



**FINAL
LIVINGSTON RAIL YARD
REMEDIAL INVESTIGATION REPORT**

Submitted to:

**Montana Department of Health
and Environmental Sciences**
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Submittal Date:

March 10, 1994

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- Figure 6.4 Windrose, Livingston - 4th Quarter 1990
- Figure 6.5 Windrose, Livingston - 1991
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LIST OF FIGURES (cont.)

Figure 6.7 Computed Linear Regression

Figure 6.8 January/February 1993 Indoor Air Sample Locations



Section 3.0 Soil Investigation

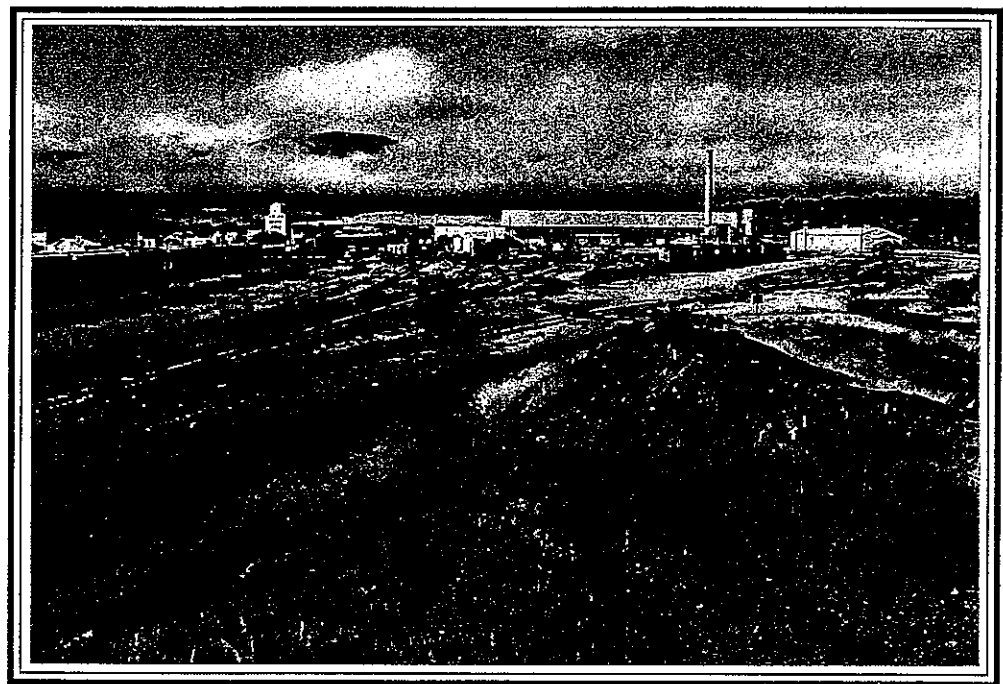
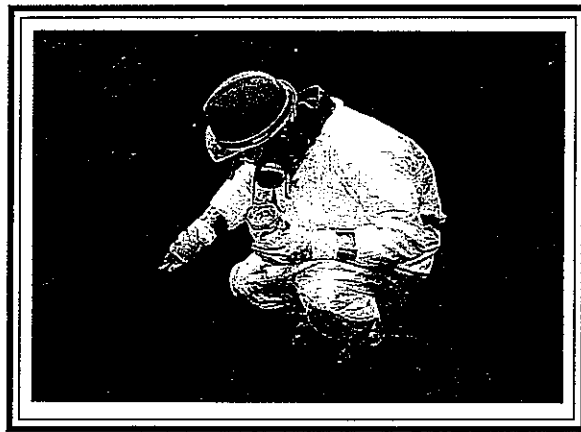


TABLE 3.8

**Summary of Analytical Results
Soil Gas Survey**

**Soil Section
Livingston Rail Yard Remedial Investigation**

SAMPLE NUMBER	LOCATION	ANALYTICAL METHOD*	DETECTED ANALYTES (mg/m ³)
140101-SG-001	Electric Shop SG-1	E	cis-1,2-Dichloroethene 1.3 Tetrachloroethene 420 Trichloroethene 2.3
140101-SG-002	Electric Shop SG-2	E	cis-1,2-Dichloroethene 6.0 Tetrachloroethene 1900 1,1,1-Trichloroethane 0.65 Trichloroethene 48
140101-SG-003	Electric Shop SG-3	E	cis-1,2-Dichloroethene 5.6 Tetrachloroethene 1100 Trichloroethene 17
140101-SG-004	Electric Shop SG-4	E	cis-1,2-Dichloroethene 36 Tetrachloroethene 1200 Trichloroethene 15
140101-SG-005	Electric Shop SG-5	E	cis-1,2-Dichloroethene 2.3 Tetrachloroethene 420 Trichloroethene 10
140101-SG-006	Drain Line SG-6	E	cis-1,2-Dichloroethene 1.1 Tetrachloroethene 1300 Trichloroethene 1.5
140101-SG-007	Drain Line SG-7	E	Tetrachloroethene 1.3
140101-SG-008	Drain Line SG-8	E	Tetrachloroethene 0.50
140101-SG-009	Drain Line SG-9	E	N/D
140101-SG-010	MRL Shop Door SG-10	E	N/D
140101-SG-011	MRL Shop Door SG-11	E	N/D
140101-SG-012	Drain Line SG-12	E	N/D
140101-SG-013	Drain Line SG-13	E	N/D
140101-SG-014	Drain Line SG-14	E	N/D
140101-SG-015	Electric Shop SG-15	E	N/D
140101-SG-017	Drain Line SG-17	E	cis-1,2-Dichloroethene 1.1 Tetrachloroethene 110 Trichloroethene 2.6
140101-SG-018	Drain Line SG-18	E	cis-1,2-Dichloroethene 2.0 Tetrachloroethene 530 Trichloroethene 11
140101-SG-019	Electric Shop SG-19	E	Tetrachloroethene 42

TABLE 3.8 cont.

SAMPLE NUMBER	LOCATION	ANALYTICAL METHOD*	DETECTED ANALYTES (mg/m ³)
140101-SG-020	Drain Line SG-20	E	cis-1,2-Dichloroethene 100 Tetrachloroethene 840 Trichloroethene 49
140101-SG-021	Drain Line SG-21	E	cis-1,2-Dichloroethene 2.0 Tetrachloroethene 140 Trichloroethene 4.1
140101-SG-022	Drain Line SG-22	E	cis-1,2-Dichloroethene 0.50 Tetrachloroethene 60 Trichloroethene 1.3
140101-SG-023	Drain Line SG-23	E	Tetrachloroethene 16
140101-SG-024	Drain Line SG-24	E	Tetrachloroethene 4.6
140101-SG-025	Drain Line SG-25	E	Tetrachloroethene 28
140101-SG-026	Drain Line SG-26	E	Tetrachloroethene 4.6
140101-SG-027	Drain Line SG-27	E	Tetrachloroethene 22
140101-SG-028	Drain Line SG-28	E	Tetrachloroethene 22
140101-SG-029	Drain Line SG-29	E	Tetrachloroethene 140 Trichloroethene 4.2
140101-SG-030	Overflow Pond Area SG-30	E	N/D
140101-SG-031	Overflow Pond Area SG-31	E	cis-1,2-Dichloroethene 1.3
140101-SG-032	Overflow Pond Area SG-32	E	N/D
140101-SG-033	Overflow Pond Area SG-33	E	N/D
140101-SG-034	Overflow Pond Area SG-34	E	N/D
140101-SG-035	Overflow Pond Area SG-35	E	Tetrachloroethene 0.98
140101-SG-036	Overflow Pond Area SG-36	E	Tetrachloroethene 1.4
140101-SG-037	Overflow Pond Area SG-37	E	N/D
140101-SG-162	Wash Rack Area SG-162	A	N/D
140101-SG-163	Wash Rack Area SG-163	A	N/D
140101-SG-164	Locomotive Shop SG-164	A	N/D
140101-SG-170	Drain Line SG-170	E	N/D
140101-SG-172	Drain Line SG-172	E	1,1,1-Trichloroethane 0.92

TABLE 3.8 cont.

SAMPLE NUMBER	LOCATION	ANALYTICAL METHOD*	DETECTED ANALYTES (mg/m3)
140101-SG-173	Drain Line SG-173	E	N/D
140101-SG-174	Drain Line SG-174	E	N/D
140101-SG-176	Drain Line SG-176	E	N/D
140101-SG-177	Drain Line SG-177	E	1,1,1-Trichloroethane 0.90 Trichloroethene 3.1
140101-SG-178	Drain Line SG-178	E	N/D
140101-SG-179	Drain Line SG-179	E	N/D
140101-SG-180	Drain Line SG-180	E	Chlorobenzene 92 2-Chlorotoluene 4.5

* Refers to EPA analytical method

TABLE 3.16

Summary of Analytical Results
Cinder Pile Area

Soil Section
Livingston Rail Yard Remedial Investigation

SAMPLE NUMBER	LOCATION	SAMPLE DEPTHS	ANALYTICAL METHOD*	CONSTITUENTS DETECTED			
				Organics	Total Priority Metals	EP Tox Metals or TCLP Metals	
140101-SO-112	TP-46	15'	F	TPH	<10 ppm	N/A	N/A
140101-SO-113	TP-47	11'	F	TPH	155 ppm	N/A	N/A
140101-SO-114	TP-48	13.5'	A,B,C,D,F,H	TPH	935 ppm	Barium 210 ppm Chromium 24 ppm Lead 13 ppm	N/D
140101-SO-115	TP-49	15'	A,B,C,D,F,H	TPH	2425 ppm	Barium 220 ppm Chromium 24 ppm Lead 14 ppm	N/D
				Chlorobenzene	3.4 ppm		
				1,2-Dichlorobenzene	2.1 ppm		
				1,3-Dichlorobenzene	1.6 ppm		
				1,4-Dichlorobenzene	18 ppm		
				Ethylbenzene	0.045 ppm		
				Xylenes	0.040 ppm		
				Fluorene	2.0 ppm		
				Naphthalene	2.6 ppm		
				Phenanthrene	4.8 ppm		
140101-SO-116	TP-50	14'	F	TPH	375 ppm	N/A	N/A
140101-SO-117	TP-51	10.5'	F	TPH	<10 ppm	N/A	N/A
140101-SO-118	TP-52	13'	F	TPH	135 ppm	N/A	N/A
140101-SO-119	TP-53	13.5'	F	TPH	20 ppm	N/A	N/A
140101-SO-120	TP-54	13.5'	A,B,C,D,F,H	TPH	<10 ppm	Barium 88 ppm Chromium 15 ppm Lead 5 ppm	N/D
140101-SO-121	TP-55	12'	F	TPH	<10 ppm	N/A	N/A
140101-SO-122	TP-56	10.5'	A,B,C,D,F,H	TPH	70 ppm	Barium 96 ppm Chromium 10 ppm	N/D
140101-SO-123	TP-57	15'	F	TPH	<10 ppm	N/A	N/A
140101-SO-124	TP-58	13.5'	F	TPH	<10 ppm	N/A	N/A
140101-SO-125	TP-59	15'	F	TPH	<10 ppm	N/A	N/A
140101-SO-126	TP-60	15'	F	TPH	180 ppm	N/A	N/A
140101-SO-127	TP-61	15'	F	TPH	110 ppm	N/A	N/A
140101-SO-128	TP-62	14'	F	TPH	105 ppm	N/A	N/A
140101-SO-145	TP-77	14'	F	TPH	10 ppm	N/A	N/A
140101-SO-146	TP-77 dup.	14'	F	TPH	20 ppm	N/A	N/A
140101-SO-147	TP-78	13'	F	TPH	<10 ppm	N/A	N/A
140101-SL-011	TE-12	4.5'	A,B,C,F,H	TPH	130000 ppm	Arsenic 0.16 ppm Barium 300 ppm Cadmium 10.2 ppm Chromium 117 ppm Lead 737 ppm Mercury 0.51 ppm Selenium 0.01 ppm Silver 4.5 ppm	N/D
				2-Chlorotoluene	69 ppm		
				Cis-1,2-Dichloroethene	2.8 ppm		
				Xylenes	4.1 ppm		
				Fluorene	17 ppm		
				Naphthalene	15 ppm		
				Phenanthrene	80 ppm		

TABLE 3.16 cont.

SAMPLE NUMBER	LOCATION	SAMPLE DEPTHS	ANALYTICAL METHOD*	CONSTITUENTS DETECTED			
				Organics		Total Priority Metals	EP Tox Metals or TCLP Metals
140101-SL-012	TE-2	5.5'	A,B,C,F,H	TPH	190 ppm	Arsenic 0.03 ppm Barium 338 ppm Cadmium 0.2 ppm Chromium 3.3 ppm Lead 29.2 ppm Mercury 0.06 ppm Selenium 0.01 ppm	N/D
140101-SO-004	CP-1	12'	A,B,C,D,F,H	TPH	27100 ppm	Barium 300 ppm Chromium 7 ppm Lead 43 ppm	N/D
				2-Chlorotoluene	43 ppm		
				1,2-Dichlorobenzene	1.1 ppm		
				Cis-1,2-Dichloroethene	1.1 ppm		
				Fluorene	7.5 ppm		
				Fluoranthene	1.5 ppm		
				Naphthalene	4.0 ppm		
				Phenanthrene	40 ppm		
				o-Xylene	1.1 ppm		
140101-SO-005	CP-2A	12'	A,B,C,D,F,H	TPH	20100 ppm	Barium 310 ppm Chromium 12 ppm Lead 400 ppm	N/D
				2-Chlorotoluene	30 ppm		
				1,2-Dichlorobenzene	0.63 ppm		
				Cis-1,2-Dichloroethene	0.43 ppm		
				Fluorene	6.7 ppm		
				Naphthalene	6.9 ppm		
				Phenanthrene	14 ppm		
				o-Xylene	1.4 ppm		
140101-SO-006	CP-3	13'	A,B,C,D,F,H	TPH	16900 ppm	Barium 430 ppm Chromium 8 ppm Lead 51 ppm	N/D
				2-Chlorotoluene	0.027 ppm		
				Bromodichloromethane	0.025 ppm		
				Cis-1,2-Dichloroethene	0.21 ppm		
				Fluorene	1.7 ppm		
				Phenanthrene	2.4 ppm		
140101-SO-007	CP-2	12'	F	TPH	10900 ppm	N/A	N/A
140101-SO-314	VE-7	11' - 13'	E	2-Chlorotoluene	6 ppm	N/A	N/A
140101-SO-315	VE-7	25'	E	Chlorobenzene	0.0064 ppm	N/A	N/A
				2-Chlorotoluene	0.017 ppm		
				1,2-Dichlorobenzene	0.078 ppm		
				1,3-Dichlorobenzene	0.0087 ppm		
				1,4-Dichlorobenzene	0.050 ppm		
140101-SO-316	VE-8	10'	E	Chlorobenzene	19 ppm	N/A	N/A
				2-Chlorotoluene	14 ppm		
				1,2-Dichlorobenzene	3.6 ppm		
				1,3-Dichlorobenzene	0.72 ppm		
				1,4-Dichlorobenzene	4.4 ppm		
140101-SO-317	VE-8	10'	E	Chlorobenzene	0.9 ppm	N/A	N/A
				2-Chlorotoluene	0.64 ppm		
				1,2-Dichlorobenzene	0.66 ppm		
				1,4-Dichlorobenzene	0.44 ppm		

TABLE 3.16 cont.

SAMPLE NUMBER	LOCATION	SAMPLE DEPTHS	ANALYTICAL METHOD*	CONSTITUENTS DETECTED		
				Organics	Total Priority Metals	EP Tox Metals or TCLP Metals
140101-SO-318	VE-9	10'	E	Chlorobenzene 0.23 ppm 1,4-Dichlorobenzene 0.37 ppm	N/A	N/A
140101-SO-319	VE-9	25'	E	N/D	N/A	N/A
140101-SO-320	VE-10	10'	E	N/D	N/A	N/A
140101-SO-321	VE-10	25'	E	Methylene Chloride 0.0072 ppm	N/A	N/A
140101-SO-330	VE-14	5'	A,F	TPH 8900 ppm 2-Chlorotoluene 7 ppm	N/A	N/A
140101-SO-331	VE-14	15'	A,F	TPH 3400 ppm	N/A	N/A
140101-SO-332	VE-14	25'	A,F	TPH 215 ppm 2-Chlorotoluene 0.040 ppm	N/A	N/A
140101-SO-333	VE-15	10'	A,F	TPH 4000 ppm 2-Chlorotoluene 1.2 ppm	N/A	N/A
140101-SO-334	VE-15	20'	A	2-Chlorotoluene 0.34 ppm Tetrachloroethene 0.063 ppm	N/A	N/A
140101-SO-335	VE-16	15'	A,F	TPH 2100 ppm 2-Chlorotoluene 0.043 ppm Tetrachloroethene 0.017 ppm	N/A	N/A
140101-SO-336	VE-16	25'	A	Chlorobenzene 0.021 ppm 2-Chlorotoluene 0.48 ppm 4-Chlorotoluene 0.0095 ppm 1,3-Dichlorobenzene 0.0055 ppm 1,4-Dichlorobenzene 0.023 ppm Tetrachloroethene 0.014 ppm	N/A	N/A
140101-SO-337	VE-17	10'	A,F	TPH 2100 ppm 2-Chlorotoluene 1.4 ppm Tetrachloroethene 0.033 ppm	N/A	N/A
140101-SO-338	VE-17	20'	A	2-Chlorotoluene 0.028 ppm Tetrachloroethene 0.011 ppm	N/A	N/A

* Refers to EPA analytical method

TABLE 3.22

**Summary of Analytical Results
Miscellaneous Investigation Areas**

**Soil Section
Livingston Rail Yard Remedial Investigation**

SAMPLE NUMBER	LOCATION	SAMPLE DEPTHS	ANALYTICAL METHOD*	CONSTITUENTS DETECTED	
				Organics	Total Priority Metals
140101-SO-241	Turntable SO-241	2'	A,C,F,H	TPH 50 ppm Methylene Chloride 0.016 ppm Fluoranthene 0.69 ppm Phenanthrene 0.38 ppm Pyrene 0.58 ppm Benzo(b)fluoranthene 0.39 ppm	Barium 150 ppm Chromium 12 ppm Lead 16 ppm
140101-SO-242	Turntable SO-242	3'	A,F	TPH 50 ppm Tetrachloroethene 0.006 ppm	N/A
140101-SO-243	Turntable SO-243	2.5'	A,C,F	TPH 530 ppm	N/A
140101-SO-244	Lube-Oil Building SO-244	4.5'	A,C,F,H	TPH <10 ppm Methylene Chloride 0.028 ppm	Barium 160 ppm Chromium 22 ppm Lead 10 ppm
140101-SO-245	Lube-Oil Building SO-245	4'	A,C,F	TPH <10 ppm	N/A
140101-SO-246	Lube-Oil Building SO-246	3'	A,F	TPH 35 ppm	N/A
140101-SO-247 Dup of 246	Lube-Oil Building SO-247	3'	A,F	TPH 40 ppm	N/A
140101-SO-268	East of Yellowstone River TP-155C	4.5'	A,F	TPH 35 ppm Methylene Chloride 0.008 ppm	N/A
140101-SO-383	Transfer Pit TP-176	3'	E	Tetrachloroethene 0.007 ppm	N/A
140101-SO-387	North Ditch TP-179A	3'	E	N/D	N/A
140101-SO-388	Transfer Pit TP-180A	4'	E	Tetrachloroethene 0.210 ppm Trichloroethene 0.005 ppm	N/A
140101-SO-389	Transfer Pit TP-180B	4'	E	N/D	N/A
140101-SO-390	Transfer Pit TP-180C	4'	E	N/D	N/A
140101-SO-391 Dup of 390	Transfer Pit TP-180C	4'	E	Tetrachloroethene 0.0055 ppm	N/A

* Refers to EPA analytical method

TABLE 3.23

**Summary of Analytical Results
Miscellaneous Areas Potentially Affected by LRY Operations**

**Soil Section
Livingston Rail Yard Remedial Investigation**

SAMPLE NUMBER	LOCATION	SAMPLE DEPTHS	ANALYTICAL METHOD*	CONSTITUENTS DETECTED	
				TPH	Organics
140101-SO-143	TP-75	13'	F	TPH	<10 ppm
140101-SO-144	TP-76	12'	F	TPH	<10 ppm
140101-SO-148	TP-79	13'	F	TPH	<10 ppm
140101-SO-149	TP-80	11'	F	TPH	<10 ppm
140101-SO-150	TP-81	12'	F	TPH	<10 ppm
140101-SO-151	TP-82	13'	F	TPH	<10 ppm
140101-SO-152	TP-83	13'	F	TPH	<10 ppm

* Refers to EPA analytical method

TABLE 3.27

Summary of Analytical Results
Surficial Soil Investigation Area A

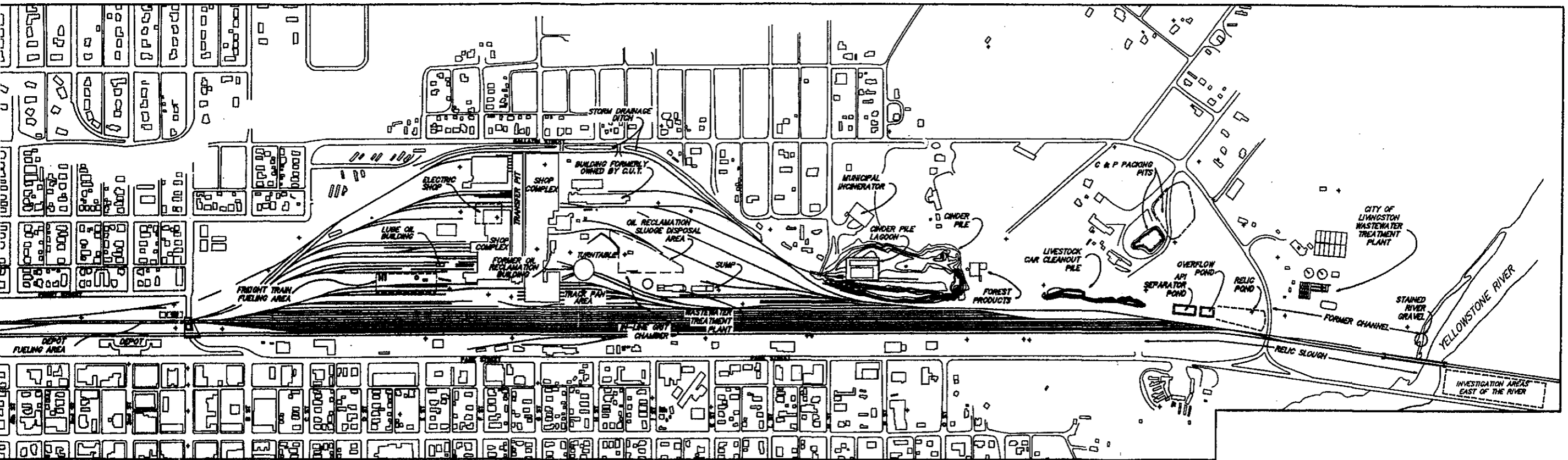
Soil Section
Livingston Rail Yard Remedial Investigation

SAMPLE NUMBER	LOCATION	SAMPLE POINT COORDINATES	ANALYTICAL METHOD*	CONSTITUENTS DETECTED			
				Organics (ug/kg)		Total Priority Metals (mg/kg)	
140101-SU-007	A-2	N 4997.0 E 5517.9	A,H,M,N	Methylene Chloride	6.8	Arsenic	9
				Trichloroethene	6.6	Barium	500
				Fluoranthene	720	Cadmium	1
				Phenanthrene	1500	Chromium	7
				Pyrene	660	Lead	34
140101-SU-004	A-3	N 5016.6 E 5369.2	A,H,M,N	Methylene Chloride	6	Arsenic	22
				Tetrachloroethene	7.9	Barium	490
				Benzo(a)anthracene	1100	Cadmium	4
				Benzo(a)pyrene	1200	Chromium	85
				Benzo(b)fluoranthene	2600	Lead	1250
				Benzo(ghi)perylene	900		
				Chrysene	1400		
				Fluoranthene	2500		
				Indeno(1,2,3-cd)pyrene	860		
				Pyrene	2300		
140101-SU-005 Dup. of SU-004	A-3	N 5016.6 E 5369.2	A,H,M,N	Methylene Chloride	6.5	Arsenic	12
				Tetrachloroethene	7.2	Barium	570
				Benzo(a)anthracene	730	Cadmium	5
				Benzo(a)pyrene	770	Chromium	43
				Benzo(b)fluoranthene	1800	Lead	920
				Chrysene	900		
				Fluoranthene	1700		
				Pyrene	1600		
140101-SU-009	A-4	N 5165.3 E 5388.8	A,H,M,N	N/D		Arsenic	7
						Barium	460
						Cadmium	7
						Chromium	87
						Lead	390
140101-SU-001	A-5	N 4926.6 E 4903.5	A,,H,M,N	Tetrachloroethene	10.7	Arsenic	10
						Barium	480
						Chromium	27
						Lead	71
140101-SU-008	A-8	N 5145.7 E 5537.5	A,H,M,N	Methylene Chloride	30	Barium	770
				Benzo(b)fluoranthene	1000	Cadmium	2
				Chrysene	670	Chromium	24
				Fluoranthene	1200	Lead	150
				Phenanthrene	670		
				Pyrene	960		

TABLE 3.27 cont.

SAMPLE NUMBER	LOCATION	SAMPLE POINT COORDINATES	ANALYTICAL METHOD*	CONSTITUENTS DETECTED			
				Organics (ug/kg)	Total Priority Metals (mg/kg)		
140101-SU-010	A-9	N 5314.0 E 5408.3	A,H,M,N	N/D			
140101-SU-002	CDM-A-1	N 4935.8 E 5143.8	A,H,M,N	Methylene Chloride	8.9	Arsenic	6
				Tetrachloroethene	8.3	Barium	640
						Cadmium	2
						Chromium	41
140101-SU-003	CDM-A-2	N 4928.1 E 5273.6	A,H,M,N			Lead	140
				Benzo(b)fluoranthene	29000	Arsenic	17
				Fluoranthene	27000	Barium	400
				Pyrene	27000	Cadmium	14
				Chromium	140		
				Lead	1020		

* Refers to EPA analytical method

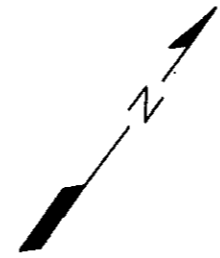


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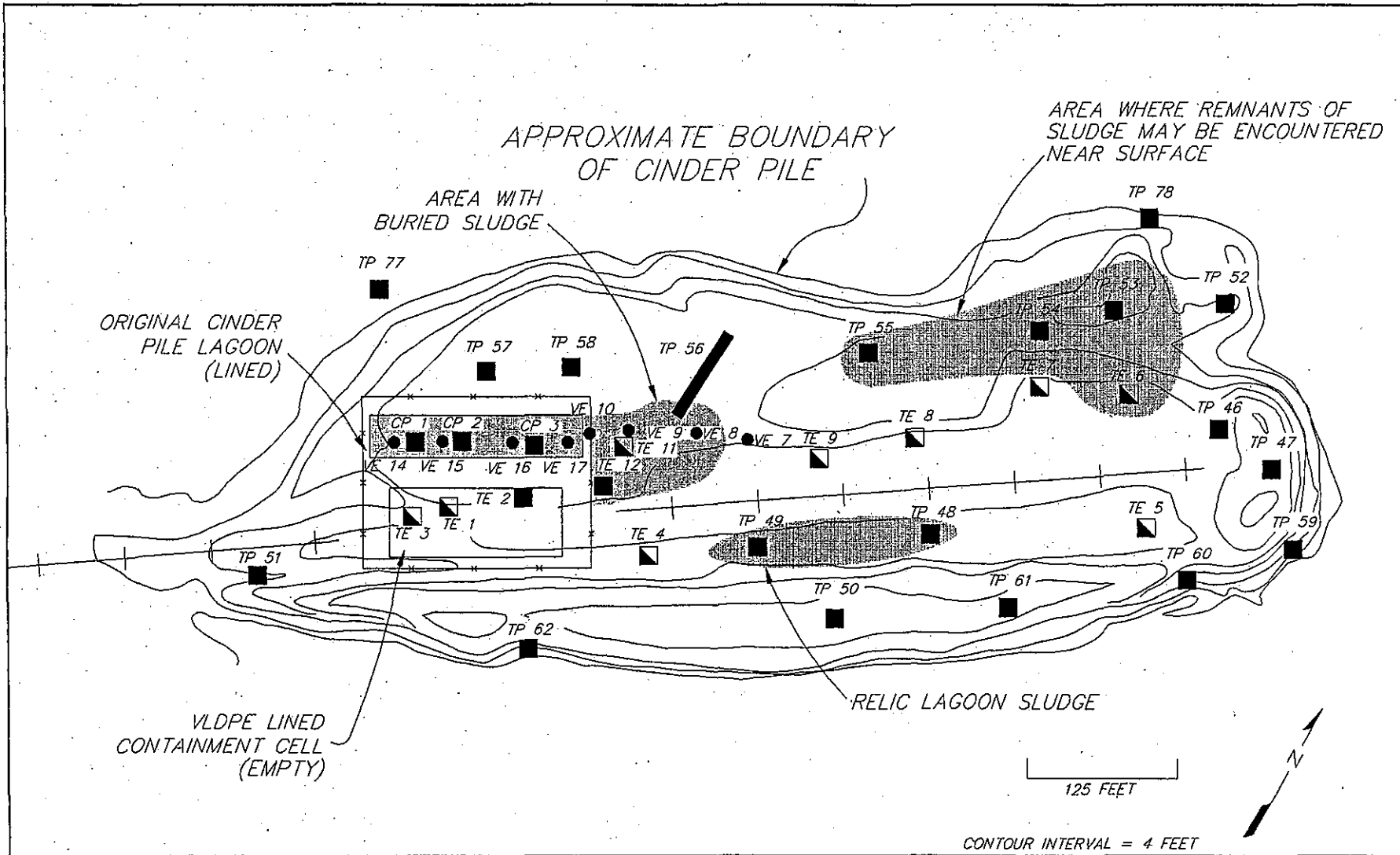


SCALE IN FEET

IF THIS LINE DOES NOT MEASURE ONE INCH - DRAWING IS NOT TO SCALE



BURLINGTON NORTHERN	REMEDIAL INVESTIGATION REPORT LIVINGSTON RAIL YARD LIVINGSTON, MONTANA	SUBSURFACE SOIL INVESTIGATION AREAS LIVINGSTON RAIL YARD	
ENVIROCON, INC.	AutoCAD FILE: FSR-011.DWG	1/24/94	FIGURE 3.1

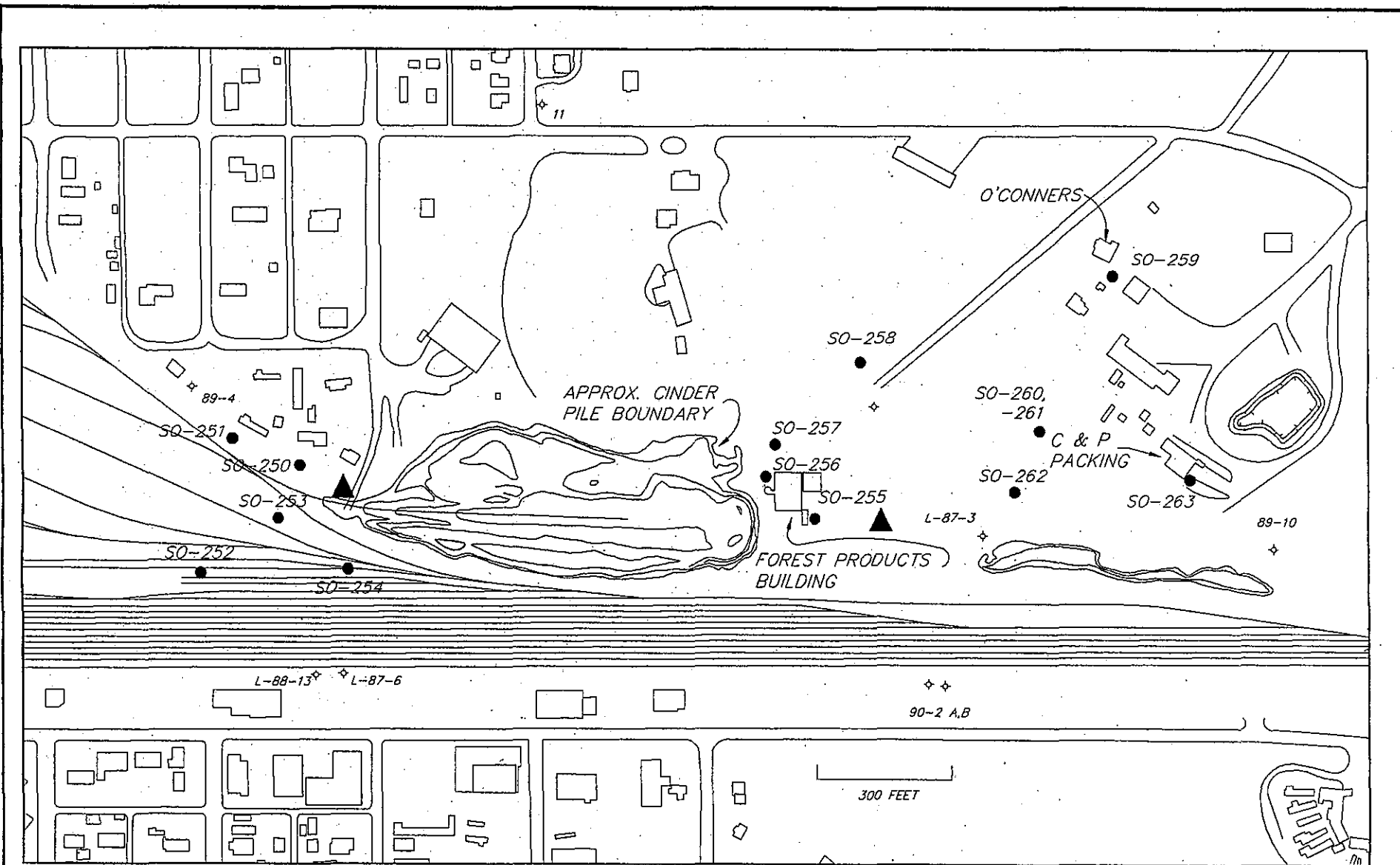


SYMBOL LEGEND	
■	TEST PIT & SOIL SAMPLE LOCATIONS
◼	TEST PIT ONLY
●	CONTAMINATED AREA
—x—x—	FENCE
●	VAPOR EXTRACTION WELL & SOIL SAMPLE LOCATIONS

BURLINGTON NORTHERN
ENVIROCON, INC.

LIVINGSTON RAIL YARD
AutoCAD FILE: PJ23.DWG_D

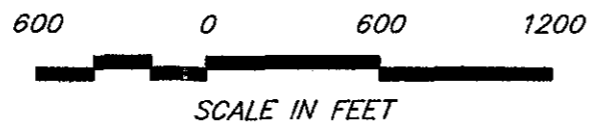
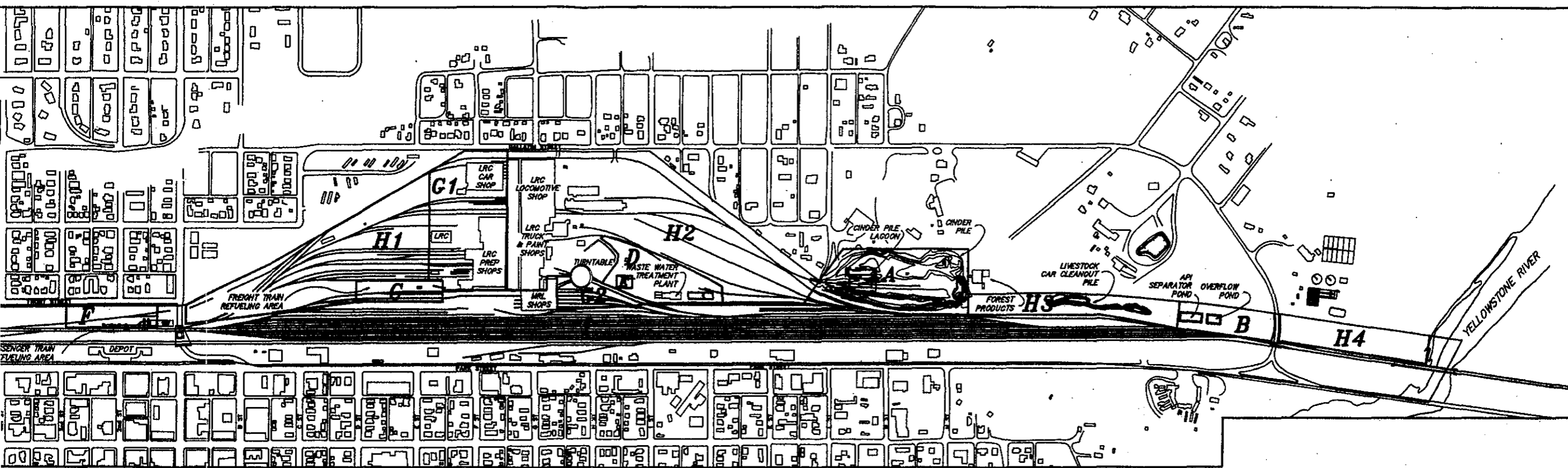
REMAINING SLUDGES ON THE CINDER PILE
10/05/92
FIGURE 3.16



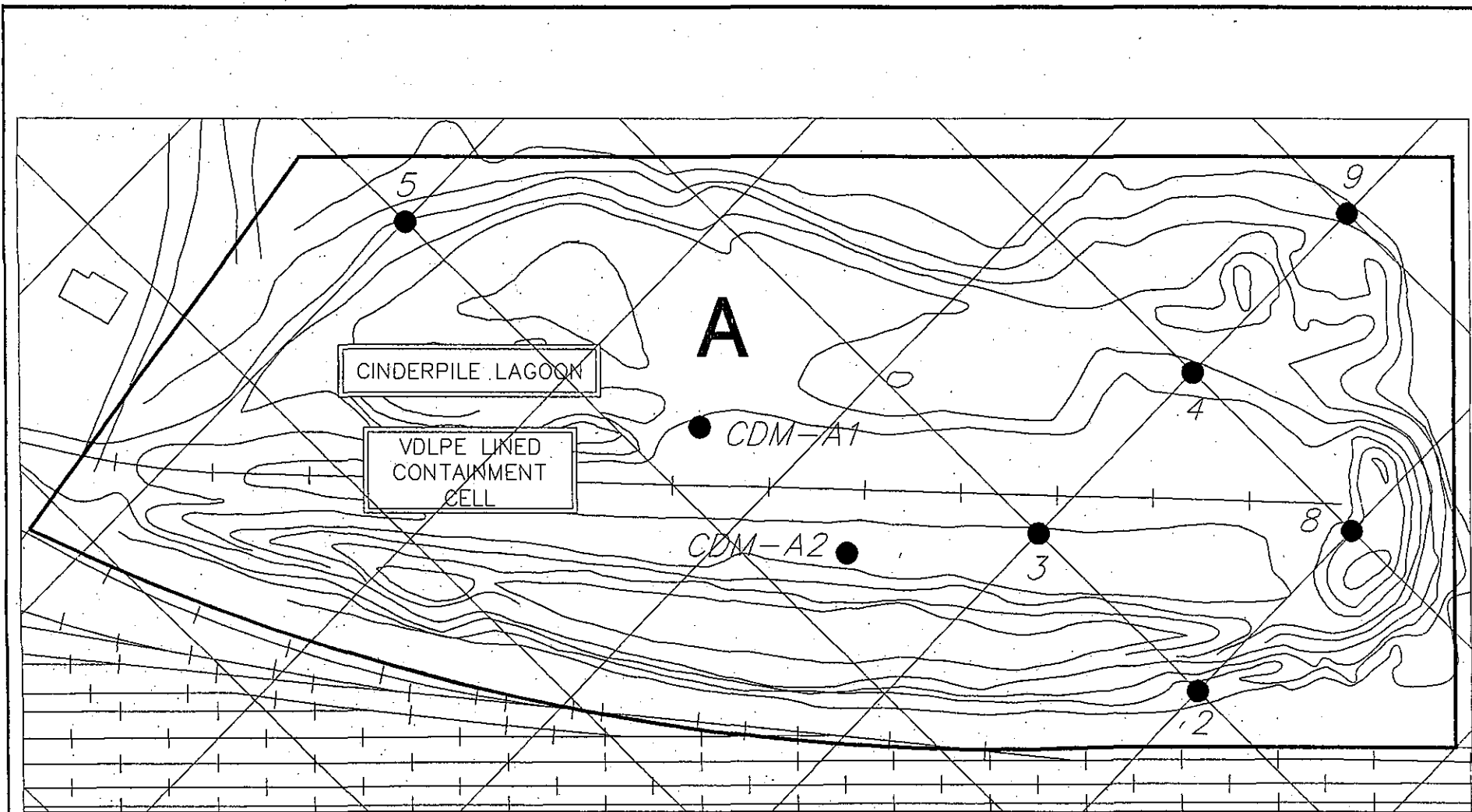
SYMBOL LEGEND

- ▲ AIR MONITORING LOCATION
- ◆ EXISTING WELL
- SOIL SAMPLE LOCATIONS

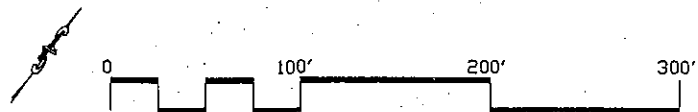
BURLINGTON NORTHERN	SOIL SECTION LIVINGSTON RAIL YARD REMEDIAL INVESTIGATION	AIR MONITORING AND SURFICIAL SOIL SAMPLE LOCATIONS FOR ASBESTOS INVESTIGATION AT THE CINDER PILE	
ENVIROCON, INC.	AutoCAD FILE: PJ_1.DWG_C	9/8/91	FIGURE 3.17



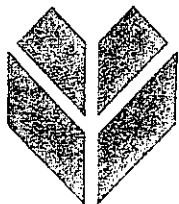
BURLINGTON NORTHERN	REMEDIAL INVESTIGATION REPORT LIVINGSTON RAIL YARD LIVINGSTON, MONTANA	SURFICIAL SOIL SAMPLING AREAS	
ENVIROCON, INC.	AutoCAD FILE:FSR-012.DWG	1/24/93	FIGURE 3.29



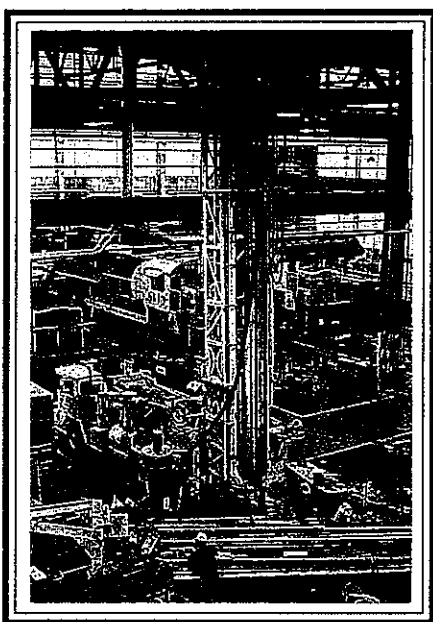
● SOIL SAMPLE LOCATION
 GRID SIZE: 150' x 150'

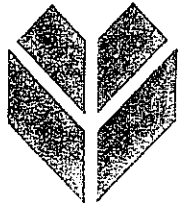


BURLINGTON NORTHERN	SOIL SECTION LIVINGSTON RAIL YARD REMEDIAL INVESTIGATION	SAMPLE GRID & SURFICIAL SOIL SAMPLE LOCATIONS AT INVESTIGATION AREA "A"	
ENVIROCON, INC.		AutoCAD FILE: SSSP-A.DWG_C	7/8/92



Section 5.0 Ground and Surface Water Investigation





Section 6.0 Air Investigation

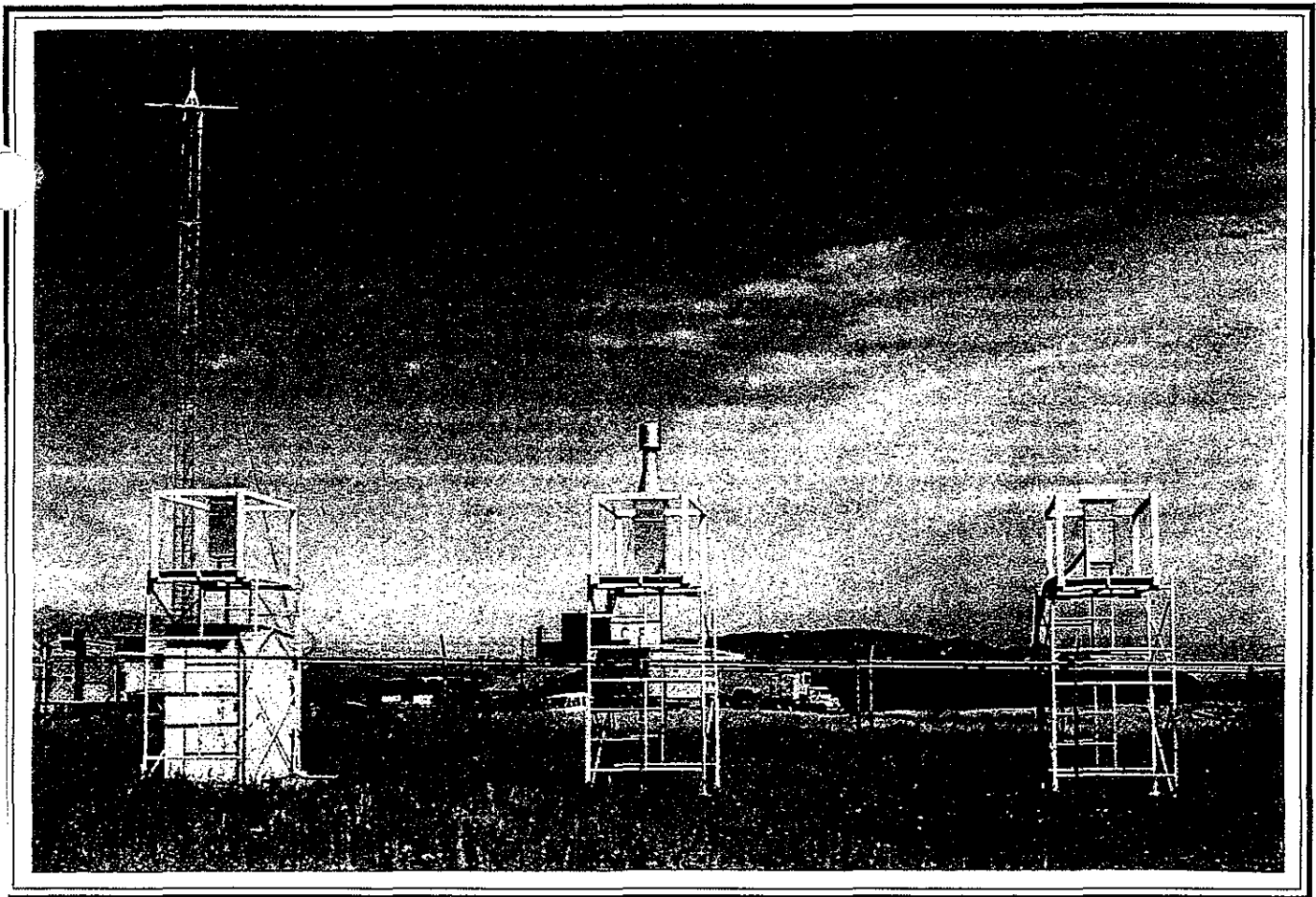


TABLE 6.11

Analytical Results for Indoor and Outdoor Air Samples Collected During February 1992

Air Section
Livingston Rail Yard Remedial Investigation

Study Area	Resident	Location	Sampler Number	Sample Type	Standard Volume	PCF (ug/m ³)	TCE (ug/m ³)	cis-1,2-DCE (ug/m ³)	trans-1,2-DCE (ug/m ³)
Background	BG-1	Basement	90	Primary	2.69	1.12	< 0.19	< 0.19	< 0.19
Background	BG-1	Upstairs	64	Primary	2.61	1.19	< 0.19	< 0.19	< 0.19
Background	BG-2	Basement	29	Primary	3.09	1.36	0.36	< 0.16	< 0.16
Background	BG-2	Upstairs	82	Primary	2.64	1.44	1.06	< 0.19	< 0.19
Background	BG-3	Basement	10	Primary	2.85	1.33	< 0.18	< 0.18	< 0.18
Background	BG-3	Upstairs	119	Primary	2.66	1.47	0.19	< 0.19	< 0.19
Background	BG-3	Outdoor	120	Primary	2.72	1.47	< 0.18	< 0.18	< 0.18
Background	BG-4	Basement	041-N	Primary	3.15	1.94	0.25	< 0.16	< 0.16
Background	BG-4	Upstairs	127-N	Primary	2.64	2.54	0.3	< 0.19	< 0.19
Background	BG-5	Basement	50	Primary	2.96	0.61	2.71	< 0.17	< 0.17
Background	BG-5	Upstairs	32	Primary	2.87	0.56	1.11	< 0.17	< 0.17
Northeast	NE-1	Basement	85	First Time	2.91	64.3	1.07	0.24	< 0.17
Northeast	NE-1	Basement	043-N	Primary	3.02	70.2	1.42	0.4	< 0.17
Northeast	NE-1	Outdoor	021-N	Primary	2.23	1.52	< 0.22	< 0.22	< 0.22
Northeast	NE-2	Basement	5	Primary	2.69	18.9	0.45	< 0.19	< 0.19
Northeast	NE-2	Basement	89	Duplicate	2.62	17.2	0.31	< 0.19	< 0.19
Northeast	NE-2	Upstairs	43	Primary	2.48	5.73	0.24	< 0.20	< 0.20
Northeast	NE-3	Basement	51	Primary	2.63	8.56	1.98	< 0.19	< 0.19
Northeast	NE-3	Upstairs	83	Primary	2.67	13.7	3.33	< 0.19	< 0.19
Southeast	SE-1	Basement	104	Primary	2.69	3.35	< 0.19	< 0.19	< 0.19
Southeast	SE-1	Upstairs	93	Primary	2.48	27	0.77	< 0.20	< 0.20
Southeast	SE-1	Upstairs	102	Duplicate	1.90	24.6	0.68	< 0.26	< 0.26
Southeast	SE-2	Basement	058-N	Primary	2.68	6.31	0.3	0.26	< 0.19
Southeast	SE-2	Basement	014-N	Duplicate	2.62	6.87	0.31	0.27	< 0.19
Southeast	SE-2	Upstairs	082-N	Primary	2.67	5.47	0.3	0.26	< 0.19
Southeast	SE-3	Basement	66	Primary	2.73	1.39	0.22	< 0.18	< 0.18
Southeast	SE-3	Upstairs	52	Primary	2.73	1.43	< 0.18	< 0.18	< 0.18
Southeast	SE-4	Basement	015-N	Primary	2.92	2.19	< 0.17	< 0.17	< 0.17
Southeast	SE-4	Upstairs	58	First Time	2.71	3.84	1.62	< 0.18	< 0.18
Southeast	SE-4	Upstairs	094-N	Primary	2.81	5.2	1.71	< 0.18	< 0.18
Southeast	SE-5	Basement	001-N	Primary	3.15	43.2	2.35	< 0.16	< 0.16
Southeast	SE-5	Basement	030-N	Duplicate	2.14	51.4	1.45	< 0.23	< 0.23
Southeast	SE-5	Upstairs	117-N	Primary	2.22	11.3	0.9	< 0.23	< 0.23
Southeast	SE-6	Basement	47	Primary	2.73	1.4	0.22	< 0.18	< 0.18
Southeast	SE-6	Upstairs	26	Primary	2.77	1.63	0.22	< 0.18	< 0.18
Southeast	SE-7	Basement	19	Primary	2.80	1.11	0.21	< 0.18	< 0.18
Southeast	SE-7	Upstairs	14	Primary	2.12	1.23	< 0.24	< 0.24	< 0.24
Southeast	SE-8	Basement	35	Primary	2.73	< 1.83	0.29	0.22	0.22
Southeast	SE-8	Upstairs	61	Primary	2.64	1.02	0.49	0.23	< 0.19
Southeast	SE-8	Upstairs	67	Duplicate	1.62	0.93	0.49	< 0.31	< 0.31

TABLE 6.12

Analytical Results for Indoor Air and Soil Gas Samples Collected During March 1992

Air Section
Livingston Rail Yard Remedial Investigation

Study Area	Resident	Location	Sampler Number	Sample Type	Standard Volume	PCE (ug/m3)	TCE (ug/m3)	cis-1,2-DCE (ug/m3)	trans-1,2-DCE (ug/m3)
Background	BG-2	Soil Gas	106-V	Primary	1.28	14.4	5	<0.39	<0.39
Background	BG-2A	Soil Gas	114-V	Primary	1.32	12.8	9.24	<0.38	<0.38
Northeast	NE-1	Basement	003-S	Primary	3.07	82.1	1.5	0.26	<0.16
Northeast	NE-1	Upstairs	125-S	Primary	2.82	27.9	0.6	<0.18	<0.18
Northeast	NE-1	Upstairs	065-S	Duplicate	2.96	26.5	0.61	<0.17	<0.17
Northeast	NE-3	Soil Gas	121-S	Primary	0.67	1.34	<0.75	<0.75	<0.75
Northeast	NE-3	Soil Gas	017-S	Duplicate	0.09	<5.56	<5.56	<5.56	<5.56
Northeast	NE-4	Basement	025-S	Primary	2.48	18.4	0.48	NI	NI
Northeast	NE-4	Upstairs	020-S	Primary	3.16	5.66	0.57	<0.16	<0.16
Northeast	NE-4	Upstairs	009-S	Duplicate	2.54	6.18	1.3	0.63	0.39
Northeast	NE-5	Basement	061-S	Primary	2.43	0.58	<0.21	<0.21	<0.21
Northeast	NE-5	Upstairs	050-S	Primary	3.07	1.07	0.23	<0.16	<0.16
Southeast	SE-2	Soil Gas	080-S	Primary	0.66	9.09	9.55	<0.76	<0.76
Southeast	SE-2	Soil Gas	069-S	Duplicate	0.09	5.56	<5.56	<5.56	<5.56

NI - No information due to water interference in sampler tube.

TABLE 6.19

Analytical Results for Indoor Air Samples Collected During November 1992

Berkeley-Multisorbent-Tube and Passive-Dosimeter-Badge Sampling

Air Section
Livingston Rail Yard Remedial Investigation

STUDY AREA/LOCATION			MULTISORBENT TUBE (BERKELEY ANALYTICAL)							PASSIVE DOSIMETER			
Study Area	Resident	Location	Sampler Number	Sample Type	Vinyl Chloride (ug/m3)	trans-1,2-DCE (ug/m3)	cis-1,2-DCE (ug/m3)	TCE (ug/m3)	PCE (ug/m3)	Sampler Number	Sample Duration	PCE (ug/m3)	
Northeast	NE-1	upstairs	86	primary	no data *	< 1.8	< 1.8	< 1.8	6.6	BT-5160	2 weeks	7.4	
Northeast	NE-1	upstairs		duplicate						FZ-2512	2 weeks	7.7	
Northeast	NE-1	upstairs	49	blank		< 0.4 ng/tube							
Northeast	NE-1	basement	73	primary									
Northeast	NE-1	basement	72	primary			< 1.5	< 1.5	< 1.5	17.8	BT-5159	2 weeks	27
Northeast	NE-1	basement		primary							BT-5123	4 weeks	30
Northeast	NE-1	basement		duplicate						BT-5225	4 weeks	31	
Northeast	NE-3	basement	43	primary	< 0.05								
Northeast	NE-3	basement	131	duplicate	< 0.06								
Northeast	NE-3	upstairs	84	primary		< 1.7	< 1.7	< 1.7	< 1.7	FZ-2506	4 weeks	2.4	
Northeast	NE-3	basement	27	primary		< 1.9	< 1.9	< 1.9	< 1.9	FZ-2560	4 weeks	2.2	
Southeast	SE-5	basement	65	primary	no data *								
Southeast	SE-5	basement	15	duplicate	no data *								
Southeast	SE-5	basement	11	primary		< 1.7	< 1.7	< 1.7	29.2	FZ-2690	2 weeks	49	
Southeast	SE-5	upstairs	7	primary		< 1.8	< 1.8	< 1.8	8.9	BT-5221	2 weeks	18	
Southeast	SE-5	upstairs	89	duplicate		< 1.8	< 1.8	< 1.8	9.1				
Southeast	SE-5	upstairs		primary						BT-5061	4 weeks	27	
	SE-5	basement		primary						FZ-2720	4 weeks	59	

* No data - indicates that sample was lost during analysis due to excess water vapor.

TABLE 6.22

January/February 1993 Sample Results

Air Section
Livingston Rail Yard Remedial Investigation

LOCATION	SAMPLE NO.	UPSTAIRS/ BASEMENT	PCE CONCENTRATION ($\mu\text{g}/\text{M}^3$)	METHOD	SAMPLING DATES
AMB-1	# 103		< 0.2	Berkeley	1/27/1993 (1/15 to 2/5)
AMB-2	# 008		10.2	Berkeley	1/27/1993 (1/15 to 2/5)
AMB-3	# 032		4.7	Berkeley	1/27/1993 (1/15 to 2/5)
AMB-4	# 118		1.0	Berkeley	1/27/1993 (1/15 to 2/5)

NE-2	WK 4798	upstairs	< 2.7	passive dos.	1/14 to 2/5
NE-2	WK 4861	basement	8.5	passive dos.	
NE-6	WK 4749	upstairs	< 4.2	passive dos.	1/13 to 1/27
NE-6	WK 4199	basement	< 4.2	passive dos.	
NE-7	WK 4476	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-7	WK 4581	basement	< 4.2	passive dos.	
NE-8	WK 4850	upstairs	< 4.5	passive dos.	1/12 to 1/26
NE-9	WK 4786	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-9	WK 4698	dirt dugout	< 4.2	passive dos.	
NE-10	WD 6096	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-10	WD 6060	dirt dugout	17.4	passive dos.	
NE-11	WD 5788	upstairs	< 4.2	passive dos.	1/11 to 1/25
NE-12	WK 4500	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-12	WK 4661	basement	< 4.2	passive dos.	
NE-13	WK 4474	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-13	WK 4510	basement	< 4.2	passive dos.	
NE-14	WK 4218	trailer	< 4.2	passive dos.	1/13 to 1/27
NE-14	WK 4195	skirting	< 4.2	passive dos.	
NE-15	WK 4662	upstairs	< 4.2	passive dos.	1/13 to 1/27
NE-15	WK 4632	basement	< 4.2	passive dos.	
NE-16	WK 4695	upstairs	19.0	passive dos.	1/12 to 1/26
NE-16	WK 4818	basement	14.0	passive dos.	
NE-17	WK 4651	upstairs	10.0	passive dos.	1/13 to 1/27
NE-17	WK 4445	basement	18.9	passive dos.	
NE-18	WK 4422	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-18	WK 4536	basement	< 4.2	passive dos.	
NE-19	WK 4755	upstairs	< 4.2	passive dos.	1/12 to 1/26
NE-20	WK 4857	upstairs	8.7	passive dos.	1/22 to 2/5
NE-20	WK 4683	dirt dugout	8.2	passive dos.	

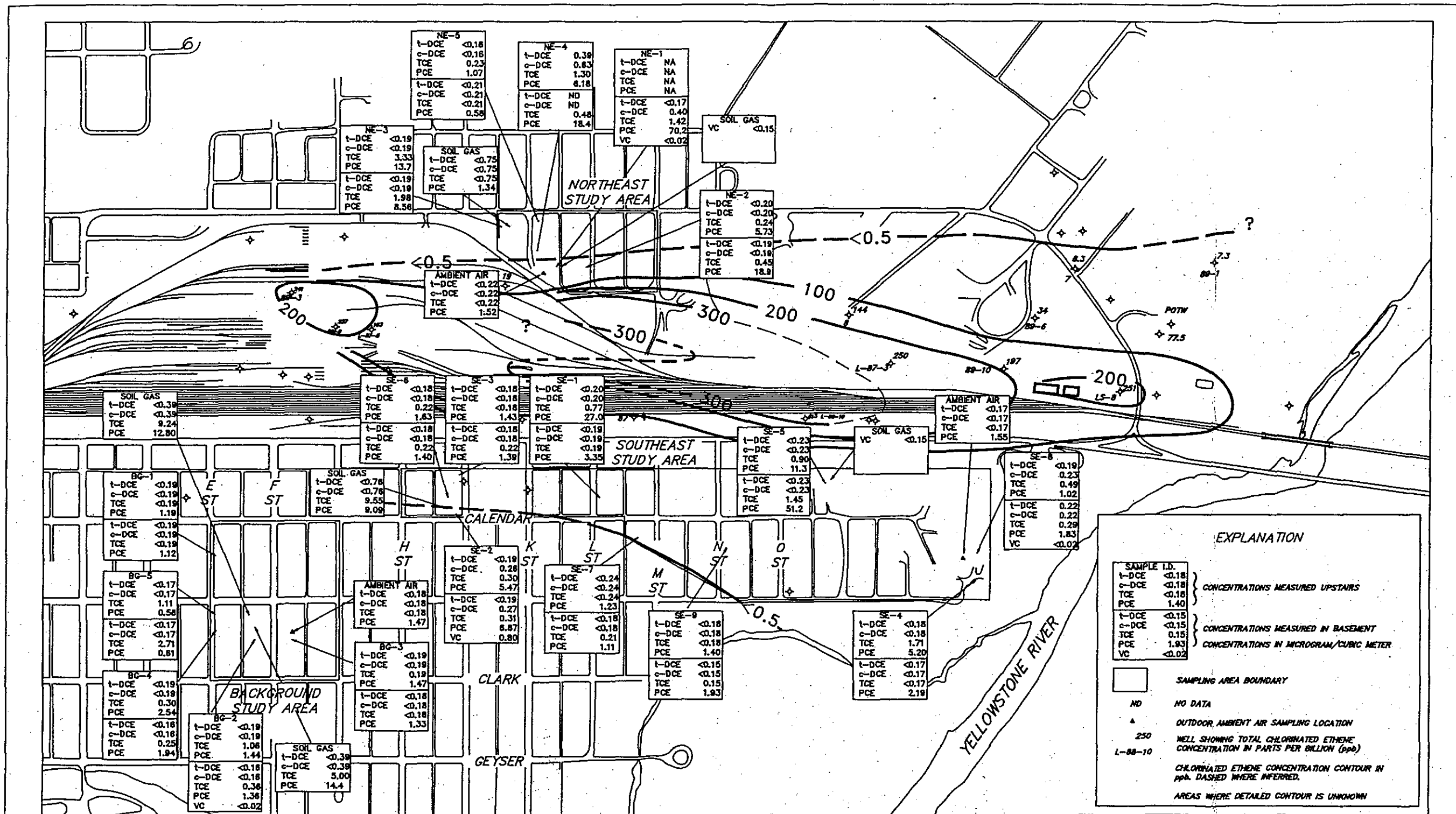
SE-5	WK 4847	upstairs	< 4.2	passive dos.	1/12 to 1/26
SE-5	WK 4682	crawlspace	5.2	passive dos.	
SE-10	WK 4833	upstairs	< 4.2	passive dos.	1/13 to 1/27

TABLE 6.22 (cont.)

January/February 1993 Sample Results

Air Section
Livingston Rail Yard Remedial Investigation

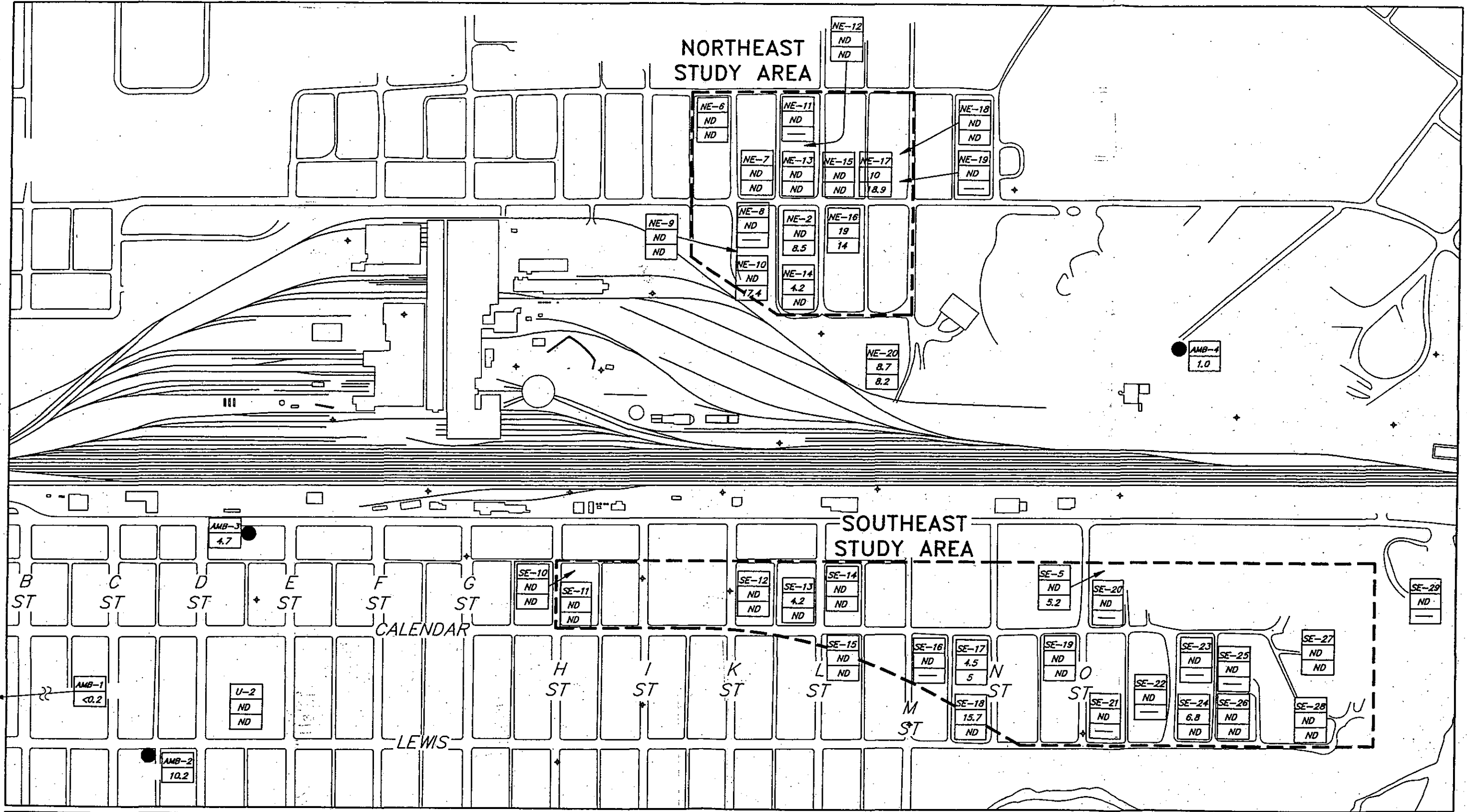
LOCATION	SAMPLE NO.	UPSTAIRS/ BASEMENT	PCE CONCENTRATION [ug/M ³]	METHOD	SAMPLING DATES
SE-10	WK 4828	basement	< 4.2	passive dos.	
SE-11	WK 4245	upstairs	< 4.5	passive dos.	1/13 to 1/26
SE-11	WK 4181	basement	< 4.5	passive dos.	
SE-12	WD 5991	upstairs	< 4.2	passive dos.	1/11 to 1/25
SE-12	WD 5847	basement	< 4.2	passive dos.	
SE-14	WK 4573	upstairs	< 4.2	passive dos.	1/12 to 1/26
SE-14	WK 4423	basement	< 4.2	passive dos.	
SE-15	WD 6221	split level-up	< 4.2	passive dos.	1/11 to 1/25
SE-15	WD 6111	basement	< 4.2	passive dos.	
SE-16	WK 4750	upstairs	< 4.2	passive dos.	1/12 to 1/26
SE-17	WK 4649	upstairs	4.5	passive dos.	1/13 to 1/26
SE-17	WK 4878	crawlspace	5.0	passive dos.	
SE-18	WD 5757	upstairs	15.7	passive dos.	1/11 to 1/25
SE-18	WD 6203	crawlspace	< 4.2	passive dos.	
SE-19	WK 4671	upstairs	< 4.2	passive dos.	1/12 to 1/26
SE-19	WK 4589	crawlspace	< 4.2	passive dos.	
SE-20	WK 4827	upstairs	< 4.2	passive dos.	1/13 to 1/27
SE-21	WD 6092	upstairs	< 4.2	passive dos.	1/11 to 1/25
SE-22	WK 4438	trailer	< 4.5	passive dos.	1/13 to 1/26
SE-23	WK 4168	upstairs	< 4.2	passive dos.	1/13 to 1/27
SE-24	WK 4600	upstairs	6.8	passive dos.	1/12 to 1/26
SE-24	WK 4593	crawlspace	< 4.2	passive dos.	
SE-25	WK 4635	upstairs	< 4.2	passive dos.	1/12 to 1/26
SE-26	WK 4242	upstairs	< 4.5	passive dos.	1/13 to 1/26
SE-26	WK 4303	crawlspace	< 4.5	passive dos.	
SE-27	WK 4456	upstairs	< 4.2	passive dos.	1/12 to 1/26
SE-27	WK 4766	basement	< 4.2	passive dos.	
SE-28	WK 4688	upstairs	< 4.2	passive dos.	1/13 to 1/27
SE-28	WK 4831	crawlspace	< 4.2	passive dos.	
SE-29	WK 4606	trailer	< 4.2	passive dos.	1/13 to 1/27
U-2	WK 4721	upstairs	< 4.2	passive dos.	1/12 to 1/26
U-2	WK 4641	basement	< 4.2	passive dos.	



600 0 600
 APPROXIMATE SCALE IN FEET



BURLINGTON NORTHERN	LIVINGSTON RAIL YARD	FEBRUARY 1991 GROUND WATER PLUME (PCE, DCE, TCE) vs INDOOR AIR SAMPLING RESULTS
ENVIROCON, INC.	AutoCADFILE: AQ-RSLT.DWG_13/27/92	FIGURE 6.3



LEGEND

- LOCATION
- UPSTAIRS
- BASEMENT/CRAWLSPACE
- AMBIENT AIR SAMPLE LOCATIONS

SCALE IN FEET

BURLINGTON NORTHERN

ENVIROCON, INC.

AIR SECTION
LIVINGSTON RAIL YARD
REMEDIAL INVESTIGATION

AutoCad FILE: IN-AIR3.DWG

JANUARY/FEBRUARY 1993
INDOOR AIR
SAMPLE LOCATIONS

2/15/93

FIGURE 6.8