			3	0			
14			4	0			
			4				@ 14 feet-same as above
			5				
							TOTAL DEPTH 15 feet
16							
18							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS



DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 15 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 14.5

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M 003-B

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
			NA	38			GW	FILL Sandy gravel (GW), dark brown (7.5Y3/3), fine to medium gravel, dense, slightly moist
				11			SP	Sand (SP), brown (7.5Y5/3), fine sand, dense, slightly moist
	✓GEOTECH			10				
5				22				Same as above, but light brown (7.5Y6/3), trace clay stringers
				11				Same as above, but moist, trace shells
							CL	Clay (CL), dark gray (7.5YN6), plastic, moist
				14			SM	Silty sand (SM), gray (7.5YN5), fine sand, dense, moist, trace clay, abundant shells
				12				Same as above
10								
15				16			SP	Sand (SP), gray (7.5YN5) with slight green tint, fine sand, dense, moist
20								

▼ Water Level

☒ Split Spoon

■ Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY JEV
DATE DRILLED 10-14-94 to 10-24-94
DRILLER Tonto Drilling Services, Inc.
DRILL METHOD Hollow-stem Auger/Mud Rotary

SAMPLING METHOD Split spoon
GROUND ELEVATION 13.56 Feet
TOC ELEVATION 12.75 Feet
BORING DIAMETER 12.0 inches
TOTAL DEPTH OF HOLE 44.5 Feet bgs
WATER LEVEL Not Available
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M003-B

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
				4			SP	BAY SEDIMENTS Same as above
				4			CL	Clay (CL), dark gray (7.5YN4), plastic, moist
				4				Same as above, but very dark gray (7.5YN3)
25 ~~5~~				11				Same as above, but dark olive gray (5Y3/2), medium stiff, trace shells
30 ~~10~~				30/6 50/6				Same as above with trace sand and abundant shell
								Same as above, but dark green (2.5YN4)
							SP	Sand (SP), very dark gray (7.5YN3), medium dense, wet
35 ~~15~~				41/6 53/6				Same as above with trace shells
								Same as above, but olive brown (2.5Y4/4), trace clay
40 ~~20~~								

Water Level

Split Spoon

Sample Collected

PROJECT		SAMPLING METHOD	
LOCATION		GROUND ELEVATION	
JOB NUMBER	044-	TOC ELEVATION	
LOGGED BY		BORING DIAMETER	
DATE DRILLED		TOTAL DEPTH OF HOLE	
DRILLER		WATER LEVEL	
DRILL METHOD		WELL INSTALLED? (Y/N)	

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M003-B

MERRITT SAND

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
				62/6 67/6			SP	Same as above, but yellowish brown (10YR5/8), no clay
				33/6 50/6				Same as above
45								TD = 44.5 Feet bgs
50								
55								
60								

Water Level

Split Spoon

Sample Collected

PROJECT

LOCATION

JOB NUMBER 044-

LOGGED BY

DATE DRILLED

DRILLER

DRILL METHOD

SAMPLING METHOD

GROUND ELEVATION

TOC ELEVATION

BORING DIAMETER

TOTAL DEPTH OF HOLE

WATER LEVEL

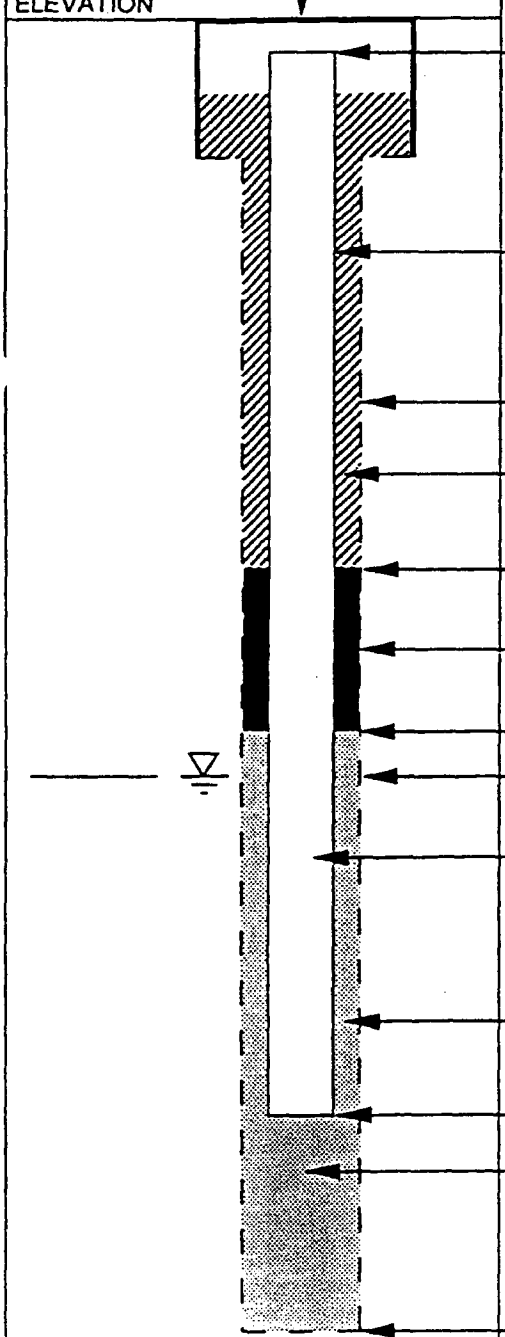
WELL INSTALLED? (Y/N)

WELL ~~BORING~~ NO. MØØ3-B

8

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Tonto Drilling Services, Inc.
PROJECT NO. Ø44 Ø28Ø	BORING MØØ3-B	DRILLING METHOD Hollow Stem Auger/Mud Rotary
~~ELEVATION~~ SITE 1	DATE 10-24-94	DEVELOPMENT METHOD Surge/Bail/Pump
FIELD GEOLOGIST JEV		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 13.56

ELEVATION OF TOP OF WELL CASING: 12.75

RISER PIPE I.D.: 3 inches

TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 8 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL (feet bgs) 26.5

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK (feet bgs) 29.5

DEPTH TOP OF SCREEN 33.0

TYPE OF SCREEN: Schedule 4Ø PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 3 inches

TYPE OF SAND PACK: #2/12 Monterey Sand

DEPTH BOTTOM OF SCREEN (feet bgs) 43.0

DEPTH BOTTOM OF SAND PACK 44.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

DEPTH OF HOLE (feet bgs) 44.5

MF

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M003-E

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-032	0	26			ML	FILL Gravelly silt (ML), tan, loose, dry
	CHEMICAL	280-S01-033	0	3			SP/SC	Sand/clayey sand (SP/SC), tan, fine to medium sand, moist, trace black tar-like material
							ML	Gravelly silt (ML), tan, pebble-size gravel, loose, moist, trace sand, trace tar-like material
	CHEMICAL	280-S01-034	0.1	12			SP	Sand (SP), tan, fine to medium sand, loose, wet, layers of shells within thin clay layers
5				NA				Same as above with black staining Sand (SP), black, fine sand, loose, wet, abundant shells
10	GEOTECH		NA	6				Same as above, but with trace shells
15			NA	33				Sand (SP), greenish-gray, fine to medium sand, loose, wet, trace shells
			NA	27				Same as above
20								

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-15-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

SAMPLING METHOD Split spoon
GROUND ELEVATION 13.22 Feet
TOC ELEVATION 12.48 Feet
BORING DIAMETER 8.5 Inches
TOTAL DEPTH OF HOLE 22 Feet bgs
WATER LEVEL 4.25 Feet bgs
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M003-E

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION (BAY SEDIMENTS)
			NA	9	X		CL/ ML	Sandy clay / sandy silt (CL/ML), black, fine to very fine sand, medium dense, wet
					X		CL	Clay (CL), black, soft, moist
								TD = 22 Feet bgs
5								
10								
15								
20								

Water Level

Split Spoon

Sample Collected

PROJECT _____ SAMPLING METHOD _____

LOCATION _____ GROUND ELEVATION _____

JOB NUMBER 044- _____ TOC ELEVATION _____

LOGGED BY _____ BORING DIAMETER _____

DATE DRILLED _____ TOTAL DEPTH OF HOLE _____

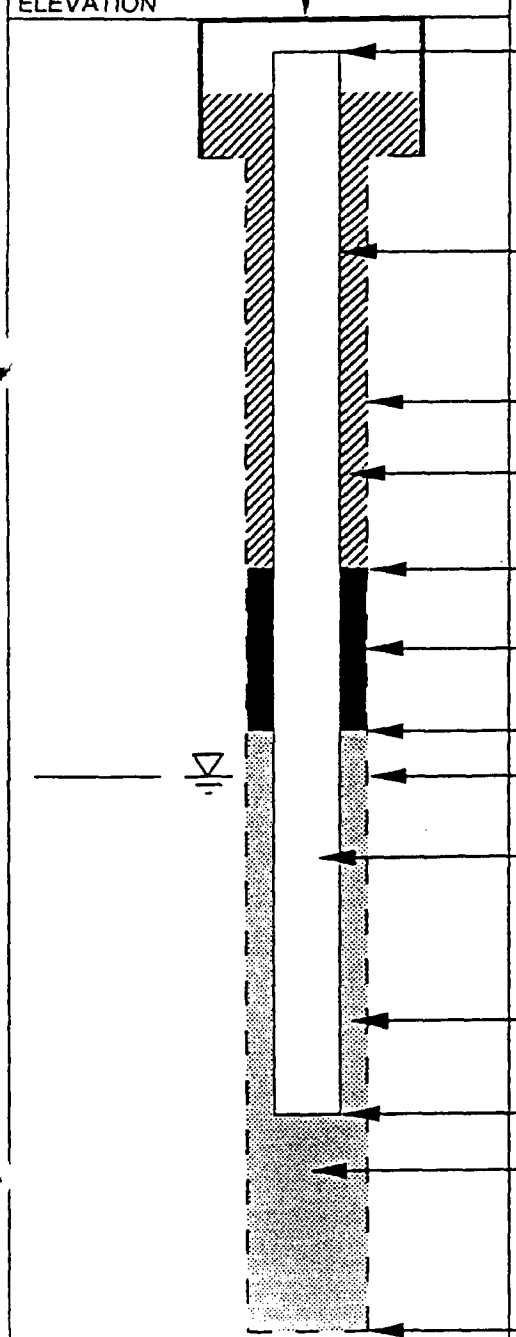
DRILLER _____ WATER LEVEL _____

DRILL METHOD _____ WELL INSTALLED? (Y/N) _____

WELL
~~BORING~~ NO. MØØ3-E

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Woodward Drilling Co.
PROJECT NO. ØØ44 Ø28Ø	BORING MØØ3-E	DRILLING METHOD Hollow Stem Auger
SITE ~~ELEVATION~~ 1	DATE 8-15-94	DEVELOPMENT METHOD Surge / Bail / Pump
FIELD GEOLOGIST DEK/JEV		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 13.22

ELEVATION OF TOP OF WELL CASING: 12.90

RISER PIPE I.D.: 2 inches

TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 8.5 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL (feet bgs) 7.25

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: 9.25

DEPTH TOP OF SCREEN (feet bgs) 11.25

TYPE OF SCREEN: Schedule 4Ø PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/16 Monterey Sand

DEPTH BOTTOM OF SCREEN (feet bgs) 21.25

DEPTH BOTTOM OF SAND PACK: 21.25

TYPE OF BACKFILL BELOW OBSERVATION WELL: Bentonite

DEPTH OF HOLE (feet bgs) 22.0

MF

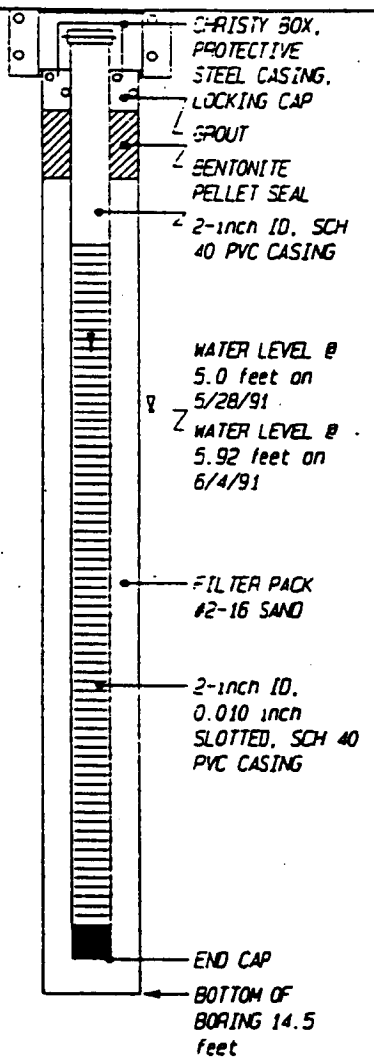
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-004A
CLIENT PRC/US NAVY
DATE STARTED 5/28/91 COMPLETED 5/28/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 8.49 SURFACE ELEVATION
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			8			SW	gravelly SAND (SW), grayish brown (2.5Y 5/2), loose, dry, 10 to 15% fines, fine to medium sand, pebble to cobble gravel clasts, moderate est K, wood chips, shell fragments, fill
			10	0			
			6				
2		CHEM	4				
			4	0			
			3				
		CHEM	3			SP	
4			2	0			
			3				SAND (SP), dark gray (5Y 4/1), loose, wet, medium sand, small shell fragments, wood, roots, fill
			3				
			2	0		SM	silty SAND (SM), very dark gray (5Y 3/1), loose, wet, very fine to fine sand, shell fragments, moderate to low est K
6			2			SP	
			3				SAND (SP), dark gray (5Y 4/1), loose, wet, medium sand, small shell fragments
			5	0			
			6				
8			3				
			4	0			
			2				
10		GEO-TECH	2				
			1	0			
			3			ML	silty CLAY (ML), trace of sand
			4			SP	SAND (SP), dark gray (5Y 4/1), loose, wet, medium sand, small shell fragments
12			4	0			
			4				
			4			SM	silty SAND (SM), very dark gray (5Y 3/1), loose, wet, 10 to 20% fines, fine to medium sand, moderate to low est K
			3				
14			4				
							TOTAL DEPTH 14.5 feet
16							
18							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS



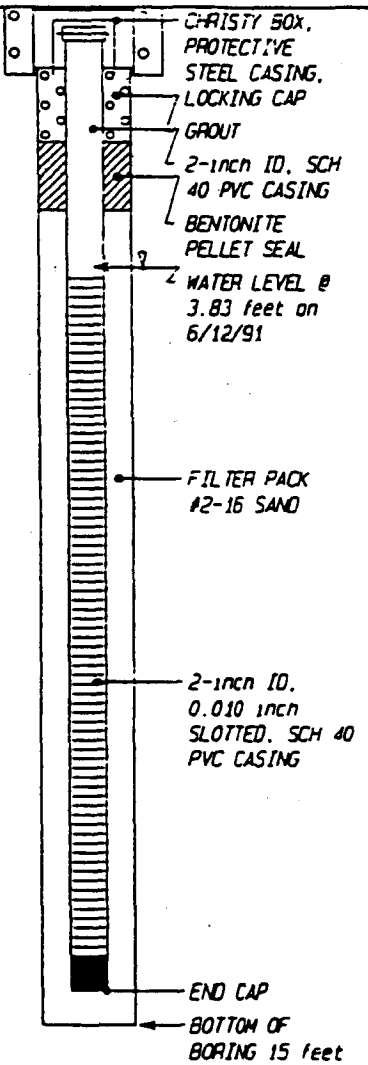
DRILLING METHOD/RIG TYPE AUGER/CME 750
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
HOLE DIAMETER 8.0 INCHES
BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 14.5 FEET
WELL COMPLETION DEPTH 14

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-025A
DATE STARTED 5/24/91 COMPLETED 5/24/91
REF. ELEVATION 6.78 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
						SP		
	■	CHEM	32 31 20	0			gravelly SAND (SP), very dark brown (2.5Y 3/2), loose, dry, 5% fines, 80% fine to medium sand, 20% 1" to 1/2" gravel, high est K, 2 inch cobble blocked shoe	
2	■	CHEM	5 4 6	0				
4								
6								
8								
10	■	GEO-TECH	14 12 11				gravelly SAND (SP), black (2.5YR 2.5/0), medium dense, wet, 10 to 15% fines, medium to coarse sand, 10% 1/2" rounded gravel, high est K	
12								
14								
							@ 15 feet-same as above (cuttings)	
							TOTAL DEPTH 15 feet	
16								
18								
							Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.	



DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 15 FEET

DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 14.5

JAMES M. MONTGOMERY
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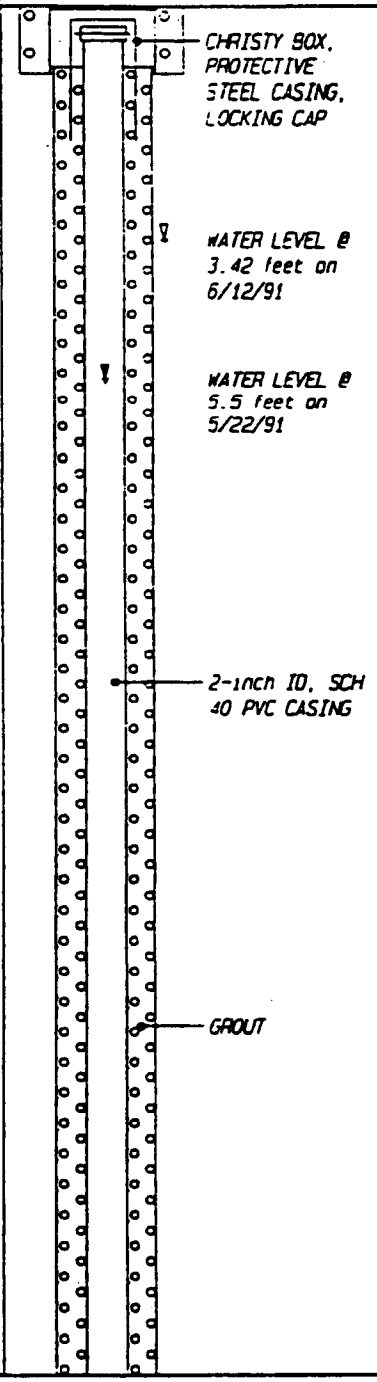
BORING/WELL NUMBER M-025C
DATE STARTED 5/22/91 COMPLETED 5/23/91
REF. ELEVATION 5.26 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST RICH HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			25			SP	gravelly SAND (SP), very dark grayish brown, (2.5Y 3/2), dense, dry, trace fines, 80% fine to medium sand, 10% gravels 1/2 inch diameter to 2 inches, moderate est K, fill
2			36				
			32				
			11				
			10				
			11				gravelly SAND (SP), very dark reddish brown, (10YR 2/2), medium dense, moist, 10 to 15% fines, fine to medium sand, black asphaltic meterial 2 inches in diameter, 65% sand, 20% gravel 1/4 to 1/2 inch in diameter, moderate est K
4			11				
			4				
			7				
			5				
			5				@ 5 feet-same as above, wet
6			4			SC	clayey SAND (SC), loose, wet, 20 to 25% fines, fine to medium sand, 10 to 15% gravel, moderate to low est K
			6				
			10				
			10			SP	SAND (SP), black (2.5YR, 2.5/0), medium dense, wet, 10 to 15% fines, medium to coarse sand, 10 to 20% gravel to 1 inch diameter, high est K
8			16				
			20				
			21				
10			6				@ 10 feet-approximately 10% gravel 1/4 to 1/2 inch round to angular
			8				
			7				
			6				
12			5				
			6				@12.5 feet-blockage in shoe, appears to be asphalt
			8				
14			11	0			SAND (SP), very dark gray (5Y 3/1), loose, wet, 5% fines, fine to medium sand, high est K, trace shell fragments
			8				
			15				
16			8	0			
			7				
			4				
			5	0			
18			6				
			10				
			7	0			@ 19 feet-same as above
			6				



DRILLING METHOD/RIG TYPE SS-15-II/ARCH
HOLE DIAMETER 7.25 INCHES
TOTAL DEPTH OF BORING 87 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./K. CHIVRELLE
BIT TYPE 7" TRICONE AIR ROTARY CASING HAMMER
WELL COMPLETION DEPTH 80.5

JAMES M. MONTGOMERY
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365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-025C
DATE STARTED 5/22/91 COMPLETED 5/23/91
REF. ELEVATION 6.26 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST RICH HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
	X		6 6 5	0		SP	SAND (SP), very dark gray (5Y 3/1), loose, wet, 5% fines, fine to medium sand, high est K, trace shell fragments	
22	X		3 4 8	0		SM	silty SAND (SM), dark olive gray (5Y 3/2), loose, wet, 20 to 30% fines, very fine to medium sand, high est K	
	X		3 3 2	0				2-inch ID, SCH 40 PVC CASING
24	X		3 3 3 1					
26	X		1 1 3 1 1 1			CL	CLAY (CL), alternating layers 1 to 3 inches of very dark gray (5Y 3/2) and olive (5Y 4/3), very soft, wet, low est K, sample is bedded, parts along bedding planes	
30	X		4 4 4	0.4		SP	SAND (SP), dark gray (5Y 4/1), loose, wet, 5 to 10% fines, very fine to fine sand, high est K	GROUT
32	X		6 3 4 3 2	0.4		CL	silty CLAY (CL), dark gray (2.5Y N4/), medium stiff, wet, 10 to 15% very fine sand, low to moderate est K, trace shell fragments @ 33 feet-same as above, 3-4" sand stringer, very fine to fine sand	
34			DRILL to 39'					
36								
38								
	X		2 3				@ 39 feet-same as above, fossiliferous oyster bed, moist	

LOG OF SOIL BORINGM-025C (continued)

JAMES M. MONTGOMERY
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BORING/WELL NUMBER M-025C
DATE STARTED 5/22/91 COMPLETED 5/23/91
REF. ELEVATION 6.26 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST RICH HALKET

DEPTH - feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			4			CL		
			8				silty CLAY (CL), dark gray (2.5Y N4/), medium stiff, wet, 10 to 15% very fine sand, low to moderate est K, trace shell fragments	
42			2					
			2					
			2					
			2					2-inch ID, SCH 40 PVC CASING
			DRILL to 48'					
44								
46								
48			2				@ 48 feet-same as above, 5-10% oyster shells	
			3					
			3					
			4					
50			2				@ 50 feet-same as above	
			3					
			3					GROUT
			15			SC		
52			DRILL to 57'				clayey SAND (SC), dark gray (2.5YR N4/), medium stiff, damp, 20-25% fines, very fine to fine sand, low to moderate est K, trace oyster shells	
54								
							@ 55 feet-same as above, interbedded clayey sand and clay (cuttings)	
56								
						SP	SAND (SP), dark olive gray (5Y 3/2), loose, wet, 5-10% fines, fine to very fine sand, moderate est K (cuttings)	
			1					
58			1					
			1					
			1					
			1				@ 59 feet-same as above, heaving sand	
			1					

LOG OF SOIL BORINGM-025C (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-025C
DATE STARTED 5/22/91 COMPLETED 5/23/91
REF. ELEVATION 6.26 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST RICH HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			1			SP		
			1				SAND (SP), dark olive gray (5Y 3/2), loose, wet, 5-10% fines, fine to very fine sand, moderate est K (cuttings)	GROUT
			DRILL to 80'					
62								
								BENTONITE PELLET SEAL
64								
							@ 65 feet-same as above (cuttings)	
66								FILTER PACK, #2/16 SAND
68								2-inch ID, SCH 40 PVC CASING
70							@ 70 feet-same as above (cuttings)	
72								
74								
								2-inch ID, 0.010 inch SLOTTED, SCH 40 PVC CASING
76								
							@ 77 feet-same as above (cuttings)	
78								
								END CAP

LOG OF SOIL BORINGM-025C (continued)

JAMES M. MONTGOMERY
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BORING/WELL NUMBER M-025C
DATE STARTED 5/22/91 COMPLETED 5/23/91
REF. ELEVATION 6.26 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST RICH HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	12			SP	SAND (SP), dark olive gray (5Y 3/2), loose, wet, 5-10% fines, fine to very fine sand, moderate est K (cuttings)	
			12					
			10			CL	CLAY (CL), black (5Y 2.5/1), hard, damp, fines, low est K	
82			12					
			5					
			6					
		GEO-TECH	10					
			11					BENTONITE PELLET SEAL
84			DRILL to 87'					
							@ 85 feet-same as above (cuttings)	
86								
							TOTAL DEPTH 87 feet	BOTTOM OF BORING 87 feet
88								
90								
92								
94								
96								
98								

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

LOG OF SOIL BORINGM-025C (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
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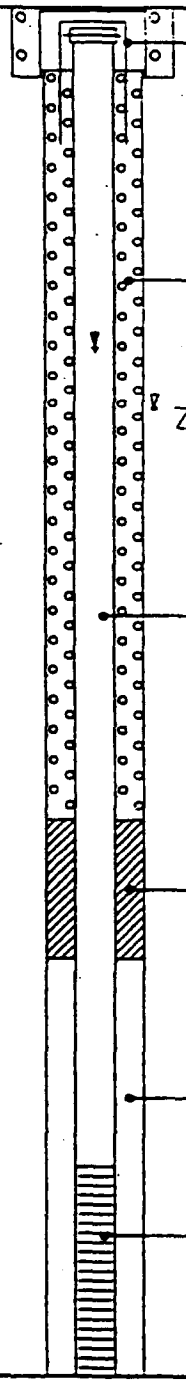
BORING/WELL NUMBER M-025E
DATE STARTED 5/24/91 COMPLETED 5/24/91
REF. ELEVATION 6.54 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			25			SP	gravelly SAND (SP), very dark grayish brown, (2.5Y, 3/2), dense, dry, trace fines, 80% fine to medium sand, 10% gravels 1/2 inch diameter to 2 inches, moderate est K, fill
			36				
			32				
2			11				
			10				gravelly SAND (SP), very dark reddish brown, (10YR, 2/2), medium dense, moist, 10 to 15% fines, fine to medium sand, black asphaltic material 2 inches in diameter, 65% sand, 20% gravel 1/4 to 1/2 inch in diameter, moderate est K
			11				
4			11				
			4				
			7				
			5				@ 5 feet-same as above, wet
			5				
6			4			SC	clayey SAND (SC), loose, wet, 20 to 25% fines, fine to medium sand, 10 to 15% gravel, moderate to low est K
			6				
			10				
			10			SP	SAND (SP), black (2.5YR, 2.5/0), medium dense, wet, 10 to 15% fines, medium to coarse sand, 10 to 20% gravel to 1 inch diameter, high est K
8			16				
			20				
			21				
10			6				@ 10 feet-approximately 10% gravel 1/4 to 1/2 inch round to angular
			8				
			7				
			6				
12			5				
			6				@ 12.5 feet-blockage in shoe, appears to be asphalt
			8				
			11	0			SAND (SP), very dark gray (5Y, 3/1), loose, wet, 5% fines, fine to medium sand, high est K, trace shell fragments
14			8				
			15				
			8	0			
16			7				
			4				
			5	0			
			6				
18							
			10				
			7	0			@ 19 feet-same as above
			6				

COMMENTS



DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 31 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 27.5

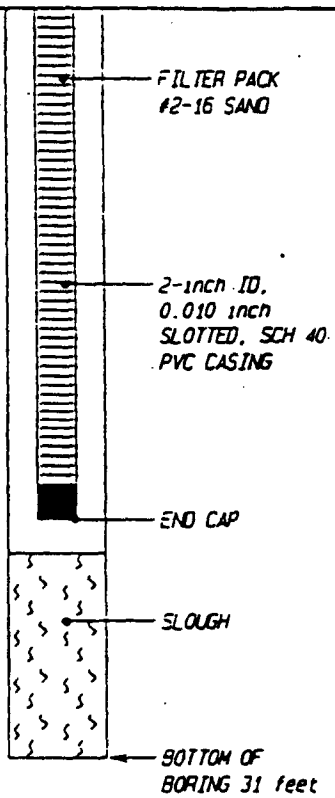
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-025E
DATE STARTED 5/24/91 COMPLETED 5/24/91
REF. ELEVATION 6.54 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CRAIG FANSHIER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		GEO-TECH	6 6 5	0		SP	SAND (SP), very dark gray (5Y, 3/1), loose, wet, 5% fines, fine to medium sand, high est K, trace shell fragments
22		CHEM	3 4 8	0		SM	silty SAND (SM), dark olive gray (5Y, 3/2), loose, wet, 20 to 30% fines, very fine to medium sand, high est K
24			3 3 2	0			
26			3 3 3				
28			1 1 1 3			CL	CLAY (CL), alternating layers 1 to 3 inches of very dark gray (5Y, 3/2) and olive (5Y, 4/3), very soft, wet, low est K, sample is bedded, parts along bedding planes.
30		GEO-TECH	1 1 1 1 1				@ 30 feet-several 1/4 inch lenses of medium sand @ 30.5 feet- several 1/4 inch lenses of shell fragments
32							TOTAL DEPTH 31 feet
34							
36							
38							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS



LOG OF SOIL BORINGM-025E (continued)

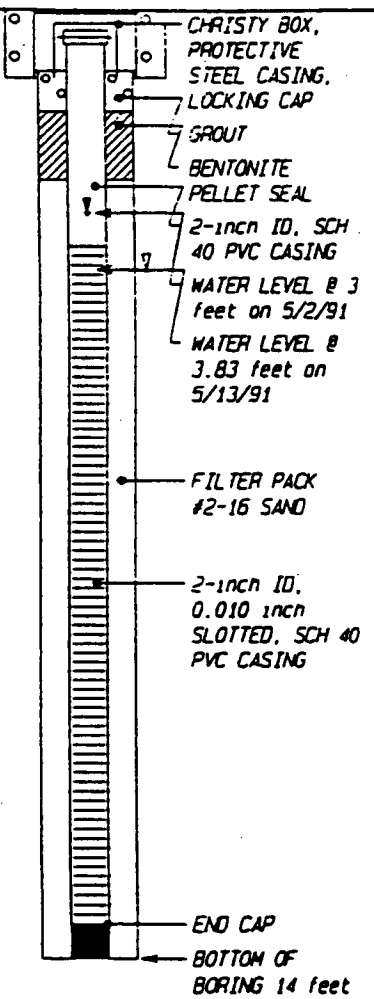
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-026A
DATE STARTED 5/2/91 COMPLETED 5/2/91
REF. ELEVATION 6.31 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 3'	0		SW	gravelly SAND (SW), dark gray brown (2.5Y 4/2), loose, damp, medium sand, 20% gravel, up to 5cm in diameter, moderate est K, concrete, fill
2							
		CHEM	7 8 9	0			
4							
			11 12 14			GW	sandy GRAVEL (GW), olive brown (2.5Y, 5/3), loose to medium dense, wet, 40% fine to coarse sand
6			3 6 9			SP	SAND (SP), gray to very dark gray (2.5Y N3/) with and olive green tinge, loose, wet, fine to medium sand, high est K, shell fragments
8			5 7 12	0			
10			5 7 12				@ 10 feet-same as above, olive gray (5Y 5/2), trace gravel
		GEO-TECH	2 3 7				
12			9 9 8	0			SAND (SP), light olive gray (5Y 6/2), loose, wet, trace silt, very fine to fine sand, high est K
14							TOTAL DEPTH 14 feet
16							
18							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS



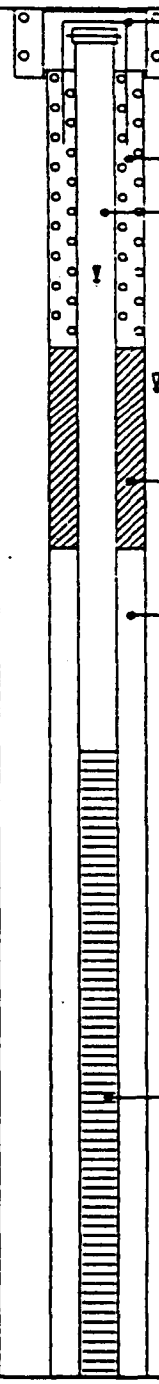
DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 14 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 14

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-26E
DATE STARTED 5/2/91 COMPLETED 5/2/91
REF. ELEVATION 6.29 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 3'			SC	clayey SAND (SC), dark gray (10YR 4/1), stiff, dry, low est K, rootlets
						SW	gravelly SAND (SW), brown (10YR, 5/3), loose wet, medium sand, 15-20% gravel, fill
2				0			
			5				
			5				
4			4	0			
			4				
			4				
			8				SAND (SW), gray (5Y 5/1) with olive green tinge, loose, wet, very fine to medium sand, trace gravel, black mottling, high est K
6			7				
			12				
			14				
			24				@ 7.5 feet-same as above, black (2.5Y N2/0), asphalt, metal pieces, wire, fill
8			26	0			
			22				
			12			SP	SAND (SP), very dark gray (2.5Y N3/0), loose, wet, medium sand, trace shell fragments, high est K, fill
			16	0			
10			20				
			4				
			6				
			13				SAND (SP), gray (5Y 5/1) with green tinge, loose, wet, very fine to fine sand, high est K, fill
12			9				
			7				
			12				SAND (SP), gray to dark gray (5Y 5/1) with a green tinge, medium sand, trace shell fragments, high est K, fill
			2				
14			3				
			5				
			3				
			3				
16			4	0			
		GEO-TECH	3				
			4				
			4				
18			8				@ 18 feet-same as above, heaving sands
			5				
			3				
		CHEM	2				

COMMENTS

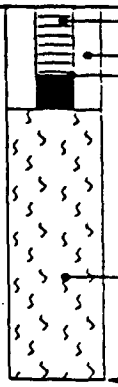


DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 25.5 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 21.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-26E
DATE STARTED 5/2/91 COMPLETED 5/2/91
REF. ELEVATION 6.29 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	2			SP		
			1			CL	CLAY (CL), very dark gray (2.5Y N3/0), very soft, wet, gray mottling, trace sand	
			1					
22			1					
			2					
			PUSH to 25.5'	0				
24								
							@ 25 feet-same as above	
							TOTAL DEPTH 25.5 feet	
26								
3								
30								
32								
34								
36								
38								



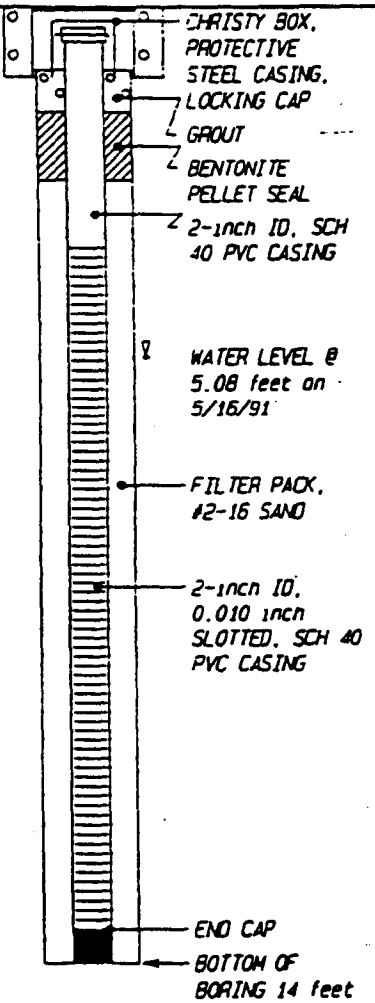
Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

LOG OF SOIL BORINGM-26E (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027A
DATE STARTED 5/13/91 COMPLETED 5/13/91
REF. ELEVATION 7.62 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			6 8 20	0		SW	gravelly SAND (SW), dark red brown (5YR 3/2), dry medium sand, 15-20% gravel, trace fines, trace glass, moderate est K.	
2							VOID, concrete and steel pier, fill	
4								
6			1 1 9			SP	SAND (SP), very dark gray (5YR 3/1), loose, wet, fine to medium sand, high est K, fill @ 6 feet-same as above, dark gray (2.5Y N4/0)	
8			7 7 7 14	0			SAND (SP), dark gray (2.5Y N4/0), loose, wet, fine to medium sand, trace shell fragments, high est K	
10			7 11 11	0				
12			3 5 6 3 6 8 5				@ 11.5 feet-same as above	
14							TOTAL DEPTH 14 feet	
16								
18								



Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 14 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 14

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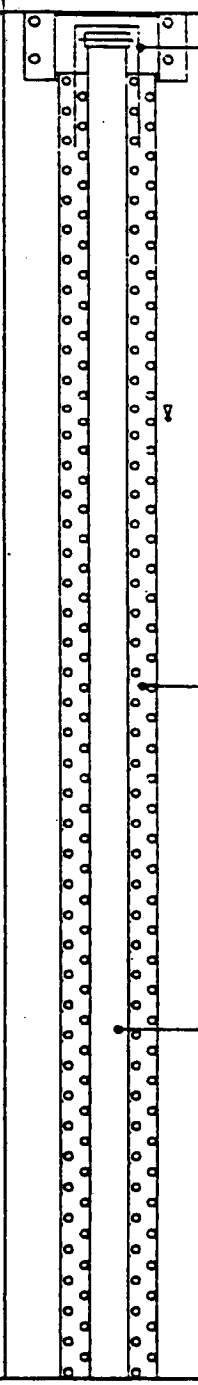
BORING/WELL NUMBER M-027B
DATE STARTED 4/29/91 COMPLETED 5/03/91
REF. ELEVATION 7.58 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 5'				No recovery to 5 feet
2							
4							
6	X		11 18 5 2	0 0		SP	SAND (SP), dark yellowish brown (10YR 3/6), loose, slightly moist, grades to gray (2.5Y N5/), loose, moist, less than 10% fines, high est K
8	■	CHEM	2 9 9 13			SW	SAND (SW), very dark gray (5Y 3/1), loose to medium dense, wet, 10 to 15% fines, fine to medium sand, moderate to high est K
10							
12	X		5 8 10 18	0 0 0 0			
14							SAND (SW), very dark gray (5Y 3/1), loose to medium dense, wet, grades downward to very fine sand, piece of glass in sample, one large bolt, fill
16							
18	X		6 7 10 13	55 12.5 0 0		CL SP	CLAY (CL), very dark gray (5Y 3/1), soft, wet, homogenous-no bedding, low est K SAND (SP), loose, wet, medium grains, fines downward to fine sand, high est K



DRILLING METHOD/RIG TYPE SS-15-II/ARCH
HOLE DIAMETER 7.25 INCHES
TOTAL DEPTH OF BORING 72 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./K. CHIVRELLE
BIT TYPE 7" TRICONE AIR ROTARY CASING HAMMER
WELL COMPLETION DEPTH 66.5

JAMES M. MONTGOMERY
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BORING/WELL NUMBER M-027B
DATE STARTED 4/29/91 COMPLETED 5/03/91
REF. ELEVATION 7.58 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			4	0		SP	SAND (SP), light olive brown (2.5Y 5/4), loose, wet, medium grains, trace fines, high est K	
			13					
			5					
			6					
22			1	0				
			3	0		SM	silty SAND (SM), very dark gray (5Y 3/1), medium stiff, wet, trace fines, very fine to fine sand, low est K, shell fragments	
			2	0		SC		
			9			SM		
24						ML	@ 23 feet-approximately 1 inch clayey SAND (SC), very dark gray (5Y 3/1)	
							clayey SILT (ML), very dark gray (5Y 3/1), soft, low est K, trace shell fragments	GROUT
26								
28								
30								
32								
34			3	0		CL	silty CLAY (CL), very dark gray to black (2.5Y 3/ to 2/), stiff, wet, 10% fine sand	
			3					2-inch ID, SCH 40 PVC CASING
			6					
			8					
36			5	0		ML	clayey SILT (ML), very dark gray (2.5Y 3/), soft, wet, 15% very fine to fine sand, 20% shell material	
			5					
			8			CL	silty CLAY (CL), very dark gray to black (2.5Y 3/ to 2/), soft, wet, trace fine sand, trace oyster shells	
			21					
38			3	0				
			4				silty CLAY (CL), very dark gray to black (2.5Y 3/ to 2/), medium stiff, approximately 20% silt, low est K	
			6					
			7					

LOG OF SOIL BORINGM-027B (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027B
DATE STARTED 4/29/91 COMPLETED 5/03/91
REF. ELEVATION 7.58 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			3 5 9	0		CL	silty CLAY (CL), iterbedded oyster hash layers several inches thick and sand lenses approximately 1 inch or less, soft to very soft, wet, increase to 15% fine sand at base to medium sand at 41.5 to 42 feet	
42				0		SP	SAND (SP), (5Y 3/1), loose, wet, medium sand, trace fines, some shell fragments, high est K	GROUT
44			9 36 50+	0			SAND (SP), medium dense, wet, trace fines, medium sand, high est K	2-inch ID, SCH 40 PVC CASING
						CL	CLAY (CL), layer, approximately 3 to 4 inches containing oyster shell fragments	
46			5 12 14 12	0		SP	SAND (SP), dark olive gray (5Y 3/2), medium dense, wet, trace fines, high est K	
			5 9	0				
50								
52				0			SAND (SP), light olive brown (2.5Y 5/4), loose to medium dense, wet, medium sand, high est K	BENTONITE PELLET SEAL
				0				
54						SM	silty SAND (SM), gray mottling, moist, moderate est K	FILTER PACK, #2/16 SAND
				0		SP	SAND (SP), very dark gray (5Y 3/2), loose to medium dense, trace fines, medium sand, trace oyster shell fragments	
56						SM	silty SAND (SM), light olive brown (2.5Y 5/4), medium dense, wet, 15% fines, fine to medium sand, angular to subrounded, moderate to high est K	2-inch ID, 0.010 inch SLOTTED, SCH 40 PVC CASING
58		GEO-TECH	4 12 15 13 2 3	0 0			silty SAND (SM), light olive brown (2.5Y 5/4), orange mottling and gray mottling, medium dense, wet, medium sand, moderate to high est K	

LOG OF SOIL BORINGM-027B (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-0278 CLIENT PRC/US NAVY
DATE STARTED 4/29/91 COMPLETED 5/03/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 7.58 SURFACE ELEVATION GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
	X		4 6			SM	silty SAND (SM), light olive brown (2.5Y 5/4), orange and gray mottling, medium dense, wet, medium sand, moderate to high est K, silt increases toward base of split spoon from 60 to 61 feet	FILTER PACK #2/16 SAND
62						SP	SAND (SP), very dark gray (5Y 3/2), loose, wet, 10% fines, fine to medium sand, high est K	
	X		0 7 7	0				2-inch ID, 0.010 inch SLOTTED, SCH 40 PVC CASING
64			20 0 4				from 65 to 72 feet-same as above, heaving sands	
66			6 51					END CAP
68								BENTONITE PELLET SEAL
70								
72							TOTAL DEPTH 72 feet	BOTTOM OF BORING 72.0 feet
74								
76								
78								

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

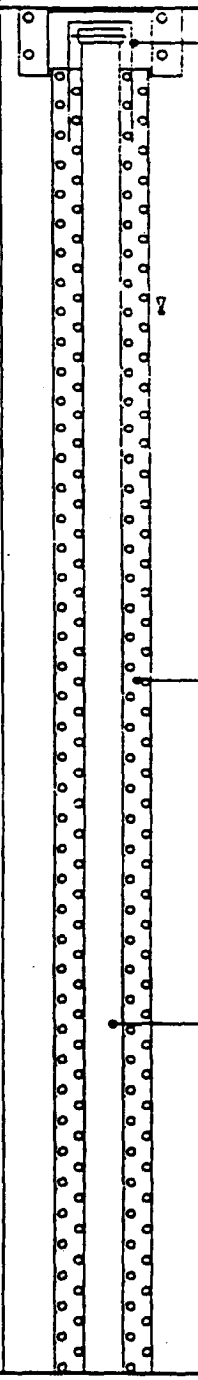
LOG OF SOIL BORINGM-0278 (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027C
CLIENT PRC/US NAVY
DATE STARTED 5/6/91 COMPLETED 5/7/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION -7.17 SURFACE ELEVATION
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 5'				No recovery to 5 feet
2							
4							
	X		11	0		SP	SAND (SP), dark yellowish brown (10YR 3/6), loose, slightly moist, grades to gray (2.5Y N5/), loose, moist, less than 10% fines, high est K
6			18				
			5				
			2	0			
	X		9			SW	SAND (SW), very dark gray (5Y 3/1), loose to medium dense, wet, 10 to 15% fines, fine to medium sand, moderate to high est K
			9				
			13				
10							
	X		5	0			
12			8	0			
			10	0			
			18	0			
14							SAND (SW), very dark gray (5Y 3/1), loose to medium dense, wet, grades downward to very fine sand, piece of glass in sample, one large bolt, fill
16							
						CL	CLAY (CL), very dark gray (5Y 3/1), soft, wet, homogenous-no bedding, low est K
18	X		6	55			
			7	12.5			
			10	0		SP	SAND (SP), loose, wet, medium grains, fines downward to fine sand, high est K
			13	0			

COMMENTS



DRILLING METHOD/RIG TYPE SS-15-II/ARCH
DRILLING CONTRACTOR/DRILLER WATER DEV./K. CHIVRELLE
HOLE DIAMETER 7.25 INCHES
BIT TYPE 7" TRICONE AIR ROTARY CASING HAMMER
TOTAL DEPTH OF BORING 94 FEET
WELL COMPLETION DEPTH 90.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027C
DATE STARTED 5/6/91 COMPLETED 5/7/91
REF. ELEVATION 7.17 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			4	0		SP	SAND (SP), light olive brown (2.5Y 5/4), loose, wet, medium grains, trace fines, high est K	
			13					
			5					
			6					
22			1	0				
Fill			3	0		SM	silty SAND (SM), very dark gray (5Y 3/1), medium stiff, wet, trace fines, very fine to fine sand, low est K, shell fragments	
BS			2	0		SC		
			4			SM	@ 23 feet-approximately 1 inch clayey SAND (SC), very dark gray (5Y 3/1)	
24			3			ML		
			6				clayey SILT (ML), very dark gray (5Y 3/1), soft, trace shell fragments, low est K	GROUT
			10					
			2				@ 25 to 26.5 feet-same as above, 20 to 30% medium to coarse shell layer, low to moderate estimated K	
26			2					
			2					
			3				clayey SILT (ML), dark olive gray, very soft, moist, trace very fine to fine sand, trace shell fragments	
			50					
28			2					
			2					
			2					
			3				@ 29 to 30 feet-same as above, clayey silt with shell hash	
30			2					
			2				@ 30 to 30.5 feet-same as above, clayey silt with shell hash layer, medium to coarse shell fragments, 5 to 10% fine sand with shell layers	
			3					
32			3					
			2					
			2					
			3					
			4					
34			DRILL to 60'			CL	silty CLAY (CL), very dark gray to black (2.5Y 3/ to 2/), stiff, wet, 10% fine sand	2-inch ID, SCH 40 PVC CASING
36						ML	clayey SILT (ML), very dark gray (2.5Y 3/), soft, wet, 15% very fine to fine sand, 20% oyster shells	
						CL	silty CLAY (CL), very dark gray to black (2.5Y 3/ to 2/), soft, wet, trace fine sand, trace oyster shells	
38							silty CLAY (CL), very dark gray to black (2.5Y 3/ to 2/), medium stiff, approximately 20% silt, low est K, very soft from rig behavior	

LOG OF SOIL BORINGM-027C (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027C
CLIENT PRC/US NAVY
DATE STARTED 5/6/91 COMPLETED 5/7/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 7.17 SURFACE ELEVATION
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			DRILL to 60'			CL	silty CLAY (CL), iterbedded oyster hash layers several inches thick and sand lenses approximately 1 inch or less, soft to very soft, wet, increase to 15% fine sand at base to medium sand at 41.5 to 42 feet	
42						SP	SAND (SP), (5Y 3/1), loose, wet, medium sand, trace fines, some shell fragments, high est K	
44							SAND (SP), medium dense, wet, trace fines, medium sand, subangular to subrounded/rounded	GROUT
						CL	CLAY (CL), very soft, clay layer approximately 3 to 4 inches containing oyster shell fragments	
46						SP	SAND (SP), dark olive gray (5Y 3/2), medium dense, wet, trace fines, high est K	
48								
50								
52							SAND (SP), light olive brown (2.5Y 5/4), loose to medium dense, wet, medium sand, high est K	
54						SM	silty SAND (SM), gray mottling, moist, moderate est K	
						SP	SAND (SP), very dark gray (5Y 3/2), loose to medium dense, trace fines, medium sand, trace oyster shell fragments	2-inch ID, SCH 40 PVC CASING
56						SM	silty SAND (SM), light olive brown (2.5Y 5/4), medium dense, wet, 15% fines, fine to medium sand, angular to subrounded, moderate to high est K	
58							silty SAND (SM), light olive brown (2.5Y 5/4), orange mottling and gray mottling, medium dense, wet, medium sand, moderate to high est K	

LOG OF SOIL BORINGM-027C (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027C
DATE STARTED 5/6/91 COMPLETED 5/7/91
REF. ELEVATION 7 17 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			6	32.9		SM/SP	SAND (SP), olive gray (5Y 3/2), medium dense, wet, 10 to 15% fines, very fine to fine sand, high est K, silt increases slightly from 61 to 62 feet (25% fines)	
			50					
			21	18.6				
			50					
62			11	15.3		SM	silty SAND (SM), olive (5Y 5/4), medium dense, wet, fine to medium sand, high est K	
			50					
			7	12.2				GROUT
			39					
64			3			SP	SAND (SP), dark olive gray (5Y 3/2), medium dense, wet, 5 to 10% fines, fine to medium sand, high est K, flowing sands	
			13	0				
			DRILL to 87'					
66								
68								2-inch ID, SCH 40 PVC CASING
							@ 69 feet-same as above (cuttings)	
70								
72								
74							SAND (SP), olive gray (5Y 3/2), wet	BENTONITE PELLET SEAL
76								
								FILTER PACK, #2/16 SAND
78								

LOG OF SOIL BORINGM-027C (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027C
DATE STARTED 5/6/91 COMPLETED 5/7/91
REF. ELEVATION 7.17 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST DAN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
						SP	SAND (SP), dark olive gray (5Y 3/2), medium dense, wet, 5 to 10% fines, fine to medium sand, high est K, flowing sands	
82								
84								2-inch ID, 0.010 inch SLOTTED, SCH 40 PVC CASING
						CL SP	@ 85 to 87 feet-CLAY (CL) and SAND (SP), in cuttings	
86								
			3			SP	SAND (SP), dark olive gray (5Y 3/2), medium dense, wet, 15 to 20% fines, very fine to fine sand, moderate to high est K	FILTER PACK #2/16 SAND
3			2					
			2					
			22					
			8					
			6					
90			5			CL	CLAY (CL), dark grey (5Y 4/1), very stiff to hard, moist, clay, silt, trace organic material	END CAP
		CHEM	7	0				
			11					
92			5				@ 92 feet-same as above, organic material increases from 92 to 94 feet	
			5					
			5					
			6					
94							TOTAL DEPTH 94 feet	BOTTOM OF BORING 94 feet
96								
98								
							Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.	

LOG OF SOIL BORINGM-027C (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-027E
DATE STARTED 5/10/91 COMPLETED 5/13/91
REF. ELEVATION 7.44 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
			6 8 20	0		SW	gravelly SAND (SW), dark red brown (5YR 3/2), dry medium sand, 15-20% gravel, trace fines, trace glass, moderate est K	CHRISTY BOX, PROTECTIVE STEEL CASING, LOCKING CAP
2							VOID, concrete and steel pier, fill	GROUT
4								
6			1 1 9			SP	SAND (SP), very dark gray (5YR 3/1), loose, wet, fine to medium sand, high est K @ 6 feet-same as above, dark gray (2.5Y N4/0)	WATER LEVEL @ 5.46 feet on 5/16/91 WATER LEVEL @ 5.5 feet on 5/10/91
8			7 7 7 14	0			SAND (SP), dark gray (2.5Y N4/0), loose, wet, fine to medium sand, trace shell fragments, high est K	BENTONITE PELLET SEAL
10			7 11 11	0				
			3 5					2-inch ID, SCH 40 PVC CASING
12		CHEM	6 3 6				@ 11.5 feet-same as above	
14			8 5 6				@ 14 feet-same as above	FILTER PACK #2-16 SAND
16			1 1 1 1					
		CHEM	3 5 4	4.7			SAND (SP), dark gray (2.5Y N4/0), loose, wet, fine to medium sand, trace oyster shell fragments, high est K	
18			3 5 8					2-inch ID, 0.010 inch SLOTTED, SCH 40 PVC CASING

DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 29.5 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 22.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA 94598 / (415) 975-3400

BORING/WELL NUMBER M-027E
DATE STARTED 5/10/91 COMPLETED 5/13/91
REF. ELEVATION 7.44 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		GEO-TECH	8			SP	SAND (SP), dark gray (2.5Y N4/0), loose, wet, fine to medium sand, trace oyster shell fragments, high est K	2-inch ID, 0.010 inch SLOTTED, SCH 40 PVC CASING; END CAP; FILTER PACK #2/16 SAND
			10					
			12					
22			8					
			7					
			6					
			2			ML	clayey SILT (ML), dark gray (2.5Y N4/0), soft, moist, low est K	
			2					
24			2					
			1					
			1					
26			1					SLOUGH
			PUSH to 29.5'					
3								
							TOTAL DEPTH 29.5 feet	BOTTOM OF BORING 29.5 feet
30								
32								
34								
36								
38								

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

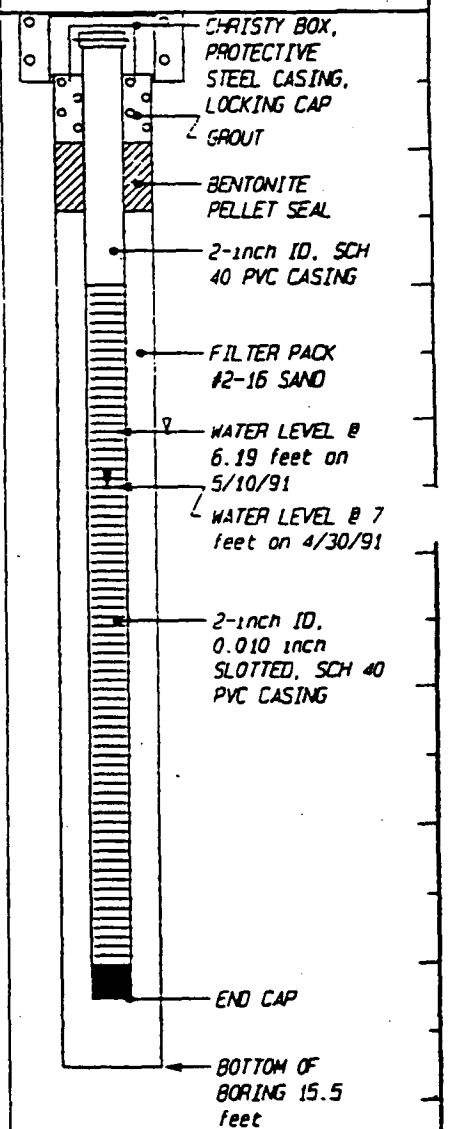
LOG OF SOIL BORINGM-027E (continued)

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-028A
DATE STARTED 4/30/91 COMPLETED 4/30/91
REF. ELEVATION 3.55 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 2.5'			SP	SAND (SP), olive (5Y 5/3), loose to medium dense, fine to medium sand, 20% gravel up to 1.5" in diameter, high est K, rootlets
2							
			7 8 9				@ 3 feet-same as above, very dark brown (10YR 2/2), white and blue precipitate, iron staining, rootlets
4			7 6 8				
6			9 5 2			GW	3" clayey sand lens, stiff, rootlets
			1 1 2				sandy GRAVEL (GW), dark gray brown (2.5Y 4/2), loose to dense, wet, fine gravel to 1/2 inch, high est K, assorted metal and concrete fragments, fill
8			1 2 22			SW	gravelly SAND (SW), black (2.5Y N2/0), loose, wet, 70% fine to medium sand, 25% fine to coarse gravel, assorted wood and metal pieces, fill
10		GEO-TECH	24 28 22			SP	SAND (SP), black (2.5Y N2/), medium dense, wet, medium sand, high est K
12			10 18 16	28			@ 13 feet-same as above, very dark gray (2.5Y N3/0), shell fragments, 2 inch olive gray clay layer at 13.25 feet
14			9 10 8	10			@ 15 feet-same as above
							TOTAL DEPTH 15.5 feet
16							
18							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.



DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 15.5 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 14.5

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING MQ28C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION (FILL)
			NA	35			SW	Gravelly sand (SW), brown (7.5Y5/2), fine sand, loose, dry, trace glass fragments
				45			SP	Sand (SP), dark brown, (7.5Y 3/2), dense, dry, trace cobbles
				26				Same as above
5				10				Same as above, but brown (7.5Y 5/2), trace charred wood pieces
				5				Same as above, but moist at 7 Feet bgs
				22			SW	Gravelly sand (SW), brown (7.5Y5/2), medium sand, medium dense, moist, black gravel at 8.5 Feet bgs
10				67				Sampler broke
15				5			SP	Sand (SP), dark gray (10Y 4/1), fine sand, loose, moist
20								

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY JEV/MM
DATE DRILLED 10-13-94 to 10-28-94
DRILLER Tonto Drilling Services, Inc.
DRILL METHOD Hollow-stem Auger

SAMPLING METHOD Split spoon
GROUND ELEVATION 12.21 Feet
TOC ELEVATION 12.27 Feet
BORING DIAMETER 12.0 inches
TOTAL DEPTH OF HOLE 92.5 Feet bgs
WATER LEVEL Not Available
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING MØ28-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	BAY SEDIMENTS MATERIALS DESCRIPTION
				9			SP	Same as above with trace clay
							CL	Clay (CL), dark gray (10Y 4/1), firm, moist
				6				Same as above
				5				Same as above
25 ~~8~~				4				Same as above
30 ~~10~~				5			CL	Silty clay (CL), green gray (5Y 3/1), soft, wet, 10% shells
35 ~~15~~				5			ML	Clayey silt (ML), green gray (5Y 3/2), soft, wet, trace shells
40 ~~20~~				3			CL	Silty clay (CL), dark greenish gray (5GY 4/1), soft, wet, 15% shells

Water Level

Split Spoon

Sample Collected

PROJECT		SAMPLING METHOD	
LOCATION		GROUND ELEVATION	
JOB NUMBER	044-	TOC ELEVATION	
LOGGED BY	.	BORING DIAMETER	
DATE DRILLED		TOTAL DEPTH OF HOLE	
DRILLER		WATER LEVEL	
DRILL METHOD		WELL INSTALLED? (Y/N)	

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M028-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							CL	
45 / 5				64			SP	Sand (SP), dark greenish gray (5GY 4/1), medium dense, damp, trace shells
50 / 10				47/6 58/6				Same as above, but fine sand, very dense, wet
								MERRITT SAND
55 / 15				42/6 50/4				Sand (SP), yellowish brown (10YR 5/4), very fine to fine sand, very dense, wet, trace silt
60 / 20				58/6 55/6				Same as above, but light yellowish brown (2.5Y 6/3), very moist to wet, 5% clay, trace to 5% silt

Water Level

Split Spoon

Sample Collected

PROJECT

LOCATION

JOB NUMBER 044-

LOGGED BY

DATE DRILLED

DRILLER

DRILL METHOD

SAMPLING METHOD

GROUND ELEVATION

TOC ELEVATION

BORING DIAMETER

TOTAL DEPTH OF HOLE

WATER LEVEL

WELL INSTALLED? (Y/N)

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M028-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							SP	
65 ~~5~~				26/6 65/4				Same as above, but yellowish brown (10YR5/8), moist
70 ~~10~~				91				Same as above, but dark yellowish brown (10Y 4/4), trace silt, trace clay
								SAN ANTONIO INTERBEDDED SAND & CLAY
75 ~~15~~				67				Sand (SP), greenish gray (5GY5/1), very dense, wet, traces of red sand
80 ~~20~~				67				Same as above, but dark blue gray (5B 4/1), medium dense

Water Level

Split Spoon

Sample Collected

PROJECT	SAMPLING METHOD
LOCATION	GROUND ELEVATION
JOB NUMBER 044-	TOC ELEVATION
LOGGED BY	BORING DIAMETER
DATE DRILLED	TOTAL DEPTH OF HOLE
DRILLER	WATER LEVEL
DRILL METHOD	WELL INSTALLED? (Y/N)

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-028-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							SP	
				58				Same as above, but greenish gray (5GY 5/1), trace silt.
85 / 5				53/6 50/5				Same as above, but dark greenish gray (5GY 4/1), fine to medium sand, damp
90 / 10				54			SC	Clayey sand (SC), dark greenish gray (5GY 4/1), wet, trace fine sand
							CL	Silty clay (CL), dark greenish gray (5GY 4/1), damp, 10% root fragments
								T.D = 92.5 Feet bgs
								YERBA BUENA MUD
95 / 15								
100 / 20								

Water Level

Split Spoon

Sample Collected

PROJECT

LOCATION

JOB NUMBER 044-

LOGGED BY

DATE DRILLED

DRILLER

DRILL METHOD

SAMPLING METHOD

GROUND ELEVATION

TOC ELEVATION

BORING DIAMETER

TOTAL DEPTH OF HOLE

WATER LEVEL

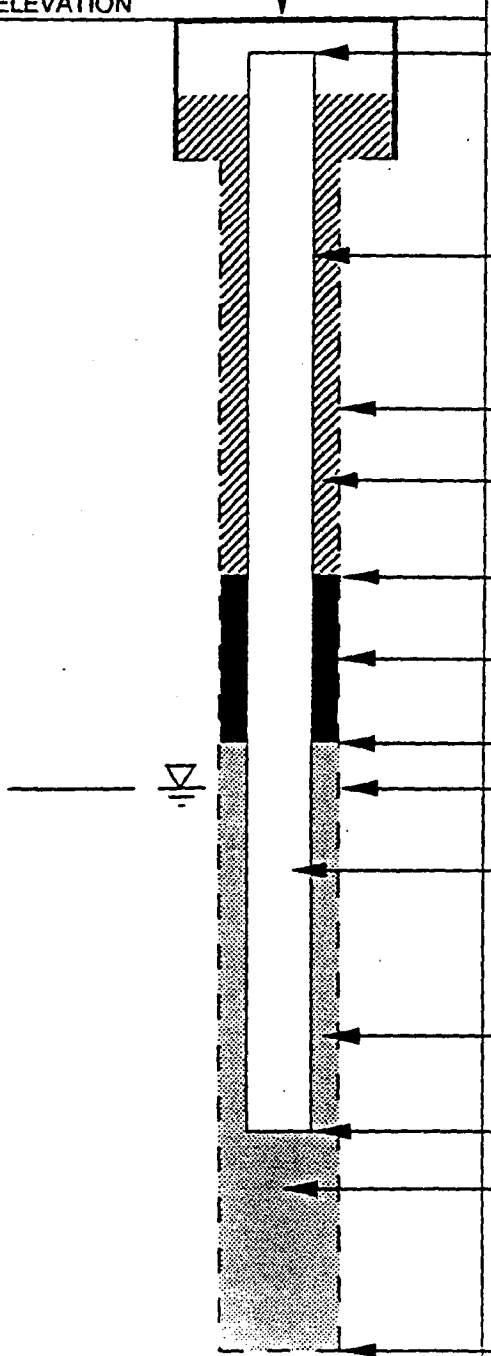
WELL INSTALLED? (Y/N)

WELL ~~BORING~~ NO. MØ28-C

MONITORING WELL SHEET

PROJECT NAS Alameda RI
LOCATION Alameda, California
PROJECT NO. Ø44 Ø28Ø
BORING MØ28-C
SITE ~~ELEVATION~~ 1
DATE ?
FIELD GEOLOGIST MM

DRILLER Tonto Drilling Services, Inc
DRILLING METHOD Mud Rotary
DEVELOPMENT METHOD Surge/Bail/Pump



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.21

ELEVATION OF TOP OF WELL CASING: 12.27

RISER PIPE I.D.: 3 inches

TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 12 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL (feet bgs) 72.0

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK (feet bgs) 75.0

DEPTH TOP OF SCREEN 80.0

TYPE OF SCREEN: Schedule 4Ø PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 3 inches

TYPE OF SAND PACK: #2/12 Monterey Sand

DEPTH BOTTOM OF SCREEN (feet bgs) 90.0

DEPTH BOTTOM OF SAND PACK 90.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: Native Material

DEPTH OF HOLE (feet bgs) 92.5

MF

ok

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M028-E

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
					NA		SM	FILL Disturbed surface soils - silty sand with gravels up to 1/4 inch diameter.
					NA		SP	Sand (SP), grayish brown (10YR 5/2), fine grain sand, moist, trace silt, clay, rootlets, shells, concrete, trace black with orange mottling.
5			NA	22			SP/SM	Sand (SP) and silty sand (SM), yellowish brown (10YR 5/6) and very dark grayish brown (10YR 3/2), mottled, fine grain sand, medium dense, very moist to wet, trace gravels up to 2-inch diameter, trace precipitates. ▼ Concrete rubble encountered at 7.5 to 8 feet bgs.
10			NA	25			SP	Sand (SP), dark gray (7.5YR N4), fine to medium sand, medium dense, wet, trace clay and silt, shells common, trace light brownish gray (2.5Y 6/2) mottling
15			NA	18				Same as above but, reddish brown (5YR 5/3) and gray (5YR 5/1) mottled, 90 to 95% fine sand, 5-10% medium sand, trace concrete, no clay
20			NA	20				BAY SEDIMENTS Same as above, but gray (5YR 5/1), fine to medium sand, saturated, trace shells, up to 25% shells

▼ Water Level

⊠ Split Spoon

■ Sample Collected

PROJECT NAS Alameda
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY WPW
DATE DRILLED 11-23-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

SAMPLING METHOD Split Spoon
GROUND ELEVATION 12.18 Feet
TOC ELEVATION 11.95 Feet
BORING DIAMETER 8.0 inches
TOTAL DEPTH OF HOLE 21 Feet bgs
WATER LEVEL 5.8 Feet bgs
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M028-E

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							SP	
								TD= 21.0 Feet bgs
5								
10								
15								
20								

Water Level

Split Spoon

Sample Collected

PROJECT _____

LOCATION

JOB NUMBER 044-

LOGGED BY .

DATE DRILLED _____

DRILLER

DRILL METHOD _____

SAMPLING METHOD

GROUND ELEVATION _____

TOC ELEVATION _____

BORING DIAMETER

TOTAL DEPTH OF HOLE _____

WATER LEVEL

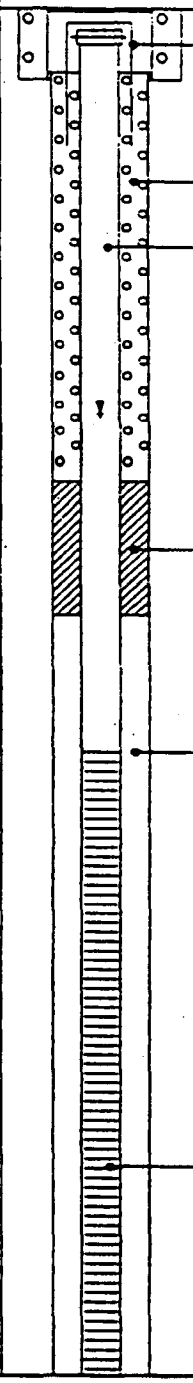
WELL INSTALLED? (Y/N) _____

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-028E
CLIENT PRC/US NAVY
DATE STARTED 5/1/91 COMPLETED 5/1/91
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
REF. ELEVATION 8.23 SURFACE ELEVATION
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 3'			SP	SAND (SP), light olive brown (2.5Y 5/3), loose, moist, medium sand, 20% gravel, rootlets, moderate to high est K
2				0		CL	sandy CLAY (CL) lens, light gray (2.5Y 7/1), stiff, moist, iron mottling
		CHEM	10	0		SP	SAND (SP), red brown and black (2.5YR 4/4 and 2.5/1), moist, 20% gravel, rootlets, 4-inch layer blue/white precipitate beginning @ 3.0'
4			10				
			16				
			10				
			12				
6			8				@ 5.5 feet-same as above, assorted refuse, including film negatives, metal chunks (up to 3" long), yellow precipitate, fill
			5				
			8				
			10				
8			20	1.3		GW	sandy GRAVEL (GW), black (5Y, 2.5/1), wet, 40% coarse sand, assorted refuse including, cooper wire, metal pieces, film negatives, noticeable oily sheen, moderate est K
			22				
			19				
			12	12.8			
10			27				
			45				
			12	1.3		SP	SAND (SP), dark gray (2.5Y N3.5/0) with a green/olive tinge, loose to medium dense, wet, medium sand, shell fragments, high est K
			14				
12			14				
			10				
			12				
			18				
			7	0.2			
14			6				@ 14 feet-same as above, flowing sands
			7				
			6				
16		GEO-TECH	8				
			10				
							@ 16 feet-same as above, color grading to gray (5Y 5/1), 20% shell fragments
18			7	0			
			9				
			10				
							@ 19 feet-same as above, shell fragments increasing in diameter up to 2 cm

COMMENTS



DRILLING METHOD/RIG TYPE AUGER/CME 750
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
HOLE DIAMETER 8.0 INCHES
BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 29.5 FEET
WELL COMPLETION DEPTH 21.5

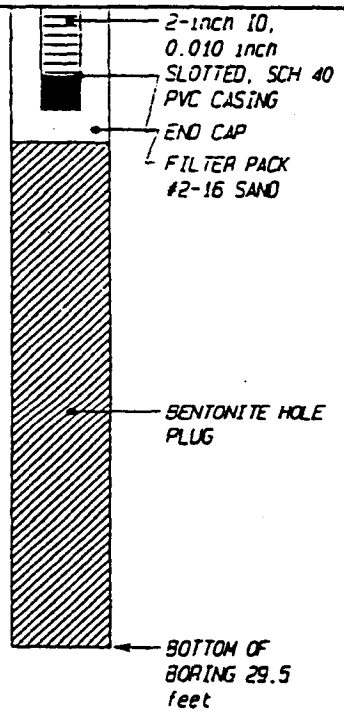
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-028E
DATE STARTED 5/1/91 COMPLETED 5/1/91
REF. ELEVATION 8.23 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			2			SP	SAND (SP), gray (5Y 5/1), with a green tinge, loose, wet, medium sand, 15 to 20% medium size shell fragments, high est K
			5				
			3				
22			2				0.5 foot clayey SAND interbed, gray (5Y 5/1), loose, wet, fine to medium sand, fine clay lamentations, shell fragments
			1				
			2				
			1			CL	CLAY (CL), dark gray (7.5YR 4/0), soft, moist, 15% silt/fine sand, trace shell fragments, fine laminations, low est K
24			1				
			2				
			PUSH to 29.5'				
26							
							@ 27 feet-same as above
28							
							CLAY (CL), 6-inch layer of clay with approximately 50% shell fragments
30							TOTAL DEPTH 29.5 feet
32							
34							
36							
38							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS

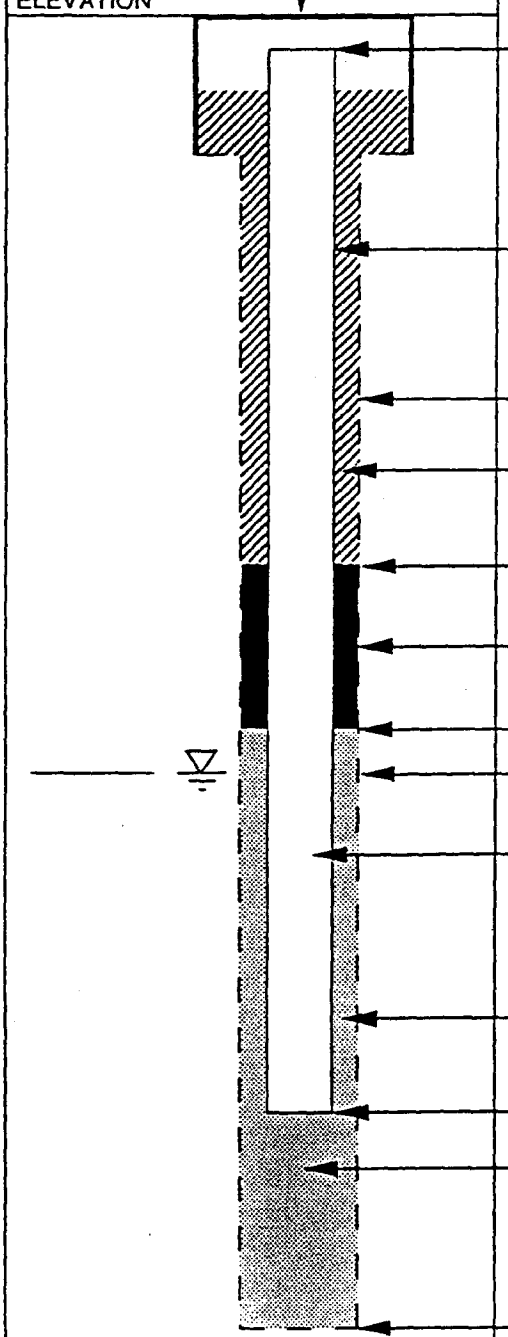


LOG OF SOIL BORINGM-028E (continued)

WELL
~~BORING~~ NO. MØ28-E2

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Woodward Drilling Co.
PROJECT NO. ØØ44Ø28Ø	BORING MØ28-E2	DRILLING METHOD Hollow Stem Auger
SITE 1	DATE 11-23-94	DEVELOPMENT METHOD Surge/Bail/Pump
~~ELEVATION~~		
FIELD GEOLOGIST WPW		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.18

ELEVATION OF TOP OF WELL CASING: ?

RISER PIPE I.D.: 2 inches

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 8 inches

TYPE OF BACKFILL: Neat Cement Grout

(feet bgs)

DEPTH OF SEAL: 7.0

TYPE OF SEAL: Bentonite

(feet bgs)

DEPTH TOP OF SAND PACK: 9.0

DEPTH TOP OF SCREEN: 11.0

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/12 Monterey Sand

(feet bgs)

DEPTH BOTTOM OF SCREEN: 21.0

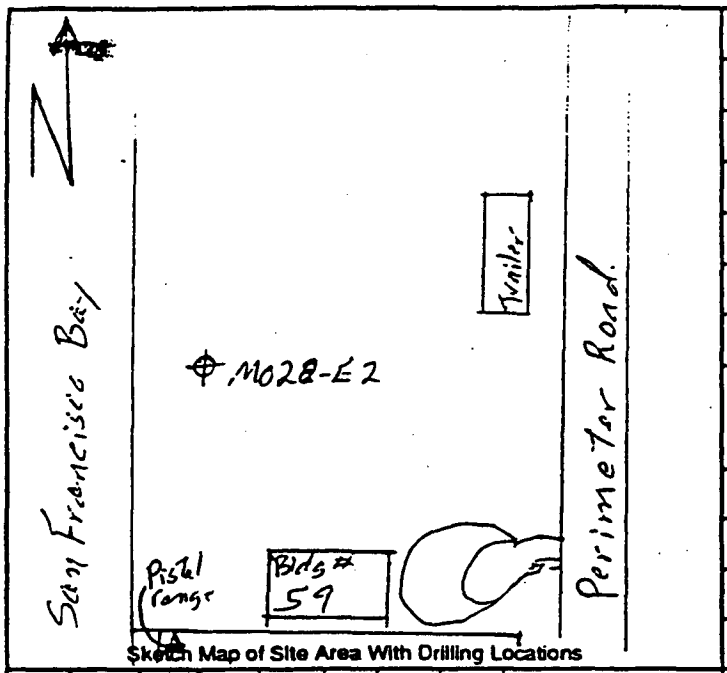
DEPTH BOTTOM OF SAND PACK: 21.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

(feet bgs)

DEPTH OF HOLE: 21.0

MF



Sketch Map of Site Area With Drilling Locations

Boring #	MW# MO28-E2 Sheet 1 of 2
Project:	NAS Alameda CTO-0290
Job #	2738.1405 Site: 1
Logged By:	WPW Proj. Eng: SMH Edited By:
Drilling Contractor:	Woodward Drilling
Drill Rig Type/Method:	Mobile B53 HSA
Drillers Name:	Erick Forsstrom
Borehole Diam./Drill Bit Type	8" Total Depth 21
	Ref. Elev.
Hammer Wt:	140 Lb Drop: 30"
Start Time:	1650 Date: 11-23-94
Completion Time:	1730 Date: 11-23-94
Backfille Time:	1820 Date: 11-23-94

	1st Water			
Boring Depth (ft.)				
Casing Depth (ft.)				
Water Depth (ft.)				
Time				
Date				

PID/OVA	Sampler Type & Depth	Blow Counts / 6 in.	Advance	Recovered (in.)		Casing Type & Size	Annulus Filler	Sample Recovery	Feet	Graphics	
									1		Disturbed surface soils - Silty Sand with gravels to 1½"Ø.
									2	SP	
									3		Fine grained Sand (SP) moist, grayish brown 10YR (5/2) Traces of Silt, Clay, rootlets, shells and concrete. Trace black with orange mottling.
									4		
		10				PVC casing	Neat Cement		5	SP, SM	fine grained Sand (SP) and Silty Sand (SM) ~~yello~~ Very moist to Saturated, med. dense, yellowish brown 10YR (5/6) and very dark grayish brown 10YR (3/2) mottled, Trace gravels to 2"Ø. Trace precipitate
		12									
		10							6		
									7		
						Solid 4"	bentonite		8		Concrete rubble encountered.
									9		
						2" Sch 40			10		
									11	SP	fine to med. grained Sand (SP) Saturated, med. dense, dark gray 7.5YR ~~4/1~~ (N4/) Trace clay
		12									
		9							12		

Boring # MW#MC28-E2 Sheet 2 of 2

Project: NAS Alameda CTO-0280

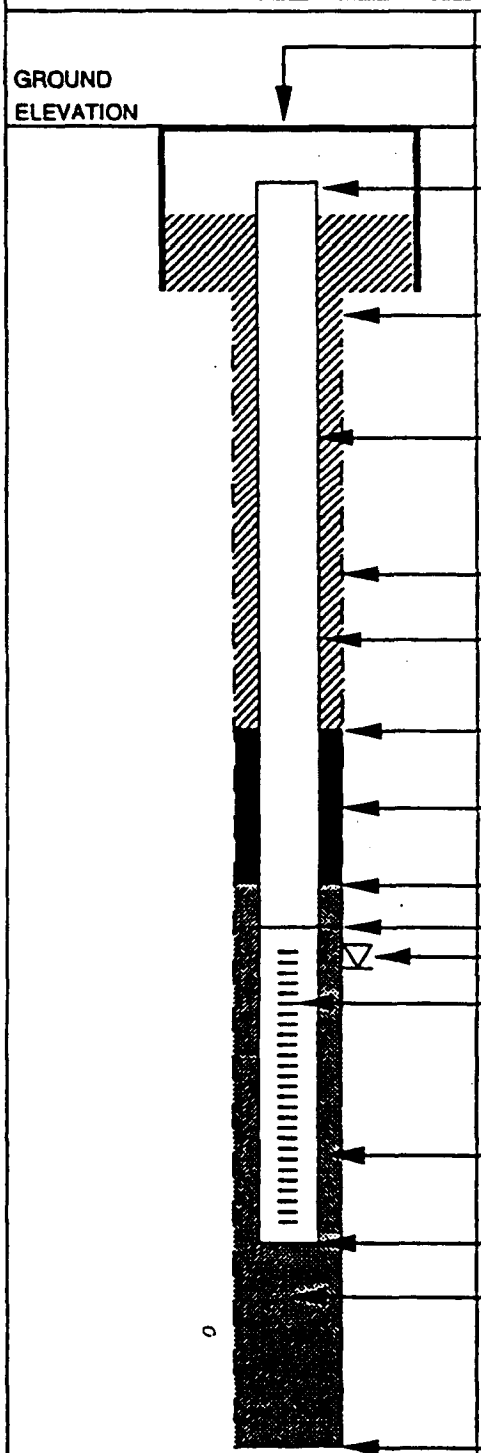
Job # 2738.1405 Site: ~~A~~ 1

PID/OVA	Sampler Type	Blow Counts	Advance	Rcvd (in.)		Casing	Annulus	Sample Rec	Feet	Graph	
		16	↓	6		2" Sch 40 PVC 4" Cl. 01 factory slot.	#2/12 Monterey Sand		12		Trace silt, sea shells common. Traces of light brownish gray 2.5Y (6/2) mottling.
									13		
									14		
									15		Fine grained sand, Saturated med. dense, Reddish brown 5YR 5/3 and gray 5YR (5/1) mottled, Trace silt, sea shells common, 5-10% med. sand. Trace concrete.
		6 8 10	↓	↓					16		
									17	SP	
									18		
									19		Fine to med. grained Sand (SP) Saturated, med. dense, gray 5YR (5/1), Trace silt, sea shells common up to 25%.
		6 8 12	↓	↓					20		
									21		
									22		TD = 21'
									23		
									24		
									25		
									26		
									27		
									28		
									29		
									30		
									1		
									2		

BORING NO. M028-E2

MONITORING WELL SHEET

PROJECT Alameda-CTC-0280	LOCATION Site 1	DRILLER Woodward	
PROJECT NO. 2738.1405	BORING M028-E2	DRILLING METHOD HSA	
ELEVATION	DATE 11-23-94	DEVELOPMENT METHOD Surge bail Pump	
FIELD GEOLOGIST WPW Weld Weston			



ELEVATION OF GROUND SURFACE: _____

ELEVATION OF TOP OF WELL CASING: _____

I.D. OF SURFACE CASING: N/A

TYPE OF SURFACE CASING: _____

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: SCH 40 PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: Neat Cement

ELEVATION / DEPTH OF SEAL: 7'

TYPE OF SEAL: bentonite

DEPTH TOP OF SAND PACK: 9'

ELEVATION / DEPTH TOP OF SCREEN: 11'

FIRST ENCOUNTERED SATURATED ZONE 6'

TYPE OF SCREEN: SCH 40 PVC

SLOT SIZE x LENGTH 0.01 Factory Slot

I.D. OF SCREEN 2"

TYPE OF SAND PACK: 2/12 Monterey Sand

ELEVATION / DEPTH BOTTOM OF SCREEN: 21'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 21'

TYPE OF BACKFILL BELOW OBSERVATION WELL: N/A

ELEVATION / DEPTH OF HOLE: 21'

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

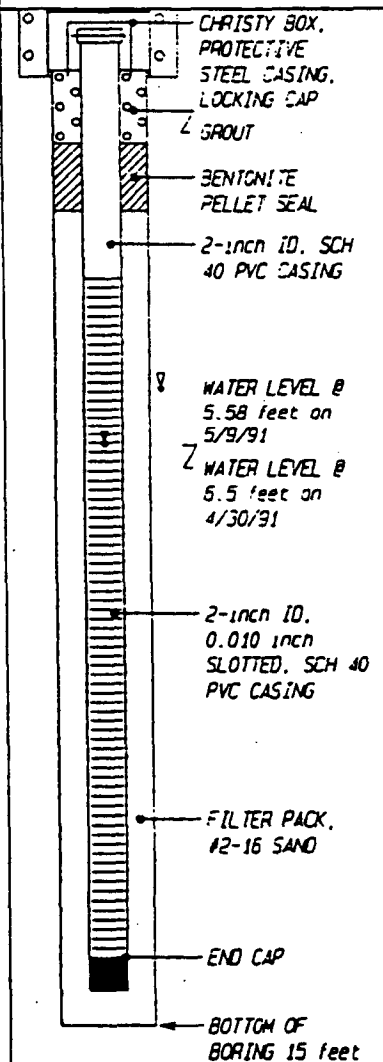
BORING/WELL NUMBER M-029A
DATE STARTED 4/29/91 COMPLETED 4/29/91
REF. ELEVATION 7.59 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 2.5'			SW	
						GW	gravelly SAND (SW), brown (10YR 5/3), very loose to loose, medium sand, high est K
2				0			sandy GRAVEL (GW), very dark gray (10YR 3/1), very loose to loose, high est K
			18				
			14				@ 3 feet-same as above, assorted refuse including glass, metal, asphalt, concrete, fill
			14				
4		CHEM	24				
			18				
			50				
			12				
6			10				
			5				
			14	22			sandy GRAVEL (GW), black (5Y 2.5/2), wet, medium sand, metal pieces, wire, wood, high est K, strong petroleum odor, black oil drops, fill
			36				
8			38	1			
			22				
			5				
			7				
10		GEO-TECH	5				@ 10 feet-same as above
			5				
			18				
			9			SP	SAND (SP), very dark gray (2.5Y 3/0), loose, wet, medium sand, subrounded, metal pieces up to 0.75" long, copper wire, high est K, fill
12			12				
			14				
			11				
14			14				
			14				
							TOTAL DEPTH 15 feet
16							
18							

Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.

COMMENTS



DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 15 FEET

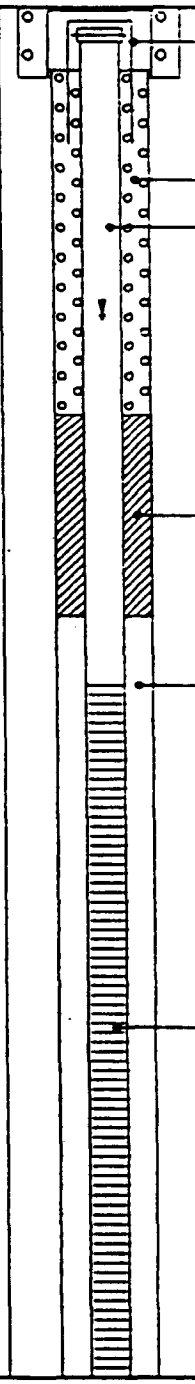
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 14.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-029E
DATE STARTED 4/29/91 COMPLETED 4/30/91
REF. ELEVATION 6.85 SURFACE ELEVATION
CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH, feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			DRILL to 3'			SP	SAND (SP), olive gray (5Y 4/2), loose, damp, medium sand, 15 to 25% gravel
						SW	gravelly SAND (SW), dark olive gray (5Y 3/2), loose; damp, medium sand, 40 to 50% coarse gravel, white precipitate, wood, fill
2			3	0			
			2				
4			15				
			18				@ 4.5 feet-same as above, mottled, 15% assorted refuse including metal pieces, nails, glass, fill
			14				
			14				
6			50			SP	SAND (SP), black (7.5YR 2/0), very loose, wet, 70% medium sand, 20 to 25% gravel, metal pieces, nails, wire cable, fill
8							
			8				
			27				
			16				
10			14				SAND (SP), black (7.5YR 2/0), very loose, wet, medium sand, 10-15% shell fragments, trace metal pieces, glass, high est K, fill
			33				
			42				
12							
			8				
			7				
			10				
14							@ 14 feet-same as above, loose to medium dense, 10-15% silt, 10% shell fragments
			14				
			12				
16			10				
			4				
18			5			SM	silty SAND (SM), dark gray (2.5Y N4/1), loose to medium dense, wet, 20% fines, medium to coarse sand, shell fragments
			6				
			6				
			4				

COMMENTS



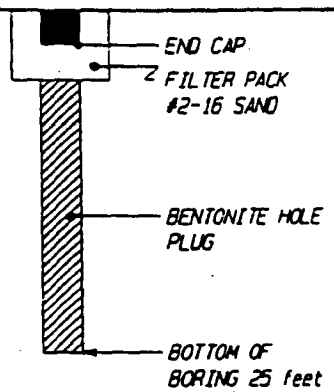
DRILLING METHOD/RIG TYPE AUGER/CME 750
HOLE DIAMETER 8.0 INCHES
TOTAL DEPTH OF BORING 25 FEET
DRILLING CONTRACTOR/DRILLER WATER DEV./M. PETERSON
BIT TYPE HOLLOW STEM AUGER
WELL COMPLETION DEPTH 20.5

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER M-029E
DATE STARTED 4/29/91 COMPLETED 4/30/91
REF. ELEVATION 5.85 SURFACE ELEVATION

CLIENT PRC/US NAVY
PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0213
GEOLOGIST CINDY FONG

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
	☒		2 PUSH to 25'			CL	silty CLAY (CL), dark gray (5Y 4/1), soft to medium stiff, wet, 10% shell fragments	END CAP; FILTER PACK #2-16 SAND
22								
							silty CLAY (CL), dark gray (2.5Y 4/0), very soft, moist to wet, laminated, 30% silt, trace shell fragments	BENTONITE HOLE PLUG
24								
							TOTAL DEPTH 25 feet	BOTTOM OF BORING 25 feet
26								
30								
32								
34								
36								
38								
							Note: All samples were screened with a Geiger-Mueller meter; no radiation was detected.	



LOG OF SOIL BORINGM-029E (continued)

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M030-A

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-042	Ø	32			SM	FILL Silty sand (SM), dark brown, loose, dry, organic
							SP	Sand (SP), tan, medium sand, loose, dry
	CHEMICAL	280-S01-043	Ø.5	20			GP	Sandy gravel (GP), medium sand, angular gravel up to 1/2-inch diameter, dense, dry
							SM	Gravelly silt (SM), dark brown, medium stiff, moist
5	GEOTECH CHEMICAL	280-S01-044	Ø.5	23			SP	sand (SP), tan, fine and medium sand, loose, wet, trace fines
	GEOTECH		NA	13				
10							GP	Gravel, based on drillers comment.
								TD = 12.5 Feet bgs
15								
20								

Water Level

Split Spoon

Sample Collected

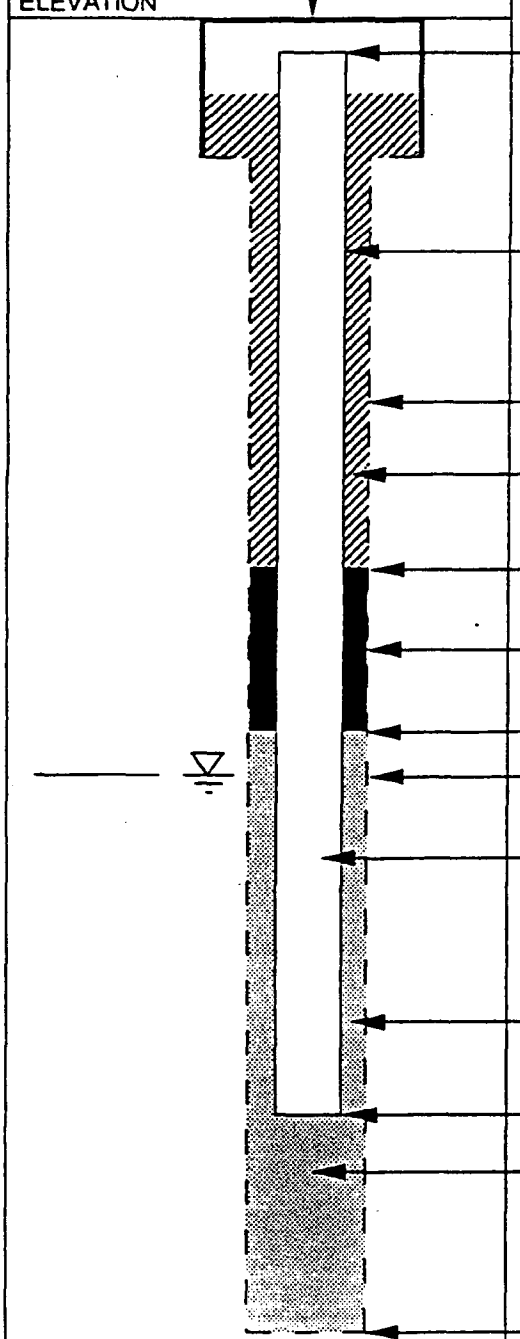
PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-15-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

SAMPLING METHOD Split Spoon
GROUND ELEVATION 12.42 Feet
TOC ELEVATION 11.62 Feet
BORING DIAMETER 8.5 inches
TOTAL DEPTH OF HOLE 12.5 Feet bgs
WATER LEVEL 4.75 Feet bgs
WELL INSTALLED? (Y/N) Y

WELL ~~BORING~~ NO. MØ3Ø-A

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Woodward Drilling Co.
PROJECT NO. Ø44 Ø28Ø	BORING MØ3Ø-A	DRILLING METHOD Hollow Stem Auger
SITE ~~ELEVATION~~	DATE 8-15-94	DEVELOPMENT METHOD Surge/Bail/Pump
FIELD GEOLOGIST DEK/JEV		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.42

ELEVATION OF TOP OF WELL CASING: 11.62

RISER PIPE I.D.: 2 inches

TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 8.5 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL (feet bgs) 1.0

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK (feet bgs) 2.0

DEPTH TOP OF SCREEN 2.5

TYPE OF SCREEN: Schedule 4Ø PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/16 Monterey Sand

DEPTH BOTTOM OF SCREEN (feet bgs) 12.5

DEPTH BOTTOM OF SAND PACK 12.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

DEPTH OF HOLE (feet bgs) 12.5

MF

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M030-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-049	NA	29			ML	FILL Sandy gravelly silt (ML), brown (10Y 5/3), fine silt, dense, dry
				24			SM	silty sand (SM), dark yellowish brown (10Y4/6), fine sand, very dense, dry
	CHEMICAL	280-S01-050		6			SC	clayey silty sand (SC), yellowish brown (10Y5/4), fine sand, dense damp
5	GEOTECH CHEMICAL	280-S01-051		16			SP	Sand (SP), yellowish brown (10Y 5/4), fine sand, dense, damp
				16				Same as above
				14				Same as above
10								
15				34				
				42			GC	Clayey gravel (GC), gray (7.5Y N5), medium to coarse gravel, dense wet
				22				Same as above
				36			CL	clay (CL), very dark gray (7.5YN3), plastic, wet
20							GC	clayey gravel (GC), gray (7.5YN5), medium to coarse gravel, dense, wet

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY JEV
DATE DRILLED 10-19-94 to 10-25-94
DRILLER Tonto Drilling Services, Inc.
DRILL METHOD Hollow-Stem Auger/Mud Rotary

SAMPLING METHOD Split Spoon
GROUND ELEVATION 12.59 Feet
TOC ELEVATION 11.94 Feet
BORING DIAMETER 12.0 inches
TOTAL DEPTH OF HOLE 89.5 Feet bgs
WATER LEVEL Not Available
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M030-C

BAY SEDIMENTS

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							GC	
				5			CL	Clay (CL), very dark gray (7.5 YN3), plastic, soft
				4				Same as above with abundant shells
25 / 5				20				
30 / 10				77				
35 / 15				49			SP	Sand (SP), dark gray (10Y4/1), fine sand, dense, moist, trace shells
40 / 20								

Water Level

Split Spoon

Sample Collected

PROJECT		SAMPLING METHOD	
LOCATION		GROUND ELEVATION	
JOB NUMBER	044-	TOC ELEVATION	
LOGGED BY		BORING DIAMETER	
DATE DRILLED		TOTAL DEPTH OF HOLE	
DRILLER		WATER LEVEL	
DRILL METHOD		WELL INSTALLED? (Y/N)	

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING MP30-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MERRITT SAND MATERIALS DESCRIPTION
				75	☒		SP	Same as above, but dark yellowish brown (10Y 4/6), no shells
45/9				31/6 50/6	☒			Same as above
50/10				50/5	☒			Same as above
55/15				60/6	☒			Same as above
60/20								

▼ Water Level

☒ Split Spoon

■ Sample Collected

PROJECT _____ SAMPLING METHOD _____

LOCATION _____ GROUND ELEVATION _____

JOB NUMBER 0JJ- _____ TOC ELEVATION _____

LOGGED BY . _____ BORING DIAMETER _____

DATE DRILLED _____ TOTAL DEPTH OF HOLE _____

DRILLER _____ WATER LEVEL _____

DRILL METHOD _____ WELL INSTALLED? (Y/N) _____

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M030-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
				55/6 53/6	☒		SM	Silty sand (SM), light yellowish brown (10YR 6/4), fine sand, very dense, moist
65				50/3	☒			SP - Sand (SP), dark yellowish brown (10Y 4/4), fine to medium sand, very dense, moist
70				50/4	☒			Same as above
								SAN ANTONIO INTERBEDDED SAND & CLAY
75				50/5	☒		SM	Silty sand (SM), dark olive gray (5Y 3/2), fine sand, very dense, wet
80								

▼ Water Level

☒ Split Spoon

■ Sample Collected

PROJECT _____

LOCATION

JOB NUMBER 044-

LOGGED BY .

DATE DRILLED _____

DRILLER

DRILL METHOD _____

SAMPLING METHOD

GROUND ELEVATION _____

TOC ELEVATION _____

BORING DIAMETER

TOTAL DEPTH OF HOLE _____

WATER LEVEL

WELL INSTALLED? (Y/N) _____

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M030-C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
				50/3	☒		SM	Same as above
				50/3	▪			Same as above, but very dark gray (2.5YN3), trace of clay
85 / 5				54/6	☒			Same as above with increasing clay
				70/6	☒		SC	Clayey sand (SC), dark gray (5Y4/1), dense, moist
							CL	Silty clay (CL), dark olive gray (5Y 3/2), hard, moist
				73/6	☒			Same as above
				76/6	☒			
90 / 10								TD = 89.5 Feet bgs
								YERBA BUENA MUD
95 / 15								
100 / 20								

▼ Water Level

☒ Split Spoon

▪ Sample Collected

PROJECT _____
LOCATION
JOB NUMBER 044-
LOGGED BY .
DATE DRILLED _____
DRILLER
DRILL METHOD _____

SAMPLING METHOD
GROUND ELEVATION _____
TOC ELEVATION _____
BORING DIAMETER
TOTAL DEPTH OF HOLE _____
WATER LEVEL
WELL INSTALLED? (Y/N) _____

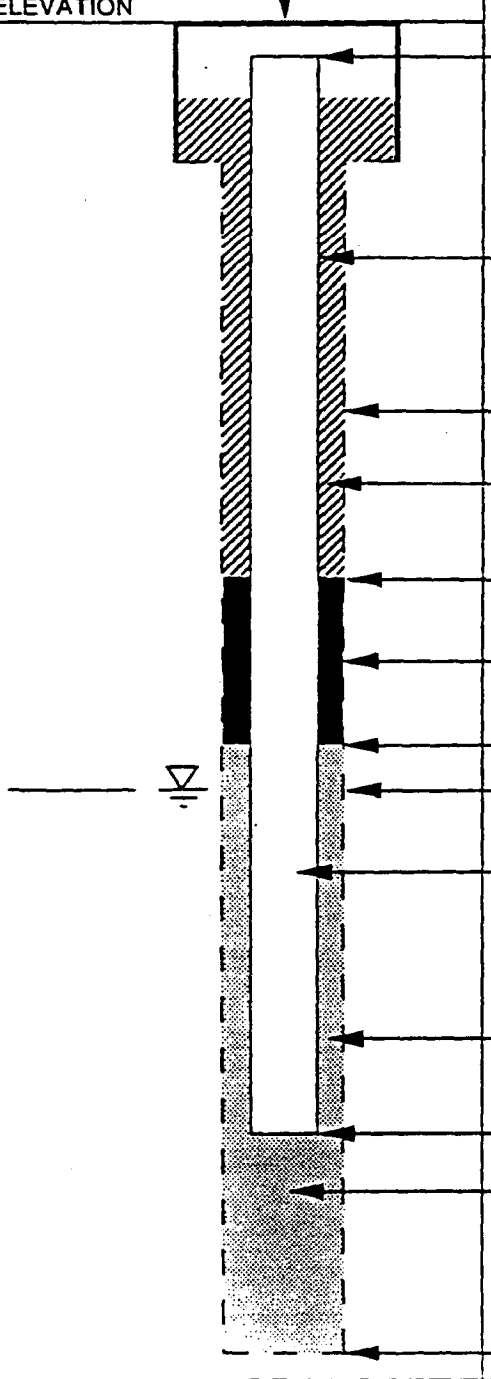
WELL ~~BORING~~ NO. M030-C

MONITORING WELL SHEET

PROJECT NAS Alameda RI
PROJECT NO. 044 0280
SITE ~~ELEVATION~~
FIELD GEOLOGIST

LOCATION Alameda, California
BORING M030-C
DATE

DRILLER Tonto Drilling Services Co.
DRILLING METHOD Hollow Stem Auger/Mud
DEVELOPMENT METHOD Surge/Bail/Pump



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.59

ELEVATION OF TOP OF WELL CASING: 11.94

RISER PIPE I.D.: 3 inches
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 12 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL (feet bgs) 70.5

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK (feet bgs) 73.5
DEPTH TOP OF SCREEN (feet bgs) 76.5

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE ~~x LENGTH~~ 0.01 inch
I.D. OF SCREEN 3 inches

TYPE OF SAND PACK: #2/12 Monterey Sand

DEPTH BOTTOM OF SCREEN (feet bgs) 86.5
DEPTH BOTTOM OF SAND PACK 87.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: #2/12 Monterey Sand

DEPTH OF HOLE (feet bgs) 89.5

MF

02

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M030-E

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-046	0	15			SM	FILL Silty sand (SM), dark brown, fine sand, loose, dry, trace gravel
							SP	Sand (SP), tan, medium sand, loose, dry
				9				Same as above, but moist
	GEOTECH CHEMICAL	280-S01-047	0					
							CL	Clay (CL), dark brown, stained reddish-black, moist to dry
	CHEMICAL	280-S01-048		17			SP	Sand (SP), tan, medium sand, loose, wet
5			0					
	DUPE	280-S01-275	NA	12				Same as above
10							GW	Gravel or cement based on drilling behavior
								BAY SEDIMENTS
	GEOTECH		NA	18			SP	Sand (SP), black, fine grain sand, loose, wet, trace to abundant shells
15							ML	Clayey silt (ML), black, soft, wet, trace to abundant shells
								TD = 16 Feet bgs
20								

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-15-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

SAMPLING METHOD Split Spoon
GROUND ELEVATION 12.46 Feet
TOC ELEVATION 11.58 Feet
BORING DIAMETER 8.5 inches
TOTAL DEPTH OF HOLE 16 Feet bgs
WATER LEVEL 4.75 Feet bgs
WELL INSTALLED? (Y/N) Y

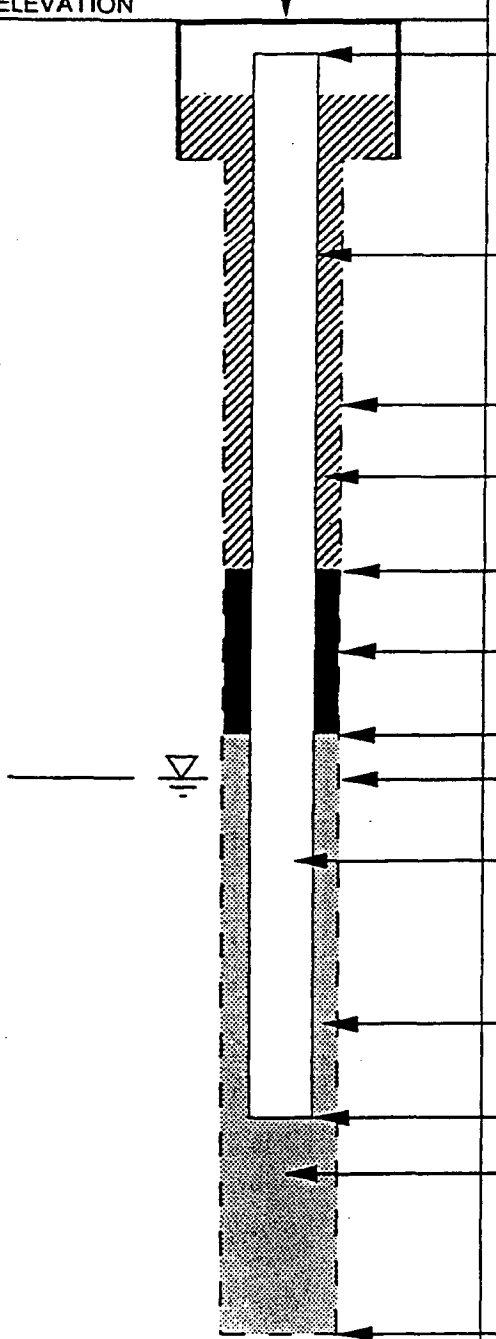
WELL
~~BORING~~ NO. MØ3Ø-E

MONITORING WELL SHEET

PROJECT NAS Alameda RI
PROJECT NO. Ø44 Ø28Ø
SITE ~~ELEVATION~~
FIELD GEOLOGIST DEK/JEV

LOCATION Alameda, California
BORING MØ3Ø-E
DATE 8-15-94

DRILLER Woodward Drilling Co.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Surge/Bail/Pump



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.46

ELEVATION OF TOP OF WELL CASING: 11.58

RISER PIPE I.D.: 2 inches
TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 8.5 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL (feet bgs) 2.0

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: (feet bgs) 4.0
DEPTH TOP OF SCREEN: 6.0

TYPE OF SCREEN: Schedule 4Ø PVC
SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch
I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/12 Monterey Sand

DEPTH BOTTOM OF SCREEN: (feet bgs) 16.0
DEPTH BOTTOM OF SAND PACK: 16.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

DEPTH OF HOLE (feet bgs) 16.0

MF

ok

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M031-A

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-052	NA	24, 50/6			SM	FILL Siltysand (SM), brown, fine and very fine sand, loose, dry
	CHEMICAL	280-S01-053	NA	33			SP	Sand (SP), brown, fine to very fine sand, loose, dry Same as above, but black, fine to medium sand, wet at 3.5 feet bgs
5	CHEMICAL	280-S01-054	NA	7				Same as above with 1" thick clay layers, wet, trace shells
10								
								TD = 12.5 Feet bgs
15								
20								

Water Level

Split Spoon

Sample Collected

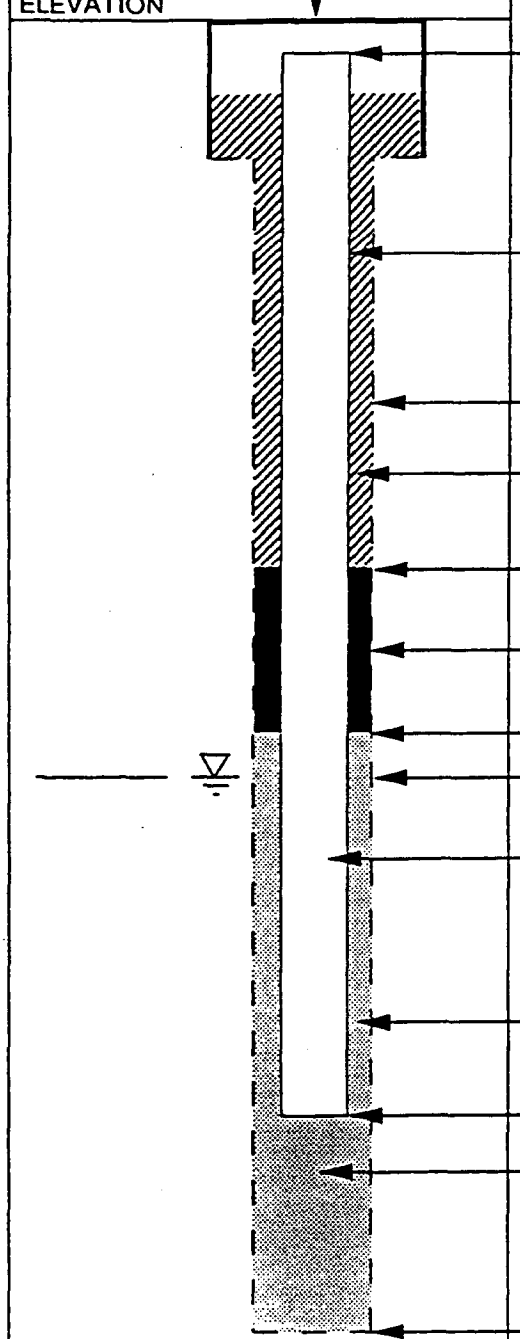
PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-10-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow Stem Auger

SAMPLING METHOD Split spoon
GROUND ELEVATION 10.85 Feet
TOC ELEVATION 10.01 Feet
BORING DIAMETER 11.50 inches
TOTAL DEPTH OF HOLE 12.5 Feet bgs
WATER LEVEL 4.45 Feet bgs
WELL INSTALLED? (Y/N) Y

WELL ~~BORING~~ NO. MØ31-A

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Woodward Drilling Co.
PROJECT NO. Ø44 Ø28Ø	BORING MØ31-A	DRILLING METHOD Hollow Stem Auger
~~SITE ELEVATION~~	DATE 8-10-94	DEVELOPMENT METHOD Surge/Bail/Pump
FIELD GEOLOGIST DEK		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 10.85

ELEVATION OF TOP OF WELL CASING: 10.01

RISER PIPE I.D.: 2 inches

TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 11.5 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL: (feet bgs) 1.5

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: (feet bgs) 2.0

DEPTH TOP OF SCREEN: 2.5

TYPE OF SCREEN: Schedule 4Ø PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/16 Monterey Sand

DEPTH BOTTOM OF SCREEN: (feet bgs) 12.5

DEPTH BOTTOM OF SAND PACK: 12.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

DEPTH OF HOLE: (feet bgs) 12.5

MF

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING MØ31-E

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	28Ø-SØ1-Ø55	Ø	75			SP/SM	FILL Sand (SP) to silty sand (SM), brown (10YR 5/3), fine and very fine sand, loose, dry
	CHEMICAL	28Ø-SØ1-Ø56	Ø	33				Same as above
5	CHEMICAL	28Ø-SØ1-Ø57	Ø	11			SP	Sand (SP), black to very dark gray (2.5YN3), fine to very fine sand, soft, moist to very moist, trace clay, trace shells
			Ø	13			SP/SM	Sand (SP) to silty sand (SM), very dark gray (2.5YN3), fine to medium sand, loose, wet, trace shells
10			Ø	22				Same as above
			Ø	18				Same as above with trace clay at bottom of shoe
15			NA	14			SC	Clayey sand (SC), black, 80% medium sand, 20% clay, soft, wet
			NA	22				Same as above
			NA	23			CL	Clay (CL), very dark gray (7.5YN3), soft, wet
20								TD= 19.5 feet bgs

Boring Water Level

Water Level Prior to Well Installation

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-Ø28Ø
LOGGED BY DEK
DATE DRILLED 8-10-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

SAMPLING METHOD Split Spoon
GROUND ELEVATION 10.83 Feet
TOC ELEVATION 10.01 Feet
BORING DIAMETER 11.50 inches
TOTAL DEPTH OF HOLE 19.5 Feet bgs
WATER LEVEL 6.0 Feet bgs
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-031C

see attached Well Diagram

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
			NA	32			SP	Sand (SP), brown (10Y 5/3), fine sand, loose, dry
				71				Same as above with dark brown (10Y 2/1) zone at 2.5 to 3 feet bgs with pebbles
				24				Same as above to 4 Feet bgs; at 4 Feet bgs, gray brown (10YR 4/1), moist
5				25			SP/SW	Sand (SP/SW), dark gray (10Y 4/1), fine sand, dense, moist
				14			SP	Same as above with trace shells
				16				Same as above, but moist
10				16				Same as above
15				13				Same as above, but grayish brown (10Y 5/2) and wet
20				20				Same as above

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY JEV
DATE DRILLED 10-13-94 to 10-20-94
DRILLER Ton to Drilling Services, Inc.
DRILL METHOD Hollow-Stem Auger/Mud Rotary

SAMPLING METHOD Split Spoon
GROUND ELEVATION 11.19 Feet
TOC ELEVATION 10.40 Feet
BORING DIAMETER 12.0 inches
TOTAL DEPTH OF HOLE 92.5 Feet bgs
WATER LEVEL 8 Feet bgs
WELL INSTALLED? (Y/N) Y

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-031

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							CL	Sandy Clay
				6			SP	Sand (SP), grayish brown (10Y 5/2), fine sand, dense, wet
							CL	Clay (CL), very dark gray (2.5YN3), plastic, moist, trace sand
				6				Same as above
				7				Same as above - continue drilling (mud rotary)
25								
30				4				Same as above, but soft with abundant shells
35				4				Same as above, but with trace sand and silt
40				36			SC	Clayey sand (SC), dark gray (5Y4/1), fine sand, dense, wet

Water Level

Split Spoon

Sample Collected

PROJECT		SAMPLING METHOD	
LOCATION		GROUND ELEVATION	
JOB NUMBER	044-	TOC ELEVATION	
LOGGED BY		BORING DIAMETER	
DATE DRILLED		TOTAL DEPTH OF HOLE	
DRILLER		WATER LEVEL	
DRILL METHOD		WELL INSTALLED? (Y/N)	

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-031C

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							SC	
45 5				86				Same as above, but dark grayish brown (10Y 4/2) to brown (10Y 5/3) and less shells
50 10				50/6 50/6			SP	Sand (SP), dark yellowish brown (10Y 4/6) to light olive brown (2.5Y 4/4), fine sand, dense, moist, trace clay and silt
55 15				64/6				Same as above, but very dense and no clay
60 20				55/6				Same as above, but more yellowish-brown and fine to medium sand

Water Level

Split Spoon

Sample Collected

PROJECT

LOCATION

JOB NUMBER 044-

LOGGED BY

DATE DRILLED

DRILLER

DRILL METHOD

SAMPLING METHOD

GROUND ELEVATION

TOC ELEVATION

BORING DIAMETER

TOTAL DEPTH OF HOLE

WATER LEVEL

WELL INSTALLED? (Y/N)

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-031

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							SP	
65				60/6				Same as above, but all fine sand
70				55/6 50/6				Same as above, switched to 1.5-inch diameter sampler
75				54/6 50/6				Same as above
80				50/6 50/6				Same as above

Water Level

Split Spoon

Sample Collected

PROJECT _____

LOCATION

JOB NUMBER 044-

LOGGED BY .

DATE DRILLED _____

DRILLER

DRILL METHOD _____

SAMPLING METHOD

GROUND ELEVATION _____

TOC ELEVATION _____

BORING DIAMETER

TOTAL DEPTH OF HOLE _____

WATER LEVEL

WELL INSTALLED? (Y/N) _____

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-03

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
							SP	
85 / 15				43			CL	clay (CL), dark olive gray (5Y 3/2), very stiff, damp.
				30/6 54/3			SP	Same as above sand (SP), dark gray (2.5Y N4), fine sand, very dense, trace clay
				76			CL	Same as above clay (CL), dark olive gray (5Y 3/2), very stiff, moist
				NA				Same as above, but with trace silt
90 / 10								
								TD = 92.5 Feet bgs
95 / 15								
100 / 20								

Water Level

Split Spoon

Sample Collected

PROJECT

LOCATION

JOB NUMBER 044-

LOGGED BY .

DATE DRILLED

DRILLER

DRILL METHOD

SAMPLING METHOD

GROUND ELEVATION

TOC ELEVATION

BORING DIAMETER

TOTAL DEPTH OF HOLE

WATER LEVEL

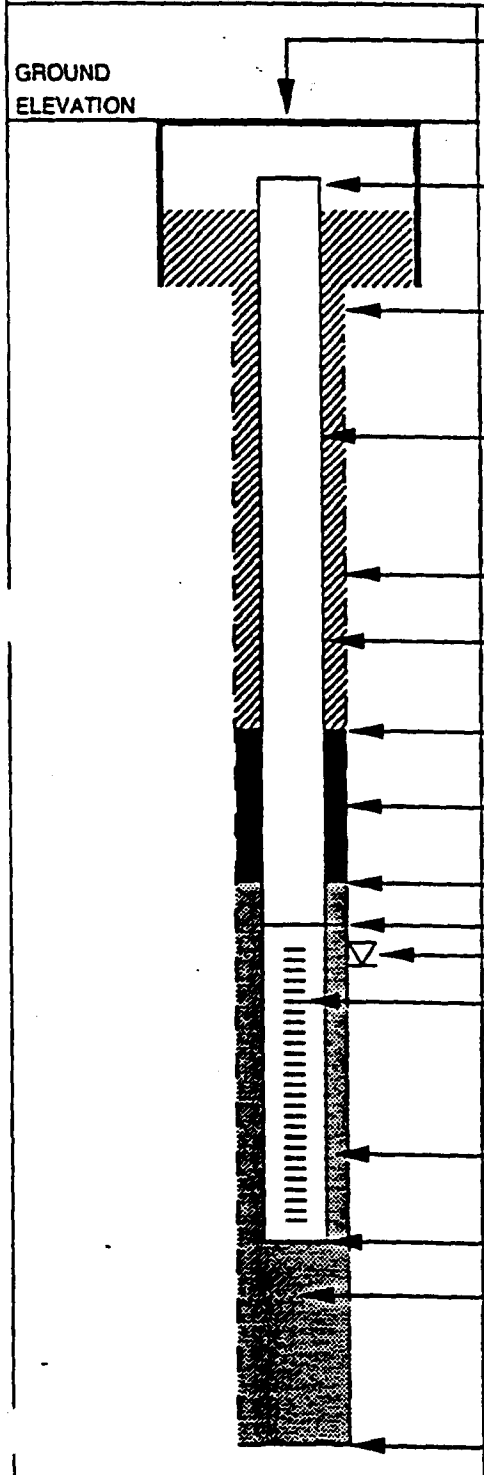
WELL INSTALLED? (Y/N)

BORING NO. M-031-C

MONITORING WELL SHEET

PROJECT NAS Alameda/CTO 289 LOCATION Site 1
PROJECT NO. 2738.1406 BORING M-031-C
ELEVATION _____ DATE 10-20-94
FIELD GEOLOGIST JOHN VALETT

DRILLER ELLIOTT VAN DE POPPE
DRILLING METHOD HSA/MUD ROTARY
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF GROUND SURFACE: _____

ELEVATION OF TOP OF WELL CASING: _____

I.D. OF SURFACE CASING: 8"
TYPE OF SURFACE CASING: Steel Conductor Casing

RISER PIPE I.D.: 3"
TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER: 7.5"

TYPE OF BACKFILL: Portland Cement Grout

ELEVATION / DEPTH OF SEAL: 71.5' bgs

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: 74.5' bgs
ELEVATION / DEPTH TOP OF SCREEN: 77.5' bgs
FIRST ENCOUNTERED SATURATED ZONE

TYPE OF SCREEN: Sch 40 PVC
SLOT SIZE x LENGTH 0.010 inches x 10 feet.
I.D. OF SCREEN 3"

TYPE OF SAND PACK: Monterey 2/12 Sand

ELEVATION / DEPTH BOTTOM OF SCREEN: 87.5' bgs
ELEVATION / DEPTH BOTTOM OF SAND PACK: 88' bgs
TYPE OF BACKFILL BELOW OBSERVATION WELL: Monterey 2/12 Sand

ELEVATION / DEPTH OF HOLE: ~~88' bgs~~ 92.5' b.w.

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M-031

see attached Well Diagram

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
			Ø	75			SP/SM	Sand (SP) to silty sand (SM), brown (10YR5/3), fine and very fine sand, loose, dry
			Ø	33				Same as above
5			Ø	11			SP	Sand (SP), black to very dark gray (2.5YN3), fine to very fine sand, soft, moist to very moist, trace clay, trace shells
			Ø	13			SP/SM	Sand (SP) to silty sand (SM), very dark gray (2.5YN3) fine to medium sand, loose, wet, trace shells
10			Ø	22				Same as above
			Ø	18				Same as above with trace clay at bottom of shoe
15			NA	14			SC	Clayey sand (SC), black, 80% medium sand, 20% clay, soft, wet
			NA	22				Same as above
			NA	23			CL	Clay (CL), very dark gray (7.5YN3), soft, wet
20								TD= 19.5 feet bgs

Boring Water Level

Water Level Prior to Well Installation

Split Spoon

Sample Collected

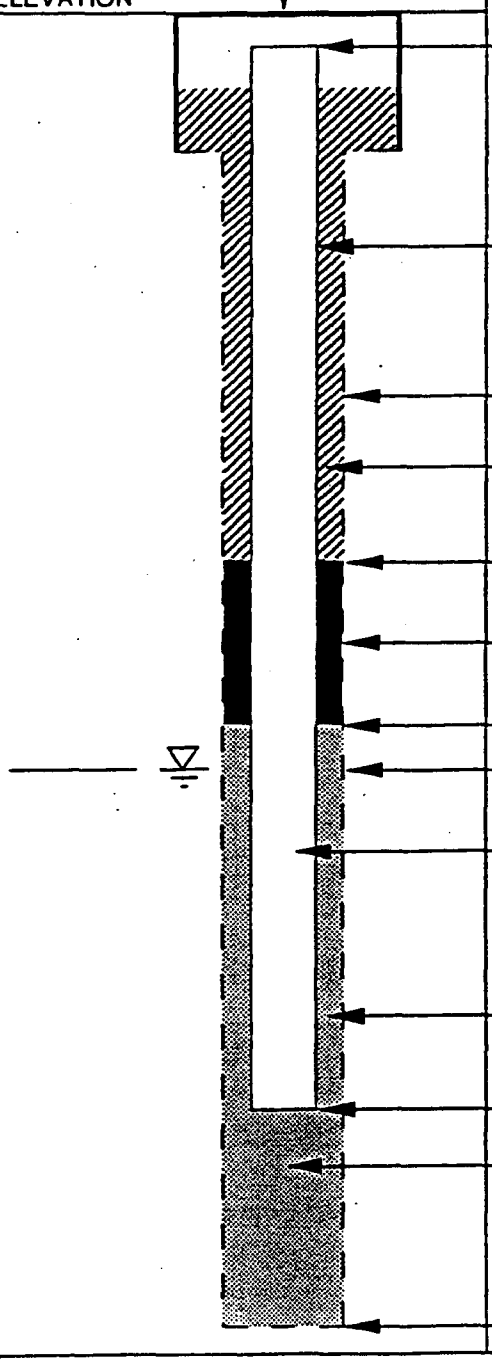
PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-10-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

SAMPLING METHOD Split Spoon
GROUND ELEVATION 10.83 feet
TOC ELEVATION 10.01 Feet
BORING DIAMETER 11.50 inches
TOTAL DEPTH OF HOLE 19.5 Feet bgs
WATER LEVEL 6.0 Feet bgs
WELL INSTALLED? (Y/N) Y

WELL
~~BORING~~ NO. MØ31-E

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Woodward Drilling Co.
PROJECT NO. Ø44 Ø28Ø	BORING MØ31-E	DRILLING METHOD Hollow Stem Auger
SITE ~~ELEVATION~~ 1	DATE 8-10-94	DEVELOPMENT METHOD Surge/Bail/Pump
FIELD GEOLOGIST DEK		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 10.83

ELEVATION OF TOP OF WELL CASING: 10.01

RISER PIPE I.D.: 2 inches

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 11.5 inches

TYPE OF BACKFILL: Neat Cement Grout

(feet bgs)

DEPTH OF SEAL: 4.0

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: 6.0

DEPTH TOP OF SCREEN: 8.0

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch

I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/16 Monterey Sand

DEPTH BOTTOM OF SCREEN: 18.0

DEPTH BOTTOM OF SAND PACK: 18.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: Native Material

DEPTH OF HOLE: 19.5

MF

ok

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M033-A

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	28Ø-SØ1-Ø65	NA	80			GW	FILL Sandy gravel (GW); brown, medium sand, pea-gravel
	CHEMICAL	28Ø-SØ1-Ø66	NA	5			SC	Clayey sand (SC), brown, fine sand, loose
5	CHEMICAL	28Ø-SØ1-Ø67	NA	9			SW	Sand (SW), brown with some gray layers, medium-sand
10								
								TD = 12.5 Feet bgs
15								
20								

Water Level

Split Spoon

Sample Collected

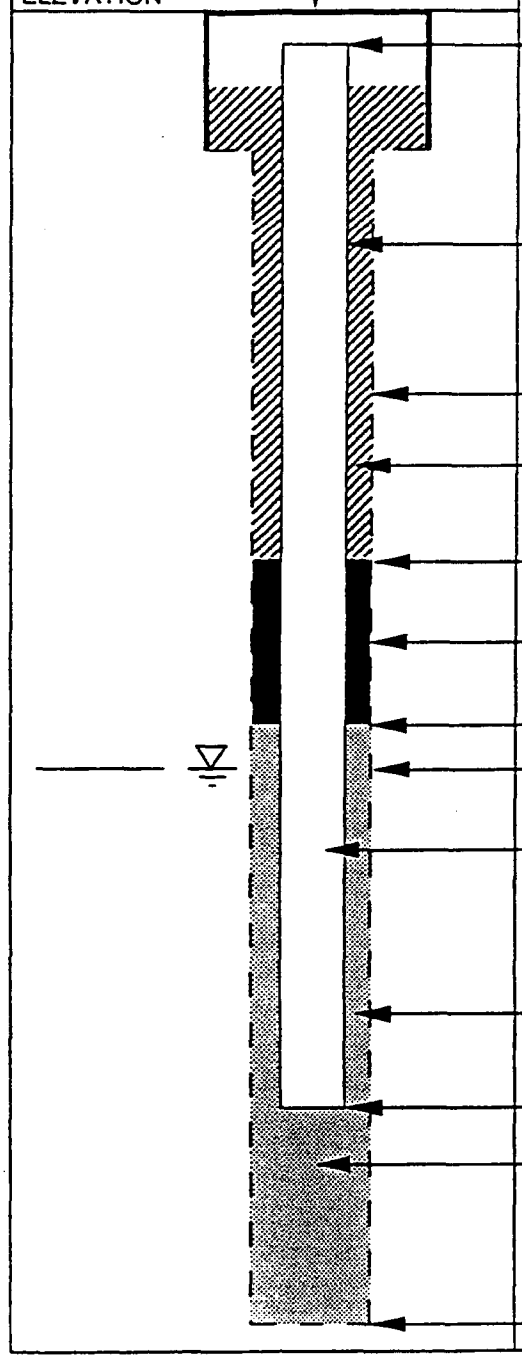
PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-Ø28Ø
LOGGED BY DEK
DATE DRILLED 8-10-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow Stem Auger

SAMPLING METHOD Split spoon
GROUND ELEVATION 12.49 Feet
TOC ELEVATION 11.70 Feet
BORING DIAMETER 11.5 inches
TOTAL DEPTH OF HOLE 12.5 Feet bgs
WATER LEVEL 4.25 Feet bgs
WELL INSTALLED? (Y/N) Y

WELL ~~BORING~~ NO. MØ33-A

MONITORING WELL SHEET

PROJECT NAS Alameda RI	LOCATION Alameda, California	DRILLER Woodward Drilling Co
PROJECT NO. 1 Ø44 Ø28Ø	BORING MØ33-A	DRILLING METHOD Hollow Stem Auger
SITE ~~ELEVATION~~	DATE 8-10-94	DEVELOPMENT METHOD Surge/Bail/Pump
FIELD GEOLOGIST DEK		



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.49

ELEVATION OF TOP OF WELL CASING: 11.70

RISER PIPE I.D.: 2 inches

TYPE OF RISER PIPE: Schedule 4Ø PVC

BOREHOLE DIAMETER: 11.25 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL: (feet bgs) 1.5

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: (feet bgs) 2.5

DEPTH TOP OF SCREEN: 4.25

TYPE OF SCREEN: Schedule 4Ø PVC

SLOT SIZE ~~x LENGTH~~: Ø.Ø1 inch

I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/16 Monterey Sand

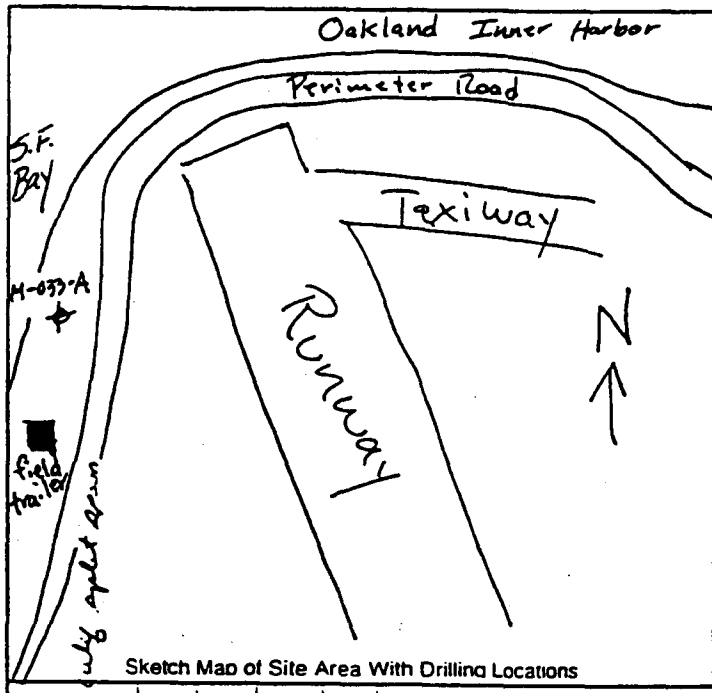
DEPTH BOTTOM OF SCREEN: (feet bgs) 12.5

DEPTH BOTTOM OF SAND PACK: 12.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

DEPTH OF HOLE: (feet bgs) 12.5

MF



Sketch Map of Site Area With Drilling Locations

Boring #	MW# M-033A Sheet 1 of 1
Project:	NAS ALAMEDA CTO 200
Job #	2738.1404 Site: 01
Logged By:	DEK Proj. Eng: Edited By:
Drilling Contractor:	WOODWARD DRILLING INC
Drill Rig Type/Method:	HSA MOBILE B57
Drillers Name:	ERIK FORSSTROM
Borehole Diam./Drill Bit Type	11.5" auger bit
Total Depth	12.5
Ref. Elev.	
Hammer Wt:	140 Drop: 30"
Start Time:	1115 Date: 8-10-97
Completion Time:	1205 Date: 8-10-97
Backfill Time:	1240 Date: 8-10-97

	1st Water			
Boring Depth (ft.)	4.25			
Casing Depth (ft.)				
Water Depth (ft.)				
Time	1145			
Date	8-10-97			

PID/OVA	Sampler Type & Depth	Blow Counts / 6 in.	Advance (in.)	Recovered (in.)		Casing Type & Size	Annulus Filler	Depth	Sample Rec. Analyses	Fuel	
		30				PVC Blank	Grout		X	1120	Sandy Gravel (GW), brown, med
		40							X	200-S01-0005	sand, poor-graded.
		40						1			
							Bent	2			
		2							X	1135	Clayey sand, brown loose,
		2							X	200-S01-0006	fine sand
		3						3			
								4			
		3				PVC			X	1145	Sand SW, brown w/ some gray
		4						5	X	200-S01-0007	layers. med-sand
		5									
								6			
						0.01-inch					Screen - 2½ - 12½
								7			Sand - 12½ - 2
											bentonite 2-1.5
				Drill out		Screen	2/12	8			grout 1.5-0
								9			
							Monterey Sand				
								10			
								11			
								12			
								12.5			TD = 12.5'

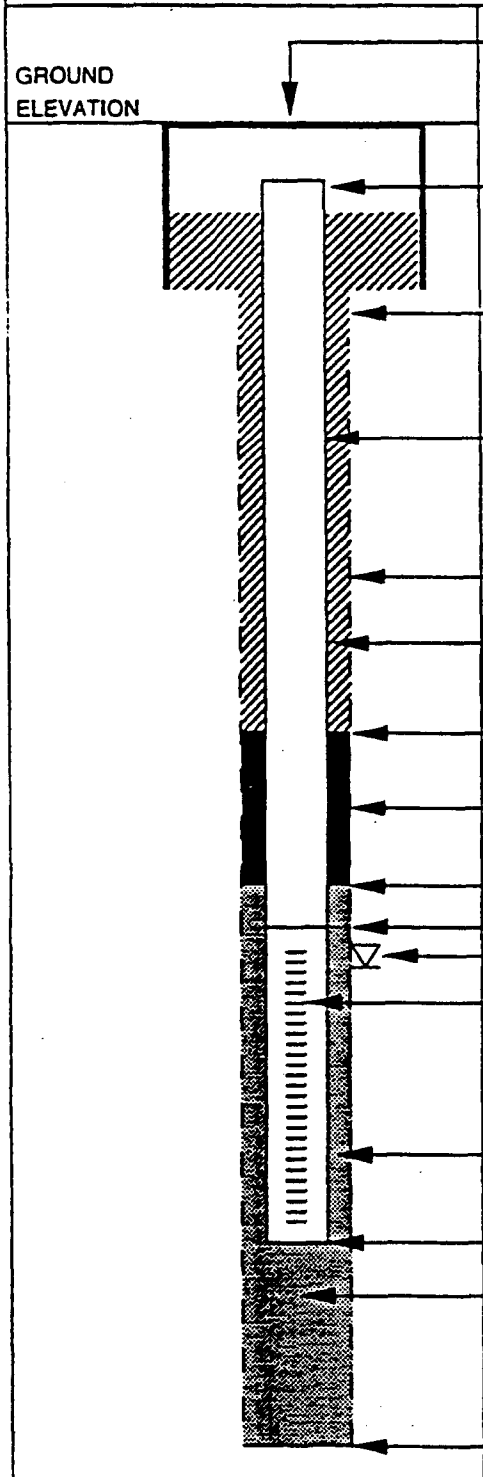
BORING NO. M-033A

MONITORING WELL SHEET

PROJECT CTO 280 NAS ALAMEDA
PROJECT NO. 2738.1404
ELEVATION
FIELD GEOLOGIST D. KRAMER

LOCATION S.k 01
BORING M-033 A
DATE 8-10-94

DRILLER ERIK FORSSTRAN
DRILLING METHOD HSA
DEVELOPMENT METHOD Bail, Surge, Pump



ELEVATION OF GROUND SURFACE: _____

ELEVATION OF TOP OF WELL CASING: 0.0' bgs

I.D. OF SURFACE CASING: 2"
TYPE OF SURFACE CASING: PVC blank

RISER PIPE I.D.: NA
TYPE OF RISER PIPE: _____

BOREHOLE DIAMETER: 11.25"

TYPE OF BACKFILL: Cement grout

ELEVATION / DEPTH OF SEAL: 1.5 bgs

TYPE OF SEAL: Bentonik

DEPTH TOP OF SAND PACK: 2.5 bgs
ELEVATION / DEPTH TOP OF SCREEN: 4.25 bgs
FIRST ENCOUNTERED SATURATED ZONE
TYPE OF SCREEN: 0.01 Slotted PVC
SLOT SIZE x LENGTH 0.01 x 10
I.D. OF SCREEN 2"

TYPE OF SAND PACK: 2/10 monterey Sand

ELEVATION / DEPTH BOTTOM OF SCREEN: 12.5 bgs

ELEVATION / DEPTH BOTTOM OF SAND PACK: _____
TYPE OF BACKFILL BELOW OBSERVATION WELL: N/A

ELEVATION / DEPTH OF HOLE: 12.5 bgs

ok

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M034-A

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-068	NA	41 50/6			SW	FILL Gravelly sand (SW), light brown, fine sand, dry, trace silt, slight petroleum-like odor
	CHEMICAL	280-S01-069	NA	7			CL	Clay (CL), black, soft, moist
5	CHEMICAL	280-S01-070	NA	6			SW	Sand (SW), black, fine to medium sand, wet
10								
								TD = 12.5 Feet bgs
15								
20								

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-10-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

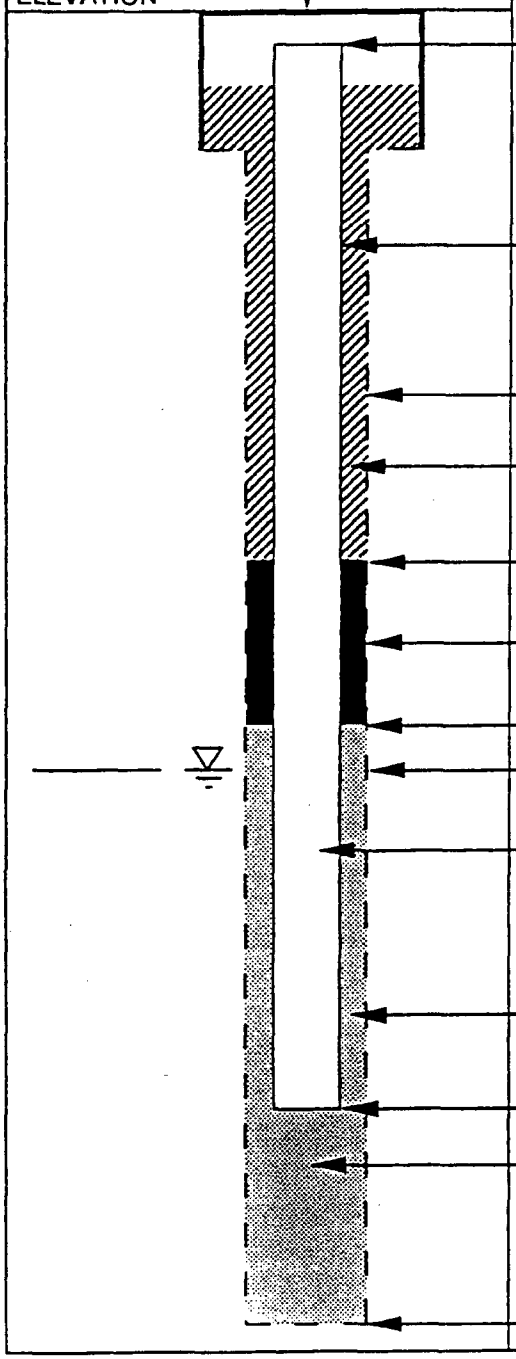
SAMPLING METHOD Split spoon
GROUND ELEVATION 11.16 Feet
TOC ELEVATION 10.41 Feet
BORING DIAMETER 11.25 inches
TOTAL DEPTH OF HOLE 12.5 Feet bgs
WATER LEVEL 4.5 Feet bgs
WELL INSTALLED? (Y/N) Y

WELL
~~BORING~~ NO. MØ34-A

MONITORING WELL SHEET

PROJECT NAS Alameda RI
LOCATION Alameda, California
PROJECT NO. ØØ44 ØØ28Ø
BORING MØ34-A
SITE ~~ELEVATION~~
DATE 8-10-94
FIELD GEOLOGIST DEK

DRILLER Woodward Drilling Co
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Surge/Bail/Pump



(feet MLLW)

ELEVATION OF GROUND SURFACE: 11.16

ELEVATION OF TOP OF WELL CASING: 10.41

RISER PIPE I.D.: 2 inches
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 11.25 inches

TYPE OF BACKFILL: Neat Cement Grout

(feet bgs)

DEPTH OF SEAL: 1.5

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: 2.5
(feet bgs)
DEPTH TOP OF SCREEN: 4.25

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE ~~x LENGTH~~ Ø.Ø1 inch
I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: # 2/16 Monterey Sand

(feet bgs)

DEPTH BOTTOM OF SCREEN: 12.5

DEPTH BOTTOM OF SAND PACK: 12.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

(feet bgs)

DEPTH OF HOLE: 12.5

MF

OK

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING M035-A

Depth (ft)	Lab Analysis	Sample No.	PID Reading (ppm)	Blows/Foot	Sample Recovery	Graphic Log	USCS Code	MATERIALS DESCRIPTION
	CHEMICAL	280-S01-071	NA	11			SP	FILL Gravelly sand (SP), brown, fine to medium sand, loose, dry
	CHEMICAL	280-S01-072	NA	13			SW	Sand (SW), yellow-brown, medium sand, loose, dry
5			NA	14			CL	Sandy clay (CL), gray with red (ironoxide), soft, moist, trace gravels
	CHEMICAL	280-S01-073	NA	14			SW/SP	Sand (SW/SP), black, fine to medium sand, medium dense, wet
							SC	Same as above, but clayey
							SW/SP	Same as above, but no clay
10								
15								TD = 14.0 Feet bgs
20								

Water Level

Split Spoon

Sample Collected

PROJECT NAS Alameda RI
LOCATION Site 1
JOB NUMBER 044-0280
LOGGED BY DEK
DATE DRILLED 8-10-94
DRILLER Woodward Drilling Co.
DRILL METHOD Hollow-Stem Auger

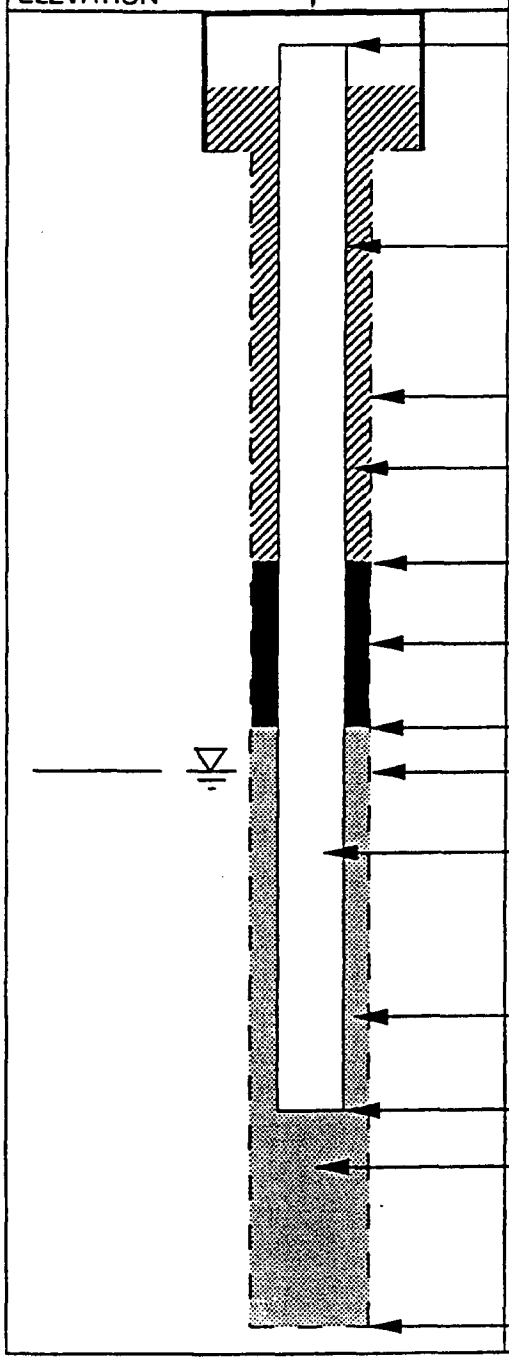
SAMPLING METHOD Split Spoon
GROUND ELEVATION 12.93 Feet
TOC ELEVATION 12.14 Feet
BORING DIAMETER 11.25 inches
TOTAL DEPTH OF HOLE 14 Feet bgs
WATER LEVEL 6.0 Feet bgs
WELL INSTALLED? (Y/N) Y

WELL ~~BORING~~ NO. M035-A

MONITORING WELL SHEET

PROJECT NAS Alameda RI LOCATION Alameda, California
PROJECT NO. 044 0280 BORING M035-A
SITE ~~ELEVATION~~ DATE 8-10-94
FIELD GEOLOGIST DEK

DRILLER Woodward Drilling Co.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Surge/Bail/Pump



(feet MLLW)

ELEVATION OF GROUND SURFACE: 12.93

ELEVATION OF TOP OF WELL CASING: 12.14

RISER PIPE I.D.: 2 inches
TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 11.25 inches

TYPE OF BACKFILL: Neat Cement Grout

DEPTH OF SEAL: (feet bgs) 1.5

TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: (feet bgs) 2.5
DEPTH TOP OF SCREEN: 4.0

TYPE OF SCREEN: Schedule 40 PVC
SLOT SIZE ~~x LENGTH~~ 0.01 inch
I.D. OF SCREEN 2 inches

TYPE OF SAND PACK: #2/16 Monterey Sand

DEPTH BOTTOM OF SCREEN: (feet bgs) 14.0
DEPTH BOTTOM OF SAND PACK: 14.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: Not Applicable

DEPTH OF HOLE: (feet bgs) 14.0

MF

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-1
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/06/00 02:40
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	3.12	0.03	1.00	0.02	sensitive fine grained	UNDFND	UNDFD	1	.3
0.50	1.64	94.88	1.41	1.48	0.07	silty sand to sandy silt	>90	>48	30	UNDEFINED
0.75	2.46	278.14	2.66	0.96	0.12	sand	>90	>48	>50	UNDEFINED
1.00	3.28	107.54	0.53	0.49	0.17	sand	>90	>48	21	UNDEFINED
1.25	4.10	71.30	1.62	2.27	0.21	sandy silt to clayey silt	UNDFND	UNDFD	27	7.1
1.50	4.92	15.80	0.49	3.07	0.26	clayey silt to silty clay	UNDFND	UNDFD	8	1.5
1.75	5.74	15.50	0.28	1.79	0.31	clayey silt to silty clay	UNDFND	UNDFD	7	1.5
2.00	6.56	16.14	0.19	1.15	0.35	sandy silt to clayey silt	UNDFND	UNDFD	6	1.5
2.25	7.38	21.12	0.16	0.76	0.40	sandy silt to clayey silt	UNDFND	UNDFD	8	2.0
2.50	8.20	51.82	0.25	0.49	0.45	sand to silty sand	50-60	40-42	12	UNDEFINED
2.75	9.02	37.44	0.39	1.03	0.50	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
3.00	9.84	75.10	0.48	0.64	0.54	sand to silty sand	60-70	42-44	18	UNDEFINED
3.25	10.66	92.12	0.53	0.57	0.58	sand to silty sand	70-80	42-44	22	UNDEFINED
3.50	11.48	107.50	0.46	0.43	0.60	sand	70-80	42-44	21	UNDEFINED
3.75	12.30	58.18	0.14	0.25	0.62	sand to silty sand	50-60	40-42	14	UNDEFINED
4.00	13.12	50.74	0.23	0.46	0.64	sand to silty sand	50-60	40-42	12	UNDEFINED
4.25	13.94	69.70	0.26	0.37	0.66	sand to silty sand	60-70	40-42	17	UNDEFINED
4.50	14.76	81.54	0.44	0.54	0.68	sand to silty sand	60-70	40-42	20	UNDEFINED
4.75	15.58	102.20	0.37	0.36	0.71	sand	70-80	42-44	20	UNDEFINED
5.00	16.40	117.66	0.36	0.30	0.73	sand	70-80	42-44	23	UNDEFINED
5.25	17.22	113.14	0.49	0.43	0.75	sand	70-80	42-44	22	UNDEFINED
5.50	18.04	140.70	0.65	0.46	0.77	sand	80-90	42-44	27	UNDEFINED
5.75	18.86	106.20	0.69	0.65	0.79	sand to silty sand	70-80	42-44	25	UNDEFINED
6.00	19.69	121.86	0.46	0.38	0.81	sand	70-80	42-44	23	UNDEFINED
6.25	20.51	65.40	0.42	0.64	0.84	sand to silty sand	50-60	38-40	16	UNDEFINED
6.50	21.33	21.46	0.28	1.28	0.86	sandy silt to clayey silt	UNDFND	UNDFD	8	2.0
6.75	22.15	8.26	0.06	0.68	0.88	sensitive fine grained	UNDFND	UNDFD	4	.7
7.00	22.97	6.38	0.07	1.06	0.90	sensitive fine grained	UNDFND	UNDFD	3	.5
7.25	23.79	6.06	0.06	0.97	0.92	sensitive fine grained	UNDFND	UNDFD	3	.4
7.50	24.61	7.48	0.09	1.24	0.94	clayey silt to silty clay	UNDFND	UNDFD	4	.6
7.75	25.43	6.26	0.07	1.17	0.96	sensitive fine grained	UNDFND	UNDFD	3	.4
8.00	26.25	6.82	0.08	1.20	0.99	sensitive fine grained	UNDFND	UNDFD	3	.5
8.25	27.07	6.40	0.04	0.70	1.01	sensitive fine grained	UNDFND	UNDFD	3	.4
8.50	27.89	6.46	0.05	0.72	1.03	sensitive fine grained	UNDFND	UNDFD	3	.4
8.75	28.71	6.34	0.04	0.67	1.05	sensitive fine grained	UNDFND	UNDFD	3	.4
9.00	29.53	9.80	0.08	0.84	1.07	clayey silt to silty clay	UNDFND	UNDFD	5	.8
9.25	30.35	32.78	0.22	0.66	1.09	silty sand to sandy silt	<40	34-36	10	UNDEFINED
9.50	31.17	66.66	0.49	0.73	1.12	sand to silty sand	50-60	38-40	16	UNDEFINED

Dr - All sands (Janiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-1 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	145.08	0.96	0.66	1.14	sand	70-80	42-44	28	UNDEFINED
10.00	32.81	233.08	1.80	0.77	1.16	sand	80-90	44-46	45	UNDEFINED
10.25	33.63	250.32	1.88	0.75	1.18	sand	>90	44-46	48	UNDEFINED
10.50	34.45	249.14	1.99	0.80	1.20	sand	>90	44-46	48	UNDEFINED
10.75	35.27	232.38	1.66	0.72	1.22	sand	80-90	42-44	45	UNDEFINED
11.00	36.09	217.12	1.47	0.68	1.24	sand	80-90	42-44	42	UNDEFINED
11.25	36.91	206.78	1.40	0.68	1.27	sand	80-90	42-44	40	UNDEFINED
11.50	37.73	174.54	1.35	0.77	1.29	sand	70-80	42-44	33	UNDEFINED
11.75	38.55	70.54	1.20	1.70	1.31	silty sand to sandy silt	50-60	38-40	23	UNDEFINED
12.00	39.37	55.50	1.66	2.99	1.33	sandy silt to clayey silt	UNDFND	UNDFD	21	5.3
12.25	40.19	129.82	5.84	4.50	1.35	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-2
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/06/94 10:10
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	43.84	0.36	0.82	0.02	silty sand to sandy silt	>90	>48	14	UNDEFINED
0.50	1.64	100.90	0.85	0.85	0.07	sand to silty sand	>90	>48	24	UNDEFINED
0.75	2.46	121.64	1.04	0.86	0.12	sand to silty sand	>90	>48	29	UNDEFINED
1.00	3.28	129.44	1.55	1.20	0.17	sand to silty sand	>90	>48	31	UNDEFINED
1.25	4.10	103.70	0.80	0.77	0.21	sand to silty sand	80-90	46-48	25	UNDEFINED
1.50	4.92	80.38	0.44	0.55	0.26	sand to silty sand	70-80	44-46	19	UNDEFINED
1.75	5.74	60.48	0.32	0.53	0.31	sand to silty sand	60-70	44-46	14	UNDEFINED
2.00	6.56	35.52	0.19	0.53	0.35	silty sand to sandy silt	50-60	40-42	11	UNDEFINED
2.25	7.38	32.06	0.21	0.65	0.40	silty sand to sandy silt	40-50	40-42	10	UNDEFINED
2.50	8.20	33.58	0.25	0.73	0.45	silty sand to sandy silt	40-50	38-40	11	UNDEFINED
2.75	9.02	52.38	0.31	0.59	0.50	sand to silty sand	50-60	40-42	13	UNDEFINED
3.00	9.84	67.12	0.31	0.46	0.54	sand to silty sand	60-70	40-42	16	UNDEFINED
3.25	10.66	34.38	0.35	1.03	0.58	silty sand to sandy silt	40-50	38-40	11	UNDEFINED
3.50	11.48	6.18	0.05	0.86	0.60	sensitive fine grained	UNDFND	UNDFD	3	.5
3.75	12.30	36.20	0.24	0.67	0.62	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
4.00	13.12	36.32	0.36	0.98	0.64	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
4.25	13.94	67.98	0.42	0.62	0.66	sand to silty sand	60-70	40-42	16	UNDEFINED
4.50	14.76	50.48	0.40	0.79	0.68	silty sand to sandy silt	50-60	38-40	16	UNDEFINED
4.75	15.58	33.96	0.25	0.73	0.71	silty sand to sandy silt	40-50	36-38	11	UNDEFINED
5.00	16.40	12.78	0.23	1.77	0.73	clayey silt to silty clay	UNDFND	UNDFD	6	1.1
5.25	17.22	4.68	0.05	1.06	0.75	sensitive fine grained	UNDFND	UNDFD	2	.3
5.50	18.04	4.38	0.05	1.23	0.77	sensitive fine grained	UNDFND	UNDFD	2	.3
5.75	18.86	4.20	0.06	1.48	0.79	sensitive fine grained	UNDFND	UNDFD	2	.3
6.00	19.69	4.76	0.07	1.37	0.81	sensitive fine grained	UNDFND	UNDFD	2	.3
6.25	20.51	5.60	0.08	1.45	0.84	sensitive fine grained	UNDFND	UNDFD	3	.4
6.50	21.33	5.60	0.05	0.81	0.86	sensitive fine grained	UNDFND	UNDFD	3	.4
6.75	22.15	5.46	0.07	1.21	0.88	sensitive fine grained	UNDFND	UNDFD	3	.4
7.00	22.97	6.00	0.05	0.90	0.90	sensitive fine grained	UNDFND	UNDFD	3	.4
7.25	23.79	4.58	0.03	0.61	0.92	sensitive fine grained	UNDFND	UNDFD	2	.3
7.50	24.61	5.90	0.06	0.97	0.94	sensitive fine grained	UNDFND	UNDFD	3	.4
7.75	25.43	4.98	0.04	0.76	0.96	sensitive fine grained	UNDFND	UNDFD	2	.3
8.00	26.25	8.12	0.04	0.45	0.99	sensitive fine grained	UNDFND	UNDFD	4	.6
8.25	27.07	21.72	0.10	0.44	1.01	silty sand to sandy silt	<40	32-34	7	UNDEFINED
8.50	27.89	22.50	0.07	0.33	1.03	silty sand to sandy silt	<40	32-34	7	UNDEFINED
8.75	28.71	9.70	0.06	0.60	1.05	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
9.00	29.53	7.08	0.05	0.72	1.07	sensitive fine grained	UNDFND	UNDFD	3	.5
9.25	30.35	9.44	0.03	0.30	1.09	sensitive fine grained	UNDFND	UNDFD	5	.7
9.50	31.17	11.64	0.03	0.29	1.12	sandy silt to clayey silt	UNDFND	UNDFD	4	.9

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-2 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	11.28	0.08	0.69	1.14	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
10.00	32.81	9.54	0.05	0.49	1.16	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
10.25	33.63	8.02	0.08	1.00	1.18	clayey silt to silty clay	UNDFND	UNDFD	4	.6
10.50	34.45	7.74	0.07	0.96	1.20	sensitive fine grained	UNDFND	UNDFD	4	.5
10.75	35.27	9.66	0.06	0.65	1.22	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
11.00	36.09	48.40	0.40	0.83	1.24	silty sand to sandy silt	40-50	36-38	15	UNDEFINED
11.25	36.91	144.94	3.41	2.36	1.27	silty sand to sandy silt	70-80	40-42	46	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-4
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/06/00 01:20
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	46.78	0.37	0.79	0.02	silty sand to sandy silt	>90	>48	15	UNDEFINED
0.50	1.64	68.60	0.55	0.81	0.07	sand to silty sand	>90	>48	16	UNDEFINED
0.75	2.46	81.84	0.45	0.56	0.12	sand to silty sand	>90	>48	20	UNDEFINED
1.00	3.28	80.08	0.40	0.50	0.17	sand to silty sand	80-90	46-48	19	UNDEFINED
1.25	4.10	84.98	0.37	0.43	0.21	sand to silty sand	80-90	46-48	20	UNDEFINED
1.50	4.92	75.08	0.35	0.47	0.26	sand to silty sand	70-80	44-46	18	UNDEFINED
1.75	5.74	50.26	0.21	0.43	0.31	sand to silty sand	60-70	42-44	12	UNDEFINED
2.00	6.56	50.58	0.22	0.44	0.35	sand to silty sand	60-70	42-44	12	UNDEFINED
2.25	7.38	57.60	0.27	0.47	0.40	sand to silty sand	60-70	42-44	14	UNDEFINED
2.50	8.20	47.16	0.22	0.47	0.45	sand to silty sand	50-60	40-42	11	UNDEFINED
2.75	9.02	31.98	0.16	0.50	0.50	silty sand to sandy silt	40-50	38-40	10	UNDEFINED
3.00	9.84	37.18	0.15	0.40	0.54	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
3.25	10.66	44.90	0.25	0.56	0.58	silty sand to sandy silt	50-60	38-40	14	UNDEFINED
3.50	11.48	37.14	0.24	0.65	0.60	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
3.75	12.30	12.00	0.16	1.36	0.62	clayey silt to silty clay	UNDFND	UNDFD	6	1.1
4.00	13.12	17.88	0.21	1.19	0.64	sandy silt to clayey silt	UNDFND	UNDFD	7	1.7
4.25	13.94	21.92	0.30	1.38	0.66	sandy silt to clayey silt	UNDFND	UNDFD	8	2.1
4.50	14.76	6.40	0.07	1.05	0.68	sensitive fine grained	UNDFND	UNDFD	3	.5
4.75	15.58	3.86	0.03	0.83	0.71	sensitive fine grained	UNDFND	UNDFD	2	.2
5.00	16.40	3.78	0.03	0.71	0.73	sensitive fine grained	UNDFND	UNDFD	2	.2
5.25	17.22	4.12	0.05	1.19	0.75	sensitive fine grained	UNDFND	UNDFD	2	.3
5.50	18.04	4.32	0.05	1.06	0.77	sensitive fine grained	UNDFND	UNDFD	2	.3
5.75	18.86	4.16	0.03	0.83	0.79	sensitive fine grained	UNDFND	UNDFD	2	.3
6.00	19.69	5.28	0.07	1.42	0.81	sensitive fine grained	UNDFND	UNDFD	3	.4
6.25	20.51	4.32	0.03	0.61	0.84	sensitive fine grained	UNDFND	UNDFD	2	.3
6.50	21.33	4.36	0.04	0.82	0.86	sensitive fine grained	UNDFND	UNDFD	2	.3
6.75	22.15	4.46	0.03	0.66	0.88	sensitive fine grained	UNDFND	UNDFD	2	.3
7.00	22.97	5.04	0.03	0.60	0.90	sensitive fine grained	UNDFND	UNDFD	2	.3
7.25	23.79	5.06	0.03	0.61	0.92	sensitive fine grained	UNDFND	UNDFD	2	.3
7.50	24.61	5.38	0.04	0.66	0.94	sensitive fine grained	UNDFND	UNDFD	3	.3
7.75	25.43	5.70	0.03	0.45	0.96	sensitive fine grained	UNDFND	UNDFD	3	.4
8.00	26.25	5.60	0.02	0.30	0.99	sensitive fine grained	UNDFND	UNDFD	3	.4
8.25	27.07	5.98	0.02	0.35	1.01	sensitive fine grained	UNDFND	UNDFD	3	.4
8.50	27.89	6.88	0.02	0.31	1.03	sensitive fine grained	UNDFND	UNDFD	3	.5
8.75	28.71	7.94	0.03	0.32	1.05	sensitive fine grained	UNDFND	UNDFD	4	.6
9.00	29.53	12.00	0.02	0.18	1.07	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
9.25	30.35	11.06	0.01	0.09	1.09	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
9.50	31.17	6.52	0.03	0.44	1.12	sensitive fine grained	UNDFND	UNDFD	3	.4

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-4 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	7.62	0.02	0.30	1.14	sensitive fine grained	UNDFND	UNDFD	4	.5
10.00	32.81	7.14	0.03	0.37	1.16	sensitive fine grained	UNDFND	UNDFD	3	.5
10.25	33.63	9.62	0.06	0.67	1.18	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
10.50	34.45	6.82	0.05	0.68	1.20	sensitive fine grained	UNDFND	UNDFD	3	.4
10.75	35.27	6.74	0.04	0.55	1.22	sensitive fine grained	UNDFND	UNDFD	3	.4
11.00	36.09	7.18	0.05	0.69	1.24	sensitive fine grained	UNDFND	UNDFD	3	.5
11.25	36.91	8.06	0.03	0.37	1.27	sensitive fine grained	UNDFND	UNDFD	4	.5
11.50	37.73	12.18	0.05	0.40	1.29	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
11.75	38.55	13.36	0.03	0.19	1.31	sandy silt to clayey silt	UNDFND	UNDFD	5	1.1
12.00	39.37	27.22	0.15	0.56	1.33	silty sand to sandy silt	<40	30-32	9	UNDEFINED
12.25	40.19	62.62	0.48	0.77	1.35	sand to silty sand	40-50	36-38	15	UNDEFINED
12.50	41.01	171.02	1.27	0.75	1.37	sand	70-80	40-42	33	UNDEFINED
12.75	41.83	195.38	1.71	0.88	1.40	sand	80-90	42-44	37	UNDEFINED
13.00	42.65	212.56	1.89	0.89	1.42	sand	80-90	42-44	41	UNDEFINED
13.25	43.47	188.16	2.14	1.14	1.44	sand	70-80	42-44	36	UNDEFINED
13.50	44.29	172.96	5.89	3.40	1.46	sandy silt to clayey silt	UNDFND	UNDFD	>50	17.0
13.75	45.11	118.60	1.94	1.64	1.48	silty sand to sandy silt	60-70	40-42	38	UNDEFINED
14.00	45.93	96.56	3.29	3.41	1.50	sandy silt to clayey silt	UNDFND	UNDFD	37	9.3

Dr - All sands (Janiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOMERY WATSO
On Site Loc:CPT-1-5
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :07/11/94 8:40
Cone Used :407
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	50.76	0.24	0.47	0.02	sand to silty sand	>90	>48	12	UNDEFINED
0.50	1.64	259.38	1.39	0.54	0.07	sand	>90	>48	50	UNDEFINED
0.75	2.46	262.74	1.92	0.73	0.12	sand	>90	>48	>50	UNDEFINED
1.00	3.28	202.46	1.04	0.51	0.17	sand	>90	>48	39	UNDEFINED
1.25	4.10	151.54	0.70	0.46	0.21	sand	>90	>48	29	UNDEFINED
1.50	4.92	120.34	0.27	0.23	0.26	sand	>90	46-48	23	UNDEFINED
1.75	5.74	90.70	0.15	0.17	0.31	sand	80-90	44-46	17	UNDEFINED
2.00	6.56	78.30	0.19	0.25	0.35	sand to silty sand	70-80	44-46	19	UNDEFINED
2.25	7.38	65.48	0.19	0.29	0.40	sand to silty sand	60-70	42-44	16	UNDEFINED
2.50	8.20	55.44	0.19	0.34	0.45	sand to silty sand	60-70	40-42	13	UNDEFINED
2.75	9.02	61.12	0.21	0.34	0.50	sand to silty sand	60-70	40-42	15	UNDEFINED
3.00	9.84	52.22	0.19	0.36	0.54	sand to silty sand	50-60	40-42	13	UNDEFINED
3.25	10.66	61.66	0.24	0.39	0.58	sand to silty sand	60-70	40-42	15	UNDEFINED
3.50	11.48	64.06	0.24	0.38	0.60	sand to silty sand	60-70	40-42	15	UNDEFINED
3.75	12.30	44.66	0.27	0.60	0.62	silty sand to sandy silt	50-60	38-40	14	UNDEFINED
4.00	13.12	65.60	0.20	0.30	0.64	sand to silty sand	60-70	40-42	16	UNDEFINED
4.25	13.94	43.46	0.28	0.64	0.66	silty sand to sandy silt	40-50	38-40	14	UNDEFINED
4.50	14.76	32.28	0.10	0.32	0.68	silty sand to sandy silt	<40	36-38	10	UNDEFINED
4.75	15.58	25.16	0.12	0.48	0.71	silty sand to sandy silt	<40	34-36	8	UNDEFINED
5.00	16.40	78.04	0.33	0.42	0.73	sand to silty sand	60-70	40-42	19	UNDEFINED
5.25	17.22	55.08	0.25	0.46	0.75	sand to silty sand	50-60	38-40	13	UNDEFINED
5.50	18.04	16.62	0.24	1.45	0.77	sandy silt to clayey silt	UNDFND	UNDFD	6	1.5
5.75	18.86	39.74	0.22	0.54	0.79	silty sand to sandy silt	40-50	36-38	13	UNDEFINED
6.00	19.69	17.28	0.28	1.63	0.81	sandy silt to clayey silt	UNDFND	UNDFD	7	1.6
6.25	20.51	12.38	0.12	0.99	0.84	sandy silt to clayey silt	UNDFND	UNDFD	5	1.1
6.50	21.33	5.26	0.02	0.36	0.86	sensitive fine grained	UNDFND	UNDFD	3	.4
6.75	22.15	5.48	0.02	0.40	0.88	sensitive fine grained	UNDFND	UNDFD	3	.4
7.00	22.97	5.68	0.02	0.34	0.90	sensitive fine grained	UNDFND	UNDFD	3	.4
7.25	23.79	5.00	0.04	0.76	0.92	sensitive fine grained	UNDFND	UNDFD	2	.3
7.50	24.61	4.50	0.02	0.52	0.94	sensitive fine grained	UNDFND	UNDFD	2	.3
7.75	25.43	4.94	0.03	0.66	0.96	sensitive fine grained	UNDFND	UNDFD	2	.3
8.00	26.25	5.62	0.05	0.86	0.99	sensitive fine grained	UNDFND	UNDFD	3	.4
8.25	27.07	7.96	0.04	0.50	1.01	sensitive fine grained	UNDFND	UNDFD	4	.6
8.50	27.89	6.20	0.02	0.26	1.03	sensitive fine grained	UNDFND	UNDFD	3	.4
8.75	28.71	6.54	0.01	0.08	1.05	sensitive fine grained	UNDFND	UNDFD	3	.4
9.00	29.53	6.54	-0.00	-0.07	1.07	undefined	UNDFND	UNDFD	UDF	UNDEFINED
9.25	30.35	10.46	-0.01	-0.11	1.09	undefined	UNDFND	UNDFD	UDF	UNDEFINED
9.50	31.17	21.40	0.01	0.07	1.12	silty sand to sandy silt	<40	30-32	7	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOMERY WATSO On Site Loc:CPT-1-5 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	9.52	0.01	0.11	1.14	sensitive fine grained	UNDFND	UNDFD	5	.7
10.00	32.81	9.06	-0.00	-0.01	1.16	undefined	UNDFND	UNDFD	UDF	UNDEFINED
10.25	33.63	22.10	0.04	0.19	1.18	silty sand to sandy silt	<40	30-32	7	UNDEFINED
10.50	34.45	10.74	-0.01	-0.08	1.20	undefined	UNDFND	UNDFD	UDF	UNDEFINED
10.75	35.27	8.86	-0.01	-0.07	1.22	undefined	UNDFND	UNDFD	UDF	UNDEFINED
11.00	36.09	8.88	-0.00	-0.02	1.24	undefined	UNDFND	UNDFD	UDF	UNDEFINED
11.25	36.91	8.46	0.01	0.09	1.27	sensitive fine grained	UNDFND	UNDFD	4	.6
11.50	37.73	16.12	0.03	0.21	1.29	sandy silt to clayey silt	UNDFND	UNDFD	6	1.3
11.75	38.55	8.64	0.01	0.08	1.31	sensitive fine grained	UNDFND	UNDFD	4	.6
12.00	39.37	28.06	0.22	0.80	1.33	silty sand to sandy silt	<40	32-34	9	UNDEFINED
12.25	40.19	115.44	0.65	0.57	1.35	sand	60-70	40-42	22	UNDEFINED
12.50	41.01	136.38	0.51	0.37	1.37	sand	70-80	40-42	26	UNDEFINED
12.75	41.83	117.70	0.40	0.34	1.40	sand	60-70	40-42	23	UNDEFINED
13.00	42.65	98.42	0.26	0.27	1.42	sand	60-70	38-40	19	UNDEFINED
13.25	43.47	163.00	0.59	0.36	1.44	sand	70-80	40-42	31	UNDEFINED
13.50	44.29	186.32	0.89	0.48	1.46	sand	70-80	42-44	36	UNDEFINED
13.75	45.11	67.58	0.49	0.73	1.48	sand to silty sand	40-50	36-38	16	UNDEFINED
14.00	45.93	31.70	0.56	1.77	1.50	sandy silt to clayey silt	UNDFND	UNDFD	12	2.9
14.25	46.75	61.76	1.87	3.03	1.52	sandy silt to clayey silt	UNDFND	UNDFD	24	5.9
14.50	47.57	174.88	7.74	4.43	1.55	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
14.75	48.39	294.20	6.07	2.06	1.57	sand to silty sand	>90	42-44	>50	UNDEFINED
15.00	49.21	363.54	4.09	1.12	1.59	sand	>90	44-46	>50	UNDEFINED
15.25	50.03	326.12	3.52	1.08	1.61	sand	>90	44-46	>50	UNDEFINED
15.50	50.85	327.26	2.33	0.71	1.63	sand	>90	44-46	>50	UNDEFINED
15.75	51.67	362.58	4.65	1.28	1.65	sand	>90	44-46	>50	UNDEFINED
16.00	52.49	361.10	5.34	1.48	1.68	sand to silty sand	>90	44-46	>50	UNDEFINED
16.25	53.31	399.18	3.95	0.99	1.70	sand	>90	44-46	>50	UNDEFINED
16.50	54.13	444.56	3.67	0.82	1.72	gravelly sand to sand	>90	44-46	>50	UNDEFINED
16.75	54.95	343.42	4.48	1.30	1.74	sand	>90	44-46	>50	UNDEFINED
17.00	55.77	287.82	2.92	1.01	1.76	sand	80-90	42-44	>50	UNDEFINED
17.25	56.59	295.24	6.99	2.37	1.78	silty sand to sandy silt	80-90	42-44	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-6
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/06/00 7:54
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	52.38	0.46	0.87	0.02	silty sand to sandy silt	>90	>48	17	UNDEFINED
0.50	1.64	117.78	0.76	0.64	0.07	sand to silty sand	>90	>48	28	UNDEFINED
0.75	2.46	124.54	0.58	0.46	0.12	sand	>90	>48	24	UNDEFINED
1.00	3.28	108.04	0.43	0.40	0.17	sand	>90	>48	21	UNDEFINED
1.25	4.10	73.24	0.31	0.42	0.21	sand to silty sand	70-80	46-48	18	UNDEFINED
1.50	4.92	58.26	0.31	0.53	0.26	sand to silty sand	70-80	44-46	14	UNDEFINED
1.75	5.74	70.78	0.36	0.51	0.31	sand to silty sand	70-80	44-46	17	UNDEFINED
2.00	6.56	69.48	0.15	0.22	0.35	sand to silty sand	70-80	42-44	17	UNDEFINED
2.25	7.38	36.64	0.04	0.11	0.40	sand to silty sand	50-60	40-42	9	UNDEFINED
2.50	8.20	53.62	0.27	0.50	0.45	sand to silty sand	60-70	40-42	13	UNDEFINED
2.75	9.02	106.18	0.79	0.74	0.50	sand to silty sand	70-80	44-46	25	UNDEFINED
3.00	9.84	80.72	0.35	0.43	0.54	sand to silty sand	60-70	42-44	19	UNDEFINED
3.25	10.66	38.28	0.20	0.52	0.58	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
3.50	11.48	26.34	0.14	0.54	0.60	silty sand to sandy silt	<40	36-38	8	UNDEFINED
3.75	12.30	40.14	0.21	0.53	0.62	silty sand to sandy silt	40-50	38-40	13	UNDEFINED
4.00	13.12	17.00	0.07	0.39	0.64	sandy silt to clayey silt	UNDFND	UNDFD	7	1.6
4.25	13.94	19.46	0.07	0.37	0.66	silty sand to sandy silt	<40	34-36	6	UNDEFINED
4.50	14.76	21.20	0.22	1.02	0.68	sandy silt to clayey silt	UNDFND	UNDFD	8	2.0
4.75	15.58	69.42	0.04	0.05	0.71	sand to silty sand	60-70	40-42	17	UNDEFINED
5.00	16.40	0.46	0.04	7.96	0.73	undefined	UNDFND	UNDFD	UDF	UNDEFINED
5.25	17.22	0.48	0.03	6.79	0.75	undefined	UNDFND	UNDFD	UDF	UNDEFINED
5.50	18.04	0.50	0.03	5.08	0.77	undefined	UNDFND	UNDFD	UDF	UNDEFINED

Dr - All sands (Janiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-6-A
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/06/00 8:30
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	22.64	0.25	1.09	0.02	sandy silt to clayey silt	UNDFND	UNDFD	9	2.2
0.50	1.64	120.86	0.86	0.71	0.07	sand to silty sand	>90	>48	29	UNDEFINED
0.75	2.46	125.86	0.86	0.68	0.12	sand	>90	>48	24	UNDEFINED
1.00	3.28	140.54	0.59	0.42	0.17	sand	>90	>48	27	UNDEFINED
1.25	4.10	98.04	0.45	0.46	0.21	sand to silty sand	80-90	46-48	23	UNDEFINED
1.50	4.92	76.02	0.25	0.32	0.26	sand to silty sand	70-80	44-46	18	UNDEFINED
1.75	5.74	79.46	0.24	0.30	0.31	sand to silty sand	70-80	44-46	19	UNDEFINED
2.00	6.56	84.26	0.18	0.21	0.35	sand	70-80	44-46	16	UNDEFINED
2.25	7.38	44.38	0.19	0.43	0.40	sand to silty sand	50-60	40-42	11	UNDEFINED
2.50	8.20	39.80	0.18	0.45	0.45	silty sand to sandy silt	50-60	40-42	13	UNDEFINED
2.75	9.02	47.18	0.35	0.74	0.50	silty sand to sandy silt	50-60	40-42	15	UNDEFINED
3.00	9.84	50.82	0.24	0.47	0.54	sand to silty sand	50-60	40-42	12	UNDEFINED
3.25	10.66	69.64	0.31	0.44	0.58	sand to silty sand	60-70	40-42	17	UNDEFINED
3.50	11.48	83.74	0.40	0.48	0.60	sand to silty sand	60-70	42-44	20	UNDEFINED
3.75	12.30	85.36	0.40	0.46	0.62	sand to silty sand	60-70	42-44	20	UNDEFINED
4.00	13.12	38.92	0.22	0.55	0.64	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
4.25	13.94	25.08	0.02	0.06	0.66	silty sand to sandy silt	<40	36-38	8	UNDEFINED
4.50	14.76	10.34	0.04	0.40	0.68	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
4.75	15.58	7.00	0.06	0.89	0.71	sensitive fine grained	UNDFND	UNDFD	3	.6
5.00	16.40	7.08	0.05	0.67	0.73	sensitive fine grained	UNDFND	UNDFD	3	.6
5.25	17.22	5.08	0.09	1.77	0.75	silty clay to clay	UNDFND	UNDFD	3	.4
5.50	18.04	9.94	0.16	1.65	0.77	clayey silt to silty clay	UNDFND	UNDFD	5	.8
5.75	18.86	8.02	0.10	1.25	0.79	clayey silt to silty clay	UNDFND	UNDFD	4	.6
6.00	19.69	7.54	0.09	1.17	0.81	undefined	UNDFND	UNDFD	UDF	UNDEFINED
6.25	20.51	7.66	0.08	0.99	0.84	sensitive fine grained	UNDFND	UNDFD	4	.6
6.50	21.33	7.26	0.06	0.80	0.86	sensitive fine grained	UNDFND	UNDFD	3	.6
6.75	22.15	6.18	0.04	0.65	0.88	sensitive fine grained	UNDFND	UNDFD	3	.4
7.00	22.97	7.30	0.05	0.75	0.90	sensitive fine grained	UNDFND	UNDFD	3	.6
7.25	23.79	6.80	0.05	0.81	0.92	sensitive fine grained	UNDFND	UNDFD	3	.5
7.50	24.61	8.12	0.06	0.71	0.94	sensitive fine grained	UNDFND	UNDFD	4	.6
7.75	25.43	27.52	0.11	0.38	0.96	silty sand to sandy silt	<40	34-36	9	UNDEFINED
8.00	26.25	26.34	0.05	0.20	0.99	silty sand to sandy silt	<40	32-34	8	UNDEFINED
8.25	27.07	10.88	0.05	0.47	1.01	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
8.50	27.89	20.46	0.16	0.77	1.03	sandy silt to clayey silt	UNDFND	UNDFD	8	1.8
8.75	28.71	29.36	0.11	0.38	1.05	silty sand to sandy silt	<40	34-36	9	UNDEFINED
9.00	29.53	28.20	0.12	0.41	1.07	silty sand to sandy silt	<40	32-34	9	UNDEFINED
9.25	30.35	25.24	0.08	0.33	1.09	silty sand to sandy silt	<40	32-34	8	UNDEFINED
9.50	31.17	20.10	0.12	0.62	1.12	sandy silt to clayey silt	UNDFND	UNDFD	8	1.8

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) **

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-6-A Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	15.20	0.17	1.11	1.14	sandy silt to clayey silt	UNDFND	UNDFD	6	1.3
10.00	32.81	12.16	0.06	0.53	1.16	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
10.25	33.63	8.56	0.04	0.45	1.18	sensitive fine grained	UNDFND	UNDFD	4	.6
10.50	34.45	11.24	0.03	0.25	1.20	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
10.75	35.27	11.82	0.08	0.69	1.22	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
11.00	36.09	55.26	0.20	0.37	1.24	sand to silty sand	40-50	36-38	13	UNDEFINED
11.25	36.91	27.92	0.25	0.91	1.27	silty sand to sandy silt	<40	32-34	9	UNDEFINED
11.50	37.73	26.10	0.16	0.60	1.29	silty sand to sandy silt	<40	30-32	8	UNDEFINED
11.75	38.55	94.70	0.60	0.63	1.31	sand to silty sand	60-70	38-40	23	UNDEFINED
12.00	39.37	137.10	0.82	0.60	1.33	sand	70-80	40-42	26	UNDEFINED
12.25	40.19	135.98	0.94	0.69	1.35	sand	70-80	40-42	26	UNDEFINED
12.50	41.01	135.70	0.82	0.61	1.37	sand	70-80	40-42	26	UNDEFINED
12.75	41.83	129.88	2.88	2.22	1.40	silty sand to sandy silt	60-70	40-42	41	UNDEFINED
13.00	42.65	140.22	6.49	4.63	1.42	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
13.25	43.47	251.50	6.83	2.72	1.44	silty sand to sandy silt	80-90	42-44	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-7
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :06/29/94 11:18
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	69.42	0.46	0.66	0.02	sand to silty sand	>90	>48	17	UNDEFINED
0.50	1.64	117.74	1.23	1.05	0.07	sand to silty sand	>90	>48	28	UNDEFINED
0.75	2.46	78.44	0.45	0.58	0.12	sand to silty sand	>90	>48	19	UNDEFINED
1.00	3.28	60.76	0.27	0.45	0.17	sand to silty sand	70-80	46-48	15	UNDEFINED
1.25	4.10	58.14	0.30	0.51	0.21	sand to silty sand	70-80	44-46	14	UNDEFINED
1.50	4.92	69.68	0.35	0.51	0.26	sand to silty sand	70-80	44-46	17	UNDEFINED
1.75	5.74	62.54	0.31	0.49	0.31	sand to silty sand	70-80	44-46	15	UNDEFINED
2.00	6.56	60.42	0.28	0.46	0.35	sand to silty sand	60-70	42-44	14	UNDEFINED
2.25	7.38	54.48	0.28	0.52	0.40	sand to silty sand	60-70	42-44	13	UNDEFINED
2.50	8.20	59.04	0.31	0.53	0.45	sand to silty sand	60-70	42-44	14	UNDEFINED
2.75	9.02	72.18	0.38	0.52	0.50	sand to silty sand	60-70	42-44	17	UNDEFINED
3.00	9.84	63.92	0.38	0.60	0.54	sand to silty sand	60-70	40-42	15	UNDEFINED
3.25	10.66	27.48	0.24	0.86	0.58	silty sand to sandy silt	<40	36-38	9	UNDEFINED
3.50	11.48	25.98	0.21	0.82	0.60	silty sand to sandy silt	<40	36-38	8	UNDEFINED
3.75	12.30	13.46	0.21	1.54	0.62	clayey silt to silty clay	UNDFND	UNDFD	6	1.2
4.00	13.12	6.08	0.11	1.86	0.64	silty clay to clay	UNDFND	UNDFD	4	.5
4.25	13.94	32.90	0.25	0.75	0.66	silty sand to sandy silt	40-50	36-38	11	UNDEFINED
4.50	14.76	40.02	0.31	0.78	0.68	silty sand to sandy silt	40-50	38-40	13	UNDEFINED
4.75	15.58	38.24	0.28	0.73	0.71	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
5.00	16.40	11.24	0.17	1.48	0.73	clayey silt to silty clay	UNDFND	UNDFD	5	1.0
5.25	17.22	3.30	0.01	0.39	0.75	sensitive fine grained	UNDFND	UNDFD	2	.2
5.50	18.04	2.68	0.01	0.34	0.77	sensitive fine grained	UNDFND	UNDFD	1	.1
5.75	18.86	3.28	0.02	0.48	0.79	sensitive fine grained	UNDFND	UNDFD	2	.2
6.00	19.69	4.18	0.01	0.30	0.81	sensitive fine grained	UNDFND	UNDFD	2	.3
6.25	20.51	4.26	0.01	0.30	0.84	sensitive fine grained	UNDFND	UNDFD	2	.3
6.50	21.33	4.56	0.01	0.32	0.86	sensitive fine grained	UNDFND	UNDFD	2	.3
6.75	22.15	5.84	0.02	0.28	0.88	sensitive fine grained	UNDFND	UNDFD	3	.4
7.00	22.97	6.62	0.01	0.19	0.90	sensitive fine grained	UNDFND	UNDFD	3	.5
7.25	23.79	7.76	0.02	0.28	0.92	sensitive fine grained	UNDFND	UNDFD	4	.6
7.50	24.61	6.58	0.02	0.28	0.94	sensitive fine grained	UNDFND	UNDFD	3	.5
7.75	25.43	12.94	0.01	0.11	0.96	sandy silt to clayey silt	UNDFND	UNDFD	5	1.1
8.00	26.25	25.16	0.02	0.09	0.99	silty sand to sandy silt	<40	32-34	8	UNDEFINED
8.25	27.07	51.84	0.30	0.57	1.01	sand to silty sand	40-50	36-38	12	UNDEFINED
8.50	27.89	9.08	0.06	0.66	1.03	clayey silt to silty clay	UNDFND	UNDFD	4	.7
8.75	28.71	8.68	0.01	0.09	1.05	sensitive fine grained	UNDFND	UNDFD	4	.7
9.00	29.53	8.24	0.01	0.11	1.07	sensitive fine grained	UNDFND	UNDFD	4	.6
9.25	30.35	7.04	0.01	0.14	1.09	sensitive fine grained	UNDFND	UNDFD	3	.5
9.50	31.17	6.24	0.01	0.18	1.12	sensitive fine grained	UNDFND	UNDFD	3	.4

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) **

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-7 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	6.62	0.02	0.25	1.14	sensitive fine grained	UNDFND	UNDFD	3	.4
10.00	32.81	6.56	0.01	0.11	1.16	sensitive fine grained	UNDFND	UNDFD	3	.4
10.25	33.63	12.74	0.01	0.10	1.18	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
10.50	34.45	19.58	0.03	0.13	1.20	silty sand to sandy silt	<40	30-32	6	UNDEFINED
10.75	35.27	11.70	0.04	0.37	1.22	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
11.00	36.09	7.58	0.01	0.15	1.24	sensitive fine grained	UNDFND	UNDFD	4	.5
11.25	36.91	8.86	0.02	0.21	1.27	sensitive fine grained	UNDFND	UNDFD	4	.6
11.50	37.73	13.92	0.04	0.28	1.29	sandy silt to clayey silt	UNDFND	UNDFD	5	1.1
11.75	38.55	20.46	0.07	0.34	1.31	silty sand to sandy silt	<40	30-32	7	UNDEFINED
12.00	39.37	38.74	0.17	0.44	1.33	silty sand to sandy silt	<40	34-36	12	UNDEFINED
12.25	40.19	42.52	0.19	0.46	1.35	silty sand to sandy silt	<40	34-36	14	UNDEFINED
12.50	41.01	49.76	0.20	0.40	1.37	sand to silty sand	40-50	36-38	12	UNDEFINED
12.75	41.83	48.22	0.19	0.39	1.40	sand to silty sand	40-50	34-36	12	UNDEFINED
13.00	42.65	38.46	0.09	0.23	1.42	sand to silty sand	<40	32-34	9	UNDEFINED
13.25	43.47	63.56	2.22	3.50	1.44	clayey silt to silty clay	UNDFND	UNDFD	30	6.1
13.50	44.29	120.58	4.42	3.66	1.46	sandy silt to clayey silt	UNDFND	UNDFD	46	11.8
13.75	45.11	119.38	3.34	2.80	1.48	sandy silt to clayey silt	UNDFND	UNDFD	46	11.6
14.00	45.93	138.96	1.58	1.13	1.50	sand to silty sand	70-80	40-42	33	UNDEFINED
14.25	46.75	280.98	2.66	0.95	1.52	sand	>90	42-44	>50	UNDEFINED
14.50	47.57	329.92	3.86	1.17	1.55	sand	>90	44-46	>50	UNDEFINED
14.75	48.39	279.70	3.95	1.41	1.57	sand to silty sand	80-90	42-44	>50	UNDEFINED
15.00	49.21	297.62	4.31	1.45	1.59	sand to silty sand	>90	42-44	>50	UNDEFINED
15.25	50.03	266.92	4.63	1.73	1.61	sand to silty sand	80-90	42-44	>50	UNDEFINED
15.50	50.85	244.74	2.13	0.87	1.63	sand	80-90	42-44	47	UNDEFINED
15.75	51.67	117.60	5.38	4.58	1.65	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
16.00	52.49	186.02	5.24	2.82	1.68	silty sand to sandy silt	70-80	40-42	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-8
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :06/28/94 8:22
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	86.52	0.38	0.44	0.02	sand to silty sand	>90	>48	21	UNDEFINED
0.50	1.64	194.72	1.63	0.84	0.07	sand	>90	>48	37	UNDEFINED
0.75	2.46	208.36	1.47	0.71	0.12	sand	>90	>48	40	UNDEFINED
1.00	3.28	162.40	0.86	0.53	0.17	sand	>90	>48	31	UNDEFINED
1.25	4.10	125.56	0.60	0.48	0.21	sand	>90	>48	24	UNDEFINED
1.50	4.92	99.24	0.49	0.49	0.26	sand to silty sand	80-90	46-48	24	UNDEFINED
1.75	5.74	85.92	0.44	0.52	0.31	sand to silty sand	70-80	44-46	21	UNDEFINED
2.00	6.56	83.62	0.47	0.57	0.35	sand to silty sand	70-80	44-46	20	UNDEFINED
2.25	7.38	114.72	0.59	0.52	0.40	sand	80-90	44-46	22	UNDEFINED
2.50	8.20	122.66	0.64	0.52	0.45	sand	80-90	44-46	23	UNDEFINED
2.75	9.02	118.36	0.56	0.47	0.50	sand	80-90	44-46	23	UNDEFINED
3.00	9.84	106.36	0.49	0.46	0.54	sand	70-80	42-44	20	UNDEFINED
3.25	10.66	86.70	0.42	0.48	0.58	sand to silty sand	70-80	42-44	21	UNDEFINED
3.50	11.48	69.16	0.35	0.51	0.60	sand to silty sand	60-70	40-42	17	UNDEFINED
3.75	12.30	84.28	0.44	0.53	0.62	sand to silty sand	60-70	42-44	20	UNDEFINED
4.00	13.12	38.94	0.35	0.91	0.64	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
4.25	13.94	21.54	0.08	0.36	0.66	silty sand to sandy silt	<40	34-36	7	UNDEFINED
4.50	14.76	40.08	0.21	0.52	0.68	silty sand to sandy silt	40-50	38-40	13	UNDEFINED
4.75	15.58	32.96	0.46	1.40	0.71	sandy silt to clayey silt	UNDFND	UNDFD	13	3.2
5.00	16.40	19.70	0.13	0.65	0.73	sandy silt to clayey silt	UNDFND	UNDFD	8	1.8
5.25	17.22	36.64	0.41	1.12	0.75	silty sand to sandy silt	40-50	36-38	12	UNDEFINED
5.50	18.04	7.12	0.08	1.12	0.77	sensitive fine grained	UNDFND	UNDFD	3	.6
5.75	18.86	7.96	0.03	0.40	0.79	sensitive fine grained	UNDFND	UNDFD	4	.6
6.00	19.69	6.16	0.03	0.49	0.81	sensitive fine grained	UNDFND	UNDFD	3	.5
6.25	20.51	6.22	0.03	0.53	0.84	sensitive fine grained	UNDFND	UNDFD	3	.5
6.50	21.33	6.76	0.06	0.83	0.86	sensitive fine grained	UNDFND	UNDFD	3	.5
6.75	22.15	7.06	0.04	0.63	0.88	sensitive fine grained	UNDFND	UNDFD	3	.5
7.00	22.97	7.68	0.11	1.45	0.90	clayey silt to silty clay	UNDFND	UNDFD	4	.6
7.25	23.79	6.34	0.04	0.58	0.92	sensitive fine grained	UNDFND	UNDFD	3	.4
7.50	24.61	7.10	0.07	0.99	0.94	sensitive fine grained	UNDFND	UNDFD	3	.5
7.75	25.43	6.76	0.07	1.01	0.96	sensitive fine grained	UNDFND	UNDFD	3	.5
8.00	26.25	8.70	0.05	0.54	0.99	sensitive fine grained	UNDFND	UNDFD	4	.7
8.25	27.07	6.64	0.00	0.07	1.01	sensitive fine grained	UNDFND	UNDFD	3	.5
8.50	27.89	6.08	0.01	0.18	1.03	sensitive fine grained	UNDFND	UNDFD	3	.4
8.75	28.71	7.60	0.01	0.18	1.05	sensitive fine grained	UNDFND	UNDFD	4	.5
9.00	29.53	15.46	0.07	0.44	1.07	sandy silt to clayey silt	UNDFND	UNDFD	6	1.3
9.25	30.35	8.88	0.01	0.08	1.09	sensitive fine grained	UNDFND	UNDFD	4	.7
9.50	31.17	7.38	0.02	0.25	1.12	sensitive fine grained	UNDFND	UNDFD	4	.5

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-8 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	7.72	0.01	0.12	1.14	sensitive fine grained	UNDFND	UNDFD	4	.5
10.00	32.81	10.96	0.00	0.03	1.16	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
10.25	33.63	17.00	0.05	0.27	1.18	sandy silt to clayey silt	UNDFND	UNDFD	7	1.5
10.50	34.45	27.78	0.14	0.50	1.20	silty sand to sandy silt	<40	32-34	9	UNDEFINED
10.75	35.27	38.42	0.20	0.51	1.22	silty sand to sandy silt	<40	34-36	12	UNDEFINED
11.00	36.09	23.80	0.10	0.43	1.24	silty sand to sandy silt	<40	30-32	8	UNDEFINED
11.25	36.91	10.98	0.03	0.32	1.27	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
11.50	37.73	9.68	0.04	0.40	1.29	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
11.75	38.55	10.20	0.06	0.55	1.31	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
12.00	39.37	9.52	0.04	0.39	1.33	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
12.25	40.19	9.60	0.01	0.07	1.35	sensitive fine grained	UNDFND	UNDFD	5	.7
12.50	41.01	8.94	0.01	0.08	1.37	sensitive fine grained	UNDFND	UNDFD	4	.6
12.75	41.83	12.26	0.01	0.09	1.40	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
13.00	42.65	23.44	0.14	0.58	1.42	silty sand to sandy silt	<40	30-32	7	UNDEFINED
13.25	43.47	94.66	0.66	0.70	1.44	sand to silty sand	50-60	38-40	23	UNDEFINED
13.50	44.29	187.68	1.37	0.73	1.46	sand	70-80	42-44	36	UNDEFINED
13.75	45.11	217.12	1.47	0.68	1.48	sand	80-90	42-44	42	UNDEFINED
14.00	45.93	239.86	2.31	0.96	1.50	sand	80-90	42-44	46	UNDEFINED
14.25	46.75	358.44	3.81	1.06	1.52	sand	>90	44-46	>50	UNDEFINED
14.50	47.57	299.36	3.34	1.12	1.55	sand	>90	42-44	>50	UNDEFINED
14.75	48.39	300.76	2.69	0.89	1.57	sand	>90	42-44	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-10
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/05/00 8:40
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	11.56	0.06	0.48	0.02	sandy silt to clayey silt	UNDFND	UNDFD	4	1.1
0.50	1.64	61.12	0.43	0.70	0.07	sand to silty sand	>90	>48	15	UNDEFINED
0.75	2.46	85.34	0.69	0.81	0.12	sand to silty sand	>90	>48	20	UNDEFINED
1.00	3.28	90.14	0.52	0.57	0.17	sand to silty sand	80-90	>48	22	UNDEFINED
1.25	4.10	112.04	0.51	0.45	0.21	sand	>90	46-48	21	UNDEFINED
1.50	4.92	102.06	0.43	0.42	0.26	sand	80-90	46-48	20	UNDEFINED
1.75	5.74	93.98	0.44	0.47	0.31	sand to silty sand	80-90	44-46	23	UNDEFINED
2.00	6.56	85.28	0.43	0.51	0.35	sand to silty sand	70-80	44-46	20	UNDEFINED
2.25	7.38	77.56	0.39	0.50	0.40	sand to silty sand	70-80	42-44	19	UNDEFINED
2.50	8.20	69.90	0.35	0.51	0.45	sand to silty sand	60-70	42-44	17	UNDEFINED
2.75	9.02	59.94	0.37	0.61	0.50	sand to silty sand	60-70	40-42	14	UNDEFINED
3.00	9.84	52.80	0.35	0.66	0.54	sand to silty sand	50-60	40-42	13	UNDEFINED
3.25	10.66	52.50	0.32	0.61	0.58	sand to silty sand	50-60	40-42	13	UNDEFINED
3.50	11.48	51.00	0.32	0.63	0.60	sand to silty sand	50-60	40-42	12	UNDEFINED
3.75	12.30	48.30	0.37	0.77	0.62	silty sand to sandy silt	50-60	38-40	15	UNDEFINED
4.00	13.12	58.56	0.35	0.59	0.64	sand to silty sand	50-60	40-42	14	UNDEFINED
4.25	13.94	45.22	0.44	0.98	0.66	silty sand to sandy silt	40-50	38-40	14	UNDEFIN
4.50	14.76	45.16	0.41	0.91	0.68	silty sand to sandy silt	40-50	38-40	14	UNDEFIN
4.75	15.58	74.42	0.42	0.57	0.71	sand to silty sand	60-70	40-42	18	UNDEFINED
5.00	16.40	65.14	0.41	0.63	0.73	sand to silty sand	50-60	40-42	16	UNDEFINED
5.25	17.22	19.96	0.38	1.91	0.75	sandy silt to clayey silt	UNDFND	UNDFD	8	1.8
5.50	18.04	7.06	0.21	2.99	0.77	clay	UNDFND	UNDFD	7	.6
5.75	18.86	62.20	0.25	0.40	0.79	sand to silty sand	50-60	38-40	15	UNDEFINED
6.00	19.69	120.06	0.69	0.57	0.81	sand	70-80	42-44	23	UNDEFINED
6.25	20.51	68.00	0.38	0.56	0.84	sand to silty sand	50-60	40-42	16	UNDEFINED
6.50	21.33	7.96	0.01	0.08	0.86	sensitive fine grained	UNDFND	UNDFD	4	.6
6.75	22.15	7.68	0.04	0.55	0.88	sensitive fine grained	UNDFND	UNDFD	4	.6
7.00	22.97	10.38	0.10	0.94	0.90	clayey silt to silty clay	UNDFND	UNDFD	5	.9
7.25	23.79	5.32	0.06	1.09	0.92	sensitive fine grained	UNDFND	UNDFD	3	.3
7.50	24.61	4.92	0.04	0.75	0.94	sensitive fine grained	UNDFND	UNDFD	2	.3
7.75	25.43	5.04	0.06	1.12	0.96	sensitive fine grained	UNDFND	UNDFD	2	.3
8.00	26.25	6.52	0.09	1.32	0.99	sensitive fine grained	UNDFND	UNDFD	3	.5
8.25	27.07	5.74	0.07	1.30	1.01	sensitive fine grained	UNDFND	UNDFD	3	.4
8.50	27.89	5.08	0.06	1.11	1.03	sensitive fine grained	UNDFND	UNDFD	2	.3
8.75	28.71	5.52	0.06	1.08	1.05	sensitive fine grained	UNDFND	UNDFD	3	.3
9.00	29.53	5.96	0.07	1.15	1.07	sensitive fine grained	UNDFND	UNDFD	3	.4
9.25	30.35	8.78	0.07	0.85	1.09	clayey silt to silty clay	UNDFND	UNDFD	4	.7
9.50	31.17	6.06	0.05	0.78	1.12	sensitive fine grained	UNDFND	UNDFD	3	.4

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-10 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	9.20	0.03	0.37	1.14	sensitive fine grained	UNDFND	UNDFD	4	.7
10.00	32.81	11.58	0.05	0.44	1.16	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
10.25	33.63	12.78	0.06	0.47	1.18	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
10.50	34.45	8.18	0.04	0.43	1.20	sensitive fine grained	UNDFND	UNDFD	4	.6
10.75	35.27	8.36	0.03	0.37	1.22	sensitive fine grained	UNDFND	UNDFD	4	.6
11.00	36.09	7.62	0.02	0.32	1.24	sensitive fine grained	UNDFND	UNDFD	4	.5
11.25	36.91	12.90	0.07	0.55	1.27	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
11.50	37.73	7.46	0.05	0.66	1.29	sensitive fine grained	UNDFND	UNDFD	4	.5
11.75	38.55	7.16	0.04	0.59	1.31	sensitive fine grained	UNDFND	UNDFD	3	.4
12.00	39.37	7.80	0.07	0.90	1.33	sensitive fine grained	UNDFND	UNDFD	4	.5
12.25	40.19	7.96	0.09	1.08	1.35	clayey silt to silty clay	UNDFND	UNDFD	4	.5
12.50	41.01	8.44	0.09	1.01	1.37	clayey silt to silty clay	UNDFND	UNDFD	4	.6
12.75	41.83	7.40	0.08	1.02	1.40	sensitive fine grained	UNDFND	UNDFD	4	.5
13.00	42.65	7.58	0.07	0.97	1.42	sensitive fine grained	UNDFND	UNDFD	4	.5
13.25	43.47	7.90	0.08	1.07	1.44	clayey silt to silty clay	UNDFND	UNDFD	4	.5
13.50	44.29	7.60	0.08	1.10	1.46	undefined	UNDFND	UNDFD	UDF	UNDEFINED
13.75	45.11	9.84	0.05	0.48	1.48	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
14.00	45.93	17.20	0.11	0.63	1.50	sandy silt to clayey silt	UNDFND	UNDFD	7	1.4
14.25	46.75	31.52	0.26	0.84	1.52	silty sand to sandy silt	<40	30-32	10	UNDEFINED
14.50	47.57	91.78	0.74	0.81	1.55	sand to silty sand	50-60	38-40	22	UNDEFINED
14.75	48.39	224.12	1.76	0.79	1.57	sand	80-90	42-44	43	UNDEFINED
15.00	49.21	294.38	2.75	0.94	1.59	sand	>90	42-44	>50	UNDEFINED
15.25	50.03	318.52	3.43	1.08	1.61	sand	>90	44-46	>50	UNDEFINED
15.50	50.85	301.88	3.10	1.03	1.63	sand	>90	42-44	>50	UNDEFINED
15.75	51.67	275.26	2.58	0.94	1.65	sand	80-90	42-44	>50	UNDEFINED
16.00	52.49	231.68	2.39	1.03	1.68	sand	80-90	42-44	44	UNDEFINED
16.25	53.31	241.88	2.19	0.90	1.70	sand	80-90	42-44	46	UNDEFINED
16.50	54.13	310.64	3.04	0.98	1.72	sand	>90	42-44	>50	UNDEFINED
16.75	54.95	305.62	3.09	1.01	1.74	sand	>90	42-44	>50	UNDEFINED
17.00	55.77	286.28	3.11	1.08	1.76	sand	80-90	42-44	>50	UNDEFINED
17.25	56.59	251.32	2.41	0.96	1.78	sand	80-90	42-44	48	UNDEFINED
17.50	57.41	229.16	1.58	0.69	1.80	sand	80-90	42-44	44	UNDEFINED
17.75	58.23	217.96	1.53	0.70	1.83	sand	80-90	40-42	42	UNDEFINED
18.00	59.06	194.52	1.58	0.81	1.85	sand	70-80	40-42	37	UNDEFINED
18.25	59.88	159.96	0.82	0.51	1.87	sand	70-80	40-42	31	UNDEFINED
18.50	60.70	165.84	0.72	0.44	1.89	sand	70-80	40-42	32	UNDEFINED
18.75	61.52	61.62	0.56	0.92	1.91	silty sand to sandy silt	40-50	34-36	20	UNDEFINED
19.00	62.34	62.16	0.58	0.93	1.93	silty sand to sandy silt	40-50	34-36	20	UNDEFINED
19.25	63.16	148.36	2.69	1.81	1.96	silty sand to sandy silt	60-70	38-40	47	UNDEFINED
19.50	63.98	90.80	4.28	4.72	1.98	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
19.75	64.80	81.66	4.57	5.60	2.00	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
20.00	65.62	85.92	4.80	5.58	2.02	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-10 Page No. 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
20.25	66.44	180.72	4.18	2.32	2.04	silty sand to sandy silt	70-80	40-42	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-11
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :06/28/94 6:40
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	66.06	0.49	0.74	0.02	sand to silty sand	>90	>48	16	UNDEFINED
0.50	1.64	121.70	0.76	0.63	0.07	sand	>90	>48	23	UNDEFINED
0.75	2.46	135.36	0.90	0.67	0.12	sand	>90	>48	26	UNDEFINED
1.00	3.28	119.38	0.55	0.46	0.17	sand	>90	>48	23	UNDEFINED
1.25	4.10	93.68	0.38	0.41	0.21	sand to silty sand	80-90	46-48	22	UNDEFINED
1.50	4.92	74.30	0.30	0.40	0.26	sand to silty sand	70-80	44-46	18	UNDEFINED
1.75	5.74	66.12	0.30	0.45	0.31	sand to silty sand	70-80	44-46	16	UNDEFINED
2.00	6.56	58.92	0.31	0.52	0.35	sand to silty sand	60-70	42-44	14	UNDEFINED
2.25	7.38	56.40	0.29	0.52	0.40	sand to silty sand	60-70	42-44	14	UNDEFINED
2.50	8.20	58.46	0.30	0.51	0.45	sand to silty sand	60-70	42-44	14	UNDEFINED
2.75	9.02	54.68	0.31	0.57	0.50	sand to silty sand	50-60	40-42	13	UNDEFINED
3.00	9.84	48.28	0.28	0.59	0.54	sand to silty sand	50-60	40-42	12	UNDEFINED
3.25	10.66	53.86	0.31	0.58	0.58	sand to silty sand	50-60	40-42	13	UNDEFINED
3.50	11.48	49.62	0.32	0.64	0.60	silty sand to sandy silt	50-60	40-42	16	UNDEFINED
3.75	12.30	57.34	0.33	0.58	0.62	sand to silty sand	50-60	40-42	14	UNDEFINED
4.00	13.12	71.48	0.39	0.54	0.64	sand to silty sand	60-70	40-42	17	UNDEFINED
4.25	13.94	44.78	0.26	0.59	0.66	silty sand to sandy silt	40-50	38-40	14	UNDEFINED
4.50	14.76	45.12	0.23	0.52	0.68	silty sand to sandy silt	40-50	38-40	14	UNDEFINED
4.75	15.58	21.72	0.20	0.90	0.71	sandy silt to clayey silt	UNDFND	UNDFD	8	2.0
5.00	16.40	7.20	0.18	2.51	0.73	silty clay to clay	UNDFND	UNDFD	5	.6
5.25	17.22	19.12	0.21	1.09	0.75	sandy silt to clayey silt	UNDFND	UNDFD	7	1.8
5.50	18.04	4.10	0.03	0.81	0.77	sensitive fine grained	UNDFND	UNDFD	2	.3
5.75	18.86	3.90	0.06	1.58	0.79	sensitive fine grained	UNDFND	UNDFD	2	.2
6.00	19.69	4.12	0.10	2.31	0.81	clay	UNDFND	UNDFD	4	.3
6.25	20.51	5.10	0.08	1.53	0.84	sensitive fine grained	UNDFND	UNDFD	2	.3
6.50	21.33	4.24	0.09	2.23	0.86	clay	UNDFND	UNDFD	4	.3
6.75	22.15	4.00	0.08	2.02	0.88	clay	UNDFND	UNDFD	4	.2
7.00	22.97	5.30	0.15	2.76	0.90	clay	UNDFND	UNDFD	5	.4
7.25	23.79	4.02	0.07	1.80	0.92	sensitive fine grained	UNDFND	UNDFD	2	.2
7.50	24.61	4.30	0.07	1.52	0.94	sensitive fine grained	UNDFND	UNDFD	2	.2
7.75	25.43	5.34	0.05	0.88	0.96	sensitive fine grained	UNDFND	UNDFD	3	.3
8.00	26.25	8.66	0.05	0.58	0.99	sensitive fine grained	UNDFND	UNDFD	4	.7
8.25	27.07	4.74	0.03	0.60	1.01	sensitive fine grained	UNDFND	UNDFD	2	.3
8.50	27.89	6.00	0.05	0.81	1.03	sensitive fine grained	UNDFND	UNDFD	3	.4
8.75	28.71	8.72	0.06	0.66	1.05	undefined	UNDFND	UNDFD	UDF	UNDEFINED
9.00	29.53	8.90	0.06	0.69	1.07	clayey silt to silty clay	UNDFND	UNDFD	4	.7
9.25	30.35	26.48	0.08	0.30	1.09	silty sand to sandy silt	<40	32-34	8	UNDEFINED
9.50	31.17	19.14	0.11	0.56	1.12	sandy silt to clayey silt	UNDFND	UNDFD	7	1.7

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-11 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	27.26	0.14	0.52	1.14	silty sand to sandy silt	<40	32-34	9	UNDEFINED
10.00	32.81	42.44	0.27	0.64	1.16	silty sand to sandy silt	<40	36-38	14	UNDEFINED
10.25	33.63	51.70	0.33	0.64	1.18	sand to silty sand	40-50	36-38	12	UNDEFINED
10.50	34.45	49.96	0.27	0.53	1.20	sand to silty sand	40-50	36-38	12	UNDEFINED
10.75	35.27	40.94	0.18	0.44	1.22	silty sand to sandy silt	<40	34-36	13	UNDEFINED
11.00	36.09	14.68	0.12	0.80	1.24	sandy silt to clayey silt	UNDFND	UNDFD	6	1.2
11.25	36.91	6.98	0.05	0.65	1.27	sensitive fine grained	UNDFND	UNDFD	3	.4
11.50	37.73	7.20	0.05	0.74	1.29	sensitive fine grained	UNDFND	UNDFD	3	.5
11.75	38.55	7.20	0.07	0.97	1.31	sensitive fine grained	UNDFND	UNDFD	3	.5
12.00	39.37	6.70	0.06	0.89	1.33	sensitive fine grained	UNDFND	UNDFD	3	.4
12.25	40.19	7.00	0.07	0.95	1.35	sensitive fine grained	UNDFND	UNDFD	3	.4
12.50	41.01	7.28	0.06	0.80	1.37	sensitive fine grained	UNDFND	UNDFD	3	.4
12.75	41.83	7.84	0.07	0.90	1.40	sensitive fine grained	UNDFND	UNDFD	4	.5
13.00	42.65	6.94	0.07	1.04	1.42	sensitive fine grained	UNDFND	UNDFD	3	.4
13.25	43.47	7.20	0.08	1.05	1.44	sensitive fine grained	UNDFND	UNDFD	3	.4
13.50	44.29	7.18	0.09	1.18	1.46	sensitive fine grained	UNDFND	UNDFD	3	.4
13.75	45.11	7.42	0.09	1.20	1.48	undefined	UNDFND	UNDFD	UDF	UNDEFINED
14.00	45.93	7.68	0.09	1.16	1.50	clayey silt to silty clay	UNDFND	UNDFD	4	.5
14.25	46.75	11.02	0.13	1.22	1.52	clayey silt to silty clay	UNDFND	UNDFD	5	.8
14.50	47.57	54.48	0.42	0.76	1.55	silty sand to sandy silt	40-50	34-36	17	UNDEFINED
14.75	48.39	266.84	2.01	0.75	1.57	sand	80-90	42-44	>50	UNDEFINED
15.00	49.21	308.34	2.83	0.92	1.59	sand	>90	42-44	>50	UNDEFINED
15.25	50.03	271.20	2.70	1.00	1.61	sand	80-90	42-44	>50	UNDEFINED
15.50	50.85	268.26	2.54	0.95	1.63	sand	80-90	42-44	>50	UNDEFINED
15.75	51.67	309.42	2.59	0.84	1.65	sand	>90	42-44	>50	UNDEFINED
16.00	52.49	317.72	2.68	0.84	1.68	sand	>90	42-44	>50	UNDEFINED
16.25	53.31	261.78	2.29	0.88	1.70	sand	80-90	42-44	>50	UNDEFINED
16.50	54.13	280.02	2.13	0.76	1.72	sand	80-90	42-44	>50	UNDEFINED
16.75	54.95	203.12	1.13	0.56	1.74	sand	70-80	40-42	39	UNDEFINED
17.00	55.77	128.88	0.70	0.54	1.76	sand	60-70	38-40	25	UNDEFINED
17.25	56.59	130.96	0.56	0.42	1.78	sand	60-70	38-40	25	UNDEFINED
17.50	57.41	131.82	0.61	0.46	1.80	sand	60-70	38-40	25	UNDEFINED
17.75	58.23	97.70	0.39	0.39	1.83	sand	50-60	36-38	19	UNDEFINED
18.00	59.06	95.26	0.56	0.59	1.85	sand to silty sand	50-60	36-38	23	UNDEFINED
18.25	59.88	141.82	0.66	0.47	1.87	sand	60-70	38-40	27	UNDEFINED
18.50	60.70	51.30	0.80	1.55	1.89	silty sand to sandy silt	<40	32-34	16	UNDEFINED
18.75	61.52	38.44	0.42	1.08	1.91	silty sand to sandy silt	<40	30-32	12	UNDEFINED
19.00	62.34	11.66	0.12	1.04	1.93	sandy silt to clayey silt	UNDFND	UNDFD	4	.8

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOMERY WATSO
On Site Loc:CPT-1-12
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :07/05/94 8:16
Cone Used :407
Water table (meters) : 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	64.40	0.32	0.50	0.02	sand to silty sand	>90	>48	15	UNDEFINED
0.50	1.64	160.02	0.71	0.44	0.07	sand	>90	>48	31	UNDEFINED
0.75	2.46	275.38	1.87	0.68	0.12	sand	>90	>48	>50	UNDEFINED
1.00	3.28	311.62	1.76	0.57	0.17	gravelly sand to sand	>90	>48	50	UNDEFINED
1.25	4.10	189.46	0.73	0.39	0.21	sand	>90	>48	36	UNDEFINED
1.50	4.92	85.12	0.47	0.55	0.26	sand to silty sand	80-90	46-48	20	UNDEFINED
1.75	5.74	50.24	0.20	0.41	0.31	sand to silty sand	60-70	42-44	12	UNDEFINED
2.00	6.56	26.66	0.28	1.05	0.35	sandy silt to clayey silt	UNDFND	UNDFD	10	2.6
2.25	7.38	36.94	0.19	0.52	0.40	silty sand to sandy silt	50-60	40-42	12	UNDEFINED
2.50	8.20	72.72	0.34	0.46	0.45	sand to silty sand	60-70	42-44	17	UNDEFINED
2.75	9.02	64.84	0.33	0.50	0.50	sand to silty sand	60-70	42-44	16	UNDEFINED
3.00	9.84	41.54	0.26	0.62	0.54	silty sand to sandy silt	50-60	38-40	13	UNDEFINED
3.25	10.66	26.80	0.19	0.72	0.58	silty sand to sandy silt	<40	36-38	9	UNDEFINED
3.50	11.48	21.60	0.17	0.79	0.60	sandy silt to clayey silt	UNDFND	UNDFD	8	2.0
3.75	12.30	7.62	0.10	1.28	0.62	clayey silt to silty clay	UNDFND	UNDFD	4	.6
4.00	13.12	3.04	0.08	2.77	0.64	clay	UNDFND	UNDFD	3	.2
4.25	13.94	1.92	0.05	2.48	0.66	clay	UNDFND	UNDFD	2	.1
4.50	14.76	9.92	0.07	0.75	0.68	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
4.75	15.58	4.40	0.05	1.06	0.71	sensitive fine grained	UNDFND	UNDFD	2	.3
5.00	16.40	8.76	0.05	0.62	0.73	sensitive fine grained	UNDFND	UNDFD	4	.7
5.25	17.22	5.40	0.09	1.62	0.75	sensitive fine grained	UNDFND	UNDFD	3	.4
5.50	18.04	11.56	0.05	0.39	0.77	sandy silt to clayey silt	UNDFND	UNDFD	4	1.0
5.75	18.86	10.92	0.06	0.53	0.79	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
6.00	19.69	12.08	0.04	0.35	0.81	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
6.25	20.51	9.48	0.12	1.24	0.84	clayey silt to silty clay	UNDFND	UNDFD	5	.8
6.50	21.33	24.16	0.42	1.74	0.86	sandy silt to clayey silt	UNDFND	UNDFD	9	2.2
6.75	22.15	34.64	0.28	0.81	0.88	silty sand to sandy silt	<40	36-38	11	UNDEFINED
7.00	22.97	76.40	0.34	0.45	0.90	sand to silty sand	60-70	40-42	18	UNDEFINED
7.25	23.79	104.00	0.55	0.53	0.92	sand to silty sand	60-70	40-42	25	UNDEFINED
7.50	24.61	97.42	0.49	0.50	0.94	sand to silty sand	60-70	40-42	23	UNDEFINED
7.75	25.43	106.96	0.52	0.48	0.96	sand	60-70	40-42	20	UNDEFINED
8.00	26.25	70.14	0.45	0.65	0.99	sand to silty sand	50-60	38-40	17	UNDEFINED
8.25	27.07	71.80	0.38	0.53	1.01	sand to silty sand	50-60	38-40	17	UNDEFINED
8.50	27.89	62.10	0.86	1.38	1.03	silty sand to sandy silt	50-60	38-40	20	UNDEFINED
8.75	28.71	21.96	0.25	1.15	1.05	sandy silt to clayey silt	UNDFND	UNDFD	8	2.0
9.00	29.53	11.06	0.16	1.48	1.07	clayey silt to silty clay	UNDFND	UNDFD	5	.9
9.25	30.35	18.46	0.31	1.69	1.09	sandy silt to clayey silt	UNDFND	UNDFD	7	1.6
9.50	31.17	52.28	0.29	0.56	1.12	sand to silty sand	40-50	36-38	13	UNDEFINED

Dr - All sands (Janiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOMERY WATSO On Site Loc:CPT-1-12 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	144.52	0.46	0.32	1.14	sand	70-80	42-44	28	UNDEFINED
10.00	32.81	157.52	0.72	0.46	1.16	sand	70-80	42-44	30	UNDEFINED
10.25	33.63	161.98	0.68	0.42	1.18	sand	70-80	42-44	31	UNDEFINED
10.50	34.45	94.08	0.52	0.55	1.20	sand to silty sand	60-70	38-40	23	UNDEFINED
10.75	35.27	121.30	0.58	0.48	1.22	sand	60-70	40-42	23	UNDEFINED
11.00	36.09	163.08	0.79	0.49	1.24	sand	70-80	42-44	31	UNDEFINED
11.25	36.91	176.52	0.83	0.47	1.27	sand	70-80	42-44	34	UNDEFINED
11.50	37.73	115.90	0.49	0.42	1.29	sand	60-70	40-42	22	UNDEFINED
11.75	38.55	35.88	0.28	0.77	1.31	silty sand to sandy silt	<40	34-36	11	UNDEFINED
12.00	39.37	12.58	0.05	0.41	1.33	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
12.25	40.19	8.60	0.03	0.36	1.35	sensitive fine grained	UNDFND	UNDFD	4	.6
12.50	41.01	7.74	0.04	0.50	1.37	sensitive fine grained	UNDFND	UNDFD	4	.5
12.75	41.83	7.20	0.05	0.68	1.40	sensitive fine grained	UNDFND	UNDFD	3	.4
13.00	42.65	7.16	0.07	1.02	1.42	sensitive fine grained	UNDFND	UNDFD	3	.4
13.25	43.47	6.72	0.08	1.19	1.44	sensitive fine grained	UNDFND	UNDFD	3	.4
13.50	44.29	6.98	0.09	1.32	1.46	sensitive fine grained	UNDFND	UNDFD	3	.4
13.75	45.11	6.86	0.08	1.23	1.48	sensitive fine grained	UNDFND	UNDFD	3	.4
14.00	45.93	7.38	0.07	0.92	1.50	sensitive fine grained	UNDFND	UNDFD	4	.4
14.25	46.75	6.72	0.09	1.27	1.52	sensitive fine grained	UNDFND	UNDFD	3	.4
14.50	47.57	6.90	0.09	1.33	1.55	sensitive fine grained	UNDFND	UNDFD	3	.4
14.75	48.39	6.86	0.09	1.37	1.57	sensitive fine grained	UNDFND	UNDFD	3	.4
15.00	49.21	7.16	0.09	1.28	1.59	undefined	UNDFND	UNDFD	UDF	UNDEFINED
15.25	50.03	7.36	0.09	1.26	1.61	undefined	UNDFND	UNDFD	UDF	UNDEFINED
15.50	50.85	7.58	0.09	1.17	1.63	undefined	UNDFND	UNDFD	UDF	UNDEFINED
15.75	51.67	7.56	0.10	1.28	1.65	clayey silt to silty clay	UNDFND	UNDFD	4	.4
16.00	52.49	7.66	0.09	1.12	1.68	undefined	UNDFND	UNDFD	UDF	UNDEFINED
16.25	53.31	7.68	0.08	1.10	1.70	undefined	UNDFND	UNDFD	UDF	UNDEFINED
16.50	54.13	7.64	0.08	0.99	1.72	sensitive fine grained	UNDFND	UNDFD	4	.4
16.75	54.95	8.70	0.07	0.75	1.74	clayey silt to silty clay	UNDFND	UNDFD	4	.5
17.00	55.77	8.34	0.06	0.73	1.76	sensitive fine grained	UNDFND	UNDFD	4	.5
17.25	56.59	8.10	0.07	0.85	1.78	sensitive fine grained	UNDFND	UNDFD	4	.4
17.50	57.41	8.42	0.08	0.93	1.80	clayey silt to silty clay	UNDFND	UNDFD	4	.5
17.75	58.23	8.58	0.07	0.82	1.83	clayey silt to silty clay	UNDFND	UNDFD	4	.5
18.00	59.06	8.62	0.07	0.83	1.85	clayey silt to silty clay	UNDFND	UNDFD	4	.5
18.25	59.88	9.28	0.04	0.47	1.87	sandy silt to clayey silt	UNDFND	UNDFD	4	.5
18.50	60.70	19.50	0.12	0.60	1.89	sandy silt to clayey silt	UNDFND	UNDFD	7	1.6
18.75	61.52	65.08	0.26	0.39	1.91	sand to silty sand	40-50	34-36	16	UNDEFINED
19.00	62.34	106.78	0.53	0.49	1.93	sand	50-60	38-40	20	UNDEFINED
19.25	63.16	27.18	0.35	1.29	1.96	sandy silt to clayey silt	UNDFND	UNDFD	10	2.3
19.50	63.98	10.04	0.04	0.40	1.98	sandy silt to clayey silt	UNDFND	UNDFD	4	.6
19.75	64.80	10.22	0.06	0.59	2.00	sandy silt to clayey silt	UNDFND	UNDFD	4	.6
20.00	65.62	9.64	0.07	0.73	2.02	sandy silt to clayey silt	UNDFND	UNDFD	4	.5

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOMERY WATSO On Site Loc:CPT-1-12 Page No. 3

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
20.25	66.44	9.50	0.09	0.91	2.04	clayey silt to silty clay	UNDFND	UNDFD	5	.5
20.50	67.26	9.80	0.10	0.97	2.06	clayey silt to silty clay	UNDFND	UNDFD	5	.5
20.75	68.08	10.34	0.10	0.96	2.09	clayey silt to silty clay	UNDFND	UNDFD	5	.6
21.00	68.90	16.52	0.16	0.99	2.11	sandy silt to clayey silt	UNDFND	UNDFD	6	1.2
21.25	69.72	84.56	0.79	0.93	2.13	sand to silty sand	50-60	36-38	20	UNDEFINED
21.50	70.54	60.78	1.00	1.65	2.15	silty sand to sandy silt	40-50	34-36	19	UNDEFINED
21.75	71.36	19.78	0.57	2.90	2.17	clayey silt to silty clay	UNDFND	UNDFD	9	1.5
22.00	72.18	11.02	0.13	1.18	2.19	clayey silt to silty clay	UNDFND	UNDFD	5	.6
22.25	73.00	10.16	0.12	1.21	2.21	clayey silt to silty clay	UNDFND	UNDFD	5	.5
22.50	73.82	10.28	0.11	1.08	2.24	clayey silt to silty clay	UNDFND	UNDFD	5	.6
22.75	74.64	10.38	0.11	1.07	2.26	clayey silt to silty clay	UNDFND	UNDFD	5	.6
23.00	75.46	10.20	0.12	1.15	2.28	clayey silt to silty clay	UNDFND	UNDFD	5	.5
23.25	76.28	15.88	0.10	0.61	2.30	sandy silt to clayey silt	UNDFND	UNDFD	6	1.1
23.50	77.10	53.46	0.27	0.50	2.32	sand to silty sand	<40	32-34	13	UNDEFINED
23.75	77.92	43.04	0.25	0.59	2.34	silty sand to sandy silt	<40	30-32	14	UNDEFINED
24.00	78.74	104.60	0.78	0.75	2.37	sand to silty sand	50-60	36-38	25	UNDEFINED
24.25	79.56	153.26	1.19	0.78	2.39	sand	60-70	38-40	29	UNDEFINED
24.50	80.38	19.32	0.43	2.21	2.41	clayey silt to silty clay	UNDFND	UNDFD	9	1.4
24.75	81.20	13.44	0.11	0.82	2.43	sandy silt to clayey silt	UNDFND	UNDFD	5	.8
25.00	82.02	12.64	0.16	1.27	2.45	clayey silt to silty clay	UNDFND	UNDFD	6	.7
25.25	82.84	12.48	0.17	1.33	2.47	clayey silt to silty clay	UNDFND	UNDFD	6	.7
5.50	83.66	12.20	0.17	1.38	2.49	clayey silt to silty clay	UNDFND	UNDFD	6	.7
25.75	84.48	11.66	0.16	1.34	2.52	clayey silt to silty clay	UNDFND	UNDFD	6	.6
26.00	85.30	11.16	0.15	1.33	2.54	clayey silt to silty clay	UNDFND	UNDFD	5	.6
26.25	86.12	12.00	0.16	1.36	2.56	clayey silt to silty clay	UNDFND	UNDFD	6	.7
26.50	86.94	12.20	0.17	1.42	2.58	clayey silt to silty clay	UNDFND	UNDFD	6	.7
26.75	87.76	12.24	0.19	1.55	2.60	clayey silt to silty clay	UNDFND	UNDFD	6	.7
27.00	88.58	12.48	0.20	1.58	2.62	clayey silt to silty clay	UNDFND	UNDFD	6	.7
27.25	89.40	12.88	0.20	1.57	2.65	clayey silt to silty clay	UNDFND	UNDFD	6	.7
27.50	90.22	12.54	0.20	1.58	2.67	clayey silt to silty clay	UNDFND	UNDFD	6	.7
27.75	91.04	12.92	0.21	1.60	2.69	clayey silt to silty clay	UNDFND	UNDFD	6	.7
28.00	91.86	13.26	0.21	1.60	2.71	clayey silt to silty clay	UNDFND	UNDFD	6	.8
28.25	92.68	13.32	0.20	1.50	2.73	clayey silt to silty clay	UNDFND	UNDFD	6	.8
28.50	93.50	12.74	0.18	1.45	2.75	clayey silt to silty clay	UNDFND	UNDFD	6	.7
28.75	94.32	13.00	0.16	1.22	2.77	sandy silt to clayey silt	UNDFND	UNDFD	5	.7
29.00	95.14	13.08	0.15	1.11	2.80	sandy silt to clayey silt	UNDFND	UNDFD	5	.7
29.25	95.96	56.90	0.46	0.81	2.82	silty sand to sandy silt	<40	30-32	18	UNDEFINED
29.50	96.78	75.30	1.78	2.36	2.84	sandy silt to clayey silt	UNDFND	UNDFD	29	6.9
29.75	97.60	29.56	1.03	3.48	2.86	clayey silt to silty clay	UNDFND	UNDFD	14	2.3
30.00	98.43	76.22	1.74	2.28	2.88	silty sand to sandy silt	40-50	32-34	24	UNDEFINED
30.25	99.25	33.70	1.18	3.50	2.90	clayey silt to silty clay	UNDFND	UNDFD	16	2.8
30.50	100.07	30.80	1.02	3.31	2.93	clayey silt to silty clay	UNDFND	UNDFD	15	2.5

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOMERY WATSO On Site Loc:CPT-1-12 Page No. 4

DEPTH (meters)	DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
30.75	100.89	34.54	1.16	3.37	2.95	clayey silt to silty clay	UNDFND	UNDFD	17	2.8
31.00	101.71	32.90	1.03	3.13	2.97	clayey silt to silty clay	UNDFND	UNDFD	16	2.7
31.25	102.53	29.80	0.70	2.35	2.99	sandy silt to clayey silt	UNDFND	UNDFD	11	2.3
31.50	103.35	28.98	0.62	2.14	3.01	sandy silt to clayey silt	UNDFND	UNDFD	11	2.3
31.75	104.17	26.62	0.45	1.71	3.03	sandy silt to clayey silt	UNDFND	UNDFD	10	2.0
32.00	104.99	23.00	0.39	1.71	3.05	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
32.25	105.81	20.52	0.30	1.48	3.08	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
32.50	106.63	21.00	0.23	1.10	3.10	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
32.75	107.45	22.60	0.30	1.34	3.12	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
33.00	108.27	23.98	0.40	1.65	3.14	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
33.25	109.09	21.44	0.32	1.51	3.16	sandy silt to clayey silt	UNDFND	UNDFD	8	1.5
33.50	109.91	19.64	0.27	1.37	3.18	sandy silt to clayey silt	UNDFND	UNDFD	8	1.3
33.75	110.73	18.92	0.25	1.31	3.21	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
34.00	111.55	19.02	0.29	1.55	3.23	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
34.25	112.37	17.80	0.23	1.31	3.25	sandy silt to clayey silt	UNDFND	UNDFD	7	1.1
34.50	113.19	17.38	0.27	1.58	3.27	sandy silt to clayey silt	UNDFND	UNDFD	7	1.0
34.75	114.01	16.40	0.28	1.69	3.29	clayey silt to silty clay	UNDFND	UNDFD	8	.9
35.00	114.83	19.66	0.26	1.34	3.31	sandy silt to clayey silt	UNDFND	UNDFD	8	1.3
35.25	115.65	20.08	0.25	1.23	3.34	sandy silt to clayey silt	UNDFND	UNDFD	8	1.3
35.50	116.47	20.34	0.28	1.38	3.36	sandy silt to clayey silt	UNDFND	UNDFD	8	1.3
35.75	117.29	22.80	0.29	1.27	3.38	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
36.00	118.11	23.26	0.29	1.23	3.40	sandy silt to clayey silt	UNDFND	UNDFD	9	1.[illegible]
36.25	118.93	18.52	0.15	0.80	3.42	sandy silt to clayey silt	UNDFND	UNDFD	7	1.[illegible]
36.50	119.75	20.82	0.21	0.98	3.44	sandy silt to clayey silt	UNDFND	UNDFD	8	1.3
36.75	120.57	21.64	0.24	1.11	3.46	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
37.00	121.39	21.14	0.31	1.47	3.49	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
37.25	122.21	19.72	0.29	1.47	3.51	sandy silt to clayey silt	UNDFND	UNDFD	8	1.2
37.50	123.03	18.10	0.28	1.54	3.53	sandy silt to clayey silt	UNDFND	UNDFD	7	1.1
37.75	123.85	17.22	0.30	1.76	3.55	sandy silt to clayey silt	UNDFND	UNDFD	7	1.0
38.00	124.67	19.62	0.34	1.72	3.57	sandy silt to clayey silt	UNDFND	UNDFD	8	1.2
38.25	125.49	23.76	0.44	1.84	3.59	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
38.50	126.31	22.20	0.35	1.57	3.62	sandy silt to clayey silt	UNDFND	UNDFD	9	1.4
38.75	127.13	22.34	0.22	0.97	3.64	sandy silt to clayey silt	UNDFND	UNDFD	9	1.5

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON
On Site Loc:CPT-1-2
Job No. :2738.1402
Tot. Unit Wt. (avg) : 115 pcf

CPT Date :01/06/94 10:10
Cone Used :462
Water table (meters) : 3

DEPTH (meters)	DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.25	0.82	43.84	0.36	0.82	0.02	silty sand to sandy silt	>90	>48	14	UNDEFINED
0.50	1.64	100.90	0.85	0.85	0.07	sand to silty sand	>90	>48	24	UNDEFINED
0.75	2.46	121.64	1.04	0.86	0.12	sand to silty sand	>90	>48	29	UNDEFINED
1.00	3.28	129.44	1.55	1.20	0.17	sand to silty sand	>90	>48	31	UNDEFINED
1.25	4.10	103.70	0.80	0.77	0.21	sand to silty sand	80-90	46-48	25	UNDEFINED
1.50	4.92	80.38	0.44	0.55	0.26	sand to silty sand	70-80	44-46	19	UNDEFINED
1.75	5.74	60.48	0.32	0.53	0.31	sand to silty sand	60-70	44-46	14	UNDEFINED
2.00	6.56	35.52	0.19	0.53	0.35	silty sand to sandy silt	50-60	40-42	11	UNDEFINED
2.25	7.38	32.06	0.21	0.65	0.40	silty sand to sandy silt	40-50	40-42	10	UNDEFINED
2.50	8.20	33.58	0.25	0.73	0.45	silty sand to sandy silt	40-50	38-40	11	UNDEFINED
2.75	9.02	52.38	0.31	0.59	0.50	sand to silty sand	50-60	40-42	13	UNDEFINED
3.00	9.84	67.12	0.31	0.46	0.54	sand to silty sand	60-70	40-42	16	UNDEFINED
3.25	10.66	34.38	0.35	1.03	0.58	silty sand to sandy silt	40-50	38-40	11	UNDEFINED
3.50	11.48	6.18	0.05	0.86	0.60	sensitive fine grained	UNDFND	UNDFD	3	.5
3.75	12.30	36.20	0.24	0.67	0.62	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
4.00	13.12	36.32	0.36	0.98	0.64	silty sand to sandy silt	40-50	38-40	12	UNDEFINED
4.25	13.94	67.98	0.42	0.62	0.66	sand to silty sand	60-70	40-42	16	UNDEFINED
4.50	14.76	50.48	0.40	0.79	0.68	silty sand to sandy silt	50-60	38-40	16	UNDEFINED
4.75	15.58	33.96	0.25	0.73	0.71	silty sand to sandy silt	40-50	36-38	11	UNDEFINED
5.00	16.40	12.78	0.23	1.77	0.73	clayey silt to silty clay	UNDFND	UNDFD	6	1.1
5.25	17.22	4.68	0.05	1.06	0.75	sensitive fine grained	UNDFND	UNDFD	2	.3
5.50	18.04	4.38	0.05	1.23	0.77	sensitive fine grained	UNDFND	UNDFD	2	.3
5.75	18.86	4.20	0.06	1.48	0.79	sensitive fine grained	UNDFND	UNDFD	2	.3
6.00	19.69	4.76	0.07	1.37	0.81	sensitive fine grained	UNDFND	UNDFD	2	.3
6.25	20.51	5.60	0.08	1.45	0.84	sensitive fine grained	UNDFND	UNDFD	3	.4
6.50	21.33	5.60	0.05	0.81	0.86	sensitive fine grained	UNDFND	UNDFD	3	.4
6.75	22.15	5.46	0.07	1.21	0.88	sensitive fine grained	UNDFND	UNDFD	3	.4
7.00	22.97	6.00	0.05	0.90	0.90	sensitive fine grained	UNDFND	UNDFD	3	.4
7.25	23.79	4.58	0.03	0.61	0.92	sensitive fine grained	UNDFND	UNDFD	2	.3
7.50	24.61	5.90	0.06	0.97	0.94	sensitive fine grained	UNDFND	UNDFD	3	.4
7.75	25.43	4.98	0.04	0.76	0.96	sensitive fine grained	UNDFND	UNDFD	2	.3
8.00	26.25	8.12	0.04	0.45	0.99	sensitive fine grained	UNDFND	UNDFD	4	.6
8.25	27.07	21.72	0.10	0.44	1.01	silty sand to sandy silt	<40	32-34	7	UNDEFINED
8.50	27.89	22.50	0.07	0.33	1.03	silty sand to sandy silt	<40	32-34	7	UNDEFINED
8.75	28.71	9.70	0.06	0.60	1.05	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
9.00	29.53	7.08	0.05	0.72	1.07	sensitive fine grained	UNDFND	UNDFD	3	.5
9.25	30.35	9.44	0.03	0.30	1.09	sensitive fine grained	UNDFND	UNDFD	5	.7
9.50	31.17	11.64	0.03	0.29	1.12	sandy silt to clayey silt	UNDFND	UNDFD	4	.9

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

E TONTO ENVIRONMENTAL DRILLING

Operator :MONTGOM. WATSON On Site Loc:CPT-1-2 Page No. 2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
9.75	31.99	11.28	0.08	0.69	1.14	sandy silt to clayey silt	UNDFND	UNDFD	4	.9
10.00	32.81	9.54	0.05	0.49	1.16	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
10.25	33.63	8.02	0.08	1.00	1.18	clayey silt to silty clay	UNDFND	UNDFD	4	.6
10.50	34.45	7.74	0.07	0.96	1.20	sensitive fine grained	UNDFND	UNDFD	4	.5
10.75	35.27	9.66	0.06	0.65	1.22	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
11.00	36.09	48.40	0.40	0.83	1.24	silty sand to sandy silt	40-50	36-38	15	UNDEFINED
11.25	36.91	144.94	3.41	2.36	1.27	silty sand to sandy silt	70-80	40-42	46	UNDEFINED

3S+036
MS

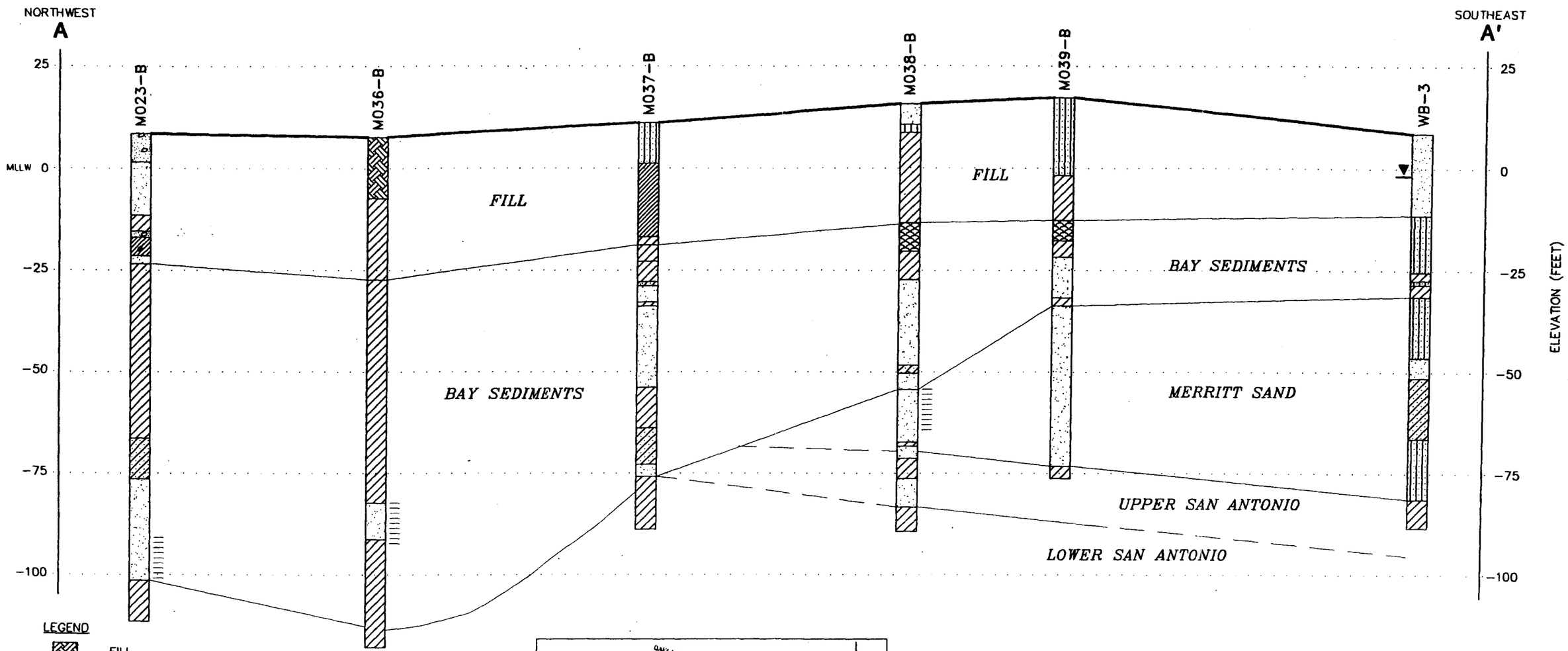
Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

GEOLOGICAL CROSS SECTION A-A'

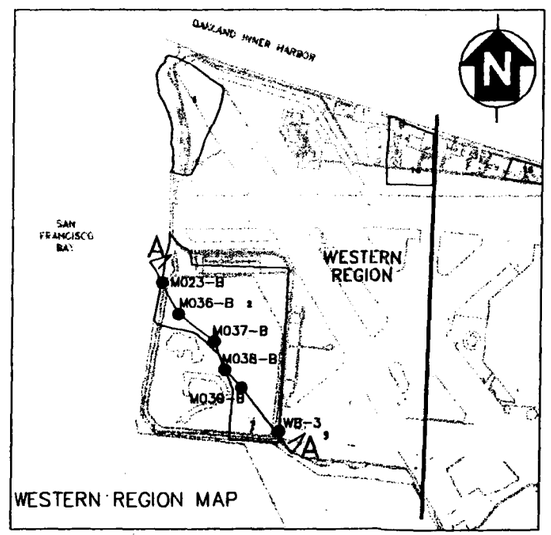
WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M023-B	Fill to Bay Sediments	Change from loose silty sand to medium stiff silty clay; presence of shell fragments at the interface.
	Bay Sediments to Lower San Antonio Formation	Change from loose sand to stiff clay; change from wet to damp.
M036-B	Fill to Bay Sediment	Change from loose flowing hydraulic fill to a very soft dark gray clay and sandy silt.
	Bay Sediment to Lower San Antonio Formation (Yerba Buena Mud)	Change from a soft to medium stiff dark gray clay to a stiff to very stiff black clay; presence of brown mottling and organic material at interface.
M037-B	Fill to Bay Sediments	Change from landfill debris and hydraulic fill to a soft to very soft dark gray clay with interbedded clayey sand and silty sand layers.
	Bay Sediment to Lower San Antonio Formation (Yerba Buena Mud)	Sharp contact between loose to medium dense dark gray silty sand and a very stiff to hard dark gray clay with organic material and iron staining.
M038-B	Fill to Bay Sediments	Change from landfill debris and hydraulic fill to a thick shell hash layer; increasing clay with depth; soft dark green gray below shells.
	Bay Sediments to Merritt Sand	Change in color from dark gray to pale olive brown; change from loose fine sand to a dense medium sand.
	Merritt Sand to Upper San Antonio Formation	Color change from pale olive brown to grayish brown to dark greenish gray with depth; change from medium dense sand to a very stiff to hard clay; presence of iron staining, mottling, and interbedded sand below a interface.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Sharp contact between a dark green gray sand and a hard to very hard green gray clay; black organic material and brown mottling present.
M039-3	Fill to Bay Sediments	Change from landfill debris and hydraulic fill to a thick shell hash layer; very soft dark green gray clay beneath shells.
	Bay Sediment to Merritt Sand	Change from a stiff dark green gray clay to a dense yellow-brown medium sand.
	Merritt Sand to Upper San Antonio Formation	Change from a dense yellow-brown medium sand to a loose to medium dense dark green gray sand.
WB-3	Fill to Bay Sediment	Change from a heaving yellow brown silty sand to a medium stiff gray silty clay with thin clayey seams and some shells at interface.
	Bay Sediments to Merritt Sand	Change from a soft gray silty clay to a dense orange brown clayey silty sand.
	Merritt Sands to Upper San Antonio Formation	Change from a loose to medium dense yellow-brown silty sand to a very stiff gray silty clay.



LEGEND

- FILL
- GW – WELL-GRADED GRAVELS
- GC – CLAYEY GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CH – ORGANIC CLAYS, HIGH PLASTICITY
- SHELLS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



WESTERN REGION MAP

NOTE: GROUND SURFACE ELEVATIONS FOR WB-3 IS ESTIMATED.

VERTICAL EXAGGERATION IS 10X.

125' 0 125' 250'

HORIZONTAL SCALE: 1" = 250'

GEOLOGICAL CROSS SECTION, A–A'
WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

1-2_ZZ.DWG - CFR - 044-0318RRIRP

GEOLOGICAL CROSS SECTION B-B'

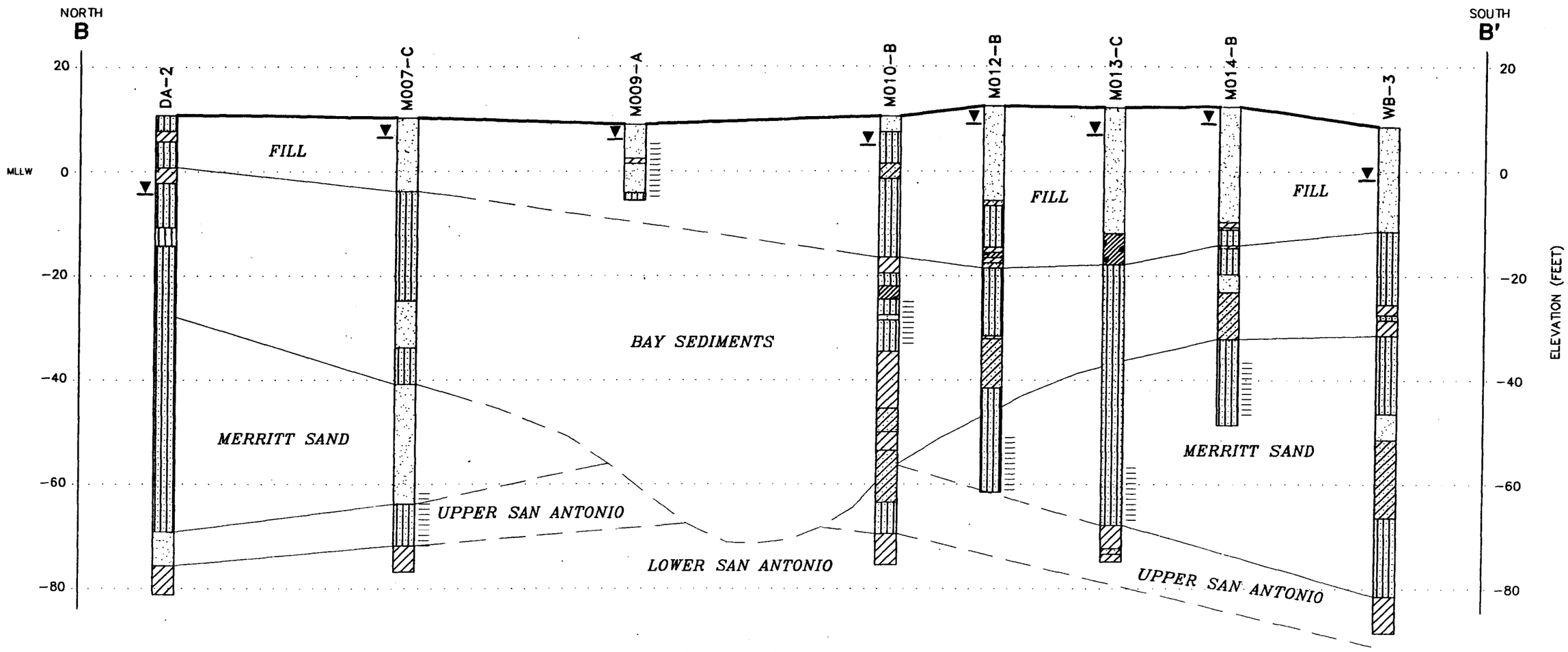
WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 2)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
DA-2	Fill to Bay Sediments	Characteristic soft gray silty clay layer at interface; appearance of shells below interface; change in color from brown to gray to gray green just above interface.
	Bay Sediments to Merritt Sand	Change from a loose to medium dense gray silty sand to a dense orange brown silty sand with traces of clay; appearance of iron oxidation below interface.
	Merritt Sand to Upper San Antonio Formation	Change from a loose light brown silty sand to a dense gray sand with trace of silt.
	Upper San Antonio Formation to Lower San Antonio Formation	Change from a dense gray sand with trace silt to a stiff gray green silty clay.
M007-C	Fill to Bay Sediments	Change in color from dark olive gray to dark gray; presence of clay deposits within the sand at the interface.
	Bay Sediment to Merritt Sand	Change from a loose dark gray sand to a dense brown to grayish brown sand; change from moist to wet; increasing blow counts
	Merritt Sand to Upper San Antonio Formation	Change from a grayish brown heaving sand to a dense dark gray silty sand.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from a dense silty sand to a very hard clay with a trace of fine sand; change from wet to moist.
M009-A	Fill	Boring did not cross lithologic unit.
M010-B	Fill to Bay Sediments	Change from a loose to medium dense green brown sand to a stiff dark gray green clay; hydrogen sulfide/organic decay odor present at the interface.
	Bay Sediments to Upper San Antonio Formation	Change in density of clayey sand; presence of shell fragments and interbedded clay layers near interface; change from very fine to medium sand where present.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from a medium dense silty sand to a very stiff clay; plant material and organic stingers present at the interface.
M012-B	Fill to Bay Sediments	Change from a soft clayey gravel to a medium dense silty sand; change from olive green to dark gray green; organic decay odor present at interface.
	Bay Sediments to Merritt Sand	Change in color from light gray green to orange brown; presence of orange brown mottling at the interface; rust-red laminations present just below interface.
M013-C	Fill to Bay Sediments	Change from a medium dense gray clayey gravel to a loose green gray silty sand; presence of heaving sand with depth.
	Bay Sediments to Merritt Sand	Change from a loose green gray silty sand to a very dense tan silty sand; increasing blow counts with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a very dense silty sand to a hard clay; change from tan to very dark gray; change from wet to damp; interbedded layers of clayey sand and clay below interface.

GEOLOGICAL CROSS SECTION B-B'

WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 2 of 2)

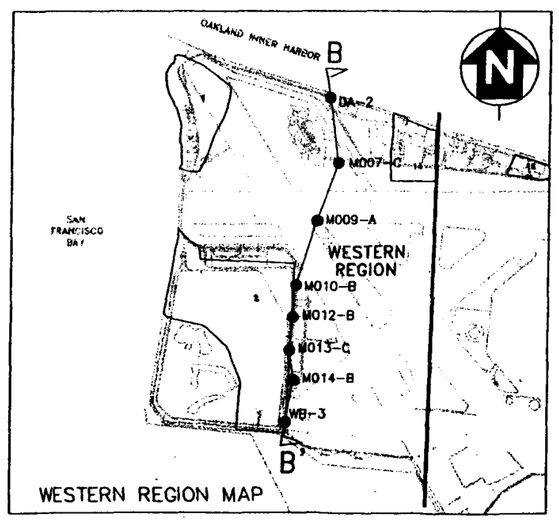
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M014-B	Fill to Bay Sediments	Change from a loose sand to a soft clayey sand; change in color from light tan to gray green; characteristic layers of silty clay and silty sand at the interface; presence of hydrogen sulfide/organic decay odor just below the interface.
	Bay Sediments to Merritt Sand	Change from a gray green to light green clayey sand to a yellow brown silty sand; rust-colored mottling present below interface.
WB-3	Fill to Bay Sediments	Change from a medium dense yellow brown sand to a medium stiff gray silty clay with trace of organic debris; presence of thin clayey seams within the silty sand at the interface.
	Bay Sediments to Merritt Sand	Change from a soft gray silty clay with sand seams to a dense orange brown clayey silty sand with trace of clay.
	Merritt Sand to Upper San Antonio Formation	Change from a loose to medium dense yellow brown silty sand to a very stiff gray silty clay; presence of heaving sands with depth.



LEGEND

- GC – CLAYEY GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL

MLLW MEAN LOWER LOW WATER



WESTERN REGION MAP

NOTE: GROUND SURFACE ELEVATIONS FOR WB-3 IS ESTIMATED.

VERTICAL EXAGGERATION IS 22.5X.

225' 0 225' 450'
HORIZONTAL SCALE: 1" = 450'

GEOLOGICAL CROSS SECTION B-B'
WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

CFR - 044-0316RRIRP

1-X2.DWG - G

GEOLOGICAL CROSS SECTION C-C'

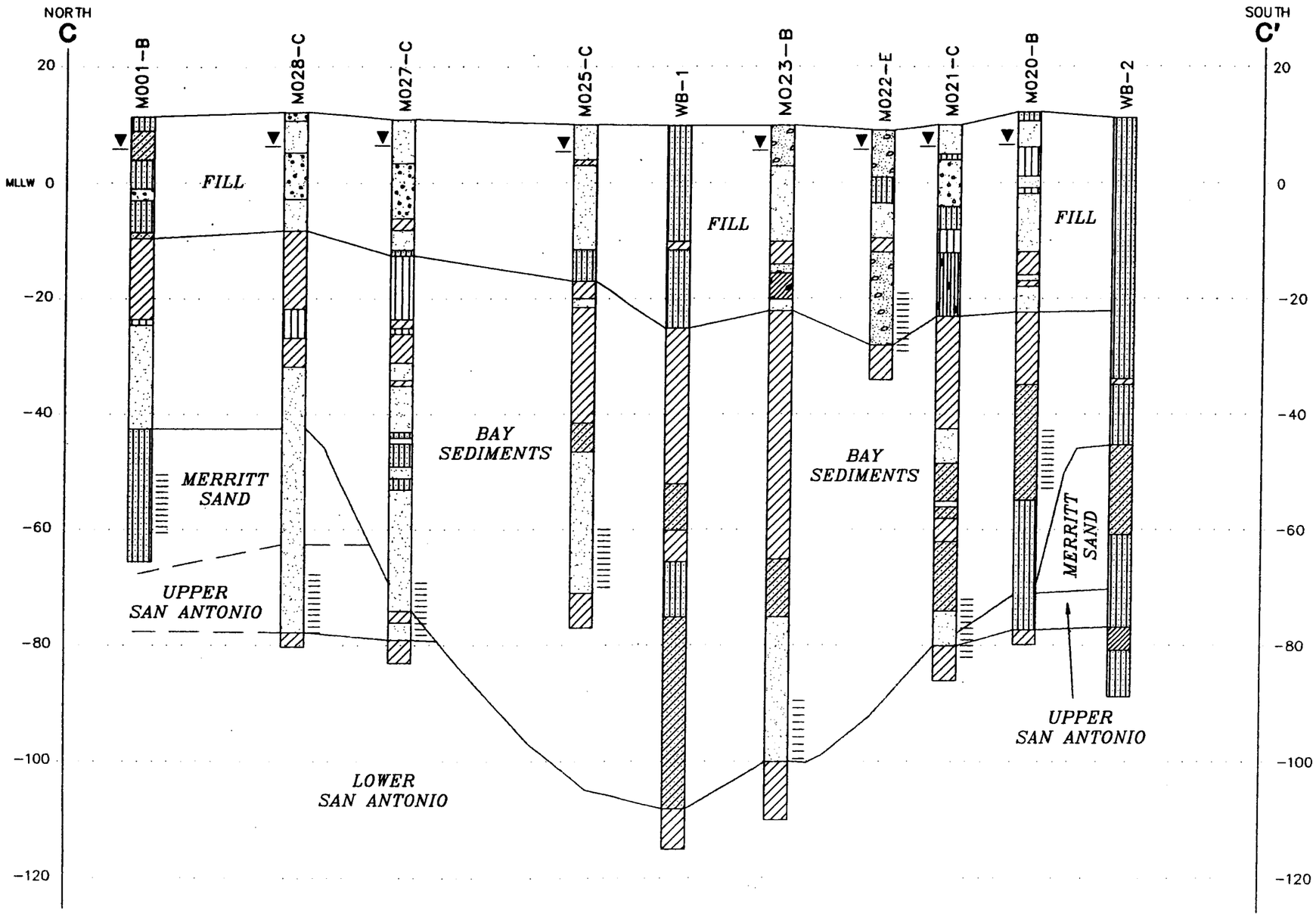
WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 2)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M001-B	Fill to Bay Sediment	Change from loose sands to soft clay; end of debris; increasing blow count with depth below the interface.
	Bay Sediment to Merritt Sand	Color change from gray to olive-yellow; increasing blow counts with depth below the interface; change from loose to medium dense sand with depth below interface.
M028-C	Fill to Bay Sediment	Change from loose sand to firm clay; trace clay in sand immediately above interface; characteristic green color is present below interface.
	Bay Sediment to Merritt Sand	Change in color from a dark green gray to yellow brown; change from medium dense to very dense sand; increasing blow counts with depth below interface.
	Merritt to Upper San Antonio Formation	Change in color from a dark yellowish brown to greenish gray sand to a characteristic dark blue gray sand directly below interface; presence of oxidized red sand at interface.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change in lithology from sand to silty clay; presence of root fragments at the interface; blow counts decreased across interface.
M027-C	Fill to Bay Sediment	Characteristic interbedded silt, sand, and clay layers above interface; color change from light olive brown to dark gray; soft at interface, increasing blow counts with depth below interface.
	Bay Sediment to Upper San Antonio Formation	Cuttings indicate probable interbedded clay and sand layers at interface; change from flowing to medium dense sand; change in grain size below interface.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from a medium dense sand to a very stiff to hard clay; change from wet to moist; increasing organic material with depth below interface.
M025-C	Fill to Bay Sediment	Change from loose sand to clay; presence of alternating color clay layers at interface; very soft, low blow count, increasing stiffness with depth.
WB-1	Fill to Bay Sediments	Change from a loose gray silty sand to a soft gray silty clay; presence of clayey silt and sand layers at the interface; abundant shells at interface.
	Bay Sediments to Lower San Antonio Formation	Change from a dense clayey sand to a very stiff silty clay; traces of root debris just below interface.
M023-B	Fill to Bay Sediments	Change from loose silty sand to a medium stiff silty clay; presence of shell fragments at the interface.
	Bay Sediments to Lower San Antonio Formation	Change from loose sand to stiff clay; change from wet to damp.
M022-E	Fill to Bay Sediments	Change from gravel to silty clay; change in color from gray brown to dark gray; hydrogen sulfide odor; first appearance of shell fragments at the interface.
M021-C	Fill to Bay Sediment	Change from loose silty gravel to a medium stiff silty clay; change from wet to damp; gravel is not native.
	Bay Sediments to Lower San Antonio Formation (Yerba Buena Mud)	Change in color from olive green to black; change from loose sand to very stiff clay; change from wet to damp.

GEOLOGICAL CROSS SECTION C-C'

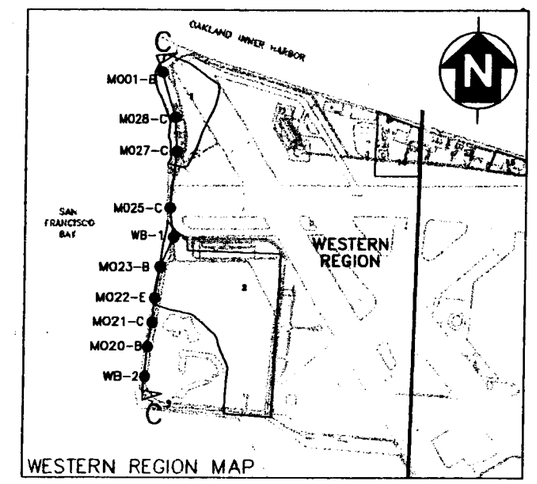
WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 2 of 2)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M020-B	Fill to Bay Sediments	Change in color from reddish brown to black; change from loose sand to soft clay; change from wet to damp; increasing stiffness with depth from interface; appearance of shell fragments at interface.
	Bay Sediment to Upper San Antonio Formation	Presence of iron staining at the interface; sand coarsens at the interface.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change in color from olive to black; change from a very dense silty sand to a hard clay; change from wet to moist; presence of organic stringers at the interface.
WB-2	Fill to Bay Sediments	Change from a loose yellow-brown silty sand to a medium stiff gray silty clay and medium dense gray silty sand.
	Bay Sediments to Merritt Sands	Change in color from gray to yellow brown, increase in iron staining and change in color to orange brown with depth; increase in density from medium dense to dense.
	Merritt Sand to Upper San Antonio Formation	Change in color from orange brown to gray brown. Change from clayey sand to a silty sand; trace of shells below interface.
	Upper San Antonio Formation to Lower San Antonio Formation	Change in color from gray green to brown gray; mottling at interface; change from sandy clay to silty sand with seams of clay.



LEGEND

- GW – WELL-GRADED GRAVELS
- GM – SILTY GRAVELS
- GC – CLAYEY GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CH – ORGANIC CLAYS, HIGH PLASTICITY
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



300' 0 300' 600'
HORIZONTAL SCALE: 1" = 600'

NOTE: GROUND SURFACE ELEVATIONS FOR WB-1 AND WB-2 ARE ESTIMATED.
VERTICAL EXAGGERATION IS 30X.

GEOLOGICAL CROSS SECTION C–C'
WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

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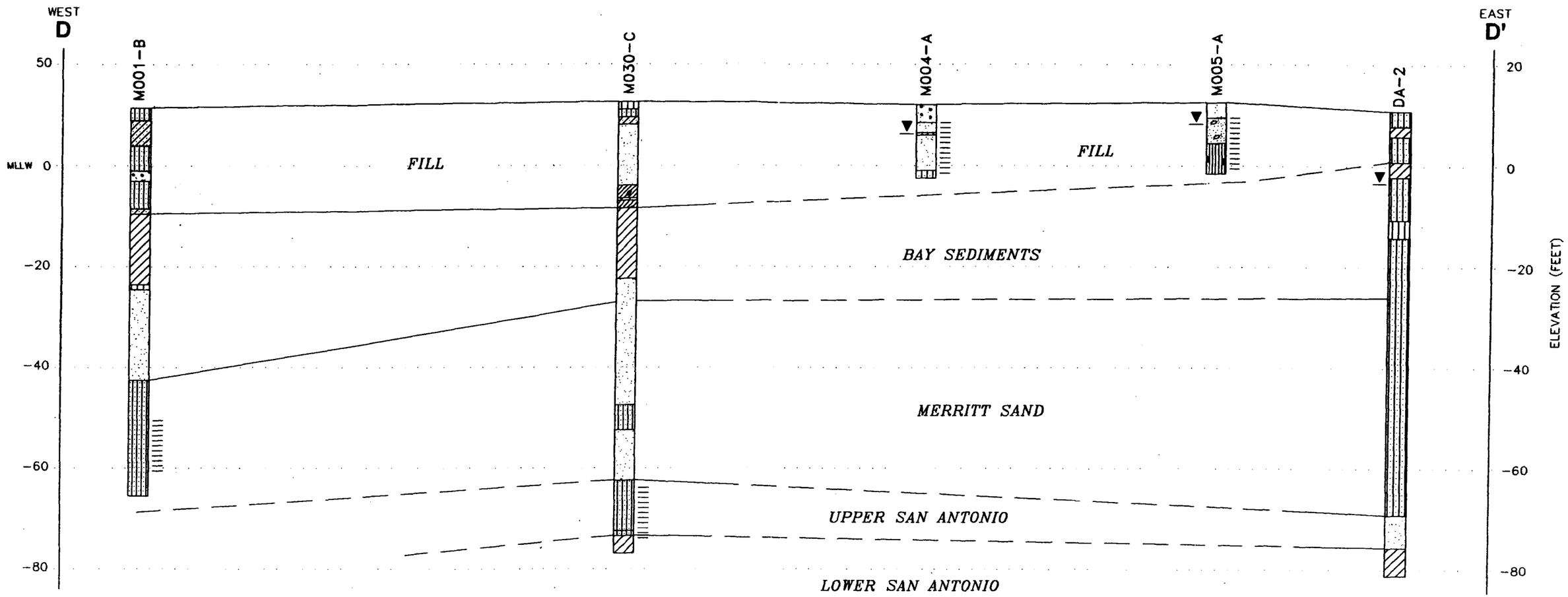
GEOLOGICAL CROSS SECTION D-D'

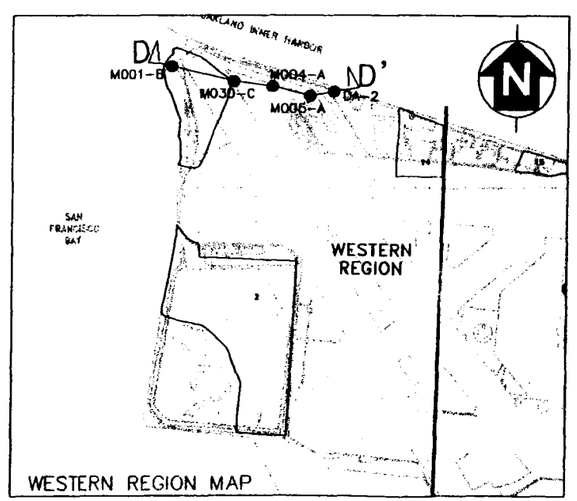
WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M001-B	Fill to Bay Sediment	Change from loose sands to soft clay; end of debris; increasing blow count with depth below the interface.
	Bay Sediment to Merritt Sand	Color change from gray to olive-yellow; increasing blow counts with depth below interface; change from loose to medium dense sand with depth below interface.
M030-C	Fill to Bay Sediment	Change from a medium to coarse gray clayey gravel to a soft very dark gray clay; appearance of shells near the interface.
	Bay Sediment to Merritt Sand	Change from a dark gray sand to a dense dark yellowish brown sand without shells.
	Merritt Sand to Upper San Antonio Formation	Change from a dense dark yellowish brown sand to a very dense dark olive gray silty sand; change from moist to wet.
	Upper San Antonio Formation to Lower San Antonio Formation	Change from a very dense dark gray silty sand to a hard dark olive gray clay; increasing clay at the interface; increase in blow counts.
M004-A	Fill	Boring does not cross a lithologic unit.
M005-A	Fill	Boring does not cross a lithologic unit.
DA-2	Fill to Bay Sediments	Characteristic soft gray silty clay layer at interface; appearance of shells below interface; change in color from brown to gray to gray green just above interface.
	Bay Sediment to Merritt Sand	Change from a loose to medium dense gray silty sand to a dense orange brown silty sand with trace clay; presence of iron oxidation with depth below interface.
	Merritt Sand to Upper San Antonio Formation	Change from a loose light brown silty sand to dense gray sand with trace of silt.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from a dense gray sand with trace silt to a stiff gray green silty clay.



LEGEND

- GW – WELL-GRADED GRAVELS
- GM – SILTY GRAVELS
- GC – CLAYEY GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



NOTE: GROUND SURFACE ELEVATIONS FOR DA-2 IS ESTIMATED.
VERTICAL EXAGGERATION IS 10X.

100' 0 100' 200'
HORIZONTAL SCALE: 1" = 200'

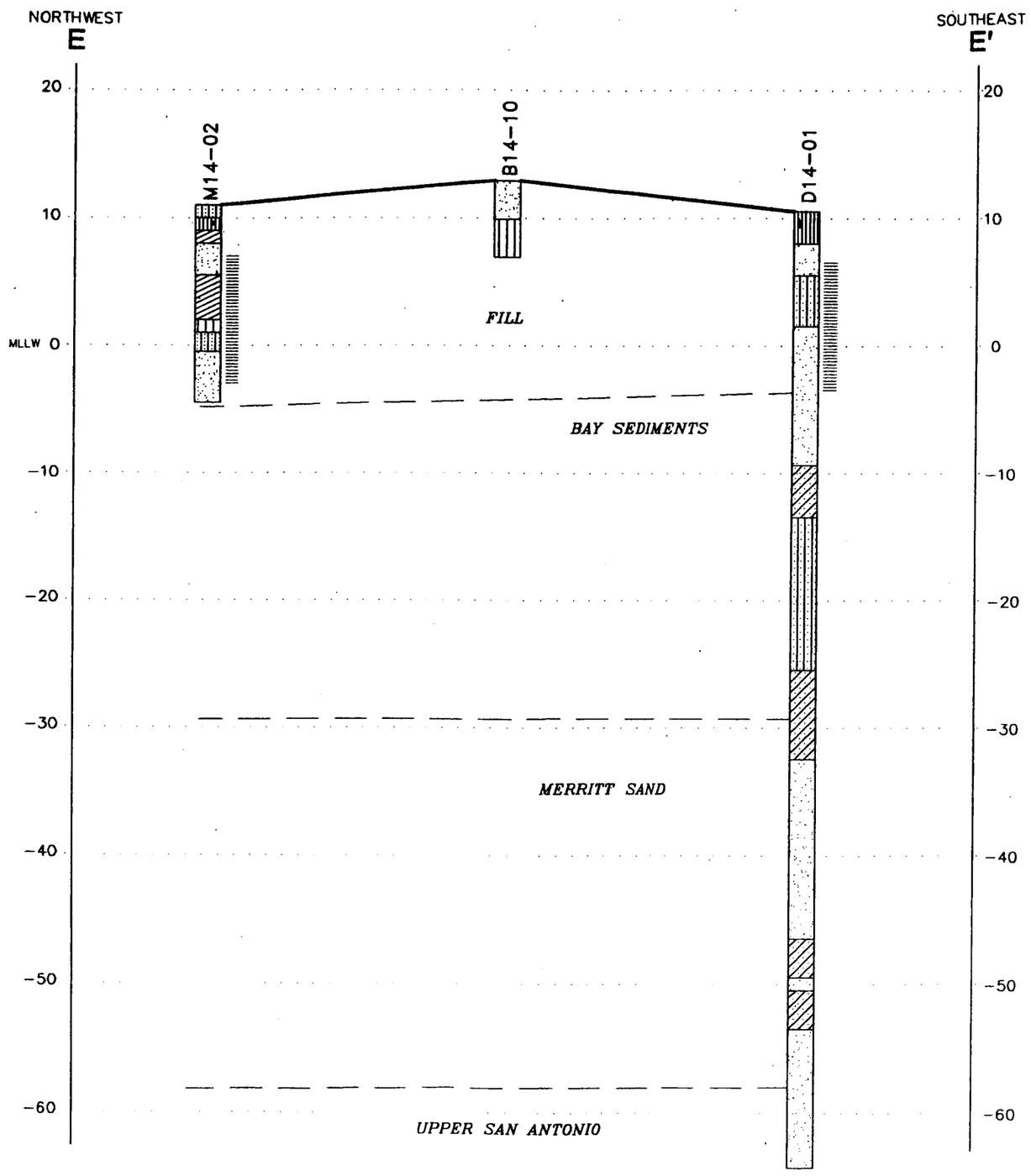
GEOLOGICAL CROSS SECTION D–D'
WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

97 - CFR - 044-0316RRRP

GEOLOGICAL CROSS SECTION E-E'

WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M14-02	Fill	Boring does not cross a lithologic unit.
B14-10	Fill	Boring does not cross a lithologic unit.
D14-01	Fill to Bay Sediments	Change from a gray very fine sand with wood and organic matter to a dark gray fine sand without wood or organic matter; shells common.
	Bay Sediment to Merritt Sand	Change from a greenish gray clayey sand with light olive brown mottling and roots to a dense yellowish-brown clayey sand, which grades to sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a light brownish gray fine sand with trace silt to a dark greenish gray sand; sand coarsens with depth.

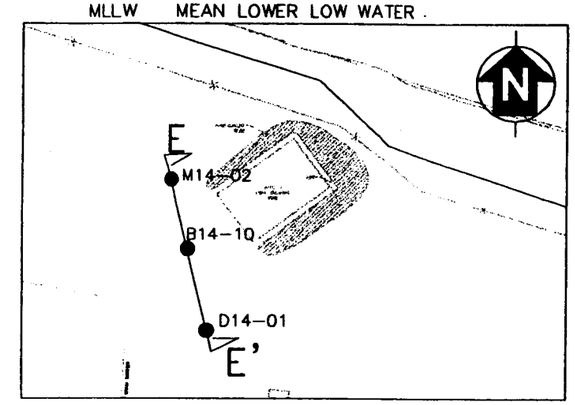


NOTE: VERTICAL EXAGGERATION IS 3X.

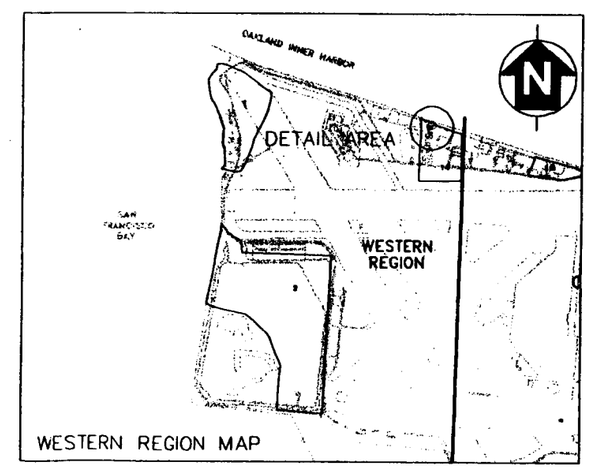
15' 0 15' 30'
HORIZONTAL SCALE: 1" = 30'

LEGEND

- GM – SILTY GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



WESTERN REGION MAP

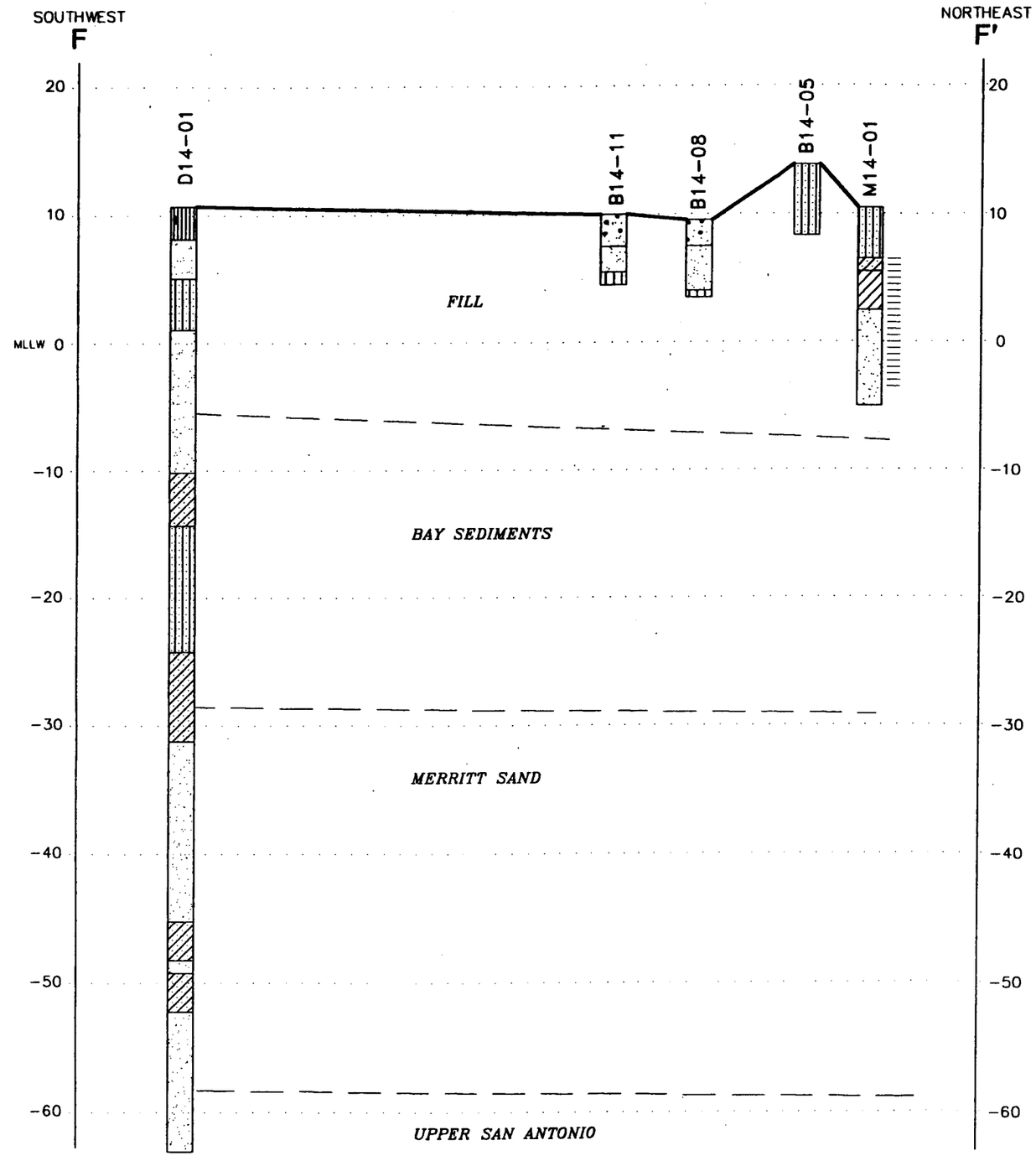
GEOLOGICAL CROSS SECTION E-E'
WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

14_XX.DWG - 02/11/97 - CFR - 044-0316RRIRP

GEOLOGICAL CROSS SECTION F-F'

WESTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

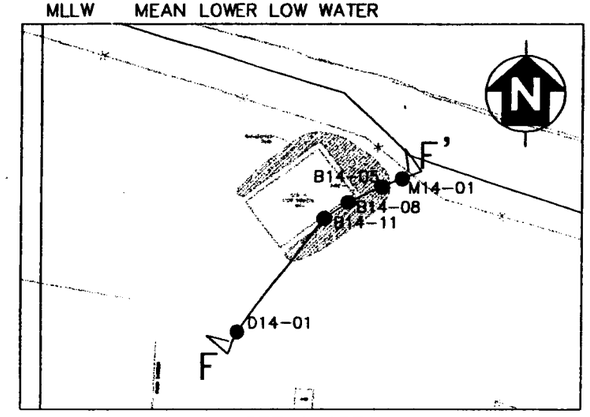
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D14-01	Fill to Bay Sediments	Change from a gray very fine sand with wood and organic matter to a dark gray fine sand without wood or organic matter; shells common.
	Bay Sediment to Merritt Sand	Change from a greenish gray clayey sand with light olive brown mottling and roots to a dense yellowish-brown clayey sand, which grades to sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a light brownish gray fine sand with trace silt to a dark greenish gray sand; sand coarsens with depth.
B14-11	Fill	Boring does not cross a lithologic unit.
B14-08	Fill	Boring does not cross a lithologic unit.
B14-05	Fill	Boring does not cross a lithologic unit.
M14-01	Fill	Boring does not cross a lithologic unit.



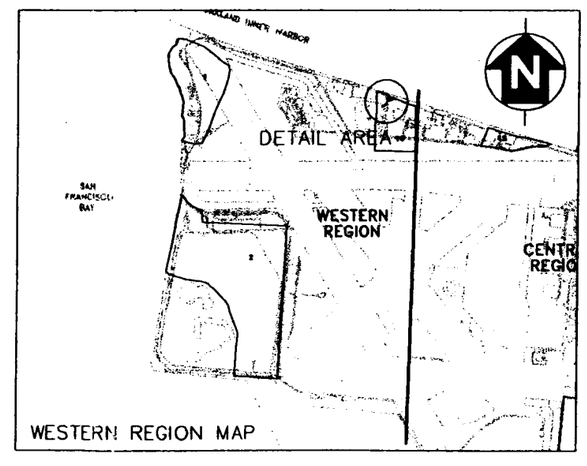
NOTE: VERTICAL EXAGGERATION IS 3X.

LEGEND

- GM – SILTY GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



WESTERN REGION MAP

15' 0 15' 30'
HORIZONTAL SCALE: 1" = 30'

GEOLOGICAL CROSS SECTION F–F'
WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

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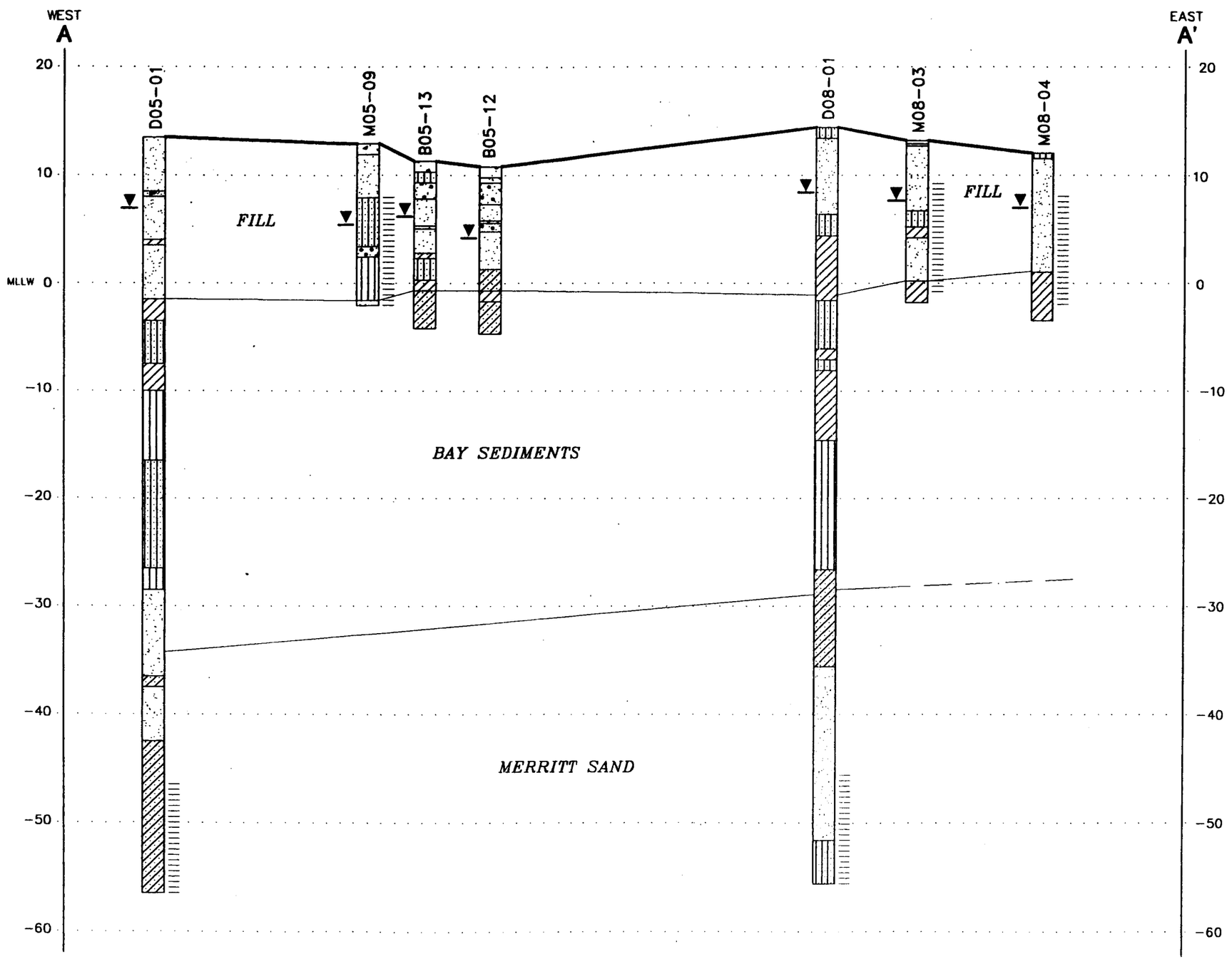
GEOLOGICAL CROSS SECTION A-A'

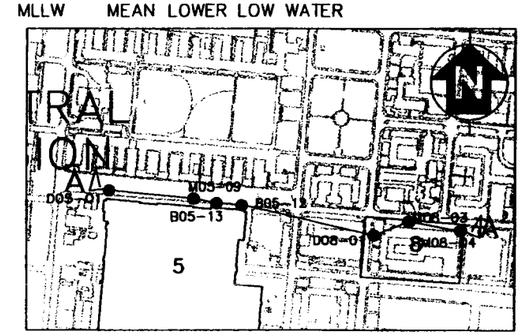
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D05-01	Fill to Bay Sediments	Change from a light brownish gray with trace red sand to a black to dark gray silty clay; shells and sand lenses present at interface.
	Bay Sediments to Merritt Sand	Change from a dark greenish gray sand with trace shells to a brown sand with no shells; presence of iron oxide staining below interface.
M05-09	Fill to Bay Sediments	Change from a soft green silt to a loose dark green sand; increase in blow counts.
B05-13	Fill to Bay Sediments	Change from a dense yellowish brown sand with some clay fragments to a medium stiff olive silty clay; characteristic layering of clayey sand and silty clay at interface.
B05-12	Fill to Bay Sediments	Change from a loose olive clayey sand to a medium stiff dark olive silty clay; alternating layers of clay and clayey sand presents below interface.
D08-01	Fill to Bay Sediments	Change from a loose green gray silty sand to a soft dark gray clay. A former tidal channel backfilled with dark gray sand and underlain by a very stiff green gray clay with roots occurs below youngest interface.
	Bay Sediments to Merritt Sand	Changes from a greenish gray clayey sand to a yellowish brown clayey sand with trace silt; grades to light yellow brown sand with depth.
M08-03	Fill to Bay Sediments	Change from a medium dense dark olive sand with shell fragments to a stiff dark olive silty clay. Silty clay grades to interbedded sand and silty clay.
M08-04	Fill to Bay Sediments	Change from an olive gray sand with clay fragments to an olive gray clayey sand and sandy clay with layers of shell fragments.

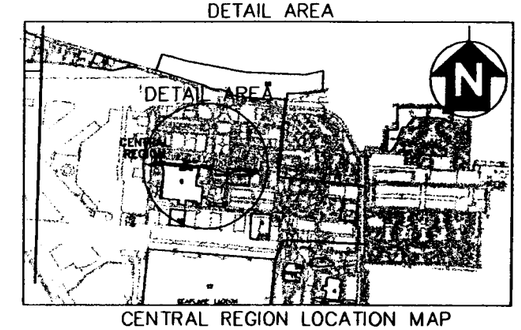


LEGEND

- AS – ASPHALT
- CN – CONCRETE
- GP – POORLY-GRADED GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

125' 0 125' 250'
HORIZONTAL SCALE: 1" = 250'

NOTE: VERTICAL EXAGGERATION IS 25X.

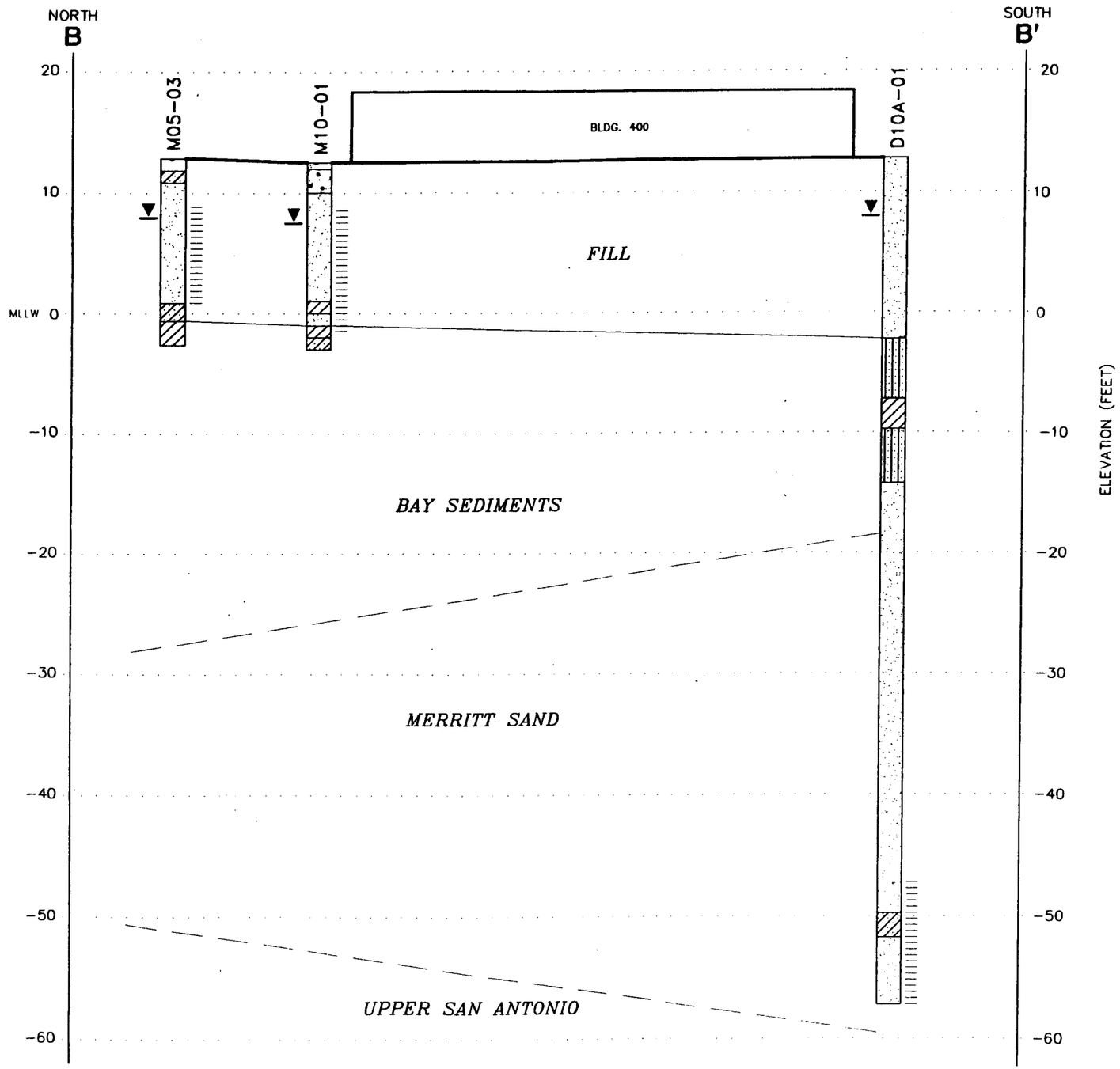
GEOLOGICAL CROSS SECTION A–A'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

5_XX.DWG – 06/05/97 – CFR – 044-0316/RRRP

GEOLOGICAL CROSS SECTION B-B'

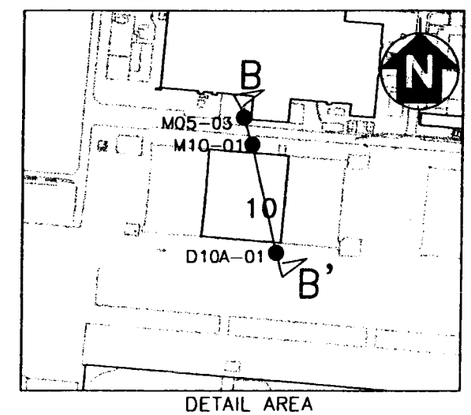
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M05-03	Fill to Bay Sediments	Change from a medium dense olive clayey sand to a stiff black to olive sandy clay; characteristic interbedded sand and clay at interface.
M10-01	Fill to Bay Sediments	Change from a loose wet olive sand to a soft moist olive clay; abundant shell fragments present below interface.
D10A-01	Fill to Bay Sediments	Change from a brown sand to a dark gray silty sand; abundant shells present below interface.
	Bay Sediments to Merritt Sand	Change from a mottled olive brown to gray silty sand to a yellow brown fine sand. Trace clay and silt disappear with depth.

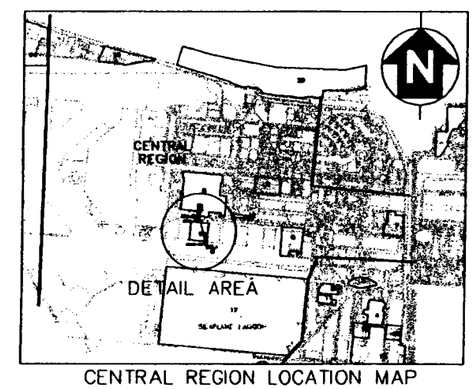


LEGEND

- CN – CONCRETE
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

NOTE: VERTICAL EXAGGERATION IS 10X.

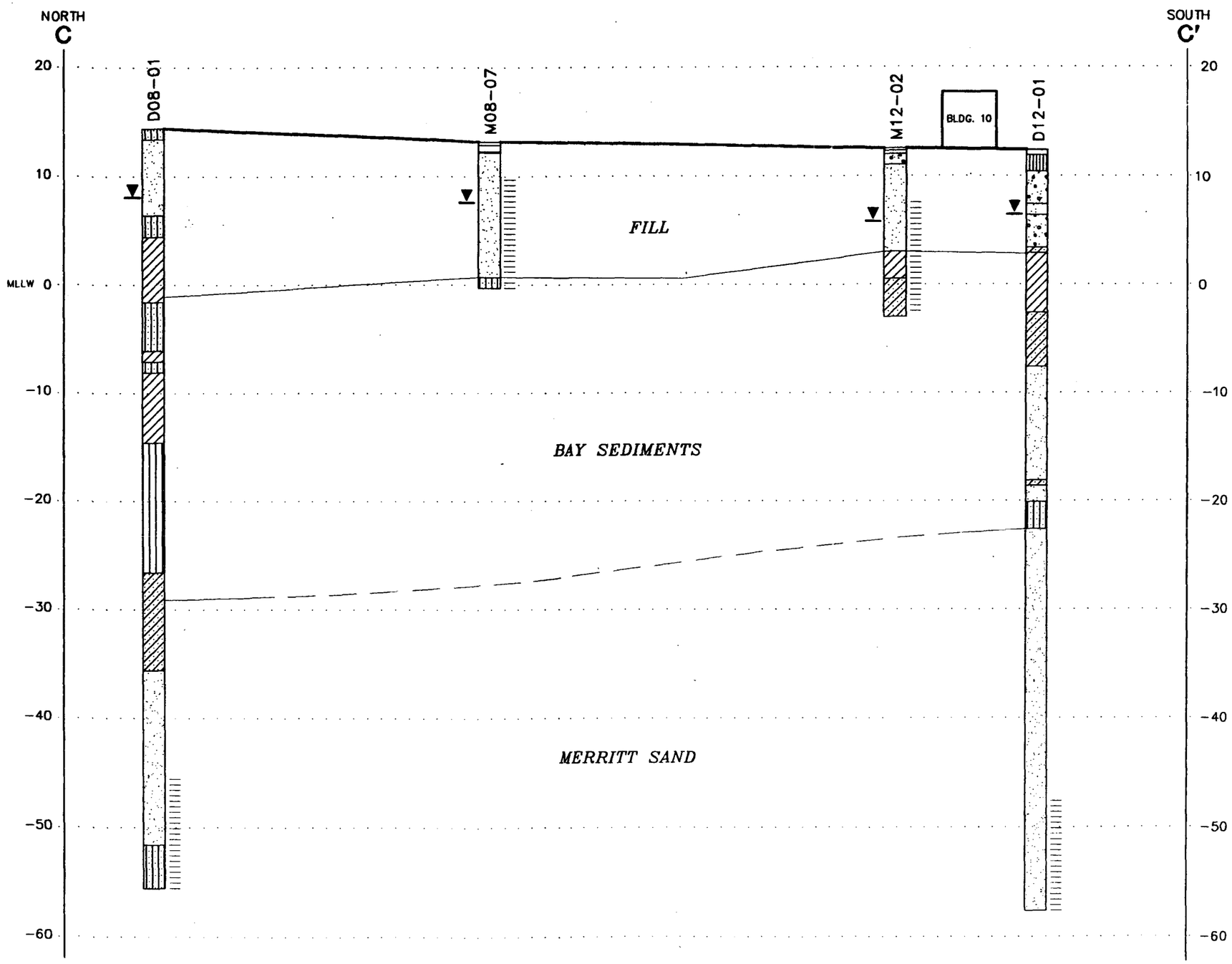
50' 0 50' 100'
HORIZONTAL SCALE: 1" = 100'

GEOLOGICAL CROSS SECTION B–B'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

GEOLOGICAL CROSS SECTION C-C'

CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

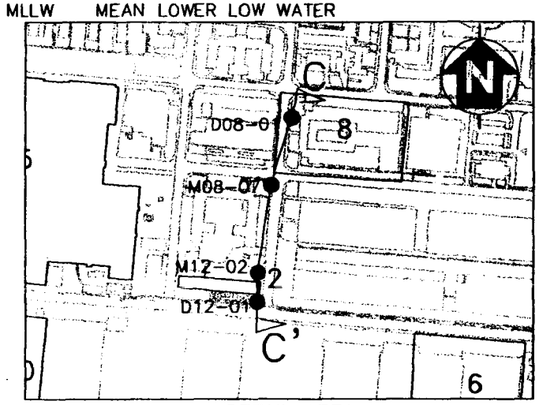
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D08-01	Fill to Bay Sediments	Change from a loose green gray silty sand to a soft dark gray clay. A former tidal channel backfilled with dark gray sand underlain by a very stiff green gray clay with roots occurs below youngest interface.
	Bay Sediments to Merritt Sand	Change from a greenish gray clayey sand to a yellowish brown clayey sand with trace silt. Grades to light yellow brown sand with depth.
M08-07	Fill to Bay Sediments	Change from a dense gray brown sand to a medium dense dark gray silty sand.
M12-02	Fill to Bay Sediments	Change from a medium dense olive gray sand to a soft black clay; abundant shell fragments present below interface.
D12-01	Fill to Bay Sediments	Change from loose olive sand to a soft dark gray clay. Thin layer of clayey sand and shells at interface.
	Bay Sediments to Merritt Sand	Change from a medium stiff pale olive silty sand to a dense light olive brown sand with greenish gray staining in the root pores; change in color to light yellowish brown below interface.



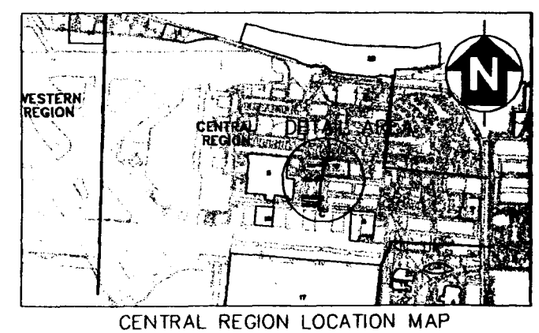
NOTE: VERTICAL EXAGGERATION IS 10X.

LEGEND

- AS – ASPHALT
- GM – SILTY GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

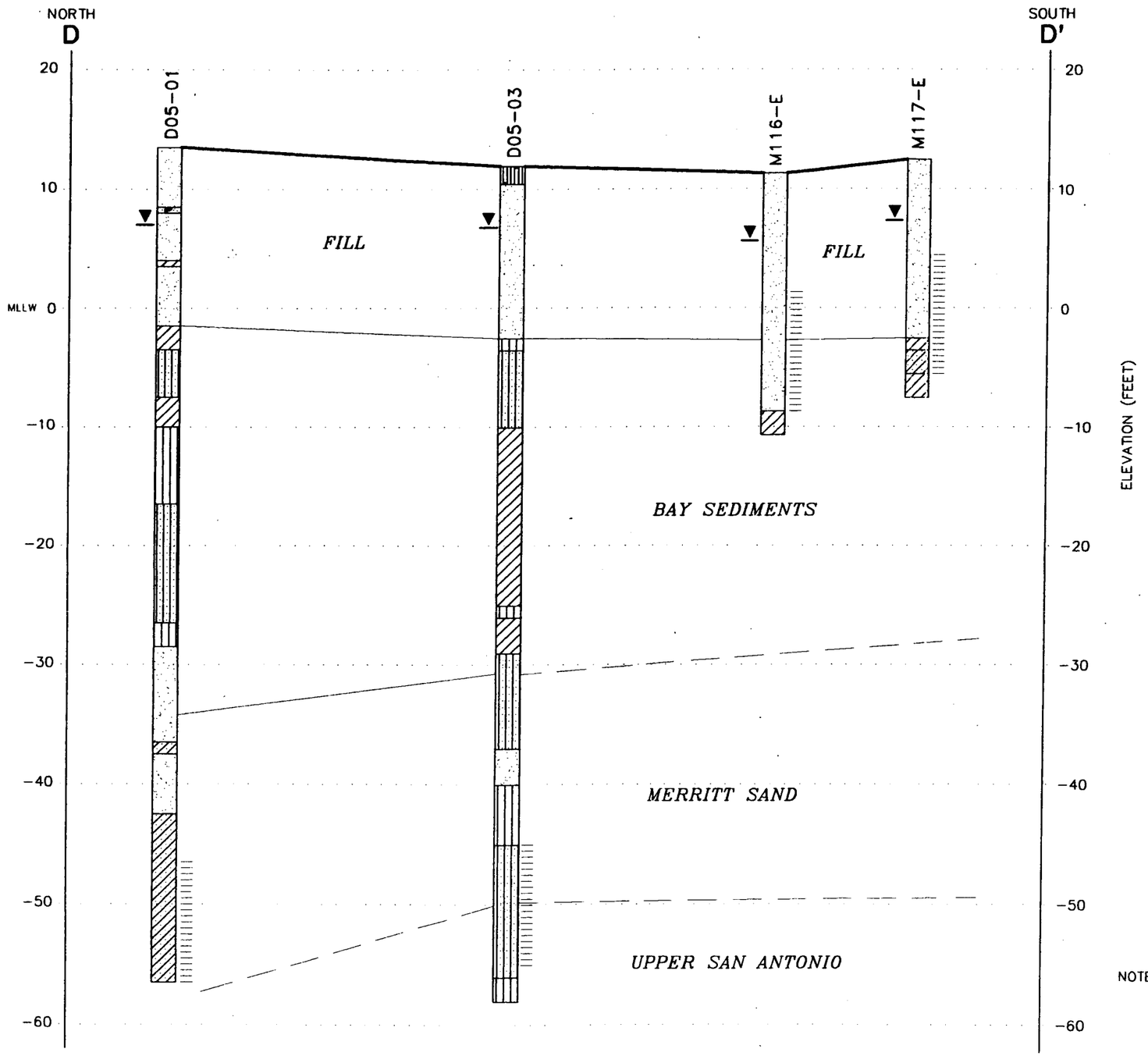
GEOLOGICAL CROSS SECTION, C–C'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

S_V2.DWG – 06/03/97 – CFR – 044-031BRRIRP

GEOLOGICAL CROSS SECTION D-D'

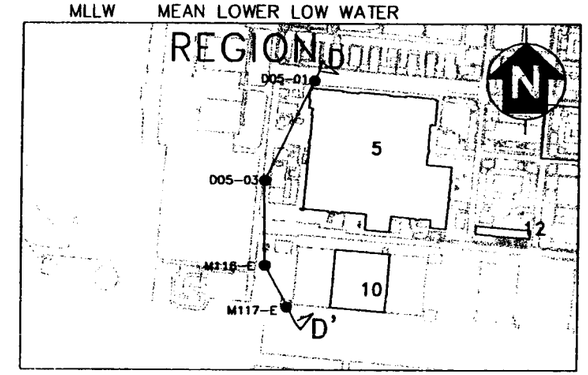
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D05-01	Fill to Bay Sediments	Change from a light brownish gray sand to a black to dark gray silty clay with shells and sand lenses present at interface.
	Bay Sediments to Merritt Sand	Change from a dark greenish gray sand with trace shells to a brown sand with no shells; iron oxide present below interface.
D05-03	Fill to Bay Sediments	Change from a medium dense gray sand to a soft dark gray clayey silt with sand; trace organic matter present at interface.
	Bay Sediments to Merritt Sand	Change from a dark gray to a light olive brown sand; increasing denseness and color change to brownish yellow with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a loose grayish brown sand with orange mottling to a medium dense olive gray to gray sand; moist to dry with depth.
M116-E	Fill to Bay Sediments	Change from a light brown to gray black sand, correlates with depth to interface of adjacent borings.
M117-E	Fill to Bay Sediments	Change from dark brown sand to a gray clay; characteristic interbedded clay and sand at interface.

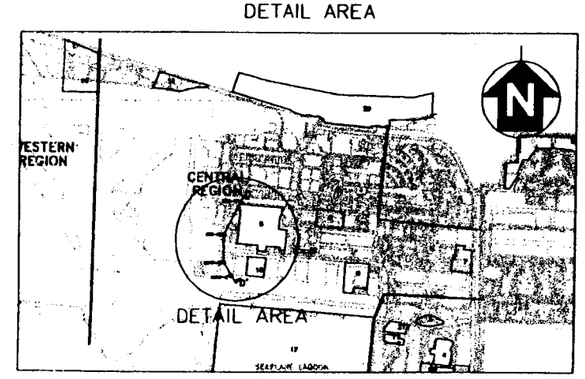


LEGEND

- GP – POORLY-GRADED GRAVELS
- GM – SILTY GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

NOTE: VERTICAL EXAGGERATION IS 25X.

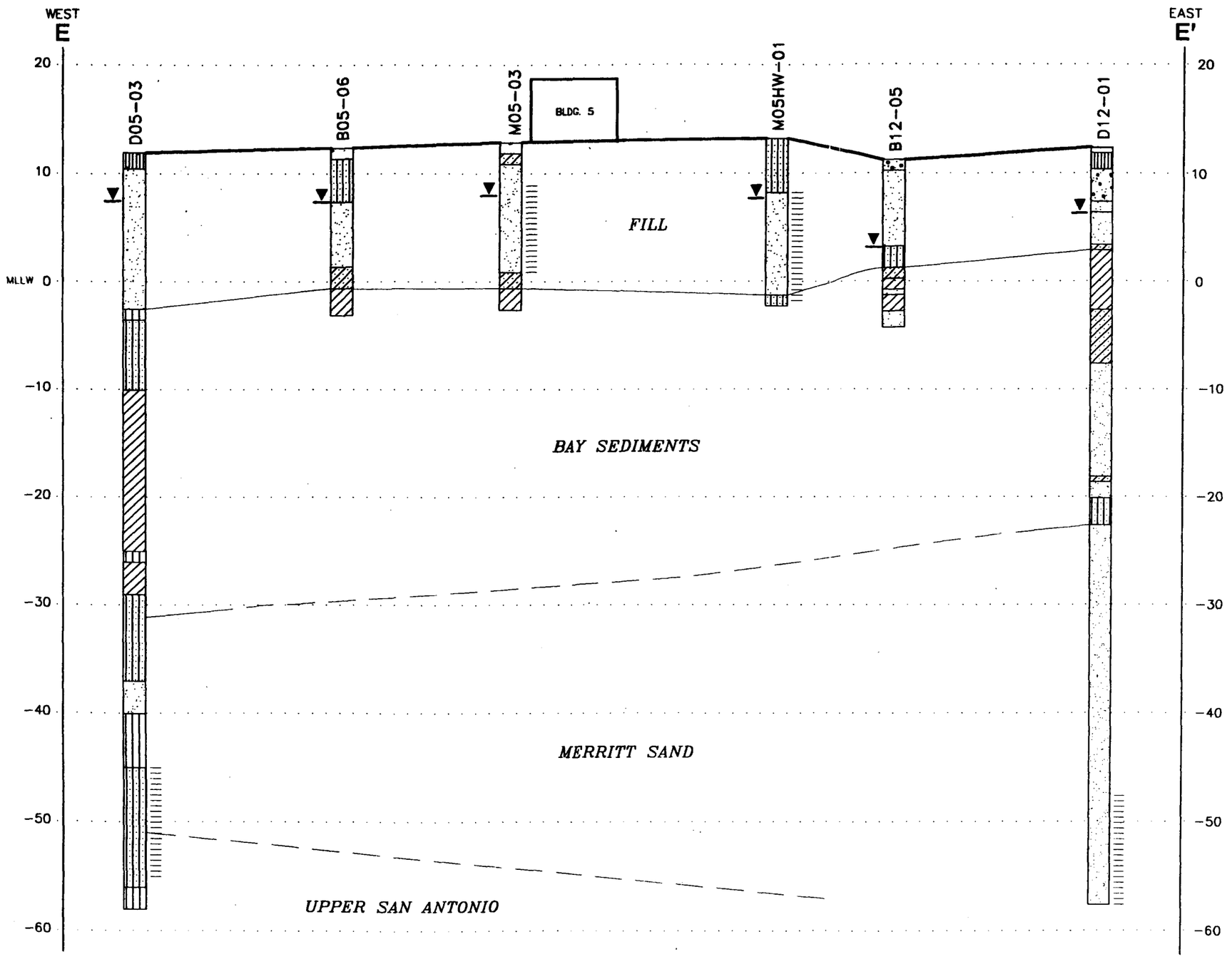
125' 0 125' 250'
HORIZONTAL SCALE: 1" = 250'

GEOLOGICAL CROSS SECTION D–D'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

GEOLOGICAL CROSS SECTION E-E'

CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

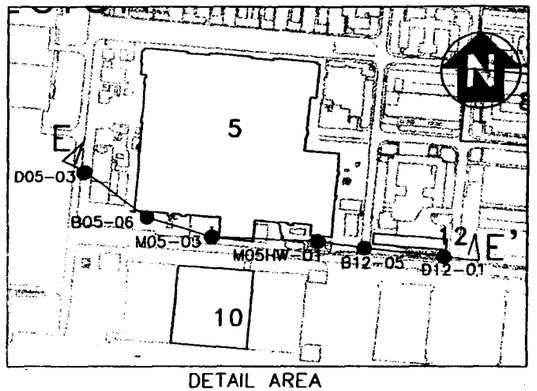
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D05-03	Fill to Bay Sediments	Change from a medium dense gray sand to a soft dark gray clayey silt with sand, trace organic matter present at interface.
	Bay Sediment to Merritt Sand	Change from a dark gray to light olive brown sand; increasing denseness and color change to brownish yellow with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a loose grayish brown sand with orange mottling to a medium dense olive gray to gray sand; moist to dry with depth.
B05-06	Fill to Bay Sediments	Change from a loose wet sand to a stiff moist clay with some clayey sand; shell fragments above interface.
M05-03	Fill to Bay Sediments	Change from a medium dense olive clayey sand to a stiff black to olive sandy clay; characteristic interbedded sand and clay at interface.
M05HW-01	Fill to Bay Sediments	Change from a red-brown sand with trace shell fragments to a dark gray silty sand with abundant whole shells.
B12-05	Fill to Bay Sediments	Change from a medium dense silty sands to a stiff clay and clayey sand; characteristic layers of interbedded sand and clay below interface.
D12-01	Fill to Bay Sediments	Change from a loose olive sand to a soft dark gray clay; dark gray clayey sand and shell layer at interface.
	Bay Sediments to Merritt Sand	Change from a pale olive silty sand to a light olive brown sand with greenish gray staining in root pores. Changes to a light yellowish brown with iron oxide staining present with depth.



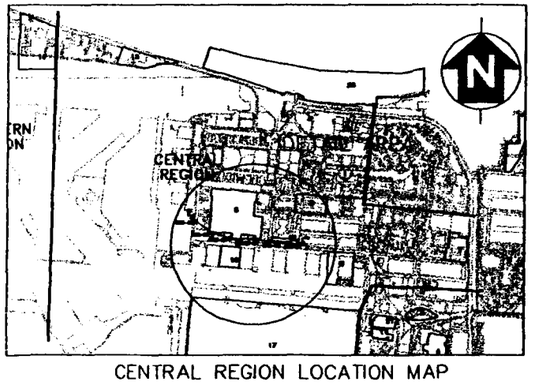
NOTE: VERTICAL EXAGGERATION IS 20X.

LEGEND

- CN – CONCRETE
- GW – WELL-GRADED GRAVELS
- GM – SILTY GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

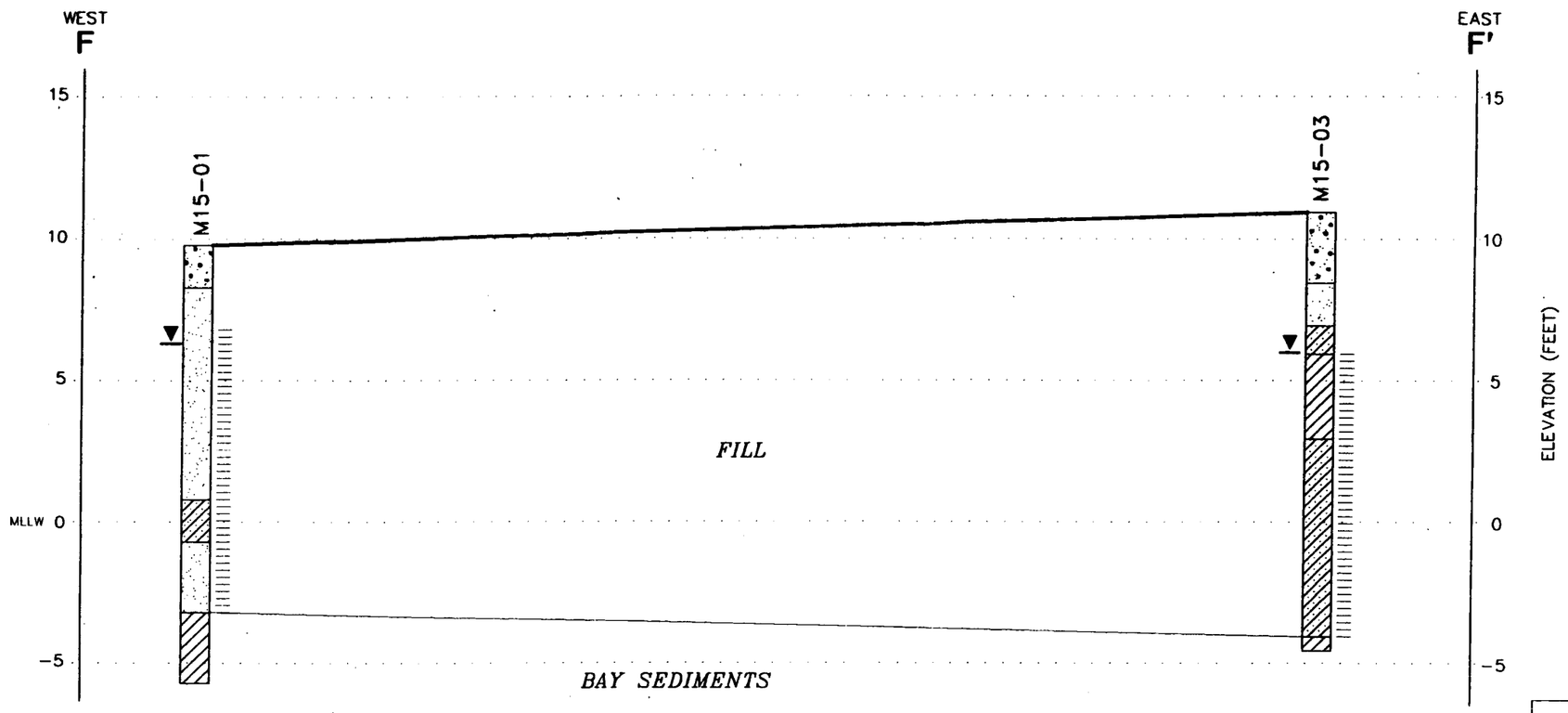
GEOLOGICAL CROSS SECTION E–E'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

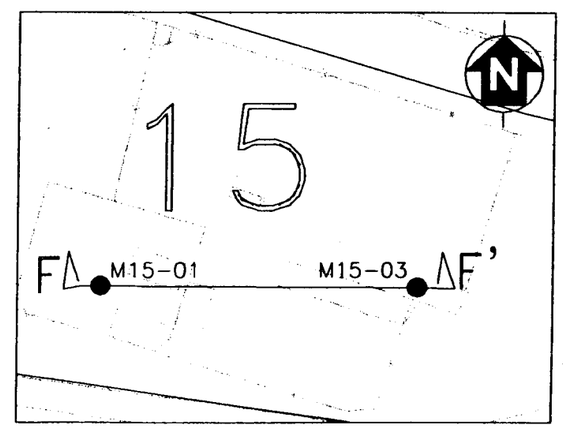
5_X2.DWG – 06/03/97 – CFR – 044-031GIRRIRP

GEOLOGICAL CROSS SECTION F-F'

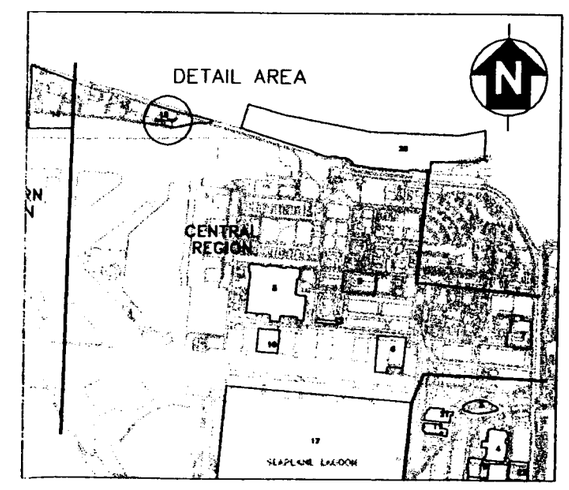
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M15-01	Fill to Bay Sediments	Change from a medium dense clayey sand to a stiff sandy clay; characteristic layers of clayey sand and sandy clay at interface.
M15-03	Fill to Bay Sediments	Change from a light olive brown clayey sand to a olive gray clay; change from wet to moist.





DETAIL AREA



CENTRAL REGION LOCATION MAP

LEGEND

- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER

NOTE: VERTICAL EXAGGERATION IS 6X.

15' 0 15' 30'
HORIZONTAL SCALE: 1" = 30'

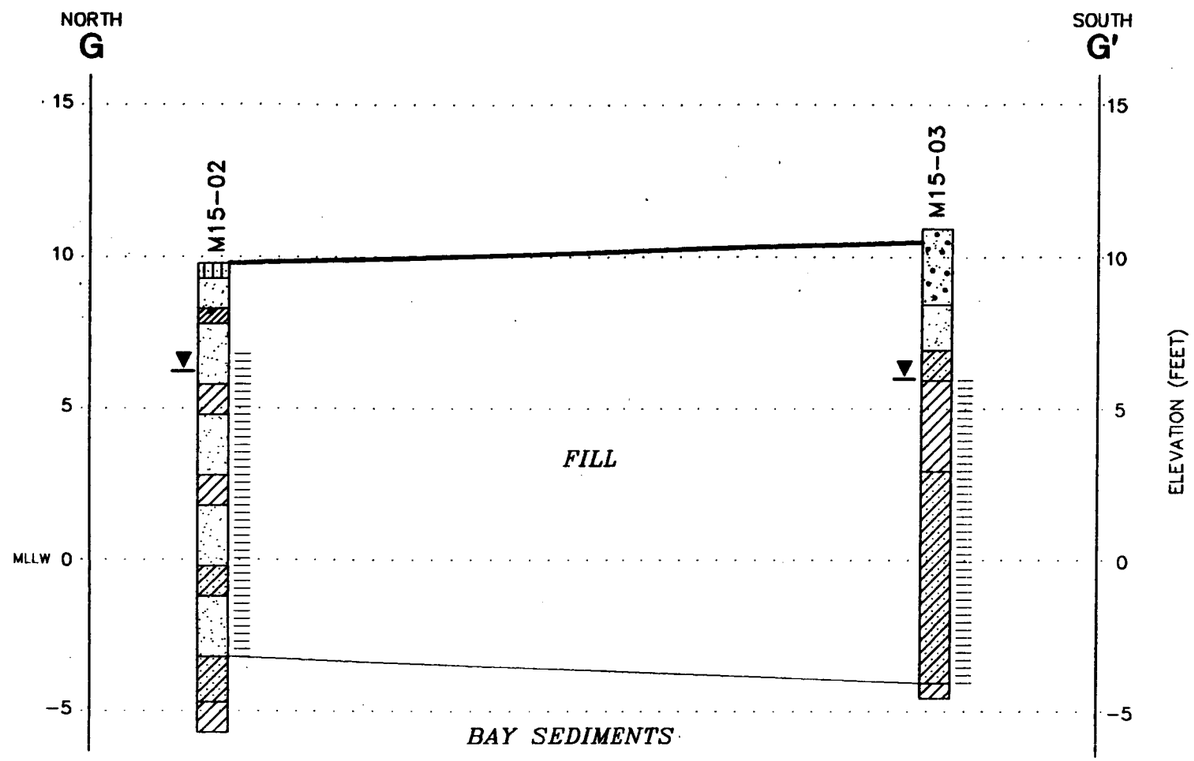
GEOLOGICAL CROSS SECTION F–F'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

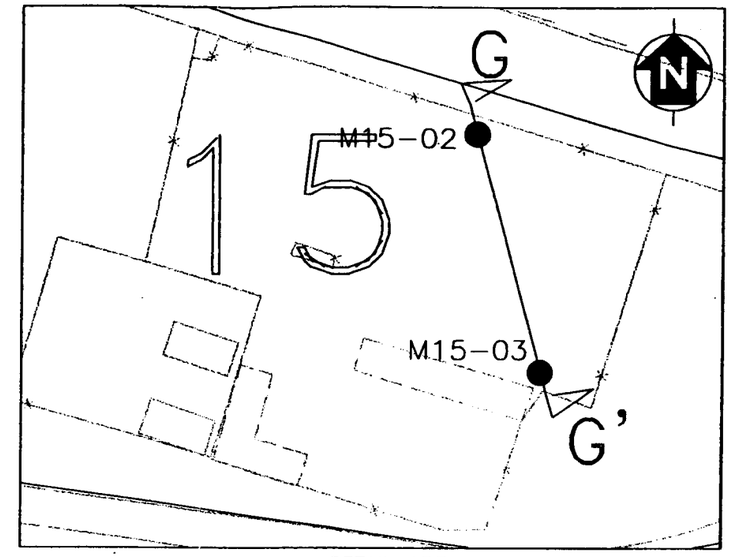
15_XX.DWG – 06/ /7 – CFR – 044-0316RRIRP

GEOLOGICAL CROSS SECTION G-G'

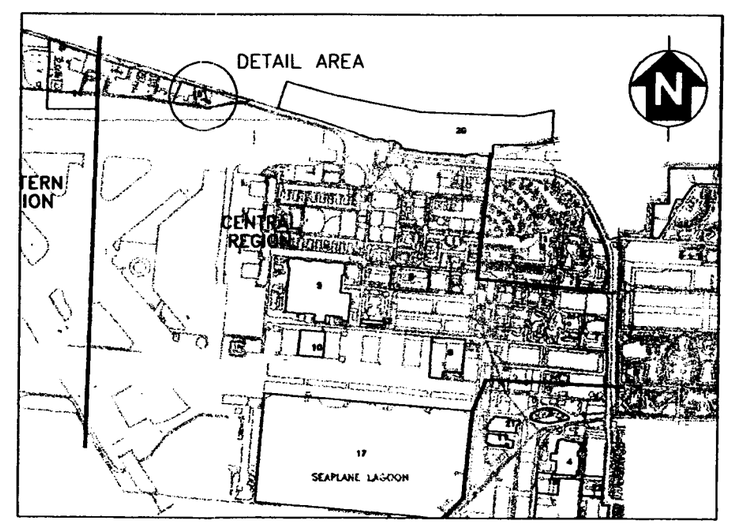
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M15-02	Fill to Bay Sediments	Change from sand to clayey sand; abundant shell fragments present at interface; grades to stiff silty clay with depth.
M15-03	Fill to Bay Sediments	Change from a light olive brown clayey sand to a olive gray clay; change from wet to moist.





DETAIL AREA



CENTRAL REGION LOCATION MAP

LEGEND

- GC – CLAYEY GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER

NOTE: VERTICAL EXAGGERATION IS 6X.

15' 0 15' 30'
HORIZONTAL SCALE: 1" = 30'

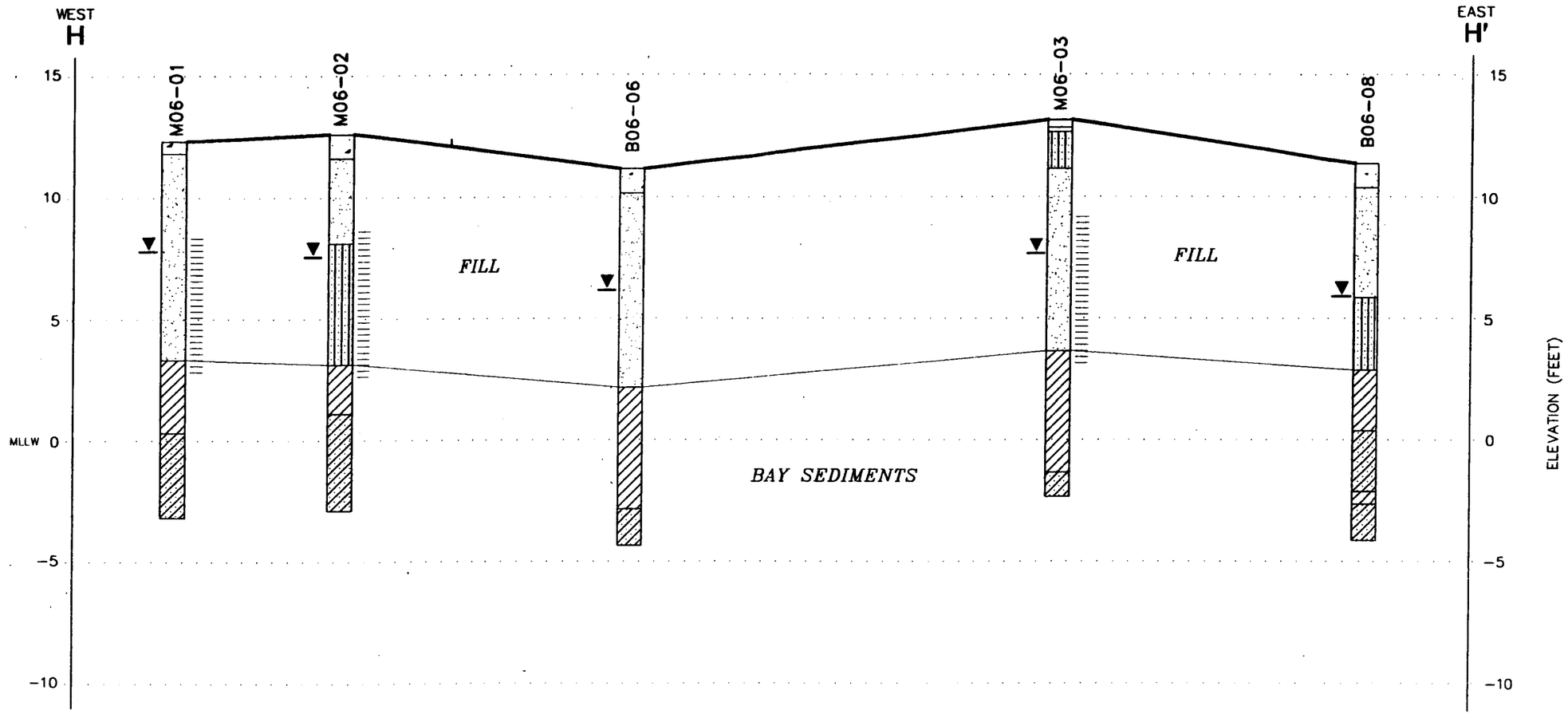
GEOLOGICAL CROSS SECTION G–G'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

15_YY.DWG - 06/03/97 - CFR - 044-0316\RRIRP

GEOLOGICAL CROSS SECTION H-H'

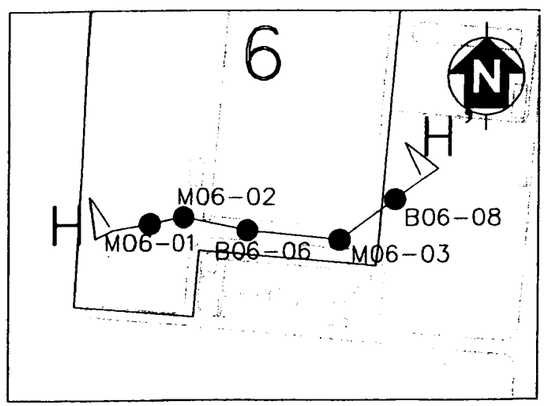
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M06-01	Fill to Bay Sediments	Change from a medium dense greenish gray sand to a stiff dark gray clay.
M06-02	Fill to Bay Sediments	Change from a medium dense greenish gray silty sand to a soft dark gray clay; plant debris present at interface.
B06-06	Fill to Bay Sediments	Change from a dense dark grayish brown sand with some gravel to a stiff black clay; layer of sandy clay and slight hydrogen sulfide odor present below interface.
M06-03	Fill to Bay Sediments	Change from a dense olive sand to a very soft very dark gray clay.
B06-08	Fill to Bay Sediments	Change from an olive gray, medium dense silty sand to a soft dark gray clay; layers of shell fragments below interface.

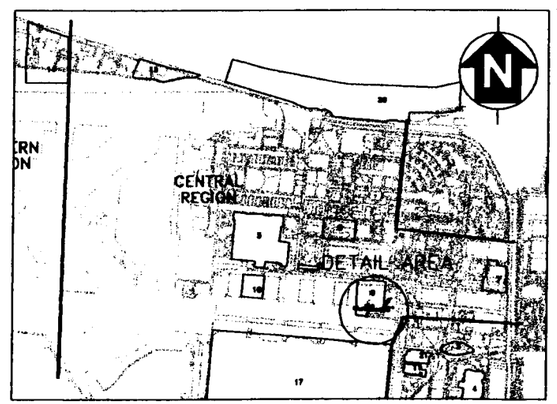


LEGEND

- AS – ASPHALT
- CN – CONCRETE
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

NOTE: VERTICAL EXAGGERATION IS 8X.

20' 0 20' 40'
HORIZONTAL SCALE: 1" = 40'

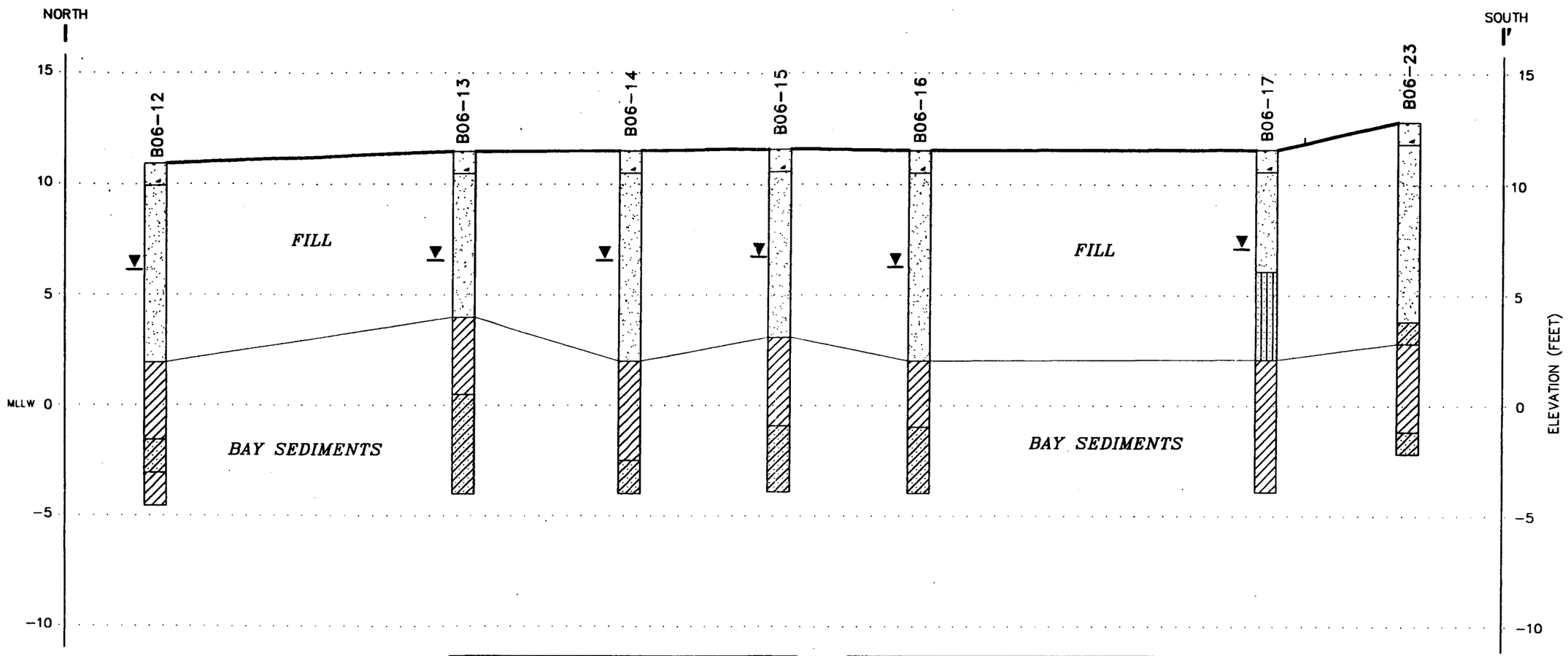
GEOLOGICAL CROSS SECTION H–H'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

6_XX.DWG - CFR - 044-0316RRIRP

GEOLOGICAL CROSS SECTION I-I'

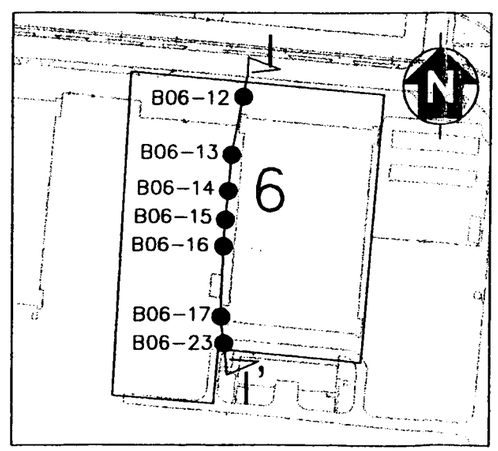
CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
B06-12	Fill to Bay Sediments	Change from a medium dense olive sand to a medium stiff dark olive clay; presence of trace shell fragments and interbedded sand below interface.
B06-13	Fill to Bay Sediments	Change from a dense olive gray sand to a soft very dark gray clay; interbedded sand layers present below interface.
B06-14	Fill to Bay Sediments	Change from a dense olive sand to a soft dark olive clay with some sandy partings; change from wet to moist. Worm burrows below interface.
B06-15	Fill to Bay Sediments	Change from a dense yellow brown sand to a medium stiff dark olive clay; interbedded black sand and shell fragments at interface.
B06-16	Fill to Bay Sediments	Change from a medium dense olive sand to a very soft dark olive clay; change from wet to moist; partings of silt and sand, burrows lined with sand.
B06-17	Fill to Bay Sediments	Change from a dense olive gray silty sand to a medium stiff very dark gray clay; shell fragments above interface.
B06-23	Fill to Bay Sediments	Change from a loose to medium dense clayey sand to a clay with trace sand and shells; sulfur odor present below interface.

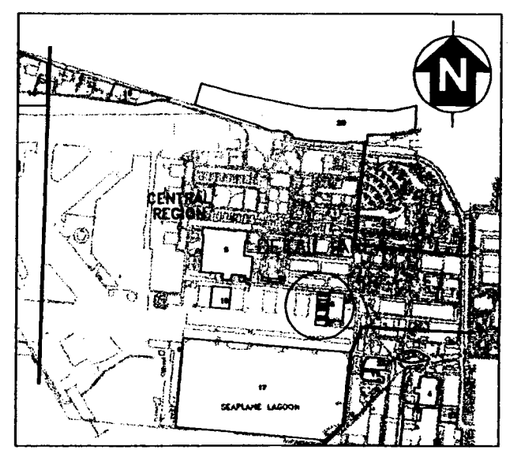


LEGEND

- CN – CONCRETE
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

NOTE: VERTICAL EXAGGERATION IS 8X.

20' 0 20' 40'
HORIZONTAL SCALE: 1" = 40'

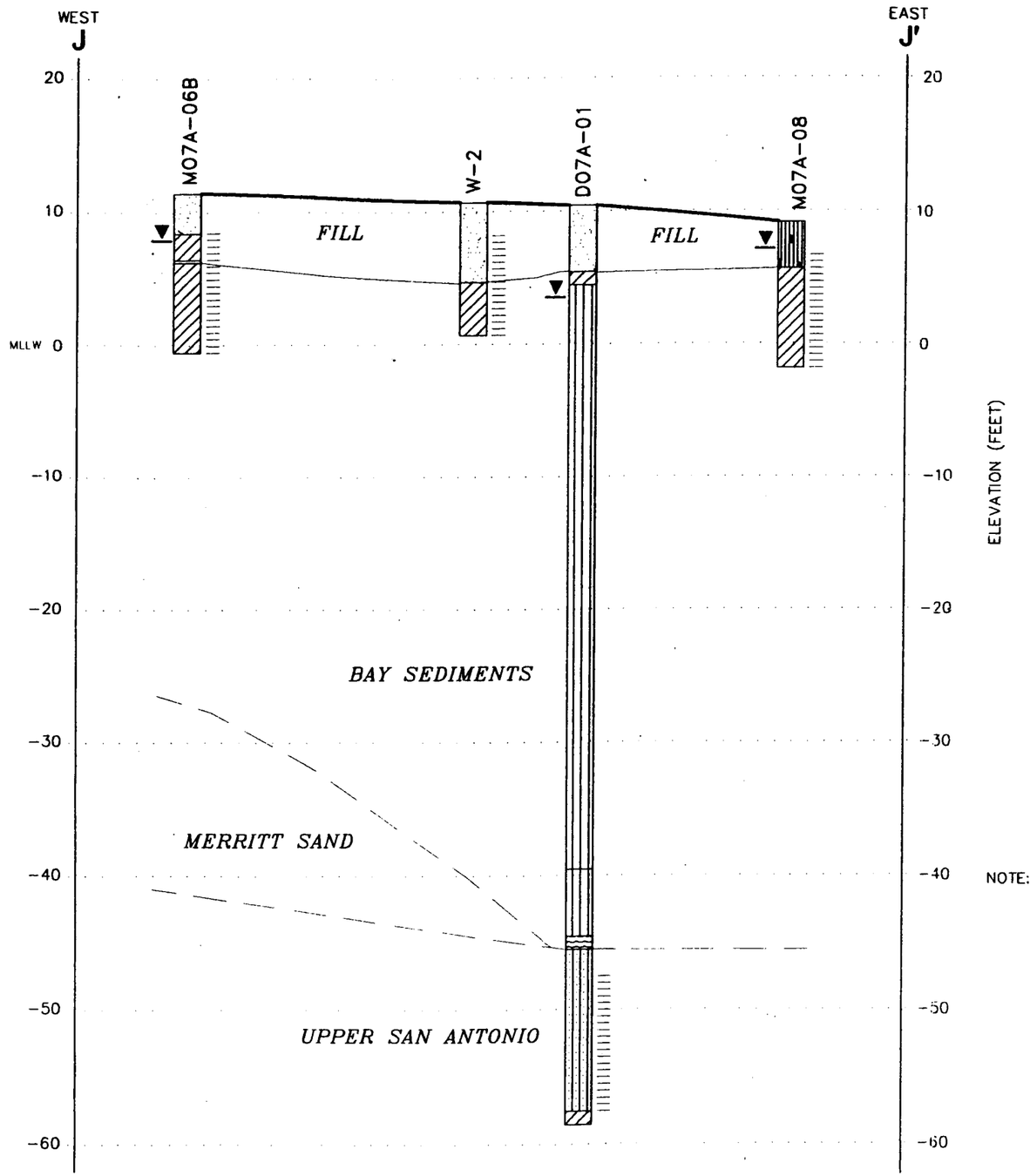
GEOLOGICAL CROSS SECTION I–I'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

6_YY.DWG - 05/21/97 - CFR - 044-0316RRIRP

GEOLOGICAL CROSS SECTION J-J'

CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

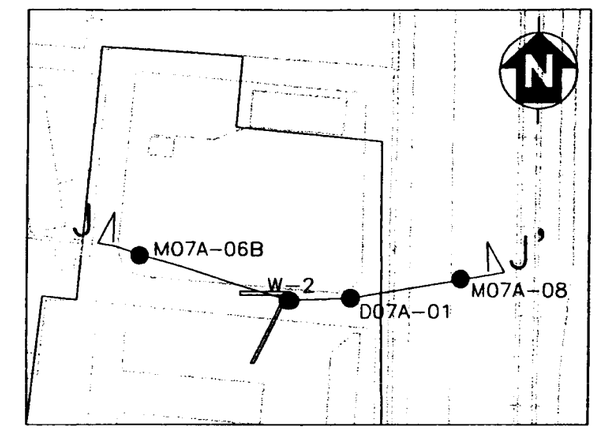
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
M07A-06B	Fill to Bay Sediments	Change from a medium stiff green gray silty clay with interbedded sand layers to a soft dark green gray clay with organic matter.
W-2	Fill to Bay Sediments	Change from a gray brown sand to a gray organic clay; slight hydrogen sulfide odor at the interface.
D07A-01	Fill to Bay Sediments	Change from fill sand to a soft grayish olive clay with black mottling; clay grades to a clayey sandy silt with depth.
	Bay Sediments to Upper San Antonio Formation	Change from a soft olive brown clayey silt to a dense grayish olive silty sand. Peat layer at interface.
M07A-08	Fill to Bay Sediments	Change from a green gray silty gravel to a soft green gray silty clay; roots common at interface.



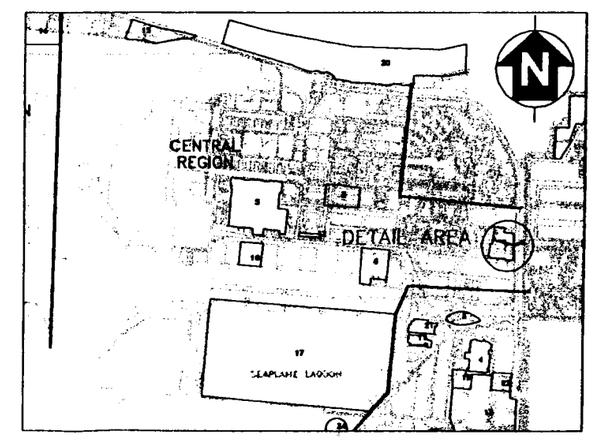
NOTE: VERTICAL EXAGGERATION IS 8X.

LEGEND

- PT – PEAT
- GM – SILTY GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

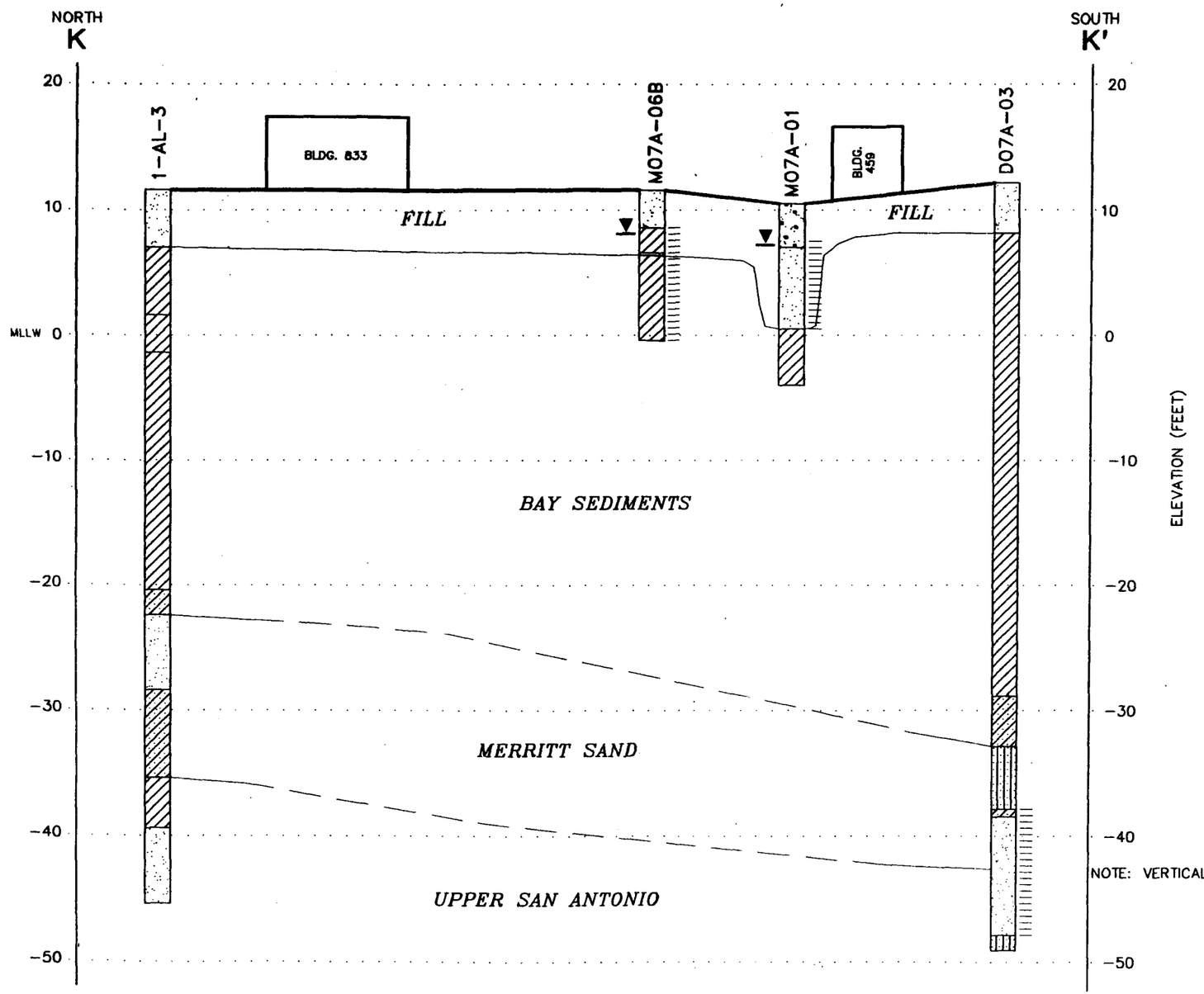
40' 0 40' 80'
HORIZONTAL SCALE: 1" = 80'

GEOLOGICAL CROSS SECTION J–J'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

GEOLOGICAL CROSS SECTION K-K'

CENTRAL REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

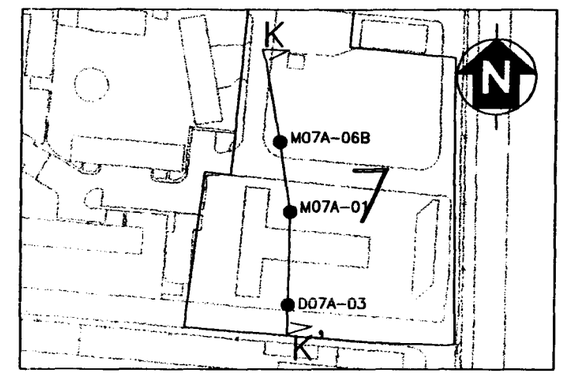
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
1-AL-3	Fill to Bay Sediments	Change from a brown sand to a dark gray clay. Peat present below interface.
	Bay Sediments to Merritt Sand	Change from a dark gray clay to a brown poorly graded sand; clayey sand layer at interface.
	Merritt Sand to Upper San Antonio Formation	Change from a clayey sand to a silty clay; grades to poorly sorted sand with depth.
M07A-06B	Fill to Bay Sediments	Change from a medium stiff green gray silty clay with interbedded sand layers to a soft dark green gray clay with organic matter.
M07A-01	Fill to Bay Sediments	Change from a dense sand with wood and cement fragments to a stiff clay with abundant roots and organic material; a strong hydrogen sulfide odor is present at this interface.
D07A-03	Fill to Bay Sediments	Change from a loose gray brown sand to a medium stiff very dark gray clay; grass and roots present below interface.
	Bay Sediments to Merritt Sand	Change from a medium dense dark gray clayey silty sand to a yellow brown silty sand; grades to a dense sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a dense dark yellowish brown sand to a medium to very dense dark gray sand; grades to a gray brown silty sand with depth.



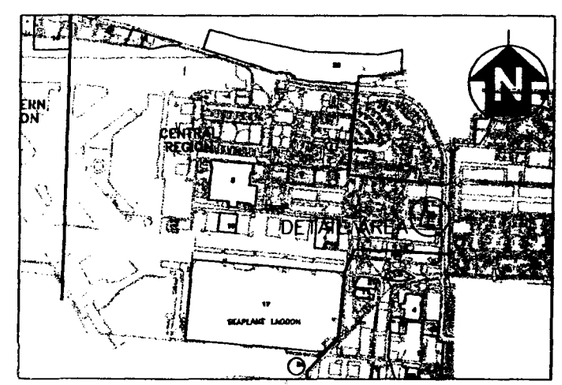
NOTE: VERTICAL EXAGGERATION IS 8X.

LEGEND

- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



CENTRAL REGION LOCATION MAP

40' 0 40' 80'
HORIZONTAL SCALE: 1" = 80'

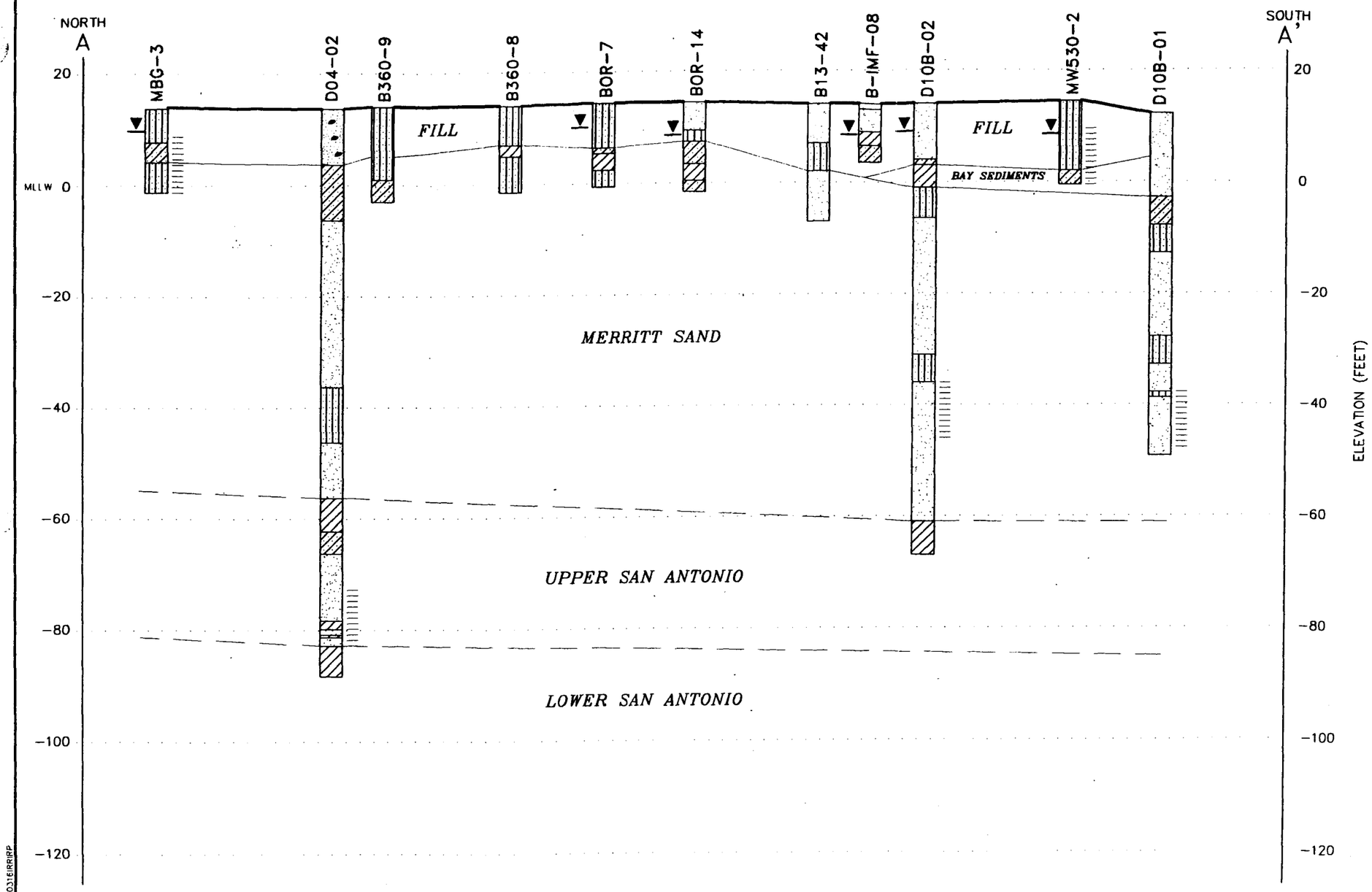
GEOLOGICAL CROSS SECTION K–K'
CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

7A_XX.DWG – 05/21/97 – CFR – 044-0316\RRIRP

GEOLOGICAL CROSS SECTION A-A'

SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
MBG-3	Fill to Merritt Sand	Change from a soft dark brown clayey sand with horizontal roots to a medium dense tan silty sand with iron staining. Buried soil overlying Merritt Sand; elevation too high for Bay Sediments.
D04-02	Fill to Merritt Sand	Change from a gravel with minor sand, silt, and clay to a medium dense yellowish brown clayey to silty sand; grades to sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a dense dark yellowish brown sand to a stiff dark gray clay with trace roots and organic matter; interbedded sands and sandy clays with depth.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from an interbedded very dense dark gray sands and very stiff olive gray clays to a stiff dark gray clay with roots and root holes.
B360-9	Fill to Merritt Sand	Change from a loose dark brown silty fine sand to a medium dense reddish brown and gray silty sand.
B360-8	Fill to Merritt Sand	Change from a medium dense brown silty sand to a stiff orange brown sandy clay with gray mottles at the interface; grading to a medium dense orange brown silty sand with depth.
BOR-7	Fill to Merritt Sand	Change from a brown silty sand to orange brown clayey sand with gray mottles at the interface; grades to silty sand and blow counts increase with depth.
BOR-14	Fill to Merritt Sand.	Change from a medium stiff gray clayey silt to a medium dense brown clayey sand with some gray to black mottling at the interface.
B13-42	Fill to Merritt Sand	Change from a medium dense green silty sand to a medium dense brown sand; blow counts increase with depth.
B-IMF-08	Fill	Boring does not cross a lithologic unit.
D10B-02	Fill to Bay Sediments	Change from a loose dark gray clayey sand to a very dark gray clay with sand inclusions and trace shells.
	Bay Sediments to Merritt Sand	Change from a very dark gray clay with sand inclusions to a dense orange brown silty sand with red mottling, increase in blow counts with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a dense light tannish brown sand to a very stiff dark grayish black clay; change from wet to moist. Interbedded sands and clayey sands with depth.
MW530-2	Fill to Bay Sediments	Change from a loose gray silty sand with trace of gravel to a gray to dark brown clayey sand with some pockets of clay; increasing clay content and appearance of shells with depth.
D10B-01	Fill to Bay Sediments	No recovery at interface. Interface depth based on Navy harbor sounding prior to filling.
	Bay Sediments to Merritt Sand	Change from a loose light brown sand to a dense reddish yellow silty clayey sand grading to a dense yellow red silty sand with depth; increasing blow count with depth.

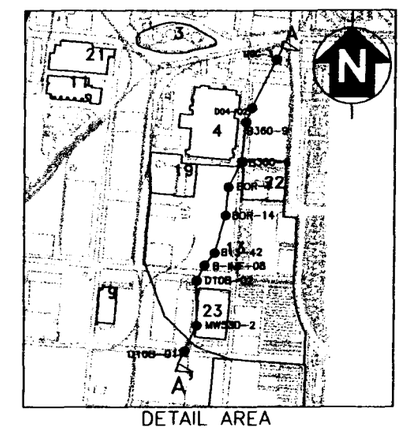


NOTE: VERTICAL EXAGGERATION IS 12.5X.

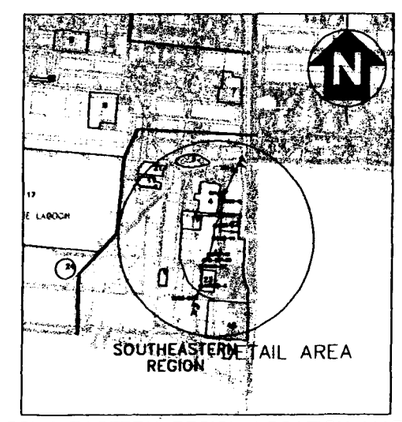
125' 0 125' 250'
HORIZONTAL SCALE: 1" = 250'

LEGEND

- GP – POORLY-GRADED GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



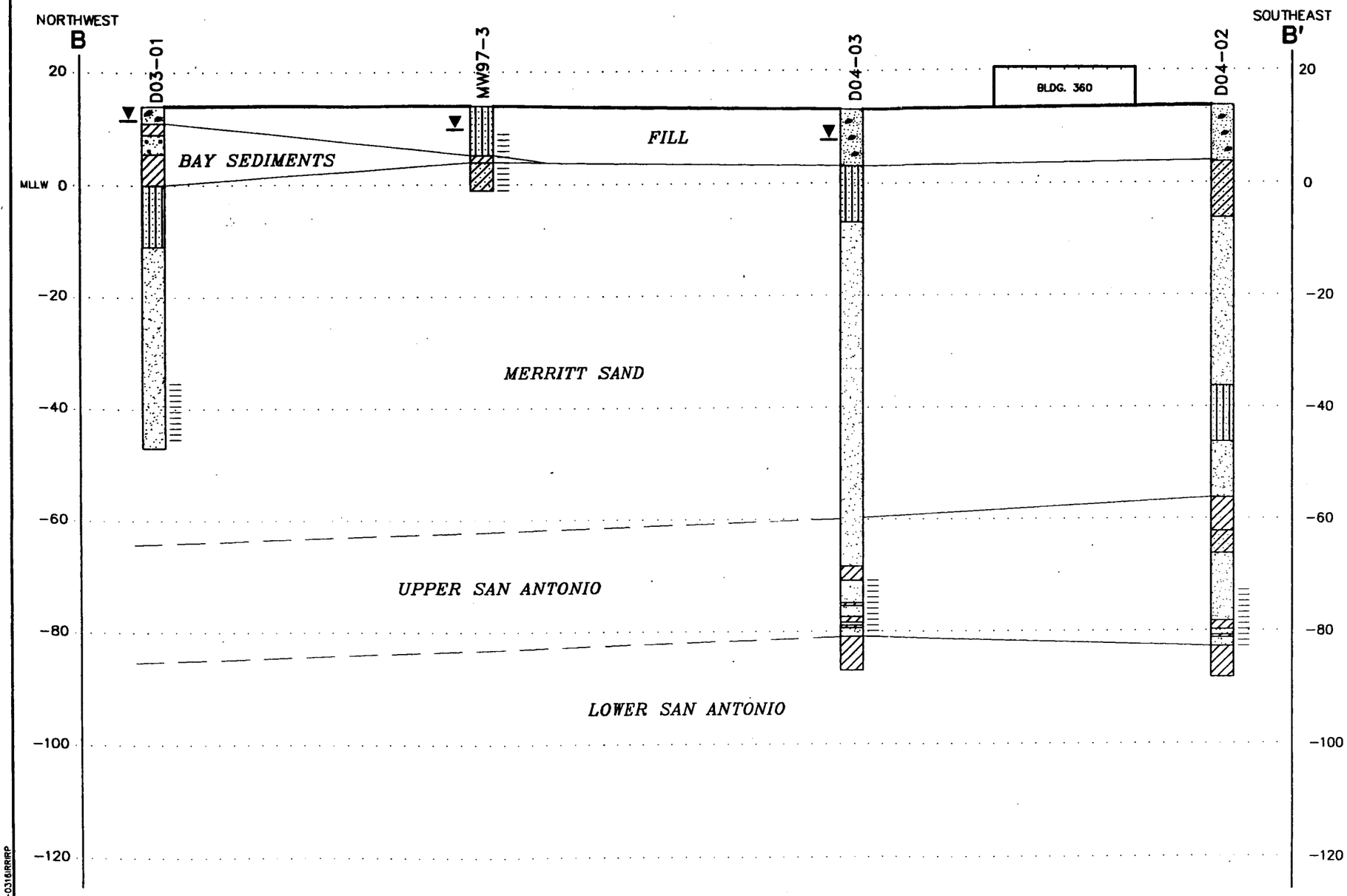
SOUTHEASTERN REGION LOCATION MAP

GEOLOGICAL CROSS SECTION A–A'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

GEOLOGICAL CROSS SECTION B-B'

SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

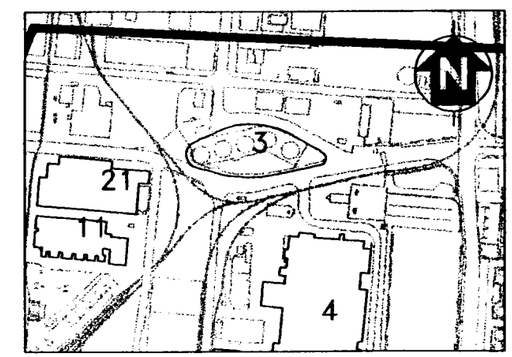
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D03-01	Fill to Bay Sediments	Change from a loose grayish olive silty gravelly sand to a soft grayish olive green clay; interbedded layers of clayey sand and silty clay at the interface.
	Bay Sediments to Merritt Sand	Change from a soft grayish olive clay to a medium dense yellowish brown silty sand; increasing blow counts at the interface.
MW97-3	Fill to Bay Sediments	Change from a loose gray silty sand to a very soft gray silty clay; appearance of shells just below the interface.
	Bay Sediments to Merritt Sand	Change from a loose dark gray silty sand with shells to a medium dense orange brown clayey sand with gray mottling; increasing density with depth.
D04-03	Fill to Merritt Sand	Change from a gravel with sand to a medium dense yellowish brown silty sand with trace clay; grades to dense dark yellow brown sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a very dense dark yellowish brown sand to a dark greenish gray sand; interbedded layers of stiff silty clay and sand near interface.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from interbedded wet dark green gray sands and sandy clays to a stiff moist clay with trace organic matter.
D04-02	Fill to Merritt Sand	Change from gravel with minor sand, silt and clay to a medium dense yellowish brown clayey to silty sand; grades to sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a dense dark yellow brown sand to a stiff dark gray clay with trace roots and organic matter; interbedded sands and sandy clays with depth.
	Upper San Antonio formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from interbedded very dense dark gray sands and very stiff olive gray clays to a stiff dark gray clay with roots and root holes.



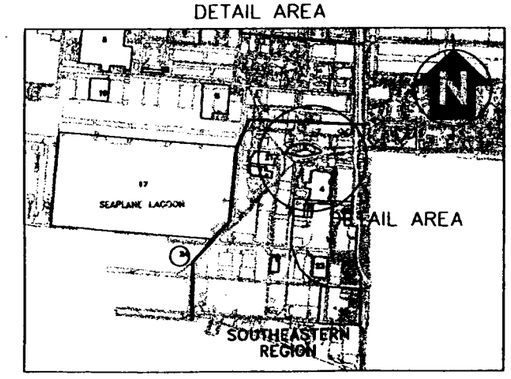
LEGEND

- GP – POORLY-GRADED GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL

MLLW MEAN LOWER LOW WATER



DETAIL AREA



SOUTHEASTERN REGION LOCATION MAP

NOTE: VERTICAL EXAGGERATION IS 6X.

60' 0 60' 120'
HORIZONTAL SCALE: 1" = 120'

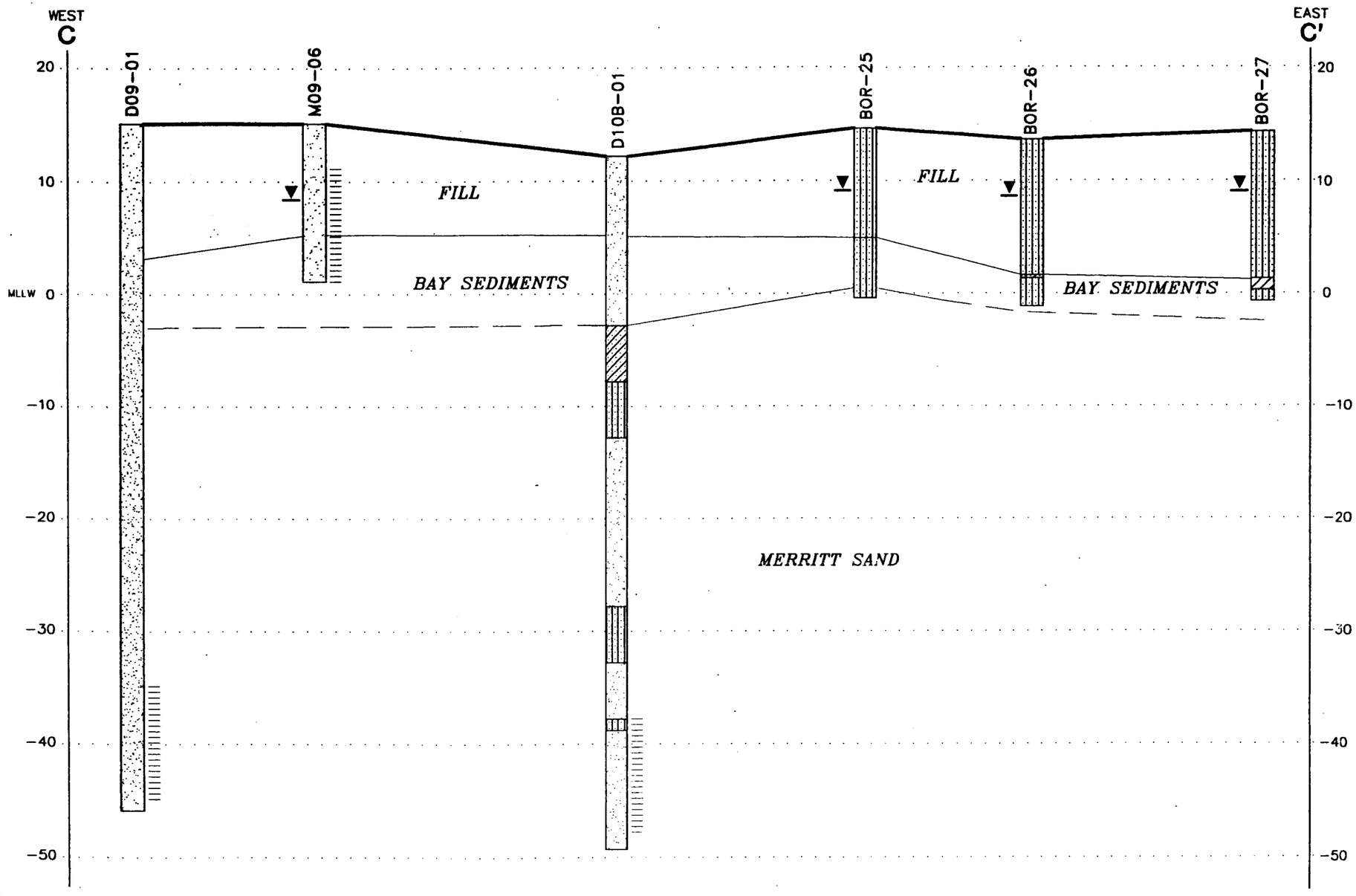
GEOLOGICAL CROSS SECTION B–B'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

3_XX.DWG – 06/03/97 – CFR – 044-0318/RRIRP

GEOLOGICAL CROSS SECTION C-C'

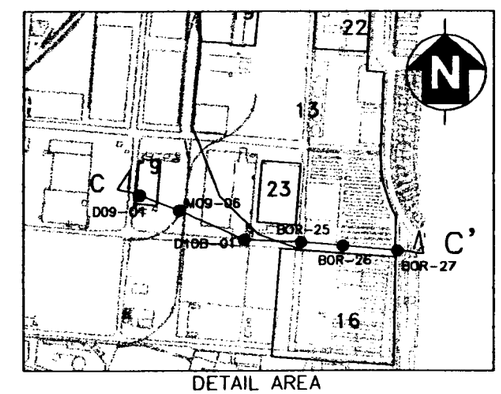
SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D09-01	Fill to Bay Sediments	Change from a medium dense light olive brown sand to a loose very dark gray sand; abundant shell fragments above the interface.
	Bay Sediments to Merritt Sand	Change from a loose light olive brown sand to a dense yellow brown sand; increasing blow counts with depth.
M09-06	Fill to Bay Sediments	Change from a medium dense light yellow brown sand to a loose light olive brown sand; trace shells near interface.
D10B-01	Fill to Bay Sediments	No recovery at interface. Interface depth based on Navy harbor soundings prior to filling.
	Bay Sediments to Merritt Sand	Change from a loose sand to a dense reddish yellow silty clayey sand which grades to a dense yellow red silty sand with depth; increasing blow count with depth.
BOR-25	Fill to Bay Sediments	Change from a dense to a loose gray silty sand; seashell fragments present above interface.
	Bay Sediments to Merritt Sand	Change from a loose dark gray silty sand to a loose orange brown silty sand with gray mottling.
BOR-26	Fill to Bay Sediments	Change from a loose gray silty sand to a dark gray clayey sand; grades to a medium dense black to dark gray silty sand with shells.
BOR-27	Fill to Bay Sediments	Change from a medium dense gray brown silty sand to a soft dark gray silty clay.

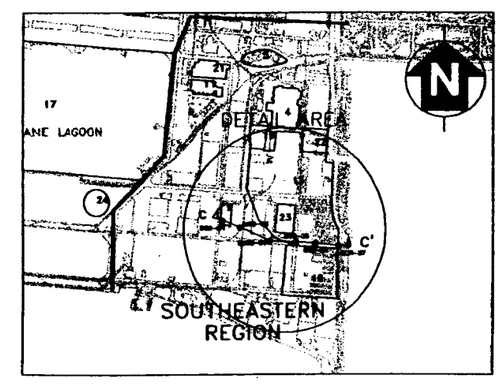


LEGEND

- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



SOUTHEASTERN REGION LOCATION MAP

75' 0 75' 150'

HORIZONTAL SCALE: 1" = 150'

NOTE: VERTICAL EXAGGERATION IS 15X.

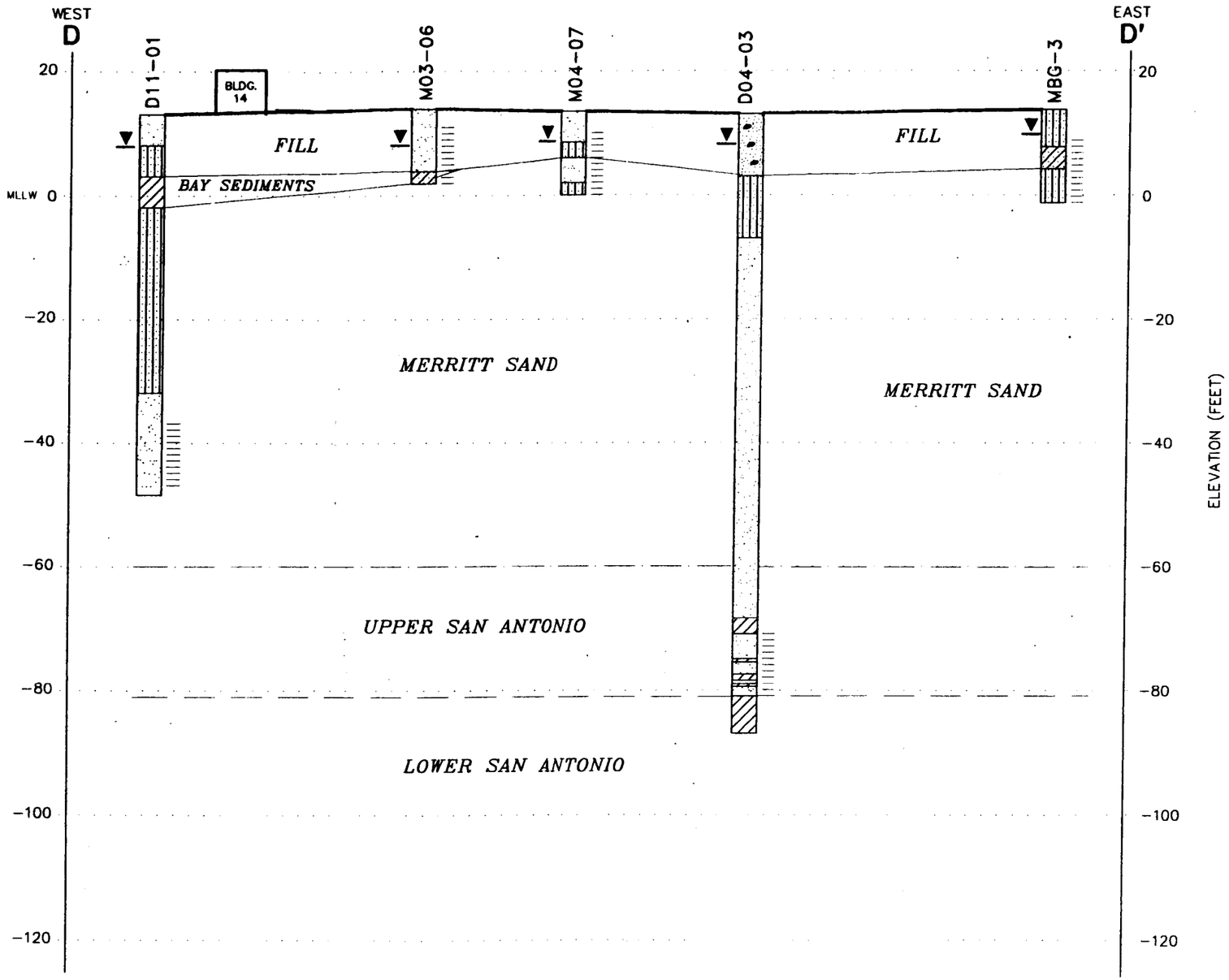
GEOLOGICAL CROSS SECTION C–C'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4-X3.DWG – 06/03/97 – CFR – 044-0316IRIRP

GEOLOGICAL CROSS SECTION D-D'

SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

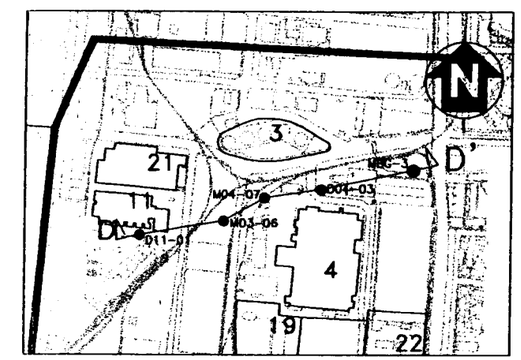
BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D11-01	Fill to Bay Sediments	Change from a medium dense orange brown silty sand to a soft black clay; slight organic odor and trace black staining present at interface.
	Bay Sediments to Merritt Sand	Change from a soft black clay to a medium dense orange brown clayey silty sand; increase in blow counts.
M03-06	Fill to Bay Sediments	Change from a medium dense black sand to a medium dense green gray grading to yellow brown clayey sand; roots common. Bay sediments pinch out where clayey sand changes color and becomes Merritt Sand.
M04-07	Fill to Merritt Sand	Change from a loose black silty sand with organic matter and trace clay to a medium dense yellowish brown sand with gray staining in root pores and trace silt.
D04-03	Fill to Merritt Sand	Change from gravel with sand to a medium dense yellowish brown silty sand with trace clay; grades to dense dark yellow brown sand with depth.
	Merritt Sand to Upper San Antonio Formation	Change from a very dense dark yellowish brown sand to a dark greenish gray sand; interbedded layers of stiff silty clay and sand near interface.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from interbedded wet dark green gray sands and sandy clays to a stiff moist clay with trace organic matter.
MBG-3	Fill to Merritt Sand	Change from a soft dark brown clayey sand with horizontal roots to a medium dense tan silty sand with iron staining. Buried soil overlying Merritt Sand; elevation too high for Bay Sediments.



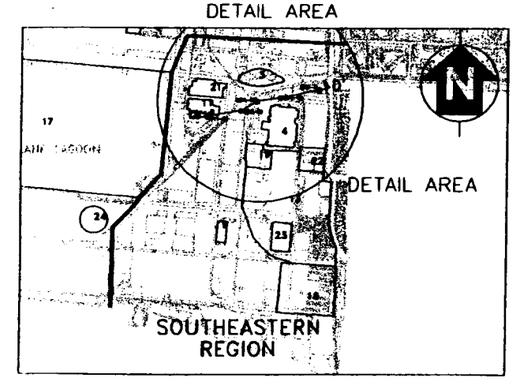
NOTE: VERTICAL EXAGGERATION IS 10X.

LEGEND

- GP – POORLY-GRADED GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



SOUTHEASTERN REGION LOCATION MAP

100' 0 100' 200'
HORIZONTAL SCALE: 1" = 200'

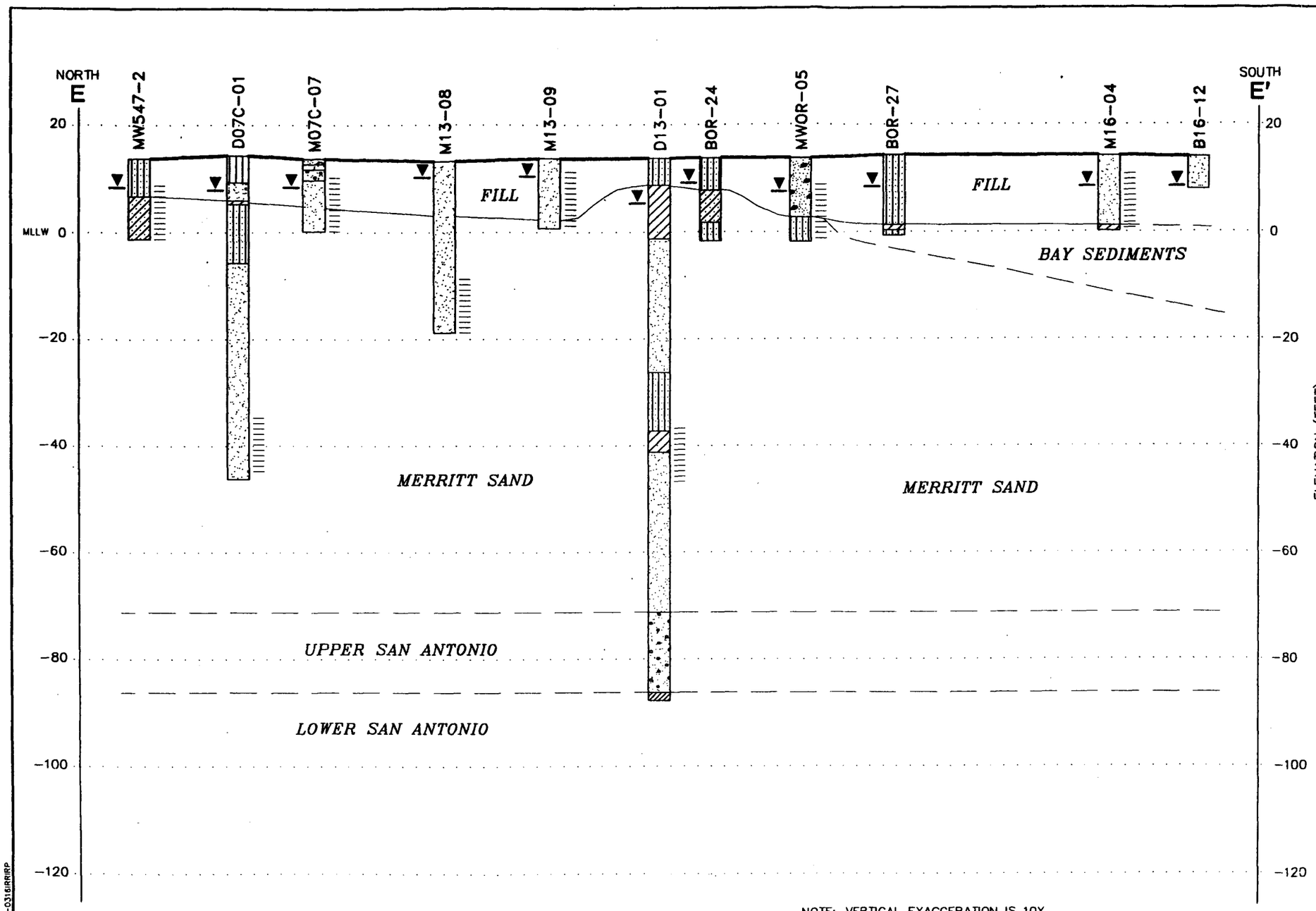
GEOLOGICAL CROSS SECTION D–D'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

3_ZZ.DWG - 0... - CFR - 044-0316RRIRP

GEOLOGICAL CROSS SECTION E-E'

SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
MW547-2	Fill to Merritt Sand	Change from a brown silty sand to a medium dense orange brown clayey sand with gray mottling.
D07C-01	Fill to Merritt Sand	Change from a medium dense dark gray sand to a loose orange brown silty sand with orange mottling; 2 inch thick layer of black clay at interface (elevation too high for Bay Sediments). Blow counts increase dramatically with depth, grading to a dense sand.
M07C-07	Fill to Merritt Sand	Change in color from light brown to gray brown; saturated; increase in blow count with depth indicates change to Merritt Sand.
M13-08	Fill to Merritt Sand	Change from a loose dark gray to light olive brown sand to a dense yellowish brown to light brownish gray sand; mottling and trace roots present at interface; increase in blow counts with depth.
M13-09	Fill to Merritt Sand	Change from a very dense greenish gray sand with roots to a yellowish brown sand with light gray mottling.
D13-01	Fill to Merritt Sand	Change from a gravelly sandy silt to a sandy silty clay; presence of dark red mottling below interface; oxidized zone present at interface (possible beach dune).
	Merritt Sand to Upper San Antonio Formation	Change from a dense light tannish brown sand to a very dense dark gray sand.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from a very dense dark gray sand to a stiff to very stiff bluish gray clay; presence of organic matter at the interface.
BOR-24	Fill to Merritt Sand	Change from a loose brown silty sand with some gravel to a loose mottled orange brown and gray clayey sand; abundant iron stains present at the interface; increasing blow count with depth.
MWOR-5	Fill to Merritt Sand	Change from a dense dark brown silty sandy gravel to a dense dark orange brown clayey silty sand.
BOR-27	Fill to Bay Sediments	Change from a medium dense gray brown silty sand to a soft dark gray silty clay.
M16-04	Fill to Bay Sediments	Change from a loose to medium dense greenish gray sand with trace shells to a stiff dark gray silty clay with dark greenish gray mottling.
B16-12	Fill	Boring does not cross a lithologic unit.

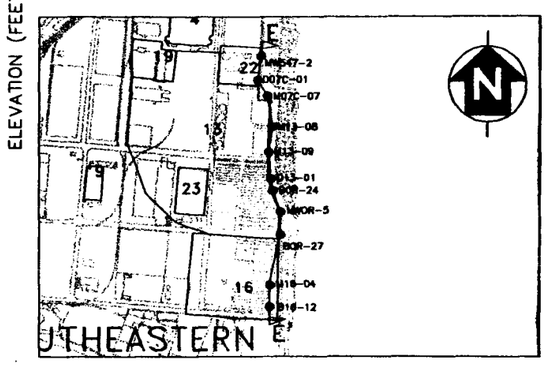


NOTE: VERTICAL EXAGGERATION IS 10X.

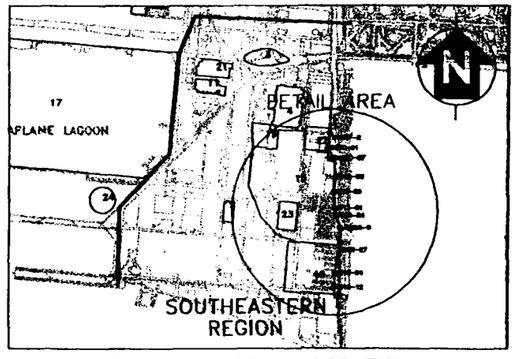
100' 0 100' 200'
HORIZONTAL SCALE: 1" = 200'

LEGEND

- GW – WELL-GRADED GRAVELS
- GP – POORLY-GRADED GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CH – ORGANIC CLAYS, HIGH PLASTICITY
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



SOUTHEASTERN REGION LOCATION MAP

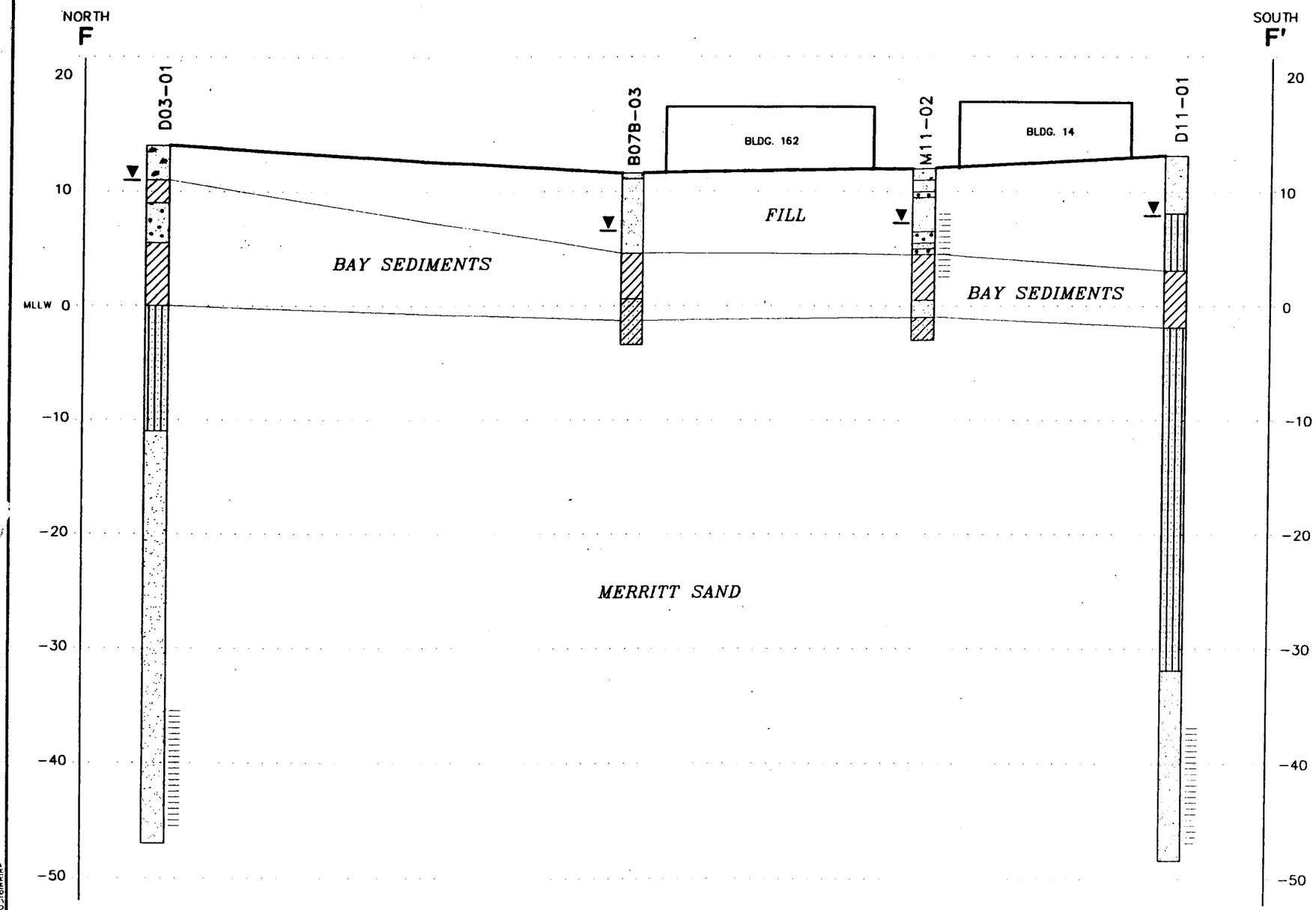
GEOLOGICAL CROSS SECTION E–E'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4_V2.DWG – 05/22/97 – CFR – 044-0316IRRIRP

GEOLOGICAL CROSS SECTION F-F'

SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D03-01	Fill to Bay Sediments	Change from a loose grayish olive silty gravelly sand to a soft grayish olive green clay; interbedded layers of clayey sand and silty clay at the interface.
	Bay Sediments to Merritt Sand	Change from a soft grayish olive clay to a medium dense yellowish brown silty sand; increasing blow counts at the interface.
B07B-03	Fill to Bay Sediments	Change from a medium dense brown sand and fine gravel with oyster shells to a medium stiff black clay; sand present on horizontal bedding plane just below interface.
	Bay Sediments to Merritt Sand	Change from a medium stiff black clay to a medium dense olive clayey sand with gray mottling; large increase in blow counts approximately halfway through clayey sand.
M11-02	Fill to Bay Sediments	Change from a medium dense dark olive gravelly sand to a soft dark olive clay with thin interbedded sands.
	Bay Sediments to Merritt Sand	Change from a black sand with shells to a dense mottled yellowish brown clayey sand.
D11-01	Fill to Bay Sediments	Change from a medium dense orange brown silty sand to a soft black clay; slight organic odor and trace black staining present at interface.
	Bay Sediments to Merritt Sand	Change from a soft black clay to a medium dense orange brown clayey silty sand; increase in blow counts.

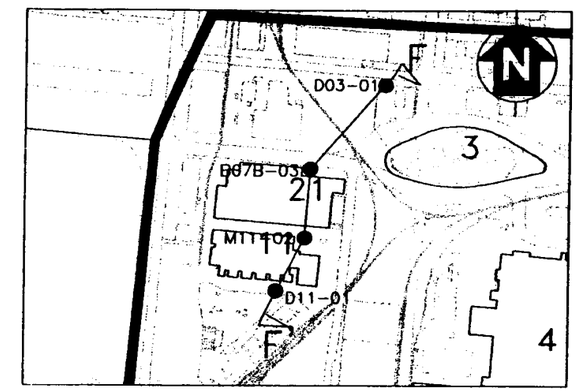


NOTE: VERTICAL EXAGGERATION IS 10X.

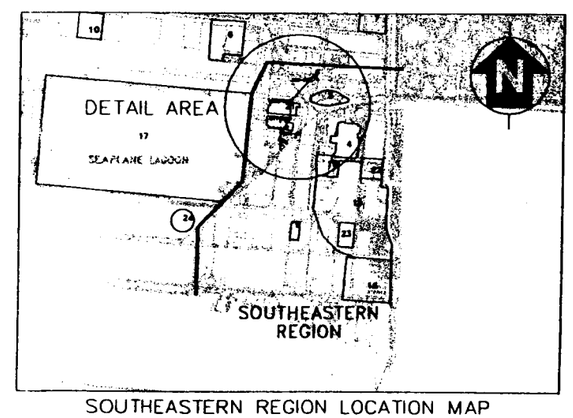
50' 0 50' 100'
HORIZONTAL SCALE: 1" = 100'

LEGEND

- CN – CONCRETE
- GP – POORLY-GRADED GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



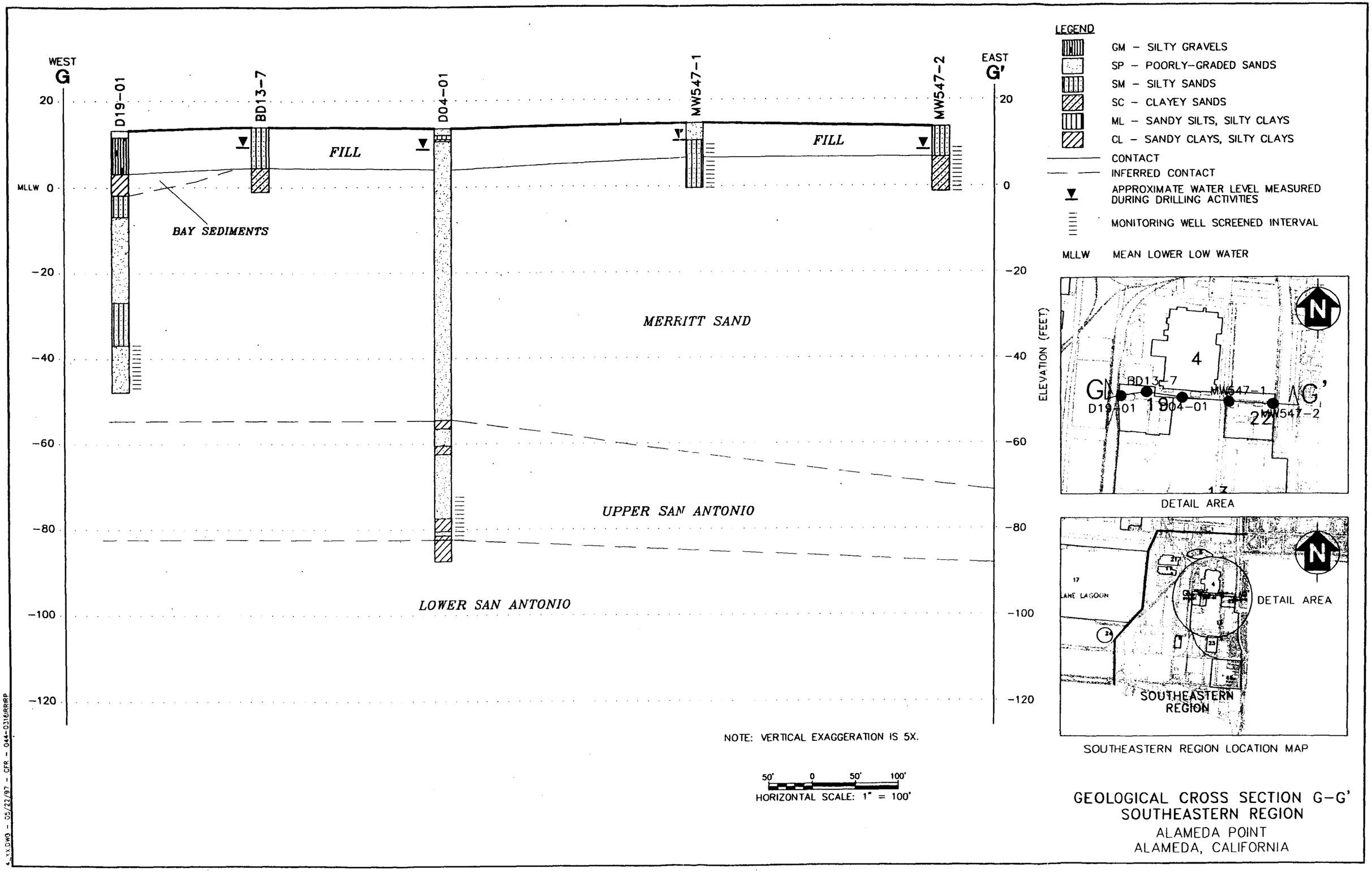
SOUTHEASTERN REGION LOCATION MAP

GEOLOGICAL CROSS SECTION, F–F'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

GEOLOGICAL CROSS SECTION G-G'

SOUTHEASTERN REGION
KEY FEATURES DISTINGUISHING CHANGES IN LITHOLOGY
ALAMEDA POINT
(Page 1 of 1)

BORING	LITHOLOGIC SEQUENCE	KEY FEATURES
D19-01	Fill to Bay Sediments	Change from a dense reddish yellow silty gravel to a stiff gray silty clay; change from dry to moist.
	Bay Sediments to Merritt Sand	Change from a stiff gray silty clay to a medium dense yellowish brown silty sand; grades to sand and increased blow count with depth.
BD13-7	Fill to Merritt Sand	Change from a loose to dense brown silty sand to a dense orange brown clayey sand; abundant iron-stained laminations present at the interface.
D04-01	Fill to Merritt Sand	Orange from a loose grayish brown sand with trace silt to a slightly consolidated yellowish brown sand with trace clay.
	Merritt Sand to Upper San Antonio Formation	Change from a slightly consolidated pale brown sand with trace silt to a dark greenish gray silty clay; organic matter present at the interface; interbedded sands and clayey sands with depth.
	Upper San Antonio Formation to Lower San Antonio Formation (Yerba Buena Mud)	Change from interbedded sands and clayey sands to a thick dark green gray silty clay; organic matter present below interface.
MW547-1	Fill to Merritt Sand	Change from a medium dense brown sand to a loose orange brown silty sand with gray mottling; increasing blow counts with depth.
MW547-2	Fill to Merritt Sand	Change from a brown silty sand to a medium dense orange brown clayey sand with gray mottling.



GEOLOGICAL CROSS SECTION G-G'
SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4_XX.DWG - 05/22/97 - CFR - 044-0316RRIRP

APPENDIX B

BACKGROUND DETERMINATION DOCUMENTATION

TerraNext 165 South Union Boulevard Union Tower, Suite 1000 Lakewood, CO 80228

Ms. Teresa Bernhard/ Ms. Camille Garibaldi
Engineers-in-Charge
Department of the Navy
Engineering Field Activity West
Naval Facilities Engineering Command
900 Commodore Drive
San Bruno, California 94066-5006

Dear Ms. Bernhard and Ms. Garibaldi:

This letter contains the results of additional analyses performed on the background data sets as requested at the interagency meeting of February 26, 1997. Specifically, outlier tests were performed for the following chemicals: zinc in the blue area; beryllium in the pink area; and arsenic and silver in the yellow area. Tables presenting the calculations and results of these tests are enclosed as Attachment A. Also, the 80th lower confidence limit on the 95th percentile of the distribution (80LCL/95) value was calculated for all inorganic chemicals at each of the three background areas, and new data summaries calculated without outlying values are included as Tables 1 through 3 of this letter; the 80LCL/95 concentrations are also reported in these data summary tables.

The outlier tests used for evaluating zinc, beryllium, arsenic, and silver were Rosner's test (for zinc and beryllium) and Dixon's test (for arsenic and silver). The Rosner's test requires at least 25 detected results for application, while Dixon's test is more appropriate for sets with less than 25 detected results. The Rosner's test calculates a test value using the mean and standard deviation of the data set after removal of the suspected outlier. The calculated test value is then compared to a critical value corresponding to a particular level of significance and sample. The Dixon's test examines the suspected outlying value relative to the range of values and the next closest value to the suspected outlier. The test value calculated in a Dixon's test is also compared to a critical value corresponding to a desired level of significance and the sample size. In both cases, if the test value exceeds the critical value, the extreme value is considered an outlier. The test are repeated, iteratively removing the most extreme value, until the test value no longer exceeds the critical value. Both of these tests are described in detail in EPA's *Guidance for Data Quality Assessment* (EPA 1996) and either may be used with normally or lognormally distributed data.

Using these test, it appears that the arsenic value of 33 milligrams per kilogram (mg/kg) in the yellow area is not an outlier. The highest value of zinc (316 mg/kg) in the blue area and of beryllium in the pink area (2.29 mg/kg) are outliers at alpha = 0.05. The questioned value of silver (30 mg/kg) in the yellow area may not be an outlier; the distribution of silver could not be defined, so the Dixon's test was performed on untransformed and lognormally transformed data. Using untransformed data, the value of 30 mg/kg appeared to be an outlier at alpha = 0.05, but not at alpha = 0.01. Using log-transformed data, the value of 30 mg/kg is not an outlier at either alpha = 0.05 or =0.01. It is recommended that this value be retained because the results of the outlier test are not unequivocal, and it is very possible that the distribution of silver is indeed lognormal. Additionally, there is no site history to indicate that silver would be site-related at any part of the base.

The sample identification number associated with the outlying zinc value is M-BG3-000 and for beryllium is B12-08-000. Additionally, the inorganic results associated with sample 280-S16-028 were removed from the yellow background data set due to an outlying value of lead, as agreed in the February 26, 1997 interagency meeting. Removal of these samples decreases the inorganic chemical sample sizes to

88 for the blue area, 50 for the pink area, and 55 for the yellow area. Revised data summaries are attached as Tables 1 through 3.

The 80LCL/95 concentrations for inorganic chemicals were calculated using the formula presented in the Statistical Methodology for Background Comparisons (NAS Alameda), which can also be found in Statistical Methods for Environmental Pollution Monitoring (Gilbert 1987). The calculation was performed on untransformed data for normally distributed data and for data for which a distribution could not be determined. For lognormally distributed data, the 80LCL/95 calculation was performed on the natural logarithm-transformed data. These concentrations were calculated after removal of sample M-BG3-000 in the blue area, B12-08-000 in the pink area, and 280-S16-28 in the yellow area. A value of one-half the sample quantitation limit was substituted for nondetect results. The 80LCL/95 concentration was not calculated for organic chemicals because this value will not be used in the assessment of anthropogenic organic chemicals.

If you have any questions or comments regarding these calculations, please call me at (303) 914-1752.

Sincerely,

Theresa K. Lopez

Theresa K. Lopez
Senior Toxicologist

cc: Susan Willoughby, PRC
Duane Balch, PRC

EPA. 1996. Guidance for Data Quality Assessment. EPA QA/G-9. Quality Assurance Division, Washington, D.C. February.

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold. New York.

TABLE 1
NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Inorganic Chemicals (mg/kg)									
Aluminum[2]	NA	88/88	2,880	26,800	5,703	1.6	7,078	0.06	15,509
Antimony[3]	0.46-9.2	2/88	0.89	1.0	1.8	1.3	2.0	0.71	4.4
Arsenic[2]	0.61-13	33/88	0.74	23.0	2.2	2.9	4.8	1.3	19.2
Barium[1]	24-25	85/88	0.30	198	48.6	32.4	55.5	0.67	114.9
Beryllium[1]	0.2-1.3	25/88	0.09	0.77	0.32	0.21	0.36	0.67	0.76
Cadmium[1]	0.06-1.3	29/88	0.1	0.82	0.31	0.23	0.36	0.73	0.78
Calcium[2]	NA	88/88	1,360	19,200	3,033	1.9	4,181	0.08	10,958
Chromium[1]	NA	88/88	11.4	81.7	33.6	13	36.4	0.39	60.1
Cobalt[1]	3.9-6.8	66/89	1.9	14	5.0	2.7	5.6	0.54	10.6
Copper[2]	5.8-6.3	83/89	4.2	89.4	10.4	2.0	15.1	0.30	42.7
Iron[1]	NA	88/88	760	26,900	10,013	5,072	11,087	0.51	20,390
Lead[2]	1.4-6.8	27/88	1.3	41	3.2	2.2	5.2	0.66	16.1
Magnesium[2]	NA	88/88	1,510	42,400	2,557	1.6	3,159	0.06	6,858
Manganese[2]	NA	88/88	50	1,060	126	1.7	160	0.11	365
Nickel[2]	NA	88/88	11.6	88.5	26.9	1.5	31.9	0.13	63.4

TABLE 1 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Potassium[2]	610	87/88	310	6,382	800	1.6	997	0.07	2,203
Selenium[3]	0.42-13	1/88	5.7	5.7	2.9	2.1	3.3	0.72	7.1
Silver[3]	0.18-6.5	2/88	0.44	0.61	0.95	1.2	1.2	1.2	3.4
Sodium[2]	288-650	68/88	88.1	3,510	299.8	2.2	473.1	0.14	1,473
Thallium[3]	0.36-13	1/88	5.3	5.3	2.4	2.2	2.8	0.93	6.9
Titanium[1]	NA	66/66	223	1,020	408.4	145.8	444.3	0.36	706.7
Vanadium[1]	NA	88/88	12.8	62.3	22.4	8.8	24.2	0.40	40.5
Zinc[2]	NA	88/88	14	84	26.2	1.5	31	0.13	61.0
Polycyclic Aromatic Hydrocarbons (ug/kg)									
Acenaphthene[3]	83-14,000	1/85	130	130	293.1	743.2	453.5	2.5	NA
Anthracene[3]	83-14,000	2/85	59	390	294.2	743.5	454.7	2.5	NA
Benzo(a)anthracene[4]	100-14,000	8/85	61	1,000	290.1	747.9	451.5	2.6	NA
Benzo(a)pyrene[2]	140-14,000	11/85	48	1,300	208.4	1.8	277.3	0.11	NA
Benzo(b)fluoranthene[2]	100-14,000	9/85	66	760	202.4	1.8	273.9	0.11	NA
Benzo(g,h,i)perylene[4]	170-14,000	6/85	140	950	304.6	745.8	465.6	2.4	NA
Benzo(k)fluoranthene[2]	100-14,000	6/85	100	1,100	208.1	1.8	280.9	0.11	NA

TABLE 1 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Chrysene[4]	100-14,000	11/85	58	1,300	288.9	752.6	451.3	2.6	NA
Dibenzo(a,h) anthracene[3]	170-14,000	1/85	230	230	296.4	742.4	456.7	2.5	NA
Fluoranthene[2]	83-14,000	12/85	54	2,000	198.2	1.9	284.2	0.13	NA
Fluorene[3]	83-14,000	1/85	100	100	292.7	743.3	453.2	2.5	NA
Indeno(1,2,3-c,d)-pyrene[2]	170-14,000	6/85	120	930	215.2	1.7	279.3	0.10	NA
Naphthalene[3]	83-14,000	1/85	35	35	292.3	743.5	452.8	2.5	NA
2-Methylnaphthalene[3]	100-14,000	1/85	320	320	294.2	742.9	454.6	2.5	NA
Phenanthrene[2]	83-14,000	8/85	27	1,600	196	2.0	284.2	0.13	NA
Pyrene[1]	83-14,000	12/85	65	2,500	343.4	785.3	484.6	2.3	NA

Notes:

SQL	Sample Quantitation Limit
95 UCL	95 percent Upper Confidence Limit of the Mean Concentration
CV	Coefficient of Variation
80LCL/95th percentile	80th percent Lower Confidence Limit of the 95th percentile of the distribution
NA	Not applicable
mg/kg	milligrams per kilogram
ug/kg	micrograms per kilogram

(1) Data normally distributed

TABLE 1 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

(2) Data lognormally distributed. Calculated CV and 80LCL/95 for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated CV and 80LCL/95th percentile from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated CV and 80LCL/95th percentile from arithmetic mean and standard deviation.

TABLE 2
NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Inorganic Chemicals (mg/kg)									
Aluminum[2]	NA	55/55	1,760	22,600	5,231	1.6	6,528	0.05	12,930
Antimony[1]	0.46-11.0	18/55	0.7	8.6	2.2	1.8	2.7	0.84	5.7
Arsenic[2]	0.59-10	45/55	0.44	15.6	1.8	2.4	3.1	1.4	8.7
Barium[2]	NA	55/55	6.9	156	36.0	1.7	47.4	0.15	103
Beryllium[1]	0.15-1.0	28/55	0.25	1.47	0.50	0.35	0.60	0.71	1.2
Cadmium[2]	0.08-1.0	11/55	0.1	3.2	0.19	2.7	0.42	0.59	1.33
Calcium[2]	NA	55/55	816	66,600	2,913	2.1	4,686	0.09	12,513
Chromium[1]	NA	55/55	15.6	66.7	30.4	9.9	33.1	0.33	50.0
Cobalt[4]	3.96-5.7	48/55	3.0	49.7	6.1	6.7	7.9	1.1	19.3
Copper[2]	8.8-10.2	52/55	3.1	49.1	7.5	1.8	10.5	0.29	24.3
Iron[2]	NA	55/55	4,500	27,900	9,365	1.5	11,230	0.04	20,394
Lead[2]	1.9-3.0	51/55	0.47	165	4.1	2.8	9.9	0.01	32.6
Magnesium[2]	NA	55/55	1,290	8,800	2,627	1.5	3,172	0.05	5,969
Manganese[2]	NA	55/55	55.5	748	126.1	1.7	167.6	0.11	363.1
Mercury[2]	0.06-0.27	7/54	0.057	2.71	0.063	2.4	0.12	0.31	0.34

TABLE 2 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Nickel[2]	NA	55/55	11.5	80.4	25.8	1.4	30.1	0.10	49.7
Potassium[2]	NA	55/55	209	2,480	683	1.5	819	0.06	1,523
Silver[2]	0.18-1.47	11/55	0.32	5.6	0.30	2.5	0.58	0.74	1.73
Sodium[2]	NA	55/55	62.6	1,580	335.9	1.9	503.4	0.11	1,251
Titanium[3]	NA	1/1	518	518	518	NA	NA	NA	NA
Vanadium[1]	NA	55/55	10.5	55.3	22.6	9.0	25.1	0.40	44.6
Zinc[2]	18	54/55	10	191	22.6	1.7	29.2	0.16	61.5
Polycyclic Aromatic Hydrocarbons (ug/kg)									
Acenaphthylene[3]	70-3,400	1/56	150	150	121.6	226.2	182.3	1.9	NA
Anthracene[3]	70-3,400	1/56	240	240	123.2	226.8	184.1	1.8	NA
Benzo(a)anthracene[3]	100-3,400	1/56	1,600	1,600	497.1	2,264.3	1,105.0	4.6	NA
Benzo(a)pyrene[3]	140-3,400	1/56	2,600	2,600	186.4	394.9	292.4	2.1	NA
Benzo(b)fluoranthene[3]	100-3,400	1/56	2,300	2,300	168.1	366.1	266.4	2.2	NA
Benzo(g,h,i)perylene[3]	160-3,400	1/56	1,700	1,700	177.1	300.4	257.7	1.7	NA
Benzo(k)fluoranthene[3]	100-3,400	1/56	620	620	138.1	232.9	200.6	1.7	NA

TABLE 2 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Chrysene[3]	100-3,400	1/56	1,500	1,500	153.8	288.9	231.4	1.9	NA
Fluoranthene[3]	70-3,400	3/56	34	3,600	207.5	477.0	355.6	2.3	NA
Indeno(1,2,3-c,d)-pyrene [3]	160-3,400	1/56	1,800	1,800	178.8	309.8	262.0	1.7	NA
Naphthalene[3]	70-3,400	1/56	99	99	120.7	226.2	181.4	1.9	NA
Phenanthrene[3]	70-3,400	2/56	240	2,200	131.3	291.1	209.4	2.2	NA
Pyrene[3]	70-3,400	3/56	210	6,100	240.5	831.0	463.5	3.5	NA

Notes:

SQL	Sample Quantitation Limit
95 UCL	95 percent Upper Confidence Limit of the Mean Concentration
CV	Coefficient of Variation
80LCL/95th percentile	80th percent Lower Confidence Limit of the 95th percentile of the distribution
NA	Not applicable
mg/kg	milligrams per kilogram
ug/kg	micrograms per kilogram

(1) Data normally distributed
(2) Data lognormally distributed. Calculated CV and 80LCL/95 for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated CV and 80LCL/95 from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated CV and 80LCL/95 from arithmetic mean and standard deviation

TABLE 3
NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Inorganic Chemicals (mg/kg)									
Aluminum[1]	NA	50/50	20	13,300	6,119	2,543	6,841	0.42	11,091
Antimony[3]	2.5-7.3	3/50	2.8	3.6	3.0	0.61	3.1	0.21	4.2
Arsenic[1]	10-12	21/50	1.1	33	7.7	6.5	9.5	0.84	20.3
Barium[2]	21-24	43/50	19.8	260	30.0	1.8	43.0	0.18	99.4
Beryllium[1]	1-1.2	9/50	0.3	1.3	0.57	0.19	0.63	0.33	0.95
Cadmium[1]	0.36-1.2	11/50	0.33	2.9	0.66	0.49	0.80	0.75	1.6
Calcium[2]	NA	50/50	500	97,000	3,411	2.0	5,256	0.08	12,995
Chromium[4]	NA	50/50	5.0	69.7	32.0	8.4	34.4	0.10	48.5
Cobalt[1]	5-6	20/50	4.3	11.4	4.3	2.3	5.0	0.54	2.6
Copper[1]	5.5-5.6	48/50	4.2	49	15.7	12.1	19.1	0.77	39.3
Iron[1]	NA	50/50	10	20,800	10,247	3,859	11,410	0.38	17,791
Lead[3]	NA	50/50	3.3	180	20.7	2.4	41.2	0.29	118
Magnesium[2]	NA	50/50	500	8,820	2,540	1.6	3,192	0.06	6,231
Manganese[1]	NA	50/50	5.0	330	136.2	74.1	157.3	0.54	281
Mercury[1]	0.05-0.11	5/9	0.05	0.18	0.08	0.06	0.12	0.72	0.15

TABLE 3 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Nickel[4]	NA	50/50	5.0	71.1	27.7	9.9	30.5	0.36	46.7
Potassium[1]	NA	50/50	500	1,700	914	289	996	0.32	1,479
Silver[4]	0.48-6	6/50	0.52	30	2.9	4.1	4.1	1.4	11.0
Sodium[1]	500-610	11/50	232	1,380	358	260	432	0.73	867
Titanium[1]	NA	41/41	280	663	456	77.1	480.2	0.17	603
Vanadium[1]	NA	50/50	15.6	50.0	25.5	7.9	27.7	0.31	40.9
Zinc[1]	NA	50/50	17.0	140.0	46.9	31.6	55.8	0.67	108.6
Polycyclic Aromatic Hydrocarbons (ug/kg)									
Benzo(a)pyrene[3]	84-6,700	1/51	24	24	400.4	487.1	537.4	1.2	NA
Benzo(g,h,i)perylene[3]	96-6,700	1/51	19	19	402.2	485.9	538.9	1.2	NA
Chrysene[3]	60-6,700	2/51	22	130	398.2	488.7	535.6	1.2	NA
Fluoranthene[3]	48-6,700	3/51	30	790	407.0	492.1	545.4	1.2	NA
Indeno(1,2,3-c,d)-pyrene [3]	96-6,700	1/51	21	21	402.2	485.9	538.9	1.2	NA
Phenanthrene[3]	48-6,700	2/51	120	200	401.9	486.7	538.8	1.2	NA
Pyrene[3]	48-6,700	4/51	33	900	411.1	492.8	549.7	1.2	NA

TABLE 3 (CONTINUED)
NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Notes:

SQL	Sample Quantitation Limit
95 UCL	95 percent Upper Confidence Limit of the Mean Concentration
CV	Coefficient of Variation
80LCL/95th percentile	80th percent Lower Confidence Limit of the 95th percentile of the distribution
NA	Not applicable
mg/kg	milligrams per kilogram
ug/kg	micrograms per kilogram

(1) Data normally distributed
(2) Data lognormally distributed. Calculated CV and 80LCL/95th percentile for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated CV and 80LCL/95th percentile from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated CV and 80LCL/95th percentile from arithmetic mean and standard deviation

ATTACHMENT A
OUTLIER TEST CALCULATIONS

Beryllium - Outlier Evaluation Using Rosner's Test									
Pink Area									
Data:								Potential	Potential
Sample	Depth Range		Chemical	Conc.	Units	Qualifier	All detects	Outlier 1	Outlier 2
280-RA-033	0.0	1.5	BERYLLIUM	0.96000	MG/KG	UJ			
280-RA-034	2.5	3.5	BERYLLIUM	0.89000	MG/KG	UJ			
280-RA-035	5.0	6.0	BERYLLIUM	0.62000	MG/KG	UJ			
280-RA-039	0.0	1.0	BERYLLIUM	0.88000	MG/KG	UJ			
280-RA-040	2.0	3.0	BERYLLIUM	0.53000	MG/KG	UJ			
280-RA-041	3.5	4.5	BERYLLIUM	0.25000	MG/KG	U			
280-RA-042	0.0	1.5	BERYLLIUM	0.54000	MG/KG	UJ			
280-RA-043	2.5	3.5	BERYLLIUM	0.54000	MG/KG	UJ			
280-RA-044	5.0	6.0	BERYLLIUM	0.36000	MG/KG	UJ			
280-RA-045	0.0	1.5	BERYLLIUM	0.55000	MG/KG	UJ			
280-RA-046	2.5	3.5	BERYLLIUM	0.52000	MG/KG	UJ			
280-RA-047	5.0	6.0	BERYLLIUM	0.54000	MG/KG	UJ			
280-RA-048	0.0	1.5	BERYLLIUM	0.67000	MG/KG	J	0.67000	0.67000	0.67000
280-RA-049	2.5	3.5	BERYLLIUM	0.61000	MG/KG	J	0.61000	0.61000	0.61000
280-RA-050	5.0	6.0	BERYLLIUM	0.38000	MG/KG	J	0.38000	0.38	0.38
B06-07-000	0.5	1.0	BERYLLIUM	0.56799	MG/KG		0.56799	0.56799	0.56799
B06-07-002	2.0	3.3	BERYLLIUM	0.34100	MG/KG		0.34100	0.341	0.341
B06-07-008	8.0	9.5	BERYLLIUM	0.16200	MG/KG	U			
B06-08-000	1.0	1.5	BERYLLIUM	0.31600	MG/KG		0.31600	0.316	0.316
B06-08-002	2.0	3.0	BERYLLIUM	0.60300	MG/KG		0.60300	0.603	0.603
B06-08-007	6.5	7.5	BERYLLIUM	0.77900	MG/KG		0.77900	0.779	0.779
B07B-02-000	0.5	1.5	BERYLLIUM	0.89900	MG/KG		0.89900	0.899	0.899
B07B-02-004	3.5	5.0	BERYLLIUM	1.25000	MG/KG		1.25000	1.25	1.25
B10-04-000	0.5	1.0	BERYLLIUM	0.68999	MG/KG		0.68999	0.68999	0.68999
B10-04-005	5.0	6.0	BERYLLIUM	0.15000	MG/KG	U			
B12-08-000	0.5	1.0	BERYLLIUM	2.29000	MG/KG	J	2.29000		
B12-08-004	3.5	5.0	BERYLLIUM	0.95400	MG/KG	J	0.95400	0.954	0.954
B12-08-010	9.5	10.0	BERYLLIUM	1.05000	MG/KG	J	1.05000	1.05	1.05
F10 [0.0-0.0]	0.0	0.0	BERYLLIUM	1.00000	MG/KG	U			
M-006A-0	2.0	2.5	BERYLLIUM	0.94600	MG/KG		0.94600	0.946	0.946
M-006A-005	3.5	4.5	BERYLLIUM	1.18000	MG/KG	J	1.18000	1.18	1.18
M-101A-004	2.0	3.5	BERYLLIUM	0.86500	MG/KG	J	0.86500	0.865	0.865
M-102A-004	2.0	3.3	BERYLLIUM	0.57200	MG/KG	J	0.57200	0.572	0.572
M-106A-0	0.0	0.0	BERYLLIUM	0.24600	MG/KG		0.24600	0.246	0.246
M-106A-003	2.0	3.0	BERYLLIUM	0.60900	MG/KG	J	0.60900	0.609	0.609
M-107A-0	0.0	0.0	BERYLLIUM	0.26300	MG/KG		0.26300	0.263	0.263
M-107A-002	0.5	2.0	BERYLLIUM	0.53100	MG/KG	J	0.53100	0.531	0.531
M-109A-0	0.0	0.0	BERYLLIUM	1.01000	MG/KG		1.01000	1.01	1.01
M-109A-007	5.5	6.3	BERYLLIUM	0.83200	MG/KG	J	0.83200	0.832	0.832
M-110A-003	1.5	3.0	BERYLLIUM	1.47000	MG/KG	J	1.47000	1.47	
M-111A-0	0.5	0.0	BERYLLIUM	1.35000	MG/KG	J	1.35000	1.35	1.35
M-111A-003	2.0	3.5	BERYLLIUM	0.38000	MG/KG	J	0.38000	0.38	0.38
M-BG1-002	2.0	2.5	BERYLLIUM	0.79200	MG/KG		0.79200	0.792	0.792
M-BG1-003	3.0	3.5	BERYLLIUM	0.76300	MG/KG	U			

M-BG1-004	5.0	5.5	BERYLLIUM	0.63200	MG/KG	U			
M-BG2-002	2.0	2.5	BERYLLIUM	0.53500	MG/KG	U			
M-BG2-005	5.0	5.5	BERYLLIUM	0.60400	MG/KG	U			
M-BG4-002	2.0	2.5	BERYLLIUM	0.52700	MG/KG	U			
M-BG4-007	7.5	8.0	BERYLLIUM	0.60700	MG/KG		0.60700	0.607	0.607
M-BG4-010	10.0	10.5	BERYLLIUM	0.57600	MG/KG	U			
M103-A	5.0	6.5	BERYLLIUM	0.18000	MG/KG	U			
M103-B	0.0	0.5	BERYLLIUM	0.16000	MG/KG	U			
M105-A	5.5	7.0	BERYLLIUM	0.19000	MG/KG	U			
M105-B	0.0	0.5	BERYLLIUM	0.16000	MG/KG	U			
M108-A	5.0	6.5	BERYLLIUM	0.19000	MG/KG	U			
M108-B	0.0	0.5	BERYLLIUM	0.17000	MG/KG	U			
	Rk is test value for Rosner's Test					Mean	0.79493	0.741535	0.714554815
						Stdev	0.4323391	0.3287809	0.301808656
						Rk		4.7097173	2.503060034
						Critical value at alpha =0.05 is 2.91			
						n=30			
				Based on these results, the highest hit of Be (2.29 mg/kg)					
				is an outlier but no other value is an outlier					

Arsenic - Outlier evaluation Using Dixon's Test		
Yellow Area		
Data are normally distributed		
Potential Outlier is Arsenic = 33 mg/kg		
Chemical	Detected Result	Units
Arsenic	1.11	
Arsenic	1.62	
Arsenic	1.74	
Arsenic	1.9	
Arsenic	2.19	
Arsenic	3.31	
Arsenic	3.8	
Arsenic	4.83	
Arsenic	5.45	
Arsenic	7.75	
Arsenic	11	
Arsenic	11	
Arsenic	11	
Arsenic	11	
Arsenic	11	
Arsenic	11	
Arsenic	13	
Arsenic	19	
Arsenic	21	
Arsenic	22	
Arsenic	28	
Arsenic	33	
N = 22		
Dixon's Test		
C =	0.156788962	
Critical Value at alpha = 0.05 is 0.43		
Based on the results of this test, As at 33 mg/kg is not an outlier at alpha = 0.05		

Silver - Outlier Evaluation Using Dixon's Test						
Yellow Area						
Distribution Unknown; tested using both transformed and untransformed data						
Detected Results:						
Chemical	Result	LN Result	Units			
Silver	30	3.401197	mg/kg			
Silver	10	2.302585	mg/kg			
Silver	0.803	-0.2194	mg/kg			
Silver	0.665	-0.40797	mg/kg			
Silver	0.544	-0.60881	mg/kg			
Silver	0.522	-0.65009	mg/kg			
Dixon's Test Using Untransformed Data for value = 30						
C=	0.678426					
Critcal Value at alpha = 0.05 =			0.56			
Critcal Value at alpha = 0.01 =			0.698			
Conclusion: This value may be an outlier at alpha = 0.05						
but is not an outlier at alpha = 0.01						
Dixon's Test Using Transformed Data for value = ln(30)						
C =	0.271182					
Critcal Value at alpha = 0.05 =			0.56			
Conclusion: This value is not an outlier at alpha = 0.05						

Zinc Outlier Evaluation Using Rosners Test
Blue Ares

Zinc - Outlier Evaluation Using Rosner's Test					
Blue Area					
Zinc is Lognormally Distributed					
Data:	Potential Outlier 1		Potential		
Chemical	Result	LN Result	Outlier 2	Units	Qualifier
ZINC	17.80000	2.87920	2.87920	MG/KG	
ZINC	17.80000	2.87920	2.87920	MG/KG	
ZINC	19.50000	2.97041	2.97041	MG/KG	
ZINC	22.10000	3.09558	3.09558	MG/KG	
ZINC	19.00000	2.94444	2.94444	MG/KG	
ZINC	20.00000	2.99573	2.99573	MG/KG	
ZINC	19.00000	2.94444	2.94444	MG/KG	
ZINC	18.30000	2.90690	2.90690	MG/KG	
ZINC	17.90000	2.88480	2.88480	MG/KG	
ZINC	17.70000	2.87356	2.87356	MG/KG	
ZINC	21.40000	3.06339	3.06339	MG/KG	
ZINC	17.90000	2.88480	2.88480	MG/KG	
ZINC	17.30000	2.85071	2.85071	MG/KG	
ZINC	15.70000	2.75366	2.75366	MG/KG	
ZINC	17.20000	2.84491	2.84491	MG/KG	
ZINC	17.10000	2.83908	2.83908	MG/KG	
ZINC	20.20000	3.00568	3.00568	MG/KG	
ZINC	22.40000	3.10906	3.10906	MG/KG	
ZINC	32.40000	3.47816	3.47816	MG/KG	
ZINC	40.40000	3.69883	3.69883	MG/KG	
ZINC	54.20000	3.99268	3.99268	MG/KG	
ZINC	31.80000	3.45947	3.45947	MG/KG	
ZINC	27.40000	3.31054	3.31054	MG/KG	
ZINC	34.90000	3.55249	3.55249	MG/KG	
ZINC	63.40000	4.14946	4.14946	MG/KG	
ZINC	80.60000	4.38950	4.38950	MG/KG	
ZINC	33.30000	3.50556	3.50556	MG/KG	
ZINC	53.50000	3.97968	3.97968	MG/KG	
ZINC	27.50000	3.31419	3.31419	MG/KG	
ZINC	17.70000	2.87356	2.87356	MG/KG	
ZINC	17.40000	2.85647	2.85647	MG/KG	
ZINC	84.00000	4.43082		MG/KG	
ZINC	33.00000	3.49651	3.49651	MG/KG	
ZINC	30.00000	3.40120	3.40120	MG/KG	
ZINC	20.00000	2.99573	2.99573	MG/KG	
ZINC	67.00000	4.20469	4.20469	MG/KG	
ZINC	23.00000	3.13549	3.13549	MG/KG	
ZINC	30.00000	3.40120	3.40120	MG/KG	
ZINC	25.00000	3.21888	3.21888	MG/KG	
ZINC	25.00000	3.21888	3.21888	MG/KG	
ZINC	17.00000	2.83321	2.83321	MG/KG	
ZINC	14.00000	2.63906	2.63906	MG/KG	
ZINC	25.00000	3.25810	3.25810	MG/KG	

Zinc Outlier Evaluation Using Rosners Test
Blue Ares

ZINC	17.00000	2.83321	2.83321	MG/KG	
ZINC	20.00000	2.99573	2.99573	MG/KG	
ZINC	17.00000	2.83321	2.83321	MG/KG	
ZINC	26.00000	3.25810	3.25810	MG/KG	
ZINC	22.30000	3.10459	3.10459	MG/KG-DRY	
ZINC	31.50000	3.44999	3.44999	MG/KG-DRY	
ZINC	27.40000	3.31054	3.31054	MG/KG-DRY	
ZINC	21.10000	3.04927	3.04927	MG/KG	J
ZINC	74.40000	4.30946	4.30946	MG/KG	J
ZINC	34.20000	3.53223	3.53223	MG/KG	J
ZINC	19.90000	2.99072	2.99072	MG/KG	J
ZINC	21.00000	3.04452	3.04452	MG/KG	J
ZINC	26.40000	3.27336	3.27336	MG/KG	J
ZINC	18.70000	2.92852	2.92852	MG/KG	J
ZINC	32.50000	3.48124	3.48124	MG/KG	
ZINC	27.80000	3.32504	3.32504	MG/KG	
ZINC	26.60000	3.28091	3.28091	MG/KG	
ZINC	20.20000	3.00568	3.00568	MG/KG	
ZINC	21.40000	3.06339	3.06339	MG/KG	
ZINC	24.80000	3.21084	3.21084	MG/KG	
ZINC	25.80000	3.28840	3.28840	MG/KG	
ZINC	30.40000	3.41444	3.41444	MG/KG	
ZINC	40.60000	3.70377	3.70377	MG/KG	
ZINC	19.90000	2.99072	2.99072	MG/KG	
ZINC	24.00000	3.17805	3.17805	MG/KG	
ZINC	24.90000	3.21487	3.21487	MG/KG	
ZINC	60.20000	4.09767	4.09767	MG/KG	
ZINC	29.30000	3.37759	3.37759	MG/KG	
ZINC	36.90000	3.60821	3.60821	MG/KG	
ZINC	18.10000	2.89591	2.89591	MG/KG	
ZINC	19.20000	2.95491	2.95491	MG/KG	
ZINC	56.90000	4.04130	4.04130	MG/KG	
ZINC	27.50000	3.31419	3.31419	MG/KG	
ZINC	39.30000	3.67122	3.67122	MG/KG	
ZINC	29.80000	3.39451	3.39451	MG/KG	
ZINC	27.00000	3.29584	3.29584	MG/KG	
ZINC	61.40000	4.11741	4.11741	MG/KG	
ZINC	20.90000	3.03975	3.03975	MG/KG	
ZINC	41.40000	3.72328	3.72328	MG/KG	
ZINC	32.00000	3.46574	3.46574	MG/KG	
ZINC	23.00000	3.13549	3.13549	MG/KG	
ZINC	25.00000	3.21888	3.21888	MG/KG	
ZINC	17.00000	2.83321	2.83321	MG/KG	
ZINC	19.00000	2.94444	2.94444	MG/KG	
ZINC	17.00000	2.83321	2.83321	MG/KG	
MEAN	28.91477	3.26765	3.25428		
ST. DEV.	14.93797	0.41002	0.39284		

Zinc Outlier Evaluation Using Rosners Test
Blue Ares

Rk		6.06851	2.99496		
Critical Value at alpha = 0.05		3.35000	3.35000		
Potential Outlier-1					
ZINC	316.00000	5.75574			
Potential Outlier 2					
ZINC	84.00000	4.43082			
Based on these results, the highest hit of Zn (316) is an outlier					
but no other value is an outlier					

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PRC

February 7, 1997

Ms. Teresa Bernhard/Ms. Camille Garibaldi
Engineers-in-Charge
Department of the Navy
Engineering Field Activity West
Naval Facilities Engineering Command
900 Commodore Drive
San Bruno, California 94066-5006

CLEAN Contract Number N62474-88-D-5086
Contract Task Order 0316

Subject: Samples for Use as Background, Naval Air Station (NAS) Alameda, Alameda, California

Dear Ms. Bernhard and Ms. Garibaldi:

PRC Environmental Management Inc. (PRC) has completed its review of the NAS Alameda Remedial Investigation (RI) database and has selected samples that could be used to provide background information for the installation. The samples were selected to represent the three distinct fill areas previously identified from the RI data. A preliminary list of samples and accompanying map were provided to you on November 27, 1996. The list (Table 1) and map (Plate 1) are now revised and are enclosed herein. Additional samples have been included in this deliverable; a description of the selection criteria is also included in this letter. A data summary table for inorganic and polycyclic aromatic hydrocarbon (PAH) analytes and cumulative plots for all inorganic analytes are also provided. Additionally, this letter report describes the basis for establishing background as well as applicable guidance from several regulatory agencies regarding definition of background, and methods for evaluating data. This report is organized into the following sections: Purpose, Project History, and Background Data Set Selection. References are provided at the end of the letter; tables and figures follow the letter. Attachment A includes graphical presentations of the data for each fill area.

Purpose

Background information is typically collected and analyzed iteratively as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. In a site investigation, determining if a release has occurred requires that information regarding background conditions be available. Data must be obtained to determine "whether site concentrations are sufficiently different from background" (EPA 1990). The determination of background conditions is an integral part of the baseline human health risk assessment (HHRA) and ecological risk assessment, which are conducted as part of the RI to ensure protection of human health and the environment — one of the two threshold criteria of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Volume I) (EPA 1989) presents a discussion of

hypothesis testing and levels of precision of statistical tests that should be met when differentiating background from site-related chemicals.

California Department of Toxic Substances Control (DTSC) guidance (1994) also presents a similar rationale for collecting background samples (emphasis not added):

> Background samples are collected to distinguish between site-related contamination and naturally occurring or anthropogenic contaminant levels. In general, the use of regional background levels for comparison to site contamination is not acceptable. Background samples should be collected for each medium being investigated, be it water, soil, soil gas, or air. Background samples should be collected at or near the site but not in areas likely to be influenced by the contamination and/or facility operations (past or present).

The establishment of background data set is also important for site remediation. CERCLA Section 104(3)(a) specifically states: "The President shall not provide for a removal or remedial action under this section in response to a release or threat of a release of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found." It is important, however, to distinguish between background chemicals and site-related chemicals due to the limitations on action as defined by CERCLA, and because remediation levels for background and ambient chemicals must be established for chemicals which may have an ambient level. It is important, therefore, to distinguish between background chemicals and site-related chemicals due to the limitations on action as defined by CERCLA, and because remediation levels for background and ambient chemicals must be established for chemicals which may have an ambient level.

The definition of background is also important to this discussion. According to the U.S. Environmental Protection Agency (EPA) (1989), background chemicals can be categorized as either:

> Nonanthropogenic or naturally occurring: minerals or other substances present in the environment in forms that have not been influenced by human activities; and
>
> Anthropogenic: natural and manmade substances present in the environment as a result of human activities not specifically related to site activities.

Nonanthropogenic chemicals are naturally occurring organic or inorganic chemicals that are in soil or water as part of the geological or hydrogeological conditions of the area and are in an unaltered form not related to human activity (for example, metals from rock formations or PAHs from forest fires). Anthropogenic background chemicals are related to human activity in the region but are unrelated to site operations; PAHs and metals may be considered anthropogenic background because they are also from sources such as car exhaust.

Inorganic Chemicals

The purpose of identifying background levels of inorganic chemicals is to distinguish between those levels that represent natural soil constituents and those related to site activities. This is a commonly accepted practice, as described in many EPA guidance documents (EPA 1989, EPA 1990). Inorganic chemicals

present as part of the natural soil composition are considered nonanthropogenic. Concentrations of inorganic chemicals may also be affected by non-site related anthropogenic activities. It was expected that concentrations of inorganic chemicals from background samples at NAS Alameda would reflect naturally occurring, ambient levels consistent with concentrations found in bay sediment, which is the source of fill soil at NAS Alameda.

Organic Chemicals (PAHs)

The Navy considers the random detections of PAHs in fill (also called polynuclear aromatic hydrocarbons or PNAs) at many areas of NAS Alameda to be anthropogenic background for two reasons. First, as described in the following section, NAS Alameda is constructed of fill dredged from the San Francisco Bay. The systematic detections of PAHs at the fill soil-native material interface at most IRP sites is evidence that the bay floor was contaminated with PAHs prior to base construction (PRC 1992). The Regional Water Quality Control Board (RWQCB) lists a total ambient level of PAHs in San Francisco Bay sediment of 5.13 milligrams per kilogram (mg/kg) (RWQCB 1996); PAHs detected at or below this concentration are likely to represent the ambient bay levels because the base is constructed of bay sediment. Second, due to its urban location, soil is expected to contain an ambient level of PAHs. For example, the Agency for Toxic Substances and Disease Control (1995) published background soil concentrations of PAHs in urban areas. The ranges are presented on a chemical-specific basis (rather than total) and are as high as 62 mg/kg for heavy molecular weight PAHs and 166 mg/kg for light molecular weight PAHs. DTSC has also recognized background levels of PAHs in the San Francisco Bay area of at least 8.5 mg/kg. As described in correspondence between DTSC and Ecology and Environment, Inc. (1993): At DTSC's request, and to put the remedial goal in perspective, background levels of PNAs were evaluated. PNAs are present in urban environments due to vehicle exhaust, asphalt paving, tobacco and barbecue smoke, and other sources. PNAs were detected in 17 out of 19 of the background samples taken as part of the RI; the level of total PNAs measured in the area near the site ranged from 0.02 to 1.03 mg/kg. The level of PNAs has also been recently measured in 98 background surface soil samples throughout northern California for 17 Preliminary Endangerment Assessments recently submitted to the Cal-EPA and presented in the Draft PHEE [Public Health and Environmental Evaluation]. Analytical data compiled and analyzed from these reports indicate a mean background concentration of total PNAs of 8.5 mg/kg for the 17 sites.

DTSC also accepted background levels of PAHs at the PG&E Martin Service Center (MSC) (1992):

> Background concentrations of total PNAs in soil from parks and along roadsides in the MSC site vicinity ranged from less than the analytical detection limits to 0.11 milligrams per kilogram (mg/kg). This falls within the range reported in the literature for other urban areas of 0.04 to 13 mg/kg (Edwards, 1983).

With these definitions and expected uses of background data, the RI database of NAS Alameda was reviewed to select appropriate background samples since background samples had not been previously collected for the installation. However, samples had been collected in and around the Installation Restoration Program (IRP) sites as part of the RI investigation, and some were collected at sites that were primarily suspected of containing petroleum contamination. Samples from these areas were considered potential background data, in accordance with DTSC recommendations for identifying background (DTSC 1995):

> The largest data set possible is desirable for describing ambient conditions. If the number of 'background' samples planned is not sufficiently large, the population size for 'background' analysis can be expanded by a technique used successfully at several other sites. Samples of soil collected because of suspected contamination with petroleum products often are found negative for these mixtures upon assay. If these same samples were analyzed for metals, the basewide data set can be augmented.

Accordingly, samples in the IRP data set were evaluated for use as background samples, and both metals and PAHs were considered as having a background level.

Background Project History

Selection of background data at NAS Alameda is complicated by the fact that the installation is constructed of fill soil. Although the exact sources of fill are unknown, it was dredged from San Francisco Bay over a period of approximately 75 years (1900 to 1975). The lithology of the fill soil is not classifiable, as it is heterogeneous throughout the base. At the southeastern corner of the base, approximately 3 feet of soil overlay the native Merritt Sand. In the rest of the installation, fill soil represents the top 10 to 14 feet of soil; soil below these depths represents the bay floor material as it existed prior to placement of fill. It is difficult to establish background for fill soil because the exact sources are unknown.

In a previous letter to the regulatory agencies (dated October 11, 1996), the identification of the different fill areas across the base has been described. Briefly, the base was examined by aggregating data collected within areas delineated by time of fill deposition. Five fill areas were first identified: the far west portion of the base ("Site 1/Site 2" area) and a small strip of land bordering the Oakland Inner Harbor; the runway area; the area east of the runway to the base boundary; and two areas within the southeast corner of the base. Iron and manganese data were compared statistically to determine whether these areas contained geologically similar soils and could be represented by one background data set. The reasons for using iron and manganese for this evaluation and the methodology employed (described in the letter of October 11, 1996) are:

- Both iron and manganese are common soil components
- Based on site history, neither chemical is related to any site activity at NAS Alameda
- Both chemicals are present at quantities well above detection limits at all sites (that is, they have 100 percent frequencies of detection), eliminating the potential problem of differing detection limits between sampling efforts at NAS Alameda. (Multiple detection limits can be a confounding factor in the interpretation of results.)
- U.S. Environmental Protection Agency (EPA)-established analytical methods for these two analytes have not changed between sampling efforts at NAS Alameda.

- The distributions of iron and manganese oxides have been shown to affect the concentration of many other chemicals in soil (Evans 1989; Jenne 1968)

Using nonparametric statistical tests, results of the evaluation indicated that some areas could be combined, but that more than one data set would be needed to represent background for the entire installation. Specifically, it appeared that Site 1 and Site 2 areas were similar; the runway and central portion of the installation were similar; and the two areas at the southeast corner of the base were similar. (These areas are denoted on Figure 1 by the colors blue, pink, and yellow.) Therefore, three background data sets are indicated to accurately conduct statistical evaluations for the purpose of selecting chemicals of concern (COCs) and establishing remediation levels, if necessary.

Environmental Baseline Survey (EBS) data were not included in the evaluation of the fill area soil types. Although this data had at one point been considered potential background data, it was eventually excluded from the evaluation because of data quality issues and concerns about the whether the data from the RI and EBS sampling efforts could be combined. The issues could not be resolved and the EBS data was not used. The EBS data had been collected for a different assessment purpose and data quality objectives for EBS data had not included use as potential background data, which requires a more stringent collection and validation process than has been planned for the EBS data.

Background Data Selection

Some samples collected as part of the IRP investigation could be used as background samples for the three areas. Use of this data would avoid costly delays associated with additional sampling and so was considered the most efficient method for developing a background data set. The RI database was reviewed on a sample-by-sample basis to select samples that could represent background. First, for each area, all samples collected from IRP sites that could contain metal contamination based on site history (Sites 4 and 5) were excluded as background samples. Also excluded from consideration were areas of suspected PAH contamination, specifically, the landfill and burn pit areas of Site 1.

Next, samples from borings that contained non-PAH organic chemicals, except for insignificant levels of laboratory contaminants and organic carbon measurements, were excluded from consideration. Common laboratory contaminants, according to EPA, are acetone, 2-butanone (methyl ethyl ketone), methylene chloride, toluene, and phthalate ethers (EPA 1989). This consideration was necessary because older data collected by Canonie had not been validated as thoroughly as data collected after 1990 and there was an indication of low level laboratory contamination which occurred sporadically in these data.

This process resulted in many samples being rejected as potential background data. After applying these steps, samples located within the IRP sites were excluded as well. The remaining samples were considered to be potential background data.

In the three fill areas identified (denoted by the colors blue, pink, and yellow on the attached plate), a total of 247 samples have been selected as potential background samples. Table 1 lists the sample identification numbers and depth interval for each sample selected. As shown in Plate 1 and Tables 2 through 4, 140 samples were identified in the blue area, 56 samples in the pink area, and 51 samples in the yellow area.

Samples in the blue area were not consistently analyzed for both metals and PAHs: 34 were analyzed for both, while 55 were analyzed only for metals and 51 only for semivolatile organic compounds (including PAHs). The samples are indicated on Plate 1 by point name, rather than sample name, because often samples were collected at multiple depths within a borehole.

Tables 2 through 4 provide data summaries for the data sets, including maximum, minimum, and average values, as well as the probability density function for each chemical. Sample quantitation limits, frequencies of detection, and standard deviations are also presented. Cumulative frequency plots for each chemical in each area are included as an attachment to this letter. The plots include all detected results and, for chemicals with less than 100 percent frequency of detection, detected results and nondetected results set equal to one-half the sample quantitation limit. Probability density functions (PDFs) were determined from detected results only. This information allows for comparison of the data selected to regional values and among the three fill areas identified at NAS Alameda. The ranges of chemical concentrations are specific to each of the three fill areas, as shown below for select chemicals (in milligrams per kilogram):

	Blue	Pink	Yellow
Arsenic	0.74 - 23.0	0.44 - 15.6	1.1 - 33.0
Beryllium	0.09 - 0.77	0.25 - 2.3	0.3 - 1.3
Chromium	11.4 - 81.7	12.3 - 66.7	5.0-69.7
Iron	760 - 26, 900	4,500-27,900	10 - 20,800
Manganese	50 - 1,060	55.5-885	5.0-330
Nickel	11.6 - 88.5	11.5 - 80.4	5.0 - 71.1
Benzo(a) pyrene	0.048 - 1.3	2.6	0.024
Chrysene	0.058 - 1.3	1.5	0.022 - 0.13

The cumulative frequency plots are provided in Attachment A, as well as coefficients of variation (standard deviation divided by the mean). These are provided on the plots in Attachment A . Overall, the coefficients of variation (also presented in Tables 2 through 4) are below 1.0. When nondetects are excluded from the data set and only detected results are plotted, the cumulative frequency graphs are relatively straight for those chemicals with lower frequencies of detection. The plots have elsewhere been used to establish a single background value for each analyte, which were subsequently used to select COCs. This value could be selected from the lower portion of a cumulative frequency plot, assuming that a "hinge point" exists to demarcate site contamination from background levels (according to a letter from DTSC to Navy dated September 29, 1995). As described by Gilbert (1996), this "definition of ambient background is predicated on the idea that testing for compliance with a background standard should be done by comparing the highest measurement from a PCA [potentially contaminated area] with a single background number (threshold). That is, the background data set should be reduced to a single number for testing purposes." He concludes that the hinge point approach is not technically defensible for at least two reasons. First, "the Type I decision error rate (probability that the analyte will be incorrectly declared a COPC [chemical of potential concern]) depends critically on the number of measurements from the PCA" (Gilbert 1996). As he describes, the hinge point method has the potential for generating extremely low background threshold levels, which will in turn result in many false positive decision errors. That is, the probability of incorrectly deciding that the analyte is a COPC becomes very high, if not certain.

Second, the hinge point method "does not make full use of the information about variability of the background measurements.... The existence of a hinge point does not necessarily mean that two populations are present and that the lower portion of the plot (nearest the origin) is the ambient background distribution....However, the more fundamental point is that, as pointed out above, the practice of reducing the background population to a single threshold value is not a technically defensible method for determining if an analyte is a COPC. "

Gilbert presents a detailed discussion of this in his letter to the Navy (1996) and in Hardin and Gilbert (1993). Therefore, while these plots provide a visual inspection of the data, they will not be used to determine a background data set or one value to represent "background." The data presented here constitute the background ranges and data that will be used to statistically determine which chemicals are above or below background levels for each site using the methodology in Navy policy.

In conclusion, the data presented here represent the background data and ranges (presented in Tables 2 through 4) for the three fill areas of NAS Alameda. The number of samples and areal distribution of samples within each of the three fill areas meets concerns of sufficient statistical power, confidence, and spatial representation of the data. The background ranges can be used to conduct statistical tests of means to select COCs. Please call me at (303) 312-8843 if you have any questions or comments regarding this deliverable.

Sincerely,

Theresa K. Lopez

Theresa K. Lopez
Senior Toxicologist

cc: Susan Willoughby, PRC
Duane Balch, PRC

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TABLE 1

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	280-S09-001	1.5	2.5	M09-05
BLUE	280-S09-002	3.0	4.0	M09-05
BLUE	280-S09-003	5.0	6.0	M09-05
BLUE	280-S16-018	0.5	1.5	B16-10
BLUE	280-S16-019	2.5	3.5	B16-10
BLUE	280-S16-020	3.5	4.5	B16-10
BLUE	280-S16-021	5.0	6.0	B16-10
BLUE	280-S16-022	1.5	2.5	B16-11
BLUE	280-S16-023	2.5	3.5	B16-11
BLUE	280-S16-024	5.0	6.0	B16-11
BLUE	280-S16-025	0.5	1.5	B16-12
BLUE	280-S16-026	2.5	3.5	B16-12
BLUE	280-S16-027	5.0	6.0	B16-12
BLUE	280-S16-028	1.0	2.0	M16-04
BLUE	280-S16-029	2.0	3.0	M16-04
BLUE	280-S7C-001	0.5	1.5	B07C-11
BLUE	280-S7C-002	2.5	3.5	B07C-11
BLUE	280-S7C-003	5.0	6.0	B07C-11
BLUE	280-S7C-004	0.5	1.5	B07C-12
BLUE	B410-7 [1.0-1.5]	1.0	1.5	B410-7
BLUE	B410-7 [3.0-3.5]	3.0	3.5	B410-7
BLUE	B410-7 [5.5-6.0]	5.5	6.0	B410-7
BLUE	B410-7 [6.0-6.5]	6.0	6.5	B410-7
BLUE	B410-7 [8.5-9.0]	8.5	9.0	B410-7
BLUE	B410-7 [9.0-9.5]	9.0	9.5	B410-7
BLUE	B410-7 [11.0-11.5]	11.0	11.5	B410-7
BLUE	B410-7 [11.5-12.0]	11.5	12.0	B410-7
BLUE	B410-7 [14.5-15.0]	14.5	15.0	B410-7
BLUE	B410-7 [15.0-15.5]	15.0	15.5	B410-7
BLUE	B410-9 [1.0-1.5]	1.0	1.5	B410-9
BLUE	B410-9 [2.5-3.0]	2.5	3.0	B410-9
BLUE	B410-9 [3.0-3.5]	3.0	3.5	B410-9
BLUE	B410-9 [5.5-6.0]	5.5	6.0	B410-9
BLUE	B410-9 [6.0-6.5]	6.0	6.5	B410-9
BLUE	B410-9 [8.5 -9.0]	8.5	9.0	B410-9
BLUE	B410-9 [9.0-9.5]	9.0	9.5	B410-9
BLUE	B410-9 [11.5-12.0]	11.5	12.0	B410-9
BLUE	B410-9 [12.0-12.5]	12.0	12.5	B410-9
BLUE	B410-9 [14.5-15.0]	14.5	15.0	B410-9
BLUE	B410-9 [15.0-15.5]	15.0	15.5	B410-9
BLUE	B547-10 [0.5-1.0]	0.5	1.0	B547-10
BLUE	B547-10 [2.0-2.5]	2.0	2.5	B547-10
BLUE	B547-10 [2.5-3.0]	2.5	3.0	B547-10
BLUE	B547-10 [5.0-5.5]	5.0	5.5	B547-10
BLUE	B547-10 [5.5-6.0]	5.5	6.0	B547-10

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	B547-10 [8.0-8.5]	8.0	8.5	B547-10
BLUE	B547-10 [8.5-9.0]	8.5	9.0	B547-10
BLUE	B547-10 [11.0-11.5]	11.0	11.5	B547-10
BLUE	B547-10 [11.5-12.0]	11.5	12.0	B547-10
BLUE	B547-10 [14.0-14.5]	14.0	14.5	B547-10
BLUE	B547-10 [14.5-15.0]	14.5	15.0	B547-10
BLUE	B547-6 [2.0-2.5]	2.0	2.5	B547-6
BLUE	B547-6 [2.5-3.0]	2.5	3.0	B547-6
BLUE	B547-6 [3.5-4.0]	3.5	4.0	B547-6
BLUE	B547-6 [4.0-5.0]	4.0	5.0	B547-6
BLUE	B547-6 [5.0-5.5]	5.0	5.5	B547-6
BLUE	B547-6 [6.0-6.5]	6.0	6.5	B547-6
BLUE	B547-6 [6.5-7.0]	6.5	7.0	B547-6
BLUE	B547-6 [9.0-9.5]	9.0	9.5	B547-6
BLUE	B547-6 [9.5-10.0]	9.5	10.0	B547-6
BLUE	B547-6 [11.0-11.5]	11.0	11.5	B547-6
BLUE	B547-6 [11.5-12.0]	11.5	12.0	B547-6
BLUE	B547-6 [14.0-14.5]	14.0	14.5	B547-6
BLUE	B547-6 [14.5-15.0]	14.5	15.0	B547-6
BLUE	BC2-7 [0.5-1.0]	0.5	1.0	BC2-7
BLUE	BC2-7 [2.5-3.0]	2.5	3.0	BC2-7
BLUE	BC2-7 [5.0-5.5]	5.0	5.5	BC2-7
BLUE	BC2-7 [7.0-7.5]	7.0	7.5	BC2-7
BLUE	BC2-7 [9.5-10.0]	9.5	10.0	BC2-7
BLUE	BC2-7 [11.0-11.5]	11.0	11.5	BC2-7
BLUE	BC2-7 [13.5-14.0]	13.5	14.0	BC2-7
BLUE	BC2-7 [14.0-14.5]	14.0	14.5	BC2-7
BLUE	M-BG3-000	0.3	0.5	MBG-3
BLUE	M-BG3-002	2.0	2.5	MBG-3
BLUE	M-BG3-004	4.0	4.5	MBG-3
BLUE	M-BG3-006	5.5	6.0	MBG-3
BLUE	MW410-1 [0.5-1.0]	0.5	1.0	MW410-1
BLUE	MW410-1 [2.0-2.5]	2.0	2.5	MW410-1
BLUE	MW410-1 [3.0-3.5]	3.0	3.5	MW410-1
BLUE	MW410-1 [5.5-6.0]	5.5	6.0	MW410-1
BLUE	MW410-1 [6.5-7.0]	6.5	7.0	MW410-1
BLUE	MW410-1 [7.0-7.5]	7.0	7.5	MW410-1
BLUE	MW410-1 [7.5-8.0]	7.5	8.0	MW410-1
BLUE	MW410-1 [8.0-8.5]	8.0	8.5	MW410-1
BLUE	MW410-1 [11.0-11.5]	11.0	11.5	MW410-1
BLUE	MW410-1 [11.5-12.0]	11.5	12.0	MW410-1
BLUE	MW410-1 [12.5-13.0]	12.5	13.0	MW410-1
BLUE	MW410-1 [14.0-14.5]	14.0	14.5	MW410-1
BLUE	MW410-1 [14.5-15.0]	14.5	15.0	MW410-1
BLUE	MW410-3 [1.0-1.5]	1.0	1.5	MW410-3
BLUE	MW410-3 [3.0-3.5]	3.0	3.5	MW410-3
BLUE	MW410-3 [4.0-4.5]	4.0	4.5	MW410-3
BLUE	MW410-3 [5.5-6.0]	5.5	6.0	MW410-3
BLUE	MW410-3 [6.0-6.5]	6.0	6.5	MW410-3

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	MW410-3 [8.5-9.0]	8.5	9.0	MW410-3
BLUE	MW410-3 [9.0-9.5]	9.0	9.5	MW410-3
BLUE	MW410-3 [11.5-12.0]	11.5	12.0	MW410-3
BLUE	MW410-3 [12.0-12.5]	12.0	12.5	MW410-3
BLUE	MW410-3 [14.5-15.0]	14.5	15.0	MW410-3
BLUE	MW410-3 [15.0-15.5]	15.0	15.5	MW410-3
BLUE	MW410-4 [1.0-1.5]	1.0	1.5	MW410-4
BLUE	MW410-4 [3.0-3.5]	3.0	3.5	MW410-4
BLUE	MW410-4 [4.0-4.5]	4.0	4.5	MW410-4
BLUE	MW410-4 [5.5-6.0]	5.5	6.0	MW410-4
BLUE	MW410-4 [6.0-6.5]	6.0	6.5	MW410-4
BLUE	MW410-4 [8.5-9.0]	8.5	9.0	MW410-4
BLUE	MW410-4 [9.0-9.5]	9.0	9.5	MW410-4
BLUE	MW410-4 [11.5-12.0]	11.5	12.0	MW410-4
BLUE	MW410-4 [12.0-12.5]	12.0	12.5	MW410-4
BLUE	MW410-4 [14.5-15.0]	14.5	15.0	MW410-4
BLUE	MW410-4 [15.0-15.5]	15.0	15.5	MW410-4
BLUE	MW547-1 [0.5-1.0]	0.5	1.0	MW547-1
BLUE	MW547-1 [2.0-2.5]	2.0	2.5	MW547-1
BLUE	MW547-1 [2.5-3.0]	2.5	3.0	MW547-1
BLUE	MW547-1 [4.5-5.0]	4.5	5.0	MW547-1
BLUE	MW547-1 [5.0-5.5]	5.0	5.5	MW547-1
BLUE	MW547-1 [8.0-8.5]	8.0	8.5	MW547-1
BLUE	MW547-1 [8.5-9.0]	8.5	9.0	MW547-1
BLUE	MW547-1 [11.0-11.5]	11.0	11.5	MW547-1
BLUE	MW547-1 [11.5-12.0]	11.5	12.0	MW547-1
BLUE	MW547-1 [14.0-14.5]	14.0	14.5	MW547-1
BLUE	MW547-1 [14.5-15]	14.5	15.0	MW547-1
BLUE	MW547-2 [0.5-1.0]	0.5	1.0	MW547-2
BLUE	MW547-2 [2.0-2.5]	2.0	2.5	MW547-2
BLUE	MW547-2 [2.5-3.0]	2.5	3.0	MW547-2
BLUE	MW547-2 [5.0-5.5]	5.0	5.5	MW547-2
BLUE	MW547-2 [5.5-6.0]	5.5	6.0	MW547-2
BLUE	MW547-2 [6.0-6.5]	6.0	6.5	MW547-2
BLUE	MW547-2 [6.5-7.0]	6.5	7.0	MW547-2
BLUE	MW547-2 [9.5-10.0]	9.5	10.0	MW547-2
BLUE	MW547-2 [10.0-10.5]	10.0	10.5	MW547-2
BLUE	MW547-2 [12.5-13.0]	12.5	13.0	MW547-2
BLUE	MW547-2 [13.0-13.5]	13.0	13.5	MW547-2
BLUE	MW547-2 [14.0-14.5]	14.0	14.5	MW547-2
BLUE	MW547-2 [14.5-15.0]	14.5	15.0	MW547-2
BLUE	MWC2-3 [1.0-1.5]	1.0	1.5	MWC2-3
BLUE	MWC2-3 [4.0-4.5]	4.0	4.5	MWC2-3
BLUE	MWC2-3 [5.0-5.5]	5.0	5.5	MWC2-3
BLUE	MWC2-3 [6.5-7.0]	6.5	7.0	MWC2-3
BLUE	MWC2-3 [7.0-7.5]	7.0	7.5	MWC2-3
BLUE	MWC2-3 [8.0-8.5]	8.0	8.5	MWC2-3
BLUE	MWC2-3 [8.5-9.0]	8.5	9.0	MWC2-3
BLUE	MWC2-3 [9.5-10.0]	9.5	10.0	MWC2-3

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	MWC2-3 [10.0-10.5]	10.0	10.5	MWC2-3
BLUE	MWC2-3 [11.0-11.5]	11.0	11.5	MWC2-3
BLUE	MWC2-3 [12.5-13.0]	12.5	13.0	MWC2-3
PINK	280-RA-033	0.0	1.5	M112-A
PINK	280-RA-034	2.5	3.5	M112-A
PINK	280-RA-035	5.0	6.0	M112-A
PINK	280-RA-039	0.0	1.0	M114-A
PINK	280-RA-040	2.0	3.0	M114-A
PINK	280-RA-041	3.5	4.5	M114-A
PINK	280-RA-042	0.0	1.5	M115-E
PINK	280-RA-043	2.5	3.5	M115-E
PINK	280-RA-044	5.0	6.0	M115-E
PINK	280-RA-045	0.0	1.5	M116-E
PINK	280-RA-046	2.5	3.5	M116-E
PINK	280-RA-047	5.0	6.0	M116-E
PINK	280-RA-048	0.0	1.5	M117-E
PINK	280-RA-049	2.5	3.5	M117-E
PINK	280-RA-050	5.0	6.0	M117-E
PINK	B06-07-000	0.5	1.0	B06-07
PINK	B06-07-002	2.0	3.3	B06-07
PINK	B06-07-007	6.5	7.5	B06-07
PINK	B06-07-008	8.0	9.5	B06-07
PINK	B06-08-000	1.0	1.5	B06-08
PINK	B06-08-002	2.0	3.0	B06-08
PINK	B07B-02-000	0.5	1.5	B07B-02
PINK	B07B-02-004	3.5	5.0	B07B-02
PINK	B10-04-000	0.5	1.0	B10-04
PINK	B10-04-005	5.0	6.0	B10-04
PINK	B12-08-000	0.5	1.0	B12-08
PINK	B12-08-004	3.5	5.0	B12-08
PINK	B12-08-010	9.5	10.0	B12-08
PINK	F10 [0.0-0.0]	0.0	0.0	F-10
PINK	M-006A-0	2.0	2.5	M006-A
PINK	M-006A-005	3.5	4.5	M006-A
PINK	M-101A-004	2.0	3.5	M101-A
PINK	M-102A-004	2.0	3.3	M102-A
PINK	M-106A-0	0.0	0.0	M106-A
PINK	M-106A-003	2.0	3.0	M106-A
PINK	M-107A-0	0.0	0.0	M107-A
PINK	M-107A-002	0.5	2.0	M107-A
PINK	M-109A-0	0.0	0.0	M109-A
PINK	M-109A-007	5.5	6.3	M109-A
PINK	M-110A-003	1.5	3.0	M110-A
PINK	M-111A-0	0.5	0.0	M111-A
PINK	M-111A-003	2.0	3.5	M111-A
PINK	M-BG1-002	2.0	2.5	MBG-1
PINK	M-BG1-003	3.0	3.5	MBG-1
PINK	M-BG1-004	5.0	5.5	MBG-1

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
PINK	M-BG2-002	2.0	2.5	MBG-2
PINK	M-BG2-005	5.0	5.5	MBG-2
PINK	M-BG4-002	2.0	2.5	MBG-4
PINK	M-BG4-007	7.5	8.0	MBG-4
PINK	M-BG4-010	10.0	10.5	MBG-4
PINK	M103-A	5.0	6.5	M103-A
PINK	M103-B	0.0	0.5	M103-B
PINK	M105-A	5.5	7.0	M105-A
PINK	M105-B	0.0	0.5	M105-B
PINK	M108-A	5.0	6.5	M108-A
PINK	M108-B	0.0	0.5	M108-B
YELLOW	280-S01-016	0.0	0.0	SS1-RA-14
YELLOW	A2 [0.0-0.0]	0.0	0.0	A-2
YELLOW	A3 [0.0-0.0]	0.0	0.0	A-3
YELLOW	A4 [0.0-0.0]	0.0	0.0	A-4
YELLOW	A5 [0.0-0.0]	0.0	0.0	A-5
YELLOW	A6 [0.0-0.0]	0.0	0.0	A-6
YELLOW	A7 [0.0-0.0]	0.0	0.0	A-7
YELLOW	A8 [0.0-0.0]	0.0	0.0	A-8
YELLOW	B2 [0.0-0.0]	0.0	0.0	B-2
YELLOW	B3 [0.0-0.0]	0.0	0.0	B-3
YELLOW	B4 [0.0-0.0]	0.0	0.0	B-4
YELLOW	B5 [0.0-0.0]	0.0	0.0	B-5
YELLOW	B6 [0.0-0.0]	0.0	0.0	B-6
YELLOW	B7 [0.0-0.0]	0.0	0.0	B-7
YELLOW	B8 [0.0-0.0]	0.0	0.0	B-8
YELLOW	F1 [0.0-0.0]	0.0	0.0	F-1
YELLOW	F2 [0.0-0.0]	0.0	0.0	F-2
YELLOW	F3 [0.0-0.0]	0.0	0.0	F-3
YELLOW	F4 [0.0-0.0]	0.0	0.0	F-4
YELLOW	F5 [0.0-0.0]	0.0	0.0	F-5
YELLOW	F6 [0.0-0.0]	0.0	0.0	F-6
YELLOW	F9 [0.0-0.0]	0.0	0.0	F-9
YELLOW	G2 [0.0-0.0]	0.0	0.0	G-2
YELLOW	G3 [0.0-0.0]	0.0	0.0	G-3
YELLOW	G5 [0.0-0.0]	0.0	0.0	G-5
YELLOW	G8 [0.0-0.0]	0.0	0.0	G-8
YELLOW	G9 [0.0-0.0]	0.0	0.0	G-9
YELLOW	H8 [0.0-0.0]	0.0	0.0	H-8
YELLOW	H9 [0.0-0.0]	0.0	0.0	H-9
YELLOW	I7 [0.0-0.0]	0.0	0.0	I-7
YELLOW	I8 [0.0-0.0]	0.0	0.0	I-8
YELLOW	J7 [0.0-0.0	0.0	0.0	J-7
YELLOW	J8 [0.0-0.0]	0.0	0.0	J-8
YELLOW	K6 [0.0-0.0]	0.0	0.0	K-6
YELLOW	K7 [0.0-0.0]	0.0	0.0	K-7
YELLOW	L5 [0.0-0.0]	0.0	0.0	L-5
YELLOW	L6 [0.0-0.0]	0.0	0.0	L-6

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
YELLOW	L7 [0.0-0.0]	0.0	0.0	L-7
YELLOW	M-004A-0	2.0	2.5	M004-A
YELLOW	M-004A-004	3.5	4.5	M004-A
YELLOW	M-005A-0	0.5	1.5	M005-A
YELLOW	M-005A-003	2.0	2.5	M005-A
YELLOW	M-008A-0	0.5	1.8	M008-A
YELLOW	M-008A-004	2.0	3.3	M008-A
YELLOW	M-025A-004	4.0	0.0	M025-A
YELLOW	M4 [0.0-0.0]	0.0	0.0	M-4
YELLOW	M5 [0.0-0.0]	0.0	0.0	M-5
YELLOW	M6 [0.0-0.0]	0.0	0.0	M-6
YELLOW	M7 [0.0-0.0]	0.0	0.0	M-7
YELLOW	M8 [0.0-0.0]	0.0	0.0	M-8

Notes:

bgs = Below ground surface
Point Name designates the sample location as shown on Figure 1.

TABLE 2

NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[2]	NA	89/89	2,880	26,800	5,726	1.6	7,096	0.06
Antimony[3]	0.46-9.2	2/89	0.89	1.0	1.8	1.3	2.1	0.71
Arsenic[2]	0.61-13	34/89	0.74	23.0	2.2	2.9	4.8	1.3
Barium[1]	24-25	86/89	0.30	198	48.9	32.3	55.7	0.66
Beryllium[1]	0.2-1.3	25/89	0.09	0.77	0.32	0.21	0.36	0.67
Cadmium[1]	0.06-1.3	30/89	0.1	0.82	0.32	0.23	0.37	0.73
Calcium[2]	NA	89/89	1,360	19,200	3,044	1.9	4,185	0.08
Chromium[1]	NA	89/89	11.4	81.7	33.7	12.9	36.5	0.38
Cobalt[1]	3.9-6.8	67/89	1.9	14	5.0	2.7	5.6	0.53
Copper[2]	5.8-6.3	84/89	4.2	89.4	10.4	2.0	15.2	0.30
Iron[1]	NA	89/89	760	26,900	10,068	5,070	11,135	0.50
Lead[2]	1.4-6.8	28/89	1.3	41	3.3	2.3	5.4	0.68
Magnesium[2]	NA	89/89	1,510	42,400	2,560	1.6	3,156	0.06
Manganese[2]	NA	89/89	50	1,060	126	1.7	160.0	0.11
Nickel[2]	NA	89/89	11.6	88.5	26.9	1.5	31.9	0.13
Potassium[2]	610	88/89	310	6,382	802	1.6	998	0.07
Selenium[3]	0.39-13	1/89	5.7	5.7	2.8	2.1	3.3	0.75
Silver[3]	0.18-6.5	2/89	0.44	0.61	0.95	1.2	1.2	1.2
Sodium[2]	288-650	69/89	88.1	3,510	299.8	2.2	470.7	0.14
Thallium[3]	0.33-13	1/89	5.3	5.3	2.3	2.2	2.8	0.94
Titanium[1]	NA	66/66	223	1,020	408.4	145.8	444.3	0.36
Vanadium[1]	NA	89/89	12.8	62.3	22.5	8.9	24.3	0.39

TABLE 2 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Zinc[2]	NA	89/89	14	316	27.0	1.6	33.5	0.15
Polycyclic Aromatic Hydrocarbons (μg/kg)								
Acenaphthene[3]	83-14,000	1/85	130	130	293.1	743.2	453.5	2.5
Anthracene[3]	83-14,000	2/85	59	390	294.2	743.5	454.7	2.5
Benzo(a)anthracene[4]	100-14,000	8/85	61	1,000	290.1	747.9	451.5	2.6
Benzo(a)pyrene[2]	140-14,000	11/85	48	1,300	208.4	1.8	277.3	0.11
Benzo(b)fluoranthene[2]	100-14,000	9/85	66	760	202.4	1.8	273.9	0.11
Benzo(g,h,i)perylene[4]	170-14,000	6/85	140	950	304.6	745.8	465.6	2.4
Benzo(k)fluoranthene[2]	100-14,000	6/85	100	1,100	208.1	1.8	280.9	0.11
Chrysene[4]	100-14,000	11/85	58	1,300	288.9	752.6	451.3	2.6
Dibenzo(a,h)anthracene[3]	170-14,000	1/85	230	230	296.4	742.4	456.7	2.5
Fluoranthene[2]	83-14,000	12/85	54	2,000	198.2	1.9	284.2	0.13
Fluorene[3]	83-14,000	1/85	100	100	292.7	743.3	453.2	2.5
Indeno(1,2,3-cd)pyrene[2]	170-14,000	6/85	120	930	215.2	1.7	279.3	0.10
Naphthalene[3]	83-14,000	1/85	35	35	292.3	743.5	452.8	2.5
Phenanthrene[2]	83-14,000	8/85	27	1,600	196.0	2.0	284.2	0.13
Pyrene[1]	83-14,000	12/85	65	2,500	343.4	785.3	484.6	2.3
2-methylnaphthalene[3]	100-14,000	1/85	320	320	294.2	742.9	454.6	2.5

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated coefficient of variation from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated coefficient of variation from arithmetic mean and standard deviation.
NA Not applicable
mg/kg milligrams per kilogram
μg/kg micrograms per kilogram

TABLE 3

NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[1]	NA	51/51	20.0	13,300	6,156	2,532	6,869	0.41
Antimony[3]	1.3-7.3	3/51	2.8	3.6	2.9	0.69	3.1	0.24
Arsenic[1]	10-12	22/51	1.1	33	7.6	6.4	9.4	0.84
Barium[2]	21-24	44/51	19.8	260	30.4	1.9	43.5	0.18
Beryllium[1]	1-1.2	10/51	0.3	1.3	0.58	0.19	0.63	0.33
Cadmium[1]	0.36-1.2	12/51	0.33	2.9	0.66	0.49	0.80	0.74
Calcium[2]	NA	51/51	500	97,000	3,441	2.0	5,269	0.08
Chromium[4]	NA	51/51	5.0	69.7	32.1	8.4	34.4	0.26
Cobalt[1]	5-7.6	20/51	4.3	11.4	4.3	2.3	4.9	0.53
Copper[1]	5.5-5.6	49/51	4.2	49	15.9	12.0	19.3	0.76
Iron[1]	NA	51/51	10.0	20,800	10,324	3,859	11,410	0.37
Lead[2]	NA	51/51	3.3	752	22.2	2.8	51.7	0.33
Magnesium[2]	NA	51/51	500	8,820	2,541	1.6	3,178	0.06
Manganese[1]	NA	51/51	5.0	330	136.9	73.6	157.6	0.54
Mercury[1]	0.05-0.15	5/10	0.05	0.18	0.08	0.05	0.12	0.68
Nickel[4]	NA	51/51	5.0	71.1	27.8	9.8	30.6	0.35
Potassium[1]	NA	51/51	500	1,700	921	291	1,003	0.32
Silver[4]	0.18-6	6/51	0.52	30	2.9	4.1	4.0	1.4
Sodium[1]	125-610	11/51	232	1,380	353	260.8	425.9	0.74
Titanium[1]	NA	41/41	280	663	456	77.1	480.2	0.17
Vanadium[1]	NA	51/51	15.6	50.0	25.7	7.9	27.9	0.31
Zinc[1]	NA	51/51	17.0	140.0	47.8	31.9	56.8	0.67

TABLE 3 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Polycyclic Aromatic Hydrocarbons (µg/kg)								
Benzo(a)pyrene[3]	84-,6,700	1/51	24.0	24.0	400.4	487.1	537.4	1.2
Benzo(g,h,i)perylene[3]	96-6,700	1/51	19.0	19.0	402.2	485.9	538.9	1.2
Chrysene[3]	60-6,700	2/51	22.0	130.0	398.2	488.7	535.6	1.2
Fluoranthene[3]	48-6,700	3/51	30.0	790.0	407.0	492.1	545.4	1.2
Indeno(1,2,3-cd)pyrene[3]	96-6,700	1/51	21.0	21.0	402.2	485.9	538.9	1.2
Phenanthrene[3]	48-6,700	2/51	120.0	200.0	401.9	486.7	538.8	1.2
Pyrene[3]	48-6,700	4/51	33.0	900.0	411.1	492.8	549.7	1.2

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution
(4) Data are not normally or lognormally distributed
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

TABLE 4

NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[2]	NA	56/56	1,700	22,600	5304.7	1.6	6,657.7	0.05
Antimony[1]	0.46-11.0	19/56	0.7	8.6	2.3	1.9	2.8	0.83
Arsenic[2]	0.59-10.0	46/56	0.44	15.6	1.8	2.3	3.2	1.4
Barium[2]	NA	56/56	6.9	156.0	36.6	1.7	48.7	0.15
Beryllium[1]	0.15-1.0	29/56	0.25	2.3	0.53	0.43	0.64	0.81
Cadmium[2]	0.08-1.0	11/56	0.1	3.2	0.18	2.7	0.42	0.58
Calcium[2]	NA	56/56	816.0	66,600.0	2,962.6	2.1	4,785.2	0.09
Chromium[1]	NA	56/56	12.3	66.7	30.1	10.1	32.8	0.34
Cobalt[4]	3.96-5.7	49/56	3.0	62.1	7.1	10.0	9.8	1.4
Copper[2]	8.8-10.2	53/56	3.1	49.1	7.6	1.8	10.5	0.29
Iron[2]	NA	56/56	4,500.0	27,900.0	9,543.0	1.5	11,604.9	0.05
Lead[2]	1.9-3.0	52/56	0.47	165.0	4.3	2.9	10.4	0.73
Magnesium[2]	NA	56/56	1,290.0	8,800.0	2,646.9	1.5	3,195.9	0.05
Manganese[2]	NA	56/56	55.5	885.0	130.6	1.8	181.7	0.12
Mercury[2]	0.06-0.269	8/56	0.057	2.71	0.064	2.4	0.12	0.32
Nickel[2]	NA	56/56	11.5	80.4	25.6	1.4	29.9	0.10
Potassium[2]	NA	56/56	209.0	2,480.0	696.3	1.5	847.9	0.07
Silver[2]	0.18-1.47	12/56	0.32	5.6	0.32	2.5	0.63	0.80
Sodium[2]	NA	56/56	62.6	1,580.0	337.3	1.9	503.1	0.11
Thallium[4]	0.11-10.0	1/56	0.53	0.53	0.25	0.65	0.43	0.34
Titanium[3]	NA	1/1	518.0	518.0	518.0	NA	NA	NA
Vanadium[1]	NA	56/56	10.5	55.3	22.9	9.2	25.4	0.40

TABLE 4 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Zinc[2]	18.0	55/56	10.0	191.0	23.2	1.7	30.8	0.17
Polycyclic Aromatic Hydrocarbons (:g/kg)								
Acenaphthene[3]	70-3,400	1/56	150.0	150.0	121.6	226.2	182.3	1.9
Anthracene[3]	70-3,400	1/56	240.0	240.0	123.2	226.8	184.1	1.8
Benzo(a)anthracene[3]	100-3,400	1/56	1,600.0	1,600.0	497.1	2,264.3	1,105.0	4.6
Benzo(a)pyrene[3]	140-3,400	1/56	2,600.0	2,600.0	186.4	394.9	292.4	2.1
Benzo(b)fluoranthene[3]	100-3,400	1/56	2,300.0	2,300.0	168.1	366.1	266.4	2.2
Benzo(g,h,i)perylene[3]	160-3,400	1/56	1,700.0	1,700.0	177.1	300.4	257.7	1.7
Benzo(k)fluoranthene[3]	100-3,400	1/56	620.0	620.0	138.1	232.9	200.6	1.7
Chrysene[3]	100-3,400	1/56	1,500.0	1,500.0	153.8	288.9	231.4	1.9
Fluoranthene[3]	70-3,400	3/56	34.0	3,600.0	207.5	477.0	355.6	2.3
Indeno(1,2,3-cd)pyrene[3]	160-3,400	1/56	1,800.00	1,800.00	178.8	309.8	262.0	1.7
Naphthalene[3]	70-3,400	1/56	99.0	99.0	120.7	226.2	181.4	1.9
Phenanthrene[3]	70-3,400	2/56	240.0	2,200.0	131.3	291.1	209.4	2.2
Pyrene[3]	70-3,400	3/56	210.0	6,100.0	240.5	831.0	463.5	3.5

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated coefficient of variation from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated coefficient of variation from arithmetic mean and standard deviation.
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

APPENDIX B

GROUNDWATER BACKGROUND DETERMINATION METHODOLOGY

Metals occur naturally in groundwater, the concentrations of which vary among locations. These inherent variations in metals concentrations can arise from several factors, including (1) differences in overlying soil characteristics in the recharge zone, (2) differences in subsurface hydrostratigraphy, (3) differences in geochemistry, and (4) location within the groundwater flow system.

Some concentrations of metals in groundwater at Alameda Point may not be naturally occurring, but are unrelated to Naval activities at Alameda Point. A review of the history of Alameda Point construction indicates that almost the entire installation is located on marshland, tidal flats, and bay margin (submerged land) that has been filled with sediment dredged from the Oakland Inner Harbor, San Francisco Bay, and the ship channel/Seaplane Lagoon area. The species and concentration of metals present in the fill sediment are not known, but may have been impacted by industrial activities along the original Oakland Bayshore and Alameda Island before placement of the dredged material began.

During technical meetings between the Navy and regulatory agencies held on April 28 and 29, 1998, the BCT decided to follow a statistical approach for the determination of the concentrations of ambient metals in groundwater similar to that used to determine the concentrations of ambient metals in soils at Alameda Point (PRC 1997). This simplified approach was followed because of the transitory nature of groundwater and the following factors arising from the construction of Alameda Point:

- The presence of anthropogenic metals in fill sediment
- The slow leaching of both naturally-occurring and anthropogenic metals from the marine sediments into the groundwater
- The marine-derived fill sediment was placed in a column of sea water and serves as the aquifer material
- The disequilibrium of groundwater chemistry due to the slow flushing of saline connate water from the pore spaces and the large geochemical gradients that occur within small horizontal and vertical distances
- Existing and potential future sea water intrusion induced by remediation- or supply-based pumping

In consultation with the BCT, the Navy proposed estimating the concentration limits of ambient metals in the following manner:

- Select well locations that appear to be unaffected by IR site-related contamination to create an initial data set to be used to determine ambient concentrations of metals

- Compare all organic groundwater data from the initial data set to the 1996 tap water preliminary remediation goals (PRG) to exclude impacted wells

- Examine the initial data set using probability plots and Rosner's test to exclude outlier concentrations of metals

- Test the remaining data (without outliers) for normality using a statistical graphics program

- Prepare summary statistics and estimate the ambient concentrations of metals from the tested data set

A subsequent meeting between the agencies and the Navy was held on May 11, 1998, to identify monitoring wells at Alameda Point for potential use in developing background groundwater. The following sections provide a detailed description of the process used to develop the ambient metals data set and the statistical procedure used to estimate the concentrations of ambient metals in groundwater at Alameda Point.

MONITORING WELL SELECTION AND DATABASE COMPILATION

Beginning in 1991, a number of environmental and geotechnical studies were conducted at Alameda Point in an effort to characterize environmental contamination that may have been caused by past activities at the air station. Over 260 monitoring wells were installed during these previous investigations. These monitoring wells form the monitoring well network that was sampled for at least four quarters and was used to develop the ambient metals data set discussed in this report.

The data set used to determine the concentrations of ambient metals in groundwater was limited to groundwater samples collected from the FWBZ. Groundwater samples collected from the SWBZ were not included in the data set due to extensive saltwater intrusion and the inherent inability of analytical methods to detect trace metals in the presence of very high levels of marine salts.

Monitoring wells were designated on a location-by-location basis as potential ambient wells if they met the following criteria:

- The well must not be located at an IR site that contains metals contamination based on site history

- The well must be located upgradient or cross-gradient from known sources of contamination at Alameda Point

- The well must not be located within any existing or previously identified organic contaminant plume

- The well must not be contaminated by any organic compound during any sampling event unless the detection was infrequent and the concentration was below 1996 tap water PRGs for the given compound

Based on the May 11, 1998, technical meeting and a subsequent comparison of potential ambient wells to tap water PRGs, 35 wells were identified as being unaffected by IR site-related groundwater contamination. These wells are referred to in this report as "unaffected wells." The 35 unaffected wells are as follows:

DRA-01	M013-A	M06-03	M108-A	M15-03
M003-E	M014-A	M06-05	M110-A	MBG-1
M006-A	M015-A	M07C-08	M117-E	MBG-2
M007-A	M025-E	M103-A	M12-02	MBG-3
M008-A	M026-A	M105-A	M12-04	MW530-3
M010-A	M026-E	M106-A	M13-08	MWOR-4
M012-A	M031-A	M107-A	M15-01	MWC2-1

Figures B-1 through B-3 show the locations of the 35 unaffected wells in each region of Alameda Point in relation to IR sites, contaminant plumes, and the direction of groundwater flow.

Filtered metals data, analyzed using Contract Laboratory Program (CLP) methodology, were used to constitute the ambient metals data set. Unfiltered metals data were not used due to large variations in turbidity values typically associated with unfiltered samples. Each of the 35 wells was sampled at least four times during the quarterly sampling; therefore, up to 188 separate measured concentrations were potentially available for each metal. However, fewer concentrations were available for hexavalent chromium due to infrequent analysis and for molybdenum due to analytical difficulties.

STATISTICAL ANALYSIS

Statistical procedures consistent with EPA and DTSC guidance documents (EPA 1989a; DTSC 1992a, 1992b, 1994) and current practices in the environmental industry were used to estimate ambient concentrations of metals in groundwater. The statistical analysis consisted of the following four steps:

- Nondetected data were substituted with numerical values at one-half the report detection limit depending on the detection frequency.
- Outliers were identified and excluded from the data set.
- Data sets for metals with high detection frequencies were tested for normality.
- Data were statistically summarized based on their probability distribution, and ambient concentrations were determined from the data.

Each of these steps is discussed separately below.

Treatment Of Nondetected Data. Before the upper limits of the concentrations of ambient metals could be estimated, the data set for all metals required special preparation to assign numerical values to nondetected results. Typically, nondetected results are assigned numerical values equal to one-half of the reported detection limit, which varies from sample to sample due to dilution factors and variations in analytical instrument response. For all chemicals, a value of one-half the reported detection limit was substituted for each nondetected data point per agreements reached in the April and May 1998 BCT monthly tracking meetings.

Exclusion Of Outliers. In any population, a few values may be significantly higher or lower than the main population, and can cause disproportionate statistical effects. To avoid these disproportionate effects, values that were significantly higher than others were identified as outliers and were excluded from the data set before estimating ambient concentrations.

Potential outliers in the data set were first visually identified using probability plots. Probability plots were constructed at an appropriate scale (normal or lognormal) for each metal, using up to 188 sample concentrations. Potential outliers for each metal were then visually identified as values that plotted a significant distance from the straight line along which the majority of the data were clustered. Rosner's test, described in EPA's Guidance for Data Quality Assessment (EPA 1996a), was performed for those metals that appeared to be potential outliers based on visual inspection of the data.

The original data set contained up to 188 samples for each metal. These data were natural-log transformed and detected values were plotted on a cumulative frequency chart. The following metals appeared to contain outliers after visual inspection of the lognormally transformed data plots: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc. Rosner's test was used to determine if the highest detected concentrations of these metals were outliers. The results of Rosner's test indicated that the preceding list of metals did not contain outliers in their data subsets with the potential exceptions of: aluminum, cobalt, lead, nickel, vanadium, and zinc.

The outliers for aluminum, cobalt, lead, nickel, vanadium, and zinc were associated with samples from the following wells collected on the dates listed:

Well Identification	Sample Date	Chemicals with Potential Outliers
MW530-3	8/24/90	Aluminum, Cobalt, Copper, Lead, Nickel, Vanadium
MWC2-1	8/29/90	Aluminum, Cobalt, Copper, Lead, Nickel, Vanadium
MWOR-4	8/27/90	Aluminum, Cobalt, Copper, Lead, Nickel, Vanadium
M008-A	7/1/91	Aluminum
M014-A	9/25/91	Aluminum, Cobalt, Lead, Nickel, Vanadium, Zinc

M117-E	3/7/95	Zinc
M003-E	5/3/95	Lead
DRA-01	3/7/95	Zinc
M107-A	3/4/95	Nickel
M110-A	3/5/95	Lead, Nickel, Zinc
M15-03	3/8/95	Zinc

Review of the laboratory reports for the first six wells listed above revealed that the samples from the corresponding quarters had not been filtered, artificially elevating metal concentrations. Therefore, analytical results for those wells (for the above-listed dates only) were removed from the groundwater ambient data set for all metals. The March 1995 sample for M003-E had an anomalously high lead detection, the basis for which could not be determined. The May 1995 sample for well DRA-01 had a detection of zinc that was high and perhaps more representative of saline water in SWBZ. Therefore, samples from wells M003-E and DRA-01 collected on the above-listed dates were also removed.

The remaining samples did not have any apparent explanation for the anomalous results, although samples from M107-A and M110-A for March 1995 were reported as turbid, which may explain the higher detection of lead, nickel, and zinc. However, there is no apparent contamination near these wells and no indication of laboratory problems with the samples. Wells M107-A, M110-A, and M15-03 were sampled before and after the detections of the apparent outliers, and all results were low to nondetected with low detection limits. Therefore, although there are anomalously high hits of lead, nickel, and zinc in these wells, the samples were retained in the ambient metals data set.

Based upon the previous discussion of exclusion of outliers, the final data set for each metal could contain up to 180 groundwater samples results. However, the actual population of a metal subset (maximum population of 180 data points) was limited by the frequency of detection for a specific metal. For example, although 180 groundwater samples were available from the ambient metals data set, the metal nickel was only detected 13 times yielding a frequency of detection of 13/180.

Normality Testing. After the removal of outliers, the data set was subjected to normality testing to objectively evaluate the distribution of the data. Normality testing is an analytical technique used to judge whether a data set is distributed normally or lognormally. The assumption of normality was tested using the Wilks-Shapiro Rank-Its plots. Normality testing was only applied to metals detected at least five times in a population of up to 180 groundwater samples. The normality tests were conducted using only detected values, which requires at least five values to provide a distribution. Metals with fewer than five detected results were evaluated assuming a normal distribution.

Estimation Of Ambient Metals Concentrations. After treating nondetected values, removing outliers from the ambient metals data set, and normality testing, the data for each metal were statistically

summarized to calculate mean concentrations and the ambient screening concentration (the 80th percent lower confidence limit [LCL] of the 95th percentile of the distribution [80 LCL/95]). All data summaries were conducted on the natural-log transformed data unless the data were normally distributed, in which case the data summaries were performed on untransformed data. The 80 LCL/95 concentration was calculated using the formula presented in Statistical Methods for Environmental Pollution Monitoring (Gilbert 1987). The concentration at the 95th upper confidence limit (95 UCL) of the mean was also calculated for information purposes.

GROUNDWATER BACKGROUND LEVEL DETERMINATION RESULTS

Estimated ambient metals concentrations at both the 80 LCL/95 and 95 UCL for shallow groundwater (FWBZ) at Alameda Point, statistical features of the data sets, and relevant water quality criteria are listed in Table B-1. The estimated concentrations of ambient metals in groundwater at the 80 LCL/95, in many cases, exceeded the maximum contaminant level (MCL) for municipal supply (RWQCB 1995). Estimated concentrations for antimony, cadmium, iron, manganese, and thallium exceeded their respective MCLs. The background data sets were used in developing COCs for IR sites at Alameda Point. COC selection procedures and results are presented in Chapter 5 of this report.

APPENDIX B-3

AMBIENT PAH DETERMINATION
(in progress)

APPENDIX B-4

SVOC AND TPH CONCENTRATIONS IN HIGH ORGANIC LAYER

TABLE B-4.1
DETECTED CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	ANALYTICAL GROUP	CHEMICAL	TOTAL SAMPLES	NUMBER OF DETECTIONS	DETECTION FREQUENCY (%)	MINIMUM VALUE (UG/KG)	MAXIMUM VALUE (UG/KG)
CENTRAL AND WESTERN REGIONS	SVOA	2-METHYLNAPHTHALENE	148	3	2.03	130	330
		ACENAPHTHENE	148	17	11.49	54	42000
		ACENAPHTHYLENE	148	14	9.46	35	11000
		ANTHRACENE	148	23	15.54	47	47000
		BENZO(A)ANTHRACENE	148	39	26.35	39	65000
		BENZO(A)PYRENE	148	48	32.43	46	130000
		BENZO(B)FLUORANTHENE	148	48	32.43	130	130000
		BENZO(G,H,I)PERYLENE	148	29	19.59	170	140000
		BENZO(K)FLUORANTHENE	148	33	22.30	65	39000
		BIS(2-CHLOROETHYL)ETHER	148	1	0.68	400	400
		BIS(2-ETHYLHEXYL)PHTHALATE	148	5	3.38	750	8600
		CHRYSENE	148	42	28.38	43	66000
		DIBENZO(A,H)ANTHRACENE	148	6	4.05	240	380
		DIETHYLPHTHALATE	148	1	0.68	36	36
		FLUORANTHENE	148	56	37.84	89	160000
		FLUORENE	148	11	7.43	35	12000
		INDENO(1,2,3-CD)PYRENE	148	29	19.59	170	76000
		NAPHTHALENE	148	26	17.57	91	18000
		PHENANTHRENE	148	44	29.73	26	170000
		PYRENE	148	68	45.95	38	170000
	TPH	TOTAL RECOVERABLE PETROLEUM HYDROCARBONS	31	9	29.03	39000	156000
MARSH SURFACE	SVOA	2-METHYLNAPHTHALENE	22	1	4.55	530	530
		4-METHYLPHENOL	22	2	9.09	230	490
		ACENAPHTHYLENE	22	2	9.09	35	260
		ANTHRACENE	22	3	13.64	91	630
		BENZO(A)ANTHRACENE	22	4	18.18	320	8000
		BENZO(A)PYRENE	22	4	18.18	380	22000
		BENZO(B)FLUORANTHENE	22	4	18.18	350	11000

TABLE B-4.1
DETECTED CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT
(Page 2 of 3)

REGION	ANALYTICAL GROUP	CHEMICAL	TOTAL SAMPLES	NUMBER OF DETECTIONS	DETECTION FREQUENCY (%)	MINIMUM VALUE (UG/KG)	MAXIMUM VALUE (UG/KG)
MARSH SURFACE	SVOA	BENZO(G,H,I)PERYLENE	22	5	22.73	570	11000
		BENZO(K)FLUORANTHENE	22	4	18.18	390	9400
		CHRYSENE	22	4	18.18	470	8100
		FLUORANTHENE	22	5	22.73	85	29000
		INDENO(1,2,3-CD)PYRENE	22	4	18.18	400	8600
		N-NITROSODIPHENYLAMINE (1)	22	1	4.55	77	77
		NAPHTHALENE	22	3	13.64	48	480
		PHENANTHRENE	22	4	18.18	120	1800
		PYRENE	22	6	27.27	260	25000
	TPH	GASOLINE RANGE ORGANICS	9	5	55.56	1800	5100000
		MOTOR OIL RANGE ORGANICS	9	8	88.89	15000	880000
		TOTAL RECOVERABLE PETROLEUM HYDROCARBONS	21	9	42.86	4900	1490000
SOUTHEAST REGION	SVOA	2,4-DIMETHYLPHENOL	244	1	0.41	12000	12000
		2-METHYLNAPHTHALENE	244	14	5.74	43	160000
		ACENAPHTHENE	241	3	1.24	37	410
		ACENAPHTHYLENE	247	3	1.21	25	130
		ANTHRACENE	243	24	9.88	32	4800
		BENZO(A)ANTHRACENE	244	35	14.34	40	1200
		BENZO(A)PYRENE	243	33	13.58	21	4500
		BENZO(B)FLUORANTHENE	244	36	14.75	20	5100
		BENZO(G,H,I)PERYLENE	243	25	10.29	62	12000
		BENZO(K)FLUORANTHENE	243	22	9.05	58	2100
		BIS(2-ETHYLHEXYL)PHTHALATE	244	4	1.64	52	13000
		CARBAZOLE	30	1	3.33	5900	5900
		CHRYSENE	244	45	18.44	22	36000
		DI-N-BUTYLPHTHALATE	244	6	2.46	32	12000
		DIBENZO(A,H)ANTHRACENE	243	7	2.88	52	640
		DIBENZOFURAN	243	3	1.23	23	6900

TABLE B-4.1
DETECTED CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT
(Page 3 of 3)

REGION	ANALYTICAL GROUP	CHEMICAL	TOTAL SAMPLES	NUMBER OF DETECTIONS	DETECTION FREQUENCY (%)	MINIMUM VALUE (UG/KG)	MAXIMUM VALUE (UG/KG)
SOUTHEAST REGION	SVOA	DIETHYLPHTHALATE	243	1	0.41	8800	8800
		FLUORANTHENE	244	43	17.62	25	3900
		FLUORENE	243	14	5.76	42	46000
		INDENO(1,2,3-CD)PYRENE	243	23	9.47	62	8700
		N-NITROSODIPHENYLAMINE (1)	243	40	16.46	44	4500
		NAPHTHALENE	243	39	16.05	36	30000
		PENTACHLOROPHENOL	244	1	0.41	930	930
		PHENANTHRENE	243	47	19.34	42	140000
		PYRENE	244	60	24.59	20	16000
	TPH	DIESEL RANGE ORGANICS	37	10	27.03	11000	35000000
		GASOLINE RANGE ORGANICS	9	3	33.33	16000	9310000
		MOTOR OIL RANGE ORGANICS	40	18	45.00	15000	23000000
		TOTAL RECOVERABLE PETROLEUM HYDROCARBONS	187	69	36.90	2000	170000000

Notes:
% = Percent
UG/KG = Microgram per kilogram
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbon

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT
(Page 1 of 8)

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
CENTRAL AND WESTERN REGIONS	5	B05-07	14	15.5	Olive to dark gray clay and black silty sand, H_2S odor. Olive sand above.
	5	B05-08	14	15.3	Dark olive gray sandy clay, H_2S/fuel odor. Olive sand above, fuel odor.
	5	B05-09	14	15.5	Olive (5Y 4/3) silty clay. Olive sand above.
	5	B05-10	14	15	Olive (5Y 4/3) silty clay, slight H_2S odor. Olive sand above, hydrocarbon odor.
	5	B05-12	14	15.3	Dark olive clay. Olive clayey sand above.
	5	B05BS-01	15	16	Black clay. Green sand above.
	6	B06-06	11	12.5	Black (7.5YR N2) clay, slight H_2S odor. Grayish brown sand above.
	6	B06-07	14	15.5	Very dark gray (2.5YR N3) clayey sand. Olive silty sand above.
	6	B06-08	14	15.5	Dark gray (2.5YR N4) clay, plant debris, strong H_2S odor. Olive gray silty sand above.
	6	B06-09	8	9.5	Very dark gray (2.5YR N3) clay. Olive gray sand above.
	6	B06-09	14	15.5	Very dark gray (2.5YR N3) clayey sand, slight H_2S odor. Olive gray sand above.
	6	B06-10	8	9.5	Very dark gray (2.5YR N3) clayey sand. Olive gray sand above.
	6	B06-11	6.5	7.5	Olive (5Y 4/3) fine gravel. Olive sand above.
	6	B06-11	14	15	Dark olive (5Y 3/3) clayey sand. Olive gravel above.
	6	B06-12	8	9.3	Olive (5Y 4/3) sand across interface. Dark yellow brown sand above.
	6	B06-12	14	15.5	Dark olive (5Y 3/3) sandy clay. Olive sand above.
	6	B06-13	8	9.5	Very dark gray 5Y 3/1) clay. Olive gray sand above.
	6	B06-20	10	11	Black clay. Light brown silty sand above.
	6	B06-20	13.5	14.5	Black clayey sand. Light brown silty sand above.
	6	B06-22	9.5	10.5	Not available.
	6	B06-23	9.5	10.5	Black clayey sand. Brown sand above.
	6	B06-23	13.5	14.5	Black clayey sand, H_2S odor. Brown sand above.
	8	B08-06	14	15.3	Dark olive gray (5Y 3/2) sand, mothball odor. Dark olive gray sand above.
	8	B08-07	12.5	14	Dark gray (2.5Y N4) clayey sand. Very dark gray (5Y 3/1) clay above.
	8	B08-08	11	12.5	Olive gray (5Y 4/2) silty sand. Olive gray sand above.
	8	B08-08	14	15.5	Dark olive gray (5Y 4/1) sandy clay. Olive gray sand above.
	8	B08-09	14	15.3	Dark olive (5Y 3/3) sand, hydrocarbon odor. Olive clayey sand above.
	8	B08-10	14	15.5	Dark olive (5Y 3/3) sand, product odor. Dark olive clayey sand above.
	8	B08-11	14	15.5	Dark olive (5Y 3/4) sand, product odor, carbon/wood frags. Dark olive clayey sand above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
CENTRAL AND WESTERN REGIONS	8	B08-12	14	15.5	Olive (5Y 5/3) silty sand, mothball odor. Olive silty sand above.
	10	B10-04	14	15.5	Olive (5Y 4/4) clay grading to olive gray (5Y4/2) sand. Olive silty sand above.
	12	B12-05	14	15.5	Dark olive gray (5Y 3/2) sand. Dark olive gray clayey sand above.
	12	B12-06	14	15.5	Dark olive gray (5Y 3/2) clayey sand. Olive gray silty sand above.
	12	B12-07	9.5	11	Black (2.5Y N2) clayey sand. Gray-green sand above.
	12	B12-07	14	15.5	Black (2.5Y N2) clayey sand. Gray-green sand above.
	12	B12-08	14	15.5	Dark olive (5Y 3/4) clayey sand. Olive brown sand above.
	12	B12-09	14	15.5	Dark olive (5Y 3/3) clayey sand. Dark olive sandy clay above.
	1	DA-1	25	25.5	Dark gray silty clay. Gray silty sand above.
	2	M019-E	33.5	35	Olive (5Y 5/3) sand. Clay above.
	1	M025-E	32	33	Very dark gray (5Y 3/2) and olive (5Y 4/3) clay. Dark olive gray silty sand above.
	5	M05-01	14	15.5	Black (2.5Y N2) silty clay. Olive sand above.
	5	M05-02	14.5	15.3	Black (2.5Y N2) silty clay. Olive sand above.
	5	M05-03	14	15.5	Black to olive (5Y 4/3) sandy clay. Olive sand above.
	5	M05-04	14	15.5	Black (2YR N2), highly organic clayey sand. Gray-green sand above.
	5	M05-05	14	15.3	Dark olive (5Y 3/3) clayey sand. Olive clayey sand above.
	5	M05-12	9	10	Dark gray (N4) silty clay, trace organic matter. Greenish gray silty sand above.
	6	M06-01	8	9.5	Dark gray (2.5Y N3) clay. Green gray sand above.
	6	M06-04	14	15.5	Dark olive to black clay. Olive gray sand above.
	6	M06-06	10	11	Dark gray (7.5YR N4) clay. Light brown sand above.
	6	M06-06	13.5	14.5	Dark gray (7.5YR N4) clay. Light brown sand above.
	8	M08-01	14	15.3	Dark olive (5Y 4/3) silty sand. Olive sand above.
	8	M08-02	14	15.5	Olive gray (5Y 4/2) clayey sand, mothball odor. Olive gray sand above.
	8	M08-03	14	15.5	Dark olive (5Y 3/3) silty clay. Dark olive sand above.
	8	M08-04	14	15.5	Olive gray (5Y 3/3) sandy clay. Olive gray sand above.
	8	M08-05	14	15.5	Dark olive (5Y 3/4) sand, mothball odor. Dark olive clayey sand above.
	10	M10-01	14	15	Black (7.5YR N2) clay. Olive sand above.
	10	M10-02	14	15.3	Olive (5Y 4/3) sand. Olive clayey sand above.
	10	M10-03	14	15.5	Dark olive (5Y 3/3) sand, slight H_2S odor. Olive sand above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT
(Page 3 of 8)

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
CENTRAL AND WESTERN REGIONS	12	M12-01	14	15.5	Dark gray (5Y 4/1) clayey sand. Dark olive gray silty sand above.
	12	M12-02	9.5	11	Black (5Y 2.5/1) clay. Olive gray (5Y 4/2) sand above.
	12	M12-02	14	15.5	Dark gray (5Y 4/1) clayey sand. Olive gray sand above.
	12	M12-03	11	12.5	Very dark gray (5Y 3/1) clay. Light olive brown sand above.
	12	M12-03	14	15.5	Dark gray (5Y 4/1) clayey sand. Light olive brown sand above.
	12	M12-04	9.5	11	Very dark gray (5Y 3/1) clay. Light olive brown sand above.
	12	M12-04	12.5	14	Very dark gray (5Y 3/1) clay. Light olive brown sand above.
	14	M14-02	8	9.5	Dark olive (5Y 3/3) clay. Dark yellow brown sand above.
MARSH SURFACE	7	B07A-05	2	3.5	Dark yellow brown to dark olive (5Y 3/3) sand. Yellowish brown gravelly sand above
	7	B07A-05	6.5	8	Dark olive gray clay, black organic material. Dark olive gray sand above.
	7	B07A-05	12.5	14	Dark olive gray clay, organic fragments, roots, stalks. clay above.
	7	B07A-06	2	3.5	Dark olive gray sand grading to clay. Dark brown sand above, strong hydrocarbon odor.
	7	B07A-06	9.5	11	Dk olive gray clay, organic rich, H_2S odor. Dk brown sand, strong hydrocarbon odor above.
	7	B07A-07	5	6.5	Dark olive gray (5Y3/3) clay, some organic matter. Light olive brown sand, HC odor above.
	7	B07A-08	5.5	6	Gray to light brown (2.5Y 5/2) sand. Green gray sandy gravel above.
	7	B07A-09	5	5.5	Dark gray (2.5Y 3/0) sand. Green gray silty gravel above, strong gasoline odor.
	7	B07A-09	10	10.5	Black (2.5Y 5/0) clay. Gray sand above.
	3	M03-04	10	11	Dark gray (5Y 4/1) silty clay, organic matter. Green gray sand above.
	4	M04-07	5	5.5	Black (2.5Y N2) silty sand, organic matter. Light brown gray sand above.
	7	M07A-01	11.5	13	Dark olive gray clay, abundant roots and organic material, strong H_2S odor. Dark olive gray sand above, HC odor
	7	M07A-02	2	3.5	Black (2.5YR N/3) clay. Black silty sand above.
	7	M07A-02	6.5	8	Black (2.5YR N3) clay, partially decayed plant matter, H_2S odor. Black silty sand above.
	7	M07A-03	4	5	Dark gray (7.5R N/3) silty clay to clayey silt, plant stem/roots, viscous black oil. Olive clayey sand above, strong diesel odor.
	7	M07A-04	5	6.5	Green (5y 5/2) sand at interface. Dark gray (5Y 3/1) clay below.
	7	M07A-05	2.5	3	Green gray (5GY 4/1) organic clay. Pale brown sandy gravel above.
	7	M07A-05	3	3.5	Greenish gray (5GY 4/1) organic clay. Pale brown sandy gravel above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT
(Page 4 of 8)

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
MARSH SURFACE	7	M07A-06	2.5	4	Green gray (5GY 5/1) silty clay. Yellow brown sand above.
	7	M07A-08	2.5	3.5	Greenish gray (5GY 5/1) sand at interface. Greenish gray silty clay below.
	7	M07A-08	4.5	5.5	Dark greenish gray (5GY 4/1) silty clay, roots common. Greenish gray sand above.
	7	M07A-09	5	6	Gray (5Y 5/1) silty clay, organic matter common. Silty gravel with sand above.
	3	MW97-1	7	7.5	Gray to black sandy clay. Black silty sand with black clay lenses above.
	3	MW97-3	7	7.5	Gray silty sand. Light brown silty sand above.
	3	MW97-3	10.5	11	Orange brown (gray mottling) clayey sand. Light brown silty sand above.
SOUTHEAST REGION	13	B-IMF-01	8	8.5	Black silty sand, coke-tar, oily. Olive clayey sand above.
	4	B04-24	5	5.5	Black (2.5Y N2) silty sand. Gray sand above.
	21	B07B-02	11	12.5	Black (2.5Y N2) clayey sand. Black clay above.
	21	B07B-02	14	14.5	Mottled brown (2.5Y 4/3) and gray (2.5Y N5) clay, root material. Black clayey sand above.
	21	B07B-03	11	12.5	Gray (2.5Y N3) clayey sand. Black clay above.
	21	B07B-04	5.5	6	Light brown sand, some clay, trace roots.
	21	B07B-05	5	6	Light brown sand, some clay, trace roots, hydrocarbon odor.
	11	B11-05	14	15	Black clayey sand. Dark yellow brown sand above.
	11	B11-06	8	9.5	Dark gray silty sand. Yellow brown sand above.
	11	B11-06	14	15.3	Dark yellow brown (10YR 4/4) clayey sand. Black clayey sand above.
	13	B13-28	5.5	6	Green-gray (5BG 4/1) sand, trace roots, odor. Very dark gray sand above.
	13	B13-29	5	5.5	Green-gray (5GY 5/1) clayey sand, caliche, trace roots. Very dark gray brown silty sand above, sheen.
	13	B13-39	8	8.5	Gray to tan sand. Pale yellow brown sand above.
	13	B13-39	11.5	12	Gray silty clay. Gray to tan sand above.
	13	B13-39	14	14.5	Gray interbedded clay and silt layers. Gray to tan sand above.
	13	B13-40	9.5	10	Dark gray silty clay. Pale yellow brown sand above.
	13	B13-40	13	13.5	Dark gray silty clay. Pale yellow sand above.
	13	B13-41	6.5	7	Black sand, black tar-like material, strong odor. Reddish brown silty sand above.
	13	B13-41	7	7.5	Black sand, black tar-like material, strong odor. Reddish brown silty sand above.
	13	B13-41	8	8.5	Black sand, black tar-like material, strong odor. Reddish brown silty sand above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
SOUTHEAST REGION	13	B13-41	8.5	9	Black sand, black tar-like material, strong odor. Reddish brown silty sand above.
	13	B13-41	9	9.5	Pale yellow brown sand. Black sand, black tar-like material, strong odor above.
	13	B13-41	11	11.5	Pale yellow brown sand. Black sand, black tar-like material, strong odor above.
	13	B13-42	12.5	13	Brown sand, hydrocarbon odor. Green silty sand above.
	13	B13-43	9.5	10	Black silty sand, black tar-like material, strong odor. Green silty sand above.
	13	B13-43	10	10.5	Black silty sand, black tar-like material, strong odor. Green silty sand above.
	13	B13-43	12	12.5	Black silty sand, black tar-like material, strong odor. Green silty sand above.
	9	B410-5	10.5	11	Black to dark gray silty clay. Brown gray silty clayey sand above.
	9	B410-5	11	11.5	Black to dark gray silty clay. Brown gray silty clayey sand above.
	9	B410-5	14	14.5	Dark gray clayey fine sand. Black to dark gray silty clay above.
	9	B410-6	11	11.5	Light brown silty sand.
	9	B410-6	11.5	12	Light brown silty sand.
	9	B410-6	13	13.5	Black silty clay. Light brown silty sand above.
	9	B410-7	11	11.5	Dark gray (mottled brown) silty clay, moderate odor, black oily discoloration. Brown gray sandy clay above.
	9	B410-7	14.5	15	Dark gray clayey sand. Dark gray (mottled brown) silty clay, moderate odor, black oily discoloration.
	9	B410-9	14.5	15	Gray silty sand, pockets of silty clay. Light brown silty sand above.
	22	B547-8	11	11.5	Black silty sand, strong fuel odor. Light gray sand above fuel odor.
	16	BC2-4	14	14.5	Dark gray clayey silt, organic matter. Light brownish gray silty sand above.
	19	BD13-11	9	9.5	Gray gravelly sand. Orange brown to brown gray gravelly sand above.
	19	BD13-11	13	13.5	Orange brown clayey sand. Dark gray silty sandy clay above.
	19	BD13-12	8.5	9	Black clayey sand, oily discoloration. Gray clayey sand above.
	19	BD13-12	10.5	11	Orange brown clayey sand. Black clayey sand, oily discoloration above.
	19	BD13-13	11	11.5	Orange brown silty sand, trace of clay. Brown silty sand above.
	19	BD13-14	9.5	10	Brown gray silty sandy gravel. Dark to light brown silty sand above.
	19	BD13-15	8.5	9	Light brown silty sand.
	19	BD13-15	10.5	11	Black silty sand. Light brown silty sand above.
	19	BD13-16	9	9.5	Dark gray gravelly silty sand, organic and wood debris. Gray brown clayey sand above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
SOUTHEAST REGION	19	BD13-16	10.5	11	Dark gray gravelly silty sand, organic and wood debris. Gray brown clayey sand above.
	19	BD13-16	12	12.5	Orange brown clayey sand. Dark gray gravelly silty sand, organic and wood debris above.
	19	BD13-16	13.5	14	Orange brown clayey sand. Dark gray gravelly silty sand, organic and wood debris above.
	19	BD13-6	5.5	6	Dark gray silty sand grading to silty clay. Light brown silty sand above.
	19	BD13-8	8	8.5	Gray brown gravelly sand.
	19	BD13-8	10.5	11	Gray clayey sand, black discoloration, strong odor. Gray brown gravelly sand above.
	19	BD13-8	11	11.5	Gray clayey sand, black discoloration, strong odor. Gray brown gravelly sand above.
	19	BD13-8	12.5	13	Orange brown clayey sand. Gray clayey sand, black discoloration, strong odor above.
	19	BD13-9	8	8.5	Gray sand. Brown silty sand above.
	19	BD13-9	8.5	9	Gray sand. Brown silty sand above.
	13	BOR-10	11	11.5	Dark gray silty clay, oil staining. Gray silty sand above.
	13	BOR-11	11	11.5	Gray silty clay. Gray silty sand above.
	23	BOR-12	8.5	9	Light gray silty sand. Light brown silty sand above.
	23	BOR-12	11	11.5	Dark gray to black sandy silty clay. Light gray silty sand above.
	13	BOR-15	11	11.5	Gray silty sand, trace clay, strong petroleum odor. Gray silty sand above.
	13	BOR-15	14	14.5	Dark orange brown (with gray mottling) clayey sand, strong odor. Gray silty sand above.
	13	BOR-17	10	10.5	Orange gray silty sand, strong odor. Gray brown silty sand above.
	13	BOR-17	10.5	11	Gray green clayey sand, strong odor. Gray brown silty sand above.
	13	BOR-19	7	7.5	Orange (with gray-green mottle) clayey sand. Orange-green clayey sand above.
	13	BOR-19	11	11.5	Gray-green silty sand. Orange green clayey sand above.
	13	BOR-20	11.5	12	Brown silty sand. Light brown silty sand above.
	13	BOR-21	7	7.5	Light brown silty sand.
	13	BOR-21	11.5	12	Orange brown (mottled gray) silty sand. Light brown silty sand above.
	13	BOR-22	7.5	8	Gray brown silty sand. Light brown silty sand above.
	13	BOR-22	11	11.5	Dark gray silty clay. Light brown silty sand above.
	13	BOR-23	11	11.5	Black silty sandy clay. Gray silty sand above.
	13	BOR-24	7	7.5	Orange brown (mottle gray) clayey sand. Brown silty sand above.
	13	BOR-24	11	11.5	Orange brown (mottle gray) clayey sand. Brown silty sand above.
	13	BOR-25	11	11.5	Gray silty sand. Light brown silty sand above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
SOUTHEAST REGION	13	BOR-26	13	13.5	Black to dark gray silty sand. Gray silty sand above.
	13	BOR-27	7	7.5	Gray brown silty sand. Light brown silty sand above.
	13	BOR-27	10	10.5	Gray brown silty sand. Light brown silty sand above.
	13	BOR-27	12.5	13	Dark gray silty clay. Light brown silty sand above.
	13	BOR-8	7	7.5	Gray silty sand. Light brown silty sand above.
	13	BOR-8	11	11.5	Dark gray silty clay. Gray silty sand above.
	13	BOR-9	11	11.5	Black silty sand, pervasive odor. Gray silty sand, strong odor above
	13	BOR-9	14	14.5	Black silty sand, pervasive odor. Gray silty sand, strong odor above
	21	M07B-01	8	9	Gray (2.5Y 5/3) clay. Gray clayey gravel above.
	11	M11-02	9.5	11	Dark olive (5Y 3/4) clay. Yellow brown sand above.
	11	M11-04	9.5	11	Dark olive (5Y 3/1) sand. Yellow brown sand above.
	9	MW410-1	11	11.5	Dark gray silty clay. Gray silty sand above.
	9	MW410-1	11.5	12	Dark gray silty clay. Gray silty sand above.
	9	MW410-1	14	14.5	Dark gray silty sand. Dark gray silty clay above.
	9	MW410-2	12	12.5	Brown gray silty sand. Light brown and above.
	9	MW410-2	15	15.5	Dark gray silty clayey sand. Brown gray silty sand above.
	9	MW410-3	14.5	15	Dark gray silty sand with pockets of clay. Gray silty sand above.
	9	MW410-4	14.5	15	Dark gray clayey sand with pockets of silty clay. Gray silty sand above.
	23	MW530-1	8.5	9	Gray silty sand, black streaks, oily odor.
	23	MW530-1	11.5	12	Gray silty sand, black streaks, oily odor.
	23	MW530-1	12	12.5	Gray silty sand, black streaks, oily odor.
	23	MW530-2	11.5	12	Gray silty sand. Light brown silty sand above.
	23	MW530-2	14	14.5	Gray to dark brown clayey sand.
	23	MW530-3	11.5	12	Gray clay.
	22	MW547-5	8.5	9	Black clayey sand. Brown sand above.
	19	MWD13-1	7	7.5	Black silty sand with pockets of gray clay. Light brown silty sand above.
	19	MWD13-2	9	9.5	Gray silty sand, organic layer. Brown silty sand above.
	19	MWD13-3	11.5	12	Dark gray silty clay grading to orange brown clayey sand.
	13	MWOR-2	12	12.5	Dark gray silty clay. Light brown silty sand above.

TABLE B-4.2
SOIL BORE LOG DESCRIPTIONS FOR SAMPLES AT TOP OF BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	INTERFACE DESCRIPTION
SOUTHEAST REGION	13	MWOR-3	10	10.5	Orange brown clayey sand, gray clay lenses. Black to dark gray brown silty sand above.
	13	MWOR-4	6.5	7	Orange brown clayey sand, gray mottling. Brown silty sand above.
	13	MWOR-4	10	10.5	Orange brown clayey sand, gray mottling. Brown silty sand above.
	13	MWOR-5	7	7.5	Dark brown silty sand with gravel.
	13	MWOR-5	10	10.5	Dark orange brown silty sand, some clay. Dark brown silty sand gravel above.
	13	MWOR-5	12.5	13	Dark orange brown silty sand, some clay. Dark brown silty sand gravel above.

Notes:
FT = Feet
BGS = Below ground Surface
HC = Hydrocarbon
Dk = Dark
Frag = Fragment

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	5	B05-07	14	15.5	11	SVOA	BENZO(B)FLUORANTHENE	62	140
CENTRAL/WESTERN	5	B05-07	14	15.5	11	SVOA	FLUORANTHENE	50	160
CENTRAL/WESTERN	5	B05-07	14	15.5	11	SVOA	PYRENE	50	220
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	BENZO(A)ANTHRACENE	77	170
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	BENZO(A)PYRENE	110	420
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	BENZO(B)FLUORANTHENE	77	370
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	CHRYSENE	77	180
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	FLUORANTHENE	62	380
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	PHENANTHRENE	62	220
CENTRAL/WESTERN	5	B05-08	14	15.3	10	SVOA	PYRENE	62	620
CENTRAL/WESTERN	5	B05-09	14	15.5	11	SVOA	BENZO(A)PYRENE	88	200
CENTRAL/WESTERN	5	B05-09	14	15.5	11	SVOA	BENZO(B)FLUORANTHENE	63	180
CENTRAL/WESTERN	5	B05-09	14	15.5	11	SVOA	FLUORANTHENE	50	120
CENTRAL/WESTERN	5	B05-09	14	15.5	11	SVOA	PYRENE	50	390
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	BENZO(A)ANTHRACENE	62	300
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	BENZO(A)PYRENE	86	1200
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	BENZO(B)FLUORANTHENE	62	1300
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	BENZO(G,H,I)PERYLENE	99	1200
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	BENZO(K)FLUORANTHENE	62	240
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	CHRYSENE	62	350
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	FLUORANTHENE	49	1100
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	INDENO(1,2,3-CD)PYRENE	99	670
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	PHENANTHRENE	49	230
CENTRAL/WESTERN	5	B05-10	14	15	9	SVOA	PYRENE	49	3800
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	BENZO(A)ANTHRACENE	64	230
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	BENZO(A)PYRENE	89	860
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	BENZO(B)FLUORANTHENE	64	900
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	BENZO(G,H,I)PERYLENE	100	710
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	BENZO(K)FLUORANTHENE	64	240
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	CHRYSENE	64	280
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	FLUORANTHENE	51	770
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	PHENANTHRENE	51	120

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	5	B05-12	14	15.3	9	SVOA	PYRENE	51	2300
CENTRAL/WESTERN	5	B05BS-01	15		12	SVOA	PYRENE	49	260
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	BENZO(A)ANTHRACENE	83	630
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	BENZO(A)PYRENE	120	2300
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	BENZO(B)FLUORANTHENE	83	1800
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	BENZO(G,H,I)PERYLENE	130	2000
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	BENZO(K)FLUORANTHENE	83	910
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	CHRYSENE	83	770
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	FLUORANTHENE	67	1000
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	INDENO(1,2,3-CD)PYRENE	130	1600
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	NAPHTHALENE	67	150
CENTRAL/WESTERN	6	B06-06	11	12.5	5	SVOA	PYRENE	67	4900
CENTRAL/WESTERN	6	B06-07	14	15.5	5	SVOA	PYRENE	88	90
CENTRAL/WESTERN	6	B06-08	14	15.5	5	SVOA	FLUORANTHENE	57	160
CENTRAL/WESTERN	6	B06-08	14	15.5	5	SVOA	PYRENE	57	380
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	ACENAPHTHENE	65	2100
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	ACENAPHTHYLENE	65	240
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	ANTHRACENE	72	150
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	ANTHRACENE	65	1100
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	BENZO(A)ANTHRACENE	90	1100
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	BENZO(A)ANTHRACENE	81	1300
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	BENZO(A)PYRENE	110	1800
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	BENZO(A)PYRENE	130	4100
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	BENZO(B)FLUORANTHENE	81	1300
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	BENZO(B)FLUORANTHENE	90	3100
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	BENZO(G,H,I)PERYLENE	130	1000
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	BENZO(G,H,I)PERYLENE	140	3300
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	BENZO(K)FLUORANTHENE	81	420
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	BENZO(K)FLUORANTHENE	90	540
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	CHRYSENE	90	1200
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	CHRYSENE	81	1400
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	FLUORANTHENE	72	1500

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	FLUORANTHENE	65	4200
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	FLUORENE	65	590
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	130	1100
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	140	3100
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	NAPHTHALENE	65	1500
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	PHENANTHRENE	72	450
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	PHENANTHRENE	65	6200
CENTRAL/WESTERN	6	B06-09	14	15.5	4	SVOA	PYRENE	65	4800
CENTRAL/WESTERN	6	B06-09	8	9.5	4	SVOA	PYRENE	72	8000
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	BENZO(A)PYRENE	120	430
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	BENZO(A)PYRENE	100	570
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	BENZO(B)FLUORANTHENE	82	340
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	BENZO(B)FLUORANTHENE	74	420
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	BENZO(G,H,I)PERYLENE	130	390
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	BENZO(G,H,I)PERYLENE	120	500
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	CHRYSENE	74	180
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	FLUORANTHENE	59	350
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	FLUORANTHENE	66	400
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	130	340
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	120	410
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	PYRENE	66	760
CENTRAL/WESTERN	6	B06-10	8	9.5	4	SVOA	PYRENE	59	1200
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	ANTHRACENE	74	110
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	BENZO(A)ANTHRACENE	110	230
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	BENZO(A)PYRENE	150	560
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	BENZO(B)FLUORANTHENE	110	570
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	BENZO(G,H,I)PERYLENE	170	590
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	BENZO(K)FLUORANTHENE	110	120
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	CHRYSENE	110	270
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	FLUORANTHENE	74	760
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	170	480
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	NAPHTHALENE	74	100

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	PHENANTHRENE	74	650
CENTRAL/WESTERN	6	B06-11	14	15	4	SVOA	PYRENE	89	170
CENTRAL/WESTERN	6	B06-11	6.5	7.5	4	SVOA	PYRENE	74	2200
CENTRAL/WESTERN	6	B06-12	8	9.3	4	SVOA	BENZO(B)FLUORANTHENE	130	160
CENTRAL/WESTERN	6	B06-12	14	15.5	4	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	68	960
CENTRAL/WESTERN	6	B06-12	8	9.3	4	SVOA	FLUORANTHENE	88	140
CENTRAL/WESTERN	6	B06-12	8	9.3	4	SVOA	PYRENE	88	270
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	ANTHRACENE	75	260
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	BENZO(A)ANTHRACENE	93	1400
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	BENZO(A)PYRENE	130	5600
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	BENZO(B)FLUORANTHENE	93	5000
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	BENZO(G,H,I)PERYLENE	150	5100
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	BENZO(K)FLUORANTHENE	93	1800
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	CHRYSENE	93	2000
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	FLUORANTHENE	75	3500
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	150	4400
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	NAPHTHALENE	75	280
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	PHENANTHRENE	75	840
CENTRAL/WESTERN	6	B06-13	8	9.5	4	SVOA	PYRENE	75	13000
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	ACENAPHTHENE	1800	120
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	ACENAPHTHYLENE	1800	170
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	ANTHRACENE	1800	770
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	BENZO(A)ANTHRACENE	430	39
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	BENZO(A)ANTHRACENE	1800	1700
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	BENZO(A)PYRENE	430	46
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	BENZO(A)PYRENE	1800	2300
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	BENZO(B)FLUORANTHENE	1800	2800
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	BENZO(G,H,I)PERYLENE	1800	1900
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	BENZO(K)FLUORANTHENE	430	65
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	CHRYSENE	430	43
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	CHRYSENE	1800	1300
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	FLUORANTHENE	430	89

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	FLUORANTHENE	1800	4500
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	FLUORENE	1800	150
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	INDENO(1,2,3-CD)PYRENE	1800	1600
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	NAPHTHALENE	1800	140
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	PHENANTHRENE	430	26
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	PHENANTHRENE	1800	2800
CENTRAL/WESTERN	6	B06-20	13.5	14.5	5	SVOA	PYRENE	430	170
CENTRAL/WESTERN	6	B06-20	10	11	5	SVOA	PYRENE	1800	8900
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	ACENAPHTHENE	650	57
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	ACENAPHTHYLENE	650	35
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	ANTHRACENE	650	160
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	BENZO(A)ANTHRACENE	650	710
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	BENZO(A)PYRENE	650	2200
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	BENZO(B)FLUORANTHENE	650	3000
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	BENZO(G,H,I)PERYLENE	650	2400
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	CHRYSENE	650	830
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	DIBENZO(A,H)ANTHRACENE	650	260
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	DIETHYLPHTHALATE	650	36
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	FLUORANTHENE	650	2000
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	INDENO(1,2,3-CD)PYRENE	650	1800
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	NAPHTHALENE	650	120
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	PHENANTHRENE	650	440
CENTRAL/WESTERN	6	B06-22	9.5	10.5	5	SVOA	PYRENE	650	9400
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	ANTHRACENE	560	47
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	BENZO(A)PYRENE	560	710
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	BENZO(B)FLUORANTHENE	560	920
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	BENZO(G,H,I)PERYLENE	560	800
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	CHRYSENE	560	260
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	FLUORANTHENE	560	590
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	INDENO(1,2,3-CD)PYRENE	560	560
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	PHENANTHRENE	560	120
CENTRAL/WESTERN	6	B06-23	13.5	14.5	6	SVOA	PYRENE	450	38

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	6	B06-23	9.5	10.5	6	SVOA	PYRENE	560	2800
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	2-METHYLNAPHTHALENE	60	130
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	ACENAPHTHENE	48	610
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	ACENAPHTHYLENE	48	220
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	ANTHRACENE	48	560
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	BENZO(A)ANTHRACENE	60	1000
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	BENZO(A)PYRENE	84	1500
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	BENZO(B)FLUORANTHENE	60	1400
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	BENZO(K)FLUORANTHENE	60	410
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	60	8600
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	CHRYSENE	60	1200
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	FLUORANTHENE	48	3400
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	FLUORENE	48	130
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	NAPHTHALENE	48	2000
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	PHENANTHRENE	48	2500
CENTRAL/WESTERN	8	B08-06	14	15.3	7	SVOA	PYRENE	48	2900
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	ANTHRACENE	48	170
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	BENZO(A)ANTHRACENE	60	440
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	BENZO(A)PYRENE	84	720
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	BENZO(B)FLUORANTHENE	60	430
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	BENZO(G,H,I)PERYLENE	96	530
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	BENZO(K)FLUORANTHENE	60	420
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	CHRYSENE	60	530
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	FLUORANTHENE	48	1200
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	INDENO(1,2,3-CD)PYRENE	96	350
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	PHENANTHRENE	48	700
CENTRAL/WESTERN	8	B08-07	12.5	14	7	SVOA	PYRENE	48	1800
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	ACENAPHTHENE	60	3100
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	ACENAPHTHENE	64	42000
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	ACENAPHTHYLENE	64	11000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	ANTHRACENE	60	2300
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	ANTHRACENE	64	47000

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	BENZO(A)ANTHRACENE	75	4100
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	BENZO(A)ANTHRACENE	80	65000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	BENZO(A)PYRENE	100	6100
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	BENZO(A)PYRENE	110	130000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	BENZO(B)FLUORANTHENE	75	6200
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	BENZO(B)FLUORANTHENE	80	130000
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	BENZO(G,H,I)PERYLENE	130	140000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	BENZO(K)FLUORANTHENE	75	2200
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	BENZO(K)FLUORANTHENE	80	27000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	CHRYSENE	75	4500
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	CHRYSENE	80	66000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	FLUORANTHENE	60	15000
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	FLUORANTHENE	64	160000
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	FLUORENE	64	2900
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	130	76000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	NAPHTHALENE	60	1200
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	NAPHTHALENE	64	9000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	PHENANTHRENE	60	10000
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	PHENANTHRENE	64	150000
CENTRAL/WESTERN	8	B08-08	11	12.5	7	SVOA	PYRENE	60	16000
CENTRAL/WESTERN	8	B08-08	14	15.5	7	SVOA	PYRENE	64	150000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	ACENAPHTHENE	48	8800
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	ACENAPHTHENE	56	33000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	ACENAPHTHYLENE	48	730
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	ACENAPHTHYLENE	56	2800
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	ANTHRACENE	48	6800
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	ANTHRACENE	56	20000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(A)ANTHRACENE	60	7000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(A)ANTHRACENE	70	21000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(A)PYRENE	84	11000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(A)PYRENE	98	39000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(B)FLUORANTHENE	60	11000

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(B)FLUORANTHENE	70	43000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(G,H,I)PERYLENE	110	48000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(K)FLUORANTHENE	60	3600
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	BENZO(K)FLUORANTHENE	70	14000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	CHRYSENE	60	8000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	CHRYSENE	70	24000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	FLUORANTHENE	48	27000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	FLUORANTHENE	56	74000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	FLUORENE	48	980
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	FLUORENE	56	3200
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	INDENO(1,2,3-CD)PYRENE	110	32000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	NAPHTHALENE	48	1100
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	NAPHTHALENE	56	3800
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	PHENANTHRENE	48	31000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	PHENANTHRENE	56	77000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	PYRENE	48	21000
CENTRAL/WESTERN	8	B08-09	14	15.3	7	SVOA	PYRENE	56	58000
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	2-METHYLNAPHTHALENE	60	330
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	ACENAPHTHENE	48	1600
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	ACENAPHTHYLENE	48	680
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	ANTHRACENE	48	1300
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	BENZO(A)ANTHRACENE	60	1800
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	BENZO(A)PYRENE	84	2300
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	60	2000
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	BENZO(G,H,I)PERYLENE	97	2100
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	BENZO(K)FLUORANTHENE	60	610
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	CHRYSENE	60	2100
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	DIBENZO(A,H)ANTHRACENE	97	240
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	FLUORANTHENE	48	4800
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	FLUORENE	48	470
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	INDENO(1,2,3-CD)PYRENE	97	1800
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	NAPHTHALENE	48	4300

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	PHENANTHRENE	48	6400
CENTRAL/WESTERN	8	B08-10	14	15.5	8	SVOA	PYRENE	48	6400
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	ACENAPHTHENE	50	21000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	ACENAPHTHYLENE	50	7400
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	ANTHRACENE	50	37000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	BENZO(A)ANTHRACENE	62	51000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	BENZO(A)PYRENE	87	68000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	BENZO(B)FLUORANTHENE	62	40000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	BENZO(G,H,I)PERYLENE	100	51000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	BENZO(K)FLUORANTHENE	62	39000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	CHRYSENE	62	56000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	FLUORANTHENE	50	130000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	FLUORENE	50	12000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	100	40000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	NAPHTHALENE	50	13000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	PHENANTHRENE	50	170000
CENTRAL/WESTERN	8	B08-11	14	15.5	7	SVOA	PYRENE	50	170000
CENTRAL/WESTERN	8	B08-12	14	15.5	7	SVOA	FLUORANTHENE	48	150
CENTRAL/WESTERN	8	B08-12	14	15.5	7	SVOA	PYRENE	48	250
CENTRAL/WESTERN	10	B10-04	14	15.5	11	SVOA	BENZO(A)PYRENE	99	220
CENTRAL/WESTERN	10	B10-04	14	15.5	11	SVOA	PYRENE	57	540
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	ACENAPHTHYLENE	49	130
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	ANTHRACENE	49	170
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	BENZO(A)ANTHRACENE	61	1900
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	BENZO(A)PYRENE	85	2700
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	61	2200
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	BENZO(G,H,I)PERYLENE	97	3400
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	BENZO(K)FLUORANTHENE	61	630
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	CHRYSENE	61	1800
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	DIBENZO(A,H)ANTHRACENE	97	320
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	FLUORANTHENE	49	3000
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	INDENO(1,2,3-CD)PYRENE	97	2500

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	NAPHTHALENE	49	120
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	PHENANTHRENE	49	500
CENTRAL/WESTERN	12	B12-05	14	15.5	8	SVOA	PYRENE	49	7600
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	BENZO(A)ANTHRACENE	61	4400
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	BENZO(A)PYRENE	86	6600
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	61	3600
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	BENZO(G,H,I)PERYLENE	98	4100
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	BENZO(K)FLUORANTHENE	61	4300
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	61	1100
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	CHRYSENE	61	5500
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	FLUORANTHENE	49	11000
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	INDENO(1,2,3-CD)PYRENE	98	3300
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	PHENANTHRENE	49	920
CENTRAL/WESTERN	12	B12-06	14	15.5	8	SVOA	PYRENE	49	19000
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	BENZO(A)ANTHRACENE	60	650
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	BENZO(A)PYRENE	85	1100
CENTRAL/WESTERN	12	B12-07	9.5	11	8	SVOA	BENZO(B)FLUORANTHENE	66	220
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	60	1100
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	BENZO(K)FLUORANTHENE	60	340
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	CHRYSENE	60	570
CENTRAL/WESTERN	12	B12-07	9.5	11	8	SVOA	FLUORANTHENE	53	410
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	FLUORANTHENE	48	1000
CENTRAL/WESTERN	12	B12-07	9.5	11	8	SVOA	PHENANTHRENE	53	260
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	PHENANTHRENE	48	370
CENTRAL/WESTERN	12	B12-07	9.5	11	8	SVOA	PYRENE	53	680
CENTRAL/WESTERN	12	B12-07	14	15.5	8	SVOA	PYRENE	48	2100
CENTRAL/WESTERN	12	B12-07	14	15.5	8	TPH	TRPH	34100	83200
CENTRAL/WESTERN	12	B12-07	9.5	11	8	TPH	TRPH	37200	90800
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	BENZO(A)ANTHRACENE	61	150
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	BENZO(A)PYRENE	86	310
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	61	260
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	BENZO(G,H,I)PERYLENE	98	300

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	CHRYSENE	61	160
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	FLUORANTHENE	49	280
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	INDENO(1,2,3-CD)PYRENE	98	220
CENTRAL/WESTERN	12	B12-08	14	15.5	8	SVOA	PYRENE	49	580
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	BENZO(A)ANTHRACENE	64	370
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	BENZO(A)PYRENE	89	800
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	64	770
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	BENZO(K)FLUORANTHENE	64	280
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	CHRYSENE	64	360
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	FLUORANTHENE	51	730
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	PHENANTHRENE	51	220
CENTRAL/WESTERN	12	B12-09	14	15.5	8	SVOA	PYRENE	51	1300
CENTRAL/WESTERN	1	DA-1	25	25.5	19	SVOA	BENZO(A)PYRENE	2400	5800
CENTRAL/WESTERN	1	DA-1	25	25.5	19	SVOA	BENZO(B)FLUORANTHENE	2400	4000
CENTRAL/WESTERN	1	DA-1	25	25.5	19	SVOA	INDENO(1,2,3-CD)PYRENE	2400	2700
CENTRAL/WESTERN	1	DA-1	25	25.5	19	SVOA	PYRENE	2400	8300
CENTRAL/WESTERN	2	M019-E	33.5	35	31	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	60	750
CENTRAL/WESTERN	1	M025-E	32	33	27	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	61	1100
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	ACENAPHTHENE	100	300
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	ANTHRACENE	100	280
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	BENZO(A)ANTHRACENE	140	1600
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	BENZO(A)PYRENE	200	5200
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	BENZO(B)FLUORANTHENE	140	4300
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	BENZO(G,H,I)PERYLENE	230	5800
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	BENZO(K)FLUORANTHENE	140	880
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	CHRYSENE	140	2000
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	DIBENZO(A,H)ANTHRACENE	230	320
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	INDENO(1,2,3-CD)PYRENE	230	5300
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	NAPHTHALENE	100	220
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	PHENANTHRENE	100	1500
CENTRAL/WESTERN	5	M05-01	14	15.5	10	SVOA	PYRENE	100	9800
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	ACENAPHTHENE	110	130

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	ACENAPHTHYLENE	110	110
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	ANTHRACENE	110	230
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	BENZO(A)ANTHRACENE	150	2100
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	BENZO(A)PYRENE	210	9100
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	BENZO(B)FLUORANTHENE	150	7700
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	BENZO(G,H,I)PERYLENE	240	9100
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	BENZO(K)FLUORANTHENE	150	1700
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	CHRYSENE	150	2800
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	FLUORANTHENE	110	6100
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	INDENO(1,2,3-CD)PYRENE	240	9100
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	NAPHTHALENE	110	410
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	PHENANTHRENE	110	1300
CENTRAL/WESTERN	5	M05-02	14.5	15.3	11	SVOA	PYRENE	1100	19000
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	BENZO(A)ANTHRACENE	74	810
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	BENZO(A)PYRENE	100	2500
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	BENZO(B)FLUORANTHENE	74	2100
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	BENZO(G,H,I)PERYLENE	120	4200
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	BENZO(K)FLUORANTHENE	74	590
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	BIS(2-CHLOROETHYL)ETHER	59	400
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	CHRYSENE	74	790
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	FLUORANTHENE	59	1800
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	INDENO(1,2,3-CD)PYRENE	120	2700
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	NAPHTHALENE	59	130
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	PHENANTHRENE	59	430
CENTRAL/WESTERN	5	M05-03	14	15.5	11	SVOA	PYRENE	59	7100
CENTRAL/WESTERN	5	M05-04	14	15.5	9	SVOA	BENZO(A)PYRENE	87	210
CENTRAL/WESTERN	5	M05-04	14	15.5	9	SVOA	FLUORANTHENE	50	240
CENTRAL/WESTERN	5	M05-04	14	15.5	9	SVOA	PHENANTHRENE	50	100
CENTRAL/WESTERN	5	M05-04	14	15.5	9	SVOA	PYRENE	59	120
CENTRAL/WESTERN	5	M05-04	14	15.5	9	SVOA	PYRENE	50	750
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	ACENAPHTHYLENE	52	110
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	ANTHRACENE	52	290

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	BENZO(A)ANTHRACENE	65	1400
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	BENZO(A)PYRENE	90	2800
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	BENZO(B)FLUORANTHENE	65	2400
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	BENZO(G,H,I)PERYLENE	100	4200
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	BENZO(K)FLUORANTHENE	65	620
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	CHRYSENE	65	1200
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	DIBENZO(A,H)ANTHRACENE	100	380
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	FLUORANTHENE	52	3300
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	INDENO(1,2,3-CD)PYRENE	100	2800
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	NAPHTHALENE	52	110
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	PHENANTHRENE	52	840
CENTRAL/WESTERN	5	M05-05	14	15.3	11	SVOA	PYRENE	52	7400
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	BENZO(A)PYRENE	460	60
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	BENZO(B)FLUORANTHENE	460	200
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	BENZO(G,H,I)PERYLENE	460	170
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	BENZO(K)FLUORANTHENE	460	110
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	FLUORANTHENE	460	200
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	INDENO(1,2,3-CD)PYRENE	460	170
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	PHENANTHRENE	460	50
CENTRAL/WESTERN	5	M05-12	9	10	8	SVOA	PYRENE	460	250
CENTRAL/WESTERN	6	M06-01	8	9.5	6	SVOA	BENZO(A)ANTHRACENE	120	130
CENTRAL/WESTERN	6	M06-01	8	9.5	6	SVOA	BENZO(A)PYRENE	170	200
CENTRAL/WESTERN	6	M06-01	8	9.5	6	SVOA	CHRYSENE	120	150
CENTRAL/WESTERN	6	M06-01	8	9.5	6	SVOA	FLUORANTHENE	87	320
CENTRAL/WESTERN	6	M06-01	8	9.5	6	SVOA	PHENANTHRENE	87	150
CENTRAL/WESTERN	6	M06-01	8	9.5	6	SVOA	PYRENE	87	440
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	BENZO(A)ANTHRACENE	120	290
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	BENZO(A)PYRENE	170	830
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	BENZO(B)FLUORANTHENE	120	800
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	BENZO(G,H,I)PERYLENE	200	890
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	BENZO(K)FLUORANTHENE	120	170
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	CHRYSENE	120	340

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DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	FLUORANTHENE	87	730
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	200	420
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	PHENANTHRENE	87	170
CENTRAL/WESTERN	6	M06-04	14	15.5	4	SVOA	PYRENE	87	2200
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	ACENAPHTHENE	600	54
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	ACENAPHTHYLENE	600	52
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	ANTHRACENE	600	140
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	BENZO(A)ANTHRACENE	600	900
CENTRAL/WESTERN	6	M06-06	13.5	14.5	5	SVOA	BENZO(A)PYRENE	420	64
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	BENZO(A)PYRENE	600	1400
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	BENZO(B)FLUORANTHENE	600	2500
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	BENZO(G,H,I)PERYLENE	600	320
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	CHRYSENE	600	980
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	DIBENZO(A,H)ANTHRACENE	600	250
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	FLUORANTHENE	600	2800
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	FLUORENE	600	35
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	INDENO(1,2,3-CD)PYRENE	600	1500
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	NAPHTHALENE	600	91
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	PHENANTHRENE	600	560
CENTRAL/WESTERN	6	M06-06	13.5	14.5	5	SVOA	PYRENE	420	180
CENTRAL/WESTERN	6	M06-06	10	11	5	SVOA	PYRENE	600	7100
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	ACENAPHTHENE	860	4600
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	ANTHRACENE	860	1200
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	BENZO(A)ANTHRACENE	1200	3000
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	BENZO(B)FLUORANTHENE	1200	3800
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	CHRYSENE	1200	3000
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	FLUORANTHENE	860	7200
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	FLUORENE	860	1200
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	NAPHTHALENE	860	18000
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	PHENANTHRENE	860	15000
CENTRAL/WESTERN	8	M08-01	14	15.3	8	SVOA	PYRENE	860	15000
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	2-METHYLNAPHTHALENE	66	220

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DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
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REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	ACENAPHTHENE	53	1000
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	ANTHRACENE	53	110
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	FLUORANTHENE	53	390
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	FLUORENE	53	180
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	NAPHTHALENE	53	3900
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	PHENANTHRENE	53	850
CENTRAL/WESTERN	8	M08-02	14	15.5	7	SVOA	PYRENE	53	1200
CENTRAL/WESTERN	8	M08-03	14	15.5	7	SVOA	FLUORANTHENE	920	3000
CENTRAL/WESTERN	8	M08-03	14	15.5	7	SVOA	NAPHTHALENE	920	1800
CENTRAL/WESTERN	8	M08-03	14	15.5	7	SVOA	PHENANTHRENE	920	1000
CENTRAL/WESTERN	8	M08-03	14	15.5	7	SVOA	PYRENE	920	5300
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	ACENAPHTHENE	1200	2000
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	BENZO(A)ANTHRACENE	1700	6100
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	BENZO(B)FLUORANTHENE	1700	10000
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	CHRYSENE	1700	4800
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	FLUORANTHENE	1200	12000
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	NAPHTHALENE	1200	1800
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	PHENANTHRENE	1200	7700
CENTRAL/WESTERN	8	M08-04	14	15.5	6	SVOA	PYRENE	1200	38000
CENTRAL/WESTERN	8	M08-05	14	15.5	7	SVOA	ACENAPHTHENE	84	360
CENTRAL/WESTERN	8	M08-05	14	15.5	7	SVOA	FLUORANTHENE	84	640
CENTRAL/WESTERN	8	M08-05	14	15.5	7	SVOA	NAPHTHALENE	84	440
CENTRAL/WESTERN	8	M08-05	14	15.5	7	SVOA	PHENANTHRENE	84	660
CENTRAL/WESTERN	8	M08-05	14	15.5	7	SVOA	PYRENE	84	1200
CENTRAL/WESTERN	10	M10-01	14	15	11	SVOA	BENZO(A)PYRENE	88	230
CENTRAL/WESTERN	10	M10-01	14	15	11	SVOA	BENZO(G,H,I)PERYLENE	100	200
CENTRAL/WESTERN	10	M10-01	14	15	11	SVOA	BENZO(K)FLUORANTHENE	63	150
CENTRAL/WESTERN	10	M10-01	14	15	11	SVOA	CHRYSENE	63	130
CENTRAL/WESTERN	10	M10-01	14	15	11	SVOA	FLUORANTHENE	50	180
CENTRAL/WESTERN	10	M10-01	14	15	11	SVOA	PYRENE	50	360
CENTRAL/WESTERN	10	M10-02	14	15.3	10	SVOA	PYRENE	50	260
CENTRAL/WESTERN	10	M10-03	14	15.5	10	SVOA	FLUORANTHENE	49	230

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	10	M10-03	14	15.5	10	SVOA	PYRENE	49	440
CENTRAL/WESTERN	12	M12-01	14	15.5	8	SVOA	BENZO(A)PYRENE	87	180
CENTRAL/WESTERN	12	M12-01	14	15.5	8	SVOA	BENZO(B)FLUORANTHENE	62	130
CENTRAL/WESTERN	12	M12-01	14	15.5	8	SVOA	FLUORANTHENE	50	160
CENTRAL/WESTERN	12	M12-01	14	15.5	8	SVOA	PYRENE	50	250
CENTRAL/WESTERN	12	M12-01	14	15.5	8	SVOA	PYRENE	50	360
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	BENZO(A)ANTHRACENE	76	1100
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	BENZO(A)PYRENE	110	5100
CENTRAL/WESTERN	12	M12-02	14	15.5	7	SVOA	BENZO(B)FLUORANTHENE	64	150
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	BENZO(B)FLUORANTHENE	76	2600
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	BENZO(G,H,I)PERYLENE	120	5700
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	BENZO(K)FLUORANTHENE	76	2700
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	CHRYSENE	76	1400
CENTRAL/WESTERN	12	M12-02	14	15.5	7	SVOA	FLUORANTHENE	51	120
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	FLUORANTHENE	61	2200
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	INDENO(1,2,3-CD)PYRENE	120	3700
CENTRAL/WESTERN	12	M12-02	14	15.5	7	SVOA	PYRENE	51	150
CENTRAL/WESTERN	12	M12-02	9.5	11	7	SVOA	PYRENE	61	10000
CENTRAL/WESTERN	12	M12-02	9.5	11	7	TPH	TRPH	42900	44500
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	BENZO(A)ANTHRACENE	62	180
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(A)ANTHRACENE	89	1100
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(A)ANTHRACENE	87	1300
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	BENZO(A)PYRENE	87	620
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(A)PYRENE	120	5900
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(A)PYRENE	120	7900
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	BENZO(B)FLUORANTHENE	62	770
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(B)FLUORANTHENE	89	4100
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(B)FLUORANTHENE	87	6400
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	BENZO(K)FLUORANTHENE	62	130
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(K)FLUORANTHENE	89	2100
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	BENZO(K)FLUORANTHENE	87	2400
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	CHRYSENE	62	170

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	CHRYSENE	89	1200
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	CHRYSENE	87	1700
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	FLUORANTHENE	50	430
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	FLUORANTHENE	71	3000
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	FLUORANTHENE	70	3900
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	140	3700
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	NAPHTHALENE	70	320
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	PHENANTHRENE	50	170
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	PHENANTHRENE	71	460
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	PHENANTHRENE	70	610
CENTRAL/WESTERN	12	M12-03	14	15.5	7	SVOA	PYRENE	50	1800
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	PYRENE	71	15000
CENTRAL/WESTERN	12	M12-03	11	12.5	7	SVOA	PYRENE	70	22000
CENTRAL/WESTERN	12	M12-03	11	12.5	7	TPH	TRPH	50200	69500
CENTRAL/WESTERN	12	M12-03	11	12.5	7	TPH	TRPH	49200	156000
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	ACENAPHTHYLENE	50	170
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	ANTHRACENE	50	170
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	BENZO(A)ANTHRACENE	63	460
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	BENZO(A)ANTHRACENE	84	1200
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	BENZO(A)PYRENE	88	1100
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	BENZO(A)PYRENE	120	5400
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	BENZO(B)FLUORANTHENE	63	1200
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	BENZO(B)FLUORANTHENE	84	4600
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	BENZO(K)FLUORANTHENE	63	400
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	BENZO(K)FLUORANTHENE	84	1700
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	CHRYSENE	63	590
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	CHRYSENE	84	1700
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	FLUORANTHENE	50	1400
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	FLUORANTHENE	67	3300
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	NAPHTHALENE	67	440
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	PHENANTHRENE	67	660
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	PHENANTHRENE	50	940

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
CENTRAL/WESTERN	12	M12-04	12.5	14	7	SVOA	PYRENE	50	3200
CENTRAL/WESTERN	12	M12-04	9.5	11	7	SVOA	PYRENE	67	18000
CENTRAL/WESTERN	14	M14-02	8	9.5	7	TPH	TRPH	40000	45100
MARSH SURFACE	7	B07A-05	12.5	14	3	SVOA	4-METHYLPHENOL	140	230
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	ACENAPHTHYLENE	75	260
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	ANTHRACENE	75	380
MARSH SURFACE	7	B07A-05	2	3.5	3	SVOA	BENZO(A)ANTHRACENE	57	110
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	BENZO(A)ANTHRACENE	94	5700
MARSH SURFACE	7	B07A-05	2	3.5	3	SVOA	BENZO(A)PYRENE	80	170
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	BENZO(A)PYRENE	130	11000
MARSH SURFACE	7	B07A-05	2	3.5	3	SVOA	BENZO(B)FLUORANTHENE	57	240
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	BENZO(B)FLUORANTHENE	94	8400
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	BENZO(G,H,I)PERYLENE	150	11000
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	BENZO(K)FLUORANTHENE	94	5800
MARSH SURFACE	7	B07A-05	2	3.5	3	SVOA	CHRYSENE	57	200
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	CHRYSENE	94	8100
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	FLUORANTHENE	75	11000
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	INDENO(1,2,3-CD)PYRENE	150	8600
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	NAPHTHALENE	75	460
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	PHENANTHRENE	75	920
MARSH SURFACE	7	B07A-05	2	3.5	3	SVOA	PYRENE	46	290
MARSH SURFACE	7	B07A-05	6.5	8	3	SVOA	PYRENE	75	15000
MARSH SURFACE	7	B07A-05	2	3.5	3	TPH	TRPH	32700	182000
MARSH SURFACE	7	B07A-05	12.5	14	3	TPH	TRPH	56100	1490000
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	2-METHYLNAPHTHALENE	57	1700
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	BENZO(A)ANTHRACENE	57	160
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	BENZO(A)PYRENE	80	240
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	BENZO(B)FLUORANTHENE	57	360
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	BENZO(G,H,I)PERYLENE	92	400
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	CHRYSENE	57	240
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	FLUORANTHENE	46	250
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	INDENO(1,2,3-CD)PYRENE	92	370

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	NAPHTHALENE	46	3600
MARSH SURFACE	7	B07A-06	2	3.5	4	SVOA	PYRENE	46	300
MARSH SURFACE	7	B07A-06	9.5	11	4	TPH	TRPH	59500	181000
MARSH SURFACE	7	B07A-06	2	3.5	4	TPH	TRPH	32700	329000
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	2-METHYLNAPHTHALENE	77	530
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	BENZO(A)ANTHRACENE	77	320
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	BENZO(A)PYRENE	110	380
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	BENZO(B)FLUORANTHENE	77	740
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	BENZO(G,H,I)PERYLENE	120	890
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	BENZO(K)FLUORANTHENE	77	420
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	CHRYSENE	77	600
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	FLUORANTHENE	62	510
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	INDENO(1,2,3-CD)PYRENE	120	660
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	NAPHTHALENE	62	480
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	PHENANTHRENE	62	120
MARSH SURFACE	7	B07A-07	5	6.5	5	SVOA	PYRENE	62	880
MARSH SURFACE	7	B07A-07	5	6.5	5	TPH	TRPH	43900	133000
MARSH SURFACE	7	B07A-08	5.5	6	5	TPH	GASOLINE RANGE ORGANICS		4700000
MARSH SURFACE	7	B07A-08	5.5	6	5	TPH	MOTOR OIL RANGE ORGANICS		56000
MARSH SURFACE	7	B07A-09	10	10.5	4	TPH	GASOLINE RANGE ORGANICS		1800
MARSH SURFACE	7	B07A-09	5	5.5	4	TPH	GASOLINE RANGE ORGANICS		5100000
MARSH SURFACE	7	B07A-09	10	10.5	4	TPH	MOTOR OIL RANGE ORGANICS		15000
MARSH SURFACE	7	B07A-09	5	5.5	4	TPH	MOTOR OIL RANGE ORGANICS		48000
MARSH SURFACE	3	M03-04	10	11	6	TPH	MOTOR OIL RANGE ORGANICS	29000	380000
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	ACENAPHTHYLENE	490	35
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	ANTHRACENE	490	91
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	BENZO(A)ANTHRACENE	490	390
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	BENZO(A)PYRENE	490	460
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	BENZO(B)FLUORANTHENE	490	350
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	BENZO(G,H,I)PERYLENE	490	570
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	BENZO(K)FLUORANTHENE	490	390
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	CHRYSENE	490	470

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	FLUORANTHENE	490	700
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	INDENO(1,2,3-CD)PYRENE	490	400
MARSH SURFACE	4	M04-07	5	5.5	5	TPH	MOTOR OIL RANGE ORGANICS	15000	880000
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	N-NITROSODIPHENYLAMINE (1)	490	77
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	NAPHTHALENE	490	48
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	PHENANTHRENE	490	500
MARSH SURFACE	4	M04-07	5	5.5	5	SVOA	PYRENE	490	820
MARSH SURFACE	7	M07A-01	11.5	13	4	TPH	TRPH	54900	833000
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	ANTHRACENE	77	630
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	BENZO(A)ANTHRACENE	96	8000
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	BENZO(A)PYRENE	130	22000
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	BENZO(B)FLUORANTHENE	96	11000
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	BENZO(G,H,I)PERYLENE	150	10000
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	BENZO(K)FLUORANTHENE	96	9400
MARSH SURFACE	7	M07A-02	2	3.5	3	SVOA	CHRYSENE	69	260
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	CHRYSENE	96	3900
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	FLUORANTHENE	77	29000
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	INDENO(1,2,3-CD)PYRENE	150	8100
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	PHENANTHRENE	77	1800
MARSH SURFACE	7	M07A-02	2	3.5	3	SVOA	PYRENE	55	1100
MARSH SURFACE	7	M07A-02	6.5	8	3	SVOA	PYRENE	77	25000
MARSH SURFACE	7	M07A-02	2	3.5	3	TPH	TRPH	39500	145000
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	BENZO(A)ANTHRACENE	88	3400
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	BENZO(A)PYRENE	120	3100
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	BENZO(B)FLUORANTHENE	88	4700
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	BENZO(G,H,I)PERYLENE	140	5600
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	BENZO(K)FLUORANTHENE	88	1400
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	CHRYSENE	88	2700
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	FLUORANTHENE	70	5900
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	INDENO(1,2,3-CD)PYRENE	140	4500
MARSH SURFACE	7	M07A-03	4	5	5	SVOA	PYRENE	70	11000
MARSH SURFACE	7	M07A-03	4	5	5	TPH	TRPH	49900	872000

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
MARSH SURFACE	7	M07A-04	5	6.5	3	SVOA	FLUORANTHENE	48	85
MARSH SURFACE	7	M07A-04	5	6.5	3	SVOA	PYRENE	48	260
MARSH SURFACE	7	M07A-05	2.5	3	3	TPH	GASOLINE RANGE ORGANICS		4500
MARSH SURFACE	7	M07A-05	3	3.5	3	TPH	GASOLINE RANGE ORGANICS		7700
MARSH SURFACE	7	M07A-05	3	3.5	3	TPH	MOTOR OIL RANGE ORGANICS		31000
MARSH SURFACE	7	M07A-05	2.5	3	3	TPH	MOTOR OIL RANGE ORGANICS		62000
MARSH SURFACE	7	M07A-06	2.5	4	3	TPH	MOTOR OIL RANGE ORGANICS	30000	84000
MARSH SURFACE	7	M07A-08	2.5	3.5	2	TPH	MOTOR OIL RANGE ORGANICS	43000	67000
MARSH SURFACE	7	M07A-08	4.5	5.5	2	TPH	MOTOR OIL RANGE ORGANICS	41000	72000
MARSH SURFACE	7	M07A-09	2.5	3.5	3	TPH	MOTOR OIL RANGE ORGANICS	26000	37000
MARSH SURFACE	7	M07A-09	5	6	3	TPH	MOTOR OIL RANGE ORGANICS	43000	72000
MARSH SURFACE	3	MW97-1	7	7.5	7	TPH	TRPH	2500	129000
MARSH SURFACE	3	MW97-3	10.5	11	6	SVOA	BENZO(G,H,I)PERYLENE	1500	1600
MARSH SURFACE	3	MW97-3	10.5	11	6	SVOA	PYRENE	1500	3100
MARSH SURFACE	3	MW97-3	7	7.5	6	TPH	TRPH	2000	5200
MARSH SURFACE	3	MW97-3	10.5	11	6	TPH	TRPH	2000	31600
SOUTHEAST	13	B-IMF-01	8	8.5	8	TPH	TRPH	436000	19700000
SOUTHEAST	4	B04-24	5	5.5	5	SVOA	BENZO(A)ANTHRACENE	390	69
SOUTHEAST	4	B04-24	5	5.5	5	SVOA	BENZO(B)FLUORANTHENE	390	96
SOUTHEAST	4	B04-24	5	5.5	5	SVOA	CHRYSENE	390	100
SOUTHEAST	4	B04-24	5	5.5	5	SVOA	FLUORANTHENE	390	250
SOUTHEAST	4	B04-24	5	5.5	5	SVOA	PHENANTHRENE	390	120
SOUTHEAST	4	B04-24	5	5.5	5	SVOA	PYRENE	390	310
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(A)ANTHRACENE	81	310
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(A)ANTHRACENE	70	350
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(A)PYRENE	98	840
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(A)PYRENE	110	870
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(B)FLUORANTHENE	81	600
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(B)FLUORANTHENE	70	630
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(G,H,I)PERYLENE	110	680
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(G,H,I)PERYLENE	130	820
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(K)FLUORANTHENE	70	470

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	BENZO(K)FLUORANTHENE	81	540
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	CHRYSENE	70	390
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	CHRYSENE	81	410
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	FLUORANTHENE	64	660
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	FLUORANTHENE	56	760
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	110	480
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	130	560
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	PHENANTHRENE	64	190
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	PHENANTHRENE	56	230
SOUTHEAST	21	B07B-02	14	14.5	7	SVOA	PYRENE	48	110
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	PYRENE	56	1900
SOUTHEAST	21	B07B-02	11	12.5	7	SVOA	PYRENE	64	2000
SOUTHEAST	21	B07B-02	11	12.5	7	TPH	TRPH	45900	60700
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	ANTHRACENE	47	130
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	BENZO(A)ANTHRACENE	58	740
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	BENZO(A)PYRENE	82	1300
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	BENZO(B)FLUORANTHENE	58	980
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	BENZO(G,H,I)PERYLENE	94	970
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	BENZO(K)FLUORANTHENE	58	600
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	CHRYSENE	58	750
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	FLUORANTHENE	47	1400
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	INDENO(1,2,3-CD)PYRENE	94	710
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	NAPHTHALENE	47	88
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	PHENANTHRENE	47	500
SOUTHEAST	21	B07B-03	11	12.5	5	SVOA	PYRENE	47	3300
SOUTHEAST	21	B07B-04	5.5	6	5	SVOA	BENZO(A)ANTHRACENE	350	40
SOUTHEAST	21	B07B-04	5.5	6	5	SVOA	BENZO(B)FLUORANTHENE	350	34
SOUTHEAST	21	B07B-04	5.5	6	5	SVOA	CHRYSENE	350	72
SOUTHEAST	21	B07B-04	5.5	6	5	SVOA	FLUORANTHENE	350	64
SOUTHEAST	21	B07B-04	5.5	6	5	TPH	MOTOR OIL RANGE ORGANICS	21000	26000
SOUTHEAST	21	B07B-04	5.5	6	5	SVOA	PYRENE	350	73
SOUTHEAST	21	B07B-05	5	6	5	SVOA	BENZO(A)PYRENE	380	21

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	21	B07B-05	5	6	5	SVOA	BENZO(B)FLUORANTHENE	380	20
SOUTHEAST	21	B07B-05	5	6	5	SVOA	CHRYSENE	380	22
SOUTHEAST	21	B07B-05	5	6	5	TPH	GASOLINE RANGE ORGANICS	580	16000
SOUTHEAST	21	B07B-05	5	6	5	SVOA	PYRENE	380	27
SOUTHEAST	11	B11-05	14	15	7	TPH	TRPH	32700	36800
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	BENZO(A)ANTHRACENE	59	270
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	BENZO(A)PYRENE	83	470
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	BENZO(B)FLUORANTHENE	59	270
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	BENZO(G,H,I)PERYLENE	95	350
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	BENZO(K)FLUORANTHENE	59	310
SOUTHEAST	11	B11-06	8	9.5	7	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	67	770
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	CHRYSENE	59	280
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	FLUORANTHENE	47	570
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	INDENO(1,2,3-CD)PYRENE	95	250
SOUTHEAST	11	B11-06	8	9.5	7	SVOA	PYRENE	54	180
SOUTHEAST	11	B11-06	14	15.3	7	SVOA	PYRENE	47	1400
SOUTHEAST	13	B13-28	5.5	6	4	TPH	GASOLINE RANGE ORGANICS	300000	9310000
SOUTHEAST	13	B13-28	5.5	6	4	TPH	MOTOR OIL RANGE ORGANICS	120000	1550000
SOUTHEAST	13	B13-29	5	5.5	4	TPH	GASOLINE RANGE ORGANICS	310000	2750000
SOUTHEAST	13	B13-29	5	5.5	4	TPH	MOTOR OIL RANGE ORGANICS	130000	2170000
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	ACENAPHTHYLENE		110
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	ANTHRACENE		34
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	ANTHRACENE		89
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	BENZO(A)ANTHRACENE		680
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	BENZO(A)PYRENE		340
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	BENZO(A)PYRENE		1700
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	BENZO(B)FLUORANTHENE		420
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	BENZO(G,H,I)PERYLENE		400
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	BENZO(G,H,I)PERYLENE		1600
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	BENZO(K)FLUORANTHENE		2100
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	CHRYSENE		140
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	CHRYSENE		800

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	B13-39	8	8.5	8	SVOA	DI-N-BUTYLPHTHALATE		32
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	DI-N-BUTYLPHTHALATE		34
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	DIBENZO(A,H)ANTHRACENE		52
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	DIBENZO(A,H)ANTHRACENE		150
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	FLUORANTHENE		270
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	FLUORANTHENE		1500
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	INDENO(1,2,3-CD)PYRENE		280
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	INDENO(1,2,3-CD)PYRENE		1200
SOUTHEAST	13	B13-39	14	14.5	8	TPH	MOTOR OIL RANGE ORGANICS		36000
SOUTHEAST	13	B13-39	11.5	12	8	TPH	MOTOR OIL RANGE ORGANICS		64000
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	NAPHTHALENE		45
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	PHENANTHRENE		87
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	PHENANTHRENE		210
SOUTHEAST	13	B13-39	8	8.5	8	SVOA	PYRENE		20
SOUTHEAST	13	B13-39	11.5	12	8	SVOA	PYRENE		490
SOUTHEAST	13	B13-39	14	14.5	8	SVOA	PYRENE		3000
SOUTHEAST	13	B13-39	8	8.5	8	TPH	TRPH		4000
SOUTHEAST	13	B13-39	11.5	12	8	TPH	TRPH		58000
SOUTHEAST	13	B13-39	14	14.5	8	TPH	TRPH		69000
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	ACENAPHTHYLENE		25
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	ANTHRACENE		82
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	BENZO(A)ANTHRACENE		180
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	BENZO(A)PYRENE		360
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	BENZO(G,H,I)PERYLENE		240
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	BENZO(K)FLUORANTHENE		500
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	CHRYSENE		230
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	DIBENZO(A,H)ANTHRACENE		74
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	FLUORANTHENE		460
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	INDENO(1,2,3-CD)PYRENE		190
SOUTHEAST	13	B13-40	13	13.5	8	TPH	MOTOR OIL RANGE ORGANICS		65000
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	PHENANTHRENE		160
SOUTHEAST	13	B13-40	13	13.5	8	SVOA	PYRENE		800

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	B13-40	9.5	10	8	TPH	TRPH		3000
SOUTHEAST	13	B13-40	13	13.5	8	TPH	TRPH		200000
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	2,4-DIMETHYLPHENOL		12000
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	2-METHYLNAPHTHALENE		43
SOUTHEAST	13	B13-41	6.5	7	6	SVOA	2-METHYLNAPHTHALENE		780
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	2-METHYLNAPHTHALENE		13000
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	2-METHYLNAPHTHALENE		29000
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	2-METHYLNAPHTHALENE		160000
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	ACENAPHTHENE		37
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	ANTHRACENE		40
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	ANTHRACENE		550
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	ANTHRACENE		2600
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	ANTHRACENE		4800
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	BENZO(A)ANTHRACENE		82
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	BENZO(A)PYRENE		84
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	BENZO(B)FLUORANTHENE		100
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	BENZO(B)FLUORANTHENE		680
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	BENZO(B)FLUORANTHENE		5100
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	BENZO(G,H,I)PERYLENE		85
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	CARBAZOLE		5900
SOUTHEAST	13	B13-41	6.5	7	6	SVOA	CHRYSENE		84
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	CHRYSENE		96
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	CHRYSENE		20000
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	CHRYSENE		36000
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	DIBENZOFURAN		23
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	DIBENZOFURAN		1600
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	DIBENZOFURAN		6900
SOUTHEAST	13	B13-41	6.5	7	6	TPH	DIESEL RANGE ORGANICS		480000
SOUTHEAST	13	B13-41	8	8.5	6	TPH	DIESEL RANGE ORGANICS		2200000
SOUTHEAST	13	B13-41	9	9.5	6	TPH	DIESEL RANGE ORGANICS		12000000
SOUTHEAST	13	B13-41	7	7.5	6	TPH	DIESEL RANGE ORGANICS		35000000
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	FLUORANTHENE		400

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	FLUORANTHENE		780
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	FLUORANTHENE		2400
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	FLUORANTHENE		3900
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	FLUORENE		42
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	FLUORENE		4600
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	FLUORENE		15000
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	FLUORENE		46000
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	INDENO(1,2,3-CD)PYRENE		62
SOUTHEAST	13	B13-41	8.5	9	6	TPH	MOTOR OIL RANGE ORGANICS		250000
SOUTHEAST	13	B13-41	8	8.5	6	TPH	MOTOR OIL RANGE ORGANICS		1200000
SOUTHEAST	13	B13-41	9	9.5	6	TPH	MOTOR OIL RANGE ORGANICS		7800000
SOUTHEAST	13	B13-41	7	7.5	6	TPH	MOTOR OIL RANGE ORGANICS		23000000
SOUTHEAST	13	B13-41	6.5	7	6	SVOA	NAPHTHALENE		61
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	NAPHTHALENE		100
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	NAPHTHALENE		2400
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	NAPHTHALENE		3600
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	NAPHTHALENE		30000
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	PHENANTHRENE		110
SOUTHEAST	13	B13-41	6.5	7	6	SVOA	PHENANTHRENE		170
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	PHENANTHRENE		1300
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	PHENANTHRENE		70000
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	PHENANTHRENE		140000
SOUTHEAST	13	B13-41	6.5	7	6	SVOA	PYRENE		55
SOUTHEAST	13	B13-41	8.5	9	6	SVOA	PYRENE		480
SOUTHEAST	13	B13-41	8	8.5	6	SVOA	PYRENE		2200
SOUTHEAST	13	B13-41	9	9.5	6	SVOA	PYRENE		10000
SOUTHEAST	13	B13-41	7	7.5	6	SVOA	PYRENE		16000
SOUTHEAST	13	B13-41	11	11.5	6	TPH	TRPH		2000
SOUTHEAST	13	B13-41	8.5	9	6	TPH	TRPH		410000
SOUTHEAST	13	B13-41	6.5	7	6	TPH	TRPH		590000
SOUTHEAST	13	B13-41	8	8.5	6	TPH	TRPH		24000000
SOUTHEAST	13	B13-41	9	9.5	6	TPH	TRPH		38000000

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	B13-41	7	7.5	6	TPH	TRPH		170000000
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	2-METHYLNAPHTHALENE		6900
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	CHRYSENE		1000
SOUTHEAST	13	B13-42	12.5	13	11	TPH	DIESEL RANGE ORGANICS		1000000
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	FLUORENE		890
SOUTHEAST	13	B13-42	12.5	13	11	TPH	MOTOR OIL RANGE ORGANICS		220000
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	N-NITROSODIPHENYLAMINE (1)		4500
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	NAPHTHALENE		4400
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	PHENANTHRENE		2800
SOUTHEAST	13	B13-42	12.5	13	11	SVOA	PYRENE		1300
SOUTHEAST	13	B13-42	12.5	13	11	TPH	TRPH		9300000
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	ANTHRACENE		32
SOUTHEAST	13	B13-43	10	10.5	9	SVOA	ANTHRACENE		37
SOUTHEAST	13	B13-43	9.5	10	9	SVOA	ANTHRACENE		42
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	BENZO(B)FLUORANTHENE		20
SOUTHEAST	13	B13-43	10	10.5	9	SVOA	CHRYSENE		110
SOUTHEAST	13	B13-43	9.5	10	9	SVOA	CHRYSENE		150
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	CHRYSENE		170
SOUTHEAST	13	B13-43	10	10.5	9	TPH	DIESEL RANGE ORGANICS		130000
SOUTHEAST	13	B13-43	9.5	10	9	TPH	DIESEL RANGE ORGANICS		380000
SOUTHEAST	13	B13-43	12	12.5	9	TPH	DIESEL RANGE ORGANICS		450000
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	FLUORANTHENE		25
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	FLUORENE		180
SOUTHEAST	13	B13-43	10	10.5	9	SVOA	FLUORENE		190
SOUTHEAST	13	B13-43	9.5	10	9	SVOA	FLUORENE		210
SOUTHEAST	13	B13-43	10	10.5	9	TPH	MOTOR OIL RANGE ORGANICS		15000
SOUTHEAST	13	B13-43	12	12.5	9	TPH	MOTOR OIL RANGE ORGANICS		70000
SOUTHEAST	13	B13-43	9.5	10	9	TPH	MOTOR OIL RANGE ORGANICS		87000
SOUTHEAST	13	B13-43	10	10.5	9	SVOA	PHENANTHRENE		190
SOUTHEAST	13	B13-43	9.5	10	9	SVOA	PHENANTHRENE		210
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	PHENANTHRENE		280
SOUTHEAST	13	B13-43	10	10.5	9	SVOA	PYRENE		93

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	B13-43	9.5	10	9	SVOA	PYRENE		98
SOUTHEAST	13	B13-43	12	12.5	9	SVOA	PYRENE		100
SOUTHEAST	13	B13-43	9.5	10	9	TPH	TRPH		310000
SOUTHEAST	13	B13-43	10	10.5	9	TPH	TRPH		310000
SOUTHEAST	13	B13-43	12	12.5	9	TPH	TRPH		1100000
SOUTHEAST	9	B410-5	14	14.5	9	SVOA	BENZO(B)FLUORANTHENE	850	85
SOUTHEAST	9	B410-5	10.5	11	9	SVOA	N-NITROSODIPHENYLAMINE (1)	400	50
SOUTHEAST	9	B410-5	11	11.5	9	SVOA	N-NITROSODIPHENYLAMINE (1)		85
SOUTHEAST	9	B410-5	14	14.5	9	SVOA	N-NITROSODIPHENYLAMINE (1)	850	96
SOUTHEAST	9	B410-5	11	11.5	9	SVOA	PYRENE	570	85
SOUTHEAST	9	B410-5	14	14.5	9	SVOA	PYRENE	850	95
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	BENZO(A)ANTHRACENE	840	98
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	BENZO(A)ANTHRACENE	1100	180
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	BENZO(A)PYRENE	840	260
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	BENZO(A)PYRENE	1100	290
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	BENZO(B)FLUORANTHENE	840	360
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	BENZO(B)FLUORANTHENE	1100	400
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	BENZO(G,H,I)PERYLENE	840	330
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	BENZO(G,H,I)PERYLENE	1100	430
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	BENZO(K)FLUORANTHENE	840	120
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	CHRYSENE	840	110
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	CHRYSENE	1100	200
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	FLUORANTHENE	840	160
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	FLUORANTHENE	1100	320
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	INDENO(1,2,3-CD)PYRENE	840	290
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	N-NITROSODIPHENYLAMINE (1)	840	130
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	NAPHTHALENE	1100	110
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	PENTACHLOROPHENOL	5200	930
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	PHENANTHRENE	840	91
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	PHENANTHRENE	1100	140
SOUTHEAST	9	B410-6	11	11.5	9	SVOA	PYRENE	410	48
SOUTHEAST	9	B410-6	13	13.5	9	SVOA	PYRENE	840	250

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	9	B410-6	11.5	12	9	SVOA	PYRENE	1100	640
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	ACENAPHTHYLENE	410	130
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	ANTHRACENE	410	390
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	BENZO(A)ANTHRACENE	410	1000
SOUTHEAST	9	B410-7	11	11.5	9	SVOA	BENZO(A)PYRENE	470	310
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	BENZO(A)PYRENE	410	1300
SOUTHEAST	9	B410-7	11	11.5	9	SVOA	BENZO(B)FLUORANTHENE	470	400
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	BENZO(B)FLUORANTHENE	410	760
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	BENZO(G,H,I)PERYLENE	410	950
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	BENZO(K)FLUORANTHENE	410	1100
SOUTHEAST	9	B410-7	11	11.5	9	SVOA	CHRYSENE	470	100
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	CHRYSENE	410	1300
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	DIBENZO(A,H)ANTHRACENE	410	230
SOUTHEAST	9	B410-7	11	11.5	9	SVOA	FLUORANTHENE	470	100
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	FLUORANTHENE	410	2000
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	FLUORENE	410	100
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	INDENO(1,2,3-CD)PYRENE	410	930
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	PHENANTHRENE	410	1600
SOUTHEAST	9	B410-7	11	11.5	9	SVOA	PYRENE	470	940
SOUTHEAST	9	B410-7	14.5	15	9	SVOA	PYRENE	410	2500
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	ANTHRACENE	450	59
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	BENZO(A)ANTHRACENE	450	110
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	BENZO(A)PYRENE	450	270
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	BENZO(B)FLUORANTHENE	450	220
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	CHRYSENE	450	140
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	FLUORANTHENE	450	290
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	PHENANTHRENE	450	170
SOUTHEAST	9	B410-9	14.5	15	11	SVOA	PYRENE	450	420
SOUTHEAST	22	B547-8	11	11.5	11	SVOA	DI-N-BUTYLPHTHALATE	400	6300
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	ACENAPHTHENE	430	45
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	ANTHRACENE	430	250
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	BENZO(A)ANTHRACENE	430	690

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	BENZO(A)PYRENE	430	970
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	BENZO(B)FLUORANTHENE	430	820
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	BENZO(G,H,I)PERYLENE	430	650
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	BENZO(K)FLUORANTHENE	430	340
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	430	52
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	CHRYSENE	430	730
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	DI-N-BUTYLPHTHALATE	430	170
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	DIBENZO(A,H)ANTHRACENE	430	96
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	FLUORANTHENE	430	1300
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	430	560
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	PHENANTHRENE	430	570
SOUTHEAST	16	BC2-4	14	14.5	7	SVOA	PYRENE	430	2200
SOUTHEAST	19	BD13-11	13	13.5	7	SVOA	BENZO(B)FLUORANTHENE		83
SOUTHEAST	19	BD13-11	13	13.5	7	SVOA	FLUORANTHENE		120
SOUTHEAST	19	BD13-11	13	13.5	7	SVOA	N-NITROSODIPHENYLAMINE (1)		95
SOUTHEAST	19	BD13-11	13	13.5	7	SVOA	PYRENE		140
SOUTHEAST	19	BD13-11	9	9.5	7	TPH	TRPH	2000	102000
SOUTHEAST	19	BD13-12	10.5	11	6	TPH	TRPH	2000	4700
SOUTHEAST	19	BD13-12	8.5	9	6	TPH	TRPH	2200	94600
SOUTHEAST	19	BD13-13	11	11.5	6	SVOA	N-NITROSODIPHENYLAMINE (1)	380	49
SOUTHEAST	19	BD13-14	9.5	10	7	TPH	TRPH	2200	9600
SOUTHEAST	19	BD13-15	8.5	9	7	SVOA	N-NITROSODIPHENYLAMINE (1)	790	100
SOUTHEAST	19	BD13-15	10.5	11	7	TPH	TRPH	1900	73400
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	ANTHRACENE		98
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	ANTHRACENE	790	100
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	BENZO(A)ANTHRACENE	790	180
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	BENZO(A)ANTHRACENE		350
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	BENZO(A)PYRENE	790	140
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	BENZO(A)PYRENE		270
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	BENZO(B)FLUORANTHENE	790	270
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	BENZO(B)FLUORANTHENE		420
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	BENZO(K)FLUORANTHENE		170

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	CHRYSENE	790	270
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	CHRYSENE		440
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	FLUORANTHENE	790	520
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	FLUORANTHENE		1000
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	FLUORENE	790	130
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	PHENANTHRENE		280
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	PHENANTHRENE	790	580
SOUTHEAST	19	BD13-16	13.5	14	6	SVOA	PYRENE	790	380
SOUTHEAST	19	BD13-16	10.5	11	6	SVOA	PYRENE		930
SOUTHEAST	19	BD13-16	12	12.5	6	TPH	TRPH	1900	71600
SOUTHEAST	19	BD13-16	9	9.5	6	TPH	TRPH	13200	586000
SOUTHEAST	19	BD13-6	5.5	6	5	TPH	TRPH	2000	23900
SOUTHEAST	19	BD13-8	10.5	11	6	SVOA	BENZO(A)ANTHRACENE	410	72
SOUTHEAST	19	BD13-8	10.5	11	6	SVOA	CHRYSENE	410	150
SOUTHEAST	19	BD13-8	12.5	13	6	SVOA	NAPHTHALENE	390	45
SOUTHEAST	19	BD13-8	10.5	11	6	SVOA	PYRENE	410	100
SOUTHEAST	19	BD13-8	11	11.5	6	TPH	TRPH	1900	14600
SOUTHEAST	19	BD13-8	8	8.5	6	TPH	TRPH	2100	75200
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	ANTHRACENE		95
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	BENZO(A)ANTHRACENE		540
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	BENZO(A)PYRENE		600
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	BENZO(B)FLUORANTHENE		920
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	BENZO(G,H,I)PERYLENE		390
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	BIS(2-ETHYLHEXYL)PHTHALATE		250
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	CHRYSENE		640
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	DIETHYLPHTHALATE		8800
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	FLUORANTHENE		1000
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	INDENO(1,2,3-CD)PYRENE		400
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	PHENANTHRENE		330
SOUTHEAST	19	BD13-9	8.5	9	6	SVOA	PYRENE		1700
SOUTHEAST	19	BD13-9	8	8.5	6	TPH	TRPH	2000	8600
SOUTHEAST	13	BOR-10	11	11.5	8	TPH	TRPH	2900	17200

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	ACENAPHTHENE		410
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	ANTHRACENE		100
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	BENZO(A)ANTHRACENE		210
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	BENZO(A)PYRENE		400
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	BENZO(B)FLUORANTHENE		440
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	BENZO(G,H,I)PERYLENE		290
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	BENZO(K)FLUORANTHENE		150
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	CHRYSENE		220
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	FLUORANTHENE		380
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	FLUORENE		150
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	N-NITROSODIPHENYLAMINE (1)		83
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	NAPHTHALENE		140
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	PHENANTHRENE		290
SOUTHEAST	13	BOR-11	11	11.5	8	SVOA	PYRENE		690
SOUTHEAST	13	BOR-11	11	11.5	8	TPH	TRPH	3000	22400
SOUTHEAST	23	BOR-12	8.5	9	8	SVOA	BENZO(A)ANTHRACENE		50
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	BENZO(A)ANTHRACENE	1200	210
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	BENZO(A)PYRENE	1200	380
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	BENZO(B)FLUORANTHENE	1200	450
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	BENZO(G,H,I)PERYLENE	1200	320
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	BENZO(K)FLUORANTHENE	1200	170
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	CHRYSENE	1200	230
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	FLUORANTHENE	1200	350
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	INDENO(1,2,3-CD)PYRENE	1200	260
SOUTHEAST	23	BOR-12	8.5	9	8	SVOA	N-NITROSODIPHENYLAMINE (1)		70
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	N-NITROSODIPHENYLAMINE (1)	1200	220
SOUTHEAST	23	BOR-12	8.5	9	8	SVOA	NAPHTHALENE		72
SOUTHEAST	23	BOR-12	8.5	9	8	SVOA	PHENANTHRENE		42
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	PHENANTHRENE	1200	200
SOUTHEAST	23	BOR-12	8.5	9	8	SVOA	PYRENE		60
SOUTHEAST	23	BOR-12	11	11.5	8	SVOA	PYRENE	1200	880
SOUTHEAST	23	BOR-12	11	11.5	8	TPH	TRPH	3100	24200

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	BOR-15	11	11.5	11	SVOA	2-METHYLNAPHTHALENE	420	50
SOUTHEAST	13	BOR-15	14	14.5	11	SVOA	N-NITROSODIPHENYLAMINE (1)	390	52
SOUTHEAST	13	BOR-15	11	11.5	11	SVOA	NAPHTHALENE	420	58
SOUTHEAST	13	BOR-15	11	11.5	11	SVOA	PHENANTHRENE	420	53
SOUTHEAST	13	BOR-15	14	14.5	11	TPH	TRPH	1900	3600
SOUTHEAST	13	BOR-15	11	11.5	11	TPH	TRPH	9800	253000
SOUTHEAST	13	BOR-17	10.5	11	9	SVOA	2-METHYLNAPHTHALENE	380	3100
SOUTHEAST	13	BOR-17	10	10.5	9	SVOA	2-METHYLNAPHTHALENE	780	8300
SOUTHEAST	13	BOR-17	10.5	11	9	SVOA	FLUORENE	380	230
SOUTHEAST	13	BOR-17	10	10.5	9	SVOA	FLUORENE	780	310
SOUTHEAST	13	BOR-17	10.5	11	9	SVOA	NAPHTHALENE	380	800
SOUTHEAST	13	BOR-17	10	10.5	9	SVOA	NAPHTHALENE	780	4100
SOUTHEAST	13	BOR-17	10.5	11	9	SVOA	PHENANTHRENE	380	360
SOUTHEAST	13	BOR-17	10	10.5	9	SVOA	PHENANTHRENE	780	450
SOUTHEAST	13	BOR-17	10.5	11	9	TPH	TRPH	94800	1430000
SOUTHEAST	13	BOR-17	10	10.5	9	TPH	TRPH	194000	1970000
SOUTHEAST	13	BOR-19	11	11.5	7	SVOA	2-METHYLNAPHTHALENE		17000
SOUTHEAST	13	BOR-19	11	11.5	7	SVOA	FLUORENE		790
SOUTHEAST	13	BOR-19	7	7.5	7	SVOA	N-NITROSODIPHENYLAMINE (1)		59
SOUTHEAST	13	BOR-19	11	11.5	7	SVOA	N-NITROSODIPHENYLAMINE (1)		2700
SOUTHEAST	13	BOR-19	7	7.5	7	SVOA	NAPHTHALENE		42
SOUTHEAST	13	BOR-19	11	11.5	7	SVOA	NAPHTHALENE		5400
SOUTHEAST	13	BOR-19	11	11.5	7	SVOA	PHENANTHRENE		760
SOUTHEAST	13	BOR-19	11	11.5	7	TPH	TRPH	97100	3660000
SOUTHEAST	13	BOR-20	11.5	12	9	SVOA	BENZO(A)PYRENE	390	64
SOUTHEAST	13	BOR-20	11.5	12	9	SVOA	FLUORANTHENE	390	86
SOUTHEAST	13	BOR-20	11.5	12	9	SVOA	PYRENE	390	110
SOUTHEAST	13	BOR-21	7	7.5	7	SVOA	N-NITROSODIPHENYLAMINE (1)	400	69
SOUTHEAST	13	BOR-21	11.5	12	7	SVOA	N-NITROSODIPHENYLAMINE (1)	400	79
SOUTHEAST	13	BOR-21	11.5	12	7	SVOA	NAPHTHALENE	400	42
SOUTHEAST	13	BOR-21	7	7.5	7	SVOA	NAPHTHALENE	400	43
SOUTHEAST	13	BOR-21	7	7.5	7	TPH	TRPH	2000	8600

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	BOR-21	11.5	12	7	TPH	TRPH	2000	46800
SOUTHEAST	13	BOR-22	7.5	8	6	TPH	TRPH	2000	9000
SOUTHEAST	13	BOR-22	11	11.5	6	TPH	TRPH	2300	16100
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	BENZO(A)ANTHRACENE		230
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	BENZO(A)PYRENE		450
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	BENZO(B)FLUORANTHENE		330
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	BENZO(G,H,I)PERYLENE		460
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	BENZO(K)FLUORANTHENE		310
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	CHRYSENE		320
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	INDENO(1,2,3-CD)PYRENE		390
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	NAPHTHALENE		99
SOUTHEAST	13	BOR-23	11	11.5	4	SVOA	PYRENE		650
SOUTHEAST	13	BOR-23	11	11.5	4	TPH	TRPH	3000	24600
SOUTHEAST	13	BOR-24	7	7.5	4	SVOA	N-NITROSODIPHENYLAMINE (1)		48
SOUTHEAST	13	BOR-24	11	11.5	4	SVOA	N-NITROSODIPHENYLAMINE (1)	390	49
SOUTHEAST	13	BOR-24	11	11.5	4	SVOA	NAPHTHALENE	390	41
SOUTHEAST	13	BOR-24	7	7.5	4	SVOA	NAPHTHALENE		41
SOUTHEAST	13	BOR-25	11	11.5	7	TPH	TRPH	2000	2900
SOUTHEAST	13	BOR-26	13	13.5	7	SVOA	BENZO(A)ANTHRACENE		55
SOUTHEAST	13	BOR-26	13	13.5	7	SVOA	BENZO(G,H,I)PERYLENE		62
SOUTHEAST	13	BOR-26	13	13.5	7	SVOA	CHRYSENE		65
SOUTHEAST	13	BOR-26	13	13.5	7	SVOA	FLUORANTHENE		110
SOUTHEAST	13	BOR-26	13	13.5	7	SVOA	PYRENE		160
SOUTHEAST	13	BOR-26	13	13.5	7	TPH	TRPH	2000	13900
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	BENZO(A)ANTHRACENE		110
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	BENZO(A)PYRENE		320
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	BENZO(B)FLUORANTHENE		220
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	BENZO(G,H,I)PERYLENE		340
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	BENZO(K)FLUORANTHENE		240
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	CHRYSENE		150
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	INDENO(1,2,3-CD)PYRENE		340
SOUTHEAST	13	BOR-27	7	7.5	7	SVOA	NAPHTHALENE		49

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	NAPHTHALENE		75
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	PHENANTHRENE		70
SOUTHEAST	13	BOR-27	12.5	13	7	SVOA	PYRENE		430
SOUTHEAST	13	BOR-27	10	10.5	7	TPH	TRPH	2000	2100
SOUTHEAST	13	BOR-27	7	7.5	7	TPH	TRPH	2000	11400
SOUTHEAST	13	BOR-27	12.5	13	7	TPH	TRPH	2500	22200
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	ANTHRACENE		75
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	BENZO(A)ANTHRACENE		390
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	BENZO(A)PYRENE		190
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	BENZO(B)FLUORANTHENE	1100	1100
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	BENZO(G,H,I)PERYLENE	1400	1400
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	BENZO(K)FLUORANTHENE		410
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	CHRYSENE		480
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	FLUORANTHENE		800
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	INDENO(1,2,3-CD)PYRENE	690	690
SOUTHEAST	13	BOR-8	7	7.5	7	SVOA	N-NITROSODIPHENYLAMINE (1)		47
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	N-NITROSODIPHENYLAMINE (1)		61
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	PHENANTHRENE		260
SOUTHEAST	13	BOR-8	11	11.5	7	SVOA	PYRENE		1900
SOUTHEAST	13	BOR-8	11	11.5	7	TPH	TRPH	2400	57900
SOUTHEAST	13	BOR-9	14	14.5	7	SVOA	2-METHYLNAPHTHALENE	1700	13000
SOUTHEAST	13	BOR-9	14	14.5	7	SVOA	NAPHTHALENE	1700	5300
SOUTHEAST	13	BOR-9	14	14.5	7	SVOA	PHENANTHRENE	1700	1800
SOUTHEAST	13	BOR-9	14	14.5	7	TPH	TRPH	96800	2370000
SOUTHEAST	13	BOR-9	11	11.5	7	TPH	TRPH	96600	2500000
SOUTHEAST	21	M07B-01	8	9	8	SVOA	FLUORANTHENE	63	140
SOUTHEAST	21	M07B-01	8	9	8	SVOA	PYRENE	63	450
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	BENZO(A)ANTHRACENE	88	1200
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	BENZO(A)PYRENE	120	4500
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	BENZO(B)FLUORANTHENE	88	3600
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	BENZO(G,H,I)PERYLENE	140	12000
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	BENZO(K)FLUORANTHENE	88	630

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	CHRYSENE	88	1200
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	DIBENZO(A,H)ANTHRACENE	140	640
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	FLUORANTHENE	70	2000
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	INDENO(1,2,3-CD)PYRENE	140	8700
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	NAPHTHALENE	70	240
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	PHENANTHRENE	70	360
SOUTHEAST	11	M11-02	9.5	11	5	SVOA	PYRENE	70	14000
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	ANTHRACENE	52	100
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	BENZO(A)ANTHRACENE	65	830
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	BENZO(A)PYRENE	92	3600
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	BENZO(B)FLUORANTHENE	65	2800
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	BENZO(G,H,I)PERYLENE	100	4700
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	BENZO(K)FLUORANTHENE	65	620
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	CHRYSENE	65	900
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	DIBENZO(A,H)ANTHRACENE	100	230
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	FLUORANTHENE	52	1500
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	INDENO(1,2,3-CD)PYRENE	100	3500
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	NAPHTHALENE	52	180
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	PHENANTHRENE	52	240
SOUTHEAST	11	M11-04	9.5	11	7	SVOA	PYRENE	52	7700
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	BENZO(A)ANTHRACENE	1000	110
SOUTHEAST	9	MW410-1	14	14.5	9	SVOA	BENZO(A)ANTHRACENE	860	160
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	BENZO(A)PYRENE	1000	210
SOUTHEAST	9	MW410-1	14	14.5	9	SVOA	BENZO(A)PYRENE	860	310
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	BENZO(B)FLUORANTHENE	1000	230
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	CHRYSENE	1000	140
SOUTHEAST	9	MW410-1	14	14.5	9	SVOA	CHRYSENE	860	180
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	FLUORANTHENE	1000	180
SOUTHEAST	9	MW410-1	14	14.5	9	SVOA	FLUORANTHENE	860	290
SOUTHEAST	9	MW410-1	11	11.5	9	SVOA	N-NITROSODIPHENYLAMINE (1)	420	52
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	PHENANTHRENE	1000	130
SOUTHEAST	9	MW410-1	11.5	12	9	SVOA	PYRENE	1000	450

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	9	MW410-1	14	14.5	9	SVOA	PYRENE	860	650
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	BENZO(A)ANTHRACENE	420	73
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	BENZO(A)PYRENE	420	170
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	BENZO(B)FLUORANTHENE	420	150
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	BENZO(K)FLUORANTHENE	420	58
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	CHRYSENE	420	83
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	FLUORANTHENE	420	270
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	INDENO(1,2,3-CD)PYRENE	420	130
SOUTHEAST	9	MW410-2	12	12.5	11	SVOA	N-NITROSODIPHENYLAMINE (1)	410	60
SOUTHEAST	9	MW410-2	15	15.5	11	SVOA	PYRENE	420	430
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	BENZO(A)PYRENE	410	180
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	BENZO(B)FLUORANTHENE	410	81
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	BENZO(G,H,I)PERYLENE	410	190
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	BENZO(K)FLUORANTHENE	410	170
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	FLUORANTHENE	410	110
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	INDENO(1,2,3-CD)PYRENE	410	140
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	PHENANTHRENE	410	82
SOUTHEAST	9	MW410-3	14.5	15	11	SVOA	PYRENE	410	220
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	BENZO(A)ANTHRACENE	430	86
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	BENZO(A)PYRENE	430	240
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	BENZO(B)FLUORANTHENE	430	130
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	BENZO(G,H,I)PERYLENE	430	250
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	BENZO(K)FLUORANTHENE	430	210
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	CHRYSENE	430	120
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	FLUORANTHENE	430	200
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	INDENO(1,2,3-CD)PYRENE	430	200
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	PHENANTHRENE	430	120
SOUTHEAST	9	MW410-4	14.5	15	9	SVOA	PYRENE	430	320
SOUTHEAST	23	MW530-1	12	12.5	8	SVOA	2-METHYLNAPHTHALENE	16000	41000
SOUTHEAST	23	MW530-1	8.5	9	8	TPH	TRPH	192000	7460000
SOUTHEAST	23	MW530-1	11.5	12	8	TPH	TRPH	96500	7560000
SOUTHEAST	23	MW530-2	11.5	12	8	SVOA	PYRENE	780	970

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	23	MW530-2	14	14.5	8	TPH	TRPH	2100	10500
SOUTHEAST	23	MW530-3	11.5	12	9	TPH	TRPH	2000	8700
SOUTHEAST	22	MW547-5	8.5	9	8	TPH	TRPH	2000	6500
SOUTHEAST	19	MWD13-1	7	7.5	5	SVOA	N-NITROSODIPHENYLAMINE (1)	380	48
SOUTHEAST	19	MWD13-2	9	9.5	6	TPH	TRPH	268000	12800000
SOUTHEAST	19	MWD13-3	11.5	12	7	SVOA	FLUORANTHENE		170
SOUTHEAST	19	MWD13-3	11.5	12	7	SVOA	N-NITROSODIPHENYLAMINE (1)		140
SOUTHEAST	19	MWD13-3	11.5	12	7	SVOA	NAPHTHALENE		150
SOUTHEAST	19	MWD13-3	11.5	12	7	SVOA	PHENANTHRENE		100
SOUTHEAST	19	MWD13-3	11.5	12	7	SVOA	PYRENE		210
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	ANTHRACENE	410	61
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	BENZO(A)ANTHRACENE	410	230
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	BENZO(A)PYRENE	410	520
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	BENZO(B)FLUORANTHENE	410	330
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	BENZO(G,H,I)PERYLENE	410	350
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	BENZO(K)FLUORANTHENE	410	510
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	CHRYSENE	410	310
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	FLUORANTHENE	410	520
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	INDENO(1,2,3-CD)PYRENE	410	280
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	PHENANTHRENE	410	220
SOUTHEAST	13	MWOR-2	12	12.5	9	SVOA	PYRENE	410	810
SOUTHEAST	13	MWOR-2	12	12.5	9	TPH	TRPH	2000	6400
SOUTHEAST	13	MWOR-3	10	10.5	10	TPH	TRPH	1900	15800
SOUTHEAST	13	MWOR-4	6.5	7	2	SVOA	N-NITROSODIPHENYLAMINE (1)	400	46
SOUTHEAST	13	MWOR-4	10	10.5	2	SVOA	NAPHTHALENE	390	47
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	ANTHRACENE		85
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	BENZO(A)ANTHRACENE		310
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	BENZO(A)PYRENE		260
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	BENZO(B)FLUORANTHENE		380
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	BENZO(G,H,I)PERYLENE		210
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	BENZO(K)FLUORANTHENE		140
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	CHRYSENE		340

TABLE B-4.3
DATA QUERY FOR CHEMICALS AT THE TOP OF THE BAY SEDIMENT UNIT
ALAMEDA POINT

REGION	SITE	POINT NAME	TOP OF SAMPLE INTERVAL (FT BGS)	BOTTOM OF SAMPLE INTERVAL (FT BGS)	DEPTH OF FILL	ANALYTICAL GROUP	CHEMICAL NAME	REPORTING LIMIT (UG/KG)	CONCENTRATION (UG/KG)
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	FLUORANTHENE		630
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	INDENO(1,2,3-CD)PYRENE		210
SOUTHEAST	13	MWOR-5	10	10.5	6	SVOA	N-NITROSODIPHENYLAMINE (1)		50
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	N-NITROSODIPHENYLAMINE (1)		55
SOUTHEAST	13	MWOR-5	10	10.5	6	SVOA	NAPHTHALENE		45
SOUTHEAST	13	MWOR-5	12.5	13	6	SVOA	NAPHTHALENE		48
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	NAPHTHALENE		53
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	PHENANTHRENE		370
SOUTHEAST	13	MWOR-5	10	10.5	6	SVOA	PYRENE		56
SOUTHEAST	13	MWOR-5	7	7.5	6	SVOA	PYRENE		670
SOUTHEAST	13	MWOR-5	7	7.5	6	TPH	TRPH	2000	5500

Notes:
TRPH = Total recoverable petroleum hydrocarbon
UG/KG = Microgram per kilogram
FT = Feet
BGS = Below ground surface

APPENDIX C

HUMAN HEALTH RISK ASSESSMENT RESULTS

ALAMEDA POINT
OPERABLE UNIT 3 DRAFT FINAL REMEDIAL INVESTIGATION REPORT
APPENDIX C
HUMAN HEALTH RISK ASSESSMENT

CONTENTS

Section		Page
C.1	INTRODUCTION	1
C.2	PURPOSE	2
C.3	BACKGROUND	5
	C.3.1 Regulatory History	5
	C.3.2 Location of OU-3	6
	C.3.3 Regional Geology	8
	C.3.4 Meteorology	9
C.4	METHODS FOR IDENTIFICATION OF CHEMICALS OF CONCERN	12
C.5	EXPOSURE ASSESSMENT	21
	C.5.1 Exposure Setting and Potential Receptors	22
	C.5.2 Exposure Pathways and Exposure Routes	24
	C.5.3 Exposure Point Concentrations	25
	C.5.4 Quantification of Chemical Intake for Pathway Specific Exposures for Each Potential Receptor	26
	C.5.5 Lead Assessment	30
	C.5.6 Radiation Dose Assessment	30
C.6	TOXICITY ASSESSMENT	51
	C.6.1 Acetone	53
	C.6.2 Aluminum	54
	C.6.3 Antimony	54

CONTENTS (CONTINUED)

SECTION PAGE

C.6.4 Barium 55

C.6.5 Benzene 56

C.6.6 Beryllium 57

C.6.7 Cadmium 57

C.6.8 Carbazole 59

C.6.9 Chlorinated Ethane Derivatives: DDT, DDD, DDE 59

C.6.10 Chlorobenzene 60

C.6.11 Chloroform 60

C.6.12 Chromium 61

C.6.13 Copper 62

C.6.14 Cyclodienes: Aldrin, Chlordane, Dieldrin and Heptachlor 63

C.6.15 1,2-Dichlorobenzene 64

C.6.16 1,3-Dichlorobenzene 64

C.6.17 1,4-Dichlorobenzene 64

C.6.18 1,1-Dichloroethene 65

C.6.19 1,2-Dichloroethene 66

C.6.20 Lead 66

C.6.21 Manganese 68

C.6.22 Mercury 68

C.6.23 Nickel 69

C.6.24 Phthalates 70

C.6.25 Polychlorinated Biphenyls, Polychlorinated Dibenzodioxins, and Polychlorinated Dibenzofurans 71

C.6.26 Polycyclic Aromatic Hydrocarbons 73

C.6.27 Radium-226 and Radium-228 76

CONTENTS (CONTINUED)

SECTION PAGE

C.6.28 Silver 77

C.6.29 Toluene 78

C.6.30 Trichloroethene 78

C.6.31 Vanadium 79

C.6.32 Vinyl Chloride 80

C.6.33 Xylenes 81

C.6.34 Zinc 81

C.7 SITE SPECIFIC RISK ASSESSMENT RESULTS 88

C.7.1. Site 1 - Landfill Area 88

C.7.1.1 Site Description 88

C.7.1.2 Data Description and COC Selection Results 88

C.7.1.3 Exposure Assessment Results 90

C.7.1.4 Risk Characterization 90

C.7.1.5 Radionuclide Risk and Dose Assessment 93

C.7.1.6 Conclusions 94

C.8 UNCERTAINTY 155

C.9 REFERENCES 159

TABLES

Table		Page
C.4-1	ALAMEDA POINT BACKGROUND DATA FOR SITE 1 DATA SUMMARY	16
C.5.4-1	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM RECREATIONAL EXPOSURE: SOIL INGESTION	32
C.5.4-2	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM RECREATIONAL EXPOSURE: DERMAL CONTACT WITH SURFACE SOIL	33
C.5.4-3	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM RECREATIONAL EXPOSURE: INHALATION OF PARTICULATES	34
C.5.4-4	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM RECREATIONAL EXPOSURE: INHALATION OF VAPORS FROM SOIL IN AMBIENT AIR	35
C.5.4-5	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM OCCUPATIONAL EXPOSURE: SOIL INGESTION	36
C.5.4-6	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM OCCUPATIONAL EXPOSURE: DERMAL CONTACT WITH SURFACE SOIL	37
C.5.4-7	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM OCCUPATIONAL EXPOSURE: INHALATION OF PARTICULATES FROM SOIL	38
C.5.4-8	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM OCCUPATIONAL EXPOSURE: INHALATION OF VAPORS FROM SOIL IN AMBIENT AIR	39
C.5.4-9	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS AND INTAKE ALGORITHM OCCUPATIONAL EXPOSURE: INHALATION OF VAPORS FROM GROUNDWATER IN AMBIENT AIR DURING SPRAY IRRIGATION	40
C.5.4-10	ALAMEDA POINT OU3 HHRA RISK-BASED CORRECTIVE ACTION (RBCA) PARAMETERS USED TO CALCULATE VF_{WAMB}	41
C.5.4-11	ALAMEDA POINT OU3 HHRA CHEMICAL-SPECIFIC PARAMETERS USED TO CALCULATE VF_{WAMB}	42
C.5.4-12	ALAMEDA POINT OU3 HHRA COMPARISON OF CHEMICAL-SPECIFIC RISK-BASED SCREENING LEVELS TO MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS	43
C.5.4-13	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS FOR RADIONUCLIDE DOSE AND RISK ASSESSMENT RECREATIONAL EXPOSURE	45
C.5.4-14	ALAMEDA POINT OU3 HHRA EXPOSURE PARAMETERS FOR RADIONUCLIDE DOSE AND RISK ASSESSMENT OCCUPATIONAL EXPOSURE	46

TABLES (Continued)

Table		Page
C.5.4-15	ALAMEDA POINT OU3 HHRA HUMAN HEALTH RISK ASSESSMENT DERMAL ABSORPTION FACTORS	47
C.5.4-16	ALAMEDA POINT OU3 HHRA EXPOSURE ASSESSMENT VOLATILIZATION FACTORS	48
C.6-1	ALAMEDA POINT OU3 HHRA TOXICITY ASSESSMENT CARCINOGENIC SLOPE FACTORS	83
C.6-2	ALAMEDA OU3 HHRA TOXICITY ASSESSMENT NONCARCINOGENIC TOXICITY VALUES	85
C.7.1-1	SITE 1, DATA SUMMARY FOR SOIL IN THE 0-2 FOOT DEPTH INTERVAL	96
C.7.1-2	SITE 1, DATA SUMMARY FOR INORGANIC CHEMICALS IN THE 0-10 FOOT DEPTH INTERVAL	~~100~~ 99
C.7.1-3	SITE 1, COC SELECTION, "HOT SPOT" COMPARISON	100
C.7.1-4	COC SELECTION RESULTS FOR SITE 1, SOIL IN THE 0 TO 2 FOOT DEPTH INTERVAL	101
C.7.1-5	SITE 1, OCCUPATIONAL EXPOSURE TO SURFACE SOIL (EPA RME ASSUMPTIONS) NONRADIONUCLIDES	103
C.7.1-6	OCCUPATIONAL EXPOSURE TO IRRIGATION WATER (NAVY RME ASSUMPTIONS) NONRADIONUCLIDES	109
C.7.1.7	SITE 1, OCCUPATIONAL EXPOSURE TO SURFACE SOIL (EPA AVG ASSUMPTIONS) NONRADIONUCLIDES	110
C.7.1-8	OCCUPATIONAL EXPOSURE TO IRRIGATION WATER (NAVY AVG ASSUMPTIONS) NONRADIONUCLIDES)	116
C.7.1-9	SITE 1, OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS, NONRADIONUCLIDES)	117
C.7.1-10	OCCUPATIONAL EXPOSURE TO IRRIGATION WATER (DTSC RME ASSUMPTIONS) NONRADIONUCLIDES	121
C.7.1-11	SITE 1, OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS) NONRADIONUCLIDES	122
C.7.1-12	OCCUPATIONAL EXPOSURE TO IRRIGATION WATER (DTSC AVG ASSUMPTIONS) NONRADIONUCLIDES	126
C.7.1-13	SITE 1, RECREATIONAL EXPOSURE TO SURFACE SOIL (EPA RME ASSUMPTIONS) NONRADIONUCLIDES	127
C.7.1-14	SITE 1, RECREATIONAL EXPOSURE TO SURFACE SOIL (EPA AVG ASSUMPTIONS) NONRADIONUCLIDES	133
C.7.1-15	SITE 1, RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS) NONRADIONUCLIDES	139
C.7.1-16	SITE 1, RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS) NONRADIONUCLIDES	143

TABLES (Continued)

Table		Page
C.7.1-17	SITE 1, LEAD ASSESSMENT RESULTS	147
C.7.1-18	ALAMEDA POINT OU3 HHRA SITE 1 OCCUPATIONAL RME EXPOSURE TO SURFACE SOIL RADIONUCLIDE RISK ASSESSMENT	148
C.7.1-19	ALAMEDA POINT OU3 HHRA SITE 1 OCCUPATIONAL RME EXPOSURE TO SURFACE SOIL RADIONUCLIDE DOSE ASSESSMENT	149
C.7.1-20	ALAMEDA POINT OU3 HHRA SITE 1 RECREATIONAL RME EXPOSURE TO SURFACE SOIL RADIONUCLIDE RISK ASSESSMENT	150
C.7.1-21	ALAMEDA POINT OU3 HHRA SITE 1 RECREATIONAL RME EXPOSURE TO SURFACE SOIL RADIONUCLIDE DOSE ASSESSMENT	151
C.7.1-22	ALAMEDA POINT OU3 HHRA SITE 1 NONRADIONUCLIDE RISK AND HAZARD INDEX SUMMARY OCCUPATIONAL AND RECREATIONAL EXPOSURE SCENARIOS	152
C.7.1-23	ALAMEDA POINT OU3 HHRA SITE 1 RADIONUCLIDE RISK AND DOSE SUMMARY OCCUPATIONAL AND RECREATIONAL SCENARIOS	154

FIGURES

Figures		Page
C.3-1	LOCATION OF ALAMEDA POINT	10
C.3-2	INSTALLATION RESTORATION SITES WITH REUSE PLAN OVERLAY	11
C.4-1	SOIL SAMPLE LOCATIONS AT SITE 1 LESS THAN 10 FEET BELOW GROUND SURFACE	18
C.4-2	FLOWCHART FOR IDENTIFYING CHEMICALS OF CONCERN	19
C.4-3	FLOWCHART FOR COMPARING SITE DATA TO BACKGROUND	20
C.5-1	ALAMEDA POINT OU3, CONCEPTUAL MODEL, POTENTIALLY COMPLETE EXPOSURE PATHWAYS	~~48~~ 49
C.5-2	OFF-BASE WELL LOCATIONS	50

APPENDIX C
ALAMEDA POINT
OPERABLE UNIT 3
BASELINE HUMAN HEALTH RISK ASSESSMENT

C.1 INTRODUCTION

The human health risk assessment (HHRA) methodology of the remedial investigation for Operable Unit 3 (OU-3) of Alameda Point (formerly Naval Air Station [NAS] Alameda) and summary of results are presented in this appendix. The HHRA is conducted as part of the Remedial Investigation under the Comprehensive Long-Term Environmental Action Navy (CLEAN) program for the environmental restoration of Naval facilities. The organization of the HHRA and methodology used to evaluate human health risks are in accordance with the U.S. Environmental Protection Agency's (EPA) Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A (EPA 1989).

OU-3 consists of Installation Restoration (IR) Program Site 1. The purpose of the HHRA is described in Section C.2, and the background of Alameda Point is presented in Section C.3. Regulatory history, regional geology and meteorology are also briefly described in Section C.3. The methodology for identification of chemicals of concern is provided in Section C.4. The exposure assessment methodology is described in Section C.5; Section C.6 presents the toxicity assessment for all chemicals of concern. Risk assessment results are presented in Section C.7, and include a brief description of the historical use of Site 1, COC selection results, exposure assessment results, risk characterization, and conclusions. The uncertainty analysis is contained in Section C.8. References are provided in Section C.9.

C.2 PURPOSE

The purpose of the HHRA is to evaluate potential site-specific human health risks associated with exposure to chemicals detected in environmental media (such as soil and groundwater) at Alameda Point. Risk is quantified for each IR site based on sampling and analysis data that have been previously collected. Risk information presented in the RI report will be used throughout the remedial investigation and feasibility study (RI/FS) process to make risk management decisions. This text presents the framework under which all HHRAs were conducted for all operable units at Alameda Point. HHRA results are presented for OU-3.

The HHRAs conducted for Alameda Point estimate potential human health risks associated with possible exposure to site-related chemicals. The HHRAs were conducted using current chemical concentrations and site conditions for those future exposures. This baseline HHRA was conducted without regard to future remediation activities or any attempt to control or mitigate chemical releases; however, reductions in chemical concentrations due to past remediation activities have been included. Risk estimates presented in the HHRA will subsequently be used to determine whether human health risks are sufficiently high to warrant risk mitigation activities through corrective action or remediation.

As part of the RI/FS, the principal objective of the HHRA is to provide adequate information to support informed risk management decisions regarding the need for remedial action, and selection of the most appropriate remedial alternative when needed for Alameda Point. Human health risks were evaluated with regard to exposure to chemicals detected in all pertinent environmental media.

The risk assessments were carried out in accordance with methods detailed in Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Volume I, Part A (EPA 1989). In an effort to expedite the RI/FS process and streamline the review and comment process of the HHRA, California Department of Toxic Substance Control (DTSC), the Regional Water Quality Control Board (RWQCB), and EPA Region 9 regional policy positions were also incorporated into the risk assessments. Exposure assumptions used to estimate chemical intake were based on information presented in the following documents: Region 9 Preliminary Remediation Goals (PRGs) 1998 (EPA 1998a); Exposure Factors Handbook (EPA 1997a); Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (EPA 1991a); Risk Assessment Guidance for Superfund, Volume I, Part B (EPA 1991b); Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (EPA 1993a); Supplemental Guidance for Human

Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (DTSC 1992); Dermal Exposure Assessment: Principles and Applications (EPA 1992a); and Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA 1993b). Information on chemical toxicity is from the following sources: the Integrated Risk Information System (IRIS; EPA 1998b); Health Effects Assessment Summary Tables (HEAST; EPA 1995a); and California Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, Criteria for Carcinogens (Cal/EPA 1994).

EPA Headquarters (EPA HQ) has developed HHRA guidance that is health protective and is used nationwide. Additionally, DTSC has developed HHRA guidance specific to California. EPA Region 9 does not have any specific baseline human health risk assessment guidance. EPA Region 9 has used a dermal exposure assessment methodology that is different from that currently recommended in EPA HQ guidance in the EPA Region 9 PRGs (1998), but the PRGs are not baseline human health risk assessment guidance as stated in the text of the PRG document. The Navy will consider all published federal and regional EPA guidance. Comments from EPA Region 9 have consistently requested changes in methodology without providing written guidance to support the changes. The Navy has consistently responded that the HHRA must be based on established, written guidance for technical defensibility. To date, EPA Region 9 has not provided written guidance to support the requested changes, nor have they agreed to review the Navy HHRA for consistency with federal EPA guidance, which has resulted in presenting both Navy and DSTC HHRA values. It is noted that EPA Region 9 supports the DTSC methodology and values rather than provide a specific technical evaluation of EPA federal guidance as applied in the Navy values calculated using that guidance.

The Navy has followed EPA HQ written guidance for conducting risk assessments. The differences in methodology and reference values have led to two sets of results for the HHRA, labeled "Navy" and "DTSC." The results labeled "Navy" represent EPA federal guidance with incorporation of EPA Region 9 methodology for dermal assessment. EPA Region 9 does not have any written guidance to supplement EPA federal guidance, but requested that the Navy follow the dermal assessment methodology as presented in the EPA Region 9 PRGs. Although this was done, EPA Region 9 does not feel the Navy has adequately addressed their concerns. At the request of EPA Region 9, the risk values calculated using EPA headquarters guidance are therefore labeled "Navy." Risk values calculated using DTSC methodologies and assumptions have been labeled "DTSC" to indicate the source of the methodology.

Following the risk assessment paradigm presented in EPA (1989), the HHRAs are composed of the four following components:

- Data evaluation and identification of chemicals of concern (COCs)
- Exposure assessment
- Toxicity assessment
- Risk characterization

These components are detailed in Sections C.4 through C.7. The following subsections present regulatory history and general site information.

C.3 BACKGROUND

C.3.1 Regulatory History

The Navy initially evaluated potential contamination at Alameda Point under the Naval Assessment and Control of Installation Pollutants (NACIP) program. An Initial Assessment Study (IAS) was completed for 12 potentially contaminated sites at Alameda Point in 1983 by Ecology and Environment (1983). These 12 sites include the current IRP sites 1, 2, 3, 4, 13, 14, 15, 16, 17, and 20, and two sites not currently part of the IRP, namely the base-wide fuel lines and the piers at Seaplane Lagoon. A confirmation study (CS) was then conducted by Wahler Associates at sites identified for further study in the IAS (Wahler 1985); the sites included were 1, 2, 3, 4, 15, 16, and 17. The CS report recommended additional investigation at five of the sites: 1, 2, 3, 4, and 16.

In 1988, the Navy received a Remedial Action Order from the California Department of Health Services, now known as the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). The sites included in the RAO were 1, 2, 3, 4, 5, 6, 7, 9, 12, 16, 17, and 20. Subsequent Navy review of facility activities, the IAS, CS, and RAO led to the Navy including the following sites in the remedial investigation/feasibility study work plans:

Site 1	1943-1956 Disposal Site
Site 2	West Beach Landfill
Site 3	Area 97 (Aviation gasoline tanks)
Site 4	Building 360
Site 5	Building 5
Site 6	Building 41 (Aircraft Intermediate Maintenance Department)
Site 7	Building 459
Site 8	Building 114 (Pest Control Area and Separator Pit)
Site 9	Building 410 (Paint Stripping Area)
Site 10	Building 400
Site 11	Building 14 (Engine Test Cell)
Site 12	Building 10 (Power Plant)
Site 13	Former Oil Refinery
Site 14	Fire Training Area
Site 15	Buildings 301 and 389 Storage Area
Site 16	CANS C-2 Area
Site 17	Seaplane Lagoon
Site 18	Station Sewer System
Site 19	Yard D-13 (Hazardous Waste Solvents)
Site 20	Oakland Inner Harbor
Site 21	Building 162
Site 22	Building 547 (Service Station)
Site 23	Building 530 (Missile Rework Station)

OU-3 consists of Site 1. The other terrestrial sites are grouped into OU-2 (Sites 3, 4, 5, 9, 10, 11, 13, 14, 19, 21, 22, 23 and 25) and OU-1 (Sites 6, 7, 8, 15, and 16; also called the light industrial OU). OU-4 is comprised of Sites 2, 17, 18, and 20.

C.3.2 Location of OU-3

Alameda Point is located at the geographic center of the San Francisco Bay Area and occupies the western quarter of Alameda Island, as shown in Figure C.3-1. Alameda Island lies along the eastern side of San Francisco Bay, adjacent to the City of Oakland. The base, rectangular in shape, is approximately 2 miles long and 1 mile wide. Approximately 1,526 acres of Alameda Point are above water and 1,108 acres are below water in lagoon and harbor areas. In September 1993, Alameda Point (then, NAS Alameda) was designated for closure under the Base Realignment and Closure (BRAC) plan. Prior to and after the closure announcement, the Navy implemented environmental programs to identify and characterize areas posing a potential threat to human health or the environment. Official closure of the base was April 22, 1997. Most activities have ceased on base, and most buildings are, or have been, cleaned and readied for lease or transfer.

Until 1930, two large industrial sites occupied by a borax processing plant and an oil refinery were located on the island near what is now the eastern end of Alameda Point. The refinery was located in what is now considered Site 13. The borax plant was located on what is now the southeastern corner of Atlantic and Eighth Streets (Sanborn-Ferris 1897). The 1899 U.S. Geological Survey (USGS) San Francisco Quadrangle topographic map (1:62,500) shows the Southern Pacific Railroad (SPRR) narrow-gauge spur extending along the southern side of the present Oakland Inner Harbor.

The U.S. Army acquired the Alameda Point site from the City of Alameda in 1930 and began construction in 1931. In 1936, the U.S. Navy acquired title to the land from the Army and began building the air station in response to the military buildup in Europe that preceded World War II. The air station is largely constructed on regional fill material of unknown origin. The Navy constructed Alameda Point south of the SPRR narrow-gauge spur, which was used as the northern breakwater for the air station. After the U.S. entered World War II in 1941, more land was acquired on Alameda Island adjacent to the air station. After the war ended, Alameda Point returned to its original primary mission of providing facilities and support for fleet aviation activities.

Figure C.3-2 shows the location of the installation restoration (IR) sites at Alameda Point. Currently, the western portion of the air station is primarily developed with runways and support facilities. The western ends of the main runways are on top of the 1943-56 Disposal Area (Site 1). Sites 3, 4, 9, 11, 13, 16, 19, 21, 22, and 23 are located in the southeastern corner of the air station and contain offices,

residences, and industrial facilities. Sites 5, 6, 10, and 12 are located in the central portion of the base, bound by Avenue C to the north and Fifth Street to the east. The Seaplane Lagoon (Site 17) and the runway area are to the south and west of these sites, respectively. Sites 14 and 15 are located in the northwestern to north central portion of the base, adjacent to the Oakland Inner Harbor (Site 20). Site 7 is located on the eastern boundary of Alameda Point, near the intersection of Main Street and Avenue F.

The planned reuse of these areas, shown in the overlay to Figure C.3-2, was determined by the Alameda Reuse and Redevelopment Authority (ARRA 1996) in their Community Reuse Plan adopted January 31, 1996. The following definitions of allowable uses of the 8 reuse options were provided in the reuse plan:

- **Civic Core**: "a mixed-use area with a major emphasis on Research & Development/ Industrial "flex" uses. Light industry, office, civic, residential, educational, recreational, commercial, and other supporting uses are allowed within the district. Community-oriented institutions such as places of worship and nonprofit organizations are also considered allowable and desirable uses."
- **Main Street Neighborhood**: "a mixed-use area with a major emphasis on residential use. Residential, parks & recreation, school, and local serving office, civic, and retail uses are allowed within the district. Supporting uses should be focused in or around two mixed-use neighborhood centers or activity nodes at the center of each residential area along Tinker Street. Community-oriented institutions such as places of worship and nonprofit organizations are also considered allowable and desirable uses."
- **Inner Harbor**: "a mixed-use area with a major emphasis on Research & Development/ Light Industrial uses. Light Industry, office and supporting retail, commercial, and residential uses are allowed within the district. Supporting uses should be focused in or around a mixed-use neighborhood center along the extension of Pacific and Lincoln Avenue, associated with patterns of use in the adjoining Marina District. Community-oriented institutions such as places or worship and nonprofit organizations are also considered allowable and desirable uses."
- **North Waterfront**: "The southern portion is a mixed-use area with a major emphasis on Research & Development/Light Industrial uses. Light industry, office, and supporting retail, commercial, and residential uses are allowed within the district. Supporting uses are developed in or around a neighborhood center on the Tinker Street extension. The northern portion is a mixed-use area with a major emphasis on Research & Development/office, residential uses, and waterfront-oriented commercial. Light industry, office, residential and supporting retail, commercial, and recreation uses are allowed within the district. Community-oriented institutions such as places of worship and nonprofit organizations are also considered allowable and desirable uses."
- **Marina**: "a mixed-use area with a major emphasis on marina, civic, residential, and recreation uses. Marina, marina-related industry, office, civic, commercial, residential, recreational, and

supporting retail are allowable uses with the district. Community-oriented institutions such as places of worship and nonprofit organizations are also considered allowable and desirable uses."

- **Northwest Territories**: "a mixed-use area with a major emphasis on International trade and commerce and light industrial uses. Recreational uses such as meeting and conference facilities, club houses, educational centers, and recreational buildings such as pools, recreation halls, gyms, and incidental storage and maintenance facilities are allowed within the district in addition to secondary warehousing, light industry, office, and supporting commercial uses. Housing may be permitted under certain conditions. Supporting uses should be developed focusing in or around a neighborhood center. Community-oriented institutions such as places of worship and nonprofit organizations are also considered allowable and desirable uses."
- **Park/Open Space**: "This [park] designation includes neighborhood parks, community parks, community open space, greenways, trails, regional serving parks and other recreational facilities... Wetlands, wildlife habitat, and water related habitat are included in this [open space] category."

These descriptions were used to guide selection of receptors, emphasizing the major intended reuse as described by ARRA (1996).

The following subsections present brief descriptions of regional geology and meteorology.

C.3.3 Regional Geology

Alameda Island is located within the San Francisco Bay basin, which lies within the Coast Range physiographic province of California. The island lies at the foot of a gently westward-sloping plain that extends from the Oakland/Berkeley hills on the east to the shore of San Francisco Bay on the west. Originally a peninsula, Alameda Island was detached from the mainland in 1876 when a channel linking San Leandro Bay and San Francisco Bay was cut. The channel was later dredged to allow access for commercial ship traffic to and from the island's early industrial sites.

Alameda Island is underlain by approximately 400 to 500 feet of unconsolidated sediments unconformably overlying consolidated, Jurassic/Cretaceous (approximately 200 to 65 million years old) Franciscan bedrock (Rogers and Figures 1991). The unconsolidated units, from oldest to youngest, are Pliocene to Late Pleistocene (from 7 million to 10,000 years old) terrestrial and estuarine deposits, Late Pleistocene estuarine deposits, Late Pleistocene/ Holocene alluvial and eolian deposits, and Holocene (less than 10,000 years old) estuarine deposits (Atwater and others 1977). These units are roughly equivalent to the Alameda, San Antonio, and Posey formations, the Merritt Sand, and the Young Bay Mud described by Trask and Rolston (1951) and Radbruch (1957).

The units of primary concern in this investigation are the Late Pleistocene/Holocene eolian (Merritt Sand) and alluvial (unnamed) deposits, the Holocene estuarine deposits, and overlying fill material. More detailed descriptions of the geology is presented in Section 2.2 of this RI report.

C.3.4 Meteorology

The San Francisco Bay area typically experiences a temperate climate with mild summer and winter temperatures. Rainfall occurs primarily during the months of October through April. Due to the varied topography of the bay area, specific climatic conditions can vary considerably throughout the region. Historically, Alameda Point averages approximately 18 inches per year of rainfall (Air Traffic Control Alameda Point 1992). Beginning in 1987, the area had experienced drought conditions and precipitation had been below normal levels. However, the area has recently experienced heavy rainfall greatly in excess of normal levels.

A more detailed discussion of meteorological conditions at Alameda Point is provided in Section 2.1 of this RI report.

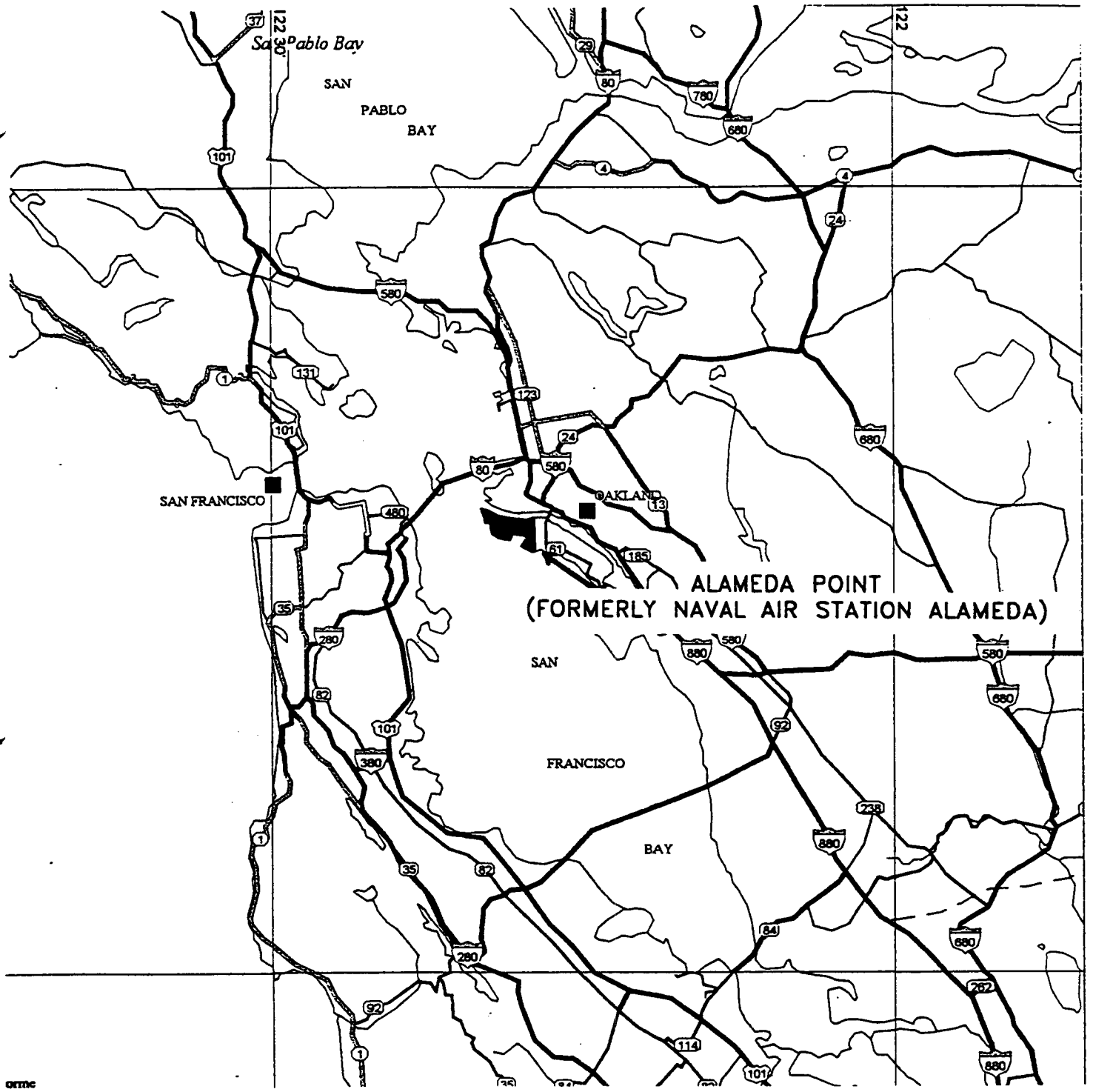
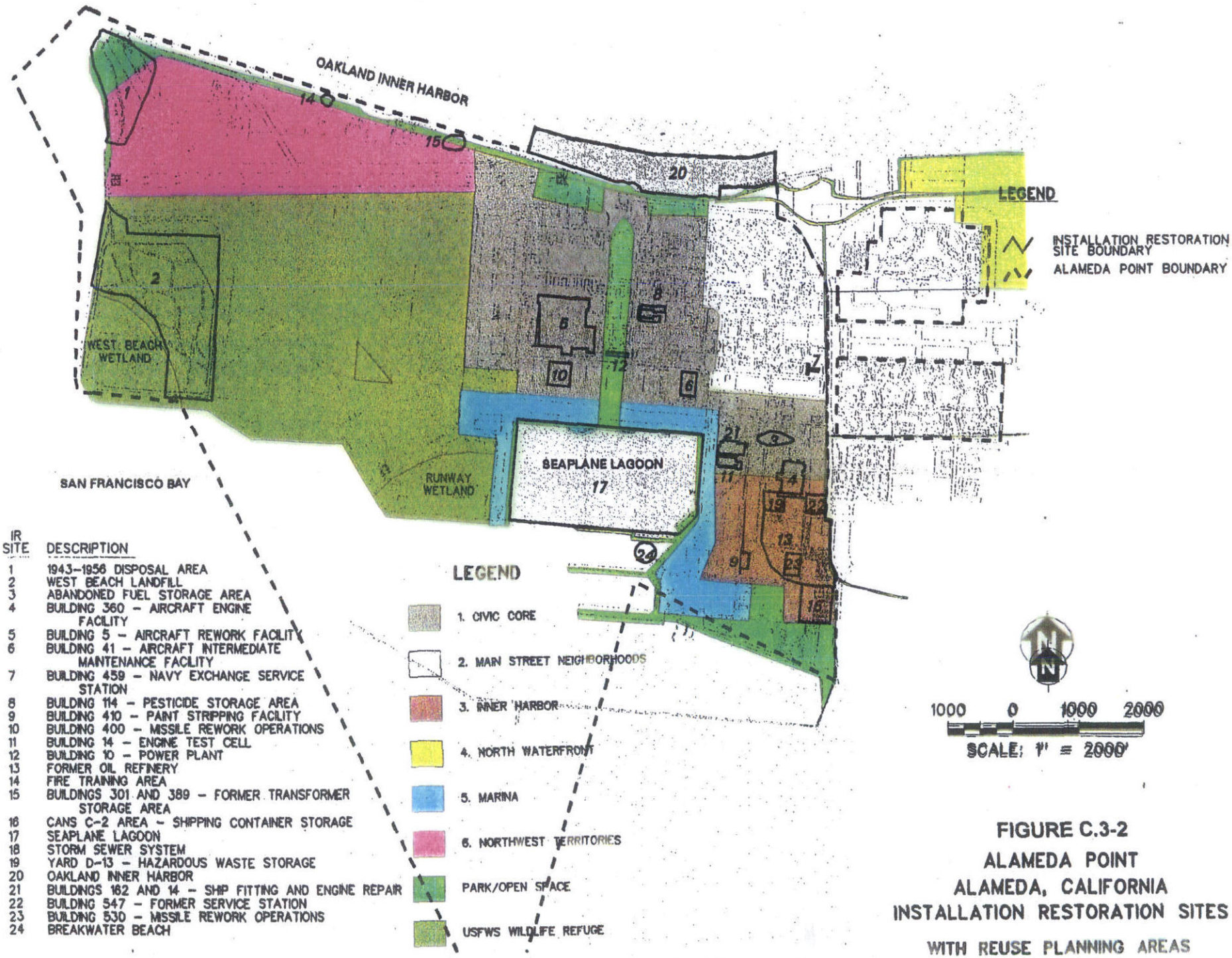


FIGURE C.3-1
ALAMEDA POINT OU3 HHRA
LOCATION OF ALAMEDA POINT



IR SITE	DESCRIPTION
1	1943–1956 DISPOSAL AREA
2	WEST BEACH LANDFILL
3	ABANDONED FUEL STORAGE AREA
4	BUILDING 360 – AIRCRAFT ENGINE FACILITY
5	BUILDING 5 – AIRCRAFT REWORK FACILITY
6	BUILDING 41 – AIRCRAFT INTERMEDIATE MAINTENANCE FACILITY
7	BUILDING 459 – NAVY EXCHANGE SERVICE STATION
8	BUILDING 114 – PESTICIDE STORAGE AREA
9	BUILDING 410 – PAINT STRIPPING FACILITY
10	BUILDING 400 – MISSILE REWORK OPERATIONS
11	BUILDING 14 – ENGINE TEST CELL
12	BUILDING 10 – POWER PLANT
13	FORMER OIL REFINERY
14	FIRE TRAINING AREA
15	BUILDINGS 301 AND 389 – FORMER TRANSFORMER STORAGE AREA
16	CANS C-2 AREA – SHIPPING CONTAINER STORAGE
17	SEAPLANE LAGOON
18	STORM SEWER SYSTEM
19	YARD D-13 – HAZARDOUS WASTE STORAGE
20	OAKLAND INNER HARBOR
21	BUILDINGS 162 AND 14 – SHIP FITTING AND ENGINE REPAIR
22	BUILDING 547 – FORMER SERVICE STATION
23	BUILDING 530 – MISSILE REWORK OPERATIONS
24	BREAKWATER BEACH

FIGURE C.3-2
ALAMEDA POINT
ALAMEDA, CALIFORNIA
INSTALLATION RESTORATION SITES
WITH REUSE PLANNING AREAS

C.4 METHODS FOR IDENTIFICATION OF CHEMICALS OF CONCERN

This subsection describes the methodology used to identify chemicals of concern (COCs). COCs are defined as chemicals that are potentially site-related, potentially toxic, and whose data are of sufficient quality for use in the risk assessment. Evaluating site-specific data is the first step in quantifying risks and identifying potential hazards at each site. Soil and groundwater sampling data were collected within and near the IR sites through several sampling efforts. These data, collected from 1990 to 1997, were used to characterize the sites. In general, the data were collected and analyzed in accordance with EPA's Contract Laboratory Program (CLP) procedures, and detection limits (sample quantitation limits [SQLs]) were sufficiently low to permit identification of potential health risks. The majority of data were validated with respect to laboratory blanks and quality control samples, and qualifiers were assigned by independent validators. Field data and screening level data were not used in this HHRA to estimate health risks and hazard indices (EPA 1990). For this reason, data collected as part of the Environmental Baseline Survey (EBS) were excluded from the HHRAs for the RI. Data quality assessment is described in detail in Section 3.0 of this RI report.

For the purposes of the HHRAs for the OU-3, the Site 1 revised boundaries were used to define the exposure unit size. The original boundary of Site 1 included areas now known to have been part of the runway extensions and that were not used as a landfill. The revised Site 1 boundary was drawn to include the landfill areas only. However, samples had been collected throughout the larger, original area. Figure C.4-1 presents the Site 1 original and revised boundaries, and soil sampling locations within the two areas.

The data summaries for each site are presented in Section C.7. Soil data for each site were aggregated in depth intervals of 0 to 2 feet below ground surface (bgs) and used for estimating exposure concentrations for occupational and recreational receptors. This soil depth interval is the only one applicable to future activity at Site 1, and to exposures under occupational and recreational scenarios. Construction activity on a closed landfill, as well as residential use of a landfill, is prohibited because it would breach the integrity of the current soil cover and any future cap (EPA 1993b).

The data summaries for each site provide the arithmetic mean and 95 upper confidence limit (UCL) of the arithmetic mean concentrations for every chemical detected at least once in soil. The probability density function (PDF) was determined for each chemical from detected values only; if the chemical was detected fewer than 5 times, a PDF could not be determined and a normal distribution was assumed. One-half the SQL was used as a proxy value for nondetected results when calculating descriptive statistics (i.e., mean, 95UCL and standard deviation).

Following the data summary, COCs for soil were selected using screening criteria recommended by EPA guidance (EPA 1989). These criteria are: essential nutrient status, frequency of detection, and a background comparison. Figure C.4-2 presents a flowchart describing the COC selection process that was used for two sites.

The essential human nutrients that may be eliminated according to EPA guidance (EPA 1989) are calcium, iron, magnesium, potassium, and sodium. Even if these chemicals are present at concentrations above naturally occurring levels, they are eliminated as COCs because they are toxic at only very high doses. In fact, toxicity values for these chemicals have not been developed.

A frequency of detection criterion is used because chemicals detected infrequently may be sampling and analytical artifacts, or spurious data (EPA 1989). These chemicals can be eliminated if there is no reason to believe that the chemicals may be present due to site-related activities. A detection frequency limit of 5 percent is conventionally used as a benchmark for elimination. This criterion also involves evaluating the chemicals for historical site use, concentration, and toxicity of the chemicals, mobility, persistence, and bioaccumulation. Therefore, any chemical considered for elimination by this criterion was also screened against one-tenth of its EPA Region 9 Preliminary Remediation Goals (PRGs) (EPA 1998a) to determine whether it would potentially pose a risk to human health. Chemicals were only eliminated as COCs if they were detected at a low frequency and their maximum concentration was below one-tenth of the EPA Region 9 PRGs for residential land use. In general, the chemicals eliminated using the frequency of detection criterion were far below one-tenth of the PRGs (usually one-hundredth to one-thousandth of the PRG). The cumulative risks and hazard indices associated with the eliminated chemicals were also generally below one-tenth of the PRG. No effect on the HHRA results would have been observed had these chemicals been retained.

The background comparison used at Alameda Point consists of a tool box approach that includes a "hot spot' comparison as well as parametric and nonparametric tests of means for inorganic chemicals. Figure C.4-3 presents a flowchart outlining the statistical toolbox approach used for Alameda Point; details of the statistical methodology are presented in the Final Statistical Methodology for Background Comparisons Report (PRC 1997). The tests of means were conducted at a confidence level of 0.95 (alpha = 0.05) and power of 0.90 (beta = 0.10) which exceed minimum recommendations of EPA (EPA 1990). The statistical tests were conducted for soil samples in the 0 to 10-foot bgs depth interval to be consistent with the background data set and other IR sites, as well as to ensure a sufficient data to support statistical calculations. Results of the background comparison were used for the 0 to 2 foot soil depth interval. Background data are discussed in Chapter 2 of the RI report.

A hot spot evaluation was conducted for each inorganic chemical using a methodology recommended by DTSC (1997). The 80th percentile lower confidence limit of the 95th percentile of the distribution (80LCL/95) was calculated for each inorganic analyte in the background data set. If the calculated 80LCL/95 exceeded the maximum detected background concentration for a chemical, the maximum detected value was used for the comparison. The maximum detected concentration of each inorganic chemical at each site was compared to the 80LCL/95 concentration of the background data. Hot spots were identified as those samples that had concentrations above the 80LCL/95 threshold value. The results of this "hot spot" comparison, together with the results of the statistical test of means, were used to determine whether a site inorganic chemical exceeded background and was a COC. While the hot spot comparison has nearly a zero error rate for misclassifying chemicals as below background (a Type 1 error), the error rate for misclassifying chemicals as above background is about 23% at a sample size of 5, up to 96% at a sample size of 64.

Table C.4-1 presents the background data summary for soil that was used for Site 1. The results of the soil COC selection process for Site 1 is provided in Section C.7.

As discussed in Section C.5, potential exposure to groundwater through several exposure pathways was evaluated on a screening level basis. Accordingly, groundwater COCs were selected using a more simplified process than was used to select soil COCs.

Due to high salinity levels found in deeper portions of the groundwater beneath Site 1 and the presence of the bay sediment unit (BSU) beneath most of OU-3, potential exposure to groundwater is assumed to be limited to groundwater from the first water-bearing zone (FWBZ). Potential exposure to groundwater was evaluated through two potential exposure pathways: (1) inhalation of volatile organic chemicals [VOC] which have migrated from the FWBZ into the ambient air and (2) inhalation of VOCs released during irrigation.

Under the first exposure scenario, COCs were selected using the following general guidelines. First, because the exposure pathway assumed chemicals would migrate from the FWBZ through the vadose zone into the ambient air, only VOCs were considered as potential COCs. Second, using the complete set of groundwater results (see Appendix I for complete groundwater results), the VOCs were evaluated for frequency of detection and maximum detected concentration. Chemicals detected less than five percent of the time and for which the maximum detected concentration was less than 10 percent of the EPA Region 9 tap water PRG were eliminated as COCs. Based on this process, 12 COCs were identified for consideration under the first potential exposure scenario: benzene, chlorobenzene,

chloroform, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dichloroethene, 1,2-dichloroethene (total), toluene, trichloroethene, vinyl chloride, and xylenes.

Under the second exposure scenario, four chemicals were identified as COCs: benzene, 1,2-dichloroethene (total), trichloroethene, and vinyl chloride. These VOCs were selected for three primary reasons: (1) they were found at the highest concentrations within the FWBZ beneath Site 1, (2) VOCs are generally the most mobile class of chemicals detected in groundwater from the FWBZ and, therefore, would be expected to migrate most quickly and be found at the highest concentrations at wells located outside the groundwater plume, and (3) all of the selected VOCs (with the exception of 1,2-dichloroethene [total]) are considered to be potential carcinogens (EPA 1998a).

TABLE C.4-1
ALAMEDA POINT
BACKGROUND DATA FOR SITE 1
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Inorganic Chemicals (mg/kg)									
Aluminum[1]	NA	50/50	20	13,300	6,119	2,543	6,841	0.42	11,091
Antimony[3]	2.5-7.3	3/50	2.8	3.6	3.0	0.61	3.1	0.21	4.2
Arsenic[1]	10-12	21/50	1.1	33	7.7	6.5	9.5	0.84	20.3
Barium[2]	21-24	43/50	19.8	260	30.0	1.8	43.0	0.18	99.4
Beryllium[1]	1-1.2	9/50	0.3	1.3	0.57	0.19	0.63	0.33	0.95
Cadmium[1]	0.36-1.2	11/50	0.33	2.9	0.66	0.49	0.80	0.75	1.6
Calcium[2]	NA	50/50	500	97,000	3,411	2.0	5,256	0.08	12,995
Chromium[4]	NA	50/50	5.0	69.7	32.0	8.4	34.4	0.10	48.5
Cobalt[1]	5-6	20/50	4.3	11.4	4.3	2.3	5.0	0.54	2.6
Copper[1]	5.5-5.6	48/50	4.2	49	15.7	12.1	19.1	0.77	39.3
Iron[1]	NA	50/50	10	20,800	10,247	3,859	11,410	0.38	17,791
Lead[2]	NA	50/50	3.3	180	20.7	2.4	41.2	0.29	118
Magnesium[2]	NA	50/50	500	8,820	2,540	1.6	3,192	0.06	6,231
Manganese[1]	NA	50/50	5.0	330	136.2	74.1	157.3	0.54	281
Mercury[1]	0.05-0.11	5/9	0.05	0.18	0.08	0.06	0.12	0.72	0.15

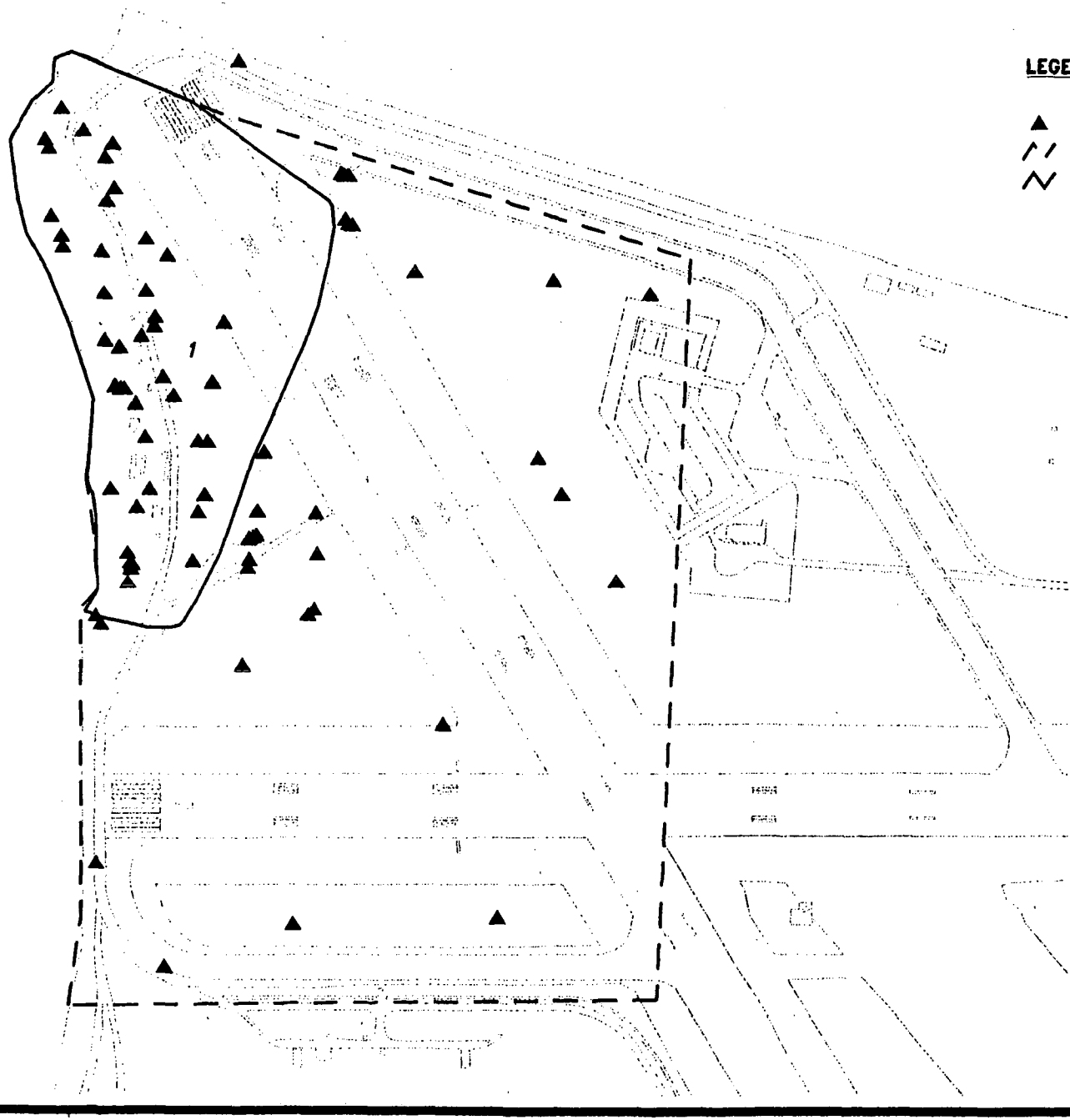
TABLE C.4-1 (Continued)
ALAMEDA POINT
BACKGROUND DATA FOR SITE 1
DATA SUMMARY

Chemical	SQL	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Standard Deviation	95 UCL	CV	80LCL/95th percentile
Nickel[4]	NA	50/50	5.0	71.1	27.7	9.9	30.5	0.36	46.7
Potassium[1]	NA	50/50	500	1,700	914	289	996	0.32	1,479
Silver[4]	0.48-6	6/50	0.52	30	2.9	4.1	4.1	1.4	11.0
Sodium[1]	500-610	11/50	232	1,380	358	260	432	0.73	867
Titanium[1]	NA	41/41	280	663	456	77.1	480.2	0.17	603
Vanadium[1]	NA	50/50	15.6	50.0	25.5	7.9	27.7	0.31	40.9
Zinc[1]	NA	50/50	17.0	140.0	46.9	31.6	55.8	0.67	108.6

Notes:

SQL	Sample Quantitation Limit
95 UCL	95 percent Upper Confidence Limit of the Mean Concentration
CV	Coefficient of Variation
80LCL/95th percentile	80th percent Lower Confidence Limit of the 95th percentile of the distribution
NA	Not applicable
mg/kg	milligrams per kilogram

(1) Data normally distributed
(2) Data lognormally distributed. Calculated CV and 80LCL/95th percentile for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated CV and 80LCL/95th percentile from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated CV and 80LCL/95th percentile from arithmetic mean and standard deviation



LEGEND

- ▲ SAMPLE LOCATION
- // ORIGINAL INSTALLATION RESTORATION SITE
- ∿ REVISED INSTALLATION RESTORATION SITE

N

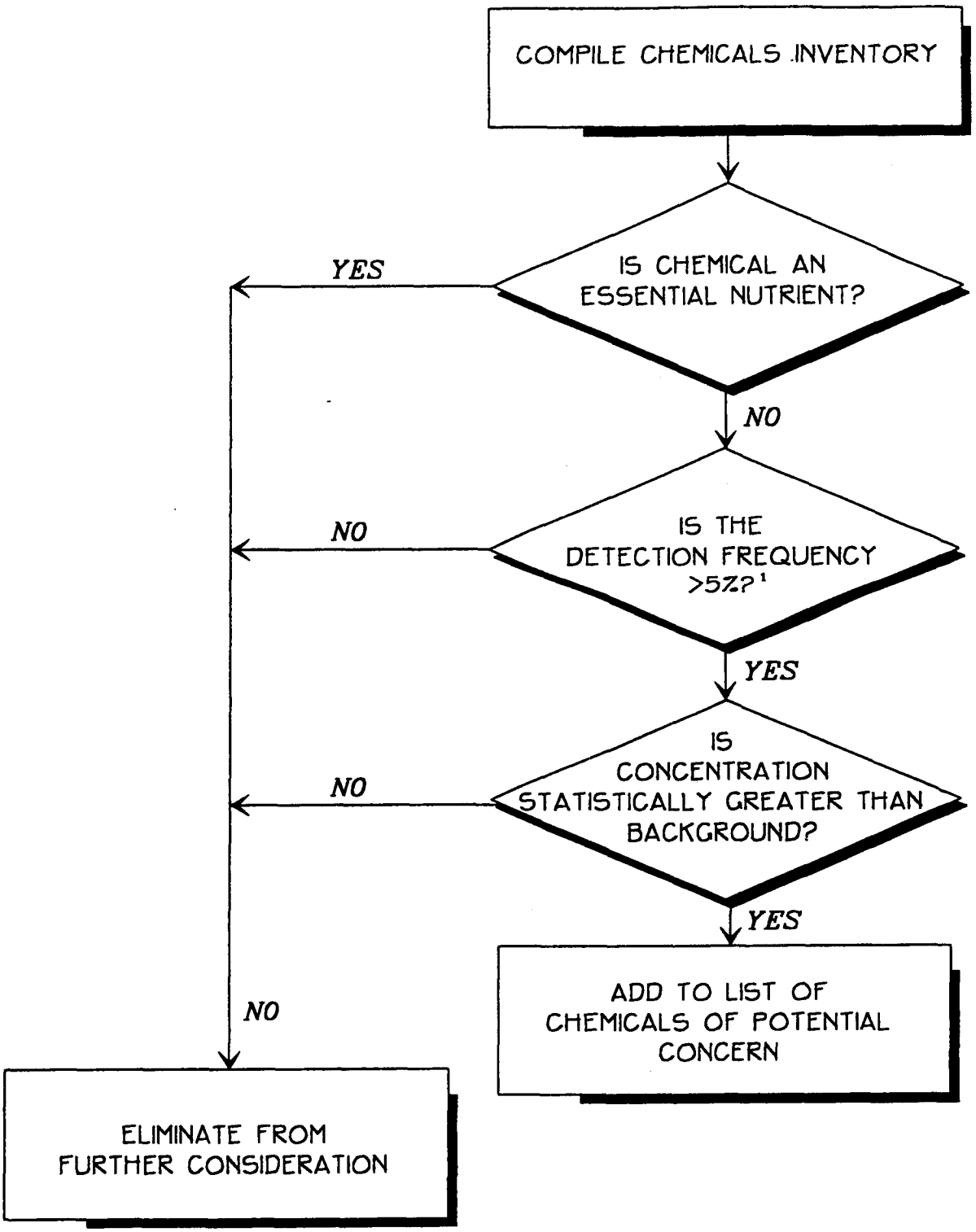
250 0 250 500

SCALE: 1" = 500'

FIGURE C.4-1

**ALAMEDA POINT
SOIL SAMPLE LOCATIONS
ASSIGNED TO SITE 1
LESS THAN 10 FEET
BELOW GROUND SURFACE**

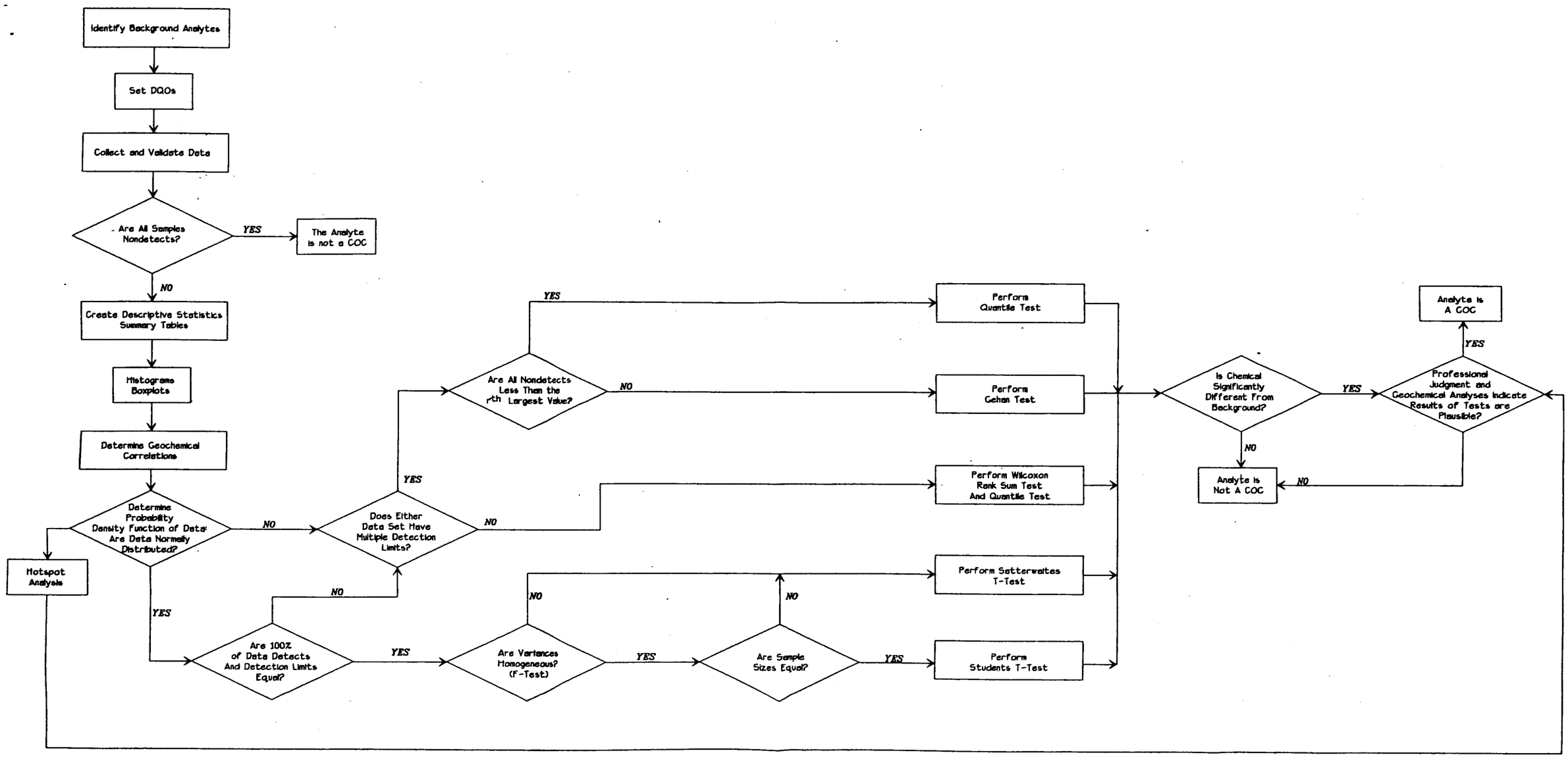
01/23/98 /data3/alameda/ou3ri/ou3soil.aml ou3soil.map BB



1 INCLUDES A COMPARISON OF MAXIMUM DETECTED CONCENTRATION TO ONE-TENTH OF THE RESIDENTIAL PRG.

FIGURE C4-2
ALAMEDA POINT OU3 HHRA
FLOW CHART FOR IDENTIFYING CHEMICALS OF CONCERN

D:\NAVYOUI\J009NAVY\J009002a.dwg.dwg 09/02/1998 12:00:09



* See Section 5.5.2 for description of r.

FIGURE C.4-3
ALAMEDA POINT OU3 HHRA
FLOW CHART FOR COMPARING
SITE DATA TO BACKGROUND

Q:\NAVYOU\J009NAVY\J009001a.dwg.dwg 09/02/1998 12:02:16

C.5 EXPOSURE ASSESSMENT

An exposure assessment includes an evaluation of potential human receptors that could contact site-related chemicals, as well as routes, magnitude, frequency, and duration of exposure. An evaluation of all possible human exposures is necessary to identify receptors that are in current contact with or that could contact Alameda Point contaminants in the future. Although the installation has closed, some personnel are still at the base in administrative, maintenance, and security roles. The principal objective of this evaluation is to identify exposures that represent reasonable maximum (RME) and average (AVG) scenarios (EPA 1992b) at Alameda Point. The concept of reasonable scenarios underlies the RME concept developed by EPA. As defined by EPA (1989), the RME is the maximum exposure that is reasonably expected to occur at a site. It should be emphasized, however, that the RME exposure is for the same receptor and that, before risks are calculated, it must be determined whether "it is likely that the <u>same</u> individual would <u>consistently</u> face the 'reasonable maximum exposure (RME)'"(EPA 1989, emphasis not added).

It is also important that intake variable values for each RME exposure pathway should be "selected so that the combination of all intake variables results in an estimate of the reasonable maximum exposure for that pathway" (EPA 1989). In other words, the most conservative intake variables for each parameter for a given pathway are not used exclusively. A combination of average and upper-bound values should be combined to estimate exposures that are meaningful and represent the actual reasonable maximum exposure for the site.

The exposure assessment for OU-3 included the following steps:

- Characterization of the exposure setting(s) and identification of potential future human receptors
- Identification of exposure pathways and exposure routes
- Estimation of exposure point concentrations, and
- Quantification of chemical intake for pathway specific exposures for each potential receptor

Following EPA guidance (1989), all complete exposure pathways were selected for evaluation unless:

- Exposure from the pathway is likely to be much less than that from another pathway involving the same medium of the same exposure point

- The potential magnitude of exposure from a pathway is likely to be very low
- The probability of the exposure occurring is very low and the risks associated with the pathway are low.

C.5.1 Exposure Setting and Potential Receptors

According to EPA (1989), the first step in evaluating current or potential future chemical exposures is an evaluation of the physical characteristics of the site, such as climate, vegetation, soil type, and hydrology of surface water and groundwater that are pertinent to the risk assessment. Surface soil is the only soil medium of concern at the OU-3 site because soil excavation is not permitted within a landfill (EPA 1993b). Surface water and sediment are not contained within Site 1 boundaries.

Although groundwater has been evaluated individually for each site, historical data indicate that shallow groundwater in the East Bay Plain area is affected by high nitrate concentrations and saltwater intrusion (ACFCWCD 1988).

As discussed in Section 2.3, the artificial fill (FWBZ) and Merritt Sands formation (SWBZ) are separated by the Bay Sediment Unit in the western and central regions of Alameda Point. The SWBZ is generally brackish to saline. A deeper fresh water aquifer (Alameda formation) is separated from the FWBZ and SWBZ by a thick impermeable layer comprised of the Yerba Buena Mud Aquitard. The FWBZ and SWBZ were sampled as part of the RI activities. Groundwater samples were not collected from the Alameda Formation. The California RWQCB, San Francisco Bay Region, has identified the groundwater basin in which Alameda Island lies for potential use as "domestic or municipal supply, industrial process supply, industrial service supply, and agricultural supply" (RWQCB 1986). However, RWQCB indicates that "local groundwater quality conditions may vary significantly, due to natural factors, making some groundwater supplies unsuitable for the uses indicated" (RWQCB 1986). Until RWQCB makes a final decision regarding potential groundwater uses of the shallow aquifer at Alameda Point, it has been assumed that the groundwater could be used for all indicated uses, including domestic or municipal water supply, except where prohibited by law (Sites 1 and 2E). Groundwater quality and potential uses are discussed in Section 2.7.

Although groundwater supply wells can not be installed within Site 1 itself (Site 1 is a landfill and is expected to be capped), a groundwater supply well could be installed upgradient of Site 1. For the

purpose of the OU-3 HHRA, two potential locations for a groundwater supply well were evaluated. The first location is adjacent to the eastern edge of Site 1 near monitoring well M031-A. This location was selected because monitoring well M031-A is located adjacent to Site 1 and is the well at which the only Site 1 pumping test was performed. It was estimated that this location will be adjacent to the eastern boundary of the Site 1 cap. The second location is east of the runway near well cluster HP1-2.

The results of groundwater modeling at these two locations is presented in Attachment 6 to Appendix C. The groundwater modeling focused on four VOCs including benzene, 1,2-dichloroethene (total), trichloroethene, and vinyl chloride. The rationale for selection of these VOCs as groundwater COCs is discussed in Section C.4. It was assumed that groundwater drawn from these theoretical well locations would be used to irrigate a golf course located on all or a part of Site 1. Also, the modeled groundwater concentrations of the four VOCs identified above were compared to their respective MCLs as a qualitative evaluation of potential drinking water exposure.

No consistent exposure scenarios currently exist at the IR sites at Alameda Point. Some security personnel patrol the base and some administrative and maintenance personnel remain at the base. Occasional recreational activities at the base may consist of jogging, walking, and picnicking, but these do not occur at IR sites. Although not associated with IR sites, residential housing is located in the northeastern corner of the base. Some areas of the base have been leased for occupational use. These general exposure scenarios cover the range of current exposure scenarios at Alameda Point. Because the future exposure scenarios associated with Alameda Point involve a greater extent and duration of exposure than current exposures, only future exposure parameters were used to evaluate risks associated with these scenarios (i.e., only future scenarios were evaluated).

Occupational and recreational exposures are the most reasonable exposure scenarios for future land use at OU-3. While EPA (1989) requires that the future land use be based on professional judgment and recognizes that "an assumption of future residential land use may not be justifiable if the probability that the site will support residential use in the future is exceedingly small," DTSC generally requires a residential scenario be evaluated. However, future land use of Site 1 is known to be non-residential, both due to reuse plans and zoning that prohibit housing development in the Site 1 area. Areas where residential housing is precluded include landfills and wetlands, which would apply to Site 1. The identification of potential receptors and land reuse has been guided solely by reuse plans for the base

developed by the ARRA (1996), which has designated Site 1 for recreational and occupational redevelopment, in fact a golf course is planned to cover a large portion of Site 1.

C.5.2 Exposure Pathways and Exposure Routes

All relevant exposure pathways were evaluated for future occupational and recreational exposure scenarios.

According to EPA guidance (1989), an exposure pathway consists of four elements:

- A source and mechanism of chemical release
- A retention or transport medium (or media in cases involving transfer of chemicals)
- A point of potential human contact with the contaminated medium (referred to as the exposure point)
- An exposure route (such as ingestion) at the contact point

Eliminating any of these elements (except in a case where the source itself is the point of exposure) results in an incomplete exposure pathway. Therefore, if no receptors exist that would contact the source or transport medium, the pathway is "incomplete" and is not evaluated. Similarly, if human contact with an exposure medium is not possible, then the exposure pathway is incomplete and is not evaluated.

Routes of potential exposure associated with occupational and recreational exposure at OU-3 are the following: incidental soil ingestion, dermal contact with soil, inhalation of particulates from soil, inhalation of vapors from soil, and inhalation of vapors from groundwater through (1) direct migration from the FWBZ through the vadose zone and into the ambient air and (2) release into the ambient air during irrigation. The evaluation of the groundwater exposure pathways was performed at a screening level. For Site 1, external exposure to radionuclides is also evaluated. Because these pathways are based on future exposures, they are considered potentially complete and were evaluated to provide a conservative estimate of risk. Not all of these pathways may actually be complete for all receptors in the future.

Figure C.5-1 is the conceptual site model that indicates which exposure pathways are complete for each potential receptor.

C.5.3 Exposure Point Concentrations

Exposure point concentrations for chemicals in each medium were estimated for each Site 1 area using the IR database. DQOs were evaluated for data usability and it was determined that it was appropriate to combine data from different IR sampling efforts. Particulate concentrations were estimated using a particulate emission factor (PEF) recommended by DTSC (DTSC 1994). For soil, a sampling depth interval of 0 to 2 feet was used for both occupational and recreational exposure assessments. The soil data representing the most current site conditions were used to estimate exposure point concentrations. The data summary and exposure point concentrations are presented in Section C.7 for the Site 1.

Within each medium, descriptive statistics were calculated for all chemicals detected. The PDFs and either the arithmetic or geometric mean were determined for inorganic chemicals in soil, and the arithmetic mean was determined for organic chemicals. In accordance with EPA guidance (EPA 1992c), the 95 percent upper confidence limit (95 UCL) of the arithmetic mean was calculated and used as the exposure point concentration in the HHRA to estimate chemical intakes for soil exposures. The 95 UCL of the arithmetic mean is defined as a value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95 percent of the time (EPA 1992c). The 95 UCL is a better predictor of actual chronic exposure conditions because it is based on the probability of long-term random contact with contaminated areas. However, in areas where the 95 UCL exceeded the maximum chemical concentration, the maximum concentration was used as the exposure point concentration.

Ambient concentrations of polycyclic aromatic hydrocarbons (PAHs) in soils at Alameda Point are currently being determined. To an extent, PAH concentrations in soils at Alameda Point are attributed to PAHs brought in with the fill material dredged from various locations in the San Francisco Bay and Oakland Inner Harbor to construct Alameda Point. These concentrations would therefore not be attributable to historical Navy activities conducted at Alameda Point. The methodology used to develop the Alameda Point ambient PAH data set and the results will be described in a technical memorandum to be prepared following the completion of the determination. This information will be used in risk management decisions, but will not be used to select COCs. Section 2.6.1.2 of the RI report discusses this issue in greater detail.

Groundwater exposure pathways were evaluated on a screening-level basis. Therefore, quantification of exposure point concentrations was performed differently than for soil. Specifically, evaluation of potential exposure through inhalation of VOCs migrating from the FWBZ, through the vadose zone and

into the ambient air was performed by comparing risk-based screening levels to maximum detected groundwater concentrations (see Section C.5.4 for a more detailed discussion). For the purpose of evaluating potential exposure through inhalation of VOCs released during irrigation, COC exposure point concentrations were estimated on the basis of groundwater modeling (see Attachments 5 and 6 to Appendix C).

C.5.4 Quantification of Chemical Intake for Pathway Specific Exposures for Each Potential Receptor

In this section of the HHRA, chemical intake rates were estimated for all complete exposure pathways based on the exposure point concentrations and on the estimated magnitude of exposure to contaminated media.

Exposure is based on "intake," which is defined as the mass of a substance taken into the body per unit body weight per unit time. Intake from a contaminated medium is determined by the amount of the chemical in the medium, the frequency and duration of exposure, body weight, the contact rate, and the averaging time. The following is a generic algorithm that is used to calculate chemical intake:

$$I = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

where

I = intake (milligram per kilogram body weight-day [mg/kg-day])

C = chemical concentration in contaminated medium (milligram per kilogram [mg/kg] or milligram per liter [mg/L])

CR = contact or ingestion rate (milligrams soil per day or liters per day)

EF = exposure frequency; how often exposure occurs (days per year)

ED = exposure duration; how long exposure occurs (years)

BW = body weight (kilogram [kg])

AT = averaging time; period over which exposure is averaged (days)

Chemical intake via ingestion and inhalation is quantified as an administered dose. However, chemical intake from dermal exposure is estimated as an absorbed dose. Dermal contact equations have additional exposure parameters of adherence and absorption factors or permeability constants. Adherence factors indicate the amount of soil that adheres to the skin. Absorption factors reflect the desorption of the chemical from soil and absorption of the chemical across the skin. Due to differences

between EPA and DTSC guidance, separate calculations were made for each set of absorption factors. Dermal absorption factors from the Preliminary Endangerment Assessment (PEA) Manual (DTSC 1994) were used for DTSC dermal exposure estimates. For EPA dermal exposure assessment, dermal absorption factors were those used in the EPA Region 9 PRGs (EPA 1998a). Per Region 9 guidance, the dermal absorption factors were used in conjunction with toxicity values that had not been adjusted for gastrointestinal absorption, although this is not recommended by EPA federal guidance (EPA 1989, EPA 1998c). These results are listed as "Navy" values. DTSC also recommends the use of unadjusted toxicity values; results obtained using DTSC methodology are listed as "DTSC" values. Table C.5.4-15 presents dermal absorption factors used in the assessment of dermal intake using EPA and DTSC methodologies.

The general equation above is also used for assessing intakes of radionuclides, except that body weight and averaging time are not used. Additionally, dermal exposure is not assessed for radionuclides. Instead, external exposure is evaluated, which incorporates a gamma shielding factor but does not rely on exposed dermal surface area or dermal absorption factors. The intake of a radionuclide is expressed as picocuries (pCi) instead of mg/kg-day (EPA 1989).

As previously noted, EPA (1992b) requires that exposure parameters used to determine contaminant intakes for a given pathway should be selected so that the estimated intake represents the average and RME exposure. Site-specific and EPA default values for exposure parameters were used in the Alameda Point HHRA. Tables C.5.4-1 through C.5.4-15 present the intake equations and exposure parameters that were used to estimate chemical intake associated with exposure to surface soil for recreational and occupational receptors. Both RME and average intakes for future receptors were calculated for chemical and radionuclide exposure. The results of these calculations are presented in Section C.7

Site-specific exposure parameters for recreational receptors were identified from several sources. Current access and potential land use were evaluated in selecting exposure factors. Parameters for recreational receptors were selected from the Exposure Factors Handbook (EPA 1997a) and DTSC guidance (DTSC 1994), and were based on the types of activities expected to occur in open space areas planned for these sites. Use of site-specific recreational parameters will ensure that calculated risks and hazard indices are "an estimate of reasonable maximum exposure for that pathway," as specified by EPA guidance (EPA 1989). Activity patterns for recreational receptors were based on site-specific information and the assumption that recreational activities are those related to a community park. A community park is assumed to be used more frequently by the same people than a regional or national park, given its proximity to homes and offices.

Inhalation of particulates and volatilized chemicals from soil via ambient air was evaluated for all receptors. For occupational receptors, it was conservatively assumed that all time spent at the site was spent outdoors and the estimated airborne concentrations for outdoor air were used. Ambient outdoor air concentrations of particulates from surface soil are usually higher outdoors than indoors. Volatilization factors for the volatile COCs in Site 1 are listed in Table C.5.4-16.

Potential exposures to COCs in groundwater were assumed to occur through two exposure pathways. The first exposure pathway assumes that groundwater pumped from a well located upgradient of Site 1 is used to irrigate a golf course constructed at Site 1. Golf course irrigation practices in the San Francisco Bay area are briefly discussed below. The upgradient locations were selected because the presumptive remedy for Site 1 is a cap which will extend to the shoreline. Because groundwater wells cannot be installed through a capped landfill, the presence of the cap effectively prohibits installation of a groundwater well downgradient of Site 1.

Irrigation of bay area golf courses generally occurs under one or more of three options. The first option involves pumping groundwater directly from an aquifer into an irrigation system. The second option involves pumping water (either groundwater or water delivered to the site from another source) into a system of holding tanks from which irrigation water is drawn. The third option involves pumping water (either groundwater or water delivered to the golf course from another source) into an on-site holding pond (usually designed as a "water hazard"); irrigation water is then drawn from this pond. Also, irrigation of bay area golf courses occurs almost exclusively at night when no potential receptors are present (Tetra Tech 1999).

Based on discussions with bay area golf course grounds keepers and superintendents, newer golf courses generally use either of the first two options. The third scenario generally occurs only at older courses (Tetra Tech 1999). For the purposes of the OU-3 HHRA, irrigation was assumed to occur through the first scenario. Potential exposure was assumed to occur primarily through inhalation of vapors generated during irrigation. Because new irrigation systems are largely automated and computer controlled, potential dermal exposure is expected to be minimal and was not evaluated. Attachment 5 describes the procedures used to estimate VOC emissions and breathing zone concentrations during spray irrigation. Table C.5.4-9 presents the intake equation and exposure parameters that were used to estimate chemical intakes associated with exposure to vapors generated during spray irrigation.

The second potential groundwater exposure pathway assumes that receptors at IR Site 1 may be exposed through inhalation to VOCs that have migrated from the FWBZ, through the vadose zone, into the ambient air above Site 1. The potential for this type of migration was estimated using chemical-specific groundwater to ambient air volatilization factors (VFwamb). The VFwamb values were generated using the method recommended by the American Society for Testing and Materials (ASTM) (ASTM

1997). Table C.5.4-10 presents the non-chemical-specific parameter values and Table C.5.4-11 the chemical-specific parameter values used to calculate chemical-specific VFwamb values. Chemical-specific VFwamb values are presented in Table C.5.4-12.

The estimated chemical-specific VFwamb values and chemical-specific EPA Region 9 ambient air PRGs (EPA 1998a) were then used to back-calculate chemical-specific risk-based screening levels (RBSL) in groundwater according to the ASTM recommended method (ASTM 1997). Specifically, the ASTM method assumes exposure through inhalation of vapors by residential exposures. Therefore, this method produces more conservative (lower) RBSLs than would be produced if occupational or recreational exposures had been assumed (as is the case for the remainder of the HHRA). The comparison of Site 1 groundwater concentrations to chemical-specific RBSLs is discussed in Section C.7.

It is documented that ingesting fish caught in San Francisco Bay can result in adverse health effects. The following is a summary of a study conducted by the Regional Water Quality Control Board (RWQCB) on ingestion of fish from the San Francisco Bay and the resulting health advisory for fish consumption issued by the Office of Environmental Health Hazard Assessment (California Environmental Protection Agency [Cal/EPA] 1994a and 1994b). The RWQCB study was conducted to measure the levels of chemical contaminants in fish caught by anglers in San Francisco Bay. Fish were collected between May 2 and June 10, 1994, from 16 sampling locations throughout the bay. The fish sampled are representative of those commonly eaten in all areas of the bay, and are most likely to be contaminated because of their fat content. The fish fillets were analyzed for over 100 potentially harmful chemicals. Of these chemicals, polychlorinated biphenyls, mercury, chlordane, DDT, dieldrin, and dioxins were detected at levels of concern (Cal/EPA 1995). Vallejo-Mare Island was the sampling location from which fish most often exhibited high levels of chemical contaminants. The concentrations of chemicals found in San Francisco Bay fish are not known to cause immediate adverse health effects. Adverse health effects associated with chronic (long-term) exposure to high levels of these chemicals include cancer, and impaired mental and motor development in fetuses, infants and small children (Cal/EPA 1995).

Cal/EPA has issued the following interim consumption advisory covering certain fish species from San Francisco Bay (Cal/EPA 1994b).

- Adults should limit their consumption of San Francisco Bay sport fish to, at most, two meals per month. A fish meal is defined by Cal/EPA as an 8-ounce portion, prior to cooking, for a 154-pound (70 kilogram) person.

- Adults should not eat any striped bass over 35 inches.

- Women who are pregnant, may become pregnant, or who are breast feeding, and children under the age of 6, should not eat more than one meal per month and, in addition, should not eat any meals of large shark (over 24 inches) or large striped bass (over 27 inches).

- This advisory does not apply to salmon, anchovies, herring, and smelt caught in the bay; other ocean caught sport fish; or commercial fish.

C.5.5 Lead Assessment

Lead was selected as a soil COC at Site 1. Risks and hazard indices are not calculated for lead in the same manner as other COCs because EPA and Cal/EPA have developed a physiologically based modeling approach to evaluate the intake and subsequent blood lead levels of receptors, based on residential exposure to soil and groundwater. Cal/EPA's Lead Model estimates the percentage of children and adults whose blood lead levels would exceed acceptable limits if exposed to a specific concentration of lead.

EPA uses 400 mg/kg of lead in soil as a screening value (EPA 1998a). Cal/EPA uses 130 mg/kg as a screening value for residential exposure (EPA 1998a). Cal/EPA's lead model (which is based on residential exposure) was used to assess lead exposures at Site 1 even though residential development of a landfill is prohibited.

C.5.6 Radiation Dose Assessment

In addition to a risk assessment, a dose assessment was performed for radium-226 and radium-228 detected at Site 1. The dose assessment was conducted in accordance with Risk Assessment Guidance for Superfund (EPA 1989) and using Federal Guidance Report 11: Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion (EPA 1988). The Federal Guidance Report is based on the 1987 Federal Radiation Protection Guidance and aimed more at occupational exposures than general population exposures. The program RESRAD was used to calculate dose from exposure to radium (DOE 1990).

The dose conversion factors (DCFs) presented in Federal Guidance Report 11 convert the intake of a radionuclide (expressed in terms of pCi per year [pCi/y]) to an effective dose equivalent (EDE) expressed in terms of millirem per year (mrem/y). The EDE is the sum of all doses to all organs of the body from some concentration of radionuclide(s) for 50 years following intake.

For the occupational receptor, the RME exposure parameters were 250 days per year (days/y), 8 hours per day; an inhalation rate of 0.83 cubic meters per hour (m^3/hr); and soil ingestion rate of 50

milligrams per day (mg/day). For the recreational receptor, the RME parameters were 242 days/y, 2.5 hours per day; an inhalation rate of 1.25 m^3/hr; and ingestion rate of 16 mg/day (based on 100 mg/day for 2.5 hours). For external exposures, the unitless ratios of hours exposed to hours per day and days exposed to days per year were added to the equation. For example, an occupational worker is exposed 8 out of 24 hours (ratio of 0.3) and 250 days out of 365 days in a year (a ratio of 0.68). Tables C.5.4-13 and C.5.4-14 present the dose assessment parameters for recreational and occupational receptors, respectively.

Results of the dose assessment are described in terms of mrem/y. Results were compared to the EPA acceptable levels of 15 mrem/y EDE and the typical cleanup requirements for sites with radium, which are 5 pCi/g over background for surface soil (0 to 15 cm bgs) and 15 pCi/g above background for deeper soils (EPA 1997b).

In addition, the RESRAD program calculates a risk corresponding to the dose. Both dose and risk are calculated from time = 0 years to time = 1,000 years. The results are summarized in Section C.7.1; complete print-outs from the RESRAD program may be found in Attachment 3.

TABLE C.5.4-1
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
RECREATIONAL EXPOSURE:
SOIL INGESTION

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times ET \times EF \times ED \times CF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site Specific	Site Specific
IR = Ingestion Rate (mg/hr)[2]	19.9	9.9
ET = Exposure Time (hours/day)[3]	2.5	1.9
EF = Exposure Frequency (days/year)[4]	242	104
ED = Exposure Duration (years)[5]	30	9
CF = Conversion Factor (kg/mg)	1E-6	1E-6
BW = Body Weight (kg)[5]	50	50
AT = Averaging Time (days)		
Noncarcinogenic	10,950	3,285
Carcinogenic	25,550	25,550

Notes:

(1) The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

(2) The time-weighted RME value is based on the following age group-specific RME outdoor soil ingestion rates: 21.4 mg/hr for children up to age 5 years, 20.7 mg/hr for children age 6 through 11 years, and 19.2 mg/hr for persons age 12 to 30 years. The time-weighted average value is based on the following age group-specific outdoor soil ingestion rates: 10.7 mg/hr for children up to age 5 years, 10.3 mg/hr for children age 6 to 11 years, and 9.6 mg/hr for receptors age 12 to 30 years. The derivation of the RME and average time-weighted outdoor soil ingestion rates are detailed in Attachment 4 to Appendix C.

(3) The time-weighted RME value is based on RME value of 1 hour/day up to age 5 years (DTSC 1992), 5.6 hr/day for children up through age 11 and 1.5 hours/day for ages 12-30 years (EPA 1997a). The average value is the time-weighted average based on AVG values of 1 hour per day up to age 5 years (DTSC 1992), 5.6 hours/day for children up through age 11 and 0.5 hours per day for ages 12-30 (EPA 1997a).

(4) The RME value was obtained from DTSC (1992): 4 days per week up to age 5 and 5 days per week ages 5-30 years. The average value is based on 2 days per week (professional judgment).

(5) The time-weighted body weight is based on the following age group-specific body weights: 15 kg for children up to age 5 years (Table 7-2 in EPA 1997a), 30.8 kg for children age 6 to 11 years (Table 7-2 in EPA 1997a), and 65.1 kg for receptors age 12 to 30 years (Table 7-3 in EPA 1997a for receptors age 12 to 17 years and Table 7-2 in EPA 1997a for receptors age 18 to 30 years [average of results for the 18 < 25 year and 25 < 35 year age groups]).

TABLE C.5.4-2
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
RECREATIONAL EXPOSURE:
DERMAL CONTACT WITH SURFACE SOIL

$$\text{Intake (mg/kg-day)} = \frac{C \times SA \times ABS \times AF \times EF \times ED \times CF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site Specific	Site-Specific
SA = Surface area (cm^2/events)[2]	5,300	2,000
ABS = Absorption factor[3]	Chemical-specific	Chemical-specific
AF = Adherence factor (mg/cm^2)[4]		
EPA	0.08	0.08
DTSC	1.0	0.2
EF = Exposure Frequency (events/year)[5]	242	104
ED = Exposure Duration (years)[6]	30	9
CF = Conversion Factor (kg/mg)	1E-6	1E-6
BW = Body Weight (kg)[6]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	10,950	3,285
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1992a. RME value corresponds to head, hands, forearms, and lower legs. AVG value corresponds to head and hands.

[3] For the DTSC dermal assessment, chemical-specific values from DTSC (DTSC 1994). For the Navy dermal assessment, chemical-specific values from the EPA Region 9 PRGs (1998a) were used. See Section C.5.4 for a discussion of dermal exposure assessment. Table C.5.4-11 presents dermal absorption factors.

[4] EPA 1998a; DTSC 1994.

[5] RME value from DTSC (1992): 4 days per week up to age 5 and 5 days per week ages 6-30 years. AVG value based on 2 days per week (professional judgment).

[6] EPA 1989.

TABLE C.5.4-3
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
RECREATIONAL EXPOSURE:
INHALATION OF PARTICULATES

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times ET \times EF \times ED \times PEF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site Specific	Site-Specific
IR = Inhalation Rate (m^3/hr)[2]	1.25	0.83
ET = Exposure Time (hours/day)[3]	2.5	1.9
EF = Exposure Frequency (days/year)[4]	242	104
ED = Exposure Duration (years)[2]	30	9
PEF = Particulate Emission Factor (kg/m^3)[5]	5E-8	5E-8
BW = Body Weight (kg)[2]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	10,950	3,285
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1989. The value of 1.25m^3/hour corresponds to moderate activity for an adult male.

[3] Time-Weighted RME value is based on RME values of 1 hour/day up to age 5 years (DTSC 1992), 5.6 hr/day for children up through age 11 and 1.5 hours/day for ages 12-30 years (EPA 1997a). Average value is time-weighted average based on AVG values of 1 hour per day up to age 5 years (DTSC 1992), 5.6 hours/day for children up through age 11 and 0.5 hours per day for ages 12-30 (EPA 1997a).

[4] DTSC 1992. RME values of 4 days per week to age 5 and 5 days per week for ages 6-30 years. AVG value based on 2 days per week (professional judgment).

[5] DTSC 1994. Default value from guidance document.

TABLE C.5.4-4
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
RECREATIONAL EXPOSURE:
INHALATION OF VAPORS FROM SOIL IN AMBIENT AIR

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times ET \times EF \times ED \times VF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site-Specific	Site-Specific
IR = Inhalation Rate (m^3/hr)[2]	1.25	0.83
ET = Exposure Time (hours/day)[3]	2.5	1.9
EF = Exposure Frequency (days/year)[4]	242	104
ED = Exposure Duration (years)[2]	30	9
VF = Volatilization Factor (kg/m^3)[5]	Chemical-specific	Chemical-specific
BW = Body Weight (kg)[2]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	10,950	3,285
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1989.

[3] Time-Weighted RME value is based on RME values of 1 hour/day up to age 5 years (DTSC 1992), 5.6 hr/day for children up through age 11 and 1.5 hours/day for ages 12-30 years (EPA 1997a). Average value is time-weighted average based on AVG values of 1 hour per day up to age 5 years (DTSC 1992), 5.6 hours/day for children up through age 11 and 0.5 hours per day for ages 12-30 (EPA 1997a).

[4] DTSC 1992. RME values of 4 days per week to age 5 and 5 days per week for ages 6-30 years. AVG value based on 2 days per week

[5] EPA 1998a.

TABLE C.5.4-5
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
OCCUPATIONAL EXPOSURE:
SOIL INGESTION

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times EF \times ED \times CF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site Specific	Site Specific
IR = Ingestion Rate (mg/day)[2]	50	50
EF = Exposure Frequency (days/year)[3]	250	219
ED = Exposure Duration (years)[3]	25	5
CF = Conversion Factor (kg/mg)	1E-6	1E-6
BW = Body Weight (kg)[2]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	9,125	1,825
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1991a.

[3] EPA 1997a. Construction worker: Professional judgment

TABLE C.5.4-6
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
OCCUPATIONAL EXPOSURE:
DERMAL CONTACT WITH SURFACE SOIL

$$\text{Intake (mg/kg-day)} = \frac{C \times SA \times ABS \times AF \times EF \times ED \times CF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site Specific	Site-Specific
SA = Surface area (cm^2/event)[2]	2,910	2,000
ABS = Absorption factor[3]	Chemical-specific	Chemical-specific
AF = Adherence factor (mg/cm^2)[4]		
EPA	0.08	0.08
DTSC	1.0	0.2
EF = Exposure Frequency (events/year)[5]	250	219
ED = Exposure Duration (years)[5]	25	5
CF = Conversion Factor (kg/mg)	1E-6	1E-6
BW = Body Weight (kg)[6]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	9,125	1,825
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1997a. RME value is 15% of total body surface area (face, forearms, and hands). AVG value corresponds to head and hands.

[3] For the DTSC dermal assessment, chemical-specific values from DTSC (DTSC 1994). For the Navy dermal assessment, chemical-specific values from EPA Region 9 PRGs (EPA 1998a) were used. Dermal absorption factors are presented in Table C.5.4-11.

[4] EPA 1998a; DTSC 1994.

[5] EPA 1997a. Construction Worker: professional judgment

[6] EPA 1989.

TABLE C.5.4-7
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
OCCUPATIONAL EXPOSURE:
INHALATION OF PARTICULATES FROM SOIL

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times ET \times EF \times ED \times PEF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site Specific	Site-Specific
IR = Inhalation Rate (m^3/hr)[2]	0.83	0.83
ET = Exposure Time (hours/day)[2]	8	8
EF = Exposure Frequency (days/year)[3]	250	219
ED = Exposure Duration (years)[3]	25	5
PEF = Particulate Emission Factor(kg/m^3)[4]	5E-8	5E-8
BW = Body Weight (kg)[2]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	9,125	1,825
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1989. The value of 1.25 m^3/hour corresponds to moderate activity for an adult male.

[3] EPA 1997a.

[4] DTSC 1994. Default value from guidance document.

TABLE C.5.4-8
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
OCCUPATIONAL EXPOSURE:
INHALATION OF VAPORS FROM SOIL IN AMBIENT AIR

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times ET \times EF \times ED \times VF}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/kg)[1]	Site-Specific	Site-Specific
IR = Inhalation Rate (m^3/hr)[2]	0.83	0.83
ET = Exposure Time (hours/day)[3]	8	8
EF = Exposure Frequency (days/year)[4]	250	219
ED = Exposure Duration (years)[2]	25	5
VF = Volatilization Factor (kg/m^3)[4]	Chemical-specific	Chemical-specific
BW = Body Weight (kg)[2]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	9,125	1,825
Carcinogenic	25,550	25,550

Notes:

[1] The lower of the maximum detected concentration and the 95 UCL of the arithmetic mean concentration.

[2] EPA 1989.

[3] EPA 1997a.

[4] EPA 1998a.

TABLE C.5.4-9
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS AND INTAKE ALGORITHM
OCCUPATIONAL EXPOSURE:
INHALATION OF VAPORS FROM GROUNDWATER IN AMBIENT AIR DURING SPRAY IRRIGATION

$$\text{Intake (mg/kg-day)} = \frac{C \times IR \times ET \times EF \times ED}{BW \times AT}$$

	RME	AVG
C = Chemical Concentration (mg/m^3)[1]	Site-Specific	Site-Specific
IR = Inhalation Rate (m^3/hr)[2]	0.83	0.83
ET = Exposure Time (hours/day)[3]	1	1
EF = Exposure Frequency (days/year)[4]	214	153
ED = Exposure Duration (years)[2]	25	5
BW = Body Weight (kg)[2]	70	70
AT = Averaging Time (days)		
Noncarcinogenic	9,125	1,825
Carcinogenic	25,550	25,550

Notes:

[1] See Attachment 5.

[2] EPA 1989.

[3] Irrigation of bay area golf courses generally occurs at night when no receptors are present. However for purposes of the OU3 HHRA, it was assumed that a ground keeper was exposed for one hour per day.

[4] Bay area golf courses are generally irrigated during periods of low precipitation; April through October (Tetra Tech 1999). Under RME conditions, it was assumed that a golf course employee would be exposed every day April through October. Under average conditions, it was assumed that the worker would be exposed 5 days per week during this time frame.

TABLE C.5.4-10
ALAMEDA POINT OU3 HHRA
RISK-BASED CORRECTIVE ACTION (RBCA) PARAMETERS
USED TO CALCULATE VF_{wamb}

Parameter	Description	Value	Reference
$Theta_T$[a]	Total soil porosity	0.38	ASTM default (ASTM 1997)
$Theta_{ws}$[a]	Volumetric water content in vadose zone soils	0.12	ASTM default (ASTM 1997)
$Theta_{as}$[a]	Volumetric air content in vadose zone soils	0.26	ASTM default (ASTM 1997)
$Theta_{wcap}$[a]	Volumetric water content in capillary fringe	0.38[b]	EPA (1992d)
$Theta_{acap}$[a]	Volumetric air content in capillary fringe	0[b]	EPA (1992d)
h_{cap} (cm)	Thickness of capillary fringe	8[c]	EPA (1992d) and Fetter (1994)
h_v (cm)	Thickness of vadose zone	152[d]	See Appendix H
L_{gw} (cm)	Depth to groundwater = $h_{cap} + h_v$	160	NA
U_{air} (cm/s)	Wind speed above ground surface in ambient mixing zone	225	ASTM default (ASTM 1997)
X_{air} (cm)	Ambient air mixing zone height	200	ASTM default (ASTM 1997)
W (cm)	Width of source area parallel to wind, or groundwater flow direction	19,446[e]	See Volume II (Figure 6-14)

Notes:

cm = centimeter
cm/s = centimeter per second

[a] All theta values are dimensionless fractions.

[b] The lower portion of the capillary fringe is assumed to be saturated; that is, without air spaces contiguous with the atmosphere through which diffusion may occur. This assumption is based on the statement by EPA (1992d), that "There exists a capillary fringe above the top of the groundwater table in which the soil pores are also filled with water (in the upper portion of the fringe, the soil moisture content is below saturation but still elevated in comparison to the soil above the fringe."

[c] Review of boring logs from Site 1 indicates that the soil above the water table is poorly sorted and consists in large part of fine to medium sand (Appendix A). Fetter (1994) indicates that the capillary fringe expected in fine to medium fine sand ranges from 25 to 50 centimeters. Conservatively, the lower value of 25 centimeters was selected. EPA (1992d) states that the lower portion of the capillary fringe is saturated. It was assumed that the lower one-third of a 25 centimeter thick capillary fringe is saturated. The model considered this saturated portion as the capillary fringe, and the unsaturated portion as part of the vadose zone.

[d] The depth to groundwater was estimated as 160 centimeters from well logs for the most highly contaminated wells (M028-A, -C, -E, and M034-A) (Appendix H). The thickness of the vadose zone was estimated as $L_{gw} - h_{cap}$.

[e] The average west-to-east width of Site 1 (see Figure 6-14).

TABLE C.5.4-11
ALAMEDA POINT OU3 HHRA
CHEMICAL-SPECIFIC PARAMETERS[a]
USED TO CALCULATE VF_{wamb}

Chemical[b]	D_{air} (cm^2/sec)	D_{water} (cm^2/sec)	H (unitless)
Benzene	0.088	9.80×10^{-6}	0.2255
Chlorobenzene	0.07198	6.80×10^{-6}	0.15252
Chloroform	0.088745	1.00×10^{-6}	0.11767
1,2-Dichlorobenzene	0.12976	7.90×10^{-6}	0.07913
1,3-Dichlorobenzene	0.12976	7.90×10^{-6}	0.0779
1,4-Dichlorobenzene	0.12976	7.90×10^{-6}	0.0656
1,1-Dichloroethene	0.07914	1.04×10^{-5}	6.314
cis-1,2-Dichloroethene	0.07914	1.13×10^{-5}	0.3075
1,2-Dichloroethene (total)	0.07914	1.13×10^{-5}	0.26896
Toluene	0.07834	8.60×10^{-6}	0.27101
trans-1,2-Dichloroethene	0.07914	1.13×10^{-5}	0.2706
Trichloroethene	0.072	8.20×10^{-6}	0.36572
Vinyl Chloride	0.107345	1.23×10^{-6}	28.7
Xylene	0.007	8.40×10^{-6}	0.2173

cm^2/sec	Square centimeter per second
D_{air}	Diffusivity in air
D_{water}	Diffusivity in water
H	Henry's Law Constant

[a] All chemical specific parameters taken USEPA Region 9 Preliminary Remediation Goals (PRG) Guidance Document (EPA 1998a).

[b] COCs were selected according to the following general guidelines. First, because the exposure pathway assumes chemicals migrate from the FWBZ through the vadose zone into the ambient air, only VOCs were considered as potential COCs. Second, using the complete set of groundwater results (see Appendix I for complete groundwater results), the VOCs were evaluated for frequency of detection and maximum detected concentration. Chemicals detected less than five percent of the time and for which the maximum detected concentration was less than 10 percent of the EPA Region 9 tap water PRG were eliminated as COCs.

TABLE C.5.4-12
ALAMEDA POINT OU3 HHRA
COMPARISON OF CHEMICAL-SPECIFIC RISK-BASED SCREENING LEVELS[a] TO MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS

Chemical[b]	VF_{wamb}[c] ([mg/m^3]/ [mg/L])	EPA Region 9 Ambient Air PRG[d] (μg/m^3)	Risk-based Screening Level (RBSL) in Groundwater[e] (μg/L)	Maximum Detected Groundwater Concentration[f] (μg/L)
Benzene	1.41E-04	0.23	1,631	150
Chlorobenzene	9.74E-05	21	215,606	160
Chloroform	1.4E-04	0.084	600	34
1,2-Dichlorobenzene	1.12E-04	210	1,875,000	75
1,3-Dichlorobenzene	1.12E-04	8.4	75,000	2
1,4-Dichlorobenzene	1.11E-04	0.28	2,523	9
1,1-Dichloroethene	1.55E-04	0.038	245	50
cis-1,2-Dichloroethene	1.63E-04	37	226,994	22,000
1,2-Dichloroethene (total)	1.63E-04	37	226,994	110,000
Toluene	1.25E-04	400	3,200,000	2,400
Trans-1,2-dichloroethene	1.63E-04	73	447,853	45,000
Trichloroethene	1.33E-04	1.1	8,271	71
Vinyl chloride	1.83E-05	0.022	1,202	20,000[f]
Xylene	9.15E-05	730	7,978,142	490

Notes:

The values in this table are presented with greater precision than is warranted by the underlying data and analysis in order to facilitate verifying the calculations.

mg/m^3	milligram per cubic meter
mg/L	milligram per liter
μg/m^3	microgram per cubic meter
μg/L	microgram per liter

[a] To assess the potential for adverse health effects associated with exposure to volatile organic chemical (VOC) concentrations in the ambient air above the landfill, chemical-specific risk-based screening levels in groundwater (RBSLgw) were compared with maximum detected groundwater concentrations. The $RBSL_{gw}$ were back-calculated using Region 9 ambient air PRGs and volatilization factors relating the concentration of each chemical in groundwater and its potential concentration in ambient air (VF_{wamb}).

[b] COCs were selected according to the following general guidelines. First, because the exposure pathway assumes chemicals migrate from the FWBZ through the vadose zone into the ambient air, only VOCs were considered as potential COCs. Second, using the complete set of groundwater results (see Appendix I for complete groundwater results), the VOCs were evaluated for frequency of detection and maximum detected concentration. Chemicals detected less than five percent of the time and for which the maximum detected concentration was less than 10 percent of the EPA Region 9 tap water PRG were eliminated as COCs.

[c] Calculated as described in ASTM (1997) using parameter values presented in Tables C.5.4-10 and C.5.4-11.

[d] EPA (1998a).

TABLE C.5.4-12 (Continued)
ALAMEDA POINT OU3 HHRA
COMPARISON OF CHEMICAL-SPECIFIC RISK-BASED SCREENING LEVELS[a]
TO MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS

[e] Calculated as VF_{wamb}/EPA Region 9 ambient air PRG (ASTM 1997).

[f] The maximum concentrations presented represent concentrations detected at all depths of the aquifer beneath Site 1. However, realistically, only VOCs present in the FWBZ are likely to volatilize into the ambient air. Complete groundwater results are presented in Appendix I.

[g] The maximum detected concentration presented for vinyl chloride was detected in May 1998 in the deepest portion of the aquifer. In the last five years, only twice has vinyl chloride been detected in the FWBZ at a concentration greater than the RBSL: 7,300 μg/L at well M028 in November 1997 and 4,200 μg/L at well M028 in October 1994. However, from 1998 to the present vinyl chloride has not been detected in the FWBZ at a concentration exceeding the risk-based screening level. Therefore, considering also that the risk-based screening level is based on residential exposure which is more conservative than either the recreational or occupational exposure scenarios evaluated at Site 1, vinyl chloride does not present a risk to receptors through inhalation of ambient air.

TABLE C.5.4-13
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS FOR RADIONUCLIDE DOSE AND RISK ASSESSMENT
RECREATIONAL EXPOSURE

Parameter	Value
Concentration	Site-specific (picoCuries/gram)
Ingestion Rate of soil [1]	6.25 milligrams per hour (mg/hr)
Exposure Time [2]	2.5 hours per day (hr/day)
Exposure Frequency[3]	242 days per year
Exposure Duration[4]	30 years
Inhalation Rate [4]	1.25 cubic meter per hour (m3/hr)
Time Exposure Fraction[5]	2.5 hours/24 hours = 0.1
Gamma Shielding Factors[5]	Inhalation - 0.4 External - 0.7

Notes:

[1] EPA 1997a. RME Value of 6.25 mg/hr equates to 100 mg/day

[2] Time-Weighted RME value is based on RME values of 1 hour/day up to age 5 years (DTSC 1992), 5.6 hr/day for children up through age 11 and 1.5 hours/day for ages 12-30 years (EPA 1997a). Average value is time-weighted average based on AVG values of 1 hour per day up to age 5 years (DTSC 1992), 5.6 hours/day for children up through age 11 and 0.5 hours per day for ages 12-30 (EPA 1997a).

[3] DTSC 1992. RME values of 4 days per week to age 5 and 5 days per week for ages 6-30 years. AVG value based on 2 days per week

[4] EPA 1989.

[5] DOE 1990.

TABLE C.5.4-14
ALAMEDA POINT OU3 HHRA
EXPOSURE PARAMETERS FOR RADIONUCLIDE DOSE AND RISK ASSESSMENT
OCCUPATIONAL EXPOSURE

Parameter	Value
Concentration	Site-specific (picoCuries/gram)
Ingestion Rate of soil [1]	50 milligrams per day (mg/day)
Exposure Time [1]	8 hours per day (hr/day)
Exposure Frequency[1]	250 days per year
Exposure Duration[1]	25 years
Inhalation Rate [2]	0.83 cubic meter per hour (m3/hr)
Time Exposure Fraction[3]	8.0 hours/24 hours = 0.3
Gamma Shielding Factors[3]	Inhalation – 0.4 External – 0.7

Notes:

[1] EPA 1997a.

[2] EPA 1989.

[3] DOE 1990.

TABLE C.5.4-15
ALAMEDA POINT OU3 HHRA
HUMAN HEALTH RISK ASSESSMENT
DERMAL ABSORPTION FACTORS

CHEMICALS	DERMAL ABSORPTION FACTORS FROM EPA (1998a)	DERMAL ABSORPTION FACTORS FROM DTSC (1994)
Chlorinated Insecticides	0.1	0.05
DDT	0.03	0.05
Chlordane	0.04	0.05
Polycyclic aromatic hydrocarbons	0.13	0.15
Organophosphates	0.1	0.25
Pentachlorophenol	0.25	0.25
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans	0.03	0.03
Polychlorinated Biphenyls (PCBs)	0.14	0.15
Other Organic Chemicals	0.10	0.10
Cadmium	0.01	0.001
Arsenic	0.03	0.03
Hexavalent Chromium	0.01	0
Other metals and complexed cyanides	0.01	0.01
Free cyanide	0.01	0.10

TABLE C.5.4-16
ALAMEDA POINT OU3 HHRA
EXPOSURE ASSESSMENT
VOLATILIZATION FACTORS

Chemical	Henry's Law Constant[1] (dimensionless)	Soil-water Partition Coefficient[2] (L/kg)	Volatilization Factor[3] (m^3/kg)
Acetone	0.0016	0.22	12,904
Acenaphthene	0.0063	460	176,382
Anthracene	0.0027	1,00	538,650
Benzene	0.23	6.5	2,777
Bis(2-chloroethyl)ether)	0.00074	75.9	664,063
Carbon Disulfide	1.24	4.57	1,191
Chloroform	0.15	3.1	2,640
Chloromethane	0.98	3.5	1,175
2-Chlorophenol	0.016	40.0	30,675
1,2-Dichlorobenzene	0.078	114.8	477
1,4-Dichlorobenzene	0.0996	117.5	12,952
1,1-Dichloroethane	0.23	3.0	2,425
1,1-Dichloroethene	1.07	6.5	1,431
1,2-Dichloroethane	0.040	1.4	388
1,2-Dichloroethene[4]	0.28	6.2	2,907
1,2-Dichloropropane	0.115	4.7	3,679
Ethylbenzene	0.323	22	5,219
Ethylene Dibromide	0.013	2.8	9,301
Fluorene	0.00261	730	372,020
2-Methylnaphthalene	0.0198	130	45,168
Naphthalene	0.0198	130	45,168
Tetrachloroethene	0.754	66.1	2,802
Toluene	0.272	25.7	4,198
1,1,1-Trichloroethane	0.705	15.0	2,212
Trichloroethene	0.422	12.6	3,219
Vinyl Chloride	1.11	18.6	1,306
Xylene	0.22	24.0	6,084

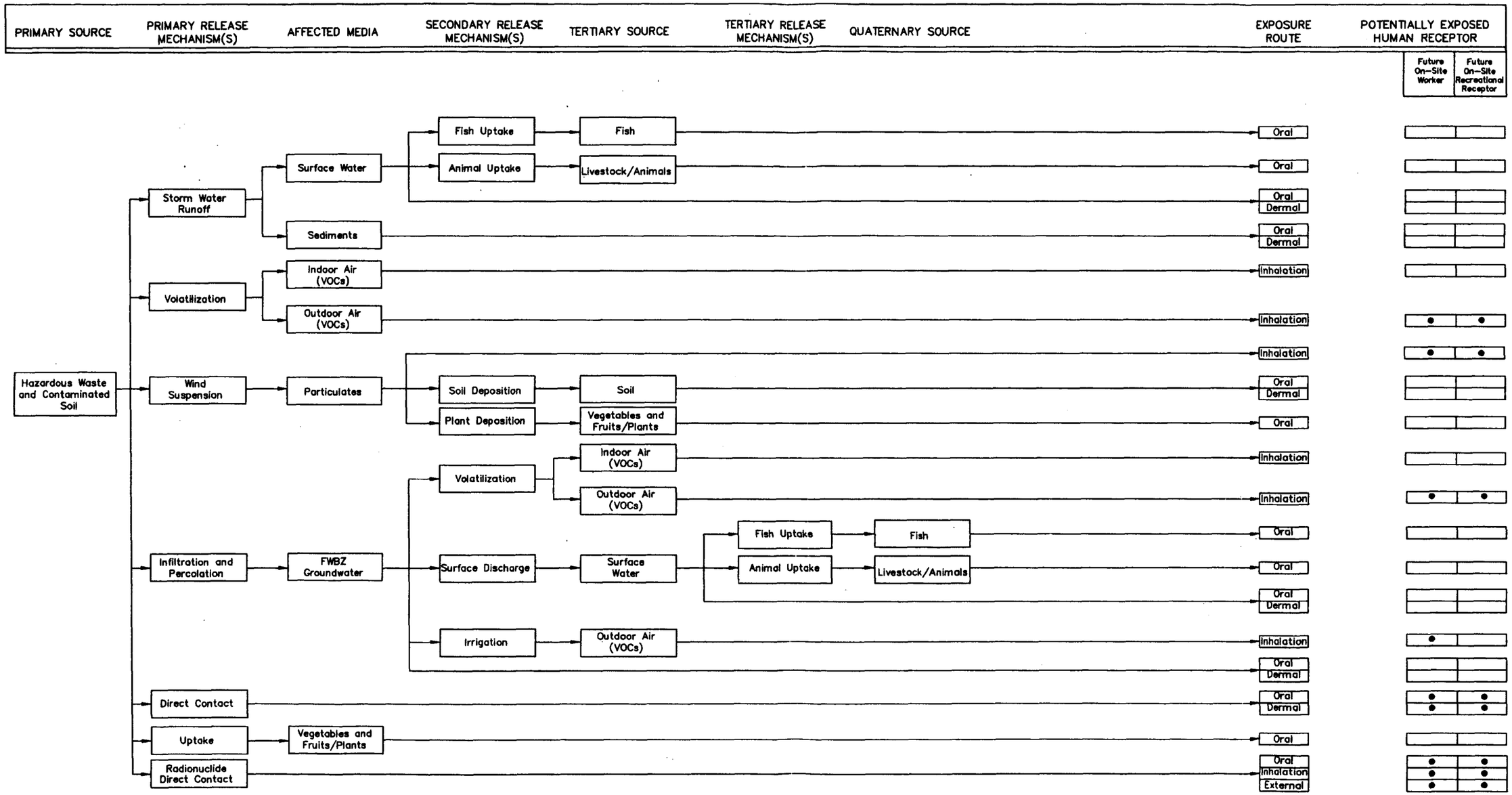
Notes:

[1] Henry's Law Constants from Soil Screening Guidance: Technical Background Document (EPA 1996b) and DTSC 1994.

[2] Soil-water partition coefficient (Kd) calculated from organic carbon partition coefficient multiplied by organic carbon content of soil (EPA 1996b). Organic carbon content is 0.1 (DTSC 1992)

[3] Volatilization factors calculated using equations presented in EPA 1998a. The inverses of these values were used in the exposure algorithms.

[4] Values in this table represent the average of values for cis-1,2-dichloroethene and trans-1,2-dichloroethene.



First water-bearing zone (FWBZ)
Volatile organic compounds (VOC)

FIGURE C.5-1
CONCEPTUAL SITE MODEL
POTENTIALLY COMPLETE EXPOSURE PATHWAYS
ALAMEDA POINT

Q:\NAVYOUT\J009NAVY\J009006a.dwg.dwg 09/08/1998 12:25:49

LEGEND
- WELL LOCATION
- ALAMEDA POINT BOUNDARY
- ROAD
- WATER

NOTE:
WELL LOCATIONS BASED ON CALIFORNIA DEPARTMENT OF WATER RESOURCES AND EAST BAY MUNICIPAL UTILITY DISTRICT RECORDS.

N

500 0 500 1000
SCALE: 1" = 1000'

FIGURE C.5-2
OFF-BASE WELL LOCATIONS
ALAMEDA POINT
ALAMEDA, CALIFORNIA

12/24/96 /data/alameda/gis/offroads.mxd /data/alameda/gis/offroads.map

C.6 TOXICITY ASSESSMENT

The toxicity assessment focuses on Site 1 COCs. Standard toxicological methodologies for assessing the toxicity of chemicals involve quantifying the dose-response relationships for adverse human health effects associated with exposure to specific chemicals. For carcinogenic health effects, carcinogenic slope factors (CSF) are used to estimate the incremental lifetime cancer risk (ILCR) of developing cancer corresponding to chemical intake. CSFs correspond to specific routes of exposure. The potential for noncarcinogenic adverse health effects for oral exposures is typically evaluated by comparing estimated daily intakes with chronic reference doses (RfD), which are "defined as an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA 1989). Reference concentrations (RfC) present the same information for inhalation exposures; RfCs are typically converted to units of milligrams per kilogram-day (mg/kg-day) and called inhalation RfDs to be consistent with the exposure algorithm methodology.

Qualitative and quantitative toxicity values and EPA and DTSC-derived toxicity values were gathered for all Alameda Point COCs. Detailed toxicity profiles were prepared for each COC. Sources of toxicity values include IRIS (EPA 1998b), HEAST (EPA 1995a), the Superfund Health Risk Technical Support Center (SHRTSC), and California Office of Environmental Health Hazard Assessment (Cal/EPA 1994). IRIS is a computerized EPA database containing verified toxicity values and up-to-date human health toxicological and EPA regulatory information for most commonly used chemicals. HEAST is a source of nonverified provisional toxicity information that was used when toxicity information is not available from IRIS. The SHRTSC provides provisional toxicity information on a chemical-specific basis for chemicals not listed in either IRIS or HEAST. The SHRTSC, a department of EPA's Environmental Criteria and Assessment Office, was contacted for information on any chemical lacking a toxicity value from IRIS or HEAST, per EPA Guidance (EPA 1989). All available information was used in the risk assessment. Carcinogenic toxicity values are available for some chemicals from Cal/EPA. These values are sometimes identical to EPA values, but do not include noncarcinogenic values.

Carcinogenic chemicals and associated risks were evaluated and presented separately from noncarcinogenic chemicals in the Alameda Point HHRA. The following information is presented for each carcinogenic COC:

- The current CSF from EPA and DTSC databases
- Weight-of-evidence classification

- Type of cancer for Class A carcinogens

Toxicity equivalency factors (TEFs) for dioxins and polycyclic aromatic hydrocarbons (PAHs) from EPA and DTSC were used to adjust toxicity values for these chemicals relative to 2,3,7,8-tetrachlorodibenzodioxin and benzo(a)pyrene, respectively.

The following information was gathered from all available sources and presented for all noncarcinogenic COCs:

- Current RfDs and RfCs and the toxicological basis for these values
- Overall database and critical study on which the toxicity value is based
- Target organs and uncertainty factor
- Possible biochemical mechanism(s) of toxicity

COCs that do not have EPA-derived toxicity values for exposure routes relevant to Alameda Point exposures are identified in the toxicity profiles and have been qualitatively evaluated in the risk characterization for each site. In the case of dermal exposure, toxicity values were derived from oral toxicity values. In doing so, no adjustment was made to the oral RfDs and CSFs to take into account differences in gastrointestinal and dermal absorption per EPA Region 9 guidance (EPA 1998a). DTSC also prefers the use of unadjusted toxicity values for estimating risks and hazard indices from dermal exposure. However, risks due to dermal exposure were calculated separately for EPA and DTSC due to methodology differences.

Many chemicals have oral toxicity values, but no inhalation toxicity values. Per EPA guidance (EPA 1996b) a route-to-route extrapolation is generally not recommended, with the possible exception of the following chemicals: acetone, bromodichloromethane, chlorodibromomethane, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 2-chlorophenol, DDE, 2,4-dichlorophenol, 2,4-dinitrotoluene, 2,6-dinitrotoluene, gamma-HCH, isophorane, n-nitrosodi-n-propylamine, and pentachlorophenol. For these 14 chemicals only, the oral toxicity values were directly extrapolated to the inhalation pathway. This procedure does not account for route of administration, target organ, portal of entry effects, and other physicochemical effects as required by EPA guidance (EPA 1994a, SHRTSC 1994), but was requested by the EPA Region 9 toxicologist. Route-to-route extrapolation in this manner increases the uncertainty of the risk assessment results.

Radionuclide toxicity is assessed differently from non-radioactive chemicals. EPA classifies all radionuclides as known human carcinogens (Class A). Cancer slope factors for radionuclides (RSFs) are available from EPA (1995) for ingestion, inhalation, and external exposures. The ingestion and inhalation slope factors "are central estimates in a linear model of the age-averaged, lifetime attributable radiation cancer incidence (fatal and nonfatal cancer) risk per unit of activity [picocuries, pCi] inhaled or ingested" (EPA 1995a). Unlike CSFs, radionuclide ingestion and inhalation CSFs are not expressed as a function of body weight and time, due to the methodology used to estimate RSFs. The ingestion and inhalation RSFs are expressed in units of risk per pCi (risk/pCi). External exposure slope factors are "central estimates of lifetime attributable radiation cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil, and are expressed as risk per year per pCi/g soil"(EPA 1995a). The RSFs can be used to estimate lifetime cancer risks to members of the general population due to radionuclide exposure (EPA 1995a). The RSFs used in this assessment include an adjustment for the ingrowth of daughter products, which is the more conservative approach.

Toxicity profiles for all COCs in OU-3 are provided below. A summary of toxicity values is also provided in Tables C.6-1 and C.6-2, following the chemical-specific toxicity profiles.

C.6.1 Acetone

Acetone is widely used in industry as a neutral organic solvent for oils, waxes, varnishes, and plastics. Like all organic solvents, acetone has the ability to dissolve fats and can dry out tissue, particularly skin, on contact. Due to its high volatility, it is readily absorbed by ingestion and can to a lesser extent penetrate the skin barrier. Transient irritation in the eyes, nose, and throat can result from exposure to acetone vapor, but damage is not usually extensive or protracted (Cornish 1975). In addition to its irritant properties, it produces narcotic effects on the central nervous system in humans at elevated atmospheric concentrations.

Studies in laboratory animals have revealed that the predominant adverse effect resulting from subchronic oral exposure to acetone is an increase in organ weights, primarily involving the liver and kidney. These changes were, for the most part nonlethal. There were no significant toxic effects from chronic inhalation of low doses. A number of studies indicate that acetone potentiates the liver toxicity induced by other organic solvents such as carbon tetrachloride and TCA.

Acetone is a class D carcinogen (not classifiable) in EPA's weight-of-evidence classification system (EPA 1998b), indicating that there is a lack of human data and insufficient or equivocal animal data. Based on *in vitro* tests, in which acetone produced no chromosomal aberrations or sister chromatid exchanges, it is not considered to be mutagenic or teratogenic.

The RfD for acetone is 0.1 milligrams per kilogram-day (mg/kg-day), with an uncertainty factor of 1,000 (EPA 1998b). The critical effect is based on laboratory experiments revealing an increased kidney weight; investigators also noted a dose-dependent correlation with hyaline droplet formation in the kidneys.

C.6.2 Aluminum

Aluminum is distributed throughout in nature. Absorption of aluminum and aluminum compounds following ingestion is minimal. This is because aluminum salts can be converted to aluminum phosphate salts in the gastrointestinal tract preventing absorption and increasing excretion in the feces. Normal daily intake averages 10 to 100 mg in the diet.

Some aluminum salts and compounds have therapeutic applications. Massive oral doses of aluminum, however, cause gastrointestinal disturbance and may interfere with phosphate absorption to produce bone deformations characterized by rickets. Inhalation of aluminum dust has been associated with lung fibrosis in occupational workers with histories of lengthy and heavy exposure. Based on occupational experience, there is little evidence of toxicity at low levels of aluminum (Stokinger 1981).

The EPA has not determined the carcinogenic potential for aluminum, but a RfD is available from the Superfund Health Risk Technical Support Center (SHRTSC 1994). The provisional RfD for aluminum is 1.0 mg/kg-day.

C.6.3 Antimony

Antimony has a highly complex chemistry and is a common pollutant in urban air. It is used as a metal to harden lead and copper and as a nonmetal to flameproof textiles. Antimony is an additive for rubber

and ceramics, and has recently found application in semiconductor devices. It is used medicinally as a parasiticide, an emetic, and an expectorant.

Antimony is moderately absorbed after oral doses. It is concentrated to some extent in the blood and liver. Excretion of the pentavalent form occurs primarily in the urine and the trivalent form in the feces.

Acute doses can produce local irritation. At high concentrations, antimony can cause death from pulmonary edema. Workers exposed by inhalation can develop gastrointestinal symptoms as well as contact lesions on the skin. Repeated exposure of workers can cause pneumoconiosis, liver damage, gastrointestinal ulcers, and an increase in heart disease. Isolated reports indicate adverse reproductive effects and lung tumors in exposed workers, but the results are inconclusive.

EPA has not determined the carcinogenic potential or derived a CSF for antimony. The oral RfD for antimony is 0.004 mg/kg-day and has an uncertainty factor of 1,000 (EPA 1998b). This value is based on the critical effects of changes in blood glucose and cholesterol and a decrease in longevity (EPA 1998b). No inhalation RfD has been derived.

C.6.4 Barium

Barium is widely distributed in the environment and is usually found with calcium. Studies suggest barium may be an essential element in trace amounts since barium-free diets cause abnormal growth in laboratory animals. At elevated levels, it is among the more toxic alkaline earth metals.

Absorption of barium compounds depends on the solubility of the compound. Approximately 2 percent present in the normal diet is absorbed. It is distributed throughout the body, with about two-thirds being deposited in the bones. Excretion is slow and occurs primarily through the feces. Little barium is excreted in the urine because almost all is reabsorbed in the renal tubules.

The effects of acute barium toxicity are observed primarily in skeletal muscle. The mechanism likely involves interference with potassium uptake from the gastrointestinal tract producing a hypokalemic condition. Following ingestion, gastrointestinal distress (nausea, vomiting, colic, and diarrhea) is initially observed. Later symptoms are manifested as peripheral nervous system disturbances and

electrocardiographic irregularities that can lead to cardiac fibrillation, general muscle paralysis, and death from respiratory arrest.

The chronic toxic effects of barium have not been well described, except for baritosis, a benign pneumoconiosis resulting from occupational inhalation exposures to barite, an insoluble sulfate salt. Chronic exposure in experimental animals, however, has been shown to produce hypertension.

The RfD for barium is 0.07 mg/kg-day (EPA 1998b) with an uncertainty factor of 3. This RfD is based on the critical effect of increased blood pressure in experimental animals. No inhalation RfD is recommended. Barium has not been classified as a carcinogen and no CSFs are available (EPA 1998b).

C.6.5 Benzene

Benzene is a highly volatile organic compound. Due to this physical characteristic, the primary route of exposure is inhalation where in humans an estimated 40 to 50 percent is absorbed into the bloodstream. Benzene is readily absorbed from the gastrointestinal tract following oral ingestion because of its lipophilic nature. In contrast, dermal absorption of benzene is limited. Benzene is distributed to fatty tissues in the body and has an affinity for adipose and nervous tissue, bone marrow, liver, spleen, and blood. In humans, approximately 12 percent of benzene is excreted unchanged in the exhaled air from the lungs. Benzene is metabolized in the liver to phenol that is subsequently excreted in the urine.

Acute benzene toxicity is manifest as central nervous system depression, dizziness, headache, drowsiness, and loss of consciousness. Fatal intoxication involves respiratory failure and circulatory collapse. Chronic exposure can result in central nervous system (CNS) and gastrointestinal effects. However, the primary pathological target is the bone marrow, the principal blood forming organ in adults. Symptoms include anemia, leukemia, and thrombocytopenia as well as other hematologic abnormalities. Triggered by chronic benzene exposure, these hematologic abnormalities may progress to leukemia. Benzene does not appear to be teratogenic.

Benzene is a class A carcinogen, based on nonlymphocytic leukemia associated with occupational exposures and neoplasia in experimental animals. The EPA and California EPA CSFs are 0.029 and

0.1 (mg/kg-day)$^{-1}$, respectively (EPA 1998b, Cal/EPA 1994). The EPA has not derived a RfD for benzene.

C.6.6 Beryllium

Beryllium is not readily absorbed by any exposure route. When inhaled, beryllium is retained in the lungs, where it is relatively immobile. The limited amount entering the bloodstream is deposited in bone, liver, or spleen. It is excreted primarily in the urine.

Occupational inhalation exposures can produce a chronic pulmonary disease known as berylliosis. However, the most common occupational condition involves skin lesions and may be of three types: dermatitis, ulceration, and granulomas. Both pulmonary and skin diseases may result, at least in part, from an immunological reaction to beryllium. Inhalation exposure to soluble compounds of beryllium in excess of 0.1 milligram per cubic meter can result in an acute pulmonary distress that may include nasopharynigitis, tracheobronchitis, and sometimes a fulminating pneumonitis. These exposure conditions, however, are found only in areas where beryllium is being manufactured.

Beryllium is a B2 carcinogen (a probable human carcinogen) (EPA 1998b). The California oral CSF is 7.0 (mg/kg-day)$^{-1}$ (Cal/EPA 1994). EPA does not consider beryllium to be carcinogenic via ingestion (EPA 1998b). The inhalation CSFs from EPA and DTSC are 8.4 and 7.0 (mg/kg-day)$^{-1}$, respectively. The RfD for beryllium is 0.002 mg/kg-day with an uncertainty factor of 100. This RfD is based on the no observed adverse effects level (NOAEL). The inhalation RfD is 0.006 mg/kg-day with an uncertainty factor of 10, based on intestinal lesions and beryllium sensitization (EPA 1998b).

C.6.7 Cadmium

Cadmium is most often associated with occupational exposure during the production of zinc or lead and in metal plating. Environmental exposures usually result from leaching of cadmium from galvanized, copper, or plastic pipes into drinking water. The extent to which cadmium is absorbed from the gastrointestinal tract depends on the solubility of the particular mineralogic form and whether cadmium is ingested as food or drinking water. Typically, about 5 percent is absorbed from drinking water and 2.5 percent from food. However, various dietary factors such as calcium and iron deficiencies may alter absorption. Cadmium is predominately concentrated in the kidneys, but may be contained in the

liver at elevated concentrations as well. Excretion via the urine is the primary route of elimination and is exceedingly slow. Cadmium is retained in the body for long periods with the biologic half-life estimated to be between 19 and 38 years.

The acute toxic effects of cadmium are rarely manifested, but include gastrointestinal distress, dermal irritation, and inflammation. Immediate death may be caused by shock and dehydration. If exposed individuals survive these acute effects, death can result from renal and cardiopulmonary failure after a short latent period. Several epidemics have resulted when cadmium leached from ceramic containers containing acidic media, such as fruit juices. Zinc and selenium can protect against cadmium toxicity through an unknown mechanism.

Chronic toxicity has been seen primarily in workers exposed to cadmium fumes and dusts and in Japanese villagers who ingested cadmium-contaminated water and rice. Chronic occupational exposure to fumes results in cadmium-induced emphysema and kidney damage. Proteinuria is one of the earliest and most sensitive diagnostic symptoms of cadmium toxicity. Female Japanese villagers also reported severe joint and muscle pains that progressed to osteomalacia with consequent multiple fractures. Epidemiological and animal studies have revealed an association between cadmium and hypertension, but direct cause and effect have not been unequivocally established. Parenteral doses of cadmium have been shown to decrease testosterone levels and produce adverse effects on the testis and prostate of test animals. There are preliminary indications that the prostate may be a target organ in workers breathing cadmium fumes.
The RfDs for cadmium is 0.0005 and 0.001 mg/kg-day for water and food, respectively (EPA 1998b). Underlying these values is an uncertainty factor of 10. Proteinuria, indicative of renal dysfunction, is the critical effect on which these values are based.

Cadmium is a class B1 carcinogen (probable human carcinogen) based on epidemiological studies (EPA 1998b). However, it has been shown to induce cancer in the lungs only by the inhalation route of exposure. The unit risk for inhalation is 0.0018 microgram per cubic meter ($\mu g/m^3$) corresponding to a CSF of 6.3 $(mg/kg\text{-}day)^{-1}$. The California inhalation CSF is 15 $(mg/kg\text{-}day)^{-1}$ (Cal/EPA 1994). Studies thus far conducted have been unable to demonstrate a positive correlation between orally ingested cadmium and carcinogenicity. Although there appears to be conflicting evidence of cadmium-induced mutagenicity, it is generally thought to be nonmutagenic or only weakly mutagenic.

C.6.8 Carbazole

Carbazole has a white crystalline form and is used an pesticide as well as dye intermediate and in making photographic plates sensitive to ultraviolet lights (Merck 1983). It is insoluble in water (Lewis 1991).

EPA has published provisional carcinogenic information about carbazole. It is classified as a B2 carcinogen (probable human carcinogen) with an oral CSF of 0.02 (mg/kg-day)-1 (EPA 1995a). This is based on liver tumors in experimental animals.

C.6.9 Chlorinated Ethane Derivatives: DDT, DDD, DDE

The chlorinated insecticide known as DDT was widely used. In practical application, the technical grade of DDT consisted of 77 percent DDT, 15 percent DDD, and 4 percent DDE. Although classified by EPA as a probable carcinogen (B2), the systematic manifestation of noncarcinogenic pathological effects suggests that DDT is not highly toxic. This is indicated by the dose-response relationship. They are highly persistent in the environment and are stored in body fat of higher organisms, leading to biomagnification. DDT is poorly absorbed through the skin and was directly applied to humans to control lice.

The primary targets of DDT poisoning are the peripheral and central nervous systems. Both sensory and motor nerve fibers are affected as well as the motor cortex in the brain. Symptoms of poisoning include paresthesia, apprehension, dizziness, disturbed equilibrium, tremor, and colonic convulsions.

DDT, DDD, and DDE are class B2 carcinogens based on the induction of lung, liver, and thyroid tumors. The EPA and California CSF is 0.34 $(mg/kg\text{-}day)^{-1}$ for both DDT and DDE and 0.24 $(mg/kg\text{-}day)^{-1}$ for DDD.

The RfD for DDT is 0.005 mg/kg-day with an uncertainty factor of 100. This RfD is based on the critical effects of liver lesions in experimental animals (EPA 1998b). There are no RfDs for DDD and DDE.

C.6.10 Chlorobenzene

Chlorobenzene is mainly used for dry cleaning, as a solvent, and in adhesives. Other names for chlorobenzene are benzene chloride, chlorobenzol, and MCB. It is an irritant to the skin and mucous membranes. In addition, acute exposures can cause narcosis and CNS depression. Chlorobenzene exposure by inhalation may cause lung, liver, and kidney damage.

Chlorobenzene is a class D carcinogen. The oral RfD is 0.02 with an uncertainty factor of 1,000. The RfD is based on a critical effect of histopathic changes in the liver. An inhalation RfD is not currently available (EPA 1998b).

C.6.11 Chloroform

Chloroform is used as a grain fumigant; solvent for pesticides, adhesives, fats, oils, rubbers, alkaloids, and waxes; as a chemical intermediate for dyes and pesticides; and as a component of cough syrups, toothpastes, and liniments. It is also an environmental degradation product of carbon tetrachloride, and is formed from the interaction of chlorine with organic material in drinking water as a by-product of chlorination.

Chloroform is well absorbed by all routes: oral, inhalation, and dermal. Once absorbed, it is widely distributed throughout the body, with high concentrations accumulating in adipose tissue and in organs with high fat content, particularly the brain. Some chloroform is exhaled unchanged, but most is oxidized primarily in the liver to the intermediate phosgene, then to carbon dioxide, which is subsequently exhaled. The ratio between metabolized and unmetabolized excretion is difficult to predict because it varies with species, sex, amount of body fat, dose, and other factors.

The primary adverse effect noted after single doses of chloroform is CNS depression that can proceed to the level of anesthesia with extensive exposure to high concentrations. Chloroform was used as a general anesthetic for decades until studies revealed that single doses were capable of causing serious and even fatal liver and kidney damage in some patients. It also occasionally caused cardiac arrest. Acute exposure via inhalation can result in disruption of body temperature regulation and respiration, as well as cardiovascular and vasomotor functions. The major target organs with repeated doses are the liver and kidneys.

Chloroform is a class B2 carcinogen based on its ability to induce liver and kidney tumors in rats and mice (EPA 1998b). The EPA and California oral CSFs are 0.0061 and 0.031 $(mg/kg\text{-}day)^{-1}$, respectively (EPA 1998b, Cal/EPA 1994). Numerous studies of humans have found evidence of increased cancer rates in persons drinking chlorinated drinking water, but a direct correlation between chloroform and tumor formation has not been established. In several animal reproductive toxicity studies, chloroform affected the neonates only at doses that had significant adverse effects on the mothers. The EPA and DTSC inhalation CSFs are 0.081 and 0.019 $(mg/kg\text{-}day)^{-1}$, respectively (EPA 1998b, Cal/EPA 1994).

The RfD for chloroform is 0.01 mg/kg-day with an uncertainty factor of 1,000 (EPA 1998b). The critical effect for this RfD is fatty cyst formation in livers of experimental animals.

C.6.12 Chromium

Chromium is an element that occurs naturally in many different mineralogic forms and is present at high concentrations at mining sites. Chromium has many industrial uses including steel fabrication, paint manufacturing, and chrome plating.

The primary routes of chromium exposure are ingestion and inhalation. Its absorption from the lungs and gastrointestinal tract is significant but not complete. Chromium exists in a variety of oxidation states. Like several other elements, its toxicity depends on the particular species under investigation (ATSDR 1987f). Hexavalent chromium is the most toxic, and EPA-derived carcinogenic toxicity values apply exclusively to the hexavalent form (EPA 1998b). Examples of the more familiar forms of hexavalent chromium are the soluble salts potassium dichromate, sodium dichromate, potassium chromate, and sodium chromate. In contrast to the toxicity of the hexavalent form, trivalent chromium is an essential nutrient. Chromium is necessary for several biochemical reactions in carbohydrate metabolism and insulin production. Preliminary evidence indicates that hexavalent chromium is reduced *in vivo* to trivalent chromium. This may represent a significant detoxification mechanism.

Acute chromium toxicity, although seldom seen, is characterized by hemorrhage and fluid loss leading to hypovolemic shock. Chronic toxicity is most commonly reported after industrial exposure to chromate, or to mixed chromate and chromic acid forms of chromium. In this setting, the routes of exposure are inhalation and dermal contact, with pathological effects developing at the site of exposure.

Thus, typical symptoms of chronic exposure involve allergic contact dermatitis, skin ulcers, rhinitis, and nasal ulceration with nasal septum perforation. Indeed, this latter condition is so characteristic of chromium exposure that the perforations are commonly referred to as "chrome holes". Lung tumors are common in chromate-exposed workers, and particularly in those who smoke cigarettes, who appear to be predisposed. Although not as common, liver and kidney lesions have also been reported.

Hexavalent chromium is a class A carcinogen. Epidemiological studies have revealed a positive dose-response relationship between occupational exposure to hexavalent chromium and lung cancer. The EPA inhalation CSF value is 42 $(mg/kg\text{-}day)^{-1}$ (EPA 1998b). The California oral CSF value is 0.42 $(mg/kg\text{-}day)^{-1}$, and the California inhalation CSF is 510 $(mg/kg\text{-}day)^{-1}$ (Cal/EPA 1994).

Trivalent chromium is noncarcinogenic. EPA has developed an oral RfD of 0.005 mg/kg-day for trivalent chromium (EPA 1998b). No inhalation RfD is available.

C.6.13 Copper

Copper is abundant in different chemical forms in numerous ores. It is an essential trace mineral necessary for the production of hemoglobin, for connective tissue maintenance, and in the proper functioning of many metabolic enzymes. Copper deficiency can result in hyperchronic microcytic anemia. At elevated levels, however, it can produce toxic effects. Soluble copper salts are well absorbed by the body. Following absorption, copper is concentrated in the liver, where it is bound in large part to metallothionein, and in bone marrow. Excretion is through the bile into the feces.

Acute toxic effects include gastrointestinal irritation, vomiting (including blood), low blood pressure, jaundice due to liver necrosis, and coma. Some cases of hemolytic anemia have been seen. Chronic toxicity is known as Wilson's disease, an inborn metabolic deficiency (Scheinberg 1980). This causes accumulation of copper, with lesions in the liver, brain, and eye, plus hemolytic anemia. It is treated by removing the excessive copper from the body with a suitable chelating agent. In the absence of this disease, chronic copper toxicity is practically unknown due to the body's homeostatic mechanisms. In limited animal teratogenicity studies, copper has some effects at quite high doses.

Copper is a class D carcinogen that does not have a CSF (EPA 1998a). The EPA has not derived an RfD for copper but a noncarcinogenic toxicity value of 0.037 mg/kg-day can be calculated from the maximum level permissible in water (EPA 1995a).

C.6.14 Cyclodienes: Aldrin, Chlordane, Dieldrin and Heptachlor

Chlorinated cyclodiene insecticides that are structurally related by the same mechanism of action include aldrin, chlordane, dieldrin, and heptachlor. In biological systems, aldrin is metabolized to dieldrin and they are both further oxidized to epoxides. Like DDT, the cyclodienes are persistent in the environment and accumulate in fatty tissue of biologic organisms.

Unlike DDT, dermal absorption of these compounds is high. The dermal median lethal dose (LD50) in rats, for instance, is only 2 to 3 times the oral LD50. Their environmental persistence and accumulation in the food chain can be attributed to preferential partitioning into fat deposits. For example, the fat:blood concentration ratio can be as high as 2,200:1 for dieldrin. Cyclodiene elimination from these fat stores is slow. The estimated half lives for dieldrin and chlordane are 9 months and 34 days, respectively, with excretion via the urine, feces, and bile.

The central and peripheral nervous systems are the target organs, and headache, nausea, vomiting, dizziness, and mild chronic jerking are the characteristic symptoms. The severity of these symptoms can advance to convulsions. The cyclodienes can also produce liver damage. In terms of relative toxicity, aldrin and dieldrin are approximately twice as toxic as heptachlor and approximately 7 to 8 times as toxic as chlordane (Hayes and Laws 1991).

All four cyclodienes are class B2 carcinogens based on liver tumors in experimental animals. The EPA CSFs are: aldrin, 17.0 $(mg/kg\text{-}day)^{-1}$; chlordane, 0.35 $(mg/kg\text{-}day)^{-1}$; dieldrin 16.0 $(mg/kg\text{-}day)^{-1}$; and heptachlor 4.5 $(mg/kg\text{-}day)^{-1}$ (EPA 1998b). With the exceptions of heptachlor and chlordane, which have California CSFs of 5.7 and 1.2 $(mg/kg\text{-}day)^{-1}$, respectively, EPA and California CSFs are identical (Cal/EPA 1994).

The RfDs for cyclodienes are: heptachlor, 0.0005 mg/kg-day; chlordane, 0.0005 mg/kg-day; aldrin, 0.00003 mg/kg-day; and dieldrin, 0.00005 mg/kg-day. These are based on the critical effect of

pathologic changes in the liver and increased liver weight of experimental animals. The inhalation RfD for chlordane is 0.29 mg/kg-day, also based on hepatic effects (EPA 1998b).

C.6.15 1,2-Dichlorobenzene

The compound 1,2-dichlorobenzene is mainly used as a solvent, insecticide, a chemical intermediate, and an ingredient of metal polishes. It is a skin, eye and mucous membrane irritant, a CNS depressant, and causes damage to the liver and kidneys. The primary entry routes are inhalation and skin absorption. The compound 1,2-dichlorobenzene is also known as o-dichlorobenzene and DCB.

Studies with laboratory animals have revealed that oral exposure to 1,2-dichlorobenzene causes increased liver and kidney weights and increased renal tubular regeneration. Acute effects of inhalation exposure include irritation to the eyes, nose and throat, and CNS depression. Chronic exposure can result in weight loss and adverse effects to the liver, kidney and spleen.

The compound 1,2-dichlorobenzene is class D carcinogen (not classifiable) based on no human data and evidence for both negative and positive trends for carcinogenic responses in rats and mice (EPA 1998b).

The RfD for 1,2-dichlorobenzene is 0.09 mg/kg-day with an uncertainty factor of 1,000 (EPA 1998b). The RfD is based on a no observed adverse effect level of exposure.

C.6.16 1,3-Dichlorobenzene

Very limited toxicological information is available for 1,3-dichlorobenzene (1,3-DCB). A risk assessment for 1,3-DCB is under review by EPA, which classifies 1,3-DCB as a class D carcinogen. A RfD for 1,3-DCB is not currently available (EPA 1998b). For this report, the toxicity values developed for 1,2-dichlorobenzene were used for 1,3-DCB.

C.6.17 1,4-Dichlorobenzene

1,4-Dichlorobenzene (1,4-DCB) is used as an insecticidal fumigant, particularly in the control of moths. Vapors from 1,4-DCB may cause irritation of the skin, throat, and eyes. Prolonged exposures to high concentrations may cause weakness, dizziness, weight loss and liver injury.

Cal/EPA lists oral and inhalation CSFs of 0.04 $(mg/kg\text{-}day)^{-1}$. These values are based on the critical effect of liver tumor induction (Cal/EPA 1994). EPA has not evaluated the carcinogenicity of 1,4-DCB.

EPA has developed an inhalation RfD for 1,4-DCB of 0.23 mg/kg-day. The RfD is based on the critical effect of increased liver weights in laboratory animals and has an uncertainty factor of 100 (EPA 1998b).

C.6.18 1,1-Dichloroethene

The compound 1,1-DCE, commonly known as vinylidene chloride, is used as a chemical intermediate, primarily for polymers such as modacrylic and saran fibers.

The compound 1,1-DCE is readily absorbed with oral, inhalation, and dermal exposures. It is oxidized and conjugated in the liver to metabolites that are excreted in the urine. Some of the parent compound, however, is exhaled unchanged. Metabolism appears to produce toxic derivatives, since experimental animals that readily metabolize 1,1-DCA are more sensitive to its toxic effects.

The primary effect of acute exposure to 1,1-DCE is fully reversible CNS depression. As a liquid, it is quite irritating to the skin, respiratory tract, and eyes. Repeated doses produce a variety of liver and kidney lesions. There have been numerous carcinogenicity studies, but the findings remain inconclusive. Reproductive toxicity is observed only at doses that produced maternal toxicity. Exposure to high concentrations via inhalation sensitizes the myocardium to arrhythmias by epinephrine injection.

The compound 1,1-DCE is a class C carcinogen based on the induction of several types of tumors in experimental animals. The EPA oral and inhalation CSFs are 0.6 and 0.18 $(mg/kg\text{-}day)^{-1}$, respectively (EPA 1998b). California does not list a CSF for this chemical (Cal/EPA 1994).

The RfD for 1,1-DCE is 0.009 mg/kg-day with an uncertainty factor of 1,000 (EPA 1998b). This RfD is based on the critical effect of hepatic lesions in experimental animals.

C.6.19 1,2-Dichloroethene

The compound 1,2-DCE exists in two isometric forms: cis and trans. Neither form has wide industrial use because they are very flammable and volatile, but the trans isomer is used as a solvent in materials such as dyes, perfume, waxes, resins, and thermoplastics. Both cis-1,2-DCE and trans-1,2-DCE are degradation products of the solvents tetrachloroethene and trichloroethene.

1,2-DCE is absorbed by all routes but has little potential to bioaccumulate. Due to the lipophilic mature of 1,2-DCE, tissues with a high lipid content would likely have the highest levels of 1,2-DCE in exposed receptors. ATSDR (1989b) reports that 1,2-DCE is metabolized in the body to chloroethylene epoxides; excretion of 1,2-DCE and its metabolites has not been well characterized.

This compound was once used as anesthetic in humans but there are no reports of long-term exposure to 1,2-DCE isomers. Acute exposure to concentrations in air of 1,2-DCE at 2,000 parts per million (ppm) causes burning of the eyes, vertigo, and nausea.

The RfD for trans-1,2-DCE is 0.02 mg/kg-day based on increased serum alkaline phosphatase levels in laboratory animals. The uncertainty factor associated with this RfD is 1,000 (EPA 1998b). The RfD for cis-1,2-DCE is 0.01 mg/kg-day (EPA 1998b) based on decreased hematocrit and hemoglobin levels in laboratory animals. The RfD for total 1,2-DCE (both isomers) is 0.009 mg/kg-day with an uncertainty factor of 1,000. This value is derived from the RfD for 1,1-DCE (EPA 1998b), which is based on hepatic lesions in experimental animals.

Carcinogenicity data are not available for 1,2-DCE. Neither isomer appears to induce genotoxic effects (EPA 1998b).

C.6.20 Lead

Lead is found in many environmental settings. It is commonly found at mining sites in the form of galena (PbS), cerussite ($PbCO_3$), and anglesite ($PbSO_4$) ores (Beliles 1975). Lead is also associated with the production and disposal of storage batteries and antiknock fuel additives, and has been widely used for pigments in paints as well as glazes and coloring on ceramic pottery.

The normal daily intake of lead for an adult is about 10 to 20 μg/day. ATSDR (1993) has estimated that the average may be between 37 and 50 μg/day for different groups based on age and sex. Normal adults absorb approximately 10 percent of an oral dose of a lead compound, depending on the particular form and the age of the individual (ATSDR 1993). However, absorption in children can be as high as 50 percent. High dietary levels of calcium and phosphorus can significantly reduce lead uptake, presumably interfering with uptake mechanisms in the gastrointestinal tract. In contrast, fasting increases the absorption of ingested lead.

In the lungs, about half the lead that reaches the alveoli is absorbed into the systemic circulation. Limited amounts of inorganic lead may also be absorbed through the skin when applied in high concentrations. Compared to inorganic forms, organic lead compounds are more readily absorbed through the skin. A lethal dermal dose in experimental animals is approximately six times the oral lethal dose.

Most (90 to 95 percent) absorbed lead is deposited in the mineral matrix of bone. The toxic effects of lead are due to interference with vital enzymes. Excretion, mostly in the urine, is very slow; the half-life of bone lead is about 20 years. Lead apparently continues to accumulate in humans throughout life.

Large doses of lead produce fatigue, sleep disturbances, and constipation, followed by colic, anemia, and neuritis. Chronic lead poisoning produces loss of appetite, metallic taste, constipation, anemia, pallor, malaise, weakness, insomnia, headache, nervous irritability, muscle and joint pains, fine tremors, damage to kidney tubules and in cases of high, long-term exposure, chronic nephritis. Other effects include certain muscular weaknesses ("wrist drop") and lead encephalopathy.

The most sensitive indicators of lead toxicity are changes in certain blood enzyme levels and neurobehavioral effects in children. Other signs of low-dose lead toxicity include learning deficits and growth retardation in children and hypertension in middle-aged men. Exposure to low doses of lead in childhood causes long-lasting effects that are thought to be irreversible. EPA has considered it inappropriate to develop an RfD for lead because the noncarcinogenic effects associated with exposure may occur at blood levels so low that a threshold is nonexistent. In other words, there may be no level of lead that is without adverse effects.

Lead has not been shown to be carcinogenic in humans, but many animal studies have found a significant increase in kidney tumors at the highest test dose. Although lead is a class B2 carcinogen, no CSFs are currently available (EPA 1998b). Lead produces severe reproductive toxicity, inducing premature deliveries and spontaneous abortions in women and sterility in men. Sensitivity to the adverse effects of lead extends from fetal development to the cessation of growth after puberty.

C.6.21 Manganese

Manganese is an essential element that is required for a number of metabolic reactions. It is sequestered primarily in the liver, kidney, intestine, and pancreas. Homeostatic mechanisms in the body maintain relatively constant tissue concentrations and are perhaps responsible for the lack of systematic toxicity following chronic oral exposure. As with many other metals, the valence state of manganese effects its toxicity and efficacy; trivalent manganese is the biologically active form while divalent manganese is more toxic (Stokinger 1981).

Occupational inhalation exposures may result in two disease states: a manganese pneumonitis following acute exposure, and a more insidious disease involving the CNS following long-term chronic exposure to high levels of manganese. The effects of the latter include encephalopathy in which behavioral and neurological changes similar to Parkinson's disease are manifest and may be accompanied by liver cirrhosis. Acute toxicity studies in experimental animals have revealed histopathologic changes, congestion, and edema in the lung. Different manganese compounds can also have opposing effects on red blood cells resulting in polycythemia vera or, conversely, hemolysis (Stokinger 1981).

Manganese is a class D carcinogen which has no CSF (EPA 1998b). The oral RfD for manganese is 0.14 mg/kg-day, with an uncertainty factor of 1, based on CNS effects. The inhalation RfD is 1.4E-5 mg/kg-day (EPA 1998b), with an uncertainty factor of 1,000. It is based on impairment of neurobehavioral function.

C.6.22 Mercury

Mercury is an element common throughout the environment. Inorganic mercury is poorly absorbed through the skin and gastrointestinal tract. Only about 7 percent of total mercury in food is bioavailable (Beliles 1975). Daily intakes under normal circumstances are estimated at 60 nanograms per day

(ng/day) from air, less than 2 ng/day from drinking water, and 5 to 10 ug/day from food (Stokinger 1981). The pharmacokinetics of absorption, distribution, and excretion are highly dependent on the particular chemical sate and valency of mercury. For example, divalent mercury and elemental mercury accumulate in the kidney, while only elemental mercury can effectively cross the blood-brain barrier.

Chronic intake of divalent mercury can result in kidney disease characterized by proteinuria (Beliles 1975). As mentioned, elemental mercury can breach the protective blood-brain barrier, where it can produce neuropathies in both central and peripheral nervous systems. These lesions are manifested as tremors in the extremities and neuropsychiatric disturbances such as irritability, insomnia, and emotional instability. In addition to systemic effects, dermal exposure to mercury can result in contact sensitization dermatitis.

The RfD for mercury is 0.0003 mg/kg-day, but this value is currently under review by the EPA (EPA 1998b). It is based on autoimmune effects and is associated with an uncertainty factor of 1,000.

Mercury is a class D carcinogen (EPA 1998b). There are no human data and animal data are insufficient. It has not been determined whether mercury is mutagenic because laboratory findings are inconclusive (EPA 1998b).

C.6.23 Nickel

The principal use of nickel is in nickel plating and the manufacturing of steel and other metal alloys. Nickel is poorly absorbed by the gastrointestinal tract. Upon reaching the systemic circulation, however, it concentrates in the kidneys and liver. The major route of excretion is urinary. Nickel is an essential trace mineral for some animals and may be essential to humans (Beliles 1975). Despite the lack of conclusive evidence that it is a human nutritional requirement, it is considered a normal constituent of the diet at low levels.

The particular form of nickel greatly influences its bioavailability and, consequently, its systemic toxicity. It has been demonstrated, for example, that there may be a 40-fold difference in absorption from the gastrointestinal tract between water soluble and nonsoluble forms. Nickel has not been shown to produce significant acute toxicity. Contact dermatitis and allergic sensitization are the most common

toxicological effects and typically result from wearing nickel containing jewelry. Dermal effects, however, can also be produced from systemic ingestion.

The major chronic effect of exposure to nickel is cancer of the respiratory tract resulting from inhalation of nickel carbonyl. Changes in the blood may also be manifested as an increase in circulating leukocytes and platelets.

The RfD for nickel is 0.02 mg/kg-day, with a cumulative uncertainty factor of 300. Decreased body and organ weights in laboratory animals are the critical effects upon which this value is based. Dermotoxicity and fetotoxicity are also sensitive adverse effects and were considered in the derivation of this value.

The EPA inhalation and DTSC CSFs for nickel are 0.84 (EPA 1998b) and 0.91 $(mg/kg\text{-}day)^{-1}$, respectively. However, the EPA value only applies to nickel refinery dust. The DTSC CSF value applies to all forms of nickel. It is a class A carcinogen, but only through the inhalation pathway.

C.6.24 Phthalates

Phthalates esters are widely used in polymer products as plasticizers, are common in the environment, and are detected in virtually all soil and water ecosystems. Some very flexible products may be half phthalate esters by weight. The most widely used phthalate monomers include di-n-butyl phthalate, n-butyl benzyl phthalate, diethylphthalate, di-n-octyl phthalate, and bis(2-ethylhexyl)phthalate, which is perhaps the best studied phthalate.

Phthalates are slowly absorbed from the gastrointestinal tract. There is no evidence of significant absorption via the lung or skin. Once absorbed, they are rapidly hydrolyzed to water soluble phthalic acid, which is excreted in the urine, and to compound-specific alcohols, which are generally metabolized to carbon dioxide.

With the exception of a few rare phthalates, the combination of poor absorption and rapid metabolism prevents the development of acute toxic effects from most exposures. The most common adverse effects are limited to local irritation including eye inflammation, eczema, nausea, abdominal cramps, and mild CNS depression. Repeated doses of phthalate monomers in experimental animals produce

lesions in the liver and testes. Phthalates can also cause general adverse, but nonspecific, effects on fetuses.

Bis(2-ethylhexyl)phthalate (BEHP)

BEHP is the most widely used phthalate and has a relatively acute toxicity. The median lethal dose (LD_{50}), delivered intraperitoneally, is between 13 and 16 gram per kilogram in mice. BEHP produces increased liver weight and disrupts lipid metabolism in experimental animals after chronic oral exposure. It is both fetotoxic and teratogenic, causing decreased fertility and damage to seminiferous tubules in mice and rats.

BEHP is a class B2 carcinogen based on liver tumor formation in experimental animals (EPA 1998b). The EPA and California oral CSFs are 0.014 and 0.0084 $(mg/kg\text{-}day)^{-1}$, respectively (EPA 1998b, Cal/EPA 1994). Cal/EPA also lists an inhalation CSF of 0.0084 $(mg/kg\text{-}day)^{-1}$.

The RfD for BEHP is 0.02 mg/kg-day with an uncertainty factor of 1,000. This RfD is based on the critical effect of increased liver weight (EPA 1998b).

C.6.25 Polychlorinated Biphenyls, Polychlorinated Dibenzodioxins, and Polychlorinated Dibenzofurans

Polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) are among the most persistent manmade compounds in the environment, resisting degradation for years. The PCB family of compounds contains 209 congeners, including Aroclor-1254 and Aroclor-1260; 11 of the 209 congeners are thought to have dioxin-like toxicity. There are 75 possible congeners of PCDD and 135 congeners of PCDFs. Only 7 of the 75 PCDD congeners and 10 of the 135 PCDF congeners are thought to have dioxin-like toxicity, specifically, those with chlorine substituted in the 2,3,7,8 positions of the ringed structures. PCDDs , PCDFs, and PCBs are primarily associated with particulate and organic matter in the environment because of their high lipophilicity and low water solubility. Dioxin-like compounds exhibit little potential for significant leaching or volatilization, once sorbed to particulate matter (EPA 1994b).

PCBs have excellent insulating and nonflammable properties, and have been used widely in the past as coolants and lubricants. The manufacture of PCBs was halted in 1977 due to their bioaccumulation in the environment. PCDDs and PCDFs, in contrast, are by-products from many sources. They may be formed during the combustion of chlorinated precursor chemicals, and are also formed through the chlorination of naturally occurring phenolic compounds such as those present in wood pulp. The manufacture of bleached paper is associated with dioxin formation. Dioxins can be formed as by-products from the manufacture of chlorine and chlorinated products, such as herbicides and PCBs (now banned) (EPA 1994a).

PCDDs, PCDFs, and PCBs are well absorbed from the gastrointestinal system, skin, and lungs. They initially concentrate in the liver, blood, and muscle, but soon are sequestered into fat tissue, where they have a long half-life. The chemicals may be metabolized to biphenyls, biphenyldiols, and dihydro dihydroxybiphenyls. Excretion occurs through urine and feces. Although there are species variations, the more highly chlorinated compounds are excreted more in the feces and are less readily metabolized than the less chlorinated congeners.

Animal studies reveal a considerable variation in equipotent doses between both species of animal and congeners of dioxin-like compounds. In comparable studies, however, the more chlorinated mixtures are more toxic than the less chlorinated ones. This trend predominantly holds between LD_{50} and carcinogenicity studies. Humans appear to be in the middle of the sensitivity range for adverse effects from exposure (EPA 1994c).

In humans, the primary acute toxic effect of dioxin-like compounds is chloracne. No distinctive acute effects have been reported in animals. Chronic ingestion of dioxin-like compounds causes "Yusho Disease", named after the town of Yusho, Japan, where an epidemic occurred when residents ate PCB- and dioxin-contaminated food for several weeks. Chloracne develops after a latent period along with pigmentation of skin areas, visual disturbances, gastrointestinal distress, jaundice, and lethargy. Infants born from exposed mothers had low birth weight and pigment blotches. Industrial exposure, which is generally limited to dermal contact, produces chloracne, and in severe cases, hepatotoxicity,

PCBs, PCDDs, and PCDFs produce reproductive toxicity based on results of the few animal studies, the Yusho incident, and more recently, a similar incidence in Taiwan.

PCBs are class B2 carcinogenic based on the induction of liver tumors in experimental animals (EPA 1998b). The EPA oral CSF is 2.0 $(mg/kg\text{-}day)^{-1}$ for RME exposures and $1(mg/kg\text{-}day)^{-1}$ for average exposures. The EPA inhalation CSF is 0.4 $(mg/kg\text{-}day)^{-1}$. The California CSF is 7.7 $(mg/kg\text{-}day)^{-1}$ for both oral and inhalation exposures (Cal/EPA 1994). EPA has derived an oral RfD for Aroclor-1254 of 0.00002 mg/kg-day (uncertainty factor of 300) based on adverse effect to the eye and antibodies as well as distorted growth in experimental animals (EPA 1998b).

The toxicity of dioxin-like compounds is described relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The oral CSF and inhalation CSFs are 1.5E+5 (mg/kg-day)-1 (EPA 1995); the Cal/EPA lists a value of 1.3E+5 (mg/kg-day)-1 for TCDD. The relative potency factors are (EPA 1994b):

2,3,7,8-TCDD	1
2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
2,3,7,8-Hexachlorodibenzo-p-dioxin	0.1
2,3,7,8-Heptachlorodibenzo-p-dioxin	0.01
Octachlorodibenzodioxin (all)	0.001
2,3,7,8-Tetrachlorodibenzofuran	1
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,7,8-Hexachlorodibenzofuran	0.1
2,3,7,8-Heptachlorodibenzofuran	0.01
Octachlorodibenzofuran (all)	0.001

Congeners that are not 2,3,7,8-substituted have relative potency factors of 0, unless otherwise listed above. These values were used to determine toxicity values for heptachlorodibenzodioxin (HpCDD), heptachlorodibenzofuran (HpCDF), octachlorodibenzodioxin (OCDD), octachlorodibenzofuran (OCDF), and pentachlorodibenzofuran (PCDF). It was assumed that the congeners were 2,3,7,8 although the chemical analyses did not specify type of congener.

C.6.26 Polycyclic Aromatic Hydrocarbons

PAHs include more than 100 different compounds (ATSDR 1987a, 1987b, 1987c, 1987d, 1987e, and 1990). They have no known use in manufacturing or industry and are associated primarily with

incomplete combustion of organic substances. Common sources of exposure to PAHs include tobacco, smoke, wood, coal, oil, and gasoline.

Although PAHs can enter the body through ingestion and dermal exposure, the most significant route of exposure is inhalation. Dermal and gastrointestinal absorption of individual PAHs varies considerably. For example, gastrointestinal absorption of benzo(a)anthracene is rapid and efficient, while only limited amounts of benzo(a)pyrene are absorbed into the systemic circulation. Due to their lipophilic properties, PAHs can be stored in tissues and organs with high fat content such as adipose tissue, the liver, and the kidneys.

The greatest health concern associated with PAHs is their tumorigenic potential. Many combinations of PAHs have been shown to induce tumors in laboratory animals after inhalation, ingestion, and direct application to the skin. Yet there is no direct evidence of carcinogenicity in humans from lung cancer. In general, studies have been conducted on humans exposed to different PAH mixtures from coke oven emissions, roofing tar emissions, and cigarette smoke (ATSDR 1990, EPA 1998b), which are composed of complex mixtures of myriad chemicals in addition to PAHs. The confounding nature of these chemically complex mixtures and diverse exposures has made it difficult to single out the contribution of individual PAHs.

Among the many PAHs, benzo(a)pyrene is the most studied and has become the archetypal carcinogenic PAH used in animal experiments. It is a potent mutagen, producing genotoxic effects in a broad range of in vitro systems (EPA 1998b). It has tested positive in mammalian cell culture DNA assays, forward mutation assays, chromosomal effects assays, and cell transformation assays.

RfDs for noncarcinogenic PAHs have been established for fluoranthene, acenaphthene, anthracene, fluorene, and pyrene. Naphthalene has a provisional RfD while no toxicity values have been determined for phenanthrene and acenaphthylene. The RfDs are:

Acenaphthene	0.06 mg/kg-day
Anthracene	0.3 mg/kg-day
Fluoranthene	0.04 mg/kg-day
Fluorene	0.04 mg/kg-day

Naphthalene	0.04 mg/kg-day
Pyrene	0.03 mg/kg-day

DTSC considers the following PAHs to be carcinogenic:

- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(j) fluoranthene
- Benzo(a)pyrene
- Chrysene
- Dibenzo(a,h)acridine
- Dibenzo(a,j)acridine
- Dibenzo(a,h)anthracene
- 7H-dibenzo(c,g)carbazole
- Dibenzo(a,e)pyrene
- Dibenzo(a,h)pyrene
- Dibenzo(a,i)pyrene
- Dibenzo(a,l)pyrene
- 7,12-Dimethylbenz(a)anthracene
- Indeno(1,2,3-c,d)pyrene
- 3-Methylcholanthrene
- 5-Methylchrysene

DTSC lists an oral CSF value for benzo(a)pyrene at 12 $(mg/kg\text{-}day)^{-1}$ and an inhalation CSF of 3.9 $(mg/kg\text{-}day)^{-1}$ (Cal/EPA 1994). EPA has promulgated a value of 7.3 $(mg/kg\text{-}day)^{-1}$ for benzo(a)pyrene but does not list an inhalation CSF (EPA 1998b). Toxicity equivalency actors for other PAHs, as developed by EPA for determining slope factors relative to benzo(a)pyrene for other carcinogenic PAHs, are:

- Benzo(a)anthracene = 0.1
- Benzo(b)fluoranthene = 0.1
- Benzo(k)fluoranthene = 0.1
- Chrysene = 0.001

- Dibenzo(a,h)anthracene = 1.0
- Indeno(1,2,3-c,d)pyrene = 0.1

These values were used to determine slope factors in this HHRA.

C.6.27 Radium-226 and Radium-228

Radium, an element naturally found in the earth's crust, was discovered in the early 1900's and was at first thought to have healing properties. It was incorporated into a wide variety of medicines and artifacts until about the 1930's. The greatest exposures in the United States, however, were to radium dial painters who could have ingested tens to thousands of micrograms of radium over a working lifetime. Luminous, radium-containing paint was developed before World War I and in 1917 there were many plants in New England and New Jersey where watch dials, clocks, and military instruments were painted. Persons exposed to radium (such as patients, dial painters, and chemists) have been studied for over 60 years to determine the body retention of radium and the health effects of long-term exposure (Cassarett and Doull 1991).

Radium-226 is a daughter product of uranium with a half-life of 1,600 years. The most significant impact of radium is that its daughter product, radon, can accumulate in buildings if one is built on soils containing radium. This is only a concern if the building is within about 5 meters of the radium; radon generally does not migrate farther than that distance (EPA 1994c). Radon exposure has been linked to lung cancer. Radium-228 has a half-life of 5.75 years (EPA 1995a).
In general, ionizing radiation has been shown to be a carcinogen, mutagen, and teratogen. The induction of tumors can occur in nearly any organ or tissue in humans, and the probability of cancer induction increases with increasing radiation dose. EPA classifies all radionuclides as known human carcinogens (Class A) based on their property of emitting ionizing radiation and on the extensive weight of evidence in humans (EPA 1995a). Radium-226 and -228 have been linked to osteogenic sarcoma (bone cancer) although not to other cancers originating in bone marrow, such as leukemia. Ingested radium is metabolized in the body much like calcium, and is incorporated into bone structure. The long half-life of radium-226 allows distribution throughout the skeleton over a lifetime (Cassarett and Doull 1991). Both isotopes, however, are cleared from the lungs in a matter of weeks after being inhaled, according to the International Commission on Radiological Protection (EPA 1995a).

EPA has developed radiation slope factors (RSFs) for evaluating risks from exposure to radium-226 and -228 (EPA 1995a). The RSFs used in this evaluation represent both the parent compound and the daughter products because they are more conservative and take into account the decay process for each isotope. The ingestion RSFs are 2.95E-10 risk /pCi for radium-226 and 2.48E-10 risk/pCi for radium-228. The inhalation RSFs are 2.75E-9 risk/pCi and 9.94E-10 risk/pCi for radium-226 and radium-228, respectively. The external exposure RSFs are 6.74E-6 risk/year per pCi/g for radium-226 and 3.28E-6 risk/year per pCi/g for radium-228. External exposure is the pathway of greatest concern for these two isotopes.

C.6.28 Silver

Silver is used most extensively in photography, making indelible inks, and for medicinal purposes (Beliles 1975). Humans are also exposed to small amounts of silver from dietary sources. In a typical diet, the daily intake of silver has been estimated to range from 27 to 88 μg/day (EPA 1998b).

Silver can be absorbed by the lungs, skin, and gastrointestinal tract. Intravenous injection results in deposits in the spleen, liver, bone marrow, lungs, muscle, and skin.

The prominent deleterious effect of silver exposure is argyria. This is a condition characterized by gray-blue to black discoloration of the skin either locally in patches or more generalized over large areas of skin (Beliles 1975, Stokinger 1981). It may also cause the same condition in the conjunctiva of the eye. Argyria is initiated by the covalent binding of silver to tissue proteins in the dermis. The bound silver subsequently undergoes photoactivated reduction as skin is exposed to sunlight (much like developing a photographic negative). Although this condition is unsightly, it is medically benign and does not pose any significant long-term health risk. The lowest dose of silver reported to cause argyria in humans is approximately 1 gram administered intravenously over a 2- to 3-year period as silver arsphenamine, which was used to treat syphilis before the advent of antibiotics. There are indications that industrial and other medicinal exposure to silver compounds may produce untoward effects in cardiovascular and hepatic systems.

EPA has calculated an RfD for silver of 0.005 mg/kg-day, with a cumulative uncertainty factor of 3. The critical effect on which this value is based is argyria (EPA 1998b).

Despite many years of therapeutic use of silver compounds and industrial exposures, no carcinogenic effects have been reported in humans. Animal data are similarly negative. In addition, there is no evidence of silver-induced mutagenicity in studies carried out thus far. As a consequence, silver is a class D carcinogen (EPA 1998b).

C.6.29 Toluene

Toluene (methylbenzene, phenylmethane, toluol) is the simplest alkylbenzene. Since benzene was determined to be a human carcinogen, toluene has been increasingly used as a less toxic substitute.

Toluene is well absorbed orally and by inhalation. It is widely distributed but concentrated in the liver (where it is metabolized) and the kidney (where it is excreted). Some toluene is exhaled unchanged, but is oxidized and rapidly excreted in the urine.

Even at low concentrations acute exposures cause contact irritation and CNS depression. Extremely high concentrations have been reported to reversibly decrease erythrocyte levels and produce liver and renal toxicity. Toluene has been reported to induce cleft palates and embryotoxic effects in mice or rats following inhalation exposure.

Toluene is a class D carcinogen which has no CSF. Toluene was not mutagenic in the few reported studies.

The oral RfD for toluene is 0.2 mg/kg-day with an uncertainty factor of 1,000 (EPA 1998b). This RfD is based on the critical effects of an increase in liver and kidney weights. The inhalation RfD is 1.1 mg/kg-day with an uncertainty factor of 300 (EPA 1998b).

C.6.30 Trichloroethene

TCE is widely used as a solvent, especially for dry cleaning and metal degreasing. TCE is well absorbed after inhalation, ingestion, and to some extent through skin. It tends to collect in fat because it is lipophilic. The compound is metabolized in the liver to a variety of metabolites that are responsible for much of the TCE toxicity. Metabolites are excreted primarily in the urine. TCE can

potentiate the toxicity of other compounds including ethanol and increase the toxicity of both compounds.

Acute exposures cause CNS depression and TCE was once used as a surgical anesthetic. Chronic dosing produces liver and kidney lesions as well as a peripheral neuritis. The chemical was found to be carcinogenic in some animal tests, but no human data are available. No evidence of reproductive toxicity exists in the few tests available.

TCE is a class B2 carcinogen based on the induction of hepatomas. The California CSF is 0.015 $(mg/kg\text{-}day)^{-1}$ and the inhalation CSF is 0.01 $(mg/kg\text{-}day)^{-1}$ (Cal/EPA 1994). The provisional EPA oral CSF is 0.011 $(mg/kg\text{-}day)^{-1}$ and the inhalation CSF is 0.006 $(mg/kg\text{-}day)^{-1}$ according to information from the Superfund Health Risk Technical Support Center (SHRTSC 1994).

The provisional oral RfD for TCE is 0.006 mg/kg-day according to information from the Superfund Health Risk Technical Support Center (SHRTSC 1994).

C.6.31 Vanadium

Vanadium is found throughout the environment and is contained in many foods, particularly fats and oils. It occurs in several ores and is a by-product of petroleum refinement.

It may have useful if not essential effects for hematopoiesis, cholesterol metabolism in the liver, and dental health. The typical human body burden of vanadium averages 30 milligrams (mg), stored primarily in the fat. A homeostatic mechanism probably operates to control blood levels, and excretion is via the kidneys and urine (Beliles 1975).

The toxic effects are primarily in the lungs, where irritation, bronchitis, and bronchopneumonia have been attributed to industrial vanadium exposure. Other effects noted from industrial exposures are eye and skin irritation, gastrointestinal distress, cardiac palpitation, tremor, nervous depression, and kidney damage (Beliles 1975). Acute effects in animal experiments are manifested primarily as nervous system disorders, where vanadium poisoning produced convulsions, paralysis, and respiratory depression at lethal doses. At lower doses, constriction of the blood vessels of the lungs, spleen, kidneys, and

intestines was observed. Air pollution containing vanadium and cadmium has been postulated to be associated with heart disease (Beliles 1975).

The RfD for vanadium is 0.007 mg/kg-day with an uncertainty factor of 100 (EPA 1998b). There are no critical effects associated with this value.

C.6.32 Vinyl Chloride

Vinyl chloride, or chloroethene, was of little toxicological interest until 1974 when it was first reported as a human carcinogen. Since then there have been many human and animal studies summarized in various reviews.

Vinyl chloride may enter the body through various routes. Once in the body, it is metabolized and excreted. The compound is fully absorbed after inhalation and ingestion, but little is absorbed though the skin. Vinyl chloride is concentrated in the liver (site of metabolism) and kidney (site of excretion). Vinyl chloride is oxidized to an exposed and other reactive intermediates, which react further. These intermediates are generally believed to be the active chemical species for the specific toxic effects of vinyl chloride. Excretion is primarily in the urine as conjugates of metabolites with sulfur-containing compounds. Very small amounts are exhaled unchanged.

Vinyl chloride produces both acute and chronic effects. Large single doses of vinyl chloride produce CNS depression. Early studies of its anesthetic potential found cardiac and circulatory disturbances. Chronic exposure to low concentrations in workers produce a syndrome called "vinyl chloride disease". This includes acroosteolysis, Raynaud's disease, scleroderma, lung toxicity, thrombocytopenia, and liver toxicity. Chromosomal abnormalities have been reported in workers.

The most striking effect of vinyl chloride toxicity is the production of hemangiosarcomas, which are extremely rare tumors. These occur in the liver and occasionally elsewhere. Since this has been repeatedly confirmed in worker exposure studies and animal studies, vinyl chloride is a confirmed human carcinogen. Some studies have also reported vinyl chloride-induced tumors at other sites, especially the brain and, after inhalation, the lungs.

There have been reports of reproductive toxicity in exposed workers, but no adverse effects have been seen in animal studies except at high doses that produce nonspecific toxic effects. Epidemiological studies in residential neighborhoods near vinyl chloride production plants have been inconclusive.

Vinyl chloride is a class A carcinogen. The EPA and California oral CSFs are 1.9 and 0.27 (mg/kg-day)$^{-1}$, respectively, and are based on the induction of tumors in the liver and lung (EPA 1995, Cal/EPA 1994). The EPA and California inhalation CSFs are 0.3 and 0.27 (mg/kg-day)$^{-1}$, respectively. No RfD for vinyl chloride has been established.

C.6.33 Xylenes

The solvent xylene is actually a mixture of dimethyl phenyl compounds often referred to as xylenes. Approximately 60 percent of the inhaled dose of xylenes is retained and absorbed; they are also readily absorbed through the skin and probably also from the gastrointestinal tract based on their lipophilicity. The highest levels are found in fatty tissues such as adipose tissue, subcutaneous fat, adrenal glands, brain, and liver. Excretion is primarily in the urine but some is exhaled.

The acute toxic potential is relatively low as is the chronic toxicity. The vapor may be irritating to eyes, skin, and mucous membranes. Xylenes cause CNS effects. Mice given high doses exhibited hyperactivity. Effects on eyes, kidneys, liver and lungs are also reported. Xylenes are fetotoxic and teratogenic in mice at high oral doses. Similar results have been reported in women exposed to solvents including xylene. Xylenes have not been found to be mutagenic (EPA 1998b).

Xylene is a class D carcinogen which has no CSF (EPA 1998b). The oral RfD for xylene is 2 mg/kg-day with an uncertainty factor of 100. This RfD is based on decreased body weight and increased mortality in experimental animals.

C.6.34 Zinc

Zinc is an essential trace element involved in enzyme functions, protein synthesis, and carbohydrate metabolism. Zinc in the diet is only partially absorbed. Once absorbed, zinc is distributed to the muscle, liver, kidney, pancreas, eyes, and male reproductive organs. Elimination is primarily in the feces with significant amounts in the pancreatic fluids and milk (Beliles 1975; Stokinger 1981).

Contact with zinc chloride can cause skin and eye irritation. Zinc in excess of 0.25 percent in the diet of rats causes growth retardation, hypochromic anemia, and defective mineralization of the bone. No zinc toxicity has been observed at dietary levels below 0.25 percent. Studies with animals and humans indicate that metabolic changes may occur as a result of the interaction of zinc and other metals in the diet. Excessive intake of zinc may cause copper deficiencies and result in anemia. In animals, normal ingestion of zinc in the diet has been shown to protect against some of the toxic effects of cadmium. Metal fume fever is the most common zinc-related industrial disease and is associated with inhalation of zinc oxide fumes. The major symptom is fever and chills with recovery in 24 to 48 hours in severe cases. No evidence of lingering adverse effects exists after recovery.

Zinc is a class D carcinogen which has no CSF (EPA 1998b). The RfD for zinc is 0.3 mg/kg-day, with an uncertainty factor of 3 (EPA 1997a). The critical effect of this toxicity factor is anemia.

TABLE C.6-1
ALAMEDA POINT OU3 HHRA
TOXICITY ASSESSMENT
CARCINOGENIC SLOPE FACTORS[1]

Chemical	Carcinogenic classification	CSF_o $(mg/kg\text{-}day)^{-1}$	CSF_I $(mg/kg\text{-}day)^{-1}$	Critical Effect	Source
Inorganic Chemicals					
Arsenic	A	1.5	50 (12)	Multiple cancers	EPA 1998b
Beryllium	B2	ND (7)	8.4 (7)	Lung tumors	EPA 1998b
Cadmium	B1	ND	6.3 (15)	Lung cancer	EPA 1998b
Chromium	A	ND (0.42)	42 (510)	Lung cancer	EPA 1998b
Nickel	A	ND	0.84 (0.91)	Lung and nasal tumors	EPA 1998b
Polychlorinated Biphenyls					
Aroclor-1254	B2	RME = 2 (7.7); Average = 1 (7.7)	0.4 (7.7)	Liver tumors	EPA 1998b
Aroclor-1260	B2	RME = 2 (7.7); Average = 1 (7.7)	0.4 (7.7)	Liver tumors	EPA 1998b
Pesticides/Herbicides					
DDD	B2	0.24	ND (0.24)	Liver tumors	EPA 1998b
DDE	B2	0.34	[0.34*] (0.24)	Liver and lung tumors	EPA 1998b
DDT	B2	0.34	0.34	Liver tumors	EPA 1998b
Dieldrin	B2	16	16	Tumorigenic potential	EPA 1998b
Semivolatile Organic Chemicals					
Benzo(a)anthracene	B2	0.73 (1.2)	ND (0.39	Multiple cancers	EPA 1998b
Benzo(a)pyrene	B2	7.3 (12)	ND (3.9)	Multiple cancers	EPA 1998b
Benzo(b)fluoranthene	B2	0.73 (1.2)	ND (0.39)	Multiple cancers	EPA 1998b
Benzo(k)fluoranthene	B2	0.073 (0.12)	ND (0.039)	Multiple cancers	EPA 1998b
Bis(2-ethylhexyl)phthalate	B2	0.014 (0.0084)	ND (0.0084)	Liver tumors	EPA 1998b
Carbazole	B2	0.02	ND	Multiple cancers	EPA 1998b

TABLE C.6-1 (Continued)
ALAMEDA POINT OU3 HHRA
TOXICITY ASSESSMENT
CARCINOGENIC SLOPE FACTORS[1]

Chemical	Carcinogenic classification	CSF_o $(mg/kg\text{-}day)^{-1}$	CSF_I $(mg/kg\text{-}day)^{-1}$	Critical Effect	Source
Chrysene	B2	0.0073 (0.012)	ND (0.0039)	Multiple cancers	EPA 1998b
Dibenzo(a,h)anthracene	B2	7.3 (12)	ND (3.9)	Multiple cancers	EPA 1998b
Indeno(1,2,3-c,d)pyrene	B2	0.73 (1.2)	ND (0.39)	Multiple cancers	EPA 1998b
N-Nitrosodiphenylamine	B2	0.049 (0.009)	ND (0.009)	Increased bladder tumors and reticulum cell carcinomas	EPA 1998b
Volatile Organic Chemicals					
Benzene	A	0.029 (0.1)	0.029 (0.1)	Leukemia	EPA 1998b
Chloroform	B2	0.061 (0.031)	0.081 (0.019)	Tumorigenic potential	EPA 1998b
1,4-Dichlorobenzene	D	ND (0.04)	ND (0.04)	Hepatocellular adenoma and carcinoma of adrenal gland	Cal/EPA 1994
1,1-Dichloroethene	C	0.6 (ND)	0.18 (ND)	Tumor Induction	EPA 1998b
Trichloroethene	B2	0.011 (0.015)	0.006 (0.01)	Liver tumors	SHRTSC 1994
Vinyl Chloride	A	1.9 (0.27)	0.3 (0.27)	Liver tumors	EPA 1995
Radionuclides					
Radium-226 + Daughter Products[(2)]	A	2.96E-10 [(3)]	2.75E-9 [(3)]	Osteogenic sarcoma	EPA 1995
Radium-228 + Daughter Products[(2)]	A	2.48E-10 [(3)]	9.94E-10 [(3)]	Osteogenic sarcoma	EPA 1995

Notes:
1 Slope factors from California EPA/DTSC are shown in parentheses where they differ from EPA values.
2 External Slope Factors: Radium-226: 6.74E-6 risk/year per pCi/g soil
Radium-228: 3.28E-6 risk/year per pCi/g soil
3 Units: risk/pCi
ND = not determined
* The toxicity value for the inhalation pathway was route-to-route extrapolated from the oral toxicity value, without adjustment, at the direction of the EPA Region 9 toxicologist. This is not an EPA-promulgated toxicity value and does not account for route of exposure, pharmacokinetic, or physiological considerations.

TABLE C.6-2
ALAMEDA OU3 HHRA
TOXICITY ASSESSMENT
NONCARCINOGENIC TOXICITY VALUES

Chemical	RfD_0 (mg/kg-day)	UF	RFD_i (mg/kg-day)	UF	Critical Effect	Source
Inorganic Chemicals						
Aluminum	1	100	ND	ND	Neurotoxicity	SHRTSC 1994
Antimony	0.0004	1,000	ND	ND	Increased mortality and altered blood chemistry	EPA 1998b
Arsenic	0.0003	3	ND	ND	Hyperpigmetation, keratosis, and vascular changes	EPA 1998b
Barium	0.07	3	ND	ND	Increased blood pressure; increased kidney weight	EPA 1998
Beryllium	0.002	300	0.006	10	Intestinal lesions; sensitization	EPA 1998
Cadmium	0.001 (food) 0.0005 (water)	10	ND	ND	Significant proteinuria	EPA 1998b
Chromium	0.005	500	ND	ND	No observed effects level	EPA 1998b
Cobalt	0.06	ND	0.00029	ND		EPA 1996
Copper	0.037	ND	ND	ND	Based on maximum contaminant level for water	EPA 1995
Lead	ND	ND	ND	ND	ND	ND
Manganese	0.14	1	0.000014	1,000	CNS effects and neurological impairments	EPA 1998b
Mercury	0.0003	1,000	ND	ND	Autoimmune effects	EPA 1995
Nickel	0.02	300	ND	ND	Decreased body weight and organ weights	EPA 1998b
Selenium	0.005	3	ND	ND	Clinical selenosis	EPA 1998b
Silver	0.005	3	ND	ND	Argyria	EPA 1998b
Thallium	8.0E-05	3,000	ND	ND	Alopecia, increased serum GOT and serum LDH	EPA 1998b
Vanadium	0.007	100	ND	ND	No observed adverse effects level	EPA 1995
Zinc	0.3	3	ND	ND	Red blood cell changes (decreases in erythrocyte superoxide dismutase)	EPA 1998b

TABLE C.6-2 (Continued)
ALAMEDA OU3 HHRA
TOXICITY ASSESSMENT
NONCARCINOGENIC TOXICITY VALUES

Chemical	RfD_0 (mg/kg-day)	UF	RFD_i (mg/kg-day)	UF	Critical Effect	Source
Polychlorinated Biphenyls						
Aroclor-1254	0.00002	300	ND	ND	Ocular effects; antibody effects; distorted growth	EPA 1998b
Aroclor-1260	ND	ND	ND	ND	ND	ND
Pesticides and Herbicides						
DDD	ND	ND	ND	ND	ND	ND
DDE	ND	ND	ND	ND	ND	ND
DDT	0.0005	100	ND	ND	Liver lesions	EPA 1998b
Dieldrin	5.00E-04	100	ND	ND	Liver lesions	EPA 1998b
Semivolatile Organic Chemicals						
Acenaphthene	0.06	3,000	ND	ND	Heptatoxicity	EPA 1998b
Anthracene	0.3	3,000	ND	ND	No observed effects level	EPA 1998b
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl))phthalate	0.02	1,000	ND	ND	Increased relative liver weight	EPA 1998b
Carbazole	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	0.04	3,000	ND	ND	Neuropathy; liver and blood effects	EPA 1998b
Indeno(1,2,3-c,d)pyrene	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND
Pyrene	0.03	3,000	ND	ND	Kidney effects	EPA 1998b

TABLE C.6-2 (Continued)
ALAMEDA OU3 HHRA
TOXICITY ASSESSMENT
NONCARCINOGENIC TOXICITY VALUES

Chemical	RfD_0 (mg/kg-day)	UF	RFD_i (mg/kg-day)	UF	Critical Effect	Source
Volatile Organic Chemicals						
Acetone	0.1	1,000	[0.1*]	ND	Increased liver and kidney weights; nephrotoxicity	EPA 1998b
Benzene	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.02	1,000	ND	ND	Histopathic changes in the liver	ND
Chloroform	0.01	1,000	ND	ND	Fatty cyst formation in liver	EPA 1998b
1,2-Dichlorobenzene	0.09	1,000	ND	ND	No observed adverse effects level	EPA 1998b
1,3-Dichlorobenzene	0.09	1,000	ND	ND	No observed adverse effects level	EPA 1998b
1,4-Dichlorobenzene	ND	ND	0.23	100	Increased liver weights	EPA 1998b
1,1-Dichloroethene	0.009	1,000	ND	ND	Liver lesions	EPA 1998b
1,2-Dichloroethene (total)	0.009	1,000	[0.009*]	ND	Liver lesions	EPA 1995
Toluene	0.2	1,000	0.11	300	Changes in liver and kidney weights; changes in neurological functions	EPA 1998b
Trichloroethene	0.006	3,000	ND	ND	No observed adverse effects level	SHRTSC 1994
Vinyl chloride	ND	ND	ND	ND	ND	ND
Xylene	2	100	ND	ND	Hyperactivity; decreased body weights; increased mortality	EPA 1998b

Notes:

ND = not determined

* The toxicity value for the inhalation pathway was route-to-route extrapolated from the oral toxicity value, without adjustment, at the direction of the EPA Region 9 toxicologist. This is not an EPA-promulgated toxicity value and does not account for route of exposure, pharmacokinetic, or physiological considerations.

C.7 SITE SPECIFIC RISK ASSESSMENT RESULTS

The following subsection provides the site-specific HHRA results for OU-3. Tables presenting the risk assessment results follow the discussion. Subsection C.7.1 presents the risk assessment results for Site 1.

C.7.1. Site 1 - Landfill Area

Section C.7.1 is organized as follows: Section C.7.1.1 describes Site 1; Section C.7.1.2 presents the data evaluation and COC selection results; Section C.7.1.3 presents the exposure assessment results; Section C.7.1.4 presents the risk characterization results; Section C.7.1.5 presents the radionuclide risk and dose assessment, and Section C.7.1.6 presents the conclusions.

C.7.1.1 Site Description

As shown on Figure C.3-2, Site 1 is located in the northwestern corner of Alameda Point. It was developed through deposition of fill material that occurred from 1942 to 1943. Prior to that time, this area was covered by waters of San Francisco Bay. Based on aerial photographs, an area of 14.7 acres served as a landfill for the base from 1943 to 1956. The landfill reportedly received all waste created at the installation except liquid waste (storm sewer discharge and industrial sewer discharge), which was discharged to the Seaplane Lagoon. Landfilled wastes reportedly included old aircraft engines, kitchen scraps and garbage from ships in port, cables, scrap metals, waste oil, waste paint, waste solvents, cleaning compounds, construction debris, and low-level radiological material.

Beginning in 1952, construction of the runways required that the northern portion of Site 1 be covered. By 1956, the entire Disposal Area was covered by fill material. Currently, a significant portion of Site 1 is paved. Other portions of Site 1 are occupied by a pistol range, a target range, a picnic area, and a running path. A more detailed description of Site 1 is provided in Chapter 6 of the RI report.

C.7.1.2 Data Description and COC Selection Results

Table C.7.1-1 presents the data summary for surface soil in Site 1 (for comparison Table C.7.1-2 presents the data summary for subsurface soil). In the 0 to 2 foot soil depth interval (surface soil), inorganic chemicals, pesticides, PCBs, SVOCS, and VOCs were detected. The same classes of chemicals were detected in the 0 to 10 foot depth interval (subsurface soil). The only VOC detected in

the 0 to 2 foot depth interval was acetone (detected once out of 1 sample). SVOCs detected were mainly PAHs and infrequently detected phthalates. Aroclor-1254 and Aroclor-1260 as well as some pesticides were also detected, although most pesticides were infrequently detected at low concentrations. Inorganic chemicals detected were metals, radium-226 and radium-228.

Inorganic chemicals (except radium) in soil were compared to background concentrations (presented in Table C.4-1) using statistical tests described in Section C.4. The results of the statistical test of means indicated that concentrations of arsenic, cobalt, and titanium at Site 1 were not greater than background concentrations, but all other inorganic chemicals (except essential nutrients) were above background and were retained as COCs. As previously described, the statistical tests of means were conducted at a confidence level of 95% and power of 90%. This means that there is a 5% chance of misidentifying a chemical as below background, when in fact, it is not (Type 1 error). There is a 10% chance of misidentifying a chemical as above background (Type 2 error). The results of the statistical tests of means are presented in Attachment 1 to this appendix.

The hot spot analysis (presented in Table C.7.1-3) showed that the maximum concentrations of arsenic, cobalt, and titanium were above the background 80LCL/95 concentration of the background data set. However, the concentration ranges of these chemicals at Site 1 were within or near the background ranges. The hot spot comparison has a relatively high error rate associated with misidentifying a chemical as above background (Type 2 error). At a sample size of 57, the error rate is approximately 90%. Because of the high error rate, and based on the statistical tests and the comparison of concentration ranges, these 3 inorganic chemicals were eliminated as COCs.

Calcium, iron, magnesium, potassium, and sodium were excluded as soil COCs because they are essential nutrients and were not detected at elevated or toxic concentrations.

In surface soil, the following chemicals were excluded as COCs based on low frequency of detection after comparison to one-tenth of the EPA Region 9 residential PRGs (EPA 1998 a): selenium, thallium, alpha- and gamma-chlordane, butylbenzylphthalate, di-n-butylphthalate, dibenzofuran, fluorene, 2-methylnaphthalene, naphthalene, and n-nitroso-diphenyl amine. Two of these chemicals have PRGs based on carcinogenic risk and the remainder are considered noncarcinogenic. The maximum detected concentrations of these chemicals were below one-tenth of the EPA Region 9 PRGs for residential

exposure to soil. The remaining chemicals detected in surface soil at Site 1 were retained as COCs. Tables C.7.1-4 summarizes COC selection for surface soil.

The selection of COCs in groundwater was described in Section C.4. For the purpose of evaluating potential exposure to VOCs migrating from the FWBZ, through the vadose zone, into the ambient air, the following COCs were identified: benzene, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dichloroethene, 1,2-dichloroethene, toluene, trichloroethene, vinyl chloride, and xylene. For the purpose of evaluating potential exposure through inhalation of vapors during spray irrigation the following four VOCs were evaluated: benzene, 1,2-dichloroethene (total), trichloroethene, and vinyl chloride.

C.7.1.3 Exposure Assessment Results

Site 1 is located on the western edge of the installation, next to the northwest shoreline. The most likely future use of the site is recreational, as shown in Figure C.3-2. Occupational reuse is also possible for the northwest area of the installation.

The exposure pathways associated with occupational and recreational use at IR Site 1 are soil ingestion, dermal contact with soil (nonradionuclides only), inhalation of particulates from soil, inhalation of volatile chemicals from soil and inhalation of vapors from groundwater through (1) direct migration from the FWBZ through the vadose zone and into the ambient air and (2) release into the ambient air during irrigation (the evaluation of the groundwater exposure pathways was performed at a screening level), and external exposure (radionuclides only). The soil depth interval of interest is 0 to 2 feet bgs (surface soil) because occupational and recreational land uses would not involve excavation activities. Excavation of a landfill area is not a possible future scenario. Therefore, only surface soil exposure is evaluated in the HHRA (EPA 1993b).

C.7.1.4 Risk Characterization

Tables C.7.1-5 through C.7.1-12 present the risk and hazard indices associated with occupational exposure to surface soil in the Site 1 inside boundary area. The total carcinogenic risk to an occupational receptor associated with non-radionuclides was 2.6E-5 using Navy/EPA HQ RME assumptions and 2.8E-4 using DTSC RME assumptions. The risk was attributable to the PAHs

benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(a)anthracene, and benzo(b)fluoranthene; the PCBs Aroclor-1254 and Aroclor-1260; and chromium. Using DTSC assumptions, the same chemicals posed most of the risk. The PAHs and PCBs were the major contributors to total risk through the dermal contact and soil ingestion exposure pathways, while chromium posed 99 percent of the risk via particulate inhalation. The major differences between Navy/EPA HQ and DTSC risk estimates were the dermal exposure pathway (due to methodological differences) and the inhalation pathway (due to the DTSC inhalation CSFs for PAHs and chromium). Using EPA assumptions, soil ingestion posed the highest risk. However, using DTSC assumptions, the dermal exposure pathway posed more risk than soil ingestion and inhalation risks combined. Additionally, this assessment assumed that all chromium was hexavalent (the carcinogenic form) although there is no reason to believe that it is entirely hexavalent; for this reason, the inhalation risks are likely overestimated.

Average occupational risks (shown in Tables C.7.1-7, C.7.1-8, C.7.1-11, and C.7.1-12) were 4.0E-6 using Navy/EPA HQ assumptions and 1.6E-5 using DTSC assumptions. Again, the differences in risk estimates were due to the dermal exposure pathway methodology and DTSC inhalation CSFs for PAHs and chromium. All hazard indices for the occupational receptor were less than the target value of 1.0. The Navy/EPA HQ total RME hazard index was approximately 0.087 and both total average hazard indices were less than 0.1. The DTSC RME hazard index was 0.240.

Total RME risks for the recreational receptor, shown in Tables C.7.1-13 and C.7.1-15, were similar to the occupational risk estimates. Using Navy/EPA HQ RME assumptions, the total RME risk was 4.4E-5 attributable mostly to benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(a)anthracene, benzo(a)fluoranthene, and indeno(1,2,3-c,d)pyrene, Aroclor-1254, Aroclor-1260, and chromium. The same chemicals were major contributors to the DTSC total RME risk of 4.9E-4. The major differences between Navy/EPA HQ and DTSC risk estimates were due to the dermal exposure pathway and the DTSC inhalation CSFs for chromium and PAHs. The AVG total risks (presented in Tables C.7.1-14 and C.7.1-16) were 2.5E-6 using Navy/EPA HQ assumptions and 8.6E-6 using DTSC assumptions.

All hazard indices to the recreational receptor at Site 1 were less than the EPA target value of 1.0. RME hazard indices were 0.095 and 0.42 using Navy/EPA HQ and DTSC assumptions, respectively. AVG hazard indices were 0.019 and 0.025 using Navy/EPA HQ and DTSC assumptions, respectively. The hazard indices were mostly associated with Aroclor-1254 and inorganic chemicals.

As discussed in Section C.5.4, the risks and hazards associated with potential exposure through inhalation of VOCs migrating from the FWBZ, through the vadose zone, and into the ambient air were evaluated by back-calculating chemical-specific RBSLs for groundwater according the ASTM

recommended method (ASTM 1997) using chemical-specific VF_{wamb} values and EPA Region 9 ambient air PRGs which are based on cancer risks of 1E-06 and a hazard index of 1 (EPA 1998a). The chemical-specific RBSLs were then compared with the maximum concentration of each COCs measured in groundwater at Site 1.

This approach is conservative for several reasons. First, the RBSLs are calculated assuming exposure through inhalation by residents. However, as stated elsewhere in the HHRA, residential exposures were not evaluated at Site 1. Rather, occupational and recreational exposures were evaluated. Because theoretical residential receptors are assumed to have greater exposure than either occupational or recreational receptors, the RBSLs calculated based on residential exposures are lower than they would have been if calculated based on either occupational or recreational exposures.

Second, the maximum detected concentrations used in the comparison were drawn from all FWBZ groundwater samples collected at Site 1. However, realistically, only VOCs present in the upper portion of the FWBZ are likely to volatilize into the ambient air. As shown in Table C.5.4-12, the chemical-specific maximum detected groundwater concentrations are well below their respective chemical-specific RBSLs. The single exception is vinyl chloride. The maximum detected concentration of vinyl chloride was detected in May 1998 in the deepest portion of the aquifer. In the last five years, only twice has vinyl chloride been detected in the FWBZ at a concentration greater than the RBSL: 7,300 ug/L at well M028 in November 1997 and 4,200 ug/L at well M028 in October 1994. However, vinyl chloride has not been detected at a concentration above its RBSL (1,202 ug/L) since November 1997. In fact the highest concentration of vinyl chloride detected in the FWBZ since November 1997 was 69 ug/L in May 1998. Therefore, the total risk and hazard posed to occupational or recreational receptors from potential exposure through inhalation of VOCs migrating from the FWBZ into the ambient air is expected to be less than 1E-06 and less than a hazard index of 1, respectively.

It should also be noted that in addition to characterizing risks and hazards associated with potential exposure through inhalation to VOCs (specifically to benzene, 1,2-dichloroethene (total), trichloroethene, and vinyl chloride) released during spray irrigation, the estimated groundwater concentrations of these four VOCs were also compared to their respective maximum contaminant levels (MCL). The results of these comparisons are shown in the chemical-specific concentration versus time plots presented in Attachment 6 to Appendix C. The salinity of groundwater from the well located near

M031-A does not exceed 3,000 mg/L indicating that this well could be used for drinking water in the 30-year modeling period. The groundwater concentrations of trichloroethene modeled at the pumping well location near monitoring well M031-A, are all less than the MCL for trichloroethene throughout the 30 year modeling period. However, the groundwater concentrations modeled for vinyl chloride, 1,2-dichloroethene (total), and benzene at this location exceeds their MCLs for the first 7.6, 6.5, and 14.4 years of pumping, respectively; after that, the modeled concentrations are less than the respective MCLs. Groundwater concentrations were not modeled at the second pumping well location because this second location is about 850 feet upgradient of the first location and the four COCs are not expected to reach this second location.

Lead was also selected as a soil COC for Site 1 with an exposure concentration of 144.8 mg/kg and range of detected concentrations of 11.4 mg/kg to 440 mg/kg. The pistol range data were not used for this risk assessment. The Cal/EPA screening concentration for lead is 130 mg/kg based on residential exposure; the corresponding EPA screening concentration is 400 mg/kg. For occupational scenarios, the screening concentration is 1,000 mg/kg. The range and exposure point concentrations of lead in this area are acceptable when compared to the EPA residential screening concentration and the occupational screening level. However, the Cal/EPA physiologically based modeling approach was used to evaluate lead exposure in this area because the exposure point concentration exceeded the Cal/EPA residential screening concentration of 130 mg/kg and because there is no screening level for recreational exposures.

The results of the modeling are shown in Table C.7.1-17. Using the exposure point concentration of 144.8 mg/kg and the default value for water ingestion of 15 μg/L, adults and normal children in the 99th percentile of exposure would have blood lead levels less than 10 μg/dL which is the Center for Disease Control's level of concern. Pica children in the 50th percentile of exposure could have blood lead levels of up to 11.1 μg/dL while those in the 99th percentile could have blood lead levels of up to 25.1 μg/dL. However, all of these estimates are based on residential exposure, which cannot occur inside the Site 1 boundary. They are overestimates of exposure, and it is unlikely that these blood lead levels in children or adults could result from exposure to Site 1 under the recreational scenario.

C.7.1.5 Radionuclide Risk and Dose Assessment

The three exposure pathways evaluated for radionuclides were soil ingestion, particulate inhalation, and external exposure; results are shown in Tables C.7.1-18 and C.7.1-19 for the occupational scenario and

Tables C.7.1-20 and C.7.1-21 for the recreational receptor. Radiological survey results were not used in this risk assessment. Risks and doses were calculated using only RME exposure parameters. Both risks and doses from exposure to radium-226 and radium-228 were calculated for up to a 1,000 year time frame. A uniform concentration of radium isotopes over the top 2 feet of soil was assumed, although the soil data do not indicate widespread radium isotopes. Risks associated with radionuclide exposure are presented separately from other chemicals because the methodology used to develop radionuclide slope factors is fundamentally different from that of chemical slope factors. Therefore, EPA guidance recommends that the two sets of risks estimates be tabulated separately, although the risks may be summed if an overall risk value is desired and the differences in the two risks are understood (EPA 1989).

For the occupational receptor, the total RME risk was 3.6E-5 at time = 0 years. The risks increased to 4.1E-5 at time = 3 years, and decreased after that time. In both cases, external exposure was the only route presenting a risk greater than 1E-6. The dose received followed the same pattern, starting at 4.73 pCi/year at time = 0 years, increased to 5.16 pCi/year at time = 3 years, and decreased after that time. Both the dose and the risk were associated mainly with radium-226, and external exposure contributed the majority of the risk.

Results were similar for the recreational receptor, where the total RME risk was 2.0E-5 at time = 0 years. Risks increased to 2.3E-5 at time = 3 years, and decreased after that time. Again, external exposure presented the majority of the risk. Dose to the recreational receptor was estimated at 1.86 pCi/year at time = 0 years and 2.06 pCi/year at time = 3 years. Dose decreased steadily after that time. Again, dose and risk were associated mainly with radium-226 and were due to external exposure.

Both of the dose estimates are below the EPA residential limit of 15 mrem/y for exposure to surface soils (EPA 1997b). Additionally, the radium soil concentrations are below the 5 pCi/g level, which is acceptable for residential exposures and even more protective for occupational or recreational exposures (EPA 1997b).

C.7.1.6 Conclusions

Table C.7.1-22 summarizes the nonradionuclide risks and hazard indices; radionuclide risks are summarized in Table C.7.1-23. Both the chemical and radionuclide risks calculated using Navy/EPA

HQ assumptions fall within EPA's acceptable risk range of 1E-6 to 1E-4, as stated in the NCP. Chemical risks calculated using DTSC RME parameters exceed 1E-4 for both occupational and recreational receptors. In both cases, the exceedance was due to the dermal exposure pathway. All hazard indices are below 1.0. Additionally, the dose assessment for radionuclides showed that the radium-226 and radium-228 concentrations are within the acceptable residential concentration of 5 pCi/g and result in a radionuclide dose that is below the residential limit of 15 mrem/year. Because Site 1 is a former landfill, it was covered with soil in 1956 when the landfill closed. To maintain the integrity of that cover, development of the landfill would not breach the cap. Therefore, the risks presented here are upper bound estimates of exposure. If additional capping is conducted at the landfill, the risks presented here would not exist because the exposure pathways would be incomplete.

TABLE C.7.1-1
SITE 1, DATA SUMMARY FOR SOIL IN THE 0-2 FOOT DEPTH INTERVAL

Chemical	Frequency of Detection	Minimum SQL (mg/kg)	Maximum SQL (mg/kg)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Mean Concentration (mg/kg)	95 UCL Concentration (mg/kg)
Inorganic Chemicals							
Aluminum[1]	41/41	NA	NA	3,040	15,400	7,133	8,213
Antimony[1]	3/41	0.45	6.7	1.0	8.3	1.5	2.9
Arsenic[1]	26/41	1.8	11.0	1.77	45.0	4.52	7.0
Barium[1]	40/41	0.086	0.086	23.0	1,090	78.6	158.9
Beryllium[1]	11/41	0.125	1.1	0.171	1.43	0.33	0.59
Cadmium[1]	34/41	0.08	1.1	0.30	16.6	1.97	7.64
Calcium[1]	41/41	NA	NA	2,400	13,300	4,330	5,376
Chromium[1]	41/41	NA	NA	22.4	109.0	41.5	47.4
Cobalt	26/41	0.59	8.3	10.0	10.0	5.6	6.2
Copper[1]	39/41	0.20	19.8	5.52	280.0	44.4	96.7
Iron[1]	41/41	NA	NA	7,140	47,600	13,711	16,289
Lead[1]	41/41	NA	NA	11.4	440.0	83.1	144.8
Magnesium[1]	41/41	NA	NA	1,760	6,000	3,331	3,742
Manganese[1]	42/42	NA	NA	110.0	495.0	212.6	249.0
Mercury[1]	12/42	0.06	0.258	0.113	9.57	0.15	0.42
Nickel[1]	41/41	NA	NA	18.0	118.0	36.3	43.7
Potassium[1]	35/41	54.8	1,370	385	1,600	869	1,051
Selenium	1/41	0.20	56.0	2.2	2.2	2.96	4.24
Silver[1]	9/41	0.17	5.6	0.29	7.2	0.87	3.6
Sodium[1]	18/41	5.0	1,070	107	3,370	239	381.9
Thallium	1/41	0.26	11.0	0.44	0.44	2.25	2.89
Titanium	17/17	NA	NA	290.0	831.0	449.5	506.5
Vanadium[1]	41/41	NA	NA	14.8	84.3	28.0	33.0
Zinc[1]	41/41	0.22	5.6	37.8	591.0	147.2	234.3
Petroleum Products							

TABLE C.7.1-1 (Continued)
SITE 1, DATA SUMMARY FOR SOIL IN THE 0-2 FOOT DEPTH INTERVAL

Chemical	Frequency of Detection	Minimum SQL (mg/kg)	Maximum SQL (mg/kg)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Mean Concentration (mg/kg)	95 UCL Concentration (mg/kg)
Diesel Range Organics	3/18	10	40	16	570	49.6	103.5
Gasoline Range Organics	1/18	0.5	0.53	1.9	1.9	0.34	0.50
Motor Oil Range Organics	18/18	NA	NA	63	2,650	612.4	932.5
Oil and Grease	5/5	NA	NA	146	3,570	1,362	2,763.7
TRPH	6/6	NA	NA	69.9	1,600	578.2	1,055.2
Polychlorinated Biphenyls							
Aroclor-1254	2/33	0.034	10.0	0.096	2.0	0.44	0.71
Aroclor-1260	13/33	0.034	10.0	0.077	4.1	0.63	0.94
Pesticides/Herbicides							
alpha-Chlordane	1/15	0.0034	0.085	0.0038	0.0038	0.0091	0.014
gamma-Chlordane	1/15	0.0034	0.085	0.0066	0.0066	0.0092	0.014
4,4'-DDD	4/33	0.0068	0.41	0.0059	0.085	0.0024	0.035
4,4'-DDE	5/33	0.0034	0.41	0.0076	0.347	0.034	0.054
4,4'-DDT	11/33	0.0068	0.41	0.011	0.45	0.053	0.083
Dieldrin	1/35	0.0034	0.41	0.0193	0.0193	0.0214	0.032
Semivolatile Organic Chemicals							
Acenaphthene	6/36	0.043	3.4	0.025	0.45	0.45	0.59
Anthracene	7/36	0.043	3.4	0.021	0.16	0.44	0.57
Benzo(a)anthracene	18/36	0.051	3.4	0.022	57.0	2.91	5.7
Benzo(a)pyrene	18/36	0.071	3.4	0.042	81.0	3.38	7.2
Benzo(b)fluoranthene	21/36	0.051	3.4	0.068	59.0	2.86	5.6
Benzo(g,h,i)perylene	14/36	0.081	3.4	0.061	82.0	2.88	6.7
Benzo(k)fluoranthene	17/36	0.051	3.4	0.036	56.0	2.73	5.5
Bis(2-ethylhexyl)phthalate	2/35	0.053	3.4	4.7	7.6	0.83	1.2
Butylbenzylphthalate	1/35	0.053	3.4	9.5	9.5	0.74	1.2
Carbazole	4/13	0.33	3.4	0.027	0.13	0.29	0.5
Chrysene	21/36	0.051	3.4	0.037	72.0	3.56	7.0

TABLE C.7.1-1 (Continued)
SITE 1, DATA SUMMARY FOR SOIL IN THE 0-2 FOOT DEPTH INTERVAL

Chemical	Frequency of Detection	Minimum SQL (mg/kg)	Maximum SQL (mg/kg)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Mean Concentration (mg/kg)	95 UCL Concentration (mg/kg)
Di-n-butylphthalate	2/36	0.042	7.3	0.44	7.8	0.80	1.2
Dibenzo(a,h)anthracne	3/36	0.081	3.4	0.23	21.0	1.1	2.0
Dibenzofuran	1/36	0.13	17.0	0.023	0.023	1.26	1.8
Fluoranthene	20/37	0.041	3.4	0.053	33.0	2.34	4.1
Fluorene	2/36	0.086	3.4	0.049	0.053	0.45	0.58
Indeno(1,2,3-c,d)pyrene	14/36	0.081	3.4	0.054	61.0	2.29	5.13
2-Methylnaphthalene	2/35	0.11	3.4	0.027	0.19	0.465	0.60
N-Nitrosodiphenylamine	1/36	0.086	3.4	0.043	0.043	0.45	0.58
Naphthalene	1/35	0.086	3.4	0.06	0.06	0.46	0.59
Phenanthrene	18/37	0.041	3.4	0.02	7.5	0.85	1.28
Pyrene	23/36	0.041	3.4	0.064	66.0	3.52	6.73
Volatile Organic Chemicals							
Acetone	1/1	NA	NA	1.1	1.1	1.1	NA
Radionuclides (pCi/g)							
Radium-226	27/29	0.1	0.42	0.1	1.9	0.37	0.9
Radium-228	18/29	0.21	0.74	0.1	4.1	0.5	0.49

Notes: SQL Sample Quantitation Limit
mg/kg milligrams per kilogram
95 UCL 95 percent upper confidence limit of the mean
TRPH Total Recoverable Petroleum Hydrocarbons

[1] Lognormally distributed; mean and 95 UCL concentrations are based on geometric distribution

TABLE C.7.1-2
SITE 1, DATA SUMMARY FOR INORGANIC CHEMICALS IN THE 0-10 FOOT DEPTH INTERVAL

Chemical	Frequency of Detection	Minimum SQL (mg/kg)	Maximum SQL (mg/kg)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Mean Concentration (mg/kg)	95 UCL Concentration (mg/kg)
Inorganic Chemicals							
Aluminum	57/57	NA	NA	3,040	91,600	7,803	10,252
Antimony[1]	12/57	0.45	6.7	1.0	42.0	2.0	5.5
Arsenic[1]	42/57	2.8	11.0	1.77	45.0	4.7	7.4
Barium[1]	56/57	0.086	151	14.4	1,090	82.4	171.5
Beryllium	20/57	0.09	1.3	0.171	8.6	0.38	0.97
Cadmium[1]	45/57	0.08	1.1	0.30	92.7	2.4	17.9
Calcium[1]	57/57	NA	NA	1,670	20,600	4,534	6,200
Chromium[1]	57/57	NA	NA	22.4	345.0	45.9	59.7
Cobalt[1]	42/57	0.585	8.3	3.8	19.3	6.8	7.6
Copper[1]	55/57	0.201	19.8	5.5	6,210	59.0	309.7
Iron	57/57	NA	NA	6,770	146,000	15,827	22,267
Lead[1]	57/57	NA	NA	2.4	9,540	83.9	436.2
Magnesium	57/57	NA	NA	1,670	12,300	3,322	3,830
Manganese[1]	58/58	NA	NA	52.7	1,460	237.5	332.6
Mercury[1]	21/42	0.06	0.258	0.113	9.57	0.17	0.64
Nickel[1]	57/57	NA	NA	18.0	431.0	41.2	55.1
Potassium	47/57	54.8	1,510	385	3,380	861	1,060
Selenium[1]	1/57	0.20	56.0	2.2	2.2	2.2	3.1
Silver[1]	20/57	0.17	5.6	0.29	21.8	1.0	5.8
Sodium[1]	34/57	5.0	1,510	103.0	3,370	276.4	493.6
Thallium	1/57	0.257	11.0	0.44	0.44	1.68	2.18
Titanium	17/17	NA	NA	290	831.0	449.5	506.5
Vanadium[1]	57/57	NA	NA	14.8	84.3	28.0	32.4
Zinc[1]	57/57	NA	NA	18.5	2,510	159.7	437.1

Notes:
NA = Not Applicable
SQL = Sample Quantitation Limit
mg/kg = milligrams per kilogram
95UCL = 95th percent upper confidence limit of the mean concentration
1 Lognormally distributed data. Mean and 95th percent upper confidence limit (95UCL) calculated for natural logarithm transformed data.
2 Normally distributed data.
3 Too few detections to determine distribution. Mean and 95UCL calculated assuming normality.

TABLE C.7.1-3
ALAMEDA POINT OU3 HHRA
SITE 1
COC SELECTION
"HOT SPOT" COMPARISON

Chemical	Site 1 Maximum Concentration (mg/kg)	Background 80LCL/95[1] Concentration (mg/kg)	Does Site Concentration exceed Background 80LCL/95?
Aluminum	91,600	11,091	Yes
Antimony	42.0	3.6	Yes
Arsenic	45.0	20.3	Yes
Barium	1,090	99.4	Yes
Beryllium	8.6	0.95	Yes
Cadmium	92.7	1.6	Yes
Chromium	345	48.5	Yes
Cobalt	19.3	8.9	Yes
Copper	6,210	39.3	Yes
Lead	9,540	118	Yes
Manganese	1,460	281	Yes
Mercury	9.57	0.15	Yes
Nickel	431	46.7	Yes
Selenium	2.2	ND	Yes
Silver	21.8	11.0	Yes
Thallium	0.44	ND	Yes
Titanium	831	603	Yes
Vanadium	84.3	40.9	Yes
Zinc	2,510	108.6	Yes

[1] 80LCL/95 80th percent lower confidence limit on the 95th percentile of the distribution; concentration listed in table is the lower of the maximum detected concentration and the calculated 80LCL/95.

Site concentration reflects maximum detected value in the 0 to 10 foot soil depth interval.

TABLE C.7.1-4
ALAMEDA POINT OU3 HHRA
SITE 1
COC SELECTION RESULTS
SOIL IN THE 0 TO 2 FOOT DEPTH INTERVAL

Chemical	COC?	Reason for Exclusion
Inorganic Chemicals		
Aluminum	Yes	None
Antimony	Yes	None
Arsenic	No	Below Background
Barium	Yes	None
Beryllium	Yes	None
Cadmium	Yes	None
Calcium	No	Essential Nutrient
Chromium	Yes	None
Cobalt	No	Below Background
Copper	Yes	None
Iron	No	Essential Nutrient
Lead	Yes	None
Magnesium	No	Essential Nutrient
Manganese	Yes	None
Mercury	Yes	None
Nickel	Yes	None
Potassium	No	Essential Nutrient
Selenium	No	Low Frequency of Detection
Silver	Yes	None
Sodium	No	Essential Nutrient
Thallium	No	Low Frequency of Detection
Titanium	No	Below Background
Vanadium	Yes	None
Zinc	Yes	None
Polychlorinated Biphenyls		
Aroclor-1254	Yes	None
Aroclor-1260	Yes	None
Pesticides/Herbicides		
alpha-Chlordane	No	Low Frequency of Detection
gamma-Chlordane	No	Low Frequency of Detection
DDD	Yes	None
DDE	Yes	None
DDT	Yes	None
Dieldrin	Yes	None
Radionuclides		
Radium-226	Yes	None
Radium-228	Yes	None

TABLE C.7.1-4 (continued)
ALAMEDA POINT OU3 HHRA
COC SELECTION RESULTS FOR SITE 1
SOIL IN THE 0 TO 2 FOOT DEPTH INTERVAL

Chemical	COC?	Reason for Exclusion
Semivolatile Organic Chemicals		
Acenaphthene	Yes	None
Anthracene	Yes	None
Benzo(a)anthracene	Yes	None
Benzo(a)pyrene	Yes	None
Benzo(b)fluoranthene	Yes	None
Benzo(g,h,i)perylene	Yes	None
Benzo(k)fluoranthene	Yes	None
Bis(2-ethylhexyl)phthalate	Yes	None
Butylbenzylphthalate	No	Low Frequency of Detection
Carbazole	Yes	None
Chrysene	Yes	None
Di-n-butylphthalate	No	Low Frequency of Detection
Dibenzo(a,h)anthracene	Yes	None
Dibenzofuran	No	Low Frequency of Detection
Fluoranthene	Yes	None
Fluorene	No	Low Frequency of Detection
Indeno(1,2,3-c,d)pyrene	Yes	None
2-Methylnaphthalene	No	Low Frequency of Detection
Naphthalene	No	Low Frequency of Detection
n-Nitroso-diphenylamine	No	Low Frequency of Detection
Phenanthrene	Yes	None
Pyrene	Yes	None
Volatile Organic Chemicals		
Acetone	Yes	None

TABLE C.7.1-5
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Soil Ingestion

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDo	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	4.02E-03	1	4.0E-03	8.9
Antimony	2.94	1.44E-06	0.0004	3.6E-03	8.0
Barium	158.86	7.77E-05	0.07	1.1E-03	2.5
Beryllium	0.59	2.88E-07	0.002	1.4E-04	0.3
Cadmium	7.64	3.74E-06	0.001	3.7E-03	8.3
Chromium	47.42	2.32E-05	0.003	7.7E-03	17.1
Copper	96.75	4.73E-05	0.037	1.3E-03	2.8
Lead	144.84	7.09E-05	ND	ND	ND
Manganese	249.05	1.22E-04	0.14	8.7E-04	1.9
Mercury	0.42	2.05E-07	0.0003	6.8E-04	1.5
Nickel	43.74	2.14E-05	0.02	1.1E-03	2.4
Silver	3.59	1.76E-06	0.005	3.5E-04	0.8
Vanadium	32.96	1.61E-05	0.007	2.3E-03	5.1
Zinc	234.29	1.15E-04	0.3	3.8E-04	0.8
Aroclor-1254	0.71	3.48E-07	0.00002	1.7E-02	38.5
Aroclor-1260	0.94	4.61E-07	ND	ND	ND
DDD	0.04	1.73E-08	ND	ND	ND
DDE	0.054	2.64E-08	ND	ND	ND
DDT	0.08	4.06E-08	0.0005	8.1E-05	0.2
Dieldrin	0.02	9.44E-09	0.00005	1.9E-04	0.4
Acenaphthene	0.45	2.20E-07	0.06	3.7E-06	0.0
Anthracene	0.16	7.83E-08	0.3	2.6E-07	0.0
Benzo(a)anthracene	5.67	2.77E-06	ND	ND	ND
Benzo(a)pyrene	7.20	3.52E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	2.75E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	3.28E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.70E-06	ND	ND	ND
Carbazole	0.13	6.36E-08	ND	ND	ND
Chrysene	7.04	3.44E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.00E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	5.87E-07	0.02	2.9E-05	0.1
Fluoranthene	4.06	1.99E-06	0.04	5.0E-05	0.1
Indeno(1,2,3-c,d)pyrene	5.13	2.51E-06	ND	ND	ND
Phenanthrene	1.28	6.28E-07	ND	ND	ND
Pyrene	6.73	3.29E-06	0.03	1.1E-04	0.2
Acetone	1.10	5.38E-07	0.1	5.4E-06	0.0
			TOTAL	4.5E-02	

TABLE C.7.1-5 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Soil Ingestion

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.03E-07	ND	ND	ND
Cadmium	7.64	1.33E-06	ND	ND	ND
Chromium	47.42	8.29E-06	ND	ND	ND
Nickel	43.74	7.64E-06	ND	ND	ND
Aroclor-1254	0.71	1.24E-07	2	2.5E-07	1.7
Aroclor-1260	0.94	1.64E-07	2	3.3E-07	2.3
DDD	0.04	6.18E-09	0.24	1.5E-09	0.0
DDE	0.054	9.44E-09	0.34	3.2E-09	0.0
DDT	0.08	1.45E-08	0.34	4.9E-09	0.0
Dieldrin	0.02	3.37E-09	16	5.4E-08	0.4
Benzo(a)anthracene	5.67	9.90E-07	0.73	7.2E-07	4.9
Benzo(a)pyrene	7.20	1.26E-06	7.3	9.2E-06	62.8
Benzo(b)fluoranthene	5.63	9.83E-07	0.73	7.2E-07	4.9
Benzo(g,h,i)perylene	6.70	1.17E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	9.66E-07	0.073	7.1E-08	0.5
Bis(2-ethylhexyl)phthalate	1.20	2.10E-07	0.014	2.9E-09	0.0
Carbazole	0.13	2.27E-08	0.02	4.5E-10	0.0
Chrysene	7.04	1.23E-06	0.0073	9.0E-09	0.1
Dibenzo(a,h)anthracene	2.05	3.58E-07	7.3	2.6E-06	17.9
Indeno(1,2,3-c,d)pyrene	5.13	8.96E-07	0.73	6.5E-07	4.5
			TOTAL	1.5E-05	

TABLE C.7.1-5 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	1.87E-04	1	1.9E-04	1.5
Antimony	2.94	6.70E-08	0.0004	1.7E-04	1.3
Barium	158.86	3.62E-06	0.07	5.2E-05	0.4
Beryllium	0.59	1.34E-08	0.002	6.7E-06	0.1
Cadmium	7.64	1.74E-07	0.001	1.7E-04	1.4
Chromium	47.42	1.08E-06	0.003	3.6E-04	2.8
Copper	96.75	2.20E-06	0.037	6.0E-05	0.5
Lead	144.84	3.30E-06	ND	ND	ND
Manganese	249.05	5.67E-06	0.14	4.1E-05	0.3
Mercury	0.42	9.57E-09	0.0003	3.2E-05	0.2
Nickel	43.74	9.96E-07	0.02	5.0E-05	0.4
Silver	3.59	8.18E-08	0.005	1.6E-05	0.1
Vanadium	32.96	7.51E-07	0.007	1.1E-04	0.8
Zinc	234.29	5.34E-06	0.3	1.8E-05	0.1
Aroclor-1254	0.71	2.27E-07	0.00002	1.1E-02	88.4
Aroclor-1260	0.94	3.00E-07	ND	ND	ND
DDD	0.04	2.42E-09	ND	ND	ND
DDE	0.054	3.69E-09	ND	ND	ND
DDT	0.08	5.67E-09	0.0005	1.1E-05	0.1
Dieldrin	0.02	4.40E-09	0.00005	8.8E-05	0.7
Acenaphthene	0.45	1.33E-07	0.06	2.2E-06	0.0
Anthracene	0.16	4.74E-08	0.3	1.6E-07	0.0
Benzo(a)anthracene	5.67	1.68E-06	ND	ND	ND
Benzo(a)pyrene	7.20	2.13E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	1.67E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	1.98E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.64E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	2.73E-07	0.02	1.4E-05	0.1
Carbazole	0.13	2.96E-08	ND	ND	ND
Chrysene	7.04	2.08E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	6.07E-07	0.02	ND	ND
Fluoranthene	4.06	1.20E-06	0.04	3.0E-05	0.2
Indeno(1,2,3-c,d)pyrene	5.13	1.52E-06	ND	ND	ND
Phenanthrene	1.28	3.80E-07	ND	ND	ND
Pyrene	6.73	1.99E-06	0.03	6.6E-05	0.5
Acetone	1.10	2.51E-07	0.1	2.5E-06	0.0
			TOTAL	1.3E-02	

TABLE C.7.1-5 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	4.79E-09	ND	ND	ND
Cadmium	7.64	6.22E-08	ND	ND	ND
Chromium	47.42	3.86E-07	ND	ND	ND
Nickel	43.74	3.56E-07	ND	ND	ND
Aroclor-1254	0.71	8.10E-08	2	1.6E-07	1.8
Aroclor-1260	0.94	1.07E-07	2	2.1E-07	2.4
DDD	0.04	8.64E-10	0.24	2.1E-10	0.0
DDE	0.054	1.32E-09	0.34	4.5E-10	0.0
DDT	0.08	2.02E-09	0.34	6.9E-10	0.0
Dieldrin	0.02	1.57E-09	16	2.5E-08	0.3
Benzo(a)anthracene	5.67	5.99E-07	0.73	4.4E-07	4.9
Benzo(a)pyrene	7.20	7.61E-07	7.3	5.6E-06	62.7
Benzo(b)fluoranthene	5.63	5.95E-07	0.73	4.3E-07	4.9
Benzo(g,h,i)perylene	6.70	7.09E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	5.85E-07	0.073	4.3E-08	0.5
Bis(2-ethylhexyl)phthalate	1.20	9.76E-08	0.014	1.4E-09	0.0
Carbazole	0.50	5.32E-08	0.02	1.1E-09	0.0
Chrysene	7.04	7.44E-07	0.0073	5.4E-09	0.1
Dibenzo(a,h)anthracene	2.05	2.17E-07	7.3	1.6E-06	17.8
Indeno(1,2,3-c,d)pyrene	5.13	5.42E-07	0.73	4.0E-07	4.5
			TOTAL	8.9E-06	

TABLE C.7.1-5 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Inhalation of Particulates from Surface Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	1.23E-05	ND	ND	ND
Antimony	2.94	4.40E-09	ND	ND	ND
Barium	158.86	2.38E-07	ND	ND	ND
Beryllium	0.59	8.81E-10	0.006	1.5E-07	0.0
Cadmium	7.64	1.14E-08	ND	ND	ND
Chromium	47.42	7.09E-08	0.000029	2.4E-03	8.5
Copper	96.75	1.45E-07	ND	ND	ND
Lead	144.84	2.17E-07	ND	ND	ND
Manganese	249.05	3.73E-07	0.0000142	2.6E-02	91.5
Mercury	0.42	6.28E-10	ND	ND	ND
Nickel	43.74	6.54E-08	ND	ND	ND
Silver	3.59	5.37E-09	ND	ND	ND
Vanadium	32.96	4.93E-08	ND	ND	ND
Zinc	234.29	3.51E-07	ND	ND	ND
Aroclor-1254	0.71	1.06E-09	ND	ND	ND
Aroclor-1260	0.94	1.41E-09	ND	ND	ND
DDD	0.04	5.29E-11	ND	ND	ND
DDE	0.054	8.08E-11	ND	ND	ND
DDT	0.08	1.24E-10	ND	ND	ND
Dieldrin	0.02	2.89E-11	ND	ND	ND
Acenaphthene	0.45	6.73E-10	ND	ND	ND
Anthracene	0.16	2.39E-10	ND	ND	ND
Benzo(a)anthracene	5.67	8.48E-09	ND	ND	ND
Benzo(a)pyrene	7.20	1.08E-08	ND	ND	ND
Benzo(b)fluoranthene	5.63	8.42E-09	ND	ND	ND
Benzo(g,h,i)perylene	6.70	1.00E-08	ND	ND	ND
Benzo(k)fluoranthene	5.53	8.27E-09	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.80E-09	ND	ND	ND
Carbazole	0.13	1.94E-10	ND	ND	ND
Chrysene	7.04	1.05E-08	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	3.06E-09	ND	ND	ND
Fluoranthene	4.06	6.08E-09	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	7.67E-09	ND	ND	ND
Phenanthrene	1.28	1.92E-09	ND	ND	ND
Pyrene	6.73	1.01E-08	ND	ND	ND
Acetone	1.10	1.65E-09	ND	ND	ND
			TOTAL	2.9E-02	

TABLE C.7.1-5 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Inhalation of Particulates from Surface Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	6.83E-10	8.4	5.7E-09	0.2
Cadmium	7.64	8.86E-09	6.3	5.6E-08	2.3
Chromium	47.42	5.50E-08	42	2.3E-06	95.6
Nickel	43.74	5.07E-08	0.84	4.3E-08	1.8
Aroclor-1254	0.71	8.25E-10	0.4	3.3E-10	0.0
Aroclor-1260	0.94	1.09E-09	0.4	4.4E-10	0.0
DDD	0.04	4.11E-11	ND	ND	ND
DDE	0.054	6.27E-11	0.34	2.1E-11	0.0
DDT	0.08	9.63E-11	0.34	3.3E-11	0.0
Dieldrin	0.02	2.24E-11	16	3.6E-10	0.0
Benzo(a)anthracene	5.67	6.58E-09	ND	ND	ND
Benzo(a)pyrene	7.20	8.35E-09	ND	ND	ND
Benzo(b)fluoranthene	5.63	6.53E-09	ND	ND	ND
Benzo(g,h,i)perylene	6.70	7.77E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	6.41E-09	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.39E-09	ND	ND	ND
Carbazole	0.13	1.51E-10	ND	ND	ND
Chrysene	7.04	8.16E-09	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	2.38E-09	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	5.95E-09	ND	ND	ND
			TOTAL	2.4E-06	

Site 1
Exposure Pathway: RME Inhalation of Vapors from Surface Soil in Ambient Air

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Acenaphthene	0.45	1.67E-06	ND	ND	ND
Anthracene	0.16	3.40E-07	ND	ND	ND
Acetone	1.10	5.54E-06	0.1	5.5E-05	ND
			TOTAL	5.5E-05	

ND = Not Determined

TABLE C.7.1-6
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO IRRIGATION WATER
(NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Inhalation of Vapors from Irrigation Water
Navy RME Assumptions for Carcinogens

Noncarcinogenic Chemicals	Exposure Concentration (mg/m3)	Intake	Slope Factor	Risk	Chemical-Specific Percentage
Benzene	0.0000160	1.11E-07	2.90E-02	3.2E-09	2.5%
Trichloroethene	0.0000080	5.56E-08	6.00E-03	3.3E-10	0.3%
Vinyl Chloride	0.0000600	4.17E-07	3.00E-01	1.3E-07	97.2%
			TOTAL	1.3E-07	

Site 1
Exposure Pathway: Inhalation of Vapors from Irrigation Water
Navy RME Assumptions for Noncarcinogens

Noncarcinogenic Chemicals	Exposure Concentration (mg/m3)	Intake	RfD	Hazard Index	Chemical-Specific Percentage
1,2-Dichloroethene	0.0001560	1.08E-06	9.00E-03	1.2E-04	100.0%
			TOTAL	1.2E-04	

TABLE C.7.1-7
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Soil Ingestion

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDo	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	3.52E-03	1	3.5E-03	8.9
Antimony	2.94	1.26E-06	0.0004	3.2E-03	8.0
Barium	158.86	6.81E-05	0.07	9.7E-04	2.5
Beryllium	0.59	2.52E-07	0.002	1.3E-04	0.3
Cadmium	7.64	3.27E-06	0.001	3.3E-03	8.3
Chromium	47.42	2.03E-05	0.003	6.8E-03	17.1
Copper	96.75	4.15E-05	0.037	1.1E-03	2.8
Lead	144.84	6.21E-05	ND	ND	ND
Manganese	249.05	1.07E-04	0.14	7.6E-04	1.9
Mercury	0.42	1.80E-07	0.0003	6.0E-04	1.5
Nickel	43.74	1.87E-05	0.02	9.4E-04	2.4
Silver	3.59	1.54E-06	0.005	3.1E-04	0.8
Vanadium	32.96	1.41E-05	0.007	2.0E-03	5.1
Zinc	234.29	1.00E-04	0.3	3.3E-04	0.8
Aroclor-1254	0.71	3.05E-07	0.00002	1.5E-02	38.5
Aroclor-1260	0.94	4.03E-07	ND	ND	ND
DDD	0.04	1.52E-08	ND	ND	ND
DDE	0.054	2.32E-08	ND	ND	ND
DDT	0.08	3.56E-08	0.0005	7.1E-05	0.2
Dieldrin	0.02	8.27E-09	0.00005	1.7E-04	0.4
Acenaphthene	0.45	1.93E-07	0.06	3.2E-06	0.0
Anthracene	0.16	6.86E-08	0.3	2.3E-07	0.0
Benzo(a)anthracene	5.67	2.43E-06	ND	ND	ND
Benzo(a)pyrene	7.20	3.09E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	2.41E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	2.87E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.37E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	5.14E-07	0.02	2.6E-05	0.1
Carbazole	0.13	5.57E-08	ND	ND	ND
Chrysene	7.04	3.02E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	8.78E-07	ND	ND	ND
Fluoranthene	4.06	1.74E-06	0.04	4.4E-05	0.1
Indeno(1,2,3-c,d)pyrene	5.13	2.20E-06	ND	ND	ND
Phenanthrene	1.28	5.50E-07	ND	ND	ND
Pyrene	6.73	2.89E-06	0.03	9.6E-05	0.2
Acetone	1.10	4.71E-07	0.1	4.7E-06	0.0
			TOTAL	4.0E-02	

TABLE C.7.1-7 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Soil Ingestion

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.80E-08	ND	ND	ND
Cadmium	7.64	2.34E-07	ND	ND	ND
Chromium	47.42	1.45E-06	ND	ND	ND
Nickel	43.74	1.34E-06	ND	ND	ND
Aroclor-1254	0.71	2.18E-08	1	2.2E-08	0.9
Aroclor-1260	0.94	2.88E-08	1	2.9E-08	1.1
DDD	0.04	1.08E-09	0.24	2.6E-10	0.0
DDE	0.054	1.65E-09	0.34	5.6E-10	0.0
DDT	0.08	2.54E-09	0.34	8.6E-10	0.0
Dieldrin	0.02	5.91E-10	16	9.5E-09	0.4
Benzo(a)anthracene	5.67	1.74E-07	0.73	1.3E-07	5.0
Benzo(a)pyrene	7.20	2.20E-07	7.3	1.6E-06	64.1
Benzo(b)fluoranthene	5.63	1.72E-07	0.73	1.3E-07	5.0
Benzo(g,h,i)perylene	6.70	2.05E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.69E-07	0.073	1.2E-08	0.5
Bis(2-ethylhexyl)phthalate	1.20	3.67E-08	0.014	5.1E-10	0.0
Carbazole	0.13	3.98E-09	0.02	8.0E-11	0.0
Chrysene	7.04	2.15E-07	0.0073	1.6E-09	0.1
Dibenzo(a,h)anthracene	2.05	6.27E-08	7.3	4.6E-07	18.2
Indeno(1,2,3-c,d)pyrene	5.13	1.57E-07	0.73	1.1E-07	4.6
			TOTAL	2.5E-06	

TABLE C.7.1-7 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	1.13E-04	1	1.1E-04	1.5
Antimony	2.94	4.03E-08	0.0004	1.0E-04	1.3
Barium	158.86	2.18E-06	0.07	3.1E-05	0.4
Beryllium	0.59	8.08E-09	0.002	4.0E-06	0.1
Cadmium	7.64	1.05E-07	0.001	1.0E-04	1.4
Chromium	47.42	6.50E-07	0.003	2.2E-04	2.8
Copper	96.75	1.33E-06	0.037	3.6E-05	0.5
Lead	144.84	1.99E-06	ND	ND	ND
Manganese	249.05	3.42E-06	0.14	2.4E-05	0.3
Mercury	0.42	5.76E-09	0.0003	1.9E-05	0.2
Nickel	43.74	6.00E-07	0.02	3.0E-05	0.4
Silver	3.59	4.92E-08	0.005	9.8E-06	0.1
Vanadium	32.96	4.52E-07	0.007	6.5E-05	0.8
Zinc	234.29	3.21E-06	0.3	1.1E-05	0.1
Aroclor-1254	0.71	1.36E-07	0.00002	6.8E-03	88.4
Aroclor-1260	0.94	1.81E-07	ND	ND	ND
DDD	0.04	1.46E-09	ND	ND	ND
DDE	0.054	2.22E-09	ND	ND	ND
DDT	0.08	3.41E-09	0.0005	6.8E-06	0.1
Dieldrin	0.02	2.65E-09	0.00005	5.3E-05	0.7
Acenaphthene	0.45	8.02E-08	0.06	1.3E-06	0.0
Anthracene	0.16	2.85E-08	0.3	9.5E-08	0.0
Benzo(a)anthracene	5.67	1.01E-06	ND	ND	ND
Benzo(a)pyrene	7.20	1.28E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	1.00E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	1.19E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	9.86E-07	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.65E-07	0.02	8.2E-06	0.1
Carbazole	0.13	2.32E-08	ND	ND	ND
Chrysene	7.04	1.25E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	3.65E-07	ND	ND	ND
Fluoranthene	4.06	7.25E-07	0:04	1.8E-05	0.2
Indeno(1,2,3-c,d)pyrene	5.13	9.14E-07	ND	ND	ND
Phenanthrene	1.28	2.29E-07	ND	ND	ND
Pyrene	6.73	1.20E-06	0.03	4.0E-05	0.5
Acetone	1.10	1.51E-07	0.1	1.5E-06	0.0
			TOTAL	7.7E-03	

TABLE C.7.1-7 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	5.77E-10	ND	ND	ND
Cadmium	7.64	7.48E-09	ND	ND	ND
Chromium	47.42	4.65E-08	ND	ND	ND
Nickel	43.74	4.28E-08	ND	ND	ND
Aroclor-1254	0.71	9.75E-09	1	9.7E-09	0.9
Aroclor-1260	0.94	1.29E-08	1	1.3E-08	1.2
DDD	0.04	1.04E-10	0.24	2.5E-11	0.0
DDE	0.054	1.59E-10	0.34	5.4E-11	0.0
DDT	0.08	2.44E-10	0.34	8.3E-11	0.0
Dieldrin	0.02	1.89E-10	16	3.0E-09	0.3
Benzo(a)anthracene	5.67	7.22E-08	0.73	5.3E-08	5.0
Benzo(a)pyrene	7.20	9.17E-08	7.3	6.7E-07	64.1
Benzo(b)fluoranthene	5.63	7.16E-08	0.73	5.2E-08	5.0
Benzo(g,h,i)perylene	6.70	8.53E-08	ND	ND	ND
Benzo(k)fluoranthene	5.53	7.04E-08	0.073	5.1E-09	0.5
Bis(2-ethylhexyl)phthalate	1.20	1.18E-08	0.014	1.6E-10	0.0
Carbazole	0.13	1.66E-09	0.02	3.3E-11	0.0
Chrysene	7.04	8.96E-08	0.0073	6.5E-10	0.1
Dibenzo(a,h)anthracene	2.05	2.61E-08	7.3	1.9E-07	18.2
Indeno(1,2,3-c,d)pyrene	5.13	6.53E-08	0.73	4.8E-08	4.6
			TOTAL	1.0E-06	

TABLE C.7.1-7 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1

Exposure Pathway: Average Inhalation of Particulates from Surface Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	1.08E-05	ND	ND	ND
Antimony	2.94	3.85E-09	ND	ND	ND
Barium	158.86	2.08E-07	ND	ND	ND
Beryllium	0.59	7.72E-10	0.006	1.3E-07	0.0
Cadmium	7.64	1.00E-08	ND	ND	ND
Chromium	47.42	6.21E-08	0.000029	2.1E-03	8.5
Copper	96.75	1.27E-07	ND	ND	ND
Lead	144.84	1.90E-07	ND	ND	ND
Manganese	249.05	3.26E-07	0.0000142	2.3E-02	91.5
Mercury	0.42	5.50E-10	ND	ND	ND
Nickel	43.74	5.73E-08	ND	ND	ND
Silver	3.59	4.70E-09	ND	ND	ND
Vanadium	32.96	4.32E-08	ND	ND	ND
Zinc	234.29	3.07E-07	ND	ND	ND
Aroclor-1254	0.71	9.31E-10	ND	ND	ND
Aroclor-1260	0.94	1.23E-09	ND	ND	ND
DDD	0.04	4.64E-11	ND	ND	ND
DDE	0.054	7.08E-11	ND	ND	ND
DDT	0.08	1.09E-10	ND	ND	ND
Dieldrin	0.02	2.53E-11	ND	ND	ND
Acenaphthene	0.45	5.90E-10	ND	ND	ND
Anthracene	0.16	2.10E-10	ND	ND	ND
Benzo(a)anthracene	5.67	7.43E-09	ND	ND	ND
Benzo(a)pyrene	7.20	9.44E-09	ND	ND	ND
Benzo(b)fluoranthene	5.63	7.37E-09	ND	ND	ND
Benzo(g,h,i)perylene	6.70	8.78E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	7.24E-09	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.57E-09	ND	ND	ND
Carbazole	0.13	1.70E-10	ND	ND	ND
Chrysene	7.04	9.22E-09	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	2.68E-09	ND	ND	ND
Fluoranthene	4.06	5.33E-09	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	6.72E-09	ND	ND	ND
Phenanthrene	1.28	1.68E-09	ND	ND	ND
Pyrene	6.73	8.82E-09	ND	ND	ND
Acetone	1.10	1.44E-09	ND	ND	ND
			TOTAL	2.5E-02	

TABLE C.7.1-7 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Inhalation of Particulates from Surface Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.20E-10	8.4	1.0E-09	0.2
Cadmium	7.64	1.55E-09	6.3	9.8E-09	2.3
Chromium	47.42	9.64E-09	42	4.0E-07	95.6
Nickel	43.74	8.89E-09	0.84	7.5E-09	1.8
Aroclor-1254	0.71	1.44E-10	0.4	5.8E-11	0.0
Aroclor-1260	0.94	1.91E-10	0.4	7.7E-11	0.0
DDD	0.04	7.19E-12	ND	ND	ND
DDE	0.054	1.10E-11	0.34	3.7E-12	0.0
DDT	0.08	1.69E-11	0.34	5.7E-12	0.0
Dieldrin	0.02	3.92E-12	16	6.3E-11	0.0
Benzo(a)anthracene	5.67	1.15E-09	ND	ND	ND
Benzo(a)pyrene	7.20	1.46E-09	ND	ND	ND
Benzo(b)fluoranthene	5.63	1.14E-09	ND	ND	ND
Benzo(g,h,i)perylene	6.70	1.36E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.12E-09	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	2.44E-10	ND	ND	ND
Carbazole	0.13	2.64E-11	ND	ND	ND
Chrysene	7.04	1.43E-09	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	4.16E-10	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	1.04E-09	ND	ND	ND
			TOTAL	4.2E-07	

Site 1
Exposure Pathway: Average Inhalation of Vapors from Surface Soil in Ambient Air

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Acenaphthene	0.45	1.46E-06	ND	ND	ND
Anthracene	0.16	2.98E-07	ND	ND	ND
Acetone	1.10	4.85E-06	0.1	4.9E-05	ND
			TOTAL	4.9E-05	

ND = Not Determined

TABLE C.7.1-8
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO IRRIGATION WATER
(NAVY AVERAGE ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Inhalation of Vapors from Irrigation Water
Navy Average Assumptions for Carcinogens

Noncarcinogenic Chemicals	Exposure Concentration (mg/m3)	Intake	Slope Factor	Risk	Chemical-Specific Percentage
Benzene	0.0000160	7.95E-08	2.90E-02	2.3E-09	2.5%
Trichloroethene	0.0000080	3.98E-08	6.00E-03	2.4E-10	0.3%
Vinyl Chloride	0.0000600	2.98E-07	3.00E-01	8.9E-08	97.2%
			TOTAL	9.2E-08	

Site 1
Exposure Pathway: Inhalation of Vapors from Irrigation Water
Navy Average Assumptions for Noncarcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/m3)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
1,2-Dichloroethene	0.0001560	7.75E-07	9.00E-03*	8.6E-05	100.0%
			TOTAL	8.6E-05	

* = The toxicity value for the inhalation pathway wa route-to-route extrapolated from the oral toxicity value, without adjustment, at the direction of the EPA Region 9 toxicologist. This is not an EPA-promulgated toxicity value and does not account for route of exposure, pharmacokinetic, or physiological considerations.

TABLE C.7.1-9
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Soil Ingestion
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.03E-07	7	7.2E-07	2.4
Cadmium	7.64	1.33E-06	ND	ND	ND
Chromium	47.42	8.29E-06	0.42	3.5E-06	11.8
Nickel	43.74	7.64E-06	ND	ND	ND
Aroclor-1254	0.71	1.24E-07	7.7	9.6E-07	3.2
Aroclor-1260	0.94	1.64E-07	7.7	1.3E-06	4.3
DDD	0.04	6.18E-09	0.24	1.5E-09	0.0
DDE	0.05	9.44E-09	0.34	3.2E-09	0.0
DDT	0.08	1.45E-08	0.34	4.9E-09	0.0
Dieldrin	0.02	3.37E-09	16	5.4E-08	0.2
Benzo(a)anthracene	5.67	9.90E-07	1.2	1.2E-06	4.0
Benzo(a)pyrene	7.20	1.26E-06	12	1.5E-05	51.3
Benzo(b)fluoranthene	5.63	9.83E-07	1.2	1.2E-06	4.0
Benzo(g,h,i)perylene	6.70	1.17E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	9.66E-07	0.12	1.2E-07	0.4
Bis(2-ethylhexyl)phthalate	1.20	2.10E-07	0.0084	1.8E-09	0.0
Carbazole	0.13	2.27E-08	0.02	4.5E-10	0.0
Chrysene	7.04	1.23E-06	0.012	1.5E-08	0.1
Dibenzo(a,h)anthracene	2.05	3.58E-07	12	4.3E-06	14.6
Indeno(1,2,3-c,d)pyrene	5.13	8.96E-07	1.2	1.1E-06	3.7
			TOTAL	2.9E-05	

TABLE C.7.1-9 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	2.34E-03	1	2.3E-03	1.4
Antimony	2.94	8.37E-07	0.0004	2.1E-03	1.2
Barium	158.86	4.52E-05	0.07	6.5E-04	0.4
Beryllium	0.59	1.68E-07	0.005	3.4E-05	0.0
Cadmium	7.64	2.18E-06	0.001	2.2E-03	1.3
Chromium	47.42	1.35E-05	0.003	4.5E-03	2.6
Copper	96.75	2.75E-05	0.037	7.4E-04	0.4
Lead	144.84	4.12E-05	ND	ND	ND
Manganese	249.05	7.09E-05	0.14	5.1E-04	0.3
Mercury	0.42	1.20E-07	0.0003	4.0E-04	0.2
Nickel	43.74	1.25E-05	0.02	6.2E-04	0.4
Silver	3.59	1.02E-06	0.005	2.0E-04	0.1
Vanadium	32.96	9.38E-06	0.007	1.3E-03	0.8
Zinc	234.29	6.67E-05	0.3	2.2E-04	0.1
Aroclor-1254	0.71	3.04E-06	0.00002	1.5E-01	89.3
Aroclor-1260	0.94	4.02E-06	ND	ND	ND
DDD	0.04	5.04E-08	ND	ND	ND
DDE	0.05	7.69E-08	ND	ND	ND
DDT	0.08	1.18E-07	0.0005	2.4E-04	0.1
Dieldrin	0.02	2.75E-08	0.00005	5.5E-04	0.3
Acenaphthene	0.45	1.92E-06	0.06	3.2E-05	0.0
Anthracene	0.16	6.83E-07	0.3	2.3E-06	0.0
Benzo(a)anthracene	5.67	2.42E-05	ND	ND	ND
Benzo(a)pyrene	7.20	3.08E-05	ND	ND	ND
Benzo(b)fluoranthene	5.63	2.40E-05	ND	ND	ND
Benzo(g,h,i)perylene	6.70	2.86E-05	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.36E-05	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	3.42E-06	0.02	1.7E-04	0.1
Carbazole	0.13	5.55E-07	ND	ND	ND
Chrysene	7.04	3.00E-05	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	8.75E-06	ND	ND	ND
Fluoranthene	4.06	1.74E-05	0.04	4.3E-04	0.3
Indeno(1,2,3-c,d)pyrene	5.13	2.19E-05	ND	ND	ND
Phenanthrene	1.28	5.48E-06	ND	ND	ND
Pyrene	6.73	2.88E-05	0.03	9.6E-04	0.6
Acetone	1.10	3.13E-06	0.1	3.1E-05	0.0
			TOTAL	1.7E-01	

TABLE C.7.1-9 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	5.99E-08	7	4.2E-07	0.2
Cadmium	7.64	7.77E-07	ND	ND	ND
Chromium	47.42	ND	0.42	ND	ND
Nickel	43.74	4.45E-06	ND	ND	ND
Aroclor-1254	0.71	1.08E-06	7.7	8.3E-06	3.8
Aroclor-1260	0.94	1.44E-06	7.7	1.1E-05	5.0
DDD	0.04	1.80E-08	0.24	4.3E-09	0.0
DDE	0.05	2.75E-08	0.34	9.3E-09	0.0
DDT	0.08	4.22E-08	0.34	1.4E-08	0.0
Dieldrin	0.02	9.81E-09	16	1.6E-07	0.1
Benzo(a)anthracene	5.67	8.65E-06	1.2	1.0E-05	4.7
Benzo(a)pyrene	7.20	1.10E-05	12	1.3E-04	59.8
Benzo(b)fluoranthene	5.63	8.58E-06	1.2	1.0E-05	4.7
Benzo(g,h,i)perylene	6.70	1.02E-05	ND	ND	ND
Benzo(k)fluoranthene	5.53	8.43E-06	0.12	1.0E-06	0.5
Bis(2-ethylhexyl)phthalate	1.20	1.22E-06	0.0084	1.0E-08	0.0
Carbazole	0.13	1.98E-07	0.02	4.0E-09	0.0
Chrysene	7.04	1.07E-05	0.012	1.3E-07	0.1
Dibenzo(a,h)anthracene	2.05	3.12E-06	12	3.7E-05	17.0
Indeno(1,2,3-c,d)pyrene	5.13	7.82E-06	1.2	9.4E-06	4.3
			TOTAL	2.2E-04	

TABLE C.7.1-9 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Inhalation of Particulates from Surface Soil
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	6.83E-10	7	4.8E-09	0.0
Cadmium	7.64	8.86E-09	15	1.3E-07	0.5
Chromium	47.42	5.50E-08	510	2.8E-05	99.1
Nickel	43.74	5.07E-08	0.91	4.6E-08	0.2
Aroclor-1254	0.71	8.25E-10	7.7	6.3E-09	0.0
Aroclor-1260	0.94	1.09E-09	7.7	8.4E-09	0.0
DDD	0.04	4.11E-11	0.24	9.9E-12	0.0
DDE	0.05	6.27E-11	0.34	2.1E-11	0.0
DDT	0.08	9.63E-11	0.34	3.3E-11	0.0
Dieldrin	0.02	2.24E-11	16	3.6E-10	0.0
Benzo(a)anthracene	5.67	6.58E-09	0.39	2.6E-09	0.0
Benzo(a)pyrene	7.20	8.35E-09	3.9	3.3E-08	0.1
Benzo(b)fluoranthene	5.63	6.53E-09	0.39	2.5E-09	0.0
Benzo(g,h,i)perylene	6.70	7.77E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	6.41E-09	0.039	2.5E-10	0.0
Bis(2-ethylhexyl)phthalate	1.20	1.39E-09	0.0084	1.2E-11	0.0
Carbazole	0.13	1.51E-10	ND	ND	ND
Chrysene	7.04	8.16E-09	0.0039	3.2E-11	0.0
Dibenzo(a,h)anthracene	2.05	2.38E-09	3.9	9.3E-09	0.0
Indeno(1,2,3-c,d)pyrene	5.13	5.95E-09	0.39	2.3E-09	0.0
			TOTAL	2.8E-05	

ND = Not Determined

TABLE C.7.1-10
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO IRRIGATION WATER
(DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Inhalation of Vapors from Irrigation Water
DTSC RME Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	SF	Cancer Risk	Chemical-Specific Percentage
Benzene	0.0000160	1.11E-07	1.00E-01	1.1E-08	8.9%
Trichloroethene	0.0000080	5.56E-08	1.00E-02	5.6E-10	0.4%
Vinyl Chloride	0.0000600	4.17E-07	2.70E-01	1.1E-07	90.6%
			TOTAL	1.2E-07	

TABLE C.7.1-11
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Soil Ingestion
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.80E-08	7	1.3E-07	2.4
Cadmium	7.64	2.34E-07	ND	ND	ND
Chromium	47.42	1.45E-06	0.42	6.1E-07	11.8
Nickel	43.74	1.34E-06	ND	ND	ND
Aroclor-1254	0.71	2.18E-08	7.7	1.7E-07	3.2
Aroclor-1260	0.94	2.88E-08	7.7	2.2E-07	4.3
DDD	0.04	1.08E-09	0.24	2.6E-10	0.0
DDE	0.054	1.65E-09	0.34	5.6E-10	0.0
DDT	0.08	2.54E-09	0.34	8.6E-10	0.0
Dieldrin	0.02	5.91E-10	16	9.5E-09	0.2
Benzo(a)anthracene	5.67	1.74E-07	1.2	2.1E-07	4.0
Benzo(a)pyrene	7.20	2.20E-07	12	2.6E-06	51.3
Benzo(b)fluoranthene	5.63	1.72E-07	1.2	2.1E-07	4.0
Benzo(g,h,i)perylene	6.70	2.05E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.69E-07	0.12	2.0E-08	0.4
Bis(2-ethylhexyl)phthalate	1.20	3.67E-08	0.0084	3.1E-10	0.0
Carbazole	0.13	3.98E-09	0.02	8.0E-11	0.0
Chrysene	7.04	2.15E-07	0.012	2.6E-09	0.1
Dibenzo(a,h)anthracene	2.05	6.27E-08	12	7.5E-07	14.6
Indeno(1,2,3-c,d)pyrene	5.13	1.57E-07	1.2	1.9E-07	3.7
			TOTAL	5.2E-06	

TABLE C.7.1-11 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	2.82E-04	1	2.8E-04	1.4
Antimony	2.94	1.01E-07	0.0004	2.5E-04	1.2
Barium	158.86	5.45E-06	0.07	7.8E-05	0.4
Beryllium	0.59	2.02E-08	0.005	4.0E-06	0.0
Cadmium	7.64	2.62E-08	0.001	2.6E-05	0.1
Chromium	47.42	1.63E-06	0.003	5.4E-04	2.7
Copper	96.75	3.32E-06	0.037	9.0E-05	0.4
Lead	144.84	4.97E-06	ND	ND	ND
Manganese	249.05	8.54E-06	0.14	6.1E-05	0.3
Mercury	0.42	1.44E-08	0.0003	4.8E-05	0.2
Nickel	43.74	1.50E-06	0.02	7.5E-05	0.4
Silver	3.59	1.23E-07	0.005	2.5E-05	0.1
Vanadium	32.96	1.13E-06	0.007	1.6E-04	0.8
Zinc	234.29	8.03E-06	0.3	2.7E-05	0.1
Aroclor-1254	0.71	3.66E-07	0.00002	1.8E-02	90.3
Aroclor-1260	0.94	4.84E-07	ND	ND	ND
DDD	0.04	6.07E-09	ND	ND	ND
DDE	0.054	9.26E-09	ND	ND	ND
DDT	0.08	1.42E-08	0.0005	2.8E-05	0.1
Dieldrin	0.02	3.31E-09	0.00005	6.6E-05	0.3
Acenaphthene	0.45	2.31E-07	0.06	3.9E-06	0.0
Anthracene	0.16	8.23E-08	0.3	2.7E-07	0.0
Benzo(a)anthracene	5.67	2.92E-06	ND	ND	ND
Benzo(a)pyrene	7.20	3.70E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	2.89E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	3.45E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.84E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	4.11E-07	0.02	2.1E-05	0.1
Carbazole	0.13	6.69E-08	ND	ND	ND
Chrysene	7.04	3.62E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.05E-06	ND	ND	ND
Fluoranthene	4.06	2.09E-06	0.04	5.2E-05	0.3
Indeno(1,2,3-c,d)pyrene	5.13	2.64E-06	ND	ND	ND
Phenanthrene	1.28	6.60E-07	ND	ND	ND
Pyrene	6.73	3.46E-06	0.03	1.2E-04	0.6
Acetone	1.10	3.77E-07	0.1	3.8E-06	0.0
			TOTAL	2.0E-02	

TABLE C.7.1-11 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.44E-09	7	1.0E-08	0.2
Cadmium	7.64	1.87E-09	ND	ND	ND
Chromium	47.42	ND	0.42	ND	ND
Nickel	43.74	1.07E-07	ND	ND	ND
Aroclor-1254	0.71	2.61E-08	7.7	2.0E-07	3.8
Aroclor-1260	0.94	3.46E-08	7.7	2.7E-07	5.0
DDD	0.04	4.33E-10	0.24	1.0E-10	0.0
DDE	0.054	6.62E-10	0.34	2.2E-10	0.0
DDT	0.08	1.02E-09	0.34	3.5E-10	0.0
Dieldrin	0.02	2.36E-10	16	3.8E-09	0.1
Benzo(a)anthracene	5.67	2.08E-07	1.2	2.5E-07	4.7
Benzo(a)pyrene	7.20	2.64E-07	12	3.2E-06	59.8
Benzo(b)fluoranthene	5.63	2.07E-07	1.2	2.5E-07	4.7
Benzo(g,h,i)perylene	6.70	2.46E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.03E-07	0.12	2.4E-08	0.5
Bis(2-ethylhexyl)phthalate	1.20	2.94E-08	0.0084	2.5E-10	0.0
Carbazole	0.13	4.78E-09	0.02	9.6E-11	0.0
Chrysene	7.04	2.58E-07	0.012	3.1E-09	0.1
Dibenzo(a,h)anthracene	2.05	7.52E-08	12	9.0E-07	17.0
Indeno(1,2,3-c,d)pyrene	5.13	1.88E-07	1.2	2.3E-07	4.3
			TOTAL	5.3E-06	

TABLE C.7.1-11 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Inhalation of Particulates from Surface Soil
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.20E-10	7	8.4E-10	0.0
Cadmium	7.64	1.55E-09	15	2.3E-08	0.5
Chromium	47.42	9.64E-09	510	4.9E-06	99.1
Nickel	43.74	8.89E-09	0.91	8.1E-09	0.2
Aroclor-1254	0.71	1.44E-10	7.7	1.1E-09	0.0
Aroclor-1260	0.94	1.91E-10	7.7	1.5E-09	0.0
DDD	0.04	7.19E-12	0.24	1.7E-12	0.0
DDE	0.054	1.10E-11	0.34	3.7E-12	0.0
DDT	0.08	1.69E-11	0.34	5.7E-12	0.0
Dieldrin	0.02	3.92E-12	16	6.3E-11	0.0
Benzo(a)anthracene	5.67	1.15E-09	0.39	4.5E-10	0.0
Benzo(a)pyrene	7.20	1.46E-09	3.9	5.7E-09	0.1
Benzo(b)fluoranthene	5.63	1.14E-09	0.39	4.5E-10	0.0
Benzo(g,h,i)perylene	6.70	1.36E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.12E-09	0.039	4.4E-11	0.0
Bis(2-ethylhexyl)phthalate	1.20	2.44E-10	0.0084	2.0E-12	0.0
Carbazole	0.13	2.64E-11	ND	ND	ND
Chrysene	7.04	1.43E-09	0.0039	5.6E-12	0.0
Dibenzo(a,h)anthracene	2.05	4.16E-10	3.9	1.6E-09	0.0
Indeno(1,2,3-c,d)pyrene	5.13	1.04E-09	0.39	4.1E-10	0.0
			TOTAL	5.0E-06	

ND = Not Determined

TABLE C.7.1-12
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL EXPOSURE TO IRRIGATION WATER
(DTSC AVERAGE ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Inhalation of Vapors from Irrigation Water
DTSC Average Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	SF	Cancer Risk	Chemical-Specific Percentage
Benzene	0.0000160	7.95E-08	1.00E-01	8.0E-09	8.9%
Trichloroethene	0.0000080	3.98E-08	1.00E-02	4.0E-10	0.4%
Vinyl Chloride	0.0000600	2.98E-07	2.70E-01	8.1E-08	90.6%
			TOTAL	8.9E-08	

TABLE C.7.1-13
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Soil Ingestion

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDo	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	5.42E-03	1	5.4E-03	8.9
Antimony	2.94	1.94E-06	0.0004	4.8E-03	8.0
Barium	158.86	1.05E-04	0.07	1.5E-03	2.5
Beryllium	0.59	3.89E-07	0.002	1.9E-04	0.3
Cadmium	7.64	5.04E-06	0.001	5.0E-03	8.3
Chromium	47.42	3.13E-05	0.003	1.0E-02	17.1
Copper	96.75	6.38E-05	0.037	1.7E-03	2.8
Lead	144.84	9.56E-05	ND	ND	ND
Manganese	249.05	1.64E-04	0.14	1.2E-03	1.9
Mercury	0.42	2.77E-07	0.0003	9.2E-04	1.5
Nickel	43.74	2.89E-05	0.02	1.4E-03	2.4
Silver	3.59	2.37E-06	0.005	4.7E-04	0.8
Vanadium	32.96	2.17E-05	0.007	3.1E-03	5.1
Zinc	234.29	1.55E-04	0.3	5.2E-04	0.8
Aroclor-1254	0.71	4.69E-07	0.00002	2.3E-02	38.5
Aroclor-1260	0.94	6.21E-07	ND	ND	ND
DDD	0.04	2.33E-08	ND	ND	ND
DDE	0.054	3.56E-08	ND	ND	ND
DDT	0.08	5.47E-08	0.0005	1.1E-04	0.2
Dieldrin	0.02	1.27E-08	0.00005	2.5E-04	0.4
Acenaphthene	0.45	2.97E-07	0.06	4.9E-06	0.0
Anthracene	0.16	1.06E-07	0.3	3.5E-07	0.0
Benzo(a)anthracene	5.67	3.74E-06	ND	ND	ND
Benzo(a)pyrene	7.20	4.75E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	3.71E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	4.42E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	3.65E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	7.92E-07	0.02	4.0E-05	0.1
Carbazole	0.13	8.58E-08	ND	ND	ND
Chrysene	7.04	4.64E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.35E-06	ND	ND	ND
Fluoranthene	4.06	2.68E-06	0.04	6.7E-05	0.1
Indeno(1,2,3-c,d)pyrene	5.13	3.38E-06	ND	ND	ND
Phenanthrene	1.28	8.47E-07	ND	ND	ND
Pyrene	6.73	4.44E-06	0.03	1.5E-04	0.2
Acetone	1.10	7.26E-07	0.1	7.3E-06	0.0
			TOTAL	6.1E-02	

TABLE C.7.1-13 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Soil Ingestion

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.67E-07	ND	ND	ND
Cadmium	7.64	2.16E-06	ND	ND	ND
Chromium	47.42	1.34E-05	ND	ND	ND
Nickel	43.74	1.24E-05	ND	ND	ND
Aroclor-1254	0.71	2.01E-07	2	4.0E-07	1.7
Aroclor-1260	0.94	2.66E-07	2	5.3E-07	2.3
DDD	0.04	1.00E-08	0.24	2.4E-09	0.0
DDE	0.054	1.53E-08	0.34	5.2E-09	0.0
DDT	0.08	2.35E-08	0.34	8.0E-09	0.0
Dieldrin	0.02	5.46E-09	16	8.7E-08	0.4
Benzo(a)anthracene	5.67	1.60E-06	0.73	1.2E-06	4.9
Benzo(a)pyrene	7.20	2.04E-06	7.3	1.5E-05	62.8
Benzo(b)fluoranthene	5.63	1.59E-06	0.73	1.2E-06	4.9
Benzo(g,h,i)perylene	6.70	1.89E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.56E-06	0.073	1.1E-07	0.5
Bis(2-ethylhexyl)phthalate	1.20	3.39E-07	0.014	4.7E-09	0.0
Carbazole	0.13	3.68E-08	0.02	7.4E-10	0.0
Chrysene	7.04	1.99E-06	0.0073	1.5E-08	0.1
Dibenzo(a,h)anthracene	2.05	5.79E-07	7.3	4.2E-06	17.9
Indeno(1,2,3-c,d)pyrene	5.13	1.45E-06	0.73	1.1E-06	4.5
			TOTAL	2.4E-05	

TABLE C.7.1-13 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	3.30E-04	1	3.3E-04	1.5
Antimony	2.94	1.18E-07	0.0004	3.0E-04	1.3
Barium	158.86	6.38E-06	0.07	9.1E-05	0.4
Beryllium	0.59	2.37E-08	0.002	1.2E-05	0.1
Cadmium	7.64	3.07E-07	0.001	3.1E-04	1.4
Chromium	47.42	1.90E-06	0.003	6.3E-04	2.8
Copper	96.75	3.89E-06	0.037	1.1E-04	0.5
Lead	144.84	5.82E-06	ND	ND	ND
Manganese	249.05	1.00E-05	0.14	7.1E-05	0.3
Mercury	0.42	1.69E-08	0.0003	5.6E-05	0.2
Nickel	43.74	1.76E-06	0.02	8.8E-05	0.4
Silver	3.59	1.44E-07	0.005	2.9E-05	0.1
Vanadium	32.96	1.32E-06	0.007	1.9E-04	0.8
Zinc	234.29	9.41E-06	0.3	3.1E-05	0.1
Aroclor-1254	0.71	4.00E-07	0.00002	2.0E-02	88.4
Aroclor-1260	0.94	5.29E-07	ND	ND	ND
DDD	0.04	4.26E-09	ND	ND	ND
DDE	0.054	6.51E-09	ND	ND	ND
DDT	0.08	1.00E-08	0.0005	2.0E-05	0.1
Dieldrin	0.02	7.75E-09	0.00005	1.6E-04	0.7
Acenaphthene	0.45	2.35E-07	0.06	3.9E-06	0.0
Anthracene	0.16	8.35E-08	0.3	2.8E-07	0.0
Benzo(a)anthracene	5.67	2.96E-06	ND	ND	ND
Benzo(a)pyrene	7.20	3.76E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	2.94E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	3.50E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.89E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	4.82E-07	0.02	2.4E-05	0.1
Carbazole	0.13	6.79E-08	ND	ND	ND
Chrysene	7.04	3.67E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.07E-06	ND	ND	ND
Fluoranthene	4.06	2.12E-06	0.04	5.3E-05	0.2
Indeno(1,2,3-c,d)pyrene	5.13	2.68E-06	ND	ND	ND
Phenanthrene	1.28	6.70E-07	ND	ND	ND
Pyrene	6.73	3.52E-06	0.03	1.2E-04	0.5
Acetone	1.10	4.42E-07	0.1	4.4E-06	0.0
			TOTAL	2.3E-02	

TABLE C.7.1-13 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.01E-08	ND	ND	ND
Cadmium	7.64	1.31E-07	ND	ND	ND
Chromium	47.42	8.16E-07	ND	ND	ND
Nickel	43.74	7.53E-07	ND	ND	ND
Aroclor-1254	0.71	1.71E-07	2	3.4E-07	1.8
Aroclor-1260	0.94	2.27E-07	2	4.5E-07	2.4
DDD	0.04	1.83E-09	0.24	4.4E-10	0.0
DDE	0.054	2.79E-09	0.34	9.5E-10	0.0
DDT	0.08	4.28E-09	0.34	1.5E-09	0.0
Dieldrin	0.02	3.32E-09	16	5.3E-08	0.3
Benzo(a)anthracene	5.67	1.27E-06	0.73	9.3E-07	4.9
Benzo(a)pyrene	7.20	1.61E-06	7.3	1.2E-05	62.7
Benzo(b)fluoranthene	5.63	1.26E-06	0.73	9.2E-07	4.9
Benzo(g,h,i)perylene	6.70	1.50E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.24E-06	0.073	9.0E-08	0.5
Bis(2-ethylhexyl)phthalate	1.20	2.07E-07	0.014	2.9E-09	0.0
Carbazole	0.50	1.13E-07	0.02	2.3E-09	0.0
Chrysene	7.04	1.57E-06	0.0073	1.1E-08	0.1
Dibenzo(a,h)anthracene	2.05	4.58E-07	7.3	3.3E-06	17.8
Indeno(1,2,3-c,d)pyrene	5.13	1.15E-06	0.73	8.4E-07	4.5
			TOTAL	1.9E-05	

TABLE C.7.1-13 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Inhalation of Particulates from Surface Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	5.60E-06	ND	ND	ND
Antimony	2.94	2.00E-09	ND	ND	ND
Barium	158.86	1.08E-07	ND	ND	ND
Beryllium	0.59	4.01E-10	0.006	6.7E-08	0.0
Cadmium	7.64	5.21E-09	ND	ND	ND
Chromium	47.42	3.23E-08	0.000029	1.1E-03	8.5
Copper	96.75	6.59E-08	ND	ND	ND
Lead	144.84	9.87E-08	ND	ND	ND
Manganese	249.05	1.70E-07	0.0000142	1.2E-02	91.5
Mercury	0.42	2.86E-10	ND	ND	ND
Nickel	43.74	2.98E-08	ND	ND	ND
Silver	3.59	2.45E-09	ND	ND	ND
Vanadium	32.96	2.25E-08	ND	ND	ND
Zinc	234.29	1.60E-07	ND	ND	ND
Aroclor-1254	0.71	4.84E-10	ND	ND	ND
Aroclor-1260	0.94	6.42E-10	ND	ND	ND
DDD	0.04	2.41E-11	ND	ND	ND
DDE	0.054	3.68E-11	ND	ND	ND
DDT	0.08	5.65E-11	ND	ND	ND
Dieldrin	0.02	1.32E-11	ND	ND	ND
Acenaphthene	0.45	3.07E-10	ND	ND	ND
Anthracene	0.16	1.09E-10	ND	ND	ND
Benzo(a)anthracene	5.67	3.86E-09	ND	ND	ND
Benzo(a)pyrene	7.20	4.91E-09	ND	ND	ND
Benzo(b)fluoranthene	5.63	3.83E-09	ND	ND	ND
Benzo(g,h,i)perylene	6.70	4.57E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	3.77E-09	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	8.18E-10	ND	ND	ND
Carbazole	0.13	8.86E-11	ND	ND	ND
Chrysene	7.04	4.79E-09	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.40E-09	ND	ND	ND
Fluoranthene	4.06	2.77E-09	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	3.50E-09	ND	ND	ND
Phenanthrene	1.28	8.75E-10	ND	ND	ND
Pyrene	6.73	4.59E-09	ND	ND	ND
Acetone	1.10	7.50E-10	ND	ND	ND
			TOTAL	1.3E-02	

TABLE C.7.1-13 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Inhalation of Particulates from Surface Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	3.74E-10	8.4	3.1E-09	0.2
Cadmium	7.64	4.85E-09	6.3	3.1E-08	2.3
Chromium	47.42	3.01E-08	42	1.3E-06	95.6
Nickel	43.74	2.77E-08	0.84	2.3E-08	1.8
Aroclor-1254	0.71	4.51E-10	0.4	1.8E-10	0.0
Aroclor-1260	0.94	5.97E-10	0.4	2.4E-10	0.0
DDD	0.04	2.24E-11	ND	ND	ND
DDE	0.054	3.43E-11	0.34	1.2E-11	0.0
DDT	0.08	5.26E-11	0.34	1.8E-11	0.0
Dieldrin	0.02	1.22E-11	16	2.0E-10	0.0
Benzo(a)anthracene	5.67	3.60E-09	ND	ND	ND
Benzo(a)pyrene	7.20	4.57E-09	ND	ND	ND
Benzo(b)fluoranthene	5.63	3.57E-09	ND	ND	ND
Benzo(g,h,i)perylene	6.70	4.25E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	3.51E-09	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	7.61E-10	ND	ND	ND
Carbazole	0.13	8.25E-11	ND	ND	ND
Chrysene	7.04	4.46E-09	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.30E-09	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	3.25E-09	ND	ND	ND
			TOTAL	1.3E-06	

Site 1
Exposure Pathway: RME Inhalation of Vapors from Surface Soil in Ambient Air

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Acenapthene	0.45	7.63E-07	ND	ND	ND
Anthracene	0.16	1.55E-07	ND	ND	ND
Acetone	1.10	2.52E-06	0.1	2.5E-05	100.0
			TOTAL	2.5E-05	

ND = Not Determined

TABLE C.7.1-14
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Soil Ingestion

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDo	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	1.16E-03	1	1.2E-03	8.9
Antimony	2.94	4.15E-07	0.0004	1.0E-03	8.0
Barium	158.86	2.24E-05	0.07	3.2E-04	2.5
Beryllium	0.59	8.31E-08	0.002	4.2E-05	0.3
Cadmium	7.64	1.08E-06	0.001	1.1E-03	8.3
Chromium	47.42	6.69E-06	0.003	2.2E-03	17.1
Copper	96.75	1.36E-05	0.037	3.7E-04	2.8
Lead	144.84	2.04E-05	ND	ND	ND
Manganese	249.05	3.51E-05	0.14	2.5E-04	1.9
Mercury	0.42	5.92E-08	0.0003	2.0E-04	1.5
Nickel	43.74	6.17E-06	0.02	3.1E-04	2.4
Silver	3.59	5.06E-07	0.005	1.0E-04	0.8
Vanadium	32.96	4.65E-06	0.007	6.6E-04	5.1
Zinc	234.29	3.30E-05	0.3	1.1E-04	0.8
Aroclor-1254	0.71	1.00E-07	0.00002	5.0E-03	38.5
Aroclor-1260	0.94	1.33E-07	ND	ND	ND
DDD	0.04	4.99E-09	ND	ND	ND
DDE	0.054	7.62E-09	ND	ND	ND
DDT	0.08	1.17E-08	0.0005	2.3E-05	0.2
Dieldrin	0.02	2.72E-09	0.00005	5.4E-05	0.4
Acenaphthene	0.45	6.35E-08	0.06	1.1E-06	0.0
Anthracene	0.16	2.26E-08	0.3	7.5E-08	0.0
Benzo(a)anthracene	5.67	7.99E-07	ND	ND	ND
Benzo(a)pyrene	7.20	1.02E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	7.93E-07	ND	ND	ND
Benzo(g,h,i)perylene	6.70	9.45E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	7.80E-07	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.69E-07	0.02	8.5E-06	0.1
Carbazole	0.13	1.83E-08	ND	ND	ND
Chrysene	7.04	9.92E-07	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	2.89E-07	ND	ND	ND
Fluoranthene	4.06	5.73E-07	0.04	1.4E-05	0.1
Indeno(1,2,3-c,d)pyrene	5.13	7.23E-07	ND	ND	ND
Phenanthrene	1.28	1.81E-07	ND	ND	ND
Pyrene	6.73	9.50E-07	0.03	3.2E-05	0.2
Acetone	1.10	1.55E-07	0.1	1.6E-06	0.0
			TOTAL	1.3E-02	

TABLE C.7.1-14 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Soil Ingestion

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.07E-08	ND	ND	ND
Cadmium	7.64	1.39E-07	ND	ND	ND
Chromium	47.42	8.60E-07	ND	ND	ND
Nickel	43.74	7.93E-07	ND	ND	ND
Aroclor-1254	0.71	1.29E-08	1	1.3E-08	0.9
Aroclor-1260	0.94	1.71E-08	1	1.7E-08	1.1
DDD	0.04	6.42E-10	0.24	1.5E-10	0.0
DDE	0.054	9.80E-10	0.34	3.3E-10	0.0
DDT	0.08	1.50E-09	0.34	5.1E-10	0.0
Dieldrin	0.02	3.50E-10	16	5.6E-09	0.4
Benzo(a)anthracene	5.67	1.03E-07	0.73	7.5E-08	5.0
Benzo(a)pyrene	7.20	1.31E-07	7.3	9.5E-07	64.1
Benzo(b)fluoranthene	5.63	1.02E-07	0.73	7.4E-08	5.0
Benzo(g,h,i)perylene	6.70	1.21E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.00E-07	0.073	7.3E-09	0.5
Bis(2-ethylhexyl)phthalate	1.20	2.18E-08	0.014	3.0E-10	0.0
Carbazole	0.13	2.36E-09	0.02	4.7E-11	0.0
Chrysene	7.04	1.28E-07	0.0073	9.3E-10	0.1
Dibenzo(a,h)anthracene	2.05	3.71E-08	7.3	2.7E-07	18.2
Indeno(1,2,3-c,d)pyrene	5.13	9.30E-08	0.73	6.8E-08	4.6
			TOTAL	1.5E-06	

TABLE C.7.1-14 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	7.49E-05	1	7.5E-05	1.5
Antimony	2.94	2.68E-08	0.0004	6.7E-05	1.3
Barium	158.86	1.45E-06	0.07	2.1E-05	0.4
Beryllium	0.59	5.37E-09	0.002	2.7E-06	0.1
Cadmium	7.64	6.97E-08	0.001	7.0E-05	1.4
Chromium	47.42	4.32E-07	0.003	1.4E-04	2.8
Copper	96.75	8.82E-07	0.037	2.4E-05	0.5
Lead	144.84	1.32E-06	ND	ND	ND
Manganese	249.05	2.27E-06	0.14	1.6E-05	0.3
Mercury	0.42	3.83E-09	0.0003	1.3E-05	0.2
Nickel	43.74	3.99E-07	0.02	2.0E-05	0.4
Silver	3.59	3.27E-08	0.005	6.5E-06	0.1
Vanadium	32.96	3.01E-07	0.007	4.3E-05	0.8
Zinc	234.29	2.14E-06	0.3	7.1E-06	0.1
Aroclor-1254	0.71	9.07E-08	0.00002	4.5E-03	88.4
Aroclor-1260	0.94	1.20E-07	ND	ND	ND
DDD	0.04	9.68E-10	ND	ND	ND
DDE	0.054	1.48E-09	ND	ND	ND
DDT	0.08	2.27E-09	0.0005	4.5E-06	0.1
Dieldrin	0.02	1.76E-09	0.00005	3.5E-05	0.7
Acenaphthene	0.45	5.33E-08	0.06	8.9E-07	0.0
Anthracene	0.16	1.90E-08	0.3	6.3E-08	0.0
Benzo(a)anthracene	5.67	6.72E-07	ND	ND	ND
Benzo(a)pyrene	7.20	8.53E-07	ND	ND	ND
Benzo(b)fluoranthene	5.63	6.67E-07	ND	ND	ND
Benzo(g,h,i)perylene	6.70	7.94E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	6.55E-07	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.09E-07	0.02	5.5E-06	0.1
Carbazole	0.13	1.54E-08	ND	ND	ND
Chrysene	7.04	8.34E-07	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	2.43E-07	ND	ND	ND
Fluoranthene	4.06	4.82E-07	0.04	1.2E-05	0.2
Indeno(1,2,3-c,d)pyrene	5.13	6.08E-07	ND	ND	ND
Phenanthrene	1.28	1.52E-07	ND	ND	ND
Pyrene	6.73	7.98E-07	0.03	2.7E-05	0.5
Acetone	1.10	5.57E-08	0.1	5.6E-07	0.0
			TOTAL	5.1E-03	

TABLE C.7.1-14 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	4.93E-10	ND	ND	ND
Cadmium	7.64	6.40E-09	ND	ND	ND
Chromium	47.42	3.97E-08	ND	ND	ND
Nickel	43.74	3.66E-08	ND	ND	ND
Aroclor-1254	0.71	8.33E-09	1	8.3E-09	0.9
Aroclor-1260	0.94	1.10E-08	1	1.1E-08	1.2
DDD	0.04	8.89E-11	0.24	2.1E-11	0.0
DDE	0.054	1.36E-10	0.34	4.6E-11	0.0
DDT	0.08	2.08E-10	0.34	7.1E-11	0.0
Dieldrin	0.02	1.62E-10	16	2.6E-09	0.3
Benzo(a)anthracene	5.67	6.17E-08	0.73	4.5E-08	5.0
Benzo(a)pyrene	7.20	7.84E-08	7.3	5.7E-07	64.1
Benzo(b)fluoranthene	5.63	6.12E-08	0.73	4.5E-08	5.0
Benzo(g,h,i)perylene	6.70	7.29E-08	ND	ND	ND
Benzo(k)fluoranthene	5.53	6.02E-08	0.073	4.4E-09	0.5
Bis(2-ethylhexyl)phthalate	1.20	1.00E-08	0.014	1.4E-10	0.0
Carbazole	0.13	1.42E-09	0.02	2.8E-11	0.0
Chrysene	7.04	7.66E-08	0.0073	5.6E-10	0.1
Dibenzo(a,h)anthracene	2.05	2.23E-08	7.3	1.6E-07	18.2
Indeno(1,2,3-c,d)pyrene	5.13	5.58E-08	0.73	4.1E-08	4.6
			TOTAL	8.9E-07	

TABLE C.7.1-14 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Inhalation of Particulates from Surface Soil

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	6.74E-07	ND	ND	ND
Antimony	2.94	4.35E-10	ND	ND	ND
Barium	158.86	2.35E-08	ND	ND	ND
Beryllium	0.59	8.71E-11	0.006	1.5E-08	0.0
Cadmium	7.64	1.13E-09	ND	ND	ND
Chromium	47.42	7.01E-09	2.90E-05	2.4E-04	8.5
Copper	96.75	1.43E-08	ND	ND	ND
Lead	144.84	2.14E-08	ND	ND	ND
Manganese	249.05	3.68E-08	0.0000142	2.6E-03	91.5
Mercury	0.42	6.21E-11	ND	ND	ND
Nickel	43.74	6.47E-09	ND	ND	ND
Silver	3.59	5.31E-10	ND	ND	ND
Vanadium	32.96	4.87E-09	ND	ND	ND
Zinc	234.29	3.46E-08	ND	ND	ND
Aroclor-1254	0.71	1.05E-10	ND	ND	ND
Aroclor-1260	0.94	1.39E-10	ND	ND	ND
DDD	0.04	5.23E-12	ND	ND	ND
DDE	0.054	7.99E-12	ND	ND	ND
DDT	0.08	1.23E-11	ND	ND	ND
Dieldrin	0.02	2.85E-12	ND	ND	ND
Acenaphthene	0.45	6.65E-11	ND	ND	ND
Anthracene	0.16	2.36E-11	ND	ND	ND
Benzo(a)anthracene	5.67	8.38E-10	ND	ND	ND
Benzo(a)pyrene	7.20	1.06E-09	ND	ND	ND
Benzo(b)fluoranthene	5.63	8.32E-10	ND	ND	ND
Benzo(g,h,i)perylene	6.70	9.90E-10	ND	ND	ND
Benzo(k)fluoranthene	5.53	8.17E-10	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.77E-10	ND	ND	ND
Carbazole	0.13	1.92E-11	ND	ND	ND
Chrysene	7.04	1.04E-09	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	3.03E-10	ND	ND	ND
Fluoranthene	4.06	6.01E-10	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	7.58E-10	ND	ND	ND
Phenanthrene	1.28	1.90E-10	ND	ND	ND
Pyrene	6.73	9.95E-10	ND	ND	ND
Acetone	1.10	1.63E-10	ND	ND	ND
			TOTAL	2.8E-03	

TABLE C.7.1-14 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (NAVY AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Inhalation of Particulates from Surface Soil

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	2.43E-11	8.4	2.0E-10	0.2
Cadmium	7.64	3.15E-10	6.3	2.0E-09	2.3
Chromium	47.42	1.96E-09	42	8.2E-08	95.6
Nickel	43.74	1.80E-09	0.84	1.5E-09	1.8
Aroclor-1254	0.71	2.93E-11	0.4	1.2E-11	0.0
Aroclor-1260	0.94	3.88E-11	0.4	1.6E-11	0.0
DDD	0.04	1.46E-12	ND	ND	ND
DDE	0.054	2.23E-12	0.34	7.6E-13	0.0
DDT	0.08	3.42E-12	0.34	1.2E-12	0.0
Dieldrin	0.02	7.96E-13	16	1.3E-11	0.0
Benzo(a)anthracene	5.67	2.34E-10	ND	ND	ND
Benzo(a)pyrene	7.20	2.97E-10	ND	ND	ND
Benzo(b)fluoranthene	5.63	2.32E-10	ND	ND	ND
Benzo(g,h,i)perylene	6.70	2.76E-10	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.28E-10	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	4.95E-11	ND	ND	ND
Carbazole	0.13	5.36E-12	ND	ND	ND
Chrysene	7.04	2.90E-10	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	8.45E-11	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	5.13	2.12E-10	ND	ND	ND
			TOTAL	8.6E-08	

Site 1
Exposure Pathway: Average Inhalation of Vapors from Surface Soil in Ambient Air

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDi	Hazard Index	Chemical-Specific Percentage
Acenephthene	0.45	1.66E-07	ND	ND	ND
Anthracene	0.16	3.36E-08	ND	ND	ND
Acetone	1.10	5.47E-07	0.1	5.5E-06	100.0
			TOTAL	5.5E-06	

ND = Not Determined

TABLE C.7.1-15
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Soil Ingestion
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.67E-07	7	1.2E-06	2.4
Cadmium	7.64	2.16E-06	ND	ND	ND
Chromium	47.42	1.34E-05	0.42	5.6E-06	11.8
Nickel	43.74	1.24E-05	ND	ND	ND
Aroclor-1254	0.71	2.01E-07	7.7	1.5E-06	3.2
Aroclor-1260	0.94	2.66E-07	7.7	2.0E-06	4.3
DDD	0.04	1.00E-08	0.24	2.4E-09	0.0
DDE	0.05	1.53E-08	0.34	5.2E-09	0.0
DDT	0.08	2.35E-08	0.34	8.0E-09	0.0
Dieldrin	0.02	5.65E-09	16	9.0E-08	0.2
Benzo(a)anthracene	5.67	1.60E-06	1.2	1.9E-06	4.0
Benzo(a)pyrene	7.20	2.04E-06	12	2.4E-05	51.3
Benzo(b)fluoranthene	5.63	1.59E-06	1.2	1.9E-06	4.0
Benzo(g,h,i)perylene	6.70	1.89E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.56E-06	0.12	1.9E-07	0.4
Bis(2-ethylhexyl)phthalate	1.20	3.39E-07	0.0084	2.8E-09	0.0
Carbazole	0.13	3.68E-08	0.02	7.4E-10	0.0
Chrysene	7.04	1.99E-06	0.012	2.4E-08	0.1
Dibenzo(a,h)anthracene	2.05	5.79E-07	12	6.9E-06	14.6
Indeno(1,2,3-c,d)pyrene	5.13	1.45E-06	1.2	1.7E-06	3.7
			TOTAL	4.8E-05	

TABLE C.7.1-15 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	4.12E-03	1	4.1E-03	1.4
Antimony	2.94	1.48E-06	0.0004	3.7E-03	1.2
Barium	158.86	7.97E-05	0.07	1.1E-03	0.4
Beryllium	0.59	2.96E-07	0.005	5.9E-05	0.0
Cadmium	7.64	3.84E-06	0.001	3.8E-03	1.3
Chromium	47.42	2.38E-05	0.003	7.9E-03	2.6
Copper	96.75	4.86E-05	0.037	1.3E-03	0.4
Lead	144.84	7.27E-05	ND	ND	ND
Manganese	249.05	1.25E-04	0.14	8.9E-04	0.3
Mercury	0.42	2.11E-07	0.0003	7.0E-04	0.2
Nickel	43.74	2.20E-05	0.02	1.1E-03	0.4
Silver	3.59	1.80E-06	0.005	3.6E-04	0.1
Vanadium	32.96	1.65E-05	0.007	2.4E-03	0.8
Zinc	234.29	1.18E-04	0.3	3.9E-04	0.1
Aroclor-1254	0.71	5.35E-06	0.00002	2.7E-01	89.3
Aroclor-1260	0.94	7.09E-06	ND	ND	ND
DDD	0.04	8.88E-08	ND	ND	ND
DDE	0.05	1.36E-07	ND	ND	ND
DDT	0.08	2.08E-07	0.0005	4.2E-04	0.1
Dieldrin	0.02	4.84E-08	0.00005	9.7E-04	0.3
Acenaphthene	0.45	3.39E-06	0.06	5.6E-05	0.0
Anthracene	0.16	1.20E-06	0.3	4.0E-06	0.0
Benzo(a)anthracene	5.67	4.27E-05	ND	ND	ND
Benzo(a)pyrene	7.20	5.42E-05	ND	ND	ND
Benzo(b)fluoranthene	5.63	4.24E-05	ND	ND	ND
Benzo(g,h,i)perylene	6.70	5.04E-05	ND	ND	ND
Benzo(k)fluoranthene	5.53	4.16E-05	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	6.02E-06	0.02	3.0E-04	0.1
Carbazole	0.13	9.79E-07	ND	ND	ND
Chrysene	7.04	5.30E-05	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	1.54E-05	ND	ND	ND
Fluoranthene	4.06	3.06E-05	0.04	7.7E-04	0.3
Indeno(1,2,3-c,d)pyrene	5.13	2.57E-05	ND	ND	ND
Phenanthrene	1.28	9.67E-06	ND	ND	ND
Pyrene	6.73	5.07E-05	0.03	1.7E-03	0.6
Acetone	1.10	5.52E-06	0.1	5.5E-05	0.0
			TOTAL	3.0E-01	

TABLE C.7.1-15 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.27E-07	7	8.9E-07	0.2
Cadmium	7.64	1.64E-06	ND	ND	ND
Chromium	47.42	ND	0.42	ND	ND
Nickel	43.74	9.41E-06	ND	ND	ND
Aroclor-1254	0.71	2.29E-06	7.7	1.8E-05	4.1
Aroclor-1260	0.94	3.04E-06	7.7	2.3E-05	5.4
DDD	0.04	3.81E-08	0.24	9.1E-09	0.0
DDE	0.05	5.81E-08	0.34	2.0E-08	0.0
DDT	0.08	8.92E-08	0.34	3.0E-08	0.0
Dieldrin	0.02	2.08E-08	16	3.3E-07	0.1
Benzo(a)anthracene	5.67	1.83E-05	1.2	2.2E-05	5.1
Benzo(a)pyrene	7.20	2.32E-05	12	2.8E-04	64.3
Benzo(b)fluoranthene	5.63	1.82E-05	1.2	2.2E-05	5.0
Benzo(g,h,i)perylene	6.70	2.16E-05	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.78E-05	0.12	2.1E-06	0.5
Bis(2-ethylhexyl)phthalate	1.20	2.58E-06	0.0084	2.2E-08	0.0
Carbazole	0.13	4.20E-07	0.02	8.4E-09	0.0
Chrysene	7.04	2.27E-05	0.012	2.7E-07	0.1
Dibenzo(a,h)anthracene	2.05	4.41E-06	12	5.3E-05	12.2
Indeno(1,2,3-c,d)pyrene	5.13	1.10E-05	1.2	1.3E-05	3.1
			TOTAL	4.3E-04	

TABLE C.7.1-15 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC RME ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: RME Inhalation of Particulates from Surface Soil
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	3.74E-10	7	2.6E-09	0.0
Cadmium	7.64	4.85E-09	15	7.3E-08	0.5
Chromium	47.42	3.01E-08	510	1.5E-05	99.1
Nickel	43.74	2.77E-08	0.91	2.5E-08	0.2
Aroclor-1254	0.71	4.51E-10	7.7	3.5E-09	0.0
Aroclor-1260	0.94	5.97E-10	7.7	4.6E-09	0.0
DDD	0.04	2.24E-11	0.24	5.4E-12	0.0
DDE	0.05	3.43E-11	0.34	1.2E-11	0.0
DDT	0.08	5.26E-11	0.34	1.8E-11	0.0
Dieldrin	0.02	1.22E-11	16	2.0E-10	0.0
Benzo(a)anthracene	5.67	3.60E-09	0.39	1.4E-09	0.0
Benzo(a)pyrene	7.20	4.57E-09	3.9	1.8E-08	0.1
Benzo(b)fluoranthene	5.63	3.57E-09	0.39	1.4E-09	0.0
Benzo(g,h,i)perylene	6.70	4.25E-09	ND	ND	ND
Benzo(k)fluoranthene	5.53	3.51E-09	0.039	1.4E-10	0.0
Bis(2-ethylhexyl)phthalate	1.20	7.61E-10	0.0084	6.4E-12	0.0
Carbazole	0.13	8.25E-11	ND	ND	ND
Chrysene	7.04	4.46E-09	0.0039	1.7E-11	0.0
Dibenzo(a,h)anthracene	2.05	1.30E-09	3.9	5.1E-09	0.0
Indeno(1,2,3-c,d)pyrene	5.13	3.25E-09	0.39	1.3E-09	0.0
			TOTAL	1.5E-05	

ND = Not Determined

TABLE C.7.1-16
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Soil Ingestion
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFo	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.07E-08	7	7.5E-08	2.4
Cadmium	7.64	1.39E-07	ND	ND	ND
Chromium	47.42	8.60E-07	0.42	3.6E-07	11.8
Nickel	43.74	7.93E-07	ND	ND	ND
Aroclor-1254	0.71	1.29E-08	7.7	9.9E-08	3.2
Aroclor-1260	0.94	1.71E-08	7.7	1.3E-07	4.3
DDD	0.04	6.42E-10	0.24	1.5E-10	0.0
DDE	0.054	9.80E-10	0.34	3.3E-10	0.0
DDT	0.08	1.50E-09	0.34	5.1E-10	0.0
Dieldrin	0.02	3.50E-10	16	5.6E-09	0.2
Benzo(a)anthracene	5.67	1.03E-07	1.2	1.2E-07	4.0
Benzo(a)pyrene	7.20	1.31E-07	12	1.6E-06	51.3
Benzo(b)fluoranthene	5.63	1.02E-07	1.2	1.2E-07	4.0
Benzo(g,h,i)perylene	6.70	1.21E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.00E-07	0.12	1.2E-08	0.4
Bis(2-ethylhexyl)phthalate	1.20	2.18E-08	0.0084	1.8E-10	0.0
Carbazole	0.13	2.36E-09	0.02	4.7E-11	0.0
Chrysene	7.04	1.28E-07	0.012	1.5E-09	0.1
Dibenzo(a,h)anthracene	2.05	3.71E-08	12	4.5E-07	14.6
Indeno(1,2,3-c,d)pyrene	5.13	9.30E-08	1.2	1.1E-07	3.7
			TOTAL	3.1E-06	

TABLE C.7.1-16 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Noncarcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	RfDd	Hazard Index	Chemical-Specific Percentage
Aluminum	8213	1.34E-04	1	1.3E-04	1.4
Antimony	2.94	4.79E-08	0.0004	1.2E-04	1.2
Barium	158.86	2.59E-06	0.07	3.7E-05	0.4
Beryllium	0.59	9.59E-09	0.005	1.9E-06	0.0
Cadmium	7.64	1.24E-08	0.001	1.2E-05	0.1
Chromium	47.42	7.72E-07	0.003	2.6E-04	2.7
Copper	96.75	1.58E-06	0.037	4.3E-05	0.4
Lead	144.84	2.36E-06	ND	ND	ND
Manganese	249.05	4.05E-06	0.14	2.9E-05	0.3
Mercury	0.42	6.84E-09	0.0003	2.3E-05	0.2
Nickel	43.74	7.12E-07	0.02	3.6E-05	0.4
Silver	3.59	5.85E-08	0.005	1.2E-05	0.1
Vanadium	32.96	5.37E-07	0.007	7.7E-05	0.8
Zinc	234.29	3.81E-06	0.3	1.3E-05	0.1
Aroclor-1254	0.71	1.74E-07	0.00002	8.7E-03	90.3
Aroclor-1260	0.94	2.30E-07	ND	ND	ND
DDD	0.04	2.88E-09	ND	ND	ND
DDE	0.054	4.40E-09	ND	ND	ND
DDT	0.08	6.75E-09	0.0005	1.4E-05	0.1
Dieldrin	0.02	1.57E-09	0.00005	3.1E-05	0.3
Acenaphthene	0.45	1.10E-07	0.06	1.8E-06	0.0
Anthracene	0.16	3.91E-08	0.3	1.3E-07	0.0
Benzo(a)anthracene	5.67	1.38E-06	ND	ND	ND
Benzo(a)pyrene	7.20	1.76E-06	ND	ND	ND
Benzo(b)fluoranthene	5.63	1.37E-06	ND	ND	ND
Benzo(g,h,i)perylene	6.70	1.64E-06	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.35E-06	ND	ND	ND
Bis(2-ethylhexyl)phthalate	1.20	1.95E-07	0.02	9.8E-06	0.1
Carbazole	0.13	3.17E-08	ND	ND	ND
Chrysene	7.04	1.72E-06	ND	ND	ND
Dibenzo(a,h)anthracene	2.05	3.33E-07	ND	ND	ND
Fluoranthene	4.06	9.93E-07	0.04	2.5E-05	0.3
Indeno(1,2,3-c,d)pyrene	5.13	8.35E-07	ND	ND	ND
Phenanthrene	1.28	3.13E-07	ND	ND	ND
Pyrene	6.73	1.64E-06	0.03	5.5E-05	0.6
Acetone	1.10	1.79E-07	0.1	1.8E-06	0.0
			TOTAL	9.6E-03	

TABLE C.7.1-16 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Dermal Contact with Soil
DTSC Assumptions for Carcinogens and Dermal Exposure

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFd	Risk	Chemical-Specific Percentage
Beryllium	0.59	1.23E-09	7	8.6E-09	0.2
Cadmium	7.64	1.60E-09	ND	ND	ND
Chromium	47.42	ND	0.42	ND	ND
Nickel	43.74	9.16E-08	ND	ND	ND
Aroclor-1254	0.71	2.23E-08	7.7	1.7E-07	3.8
Aroclor-1260	0.94	2.96E-08	7.7	2.3E-07	5.0
DDD	0.04	3.70E-10	0.24	8.9E-11	0.0
DDE	0.054	5.66E-10	0.34	1.9E-10	0.0
DDT	0.08	8.68E-10	0.34	3.0E-10	0.0
Dieldrin	0.02	2.02E-10	16	3.2E-09	0.1
Benzo(a)anthracene	5.67	1.78E-07	1.2	2.1E-07	4.7
Benzo(a)pyrene	7.20	2.26E-07	12	2.7E-06	59.8
Benzo(b)fluoranthene	5.63	1.77E-07	1.2	2.1E-07	4.7
Benzo(g,h,i)perylene	6.70	2.10E-07	ND	ND	ND
Benzo(k)fluoranthene	5.53	1.74E-07	0.12	2.1E-08	0.5
Bis(2-ethylhexyl)phthalate	1.20	2.51E-08	0.0084	2.1E-10	0.0
Carbazole	0.13	4.08E-09	0.02	8.2E-11	0.0
Chrysene	7.04	2.21E-07	0.012	2.7E-09	0.1
Dibenzo(a,h)anthracene	2.05	6.43E-08	12	7.7E-07	17.0
Indeno(1,2,3-c,d)pyrene	5.13	1.61E-07	1.2	1.9E-07	4.3
			TOTAL	4.5E-06	

TABLE C.7.1-16 (continued)
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL EXPOSURE TO SURFACE SOIL (DTSC AVG ASSUMPTIONS)
NONRADIONUCLIDES

Site 1
Exposure Pathway: Average Inhalation of Particulates from Surface Soil
DTSC Assumptions for Carcinogens

Carcinogenic Chemicals	Exposure Concentration (mg/kg)	Intake	CSFi	Risk	Chemical-Specific Percentage
Beryllium	0.59	2.43E-11	7	1.7E-10	0.0
Cadmium	7.64	3.15E-10	15	4.7E-09	0.5
Chromium	47.42	1.96E-09	510	1.0E-06	99.1
Nickel	43.74	1.80E-09	0.91	1.6E-09	0.2
Aroclor-1254	0.71	2.93E-11	7.7	2.3E-10	0.0
Aroclor-1260	0.94	3.88E-11	7.7	3.0E-10	0.0
DDD	0.04	1.46E-12	0.24	3.5E-13	0.0
DDE	0.054	2.23E-12	0.34	7.6E-13	0.0
DDT	0.08	3.42E-12	0.34	1.2E-12	0.0
Dieldrin	0.02	7.96E-13	16	1.3E-11	0.0
Benzo(a)anthracene	5.67	2.34E-10	0.39	9.1E-11	0.0
Benzo(a)pyrene	7.20	2.97E-10	3.9	1.2E-09	0.1
Benzo(b)fluoranthene	5.63	2.32E-10	0.39	9.1E-11	0.0
Benzo(g,h,i)perylene	6.70	2.76E-10	ND	ND	ND
Benzo(k)fluoranthene	5.53	2.28E-10	0.039	8.9E-12	0.0
Bis(2-ethylhexyl)phthalate	1.20	4.95E-11	0.0084	4.2E-13	0.0
Carbazole	0.13	5.36E-12	ND	ND	ND
Chrysene	7.04	2.90E-10	0.0039	1.1E-12	0.0
Dibenzo(a,h)anthracene	2.05	8.45E-11	3.9	3.3E-10	0.0
Indeno(1,2,3-c,d)pyrene	5.13	2.12E-10	0.39	8.3E-11	0.0
			TOTAL	1.0E-06	

ND = Not Determined

TABLE C.7.1-17
ALAMEDA POINT OU3 HHRA
SITE 1
LEAD ASSESSMENT RESULTS

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT

MEDIUM	LEVEL
LEAD IN AIR (ug/m^3)	0.01
LEAD IN SOIL (ug/g)	144.8
LEAD IN WATER (ug/l)	15
PLANT UPTAKE? 1=YES 0	0
AIRBORNE DUST (ug/m^3	50

OUTPUT

		percentiles 50th	90th	95th	98th	99th
BLOOD Pb, ADULT	(ug/dl)	1.8	2.9	3.3	3.8	4.2
BLOOD Pb, CHILD	(ug/dl)	3.7	5.7	6.5	7.5	8.3
BLOOD Pb, PICA CHILD	(ug/dl)	11.1	17.4	19.7	22.8	25.1

EQUATIONS, ADULTS

Pathway	Blood Pb ug/dl		Route-specific constant	concentration in medium	contact rate	percent of total
SOIL CONTACT	0.03 =	1E-04	(ug/dl)/(ug/day) *	145 ug/g *	1.85 g soil/day (5 g/m^2 * 0.37 m^2)	2%
SOIL INGESTIO	0.06 =	0.018	(ug/dl)/(ug/day) *	145 ug/g *	0.03 g soil/day	3%
INHALATION:	0.03 =	1.64	(ug/dl)/(ug/m^3) *	0.02 ug/m^3		2%
WATER INGES	0.84 =	0.04	(ug/dl)/(ug/day) *	15 ug/l *	1.4 l water/day	46%
FOOD INGESTI	0.88 =	0.04	(ug/dl)/(ug/day) *	10.0 ug Pb/kg diet *	2.2 kg diet/day	48%

EQUATIONS, CHILDREN (TYPICAL)

Pathway	Blood Pb ug/dl		Route-specific constant	concentration in medium	contact rate	percent of total
SOIL CONTACT	0.02 =	1E-04	(ug/dl)/(ug/day) *	145 ug/g *	1.4 g soil/day (5 g/m^2 * 0.28 m^2)	1%
SOIL INGESTIO	0.56 =	0.07	(ug/dl)/(ug/day) *	145 ug/g *	0.06 g soil/day	15%
INHALATION:	0.03 =	1.92	(ug/dl)/(ug/m^3) *	0.02 ug/m^3		1%
WATER INGES	0.96 =	0.16	(ug/dl)/(ug/day) *	15 ug/l *	0.4 l water/day	26%
FOOD INGESTI	2.08 =	0.16	(ug/dl)/(ug/day) *	10.0 ug Pb/kg diet *	1.3 kg diet/day	57%

EQUATIONS, CHILDREN (PICA)

Pathway	Blood Pb ug/dl		Route-specific constant	concentration in medium	contact rate	percent of total
SOIL CONTACT	0.02 =	1E-04	(ug/dl)/(ug/day) *	145 ug/g *	1.4 g soil/day (5 g/m^2 * 0.25 m^2)	0%
SOIL INGESTIO	8.01 =	0.07	(ug/dl)/(ug/day) *	145 ug/g *	0.79 g soil/day	72%
INHALATION:	0.03 =	1.92	(ug/dl)/(ug/m^3) *	0.02 ug/m^3		0%
WATER INGES	0.96 =	0.16	(ug/dl)/(ug/day) *	15 ug/l *	0.4 l water/day	9%
FOOD INGESTI	2.08 =	0.16	(ug/dl)/(ug/day) *	10.0 ug Pb/kg diet *	1.3 kg diet/day	19%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD .945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PROD = 10 ug/kg or 0.00045 * soil lead d = 10.0 ug/kg

TABLE C.7.1-18
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL RME EXPOSURE TO SURFACE SOIL
RADIONUCLIDE RISK ASSESSMENT

Time (years)	Isotope	RISK					Percent Of Total
		Soil Ingestion	Inhalation	Radon	External Exposure	Total Risk	
0	Ra-226	1.0E-8	2.6E-9	6.0E-7	2.8E-5	2.9E-5	79.5
	Ra-228	4.6E-9	3.3E-10	0	7.4E-6	7.5E-6	20.5
	Total	1.5E-8	2.9E-9	6.0E-7	3.6E-5	3.6E-5	100.0
1	Ra-226	1.2E-8	2.7E-9	6.0E-7	2.8E-5	2.9E-5	72.9
	Ra-228	4.8E-9	1.1E-8	5.1E-8	1.1E-5	1.1E-5	27.1
	Total	1.6E-8	1.4E-8	6.5E-7	3.9E-5	3.9E-5	100.0
3	Ra-226	1.5E-8	2.9E-9	5.9E-7	2.8E-5	2.8E-5	68.8
	Ra-228	4.5E-9	2.0E-8	9.6E-8	1.3E-5	1.3E-5	31.2
	Total	1.9E-8	2.3E-8	6.8E-7	4.0E-5	4.1E-5	100.0
10	Ra-226	2.3E-8	3.3E-9	5.5E-7	2.6E-5	2.7E-5	77.6
	Ra-228	2.3E-9	1.5E-8	7.0E-8	7.6E-6	7.7E-6	22.4
	Total	2.5E-8	1.8E-8	6.2E-7	3.4E-5	3.4E-5	100.0
30	Ra-226	3.5E-8	3.8E-9	4.5E-7	2.2E-5	2.3E-5	97.3
	Ra-228	1.8E-10	1.3E-9	6.0E-9	6.3E-7	6.4E-7	2.7
	Total	3.5E-8	5.1E-9	4.6E-7	2.3E-5	2.3E-5	100.0
100	Ra-226	3.0E-8	2.8E-9	2.3E-7	1.2E-5	1.3E-5	100.0
	Ra-228	2.3E-14	1.6E-13	7.7E-13	8.0E-11	8.1E-11	0
	Total	3.0E-8	2.8E-9	2.3E-7	1.2E-5	1.3E-5	100.0
300	Ra-226	6.1E-9	5.6E-10	2.8E-8	2.3E-6	2.3E-6	100.0
	Ra-228	1.7E-25	1.2E-24	5.7E-24	5.6E-22	5.7E-22	0
	Total	6.1E-9	5.6E-10	2.8E-8	2.3E-6	2.3E-6	100.0
1000	Ra-226	0	0	4.6E-8	0	4.6E-8	100.0
	Ra-228	0	0	0	0	0	0
	Total	0	0	4.6E-8	0	4.6E-8	100.0

TABLE C.7.1-19
ALAMEDA POINT OU3 HHRA
SITE 1
OCCUPATIONAL RME EXPOSURE TO SURFACE SOIL
RADIONUCLIDE DOSE ASSESSMENT

Time (years)	Isotope	Dose (mrem/yr)					
		Soil Ingestion	Inhalation	Radon	External Exposure	Total Risk	Percent Of Total
0	Ra-226	0.0037	0.00028	0.83	3.024	3.86	81.6
	Ra-228	0.0022	0.000087	0	0.87	0.87	18.4
	Total	0.0059	0.00037	0.83	3.89	4.73	100.0
1	Ra-226	0.0044	0.0003	0.83	2.99	3.83	76.2
	Ra-228	0.0023	0.0018	0.025	1.16	1.19	23.8
	Total	0.0067	0.0021	0.85	4.16	5.02	100.0
3	Ra-226	0.0056	0.00034	0.81	2.95	3.77	73.0
	Ra-228	0.0022	0.0032	0.047	1.34	1.39	27.0
	Total	0.0078	0.0036	0.86	4.29	5.16	100.0
10	Ra-226	0.0091	0.00044	0.76	2.8	3.6	81.1
	Ra-228	0.0011	0.0023	0.035	0.79	0.83	18.9
	Total	0.010	0.0028	0.79	3.57	4.4	100.0
30	Ra-226	0.014	0.00058	0.63	2.36	3.0	97.8
	Ra-228	0.00009	0.00019	0.003	0.065	0.068	2.2
	Total	0.014	0.00078	0.63	2.4	3.1	100.0
100	Ra-226	0.012	0.0005	0.32	1.32	1.65	100.0
	Ra-228	1.2E-8	2.5E-8	3.8E-7	8.2E-6	8.7E-6	0
	Total	0.012	0.0005	0.32	1.32	1.65	100.0
300	Ra-226	0.0024	9.3E-5	0.039	0.25	0.29	100.0
	Ra-228	8.8E-20	1.9E-19	2.8E-18	5.8E-17	6.1E-17	0
	Total	0.0024	9.3E-5	0.039	0.25	0.29	100.0
1000	Ra-226	0	0	0.064	0	0.064	100.0
	Ra-228	0	0	0	0	0	0
	Total	0	0	0.064	0	0.064	100.0

TABLE C.7.1-20
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL RME EXPOSURE TO SURFACE SOIL
RADIONUCLIDE RISK ASSESSMENT

Time (years)	Isotope	RISK					
		Soil Ingestion	Inhalation	Radon	External Exposure	Total Risk	Percent Of Total
0	Ra-226	1.2E-9	1.2E-9	1.9E-8	1.6E-5	1.6E-5	79.2
	Ra-228	5.6E-10	1.5E-10	0	4.3E-6	4.3E-6	20.8
	Total	1.8E-9	1.4E-9	1.9E-8	2.0E-5	2.0E-5	100.0
1	Ra-226	1.4E-9	1.2E-9	1.9E-8	1.6E-5	1.6E-5	72.5
	Ra-228	5.8E-10	5.0E-9	1.6E-8	6.1E-6	6.1E-6	27.5
	Total	2.0E-9	6.2E-9	3.5E-8	2.2E-5	2.2E-5	100.0
3	Ra-226	1.8E-9	1.3E-9	1.8E-8	1.6E-5	1.6E-5	68.4
	Ra-228	5.4E-10	9.2E-9	3.0E-8	7.2E-6	7.3E-6	31.6
	Total	2.3E-9	1.1E-8	4.9E-8	2.3E-5	2.3E-5	100.0
10	Ra-226	2.8E-9	1.5E-9	1.7E-8	1.5E-5	1.5E-5	77.3
	Ra-228	2.7E-10	6.7E-9	2.2E-8	4.4E-6	4.4E-6	22.7
	Total	3.1E-9	8.2E-9	3.9E-8	1.9E-5	1.9E-5	100.0
30	Ra-226	4.3E-9	1.7E-9	1.4E-8	1.3E-5	1.3E-5	97.2
	Ra-228	2.2E-11	5.7E-10	1.9E-9	3.6E-7	3.6E-7	2.8
	Total	4.3E-9	2.3E-9	1.6E-8	1.3E-5	1.3E-5	100.0
100	Ra-226	3.6E-9	1.3E-9	7.2E-9	7.1E-6	7.1E-6	100.0
	Ra-228	2.8E-15	7.3E-14	2.4E-13	4.6E-11	4.6E-11	0
	Total	3.6E-9	1.3E-9	7.2E-9	7.1E-6	7.1E-6	100.0
300	Ra-226	7.3E-10	2.5E-10	8.9E-10	1.3E-6	1.3E-6	100.0
	Ra-228	2.1E-26	5.4E-25	1.8E-24	3.2E-22	3.2E-22	0
	Total	7.3E-10	2.5E-10	8.9E-10	1.3E-6	1.3E-6	100.0
1000	Ra-226	0	0	0	0	0	0
	Ra-228	0	0	0	0	0	0
	Total	0	0	0	0	0	0

TABLE C.7.1-21
ALAMEDA POINT OU3 HHRA
SITE 1
RECREATIONAL RME EXPOSURE TO SURFACE SOIL
RADIONUCLIDE DOSE ASSESSMENT

Time (years)	Isotope	Dose (mrem/yr)					
		Soil Ingestion	Inhalation	Radon	External Exposure	Total Risk	Percent Of Total
0	Ra-226	0.0004	0.00011	0.003	1.44	1.44	77.7
	Ra-228	0.0002	0.00003	0	0.41	0.41	22.3
	Total	0.0006	0.00014	0.003	1.85	1.86	100.0
1	Ra-226	0.00044	0.0001	0.003	1.43	1.43	71.9
	Ra-228	0.00023	0.0007	0.004	0.55	0.56	28.1
	Total	0.0007	0.0008	0.007	1.98	1.99	100.0
3	Ra-226	0.0006	0.00013	0.003	1.41	1.41	68.5
	Ra-228	0.0002	0.0012	0.008	0.64	0.65	31.5
	Total	0.0008	0.0014	0.011	2.04	2.06	100.0
10	Ra-226	0.0009	0.0002	0.003	1.33	1.33	77.7
	Ra-228	0.0001	0.0009	0.006	0.37	0.38	22.3
	Total	0.001	0.0011	0.009	1.7	1.71	100.0
30	Ra-226	0.0014	0.0002	0.0024	1.13	1.13	97.3
	Ra-228	9.4E-6	0.00008	0.0005	0.03	0.03	2.7
	Total	0.0014	0.0003	0.0029	1.16	1.16	100.0
100	Ra-226	0.0012	0.00017	0.0012	0.63	0.63	100.0
	Ra-228	1.2E-9	9.7E-9	6.3E-8	3.9E-6	4.0E-6	0
	Total	0.0012	0.00017	0.0012	0.63	0.63	100.0
300	Ra-226	0.00024	3.5E-5	0.00015	0.12	0.12	100.0
	Ra-228	8.9E-21	7.2E-20	4.7E-19	2.7E-17	2.8E-17	0
	Total	0.00024	3.5E- 5	0.00015	0.12	0.12	100.0
1000	Ra-226	0	0	0	0	0	0
	Ra-228	0	0	0	0	0	0
	Total	0	0	0	0	0	0

TABLE C.7.1-22
ALAMEDA POINT OU3 HHRA
SITE 1
NONRADIONUCLIDE RISK AND HAZARD INDEX SUMMARY
OCCUPATIONAL AND RECREATIONAL EXPOSURE SCENARIOS

SCENARIO: OCCUPATIONAL, NONRADIONUCLIDE RISK ESTIMATES					
Pathway	RME		AVERAGE		Chemical-specific percentages[1]
	EPA	DTSC	EPA	DTSC	Benzo(a)pyrene - 56.9%
Soil Ingestion	1.5E-5	2.9E-5	2.5E-6	5.2E-6	Dibenzo(a,h)anthracene-16.2%
Dermal Contact with soil	8.9E-6	2.2E-4	1.0E-6	5.3E-6	Benzo(a)anthracene - 4.5%
Inhalation of particulates	2.4E-6	2.8E-5	4.2E-7	5.0E-6	Benzo(b)fluoranthene - 4.4%
Volatile inhalation (ambient air) from soil	NA	NA	NA	NA	Aroclor-1260 - 2.1%
SOIL SUBTOTAL	2.6E-5	2.8E-4	3.9E-6	1.6E-5	Aroclor-1254 - 1.6%
					Chromium - 8.9%
Volatile inhalation (ambient air), spray irrigation[2]	1.3E-7	1.2E-7	9.2E-8	8.9E-8	Vinyl chloride - 97.5%; Benzene - 2.3%; Trichloroethene - 0.2%
Volatile inhalation (ambient air), vapor phase migration from FWBZ	< 1E-6	NE	< 1E-6	NE	NE
GROUNDWATER SUBTOTAL	1.3E-7	1.2E-7	9.2E-8	8.9-8	
TOTAL[3]	2.6E-5	2.8E-4	4.0E-6	1.6E-5	

SCENARIO: OCCUPATIONAL, HAZARD INDEX					
Pathway	RME		AVERAGE		Chemical-specific percentages[1]
	EPA	DTSC	EPA	DTSC	Aroclor-1254 - 35.6%
Soil Ingestion	0.045	0.045	0.04	0.04	Manganese - 33.6%
Dermal Contact with soil	0.013	0.17	0.0077	0.02	Chromium - 6.0%
Inhalation of particulates	0.029	0.029	0.025	0.025	Aluminum - 5.2%
Volatile inhalation (ambient air) from soil	5.5E-5	5.5E-5	4.9E-5	4.9E-5	Antimony - 4.7%
SOIL SUBTOTAL	0.087	0.24	0.073	0.085	Cadmium - 4.8%
Volatile inhalation (ambient air), spray irrigation[2]	0.00012	0.00012	8.6E-5	8.6E-5	NE
Volatile inhalation (ambient air), vapor phase migration from FWBZ	< 1	NE	< 1	NE	NE
GROUNDWATER SUBTOTAL	0.00012	0.00012	8.6E-5	8.6E-5	
TOTAL[3]	0.087	0.240	0.073	0.085	

SCENARIO: RECREATIONAL, NONRADIONUCLIDE RISK ESTIMATES					
Pathway	RME		AVERAGE		Chemical-specific percentages[1]
	EPA	DTSC	EPA	DTSC	Benzo(a)pyrene - 59.5%
Soil Ingestion	2.4E-5	4.8E-05	1.5E-6	3.1E-06	Dibenzo(a,h)anthracene-16.9%
Dermal Contact with soil	1.9E-5	4.3E-4	8.9E-7	4.5E-6	Benzo(a)anthracene - 4.7%
Inhalation of particulates	1.3E-6	1.5E-5	8.6E-8	1.0E-6	Benzo(b)fluoranthene - 4.6%
Volatile inhalation (ambient air)	NA	NA	NA	NA	Indeno(1,2,3-c,d)pyrene-4.2%
SOIL SUBTOTAL	4.4E-05	4.9E-4	2.5E-6	8.6E-6	Aroclor-1260 - 1.7%
					Aroclor-1254 - 2.3%
					Chromium - 5.0%
Volatile inhalation (ambient air), vapor phase migration from FWBZ	< 1E-06	NE	< 1E-06	NE	NE
GROUNDWATER SUBTOTAL	< 1E-06	NE	< 1E-06	NE	
TOTAL[3]	4.4E-5	4.9E-4	2.5E-6	8.6E-6	

TABLE C.7.1-22 (Continued)
ALAMEDA POINT OU3 HHRA
SITE 1
NONRADIONUCLIDE RISK AND HAZARD INDEX SUMMARY
OCCUPATIONAL AND RECREATIONAL EXPOSURE SCENARIOS

SCENARIO: RECREATIONAL, HAZARD INDEX					
Pathway	RME		AVERAGE		Chemical-specific percentages[1]
	EPA	DTSC	EPA	DTSC	Aroclor-1254 - 53.9%
Soil Ingestion	0.061	0.061	0.013	0.013	Manganese - 26.2%
Dermal Contact with soil	0.022	0.35	0.0036	0.0095	Chromium - 3.8%
Inhalation of particulates	0.012	0.012	0.0026	0.0026	Aluminum - 3.3%
Volatile inhalation (ambient air)	2.5E-5	2.5E-5	5.5E-6	5.5E-6	Antimony - 3.0%
SOIL SUBTOTAL	0.095	0.42	0.019	0.025	
Volatile inhalation (ambient air), vapor phase migration from FWBZ	<1	NE	<1	NE	NE
GROUNDWATER SUBTOTAL	<1	NE	<1	NE	
TOTAL[3]	0.095	0.42	0.019	0.025	

Notes:

NA Not Applicable - the volatile chemicals selected as COCs are not carcinogenic.
NE Not evaluated; EPA Region 9 ambient air PRGs were used in the calculations.

1 Percentages based on contribution to total EPA RME risk or hazard index. These chemicals represent the majority of risk or hazard index; percentages may not total 100%.

2 The workers assumed to be exposed under this pathway are golfcourse groundskeepers; these receptors are unlikely to represent the same receptors assumed to be exposed under the other occupational exposure scenario. Therefore, the groundwater subtotal and total risks are overestimated by including the risk results for the spray irrigation pathway.

3 The total results are calculated as the sum of the groundwater and soil subtotal results.

TABLE C.7.1-23
ALAMEDA POINT OU3 HHRA
SITE 1
RADIONUCLIDE RISK AND DOSE SUMMARY
OCCUPATIONAL AND RECREATIONAL SCENARIOS

SCENARIO: OCCUPATIONAL, RME RADIONUCLIDE RISK/DOSE ESTIMATES					
Pathway	Time = 0 years		Time = 30 years		Isotope-Specific Percentages[1]
	Risk	Dose (mrem/year)	Risk	Dose (mrem/year)	
Soil Ingestion	1.5E-8	0.00059	3.5E-8	0.014	Radium-226 - 79.5%
Inhalation[2]	6.0E-7	0.83	4.6E-7	0.63	Radium-228 - 20.5%
External Exposure	3.6E-5	3.89	2.3E-5	2.4	
TOTAL	3.6E-5	4.73	2.3E-5	3.1	

SCENARIO: RECREATIONAL, RME RADIONUCLIDE RISK/DOSE ESTIMATES					
Pathway	Time = 0 years		Time = 30 years		Isotope-Specific Percentages[1]
	Risk	Dose (mrem/year)	Risk	Dose (mrem/year)	
Soil Ingestion	1.8E-9	0.0006	4.3E-9	0.0014	Radium-226 - 79.5%
Inhalation[2]	2.0E-8	0.003	1.8E-8	0.0032	Radium-228 - 20.5%
External Exposure	2.0E-5	1.85	1.3E-5	1.16	
TOTAL	2.0E-5	1.86	1.3E-5	1.16	

Notes:

[1] Based on risks at time = 0 years.

[2] Inhalation includes radon exposure.

C.8 UNCERTAINTY

There are varying degrees of uncertainty at each stage of the HHRA arising from assumptions made in the risk assessment and limitations of the data used to calculate risk estimates. Uncertainty and variability are inherent in the exposure assessment, toxicity values, and risk characterization. EPA guidance (1989) states (emphasis not added):

> There are several categories of uncertainties associated with site risk assessments. One is the initial selection of substances used to characterize exposures and risk on the basis of the sampling data and available toxicity information. Other sources of uncertainty are inherent in the toxicity values for each substance used to characterize risk. Additional uncertainties are inherent in the exposure assessment for individual substances and individual exposures. These uncertainties are usually driven by uncertainty in the chemical monitoring data and the models used to estimate exposure concentrations in the absence of monitoring data, but can also be driven by population intake parameters. Finally, additional uncertainties are incorporated in the risk assessment when exposure to several substances across multiple pathways are summed.

EPA defines uncertainty as a "lack of knowledge about specific factors, parameters or models" including "parameter uncertainty (measurement errors, sampling errors, and systematic errors), model uncertainty (uncertainty due to necessary simplification of real-world processes, mis-specification of the model structure, model misuse, use of inappropriate surrogate variables), and scenario uncertainty (descriptive errors, aggregation errors, errors in professional judgment, incomplete analysis)" (EPA 1997c). Variability is defined as "observed differences attributable to true heterogeneity or diversity in a population or exposure parameter" (EPA 1997c). Variability is the result of natural random process, such as variations in body weight, breathing rate or drinking water rates. Variability cannot be reduced by further study, but may be better characterized through further measurements.

For OU-3, the selection of substances for inclusion in the risk assessment was quite conservative. The only chemicals not quantitatively evaluated in the risk assessment were those that are essential nutrients; were detected at concentrations below background levels (inorganic chemicals only); or were infrequently detected and below one-tenth of the EPA Region 9 PRGs for residential exposure (EPA 1998a). It is unlikely that chemicals eliminated from the risk assessment were either site-related or would have posed a health risk of significance. The uncertainty related with this component of the risk assessment is likely to result in an overestimate of risk by inclusion of chemicals that are not site-related. Also, no decrease in chemical concentrations over time was assumed to occur. This also results in a more conservative risk estimate.

Tentatively identified compounds (TICs) are another source of uncertainty in risk assessments. TICs are reported from VOC and SVOC analyses performed on environmental samples using gas chromatography and mass spectrometry (GC/MS). TICs are non-target compounds that the data quantitation software identifies through the comparison of the compound's mass spectra to that of known mass spectra stored in a standardized National Institute of Standards and Technology (NIST) mass spectral data base or "library." This "library search" identifies a non-target compound by either (1) a specific compound name such as "cyclohexane," (2) by chemical class such as "alkyl aromatic hydrocarbon," or (3) as an "unknown." According to EPA guidance (1989a), "the assigned identity is in most cases highly uncertain."

TICs identified in the Alameda Point samples were frequently identified as belonging to classes of compounds associated with petroleum hydrocarbons or as unknowns. It is not possible to quantify a risk to a chemical that is only broadly identified by chemical class or as an unknown. Therefore, TICs were not included in the COC selection process. Given the large number of target analytes identified in the RI samples collected at Alameda Point, however, the effect of TICs on the outcome of the risk assessment would likely have been insignificant.

Uncertainties associated with the toxicity values in the HHRA include:

- Unknown differences between humans and laboratory animals in absorption, distribution, metabolism, and excretion, which can greatly affect toxicity values.
- Validity and quality of scientific studies that form the basis of EPA-derived and DTSC-derived toxicity values
- Statistical models used to extrapolate from high to low doses in animals in development of toxicity values
- Basic underlying assumptions in the dose-response model for carcinogens that there is no threshold involved in the pathogenesis of cancer.
- Routine use of the 95 UCL of the CSF

In general, toxicity values are developed to be protective of sensitive receptors, and are likely to be overestimates of the chemical's toxicity. Toxicity values have not been developed for all chemicals, however; in these cases, risk or hazard indices may be underestimated. Toxicity values may not be available for a variety of reasons, including that a chemical may not have been studied; studies conducted were inconclusive; or the chemical has been studied only as part of a mixture and no chemical-specific information was generated. In each case, the lack of a toxicity value is likely to cause an underestimate of risk. The magnitude of the underestimation is unknown, because a lack of a

toxicity value indicates the lack of any reliable toxicity information. Also, in this assessment, toxicity values were used to assess risks from dermal exposure without adjustment for gastrointestinal absorption efficiency. This may result in an underestimate of risk, the magnitude of which is inversely proportional to the gastrointestinal absorption of the chemical.

The exposure assessment relies on current and predicted future use of the land and the parameters that are available to estimate the magnitude and duration of exposures associated with those land uses. In many cases, the land uses are known; however, the range of exposure parameters available may lead to a wide range of risk estimates. In this risk assessment, reuse plans developed by the Alameda Reuse Authority were used to select future potential receptors. This limited the future reuse to recreational and occupational for Site 1. Development of a landfill area (Site 1) is prohibited because it would breach the integrity of the current soil cover and any future landfill cap (EPA 1993b). The future exposure scenarios evaluated in this assessment are conservative and provide upper-bound estimates of risk.

Variability and uncertainty are also related to exposure parameters used in the risk assessment. Variability in exposure duration and frequency, as well as breathing rates, soil ingestion rates, and amount of dermal contact with soil can be substantial. In this risk assessment, the RME and AVG exposures were characterized for each receptor. The use of default RME exposure parameters, however, leads to a compounding of conservative assumptions that likely overestimates risk. The default RME parameters are selected to be representative of the 95th percentile of exposure or higher, for each exposure pathway. For the occupational RME exposure, for example, a person is assumed to be exposed to the site 8 hours per day, 250 days per year for 25 years. The AVG exposure parameters represent the average or median exposures for each scenario. These values, particularly for exposure frequency and duration, may be more representative of expected exposures. It is important to note that there are many different combinations of exposure parameters that will result in risk estimates between the RME and AVG risks presented here. However, for Site 1, placement of a cap on the landfill area will cause all of the exposure pathways to be incomplete.

To calculate total risks and hazard indices, the chemical-specific risks for each exposure pathway are summed. According to EPA guidance (EPA 1989), "uncertainties associated with summing risks or hazard indices for several substances are of particular concern in the risk characterization step. The assumption of dose additivity ignores possible synergisms or antagonisms among chemicals, and

assumes similarity in mechanisms of action and metabolism. Unfortunately, data to assess interactions quantitatively are lacking." EPA guidance recommends summing the risks and hazard indices in order to avoid underestimating cancer risk or potential noncarcinogenic health effects at a site, despite the concerns stated above. Summing the risks and hazard indices may overestimate results, because mechanisms of action and metabolism are assumed to be similar and because potential antagonistic effects are ignored. It is also possible that total risks and hazard indices may be underestimated because potential synergistic effects are ignored.

Overall, RME risks and hazard indices presented in this HHRA for each site are conservative estimates and are more likely to have overestimated risks than to have underestimated them. The estimates presented here are single-value results intended to provide a range of values. However, rarely do single point estimates accurately represent actual exposures, and much information on variability is lost by using point-estimates of exposure rather than distributions. As stated in DTSC guidance, "Uncertainty and variability in the movement of the chemical across the environment as well as the nature of the potential human exposures mean that the risk is more accurately characterized by a range or distribution" (DTSC 1995). When making decisions based on risk estimates, the range of risks should be considered (EPA 1992b, EPA 1995b).

C.9 REFERENCES

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ATTACHMENT 1

This attachment contains the site-specific results of the background comparisons conducted using statistical tests of means. A combination of parametric and nonparametric tests were used as appropriate. The tests are outlined in Figure C.4-2. The results of these statistical tests were used to determine whether an inorganic chemical was present at a site at concentrations in excess of background concentrations.

The results of the statistical tests of means for soil are presented for Site 1. For some chemicals, more than one test may have been conducted per the process outlined in Figure C.4-2. Occasionally, the chemical names have been abbreviated on these results, reflecting how they are present in the database. Chemical names followed by the letter "y" indicate that the data are from the "yellow" background data set (for Site 1). Site data are followed by the site number, or appear just as the chemical name.

STATISTIX FOR WINDOWS 08/20/98, 14:48

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR ALD1 VS ALY

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
ALD1	3660.5	57	2007.5	64.2
ALY	2117.5	50	842.50	42.4
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 3.634
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0003

TOTAL NUMBER OF VALUES THAT WERE TIED 20
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

STATISTIX FOR WINDOWS 08/20/98, 14:48

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR CRY VS CRD1

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
CRY	1911.5	50	636.50	38.2
CRD1	3866.5	57	2213.5	67.8
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 4.920
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0000

TOTAL NUMBER OF VALUES THAT WERE TIED 50
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

STATISTIX FOR WINDOWS 08/20/98, 14:49

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR CU1 VS CU2Y

IABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
CU1	4051.0	57	2398.0	71.1
CU2Y	1727.0	50	452.00	34.5
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 6.072
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0000

TOTAL NUMBER OF VALUES THAT WERE TIED 33
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR PBY VS PBD1

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
PBY	1811.5	50	536.50	36.2
PBD1	3966.5	57	2313.5	69.6
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 5.545
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0000

TOTAL NUMBER OF VALUES THAT WERE TIED 35
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR MND1 VS MNY

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
MND1	4082.0	58	2371.0	70.4
MNY	1804.0	50	529.00	36.1
TOTAL	5886.0	108		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 5.672
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0000

TOTAL NUMBER OF VALUES THAT WERE TIED 54
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 108 MISSING CASES 8

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR NID1 VS NIY

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
NID1	3910.0	57	2257.0	68.6
NIY	1868.0	50	593.00	37.4
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 5.192
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0000

TOTAL NUMBER OF VALUES THAT WERE TIED 50
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

STATISTIX FOR WINDOWS 08/20/98, 14:50

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR VAD1 VS VAY

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
VAD1	3407.0	57	1754.0	59.8
VAY	2371.0	50	1096.0	47.4
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 2.051
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0403

TOTAL NUMBER OF VALUES THAT WERE TIED 58
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

STATISTIX FOR WINDOWS 08/20/98, 14:50

RANK SUM TWO-SAMPLE (MANN-WHITNEY) TEST FOR ZND1 VS ZNY

VARIABLE	RANK SUM	SAMPLE SIZE	U STAT	MEAN RANK
ZND1	4150.5	57	2497.5	72.8
ZNY	1627.5	50	352.50	32.6
TOTAL	5778.0	107		

NORMAL APPROXIMATION WITH CONTINUITY CORRECTION 6.693
TWO-TAILED P-VALUE FOR NORMAL APPROXIMATION 0.0000

TOTAL NUMBER OF VALUES THAT WERE TIED 32
MAXIMUM DIFFERENCE ALLOWED BETWEEN TIES 0.00001

CASES INCLUDED 107 MISSING CASES 9

STATISTIX FOR WINDOWS 08/20/98, 14:51

TWO-SAMPLE T TESTS FOR TID1 VS TIY

VARIABLE	MEAN	SAMPLE SIZE	S.D.	S.E.
TID1	449.47	17	134.62	32.649
TIY	455.85	41	77.149	12.049
DIFFERENCE	-6.3831			

NULL HYPOTHESIS: DIFFERENCE = 0
ALTERNATIVE HYP: DIFFERENCE <> 0

ASSUMPTION	T	DF	P	95% CI FOR DIFFERENCE
EQUAL VARIANCES	-0.23	56	0.8206	(-62.496, 49.730)
UNEQUAL VARIANCES	-0.18	20.5	0.8563	(-78.863, 66.097)

	F	NUM DF	DEN DF	P
TESTS FOR EQUALITY OF VARIANCES	3.04	16	40	0.0022

CASES INCLUDED 58 MISSING CASES 58

Site 1 Quantile Tests
at m=50, n=57: R= 8, K=7

Arsenic is not above background		Barium is above background		Beryllium is above background	
Background Arsenic	Site 1 Arsenic	Background Barium	Site 1 Barium	Background Beryllium	Site 1 Beryllium
1.11	1.4	0.56	10.5	0.28	0.045
1.62	1.55	0.81	14.4	0.30	0.055
1.74	1.7	0.87	18.9	0.44	0.055
1.90	1.77	0.95	23	0.48	0.065
2.19	1.8	1.10	24.5	0.55	0.068
3.31	1.8	1.66	37.6	0.52	0.105
4.83	1.88	2.42	39.8	1.21	0.105
5	2.07	19.80	40	0.71	0.105
5	2.09	20.00	40	0.72	0.11
5	2.1	21.00	43	10.50	0.11
5	2.1	22.00	43.1	0.92	0.11
5	2.1	22.00	43.5	0.97	0.11
5	2.52	22.00	45	1.14	0.14
5	2.61	22.00	46	1.19	0.14
5	2.82	23.00	46.2	11.50	0.145
5	2.91	25.00	48	1.28	0.145
5	3	25.00	50.2	12.50	0.171
5	3.4	26.00	51.6	13.00	0.186
5	3.4	27.00	52	13.50	0.31
5	3.5	27.00	55.8	13.50	0.34
5	3.8	27.00	56.7	13.50	0.345
5	4.13	27.00	57.3	13.50	0.44
5	4.3	27.00	58	13.50	0.45
5.45	4.4	29.00	58.4	14.50	0.5
5.5	4.6	30.00	58.7	15.00	0.5
5.5	4.8	30.00	60	15.00	0.5
5.5	4.9	30.00	61	15.00	0.5
5.5	5	30.10	61	15.05	0.5
5.5	5	30.50	62.3	15.25	0.5
5.5	5	31.60	67.6	15.80	0.5
5.5	5	32.00	68.8	16.00	0.5
5.5	5	32.00	80.8	16.00	0.5
5.5	5	35.00	82	17.50	0.5
5.5	5	35.00	86.8	17.50	0.5
5.5	5	37.00	89.4	18.50	0.5
6	5	39.00	90.9	19.50	0.5
6	5	41.00	92.9	20.50	0.5
7.75	5	42.00	93	21.00	0.5
11	5.3	42.80	106	21.40	0.5
11	5.5	43.00	106	21.50	0.542
11	5.6	45.00	110	22.50	0.55
11	5.8	49.00	112	24.50	0.55
11	6.1	52.00	120	26.00	0.55
11	7.21	54.80	125	27.40	0.57

13	7.6	56.50	130	28.25	0.629
19.00	8.2	71.00	130	35.50	0.65
21	8.8	73.00	144	36.50	0.721
22.00	9.15	74.00	198	37.00	0.75
28.00	10	81.00	238	40.50	0.751
33.00	11.4	260.00	271	130.00	1.1
	12		322		1.4
	12		348		1.43
	14		445		1.53
	14.1		524		2.49
	14.5		551		2.81
	29.1		910		3
	45		1090		8.6

Site 1 Quantile Tests
at m=50, n=57: R= 8, K=7

Cadmium is
above background

Background Cadmium	Site 1 Cadmium
0.14	0.15
0.15	0.255
0.22	0.265
0.24	0.3
0.27	0.3
0.26	0.305
0.33	0.38
0.36	0.385
0.36	0.45
5.25	0.469
0.46	0.471
0.48	0.477
0.57	0.5
0.60	0.5
5.75	0.5
0.64	0.5
0.72	0.52
1.00	0.55
1.00	0.55
1.13	0.63
1.20	0.9
1.40	1
1.70	1.2
2.30	1.2
2.90	1.5
7.50	1.8
7.50	2
7.53	2.01
7.63	2.1
7.90	2.8
8.00	3.7
8.00	3.8
8.75	4.2
8.75	4.7
9.25	5
9.75	5.1
10.25	5.3
10.50	5.3
10.70	5.4
10.75	7
11.25	7
12.25	7.5
13.00	7.8
13.70	8.3

Cobalt is
above background

Background Cobalt	Site 1 Cobalt
0.07	2.5
0.08	2.5
0.11	2.5
0.12	2.55
0.14	2.55
0.13	2.6
0.16	2.95
0.18	3.2
0.18	3.25
2.63	3.35
0.23	3.7
0.24	3.75
0.29	3.8
0.30	3.85
2.88	3.89
0.32	4.05
0.36	4.15
0.50	4.65
0.50	4.9
0.57	5.05
0.60	5.1
0.70	5.37
0.85	5.4
1.15	5.49
1.45	6
3.75	6.01
3.75	6.1
4.29	6.1
3.81	6.3
4.52	6.3
4.00	6.3
4.85	6.37
4.38	6.5
5.00	6.6
5.30	6.8
5.40	7.3
5.80	7.4
5.84	7.4
6.10	7.4
6.20	7.46
6.40	7.7
7.14	7.7
7.40	7.76
7.55	8.2

At m=9, n=42
R=K=5
Mercury is
above background

Background Mercury	Site 1 Mercury
0.18	0.03
0.08	0.035
0.10	0.044
0.05	0.05
0.07	0.05
0.06	0.051
0.17	0.0545
0.09	0.06
0.09	0.06
	0.06
	0.075
	0.075
	0.075
	0.075
	0.075
	0.075
	0.075
	0.075
	0.075
	0.075
	0.11
	0.113
	0.134
	0.16
	0.192
	0.2
	0.33
	0.334
	0.357
	0.39
	0.43
	0.48
	0.554
	0.575
	0.6
	0.606
	0.75
	0.84
	0.953
	1.04
	1.4
	9.57

14.13	9.1	7.58	8.3
17.75	9.68	7.70	9.17
18.25	11	7.90	9.3
18.50	11.4	9.16	9.7
20.25	11.7	9.60	9.8
65.00	12	11.40	10
	13		11
	16.6		12.1
	35		12.2
	54.9		14.2
	55.1		15.9
	62.6		17.1
	92.7		19.3

ATTACHMENT 2
Of Appendix C

EPA Region 9 Preliminary Remediation Goals (PRGs)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Subject: Region 9 Preliminary Remediation Goals (PRGs) 1998

From: Stanford J. Smucker, Ph.D.
Regional Toxicologist (SFD-8-B)
Technical Support Team

To: PRG Table Mailing List

Please find the annual update to the Region 9 PRG table. Risk-based PRGs presented in the "lookup" table are useful tools for evaluating and cleaning up contaminated sites. They are being used to streamline and standardize all stages of the risk decision-making process. If you are not currently on the PRG table mailing list but would like to be, please call Lynn Trujillo (415.744.2419) or email her (Trujillo.Dianna@epamail.epa.gov) and leave your name, address, and phone number.

EPA Region 9 has established a homepage on the World Wide Web which you can find at **http://www.epa.gov/region 09/**. Once you reach our website, simply scroll down to and click on "Solid and Hazardous Waste Programs" followed by "Preliminary Remediation Goals". You may want to set a bookmark to ease future access.

The PRG '98 table can be browsed online. It includes information not available in the hard copy sent out to folks on the mailing list. Additional information includes pathway specific PRGs, non-cancer PRGs for carcinogenic substances, and physical-chemical information used to estimate volatilization factors (VF). The table can also be downloaded for use with Lotus or Excel software. Please note that the downloadable files contain the same information as can be browsed online, though you will need to unzip the files and display the hidden columns to see all of the information.

Region 9 risk-based PRGs are "evergreen" and have evolved as new methodologies and parameters have been developed. Changes that have occurred from the 1996 table reflect one or more of the following: (1) updates in toxicity information, (2) revisions in dermal exposure factors, or (3) [illegible] of physical-chemical information with *Soil Screening Guidance* issued by EPA's Office of Solid Waste and Emergency Response (OSWER), dated April 1996. These changes are described in the preamble (see below).

Updates to EPA toxicity values were obtained from IRIS, HEAST, or the National Center for Environmental Assessment (NCEA) through March 1998. To help users rapidly identify substances with new or revised toxicity values, the PRGs for these contaminants are printed in boldface type in the table.

Before relying on any number in the table, it is recommended that the user verify the numbers with an agency toxicologist or risk assessor because the toxicity / exposure information in the table may contain errors or default assumptions that need to be refined based on further evaluation. If you find an error please send me a note via email at smucker.stan@epamail.epa.gov or fax at 415.744.1916.

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DISCLAIMER

Preliminary remediation goals (PRGs) focus on common exposure pathways and may not consider all exposure pathways encountered at CERCLA / RCRA sites (Exhibit 1-1). PRGs do not consider impact to groundwater or address ecological concerns. PRGs are specifically not intended as a (1) stand-alone decision-making tool, (2) as a substitute for EPA guidance for preparing baseline risk assessments, or (3) a rule to determine if a waste is hazardous under RCRA.

The guidance set out in this document is not final Agency action. It is not intended, nor can it be relied upon to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided herein, or act at variance with the guidance, based on an analysis of specific circumstances. The Agency also reserves the right to change this guidance at any time without public notice.

1.0 INTRODUCTION

Region 9 Preliminary Remediation Goals (PRGs) are risk-based tools for evaluating and cleaning up contaminated sites. They are being used to streamline and standardize all stages of the risk decision-making process.

The Region 9 PRG table combines current EPA toxicity values with "standard" exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that are considered protective of humans, including sensitive groups, over a lifetime. Chemical concentrations above these levels would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. Further evaluation may include additional sampling, consideration of ambient levels in the environment, or a reassessment of the assumptions contained in these screening-level estimates (e.g. appropriateness of route-to-route extrapolations, appropriateness of using chronic toxicity values to evaluate childhood exposures, appropriateness of generic exposure factors for a specific site etc.).

The PRG concentrations presented in the table can be used to screen pollutants in environmental media, trigger further investigation, and provide an initial cleanup goal if applicable. When considering PRGs as preliminary goals, residential concentrations should be used for maximum beneficial uses of a property. Industrial concentrations are included in the table as an alternative cleanup goal for soils. In general, it is not recommended that industrial PRGs be used for screening sites unless they are used in conjunction with residential values.

Before applying PRGs as screening tools or initial goals, the user of the table should consider whether the exposure pathways and exposure scenarios at the site are fully accounted for in the PRG calculation. Region 9 PRG concentrations are based on exposure pathways for which generally accepted methods, models, and assumptions have been developed (i.e. ingestion, dermal contact, and inhalation) for specific land-use conditions and do not consider impact to groundwater or ecological receptors (see Developing a Conceptual Site Model below).

EXHIBIT 1-1
TYPICAL EXPOSURE PATHWAYS BY MEDIUM
FOR RESIDENTIAL AND INDUSTRIAL LAND USES[a]

EXPOSURE PATHWAYS, ASSUMING:		
MEDIUM	RESIDENTIAL LAND USE	INDUSTRIAL LAND USE
Ground Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
Surface Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
	Ingestion during swimming	
	Ingestion of contaminated fish	
Soil	***Ingestion***	***Ingestion***
	Inhalation of particulates	***Inhalation of particulates***
	Inhalation of volatiles	***Inhalation of volatiles***
	Exposure to indoor air from soil gas	Exposure to indoor air from soil gas
	Exposure to ground water contaminated by soil leachate	Exposure to ground water contaminated by soil leachate
	Ingestion via plant, meat, or dairy products	Inhalation of particulates from trucks and heavy equipment
	Dermal absorption	***Dermal absorption***

Footnote:
[a]Exposure pathways considered in the PRG calculations are indicated in boldface italics.

2.0 READING THE PRG TABLE

2.1 General Considerations

With the exceptions described below, PRGs are chemical concentrations that correspond to fixed levels of risk (i.e. either a one-in-one million [10^{-6}] cancer risk or a noncarcinogenic hazard quotient of 1) in soil, air, and water. In most cases, where a substance causes both cancer and noncancer (systemic) effects, the 10^{-6} cancer risk will result in a more stringent criteria and consequently this value is presented in the hard copy of the table. PRG concentrations that equate to a 10^{-6} cancer risk are indicated by "ca". PRG concentrations that equate to a hazard quotient of 1 for noncarcinogenic concerns are indicated by "nc".

If the risk-based concentrations are to be used for site screening, it is recommended that both cancer and noncancer-based PRGs be obtained. All PRG values can be obtained in the electronic version of the table (e.g. noncancer PRGs for a carcinogenic substance), by displaying the hidden sections of the spreadsheet. To view or download an electronic copy of the table, simply access EPA Region 9's homepage at:

http://www.epa.gov/region09/waste/sfund/prg/index.html

It has come to my attention that some users have been multiplying the cancer PRG concentrations by 10 or 100 to set "action levels" for triggering remediation or to set less stringent cleanup levels for a specific site after considering non-risk-based factors such as ambient levels, detection limits, or technological feasibility. This risk management practice recognizes that there may be a range of values that may be "acceptable" for carcinogenic risk (EPA's cancer risk range is from 10^{-6} to 10^{-4}). However, this practice could lead one to overlook serious noncancer health threats and it is strongly recommended that the user consult with a toxicologist or regional risk assessor before doing this. For carcinogens, I have indicated by asterisk ("ca*") in the PRG table where the noncancer PRGs would be exceeded if the cancer value that is displayed is multiplied by 100. Two stars ("ca**") indicate that the noncancer values would be exceeded if the cancer PRG were multiplied by 10. There is no range of "acceptable" noncarcinogenic "risk" so that under no circumstances should noncancer PRGs be multiplied by 10 or 100, when setting final cleanup criteria.

In general, PRG concentrations in the table are risk-based but for soil there are two important exceptions: (1) for several volatile chemicals, PRGs are based on the soil saturation equation ("sat") and (2) for relatively less toxic inorganic and semivolatile contaminants, a non-risk based "ceiling limit" concentration is given as 10^{+5} mg/kg ("max").

Also included in the PRG table are California EPA PRGs ("CAL-Modified PRGs") for specific chemicals where CAL-EPA values may be more restrictive than the federal values; and, soil screening levels (SSLs) for protection of groundwater (see Section 2.3 below).

2.2 Toxicity Values

EPA toxicity values, known as noncarcinogenic reference doses (RfD) and carcinogenic slope

factors (SF) were obtained from IRIS, HEAST, and NCEA (formerly ECAO) through March 1998. The priority among sources of toxicological constants used are as follows: (1) IRIS (indicated by "i"), (2) HEAST ("h"), (3) NCEA ("n"), (4) withdrawn from IRIS or HEAST and under review ("x") or obtained from other EPA documents ("o").

To help users rapidly identify substances with new toxicity values, these chemicals are printed in boldface type. This issue of the PRG table contains new or revised toxicity values for acifluorfen, aniline, barium, benzene, 1,1-biphenyl, bromobenzene, butylbenzenes, chlordane, 1,3 dichlorobenzene, dimethylphenethylamine, diphenylsulfone, ethyl chloride, iron, isobutane, mercaptobenzothiazole, methyl mercaptan, methyl phosphonic acid, MTBE, napthylamine, 4-nitrophenol, perchlorate, phenothiazine, PCB, PCE, polychlorinated terphenyls, thiocyanate, and trimethylbenzenes.

Route-to-route extrapolations ("r") were frequently used when there were no toxicity values available for a given route of exposure. Oral cancer slope factors ("SFo") and reference doses ("RfDo") were used for both oral and inhaled exposures for organic compounds lacking inhalation values. Inhalation slope factors ("SFi") and inhalation reference doses ("RfDi") were used for both inhaled and oral exposures for organic compounds lacking oral values. Route extrapolations were not performed for inorganics due to portal of entry effects and known differences in absorption efficiency for the two routes of exposure.

An additional route extrapolation is the use of oral toxicity values for evaluating dermal exposures. For many chemicals, a scientifically defensible data base does not exist for making an adjustment of an oral slope factor/RfD to estimate a dermal toxicity value (see Section 4.3).

Although route-to-route methods are a useful screening procedure, the appropriateness of these default assumptions for specific contaminants should be verified by a toxicologist or regional risk assessor.

2.3 Soil Screening Levels

Generic, soil screening levels (SSLs) for the protection of groundwater have been included in the PRG table for 100 of the most common contaminants at Superfund sites. Generic SSLs are derived using default values in standardized equations presented in *Soil Screening Guidance* (available from NTIS as document numbers PB96-963502 and PB96-963505 or EPA/540/R-95/128 and EPA/540/R-96/018).

The SSLs were developed using a default dilution-attenuation factor (DAF) of 20 to account for natural processes that reduce contaminant concentrations in the subsurface. Also included are generic SSLs that assume no dilution or attenuation between the source and the receptor well (i.e., a DAF of 1). These values can be used at sites where little or no dilution or attenuation of soil leachate concentrations is expected at a site (e.g., sites with shallow water tables, fractured media, karst topography, or source size greater than 30 acres).

In general, if an SSL is not exceeded for the migration to groundwater pathway, the user may eliminate this pathway from further investigation.

2.4 Miscellaneous

Volatile organic chemicals (VOCs) are indicated by "1" in the VOC column of the table and are defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole). These contaminants are evaluated for potential volatilization from soil/water to air using volatilization factors (see Section 4.1).

Chemical-specific dermal absorption values for contaminants in soil and dust are presented for arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols as recommended in the Dermal Supplemental Guidance to RAGS (USEPA 1998b). Otherwise, default skin absorption fractions are assumed to be 0.01 and 0.10 for inorganics and organics, respectively.

3.0 USING THE PRG TABLE

The decision to use PRGs at a site will be driven by the potential benefits of having generic risk-based concentrations in the absence of site-specific risk assessments. The original intended use of PRGs was to provide initial cleanup goals for individual chemicals given specific medium and land-use combinations (see RAGS Part B, 1991), however risk-based concentrations have several applications. They can also be used for:

- Setting health-based detection limits for chemicals of potential concern
- Screening sites to determine whether further evaluation is appropriate
- Calculating cumulative risks associated with multiple contaminants

A few basic procedures are recommended for using PRGs properly. These are briefly described below. Potential problems with the use of PRGs are also identified.

3.1 Developing a Conceptual Site Model

The primary condition for use of PRGs is that exposure pathways of concern and conditions at the site match those taken into account by the PRG framework. Thus, it is always necessary to develop a conceptual site model (CSM) to identify likely contaminant source areas, exposure pathways, and potential receptors. This information can be used to determine the applicability of PRGs at the site and the need for additional information. For those pathways not covered by PRGs, a risk assessment specific to these additional pathways may be necessary. Nonetheless, the PRG lookup values will still be useful in such situations for focusing further investigative efforts on the exposure pathways not addressed.

To develop a site-specific CSM, perform an extensive records search and compile existing data (e.g. available site sampling data, historical records, aerial photographs, and hydrogeologic information). Once this information is obtained, CSM worksheets such as those provided in ASTM's *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (1995) can be used to tailor the generic worksheet model to a site-specific CSM. The final CSM

diagram represents linkages among contaminant sources, release mechanisms, exposure pathways and routes and receptors. It summarizes our understanding of the contamination problem.

As a final check, the CSM should answer the following questions:

- Are there potential ecological concerns?
- Is there potential for land use other than those covered by the PRGs (that is, residential and industrial)?
- Are there other likely human exposure pathways that were not considered in development of the PRGs (e.g. impact to groundwater, local fish consumption, raising beef, dairy, or other livestock)?
- Are there unusual site conditions (e.g. large areas of contamination, high fugitive dust levels, potential for indoor air contamination)?

If any of these four conditions exist, the PRG may need to be adjusted to reflect this new information. Suggested references for evaluating pathways not currently evaluated by Region 9 PRG's are presented in Exhibit 3-1.

EXHIBIT 3-1
SUGGESTED READINGS FOR EVALUATING EXPOSURE PATHWAYS NOT CURRENTLY ADDRESSED BY REGION 9 PRGs

EXPOSURE PATHWAY	REFERENCE
Migration of contaminants to an underlying potable aquifer	*Soil Screening Guidance* (USEPA 1996a,b), *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM 1995)
Ingestion via plant uptake	*Soil Screening Guidance* (USEPA 1996a,b)
Ingestion via meat, dairy products, human milk	*Estimating Exposure to Dioxin-Like Compounds* (USEPA 1994a)
Inhalation of volatiles that have migrated into basements	*User's Guide for Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings* (USEPA 1997a)
Ecological pathways	*Ecological Risk Assessment: Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*, (USEPA 1997b), *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities* (CAL-EPA 1996)

3.2 Background Levels Evaluation

A necessary step in determining the usefulness of Region 9 PRGs is the consideration of background contaminant concentrations. EPA may be concerned with two types of background at sites: naturally occurring and anthropogenic. Natural background is usually limited to metals whereas anthropogenic (i.e. human-made) "background" includes both organic and inorganic contaminants. Before embarking on an extensive sampling and analysis program to determine local background concentrations in the area, one should first compile existing data on the subject. Far too often there is pertinent information in the literature that gets ignored, resulting in needless expenditures of time and money.

Generally EPA does not clean up below natural background. In some cases, the predictive risk-based models generate PRG levels that lie within or even below typical background. If natural background concentrations are higher than the risk-based PRGs, an adjustment of the PRG is probably needed. Exhibit 3-2 presents summary statistics for selected elements in soils that have background levels that may exceed risk-based PRGs. An illustrative example of this is naturally occurring arsenic in soils which frequently is higher than the risk-based PRG set at a one-in-one-million cancer risk (PRG for residential soils is 0.38 mg/kg). After considering background concentrations in a local area, EPA Region 9 has at times used the non-cancer PRG (22 mg/kg) to evaluate sites recognizing that this value tends to be above background levels yet still falls within the range of soil concentrations (0.38-38 mg/kg) that equate to EPA's "permissible" cancer risk range (10E-6 to 10E-4).

Where anthropogenic "background" levels exceed PRGs and EPA has determined that a response action is necessary and feasible, EPA's goal will be to develop a comprehensive response to the widespread contamination. This will often require coordination with different authorities that have jurisdiction over the sources of contamination in the area.

EXHIBIT 3-2
BACKGROUND CONCENTRATIONS OF SELECTED ELEMENTS IN SOILS

TRACE	U.S. STUDY DATA[1]			CALIFORNIA DATA[2]		
ELEMENT	Range	GeoMean	ArMean	Range	GeoMean	ArMean
Arsenic	<.1-97	5.2 mg/kg	7.2 mg/kg	0.59-11	2.75 mg/kg	3.54 mg/kg
Beryllium	<1-15	0.63 "	0.92 "	0.10-2.7	1.14 "	1.28 "
Cadmium	<1-10	--	<1	0.05-1.7	0.26	0.36
Chromium	1-2000	37	54	23-1579	76.25	122.08
Nickel	<5-700	13	19	9.0-509	35.75	56.60

[1]Shacklette and Hansford, "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States",USGS Professional Paper 1270, 1984.

[2]Bradford et. al, "Background Concentrations of Trace and Major Elements in California Soils", Kearney Foundation Special Report, UC-Riverside and CAL-EPA DTSC, March 1996.

3.3 Screening Sites with Multiple Pollutants

A suggested stepwise approach for PRG-screening of sites with multiple pollutants is as follows:

- Perform an extensive records search and compile existing data.

- Identify site contaminants in the PRG Table. Record the PRG concentrations for various media and note whether PRG is based on cancer risk (indicated by "ca") or noncancer hazard (indicated by "nc"). Segregate cancer PRGs from non-cancer PRGs and exclude (but don't eliminate) non-risk based PRGs ("sat" or "max").

- For cancer risk estimates, take the site-specific concentration (maximum or 95 UCL) and divide by the PRG concentrations that are designated for cancer evaluation ("ca"). Multiply this ratio by 10^{-6} to estimate chemical-specific risk for a reasonable maximum exposure (RME). For multiple pollutants, simply add the risk for each chemical:

$$Risk = [(\frac{conc_x}{PRG_x}) + (\frac{conc_y}{PRG_y}) + (\frac{conc_z}{PRG_z})] \times 10^{-6}$$

- For non-cancer hazard estimates. Divide the concentration term by its respective non-cancer PRG designated as "nc" and sum the ratios for multiple contaminants. The cumulative ratio represents a non-carcinogenic hazard index (HI). A hazard index of 1 or less is generally considered "safe". A ratio greater than 1 suggests further evaluation. **[Note that carcinogens may also have an associated non-cancer PRG that is not listed in the printed copy of the table sent to folks on the mailing list. To obtain these values, the user should download or view the PRG table at our website and display the appropriate sections.]**

$$Hazard\ Index = [(\frac{conc_x}{PRG_x}) + (\frac{conc_y}{PRG_y}) + (\frac{conc_z}{PRG_z})]$$

For more information on screening site risks, the reader should contact EPA Region 9's Technical Support Team.

3. 4 Potential Problems

As with any risk-based tool, the potential exists for misapplication. In most cases the root cause will be a lack of understanding of the intended use of Region 9 PRGs. In order to prevent misuse of PRGs, the following should be avoided:

- Applying PRGs to a site without adequately developing a conceptual site model that identifies relevant exposure pathways and exposure scenarios,
- Not considering background concentrations when choosing PRGs as cleanup goals,
- Use of PRGs as cleanup levels without the nine-criteria analysis specified in the National Contingency Plan (or, comparable analysis for programs outside of Superfund),
- Use of PRGs as cleanup levels without verifying numbers with a toxicologist or regional risk assessor,
- Use of antiquated PRG tables that have been superseded by more recent publications,
- Not considering the effects of additivity when screening multiple chemicals, and
- Adjusting PRGs upward by factors of 10 or 100 without consulting a toxicologist or regional risk assessor.

4.0 TECHNICAL SUPPORT DOCUMENTATION

Region 9 PRGs consider human exposure hazards to chemicals from contact with contaminated soils, air, and water. The emphasis of the PRG equations and technical discussion are aimed at developing initial goals for soils, since this is an area where few standards exist. For air and water, additional reference concentrations or standards are available for many chemicals (e.g. non-zero MCLGs, AWQC, and NAAQS) and consequently the discussion of these media are brief.

4.1 Soil - Direct Ingestion

Calculation of PRGs for direct ingestion of soil is based on the methodology presented in RAGS HHEM, Part B (USEPA 1991a). Briefly, this methodology backcalculates a soil concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens). A number of studies have shown that inadvertent ingestion of soil is common among children for 6 years old and younger (Calabrese et al. 1989, Davis et al. 1990, Van Wijnen et al. 1990). Therefore, the approach uses an age-adjusted soil ingestion factor that takes into account the difference in daily soil ingestion rates, body weights, and exposure duration for children from 1 to 6 years old and others from 7 to 31 years old. The higher intake rate of soil by children and their lower body weights lead to a lower, or more conservative, risk-based concentration compared to an adult-only assumption.

For noncarcinogens, the definition of an RfD has led to debates concerning the comparison of

less-than-lifetime estimates of exposure to the RfD. Specifically, it is often asked whether the comparison of a 6-year exposure, estimated for children via soil ingestion, to the chronic RfD is unnecessarily conservative. In their analysis of the issue, the Science Advisory Board (SAB) indicates that, for most chemicals, the approach of combining the higher 6-year exposure for children with chronic toxicity criteria may be overly protective. However, they noted that there are specific instances when the chronic RfD may be based on endpoints of toxicity that are specific to children (e.g. fluoride and nitrates) or when the dose-response is steep (i.e., the dosage difference between the no-observed-adverse-effects level (NOAEL) and an adverse effects level is small). Thus, for the purposes of screening, EPA Region 9 has opted to base the generic PRGs for noncarcinogenic contaminants on the more conservative "childhood only" exposure.

4.2 Soil - Vapor and Particulate Inhalation

Agency toxicity criteria indicate that risks from exposure to some chemicals via inhalation far outweigh the risk via ingestion; therefore soil PRGs have been designed to address this pathway as well. The models used to calculate PRGs for inhalation of volatiles/particulates are updates of risk assessment methods presented in RAGS Part B (USEPA 1991a) and are identical to the *Soil Screening Guidance: User's Guide and Technical Background Document* (USEPA 1996a,b).

To address the soil-to-air pathways the PRG calculations incorporate volatilization factors (VF_s) for volatile contaminants and particulate emission factors (PEF) for nonvolatile contaminants. These factors relate soil contaminant concentrations to air contaminant concentrations that may be inhaled on-site. The VF_s and PEF equations can be broken into two separate models: an emission model to estimate emissions of the contaminant from the soil and a dispersion model to simulate the dispersion of the contaminant in the atmosphere.

It should be noted that the box model in RAGS Part B has been replaced with a dispersion term (Q/C) derived from a modeling exercise using meteorological data from 29 locations across the United States because the box model may not be applicable to a broad range of site types and meteorology and does not utilize state-of-the-art techniques developed for regulatory dispersion modeling. The dispersion model for both volatiles and particulates is the AREA-ST, an updated version of the Office of Air Quality Planning and Standards, Industrial Source Complex Model, ISC2. However, different Q/C terms are used in the VF and PEF equations. Los Angeles was selected as the 90th percentile data set for volatiles and Minneapolis was selected as the 90th percentile data set for fugitive dusts (USEPA 1996 a,b). A default source size of 0.5 acres was chosen for the PRG calculations. This is consistent with the default exposure area over which Region 9 typically averages contaminant concentrations in soils. If unusual site conditions exist such that the area source is substantially larger than the default source size assumed here, an alternative Q/C could be applied (see USEPA 1996a,b).

<u>Volatilization Factor for Soils</u>

Volatile chemicals, defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole, were screened for inhalation exposures using a volatilization factor for soils (VF_s). Please note that VF_s's are available at our website.

The emission terms used in the VF_s are chemical-specific and were calculated from physical-chemical information obtained from several sources. The priority of these sources were as

follows: *Soil Screening Guidance* (USEPA 1996a,b), *Superfund Chemical Data Matrix* (USEPA 1996c), *Fate and Exposure Data* (Howard 1991), *Subsurface Contamination Reference Guide* (EPA 1990a), and *Superfund Exposure Assessment Manual* (SEAM, EPA 1988). In those cases where Diffusivity Coefficients (Di) were not provided in existing literature, Di's were calculated using Fuller's Method described in SEAM. A surrogate term was required for some chemicals that lacked physico-chemical information. In these cases, a proxy chemical of similar structure was used that may over- or under-estimate the PRG for soils.

Equation 4-9 forms the basis for deriving generic soil PRGs for the inhalation pathway. The following parameters in the standardized equation can be replaced with specific site data to develop a simple site-specific PRG

- Source area
- Average soil moisture content
- Average fraction organic carbon content
- Dry soil bulk density

The basic principle of the VF_s model (Henry's law) is applicable only if the soil contaminant concentration is at or below soil saturation "sat". Above the soil saturation limit, the model cannot predict an accurate VF-based PRG. How these particular cases are handled, depends on whether the contaminant is liquid or solid at ambient soil temperatures (see Section 4.5).

Particulate Emission Factor for Soils

Inhalation of chemicals adsorbed to respirable particles (PM_{10}) were assessed using a default PEF equal to 1.316×10^9 m^3/kg that relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils. The generic PEF was derived using default values in Equation 4-11, which corresponds to a receptor point concentration of approximately 0.76 ug/m^3. The relationship is derived by Cowherd (1985) for a rapid assessment procedure applicable to a typical hazardous waste site where the surface contamination provides a relatively continuous and constant potential for emission over an extended period of time (e.g. years). This represents an annual average emission rate based on wind erosion that should be compared with chronic health criteria; it is not appropriate for evaluating the potential for more acute exposures.

The impact of the PEF on the resultant PRG concentration (that combines soil exposure pathways for ingestion, skin contact, and inhalation) can be assessed by downloading the PRG tables and displaying the hidden columns. Equation 4-11 forms the basis for deriving a generic PEF for the inhalation pathway. For more details regarding specific parameters used in the PEF model, the reader is referred to *Soil Screening Guidance: Technical Background Document* (USEPA 1996a).

Note: the generic PEF evaluates windborne emissions and does not consider dust emissions from traffic or other forms of mechanical disturbance that could lead to greater emissions than assumed here.

4.3 Soil - Dermal Absorption

Much uncertainty surrounds the determination of hazards associated with skin contact with soils. One important data gap is the lack of EPA verified toxicity values for the dermal route. For screening purposes it is assumed that dermal toxicity values can be route-to-route extrapolated from oral values but this may not always be an appropriate assumption and should be checked.

Per RAGS (1989) Appendix A, an adjustment of an oral slope factor/RfD to estimate a dermal toxicity value could be performed if the following conditions are met:

1) The critical study upon which the toxicity value is based employed an administered dose (e.g., delivery in diet or by gavage) in its study design

2) A scientifically defensible data base exists and demonstrates that the gastrointestinal absorption of the chemical in question, from a media (e.g., water, feed) similar to the one employed in the critical study, is significantly less than 100%.

Most often, it is the second condition that precludes the adjustment of oral slope factors/RfDs to estimate dermal toxicity values for a given compound. When the aforementioned criteria is not met, it is recommended that a default value of complete (i.e., 100%) oral absorption be assumed, thereby eliminating the need for oral toxicity value adjustment. It should be noted that employing the oral absorption default value may result in an underestimation of risk; the magnitude of the underestimation being inversely proportional to the true oral absorption of the chemical in question.

Chemical-specific dermal absorption values for contaminants in soil and dust are presented for arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols as recommended in the Supplemental Dermal Guidance to RAGS (USEPA 1998). Otherwise, default skin absorption fractions are assumed to be 0.01 and 0.10 for inorganics and organics, respectively.

Since the 1996 PRG table was issued, default values for dermal contact with soil have changed for two parameters, surface area and soil adherence (see Exhibit 4-1). Exposed surface areas change from 5000 and 2000 to 5700 and 2900 for adults and children, respectively. Recommended adherence factors change from 0.2 mg/cm^2 for both adults and children to age-specific adherence factors of 0.08 and 0.3 mg/cm^2 for adults and children, respectively. The justification for these changes is explained in detail in *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment* (USEPA 1998b) and will not be repeated here.

4.4 Soils - Migration to Groundwater

The methodology for calculating SSLs for the migration to groundwater was developed to identify chemical concentrations in soil that have the potential to contaminate groundwater. Migration of contaminants from soil to groundwater can be envisioned as a two-stage process: (1) release of contaminant in soil leachate and (2) transport of the contaminant through the underlying soil and aquifer to a receptor well. The SSL methodology considers both of these fate and transport mechanisms.

SSLs are backcalculated from acceptable ground water concentrations (i.e. nonzero MCLGs, MCLs, or risk-based PRGs). First, the acceptable groundwater concentration is multiplied by a dilution factor to obtain a target leachate concentration. For example, if the dilution factor is 10 and the acceptable ground water concentration is 0.05 mg/L, the target soil leachate concentration would be 0.5 mg/L. The partition equation (presented in the *Soil Screening Guidance* document) is then used to calculate the total soil concentration (i.e. SSL) corresponding to this soil leachate concentration.

The SSL methodology was designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, the methodology is based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface. For more on SSLs, and how to calculate site-specific SSLs versus generic SSLs presented in the PRG table, the reader is referred to the *Soil Screening Guidance* document (USEPA 1996a,b).

4.5 Soil Saturation Limit

The soil saturation concentration "sat" corresponds to the contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the soil contaminant may be present in free phase, i.e., nonaqueous phase liquids (NAPLs) for contaminants that are liquid at ambient soil temperatures and pure solid phases for compounds that are solid at ambient soil temperatures.

Equation 4-10 is used to calculate "sat" for each volatile contaminant. As an update to RAGS HHEM, Part B (USEPA 1991a), this equation takes into account the amount of contaminant that is in the vapor phase in soil in addition to the amount dissolved in the soil's pore water and sorbed to soil particles.

Chemical-specific "sat" concentrations must be compared with each VF-based PRG because a basic principle of the PRG volatilization model is not applicable when free-phase contaminants are present. How these cases are handled depends on whether the contaminant is liquid or solid at ambient temperatures. Liquid contaminant that have a VF-based PRG that exceeds the "sat" concentration are set equal to "sat" whereas for solids (e.g., PAHs), soil screening decisions are based on the appropriate PRGs for other pathways of concern at the site (e.g., ingestion and dermal contact).

4.6 Ground Water/Surface Water - Ingestion and Inhalation

Calculation of PRGs for ingestion and inhalation of contaminants in domestic water is based on the methodology presented in RAGS HHEM, Part B (USEPA 1991a). Ingestion of drinking water is an appropriate pathway for all chemicals. For the purposes of this guidance, however, inhalation of volatile chemicals from water is considered routinely only for chemicals with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater <u>and</u> with a molecular weight of less than 200 g/mole.

For volatile chemicals, an upperbound volatilization constant (VF_w) is used that is based on all uses of household water (e.g showering, laundering, and dish washing). Certain assumptions were made. For example, it is assumed that the volume of water used in a residence for a family

of four is 720 L/day, the volume of the dwelling is 150,000 L and the air exchange rate is 0.25 air changes/hour (Andelman in RAGS Part B). Furthermore, it is assumed that the average transfer efficiency weighted by water use is 50 percent (i.e. half of the concentration of each chemical in water will be transferred into air by all water uses). Note: the range of transfer efficiencies extends from 30% for toilets to 90% for dishwashers.

4.7 Default Exposure Factors

Default exposure factors were obtained primarily from RAGS Supplemental Guidance Standard Default *Exposure Factors* (OSWER Directive, 9285.6-03) dated March 25, 1991 and more recent information from U.S. EPA's Office of Solid Waste and Emergency Response, U.S. EPA's Office of Research and Development, and California EPA's Department of Toxic Substances Control (see Exhibit 4-1).

Because contact rates may be different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors ("adj"). Use of age-adjusted factors are especially important for soil ingestion exposures, which are higher during childhood and decrease with age. However, for purposes of combining exposures across pathways, additional age-adjusted factors are used for inhalation and dermal exposures. These factors approximate the integrated exposure from birth until age 30 combining contact rates, body weights, and exposure durations for two age groups - small children and adults. Age-adjusted factors were obtained from RAGS PART B or developed by analogy (see derivations next page).

For soils only, noncarcinogenic contaminants are evaluated in children separately from adults. No age-adjustment factor is used in this case. The focus on children is considered protective of the higher daily intake rates of soil by children and their lower body weight. For maintaining consistency when evaluating soils, dermal and inhalation exposures are also based on childhood contact rates.

(1) ingestion([mg-yr]/[kg-d]:

$$IFS_{adj} = \frac{ED_c \times IRS_c}{BW_c} + \frac{(ED_r - ED_c) \times IRS_a}{BW_a}$$

(2) skin contact([mg-yr]/[kg-d]:

$$SFS_{adj} = \frac{ED_c \times AF \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times AF \times SA_a}{BW_a}$$

(3) inhalation ([m^3-yr]/[kg-d]):

$$InhF_{adj} = \frac{ED_c \times IRA_c}{BW_c} + \frac{(ED_r - ED_c) \times IRA_a}{BW_a}$$

EXHIBIT 4-1
STANDARD DEFAULT FACTORS

Symbol	Definition (units)	Default	Reference
CSFo	Cancer slope factor oral (mg/kg-d)-1	–	IRIS, HEAST, or NCEA
CSFi	Cancer slope factor inhaled (mg/kg-d)-1	–	IRIS, HEAST, or NCEA
RfDo	Reference dose oral (mg/kg-d)	–	IRIS, HEAST, or NCEA
RfDi	Reference dose inhaled (mg/kg-d)	–	IRIS, HEAST, or NCEA
TR	Target cancer risk	10^{-6}	–
THQ	Target hazard quotient	1	–
BWa	Body weight, adult (kg)	70	RAGS (Part A), EPA 1989 (EPA/540/1-89/002)
BWc	Body weight, child (kg)	15	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
ATc	Averaging time - carcinogens (days)	25550	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
ATn	Averaging time - noncarcinogens (days)	ED*365	
SAa	Exposed surface area, adult (cm^2/day)	5700	Dermal Assessment, EPA 1998 (NCEA-W-0364)
SAc	Exposed surface area, child (cm^2/day)	2900	Dermal Assessment, EPA 1998 (NCEA-W-0364)
AFa	Adherence factor, adult (mg/cm^2)	0.08	Dermal Assessment, EPA 1998 (NCEA-W-0364)
AFc	Adherence factor, child (mg/cm^2)	0.3	Dermal Assessment, EPA 1998 (NCEA-W-0364)
ABS	Skin absorption (unitless):		
	– organics	0.1	Dermal Assessment, EPA 1998 (NCEA-W-0364)
	–Inorganics	0.01	Dermal Assessment, EPA 1998 (NCEA-W-0364)
IRAa	Inhalation rate - adult (m^3/day)	20	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRAc	Inhalation rate - child (m^3/day)	10	Exposure Factors, EPA 1997 (EPA/600/P-95/002Fa)
IRWa	Drinking water ingestion - adult (L/day	2	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
IRWc	Drinking water ingestion - child (L/day)	1	PEA, Cal-EPA (DTSC, 1994)
IRSa	Soil ingestion - adult (mg/day)	100	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSc	Soil ingestion - child (mg/day),	200	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSo	Soil ingestion - occupational (mg/day)	50	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EFr	Exposure frequency - residential (d/y)	350	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EFo	Exposure frequency - occupational (d/y)	250	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDr	Exposure duration - residential (years)	30*	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDc	Exposure duration - child (years)	6	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDo	Exposure duration - occupational (years)	25	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
	Age-adjusted factors for carcinogens:		
IFSadj	Ingestion factor, soils ([mg-yr]/[kg-d])	114	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
SFSadj	Skin contact factor, soils ([mg-yr]/[kg-d])	504	By analogy to RAGS (Part B)
InhFadj	Inhalation factor ([m^3-yr]/[kg-d])	11	By analogy to RAGS (Part B)
IFWadj	Ingestion factor, water ([l-yr]/[kg-d])	1.1	By analogy to RAGS (Part B)
VFw	Volatilization factor for water (L/m^3)	0.5	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
PEF	Particulate emission factor (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
VFs	Volatilization factor for soil (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
sat	Soil saturation concentration (mg/kg)	See below	Soil Screening Guidance (EPA 1996a,b)

Footnote:
*Exposure duration for lifetime residents is assumed to be 30 years total. For carcinogens, exposures are combined for children (6 years) and adults (24 years) .

4.8 Standardized Equations

The equations used to calculate the PRGs for carcinogenic and noncarcinogenic contaminants are presented in Equations 4-1 through 4-8. The PRG equations update RAGS Part B equations. The methodology backcalculates a soil, air, or water concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens). For completeness, the soil equations combine risks from ingestion, skin contact, and inhalation simultaneously. Note: the electronic version of the table also includes pathway-specific PRGs, should the user decide against combining specific exposure pathways; or, the user wants to identify the relative contribution of each pathway to exposure.

To calculate PRGs for volatile chemicals in soil, a chemical-specific volatilization factor is calculated per Equation 4-9. Because of its reliance on Henry's law, the VF_s model is applicable only when the contaminant concentration in soil is at or below saturation (i.e. there is no free-phase contaminant present). Soil saturation ("sat") corresponds to the contaminant concentration in soil at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above this point, pure liquid-phase contaminant is expected in the soil. If the PRG calculated using VF_s was greater than the calculated sat, the PRG was set equal to sat, in accordance with *Soil Screening Guidance* (USEPA 1996 a,b). The equation for deriving sat is presented in Equation 4-10.

PRG EQUATIONS

Soil Equations: For soils, equations were based on three exposure routes (ingestion, skin contact, and inhalation).

Equation 4-1: Combined Exposures to Carcinogenic Contaminants in Residential Soil

$$C(mg/kg) = \frac{TR \times AT_c}{EF_r \left[\left(\frac{IFS_{adj} \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{SFS_{adj} \times ABS \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{InhF_{adj} \times CSF_i}{VF_s^a} \right) \right]}$$

Equation 4-2: Combined Exposures to Noncarcinogenic Contaminants in Residential Soil

$$C(mg/kg) = \frac{THQ \times BW_c \times AT_n}{EF_r \times ED_c \left[\left(\frac{1}{RfD_o} \times \frac{IRS_c}{10^6 mg/kg} \right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times ABS}{10^6 mg/kg} \right) + \left(\frac{1}{RfD_i} \times \frac{IRA_c}{VF_s^a} \right) \right]}$$

Equation 4-3: Combined Exposures to Carcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{TR \times BW_a \times AT_c}{EF_o \times ED_o \left[\left(\frac{IRS_o \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{SA_a \times AF \times ABS \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{IRA_a \times CSF_i}{VF_s^a} \right) \right]}$$

Footnote:
[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

Equation 4-4: Combined Exposures to Noncarcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{THQ \times BW_a \times AT_n}{EF_o \times ED_o[(\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 mg/kg}) + (\frac{1}{RfD_o} \times \frac{SA_a \times AF \times ABS}{10^6 mg/kg}) + (\frac{1}{RfD_i} \times \frac{IRA_a}{VF_s^a})]}$$

Tap Water Equations:

Equation 4-5: Ingestion and Inhalation Exposures to Carcinogenic Contaminants in Water

$$C(ug/L) = \frac{TR \times AT_c \times 1000 ug/mg}{EF_r\ [(IFW_{adj} \times CSF_o) + (VF_w \times InhF_{adj} \times CSF_i)]}$$

Equation 4-6: Ingestion and Inhalation Exposures to Noncarcinogenic Contaminants in Water

$$C(ug/L) = \frac{THQ \times BW_a \times AT_n \times 1000 ug/mg}{EF_r \times ED_r\ [(\frac{IRW_a}{RfD_o}) + (\frac{VF_w \times IRA_a}{RfD_i})]}$$

Air Equations:

Equation 4-7: Inhalation Exposures to Carcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{TR \times AT_c \times 1000 ug/mg}{EF_r \times InhF_{adj} \times CSF_i}$$

Equation 4-8: Inhalation Exposures to Noncarcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{THQ \times RfD_i \times BW_a \times AT_n \times 1000 ug/mg}{EF_r \times ED_r \times IRA_a}$$

Footnote:

[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

SOIL-TO-AIR VOLATILIZATION FACTOR (VF_s)

Equation 4-9: Derivation of the Volatilization Factor

$$VF_s(m^3/kg) = (Q/C) \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4}(m^2/cm^2)$$

where:

$$D_A = \frac{[(\Theta_a^{10/3} D_i H' + \Theta_w^{10/3} D_w)/n^2]}{\rho_B K_d + \Theta_w + \Theta_a H'}$$

Parameter	Definition (units)	Default
VF_s	Volatilization factor (m^3/kg)	--
D_A	Apparent diffusivity (cm^2/s)	--
Q/C	Inverse of the mean conc. at the center of a 0.5-acre square source (g/m^2-s per kg/m^3)	68.81
T	Exposure interval (s)	9.5×10^8
ρ_b	Dry soil bulk density (g/cm^3)	1.5
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
ρ_s	Soil particle density (g/cm^3)	2.65
Di	Diffusivity in air (cm^2/s)	Chemical-specific
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	Calculated from H by multiplying by 41 (USEPA 1991a)
D_w	Diffusivity in water (cm^2/s)	Chemical-specific
K_d	Soil-water partition coefficient (cm^3/g) = $K_{oc}f_{oc}$	Chemical-specific
K_{oc}	Soil organic carbon-water partition coefficient (cm^3/g)	Chemical-specific
f_{oc}	Fraction organic carbon in soil (g/g)	0.006 (0.6%)

SOIL SATURATION CONCENTRATION (sat)

Equation 4-10: Derivation of the Soil Saturation Limit

$$sat = \frac{S}{\rho_b} (K_d \rho_b + \Theta_w + H' \Theta_a)$$

Parameter	Definition (units)	Default
sat	Soil saturation concentration (mg/kg)	--
S	Solubility in water (mg/L-water)	Chemical-specific
ρ_b	Dry soil bulk density (kg/L)	1.5
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
ρ_s	Soil particle density (kg/L)	2.65
K_d	Soil-water partition coefficient (L/kg)	K_{oc} x f_{oc} (chemical-specific)
k_{oc}	Soil organic carbon/water partition coefficient (L/kg)	Chemical-specific
f_{oc}	Fraction organic carbon content of soil (g/g)	0.006 or site-specific
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
w	Average soil moisture content (kg_{water}/kg_{soil} or L_{water}/kg_{soil})	0.1
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	H x 41, where 41 is a units conversion factor

SOIL-TO-AIR PARTICULATE EMISSION FACTOR (PEF)

Equation 4-11: Derivation of the Particulate Emission Factor

$$PEF(m^3/kg) = Q/C \times \frac{3600 s/h}{0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x)}$$

Parameter	Definition (units)	Default
PEF	Particulate emission factor (m^3/kg)	1.316×10^9
Q/C	Inverse of the mean concentration at the center of a 0.5-acre-square source (g/m^2-s per kg/m^3)	90.80
V	Fraction of vegetative cover (unitless)	0.5
U_m	Mean annual windspeed (m/s)	4.69
U_t	Equivalent threshold value of windspeed at 7 m (m/s)	11.32
F(x)	Function dependent on U_m/U_t derived using Cowherd (1985) (unitless)	0.194

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Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.7E-03	i	4.0E-03	i	8.7E-03	r	4.0E-03	r	0	0.10	30560-19-1	Acephate	5.1E+01	ca**	3.4E+02	ca*	7.7E-01	ca*	7.7E+00	ca*		6.0E+01
7.7E-03	r	2.6E-03	r	7.7E-03	i	2.6E-03	i	1	0.10	75-07-0	Acetaldehyde	9.2E+00	ca**	2.2E+01	ca**	8.7E-01	ca*	1.5E+00	ca*		
		2.0E-02	i			2.0E-02	r	0	0.10	34256-82-1	Acetochlor	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			1.0E-01	r	1	0.10	67-64-1	Acetone	1.4E+03	nc	6.1E+03	nc	3.7E+02	nc	6.1E+02	nc	1.6E+01	8.0E-01
		8.0E-04	h			2.9E-03	x	0	0.10	75-86-5	Acetone cyanohydrin	4.4E+01	nc	8.6E+02	nc	1.0E+01	nc	2.9E+01	nc		
		6.0E-03	i			1.4E-02	h	1	0.10	75-05-8	Acetonitrile	2.0E+02	nc	1.3E+03	nc	5.2E+01	nc	7.1E+01	nc		
		1.0E-01	i			5.7E-06	x	1	0.10	98-86-2	Acetophenone	4.9E-01	nc	1.6E+00	nc	2.1E-02	nc	4.2E-02	nc		
1.1E-01	o	1.3E-02	i	1.1E-01	r	1.3E-02	r	0	0.10	50594-66-6	Acifluorfen	4.0E+00	ca	2.7E+01	ca	6.1E-02	ca	6.1E-01	ca		
		2.0E-02	h			5.7E-06	i	1	0.10	107-02-8	Acrolein	1.0E-01	nc	3.4E-01	nc	2.1E-02	nc	4.2E-02	nc		
4.5E+00	i	2.0E-04	i	4.5E+00	i	2.0E-04	r	0	0.10	79-06-1	Acrylamide	9.8E-02	ca	6.6E-01	ca	1.5E-03	ca	1.5E-02	ca		
		5.0E-01	i			2.9E-04	i	0	0.10	79-10-7	Acrylic acid	2.6E+04	nc	4.2E+05	nc	1.0E+00	nc	1.8E+04	nc		
5.4E-01	i	1.0E-03	h	2.4E-01	i	5.7E-04	i	1	0.10	107-13-1	Acrylonitrile	1.9E-01	ca*	4.9E-01	ca*	2.8E-02	ca*	3.7E+00	ca*		
8.1E-02	h	1.0E-02	i	8.0E-02	r	1.0E-02	r	0	0.10	15972-60-8	Alachlor	5.5E+00	ca*	3.7E+01	ca	8.4E-02	ca	8.4E-01	ca		
		1.5E-01	i			1.5E-01	r	0	0.10	1596-84-5	Alar	8.2E+03	nc	1.6E+05	nc	5.5E+02	nc	5.5E+03	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	116-06-3	Aldicarb	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	1646-88-4	Aldicarb sulfone	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
1.7E+01	i	3.0E-05	i	1.7E+01	i	3.0E-05	r	0	0.10	309-00-2	Aldrin	2.6E-02	ca*	1.8E-01	ca	3.9E-04	ca	4.0E-03	ca	1.2E+04	5.9E+02
		2.5E-01	i			2.5E-01	r	0	0.10	5585-64-8	Ally	1.4E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		5.0E-03	x			5.0E-03	r	0	0.10	107-18-6	Allyl alcohol	2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-02	h			2.9E-04	i	0	0.10	107-05-1	Allyl chloride	2.7E+03	nc	5.2E+04	nc	1.0E+00	nc	1.8E+03	nc		
		1.0E+00	n					0	0.01	7429-90-5	Aluminum	7.5E+04	nc	1.0E+05	max			3.7E+04	nc		
		4.0E-04	i					0	0.01	20859-73-8	Aluminum phosphide	3.0E+01	nc	7.5E+02	nc			1.5E+01	nc		
		3.0E-04	i			3.0E-04	r	0	0.10	67485-29-4	Amdro	1.6E+01	nc	3.2E+02	nc	1.1E+00	nc	1.1E+01	nc		
		9.0E-03	i			9.0E-03	r	0	0.10	834-12-8	Ametryn	4.9E+02	nc	9.6E+03	nc	3.3E+01	nc	3.3E+02	nc		
		7.0E-02	h			7.0E-02	r	0	0.10	591-27-5	m-Aminophenol	3.8E+03	nc	7.5E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-05	h			2.0E-05	r	0	0.10	504-24-5	4-Aminopyridine	1.1E+00	nc	2.1E+01	nc	7.3E-02	nc	7.3E-01	nc		
		2.5E-03	i			2.5E-03	r	0	0.10	33089-61-1	Amitraz	1.4E+02	nc	2.7E+03	nc	9.1E+00	nc	9.1E+01	nc		
						2.9E-02	i	n/a	n/a	7664-41-7	Ammonia					1.0E+02	nc				
		2.0E-01	i					0	0.10	7773-06-0	Ammonium sulfamate	1.1E+04	nc	1.0E+05	max			7.3E+03	nc		
5.7E-03	i	7.0E-03	n	5.7E-03	r	2.9E-04	i	0	0.10	62-53-3	Aniline	7.8E+01	ca**	5.3E+02	ca*	1.0E+00	nc	1.2E+01	ca*		
		4.0E-04	i					0	0.01	7440-36-0	Antimony and compounds	3.0E+01	nc	7.5E+02	nc			1.5E+01	nc	5.0E+00	3.0E-01
		5.0E-04	h					0	0.01	1314-60-9	Antimony pentoxide	3.7E+01	nc	9.4E+02	nc			1.8E+01	nc		
		9.0E-04	h					0	0.01	28300-74-5	Antimony potassium tartrate	6.7E+01	nc	1.7E+03	nc			3.3E+01	nc		
		4.0E-04	h					0	0.01	1332-81-6	Antimony tetroxide	3.0E+01	nc	7.5E+02	nc			1.5E+01	nc		
		4.0E-04	h					0	0.01	1309-64-4	Antimony trioxide	3.0E+01	nc	7.5E+02	nc			1.5E+01	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	74115-24-5	Apollo	7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
2.5E-02	i	5.0E-02	h	2.5E-02	i	5.0E-02	r	0	0.10	140-57-8	Aramite	1.8E+01	ca	1.2E+02	ca	2.7E-01	ca	2.7E+00	ca		
		3.0E-04	i					0	0.03	7440-38-2	Arsenic (noncancer endpoint)	2.1E+01	nc	4.8E+02	nc						
1.5E+00	i	3.0E-04	i	1.5E+01	i			0	0.03	7440-38-2	Arsenic (cancer endpoint)	3.8E-01	ca*	3.0E+00	ca	4.5E-04	ca	4.5E-02	ca	2.9E+01	1.0E+00
						1.4E-05	i	n/a	n/a	7784-42-1	Arsine (see arsenic for cancer endpoint)					5.2E-02	nc				
		9.0E-03	i			9.0E-03	r	0	0.10	76578-12-6	Assure	4.9E+02	nc	9.6E+03	nc	3.3E+01	nc	3.3E+02	nc		
		5.0E-02	i			5.0E-02	r	0	0.10	3337-71-1	Asulam	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
2.2E-01	h	3.5E-02	h	2.2E-01	r	3.5E-02	h	0	0.10	1912-24-9	Atrazine	2.0E+00	ca	1.3E+01	ca	3.1E-02	ca	3.0E-01	ca		
		4.0E-04	i			4.0E-04	r	0	0.10	71751-41-2	Avermectin B1	2.2E+01	nc	4.3E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.1E-01	i			1.1E-01	i			0	0.10	103-33-3	Azobenzene	4.0E+00	ca	2.7E+01	ca	6.2E-02	ca	6.1E-01	ca		

Key: I=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
	7.0E-02 I		1.4E-04 h	0	0.01	7440-39-3	Barium and compounds		5.2E+03	nc	1.0E+05	max	5.2E-01	nc	2.6E+03	nc	1.6E+03	8.2E+01
	4.0E-03 I		4.0E-03 r	0	0.10	114-26-1	Baygon		2.2E+02	nc	4.3E+03	nc	1.5E+01	nc	1.5E+02	nc		
	3.0E-02 I		3.0E-02 r	0	0.10	43121-43-3	Bayleton		1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
	2.5E-02 I		2.5E-02 r	0	0.10	68359-37-5	Baythroid		1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
	3.0E-01 I		3.0E-01 r	0	0.10	1861-40-1	Benefin		1.6E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
	5.0E-02 I		5.0E-02 r	0	0.10	17804-35-2	Benomyl		2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	3.0E-02 I		3.0E-02 r	0	0.10	25057-89-0	Bentazon		1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
	1.0E-01 I		1.0E-01 r	0	0.10	100-52-7	Benzaldehyde		5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
2.9E-02 I	3.0E-03 n	2.9E-02 I	1.7E-03 n	1	0.10	71-43-2	Benzene		6.2E-01	ca*	1.4E+00	ca*	2.3E-01	ca*	3.9E-01	ca*	3.0E-02	2.0E-03
2.3E+02 I	3.0E-03 I	2.3E+02 I	3.0E-03 r	0	0.10	92-87-5	Benzidine		1.9E-03	ca	1.3E-02	ca	2.9E-05	ca	2.9E-04	ca		
	4.0E+00 I		4.0E+00 I	0	0.10	65-85-0	Benzoic acid		1.0E+05	max	1.0E+05	max	1.5E+04	nc	1.5E+05	nc	4.0E+02	2.0E+01
1.3E+01 I		1.3E+01 r		0	0.10	98-07-7	Benzotrichloride		3.4E-02	ca	2.3E-01	ca	5.2E-04	ca	5.2E-03	ca		
	3.0E-01 h		3.0E-01 r	0	0.10	100-51-6	Benzyl alcohol		1.6E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
1.7E-01 I		1.7E-01 r		1	0.10	100-44-7	Benzyl chloride		8.1E-01	ca	2.2E+00	ca	4.0E-02	ca	6.6E-02	ca		
	2.0E-03 I	8.4E+00 I	5.7E-06 I	0	0.01	7440-41-7	Beryllium and compounds		1.5E+02	nc	3.4E+03	nc	8.0E-04	ca*	7.3E+01	nc	6.3E+01	3.0E+00
	1.0E-04 I		1.0E-04 r	0	0.10	141-66-2	Bidrin		5.5E+00	nc	1.0E+00	nc	3.7E-01	nc	3.7E+00	nc		
	1.5E-02 I		1.5E-02 r	0	0.10	82657-04-3	Biphenthrin (Talstar)		8.2E+02	nc	1.6E+04	nc	5.5E+01	nc	5.5E+02	nc		
	5.0E-02 I		5.0E-02 r	1	0.10	92-52-4	1,1-Biphenyl		2.3E+03	nc	2.4E+04	nc	1.8E+02	nc	3.0E+02	nc		
1.1E+00 I		1.2E+00 I		1	0.10	111-44-4	Bis(2-chloroethyl)ether		1.8E-01	ca	5.6E-01	ca	5.8E-03	ca	9.8E-03	ca	4.0E-04	2.0E-05
7.0E-02 h	4.0E-02 I	3.5E-02 h	4.0E-02 r	1	0.10	39638-32-9	Bis(2-chloroisopropyl)ether		2.5E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
2.2E+02 I		2.2E+02 I		1	0.10	542-88-1	Bis(chloromethyl)ether		1.9E-04	ca	4.3E-04	ca	3.1E-05	ca	5.2E-05	ca		
7.0E-02 h		3.5E-02 h		0	0.10	108-60-1	Bis(2-chloro-1-methylethyl)ether		6.3E+00	ca	4.3E+01	ca	1.9E-01	ca	9.6E-01	ca		
1.4E-02 I	2.0E-02 I	1.4E-02 r	2.2E-02 r	0	0.10	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)		3.2E+01	ca*	2.1E+02	ca	4.8E-01	ca	4.8E+00	ca		
	5.0E-02 I		5.0E-02 r	0	0.10	80-05-7	Bisphenol A		2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	9.0E-02 I		5.7E-03 h	0	0.10	7440-42-8	Boron		4.9E+03	nc	9.6E+04	nc	2.1E+01	nc	3.3E+03	nc		
			2.0E-04 h	0	0.10	7637-07-2	Boron trifluoride						7.3E-01	nc				
	2.0E-02 n		2.9E-03 n	1	0.10	S 108-86-1	Bromobenzene		2.8E+01	nc	9.2E+01	nc	1.0E+01	nc	2.0E+01	nc		
6.2E-02 I	2.0E-02 I	6.2E-02 r	2.0E-02 r	1	0.10	75-27-4	Bromodichloromethane		9.8E-01	ca	2.3E+00	ca	1.1E-01	ca	1.8E-01	ca	6.0E-01	3.0E-02
7.9E-03 I	2.0E-02 I	3.9E-03 I	2.0E-02 r	0	0.10	75-25-2	Bromoform (tribromomethane)		5.6E+01	ca*	3.8E+02	ca*	1.7E+00	ca*	8.5E+00	ca*	8.0E-01	4.0E-02
	1.4E-03 I		1.4E-03 I	1	0.10	74-83-9	Bromomethane (Methyl bromide)		3.8E+00	nc	1.3E+01	nc	5.2E+00	nc	8.7E+00	nc	2.0E-01	1.0E-02
				0	0.10	101-55-3	4-Bromophenyl phenyl ether											
	5.0E-03 h		5.0E-03 r	0	0.10	2104-96-3	Bromophos		2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
	2.0E-02 I		2.0E-02 r	0	0.10	1689-84-5	Bromoxynil		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	1.8E+02	nc		
	2.0E-02 I		2.0E-02 r	0	0.10	1689-99-2	Bromoxynil octanoate		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
9.8E-01 r		9.8E-01 I		1	0.10	106-99-0	1,3-Butadiene		6.5E-03	ca	1.4E-02	ca	6.9E-03	ca	1.1E-02	ca		
	1.0E-01 I		1.0E-01 r	0	0.10	71-36-3	1-Butanol		5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc	1.7E+01	9.0E-01
	5.0E-02 I		5.0E-02 r	0	0.10	2008-41-5	Butylate		2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	1.0E-02 n		1.0E-02 r	1	0.10	104-51-8	n-Butylbenzene		1.3E+02	nc	5.5E+02	nc	3.7E+01	nc	6.1E+01	nc		
	1.0E-02 n		1.0E-02 r	1	0.10	135-98-8	sec-Butylbenzene		1.0E+02	nc	4.1E+02	nc	3.7E+01	nc	6.1E+01	nc		
	1.0E-02 n		1.0E-02 r	1	0.10	104-5-18	tert-Butylbenzene		1.2E+02	nc	4.9E+02	nc	3.7E+01	nc	6.1E+01	nc		
	2.0E-01 I		2.0E-01 r	0	0.10	85-68-7	Butyl benzyl phthalate		9.3E+02	sat	9.3E+02	sat	7.3E+02	nc	7.3E+03	nc	9.3E+02	8.1E+02
	1.0E+00 I		1.0E+00 r	0	0.10	85-70-1	Butylphthalyl butylglycolate		5.5E+04	nc	1.0E+05	max	3.7E+03	nc	3.7E+04	nc		
	3.0E-03 h		3.0E-03 r	0	0.10	75-60-5	Cacodylic acid		1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc		
	5.0E-04 I	6.3E+00 I	5.7E-05 x	0	0.01	7440-43-9	Cadmium and compounds		3.7E+01	nc	9.3E+02	nc	1.1E-03	ca	1.8E+01	nc	8.0E+00	4.0E-01
							"CAL-Modified PRG" (PEA, 1994)		9.0E+00									

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FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
	5.0E-01 i		5.0E-01 r	0	0.10	105-60-2	Caprolactam		2.7E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
6.6E-03 h	2.0E-03 i	6.6E-03 r	2.0E-03 r	0	0.10	2425-06-1	Captafol		5.2E+01	ca**	3.5E+02	ca**	7.8E-01	ca*	7.8E+00	ca*		
3.5E-03 h	1.3E-01 i	3.5E-03 r	1.3E-01 r	0	0.10	133-06-2	Captan		1.3E+02	ca*	8.6E+02	ca	1.9E+00	ca	1.9E+01	ca		
	1.0E-01 i		1.1E-01 r	0	0.10	63-25-2	Carbaryl		5.5E+03	nc	1.1E+05	nc	4.0E+02	nc	3.7E+03	nc		
2.0E-02 h		2.0E-02 r		0	0.10	86-74-8	Carbazole		2.2E+01	ca	1.5E+02	ca	3.4E-01	ca	3.4E+00	ca	6.0E-01	3.0E-02
	5.0E-03 i		5.0E-03 r	0	0.10	1563-66-2	Carbofuran		2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
	1.0E-01 i		2.0E-01 i	1	0.10	75-15-0	Carbon disulfide		3.5E+02	nc	1.2E+03	nc	7.3E+02	nc	1.0E+03	nc	3.2E+01	2.0E+00
1.3E-01 i	7.0E-04 i	5.3E-02 i	5.7E-04 x	1	0.10	56-23-5	Carbon tetrachloride		2.3E-01	ca**	5.2E-01	ca*	1.3E-01	ca*	1.7E-01	ca*	7.0E-02	3.0E-03
	1.0E-02 i		1.0E-02 r	0	0.10	55285-14-8	Carbosulfan		5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
	1.0E-01 i		1.0E-01 r	0	0.10	5234-68-4	Carboxin		5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
	2.0E-03 i		2.0E-03 r	0	0.10	302-17-0	Chloral		1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	1.6E-02 i		1.6E-02 r	0	0.10	133-90-4	Chloramben		8.2E+02	nc	1.6E+04	nc	5.5E+01	nc	5.5E+02	nc		
4.0E-01 h		4.0E-01 r		0	0.10	118-75-2	Chloranil		1.1E+00	ca	7.4E+00	ca	1.7E-02	ca	1.7E-01	ca		
3.5E-01 i	5.0E-04 i	3.5E-01 i	2.3E-05 i	0	0.04	57-74-9	Chlordane		1.6E+00	ca*	1.2E+01	ca*	1.9E-02	ca**	1.9E-01	ca*	1.0E+01	5.0E-01
	2.0E-02 i		2.0E-02 r	0	0.10	90982-32-4	Chlorimuron-ethyl		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	1.0E-01 i			0	0.01	7782-50-5	Chlorine								3.7E+03	nc		
			5.7E-05 i	n/a	n/a	10049-04-4	Chlorine dioxide						2.1E-01	nc				
				1	0.10	107-20-0	Chloroacetaldehyde											
	2.0E-03 h		2.0E-03 r	0	0.10	79-11-8	Chloroacetic acid		1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	8.8E-06 r		8.8E-06 i	1	0.10	532-27-4	2-Chloroacetophenone		3.2E-02	nc	1.1E-01	nc	3.1E-02	nc	5.2E-02	nc		
	4.0E-03 i		4.0E-03 r	0	0.10	106-47-8	4-Chloroaniline		2.2E+02	nc	4.3E+03	nc	1.5E+01	nc	1.5E+02	nc	7.0E-01	3.0E-02
	2.0E-02 i		5.7E-03 h	1	0.10	108-90-7	Chlorobenzene		5.4E+01	nc	1.8E+02	nc	2.1E+01	nc	3.9E+01	nc	1.0E+00	7.0E-02
2.7E-01 h	2.0E-02 i	2.7E-01 h	2.0E-02 r	0	0.10	510-15-6	Chlorobenzilate		1.6E+00	ca	1.1E+01	ca	2.5E-02	ca	2.5E-01	ca		
	2.0E-01 h		2.0E-01 r	0	0.10	74-11-3	p-Chlorobenzoic acid		1.1E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
	2.0E-02 h		2.0E-02 r	0	0.10	98-56-6	4-Chlorobenzotrifluoride		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	2.0E-02 h		2.0E-03 h	1	0.10	126-99-8	2-Chloro-1,3-butadiene		3.6E+00	nc	1.2E+01	nc	7.3E+00	nc	1.4E+01	nc		
	4.0E-01 h		4.0E-01 r	1	0.10	109-69-3	1-Chlorobutane		4.8E+02	ssl	4.8E+02	ssl	1.5E+03	nc	2.4E+03	nc		
	1.4E+01 r		1.4E+01 i	1	0.10	75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)		3.4E+02	ssl	3.4E+02	ssl	5.2E+04	nc	8.7E+04	nc		
	1.4E+01 r		1.4E+01 i	1	0.10	75-45-6	Chlorodifluoromethane		3.4E+02	ssl	3.4E+02	ssl	5.1E+04	nc	8.5E+04	nc		
				1	0.10	110-75-8	2-Chloroethyl vinyl ether											
6.1E-03 i	1.0E-02 i	6.1E-02 i	1.0E-02 r	1	0.10	67-66-3	Chloroform		2.4E-01	ca	5.2E-01	ca	8.4E-02	ca	1.6E-01	ca	6.0E-01	3.0E-02
1.3E-02 h		6.3E-03 h		1	0.10	74-87-3	Chloromethane		1.2E+00	ca	2.6E+00	ca	1.1E+00	ca	1.5E+00	ca		
5.8E-01 h		5.8E-01 r		0	0.10	95-69-2	4-Chloro-2-methylaniline		7.7E-01	ca	5.2E+00	ca	1.2E-02	ca	1.2E-01	ca		
4.6E-01 h		4.6E-01 r		0	0.10	3165-93-3	4-Chloro-2-methylaniline hydrochloride		9.7E-01	ca	6.5E+00	ca	1.5E-02	ca	1.5E-01	ca		
	8.0E-02 i		8.0E-02 r	1	0.10	91-58-7	beta-Chloronaphthalene		3.7E+03	nc	2.4E+04	nc	2.9E+02	nc	4.9E+02	nc		
2.5E-02 h		2.5E-02 r	r	0	0.10	88-73-3	o-Chloronitrobenzene		1.8E+01	ca	1.2E+02	ca	2.7E-01	ca	2.7E+00	ca		
1.8E-02 h		1.8E-02 r	r	0	0.10	100-00-5	p-Chloronitrobenzene		2.5E+01	ca	1.7E+02	ca	3.7E-01	ca	3.7E+00	ca		
	5.0E-03 i		5.0E-03 r	1	0.10	95-57-8	2-Chlorophenol		5.9E+01	nc	2.4E+02	nc	1.8E+01	nc	3.8E+01	nc	4.0E+00	2.0E-01
	2.9E-02 r		2.9E-02 h	1	0.10	75-29-6	2-Chloropropane		1.6E+02	nc	5.9E+02	nc	1.0E+02	nc	1.7E+02	nc		
1.1E-02 h	1.5E-02 i	1.1E-02 r	1.5E-02 r	0	0.10	1897-45-6	Chlorothalonil		4.0E+01	ca*	2.7E+02	ca*	6.1E-01	ca*	6.1E+00	ca*		
	2.0E-02 i		2.0E-02 r	1	0.10	95-49-8	o-Chlorotoluene		1.5E+02	nc	5.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
	2.0E-01 i		2.0E-01 r	0	0.10	101-21-3	Chlorpropham		1.1E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
	3.0E-03 i		3.0E-03 r	0	0.10	2921-88-2	Chlorpyrifos		1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc		
	1.0E-02 h		1.0E-02 r	0	0.10	5598-13-0	Chlorpyrifos-methyl		5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
	5.0E-02 i		5.0E-02 r	0	0.10	64902-72-3	Chlorsulfuron		2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION				CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C skin abs. soils CAS No.		Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Ambient Air (ug/m^3)	Tap Water (ug/l)	Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
	8.0E-04 h		8.0E-04 r	0 0.10 60238-56-4	Chlorthiophos	4.4E+01 nc	8.6E+02 nc	2.9E+00 nc	2.9E+01 nc		
		4.2E+01 I		0 0.01 n/a	Total Chromium (1/6 ratio Cr VI/Cr III)	2.1E+02 ca	4.5E+02 ca	1.6E-04 ca		3.8E+01	2.0E+00
	5.0E-03 I	2.9E+02 I		0 0.01 7440-47-3	Chromium VI	3.0E+01 ca*	6.4E+01 ca	2.3E-05 ca	1.8E+02 nc	3.8E+01	2.0E+00
					"CAL-Modified PRG" (PEA, 1994)	2.0E-01			1.6E-01		
	6.0E-02 x		5.7E-06 x	0 0.01 7440-48-4	Cobalt	3.3E+03 nc	2.9E+04 nc	2.1E-02 nc	2.2E+03 nc		
		2.2E+00 I		0 0.01 8007-45-2	Coke Oven Emissions			3.1E-03 ca			
	3.7E-02 h			0 0.01 7440-50-8	Copper and compounds	2.8E+03 nc	7.0E+04 nc		1.4E+03 nc		
1.9E+00 h	1.0E-02 x	1.9E+00 x	1.0E-02 r	1 0.10 123-73-9	Crotonaldehyde	5.3E-03 ca	1.1E-02 ca	3.5E-03 ca	5.9E-03 ca		
	1.0E-01 I		1.1E-01 I	1 0.10 98-82-8	Cumene (isopropylbenzene)	1.6E+02 nc	5.2E+02 nc	4.0E+02 nc	6.6E+02 nc		
8.4E-01 h	2.0E-03 h	8.4E-01 r	2.0E-03 r	0 0.10 21725-46-2	Cyanazine	5.3E-01 ca	3.6E+00 ca	8.0E-03 ca	8.0E-02 ca		
				n/a	Cyanides						
	1.0E-01 h			0 0.10 542-62-1	Barium cyanide	5.5E+03 nc	1.0E+05 max		3.7E+03 nc		
	4.0E-02 I			0 0.10 592-01-8	Calcium cyanide	2.2E+03 nc	4.3E+04 nc		1.5E+03 nc		
	5.0E-03 I			0 0.10 544-92-3	Copper cyanide	2.7E+02 nc	5.3E+03 nc		1.8E+02 nc		
	4.0E-02 I			0 0.10 460-19-5	Cyanogen	2.2E+03 nc	4.3E+04 nc		1.5E+03 nc		
	9.0E-02 I			0 0.10 506-68-3	Cyanogen bromide	4.9E+03 nc	1.0E+05 max		3.3E+03 nc		
	5.0E-02 I			0 0.10 506-77-4	Cyanogen chloride	2.7E+03 nc	5.3E+04 nc		1.8E+03 nc		
	2.0E-02 I			0 0.10 57-12-5	Free cyanide	1.1E+03 nc	2.1E+04 nc		7.3E+02 nc	4.0E+01	2.0E+00
	2.0E-02 I		8.6E-04 I	1 0.10 74-90-8	Hydrogen cyanide	1.1E+01 nc	3.5E+01 nc	3.1E+00 nc	6.2E+00 nc		
	5.0E-02 I			0 0.10 151-50-8	Potassium cyanide	2.7E+03 nc	5.3E+04 nc		1.8E+03 nc		
	2.0E-01 I			0 0.10 506-61-6	Potassium silver cyanide	1.1E+04 nc	1.0E+05 max		7.3E+03 nc		
	1.0E-01 I			0 0.10 506-64-9	Silver cyanide	5.5E+03 nc	1.1E+05 nc		3.7E+03 nc		
	4.0E-02 I			0 0.10 143-33-9	Sodium cyanide	2.2E+03 nc	4.3E+04 nc		1.5E+03 nc		
	5.0E-02 I			0 0.10 557-21-1	Zinc cyanide	2.7E+03 nc	5.3E+04 nc		1.8E+03 nc		
	5.0E+00 I		5.0E+00 r	0 0.10 108-94-1	Cyclohexanone	1.0E+05 max	1.0E+05 max	1.8E+04 nc	1.8E+05 nc		
	2.0E-01 I		2.0E-01 r	0 0.10 108-91-8	Cyclohexylamine	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
	5.0E-03 I		5.0E-03 r	0 0.10 68085-85-8	Cyhalothrin/Karate	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	1.0E-02 I		1.0E-02 r	0 0.10 52315-07-8	Cypermethrin	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	7.5E-03 I		7.5E-03 r	0 0.10 66215-27-8	Cyromazine	4.1E+02 nc	8.0E+03 nc	2.7E+01 nc	2.7E+02 nc		
	1.0E-02 I		1.0E-02 r	0 0.10 1861-32-1	Dacthal	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	3.0E-02 I		3.0E-02 r	0 0.10 75-99-0	Dalapon	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	2.5E-02 I		2.5E-02 r	0 0.10 39515-41-8	Danitol	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
2.4E-01 I		2.4E-01 r		0 0.03 72-54-8	DDD	2.4E+00 ca	1.9E+01 ca	2.8E-02 ca	2.8E-01 ca	1.6E+01	8.0E-01
3.4E-01 I		3.4E-01 r		0 0.03 72-55-9	DDE	1.7E+00 ca	1.3E+01 ca	2.0E-02 ca	2.0E-01 ca	5.4E+01	3.0E+00
3.4E-01 I	5.0E-04 I	3.4E-01 I	5.0E-04 r	0 0.03 50-29-3	DDT	1.7E+00 ca*	1.3E+01 ca*	2.0E-02 ca*	2.0E-01 ca*	3.2E+01	2.0E+00
	1.0E-02 I		1.0E-02 r	0 0.10 1163-19-5	Decabromodiphenyl ether	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	4.0E-05 I		4.0E-05 r	0 0.10 6065-46-3	Demeton	2.2E+00 nc	4.3E+01 nc	1.5E-01 nc	1.5E+00 nc		
6.1E-02 h		6.1E-02 r		0 0.10 2303-16-4	Diallate	7.3E+00 ca	4.9E+01 ca	1.1E-01 ca	1.1E+00 ca		
	9.0E-04 h		9.0E-04 r	0 0.10 333-41-5	Diazinon	4.9E+01 nc	9.6E+02 nc	3.3E+00 nc	3.3E+01 nc		
	4.0E-03 x		4.0E-03 r	1 0.10 132-64-9	Dibenzofuran	2.1E+02 nc	3.2E+03 nc	1.5E+01 nc	2.4E+01 nc		
	1.0E-02 I		1.0E-02 r	0 0.10 106-37-6	1,4-Dibromobenzene	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
8.4E-02 I	2.0E-02 I	8.4E-02 r	2.0E-02 r	0 0.10 124-48-1	Dibromochloromethane	5.3E+00 ca	3.6E+01 ca	8.0E-02 ca	1.0E+00 ca	4.0E-01	2.0E-02
1.4E+00 h	5.7E-05 r	2.4E-03 h	5.7E-05 I	0 0.10 96-12-8	1,2-Dibromo-3-chloropropane	3.2E-01 ca**	2.1E+00 ca*	2.1E-01 nc	4.8E-02 ca*		
					"CAL-Modified PRG" (PEA, 1994)	6.0E-02		9.6E-04	4.7E-03		
8.5E+01 I	5.7E-05 r	7.7E-01 I	5.7E-05 h	1 0.10 106-93-4	1,2-Dibromoethane	4.9E-03 ca	2.9E-02 ca*	8.7E-03 ca*	7.6E-04 ca		

Key : i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
																	Migration to Ground Water	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFI 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
	1.0E-01 i		1.0E-01 r	0	0.10	84-74-2		Dibutyl phthalate	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc	2.3E+03	2.7E+02
	3.0E-02 i		3.0E-02 r	0	0.10	1918-00-9		Dicamba	1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
	9.0E-02 i		5.7E-02 h	1	0.10	95-50-1		1,2-Dichlorobenzene	3.7E+02	sat	3.7E+02	sat	2.1E+02	nc	3.7E+02	nc	1.7E+01	9.0E-01
	3.0E-02 n		2.3E-03 n	1	0.10	541-73-1		1,3-Dichlorobenzene	4.1E+01	nc	1.4E+02	nc	8.4E+00	nc	1.7E+01	nc		
2.4E-02 h	2.0E-01 n	2.4E-02 r	2.3E-01 i	1	0.10	106-46-7		1,4-Dichlorobenzene	3.0E+00	ca	7.3E+00	ca	2.8E-01	ca	4.7E-01	ca	2.0E+00	1.0E-01
4.5E-01 i		4.5E-01 r		0	0.10	91-94-1		3,3-Dichlorobenzidine	9.9E-01	ca	6.7E+00	ca	1.5E-02	ca	1.5E-01	ca	7.0E-03	3.0E-04
9.3E+00 r		9.3E+00 h		1	0.10	764-41-0		1,4-Dichloro-2-butene	7.5E-03	ca	1.8E-02	ca	7.2E-04	ca	1.2E-03	ca		
	2.0E-01 i		5.7E-02 h	1	0.10	75-71-8		Dichlorodifluoromethane	9.4E+01	nc	3.1E+02	nc	2.1E+02	nc	3.9E+02	nc		
	1.0E-01 h		1.4E-01 h	1	0.10	75-34-3		1,1-Dichloroethane	5.7E+02	nc	2.0E+03	nc	5.2E+02	nc	8.1E+02	nc	2.3E+01	1.0E+00
9.1E-02 i	2.9E-03 r	9.1E-02 i	2.9E-03 x	1	0.10	107-06-2		1,2-Dichloroethane (EDC)	3.4E-01	ca*	7.6E-01	ca*	7.4E-02	ca	1.2E-01	ca	2.0E-02	1.0E-03
6.0E-01 i	9.0E-03 i	1.8E-01 i	9.0E-03 r	1	0.10	75-35-4		1,1-Dichloroethylene	5.2E-02	ca	1.2E-01	ca	3.8E-02	ca	4.6E-02	ca	6.0E-02	3.0E-03
	1.0E-02 h		1.0E-02 r	1	0.10	156-59-2		1,2-Dichloroethylene (cis)	4.2E+01	nc	1.5E+02	nc	3.7E+01	nc	6.1E+01	nc	4.0E-01	2.0E-02
	2.0E-02 i		2.0E-02 r	1	0.10	156-60-5		1,2-Dichloroethylene (trans)	6.2E+01	nc	2.1E+02	nc	7.3E+01	nc	1.2E+02	nc	7.0E-01	3.0E-02
	3.0E-03 i		3.0E-03 r	0	0.10	120-83-2		2,4-Dichlorophenol	1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc	1.0E+00	5.0E-02
	8.0E-03 i		8.0E-03 r	0	0.10	94-82-6		4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.4E+02	nc	8.6E+03	nc	2.9E+01	nc	2.9E+02	nc		
	1.0E-02 i		1.0E-02 r	0	0.05	94-75-7		2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.4E+02	nc	1.4E+04	nc	3.7E+01	nc	3.7E+02	nc		
6.8E-02 h	1.1E-03 r	6.8E-02 r	1.1E-03 i	1	0.10	78-87-5		1,2-Dichloropropane	3.4E-01	ca*	7.6E-01	ca*	9.9E-02	ca*	1.6E-01	ca*	3.0E-02	1.0E-03
1.8E-01 h	3.0E-04 i	1.3E-01 h	5.7E-03 i	1	0.10	542-75-6		1,3-Dichloropropene	8.1E-02	ca*	1.8E-01	ca	5.2E-02	ca	8.1E-02	ca	4.0E-03	2.0E-04
	3.0E-03 i		3.0E-03 r	0	0.10	616-23-9		2,3-Dichloropropanol	1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc		
2.9E-01 i	5.0E-04 i	2.9E-01 r	1.4E-04 i	0	0.10	62-73-7		Dichlorvos	1.5E+00	ca*	1.0E+01	ca*	2.3E-02	ca*	2.3E-01	ca*		
4.4E-01 x		4.4E-01 r		0	0.10	115-32-2		Dicofol	1.0E+00	ca	6.8E+00	ca	1.5E-02	ca	1.5E-01	ca		
	3.0E-02 h		5.7E-05 h	1	0.10	77-73-6		Dicyclopentadiene	5.4E-01	nc	1.8E+00	nc	2.1E-01	nc	4.2E-01	nc		
1.6E+01 i	5.0E-05 i	1.6E+01 i	5.0E-05 r	0	0.10	60-57-1		Dieldrin	2.8E-02	ca*	1.9E-01	ca	4.2E-04	ca	4.2E-03	ca	4.0E-03	2.0E-04
	5.7E-03 h		5.7E-03 x	0	0.10	112-34-5		Diethylene glycol, monobutyl ether	3.1E+02	nc	6.1E+03	nc	2.1E+01	nc	2.1E+02	nc		
	2.0E+00 h		2.0E+00 r	0	0.10	111-90-0		Diethylene glycol, monoethyl ether	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
	1.1E-02 h		1.1E-02 r	0	0.10	617-84-5		Diethylformamide	6.0E+02	nc	1.2E+04	nc	4.0E+01	nc	4.0E+02	nc		
1.2E-03 i	6.0E-01 i	1.2E-03 r	6.0E-01 r	0	0.10	103-23-1		Di(2-ethylhexyl)adipate	3.7E+02	ca	2.5E+03	ca	5.6E+00	ca	5.6E+01	ca		
	8.0E-01 i		8.0E-01 r	0	0.10	84-66-2		Diethyl phthalate	4.4E+04	nc	1.0E+05	max	2.9E+03	nc	2.9E+04	nc		
4.7E+03 h		4.7E+03 r		0	0.10	56-53-1		Diethylstilbestrol	9.4E-05	ca	6.4E-04	ca	1.4E-06	ca	1.4E-05	ca		
	8.0E-02 i		8.0E-02 r	0	0.10	43222-48-6		Difenzoquat (Avenge)	4.4E+03	nc	8.6E+04	nc	2.9E+02	nc	2.9E+03	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	35367-38-5		Diflubenzuron	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	1.1E+01 r		1.1E+01 i	1	0.10	75-37-6		1,1-Difluoroethane					4.2E+04	nc	6.9E+04	nc		
	8.0E-02 i		8.0E-02 r	0	0.10	1445-75-6		Diisopropyl methylphosphonate	4.4E+03	nc	8.6E+04	nc	2.9E+02	nc	2.9E+03	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	55290-64-7		Dimethipin	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	2.0E-04 i		2.0E-04 r	0	0.10	60-51-5		Dimethoate	1.1E+01	nc	2.1E+02	nc	7.3E-01	nc	7.3E+00	nc		
1.4E-02 h		1.4E-02 r		0	0.10	119-90-4		3,3'-Dimethoxybenzidine	3.2E+01	ca	2.1E+02	ca	4.8E-01	ca	4.8E+00	ca		
	5.7E-06 r		5.7E-06 x	1	0.10	124-40-3		Dimethylamine	6.3E-02	nc	2.5E-01	nc	2.1E-02	nc	3.5E-02	nc		
	2.0E-03 i		2.0E-03 r	0	0.10	121-69-7		N-N-Dimethylaniline	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
7.5E-01 h		7.5E-01 r		0	0.10	95-68-1		2,4-Dimethylaniline	5.9E-01	ca	4.0E+00	ca	9.0E-03	ca	9.0E-02	ca		
5.8E-01 h		5.8E-01 r		0	0.10	21436-96-4		2,4-Dimethylaniline hydrochloride	7.7E-01	ca	5.2E+00	ca	1.2E-02	ca	1.2E-01	ca		
9.2E+00 h		9.2E+00 r		0	0.10	119-93-7		3,3'-Dimethylbenzidine	4.8E-02	ca	3.3E-01	ca	7.3E-04	ca	7.3E-03	ca		
2.6E+00 x		3.5E+00 x		0	0.10	57-14-7		1,1-Dimethylhydrazine	1.7E-01	ca	1.2E+00	ca	1.9E-03	ca	2.6E-02	ca		
3.7E+01 x		3.7E+01 x		0	0.10	540-73-8		1,2-Dimethylhydrazine	1.2E-02	ca	8.1E-02	ca	1.8E-04	ca	1.8E-03	ca		
	1.0E-01 h		8.6E-03 i	0	0.10	68-12-2		N,N-Dimethylformamide	5.4E+03	nc	1.1E+05	nc	3.1E+01	nc	3.7E+03	nc		
	1.0E-03 n		1.0E-03 r	0	0.10	122-09-8		Dimethylphenethylamine	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
				V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)															
	2.0E-02 I		2.0E-02 r	0	0.10	105-67-9		2,4-Dimethylphenol	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc	9.0E+00	4.0E-01
	6.0E-04 I		6.0E-04 r	0	0.10	576-26-1		2,6-Dimethylphenol	3.3E+01	nc	6.4E+02	nc	2.2E+00	nc	2.2E+01	nc		
	1.0E-03 I		1.0E-03 r	0	0.10	95-65-8		3,4-Dimethylphenol	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
	1.0E+01 h		1.0E+01 r	0	0.10	131-11-3		Dimethyl phthalate	1.0E+05	max	1.0E+05	max	3.7E+04	nc	3.7E+05	nc		
	1.0E-01 I		1.0E-01 r	0	0.10	120-61-6		Dimethyl terephthalate	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
	2.0E-03 I		2.0E-03 r	0	0.10	131-89-5		4,6-Dinitro-o-cyclohexyl phenol	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	4.0E-04 h		4.0E-04 r	0	0.10	528-29-0		1,2-Dinitrobenzene	2.2E+01	nc	4.3E+02	nc	1.5E+00	nc	1.5E+01	nc		
	1.0E-04 I		1.0E-04 r	0	0.10	99-65-0		1,3-Dinitrobenzene	5.5E+00	nc	1.1E+02	nc	3.7E-01	nc	3.7E+00	nc		
	4.0E-04 h		4.0E-04 r	0	0.10	100-25-4		1,4-Dinitrobenzene	2.2E+01	nc	4.3E+02	nc	1.5E+00	nc	1.5E+01	nc		
	2.0E-03 I		2.0E-03 r	0	0.10	51-28-5		2,4-Dinitrophenol	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc	3.0E-01	1.0E-02
6.8E-01 I		6.8E-01 r		0	0.10	25321-14-6		Dinitrotoluene mixture	6.5E-01	ca	4.4E+00	ca	9.9E-03	ca	9.9E-02	ca	8.0E-04	4.0E-05
	2.0E-03 I		2.0E-03 r	0	0.10	121-14-2		2,4-Dinitrotoluene (also see Dinitrotoluene mixture)	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc	8.0E-04	4.0E-05
	1.0E-03 h		1.0E-03 r	0	0.10	606-20-2		2,6-Dinitrotoluene (also see Dinitrotoluene mixture)	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc	7.0E-04	3.0E-05
	1.0E-03 I		1.0E-03 r	0	0.10	88-85-7		Dinoseb	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
	2.0E-02 h		2.0E-02 r	0	0.10	117-84-0		di-n-Octyl phthalate	1.1E+03	nc	1.0E+04	sat	7.3E+01	nc	7.3E+02	nc	1.0E+04	1.0E+04
1.1E-02 I		1.1E-02 r		0	0.10	123-91-1		1,4-Dioxane	4.0E+01	ca	2.7E+02	ca	6.1E-01	ca	6.1E+00	ca		
1.5E+05 h		1.5E+05 h		0	0.03	1746-01-6		Dioxin (2,3,7,8-TCDD)	3.8E-06	ca	3.0E-05	ca	4.5E-08	ca	4.5E-07	ca		
	3.0E-02 I		3.0E-02 r	0	0.10	957-51-7		Diphenamid	1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
	2.5E-02 I		2.5E-02 r	0	0.10	122-39-4		Diphenylamine	1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
8.0E-01 I		7.7E-01 I		0	0.10	122-66-7		1,2-Diphenylhydrazine	5.6E-01	ca	3.7E+00	ca	8.7E-03	ca	8.4E-02	ca		
	9.0E-03 n		9.0E-03 r	0	0.10	127-63-9		Diphenyl sulfone	4.9E+02	nc	9.6E+03	nc	3.3E+01	nc	3.3E+02	nc		
	2.2E-03 I		2.2E-03 r	0	0.10	85-00-7		Diquat	1.2E+02	nc	2.4E+03	nc	8.0E+00	nc	8.0E+01	nc		
8.6E+00 h		8.6E+00 r		0	0.10	1937-37-7		Direct black 38	5.2E-02	ca	3.5E-01	ca	7.8E-04	ca	7.8E-03	ca		
8.1E+00 h		8.1E+00 r		0	0.10	2602-46-2		Direct blue 6	5.5E-02	ca	3.7E-01	ca	8.3E-04	ca	8.3E-03	ca		
9.3E+00 h		9.3E+00 r		0	0.10	16071-86-6		Direct brown 95	4.8E-02	ca	3.2E-01	ca	7.2E-04	ca	7.2E-03	ca		
	4.0E-05 I		4.0E-05 r	0	0.10	298-04-4		Disulfoton	2.2E+00	nc	4.3E+01	nc	1.5E-01	nc	1.5E+00	nc		
	1.0E-02 I		1.0E-02 r	0	0.10	505-29-3		1,4-Dithiane	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
	2.0E-03 I		2.0E-03 r	0	0.10	330-54-1		Diuron	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	4.0E-03 I		4.0E-03 r	0	0.10	2439-10-3		Dodine	2.2E+02	nc	4.3E+03	nc	1.5E+01	nc	1.5E+02	nc		
	6.0E-03 I		6.0E-03 r	0	0.10	115-29-7		Endosulfan	3.3E+02	nc	6.4E+03	nc	2.2E+01	nc	2.2E+02	nc	1.8E+01	9.0E-01
	2.0E-02 I		2.0E-02 r	0	0.10	145-73-3		Endothall	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	3.0E-04 I		3.0E-04 r	0	0.10	72-20-8		Endrin	1.6E+01	nc	3.2E+02	nc	1.1E+00	nc	1.1E+01	nc	1.0E+00	5.0E-02
9.9E-03 I	2.0E-03 h	4.2E-03 I	2.9E-04 I	1	0.10	106-89-8		Epichlorohydrin	7.4E+00	nc	2.6E+01	nc	1.0E+00	nc	2.0E+00	nc		
	5.7E-03 r		5.7E-03 I	0	0.10	106-88-7		1,2-Epoxybutane	3.1E+02	nc	6.1E+03	nc	2.1E+01	nc	2.1E+02	nc		
	2.5E-02 I		2.5E-02 r	0	0.10	759-94-4		EPTC (S-Ethyl dipropylthiocarbamate)	1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
	5.0E-03 I		5.0E-03 r	0	0.10	16672-87-0		Ethephon (2-chloroethyl phosphonic acid)	2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
	5.0E-04 I		5.0E-04 r	0	0.10	563-12-2		Ethion	2.7E+01	nc	5.3E+02	nc	1.8E+00	nc	1.8E+01	nc		
	4.0E-01 h		5.7E-02 I	0	0.10	110-80-5		2-Ethoxyethanol	2.2E+04	nc	1.0E+05	max	2.1E+02	nc	1.5E+04	nc		
	3.0E-01 h		3.0E-01 r	0	0.10	111-15-9		2-Ethoxyethanol acetate	1.6E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
	9.0E-01 I		9.0E-01 r	1	0.10	141-78-6		Ethyl acetate	1.7E+04	nc	7.7E+04	sat	3.3E+03	nc	5.5E+03	nc		
4.8E-02 h		4.8E-02 r		1	0.10	140-88-5		Ethyl acrylate	2.1E-01	ca	4.5E-01	ca	1.4E-01	ca	2.3E-01	ca		
	1.0E-01 I		2.9E-01 I	1	0.10	100-41-4		Ethylbenzene	2.3E+02	sat	2.3E+02	sat	1.1E+03	nc	1.3E+03	nc	1.3E+01	7.0E-01
	4.0E-01 n		2.9E+00 I	1	0.10	75-00-3		Ethyl chloride	1.6E+03	sat	1.6E+03	sat	1.0E+04	nc	8.6E+03	nc		
	3.0E-01 h		3.0E-01 r	0	0.10	109-78-4		Ethylene cyanohydrin	1.6E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
	2.0E-02 h		2.0E-02 r	0	0.10	107-15-3		Ethylene diamine	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)						SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
	2.0E+00 i		2.0E+00 r	0	0.10	107-21-1		Ethylene glycol	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
	5.7E-03 r		5.7E-03 h	0	0.10	111-76-2		Ethylene glycol, monobutyl ether	3.1E+02	nc	6.1E+03	nc	2.1E+01	nc	2.1E+02	nc		
1.0E+00 h		3.5E-01 h		1	0.10	75-21-8		Ethylene oxide	1.3E-01	ca	3.4E-01	ca	1.9E-02	ca	2.4E-02	ca		
1.1E-01 h	8.0E-05 i	1.1E-01 r	8.0E-05 r	0	0.10	96-45-7		Ethylene thiourea (ETU)	4.0E+00	ca**	2.7E+01	ca**	6.1E-02	ca**	6.1E-01	ca**		
	2.0E-01 i		2.0E-01 r	1	0.10	60-29-7		Ethyl ether	1.8E+03	sat	1.8E+03	sat	7.3E+02	nc	1.2E+03	nc		
	9.0E-02 h		9.0E-02 r	1	0.10	97-63-2		Ethyl methacrylate	1.4E+02	sat	1.4E+02	sat	3.3E+02	nc	5.5E+02	nc		
	1.0E-05 i		1.0E-05 r	0	0.10	2104-64-5		Ethyl p-nitrophenyl phenylphosphorothioate	5.5E-01	nc	1.1E+01	nc	3.7E-02	nc	3.7E-01	nc		
	3.0E+00 i		3.0E+00 r	0	0.10	84-72-0		Ethylphthalyl ethyl glycolate	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
	8.0E-03 i		8.0E-03 r	0	0.10	101200-48-		Express	4.4E+02	nc	8.6E+03	nc	2.9E+01	nc	2.9E+02	nc		
	2.5E-04 i		2.5E-04 r	0	0.10	22224-92-6		Fenamiphos	1.4E+01	nc	2.7E+02	nc	9.1E-01	nc	9.1E+00	nc		
	1.3E-02 i		1.3E-02 r	0	0.10	2164-17-2		Fluometuron	7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
	6.0E-02 i			0	0.10	16984-48-8		Flouride (soluble)	3.3E+03	nc	6.4E+04	nc			2.2E+03	nc		
	8.0E-02 i		8.0E-02 r	0	0.10	59756-60-4		Fluoridone	4.4E+03	nc	8.6E+04	nc	2.9E+02	nc	2.9E+03	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	56425-91-3		Flurprimidol	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	6.0E-02 i		6.0E-02 r	0	0.10	66332-96-5		Flutolanil	3.3E+03	nc	6.4E+04	nc	2.2E+02	nc	2.2E+03	nc		
	1.0E-02 i		1.0E-02 r	0	0.10	69409-94-5		Fluvalinate	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
3.5E-03 i	1.0E-01 i	3.5E-03 r	1.0E-01 r	0	0.10	133-07-3		Folpet	1.3E+02	ca*	8.6E+02	ca	1.9E+00	ca	1.9E+01	ca		
1.9E-01 i		1.9E-01 r		0	0.10	72178-02-0		Fomesafen	2.3E+00	ca	1.6E+01	ca	3.5E-02	ca	3.5E-01	ca		
	2.0E-03 i		2.0E-03 r	0	0.10	944-22-9		Fonofos	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	1.5E-01 i	4.6E-02 i		0	0.10	50-00-0		Formaldehyde	8.2E+03	nc	1.0E+05	nc	1.5E-01	ca	5.5E+03	nc		
	2.0E+00 h		2.0E+00 r	0	0.10	64-18-6		Formic Acid	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
	3.0E+00 i		3.0E+00 r	0	0.10	39148-24-8		Fosetyl-al	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
	1.0E-03 i		1.0E-03 r	1	0.10	110-00-9		Furan	2.5E+00	nc	8.5E+00	nc	3.7E+00	nc	6.1E+00	nc		
3.8E+00 h		3.8E+00 r		0	0.10	67-45-8		Furazolidone	1.2E-01	ca	7.9E-01	ca	1.8E-03	ca	1.8E-02	ca		
	3.0E-03 i		1.4E-02 h	0	0.10	98-01-1		Furfural	1.6E+02	nc	3.2E+03	nc	5.2E+01	nc	1.1E+02	nc		
5.0E+01 h		5.0E+01 r		0	0.10	531-82-8		Furium	8.9E-03	ca	6.0E-02	ca	1.3E-04	ca	1.3E-03	ca		
3.0E-02 i		3.0E-02 r		0	0.10	60568-05-0		Furmecyclox	1.5E+01	ca	1.0E+02	ca	2.2E-01	ca	2.2E+00	ca		
	4.0E-04 i		4.0E-04 r	0	0.10	77182-82-2		Glufosinate-ammonium	2.2E+01	nc	4.3E+02	nc	1.5E+00	nc	1.5E+01	nc		
	4.0E-04 i		2.9E-04 h	0	0.10	765-34-4		Glycidaldehyde	2.2E+01	nc	4.3E+02	nc	1.0E+00	nc	1.5E+01	nc		
	1.0E-01 i		1.0E-01 r	0	0.10	1071-83-6		Glyphosate	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
	5.0E-05 i		5.0E-05 r	0	0.10	69806-40-2		Haloxyfop-methyl	2.7E+00	nc	5.3E+01	nc	1.8E-01	nc	1.8E+00	nc		
	1.3E-02 i		1.3E-02 r	0	0.10	79277-27-3		Harmony	7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
4.5E+00 i	5.0E-04 i	4.6E+00 i	5.0E-04 r	0	0.10	76-44-8		Heptachlor	9.9E-02	ca	6.7E-01	ca	1.5E-03	ca	1.5E-02	ca	2.3E+01	1.0E+00
9.1E+00 i	1.3E-05 i	9.1E+00 i	1.3E-05 r	0	0.10	1024-57-3		Heptachlor epoxide	4.9E-02	ca*	3.3E-01	ca*	7.4E-04	ca*	7.4E-03	ca*	7.0E-01	3.0E-02
	2.0E-03 i		2.0E-03 r	0	0.10	87-82-1		Hexabromobenzene	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
1.6E+00 i	8.0E-04 i	1.6E+00 i	8.0E-04 r	0	0.10	118-74-1		Hexachlorobenzene	2.8E-01	ca	1.9E+00	ca	4.2E-03	ca	4.2E-02	ca	2.0E+00	1.0E-01
7.8E-02 i	2.0E-04 h	7.7E-02 i	2.0E-04 r	0	0.10	87-68-3		Hexachlorobutadiene	5.7E+00	ca**	3.8E+01	ca**	8.7E-02	ca*	8.6E-01	ca*	2.0E+00	1.0E-01
6.3E+00 i		6.3E+00 i		0	0.04	319-84-6		HCH (alpha)	8.6E-02	ca	6.7E-01	ca	1.1E-03	ca	1.1E-02	ca	5.0E-04	3.0E-05
1.8E+00 i		1.8E+00 i		0	0.04	319-85-7		HCH (beta)	3.0E-01	ca	2.3E+00	ca	3.7E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
1.3E+00 h	3.0E-04 i	1.3E+00 r	3.0E-04 r	0	0.04	58-89-9		HCH (gamma) Lindane	4.2E-01	ca*	3.2E+00	ca	5.2E-03	ca	5.2E-02	ca	9.0E-03	5.0E-04
1.8E+00 i		1.8E+00 i		0	0.04	608-73-1		HCH-technical	3.0E-01	ca	2.3E+00	ca	3.8E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
	7.0E-03 i		2.0E-05 h	0	0.10	77-47-4		Hexachlorocyclopentadiene	3.8E+02	nc	7.1E+03	nc	7.3E-02	nc	2.6E+02	nc	4.0E+02	2.0E+01
6.2E+03 i		4.6E+03 i		0	0.10	19408-74-3		Hexachlorodibenzo-p-dioxin mixture (HxCDD)	7.2E-05	ca	4.8E-04	ca	1.5E-06	ca	1.1E-05	ca		
1.4E-02 i	1.0E-03 i	1.4E-02 i	1.0E-03 r	0	0.10	67-72-1		Hexachloroethane	3.2E+01	ca**	2.1E+02	ca**	4.8E-01	ca**	4.8E+00	ca**	5.0E-01	2.0E-02
	3.0E-04 i		3.0E-04 r	0	0.10	70-30-4		Hexachlorophene	1.6E+01	nc	3.2E+02	nc	1.1E+00	nc	1.1E+01	nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
					V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFI 1/(mg/kg-d)		RfDi (mg/kg-d)												
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r	0 0.10 121-82-4 Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.0E+00	ca*	2.7E+01	ca	6.1E-02	ca	6.1E-01	ca		
		2.9E-06	r			2.9E-06	i	0 0.10 822-06-0 1,6-Hexamethylene diisocyanate					1.0E-02	nc	1.0E-01	nc		
		6.0E-02	h			5.7E-02	i	1 0.10 110-54-3 n-Hexane	1.1E+02	sat	1.1E+02	sat	2.1E+02	nc	3.5E+02	nc		
		3.3E-02	i			3.3E-02	r	0 0.10 51235-04-2 Hexazinone	1.8E+03	nc	3.5E+04	nc	1.2E+02	nc	1.2E+03	nc		
3.0E+00	i			1.7E+01	i			0 0.10 302-01-2 Hydrazine, hydrazine sulfate	1.5E-01	ca	1.0E+00	ca	3.9E-04	ca	2.2E-02	ca		
						5.7E-03	i	0 0.10 7647-01-0 Hydrogen chloride					2.1E+01	nc				
		3.0E-03	i			2.9E-04	i	1 0.10 7783-06-4 Hydrogen sulfide					1.0E+00	nc	2.0E+00	nc		
		4.0E-02	h			4.0E-02	r	0 0.10 123-31-9 p-Hydroquinone	2.2E+03	nc	4.3E+04	nc	1.5E+02	nc	1.5E+03	nc		
		1.3E-02	i			1.3E-02	r	0 0.10 35554-44-0 Imazalil	7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-01	i			2.5E-01	r	0 0.10 81335-37-7 Imazaquin	1.4E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		4.0E-02	i			4.0E-02	r	0 0.10 36734-19-7 Iprodione	2.2E+03	nc	4.3E+04	nc	1.5E+02	nc	1.5E+03	nc		
		3.0E-01	n					0 0.01 7439-89-6 Iron	2.2E+04	nc	1.0E+05	max			1.1E+04	nc		
		3.0E-01	i			3.0E-01	r	1 0.10 78-83-1 Isobutanol	1.0E+04	nc	4.0E+04	sat	1.1E+03	nc	1.8E+03	nc		
9.5E-04	i	2.0E-01	i	9.5E-04	r	2.0E-01	r	0 0.10 78-59-1 Isophorone	4.7E+02	ca*	3.2E+03	ca*	7.1E+00	ca	7.1E+01	ca	5.0E-01	3.0E-02
		1.5E-02	i			1.5E-02	r	0 0.10 33820-53-0 Isopropalin	8.2E+02	nc	1.6E+04	nc	5.5E+01	nc	5.5E+02	nc		
		1.0E-01	i			1.1E-01	r	0 0.10 1832-54-8 Isopropyl methyl phosphonic acid	5.5E+03	nc	1.1E+05	nc	4.0E+02	nc	3.7E+03	nc		
		5.0E-02	i			5.0E-02	r	0 0.10 82558-50-7 Isoxaben	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
1.8E+01	n			1.8E+01	r			0 0.10 143-50-0 Kepone	2.5E-02	ca	1.7E-01	ca	3.7E-04	ca	3.7E-03	ca		
		2.0E-03	i			2.0E-03	r	0 0.10 77501-63-4 Lactofen	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
PRGs Based on EPA Models, IEUBK (1994) and TRW (1996)								7439-92-1 Lead	4.0E+02	nc	1.0E+03	nc			4.0E+00	nc		
								"CAL-Modified PRG" (PEA, 1994)	1.3E+02									
		1.0E-07	i					0 0.10 78-00-2 Lead (tetraethyl)	5.5E-03	nc	1.1E-01	nc			3.7E-03	nc		
		2.0E-03	i			2.0E-03	r	0 0.10 330-55-2 Linuron	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	x					0 0.01 7439-93-2 Lithium	1.5E+03	nc	3.7E+04	nc			7.3E+02	nc		
		2.0E-01	i			2.0E-01	r	0 0.10 83055-99-6 Londax	1.1E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	i			2.0E-02	r	0 0.10 121-75-5 Malathion	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			1.0E-01	r	0 0.10 108-31-6 Maleic anhydride	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
		6.0E-01	i			5.0E-01	r	1 0.10 123-33-1 Maleic hydrazide	1.6E+03	nc	5.6E+03	nc	1.8E+03	nc	3.0E+03	nc		
		2.0E-05	h			2.0E-05	r	0 0.10 109-77-3 Malononitrile	1.1E+00	nc	2.1E+01	nc	7.3E-02	nc	7.3E-01	nc		
		3.0E-02	h			3.0E-02	r	0 0.10 8018-01-7 Mancozeb	1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
6.0E-02	o	5.0E-03	i	6.0E-02	r	5.0E-03	r	0 0.10 12427-38-2 Maneb	7.4E+00	ca*	5.0E+01	ca	1.1E-01	ca	1.1E+00	ca		
		4.7E-02	i			1.4E-05	i	0 0.01 7439-96-5 Manganese and compounds	3.1E+03	nc	4.5E+04	nc	5.1E-02	nc	1.7E+03	nc		
		9.0E-05	h			9.0E-05	r	0 0.10 950-10-7 Mephosfolan	4.9E+00	nc	9.6E+01	nc	3.3E-01	nc	3.3E+00	nc		
		3.0E-02	i			3.0E-02	r	0 0.10 24307-26-4 Mepiquat	1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
2.9E-02	n	1.0E-01	n	2.9E-02	r	1.0E-01	r	0 0.10 149-30-4 2-Mercaptobenzothiazole	1.5E+01	ca	1.0E+02	ca	2.3E-01	ca	2.3E+00	ca		
		3.0E-04	i					0 0.01 7487-94-7 Mercury and compounds	2.2E+01	nc	5.6E+02	nc			1.1E+01	nc		
						8.6E-05	i	n/a n/a 7439-97-6 Mercury (elemental)					3.1E-01	nc				
		1.0E-04	i					0 0.10 22967-92-6 Mercury (methyl)	5.5E+00	nc	1.1E+02	nc			3.7E+00	nc		
		3.0E-05	i			3.0E-05	r	0 0.10 150-50-5 Merphos	1.6E+00	nc	3.2E+01	nc	1.1E-01	nc	1.1E+00	nc		
		3.0E-05	i			3.0E-05	r	0 0.10 78-48-8 Merphos oxide	1.6E+00	nc	3.2E+01	nc	1.1E-01	nc	1.1E+00	nc		
		6.0E-02	i			6.0E-02	r	0 0.10 57837-19-1 Metalaxyl	3.3E+03	nc	6.4E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-04	i			2.0E-04	h	1 0.10 126-98-7 Methacrylonitrile	1.8E+00	nc	8.4E+00	nc	7.3E-01	nc	1.0E+00	nc		
		5.0E-05	i			5.0E-05	r	0 0.10 10265-92-6 Methamidophos	2.7E+00	nc	5.3E+01	nc	1.8E-01	nc	1.8E+00	nc		
		5.0E-01	i			5.0E-01	r	0 0.10 67-56-1 Methanol	2.7E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
		1.0E-03	i			1.0E-03	r	0 0.10 950-37-8 Methidathion	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		

Key : i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG ssl=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFI 1/(mg/kg-d)		RfDI (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
		2.5E-02	i			2.5E-02	r	1	0.10	16752-77-5	Methomyl	4.4E+01	nc	1.5E+02	nc	9.1E+01	nc	1.5E+02	nc		
		5.0E-03	i			5.0E-03	r	0	0.10	72-43-5	Methoxychlor	2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc	1.6E+02	8.0E+00
		1.0E-03	h			5.7E-03	i	0	0.10	109-86-4	2-Methoxyethanol	5.5E+01	nc	1.1E+03	nc	2.1E+01	nc	3.7E+01	nc		
		2.0E-03	h			2.0E-03	r	0	0.10	110-49-6	2-Methoxyethanol acetate	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
4.6E-02	h			4.6E-02	r			0	0.10	99-59-2	2-Methoxy-5-nitroaniline	9.7E+00	ca	6.5E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E+00	h			1.0E+00	r	1	0.10	79-20-9	Methyl acetate	2.0E+04	nc	9.2E+04	nc	3.7E+03	nc	6.1E+03	nc		
		3.0E-02	h			3.0E-02	r	1	0.10	96-33-3	Methyl acrylate	6.9E+01	nc	2.3E+02	nc	1.1E+02	nc	1.8E+02	nc		
2.4E-01	h			2.4E-01	r			0	0.10	95-53-4	2-Methylaniline (o-toluidine)	1.9E+00	ca	1.2E+01	ca	2.8E-02	ca	2.8E-01	ca		
1.8E-01	h			1.8E-01	r			0	0.10	636-21-5	2-Methylaniline hydrochloride	2.5E+00	ca	1.7E+01	ca	3.7E-02	ca	3.7E-01	ca		
		1.0E+00	x			1.0E+00	r	0	0.10	79-22-1	Methyl chlorocarbonate	5.5E+04	nc	1.0E+05	max	3.7E+03	nc	3.7E+04	nc		
		5.0E-04	i			5.0E-04	r	0	0.10	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	2.7E+01	nc	5.3E+02	nc	1.8E+00	nc	1.8E+01	nc		
		1.0E-02	i			1.0E-02	r	0	0.10	94-81-5	4-(2-Methyl-4-chlorophenoxy) butyric acid	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	93-65-2	2-(2-Methyl-4-chlorophenoxy) propionic acid	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
		1.0E-03	i			1.0E-03	r	0	0.10	16484-77-8	2-(2-Methyl-1,4-chlorophenoxy) propionic acid	5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
		6.6E-01	r			6.6E-01	h	0	0.10	108-87-2	Methylcyclohexane	4.7E+04	nc	1.0E+05	max	3.1E+03	nc	3.1E+04	nc		
2.5E-01	h			2.5E-01	r			0	0.10	101-77-9	4,4'-Methylenebisbenzeneamine	1.8E+00	ca	1.2E+01	ca	2.7E-02	ca	2.7E-01	ca		
1.3E-01	h	7.0E-04	h	1.3E-01	h	7.0E-04	r	0	0.10	101-14-4	4,4'-Methylene bis(2-chloroaniline)	3.4E+00	ca*	2.3E+01	ca*	5.2E-02	ca*	5.2E-01	ca*		
4.6E-02	i			4.6E-02	r			0	0.10	101-61-1	4,4'-Methylene bis(N,N'-dimethyl)aniline	9.7E+00	ca	6.5E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E-02	h			1.0E-02	r	0	0.10	74-95-3	Methylene bromide	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
7.5E-03	i	6.0E-02	i	1.6E-03	i	8.6E-01	h	1	0.10	75-09-2	Methylene chloride	8.5E+00	ca	2.0E+01	ca	4.1E+00	ca	4.3E+00	ca	2.0E-02	1.0E-03
		1.7E-04	r			1.7E-04	i	0	0.10	101-68-8	4,4'-Methylene diphenyl diisocyanate	9.3E+00	nc	1.8E+02	nc	6.2E-01	nc	6.2E+00	nc		
		8.0E-01	i			2.9E-01	i	1	0.10	78-93-3	Methyl ethyl ketone	6.9E+03	nc	2.7E+04	nc	1.0E+03	nc	1.9E+03	nc		
1.1E+00	h			1.1E+00	r			0	0.10	60-34-4	Methyl hydrazine	4.0E-01	ca	2.7E+00	ca	6.1E-03	ca	6.1E-02	ca		
		8.0E-02	h			2.3E-02	h	1	0.10	108-10-1	Methyl isobutyl ketone	7.5E+02	nc	2.8E+03	nc	8.3E+01	nc	1.6E+02	nc		
		8.7E-04	r			8.7E-04	n	0	0.10	74-93-1	Methyl Mercaptan	3.1E+01	nc	6.1E+02	nc	2.1E+00	nc	2.1E+01	nc		
		1.4E+00	i			2.0E-01	i	1	0.10	80-62-6	Methyl methacrylate	2.2E+03	nc	7.3E+03	nc	7.3E+02	nc	1.4E+03	nc		
3.3E-02	h			3.3E-02	r			0	0.10	99-55-8	2-Methyl-5-nitroaniline	1.3E+01	ca	9.1E+01	ca	2.0E-01	ca	2.0E+00	ca		
		2.5E-04	i			2.5E-04	r	0	0.10	298-00-0	Methyl parathion	1.4E+01	nc	2.7E+02	nc	9.1E-01	nc	9.1E+00	nc		
		5.0E-02	x			5.0E-02	r	0	0.10	95-48-7	2-Methylphenol	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc	1.5E+01	8.0E-01
		5.0E-02	x			5.0E-02	r	0	0.10	108-39-4	3-Methylphenol	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	h			5.0E-03	r	0	0.10	106-44-5	4-Methylphenol	2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	n			2.0E-02	r	0	0.10	993-13-5	Methyl phosphonic acid	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-03	h			1.1E-02	h	1	0.10	25013-15-4	Methyl styrene (mixture)	1.2E+02	nc	5.4E+02	nc	4.2E+01	nc	6.0E+01	nc		
		7.0E-02	h			7.0E-02	r	1	0.10	98-83-9	Methyl styrene (alpha)	6.8E+02	sat	6.8E+02	sat	2.6E+02	nc	4.3E+02	nc		
						8.6E-01	i	1	0.10	1634-04-4	Methyl tertbutyl ether (MTBE)	n/a		n/a		3.1E+03	nc	2.0E+01	nc/ca		
		1.5E-01	i			1.5E-01	r	0	0.10	51218-45-2	Metolacior (Dual)	8.2E+03	nc	1.0E+05	max	5.5E+02	nc	5.5E+03	nc		
		2.5E-02	i			2.5E-02	r	0	0.10	21087-64-9	Metribuzin	1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.9E+00	h	2.0E-04	i	1.9E+00	r	2.0E-04	r	0	0.10	2385-85-5	Mirex	2.5E-01	ca*	1.7E+00	ca	3.7E-03	ca	3.7E-02	ca		
		2.0E-03	i			2.0E-03	r	0	0.10	2212-67-1	Molinate	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-03	h					0	0.01	7439-98-7	Molybdenum	3.7E+02	nc	9.4E+03	nc			1.8E+02	nc		
		1.0E-01	h			1.0E-01	h	0	0.10	10599-90-3	Monochloramine	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
		2.0E-03	i			2.0E-03	r	0	0.10	300-76-5	Naled	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	15299-99-7	Napropamide	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
		2.0E-02	i					0	0.01	7440-02-0	Nickel (soluble salts)	1.5E+03	nc	3.7E+04	nc			7.3E+02	nc	1.3E+02	7.0E+00
											"CAL-Modified PRG" (PEA, 1994)	1.6E+02									

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FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. solis	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
		8.4E-01 i		0	0.01	n/a		Nickel refinery dust					8.0E-03	ca				
		1.7E+00 i		0	0.01	12035-72-2		Nickel subsulfide			1.1E+04	ca	4.0E-03	ca				
	1.5E-03 x		1.5E-03 r	0	0.10	1929-82-4		Nitrapyrin	8.2E+01	nc	1.6E+03	nc	5.5E+00	nc	5.5E+01	nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)						14797-55-8		Nitrate							1.0E+04	nc		
	1.0E-01 x			0	0.10	10102-43-9		Nitric Oxide	5.5E+03	nc	1.1E+05	nc			3.7E+03	nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)						14797-65-0		Nitrite							1.0E+03	nc		
	6.0E-05 r		5.7E-05 h	0	0.10	88-74-4		2-Nitroaniline	3.3E+00	nc	6.4E+01	nc	2.1E-01	nc	2.2E+00	nc		
				0	0.10	99-09-2		3-Nitroaniline										
				0	0.10	100-01-6		4-Nitroaniline										
	5.0E-04 i		5.7E-04 h	1	0.10	98-95-3		Nitrobenzene	1.6E+01	nc	1.0E+02	nc	2.1E+00	nc	3.4E+00	nc	1.0E-01	7.0E-03
	7.0E-02 h		7.0E-02 r	0	0.10	67-20-9		Nitrofurantoin	3.8E+03	nc	7.5E+04	nc	2.6E+02	nc	2.6E+03	nc		
1.5E+00 h		9.4E+00 h		0	0.10	59-87-0		Nitrofurazone	3.0E-01	ca	2.0E+00	ca	7.2E-04	ca	4.5E-02	ca		
	1.0E+00 x			0	0.10	101102-44-		Nitrogen dioxide										
	1.0E-01 i		1.0E-01 r	0	0.10	556-88-7		Nitroguanidine	5.5E+03	nc	1.1E+05	nc	3.7E+02	nc	3.7E+03	nc		
	6.2E-02 o		6.2E-02 r	0	0.10	100-02-7		4-Nitrophenol	3.4E+03	nc	6.6E+04	nc	2.3E+02	nc	2.3E+03	nc		
9.4E+00 r	5.7E-03 r	9.4E+00 h	5.7E-03 i	1	0.10	79-46-9		2-Nitropropane					7.2E-04	ca	3.5E+01	ca		
5.4E+00 i		5.4E+00 i		1	0.10	924-16-3		N-Nitrosodi-n-butylamine	2.2E-02	ca	5.8E-02	ca	1.2E-03	ca	2.0E-03	ca		
2.8E+00 i		2.8E+00 r		0	0.10	1116-54-7		N-Nitrosodiethanolamine	1.6E-01	ca	1.1E+00	ca	2.4E-03	ca	2.4E-02	ca		
1.5E+02 i		1.5E+02 i		0	0.10	55-18-5		N-Nitrosodiethylamine	3.0E-03	ca	2.0E-02	ca	4.5E-05	ca	4.5E-04	ca		
6.1E+01 i		4.9E+01 i		0	0.10	62-75-9		N-Nitrosodimethylamine	8.7E-03	ca	5.9E-02	ca	1.4E-04	ca	1.3E-03	ca		
4.9E-03 i		4.9E-03 r		0	0.10	86-30-6		N-Nitrosodiphenylamine	9.1E+01	ca	6.1E+02	ca	1.4E+00	ca	1.4E+01	ca	1.0E+00	6.0E-02
7.0E+00 i		7.0E+00 r		0	0.10	621-64-7		N-Nitroso di-n-propylamine	6.3E-02	ca	4.3E-01	ca	9.6E-04	ca	9.6E-03	ca	5.0E-05	2.0E-06
2.2E+01 i		2.2E+01 r		0	0.10	10595-95-6		N-Nitroso-N-methylethylamine	2.0E-02	ca	1.4E-01	ca	3.1E-04	ca	3.1E-03	ca		
2.1E+00 i		2.1E+00 i		0	0.10	930-55-2		N-Nitrosopyrrolidine	2.1E-01	ca	1.4E+00	ca	3.1E-03	ca	3.2E-02	ca		
	1.0E-02 h		1.0E-02 r	0	0.10	99-08-1		m-Nitrotoluene	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
	1.0E-02 h		1.0E-02 r	0	0.10	99-08-1		o-Nitrotoluene	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
	1.0E-02 h		1.0E-02 r	0	0.10	99-99-0		p-Nitrotoluene	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
	4.0E-02 i		4.0E-02 r	0	0.10	27314-13-2		Norflurazon	2.2E+03	nc	4.3E+04	nc	1.5E+02	nc	1.5E+03	nc		
	7.0E-04 i		7.0E-04 r	0	0.10	85509-19-9		NuStar	3.8E+01	nc	7.5E+02	nc	2.6E+00	nc	2.6E+01	nc		
	3.0E-03 i		3.0E-03 r	0	0.10	32536-52-0		Octabromodiphenyl ether	1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc		
	5.0E-02 i		5.0E-02 r	0	0.10	2691-41-0		Octahydro-1357-tetranitro-1357- tetrazocine (HMX)	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	2.0E-03 h		2.0E-03 r	0	0.10	152-16-9		Octamethylpyrophosphoramide	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	5.0E-02 i		5.0E-02 r	0	0.10	19044-88-3		Oryzalin	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	5.0E-03 i		5.0E-03 r	0	0.10	19666-30-9		Oxadiazon	2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
	2.5E-02 i		2.5E-02 r	0	0.10	23135-22-0		Oxamyl	1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
	3.0E-03 i		3.0E-03 r	0	0.10	42874-03-3		Oxyfluorfen	1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc		
	1.3E-02 i		1.3E-02 r	0	0.10	76738-62-0		Paclobutrazol	7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
	4.5E-03 i		4.5E-03 r	0	0.10	4685-14-7		Paraquat	2.5E+02	nc	4.8E+03	nc	1.6E+01	nc	1.6E+02	nc		
	6.0E-03 h		6.0E-03 r	0	0.10	56-38-2		Parathion	3.3E+02	nc	6.4E+03	nc	2.2E+01	nc	2.2E+02	nc		
	5.0E-02 h		5.0E-02 r	0	0.10	1114-71-2		Pebulate	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	4.0E-02 i		4.0E-02 r	0	0.10	40487-42-1		Pendimethalin	2.2E+03	nc	4.3E+04	nc	1.5E+02	nc	1.5E+03	nc		
2.3E-02 h		2.3E-02 r		0	0.10	87-84-3		Pentabromo-6-chloro cyclohexane	1.9E+01	ca	1.3E+02	ca	2.9E-01	ca	2.9E+00	ca		
	2.0E-03 i		2.0E-03 r	0	0.10	32534-81-9		Pentabromodiphenyl ether	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	8.0E-04 i		8.0E-04 r	0	0.10	608-93-5		Pentachlorobenzene	4.4E+01	nc	8.6E+02	nc	2.9E+00	nc	2.9E+01	nc		
2.6E-01 h	3.0E-03 i	2.6E-01 r	3.0E-03 r	0	0.10	82-68-8		Pentachloronitrobenzene	1.7E+00	ca*	1.2E+01	ca	2.6E-02	ca	2.6E-01	ca		

Key: i=IRIS h=HEAST n=NCEA w=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
1.2E-01 i	3.0E-02 i	1.2E-01 r	3.0E-02 r	0	0.25	87-86-5		Pentachlorophenol	2.5E+00	ca	1.5E+01	ca	5.6E-02	ca	5.6E-01	ca	3.0E-02	1.0E-03
	5.0E-04 n			0	0.01	7601-90-3		Perchlorate	3.7E+01	nc	9.4E+02	nc			1.8E+01	nc		
	5.0E-02 i		5.0E-02 r	0	0.10	52645-53-1		Permethrin	2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	2.5E-01 i		2.5E-01 r	0	0.10	13684-63-4		Phenmedipham	1.4E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
	6.0E-01 i		6.0E-01 r	0	0.10	108-95-2		Phenol	3.3E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc	1.0E+02	5.0E+00
	2.0E-03 n		2.0E-03 r	0	0.10	92-84-2		Phenothiazine	1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	6.0E-03 i		6.0E-03 r	0	0.10	108-45-2		m-Phenylenediamine	3.3E+02	nc	6.4E+03	nc	2.2E+01	nc	2.2E+02	nc		
	1.9E-01 h		1.9E-01 r	0	0.10	106-50-3		p-Phenylenediamine	1.0E+04	nc	1.0E+05	max	6.9E+02	nc	6.9E+03	nc		
	8.0E-05 i		8.0E-05 r	0	0.10	62-38-4		Phenylmercuric acetate	4.4E+00	nc	8.6E+01	nc	2.9E-01	nc	2.9E+00	nc		
1.9E-03 h		1.9E-03 r		0	0.10	90-43-7		2-Phenylphenol	2.3E+02	ca	1.5E+03	ca	3.5E+00	ca	3.5E+01	ca		
	2.0E-04 h		2.0E-04 r	0	0.10	298-02-2		Phorate	1.1E+01	nc	2.1E+02	nc	7.3E-01	nc	7.3E+00	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	732-11-6		Phosmet	1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	3.0E-04 h		8.6E-05 i	0	0.10	7803-51-2		Phosphine	1.6E+01	nc	3.2E+02	nc	3.1E-01	nc	1.1E+01	nc		
			2.9E-03 i	n/a	n/a	7664-38-2		Phosphoric acid					1.0E+01	nc				
	2.0E-05 i			0	0.01	7723-14-0		Phosphorus (white)	1.5E+00	nc	3.7E+01	nc			7.3E-01	nc		
	1.0E+00 h		1.0E+00 r	0	0.10	100-21-0		p-Phthalic acid	5.5E+04	nc	1.0E+05	max	3.7E+03	nc	3.7E+04	nc		
	2.0E+00 i		3.4E-02 h	0	0.10	85-44-9		Phthalic anhydride	1.0E+05	max	1.0E+05	max	1.2E+02	nc	7.3E+04	nc		
	7.0E-02 i		7.0E-02 r	0	0.10	1918-02-1		Picloram	3.8E+03	nc	7.5E+04	nc	2.6E+02	nc	2.6E+03	nc		
	1.0E-02 i		1.0E-02 r	0	0.10	23505-41-1		Pirimiphos-methyl	5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
8.9E+00 h	7.0E-05 h	8.9E+00 r	7.0E-05 r	0	0.10			Polybrominated biphenyls	5.0E-02	ca**	3.4E-01	ca*	7.6E-04	ca*	7.6E-03	ca*		
2.0E+00 i		2.0E+00 r		0	0.14	1336-36-3		Polychlorinated biphenyls (PCBs)	2.0E-01	ca**	1.3E+00	ca*	3.4E-03	ca*	3.4E-02	ca*		
	7.0E-05 i		7.0E-05 r	0	0.14	12674-11-2		Aroclor 1016 (see PCBs for cancer endpoint)	3.4E+00	nc	6.3E+01	nc	2.6E-01	nc	2.6E+00	nc		
	2.0E-05 i		2.0E-05 r	0	0.14	11097-69-1		Aroclor 1254 (see PCBs for cancer endpoint)	9.7E-01	nc	1.8E+01	nc	7.3E-02	nc	7.3E-01	nc		
					0.13			Polynuclear aromatic hydrocarbons (PAHs)										
	6.0E-02 i		6.0E-02 r	1	0.13	83-32-9		Acenaphthene	2.6E+03	nc	2.8E+04	nc	2.2E+02	nc	3.7E+02	nc	5.7E+02	2.9E+01
	3.0E-01 i		3.0E-01 r	1	0.13	120-12-7		Anthracene	1.4E+04	nc	2.2E+05	nc	1.1E+03	nc	1.8E+03	nc	1.2E+04	5.9E+02
7.3E-01 n		3.1E-01 n		0	0.13	56-55-3		Benz[a]anthracene	5.6E-01	ca	3.6E+00	ca	2.2E-02	ca	9.2E-02	ca	2.0E+00	8.0E-02
7.3E-01 n		3.1E-01 n		0	0.13	205-99-2		Benzo[b]fluoranthene	5.6E-01	ca	3.6E+00	ca	2.2E-02	ca	9.2E-02	ca	5.0E+00	2.0E-01
7.3E-02 n		3.1E-02 n		0	0.13	207-08-9		Benzo[k]fluoranthene	5.6E+00	ca	3.6E+01	ca	2.2E-01	ca	9.2E-01	ca	4.9E+01	2.0E+00
								"CAL-Modified PRG" (PEA, 1994)	6.1E-01									
7.3E+00 i		3.1E+00 n		0	0.13	50-32-8		Benzo[a]pyrene	5.6E-02	ca	3.6E-01	ca	2.2E-03	ca	9.2E-03	ca	8.0E+00	4.0E-01
								"CAL-Modified PRG" (PEA, 1994)							1.5E-03			
7.3E-03 n		3.1E-03 n		0	0.13	218-01-9		Chrysene	5.6E+01	ca	3.6E+02	ca	2.2E+00	ca	9.2E+00	ca	1.6E+02	8.0E+00
								"CAL-Modified PRG" (PEA, 1994)	6.1E+00									
7.3E+00 n		3.1E+00 n		0	0.13	53-70-3		Dibenz[ah]anthracene	5.6E-02	ca	3.6E-01	ca	2.2E-03	ca	9.2E-03	ca	2.0E+00	8.0E-02
	4.0E-02 i		4.0E-02 r	0	0.13	206-44-0		Fluoranthene	2.0E+03	nc	3.7E+04	nc	1.5E+02	nc	1.5E+03	nc	4.3E+03	2.1E+02
	4.0E-02 i		4.0E-02 r	1	0.13	86-73-7		Fluorene	1.8E+03	nc	2.2E+04	nc	1.5E+02	nc	2.4E+02	nc	5.6E+02	2.8E+01
7.3E-01 n		3.1E-01 n		0	0.13	193-39-5		Indeno[1,2,3-cd]pyrene	5.6E-01	ca	3.6E+00	ca	2.2E-02	ca	9.2E-02	ca	1.4E+01	7.0E-01
	2.0E-02 i		8.6E-04 i	1	0.13	91-20-3		Naphthalene	5.5E+01	nc	1.9E+02	nc	3.1E+00	nc	6.2E+00	nc	8.4E+01	4.0E+00
	3.0E-02 i		3.0E-02 r	1	0.13	129-00-0		Pyrene	1.5E+03	nc	2.6E+04	nc	1.1E+02	nc	1.8E+02	nc	4.2E+03	2.1E+02
1.5E-01 i	9.0E-03 i	1.5E-01 r	9.0E-03 r	0	0.10	67747-09-5		Prochloraz	3.0E+00	ca	2.0E+01	ca	4.5E-02	ca	3.3E+02	ca		
	6.0E-03 h		6.0E-03 r	0	0.10	26399-36-0		Profluralin	3.3E+02	nc	6.4E+03	nc	2.2E+01	nc	2.2E+02	nc		
	1.5E-02 i		1.5E-02 r	0	0.10	1610-18-0		Prometon	8.2E+02	nc	1.6E+04	nc	5.5E+01	nc	5.5E+02	nc		
	4.0E-03 i		4.0E-03 r	0	0.10	7287-19-6		Prometryn	2.2E+02	nc	4.3E+03	nc	1.5E+01	nc	1.5E+02	nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
	7.5E-02 i		7.5E-02 r	0	0.10	23950-58-5	Pronamide		4.1E+03	nc	8.0E+04	nc	2.7E+02	nc	2.7E+03	nc		
	1.3E-02 i		1.3E-02 r	0	0.10	1918-18-7	Propachlor		7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
	5.0E-03 i		5.0E-03 r	0	0.10	709-98-8	Propanil		2.7E+02	nc	5.3E+03	nc	1.8E+01	nc	1.8E+02	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	2312-35-8	Propargite		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	2.0E-03 i		2.0E-03 r	0	0.10	107-19-7	Propargyl alcohol		1.1E+02	nc	2.1E+03	nc	7.3E+00	nc	7.3E+01	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	139-40-2	Propazine		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	2.0E-02 i		2.0E-02 r	0	0.10	122-42-9	Propham		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	1.3E-02 i		1.3E-02 r	0	0.10	60207-90-1	Propiconazole		7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
	1.0E-02 n		1.0E-02 r	1	0.10	104-51-8	Iso-Propylbenzene		1.2E+02	nc	4.9E+02	nc	3.7E+01	nc	6.1E+01	nc		
	1.0E-02 n		1.0E-02 r	1	0.10	104-51-8	n-Propylbenzene		1.3E+02	nc	5.5E+02	nc	3.7E+01	nc	6.1E+01	nc		
	2.0E+01 h		2.0E+01 r	0	0.10	57-55-6	Propylene glycol		1.0E+05	max	1.0E+05	max	7.3E+04	nc	7.3E+05	nc		
	7.0E-01 h		7.0E-01 r	0	0.10	111-35-3	Propylene glycol, monoethyl ether		3.8E+04	nc	1.0E+05	max	2.6E+03	nc	2.6E+04	nc		
	7.0E-01 h		8.7E-01 i	0	0.10	107-98-2	Propylene glycol, monomethyl ether		3.8E+04	nc	1.0E+05	max	2.1E+03	nc	2.6E+04	nc		
2.4E-01 i	8.6E-03 r	1.3E-02 i	8.6E-03 i	1	0.10	75-56-9	Propylene oxide		1.5E+00	ca	6.8E+00	ca	5.2E-01	ca*	2.2E-01	ca		
	2.5E-01 i		2.5E-01 r	0	0.10	81335-77-5	Pursuit		1.4E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
	2.5E-02 i		2.5E-02 r	0	0.10	51630-58-1	Pydrin		1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
	1.0E-03 i		1.0E-03 r	0	0.10	110-86-1	Pyridine		5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
	5.0E-04 i		5.0E-04 r	0	0.10	13593-03-8	Quinalphos		2.7E+01	nc	5.3E+02	nc	1.8E+00	nc	1.8E+01	nc		
1.2E+01 h		1.2E+01 r		0	0.10	91-22-5	Quinoline		3.7E-02	ca	2.5E-01	ca	5.6E-04	ca	5.6E-03	ca		
1.1E-01 i	3.0E-03 i	1.1E-01 r	3.0E-03 r	0	0.10	121-82-4	RDX (Cyclonite)		4.0E+00	ca*	2.7E+01	ca	6.1E-02	ca	6.1E-01	ca		
	3.0E-02 i		3.0E-02 r	0	0.10	10453-86-8	Resmethrin		1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
	5.0E-02 h		5.0E-02 r	0	0.10	299-84-3	Ronnel		2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		
	4.0E-03 i		4.0E-03 r	0	0.10	83-79-4	Rotenone		2.2E+02	nc	4.3E+03	nc	1.5E+01	nc	1.5E+02	nc		
	2.5E-02 i		2.5E-02 r	0	0.10	78587-05-0	Savey		1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
	5.0E-03 i			0	0.10	7783-00-8	Selenious Acid		2.7E+02	nc	5.3E+03	nc			1.8E+02	nc		
	5.0E-03 i			0	0.01	7782-49-2	Selenium		3.7E+02	nc	9.4E+03	nc			1.8E+02	nc	5.0E+00	3.0E-01
	5.0E-03 h			0	0.10	630-10-4	Selenourea		2.7E+02	nc	5.3E+03	nc			1.8E+02	nc		
	9.0E-02 i		9.0E-02 r	0	0.10	74051-80-2	Sethoxydim		4.9E+03	nc	9.6E+04	nc	3.3E+02	nc	3.3E+03	nc		
	6.0E-03 i			0	0.01	7440-22-4	Silver and compounds		3.7E+02	nc	9.4E+03	nc			1.8E+02	nc	3.4E+01	2.0E+00
1.2E-01 h	5.0E-03 i	1.2E-01 r	2.0E-03 r	0	0.10	122-34-9	Simazine		3.7E+00	ca*	2.5E+01	ca	5.6E-02	ca	5.6E-01	ca		
	4.0E-03 i		4.0E-03 r	0	0.10	26628-22-8	Sodium azide		2.2E+02	nc	4.3E+03	nc	1.5E+01	nc	1.5E+02	nc		
2.7E-01 h	3.0E-02 i	2.7E-01 r	3.0E-02 r	0	0.10	148-18-5	Sodium diethyldithiocarbamate		1.6E+00	ca	1.1E+01	ca	2.5E-02	ca	2.5E-01	ca		
	2.0E-05 i		2.0E-05 r	0	0.10	62-74-8	Sodium fluoroacetate		1.1E+00	nc	2.1E+01	nc	7.3E-02	nc	7.3E-01	nc		
	1.0E-03 h		1.0E-03 r	0	0.10	13718-26-8	Sodium metavanadate		5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
	6.0E-01 i			0	0.01	7440-24-6	Strontium, stable		4.5E+04	nc	1.0E+05	max			2.2E+04	nc		
	3.0E-04 i		3.0E-04 r	0	0.10	57-24-9	Strychnine		1.6E+01	nc	3.2E+02	nc	1.1E+00	nc	1.1E+01	nc		
	2.0E-01 i		2.0E-01 i	1	0.10	100-42-5	Styrene		1.7E+03	sat	1.7E+03	sat	1.1E+03	nc	1.6E+03	nc	4.0E+00	2.0E-01
	2.5E-02 i		2.5E-02 r	0	0.10	98671-89-0	Systhane		1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.5E+05 h		1.5E+05 h		0	0.03	1746-01-6	2,3,7,8-TCDD (dioxin)		3.8E-06	ca	3.0E-05	ca	4.5E-08	ca	4.5E-07	ca		
	7.0E-02 i		7.0E-02 r	0	0.10	34014-18-1	Tebuthiuron		3.8E+03	nc	7.5E+04	nc	2.6E+02	nc	2.6E+03	nc		
	2.0E-02 h		2.0E-02 r	0	0.10	3383-96-8	Temephos		1.1E+03	nc	2.1E+04	nc	7.3E+01	nc	7.3E+02	nc		
	1.3E-02 i		1.3E-02 r	0	0.10	5902-51-2	Terbacil		7.1E+02	nc	1.4E+04	nc	4.7E+01	nc	4.7E+02	nc		
	2.5E-05 h		2.5E-05 r	0	0.10	13071-79-9	Terbufos		1.4E+00	nc	2.7E+01	nc	9.1E-02	nc	9.1E-01	nc		
	1.0E-03 i		1.0E-03 r	0	0.10	886-50-0	Terbutryn		5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
	3.0E-04 i		3.0E-04 r	0	0.10	95-94-3	1,2,4,5-Tetrachlorobenzene		1.6E+01	nc	3.2E+02	nc	1.1E+00	nc	1.1E+01	nc		

Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFI 1/(mg/kg-d)	RfDI (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Ambient Air (ug/m^3)	Tap Water (ug/l)	Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
2.6E-02 i	3.0E-02 i	2.6E-02 i	3.0E-02 r	1	0.10	630-20-6	1,1,1,2-Tetrachloroethane	2.8E+00 ca	6.8E+00 ca	2.6E-01 ca	4.3E-01 ca		
2.0E-01 i		2.0E-01 i		1	0.10	79-34-5	1,1,2,2-Tetrachloroethane	3.6E-01 ca	8.7E-01 ca	3.3E-02 ca	5.5E-02 ca	3.0E-03	2.0E-04
5.2E-02 n	1.0E-02 i	2.0E-03 n	1.1E-01 n	1	0.10	127-18-4	Tetrachloroethylene (PCE)	4.7E+00 ca*	1.6E+01 ca	3.3E+00 ca	1.1E+00 ca	6.0E-02	3.0E-03
							"CAL-Modified PRG" (PEA, 1994)			3.2E-01			
	3.0E-02 i		3.0E-02 r	0	0.10	58-90-2	2,3,4,6-Tetrachlorophenol	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
2.0E+01 h		2.0E+01 r		0	0.10	5216-25-1	p,a,a,a-Tetrachlorotoluene	2.2E-02 ca	1.5E-01 ca	3.4E-04 ca	3.4E-03 ca		
2.4E-02 h	3.0E-02 i	2.4E-02 r	3.0E-02 r	0	0.10	961-11-5	Tetrachlorovinphos	1.9E+01 ca*	1.2E+02 ca	2.8E-01 ca	2.8E+00 ca		
	5.0E-04 i		5.0E-04 r	0	0.10	3689-24-5	Tetraethyldithiopyrophosphate	2.7E+01 nc	5.3E+02 nc	1.8E+00 nc	1.8E+01 nc		
	6.6E-02 r		6.6E-02 n	0	0.10	109-99-9	Tetrahydrofuran	4.7E+03 nc	9.2E+04 nc	3.1E+02 nc	3.1E+03 nc		
	7.0E-05 h			0	0.01	1314-32-5	Thallic oxide	5.2E+00 nc	1.3E+02 nc		2.6E+00 nc		
	9.0E-05 i			0	0.01	563-68-8	Thallium acetate	6.7E+00 nc	1.7E+02 nc		3.3E+00 nc	7.0E-01	4.0E-01
	8.0E-05 i			0	0.01	6533-73-9	Thallium carbonate	6.0E+00 nc	1.5E+02 nc		2.9E+00 nc	7.0E-01	4.0E-01
	8.0E-05 i			0	0.01	7791-12-0	Thallium chloride	6.0E+00 nc	1.5E+02 nc		2.9E+00 nc	7.0E-01	4.0E-01
	9.0E-05 i			0	0.01	10102-45-1	Thallium nitrate	6.7E+00 nc	1.7E+02 nc		3.3E+00 nc	7.0E-01	4.0E-01
	9.0E-05 x			0	0.01	12039-52-0	Thallium selenite	6.7E+00 nc	1.7E+02 nc		3.3E+00 nc	7.0E-01	4.0E-01
	8.0E-05 i			0	0.01	7446-18-6	Thallium sulfate	6.0E+00 nc	1.5E+02 nc		2.9E+00 nc	7.0E-01	4.0E-01
	1.0E-02 i		1.0E-02 r	0	0.10	28249-77-6	Thiobencarb	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	1.0E-01 n		1.0E-01 r	0	0.10	N/A	Thiocyanate	5.5E+03 nc	1.0E+05 max	3.7E+02 nc	3.7E+03 nc		
	3.0E-02 x		3.0E-02 r	0	0.10	21564-17-0	2-(Thiocyanomethylthio)- benzothiazole (TCMTB)	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	3.0E-04 h		3.0E-04 r	0	0.10	39196-18-4	Thiofanox	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
	8.0E-02 i		8.0E-02 r	0	0.10	23564-05-8	Thiophanate-methyl	4.4E+03 nc	8.6E+04 nc	2.9E+02 nc	2.9E+03 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	137-26-8	Thiram	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	8.0E-01 h			0	0.01	n/a	Tin (inorganic, see tributyltin oxide for organic tin)	4.5E+04 nc	1.0E+05 max		2.2E+04 nc		
	2.0E-01 i		1.1E-01 h	1	0.10	108-88-3	Toluene	5.2E+02 sat	5.2E+02 sat	4.0E+02 nc	7.2E+02 nc	1.2E+01	6.0E-01
3.2E+00 h		3.2E+00 r		0	0.10	95-80-7	Toluene-2,4-diamine	1.4E-01 ca	9.4E-01 ca	2.1E-03 ca	2.1E-02 ca		
	6.0E-01 h		6.0E-01 r	0	0.10	95-70-5	Toluene-2,5-diamine	3.3E+04 nc	1.0E+05 max	2.2E+03 nc	2.2E+04 nc		
	2.0E-01 h		2.0E-01 r	0	0.10	823-40-5	Toluene-2,6-diamine	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
1.9E-01 i		1.9E-01 r		0	0.10	100-49-0	p-Toluidine	2.3E+00 ca	1.6E+01 ca	3.5E-02 ca	3.5E-01 ca		
1.1E+00 i		1.1E+00 i		0	0.10	8001-35-2	Toxaphene	4.0E-01 ca	2.7E+00 ca	6.0E-03 ca	6.1E-02 ca	3.1E+01	2.0E+00
	7.5E-03 i		7.5E-03 r	0	0.10	66841-25-	Tralomethrin	4.1E+02 nc	8.0E+03 nc	2.7E+01 nc	2.7E+02 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	2303-17-5	Triallate	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	82097-50-5	Triasulfuron	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	615-54-3	1,2,4-Tribromobenzene	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	3.0E-04 i			0	0.10	56-35-9	Tributyltin oxide (TBTO)	1.6E+01 nc	3.2E+02 nc		1.1E+01 nc		
3.4E-02 h		3.4E-02 r		0	0.10	634-93-5	2,4,6-Trichloroaniline	1.3E+01 ca	8.8E+01 ca	2.0E-01 ca	2.0E+00 ca		
2.9E-02 h		2.9E-02 r		0	0.10	33663-50-2	2,4,6-Trichloroaniline hydrochloride	1.5E+01 ca	1.0E+02 ca	2.3E-01 ca	2.3E+00 ca		
	1.0E-02 i		5.7E-02 h	1	0.10	120-82-1	1,2,4-Trichlorobenzene	4.8E+02 nc	1.7E+03 sat	2.1E+02 nc	1.9E+02 nc	5.0E+00	3.0E-01
	3.5E-02 n		2.9E-01 n	1	0.10	71-55-6	1,1,1-Trichloroethane	6.8E+02 nc	1.4E+03 sat	1.0E+03 nc	7.9E+02 nc	2.0E+00	1.0E-01
5.7E-02 i	4.0E-03 i	5.6E-02 i	4.0E-03 r	1	0.10	79-00-5	1,1,2-Trichloroethane	8.2E-01 ca*	1.9E+00 ca*	1.2E-01 ca	2.0E-01 ca	2.0E-02	9.0E-04
1.1E-02 n	6.0E-03 x	6.0E-03 n	6.0E-03 r	1	0.10	79-01-6	Trichloroethylene (TCE)	2.7E+00 ca**	6.1E+00 ca*	1.1E+00 ca*	1.6E+00 ca*	6.0E-02	3.0E-03
	3.0E-01 i		2.0E-01 h	1	0.10	75-69-4	Trichlorofluoromethane	3.8E+02 nc	1.3E+03 nc	7.3E+02 nc	1.3E+03 nc		
	1.0E-01 i		1.0E-01 r	0	0.10	95-95-4	2,4,5-Trichlorophenol	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc	2.7E+02	1.4E+01
1.1E-02 i		1.1E-02 i		0	0.10	88-06-2	2,4,6-Trichlorophenol	4.0E+01 ca	2.7E+02 ca	6.2E-01 ca	6.1E+00 ca	2.0E-01	8.0E-03
	1.0E-02 i		1.0E-02 r	0	0.10	93-76-5	2,4,5-Trichlorophenoxyacetic Acid	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	8.0E-03 i		8.0E-03 r	0	0.10	93-72-1	2-(2,4,5-Trichlorophenoxy) propionic acid	4.4E+02 nc	8.6E+03 nc	2.9E+01 nc	2.9E+02 nc		

Key : i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION								CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)								SOIL SCREENING LEVELS	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFi 1/(mg/kg-d)	RfDi (mg/kg-d)	V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		Migration to Ground Water DAF 20 (mg/kg)	DAF 1 (mg/kg)
	5.0E-03 i		5.0E-03 r	1	0.10	598-77-6	1,1,2-Trichloropropane		1.5E+01	nc	5.1E+01	nc	1.8E+01	nc	3.0E+01	nc		
7.0E+00 h	6.0E-03 i	7.0E+00 r	5.0E-03 r	1	0.10	96-18-4	1,2,3-Trichloropropane		1.4E-03	ca	3.1E-03	ca	9.6E-04	ca	1.6E-03	ca		
	5.0E-03 h		5.0E-03 r	1	0.10	96-19-5	1,2,3-Trichloropropene		1.1E+01	nc	3.8E+01	nc	1.8E+01	nc	3.0E+01	nc		
	3.0E+01 i		8.6E+00 h	1	0.10	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane		5.6E+03	sat	5.6E+03	sat	3.1E+04	nc	5.9E+04	nc		
	3.0E-03 i		3.0E-03 r	0	0.10	58138-08-2	Tridiphane		1.6E+02	nc	3.2E+03	nc	1.1E+01	nc	1.1E+02	nc		
	2.0E-03 r		2.0E-03 i	1	0.10	121-44-8	Triethylamine		2.2E+01	nc	8.6E+01	nc	7.3E+00	nc	1.2E+01	nc		
7.7E-03 i	7.5E-03 i	7.7E-03 r	7.5E-03 r	0	0.10	1582-09-8	Trifluralin		5.8E+01	ca**	3.9E+02	ca*	8.7E-01	ca*	8.7E+00	ca*		
	6.0E-02 n		1.7E-03 n	1	0.10	95-63-6	1,2,4-Trimethylbenzene		5.1E+01	nc	1.7E+02	nc	6.2E+00	nc	1.2E+01	nc		
	6.0E-02 n		1.7E-03 n	1	0.10	108-67-8	1,3,5-Trimethylbenzene		2.1E+01	nc	7.0E+01	nc	6.2E+00	nc	1.2E+01	nc		
3.7E-02 h		3.7E-02 r		0	0.10	512-56-1	Trimethyl phosphate		1.2E+01	ca	8.1E+01	ca	1.8E-01	ca	1.8E+00	ca		
	3.0E-02 i		3.0E-02 r	0	0.10	99-35-4	1,3,5-Trinitrobenzene		1.6E+03	nc	3.2E+04	nc	1.1E+02	nc	1.1E+03	nc		
	1.0E-02 h		1.0E-02 r	0	0.10	479-45-8	Trinitrophenylmethylnitramine		5.5E+02	nc	1.1E+04	nc	3.7E+01	nc	3.7E+02	nc		
3.0E-02 i	5.0E-04 i	3.0E-02 r	5.0E-04 r	0	0.10	118-96-7	2,4,6-Trinitrotoluene		1.5E+01	ca**	1.0E+02	ca**	2.2E-01	ca**	2.2E+00	ca**		
	7.0E-03 h			0	0.01	7440-62-2	Vanadium		5.2E+02	nc	1.3E+04	nc			2.6E+02	nc	6.0E+03	3.0E+02
	9.0E-03 i			0	0.01	1314-62-1	Vanadium pentoxide		6.7E+02	nc	1.7E+04	nc			3.3E+02	nc	6.0E+03	3.0E+02
	2.0E-02 h			0	0.01	13701-70-7	Vanadium sulfate		1.5E+03	nc	3.7E+04	nc			7.3E+02	nc	6.0E+03	3.0E+02
	1.0E-03 i		1.0E-03 r	0	0.10	1929-77-7	Vernam		5.5E+01	nc	1.1E+03	nc	3.7E+00	nc	3.7E+01	nc		
	2.5E-02 i		2.5E-02 r	0	0.10	50471-44-8	Vinclozolin		1.4E+03	nc	2.7E+04	nc	9.1E+01	nc	9.1E+02	nc		
	1.0E+00 h		5.7E-02 i	1	0.10	108-05-4	Vinyl acetate		4.2E+02	nc	1.4E+03	nc	2.1E+02	nc	4.1E+02	nc	1.7E+02	8.0E+00
1.1E-01 r	8.6E-04 r	1.1E-01 h	8.6E-04 i	1	0.10	593-60-2	Vinyl bromide (bromoethene)		1.9E-01	ca*	4.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		
1.9E+00 h		3.0E-01 h		1	0.10	75-01-4	Vinyl chloride		2.1E-02	ca	4.8E-02	ca	2.2E-02	ca	2.0E-02	ca	1.0E-02	7.0E-04
	3.0E-04 i		3.0E-04 r	0	0.10	81-81-2	Warfarin		1.6E+01	nc	3.2E+02	nc	1.1E+00	nc	1.1E+01	nc		
	2.0E+00 i		2.0E-01 x	1	0.10	108-38-3	m-Xylene		2.1E+02	sat	2.1E+02	sat	7.3E+02	nc	1.4E+03	nc	2.1E+02	1.0E+01
	2.0E+00 i		2.0E-01 x	1	0.10	95-47-6	o-Xylene		2.8E+02	sat	2.8E+02	sat	7.3E+02	nc	1.4E+03	nc	1.9E+02	9.0E+00
				1	0.10	106-42-3	p-Xylene		3.7E+02	sat	3.7E+02	sat					2.0E+02	1.0E+01
	3.0E-01 i			0	0.01	7440-66-6	Zinc		2.2E+04	nc	1.0E+05	max			1.1E+04	nc	1.2E+04	6.2E+02
	3.0E-04 i			0	0.01	1314-84-7	Zinc phosphide		2.2E+01	nc	5.6E+02	nc			1.1E+01	nc		
	5.0E-02 i		5.0E-02 r	0	0.10	12122-67-7	Zineb		2.7E+03	nc	5.3E+04	nc	1.8E+02	nc	1.8E+03	nc		

N00236.001656
ALAMEDA POINT
SSIC NO. 5090.3

APPENDIX C – HUMAN HEALTH RISK ASSESSMENT RESULTS

ATTACHMENT 3

FINAL
OU-3 REMEDIAL INVESTIGATION REPORT

DATED 09 AUGUST 1999

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 4
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+01 12
Time = 3.000E+01 13
Time = 1.000E+02 14
Time = 3.000E+02 15
Time = 1.000E+03 16
Dose/Source Ratios Summed Over All Pathways 17
Single Radionuclide Soil Guidelines 17
Dose Per Nuclide Summed Over All Pathways 18
Soil Concentration Per Nuclide 18

Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
A-1	Ground external gamma, volume DCF's, (mrem/yr)/(pCi/cm**3):			
A-1	Pb-210+D , soil density = 1.0 g/cm**3	4.870E-03	4.870E-03	DCF1(1,1)
A-1	Pb-210+D , soil density = 1.8 g/cm**3	2.310E-03	2.310E-03	DCF1(1,2)
A-1				
A-1	Ra-226+D , soil density = 1.0 g/cm**3	1.550E+01	1.550E+01	DCF1(2,1)
A-1	Ra-226+D , soil density = 1.8 g/cm**3	8.560E+00	8.560E+00	DCF1(2,2)
A-1				
A-1	Ra-228+D , soil density = 1.0 g/cm**3	8.180E+00	8.180E+00	DCF1(3,1)
A-1	Ra-228+D , soil density = 1.8 g/cm**3	4.510E+00	4.510E+00	DCF1(3,2)
A-1				
A-1	Th-228+D , soil density = 1.0 g/cm**3	1.330E+01	1.330E+01	DCF1(4,1)
A-1	Th-228+D , soil density = 1.8 g/cm**3	7.360E+00	7.360E+00	DCF1(4,2)
A-3	Depth factors, ground external gamma, dimensionless:			
A-3	Pb-210+D , soil density = 1.0 g/cm**3, thickness = .15 m	8.800E-01	8.800E-01	FD(1,1,1)
A-3	Pb-210+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,1)
A-3	Pb-210+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,1)
A-3	Pb-210+D , soil density = 1.8 g/cm**3, thickness = .15 m	9.700E-01	9.700E-01	FD(1,1,2)
A-3	Pb-210+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,2)
A-3	Pb-210+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,2)
A-3				
A-3	Ra-226+D , soil density = 1.0 g/cm**3, thickness = .15 m	6.300E-01	6.300E-01	FD(2,1,1)
A-3	Ra-226+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	9.200E-01	9.200E-01	FD(2,2,1)
A-3	Ra-226+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,1)
A-3	Ra-226+D , soil density = 1.8 g/cm**3, thickness = .15 m	8.500E-01	8.500E-01	FD(2,1,2)
A-3	Ra-226+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(2,2,2)
A-3	Ra-226+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,2)
A-3				
A-3	Ra-228+D , soil density = 1.0 g/cm**3, thickness = .15 m	6.800E-01	6.800E-01	FD(3,1,1)
A-3	Ra-228+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	9.700E-01	9.700E-01	FD(3,2,1)
A-3	Ra-228+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,1)
A-3	Ra-228+D , soil density = 1.8 g/cm**3, thickness = .15 m	8.500E-01	8.500E-01	FD(3,1,2)
A-3	Ra-228+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(3,2,2)
A-3	Ra-228+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,2)
A-3				
A-3	Th-228+D , soil density = 1.0 g/cm**3, thickness = .15 m	6.100E-01	6.100E-01	FD(4,1,1)
A-3	Th-228+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	9.400E-01	9.400E-01	FD(4,2,1)
A-3	Th-228+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(4,3,1)
A-3	Th-228+D , soil density = 1.8 g/cm**3, thickness = .15 m	7.500E-01	7.500E-01	FD(4,1,2)
A-3	Th-228+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(4,2,2)
A-3	Th-228+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(4,3,2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.100E-02	2.100E-02	DCF2(1)
B-1	Ra-226+D	7.900E-03	7.900E-03	DCF2(2)
B-1	Ra-228+D	4.500E-03	4.500E-03	DCF2(3)
B-1	Th-228+D	3.100E-01	3.100E-01	DCF2(4)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	6.700E-03	6.700E-03	DCF3(1)
D-1	Ra-226+D	1.100E-03	1.100E-03	DCF3(2)

Dose Conversion Factor (and Related) Parameter Summary (continued)

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Ra-228+D	1.200E-03	1.200E-03	DCF3(3)
D-1	Th-228+D	7.500E-04	7.500E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
	Bioaccumulation factors, fresh water, L/kg:			
	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	4.856E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.100E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	3.000E+03	---	T(9)
R011	Times for calculations (yr)	not used	1.000E+04	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	9.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	4.900E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.783E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.783E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
	Distribution coefficients for daughter Pb-210				
	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.453E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.107E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	7.563E+02	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.000E-01	2.500E-01	---	FOTD
R017	Shape factor, external gamma	1.000E+00	1.000E+00	---	FS1

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Outer annular radius (m) = <(1/Ð)	not used	1.000E+00	---	FRACA(1)
R017	Outer annular radius (m) = <(10/Ð)	not used	1.000E+00	---	FRACA(2)
R017	Outer annular radius (m) = <(20/Ð)	not used	1.000E+00	---	FRACA(3)
R017	Outer annular radius (m) = <(50/Ð)	not used	1.000E+00	---	FRACA(4)
R017	Outer annular radius (m) = <(100/Ð)	not used	1.000E+00	---	FRACA(5)
R017	Outer annular radius (m) = <(200/Ð)	not used	1.000E+00	---	FRACA(6)
R017	Outer annular radius (m) = <(500/Ð)	not used	1.000E+00	---	FRACA(7)
R017	Outer annular radius (m) = <(1000/Ð)	not used	1.000E+00	---	FRACA(8)
R017	Outer annular radius (m) = <(5000/Ð)	not used	1.000E+00	---	FRACA(9)
R017	Outer annular radius (m) = <(1.E+04/Ð)	not used	1.000E+00	---	FRACA(10)
R017	Outer annular radius (m) = <(1.E+05/Ð)	not used	0.000E+00	---	FRACA(11)
R017	Outer annular radius (m) = <(1.E+06/Ð)	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.780E+00	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	not used	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	not used	1.000E+00	---	STOR_T(2)
STOR	Milk	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	not used	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
STOR	Well water	not used	1.000E+00	---	STOR_T(7)
STOR	Surface water	not used	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	not used	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	not used	1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	48564.00 square meters	Ra-226	9.000E-01
Thickness:	0.61 meters	Ra-228	4.900E-01
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	1.858E+00	1.991E+00	2.056E+00	1.712E+00	1.160E+00	6.332E-01	1.172E-01	0.000E+00
M(t):	6.192E-02	6.638E-02	6.853E-02	5.706E-02	3.867E-02	2.111E-02	3.907E-03	0.000E+00

Maximum TDOSE(t): 2.058E+00 mrem/yr at t = 2.681 þ 0.003 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.681 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.565E+00	0.0000	1.399E-04	0.0000	3.458E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.056E-04	0
Ra-228	1.298E+00	0.0000	2.415E-03	0.0000	1.558E-02	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.668E-04	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.681 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.440E+00	0.7752	1.061E-04	0.0001	3.192E-03	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.742E-04	0.0002
Ra-228	4.136E-01	0.2227	3.290E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.223E-04	0.0001
Total	1.854E+00	0.9979	1.390E-04	0.0001	3.192E-03	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.965E-04	0.0003

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.444E+00	0.7772
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.139E-01	0.2228
[illegible]	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.858E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.428E+00	0.7172	1.138E-04	0.0001	3.162E-03	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.404E-04	0.0002
Ra-228	5.543E-01	0.2784	6.731E-04	0.0003	4.240E-03	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.350E-04	0.0001
Total	1.982E+00	0.9955	7.869E-04	0.0004	7.402E-03	0.0037	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.755E-04	0.0003

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.432E+00	0.7191
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.595E-01	0.2809
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.991E+00	1.

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.405E+00	0.6833	1.281E-04	0.0001	3.103E-03	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.639E-04	0.0003
Ra-228	6.378E-01	0.3102	1.227E-03	0.0006	7.932E-03	0.0039	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.252E-04	0.0001
Total	2.043E+00	0.9936	1.356E-03	0.0007	1.103E-02	0.0054	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.891E-04	0.0004

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.409E+00	0.6852
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.472E-01	0.3148
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.056E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.326E+00	0.7747	1.681E-04	0.0001	2.903E-03	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.130E-04	0.0005
Ra-228	3.749E-01	0.2190	8.893E-04	0.0005	5.794E-03	0.0034	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.157E-04	0.0001
Total	1.701E+00	0.9937	1.057E-03	0.0006	8.697E-03	0.0051	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.029E-03	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.330E+00	0.7770
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.817E-01	0.2230
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.712E+00	1

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.125E+00	0.9693	2.214E-04	0.0002	2.398E-03	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.412E-03	0.0012
Ra-228	3.099E-02	0.0267	7.574E-05	0.0001	4.939E-04	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.358E-06	0.0000
Total	1.156E+00	0.9960	2.971E-04	0.0003	2.892E-03	0.0025	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.421E-03	0.0012

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.129E+00	0.9728
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.157E-02	0.0272
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.160E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	6.306E-01	0.9959	1.748E-04	0.0003	1.214E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.200E-03	0.0019
Ra-228	3.925E-06	0.0000	9.655E-09	0.0000	6.296E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.192E-09	0.0000
Total	6.306E-01	0.9959	1.748E-04	0.0003	1.214E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.200E-03	0.0019

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.332E-01	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.999E-06	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.332E-01	1.[illegible]

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.168E-01	0.9963	3.534E-05	0.0003	1.505E-04	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.445E-04	0.0021
Ra-228	2.747E-17	0.0000	7.183E-20	0.0000	4.684E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.872E-21	0.0000
Total	1.168E-01	0.9963	3.534E-05	0.0003	1.505E-04	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.445E-04	0.0021

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.172E-01	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.802E-17	0.0000
[illegible]	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.172E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	1.604E+00	1.591E+00	1.565E+00	1.477E+00	1.252E+00	7.021E-01	1.299E-01	0.000E+00
Ra-226	Pb-210	1.000E+00	0.000E+00	1.004E-04	2.882E-04	8.239E-04	1.622E-03	1.501E-03	3.082E-04	0.000E+00
Ra-226	ÖDSR(j)		1.604E+00	1.591E+00	1.565E+00	1.478E+00	1.254E+00	7.036E-01	1.302E-01	0.000E+00
Ra-228	Ra-228	1.000E+00	8.447E-01	7.431E-01	5.751E-01	2.345E-01	1.808E-02	2.296E-06	1.647E-17	0.000E+00
Ra-228	Th-228	1.000E+00	0.000E+00	3.987E-01	7.457E-01	5.444E-01	4.634E-02	5.865E-06	4.073E-17	0.000E+00
Ra-228	ÖDSR(j)		8.447E-01	1.142E+00	1.321E+00	7.790E-01	6.442E-02	8.161E-06	5.719E-17	0.000E+00

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life μ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	1.870E+01	1.886E+01	1.917E+01	2.030E+01	2.392E+01	4.264E+01	2.303E+02	*9.882E+11
Ra-228	3.552E+01	2.628E+01	2.271E+01	3.851E+01	4.657E+02	3.676E+06	*2.721E+14	*2.721E+14

*Specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.681 þ 0.003 years

Nuclide (i)	Initial pCi/g	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	9.000E-01	0.000E+00	1.604E+00	1.870E+01	1.569E+00	1.912E+01
Ra-228	4.900E-01	3.037 þ 0.003	1.321E+00	2.271E+01	1.317E+00	2.278E+01

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	1.444E+00	1.432E+00	1.408E+00	1.329E+00	1.127E+00	6.319E-01	1.169E-01	0.000E+00
Pb-210	Ra-226	1.000E+00	0.000E+00	9.039E-05	2.594E-04	7.415E-04	1.460E-03	1.351E-03	2.774E-04	0.000E+00
Ra-228	Ra-228	1.000E+00	4.139E-01	3.641E-01	2.818E-01	1.149E-01	8.858E-03	1.125E-06	8.069E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.953E-01	3.654E-01	2.668E-01	2.271E-02	2.874E-06	1.996E-17	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	9.000E-01	8.926E-01	8.781E-01	8.290E-01	7.034E-01	3.958E-01	7.653E-02	2.433E-04
Pb-210	Ra-226	1.000E+00	0.000E+00	2.736E-02	7.850E-02	2.244E-01	4.419E-01	4.088E-01	8.398E-02	2.670E-04
Ra-228	Ra-228	1.000E+00	4.900E-01	4.311E-01	3.336E-01	1.361E-01	1.049E-02	1.337E-06	9.944E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.392E-01	2.605E-01	1.903E-01	1.622E-02	2.068E-06	1.538E-17	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors 2
Amount of Intake Quantities and Excess Cancer Risks
Time= 0.000E+00 3
Time= 1.000E+00 6
Time= 3.000E+00 9
Time= 1.000E+01 12
Time= 3.000E+01 15
Time= 1.000E+02 18
Time= 3.000E+02 21
Time= 1.000E+03 24

Cancer Risk Slope Factors Summary Table

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Pb-210+D	1.60E-10	1.60E-10	SLPF(1,1)
Sf-1	Ra-226+D	6.00E-06	6.00E-06	SLPF(2,1)
Sf-1	Ra-228+D	2.90E-06	2.90E-06	SLPF(3,1)
Sf-1	Th-228+D	5.60E-06	5.60E-06	SLPF(4,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Pb-210+D	4.00E-09	4.00E-09	SLPF(1,2)
Sf-2	Ra-226+D	3.00E-09	3.00E-09	SLPF(2,2)
Sf-2	Ra-228+D	6.90E-10	6.90E-10	SLPF(3,2)
Sf-2	Th-228+D	7.80E-08	7.80E-08	SLPF(4,2)
Sf-3	Ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	6.60E-10	6.60E-10	SLPF(1,3)
Sf-3	Ra-226+D	1.20E-10	1.20E-10	SLPF(2,3)
Sf-3	Ra-228+D	1.00E-10	1.00E-10	SLPF(3,3)
Sf-3	Th-228+D	5.50E-11	5.50E-11	SLPF(4,3)
Sf-Rn	Radon Inhalation slope factors, 1/(pCi):			
Sf-Rn	Rn-222	7.30E-13	7.30E-13	SLPFRN(1,1)
Sf-Rn	Po-218	5.80E-13	5.80E-13	SLPFRN(1,2)
Sf-Rn	Pb-214	2.90E-12	2.90E-12	SLPFRN(1,3)
Sf-Rn	Bi-214	2.10E-12	2.10E-12	SLPFRN(1,4)
Sf-Rn	Rn-220	1.20E-13	1.20E-13	SLPFRN(2,1)
Sf-Rn	Po-216	4.80E-16	4.80E-16	SLPFRN(2,2)
Sf-Rn	Pb-212	4.30E-11	4.30E-11	SLPFRN(2,3)
Sf-Rn	Bi-212	6.60E-12	6.60E-12	SLPFRN(2,4)

Note: Defaults values followed by '*' were derived by multiplying the dose conversion factors with 5.0E-7 (risk/mrem). For external radiation, the dose conversion factors used for this derivation were obtained from the EPA's Federal Guidance Report No.12, and for inhalation and ingestion, the dose conversion factors were the ones used in RESRAD default database.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	1.343E-02	0.000E+00	0.000E+00	0.000E+00	3.402E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.402E-01
Ra-228	7.312E-03	0.000E+00	0.000E+00	0.000E+00	1.852E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.852E-01
Th-228	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.987E+02	7.783E+01	6.229E-01	4.659E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1	7.987E+02	7.783E+01	6.229E-01	4.659E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.616E-05	0.7914	1.209E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.225E-09	0.0001
Ra-228	4.255E-06	0.2084	1.514E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.557E-10	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.041E-05	0.9998	1.360E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.780E-09	0.0001

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.616E-05	0.7915
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.256E-06	0.2085
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.042E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 0.000E+00 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.749E-08	1.354E-09	5.419E-11	2.935E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.749E-08	1.354E-09	5.419E-11	2.935E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.616E-05	0.7907	1.209E-09	0.0001	1.890E-08	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.225E-09	0.0001
Ra-228	4.255E-06	0.2082	1.514E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.557E-10	0.0000
Total	2.041E-05	0.9989	1.360E-09	0.0001	1.890E-08	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.780E-09	0.0001

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.618E-05	0.7917
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.256E-06	0.2083
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.043E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	4.082E-04	0.000E+00	0.000E+00	0.000E+00	1.034E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.034E-02
Ra-226	1.332E-02	0.000E+00	0.000E+00	0.000E+00	3.374E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.374E-01
Ra-228	6.433E-03	0.000E+00	0.000E+00	0.000E+00	1.629E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.629E-01
Th-228	2.078E-03	0.000E+00	0.000E+00	0.000E+00	5.263E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.263E-02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.911E+02	7.709E+01	6.170E-01	4.615E-03	3.746E+03	3.736E+03	2.064E+00	7.582E-03
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.911E+02	7.709E+01	6.170E-01	4.615E-03	3.746E+03	3.736E+03	2.064E+00	7.582E-03

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.313E-11	0.0000	4.899E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.047E-10	0.0000
Ra-226	1.602E-05	0.7252	1.199E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.215E-09	0.0001
Ra-228	3.743E-06	0.1694	1.332E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.888E-10	0.0000
Th-228	2.321E-06	0.1050	4.862E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.685E-11	0.0000
Total	2.209E-05	0.9996	6.243E-09	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.995E-09	0.0001

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.669E-10	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.603E-05	0.7253
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.744E-06	0.1694
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.326E-06	0.1053
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.210E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+00 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.733E-08	1.341E-09	5.368E-11	2.907E-13	1.348E-08	5.379E-11	2.663E-09	1.501E-12
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.733E-08	1.341E-09	5.368E-11	2.907E-13	1.348E-08	5.379E-11	2.663E-09	1.501E-12

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.602E-05	0.7240	1.248E-09	0.0001	1.872E-08	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.419E-09	0.0001
Ra-228	6.064E-06	0.2740	4.995E-09	0.0002	1.620E-08	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.757E-10	0.0000
Total	2.209E-05	0.9980	6.243E-09	0.0003	3.492E-08	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.995E-09	0.0001

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-														
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.605E-05	0.7250
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.086E-06	0.2750
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.213E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.171E-03	0.000E+00	0.000E+00	0.000E+00	2.967E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.967E-02
Ra-226	1.310E-02	0.000E+00	0.000E+00	0.000E+00	3.319E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.319E-01
Ra-228	4.979E-03	0.000E+00	0.000E+00	0.000E+00	1.261E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.261E-01
Th-228	3.887E-03	0.000E+00	0.000E+00	0.000E+00	9.847E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.847E-02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.763E+02	7.564E+01	6.054E-01	4.528E-03	7.007E+03	6.988E+03	3.862E+00	1.418E-02
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.763E+02	7.564E+01	6.054E-01	4.528E-03	7.007E+03	6.988E+03	3.862E+00	1.418E-02

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	3.768E-11	0.0000	1.406E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.875E-10	0.0000
Ra-226	1.576E-05	0.6849	1.179E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.195E-09	0.0001
Ra-228	2.897E-06	0.1259	1.031E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.783E-10	0.0000
Th-228	4.342E-06	0.1887	9.096E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.625E-10	0.0000
Total	2.300E-05	0.9994	1.052E-08	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.323E-09	0.0001

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.658E-10	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.576E-05	0.6850
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.897E-06	0.1259
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.351E-06	0.1891
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.301E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+00 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.700E-08	1.316E-09	5.267E-11	2.852E-13	2.523E-08	1.006E-10	4.981E-09	2.808E-12
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.700E-08	1.316E-09	5.267E-11	2.852E-13	2.523E-08	1.006E-10	4.981E-09	2.808E-12

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.576E-05	0.6835	1.320E-09	0.0001	1.837E-08	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.782E-09	0.0001
Ra-228	7.239E-06	0.3139	9.200E-09	0.0004	3.031E-08	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.408E-10	0.0000
Total	2.300E-05	0.9973	1.052E-08	0.0005	4.868E-08	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.323E-09	0.0001

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.578E-05	0.6844
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.279E-06	0.3156
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.306E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	3.349E-03	0.000E+00	0.000E+00	0.000E+00	8.483E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.483E-02
Ra-226	1.237E-02	0.000E+00	0.000E+00	0.000E+00	3.134E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.134E-01
Ra-228	2.031E-03	0.000E+00	0.000E+00	0.000E+00	5.144E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.144E-02
Th-228	2.839E-03	0.000E+00	0.000E+00	0.000E+00	7.192E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.192E-02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.262E+02	7.077E+01	5.664E-01	4.236E-03	5.119E+03	5.105E+03	2.821E+00	1.036E-02
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.262E+02	7.077E+01	5.664E-01	4.236E-03	5.119E+03	5.105E+03	2.821E+00	1.036E-02

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.077E-10	0.0000	4.019E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.680E-09	0.0001
Ra-226	1.488E-05	0.7733	1.113E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.128E-09	0.0001
Ra-228	1.181E-06	0.0614	4.203E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.543E-10	0.0000
Th-228	3.170E-06	0.1647	6.644E-09	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.187E-10	0.0000
Total	1.923E-05	0.9994	8.201E-09	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.081E-09	0.0002

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.189E-09	0.0001
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.488E-05	0.7734
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.182E-06	0.0614
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.177E-06	0.1651
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.924E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+01 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.590E-08	1.231E-09	4.928E-11	2.669E-13	1.843E-08	7.351E-11	3.639E-09	2.051E-12
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.590E-08	1.231E-09	4.928E-11	2.669E-13	1.843E-08	7.351E-11	3.639E-09	2.051E-12

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.488E-05	0.7717	1.515E-09	0.0001	1.719E-08	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.808E-09	0.0001
Ra-228	4.351E-06	0.2257	6.686E-09	0.0003	2.214E-08	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.730E-10	0.0000
Total	1.923E-05	0.9974	8.201E-09	0.0004	3.933E-08	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.081E-09	0.0002

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.490E-05	0.7728
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.380E-06	0.2272
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.928E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	6.595E-03	0.000E+00	0.000E+00	0.000E+00	1.670E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.670E-01
Ra-226	1.050E-02	0.000E+00	0.000E+00	0.000E+00	2.659E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.659E-01
Ra-228	1.566E-04	0.000E+00	0.000E+00	0.000E+00	3.967E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.967E-03
Th-228	2.420E-04	0.000E+00	0.000E+00	0.000E+00	6.131E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.131E-03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.999E+02	5.846E+01	4.679E-01	3.499E-03	4.363E+02	4.351E+02	2.404E-01	8.831E-04
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
¬l	5.999E+02	5.846E+01	4.679E-01	3.499E-03	4.363E+02	4.351E+02	2.404E-01	8.831E-04

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	2.121E-10	0.0000	7.914E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.307E-09	0.0003
Ra-226	1.262E-05	0.9717	9.447E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.572E-10	0.0001
Ra-228	9.106E-08	0.0070	3.242E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.190E-11	0.0000
Th-228	2.698E-07	0.0208	5.664E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.012E-11	0.0000
Total	1.298E-05	0.9995	2.306E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.287E-09	0.0003

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.311E-09	0.0003
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.262E-05	0.9718
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.108E-08	0.0070
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.704E-07	0.0208
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.298E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.314E-08	1.017E-09	4.070E-11	2.204E-13	1.571E-09	6.266E-12	3.102E-10	1.749E-13
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.314E-08	1.017E-09	4.070E-11	2.204E-13	1.571E-09	6.266E-12	3.102E-10	1.749E-13

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.262E-05	0.9705	1.736E-09	0.0001	1.420E-08	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.265E-09	0.0003
Ra-228	3.609E-07	0.0278	5.696E-10	0.0000	1.887E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.202E-11	0.0000
Total	1.298E-05	0.9983	2.306E-09	0.0002	1.608E-08	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.287E-09	0.0003

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.264E-05	0.9720
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.634E-07	0.0280
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.300E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	6.100E-03	0.000E+00	0.000E+00	0.000E+00	1.545E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.545E-01
Ra-226	5.906E-03	0.000E+00	0.000E+00	0.000E+00	1.496E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.496E-01
Ra-228	1.995E-08	0.000E+00	0.000E+00	0.000E+00	5.052E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.052E-07
Th-228	3.086E-08	0.000E+00	0.000E+00	0.000E+00	7.816E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.816E-07

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	3.038E+02	2.960E+01	2.369E-01	1.772E-03	5.562E-02	5.547E-02	3.065E-05	1.126E-07
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	3.038E+02	2.960E+01	2.369E-01	1.772E-03	5.562E-02	5.547E-02	3.065E-05	1.126E-07

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.962E-10	0.0000	7.320E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.060E-09	0.0004
Ra-226	7.074E-06	0.9993	5.315E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.386E-10	0.0001
Ra-228	1.157E-11	0.0000	4.129E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.516E-15	0.0000
Th-228	3.414E-11	0.0000	7.220E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.290E-15	0.0000
Total	7.074E-06	0.9993	1.264E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.598E-09	0.0005

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.988E-09	0.0006
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.075E-06	0.9994
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.157E-11	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.421E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.079E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+02 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	6.653E-09	5.151E-10	2.061E-11	1.116E-13	2.002E-13	7.988E-16	3.954E-14	2.229E-17
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	6.653E-09	5.151E-10	2.061E-11	1.116E-13	2.002E-13	7.988E-16	3.954E-14	2.229E-17

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	7.074E-06	0.9983	1.264E-09	0.0002	7.189E-09	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.598E-09	0.0005
Ra-228	4.571E-11	0.0000	7.261E-14	0.0000	2.406E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.805E-15	0.0000
Total	7.074E-06	0.9983	1.264E-09	0.0002	7.190E-09	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.598E-09	0.0005

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.086E-06	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.602E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.086E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.253E-03	0.000E+00	0.000E+00	0.000E+00	3.174E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.174E-02
Ra-226	1.142E-03	0.000E+00	0.000E+00	0.000E+00	2.893E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.893E-02
Ra-228	1.484E-19	0.000E+00	0.000E+00	0.000E+00	3.759E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.759E-18
Th-228	2.296E-19	0.000E+00	0.000E+00	0.000E+00	5.815E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.815E-18

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	3.765E+01	3.669E+00	2.937E-02	2.196E-04	4.138E-13	4.127E-13	2.281E-16	8.376E-19
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
al	3.765E+01	3.669E+00	2.937E-02	2.196E-04	4.138E-13	4.127E-13	2.281E-16	8.376E-19

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	4.017E-11	0.0000	1.504E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.285E-10	0.0005
Ra-226	1.310E-06	0.9992	1.028E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-10	0.0001
Ra-228	8.295E-23	0.0000	3.072E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.128E-26	0.0000
Th-228	2.366E-22	0.0000	5.372E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.595E-27	0.0000
Total	1.310E-06	0.9992	2.532E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.327E-10	0.0006

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.191E-10	0.0006
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.310E-06	0.9994
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.296E-23	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.372E-22	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.311E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+02 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	8.246E-10	6.385E-11	2.555E-12	1.384E-14	1.490E-24	5.943E-27	2.942E-25	1.659E-28
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	8.246E-10	6.385E-11	2.555E-12	1.384E-14	1.490E-24	5.943E-27	2.942E-25	1.659E-28

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.310E-06	0.9986	2.532E-10	0.0002	8.911E-10	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.327E-10	0.0006
Ra-228	3.196E-22	0.0000	5.403E-25	0.0000	1.790E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.087E-26	0.0000
Total	1.310E-06	0.9986	2.532E-10	0.0002	8.911E-10	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.327E-10	0.0006

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.312E-06	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.219E-22	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.312E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+03 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-														
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors 2
Amount of Intake Quantities and Excess Cancer Risks
Time= 0.000E+00 3
Time= 1.000E+00 6
Time= 3.000E+00 9
Time= 1.000E+01 12
Time= 3.000E+01 15
Time= 1.000E+02 18
Time= 3.000E+02 21
Time= 1.000E+03 24

Cancer Risk Slope Factors Summary Table

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Pb-210+D	1.60E-10	1.60E-10	SLPF(1,1)
Sf-1	Ra-226+D	6.00E-06	6.00E-06	SLPF(2,1)
Sf-1	Ra-228+D	2.90E-06	2.90E-06	SLPF(3,1)
Sf-1	Th-228+D	5.60E-06	5.60E-06	SLPF(4,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Pb-210+D	4.00E-09	4.00E-09	SLPF(1,2)
Sf-2	Ra-226+D	3.00E-09	3.00E-09	SLPF(2,2)
Sf-2	Ra-228+D	6.90E-10	6.90E-10	SLPF(3,2)
Sf-2	Th-228+D	7.80E-08	7.80E-08	SLPF(4,2)
Sf-3	Ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	6.60E-10	6.60E-10	SLPF(1,3)
Sf-3	Ra-226+D	1.20E-10	1.20E-10	SLPF(2,3)
Sf-3	Ra-228+D	1.00E-10	1.00E-10	SLPF(3,3)
Sf-3	Th-228+D	5.50E-11	5.50E-11	SLPF(4,3)
Sf-Rn	Radon Inhalation slope factors, 1/(pCi):			
Sf-Rn	Rn-222	7.30E-13	7.30E-13	SLPFRN(1,1)
Sf-Rn	Po-218	5.80E-13	5.80E-13	SLPFRN(1,2)
Sf-Rn	Pb-214	2.90E-12	2.90E-12	SLPFRN(1,3)
Sf-Rn	Bi-214	2.10E-12	2.10E-12	SLPFRN(1,4)
Sf-Rn	Rn-220	1.20E-13	1.20E-13	SLPFRN(2,1)
Sf-Rn	Po-216	4.80E-16	4.80E-16	SLPFRN(2,2)
Sf-Rn	Pb-212	4.30E-11	4.30E-11	SLPFRN(2,3)
Sf-Rn	Bi-212	6.60E-12	6.60E-12	SLPFRN(2,4)

Note: Defaults values followed by '*' were derived by multiplying the dose conversion factors with 5.0E-7 (risk/mrem). For external radiation, the dose conversion factors used for this derivation were obtained from the EPA's Federal Guidance Report No.12, and for inhalation and ingestion, the dose conversion factors were the ones used in RESRAD default database.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	3.537E-02	0.000E+00	0.000E+00	0.000E+00	3.375E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.375E+00
Ra-228	1.926E-02	0.000E+00	0.000E+00	0.000E+00	1.838E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.838E+00
Th-228	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.181E+03	5.016E+03	3.797E+03	3.069E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ıl	5.181E+03	5.016E+03	3.797E+03	3.069E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	2.827E-05	0.7912	2.653E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.013E-08	0.0003
Ra-228	7.446E-06	0.2084	3.322E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.594E-09	0.0001
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.572E-05	0.9995	2.985E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.472E-08	0.0004

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.829E-05	0.7915
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.451E-06	0.2085
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.574E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 0.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	9.455E-08	7.273E-08	2.752E-07	1.611E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	9.455E-08	7.273E-08	2.752E-07	1.611E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	2.827E-05	0.7780	2.653E-09	0.0001	6.037E-07	0.0166	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.013E-08	0.0003
Ra-228	7.446E-06	0.2049	3.322E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.594E-09	0.0001
Total	3.572E-05	0.9829	2.985E-09	0.0001	6.037E-07	0.0166	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.472E-08	0.0004

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.889E-05	0.7950
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.451E-06	0.2050
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.634E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.075E-03	0.000E+00	0.000E+00	0.000E+00	1.026E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.026E-01
Ra-226	3.508E-02	0.000E+00	0.000E+00	0.000E+00	3.347E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.347E+00
Ra-228	1.694E-02	0.000E+00	0.000E+00	0.000E+00	1.617E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.617E+00
Th-228	5.473E-03	0.000E+00	0.000E+00	0.000E+00	5.222E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.222E-01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.132E+03	4.968E+03	3.761E+03	3.040E+03	2.710E+02	2.718E+02	4.334E+01	2.511E+01
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.132E+03	4.968E+03	3.761E+03	3.040E+03	2.710E+02	2.718E+02	4.334E+01	2.511E+01

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	2.298E-11	0.0000	1.075E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.693E-09	0.0000
Ra-226	2.804E-05	0.7249	2.631E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.004E-08	0.0003
Ra-228	6.551E-06	0.1693	2.923E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.041E-09	0.0001
Th-228	4.062E-06	0.1050	1.067E-08	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.180E-10	0.0000
Total	3.866E-05	0.9992	1.370E-08	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.649E-08	0.0004

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.823E-09	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.806E-05	0.7252
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.555E-06	0.1694
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.073E-06	0.1053
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.869E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+00 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
r-ind.	9.366E-08	7.204E-08	2.726E-07	1.596E-07	8.131E-10	3.261E-12	4.660E-08	4.143E-09
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	9.366E-08	7.204E-08	2.726E-07	1.596E-07	8.131E-10	3.261E-12	4.660E-08	4.143E-09

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	2.804E-05	0.7129	2.739E-09	0.0001	5.979E-07	0.0152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.173E-08	0.0003
Ra-228	1.061E-05	0.2698	1.096E-08	0.0003	5.155E-08	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.759E-09	0.0001
Total	3.866E-05	0.9827	1.370E-08	0.0003	6.495E-07	0.0165	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.649E-08	0.0004

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-														
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.866E-05	0.7285
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.068E-05	0.2715
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.934E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	3.085E-03	0.000E+00	0.000E+00	0.000E+00	2.944E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.944E-01
Ra-226	3.451E-02	0.000E+00	0.000E+00	0.000E+00	3.293E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.293E+00
Ra-228	1.311E-02	0.000E+00	0.000E+00	0.000E+00	1.251E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.251E+00
Th-228	1.024E-02	0.000E+00	0.000E+00	0.000E+00	9.769E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.769E-01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+00 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	5.035E+03	4.875E+03	3.690E+03	2.983E+03	5.071E+02	5.084E+02	8.109E+01	4.698E+01
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	5.035E+03	4.875E+03	3.690E+03	2.983E+03	5.071E+02	5.084E+02	8.109E+01	4.698E+01

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	6.594E-11	0.0000	3.085E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.857E-09	0.0001
Ra-226	2.758E-05	0.6846	2.588E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.878E-09	0.0002
Ra-228	5.070E-06	0.1258	2.262E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.128E-09	0.0001
Th-228	7.598E-06	0.1886	1.997E-08	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.343E-09	0.0000
Total	4.025E-05	0.9990	2.309E-08	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.921E-08	0.0005

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.232E-09	0.0001
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.760E-05	0.6849
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.073E-06	0.1259
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.619E-06	0.1891
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.029E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+00 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	9.189E-08	7.069E-08	2.675E-07	1.566E-07	1.521E-09	6.101E-12	8.717E-08	7.751E-09
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	9.189E-08	7.069E-08	2.675E-07	1.566E-07	1.521E-09	6.101E-12	8.717E-08	7.751E-09

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	2.758E-05	0.6732	2.897E-09	0.0001	5.867E-07	0.0143	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.474E-08	0.0004
Ra-228	1.267E-05	0.3091	2.019E-08	0.0005	9.645E-08	0.0024	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.471E-09	0.0001
Total	4.025E-05	0.9823	2.309E-08	0.0006	6.831E-07	0.0167	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.921E-08	0.0005

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.819E-05	0.6879
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.279E-05	0.3121
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.098E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	8.820E-03	0.000E+00	0.000E+00	0.000E+00	8.415E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.415E-01
Ra-226	3.258E-02	0.000E+00	0.000E+00	0.000E+00	3.109E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.109E+00
Ra-228	5.348E-03	0.000E+00	0.000E+00	0.000E+00	5.103E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.103E-01
Th-228	7.479E-03	0.000E+00	0.000E+00	0.000E+00	7.135E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.135E-01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	4.711E+03	4.561E+03	3.452E+03	2.791E+03	3.704E+02	3.714E+02	5.923E+01	3.431E+01
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	4.711E+03	4.561E+03	3.452E+03	2.791E+03	3.704E+02	3.714E+02	5.923E+01	3.431E+01

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.885E-10	0.0000	8.820E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.389E-08	0.0004
Ra-226	2.604E-05	0.7727	2.444E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.326E-09	0.0003
Ra-228	2.067E-06	0.0614	9.226E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.276E-09	0.0000
Th-228	5.547E-06	0.1646	1.458E-08	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.811E-10	0.0000
Total	3.365E-05	0.9987	1.800E-08	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.547E-08	0.0008

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.496E-08	0.0004
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.605E-05	0.7731
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.069E-06	0.0614
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.563E-06	0.1651
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.370E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+01 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	8.597E-08	6.613E-08	2.503E-07	1.465E-07	1.111E-09	4.456E-12	6.367E-08	5.662E-09
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	8.597E-08	6.613E-08	2.503E-07	1.465E-07	1.111E-09	4.456E-12	6.367E-08	5.662E-09

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	2.604E-05	0.7588	3.326E-09	0.0001	5.489E-07	0.0160	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.321E-08	0.0007
Ra-228	7.615E-06	0.2219	1.468E-08	0.0004	7.045E-08	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.257E-09	0.0001
Total	3.365E-05	0.9807	1.800E-08	0.0005	6.193E-07	0.0180	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.547E-08	0.0007

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.661E-05	0.7756
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.702E-06	0.2244
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.432E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.737E-02	0.000E+00	0.000E+00	0.000E+00	1.657E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.657E+00
Ra-226	2.765E-02	0.000E+00	0.000E+00	0.000E+00	2.638E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.638E+00
Ra-228	4.125E-04	0.000E+00	0.000E+00	0.000E+00	3.935E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.935E-02
Th-228	6.375E-04	0.000E+00	0.000E+00	0.000E+00	6.082E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.082E-02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	3.891E+03	3.767E+03	2.852E+03	2.305E+03	3.157E+01	3.166E+01	5.049E+00	2.925E+00
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ıl	3.891E+03	3.767E+03	2.852E+03	2.305E+03	3.157E+01	3.166E+01	5.049E+00	2.925E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	3.712E-10	0.0000	1.737E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.734E-08	0.0012
Ra-226	2.208E-05	0.9704	2.074E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.913E-09	0.0003
Ra-228	1.594E-07	0.0070	7.115E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.838E-11	0.0000
Th-228	4.722E-07	0.0208	1.243E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.363E-11	0.0000
Total	2.271E-05	0.9982	5.061E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.544E-08	0.0016

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.945E-08	0.0013
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.209E-05	0.9709
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.595E-07	0.0070
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.735E-07	0.0208
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.275E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+01 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	7.102E-08	5.463E-08	2.067E-07	1.210E-07	9.472E-11	3.799E-13	5.428E-09	4.826E-10
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.102E-08	5.463E-08	2.067E-07	1.210E-07	9.472E-11	3.799E-13	5.428E-09	4.826E-10

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	2.208E-05	0.9513	3.810E-09	0.0002	4.534E-07	0.0195	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.526E-08	0.0015
Ra-228	6.315E-07	0.0272	1.250E-09	0.0001	6.005E-09	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.820E-10	0.0000
Total	2.271E-05	0.9785	5.061E-09	0.0002	4.594E-07	0.0198	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.544E-08	0.0015

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.257E-05	0.9725
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.390E-07	0.0275
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.321E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.607E-02	0.000E+00	0.000E+00	0.000E+00	1.533E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.533E+00
Ra-226	1.556E-02	0.000E+00	0.000E+00	0.000E+00	1.484E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.484E+00
Ra-228	5.253E-08	0.000E+00	0.000E+00	0.000E+00	5.012E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.012E-06
Th-228	8.127E-08	0.000E+00	0.000E+00	0.000E+00	7.754E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.754E-06

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	1.971E+03	1.908E+03	1.444E+03	1.167E+03	4.025E-03	4.036E-03	6.436E-04	3.729E-04
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	1.971E+03	1.908E+03	1.444E+03	1.167E+03	4.025E-03	4.036E-03	6.436E-04	3.729E-04

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	3.434E-10	0.0000	1.607E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.529E-08	0.0020
Ra-226	1.238E-05	0.9973	1.167E-09	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.452E-09	0.0004
Ra-228	2.024E-11	0.0000	9.062E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.253E-14	0.0000
Th-228	5.975E-11	0.0000	1.585E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.066E-14	0.0000
Total	1.238E-05	0.9974	2.774E-09	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.975E-08	0.0024

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.724E-08	0.0022
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.238E-05	0.9978
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.026E-11	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.992E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.241E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+02 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
r-ind.	3.597E-08	2.766E-08	1.047E-07	6.129E-08	1.207E-14	4.843E-17	6.919E-13	6.153E-14
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	3.597E-08	2.766E-08	1.047E-07	6.129E-08	1.207E-14	4.843E-17	6.919E-13	6.153E-14

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	1.238E-05	0.9793	2.773E-09	0.0002	2.296E-07	0.0182	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.975E-08	0.0024
Ra-228	7.999E-11	0.0000	1.594E-13	0.0000	7.656E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.319E-14	0.0000
Total	1.238E-05	0.9793	2.774E-09	0.0002	2.296E-07	0.0182	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.975E-08	0.0024

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.264E-05	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.094E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.264E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	3.301E-03	0.000E+00	0.000E+00	0.000E+00	3.149E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.149E-01
Ra-226	3.008E-03	0.000E+00	0.000E+00	0.000E+00	2.870E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.870E-01
Ra-228	3.909E-19	0.000E+00	0.000E+00	0.000E+00	3.729E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.729E-17
Th-228	6.047E-19	0.000E+00	0.000E+00	0.000E+00	5.769E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.769E-17

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	2.443E+02	2.365E+02	1.790E+02	1.447E+02	2.995E-14	3.003E-14	4.789E-15	2.774E-15
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ıl	2.443E+02	2.365E+02	1.790E+02	1.447E+02	2.995E-14	3.003E-14	4.789E-15	2.774E-15

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	7.030E-11	0.0000	3.301E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.196E-09	0.0023
Ra-226	2.292E-06	0.9971	2.256E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.609E-10	0.0004
Ra-228	1.452E-22	0.0000	6.742E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.323E-26	0.0000
Th-228	4.141E-22	0.0000	1.179E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.932E-26	0.0000
Total	2.292E-06	0.9971	5.557E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.057E-09	0.0026

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.596E-09	0.0024
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.293E-06	0.9976
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.453E-22	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.153E-22	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.299E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 3.000E+02 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	4.458E-09	3.429E-09	1.298E-08	7.596E-09	8.984E-26	3.603E-28	5.148E-24	4.578E-25
Water-dep.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	4.458E-09	3.429E-09	1.298E-08	7.596E-09	8.984E-26	3.603E-28	5.148E-24	4.578E-25

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	2.292E-06	0.9849	5.557E-10	0.0002	2.846E-08	0.0122	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.057E-09	0.0026
Ra-228	5.592E-22	0.0000	1.186E-24	0.0000	5.696E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.725E-25	0.0000
Total	2.292E-06	0.9849	5.557E-10	0.0002	2.846E-08	0.0122	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.057E-09	0.0026

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-														
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.328E-06	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.663E-22	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.328E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Radio- Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Amount of Intake Quantities QINT9(irn,i,t) and QINT9W(irn,i,t) for Inhalation of
Radon and its Decay Products as pCi/yr at t= 1.000E+03 years

Radon	Radionuclides							
Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
Water-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	3.981E+02	3.841E+02	2.906E+02	2.349E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	3.981E+02	3.841E+02	2.906E+02	2.349E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio- Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS9(irn,i,t) and CNRS9W(irn,i,t) for Inhalation of
Radon and its Decay Products at t= 1.000E+03 years

Radionuclides

Radon Pathway	Rn-222	Po-218	Pb-214	Bi-214	Rn-220	Po-216	Pb-212	Bi-212
-ind.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Water-dep.	7.266E-09	5.569E-09	2.107E-08	1.233E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total	7.266E-09	5.569E-09	2.107E-08	1.233E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water-ind. == Water-independent Water-dep. == Water-dependent

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	4.624E-08	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.624E-08	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	4.624E-08	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.624E-08	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 4
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+01 12
Time = 3.000E+01 13
Time = 1.000E+02 14
Time = 3.000E+02 15
Time = 1.000E+03 16
Dose/Source Ratios Summed Over All Pathways 17
Single Radionuclide Soil Guidelines 17
Dose Per Nuclide Summed Over All Pathways 18
Soil Concentration Per Nuclide 18

Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
A-1	Ground external gamma, volume DCF's, (mrem/yr)/(pCi/cm**3):			
A-1	Pb-210+D , soil density = 1.0 g/cm**3	4.870E-03	4.870E-03	DCF1(1,1)
A-1	Pb-210+D , soil density = 1.8 g/cm**3	2.310E-03	2.310E-03	DCF1(1,2)
A-1				
A-1	Ra-226+D , soil density = 1.0 g/cm**3	1.550E+01	1.550E+01	DCF1(2,1)
A-1	Ra-226+D , soil density = 1.8 g/cm**3	8.560E+00	8.560E+00	DCF1(2,2)
A-1				
A-1	Ra-228+D , soil density = 1.0 g/cm**3	8.180E+00	8.180E+00	DCF1(3,1)
A-1	Ra-228+D , soil density = 1.8 g/cm**3	4.510E+00	4.510E+00	DCF1(3,2)
A-1				
A-1	Th-228+D , soil density = 1.0 g/cm**3	1.330E+01	1.330E+01	DCF1(4,1)
A-1	Th-228+D , soil density = 1.8 g/cm**3	7.360E+00	7.360E+00	DCF1(4,2)
A-3	Depth factors, ground external gamma, dimensionless:			
A-3	Pb-210+D , soil density = 1.0 g/cm**3, thickness = .15 m	8.800E-01	8.800E-01	FD(1,1,1)
A-3	Pb-210+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,1)
A-3	Pb-210+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,1)
A-3	Pb-210+D , soil density = 1.8 g/cm**3, thickness = .15 m	9.700E-01	9.700E-01	FD(1,1,2)
A-3	Pb-210+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,2)
A-3	Pb-210+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,2)
A-3				
A-3	Ra-226+D , soil density = 1.0 g/cm**3, thickness = .15 m	6.300E-01	6.300E-01	FD(2,1,1)
A-3	Ra-226+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	9.200E-01	9.200E-01	FD(2,2,1)
A-3	Ra-226+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,1)
A-3	Ra-226+D , soil density = 1.8 g/cm**3, thickness = .15 m	8.500E-01	8.500E-01	FD(2,1,2)
A-3	Ra-226+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(2,2,2)
A-3	Ra-226+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,2)
A-3				
A-3	Ra-228+D , soil density = 1.0 g/cm**3, thickness = .15 m	6.800E-01	6.800E-01	FD(3,1,1)
A-3	Ra-228+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	9.700E-01	9.700E-01	FD(3,2,1)
A-3	Ra-228+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,1)
A-3	Ra-228+D , soil density = 1.8 g/cm**3, thickness = .15 m	8.500E-01	8.500E-01	FD(3,1,2)
A-3	Ra-228+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(3,2,2)
A-3	Ra-228+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,2)
A-3				
A-3	Th-228+D , soil density = 1.0 g/cm**3, thickness = .15 m	6.100E-01	6.100E-01	FD(4,1,1)
A-3	Th-228+D , soil density = 1.0 g/cm**3, thickness = 0.5 m	9.400E-01	9.400E-01	FD(4,2,1)
A-3	Th-228+D , soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(4,3,1)
A-3	Th-228+D , soil density = 1.8 g/cm**3, thickness = .15 m	7.500E-01	7.500E-01	FD(4,1,2)
A-3	Th-228+D , soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(4,2,2)
A-3	Th-228+D , soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(4,3,2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.100E-02	2.100E-02	DCF2(1)
B-1	Ra-226+D	7.900E-03	7.900E-03	DCF2(2)
B-1	Ra-228+D	4.500E-03	4.500E-03	DCF2(3)
B-1	Th-228+D	3.100E-01	3.100E-01	DCF2(4)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	6.700E-03	6.700E-03	DCF3(1)
D-1	Ra-226+D	1.100E-03	1.100E-03	DCF3(2)

Dose Conversion Factor (and Related) Parameter Summary (continued)

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Ra-228+D	1.200E-03	1.200E-03	DCF3(3)
D-1	Th-228+D	7.500E-04	7.500E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
	Bioaccumulation factors, fresh water, L/kg:			
	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	4.856E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.100E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	3.000E+03	---	T(9)
R011	Times for calculations (yr)	not used	1.000E+04	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	9.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	4.900E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.783E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.783E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
	Distribution coefficients for daughter Pb-210				
	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.453E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.107E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	1.660E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	3.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	0.000E+00	2.500E-01	---	FOTD
R017	Shape factor, external gamma	1.000E+00	1.000E+00	---	FS1

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Outer annular radius (m) = <(1/Đ)	not used	1.000E+00	---	FRACA(1)
R017	Outer annular radius (m) = <(10/Đ)	not used	1.000E+00	---	FRACA(2)
R017	Outer annular radius (m) = <(20/Đ)	not used	1.000E+00	---	FRACA(3)
R017	Outer annular radius (m) = <(50/Đ)	not used	1.000E+00	---	FRACA(4)
R017	Outer annular radius (m) = <(100/Đ)	not used	1.000E+00	---	FRACA(5)
R017	Outer annular radius (m) = <(200/Đ)	not used	1.000E+00	---	FRACA(6)
R017	Outer annular radius (m) = <(500/Đ)	not used	1.000E+00	---	FRACA(7)
R017	Outer annular radius (m) = <(1000/Đ)	not used	1.000E+00	---	FRACA(8)
R017	Outer annular radius (m) = <(5000/Đ)	not used	1.000E+00	---	FRACA(9)
R017	Outer annular radius (m) = <(1.E+04/Đ)	not used	1.000E+00	---	FRACA(10)
R017	Outer annular radius (m) = <(1.E+05/Đ)	not used	0.000E+00	---	FRACA(11)
R017	Outer annular radius (m) = <(1.E+06/Đ)	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	not used	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	not used	1.000E+00	---	STOR_T(2)
STOR	Milk	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	not used	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
STOR	Well water	not used	1.000E+00	---	STOR_T(7)
STOR	Surface water	not used	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	not used	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
	in cover material	not used	2.000E-06	---	DIFCV
	in foundation material	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	0.000E+00	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	1.000E+00	1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	48564.00 square meters	Ra-226	9.000E-01
Thickness:	0.61 meters	Ra-228	4.900E-01
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	4.733E+00	5.024E+00	5.159E+00	4.379E+00	3.071E+00	1.654E+00	2.871E-01	6.388E-02
M(t):	1.578E-01	1.675E-01	1.720E-01	1.460E-01	1.024E-01	5.514E-02	9.570E-03	2.129E-03

Maximum TDOSE(t): 5.164E+00 mrem/yr at t = 2.642 þ 0.003 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.642 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.288E+00	0.0000	3.677E-04	0.0000	9.042E-01	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.982E-03	0.
Ra-228	2.725E+00	0.0000	6.326E-03	0.0000	9.251E-02	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.639E-03	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.642 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.024E+00	0.6389	2.795E-04	0.0001	8.345E-01	0.1763	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.713E-03	0.0008
Ra-228	8.686E-01	0.1835	8.667E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.205E-03	0.0005
Total	3.893E+00	0.8224	3.661E-04	0.0001	8.345E-01	0.1763	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.918E-03	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.862E+00	0.8160
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.709E-01	0.1840
[illegible]	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.733E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.999E+00	0.5970	2.998E-04	0.0001	8.266E-01	0.1645	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.369E-03	0.0009
Ra-228	1.164E+00	0.2317	1.773E-03	0.0004	2.532E-02	0.0050	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.331E-03	0.0005
Total	4.163E+00	0.8287	2.073E-03	0.0004	8.519E-01	0.1696	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.701E-03	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.830E+00	0.7624
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.193E+00	0.2376
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.024E+00	1.[illegible]

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.950E+00	0.5718	3.374E-04	0.0001	8.110E-01	0.1572	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.594E-03	0.0011
Ra-228	1.339E+00	0.2596	3.233E-03	0.0006	4.736E-02	0.0092	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.234E-03	0.0004
Total	4.290E+00	0.8314	3.571E-03	0.0007	8.584E-01	0.1664	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.828E-03	0.0015

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.767E+00	0.7302
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.392E+00	0.2698
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.159E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.785E+00	0.6360	4.426E-04	0.0001	7.588E-01	0.1733	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.058E-03	0.0021
Ra-228	7.873E-01	0.1798	2.342E-03	0.0005	3.460E-02	0.0079	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.147E-03	0.0003
Total	3.572E+00	0.8158	2.785E-03	0.0006	7.934E-01	0.1812	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.021E-02	0.0023

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.553E+00	0.8115
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.254E-01	0.1885
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.379E+00	1.

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.362E+00	0.7689	5.832E-04	0.0002	6.268E-01	0.2041	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.400E-02	0.0046
Ra-228	6.507E-02	0.0212	1.995E-04	0.0001	2.949E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.284E-05	0.0000
Total	2.427E+00	0.7901	7.827E-04	0.0003	6.297E-01	0.2050	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.410E-02	0.0046

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.003E+00	0.9778
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.832E-02	0.0222
[illegible]	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.071E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.324E+00	0.8006	4.603E-04	0.0003	3.174E-01	0.1919	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.190E-02	0.0072
Ra-228	8.243E-06	0.0000	2.543E-08	0.0000	3.760E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.183E-08	0.0000
Total	1.324E+00	0.8006	4.603E-04	0.0003	3.174E-01	0.1919	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.190E-02	0.0072

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.654E+00	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.656E-06	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.654E+00	1.

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.452E-01	0.8542	9.308E-05	0.0003	3.934E-02	0.1370	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.426E-03	0.0084
Ra-228	5.770E-17	0.0000	1.892E-19	0.0000	2.797E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.802E-20	0.0000
Total	2.452E-01	0.8542	9.308E-05	0.0003	3.934E-02	0.1370	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.426E-03	0.0084

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.871E-01	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.077E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.871E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	6.388E-02	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.388E-02	1.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	6.388E-02	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.388E-02	1.

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	4.292E+00	4.255E+00	4.183E+00	3.941E+00	3.323E+00	1.826E+00	3.165E-01	7.098E-02
Ra-226	Pb-210	1.000E+00	0.000E+00	8.180E-04	2.347E-03	6.710E-03	1.321E-02	1.222E-02	2.511E-03	0.000E+00
Ra-226	∂DSR(j)		4.292E+00	4.256E+00	4.186E+00	3.948E+00	3.337E+00	1.838E+00	3.190E-01	7.098E-02
Ra-228	Ra-228	1.000E+00	1.777E+00	1.564E+00	1.210E+00	4.935E-01	3.804E-02	4.832E-06	3.465E-17	0.000E+00
Ra-228	Th-228	1.000E+00	0.000E+00	8.720E-01	1.631E+00	1.191E+00	1.014E-01	1.283E-05	8.937E-17	0.000E+00
Ra-228	∂DSR(j)		1.777E+00	2.436E+00	2.841E+00	1.684E+00	1.394E-01	1.767E-05	1.240E-16	0.000E+00

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life μ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	6.991E+00	7.049E+00	7.167E+00	7.599E+00	8.991E+00	1.632E+01	9.404E+01	4.227E+02
Ra-228	1.688E+01	1.232E+01	1.056E+01	1.781E+01	2.152E+02	1.698E+06	*2.721E+14	*2.721E+14

* specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.642 þ 0.003 years

Nuclide (i)	Initial pCi/g	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	9.000E-01	0.000E+00	4.292E+00	6.991E+00	4.198E+00	7.146E+00
Ra-228	4.900E-01	3.079 þ 0.003	2.842E+00	1.056E+01	2.828E+00	1.061E+01

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.862E+00	3.830E+00	3.765E+00	3.547E+00	2.991E+00	1.643E+00	2.848E-01	6.388E-02
Pb-210	Ra-226	1.000E+00	0.000E+00	7.362E-04	2.113E-03	6.039E-03	1.189E-02	1.100E-02	2.260E-03	0.000E+00
Ra-228	Ra-228	1.000E+00	8.709E-01	7.662E-01	5.930E-01	2.418E-01	1.864E-02	2.368E-06	1.698E-17	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	4.273E-01	7.993E-01	5.836E-01	4.968E-02	6.289E-06	4.379E-17	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	9.000E-01	8.926E-01	8.781E-01	8.290E-01	7.034E-01	3.958E-01	7.653E-02	2.433E-04
Pb-210	Ra-226	1.000E+00	0.000E+00	2.736E-02	7.850E-02	2.244E-01	4.419E-01	4.088E-01	8.398E-02	2.670E-04
Ra-228	Ra-228	1.000E+00	4.900E-01	4.311E-01	3.336E-01	1.361E-01	1.049E-02	1.337E-06	9.944E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.392E-01	2.605E-01	1.903E-01	1.622E-02	2.068E-06	1.538E-17	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

ATTACHMENT 4

DERIVATION OF TIME-WEIGHTED OUTDOOR SOIL INGESTION RATES

ATTACHMENT 4

DERIVATION OF TIME-WEIGHTED OUTDOOR SOIL INGESTION RATES

Under the recreational exposure scenario, it was assumed that receptors may be exposed to site contaminants through incidental ingestion of surface soil. For the purposes of the Operable Unit (OU) 3 human health risk assessment (HHRA) recreational exposure was assumed to occur at a community park located at Site 1. Under this scenario, receptors were assumed to range in age from young children to adults.

As stated in agency guidance, children have higher soil ingestion rates per kilogram (kg) body weight than adults (DTSC 1992; EPA 1989 and 1997a). Further, soil ingestion for receptors of all ages occurs at a higher rate during outdoor versus indoor activities (EPA 1997a). Therefore, a time-weighted outdoor soil ingestion rate was developed in order (1) to reflect age group-specific outdoor incidental soil ingestion rates and (2) to be consistent with other time-weighted exposure parameter values used in the recreational exposure soil ingestion algorithm.

Time-weighted hourly outdoor soil ingestion rates (IR_{twh}) were developed under both reasonable maximum exposure (RME) and average exposure conditions following a six-step process:

- First, age group-specific daily soil ingestion rates (IR_d) were identified; the age groups evaluated were children up to age 5 years, children age 6 to 11 years; and older children and adults age 12 to 30 years.
- Second, the proportion of IR_d contributed by outdoor activities (P_{out}) was identified for each age group
- Third, the outdoor proportion of the daily soil ingestion rate (IR_{od}) was identified for each age group by multiplying IR_d by P_{out}
- Fourth, the hours spent each day in outdoor recreation (t_{orec}) was identified for each age group
- Fifth, age group-specific hourly outdoor soil ingestion rates (IR_{oh}) were calculated by dividing IR_{od} (mg/day) by t_{orec} (hour [hr]/day)
- Finally, a time-weighted hourly outdoor soil ingestion rate (IR_{twh}) was calculated from the age group-specific IR_{oh} values

The derivation of the IR_{twh} value is described below first under RME conditions and then under average conditions.

IR_{twh} – RME Conditions

The derivation of age group-specific IR_{oh} values is described first, followed by the derivation of the IR_{twh} value.

IR_{oh} – 0- to 5-year age group

The RME default value of 200 milligrams per day (mg/day) was used as the daily soil ingestion rate (DTSC 1992; EPA 1991 and 1997a).

The P_{out} value was estimated from Table 4-15 in EPA's "Exposure Factors Handbook" (EPA 1997a). Table 4-15 presents the contribution of outdoor and indoor exposures to average daily soil ingestion rates for several age groups. For the 0 to 5 year age group, outdoor exposures were estimated to contribute 50 mg/day towards an average daily soil ingestion rate of 110 mg/day. Therefore, P_{out} was estimated as:

$$(50 \text{ mg/day})/(110 \text{ mg/day}) = 0.45$$

It was assumed that the P_{out} calculated for average conditions was applicable to RME conditions. As a result, the IR_{od} value or the 0 to 5 year age group was estimated as:

$$200 \text{ mg/day} \times 0.45 = 90 \text{ mg/day}$$

The t_{orec} value for the 0 to 5 year age group was estimated from information presented in Table 15-86 in EPA's "Exposure Factors Handbook" (EPA 1997b). Specifically, this table presents the amount of time (hr/day) spent in outdoor recreation by different age groups. The t_{orec} value for the 0 to 5 year age group was calculated as the average of the 50th and 90th percentile values for children 1 to 4 years old or 250 minutes per day (4.2 hr/day).

Consistent with the approach used for other parameters, the 90th percentile t_{orec} value could have been used to represent RME conditions and the 50th percentile t_{orec} value could have been used to represent average conditions. However, the 90th percentile t_{orec} value is larger than 50th percentile value and as shown below ; the t_{orec} value is used in the denominator to calculate IR_{oh} values. Therefore, a smaller (average) value in

the denominator would result in a larger IR_{oh} value than would be calculated if a larger (RME) value were used. In order to address this situation, the 50th and 90th percentile t_{orec} values were averaged together to develop a t_{orec} value that could be used to adequately represent both average and RME conditions.

The IR_{oh} value for the 0 to 5 year age group was calculated as follows:

(90 mg/day)/(4.2 hr/day) = 21.4 mg/hr

IR_{oh} – 6- to 11-year age group

The daily soil ingestion rate under RME conditions for this age group was identified as 100 mg/day; this is a standard default assumption for this age group (DTSC 1992; EPA 1991 and 1997a).

The P_{out} value was estimated from Table 4-15 in EPA's "Exposure Factors Handbook" (EPA 1997a). Based on results presented for six -year-olds, outdoor exposures were estimated to contribute 20 mg/day towards an average daily soil ingestion rate of 22 mg/day. Therefore, P_{out} was estimated as:

(20 mg/day)/(22 mg/day) = 0.91

It was assumed that the P_{out} calculated for average conditions was applicable to RME conditions. As a result, the IR_{od} value for the 6 to 11 year age group was estimated as:

100 mg/day x 0.91 = 91 mg/day

The t_{orec} value for the 6 to 11 year age group was estimated from information presented in Table 15-86 in EPA's "Exposure Factors Handbook" (EPA 1997b). The t_{orec} value for the 6 to 11 year age group was calculated as the average of the 50th and 90th percentile values for children 5 to 11 years old or 263 minutes per day (4.4 hr/day).

The IR_{oh} value for the 6 to 11 year age group was calculated as follows:

(91 mg/day)/(4.4 hr/day) = 20.7 mg/hr

IR_{oh} – 12- to 30-year age group

The daily soil ingestion rate under RME conditions for this age group was identified as 100 mg/day; this is a standard default assumption for this age group (DTSC 1992; EPA 1991 and 1997a).

The P_{out} value was estimated from Table 4-15 in EPA's "Exposure Factors Handbook" (EPA 1997a). Based on results presented for adult gardeners, outdoor exposures were estimated to contribute 20 mg/day towards an average daily soil ingestion rate of 20.4 mg/day. Therefore, P_{out} was estimated as:

$$(20 \text{ mg/day})/(20.4 \text{ mg/day}) = 0.98$$

It was assumed that the P_{out} calculated for average conditions was applicable to RME conditions. As a result, the IR_{od} value for the 12 to 30 year age group was estimated as:

$$100 \text{ mg/day} \times 0.98 = 98 \text{ mg/day}$$

The t_{orec} value for the 12 to 30 year age group was estimated from information presented in Table 15-86 in EPA's "Exposure Factors Handbook" (EPA 1997b). The t_{orec} value for the 12 to 30 year age group was calculated as the average of the 50th and 90th percentile values for receptors 12 to 17 and 18 to 64 years old or 308 minutes per day (5.1 hr/day).

The IR_{oh} value for the 12 to 30 year age group was calculated as follows:

$$(98 \text{ mg/day})/(5.1 \text{ hr/day}) = 19.2 \text{ mg/hr}$$

Based on these age group-specific hourly outdoor soil ingestion rates, the time-weighted hourly outdoor soil ingestion rate under RME conditions (IR_{tw}) was calculated as follows:

$$([21.4 \text{ mg/hr} \times 5 \text{ yr}]/30 \text{ yr}) + ([20.7 \text{ mg/hr} \times 6 \text{ yr}]/30 \text{ yr}) + ([19.2 \text{ mg/hr} \times 19 \text{ yr}]/30 \text{ yr}) = 19.9 \text{ mg/hr}$$

IR_{twh} – Average Conditions

The IR_{twh} value under average conditions was derived following the same procedures used to derive the IR_{twh} value under RME conditions. The derivation of age group-specific IR_{oh} values is described first, followed by the derivation of the IR_{twh} value.

IR_{oh} – 0- to 5-year age group

The daily soil ingestion rate under average conditions for this age group was identified as 100 mg/day (EPA 1997a). The P_{out} value derived under RME conditions (0.45) was used for the average calculation as discussed above. As a result, the IR_{od} value or the 0 to 5 year age group was estimated as:

$$100 \text{ mg/day} \times 0.45 = 45 \text{ mg/day}$$

The t_{orec} value derived under RME conditions (4.2 hr/day) was used for the average calculation. Therefore, the IR_{oh} value for the 0 to 5 year age group was calculated as follows:

$$(45 \text{ mg/day})/(4.2 \text{ hr/day}) = 10.7 \text{ mg/hr}$$

IR_{oh} – 6- to 11-year age group

The daily soil ingestion rate under RME conditions for this age group was identified as 50 mg/day; this value is consistent with the assumption that the exposures of these children are more like those of adults than young children (DTSC 1992; EPA 1991 and 1997a).

The P_{out} value derived under RME conditions (0.91) was also used for the average calculation. As a result, the IR_{od} value for the 6 to 11 year age group was estimated as:

$$50 \text{ mg/day} \times 0.91 = 45.5 \text{ mg/day}$$

The t_{orec} value derived under RME conditions (4.4 hr/day) was also used for the average calculation. Therefore, the IR_{oh} value for the 6 to 11 year age group was calculated as follows:

$$(45.5 \text{ mg/day})/(4.4 \text{ hr/day}) = 10.3 \text{ mg/hr}$$

IR_{oh} – 12- to 30-year age group

The daily soil ingestion rate under RME conditions for this age group was identified as 50 mg/day; this value is consistent with the assumption that the exposures of these receptors are more like those of adults than young children (EPA 1997a).

The P_{out} value derived under RME conditions (0.98) was also used for the average calculation. As a result, the IR_{od} value for the 12 to 30 year age group was estimated as:

$$50 \text{ mg/day} \times 0.98 = 49 \text{ mg/day}$$

The t_{orec} value derived under RME conditions (5.1 hr/day) was also used for the average calculation. Therefore, the IR_{oh} value for the 12 to 30 year age group was calculated as follows:

$$(49 \text{ mg/day})/(5.1 \text{ hr/day}) = 9.6 \text{ mg/hr}$$

Based on these age group-specific hourly outdoor soil ingestion rates, the time-weighted hourly outdoor soil ingestion rate under average conditions (IR_{twh}) was calculated as follows:

$$([10.7 \text{ mg/hr} \times 5 \text{ yr}]/30 \text{ yr}) + ([10.3 \text{ mg/hr} \times 6 \text{ yr}]/30 \text{ yr}) + ([9.6 \text{ mg/hr} \times 19 \text{ yr}]/30 \text{ yr}) = 9.9 \text{ mg/hr}$$

It should be noted that exposure duration of 30 years used to calculate IR_{twh} under average conditions rather than the 9 year exposure duration used in the exposure calculations. This was done to be consistent with the procedure used to develop other time-weighted exposure parameter values used under average exposure conditions and to better reflect the relative contributions of age group-specific ingestion rates.

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ATTACHMENT 5

ESTIMATION OF EMISSIONS AND BREATHING ZONE CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS (VOC) DURING SPRAY IRRIGATION

ATTACHMENT 5

ESTIMATION OF EMISSIONS AND BREATHING ZONE CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS (VOC) DURING SPRAY IRRIGATION

Consistent with the Community Reuse Plan adopted by the Alameda Reuse and Redevelopment Authority (ARRA), all or a portion of Site 1 may be developed as a golf course (ARRA 1996). Based on an informal survey of bay area golf course superintendents and groundskeepers, such a golf course may be irrigated using groundwater (Tetra Tech 1999). Therefore, inhalation exposures to volatile organic compounds (VOC) during spray irrigation of a hypothetical golf course constructed at Site 1 in Operable Unit (OU) 3 of Alameda Point were evaluated. Emissions and breathing zone concentrations of VOCs were estimated using a model which assumes that all the VOCs present in groundwater pumped through a sprinkler are released into the air during spraying, and incorporates many of the factors that influence the release of VOCs during spraying.

As discussed elsewhere in the OU 3 human health risk assessment (HHRA) (Appendix C), it was assumed that a groundwater pumping well would not be installed within Site 1, because Site 1 is a landfill and is expected to be capped. Therefore, two potential groundwater pumping well locations were evaluated. The first location is adjacent to the eastern edge of Site 1 near monitoring well M031-A. A second location is east of the runway near well cluster HP1-2. The results of groundwater modeling at these two locations is presented in Attachment 6 to Appendix C. The groundwater modeling focused on four VOCs including benzene; 1,2-dichloroethene (total); trichloroethene; and vinyl chloride. These VOCs were selected for three main reasons: (1) they were found at the highest concentrations within the First Water-Bearing Zone (FWBZ) beneath Site 1; (2) VOCs are generally the most mobile class of chemicals detected in groundwater from the FWBZ and, therefore, would be expected to migrate most quickly and be found at the highest concentrations at wells located outside the groundwater plume; and (3) all of the selected VOCs (except 1,2-dichloroethene [total]) are considered to be potential carcinogens (EPA 1998a)

Estimated VOC concentrations in groundwater at the theoretical pumping well located near monitoring well M031-A were combined with the irrigation modeling described below to estimate VOC emissions and breathing zone concentrations to which receptors may be exposed.

Inhalation exposures to VOCs depend on three factors: (1) the rate of chemical release into the air; (2) the buildup and decay of VOCs in the ambient air to which receptors may be exposed; and (3) the rate of inhalation while spray irrigation is occurring and after spray irrigation has stopped.

The VOC generation rate at the golf course can be estimated from Equation 5-1:

$$S = C_{wc} (FR) / EB \qquad (5\text{-}1)$$

where:

S = VOC generation rate ($\mu g/m^3$- min)

C_{wc} = Groundwater concentration ($\mu g/L$)

FR = Irrigation water flow rate (L/min)

EB = Exposure box air volume (m^3)

A one-box outdoor air pollution model was used to estimate VOC air concentrations in the breathing zone at a hypothetical golf course constructed at Site 1 in OU 3 at Alameda Point. This model assumes that the air at the golf course to which receptors including groundskeepers, other employees, and golfers may be exposed can be estimated as a box. For the purposes of estimation the box was assumed to have an area equal to the coverage area of a representative sprinkler operating at a discharge rate of 11 gallons per minute (gpm), which represents the pumping rate used during the pump test conducted at monitoring well M031-A (PRC 1996) and in the groundwater modeling (see Attachment 6). The diameter of the area covered by such a sprinkler was estimated as 30.5 meters (IGIN 1999); therefore, the area covered was estimated as 232.6 square meters. Also, the box was assumed to be 2 meters high. Therefore, the volume of the box was estimated as 465.2 cubic meters (m3). It was also assumed that the air moves through the coverage area at a rate equal to the average annual wind speed. This model can be expressed as a differential equation:

$$d\,Ca/dt = -RCa + S \qquad (5\text{-}2)$$

where:

Ca = VOC air concentration ($\mu g/m^3$)

R = Air exchange rate (min^{-1})

The value of R was estimated as shown in Equations 5-3 and 5-4:

$$r = (D_1/W) \times CF \qquad (5\text{-}3)$$

where:

r	=	The length of time air entering the exposure box remains in the box (minutes [min]); 0.23
D_1	=	Diameter of the sprinkler coverage area; represents average sprinkler coverage for sprinklers with a discharge rate of approximately 11 gallons per minute (11 gpm) (IGIN 1999); 30.5 meters
W	=	Average annual wind speed; 2.25 meters per second (ASTM 1997)
CF	=	Minute per second; 0.0167

The value of R can be estimated as:

$$R = r^{-1}$$

$$R = 4.3 \text{ min}^{-1} \qquad (5\text{-}4)$$

It should be noted that this model assumes instantaneous mixing of the air and no chemical decay of VOCs once they are released.

When Equation 5-2 is integrated, the time-dependent concentration is estimated as:

$$Ca(t) = (S/R)\,(1 - \exp[-Rt]) \qquad (5\text{-}5)$$

where:

Ca(t)	=	Air concentration at time t (μ/m^3)
t	=	Irrigation duration time (min)

General input parameters for the irrigation model are presented in Table 5-1. Chemical-specific parameters and model outputs are presented in Table 5-2.

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TABLE 5-1

INPUT PARAMETERS FOR THE IRRIGATION MODEL

Parameter	Value	Reference
Irrigation water flow rate (FR) (L/min)	42	PRC 1996[a]
Air exchange rate (R) (min^{-1})	4.3	Calculated[b]
Exposure box volume (SV) (m^3)	1,461	Professional judgment[c]
Irrigation duration (t) (min)	60	Professional judgment[d]

Notes:

L/min = Liter per minute
m^3 = Cubic meter
min = Minute
min^{-1} = Per minute

[a] This was the pumping rate used to perform the pump test at monitoring well M031-A (PRC 1996). This was also the pumping rate used to perform the groundwater modeling (see Attachment 6).

[b] Calculated using Equations 5-3 and 5-4.

[c] The area of the exposure box was assumed to be equal to the area covered by a representative sprinkler operating at a discharge rate of 11 gallons per minute (see footnote "a"); the diameter of this area was estimated as 30.5 meters (IGIN 1999). The area was calculated as Pi x $(D/2)^2$. Also, the box was assumed to be 2 meters high; this height approximates the height of an average adult.

[d] Irrigation of bay area golf courses generally occurs at night when no receptors are present (Tetra Tech 1999). However, for purposes of this evaluation, it was assumed that a groundskeeper was exposed for 1 hour (60 minutes) per day.

TABLE 5-2

ALAMEDA POINT OU3 HHRA
ESTIMATION OF VOLATILE EMISSIONS AND
BREATHING ZONE CONCENTRATIONS DURING SPRAY IRRIGATION

COPC	Irrigation Groundwater Concentration[a] (μg/L)	VOC Generation Rate (S)[b] (μg/m^3 - min)	Concentration of VOC in the Breathing Zone During Garden Irrigation[c] (μg/m3)
Benzene	2.4	0.069	0.016
1,2-Dichloroethene (total)	23.2	0.667	0.156
Trichloroethene	1.2	0.034	0.008
Vinyl Chloride	8.9	0.256	0.060

Notes:

COPC = Chemical of potential concern
μg/L = Microgram per liter
μg/m^3 = Microgram per cubic meter
μg/m^3 - min = Microgram per cubic per minute

[a] Calculated as the average concentration over a 25-year employment period from the chemical-specific concentration versus time plots created using groundwater modeling (see Attachment 6) for a theoretical pumping well located near monitoring well M031-A. Specifically, a concentration was estimated at the midpoint of each 1,000 day period through 9,000 days (approximately 25 years). If the chemical-specific concentration for a period was reported as "less than zero" on the concentration versus time plot, a value equal to one-half of the chemical-specific detection limit as reported in Appendix I was used. The concentrations for each of the nine 1,000-day periods were averaged to arrive at the estimated average groundwater concentration.

[b] Calculated using Equation 5-1.

[c] Estimated using Equation 5-5.

ATTACHMENT 6
GROUNDWATER MODELING

ALAMEDA POINT GROUNDWATER MODELING

As part of the Alameda Point OU-3 Human Health Risk Assessment (HHRA) evaluation, groundwater modeling was performed to assess contaminant migration in the first water-bearing zone towards a hypothetical irrigation well installed at two different locations east of Site 1. Groundwater contaminant concentrations at each irrigation well, modeled over a 30-year period, were compared to maximum contaminant levels (MCL) to evaluate risk for a potential drinking water pathway. Groundwater contaminant concentrations were subsequently used in a HHRA to evaluate the irrigation pathway for an occupational receptor.

The computer program MODFLOW was used to perform the groundwater modeling. MODFLOW was developed by the U.S. Geological Survey and consists of a finite-difference model and associated modular components. Additional models developed to work in conjunction with MODFLOW include MODPATH and MT3D. MODPATH and MT3D simulate the movement of groundwater particles and contaminants in groundwater, respectively. The output from these programs can be used to illustrate features such as direction and rate of groundwater flow, extent of contaminant migration in groundwater, and contaminant concentrations at various points in time.

The initial step in the modeling process involved calibration of input parameters in the groundwater flow model. Where available, site-specific data such as aquifer transmissivity and aquifer thickness was used as input for aquifer parameters. Input parameters used in the groundwater model are presented in Table 6-1. A low-hydraulic conductivity wall was used in the model to simulate the barges along the shoreline on the western Site 1 boundary. Groundwater elevation data indicates that the barges restrict groundwater movement toward the bay in this area. Groundwater levels in the model were calibrated to recently collected groundwater levels. After running the groundwater flow portion of MODFLOW, water levels from the calibrated (steady state) groundwater model were compared to actual measured groundwater levels. If the modeled water levels were not similar in elevation to the measured water levels, the input parameters in the model were adjusted, within reasonable tolerances, and the model was rerun until the modeled water levels were similar to the measured water levels.

As a measure of the model calibration, MODFLOW calculates a mean error (ME), mean absolute error (MAE), and root mean squared error (RMSE) between the modeled and measured groundwater levels. ME is the summation of the differences between modeled and measured water levels for each

observation well, divided by the total number of observation wells. MAE is the same as the ME except the absolute difference between the modeled and measured water levels are summated. RMSE is the square root of the sum of the square of the differences between the modeled and measured heads, divided by the number of observation wells. Ideally, if the modeled and measured heads were equal, the ME, MAE, and RMSE values would be 0; therefore, the closer these values are to 0, the better the calibration of the model. The ME, MAE, and RMSE values for the calibrated Site 1 model were -0.70198, 0.745465, and 0.893174, respectively. Differences in the modeled and measured heads can be attributed to tidal fluctuations which affect groundwater levels in some wells at Site 1. In wells that are tidally influenced, groundwater levels in monitoring wells fluctuate from 0.11 to 3.84 feet. To calibrate the model, a value between the high and low tide groundwater levels for each well was selected as the calibration target. Error in the estimation of these groundwater levels likely contribute to the error calculated by the model. However, based on the error calculations, the model is sufficiently calibrated to perform additional modeling such as contaminant transport.

After calibrating the steady state model, contaminants including vinyl chloride; 1,2-dichloroethene (DCE); trichloroethene (TCE); benzene, were modeled using MT3D along with MODFLOW to determine future concentrations in each irrigation well proposed under the HHRA scenario. The groundwater model was run separately for irrigation wells placed at two different locations. Irrigation Well 1 was placed at well cluster M031, directly east of the landfill, and Irrigation Well 2 was placed at Hydropunch cluster HP1-2, directly east of the runway.

For each scenario, the irrigation well was pumped at 11 gallons per minute (gpm) for 30 years. Contaminant concentrations at the well were observed over the 30-year time frame. A pumping rate of 11 gpm was selected as the approximate maximum yield of the aquifer based on pump test data for Site 1 (TtEMI 1996). Input values required in MT3D include adsorption, biodegradation, aquifer bulk density, aquifer organic carbon content, and dispersion values. These values were obtained from the OU-3 RI and various literature sources and are presented in Table 6-1. Initial contaminant concentrations were based on contaminant plume maps presented in Figures 6-29 and 6-30 of the OU-3 RI and the Technical Memorandum for Aquifer Test Data Analysis (Tetra Tech 1996). For contaminant modeling, it was assumed that the contaminant plumes, as depicted in Figures 6-29 and 6-30 of the OU-3 RI, were at steady state conditions and would act as continuing sources of contaminants in groundwater. The steady state assumption was based on the fact that the buried material in the landfill has been present for a sufficient period of time to reach steady-state contaminant loading.

MODEL RESULTS

Based on model results, concentrations of vinyl chloride, 1,2-DCE, benzene, and TCE never exceeded MCLs at Irrigation Well 2 during the 30-year time frame. Vinyl chloride, 1,2-DCE, and benzene concentrations did however exceed MCLs from Irrigation Well 1 during the 30 year time frame. Vinyl chloride was detected above its MCL in Irrigation Well 1 from the initiation of pumping to approximately 7.6 years in the future; 1,2-DCE was detected above its MCL in Irrigation Well 1 from the initiation of pumping to approximately 6.5 years in the future; and benzene was detected above its MCL in Irrigation Well 1 from the initiation of pumping to approximately 14.4 years in the future. Results of the contaminant concentrations in Irrigation Well 1 are presented in Figures C6-1 through C6-4.

Contaminants including vinyl chloride, 1,2-DCE, and benzene would be extracted from Irrigation Well 1 in excess of MCLs for a period of up to 14.4 years. These results are expected because the edge of the contaminant plumes, shown in Figures 6-29 and 6-30 of the OU-3 RI, are about 225 feet downgradient from Irrigation Well 1 located near M031-A. The 11 gpm pumping rate of the irrigation well draws a portion of the contaminant plumes into the well; however, uncontaminated groundwater is also drawn into the well at the same time. The uncontaminated groundwater dilutes the contaminated groundwater and the dilution continues until a steady state of contaminated and uncontaminated water being drawn into the well is reached for each contaminant. The results of the modeling for Irrigation Well 1 for all the contaminants are presented in Figures C6-1 through C6-4.

PAGE NO. 6 - 4

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TABLE 6-1

MODFLOW AND MT3D INPUT PARAMETERS

Parameter	Value
Hydraulic Conductivity	3.53×10^{-4} cm/s
Porosity	0.3
Recharge Rate	12 in/yr
Bulk Density	48.136 kg/ft^3
Fraction Organic Carbon	0.02
Adsorption (K_d)[a]	
Vinyl Chloride	0.13 ft^3/kg
1,2-DCE	0.031 ft^3/kg
TCE	0.09 ft^3/kg
Benzene	0.043 ft^3/kg
Biodegradation[b]	
Vinyl Chloride	365 days
1,2-DCE	365 days
TCE	730 days
Benzene	365 days

Notes:

cm/s Centimeters per second

DCE Dichloroethene

ft^3/kg Cubic feet per kilogram

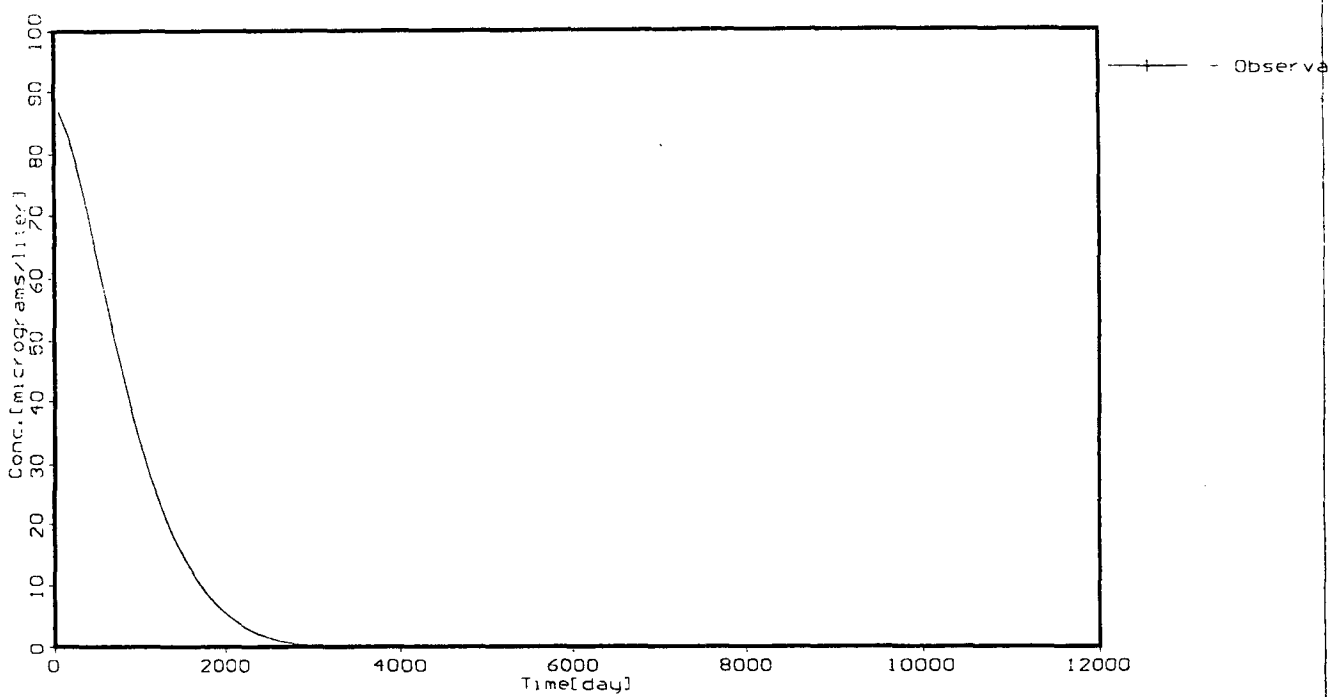
in/yr Inches per year

kg/ft^3 Kilograms per cubic foot

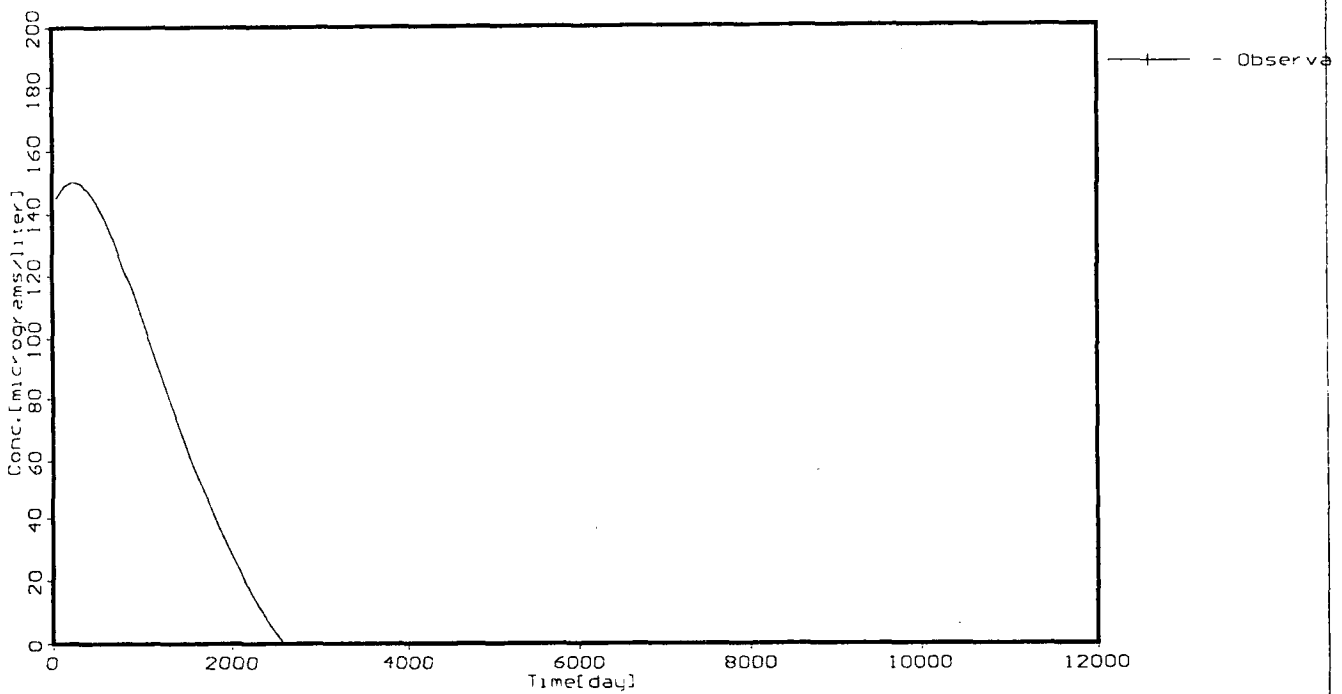
TCE Trichloroethene

[a] Value obtained from EPA (1996)

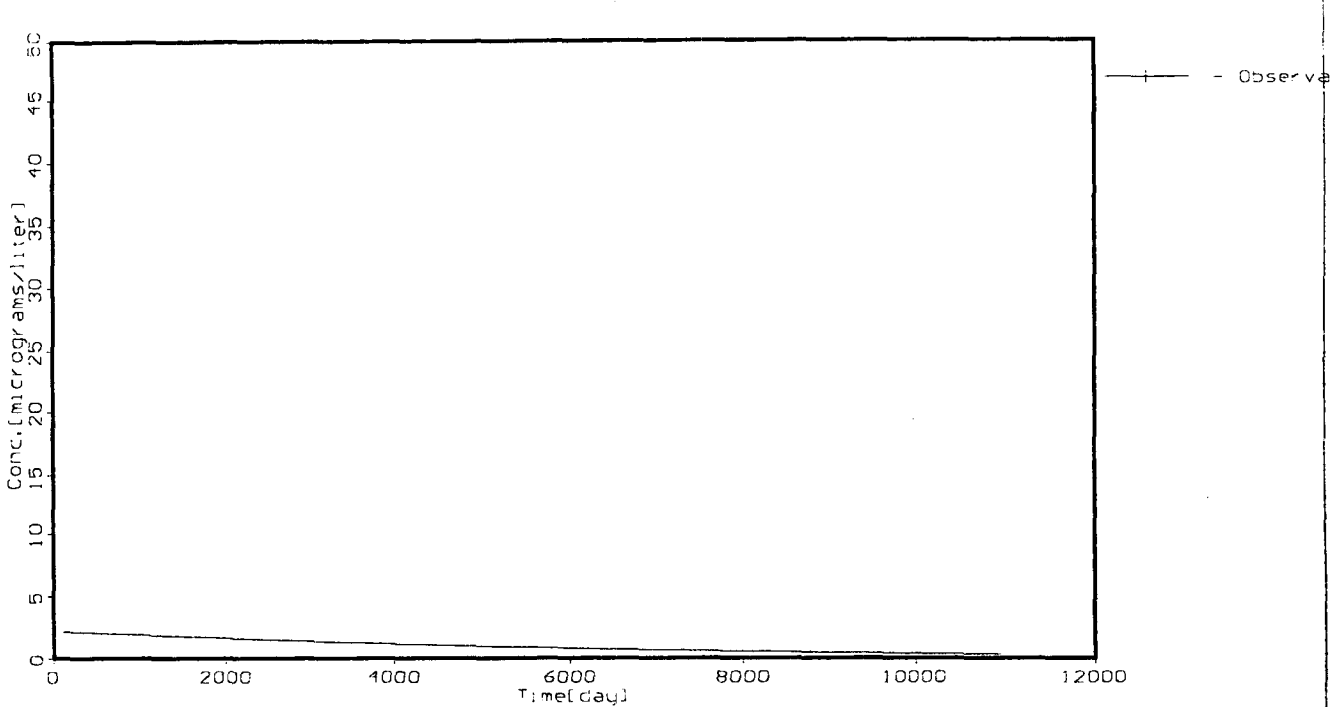
[b] Value obtained from Howard and others (1991)



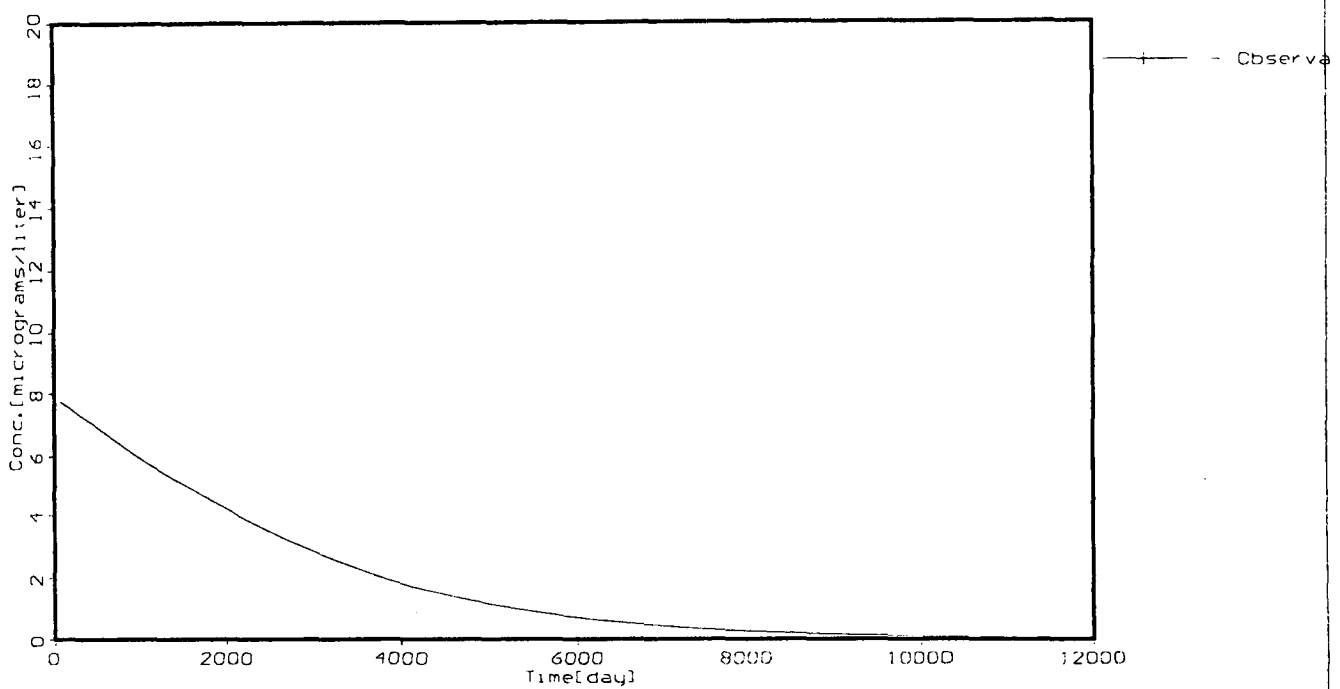
PRC EMI – Chicago, IL Project: Fig C6-1 30 Yr Vinyl Cl Description: Site 01 Pump 1 – 11gpm 11 May 99	Visual MODFLOW v.2.50, (C) 1995-1997 Waterloo Hydrogeologic Software NC: 50 NR: 50 NL: 1 Current Layer: 1



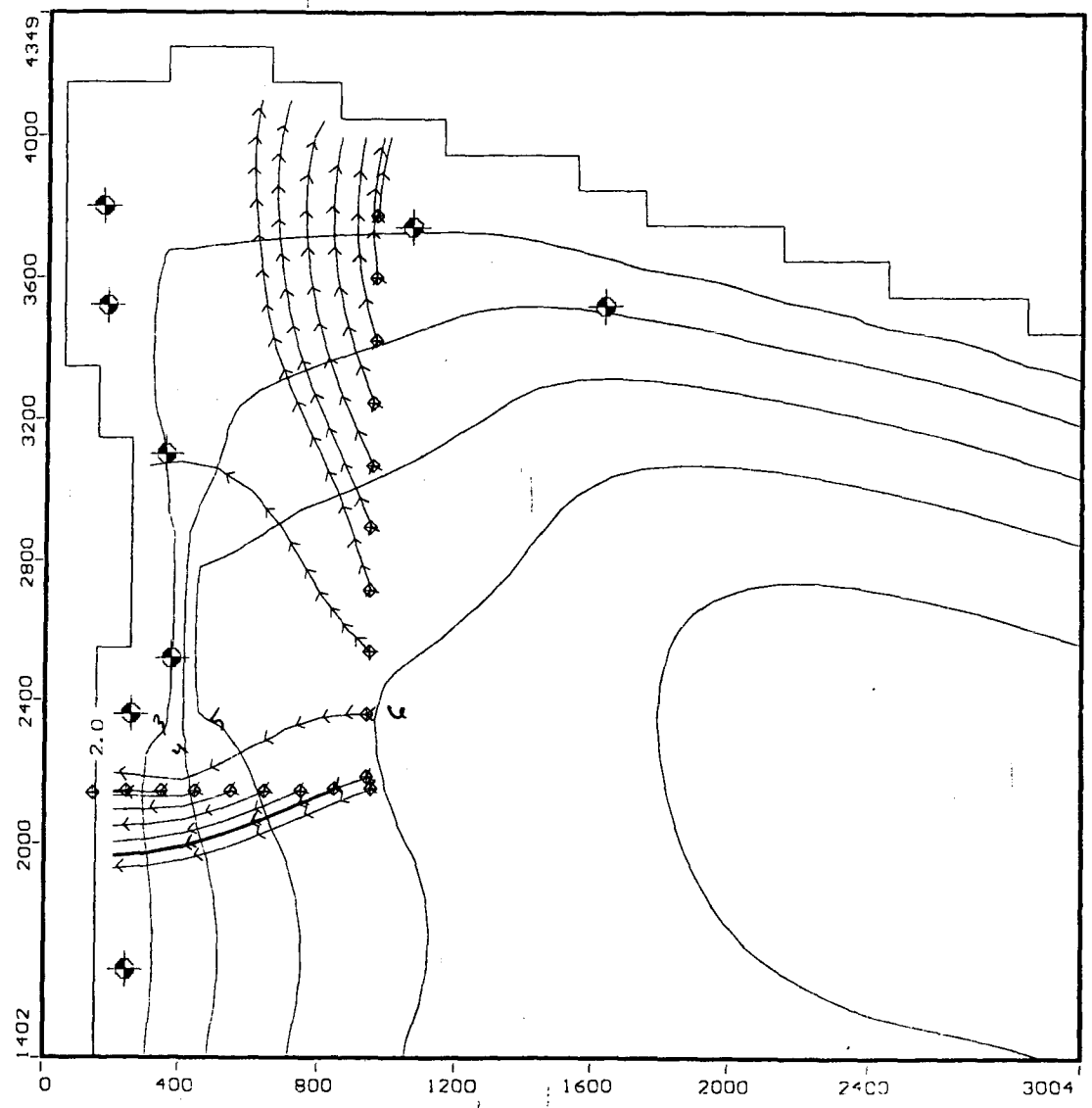
PRC EMI – Chicago, IL Project: Fig C6–2 30 Yr DCE Description: Site 01 Pump 1 – 11 gpm 11 May 99	Visual MODFLOW v.2.50, (C) 1995–1997 Waterloo Hydrogeologic Software NC: 54 NR: 50 NL: 1 Current Layer: 1



PRC EMI – Chicago, IL Project: Fig C6-3 30 Yr TCE Description: Site 01 Pump 1 – 11 gpm 11 May 99	Visual MODFLOW v.2.50, (C) 1995–1997 Waterloo Hydrogeologic Software NC: 54 NR: 50 NL: 1 Current Layer: 1

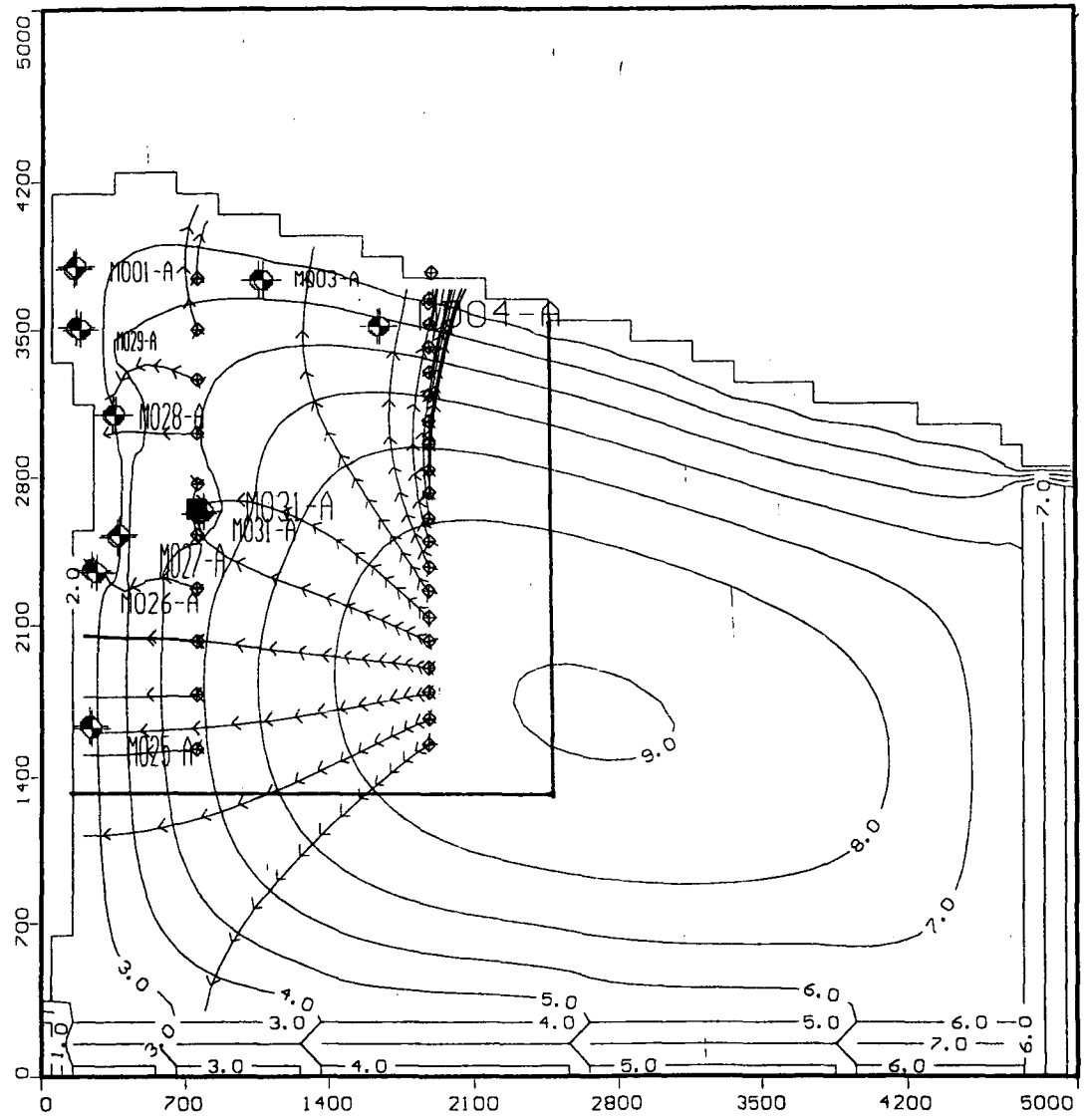


PRC EMI – Chicago, IL Project: Fig C6-4 30 Yr Benzene Description: Site 01 Pump 1 – 11 gpm 11 May 99	Visual MODFLOW v.2.50, (C) 1995–1997 Waterloo Hydrogeologic Software NC: 54 NR: 50 NL: 1 Current Layer: 1



PRC EMI – Chicago, IL
Project: Alameda Particle Track
Description: Site 01 Steady State
27 Apr 99

Visual MODFLOW v.2.50, (C) 1995–1997
Waterloo Hydrogeologic Software
NC: 50 NR: 50 NL: 1
Current Layer: 1



PRC EMI – Chicago, IL
Project: Alameda 30 Year Flowpath
Description: Site 01 Pump 1 – 11gpm
29 Apr 99

Visual MODFLOW v.2.50, (C) 1995–1997
Waterloo Hydrogeologic Software
NC: 50 NR: 50 NL: 1
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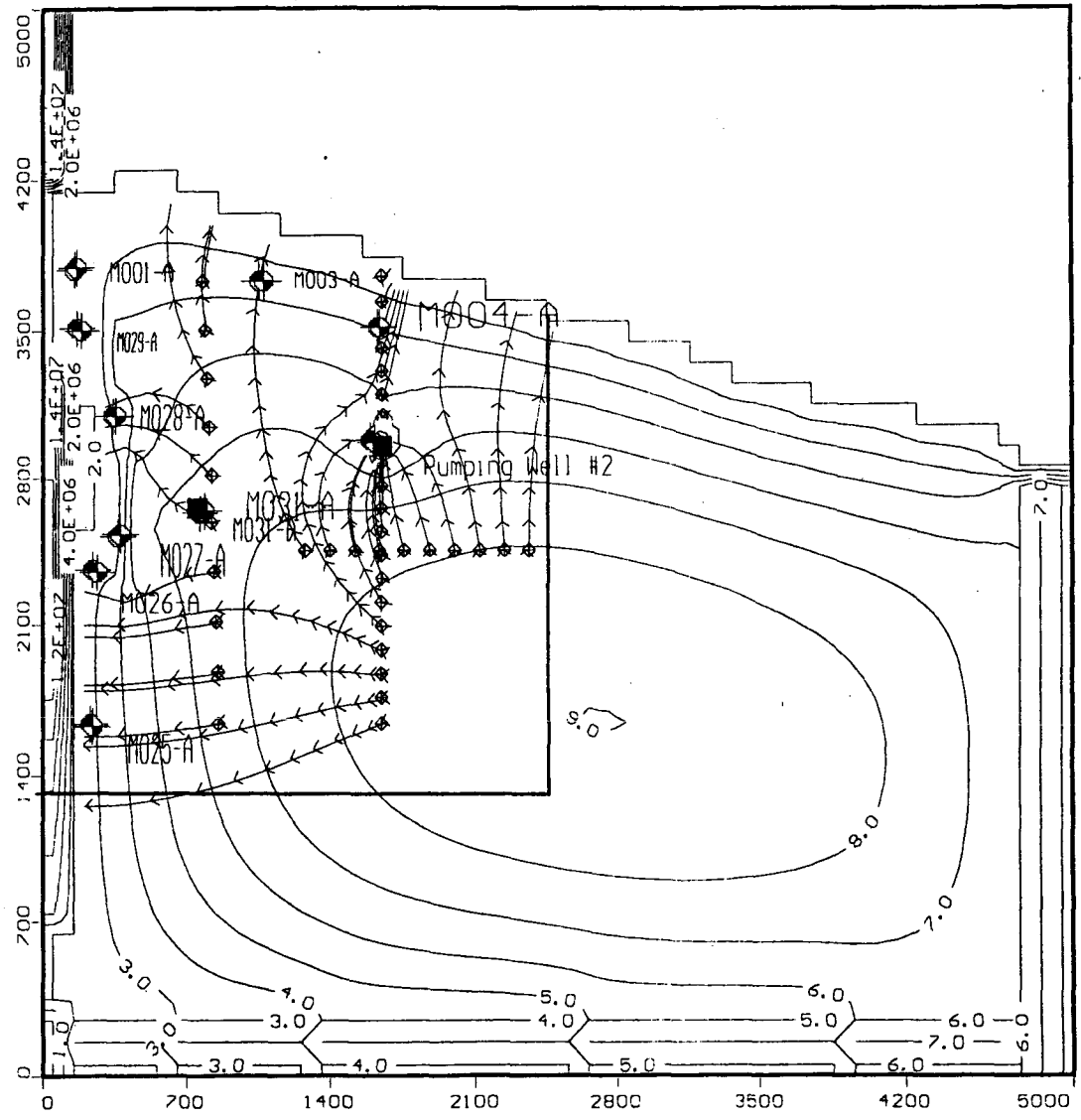

PRC EMI – Chicago, IL
Project: Alameda 30 Year TDS–ug/l
Description: Site 01 Pump 2 – 11gpm
29 Apr 99

Visual MODFLOW v.2.50, (C) 1995–1997
Waterloo Hydrogeologic Software
NC: 50 NR: 50 NL: 1
Current Layer: 1

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APPENDIX D

INVESTIGATION TECHNIQUES

APPENDIX D
INVESTIGATION TECHNIQUES

The following paragraphs describe the methods used for collection of data for the remedial investigation (RI) performed at Alameda Point. The topics discussed include a brief rationale for use of the method, a method description, and documentation and record keeping procedures.

MONITORING WELL INSTALLATION

Groundwater monitoring wells were constructed at all of the Installation Restoration sites at NAS Alameda to help determine the nature and extent of groundwater contamination. Typically, the wells were designed to intercept the first water bearing zone while not extending into the second zone. To accomplish this, the wells were constructed with the screened interval extending downward from approximately 1 foot above the water table. When aquitards were encountered, shorter screens were used (extending from 1 foot above the water table to the depth of the aquitard). For purposed of this field program, the onsite field geologist considered clay layers greater than 1-foot-thick to be aquitards. Most of the soil borings were drilled to the appropriate depths during the RI at NAS Alameda using hollow stem auger. However, air rotary casing hammer and mud rotary drill rigs were also used.

Wells were constructed with 2 or 4-inch diameter Schedule 40 PVC casing and screen. The screen slot size was 0.010-inch. A threaded shoe was placed on the bottom of wells where the screen was a full 10 feet long and a slip cap with at least three stainless steel retaining screws was placed on wells with screen shorter than 10 feet. All joints were flush threaded and watertight. The drillers used no solvent or glue on the casing joints. As discussed above, the drillers installed screens that were shorter than 10 feet long in some wells in order to not penetrate aquitards. In these wells, boreholes were backfilled with bentonite chips to the appropriate depth prior to installing the casing. When flowing sands were encountered, water from an approved on-base source was added to the borehole prior to installing the casing. The water provided hydraulic head to keep the sand from flowing into the augers during well construction.

A filter pack of Monterey sand was poured around the slotted interval of the casing. The filter pack size ranged from #1/20 to #2/12 in diameter, depending on site conditions. As the filter pack level rose in the annular space, the augers were incrementally removed. The sand level in

the auger was monitored with a weighted tag line to ensure that a small amount of sand remained in the augers at all times to prevent borehole sloughing. The filter pack typically extended from the bottom of the well to one foot above the screened interval.

After filter pack installation, a sanitary seal of bentonite pellets was installed using the same technique. Typical sanitary seal thickness was 1 to 2 feet depending on well depth. Because there was some concern about the hydrating properties of the brackish groundwater encountered at NAS Alameda, a small cup of pellets was hydrated with the same water used in the well simultaneously with the seal. The seal was considered complete when the pellets in the cup were hydrated. After the seal was hydrated, the well was grouted to the surface with a mixture of 95% Portland cement and approximately 5% bentonite slurry. The grout was installed in the annular space between the well casing and the augers in the same manner as the filter pack and bentonite seal.

After the grout had cured, the wells were finished with a surface completion consisting of a locking steel stove pipe or a flush-mounted Christie Box. The concrete was sloped slightly away from the Christie Box so water would not pond on the box lid. A State of California licensed surveyor then surveyed the well casing relative to the State Plane Coordinate system (zone 3, NAD 27) for horizontal control, and Mean Low Low Tide markers for vertical control.

Well development techniques included bailing, swabbing, and pumping. Approximately two borehole well volumes of water were bailed from the well which was then swabbed for 30 minutes. After swabbing, an additional five borehole volumes of water were then bailed from the well. A total of ten well borehole volumes were removed. All bailers and bailer parts were steam cleaned between wells. Personnel measured and recorded water quality parameters including conductivity, temperature, pH, and turbidity at the beginning of development and after every borehole volume was removed. All purged water was collected in 55-gallon drums and transported to a central location on base, where it was transferred to a single large Baker tank. The water in the Baker tank was analyzed and disposed of following investigation-derived waste protocol.

Field documentation for monitoring well construction and development consisted of boring logs, field notebooks, well construction logs, and development logs. The screened interval, blank casing interval, sand pack, seal, grout interval, and amount and type of well materials were

recorded on both the boring log and the well construction log. Start and stop times, daily events, and problems were recorded in the field notebooks. Calculations, removed volumes, and parameter measurements were recorded on the well development logs.

Decontamination procedures included steam cleaning the augers and drill rig at the beginning of the event, then by steam cleaning the augers after each boring. The rig was steam cleaned at a minimum between each installation restoration site.

Hollow stem auger, air rotary casing hammer, and mud rotary drilling methods all employed the same procedures for well construction, completion, development, decontamination, and field documentation. The basic difference is the drill rig. Site conditions and sampling objectives determined which drill rig was used. The following paragraphs give a brief description of the differences between the drill rigs.

DRILLING - HOLLOW STEM AUGER

The hollow stem auger method employs the use of a hollow stem auger mounted on a drill rig for the construction of boreholes for soil sampling and groundwater monitoring wells. The borehole is constructed by simultaneously rotating and axially advancing the auger column into unconsolidated or poorly consolidated formations. Stainless steel augers with a diameter of 8-to-12-inches were used for drilling at NAS Alameda. As the augers are rotated and advanced into the ground, they act as casing to stabilize the borehole. The pilot bit and teeth on the auger head drill into the soil and direct the cuttings to the auger flights. As the augers are rotated, the cuttings are brought to the surface by moving along the continuous flights on the outside of the hollow stem. A wooden cork at the bottom was used to plug the hollow core of the augers during drilling.

Borings were sampled continuously to the bottom of the borehole using a 1.5-foot long, 2.5-inch interior diameter steel split spoon sampler. Samplers were advanced using a 140 pound hammer with a 30 inch drop. Once retrieved, the split spoons were opened on clean aluminum foil. The soil collected within each sampler was described on a borehole log using the United Soil Classification System along with other documentation.

Borings in which monitoring wells were not constructed were grouted at the completion of drilling. The grout material consisted of Portland cement with approximately 3% bentonite powder. The grout was installed through tremie pipe inside the augers to ensure that all water in the boring was displaced and to prevent the boring from collapsing. The drillers withdrew the augers only after the grout had reached the surface.

DRILLING - AIR ROTARY CASING HAMMER

The Air Rotary Casing Hammer drilling method uses a nonrotating threaded casing that is driven simultaneously with the rotated drilling of a smaller diameter borehole while forcing filtered air from an air compressor downward through the center of the interior drill rod to the bit. The drive casing is a heavy wall flush threaded stainless steel pipe driven by a pneumatic drill mounted on a drill rig through the drive hammer. The air returns upward though the annulus between the drive casing and the smaller rotating drill rod, bringing with it a continuous discharge of drill cuttings. The cuttings are discharged into a cyclone which separates the air from the cuttings and formation water and allows the direct containment of cuttings and formation water.

Following the drilling of the borehole, the drill bit and rods are removed and well construction materials are installed in the casing. Withdrawal of the casing is accomplished by a hydraulic casing extractor system. Filter pack sand, bentonite pellets, and grout are installed in the annulus as the casing is withdrawn from the borehole.

Borings in which monitoring wells were not constructed were grouted at the completion of drilling. The grout material consisted of Portland cement with approximately 3% bentonite powder. The grout was installed through tremie pipe inside the augers to ensure that all water in the boring was displaced and to prevent the boring from collapsing. The drillers withdrew the augers only after the grout had reached the surface.

DRILLING - MUD ROTARY

The mud-rotary drilling technique involves the construction of a borehole by rotating a cutting bit into the ground at the end of a length of hollow drill pipe. The mud rotary drill rig has a pump mounted on it to force a drilling fluid through the drill pipe. The fluid consists of a mixture of bentonite mud and water. The fluid, escaping through orifices in the bit, carries the formation

cuttings to the surface via the annular space between the borehole wall and the rotating drill pipe. When the drilling fluid reaches the surface, it is pumped into the fluid treatment equipment, which consists of a shale shaker, settling chambers, pumps, and cyclone separators. This equipment is designed to remove the silts, sands, and solids from the drilling fluid. A mud pump then recycles the drilling fluid back down the drill pipe. Following the drilling of the borehole, well construction materials are installed in the casing. Filter pack sand, bentonite pellets, and grout are installed in the annulus as the casing is withdrawn from the borehole.

Borings in which monitoring wells were not constructed were grouted at the completion of drilling. The grout material consisted of Portland cement with approximately 3% bentonite powder. The grout was installed through tremie pipe inside the augers to ensure that all water in the boring was displaced and to prevent the boring from collapsing. The drillers withdrew the augers only after the grout had reached the surface.

GEOPROBE SAMPLING

At each soil and/or groundwater Geoprobe boring, samples were collected at discrete intervals with a hydraulic powered probe-sampling machine (the Geoprobe). The Geoprobe is mounted in the bed of a pick-up truck or van and is capable of collecting soil and groundwater samples up to 80 feet below ground surface or until refusal from an impervious object. The Geoprobe was used to complement the RI sampling activities because of the ability of the Geoprobe to access confined locations more easily than a drill rig. Also, the Geoprobe generates much less investigation-derived waste (IDW) than conventional drilling techniques.

GEOPROBE SOIL SAMPLING METHODOLOGY

Soil sampling was conducted using both a 1.4-inch diameter by 2-foot long core barrel with a retractable piston drive point and a 2-inch diameter by 4-foot long core barrel continuous sampler.

The 1.4-inch diameter by 2-foot soil sampler is known as a large bore (LB) sampler. The sampler uses a retractable piston that allows the collection of soil samples at discrete sample depths. To collect a soil sample, the LB sampler is driven to the top of the sampling interval and a set screw that prevents the piston from moving is removed. The sampler is then driven 2 feet, to the bottom

the sampling depth. As the sampler is driven into the soil, the soil is forced into a 1-inch diameter acetate liner in the LB sampler while the soil displaces the piston in the sampler. The sample is then removed from the boring, the sampler disassembled, and the soil sample removed.

The 2-inch diameter by 4-foot soil sampler is know as a macro core (MC) sampler. The MC sampler collects a continuous (up to 4 feet in length), 1.5 inches in diameter, sample. In sandy soils, the MC sampler is mostly used where sampling depths are less than 4 feet . In clay and silty soils, the MC sampler is mostly used above the water table.

After the soil sample is collected, the sample liner containing the soil is then cut to specified length to represent a discrete depth. Teflon squares are placed on the ends of the sample liner and are subsequently capped with vinyl end caps. A label identifying the time, date, boring number, sample depth, and sample number is placed on the sample liner. The samples are placed into an ice chest, preserved at 4°C, and shipped to the assigned laboratory for analysis. Soil cuttings are placed in a 55-gallon drum for storage prior to disposal. The soil samples are decontaminated prior to reuse and the boring is backfilled with a mixture of 95% Portland cement and 5% bentonite slurry.

GEOPROBE GROUNDWATER SAMPLING METHODOLOGY

Groundwater samples are collected by the Geoprobe using a 1-inch diameter by 2-foot long mill-slotted well point groundwater sampler. The sampler has 0.02-inch mill cut slots that are 1.7-inches long. The slotted pipe is driven to the desired sample depth and allowed to fill with groundwater. For volatile organic analysis, polyethylene tubing is placed inside the drill pipe and lowered into the groundwater sampler. The top of the tubing is bent, thereby forming a seal at the top of the tubing. The seal allows the groundwater to remain inside the tubing as it is removed from the drill rod. The water inside of the tubing is placed inside the sample container by straightening out the bend in the tubing. This is done to minimize the disturbance to the groundwater and possible release of volatile organic compounds from the groundwater. Containers for all other analytes are filled with the use of a peristaltic pump, that pulls the groundwater to the surface for dispensation into the sample containers. A label identifying the time, date, boring number, sample depth, and sample number is placed on the sample container. The samples are placed in an ice chest, preserved at 4°C, and shipped to the assigned laboratory for analysis. After the sample is collected, the drill rod is withdrawn from the borehole and

decontaminated prior to reuse, and the boring is backfilled with a mixture of 95% Portland cement and 5% bentonite slurry.

Field documentation for Geoprobe soil and groundwater sampling was recorded on boring logs and field notebooks. The documentation consisted of start and stop times, daily events, and problems encountered.

CONE PENETROMETER/HYDROPUNCH

The CPT consists of an electro-mechanical cone that is hydraulically pushed vertically through the soil at a constant rate using a CPT rig while physical parameters are electronically recorded. These physical parameters are (1) penetration resistance as measured at the cone tip, (2) friction as measured on a friction sleeve, and (3) pore pressure as measured directly behind the cone tip. A continuous profile of these three parameters with depth provides a qualitative interpretation of soil lithology.

The primary objective of the HydroPunch sampling was to obtain grab groundwater samples at discrete locations in the second water-bearing zone for an evaluation of groundwater quality. The data were used to evaluate the necessity of deep groundwater monitoring wells. At several sites, HydroPunch groundwater samples were obtained from the first water-bearing zone to assist in locating shallow monitoring wells. The HydroPunch sampler consists of a 3.5-foot disposable polyvinyl chloride (PVC) screen and stainless steel drive tip which was advanced by direct push using the CPT vehicle and CPT rods. The screened segment was encased in the rods during advancement. When the final depth was attained, the rods were partially retracted to expose the PVC screen. Groundwater was collected with a 3-foot long, 0.5-inch diameter PVC bailer. After collection of the groundwater sample, the disposable PVC screen and stainless steel drive tip were left in the ground and the drill rods were removed. The holes were grouted simultaneously as the rods were removed.

The CPT/HydroPunch sampling program consisted of CPT advancement combined with HydroPunch groundwater sampling at selected locations. The objective of CPT advancement was to obtain supplemental lithologic information and evaluate the depth and thickness of the second water-bearing zone for the purpose of selecting HydroPunch sample depths.

Field documentation for CPT and HydroPunch activities was recorded on the CPT logs and in the field notebooks. The CPT logs were computer generated and included values for the physical parameters measured. Field notebook documentation consisted of start and stop times, daily events, and problems encountered.

HAND AUGER SOIL SAMPLING

Hand auger sampling consists of an auger that is turned into the ground to the sample depth. The auger is then removed and a slide hammer is used to drive a brass tube that is contained in a hand sampler unit into the undisturbed soil formation. The hand sampler is then pulled out of the ground. The brass tube is removed from the hand sampler and the ends are covered with teflon and a plastic cap to form a seal. After the sample is obtained, the borehole is backfilled with the soil that was removed from above the sample interval.

Samples were labeled, sealed in individual bags, and stored on ice in insulated coolers, before being shipped or transported directly to the analytical laboratory on a daily basis.

Field documentation for hand auger sampling was recorded in a field notebook. The documentation consisted of start and stop times, daily events, and problems encountered.

GEOPHYSICAL SURVEYS

Proposed borehole locations were surveyed prior to drilling to determine the presence of buried utilities or other subterranean hazards. Locations were surveyed with a Geonics EM31 Conductivity Meter and a GeoMetrics 856 Magnetometer using a continuous instrument-sweep approach. The survey sweep approach consisted of repetitive back-and-forth profiling over each proposed borehole location. When the instruments gave no anomalous readings over the proposed location, the geophysicist approved the proposed boring location for drilling. When the instruments showed anomalies beneath a proposed borehole the geophysicist moved the borehole to a nearby location that was clear.

Geophysical survey equipment used included a ground penetrating radar unit (GPR), magnetic (MAG), and electromagnetic (EM) equipment.

VIDEO SURVEY

The objective of the video survey program was to verify the integrity of drain lines in Building 410 at Site 9. The drain lines at Building 410 were used to transport methylene chloride waste fluids and other solvent wastes from paint stripping operations. Cracks caused by corrosion or other stresses in the drain lines may have acted as conduits for introducing contaminants to the soil and groundwater.

The video inspection survey of the floor drain lines was conducted prior to the field investigation. Several of the drain lines had debris blockages that prevented a complete video survey.

LAND SURVEYING

The following land surveying tasks were performed at NAS Alameda, although not necessarily at every site:

- Location and elevations of soil borings and surface soil sample locations
- Location and elevations of installed groundwater monitoring wells
- Location of CPT and HydroPunch II® samples

All surveying was done by a surveyor licensed by the State of California using the California State Plane Coordinate System. Elevations were surveyed relative to the 1929 USGS Mean Lower Low Water (MLLW) datum. To remain consistent with standard survey practices used by NAS Alameda Facilities Management Office, a baseline of 100 feet was added to the MLLW datum to remove the possibility of negative elevations. Elevations of the top of the well casings and the ground surface adjacent to each were recorded. The measurement point on the casing was clearly and permanently marked for future water level measurements. Following the field work, maps were prepared by the land surveyor to show all survey locations and elevations, along with site physical features, to aid in the transfer of data. Data was also provided electronically in a specified Geographical Information System compatible format.

SLUG TESTING

Rising head slug tests were performed in each monitoring well to determine the in-situ permeability's of the aquifers. The slugs were constructed of 5-foot lengths of 1-inch diameter PVC pipe. The pipe was filled with clean sand and both ends were sealed watertight. Slugs were cleaned with Liquinox soap and deionized (DI) water prior to use in each well. A new nylon cord was also used for each well.

Data were recorded with a Hermit 1000B data logger and a 10 pound-per-square-inch transducer. The transducer was lowered to near the bottom of the well and secured with duct tape to prevent it from moving. The slug was then placed into the well and the water level allowed to stabilize and the data logger programmed. For the rising head test, the slug was quickly withdrawn from the well while simultaneously starting the data logger. The water level was allowed to recover to at least 80% of its original level before the test was stopped.

Data from the data logger was transferred to a computer with an interface cable and the manufacturer-supplied software package. Data were plotted and analyzed using the commercial software package AQTESOLV Aquifer Test solver version 1.00. This package uses the Bouwer and Rice method for partially penetrating unconfined aquifers.

SURFACE SOIL SAMPLING

Surface soil samples program were collected to help assess the extent of contaminants in surface soils. Surface soil samples were collected with a small stainless steel trowel, which was decontaminated between each sample collection with Liquinox wash and a triple DI water rinse. The samples were collected at depths ranging from 0 and 0.5 feet and were placed into glass sample jars and placed on ice for shipment to the analytical laboratory.

Field documentation was recorded in field notebooks. The documentation consisted of start and stop times, daily events, and problems encountered.

SOIL SAMPLING

Subsurface soil sampling, in conjunction with borehole drilling, is required for soil sampling from depths greater than approximately 5 feet. Subsurface soil sampling is frequently coupled with exploratory boreholes or monitoring well installation. Subsurface soil sampling may be conducted using a drilling rig or power auger. Selection of sampling equipment depends upon geologic conditions and the scope of the sampling program.

Sampling at Alameda Point was performed using a split-spoon sampler. Split-spoon samplers are available in a variety of types and sizes. Site conditions and project needs such as large sample volumes for multiple analyses determine the split-spoon sampler to be used. Figure 3 shows a generic split-spoon sampler. The split-spoon sampler is advanced into the undisturbed material beneath the bottom of the casing or borehole using a weighted hammer and a drill rod. The relationship between hammer weight, hammer drop, and number of blows required to advance the split-spoon sampler in 6-inch increments indicates the density or consistency of subsurface soil. After the split-spoon sampler has been driven to its intended depth, it should be removed carefully to avoid loss of sample material. In noncohesive or saturated soils, a catcher or basket should be used to help retain the sample. The remainder of the recovered material can then be used for visual classification of the sample and containerized for physical analysis. The entire sample (except for the top several inches of possibly disturbed material) is retained for analysis or disposal.

Field documentation was recorded in field notebooks. The documentation consisted of start and stop times, daily events, and problems encountered.

SOIL GAS SAMPLING

Soil gas surveys were conducted at Sites 7A and 14 to provide plume definition and to aid in locating monitoring wells. Soil gas probes were inserted 2 to 4 feet below ground surface. Soil gas was then drawn into the probe and purged until soil gas concentrations stabilized. Field measurements to determine stability were collected using an organic vapor analyzer. When soil gas concentrations stabilized, soil gas samples were collected by evacuating air collected in the probes through the use of a small air pump. The air was then either pumped into a Tedlar bag or

a stainless steel canister. These gas samples were then sent off site to the laboratory for analysis. Surveys were performed by Hydro-Geo-Chem of Tucson, Arizona. Full description of the methodology and results of the surveys are presented in the Phases 1 and 2A (PRC and JMM 1993b) and Phases 2B and 3 (PRC and JMM 1992b) data summary reports.

GROUNDWATER SAMPLING

Groundwater samples were collected from groundwater monitoring wells that were installed for this project. Sample analytes varied by site. In order to compute groundwater gradients, the water levels in all the wells at a site were measured prior to any sampling. Measurements were made relative to the top of the well casing.

Groundwater sampling followed a five-step procedure. First, the water level was measured and the volume of the submerged well boring (well casing plus filter pack) computed. Second, the well was purged of three well bore volumes with a (disposable) Teflon bailer. Wells were sampled after recovering to 80% of their original water level prior to bailing. During purging, water quality parameters including conductivity, temperature, pH, and salinity of the water were measured and recorded after every 5 gallons were purged. Third, a sample was collected from the well with the same bailer that was used for purging. In order to obtain representative samples, all samples were collected from the middle of the screened interval. Duplicate samples were collected from approximately 10% of the well to comply with quality assurance and quality control requirements. Next, the samples that required dissolved metals analysis, were filtered through disposable 0.45-micron filters. Finally, samples were packed in ice for shipping. All volatile organic compound samples that were collected during the same day were shipped together with a trip blank to determine if volatile compounds may have cross-contaminated the samples during shipment.

All bailers, bailer parts, and water level probes were steam cleaned at the beginning of each day using the base's approved water supply. During the day, water level probes were cleaned with Liquinox soap and DI water between wells. A new nylon cord was used for each bailer; nylon cord was never reused. Equipment blanks were collected every other day to monitor the quality of decontamination. The blanks were taken by pouring deionized water into a cleaned bailer and then pouring the water from the bailer into appropriate water sample containers. The laboratory analyzed the equipment blanks for the site specific analytes.

Field documentation for groundwater sampling consisted of labels and chains of custody for the water samples, water sample logs, a field log book, and a sample register. Field personnel filled out sample labels and chains of custody as the samples were taken. Recorded information included the amount of purged water and the measurements of water quality parameters stated above. The field log book was used to record start and stop times, problems, and other events of the day. All samples, duplicates, and blanks were recorded in the sample register.

All purged water was collected in 55-gallon drums and transported to a central location on base, where it was transferred to a single large Baker Tank. The water in the Baker Tank was analyzed and disposed of following IDW protocol.

BUILDING SURFACE SAMPLES

Building surface samples were collected at Sites 4 and 5. Both wipe and scrape samples were collected. The sampling methodology for each of these techniques is presented in the follow-on investigation for additional work performed at Sites 4 and 5 (PRC and MW 1996a).

Decontamination procedures and documentation for collection of the samples are identical to those used for other types of soil sampling.

SURFACE WATER SAMPLING

Surface water samples were collected from both wetland and subtidal areas. A description of the sampling methodology used for each of these areas is presented. Samples were field screened for determination of salinity, dissolved oxygen (DO) concentration, temperature, pH, and turbidity at all surface water sample locations.

Water from wetland stations was collected from low-lying submerged areas during ebb tides. Water samples were collected using the vacuum intercept pumping system (VIPS) or by immersion of the sample bottles in standing water at the site. The VIPS sampled water by creating negative pressure inside a vacuum box that contained the sample bottles. When the box was under vacuum, ambient atmospheric pressure forced water from the sampling location through a clean Teflon hose into a sample bottle, minimizing contamination. A clean Teflon hose was used for each station.

Water at all subtidal stations was collected using the VIPS. Sample bottles were filled from within a plexiglass clean box by technicians in arm-length polyethylene gloves to avoid airborne and surface-borne contaminants. Water was introduced directly into the sample bottles on site. The Teflon intake hose was replaced with a clean hose at each station. Placement of the VIPS intake hose at each station was as follows: the hose was secured to a stainless-steel rod with nylon cable ties, and 2 feet of the hose extended past the tip of the rod. The rod and hose were secured to the bow of the boat so that the end of the hose extended approximately 5 meters out in front of the boat and was submerged approximately 1 meter below the water surface. When pumping, the bow of the boat was pointing upcurrent. All personnel wore clean polyethylene gloves while handling the hose, and the ends of the intake hose were always coupled together until it was placed into the water.

Field logs describing the conditions under which sampling was conducted were kept at all stations where water was collected. These logs were used to record field measurements, analyses to be performed, and any other special circumstances. Logs were also kept of standard observations (such as weather or sea state), safety procedures, and instrument calibrations.

VIBRACORE SAMPLING

Vibracore sampling was performed to collect subtidal sediments in locations where gravity coring was not practical. The vibracore device consisted of a large sealed aluminum container with two offset electric motors powered by a three-phase, 220 volt generator. The samples were obtained in 6-foot long, high grade aluminum tubes that clamped to the motor assembly. A #306 stainless-steel core catcher/cutter was attached to the bottom of the tubes. The cutting tip, core catcher, and compositing equipment were cleaned in the same matter as the gravity core equipment.

To collect sediments using the vibracore, three-point anchoring was needed to keep the boat in position over each sampling location. The vibracore was lowered and retrieved by winch. Desired penetration was determined with a tape measure that ran from the top of the vibracore head to the boat. Prior to each core attempt, the depth of water was recorded from a lead line. Once on board, the core tubing, cutting tip, and core catcher were dissassembled. Each core was cut longitudinally in two places using electric shears to retrieve the sample. After the top half of the tube was removed, the entire core was photographed next to a ruler and the geotechnical properties were observed. The outside layer of each core was scraped away with a stainless steel

spoon before removing the inner portion of the core for compositing and analysis. Three replicate core samples of at least 100 centimeters in length were collected at each station. Each core yielded four subsamples. Samples were placed in pre-cleaned glass jars.

Field samples were recorded in a field log describing the conditions under which the sample was collected (time, date, water depth, sediment appearance, presence of shell hash) and any special circumstance of the collection. Logs were also kept of standard observation s (weather, sea state, wildlife), safety procedures, and instrument calibrations.

AQUIFER PUMP TEST

Aquifer tests were performed to determine the hydraulic and performance characteristics of the shallow water bearing zone at Sites 2, 4, 5, and 13 at Alameda Point. Properties that are determined include hydraulic conductivity, transmissivity, specific yield, and the storage coefficient. Water is pumped from one or more extraction wells and water levels in the well are monitored using pressure transducers. Data is collected at specific time intervals through the use of a data logger. Data from the data logger was transferred to a computer with an interface cable and the manufacturer-supplied software package. Data were plotted and analyzed using the commercial software package AQTESOLV Aquifer Test solver version 1.00. This package uses the Bouwer and Rice method for partially penetrating unconfined aquifers. Based on the drawdowns observed in the extraction wells and neighboring observation wells, the properties of the aquifer can be determined. The procedures for aquifer testing are presented in more detail in the NAS Alameda Aquifer Test Work Plan dated December 1995.

TIDAL INFLUENCE STUDY

A tidal influence study was performed to determine the effect of tides on groundwater flow and by developing a relationship with surface water/groundwater interaction. To perform the studies, groundwater and surface water levels were measured at different times during a 72-hour cycle. Data were collected for each hour of the 72 hour cycle. Surface water measurements were measured using staff gauge and other water level measurements. Groundwater levels were measured using an electronic water level indicator.

RADIOLOGICAL SURVEYS

Radiological surveys were performed to determine the presence and nature of near-surface radiological contamination and recommend interim corrective actions to limit human exposure to Site contaminants and minimize the potential for contamination dispersion. Survey areas were divided into 20-meter grid blocks. Each of the 20-meter transects that connected the grid nodes were surveyed using the Ludlum Model 19 1-inch by 1-inch NaI μR exposure rate meter. The transect was surveyed at a pace of about 0.5 meter per second. During the survey, the detector was swept back and forth across the transect over an area about 1 meter wide while keeping the detector as near to the ground surface as possible. The detector's response was visually and audibly monitored.

If elevated radiation levels were detected by the survey meter, the area of highest radiations was determined and the location was noted and marked as an anomaly. The Ludlum Model 44-10 2-inch by 2-inch NaI detector was then used to determine a count rate at the location.

At each of the anomaly locations, an in situ gamma energy spectrum was collected to identify the radioisotopes present above background levels in the soil. The instruments used to collect the spectrum were the EG&G ORTEC and MicroNOMAD™ Portable Spectroscopy System for NaI Detectors, the EG&G ORTEC ScintiPack™ and high voltage supply, and the Teledyne 2-inch by 2-inch NaI photomultiplier tube. The MicroNOMAD™ system allowed for the collection of the spectra in the field for later analysis using a personal computer and the EG&G MicroMCB™ for Windows NaI Emulator and Analysis Software, Version 1.2.

The sources of radiation present in the soil were identified by analyzing the photopeaks in the gamma energy spectrum. The MicroMCB™ software has the capabilities of comparing the photopeak energies to radioisotopes in its library and selecting the best match. This computer analysis was then verified using radiological information and decay tables. The accuracy of the computer analysis is based on the efficiencies of the energy and efficiency calibrations performed with a known radioactive standard.

All in situ energy spectra were collected at each anomaly in the same manner. The detector setup involved suspending the photomultiplier tube, coupled to the preamplifier, from a tripod so that the detector would remain 3 inches above the ground surface. The duration of the counting time

was either 15 or 30 minutes, and the spectrum was collected on the buffer of the MicroNOMAD™ system. The buffer was periodically downloaded onto a personal computer and stored on the computer hard disk and a floppy disk. Analysis was performed on the personal computer using MicroNOMAD™ software.

APPENDIX E

PRESUMPTIVE REMEDY TECH MEMO

Tetra Tech EM Inc.

To: File

Date: August 6, 1999

Re: Applicability of the United States Environmental Protection Agency (EPA) Presumptive Remedy to Cap the IR Site 1 Landfill

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This memorandum outlines the remedial investigation (RI) report preparation approach to be followed by Tetra Tech EM Inc. (TtEMI) for Installation Restoration (IR) Site 1 at Alameda Point. IR Site 1 contains the 1943-1956 landfill and a pistol range area located west of the landfill (Figure E-1). The landfill consists of seven waste disposal cells occupying an area of approximately 14.7 acres and a burn area of approximately 4 acres. The pistol range area, which includes a pistol range, a shotgun range, and a disposal area, is about 220 feet by 200 feet (approximately 1 acre) in area. A 24-acre cap is proposed to cover IR Site 1.

The U.S. Environmental Protection Agency (EPA) established source containment as the presumptive remedy for municipal landfill sites regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in September 1993 (EPA 1993). The presumptive remedy also applies to all appropriate military landfills per the publication "Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills" (EPA 1996). The appropriateness or applicability of the presumptive remedy is based on the type of wastes disposed of at the landfill, landfill size, and proposed site reuse as discussed later in this memorandum. The Navy plans to implement the presumptive remedy at IR Site 1 by placing a 24-acre cap over the site. The landfill at IR Site 1 qualifies for the presumptive remedy per the memo "Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills" (EPA 1996). The presumptive remedy contains provisions for a landfill cap, hot spot removal (for example the pistol range, radiological dials, and unexploded ordnance [UXO]), groundwater and leachate treatment, landfill gas collection and treatment, and institutional controls (EPA 1993).

The following sections discuss the applicability of the presumptive remedy to the landfill at IR Site 1, the impact of using the presumptive remedy on the RI report preparation approach, and the media to be addressed as a part of the IR Site 1 RI.

A. Determination of the Applicability of the Presumptive Remedy

The applicability of the presumptive remedy to the IR Site 1 landfill was determined by evaluating the characteristics of the landfill in accordance with Highlights 3 and 4 of the EPA guidance (EPA 1996). The discussion below follows the criteria listed in the "Decision Framework for the Evaluation of Applicability of the Presumptive Remedy to Military Landfills" and Exhibit 4 as presented in the above referenced document.

1. What Information Should be Collected?

This step involves determination of the sources, types, and volumes of landfill wastes. This information is then used in subsequent steps for determining the applicability of the presumptive remedy at a particular site. Information available on the sources, types, and volumes of landfill wastes disposed of at IR Site 1 was assembled via personnel interviews and historical Navy document searches at Alameda Point. The information is summarized in the Final Operable Unit 3 (OU-3) RI report.

2. How May Land Reuse Plans Affect Remedy Selection?

The EPA guidance states that for smaller landfills (generally less than two acres in size), land reuse plans may influence the decision on the practicality of excavation and consolidation or treatment of landfill contents. However, the 24 acres proposed to be included beneath the landfill cap at IR Site 1 is significantly larger than the small landfill defined in the guidance. Therefore, excavation and consolidation or treatment of the landfilled materials is not considered a practical alternative at IR Site 1.

3 and 4. Do Landfill Contents Meet Municipal Landfill-type Waste Definition? Are Military Wastes Present?

EPA guidance states that military waste, especially high-hazard military wastes (for example chemical warfare agents, artillery, and bombs), may possess unique safety, risk, and toxicity characteristics. If military waste is present at a site, the guidance requires consultation with specialists in military wastes to determine if the military waste falls into the low-hazard or high-hazard waste category.

Materials known to have been disposed of in the seven disposal cells at the IR Site 1 landfill include old aircraft engines, kitchen scraps and garbage from ships in port, cables, scrap metal, waste oil, paint waste, solvents, cleaning compounds, construction debris, dredge spoils, medical waste, ash from the incinerator located in Building 68 and low-level radiological material (Canonie 1990). Additionally, a limited quantity of ordnance was disposed of in an area of the pistol range at IR Site 1.

The low-level radiological materials and the ordnance are the only military-specific wastes disposed of at IR Site 1. The Navy is working with military waste specialists in addressing the two military-specific wastes at the site as described below.

Radiological Wastes

The Navy has been addressing low-level radiological waste at IR Site 1 under a radiological removal action being conducted under the supervision of the Radiological Affairs Support Office based in Virginia. The radiological removal action is being conducted in accordance with a removal action work plan (TtEMI 1998) and a health and safety work plan reviewed and approved by the regulatory agencies. Radiological anomalies will be removed to levels that will be protective of human health and the environment before the remedial action is implemented.

In Highlight 3 of the EPA guidance (EPA 1996), military-specific wastes considered comparable to hazardous wastes typically found in municipal landfills include low-level radioactive wastes. Radioactive dials within the IR Site 1 boundary will be removed, as required, to be protective of human health and the environment, taking into account the landfill cap thickness of at least 2 feet. Radioactive anomalies located in the former IR Site 1area (outside boundary) beyond the proposed landfill cap will

be removed to be protective of human health, not taking into account any shielding provided by a landfill cap.

Unexploded Ordnance (UXO)

Ordnance at IR Site 1 was discovered in the pistol range area during the week of October 5, 1998. Air Force Explosive Ordnance Disposal (EOD) personnel responding to this incident removed approximately 20 20 millimeter (mm) projectiles from the area. Supervisor of Shipbuilding, Conversion, & Repair Environmental Detachment (SSPORTS) UXO representatives visited the site on October 26, 1998, and observed additional projectiles near the berm used as a backstop in the pistol range area. During further investigations by SSPORTS UXO personnel, approximately 14,000 20 mm rounds, of which 335 were live, were found. These rounds were removed from the pistol range area and stored at Alameda Point under a UXO lock. Essentially all of the rounds were found within a 50- by 50-foot area in a few shallow pits within the disposal area located adjacent to and north of the pistol range.

The live 20 mm high explosive projectiles discovered and removed at the pistol range would be considered a "high-hazard military specific waste" according to Highlight 3 of the EPA guidance (EPA 1996). A UXO sweep of the entire outside boundary area of IR Site 1was recently completed. This sweep indicated that no surface evidence of UXO was found in the former IR Site 1 area (outside boundary) .

A geophysical UXO survey was conducted in an area of about 3 acres, encompassing the former pistol range. Results from this survey are currently being assessed. Prior to any remedial action at the site, UXO will be removed from the pistol range area in accordance with DDESB requirements for transfer of property to the public.

B. Impact of Presumptive Remedy on Remedial Investigation Report Preparation

Based on the use of the presumptive remedy at IR Site 1, the following RI report preparation approach is being used for IR Site 1.

Human Health Risk Assessment

The current and future exposure scenarios for the human health risk assessment for IR Site 1 involve occupational and recreational use. The residential exposure scenario does not apply to the site and therefore residential exposure risks for soil and groundwater are not being assessed. Carcinogenic risks and noncarcinogenic hazards, associated with radioactive and nonradioactive materials in the landfill soils, will be evaluated for occupational and recreational use of the site. Although the risk assessment for occupational and recreational use is being conducted, use of the presumptive remedy will result in elimination of the exposure pathways. Therefore, any risk determined under these two scenarios will be addressed through implementation of the presumptive remedy.

A human health risk assessment for future groundwater use is being conducted at IR Site 1 assuming that groundwater is extracted from an upgradient well east of the landfill and used for golf course irrigation. Fate and transport modeling was performed to determine contaminant concentrations at the extraction well, and a human health risk assessment was performed assuming occupational exposure during irrigation of the golf course.

Ecological Risk Assessment

The IR Site 1 presumptive remedy will lead to incomplete terrestrial exposure pathways for ecological receptors. Therefore, no terrestrial ecological risk assessment was conducted at IR Site 1. The ecological risk assessment for IR Site 1 was limited to assessment of the impact of groundwater contamination on ecological receptors in San Francisco Bay (the surface water body closest to IR Site 1).

C. Media to be Addressed

Soil and groundwater data were collected at IR Site 1, and offshore sediment data were collected in San Francisco Bay (west of the site). Preliminary evaluation of the data collected show no evidence that sediments offshore from IR Site 1 contain elevated chemical concentrations significantly above those in sediments from other areas around Alameda Point. Most of the chemicals in sediment samples, with the exception of polynuclear aromatic hydrocarbons collected off-shore from IR Site 1, were detected at concentrations below ambient sediment screening values. All offshore sediment data collected at Alameda Point will therefore be addressed in a basewide discussion of offshore sediment samples by the sediment work group. Attachment 1, of this appendix, provides more details on the initial data assessment conducted for sediment samples collected offshore from IR Site 1 at Alameda Point.

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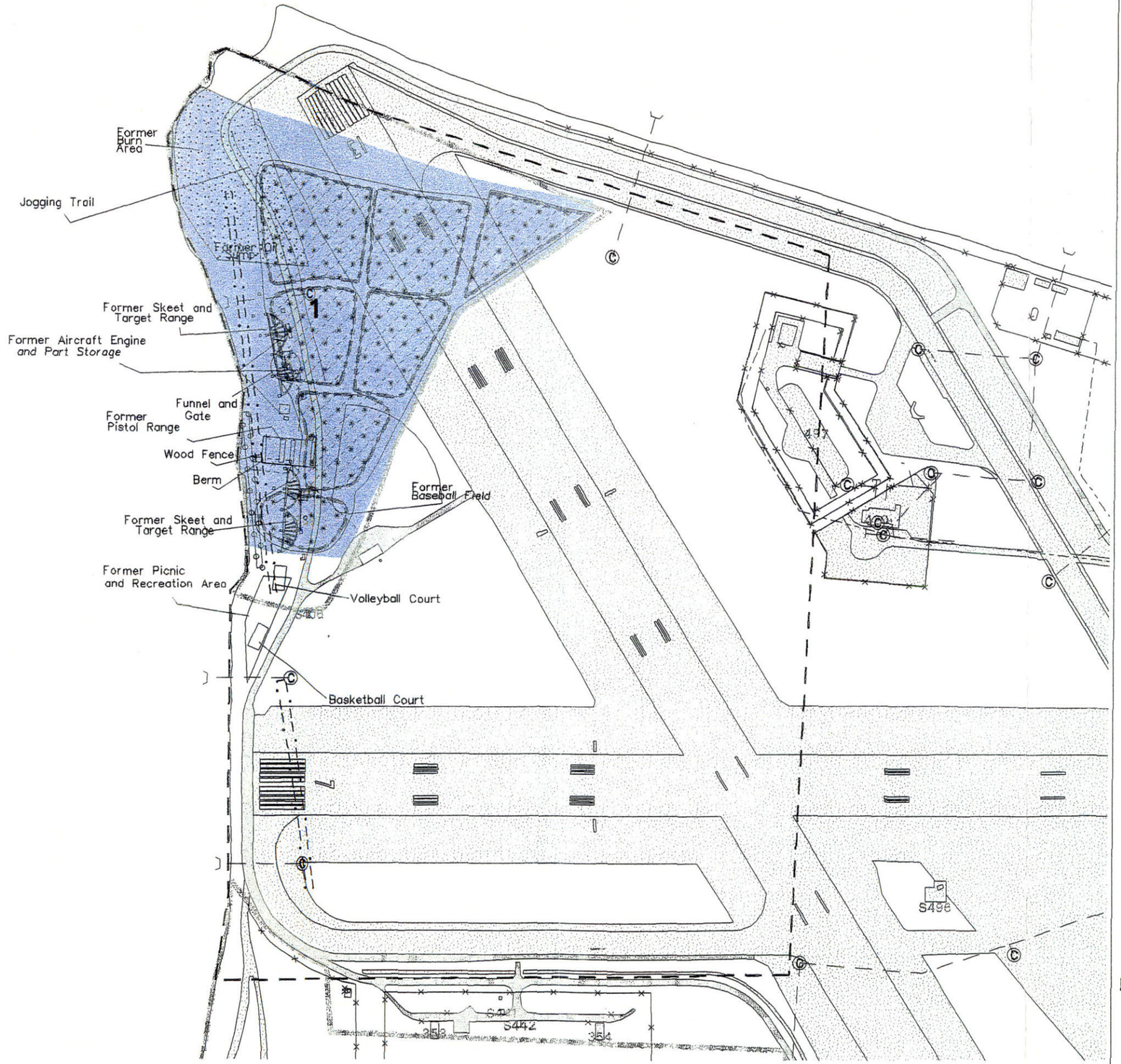

LEGEND

- STORM DRAIN CATCH BASIN
- ORIGINAL IR SITE (OUTSIDE BOUNDARY)
- FENCE
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 1 INSTALLATION RESTORATION SITE (INSIDE BOUNDARY)
- 517 BUILDING AND BUILDING NUMBER
- 1947 DISPOSAL ACTIVITIES
- 1949 DISPOSAL ACTIVITIES
- 1957 DISPOSAL ACTIVITIES
- WASTE DISPOSAL CELL BOUNDARY
- BARGE LINES (1949 AERIAL SURVEY)
- BARGE LINES (1957 AERIAL SURVEY)

NOTE: BARGE LINES ARE INFERRED

N

150 0 150 300

SCALE: 1" = 300'

SITE 1
PROPOSED LANDFILL CAP BOUNDARY MAP
ALAMEDA POINT
ALAMEDA, CALIFORNIA

05/12/99 data3/alameda/ou3ri/propbnd.map propbnd.aml BB

Tetra Tech EM Inc.

Interoffice Correspondence

Date: November 1, 1998

To: Mukul Sharma

From: E. J. Koford

Subject: Preliminary Evaluation Of Sediment Data Collected Off-Shore Of Site 1 At Alameda Point

Introduction

This memorandum provides results of a preliminary data assessment conducted for sediment samples collected off-shore from Site 1 at Alameda Point. The results of this assessment will be used to decide whether sediment data collected offshore of Site 1 (Western Bayside Data) are discussed as a part of the Site 1 evaluation or as a part of an overall facility-wide sediment data evaluation being completed for OU-4. If sediment samples collected offshore of Site 1 show elevated concentrations of chemicals with potential sources at Site 1, the data would be included in the Site 1 risk assessment. If the concentrations do not appear to be associated with Site 1, the data would be evaluated in conjunction with offshore sediment data collected from elsewhere around the facility. Alternatively, if none of the sediment data exceed criteria for adverse effect on ecological receptors, or ambient concentrations, the relative concentrations in sediment samples offshore from various sites may not be significant to assessing ecological risk.

Sediment data for the Western Bayside sampling stations are reported in *Chemical Data Summary Report for Offshore Sediment and Wetland Areas at Alameda Point, Alameda, California* (Tetra Tech EM Inc[TtEMI 1998a]), and were used to develop the following analysis. Data are presented from both 1993 and 1996, and include metals, pesticides, polyaromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), and semivolatile organics (SVOC).

Comparative Criteria and Guidance

To identify potential risks to aquatic communities from chemicals in sediments, there are several criteria available for comparison against site data. Site data are compared to the ambient sediment screening values (Regional Water Quality Control Board [RWQCB] 1998), as well as effects-range-low (ER-L) values (Long and Morgan 1990, Long and others 1995).

During the assessment of the sediment data collected off-shore of Site 1, chemical concentrations detected in sediments were considered to pose a potential ecological risk if the concentrations exceeded the ambient sedimentscreening values. Where ambient sediment screening values were unavailable, chemicals with concentrations that exceeded ER-Ls were considered to pose a potential ecological risk. Some samples are evaluated with a qualitative outlier analysis (comparing sample results among various sampling dates for consistent trends). This screening method is consistent with methodologies previously used for this project *(Ecological Risk Assessment Work Plan and Field Sampling and Analysis Plan, Breakwater Beach, Pier Area, and Seaplane Lagoon* [TtEMI 1998]).

Analytical results for most sediment samples collected offshore from Site 1 are reported as "replicate mean concentrations," which are mean values of three samples collected at the same location on the same day. These in turn are summarized to provide a mean of replicate values, standard deviation, maximum and frequency of detection. In some cases, where an average value exceeds criteria, it is useful to look carefully at the contributing individual replicates to determine from which location they were collected, or whether data qualifiers or other information are associated with the samples that would assist in evaluating the significance of reported concentrations.

Metals

Total metals data for surface sediment samples from the 1996-97 follow on investigation, which were collected in 1993 and 1994 (Table A-1a from TtEMI 1998b) show that no metal concentrations exceeded ambient sediment screening values or ER-L values.

Total metals data for surface sediment samples from the 1996 Ecological Assessment Report (Table A-1a,b) show potential exceedances for arsenic, chromium, mercury and nickel. The following table compares the mean and maxima of replicate means as described above, and provides frequency, detection limit and comparison criteria information.

	Total Metals in Surface Sediment (mg/kg)			
	Arsenic	**Chromium**	**Mercury**	**Nickel**
Detections/ Total Samples[a]	46/48	46/46	42/46	46/46
Minimum Non-detect/ Maximum Non-detect	2.3U/2.4U	NA	0.03U/0.12U	NA
Maximum value	12	163	0.85	90
Average Value	8.4	120	0.30	61
ER-L	8.2	81	0.15	20.9
Ambient Sediment Screening values	16.1	212	0.41	115

[a] Detections are for individual replicates identified in the Chemical Data Summary Report

Mercury was the only chemical detected above ambient sediment screening values. Mercury had two individual sample detections at sampling site B11 of 1.50 milligrams per kilogram (mg/kg) and 0.73 mg/kg that substantially raise the replicate mean maximum value reported. Sample site B11 is located south of the West Beach Landfill, remote from Site 1, and therefore does not appear to be directly related to Site 1.

Pesticides and PCBs

Pesticides and PCBs data for surface sediment samples from 1996/1997 (Table A-1d) show potential criterion exceedances for PCBs and DDT.

	Pesticides and PCBs in Surface Sediment Samples (µg/kg)	
	PCBs	**Total DDT**
Detections[a]/ Total Samples	31/110	7/87
Minimum Non-detect/Maximum Non-detect	21U/120U	2.1U/10U
Maximum value	54	15
Average Value	29[b]	8.25[c]
ER-L	22.7	1.58
Ambient Sediment Screening values	50	2.8[d] ,7[e]

[a] Detections are for individual replicates identified in the Chemical Data Summary Report
b Incorrectly reported as 35 in Table A-1d
[c] Incorrectly reported as 9.4 in Table A-1d
[d] Ambient Sediment Screening Value for Fines < 40 percent (RWQCB 1998)
[e] Ambient Sediment Screening Value for Fines >40 percent (RWQCB 1998)

Total DDT concentrations appear to exceed the ER-L and the ambient sediment screening values. However, an inspection of the raw data indicates that these values may not be reliable due to the following rationale.

- Total DDT values were calculated from 29 samples (corresponding to a total of 87 individual results) analyzed for each of DDD, DDE and DDT.
- Out of the total 87 results, 80 were reported as below detection limits.
- Out of the 7 samples with detections, 6 samples were reported as "estimated concentrations below detection limits" of 2.3 to 10 micrograms per kilogram (µg/kg). Concentration in the remaining sample was reported as 11 µg/kg.
- The highest concentration was detected in a sample collected from WB001, located near the northwest tip of Alameda Point, in an area unlikely to be influenced by Site 1.
- Average and standard deviation values for DDT were calculated using "1/2 the SQL [sample quantitation limit] for non-detects." In this case, SQL range from 2.1 to 12 µg/kg. Using these SQLs it cannot be determined whether the total DDT criterion has actually been exceeded. Total PCB concentrations reported in Table A-1d are compared incorrectly to an ambient sediment screening value of "0.05 µg/kg," which would lead to the conclusion that total PCBs exceeded criteria. The

correct ambient sediment screening value is 50 µg/kg. One replicate mean maximum value exceeds the corrected criterion (of 110 samples) and the average of replicate mean does not.

Pesticides and PCB data for surface sediment samples from 1996 Ecological Assessment (Table A-1e) show potential exceedances for PCBs and DDT.

	Pesticides and PCBs in Surface Sediment Samples (µg/kg)	
	PCBs	**Total DDT**
Detections/Total Samples[a]	3/39	3/117
Minimum Non-detect/ Maximum Non-detect	26U/57U	0.8U/11U
Maximum value	36	10.2
Average Value	32.5	7.6
ER-L	22.7	1.58
Ambient Sediment Screening Values	50	2.8[b] ,7[c]

[a] Detections are for individual replicates identified in the Chemical Data Summary Report.
[b] Ambient Sediment Screening Value for Fines < 40 percent (RWQCB 1998)
[c] Ambient Sediment Screening Value for Fines >40 percent (RWQCB 1998)

PCB values exceed the ER-L, but not the ambient sediment screening values.

Total DDT values appear to exceed the ER-L and ambient sediment screening values set by the RWQCB. However, as previously described, the raw data indicate that these values may not be statistically reliable due to the following rationale.

- Total DDT values were calculated from 39 samples analyzed for each of DDD, DDE and DDT.
- Out of the total 117 results, 114 were reported as below detection limits.
- The remaining three results were reported as "estimated concentrations below detection limits" of 10, 13 and 6.4 µg/kg. These three results correspond to three different samples collected from sampling locations B2 (near the entrance of the Oakland Harbor Channel), B14m (located 1500 feet west of Site 1 and the farthest from shore) and B7 (located about midway between Site 1 and West Beach Landfill) respectively. These sites are relatively remote from Site 1 in areas that are unlikely to be impacted by Site 1.

- Average and standard deviation values for DDT were calculated using "1/2 the SQL [sample quantitation limit] for non-detects." In this case, SQLs range from 2.0 to 45 µg/kg. Using these SQLs it cannot be determined whether the total DDT criterion has actually been exceeded.

PAHs and Organic Compounds:

Tables A-1f, g, h, i report PAHs and SVOCs detected in surface sediment samples from 1993, 1996 and the 1996-1997 follow-on investigation. Of the PAHs, benzo(a)pyrene, benzo(b)pyrene, chrysene, fluoranthene, and pyrene were detected in excess of ambient sediment screening values provided by the RWQCB. However, the ambient screening values are generally in the range of 18 to 78 µg/kg. Maximum PAH results generally do not exceed ER-Ls, in the range of 261 to 600 µg/kg. Sample quantitation limits of the analyses reported are in the range of 200 to 250 µg/kg, and all detections are flagged as estimates at concentrations less than the sample quantitation limits. The detection limits of the analysis are not generally low enough to reliably determine whether PAHs exceed the ambient sediment screening values.

Of the SVOCs bis 2-ethylhexylphthalate, diethylphthalate, dibutylphthalates and phenol were detected. Phthalates are a common constituent of plastics and common laboratory contaminants. No ambient sediment screening values or ER-Ls have been developed for phthalates. Similarly there are no ambient sediment screening values or ER-Ls developed for phenol. The lowest observed effect levels for chronic exposure to phenol are reported as 2560 µg/l far in excess of any detection in samples. Therefore, it is probably more significant that no other SVOCs were detected than that these compounds were present in the samples.

Organotins

Only tributyltin was detected in Western Bayside sediments (Table A-1j, k). No ambient sediment screening values or ER-Ls are available for tributyltin. The highest value was reported from site B-2 (located near the mouth of the Oakland Harbor). The second highest value was reported from B-11, located south of the West Beach Landfill. Neither location is associated with Site 1.

Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPH) reported in Table A-1m were detected in nearly all samples, at replicate mean maximum values of 62.0 and 205.3 mg/kg. No ambient sediment screening values or ER-Ls have been developed for TPH. The higher reported concentrations were at B7 (midway between Site 1 and West Beach Landfill Wetland), and B8 (located west of the West Beach Landfill Wetland). Relatively high values of TPH as motor oil (62.0 and 54.0 mg/kg) were reported from WB003 (west of Site 1 north outfall) and WB007 (west of Site 1 south outfall), but sample sites B3, B4 and B5 which are also located west of Site 1, were not evidently higher than samples from elsewhere around the base. There appears to be no indication that sediments proximate to the Site 1 landfill show any higher concentrations of TPH than samples from other parts of the facility.

Summary

Reported concentrations of chemicals in sediment samples from areas close to and far from Site 1 were compared to determine if (1) chemical concentrations significantly exceeded screening criteria, and (2) there was any indication of a pattern that would lead to the conclusion that Site 1 contributed disproportionately to sediment contamination in the adjacent bay waters. Based on the sampling information in the Chemical Data Summary Report of March 1998, which summarizes various sampling efforts in 1993, 1996 and 1997, there is no indication that elevated concentrations of chemicals in sediments s originate from Site 1. Therefore, the ecological risk assessment for sediments in the vicinity of Alameda Point should include areas adjacent to Site 1 in the risk assessment for offshore sediment samples collected around the entire facility, rather than specifically offshore from Site 1. The sediment data from offshore of Site 1 would be addressed at a later time under OU-4.

References:

Long, E.R., and L.G. Morgan. 1990. *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program."* National Oceanic and Atmospheric Administration (NOAA) Technical memorandum NOS OMA 65.

Long, E.R. D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. *Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments*. Environmental Management Vol 19, NO. 1, pp. 81-97.

Tetra Tech EM Inc. (TtEMI). 1998a. *Chemical Summary Report for Offshore Sediment and Wetland Areas at Alameda Point, Alameda, California.* March.

TtEMI. 1998b. *Ecological Risk Assessment Work Plan and Field Sampling and Analysis Plan, Breakwater Beach, Pier Area, and Seaplane Lagoon. Draft*, August.

Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 1998. *Ambient Concentrations of Toxic Chemicals in Sediments*. April

Figures

Refer to *Figure 1, Alameda Point, OU 4 Follow-On and Seaplane Lagoon Sample Locations* for sample locations.

Table A-1a
Western Bayside
Total Metals in Surface Sediment Samples (mg/kg)
(Page 1 of 2)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
PRC 1996/1997 Follow-on Investigation																
SS001	013-SSH-001	10/3/96	0.00	0.50	7290	0.95 U	3.7	22.7 J	0.03 U	0.06 U	7780	34.9	8.0 J	23.1	12800	10.8
SS002	013-SSH-002	10/3/96	0.00	0.50	8500	0.90 U	3.4	39.7 J	0.03 U	0.06 U	8890	38	7.5 J	15.1	12600	9.9
WB003	013-WBS-005	10/3/96	0.00	0.50	4930	0.79 U	4.1	16.4 J	0.02 U	0.05 U	2740	32.4	5.7 J	24	11500	26.2
WB007	013-WBS-012	10/3/96	0.00	0.50	4320	0.81 U	3.7	25.8 J	0.03 U	0.05 U	2960	26	5.7 J	10.1	9010	14.2
WB009	013-WBS-015	10/3/96	0.00	0.50	5600	0.86 J	4.0	19.1 J	0.03 U	0.05 U	2410	34.5	6.7 J	12.4	11500	15.5
WB010	013-WBS-017	10/15/96	0.00	0.50	3620	0.85 UJ	2.4 UJ	14.9 J	0.03 U	0.05 U	1710	24	4.7 J	6.5 J	7860	9.0 J
WB011	013-WBS-019	10/15/96	0.00	0.50	3560	0.87 UJ	2.6 J	21.1 J	0.03 U	0.05 U	2070	24.5	4.9 J	5.1 J	7590	8.4 J
WB012	013-WBS-021	10/15/96	0.00	0.50	4100	0.86 UJ	2.3 UJ	15.2 J	0.03 U	0.05 U	2770	25.9	5.0 J	7.2	8280	8.5 J
WB013	013-WBS-023	10/15/96	0.00	0.50	3360	0.78 UJ	2.6	10 J	0.02 U	0.05 U	3040	23.9	4.8 J	5.4 J	7440	6.6 J
Frequency of Detection (%)					100	20	78	100	0	0	100	100	100	100	100	100
*Average Values**					5031	0.51	2.9	21	---	---	3819	29	5.9	12	9842	12
*Standard Deviation**					1795	---	1.1	8.6	---	---	2610	5.6	1.2	7.3	2229	6.0
Maximum Values					8500	0.87	4.1	40	---	---	8890	38	8.0	24	12800	26
Ambient Sediment Screening Values (mg/kg)					NV	NV	16.1	NV	NV	0.4	NV	212	NV	63	NV	35
Effects Range Low (ER-L), (mg/kg)					NV	2.0	8.2	NV	NV	1.2	NV	81	NV	34	NV	46.7
Effects Range Median (ER-M), (mg/kg)					NV	25	70	NV	NV	9.6	NV	370	NV	270	NV	218

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1a
Western Bayside
Total Metals in Surface Sediment Samples (mg/kg)
(Page 2 of 2)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
PRC 1996/1997 Follow-on Investigation																
SS001	013-SSH-001	10/3/96	0.00	0.50	5420	192	0.07 J	0.36 U	35.1	2120	0.92 U	0.18 U	6430	0.48 U	26.2	65.9
SS002	013-SSH-002	10/3/96	0.00	0.50	5180	180	0.11 J	0.34 U	34.1	2050	0.88 U	0.17 U	5110	0.45 U	27.9	54.0
WB003	013-WBS-005	10/3/96	0.00	0.50	3450	186	0.06 J	0.33 UJ	29.6	963 J	0.76 U	0.15 U	2510	0.39 U	23.5	63.8
WB007	013-WBS-012	10/3/96	0.00	0.50	2910	157	0.03 U	0.30 U	23.5	943 J	0.78 U	0.15 U	2730	0.40 U	21.3	49.4
WB009	013-WBS-015	10/3/96	0.00	0.50	3880	171	0.06 J	0.30 U	31.4	1360	0.78 U	0.15 U	3320	0.40 U	25.2	60.7
WB010	013-WBS-017	10/15/96	0.00	0.50	2730	130	0.12 J	0.32 U	21.2	909 J	0.82 UJ	0.16 U	3600 J	0.42 U	18.5	38.5 J
WB011	013-WBS-019	10/15/96	0.00	0.50	2880	141	0.04 UJ	0.33 U	21.7	885 J	0.85 U	0.16 U	4350 J	0.44 U	17.8	30
WB012	013-WBS-021	10/15/96	0.00	0.50	3140	162	0.05 UJ	0.32 U	22.4	1010 J	0.84 U	0.16 U	4340 J	0.43 U	18.8	30.8
WB013	013-WBS-023	10/15/96	0.00	0.50	2530	144	0.04 UJ	0.29 U	21.1	749 J	0.75 U	0.15 U	2350 J	0.39 U	17.1	26.3
Frequency of Detection (%)					100	100	63	0	100	100	0	0	100	0	100	100
*Average Values**					3569	163	0.061	---	27	1221	---	---	3860	---	22	47
*Standard Deviation**					1061	21	0.038	---	5.8	517	---	---	1341	---	4.0	16
Maximum Values					5420	192	0.12	---	35	2120	0.86	---	6430	---	28	66
Ambient Sediment Screening Values (mg/kg)					NV	NV	0.41	NV	115	NV	1.0	0.56	NV	NV	NV	156
Effects Range Low (ER-L), (mg/kg)					NV	NV	0.15	NV	20.9	NV	NV	1	NV	NV	NV	150
Effects Range Median (ER-M), (mg/kg)					NV	NV	0.71	NV	51.6	NV	NV	3.7	NV	NV	NV	410

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The a[illegible] and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1b
Western Bayside
Total Metals in Surface Sediment Samples (mg/kg)
(Page 1 of 2)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
1996 Ecological Assessment Report																	
B1	PRC93SED0170	6/9/93	0.00	0.30	13	6.0	0.25 U	0.25 U	87	22	13	0.17	43	0.25 U	0.50 U	0.50 UJ	80
B1	PRC93SED0171	6/9/93	0.00	0.30	12	6.4	0.25 U	0.25 U	86	24	19	0.15	45	0.25 U	0.50 U	0.50 UJ	94
B1	PRC93SED0172	6/9/93	0.00	0.30	14	7.0	0.25 U	0.25 U	91	27	20	0.17	50	0.25 U	0.50 U	0.50 UJ	94
Replicate Mean Value					***13***	***6.5***	***0.13***	***0.13***	***88***	***24***	***17***	***0.16***	***46***	***0.13***			***89***
B11	PRC93SED0225	5/11/93	0.00	0.30	22	7.1	0.25 U	0.25 U	110	24	16	1.50	49	0.25 U	0.50 U	0.50 UJ	81
B11	PRC93SED0226	5/11/93	0.00	0.30	23	8.2	0.25 U	0.25 U	130	33	18	0.73	56	0.25 U	0.50 U	0.50 UJ	110
B11	PRC93SED0227	5/11/93	0.00	0.30	20	7.5	0.25 U	0.25 U	120	25	16	0.31	52	0.25 U	0.50 U	0.50 UJ	87
Replicate Mean Value					***22***	***7.6***	***0.13***	***0.13***	***120***	***27***	***17***	***0.85***	***52***	***0.13***			***93***
B12	PRC93SED0230	4/28/93	0.00	0.30	11	5.5	0.25 U	0.25 U	93	19	12	0.24	40	0.25 U	0.50 U	0.50 UJ	69
B12	PRC93SED0231	4/28/93	0.00	0.30	11	5.3	0.25 U	0.25 U	100	22	11	0.18	42	0.25 U	0.50 U	0.50 UJ	73
B12	PRC93SED0232	4/28/93	0.00	0.30	12	5.2	0.25 U	0.25 U	99	21	12	0.30	41	0.25 U	0.50 U	0.50 UJ	74
Replicate Mean Value					***11***	***5.3***	***0.13***	***0.13***	***97***	***21***	***12***	***0.24***	***41***	***0.13***			***72***
B13	PRC93SED0236	5/25/93	0.00	0.30	41	13	0.41	0.25 U	140	46	24	0.34	90	0.25 U	0.50 U	0.50 UJ	140
B13	PRC93SED0237	5/25/93	0.00	0.30	45	13	0.44	0.25 U	130	52	24	0.38	97	0.25 U	0.50 U	0.50 UJ	140
B13	PRC93SED0238	5/25/93	0.00	0.30	16	11	0.25 U	0.25 U	110	45	26	0.31	83	0.25 U	0.50 U	0.50 UJ	69
Replicate Mean Value					***34***	***12***	***0.33***	***0.13***	***127***	***48***	***25***	***0.34***	***90***	***0.13***			***116***
B14	PRC93SED0241	5/27/93	0.00	0.30	34	10	0.31	0.25 U	150	39	23	0.34 J	68	0.26	0.50 U	0.50 UJ	120
B14	PRC93SED0242	5/27/93	0.00	0.30	35	11	0.32	0.25 U	150	40	23	0.32 J	70	0.27	0.50 U	0.50 UJ	120
B14	PRC93SED0243	5/27/93	0.00	0.30	37	11	0.32	0.25 U	160	40	24	0.52 J	73	0.29	0.50 U	0.50 UJ	130
Replicate Mean Value					***35***	***11***	***0.32***	***0.13***	***153***	***40***	***23***	***0.39***	***70***	***0.27***			***123***
B2	PRC93SED0175	6/8/93	0.00	0.30	29	10	0.30	0.25 U	170	43	26	0.31	70	0.25 U	0.50 U	0.50 UJ	140
B2	PRC93SED0176	6/8/93	0.00	0.30	38	11	0.37	0.25 U	160	48	27	0.28	75	0.29	0.50 U	0.50 UJ	140
B2	PRC93SED0177	6/8/93	0.00	0.30	33	10	0.34	0.25 U	160	45	26	0.28	71	0.28	0.50 U	0.50 UJ	140
Replicate Mean Value					***33***	***10***	***0.34***	***0.13***	***163***	***45***	***26***	***0.29***	***72***	***0.23***			***140***
B3	PRC93SED0181	5/25/93	0.00	0.30	41	12.0	0.36	0.25 U	110	47	24	0.35	89	0.25 U	0.50 U	0.50 UJ	130
B3	PRC93SED0182	5/25/93	0.00	0.30	38	11.0	0.39	0.25 U	100	46	23	0.31	88	0.25 U	0.50 U	0.50 UJ	130
B3	PRC93SED0183	5/25/83	0.00	0.30	39	12.0	0.38	0.25 U	110	48	24	0.34	91	0.25 U	0.50 U	0.50 UJ	130
Replicate Mean Value					***39***	***12***	***0.38***	***0.13***	***107***	***47***	***24***	***0.33***	***89***	***0.13***			***130***
B4	PRC93SED0186	6/8/93	0.00	0.30	22	7.9	0.25 U	0.25 U	130	31	25	0.22	53	0.25 U	0.50 U	0.50 UJ	110
B4	PRC93SED0187	6/8/93	0.00	0.30	23	8.3	0.26	0.48	140	30	26	0.24	59	0.25 U	0.50 U	0.50 UJ	100
B4	PRC93SED0188	6/8/93	0.00	0.30	15	6.7	0.25 U	0.25 U	110	19	22	0.18	46	0.25 U	0.50 U	0.50 UJ	89
Replicate Mean Value					***20***	***8***	***0.17***	***0.24***	***127***	***27***	***24***	***0.21***	***53***	***0.13***			***100***

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1b
Western Bayside
Total Metals in Surface Sediment Samples (mg/kg)
(Page 2 of 2)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
B5	PRC93SED0192	6/8/93	0.00	0.30	29	11.0	0.28	0.25 U	150	27	24	0.27	65	0.25 U	0.50 U	0.50 UJ	130
B5	PRC93SED0193	6/8/93	0.00	0.30	33	9.7	0.30	0.25 U	150	37	26	0.28	67	0.26	0.50 U	0.50 UJ	120
B5	PRC93SED0194	6/8/93	0.00	0.30	34	10.0	0.32	0.25 U	160	39	26	0.27	70	0.25 U	0.50 U	0.50 UJ	140
Replicate Mean Value					*32*	*10*	*0.30*	*0.13*	*153*	*34*	*25*	*0.27*	*67*	*0.17*			*130*
B6	PRC93SED0197	6/9/93	0.00	0.30	29	8.3	0.25 U	0.25 U	110	32	19	0.20	65	0.25 U	0.50 U	0.50 UJ	110
B6	PRC93SED0198	6/9/93	0.00	0.30	30	9.6	0.25 U	0.25 U	110	33	21	0.24	65	0.25 U	0.50 U	0.50 UJ	110
B6	PRC93SED0199	6/9/93	0.00	0.30	32	10	0.26	0.26	120	36	23	0.26	72	0.25 U	0.50 U	0.50 UJ	120
Replicate Mean Value					*30*	*9.3*	*0.17*	*0.17*	*113*	*34*	*21*	*0.23*	*67*	*0.13*			*113*
B7	PRC93SED0203	6/24/93	0.00	0.30	31	8.9	0.30	0.25 U	130	40	22	0.22	78	0.25 U	0.50 U	0.50 UJ	100
B7	PRC93SED0204	6/24/93	0.00	0.30	29	9.1	0.33	0.25 U	130	36	20	0.22	76	0.25 U	0.50 U	0.50 UJ	98
B7	PRC93SED0205	6/24/93	0.00	0.30	16	8.5	0.25	0.25 U	120	35	20	0.27	74	0.25 U	0.50 U	0.50 UJ	53
Replicate Mean Value					*25*	*8.8*	*0.29*	*0.13*	*123*	*36*	*21*	*0.24*	*73*	*0.13*			*84*
B8	PRC93SED0208	6/24/93	0.00	0.30	11	4.3	0.25 U	0.25 U	98	14	9.0	0.14	45	0.25 U	0.50 U	0.50 UJ	54
B8	PRC93SED0209	6/24/93	0.00	0.30	12	4.1	0.25 U	0.25 U	93	14	7.7	0.13	43	0.25 U	0.50 U	0.50 UJ	51
B8	PRC93SED0210	6/24/93	0.00	0.30	16	5.3	0.25 U	0.25 U	100	17	9.6	0.17	50	0.25 U	0.50 U	0.50 UJ	66
Replicate Mean Value					*13*	*4.6*	*0.13*	*0.13*	*97*	*15*	*8.8*	*0.15*	*46*	*0.25*			*57*
B9	PRC93SED0214	5/27/93	0.00	0.30	7.1	3.3	0.25 U	0.25 U	96	9.4	6.0	0.24 J	29	0.25 U	0.50 U	0.50 UJ	37
B9	PRC93SED0215	5/27/93	0.00	0.30	8.8	3.9	0.25 U	0.25 U	96	10	7.1	0.20 J	32	0.25 U	0.50 U	0.50 UJ	39
B9	PRC93SED0216	5/27/93	0.00	0.30	8.6	3.9	0.25 U	0.25 U	93	10	6.9	0.12 J	31	0.25 U	0.50 U	0.50 UJ	38
Replicate Mean Value					*8.2*	*3.7*	*0.13*	*0.13*	*95*	*10*	*6.7*	*0.19*	*31*	*0.25*			*38*
Frequency of Detection (%)					100	100	62	15	100	100	100	100	100	23	0	0	100
*Average Values**					24	8.4	0.22	0.14	120	31	19	0.30	61	0.17	---	---	99
*Standard Deviation**					11	2.7	0.10	---	24	12	6.6	0.18	18	0.060	---	---	31
Maximum Values					39	12	0.38	0.24	163	48	26	0.85	90	0.27	---	---	140
Ambient Sediment Screening Values (mg/kg)					---	16.1	NV	0.4	212	63	35	0.41	115	1.0	0.56	NV	156
Effects Range Low (ER-L), (mg/kg)					20	8.2	NV	1.2	81	34	46.7	0.15	20.9	NV	1	NV	150
Effects Range Median (ER-M), (mg/kg)					25	70	NV	9.6	370	270	218	0.71	51.6	NV	3.7	NV	410

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The [illegible] and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1c
Western Bayside
Simultaneously Extracted Metals in Surface Sediment Samples (mg/kg)
(Page 1 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Total Chromium	Cobalt	Copper
PRC 1996/1997 Follow-on Investigation														
SS001	013-SSH-001	10/3/96	0.00	0.50	1670	0.10 J	0.77 J	8.0	0.082 UJ	0.12	15400 J	9.0 J	2.5	8.7 J
SS002	013-SSH-002	10/3/96	0.00	0.50	1380	0.088 J	0.65 J	12.3	0.067 UJ	0.10	4420 J	7.7 J	2.0	7.1 J
WB003	013-WBS-005	10/3/96	0.00	0.50	523	0.15 J	1.1 J	4.7	0.028 UJ	0.13	1920 J	4.1 J	1.3	9.5 J
WB007	013-WBS-012	10/3/96	0.00	0.50	510	0.060 J	1.1 J	2.7 J	0.029 UJ	0.057 UJ	1970 J	3.4 J	1.4	4.5 J
WB009	013-WBS-015	10/3/96	0.00	0.50	724	0.070 J	1.0 J	4.2	0.037 UJ	0.056 UJ	928 J	4.6 J	1.7	4.5 J
Frequency of Detection (%)					100	100	100	100	0	60	100	100	100	100
*Average Values**					961	0.09	0.92	6.4	---	0.080	4928	5.8	1.8	6.9
*Standard Deviation**					531	0.035	0.20	3.8	---	0.050	5994	2.4	0.49	2.3
Maximum Values					1670	0.15	1.1	12	---	0.13	15400	9.0	2.5	9.5

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation values were calculated using 1/2 of the SQL for non-detects.

Table A-1c
Western Bayside
Simultaneously Extracted Metals in Surface Sediment Samples (mg/kg)
(Page 2 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium
PRC 1996/1997 Follow-on Investigation													
SS001	013-SSH-001	10/3/96	0.00	0.50	4560	7.4	1810 J	92.4 J	0.027 J	0.073 J	9.7	728	0.091 J
SS002	013-SSH-002	10/3/96	0.00	0.50	3670	7.6	1480 J	74 J	0.027 J	0.053 J	7.9	613	0.069 J
WB003	013-WBS-005	10/3/96	0.00	0.50	2560	16.8	664 J	71.4 J	0.024 J	0.082 J	3.5	252	0.062 J
WB007	013-WBS-012	10/3/96	0.00	0.50	2420	10.4	677 J	66.4 J	0.013 J	0.061 J	3.1	286	0.088 J
WB009	013-WBS-015	10/3/96	0.00	0.50	2910	10.3	906 J	58.4 J	0.020 J	0.034 J	4.8	360	0.072 U
Frequency of Detection (%)					100	100	100	100	100	100	100	100	80
*Average Values**					3224	11	1107	73	0.022	0.061	5.8	448	0.069
*Standard Deviation**					890	3.8	514	13	0.006	0.019	2.9	211	0.022
Maximum Values					4560	17	1810	92	0.027	0.082	9.7	728	0.091

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qual[illegible] [illegible]initions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*Th[illegible] [illegible]e and standard deviation values were calculated using 1/2 of the SQL for non-detects.

Table A-1c
Western Bayside
Simultaneously Extracted Metals in Surface Sediment Samples (mg/kg)
(Page 3 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Silver	Sodium	Thallium	Vanadium	Zinc	AVS
PRC 1996/1997 Follow-on Investigation										
SS001	013-SSH-001	10/3/96	0.00	0.50	0.026 U	1250	0.072 U	8.6	24.7 J	110
SS002	013-SSH-002	10/3/96	0.00	0.50	0.021 U	3210	0.056 U	6.9	20.6 J	68.3
WB003	013-WBS-005	10/3/96	0.00	0.50	0.018 U	1900	0.050 U	4.6	25.2 J	4.9 U
WB007	013-WBS-012	10/3/96	0.00	0.50	0.023 U	2110	0.063 U	4.5	18.5 J	6.1 U
WB009	013-WBS-015	10/3/96	0.00	0.50	0.023 U	2440	0.063 U	4.9	18.8 J	6.1 U
Frequency of Detection (%)					0	100	0	100	100	40
*Average Values**					---	2182	---	5.9	22	37
*Standard Deviation**					---	721	---	1.8	3.2	---
Maximum Values					---	3210	---	8.6	25	110

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation values were calculated using 1/2 of the SQL for non-detects.

Table A-1d
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 1 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ABHC	ACHLRDNE	ALDRIN	AR1016	AR1221	AR1232	AR1242	AR1248	AR1254	AR1260	BBHC
PRC 1996/1997 Follow-on Investigation															
SS001	013-SSH-001	10/3/96	0.00	0.50	1.3 U	1.3 U	1.3 U	25 U	50 U	25 U	25 U	25 U	25 U	25 U	1.3 U
SS002	013-SSH-002	10/3/96	0.00	0.50	1.2 U	1.2 U	1.2 U	23 U	47 U	23 U	23 U	23 U	13 J	23 U	1.2 U
WB001	013-WBS-002	10/9/96	0.00	0.50	1.1 U	1.1 U	1.1 U	21 U	43 U	21 U	21 U	21 U	27 J	27 J	1.1 U
WB002	013-WBS-004	10/9/96	0.00	0.50	1.1 U	1.1 U	1.1 U	21 U	42 U	21 U	21 U	21 U	17 J	18 J	1.1 U
WB003	013-WBS-005	10/3/96	0.00	0.50	1.0 U	1.0 U	1.0 U	20 U	41 U	20 U	20 U	20 U	20 U	14 J	1.0 U
WB004	013-WBS-007	10/14/96	0.00	0.50	5.3 UJ	5.3 U	5.3 U	100 U	210 U	100 U	100 U	100 U	100 U	100 U	5.3 U
WB005	013-WBS-009	10/14/96	0.00	0.50	5.4 UJ	5.4 U	5.4 U	100 U	210 U	100 U	100 U	100 U	100 U	100 U	5.4 U
WB006	013-WBS-011	10/14/96	0.00	0.50	5.2 UJ	5.2 U	5.2 U	100 U	210 U	100 U	100 U	100 U	100 U	100 U	5.2 U
WB007	013-WBS-012	10/3/96	0.00	0.50	1.1 U	1.1 U	1.1 U	21 U	42 U	21 U	21 U	21 U	21 U	21 U	1.1 U
WB008	013-WBS-014	10/14/96	0.00	0.50	5.3 UJ	5.3 U	5.3 U	100 U	210 U	100 U	100 U	100 U	100 U	100 U	5.3 U
WB009	013-WBS-015	10/3/96	0.00	0.50	1.1 U	1.1 U	1.1 U	21 U	42 U	21 U	21 U	21 U	21 U	21 U	1.1 U
WB014	013-WBS-025	10/15/96	0.00	0.50	5.9 UJ	5.9 U	5.9 U	110 U	230 U	110 U	110 U	110 U	110 U	110 U	5.9 U
WB016	013-WBS-029	10/15/96	0.00	0.50	6.3 UJ	6.3 U	6.3 U	120 U	250 U	120 U	120 U	120 U	120 U	120 U	6.3 U
WB017	013-WBS-031	10/17/96	0.00	0.50	1.2 UJ	1.2 U	1.2 U	24 U	48 U	24 U	24 U	24 U	24 U	24 U	1.2 U
WB018	013-WBS-033	10/17/96	0.00	0.50	1.4 UJ	2.2 J	1.4 U	27 U	54 U	27 U	27 U	27 U	27 U	27 U	1.4 U
WB019	013-WBS-035	10/17/96	0.00	0.50	1.8 UJ	1.8 U	1.8 U	36 U	73 U	36 U	36 U	36 U	36 U	36 U	1.8 U
Frequency of Detection (%)					0	0	0	0	0	0	0	0	19	19	0
*Average Values**					---	---	---	---	---	---	---	---	29	29	---
*Standard Deviation**					---	---	---	---	---	---	---	---	20	19	---
Maximum Values					---	---	---	---	---	---	---	---	27	27	---
Ambient Sediment Screening Values (µg/kg)					NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range Low (ER-L), (µg/kg)					NV	0.5	NV	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range-Median (ER-M), (µg/kg)					NV	6	NV	NV	NV	NV	NV	NV	NV	NV	NV

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1d
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 2 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		DBHC	DDD	DDE	DDT	DIELDRIN	ENDOSI	ENDOSII	ENDOSSLF	ENDRIN	ENDRINAL	ENDRINKT
PRC 1996/1997 Follow-on Investigation															
SS001	013-SSH-001	10/3/96	0.00	0.50	1.3 U	2.5 U	2.5 U	2.5 U	2.5 U	1.3 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
SS002	013-SSH-002	10/3/96	0.00	0.50	1.2 U	2.3 U	2.3 U	2.3 U	2.3 U	1.2 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
WB001	013-WBS-002	10/9/96	0.00	0.50	1.1 U	2.3 J	1.2 J	11	2.1 U	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
WB002	013-WBS-004	10/9/96	0.00	0.50	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
WB003	013-WBS-005	10/3/96	0.00	0.50	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
WB004	013-WBS-007	10/14/96	0.00	0.50	5.3 U	10 U	10 U	10 U	10 U	5.3 U	10 U	10 U	10 U	10 U	10 U
WB005	013-WBS-009	10/14/96	0.00	0.50	5.4 U	10 U	10 U	10 U	10 U	5.4 U	10 U	10 U	10 U	10 U	10 U
WB006	013-WBS-011	10/14/96	0.00	0.50	5.2 U	10 U	10 U	10 U	10 U	5.2 U	10 U	10 U	10 U	10 U	10 U
WB007	013-WBS-012	10/3/96	0.00	0.50	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
WB008	013-WBS-014	10/14/96	0.00	0.50	5.3 U	10 U	10 U	10 U	10 U	5.3 U	10 U	10 U	10 U	10 U	10 U
WB009	013-WBS-015	10/3/96	0.00	0.50	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	1.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
WB014	013-WBS-025	10/15/96	0.00	0.50	5.9 U	11 U	11 U	11 U	11 U	5.9 U	11 U	11 U	11 U	11 U	11 U
WB016	013-WBS-029	10/15/96	0.00	0.50	6.3 U	12 U	12 U	12 U	12 U	6.3 U	12 U	12 U	12 U	12 U	12 U
WB017	013-WBS-031	10/17/96	0.00	0.50	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U	1.2 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
WB018	013-WBS-033	10/17/96	0.00	0.50	1.4 U	2.7 U	2.7 U	1.5 J	2.7 U	1.4 U	2.7 U	2.7 U	2.7 U	2.7 U	2.2 J
WB019	013-WBS-035	10/17/96	0.00	0.50	1.8 U	3.6 U	3.6 U	3.6 U	3.6 U	1.8 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Frequency of Detection (%)					0	6.3	6.3	13	0	0	0	0	0	0	6.3
*Average Values**					---	2.8	2.7	3.3	---	---	---	---	---	---	2.9
*Standard Deviation**					---	---	---	---	---	---	---	---	---	---	---
Maximum Values					---	2.3	1.2	11	---	---	---	---	---	---	2.2
Ambient Sediment Screening Values (µg/kg)					NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range Low (ER-L), (µg/kg)					NV	2.0	2.2	1.0	0.02	NV	NV	NV	0.02	NV	NV
Effects Range-Median (ER-M), (µg/kg)					NV	20	27	7	8.0	NV	NV	NV	45	NV	NV

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1d
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 3 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		GBHC	CHLRDN	HPTCLR	HPTCLREP	MTHOXCHL	TOXPHENE	TOTAL PCBs	TOTAL DDTs
PRC 1996/1997 Follow-on Investigation												
SS001	013-SSH-001	10/3/96	0.00	0.50	1.3 U	1.3 U	1.3 U	1.3 U	13 U	130 U	--	--
SS002	013-SSH-002	10/3/96	0.00	0.50	1.2 U	1.2 U	1.2 U	1.2 U	12 U	120 U	25	--
WB001	013-WBS-002	10/9/96	0.00	0.50	1.1 U	1.1 U	1.1 U	1.1 U	11 U	110 U	54	15
WB002	013-WBS-004	10/9/96	0.00	0.50	1.1 U	1.1 U	1.1 U	1.1 U	11 U	110 U	35	--
WB003	013-WBS-005	10/3/96	0.00	0.50	1.0 U	1.0 U	1.0 U	1.0 U	10 U	100 U	24	--
WB004	013-WBS-007	10/14/96	0.00	0.50	5.3 U	5.3 U	5.3 U	5.3 U	53 U	530 U	--	--
WB005	013-WBS-009	10/14/96	0.00	0.50	5.4 U	5.4 U	5.4 U	5.4 U	54 U	540 U	--	--
WB006	013-WBS-011	10/14/96	0.00	0.50	5.2 U	5.2 U	5.2 U	5.2 U	52 U	520 U	--	--
WB007	013-WBS-012	10/3/96	0.00	0.50	1.1 U	1.1 U	1.1 U	1.1 U	11 U	110 U	--	--
WB008	013-WBS-014	10/14/96	0.00	0.50	5.3 U	5.3 U	5.3 U	5.3 U	53 U	530 U	--	--
WB009	013-WBS-015	10/3/96	0.00	0.50	1.1 U	1.1 U	1.1 U	1.1 U	11 U	110 U	--	--
WB014	013-WBS-025	10/15/96	0.00	0.50	5.9 U	5.9 U	5.9 U	5.9 U	59 U	590 U	--	--
WB016	013-WBS-029	10/15/96	0.00	0.50	6.3 U	6.3 U	6.3 U	6.3 U	63 U	630 U	--	--
WB017	013-WBS-031	10/17/96	0.00	0.50	1.2 U	1.2 U	1.2 U	1.2 U	12 U	120 U	--	--
WB018	013-WBS-033	10/17/96	0.00	0.50	1.4 U	1.4 U	1.4 U	1.4 U	14 U	140 U	--	4.2
WB019	013-WBS-035	10/17/96	0.00	0.50	1.8 U	1.8 U	1.8 U	1.8 U	18 U	180 U	--	--
Frequency of Detection (%)					0	0	0	0	0	0	---	---
*Average Values**					---	---	---	---	---	---	35	9.4
*Standard Deviation**					---	---	---	---	---	---	14	---
Maximum Values					---	---	---	---	---	---	54	15
Ambient Sediment Screening Values (µg/kg)					NV	NV	NV	NV	NV	NV	0.05	NV
Effects Range Low (ER-L), (µg/kg)					NV	0.5	NV	NV	NV	NV	22.7	1.58
Effects Range-Median (ER-M), (µg/kg)					NV	6	NV	NV	NV	NV	180	46.1

Notes:
NA = Not Analyzed, NV = No Value, --- = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1e
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 1 of 6)

Sampling Location	Sample Identification	Sampling Date	ABHC	ACHLRDNE	ALDRIN	AR1016	AR1221	AR1232	AR1242	AR1248	AR1254	AR1260	BBHC
1996 Ecological Assessment Report													
B1	PRC93SED0170	6/9/93	0.80 U	0.80 U	0.80 U	33 U	67 U	33 U	33 U	33 U	33 U	33 U	0.80 U
B1	PRC93SED0171	6/9/93	0.80 U	0.80 U	0.80 U	34 U	68 U	34 U	34 U	34 U	34 U	34 U	0.80 U
B1	PRC93SED0172	6/9/93	0.90 U	0.90 U	0.90 U	36 U	73 U	36 U	36 U	36 U	36 U	36 U	0.90 U
Replicate Mean Value											*17*	*17*	
B11	PRC93SED0225	5/11/93	1.0 UJ	1.0 UJ	1.0 UJ	40 UJ	80 UJ	40 UJ	40 UJ	40 UJ	40 UJ	40 UJ	1.0 UJ
B11	PRC93SED0226	5/11/93	1.1 UJ	1.1 UJ	1.1 UJ	44 UJ	89 UJ	44 UJ	44 UJ	44 UJ	44 UJ	44 UJ	1.1 UJ
B11	PRC93SED0227	5/11/93	1.1 UJ	1.1 UJ	1.1 UJ	43 UJ	85 UJ	43 UJ	43 UJ	43 UJ	43 UJ	43 UJ	1.1 UJ
Replicate Mean Value											*21*	*21*	
B12	PRC93SED0230	4/28/93	0.83 UJ	0.83 UJ	0.83 UJ	33 UJ	67 UJ	33 UJ	33 UJ	33 UJ	33 UJ	33 UJ	8.0 UJ
B12	PRC93SED0231	4/28/93	0.82 UJ	0.82 UJ	0.82 UJ	33 UJ	66 UJ	33 UJ	33 UJ	33 UJ	52 J	33 UJ	8.0 UJ
B12	PRC93SED0232	4/28/93	0.82 UJ	0.82 UJ	0.82 UJ	33 UJ	66 UJ	33 UJ	33 UJ	33 UJ	33 UJ	33 UJ	8.0 UJ
Replicate Mean Value											*28*	*17*	
B13	PRC93SED0236	5/25/93	14 U	1.4 U	1.4 U	556 U	1111 U	56 U	56 U	56 U	56 U	56 U	1.4 U
B13	PRC93SED0237	5/25/93	1.4 U	1.4 U	1.4 U	57 U	110 U	57 U	57 U	57 U	57 U	57 U	1.4 U
B13	PRC93SED0238	5/25/93	23 U	1.1 U	1.1 U	909 U	1818 U	909 U	909 U	45 U	45 U	45 U	1.1 U
Replicate Mean Value											*26*	*26*	
B14	PRC93SED0241	5/27/93	1.3 UJ	1.3 UJ	13 UJ	53 UJ	105 UJ	53 UJ	53 UJ	53 UJ	53 UJ	53 UJ	13 UJ
B14	PRC93SED0242	5/27/93	1.3 UJ	1.3 UJ	13 UJ	53 UJ	105 UJ	53 UJ	53 UJ	53 UJ	53 UJ	53 UJ	13 UJ
B14	PRC93SED0243	5/27/93	1.4 UJ	1.4 UJ	14 UJ	54 UJ	108 UJ	54 UJ	54 UJ	54 UJ	54 UJ	54 UJ	14 UJ
Replicate Mean Value											*27*	*27*	
B2	PRC93SED0175	6/8/93	11 UJ	1.1 UJ	1.1 UJ	444 UJ	889 UJ	444 UJ	444 UJ	44 UJ	44 UJ	44 UJ	11 UJ
B2	PRC93SED0176	6/8/93	11 UJ	1.1 UJ	1.1 UJ	444 UJ	889 UJ	444 UJ	444 UJ	44 UJ	44 UJ	44 UJ	11 UJ
B2	PRC93SED0177	6/8/93	1.1 UJ	1.1 UJ	1.1 UJ	217 UJ	435 UJ	217 UJ	217 UJ	43 UJ	43 UJ	43 UJ	1.1 UJ
Replicate Mean Value											*22*	*22*	
B3	PRC93SED0181	5/25/93	14 U	1.4 U	1.4 U	54 U	1081 U	54 U	54 U	54 U	54 U	54 U	1.4 U
B3	PRC93SED0182	5/25/93	1.4 U	1.4 U	1.4 U	54 U	110 U	54 U	54 U	54 U	54 U	54 U	1.4 U
B3	PRC93SED0183	5/25/83	1.4 U	1.4 U	1.4 U	541 U	1081 U	54 U	54 U	54 U	54 U	54 U	1.4 U
Replicate Mean Value											*27*	*27*	
B4	PRC93SED0186	6/8/93	1.0 UJ	1.0 UJ	1.0 UJ	39 UJ	78 UJ	39 UJ	39 UJ	39 UJ	39 UJ	39 UJ	1.0 UJ
B4	PRC93SED0187	6/8/93	1.0 UJ	1.0 UJ	1.0 UJ	42 UJ	83 UJ	42 UJ	42 UJ	42 UJ	83 UJ	500 J	1.0 UJ
B4	PRC93SED0188	6/8/93	7.8 UJ	0.78 UJ	0.8 UJ	156 UJ	313 UJ	156 UJ	156 UJ	31 UJ	31 UJ	31 UJ	0.8 UJ
Replicate Mean Value											*26*	*178*	
B5	PRC93SED0192	6/8/93	57 UJ	1.1 UJ	1.1 UJ	45 UJ	91 UJ	45 UJ	45 UJ	45 UJ	45 UJ	45 UJ	1.1 UJ
B5	PRC93SED0193	6/8/93	244 UJ	1.2 UJ	1.2 UJ	488 UJ	976 UJ	488 UJ	488 UJ	49 UJ	49 UJ	49 UJ	1.2 UJ
B5	PRC93SED0194	6/8/93	13 UJ	1.3 UJ	1.3 UJ	500 UJ	1000 UJ	500 UJ	500 UJ	50 UJ	50 UJ	50 UJ	1.3 UJ
Replicate Mean Value											*24*	*24*	
B6	PRC93SED0197	6/9/93	1.0 U	1.0 U	1.0 U	40 U	80 U	40 U	40 U	40 U	40 U	40 U	100 U
B6	PRC93SED0198	6/9/93	1.1 U	1.1 U	1.1 U	44 U	89 U	44 U	44 U	44 U	44 U	44 U	111 U
B6	PRC93SED0199	6/9/93	1.1 U	1.1 U	1.1 U	45 U	91 U	45 U	45 U	45 U	45 U	45 U	1.1 U
Replicate Mean Value											*22*	*22*	

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1e
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 2 of 6)

Sampling Location	Sample Identification	Sampling Date	ABHC	ACHLRDNE	ALDRIN	AR1016	AR1221	AR1232	AR1242	AR1248	AR1254	AR1260	BBHC
B7	PRC93SED0203	6/24/93	1.1 UJ	1.1 UJ	1.1 UJ	43 UJ	85 UJ	43 UJ	43 UJ	43 UJ	43 UJ	43 UJ	1.1 UJ
B7	PRC93SED0204	6/24/93	1.0 UJ	1.0 UJ	1.0 UJ	40 UJ	80 UJ	40 UJ	40 UJ	40 UJ	40 UJ	40 UJ	10 UJ
B7	PRC93SED0205	6/24/93	1.0 UJ	1.0 UJ	1.0 UJ	42 UJ	83 UJ	42 UJ	42 UJ	42 UJ	42 UJ	42 UJ	1.0 UJ
Replicate Mean Value											*21*	*21*	
B8	PRC93SED0208	6/24/93	0.70 UJ	0.70 UJ	0.70 UJ	29 UJ	57 UJ	29 UJ	29 UJ	29 UJ	31 J	29 UJ	7.1 UJ
B8	PRC93SED0209	6/24/93	0.80 UJ	0.80 UJ	0.80 UJ	30 UJ	61 UJ	30 UJ	30 UJ	30 UJ	30 UJ	30 UJ	0.80 UJ
B8	PRC93SED0210	6/24/93	0.80 UJ	0.80 UJ	0.80 UJ	33 UJ	66 UJ	33 UJ	33 UJ	33 UJ	33 UJ	33 UJ	8.2 UJ
Replicate Mean Value											*21*	*16*	
B9	PRC93SED0214	5/27/93	0.60 UJ	0.60 UJ	6.50 UJ	26 UJ	52 UJ	26 UJ	26 UJ	26 UJ	26 UJ	26 UJ	6.5 UJ
B9	PRC93SED0215	5/27/93	0.70 UJ	0.70 UJ	6.80 UJ	27 UJ	55 UJ	27 UJ	27 UJ	27 UJ	27 UJ	27 UJ	6.8 UJ
B9	PRC93SED0216	5/27/93	0.70 UJ	0.70 UJ	6.90 UJ	28 UJ	56 UJ	28 UJ	28 UJ	28 UJ	28 UJ	28 UJ	6.9 UJ
Replicate Mean Value											*14*	*14*	
Frequency of Detection (%)			0	0	0	0	0	0	0	0	15.0	8	0
*Average Values**			---	---	---	---	---	---	---	---	22	34	---
*Standard Deviation**			---	---	---	---	---	---	---	---	---	---	---
Maximum Values			---	---	---	---	---	---	---	---	28	178	---
Ambient Sediment Screening Values (µg/kg)			NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range Low (ER-L), (µg/kg)			NV	0.5	NV	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range-Median (ER-M), (µg/kg)			NV	6	NV	NV	NV	NV	NV	NV	NV	NV	NV

Notes:
NA = No[illegible]zed, NV = No Value, — = No Statistics
Qualifi[illegible]ons: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The [illegible] and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1e
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 3 of 6)

Sampling Location	Sample Identification	Sampling Date	DBHC	DDD	DDE	DDT	DIELDRIN	ENDOSI	ENDOSII	ENDOSSLF	ENDRIN	ENDRINAL	ENDRINKT
1996 Ecological Assessment Report													
B1	PRC93SED0170	6/9/93	0.80 U	3.3 U	3.3 U	3.3 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	3.3 U	4.2 U
B1	PRC93SED0171	6/9/93	0.80 U	3.4 U	3.4 U	3.4 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	3.4 U	4.2 U
B1	PRC93SED0172	6/9/93	0.90 U	3.6 U	3.6 U	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	3.6 U	4.5 U
Replicate Mean Value				*1.7*	*1.7*	*1.7*							
B11	PRC93SED0225	5/11/93	1.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	4.0 UJ	5.0 UJ
B11	PRC93SED0226	5/11/93	1.1 UJ	4.4 UJ	4.4 UJ	4.4 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	4.4 UJ	5.6 UJ
B11	PRC93SED0227	5/11/93	1.1 UJ	4.3 UJ	4.3 UJ	4.3 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	4.3 UJ	5.3 UJ
Replicate Mean Value				*2.1*	*2.1*	*2.1*							
B12	PRC93SED0230	4/28/93	8.0 UJ	3.3 UJ	3.3 UJ	3.3 UJ	1.7 UJ	1.7 UJ	1.7 UJ	1.7 UJ	17 UJ	3.3 UJ	4.2 UJ
B12	PRC93SED0231	4/28/93	8.0 UJ	3.3 UJ	3.3 UJ	3.3 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	16 UJ	3.3 UJ	4.1 UJ
B12	PRC93SED0232	4/28/93	8.0 UJ	3.3 UJ	3.3 UJ	3.3 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	16 UJ	3.3 UJ	4.1 UJ
Replicate Mean Value				*1.7*	*1.7*	*1.7*							
B13	PRC93SED0236	5/25/93	1.4 U	5.6 U	5.6 U	5.6 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	5.6 U	6.9 U
B13	PRC93SED0237	5/25/93	1.4 U	5.7 U	5.7 U	5.7 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	5.7 U	7.1 U
B13	PRC93SED0238	5/25/93	1.1 U	4.5 U	4.5 U	4.5 U	45.0 U	2.3 U	2.3 U	2.3 U	45 U	91 U	114 U
Replicate Mean Value				*2.6*	*2.6*	*2.6*							
B14	PRC93SED0241	5/27/93	13 UJ	5.3 UJ	5.3 UJ	11.0 UJ	5.3 UJ	2.6 UJ	2.6 UJ	2.6 UJ	5.3 UJ	5.3 UJ	6.6 UJ
B14	PRC93SED0242	5/27/93	13 UJ	5.3 UJ	13 J	11.0 UJ	5.3 UJ	2.6 UJ	2.6 UJ	2.6 UJ	5.3 UJ	5.3 UJ	6.6 UJ
B14	PRC93SED0243	5/27/93	14 UJ	5.4 UJ	5.4 UJ	11.0 UJ	5.4 UJ	2.7 UJ	2.7 UJ	2.7 UJ	5.4 UJ	5.4 UJ	6.8 UJ
Replicate Mean Value				*2.7*	*6.1*	*5.5*							
B2	PRC93SED0175	6/8/93	11 UJ	4.4 UJ	4.4 UJ	4.4 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	22 UJ	4.4 UJ	5.6 UJ
B2	PRC93SED0176	6/8/93	11 UJ	10 J	4.4 UJ	4.4 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	4.4 UJ	5.6 UJ
B2	PRC93SED0177	6/8/93	1.1 UJ	4.3 UJ	4.3 UJ	4.3 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	43 UJ	5.4 UJ
Replicate Mean Value				*4.8*	*2.2*	*2.2*							
B3	PRC93SED0181	5/25/93	1.4 U	5.4 U	5.4 U	5.4 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	5.4 U	6.8 U
B3	PRC93SED0182	5/25/93	1.4 U	5.4 U	5.4 U	5.4 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	5.4 U	6.8 U
B3	PRC93SED0183	5/25/83	1.4 U	5.4 U	5.4 U	5.4 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	5.4 U	6.8 U
Replicate Mean Value				*2.7*	*2.7*	*2.7*							
B4	PRC93SED0186	6/8/93	1.0 UJ	3.9 UJ	3.9 UJ	3.9 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	3.9 UJ	4.9 UJ
B4	PRC93SED0187	6/8/93	1.0 UJ	4.2 UJ	4.2 UJ	4.2 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	4.2 UJ	5.2 UJ
B4	PRC93SED0188	6/8/93	0.8 UJ	3.1 UJ	3.1 UJ	3.1 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	3.1 UJ	3.9 UJ
Replicate Mean Value				*1.9*	*1.9*	*1.9*							
B5	PRC93SED0192	6/8/93	1.1 UJ	4.5 UJ	4.5 UJ	4.5 UJ	45.0 UJ	2.3 UJ	2.3 UJ	2.3 UJ	45 UJ	91 UJ	5.7 UJ
B5	PRC93SED0193	6/8/93	1.2 UJ	4.9 UJ	4.9 UJ	4.9 UJ	24.0 UJ	2.4 UJ	2.4 UJ	2.4 UJ	24 UJ	49 UJ	6.1 UJ
B5	PRC93SED0194	6/8/93	1.3 UJ	5.0 UJ	5.0 UJ	5.0 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	5.0 UJ	6.3 UJ
Replicate Mean Value				*2.4*	*2.4*	*2.4*							
B6	PRC93SED0197	6/9/93	100 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U	5.0 U
B6	PRC93SED0198	6/9/93	111 U	4.4 U	4.4 U	4.4 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	4.4 U	5.6 U
B6	PRC93SED0199	6/9/93	11.4 U	4.5 U	4.5 U	4.5 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	4.5 U	5.7 U
Replicate Mean Value				*2.2*	*2.2*	*2.2*							

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1e
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 4 of 6)

Sampling Location	Sample Identification	Sampling Date	DBHC	DDD	DDE	DDT	DIELDRIN	ENDOSI	ENDOSII	ENDOSSLF	ENDRIN	ENDRINAL	ENDRINKT
B7	PRC93SED0203	6/24/93	1.1 UJ	4.3 UJ	4.3 UJ	6.4 J	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	4.3 UJ	5.3 UJ
B7	PRC93SED0204	6/24/93	10 UJ	4.0 UJ	4.0 UJ	4.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	4.0 UJ	5.0 UJ
B7	PRC93SED0205	6/24/93	1.0 UJ	4.2 UJ	4.2 UJ	4.2 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	4.2 UJ	5.2 UJ
Replicate Mean Value				*2.1*	*2.1*	*3.5*							
B8	PRC93SED0208	6/24/93	7.1 UJ	2.9 UJ	2.9 UJ	2.9 UJ	1.4 UJ	1.4 UJ	1.4 UJ	1.4 UJ	1.4 UJ	2.9 UJ	3.6 UJ
B8	PRC93SED0209	6/24/93	0.80 UJ	3.0 UJ	3.0 UJ	3.0 UJ	1.5 UJ	1.5 UJ	1.5 UJ	1.5 UJ	1.5 UJ	3.0 UJ	3.8 UJ
B8	PRC93SED0210	6/24/93	8.2 UJ	3.3 UJ	3.3 UJ	3.3 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	3.3 UJ	4.1 UJ
Replicate Mean Value				*1.5*	*1.5*	*1.5*							
B9	PRC93SED0214	5/27/93	6.5 UJ	2.6 UJ	2.6 UJ	5.2 UJ	2.6 UJ	1.3 UJ	1.3 UJ	1.3 UJ	2.6 UJ	2.6 UJ	3.2 UJ
B9	PRC93SED0215	5/27/93	6.8 UJ	2.7 UJ	2.7 UJ	5.5 UJ	2.7 UJ	1.4 UJ	1.4 UJ	1.4 UJ	2.7 UJ	2.7 UJ	3.4 UJ
B9	PRC93SED0216	5/27/93	6.9 UJ	2.8 UJ	2.8 UJ	5.6 UJ	2.8 UJ	1.4 UJ	1.4 UJ	1.4 UJ	2.8 UJ	2.8 UJ	3.5 UJ
Replicate Mean Value				*1.4*	*1.4*	*2.7*							
Frequency of Detection (%)			0	8.0	8.0	8.0	0	0	0	0	0	0	0
*Average Values**			---	2.2	2.3	2.5	---	---	---	---	---	---	---
*Standard Deviation**			---	---	---	---	---	---	---	---	---	---	---
Maximum Values			---	5	6	5.5	---	---	---	---	---	---	---
Ambient Sediment Screening Values (µg/kg)			NV	NV	---	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range Low (ER-L), (µg/kg)			NV	2.0	2.2	1.0	0.02	NV	NV	NV	0.02	NV	NV
Effects Range-Median (ER-M), (µg/kg)			NV	20	27	7	8.0	NV	NV	NV	45	NV	NV

Notes:
NA = No[illegible]yzed, NV = No Value, --- = No Statistics
Qual[illegible]ione: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The [illegible] and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1e
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 5 of 6)

Sampling Location	Sample Identification	Sampling Date	GBHC	GCHLRDNE	HPTCLR	HPTCLREP	MTHOXCHL	TOTAL PCBs	TOTAL DDTs
1996 Ecological Assessment Report									
B1	PRC93SED0170	6/9/93	0.80 U	0.80 U	0.80 U	0.80 U	1.7 U		
B1	PRC93SED0171	6/9/93	0.80 U	0.80 U	0.80 U	0.80 U	1.7 U		
B1	PRC93SED0172	6/9/93	0.90 U	0.90 U	0.90 U	0.90 U	1.8 U		
Replicate Mean Value								--	--
B11	PRC93SED0225	5/11/93	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	2.0 UJ		
B11	PRC93SED0226	5/11/93	1.1 UJ	1.1 UJ	1.1 UJ	1.1 UJ	2.2 UJ		
B11	PRC93SED0227	5/11/93	1.1 UJ	1.1 UJ	1.1 UJ	1.1 UJ	2.1 UJ		
Replicate Mean Value								--	--
B12	PRC93SED0230	4/28/93	0.83 UJ	0.83 UJ	8.0 UJ	0.83 UJ	1.7 UJ		
B12	PRC93SED0231	4/28/93	0.82 UJ	0.82 UJ	8.0 UJ	0.82 UJ	1.6 UJ		
B12	PRC93SED0232	4/28/93	0.82 UJ	0.82 UJ	8.0 UJ	0.82 UJ	1.6 UJ		
Replicate Mean Value								36	--
B13	PRC93SED0236	5/25/93	14 U	1.4 U	1.4 U	1.4 U	2.8 U		
B13	PRC93SED0237	5/25/93	1.4 U	1.4 U	1.4 U	1.4 U	2.9 U		
B13	PRC93SED0238	5/25/93	23 U	1.1 U	23.0 U	1.1 U	2.3 U		
Replicate Mean Value								--	--
B14	PRC93SED0241	5/27/93	13 UJ	1.3 UJ	13 UJ	1.3 UJ	2.6 UJ		
B14	PRC93SED0242	5/27/93	13 UJ	1.3 UJ	13 UJ	1.3 UJ	2.6 UJ		
B14	PRC93SED0243	5/27/93	14 UJ	1.4 UJ	14 UJ	1.4 UJ	2.7 UJ		
Replicate Mean Value								--	10.2
B2	PRC93SED0175	6/8/93	11 UJ	1.1 UJ	11 UJ	1.1 UJ	2.2 UJ		
B2	PRC93SED0176	6/8/93	11 UJ	1.1 UJ	11 UJ	1.1 UJ	2.2 UJ		
B2	PRC93SED0177	6/8/93	1.1 UJ	1.1 UJ	1.1 UJ	1.1 UJ	2.2 UJ		
Replicate Mean Value								--	7.0
B3	PRC93SED0181	5/25/93	14 U	1.4 U	1.4 U	1.4 U	2.7 U		
B3	PRC93SED0182	5/25/93	1.4 U	1.4 U	1.4 U	1.4 U	2.7 U		
B3	PRC93SED0183	5/25/83	1.4 U	1.4 U	1.4 U	1.4 U	2.7 U		
Replicate Mean Value								--	--
B4	PRC93SED0186	6/8/93	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	2.0 UJ		
B4	PRC93SED0187	6/8/93	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	2.1 UJ		
B4	PRC93SED0188	6/8/93	7.8 UJ	1.6 UJ	0.78 UJ	0.78 UJ	1.6 UJ		
Replicate Mean Value								--	--
B5	PRC93SED0192	6/8/93	1.1 UJ	1.1 UJ	1.1 UJ	1.1 UJ	2.3 UJ		
B5	PRC93SED0193	6/8/93	244 UJ	1.2 UJ	1.2 UJ	1.2 UJ	2.4 UJ		
B5	PRC93SED0194	6/8/93	13 UJ	1.3 UJ	1.3 UJ	1.3 UJ	2.5 UJ		
Replicate Mean Value								--	--
B6	PRC93SED0197	6/9/93	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U		
B6	PRC93SED0198	6/9/93	1.1 U	1.1 U	11.1 U	1.1 U	2.2 U		
B6	PRC93SED0199	6/9/93	1.1 U	1.1 U	1.1 U	1.1 U	2.3 U		
Replicate Mean Value								--	--

Notes:
NA = Not Analyzed, NV = No Value, --- = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1e
Western Bayside
Pesticides and PCBs in Surface Sediment Samples (µg/kg)
(Page 6 of 6)

Sampling Location	Sample Identification	Sampling Date	GBHC	GCHLRDNE	HPTCLR	HPTCLREP	MTHOXCHL	TOTAL PCBs	TOTAL DDTs
B7	PRC93SED0203	6/24/93	1.1 UJ	1.1 UJ	1.1 UJ	1.1 UJ	2.1 UJ		
B7	PRC93SED0204	6/24/93	1.0 UJ	1.0 UJ	10 UJ	1.0 UJ	2.0 UJ		
B7	PRC93SED0205	6/24/93	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	2.1 UJ		
Replicate Mean Value								--	5.6
B8	PRC93SED0208	6/24/93	0.70 UJ	0.70 UJ	7.1 UJ	0.70 UJ	1.4 UJ		
B8	PRC93SED0209	6/24/93	0.80 UJ	0.80 UJ	0.80 UJ	0.80 UJ	1.5 UJ		
B8	PRC93SED0210	6/24/93	0.80 UJ	0.80 UJ	8.2 UJ	0.80 UJ	1.6 UJ		
Replicate Mean Value								29	--
B9	PRC93SED0214	5/27/93	6.5 UJ	0.60 UJ	6.5 UJ	0.60 UJ	1.3 UJ		
B9	PRC93SED0215	5/27/93	6.8 UJ	0.70 UJ	6.8 UJ	0.70 UJ	1.4 UJ		
B9	PRC93SED0216	5/27/93	6.9 UJ	0.70 UJ	6.9 UJ	0.70 UJ	1.4 UJ		
Replicate Mean Value								--	--
Frequency of Detection (%)			0	0	0	0	0	---	---
*Average Values**			---	---	---	---	---	32.5	7.6
*Standard Deviation**			---	---	---	---	---	---	2.4
Maximum Values			---	---	---	---	---	36	10.2
Ambient Sediment Screening Values (µg/kg)			NV	0.5	NV	NV	NV	0.05	NV
Effects Range Low (ER-L), (µg/kg)			NV	NV	NV	NV	NV	22.7	1.58
Effects Range-Median (ER-M), (µg/kg)			NV	6	NV	NV	NV	180	46

Notes:
NA = N[illegible]rzed, NV = No Value, --- = No Statistics
Qua[illegible]tions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The [illegible]ge and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1f
Western Bayside
PAH Compounds in Surface Sediment Samples (µg/kg)
(Page 1 of 2)

Sampling Location	Sample Identification	Sampling Date	ACENAP	ACENAPHY	ANTHRACN	BENZANTH	BENZAPY	BENZBFL	BENZGPER	BENZKFL	CARBAZOLE	CHRYSENE	DIBENZAH	FLRANTH
PRC 1996/1997 Follow-on Investigation														
SS001	013-SSH-001	10/3/96	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	120 J
SS002	013-SSH-002	10/3/96	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	120 J
WB003	013-WBS-005	10/3/96	200 U	200 U	200 U	200 U	200 UJ	200 UJ	200 UJ	200 UJ	200 U	200 U	200 UJ	200 U
WB007	013-WBS-012	10/3/96	210 U	210 U	210 U	210 U	130 J	210 UJ	210 UJ	210 UJ	210 U	110 J	210 UJ	210 U
WB009	013-WBS-015	10/3/96	210 U	210 U	210 U	210 U	140 J	240 J	210 UJ	210 UJ	210 U	100 J	210 UJ	110 J
Frequency of Detection (%)			0	0	0	0	40	20	0	0	0	40	0	60
*Average Values**			---	---	---	---	122	137	---	---	---	110	---	111
*Standard Deviation**			---	---	---	---	---	---	---	---	---	---	---	8.9
Maximum Values			---	---	---	---	140	240	---	---	---	110	---	120
Ambient Sediment Screening Values (µg/kg)			NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Effects Range Low (ER-L) (µg/kg)			16	44	85.3	261	430	NV	NV	NV	NV	384	63.4	600
Effects Range Median (ER-M), (µg/kg)			500	640	1100	1600	1600	NV	NV	NV	NV	2800	260	5100

Notes:
NA = Not Analyzed, NV = No Value, --- = No Statistics
Qualifier Definitions: U = Non-Detects, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation values were calculated using 1/2 of the SQL for non-detects.

Table A-1f
Western Bayside
PAH Compounds in Surface Sediment Samples (µg/kg)
(Page 2 of 2)

Sampling Location	Sample Identification	Sampling Date	FLUORENE	ID123PYR	METHNAP2	NAPTHLNE	PHENANTH	PYRENE	LMW PAH	HMW PAH	TOTAL PAH
PRC 1996/1997 Follow-on Investigation											
SS001	013-SSH-001	10/3/96	250 U	250 U	250 U	250 U	250 U	140 J	---	260	260
SS002	013-SSH-002	10/3/96	230 U	230 U	230 U	230 U	230 U	120 J	---	240	240
WB003	013-WBS-005	10/3/96	200 U	200 UJ	200 U	200 U	200 U	200 U	---	380	---
WB007	013-WBS-012	10/3/96	210 U	210 UJ	210 U	210 U	210 U	140 J	---	---	380
WB009	013-WBS-015	10/3/96	210 U	210 UJ	210 U	210 U	210 U	150 J	---	500	740
Frequency of Detection (%)			0	0	0	0	0	80	---	---	---
*Average Values**			---	---	---	---	---	130	---	---	---
*Standard Deviation**			---	---	---	---	---	20	---	---	---
Maximum Values			---	---	---	---	---	150	---	---	---
Ambient Sediment Screening Values (µg/kg)			NV	NV	NV	NV	NV	NV	NV	NV	5130
Effects Range Low (ER-L) (µg/kg)			19	NV	70	160	240	665	552	1700	4022
Effects Range Median (ER-M), (µg/kg)			540	NV	670	2100	2600	2600	3160	9600	44792

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qual[illegible] [illegible]initions: U = Non-Detects, J = Estimated, Blank = Unqualified Detect
*The[illegible] [illegible]ge and standard deviation values were calculated using 1/2 of the SQL for non-[illegible]

Table A-1g
Western Bayside
PAH Compounds in Surface Sediment Samples (µg/kg)
(Page 1 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ACENAP	ACENAPHY	ANTHRACN	BENZANTH	BENZAPY	BENZBFL	BENZGPER	BENZKFL	CHRYSENE	DIBENZAH	FLRANTH	FLUORENE
PRC 1996/1997 Follow-on Investigation																
B1	PRC94SVL1115	4/26/94	0.00	0.30	110 UJ	110 UJ	110 UJ	140 J	190 J	220 J	170 J	110 UJ	250 J	110 UJ	360 J	60 UJ
B1	PRC94SVL1117	4/26/94	0.00	0.30	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 J	110 UJ	110 UJ	110 UJ	110 UJ	180 J	60 UJ
B1	PRC94SVL1118	4/26/94	0.00	0.30	110 UJ	110 UJ	110 UJ	110 UJ	170 J	220 J	160 J	110 UJ	190 J	110 UJ	390 J	60 UJ
Replicate Mean Value								*83*	*138*	*183*	*128*	*55*	*165*		*310*	
B11	PRC94SVL1036	3/29/94	0.00	0.30	130 U	130 U	130 U	130 U	130 U	130	130 U	130 U	130 U	130 U	230	67 U
B11	PRC94SVL1038	3/29/94	0.00	0.30	140 U	140 U	140 U	140 U	160	200	140 U	140 U	140 U	140 U	220	71 U
B11	PRC94SVL1039	3/29/94	0.00	0.30	140 U	140 U	140 U	140 U	190	260	210	140 U	140 U	140 U	260	74 U
Replicate Mean Value								*68*	*138*	*197*	*115*	*68*	*68*		*237*	
B12	PRC94SVL1112	4/26/94	0.00	0.30	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	130 J	120 UJ	120 UJ	120 UJ	120 UJ	130 J	60 UJ
B12	PRC94SVL1113	4/26/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	150 J	70 UJ
B12	PRC94SVL1114	4/26/94	0.00	0.30	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	50 UJ
Replicate Mean Value								*58*	*58*	*82*	*58*	*58*	*58*		*110*	
B13	PRC94SVL1040	3/28/94	0.00	0.30	170 U	170 U	170 U	170 U	180	250	220	170 U	170 U	170 U	250	88 U
B13	PRC94SVL1041	3/28/94	0.00	0.30	170 U	170 U	170 U	170 U	180	280	240	170 U	170 U	170 U	190	90 U
B13	PRC94SVL1042	3/28/94	0.00	0.30	170 U	170 U	170 U	170 U	170 U	210	170 U	170 U	170 U	170 U	310	90 U
Replicate Mean Value								*85*	*148*	*247*	*182*	*85*	*85*		*250*	
B13	PRC94SVL1179	5/2/94	0.00	0.30	120 UJ	120 UJ	120 UJ	120 UJ	130 J	170 J	120 J	120 UJ	120 UJ	120 UJ	210 J	60 UJ
B13	PRC94SVL1181	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	140 J	130 UJ	130 UJ	130 UJ	130 UJ	170 J	69 UJ
B13	PRC94SVL1182	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	66 UJ
Replicate Mean Value								*63*	*87*	*125*	*83*	*63*	*63*		*148*	
B14	PRC94SVL1043	3/28/94	0.00	0.30	160 U	160 U	160 U	160 U	200	270	160 U	160 U	160 U	160 U	490	85 U
B14	PRC94SVL1045	3/28/94	0.00	0.30	160 U	160 U	160 U	160 U	160	190	160 U	160 U	160 U	160 U	360	83 U
B14	PRC94SVL1046	3/28/94	0.00	0.30	160 U	160 U	160 U	160 U	180	200	180	160 U	160 U	160 U	430	83 U
Replicate Mean Value								*80*	*180*	*220*	*113*	*80*	*80*		*427*	
B2	PRC94SVL1022	3/30/94	0.00	0.30	170 U	170 U	170 U	170 U	220	360	260	170 U	170 U	170 U	280	90 U
B2	PRC94SVL1024	3/30/94	0.00	0.30	140 U	140 U	140 U	140 U	190	260	190	140 U	160	140 U	200	74 U
B2	PRC94SVL1025	3/30/94	0.00	0.30	150 U	150 U	150 U	150 U	150 U	210	150 U	150 U	150 U	150 U	330	76 U
Replicate Mean Value								*77*	*162*	*277*	*175*	*77*	*107*		*270*	
B3	PRC94SVL1026	3/29/94	0.00	0.30	160 U	160 U	160 U	160 U	160 U	220	160 U	160 U	160 U	160 U	370	85 U
B3	PRC94SVL1027	3/29/94	0.00	0.30	140 R	140 R	140 R	540 J	160 J	730 J	270 J	180 J	630 J	140 R	880 J	73 R
B3	PRC94SVL1028	3/29/94	0.00	0.30	130 U	130 U	130 U	130	130	210	160	130 U	160	130 U	310	67 U
Replicate Mean Value								250	123	387	170	108	290		520	

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1g
Western Bayside
PAH Compounds in Surface Sediment Samples (µg/kg)
(Page 2 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ACENAP	ACENAPHY	ANTHRACN	BENZANTH	BENZAPY	BENZBFL	BENZGPER	BENZKFL	CHRYSENE	DIBENZAH	FLRANTH	FLUORENE
B3	PRC94SVL1183	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	180 J	240 J	190 J	130 UJ	150 J	130 UJ	220 J	70 UJ
B3	PRC94SVL1184	5/2/94	0.00	0.30	140 UJ	140 UJ	140 UJ	140 UJ	200 J	240 J	180 J	140 UJ	140 J	140 UJ	240 J	71 UJ
B3	PRC94SVL1185	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	160 J	200 J	180 J	130 UJ	140 J	130 UJ	240 J	70 UJ
B3	PRC94SVL1186	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	160 J	130 UJ	130 UJ	130 UJ	130 UJ	160 J	66 UJ
Replicate Mean Value								*66*	*151*	*210*	*154*	*66*	*124*		*215*	
B4	PRC94SVL1083	4/25/94	0.00	0.30	100 U	100 U	100 U	100 U	200	230	160	100 U	140	100 U	110	50 U
B4	PRC94SVL1085	4/25/94	0.00	0.30	110 U	110 U	110 U	130	280	320	270	120	180	110 U	110 U	60 U
B4	PRC94SVL1086	4/25/94	0.00	0.30	90 U	90 U	90 U	90 U	220	250	180	90 U	140	90 U	100	50 U
Replicate Mean Value								*75*	*233*	*267*	*203*	*72*	*153*		*88*	
B5	PRC94SVL1029	3/29/94	0.00	0.30	160 U	160 U	160 U	160 U	210	220	210	160 U	190	160 U	430	83 U
B5	PRC94SVL1031	3/29/94	0.00	0.30	160 U	160 U	160 U	160 U	170	230	190	160 U	160 U	160 U	280	81 U
B5	PRC94SVL1032	3/29/94	0.00	0.30	160 U	160 U	160 U	160 U	170	220	190	160 U	170	160 U	390	85 U
Replicate Mean Value								*80*	*183*	*223*	*197*	*80*	*147*		*367*	
B6	PRC94SVL1087	4/25/94	0.00	0.30	120 U	120 U	120 U	120 U	170	210	170	120 U	120 U	120 U	120 U	60 U
B6	PRC94SVL1089	4/25/94	0.00	0.30	100 U	100 U	100 U	100 U	210	200	180	100 U	140	100 U	170	53 U
B6	PRC94SVL1090	4/25/94	0.00	0.30	94 U	94 U	94 U	94 U	140	180	140	94 U	110 U	94 U	94 U	49 U
Replicate Mean Value								*52*	*173*	*197*	*163*	*52*	*85*		*92*	
B7	PRC94SVL1033	3/29/94	0.00	0.30	130 U	130 U	130 U	130 U	140	160	130	130 U	170	130 U	320	66 U
B7	PRC94SVL1034	3/29/94	0.00	0.30	120 U	120 U	120 U	120 U	130	170	140	120 U	130	120 U	250	63 U
B7	PRC94SVL1035	3/29/94	0.00	0.30	120 U	120 U	120 U	120 U	120 U	130	120	120 U	120 U	120 U	230	61 U
Replicate Mean Value								*62*	*110*	*153*	*130*	*62*	*120*		*267*	
B8	PRC94SVL1103	4/26/94	0.00	0.30	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	60 U
B8	PRC94SVL1105	4/26/94	0.00	0.30	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	50 U
B8	PRC94SVL1106	4/26/94	0.00	0.30	120 U	120 U	120 U	120 U	180	250	240	120 U	120 U	120 U	220	60 U
Replicate Mean Value								*57*	*97*	*120*	*117*	*57*	*57*		*110*	
B9	PRC94SVL1107	4/26/94	0.00	0.30	100 U	100 U	100 U	100 U	100 U	130	110	100 U	100 U	100 U	100 U	50 U
B9	PRC94SVL1109	4/26/94	0.00	0.30	180 U	180 U	180 U	180 U	180 U	250	180 U	180 U	180 U	180 U	180 U	95 U
B9	PRC94SVL1110	4/26/94	0.00	0.30	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	50 UJ
Replicate Mean Value								*63*	*63*	*143*	*83*	*63*	*63*		*63*	
Frequency of Detection (%)					0	0	0	20	87	100	93	13	53	0	93	0
*Average Values**					---	---	---	81	136	202	138	70	111	---	232	---
*Standard Deviation**					---	---	---	48	48	76	44	---	61	---	135	---
Maximum Values					---	---	---	250	233	387	203	108	290	---	520	---

PR-L

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifi[illegible]tions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The [illegible]nd standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1g
Western Bayside
PAH Compounds in Surface Sediment Samples (µg/kg)
(Page 3 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ID123PYR	METHNAP2	NAPTHLNE	PHENANTH	PYRENE	LMW PAH	HMW PAH	TOTAL PAH
PRC 1996/1997 Follow-on Investigation												
B1	PRC94SVL1115	4/26/94	0.00	0.30	140 J	110 UJ	110 UJ	130 J	340 J			
B1	PRC94SVL1117	4/26/94	0.00	0.30	110 UJ	110 UJ	110 UJ	110 UJ	160 J			
B1	PRC94SVL1118	4/26/94	0.00	0.30	120 J	110 UJ	110 UJ	120 J	340 J			
Replicate Mean Value					***105***		***55***	***102***	***280***	***157***	***976***	***1549***
B11	PRC94SVL1036	3/29/94	0.00	0.30	130 U	130 U	130 U	130 U	250			
B11	PRC94SVL1038	3/29/94	0.00	0.30	140 U	140 U	140 U	140 U	350			
B11	PRC94SVL1039	3/29/94	0.00	0.30	140 U	140 U	140 U	140 U	320			
Replicate Mean Value					***68***		***68***	***68***	***307***	---	***682***	***994***
B12	PRC94SVL1112	4/26/94	0.00	0.30	120 UJ	120 UJ	120 UJ	120 UJ	190 J			
B12	PRC94SVL1113	4/26/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ			
B12	PRC94SVL1114	4/26/94	0.00	0.30	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ			
Replicate Mean Value					***58***		***58***	***58***	***102***	---	***212***	***294***
B13	PRC94SVL1040	3/28/94	0.00	0.30	170 U	170 U	170 U	170 U	380			
B13	PRC94SVL1041	3/28/94	0.00	0.30	170 U	170 U	170 U	170 U	330 U			
B13	PRC94SVL1042	3/28/94	0.00	0.30	170 U	170 U	170 U	170 U	380			
Replicate Mean Value					***85***		***85***	***85***	***308***	---	***706***	***1135***
B13	PRC94SVL1179	5/2/94	0.00	0.30	120 UJ	120 UJ	120 UJ	120 J	240 J			
B13	PRC94SVL1181	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	200 J			
B13	PRC94SVL1182	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ			
Replicate Mean Value					***63***		***63***	***63***	***168***	***63***	***403***	***674***
B14	PRC94SVL1043	3/28/94	0.00	0.30	160 U	160 U	160 U	340	540			
B14	PRC94SVL1045	3/28/94	0.00	0.30	160 U	160 U	160 U	200	360			
B14	PRC94SVL1046	3/28/94	0.00	0.30	160 U	160 U	160 U	200	480			
Replicate Mean Value					***80***		***80***	***247***	***460***	***247***	***1067***	***1647***
B2	PRC94SVL1022	3/30/94	0.00	0.30	240	170 U	170 U	170 U	410			
B2	PRC94SVL1024	3/30/94	0.00	0.30	180	140 U	140 U	140 U	320			
B2	PRC94SVL1025	3/30/94	0.00	0.30	150 U	150 U	150 U	150 U	330			
Replicate Mean Value					***165***		***77***	***77***	***353***	---	***892***	***1509***
B3	PRC94SVL1026	3/29/94	0.00	0.30	160 U	160 U	160 U	160 U	390			
B3	PRC94SVL1027	3/29/94	0.00	0.30	200 J	140 R	630 J	730 J	730 J			
B3	PRC94SVL1028	3/29/94	0.00	0.30	150	130 U	130 U	170	370			
Replicate Mean Value					143		258	327	497	585	1680	3073

Notes:
NA = Not Analyzed, NV = No Value, --- = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1g
Western Bayside
PAH Compounds in Surface Sediment Samples (µg/kg)
(Page 4 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ID123PYR	METHNAP2	NAPTHLNE	PHENANTH	PYRENE	LMW PAH	HMW PAH	TOTAL PAH
B3	PRC94SVL1183	5/2/94	0.00	0.30	190 J	130 UJ	130 UJ	130 UJ	320 J			
B3	PRC94SVL1184	5/2/94	0.00	0.30	170 J	140 UJ	140 UJ	140 UJ	270 J			
B3	PRC94SVL1185	5/2/94	0.00	0.30	160 J	130 UJ	130 UJ	130 UJ	280 J			
B3	PRC94SVL1186	5/2/94	0.00	0.30	130 UJ	130 UJ	130 UJ	130 UJ	230 J			
Replicate Mean Value					*146*		*66*	*66*	*275*	---	*765*	*1275*
B4	PRC94SVL1083	4/25/94	0.00	0.30	140	100 U	100 U	100 U	200			
B4	PRC94SVL1085	4/25/94	0.00	0.30	220	110 U	110 U	110 U	400			
B4	PRC94SVL1086	4/25/94	0.00	0.30	180	90 U	90 U	90 U	210			
Replicate Mean Value					*180*		*50*	*50*	*270*	---	*819*	*1541*
B5	PRC94SVL1029	3/29/94	0.00	0.30	190	160 U	160 U	170	480			
B5	PRC94SVL1031	3/29/94	0.00	0.30	170	160 U	160 U	160 U	330			
B5	PRC94SVL1032	3/29/94	0.00	0.30	160	160 U	160 U	160 U	410			
Replicate Mean Value					*173*		*80*	*110*	*407*	*110*	*1104*	*1807*
B6	PRC94SVL1087	4/25/94	0.00	0.30	140	120 U	120 U	120 U	210			
B6	PRC94SVL1089	4/25/94	0.00	0.30	150	100 U	100 U	100 U	270			
B6	PRC94SVL1090	4/25/94	0.00	0.30	110	94 U	94 U	94 U	140			
Replicate Mean Value					*133*		*52*	*52*	*207*	---	*557*	*1050*
B7	PRC94SVL1033	3/29/94	0.00	0.30	130 U	130 U	130 U	150	360			
B7	PRC94SVL1034	3/29/94	0.00	0.30	120	120 U	120 U	120 U	300			
B7	PRC94SVL1035	3/29/94	0.00	0.30	120 U	120 U	120 U	120 U	260			
Replicate Mean Value					*82*		*62*	*90*	*307*	*90*	*804*	*1259*
B8	PRC94SVL1103	4/26/94	0.00	0.30	120 U	120 U	120 U	120 U	130			
B8	PRC94SVL1105	4/26/94	0.00	0.30	100 U	100 U	100 U	100 U	100 U			
B8	PRC94SVL1106	4/26/94	0.00	0.30	170	120 U	120 U	120 U	200			
Replicate Mean Value					*93*		*57*	*57*	*127*	---	*334*	*664*
B9	PRC94SVL1107	4/26/94	0.00	0.30	100 U	100 U	100 U	100 U	120			
B9	PRC94SVL1109	4/26/94	0.00	0.30	180 U	180 U	180 U	180 U	190			
B9	PRC94SVL1110	4/26/94	0.00	0.30	100 UJ	100 UJ	100 UJ	100 UJ	100 J			
Replicate Mean Value					*63*		*63*	*63*	*137*	---	*137*	*363*
Frequency of Detection (%)					60	0	6.0	40	100	---	---	---
*Average Values**					109	---	78	101	280	---	---	---
*Standard Deviation**					43	---	---	79	119	---	---	---
Maximum Values					180	---	---	327	497	---	---	---

Notes:
NA = Not Analyzed, NV = No Value, --- = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The [illegible] and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1h
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 1 of 3)

Sampling Location	Sample Identification	Sampling Date	BIS2CLEE	BIS2CLEM	BIS2CLIE	BIS2EHPH	BROMPPE4	BUTBENZP	CHLRNAP2	CHLRPPE4	CL4MTHP3	CLRANLN4	CLRP2	DCB12	DCB13	DCB14	DIBENZOF	DICLBZ33
PRC 1996/1997 Follow-on Investigation																		
SS001	013-SSH-001	10/3/96	250 U	250 U	250 U	190 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
SS002	013-SSH-002	10/3/96	230 U	230 U	230 U	180 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U	230 U
WB003	013-WBS-005	10/3/96	200 U	200 U	200 U	210 UJ	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
WB007	013-WBS-012	10/3/96	210 U	210 U	210 U	160 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U
WB009	013-WBS-015	10/3/96	210 U	210 U	210 U	160 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U	210 U

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detects, J = Estimated, Blank = Unqualified Detect

Table A-1h
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 2 of 3)

Sampling Location	Sample Identification	Sampling Date	DICLRP24	DIETHPH	DIMETHPH	DIMTHP24	DINBUTLP	DINCRS46	DINITP24	DNOCTPHT	DNT24	DNT26	HEXCLBNZ	HEXCLBUT	HEXCLCPD	HEXCLETH	ISOPHOR
PRC 1996/1997 Follow-on Investigation																	
SS001	013-SSH-001	10/3/96	250 U	250 U	250 U	250 U	250 U	600 UJ	600 UJ	250 U	250 U	250 U	250 U	250 U	250 UJ	250 U	250 U
SS002	013-SSH-002	10/3/96	230 U	230 U	230 U	230 U	230 U	560 UJ	560 UJ	230 U	230 U	230 U	230 U	230 U	230 UJ	230 U	230 U
WB003	013-WBS-005	10/3/96	200 U	200 U	200 U	200 U	200 U	490 UJ	490 UJ	200 UJ	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U
WB007	013-WBS-012	10/3/96	210 U	210 U	210 U	210 U	210 U	510 UJ	510 UJ	210 UJ	210 U	210 U	210 U	210 U	210 UJ	210 U	210 U
WB009	013-WBS-015	10/3/96	210 U	210 U	210 U	210 U	210 U	500 UJ	500 UJ	210 UJ	210 U	210 U	210 U	210 U	210 UJ	210 U	210 U

Notes:
NA = N[illegible]lyzed, NV = No Value, — = No Statistics
Qual[illegible]itions: U = Non-Detects, J = Estimated, Blank = Unqualified Detect

Table A-1h
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 3 of 3)

Sampling Location	Sample Identification	Sampling Date	METHPHN2	METHPHN4	NITROAN2	NITROAN3	NITROAN4	NITROBNZ	NITROPH2	NITROPH4	NNITRONP	NNITROSP	PENTCLPH	PHENOL	TCP245	TCP246	TRICB124
PRC 1996/1997 Follow-on Investigation																	
SS001	013-SSH-001	10/3/96	250 U	250 U	600 U	600 U	600 U	250 U	250 U	600 U	250 U	250 U	600 U	250 U	600 U	250 U	250 U
SS002	013-SSH-002	10/3/96	230 U	230 U	560 U	560 U	560 U	230 U	230 U	560 U	230 U	230 U	560 U	230 U	560 U	230 U	230 U
WB003	013-WBS-005	10/3/96	200 U	200 U	490 U	490 U	490 U	200 U	200 U	490 U	200 U	200 U	490 U	200 U	490 U	200 U	200 U
WB007	013-WBS-012	10/3/96	210 U	210 U	510 U	510 U	510 U	210 U	210 U	510 U	210 U	210 U	510 U	210 U	510 U	210 U	210 U
WB009	013-WBS-015	10/3/96	210 U	210 U	500 U	500 U	500 U	210 U	210 U	500 U	210 U	210 U	500 U	210 U	500 U	210 U	210 U

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detects, J = Estimated, Blank = Unqualified Detect

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 1 of 8)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		BENZACID	BENZALC	BENDINE	BIS2CLEE	BIS2CLEM	BIS2CLIE	BIS2EHPH	BROMPPE4	BUTBENZP	CHLRNAP2	CHLRPPE4	CLAMTHP3
1996 Ecological Assessment Report																
B1	PRC94SVL1115	4/26/94	0.00	0.30	1140 UJ	560 UJ	1140 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	220 UJ
B1	PRC94SVL1117	4/26/94	0.00	0.30	1100 UJ	540 UJ	1100 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	210 UJ
B1	PRC94SVL1118	4/26/94	0.00	0.30	1140 UJ	560 UJ	1140 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	220 UJ
Replicate Mean Value											*55*					
B11	PRC94SVL1036	3/29/94	0.00	0.30	1300 U	630 U	1300 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U	250 U
B11	PRC94SVL1038	3/29/94	0.00	0.30	1400 U	670 U	1400 U	140 U	140 U	140 U	150	140 U	140 U	140 U	140 U	270 U
B11	PRC94SVL1039	3/29/94	0.00	0.30	1400 U	700 U	1400 U	140 U	140 U	140 U	190	140 U	140 U	140 U	140 U	280 U
Replicate Mean Value											*135*					
B12	PRC94SVL1112	4/26/94	0.00	0.30	1160 UJ	570 UJ	1160 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	220 UJ
B12	PRC94SVL1113	4/26/94	0.00	0.30	1260 UJ	620 UJ	1260 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	250 UJ
B12	PRC94SVL1114	4/26/94	0.00	0.30	1020 UJ	500 UJ	1020 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	200 UJ
Replicate Mean Value											*58*					
B13	PRC94SVL1040	3/28/94	0.00	0.30	1700 U	830 U	1700 U	170 U	170 U	170 U	180	170 U	170 U	170 U	170 U	330 U
B13	PRC94SVL1041	3/28/94	0.00	0.30	1700 U	850 U	1700 U	170 U	170 U	170 U	250	170 U	170 U	170 U	170 U	330 U
B13	PRC94SVL1042	3/28/94	0.00	0.30	1700 U	850 U	1700 U	170 U	170 U	170 U	190	170 U	170 U	170 U	170 U	330 U
B13	PRC94SVL1179	5/2/94	0.00	0.30	1200 UJ	570 UJ	1200 UJ	120 UJ	120 UJ	120 UJ	190 J	120 UJ	120 UJ	120 UJ	120 UJ	220 UJ
B13	PRC94SVL1181	5/2/94	0.00	0.30	1300 UJ	650 UJ	1300 UJ	130 UJ	130 UJ	130 UJ	200 J	130 UJ	130 UJ	130 UJ	130 UJ	250 UJ
B13	PRC94SVL1182	5/2/94	0.00	0.30	1300 UJ	620 UJ	1300 UJ	130 UJ	130 UJ	130 UJ	180 J	130 UJ	130 UJ	130 UJ	130 UJ	250 UJ
Replicate Mean Value											*198*					
B14	PRC94SVL1043	3/28/94	0.00	0.30	1600 U	800 U	1600 U	160 U	160 U	160 U	200	160 U	160 U	160 U	160 U	320 U
B14	PRC94SVL1045	3/28/94	0.00	0.30	1600 U	790 U	1600 U	160 U	160 U	160 U	190	160 U	160 U	160 U	160 U	310 U
B14	PRC94SVL1046	3/28/94	0.00	0.30	1600 U	790 U	1600 U	160 U	160 U	160 U	220	160 U	230	160 U	160 U	310 U
Replicate Mean Value											*203*					
B2	PRC94SVL1022	3/30/94	0.00	0.30	1700 U	850 U	1700 U	170 U	170 U	170 U	220	170 U	170 U	170 U	170 U	330 U
B2	PRC94SVL1024	3/30/94	0.00	0.30	1400 U	700 U	1400 U	140 U	140 U	140 U	230	140 U	140 U	140 U	140 U	280 U
B2	PRC94SVL1025	3/30/94	0.00	0.30	1500 U	720 U	1500 U	150 U	150 U	150 U	260	150 U	150 U	150 U	150 U	280 U
Replicate Mean Value											*237*					
B3	PRC94SVL1026	3/29/94	0.00	0.30	1600 U	800 U	1600 U	160 U	160 U	160 U	390	160 U	160 U	160 U	160 U	320 U
B3	PRC94SVL1027	3/29/94	0.00	0.30	1400 R	690 R	1400 R	140 R	140 R	140 R	150 J	140 R	140 R	140 R	140 R	270 R
B3	PRC94SVL1028	3/29/94	0.00	0.30	1300 U	630 U	1300 U	130 U	130 U	130 U	160	130 U	130 U	130 U	130 U	250 U
B3	PRC94SVL1183	5/2/94	0.00	0.30	1300 UJ	660 UJ	1300 UJ	130 UJ	130 UJ	130 UJ	420 J	130 UJ	130 UJ	130 UJ	130 UJ	260 UJ
B3	PRC94SVL1184	5/2/94	0.00	0.30	1400 UJ	670 UJ	1400 UJ	140 UJ	140 UJ	140 UJ	190 J	140 UJ	140 UJ	140 UJ	140 UJ	270 UJ
B3	PRC94SVL1185	5/2/94	0.00	0.30	1300 UJ	660 UJ	1300 UJ	130 UJ	130 UJ	130 UJ	140 J	130 UJ	130 UJ	130 UJ	130 UJ	260 UJ
B3	PRC94SVL1186	5/2/94	0.00	0.30	1300 UJ	620 UJ	1300 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	250 UJ
Replicate Mean Value											*216*					

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 2 of 8)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		BENZACID	BENZALC	BENDINE	BIS2CLEE	BIS2CLEM	BIS2CLIE	BIS2EHPH	BROMPPE4	BUTBENZP	CHLRNAP2	CHLRPPE4	CL4MTHP3
B4	PRC94SVL1083	4/25/94	0.00	0.30	970 U	480 U	970 U	100 U	100 U	100 U	380 U	100 U	100 U	100 U	100 U	190 U
B4	PRC94SVL1085	4/25/94	0.00	0.30	1120 U	550 U	1120 U	110 U	110 U	110 U	480 U	110 U	110 U	110 U	110 U	220 U
B4	PRC94SVL1086	4/25/94	0.00	0.30	930 U	460 U	930 U	90 U	90 U	90 U	330 U	90 U	90 U	90 U	90 U	180 U
Replicate Mean Value											*198*					
B5	PRC94SVL1029	3/29/94	0.00	0.30	1600 U	790 U	1600 U	160 U	160 U	160 U	330	160 U	160 U	160 U	160 U	310 U
B5	PRC94SVL1031	3/29/94	0.00	0.30	1600 U	770 U	1600 U	160 U	160 U	160 U	200	160 U	160 U	160 U	160 U	300 U
B5	PRC94SVL1032	3/29/94	0.00	0.30	1600 U	800 U	1600 U	160 U	160 U	160 U	210	160 U	160 U	160 U	160 U	320 U
Replicate Mean Value											*247*					
B6	PRC94SVL1087	4/25/94	0.00	0.30	1160 U	570 U	1160 U	120 U	120 U	120 U	310 U	120 U	120 U	120 U	120 U	220 U
B6	PRC94SVL1089	4/25/94	0.00	0.30	1000 U	500 U	1000 U	100 U	100 U	100 U	440 U	100 U	100 U	100 U	100 U	200 U
B6	PRC94SVL1090	4/25/94	0.00	0.30	940 U	460 U	940 U	94 U	94 U	94 U	490 U	94 U	94 U	94 U	94 U	180 U
Replicate Mean Value											*207*					
B7	PRC94SVL1033	3/29/94	0.00	0.30	1300 U	620 U	1300 U	130 U	130 U	130 U	150	130 U	130 U	130 U	130 U	250 U
B7	PRC94SVL1034	3/29/94	0.00	0.30	1200 U	590 U	1200 U	120 U	120 U	120 U	130	120 U	120 U	120 U	120 U	230 U
B7	PRC94SVL1035	3/29/94	0.00	0.30	1200 U	580 U	1200 U	120 U	120 U	120 U	150	120 U	120 U	120 U	120 U	230 U
Replicate Mean Value											*143*					
B8	PRC94SVL1103	4/26/94	0.00	0.30	1200 U	570 U	1200 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	220 U
B8	PRC94SVL1105	4/26/94	0.00	0.30	1020 U	500 U	1020 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	200 U
B8	PRC94SVL1106	4/26/94	0.00	0.30	1220 U	600 U	1220 U	120 U	120 U	120 U	130	120 U	120 U	120 U	120 U	240 U
Replicate Mean Value											*80*					
B9	PRC94SVL1107	4/26/94	0.00	0.30	1020 U	500 U	1020 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	200 U
B9	PRC94SVL1109	4/26/94	0.00	0.30	1800 U	890 U	1800 U	180 U	180 U	180 U	180 U	180 U	180 U	180 U	180 U	350 U
B9	PRC94SVL1110	4/26/94	0.00	0.30	970 UJ	480 UJ	970 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	190 UJ
Replicate Mean Value											*63*					
Frequency of Detection (%)					0	0	0	0	0	0	62	0	0	0	0	0
*Average Values**					—	—	—	—	—	—	157	—	—	—	—	—
*Standard Deviation**					—	—	—	—	—	—	72	—	—	—	—	—
Maximum Values					—	—	—	—	—	—	247	—	—	—	—	—

Notes:
NA = [illegible]yzed, NV = No Value, — = No Statistics
Qualifi[illegible]finitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
[illegible] calculated using 1/2 of the SQL for non-detects.

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)

Sampling Location	Sample Identification	Sampling Date	CLRANLN4	CLRP2	DCB12	DCB13	DCB14	DIBENZOF	DICLBZ33	DICLRP24	DIETHPH	DIMETHPH	DIMTHP24	DINBUTLP	DINCRS46
1996 Ecological Assessment Report															
B1	PRC94SVL1115	4/26/94	340 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	340 UJ	110 UJ	110 UJ	220 UJ	170 UJ	1140 UJ
B1	PRC94SVL1117	4/26/94	330 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	330 UJ	110 UJ	110 UJ	210 UJ	130 UJ	1100 UJ
B1	PRC94SVL1118	4/26/94	340 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	340 UJ	110 UJ	110 UJ	220 UJ	140 UJ	1140 UJ
Replicate Mean Value											55			73	
B11	PRC94SVL1036	3/29/94	380 U	130 U	130 U	130 U	130 U	130 U	130 U	380 U	130 U	130 U	250 U	130 U	1300 U
B11	PRC94SVL1038	3/29/94	410 U	140 U	140 U	140 U	140 U	140 U	140 U	410 U	140 U	140 U	270 U	140 U	1400 U
B11	PRC94SVL1039	3/29/94	430 U	140 U	140 U	140 U	140 U	140 U	140 U	430 U	140 U	140 U	280 U	140 U	1400 U
Replicate Mean Value											68			68	
B12	PRC94SVL1112	4/26/94	340 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	340 UJ	120 J	120 UJ	220 UJ	190 UJ	1160 UJ
B12	PRC94SVL1113	4/26/94	380 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	380 UJ	130 UJ	130 UJ	250 UJ	190 UJ	1260 UJ
B12	PRC94SVL1114	4/26/94	300 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	300 UJ	100 UJ	100 UJ	200 UJ	180 UJ	1020 UJ
Replicate Mean Value											78			93	
B13	PRC94SVL1040	3/28/94	500 U	170 U	170 U	170 U	170 U	170 U	170 U	500 U	170 U	170 U	330 U	240 U	1700 U
B13	PRC94SVL1041	3/28/94	510 U	170 U	170 U	170 U	170 U	170 U	170 U	510 U	170 U	170 U	330 U	230 U	1700 U
B13	PRC94SVL1042	3/28/94	510 U	170 U	170 U	170 U	170 U	170 U	170 U	510 U	170 U	170 U	330 U	310	1700 U
B13	PRC94SVL1179	5/2/94	340 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	120 UJ	340 UJ	120 UJ	120 UJ	220 UJ	220 UJ	1200 UJ
B13	PRC94SVL1181	5/2/94	390 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	390 UJ	130 UJ	130 UJ	250 UJ	1000 UJ	1300 UJ
B13	PRC94SVL1182	5/2/94	380 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	380 UJ	130 UJ	130 UJ	250 UJ	320 UJ	1300 UJ
Replicate Mean Value											74			219	
B14	PRC94SVL1043	3/28/94	490 U	160 U	160 U	160 U	160 U	160 U	160 U	490 U	160 U	160 U	320 U	270	1600 U
B14	PRC94SVL1045	3/28/94	480 U	160 U	160 U	160 U	160 U	160 U	160 U	480 U	160 U	160 U	310 U	200	1600 U
B14	PRC94SVL1046	3/28/94	480 U	160 U	160 U	160 U	160 U	160 U	160 U	480 U	160 U	160 U	310 U	260	1600 U
Replicate Mean Value											80			243	
B2	PRC94SVL1022	3/30/94	510 U	170 U	170 U	170 U	170 U	170 U	170 U	510 U	170 U	170 U	330 U	170 U	1700 U
B2	PRC94SVL1024	3/30/94	430 U	140 U	140 U	140 U	140 U	140 U	140 U	430 U	140 U	140 U	280 U	140 U	1400 U
B2	PRC94SVL1025	3/30/94	430 U	150 U	150 U	150 U	150 U	150 U	150 U	430 U	150 U	150 U	280 U	260	1500 U
Replicate Mean Value											77			138	
B3	PRC94SVL1026	3/29/94	490 U	160 U	160 U	160 U	160 U	160 U	160 U	490 U	160 U	160 U	320 U	290	1600 U
B3	PRC94SVL1027	3/29/94	420 R	140 R	140 R	140 R	140 R	140 R	140 R	420 R	140 R	140 R	270 R	140 R	1400 R
B3	PRC94SVL1028	3/29/94	380 U	130 U	130 U	130 U	130 U	130 U	130 U	380 U	130 U	130 U	250 U	130 U	1300 U
B3	PRC94SVL1183	5/2/94	400 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	400 UJ	130 UJ	130 UJ	260 UJ	190 UJ	1300 UJ
B3	PRC94SVL1184	5/2/94	410 UJ	140 UJ	140 UJ	140 UJ	140 UJ	140 UJ	140 UJ	410 UJ	140 UJ	140 UJ	270 UJ	180 UJ	1400 UJ
B3	PRC94SVL1185	5/2/94	400 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	400 UJ	130 UJ	130 UJ	260 UJ	170 UJ	1300 UJ
B3	PRC94SVL1186	5/2/94	380 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	380 UJ	130 UJ	130 UJ	250 UJ	160 UJ	1300 UJ
Replicate Mean Value											68			118	

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
[illegible] values were calculated using 1/2 of the SQL for non-detects.

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 4 of 8)

Sampling Location	Sample Identification	Sampling Date	CLRANLN4	CLRP2	DCB12	DCB13	DCB14	DIBENZOF	DICLBZ33	DICLRP24	DIETHPH	DIMETHPH	DIMTHP24	DINBUTLP	DINCRS46
B4	PRC94SVL1083	4/25/94	290 U	100 U	100 U	100 U	100 U	100 U	100 U	290 U	100 U	100 U	190 U	870 U	970 U
B4	PRC94SVL1085	4/25/94	330 U	110 U	110 U	110 U	110 U	110 U	110 U	330 U	110 U	110 U	220 U	870 U	1120 U
B4	PRC94SVL1086	4/25/94	280 U	90 U	90 U	90 U	90 U	90 U	90 U	280 U	90 U	90 U	180 U	720 U	930 U
Replicate Mean Value											50			410	
B5	PRC94SVL1029	3/29/94	480 U	160 U	160 U	160 U	160 U	160 U	160 U	480 U	160 U	160 U	310 U	230	1600 U
B5	PRC94SVL1031	3/29/94	470 U	160 U	160 U	160 U	160 U	160 U	160 U	470 U	160 U	160 U	300 U	160 U	1600 U
B5	PRC94SVL1032	3/29/94	490 U	160 U	160 U	160 U	160 U	160 U	160 U	490 U	160 U	160 U	320 U	160 U	1600 U
Replicate Mean Value											80			130	
B6	PRC94SVL1087	4/25/94	340 U	120 U	120 U	120 U	120 U	120 U	120 U	340 U	120 U	120 U	220 U	1000 U	1160 U
B6	PRC94SVL1089	4/25/94	300 U	100 U	100 U	100 U	100 U	100 U	100 U	300 U	100 U	100 U	200 U	740 U	1000 U
B6	PRC94SVL1090	4/25/94	280 U	94 U	94 U	94 U	94 U	94 U	94 U	280 U	94 U	94 U	180 U	830 U	940 U
Replicate Mean Value											52			428	
B7	PRC94SVL1033	3/29/94	380 U	130 U	130 U	130 U	130 U	130 U	130 U	380 U	130 U	130 U	250 U	130 U	1300 U
B7	PRC94SVL1034	3/29/94	360 U	120 U	120 U	120 U	120 U	120 U	120 U	360 U	120 U	120 U	230 U	120 U	1200 U
B7	PRC94SVL1035	3/29/94	350 U	120 U	120 U	120 U	120 U	120 U	120 U	350 U	120 U	120 U	230 U	190	1200 U
Replicate Mean Value											62			105	
B8	PRC94SVL1103	4/26/94	340 U	120 U	120 U	120 U	120 U	120 U	120 U	340 U	120 U	120 U	220 U	120 U	1200 U
B8	PRC94SVL1105	4/26/94	300 U	100 U	100 U	100 U	100 U	100 U	100 U	300 U	100 U	100 U	200 U	100 U	1020 U
B8	PRC94SVL1106	4/26/94	360 U	120 U	120 U	120 U	120 U	120 U	120 U	360 U	120 U	120 U	240 U	240	1220 U
Replicate Mean Value											57			117	
B9	PRC94SVL1107	4/26/94	300 U	100 U	100 U	100 U	100 U	100 U	100 U	300 U	100 U	100 U	200 U	100 U	1020 U
B9	PRC94SVL1109	4/26/94	540 U	180 U	180 U	180 U	180 U	180 U	180 U	540 U	180 U	180 U	350 U	180 U	1800 U
B9	PRC94SVL1110	4/26/94	290 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	290 UJ	100 UJ	100 UJ	190 UJ	260 UJ	970 UJ
Replicate Mean Value											63			90	
Frequency of Detection (%)			0	0	0	0	0	0	0	0	8	0	0	53	0
*Average Values**			---	---	---	---	---	---	---	---	67	---	---	172	---
*Standard Deviation**			---	---	---	---	---	---	---	---	11	---	---	121	---
Maximum Values			---	---	---	---	---	---	---	---	78.0	---	---	243	---

Notes:
NA = N[illegible]zed, NV = No Value, --- = No Statistics
Qualifi[illegible]tions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
[illegible] standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 5 of 8)

Sampling Location	Sample Identification	Sampling Date	DINITP24	DNOCTPHT	DNT24	DNT26	HEXCLBNZ	HEXCLBUT	HEXCLCPD	HEXCLETH	ISOPHOR	METHPHN2	METHPHN4	NITROAN2	NITROAN3	NITROAN4	NITROBNZ
1996 Ecological Assessment Report																	
B1	PRC94SVL1115	4/26/94	560 UJ	110 UJ	560 UJ	560 UJ	110 UJ	220 UJ	560 UJ	220 UJ	110 UJ	110 UJ	110 UJ	560 UJ	560 UJ	560 UJ	110 UJ
B1	PRC94SVL1117	4/26/94	540 UJ	110 UJ	540 UJ	540 UJ	110 UJ	210 UJ	540 UJ	210 UJ	110 UJ	110 UJ	110 UJ	540 UJ	540 UJ	540 UJ	110 UJ
B1	PRC94SVL1118	4/26/94	560 UJ	110 UJ	560 UJ	560 UJ	110 UJ	220 UJ	560 UJ	220 UJ	110 UJ	110 UJ	110 UJ	560 UJ	560 UJ	560 UJ	110 UJ
Replicate Mean Value													55				
B11	PRC94SVL1036	3/29/94	630 U	130 U	630 U	630 U	130 U	250 U	630 U	250 U	130 U	130 U	130 U	630 U	630 U	630 U	130 U
B11	PRC94SVL1038	3/29/94	670 U	140 U	670 U	670 U	140 U	270 U	670 U	270 U	140 U	140 U	140 U	670 U	670 U	670 U	140 U
B11	PRC94SVL1039	3/29/94	700 U	140 U	700 U	700 U	140 U	280 U	700 U	280 U	140 U	140 U	140 U	700 U	700 U	700 U	140 U
Replicate Mean Value													68				
B12	PRC94SVL1112	4/26/94	570 UJ	120 UJ	570 UJ	570 UJ	120 UJ	220 UJ	570 UJ	220 UJ	120 UJ	120 UJ	120 UJ	570 UJ	570 UJ	570 UJ	120 UJ
B12	PRC94SVL1113	4/26/94	620 UJ	130 UJ	620 UJ	620 UJ	130 UJ	250 UJ	620 UJ	250 UJ	130 UJ	130 UJ	130 UJ	620 UJ	620 UJ	620 UJ	130 UJ
B12	PRC94SVL1114	4/26/94	500 UJ	100 UJ	500 UJ	500 UJ	100 UJ	200 UJ	500 UJ	200 UJ	100 UJ	100 UJ	100 UJ	500 UJ	500 UJ	500 UJ	100 UJ
Replicate Mean Value													58				
B13	PRC94SVL1040	3/28/94	830 U	170 U	830 U	830 U	170 U	330 U	830 U	330 U	170 U	170 U	170 U	830 U	830 U	830 U	170 U
B13	PRC94SVL1041	3/28/94	850 U	170 U	850 U	850 U	170 U	330 U	850 U	330 U	170 U	170 U	170 U	850 U	850 U	850 U	170 U
B13	PRC94SVL1042	3/28/94	850 U	170 U	850 U	850 U	170 U	330 U	850 U	330 U	170 U	170 U	170 U	850 U	850 U	850 U	170 U
B13	PRC94SVL1179	5/2/94	570 UJ	120 UJ	570 UJ	570 UJ	120 UJ	220 UJ	570 UJ	220 UJ	120 UJ	120 UJ	120 UJ	570 UJ	570 UJ	570 UJ	120 UJ
B13	PRC94SVL1181	5/2/94	650 UJ	130 UJ	650 UJ	650 UJ	130 UJ	250 UJ	650 UJ	250 UJ	130 UJ	130 UJ	130 UJ	650 UJ	650 UJ	650 UJ	130 UJ
B13	PRC94SVL1182	5/2/94	620 UJ	130 UJ	620 UJ	620 UJ	130 UJ	250 UJ	620 UJ	250 UJ	130 UJ	130 UJ	130 UJ	620 UJ	620 UJ	620 UJ	130 UJ
Replicate Mean Value													74				
B14	PRC94SVL1043	3/28/94	800 U	160 U	800 U	800 U	160 U	320 U	800 U	320 U	160 U	160 U	160 U	800 U	800 U	800 U	160 U
B14	PRC94SVL1045	3/28/94	790 U	160 U	790 U	790 U	160 U	310 U	790 U	310 U	160 U	160 U	160 U	790 U	790 U	790 U	160 U
B14	PRC94SVL1046	3/28/94	790 U	160 U	790 U	790 U	160 U	310 U	790 U	310 U	160 U	160 U	160 U	790 U	790 U	790 U	160 U
Replicate Mean Value													80				
B2	PRC94SVL1022	3/30/94	850 U	170 U	850 U	850 U	170 U	330 U	850 U	330 U	170 U	170 U	170 U	850 U	850 U	850 U	170 U
B2	PRC94SVL1024	3/30/94	700 U	140 U	700 U	700 U	140 U	280 U	700 U	280 U	140 U	140 U	140 U	700 U	700 U	700 U	140 U
B2	PRC94SVL1025	3/30/94	720 U	150 U	720 U	720 U	150 U	280 U	720 U	280 U	150 U	150 U	150 U	720 U	720 U	720 U	150 U
Replicate Mean Value													77				
B3	PRC94SVL1026	3/29/94	800 U	160 U	800 U	800 U	160 U	320 U	800 U	320 U	160 U	160 U	160 U	800 U	800 U	800 U	160 U
B3	PRC94SVL1027	3/29/94	690 R	140 R	690 R	690 R	140 R	270 R	690 R	270 R	140 R	140 R	140 R	690 R	690 R	690 R	140 R
B3	PRC94SVL1028	3/29/94	630 U	130 U	630 U	630 U	130 U	250 U	630 U	250 U	130 U	130 U	130 U	630 U	630 U	630 U	130 U
B3	PRC94SVL1183	5/2/94	660 UJ	130 UJ	660 UJ	660 UJ	130 UJ	260 UJ	660 UJ	260 UJ	130 UJ	130 UJ	130 UJ	660 UJ	660 UJ	660 UJ	130 UJ
B3	PRC94SVL1184	5/2/94	670 UJ	140 UJ	670 UJ	670 UJ	140 UJ	270 UJ	670 UJ	270 UJ	140 UJ	140 UJ	140 UJ	670 UJ	670 UJ	670 UJ	140 UJ
B3	PRC94SVL1185	5/2/94	660 UJ	130 UJ	660 UJ	660 UJ	130 UJ	260 UJ	660 UJ	260 UJ	130 UJ	130 UJ	170 J	660 UJ	660 UJ	660 UJ	130 UJ
B3	PRC94SVL1186	5/2/94	620 UJ	130 UJ	620 UJ	620 UJ	130 UJ	250 UJ	620 UJ	250 UJ	130 UJ	130 UJ	130 UJ	620 UJ	620 UJ	620 UJ	130 UJ
Replicate Mean Value													86				

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
[illegible] estimated using 1/2 of the SQL for non-detects.

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 6 of 8)

Sampling Location	Sample Identification	Sampling Date	DINITP24	DNOCTPHT	DNT24	DNT26	HEXCLBNZ	HEXCLBUT	HEXCLCPD	HEXCLETH	ISOPHOR	METHPHN2	METHPHN4	NITROAN2	NITROAN3	NITROAN4	NITROBNZ
B4	PRC94SVL1083	4/25/94	480 U	100 U	480 U	480 U	100 U	190 U	480 U	190 U	100 U	100 U	100 U	480 U	480 U	480 U	100 U
B4	PRC94SVL1085	4/25/94	550 U	110 U	550 U	550 U	110 U	220 U	550 U	220 U	110 U	110 U	110 U	550 U	550 U	550 U	110 U
B4	PRC94SVL1086	4/25/94	460 U	90 U	460 U	460 U	90 U	180 U	460 U	180 U	90 U	90 U	90 U	460 U	460 U	460 U	90 U
Replicate Mean Value													50				
B5	PRC94SVL1029	3/29/94	790 U	160 U	790 U	790 U	160 U	310 U	790 U	310 U	160 U	160 U	160 U	790 U	790 U	790 U	160 U
B5	PRC94SVL1031	3/29/94	770 U	160 U	770 U	770 U	160 U	300 U	770 U	300 U	160 U	160 U	160 U	770 U	770 U	770 U	160 U
B5	PRC94SVL1032	3/29/94	800 U	160 U	800 U	800 U	160 U	320 U	800 U	320 U	160 U	160 U	160 U	800 U	800 U	800 U	160 U
Replicate Mean Value													80				
B6	PRC94SVL1087	4/25/94	570 U	120 U	570 U	570 U	120 U	220 U	570 U	220 U	120 U	120 U	120 U	570 U	570 U	570 U	120 U
B6	PRC94SVL1089	4/25/94	500 U	100 U	500 U	500 U	100 U	200 U	500 U	200 U	100 U	100 U	100 U	500 U	500 U	500 U	100 U
B6	PRC94SVL1090	4/25/94	460 U	94 U	460 U	460 U	94 U	180 U	460 U	180 U	94 U	94 U	94 U	460 U	460 U	460 U	94 U
Replicate Mean Value													52				
B7	PRC94SVL1033	3/29/94	620 U	130 U	620 U	620 U	130 U	250 U	620 U	250 U	130 U	130 U	130 U	620 U	620 U	620 U	130 U
B7	PRC94SVL1034	3/29/94	590 U	120 U	590 U	590 U	120 U	230 U	590 U	230 U	120 U	120 U	120 U	590 U	590 U	590 U	120 U
B7	PRC94SVL1035	3/29/94	580 U	120 U	580 U	580 U	120 U	230 U	580 U	230 U	120 U	120 U	120 U	580 U	580 U	580 U	120 U
Replicate Mean Value													62				
B8	PRC94SVL1103	4/26/94	570 U	120 U	570 U	570 U	120 U	220 U	570 U	220 U	120 U	120 U	120 U	570 U	570 U	570 U	120 U
B8	PRC94SVL1105	4/26/94	500 U	100 U	500 U	500 U	100 U	200 U	500 U	200 U	100 U	100 U	100 U	500 U	500 U	500 U	100 U
B8	PRC94SVL1106	4/26/94	600 U	120 U	600 U	600 U	120 U	240 U	600 U	240 U	120 U	120 U	120 U	600 U	600 U	600 U	120 U
Replicate Mean Value													57				
B9	PRC94SVL1107	4/26/94	500 U	100 U	500 U	500 U	100 U	200 U	500 U	200 U	100 U	100 U	100 U	500 U	500 U	500 U	100 U
B9	PRC94SVL1109	4/26/94	890 U	180 U	890 U	890 U	180 U	350 U	890 U	350 U	180 U	180 U	180 U	890 U	890 U	890 U	180 U
B9	PRC94SVL1110	4/26/94	480 UJ	100 UJ	480 UJ	480 UJ	100 UJ	190 UJ	480 UJ	190 UJ	100 UJ	100 UJ	100 UJ	480 UJ	480 UJ	480 UJ	100 UJ
Replicate Mean Value													63				
Frequency of Detection (%)			0	0	0	0	0	0	0	0	0	0	8	0	0	0	0
*Average Values**			---	---	---	---	---	---	---	---	---	---	66	---	---	---	---
*Standard Deviation**			---	---	---	---	---	---	---	---	---	---	12	---	---	---	---
Maximum Values			---	---	---	---	---	---	---	---	---	---	86	---	---	---	---

Notes:
NA = [illegible]zed, NV = No Value, — = No Statistics
Qualifi[illegible]nitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
[illegible] using 1/2 of the SQL for non-detects.

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 7 of 8)

Sampling Location	Sample Identification	Sampling Date	NITROPH2	NITROPH4	NNITRONP	NNITROSP	PENTCLPH	PHENOL	TCP245	TCP246	TRICB124
1996 Ecological Assessment Report											
B1	PRC94SVL1115	4/26/94	560 UJ	560 UJ	110 UJ	110 UJ	560 UJ	220 UJ	560 UJ	560 UJ	110 UJ
B1	PRC94SVL1117	4/26/94	540 UJ	540 UJ	110 UJ	110 UJ	540 UJ	210 UJ	540 UJ	540 UJ	110 UJ
B1	PRC94SVL1118	4/26/94	560 UJ	560 UJ	110 UJ	110 UJ	560 UJ	220 UJ	560 UJ	560 UJ	110 UJ
Replicate Mean Value								*108*			
B11	PRC94SVL1036	3/29/94	630 U	630 U	130 U	130 U	630 U	250 U	630 U	630 U	130 U
B11	PRC94SVL1038	3/29/94	670 U	670 U	140 U	140 U	670 U	270 U	670 U	670 U	140 U
B11	PRC94SVL1039	3/29/94	700 U	700 U	140 U	140 U	700 U	280 U	700 U	700 U	140 U
Replicate Mean Value								*133*			
B12	PRC94SVL1112	4/26/94	570 UJ	570 UJ	120 UJ	120 UJ	570 UJ	220 UJ	570 UJ	570 UJ	120 UJ
B12	PRC94SVL1113	4/26/94	620 UJ	620 UJ	130 UJ	130 UJ	620 UJ	250 UJ	620 UJ	620 UJ	130 UJ
B12	PRC94SVL1114	4/26/94	500 UJ	500 UJ	100 UJ	100 UJ	500 UJ	200 UJ	500 UJ	500 UJ	100 UJ
Replicate Mean Value								*112*			
B13	PRC94SVL1040	3/28/94	830 U	830 U	170 U	170 U	830 U	650 U	830 U	830 U	170 U
B13	PRC94SVL1041	3/28/94	850 U	850 U	170 U	170 U	850 U	330 U	850 U	850 U	170 U
B13	PRC94SVL1042	3/28/94	850 U	850 U	170 U	170 U	850 U	330 U	850 U	850 U	170 U
B13	PRC94SVL1179	5/2/94	570 UJ	570 UJ	120 UJ	120 UJ	570 UJ	220 UJ	570 UJ	570 UJ	120 UJ
B13	PRC94SVL1181	5/2/94	650 UJ	650 UJ	130 UJ	130 UJ	650 UJ	250 UJ	650 UJ	650 UJ	130 UJ
B13	PRC94SVL1182	5/2/94	620 UJ	620 UJ	130 UJ	130 UJ	620 UJ	250 UJ	620 UJ	620 UJ	130 UJ
Replicate Mean Value								*169*			
B14	PRC94SVL1043	3/28/94	800 U	800 U	160 U	160 U	800 U	320 U	800 U	800 U	160 U
B14	PRC94SVL1045	3/28/94	790 U	790 U	160 U	160 U	790 U	310 U	790 U	790 U	160 U
B14	PRC94SVL1046	3/28/94	790 U	790 U	160 U	160 U	790 U	310 U	790 U	790 U	160 U
Replicate Mean Value								*157*			
B2	PRC94SVL1022	3/30/94	850 U	850 U	170 U	170 U	850 U	330 U	850 U	850 U	170 U
B2	PRC94SVL1024	3/30/94	700 U	700 U	140 U	140 U	700 U	280 U	700 U	700 U	140 U
B2	PRC94SVL1025	3/30/94	720 U	720 U	150 U	150 U	720 U	280 U	720 U	720 U	150 U
Replicate Mean Value								*148*			
B3	PRC94SVL1026	3/29/94	800 U	800 U	160 U	160 U	800 U	320 U	800 U	800 U	160 U
B3	PRC94SVL1027	3/29/94	690 R	690 R	140 R	140 R	690 R	270 R	690 R	690 R	140 R
B3	PRC94SVL1028	3/29/94	630 U	630 U	130 U	130 U	630 U	250 U	630 U	630 U	130 U
B3	PRC94SVL1183	5/2/94	660 UJ	660 UJ	130 UJ	130 UJ	660 UJ	260 UJ	660 UJ	660 UJ	130 UJ
B3	PRC94SVL1184	5/2/94	670 UJ	670 UJ	140 UJ	140 UJ	670 UJ	270 UJ	670 UJ	670 UJ	140 UJ
B3	PRC94SVL1185	5/2/94	660 UJ	660 UJ	130 UJ	130 UJ	660 UJ	260 UJ	660 UJ	660 UJ	130 UJ
B3	PRC94SVL1186	5/2/94	620 UJ	620 UJ	130 UJ	130 UJ	620 UJ	250 UJ	620 UJ	620 UJ	130 UJ
Replicate Mean Value								*134*			

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
[illegible] U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-1i
Western Bayside
Semi-Volatile Organic Compounds in Surface Sediment Samples (µg/kg)
(Page 8 of 8)

Sampling Location	Sample Identification	Sampling Date	NITROPH2	NITROPH4	NNITRONP	NNITROSP	PENTCLPH	PHENOL	TCP245	TCP246	TRICB124
B4	PRC94SVL1083	4/25/94	480 U	480 U	100 U	100 U	480 U	380	480 U	480 U	100 U
B4	PRC94SVL1085	4/25/94	550 U	550 U	110 U	110 U	550 U	300	550 U	550 U	110 U
B4	PRC94SVL1086	4/25/94	460 U	460 U	90 U	90 U	460 U	210	460 U	460 U	90 U
Replicate Mean Value								*297*			
B5	PRC94SVL1029	3/29/94	790 U	790 U	160 U	160 U	790 U	310 U	790 U	790 U	160 U
B5	PRC94SVL1031	3/29/94	770 U	770 U	160 U	160 U	770 U	300 U	770 U	770 U	160 U
B5	PRC94SVL1032	3/29/94	800 U	800 U	160 U	160 U	800 U	320 U	800 U	800 U	160 U
Replicate Mean Value								*155*			
B6	PRC94SVL1087	4/25/94	570 U	570 U	120 U	120 U	570 U	220	570 U	570 U	120 U
B6	PRC94SVL1089	4/25/94	500 U	500 U	100 U	100 U	500 U	270	500 U	500 U	100 U
B6	PRC94SVL1090	4/25/94	460 U	460 U	94 U	94 U	460 U	180 U	460 U	460 U	94 U
Replicate Mean Value								*193*			
B7	PRC94SVL1033	3/29/94	620 U	620 U	130 U	130 U	620 U	250 U	620 U	620 U	130 U
B7	PRC94SVL1034	3/29/94	590 U	590 U	120 U	120 U	590 U	230 U	590 U	590 U	120 U
B7	PRC94SVL1035	3/29/94	580 U	580 U	120 U	120 U	580 U	230 U	580 U	580 U	120 U
Replicate Mean Value								*118*			
B8	PRC94SVL1103	4/26/94	570 U	570 U	120 U	120 U	570 U	220 U	570 U	570 U	120 U
B8	PRC94SVL1105	4/26/94	500 U	500 U	100 U	100 U	500 U	200 U	500 U	500 U	100 U
B8	PRC94SVL1106	4/26/94	600 U	600 U	120 U	120 U	600 U	240 U	600 U	600 U	120 U
Replicate Mean Value								*110*			
B9	PRC94SVL1107	4/26/94	500 U	500 U	100 U	100 U	500 U	200 U	500 U	500 U	100 U
B9	PRC94SVL1109	4/26/94	890 U	890 U	180 U	180 U	890 U	350 U	890 U	890 U	180 U
B9	PRC94SVL1110	4/26/94	480 UJ	480 UJ	100 UJ	100 UJ	480 UJ	190 UJ	480 UJ	480 UJ	100 UJ
Replicate Mean Value								*123*			
Frequency of Detection (%)			0	0	0	0	0	15	0	0	0
*Average Values**			---	---	---	---	---	150	---	---	---
*Standard Deviation**			---	---	---	---	---	51	---	---	---
Maximum Values			---	---	---	---	---	297	---	---	---

Notes:
NA = [illegible]rzed, NV = No Value, --- = No Statistics
Quali[illegible]itions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 of the SQL for non-detects.

Table A-1j
Western Bayside
Organotins in Surface Sediment Samples (µg/kg)
(Page 1 of 1)

Sampling Location	Sample Identification	Sampling Date	Monobutyl Tin	Dibutyl Tin	Tributyl Tin	Tetrabutyl Tin
PRC 1996/1997 Follow-on Investigation						
SS001	013-SSH-001	10/3/96	2.4 R	2.4 U	2.4 U	2.4 U
SS002	013-SSH-002	10/3/96	2.4 R	2.4 U	2.4 U	2.4 U
WB003	013-WBS-005	10/3/96	2.0 R	2.0 U	2.0 U	2.0 U
WB007	013-WBS-012	10/3/96	2.2 R	2.2 U	2.2 U	2.2 U
WB009	013-WBS-015	10/3/96	2.1 R	2.1 U	2.1 U	2.1 U

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect

Table A-1k
Western Bayside
Organotins in Surface Sediment Samples (µg/kg)
(Page 1 of 2)

Sampling Location	Sample Identification	Sampling Date	Monobutyl Tin	Dibutyl Tin	Tributyl Tin	Tetrabutyl Tin
1996 Ecological Assessment Report						
B1	PRC93SED0170	6/9/93	5.0 U	5.0 U	10	5.0 U
B1	PRC93SED0171	6/9/93	5.0 U	5.0 U	10	5.0 U
B1	PRC93SED0172	6/9/93	5.0 U	5.0 U	15	5.0 U
Replicate Mean Value					***12***	
B11	PRC93SED0225	5/11/93	5.0 U	5.0 U	46	5.0 U
B11	PRC93SED0226	5/11/93	5.0 U	5.0 U	5.0 U	5.0 U
B11	PRC93SED0227	5/11/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					***17***	
B12	PRC93SED0230	4/28/93	5.0 U	5.0 U	5.0 U	5.0 U
B12	PRC93SED0231	4/28/93	5.0 U	5.0 U	5.0 U	5.0 U
B12	PRC93SED0232	4/28/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					***2.5***	
B13	PRC93SED0236	5/25/93	5.0 U	5.0 U	5.0 U	5.0 U
B13	PRC93SED0237	5/25/93	5.0 U	5.0 U	5.0 U	5.0 U
B13	PRC93SED0238	5/25/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					***2.5***	
B14	PRC93SED0241	5/27/93	5.0 U	5.0 U	5.0 U	5.0 U
B14	PRC93SED0242	5/27/93	5.0 U	5.0 U	5.0 U	5.0 U
B14	PRC93SED0243	5/27/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					***2.5***	
B2	PRC93SED0175	6/8/93	5.0 U	5.0 U	5.0 U	5.0 U
B2	PRC93SED0176	6/8/93	5.0 U	5.0 U	20	5.0 U
B2	PRC93SED0177	6/8/93	5.0 U	5.0 U	35	5.0 U
Replicate Mean Value					***19***	
B3	PRC93SED0181	5/25/93	5.0 U	5.0 U	5.0 U	5.0 U
B3	PRC93SED0182	5/25/93	5.0 U	5.0 U	16	5.0 U
B3	PRC93SED0183	5/25/83	5.0 U	5.0 U	14	5.0 U
Replicate Mean Value					***12***	
B4	PRC93SED0186	6/8/93	5.0 U	5.0 U	10	5.0 U
B4	PRC93SED0187	6/8/93	5.0 U	5.0 U	17	5.0 U
B4	PRC93SED0188	6/8/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					***9.8***	
B5	PRC93SED0192	6/8/93	5.0 U	5.0 U	5.0 U	5.0 U
B5	PRC93SED0193	6/8/93	5.0 U	5.0 U	5.0 U	5.0 U
B5	PRC93SED0194	6/8/93	5.0 U	5.0 U	13	5.0 U
Replicate Mean Value					***6.0***	

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1k
Western Bayside
Organotins in Surface Sediment Samples (µg/kg)
(Page 2 of 2)

Sampling Location	Sample Identification	Sampling Date	Monobutyl Tin	Dibutyl Tin	Tributyl Tin	Tetrabutyl Tin
B6	PRC93SED0197	6/9/93	5.0 U	5.0 U	14	5.0 U
B6	PRC93SED0198	6/9/93	5.0 U	5.0 U	5.0 U	5.0 U
B6	PRC93SED0199	6/9/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					*6.3*	
B7	PRC93SED0203	6/24/93	5.0 U	5.0 U	11	5.0 U
B7	PRC93SED0204	6/24/93	5.0 U	5.0 U	10	5.0 U
B7	PRC93SED0205	6/24/93	5.0 U	5.0 U	10	5.0 U
Replicate Mean Value					*10*	
B8	PRC93SED0208	6/24/93	5.0 U	5.0 U	5.0 U	5.0 U
B8	PRC93SED0209	6/24/93	5.0 U	5.0 U	12	5.0 U
B8	PRC93SED0210	6/24/93	5.0 U	5.0 U	13	5.0 U
Replicate Mean Value					*9.2*	
B9	PRC93SED0214	5/27/93	5.0 U	5.0 U	5.0 U	5.0 U
B9	PRC93SED0215	5/27/93	5.0 U	5.0 U	5.0 U	5.0 U
B9	PRC93SED0216	5/27/93	5.0 U	5.0 U	5.0 U	5.0 U
Replicate Mean Value					*2.5*	
Frequency of Detection (%)			0	0	69	0
*Average Values**			---	---	8.5	---
*Standard Deviation**			---	---	5.5	---
Maximum Values			---	---	19	---

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifications: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-11
Western Bayside
Total Petroleum Hydrocarbons in Surface Sediment Samples (µg/kg)
(Page 1 of 1)

Sampling Location	Sampling Identification	Sample Date	Sampling Interval		Total Recoverable Petroleum Hydrocarbons as Gasoline	Total Petroleum Hydrocarbons as Diesel	Total Petroleum Hydrocarbons as Motor Oil
PRC 1996/1997 Ecological Assessment Report							
SS001	013-SSH-001	10/3/96	0.00	0.50	700 U	15000 U	15000 U
SS002	013-SSH-002	10/3/96	0.00	0.50	700 U	15000 U	15000 U
WB003	013-WBS-005	10/3/96	0.00	0.50	600 U	12000 U	62000 J
WB007	013-WBS-012	10/3/96	0.00	0.50	600 U	12000 U	54000 J
WB009	013-WBS-015	10/3/96	0.00	0.50	600 U	11000 U	43000 J
Frequency of Detection (%)					0	0	60
*Average Values**					---	---	34800
*Standard Deviation**					---	---	25818
Maximum Values					---	---	62000

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1m
Western Bayside
Total Petroleum Hydrocarbons as Oil and Grease in Surface Sediment Samples (µg/kg)
(Page 1 of 2)

Sampling Location	Sampling Identification	Sample Date	Sampling Interval		Oil and Grease
1996 Ecological Assessment Report					
B1	PRC93SED0170	6/9/93	0.00	0.30	72000
B1	PRC93SED0171	6/9/93	0.00	0.30	88000
B1	PRC93SED0172	6/9/93	0.00	0.30	110000
Replicate Mean Value					***90000***
B11	PRC93SED0225	5/11/93	0.00	0.30	62000
B11	PRC93SED0226	5/11/93	0.00	0.30	59000
B11	PRC93SED0227	5/11/93	0.00	0.30	66000
Replicate Mean Value					***62333***
B12	PRC93SED0230	4/28/93	0.00	0.30	78000
B12	PRC93SED0231	4/28/93	0.00	0.30	64000
B12	PRC93SED0232	4/28/93	0.00	0.30	62000
Replicate Mean Value					***68000***
B13	PRC93SED0236	5/25/93	0.00	0.30	53000
B13	PRC93SED0237	5/25/93	0.00	0.30	57000
B13	PRC93SED0238	5/25/93	0.00	0.30	52000
Replicate Mean Value					***54000***
B14	PRC93SED0241	5/27/93	0.00	0.30	20000 U
B14	PRC93SED0242	5/27/93	0.00	0.30	36000
B14	PRC93SED0243	5/27/93	0.00	0.30	38000
Replicate Mean Value					***28000***
B2	PRC93SED0175	6/8/93	0.00	0.30	72000
B2	PRC93SED0176	6/8/93	0.00	0.30	54000
B2	PRC93SED0177	6/8/93	0.00	0.30	56000
Replicate Mean Value					***60667***
B3	PRC93SED0181	5/25/93	0.00	0.30	66000
B3	PRC93SED0182	5/25/93	0.00	0.30	53000
B3	PRC93SED0183	5/25/83	0.00	0.30	58000
Replicate Mean Value					***59000***
B4	PRC93SED0186	6/8/93	0.00	0.30	93000
B4	PRC93SED0187	6/8/93	0.00	0.30	59000
B4	PRC93SED0188	6/8/93	0.00	0.30	54000
Replicate Mean Value					***68667***
B5	PRC93SED0192	6/8/93	0.00	0.30	47000
B5	PRC93SED0193	6/8/93	0.00	0.30	70000
B5	PRC93SED0194	6/8/93	0.00	0.30	62000
Replicate Mean Value					***59667***

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-1m
Western Bayside
Total Petroleum Hydrocarbons as Oil and Grease in Surface Sediment Samples (µg/kg)
(Page 2 of 2)

Sampling Location	Sampling Identification	Sample Date	Sampling Interval		Oil and Grease
B6	PRC93SED0197	6/9/93	0.00	0.30	51000
B6	PRC93SED0198	6/9/93	0.00	0.30	60000
B6	PRC93SED0199	6/9/93	0.00	0.30	64000
Replicate Mean Value					*58333*
B7	PRC93SED0203	6/24/93	0.00	0.30	260000
B7	PRC93SED0204	6/24/93	0.00	0.30	310000
B7	PRC93SED0205	6/24/93	0.00	0.30	46000
Replicate Mean Value					*205333*
B8	PRC93SED0208	6/24/93	0.00	0.30	180000
B8	PRC93SED0209	6/24/93	0.00	0.30	31000
B8	PRC93SED0210	6/24/93	0.00	0.30	310000
Replicate Mean Value					*173667*
B9	PRC93SED0214	5/27/93	0.00	0.30	20000 U
B9	PRC93SED0215	5/27/93	0.00	0.30	48000
B9	PRC93SED0216	5/27/93	0.00	0.30	20000 U
Replicate Mean Value					*22660*
Frequency of Detection (%)					100
*Average Values**					77717
*Standard Deviation**					52808
Maximum Values					205333

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifications: U = Non Detect, J = Estimated, Blank = Unqualified Detect
*The average and standard deviation value were calculated using 1/2 the SQL for non-detects.

Table A-2a
Western Bayside
Total Metals in Core Sediment Samples (mg/kg)
(Page 1 of 1)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
1996 Ecological Assessment Report																	
B12	PRC93SED0440	6/25/93	0.00	0.33	41	13	0.37	0.63	150	55	34	0.75	98	0.25 U	0.50 U	0.50 UJ	140
B12	PRC93SED0441	6/25/93	0.33	1.31	42	15	0.38	0.77	160	60	42	0.85	110	0.25 U	0.50 U	0.50 UJ	160
B12	PRC93SED0442	6/25/93	1.31	2.30	15	6.6	0.25 U	0.34	95	24	16	0.45	54	0.25 U	0.50 U	0.50 UJ	72
B12	PRC93SED0443	6/25/93	2.79	3.12	8	3.7	0.25 U	0.25 U	70	6.5	4.5	0.15	23	0.25 U	0.50 U	0.50 UJ	28
B2	PRC93SED0420	6/22/93	0.00	0.33	10	10	0.25 U	0.25 U	120	37	23	0.28	68	0.25 U	0.50 U	0.50 UJ	120
B2	PRC93SED0421	6/22/93	0.33	1.31	10	8.1	0.25 U	0.25 U	87	26	16	0.22	49	0.25 U	0.50 U	0.50 UJ	78
B2	PRC93SED0422	6/22/93	1.31	2.30	21	9.4	0.25 U	0.25 U	100	33	17	0.24	62	0.25 U	0.50 U	0.50 UJ	87
B2	PRC93SED0423	6/22/93	2.79	3.12	39	13	0.25 U	0.25 U	150	48	23	0.38	87	0.25 U	0.50 U	0.50 UJ	140
B4	PRC93SED0424	6/22/93	0.00	0.33	19	8.4	0.25 U	0.33	130	41	28	0.33	66	0.25 U	0.50 U	0.50 UJ	130
B4	PRC93SED0425	6/22/93	0.33	1.31	26	11	0.25 U	0.25 U	140	32	18	0.22	88	0.25 U	0.50 U	0.50 UJ	120
B4	PRC93SED0426	6/22/93	1.31	2.30	37	13	0.25 U	0.25 U	170	50	25	0.37	110	0.25 U	0.50 U	0.50 UJ	160
B4	PRC93SED0427	6/22/93	2.79	3.12	35	14	0.25 U	0.25 U	170	53	24	0.41	120	0.25 U	0.50 U	0.50 UJ	160
B6	PRC93SED0428	6/25/93	0.00	0.33	14	4.0	0.25 U	0.25 U	86	18	16	0.13	46	0.25 U	0.50 U	0.50 UJ	63
B6	PRC93SED0429	6/25/93	0.33	1.31	16	5.8	0.25 U	0.30	92	25	23	0.20	53	0.25 U	0.50 U	0.50 UJ	91
B6	PRC93SED0430	6/25/93	1.31	2.30	7.7	2.5	0.25 U	0.25 U	68	6.7	4.4	0.09	32	0.25 U	0.50 U	0.50 UJ	29
B6	PRC93SED0431	6/25/93	2.79	3.12	7.0	2.0	0.25 U	0.25 U	67	6.3	1.9	0.01	32	0.25 U	0.50 U	0.50 UJ	24
B8	PRC93SED0432	6/25/93	0.00	0.33	9.4	3.5	0.25 U	0.25 U	75	12	7.7	0.09	39	0.25 U	0.50 U	0.50 UJ	44
B8	PRC93SED0433	6/25/93	0.33	1.31	7.3	2.6	0.25 U	0.25 U	71	6.6	5.4	0.04	28	0.25 U	0.50 U	0.50 UJ	29
B8	PRC93SED0434	6/25/93	1.31	2.30	5.8	2.5	0.25 U	0.25 U	60	5.2	3.0	0.040	24	0.25 U	0.50 U	0.50 UJ	22
B8	PRC93SED0435	6/25/93	2.79	3.12	6.6	2.7	0.25 U	0.25 U	76	5.6	3.7	0.03	28	0.25 U	0.50 U	0.50 UJ	27
B9	PRC93SED0436	6/22/93	0.00	0.33	6.2	3.3	0.25 U	0.25 U	98	7.7	8.3	0.11	31	0.25 U	0.50 U	0.50 UJ	37
B9	PRC93SED0437	6/22/93	0.33	1.31	17	7.9	0.25 U	0.37	110	23	20	0.27	59	0.25 U	0.50 U	0.50 UJ	91
B9	PRC93SED0438	6/22/93	1.31	2.30	21	10	0.25 U	0.57	130	37	25	0.48	77	0.25 U	0.50 U	0.50 UJ	130
B9	PRC93SED0439	6/22/93	2.79	3.12	21	12	0.25 U	0.70	120	35	30	0.39	75	0.25 U	0.50 U	0.50 UJ	150

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-2b
Western Bayside
Pesticides and PCBs in Core Sediment Samples (µg/kg)
(Page 1 of 3)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ABHC	ACHLRDNE	ALDRIN	AR1016	AR1221	AR1232	AR1242	AR1248	AR1254	AR1260	BBHC
1996 Ecological Assessment Report															
B12	PRC93SED0440	6/25/93	0.00	0.30	1.2 U	1.2 U	1.2 U	48 U	95 U	48 U	48 U	48 U	90	48 U	1.2 U
B12	PRC93SED0441	6/25/93	0.30	1.30	1.2 UJ	1.2 UJ	1.2 UJ	47 UJ	93 UJ	47 UJ	47 UJ	47 UJ	47 UJ	47 UJ	1.2 UJ
B12	PRC93SED0442	6/25/93	1.30	2.30	0.76 U	0.76 U	0.76 U	30 U	61 U	30 U	30 U	30 U	50	30 U	0.76 U
B12	PRC93SED0443	6/25/93	2.80	3.20	0.63 U	0.63 U	0.63 U	25 U	51 U	25 U	25 U	25 U	25 U	25 U	0.63 U
B2	PRC93SED0420	6/22/93	0.00	0.30	1.0 U	1.0 U	1.0 U	40 U	80 U	40 U	40 U	40 U	40 U	40 U	1.0 U
B2	PRC93SED0421	6/22/93	0.30	1.30	0.80 U	0.80 U	0.80 U	31 U	62 U	31 U	31 U	31 U	31 U	31 U	0.8 U
B2	PRC93SED0422	6/22/93	1.30	2.30	0.80 U	0.80 U	0.80 U	32 U	63 U	32 U	32 U	32 U	32 U	32 U	79 U
B2	PRC93SED0423	6/22/93	2.80	3.20	1.0 U	1.0 U	1.0 U	40 U	80 U	40 U	40 U	40 U	40 U	40 U	100 U
B4	PRC93SED0424	6/22/93	0.00	0.30	0.80 U	0.80 U	0.80 U	33 U	67 U	33 U	33 U	33 U	50	33 U	83 U
B4	PRC93SED0425	6/22/93	0.30	1.30	0.90 U	0.90 U	0.90 U	35 U	70 U	35 U	35 U	35 U	35 U	35 U	0.90 U
B4	PRC93SED0426	6/22/93	1.30	2.30	1.0 U	1.0 U	1.0 U	39 U	78 U	39 U	39 U	39 U	39 U	39 U	98 U
B4	PRC93SED0427	6/22/93	2.80	3.20	1.0 U	1.0 U	1.0 U	40 U	80 U	40 U	40 U	40 U	40 U	40 U	1.0 U
B6	PRC93SED0428	6/25/93	0.00	0.30	0.68 U	0.68 U	0.68 U	27 U	55 U	27 U	27 U	27 U	27 U	27 U	0.7 U
B6	PRC93SED0429	6/25/93	0.30	1.30	0.70 U	0.70 U	0.70 U	28 U	56 U	28 U	28 U	28 U	49	28 U	0.7 U
B6	PRC93SED0430	6/25/93	1.30	2.30	0.60 U	0.60 U	0.60 U	24 U	48 U	24 U	24 U	24 U	24 U	24 U	0.6 U
B6	PRC93SED0431	6/25/93	2.80	3.20	0.61 U	0.61 U	0.61 U	24 U	49 U	24 U	24 U	24 U	24 U	24 U	0.6 U
B8	PRC93SED0432	6/25/93	0.00	0.30	0.72 U	0.72 U	0.72 U	29 U	58 U	29 U	29 U	29 U	29 U	29 U	0.7 U
B8	PRC93SED0433	6/25/93	0.30	1.30	0.60 U	0.60 U	0.60 U	24 U	48 U	24 U	24 U	24 U	24 U	24 U	0.6 U
B8	PRC93SED0434	6/25/93	1.30	2.30	0.59 U	0.59 U	0.59 U	24 U	47 U	24 U	24 U	24 U	24 U	24 U	0.59 U
B8	PRC93SED0435	6/25/93	2.80	3.20	0.59 U	0.59 U	0.59 U	24 U	47 U	24 U	24 U	24 U	24 U	24 U	0.59 U
B9	PRC93SED0436	6/22/93	0.00	0.30	0.60 U	0.60 U	0.60 U	26 U	51 U	26 U	26 U	26 U	26 U	26 U	64 U
B9	PRC93SED0437	6/22/93	0.30	1.30	0.70 U	0.70 U	0.70 U	29 U	58 U	29 U	29 U	29 U	52	29 U	72 U
B9	PRC93SED0438	6/22/93	1.30	2.30	0.80 U	0.80 U	0.80 U	33 U	66 U	33 U	33 U	33 U	121	33 U	82 U
B9	PRC93SED0439	6/22/93	2.80	3.20	0.80	0.80	0.80 U	31 U	63 U	31 U	31 U	31 U	94	31 U	78 U

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect

Table A-2b
Western Bayside
Pesticides and PCBs in Core Sediment Samples (µg/kg)
(Page 2 of 3)

Sampling Location	Sample Identification	Sampling Date	DBHC	DDD	DDE	DDT	DIELDRIN	ENDOSI	ENDOSII	ENDOSSLF	ENDRIN	ENDRINAL	ENDRINKT
1996 Ecological Assessment Report													
B12	PRC93SED0440	6/25/93	1.2 U	4.8	4.8 U	4.8 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	4.8 U	6.0 U
B12	PRC93SED0441	6/25/93	1.2 UJ	8.1 J	5.6 J	4.7 UJ	2.3 UJ	2.3 UJ	2.3 UJ	2.3 UJ	2.3 UJ	4.7 UJ	5.8 UJ
B12	PRC93SED0442	6/25/93	0.76 U	3.0	3.0 U	3.0 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	3.0 U	3.8 U
B12	PRC93SED0443	6/25/93	0.63 U	2.5 U	2.5 U	2.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	2.5 U	3.2 U
B2	PRC93SED0420	6/22/93	1.0 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U	5.0 U
B2	PRC93SED0421	6/22/93	0.8 U	3.1 U	3.1 U	3.1 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	3.1 U	3.8 U
B2	PRC93SED0422	6/22/93	79 U	3.2 U	3.2 U	3.2 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	3.2 U	4.0 U
B2	PRC93SED0423	6/22/93	100 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U	5.0 U
B4	PRC93SED0424	6/22/93	83 U	3.3 U	3.3 U	3.3 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	3.3 U	4.2 U
B4	PRC93SED0425	6/22/93	0.90 U	3.5 U	3.5 U	3.5 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	3.5 U	4.4 U
B4	PRC93SED0426	6/22/93	98 U	3.9 U	3.9 U	3.9 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	3.9 U	4.9 U
B4	PRC93SED0427	6/22/93	1.0 U	4.0 U	4.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U	5.0 U
B6	PRC93SED0428	6/25/93	0.7 U	2.7 U	2.7 U	2.7 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2.7 U	3.4 U
B6	PRC93SED0429	6/25/93	0.7 U	2.8	2.8 U	2.8 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2.8 U	3.5 U
B6	PRC93SED0430	6/25/93	0.6 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	3.0 U
B6	PRC93SED0431	6/25/93	0.6 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	3.0 U
B8	PRC93SED0432	6/25/93	0.7 U	2.9 U	2.9 U	2.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2.9 U	3.6 U
B8	PRC93SED0433	6/25/93	0.6 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	3.0 U
B8	PRC93SED0434	6/25/93	0.59 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	2.9 U
B8	PRC93SED0435	6/25/93	0.59 U	2.4 U	2.4 U	2.4 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	2.9 U
B9	PRC93SED0436	6/22/93	64 U	2.6 U	2.6 U	2.6 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	2.6 U	3.2 U
B9	PRC93SED0437	6/22/93	72 U	5.2 J	2.9 U	2.9 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2.9 U	3.6 U
B9	PRC93SED0438	6/22/93	82 U	3.3 U	3.3 U	3.3 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	3.3 U	4.1 U
B9	PRC93SED0439	6/22/93	78 U	12 J	5.6	3.1 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	3.1 U	3.9 U

Notes:
NA = Not [illegible]ted, NV = No Value, — = No Statistics
Qualifi[illegible]ons: U = Non Detect, J = Estimated, Blank = Unqualified Detect

Table A-2b
Western Bayside
Pesticides and PCBs in Core Sediment Samples (µg/kg)
(Page 3 of 3)

Sampling Location	Sample Identification	Sampling Date	GBHC	GCHLRDNE	HPTCLR	HPTCLREP	MTHOXCHL	TOXPHENE	TOTAL PCBs	TOTAL DDTs
1996 Ecological Assessment Report										
B12	PRC93SED0440	6/25/93	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	95 U	114	9.6
B12	PRC93SED0441	6/25/93	1.2 UJ	1.2 UJ	1.2 UJ	1.2 UJ	2.3 UJ	93 UJ	---	16
B12	PRC93SED0442	6/25/93	0.76 U	0.76 U	0.76 U	0.76 U	1.5 U	61 U	65	6.0
B12	PRC93SED0443	6/25/93	0.63 U	0.63 U	0.63 U	0.63 U	1.3 U	51 U	---	---
B2	PRC93SED0420	6/22/93	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	80 U	---	---
B2	PRC93SED0421	6/22/93	0.80 U	0.80 U	0.80 U	0.80 U	1.5 U	62 U	---	---
B2	PRC93SED0422	6/22/93	0.80 U	0.80 U	79 U	0.80 U	1.6 U	63 U	---	---
B2	PRC93SED0423	6/22/93	1.0 U	1.0 U	100 U	1.0 U	2.0 U	80 U	---	---
B4	PRC93SED0424	6/22/93	0.80 U	0.80 U	83 U	0.80 U	1.7 U	67 U	67	---
B4	PRC93SED0425	6/22/93	0.90 U	0.90 U	0.90 U	0.90 U	1.8 U	70 U	---	---
B4	PRC93SED0426	6/22/93	1.0 U	1.0 U	98 U	1.0 U	2.0 U	78 U	---	---
B4	PRC93SED0427	6/22/93	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	80 U	---	---
B6	PRC93SED0428	6/25/93	0.68 U	0.68 U	0.68 U	0.68 U	1.4 U	55 U	---	---
B6	PRC93SED0429	6/25/93	0.70 U	0.70 U	0.70 U	0.70 U	1.4 U	56 U	63	5.6
B6	PRC93SED0430	6/25/93	0.60 U	0.60 U	0.60 U	0.6 U	1.2 U	48 U	---	---
B6	PRC93SED0431	6/25/93	0.61 U	0.61 U	0.61 U	0.6 U	1.2 U	49 U	---	---
B8	PRC93SED0432	6/25/93	0.72 U	0.72 U	0.72 U	0.72 U	1.4 U	58 U	---	---
B8	PRC93SED0433	6/25/93	0.60 U	0.60 U	0.6 U	0.60 U	1.2 U	48 U	---	---
B8	PRC93SED0434	6/25/93	0.59 U	0.59 U	0.59 U	0.59 U	1.2 U	47 U	---	---
B8	PRC93SED0435	6/25/93	0.59 U	0.59 U	0.59 U	0.59 U	1.2 U	47 U	---	---
B9	PRC93SED0436	6/22/93	0.60 U	0.60 U	64 U	0.60 U	1.3 U	51 U	---	---
B9	PRC93SED0437	6/22/93	0.70 U	0.70 U	72.0 U	0.70 U	1.4 U	58 U	67	8.1
B9	PRC93SED0438	6/22/93	0.80 U	0.80 U	82 U	0.80 U	1.6 U	66 U	138	---
B9	PRC93SED0439	6/22/93	0.80 U	0.80	78 U	0.80 U	1.6 U	63 U	110	19

Notes:
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Table A-2c
Western Bayside
PAH Compounds in Core Sediment Samples (µg/kg)
(Page 1 of 2)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		ACENAP	ACENAPHY	ANTHRACN	BENZANTH	BENZAPY	BENZBFL	BENZGPER	BENZKFL	CHRYSENE	DIBENZAH	FLRANTH
1996 Ecological Assessment Report															
B12	PRC94SVL1147	4/28/94	0.30	1.30	86 U	86 U	86 U	86 U	86 U	86 U	86 U	86 U	86 U	86 U	86 U
B12	PRC94SVL1149	4/28/94	1.30	2.30	93 U	93 U	93 U	93 U	93 U	110	93 U	93 U	93 U	93 U	93 U
B12	PRC94SVL1150	4/28/94	2.80	3.10	99 U	99 U	99 U	99 U	99 U	240	180	99 U	99 U	99 U	120
B2	PRC94SVL1163	4/29/94	0.30	1.30	100 UJ	130 J	140 J	250 J	490 J	480 J	450 J	130 J	340 J	100 UJ	720 J
B2	PRC94SVL1165	4/29/94	1.30	2.30	110 UJ	190 J	170 J	900 J	2000 J	1900 J	2000 J	540 J	1200 J	160 J	2200 J
B2	PRC94SVL1166	4/29/94	2.80	3.10	110 UJ	200 J	150 J	920 J	2000 J	1700 J	1800 J	580 J	1200 J	160 J	1700 J
B4	PRC94SVL1143	4/28/94	0.30	1.30	120 U	120 U	120 U	120 U	410	360	390	140	130	120 U	270
B4	PRC94SVL1144	4/28/94	1.30	2.30	140 U	140 U	140 U	290	710	670	710	200	270	140 U	730
B4	PRC94SVL1146	4/28/94	2.80	3.10	140 U	140 U	140 U	170	780	760	840	220	240	140 U	530
B6	PRC94SVL1139	4/28/94	0.30	1.30	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ
B6	PRC94SVL1140	4/28/94	1.30	2.30	82 U	82 U	82 U	82 U	82 U	82 U	82 U	82 U	82 U	82 U	82 U
B6	PRC94SVL1142	4/28/94	2.80	3.10	99 UJ	99 UJ	99 UJ	160 J	340 J	350 J	310 J	110 J	240 J	99 UJ	280 J
B8	PRC94SVL1135	4/28/94	0.30	1.30	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ
B8	PRC94SVL1136	4/28/94	1.30	2.30	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ
B8	PRC94SVL1138	4/28/94	2.80	3.10	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ
B9	PRC94SVL1131	4/28/94	0.30	1.30	110 UJ	110 J	110 UJ	250 J	420 J	450	400 J	110 UJ	320 J	110 UJ	450 J
B9	PRC94SVL1132	4/28/94	1.30	2.30	110 UJ	200 J	160 J	440 J	770 J	750 J	690 J	250 J	590 J	110 UJ	1000 J
B9	PRC94SVL1134	4/28/94	2.80	3.10	100 UJ	170 J	200 J	430 J	820 J	750 J	750 J	280 J	540 J	100 UJ	1100 J

Notes:
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Table A-2c
Western Bayside
PAH Compounds in Core Sediment Samples (µg/kg)
(Page 2 of 2)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		FLUORENE	ID123PYR	METHNAP2	NAPTHLNE	PHENANTH	PYRENE	LMW PAH	HMW PAH	TOTAL PAH
1996 Ecological Assessment Report													
B12	PRC94SVL1147	4/28/94	0.30	1.30	45 U	86 U	86 U	86 U	86 U	86 U	---	---	---
B12	PRC94SVL1149	4/28/94	1.30	2.30	49 U	93 U	93 U	93 U	93 U	93 U	---	---	110
B12	PRC94SVL1150	4/28/94	2.80	3.10	51 U	150	99 U	99 U	99 U	190	---	310	880
B2	PRC94SVL1163	4/29/94	0.30	1.30	65 J	400 J	100 UJ	100 UJ	510 J	1000 J	845	2800	5105
B2	PRC94SVL1165	4/29/94	1.30	2.30	61 J	1700 J	110 UJ	110 UJ	470 J	3400 J	891	9860	16891
B2	PRC94SVL1166	4/29/94	2.80	3.10	58 UJ	1600 J	110 UJ	110 UJ	300 J	3200 J	650	9180	15510
B4	PRC94SVL1143	4/28/94	0.30	1.30	63 U	320	120 U	120 U	120 U	520	---	*1330*	*2540*
B4	PRC94SVL1144	4/28/94	1.30	2.30	71 U	590	140 U	140 U	450	1000	*450*	*3000*	*5620*
B4	PRC94SVL1146	4/28/94	2.80	3.10	71 U	630	140 U	140 U	270	920	*270*	*2640*	*5360*
B6	PRC94SVL1139	4/28/94	0.30	1.30	45 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	---	---	---
B6	PRC94SVL1140	4/28/94	1.30	2.30	43 U	82 U	82 U	82 U	82 U	82 U	---	---	---
B6	PRC94SVL1142	4/28/94	2.80	3.10	51 UJ	290 J	99 UJ	99 UJ	180 J	740 J	*180*	*1760*	*3000*
B8	PRC94SVL1135	4/28/94	0.30	1.30	44 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	---	---	---
B8	PRC94SVL1136	4/28/94	1.30	2.30	44 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	---	---	---
B8	PRC94SVL1138	4/28/94	2.80	3.10	44 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	---	---	---
B9	PRC94SVL1131	4/28/94	0.30	1.30	58 UJ	330 J	110 UJ	110 UJ	270 J	900 J	*380*	*2340*	*3900*
B9	PRC94SVL1132	4/28/94	1.30	2.30	64 J	660 J	110 UJ	110 UJ	520 J	1600 J	*944*	*4400*	*7694*
B9	PRC94SVL1134	4/28/94	2.80	3.10	69 J	660 J	100 UJ	100 UJ	600 J	1500 J	*1039*	*4390*	*7869*

Notes:
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Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-2d
Western Bayside
Semi-Volatile Organic Compounds in Core Sediment Samples (µg/kg)
(Page 1 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		BENZACID	BENZALC	BENDINE	BIS2CLEE	BIS2CLEM	BIS2CLIE	BIS2EHPH	BROMPPE4	BUTBENZP	CHLRNAP2	CHLRPPE4	CLAMTHP3
1996 Ecological Assessment Report																
B12	PRC94SVL1147	4/28/94	0.30	1.30	860 U	420 U	860 U	86 U	86 U	86 U	630	86 U	86 U	86 U	86 U	170 U
B12	PRC94SVL1149	4/28/94	1.30	2.30	930 U	460 U	930 U	93 U	93 U	93 U	93 U	93 U	93 U	93 U	93 U	180 U
B12	PRC94SVL1150	4/28/94	2.80	3.10	990 U	490 U	990 U	99 U	99 U	99 U	99 U	99 U	99 U	99 U	99 U	190 U
B2	PRC94SVL1163	4/29/94	0.30	1.30	1000 UJ	510 UJ	1000 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	200 UJ
B2	PRC94SVL1165	4/29/94	1.30	2.30	1100 UJ	560 UJ	1100 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	220 UJ
B2	PRC94SVL1166	4/29/94	2.80	3.10	1100 UJ	550 UJ	1100 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	220 UJ
B4	PRC94SVL1143	4/28/94	0.30	1.30	1200 U	590 U	1200 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	230 U
B4	PRC94SVL1144	4/28/94	1.30	2.30	1400 U	670 U	1400 U	140 U	140 U	140 U	140 U	140 U	140 U	140 U	140 U	270 U
B4	PRC94SVL1146	4/28/94	2.80	3.10	1400 U	670 U	1400 U	140 U	140 U	140 U	140 U	140 U	140 U	140 U	140 U	270 U
B6	PRC94SVL1139	4/28/94	0.30	1.30	870 UJ	430 UJ	870 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	170 UJ
B6	PRC94SVL1140	4/28/94	1.30	2.30	820 U	400 U	820 U	82 U	82 U	82 U	82 U	82 U	82 U	82 U	82 U	160 U
B6	PRC94SVL1142	4/28/94	2.80	3.10	990 UJ	490 UJ	990 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	190 UJ
B8	PRC94SVL1135	4/28/94	0.30	1.30	840 UJ	410 UJ	840 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	160 UJ
B8	PRC94SVL1136	4/28/94	1.30	2.30	840 UJ	410 UJ	840 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	160 UJ
B8	PRC94SVL1138	4/28/94	2.80	3.10	840 UJ	410 UJ	840 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	160 UJ
B9	PRC94SVL1131	4/28/94	0.30	1.30	1100 UJ	550 UJ	1100 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	220 UJ
B9	PRC94SVL1132	4/28/94	1.30	2.30	1100 UJ	540 UJ	1100 UJ	110 UJ	110 UJ	110 UJ	250 J	110 UJ	110 UJ	110 UJ	110 UJ	210 UJ
B9	PRC94SVL1134	4/28/94	2.80	3.10	1000 UJ	510 UJ	1000 UJ	100 UJ	100 UJ	100 UJ	220 J	100 UJ	100 UJ	100 UJ	100 UJ	200 UJ

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-2d
Western Bayside
Semi-Volatile Organic Compounds in Core Sediment Samples (µg/kg)
(Page 2 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		CLRANLN4	CLRP2	DCB12	DCB13	DCB14	DIBENZOF	DICLBZ33	DICLRP24	DIETHPH	DIMETHPH	DIMTHP24	DINBUTLP	DINCRS46
1996 Ecological Assessment Report																	
B12	PRC94SVL1147	4/28/94	0.30	1.30	260 U	86 U	86 U	86 U	86 U	86 U	86 U	260 U	86 U	86 U	170 U	780	860 U
B12	PRC94SVL1149	4/28/94	1.30	2.30	280 U	93 U	93 U	93 U	93 U	93 U	93 U	280 U	93 U	93 U	180 U	93	930 U
B12	PRC94SVL1150	4/28/94	2.80	3.10	290 U	99 U	99 U	99 U	99 U	99 U	99 U	290 U	99 U	99 U	190 U	99 U	990 U
B2	PRC94SVL1163	4/29/94	0.30	1.30	310 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	310 UJ	100 UJ	100 UJ	200 UJ	200 UJ	1000 UJ
B2	PRC94SVL1165	4/29/94	1.30	2.30	340 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 JU	340 UJ	110 UJ	110 UJ	220 UJ	470 UJ	1100 UJ
B2	PRC94SVL1166	4/29/94	2.80	3.10	330 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	330 UJ	110 UJ	110 UJ	220 UJ	650 UJ	1100 UJ
B4	PRC94SVL1143	4/28/94	0.30	1.30	360 U	120 U	120 U	120 U	120 U	120 U	120 U	360 U	120 U	120 U	230 U	150	1200 U
B4	PRC94SVL1144	4/28/94	1.30	2.30	410 U	140 U	140 U	140 U	140 U	140 U	140 U	410 U	140 U	140 U	270 U	140 U	1400 U
B4	PRC94SVL1146	4/28/94	2.80	3.10	410 U	140 U	140 U	140 U	140 U	140 U	140 U	410 U	140 U	140 U	270 U	140	1400 U
B6	PRC94SVL1139	4/28/94	0.30	1.30	260 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	87 UJ	260 UJ	87 UJ	87 UJ	170 UJ	260 J	870 UJ
B6	PRC94SVL1140	4/28/94	1.30	2.30	240 U	82 U	82 U	82 U	82 U	82 U	82 U	240 U	82 U	82 U	160 U	82 U	820 U
B6	PRC94SVL1142	4/28/94	2.80	3.10	290 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	290 UJ	99 UJ	99 UJ	190 UJ	370 J	990 UJ
B8	PRC94SVL1135	4/28/94	0.30	1.30	250 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	250 UJ	84 UJ	84 UJ	160 UJ	100 J	840 UJ
B8	PRC94SVL1136	4/28/94	1.30	2.30	250 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	250 UJ	84 UJ	84 UJ	160 UJ	110 J	840 UJ
B8	PRC94SVL1138	4/28/94	2.80	3.10	250 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	84 UJ	250 UJ	84 UJ	84 UJ	160 UJ	330 J	840 UJ
B9	PRC94SVL1131	4/28/94	0.30	1.30	330 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	330 UJ	110 UJ	110 UJ	220 UJ	450 J	1100 UJ
B9	PRC94SVL1132	4/28/94	1.30	2.30	330 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	330 UJ	110 UJ	110 UJ	210 UJ	120 J	1100 UJ
B9	PRC94SVL1134	4/28/94	2.80	3.10	310 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	310 UJ	100 UJ	100 UJ	200 UJ	100 UJ	1000 UJ

Notes:
NA = N[illegible]lyzed, NV = No Value, — = No Statistics
Qual[illegible]itions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-2d
Western Bayside
Semi-Volatile Organic Compounds in Core Sediment Samples (µg/kg)
(Page 3 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		DINITP24	DNOCTPHT	DNT24	DNT26	HEXCLBNZ	HEXCLBUT	HEXCLCPD	HEXCLETH	ISOPHOR	METHPHN2	METHPHN4	NITROAN2	NITROAN3	NITROAN4
1996 Ecological Assessment Report																		
B12	PRC94SVL1147	4/28/94	0.30	1.30	420 U	86 U	420 U	420 U	86 U	170 U	420 U	170 U	86 U	86 U	86 U	420 U	420 U	420 U
B12	PRC94SVL1149	4/28/94	1.30	2.30	460 U	93 U	460 U	460 U	93 U	180 U	460 U	180 U	93 U	93 U	93 U	460 U	460 U	460 U
B12	PRC94SVL1150	4/28/94	2.80	3.10	490 U	99 U	490 U	490 U	99 U	190 U	490 U	190 U	99 U	99 U	99 U	490 U	490 U	490 U
B2	PRC94SVL1163	4/29/94	0.30	1.30	510 UJ	100 UJ	510 UJ	510 UJ	100 UJ	200 UJ	510 UJ	200 UJ	100 UJ	100 UJ	100 UJ	510 UJ	510 UJ	510 UJ
B2	PRC94SVL1165	4/29/94	1.30	2.30	560 UJ	110 UJ	560 UJ	560 UJ	110 UJ	220 UJ	560 UJ	220 UJ	110 UJ	110 UJ	110 UJ	560 UJ	560 UJ	560 UJ
B2	PRC94SVL1166	4/29/94	2.80	3.10	550 UJ	110 UJ	550 UJ	550 UJ	110 UJ	220 UJ	550 UJ	220 UJ	110 UJ	110 UJ	110 UJ	550 UJ	550 UJ	550 UJ
B4	PRC94SVL1143	4/28/94	0.30	1.30	590 U	120 U	590 U	590 U	120 U	230 U	590 U	230 U	120 U	120 U	120 U	590 U	590 U	590 U
B4	PRC94SVL1144	4/28/94	1.30	2.30	670 U	140 U	670 U	670 U	140 U	270 U	670 U	270 U	140 U	140 U	140 U	670 U	670 U	670 U
B4	PRC94SVL1146	4/28/94	2.80	3.10	670 U	140 U	670 U	670 U	140 U	270 U	670 U	270 U	140 U	140 U	140 U	670 U	670 U	670 U
B6	PRC94SVL1139	4/28/94	0.30	1.30	430 UJ	87 UJ	430 UJ	430 UJ	87 UJ	170 UJ	430 UJ	170 UJ	87 UJ	87 UJ	87 UJ	430 UJ	430 UJ	430 UJ
B6	PRC94SVL1140	4/28/94	1.30	2.30	400 U	82 U	400 U	400 U	82 U	160 U	400 U	160 U	82 U	82 U	82 U	400 U	400 U	400 U
B6	PRC94SVL1142	4/28/94	2.80	3.10	490 UJ	99 UJ	490 UJ	490 UJ	99 UJ	190 UJ	490 UJ	190 UJ	99 UJ	99 UJ	99 UJ	490 UJ	490 UJ	490 UJ
B8	PRC94SVL1135	4/28/94	0.30	1.30	410 UJ	84 UJ	410 UJ	410 UJ	84 UJ	160 UJ	410 UJ	160 UJ	84 UJ	84 UJ	84 UJ	410 UJ	410 UJ	410 UJ
B8	PRC94SVL1136	4/28/94	1.30	2.30	410 UJ	84 UJ	410 UJ	410 UJ	84 UJ	160 UJ	410 UJ	160 UJ	84 UJ	84 UJ	84 UJ	410 UJ	410 UJ	410 UJ
B8	PRC94SVL1138	4/28/94	2.80	3.10	410 UJ	84 UJ	410 UJ	410 UJ	84 UJ	160 UJ	410 UJ	160 UJ	84 UJ	84 UJ	84 UJ	410 UJ	410 UJ	410 UJ
B9	PRC94SVL1131	4/28/94	0.30	1.30	550 UJ	110 UJ	550 UJ	550 UJ	110 UJ	220 UJ	550 UJ	220 UJ	110 UJ	110 UJ	110 UJ	550 UJ	550 UJ	550 UJ
B9	PRC94SVL1132	4/28/94	1.30	2.30	540 UJ	110 UJ	540 UJ	540 UJ	110 UJ	210 UJ	540 UJ	210 UJ	110 UJ	110 UJ	110 UJ	540 UJ	540 UJ	540 UJ
B9	PRC94SVL1134	4/28/94	2.80	3.10	510 UJ	100 UJ	510 UJ	510 UJ	100 UJ	200 UJ	510 UJ	200 UJ	100 UJ	100 UJ	100 UJ	510 UJ	510 UJ	510 UJ

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-2d
Western Bayside
Semi-Volatile Organic Compounds in Core Sediment Samples (µg/kg)
(Page 4 of 4)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		NITROBNZ	NITROPH2	NITROPH4	NNITRONP	NNITROSP	PENTCLPH	PHENOL	TCP245	TCP246	TRICB124
1996 Ecological Assessment Report														
B12	PRC94SVL1147	4/28/94	0.30	1.30	86 U	420 U	420 U	86 U	86 U	420 U	170 U	420 U	420 U	86 U
B12	PRC94SVL1149	4/28/94	1.30	2.30	93 U	460 U	460 U	93 U	93 U	460 U	180 U	460 U	460 U	93 U
B12	PRC94SVL1150	4/28/94	2.80	3.10	99 U	490 U	490 U	99 U	99 U	490 U	190 U	490 U	490 U	99 U
B2	PRC94SVL1163	4/29/94	0.30	1.30	100 UJ	510 UJ	510 UJ	100 UJ	100 UJ	510 UJ	200 UJ	510 UJ	510 UJ	100 UJ
B2	PRC94SVL1165	4/29/94	1.30	2.30	110 UJ	560 UJ	560 UJ	110 UJ	110 UJ	560 UJ	220 UJ	560 UJ	560 UJ	110 UJ
B2	PRC94SVL1166	4/29/94	2.80	3.10	110 UJ	550 UJ	550 UJ	110 UJ	110 UJ	550 UJ	220 UJ	550 UJ	550 UJ	110 UJ
B4	PRC94SVL1143	4/28/94	0.30	1.30	120 U	590 U	590 U	120 U	120 U	590 U	230 U	590 U	590 U	120 U
B4	PRC94SVL1144	4/28/94	1.30	2.30	140 U	670 U	670 U	140 U	140 U	670 U	270 U	670 U	670 U	140 U
B4	PRC94SVL1146	4/28/94	2.80	3.10	140 U	670 U	670 U	140 U	140 U	670 U	270 U	670 U	670 U	140 U
B6	PRC94SVL1139	4/28/94	0.30	1.30	87 UJ	430 UJ	430 UJ	87 UJ	87 UJ	430 UJ	170 UJ	430 UJ	430 UJ	87 UJ
B6	PRC94SVL1140	4/28/94	1.30	2.30	82 U	400 U	400 U	82 U	82 U	400 U	160 U	400 U	400 U	82 U
B6	PRC94SVL1142	4/28/94	2.80	3.10	99 UJ	490 UJ	490 UJ	99 UJ	99 UJ	490 UJ	190 UJ	490 UJ	490 UJ	99 UJ
B8	PRC94SVL1135	4/28/94	0.30	1.30	84 UJ	410 UJ	410 UJ	84 UJ	84 UJ	410 UJ	160 UJ	410 UJ	410 UJ	84 UJ
B8	PRC94SVL1136	4/28/94	1.30	2.30	84 UJ	410 UJ	410 UJ	84 UJ	84 UJ	410 UJ	160 UJ	410 UJ	410 UJ	84 UJ
B8	PRC94SVL1138	4/28/94	2.80	3.10	84 UJ	410 UJ	410 UJ	84 UJ	84 UJ	410 UJ	160 UJ	410 UJ	410 UJ	84 UJ
B9	PRC94SVL1131	4/28/94	0.30	1.30	110 UJ	550 UJ	550 UJ	110 UJ	110 UJ	550 UJ	220 UJ	550 UJ	550 UJ	110 UJ
B9	PRC94SVL1132	4/28/94	1.30	2.30	110 UJ	540 UJ	540 UJ	110 UJ	110 UJ	540 UJ	210 UJ	540 UJ	540 UJ	110 U
B9	PRC94SVL1134	4/28/94	2.80	3.10	100 UJ	510 UJ	510 UJ	100 UJ	100 UJ	510 UJ	200 UJ	510 UJ	510 UJ	100 UJ

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifications: U = Non-Detect, J = Estimated, Blank = Unqualified Detect

Table A-2e
Western Bayside
Organotins in Core Sediment Samples (µg/kg)
(Page 1 of 1)

Sampling Location	Sample Identification	Sampling Date	Sampling Interval		Monobutyl Tin	Dibutyl Tin	Tributyl Tin	Tetrabutyl Tin
1996 Ecological Assessment Report								
B12	PRC93SED0440	6/25/93	0.00	0.30	5.0 U	5.0 U	5.0 U	5.0 U
B12	PRC93SED0441	6/25/93	0.30	1.30	5.0 U	5.0 U	5.0 U	5.0 U
B12	PRC93SED0442	6/25/93	1.30	2.30	5.0 U	5.0 U	5.0 U	5.0 U
B12	PRC93SED0443	6/25/93	2.80	3.10	5.0 U	5.0 U	5.0 U	5.0 U
B2	PRC93SED0420	4/27/93	0.00	0.30	5.0 U	5.0 U	120	5.0 U
B2	PRC93SED0421	4/27/93	0.30	1.30	5.0 U	5.0 U	130	8.0
B2	PRC93SED0422	4/27/93	1.30	2.30	5.0 U	5.0 U	160	5.0 U
B2	PRC93SED0423	4/27/93	2.80	3.20	5.0 U	5.0 U	250	22
B4	PRC93SED0424	6/22/93	0.00	0.30	5.0 U	5.0 U	100	5.0 U
B4	PRC93SED0425	6/22/93	0.30	1.30	5.0 U	5.0 U	5.0 U	5.0 U
B4	PRC93SED0426	6/22/93	1.30	2.30	5.0 U	5.0 U	120	5.0 U
B4	PRC93SED0427	6/22/93	2.80	3.20	5.0 U	5.0 U	5.0 U	5.0 U
B6	PRC93SED0428	6/25/93	0.00	0.30	5.0 U	5.0 U	5.0 U	5.0 U
B6	PRC93SED0429	6/25/93	0.30	1.30	5.0 U	5.0 U	5.0 U	5.0 U
B6	PRC93SED0430	6/25/93	1.30	2.30	5.0 U	5.0 U	5.0 U	5.0 U
B6	PRC93SED0431	6/25/93	2.80	3.10	5.0 U	5.0 U	5.0 U	5.0 U
B8	PRC93SED0432	6/18/93	0.00	0.30	5.0 U	5.0 U	310	5.0 U
B8	PRC93SED0433	4/27/93	0.30	1.30	5.0 U	140	200	5.0 U
B8	PRC93SED0434	6/25/93	1.30	2.30	5.0 U	5.0 U	5.0 U	5.0 U
B8	PRC93SED0435	6/25/93	2.80	3.10	5.0 U	5.0 U	5.0 U	5.0 U
B9	PRC93SED0436	6/22/93	0.00	0.30	5.0 U	5.0 U	12	5.0 U
B9	PRC93SED0437	6/22/93	0.30	1.30	5.0 U	5.0 U	9.0	5.0 U
B9	PRC93SED0438	6/22/93	1.30	2.30	5.0 U	5.0 U	5.0 U	5.0 U
B9	PRC93SED0439	6/22/93	2.80	3.10	5.0 U	5.0 U	5.0 U	5.0 U

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect

Table A-2f
Western Bayside
Total Petroleum Hydrocarbons as Oil and Grease in Core Sediment Samples (µg/kg)
(Page 1 of 1)

Sampling Location	Sampling Identification	Sample Date	Sampling Interval		Oil and Grease
1996 Ecological Assessment Report					
B12	PRC93SED0440	6/25/93	0.00	0.30	120000
B12	PRC93SED0441	6/25/93	0.30	1.30	150000
B12	PRC93SED0442	6/25/93	1.30	2.30	80000
B12	PRC93SED0443	6/25/93	2.80	3.10	21000
B2	PRC93SED0420	6/22/93	0.00	0.30	130000
B2	PRC93SED0421	6/22/93	0.30	1.30	130000
B2	PRC93SED0422	6/22/93	1.30	2.30	130000
B2	PRC93SED0423	6/22/93	2.80	3.10	150000
B4	PRC93SED0424	6/22/93	0.00	0.30	200000
B4	PRC93SED0425	6/22/93	0.30	1.30	66000
B4	PRC93SED0426	6/22/93	1.30	2.30	170000
B4	PRC93SED0427	6/22/93	2.80	3.10	170000
B6	PRC93SED0428	6/25/93	0.00	0.30	48000
B6	PRC93SED0429	6/25/93	0.30	1.30	62000
B6	PRC93SED0430	6/25/93	1.30	2.30	20000 U
B6	PRC93SED0431	6/25/93	2.80	3.10	20000 U
B8	PRC93SED0432	6/25/93	0.00	0.30	91000
B8	PRC93SED0433	6/25/93	0.30	1.30	20000 U
B8	PRC93SED0434	6/25/93	1.30	2.30	20000 U
B8	PRC93SED0435	6/25/93	2.80	3.10	20000 U
B9	PRC93SED0436	6/22/93	0.00	0.30	180000
B9	PRC93SED0437	6/22/93	0.30	1.30	270000
B9	PRC93SED0438	6/22/93	1.30	2.30	240000
B9	PRC93SED0439	6/22/93	2.80	3.10	260000

Notes:
NA = Not Analyzed, NV = No Value, — = No Statistics
Qualifier Definitions: U = Non Detect, J = Estimated, Blank = Unqualified Detect

APPENDIX F

ENVIRONMENTAL BASELINE SURVEY SAMPLE LOCATION MAP AND ANALYTICAL RESULTS

EBS SOIL DATA SUMMARY STATISTICS
SITE 1-INSIDE BOUNDARY
ALAMEDA POINT

CHEMICAL NAME	TOTAL SAMPES	SAMPLES WITH DETECTIONS	FREQUENCY OF DETECTION (%)	DETECTED CONCENTRATIONS		DATA SUMMARY STATISTICS	
				MINIMUM	MAXIMUM	STANDARD DEVIATION	MEAN
TOTAL PETROLEUM HYDROCARBONS (mg/kg)							
Motor Oil Range Organics	1	1	100	230	230	0	230
SEMI-VOLATILE ORGANICS (mg/kg)							
Acenaphthene	4	1	25	0.97	0.97	0.38	0.42
Benzo(a)anthracene	4	4	100	0.16	9.7	4.7	2.6
Benzo(a)pyrene	4	4	100	0.12	18.0	8.9	4.7
Benzo(b)flouranthene	4	4	100	0.33	21.0	10.3	5.6
Benzo(g,h,i)perylene	4	4	100	0.019	14.0	6.9	3.7
Benzo(k)flouranthene	4	2	50	0.91	8.2	3.9	2.4
Bis(2-ethylhexyl)phthalate	4	1	25	0.62	0.62	0.21	0.33
Butylbenzylphthalate	4	1	25	0.025	0.025	2.7	1.5
Chrysene	4	4	100	0.15	11.0	5.4	2.9
Dibenzo(a,h)anthracene	4	3	75	0.031	2.9	1.4	0.79
Dimethylphthalate	4	1	25	0.061	0.061	2.7	1.524
Fluoranthene	4	4	100	0.14	8.8	4.3	2.405
Indeno(1,2,3-cd)pyrene	4	4	100	0.088	13.0	6.4	3.4
Phenanthrene	4	4	100	0.036	2.6	1.3	0.71
Pyrene	4	4	100	0.11	11.0	5.3	3.0
POLYCHLORINATED BIPHENYLS (mg/kg)							
Aroclor-1260	1	1	100	0.24	0.24	0	0.24
PESTICIDES (mg/kg)							
4,4'-DDT	1	1	100	0.031	0.031	0	0.031
TOTAL METALS (mg/kg)							
Lead	4	4	100	18.1	108	39	52.5

Notes:
% - Percent
Mean - Mean of detected concentrations and one-half the reporting limit for non-detects
Standard Deviation - Standard deviation of detected concentrations and one-half the reporting limit for non-detects
All EBS soil sample depths are included.

EBS DATA SUMMARY STATISTICS
SITE 1-OUTSIDE BOUNDARY
ALAMEDA POINT

CHEMICAL NAME	TOTAL SAMPLES	SAMPLES WITH DETECTIONS	FREQUENCY OF DETECTIONS (%)	DETECTED CONCENTRATIONS		DATA SUMMARY STATISTICS	
				MINIMUM	MAXIMUM	STANDARD DEVIATION	MEAN
SEMIVOLATILE ORGANICS (mg/kg)							
4-Chloro-3-methylphenol	1	1	100	21	21	0	21
Bis(2-ethylhexyl)phthalate	1	1	100	230	230	0	230
Pyrene	1	1	100	23	23	0	23
TOTAL METALS (mg/kg)							
Nickel	1	1	100	35000	35000	0	35000
TOTAL PETROLEUM HYDROCARBONS (mg/kg)							
Diesel range organics	7	1	14.3	3000	3000	8595	6071
Motor oil range organic	6	4	66.7	55000	2200000	855659	478667
Oil and grease	1	1	100	1500000	1500000	0	1500000

Notes:
% - Percent
Mean - Mean of detected concentrations and one-half the reporting limit for non-detects
Standard Deviation - Standard deviation of detected concentrations and one-half the reporting limit for non-detects
All EBS soil sample depths are included.

Site 1 Soil E Analytical Results

Operable Unit 3
Alameda Point

Point Type:	SL		SL		SL		SL		SL		SL	
Point Name:	001-001-001		001-001-002		001-001-003		001-001-004		001-002-005		005-001-002	
Sample Id:	001-0001		001-0002		001-0003		001-0004		001-0005		005-0002	
Sample Date:	07-APR-95		07-APR-95		07-APR-95		07-APR-95		07-APR-95		13-APR-95	
Water Bearing Unit or Depth:	0 - .5 ft		0 - .5 ft		0 - .5 ft		0 - .5 ft		0 - .5 ft		0 - .5 ft	
Investigation:	EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A	
TPH (MG/KG)												
DIESEL RANGE ORGANICS	N/A		N/A		N/A		N/A		11	U	N/A	
MOTOR OIL RANGE ORGANICS	N/A		N/A		N/A		N/A		**230**	YJ	N/A	
VOA (MG/KG)												
1,2-DICHLOROBENZENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
1,3-DICHLOROBENZENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
1,4-DICHLOROBENZENE	.35	U	11	UJ	.34	U	.73	U	N/A		N/A	
SVOA (MG/KG)												
1,2,4-TRICHLOROBENZENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2,2'-OXYBIS(1-CHLOROPROPANE)	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2,4,5-TRICHLOROPHENOL	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
2,4,6-TRICHLOROPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2,4-DICHLOROPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2,4-DIMETHYLPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2,4-DINITROPHENOL	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
2,4-DINITROTOLUENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2,6-DINITROTOLUENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2-CHLORONAPHTHALENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2-CHLOROPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2-METHYLNAPHTHALENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2-METHYLPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
2-NITROANILINE	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
2-NITROPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
3,3'-DICHLOROBENZIDINE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
3-NITROANILINE	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
4,6-DINITRO-2-METHYLPHENOL	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
4-BROMOPHENYL-PHENYLETHER	.35	U	11	U	.34	U	.73	U	N/A		N/A	
4-CHLORO-3-METHYLPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
4-CHLOROANILINE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
4-CHLOROPHENYL-PHENYLETHER	.35	U	11	U	.34	U	.73	U	N/A		N/A	
4-METHYLPHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
4-NITROANILINE	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
4-NITROPHENOL	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
ACENAPHTHENE	.35	U	**.97**	J	.34	U	.73	U	N/A		N/A	
ACENAPHTHYLENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
ANTHRACENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
BENZO(A)ANTHRACENE	**.17**	J	**9.7**	J	**.16**	J	**.4**	J	N/A		N/A	

Site 1 Soil EBS Analytical Results

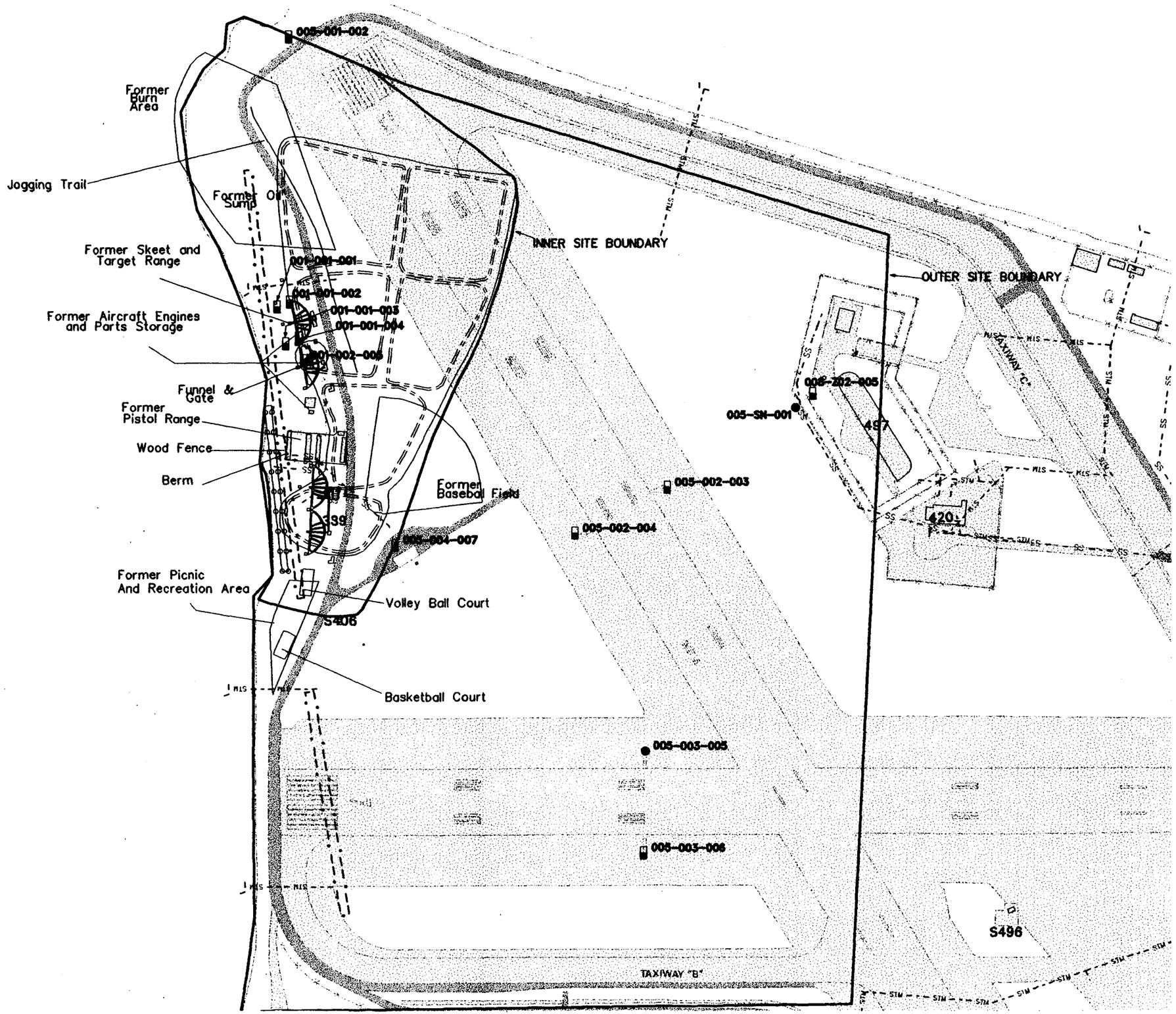
Operable Unit 3
Alameda Point

Point Type:	SL		SL		SL		SL		SL		SL	
Point Name:	001-001-001		001-001-002		001-001-003		001-001-004		001-002-005		005-001-002	
Sample Id:	001-0001		001-0002		001-0003		001-0004		001-0005		005-0002	
Sample Date:	07-APR-95		07-APR-95		07-APR-95		07-APR-95		07-APR-95		13-APR-95	
Water Bearing Unit or Depth:	0 - .5 ft		0 - .5 ft		0 - .5 ft		0 - .5 ft		0 - .5 ft		0 - .5 ft	
Investigation:	EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A		EBS PHASE 2A	
SVOA (MG/KG)												
BENZO(A)PYRENE	**.12**	J	**18**		**.24**	J	**.53**	J	N/A		N/A	
BENZO(B)FLUORANTHENE	**.33**	J	**21**		**.34**		**.73**	J	N/A		N/A	
BENZO(G,H,I)PERYLENE	**.019**	J	**14**		**.18**	J	**.69**	J	N/A		N/A	
BENZO(K)FLUORANTHENE	.35	U	**8.2**	J	.34	U	**.91**		N/A		N/A	
BIS(2-CHLOROETHOXY)METHANE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
BIS(2-CHLOROETHYL)ETHER	.35	U	11	U	.34	U	.73	U	N/A		N/A	
BIS(2-ETHYLHEXYL)PHTHALATE	.35	U	**.62**	J	.34	U	.73	U	N/A		N/A	
BUTYLBENZYLPHTHALATE	.35	U	11	U	**.025**	J	.73	U	N/A		N/A	
CARBAZOLE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
CHRYSENE	**.2**	J	**11**	J	**.15**	J	**.44**	J	N/A		N/A	
DI-N-BUTYLPHTHALATE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
DI-N-OCTYLPHTHALATE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
DIBENZO(A,H)ANTHRACENE	.35	U	**2.9**	J	**.031**	J	**.039**	J	N/A		N/A	
DIBENZOFURAN	.35	U	11	U	.34	U	.73	U	N/A		N/A	
DIETHYLPHTHALATE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
DIMETHYLPHTHALATE	**.061**	J	11	U	.34	U	.73	U	N/A		N/A	
FLUORANTHENE	**.14**	J	**8.8**	J	**.22**	J	**.46**	J	N/A		N/A	
FLUORENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
HEXACHLOROBENZENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
HEXACHLOROBUTADIENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
HEXACHLOROCYCLOPENTADIENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
HEXACHLOROETHANE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
INDENO(1,2,3-CD)PYRENE	**.088**	J	**13**		**.15**	J	**.52**	J	N/A		N/A	
ISOPHORONE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
N-NITROSO-DI-N-PROPYLAMINE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
N-NITROSODIPHENYLAMINE (1)	.35	U	11	U	.34	U	.73	U	N/A		N/A	
NAPHTHALENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
NITROBENZENE	.35	U	11	U	.34	U	.73	U	N/A		N/A	
PENTACHLOROPHENOL	.86	U	28	U	.81	U	1.8	U	N/A		N/A	
PHENANTHRENE	**.036**	J	**2.6**	J	**.061**	J	**.14**	J	N/A		N/A	
PHENOL	.35	U	11	U	.34	U	.73	U	N/A		N/A	
PYRENE	**.11**	J	**11**	J	**.27**	J	**.65**	J	N/A		N/A	
PCB (MG/KG)												
AROCLOR-1016	N/A		N/A		N/A		N/A		N/A		.84	U
AROCLOR-1221	N/A		N/A		N/A		N/A		N/A		1.7	U
AROCLOR-1232	N/A		N/A		N/A		N/A		N/A		.84	U
AROCLOR-1242	N/A		N/A		N/A		N/A		N/A		.84	U
AROCLOR-1248	N/A		N/A		N/A		N/A		N/A		.84	U

Site 1 Soil Analytical Results

Operable Unit 3
Alameda Point

Point Type:	SL	SL	SL	SL	SL	SL	
Point Name:	001-001-001	001-001-002	001-001-003	001-001-004	001-002-005	005-001-002	
Sample Id:	001-0001	001-0002	001-0003	001-0004	001-0005	005-0002	
Sample Date:	07-APR-95	07-APR-95	07-APR-95	07-APR-95	07-APR-95	13-APR-95	
Water Bearing Unit or Depth:	0 - .5 ft	0 - .5 ft	0 - .5 ft	0 - .5 ft	0 - .5 ft	0 - .5 ft	
Investigation:	EBS PHASE 2A	EBS PHASE 2A	EBS PHASE 2A	EBS PHASE 2A	EBS PHASE 2A	EBS PHASE 2A	
PCB (MG/KG)							
AROCLOR-1254	N/A	N/A	N/A	N/A	N/A	.84	U
AROCLOR-1260	N/A	N/A	N/A	N/A	N/A	**.24**	J
PEST (MG/KG)							
4,4'-DDD	N/A	N/A	N/A	N/A	N/A	.084	U
4,4'-DDE	N/A	N/A	N/A	N/A	N/A	.084	U
4,4'-DDT	N/A	N/A	N/A	N/A	N/A	**.031**	JP
ALDRIN	N/A	N/A	N/A	N/A	N/A	.043	U
ALPHA-BHC	N/A	N/A	N/A	N/A	N/A	.043	U
ALPHA-CHLORDANE	N/A	N/A	N/A	N/A	N/A	.043	U
BETA-BHC	N/A	N/A	N/A	N/A	N/A	.043	U
DELTA-BHC	N/A	N/A	N/A	N/A	N/A	.043	U
DIELDRIN	N/A	N/A	N/A	N/A	N/A	.084	U
ENDOSULFAN I	N/A	N/A	N/A	N/A	N/A	.043	U
ENDOSULFAN II	N/A	N/A	N/A	N/A	N/A	.084	U
ENDOSULFAN SULFATE	N/A	N/A	N/A	N/A	N/A	.084	U
ENDRIN	N/A	N/A	N/A	N/A	N/A	.084	U
ENDRIN ALDEHYDE	N/A	N/A	N/A	N/A	N/A	.084	U
ENDRIN KETONE	N/A	N/A	N/A	N/A	N/A	.084	U
GAMMA-BHC (LINDANE)	N/A	N/A	N/A	N/A	N/A	.043	U
GAMMA-CHLORDANE	N/A	N/A	N/A	N/A	N/A	.043	U
HEPTACHLOR	N/A	N/A	N/A	N/A	N/A	.043	U
HEPTACHLOR EPOXIDE	N/A	N/A	N/A	N/A	N/A	.043	U
METHOXYCHLOR	N/A	N/A	N/A	N/A	N/A	.43	U
TOXAPHENE	N/A	N/A	N/A	N/A	N/A	4.3	U
METALS (MG/KG)							
LEAD	**108**	**18.1**	**40.4**	**43.6**	N/A	N/A	



LEGEND

- INTERIOR AIR MONITOR
- HYDROPUNCH
- SOIL BORING
- SOIL GAS
- SURFACE LOCATION
- INDUSTRIAL WASTE LINE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 617 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE
- WASTE DISPOSAL CELL
- BARGE LINE (INFERRED FROM 1949 PHOTO)
- BARGE LINE (INFERRED FROM 1957 PHOTO)

NOTE:
POINTS THAT ARE NOT LABELED ARE NOT ASSOCIATED WITH SITE 1.

150 0 150 300
SCALE: 1" = 300'

ENVIRONMENTAL BASELINE SURVEY SAMPLE LOCATIONS WITHIN INSTALLATION RESTORATION SITE 1
ALAMEDA POINT
ALAMEDA, CALIFORNIA

11/03/98 /data3/alameda/ev02s1/site1_sbs.mxd /data3/alameda/ev02s1/site1_sm_map_mckellip

APPENDIX G

GEOTECHNICAL RESULTS AND IN SITU PERMIABILITY (SLUG) TEST RESULTS

SITE 1 GEOTECHNICAL RESULTS

CTL Cooper Testing Laboratory
Independent Geotechnical Lab
1951 Colony, Unit X • Mountain View, CA 94043

David R. Cooper
415 968-447
Fax (415) 968-422

LETTER OF TRANSMITTAL

TO: Tim Bodkin
Canonie Environmental Services
1825 S. Grant St., Suite 260
San Mateo, CA 94402

DATE: 6 Aug 90

PROJECT: 86.86-018 U.S. Navy

CTL#: 034-10

ENCLOSED: Laboratory soil test data.

REMARKS:

BY: David R. Cooper

David R. Cooper

DATE SAMPLED _____ DATE TESTED 7/17/90 BY: DC CHECKED BY _____

COOPER TESTING LABORATORY

MOISTURE - DENSITY DATA SHEET

JOB NO. _____ CLIENT _____ LOCATION _____ SHEET ___ OF ___

BORING NUMBER		DA-1R	DA-1	DA-2R	DA-2	WB-1	WB-1	WB-1	WB-3R	WB-3	WB-3
DEPTH (FEET)		0-0.5'	26.5-27.0	0.0-0.5	10.0-10.5	0-0.5'	20.5-21.0	36.5-37.0	0.0-0.5	16.5-17.0	17.5-18.0
FIELD CLASSIFICATION											
LABORATORY CLASSIFICATION		BROWN SILTY SAND W/GRV (SM)	BAYMUD W/SHELLS	BROWN FINE SAND W/SILT (SP/SM)	BAYMUD TO (SC) BM TESTED	GREENISH BROWN SILTY FINE SAND (SM) W/GRAVEL	MIX OF BAYMUD & SAND	SCAT SANDY CLAY	BROWN SILTY FINE SAND (SM)	BROWN FINE SAND (SP)	BROWN FINE SAND (SP)
NUMBER OF RINGS		D	6	2	2	6	5	3	5.63	3	3
WT. IN GM.	RINGS & SOIL	I	689.6	212.2	211.7	684.6	604.0		69.6	362.4	364.4
	RINGS	S	181.9	55.0	55.7	184.2	163.4		18.5	80	80
	OF SOIL	T	507.7	157.2	156.0	500.4	440.6	264.8	432.1	282.4	284.4
RING FACTOR		U	1.302/6	1.302/2	1.302/2	1.302/6	1.302/5	1.302/3	1.302/5.63	1.302/3	1.302/3
WET DENSITY pcf		R B	110.2	102.3	101.6	108.6	114.7	114.9	49.9	122.6	123.4
DRYING DISH NUMBER		E	40	142	A-14	14	122	70	78	A-15	19
WT. IN GM.	MOIST SOIL & DISH	D	70.4	143.8	50.2	172.3	122.4	111.5	120.6	137.8	109.4
	DRY SOIL & DISH		56.2	130.1	38.7	160.4	96.4	87.6	119.0	119.7	94.6
	MOISTURE		14.2	13.7	11.5	11.9	26.0	23.9	1.6	18.1	14.8
	DISH		20.2	20.7	20.7	19.4	20.8	19.6	19.4	20.6	20.7
	DRY SOIL		36.0	109.4	18.0	141.0	75.6	68.0	99.6	99.1	73.9
MOISTURE CONTENT %			39.4	12.5	63.9	8.4	34.4	35.2	1.6	18.3	30.0
DRY DENSITY pcf			79.0	90.9	62.6	100.1	85.4	85.0	48.3	103.6	102.8

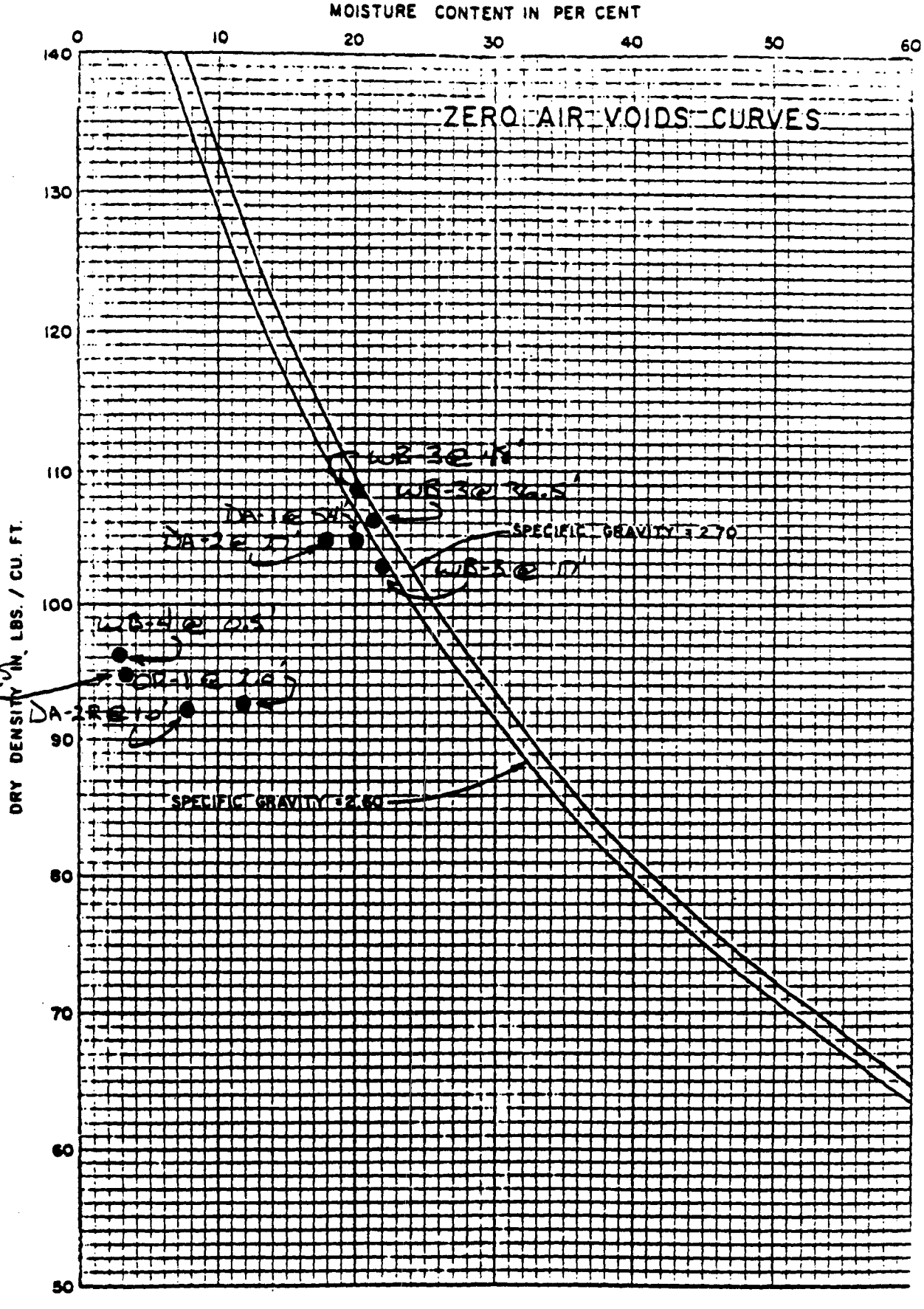
COOPER TESTING LABORATORY

JOB NO. _____

SUBJECT: MOISTURE-DENSITY DATA _____

_____ SHEET ____ OF _____

REVISIONS:
BY _____ DATE _____ TO EO _____
BY _____ DATE _____ TO EO _____



BY DC DATE 8/3/90

CHECKED BY _____

COPY TO EO _____

COOPER TESTING LABORATORY

Project: CALDWIE 86-018-17 Location: ALAMEDA NAS Job No. 034-10

Soil Classification: SHELLS w/ BAYMUD Boring No. DA-1

SAMPLE DISTURBED Sample No.

Test Started By: DC 7/20/90 Test Completed By: HC 7/30/90 Depth (ft) 30.0 - 30.5

Data Computed By: / / Data Plotted By: / / Checked By: / /

SAMPLE TYPE

☐ Undisturbed ☐ Undisturbed (Trimmed to) ☐ Remolded to ☐ % D_d ☐ % Compaction

DATA REQUIREMENT

$\gamma_{dmx.}$ = pcf

☐ e log P curve ☐ c log P curves ☐ k vs. e plot ☐ others (specify)

TEST METHOD

☑ STANDARD:

– Inundate sample at ☑ beginning ☐ completion of 150 psf

– Load cycle:

– Take time vs. deformation reading at:

☐ SPECIAL:

Instruction and notes:

By: / /

MOISTURE & DENSITY DATA

	Initial	Final
Sample Height (H_o) – in.	1.00	.8461
Sample Diameter (D_o) – in.	1.93	1.93
Sample Area (A_o) – in.	2.93	2.93
Sample Volume (V_o) – in./cc	2.93	2.48
Weight of Ring(s) + Wet Soil – gm	112.2	105.6
Weight of Rings Only – gm	29.0	29.0
Weight of Wet Soil – gm	83.2	76.6
Wet Density – pcf	108.3	117.9
Weight of Wet Soil + Dish (Ring) – gm	83.2	121.5
Weight of Dry Soil + Dish (Ring) – gm	55.7	100.6
Weight of Lost Moisture – gm	27.5	20.9
Weight of Dish (Ring) – gm (CW) 15.9		44.9
Weight of Dry Soil – gm		55.7
Moisture as % of Dry Weight – %	49.3	37.5
Dry Density – pcf	72.5	85.7

(Final Dry Density = Initial Dry Density x H_o/H_f)

G_s: Specific Gravity ☐ Assumed ☐ Determined

S : Degree of Saturation = (G_s x Water Content) / e

Initial	Final

VOID RATIO COMPUTATION

H_s: Height of Solid

$= \frac{\text{Weight of Solid in gm}}{(G_s)\ (A_o \text{ in cm}^2)\ (\gamma_w)} = \frac{(\quad)}{(\quad)\ (4.43)\ (18.4)\ (1)} =$

H_c: Height of sample after consolidation

e : Void ratio

$= \frac{H_c - H_s}{H_s} = \frac{1}{H_c H_s} - 1$

$\cdots\cdots \frac{1}{H_s} = (\quad) / (\quad) =$

Load, psf	Dial Reading .0001 in.	H, in.	Height of Sample, H_c	e
		.0000		

REMARKS:

EQUIPMENT: Consolidometer 6

Load Factor: 1 CGR = psf

COOPER TESTING LABORATORY

Project: 86-018-1806 Location: _____ Job No. 034-10

Soil Classification: BAY MUD w/SHELLS THROUGHOUT SAMPLE DISTURBED Boring No. A-1

Sample No. _____

Test Started By: DC 7/20/86 Test Completed By: _____ / / Depth (ft) 30.5-31.0

Data Computed By: _____ / / Data Plotted By: _____ / / Checked By: _____ / /

SAMPLE TYPE

☐ Undisturbed ☐ Undisturbed (Trimmed to _____) ☐ Remolded to _____ ☐ % D_d ☐ % Compaction

DATA REQUIREMENT

$\gamma_{dmx.}$ = _____ pcf

☐ e log P curve ☐ c log P curves ☐ k vs. e plot ☐ others (specify) _____

TEST METHOD

☐ STANDARD:

– Inundate sample at ☑ beginning ☐ completion of 150 psf

– Load cycle: _____

– Take time vs. deformation reading at: _____

☐ SPECIAL:

Instruction and notes: _____

By: _____ / / _____

MOISTURE & DENSITY DATA

	Initial	Final
Sample Height (H_o) – in.	1.00	.8450
Sample Diameter (D_o) – in.	1.93	1.93
Sample Area (A_o) – in.	2.93	2.93
Sample Volume (V_o) – in./cc	2.93	2.47
Weight of Ring(s) + Wet Soil – gm	112.9	106.1
Weight of Rings Only – gm	23.8	23.8
Weight of Wet Soil – gm	89.1	82.3
Wet Density – pcf	116.0	126.8
Weight of Wet Soil + Dish (Ring) – gm	89.1	125.8
Weight of Dry Soil + Dish (Ring) – gm	61.4	104.8
Weight of Lost Moisture – gm	27.7	21.0
Weight of Dish (Ring) – gm (70)		43.4
Weight of Dry Soil – gm 19.6		61.4
Moisture as % of Dry Weight – %	45.1	34.2
Dry Density – pcf (Final Dry Density = Initial Dry Density x H_o/H_f)	79.8	94.5

G_s: Specific Gravity _____ ☐ Assumed ☐ Determined

S : Degree of Saturation = (G_s x Water Content) / e

Initial	Final

VOID RATIO COMPUTATION

H_s: Height of Solid

$= \frac{\text{Weight of Solid in gm}}{(G_s)\ (A_o \text{ in cm}^2)\ (\gamma_w)} = \frac{(\quad)}{(\quad)\ (4.42)\ (16.4)\ (1)} =$ 293

H_c: Height of sample after consolidation

e : Void ratio

$= \frac{H_c - H_s}{H_s} = \frac{1}{H_c/H_s} - 1$

$\cdots\cdots \frac{1}{H_s} = (\quad) / (\quad) =$ _____

Load, psf	Dial Reading .0001 in.	H, in.	Height of Sample, H_c	e
		.0000		

REMARKS: _____

EQUIPMENT: Consolidometer 4

Load Factor: 1 CGR = _____ psf

COOPER TESTING LABS

DATA SHEET FOR SPECIFIC GRAVITY TEST

JOB NO. 034-10 NAME CANONITE / 76-018-15006 LOCATION

TESTED BY DC DATE 7/10/90 CHECKED BY

Dish Number	C-28	C-2	C-2	C-31
Boring Number	DA-1R	W3-3	DA-2	W2-3
Depth of Sample in Feet	0.5-1.0	36.5-37.0	41.0-41.5	46.5-47.0
Field Classification of Soil	W/SOME ORGANIC MATTER			
Lab Classification of Soil	BROWN SILTY FINE SAND (SM)	GRAY MED. TO FINE SAND (SP)	BROWN SILTY MED. TO FINE SAND (SP/SM)	BROWN FINE TO MED SAND W/ SILT (SP/SM)
Test Performed on Whole Sample? Or Some Fraction? Specify Percent	-#4	100% -#4	100% -#4	100% -#4
Pycnometer Number	4	4	3	3
Wt. of Pycnometer + Soil + Water ..... Wb	329.3	327.8	319.0	326.4
Test Temperature in °C, Tx	24	25	24	24
Wt. of Pycnometer + Water ..... Wa (from calibration curve)	294.34	294.3	291.69	291.5
Drying Dish Number				
Wt. of Dry Soil + Dish				
Wt. of Dish				
Wt. of Dry Soil ..... Wo	56.86	53.06	43.65	55.29
Temp. Correction Factor ..... K (from chart below)	.9991	.9989	.9991	.9991
K. Wo	56.81	53.00	43.61	55.24
Wo + Wa — Wb	21.9	19.56	16.3	20.5
Specify Gravity (20°C) = $\frac{K\ Wo}{Wo + Wa - Wb}$	2.59	2.71	2.68	2.69

Notes: 1. Based on "Standard Method of Test for Specific Gravity of Soils," ASTM Designation D 854-52. (For sand and fines)

2. All weights are in grams.

Tx	K
18	1.0004
19	1.0002
20	1.0000
21	.9998
22	.9996
23	.9993
24	.9991
25	.9989
26	.9986
27	.9983
28	.9980
29	.9977
30	.9974

Lab 11 (2-60)

Job 03-10 CANYON 186-018-191

Date Tested 7/30/90 By PH Boring No. DA-1 Sample No. _____ Depth _____

Description of Soil BROWN SILTY SAND W/ GVL. (SURFACE FILL MATL.) / BROKEN GLASS

Initial Gradation: +¾ 8.5 %, #4 > 33% Portion Tested: All ☐, —¾" ☐, +¾" Repl. with No. 4 x ¾" ☐ —No.4 ☐ 65 33 5 3

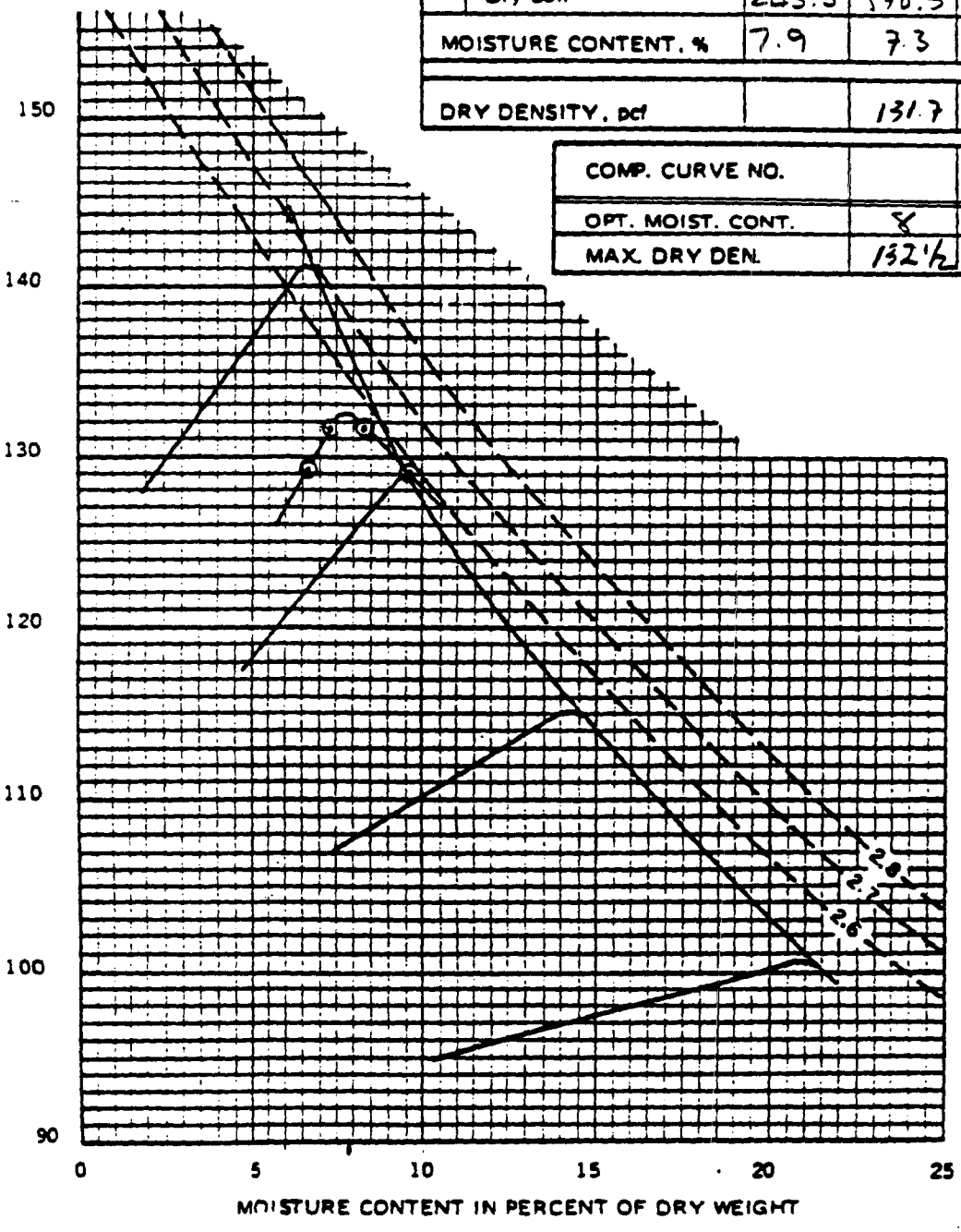
☒ MODIFIED AASHO 10 lb. rammer dropped 18" on each of 5 layers (ASTM Des¾ D1557-70T)

☒ 6" MOLD 1/13 cu ft

☐ 4" MOLD 1/30 cu ft

wt. in lbs	Mold and Moist Soil		6.84	16.93	16.85		6.57
	Mold		6.24	6.24	6.24		6.20
	Moist Soil		10.60	10.69	10.61		10.37
Factor (1/Vol. of Soil, cu ft)			13.33	13.33	13.33		
WET DENSITY, pcf		N.T.D.	141.30	142.5	141.4		137.0
wt. in gms.	Moist Soil and Dish	276.7	666.0	862.9	873.6		1773
	Dry Soil and Dish	257.4	624.7	801.2	801.5		1751.2
	Moisture	19.3	41.3	61.7	72.1		46.1
	Dish	(M) 12.1	(B) 54.2	(E) 53.4	(H) 53.4		E 55.8
	Dry Soil	245.3	570.5	747.8	748.1		695.4
MOISTURE CONTENT, %		7.9	7.3	8.3	9.6		6.6
DRY DENSITY, pcf			131.7	131.6	129.0		129.2

COMP. CURVE NO.				
OPT. MOIST. CONT.	8			
MAX. DRY DEN.	132½			



SOURCE OF SOIL:
USE OF SOIL:
REASON FOR TEST:
ETC.

COMPACTION TEST DATA SHEET

Job [illegible] CANONE (86-018-17)

Date Tested 7/20/90 By PU Boring No. ____ Sample No. CA-2 Depth 0 - 2'

Description of Soil LT. GREENISH BROWN FINE SAND W/ SHELLS & GRAVEL & SILT (SP/SM)

Initial Gradation: +¾ .24 %, RETAINED #4 (6.5%)

Portion Tested: All ☐, —¾" ☐, +¾" Repl. with No. 4 x ¾" ☐, —No.4 ☐ 19.2 2% +5:

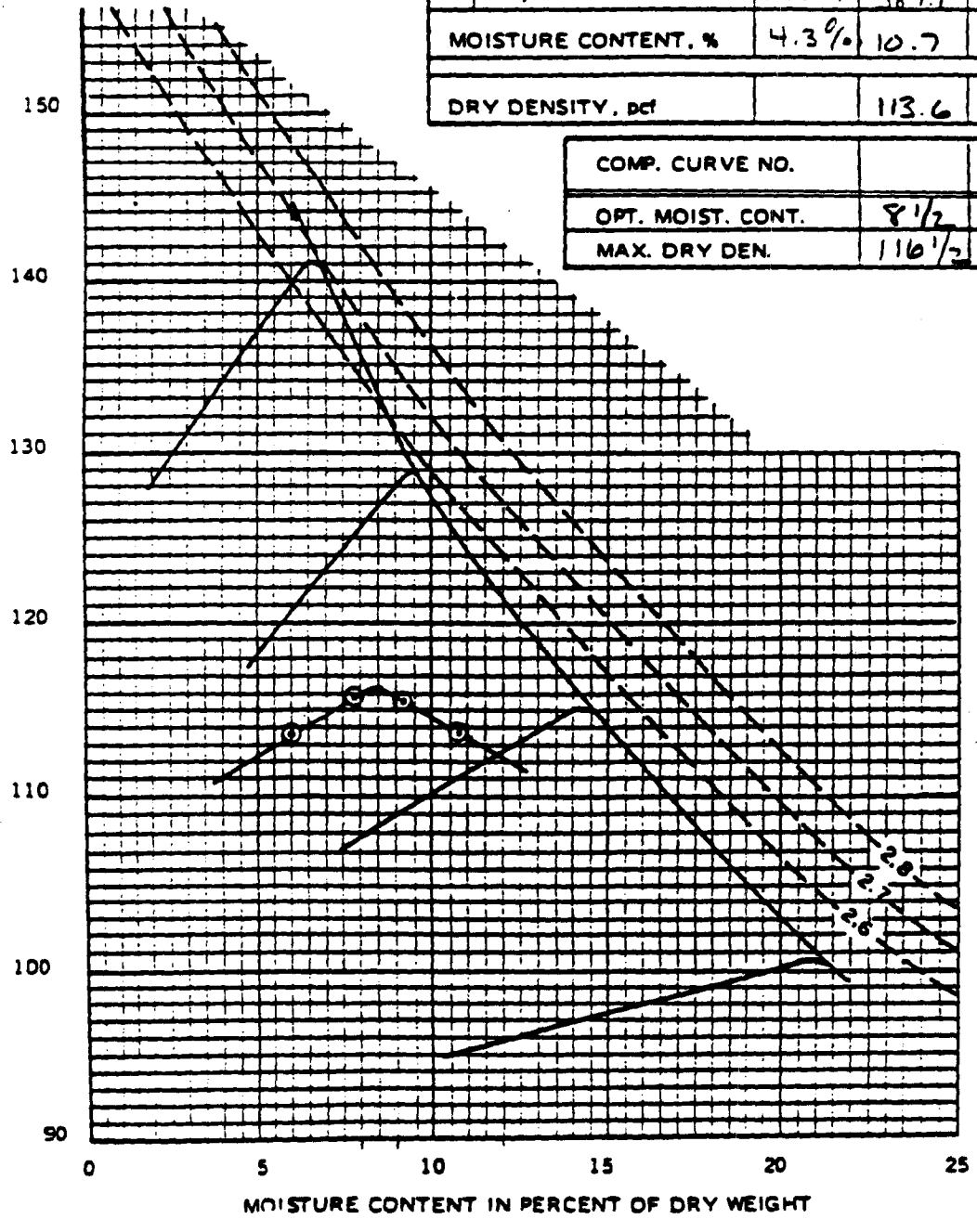
☑ MODIFIED AASHO 10 lb. rammer dropped 18" on each of 5 layers (ASTM Des¾ D1557-70T)

☐ 6" MOLD 1/13 cu ft

☑ 4" MOLD 1/30 cu ft

wt. in lbs	Mold and Moist Soil		8.69	8.56	8.51	8.70
	Mold		4.50	4.50	4.50	4.50
	Moist Soil		4.19	4.06	4.01	4.20
Factor (1/Vol. of Soil, cu ft)			30	30	30	30
WET DENSITY, pcf		INITIAL	125.7	124.8	120.3	126
wt. in gms.	Moist Soil and Dish	259.3	705.2	878.6	851.0	724.5
	Dry Soil and Dish	249.0	642.0	824.0	809.5	668.0
	Moisture	10.3	63.2	54.6	41.5	56.5
	Dish	M 12.1	D 52.9	H 122.0	L 122.2	M 53.4
	Dry Soil	236.9	589.1	702.0	687.3	614.6
MOISTURE CONTENT, %		4.3%	10.7	7.8	6.0	9.2
DRY DENSITY, pcf			113.6	115.8	113.5	115.4

COMP. CURVE NO.				
OPT. MOIST. CONT.	8 1/2			
MAX. DRY DEN.	116 1/2			



SOURCE OF SOIL:
USE OF SOIL:
REASON FOR TEST:
ETC.

COOPER TESTING LABORATORY

LABORATORY PERMEABILITY TEST DATA SHEET

SUMMARY

Initial Moisture Content 3.5 %
Initial Dry Density 104.6 pcf.
Perm. at 20°C 1×10^{-5} cm/sec

Job 034-10 (CANONIE 186-058-506) Boring No. DA-12 Sample No. _____ Depth 0.5-1.0'

Date Sampled _____ By _____ : Test Started 7/10 PM By DC : Computed by ___

Description of Soil BROWN SILTY FINE SAND (SM) DRY & LOOSE Checked by _____

☑ UNDISTURBED, d = ~~2.375~~ 1.93", ℓ = 1" ☐ or ℓ = 2" ☐

☐ REMOLDED, d = 4.00", ℓ = 4.59" (1/30 cubic foot mold)

_____ blows of a _____ lb. hammer dropped _____ inches on each of _____ layers

Apparatus No. 1 Surcharge Pressure 300 lbs./sq. ft.

Dial Readings in .001 inch: Search Dial Before Corr.	Dial Readings in .001 inch: Diff. Dial After Corr.	Date	Time	Elapsed Time, t, in hours	Burette Reading in cc	Volume of Water Used, V, in cc: Original	Volume of Water Used, V, in cc: Corr. .99 x orig.	Head of Water, h in inches	Perm. in cm/sec at test temp.	Test Temp. in °C	Viscosity Correc. Factor	Permeability, K, in cm/sec at 20°C
816	132	7/10	1553	—	SATURATING							
-040			1023	0	2.0			10		—		
776	129		1050	.45	7.1	5.1	4.85		1.6×10^{-5}	25	.89	1.4×10^{-5}
			1128	1.08	17.1	15.1	14.35		2.0×10^{-5}	25	.89	1.7×10^{-5}
			1218	1.92	26.3	24.3	23.09		1.8×10^{-5}	25	.89	1.6×10^{-5}
			1423	4.0	41.0	39.0	37.05		1.4×10^{-5}	26	.87	1.2×10^{-5}
			1612	5.82	50.2	48.2	45.79		1.2×10^{-5}	26	.87	1.0×10^{-5}

CONSTANT-HEAD TEST

$$K = \frac{V\ell}{thA}$$

K = coeff. of perm. in cm/sec
V = volume of water in cc.
ℓ = length of sample in inches
t = elapsed time in hours
h = head of water in inches
A = area of sample in sq. inches

For a sample with ℓ = 1", d = 2.375"

$$K = 9.72 \times 10^{-6} \frac{V}{th}$$

For a sample with ℓ = 4.59", d = 4"

$$K = 1.57 \times 10^{-6} \frac{V}{th}$$

MOISTURE-DENSITY DATA

Before Test		After Test
110.7	Wt. of 1 rings + soil	119.3
27.5	Wt. of _____ rings	27.5
83.2	Wt. of soil	91.8
1.302	Ring Factor	1.302
108.3	WET DENSITY, PCF	119.5
	Wt. of soil + dish No. 145	112.7
	Dry wt. of soil + dish	100.3
	Net loss of moisture	11.4
	Wt. of dish	20.7
	Wt. of dry soil	80.1
3.5	MOISTURE CONTENT, %	14.2
104.6	DRY DENSITY, PCF	

d = 1.93

$$K = 1.47 \times 10^{-5} \frac{V}{th}$$

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
22	.95
23	.93
24	.91

CONVERSION FACTORS

(Multiply by these factors to convert from cm/sec to the indicated units)

ft/sec = 3.28×10^{-6}
ft/day = 2.84×10^{-2}
ft/yr = 1.04×10^{-5}
gal/ft²-day = 2.12×10^{-4}

Lab 15 (4-60)

COOPER TESTING LABORATORY

LABORATORY PERMEABILITY TEST DATA SHEET

SUMMARY

Initial Moisture Content 20.0 %
Initial Dry Density 104.7 pcf
Perm. at 20°C 2×10^{-6} cm/sec

Job 034-10 (CALDWELL 86-018-1806) Boring No. DA-1 Sample No. ____ Depth 54.0 - 54.5

Date Sampled ____ By ____ : Test Started 7/10/90 By DC : Computed by ____

Description of Soil BROWN SILTY MED. TO FINE SAND (SM/SP) SATURATED Checked by ____

☐ UNDISTURBED, d = ~~2.375"~~ 1.87", ℓ = 1" ☐ or ℓ = 2" ☐

☐ REMOLDED, d = 4.00", ℓ = 4.59" (1/30 cubic foot mold)

____ blows of a ____ lb. hammer dropped ____ inches on each of ____ layers

Apparatus No. 2 Surcharge Pressure 300 lbs./sq. ft.

Dial Readings in .001 inch: Source Dial Before Corr.	Dial Readings in .001 inch: Defl. Dial After Corr.	Date	Time	Elapsed Time, t, in hours	Burette Reading in cc	Volume of Water Used, V, in cc: Original	Volume of Water Used, V, in cc: Corr. .95 x orig.	Head of Water, h in inches	Perm. in cm/sec at test temp.	Test Temp. in °C	Viscosity Correc. Factor	Permeability, K, in cm/sec at 20°C
885	071	7/10	1659	-	SATURATING							
-040			806	0	6.0	0		36		-		
845	269		905	.98	14.0	8.0	7.6		3.4×10^{-6}	25	.89	3.0×10^{-6}
			1024	2.30	22.3	16.3	15.49		2.9×10^{-6}	25	.89	2.6×10^{-6}
			1128	3.37	28.2	22.2	21.09		2.7×10^{-6}	25	.89	2.4×10^{-6}
			1217	4.18	32.4	26.4	25.08		2.6×10^{-6}	25	.89	2.3×10^{-6}
			1424	6.30	43.0	37.0	35.15		2.4×10^{-6}	26	.87	2.1×10^{-6}
			1613	8.12	52.2	46.2	43.89		2.4×10^{-6}	26	.87	2.1×10^{-6}

CONSTANT-HEAD TEST

$$K = \frac{V\ell}{thA}$$

K = coeff. of perm. in cm/sec
V = volume of water in cc.
ℓ = length of sample in inches
t = elapsed time in hours
h = head of water in inches
A = area of sample in sq. inches

For a sample with ℓ = 1", d = 2.375"

$$K = 9.72 \times 10^{-6} \frac{V}{th}$$

For a sample with ℓ = 4.59", d = 4"

$$K = 1.57 \times 10^{-6} \frac{V}{th}$$

MOISTURE - DENSITY DATA

Before Test		After Test
145.5	Wt. of 1 rings + soil	144.7
55.1	Wt. of ____ rings	55.1
90.4	Wt. of soil	89.6
1.389	Ring Factor	1.389
125.6	WET DENSITY, PCF	124.5
	Wt. of soil + dish No. 59	105.3
	Dry wt. of soil + dish	94.2
	Net loss of moisture	14.1
	Wt. of dish	18.6
	Wt. of dry soil	74.6
20.0	MOISTURE CONTENT, %	18.9
104.7	DRY DENSITY, PCF	

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
22	.95
23	.93
24	.91

d = 1.87

$$K = 1.57 \times 10^{-5} \frac{V}{th}$$

CONVERSION FACTORS

(Multiply by these factors to convert from cm/sec to the indicated units)

ft/sec = 3.28×10^{-6}
ft/day = 2.84×10^{-3}
ft/yr = 1.04×10^{-1}
gal/ft²-day = 2.12×10^{-4}

Lab 13 (4-60)

COOPER TESTING LABORATORY

LABORATORY PERMEABILITY TEST DATA SHEET

SUMMARY

Initial Moisture Content 7.7 %
Initial Dry Density 92.2 pcf
Perm. at 20°C 6×10^{-4} cm/sec

Job 034-10 (CANONNE 86-018-1806) Boring No. DA-22 Sample No. ____ Depth 1.0-1.5

Date Sampled ____ By ____ : Test Started 7/11/80 By DC : Computed by ____

Description of Soil GREENISH BROWN SILTY SAND (SM) Checked by ____

☑ UNDISTURBED, d = ~~2.375~~ 1.93", ℓ = 1" ☑ or ℓ = 2" ☐

☐ REMOLDED, d = 4.00", ℓ = 4.59" (1/30 cubic foot mold)

____ blows of a ____ lb. hammer dropped ____ inches on each of ____ layers

Apparatus No. 6 Surcharge Pressure 300 lbs./sq. ft.

Dial Readings in .001 inch: Sample Gauge Before Corr.	Dial Gauge After Corr.	Date	Time	Elapsed Time, t, in hours	Burette Reading in cc	Volume of Water Used, V, in cc: Original	Corr. .95 x orig.	Head of Water, h in inches	Perm. in cm/sec at test temp.	Test Temp. in °C	Viscosity Correc. Factor	Permeability, K, in cm/sec at 20°C
914	108	7/11	1452	—	SATURATING							
~~960~~			1547	0	3.0	0		2		—		
854	106		1554	.12	15.6	12.6	11.97		7.3×10^{-4}	26	.87	6.4×10^{-4}
			1612	.42	44.2	41.2	39.14		6.9×10^{-4}	26	.87	6.0×10^{-4}
			1630	.72	71.6	68.6	65.17		6.7×10^{-4}	26	.87	5.8×10^{-4}
		7/12	1158	0	3.0	0				—		
			1205	.12	21.6	18.6	17.67		1.1×10^{-3}	26	.87	9.4×10^{-4}
			1225	.45	68.0	65.0	61.75		1.0×10^{-3}	26	.87	8.8×10^{-4}
			1251	0	1.8	0				—		
			1340	.82	88.0	86.2	81.89		7.3×10^{-4}	27	.85	6.2×10^{-4}

CONSTANT-HEAD TEST

$$K = \frac{V\ell}{thA}$$

K = coeff. of perm. in cm/sec
V = volume of water in cc.
ℓ = length of sample in inches
t = elapsed time in hours
h = head of water in inches
A = area of sample in sq. inches

For a sample with ℓ = 1", d = 2.375"

$$K = 9.72 \times 10^{-6} \frac{V}{th}$$

For a sample with ℓ = 4.59", d = 4"

$$K = 1.57 \times 10^{-6} \frac{V}{th}$$

MOISTURE-DENSITY DATA

Before Test		After Test
104.7	Wt. of 1 rings + soil	114.8
28.4	Wt. of ____ rings	28.4
76.3	Wt. of soil	86.4
1.302	Ring Factor	1.302
99.3	WET DENSITY, PCF	112.5
	Wt. of soil + dish No. 62	105.5
	Dry wt. of soil + dish	99.0
	Net loss of moisture	15.5
	Wt. of dish	18.4
	Wt. of dry soil	20.6
7.7	MOISTURE CONTENT, %	22.0
92.2	DRY DENSITY, PCF	

d = 1.93

$$K = 1.47 \times 10^{-5} \frac{V}{th}$$

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
22	.95
23	.93
24	.91

CONVERSION FACTORS

(Multiply by these factors to convert from cm/sec to the indicated units)

ft/sec = 3.28×10^{-6}
ft/day = 2.84×10^{-2}
ft/yr = 1.04×10^{-5}
gal/ft²-day = 2.12×10^{-4}

Lab 13 (4-60)

COOPER TESTING LABORATORY

LABORATORY PERMEABILITY TEST DATA SHEET

SUMMARY

Initial Moisture Content 17.9 %
Initial Dry Density 114.4 pcf.
Perm. at 20°C 3×10^{-5} cm/sec

Job 034-10 (CANONIE 96-019-1906) Boring No. DA-2 Sample No. ____ Depth 27-27.5

Date Sampled ____ By ____ : Test Started 7/12/90 By DC : Computed by ____

Description of Soil SLAY MED TO FINE SAND (SP/SM) w/SOME SHELLS, DENSE Checked by ____

☑ UNDISTURBED, d = ~~2.375~~ 1.90", ℓ = 1" ☐ or ℓ = 2" ☐

☐ REMOLDED, d = 4.00", ℓ = 4.59" (1/30 cubic foot mold)

____ blows of a ____ lb. hammer dropped ____ inches on each of ____ layers

Apparatus No. 1 Surcharge Pressure 320 lbs./sq. ft.

Dial Readings in .001 inch: Switch Dial Before Corr.	Dial Readings in .001 inch: Diff. Dial After Corr.	Date	Time	Elapsed Time, t, in hours	Burette Reading in cc	Volume of Water Used, V, in cc: Original	Volume of Water Used, V, in cc: Corr. .95 x orig.	Head of Water, h in inches	Perm. in cm/sec at test temp.	Test Temp. in °C	Viscosity Correc. Factor	Permeability, K, in cm/sec at 20°C
815	122	7/12	1132	–	SATURATING							
320			1236	0	34.6	0		13		–		
275	122		1413	1.78	95.4	60.8	57.76		3.8×10^{-5}	27	.85	3.2×10^{-5}
			1426	0	9.2	0				–		
			1524	.97	35.5	32.3	30.69		3.7×10^{-5}	28	.83	3.1×10^{-5}
			1605	1.65	59.8	56.6	53.77		3.8×10^{-5}	28	.83	3.2×10^{-5}
			1629	2.05	73.8	70.6	67.07		3.8×10^{-5}	28	.83	3.2×10^{-5}
			1704	2.63	93.4	90.2	85.69		3.8×10^{-5}	28	.83	3.2×10^{-5}

CONSTANT-HEAD TEST

$$K = \frac{V\ell}{thA}$$

K = coeff. of perm. in cm/sec
V = volume of water in cc.
ℓ = length of sample in inches
t = elapsed time in hours
h = head of water in inches
A = area of sample in sq. inches

For a sample with ℓ = 1", d = 2.375"

$$K = 9.72 \times 10^{-4} \frac{V}{th}$$

For a sample with ℓ = 4.59", d = 4"

$$K = 1.57 \times 10^{-3} \frac{V}{th}$$

MOISTURE-DENSITY DATA

Before Test		After Test
135.1	Wt. of 1 rings + soil	134.7
34.6	Wt. of ____ rings	34.6
100.5	Wt. of soil	100.1
1.342	Ring Factor	1.342
134.9	WET DENSITY, PCF	134.3
	Wt. of soil + dish No. 153	119.2
	Dry wt. of soil + dish	104.4
	Net loss of moisture	14.8
	Wt. of dish	19.2
	Wt. of dry soil	84.2
17.9	MOISTURE CONTENT, %	17.5
114.4	DRY DENSITY, PCF	

d = 1.90"

$$K = 1.52 \times 10^{-5} \frac{V}{th}$$

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
22	.95
23	.93
24	.91

CONVERSION FACTORS

(Multiply by these factors to convert from cm/sec to the indicated units)

ft/sec = 3.28×10^{-2}
ft/day = 2.84×10^{3}
ft/yr = 1.04×10^{6}
gal/ft²-day = 2.12×10^{4}

Lab 15 (4-60)

COOPER TESTING LABORATORY

LABORATORY PERMEABILITY TEST DATA SHEET

SUMMARY

Initial Moisture Content 18.7 %
Initial Dry Density 114.3 pcf.
Perm. at 20°C 2×10^{-7} cm/sec

Job 034-10 (CANONIE 86-018-1846) Boring No. DA-2 Sample No. ..... Depth 41 - 41.5

Date Sampled ..... By ..... : Test Started 7/12/90 By DC : Computed by ...

Description of Soil BROWN SILTY F. TO MED. SAND (SP/SM) DENSE Checked by

☑ UNDISTURBED, d = ~~2.375"~~ 1.90, ℓ = 1" ☑ or ℓ = 2" ☐

☐ REMOLDED, d = 4.00", ℓ = 4.59" (1/30 cubic foot mold)

_____ blows of a _____ lb. hammer dropped _____ inches on each of _____ layers

Apparatus No. 2 Surcharge Pressure 300 lbs./sq. ft.

Dial Readings in .001 inch: Surch. Dial Before Corr.	Dial Readings in .001 inch: Diff. Dial After Corr.	Date	Time	Elapsed Time, t, in hours	Burette Reading in cc	Volume of Water Used, V, in cc: Original	Volume of Water Used, V, in cc: Corr. .95 x orig.	Head of Water, h in inches	Perm. in cm/sec at test temp.	Test Temp. in °C	Viscosity Correc. Factor	Permeability, K, in cm/sec at 20°C
500	088	7/12	1155	—	SATURATING							
040			1243	0	16.6	0		36		—		
860	054		1425	1.70	26.5	9.9	9.41		2.3×10^{-6}	27	.85	1.9×10^{-6}
			1524	2.68	30.8	14.2	13.49		2.1×10^{-6}	28	.83	1.7×10^{-6}
			1606	3.38	33.4	16.80	15.96		1.9×10^{-6}	28	.83	1.6×10^{-6}
			1704	4.35	36.4	19.80	18.81		1.8×10^{-6}	28	.83	1.5×10^{-6}
		7/13	803	19.33	70.6	54.0	51.30		1.1×10^{-6}	25	.89	9.6×10^{-7}
			1546	27.05	79.8	63.2	60.04		9.1×10^{-7}	27	.85	7.7×10^{-7}
			1648	0	24	0				—		
		7/14	823	15.58	8.0	16.6	15.77		4.1×10^{-7}	24	.91	3.8×10^{-7}

OVER

CONSTANT-HEAD TEST

$$K = \frac{V\ell}{thA}$$

K = coeff. of perm. in cm/sec
V = volume of water in cc.
ℓ = length of sample in inches
t = elapsed time in hours
h = head of water in inches
A = area of sample in sq. inches

For a sample with ℓ = 1", d = 2.375"

$$K = 9.72 \times 10^{-4} \frac{V}{th}$$

For a sample with ℓ = 4.59", d = 4"

$$K = 1.57 \times 10^{-4} \frac{V}{th}$$

MOISTURE-DENSITY DATA

Before Test		After Test
135.7	Wt. of 1 rings + soil	135.4
34.6	Wt. of ____ rings	34.6
101.1	Wt. of soil	100.8
1.342	Ring Factor	1.342
135.7	WET DENSITY, PCF	135.3
	Wt. of soil + dish No. 62	119.6
	Dry wt. of soil + dish	104.1
	Net loss of moisture	15.5
	Wt. of dish	19.4
	Wt. of dry soil	84.7
18.7	MOISTURE CONTENT, %	18.3
114.3	DRY DENSITY, PCF	

d = 1.90

$$K = 1.47 \times 10^{-5} \frac{V}{th}$$

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
22	.95
23	.93
24	.91

CONVERSION FACTORS

(Multiply by these factors to convert from cm/sec to the indicated units)

ft/sec = 3.28×10^{-6}
ft/day = 2.84×10^{-3}
ft/yr = 1.04×10^{0}
gal/ft²-day = 2.12×10^{-4}

Lab 13 (4-60)

COOPER TESTING LABORATORY

LABORATORY PERMEABILITY TEST DATA SHEET

SUMMARY

Initial Moisture Content	19.6 %
Initial Dry Density	108.6 pcf.
Perm. at 20°C	1×10^{-3} cm/sec

Job 034-10 (CANONIE 96-08-506) Boring No. DA-2 Sample No. _____ Depth 80-80.5

Date Sampled _____ By _____ : Test Started 7/16/90 By DC : Computed by _____

Description of Soil GREENISH BROWN FINE TO MED SAND (SP) Checked by _____

☑ UNDISTURBED, d = ~~2.375~~ 1.93", ℓ = 1" ☑ or ℓ = 2" ☐

☐ REMOLDED, d = 4.00", ℓ = 4.59" (1/30 cubic foot mold)

_____ blows of a _____ lb. hammer dropped _____ inches on each of _____ layers

Apparatus No. 3 Surcharge Pressure 300 lbs./sq. ft.

Dial Readings in .001 inch: Surch. Dial Before Corr.	Defl. Dial After Corr.	Date	Time	Elapsed Time, t, in hours	Burette Reading in cc	Volume of Water Used V, in cc: Original	Corr. .99 x orig.	Head of Water, h in inches	Perm. in cm/sec at test temp.	Test Temp. in °C	Viscosity Correc. Factor	Permeability, K, in cm/sec at 20°C
845	109	7/16	1012	SATURATING								
-060			1042	0	3.6	0		2		—		
785	107		1056	.23	30.2	26.6	25.27		8.1×10^{-4}	24	.91	7.4×10^{-4}
			1125	.48	87.4	57.2	54.34		8.3×10^{-4}	24	.91	7.6×10^{-4}
			1309	0	5.8	0				—		
			1324	.25	38.6	32.8	31.16		9.2×10^{-4}	25	.89	8.2×10^{-4}
			1341	.53	78.8	73.0	69.35		9.6×10^{-4}	25	.89	8.6×10^{-4}
			1358	0	2.4	0				—		
			1414	.27	46.2	43.80	41.61		1.1×10^{-3}	25	.89	1.0×10^{-3}
			1429	.52	88.6	86.20	81.89		1.2×10^{-3}	25	.89	1.0×10^{-3}

OVER

CONSTANT-HEAD TEST

$$K = \frac{V\ell}{thA}$$

K = coeff. of perm. in cm/sec
V = volume of water in cc.
ℓ = length of sample in inches
t = elapsed time in hours
h = head of water in inches
A = area of sample in sq. inches

For a sample with ℓ = 1", d = 2.375"

$$K = 9.72 \times 10^{-4} \frac{V}{th}$$

For a sample with ℓ = 4.59", d = 4"

$$K = 1.57 \times 10^{-6} \frac{V}{th}$$

MOISTURE-DENSITY DATA

Before Test		After Test
124.6	Wt. of 1 rings + soil	125.1
24.9	Wt. of _____ rings	24.9
99.7	Wt. of soil	100.2
1.302	Ring Factor	1.302
129.8	WET DENSITY, PCF	130.5
	Wt. of soil + dish No. 02	120.0
	Dry wt. of soil + dish	119.3
	Net loss of moisture	16.7
	Wt. of dish	36.5
	Wt. of dry soil	82.8
19.6	MOISTURE CONTENT, %	20.2
108.6	DRY DENSITY, PCF	

d = 1.93

$$K = 1.47 \times 10^{-5} \frac{V}{th}$$

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
22	.95
23	.93
24	.91

CONVERSION FACTORS

(Multiply by these factors to convert from cm/sec to the indicated units)

ft/sec = 3.28×10^{-2}
ft/day = 2.84×10^{3}
ft/yr = 1.04×10^{6}
gal/ft²-day = 2.12×10^{4}

Lab 13 (4-60)

FALLING HEAD PERMEABILITY TEST

PROJECT & LOCATION: 034-10 CANANDAIGUA 86-018-1906

BORING NO.: DA-1 SAMPLE NO.: ____ DEPTH (FT): 30.5-31.0 SAMPLED BY: ____ /

LABORATORY CLASSIFICATION: RAYMOND W/SHELBY THROUGHOUT SAMPLE

TESTED BY: DC 7/12/90 COMPUTED BY: ____ / / CHECKED BY: ____ /

TYPE OF SAMPLE: ☑ Undisturbed ____

☐ Remolded ____

SAMPLE DIMENSIONS	Initial	Final
Sample Height (In.)	2.0	1.88
Sample Diameter (In.)	1.93	1.84
Sample Area (In.^{2})	2.93	2.66
Sample Volume (In.^{3})	5.86	5.00
VOID RATIO		
Volume of Sample - V_t (CC)	96.03	81.92
Volume of Solid - V_s (CC)	35.52	35.52
Volume of Void - V_v (CC)	60.51	46.40
Void Ratio - e	1.704	1.306
Degree of Saturation - S (%)	97.2	99.4

Specific Gravity (ASSUMED) 2.7

SATURATION & CONSOLIDATION

DATE TIME	PRESSURE CELL	PRESSURE BACK	PORE PRESSURE	Δ U	Δ CELL	B

MOISTURE & DENSITY DATA

	Before	After
Wet Weight + Tare, gm		162.7
Dry Weight + Tare, gm		116.6
Weight of Water, gm		46.1
Weight of Tare, gm 129		20.7
Weight of Dry Soil, gm		95.9
Moisture Content, %	61.3	48.1
Total Wet Weight, gm	154.7	142.0
Total Dry Weight, gm	95.9	95.9
Weight of Water, gm	58.8	46.1
Wet Density, pcf	100.5	108.1
Dry Density, pcf	62.3	73.0

Cell# 1

VISCOSITY CORRECTION FACTORS

Test Temp. in °C	Viscosity Correc. Factor
16	1.11
17	1.08
18	1.05
19	1.03
20	1.00
21	.98
[illegible]	.95
23	.93
24	.91

CONSOLIDATION DATA

DATE	TIME Hr.	TIME Elapsed Min.	Burette Reading
		0	

DATA SHEET FOR CLASSIFICATION TEST

COOPER TESTING LABORATORY

SUMMARY:

LIQUID LIMIT 41 PLASTICITY INDEX 20

% GRAVEL ____ SAND ____ FINES ____ CLASSIFICATION (CL)

JOB 331-70 (CALVANE 546-018-18-6) BORING NO. DA-1 SAMPLE NO. ____ DEPTH 26.5-27.0

DATE TESTED 7/8/80 BY DC COMPUTED BY ____ CHECKED BY ____

DESCRIPTION OF SOIL RAINUD w/ SHELLS

Dish 10

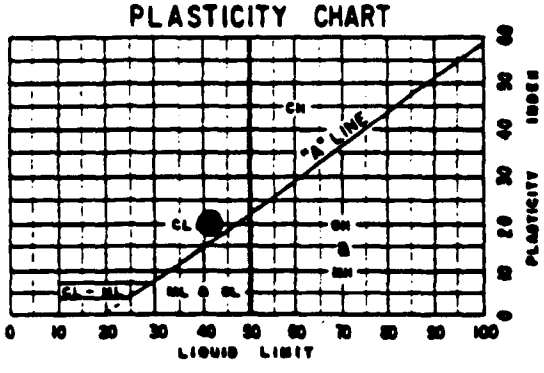
PAN F

DISH NUMBER		PLASTIC LIMIT B-4	PLASTIC LIMIT B-6	PLASTIC LIMIT B-16
WT. IN GMS	MOIST SOIL & DISH	16.81	12.41	15.21
	DRY SOIL & DISH	14.62	11.07	13.36
	MOISTURE	2.19	1.34	1.85
	DISH	4.43	4.40	4.30
	DRY SOIL	10.19	6.67	9.06
MOISTURE CONTENT, %		21.5	20.1	20.4

This line is 1/8" thick

LIQUID LIMIT	A	C	J	H
MOIST SOIL & DISH	18.76	21.40	19.80	15.99
DRY SOIL & DISH	16.06	18.38	16.65	12.95
MOISTURE	2.7	3.02	3.15	3.04
DISH	9.1	11.00	9.31	6.20
DRY SOIL	6.96	7.38	7.34	6.75
MOISTURE CONTENT, %	38.8	40.9	42.9	45.0
NUMBER OF BLOWS	36	28	17	13

PLASTICITY CHART

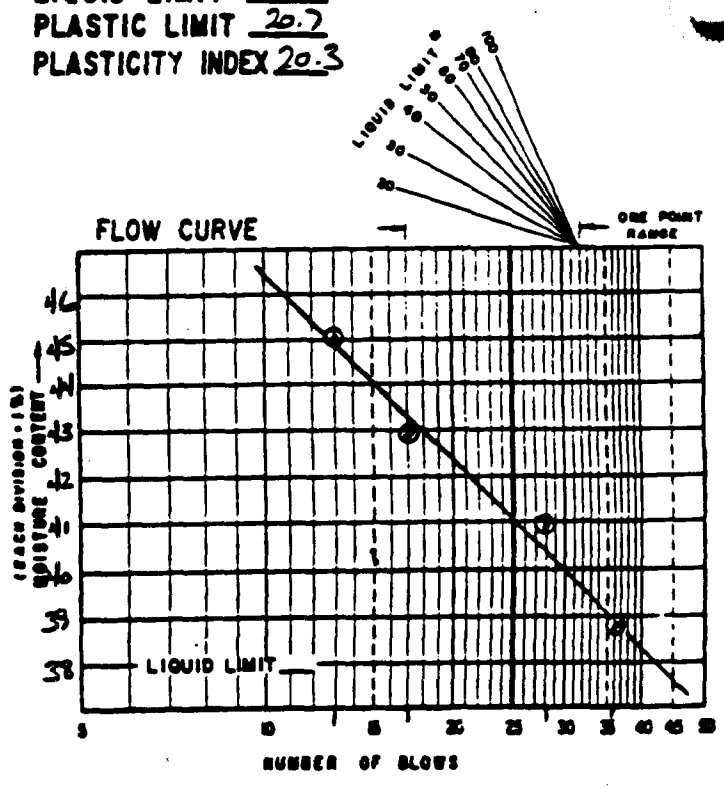


LIQUID LIMIT 41.0

PLASTIC LIMIT 20.7

PLASTICITY INDEX 20.3

FLOW CURVE



* USE THE APPROPRIATE SLOPE TO EXTRAPOLATE ONE-POINT LIQUID LIMIT TRIALS (BETWEEN 17 AND 36 BLOWS) TO THE 25-BLOW LINE.

WASH ANALYSIS (#200 SIEVE)

	BEFORE WASH	AFTER WASH
WT. OF DISH + OVEN-DRY SOIL		
WT. OF DISH NO. ____		
WT. OF OVEN-DRY SOIL		

% COARSE SOIL ____

SIEVE ANALYSIS

U.S. SIEVE NUMBER	CUMULATIVE WEIGHT RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING
3"			
3/4"			
#4			
#10			
#40			
#200			
PAN		100	0

LAB 312-86

DATA SHEET FOR CLASSIFICATION TEST

COOPER TESTING LABORATORY

SUMMARY:

LIQUID LIMIT 44 PLASTICITY INDEX 23

% GRAVEL _____ SAND _____ FINES _____ CLASSIFICATION (CL)

JOB 034-10 (CANONGE 86-05-1506) BORING NO. A-2 SAMPLE NO. _____ DEPTH 10.0 - 10.5'

DATE TESTED 7/30/90 BY _____ COMPUTED BY _____ CHECKED BY _____

DESCRIPTION OF SOIL RAYMUD TO CLAYEY SAND (CHANGE)

DM TESTED

Dish 4

Pan G

PLASTIC LIMIT

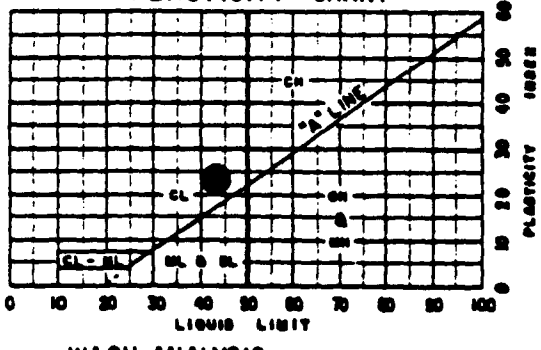
DISH NUMBER	B-5	B-7	B-51
WT. IN GMS: MOIST SOIL & DISH	14.34	13.54	14.25
WT. IN GMS: DRY SOIL & DISH	12.60	11.98	12.53
WT. IN GMS: MOISTURE	1.74	1.56	1.72
WT. IN GMS: DISH	4.48	4.42	4.48
WT. IN GMS: DRY SOIL	8.12	7.56	8.05
MOISTURE CONTENT, %	21.4	20.6	21.4

LIQUID LIMIT

	A-1	A-4	A-12	A-23
MOIST SOIL & DISH	23.69	23.34	22.40	22.49
DRY SOIL & DISH	20.03	19.62	19.04	19.90
MOISTURE	3.66	3.72	3.36	3.59
DISH	11.50	11.15	11.73	11.22
DRY SOIL	8.53	8.47	7.31	7.68
MOISTURE CONTENT, %	42.9	43.9	46.0	46.7
NUMBER OF BLOWS	30	23	17	14

This line is 1/8" thick

PLASTICITY CHART



LIQUID LIMIT 43.8

PLASTIC LIMIT 21.1

PLASTICITY INDEX 22.7

WASH ANALYSIS (#200 SIEVE)

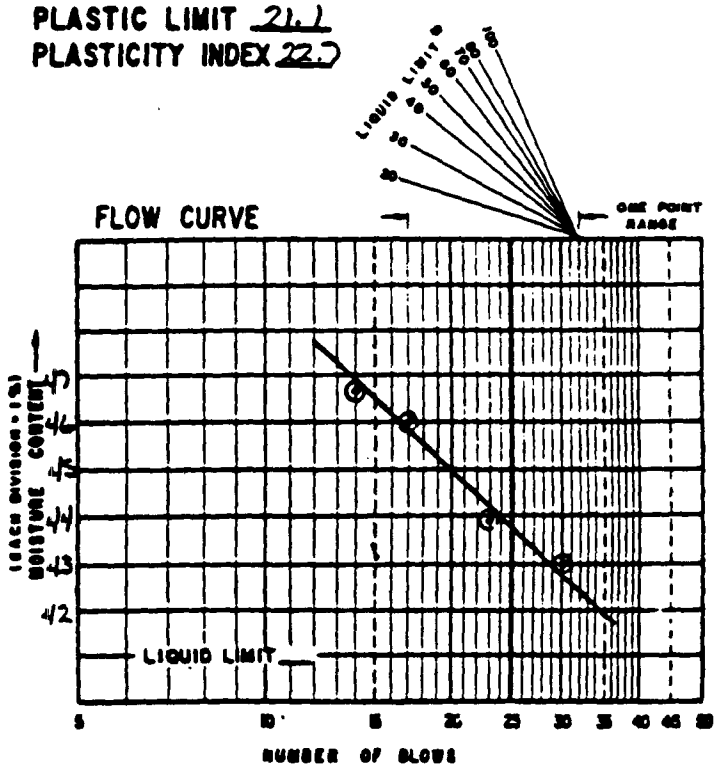
	BEFORE WASH	AFTER WASH
WT. OF DISH + OVEN-DRY SOIL		
WT. OF DISH NO. _____		
WT. OF OVEN-DRY SOIL		

% COARSE SOIL _____

SIEVE ANALYSIS

U.S. SIEVE NUMBER	CUMULATIVE WEIGHT RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING
3"			
3/4"			
#4			
#10			
#40			
#200			
PAN		100	0

FLOW CURVE



* USE THE APPROPRIATE SLOPE TO EXTRAPOLATE ONE-POINT LIQUID LIMIT TRIALS (BETWEEN 17 AND 30 BLOWS) TO THE 25-BLOW LINE.

DATA SHEET FOR CLASSIFICATION TEST

COOPER TESTING LABORATORY

SUMMARY:

LIQUID LIMIT 43 PLASTICITY INDEX 23

% GRAVEL _____ SAND _____ FINES _____ CLASSIFICATION FINES (CL)

JOB 034-10 (CANONIE 86-08-17) BORING NO. DA-1 SAMPLE NO. _____ DEPTH 30-30.5

DATE TESTED 7/20/86 BY _____ COMPUTED BY _____ CHECKED BY _____

DESCRIPTION OF SOIL SHELLS W/ BAYMUD

Dish 1
PAN B-1

PLASTIC LIMIT

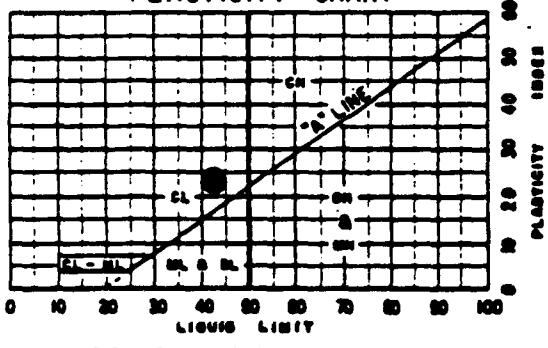
DISH NUMBER	B-9	B-13	B-18
WT. IN GMS: MOIST SOIL & DISH	10.38	10.58	10.31
WT. IN GMS: DRY SOIL & DISH	9.46	9.53	9.32
WT. IN GMS: MOISTURE	0.92	1.05	0.99
WT. IN GMS: DISH	4.32	4.42	4.38
WT. IN GMS: DRY SOIL	5.14	5.11	4.94
MOISTURE CONTENT, %	17.9	20.6	20.0

LIQUID LIMIT

	B	D	K	L
MOIST SOIL & DISH	18.72	20.43	16.40	19.05
DRY SOIL & DISH	15.87	17.09	13.26	15.79
MOISTURE	2.85	3.34	3.14	3.26
DISH	9.28	9.48	6.43	9.01
DRY SOIL	6.59	7.61	6.83	6.78
%	43.3	43.9	46.0	48.1
NUMBER OF BLOWS	30	20	15	11

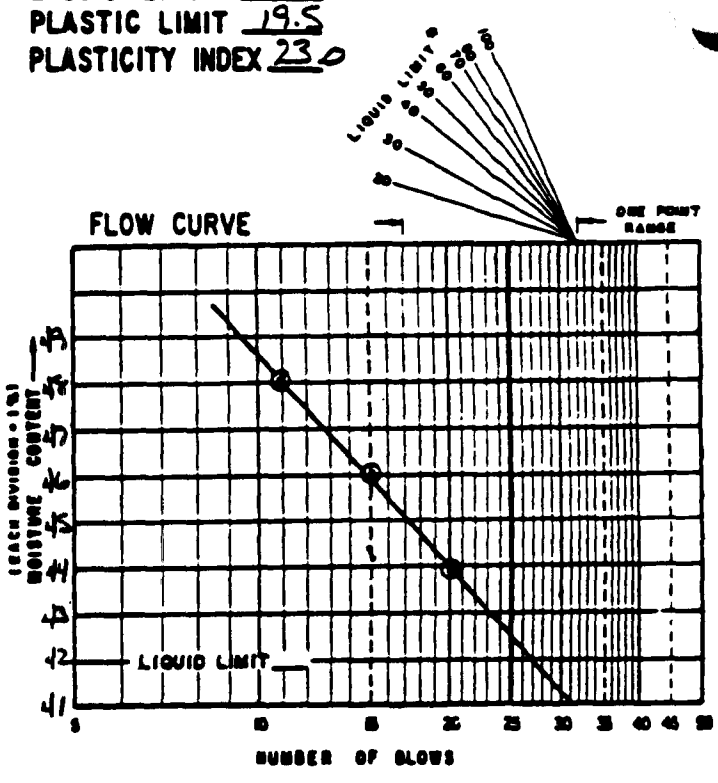
This line is 1/8" thick

PLASTICITY CHART



LIQUID LIMIT 42.5
PLASTIC LIMIT 19.5
PLASTICITY INDEX 23.0

FLOW CURVE



* USE THE APPROPRIATE SLOPE TO EXTRAPOLATE ONE-POINT LIQUID LIMIT TRIALS (BETWEEN 17 AND 30 BLOWS) TO THE 25-BLOW LINE.

WASH ANALYSIS (#200 SIEVE)

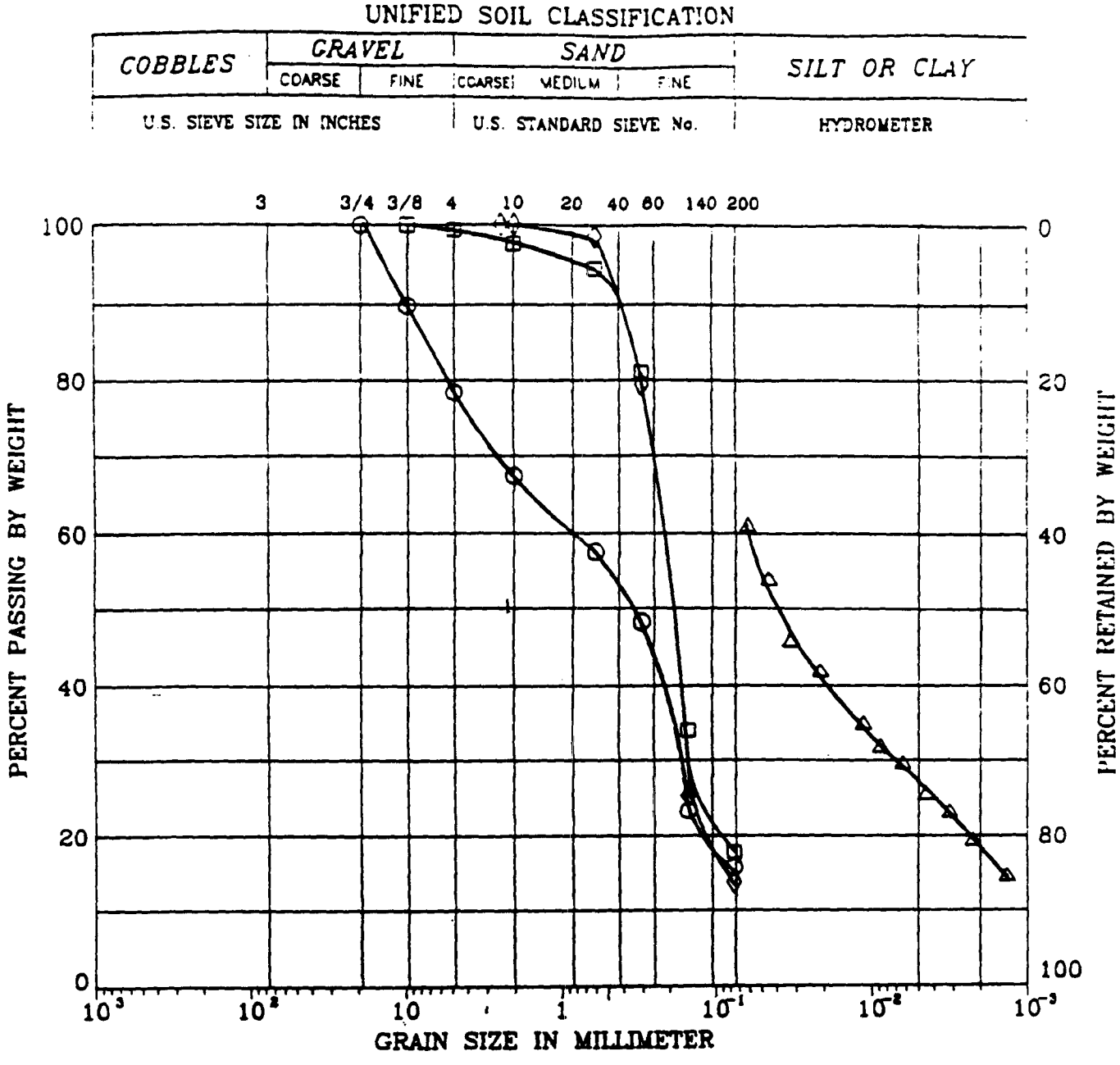
	BEFORE WASH	AFTER WASH
WT. OF DISH + OVEN-DRY SOIL		
WT. OF DISH NO. _____		
WT. OF OVEN-DRY SOIL		

% COARSE SOIL _____

SIEVE ANALYSIS

U.S. SIEVE NUMBER	CUMULATIVE WEIGHT RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING
3"			
3/4"			
#4			
#10			
#40			
#200			
PAN		100	0

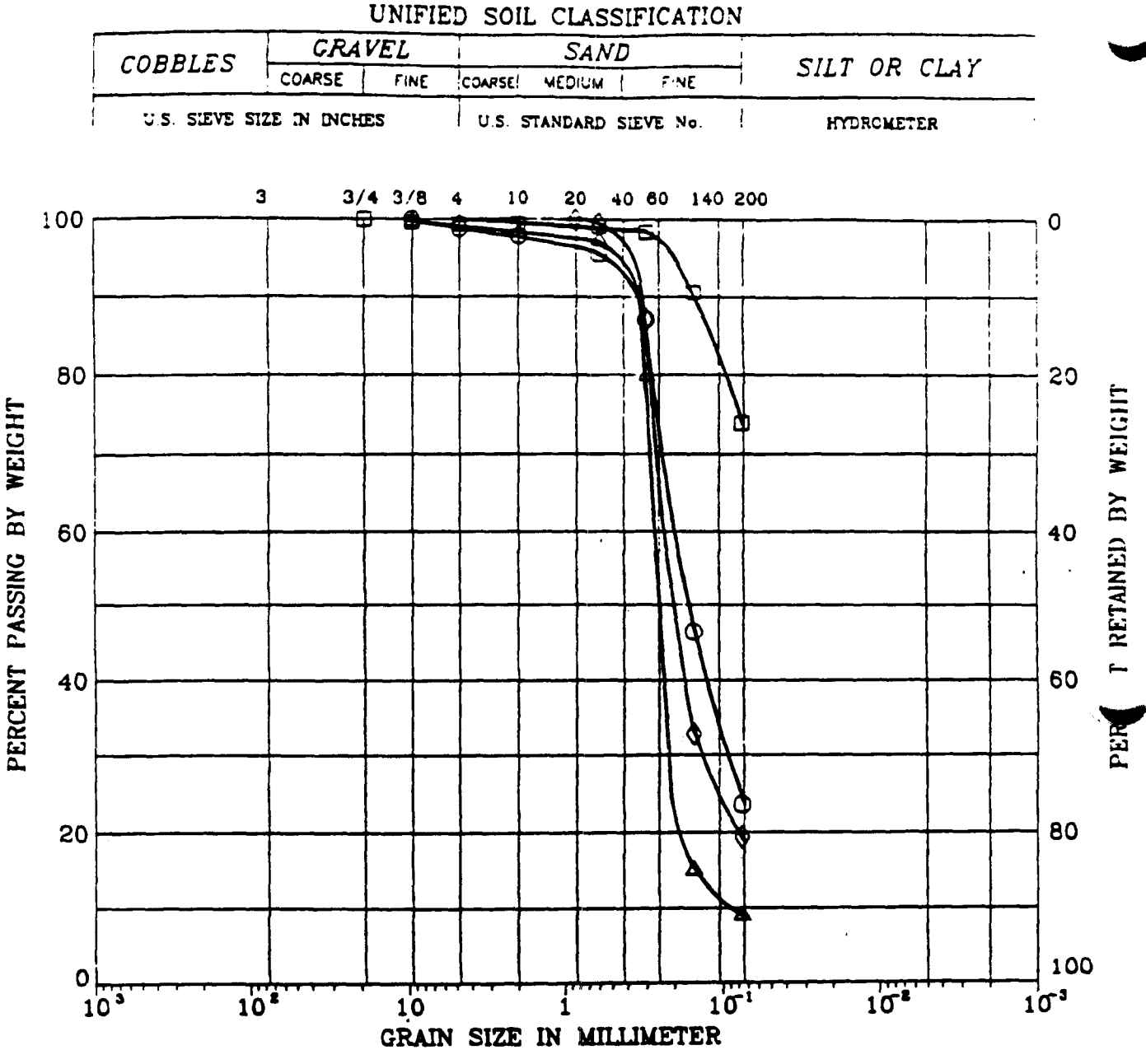
LAB 312-86



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	DA-1R	0-0.5			Brown silty sand w/gravel (SM)
□	DA-1R	.5-1.0			Brown silty fine sand (SM)
△	DA-1	26.5-27	41	20	Gray sandy clay w/shells (CL)
◇	DA-1	54-54.5			Brown silty fine to medium sand (SM)

Remark :

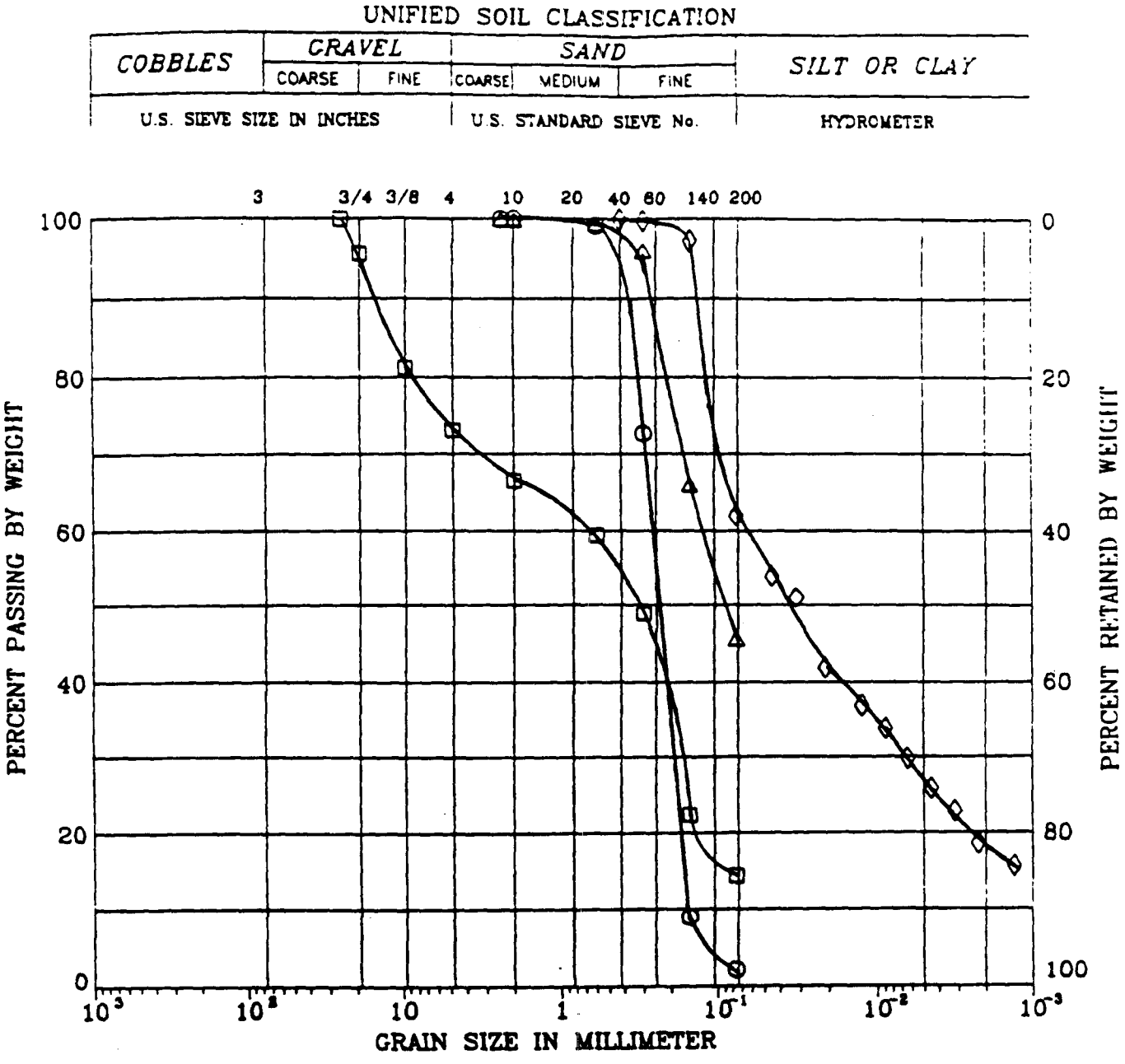
Project No.034-10	Canonie 86-018-1806
Cooper Testing Labs Mountain View CA	GRAIN SIZE DISTRIBUTION Figure No.1



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	DA-2R	0-0.5			Brown silty fine sand (SM)
□	DA-2	10-10.5	44	23	Gray sandy clay (CL)
△	DA-2	27-27.5			Gray sand w/silt (SP)
◇	DA-2	41-41.5			Brown silty sand (SM)

Remark :

Project No.034-10	Canonie 86-018-1806
Cooper Testing Labs Mountain View CA	GRAIN SIZE DISTRIBUTION Figure No.2



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	DA-2	80-80.5			Greenish brown fine sand (SP)
□	WB-1	0-0.5			Greenish brown silty sand w/gravel (SM)
△	WB-1	20.5-21			Gray clayey sand (SC)
◇	WB-1	36.5-37	33	15	Gray sandy clay (CL)

Remark :

Project No.034-10b	Canonie 86-018-1806
Cooper Testing Labs Mountain View CA	GRAIN SIZE DISTRIBUTION Figure No.3

CTL Cooper Testing Laboratory, Inc.
Independent Geotechnical Lab
1951 Colony, Unit X • Mountain View, CA 94043
(415) 968-94
Fax (415) 968-42

LETTER OF TRANSMITTAL

TO: Montgomery Watson
365 Lennon Lane
Walnut Creek, CA 94598
Attn: Shelly Hill

DATE: 13 DEC 94

PROJECT: 2738.1236/8.1

CTL#: 153-004

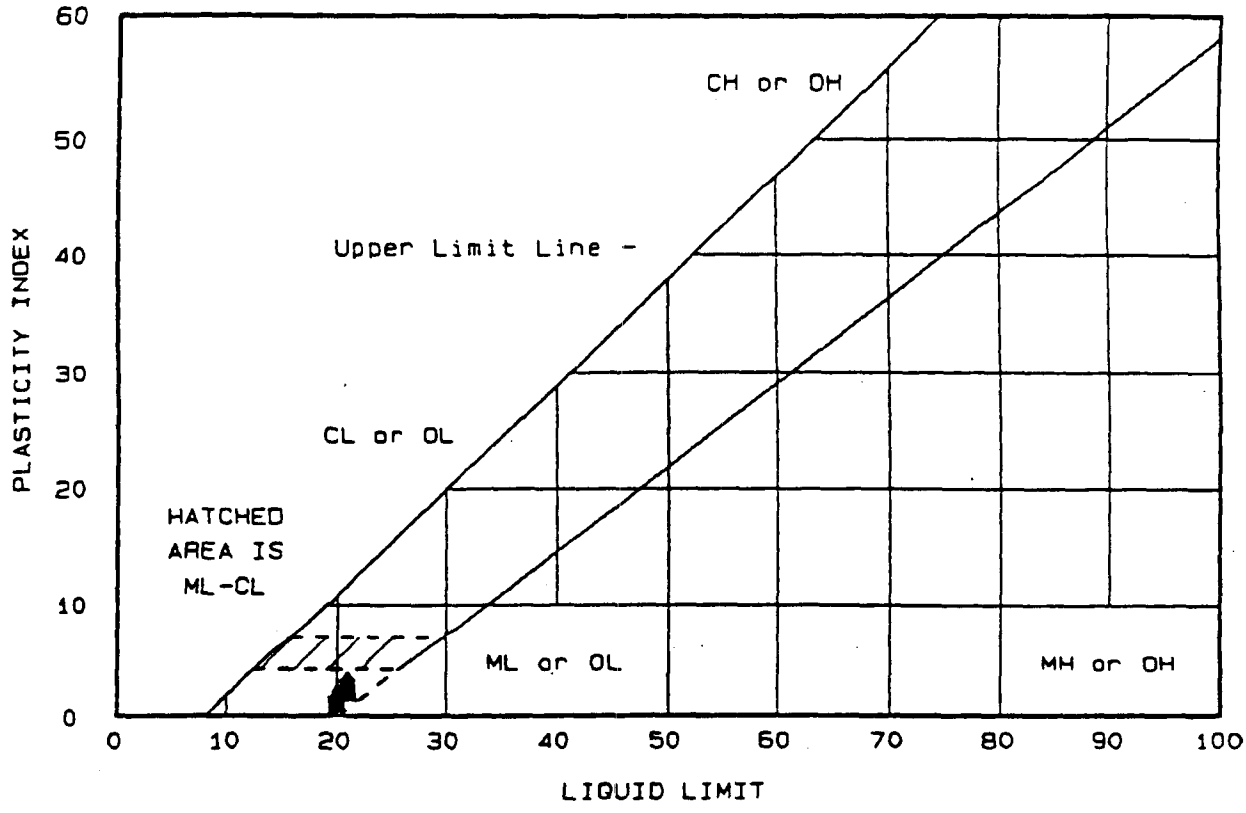
ENCLOSED: Laboratory soil test data.

REMARKS:

BY: David R. Cooper

David R. Cooper

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	M-016E @ 6.5-8' yellowish gray silty Sand	20	19	1		
▲	M-06-06 @ 3.5-5' grayish brown silty Sand	20	18	2		
■	M-016E @ 14.5-16 grayish brown silty Sand	21	19	2		
◆	M-116E @ 3.5-4.5' grayish brown silty Sand	21	18	3		
×	M030-E @ 14-15.5' grayish brown silty Sand	20	19	1		

Project No.: 153-04
Project: 2738.1405

Client: Montgomery-Watson
Location:

Date: 12/3/94

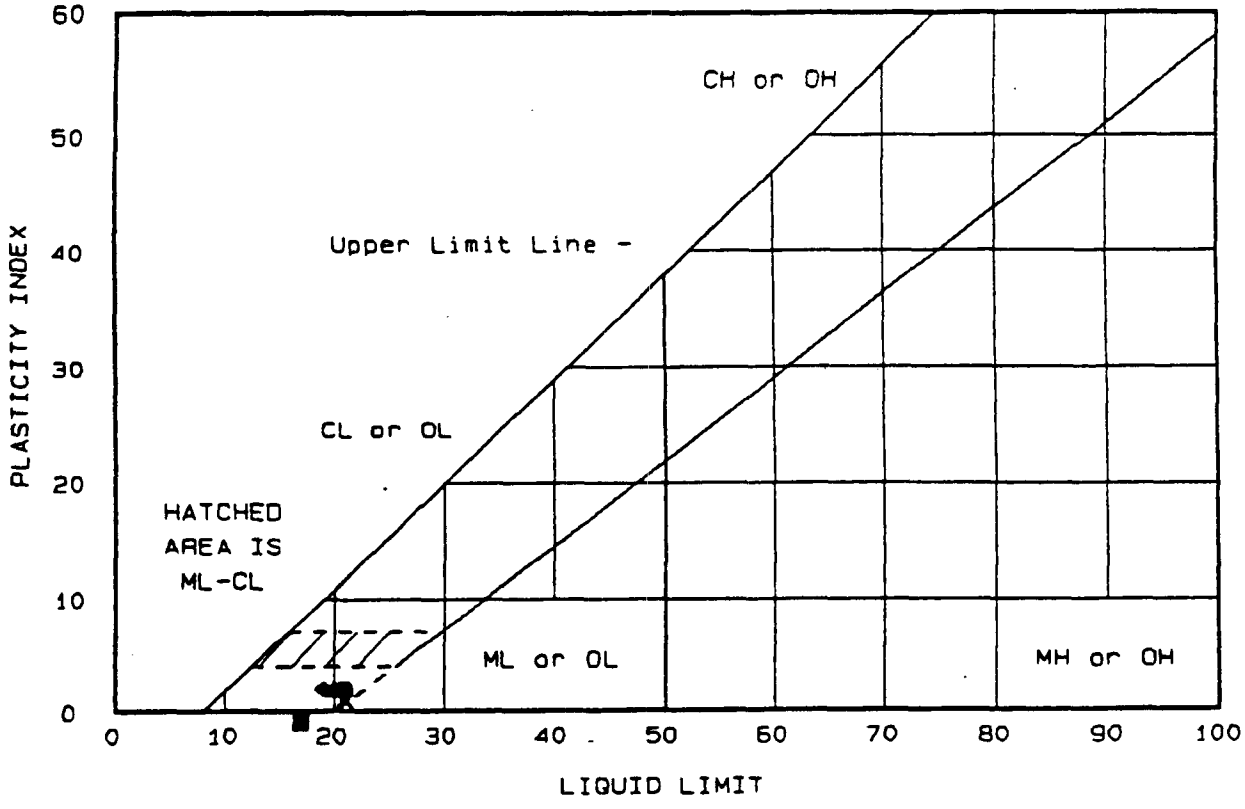
Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Fig. No. _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	M11-06 @ 3.5-5' brown Sand	21	19	2		
▲	M030-A @ 8.5-10' grayish brown silty Sand	20	18	2		
■	M030-A @ 4-6.5' grayish brown silty Sand	17	18	-1		
◆	M030-E @ 2.5-4' grayish brown clayey Sand	19	17	2		
✕	M112-A @ 10.5-12' grayish brown silty Sand	21	20	1		

Project No.: 153-04
Project: 2738.1403

Client: Montgomery-Watson
Location:

Date: 12/3/94

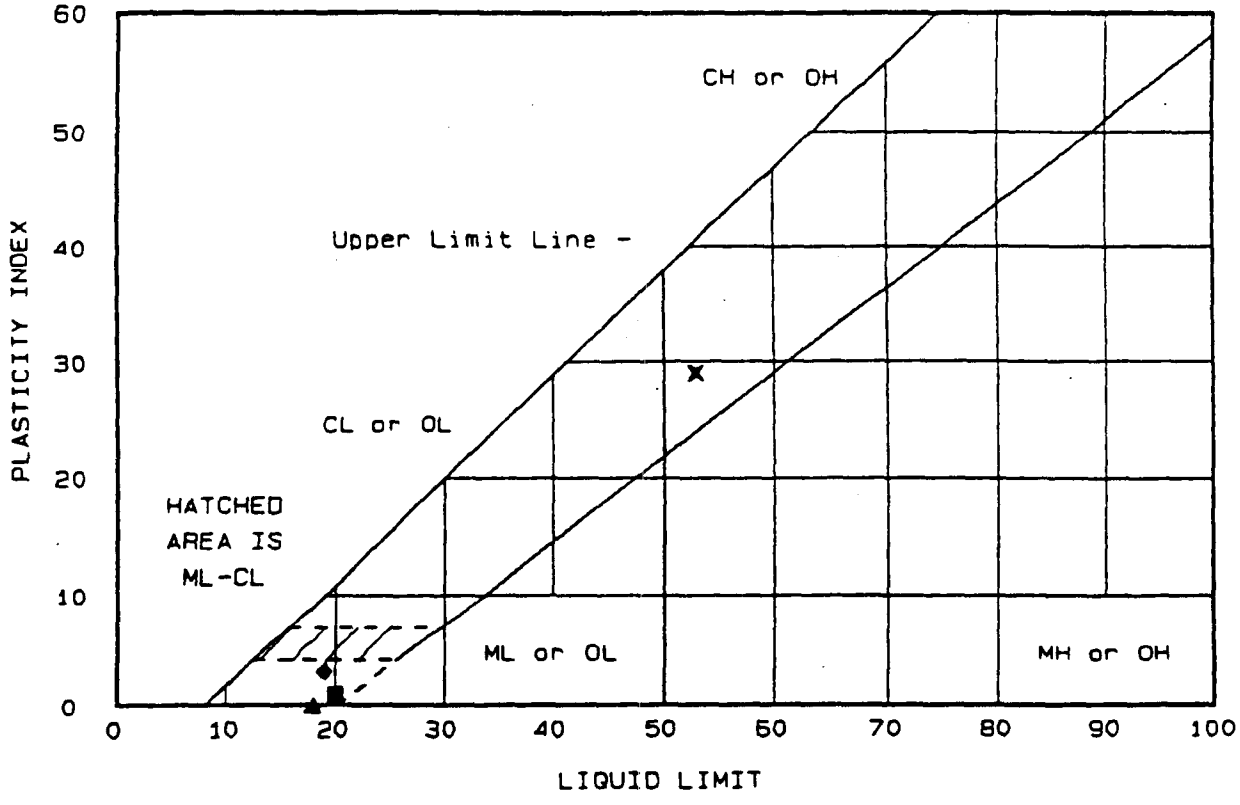
Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Fig. No. _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	M-7C-09 @ 10.5-12' brown silty Sand	20	19	1		
▲	M-003-E @ 11.5-13' grayish brown silty Sand	18	18	0		
■	M016B @ 6.5-8' grayish brown silty Sand	20	19	1		
◆	M003-B @ 3.5-5' grayish brown silty Sand	19	16	3		
×	M030-C @ 4.5-5' grayish brown sandy Clay	53	24	29		

Project No.: 153-04
Project: 2738.1405

Client: Montgomery Watson
Location:

Date: 12/1/94

Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Fig. No. _____

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

'roject No.: 153-04 Date: 12/3/94
:lient: Montgomery-Watson
'roject: 2738.1405

'roject location:

:emarks:

'igure Number:

TEST DATA - Test number 5

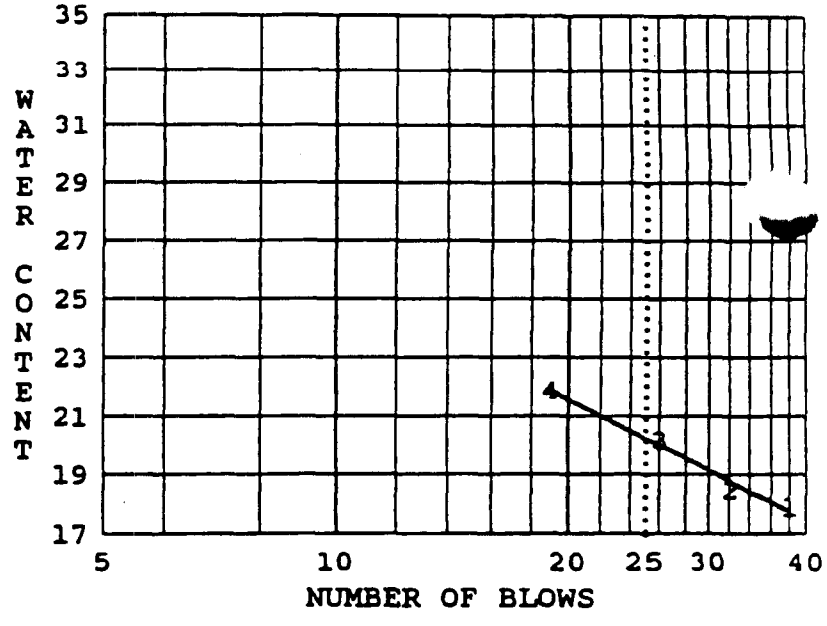
.ocation and description: M030-E @ 14-15.5'
grayish brown silty Sand

LIQUID LIMITS

:un No.	1	2	3	4
/T w+t	17.62	13.44	16.5	15.12
/T d+t	15.99	12.03	14.48	13.19
/T tare	6.86	4.42	4.48	4.37
: Blows	38	32	26	19
Moisture	17.9	18.5	20.2	21.9

PLASTIC LIMITS

Run No.	1	2	3
/T w+t	28.75	29.28	26.72
/T d+t	26.09	26.46	24.32
/T tare	11.83	11.42	11.65
Moisture	18.7	18.8	18.9



Liquid Limit = 20
Plastic Limit = 19
Plasticity Index = 1

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 20 PL = 19 PI = 1 LL (oven dry) =
ASTM =
AASHTO =

COOPER TESTING LABORATORY

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 153-04 Date: 12/3/94
Client: Montgomery-Watson
Project: 2738.1403

Project location:

Remarks:

Figure Number:

TEST DATA - Test number 4

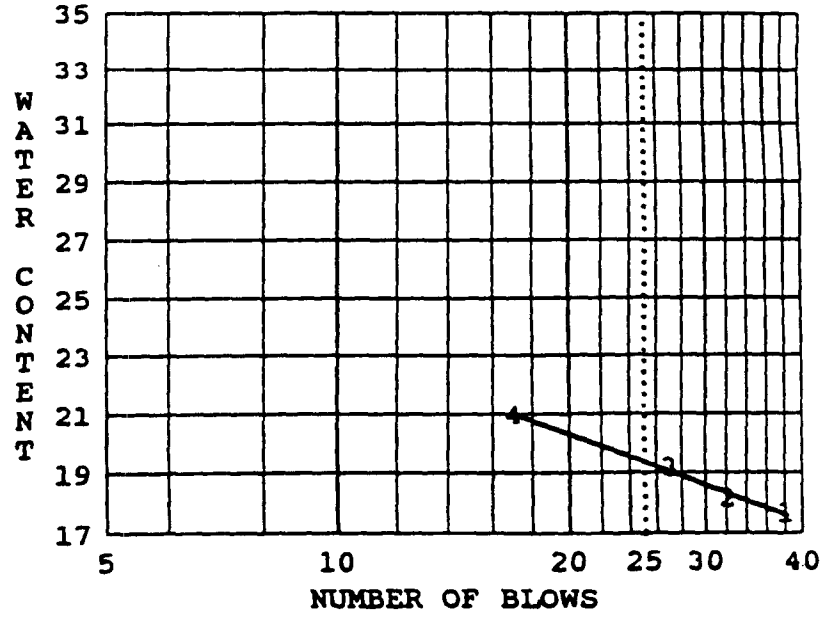
Location and description: M030-E @ 2.5-4'
grayish brown clayey Sand

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	14.21	14.12	15.53	14.86
WT d+t	12.75	12.63	14.1	13.03
WT tare	4.49	4.43	6.64	4.31
# Blows	38	32	27	17
Moisture	17.7	18.2	19.2	21.0

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	24.78	25.7	25.33
WT d+t	22.84	23.59	23.32
WT tare	11.15	11.46	11.73
Moisture	16.6	17.4	17.3



Liquid Limit = 19
Plastic Limit = 17
Plasticity Index = 2

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 19 PL = 17 PI = 2 LL (oven dry) =
ASTM =
AASHTO =

COOPER TESTING LABORATORY

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 153-04 Date: 12/3/94
Client: Montgomery-Watson
Project: 2738.1403

Project location:

Remarks:

Figure Number:

TEST DATA - Test number 3

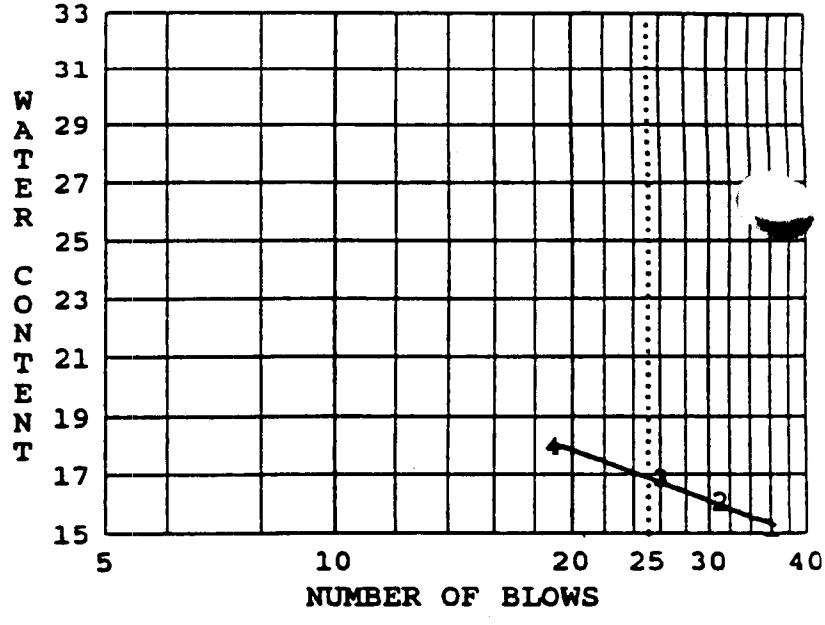
Location and description: M030-A @ 4-6.5'
grayish brown silty Sand

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	14.89	14.98	15.64	16.68
WT d+t	13.51	13.51	14	14.79
WT tare	4.42	4.37	4.32	4.27
# Blows	36	31	26	19
Moisture	15.2	16.1	16.9	18.0

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	26.67	25.4	28.22
WT d+t	24.28	23.41	25.78
WT tare	11.5	11.84	11.86
Moisture	18.7	17.2	17.5



Liquid Limit = 17
Plastic Limit = 18
Plasticity Index = -1

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 17 PL = 18 PI = None LL (oven dry) =
ASTM =
AASHTO =

COOPER TESTING LABORATORY

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 153-04 Date: 12/3/94
Client: Montgomery-Watson
Project: 2738.1403

Project location:

Remarks:

Figure Number:

TEST DATA - Test number 2

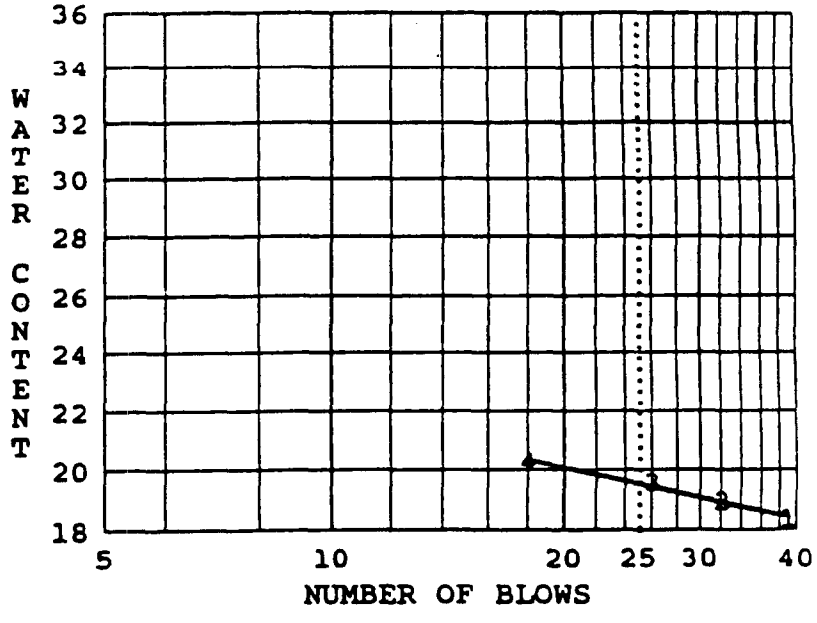
Location and description: M030-A @ 8.5-10'
grayish brown silty Sand

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	15.36	13.06	14.21	12.93
WT d+t	14.02	11.67	12.6	11.48
T tare	6.75	4.34	4.38	4.35
# Blows	39	32	26	18
Moisture	18.4	19.0	19.6	20.3

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	22.32	25.67	26.83
WT d+t	20.63	23.62	24.49
WT tare	11.43	11.73	11.76
Moisture	18.4	17.2	18.4



Liquid Limit = 20
Plastic Limit = 18
Plasticity Index = 2

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 20 PL = 18 PI = 2 LL (oven dry) =

ASTM =
AASHTO =

COOPER TESTING LABORATORY

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

'roject No.: 153-04 Date: 12/1/94
:lient: Montgomery Watson
'roject: 2738.1405

'roject location:

:emarks:

'igure Number:

TEST DATA - Test number 2

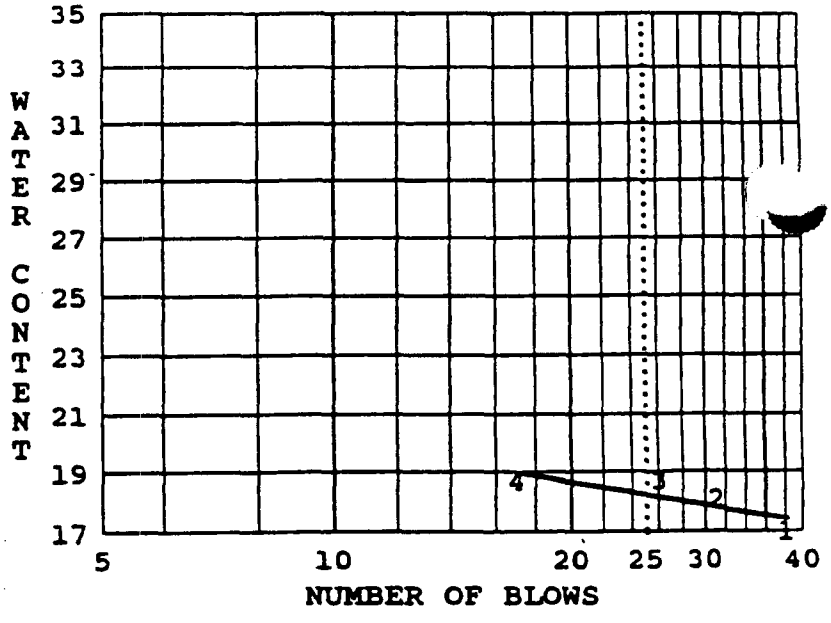
:ocation and description: M-003-E
grayish brown silty Sand

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	16.32	19.9	18.56	18.36
WT d+t	14.93	17.52	16.34	16.15
WT tare	6.76	4.38	4.47	4.35
# Blows	38	31	26	17
Moisture	17.0	18.1	18.7	18.7

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	24.82	26.61	26.81
WT d+t	22.77	24.3	24.5
WT tare	11.25	11.7	11.37
Moisture	17.8	18.3	17.6



Liquid Limit = 18
Plastic Limit = 18
Plasticity Index = 0

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 18 PL = 18 PI = None LL (oven dry) =

ASTM =
AASHTO =

COOPER TESTING LABORATORY

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 153-04 Date: 12/1/94
Client: Montgomery Watson
Project: 2738.1405

Project location:

Remarks:

Figure Number:

TEST DATA - Test number 5

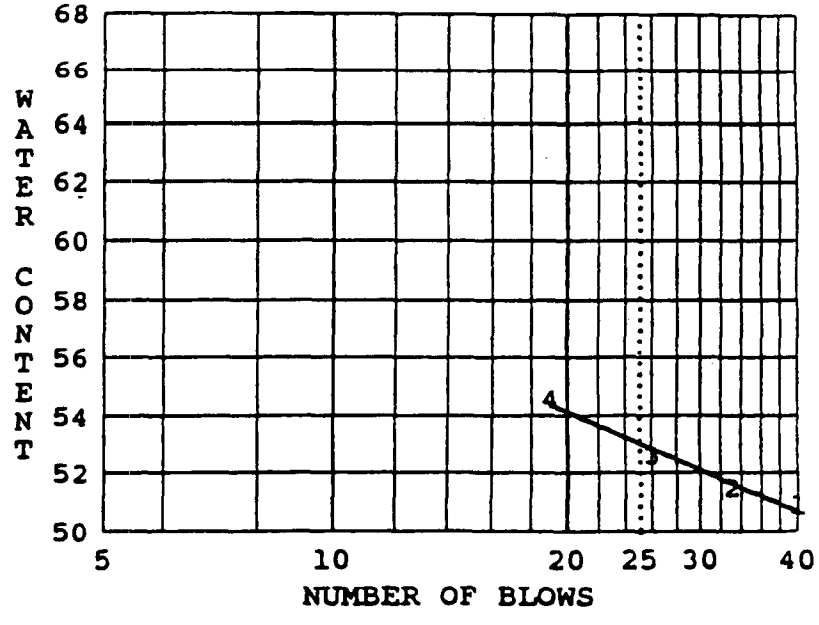
Location and description: M030-C @ 4.5-5'
grayish brown sandy Clay

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	12.47	9.76	10.83	11.19
WT d+t	10.54	7.91	8.64	8.78
WT tare	6.75	4.32	4.48	4.37
# Blows	40	33	26	19
Moisture	50.9	51.5	52.6	54.6

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	19.05	18.06	18.69
WT d+t	17.64	16.77	17.36
WT tare	11.83	11.45	11.82
Moisture	24.3	24.2	24.0



Liquid Limit = 53
Plastic Limit = 24
Plasticity Index = 29

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 53 PL = 24 PI = 29 LL (oven dry) =
ASTM =
AASHTO =

COOPER TESTING LABORATORY

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 153-04 Date: 12/1/94
Client: Montgomery Watson
Project: 2738.1405

Project location:

Remarks:

Figure Number:

TEST DATA - Test number 4

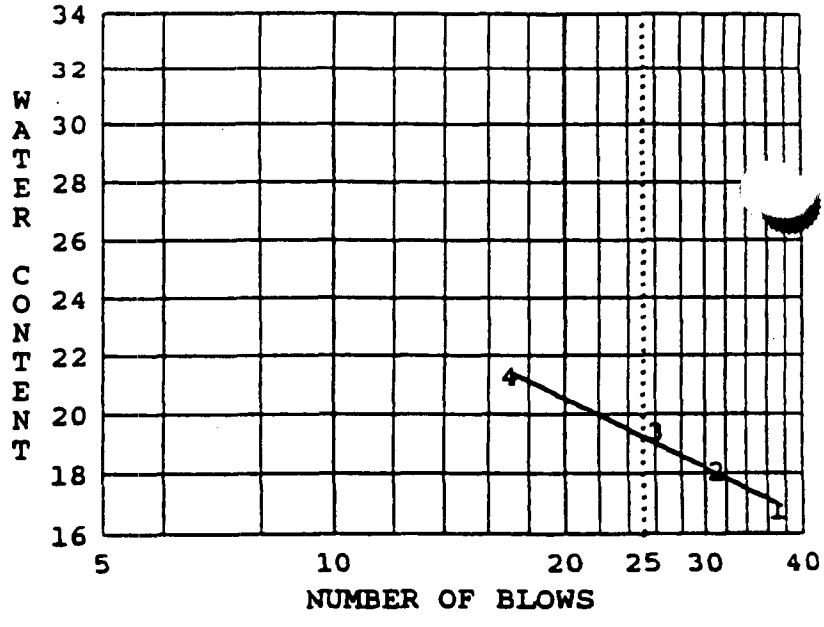
Location and description: M003-B @ 3.5-5'
grayish brown silty Sand

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	16.57	13.45	14.58	15.31
WT d+t	15.16	12.07	12.92	13.38
WT tare	6.79	4.45	4.36	4.3
# Blows	37	31	26	17
Moisture	16.8	18.1	19.4	21.3

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	26.42	29.49	28.18
WT d+t	24.35	27.02	25.79
WT tare	11.35	11.56	11.89
Moisture	15.9	16.0	17.2

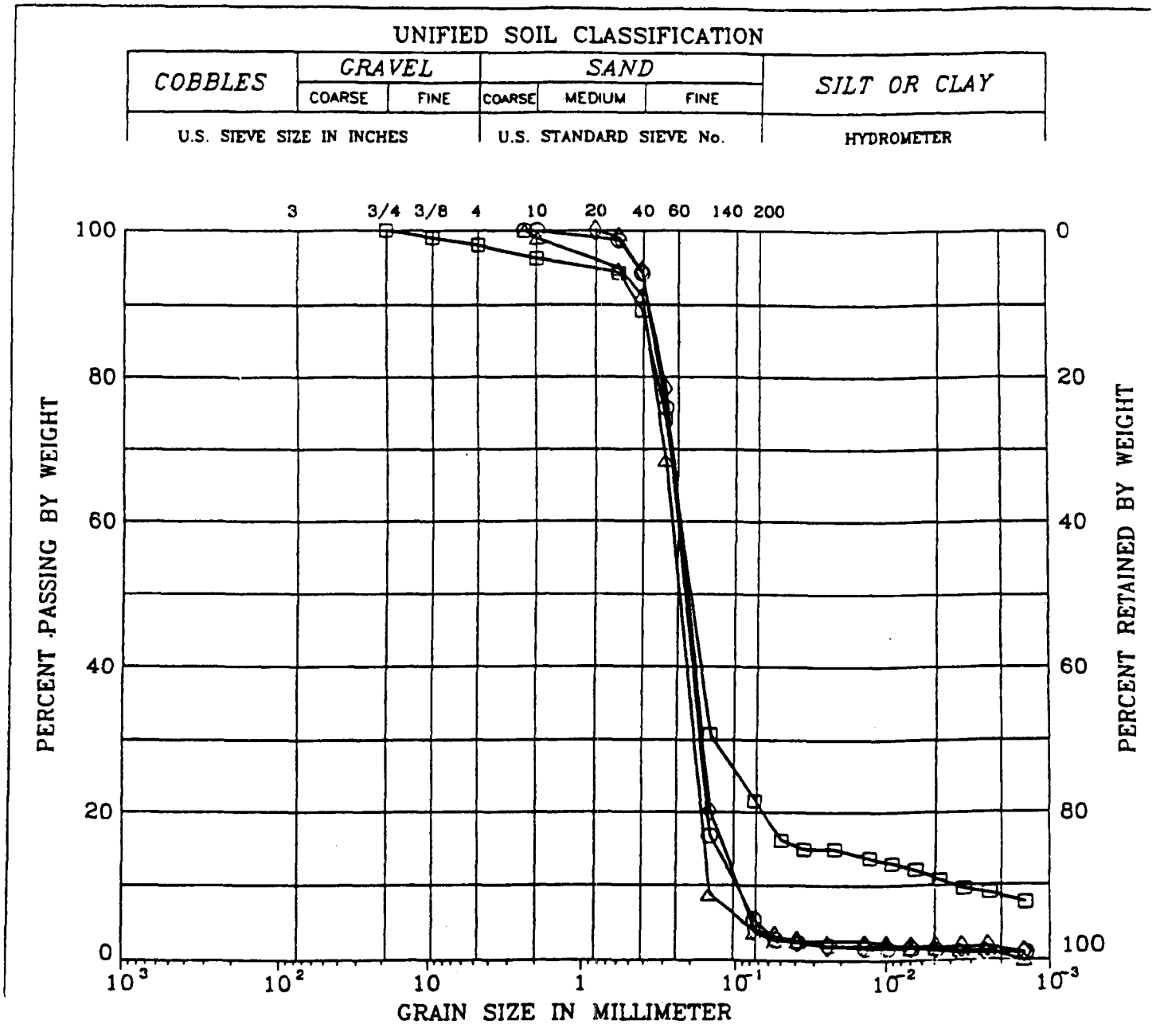


Liquid Limit = 19
Plastic Limit = 16
Plasticity Index = 3

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 19 PL = 16 PI = 3 LL (oven dry) =
ASTM =
AASHTO =

COOPER TESTING LABORATORY



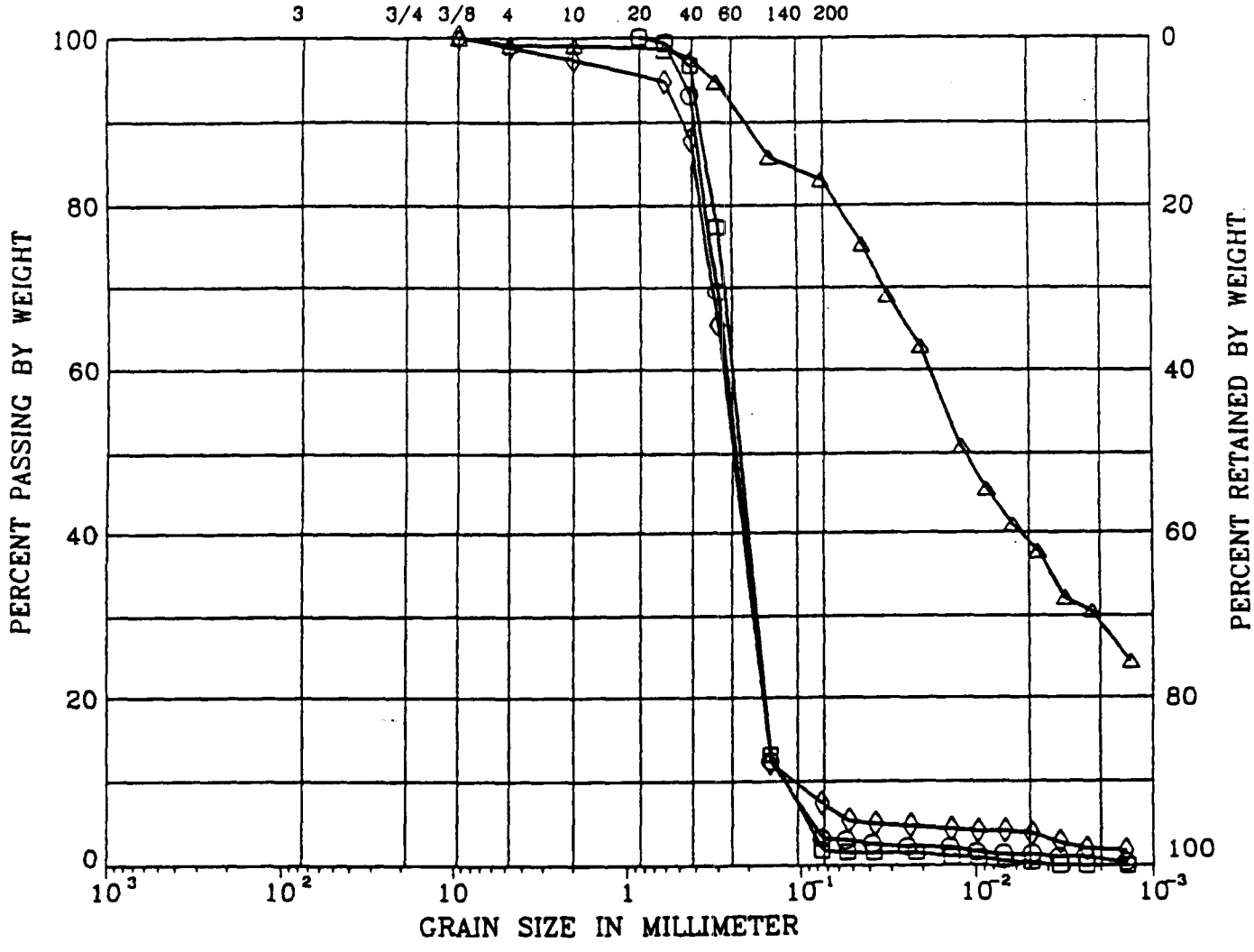
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	M-030-A	8.5-10	20	2	grayish brown Sand w/silt (SP-SM)
□	M-030-E	2.5-4	19	2	grayish brown silty Sand (SM)
△	M-030-E	14.15.5	20	1	grayish brown Sand (SP)
◇	M-11-06	3.5-5	21	2	brown Sand (SP)

Remark :

Project No.153-04d	Montgomery-Watson 2738.1405
Cooper Testing Labs ntain View CA	GRAIN SIZE DISTRIBUTION Figure No.

UNIFIED SOIL CLASSIFICATION

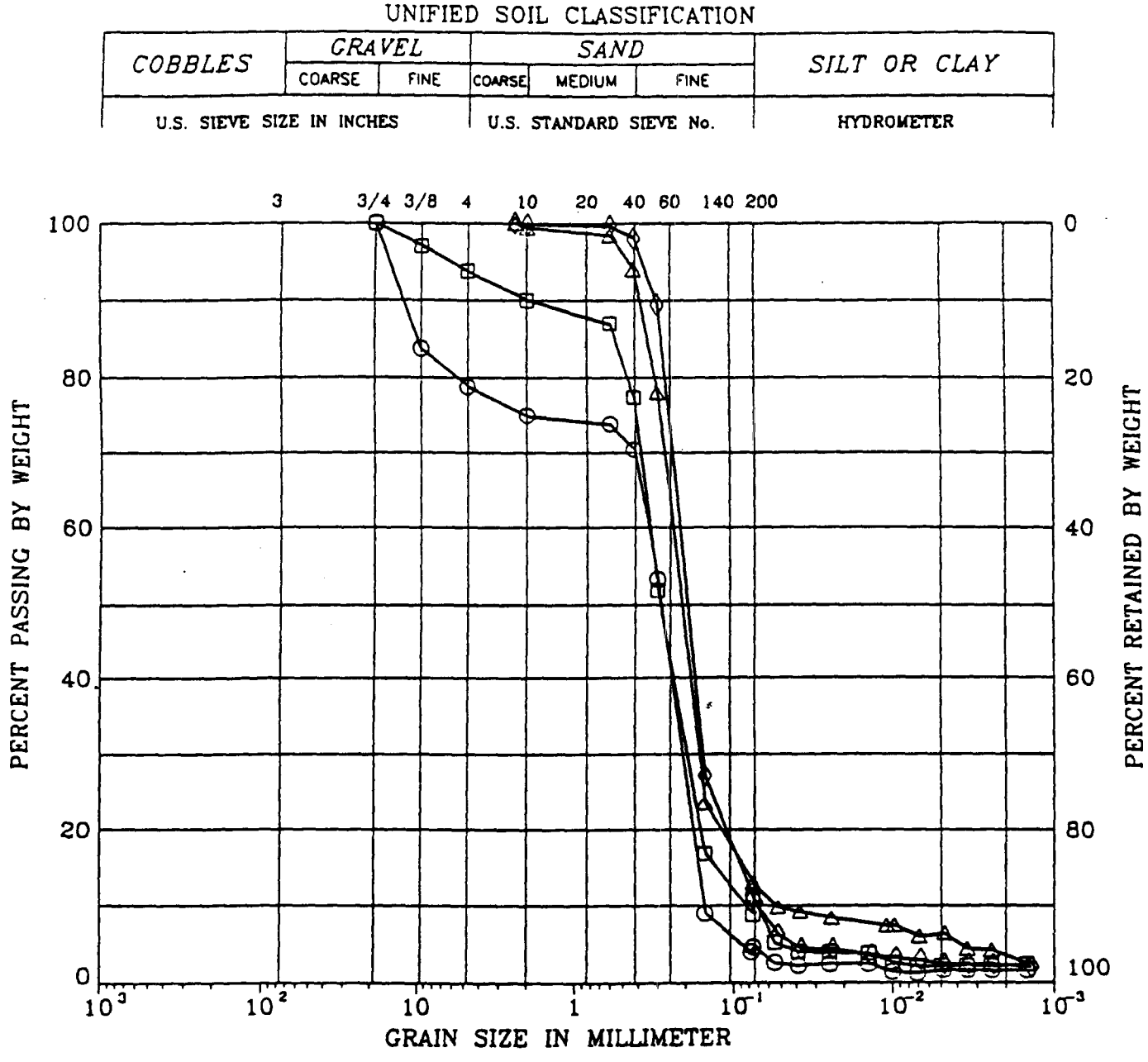
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	M-117-E	3.5-5	19		brown Sand (SP)
□	M-117-E	10-11.5	23	3	brown Sand (SP)
△	M-030-C	4-5.5	53	29	gray Clay w/sand (CH)
◇	M-030-A	4.5-6	17		grayish brown Sand w/silt (SP-SM)

Remark :

Project No.153-04c	Montgomery-Watson 2738.1405
Cooper Testing Labs Mountain View CA	GRAIN SIZE DISTRIBUTION Figure No.



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	M-003-B	3.5-5	19	3	grayish brown Sand (SP)
□	M-003-E	11.5-13	18	0	grayish brown Sand w/silt (SP-SM)
△	M-112-A	3.5-5	18	2	brown silty Sand (SM)
◇	M-112-A	10.5-12	21	1	grayish brown Sand w/silt (SP-SM)

Remark :

Project No.153-04	Montgomery-Watson 2738.1405
Cooper Testing Labs Mountain View CA	GRAIN SIZE DISTRIBUTION Figure No.

Cooper Testing Laboratories

Project No.153-04d

Montgomery-Watson 2738.1405

Figure No.

BORING	DEPTH	% COBBLES	% GRAVEL	% SAND	% FINE	% SILT	% CLAY	Cu	Cc
-030-A	8.5-10	0.00	0.00	94.58		3.98	1.44	2.5	1.2
-030-E	2.5-4	0.00	2.04	76.30		10.61	11.05	64.4	22.7
-030-E	14.15.5	0.00	0.00	96.12		2.21	1.66	1.8	0.9
-11-06	3.5-5	0.00	0.00	95.84		2.28	1.87	2.5	1.2

M-030-A 8.5-10		M-030-E 2.5-4		M-030-E 14.15.5		M-11-06 3.5-5	
Grain Size (mm)	% Finer	Grain Size (mm)	% Finer	Grain Size (mm)	% Finer	Grain Size (mm)	% Finer
.0014	0.99	0.0014	7.66	0.0015	0.00	0.0014	1.09
.0024	0.99	0.0023	8.93	0.0025	1.33	0.0024	1.87
0.0034	0.99	0.0033	9.57	0.0035	1.33	0.0034	1.87
0.0049	1.42	0.0047	10.85	0.0049	1.66	0.0048	1.87
0.0069	1.64	0.0066	12.12	0.0070	1.66	0.0070	1.87
0.0097	1.64	0.0093	13.08	0.0099	2.33	0.0100	2.02
0.0137	1.64	0.0131	13.72	0.0139	2.66	0.0141	2.02
0.0239	1.97	0.0225	14.99	0.0243	2.66	0.0244	2.02
0.0378	2.41	0.0356	14.99	0.0385	2.66	0.0385	2.64
0.0534	2.84	0.0501	16.27	0.0544	2.66	0.0544	3.28
0.0750	5.42	0.0750	21.66	0.0750	3.88	0.0750	4.16
0.1500	16.79	0.1500	30.71	0.1500	8.82	0.1500	20.29
0.3000	75.73	0.3000	74.15	0.3000	68.43	0.3000	78.36
0.4250	94.10	0.4250	89.19	0.4250	91.15	0.4250	94.31
0.6000	98.60	0.6000	94.28	0.6000	94.90	0.6000	99.05
2.0000	99.92	2.0000	96.19	2.0000	98.90	0.8500	100.00
2.3800	100.00	4.7500	97.96	2.3800	100.00		
		9.5250	98.93				
		19.0500	100.00				

Cooper Testing Laboratories

Project No.153-04c

Montgomery-Watson 2738.1405

Figure No.

BORING	DEPTH	% COBBLES	% GRAVEL	% SAND	% FINE	% SILT	% CLAY	Cu	Cc
-117-E	3.5-5	0.00	0.00	96.73		1.97	1.31	2.1	1.0
-117-E	10-11.5	0.00	0.00	98.15		1.51	0.34	2.0	1.1
-030-C	4-5.5	0.00	0.84	16.10		44.24	38.82		
-030-A	4.5-6	0.00	1.11	91.58		3.45	3.85	2.6	1.2

M-117-E 3.5-5		M-117-E 10-11.5		M-030-C 4-5.5		M-030-A 4.5-6	
Grain Size (mm)	% Finer	Grain Size (mm)	% Finer	Grain Size (mm)	% Finer	Grain Size (mm)	% Finer
0014	0.33	0.0014	0.00	0.0014	24.37	0.0015	1.77
.0025	1.08	0.0024	0.00	0.0022	30.56	0.0024	2.06
0.0035	1.08	0.0034	0.00	0.0032	32.15	0.0034	2.75
0.0049	1.31	0.0049	0.33	0.0045	37.86	0.0048	3.83
0.0070	1.31	0.0069	0.54	0.0062	40.97	0.0068	4.13
0.0099	1.63	0.0098	0.99	0.0087	45.80	0.0097	4.13
0.0140	2.28	0.0139	1.09	0.0122	50.82	0.0137	4.42
0.0244	2.28	0.0220	1.53	0.0203	62.75	0.0237	4.72
0.0386	2.61	0.0380	1.53	0.0314	68.97	0.0374	5.01
0.0545	3.04	0.0538	1.53	0.0432	75.19	0.0528	5.30
0.0750	3.27	0.0750	1.85	0.0750	83.06	0.0750	7.30
0.1500	12.30	0.1500	13.19	0.1500	85.73	0.1500	12.24
0.3000	69.37	0.3000	77.31	0.3000	94.79	0.3000	65.32
0.4250	93.19	0.4250	96.70	0.4250	97.67	0.4250	87.87
0.6000	99.35	0.6000	99.34	0.6000	98.70	0.6000	94.80
0.8500	100.00	0.8500	100.00	2.0000	99.11	2.0000	97.50
				4.7500	99.16	4.7500	98.89
				9.5250	100.00	9.5250	100.00

Cooper Testing Laboratories

Project No.153-04

Montgomery-Watson 2738.1405

Figure No.

BORING	DEPTH	% COBBLES	% GRAVEL	% SAND	% FINE	% SILT	% CLAY	Cu	Cc
-003-B	3.5-5	0.00	21.10	74.21		3.01	1.67	2.3	0.8
-003-E	11.5-13	0.00	6.30	82.63		8.93	2.15	4.7	1.6
-112-A	3.5-5	0.00	0.00	86.99		6.69	6.31	4.4	2.1
-112-A	10.5-12	0.00	0.00	89.00		8.57	2.42	3.1	1.6

M-003-B 3.5-5		M-003-E 11.5-13		M-112-A 3.5-5		M-112-A 10.5-12	
Grain Size (mm)	% Finer	Grain Size (mm)	% Finer	Grain Size (mm)	% Finer	Grain Size (mm)	% Finer
0.0015	1.61	0.0015	2.42	0.0014	2.47	0.0014	2.06
0.0024	1.61	0.0024	2.15	0.0024	4.23	0.0024	2.36
0.0035	1.61	0.0035	2.23	0.0034	4.46	0.0034	2.36
0.0049	1.68	0.0050	2.15	0.0048	6.34	0.0048	2.36
0.0071	1.22	0.0071	2.15	0.0069	5.99	0.0068	2.95
0.0101	1.38	0.0101	2.68	0.0097	7.40	0.0096	3.24
0.0142	2.45	0.0142	3.76	0.0111	7.40	0.0136	3.63
0.0245	2.45	0.0245	3.93	0.0239	8.46	0.0234	4.42
0.0392	2.22	0.0391	4.03	0.0376	9.16	0.0370	4.42
0.0553	2.53	0.0550	5.10	0.0530	9.87	0.0519	6.19
0.0750	4.68	0.0750	11.08	0.0741	12.69	0.0720	10.32
0.0775	3.91	0.0762	8.86	0.0750	13.01	0.0750	11.00
0.1500	8.99	0.1500	16.83	0.1500	23.61	0.1500	27.11
0.3000	53.27	0.3000	51.86	0.3000	77.91	0.3000	89.32
0.4250	70.42	0.4250	77.32	0.4250	94.03	0.4250	98.09
0.6000	73.72	0.6000	86.90	0.6000	98.41	0.6000	99.63
2.0000	74.91	2.0000	90.10	2.0000	99.40	2.0000	99.86
4.7500	78.90	4.7500	93.70	2.3800	100.00	2.3800	100.00
9.5250	83.78	9.5250	97.08				
19.0500	100.00	19.0500	100.00				

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Cooper Testing Labs, Inc. 1951-X Colony Street Mountain View, CA 94043	Client Proj. ID: Montgomery Watson 2738.1405 Lab Proj. ID: 9411G88	Sampled: 08/15/94 Received: 11/28/94 Analyzed: see below
Attention: Dave Cooper		Reported: 12/09/94

LABORATORY ANALYSIS

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9411G88-01 Sample Desc : SOLID,M-003-B 3.5-5'				
Cation Exchange Capacity	meq/Kg	12/01/94	0.50	41
Lab No: 9411G88-02 Sample Desc : SOLID,M-003-E 11.5-13'				
Cation Exchange Capacity	meq/Kg	12/01/94	0.50	27

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Suzanne Chin
Project Manager

Sequoia Analytical

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8319 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Cooper Testing Labs, Inc. 1951-X Colony Street Mountain View, CA 94043	Client Proj. ID: Montgomery Watson 2738.1405 Lab Proj. ID: 9411G88	Sampled: 08/15/94 Received: 11/28/94 Analyzed: see below
Attention: Dave Cooper		Reported: 12/09/94

LABORATORY ANALYSIS

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9411G88-15 Sample Desc : SOLID,M-030-C 4-5.5'				
Cation Exchange Capacity	meq/Kg	12/06/94	0.50	48
Lab No: 9411G88-16 Sample Desc : SOLID,M-030-A 8.5-10'				
Cation Exchange Capacity	meq/Kg	12/06/94	0.50	46
Lab No: 9411G88-17 Sample Desc : SOLID,M-030-E 2.5-4.0'				
Cation Exchange Capacity	meq/Kg	12/06/94	0.50	120
Lab No: 9411G88-18 Sample Desc : SOLID,M-030-E 14-15.5'				
Cation Exchange Capacity	meq/Kg	12/06/94	0.50	23

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Suzanne Chin
Project Manager

Sequoia Analytical

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1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Cooper Testing Labs, Inc. 1951-X Colony Street Mountain View, CA 94043	Client Proj. ID: Montgomery Watson 2738.1405 Lab Proj. ID: 9411G88	Sampled: 08/15/94 Received: 11/28/94 Analyzed: see below
Attention: Dave Cooper		Reported: 12/09/94

LABORATORY ANALYSIS

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9411G88-23 Sample Desc : SOLID,M-030-A 4.5-6'				
Cation Exchange Capacity	meq/Kg	12/06/94	0.50	38

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Suzanne Chin
Project Manager

Constant Head Permeability
ASTM D 2434
Cooper Testing Lab, Inc.

Job No:	153-04a	Boring:		Date:	11/29/94
Client:	Montgomery-Watson	Sample:	M-003-E	By:	DC
Project:	2738.1405	Depth:	11.5-13'		
Soil:	grayish brown silty Sand				

Hydraulic Gradient: 2.5

Elapsed Time (min)	Head (in.)	Permeability cm/sec
0	5	Start of Test
1		2.7 X 10E-3
2		3.0 X 10E-3
5		2.9 X 10E-3
6		2.9 X 10E-3
7		2.8 X 10E-3
9		2.8 X 10E-3

Average Permeability: 3 X 10E-3

Sample Data:	Initial	Final
Height, in.:	2.00	2.00
Diameter, in.:	1.93	1.93
Area, in2:	2.93	2.93
Volume, in3:	5.85	5.85
Total Volume, cc:	95.88	95.88
Vol. of Solids, cc:	59.73	59.73
Vol. of Voids, cc:	36.15	36.15
Void Ratio:	0.61	0.61
Porosity, %:	37.70	37.70
Saturation, %	83.83	91.02
Sp. Gravity:	2.64	2.64
Wet Weight:	188.0	190.6
Dry Weight:	157.7	157.7
Tare:	0.00	0.00
Moisture, %:	19.2	20.9
Density, pcf:	102.6	102.6

Constant Head Permeability
ASTM D 2434
Cooper Testing Lab, Inc.

Job No:	153-04c	Boring:		Date:	11/29/94
Client:	Montgomery-Watson	Sample:	M-003-B	By:	DC
Project:	2738.1405	Depth:	3.5-5'		
Soil:	grayish brown silty Sand				

Hydraulic Gradient: 1.5

Elapsed Time (min)	Head (in.)	Permeability cm/sec
0	3	Start of Test
4		6.5 X 10E-3
6		6.4 X 10E-3
7		6.4 X 10E-3
8		6.3 X 10E-3
0	3	
2		6.9 X 10E-3
4		6.5 X 10E-3

Average Permeability: 7 X 10E-3

Sample Data:	Initial	Final
Height, in.:	2.00	1.95
Diameter, in.:	1.93	1.93
Area, in2:	2.93	2.93
Volume, in3:	5.85	5.70
Total Volume, cc:	95.88	93.48
Vol. of Solids, cc:	51.65	51.65
Vol. of Voids, cc:	44.23	41.83
Void Ratio:	0.86	0.81
Porosity, %:	46.13	44.75
Saturation, %	14.24	75.78
Sp. Gravity:	2.66	2.66
Wet Weight:	143.7	169.1
Dry Weight:	137.4	137.4
Tare:	0.00	0.00
Moisture, %:	4.6	23.1
Density, pcf:	89.4	91.7

Falling Head Permeability
ASTM D 5084
Cooper Testing Lab, Inc.

Job No:	153-04m	Boring:		Date:	12/2/94
Client:	Montgomery-Watson	Sample:	M030-E	By:	DC
Project:	2738.1405	Depth:	2.5-4'		
Soil:	grayish brown clayey Sand				

Sample Pressures:

Cell: 50 psi Bot. Cap: 47 psi Top Cap: 46 psi Hydraulic Gradient: 5

Elapsed Time (min)	Head	Permeability cm/sec
0	28.0	Start of Test
3	20.0	2.6 X 10E-4
9	10.5	2.5 X 10E-4
15	5.7	2.4 X 10E-4
0	28.0	
5	16.2	2.5 X 10E-4
17	4.8	2.4 X 10E-4

Average Permeability: 2 X 10E-4 cm/sec

Sample Data:	Initial	Final
Height, in.:	2.00	1.94
Diameter, in.:	1.93	1.93
Area, in2:	2.93	2.93
Volume, in3:	5.85	5.68
Total Volume, cc:	95.88	93.00
Vol. of Solids, cc:	61.24	61.24
Vol. of Voids, cc:	34.65	31.77
Void Ratio:	0.57	0.52
Porosity, %:	36.13	34.16
Saturation, %	70.43	100.10
Sp. Gravity:	2.67	2.67
Wet Weight:	187.9	195.3
Dry Weight:	163.5	163.5
Tare:	0.00	0.00
Moisture, %:	14.9	19.4
Dry Density, pcf:	106.4	109.7

Falling Head Permeability
ASTM D 5084
Cooper Testing Lab, Inc.

Job No:	153-04j	Boring:		Date:	12/2/94
Client:	Montgomery-Watson	Sample:	M-030-C	By:	DC
Project:	2738.1405	Depth:	4-4.5'		
Soil:	grayish brown sandy Clay				

Sample Pressures:

Cell: 70 psi Bot. Cap: 67 psi Top Cap: 64 psi Hydraulic Gradient: 24

Elapsed Time (min)	Head	Permeability cm/sec
0	251.0	Start of Test
66	250.4	1.2 X 10E-7
255	248.9	1.1 X 10E-7
350	248.2	1.0 X 10E-7
1197	241.4	1.2 X 10E-7

Average Permeability: 1 X 10E-7 cm/sec

Sample Data:	Initial	Final
Height, in.:	4.08	3.87
Diameter, in.:	1.93	1.89
Area, in2:	2.93	2.81
Volume, in3:	11.94	10.87
Total Volume, cc:	195.60	178.10
Vol. of Solids, cc:	76.89	76.89
Vol. of Voids, cc:	118.70	101.21
Void Ratio:	1.54	1.32
Porosity, %:	60.69	56.83
Saturation, %	83.74	99.50
Sp. Gravity:	2.64	2.64
Wet Weight:	302.4	303.7
Dry Weight:	203.0	203.0
Tare:	0.00	0.00
Moisture, %:	49.0	49.6
Dry Density, pcf:	64.8	71.1

Constant Head Permeability
ASTM D 2434
Cooper Testing Lab, Inc.

Job No:	153-04n	Boring:		Date:	12/2/94
Client:	Montgomery-Watson	Sample:	M-030-E	By:	DC
Project:	2738.1405	Depth:	14-15.5'		
Soil:	grayish brown silty Sand				

Hydraulic Gradient: 2.5

Elapsed Time (min)	Head (in.)	Permeability cm/sec
0	5	Start of Test
2		1.1 X 10E-3
3		1.1 X 10E-3
4		1.1 X 10E-3
5		1.2 X 10E-3

Average Permeability: 1 X 10E-3

Sample Data:	Initial	Final
Height, in.:	2.00	2.00
Diameter, in.:	1.93	1.93
Area, in2:	2.93	2.93
Volume, in3:	5.85	5.85
Total Volume, cc:	95.88	95.88
Vol. of Solids, cc:	60.56	60.56
Vol. of Voids, cc:	35.32	35.32
Void Ratio:	0.58	0.58
Porosity, %:	36.84	36.84
Saturation, %	86.07	96.26
Sp. Gravity:	2.67	2.67
Wet Weight:	192.1	195.7
Dry Weight:	161.7	161.7
Tare:	0.00	0.00
Moisture, %:	18.8	21.0
Density, pcf:	105.2	105.2

Constant Head Permeability
ASTM D 2434
Cooper Testing Lab, Inc.

Job No:	153-04g	Boring:		Date:	12/1/94
Client:	Montgomery-Watson	Sample:	M030-A	By:	DC
Project:	2738.1405	Depth:	8.5-10'		
Soil:	grayish brown silty Sand				

Hydraulic Gradient: 2.5

Elapsed Time (min)	Head (in.)	Permeability cm/sec
0	5	Start of Test
2		1.0 X 10E-3
3		1.0 X 10E-3
4		1.0 X 10E-3
5		1.1 X 10E-3
6		1.2 X 10E-3
7		1.1 X 10E-3

Average Permeability: 1 X 10E-3

Sample Data:	Initial	Final
Height, in.:	2.00	2.00
Diameter, in.:	1.93	1.93
Area, in2:	2.93	2.93
Volume, in3:	5.85	5.85
Total Volume, cc:	95.88	95.88
Vol. of Solids, cc:	58.11	58.11
Vol. of Voids, cc:	37.77	37.77
Void Ratio:	0.65	0.65
Porosity, %:	39.39	39.39
Saturation, %	83.13	89.75
Sp. Gravity:	2.70	2.70
Wet Weight:	188.3	190.8
Dry Weight:	156.9	156.9
Tare:	0.00	0.00
Moisture, %:	20.0	21.6
Density, pcf:	102.1	102.1

Constant Head Permeability
ASTM D 2434
Cooper Testing Lab, Inc.

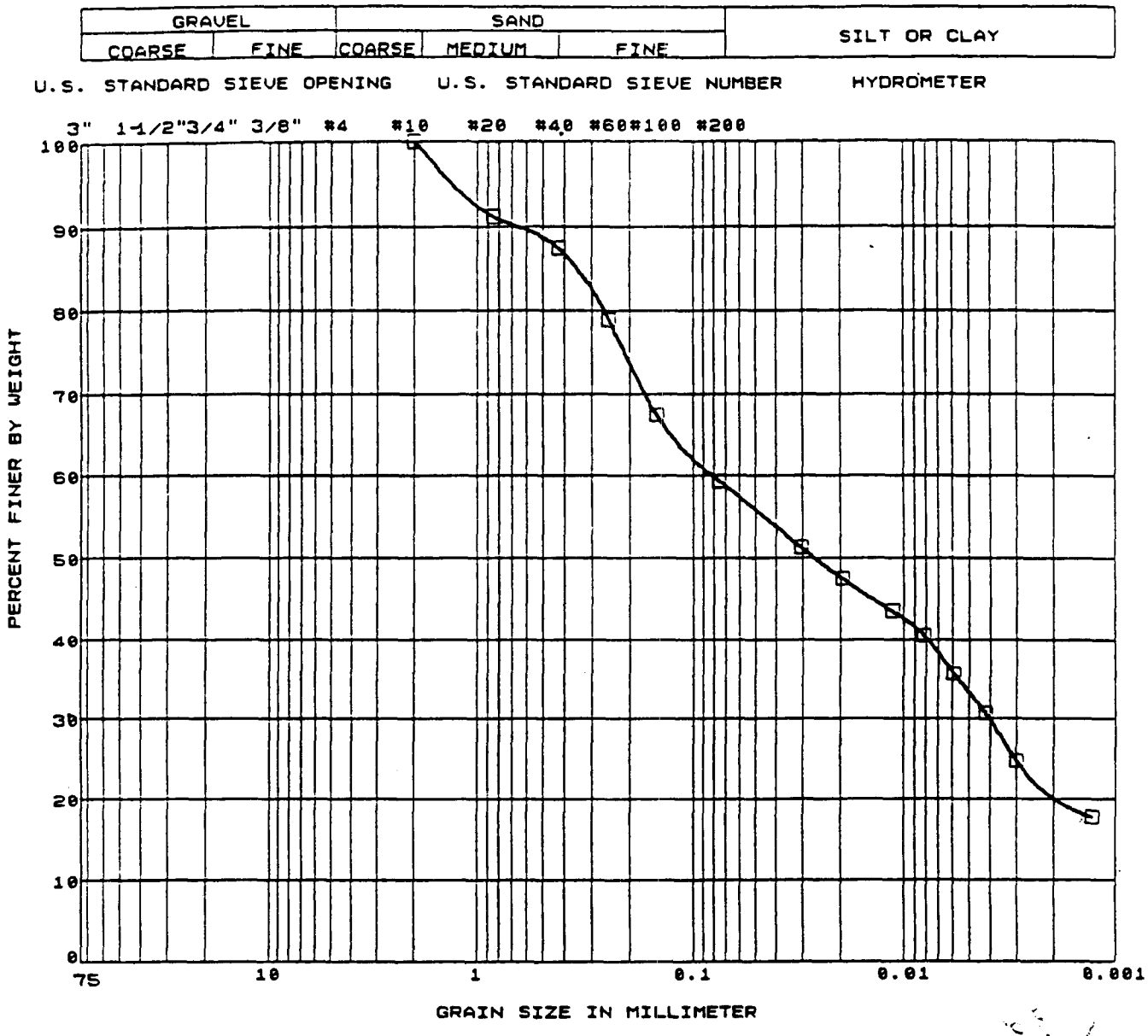
Job No:	153-04i	Boring:		Date:	12/2/94
Client:	Montgomery-Watson	Sample:	M-030-A	By:	DC
Project:	2738.1405	Depth:	4.5-6.0'		
Soil:	grayish brown silty Sand				

Hydraulic Gradient: 2.5

Elapsed Time (min)	Head (in.)	Permeability cm/sec
0	5	Start of Test
1		3.6 X 10E-3
2		3.7 X 10E-3
3		3.7 X 10E-3
4		3.6 X 10E-3
5		3.7 X 10E-3
6		3.6 X 10E-3

Average Permeability: 4 X 10E-3

Sample Data:	Initial	Final
Height, in.:	2.00	2.00
Diameter, in.:	1.93	1.93
Area, in2:	2.93	2.93
Volume, in3:	5.85	5.85
Total Volume, cc:	95.88	95.88
Vol. of Solids, cc:	61.32	61.32
Vol. of Voids, cc:	34.57	34.57
Void Ratio:	0.56	0.56
Porosity, %:	36.05	36.05
Saturation, %	86.50	90.84
Sp. Gravity:	2.66	2.66
Wet Weight:	193.0	194.5
Dry Weight:	163.1	163.1
Tare:	0.00	0.00
Moisture, %:	18.3	19.3
Density, pcf:	106.1	106.1



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-002E	20.5-21	TUBE			

The Earth Technology Corporation

PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 29

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NAME: NAS-Alameda

TETC NO: 92-220-7003

PROJECT NUMBER: 2738.0215

CLIENT: James M. Montgomery

DATE: Sept. 27, 1991

SUMMARIZED BY: S. Sayawatana

SAMPLE NO.	DEPTH (ft)	MOISTURE CONTENT ASTM D2216 (%)	DRY DENSITY ASTM D2937 (pcf)	SPECIFIC GRAVITY ASTM D854	CATION EXCHANGE CAPACITY	
					CEC EPA 9080 (meq/100g)	DETECTION LIMIT (meq/100g)
M-001B	60.5-61.5	20.5	109.5	2.73	7.2	3.3
M-013C	62-63	19.5	105.0	2.74	22.7	3.3
M-027B	57.5-58	20.0	110.5	2.73	28.2	3.3
M-001A	10.5-11	-	-	-	26.0	0.3
M-003A	10.5-11	-	-	-	6.1	0.3
M-028A	10.5-11	13.5	108.5	2.71	10.8	0.3
M-026A	11.5-12	22.0	109.0	2.74	4.2	0.3
M-024A	11-11.5	*	*	*	*	*
M-022A	10-10.5	14.5	104.5	2.71	4.6	0.3
M-020A	10.5-11	20.0	104.5	2.81	7.6	0.3
M-018A	10.5-11	18.5	91.0	-	7.5	0.3
M-016A	10.5-11	20.0	110.5	2.70	11.6	0.3
M-015A	10.5-11	22.0	105.0	2.70	5.3	0.3
M-05A	11.5-12.5	**	**	2.60	10.2	0.3
M-023A	11-11.5	26.0	85.5	2.71	5.9	0.3
M-104A	10.5-11	18.0	104.5	2.72	5.7	0.3
M-013A	11-11.5	21.0	115.0	2.73	8.6	0.3
M-011A	10.5-11	19.5	106.0	2.74	6.8	0.3
M-007A	8-8.5	19.5	103.5	2.74	5.5	0.3
M-09A	11-11.5	23.5	96.5	2.74	8.0	0.3

* Missing Sample

** Disturbed Sample

TABLE 2

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NAME: NAS-Alameda

TETC NO: 92-220-7003

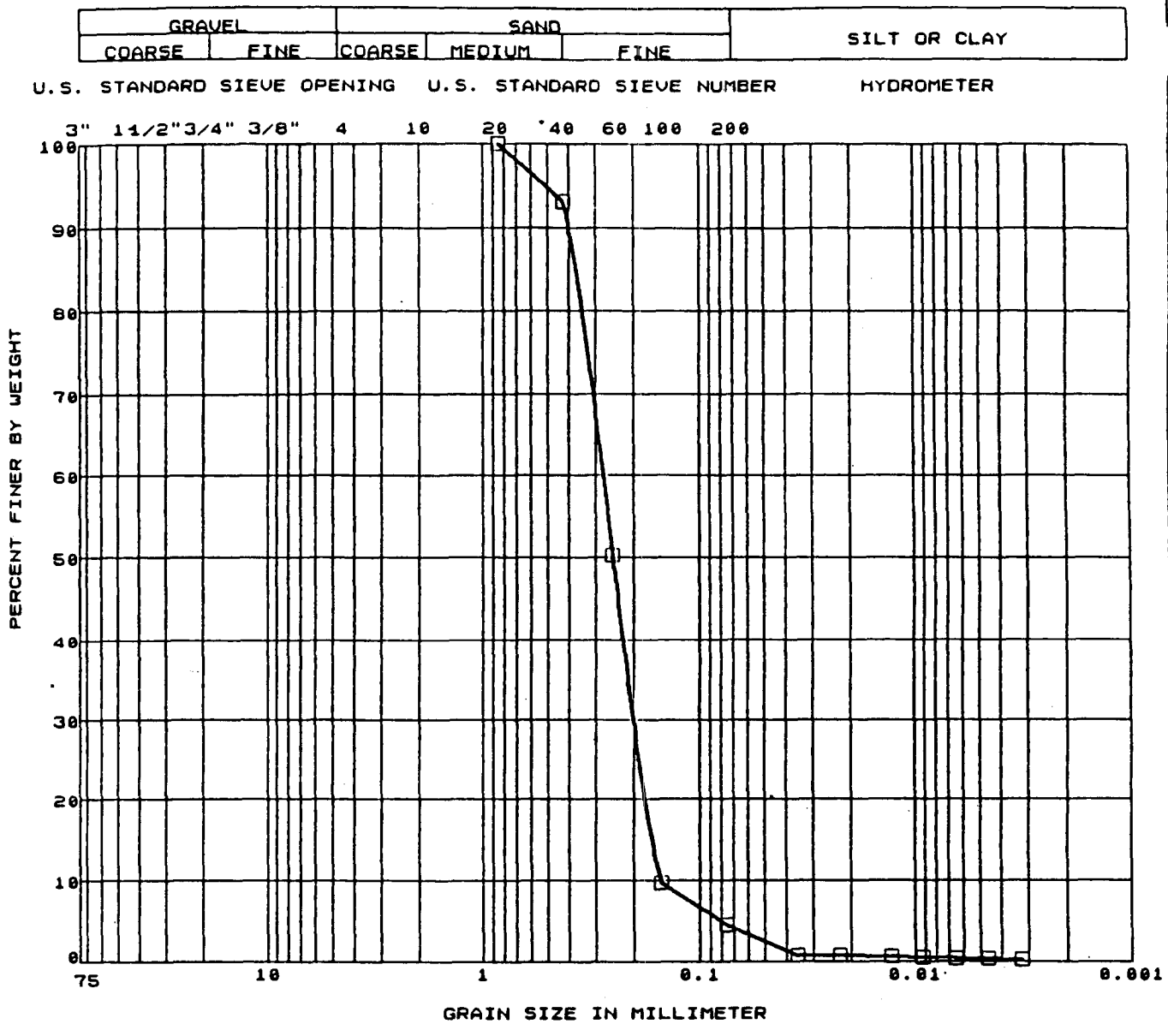
PROJECT NUMBER: 2738.0215

CLIENT: James M. Montgomery

DATE: Sept. 27, 1991

SUMMARIZED BY: S. Sayawatana

SAMPLE NO.	DEPTH (ft)	MOISTURE CONTENT ASTM D2216 (%)	DRY DENSITY ASTM D2937 (pcf)	PERMEABILITY	
				EFFECTIVE STRESSES (psi)	HYDRAULIC CONDUCTIVITY (EPA 9100) (cm/s)
M-022A	10-10.5	14.5	104.0	6	1.50E-05
M-001E	28.5	43.5	78.0	15	3.16E-08
M-002E	20.5	68.5	62.5	10	2.53E-08
M-104C	69-69.5	48.0	74.0	35	2.07E-08
M-027C	91	45.5	74.5	30	4.22E-09
M-025C	83-83.5	29.0	84.0	42	3.13E-09
M-025E	28.5-29	39.0	83.0	15	4.56E-08
M-020B	89.5-90	45.5	75.0	40	3.38E-08
M-020E	37	39.0	81.5	19	3.06E-08
M-024E	15.5-16	78.5	53.0	7	4.20E-07
M-023B	120-120.5	51.5	68.0	40	7.31E-09
M-007C	83.5-84	46.5	74.0	42	4.64E-09
M-013C	83-83.5	47.0	75.5	43	4.93E-09
M-019E	43-43.5	19.0	103.5	25	2.87E-07
M-021C	35.5-36	38.0	84.5	19	2.20E-08



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-001B	60.5-61.5	TUBE			

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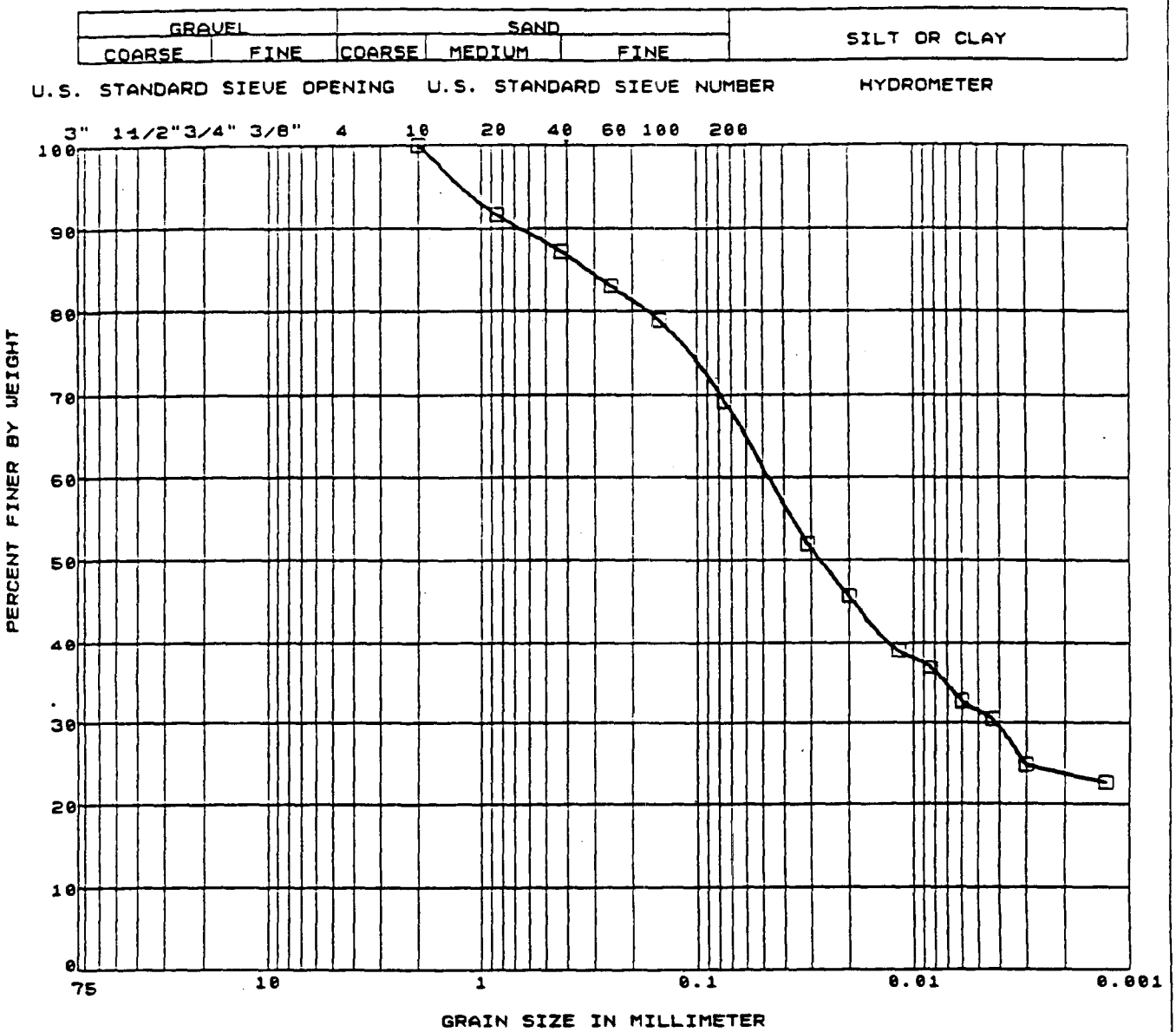
PROJECT NAME: NAS-Alameda

Grain Size Distribution Curve

9/91

FIGURE 1



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-001E	28.5	TUBE	CL	40	21

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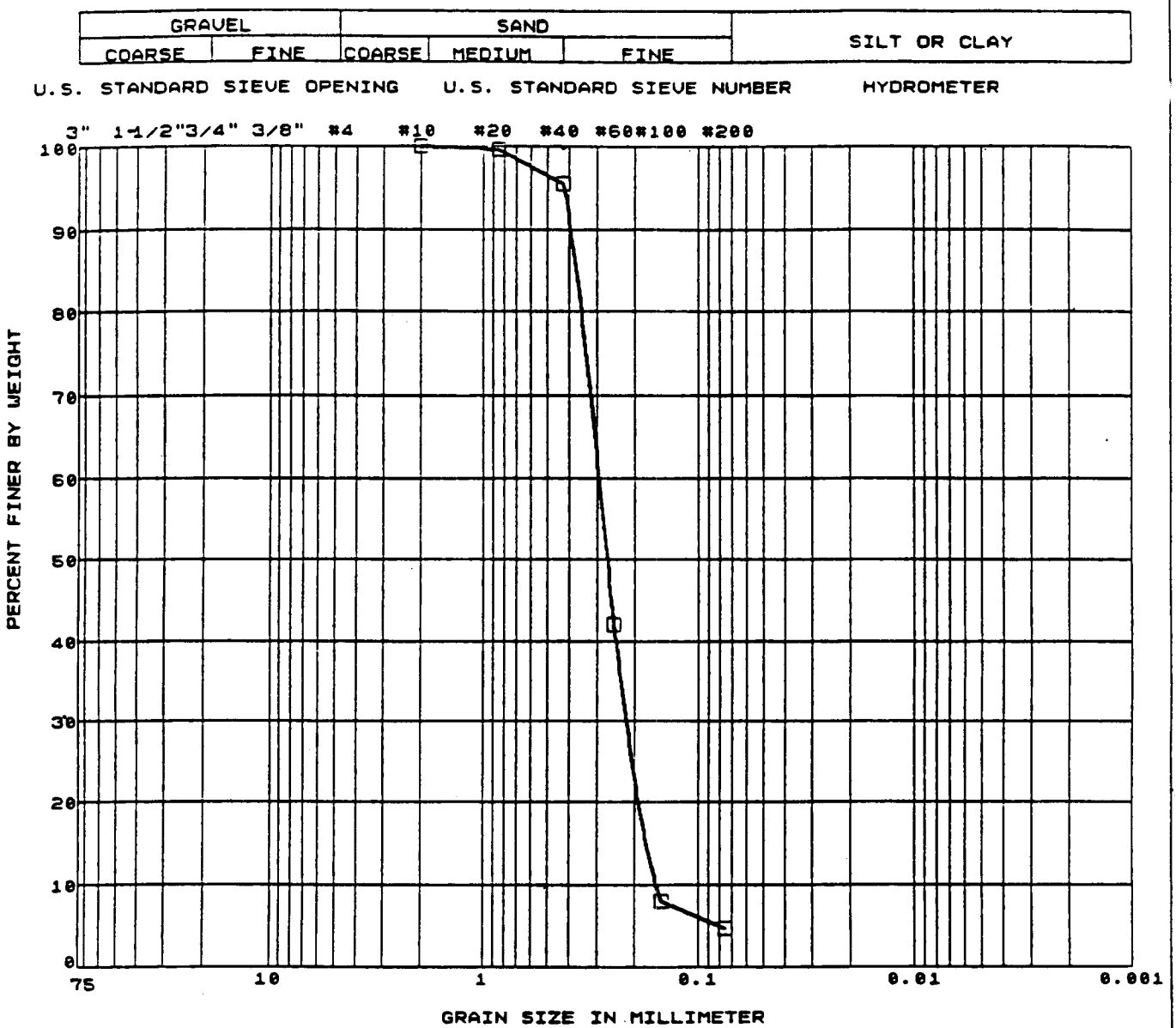
PROJECT NAME: NAS-Alameda

Grain Size Distribution Curve

9/91

FIGURE 28



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-002A	5.5-6	TUBE			

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GRAIN SIZE DISTRIBUTION CURVE

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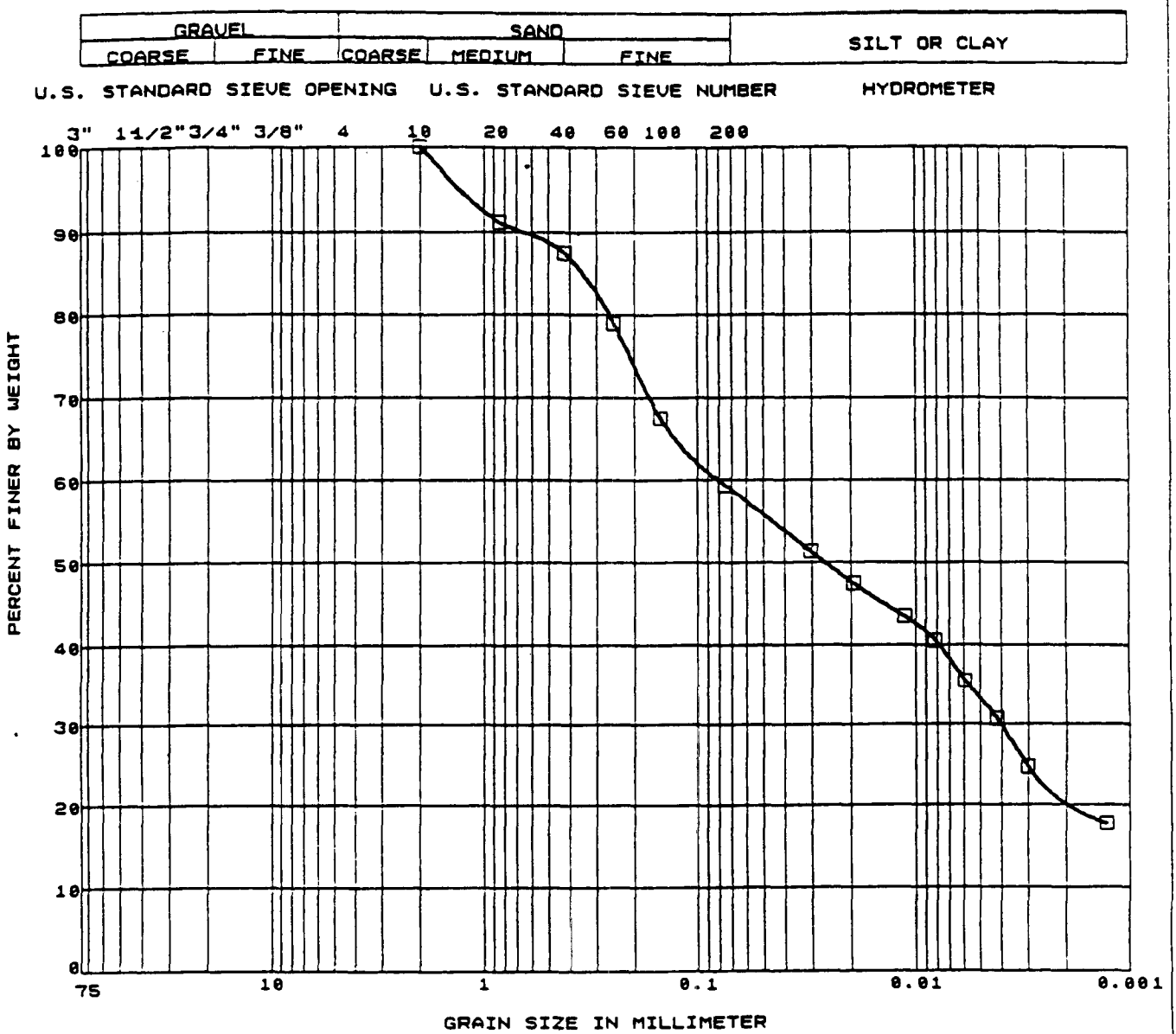
FIGURE 14



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-002E	20.5-21	TUBE	CL	40	21

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PROJECT NAME:
NAS-Alameda
ST. IMPROVEMENT

Grain Size Distribution Curve

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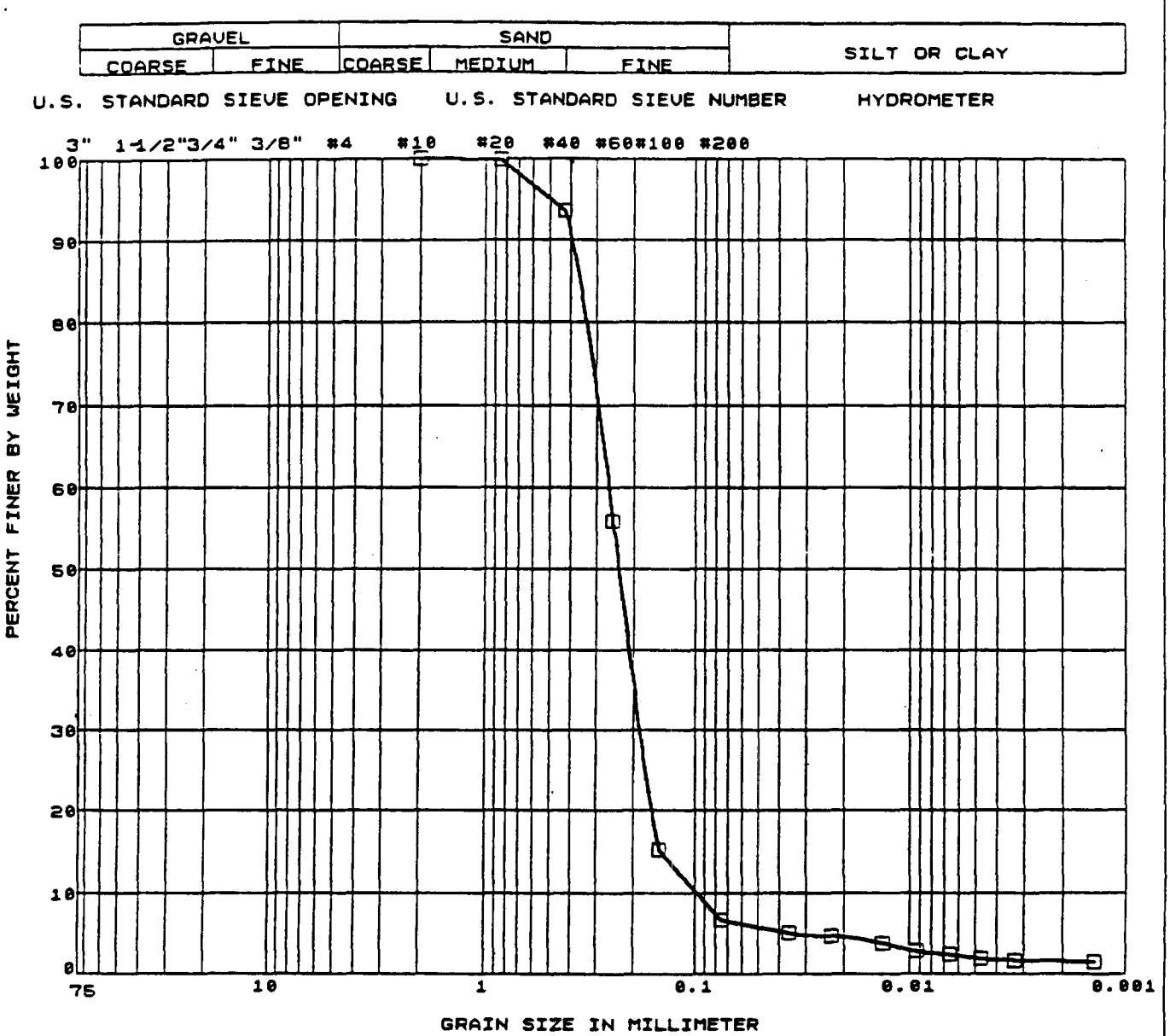
FIGURE 29



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-003A	10.5-11	TUBE			

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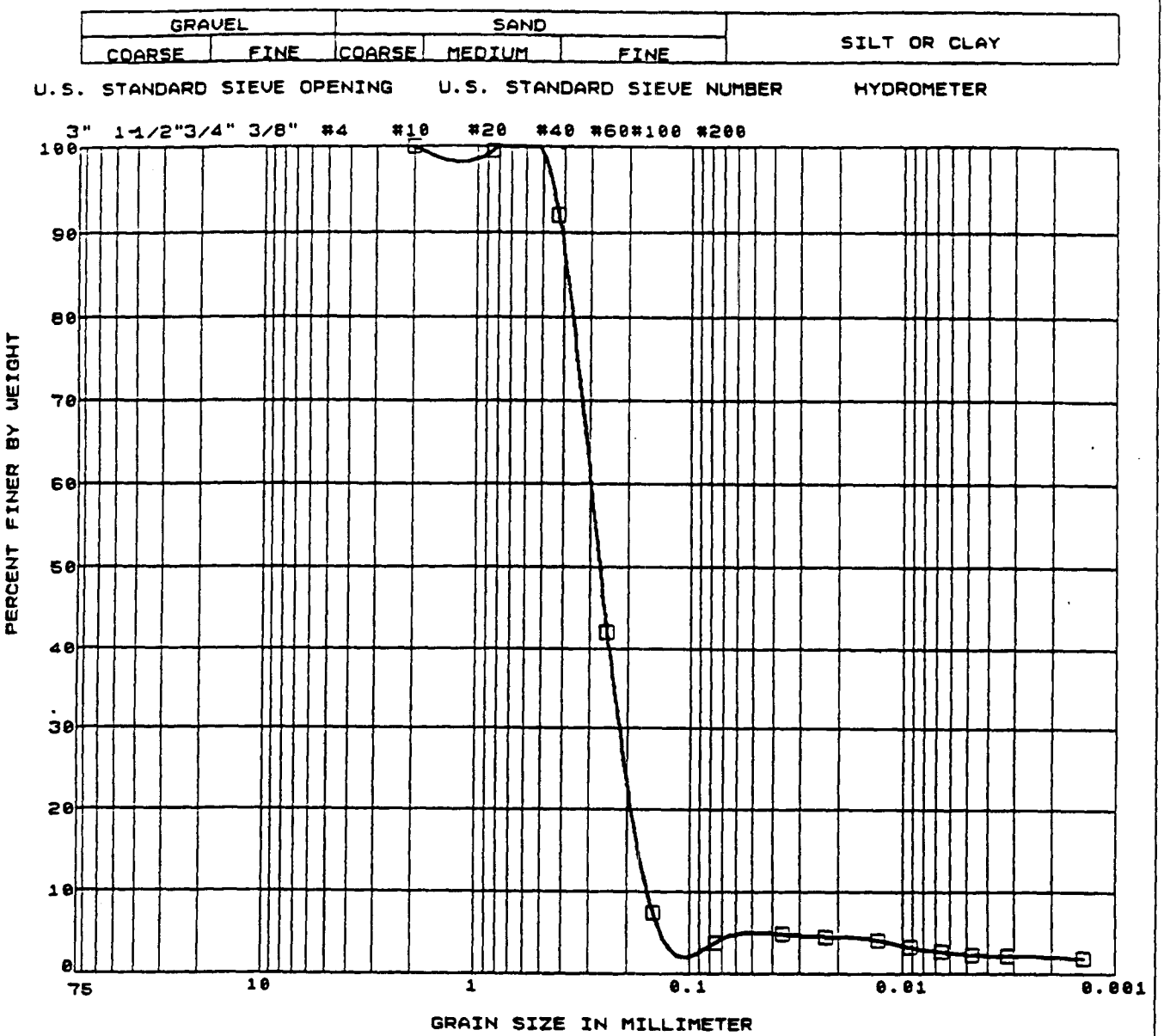
PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 15



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-04A	10.5-11	TUBE			

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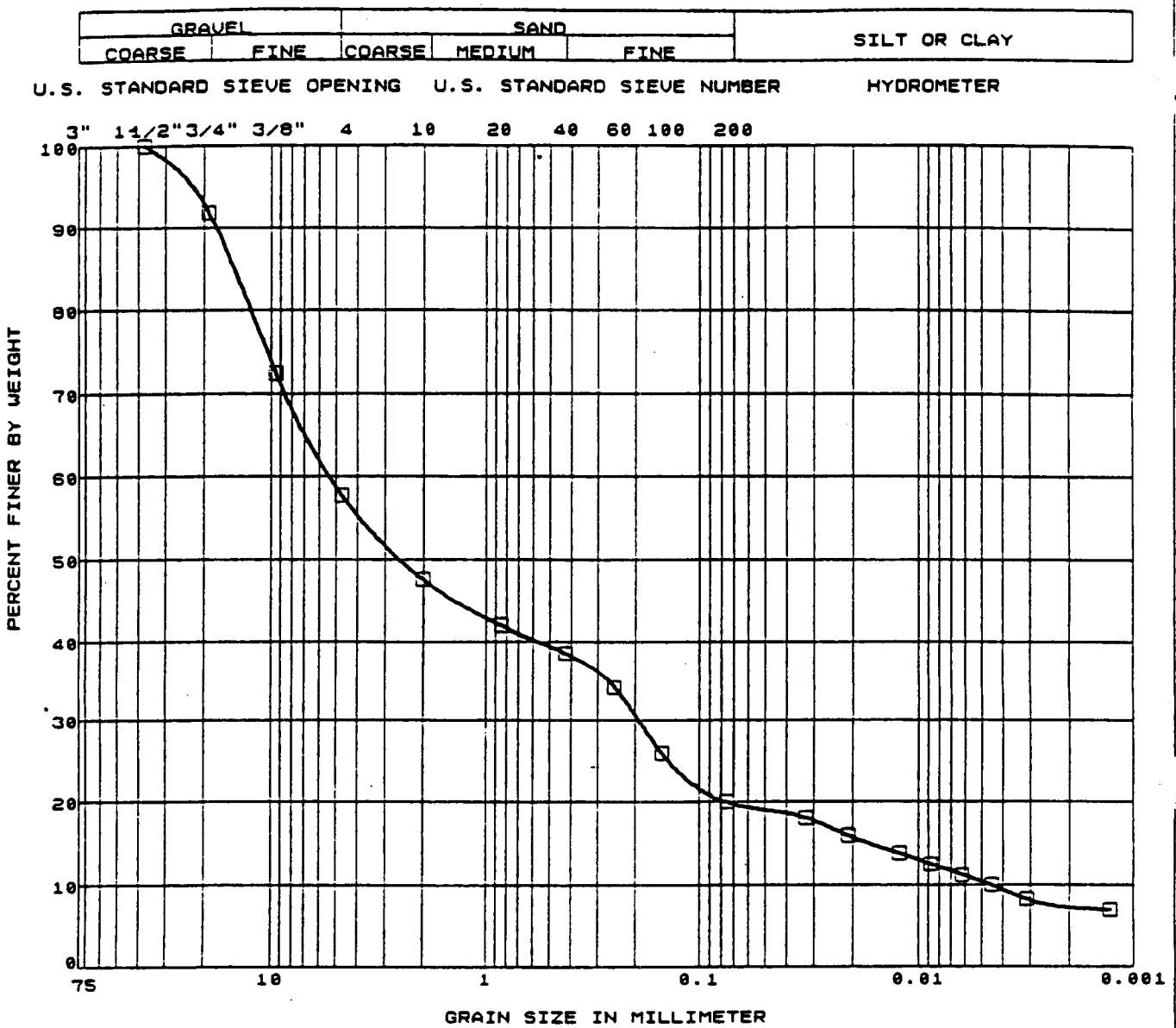
PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 16



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-05A	11.5-12.5	TUBE			

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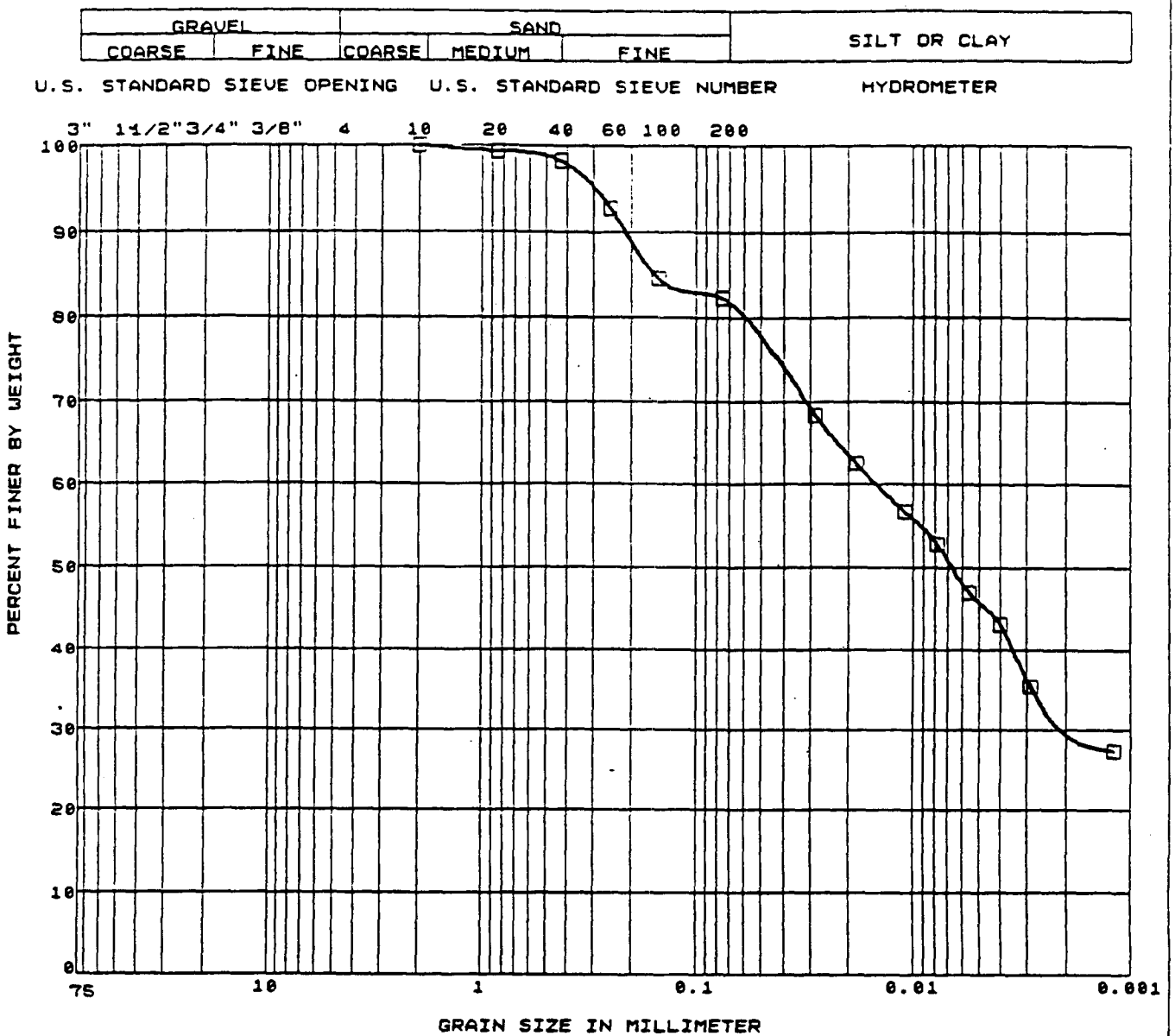
PROJECT NAME: NAS-Alameda

Grain Size Distribution Curve

10/91

FIGURE 10



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-024E	15.5-16	TUBE	CL	33	17

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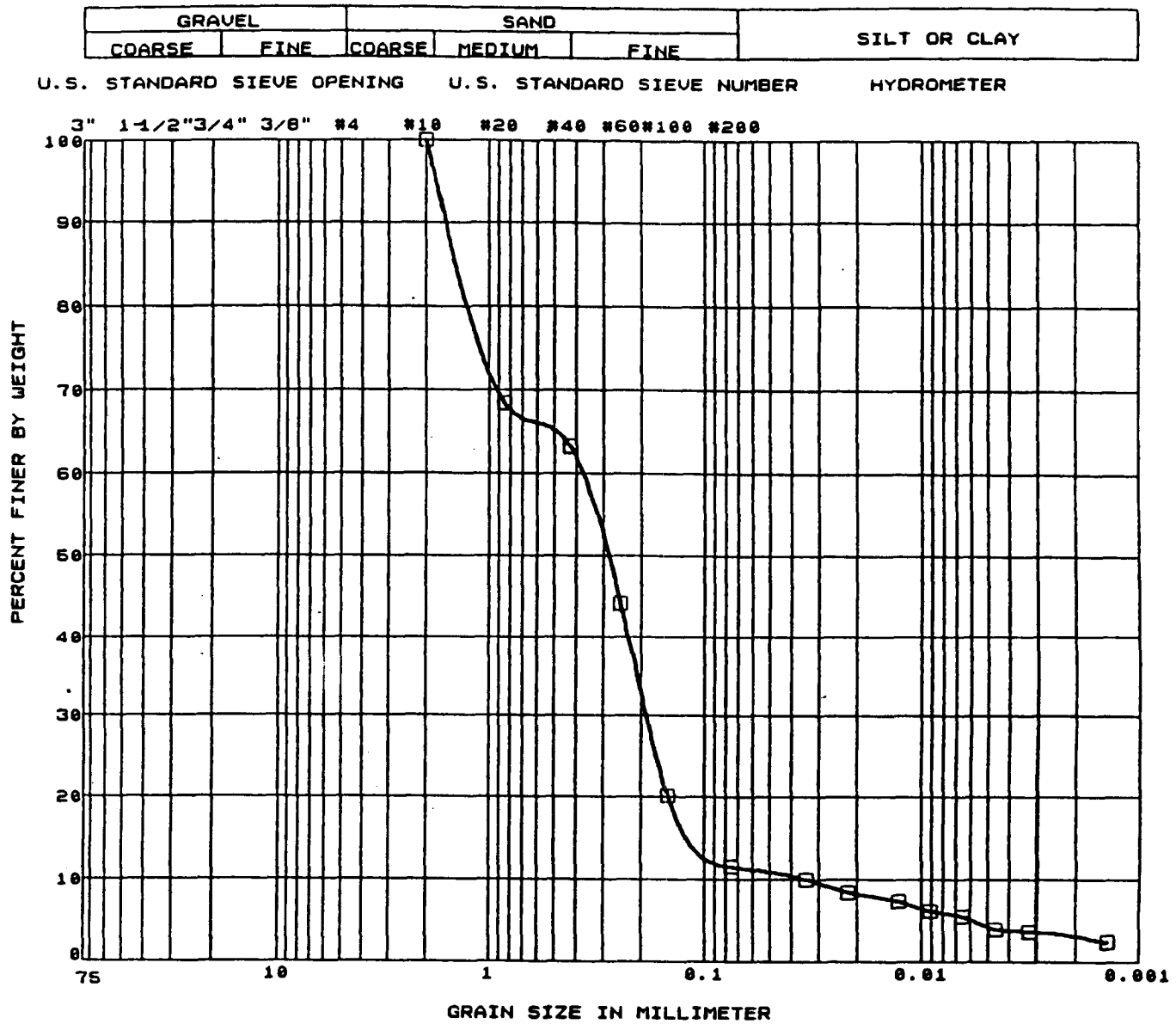
PROJECT NAME: NAS-Alameda

Grain Size Distribution Curve

9/91

FIGURE 34



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-025A	10-10.5	TUBE			

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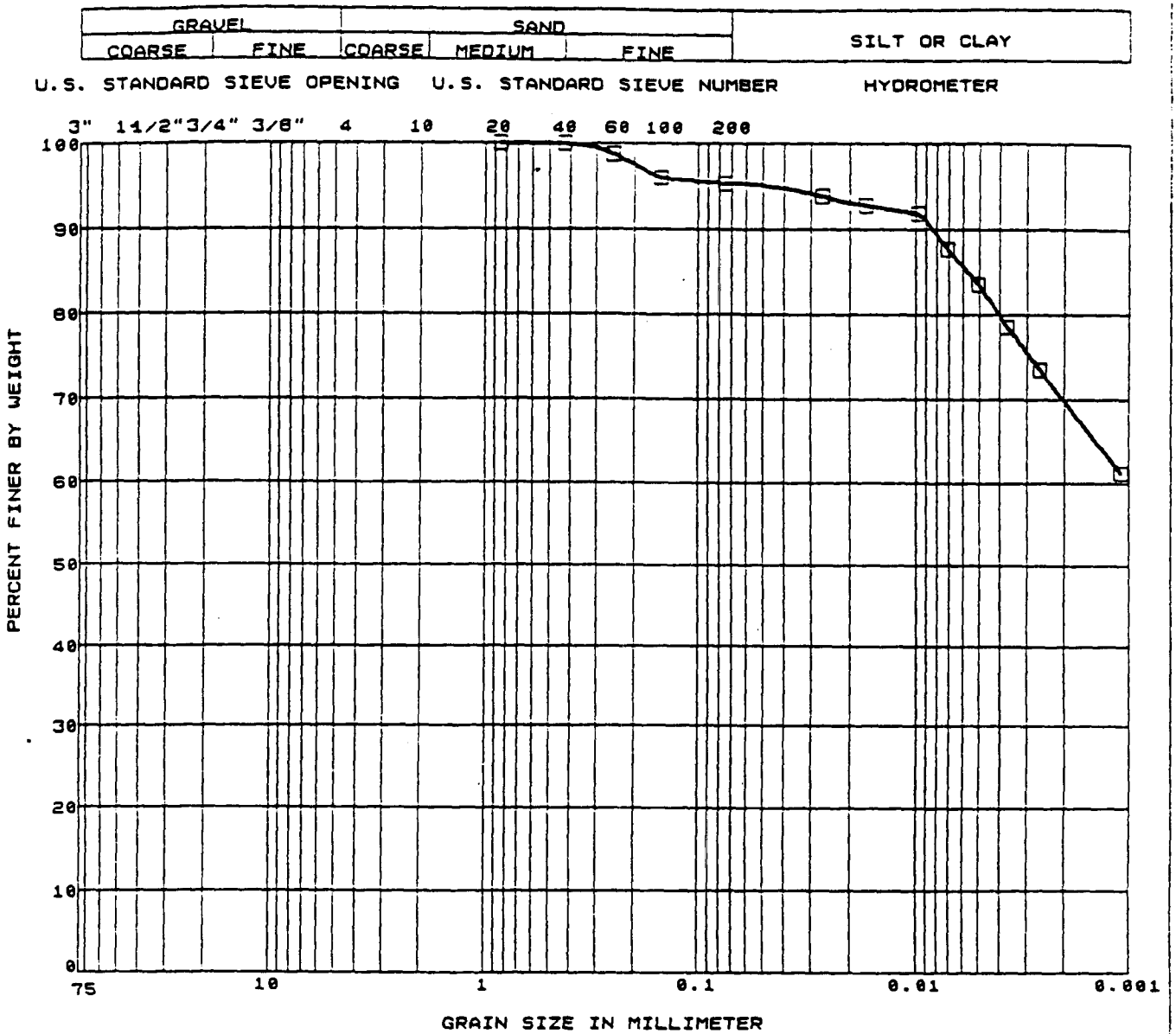
PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

FIGURE 47



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-025C	83-83.5	TUBE	CH	53	36

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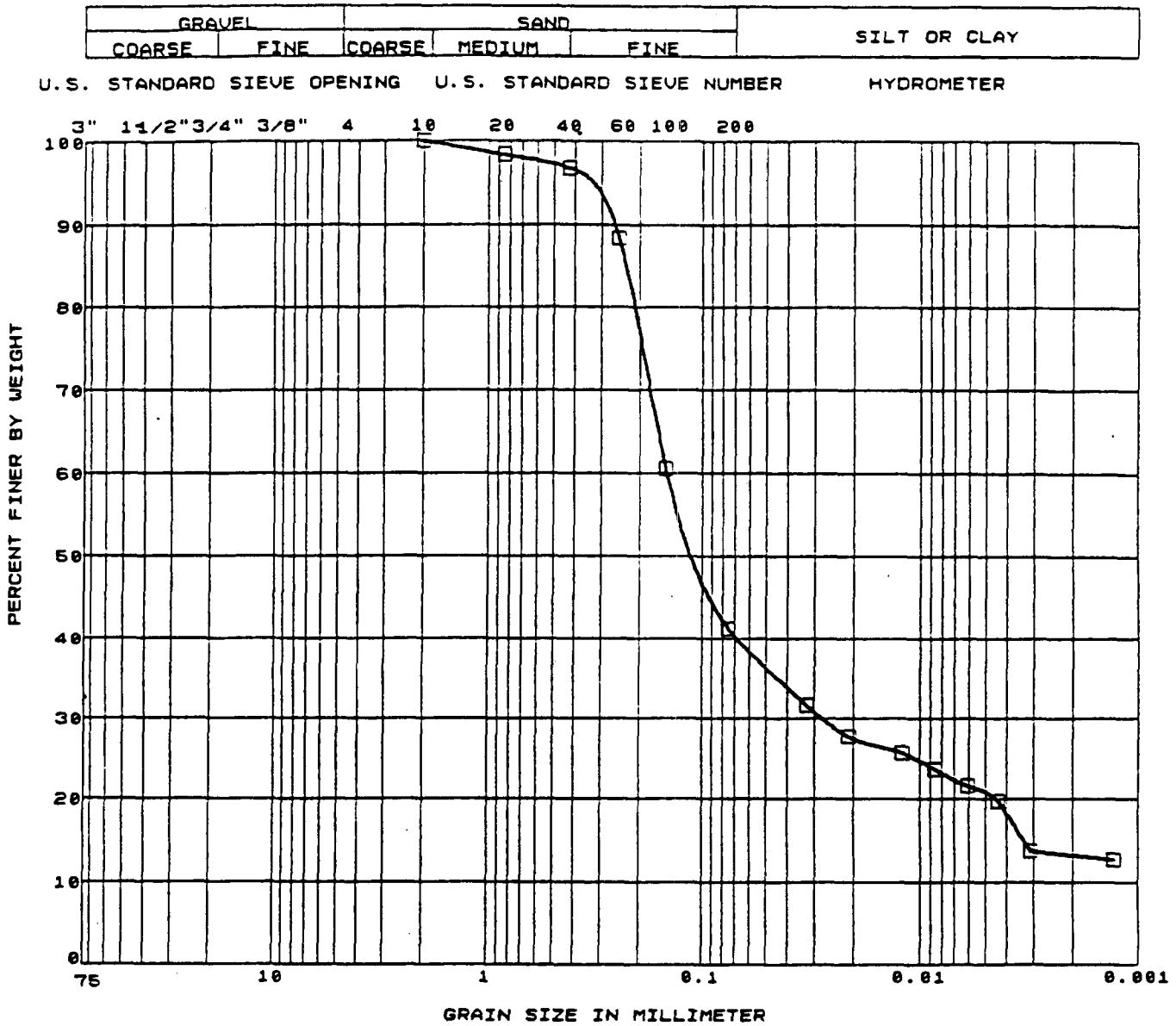
PROJECT NAME: NAS-Alameda

Grain Size Distribution Curve

10/91

FIGURE 30



SYMBOL	BORING NO	SAMPLE NO	DEPTH (in)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-025E	28.5-29	TUBE	CL	49	29

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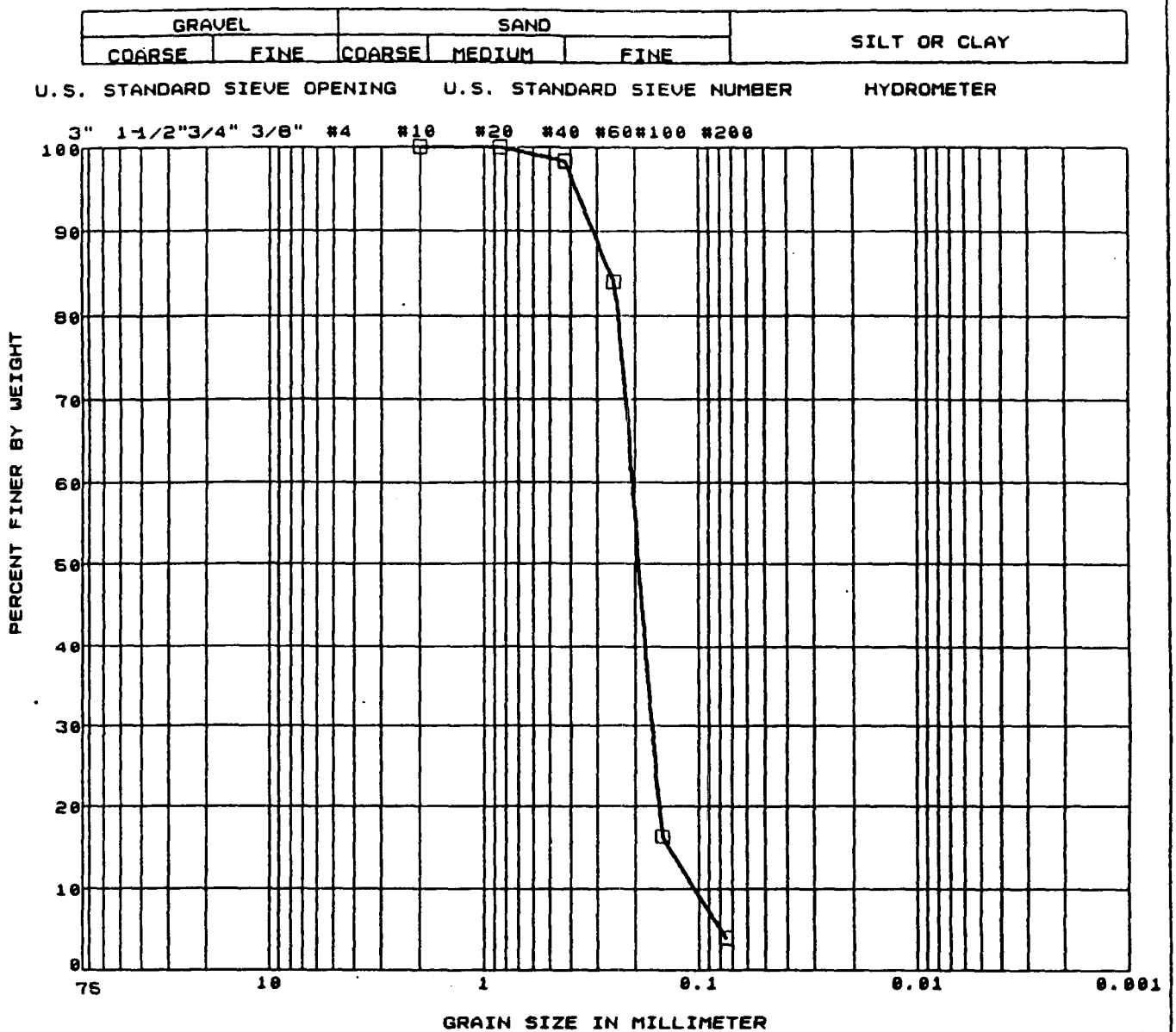
PROJECT NAME: NAS-Alameda

Grain Size Distribution Curve

9/91

FIGURE 31



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-026A	11.5-12	TUBE			

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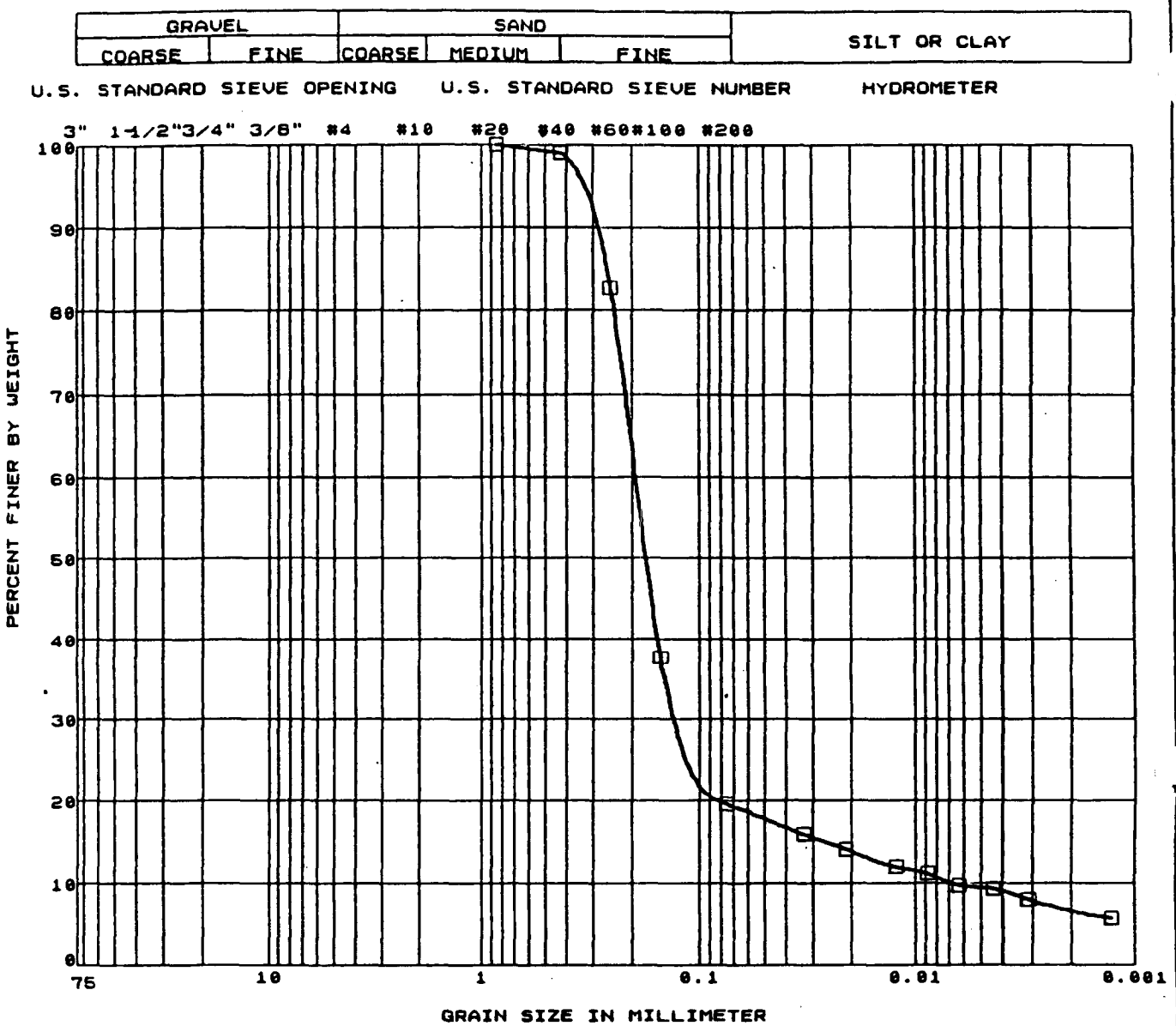
PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 5



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-027B	57.5-58	TUBE			

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PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

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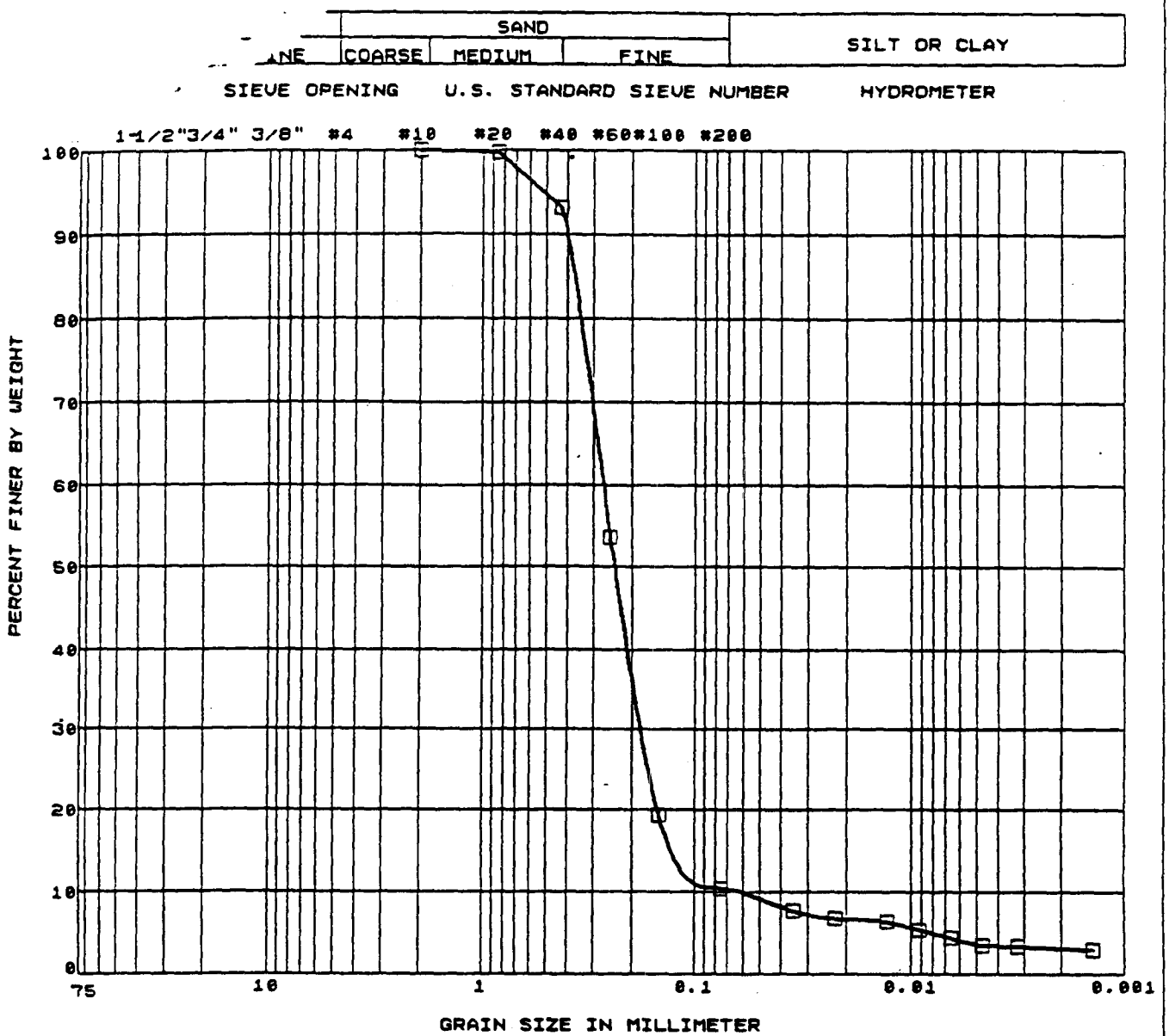
FIGURE 3



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-029E	16-16.5	TUBE			

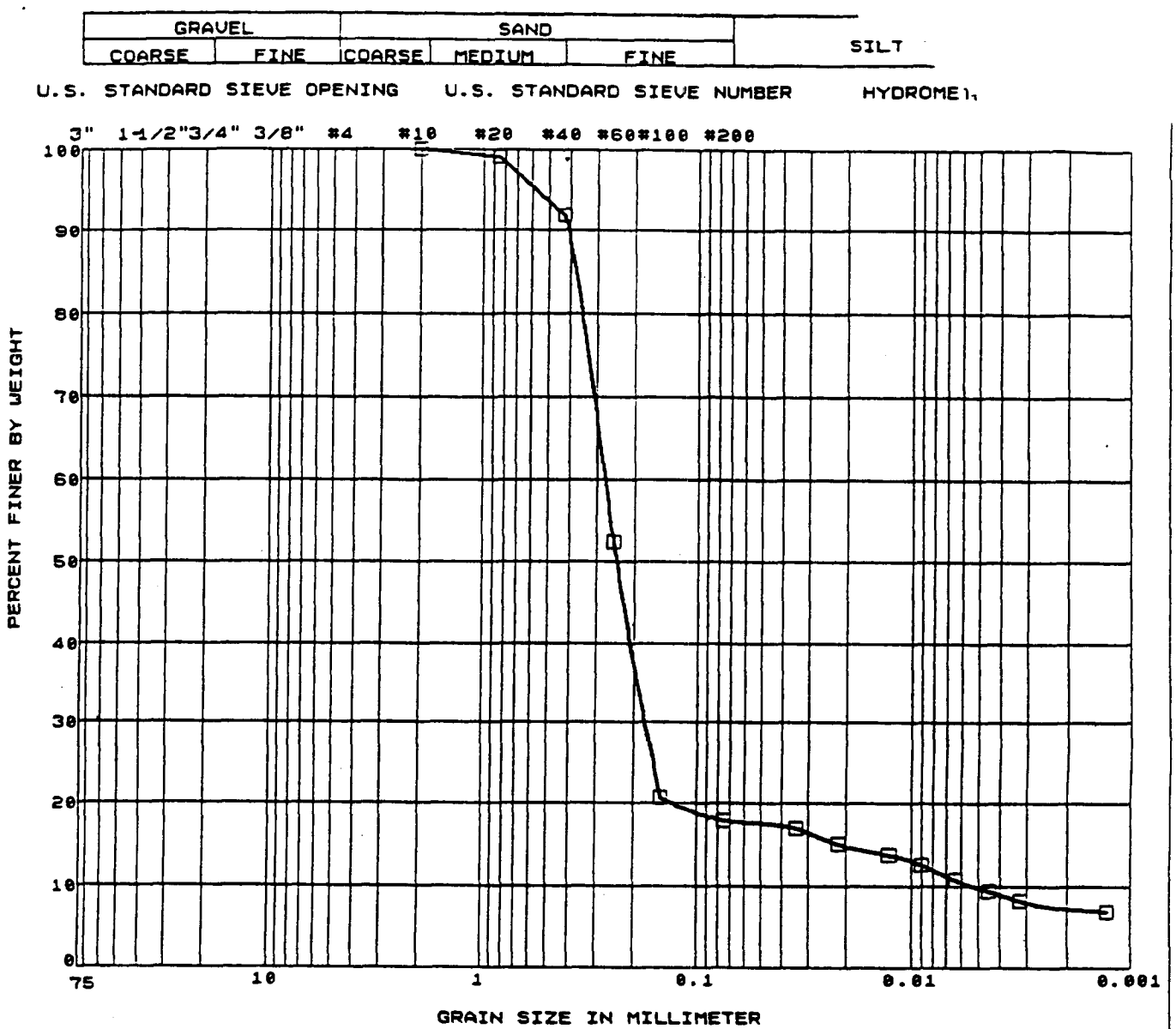
The Earth Technology Corporation

PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 19



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-101A	10-10.5	TUBE			

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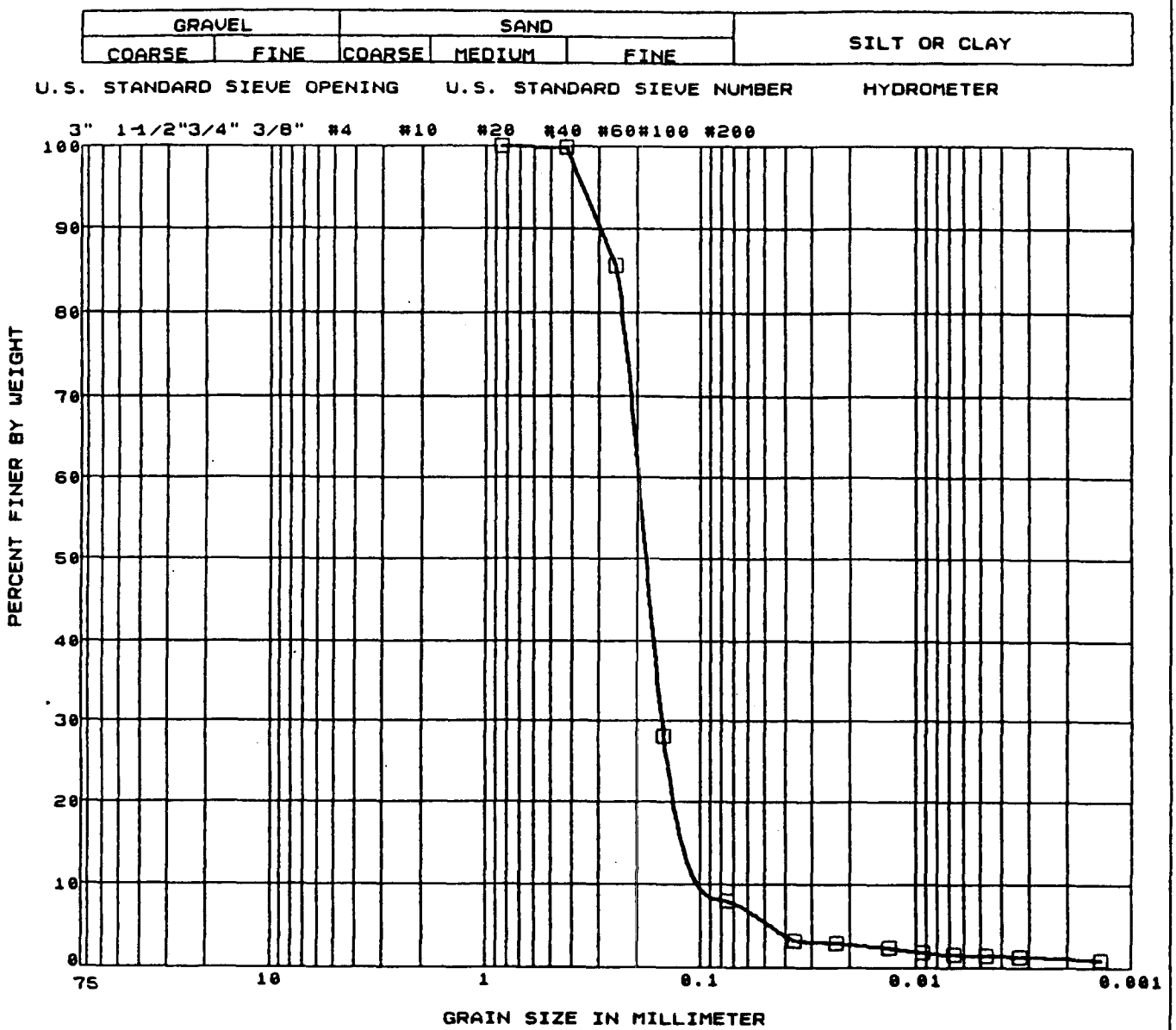
PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 20



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-027E	20.5-21	TUBE			

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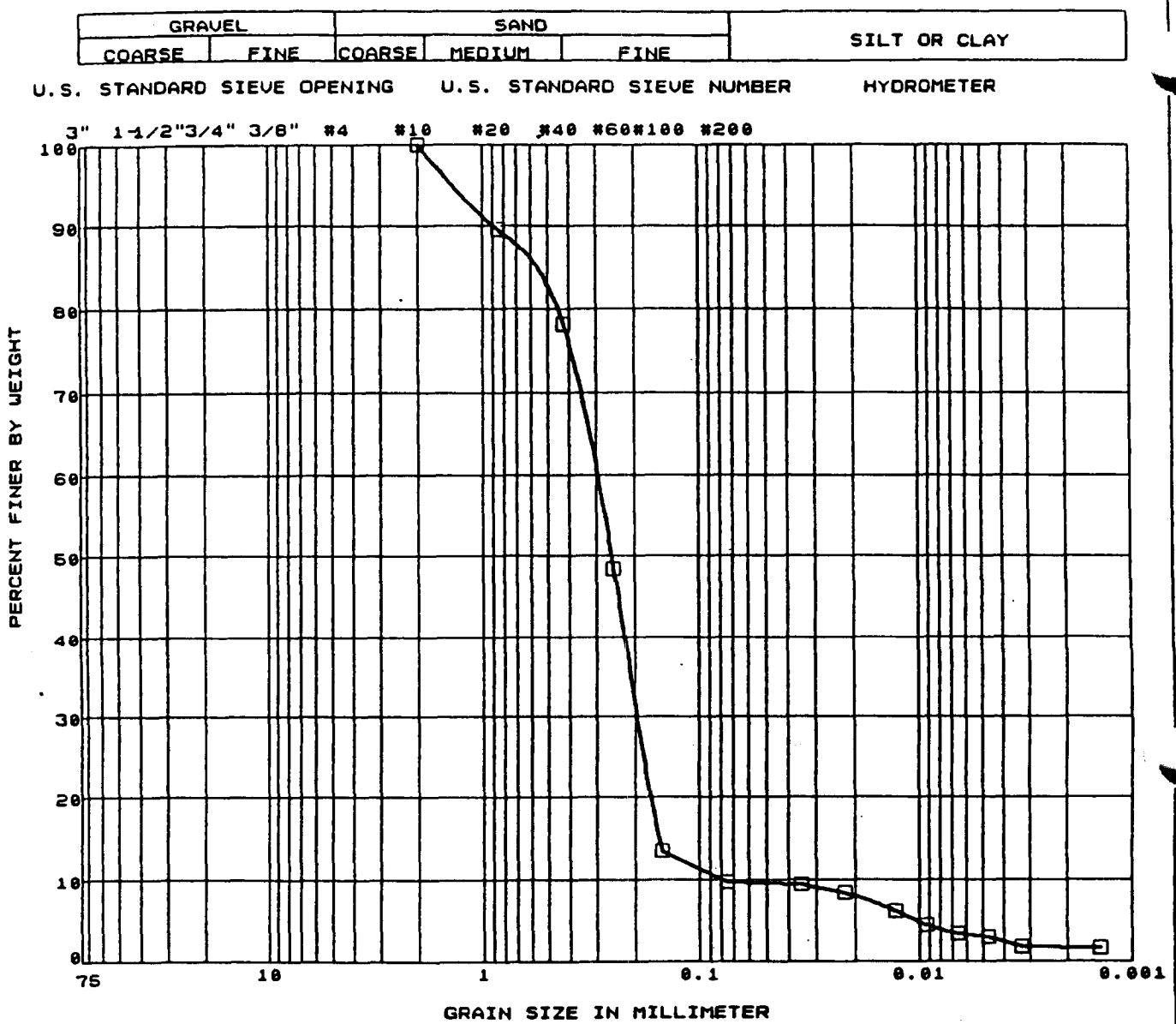
PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 4B



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□		M-028A	10.5-11	TUBE			

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PROJECT NAME: NAS-Alameda

GRAIN SIZE DISTRIBUTION CURVE

9/91

FIGURE 4

TABLE 4

SUMMARY

OF

CONSOLIDATION TEST RESULTS

(ASTM D2435)

PROJECT NAME:	NAS-Alameda	TETC #:	91-220-7003
CLIENT PROJECT NO.:	2738.0215	CLIENT:	J.M. MONTGOMERY
REPORTED DATE:	Sept. 25, 1991	SUMMARIZED BY:	S. Sayawatana

Sample No.:	M-024E	Depth (ft.) :	15.5-16
Dry Density (pcf):	48.42	Specific Gravity:	2.70 (Assumed)
Initial Moisture (%):	98.60	Final Moisture (%) :	57.89
Initial Length (in.):	0.8000	Initial Void Ratio :	2.481
Initial Dial Reading:	0.3416		

PRESSURE (p) (ksf)	FINAL READING (in)	THICKNESS (in)	VOID RATIO	STRAIN % OF SAMPLE THICKNESS	LOAD COMPLIANCE (%)	CORRECTED STRAIN (%)
0.25	0.3289	0.7873	1.741	1.587	0.08	1.51
H2O	0.3289	0.7873	1.741	1.587	0.08	1.51
0.50	0.3270	0.7854	1.734	1.825	0.20	1.62
1.00	0.3112	0.7696	1.679	3.800	0.35	3.45
2.00	0.2452	0.7036	1.449	12.050	0.54	11.51
4.00	0.1669	0.6253	1.177	21.837	0.72	21.12
8.00	0.1027	0.5611	0.953	29.862	1.00	28.86
16.00	0.0372	0.4956	0.725	38.050	1.54	36.51
4.00	0.0501	0.5085	0.770	36.437	1.27	35.17
1.00	0.0732	0.5316	0.851	33.550	1.07	32.48

TABLE 5

SUMMARY

OF

CONSOLIDATION TEST RESULTS

(ASTM D2435)

PROJECT NAME:	NAS-Alameda	TETC #:	91-220-7003
CLIENT PROJECT NO.:	2738.0215	CLIENT:	J.M. MONTGOMERY
DATE:	Sept. 25, 1991	SUMMARIZED BY:	S. Sayawatana

Sample No.:	M-002E	Depth (ft.):	20.5-21
Dry Density (pcf):	63.80	Specific Gravity:	2.70 (Assumed)
Initial Moisture (%):	63.00	Final Moisture (%):	31.60
Initial Length (in.):	0.8000	Initial Void Ratio:	1.642
Initial Dial Rdg (in):	0.2913	Wt. of Dry Soil (g.)	39.39
		Dia.of sample (in.)	1.935

PRESSURE (p) (ksf)	FINAL READING (in)	THICKNESS (in)	VOID RATIO	STRAIN % OF SAMPLE THICKNESS	LOAD COMPLIANCE (%)	CORRECTED STRAIN (%)
0.25	0.2593	0.7680	1.538	4.000	0.02	3.98
H2O	0.2593	0.7680	1.538	4.000	0.02	3.98
0.50	0.2504	0.7591	1.508	5.112	0.06	5.05
1.00	0.2253	0.7340	1.426	8.250	0.10	8.15
2.00	0.1790	0.6877	1.273	14.037	0.19	13.85
4.00	0.1193	0.6280	1.075	21.500	0.35	21.15
8.00	0.0789	0.5876	0.942	26.550	0.55	26.00
16.00	0.0452	0.5539	0.830	30.762	0.78	29.98
4.00	0.0497	0.5584	0.845	30.200	0.53	29.67
1.00	0.0576	0.5663	0.871	29.213	0.40	28.81

TABLE 6

SUMMARY

OF

CONSOLIDATION TEST RESULTS

(ASTM D2435)

PROJECT NAME:	NAS-Alameda	TETC #:	91-220-7003
CLIENT PROJECT NO.:	2738.0215	CLIENT:	J.M. MONTGOMERY
DATE:	Sept. 25, 1991	SUMMARIZED BY:	S. Sayawatana

Sample No.:	M-025E	Depth (ft.):	28.5-29
Dry Density (pcf):	82.45	Specific Gravity:	2.70 (Assumed)
Initial Moisture (%):	39.58	Final Moisture (%):	29.29
Initial Length (in.):	0.8000	Initial Void Ratio:	1.044
Initial Dial Rdg (in):	0.3222	Wt. of Dry Soil (g.)	50.91
		Dia.of sample (in.)	1.935

PRESSURE (p) (ksf)	FINAL READING (in)	THICKNESS (in)	VOID RATIO	STRAIN % OF SAMPLE THICKNESS	LOAD COMPLIANCE (%)	CORRECTED STRAIN (%)
0.25	0.3095	0.7873	1.013	1.587	0.07	1.52
H2O	0.3095	0.7873	1.013	1.587	0.07	1.52
0.50	0.3093	0.7871	1.012	1.612	0.17	1.44
1.00	0.3037	0.7815	0.998	2.312	0.31	2.00
2.00	0.2813	0.7591	0.941	5.112	0.51	4.60
4.00	0.2561	0.7339	0.876	8.262	0.77	7.49
8.00	0.2300	0.7078	0.810	11.525	1.07	10.45
16.00	0.2010	0.6788	0.736	15.150	1.49	13.66
4.00	0.2051	0.6829	0.746	14.637	1.23	13.41
1.00	0.2113	0.6891	0.762	13.862	1.03	12.83

TABLE 7

SUMMARY

OF

CONSOLIDATION TEST RESULTS

(ASTM D2435)

PROJECT NAME:	NAS-Alameda	TETC #:	91-220-7003
CLIENT PROJECT NO.:	2738.0215	CLIENT:	J.M. MONTGOMERY
DATE:	Oct. 10, 1991	SUMMARIZED BY:	S. Sayawatana

Sample No.:	M-001E	Depth (ft.) :	28.50	
Dry Density (pcf):	69.70	Specific Gravity:	2.70	(Assumed)
Initial Moisture (%):	53.50	Final Moisture (%) :	30.00	
Initial Length (in.):	0.8000	Initial Void Ratio :	1.418	
Initial Dial Rdg (in):	0.2803	Wt. of Dry Soil (g.)	43.04	
		Dia.of sample (in.)	1.94	

PRESSURE (p) (ksf)	FINAL READING (in)	THICKNESS (in)	VOID RATIO	STRAIN % OF SAMPLE THICKNESS	LOAD COMPLIANCE (%)	CORRECTED STRAIN (%)
0.10	0.2738	0.7935	1.400	0.812	0.00	0.81
0.25	0.2601	0.7798	1.358	2.525	0.02	2.50
0.50	0.2360	0.7557	1.285	5.538	0.06	5.48
H2O	0.2350	0.7547	1.282	5.663	0.06	5.60
1.00	0.2134	0.7331	1.217	8.362	0.10	8.26
2.00	0.1717	0.6914	1.091	13.575	0.19	13.39
4.00	0.1280	0.6477	0.959	19.037	0.35	18.69
8.00	0.0879	0.6076	0.838	24.050	0.58	23.47
16.00	0.0460	0.5657	0.711	29.287	0.87	28.42
4.00	0.0488	0.5685	0.719	28.938	0.57	28.37
1.00	0.0584	0.5781	0.748	27.737	0.37	27.37

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: NAS-Alameda SML / TETC NO. : 91-220-7003

CLIENT PROJECT NO.: 2738.0215 CLIENT : JAMES M. MONTGOMERY

DATE: Sept. 25, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : M-024E DEPTH : 15.5-16 ft.

INITIAL DRY DENSITY : 48.42 pcf. INITIAL MOISTURE CONTENT : 98.6 pct.

INITIAL VOID RATIO : 2.481

SPECIFIC GRAVITY : 2.70 (assumed)

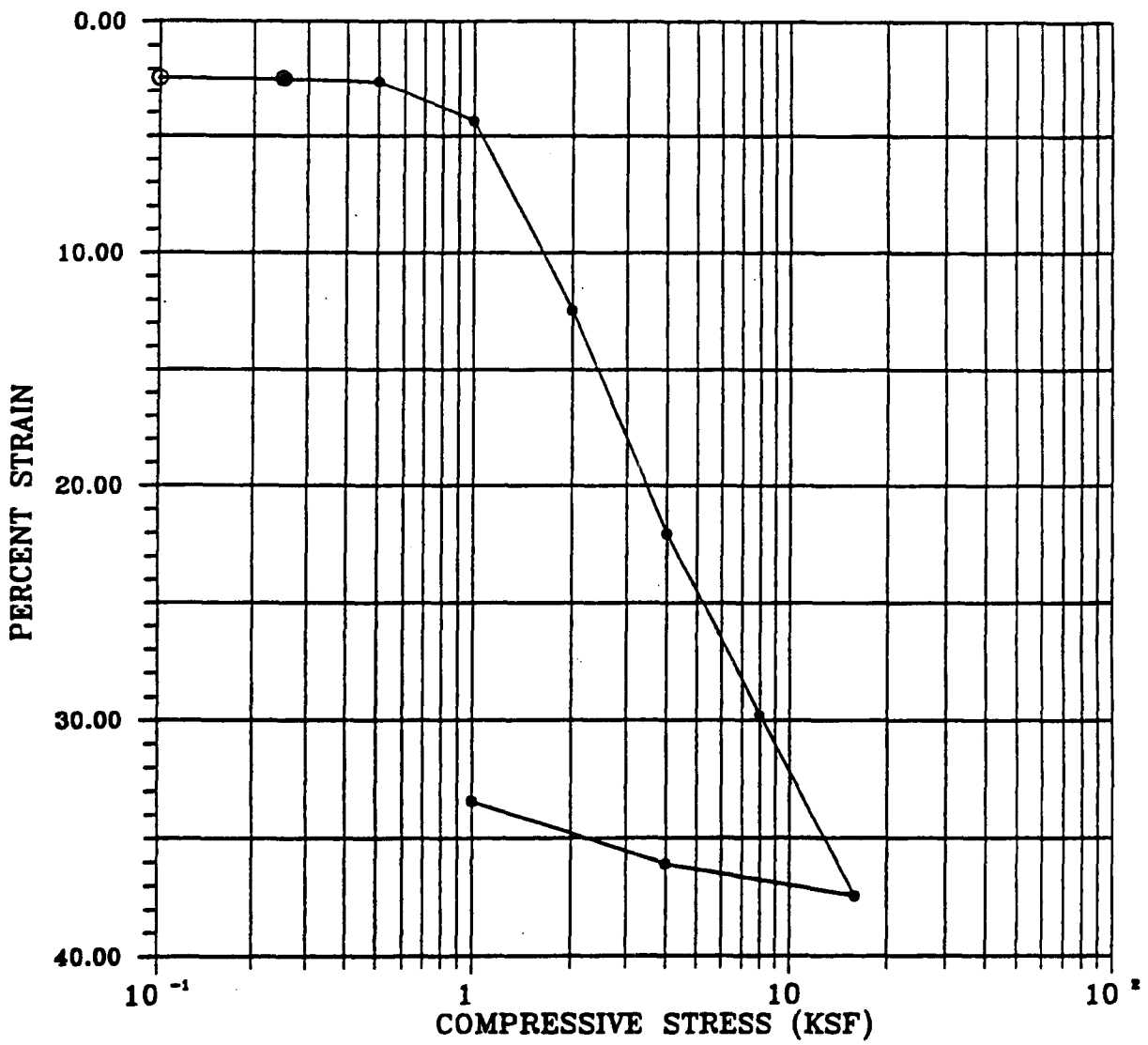


Figure 50

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: NAS-Alameda SML / TETC NO. : 91-220-7003

CLIENT PROJECT NO.: 2738.0215 CLIENT : JAMES M. MONTGOMERY

DATE: Sept. 25, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : M-002E DEPTH : 20.5-21 ft.

INITIAL DRY DENSITY : 63.82 pcf. INITIAL MOISTURE CONTENT : 63.0 pct.

INITIAL VOID RATIO : 1.642

SPECIFIC GRAVITY : 2.70 (assumed)

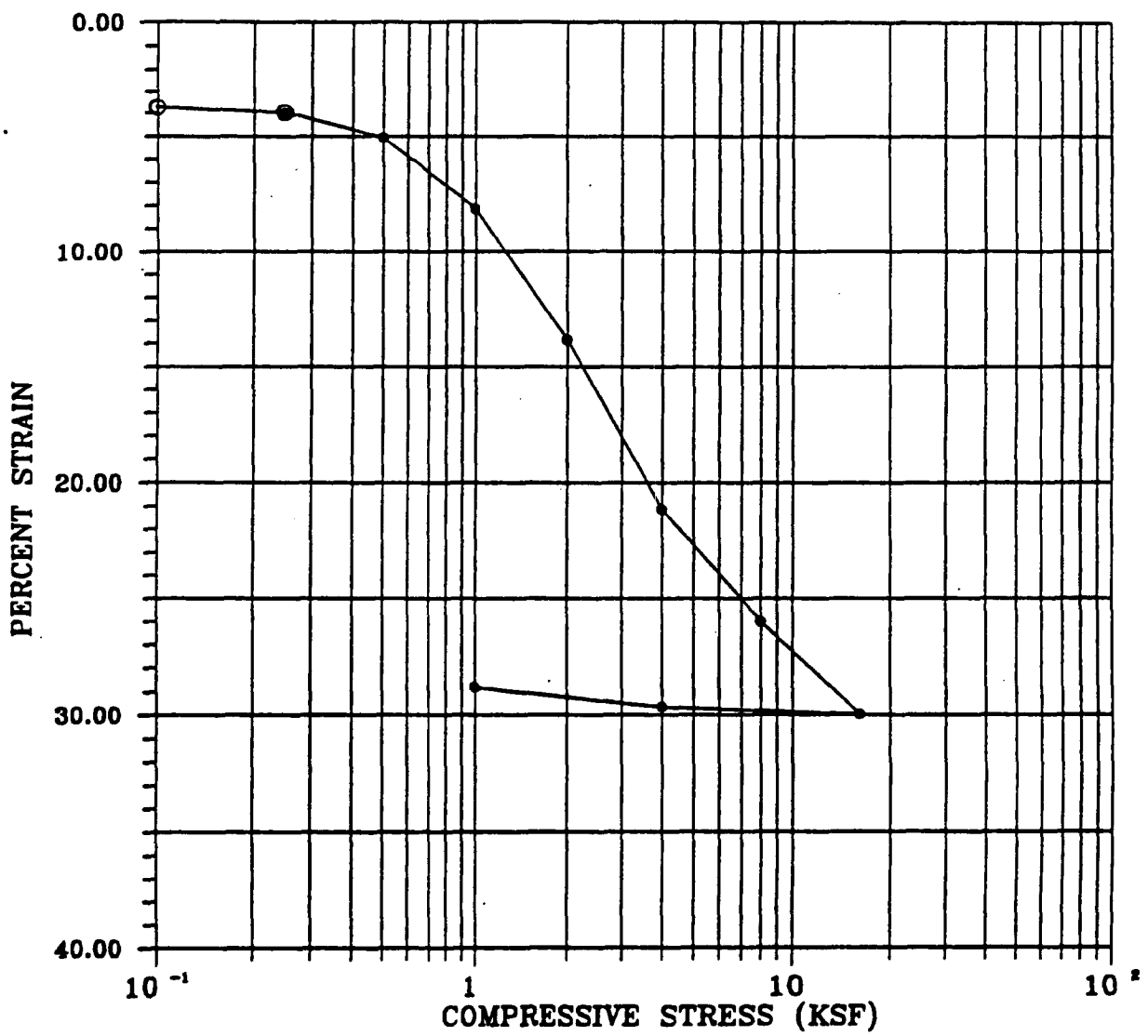


Figure 51

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: NAS-Alameda SML / TETC NO. : 91-220-7003

CLIENT PROJECT NO.: 2738.0215 CLIENT : JAMES M. MONTGOMERY

DATE: Sept. 25, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : M-025E DEPTH : 28.5-29 ft.

INITIAL DRY DENSITY : 82.45 pcf. INITIAL MOISTURE CONTENT : 39.58 pct.

INITIAL VOID RATIO : 1.044

SPECIFIC GRAVITY : 2.70 (assumed)

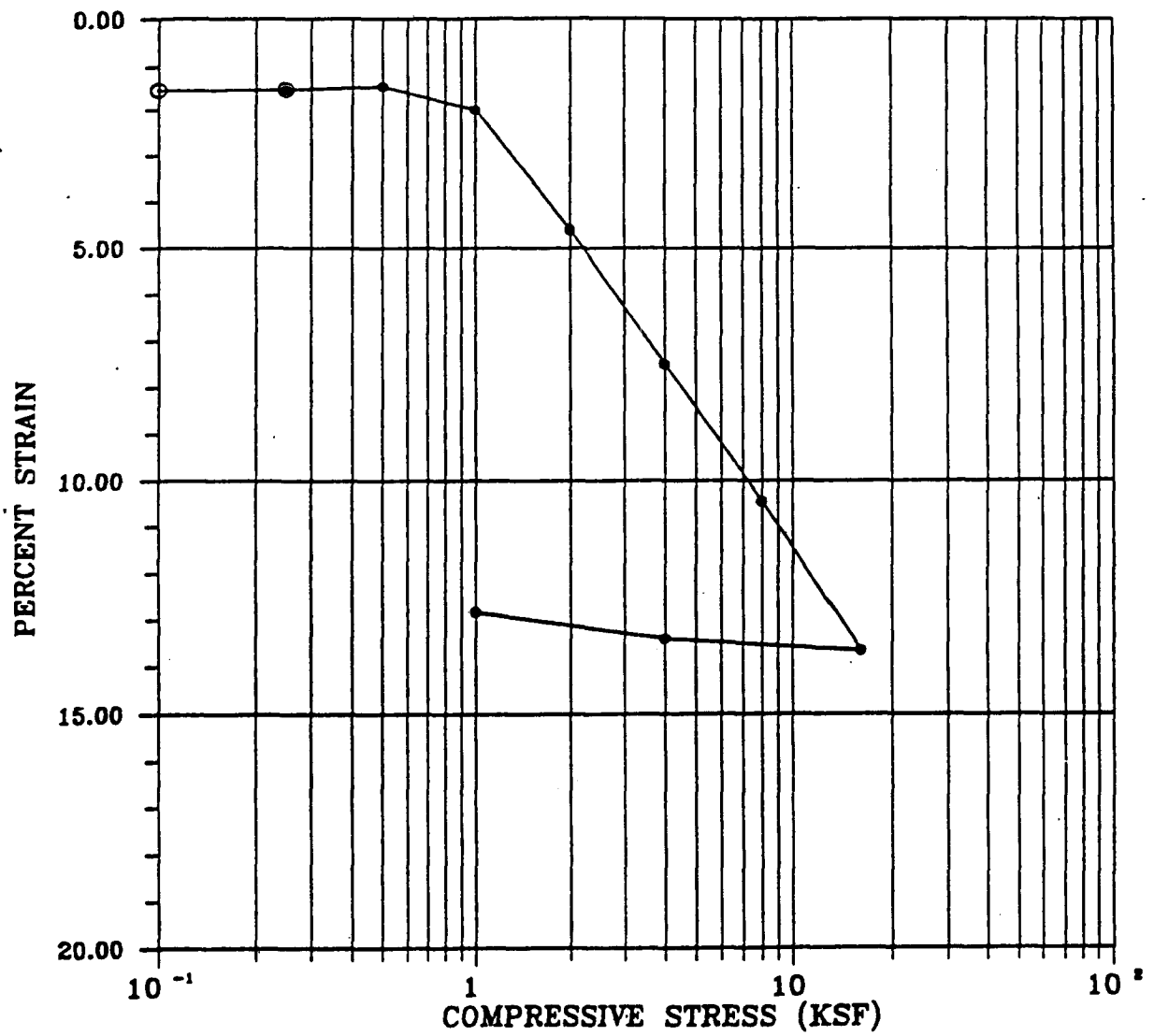


Figure 52

CONSOLIDATION TIME CURVE

SAMPLE NUMBER: M-022A DEPTH: 10.0-10.5

COMPRESSIVE STRESS 1.0 KSF

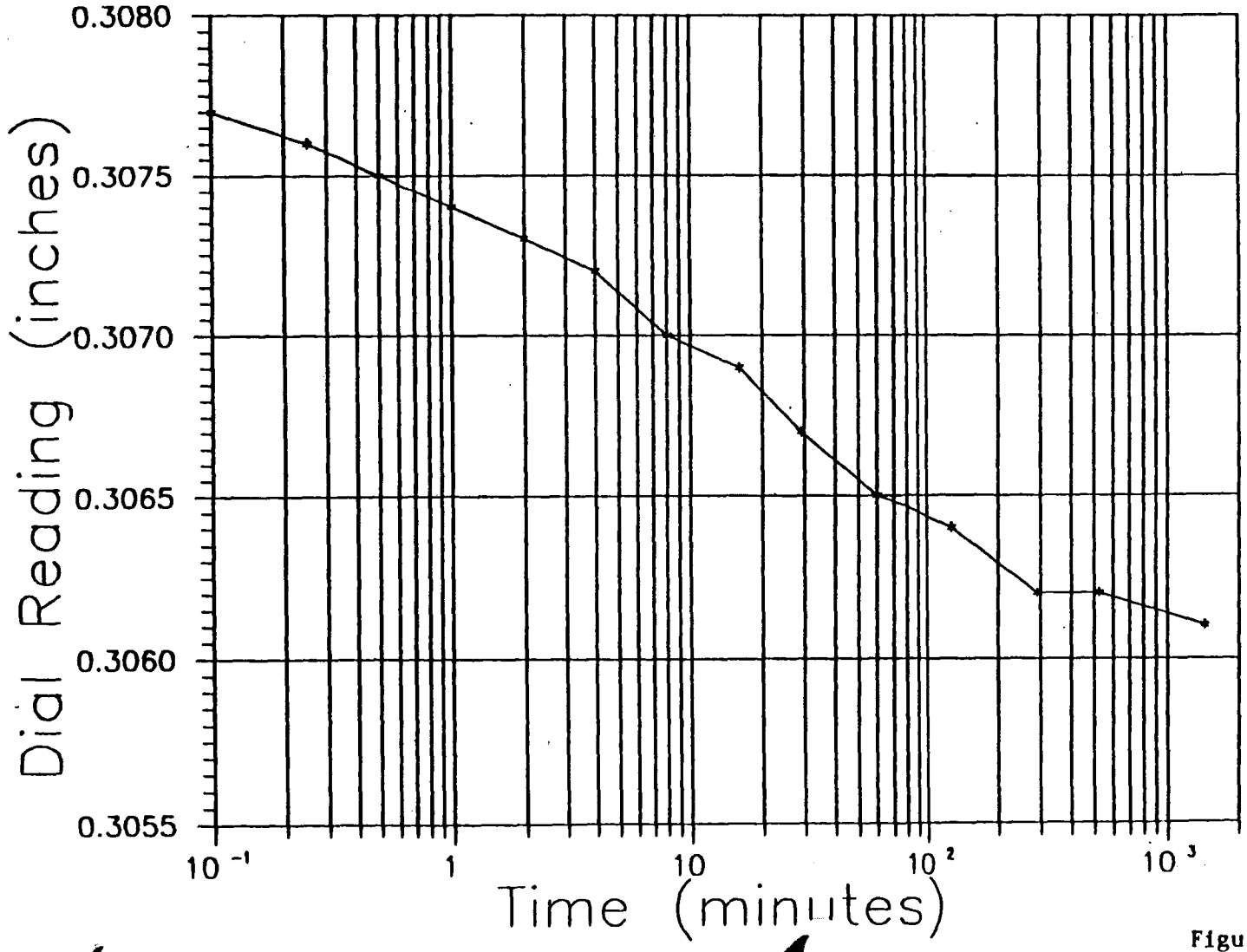


Figure 53

CONSOLIDATION TIME CURVE

SAMPLE NUMBER: M-024E *DEPTH: 15.5-16.0*

COMPRESSIVE STRESS 1.0 KSF

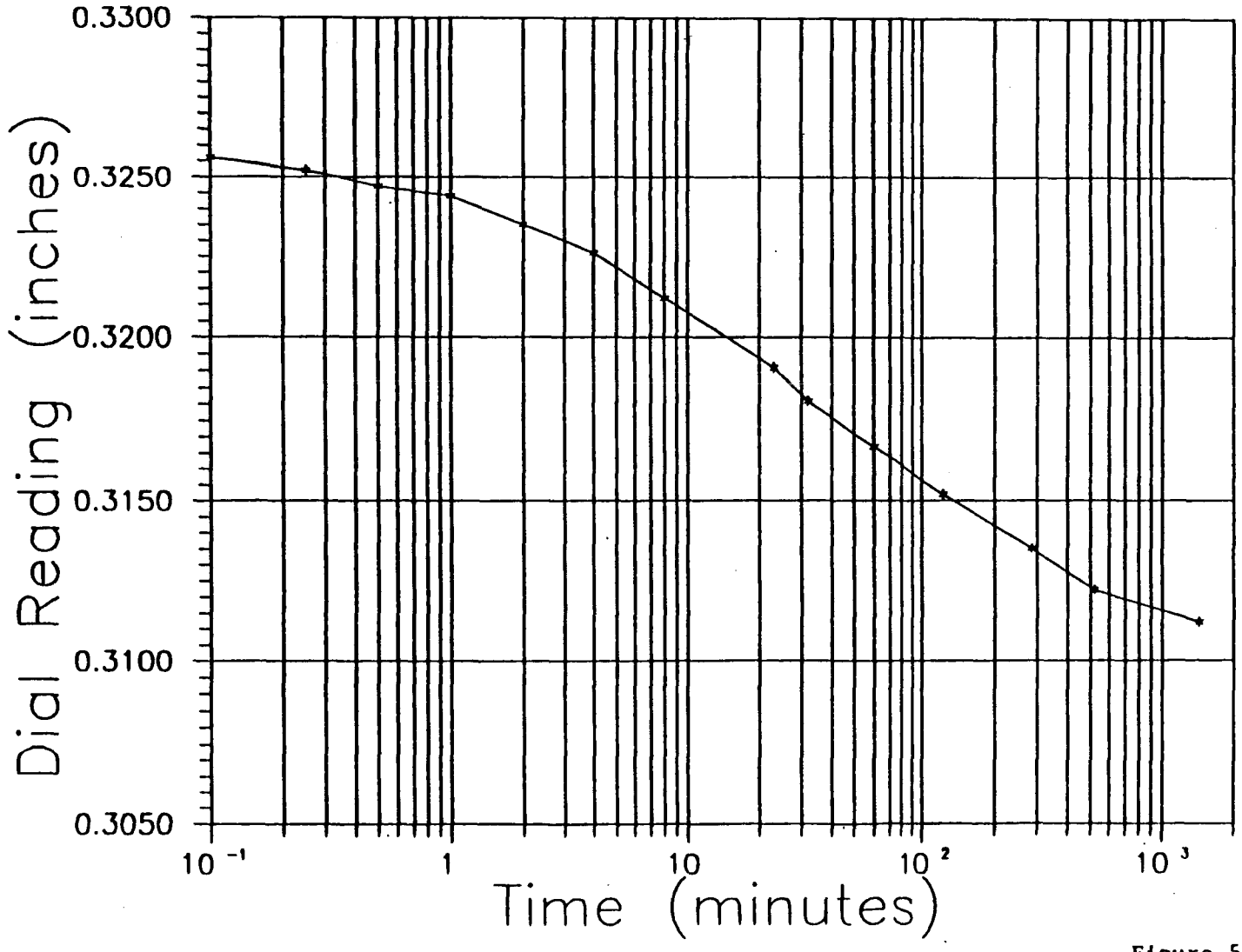


Figure 54

CONSOLIDATION TIME CURVE

SAMPLE NUMBER: M-002E DEPTH: 20.5-21.0

COMPRESSIVE STRESS 1.0 KSF

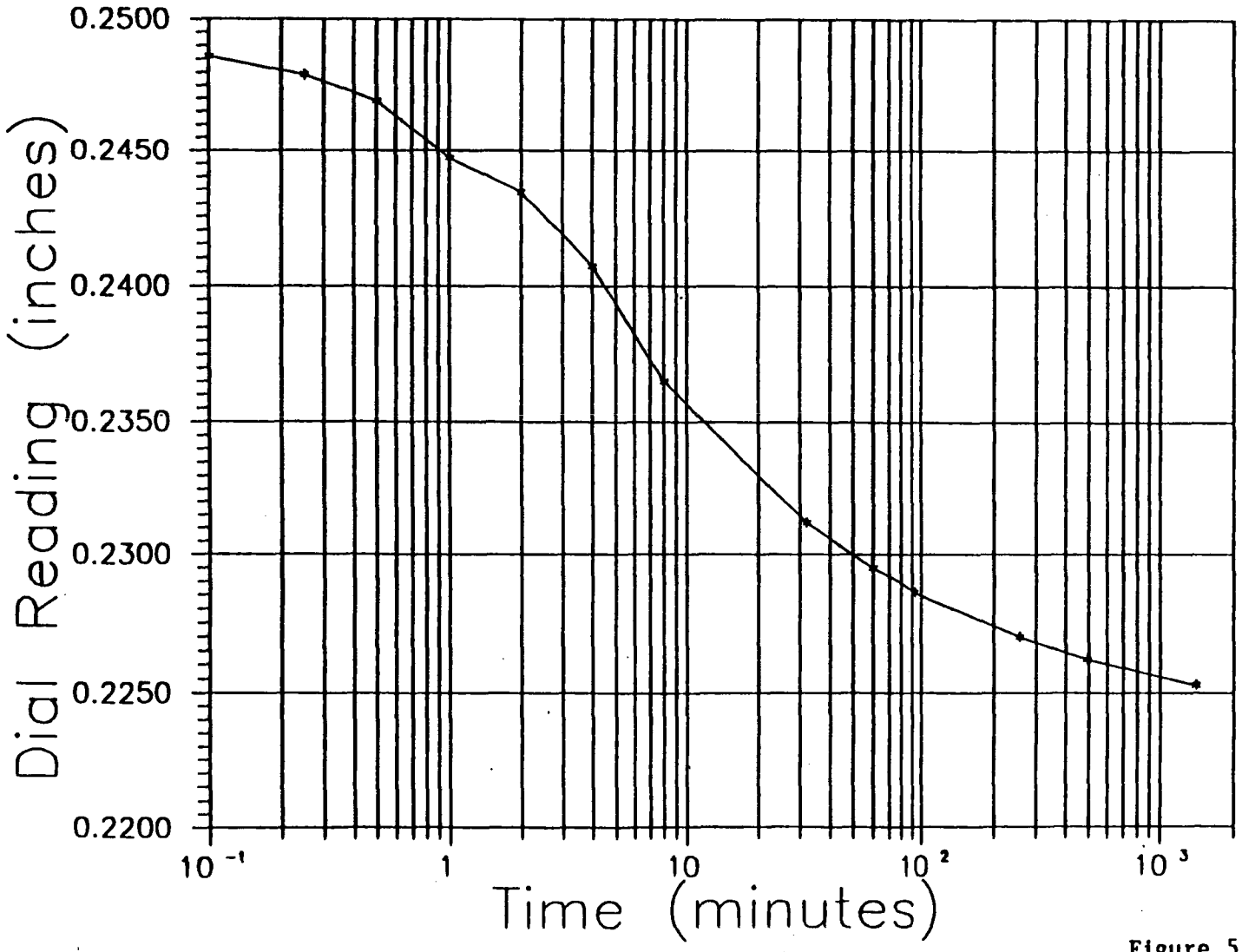


Figure 55

CONSOLIDATION TIME CURVE

SAMPLE NUMBER: M-025E *DEPTH: 28.5-29.0*

COMPRESSIVE STRESS 1.0 KSF

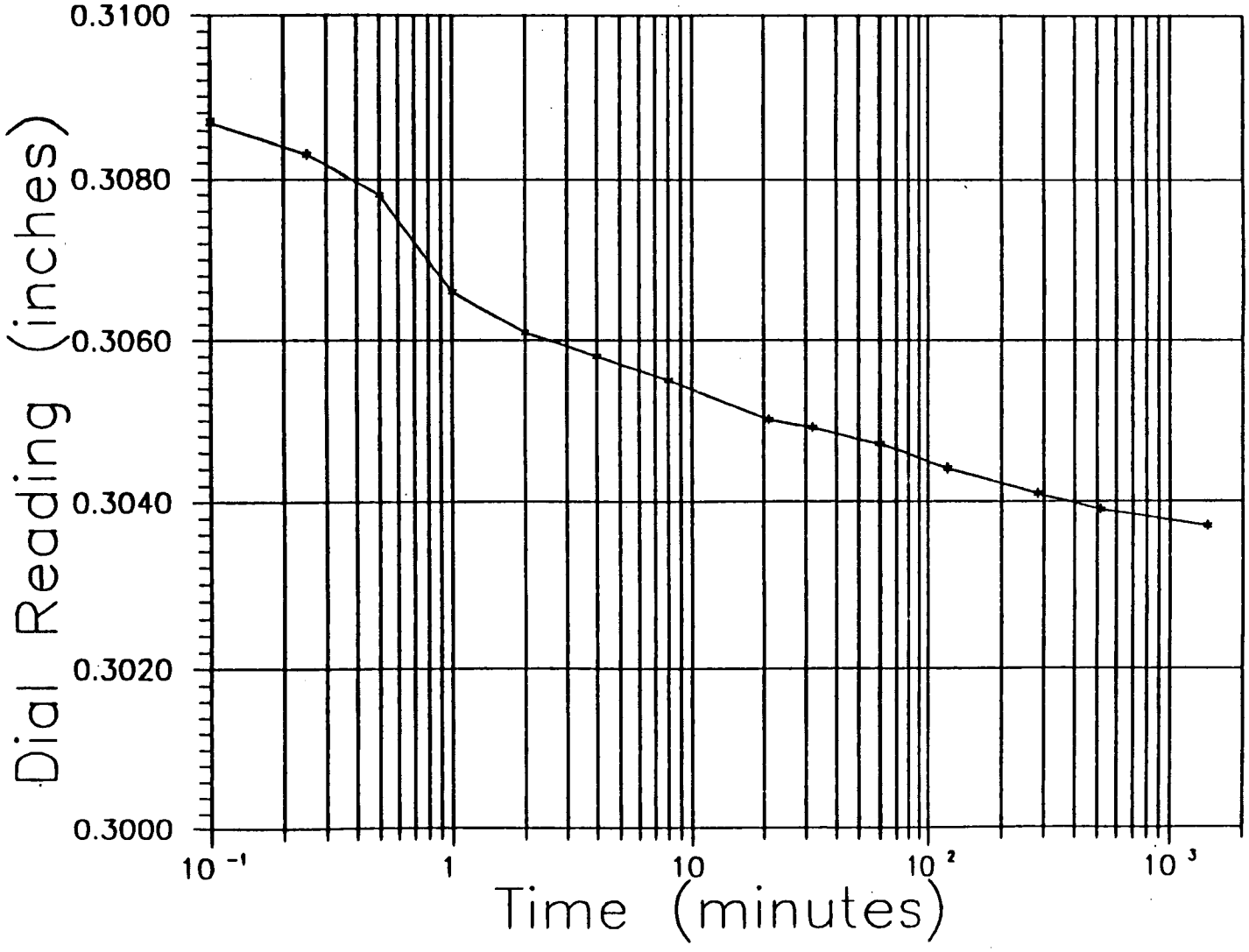


Figure 56

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: NAS-Alameda SML / TETC NO. : 91-220-7003

CLIENT PROJECT NO.: 2738.0215 CLIENT : JAMES M. MONTGOMERY

DATE: Oct. 10, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : M-001E DEPTH : 28.5 ft.

INITIAL DRY DENSITY : 69.7 pcf. INITIAL MOISTURE CONTENT : 53.5 pct.

INITIAL VOID RATIO : 1.418

SPECIFIC GRAVITY : 2.70 (assumed)

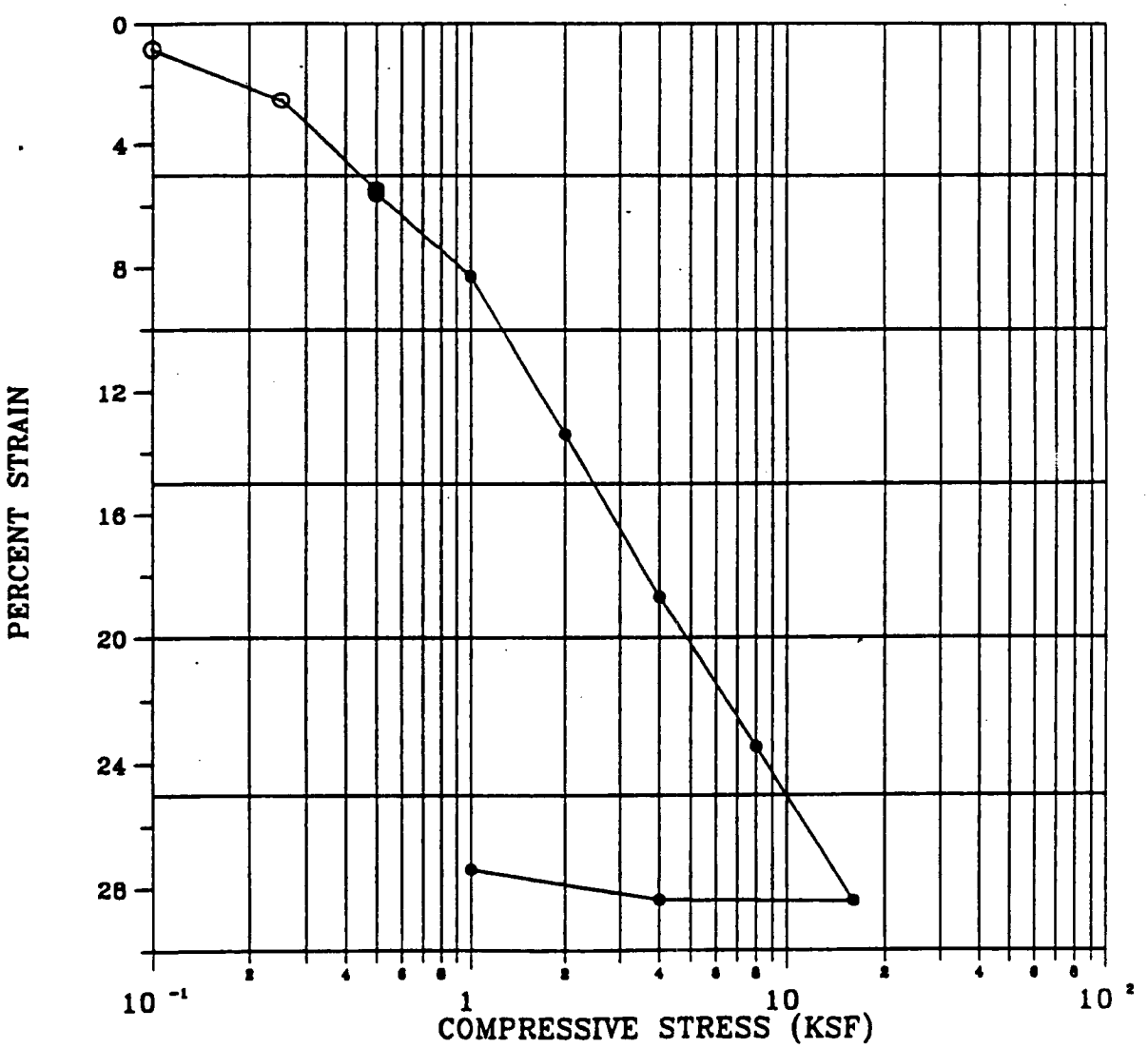


Figure 57

CONSOLIDATION TIME CURVE

SAMPLE NUMBER: M-001E DEPTH: 28.5

COMPRESSIVE STRESS 1.0 KSF

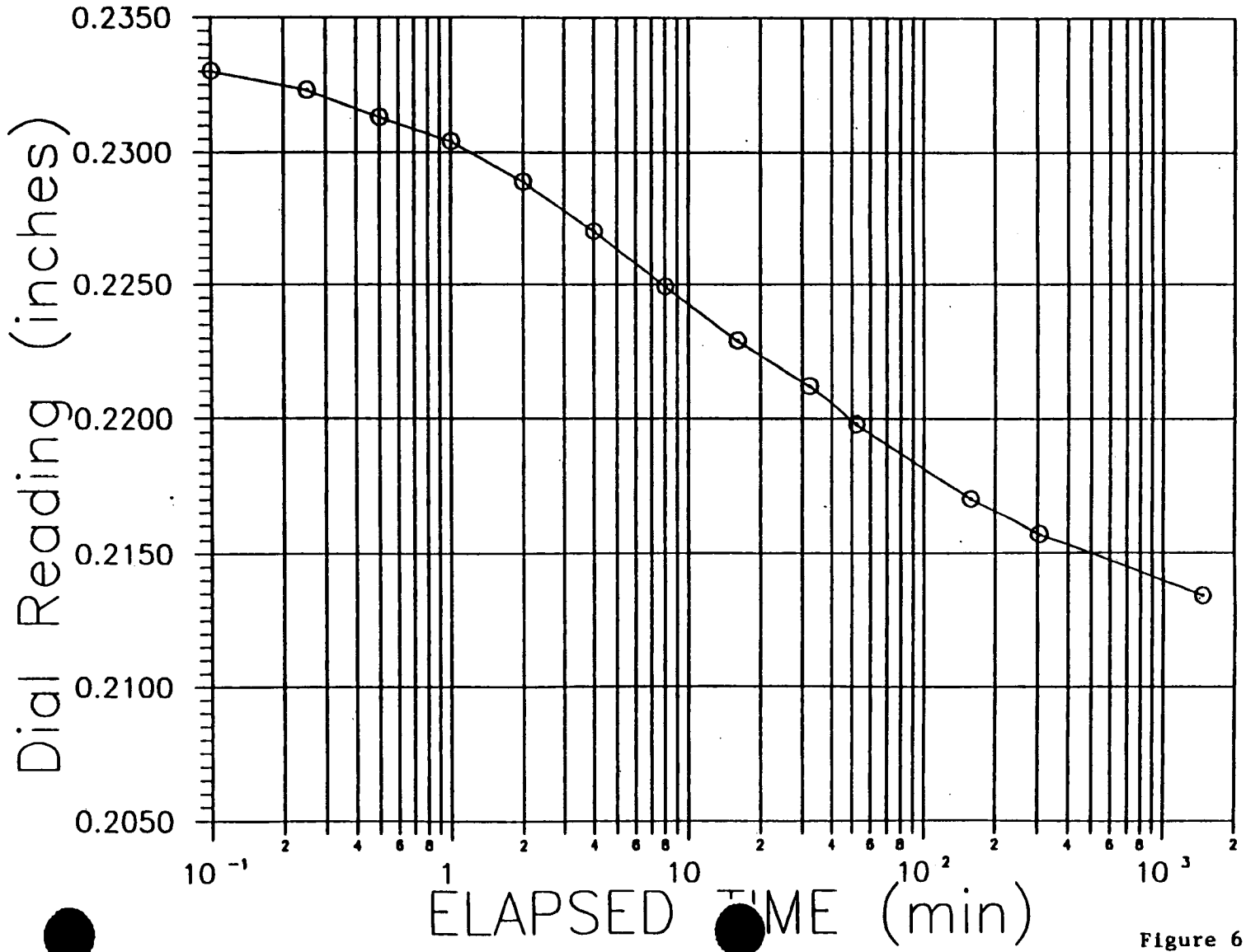


Figure 61

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: NAS-Alameda SML / TETC NO. : 91-220-7003

CLIENT PROJECT NO.: 2738.0215 CLIENT : JAMES M. MONTGOMERY

DATE: Oct. 10, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : M-021C DEPTH : 35.5-36 ft.

INITIAL DRY DENSITY : 82.7 pcf. INITIAL MOISTURE CONTENT : 40.8 pct.

INITIAL VOID RATIO : 1.038

SPECIFIC GRAVITY : 2.70 (assumed)

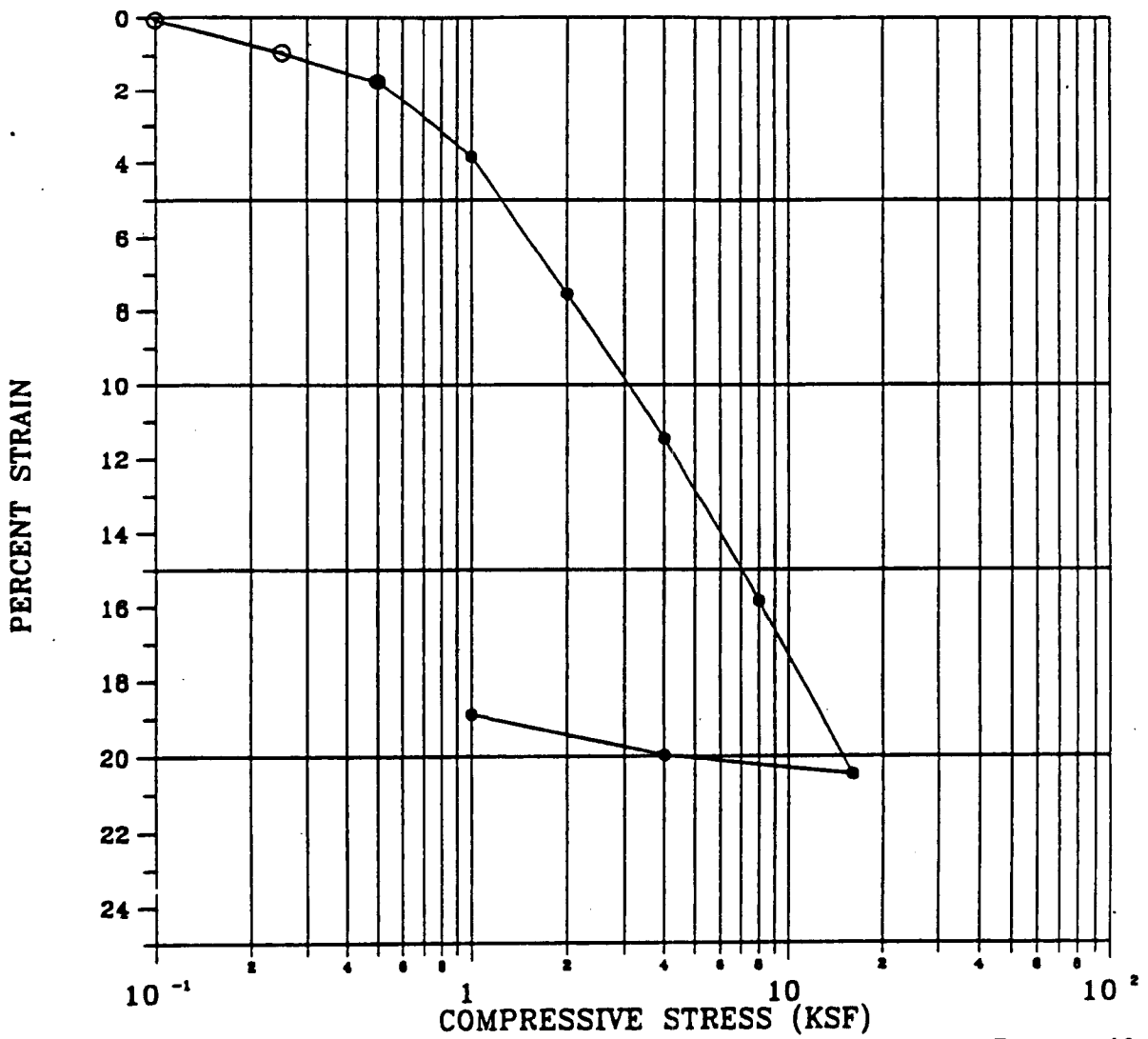


Figure 60

SITE 1 IN SITU PERMIABILITY (SLUG) TEST RESULTS

TABLE G-1

SUMMARY OF HYDRAULIC CONDUCTIVITIES FROM SLUG TESTS
(Sheet 1 of 2)

Well ID	K (cm/sec)	T (cm^2/sec)	b (cm)	Method	Miscellaneous Comments
M001A	2.2E-03	--	--	B&R	fast recovery
M002A	3.1E-03	--	--	B&R	fast recovery
M003A	2.9E-03	--	--	B&R	fast recovery
M004A	3.0E-04	--	--	B&R	
M005A	3.7E-03	--	--	B&R	fast recovery
M006A	1.7E-03	--	--	B&R	fast recovery
M007A	1.6E-02	--	--	B&R	fast recovery
M008A	1.3E-03	--	--	B&R	
M009A	5.0E-04	--	--	B&R	
M010A	3.5E-03	--	--	B&R	fast recovery
M011A	2.6E-03	--	--	B&R	fast recovery
M012A	4.1E-04	--	--	B&R	
M013A	1.0E-03	--	--	B&R	
M014A	5.3E-03	--	--	B&R	fast recovery
M015A	1.1E-02	--	--	B&R	fast recovery
M016A	2.0E-03	--	--	B&R	
M017A	3.1E-03	--	--	B&R	fast recovery
M018A	1.2E-02	--	--	B&R	fast recovery
M019A	4.2E-03	--	--	B&R	fast recovery
M020A	1.1E-03	--	--	B&R	
M021A	9.3E-04	--	--	B&R	
M022A	2.2E-03	--	--	B&R	fast recovery
M023A	6.5E-04	--	--	B&R	
M024A	5.3E-04	--	--	B&R	
M025A	1.4E-03	--	--	B&R	
M026A	2.1E-03	--	--	B&R	
M027A	4.2E-03	--	--	B&R	fast recovery
M028A	1.5E-03	--	--	B&R	
M029A	2.6E-03	--	--	B&R	fast recovery
M101A	6.7E-04	--	--	B&R	
M102A	1.1E-03	--	--	B&R	
M103A	3.9E-04	--	--	B&R	
M104A	3.4E-03	--	--	B&R	fast recovery
M105A	1.5E-03	--	--	B&R	
M106A	1.1E-02	--	--	B&R	fast recovery
M107A	1.0E-03	--	--	B&R	
M108A	1.9E-03	--	--	B&R	fast recovery
M109A	5.5E-03	--	--	B&R	fast recovery
M110A	2.5E-03	--	--	B&R	fast recovery
M111A	1.9E-03	--	--	B&R	
M001E	4.0E-04	--	--	B&R	
M002E	2.3E-03	--	--	B&R	
M018E	8.1E-04	--	--	B&R	
M019E	3.9E-03	--	--	B&R	
M020E	1.2E-03	--	--	B&R	
M021E	5.2E-05	--	--	B&R	

TABLE G-1

SUMMARY OF HYDRAULIC CONDUCTIVITIES FROM SLUG TESTS
(Sheet 2 of 2)

Well ID	K (cm/sec)	T (cm^2/sec)	b (cm)	Method	Miscellaneous Comments
M022E	5.5E-02	--	--	B&R	fast recovery
M023E	2.3E-03	--	--	B&R	
M024E	4.6E-03	--	--	B&R	fast recovery
M025E	1.5E-03	--	--	B&R	fast recovery
M026E	1.7E-03	--	--	B&R	fast recovery
M027E	4.4E-04	--	--	B&R	
M028E	2.7E-03	--	--	B&R	
M029E	1.6E-03	--	--	B&R	
M001B	2.7E-03	3.7	1,371.60	Cooper	fast recovery
M010B	5.2E-05	0.038	731.52	Cooper	
M012B	2.3E-03	3.0	1,341.12	Cooper	
M014B	7.6E-04	1.3	1,706.88	Cooper	
M020B	2.8E-04	0.39	1,371.60	Cooper	
M023B	6.1E-04	0.76	1,249.68	Cooper	
M027B	1.9E-03	2.72	1,463.04	Cooper	
M103B	3.4E-05	0.029	847.34	Cooper	
M105B	1.7E-04	0.24	1,447.80	Cooper	
M108B	1.7E-04	0.28	1,676.40	Cooper	
M007C	2.1E-04	0.50	2,380.49	Cooper	
	6.2E-04			B&R	
M013C	3.8E-04	0.85	2,233.57	Cooper	
	1.9E-03			B&R	
M021C	3.9E-04	0.25	640.08	Cooper	
M025C	7.9E-04	0.69	868.68	Cooper	fast recovery
M027C	1.2E-03	1.81	1,463.04	Cooper	fast recovery
M104C	2.5E-05	0.014	563.88	Cooper	

Note: K - Hydraulic conductivity.
T - Transmissivity.
b - Saturated aquifer thickness.
B&R - Bouwer & Rice unconfined slug test method using AQTESOLV 1.1.
Cooper - Cooper et al. confined slug test method using AQTESOLV 1.1.
fast recovery - Well recovery may be too fast to obtain enough data to produce a good hydraulic conductivity (K) estimate.

SLUG TEST DATA INFORMATION SUMMARY SHEET

This information page summarizes and clarifies information found in the following rising head field data, result output, and graphs. The aquifer testing program description at the beginning of this appendix discusses the following information in greater detail.

Rising Head Field Data*	Measurement Units/Comments
Value (Head)	feet (ft)
Elapsed time**	minutes (min)

* This data was converted in the program to SI units of centimeters and seconds.

** Some values are negative numbers as is a result of the datalogger recording procedures. Based upon initial head readings, the appropriate change in head values were calculated.

Result Output - Bouwer and Rice Method	Measurement Units/Comments
Knowns and Constants:	
Radius of well casing	centimeter (cm)
Radius of well (borehole)*	cm
Aquifer saturated thickness	cm
Well screen length	cm
Static height of water in well	cm
$\text{Log}(R_e/R_w)$	Program printout error, should be $\ln(R_e/R_w)$
A,B,C	Dimensionless parameter as a function of L_e/R_w for the calculation of $\ln(R_e/R_w)$ (see Bouwer and Rice, 1989). These parameters are calculated by the program.
R_e	Equivalent radius over which head loss occurs
R_w	Radius of well (including gravel pack)

* This value may have an borehole radius adjustment (see Bouwer and Rice, 1989).

Results from Visual Curve Matching:	
K (hydraulic conductivity)	cm/sec
y_0	cm; intersection of the slope on the y axis
Visual match parameter estimates	The program statistics provide an incorrect K estimation.
Type Curve Data	Correct estimated K produced by visual/manual curve matching. The time and drawdown data following the K and y_0 results are residual program statistics information. This information is not immediately relevant to the calculated K value.

Result Output Graph:

Figures G-1 and G-2 discussed in the aquifer testing program description illustrate the appropriate slopes on a time versus drawdown graph.

Result Output - Cooper et al Method	Measurement Units/Comments
Knowns and Constants:	
Pumping rate	defaulted to 1
Radius (distance) to obs. well	cm
Results from Curve Matching:	
Transmissivity (T)*	cm^2/sec
Storativity (S)	value meaningless for slug tests

* The hydraulic conductivity, K, was calculated using the following equation: $K = T/b$ where b is the saturated aquifer thickness.

Result Output Graph:

Figure G-4 in the aquifer testing program description illustrates the curve-matching method. The program allowed for statistical and manual best-fit curve matching.

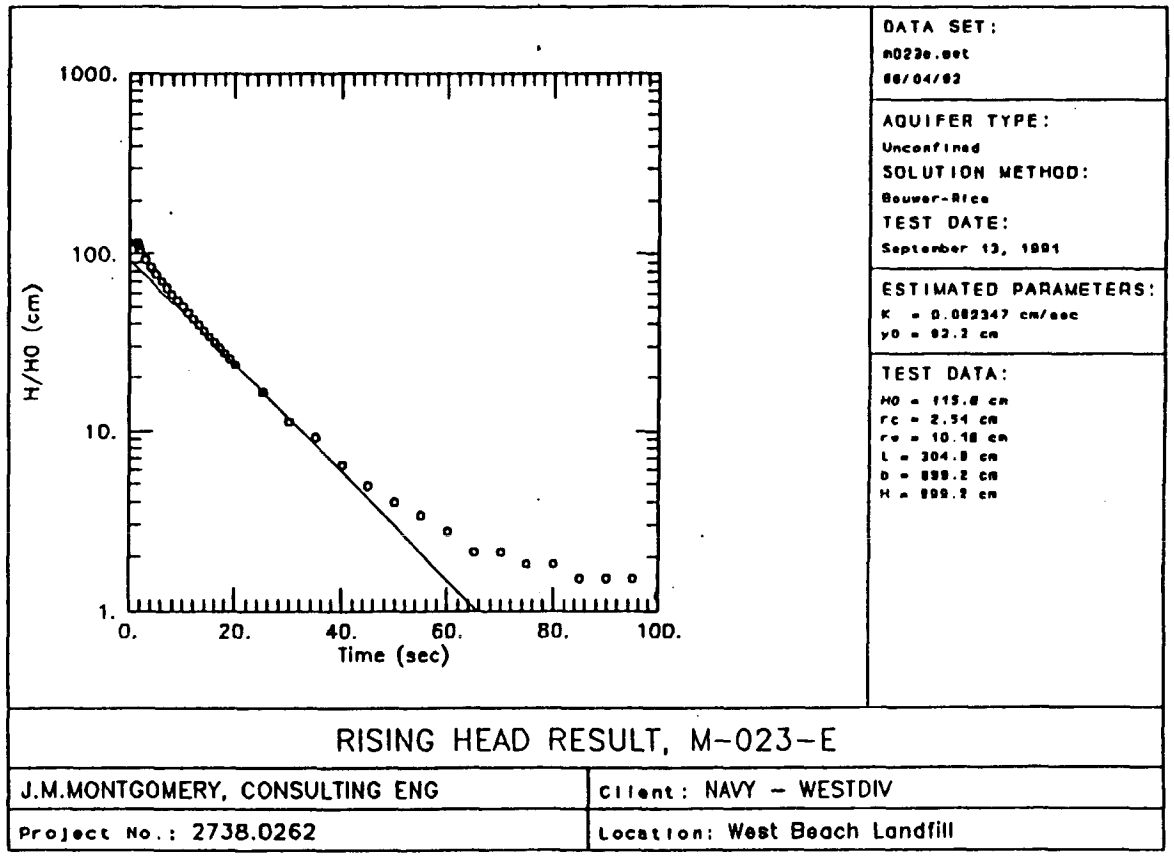


Figure G-1
Example of a typical time versus drawdown graph for unconfined conditions.

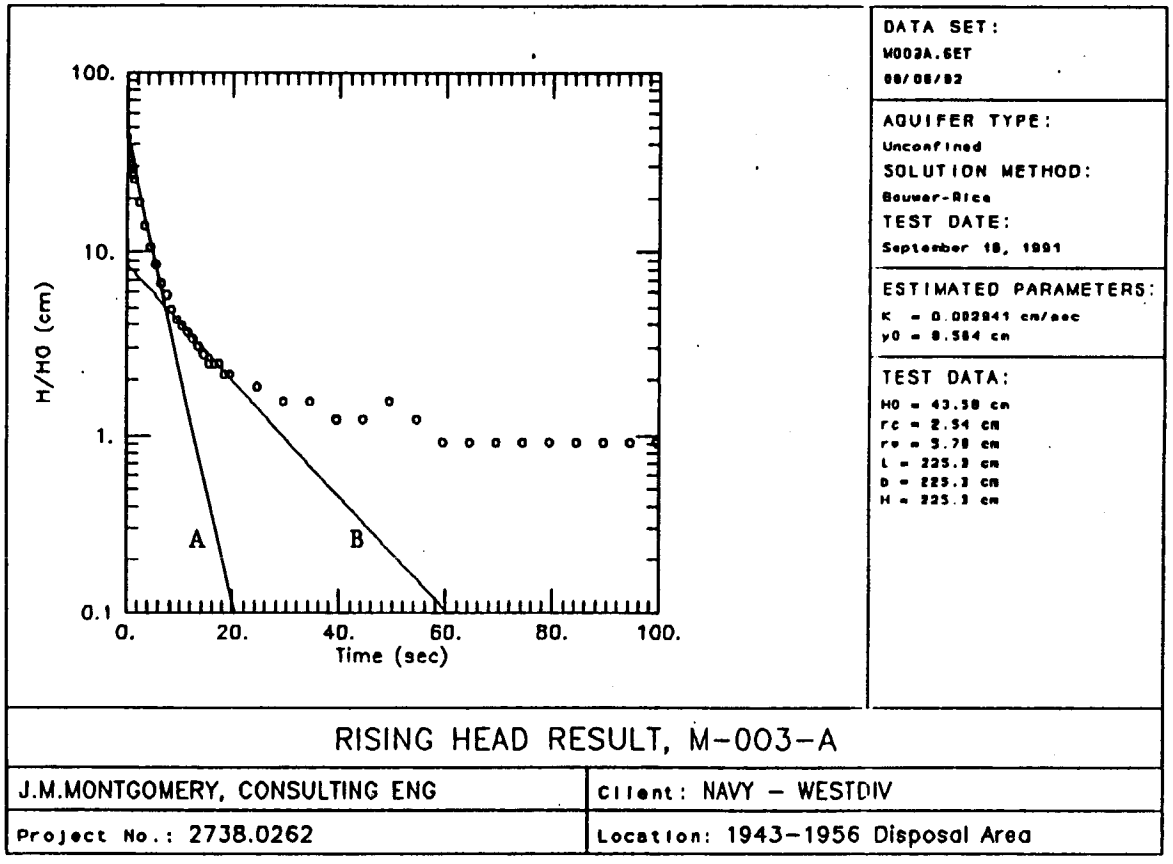


Figure G-2
Example of a time versus drawdown graph illustrating a steep slope, A (early time) and a flat slope, B (late time) for unconfined conditions in which the screen or open interval straddles the water table.

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S

Version 1.10

02/24/92 15:30:30

==

TEST DESCRIPTION

Data set........... m001a.set
Data set title..... RISING HEAD RESULT, M-001-A
Company............ JAMES M. MONTGOMERY
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:
No. of data points.................... 35
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 274.3
Well screen length.................. 274.3
Static height of water in well...... 274.3
Log(Re/Rw).......................... 2.951
A, B, C............................. 0.000, 0.000, 2.549

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

Estimate
K = 1.8613E-003 (Incorrect hydraulic conductivity estimation)
y0 = -1.3253E+100

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 2.21280E-003 cm/sec (Correct estimated hydraulic conductivity)
y0 = 7.16778E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	7.168E+000	8.000E+001	4.361E-002		

Figure G-3
Example of a result output file using the Bouwer and Rice method.

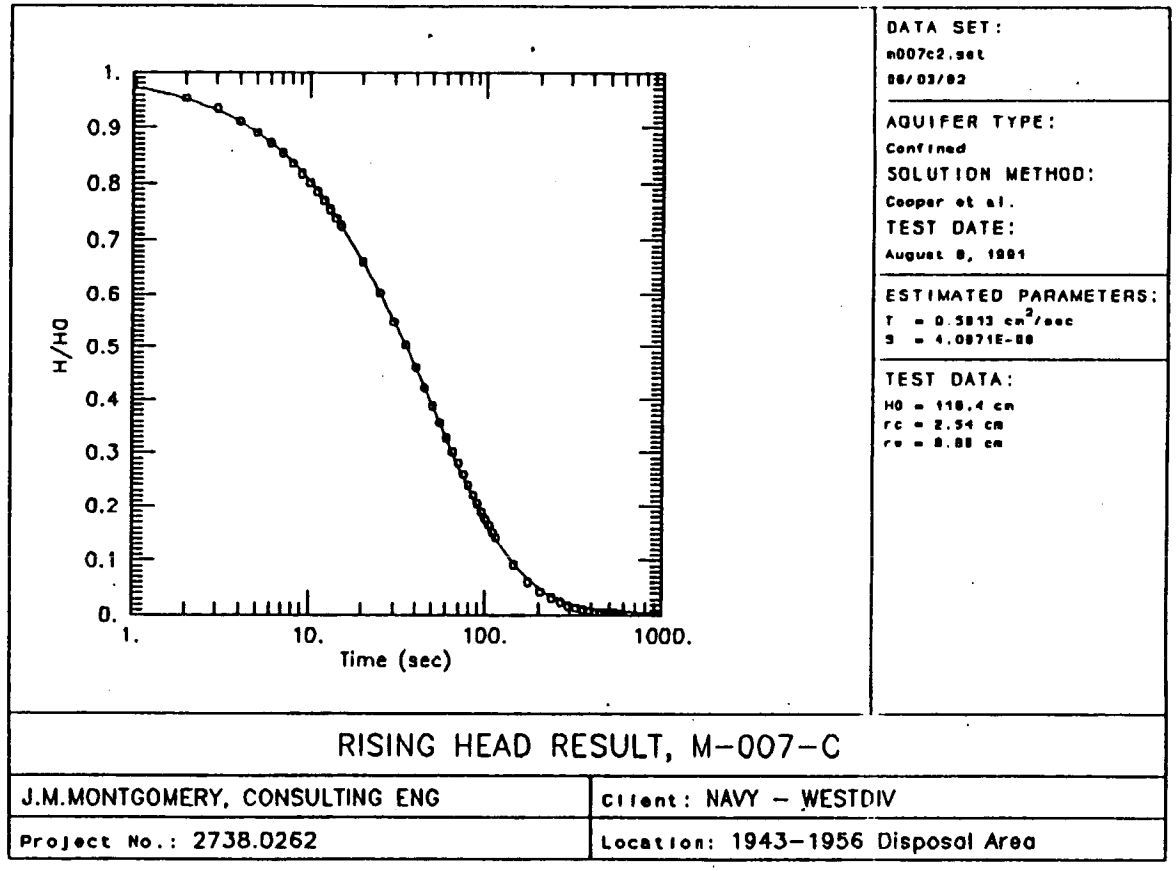


Figure G-4
Example of a change in head versus time semi-log graph using the Cooper et al. curve-matching method.

AQTESOLV RESULTS
Version 1.10

06/04/92

TEST DESCRIPTION

Data set..... m001b.set
Data set title..... RISING HEAD RESULT, M-001-B
Company..... J.M.MONTGOMERY, CONSULTING ENG
Project..... 2738.0262
Client..... NAVY - WESTDIV
Location..... 1943-1956 Disposal Area
Test date..... July 26, 1991

Knowns and Constants:
No. of data points..... 24
Pumping rate..... 1
Radius (distance) to obs. well..... 2.54

ANALYTICAL METHOD

Cooper et al. (Confined Aquifer Slug Test)

RESULTS FROM CURVE MATCHING

MATCH PARAMETER ESTIMATES

		Estimate	
T	=	3.6670E+000	cm^2/sec
S	=	3.2728E-005	

Figure G-5
Example of a result output file using the Cooper et al. method.

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S

Version 1.10

02/24/92 15:30:30

==

TEST DESCRIPTION

Data set........... m001a.set
Data set title..... RISING HEAD RESULT, M-001-A
Company............ JAMES M. MONTGOMERY
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:

No. of data points..................... 35
Radius of well casing................ 2.54
Radius of well....................... 5.79
Aquifer saturated thickness......... 274.3
Well screen length.................. 274.3
Static height of water in well...... 274.3
Log(Re/Rw)........................... 2.951
A, B, C............................. 0.000, 0.000, 2.549

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

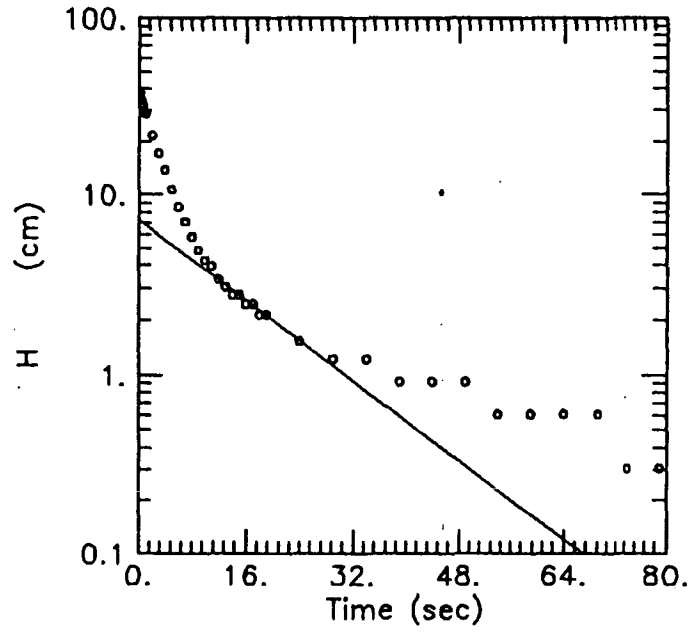
	Estimate
K =	1.8613E-003
y0 =	-1.3253E+100

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 2.21280E-003
y0 = 7.16778E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	7.168E+000	8.000E+001	4.361E-002		



DATA SET:
m001a.est
02/24/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 28, 1991

ESTIMATED PARAMETERS:
K = 0.082213 cm/sec
y0 = 7.186 cm

TEST DATA:
H0 = 38.4 cm
rc = 2.54 cm
rw = 5.78 cm
L = 274.3 cm
b = 274.3 cm
H = 274.3 cm

RISING HEAD RESULT, M-001-A

JAMES M. MONTGOMERY	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: 1943–1956 Disposal Area

M-002-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/13 12:45

Unit# 00515 Test# 9

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/13 10:58

Elapsed Time (min)	Value (ft)
0.0000	0.00
0.0033	0.00
0.0066	1.79
0.0099	1.24
0.0133	0.97
0.0166	0.92
0.0200	0.90
0.0233	0.87
0.0266	0.86
0.0300	0.82
0.0333	0.80
0.0500	0.68
0.0666	0.58
0.0833	0.49
0.1000	0.41
0.1166	0.35
0.1333	0.29
0.1500	0.25
0.1666	0.22
0.1833	0.19
0.2000	0.17
0.2166	0.15
0.2333	0.14
0.2500	0.12
0.2666	0.10
0.2833	0.09
0.3000	0.09
0.3166	0.08
0.3333	0.07
0.4167	0.06
0.5000	0.04
0.5833	0.04
0.6667	0.03
0.7500	0.02
0.8333	0.02
0.9167	0.02
1.0000	0.02
1.0833	0.02
1.1667	0.01
1.2500	0.01
1.3333	0.01
1.4166	0.01
1.5000	0.01
1.5833	0.01
1.6667	0.01
1.7500	0.01
1.8333	0.01
1.9167	0.01
2.0000	0.01

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>

A Q T E S O L V   R E S U L T S

Version 1.10

02/24/92 16:06:00

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TEST DESCRIPTION

Data set........... M002A.SET
Data set title..... RISING HEAD RESULT, M-002-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... September 13, 1991

Knowns and Constants:
No. of data points................... 46
Radius of well casing................ 2.54
Radius of well....................... 5.79
Aquifer saturated thickness.......... 73.15
Well screen length................... 73.15
Static height of water in well...... 73.15
Log(Re/Rw)........................... 1.834
A, B, C.............................. 0.000, 0.000, 1.408

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

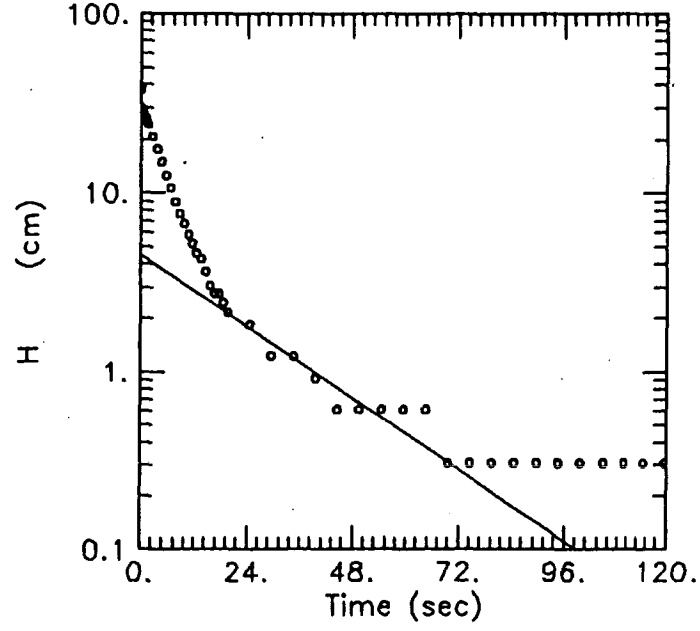
	Estimate
K =	3.2909E-003
y0 =	-1.3253E+100

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>

TYPE CURVE DATA

K = 3.11689E-003
y0 = 4.50557E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	4.506E+000	1.200E+002	4.423E-002		



DATA SET:
M002A.SET
82/24/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bower-Rice
TEST DATE:
September 13, 1991

ESTIMATED PARAMETERS:
K = 0.083117 cm/sec
y0 = 4.588 cm

TEST DATA:
H0 = 28.21 cm
rc = 2.54 cm
rw = 5.78 cm
L = 73.15 cm
D = 73.15 cm
H = 73.15 cm

RISING HEAD RESULT, M-002-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-003-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/16 13:26

Unit# 00515 Test# 1

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/16 09:19

Elapsed Time (min)	Value (ft)
0.0000	5.90
0.0033	7.47
0.0066	0.98
0.0099	1.43
0.0133	1.24
0.0166	1.16
0.0200	1.09
0.0233	1.00
0.0266	0.95
0.0300	0.88
0.0333	0.83
0.0500	0.62
0.0666	0.46
0.0833	0.35
0.1000	0.28
0.1166	0.22
0.1333	0.19
0.1500	0.16
0.1666	0.14
0.1833	0.13
0.2000	0.12
0.2166	0.11
0.2333	0.10
0.2500	0.09
0.2666	0.08
0.2833	0.08
0.3000	0.08
0.3166	0.07
0.3333	0.07
0.4167	0.06
0.5000	0.05
0.5833	0.05
0.6667	0.04
0.7500	0.04
0.8333	0.05
0.9167	0.04
1.0000	0.03
1.0833	0.03
1.1667	0.03
1.2500	0.03
1.3333	0.03
1.4166	0.03
1.5000	0.03
1.5833	0.03
1.6667	0.03
1.7500	0.03
1.8333	0.03
1.9167	0.03
2.0000	0.03

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A Q T E S O L V   R E S U L T S

Version 1.10

06/08/92 06:18:01

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TEST DESCRIPTION

Data set........... M003A.SET
Data set title..... RISING HEAD RESULT, M-003-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... September 16, 1991

Knowns and Constants:
   No. of data points.................. 45
   Radius of well casing............... 2.54
   Radius of well...................... 5.79
   Aquifer saturated thickness......... 225.3
   Well screen length.................. 225.3
   Static height of water in well...... 225.3
   Log(Re/Rw).......................... 2.789
   A, B, C............................. 0.000, 0.000, 2.260

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

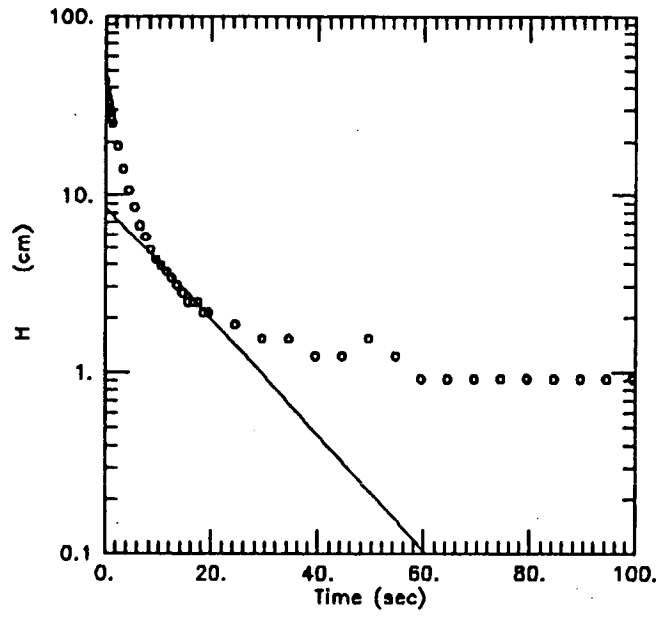
	Estimate
K =	2.9409E-003
y0 =	4.2766E-306

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 2.94090E-003
y0 = 8.56363E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	8.564E+000	1.000E+002	5.432E-003		



DATA SET:
M003A.SET
08/08/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
September 18, 1991

ESTIMATED PARAMETERS:
K = 0.082941 cm/sec
y0 = 0.584 cm

TEST DATA:
H0 = 43.38 cm
rc = 2.54 cm
rw = 5.78 cm
L = 225.3 cm
b = 225.3 cm
H = 225.3 cm

RISING HEAD RESULT, M-003-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-004-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/16 13:35

Unit# 00515 Test# 3

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/16 09:44

Elapsed Time (min)	Value (ft)
0.0000	0.00
0.0033	0.02
0.0066	6.00
0.0099	8.69
0.0133	-2.97
0.0166	4.09
0.0200	0.64
0.0233	2.94
0.0266	1.25
0.0300	2.45
0.0333	1.57
0.0500	1.93
0.0666	1.87
0.0833	1.83
0.1000	1.80
0.1166	1.78
0.1333	1.75
0.1500	1.73
0.1666	1.71
0.1833	1.68
0.2000	1.66
0.2166	1.64
0.2333	1.62
0.2500	1.60
0.2666	1.58
0.2833	1.56
0.3000	1.54
0.3166	1.52
0.3333	1.50
0.4167	1.42
0.5000	1.34
0.5833	1.27
0.6667	1.17
0.7500	1.15
0.8333	1.10
0.9167	1.05
1.0000	1.00
1.0833	0.96
1.1667	0.92
1.2500	0.88
1.3333	0.85
1.4166	0.81
1.5000	0.78
1.5833	0.75
1.6667	0.72
1.7500	0.70
1.8333	0.67
1.9167	0.65
2.0000	0.63
2.5000	0.52
3.0000	0.46
3.5000	0.41
4.0000	0.38
4.5000	0.35
5.0000	0.34
5.5000	0.32
6.0000	0.31
6.5000	0.30
7.0000	0.29
7.5000	0.28
8.0000	0.28
8.5000	0.27

A Q T E S O L V   R E S U L T S
Version 1.10

06/04/92 03:38:44

TEST DESCRIPTION

Data set........... m004a.set
Data set title..... RISING HEAD RESULT, M-004-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... September 16, 1991

Knowns and Constants:
No. of data points................... 50
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 228
Well screen length.................. 228
Static height of water in well...... 228
Log(Re/Rw).......................... 2.799
A, B, C............................. 0.000, 0.000, 2.276

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.6723E-004
y0 =	4.7289E-308

TYPE CURVE DATA

K = 3.00569E-004
y0 = 4.65933E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	4.659E+001	4.000E+002	2.238E+000		

M-024-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/30 22:09

Unit# 00515 Test# 5

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/30 15:29

Elapsed Time (min)	Value (ft)
0.0000	-8.88
0.0033	-9.57
0.0066	-7.22
0.0099	-4.24
0.0133	-8.06
0.0166	-8.86
0.0200	-7.57
0.0233	-8.24
0.0266	-8.33
0.0300	-8.27
0.0333	-8.37
0.0500	-8.52
0.0666	-8.65
0.0833	-8.74
0.1000	-8.80
0.1166	-8.86
0.1333	-8.91
0.1500	-8.96
0.1666	-8.99
0.1833	-9.03
0.2000	-9.06
0.2166	-9.08
0.2333	-9.11
0.2500	-9.14
0.2666	-9.15
0.2833	-9.17
0.3000	-9.19
0.3166	-9.20
0.3333	-9.21
0.4167	-9.26
0.5000	-9.29
0.5833	-9.31
0.6667	-9.32
0.7500	-9.33
0.8333	-9.34
0.9167	-9.35
1.0000	-9.35
1.0833	-9.36
1.1667	-9.36
1.2500	-9.37
1.3333	-9.37
1.4166	-9.37
1.5000	-9.38
1.5833	-9.38
1.6667	-9.38
1.7500	-9.38
1.8333	-9.38
1.9167	-9.39
2.0000	-9.39
2.5000	-9.40
3.0000	-9.40
3.5000	-9.40
4.0000	-9.41
4.5000	-9.40
5.0000	-9.42
5.5000	-9.43
6.0000	-9.43
6.5000	-9.43
7.0000	-9.43
7.5000	-9.43
8.0000	-9.42
8.5000	-9.43
9.0000	-9.43
9.5000	-9.43
10.0000	-9.43
12.0000	-9.43

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S
Version 1.10

02/25/92 16:44:51

==

TEST DESCRIPTION

Data set........... m024a.set
Data set title..... RISING HEAD RESULT, M-024-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... West Beach Landfill
Test date.......... July 30, 1991

Knowns and Constants:
No. of data points................... 46
Radius of well casing................ 2.54
Radius of well....................... 5.79
Aquifer saturated thickness.......... 259.7
Well screen length................... 259.7
Static height of water in well...... 259.7
Log(Re/Rw)........................... 2.906
A, B, C.............................. 0.000, 0.000, 2.462

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

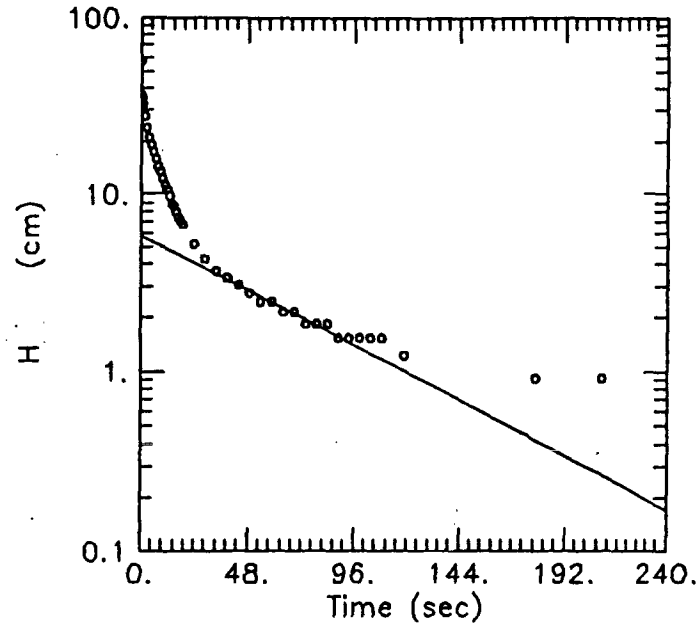
	Estimate
K =	5.2979E-004
y0 =	6.6365E+265

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 5.29787E-004
y0 = 5.76843E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	5.768E+000	2.400E+002	1.703E-001		



DATA SET:
m024a.aet
92/23/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 30, 1991

ESTIMATED PARAMETERS:
K = 0.0005288 cm/sec
y0 = 5.788 cm

TEST DATA:
H0 = 58.88 cm
rc = 2.54 cm
rw = 5.78 cm
L = 259.7 cm
b = 259.7 cm
H = 259.7 cm

RISING HEAD RESULT, M-024-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: West Beach Landfill

M-025-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/30 22:02

Unit# 00515 Test# 3

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/30 12:57

Elapsed Time (min)	Value (ft)
0.0000	-9.62
0.0033	-9.05
0.0066	-7.02
0.0099	-5.01
0.0133	-10.09
0.0166	-6.74
0.0200	-8.15
0.0233	-8.00
0.0266	-8.02
0.0300	-8.06
0.0333	-8.10
0.0500	-8.25
0.0666	-8.37
0.0833	-8.48
0.1000	-8.58
0.1166	-8.68
0.1333	-8.76
0.1500	-8.83
0.1666	-8.89
0.1833	-8.94
0.2000	-8.99
0.2166	-9.03
0.2333	-9.07
0.2500	-9.10
0.2666	-9.13
0.2833	-9.16
0.3000	-9.18
0.3166	-9.21
0.3333	-9.22
0.4167	-9.30
0.5000	-9.36
0.5833	-9.39
0.6667	-9.42
0.7500	-9.44
0.8333	-9.46
0.9167	-9.47
1.0000	-9.49
1.0833	-9.50
1.1667	-9.51
1.2500	-9.52
1.3333	-9.53
1.4166	-9.53
1.5000	-9.54
1.5833	-9.55
1.6667	-9.56
1.7500	-9.56
1.8333	-9.57
1.9167	-9.57
2.0000	-9.58
2.5000	-9.62
3.0000	-9.64
3.5000	-9.67
4.0000	-9.69
4.5000	-9.71
5.0000	-9.73
5.5000	-9.74
6.0000	-9.76
6.5000	-9.77
7.0000	-9.78
7.5000	-9.79
8.0000	-9.79
8.5000	-9.81
9.0000	-9.82
9.5000	-9.83
10.0000	-9.82
12.0000	-9.85
14.0000	-9.86

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A Q T E S O L V   R E S U L T S

Version 1.10

06/08/92 06:39:23

==

TEST DESCRIPTION

Data set........... M025A.set
Data set title..... RISING HEAD RESULT, M-025-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 30, 1991

Knowns and Constants:

No. of data points.................. 55
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 264
Well screen length.................. 264
Static height of water in well...... 264
Log(Re/Rw).......................... 2.919
A, B, C............................. 0.000, 0.000, 2.487

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

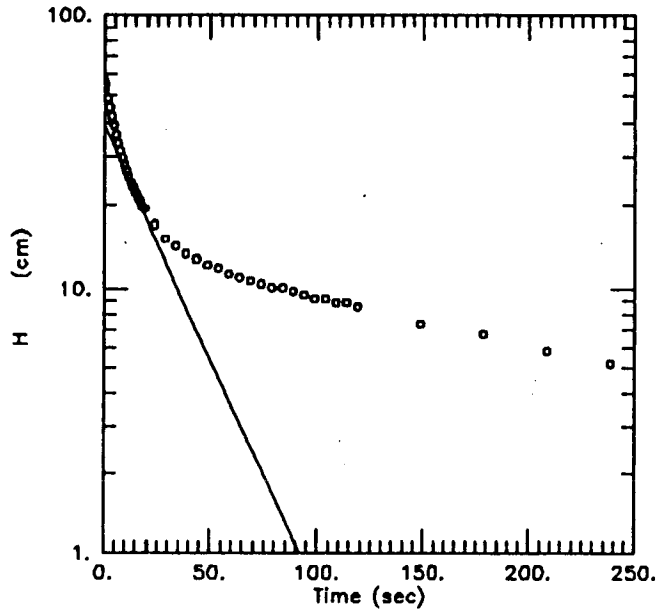
	Estimate
K =	9.2341E-004
y0 =	4.2766E-306

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 1.41573E-003
y0 = 3.87669E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	3.877E+001	2.500E+002	1.905E-003		



DATA SET:
M025A.aet
86/08/02

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 30, 1991

ESTIMATED PARAMETERS:
K = 0.081418 cm/sec
y0 = 38.77 cm

TEST DATA:
H0 = 50.88 cm
rc = 2.54 cm
rw = 5.78 cm
L = 264. cm
D = 264. cm
H = 284. cm

RISING HEAD RESULT, M-025-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-026-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/30 21:53

Unit# 00515 Test# 1

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/30 11:37

Elapsed Time (min)	Value (ft)
0.0000	-9.61
0.0033	-8.92
0.0066	-5.67
0.0099	-2.18
0.0133	-11.02
0.0166	-7.78
0.0200	-7.61
0.0233	-7.70
0.0266	-7.77
0.0300	-7.83
0.0333	-7.90
0.0500	-8.15
0.0666	-8.37
0.0833	-8.56
0.1000	-8.72
0.1166	-8.85
0.1333	-8.97
0.1500	-9.07
0.1666	-9.16
0.1833	-9.23
0.2000	-9.28
0.2166	-9.33
0.2333	-9.36
0.2500	-9.39
0.2666	-9.42
0.2833	-9.44
0.3000	-9.45
0.3166	-9.47
0.3333	-9.48
0.4167	-9.53
0.5000	-9.56
0.5833	-9.57
0.6667	-9.59
0.7500	-9.60
0.8333	-9.61
0.9167	-9.62
1.0000	-9.62
1.0833	-9.63
1.1667	-9.63
1.2500	-9.64
1.3333	-9.64
1.4166	-9.64
1.5000	-9.64
1.5833	-9.64
1.6667	-9.65
1.7500	-9.65
1.8333	-9.65
1.9167	-9.65
2.0000	-9.65
2.5000	-9.66
3.0000	-9.67
3.5000	-9.67
4.0000	-9.68
4.5000	-9.68
5.0000	-9.68
5.5000	-9.68
6.0000	-9.68
6.5000	-9.68
7.0000	-9.68
7.5000	-9.69
8.0000	-9.69
8.5000	-9.70
9.0000	-9.71
9.5000	-9.71
10.0000	-9.71
12.0000	-9.72
14.0000	-9.72

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A Q T E S O L V   R E S U L T S

Version 1.10

06/08/92 06:41:54

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TEST DESCRIPTION

Data set........... m026a.set
Data set title..... RISING HEAD RESULT, M-026-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 30, 1991

Knowns and Constants:

No. of data points................... 58
Radius of well casing................ 2.54
Radius of well....................... 5.79
Aquifer saturated thickness.......... 228.3
Well screen length................... 228.3
Static height of water in well....... 228.3
Log(Re/Rw)........................... 2.8
A, B, C.............................. 0.000, 0.000, 2.277

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

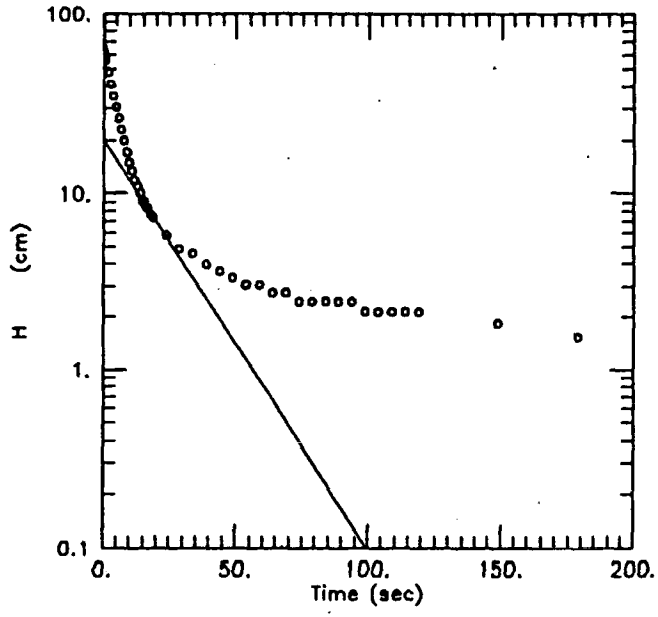
	Estimate
K =	2.1028E-003
y0 =	4.2766E-306

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 2.10277E-003
y0 = 2.00703E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.007E+001	2.000E+002	4.857E-004		



DATA SET:
m026a.aet
06/08/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 30, 1991

ESTIMATED PARAMETERS:
K = 0.002103 cm/sec
y0 = 20.87 cm

TEST DATA:
H0 = 84.31 cm
rc = 2.54 cm
rw = 5.78 cm
L = 228.3 cm
D = 228.3 cm
H = 228.3 cm

RISING HEAD RESULT, M-026-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-027-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/29 15:19

Unit# 00515 Test# 3

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/26 12:07

Elapsed Time (min)	Value (ft)
0.0000	-3.01
0.0033	-8.41
0.0066	-8.04
0.0099	-8.17
0.0133	-8.28
0.0166	-8.35
0.0200	-8.42
0.0233	-8.49
0.0266	-8.56
0.0300	-8.62
0.0333	-8.67
0.0500	-8.90
0.0666	-9.06
0.0833	-9.18
0.1000	-9.26
0.1166	-9.33
0.1333	-9.37
0.1500	-9.41
0.1666	-9.43
0.1833	-9.46
0.2000	-9.47
0.2166	-9.49
0.2333	-9.50
0.2500	-9.50
0.2666	-9.51
0.2833	-9.52
0.3000	-9.52
0.3166	-9.52
0.3333	-9.53
0.4167	-9.54
0.5000	-9.55
0.5833	-9.55
0.6667	-9.55
0.7500	-9.56
0.8333	-9.56
0.9167	-9.56
1.0000	-9.56
1.0833	-9.56
1.1667	-9.56
1.2500	-9.56
1.3333	-9.57
1.4166	-9.57
1.5000	-9.57
1.5833	-9.57
1.6667	-9.57
1.7500	-9.57
1.8333	-9.57
1.9167	-9.57
2.0000	-9.57
2.5000	-9.57
3.0000	-9.57
3.5000	-9.58
4.0000	-9.58
4.5000	-9.58
5.0000	-9.57
5.5000	-9.58
6.0000	-9.58
6.5000	-9.57
7.0000	-9.57
7.5000	-9.57
8.0000	-9.57
8.5000	-9.57
9.0000	-9.58
9.5000	-9.58
10.0000	-9.58
12.0000	-9.58
14.0000	-9.58
16.0000	-9.59
18.0000	-9.59
20.0000	-9.60

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A Q T E S O L V   R E S U L T S

Version 1.10

06/08/92 06:44:15

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TEST DESCRIPTION

Data set........... m027a.set
Data set title..... RISING HEAD RESULT, M-027-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:
No. of data points.................. 51
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 252.4
Well screen length.................. 252.4
Static height of water in well...... 252.4
Log(Re/Rw).......................... 2.883
A, B, C............................. 0.000, 0.000, 2.419

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

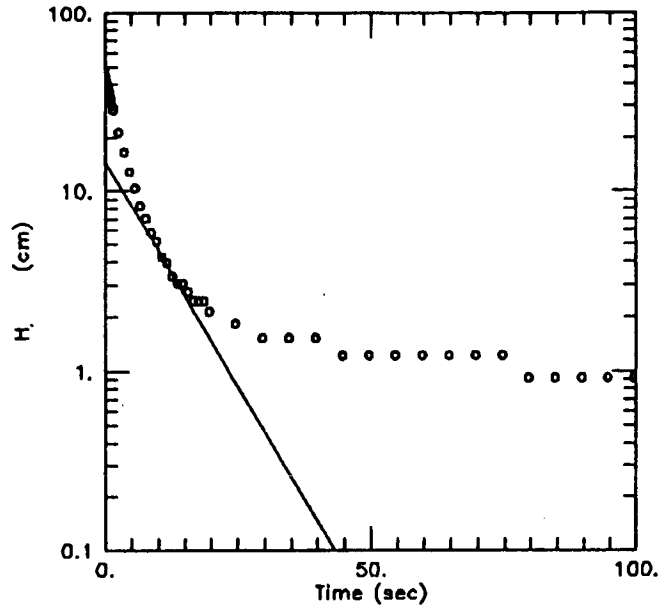
	Estimate
K =	4.4987E-003
y0 =	4.2766E-306

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

TYPE CURVE DATA

K = 4.24143E-003
y0 = 1.45071E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	1.451E+001	1.000E+002	1.453E-004		



DATA SET:
m027a.aet
88/08/02

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 28, 1981

ESTIMATED PARAMETERS:
K = 0.084241 cm/sec
y0 = 14.51 cm

TEST DATA:
H0 = 47.55 cm
rc = 2.54 cm
rw = 5.78 cm
L = 252.4 cm
b = 252.4 cm
H = 252.4 cm

RISING HEAD RESULT, M-027-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-028-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/29 15:42

Unit# 00515 Test# 9

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/26 15:57

Elapsed Time (min)	Value (ft)
0.0000	0.82
0.0033	5.06
0.0066	7.97
0.0099	2.89
0.0133	2.96
0.0166	2.49
0.0200	2.53
0.0233	2.47
0.0266	2.46
0.0300	2.30
0.0333	2.25
0.0500	2.01
0.0666	1.82
0.0833	1.68
0.1000	1.54
0.1166	1.45
0.1333	1.37
0.1500	1.30
0.1666	1.25
0.1833	1.21
0.2000	1.18
0.2166	1.15
0.2333	1.12
0.2500	1.10
0.2666	1.08
0.2833	1.06
0.3000	1.04
0.3166	1.02
0.3333	1.00
0.4167	0.96
0.5000	0.93
0.5833	0.91
0.6667	0.90
0.7500	0.89
0.8333	0.88
0.9167	0.88
1.0000	0.88
1.0833	0.87
1.1667	0.87
1.2500	0.87
1.3333	0.87
1.4166	0.86
1.5000	0.86
1.5833	0.86
1.6667	0.86
1.7500	0.86
1.8333	0.86
1.9167	0.86
2.0000	0.86
2.5000	0.84
3.0000	0.85
3.5000	0.85
4.0000	0.85
4.5000	0.84
5.0000	0.84
5.5000	0.84
6.0000	0.84
6.5000	0.85
7.0000	0.85
7.5000	0.85
8.0000	0.84
8.5000	0.84
9.0000	0.84
9.5000	0.84
10.0000	0.84
12.0000	0.84
14.0000	0.86
16.0000	0.86
18.0000	0.84
20.0000	0.84
22.0000	0.85
24.0000	0.85
26.0000	0.85

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A Q T E S O L V   R E S U L T S

Version 1.10

06/04/92 04:03:00

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TEST DESCRIPTION

Data set........... m028a.set
Data set title..... RISING HEAD RESULT, M-028-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:

No. of data points.................. 42
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 224.3
Well screen length.................. 224.3
Static height of water in well...... 224.3
Log(Re/Rw).......................... 2.786
A, B, C............................. 0.000, 0.000, 2.254

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

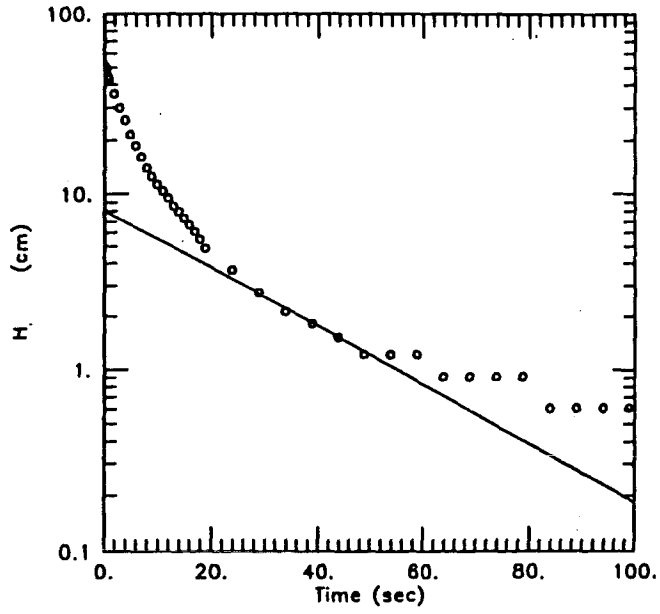
	Estimate
K =	1.5183E-003
y0 =	4.7289E-308

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 1.51830E-003
y0 = 8.04973E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	8.050E+000	1.000E+002	1.818E-001		



DATA SET:
m028a.set
06/04/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 28, 1991

ESTIMATED PARAMETERS:
K = 0.001518 cm/sec
y0 = 8.05 cm

TEST DATA:
H0 = 51.51 cm
rc = 2.54 cm
rw = 5.79 cm
L = 224.3 cm
b = 224.3 cm
H = 224.3 cm

RISING HEAD RESULT, M-028-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-029-A
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/29 15:35

Unit# 00515 Test# 7

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/26 14:41

Elapsed Time (min)	Value (ft)
0.0000	4.91
0.0033	3.86
0.0066	0.38
0.0099	1.73
0.0133	1.44
0.0166	1.36
0.0200	1.31
0.0233	1.24
0.0266	1.19
0.0300	1.15
0.0333	1.11
0.0500	0.92
0.0666	0.78
0.0833	0.68
0.1000	0.59
0.1166	0.52
0.1333	0.47
0.1500	0.42
0.1666	0.37
0.1833	0.34
0.2000	0.31
0.2166	0.28
0.2333	0.27
0.2500	0.25
0.2666	0.23
0.2833	0.22
0.3000	0.21
0.3166	0.20
0.3333	0.19
0.4167	0.14
0.5000	0.12
0.5833	0.10
0.6667	0.09
0.7500	0.08
0.8333	0.07
0.9167	0.07
1.0000	0.06
1.0833	0.06
1.1667	0.06
1.2500	0.06
1.3333	0.06
1.4166	0.05
1.5000	0.05
1.5833	0.04
1.6667	0.04
1.7500	0.02
1.8333	0.03
1.9167	0.04
2.0000	0.04
2.5000	0.02
3.0000	0.00
3.5000	-0.00
4.0000	-0.00
4.5000	0.00
5.0000	-0.00

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A Q T E S O L V   R E S U L T S

Version 1.10

06/08/92 06:46:14

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TEST DESCRIPTION

Data set........... m029a.set
Data set title..... RISING HEAD RESULT, M-029-A
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:
No. of data points................... 42
Radius of well casing................ 2.54
Radius of well....................... 5.79
Aquifer saturated thickness.......... 262.1
Well screen length................... 262.1
Static height of water in well....... 262.1
Log(Re/Rw)........................... 2.914
A, B, C.............................. 0.000, 0.000, 2.477

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

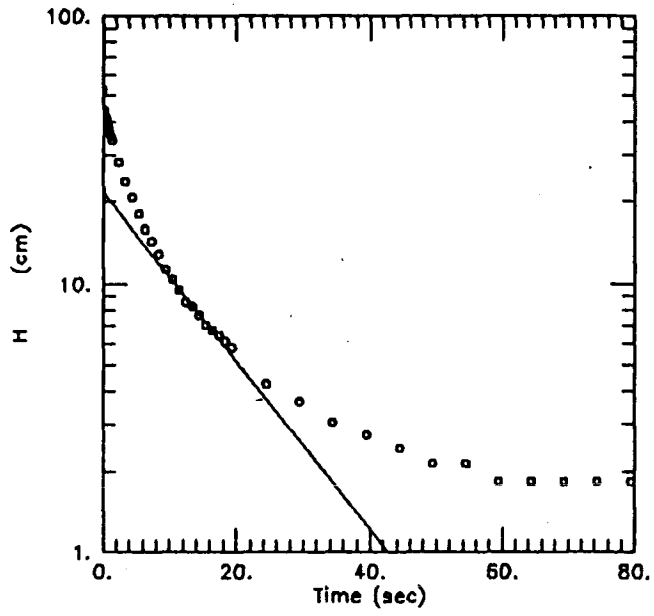
	Estimate
K =	2.5805E-003
y0 =	4.2766E-306

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 2.58050E-003
y0 = 2.15670E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.157E+001	8.000E+001	6.813E-002		



DATA SET:
m029a.aet
88/09/02

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 28, 1991

ESTIMATED PARAMETERS:
K = 0.08258 cm/sec
y0 = 21.57 cm

TEST DATA:
H0 = 52.73 cm
rc = 2.54 cm
rw = 5.78 cm
L = 282.1 cm
b = 252.1 cm
H = 282.1 cm

RISING HEAD RESULT, M-029-A

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-001-B
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE2000
Environmental Logger
07/29 14:09

Unit# Test 7

INPUT 1: Level (F) TOC

Reference	0.000
SG	1.000
Linearity	0.000
Scale factor	49.900
Offset	0.010
Delay mSEC	50.000

Step 0 07/26 16:11:57

Elapsed Time (min)	INPUT 1 (ft)
0.0000	-41.942
0.0083	-41.533
0.0166	-41.990
0.0250	-42.541
0.0333	-42.935
0.0416	-43.045
0.0500	-43.045
0.0583	-43.077
0.0666	-43.171
0.0750	-43.313
0.0833	-43.486
0.1000	-43.770
0.1166	-43.928
0.1333	-44.038
0.1500	-44.132
0.1666	-44.227
0.1833	-44.306
0.2000	-44.369
0.2166	-44.416
0.2333	-44.463
0.2500	-44.511
0.2666	-44.542
0.2833	-44.558
0.3000	-44.589
0.3166	-44.605
0.3333	-44.621
0.4166	-44.684
0.5000	-44.731
0.5833	-44.763
0.6666	-44.779
0.7500	-44.779
0.8333	-44.794
0.9166	-44.794
1.0000	-44.810
1.0833	-44.810
1.1666	-44.810
1.2500	-44.810
1.3333	-44.810
1.4166	-44.810
1.5000	-44.810
1.5833	-44.810
1.6666	-44.810
1.7500	-44.810
1.8333	-44.810
1.9166	-44.826
2.0000	-44.810
2.5000	-44.810
3.0000	-44.810
3.5000	-44.810
4.0000	-44.810
4.5000	-44.810
5.0000	-44.794
5.5000	-44.794
6.0000	-44.794
6.5000	-44.794
7.0000	-44.794
7.5000	-44.794
8.0000	-44.779
8.5000	-44.779
9.0000	-44.779
9.5000	-44.779
10.0000	-44.763
12.0000	-44.763
14.0000	-44.763
16.0000	-44.747
18.0000	-44.731
20.0000	-44.731
22.0000	-44.700
24.0000	-44.684
26.0000	-44.684
28.0000	-44.668
30.0000	-44.668
32.0000	-44.668

A Q T E S O L V R E S U L T S
Version 1.10

06/04/92

TEST DESCRIPTION

Data set..... m001b.set
Data set title..... RISING HEAD RESULT, M-001-B
Company..... J.M.MONTGOMERY, CONSULTING ENG
Project..... 2738.0262
Client..... NAVY - WESTDIV
Location..... 1943-1956 Disposal Area
Test date..... July 26, 1991

Knowns and Constants:
No. of data points..... 24
Pumping rate..... 1
Radius (distance) to obs. well..... 2.54

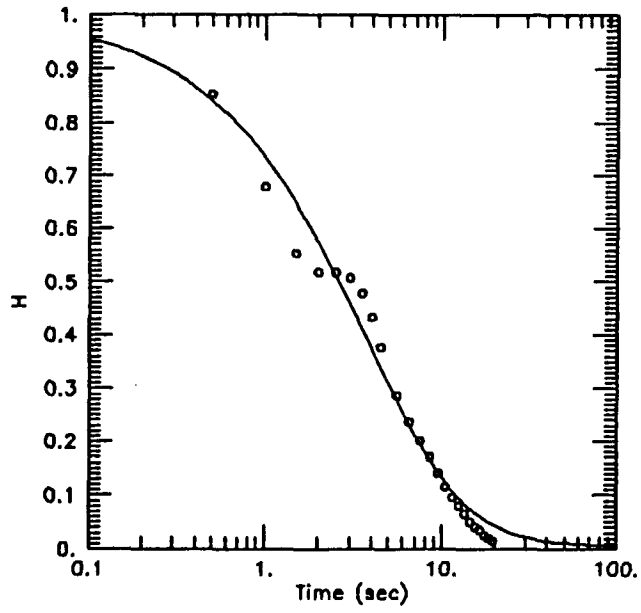
ANALYTICAL METHOD

Cooper et al. (Confined Aquifer Slug Test)

RESULTS FROM CURVE MATCHING

MATCH PARAMETER ESTIMATES

		Estimate
T	=	3.6670E+000
S	=	3.2728E-005



DATA SET:
m001b.aet
88/04/02

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
July 28, 1991

ESTIMATED PARAMETERS:
T = 3.887 cm^2/sec
S = 3.2728E-05

TEST DATA:
H0 = 85.33 cm
rc = 2.54 cm
rw = 8.89 cm

RISING HEAD RESULT, M-001-B

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-010-B
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
08/12 09:35

Unit# 00515 Test# 3

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 08/09 13:39

Elapsed Time (min)	Value (ft)
0.0000	-11.91
0.0033	-11.54
0.0066	-9.26
0.0099	-7.64
0.0133	-7.05
0.0166	-7.18
0.0200	-7.63
0.0233	-8.60
0.0266	-8.55
0.0300	-8.13
0.0333	-7.55
0.0500	-8.14
0.0666	-7.90
0.0833	-7.92
0.1000	-8.06
0.1166	-8.08
0.1333	-8.11
0.1500	-8.16
0.1666	-8.13
0.1833	-8.19
0.2000	-8.21
0.2166	-8.23
0.2333	-8.25
0.2500	-8.27
0.2666	-8.29
0.2833	-8.31
0.3000	-8.32
0.3166	-8.34
0.3333	-8.36
0.4167	-8.44
0.5000	-8.51
0.5833	-8.57
0.6667	-8.64
0.7500	-8.70
0.8333	-8.75
0.9167	-8.80
1.0000	-8.86
1.0833	-8.91
1.1667	-8.96
1.2500	-9.01
1.3333	-9.05
1.4166	-9.10
1.5000	-9.14
1.5833	-9.19
1.6667	-9.23
1.7500	-9.29
1.8333	-9.31
1.9167	-9.35
2.0000	-9.39
2.5000	-9.60
3.0000	-9.78
3.5000	-9.92
4.0000	-10.06
4.5000	-10.18
5.0000	-10.29
5.5000	-10.40
6.0000	-10.50
6.5000	-10.58
7.0000	-10.65
7.5000	-10.72
8.0000	-10.80
8.5000	-10.85
9.0000	-10.90
9.5000	-10.95
10.0000	-10.99
12.0000	-11.13
14.0000	-11.26
16.0000	-11.34
18.0000	-11.41
20.0000	-11.45
22.0000	-11.49
24.0000	-11.52
26.0000	-11.55
28.0000	-11.57
30.0000	-11.59
32.0000	-11.59
34.0000	-11.60
36.0000	-11.61
38.0000	-11.62
40.0000	-11.62
42.0000	-11.63

M-027-B
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE2000
Environmental Logger
07/29 14:02

Unit# Test 3

INPUT 1: Level (F) TOC

Reference	0.000
SG	1.000
Linearity	0.000
Scale factor	49.900
Offset	0.010
Delay mSEC	50.000

Step 0 07/26 11:52:03

Elapsed Time (min)	INPUT 1 (ft)
0.0000	-32.914
0.0083	-31.575
0.0166	-30.692
0.0250	-30.283
0.0333	-30.299
0.0416	-30.645
0.0500	-31.086
0.0583	-31.512
0.0666	-31.843
0.0750	-32.079
0.0833	-32.237
0.1000	-32.441
0.1166	-32.599
0.1333	-32.757
0.1500	-32.867
0.1666	-32.946
0.1833	-33.024
0.2000	-33.072
0.2166	-33.119
0.2333	-33.150
0.2500	-33.182
0.2666	-33.213
0.2833	-33.229
0.3000	-33.261
0.3166	-33.277
0.3333	-33.292
0.4166	-33.340
0.5000	-33.371
0.5833	-33.387
0.6666	-33.403
0.7500	-33.403
0.8333	-33.418
0.9166	-33.418
1.0000	-33.434
1.0833	-33.434
1.1666	-33.434
1.2500	-33.434
1.3333	-33.434
1.4166	-33.434
1.5000	-33.434
1.5833	-33.450
1.6666	-33.450
1.7500	-33.450
1.8333	-33.450
1.9166	-33.450
2.0000	-33.450
2.5000	-33.450
3.0000	-33.466
3.5000	-33.466
4.0000	-33.466
4.5000	-33.466
5.0000	-33.466
5.5000	-33.481
6.0000	-33.481
6.5000	-33.481
7.0000	-33.481
7.5000	-33.481
8.0000	-33.497
8.5000	-33.497
9.0000	-33.497
9.5000	-33.497
10.0000	-33.497
12.0000	-33.497
14.0000	-33.513
16.0000	-33.513
18.0000	-33.529
20.0000	-33.529
22.0000	-33.529

A Q T E·S O L V R E S U L T S
Version 1.10

06/04/92

TEST DESCRIPTION

Data set..... m027b.set
Data set title..... RISING HEAD RESULT, M-027-B
Company..... J.M.MONTGOMERY, CONSULTING ENG
Project..... 2738.0262
Client..... NAVY - WESTDIV
Location..... 1943-1956 Disposal Area
Test date..... July 26, 1991

Knowns and Constants:
No. of data points..... 60
Pumping rate..... 1
Radius (distance) to obs. well..... 2.54

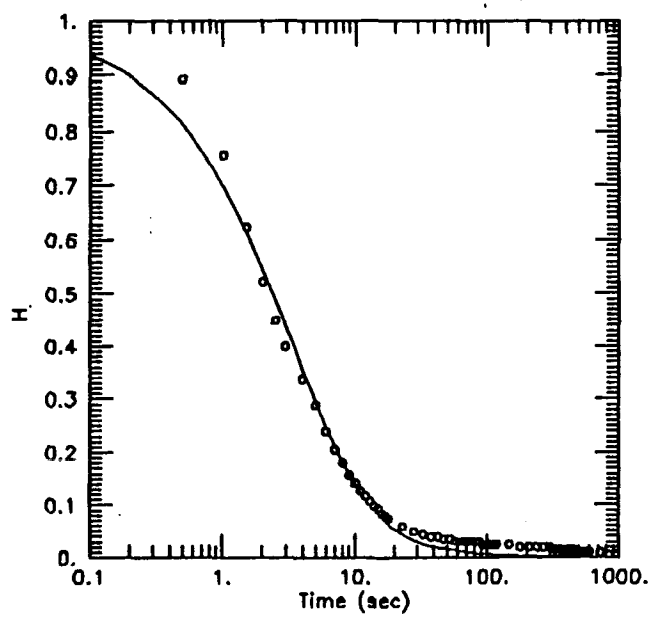
ANALYTICAL METHOD

Cooper et al. (Confined Aquifer Slug Test)

RESULTS FROM CURVE MATCHING

MATCH PARAMETER ESTIMATES

		Estimate
T	=	2.7162E+000
S	=	3.8981E-004



DATA SET:
m027b.aet
08/04/92

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
July 28, 1991

ESTIMATED PARAMETERS:
T = 2.718 cm^2/sec
S = 0.0003888

TEST DATA:
H0 = 88.45 cm
rc = 2.54 cm
rw = 8.88 cm

RISING HEAD RESULT, M-027-B

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-103-B
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/16 13:37

Unit# 00515 Test# 5

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/16 11:19

Elapsed Time (min)	Value (ft)
0.0000	0.00
0.0033	1.37
0.0066	6.74
0.0099	9.80
0.0133	8.20
0.0166	4.72
0.0200	2.96
0.0233	2.42
0.0266	3.60
0.0300	4.24
0.0333	4.35
0.0500	3.74
0.0666	3.63
0.0833	3.58
0.1000	3.53
0.1166	3.49
0.1333	3.46
0.1500	3.43
0.1666	3.40
0.1833	3.38
0.2000	3.35
0.2166	3.33
0.2333	3.31
0.2500	3.29
0.2666	3.27
0.2833	3.25
0.3000	3.23
0.3166	3.21
0.3333	3.20
0.4167	3.11
0.5000	3.04
0.5833	2.97
0.6667	2.88
0.7500	2.85
0.8333	2.79
0.9167	2.74
1.0000	2.68
1.0833	2.63
1.1667	2.59
1.2500	2.54
1.3333	2.49
1.4166	2.44
1.5000	2.39
1.5833	2.35
1.6667	2.30
1.7500	2.26
1.8333	2.22
1.9167	2.18
2.0000	2.14
2.5000	1.96
3.0000	1.78
3.5000	1.63
4.0000	1.49
4.5000	1.36
5.0000	1.24
5.5000	1.15
6.0000	1.09
6.5000	1.01
7.0000	0.95
7.5000	0.88
8.0000	0.82
8.5000	0.77
9.0000	0.73
9.5000	0.70
10.0000	0.66
12.0000	0.53
14.0000	0.46
16.0000	0.40
18.0000	0.36
20.0000	0.32
22.0000	0.29

M-025-C
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
08/12 09:47

Unit# 00515 Test# 7

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 08/09 16:11

Elapsed Time (min)	Value (ft)
0.0000	0.20
0.0033	0.99
0.0066	1.84
0.0099	1.82
0.0133	5.61
0.0166	3.00
0.0200	2.82
0.0233	3.70
0.0266	3.20
0.0300	4.04
0.0333	3.87
0.0500	3.41
0.0666	3.14
0.0833	2.79
0.1000	2.59
0.1166	2.39
0.1333	2.21
0.1500	2.06
0.1666	1.92
0.1833	1.79
0.2000	1.68
0.2166	1.58
0.2333	1.48
0.2500	1.39
0.2666	1.31
0.2833	1.24
0.3000	1.17
0.3166	1.11
0.3333	1.06
0.4167	0.83
0.5000	0.67
0.5833	0.56
0.6667	0.48
0.7500	0.42
0.8333	0.38
0.9167	0.34
1.0000	0.32
1.0833	0.29
1.1667	0.28
1.2500	0.26
1.3333	0.25
1.4166	0.24
1.5000	0.23
1.5833	0.22
1.6667	0.21
1.7500	0.21
1.8333	0.21
1.9167	0.20
2.0000	0.19
2.5000	0.18
3.0000	0.17
3.5000	0.16
4.0000	0.14
4.5000	0.16
5.0000	0.17
5.5000	0.16
6.0000	0.17
6.5000	0.16
7.0000	0.17

A Q T E S O L V R E S U L T S

Version 1.10

03/03/92

==========

TEST DESCRIPTION

Data set..... m025c.set
Data set title..... RISING HEAD RESULT, M-025-C
Company..... J.M.MONTGOMERY, CONSULTING ENGINEERS
Project..... 2738.0262
Client..... NAVY - WESTDIV
Location..... 1943-1956 Disposal Area
Test date..... August 9, 1991

Knowns and Constants:
No. of data points..... 42
Pumping rate..... 1
Radius to obs. well..... 2.54

==========

ANALYTICAL METHOD

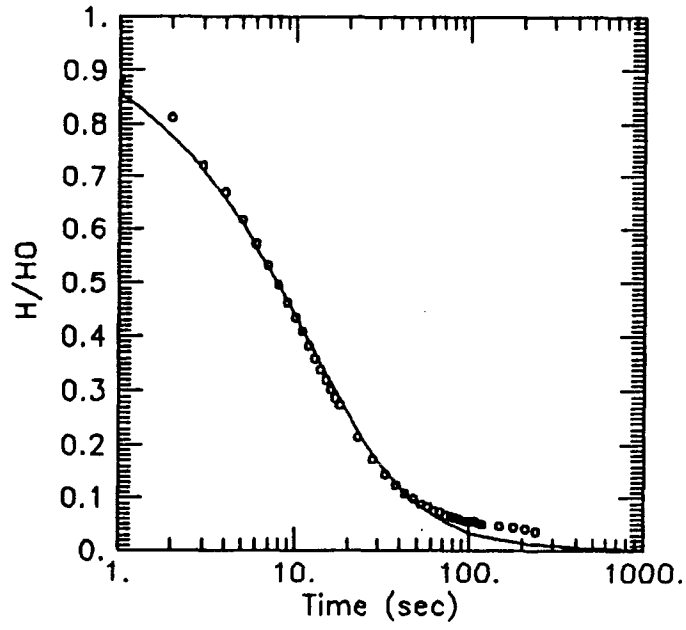
Cooper et al. (Confined Aquifer Slug Test)

==========

RESULTS FROM CURVE MATCHING

MATCH PARAMETER ESTIMATES

		Estimate
T	=	6.85626E-001
S	=	8.93127E-004



DATA SET:
m025c.aet
03/03/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
August 9, 1991

ESTIMATED PARAMETERS:
T = 0.8858 cm^2/sec
S = 0.0000001

TEST DATA:
HO = 110. cm
rc = 2.54 cm
rw = 8.88 cm

RISING HEAD RESULT, M-025-C

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-027-C
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE2000
Environmental Logger
07/29 13:56

Unit# Test 1

INPUT 1: Level (F) TOC

Reference	0.000
SG	1.000
Linearity	0.000
Scale factor	49.900
Offset	0.010
Delay mSEC	50.000

Step 0 07/26 10:27:34

Elapsed Time (min)	INPUT 1 (ft)
0.0000	-31.370
0.0083	-32.300
0.0166	-31.937
0.0250	-31.874
0.0333	-31.953
0.0416	-32.237
0.0500	-32.504
0.0583	-32.772
0.0666	-32.883
0.0750	-33.072
0.0833	-33.213
0.1000	-33.466
0.1166	-33.670
0.1333	-33.859
0.1500	-34.017
0.1666	-34.143
0.1833	-34.269
0.2000	-34.364
0.2166	-34.458
0.2333	-34.537
0.2500	-34.600
0.2666	-34.663
0.2833	-34.726
0.3000	-34.773
0.3166	-34.821
0.3333	-34.852
0.4166	-34.978
0.5000	-35.073
0.5833	-35.136
0.6666	-35.167
0.7500	-35.199
0.8333	-35.215
0.9166	-35.230
1.0000	-35.246
1.0833	-35.246
1.1666	-35.246
1.2500	-35.262
1.3333	-35.262
1.4166	-35.262
1.5000	-35.278
1.5833	-35.278
1.6666	-35.278
1.7500	-35.278
1.8333	-35.278
1.9166	-35.278
2.0000	-35.278
2.5000	-35.293
3.0000	-35.293
3.5000	-35.309
4.0000	-35.309
4.5000	-35.309
5.0000	-35.309
5.5000	-35.309
6.0000	-35.325
6.5000	-35.325
7.0000	-35.325
7.5000	-35.341
8.0000	-35.341
8.5000	-35.341
9.0000	-35.341
9.5000	-35.341
10.0000	-35.356
12.0000	-35.356
14.0000	-35.372
16.0000	-35.372
18.0000	-35.388
20.0000	-35.388
22.0000	-35.404

A Q T E S O L V R E S U L T S

Version 1.10

06/03/92

==========

TEST DESCRIPTION

Data set..... m027c.set
Data set title..... RISING HEAD RESULT, M-027-C
Company..... J.M.MONTGOMERY, CONSULTING ENGINEERS
Project..... 2738.0262
Client..... NAVY - WESTDIV
Location..... 1943-1956 Disposal Area
Test date..... July 26, 1991

Knowns and Constants:
No. of data points..... 63
Pumping rate..... 1
Radius (distance) to obs. well..... 2.54

==========

ANALYTICAL METHOD

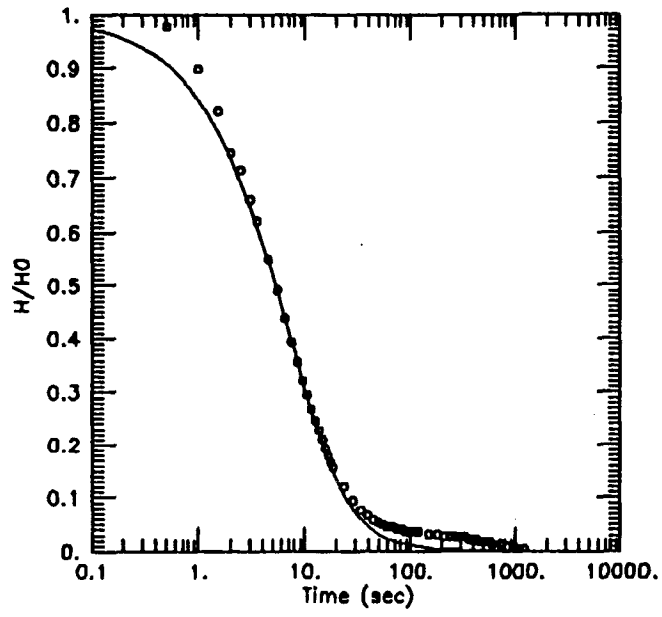
Cooper et al. (Confined Aquifer Slug Test)

==========

RESULTS FROM CURVE MATCHING

MATCH PARAMETER ESTIMATES

		Estimate
T	=	1.81411E+000
S	=	3.50000E-005



DATA SET:
m027c.aet
88/03/02

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
July 28, 1981

ESTIMATED PARAMETERS:
T = 1.814 cm^2/sec
S = 3.5E-05

TEST DATA:
H0 = 107.6 cm
rc = 2.54 cm
rw = 8.88 cm

RISING HEAD RESULT, M-027-C

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: 1943–1956 Disposal Area

M-104-C
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
08/07 17:20

Unit# 00515 Test# 1

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 08/07 11:44

Elapsed Time (min)	Value (ft)
0.0000	-0.05
0.0033	3.00
0.0066	4.23
0.0099	1.17
0.0133	2.33
0.0166	3.69
0.0200	3.33
0.0233	3.78
0.0266	4.11
0.0300	3.88
0.0333	3.69
0.0500	3.40
0.0666	3.93
0.0833	3.44
0.1000	3.38
0.1166	3.45
0.1333	3.35
0.1500	3.32
0.1666	3.33
0.1833	3.28
0.2000	3.28
0.2166	3.24
0.2333	3.23
0.2500	3.22
0.2666	3.21
0.2833	3.18
0.3000	3.17
0.3166	3.15
0.3333	3.14
0.4167	3.07
0.5000	3.00
0.5833	2.94
0.6667	2.91
0.7500	2.89
0.8333	2.87
0.9167	2.85
1.0000	2.82
1.0833	2.79
1.1667	2.74
1.2500	2.71
1.3333	2.67
1.4166	2.64
1.5000	2.60
1.5833	2.57
1.6667	2.53
1.7500	2.50
1.8333	2.47
1.9167	2.44
2.0000	2.41
2.5000	2.24
3.0000	2.09
3.5000	1.96
4.0000	1.84
4.5000	1.73
5.0000	1.63
5.5000	1.53
6.0000	1.45
6.5000	1.37
7.0000	1.30
7.5000	1.24
8.0000	1.18
8.5000	1.12
9.0000	1.07
9.5000	1.02
10.0000	0.97
12.0000	0.81
14.0000	0.69
16.0000	0.59
18.0000	0.52
20.0000	0.46
22.0000	0.40
24.0000	0.35
26.0000	0.33
28.0000	0.30
30.0000	0.27
32.0000	0.25
34.0000	0.23
36.0000	0.21
38.0000	0.19
40.0000	0.19
42.0000	0.18

A Q T E S O L V R E S U L T S

Version 1.10

06/03/92

==========

TEST DESCRIPTION

Data set..... m104c.set
Data set title..... RISING HEAD RESULT, M-104-C
Company..... J.M.MONTGOMERY, CONSULTING ENGINEERS
Project..... 2738.0262
Client..... NAVY - WESTDIV
Location..... Background Well
Test date..... August 7, 1991

Knowns and Constants:
No. of data points..... 71
Pumping rate..... 1
Radius (distance) to obs. well..... 2.54

==========

ANALYTICAL METHOD

Cooper et al. (Confined Aquifer Slug Test)

==========

RESULTS FROM CURVE MATCHING

MATCH PARAMETER ESTIMATES

		Estimate
T	=	1.38237E-002
S	=	7.50000E-003

M-001-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE2000
Environmental Logger
07/29 14:06

Unit# Test 5

INPUT 1: Level (F) TOC

Reference	0.000
SG	1.000
Linearity	0.000
Scale factor	49.900
Offset	0.010
Delay mSEC	50.000

Step 0 07/26 14:58:14

Elapsed Time (min)	INPUT 1 (ft)
0.0000	5.955
0.0083	2.300
0.0166	4.017
0.0250	1.906
0.0333	3.025
0.0416	2.032
0.0500	2.394
0.0583	1.985
0.0666	2.032
0.0750	1.843
0.0833	1.811
0.1000	1.638
0.1166	1.496
0.1333	1.386
0.1500	1.292
0.1666	1.197
0.1833	1.118
0.2000	1.055
0.2166	0.992
0.2333	0.945
0.2500	0.882
0.2666	0.835
0.2833	0.803
0.3000	0.756
0.3166	0.724
0.3333	0.693
0.4166	0.582
0.5000	0.504
0.5833	0.456
0.6666	0.409
0.7500	0.378
0.8333	0.346
0.9166	0.315
1.0000	0.299
1.0833	0.283
1.1666	0.267
1.2500	0.252
1.3333	0.236
1.4166	0.220
1.5000	0.220
1.5833	0.204
1.6666	0.204
1.7500	0.189
1.8333	0.189
1.9166	0.189
2.0000	0.173
2.5000	0.141
3.0000	0.126
3.5000	0.110
4.0000	0.094
4.5000	0.078
5.0000	0.078
5.5000	0.078
6.0000	0.078
6.5000	0.078
7.0000	0.063
7.5000	0.063
8.0000	0.063
8.5000	0.063
9.0000	0.047
9.5000	0.047
10.0000	0.047

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V R E S U L T S
Version 1.10

06/04/92 02:17:51

==

TEST DESCRIPTION

Data set........... m001e.set
Data set title..... RISING HEAD RESULT, M-001-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:
No. of data points................... 53
Radius of well casing................ 2.54
Radius of well....................... 5.79
Aquifer saturated thickness......... 407.8
Well screen length.................. 304.8
Static height of water in well...... 407.8
Log(Re/Rw).......................... 3.221
A, B, C............................. 0.000, 0.000, 2.732

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

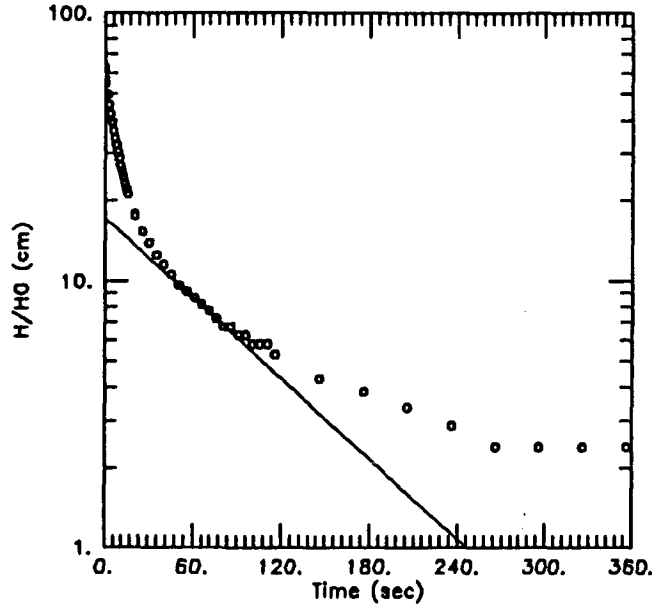
	Estimate
K =	1.8817E-003
y0 =	4.7289E-308

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 3.95793E-004
y0 = 1.73290E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	1.733E+001	3.600E+002	2.652E-001		



DATA SET:
m001e.aet
89/04/02

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 28, 1981

ESTIMATED PARAMETERS:
K = 0.0003858 cm/sec
y0 = 17.33 cm

TEST DATA:
H0 = 81.84 cm
rc = 2.54 cm
rw = 5.72 cm
L = 304.8 cm
b = 407.8 cm
H = 407.8 cm

RISING HEAD RESULT, M-001-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-002-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/11 17:20

Unit# 00515 Test# 9

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/11 15:01

Elapsed Time (min)	Value (ft)
0.0000	-0.00
0.0033	-0.00
0.0066	0.77
0.0099	4.37
0.0133	4.96
0.0166	5.98
0.0200	4.25
0.0233	2.20
0.0266	0.84
0.0300	2.54
0.0333	2.90
0.0500	2.05
0.0666	1.79
0.0833	1.62
0.1000	1.47
0.1166	1.34
0.1333	1.23
0.1500	1.13
0.1666	1.04
0.1833	0.96
0.2000	0.88
0.2166	0.82
0.2333	0.76
0.2500	0.71
0.2666	0.65
0.2833	0.61
0.3000	0.57
0.3166	0.53
0.3333	0.50
0.4167	0.35
0.5000	0.26
0.5833	0.19
0.6667	0.14
0.7500	0.09
0.8333	0.08
0.9167	0.05
1.0000	0.05
1.0833	0.04
1.1667	0.03
1.2500	0.02
1.3333	0.02
1.4166	0.02
1.5000	0.01
1.5833	0.01
1.6667	0.01
1.7500	0.01
1.8333	0.00
1.9167	0.00
2.0000	0.00
2.5000	0.01
3.0000	0.02
3.5000	0.01

A Q T E S O L V   R E S U L T S
Version 1.10

06/04/92 02:19:54

TEST DESCRIPTION

Data set........... m002e.set
Data set title..... RISING HEAD RESULT, M-002-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... September 11, 1991

Knowns and Constants:
No. of data points.................. 35
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 474.9
Well screen length.................. 304.8
Static height of water in well...... 474.9
Log(Re/Rw).......................... 3.317
A, B, C............................. 0.000, 0.000, 2.732

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

RESULTS FROM VISUAL CURVE MATCHING

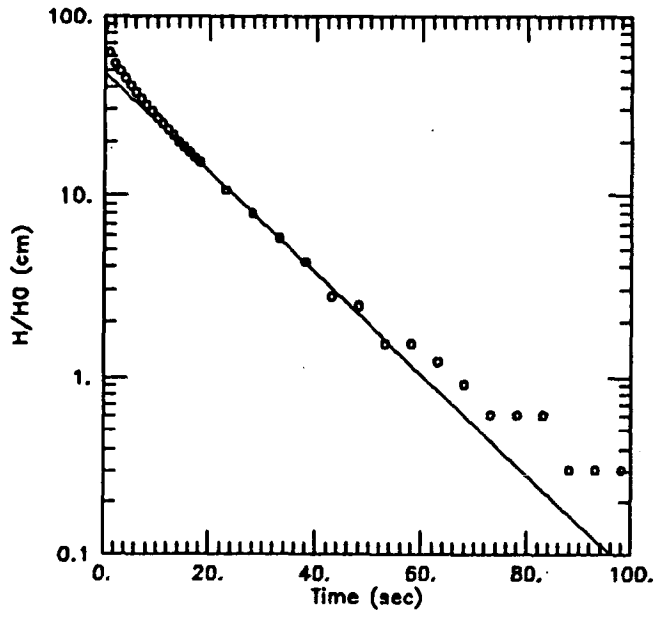
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	2.2549E-003
y0 =	4.7289E-308

TYPE CURVE DATA

K = 2.25486E-003
y0 = 4.77102E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	4.771E+001	1.000E+002	7.740E-002		



DATA SET:
m002e.aet
88/04/82

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
September 11, 1991

ESTIMATED PARAMETERS:
K = 0.002255 cm/sec
y0 = 47.71 cm

TEST DATA:
H0 = 88.38 cm
rc = 2.54 cm
rw = 5.78 cm
L = 304.8 cm
b = 474.8 cm
H = 474.8 cm

RISING HEAD RESULT, M-002-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: 1943–1956 Disposal Area

M-018-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/13 12:43

Unit# 00515 Test# 7

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/13 10:14

Elapsed Time (min)	Value (ft)
0.0000	1.35
0.0033	8.14
0.0066	11.09
0.0099	6.54
0.0133	3.18
0.0166	3.58
0.0200	3.72
0.0233	4.51
0.0266	4.13
0.0300	3.83
0.0333	3.85
0.0500	3.73
0.0666	3.58
0.0833	3.46
0.1000	3.35
0.1166	3.24
0.1333	3.15
0.1500	3.05
0.1666	2.95
0.1833	2.87
0.2000	2.79
0.2166	2.71
0.2333	2.63
0.2500	2.55
0.2666	2.48
0.2833	2.41
0.3000	2.35
0.3166	2.29
0.3333	2.22
0.4167	1.94
0.5000	1.70
0.5833	1.46
0.6667	1.29
0.7500	1.14
0.8333	1.01
0.9167	0.92
1.0000	0.81
1.0833	0.72
1.1667	0.64
1.2500	0.57
1.3333	0.51
1.4166	0.46
1.5000	0.41
1.5833	0.37
1.6667	0.33
1.7500	0.29
1.8333	0.26
1.9167	0.25
2.0000	0.22
2.5000	0.13
3.0000	0.07
3.5000	0.04
4.0000	0.03

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A Q T E S O L V   R E S U L T S

Version 1.10

06/04/92 02:21:46

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TEST DESCRIPTION

Data set........... m018e.set
Data set title..... RISING HEAD RESULT, M-018-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... West Beach Landfill
Test date.......... September 13, 1991

Knowns and Constants:
No. of data points................... 42
Radius of well casing................ 2.54
Radius of well....................... 10.16
Aquifer saturated thickness.......... 1201
Well screen length................... 304.8
Static height of water in well...... 1201
Log(Re/Rw)........................... 3.377
A, B, C.............................. 0.000, 0.000, 1.969

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	8.1049E-004
y0 =	4.7289E-308

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 8.10494E-004
y0 = 9.16593E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	9.166E+001	2.400E+002	3.967E-001		

M-024-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/11 17:12

Unit# 00515 Test# 1

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/11 13:02

Elapsed Time (min)	Value (ft)
0.0000	-0.29
0.0033	-0.29
0.0066	0.07
0.0099	6.19
0.0133	13.70
0.0166	8.33
0.0200	4.57
0.0233	1.47
0.0266	1.04
0.0300	2.72
0.0333	2.86
0.0500	2.36
0.0666	2.03
0.0833	1.78
0.1000	1.56
0.1166	1.36
0.1333	1.20
0.1500	1.05
0.1666	0.92
0.1833	0.81
0.2000	0.71
0.2166	0.62
0.2333	0.54
0.2500	0.47
0.2666	0.40
0.2833	0.35
0.3000	0.29
0.3166	0.25
0.3333	0.21
0.4167	0.05
0.5000	-0.05
0.5833	-0.11
0.6667	-0.16
0.7500	-0.19
0.8333	-0.21
0.9167	-0.22
1.0000	-0.24
1.0833	-0.24
1.1667	-0.25
1.2500	-0.26
1.3333	-0.26
1.4166	-0.27
1.5000	-0.27
1.5833	-0.27
1.6667	-0.28
1.7500	-0.28
1.8333	-0.28
1.9167	-0.28
2.0000	-0.28
2.5000	-0.30
3.0000	-0.30

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A Q T E S O L V   R E S U L T S

Version 1.10

06/04/92 02:39:38

==

TEST DESCRIPTION

Data set........... m024e.set
Data set title..... RISING HEAD RESULT, M-024-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... West Beach Landfill
Test date.......... September 11, 1991

Knowns and Constants:
No. of data points................... 19
Radius of well casing................ 2.54
Radius of well....................... 10.16
Aquifer saturated thickness.......... 801.3
Well screen length................... 304.8
Static height of water in well....... 801.3
Log(Re/Rw)........................... 3.15
A, B, C.............................. 0.000, 0.000, 1.969

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

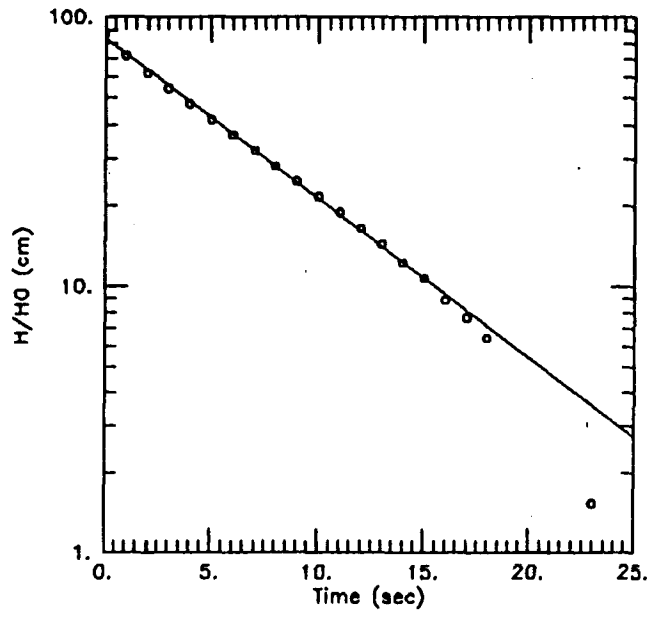
	Estimate
K =	5.1635E-003
y0 =	8.8085E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 4.57371E-003
y0 = 8.36002E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	8.360E+001	2.500E+001	2.708E+000		



DATA SET:
m024e.set
88/04/82

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
September 11, 1991

ESTIMATED PARAMETERS:
K = 0.084574 cm/sec
y0 = 83.8 cm

TEST DATA:
H0 = 87.17 cm
rc = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
D = 801.3 cm
H = 801.3 cm

RISING HEAD RESULT, M-024-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: West Beach Landfill

M-025-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
08/12 09:41

Unit# 00515 Test# 5

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 08/09 15:17

Elapsed Time (min)	Value (ft)
0.0000	0.35
0.0033	0.35
0.0066	0.53
0.0099	4.05
0.0133	6.29
0.0166	4.47
0.0200	1.85
0.0233	1.50
0.0266	2.91
0.0300	3.73
0.0333	3.96
0.0500	3.45
0.0666	3.05
0.0833	2.74
0.1000	2.48
0.1166	2.26
0.1333	2.07
0.1500	1.91
0.1666	1.77
0.1833	1.64
0.2000	1.53
0.2166	1.43
0.2333	1.34
0.2500	1.27
0.2666	1.20
0.2833	1.14
0.3000	1.08
0.3166	1.03
0.3333	0.98
0.4167	0.81
0.5000	0.70
0.5833	0.62
0.6667	0.57
0.7500	0.53
0.8333	0.51
0.9167	0.49
1.0000	0.47
1.0833	0.46
1.1667	0.45
1.2500	0.44
1.3333	0.43
1.4166	0.43
1.5000	0.43
1.5833	0.42
1.6667	0.42
1.7500	0.42
1.8333	0.42
1.9167	0.42
2.0000	0.42
2.5000	0.41
3.0000	0.40
3.5000	0.40
4.0000	0.40
4.5000	0.40
5.0000	0.41
5.5000	0.41
6.0000	0.41
6.5000	0.42
7.0000	0.42
7.5000	0.43
8.0000	0.43
8.5000	0.43
9.0000	0.44
9.5000	0.44
10.0000	0.45
12.0000	0.46
14.0000	0.49
16.0000	0.51

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A Q T E S O L V   R E S U L T S

Version 1.10

06/04/92 02:42:46

==

TEST DESCRIPTION

Data set........... m025e.set
Data set title..... RISING HEAD RESULT, M-025-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... August 9, 1991

Knowns and Constants:
No. of data points.................. 43
Radius of well casing............... 2.54
Radius of well...................... 10.16
Aquifer saturated thickness......... 706.8
Well screen length.................. 304.8
Static height of water in well...... 706.8
Log(Re/Rw).......................... 3.078
A, B, C............................. 0.000, 0.000, 1.969

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

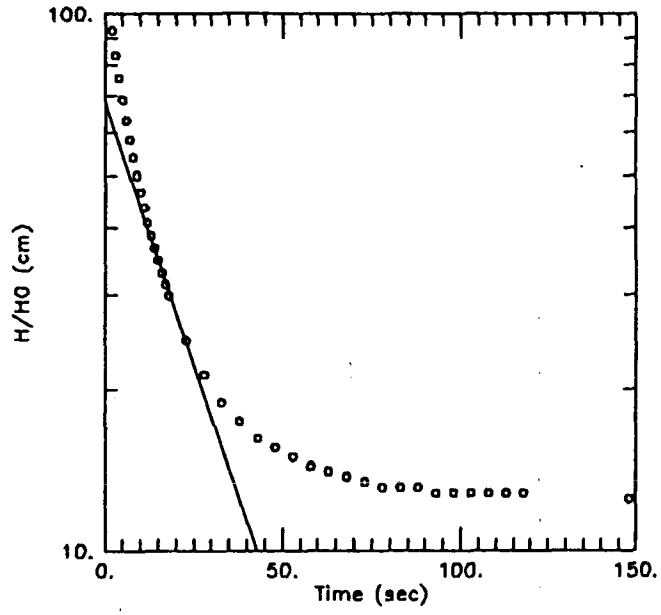
	Estimate
K =	2.5048E-004
y0 =	8.8085E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 1.45859E-003
y0 = 6.78032E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	6.780E+001	1.500E+002	8.205E-002		



DATA SET:
m025e.aet
89/04/02

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
August 9, 1991

ESTIMATED PARAMETERS:
K = 0.081450 cm/sec
y0 = 87.8 cm

TEST DATA:
H0 = 109.5 cm
rc = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
b = 705.8 cm
H = 708.8 cm

RISING HEAD RESULT, M-025-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

M-026-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/11 17:14

Unit# 00515 Test# 3

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/11 13:36

Elapsed Time (min)	Value (ft)
0.0000	6.05
0.0033	10.25
0.0066	13.46
0.0099	14.52
0.0133	9.39
0.0166	11.03
0.0200	9.48
0.0233	5.87
0.0266	7.82
0.0300	8.41
0.0333	9.00
0.0500	8.86
0.0666	8.57
0.0833	8.35
0.1000	8.14
0.1166	7.97
0.1333	7.81
0.1500	7.67
0.1666	7.55
0.1833	7.43
0.2000	7.33
0.2166	7.24
0.2333	7.15
0.2500	7.08
0.2666	7.00
0.2833	6.94
0.3000	6.88
0.3166	6.83
0.3333	6.77
0.4167	6.58
0.5000	6.44
0.5833	6.34
0.6667	6.26
0.7500	6.22
0.8333	6.18
0.9167	6.15
1.0000	6.13
1.0833	6.11
1.1667	6.10
1.2500	6.08
1.3333	6.08
1.4166	6.07
1.5000	6.06
1.5833	6.06
1.6667	6.05
1.7500	6.05
1.8333	6.04
1.9167	6.04
2.0000	6.04
2.5000	6.03
3.0000	6.02
3.5000	6.00
4.0000	6.01
4.5000	6.01

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S

Version 1.10

06/04/92 02:45:11

==

TEST DESCRIPTION

Data set........... m026e.set
Data set title..... RISING HEAD RESULT, M-026-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... September 11, 1991
Test date.......... August 9, 1991

Knowns and Constants:

- No. of data points................... 40
- Radius of well casing................ 2.54
- Radius of well....................... 10.16
- Aquifer saturated thickness.......... 541.9
- Well screen length................... 304.8
- Static height of water in well....... 541.9
- Log(Re/Rw)........................... 2.922
- A, B, C.............................. 0.000, 0.000, 1.969

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

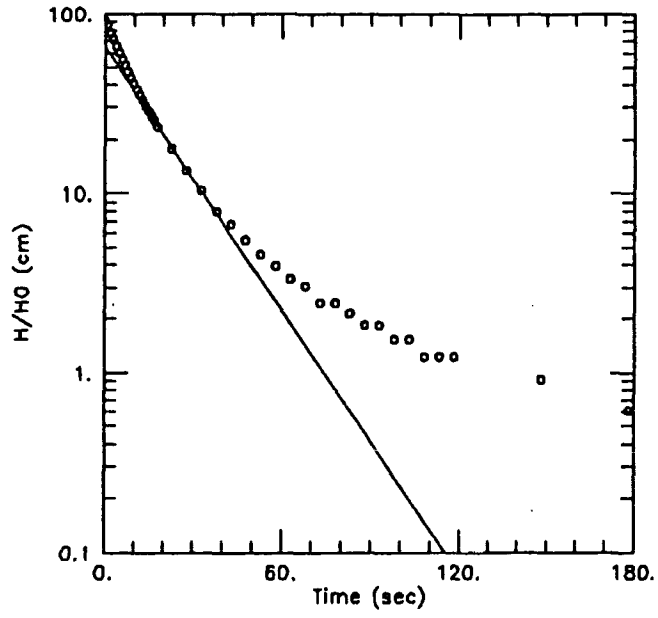
	Estimate
K =	1.7421E-003
y0 =	8.8085E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 1.74213E-003
y0 = 6.51136E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	6.511E+001	1.800E+002	2.568E-003		



DATA SET:
m026e.aet
89/04/02

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
August 9, 1991

ESTIMATED PARAMETERS:
K = 0.081742 cm/sec
y0 = 85.11 cm

TEST DATA:
H0 = 91.44 cm
rc = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
D = 341.8 cm
H = 341.8 cm

RISING HEAD RESULT, M-026-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: September 11, 1991

M-027-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
07/29 14:56

Unit# 00515 Test# 1

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 07/26 10:11

Elapsed Time (min)	Value (ft)
0.0000	-17.78
0.0033	-8.82
0.0066	0.00
0.0099	-17.31
0.0133	-12.48
0.0166	-14.60
0.0200	-14.00
0.0233	-14.25
0.0266	-14.33
0.0300	-14.33
0.0333	-14.41
0.0500	-14.68
0.0666	-14.87
0.0833	-15.04
0.1000	-15.19
0.1166	-15.32
0.1333	-15.45
0.1500	-15.56
0.1666	-15.67
0.1833	-15.77
0.2000	-15.87
0.2166	-15.96
0.2333	-16.05
0.2500	-16.13
0.2666	-16.20
0.2833	-16.28
0.3000	-16.35
0.3166	-16.41
0.3333	-16.47
0.4167	-16.74
0.5000	-16.94
0.5833	-17.10
0.6667	-17.23
0.7500	-17.33
0.8333	-17.41
0.9167	-17.48
1.0000	-17.53
1.0833	-17.57
1.1667	-17.61
1.2500	-17.64
1.3333	-17.67
1.4166	-17.69
1.5000	-17.71
1.5833	-17.72
1.6667	-17.74
1.7500	-17.75
1.8333	-17.76
1.9167	-17.77
2.0000	-17.78
2.5000	-17.82
3.0000	-17.84
3.5000	-17.85
4.0000	-17.86
4.5000	-17.87
5.0000	-17.88
5.5000	-17.88
6.0000	-17.88
6.5000	-17.88
7.0000	-17.89
7.5000	-17.90
8.0000	-17.90
8.5000	-17.89
9.0000	-17.89
9.5000	-17.89
10.0000	-17.89
12.0000	-17.90
14.0000	-17.90
16.0000	-17.91
18.0000	-17.90
20.0000	-17.91
22.0000	-17.91

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A Q T E S O L V   R E S U L T S
Version 1.10

06/04/92 02:49:37

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TEST DESCRIPTION

Data set........... m027e.set
Data set title..... RISING HEAD RESULT, M-027-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... July 26, 1991

Knowns and Constants:
No. of data points................... 59
Radius of well casing................ 2.54
Radius of well....................... 10.16
Aquifer saturated thickness.......... 497.1
Well screen length................... 304.8
Static height of water in well...... 497.1
Log(Re/Rw)........................... 2.87
A, B, C.............................. 0.000, 0.000, 1.969

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	4.3951E-004
y0 =	8.8085E+001

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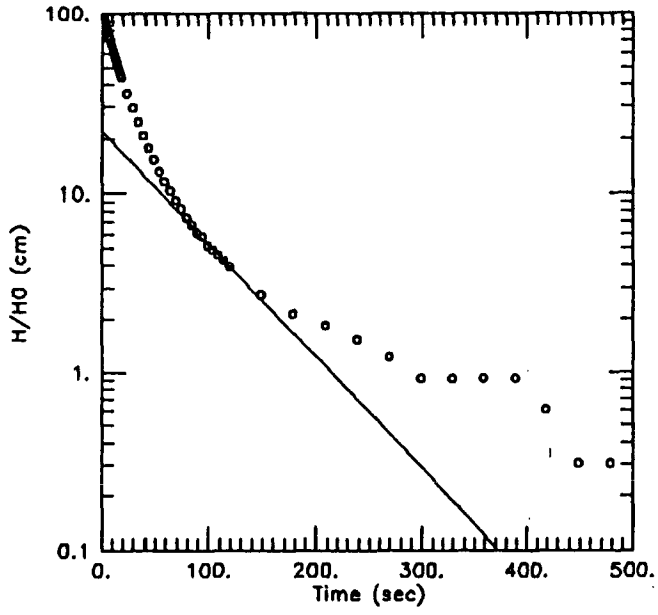
TYPE CURVE DATA

K = 4.39508E-004
y0 = 2.21224E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.212E+001	5.000E+002	1.597E-002		



DATA SET:
m027e.set
08/04/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
July 28, 1991

ESTIMATED PARAMETERS:
K = 0.0804391 cm/sec
y0 = 22.12 cm

TEST DATA:
H0 = 111.8 cm
rc = 2.54 cm
rw = 10.18 cm
L = 304.8 cm
b = 497.1 cm
H = 497.1 cm

RISING HEAD RESULT, M-027-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: 1943–1956 Disposal Area

M-028-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/11 17:16

Unit# 00515 Test# 5

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/11 14:03

Elapsed Time (min)	Value (ft)
0.0000	11.03
0.0033	18.62
0.0066	16.76
0.0099	11.93
0.0133	12.51
0.0166	13.25
0.0200	13.05
0.0233	12.93
0.0266	12.82
0.0300	12.70
0.0333	12.57
0.0500	12.17
0.0666	11.84
0.0833	11.57
0.1000	11.35
0.1166	11.15
0.1333	10.99
0.1500	10.85
0.1666	10.72
0.1833	10.62
0.2000	10.52
0.2166	10.44
0.2333	10.37
0.2500	10.31
0.2666	10.26
0.2833	10.21
0.3000	10.17
0.3166	10.13
0.3333	10.10
0.4167	9.98
0.5000	9.90
0.5833	9.86
0.6667	9.83
0.7500	9.81
0.8333	9.80
0.9167	9.79
1.0000	9.78
1.0833	9.78
1.1667	9.77
1.2500	9.77
1.3333	9.76
1.4166	9.76
1.5000	9.76
1.5833	9.76
1.6667	9.76
1.7500	9.75
1.8333	9.75
1.9167	9.75
2.0000	9.75
2.5000	9.75

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A Q T E S O L V   R E S U L T S
Version 1.10

06/04/92 02:55:21

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TEST DESCRIPTION

Data set........... m028e.set
Data set title..... RISING HEAD RESULT, M-028-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... September 11, 1991

Knowns and Constants:
No. of data points.................. 39
Radius of well casing................ 2.54
Radius of well....................... 10.16
Aquifer saturated thickness.......... 453.2
Well screen length................... 304.8
Static height of water in well...... 453.2
Log(Re/Rw)........................... 2.815
A, B, C............................. 0.000, 0.000, 1.969

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.8640E-003
y0 =	0.0000E+000

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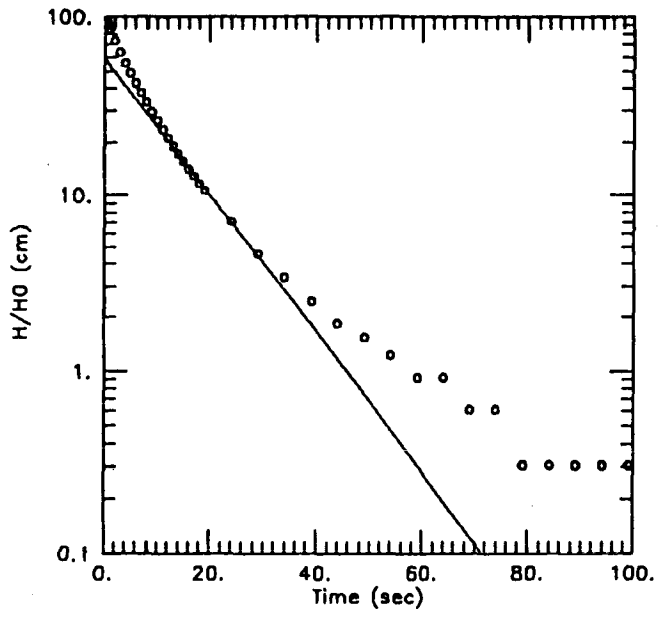
TYPE CURVE DATA

K = 2.65139E-003
y0 = 5.82898E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	5.829E+001	1.000E+002	7.949E-003		



DATA SET:
m028e.aet
88/04/03

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
September 11, 1991

ESTIMATED PARAMETERS:
K = 0.082851 cm/sec
y0 = 58.28 cm

TEST DATA:
H0 = 108.7 cm
rc = 2.54 cm
rw = 10.18 cm
L = 304.8 cm
b = 453.2 cm
H = 453.2 cm

RISING HEAD RESULT, M-028-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY – WESTDIV
Project No.: 2738.0262	Location: 1943–1956 Disposal Area

M-029-E
RISING HEAD FIELD DATA
NAS ALAMEDA, CTO-107
1991

SE1000B
Environmental Logger
09/11 17:19

Unit# 00515 Test# 7

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 10.09
Offset 0.00

Step# 0 09/11 14:32

Elapsed Time (min)	Value (ft)
0.0000	9.82
0.0033	14.32
0.0066	19.44
0.0099	16.63
0.0133	11.53
0.0166	10.63
0.0200	14.00
0.0233	12.19
0.0266	12.60
0.0300	12.37
0.0333	12.36
0.0500	12.07
0.0666	11.88
0.0833	11.71
0.1000	11.58
0.1166	11.45
0.1333	11.33
0.1500	11.22
0.1666	11.11
0.1833	11.00
0.2000	10.91
0.2166	10.82
0.2333	10.73
0.2500	10.65
0.2666	10.58
0.2833	10.51
0.3000	10.45
0.3166	10.39
0.3333	10.33
0.4167	10.09
0.5000	9.92
0.5833	9.80
0.6667	9.71
0.7500	9.64
0.8333	9.60
0.9167	9.54
1.0000	9.50
1.0833	9.46
1.1667	9.43
1.2500	9.42
1.3333	9.40
1.4166	9.39
1.5000	9.37
1.5833	9.37
1.6667	9.36
1.7500	9.35
1.8333	9.35
1.9167	9.35
2.0000	9.34
2.5000	9.33
3.0000	9.33

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A Q T E S O L V   R E S U L T S

Version 1.10

06/04/92 02:57:32

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TEST DESCRIPTION

Data set........... m029e.set
Data set title..... RISING HEAD RESULT, M-029-E
Company............ J.M.MONTGOMERY, CONSULTING ENG
Project............ 2738.0262
Client............. NAVY - WESTDIV
Location........... 1943-1956 Disposal Area
Test date.......... September 11, 1991

Knowns and Constants:

No. of data points.................. 40
Radius of well casing............... 2.54
Radius of well...................... 5.79
Aquifer saturated thickness......... 426.1
Well screen length.................. 304.8
Static height of water in well...... 426.1
Log(Re/Rw).......................... 3.249
A, B, C............................. 0.000, 0.000, 2.732

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.5523E-003
y0 =	0.0000E+000

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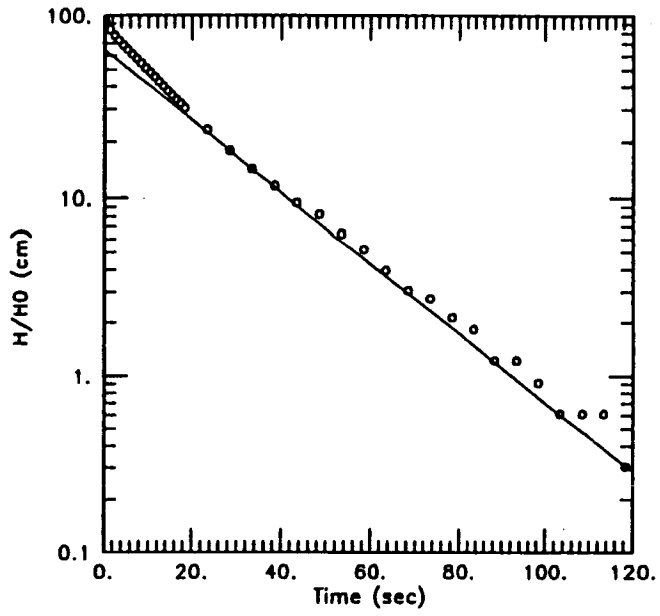
TYPE CURVE DATA

K = 1.55230E-003
y0 = 6.41791E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	6.418E+001	1.200E+002	2.848E-001		



DATA SET:
m029e.set
06/04/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
September 11, 1991

ESTIMATED PARAMETERS:
K = 0.001552 cm/sec
y0 = 64.18 cm

TEST DATA:
H0 = 99.67 cm
rc = 2.54 cm
rw = 5.79 cm
L = 304.8 cm
b = 426.1 cm
H = 426.1 cm

RISING HEAD RESULT, M-029-E

J.M.MONTGOMERY, CONSULTING ENG	Client: NAVY - WESTDIV
Project No.: 2738.0262	Location: 1943-1956 Disposal Area

APPENDIX H INSERT

HISTORICAL GROUNDWATER ELEVATIONS

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M001-A	6/17/91	TOWC	4.83	9.34	4.51	NO
1	M001-A	9/19/91	TOWC	5.06	9.34	4.28	NO
1	M001-A	1/14/92	TOWC	4.01	9.34	5.33	NO
1	M001-A	3/26/92	TOWC	3.34	9.34	6	NO
1	M001-A	10/4/94	TOWC	5.11	9.34	4.23	NO
1	M001-A	1/25/95	TOWC	2.24	9.34	7.1	NO
1	M001-A	4/4/95	TOWC	3.51	9.34	5.83	NO
1	M001-A	7/13/95	TOWC	4.65	9.34	4.69	NO
1	M001-A	4/9/98	TOWC	3.5	9.34	5.84	NO
1	M001-B	6/18/91	TOWC	5.35	9.88	2.57	YES
1	M001-B	9/19/91	TOWC	5.16	9.88	2.53	YES
1	M001-B	1/14/92	TOWC	5.37	9.88	2.61	YES
1	M001-B	3/27/92	TOWC	4.24	9.88	2.97	YES
1	M001-B	10/8/94	TOWC	5.22	9.88	1.52	YES
1	M001-B	4/4/95	TOWC	6.46	9.88	4.92	YES
1	M001-B	7/13/95	TOWC	6.94	9.88	4.2	YES
1	M001-B	5/2/97	TOWC	5.21	9.88	2	YES
1	M001-B	6/18/97	TOWC	7.61	9.88	-0.21	YES
1	M001-B	4/9/98	TOWC	6.9	9.88	4.02	YES
1	M001-E	6/17/91	TOWC	5.68	10.05	4.37	NO
1	M001-E	9/19/91	TOWC	5.91	10.05	4.14	NO
1	M001-E	1/14/92	TOWC	5.39	10.05	4.66	NO
1	M001-E	3/27/92	TOWC	4.31	10.05	5.74	NO
1	M001-E	10/4/94	TOWC	6.13	10.05	3.92	NO
1	M001-E	1/25/95	TOWC	3.5	10.05	6.55	NO
1	M001-E	4/4/95	TOWC	4.56	10.05	5.49	NO
1	M001-E	7/13/95	TOWC	5.55	10.05	4.5	NO
1	M001-E	5/2/97	TOWC	6.4	10.05	3.65	NO
1	M001-E	6/18/97	TOWC	5.78	10.05	4.27	NO
1	M001-E	10/29/97	TOWC	5.82	10.05	4.23	NO
1	M001-E	2/4/98	TOWC	3.21	10.05	6.84	NO
1	M001-E	4/9/98	TOWC	4.51	10.05	5.54	NO
1	M001-E	5/12/98	TOWC	5.12	10.05	4.93	NO
1	M001-E	8/3/98	TOWC	5.95	10.05	4.1	NO
1	M002-A	6/19/91	TOWC	6.87	11.27	4.4	NO
1	M002-A	9/20/91	TOWC	7.1	11.27	4.17	NO
1	M002-A	1/14/92	TOWC	6.84	11.27	4.43	NO
1	M002-A	3/30/92	TOWC	6.38	11.27	4.89	NO
1	M002-A	12/7/94	TOWC	6.35	11.27	4.92	NO
1	M002-A	1/25/95	TOWC	5.57	11.27	5.7	NO
1	M002-A	4/4/95	TOWC	6.75	11.27	4.52	NO
1	M002-A	7/13/95	TOWC	6.51	11.27	4.76	NO
1	M002-A	6/18/97	TOWC	6.91	11.27	4.36	NO
1	M002-A	4/9/98	TOWC	6.18	11.27	5.09	NO
1	M002-E	6/19/91	TOWC	6.66	11.07	4.41	NO
1	M002-E	9/20/91	TOWC	6.55	11.07	4.52	NO
1	M002-E	1/14/92	TOWC	9.95	11.07	1.12	NO
1	M002-E	3/30/92	TOWC	8.6	11.07	2.47	NO

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M002-E	10/4/94	TOWC	4.37	11.07	6.7	NO
1	M002-E	1/25/95	TOWC	6.13	11.07	4.94	NO
1	M002-E	4/4/95	TOWC	6.91	11.07	4.16	NO
1	M002-E	7/13/95	TOWC	5.77	11.07	5.3	NO
1	M002-E	5/2/97	TOWC	5.02	11.07	6.05	NO
1	M002-E	6/18/97	TOWC	10.25	11.07	0.82	NO
1	M002-E	10/29/97	TOWC	4.62	11.07	6.45	NO
1	M002-E	2/4/98	TOWC	8.11	11.07	2.96	NO
1	M002-E	4/9/98	TOWC	6.3	11.07	4.77	NO
1	M002-E	5/14/98	TOWC	2.98	11.07	8.09	NO
1	M002-E	8/3/98	TOWC	7.21	11.07	3.86	NO
1	M003-A	6/17/91	TOWC	6.13	11.13	5	NO
1	M003-A	9/20/91	TOWC	6.54	11.13	4.53	YES
1	M003-A	1/14/92	TOWC	4.4	11.13	6.74	YES
1	M003-A	4/10/92	TOWC	4.95	11.13	6.19	YES
1	M003-A	10/4/94	TOWC	6.4	11.13	4.64	YES
1	M003-A	1/26/95	TOWC	2.61	11.13	8.52	NO
1	M003-A	4/4/95	TOWC	4.22	11.13	6.92	YES
1	M003-A	7/13/95	TOWC	5.93	11.13	5.15	YES
1	M003-A	6/18/97	TOWC	7.03	11.13	4.05	YES
1	M003-A	4/9/98	TOWC	4.08	11.13	6.97	YES
1	M003-B	11/28/94	TOWC	6.73	11.55	5.39	YES
1	M003-B	1/31/95	TOWC	7.6	11.55	1.54	YES
1	M003-B	4/4/95	TOWC	8.97	11.55	3.03	YES
1	M003-B	7/13/95	TOWC	7.88	11.55	1.26	YES
1	M003-B	5/2/97	TOWC	7.41	11.55	1.48	YES
1	M003-B	6/18/97	TOWC	8.71	11.55	0.51	YES
1	M003-B	4/9/98	TOWC	6.8	11.55	2.2	YES
1	M004-A	6/18/91	TOWC	5.81	10.6	4.79	NO
1	M004-A	9/20/91	TOWC	6.12	10.6	4.48	NO
1	M004-A	1/15/92	TOWC	4.74	10.6	5.86	NO
1	M004-A	4/13/92	TOWC	4.42	10.6	6.18	NO
1	M004-A	9/19/94	TOWC	6.29	10.6	4.31	NO
1	M004-A	10/4/94	TOWC	6.17	10.6	4.43	NO
1	M004-A	1/5/95	TOWC	2.55	10.6	8.05	NO
1	M004-A	1/26/95	TOWC	2.47	10.6	8.13	NO
1	M004-A	4/4/95	TOWC	3.6	10.6	7	NO
1	M004-A	7/13/95	TOWC	5.81	10.6	4.79	NO
1	M004-A	5/2/97	TOWC	5.85	10.6	4.75	NO
1	M004-A	6/18/97	TOWC	6.16	10.6	4.44	NO
1	M004-A	4/9/98	TOWC	3.33	10.6	7.27	NO
1	M01-P	4/9/98	TOWC	1.55	9.43	7.88	NO
1	M025-A	6/28/91	TOWC	3.4	8.86	4.08	YES
1	M025-A	10/2/91	TOWC	4.61	8.86	3.24	YES
1	M025-A	1/23/92	TOWC	4.75	8.86	4.78	YES
1	M025-A	3/31/92	TOWC	4.22	8.86	4.64	NO
1	M025-A	10/6/94	TOWC	3.46	8.86	3.9	YES
1	M025-A	1/26/95	TOWC	3.33	8.86	4.38	YES

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M025-A	4/4/95	TOWC	4.65	8.86	4.42	YES
1	M025-A	7/13/95	TOWC	4.68	8.86	4.11	YES
1	M025-A	6/18/97	TOWC	4.58	8.86	4.84	YES
1	M025-A	4/9/98	TOWC	4.01	8.86	3.97	YES
1	M025-C	6/28/91	TOWC	3.35	8.33	4.57	YES
1	M025-C	10/2/91	TOWC	3.38	8.33	4.44	YES
1	M025-C	2/3/92	TOWC	3.19	8.33	4.55	YES
1	M025-C	4/8/92	TOWC	3.65	8.33	4.7	YES
1	M025-C	10/6/94	TOWC	3.67	8.33	4.97	YES
1	M025-C	4/4/95	TOWC	3.44	8.33	5.02	YES
1	M025-C	7/13/95	TOWC	3.86	8.33	4.06	YES
1	M025-C	5/2/97	TOWC	3.65	8.33	4.17	YES
1	M025-C	6/18/97	TOWC	3.84	8.33	4.07	YES
1	M025-C	4/9/98	TOWC	3.29	8.33	5.23	YES
1	M027-A	6/25/91	TOWC	5.1	9.7	4.39	YES
1	M027-A	10/3/91	TOWC	5.1	9.7	4.42	YES
1	M027-A	1/31/92	TOWC	4.23	9.7	5.21	YES
1	M027-A	3/26/92	TOWC	3.76	9.7	5.72	YES
1	M027-A	10/7/94	TOWC	5.07	9.7	4.72	YES
1	M027-A	1/30/95	TOWC	3.13	9.7	6.35	YES
1	M027-A	4/4/95	TOWC	4.48	9.7	5.26	YES
1	M027-A	7/13/95	TOWC	5.13	9.7	4.53	YES
1	M027-A	6/18/97	TOWC	5.29	9.7	4.22	YES
1	M027-A	4/9/98	TOWC	4.13	9.7	5.71	YES
1	M027-B	6/26/91	TOWC	5.38	9.66	4.89	YES
1	M027-B	10/3/91	TOWC	4.75	9.66	3.83	YES
1	M027-B	1/31/92	TOWC	4.21	9.66	4.03	YES
1	M027-B	4/7/92	TOWC	5.93	9.66	3.76	YES
1	M027-B	7/13/95	TOWC	6.22	9.66	3.51	YES
1	M027-B	5/2/97	TOWC	5.02	9.66	3.53	YES
1	M027-B	6/18/97	TOWC	5.75	9.66	3.01	YES
1	M027-B	4/9/98	TOWC	5.39	9.66	4.53	YES
1	M027-C	6/26/91	TOWC	4.61	9.26	3.6	YES
1	M027-C	10/3/91	TOWC	4.95	9.26	4.9	YES
1	M027-C	1/31/92	TOWC	3.99	9.26	3.87	YES
1	M027-C	4/6/92	TOWC	5.35	9.26	4.2	YES
1	M027-C	11/30/94	TOWC	5.82	9.26	3.34	YES
1	M027-C	4/4/95	TOWC	5.3	9.26	4.33	YES
1	M027-C	7/13/95	TOWC	6.05	9.26	3.19	YES
1	M027-C	5/2/97	TOWC	4.77	9.26	3.42	YES
1	M027-C	6/18/97	TOWC	5.41	9.26	2.95	YES
1	M027-C	4/9/98	TOWC	5.22	9.26	4.31	YES
1	M027-E	6/25/91	TOWC	4.77	9.52	4.43	YES
1	M027-E	10/3/91	TOWC	4.95	9.52	4.28	YES
1	M027-E	1/31/92	TOWC	3.97	9.52	5.2	YES
1	M027-E	3/26/92	TOWC	3.62	9.52	5.59	YES
1	M027-E	10/7/94	TOWC	4.87	9.52	4.82	YES
1	M027-E	1/30/95	TOWC	3.02	9.52	6.12	YES

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M027-E	4/4/95	TOWC	4.48	9.52	5.11	YES
1	M027-E	7/13/95	TOWC	5.04	9.52	4.43	YES
1	M027-E	5/2/97	TOWC	4.99	9.52	4.25	YES
1	M027-E	6/18/97	TOWC	5.15	9.52	4.09	YES
1	M027-E	10/30/97	TOWC	4.5	9.52	4.64	YES
1	M027-E	2/3/98	TOWC	2.31	9.52	7.49	YES
1	M027-E	4/9/98	TOWC	4.11	9.52	5.54	YES
1	M027-E	5/14/98	TOWC	4.32	9.52	5.37	YES
1	M027-E	8/3/98	TOWC	4.9	9.52	4.34	YES
1	M028-A	6/24/91	TOWC	6.12	10.66	4.47	YES
1	M028-A	10/11/91	TOWC	5.97	10.66	4.62	YES
1	M028-A	2/4/92	TOWC	5.34	10.66	5.25	YES
1	M028-A	4/27/92	TOWC	5.67	10.66	4.92	YES
1	M028-A	10/10/94	TOWC	6.8	10.66	3.76	YES
1	M028-A	1/27/95	TOWC	3.74	10.66	6.96	YES
1	M028-A	4/4/95	TOWC	4.9	10.66	5.79	YES
1	M028-A	7/13/95	TOWC	5.95	10.66	4.72	YES
1	M028-A	5/2/97	TOWC	6.11	10.66	4.45	YES
1	M028-A	6/18/97	TOWC	6.16	10.66	4.4	YES
1	M028-A	11/7/97	TOWC	6.18	10.66	4.39	YES
1	M028-A	2/3/98	TOWC	3.08	10.66	7.65	YES
1	M028-A	4/9/98	TOWC	5.23	10.66	5.48	YES
1	M028-A	5/4/98	TOWC	5.7	10.66	4.99	YES
1	M028-A	8/3/98	TOWC	6.35	10.66	4.23	YES
1	M028-C	1/31/95	TOWC	5.36	11.07	4.59	YES
1	M028-C	4/4/95	TOWC	7.31	11.07	2.96	YES
1	M028-C	7/13/95	TOWC	8.07	11.07	3.35	YES
1	M028-C	2/3/98	TOWC	5.45	11.18	6.45	YES
1	M028-C	4/9/98	TOWC	7.76	11.18	3.75	YES
1	M028-C	5/5/98	TOWC	6.46	11.18	3.62	YES
1	M028-C	8/4/98	TOWC	6.97	11.18	3.3	YES
1	M028-E	6/25/91	TOWC	5.9	10.75	4.64	YES
1	M028-E	6/25/91	TOWC	5.9	10.75	4.64	YES
1	M028-E	10/11/91	TOWC	5.75	10.75	4.86	YES
1	M028-E	2/4/92	TOWC	5.27	10.75	5.34	YES
1	M028-E	4/27/92	TOWC	5.46	10.75	5.34	YES
1	M028-E	11/28/94	TOWC	5.28	10.75	5.51	YES
1	M028-E	1/27/95	TOWC	2.91	10.75	7.65	YES
1	M028-E	4/4/95	TOWC	5.05	10.75	5.57	YES
1	M028-E	7/13/95	TOWC	5.98	10.75	4.79	YES
1	M028-E	6/18/97	TOWC	6.21	10.75	4.36	YES
1	M028-E	10/30/97	TOWC	5.96	10.75	4.63	YES
1	M028-E	2/3/98	TOWC	2.84	10.74	8.05	YES
1	M028-E	4/9/98	TOWC	4.99	10.74	5.84	YES
1	M028-E	5/4/98	TOWC	5.52	10.74	5.27	YES
1	M028-E	8/3/98	TOWC	6	10.74	4.88	YES
1	M029-A	6/20/91	TOWC	5.29	9.78	4.4	YES
1	M029-A	10/10/91	TOWC	5.31	9.78	4.38	YES

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M029-A	2/4/92	TOWC	4.56	9.78	5.12	YES
1	M029-A	3/27/92	TOWC	3.98	9.78	5.72	YES
1	M029-A	10/10/94	TOWC	5.38	9.78	4.33	YES
1	M029-A	4/4/95	TOWC	4.52	9.78	5.28	YES
1	M029-A	7/13/95	TOWC	5.78	9.78	3.99	YES
1	M029-A	6/18/97	TOWC	5.7	9.78	4.13	YES
1	M029-A	4/9/98	TOWC	4.29	9.78	5.41	YES
1	M029-E	6/20/91	TOWC	4.55	8.94	4.21	YES
1	M029-E	10/10/91	TOWC	5.6	8.94	3.07	YES
1	M029-E	2/4/92	TOWC	4.01	8.94	4.6	YES
1	M029-E	3/27/92	TOWC	2.98	8.94	5.72	YES
1	M029-E	10/10/94	TOWC	4.54	8.94	4.18	YES
1	M029-E	1/27/95	TOWC	1.7	8.94	6.99	YES
1	M029-E	4/4/95	TOWC	3.33	8.94	5.68	YES
1	M029-E	7/13/95	TOWC	4.41	8.94	4.52	YES
1	M029-E	5/2/97	TOWC	4.62	8.94	4.07	YES
1	M029-E	6/18/97	TOWC	4.72	8.94	4.03	YES
1	M029-E	10/29/97	TOWC	4.34	8.94	4.29	YES
1	M029-E	2/4/98	TOWC	0.91	8.94	8.16	YES
1	M029-E	4/9/98	TOWC	3.29	8.94	5.42	YES
1	M029-E	5/6/98	TOWC	3.62	8.94	5.13	YES
1	M029-E	8/3/98	TOWC	4.4	8.94	4.29	YES
1	M030-A	9/19/94	TOWC	5.66	10.42	4.76	NO
1	M030-A	10/10/94	TOWC	5.32	10.42	5.1	NO
1	M030-A	1/5/95	TOWC	2	10.42	8.42	NO
1	M030-A	2/1/95	TOWC	1.91	10.42	8.51	NO
1	M030-A	7/13/95	TOWC	4.95	10.42	5.47	NO
1	M030-A	4/9/98	TOWC	2.76	10.42	7.66	NO
1	M030-C	2/14/95	TOWC	5.75	10.74	3.84	YES
1	M030-C	4/4/95	TOWC	7.63	10.74	3.37	YES
1	M030-C	7/13/95	TOWC	6.92	10.74	2.43	YES
1	M030-C	5/2/97	TOWC	6.78	10.74	2.78	YES
1	M030-C	6/18/97	TOWC	7.8	10.74	1.63	YES
1	M030-C	4/9/98	TOWC	6.2	10.74	3.23	YES
1	M030-E	9/19/94	TOWC	5.64	10.38	4.74	NO
1	M030-E	10/10/94	TOWC	5.32	10.38	5.06	NO
1	M030-E	1/5/95	TOWC	2	10.38	8.38	NO
1	M030-E	2/1/95	TOWC	2.02	10.38	8.36	NO
1	M030-E	4/4/95	TOWC	2.91	10.38	7.47	NO
1	M030-E	7/13/95	TOWC	4.9	10.38	5.48	NO
1	M030-E	5/2/97	TOWC	4.82	10.38	5.56	NO
1	M030-E	6/18/97	TOWC	5.3	10.38	5.08	NO
1	M030-E	10/29/97	TOWC	5.34	10.38	5.04	NO
1	M030-E	2/4/98	TOWC	0.91	10.38	9.47	NO
1	M030-E	4/9/98	TOWC	2.7	10.38	7.68	NO
1	M030-E	5/14/98	TOWC	3.47	10.38	6.91	NO
1	M030-E	8/3/98	TOWC	4.98	10.38	5.4	NO
1	M031-C	12/5/94	TOWC	4.18	9.2	4.42	YES

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M031-C	2/18/95	TOWC	4.56	9.2	4.82	YES
1	M031-C	4/4/95	TOWC	5.14	9.2	4.16	YES
1	M031-C	7/14/95	TOWC	5.49	9.2	3.63	YES
1	M031-C	5/2/97	TOWC	5.11	9.2	3.55	YES
1	M031-C	6/18/97	TOWC	5.39	9.2	3.35	YES
1	M031-C	4/9/98	TOWC	4.96	9.2	4.37	YES
1	M031-E	9/19/94	TOWC	4.22	8.81	4.59	NO
1	M031-E	10/10/94	TOWC	3.71	8.81	5.1	NO
1	M031-E	1/5/95	TOWC	0.25	8.81	8.56	NO
1	M031-E	2/1/95	TOWC	0.5	8.81	8.31	NO
1	M031-E	4/4/95	TOWC	1.67	8.81	7.14	NO
1	M031-E	7/14/95	TOWC	3.66	8.81	5.15	NO
1	M031-E	5/2/97	TOWC	3.99	8.81	4.82	NO
1	M031-E	6/18/97	TOWC	3.96	8.81	4.85	NO
1	M031-E	10/29/97	TOWC	3.77	8.81	5.04	NO
1	M031-E	2/10/98	TOWC	0.1	8.81	8.71	NO
1	M031-E	4/9/98	TOWC	0.99	8.81	7.82	NO
1	M031-E	5/14/98	TOWC	1.4	8.81	7.41	NO
1	M031-E	8/3/98	TOWC	4.39	8.81	4.42	NO
1	M033-A	9/19/94	TOWC	5.95	10.5	4.55	NO
1	M033-A	11/29/94	TOWC	4.61	10.5	5.89	NO
1	M033-A	1/5/95	TOWC	3.8	10.5	6.7	NO
1	M033-A	1/30/95	TOWC	3.22	10.5	7.28	NO
1	M033-A	4/4/95	TOWC	4.3	10.5	6.2	NO
1	M033-A	7/14/95	TOWC	5.54	10.5	4.96	NO
1	M033-A	4/9/98	TOWC	4.25	10.5	6.25	NO
1	M034-A	9/19/94	TOWC	4.6	9.21	4.61	NO
1	M034-A	10/11/94	TOWC	4.32	9.21	4.89	NO
1	M034-A	1/5/95	TOWC	2.2	9.21	7.01	NO
1	M034-A	1/26/95	TOWC	1.84	9.21	7.37	NO
1	M034-A	4/4/95	TOWC	2.8	9.21	6.41	NO
1	M034-A	7/14/95	TOWC	4.14	9.21	5.07	NO
1	M034-A	5/2/97	TOWC	4.25	9.21	4.96	NO
1	M034-A	6/18/97	TOWC	4.43	9.21	4.78	NO
1	M034-A	11/4/97	TOWC	4.36	9.21	4.85	NO
1	M034-A	2/4/98	TOWC	1	9.21	8.21	NO
1	M034-A	4/9/98	TOWC	2.59	9.21	6.62	NO
1	M034-A	5/7/98	TOWC	3.14	9.21	6.07	NO
1	M034-A	8/3/98	TOWC	4.17	9.21	5.04	NO
1	M035-A	9/19/94	TOWC	5.41	10.94	5.53	NO
1	M035-A	10/11/94	TOWC	6.04	10.94	4.9	NO
1	M035-A	1/5/95	TOWC	4.2	10.94	6.74	NO
1	M035-A	1/25/95	TOWC	3.83	10.94	7.11	NO
1	M035-A	4/4/95	TOWC	4.88	10.94	6.06	NO
1	M035-A	7/14/95	TOWC	5.98	10.94	4.96	NO
1	M035-A	6/18/97	TOWC	6.29	10.94	4.65	NO
1	M035-A	11/4/97	TOWC	6.06	10.94	4.88	NO
1	M035-A	2/3/98	TOWC	2.58	10.94	8.36	NO

GROUNDWATER ELEVATION DATA
IR SITE 1 (1991-1998)
ALAMEDA POINT

IR Site	Monitoring Well	Sampling Date	Reference Point	Depth in Water (feet)	Reference Point Elevation (ft. MLLW)	Water Elevation (ft. MLLW)	Tidally Corrected
1	M035-A	4/9/98	TOWC	4.75	10.94	6.19	NO
1	M035-A	5/7/98	TOWC	5.3	10.94	5.64	NO
1	M035-A	8/3/98	TOWC	6.11	10.94	4.83	NO
1	M2A	4/9/98	TOWC	6.24	11.26	5.02	NO
1	P01-01	4/9/98	TOWC	1.56	9.4	7.84	NO
1	P01-02	4/9/98	TOWC	1.58	9.44	7.86	NO
1	P01-03	4/9/98	TOWC	1.2	9	7.8	NO

Notes:
MLLW - Mean lower low water

APPENDIX I

SOIL, GROUNDWATER, AND BACKGROUND ANALYTICAL RESULTS

N00236.001656
ALAMEDA POINT
SSIC NO. 5090.3

APPENDIX I – SOIL, GROUNDWATER AND BACKGROUND ANALYTICAL RESULTS

THIS RECORD CONTAINS LARGE VOLUMES OF DATA AND IS NOT REQUIRED TO BE PHYSICALLY LOCATED WITH THE ADMINISTRATIVE RECORD DOCUMENT.

DUE TO EXTENSIVE VOLUME, THIS DATA WILL NOT BE IMAGED.

TO VIEW THE DATA, CONTACT:

DIANE C. SILVA
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NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 532-3676

APPENDIX J

RADIATION SURVEY DATA

TABLE J-1

SITE 1 TRANSECT WALKOVER SURVEY ANOMALIES

Anomaly Number	Location	Count Rate (cpm)	Exposure Rate (μR/hr)
1	8 m N of G-8	NC	17
2	8 m N of G-8	4,662	17
3	1.3 m W of J-8	4,523	12
4	13 m E of J-8	26,566	100
5	13 m N of trailer in C-D/23	10,462	30
6	just N and W of #5	5,238	20
7[a]	10 m W of D-3	NC	200(8 to 10)
8	10 m E of B-3	5,189	20
9	5.3 m E of B-3	34,328	120
10	near A-3, in front of blue waste bin	22,988	100
11	2 m E of volley ball court, S of trailer	13,219	50
12[a]	between I-3/4,7 m NE of northern corner yellow post/Bldg. 133	188,888	150 (5 to 7)
13[b]	between I-8/I-9	5,720	25
14	between J-8/J-7	13,431	50
15	between O-3/O-4	2,544	15
16	3.3 m E of O-4	23,379	100
18[a]	3.3 m E of S-1	27,129	190(15)
19	2.6 m W of S-1	5,672	20
20	3.6 m W of C-3	32,826	120
21[a]	1.2 m S of DD-16	178,563	2,500 (10 to 12)
23[b]	5 m east of #18	NC	2,000

Notes:

cpm	counts per minute	µR/hr	microRoentgens per hour
N, S, E, W	north, south, east, west	m	meters
NC	no count rate determined	( )	post-recovery rate

a Source recovered

b Expose rate did not drop off dramatically with distance suggesting a deep strong source

Source:

PRC. 1997. "Addendum to the Remedial Investigation/Feasibility Study, Data Transmittal Memorandum, Site 1 and Site 2 Radiation Survey Report." Final, February.

TABLE J-2

IN SITU GAMMA SPECTROSCOPY RESULTS

Anomaly No.	Collection Time (minutes)	Ra-226 Activity[a] (μCi)	Total Spectrum cpm	Comments
1	15	0.003	12,546	small peak
2	15	0.005	24,881	small peak
3	15	0.004	22,596	very small peak
4	14	0.026	179,235	small peak
5	30	0.005	19,203	small peak
6	30	0.003	14,358	small peak
7[b]	30	0.001	7,674	source removed / small peak
8	15	0.006	27,666	very small peak
9	15	0.022	116,061	small peak
10	15	0.042	95,967	well defined peak
11	30	0.014	35,529	well defined peak
12[b]	NA	NA	NA	source removed / no spectrum taken
13	15	0.004	34,474	small peak
14	15	0.039	73,232	well defined peak
15	30	0.002	9,780	very small peak
16	30	0.019	106,572	very small peak
17	30	0.009	6,982	well defined peak
18[b]	30	0.146	143,196	source removed / well defined peak
19	30	no peak identified	16,421	no peaks identified
20	15	0.023	150,708	small peak
21[b]	NA	NA	NA	source removed / no spectrum taken
22	15	0.013	29,986	well defined peak
23	15	0.724	209,402	very small peak
Background	15	no peak identified	6,492	no peaks identified

Notes:
- NA — No spectrum was collected as a result of the response of the Ludlum Model 44-10 2-inch by 2-inch detector, indicating that the location did not exhibit counts above background once the source was removed.
- cpm — counts per minute
- a — Ra-226 (radium-226) activity equal to the bismuth-214 activity as determined by the MicroMCB™ program (the background activity has been subtracted).
- b — A discrete source was located and removed before the spectrum was collected.

TABLE J-3

RADIOACTIVE SOURCES RECOVERED FROM SITES 1 AND 2

Anomaly No.	Depth to Source (inches)	Physical Description	Approximate Activity[a] (µCi)	Exposure Rate[b] (µR/hr)
7	surface	~ 2 inch long cylinder, threaded and open at one end	0.61	300
12	3	small cylinder ~ 0.25 inches in diameter by ~ 1 inch long	0.23	180
18	3	~ 1.3 inch diameter disk (may have been a deck marker)	0.70	200
21	5	metal plate with curved sides approximately 3 inches by 1.5 inches	9.46	3,500

Notes: µCi microCurie
µR/hr microRoentgens per hour
a The activity was approximated using the Ludlum Model 44-10 2-inch by 2-inch NaI detector and the known activity of the 0.87 µCi radium-226 button using the following equation:

$$A\ (\mu Ci) = \frac{C_2 - B}{C_1 - B} \cdot 0.87\ \mu Ci \qquad \text{(Equation 7-1)}$$

where:

A = the activity of the unknown source in µCi
C_2 = number of counts due to the unknown source at a distance x from the detector
C_1 = number of counts due to the known 0.87 µCi button at a distance x from the detector
B = number of background counts

b Exposure rates taken at one inch from the sample jar containing the source.

TABLE J-4

NORTHWEST POINT OF SITE 1 ANOMALIES

Anomaly	Initial Count Rate [a] (cpm)	Initial Exposure Rate [b] (μR/hr)	Source Recovered	Final Count Rate [c] (cpm)	Final Exposure Rate [b] (μR/hr)
FP01	8,824	6-8	No[d]	2,916	6-8
FP02	1,578	7-9	Yes	5,313	7-9
FP03	5,037	8-10	No	n/a	n/a
FP04	379,842	280	No	n/a	n/a
FP05	1,396	5-7	Yes	2,252	6-7
FP06	40,637	80	No	n/a	n/a
FP07	2,249	8-10	No	n/a	n/a
FP08	8,922	7-8	No	n/a	n/a
FP09	704	6-8	No	n/a	n/a
FP10	3,844	5-7	Yes	465	9-11
FP11	1,233	4-6	No	n/a	n/a
FP12	44,372	5-7	Yes	953	6-7
FP13	17,850	4-5	Yes	533	5-6
FP14	6,500	4-5	No	n/a	n/a
FP15	13,178	8-9	Yes	1,084	5-6
FP16	948	6-7	No	n/a	n/a
FP17	4,515	4-6	No	n/a	n/a
FP18	16,868	6-7	Yes	1	4-5
FP19	3,313	4-5	No[e]	172	4-5

Notes:
[a] Net counts on the ground surface prior to excavation
[b] Taken at 1 meter above the ground surface
[c] Net counts on the ground surface after excavation
[d] No single source recovered, soil appeared to have dispersed activity
[e] Anomaly could not be located again
n/a = no source recovered, count rates increased with depth
cpm = counts per minute
μR/hr - microRoentgens per hour

TABLE J-5
NORTHWEST POINT OF SITE 1
GRID NODE SURVEY RESULTS

Grid Node	Count Rate[a] (cpm)	Grid Node	Count Rate[a] (cpm)
A,0	$<L_D$	F,-1	414
A,-2	$<L_D$	F,-3	$<L_D$
A,-4	$<L_D$	G,0	$<L_D$
A,-6	138	G,-2	345
B,-1	$<L_D$	G,-3.5	182
B,-3	$<L_D$	H,1	$<L_D$
B,-5	$<L_D$	H,-1	$<L_D$
C,0	$<L_D$	H,-3	$<L_D$
C,-2	$<L_D$	I,4	$<L_D$
C,-4	$<L_D$	I,2	$<L_D$
D,-1	$<L_D$	I,0	$<L_D$
D,-3	$<L_D$	I,-2	$<L_D$
D,-5	115	J,5	145
E,0	355	J,3	137
E,-2	$<L_D$	J,5	145
E,-4	179	——	——

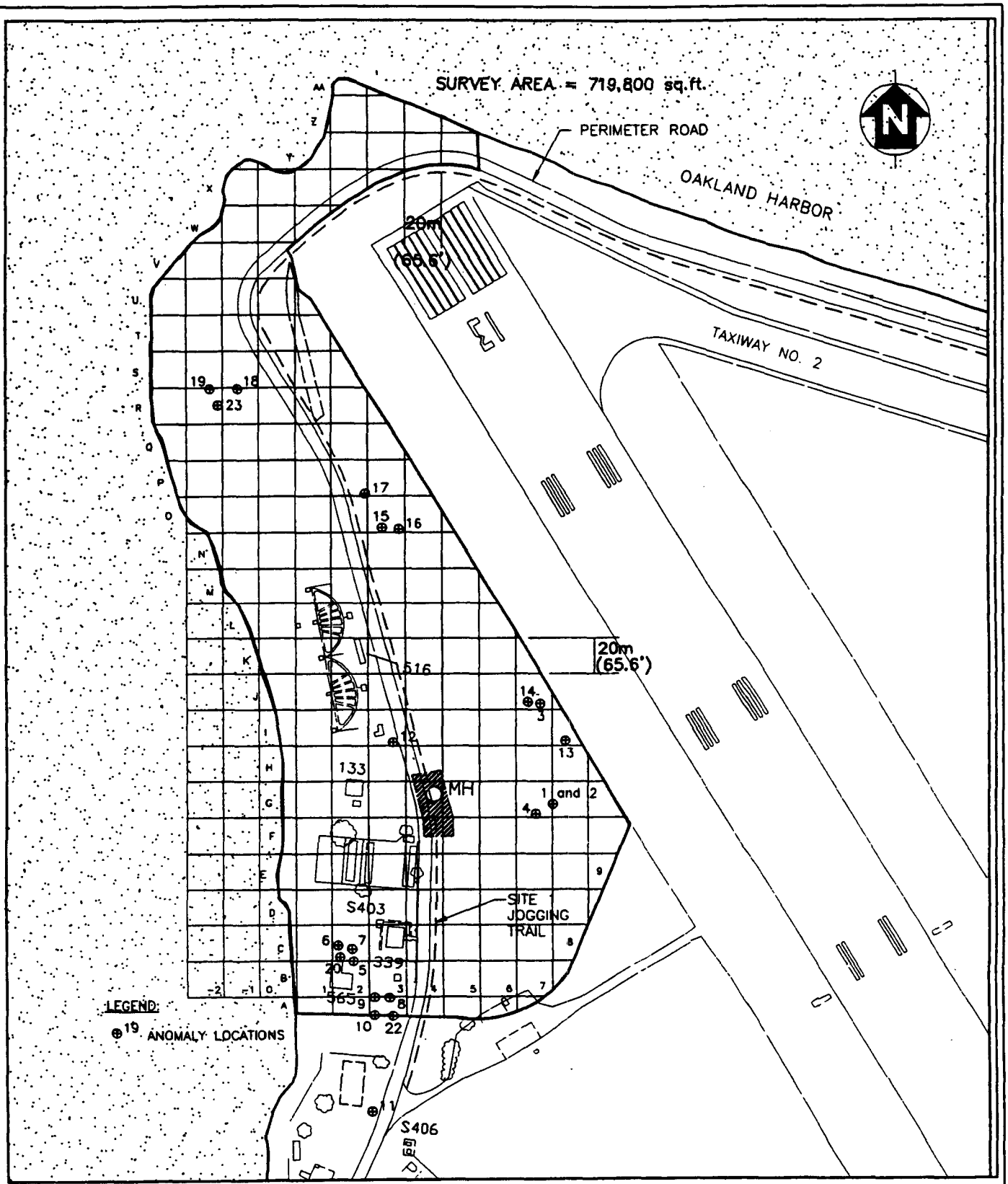
Notes:
cpm = counts per minute
L_d = Detection limit = 110 cpm
[a] = Net gamma count rate

TABLE J-6

SITE 1 JOGGING TRAIL ANOMALIES

Anomaly	Initial Count Rate [a] (cpm)	Initial Exposure Rate [b] (μR/hr)	Source Recovered	Final Count Rate [c] (cpm)	Final Exposure Rate [b] (μR/hr)
JT01	9,199	8-9	Yes[d]	1,353	5-6
JT02	886	6-8	No	n/a	n/a
JT03	7,631	6-8	Yes	109	5-6
JT04	3,795	7-9	Yes	367	5-6
JT05	5,039	7-8	Yes	863	7-8
JT06	7,192	6-8	No[e]	2,345	6-8

Notes:
[a] Net counts on the ground surface prior to excavation
[b] Taken at 1 meter above the ground surface
[c] Net counts on the ground surface after excavation
[d] Several small sources recovered (<1/8 inch diameter), soil activity remained elevated
[e] 7,192 cpm location could not be located again, soil activity was elevated
n/a = no source recovered, count rates increased with depth
cpm = counts per minute
μR/hr - microRoentgens per hour



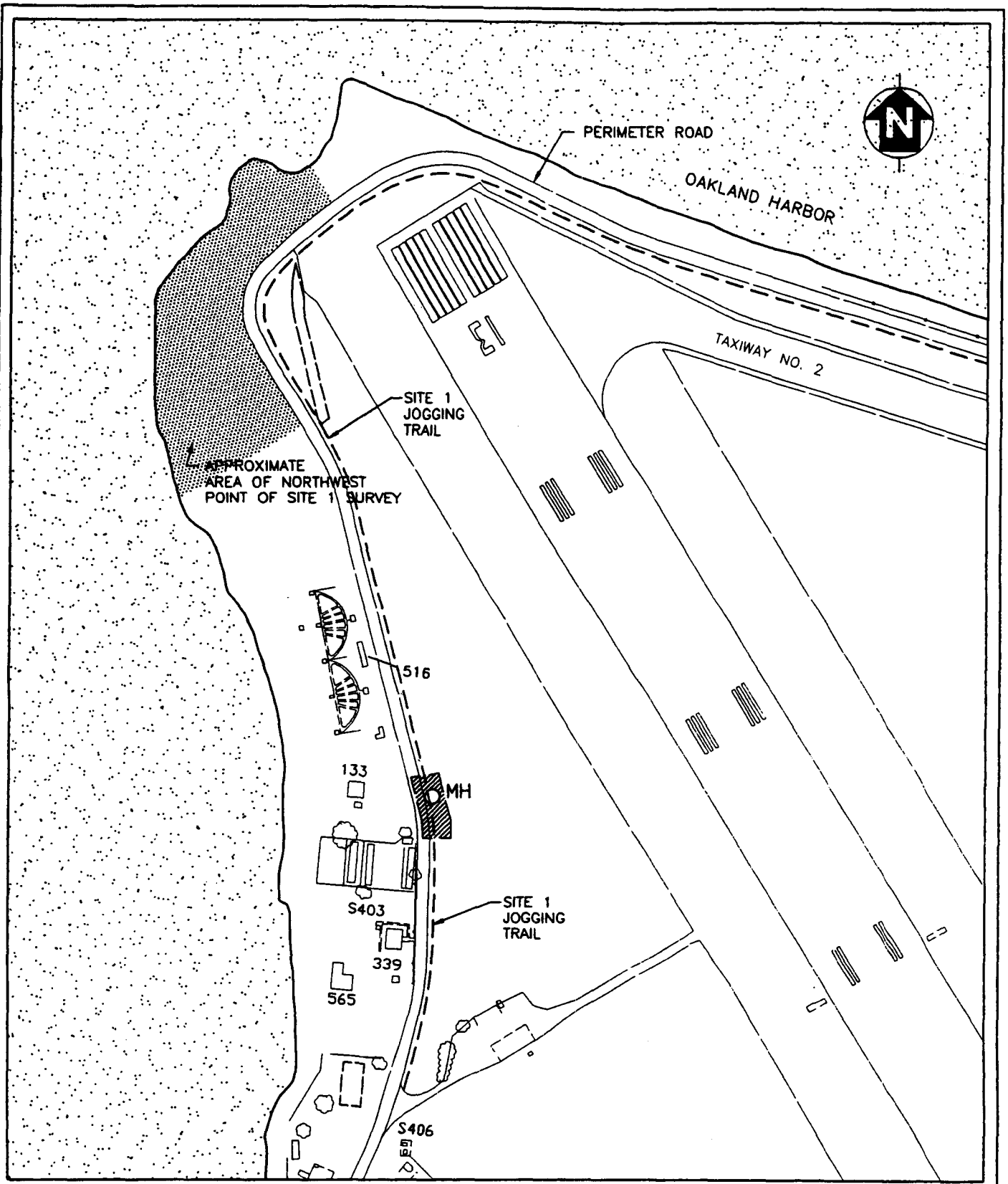
100 0 100 200
SCALE: 1" = 200

NAS ALAMEDA, CALIFORNIA

FIGURE J-1
SITE 1–TRANSECT WALKOVER SURVEY GRID AND ANOMALY LOCATIONS

Tetratech EM, Inc.

KCH (SF) (069-147) NASANOMO.DWG - 07/08/98-PLOT 1:1 - REV.003



LEGEND:

APPROXIMATE AREA OF JOGGING TRAIL ANAMOLIES

125' 0 125' 250'

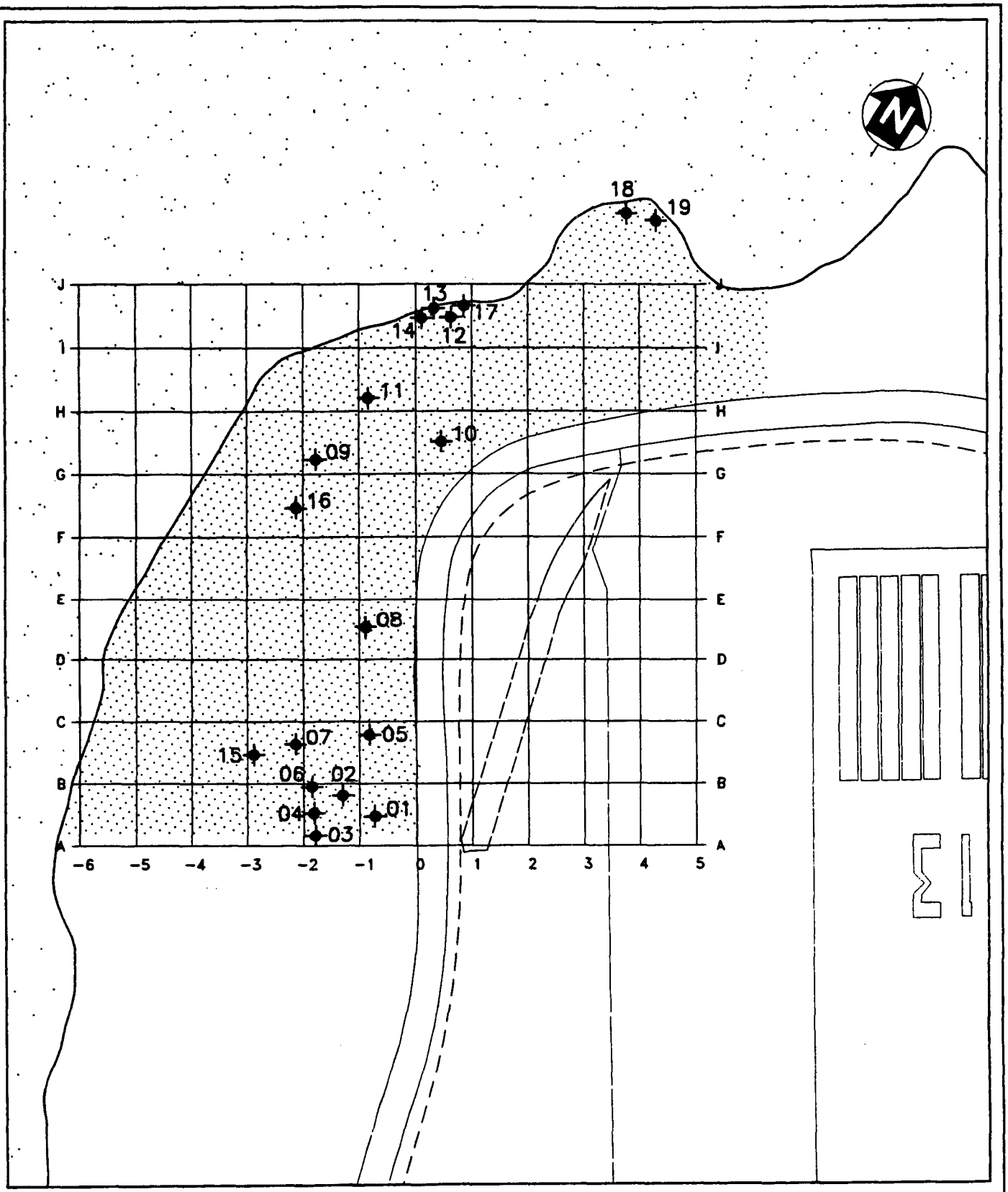
SCALE: 1" = 250'

NAS ALAMEDA, CALIFORNIA

FIGURE J-2
SITE 1
JOGGING TRAIL ANOMALY LOCATIONS

Tetratech EM, Inc.

KCH (SF) (069-14... ANOMO.DWG - 07/08/98-PLOT 1:1 - REV.003



LEGEND:

01 ANOMALY LOCATION

NORTHWEST POINT OF SITE 1

5' 0 5' 10'

SCALE: 1'=100

NAS ALAMEDA, CALIFORNIA

FIGURE J-3
NORTHWEST POINT OF SITE 1
SURVEY GRID AND ANOMALY LOCATIONS

Tetratech EM, Inc.

KCH (SF) (069-147) ...ANOM40.DWG - 07/08/98-PLOT 1:1 - REV.003

APPENDIX K

FUNNEL-AND-GATE

FUNNEL-AND-GATE DEMONSTRATION AND TREATABILITY STUDY

The funnel-and-gate permeable reactive barrier system for treating groundwater contaminated with chlorinated solvents and petroleum hydrocarbons was installed at IR Site 1 in December 1996 under the Advanced Applied Technology Demonstration Facility (AATDF) program. The funnel-and-gate system was designed by the University of Waterloo (Waterloo) and Environmental Technologies, Inc. A plume delineation was conducted to determine the optimal location for the system. Pilot-scale testing under controlled conditions began in April 1997. The data collected during the plume delineation and demonstration were not included in the risk assessment, because the DQOs developed for the study were not intended to support inclusion of the data in risk assessments.

The Waterloo Demonstration Project is located in the southwestern portion of IR Site 1 adjacent to San Francisco Bay (Figure K-1). The in situ technology treats groundwater through (1) reductive dechlorination of chlorinated ethenes by contact with zero valent iron, which comprises the permeable, reactive barrier; and (2) in situ aerobic bioremediation of petroleum hydrocarbons stimulated by minimal oxygen addition using an in situ biosparge system. Details of the technology are presented in the revised work plan prepared by Waterloo (Waterloo 1996). Figure K-2 shows a plan view of the funnel-and-gate system including the monitoring well locations within the remedial gate and control gate. The purpose of the control gate is to monitor natural degradation of the chemicals. Figure K-3 presents a cross-sectional view of the remedial gate. The remedial gate was installed in the FWBZ and is keyed into the BSU.

Samples to monitor effectiveness were collected from two types of monitoring wells within the remedial and control gates (Figure K-3). "Performance" wells are fully screened wells, and their data represent vertically integrated (averaged) concentrations with depth. "Treatment" wells are three-point multilevel wells and their data represent depth-discrete concentrations with depth. Concentrations from samples collected from treatment wells are typically higher than concentrations from fully screened wells because of lower dilution effects. In addition, "performance" well data are validated, whereas treatment well data are not.

Details on the performance of the funnel-and-gate system are available in data summary reports for four quarters of sampling conducted between April 1998 and February 1999 (TtEMI 1998d,

1998e, 1999b, and 1999c). The results of the quarterly monitoring showed the contaminant plume to be spatially variable. Influent concentrations were also variable over time. Very high influent concentrations (in the part per million range) of cis-1,2-DCE; vinyl chloride; and toluene were detected upgradient of the reactive barrier of the remedial gate and the control gate. Performance monitoring identified floating product in one multilevel well less than 50 feet east of the remedial gate. Figures K-4, K-5, and K-6 show the concentrations of vinyl chloride; cis-1,2-DCE; and toluene detected in samples collected from the multilevel wells during the February 1999 sampling event. Table K-1 summarizes the concentrations detected in samples collected from the fully screened wells during the February 1999 sampling event. Tables K-2 and K-3 present statistical summaries of chlorinated hydrocarbon and BTEX compound concentrations, respectively, for the four quarters of sampling. As Table K-4 shows, concentration reductions of 98 percent or greater were achieved for all chlorinated VOCs and BTEX compounds of interest based on data for samples collected in February 1999. The concentration reductions were relatively constant throughout the duration of the demonstration.

In conjunction with the objectives of the AATDF program, which were to demonstrate the remedial technology's capabilities and limitations, remedial objectives were set for the funnel-and-gate demonstration. The remedial objectives proposed for the demonstration, which for the most part coincide with California MCLs, are shown in Table K-5 along with a comparison of the effluent concentrations from the February 1999 sampling event (TtEMI 1999b).

The Waterloo plume delineation, conducted to determine the optimal location for installation of the funnel-and-gate system, focused on the groundwater hot spot area (wells M028 and M034). The location of monitoring wells and multilevel sampling points are shown in Figure K-7. Results of this plume delineation are presented in Table K-6. Isocontours for chlorinated VOCs and total BTEX concentrations are presented in Figures K-8 and K-9, respectively. Data from the Waterloo investigation were also used to prepare the isoconcentration contours for VOCs appearing in Figures 6-29 and 6-30.

REFERENCES

TtEMI. 1998d. Funnel-and-Gate Demonstration Data Summary Report First Quarter - Final. Prepared for the Department of the Navy, Western Division. San Bruno, California. July.

TtEMI. 1998e. Funnel-and-Gate Demonstration Data Summary Report Second Quarter - Final. Prepared for the Department of the Navy, Western Division. San Bruno, California. November.

TtEMI. 1999b. Funnel-and-Gate Demonstration Data Summary Report Third Quarter - Final. Prepared for the Department of the Navy, Western Division. San Bruno, California. February.

TtEMI. 1999c. Funnel-and-Gate Demonstration Data Summary Report Fourth Quarter - Final. Prepared for the Department of the Navy, Western Division. San Bruno, California. May.

University of Waterloo (Waterloo). 1996. Revised Workplan for Semi-passive Groundwater Remediation Demonstration Project.

TABLE K-1
CHLORINATED AND PETROLEUM HYDROCARBON CONCENTRATIONS IN PERFORMANCE WELLS
FOURTH QUARTER (FEBRUARY 1999)
FUNNEL-AND-GATE
ALAMEDA POINT

Sample Location	VC	1,1-DCE	c-1,2-DCE	t-1,2-DCE	TCE	BENZENE	TOLUENE	ETHYLBENZENE	XYLENE(total)
CR1P	520	1 U	200	6	1 U	6	89	36	140
CR5P	1,100	1 U	300	5	1 U	16	120	31	92
CR7P	860	1 U	220	4	1 U	20	60	32	78
R1PA	15,000	25 U	25,000	25 U	25 U	40	620	26	140
R5PA	41	1 U	18	1 U	1 U	7	120	2	4
R7PA	0.5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U
R8PA	0.5 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	1 U
R1PB	3,200	100 U	1,600	100 U	100 U	50 U	160	100 U	100 U
R5PB	1	1 U	4	1 U	1 U	1	6	1 U	1 U
R7PB	0.5 U	1 U	1	1 U	1 U	0.5 U	1 U	1 U	1 U
R8PB	0.6	1 U	2	1 U	1 U	0.5 U	1 U	1 U	1 U
R1PC	2,000	50 U	640	50 U	50 U	32	510	50 U	73
R5PC	2	1 U	3	1 U	1 U	3	14	1 U	1 U
R7PC	0.5 U	1 U	1	1 U	1 U	0.5 U	1 U	1 U	1 U

Notes:

[1]All units in micrograms per liter

1,1-DCE 1,1-Dichloroethene
c-1,2-DCE cis 1,2-Dichloroethene
J Estimated concentration
t-1,2-DCE trans 1,2-Dichloroethene
BTEX Benzene, Toluene, Ethyl benzene, and Xylene
CVOC Chlorinated volatile organic compound
TCE Trichloroethene
U Nondetect
VC Vinyl chloride

TABLE K-2

STATISTICAL SUMMARY OF CHLORINATED VOLATILE ORGANIC COMPOUND CONCENTRATIONS FOR FOUR QUARTERS OF SAMPLING

REMEDIAL GATE PERFORMANCE WELLS [a,b]

FUNNEL-AND-GATE

ALAMEDA POINT

	Row 1		Row 5		Row 7	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
First Quarter						
Vinyl Chloride	11,100	5,587	37.0	33.4	1.2	1.3
1,1-Dichloroethene	250	-	3.8	4.4	0.5	-
trans 1,2-Dichloroethene	250	-	3.8	4.4	0.5	-
cis 1,2-Dichloroethene	24,667	11,441	66.3	25.0	8.7	4.5
Trichloroethene	250	-	3.8	4.4	0.5	-
Second Quarter						
Vinyl Chloride	23,667	4,784	243	69.4	193	28.7
1,1-Dichloroethene	125	-	1.8	0.9	0.5	-
trans 1,2-Dichloroethene	125	-	1.2	0.9	0.5	-
cis 1,2-Dichloroethene	36,000	14,445	317	41.1	287	17.0
Trichloroethene	125	-	1.8	0.9	0.5	-
Third Quarter						
Vinyl Chloride	19,667	3,859	2.0	0.9	2.7	0.5
1,1-Dichloroethene	70.0	28	0.5	-	0.5	-
trans 1,2-Dichloroethene	50.0	-	0.5	-	0.5	-
cis 1,2-Dichloroethene	47,333	9,104	9.3	2.9	5.3	0.5
Trichloroethene	50.0	-	0.5	-	0.5	-
Fourth Quarter						
Vinyl Chloride	6,733	5,865	14.7	18.6	0.3	0.1
1,1-Dichloroethene	29.2	16	0.5	-	0.5	-
trans 1,2-Dichloroethene	29.2	16	0.5	-	0.5	-
cis 1,2-Dichloroethene	9,080	11,263	8.3	6.8	0.8	0.2
Trichloroethene	29.2	16	0.5	-	0.5	-

Notes:

[a] All units in micrograms per liter

[b] Rows with a standard deviation of '-' indicates all samples from that row were non-detect for that compound and means are one-half reporting limit.

Std. Dev. - Standard deviation

Row 1 mean calculated using columns A, B, and C.

S:\ALAMEDA\CTO205\1STQTR\TBL4-13.XLS

TABLE K-3
STATISTICAL SUMMARY OF BENZENE, TOLUENE, ETHYL BENZENE, AND XYLENE CONCENTRATIONS FOR FOUR QUARTERS OF SAMPLING
REMEDIAL GATE PERFORMANCE WELLS [a,b]
FUNNEL-AND-GATE
ALAMEDA POINT

	Row 1		Row 5		Row 7	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
First Quarter						
Toluene	1,743	978	295	248	1	-
Benzene	125	-	18.7	15.6	0.3	-
Ethylbenzene	250	-	3.8	4.4	0.5	-
Xylene (total)	250	-	7.2	9.1	0.5	-
Second Quarter						
Toluene	2,033	403	147.3	88.9	45.7	12.1
Benzene	80.0	28.3	15.3	1.7	7.0	0.8
Ethylbenzene	125	-	1.8	0.9	0.5	-
Xylene (total)	125	-	1.8	0.9	0.5	-
Third Quarter						
Toluene	2,433	249	17.7	4.5	0.5	-
Benzene	93.0	13.1	1.9	0.9	0.3	-
Ethylbenzene	50.0	-	0.5	-	0.5	-
Xylene (total)	347	28.7	0.5	-	0.5	-
Fourth Quarter						
Toluene	430	196	46.7	51.9	0.5	-
Benzene	32.3	6.2	3.7	2.5	0.3	-
Ethylbenzene	33.7	11.5	1.0	0.7	0.5	-
Xylene (total)	88	38.2	1.7	1.6	0.5	-

Notes:

[a] All units in micorgrams per liter

[b] Rows with a standard deviation of '-' indicates all samples from that row were non-detect for that compound and means are one-half reporting limit.

Std. Dev. - Standard Deviation

Row 1 means were calculated using column A, B, and C wells.

TABLE K-4
PERCENT CONCENTRATION REDUCTION ACHIEVED IN REMEDIAL GATE PERFORMANCE WELLS
FOURTH QUARTER (FEBRUARY 1999)
FUNNEL-AND-GATE
ALAMEDA POINT

Compound	Row 1 Average Influent Concentration (µg/L)	Row 8 Average Effluent Concentration (µg/L)	Percent Removal[a]
Vinyl chloride	10,920	0.43	99.9
1,1-dichloroethene	48	0.50	98.9[b]
cis 1,2-dichloroethene	18,028	1.25	99.9
trans 1,2-dichloroethene	40	0.50	98.7[b]
trichloroethene	30	0.50	98.3[b]
Benzene	53	0.25	99.5[b]
Toluene	898	0.50	99.9[b]
Ethylbenzene	41	0.50	98.8[b]
Xylene (total)	125	0.50	99.6[b]

Notes:

[a] Percent removal calculated as $\frac{\text{Row 1 (A to E) - Row 8 (A,B)}}{\text{Row 1 (A to E)}} \times 100\ \%$

[b] These compounds had at least one nondetect value. Averages were calculated using half of the quantitation limit for samples having a U qualifier.

µg/L microgram per liter

TABLE K-5
COMPARISON OF REMEDIAL OBJECTIVES
AND EFFLUENT CONCENTRATIONS IN PERFORMANCE WELLS
FOURTH QUARTER (FEBRUARY 1999)
FUNNEL-AND-GATE
ALAMEDA POINT

Compound	Remedial Objective[a] (µg/L)	Effluent Concentrations in R8PA (µg/L)	Effluent Concentration in R8PB (µg/L)
Vinyl chloride	2	0.5U	0.6
1,1-dichloroethene	6	1U	1U
cis 1,2-dichloroethene	10	1U	2
trans 1,2-dichloroethene	10	1U	1U
Benzene	10	0.5U	0.5U
Toluene	150	1U	1U
Ethylbenzene	700	1U	1U
Xylene (total)	1,750	1U	1U

Notes:

[a] Remedial objectives are the same values as selected by the University of Waterloo.

R8PA and R8PB are the effluent performance wells in Row 8.

µg/L microgram per liter

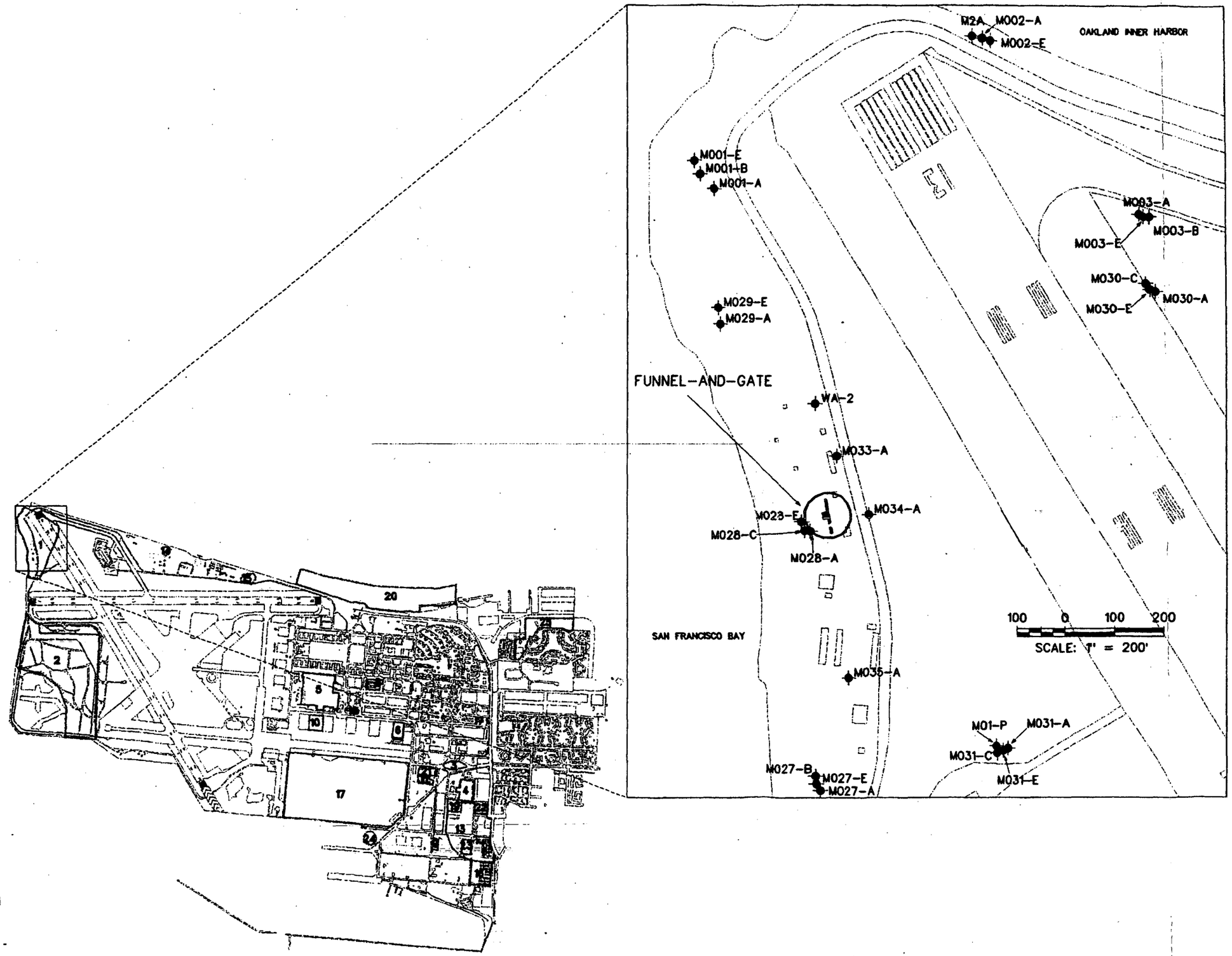
U nondetect

TABLE K-6
CHLORINATED AND PETROLEUM HUDROCARBON CONCENTRATIONS IN MONITORING WELLS AND MULTI-SCREEN SAMPLING POINTS
WATERLOO PLUME DELINEATION, 1996
IR SITE 1, ALAMEDA POINT
(Page 1 of 2)

ID	1,1DCE	t12DCE	c12DCE	TCE	PCE	VC (µg/L)	BEN	TOL	ET-BEN	P/M XYL	O XYL
BLANK 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLANK 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH11-1	0.0	259.7	0.0	4.5	0.0	0.0	0.0	3.5	0.0	0.0	0.0
BH11-3	7.4	120.8	7048.5	0.0	0.0	884.9	0.0	0.0	0.0	0.0	0.0
BH03-1	388.7	315.0	218625.1	239.1	0.0	16696.8	286.0	8782.5	173.2	706.0	300.8
BH03-3	0.0	7.0	240.6	0.0	0.0	307.8	0.0	17.8	0.0	0.0	0.0
BH04-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH04-3	0.0	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH02-1	136.3	290.1	72838.9	29.3	0.0	6766.7	117.3	7284.9	148.5	602.2	288.6
BH02-3	0.0	5.4	650.4	0.0	0.0	158.9	0.0	125.6	0.0	22.4	9.1
BH06-1	0.0	274.9	61.9	7.3	0.0	176.4	0.0	22.9	47.4	7.5	0.0
BH06-2	0.0	123.8	0.0	0.0	0.0	58.6	22.2	0.0	0.0	4.4	0.0
BH08-1	0.0	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH08-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH09-1	0.0	144.4	0.0	0.0	0.0	65.5	0.0	0.0	0.0	0.0	0.0
BH09-3	0.0	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH07-1	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH07-3	0.0	209.8	2020.9	242.4	0.0	110.1	0.0	0.0	0.0	0.0	0.0
BH10-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH10-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH05-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH05-2	0.0	0.0	56.3	0.0	0.0	9.7	0.0	0.0	0.0	0.0	0.0
BH12-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH12-3	0.0	0.0	60.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH03-2	0.0	7.2	339.7	0.0	0.0	214.7	0.0	25.0	0.0	0.0	0.0
BH11-2	0.0	5.3	1401.7	0.0	0.0	651.9	9.8	19.8	0.0	0.0	0.0

TABLE K-6 (Continued)
CHLORINATED AND PETROLEUM HUDROCARBON CONCENTRATIONS IN MONITORING WELLS
AND MULTI-SCREEN SAMPLING POINTS
WATERLOO PLUME DELINEATION, 1996
IR SITE 1, ALAMEDA POINT
(Page 2 of 2)

ID	1,1DCE	t12DCE	c12DCE	TCE	PCE	VC (µg/L)	BEN	TOL	ET-BEN	P/M XYL	O XYL
BH04-2	0.0	0.0	23.7	0.0	0.0	36.7	0.0	0.0	0.0	0.0	0.0
BH02-2	0.0	9.5	1179.5	0.0	0.0	431.1	6.3	200.4	6.1	34.4	16.2
BH08-2	16.6	27.2	5538.4	11.4	0.0	7408.7	49.1	1743.6	84.9	320.1	145.1
BH09-2	0.0	28.8	0.0	0.0	0.0	33.3	34.6	0.0	0.0	0.0	0.0
BH07-2	0.0	0.0	0.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH10-2	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH12-2	0.0	0.0	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MW-2	0.0	356.8	730.9	170.2	0.0	475.6	0.0	4.1	26.2	10.1	0.0
MW-3	42.7	67.7	22380.6	7.8	0.0	4792.5	55.5	960.9	51.1	110.8	47.5
MW-1	0.0	17.0	0.0	0.0	0.0	0.0	35.6	15.1	0.0	0.0	0.0
MW-4	37.1	59.8	23250.2	0.5	0.0	4630.9	52.1	931.0	105.3	112.1	47.8
BH13-1	0.0	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BH13-2	15.6	26.3	5145.2	8.0	0.0	6953.7	47.0	1633.8	84.6	300.1	131.5
BH13-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAB BL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPBL B-6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPBL B-4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPBL B-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



LEGEND

MONITORING WELL

IR SITE BOUNDARY

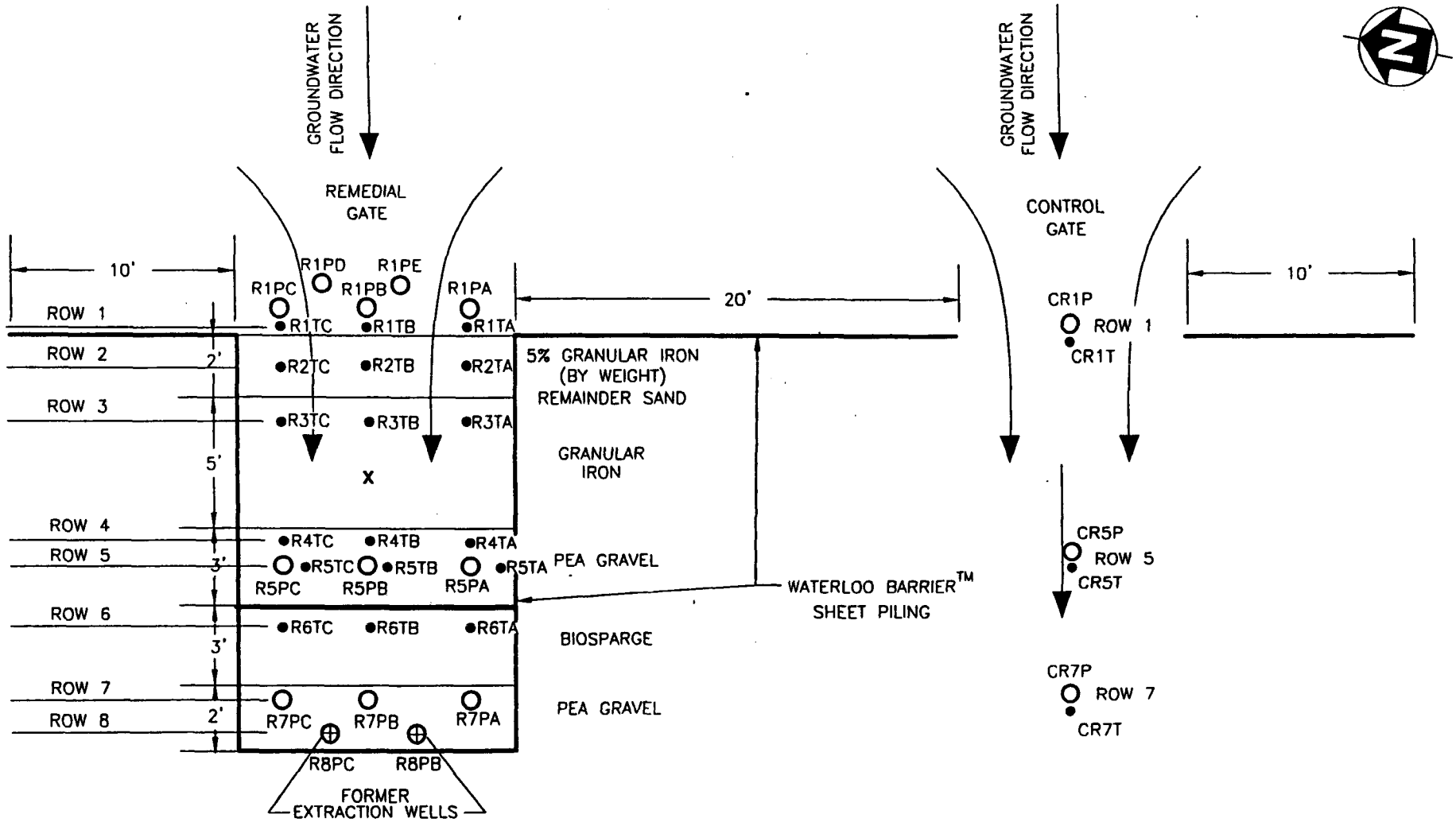
N

1200 0 1200 2400

SCALE: 1" = 2400'

FIGURE K-1
APPROXIMATE LOCATION OF FUNNEL-AND-GATE DEMONSTRATION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DATE: 12/1 MVT DN FILE NAME: R:\CAD\069\2058\0301\2-7-TREATMENT.DWG



LEGEND

O	PERFORMANCE WELL (RP WELLS)	A	SOUTHERN EDGE OF GATE
•	MULTI-LEVEL TREATMENT WELL (RT WELLS)	B	MIDDLE OF GATE
X	IN-SITU PERMEABLE FLOW SENSORS	C	NORTHERN EDGE OF GATE

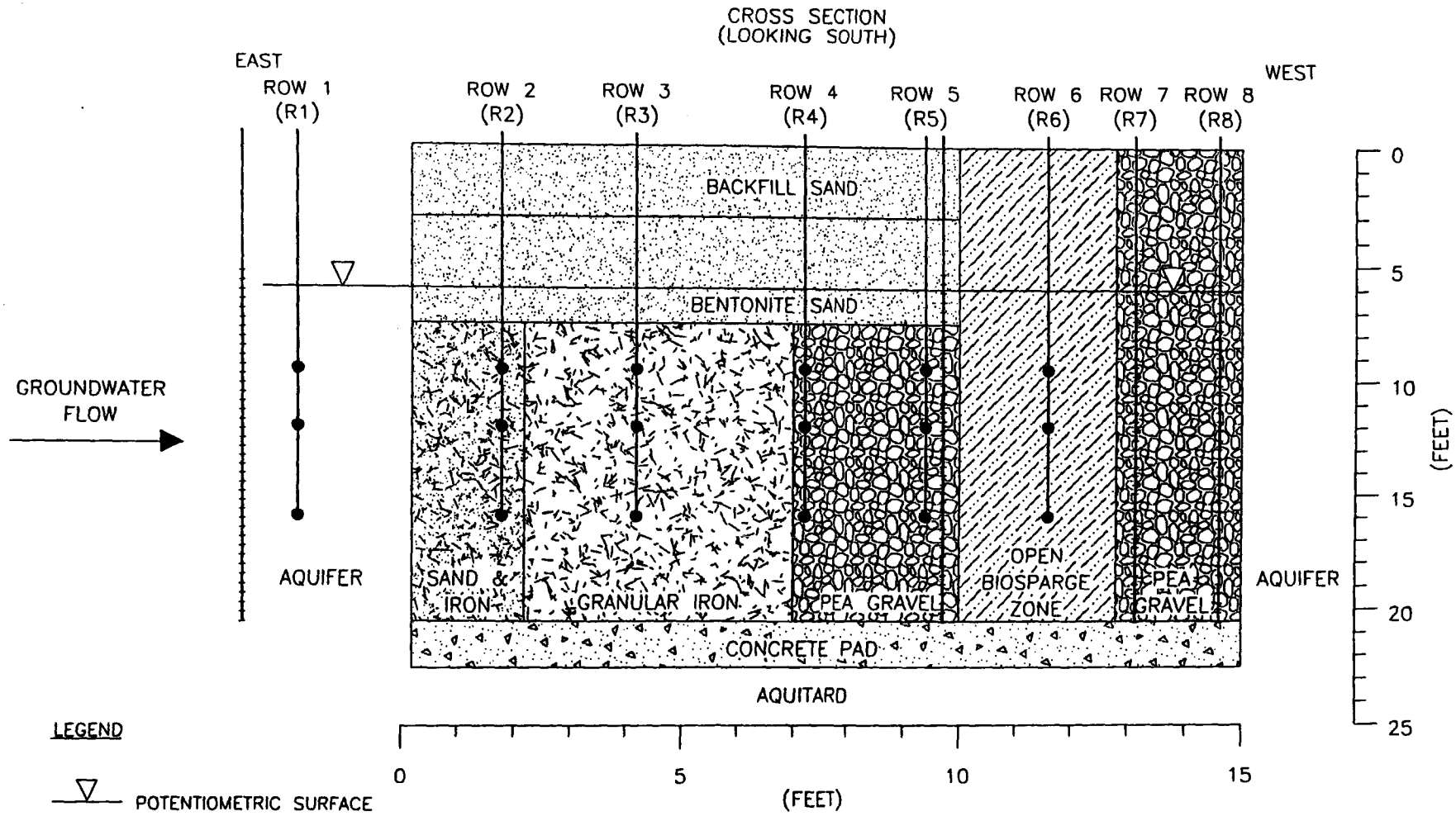
FIGURE K-2

PERFORMANCE AND TREATMENT MONITORING WELL LOCATIONS

ALAMEDA POINT

ALAMEDA, CALIFORNIA

DATE: 09/16/98 MVT DN FILE NAME: R:\CAD\069\205B\0301\2-5-REMGATE.DWG



LEGEND

POTENTIOMETRIC SURFACE

FULLY SCREENED PERFORMANCE WELL

MULTILEVEL TREATMENT WELL

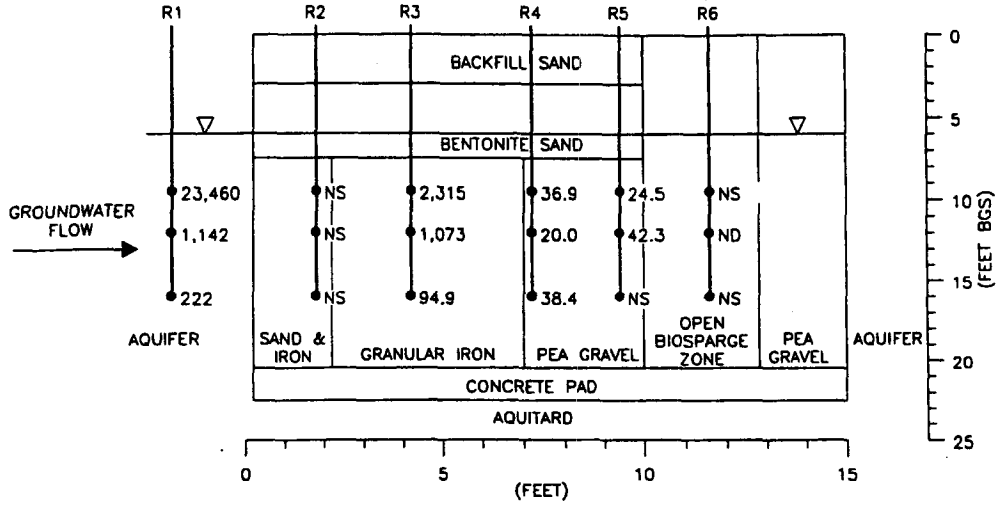
FIGURE K-3

LOCATIONS OF THE GROUNDWATER MONITORING WELLS ALONG CROSS SECTION OF THE REMEDIAL GATE

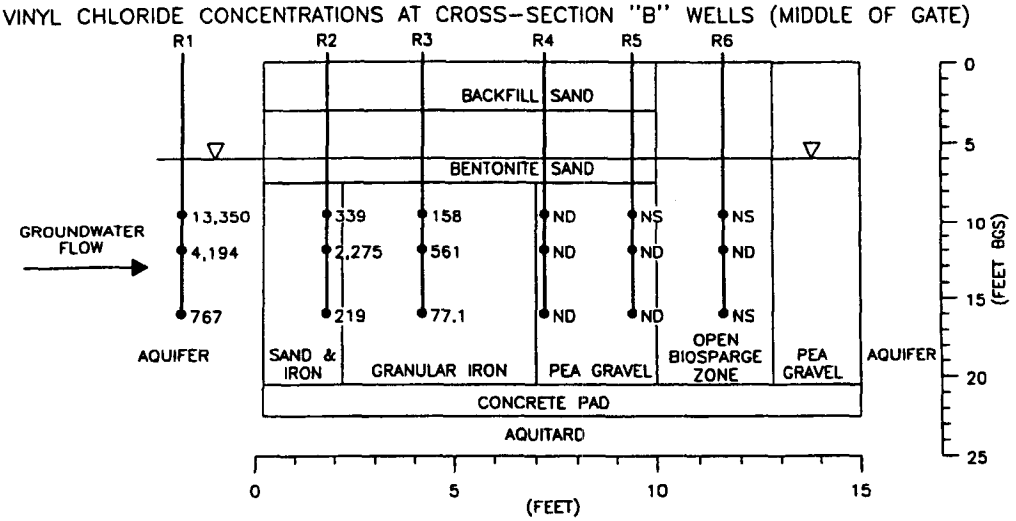
ALAMEDA POINT

ALAMEDA, CALIFORNIA

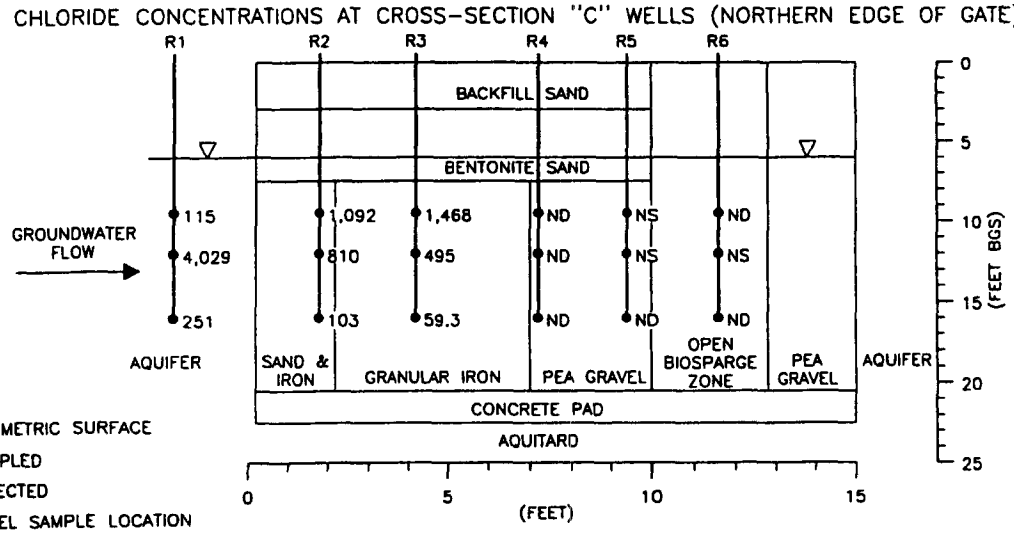
VINYL CHLORIDE CONCENTRATIONS AT CROSS-SECTION "A" WELLS (SOUTHERN EDGE OF GATE)



VINYL CHLORIDE CONCENTRATIONS AT CROSS-SECTION "B" WELLS (MIDDLE OF GATE)



VINYL CHLORIDE CONCENTRATIONS AT CROSS-SECTION "C" WELLS (NORTHERN EDGE OF GATE)



LEGEND

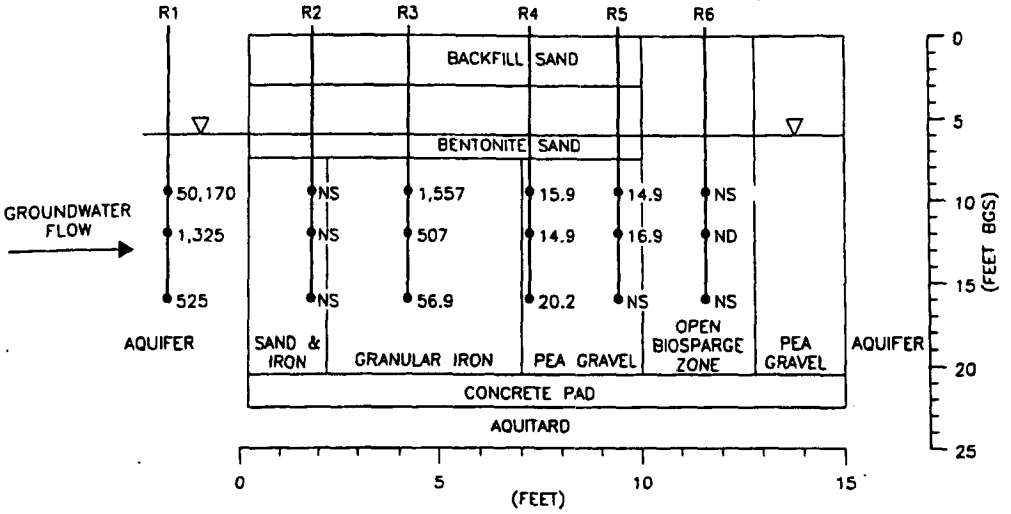
▽	POTENTIOMETRIC SURFACE
NS	NOT SAMPLED
ND	NOT DETECTED
♦	MULTILEVEL SAMPLE LOCATION

NOTES:
- ALL UNITS IN MICROGRAMS PER LITER
- METHOD DETECTION LIMIT = 10.9 $\mu g/L$
- SAMPLES COLLECTED FEBRUARY 9-10, 1999
- POSTED VALUES ARE AVERAGES OF MEASURED CONCENTRATIONS WHEN AVAILABLE. 1/2 MDL IS USED FOR NDs WHEN MORE THAN ONE VALUE IS AVAILABLE.
- REFER TO FIGURE 2-1 FOR LOCATIONS OF CROSS SECTIONS

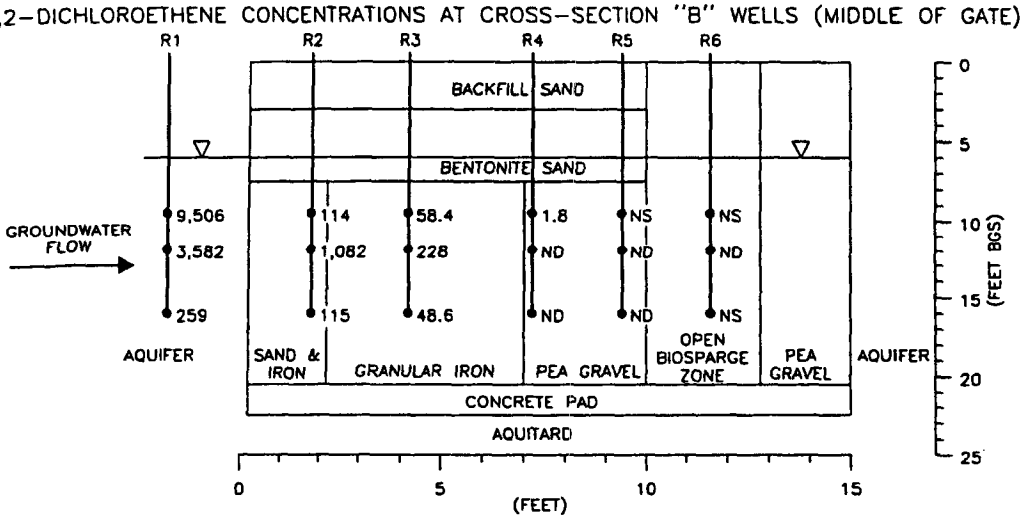
FIGURE K-4
VINYL CHLORIDE CONCENTRATIONS AT MULTILEVEL TREATMENT WELLS
ALAMEDA POINT
ALAMEDA, CALIFORNIA

FILE NAME: R:\CAD\069\2058\0303\FEB99\H-4-1-VC.DWG
DATE: 04/26/... 4VT DN

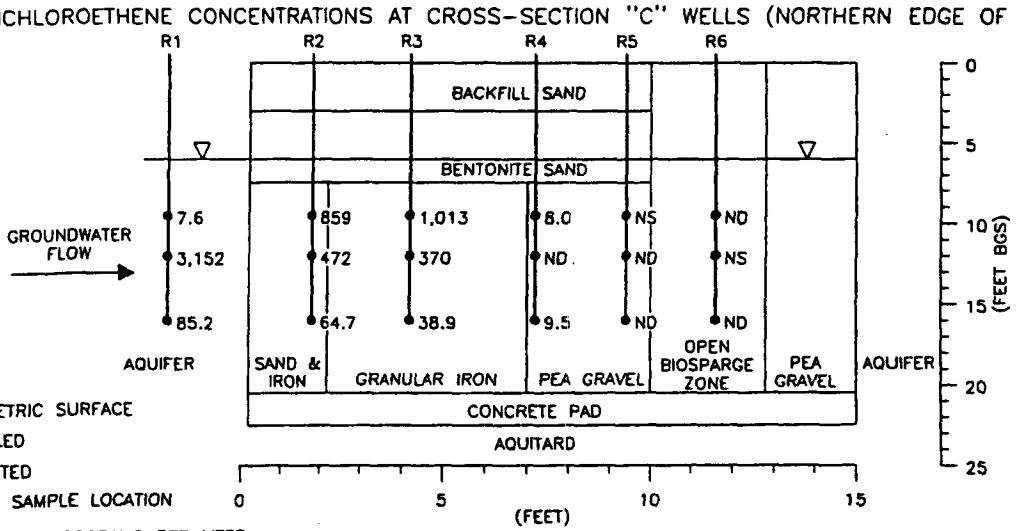
CIS 1,2-DICHLOROETHENE CONCENTRATIONS AT CROSS-SECTION "A" WELLS (SOUTHERN EDGE OF GATE)



CIS 1,2-DICHLOROETHENE CONCENTRATIONS AT CROSS-SECTION "B" WELLS (MIDDLE OF GATE)



CIS 1,2-DICHLOROETHENE CONCENTRATIONS AT CROSS-SECTION "C" WELLS (NORTHERN EDGE OF GATE)



LEGEND

▽	POTENTIOMETRIC SURFACE
NS	NOT SAMPLED
ND	NOT DETECTED
♦	MULTILEVEL SAMPLE LOCATION

NOTES:

ALL UNITS IN MICROGRAMS PER LITER

METHOD DETECTION LIMIT = 4.1 μg/L

SAMPLES COLLECTED FEBRUARY 9-10, 1999

POSTED VALUES ARE AVERAGES OF MEASURED CONCENTRATIONS WHEN AVAILABLE. 1/2 MDL IS USED FOR NDs WHEN MORE THAN ONE VALUE IS AVAILABLE.

REFER TO FIGURE 2-1 FOR LOCATIONS OF CROSS SECTIONS

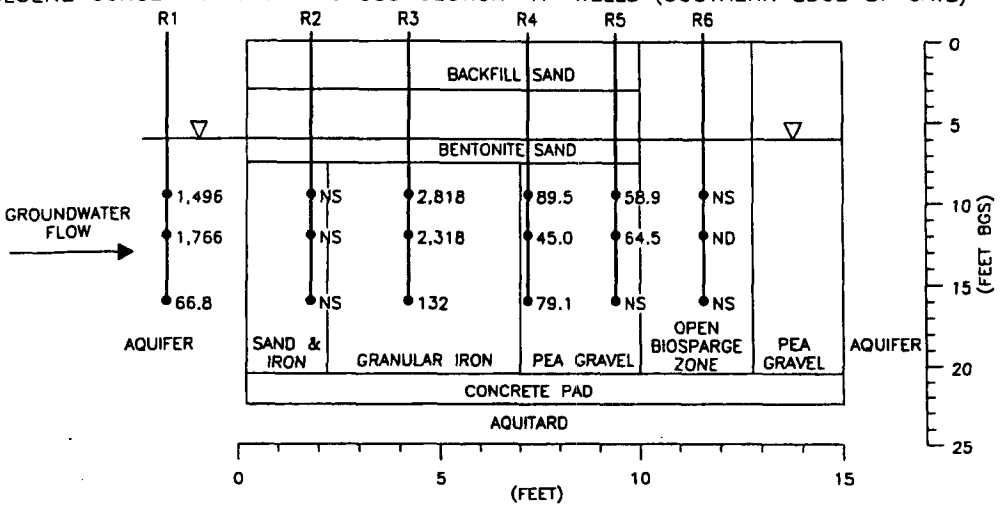
FIGURE K-5

CIS 1,2-DICHLOROETHENE CONCENTRATIONS AT MULTILEVEL TREATMENT WELLS

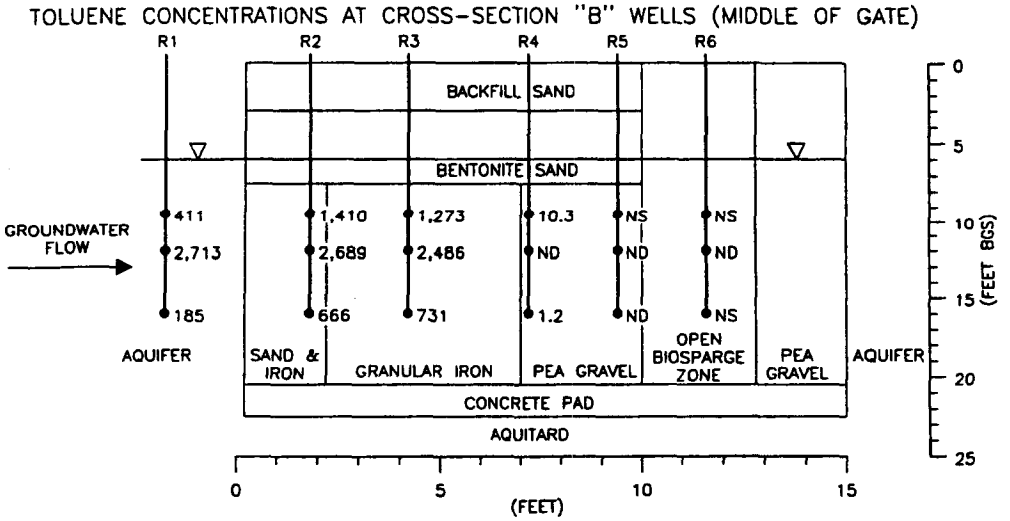
ALAMEDA POINT
ALAMEDA, CALIFORNIA

FILE NAME: R:\CAD\069\2059\0303\FE899\W4-4-C12DCE.DWG
DATE: 04/07/ WVT DN

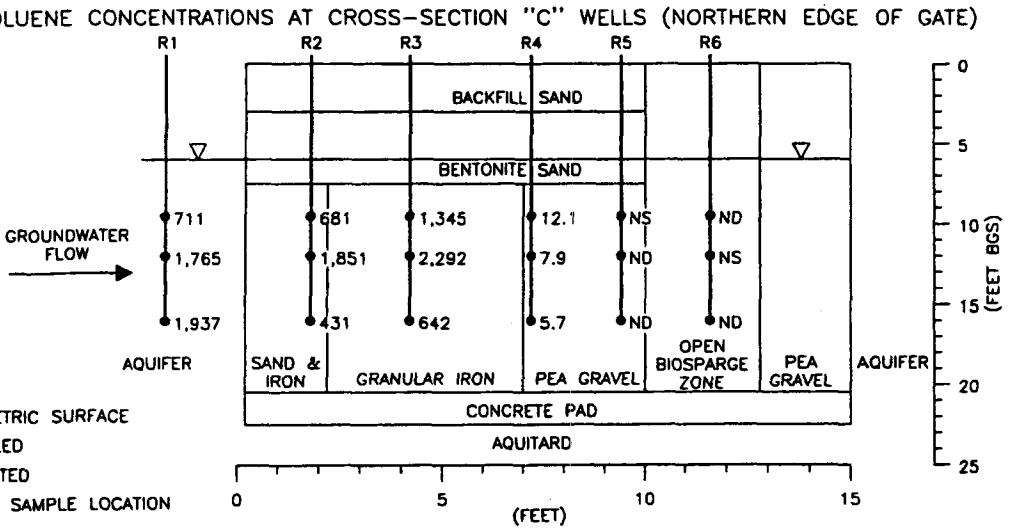
TOLUENE CONCENTRATIONS AT CROSS-SECTION "A" WELLS (SOUTHERN EDGE OF GATE)



TOLUENE CONCENTRATIONS AT CROSS-SECTION "B" WELLS (MIDDLE OF GATE)



TOLUENE CONCENTRATIONS AT CROSS-SECTION "C" WELLS (NORTHERN EDGE OF GATE)



LEGEND

▽	POTENTIOMETRIC SURFACE
NS	NOT SAMPLED
ND	NOT DETECTED
♦	MULTILEVEL SAMPLE LOCATION

NOTES:

ALL UNITS IN MICROGRAMS PER LITER

METHOD DETECTION LIMIT = 8.4 $\mu g/L$

SAMPLES COLLECTED FEBRUARY 9-10, 1999

POSTED VALUES ARE AVERAGES OF MEASURED CONCENTRATIONS WHEN AVAILABLE. 1/2 MDL IS USED FOR NDs WHEN MORE THAN ONE VALUE IS AVAILABLE.

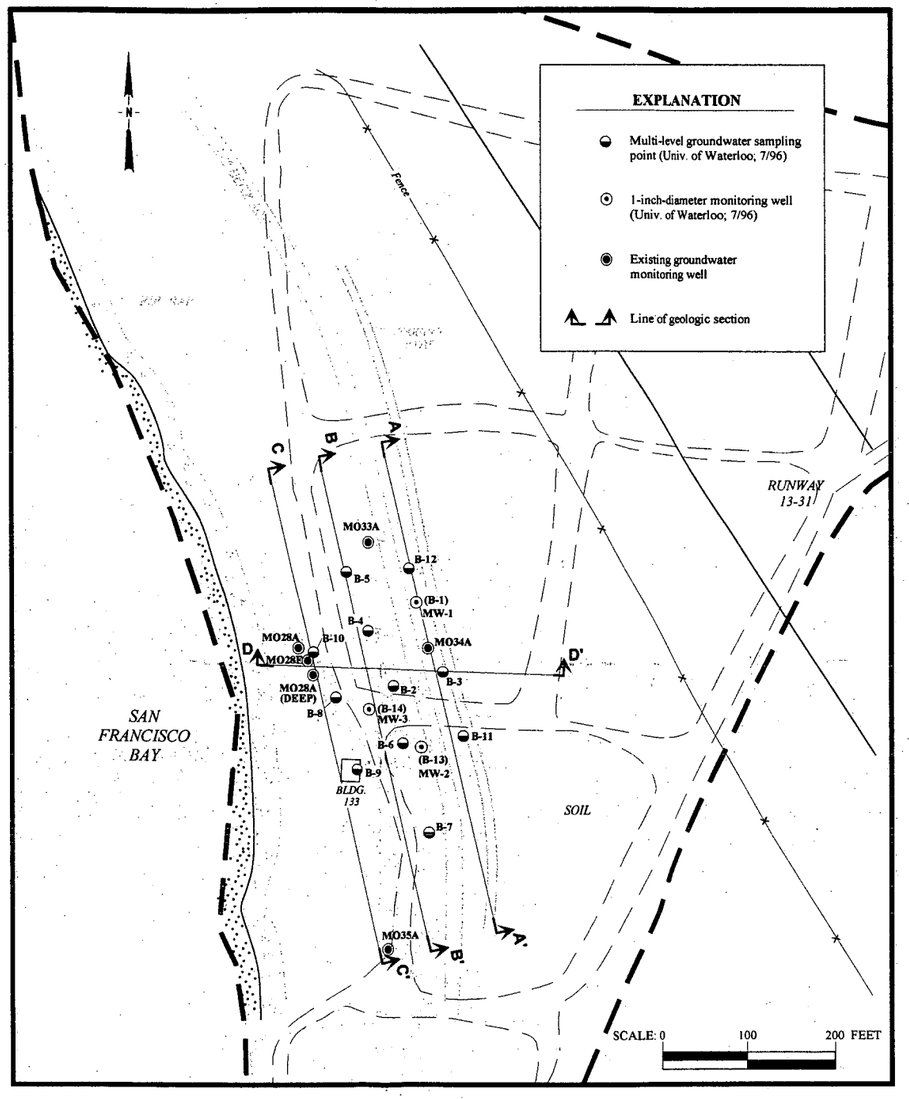
REFER TO FIGURE 2-1 FOR LOCATIONS OF CROSS SECTIONS

FIGURE K-6

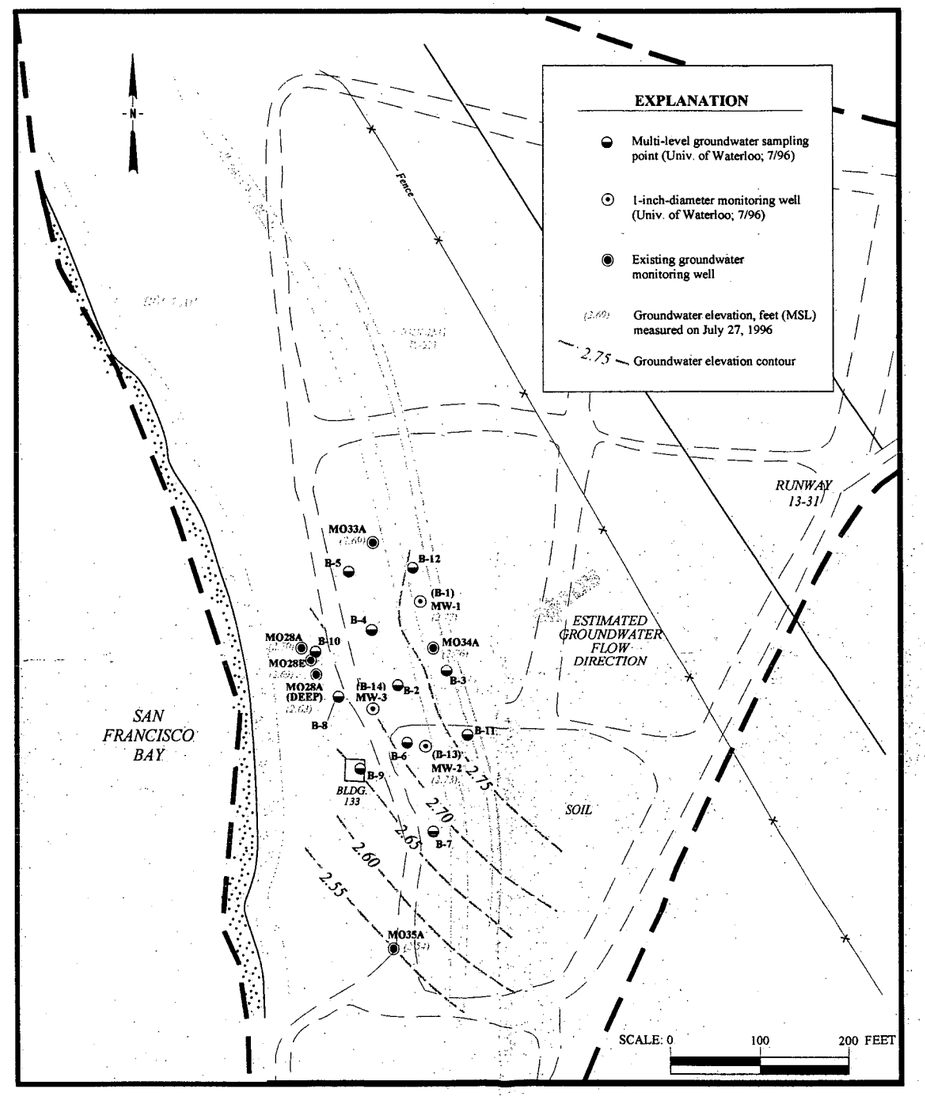
TOLUENE CONCENTRATIONS AT MULTILEVEL TREATMENT WELLS
ALAMEDA POINT
ALAMEDA, CALIFORNIA

FILE NAME: R:\CAD\069\2058\0303\FEB99\W4-6-TOL.DWG

DATE: 04/26, VT DN



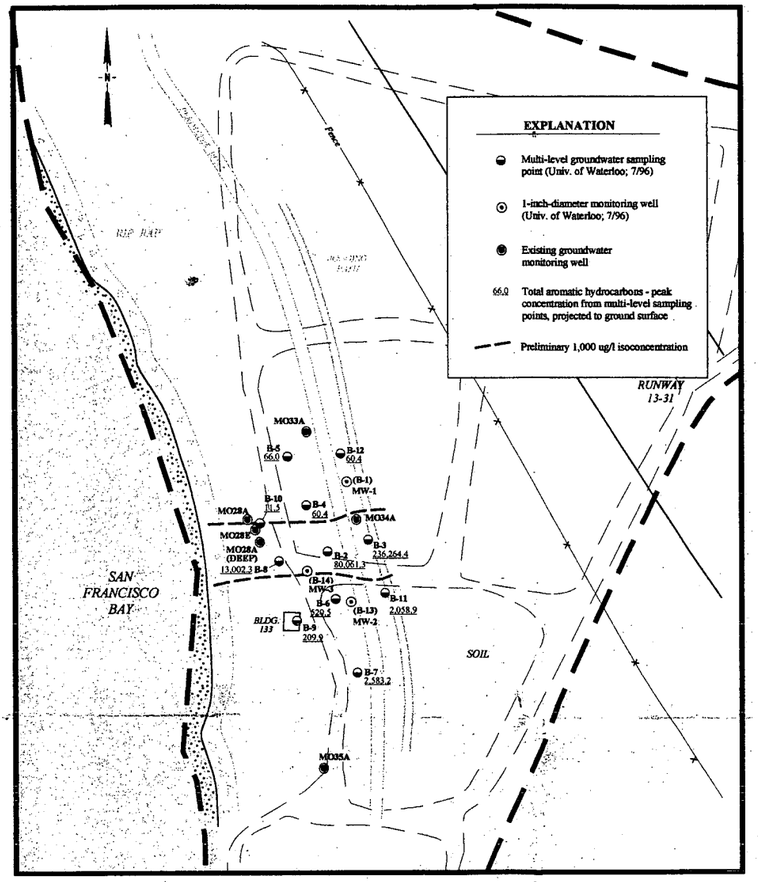
SITE PLAN



GROUNDWATER CONTOURS, JULY 1996

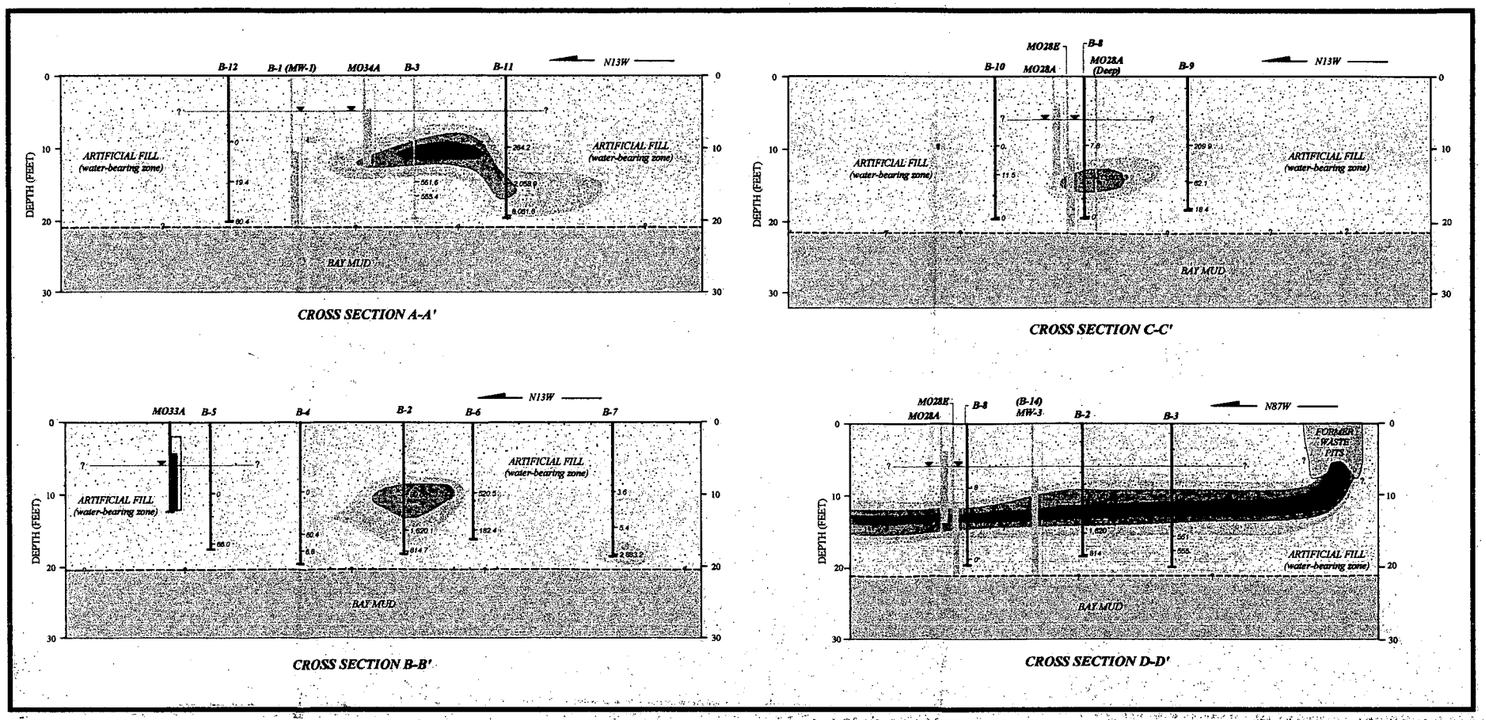
FIGURE K-7
FUNNEL-AND-GATE REMEDIATION SYSTEM
WATERLOO PLUME DELINEATION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

069A168B\02\20K-7.DSF JLH DN 07-30-99



TOTAL CHLORINATED ORGANIC COMPOUNDS IN GROUNDWATER, JULY 1996

SCALE: 0 100 200 FEET



TOTAL CHLORINATED VOC DISTRIBUTION

SCALE: 0 50 100 150 FEET (HORIZONTAL)

EXPLANATION

Artificial Fill: Silty Sand (SM), Gravelly Sand (SW), Silty, Gravelly Sand (SM)

Bay Mud

Static groundwater level measured in monitoring wells on 7/27/96

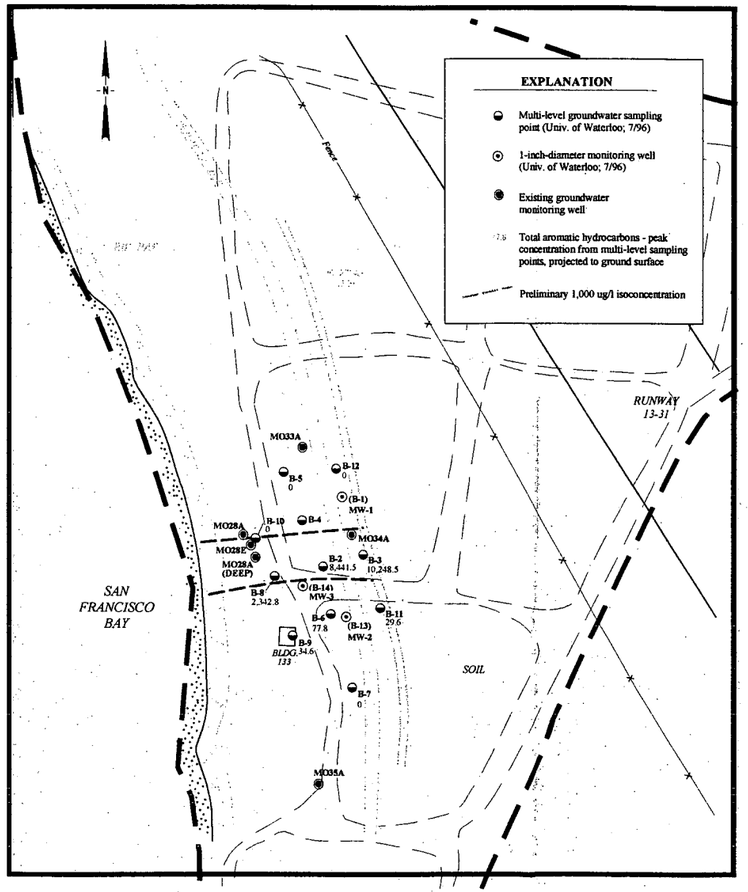
MO34A Boring/well designation
Borehole
Sand pack
Screened interval (Gray where well data not used in contouring)

B-11 Multi-level sample point designation
11.5 Total Chlorinated Hydrocarbon (µg/L) in groundwater
* Concentration averaged over interval of well screen

Chlorinated Hydrocarbons
100 to 1,000 ug/l in groundwater
1,000 to 10,000 ug/l in groundwater
10,000 to 100,000 ug/l in groundwater
>100,000 ug/l in groundwater

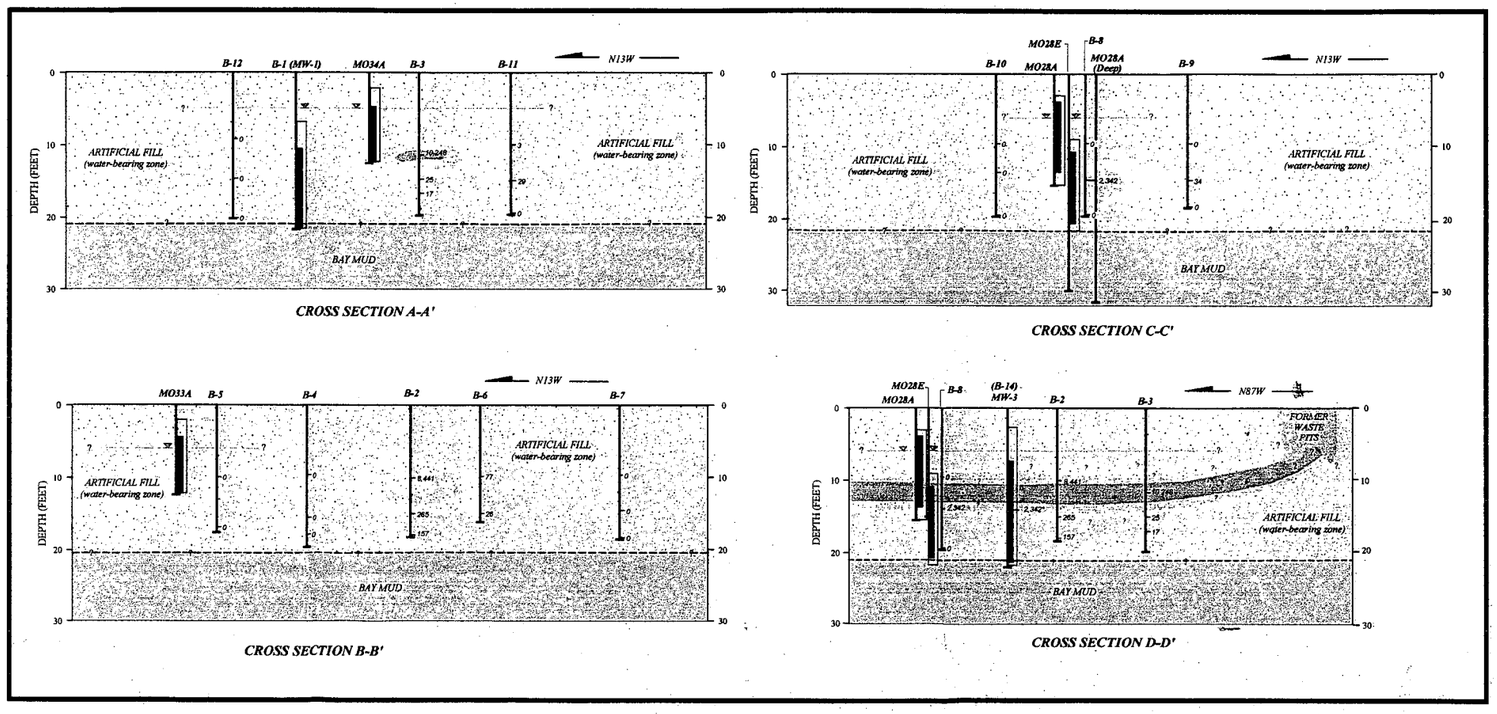
FIGURE K-8
FUNNEL-AND-GATE REMEDIATION SYSTEM
WATERLOO PLUME DELINEATION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G:\GIS\0\0\0ZZCK-8.DSF JLH DN 07-30-99



TOTAL BTEX IN GROUNDWATER JULY 1996

SCALE: 0 100 200 FEET



TOTAL BTEX DISTRIBUTION

SCALE: 0 50 100 150 FEET (HORIZONTAL)

EXPLANATION

- Artificial Fill: Silty Sand (SM), Gravelly Sand (SW), Silty, Gravelly Sand (SM)
- Bay Mud
- Static groundwater level measured in monitoring wells on 7/27/96
- MO34A — Boring/well designation
- Borehole
- Sand pack
- Screened interval (Gray where well data not used in contouring)
- B-11 — Multi-level sample point designation
- 34.6 — Total BTEX (µg/L) in groundwater
- BTEX — * Concentration averaged over interval of well screen
- 100 to 1,000 µg/L in groundwater
- 1,000 to 10,000 µg/L in groundwater
- 10,000 to 100,000 µg/L in groundwater
- >100,000 µg/L in groundwater

FIGURE K-9
FUNNEL-AND-GATE REMEDIATION SYSTEM
WATERLOO PLUME DELINEATION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

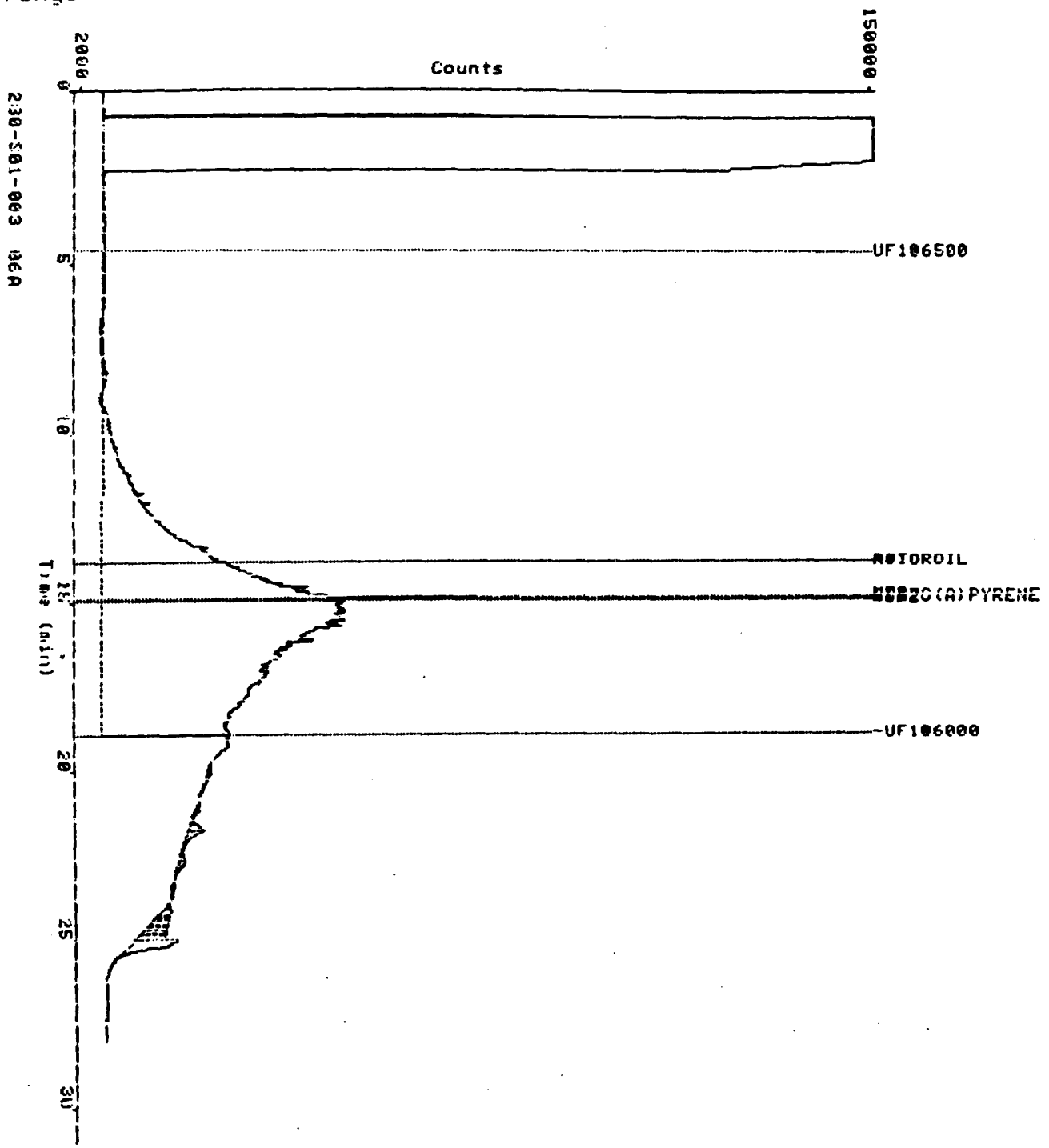
0691/689/0202K-9.DSF JLH DN 07-30-99

APPENDIX L

EXAMPLE TPH CHROMATOGRAMS

7-30-94
EC

Data file: R2HYYC$DIA1:[SYS1.GC1]A206_026.RAW;1
Report: 459309
Acquired: 26-JUL-1994 23:44:55
Time range: 0.00-31.00

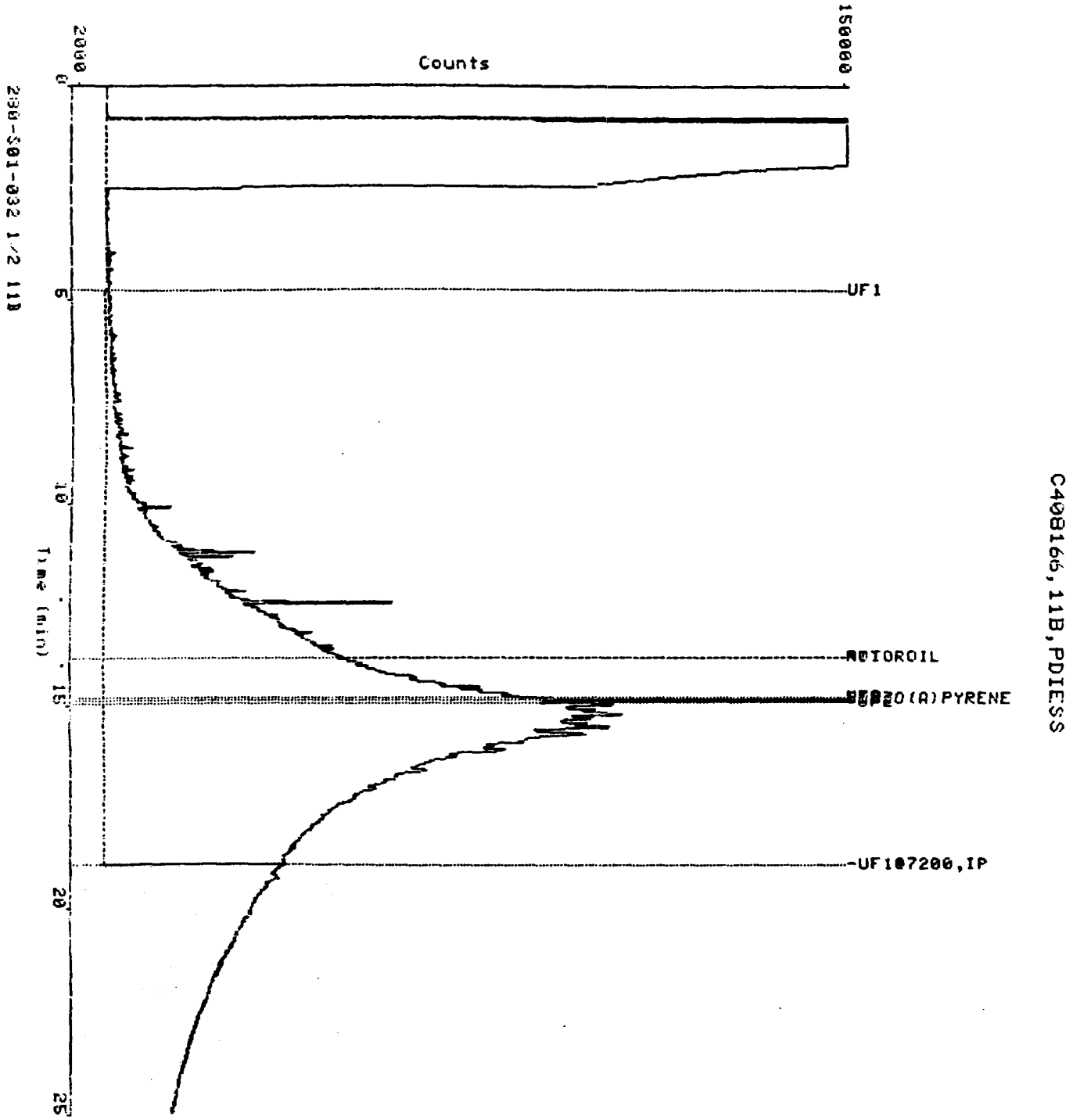


C40202,06A,PDIESS

Site 1
tph extractables
SDG # A5T03
Sample # 280-S01-003
Field ID # SS1-RA-3

8/5/94

Data file: R2HYYC$DIA1:[SYS1.GC1]A236_018.RAW;1
Report: 473894
Acquired: 25-AUG-1994 10:46:50
Time range: 0.00-25.00



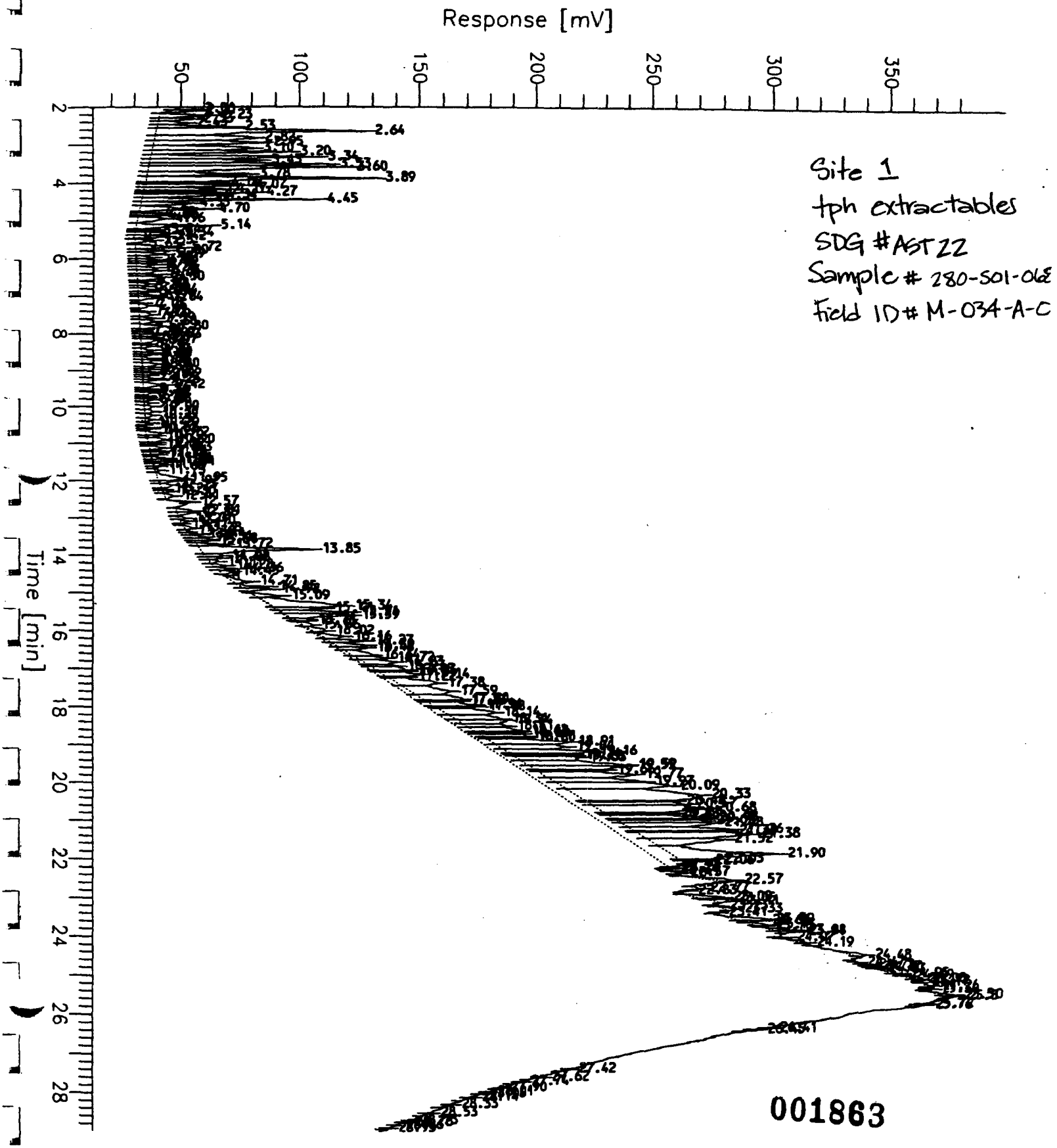
Site 1
tph extractables
SDG # AST17
Sample # 280-S01-032
Field ID # M-003-E-0

B 9/6/94

T P H

Sample Name : 5821-007
File Name : G:\USERS\ACQUIRE\GC6\FA02672.raw
Method : FTPH
Start Time : 2.00 min End Time : 29.00 min
Scale Factor: 1.0 Plot Offset: 12 mV

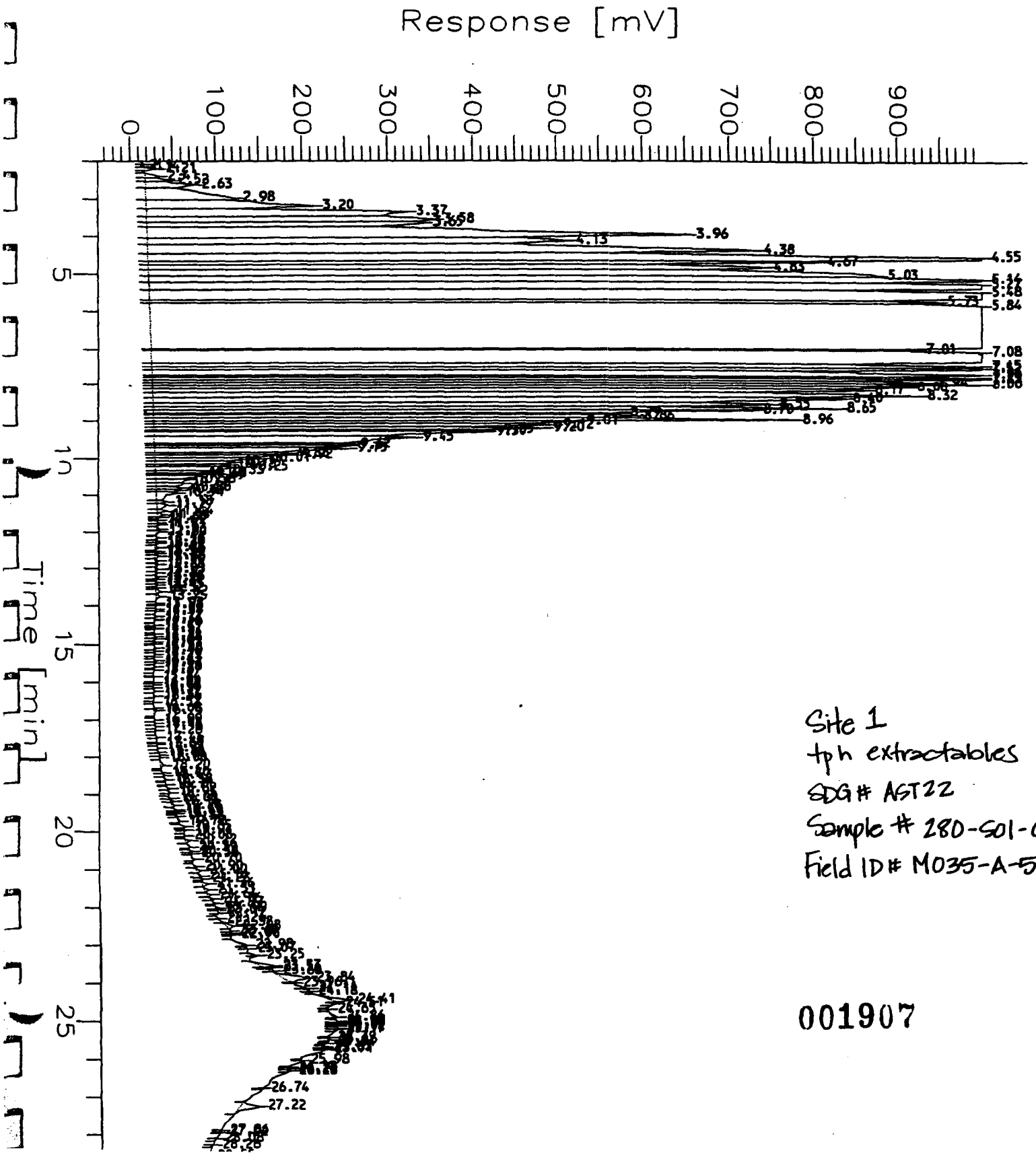
Sample #: 32
Date : 09/09/94 11:18
Time of Injection: 09/07/94 21:41
Low Point : 11.82 mV High Point : 380.33 mV
Plot Scale: 368.5 mV



T P H

Name : 5821-003
File : G:\USERS\ACQUIRE\GC6\FA02668.raw
Method : FTPH
Start Time : 2.00 min End Time : 29.00 min
Scale Factor: 1.0 Plot Offset: -38 mV

Sample #: 28 Page 1 of 1
Date : 9/8/94 03:18
Time of Injection: 9/7/94 09:21
Low Point : -37.71 mV High Point : 1000.00 mV
Plot Scale: 1037.7 mV



Site 1
tph extractables
SDG # AGT22
Sample # 280-501-07
Field ID # M035-A-5.0

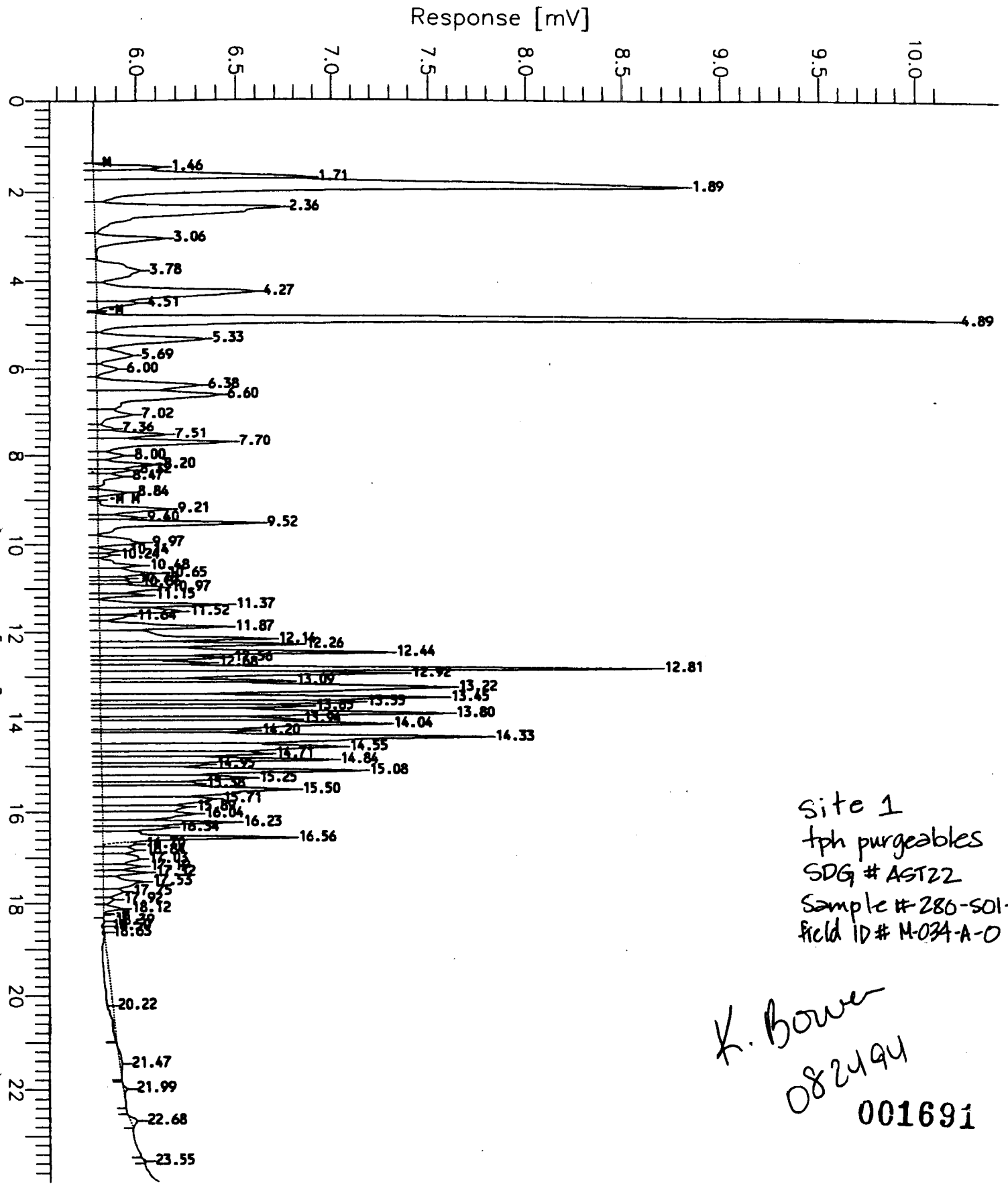
001907

Gasoline

5821-007 HA082494

Sample Name : ~~5822-007~~ (1-g)
FileName : G:\USERS\ACQUIRE\GC8\HA01997.raw
Method : gas8s.ins
Start Time : 0.00 min End Time : 24.00 min
'e Factor: 1.0 Plot Offset: 6 mV

Sample #: 29 Page 1 of 1
Date : 08/24/94 07:49
Time of Injection: 08/24/94 07:14
Low Point : 5.56 mV High Point : 10.19 mV
Plot Scale: 4.6 mV

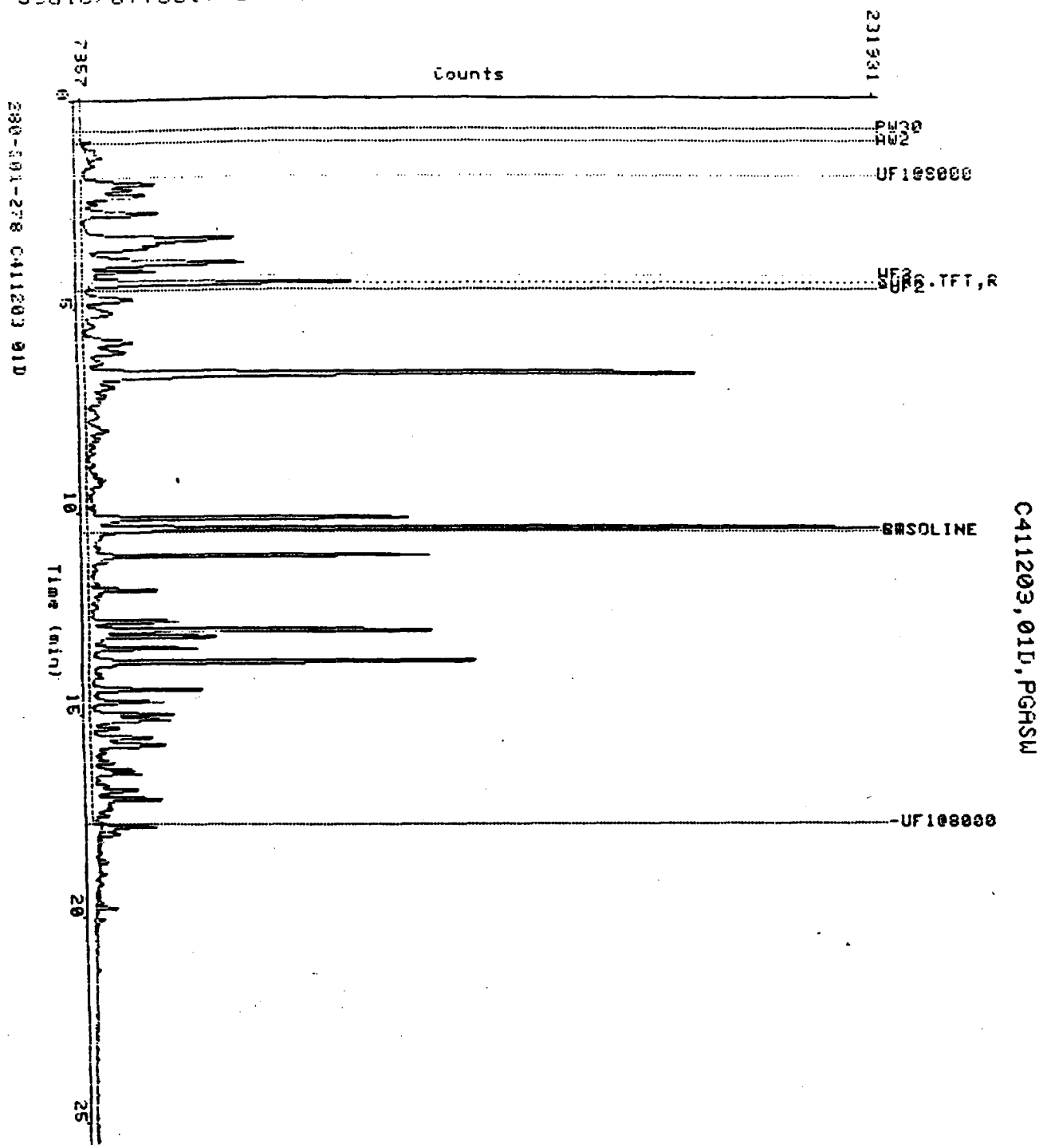


site 1
tph purgeables
SDG # AGT22
Sample # 280-501-1
field ID # M-034-A-0

K. Bower
082494

001691

Data file: R2HYYL$DIA1:[SYS1.GC26]A_316_1107.RAW;1
Report: 497217
Acquired: 15-NOV-1994 04:42:35
Time range: 0.00-25.50
Int. scale/offset: 1.0/0



Site 1
tph purgeables
SDG # AST48
Sample # 280-501-278
field ID# MTE 11-22-94
QA BLIND SAMPLE

APPENDIX M

RESPONSE TO COMMENTS FOR THE DRAFT OU-3 RI REPORT

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
Ref	Comment	Responsible Party & Response
OU3	**Focus Group, RAB, Mary Sutter**	
1	**Landfill Presumptive Remedy** The OU-3 focus group doubts whether proposing a presumptive remedy is appropriate at this point in time for the OU-3 landfill site. We are concerned with the problem of shallow ground water and the fact that sections of the landfill are located on the edge of the Bay (indeed, landfill waste had been used as bay fill material in the burn area). Furthermore, the landfill contains unknown quantities of Ra-226 and has received large quantities of industrial wastes. Thus, the OU-3 landfill does not appear to meet all the required criteria to pursue the presumptive remedy approach at this stage of the analysis.	The landfill at Site 1 qualifies for the presumptive remedy per the memo "Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills" (EPA, 1996). The presumptive remedy contains provisions for a landfill cap, "hot spot" removal, groundwater and leachate treatment, landfill gas collection and treatment, and institutional controls. Military landfills with "large quantities of industrial wastes" have been capped under the presumptive remedy as detailed in the EPA memo (EPA 1996). In Highlight 3 of the EPA memo, military-specific wastes considered comparable to hazardous wastes typically found in municipal landfills include low-level radioactive wastes. The radioactive dials found throughout the landfill will potentially fall into the low-level radioactive wastes category. The radiological survey should be completed by June 1999 at Site 1. Radioactive dials within the area to be capped will be removed only as required to be protective of human health and the environment, taking into account the landfill cap thickness of at least 4 feet. Radioactive anomalies located outside the proposed landfill cap area will be either removed or capped, depending on the quantity and distribution. Appropriate engineering measures will be taken when extending the landfill cap to the edge of the Bay to protect against erosion. Shallow groundwater remedial actions will be evaluated in the OU 3 Feasibility Study to protect human health and the environment. The presumptive remedy technical memorandum will be expanded in Appendix E to address these issues.
2	**Onshore versus Offshore Risk Assessment** The OU-3 focus group assumes that the data collected during the remedial investigation should be used to help determine the best possible approach and remedy during the feasibility study. By separating the onshore landfill from the offshore water, the risks to the offshore area and the interaction of the potential remedy of the landfill with the offshore area cannot be properly	Groundwater from the landfill is addressed in the OU 3 RI. Addressing sediments in the OU 4 RI will not interfere with the remedial action selection at Site 1. A review of the offshore sediment data indicate that the

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	assessed. Since the offshore risks are due to the landfill, the focus group believes that it should be assessed in this remedial investigation, not by waiting until OU-4. Additionally, the area offshore of the landfill does not show up in OU-4 in any document that we could find. Nor does it show as an area requiring any remedy in Figure 1-2. Please outline the water area outside of Site 1 similarly to the offshore areas otherwise shown in OU-4. Potentially, this area should be provided with a different site number to assure that it is included in all future analysis.	chemicals detected in sediments are frequently not those detected at Site 1, and therefore an association between chemicals at Site 1 and offshore sediment is not clear. Also contaminants such as DDT and PCBs were detected in offshore sediments that were not identified in the Site 1 RI as COPCs. These compounds may originate from other sources at Alameda Point or around the Bay. Finally, the highest detections of some chemicals in sediments are at the greatest distances from shore, therefore appear not to be related to Alameda sources. The preliminary review of sediment data indicated that all sediment chemicals should be analyzed in view of sources from a broader area, and analyzed in a more comprehensive manner than is possible looking at Site 1 alone. Therefore this analysis will be combined with all offshore sediment data and evaluated as par t of OU-4. A footnote will be added to Figure 1-2 to indicate that offshore samples will be addressed under the OU-4 RI.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
3	**Incomplete Exposure Pathway Analysis** The RI presents an incomplete exposure pathway analysis and has therefore underestimated the potential impacts of the landfill site. The following important exposure pathways have been ignored: 1. *The Landfill Gas Pathway.* The landfill contains undetermined quantities of volatile organic chemicals and Ra-226, mixed together with other wastes such as garbage. This mixture may produce toxic and radiological landfill gases, e.g., vinyl chloride from the biodegradation of chlorinated VOCs, and Rn-222 from the decomposition of Ra-226. However, no air monitoring or air-dispersion modeling has apparently been completed at or downwind of the landfill. Likewise no exposure pathways downwind of the landfill have been analyzed. 2. *The Surface Water and Sediments Pathway.* Contaminated ground water has been discharging into the SF Bay waters from the boundary of the landfill. Future use of the areas where this discharge is occurring would include recreational activities in which individuals may be exposed to site related contaminants in nearby surface water and sediments. The OU-3 Focus Group does not agree that the analysis of Bay surface water and sediments should be dealt with only in the OU-4 RI; these issues should be thoroughly analyzed in both RI documents. 3. *Ground Water Pathway.* Regardless of the engineering approach chosen for the landfill, ground water wells could be established near the landfill site. For example, during future drought seasons, wells could be established in the proximity of the site for irrigation. Pumping of these wells could change the ground water gradient creating a contaminant plume in areas that are currently upgradient of the landfill. Because of this possibility, the future ground water pathway should to be assessed in the RI, even if only to document the need for institutional controls on the use of ground water near OU-3.	1. In the future, the landfill will be capped. Gas emissions from landfill vents will be monitored and treated as necessary to meet applicable emissions standards. Therefore, air monitoring beyond that described above, and downwind air dispersion modeling will not be necessary after the landfill is capped. Potential exposure to volatile emissions from surface soil (0 to 2 feet below ground surface [bgs]) at the uncapped landfill were evaluated in the human health risk assessment (HHRA) under current conditions. No volatile carcinogenic chemicals were detected in surface soil, and the hazards associated with inhalation of non-carcinogenic volatile emissions from surface soil are insignificant (less than 1E-04) under both occupational and recreational exposure conditions. Similarly, risks associated with inhalation of volatile radionuclides are less than 1E-08 under both occupational and recreational condition. To further substantiate this point, the Navy investigated the impacts of evaluating potential volatile emissions from the full soil column. In addition to acetone and radium-226 (chemicals of concern [COC] in surface soil), seven other volatile organic chemicals (VOC) were infrequently detected in the full soil column. However, all seven of these VOCs were detected at frequencies less than five percent and at maximum concentrations less than 10 percent of their respective EPA Region 9 residential soil PRGs. Therefore, consistent with the COC selection process described in the HHRA, these VOCs would not have been retained as COCs. Further, the exposure point concentration (EPC) for acetone was reduced from 1.1 mg/kg to 0.11 mg/kg and for radium-226 was slightly increased from 0.9 pCi/g to 1.2 pCi/g when calculated based on results for the full soil column. Therefore, even if results for the full soil column were considered, risks and hazards associated with inhalation exposures above the landfill would be insignificant. Because risks and hazards associated with inhalation

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		exposures directly above the landfill are insignificant, and exposures downwind of the landfill will be lower than above the landfill (even if downwind residential exposure is assumed), there is no need to conduct either air monitoring or air dispersion modeling. The Navy acknowledges that high concentrations of vinyl chloride and other solvents were measured in ground water samples collected beneath the landfill. However, in order for receptors to potentially be exposed to these solvents through inhalation of ambient air above the landfill, the chemicals first have to migrate from the ground water into the vadose zone and from the vadose zone into the ambient air. Further, because no construction is assumed to occur on the landfill, there will be no enclosed spaces for the volatile chemicals to accumulate. Nevertheless, the Navy will model potential emissions of VOCs present in the groundwater beneath the landfill and will estimate the resulting concentrations of these VOCs in ambient air above the landfill. The estimated ambient air concentrations will be compared with EPA Region 9 ambient air PRGs. The RI will be revised to include the results of the modeling and comparison of estimated ambient air concentrations to EPA Region 9 ambient air PRGs. If the estimated ambient air concentration for at least one VOC exceeds its EPA Region 9 ambient air PRG, the RI will be revised to evaluate potential exposures to the estimated ambient air concentrations under both occupational and recreational exposure scenarios. As described above regarding potential VOC emissions from soil, the Navy will evaluate the need to conduct air monitoring or air dispersion modeling based on the results of the PRG comparison and any additional exposure and risk analysis. 2. The Navy acknowledges that contaminated groundwater has been discharging into San Francisco Bay. The Navy also acknowledges the potential that recreational activities such as boating could result in exposures by receptors to contaminated surface water and sediments.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		However, though the surface water and sediment exposure pathways are theoretically complete, the Navy asserts that any such exposure is likely to be minimal for the following reasons. There is no beach along the San Francisco Bay off of Alameda Point, the temperature of the bay water is very cold, and dangerous currents in the area are well known. These factors would significantly reduce, even eliminate potential exposures to surface water and sediments associated with these recreational activities. While boating may occur off of Site 1, potential receptors are assumed to remain in their boats to avoid the cold water and dangerous currents. The Navy has significant concerns regarding quantitative characterization of risks and hazards associated with potential exposure to chemicals in media such as surface water, sediment, and aquatic life that have been impacted by a host of sources and releases unrelated to bay area Naval installations. More specifically, the Navy is currently evaluating this issue on a program-wide basis. At a minimum, the Navy will revise the RI to briefly, but clearly, summarize the reasons why potential exposures to surface water and sediments off of Site 1 are expected to be minimal. As necessary, the RI will be revised consistent with the results of the on-going program-wide evaluation. Analysis of bay surface water and sediments will be evaluated more completely in the OU-4 RI. 3. The Navy acknowledges that regardless of the engineering approach chosen for the landfill, groundwater wells could be established near the east side (upgradient) of Site 1. The Navy is currently conducting modeling to evaluate whether sustained pumping of a ground water well in this area would (1) result in total dissolved solids (TDS) levels in the ground water withdrawn from this well to exceed 10,000 ppm (making the ground water unusable as a drinking water source), (2) assuming sustained pumping,

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		how long before such a TDS level was reached, and (3) would the sustained groundwater pumping result in contaminants present in the groundwater plume impacting the quality of the water being drawn from the hypothetical groundwater well. At a minimum, the RI will be revised to present the methodology and results of the sustained pumping model. If the modeling results indicate that sustained pumping is theoretically possible (without resulting in TDS levels exceeding 10,000 ppm) and that such pumping could impact and draw contaminants from the groundwater plume, thereby impacting the quality of the water being drawn from the well, the Navy will revise the OU 3 RI to incorporate an evaluation of the exposures, risk, and hazards associated with this groundwater pathway.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
4	**Radiological Removal Action** 1. The action level for cleanup of Ra-226 should be based upon CERCLA acceptable risk. EPA Region 9 has calculated that the 1 in one-million risk level for Ra-226 (in equilibrium with its daughters) would be 0.02 pCi/g and 0.006 pCi/g for commercial soil and residential soils, respectively (See: "Risk Comparison for Radionuclides in Soil," Steve Dean EPA Region 9 Health Physicist, December 18, 1996). Given that these activity levels are likely to be lower than the regional background levels, this means that the CERCLA cleanup level for Ra-226 should be set at background levels, not at 5 pCi/g. 2. The nature and extent of this removal action needs to be thoroughly discussed in the RI. In particular, the level of confidence in radium removal should be reported.	1. The Navy disagrees that cleanup levels should be based on PRGs. The Navy cleanup level initially proposed for the radiological removal action was 5 pCi/g per 40 CFR 192.12(1). This regulation establishes cleanup criteria for radium-226 averaged over 100 square meters not to exceed the background level by more than 5 pCi/g averaged over the first 15 cm soil depth. Another cleanup level of 25 mrem/yr TEDE above background for average members of a critical group where residual radioactivity has been reduced to levels that are as low as reasonable achievable (ALARA) is an ARAR under 10 CFR 10.1402. A risk assessment will be performed in accordance with EPA guidance to ensure the risk from Ra-226 is reduced to an acceptable level in areas outside of the Site 1 landfill cap. This will all take place under the proposed removal action or under the Site 1 remedial action. Radiation anomalies within the landfill will most likely not require removal to be protective of human health and the environment, taking into account shielding provided by the landfill cap. Radiation levels penetrating the landfill cap will be modeled using a software program (Microshield) to optimize cap design and potential anomaly removal. This information will be used to ensure that the cap thickness will be protective of any radiation left within the landfill. 2. The radiological removal action as initially proposed, has not been carried out by the Navy. To date, radiological surveys have been completed within the Site 1 boundary but the removal action has not occurred due to the number of anomalies detected. Currently, additional radiological surveys are being conducted adjacent to Site 1 boundaries. Results from the surveys are anticipated in June 1999. The Navy has decided to address radiation anomalies within Site 1 boundaries under the OU 3 RI. Results from the radiological survey outside of Site 1 boundaries are anticipated to be addressed under the removal action. However, the Navy will make the determination whether to expand Site 1 boundaries to address additional radiation

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		anomalies after survey results have been reviewed. A discussion of the ongoing radiological surveys and strategy will be added as Section 6.4.3 of the draft final OU 3 RI.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
5	**Baseline Risk Assessment Issues** 1. The RI has underestimated potential baseline impacts of the site since it has failed to consider a residential exposure scenario. The Risk Assessment reports that housing may be permitted in the Northwest Territories reuse zone, part of which contains the landfill. Zoning is not a fail-safe mechanism for prevention of certain residential development near the landfill site. For example, live-work spaces and other zoning variances are likely to occur. The pathway analysis has ignored the possibility that future residences may be placed in the proximity of, and downwind of the landfill site. 2. Soil ingestion rates for recreational exposure. Table C.5.4-1 of the risk assessment presents recreational soil ingestion rates that are inconsistent, in several ways, with the guidance presented in EPA's 1997 version of the Exposure Factors Handbook. First, contrary to the Navy's assumptions in the risk assessment, soil ingestion rates do not remain constant over the course of the day. Table 4-15 of EPA's Exposure Factors Handbook indicates that the outdoor soil ingestion rate for children is approximately 7 times greater than the indoor rate. Second, the Navy used daily soil ingestion rates of 100 mg/day and 50 mg/day, respectively, to calculate its RME and average hourly soil ingestion rates. However, EPA's recommended values for high-end and average daily soil ingestion in children are 400 mg/day and 100 mg/day, respectively. The information presented in the Exposure Factors Handbook implies that an RME recreational soil exposure rate for children should be set at around 70 mg/hour (which can be calculated using the information presented above, and by assuming a constant outdoor soil ingestion rate, and also, that children spend about 1,000 hours per year outdoors). 3. The Navy should use all available RfDs and Slope Factors. The Navy should also use surrogates, route-to-route extrapolation, and primary literature to develop toxicity values for other chemicals. Otherwise do a thorough qualitative assessment of exposure for qualitatively analyzed chemicals. This issue was also brought up in the remedial investigation for Operable Unit #1.	1. As described under the response to "Incomplete Exposure Pathway Analysis," potential occupational and recreational exposures to receptors located above the landfill were evaluated in the HHRA and determined to be insignificant. Further, even if residential exposure above the landfill were assumed, the risks and hazards associated with exposure to volatile COCs migrating from site soil through inhalation would be insignificant. Because the concentrations of COCs in the air downwind of the landfill will be lower than concentrations above the landfill, the risks and hazards associated with exposure to volatile COCs through inhalation at locations downwind of the landfill would also be insignificant. Therefore, with regard to potential exposure to VOCs release from site soil, the RI has not underestimated potential baseline impacts; evaluation of potential residences located downwind of the landfill is unnecessary. The Navy is modeling the potential release of VOCs present in the ground water plume beneath the landfill into the ambient air above the landfill. As described above under the response to "Incomplete Exposure Pathway Analysis," the Navy will assess the need to conduct air monitoring or air dispersion modeling based on the evaluation of the modeling results 2. The soil ingestion rates used in the OU 3 HHRA are associated with exposure by adult receptors and are the same assumptions used to assess potential recreational exposures at other Alameda Point sites (for example, OU-1). The soil ingestion rates identified in the comment are specific to exposure by a child receptor. Recognizing that the OU 3 RI, unlike other Alameda OU RIs, did not evaluate potential residential exposure because Site 1 is a landfill, the Navy acknowledges that evaluation of potential exposure by a child receptor in a recreational setting is appropriate. The Navy will revise the OU 3 HHRA to incorporate an assessment of potential exposures by a child receptor in a

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		recreational setting. The Navy will identify and use soil ingestion rates consistent with EPA's 1997 "Exposure Factors Handbook" and DTSC's "Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities." 3. The Navy agreed to display only the risk and hazard indices values calculated using DTSC methodology without any further changes. In review of the draft OU1 report dated August 28, 1998, which contains the same values as displayed in the draft final report, the DTSC toxicologist made the following comments: "The exposure parameters (Tables D.5.2-1 through D.5.2-18) were checked at random and found to be those previously agreed upon." "The DTSC dermal absorption factors (Table D.5.4-17) were checked and found to accurately reflect those contained in the DTSC Preliminary Endangerment Assessment (PEA) Manual." "The CalEPA CSFS were checked at random and found to accurately reflect the most recent listing by the Office of Environmental Health Hazard Assessment (OEHHA)." "Intake calculations, and the associated non-cancer hazard and incremental cancer risk, were checked at random and we were able to duplicate the values presented." Further, the Navy did not and will not rely on the EPA Region 9 PRG table as a source of toxicity information; toxicity information was gathered from IRIS and HEAST as described in the text of Appendix D. The noncarcinogenic assessment fully complies with all DTSC and EPA guidance documents. EPA Region 9 PRGs were included as an attachment to Appendix D solely as a reference for the dermal exposure assessment methodology that was used in the Navy values,

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		at the direction of EPA. EPA failed to provide the guidance document on which that methodology is based, but had insisted that the Navy use it. Therefore, the Navy referenced the EPA Region 9 PRGs. PRGs are also included in the upcoming HHRAs as a reference for the COPC selection process.
6	**Lack of Dioxin Data** The RI has inadequately tested for possible dioxin contamination at OU-3, especially in the burn areas. The few surface soil samples that were tested for dioxins had detection limits that were greater than soil PRGs by a factor of 10.	The Navy agrees that dioxin would be expected to be present in the burn area. The burn area is proposed to be capped under the presumptive remedy, thereby protecting human health and the environment. Additional sampling in this area would therefore not be warranted.
7	**Unexploded Ordinance Removal Action** There does not appear to be any discussion of unexploded ordinance (UXO) and the UXO removal action that has taken place at OU-3. This should be presented in the document.	A discussion of the UXO removal action was presented with the Pistol Range Investigation data in Section 6.4, because the removal action occurred during the Pistol Range Investigation. A more detailed discussion of the UXO removal action and additional proposed UXO surveys will be added to the Draft Final OU 3 RI in Section 6.4.4.
	General Questions **RAB COMMENTS**	
1	What is the best estimate of the area and volume of the landfill, pistol range, and contaminated bay sediment in OU-3?	The area of landfill disposal cells is approximately 14.7 acres. The area of the pistol range is approximately 1 acre. The proposed landfill cap will cover an area of approximately 24 acres encompassing the majority of Site 1. A seventh disposal cell was added to the landfill based on aerial photos. Records have not been found that indicate burial depth of waste. Although the volume of the landfill can be estimated, it is irrelevant for the presumptive remedy of capping and will not be presented in the RI/FS. Estimated bay sediment area and volume will be presented in the OU 4 RI.
2	Please describe how the soil, water, and air samples were used to operationally define the geographical boundaries - vertical and lateral extent - of contaminated media.	The criteria used to define the geographical boundaries of the disposal cells were delineated from aerial photographs. Soil samples were collected from the landfill and areas adjacent to the landfill. Groundwater samples were collected to determine the vertical and lateral extent of groundwater contamination. Wells were positioned upgradient, downgradient, and along

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		the northern and southern boundaries of the landfill. Numerous wells were positioned along the shoreline directly west of the fill cells to determine the extent of contaminants entering the Bay. Air samples were not collected during the OU 3 RI.
3	Please provide a an appendix of all information that was used to establish the history of contamination in OU-3 and the offshore water in OU-4.	This discussion is presented in Section 6.2 of the RI report and references are provided. Past disposal records were not available for the Site 1 landfill.
4	On page 5-4, Identification of Chemicals of Concern, Paragraph 2, it is stated that: "Subsurface soil and groundwater are not considered exposure media at Site 1 because, as a landfill that was covered with fill soil and closed in 1956, the site cannot be excavated and the groundwater beneath it cannot be used." We believe that because the area is a landfill and groundwater is contaminated, all COCs in soil, soil gas, groundwater, surface water, and air must be identified and adequately sampled in order to conduct a valid HHRA and Ecological risk assessment under the assumption of no landfill cover (the current condition). This does no appear to have been done. However, if a risk assessment is conducted under the hypothetical scenario of a "cap", the detailed specifications of the engineered cap must be provided i.e. the surface soil permeability rates, ground water movements rates, and any other mitigating effects on the movements of chemicals, or concentrations of chemicals of concern in the landfill, landfill leachate, and bay sediment contaminated by the landfill. Without the details of the cap, the risk assessment may be incomplete.	The subsurface soil is not considered an exposure medium for the Site 1 HHRA. However, the subsurface soil has been adequately sampled following plans and procedures reviewed and approved by the regulatory agencies. COCs for surface soil were selected based on the analytical results from approved samples. The decision to assess potential exposures to chemicals in soil to the interval 0 to 2 feet bgs was incorporated into the approved work plan and is consistent with the HHRAs performed at other Alameda OUs. Presently groundwater is also not considered an exposure medium for the Site 1 HHRA. However, based on the Navy's modeling of the impact of sustained groundwater pumping, the HHRA may be revised to incorporate potential groundwater exposures. As with site soil, groundwater beneath Site 1 has been adequately sampled following plans and procedures reviewed and approved by the regulatory agencies. As appropriate, groundwater COCs will be identified based on analytical results from these approved samples. It should be noted that soil gas samples were not collected at Site 1. Instead, COCs for soil gas and air were identified as volatile surface soil COCs. Concentrations of these volatile COCs in the air above the landfill were modeled based on concentrations of these volatile COCs in the surface soil. Volatilization of these COCs from soil occurs within the vadose zone which is limited to soil approximately 0 to 4 feet bgs because of the presence of shallow ground water beneath Site 1. The analytical results

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		from 2 to 4 feet bgs were not considered in identifying air COCs or in estimating the concentration of COCs in the air above the landfill. However, as described under the response to the comment titled "Incomplete Exposure Pathway Analysis" even if the entire soil column were considered, the list of soil and therefore air COCs would not change. Also, the estimated inhalation exposures and associated risks and hazards would be similar to or less than those presented in the HHRA. The HHRA will be revised to incorporate the modeling of the emission of VOCs present in ground water and the estimation of the concentration of these VOCs in ambient air above the landfill. Once again, the VOCs will be identified based on the analytical results of approved ground water samples. Similarly, while surface water COCs were not identified in the HHRA, ecological contaminants of potential concern (ecological COPCs) were identified by comparing groundwater analytical results to appropriate surface water criteria. In summary, while the HHRA did not evaluate direct exposures to subsurface soil and may be revised to evaluate direct exposures to groundwater, soil (including both surface and subsurface soil) and groundwater have been adequately sampled following approved sampling plans. Based on the analytical results from the soil and groundwater samples collected, COCs in soil, air, groundwater, surface water have also been adequately identified.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
5	Page 6-11, Section 6.7.1.1. Soil Investigation Activity, paragraph 2: "The surface and subsurface soil samples were selectively analyzed for VOC's, SVOCs, TPH-P, TPH-E...pesticides, dioxins...." We were unable to determine a detailed explanation of the rationale, methodology, and procedures the Navy used to determine when and when not to analyze for a parameter. Without this, we cannot determine whether the results are valid. Please provide this information.	The statement, "Analyses were selected on the basis of suspected disposal activities and possible releases to soil and groundwater" will be added to sections 6.7.1.1 and 6.7.1.2.
	Ecological Risk Assessment by OU-3 Focus Group	
1	The OU-3 Ecological Assessment uses the presumptive remedy as a rationale for ignoring the ecological impacts of surface soils. We disagree with this approach. Regardless of whether the landfill presumptive remedy is ultimately chosen for OU-3, the RI should analyze baseline ecological risks in order to provide data to formulate a final remedy that has the appropriate engineering design and institutional controls.	Because Site 1 will essentially all be capped, there would be no wildlife exposure. According to EPA guidance set forth in "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA 1993), the risk resulting from the exposure pathway of direct contact with soil and/or debris is prevented by the cap. Therefore a risk assessment to all media is not necessary where a presumptive remedy is implied.
2	The assessment does an incomplete job of determining risks due to marine wildlife (e.g. There is no consideration of the impacts of sediment contamination, there is no discussion of food-chain effects, etc). If these pathways are to be covered in a basewide ecological assessment, then the OU-3 RI should discuss this fact; and the RI should also delineate exactly which assessment components are to be covered in the basewide assessment.	It is not clear from offshore data that there is a link between COPCs identified at Site 1 and chemicals identified in offshore sediments. Offshore sediments therefore are proposed to be evaluated for all the base in a subsequent report issued under OU-4.
3	Section 6.8.2 states that the SWBZ is presumed to enter the Bay "far enough off shore such that contaminant concentrations are reduced to below water quality criteria..." The RI must present data and calculations to show that this is, in fact, the case.	The second water bearing zone occurs generally at depths greater than 40 feet. The predominant groundwater flow direction in FWBZ is to the west and northwest. Using a simple assumption that the SWBZ intercepts the bottom sediments of the bay at approximately the same depth as they occur at the site, the lateral distance chemicals would potentially travel before emerging in surface waters can be estimated. Over the distance these chemicals migrate, physical factors such as dilution, attenuation and degradation would be acting to reduce the concentration and toxicity of the chemicals. Organic chemicals that adsorb strongly to sediments may only move a few feet before they are degraded, while highly soluble compounds could migrate hundreds of feet a year. The distance from the west shore of Site 1 to the 40 foot depth contour is in excess of 2300 yards at the northern shoreline and 1600 yards at the southern shoreline. The Oakland Inner Harbor channel north of the site is shown to be dredged to controlling

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		depths of 34 feet (NOAA 1992), and is proposed to be increased to a depth of 50 feet. The channel may intercept SWBZ groundwater to the north of the site, in which case groundwater would emerge in surface water at distances of 150 yards to 870 yards north of Site 1.
4	We do not agree with the methodology presented on page 6-31, which regards elevated analytical results as "outlier data" just because they are unusual. Exceptionally elevated analytical results may represent the true variability of environmental data. A sample value should not be defined as an "outlier" unless it can be shown to be impacted by a significant sampling or analytical error.	Several commentors requested a more quantitative approach to identifying potential outliers. Because the number of detections was quite low (often less than 10), a qualitative outlier analysis had been used. The RI has been revised such that no ecological COPCs are removed from analysis as "outliers." Instead, 95 % Upper confidence limits (UCLs) are calculated for chemicals where maximum levels exceed screening criteria, and those values are used to compare to AWQCs. Calculation of the 95% UCL is generally a better measure of the central tendency of the data where one or two extreme values may be present. Data were also evaluated for the presence of "hot spots" to ensure that extreme values originating from the same source were identified as "hot spots."
Ecological Risk Assessment by TOSC Consultant The RAB OU-3 Focus team was fortunate to engage the services of Mary Masters		
1	Although this is a screening-level ERA that concludes that certain chemicals in groundwater may pose a significant risk to aquatic receptors, there are no numerical risk conclusions provided, nor any indications that a more quantitative, complete ERA will be conducted during the RI/FS. Please clarify when the ecological risks will be calculated to complete the ERA.	The purpose of a numerical risk analysis is to assist in the determination whether remediation can or should be applied to reduce the concentration of chemicals to a level that would not cause adverse effect to human health or the environment. Based on a numeric risk assessment, the decision makers could decide that the risk at a particular site does not warrant remediation, or that the site requires remediation. It is then the purpose of the Feasibility Study to explore the alternatives for remediation and the concentrations to which chemicals should be "cleaned-up."
2	EPA's Ecological Risk Assessment Guidance for Superfund, June 1997, ("ERA Guidance") advises that the preferred screening ecotoxicity values should represent a no-observed-adverse-effect-level (NOAEL) for chronic exposures to a contaminant. Using the NOAEL rather than the lowest-observed-adverse-effect-level (LOAEL) ensures that risks are not underestimated. (Pg. 1-10,11) If NOAELs are not available for the chemicals of concern, then standard practice is for the LOAELs to be multiplied by a factor of 0.1 when used as screening factors. Please explain the justification for using LOAELs instead of NOAELs as toxicity screening criteria in the Alameda OU-3 ERA, and clarify whether the 0.1 factor was used.	The RI has been revised to use hazard quotients, calculated using "secondary reference criteria" as threshold reference values (TRV). TRVs could theoretically include LOELs adjusted to NOELs by multiplying by a 0.1 safety factor. In practical terms, secondary reference values were available from the literature for nearly all chemicals, and no LOELs were used for screening or hazard quotient calculations.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
3	Page 6-11 states that 29 groundwater monitoring wells were installed at Site 1. Tables 6-10 and 6-14 indicate 40 and 33 wells were installed, respectively. Please explain these inconsistencies.	The actual number of wells installed during the RI is 33 as indicated in Table 6-14. Table 6-10 as well as the text on page 6-11 and will be changed to reflect this.
4	There appears to be a typographical error on page 6-17, under FWBZU in the table: should 0.15 be 0.015?	Yes, this number will be changed to 0.015 in the table.
5	Page 6-25: Radiation anomalies FP04 and FP06 are close to the shoreline and may be under water at high tide. Table J-4 indicates that these anomalies have not yet been removed, but have very high count and exposure rates. Please explain how the tidal action and potential Bay waters contamination were factored into the ERA.	This pathway was not examined under the ecological risk assessment. However, the impact of a few radioactive dials mixing in the Bay, which already contains naturally occurring radium, is infinitesimally small. One dial contains about 1 to 15 microCuries of radium. Concentrations of radium in sea water are typically on the order of 1/10th of a picoCurie per liter. It would not require many liters of water to reduce the level to that of naturally occurring radiation.
6	Page 6-30 indicates that SWBZ water may contact the Bay at some distance from the shoreline, but this location is unknown and presumed to be sufficiently far to result in contaminant dilution and/or attenuation. This conclusion should be confirmed before ruling out potential contamination to the Bay from the SWBZ.	See OU 3 Focus Group Comment # 3
7	Pages 6-31 through 6-33 discuss the rationale for deleting all metals and inorganics from the groundwater ecological COC list. The reasons range from "no consistent pattern" of detection, to less reliable data from the 1991-92 sampling events, to results that indicate that CTRs "are generally not exceeded." Given that this is a screening ERA, EPA's ERA Guidance advises that the ERA should be biased toward overestimating risk, to minimize the chance of concluding there is no risk when one may exist. At a minimum, copper, nickel and zinc should be retained as COCs.	With regard to excluding 1991-92 data, the more recent data are considered to be of higher quality because analytical methods improved, lower detection limits were achieved, and QA/QC validation was implemented on subsequent data. A preliminary analysis of the groundwater data from Site 1 showed a disproportionate majority of detections exceeding criteria to be in the 1991-92 sampling period. This could lead to one or two conclusions: 1) chemical concentrations which existed in 1991-92 have been dramatically reduced, in which case, the more recent data are a more appropriate measure, or 2) the methods used during this period were less accurate than more recent methods. We think the latter is the correct description, but in either case, the more recent data reflects the existing conditions better than historic conditions. Secondly with regard to 1991-92 data, many minimum detection limits exceeded the criteria, many of which were enacted more recently in response to better analytical techniques. Matrix and spike controls were not uniformly implemented and there are some questions whether field techniques such as sample filtration were uniformly

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		implemented because of the lack of QA/QC data. With regard to copper, nickel, and zinc these data were re-analyzed using the 80LCL/95 measure for background wells, consistent with the human health risk assessment. These chemicals were screened against AWQCs after dividing by 10, consistent with advice from NOAA (1999). In this context, none of these chemicals was retained as an ecological COPC.
8	Table 5-7 references a National Toxics Rule LOEL, but the text on page 5-22 does not include a National Toxics Rule in its description of the ecological toxicity criteria. Please clarify.	Table 5-7 has been removed from the revised RI. The ecological reference criteria used to screen ecological COPECs are shown in Tables 6-32 and 6-33, and referenced as AWQCs.
9	Tables 6-15 and 6-24 indicate that cyanide was detected in 22.7% of groundwater samples collected in 1991-92, but analysis for cyanide was not included in later sampling events. Please explain the reason for exclusion of cyanide analysis after 1991-92.	The Navy cannot justify the exclusion of cyanide analysis after the 1991-1992 sampling round. Site 1 wells could be re-sampled to obtain additional cyanide data, however, the Navy does not believe this is necessary. A dilution factor of 10 is recommended by NOAA when screening groundwater against Ambient Water Quality Criteria at the shoreline (March 1999). Cyanide in the 1991-1992 samples was below the detection limit of 10 ug/L at all Site 1 wells except M025. Applying a dilution factor of 10 would provide a concentration of 1 ug/L at the shoreline, which is equivalent to the AWQC screening criteria for cyanide.
10	Tables 6-24 through 6-30 indicate several chemicals with detection limit concentration ranges far in exceedance of ecological screening criteria concentrations. Elevated detection limits eliminate the ability to effectively compare those chemical concentrations to screening criteria. It would be useful to the reader to have a table of the subset of groundwater monitoring data obtained with appropriate detection limits.	It appears the commentor may have misinterpreted the tables in question. In all cases where minimum detection limits exceed the relevant comparative criteria, this fact is discussed in the text. We believe there are no such data in the mentioned tables. What the commentor may be referring to is the maximum reporting limits often exceed the comparison criteria. It is not uncommon for the data to be reported as 3000 ug/L "U", although the minimum detection limit for the method may be 5 ug/L. This situation can occur when there are matrix effects in a sample, blanks that contain chemicals or an instrument malfunctions. If 1 sample of the 105 reported is shown as 3000 ug/L "U", the maximum reported limit is shown as 3000, although many or most samples might be reported at well below the comparison criterion. This information is provided because it is possible to calculate an "average"

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		concentration that exceeds the maximum detected. This happens from the standard practice of using ½ the detection limit when calculating mean values from data containing many analytes that are below levels of detection. For example, if there were 10 samples, 5 of which were reported as 3000 ug/L "U", and 5 of which were reported at 10 ug/L, the mean value would be reported as 755 ug/L, which exceeds the maximum detected. A table reporting only the data which were reported at less than the comparison data would be nearly the same size as the raw data itself, as of 40 samples, as many as 30 % could be reported above the comparison criteria.
11	Page 6-37 states that 2,4-DMP was not detected in the SWBZ. Table 6-27 indicates otherwise. Please make the report consistent.	The statement has been removed from the revised RI.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	EPA Region IX, Anna Marie Cook	
1	*ES-2, second paragraph*: Stating that limited quantities of small caliber ordnance were discovered at Site 1 downplays a problem which necessitated an emergency level response. The extent of the UXO problem is still unknown and has resulted in Site 1 becoming a secured area only accessible to personnel trained in dealing with UXO problems.	The UXO investigation is ongoing and a discussion of past findings during the removal action as well as additional investigations will be added in Section 6.4.4 of the draft final RI. As results of the UXO survey become available they will be added to the final RI.
2	*ES-2, last paragraph*: Revise to reflect that only DTSC methodology will be presented in the RI.	As indicated at the March 16, 1999 BCT meeting, the Navy has decided to review the use of DTSC and EPA Headquarters human health risk assessment methodologies and risk factors across all San Francisco Bay area Navy installations. Therefore, the draft final OU-3 RI report will continue to use the dual tracking risk assessment approach. The Navy will be discussing this issue with the regulators on a program-wide basis involving all Bay area Navy installations. Text was revised to further clarify the dual tracking approach.
3	*ES-3, first paragraph, last sentence*: Revise to reflect that only DTSC methodology will be presented in the RI.	The draft final OU-3 RI report will continue to use the dual tracking risk assessment approach. The Navy will be discussing this issue with the regulators on a program-wide basis involving all Bay area Navy installations. See EPA Comment #2.
4	*ES-3, second and third paragraphs*: These paragraphs should be deleted.	Text will be revised; however, the draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2).
5	*ES-4, second and third paragraphs*: Revise to reflect that only DTSC methodology will be presented in the RI. Also update to reflect latest status of radiological study and removal action completion.	Text will be revised; however, the draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2). An update will be added regarding status of the radiological survey and removal action.
6	*ES-4, last paragraph*: While it is almost certain that some form of capping will be used as part of the remedy selected for Site 1, it is premature to assume that a presumptive remedy landfill cap will be the remedy selected. The reasons for this are 1) the characteristics of the landfill do not meet all the criteria for a presumptive remedy; 2) the environmental receptors needing protection may not be best served by a presumptive remedy cap; and 3) it may be in the best interests of the Navy, the City and the environment to perform soil removals on radiological, UXO, and lead from the Rifle Range, and mitigate the high concentrations of solvents in groundwater prior to installation of any sort of cap. These issues, and likely some other	The Navy agrees that the landfill will require a cap and believes that the landfill characteristics meet the criteria for the use of a presumptive remedy (See RAB Focus Group Mary Sutter, comment #1). The reviewer is requested to cite specific presumptive remedy requirements that the landfill does not meet. Per EPA presumptive remedy guidelines, "hot spot"

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	options, need to be discussed with the regulators prior to submission of the draft final report and prior to work on the FS going too far down one path.	removal and groundwater remediation will be evaluated in the OU 3 FS. "Hot spot" areas that may be addressed in the FS include the pistol range, radiation anomalies, UXO, and solvent source areas. Essentially all of the Site 1 area will be capped. Areas outside of the Site 1 boundary are not proposed to be capped under the landfill presumptive remedy. The live 20 mm high explosive projectiles discovered and removed at the pistol range would be considered a "high-hazard military specific waste" according to Highlight 3 of the EPA memo "Application of the CERCLA Municipal Landfill Presumptive remedy to Military Landfills." The Navy will complete a UXO by September, 1999 for the entire outside boundary area of Site 1. The survey will include an initial sweep to identify and remove any surface UXO, and a geophysical survey in areas where surface UXO were discovered. Department of Defense Ammunition and Explosives Safety Standards (August, 1997) indicate that UXO must be assessed to a depth of 4 feet for public surface access, consistent with the planned reuse of Site 1 as a golf course. The landfill cap will be constructed to a depth of at least four feet, thereby providing sufficient thickness to meet the DOD criteria. UXO will be removed from the cap area to provide safety during construction. If UXO is discovered in areas outside the proposed landfill cap, additional removal will occur to comply with DOD requirements. The UXO will most likely be removed under a removal action. Remedial alternatives to be addressed in the OU 3 FS will be discussed with regulators prior to submittal of the FS.
7	*Pg 1-1, Section 1.1*: Does the acreage given of the landfill include the increased area due to recent findings of more extensive radiological contamination?	The acreage given of the landfill does not include the increased area due to recent findings of more extensive radiological contamination. The Site 1 landfill is defined as the disposal cells and burn area, based on aerial photographs. A UXO search is planned for the summer of 1999 in which an attempt will be made to more clearly define landfill boundaries. Until such determination is complete the "landfill boundaries" will remain as they are

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		currently depicted. Radiological surveys outside of Site 1 boundaries are currently underway and should be complete by June, 1999. Risks due to UXO and/or radiation identified outside the Site 1 boundary will most likely be addressed under a removal action. This assumption will be stated in the draft final OU 3 RI. However, depending on the radiological and UXO survey findings, the option to extend Site 1 boundaries and include additional areas in the final OU 3 RI and FS will be evaluated.
8	*Pg 1-6, Section 1.4.2*: The text and table for this section should be revised with regard to the information given on the ecological risk assessments. The Phase 4 investigations occurred during 1991-1993 and 1996-1998 rather than the stated 1991-1992 and 1996-1997, and it should be made clear that the investigations are still ongoing. Also, the stated purpose of the ecological assessment is too narrow; the purpose is to assess ecological impacts using a risk-based approach, not simply to determine if any of the IR sites provide necessary habitats for special status species.	This comment will be incorporated. Objectives of the Phase 4 ecological assessment were added to the text.
9	*Pg 1-8, Section 1.5*: It is confusing to present operable units within operable units. NAS Alameda has been divided into four operable units (rather than the stated eight) and five conveyance parcels (rather than the stated four). All parcels and OUs fall under CERCLA. Operable Unit 2 may be further subdivided into geographic site groupings, but these groupings should not also be referred to as operable units.	The text will be revised. The site groupings within OU 2 will hereafter be referred to as: Central Area Eastern Area Southeastern Area
10	*Pg 1-9, Section 1.5.1*: It should be mentioned that any deed restrictions will not only be documented in a FOST, but also in a Record of Decision for that property. If there are no deed restrictions, then the property can be transferred without a ROD. Bearing the need for a ROD in mind, it may be worthwhile to break Conveyance Parcel A into two subgroups (A1 and A2) with A1 being all property that can be transferred without deed restrictions and therefore without a ROD, and A2 being the property that can be transferred using the Alameda Annex FS and with a very minor ROD.	Section 1.5.1 will be revised to note that this issue will be addressed under the Alameda Point EBS program within appropriate EBS documentation.
11	*Pg 1-10, Section 1.5.2*: The term early transfer is typically used to transfer properties which have not yet been cleaned up and where special arrangements have been made to keep cleanup going after transfer. Because of the confusion that may result in use of this term, perhaps stating something like "have the potential for being transferred soon to the community for reuse" would be better. The Navy may also want to state that petroleum only contaminated sites do not need to be cleaned up prior to transfer and that some sites in OU 1 that have petroleum only contamination may be currently eligible for transfer under CERCLA.	This comment will be incorporated.
12	*Pg 1-10, Section 1.5.4*: To avoid confusion, please use a different term other than operable unit to describe the geographically similar sites in OU 2.	See EPA Comment # 9.
13	*Pg 1-11, Section 1.5.5*: Site 18 has recently been considered for inclusion into each appropriate	An explanation will be added that a storm sewer repair

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	operable unit. The pros and cons of breaking up Site 18 and the decision that results should be made prior to submitting the draft final OU 3 RI.	program is being implemented at Alameda Point. Manhole sampling recommendations needed to identify storm sewer sections requiring repairs are being made in the appropriate RI reports corresponding with the individual sites. The storm sewer project does not affect Site 1 in OU 3, because ecological COCs above screening criteria are not in close proximity to any storm sewer lines.
14	*Pg 2-6, Section on "Artificial Fill"*: The information contained in the EBS, and in the Alameda Annex FS, regarding fill operations is quite detailed and would give a better description of how and when filling proceeded than the description currently given in this section.	The Navy does not believe that detailed artificial fill information would be useful in the RI. A reference for the EBS document will be added.
15	*Pg 2-15, last paragraph*: There is some indication of vertical hydraulic communication between the FWBZ and SWBZ through the BSU when looking at Site 7 data. Benzene has apparently been able to migrate downward, indicating a net downward gradient in this vicinity of the Base.	The comment that interbedded fingers may allow preferential flow between the FWBZ and SWBZ will be incorporated in the last paragraph of Section 6.7.2.2.
16	*Figure 2-15 and 2-16*: To adhere to federal as well as state criteria for delineating groundwater by TDS, the 10,000 ppm TDS delineation should also appear on both figures.	The 10,000 ppm TDS delineation will be added to Figures 2-15 and 2-16.
17	*Pg 3-13, Section 3.3.3*: This section should specify whether data validation packages are available for Phase 4 Ecological Risk Assessment data.	The 1993-1994 Phase 4 ecological data were not validated. The 1996-1997 Phase 4 ecological data were analyzed using CLP methods and validation reports were prepared. This information will be included in Section 3.3.3 of the draft final OU 3 RI
18	*Pg 4-7, Section 4.4.1.2*: Revise the second sentence of the first paragraph to reflect that chemical-specific ARARs may apply to groundwater when considering impacts to aquatic receptors. Actually, the last paragraph of this section does indeed make reference to some of the chemical-specific ARARs under the Clean Water Act, so the first paragraph currently conflicts with the last paragraph. Also, chemical-specific ARARs may apply to possible inhalation pathways from groundwater in the form of landfill gas. It is stated than under the RWQCB criteria the aquifer underneath NAS Alameda is considered a Class III aquifer. Please also state that under NCP guidelines, the aquifer at NAS Alameda is considered a Class IIB aquifer.	The second sentence of Section 4.4.1.2 will be changed to indicate that AWQC are ARARs when considering impacts to aquatic receptors. Other groundwater ARARs include MCLs because the drinking water pathway from a well outside of the landfill was evaluated. ARARs regarding landfill gas will be added to this section.
19	*Pg 4-9, Section on California Fish and Game Code*: The fact that the Waterloo treatability study was put in place, and the resulting data from that study, do indicate a potential adverse impact on aquatic receptors from leachate from the landfill.	The statement will be revised to indicate that Section 5650 of the California Fish and Game Code (FGC) applies.
20	*Pg 5-1, Section 5.1*: Delete the last two paragraphs on this page.	See EPA Comment #4
21	*Pg 5-2, first paragraph*: Revise to reflect that only DTSC methodology will be presented in the RI.	The draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2).
22	*Pg 5-3*: Revise bullets to reflect that only DTSC methodology will be presented in the RI and delete reference to the EPA HQ/Navy methodology.	The draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2).
23	*Pg 5-4, Section 5.1.2*: Although it is unlikely that excavation of the landfill will be selected as a	See EPA Comments #6 and #7 and RAB Focus Group

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	remedy, the fact that it is covered with soil and closed in 1956 does not mean it cannot be excavated. Eliminating two media, groundwater and subsurface soil, based on selecting a presumptive landfill cap remedy, may not be in the best interests of the Navy, the City or the environment. Radiological contamination, unexploded ordnance, lead from the rifle range and two small high concentration solvent plumes may be best remedied through removal prior to any type of landfill cap or covering. These issues, among others, should be discussed prior to submission of the draft final RI. Using the IR site boundary as the exposure unit size presents some problems. Landfill sites are typically very heterogeneous in nature and this fact combined with the limited sampling performed on a landfill means that hot spots are very likely to be missed. In addition, averaging known hot spots like the Rifle Range over the entire site minimizes the risk from this area. Contaminants such as the UXO, the radiological contamination, the solvents in the groundwater and the lead levels in the Rifle Range deserve to be considered for removal and not to be averaged over the entire landfill area.	Comment # 1. Surface soil was eliminated as an exposure media based on the presumptive remedy. Groundwater was addressed for ecological receptors in the Bay. An additional human health pathway has been added to the draft final RI. This pathway involves installing a groundwater well upgradient from the landfill area. A fate and transport model was developed for this scenario and concentrations extracted from the well were compared to MCLs and used in a human health risk assessment for occupational exposure to irrigation. This pathway is more clearly discussed in Comment # Hot spots were generally not averaged over the Site 1 area. Pistol range data were not averaged across the site, nor was the UXO or radiological survey information. The Navy has identified groundwater COCs that will be addressed under the FS.
24	*Pg 5-8, Section 5.1.3.1, last paragraph*: Please state what laws prohibit housing at landfills and wetlands. This information is important from a location-specific ARARs standpoint and also for determining institutional controls in remedy selection. In the RI stage, it is important to present the information as a justification for not looking at residential and construction exposure scenarios. Zoning ordinances provide a less convincing argument because they are subject to change with more ease than a law or regulation.	The Navy is not aware of any laws that prohibit housing at landfills and wetlands. This issue is typically addressed by zoning ordinances. Per the NAS Alameda County Reuse Plan (EDAW 1996), Conveyance Parcel C is zoned as "light industrial/research and development and park categories." The reuse plan at Site 1 is to construct a golf course. EPA states that "... it is not appropriate or necessary to estimate the risk associated with future residential use of the landfill source, as such use would be incompatible with the need to maintain the integrity of the containment system." EPA. 1993. Presumptive Remedy for CERCLA Municipal Landfill Sites. September.
25	*Pg 5-9, Section 5.1.3.2*: The fish consumption pathway has not been addressed. Ambient water quality criteria for the protection of human health should be compared with groundwater concentrations to determine potential impact due to uptake of contaminants by edible fish.	The Navy has significant concerns regarding quantitative characterization of risks and hazards associated with potential exposure to chemicals in media such as surface water, sediment, and aquatic life that have been impacted by a host of sources and releases unrelated to bay area Naval installations. More specifically, the Navy is currently evaluating this issue on a program-wide basis. As necessary, the RI will be revised consistent with the results of the on-going program-wide evaluation.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
26	*Pg 5-11*: Delete the first paragraph on this page and revise the third paragraph. The last paragraph discusses inhalation pathways, but only from surface soil. Also of concern is any inhalation exposure posed by the extremely high levels of vinyl chloride and other solvents found in discrete pockets within the landfill.	The Navy acknowledges that high concentrations of vinyl chloride and other solvents were measured in groundwater samples collected beneath the landfill. However, in order for receptors to potentially be exposed to these solvents through inhalation of ambient air above the landfill, the chemicals first have to migrate from the groundwater into the vadose zone and from the vadose zone into the ambient air. Further, because no construction is assumed to occur on the landfill, there will be no enclosed spaces for the volatile chemicals to accumulate. Nevertheless, the Navy will model potential emissions of VOCs present in the groundwater beneath the landfill and will estimate the resulting concentrations of these VOCs in ambient air above the landfill. The estimated ambient air concentrations will be compared with EPA Region 9 ambient air PRGs. The RI will be revised to include the results of the modeling and comparison of estimated ambient air concentrations to EPA Region 9 ambient air PRGs. If the estimated ambient air concentration for at least one VOC exceeds its EPA Region 9 ambient air PRG, the RI will be revised to evaluate potential exposures to the estimated ambient air concentrations under both occupational and recreational exposure scenarios. As described above regarding potential VOC emissions from soil, the Navy will evaluate the need to conduct air monitoring or air dispersion modeling based on the results of the PRG comparison and any additional exposure and risk analysis.
27	*Pg 5-12, Section 5.1.4, second paragraph*: Revise to reflect that only DTSC methodology will be presented in the RI.	See EPA Comment #2 The draft final OU 3 RI will continue to present both the Navy and DTSC methodology
28	*Pg 5-21 and 22, Section 5.2.3 and Figure 5.1*: It is not acceptable to simply eliminate chemicals from consideration as contaminants of potential ecological concern (COPECs) if the detection frequency is less than 5%. A limited hit of a toxic chemical can still represent an ecological risk or toxic hot spot. If, for instance, a sampling grid with a very large number of sampling sites is uses, then potentially significant contaminant hits could be numerically diluted out. All detections of toxic chemicals should be considered in light of the absolute magnitude of the detections and against any spatial and temporal patterns of detection. Figure 5.2 appears	See response to OU 3 Focus Group Comment # 4. Regarding "hot spots", all groundwater data were evaluated with respect to geographic clusters of detected chemicals. In cases where several detections exceeding criteria came from a single well or two closely associated wells, the COPC was maintained as a COC (e.g., all quarters of

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	to refer to this sort of analysis, although the "Hot spot Analysis" box contains no details. The Navy should list clearly those compounds which were excluded from consideration as COPECs based on the 5% comparison.	sampling data indicated 2-4 DMP was elevated in Well 34. However, if only one sample showed elevated data in one well at one time, and subsequent samples showed non-detect, and there were no other similar detections in the vicinity, then it implied that no "hot spot" was present. The Eco. COPC list should provide the list they are looking for – Table 5-2b provides the information asked for.
29	*Pg 5-22, Section 5.2.4, second bullet*: The Navy should use the National Toxics Rule when CTR values are not available. Also, SF Basin Plan values would apply for mercury for this evaluation.	The Navy will revise comparison values to appropriately include the National Toxics Rule Criteria. Regarding SF Basin Plan values for mercury at 0.025 ug/L, this comparison value is substantially less than the minimum detection limits that were commercially available on the groundwater analyses reported in the RI. As noted on page 6-32 of the RI, there were no detections of mercury in samples subsequent to 1991-92, at minimum detection limits generally of 0.2 ug/L. Therefore mercury was not further considered as an ecological COPC. The San Francisco Regional Water Quality Control Board (SFRWQCB) has recently been re-evaluating the regulatory criteria for mercury, based on the finding that sportfish and some wildlife (i.e. clapper rails in the south bay wetlands) may be affected by mercury in the food chain. The Staff Summary Report (Taylor 1998) indicates that water column toxicity is negligible. TtEMI recently prepared a Hazard Quotient analysis on six surrogate wildlife species, including the dowitcher. Dowitchers are similar to clapper rails, in that they are wading birds that occur in bay marshes. Dowitchers feed primarily on invertebrates they capture by probing into the mud and sediments, and are therefore highly exposed to potentially contaminated sediments. The Hazard Quotient analysis used ½ the minimum detection limit (½ * 0.13 ug/L) as the estimated concentration in water, which is a higher concentration than the 0.0025 criterion suggested by the Basin Plan. The results of this analysis was that the Hazard Quotient was less than 1, indicating no significant adverse effect to this surrogate species was likely. By inference, it would appear that although detection limits for mercury are not low enough to make a meaningful comparison to the Basin Plan

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		criteria, an analysis of a potentially susceptible species indicates that no adverse effect would occur. A similar analysis was performed for Great Blue Heron, which are similar to clapper rails in that they eat primarily a secondary consumer (e.g. fish). The hazard quotient calculated for mercury was similarly less than 1, indicating that adverse effect is unlikely. These analyses will be published as part of the Site 2 Ecological Risk Assessment.
30	*Tables 5-2*: Where is a table of VOCs that are COPECs? The ecological risk assessment concludes that some VOCs are potentially harmful to aquatic receptors, and the Waterloo treatability study was designed to treat the VOCs in question.	VOCs will be added to the list of chemicals in Table 5-2b evaluated for inclusion as ecological COPCs.
31	*Pg 6-1, last paragraph*: Delete paragraph.	The draft final OU 3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2). Text was per EPA comment #2.
32	*Pg 6-2*: Revise second paragraph, delete third and fourth paragraph.	Text was revised as per EPA comment #2. Also, see EPA comment #31.
33	*Pg 6-3, first paragraph*: What defines the inside and outside boundary of Site 1 and what effect did the different delineations have on investigations performed in the area? Of recent concern, was the extended boundary delineated as part of the radiological removal action, and even the UXO, taken into account? It appears that the boundaries for Site 1 presented at recent meetings are larger than those given in this RI.	The "outside boundary" was historically used to delineate Site 1. As stated in the cited paragraph, a review of aerial photographs originally identified a 12-acre area defined by a series of landfill cells. The Navy added a seventh disposal cell after additional aerial photograph review, thereby increasing the landfill area to 14.7 acres, and increasing the Site 1 "inside boundary." The landfill cells and associated areas constitute the "inside boundary" or the current delineation of Site 1. Prior to revising the delineation of Site 1, soil samples were collected both within the landfill area and outside this area. Analytical results from these soils substantiate the current Site 1 delineation. Specifically, the concentrations of chemicals in soil are clearly higher within the landfill area when compared to concentrations detected in samples collected outside the landfill area. The ongoing radiological removal and unexploded ordinance (UXO) actions encompass both the "inside boundary" as well as areas outside of Site 1. However, the RI (including the HHRA) is limited to the landfill area. The Navy will revise the RI to briefly clarify the

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		differences between the boundary of Site 1 used in the RI and the boundaries used in the radiological survey and UXO survey.
34	*Pg 6-4, third paragraph*: Where was the base incinerator located?	The following sentence will be added to the Draft Final RI text: "....ashes from the base incinerator located in former Building 68 (demolished in 1961) adjacent to Building 459 within IR Site 7."
35	*Pg 6-5, Section 6.3, last sentence*: Please clarify the point being made here. Wahler Associates concluded that elevated concentrations of heavy metals and organic compounds were present in soils and groundwater and that, although these contaminants did not appear to be a threat to human health or safety, additional groundwater monitoring should be conducted for further site characterization. The background data set for metals in soils developed in 1994 would not contradict Wahler Associates findings regarding organics in soils and groundwater, so how does this information impact their findings?	The referenced text was provided to put the Wahler conclusions in context, since the soil background data were developed in 1997, and the Wahler report was published in 1985. The referenced text will be revised to indicate that the statement only applies to metal concentrations in soils.
36	*Pg 6-6, second paragraph*: Update to describe that additional UXO work will be performed at Site 1, and the approximate schedule if known, should be added to this section.	Information regarding UXO surveys will be added as Section 6.4.4. Results from the UXO removal action and information on the proposed UXO survey will be addressed in this section.
37	*Pg 6-6, last paragraph*: Please explain why TTLC was used for determining metals concentrations in soil. TTLC can be used for characterizing waste for disposal purposes and as an estimate of the concentration at which the metals would be expected to leach into the groundwater.	The pistol range area is treated as a Site 1 hot spot, therefore the investigation focused on comparing concentrations to land disposal criteria. This information was left in the draft final RI, because it will be useful for remedial alternative evaluation in the FS.
38	*Pg 6-8, second paragraph*: While it is almost certain that some form of capping will be used as part of the remedy selected for Site 1, it is premature to assume that a presumptive remedy landfill cap will be the remedy selected. The reasons for this are 1) the characteristics of the landfill do not meet all the criteria for a presumptive remedy; 2) the environmental receptors needing protection may not be best served by a presumptive remedy cap; and 3) it may be in the best interests of the Navy, the City and the environment to perform removal actions on radiological, UXO, and lead from the Rifle Range, and mitigate the high concentrations of solvents from the groundwater prior to installation of any sort of cap. These issues, and likely some other options, need to be discussed with the regulators prior to submission of the draft final report and prior to work on the FS going too far down one path. In addition, the usefulness of performing a risk assessment on certain contaminants should be carefully considered. It appears that two paths of logic are being used simultaneously in regards to risks posed by the lead in the Rifle Range. One path states that since a cap will be put in place, there is no need to perform a risk assessment. The other path states that a risk assessment will be performed over the entire Site 1 exposure area (Section 5.1.2), despite the fact that high concentrations of lead are clustered in the Rifle Range area. Either logic path precludes looking at the real risk posed by the Rifle Range itself and side steps the discussion of how best	See EPA comments #6, #23, and RAB Focus Group Comment #1. The Navy agrees that the landfill will require a cap and also believes that the landfill characteristics meet the criteria for the use of a presumptive remedy. "Hot spots" were generally not averaged over the Site 1 area. Pistol range data was not averaged across Site 1, in fact a risk assessment was not performed for the pistol range. The statement regarding the lack of need for a risk assessment was made regarding the pistol range. A HHRA was conducted for the landfill area as discussed in Section 6.8.1. The pistol range will most likely be addressed as a "hot spot" in the FS.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	to deal with the situation.	
39	*Pg 6-9, third paragraph*: The two sentences in this paragraph appear to contradict each other.	Comment incorporated. The last paragraph of section 6.5 will be revised to state that "EBS sampling indicated that no significant contamination or sources of contamination are present in the areas investigated, except in the area near the skeet range. High concentrations of SVOCs detected during the RI near the skeet range are further addressed in the RI investigation and HHRA."
40	*Pg 6-9, Section 6.6, first paragraph*: UXO should be included in the description of items disposed of at this site.	Comment incorporated. UXO will be added to the list of materials disposed of at Site 1.
41	*Pg 6-10, first paragraph*: Also of concern is any inhalation exposure posed by the extremely high levels of vinyl chloride and other solvents found in discrete pockets within the landfill.	The Navy acknowledges that high concentrations of vinyl chloride and other solvents were measured in ground water samples collected beneath the landfill. However, in order for receptors to potentially be exposed to these solvents through inhalation of ambient air above the landfill, the chemicals first have to migrate from the ground water into the vadose zone and from the vadose zone into the ambient air. Further, because no construction is assumed to occur on the landfill, there will be no enclosed spaces for the volatile chemicals to accumulate. Nevertheless, the Navy will model potential emissions of VOCs present in the ground water beneath the landfill and will estimate the resulting concentrations of these VOCs in ambient air above the landfill. The estimated ambient air concentrations will be compared with EPA Region 9 ambient air PRGs. The RI will be revised to include the results of the modeling and comparison of estimated ambient air concentrations to EPA Region 9 ambient air PRGs. If the estimated ambient air concentration for at least one VOC exceeds its EPA Region 9 ambient air PRG, the RI will be revised to evaluate potential exposures to the estimated ambient air concentrations under both occupational and recreational exposure scenarios. As described above regarding potential VOC emissions from soil, the Navy will evaluate the need to conduct air monitoring or air dispersion modeling based on the results of the PRG comparison and any additional exposure and risk analysis.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
42	*Pg 6-11, Section 6.7.1.2*: The Waterloo study and sampling results should be included in this section.	The groundwater investigation performed by Waterloo at Site 1 was not conducted as part of the Site 1 RI, but rather was conducted for the funnel-and-gate treatability study. The data quality objectives were not the same as those of the RI. A discussion of the funnel-and-gate demonstration will be presented in Section 6.4.2 under "Ancillary Site 1 Investigation Activities And Results."
43	*Pg 6-13, second paragraph*: Update this paragraph to reflect that the removal action has been completed for this site and any additional work will be performed as part of the remedy selected for Site 1. In addition, EPA suggests removing the cleanup level stated in this paragraph as no agreement has been reached between the Navy and the regulators on this level yet, and it may end up not being an issue depending on the remedy selected.	The discussion of the radiological survey will be moved to Section 6.4.3. In this section, it is stated that the removal action was not completed, and that the radiological survey will be completed by June 1999. Pending results of the survey, radiation may be addressed under a removal action or incorporated into the Site 1 remedial action. The cleanup criteria has been removed from the discussion and ARARs have been added addressing radiation cleanup levels.
44	*Pg 6-14, third paragraph*: EPA has been unable to find a description of depth of burial of refuse in this landfill. The water table appears to be anywhere between 3 and 12 feet bgs, so how does the landfill depth itself compare to the water table depth?	Available information regarding waste burial depth was provided at the following two locations in the draft RI report: Page 6-3, 2nd paragraph, second to last sentence: "According to a screening questionnaire completed by the Navy on June 21, 1988, the landfill has no liner, and the depth of waste is unknown." Page 6-4, 1st paragraph, 3rd sentence: "Landfilling activities at the site consisted of digging trenches in the hydraulic fill to the water table, filling the trenches with waste, and compacting the material with a bulldozer."
45	*Pg 6-18, Section 6.7.2.3.1*: The subsections on soil and groundwater contaminants should cite maximum concentrations, or maximum to minimum range, of contaminants in the text so that the reader doesn§t have to fold out a figure to get the basic information. It seems that when contaminants do not exceed PRGs, that fact is stated. However, for contaminants that do exceed PRGs (such as SVOCs and PCBs), no statement is made about the exceedence.	The text will clearly state when contaminants exceed PRGs. Minimum and maximum concentrations are presented in tables and figures. The Navy does not feel that the numbers should be presented in the text.
46	*Section 6.7.2.3.2*: This section should specify whether free product is present on any sampling locations. According to the presentation given recently by Waterloo, LNAPL exists up-gradient from the funnel and gate. Is there also evidence of DNAPL at the site? Also the	LNAPL has been detected as part of the funnel-and-gate demonstration; however none of the monitoring wells installed during the RI investigation contained free-product

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	Waterloo investigation should be included in the list of groundwater investigations performed for this site. Descriptions of groundwater contaminants should cite maximum concentrations, or maximum to minimum range, of contaminants in the text.	See EPA Comment # 42 regarding the Waterloo investigation. The continued presence of high concentrations of solvents downgradient from the funnel-and-gate system indicate that a localized DNAPL source may exist. See response to EPA comment #45 for distribution descriptions.
47	*Pg 6-21, second and third paragraph*: It would be useful to see the difference, if any, in contouring the 1994-1995 data versus the 1997-1998 data. More recent data is helpful in noting trends when compared to data taken four or five years previously.	As explained in the third paragraph, the 1994-1995 data set was used to contour because it was the most recent data set with the most number of monitoring wells. The time series plots indicate the concentration changes with time at the monitoring wells resampled in 1997 and 1998. No additional chemical contours will be generated.
48	*Pg 6-24, Radionuclides subsection*: Why were groundwater samples not analyzed for radionuclides in 1997-1998 sampling events?	The objectives of the follow-on sampling at Site 1 were to monitor water quality associated with a solvent plume in groundwater located in the southern portion of the site. Therefore, only VOC analyses were conducted for these samples.
49	*Pg 6-26, third paragraph*: Update this paragraph to reflect that the removal action has been completed for this site and any additional work will be performed as part of the remedy selected for Site 1.	See response to EPA Comment # 43
50	*Pg 6-26, Section 6.8.1*: The fish consumption pathway is an indirect contact exposure scenario for groundwater and should be included for evaluation in the HHRA.	Fish in San Francisco Bay have historically been caught and eaten by humans. Because fish caught in the Bay are typically migratory and do not live and feed exclusively in one area, however, contaminants detected in fish tissues would be difficult to link to a discrete source or IR Site 1. Further, in a RWQCB study, it is documented that ingesting fish caught in the Bay can result in adverse health effects. Signs prohibiting fishing are posted at IR Site 1, and the Office of Environmental Health and Hazard Assessment of the California Environmental Protection Agency (Cal/EPA) has published health advisories warning that high levels of contaminants may be present in fish in San Francisco Bay. In view of these factors, fish ingestion is assumed to pose a health risk, but one that cannot be readily related to activities at Alameda Point; therefore, consumption of fish is not evaluated in the OU 3 RI risk assessment.
51	*Pg 6-27, Section 6.8.1.1*: Revise to reflect that only DTSC methodology will be presented in	The draft final OU-3 RI report will continue to use the dual

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	the RI.	tracking risk assessment approach. The Navy will be discussing this issue with the regulators on a program-wide basis involving all Bay area Navy installations. Text was revised as per EPA comment #2.
52	*Pg 6-28, Lead Assessment Section*: Was lead averaged over the entire site? If the biokinetic uptake model were restricted to the berm area of the Rifle Range, would the results be different?	The concentration of lead in soil used in the biokinetic uptake model was calculated as the 95 percent upper confidence limit of the mean of lead concentrations measured in individual surface soil samples collected over the landfill. The Navy has identified the pistol range as a lead hot spot and intends to handle the pistol range separately from the RI. Therefore, the results from samples collected within the pistol range were not evaluated in the OU-3 RI HHRA.
53	*Pg 6-29, Section 6.8.1.3*: The summary is disappointing for a number of reasons. Due to the heterogeneous nature of a landfill in general, and particularly one that has accepted hazardous waste and UXO, it stands to reason that the site does pose a risk to human health and the environment. Performing a risk assessment on fairly limited data, excluding groundwater and subsurface soil from risk calculations, and using an exposure area that covers the entire site leads to falsely low risk numbers, whether the numbers are derived using Navy or DTSC methodology. In addition, the presumptive remedy cap is used as a justification for not incorporating certain types of risk into the risk assessment which again feeds into underestimating risk. Setting aside risk numbers, the fact that there are high levels of lead contamination in the berm areas of the Rifle Range, there are unknown amounts of UXO , the radiological contamination is more extensive than originally thought, and there are pockets of high solvent concentrations in the groundwater, means that the site should be considered for some type of action. The summary should be revised so that the DTSC risk numbers are used; the limitations that went into the risk calculations are articulated; the contamination from UXO, radiological, lead and solvents are acknowledged; the stated levels for radiological clean up are removed; and it is made clear that while some form of capping is the most likely outcome for a remedy for Site 1, other actions in addition to capping will be considered.	Section 6.8.1.3 is a summary of the human health risk assessment findings. The risk assessment was conducted using the appropriate exposure scenarios based on the intended reuse of the site. Additionally, the data set used for the risk assessments was appropriate. The final recommendations (section 6.10) incorporate the risk assessment findings and all other site characteristics in light of the presumptive remedy of a landfill cap to determine the type of action appropriate for the site. The presumptive remedy of a landfill cap does not preclude incorporating hot spot removal related to radiation anomalies, UXO, and lead contamination. In addition, under the landfill cap presumptive remedy, groundwater contamination must be addressed.
54	*Pg 6-31, Section 6.8.2*: Exceptionally elevated detections in COPECs in one sampling quarter should not simply be regarded as outlier data. For example, shallow groundwater flow can potentially have a strong seasonal component. If the exceptional data are temporally associated, these detections should be regarded as temporal hotspots.	See response to OU-3 Focus Group Comment # 4.
55	*Section 6.8.2.* Metals and Inorganics Section: Although the Navy stresses the improved validation of more recent data, there is no indication that data from earlier rounds of groundwater sampling are invalid. As such, any exceedence of toxicity reference values for	Only dissolved concentrations were compared to ecological reference criteria during the ecological risk screening. A footnote will be added to clarify this.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	inorganic COPECs from earlier sampling events should not be dismissed. This section should clarify whether total or dissolved concentrations are being used to compare with ecological criteria. The 1986 SF Bay Basin Plan gives the water quality objective for mercury at 0.025 ug/l. Therefore mercury may be a groundwater ecological COC. The detection limits for mercury in the RI appear too high to make the determination of whether the contaminant is a COC. This problem should be discussed and resolved with the regulators.	See response to EPA comment # 29 regarding mercury.
56	*Section 6.8.2, Volatile and Semivolatile Section and Appendix K*: The detectable levels of compounds such as total DCE are much higher in Table K-1 than in Table 6-24. In further consideration of ecological risk from organic contaminants in this groundwater plume the highest validated values must be used.	The detected concentrations from the funnel-and-gate demonstration are typically higher because the samples were collected from multi-level monitoring wells. These wells collect water from a discrete depth which reduces any mixing typical of fully-screened wells. In addition, all of the samples associated with the funnel-and-gate demonstration are located near the known plume at the site.
57	*Section 6.9.2*: This section should include a discussion of contaminant heterogeneity in groundwater as this factor will be critical to consider in selecting a remedy for this site. The heterogeneity at Site 1 is considerable, as can be seen by comparing the results of the November 1998 Waterloo sampling (Appendix K) with maximum concentrations reported for the RI. This difference is due in part to the difference in sampling techniques (precision push vs monitoring wells), and also due to spatial heterogeneity that was not detected (or was masked due to sampling methods) during the RI effort. It should be noted that when the results of the Waterloo investigation are considered, toluene and TCE exceed ecological reference values in addition to 2,4-DMP.	A discussion of the heterogeneity of chemical distribution will be presented in Section 6.4.2.
58	*Pg 6-38*: Revise the second paragraph to reflect that only DTSC methodology will be used in the RI.	The draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2).
59	*Pg 6-39*: Revise this page to reflect only DTSC methodology.	The draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2).
60	*Pg 6-40*: Revise this page to reflect only DTSC methodology. Provide an updated status of the radiological removal action and the UXO problem. In addition, please revise the statement that a presumptive remedy will be used at the site to state that capping is likely and other actions may be considered for all the reasons given in the above comments.	The draft final OU-3 RI will continue to present both the Navy and DTSC methodology (see EPA comment #2). Updated status of the radiological removal action and UXO survey will also be added.
DTSC Comments in Conjunction with N. California Geologic Services Unit (James Rohrer)		
	Groundwater Characterization	
1	Assessment of the characterization of contaminants in groundwater at the western middle disposal area was evaluated by reviewing analytical results for groundwater samples collected from monitoring wells M028-A, M028-E, and M034-A. Monitoring wells M028-A and	The Navy agrees that the solvent plume may be migrating down towards the lower portion of the first water bearing zone because of the density of the solvents. In addition, the

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	M034A are screened in the upper part of the first water bearing zone (FWBZU). Well M028-E is screened in the lower part of the first water zone (FWBZL). Some contaminant concentrations (eg. cis 1,2-DCE and vinyl chloride) have increased significantly in down gradient monitoring well M028-E over the quarterly sampling events from October 1997 to August 1998 while concentrations in upgradient well M034A and downgradient well M028A have decreased. This may indicate downward migration of contaminants from the FWBZU to the FWBZL or contaminants detected in the FWBZU may have migrated to San Francisco Bay. Sunken steel barges located west of well M028E may be allowing for contaminant accumulation in well M028E. Concentrations of contaminants in groundwater from well M034A are significantly less than concentrations detected in the down gradient well M028E (eg vinyl chloride @ 20,000 µg/L in groundwater from M028-E [May 98] as compared to 1,700 µg/L in groundwater from M034A [Nov. 97]). This may be the result of more than one contaminant source release and suggests the possibility of coalescing groundwater plumes at M028-E. Possible source area locations include the area immediately upgradient well M028E and areas upgradient of well M034A. Another source to be considered is the potentially high contaminant concentration levels in the FWBZL at the M034A location, which has not been characterized. If high contaminant concentration levels in FWBZL exist, then the contaminants detected in groundwater from M028-E may be from the same source as the contaminants detected in groundwater from M034A. **Recommendation** GSU recommends to further evaluate and clearly define the nature and extent of contaminants in groundwater at Site 1. This should include groundwater sampling to define both the lateral and vertical extent of contamination. In addition, a soil vapor survey could be implemented to assess the potential for the occurrence of contaminant releases; the results of the soil vapor survey could be used to locate hydropunch groundwater sampling locations and/or monitoring wells.	Navy agrees that the solvent plume has probably entered the San Francisco Bay, because of the proximity of the M028 well cluster to the shore. Well M034-A is on the northern edge of the plume. Constituents at wells M028 and M034 are believed to be from the same source. The lateral and vertical extent of the plume has been delineated outside of the landfill, where potential exposure pathways could be completed. A soil vapor survey would aid in identifying the source(s) of the groundwater plume. However, the Navy is not planning to undertake any characterization that would compromise the integrity of the landfill cells for the RI. If source removal is selected as part of the remedy in the ROD, then the extent of the source area would be determined prior to or during the removal action. Groundwater will be treated as required to be protective of human health and the environment. Soil vapors will be controlled by vents within the landfill cap and potential treatment as warranted by local Bay Area air requirements.
2	Inferred chemical contours illustrated on Figures 6-27 and 6-28 are shown to decrease in the eastern direction from monitoring well M034-A (middle-western disposal cell). There are no data to substantiate chemical contours east of monitoring well MO34-A and the contours should not be inferred. Disposal cells in the immediate vicinity may be sources of groundwater contamination and, as a result, the inferred contours would likely be incorrect. **Recommendation** The final RI report chemical contours should not be inferred on figures where data are not	The Navy agrees that the contours should be dashed where inferred. Due to the groundwater flow direction, and because solvent concentrations increase in the westerly direction, it can be inferred that the plume decreases in concentration towards the east.

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	available.	
3	Extremely high vinyl chloride concentrations at levels in excess of the solubility concentration for vinyl chloride in water (1,100 µg/L) were detected in groundwater from monitoring well M028E. Concentrations greater than the solubility concentration for vinyl chloride in water may be the result of the presence of vinyl chloride dissolved in organic solvents such as diesel or gasoline constituents or humic acids. Monitoring well M028 is down gradient of a funnel and gate treatment system that was installed during April 1997. Chlorinated solvents flowing through this system allow for anaerobic biodegradation of dichloroethene to vinyl chloride. Influent and effluent sampling of groundwater flowing through this system indicated that high levels of vinyl chloride are not exiting the system. This indicates that the elevated levels of vinyl chloride in well M028-E is likely the result of contaminant migration around the funnel and gate system and not through the system. It is alarming that vinyl chloride concentrations in groundwater from well M028-E increased significantly from the February 1998 sampling event (130 µg/L) to the May 1998 sampling event (20,000 µg/L). It is also important to note that cis-1,2-DCE increased 49 µg/L to 22,000 µg/L from the February 1998 sampling event to the May 1998 sampling event. The high concentrations of vinyl chloride is alarming as high concentrations of vinyl chloride in the soil gas may result by volatilization from groundwater. These soil gas concentrations may pose a significant risk to human health. **Recommendation** The soil vapor survey as recommended above will help assess the movement of potential toxic soil gas. During any future investigations, Health and Safety considerations, if not as yet been considered, should include the potential need for supplied air for protection against potential exposure to extreme vinyl chloride concentrations. The GSU recommends collecting split groundwater samples from monitoring well M028-E to be analyzed by two laboratories. This could validate the extremely high levels of detected vinyl chloride at concentrations exceeding the solubility concentration.	The Navy agrees that vinyl chloride is circumventing the funnel-and-gate treatability study. If this remedial alternative is selected to treat groundwater in the ROD, then it will be scaled up to meet remedial action objectives. The relatively low groundwater concentrations of vinyl chloride and cis-1,2-DCE in February 1998 can be attributed to dilution from high groundwater tables during February. Groundwater concentrations were diluted by heavy rain during the February 1998 sampling event, as evidenced by the high water table in well M028-E (depth to groundwater of 2.8 feet bgs). The depth to groundwater returned to the customary elevation of greater than 5 feet bgs in May 1998. See RAB Focus Group Comment #3 regarding a risk assessment to human health from volatile constituents in groundwater. As far as health and safety issues related to sampling at the site, the air space within the work zone has been and will continue to be monitored to ensure worker safety. No upgrade to respirator or supplied air has been necessary to date. Extremely high levels of solvents have been identified in the past and duplicate samples were collected to verify concentrations.
4	On page 2-9 it is indicated that the bay sediments are laterally continuous in western and central regions of the installation and that the bay sediments behaves as a local semi-confining layer. It is important to note that these sediments may very well be a semi-confining layer but contaminants (eg. Benzene, 1,2-DCE) were detected in groundwater from second water bearing zone (SWBZ). This suggests that contaminants are moving slowly through the Bay Sediments Unit or that this unit is not a continuous semi-confining layer as reported. **Recommendation**	Under California Regulations 14 CCR 17782 and 23 CCR 2550, groundwater monitoring must be conducted downgradient from a landfill. This monitoring will most likely include the installation of one or more wells in the SWBZ. It is not practical to install any wells west of the M028 cluster. These wells are adjacent to a sunken barge. A

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	GSU recommends that, at a minimum, semi-annual monitoring should be implemented to evaluate the downward migration of contaminants from the FWBZ to the SWBZ. This monitoring could also be used to assess the potential for accumulation of contaminants in groundwater against the sunken barges, located west of well M028-E.	rocky shoreline lies beyond the barge, further precluding well installation. The presence of potential preferential flow paths allowing chemical transport between the FWBZ and the SWBZ is acknowledged in Section 6.7.2.2.
5	The Draft RI Report indicates that tidal influence is not realized in near shore wells screened in the FWBZ, however, influences are indicated in wells screened in the SWBZ. Tidal influences in affected wells cause short term changes in groundwater flow directions, but these changes are not characterized. **Recommendation** GSU recommends that the final RI report discuss tidal influences on possible changes in groundwater flow directions due to tidal influence (if any) and include the data obtained during a tidal influence study to support conclusions.	This information will be presented in the draft final RI. Results of the tidal influence study conducted in 1993 indicate that the aquifer response to tidal fluctuations is relatively uniform along the shoreline. Due to the uniform response, short term changes in the hydraulic gradient occur but the groundwater flow direction does not change.
6	Analytical results for the August 1998 quarterly groundwater sampling round are not included in the appendix of the Draft RI report. **Recommendation** Include the August 1998 quarterly groundwater sampling results in the Final RI report.	The August 1998 quarterly groundwater sampling results will be included in the Final OU-3 RI report.
7	Low concentrations of VOCs detected in groundwater from wells M029-A, M029-E, M001-A, M001-E, M002-A, and M002-E may be indicative of releases from the northwestern and/or northeastern most disposal cells. **Recommendation** To further evaluate the nature and extent of contaminants, a soil vapor survey is recommended at the northwestern most and northeastern most disposal cells. Currently there is not sufficient analytical data for these cells to evaluate the potential for groundwater contamination at these locations. The results of the soil vapor survey at these disposal cells should be used to locate hydropunch groundwater sampling locations and monitoring wells. Extreme care should be used if wells are drilled in the disposal cell area due to the possibility of landfill gases emanating to the surface from the bore holes.	A soil vapor survey would aid in identifying the source(s) of groundwater contamination near wells M029-A, M029-E, M001-A, M001-E, M002-A, and M002-E. However, the Navy is not planning to undertake any characterization that would compromise the integrity of the landfill cells for the RI. The Navy assumes that because the landfill has been closed since 1956, steady state concentrations in groundwater have been achieved with leachable constituents in refuse. Groundwater will be treated as required to be protective of human health and the environment.
	Soil Characterization	
1	Figure 6-4 indicates many detected soil lead concentrations for samples collected from the bermed area during a previous investigation that exceed the Total Threshold Limit Concentration (TTLC) of 1000 mg/kg. Generally, the vertical extent of soil lead was only assessed to a depth of 24 inches in the bermed area and to a depth of 12 inches outside the bermed area during the March 1988 sampling collection effort. Lead concentrations were	The pistol range area will be treated as a "hot spot" under the OU 3 FS. Remedial alternatives may include, but are not limited to, excavation and off-site disposal , grading and capping over the pistol range, and/or incorporating the lead contaminated soil into the landfill cap. The vertical

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	detected at elevated levels (10 to 23,000 mg/kg) in many samples collected at the total depths of borings during the March 1988 investigation. Waste extraction tests were performed on samples collected during the July 1988 sampling event and results of these tests indicated many concentrations exceeded the Soluble Threshold Limit Concentration (STLC) value. It is important to note that the STLC concentration is the criteria used to distinguish hazardous waste. Furthermore, the RI report indicates on page 6-8 that synthetic precipitation leaching procedure (SPLP) was run on the samples collected during the July 1988 sampling event and that this test is more representative of the threat to groundwater. However, Table 6-3 indicates only three samples were run for the SPLP. These samples were collected from the ground surface and one of the these samples indicated a SPLP concentration of 15 mg/L. The other two samples gave analytical results of 0.18 mg/L and <0.10 mg/L. The 15 mg/L concentration is of potential concern as the STLC is only 5 mg/L for lead. It is also important to note that other samples collected from this area of the site were found to contain total lead at concentrations greater than the total lead concentration detected in the sample found to contain a SPLP concentration of 15 mg/L. This indicates that other samples not tested for SPLP likely have SPLP concentrations that exceed the STLC and therefore there is a significant potential for lead in soil to leach into groundwater. **Recommendation** GSU recommends that the vertical extent of hazardous levels of soil lead be assessed to evaluate remedial alternatives in the FS Study. For example, the vertical extent of contaminants need to be determined to estimate the volume of soil to be excavated and disposed and thereby assess costs associated with this potential alternative or to evaluate costs associated with a stabilization remedy. The proposed capping of the site may not be a stand alone mitigation alternative as shallow water levels could allow for lead and other contaminants in soil to move into the groundwater.	extent of lead contamination may be delineated during the remedial action to ensure protection of human health and the environment.
2	SVOCs were detected in two previous investigation soil samples (S-6 and S-16) collected from a depth of 1 foot below ground surface in the pistol range area of the site. A risk assessment could indicate that the SVOC concentrations are a risk to ecological receptors. **Recommendation** If the levels of detected SVOCs are determined to exceed risk criteria and it is determined that the proposed landfill cap alternative is not a stand alone mitigation technique, then assessment of the vertical and lateral extent of these contaminants is recommended to thoroughly evaluate remedial alternatives in the FS study.	The Navy proposes to extend the landfill cap as far to the western edge of Site 1 as is practical. Therefore, the ecological exposure pathway will be eliminated.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
3	The vertical extent of Total Recoverable Petroleum Hydrocarbons (TRPH) and oil and grease detected in surface soil from boring M002-A and M001-B (burn pit area) has not been assessed. In addition, high concentrations of diesel and JP5 range organics were detected in a soil sample collected from a depth of 6 to 7 feet bgs at boring M035-A. The vertical extent of diesel and JP5 range organics at boring M035-A was not assessed below a depth of 7 feet below ground surface (bgs). It is important to note that diesel and JP-5 range organics increased in concentration from a depth of 2.5 to 3 feet bgs (diesel: 110 mg/kg, JP5: <10 mg/kg) to 6 to 7 feet bgs (diesel: 2,200 mg/kg, JP5: 2,100 mg/kg). Many of the surface soil samples collected from the burn pit had detected concentrations of motor oil range organics or other petroleum hydrocarbon constituents. The vertical extent of oil and grease and TRPH at M029A was not assessed below the surface. **Recommendation** GSU recommends the assessment of the vertical and lateral extent of these contaminants to thoroughly evaluate remedial alternatives in the FS study. GSU is concerned that shallow groundwater and tidal influences on groundwater may provide for these contaminants in soil to move into groundwater.	The burn area is included in the proposed area to be capped under the landfill presumptive remedy. Groundwater in wells M001 and M002 did not contain levels of petroleum hydrocarbon constituents that exceeded ecological screening criteria. Therefore, the Navy believes there is no reason to further delineate soil concentrations.
4	The vertical extent of the of Polychlorinated biphenyls (PCBs) as Alchlor 1260 and pesticides in soil has not been fully assessed. Alchlor 1260 and some pesticides were detected in surface and intermediate depth soils at several locations at Site 1. The deepest sample within the Site 1 boundary with a detected alchlor 1260 concentration was collected from a depth of 13 feet bgs from boring M001-A. Samples collected from the surface, 4.5 to 5.5 feet bgs and 20 to 21.5 feet bgs, north of the northern site boundary, had detected alchlor 1260 concentrations of 0.37 mg/kg, 0.11mg/kg, and 0.16 mg/kg, respectively. Detected alchlor 1260 concentrations are of concern as the area north of the Site 1 boundary may not be included in the proposed capping remedial alternative. **Recommendation** If it is determined that the proposed landfill cap alternative is not a stand alone mitigation technique, then GSU recommends the assessment of the extent of these contaminants to thoroughly evaluate remedial alternatives in the FS study. GSU is concerned that shallow groundwater and tidal influences on groundwater may provide for these contaminants in soil to move into groundwater.	Soil boring M001-A is within the burn area, proposed to be capped under the landfill presumptive remedy. Groundwater in well M001-A did not contain detected levels of Aroclor 1260. Therefore, the Navy believes there is no reason to further delineate soil concentrations.
5	The characterization for the potential presence of dioxins in soil at the former area was conducted with only four surface soil samples. Dioxins were not detected in any of the samples analyzed, however, the large area encompassed by the former burn area does not appear to be	The burn area is included in the proposed area to be capped under the landfill presumptive remedy. Therefore, the potential human health exposure pathway posed by dioxin

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	adequately characterized with just four surface samples. **Recommendation** GSU recommends that further characterization of the potential presence of dioxins in soil be conducted to adequately assess the potential presence of dioxins across the burn area. Core samples could be collected to assess zones of burned material. It would be in these zones that dioxins could be present.	will be mitigated.
6	Proposed capping as mitigation remedy The proposed landfill cap to prevent further spreading of contaminants should be addressed in the feasibility study to assess effectiveness of the remedy. For example capping may prevent infiltration of surface water and precipitation; however, a rising water table as a result of upgradient recharge could allow for further spread of contaminants in vadose soil to groundwater. Also, the potential for lateral migration of landfill gases such as vinyl chloride may not be controlled by the proposed cap and as a result terrestrial ecological receptors and human recreational receptors on the property may be adversely affected. **Recommendation** GSU recommends that the proposed landfill cap remedial alternative be evaluated in conjunction with other alternatives to provide for the most efficient and effective alternative to be selected.	The Navy agrees that remedial alternatives that address the landfill, groundwater, and landfill gas should be evaluated in the FS. It is important to note that the purpose of the landfill cap is to eliminate the exposure pathway of human and terrestrial ecological receptors from coming into contact with soil contaminants and landfill refuse Landfill caps to be evaluated in the FS will include both caps that meet RCRA requirements (impermeable) as well as more permeable caps (i.e. composed only of soil). A more permeable cap will be evaluated in the FS, because of the high water table at the landfill . A portion of the refuse is always saturated with groundwater, and seasonally rising water tables further leach constituents from refuse, therefore the purpose of the impermeable landfill cap, to minimize leachate generation, is not required at this site. A human health risk assessment was performed to address migration of gases such as vinyl chloride. See response to RAB Focus Group comment # 3. This risk assessment was added to the draft final OU 3 RI.
	Additional comments	
1	On page 2-9 it is indicated that petroleum based chemicals in the high organic layer of the Bay Sediment Unit may have been associated with release from Navy IR sites or with a former oil refinery located in the southeast region of Alameda point. Is there a pathway for contaminants from the former refinery to get to Site 1 soil? Could they be the result of leaking tanks or underground pipelines or from placement of contaminated engineered fill derived from the site of the former refinery? Did these contaminants flow with groundwater to Site 1 and then get deposited in the bay sediment unit or is the former refinery a potential source for IR sites other than Site 1?	Chemicals in the organic layer associated with the refinery and manufactured gas plants are associated with the tidal zone. Site 1 is primarily constructed in an area beyond the tidal zone. TPH and other organic compounds at Site 1 are related to the solvent and petroleum hydrocarbon plume associated with disposal activities at the site.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	Recommendation GSU would like clarification on this issue.	
2	On page 2-14, fourth paragraph, the units given for hydraulic conductivity value are feet/minute while the units for hydraulic conductivity values shown on Table G-1 are centimeters/second. **Recommendation** Values of hydraulic conductivity should be consistent to provide for valid comparison of values.	The units will be changed to feet per minute for consistency in the draft final OU 3 RI.
3	On page 2-17, third paragraph, the artificial fill is referred as the unit of the FWBZ in the central region but a following sentence indicates that the Merritt Sand is the FWBZ unit in the central region. **Recommendation** GSU would like clarification on this inconsistency.	This will be changed in the draft final RI to read "The FWBZ (artificial fill layer) in the central region and the FWBZ (Merritt Sand Unit) in the southeastern region are in fact the same hydrogeologic unit, though at different depth intervals."
4	Page 2-18, second paragraph, indicates general groundwater flow directions to the west or southwest. Figure 2-14b indicates groundwater flow directions to the west, southwest and north toward the Oakland Inner Harbor. **Recommendation** GSU would like clarification on this inconsistency.	The text will be changed to read that groundwater flows to the west, southwest and north.
5	Figure 2-14d illustrates potentiometric contours crossing over the paleochannel location indicating that SWBZ groundwater is flowing through the paleochannel. Is there data to suggest that groundwater is flowing through the paleochannel? **Recommendation** GSU recommends to further evaluate and characterize the paleochannel and its influence on groundwater.	The paleochannel has been filled with young bay mud and bay sediments. Any flow that occurs within the channel is related to the interconnected bay sands and the Merritt sand unit. Please refer to Appendix A, cross section C-C'.
6	Table 6-8: the definition for pCi/q was inadvertently not spelled out.	The definition will be added to the Draft Final RI.

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	Recommendation GSU recommends that the definition for pCi/q be spelled out in the notes section of the table to avoid potential misunderstandings.	
7	The ecological risk assessment is not including terrestrial receptors based on the capping of the site as a presumptive remedy. Will the proposed presumptive remedy protect burrowing creatures such as burrowing owls? **Recommendation** GSU recommends considering the effectiveness of the proposed presumptive remedy to protect burrowing creatures as there may be a potential for such creatures to burrow below the cap and be exposed to high levels of contaminants.	The landfill cap will be designed with a layer of gravel to prevent animals from burrowing through the cap.
8	Figure 6-8 depicts the site conceptual model. The sea level on this model is shown to be higher than the groundwater level. The groundwater level is shown to be at an approximate depth of 30 feet bgs, however, the on page 2-14 it is indicated that the groundwater in the western and central regions range from two to eight feet bgs. **Recommendation** GSU would like clarification on this inconsistency.	The groundwater depth will be changed from 30 feet bgs to 3 to 8 feet bgs on Figure 6-8.
DTSC Specific Comments		
1	Page 5-13, Section 5.1.4.3, Please explain how Radium-228 was selected as a contaminant of concern.	Radium-228 was selected as a chemical of concern (COC) following the procedure described in Section C.4 of Appendix C to the OU 3 Remedial Investigation. In summary, radium-228 along with radium-226 were the only specific radionuclides analyzed for in soil samples collected from 0 to 2 feet below ground surface (bgs). Both radionuclides were detected in greater than five percent of the samples (see Table C.7.1-1 in Appendix C) and therefore were retained as COCs (see Table C.7.1-4).
2	Table 4-1. This potential ARARs table does not list regulations related to the potential health risk of ionizing radiation. 40 CFR 192 contains potential chemical-specific ARARs. In addition, the Nuclear Regulatory Commission issued their Final Rule on Radiological Criteria	ARARs pertaining to radiation will be added to Table 4-1. These include: 1) 10 CFR 10.1402 which sets a standard of 25 mrem/yr

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
	for License Termination (July 21, 1997) that should be considered as a potential ARAR. Although the NRC does not regulate radium, the standard for limiting exposure to ionizing radiation would be applicable to radium. The State of California does regulate radium and would apply this standard to any land transfers where the land would no longer be under federal jurisdiction. The State Department of Health Services has regulatory authority under California Health and Safety Code Part 9, Chapter 8, Sections 11490, et seq., and Part 9, Chapter 5, Article 1, Sections 114705, et seq.	TEDE above background for average members of a critical group where residual radioactivity has been reduced to levels that are as low as reasonably achievable. 2) 40 CFR 192.12 (a) that establishes cleanup criteria for radium-226 averaged over 100 square meters not to exceed the background level by more than 5 pCi/g averaged over the first 15 cm soil depth.
3	Figure 1-2. The boundaries provided for OU-3 (Conveyance Parcel C) may require re-evaluation based on the radiological surveys to date. Please specify what changes are planned for the boundary.	See EPA comment #43. Currently, the radiological anomalies outside the proposed capped area will be addressed under a removal action; however, depending on the quantity and location, the Navy may decide to address radiological anomalies as part of the remedial action selected in the ROD. The boundaries of Site 1 will be extended as required for the final RI pending results of the radiological survey scheduled for completion in June 1999.
4	Appendix C, Attachment 3. Please discuss how the input parameters for radium-226 and radium-228 concentrations were determined at 0.9 pCi/g and 0.49 pCi/g, respectively. In addition, discuss how discrete sources of radioactive material are addressed in the risk assessment.	The input parameters for radium-226 and radium-228, 0.9 and 0.49 picocuries per gram (pCi/g), respectively, represent the 95 percent upper confidence limit of the mean (95 UCL) for these two radionuclides in soil at 0 to 2 feet bgs (see Table C.7.1-1 in Appendix C). It should be noted that Table C.7.1-1 incorrectly identifies the units for the radium-226 and radium-228 95 UCLs as milligram per kilogram (mg/kg). Appendix I to the OU 3 RI correctly identifies the units for the radium-226 and radium-228 analytical results as pCi/g. Table C.7.1-1 will be revised to present the correct units. With regard to the second half of the comment, the HHRA does not evaluate risks associated with exposure to discrete sources of radioactive material. Receptor exposure to external radiation from site soil(specifically recreational and occupational exposure) is assumed to occur randomly throughout Site1. Therefore, consistent with U.S. EPA's 1992 guidance titled "Supplemental Guidance to RAGS:

Submitted: 05/14/99

REF	COMMENT	RESPONSIBLE PARTY & RESPONSE
		Calculating the Concentration Term" (Publication 9285.7-08I), the soil concentration term for the two radionuclides was estimated as the 95 UCL. Radiation surveys conducted at OU 3 have identified isolated areas of radioactive activity (referred to as anomalies in OU 3 RI) at Site 1. The anomalies are generally assumed to be radium dials and represent discrete sources of radioactive activity. Figures J-1 through J-3 in Appendix J to the OU 3 RI presented initial Site 1 anomaly locations. These figures will be revised based on the on-going radiation survey activities being conducted at OU 3. Remediation of the discrete sources of radioactive activity will be evaluated by the Navy as part of the OU 3 final remedial investigation and feasibility study reports.
5	Page 6-38, Section 6.10. The conclusions appear to indicate that the health risks are within the acceptable risk range "for the intended use of the site". As discussed in a meeting between the US Navy and State of California representatives on February 4, 1998, the Department of Health Services will specify restrictions if, for example, discrete sources of radioactive material remain at the site. Authority is discussed in Comment 2 above. Also, the intended use of the site needs to be clarified, in addition to required deed restrictions, to ensure that the health risks will be as stated. Page 2-29 states that the redevelopment of the Northwest Territories (which includes OU-3) is planned to consist of light industrial/research and development, and park categories. The Light Industry land use category could involve construction which could interfere with cap integrity.	The intended reuse of Site 1 is a golf course per the BRAC Cleanup Plan Revision 05 (TtEMI 1998). Any required deed restrictions will also be discussed in the RI. Any construction that would occur at the landfill could not compromise the integrity of the landfill cap. A stability analysis would be required for any buildings built on top of the landfill cap.

Submitted: 05/14/99

REF	COMMENT	RESPONSE
Ref	Comment	
OU3	**DTSC, Mary Rose Cassa, R.G.**	
1	**Response to Comment #1 (Groundwater Characterization)** This response indicates that well M034-A is located on the northern edge of the plume. However, it appears from the chemical contours on Figures 6-27 and 6-28 that well M034-A would be closer to the eastern edge of the plume. It appears that the Navy believes that the vertical and lateral extent of the plume has been delineated outside the landfill. The source of this plume is near wells M028-A and M028-E. It appears from Figure 6-27 that wells M035-A, M027-A, and M027-E are used to define the plume to the south. Wells used to define the northern extent appear to be M033-A, M029-A and M029-E. Our concern is that there is a potential for other source areas to be present that may have allowed for releases to the groundwater. This could account for greater concentrations of contaminants in groundwater located between the wells currently used to delineate the plume. Potential source areas include the two southernmost disposal cells, the northwestern most disposal cell, the northeastern most cell, and the middle eastern cell. In addition, potential releases from the northern third of the middle western disposal cell may not be detected in the wells currently installed onsite. It is unclear to DTSC how a soil gas survey would compromise the integrity of the landfill cells because groundwater is believed to saturate a portion of the refuge. If the concern is creating a route of vertical contaminant migration, the survey could be designed to not penetrate groundwater and, upon removal of soil gas probes, the borings would be properly backfilled with grout to prevent downward migration of contaminants. While the probe is in place contaminants could not migrate down the boring, because the probe would prevent contaminants from entering the boring.	The Navy agrees that M034-A is closer to the eastern edge of the plume. Groundwater monitoring wells at the site are located downgradient from or within each landfill disposal cell. The Navy agrees that localized plumes could be present beneath landfill disposal cells; however, refuse has been in the landfill for over forty years, and it is expected that steady state or declining concentrations would be observed in groundwater flowing through the landfill. Therefore, the Navy does not propose to conduct a soil vapor survey or construct any additional monitoring wells within the landfill disposal cells. Exposure pathways would not be completed unless groundwater COCs enter the bay at levels harmful to aquatic receptors. A landfill postclosure monitoring program will be in place to prevent completion of this exposure route. The Navy will conduct a data gap investigation, where additional groundwater samples will be collected near the shoreline, before the FS is finalized. The Navy will also collect groundwater samples east of well M034-A to delineate the extent of the hot spot. Although, the HHRA indicated that no risk would be posed to an occupational receptor through irrigation, additional potential hot spots could increase the risk. Therefore, in the OU-3 FS, an institutional control will be placed on wells installed near OU-3 to prohibit screening within the FWBZ.
Draft Comment # 1	**Assessment of the characterization of contaminants in groundwater at the western middle disposal area was evaluated by reviewing analytical results for groundwater samples collected from monitoring wells M028-A, M028-E, and M034-A. Monitoring wells M028-A and M034A are screened in the upper part of the first water bearing zone (FWBZU). Well M028-E is screened in the lower part of the first water zone (FWBZL). Some contaminant concentrations (e.g. cis 1,2-DCE and vinyl chloride) have increased significantly in down gradient monitoring well M028-E over the quarterly sampling events from October 1997 to August 1998 while concentrations in upgradient well M034A and downgradient well M028A have decreased. This may indicate downward migration of contaminants from the FWBZU to the FWBZL or contaminants detected in the FWBZU may have migrated to San Francisco Bay. Sunken steel barges located west of well M028E may be allowing for contaminant accumulation in well M028E.**	**The Navy agrees that the solvent plume may be migrating down towards the lower portion of the first water bearing zone because of the density of the solvents. In addition, the Navy agrees that the solvent plume has probably entered the San Francisco Bay, because of the proximity of the M028 well cluster to the shore.** **Well M034-A is on the northern edge of the plume. Constituents at wells M028 and M034 are believed to be from the same source. The lateral and vertical extent of the plume has been delineated outside of the landfill, where potential exposure pathways could be completed.**

Submitted: 08/10/99

REF	COMMENT	RESPONSE
	Concentrations of contaminants in groundwater from well M034A are significantly less than concentrations detected in the down gradient well M028E (e.g. vinyl chloride @ 20,000 µg/L in groundwater from M028-E [May 98] as compared to 1,700 µg/L in groundwater from M034A [Nov. 97]). This may be the result of more than one contaminant source release and suggests the possibility of coalescing groundwater plumes at M028-E. Possible source area locations include the area immediately upgradient well M028E and areas upgradient of well M034A. Another source to be considered is the potentially high contaminant concentration levels in the FWBZL at the M034A location, which has not been characterized. If high contaminant concentration levels in FWBZL exist, then the contaminants detected in groundwater from M028-E may be from the same source as the contaminants detected in groundwater from M034A. **Recommendation** **GSU recommends to further evaluate and clearly define the nature and extent of contaminants in groundwater at Site 1. This should include groundwater sampling to define both the lateral and vertical extent of contamination. In addition, a soil vapor survey could be implemented to assess the potential for the occurrence of contaminant releases; the results of the soil vapor survey could be used to locate hydropunch groundwater sampling locations and/or monitoring wells.**	**A soil vapor survey would aid in identifying the source(s) of the groundwater plume. However, the Navy is not planning to undertake any characterization that would compromise the integrity of the landfill cells for the RI. If source removal is selected as part of the remedy in the ROD, then the extent of the source area would be determined prior to or during the removal action.** **Groundwater will be treated as required to be protective of human health and the environment. Soil vapors will be controlled by vents within the landfill cap and potential treatment as warranted by local Bay Area air requirements.**
2	**Response to Comment #2 (Groundwater Characterization)** Chemical contours are inferred as a result of groundwater flow direction and increasing groundwater concentrations in the downgradient direction. However, because more than one source is likely at Site 1 and because groundwater moves in more than one direction, decreasing contours inferred next to or within a potential source (i.e. eastern-central disposal cell, northwestern disposal cell and southernmost disposal cells) that currently has not been assessed may not be representative of site conditions.	The Navy will refine plume lines on Figures 6-29 and 6-30 to include more dashed lines at boundaries, where appropriate. Plume contours that are dashed are not intended to imply that other localized plumes could not exist at the site, they merely show the trend of the known plumes. Isoconcentration contours in Figures 6-29 and 6-30 will be refined to include information from the 1996 University of Waterloo investigation (conducted as part of the funnel and gate study).
Draft Comment #2	**Inferred chemical contours illustrated on Figures 6-27 and 6-28 are shown to decrease in the eastern direction from monitoring well M034-A (middle-western disposal cell). There are no data to substantiate chemical contours east of monitoring well MO34-A and the contours should not be inferred. Disposal cells in the immediate vicinity may be sources of groundwater contamination and, as a result, the inferred contours would likely be incorrect.** **Recommendation**	**The Navy agrees that the contours should be dashed where inferred. Due to the groundwater flow direction, and because solvent concentrations increase in the westerly direction, it can be inferred that the plume decreases in concentration towards the east.**

Submitted: 08/10/99

REF	COMMENT	RESPONSE
	The final RI report chemical contours should not be inferred on figures where data are not available.	
3	**Response to Comment #3 (Groundwater Characterization)** The February 1998 concentrations for vinyl chloride and cis-1,2-DCE are referred to as relatively low. These concentrations are magnitudes greater than MCLs. It would be more appropriate to refer to these concentrations as "the lower concentrations".	The term "relatively low" was used to compare February 1998 groundwater concentrations to May 1998 concentrations. MCLs were not used as a comparative value in this statement.
Draft Comment # 3	**Extremely high vinyl chloride concentrations at levels in excess of the solubility concentration for vinyl chloride in water (1,100 µg/L) were detected in groundwater from monitoring well M028E. Concentrations greater than the solubility concentration for vinyl chloride in water may be the result of the presence of vinyl chloride dissolved in organic solvents such as diesel or gasoline constituents or humic acids. Monitoring well M028 is down gradient of a funnel and gate treatment system that was installed during April 1997. Chlorinated solvents flowing through this system allow for anaerobic biodegradation of dichloroethene to vinyl chloride. Influent and effluent sampling of groundwater flowing through this system indicated that high levels of vinyl chloride are not exiting the system. This indicates that the elevated levels of vinyl chloride in well M028-E is likely the result of contaminant migration around the funnel and gate system and not through the system.** **It is alarming that vinyl chloride concentrations in groundwater from well M028-E increased significantly from the February 1998 sampling event (130 µg/L) to the May 1998 sampling event (20,000 µg/L). It is also important to note that cis-1,2-DCE increased 49 µg/L to 22,000 µg/L from the February 1998 sampling event to the May 1998 sampling event. The high concentrations of vinyl chloride is alarming as high concentrations of vinyl chloride in the soil gas may result by volatilization from groundwater. These soil gas concentrations may pose a significant risk to human health.** **Recommendation** **The soil vapor survey as recommended above will help assess the movement of potential toxic soil gas. During any future investigations, Health and Safety considerations, if not as yet been considered, should include the potential need for supplied air for protection against potential exposure to extreme vinyl chloride concentrations.** **The GSU recommends collecting split groundwater samples from monitoring well M028-E to be analyzed by two laboratories. This could validate the extremely high levels of detected vinyl chloride at concentrations exceeding the solubility concentration.**	**The Navy agrees that vinyl chloride is circumventing the funnel-and-gate treatability study. If this remedial alternative is selected to treat groundwater in the ROD, then it will be scaled up to meet remedial action objectives.** **The relatively low groundwater concentrations of vinyl chloride and cis-1,2-DCE in February 1998 can be attributed to dilution from high groundwater tables during February. Groundwater concentrations were diluted by heavy rain during the February 1998 sampling event, as evidenced by the high water table in well M028-E (depth to groundwater of 2.8 feet bgs). The depth to groundwater returned to the customary elevation of greater than 5 feet bgs in May 1998.** **See RAB Focus Group Comment #3 regarding a risk assessment to human health from volatile constituents in groundwater.** **As far as health and safety issues related to sampling at the site, the air space within the work zone has been and will continue to be monitored to ensure worker safety. No upgrade to respirator or supplied air has been necessary to date.** **Extremely high levels of solvents have been identified in the past and duplicate samples were collected to verify concentrations.**

Submitted: 08/10/99

REF	COMMENT	RESPONSE
4	**Response to Comment #7 (Groundwater Characterization)** As discussed above, it is unclear to DTSC how a soil gas survey would compromise the integrity of the landfill cells because groundwater is believed to saturate a portion of the refuge. If the concern is creating a route of vertical contaminant migration, the survey could be designed to not penetrate groundwater and, upon removal of soil gas probes, the borings would be properly backfilled with grout to prevent downward migration of contaminants. While the probe is in place contaminants could not migrate down the boring because the probe would prevent contaminants from entering the boring. The Navy will treat groundwater as required to be protective of human health and the environment. It is important to note that, if groundwater treatment is required remedy, additional wells could be needed for monitoring and efficient removal of the greatest concentrations of contaminants.	The Navy agrees that a soil vapor survey could potentially be performed within the landfill cells using methods that would minimize downward migration of contaminants. The Navy agrees that if groundwater treatment is a required remedy, then additional wells would most likely be installed to extract groundwater (if selected as the remedial action) and monitor system effectiveness. This information will be presented in the FS report.
5	**Response to Comment #7 (Additional Comments)** The response indicates that a gravel layer will be installed to prevent animals from burrowing through the cap. Our initial concern was the potential for animals to start a burrow from outside the cap boundary that extends to below the cap. Is this still a potential scenario or would the design of the cap be such that this would not occur? It appears that the vents which would be installed with the cap could mitigate any potential threat to burrowing creatures from landfill gases.	The landfill cap will be constructed with a layer to prevent biointrusion of burrowing animals. The cap will be sloped on the sides to minimize the potential for animals to burrow from outside the boundary.
Draft Comment # 7	**Low concentrations of VOCs detected in groundwater from wells M029-A, M029-E, M001-A, M001-E, M002-A, and M002-E may be indicative of releases from the northwestern and/or northeastern most disposal cells.** **Recommendation** **To further evaluate the nature and extent of contaminants, a soil vapor survey is recommended at the northwestern most and northeastern most disposal cells. Currently there is not sufficient analytical data for these cells to evaluate the potential for groundwater contamination at these locations. The results of the soil vapor survey at these disposal cells should be used to locate hydropunch groundwater sampling locations and monitoring wells. Extreme care should be used if wells are drilled in the disposal cell area due to the possibility of landfill gases emanating to the surface from the bore holes.**	**A soil vapor survey would aid in identifying the source(s) of groundwater contamination near wells M029-A, M029-E, M001-A, M001-E, M002-A, and M002-E. However, the Navy is not planning to undertake any characterization that would compromise the integrity of the landfill cells for the RI.** **The Navy assumes that because the landfill has been closed since 1956, steady state concentrations in groundwater have been achieved with leachable constituents in refuse. Groundwater will be treated as required to be protective of human health and the environment.**

Submitted: 08/10/99

REF	COMMENT	RESPONSE
Ref	Comment	
OU3	**Focus Group, RAB, Mary Sutter**	
1	**General Comments** The Draft Final RI for OU-3 contains significant new material, such as new sections for groundwater modeling and exposure modeling for a golf course irrigation scenario. Given the fact that such major changes have been included in this version of the document, we do not think that it was appropriate to have moved to the Draft Final stage. Instead a second draft should have been prepared. In the future, we recommend that the Navy not push forward to the Draft Final stage of any RI or FS document until all significant additions and changes have been made to the document. In this case, we suggest that the Navy produce a Second Draft Final document.	The Navy added new material to the Draft Final OU-3 RI report, including groundwater modeling and exposure modeling for a golf course irrigation scenario, in response to comments received on the Draft OU-3 RI. The purpose of issuing Draft and Draft Final versions of this document is to allow for RAB and agency review. Changes are made in subsequent revisions, based on these comments. The Navy does not plan to issue a revised Draft Final OU-3 RI report.
2	**General Comments** We also recommend that the Navy add prefatory sections to all of its RI/FS program documents, which would describe significant changes that have been made to the document as it develops from the first draft to the final stage. For example, the Draft Final RI for OU-3 should have included a preface alerting the reviewer that whole new sections on groundwater and exposure modeling had been added, as well as, a new method for calculating soil exposure in a recreational setting. Including this type of information at the beginning of each document would be a great service to the individuals involved in document review.	The Navy will summarize significant changes to the Final OU-3 RI report and will include this information in the transmittal letter that will accompany the document.
3	**Landfill Presumptive Remedy** In our comments on the Draft RI, we disagreed with the Navy's position that the landfill presumptive remedy was appropriate for the military landfill at OU-3. The OU-3 focus group continues to express discontent with the Navy's use of the presumptive remedy approach. EPA's, *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills,* lists at least two factors which make the presumptive remedy approach inappropriate for a military landfill: First, "Site-specific conditions may limit the use of the containment presumptive remedy. For example, the presence of high water tables..." Second, "The proportion and distribution of hazardous wastes in a landfill are important considerations. Generally, municipal landfills produce low-level threats with occasional hot spots. Similarly, most military landfills present only low-level threats with pockets of high-hazard waste. However, some military facilities, (e.g., ...major aircraft or equipment repair depots) have a high level of industrial activity compared to overall site activities..." We believe that the these two limiting characteristics are relevant to the OU-3 landfill and	The Navy believes that the landfill presumptive remedy is applicable to the landfill at OU-3 based on the EPA fact sheet: *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills.* Because a portion of the refuse is saturated by groundwater, an impermeable cap could be unnecessary at the site. This is taken into account in the OU-3 FS, wherein a native soil cap is a containment remedial alternative. Regarding the second point, landfills listed in the EPA fact sheet for which the presumptive remedy of containment was used, contained wastes similar to those reportedly disposed of at the OU-3 landfill. The Navy has followed the decision framework set forth in the EPA fact sheet as follows. **What Information Should be Collected?**

REF	COMMENT	RESPONSE
	therefore we once again recommend against the presumptive remedy approach.	Information available on the sources, types, and volumes of landfill wastes disposed of at IR Site 1 was assembled through personnel interviews and historical Navy document searches at Alameda Point. **How May Land Reuse Plans Affect Remedy Selection?** EPA guidance states that for smaller landfills (generally less than 2 acres in size), land reuse plans may influence the decision on the practicality of excavation. The 24 acres proposed to be contained at IR Site 1 are significantly larger than the small landfill defined in the guidance. Therefore, excavation and consolidation or treatment of the landfilled materials is not considered a practical alternative at IR Site 1. **Do Landfill Contents Meet Municipal landfill Type Waste Definitions? Are Military Wastes Present?** Waste in CERCLA landfills usually is present in large volumes and is a heterogeneous mixture of municipal waste frequently disposed of with industrial and hazardous waste. EPA guidance states that military waste, especially high-hazard military wastes (for example chemical warfare agents, artillery, and bombs), may possess unique safety, risk, and toxicity characteristics. If military waste is present at a site, the guidance requires consultation with specialists to determine if the military waste falls into the low- or high-hazard category. Materials known to have been disposed of in the disposal cells at the landfill include old aircraft engines; kitchen scraps and garbage from ships in port; cables; scrap metal; waste oil; paint waste; solvents; cleaning compounds; construction debris, dredge spoils; medical waste; ash from the incinerator located in Building 68; and low-level radiological material. In addition, a limited quantity of ordnance was disposed of in an area outside the landfill cells near the pistol range. The low-level radiological materials and ordnance are the

REF	COMMENT	RESPONSE
		only military-specific wastes present at IR Site 1. The Navy is working with military waste specialists to address these two military-specific wastes. Following removal activities for these two military-specific wastes, components of the landfill will fall into the same category as municipal-type wastes in accordance with Highlight 3 of the EPA fact sheet. **Is Excavation of Contents Practical?** EPA guidance states that the volume, types of wastes, hydrogeology, and safety must be considered when assessing the practicality of excavation. Although a set excavation volume limit does not exist, landfills with a content of more than 100,000 cubic yards (approximately 2 acres, 30 feet deep) would normally not be considered for excavation. The area to be capped at IR Site 1 would be about 25 acres and fill could be present at depths estimated at about 10 feet bgs, for a total volume of about 400,000 cubic yards, making the landfill impractical to excavate. **Can the Presumptive Remedy be Used?** EPA guidance states that the site manager will make the initial decision of whether a particular military landfill site is suitable for the presumptive remedy. In addition, the community and state must also be notified before work begins on the RI/FS. The Navy has determined that the presumptive remedy is applicable for IR Site 1 because of the items discussed above and has notified the state and the public. State and community input will be taken into consideration before the FS is finalized and the ROD is prepared.

REF	COMMENT	RESPONSE
4	**Landfill Presumptive Remedy** The streamlined feasibility study (FS) that is part of the presumptive remedy precludes addressing other options that may provide for a more protective and cost-effective remedy in the long-term. For example, the application of a cap may slow down the breakdown process of volatile organic compounds, thus causing an increase in long-term releases to ground and surface waters. Given that this landfill was constructed on the shore of the Bay, given that portions of the landfill contents are in the saturated zone, and since the landfill contents are likely to contain large amounts of hazardous materials, we believe that a standard RI/FS should be performed. We further recommend that additional efforts be made to locate and actively remediate toxic hot spots in the landfill.	Please see Comment 3. A native soil cap is being incorporated into a remedial alternative in the FS that would allow limited infiltration. Groundwater will continue to flow through the landfill bringing in nutrients to promote biodegradation. The exposure pathways are addressed in the FS and remedial actions are being developed that will be protective of human health and the environment.
5	**Landfill Presumptive Remedy** Although we do not recommend use of the presumptive remedy approach, we note that the Navy should not continually refer to the presumptive remedy for OU-3 as a "cap" or as "capping," but instead should use the more comprehensive term, "containment."	The Navy will use the term "containment" as appropriate.
6	**Onshore versus Offshore Risk Assessment** We feel the Navy did not adequately address our Draft RI concern regarding separation of the onshore and offshore components of the risk assessment. Chemicals such as 2,4-DMP, 1,2-Dichloroethene, and vinyl chloride have been found in concentrations that may have a potential adverse impact on aquatic biota. Although a prototypical funnel and gate system is currently in place, monitoring of the system indicate that it is not working adequately (e.g., chemicals are going around the funnel and gate and into the Bay). Therefore, any actions taken during the OU-3 FS will directly affect the offshore risk, and as stated above, the risk may not be able to be remediated adequately without a more thorough characterization during the OU-3 RI/FS.	Groundwater that flows through the landfill that could potentially affect aquatic receptors, is addressed by the ecological risk assessment in the OU 3 RI. Remedial alternatives that address the groundwater hot spot, including the funnel and gate system, will be evaluated in the OU-3 FS. If the funnel and gate system is the recommended remedial action for groundwater at the site, the system will be expanded as required to meet remedial action objectives developed in the FS. Addressing sediments in a subsequent RI will not interfere with the remedial action selection at IR Site 1.
7	**Onshore versus Offshore Risk Assessment** We appreciate the addition of the footnote on Figure 1-2 to indicate that offshore samples will be addressed during OU-4. However, the area outside of OU-3 needs to be included as part of OU-4 on this map. Especially given that OU-4 may ultimately become part of a Bay-wide base assessment, we feel that it is necessary to indicate explicitly that the area off-shore of OU-3 is a part of OU-4.	The offshore areas adjacent to OU-3are no longer considered as part of OU-4 but will now be addressed by the Sediment Work Group. The footnote will be changed on Figure 1-2.
8	**Exposure Pathway Analysis and Risk Assessment** In its responses to our Draft RI comments, the Navy states that the presumptive remedy allows it to bypass various exposure pathways in the risk assessment. This might have been an acceptable response, had the Navy also included a more detailed description of its presumed remedy in the RI. If the Navy wishes to eliminate exposure pathways based upon a presumed remedy, then it must demonstrate that its remedy would indeed protect potential receptors from	The Navy will add a discussion to the RI that addresses these pathways. Action specific ARARs for landfill closure will be followed under which gas and groundwater monitoring may be required. General cap design features will be discussed in the summary of the RI.

REF	COMMENT	RESPONSE
	air, groundwater, and soil exposures. The only explicit description of the Navy's presumptive remedy for Site 1 is presented in Section 6.9.3. Here it is stated that the remedy will be a cap, but there is no discussion of the characteristics of this cap. There is no description of cover material composition, thickness or permeability; no discussion of the presumed landfill gas treatment system or the air standards that are to be met by such a system, no discussion of whether and how Bay water intrusion into the landfill is to be prevented, or how leachate will be prevented from seeping into the Bay. In the absence of this type of discussion, i.e., one detailing how, and to what level, the presumptive containment strategies will mitigate the various exposure pathways, we do not feel that the potential risks of the landfill have been adequately addressed.	
9	**Exposure Pathway Analysis and Risk Assessment** The Landfill Gas Pathway. In response to various reviewers comments on draft RI, the Navy claims to have modeled the groundwater-to-landfill gas-to air pathway. However, we could not find this analysis presented in the Draft Final RI. Please provide this analysis in the Second Draft Final document.	This pathway was discussed in Section 6.7.1: "The HHRA also evaluated potential exposures to VOCs migrating from the FWBZ through the vadose zone to ambient air." This pathway was further discussed in Section 6.9.1 "The groundwater HHRA performed for the occupational exposure scenario indicated that human health risks associated with spray irrigation and volatilization from the subsurfce are below 1E-06 for carcinogenic risk and below an HI of 1." This pathway is discussed in detail in Appendix C.
10	**Exposure Pathway Analysis and Risk Assessment** We strongly support the DTSC's request for soil gas sampling to be undertaken at the landfill in order to locate VOC hot-spots in the landfill contents and the underlying groundwater.	The Navy has installed monitoring wells downgradient from the landfill. Hot spots within the landfill would not require characterization as long as downgradient receptors are not impacted. The only downgradient wells that indicate elevated levels of COCs, potentially harmful to aquatic receptors, are within the hot spot near Wells M-028 and M-034. Additional groundwater samples will be collected at areas close to the site shoreline, to determine if any COCs are present at levels potentially harmful to aquatic receptors. Results from the data gap sampling will be presented in the FS report and an RI addendum, as appropriate.
11	**Exposure Pathway Analysis and Risk Assessment** Appendix C-6, Ground Water Pathway. We were pleased to see that the Navy evaluated a groundwater scenario. However, we have some questions regarding the groundwater modeling procedures and results, as follows: a) The concentration graphs C6-1 through C6-4 do not appear to be correct. For example, C6-1 shows the modeled concentrations of vinyl chloride at M31-A at time zero as 88	a) For the groundwater pathway, two scenarios were evaluated. The first scenario involved the placement of a well near M031 well cluster and the second scenario involved placement of an irrigation well near Hydropunch cluster HP1-2. Both of these locations are east of the area where organic contaminants have been detected in groundwater. Initial groundwater

REF	COMMENT	RESPONSE
	ug/L. However, the modeling exercise derives initial plume concentrations from RI figure 6-29, which for vinyl chloride, are shown as less than 1 ug/L. Furthermore, given the assumption of a steady source term, one would expect concentrations to build-up over time (supposedly from an initial value of < 1 ug/L), ultimately reaching a plateau value. Appendix C-6 also states that a steady-state concentration at the modeled well is achieved once a constant proportion of influent contaminated and uncontaminated water has been established. Based upon this description, one would not expect the concentration of vinyl chloride, for example, to decrease to zero, as is presented in figure C6-1. b) If the final concentration at the modeled well depends upon the proportion of contaminated to uncontaminated water being drawn into the well, then a more conservative location at which to run the model would appear to be approximately 500 feet north of well M31-A. c) It would be very useful to include a diagram showing the groundwater flow-paths calculated for the groundwater extraction scenario used in the exercise. d) The biodegradation rates used in this model need to be justified using site-specific data. e) The modeling section should also include a description of groundwater recharge conditions under future-use assumptions. Additionally, several recharge scenarios should be modeled based upon varying land-use assumptions.	concentrations were obtained from Figure 6-27 and 6-28, not Figure 6-29. After the initiation of pumping, groundwater concentrations of various organic compounds began to decrease because of the distance from the contaminant source and also because the majority of the water being drawn into the irrigation wells was clean water from upgradient areas. This is why there is no buildup of contaminant concentrations over time. Furthermore, the contaminant concentrations, such as that for vinyl chloride, do not decrease to zero. However, the concentrations do become very low and eventually reach an asymptotic condition at steady state. b) An irrigation well scenario with a location 500 feet north of M031 could be performed; however, this location would appear to be within the limits of the landfill cells. It is unlikely that a well would be drilled through the landfill when there are other likely locations in lesser or uncontaminated areas. c) Diagrams illustrating the groundwater flow paths are available and will be included with the revised report. d) Site-specific biodegradation rate data is not available. Historical trends in contaminant concentrations could be reviewed in order to estimate organic contaminant half-lives. However, there would be uncertainty associated with the causes of the decreasing trends for contaminants. These uncertainties would include dilution with clean groundwater instead of biodegradation and too small of a historical data set to properly determine statistical trends in the contaminant concentrations.

REF	COMMENT	RESPONSE
		e) Additional groundwater scenarios could be performed. However, the initial scenarios assessed conservatively reflected site conditions such as recharge and the presence of the runway.
12	**Exposure Pathway Analysis and Risk Assessment** Appendix C-4. We were also pleased to see that the Navy re-evaluated its soil ingestion rates for recreational exposures, using EPA's 1997 Exposure Factors Handbook. However, we still have a few comments related to the specific calculations presented in the appendix. First, EPA's recommended values for high-end and average daily soil ingestion in children are 400 mg/day and 100 mg/day, respectively (see: Exposure Factors Handbook, Table 4-23). The Navy used values that were lower than the recommended ones in its calculations. Second, the Navy used an average of the 50th percentile and 95th percentile values for time spent in outdoor recreation. This procedure is not statistically sound. It would be better to simply use the 50th percentile value to calculate both the average and the RME hourly soil ingestion rate (N.B. This method is similar to EPA's treatment of body weight in RME calculations). Using the general procedure of Appendix C-4, along with the above suggested modifications, the RME hourly soil ingestion rate for the 0-5 year age group would be as follows: $\frac{(400 \text{ mg/day}) \times 0.45}{(130 \text{ min/day}) \times (1 \text{ hr}/60 \text{ min})}$ = approximately 80 mg/hour, which is close to the 70 mg/hour value that we originally suggested in our comments on the draft RI. Based upon the current discussion, we recommend that the Navy adopt a recreational soil ingestion rate for children of 80 mg/hour.	The primary purpose of the exposure assessment portion of the baseline human health risk assessment (HHRA) at Operable Unit 3 (OU 3) is to identify exposures that represent reasonable maximum exposure (RME) and average conditions. As defined by in U.S. EPA's *Risk Assessment Guidance for Superfund*, the RME is the maximum exposure that is reasonably expected to occur at a site. More importantly, because the RME is for the same receptor, it must be determined whether "it is likely that the same individual would consistently face the RME." The value selected for a single variable must be determined within the context of the values selected for the other intake variables. As stated by EPA, "intake variable values for a given pathway should be selected so that the combination of all intake variables results in an estimate of the [RME] for that pathway." Specifically, under this approach, "some intake variables may not be at their individual maximum values but when in combination with other variables will result in estimates of the RME." The Navy notes that EPA in its 1997 *Exposure Factors Handbook* identifies 400 milligrams per day (mg/day) as the recommended "upper percentile" soil ingestion value for children. However, in identifying this value, EPA notes that because the study period used to develop this estimate was short, this value is not an estimate of "usual intake." EPA further notes that a value of 200 mg/day "may be used as a conservative estimate of the mean." Intake through the soil ingestion pathway is estimated using the following variables in addition to ingestion rate: concentration, exposure frequency and time, exposure duration, body weight, averaging time, as well as conversion factors. As described in the draft final OU 3 baseline HHRA, values for several of these intake variables have been conservatively estimated. In this context,

REF	COMMENT	RESPONSE
		conservative means a value results in a higher or increased intake estimate. For example, consistent with EPA's *Calculating the Concentration Term* guidance, mean concentrations were conservatively estimated as the lesser of the 95th percent upper confidence limit (95 UCL) on the mean or the maximum detected concentration. Exposure frequency and time were conservatively estimated as four days per week, one hour per day, for 50 weeks consistent with DTSC's 1992 *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities.* Body weight (which appears in the denominator of the intake equation) was estimated as an average value, rather than a larger "upper percentile value." Also, the Navy is modifying its approach to use the 50th percentile value for time spent in outdoor recreation as recommended by the RAB. Use of this smaller value will increase the estimated ingestion rate as shown below. It has been demonstrated that when values for two or more exposure (intake) variables are based on their 95th percentile values, the estimated exposure overestimates the true 95th percentile. In fact, the estimated exposures are located at about the 99th percentile (Cullen 1994). When overestimated exposure results are multiplied again by conservative toxicity factors, the resulting risk and hazard estimates are overestimated to an even greater extent. Therefore, considering that values for more than two intake variables were previously set at conservative levels, the Navy feels that a child soil ingestion rate based on a "conservative estimate of the mean" value of 200 mg/day, further adjusted by a conservative estimate (50th percentile) of the time spent in outdoor recreation, is protective of human health and appropriate for use in the baseline HHRA. The RME hourly soil ingestion rate for the 0-5 year age group is estimated as follows: $\frac{200 \text{ mg/day} \times 0.45}{40.9 \text{ mg/hr}} = 2.2$ hours/day Cullen, Allison. 1994. "Measures of Compounding

REF	COMMENT	RESPONSE
		Conservatism in Probabilistic Risk Assessment." *Risk Analysis*. Volume 14, Number 4. August.
13	**Use of RfDs and Slope Factors** We reiterate our opinion that the Navy should use all available RfDs and Slope Factors, including those presented in the EPA Region 9 PRG tables, in order to present a risk assessment that covers as many chemicals of concern as is possible. The Navy should also use chemical surrogates, route-to-route extrapolation, and the primary literature to develop toxicity values for other chemicals. We also point out that RfDs have been developed for various TPH fractions (See: *Development of Fraction Specific Reference Doses, RfDs, and Reference Concentrations, RfCs, for Total Petroleum Hydrocarbons, TPH,* Exxon Biomedical Sciences, Inc., et. al., Amherst Scientific Publishers, 1997).	The Navy acknowledges the comment. However, as stated in the Navy's response to similar comments on the draft HHRA, the toxicity factors used by the Navy were reviewed by DTSC and found to be acceptable. Also, because a presumptive remedy (containment) has been identified for Site 1, modifying the toxicity factors will not impact the remedy selection. Therefore, no changes will be made to the toxicity factors used in the Site 1 HHRA.
14	**Lack of Dioxin Data** During review of the Draft RI, both the OU-3 Focus group and the DTSC requested more dioxin sampling at the landfill burn area. The Navy replied that, since the burn area would be "capped," additional sampling would not be necessary. In response, we would reiterate our earlier comment (see: Comment B.3) that the landfill presumptive remedy should be described as "containment" and not simply capping. Once the remedy is conceived of as "containment," then the need for more sampling in the burn area becomes clear: Its purpose is to establish whether or not chemicals residing in the area present a threat to the waters of the Bay. We also reiterate our request for more sampling at the landfill burn area.	The burn area will be contained (by a cap) under the presumptive remedy, thereby protecting human health and the environment. Additional sampling in this area would therefore not be warranted. Dioxin is considered insoluble in water per the EPA Office of Ground Water and Drinking Water internet site (http://www.epa.gov/OGWDW/dwh/t-soc/dioxin.html). Groundwater VLEACH modeling conducted for a similar landfill site at the Naval Computer and Telecommunications Station San Diego Detachment Stockton with shallow groundwater conditions, indicated that dioxins would not leach from soil into groundwater.
15	**Ecological Risk Assessment** In our Draft RI comments, our TOSC consultant noted that the Navy had dropped cyanide from its sampling events after 1992 even though 22.7% of groundwater samples collected in 1991-92 had measurable levels. The Navy response was that it would not resample wells to eliminate this data gap since the measured concentrations of cyanide were only 10 times greater than the AWQC for cyanide. Given that the Navy had no reason to drop cyanide from its sampling protocol, and given that cyanide appears to be present in relatively high concentrations in at least one well, we recommend that sampling for cyanide be carried out at OU-3.	The Navy reiterates its response that because cyanide levels in the 1991-1992 samples were below the detection limit of 10 μg/L at all Site 1 wells, except M025, additional sampling is not warranted. Applying a dilution factor of 10 would provide a concentration of 1 μg/L at the shoreline, which is equivalent to the AWQC screening criteria for cyanide. Well M025, which contained elevated levels of cyanide in 1991-1992, was not used in the ecological screening for the final RI report, because it is south and not downgradient from the landfill cells; therefore, it would not be impacted by groundwater flowing through the landfill. This well will, however, be sampled by the Navy during the data gap investigation summarized in Chapter 6 of the report.
16	**Ecological Risk Assessment**	This will be incorporated into the Final OU-3 RI report.

REF	COMMENT	RESPONSE
	Tables 6-24 through 6-30 indicate several chemicals with at least some maximum detection limit concentrations far in exceedance of ecological screening criteria concentrations. However, these tables do not provide any indication of the percentage of undetected samples having detection limits exceeding the screening criteria. Please include this information in one column of the tables.	
REF	**COMMENT**	**RESPONSE**
	EPA Region IX, Phillip Ramsey	
1	In U.S. EPA's March 15, 1999 Draft RI Review letter, and consistent with EPA's December 1996 guidance, "Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills" (Directive no. 9355.0-67FS, EPA/540/F-96/020) U.S. EPA identified the need in the RI to characterize potential "hot-spot" areas associated with unexploded ordnance (UXO), radiological materials, lead at the rifle range, and high concentrations of volatile organic compounds (VOCs) in groundwater. Based upon U.S. EPA review of the draft-final OU3 RI, site characterization is sufficient to evaluate "hot-spot" actions in an OU-3 FS that would address UXO, lead, and radiation in shallow subsurface soils. However, site characterization is not sufficient to evaluate actions that address potential VOC contamination "hot-spots" in soil and groundwater. Additional investigations (primarily groundwater) are needed prior to completing the OU-3 Feasibility Study (FS). Further, U.S. EPA understands the RAB has raised other issues regarding incomplete characterization (i.e., need for dioxin sampling in the "Burn Area" and testing for cyanide in groundwater). U.S. EPA agrees with these recommendations.	Please see Response to DTSC comment #1. Please see response to RAB Comments # 14 and # 15.
2	As a result of groundwater characterization deficiencies, additional groundwater investigations should be completed for OU3, and must be conducted prior to completing the FS. U.S. EPA believes it is important for the BCT to reach consensus on the scope and timing of the additional groundwater investigations at OU3 and U.S. EPA is prepared to assist the Navy in scoping the investigation and developing an acceptable supplemental sampling plan. If the Navy decides to finalize the RI, prior to completing a supplemental investigation, the revised RI should at a minimum state that groundwater data gaps have been identified by the BCT, and the Navy commits to resolve the data gap issue through additional groundwater investigations. The additional groundwater investigations would be included as an RI Addendum. U.S. EPA notes that the Department of Toxic Substances Control (DTSC) draft-final RI review letter, dated June 10, 1999, raises similar concerns regarding completeness of groundwater characterization. U.S. EPA also support DTSC recommendation that a soil gas survey be implemented to identify possible source areas and assist with citing monitoring well or hydropunch sampling locations and agrees with the DTSC that the recommended soil gas survey will not compromise the integrity of the landfill cells.	Please see Response to DTSC comment #1. The Navy will finalize the OU-3 RI report and include a section discussing data gaps. Meetings will be held with the U.S. EPA to discuss data gaps at the site and the need for any additional investigations. Results from the data gap investigation will be issued in an RI Addendum and the FS report, as appropriate.

REF	COMMENT	RESPONSE
3	U.S. EPA does not agree with the Navy's risk assessment methodology, as it is inconsistent with U.S. EPA Region IX and U.S. EPA HQ methodology. DTSC's methodology is consistent with U.S. EPA's methodology. While DTSC cancer slope factors are not always the same, they are more conservative and, therefore, at least as protective as U.S. EPA's. In addition, because the Navy has decided to continue its dual-track risk assessment methodology, a dual-discussion in the risk assessment conclusions section must also be included.	As stated in the Navy's response to similar comments on the draft HHRA, the toxicity factors used by the Navy were reviewed by DTSC and found to be acceptable. Also, because a presumptive remedy (containment) has been identified for Site 1, modifying the toxicity factors will not impact the remedy selection. Therefore, no changes will be made to the toxicity factors used in the Site 1 HHRA. Dual-track risk assessment results will be included in the risk assessment conclusions section of the Final OU-3 RI report.
4	The Navy is encouraged to coordinate and communicate with the BRAC Cleanup Team (BCT) during document revisions. The process of informal communications between the BCT and transmittal of Response to Comments prior to document revision assist the BCT in producing acceptable documents and maximize use of limited financial and human resources. In EPA's March 15, 1999 draft RI review letter, we indicated our concern with the Navy's emphasis on a "presumptive remedy cap" and suggested that the Navy discuss this issue with the regulators prior to submission of a draft-final document. No discussions were initiated by the Navy prior to submitting the draft-final RI, despite significant modifications and additions. Also, the Response to Comments, which are typically submitted and reviewed/discussed by the BCT prior to document revision, was not transmitted prior to but as an attachment of the draft-final RI Report. Further, in several instances U.S. EPA believes the Navy could have provided a more detailed and accurate Response to Comments that would have expedited our review of the draft final OU3 RI.	The Navy is not required to transmit response to comments before submitting a subsequent version of a document. The Navy will, however, discuss comments in meetings with regulatory agencies at the BCT meeting and subsequent meetings, as required. These discussions will include the landfill presumptive remedy.
5	In general (and with some limited exceptions) U.S. EPA believes the figures and tables presented are relatively complete and well prepared. However, two additional tables are needed to clearly and concisely present well-specific (or for hydropunch samples, location-specific) volatile organic compound (VOC) data collected over time. One table should provide all VOC groundwater data that was used for the risk assessment, and a second would provide all other groundwater data (i.e., hydropunch results). A corresponding figure is needed to clearly identify all sampling locations.	All data is presented in the Appendix of the RI Report, and time series plots of contaminants of concern are presented in Figure 6-28 for site wells.

REF	COMMENT	RESPONSE
6	U.S. EPA requests that information on groundwater flow direction and gradient be presented in greater detail in the revised RI Report. For example, based upon U.S. EPA's review of the draft-final RI, it is unclear how many water elevation data points have been obtained as part of the RI. While the Basewide (Regional) hydrogeology is somewhat developed in text, the site-specific presentation of data and discussion is too brief. Groundwater isocontour lines should be presented to support general flow directions (see Figure 6-11, Site 1 Soil and Groundwater Sampling Location Map). The Navy needs to better present water elevation and flow direction information to support statements like that in Appendix C-6 (Groundwater Modeling, page 6-1). That "[g]roundwater elevation data indicates that the barges restrict groundwater movement toward the bay in this area."	Isocontour lines are presented in Figure 2- 14. These isocontours are based on 1998 data. Isocontours based on data collected from other sampling events will be prepared and inserted into the RI if there is any significant variation.
7	Appendix K, Funnel and Gate Summary. The information (figures/tables) presented in the appendix does not provide useful and developed information with which to gain a broader understanding of magnitude and distribution of VOCs in groundwater and it is not responsive to previous U.S. EPA comments on the issue. U.S. EPA's March 15, 1999 Specific Comment No. 46 sought additional groundwater information on the funnel and gate pilot study, requested clarification on LNAPL and potential DNAPL, and requested descriptions in text of maximum contaminant concentrations or minimum to maximum ranges. It appears that valuable water quality information has been obtained at the site, which should be thoroughly evaluated in terms of adequacy of site characterization. Monitoring well-specific data and other groundwater samples (i.e., hydropunch) may provide information regarding possible hot-spots and direct the Navy to other areas of the site. For example, revised text on page 6-9 states, "...Very high influent concentrations [of VOCs] were detected upgradient of the reactive barrier in one multilevel well less than 50 feet east of the remedial gate. Also, as part of the discussion, please briefly summarize the Navy's rationale for citing the pilot system.	A plume characterization in the hot spot area will be added to Appendix K, that was conducted as part of the funnel-and-gate treatability study. This study was conducted in 1996 and has data to delineate the hot spot area to the north and south. Performance of the pilot system was included in the RI, and is also included in the FS report.
8	The draft-final OU-3 RI does not evaluate groundwater beneficial use based upon federal groundwater classification guidelines. As recently indicated in the U.S. EPA's June 21, 1999 review of the OU-1 draft FS, if the Navy has data that indicates that groundwater is not a potential drinking water source, as defined by state and federal groundwater classification guidelines, please include this information. As an enclosure to our June 21, 1999 letter, the Navy was also provided additional clarification on applying federal criteria of determining groundwater beneficial uses for CERCLA cleanups. The Navy is encouraged to utilize the previous enclosure for evaluating groundwater beneficial use at OU-3.	The Navy will add a discussion of the beneficial uses of groundwater at the site, and indicate that groundwater is not a potential drinking water source.

REF	COMMENT	RESPONSE
9 (Spec Com #1)	Figure 6-27, Organic and Inorganic Chemicals Detected in Groundwater [SWBZ]: The following comments apply: A. U.S. EPA requests that water quality data not be shown as "average values based on sampling events conducted between 1994 and 1996," but as specific values collected over time. This comment to applies to other tables as well. B. There appears to be an error in the sampling interval for well M2A. C. Please clarify why location HP-2-D is shown without analytical data. If results were non-detects for specific groups of contaminants, please specify.	A. The Navy has consistently used this approach at the OUs at Alameda Point to provide summary data without overloading a figure. Individual concentrations can be found in the time series plots (Figure 6-28) or in the Appendix. B. This well was evaluated and removed from the figure because it was determined to be a FWBZ well. C. Results will be placed on this figure.
10 (Spec Com #2)	U.S. EPA's March 15, 1999 Specific Comment No. 45 requested the navy to cite in revised Section 6.7.2.2, Volatile and Semivolatile Compounds. "...maximum concentrations or maximum to minimum range, of contaminants, so the reader does not have to fold out a figure to get the basic information. For groundwater data, the basic well information requested has not been provided. While the Navy's response indicates that minimum and maximum concentrations are presented in tables and figures, well-specific minimum and maximum concentrations are not provided. It is essential that those well-specific or location-specific data be presented as requested.	The Navy feels that including concentration ranges in the text would be unnecessary and potentially confusing. Data is presented in the Appendix and summary statistics are presented in tables and discussed in risk assessments.

APPENDIX N

VLEACH MODELING

ALAMEDA POINT VLEACH MODELING

Leach modeling using the computer program VLEACH was performed to assess the overall impact of lead on underlying groundwater as a result of infiltration through pistol range soil at IR site 1. VLEACH is a one-dimensional finite difference vadose zone leaching model that was developed by the U.S. Geological Survey for estimating the impact due to the mobilization and migration of a sorbed contaminant in the vadose zone on the underlying groundwater. Since its development, the model has been used at numerous contaminated sites. Processes in the VLEACH model include liquid advection and dispersion, gas diffusion, equilibrium sorption, and decay (either natural or biodegradation).

Input values required in VLEACH include items such as aquifer recharge, porosity, aquifer bulk density, aquifer organic carbon content, and contaminant adsorption and decay rates. These values were obtained from the OU-3 RI and various literature sources and are presented in Table 1. Initial contaminant concentrations were based on contaminant distribution maps presented in Figures 6-4 through 6-7 of the OU-3 RI (Tetra Tech 1996).

TABLE 1
VLEACH INPUT PARAMETERS

Parameter	Value
Pistol Range Area	220 ft x 200 ft
Solubility	1,000 mg/L[a]
Air Diffusion Coefficient	0[b]
Henry's Constant	0 (dimensionless)[c]
Porosity	0.3
Volumetric Water Content	0.3
Recharge Rate	1 ft/yr (scenario 1), 0.5 ft/yr (scenario 2)
Bulk Density	48.136 kg/ft^3
Fraction Organic Carbon	0.02
Adsorption (K_d)[d]	0.13 ft^3/kg
Biodegradation	0[e]

Notes:

cm/s	Centimeters per second
ft^3/kg	Cubic feet per kilogram
ft/yr	Foot per year
kg/ft^3	Kilograms per cubic foot
a	Value used to maximize the amount of lead that could be dissolved in groundwater
b,c	Values set to 0 because lead does not partition into vapor phase
d	Value obtained from EPA (1996)
e	Value set to 0 to prevent biodegradation and maximize amount of lead leached to groundwater

Two scenarios were modeled. Scenario (1) involved using the infiltration rate (1 foot/year [ft/yr]) used in the IR Site 1 contaminant fate and transport model. Scenario (2) involved using an infiltration rate equal to 50 percent (0.5 ft/yr) of the infiltration rate used in the IR Site 1 contaminant fate and transport model. The 50 percent infiltration rate was intended to simulate the reduction in infiltraion at IR Site 1 resulting from construction and grading of a soil cap. For each scenario, contaminant concentrations in groundwater beneath the pistol range were modeled over a 30-year period.

The VLEACH modeling predicted the following concentrations of lead in groundwater beneath the pistol range after 30 years of leaching:

	Lead Concentration (μg/L)
Scenario 1	140
Scenario 2	44

The AWQC for lead to protect aquatic receptors in saltwater is 8.1 μg/L. Therefore, taking into account the factor of 10 dilution (NOAA 1999), lead levels below 81 μg/L would not adversely impact aquatic receptors in the bay. The VLEACH modeling results indicate that under present conditions, levels of lead leaching from the pistol range could adversely impact aquatic receptors. However, the VLEACH results also indicate that capping and grading would reduce the lead infiltration to levels that would not adversely impact aquatic receptors. The VLEACH output files are presented below.

REFERENCES

Tetra Tech EM, Inc. (TtEMI). 1999. "OU-3 Draft Final Remedial Investigation Report." Draft. January 29.

U.S. Environmental Protection Agency (EPA). 1996. "Soil Screening Guidance Document: Technical Background Document." EPA/540/R-95/128. May.

EPA. 1997. "VLEACH - A One-Dimensional Finite Difference Vadose Zone Leaching Model." Version 2.2.

VLEACH OUTPUT FILES

SATURATED GW CONCENTRATION (underneath columns) DUE TO MIXING
SOIL COLUMNS ARE ARRANGED PARALLEL TO GROUND-WATER DIRECTION
Liquid Phase Concentrations [mg/L]

Column 1 [mg/L]

TIME	Cw,vad(in)	Caq,aqui(in)	Cmx(out)
0.10	0.72701E-04	0.00000E+00	0.72538E-04
0.20	0.14881E-03	0.00000E+00	0.14847E-03
0.30	0.22830E-03	0.00000E+00	0.22779E-03
0.40	0.31118E-03	0.00000E+00	0.31049E-03
0.50	0.39744E-03	0.00000E+00	0.39655E-03
0.60	0.48707E-03	0.00000E+00	0.48598E-03
0.70	0.58006E-03	0.00000E+00	0.57875E-03
0.80	0.67639E-03	0.00000E+00	0.67487E-03
0.90	0.77607E-03	0.00000E+00	0.77433E-03
1.00	0.87908E-03	0.00000E+00	0.87711E-03
1.10	0.98542E-03	0.00000E+00	0.98321E-03
1.20	0.10951E-02	0.00000E+00	0.10926E-02
1.30	0.12080E-02	0.00000E+00	0.12053E-02
1.40	0.13243E-02	0.00000E+00	0.13213E-02
1.50	0.14439E-02	0.00000E+00	0.14406E-02
1.60	0.15667E-02	0.00000E+00	0.15632E-02
1.70	0.16928E-02	0.00000E+00	0.16890E-02
1.80	0.18222E-02	0.00000E+00	0.18181E-02
1.90	0.19548E-02	0.00000E+00	0.19504E-02
2.00	0.20907E-02	0.00000E+00	0.20860E-02
2.10	0.22298E-02	0.00000E+00	0.22248E-02
2.20	0.23722E-02	0.00000E+00	0.23669E-02
2.30	0.25178E-02	0.00000E+00	0.25121E-02
2.40	0.26666E-02	0.00000E+00	0.26606E-02
2.50	0.28186E-02	0.00000E+00	0.28123E-02
2.60	0.29738E-02	0.00000E+00	0.29672E-02
2.70	0.31322E-02	0.00000E+00	0.31252E-02
2.80	0.32938E-02	0.00000E+00	0.32864E-02
2.90	0.34586E-02	0.00000E+00	0.34508E-02
3.00	0.36265E-02	0.00000E+00	0.36184E-02
3.10	0.37976E-02	0.00000E+00	0.37891E-02
3.20	0.39718E-02	0.00000E+00	0.39629E-02
3.30	0.41492E-02	0.00000E+00	0.41399E-02
3.40	0.43298E-02	0.00000E+00	0.43200E-02
3.50	0.45134E-02	0.00000E+00	0.45033E-02
3.60	0.47002E-02	0.00000E+00	0.46896E-02
3.70	0.48900E-02	0.00000E+00	0.48791E-02
3.80	0.50830E-02	0.00000E+00	0.50716E-02
3.90	0.52791E-02	0.00000E+00	0.52672E-02
4.00	0.54782E-02	0.00000E+00	0.54659E-02
4.10	0.56805E-02	0.00000E+00	0.56677E-02

4.20	0.58858E-02	0.00000E+00	0.58726E-02
4.30	0.60941E-02	0.00000E+00	0.60805E-02
4.40	0.63056E-02	0.00000E+00	0.62914E-02
4.50	0.65200E-02	0.00000E+00	0.65054E-02
4.60	0.67375E-02	0.00000E+00	0.67224E-02
4.70	0.69581E-02	0.00000E+00	0.69425E-02
4.80	0.71816E-02	0.00000E+00	0.71655E-02
4.90	0.74082E-02	0.00000E+00	0.73916E-02
5.00	0.76378E-02	0.00000E+00	0.76206E-02
5.10	0.78704E-02	0.00000E+00	0.78527E-02
5.20	0.81059E-02	0.00000E+00	0.80877E-02
5.30	0.83445E-02	0.00000E+00	0.83257E-02
5.40	0.85860E-02	0.00000E+00	0.85667E-02
5.50	0.88305E-02	0.00000E+00	0.88107E-02
5.60	0.90780E-02	0.00000E+00	0.90576E-02
5.70	0.93284E-02	0.00000E+00	0.93074E-02
5.80	0.95817E-02	0.00000E+00	0.95602E-02
5.90	0.98380E-02	0.00000E+00	0.98159E-02
6.00	0.10097E-01	0.00000E+00	0.10075E-01
6.10	0.10359E-01	0.00000E+00	0.10336E-01
6.20	0.10624E-01	0.00000E+00	0.10601E-01
6.30	0.10892E-01	0.00000E+00	0.10868E-01
6.40	0.11163E-01	0.00000E+00	0.11138E-01
6.50	0.11437E-01	0.00000E+00	0.11411E-01
6.60	0.11714E-01	0.00000E+00	0.11687E-01
6.70	0.11993E-01	0.00000E+00	0.11966E-01
6.80	0.12275E-01	0.00000E+00	0.12248E-01
6.90	0.12561E-01	0.00000E+00	0.12532E-01
7.00	0.12849E-01	0.00000E+00	0.12820E-01
7.10	0.13140E-01	0.00000E+00	0.13110E-01
7.20	0.13433E-01	0.00000E+00	0.13403E-01
7.30	0.13730E-01	0.00000E+00	0.13699E-01
7.40	0.14029E-01	0.00000E+00	0.13998E-01
7.50	0.14332E-01	0.00000E+00	0.14299E-01
7.60	0.14637E-01	0.00000E+00	0.14604E-01
7.70	0.14944E-01	0.00000E+00	0.14911E-01
7.80	0.15255E-01	0.00000E+00	0.15221E-01
7.90	0.15568E-01	0.00000E+00	0.15533E-01
8.00	0.15885E-01	0.00000E+00	0.15849E-01
8.10	0.16204E-01	0.00000E+00	0.16167E-01
8.20	0.16525E-01	0.00000E+00	0.16488E-01
8.30	0.16850E-01	0.00000E+00	0.16812E-01
8.40	0.17177E-01	0.00000E+00	0.17138E-01
8.50	0.17507E-01	0.00000E+00	0.17467E-01
8.60	0.17839E-01	0.00000E+00	0.17799E-01
8.70	0.18175E-01	0.00000E+00	0.18134E-01
8.80	0.18513E-01	0.00000E+00	0.18471E-01
8.90	0.18854E-01	0.00000E+00	0.18811E-01

9.00	0.19197E-01	0.00000E+00	0.19154E-01
9.10	0.19544E-01	0.00000E+00	0.19500E-01
9.20	0.19892E-01	0.00000E+00	0.19848E-01
9.30	0.20244E-01	0.00000E+00	0.20199E-01
9.40	0.20598E-01	0.00000E+00	0.20552E-01
9.50	0.20955E-01	0.00000E+00	0.20908E-01
9.60	0.21315E-01	0.00000E+00	0.21267E-01
9.70	0.21677E-01	0.00000E+00	0.21628E-01
9.80	0.22042E-01	0.00000E+00	0.21992E-01
9.90	0.22409E-01	0.00000E+00	0.22359E-01
10.00	0.22779E-01	0.00000E+00	0.22728E-01
10.10	0.23152E-01	0.00000E+00	0.23100E-01
10.20	0.23528E-01	0.00000E+00	0.23475E-01
10.30	0.23906E-01	0.00000E+00	0.23852E-01
10.40	0.24286E-01	0.00000E+00	0.24232E-01
10.50	0.24669E-01	0.00000E+00	0.24614E-01
10.60	0.25055E-01	0.00000E+00	0.24999E-01
10.70	0.25443E-01	0.00000E+00	0.25386E-01
10.80	0.25834E-01	0.00000E+00	0.25776E-01
10.90	0.26228E-01	0.00000E+00	0.26169E-01
11.00	0.26624E-01	0.00000E+00	0.26564E-01
11.10	0.27022E-01	0.00000E+00	0.26962E-01
11.20	0.27424E-01	0.00000E+00	0.27362E-01
11.30	0.27827E-01	0.00000E+00	0.27765E-01
11.40	0.28233E-01	0.00000E+00	0.28170E-01
11.50	0.28642E-01	0.00000E+00	0.28578E-01
11.60	0.29053E-01	0.00000E+00	0.28988E-01
11.70	0.29467E-01	0.00000E+00	0.29401E-01
11.80	0.29883E-01	0.00000E+00	0.29816E-01
11.90	0.30302E-01	0.00000E+00	0.30234E-01
12.00	0.30723E-01	0.00000E+00	0.30654E-01
12.10	0.31147E-01	0.00000E+00	0.31077E-01
12.20	0.31573E-01	0.00000E+00	0.31502E-01
12.30	0.32002E-01	0.00000E+00	0.31930E-01
12.40	0.32433E-01	0.00000E+00	0.32360E-01
12.50	0.32866E-01	0.00000E+00	0.32793E-01
12.60	0.33302E-01	0.00000E+00	0.33228E-01
12.70	0.33741E-01	0.00000E+00	0.33665E-01
12.80	0.34182E-01	0.00000E+00	0.34105E-01
12.90	0.34625E-01	0.00000E+00	0.34547E-01
13.00	0.35071E-01	0.00000E+00	0.34992E-01
13.10	0.35519E-01	0.00000E+00	0.35439E-01
13.20	0.35969E-01	0.00000E+00	0.35889E-01
13.30	0.36422E-01	0.00000E+00	0.36341E-01
13.40	0.36878E-01	0.00000E+00	0.36795E-01
13.50	0.37335E-01	0.00000E+00	0.37252E-01
13.60	0.37795E-01	0.00000E+00	0.37711E-01
13.70	0.38258E-01	0.00000E+00	0.38172E-01

13.80	0.38723E-01	0.00000E+00	0.38636E-01
13.90	0.39190E-01	0.00000E+00	0.39102E-01
14.00	0.39659E-01	0.00000E+00	0.39570E-01
14.10	0.40131E-01	0.00000E+00	0.40041E-01
14.20	0.40605E-01	0.00000E+00	0.40514E-01
14.30	0.41082E-01	0.00000E+00	0.40990E-01
14.40	0.41561E-01	0.00000E+00	0.41468E-01
14.50	0.42042E-01	0.00000E+00	0.41948E-01
14.60	0.42525E-01	0.00000E+00	0.42430E-01
14.70	0.43011E-01	0.00000E+00	0.42915E-01
14.80	0.43499E-01	0.00000E+00	0.43402E-01
14.90	0.43990E-01	0.00000E+00	0.43891E-01
15.00	0.44482E-01	0.00000E+00	0.44383E-01
15.10	0.44977E-01	0.00000E+00	0.44876E-01
15.20	0.45474E-01	0.00000E+00	0.45372E-01
15.30	0.45974E-01	0.00000E+00	0.45871E-01
15.40	0.46476E-01	0.00000E+00	0.46371E-01
15.50	0.46980E-01	0.00000E+00	0.46874E-01
15.60	0.47486E-01	0.00000E+00	0.47379E-01
15.70	0.47994E-01	0.00000E+00	0.47887E-01
15.80	0.48505E-01	0.00000E+00	0.48396E-01
15.90	0.49018E-01	0.00000E+00	0.48908E-01
16.00	0.49533E-01	0.00000E+00	0.49422E-01
16.10	0.50050E-01	0.00000E+00	0.49938E-01
16.20	0.50570E-01	0.00000E+00	0.50457E-01
16.30	0.51092E-01	0.00000E+00	0.50977E-01
16.40	0.51616E-01	0.00000E+00	0.51500E-01
16.50	0.52142E-01	0.00000E+00	0.52025E-01
16.60	0.52670E-01	0.00000E+00	0.52552E-01
16.70	0.53201E-01	0.00000E+00	0.53081E-01
16.80	0.53733E-01	0.00000E+00	0.53613E-01
16.90	0.54268E-01	0.00000E+00	0.54146E-01
17.00	0.54805E-01	0.00000E+00	0.54682E-01
17.10	0.55344E-01	0.00000E+00	0.55220E-01
17.20	0.55886E-01	0.00000E+00	0.55760E-01
17.30	0.56429E-01	0.00000E+00	0.56302E-01
17.40	0.56974E-01	0.00000E+00	0.56847E-01
17.50	0.57522E-01	0.00000E+00	0.57393E-01
17.60	0.58072E-01	0.00000E+00	0.57942E-01
17.70	0.58624E-01	0.00000E+00	0.58492E-01
17.80	0.59178E-01	0.00000E+00	0.59045E-01
17.90	0.59734E-01	0.00000E+00	0.59600E-01
18.00	0.60292E-01	0.00000E+00	0.60157E-01
18.10	0.60852E-01	0.00000E+00	0.60716E-01
18.20	0.61415E-01	0.00000E+00	0.61277E-01
18.30	0.61979E-01	0.00000E+00	0.61840E-01
18.40	0.62545E-01	0.00000E+00	0.62405E-01
18.50	0.63114E-01	0.00000E+00	0.62972E-01

18.60	0.63685E-01	0.00000E+00	0.63542E-01
18.70	0.64257E-01	0.00000E+00	0.64113E-01
18.80	0.64832E-01	0.00000E+00	0.64686E-01
18.90	0.65409E-01	0.00000E+00	0.65262E-01
19.00	0.65987E-01	0.00000E+00	0.65839E-01
19.10	0.66568E-01	0.00000E+00	0.66419E-01
19.20	0.67151E-01	0.00000E+00	0.67000E-01
19.30	0.67736E-01	0.00000E+00	0.67584E-01
19.40	0.68323E-01	0.00000E+00	0.68169E-01
19.50	0.68911E-01	0.00000E+00	0.68757E-01
19.60	0.69502E-01	0.00000E+00	0.69346E-01
19.70	0.70095E-01	0.00000E+00	0.69938E-01
19.80	0.70690E-01	0.00000E+00	0.70531E-01
19.90	0.71287E-01	0.00000E+00	0.71127E-01
20.00	0.71885E-01	0.00000E+00	0.71724E-01
20.10	0.72486E-01	0.00000E+00	0.72323E-01
20.20	0.73089E-01	0.00000E+00	0.72925E-01
20.30	0.73693E-01	0.00000E+00	0.73528E-01
20.40	0.74300E-01	0.00000E+00	0.74133E-01
20.50	0.74908E-01	0.00000E+00	0.74740E-01
20.60	0.75519E-01	0.00000E+00	0.75349E-01
20.70	0.76131E-01	0.00000E+00	0.75960E-01
20.80	0.76745E-01	0.00000E+00	0.76573E-01
20.90	0.77361E-01	0.00000E+00	0.77188E-01
21.00	0.77979E-01	0.00000E+00	0.77804E-01
21.10	0.78599E-01	0.00000E+00	0.78423E-01
21.20	0.79221E-01	0.00000E+00	0.79044E-01
21.30	0.79845E-01	0.00000E+00	0.79666E-01
21.40	0.80471E-01	0.00000E+00	0.80290E-01
21.50	0.81098E-01	0.00000E+00	0.80916E-01
21.60	0.81728E-01	0.00000E+00	0.81544E-01
21.70	0.82359E-01	0.00000E+00	0.82174E-01
21.80	0.82992E-01	0.00000E+00	0.82806E-01
21.90	0.83627E-01	0.00000E+00	0.83439E-01
22.00	0.84264E-01	0.00000E+00	0.84075E-01
22.10	0.84903E-01	0.00000E+00	0.84712E-01
22.20	0.85543E-01	0.00000E+00	0.85351E-01
22.30	0.86186E-01	0.00000E+00	0.85992E-01
22.40	0.86830E-01	0.00000E+00	0.86635E-01
22.50	0.87476E-01	0.00000E+00	0.87280E-01
22.60	0.88124E-01	0.00000E+00	0.87926E-01
22.70	0.88773E-01	0.00000E+00	0.88574E-01
22.80	0.89425E-01	0.00000E+00	0.89224E-01
22.90	0.90078E-01	0.00000E+00	0.89876E-01
23.00	0.90733E-01	0.00000E+00	0.90530E-01
23.10	0.91390E-01	0.00000E+00	0.91185E-01
23.20	0.92049E-01	0.00000E+00	0.91842E-01
23.30	0.92709E-01	0.00000E+00	0.92501E-01

23.40	0.93371E-01	0.00000E+00	0.93162E-01
23.50	0.94035E-01	0.00000E+00	0.93824E-01
23.60	0.94701E-01	0.00000E+00	0.94488E-01
23.70	0.95368E-01	0.00000E+00	0.95154E-01
23.80	0.96038E-01	0.00000E+00	0.95822E-01
23.90	0.96709E-01	0.00000E+00	0.96491E-01
24.00	0.97381E-01	0.00000E+00	0.97163E-01
24.10	0.98056E-01	0.00000E+00	0.97836E-01
24.20	0.98732E-01	0.00000E+00	0.98510E-01
24.30	0.99410E-01	0.00000E+00	0.99187E-01
24.40	0.10009E+00	0.00000E+00	0.99865E-01
24.50	0.10077E+00	0.00000E+00	0.10054E+00
24.60	0.10145E+00	0.00000E+00	0.10123E+00
24.70	0.10214E+00	0.00000E+00	0.10191E+00
24.80	0.10282E+00	0.00000E+00	0.10259E+00
24.90	0.10351E+00	0.00000E+00	0.10328E+00
25.00	0.10420E+00	0.00000E+00	0.10397E+00
25.10	0.10489E+00	0.00000E+00	0.10466E+00
25.20	0.10559E+00	0.00000E+00	0.10535E+00
25.30	0.10628E+00	0.00000E+00	0.10604E+00
25.40	0.10698E+00	0.00000E+00	0.10674E+00
25.50	0.10768E+00	0.00000E+00	0.10743E+00
25.60	0.10838E+00	0.00000E+00	0.10813E+00
25.70	0.10908E+00	0.00000E+00	0.10883E+00
25.80	0.10978E+00	0.00000E+00	0.10953E+00
25.90	0.11049E+00	0.00000E+00	0.11024E+00
26.00	0.11119E+00	0.00000E+00	0.11094E+00
26.10	0.11190E+00	0.00000E+00	0.11165E+00
26.20	0.11261E+00	0.00000E+00	0.11236E+00
26.30	0.11332E+00	0.00000E+00	0.11307E+00
26.40	0.11403E+00	0.00000E+00	0.11378E+00
26.50	0.11475E+00	0.00000E+00	0.11449E+00
26.60	0.11546E+00	0.00000E+00	0.11520E+00
26.70	0.11618E+00	0.00000E+00	0.11592E+00
26.80	0.11690E+00	0.00000E+00	0.11664E+00
26.90	0.11762E+00	0.00000E+00	0.11736E+00
27.00	0.11834E+00	0.00000E+00	0.11808E+00
27.10	0.11907E+00	0.00000E+00	0.11880E+00
27.20	0.11979E+00	0.00000E+00	0.11952E+00
27.30	0.12052E+00	0.00000E+00	0.12025E+00
27.40	0.12125E+00	0.00000E+00	0.12098E+00
27.50	0.12198E+00	0.00000E+00	0.12170E+00
27.60	0.12271E+00	0.00000E+00	0.12243E+00
27.70	0.12344E+00	0.00000E+00	0.12317E+00
27.80	0.12418E+00	0.00000E+00	0.12390E+00
27.90	0.12491E+00	0.00000E+00	0.12463E+00
28.00	0.12565E+00	0.00000E+00	0.12537E+00
28.10	0.12639E+00	0.00000E+00	0.12611E+00

28.20	0.12713E+00	0.00000E+00	0.12685E+00
28.30	0.12787E+00	0.00000E+00	0.12759E+00
28.40	0.12862E+00	0.00000E+00	0.12833E+00
28.50	0.12936E+00	0.00000E+00	0.12907E+00
28.60	0.13011E+00	0.00000E+00	0.12982E+00
28.70	0.13086E+00	0.00000E+00	0.13056E+00
28.80	0.13161E+00	0.00000E+00	0.13131E+00
28.90	0.13236E+00	0.00000E+00	0.13206E+00
29.00	0.13311E+00	0.00000E+00	0.13281E+00
29.10	0.13387E+00	0.00000E+00	0.13356E+00
29.20	0.13462E+00	0.00000E+00	0.13432E+00
29.30	0.13538E+00	0.00000E+00	0.13507E+00
29.40	0.13614E+00	0.00000E+00	0.13583E+00
29.50	0.13690E+00	0.00000E+00	0.13659E+00
29.60	0.13766E+00	0.00000E+00	0.13735E+00
29.70	0.13842E+00	0.00000E+00	0.13811E+00
29.80	0.13919E+00	0.00000E+00	0.13887E+00
29.90	0.13995E+00	0.00000E+00	0.13964E+00
30.00	0.14072E+00	0.00000E+00	0.14040E+00

SATURATED GW CONCENTRATION (underneath columns) DUE TO MIXING
SOIL COLUMNS ARE ARRANGED PARALLEL TO GROUND-WATER DIRECTION
Liquid Phase Concentrations [mg/L]

50% Infiltration Rate

Soil Column 1 [mg/L]

TIME	Cw,vad(in)	Caq,aqui(in)	Cmx(out)
0.10	0.35925E-04	0.00000E+00	0.35764E-04
0.20	0.72702E-04	0.00000E+00	0.72376E-04
0.30	0.11033E-03	0.00000E+00	0.10984E-03
0.40	0.14881E-03	0.00000E+00	0.14814E-03
0.50	0.18813E-03	0.00000E+00	0.18729E-03
0.60	0.22830E-03	0.00000E+00	0.22728E-03
0.70	0.26932E-03	0.00000E+00	0.26812E-03
0.80	0.31119E-03	0.00000E+00	0.30979E-03
0.90	0.35389E-03	0.00000E+00	0.35231E-03
1.00	0.39745E-03	0.00000E+00	0.39567E-03
1.10	0.44184E-03	0.00000E+00	0.43986E-03
1.20	0.48707E-03	0.00000E+00	0.48489E-03
1.30	0.53315E-03	0.00000E+00	0.53076E-03
1.40	0.58006E-03	0.00000E+00	0.57746E-03
1.50	0.62781E-03	0.00000E+00	0.62500E-03
1.60	0.67640E-03	0.00000E+00	0.67337E-03
1.70	0.72582E-03	0.00000E+00	0.72257E-03
1.80	0.77608E-03	0.00000E+00	0.77260E-03
1.90	0.82717E-03	0.00000E+00	0.82346E-03
2.00	0.87909E-03	0.00000E+00	0.87515E-03
2.10	0.93184E-03	0.00000E+00	0.92767E-03
2.20	0.98543E-03	0.00000E+00	0.98101E-03
2.30	0.10398E-02	0.00000E+00	0.10352E-02
2.40	0.10951E-02	0.00000E+00	0.10902E-02
2.50	0.11512E-02	0.00000E+00	0.11460E-02
2.60	0.12080E-02	0.00000E+00	0.12026E-02
2.70	0.12658E-02	0.00000E+00	0.12601E-02
2.80	0.13243E-02	0.00000E+00	0.13184E-02
2.90	0.13837E-02	0.00000E+00	0.13775E-02
3.00	0.14439E-02	0.00000E+00	0.14374E-02
3.10	0.15049E-02	0.00000E+00	0.14981E-02
3.20	0.15667E-02	0.00000E+00	0.15597E-02
3.30	0.16294E-02	0.00000E+00	0.16221E-02
3.40	0.16928E-02	0.00000E+00	0.16852E-02
3.50	0.17571E-02	0.00000E+00	0.17492E-02
3.60	0.18222E-02	0.00000E+00	0.18140E-02
3.70	0.18881E-02	0.00000E+00	0.18797E-02
3.80	0.19548E-02	0.00000E+00	0.19461E-02
3.90	0.20224E-02	0.00000E+00	0.20133E-02

4.00	0.20907E-02	0.00000E+00	0.20814E-02
4.10	0.21599E-02	0.00000E+00	0.21502E-02
4.20	0.22299E-02	0.00000E+00	0.22199E-02
4.30	0.23006E-02	0.00000E+00	0.22903E-02
4.40	0.23722E-02	0.00000E+00	0.23616E-02
4.50	0.24446E-02	0.00000E+00	0.24337E-02
4.60	0.25178E-02	0.00000E+00	0.25065E-02
4.70	0.25918E-02	0.00000E+00	0.25802E-02
4.80	0.26666E-02	0.00000E+00	0.26547E-02
4.90	0.27422E-02	0.00000E+00	0.27299E-02
5.00	0.28186E-02	0.00000E+00	0.28060E-02
5.10	0.28958E-02	0.00000E+00	0.28829E-02
5.20	0.29739E-02	0.00000E+00	0.29605E-02
5.30	0.30527E-02	0.00000E+00	0.30390E-02
5.40	0.31323E-02	0.00000E+00	0.31182E-02
5.50	0.32127E-02	0.00000E+00	0.31983E-02
5.60	0.32938E-02	0.00000E+00	0.32791E-02
5.70	0.33758E-02	0.00000E+00	0.33607E-02
5.80	0.34586E-02	0.00000E+00	0.34431E-02
5.90	0.35422E-02	0.00000E+00	0.35263E-02
6.00	0.36265E-02	0.00000E+00	0.36103E-02
6.10	0.37117E-02	0.00000E+00	0.36951E-02
6.20	0.37976E-02	0.00000E+00	0.37806E-02
6.30	0.38844E-02	0.00000E+00	0.38670E-02
6.40	0.39719E-02	0.00000E+00	0.39541E-02
6.50	0.40602E-02	0.00000E+00	0.40420E-02
6.60	0.41493E-02	0.00000E+00	0.41307E-02
6.70	0.42391E-02	0.00000E+00	0.42201E-02
6.80	0.43298E-02	0.00000E+00	0.43104E-02
6.90	0.44212E-02	0.00000E+00	0.44014E-02
7.00	0.45134E-02	0.00000E+00	0.44932E-02
7.10	0.46064E-02	0.00000E+00	0.45858E-02
7.20	0.47002E-02	0.00000E+00	0.46791E-02
7.30	0.47947E-02	0.00000E+00	0.47733E-02
7.40	0.48901E-02	0.00000E+00	0.48682E-02
7.50	0.49862E-02	0.00000E+00	0.49638E-02
7.60	0.50830E-02	0.00000E+00	0.50603E-02
7.70	0.51807E-02	0.00000E+00	0.51575E-02
7.80	0.52791E-02	0.00000E+00	0.52555E-02
7.90	0.53783E-02	0.00000E+00	0.53542E-02
8.00	0.54783E-02	0.00000E+00	0.54537E-02
8.10	0.55790E-02	0.00000E+00	0.55540E-02
8.20	0.56805E-02	0.00000E+00	0.56551E-02
8.30	0.57828E-02	0.00000E+00	0.57569E-02
8.40	0.58858E-02	0.00000E+00	0.58595E-02
8.50	0.59896E-02	0.00000E+00	0.59628E-02
8.60	0.60942E-02	0.00000E+00	0.60669E-02
8.70	0.61995E-02	0.00000E+00	0.61717E-02

8.80	0.63056E-02	0.00000E+00	0.62774E-02
8.90	0.64125E-02	0.00000E+00	0.63837E-02
9.00	0.65201E-02	0.00000E+00	0.64909E-02
9.10	0.66285E-02	0.00000E+00	0.65988E-02
9.20	0.67376E-02	0.00000E+00	0.67074E-02
9.30	0.68475E-02	0.00000E+00	0.68168E-02
9.40	0.69581E-02	0.00000E+00	0.69270E-02
9.50	0.70695E-02	0.00000E+00	0.70379E-02
9.60	0.71817E-02	0.00000E+00	0.71495E-02
9.70	0.72946E-02	0.00000E+00	0.72619E-02
9.80	0.74083E-02	0.00000E+00	0.73751E-02
9.90	0.75227E-02	0.00000E+00	0.74890E-02
10.00	0.76378E-02	0.00000E+00	0.76036E-02
10.10	0.77538E-02	0.00000E+00	0.77190E-02
10.20	0.78704E-02	0.00000E+00	0.78352E-02
10.30	0.79878E-02	0.00000E+00	0.79520E-02
10.40	0.81060E-02	0.00000E+00	0.80697E-02
10.50	0.82249E-02	0.00000E+00	0.81880E-02
10.60	0.83445E-02	0.00000E+00	0.83072E-02
10.70	0.84649E-02	0.00000E+00	0.84270E-02
10.80	0.85861E-02	0.00000E+00	0.85476E-02
10.90	0.87079E-02	0.00000E+00	0.86689E-02
11.00	0.88306E-02	0.00000E+00	0.87910E-02
11.10	0.89539E-02	0.00000E+00	0.89138E-02
11.20	0.90780E-02	0.00000E+00	0.90374E-02
11.30	0.92029E-02	0.00000E+00	0.91616E-02
11.40	0.93284E-02	0.00000E+00	0.92866E-02
11.50	0.94547E-02	0.00000E+00	0.94124E-02
11.60	0.95818E-02	0.00000E+00	0.95389E-02
11.70	0.97096E-02	0.00000E+00	0.96661E-02
11.80	0.98381E-02	0.00000E+00	0.97940E-02
11.90	0.99673E-02	0.00000E+00	0.99227E-02
12.00	0.10097E-01	0.00000E+00	0.10052E-01
12.10	0.10228E-01	0.00000E+00	0.10182E-01
12.20	0.10359E-01	0.00000E+00	0.10313E-01
12.30	0.10492E-01	0.00000E+00	0.10445E-01
12.40	0.10624E-01	0.00000E+00	0.10577E-01
12.50	0.10758E-01	0.00000E+00	0.10710E-01
12.60	0.10892E-01	0.00000E+00	0.10844E-01
12.70	0.11027E-01	0.00000E+00	0.10978E-01
12.80	0.11163E-01	0.00000E+00	0.11113E-01
12.90	0.11300E-01	0.00000E+00	0.11249E-01
13.00	0.11437E-01	0.00000E+00	0.11386E-01
13.10	0.11575E-01	0.00000E+00	0.11523E-01
13.20	0.11714E-01	0.00000E+00	0.11661E-01
13.30	0.11853E-01	0.00000E+00	0.11800E-01
13.40	0.11993E-01	0.00000E+00	0.11939E-01
13.50	0.12134E-01	0.00000E+00	0.12080E-01

13.60	0.12275E-01	0.00000E+00	0.12221E-01
13.70	0.12418E-01	0.00000E+00	0.12362E-01
13.80	0.12561E-01	0.00000E+00	0.12504E-01
13.90	0.12704E-01	0.00000E+00	0.12647E-01
14.00	0.12849E-01	0.00000E+00	0.12791E-01
14.10	0.12994E-01	0.00000E+00	0.12936E-01
14.20	0.13140E-01	0.00000E+00	0.13081E-01
14.30	0.13286E-01	0.00000E+00	0.13227E-01
14.40	0.13433E-01	0.00000E+00	0.13373E-01
14.50	0.13581E-01	0.00000E+00	0.13521E-01
14.60	0.13730E-01	0.00000E+00	0.13669E-01
14.70	0.13879E-01	0.00000E+00	0.13817E-01
14.80	0.14029E-01	0.00000E+00	0.13967E-01
14.90	0.14180E-01	0.00000E+00	0.14117E-01
15.00	0.14332E-01	0.00000E+00	0.14267E-01
15.10	0.14484E-01	0.00000E+00	0.14419E-01
15.20	0.14637E-01	0.00000E+00	0.14571E-01
15.30	0.14790E-01	0.00000E+00	0.14724E-01
15.40	0.14945E-01	0.00000E+00	0.14878E-01
15.50	0.15099E-01	0.00000E+00	0.15032E-01
15.60	0.15255E-01	0.00000E+00	0.15187E-01
15.70	0.15411E-01	0.00000E+00	0.15342E-01
15.80	0.15569E-01	0.00000E+00	0.15499E-01
15.90	0.15726E-01	0.00000E+00	0.15656E-01
16.00	0.15885E-01	0.00000E+00	0.15814E-01
16.10	0.16044E-01	0.00000E+00	0.15972E-01
16.20	0.16204E-01	0.00000E+00	0.16131E-01
16.30	0.16364E-01	0.00000E+00	0.16291E-01
16.40	0.16525E-01	0.00000E+00	0.16451E-01
16.50	0.16687E-01	0.00000E+00	0.16612E-01
16.60	0.16850E-01	0.00000E+00	0.16774E-01
16.70	0.17013E-01	0.00000E+00	0.16937E-01
16.80	0.17177E-01	0.00000E+00	0.17100E-01
16.90	0.17342E-01	0.00000E+00	0.17264E-01
17.00	0.17507E-01	0.00000E+00	0.17429E-01
17.10	0.17673E-01	0.00000E+00	0.17594E-01
17.20	0.17840E-01	0.00000E+00	0.17760E-01
17.30	0.18007E-01	0.00000E+00	0.17926E-01
17.40	0.18175E-01	0.00000E+00	0.18094E-01
17.50	0.18344E-01	0.00000E+00	0.18262E-01
17.60	0.18513E-01	0.00000E+00	0.18430E-01
17.70	0.18683E-01	0.00000E+00	0.18600E-01
17.80	0.18854E-01	0.00000E+00	0.18769E-01
17.90	0.19025E-01	0.00000E+00	0.18940E-01
18.00	0.19197E-01	0.00000E+00	0.19111E-01
18.10	0.19370E-01	0.00000E+00	0.19283E-01
18.20	0.19544E-01	0.00000E+00	0.19456E-01
18.30	0.19718E-01	0.00000E+00	0.19629E-01

18.40	0.19893E-01	0.00000E+00	0.19803E-01
18.50	0.20068E-01	0.00000E+00	0.19978E-01
18.60	0.20244E-01	0.00000E+00	0.20153E-01
18.70	0.20421E-01	0.00000E+00	0.20329E-01
18.80	0.20598E-01	0.00000E+00	0.20506E-01
18.90	0.20777E-01	0.00000E+00	0.20683E-01
19.00	0.20955E-01	0.00000E+00	0.20861E-01
19.10	0.21135E-01	0.00000E+00	0.21040E-01
19.20	0.21315E-01	0.00000E+00	0.21219E-01
19.30	0.21496E-01	0.00000E+00	0.21399E-01
19.40	0.21677E-01	0.00000E+00	0.21580E-01
19.50	0.21859E-01	0.00000E+00	0.21761E-01
19.60	0.22042E-01	0.00000E+00	0.21943E-01
19.70	0.22225E-01	0.00000E+00	0.22126E-01
19.80	0.22410E-01	0.00000E+00	0.22309E-01
19.90	0.22594E-01	0.00000E+00	0.22493E-01
20.00	0.22780E-01	0.00000E+00	0.22678E-01
20.10	0.22966E-01	0.00000E+00	0.22863E-01
20.20	0.23152E-01	0.00000E+00	0.23049E-01
20.30	0.23340E-01	0.00000E+00	0.23235E-01
20.40	0.23528E-01	0.00000E+00	0.23422E-01
20.50	0.23717E-01	0.00000E+00	0.23610E-01
20.60	0.23906E-01	0.00000E+00	0.23799E-01
20.70	0.24096E-01	0.00000E+00	0.23988E-01
20.80	0.24286E-01	0.00000E+00	0.24178E-01
20.90	0.24478E-01	0.00000E+00	0.24368E-01
21.00	0.24670E-01	0.00000E+00	0.24559E-01
21.10	0.24862E-01	0.00000E+00	0.24751E-01
21.20	0.25055E-01	0.00000E+00	0.24943E-01
21.30	0.25249E-01	0.00000E+00	0.25136E-01
21.40	0.25444E-01	0.00000E+00	0.25330E-01
21.50	0.25639E-01	0.00000E+00	0.25524E-01
21.60	0.25835E-01	0.00000E+00	0.25719E-01
21.70	0.26031E-01	0.00000E+00	0.25914E-01
21.80	0.26228E-01	0.00000E+00	0.26111E-01
21.90	0.26426E-01	0.00000E+00	0.26307E-01
22.00	0.26624E-01	0.00000E+00	0.26505E-01
22.10	0.26823E-01	0.00000E+00	0.26703E-01
22.20	0.27023E-01	0.00000E+00	0.26902E-01
22.30	0.27223E-01	0.00000E+00	0.27101E-01
22.40	0.27424E-01	0.00000E+00	0.27301E-01
22.50	0.27625E-01	0.00000E+00	0.27502E-01
22.60	0.27828E-01	0.00000E+00	0.27703E-01
22.70	0.28030E-01	0.00000E+00	0.27905E-01
22.80	0.28234E-01	0.00000E+00	0.28107E-01
22.90	0.28438E-01	0.00000E+00	0.28310E-01
23.00	0.28642E-01	0.00000E+00	0.28514E-01
23.10	0.28848E-01	0.00000E+00	0.28718E-01

23.20	0.29054E-01	0.00000E+00	0.28924E-01
23.30	0.29260E-01	0.00000E+00	0.29129E-01
23.40	0.29467E-01	0.00000E+00	0.29335E-01
23.50	0.29675E-01	0.00000E+00	0.29542E-01
23.60	0.29884E-01	0.00000E+00	0.29750E-01
23.70	0.30093E-01	0.00000E+00	0.29958E-01
23.80	0.30302E-01	0.00000E+00	0.30167E-01
23.90	0.30513E-01	0.00000E+00	0.30376E-01
24.00	0.30724E-01	0.00000E+00	0.30586E-01
24.10	0.30935E-01	0.00000E+00	0.30797E-01
24.20	0.31147E-01	0.00000E+00	0.31008E-01
24.30	0.31360E-01	0.00000E+00	0.31220E-01
24.40	0.31573E-01	0.00000E+00	0.31432E-01
24.50	0.31788E-01	0.00000E+00	0.31645E-01
24.60	0.32002E-01	0.00000E+00	0.31859E-01
24.70	0.32217E-01	0.00000E+00	0.32073E-01
24.80	0.32433E-01	0.00000E+00	0.32288E-01
24.90	0.32650E-01	0.00000E+00	0.32503E-01
25.00	0.32867E-01	0.00000E+00	0.32720E-01
25.10	0.33084E-01	0.00000E+00	0.32936E-01
25.20	0.33303E-01	0.00000E+00	0.33154E-01
25.30	0.33522E-01	0.00000E+00	0.33372E-01
25.40	0.33741E-01	0.00000E+00	0.33590E-01
25.50	0.33961E-01	0.00000E+00	0.33809E-01
25.60	0.34182E-01	0.00000E+00	0.34029E-01
25.70	0.34403E-01	0.00000E+00	0.34249E-01
25.80	0.34625E-01	0.00000E+00	0.34470E-01
25.90	0.34848E-01	0.00000E+00	0.34692E-01
26.00	0.35071E-01	0.00000E+00	0.34914E-01
26.10	0.35295E-01	0.00000E+00	0.35137E-01
26.20	0.35519E-01	0.00000E+00	0.35360E-01
26.30	0.35744E-01	0.00000E+00	0.35584E-01
26.40	0.35970E-01	0.00000E+00	0.35809E-01
26.50	0.36196E-01	0.00000E+00	0.36034E-01
26.60	0.36423E-01	0.00000E+00	0.36260E-01
26.70	0.36650E-01	0.00000E+00	0.36486E-01
26.80	0.36878E-01	0.00000E+00	0.36713E-01
26.90	0.37107E-01	0.00000E+00	0.36940E-01
27.00	0.37336E-01	0.00000E+00	0.37168E-01
27.10	0.37565E-01	0.00000E+00	0.37397E-01
27.20	0.37796E-01	0.00000E+00	0.37627E-01
27.30	0.38027E-01	0.00000E+00	0.37856E-01
27.40	0.38258E-01	0.00000E+00	0.38087E-01
27.50	0.38490E-01	0.00000E+00	0.38318E-01
27.60	0.38723E-01	0.00000E+00	0.38550E-01
27.70	0.38956E-01	0.00000E+00	0.38782E-01
27.80	0.39190E-01	0.00000E+00	0.39015E-01
27.90	0.39425E-01	0.00000E+00	0.39248E-01

28.00	0.39660E-01	0.00000E+00	0.39482E-01
28.10	0.39895E-01	0.00000E+00	0.39717E-01
28.20	0.40132E-01	0.00000E+00	0.39952E-01
28.30	0.40369E-01	0.00000E+00	0.40188E-01
28.40	0.40606E-01	0.00000E+00	0.40424E-01
28.50	0.40844E-01	0.00000E+00	0.40661E-01
28.60	0.41082E-01	0.00000E+00	0.40898E-01
28.70	0.41322E-01	0.00000E+00	0.41136E-01
28.80	0.41561E-01	0.00000E+00	0.41375E-01
28.90	0.41802E-01	0.00000E+00	0.41614E-01
29.00	0.42042E-01	0.00000E+00	0.41854E-01
29.10	0.42284E-01	0.00000E+00	0.42094E-01
29.20	0.42526E-01	0.00000E+00	0.42335E-01
29.30	0.42769E-01	0.00000E+00	0.42577E-01
29.40	0.43012E-01	0.00000E+00	0.42819E-01
29.50	0.43256E-01	0.00000E+00	0.43062E-01
29.60	0.43500E-01	0.00000E+00	0.43305E-01
29.70	0.43745E-01	0.00000E+00	0.43549E-01
29.80	0.43990E-01	0.00000E+00	0.43793E-01
29.90	0.44236E-01	0.00000E+00	0.44038E-01
30.00	0.44483E-01	0.00000E+00	0.44284E-01