

2nd Revised Task J Surface Soil Supplemental Investigation Report

**Burlington Northern Livingston Shop Complex
Livingston, Montana**

Volume 1 of 5

BNSF Railway Company

**K/J 1296021.16
July 2012**

Kennedy/Jenks Consultants

**2nd REVISED TASK J SURFACE SOIL
SUPPLEMENTAL INVESTIGATION REPORT
Burlington Northern Livingston Shop Complex
Livingston, Montana**

Volume 1 of 5

Prepared for

BNSF RAILWAY COMPANY

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K/J 1296021.16

July 2012

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LIST OF ACRONYMS

<u>Abbreviation</u>	<u>Description</u>
bgs	below ground surface
BNSF	BNSF Railway Company
BRA	baseline risk assessment
CLP	Contract Laboratory Program
COC	chemical of concern (COCs for plural)
cPAH	carcinogenic polynuclear aromatic hydrocarbons (cPAHs for plural)
DEQ	Montana Department of Environmental Quality
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration (EPCs for plural)
EPH	extractable petroleum hydrocarbons
ERCL	environmental requirement, criterion, and limitation (ERCLs for plural)
FS	feasibility study
GPS	Global Positioning System
HASP	Health and Safety Plan
IDW	investigation-derived waste
LSI	Listing Site Inspection
MADEP	Massachusetts Department of Environmental Protection
MRL	Montana Rail Link
MPDES	Montana Pollutant Discharge Elimination System
PAH	polynuclear aromatic hydrocarbon (PAHs for plural)
QAPP	Quality Assurance Project Plan
QA	quality assurance
QC	quality control
RA	remedial action
RBCA	risk-based corrective action
RBSL	risk-based screening level (RBSLs for plural)
RD	remedial design
RI	remedial investigation
ROD	Record of Decision
RPD	relative percent differences (RPDs for plural)
SAP	Sampling and Analysis Plan
SI	supplemental investigation
SIM	selective ion monitoring
SOG	Standard Operating Guideline (SOGs for plural)
SOW	Statement of Work
SSL	soil screening level (SSLs for plural)
TEF	toxicity equivalency factor
TRW	Technical Review Workgroup
UCL	upper confidence level
VOC	volatile organic compound (VOCs for plural)
VPH	volatile petroleum hydrocarbons
WWTP	wastewater treatment plant
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
µg/L	micrograms per liter

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SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA A (WORK PLAN AREA 9)			EXPOSURE AREA B														
SAMPLING GRID ID ^(b)										2A	4A	6A	1B	3B	10B	15B	47B	50B	5C	5C	7C	7C	9C				
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	10-SS9-1a,1b,1c,1d,1e Composite	10-SS9-2a,2b,2c,2d,2e Composite	10-SS9-3a,3b,3c,3d,3e Composite	1B-SS-a,b,c,d,e-comp Composite	3B-SS-a,b,c,d,e-comp Composite	10B-SS-a,b,c-comp Composite	15B-SS-a,b,c-comp Composite	47B-SS-a,b,c-comp Composite	B-50B-SS-a,b,c,d-comp Composite	5C-SS-a,b,c,d,e-comp Composite	5C-SS-c-1.5 Discrete	7C-SS-a,b,c,d,e-comp Composite	7C-SS-c-1.5 Discrete	9C-SS-a,b,c,d,e-comp Composite							
Analytes							9-Jul-10	9-Jul-10	9-Jul-10	5-Oct-10	5-Oct-10	5-Oct-10	5-Oct-10	5-Oct-10	5-Oct-10	13-Oct-10	8-Nov-10	12-Oct-10	8-Nov-10	12-Oct-10							
Total Metals (mg/kg)^(h)																											
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800	NA ^(l)	80	NA	NA	NA	210	490	140	NA	NA	NA	NA	170 j						
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																											
EPH Screen	--	--	--	Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching > 20 feet	--	--	178	157	112	280	560	330 j ⁽ⁿ⁾	1,100 j	360	150	46	<12	67	<12	210 j				
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)^(o)																											
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	NA	NA	NA	58	110	63	170	110	NA	NA	NA	NA	45					
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	NA	NA	NA	100	340	190 j	710	160	NA	NA	NA	NA	120 j					
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	NA	NA	NA	<45 ^(q)	<45	<43 Uj ^(r)	<92	140	NA	NA	NA	NA	<43 j					
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	160	460	260	880	420	NA	NA	NA	NA	160 j					
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																											
				Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching >20 feet																				
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	<0.049	<0.043	<0.044	0.086	0.10	0.20	0.18	0.030	0.082	0.11	<0.0062	0.040	<0.0057	0.064				
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	<0.049	<0.043	<0.044	0.053	0.066	0.17	0.14	0.016	0.039	0.090	<0.0062	0.045	<0.0057	0.040				
Acenaphthylene	--	na	na	--	--	--	--	--	na	<0.049	<0.043	<0.044	0.26	0.19	0.32	0.24	0.088	0.57	0.075	<0.0062	0.028	<0.0057	0.023				
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	<0.049	<0.043	<0.044	0.025	0.034	0.12	0.029	0.0096	0.070	0.0073 J ^(t)	<0.0062	0.0066	<0.0057	0.0089				
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	<0.049	<0.043	<0.044	0.029	0.035	0.083	0.033	0.011	0.060	0.021 J	<0.0062	0.011	<0.0057	0.0098				
Phenanthrene	--	na	na	--	--	--	--	--	na	0.054	0.083	0.044	0.22	0.36	0.89	0.58	0.17	0.31	0.29	<0.0062	0.17	<0.0057	0.094				
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	<0.049	<0.043	<0.044	0.32	0.39	0.78	0.48	0.22	1.1	0.056	<0.0062	0.051	<0.0057	0.034				
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	0.11	0.17	0.075	0.53	1.1	1.5	1.1	0.67	1.4	0.55	<0.0062	0.47	<0.0057	0.19				
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	0.093	0.15	0.068	0.44	0.95	1.3	0.88	0.60	4.7	0.58	<0.0062	0.35	<0.0057	0.15				
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	0.081	0.091	0.049	0.17	0.41	0.76	0.44	0.12	0.60	0.21	<0.0062	0.11	<0.0057	0.090				
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	0.074	0.078	0.046	0.35	1.1	1.0	0.95	0.53	3.3	0.33	<0.0062	0.40	<0.0057	0.15				
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	0.088	0.14	0.087	0.34	1.1	1.3	0.98	0.50	5.6	0.34	<0.0062	0.32	<0.0057	0.18				
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	0.052	0.073	0.046	0.12	0.25	0.45	0.34	0.15	0.94	0.17	<0.0062	0.12	<0.0057	0.082				
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	0.086	0.12	0.073	0.23	0.52	0.83	0.35	0.18	5.9	0.28	<0.0062	0.12	<0.0057	0.13				
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	0.067	0.10	0.071	0.28	0.66	0.67	0.25	0.25	2.9	0.15	<0.0062	0.095	<0.0057	0.073				
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	<0.049	<0.043	<0.044	0.069	0.18	0.18	0.078	0.062	0.84	0.040	<0.0062	0.022	<0.0057	0.020				
Benzo(g,h,i)perylene	--	na	na	--	--	--	--	--	na	0.090	0.092	0.075	0.71	1.0	0.85	0.25	0.39	3.1	0.17	<0.0062	0.090	<0.0057	0.075				
Total carcinogenic PAHs ^(v)	4	na	na	na	na	na	na	na	na	0.13	0.18	0.12	0.38	0.92	1.3	0.60	0.33	7.7	0.39	0.01	0.20	0.01	0.19				
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																											
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
o-Xylenes	--	--	na	--	--	--	--	100	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Methy-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																											
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA B (continued)				EXPOSURE AREA C												
SAMPLING GRID ID ^(b)										32C	34C	36C	38C	15A	15A	17A	19A	24A	27A	28A	30A	34A	35A			
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	32C-SS-a,b,c,d,e-comp	34C-SS-a,b,c,d,e-comp	36C-SS-a,b,c,d,e-comp	38C-SS-a,b,c,d,e-comp	15A-SS-a,b,c,d,e-comp	15A-SS-a-1.5	17A-SS-a,b,c,d,e-comp	19A-SS-a,b,c,d,e-comp	24A-SS-a,b,c,d,e-comp	27A-SS-a,b,c,d,e-comp	28A-SS-a,b,c,d,e-comp	30A-SS-a,b,c,d,e-comp	34A-SS-a,b,c,d,e-comp	35A-SS-a,b,c,d,e-comp						
Sample Type							Composite	Composite	Composite	Composite	Composite	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite						
Analytes							7-Oct-10	7-Oct-10	7-Oct-10	8-Oct-10	9-Oct-10	9-Nov-10	9-Oct-10	9-Oct-10	9-Oct-10	9-Oct-10	9-Oct-10	10-Oct-10	10-Oct-10	10-Oct-10						
Total Metals (mg/kg)^(h)																										
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800					55	NA	NA	150	76 j	360 j	NA	42 j	250 j	NA	180 j	NA	NA	120 j
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																										
				Direct Contact	Leaching	Leaching	Leaching																			
				Commercial	0-10 feet	10-20 feet	> 20 feet																			
EPH Screen	--	--	--	--	--	--	--	--	--	--	130	520	740	440	51	87	92	96	400	89	250	100	220	310		
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																										
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	NA	150	200	90	NA	NA	NA	NA	45	NA	<83	NA	<41	100			
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	NA	190	330	140	NA	NA	NA	NA	150	NA	130	NA	120	130			
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	NA	47 j	59	<45	NA	NA	NA	NA	<41	NA	<83	NA	<41	<86			
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	NA	380	590	230	NA	NA	NA	NA	200	NA	160	NA	150	240			
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																										
				Direct Contact	Leaching	Leaching	Leaching																			
				Commercial	0-10 feet	10-20 feet	>20 feet																			
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	0.025	0.19	0.048	0.035	0.026	0.057	<0.0050	0.013	0.017	0.011	0.016	0.0084	0.014	0.014			
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	0.031	0.39	0.14	0.033	0.030	0.087	0.0048 J	0.041	0.030	0.010	0.016	0.0080	0.019	0.018 j			
Acenaphthylene	--	na	na	--	--	--	--	--	na	0.011	0.22	0.083	0.094	0.026	0.013	0.0059	0.0071	0.011	0.016	0.013	0.017	0.0079	0.011			
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	0.0056	0.026	0.036	0.0065	0.0077	0.0088	0.024	0.0028 J	0.0015 J	0.0033 J	0.0031 J	0.0027 J	0.0015 J	0.0031 J			
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	0.0020 J	0.028	0.017	0.0093	0.010	0.012	0.017	<0.0052	<0.0050	0.0041 J	0.0046 J	0.0045 J	<0.0049	0.0046 J			
Phenanthrene	--	na	na	--	--	--	--	--	na	0.056	0.32	0.35	0.16	0.28	0.14	0.33	0.040	0.031	0.086	0.057	0.059	0.033	0.082			
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	0.032	0.28	0.22	0.12	0.074	0.024	0.068	0.0070	0.010	0.023	0.020	0.028	0.011	0.028			
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	0.13	0.66	0.68	0.44	1.5	0.14	1.0	0.11	0.074	0.25	0.18	0.18	0.086	0.28			
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	0.11	0.55	0.60	0.40	1.4	0.12	0.85	0.094	0.069	0.21	0.14	0.16	0.073	0.26			
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	0.047	0.51	0.28	0.20	0.86	0.066	0.41	0.060	0.029	0.12	0.086	0.079	0.038	0.19 j			
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	0.099	0.74	0.37	0.35	0.85	0.093	0.44	0.073	0.047	0.14	0.087	0.096	0.050	0.23			
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	0.079	0.83	0.39	0.39	1.5	0.093	0.65	0.12	0.069	0.23	0.15	0.15	0.082	0.26			
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	0.036	0.36	0.20	0.18	0.46	0.028	0.19	0.030	0.014	0.055	0.043	0.046	0.025	0.064			
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	0.044	0.51	0.26	0.24	0.92	0.061	0.41	0.066	0.029	0.12	0.081	0.11	0.046	0.16			
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	0.027	0.29	0.16	0.16	0.58	0.038	0.27	0.045	0.033	0.091	0.079	0.080	0.038	0.087			
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	0.0086	0.099	0.048	0.051	0.20	0.010	0.078	0.016	0.0095	0.034	0.018	0.022	0.013	0.032			
Benzo(g,h,i)perylene	--	na	na	--	--	--	--	--	na	0.030 j	0.26	0.16	0.15	0.61	0.048	0.29	0.054	0.045	0.10	0.094	0.089	0.046	0.11			
Total carcinogenic PAHs ^(v)	4	na	na	na	na	na	na	na	na	0.07	0.78	0.39	0.37	1.4	0.09	0.62	0.10	0.05	0.20	0.13	0.16	0.08	0.25			
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)										32C-SS-a,b,c,d,e-VPH-comp																
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	<0.053	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	<0.053	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	<0.053	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	<0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
o-Xylenes	--	--	na	--	--	--	--	100	300	<0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	<0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Methyl-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	<0.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	0.032 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																										
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	<2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	<2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	<2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	<2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA C (continued)				EXPOSURE AREA D									
SAMPLING GRID ID ^(b)										35A (duplicate)	39A	41A	43A	22B	28B	30B	17C	17C (duplicate)	19C	22C	28C	30C	30C
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	D10-10-10-a,b,c,d,e-comp	39A-SS-a,b,c,d,e-comp	41A-SS-a,b,c,d,e-comp	43A-SS-a,b,c,d,e-comp	22B-SS-a,b,c,d-comp	28B-SS-a,b,c-comp	30B-SS-a,b,c,e-comp	17C-SS-a,b,c,d,e-comp	D-10-7-10-a,b,c,d,e-comp	19C-SS-a,b,c,d,e-comp	22C-SS-a,b,c,d,e-comp	28C-SS-c,d,e-comp	30C-SS-a,b,c,d,e-comp	30C-SS-a-1.5			
Analytes							Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Discrete		
							10-Oct-10	10-Oct-10	10-Oct-10	10-Oct-10	6-Oct-10	6-Oct-10	6-Oct-10	7-Oct-10	7-Oct-10	7-Oct-10	6-Oct-10	6-Oct-10	6-Oct-10	6-Oct-10	8-Nov-10		
Total Metals (mg/kg)^(h)																							
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800															
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																							
				Direct Contact	Leaching	Leaching	Leaching																
				Commercial	0-10 feet	10-20 feet	> 20 feet																
EPH Screen	--	--	--	--	--	--	--	--	320	160	160	2,800	180	75	200	310	370	180	140	610	1,300	1,700	
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																							
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	<84	NA	NA	240	NA	NA	74	110	100	NA	NA	110	120	810
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	140	NA	NA	2,000	NA	NA	96	170	180	NA	NA	390	950	230
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	<84	NA	NA	<43	NA	NA	<46	<45	<46	NA	NA	<43	<43	420
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	200	NA	NA	2,300	NA	NA	190	300	300	NA	NA	510	1,100	1,400
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																							
				Direct Contact	Leaching	Leaching	Leaching																
				Commercial	0-10 feet	10-20 feet	>20 feet																
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	0.038	0.0065	<0.0049	0.0079	0.030	0.095	0.19	0.046	0.051	0.042	0.084	0.041	0.75	1.2
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	0.046 j	0.0077	0.0049	0.0073	0.019	0.095	0.18	0.055	0.067	0.098	0.17	0.067	0.57	9.8
Acenaphthylene	--	na	na	--	--	--	--	--	na	0.012 J	0.017	0.0051	0.013	0.089	0.25	0.35	0.12	0.12	0.049	0.050	0.072	0.27	0.096
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	0.0034 J	0.0048 J	0.0017 J	0.0013 J	0.0062	0.023	0.050	0.015	0.015	0.0081	0.021	0.0082	0.36	0.19
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	0.0087 J	0.0048 J	0.0017 J	0.0020 J	0.0071	0.044	0.052	0.012	0.012	0.0056	0.014	0.014	0.25	0.059
Phenanthrene	--	na	na	--	--	--	--	--	na	0.086	0.070	0.029	0.043	0.12	0.61	0.74	0.15	0.16	0.10	0.30	0.18	0.95	2.5
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	0.023 J	0.025	0.0090	0.011	0.13	0.36	0.39	0.17	0.16	0.087	0.16	0.17	0.66	0.12
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	0.22	0.25	0.089	0.12	0.37	1.9	1.3	0.41	0.36	0.23	0.88	0.41	1.7	0.36
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	0.22	0.22	0.077	0.099	0.30	1.4	0.98	0.36	0.32	0.17	0.74	0.37	1.4	0.39
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	0.11 j	0.13	0.039	0.053	0.13	0.83	0.50	0.17	0.13	0.089	0.25	0.19	0.41	0.20
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	0.21	0.17	0.049	0.067	0.28	1.1	0.76	0.38	0.30	0.17	0.61	0.25	0.69	0.30
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	0.20	0.21	0.071	0.10	0.27	1.5	1.1	0.50	0.32	0.20	0.53	0.36	0.59	0.22
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	0.10	0.053	0.023	0.031	0.12	0.57	0.33	0.14	0.12	0.075	0.16	0.11	0.22	0.053
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	0.13	0.13	0.041	0.052	0.14	0.79	0.60	0.21	0.13	0.10	0.27	0.22	0.36	0.092
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	0.083	0.081	0.030	0.042	0.11	0.47	0.50	0.19	0.15	0.090	0.190	0.14	0.34	0.049
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	0.023 J	0.031	0.011	0.013	0.036	0.18	0.16	0.056	0.041	0.027	0.051	0.056	0.12	0.024
Benzo(g,h,i)perylene	--	na	na		--	--	--	--	--	na	0.10	0.096	0.049	0.052	0.13	0.43	0.52	0.20	0.16	0.11	0.19	0.15	0.41
Total carcinogenic PAHs ^(v)	4	na	na	na	na	na	na	na	na	0.19	0.20	0.07	0.08	0.23	1.3	0.97	0.35	0.23	0.17	0.42	0.35	0.62	0.16
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																							
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.082
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.082
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.11
o-Xylenes	--	--	na	--	--	--	--	100	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.11
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.078 J
Methy-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.33
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.13
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																							
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.2
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.3
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.5
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.2

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA D (continued)						EXPOSURE AREA E											
SAMPLING GRID ID ^(b)										23D	24D	24D (additional sample)	24D (additional sample)	31D	31D	21D	22D	35D	36D	16E	19E	19E	24E				
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	23D-SS-a,b,c,d,e-comp	24D-SS-a,b,c,d,e-comp	24D-SS-c-BN	24D-SS-a,b,d,e-BN	31D-SS-a,b,c,d,e-comp	31D-SS-a-1.5	21D-SS-A,B,C,D,E-Comp	22D-SS-a,b,c,d,e-Comp	35D-SS-a,b,c,d,e-Comp	36D-SS-a,b,c,d,e-comp	E-16E-SS-a,b,c,d,e-Comp	19E-SS-a,b,c,d,e-Comp	19E-SS-c-1.5	24E-SS-a,b,c,d,e-Comp							
Sample Type							Composite	Composite	Discrete	Composite	Composite	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Discrete	Composite							
Analytes							7-Oct-10	7-Oct-10	7-Oct-10	7-Oct-10	8-Oct-10	8-Nov-10	13-Sep-10	13-Sep-10	16-Sep-10	8-Oct-10	14-Sep-10	13-Sep-10	8-Nov-10	16-Sep-10							
Total Metals (mg/kg)^(h)																											
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800					360	250	310	280	NA	NA	510	270	250	NA	770	NA	NA	450	
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																											
EPH Screen	--	--	--	Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching > 20 feet	--	--				280	450	1,400 j	360 j	100	<11	180	450	220	230	140	99	<12	1,100	
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																											
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--				130	190	270	120	NA	NA	NA	280	69	57	NA	NA	NA	220	
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile				--	--				110 j	190	1,000 j	130	NA	NA	NA	90	130	77	NA	NA	NA	390
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--				<43 Uj	<83	<83 Uj	<84	NA	NA	NA	<42	<43	<44	NA	NA	NA	<170	
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--				250	400	1,300	260	NA	NA	NA	370	200	140	NA	NA	NA	630	
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																											
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na				0.39	0.11	0.030	0.12	0.029	<0.0055	NA	0.21	0.064	0.034	NA	0.048	<0.0058	0.30	
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220				0.44	0.14	0.025	0.13	0.034	<0.0055	NA	0.15	0.094	0.037	NA	0.066	<0.0058	0.39	
Acenaphthylene	--	na	na	--	--	--	--	--	na				0.18	0.095	0.042	0.11	0.018	<0.0055	NA	0.10	0.075	0.11	NA	0.034	<0.0058	0.12	
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na				0.97	0.20	0.044	0.42	0.0064	<0.0055	NA	0.51	0.014	0.018	NA	0.024	<0.0058	0.18	
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na				0.74	0.16	0.025	0.23	0.0096	<0.0055	NA	0.49	0.016	0.020	NA	0.019	<0.0058	0.14	
Phenanthrene	--	na	na	--	--	--	--	--	na				11	2.60	0.48	4.5	0.13	<0.0055	NA	6.0	0.21	0.41	NA	0.39	0.00095 J	2.2	
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na				2.6	0.72	0.18	0.74	0.06	<0.0055	NA	1.4	0.091	0.28	NA	0.082	<0.0058	0.48	
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na				22	5.0	1.2	8.0 E	0.26	<0.0055	NA	11	0.47	1.5	NA	0.68	0.0013 J	4.7	
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na				18	4.4	0.88	7.9	0.25	0.0055 U	NA	8.9	0.42	1.3	NA	0.62	0.0016 J	3.8	
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na				6.4	2.0	0.49	2.6	0.12	<0.0055	NA	3.9	0.29	0.63	NA	0.38	0.00086 J	1.9	
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na					9.7	2.6	0.75	4.0	0.15	<0.0055	NA	5.2	0.44	1.5	NA	0.39	<0.0058	3.1
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na					7.8	3.1	0.75	3.8	0.12	<0.0055	NA	5.1	0.68	0.99	NA	0.43	0.0014 J	3.9
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na					2.5	1.2	0.34	1.3	0.082	<0.0055	NA	1.7	0.17	0.42	NA	0.15	<0.0058	0.95
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na					7.2	2.3	0.52	2.6	0.10	<0.0055	NA	3.8	0.38	0.49	NA	0.30	0.00070 J	2.2
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na					2.8	1.5	0.35	1.5	0.049	<0.0055	NA	2.2	0.25	0.26	NA	0.19	<0.0058	1.8
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na					0.86	0.43	0.099	0.43	0.014	<0.0055	NA	0.65	0.085	0.088	NA	0.057	<0.0058	0.52
Benzo(g,h,i)perylene	--	na	na		--	--	--	--	--	na				2.8	1.8	0.39	1.5	0.048	<0.0055	NA	2.3	0.26	0.28	NA	0.20	0.00083 J	2.1
Total carcinogenic PAHs ^(v)	4	na	na		na	na	na	na	na	na				9.8	3.4	0.78	3.8	0.14	0.01	NA	5.6	0.59	0.77	NA	0.46	0.00	3.5
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																											
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na				NA	NA	NA	NA	NA	<0.053	<0.062	NA	<0.054	NA	NA	NA	NA	NA	NA
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na				NA	NA	NA	NA	NA	<0.053	<0.062	NA	<0.054	NA	NA	NA	NA	NA	
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na				NA	NA	NA	NA	NA	<0.053	<0.062	NA	<0.054	NA	NA	NA	NA	NA	
m+p Xylenes	--	--	na	--	--	--	--	94.74	250				NA	NA	NA	NA	NA	<0.11	<0.12	NA	<0.11	NA	NA	NA	NA	NA	
o-Xylenes	--	--	na	--	--	--	--	100	300				NA	NA	NA	NA	NA	<0.11	<0.12	NA	<0.11	NA	NA	NA	NA	NA	
Xylenes, Total	--	--	na	319	217	679	1,050	98	na				NA	NA	NA	NA	NA	<0.11	<0.12	NA	<0.11	NA	NA	NA	NA	NA	
Methy-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na				NA	NA	NA	NA	NA	<0.21	<0.25	NA	<0.22	NA	NA	NA	NA	NA	
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na				NA	NA	NA	NA	NA	0.073 J	0.12 U	NA	0.11 U	NA	NA	NA	NA	NA	
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																											
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--				NA	NA	NA	NA	NA	<2.1	<2.5	NA	<2.2	NA	NA	NA	NA	NA	NA
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--				NA	NA	NA	NA	NA	<2.1	<2.5	NA	<2.2	NA	NA	NA	NA	NA	NA
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--				NA	NA	NA	NA	NA	<2.1	<2.5	NA	<2.2	NA	NA	NA	NA	NA	NA
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--				NA	NA	NA	NA	NA	<2.1	<2.5	NA	<2.2	NA	NA	NA	NA	NA	NA

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA E (continued)													
SAMPLING GRID ID ^(b)										20F	20F	21F	21F	21F (additional sample)	21F (additional sample)	22F	26F	34F	17G	18G	21G	21G	
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	20F-SS-a,b,c,d,e-Comp	20F-SS-c-1.5	21F-SS-a,b,c,d,e-Comp	21F-SS-c-1.5	BN-21F-SS-a,b,d,e-Comp	BN-21F-SS-c	22F-SS-a,b,c,d,e-Comp	26F-SS-a,b,c,d,e-Comp	34F-SS-a,b,c,d,e-Comp	E-17G-SS-a,b,c,d,e-Comp	E-18G-SS-a,b,c,d,e-Comp	21G-SS-a,b,c,d,e-Comp	21G-SS-d-1.5				
Sample Type							Composite	Discrete	Composite	Discrete	Composite	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Discrete				
Analytes							14-Sep-10	8-Nov-10	14-Sep-10	8-Nov-10	14-Sep-10	14-Sep-10	14-Sep-10	16-Sep-10	16-Sep-10	14-Sep-10	14-Sep-10	15-Sep-10	8-Nov-10				
Total Metals (mg/kg)^(h)																							
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800	NA	NA	NA	NA	NA	NA	340	290	NA	77	NA	420	52 j		
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																							
EPH Screen	--	--	--	--	--	--	87	15	2,300	93	350	47,000	100	2,500	140	62	250	220	<12				
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																							
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	NA	NA	470	NA	170	<2,200	NA	530	NA	NA	89	86	NA	
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	NA	NA	3,700	NA	99	21,000	NA	1,200	NA	NA	130	51	NA	
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	NA	NA	<43	NA	<42	<2,200	NA	<170	NA	NA	<21	<44	NA	
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	NA	NA	4,200	NA	280	22,000	NA	1,800	NA	NA	240	180	NA	
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																							
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	NA	0.025	0.67	0.14	2.4	0.46	NA	0.24	NA	NA	0.092	0.056	<0.0061	
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	NA	0.048	0.22	0.12	0.58	0.21	NA	0.095	NA	NA	0.068	0.069	0.0028 J	
Acenaphthylene	--	na	na	--	--	--	--	--	na	NA	0.0033 J	1.1	0.10	0.56	0.15	NA	0.20	NA	NA	0.055	0.10	0.0013 J	
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	NA	0.0018 J	0.47	0.087	1.6	0.18	NA	0.46	NA	NA	0.13	0.023	<0.0061	
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	NA	0.0040 J	0.72	0.097	2.2	0.25	NA	0.42	NA	NA	0.13	0.025	<0.0061	
Phenanthrene	--	na	na	--	--	--	--	--	na	NA	0.048	12	1.1	20	3.5	NA	4.4	NA	NA	1.7	0.28	0.0073	
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	NA	0.0033 J	3.3	0.30	5.1	0.43	NA	1.4	NA	NA	0.45	0.11	0.0016 J	
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	NA	0.015	35	2.0	33	7.2	NA	8.5	NA	NA	3.1	0.63	0.012	
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	NA	0.017	27	2.0	25	5.5	NA	7.0	NA	NA	2.4	0.55	0.013	
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	NA	0.0086	21	1.1	15	2.9	NA	4.1	NA	NA	1.4	0.37	0.0066	
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	NA	0.019	20	1.3	14	3.8	NA	4.3	NA	NA	1.3	0.41	0.0057 J	
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	NA	0.016	23	1.6	18	4.8	NA	5.1	NA	NA	1.8	0.58	0.0093	
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	NA	0.0049 J	7.3	0.55	5.7	1.4	NA	1.6	NA	NA	0.54	0.16	0.0049 J	
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	NA	0.0083	16	1.3	13	3.2	NA	3.0	NA	NA	1.2	0.28	0.0072	
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	NA	0.0054 J	9.1	0.69	7.8	1.7	NA	1.7	NA	NA	0.67	0.25	0.0057 J	
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	NA	0.0021 J	3.0	0.19	2.5	0.50	NA	0.52	NA	NA	0.22	0.082	0.0019 J	
Benzo(g,h,i)perylene	--	na	na		--	--	--	--	na	NA	0.0085	8.8	0.81	7.6	2.0	NA	1.8	NA	NA	0.64	0.28	0.0059 J	
Total carcinogenic PAHs ^(v)	4	na	na		na	na	na	na	na	na	NA	0.01	24	1.8	20	4.7	NA	4.6	NA	NA	1.8	0.48	0.01
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																							
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
o-Xylenes	--	--	na	--	--	--	--	100	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Methy-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																							
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA E (continued)												
SAMPLING GRID ID ^(b)										27G	27G	27G (additional sample)	27G (additional sample)	18H	18H (duplicate)	19H	21H	23H	20J	21J	24J	
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	27G-SS-a,b,c,d,e-Comp	27G-SS-c-1.5	BN-27G-SS-a,b,d,e-comp	BN-27G-SS-C	E-18H-SS-a,b,c,d,e-Comp	D-9-15-10-a,b,c,d,e-Comp	E-19H-SS-a,b,c,d,e-Comp	21H-SS-a,d,e-Comp	23H-SS-a,b,c,d,e-Comp	E-20J-SS-a,b,c,d,e-Comp	E-21J-SS-a,b,c,d,e-Comp	24J-SS-a,b,c,d,e-Comp				
Sample Type							Composite	Discrete	Composite	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite				
Analytes							16-Sep-10	9-Nov-10	16-Sep-10	16-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	15-Sep-10	16-Sep-10				
Total Metals (mg/kg)^(h)																						
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800	NA	NA	NA	NA	130	180	41	170	100	470	96	630		
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																						
EPH Screen	--	--	--	Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching > 20 feet	--	--	610	<13	280	11,000	53	57	37	180	290	62	170	2,300	
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																						
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	100	NA	58	<1,100	NA	NA	NA	NA	99	NA	NA	540	
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	410	NA	140	6,800	NA	NA	NA	NA	120	NA	NA	1,000	
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	<42	NA	<43 j	<1,100	NA	NA	NA	NA	<83	NA	NA	<430	
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	520	NA	200	7,700	NA	NA	NA	NA	220	NA	NA	1,600	
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																						
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	0.024 J ^(j)	0.014	0.017	0.028 J	NA	NA	NA	NA	0.12	NA	NA	0.57	
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	0.018 J	0.011	0.017	<0.051	NA	NA	NA	NA	0.038 J	NA	NA	0.32	
Acenaphthylene	--	na	na	--	--	--	--	--	na	0.055	0.035	0.044	0.095	NA	NA	NA	NA	0.11	NA	NA	0.45	
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	0.026 J	0.017	0.017	0.040 J	NA	NA	NA	NA	0.25	NA	NA	0.79	
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	0.021 J	0.024	0.018	0.027 J	NA	NA	NA	NA	0.26	NA	NA	0.71	
Phenanthrene	--	na	na	--	--	--	--	--	na	0.49	0.34	0.39	0.45	NA	NA	NA	NA	4.2	NA	NA	8.3	
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	0.13	0.081	0.079	0.28	NA	NA	NA	NA	0.99	NA	NA	2.1	
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	1.8	0.55	1.4	1.3 j	NA	NA	NA	NA	9.5	NA	NA	18	
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	1.6	0.44	1.2	1.2 j	NA	NA	NA	NA	7.5	NA	NA	14	
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	1.3	0.24	0.76	0.58	NA	NA	NA	NA	4.0	NA	NA	8.1	
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	1.4	0.33	1.0	0.73	NA	NA	NA	NA	4.8	NA	NA	8.1	
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	1.8	0.32	1.4	1.2 j	NA	NA	NA	NA	5.4	NA	NA	12	
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	0.59	0.12	0.45	0.30	NA	NA	NA	NA	1.7	NA	NA	3.7	
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	1.1	0.23	0.80	0.54	NA	NA	NA	NA	3.3	NA	NA	7.4	
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	0.74	0.12	0.51	0.53	NA	NA	NA	NA	2.1	NA	NA	4.7	
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	0.22	0.031	0.17	0.13	NA	NA	NA	NA	0.66	NA	NA	1.5	
Benzo(g,h,i)perylene	--	na	na		--	--	--	--	na	0.78	0.13	0.52	0.69	NA	NA	NA	NA	2.1	NA	NA	4.9	
Total carcinogenic PAHs ^(v)	4	na	na		na	na	na	na	na	na	1.7	0.33	1.2	0.90	NA	NA	NA	NA	5.1	NA	NA	11
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																						
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
o-Xylenes	--	--	na	--	--	--	--	100	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Methy-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																						
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA F												
SAMPLING GRID ID ^(b)										11C	11C	12C	12C	12C (duplicate)	15C	15C (duplicate)	43C	13D	13D	43D	11E	42E
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	11C-SS-a,b,c,d,e-comp	11C-SS-d-1.5	12C-SS-a,b,c,d,e-comp	12C-SS-e-1.5	D-11-8-10	F-15C-SS-a,b,c,d,e-comp	D-10-12-10-a,b,c,d,e-comp	43C-SS-a,b,c,d,e-comp	13D-SS-a,b,c,d,e-comp	13D-SS-c-1.5	43D-SS-a,b,c,d,e-comp	11E-SS-a,b,c,d,e-comp	42E-SS-a,b,c,d,e-comp			
Sample Type							Composite	Discrete	Composite	Discrete	Discrete	Composite	Composite	Composite	Composite	Discrete	Composite	Composite	Composite			
Analytes							12-Oct-10	8-Nov-10	12-Oct-10	8-Nov-10	8-Nov-10	12-Oct-10	12-Oct-10	8-Oct-10	8-Oct-10	8-Nov-10	4-Oct-10	11-Oct-10	4-Oct-10			
Total Metals (mg/kg)^(h)																						
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800	NA	NA	NA	NA	NA	71	690 j	25 j	51	54 j	24			
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																						
EPH Screen	--	--	--	Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching >20 feet	--	--	120	61	68	93 j	190 j	440 j	51 j	82	210	<13	76	37	140
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																						
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	NA	NA	NA	NA	53	NA	NA	NA	<45	NA	NA	NA	NA
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	NA	NA	NA	NA	230	NA	NA	NA	59	NA	NA	NA	NA
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	NA	NA	NA	NA	<44	NA	NA	NA	<45	NA	NA	NA	NA
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	290	NA	NA	NA	100	NA	NA	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																						
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	0.12	0.042	0.12	0.087	0.096	0.11	0.15	0.014	0.045	<0.0063	0.017	<0.0050	0.013
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	0.25	0.073	0.20	0.16	0.17	0.18	0.21	0.012	0.045	0.0026 J	0.040	0.0027 J	0.015
Acenaphthylene	--	na	na	--	--	--	--	--	na	0.064	0.0041 J	0.051	0.012	0.013	0.029 j	0.064 j	0.020	0.088	0.00074 J	0.019	0.0036 J	0.0051 J
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	0.048	0.0028 J	0.015	0.010	0.013	0.011 j	0.021 j	0.0055 U	0.0061	<0.0063	0.0043 J	0.0019 J	0.0033 J
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	0.051	0.0070	0.018	0.012	0.014	0.014	0.022	0.0031 J	0.0077	<0.0063	0.0037J	0.0020 J	0.0034 J
Phenanthrene	--	na	na	--	--	--	--	--	na	0.35	0.073	0.25	0.13	0.16	0.22	0.31	0.065	0.12	0.0031 J	0.069	0.030	0.053
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	0.11	0.013	0.059	0.020	0.022	0.047	0.077	0.043	0.095	<0.0063	0.021	0.0074	0.010
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	0.67	0.038	0.46	0.075	0.082	0.28 j	0.60 j	0.20	0.38	0.0057 J	0.19	0.098	0.12
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	0.55	0.038	0.35	0.071	0.080	0.23 j	0.46 j	0.18	0.33	0.0055 J	0.15	0.086	0.095
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	0.20	0.022	0.17	0.041	0.039	0.11 j	0.22 j	0.10	0.17	0.0039 J	0.089	0.040	0.049
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	0.55	0.037	0.31	0.059	0.049	0.25	0.41	0.14	0.20	<0.0063	0.13	0.058	0.069
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	0.58	0.027	0.36	0.050	0.044	0.26 j	0.47 j	0.18	0.50	0.0060 J	0.15	0.071	0.074
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	0.24	0.011	0.15	0.015	0.011	0.095 j	0.21 j	0.055	0.12	0.0031 J	0.043	0.027	0.022
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	0.37	0.019	0.18	0.034	0.022	0.13 j	0.27 j	0.099	0.26	0.0028 J	0.094	0.050	0.050
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	0.30	0.011	0.12	0.022	0.014	0.093 j	0.19 j	0.055	0.24	0.0027 J	0.058	0.037	0.028
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	0.061	0.0032 J	0.033	0.0054 J	0.0035 J	0.020 j	0.050 j	0.017	0.077	<0.0063	0.018	0.011	0.0086
Benzo(g,h,i)perylene	--	na	na	--	--	--	--	na	0.34	0.014	0.12	0.027 j	0.016 j	0.083 j	0.18 j	0.053	0.30	0.0031 J	0.059	0.045	0.029	
Total carcinogenic PAHs ^(v)	4	na	na	na	na	na	na	na	na	0.54	0.03	0.28	0.05	0.04	0.20 j	0.41 j	0.15	0.43	0.01	0.14	0.08	0.07
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																						
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylenes	--	--	na	--	--	--	--	100	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																						
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA F (continued)										EXPOSURE AREA G						
SAMPLING GRID ID ^(b)										42E	42E (duplicate)	16F	17F	39F	42F	42G	45G	47G	46H	44A	44A	54A	61A			
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	42E-SS-b-1.5	D2-11-9-10	F16F-SS-a,b,c,d,e-comp	F17F-SS-a,b,c,d,e-comp	39F-SS-a,b,c,d,e-comp	42F-SS-a,b,c,d,e-comp	42G-SS-a,b,c,d,e-comp	45G-SS-a,b,c,d,e-comp	47G-SS-a,b,c,d,e-comp	46H-SS-a,b,c,d,e-comp	44A-SS-a,b,c,d,e-comp	44A-SS-d-1.5	54A-SS-b,c,d,e-comp	61A-SS-a,b,c,d,e-comp						
Sample Type							Discrete	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Discrete	Composite	Composite						
Analytes							9-Nov-10	9-Nov-10	8-Oct-10	8-Oct-10	13-Oct-10	4-Oct-10	4-Oct-10	4-Oct-10	4-Oct-10	4-Oct-10	11-Oct-10	9-Nov-10	5-Oct-10	11-Oct-10						
Total Metals (mg/kg)^(h)																										
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	13 j	14 j	85 j	NA	NA	67	160	NA	37	NA	NA	NA	NA	NA						
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																										
EPH Screen	--	--	--	--	--	--	15	24	64	90	340	150	340	89	39	160	48	<11	200	280						
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																										
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	NA	NA	NA	NA	<84	NA	27	NA	NA	NA	NA	NA	NA	<97	63					
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			NA	NA	NA	NA	120	NA	220	NA	NA	NA	NA	NA	<97	57					
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	NA	NA	NA	NA	<84	NA	<25	NA	NA	NA	NA	NA	NA	<97	<45					
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	NA	NA	NA	NA	170	NA	250	NA	NA	NA	NA	NA	NA	160	120					
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																										
Naphthalene	--	na	na	21	9.32	30.6	0.0036 J	<0.0053	0.027	0.033	<0.051	0.041	0.015	0.023	0.028	0.024	0.0058	<0.0052	0.042	0.035						
2-Methylnaphthalene	--	na	na	--	--	--	0.0026 J	0.0032 J	0.029	0.028	<0.051	0.040	0.013	0.017	0.037	0.019	0.0048 J	<0.0052	0.040	0.13						
Acenaphthylene	--	na	na	--	--	--	<0.0053	0.00062 J	0.017	0.021	0.0059 J	0.010	0.0064	0.010	0.0095	0.017	0.0080	<0.0052	0.048	0.033						
Acenaphthene	--	na	na	4,125	249	840	<0.0053	<0.0053	0.0087	0.014	<0.051	0.0066	0.0048 J	0.0025 J	0.016	0.0050 J	0.0082	<0.0052	0.029	0.047						
Fluorene	--	na	na	2,750	643	2,170	<0.0053	<0.0053	0.0061	0.0095	0.0060 J	0.0047 J	0.0035 J	0.0073	0.0096	0.0063	0.0084	<0.0052	0.023	0.037						
Phenanthrene	--	na	na	--	--	--	0.0059	0.0063	0.13	0.23	0.026 J	0.087	0.040	0.052	0.15	0.063	0.12	<0.0052	0.37	0.76						
Anthracene	--	na	na	20,627	3,740	12,600	0.00081 J	0.00070 J	0.031	0.065	0.012 J	0.036	0.0098	0.015	0.033	0.014	0.031	<0.0052	0.21	0.21						
Fluoranthene	--	na	na	2,750	484	1,630	0.0063	0.0096	0.33	0.58	0.052	0.17	0.082	0.11	0.40	0.15	0.30	<0.0052	1.1	1.9						
Pyrene	--	na	na	2,063	4,280	14,400	0.0050	0.0065	0.28	0.45	0.069 U	0.13	0.062	0.080	0.32	0.12	0.26	0.00052 U	0.96	1.6						
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	0.0017 J	0.0020 J	0.13 j	0.19	0.041 J	0.069	0.028	0.039	0.14	0.045	0.12	<0.0052	0.58	0.84						
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	<0.0053	0.00043 J	0.20	0.37	0.057	0.11	0.047	0.062	0.20	0.079	0.15	<0.0052	0.77	0.81					
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	0.0036 J	0.0037 J	0.21	0.46	0.061	0.14	0.044	0.065	0.25	0.097	0.18	<0.0052	0.77	1.2					
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	0.0016 J	0.0018 J	0.095	0.17	0.038 J	0.045	0.015	0.021	0.096	0.033	0.051	<0.0052	0.37	0.41					
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.0020 J	0.0024 J	0.16	0.25	0.063	0.031	0.037	0.039	0.17	0.057	0.12	<0.0052	0.69	0.89					
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	0.0015 J	0.0015 J	0.10	0.17	0.044 J	0.039	0.028	0.024	0.10	0.045	0.085	<0.0052	0.46	0.54					
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	<0.0053	<0.0053	0.025	0.041	0.012 J	0.0032 J	0.0068	0.0084	0.030	0.011	0.024	<0.0052	0.13	0.21					
Benzo(g,h,i)perylene ^(u)	--	na	na		--	--	--	0.0019 J	0.0018 J	0.11	0.17	0.073	0.039	0.019	0.027	0.10	0.040	0.098	0.00076 J	0.55	0.60					
Total carcinogenic PAHs ^(v)	4	na	na	na	na	na	0.01	0.01	0.23	0.38	0.09	0.06	0.05	0.06	0.25	0.09	0.18	0.01	1.0	1.4						
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																										
Benzene	--	--	na	6	0.0379	0.101	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA						
Toluene	--	--	na	5,801	13.9	40.7	NA	NA	NA	NA	NA	NA	<0.076	NA	NA	NA	NA	NA	NA	NA						
Ethylbenzene	--	--	na	30	13.3	40.1	NA	NA	NA	NA	NA	NA	<0.076	NA	NA	NA	NA	NA	NA	NA						
m+p Xylenes	--	--	na	--	--	--	NA	NA	NA	NA	NA	NA	<0.15	NA	NA	NA	NA	NA	NA	NA						
o-Xylenes	--	--	na	--	--	--	NA	NA	NA	NA	NA	NA	<0.15	NA	NA	NA	NA	NA	NA	NA						
Xylenes, Total	--	--	na	319	217	679	NA	NA	NA	NA	NA	NA	<0.15	NA	NA	NA	NA	NA	NA	NA						
Methyl-t-butyl-ether	--	--	na	208	0.0784	0.164	NA	NA	NA	NA	NA	NA	<0.31	NA	NA	NA	NA	NA	NA	NA						
Naphthalene	--	--	na	21	9.32	30.6	NA	NA	NA	NA	NA	NA	0.026 J	NA	NA	NA	NA	NA	NA	NA						
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																										
C9 to C10 Aromatics	--	--	na	891	136	459	NA	NA	NA	NA	NA	NA	<3.1	NA	NA	NA	NA	NA	NA	NA						
C5 to C8 Aliphatics	--	--	na	301	223	757	NA	NA	NA	NA	NA	NA	<3.1	NA	NA	NA	NA	NA	NA	NA						
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	NA	NA	NA	NA	NA	NA	<3.1	NA	NA	NA	NA	NA	NA	NA						
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	NA	NA	NA	NA	NA	NA	<3.1	NA	NA	NA	NA	NA	NA	NA						

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
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DEQ EXPOSURE AREA ID ^(a)										EXPOSURE AREA G (continued)							
SAMPLING GRID ID ^(b)										58AA	61AA	58B	60B	45C	48C	48C	53C
Sample ID	ROD Cleanup Level (mg/kg) ^(c)	ROD Screening Level (mg/kg) ^(c)	Task J SI Work Plan Screening Level (mg/kg) ^(d)	2009 RBSLs (mg/kg) ^(e)	2012 SSLs (mg/kg) ^(f)	2012 RSLs (mg/kg) ^(g)	58AA-SS-a,b,c,d,e-comp	61AA-SS-a,b,c,d,e-comp	58B-SS-a,b,c,d,e-comp	60B-SS-a,b,c,d,e-comp	45C-SS-a,b,c,d,e-comp	48C-SS-a,b,c,d,e-comp	48C-SS-e-1.5	53C-SS-a,b,c,d,e-comp			
Analytes							Composite	Composite	Composite	Composite	Composite	Composite	Discrete	Composite			
							11-Oct-10	11-Oct-10	11-Oct-10	11-Oct-10	8-Oct-10	13-Oct-10	9-Nov-10	6-Oct-10			
Total Metals (mg/kg)^(h)																	
Lead	na ⁽ⁱ⁾	750 ⁽ⁱ⁾	na	-- ^(k)	--	--	140	800	NA	NA	84	NA	NA	NA			
Extractable Petroleum Hydrocarbon Screen (EPH Screen) (mg/kg)^(m)																	
EPH Screen	--	--	--	Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching > 20 feet	--	--	77	56	280	110	170	58	<10	1,000
Extractable Petroleum Hydrocarbons (EPH) (mg/kg)⁽ⁿ⁾																	
C11 to C22 Aromatics	na	750 ^(p)	300	3,757	380	1,280	1,980	--	--	NA	NA	<43	NA	NA	NA	NA	240
C19 to C36 Aliphatics	na	5,000 ^(p)	5,000	153,916	considered immobile			--	--	NA	NA	110	NA	NA	NA	NA	460
C9 to C18 Aliphatics	na	2,500 ^(p)	600	1,169	51,700	174,000	269,000	--	--	NA	NA	<43	NA	NA	NA	NA	<86
Total Extractable Hydrocarbons	na	5,000 ^(p)	5,000	not listed	not listed	not listed	not listed	--	--	NA	NA	150	NA	NA	NA	NA	730
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/kg)^(s)																	
				Direct Contact Commercial	Leaching 0-10 feet	Leaching 10-20 feet	Leaching >20 feet										
Naphthalene	--	na	na	21	9.32	30.6	47.4	3.4	na	<0.0054	0.020	0.023	0.020	0.037	0.053	<0.0051	0.077
2-Methylnaphthalene	--	na	na	--	--	--	--	1.4	220	0.0037 J	0.011	0.034	0.024	0.050	0.034	<0.0051	0.32
Acenaphthylene	--	na	na	--	--	--	--	--	na	0.0034 J	0.023	0.11	0.015	0.22	0.058	<0.0051	0.053
Acenaphthene	--	na	na	4,125	249	840	1,300	69	na	0.0013 J	0.065	0.0062	0.034	0.016	0.0087	<0.0051	0.043
Fluorene	--	na	na	2,750	643	2,170	3,350	200	na	0.0026 J	0.061	0.0094	0.042	0.15	0.011	<0.0051	0.017
Phenanthrene	--	na	na	--	--	--	--	--	na	0.018	0.93	0.11	0.86	0.43	0.13	<0.0051	0.16
Anthracene	--	na	na	20,627	3,740	12,600	19,500	679	na	0.0059	0.21	0.097	0.23	2.4	0.076	<0.0051	0.074
Fluoranthene	--	na	na	2,750	484	1,630	2,520	144	na	0.038	2.4	0.40	2.0	1.3	0.40	<0.0051	0.20
Pyrene	--	na	na	2,063	4,280	14,400	22,300	906	na	0.033	2.0	0.35	1.6	2.0	0.30	0.00051 U	0.18
Benzo(a)anthracene ^(u)	--	na	na	na - ROD cleanup level	13.6	45.7	70.6	1.72	na	0.018	1.0	0.18	0.95	2.8	0.12	<0.0051	0.088
Chrysene ^(u)	--	na	na		1,510	5,080	7,850	190	na	0.024	1.0	0.41	0.82	8.0	0.33	<0.0051	0.13
Benzo(b)fluoranthene ^(u)	--	na	na		46.6	157	243	6.0	na	0.032	1.4	0.81	1.1	4.6	0.36	<0.0051	0.14
Benzo(k)fluoranthene ^(u)	--	na	na		466	1,570	2,430	60	na	0.010	0.49	0.21	0.36	1.5	0.13	<0.0051	0.054
Benzo(a)pyrene ^(u)	--	na	na		3.67	12.4	19.1	0.60	na	0.020	1.0	0.63	0.73	2.9	0.15	<0.0051	0.076
Indeno(1,2,3-cd)pyrene ^(u)	--	na	na		132	443	685	21	na	0.016	0.60	0.42	0.46	1.1	0.14	<0.0051	0.058
Dibenzo(a,h)anthracene ^(u)	--	na	na		6.78	22.8	35.3	1.9	na	0.0058	0.20	0.16	0.16	0.31	0.035	<0.0051	0.017
Benzo(g,h,i)perylene ^(u)	--	na	na		--	--	--	--	na	0.023	0.62	0.46	0.47	0.93	0.15	<0.0051	0.087
Total carcinogenic PAHs ^(v)	4	na	na	na	na	na	na	na	na	0.03	1.5	0.93	1.2	4.1	0.25	0.01	0.12
MBTEXN Volatile Petroleum Hydrocarbons (mg/kg)^(w)																	
Benzene	--	--	na	6	0.0379	0.101	0.156	0.026	na	NA	NA	NA	NA	NA	NA	NA	<0.061
Toluene	--	--	na	5,801	13.9	40.7	62.8	6.9	na	NA	NA	NA	NA	NA	NA	NA	<0.061
Ethylbenzene	--	--	na	30	13.3	40.1	62	7.8	na	NA	NA	NA	NA	NA	NA	NA	<0.061
m+p Xylenes	--	--	na	--	--	--	--	94.74	250	NA	NA	NA	NA	NA	NA	NA	<0.12
o-Xylenes	--	--	na	--	--	--	--	100	300	NA	NA	NA	NA	NA	NA	NA	<0.12
Xylenes, Total	--	--	na	319	217	679	1,050	98	na	NA	NA	NA	NA	NA	NA	NA	<0.12
Methy-t-butyl-ether	--	--	na	208	0.0784	0.164	0.252	0.07	na	NA	NA	NA	NA	NA	NA	NA	<0.24
Naphthalene	--	--	na	21	9.32	30.6	47.4	3.4	na	NA	NA	NA	NA	NA	NA	NA	<0.12
Volatile Petroleum Hydrocarbons (VPH) (mg/kg)^(w)																	
C9 to C10 Aromatics	--	--	na	891	136	459	710	--	--	NA	NA	NA	NA	NA	NA	NA	<2.4
C5 to C8 Aliphatics	--	--	na	301	223	757	1,170	--	--	NA	NA	NA	NA	NA	NA	NA	<2.4
C9 to C12 Aliphatics	--	--	na	713	11,500	38,900	60,100	--	--	NA	NA	NA	NA	NA	NA	NA	<2.4
Total Purgeable Hydrocarbons	--	--	na	not listed	not listed	not listed	not listed	--	--	NA	NA	NA	NA	NA	NA	NA	<2.4

SURFACE SOIL ANALYTICAL RESULTS (DEQ EXPOSURE AREAS) - 2010
Burlington Northern Livingston Shop Complex

Notes:

- (a) Montana Department of Environmental Quality (DEQ)-defined exposure area identified in DEQ's letter to BNSF dated 10 June 2010.
- (b) Sampling grid identified in Final Task J Supplemental Investigation Work Plan for Surface Soil dated December 2005 (Task J SI Work Plan - DEQ Version).
- (c) Cleanup/screening level from Record of Decision (ROD) (DEQ 2001).
- (d) Risk-based screening levels (RBSLs) based on Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases dated October 2003.
- (e) RBSLs from Master Table - All Potential Tier 1 RBSLs for Soil (Appendix C) of Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases dated September 2009.
- (f) Soil screening levels (SSLs) based on U.S. Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites dated May 2012 for contaminant leaching to groundwater pathway. An SSL has been calculated based on Montana's numeric water quality (DEQ-7) standards, adjusted for a dilution attenuation factor (DAF) of 10. The DEQ-7 adjusted risk-based SSL is equal to the ratio of the DEQ-7 standard to the tap water RSL multiplied by the risk-based SSL and a factor of 10. If the DEQ-7 standard and EPA maximum contaminant level (MCL) were the same value, the MCL-based SSL provided in the RSL table (May 2012), adjusted for a DAF of 10, was used. DEQ has determined that a DAF of 10 is appropriate for conditions in Montana. If no DEQ-7 standard is available, the EPA SSL, adjusted for a DAF of 10, has been provided.
- (g) Industrial RSLs based on EPA RSLs for Chemical Contaminants at Superfund Sites dated May 2012. If the compound is a non-carcinogen, the non-carcinogenic RSL has been divided by 10. The non-carcinogenic RSL for lead has not been divided by 10.
- (h) Soil samples were analyzed for lead using EPA Method 6010. Samples were sieved using a 250 micron (No. 60) sieve by the analytical laboratory prior to analysis for total lead.
- (i) "na" denotes not applicable.
- (j) Screening levels from EPA Recommendations of the Technical Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil (EPA 1996), including use of the Technical Review Workgroup memorandum dated April 1999.
- (k) "--" denotes a ROD cleanup level or screening level (RBSL/RSL/SSL) has not been established.
- (l) "NA" denotes not analyzed per Task J SI Work Plan - DEQ Version and DEQ's letter dated 10 June 2010.
- (m) Soil samples were screened for extractable petroleum hydrocarbons (EPH) using modified EPA Method 8015. The EPH screening method is a screening technique for EPH analysis via the Montana Method. If the EPH screen result exceeded 200 mg/kg, the sample was analyzed for EPH fractions and polynuclear aromatic hydrocarbons (PAHs), unless sample was already designated for PAH analysis (as a primary analysis).
- (n) "j" denotes the value has been qualified as an estimated concentration based on data validation findings.
- (o) Soil samples were analyzed for EPH fractions using Massachusetts Department of Environmental Protection (MADEP) EPH Fractionation Method.
- (p) ROD values for petroleum in surface soil are RBSLs based on Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases (Final Draft) dated March 2000.
- (q) "<" denotes analyte was not detected at the indicated method reporting limit.
- (r) "U" denotes the analyte was not detected at the indicated value based on data validation findings.
- (s) Soil samples were analyzed for PAHs using EPA Method 8270 in selective ion monitoring (SIM) mode.
- (t) "J" denotes estimated value. The analyte is present but at a concentration less than the limit of quantitation.
- (u) Carcinogenic PAH (cPAH).
- (v) Possible total cPAHs are based on the relative toxicity of each cPAH to benzo(a)pyrene and were calculated by multiplying the individual cPAH concentrations by a toxicity equivalency factor (TEF) and summing the adjusted concentrations. If no individual cPAH was detected, a value of one half the method reporting limit was used in the calculation as required by DEQ, based on the procedure normally used for risk assessments.
- (w) Soil samples were analyzed for volatile petroleum hydrocarbons (VPH) by the MADEP VPH Method [including methyl-t-butyl-ether (MTBE), benzene, toluene, ethylbenzene, xylenes, and naphthalene, collectively referred to as MBTEXN].

Detected values shown in bold.

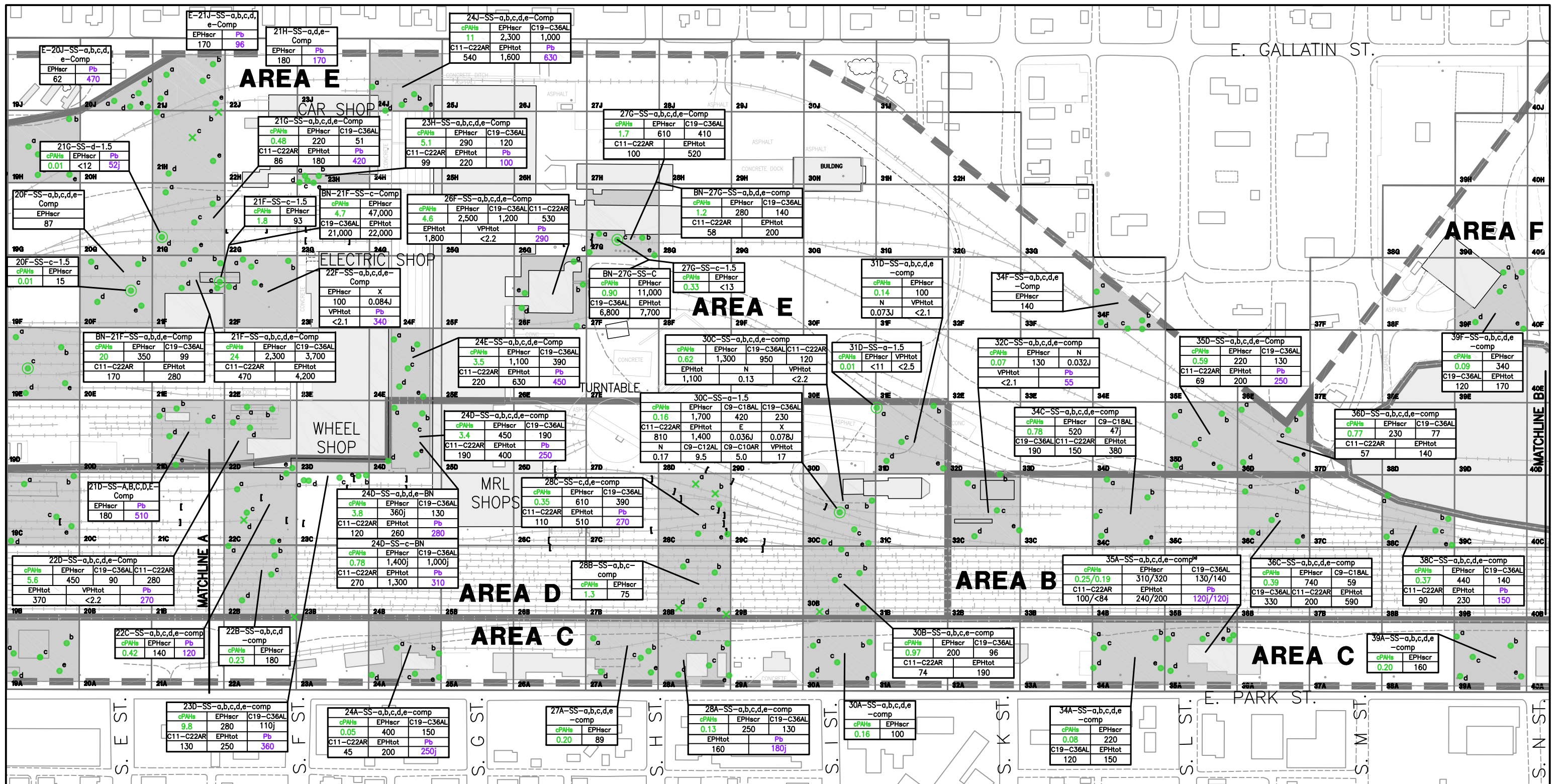
Sub-samples were either composited in the field or composited by the analytical laboratory prior to analysis.

Analytical results are reported on a dry weight basis.

mg/kg - milligrams per kilogram

Discrete sample collected 18 to 24 inches below ground surface.

Figures



LEGEND

9C-SS-a,b,c,d,e-comp	E	ETHYLBENZENE	NA	NOT ANALYZED
cPAHs	X	TOTAL XYLENES	J	ANALYTE DETECTED BELOW THE METHOD REPORTING LIMIT
EPHscr	N	NAPHTHALENE	j	ESTIMATED CONCENTRATION BASED ON DATA VALIDATION
C19-C36AL	EPHscr	EXTRACTABLE PETROLEUM HYDROCARBONS SCREEN	b	NEAR-SURFACE SOIL SUB-SAMPLE LOCATION (2010)
C11-C22AR	EPHtot	TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS (SUM OF EPH FRACTIONS)	e	18-24 INCH DISCRETE SURFACE SOIL SAMPLE LOCATION (2010)
EPHtot	EPHtot	TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS (SUM OF EPH FRACTIONS)	x	BALLAST SUB-SAMPLE LOCATION (2010)
VPhtot	Pb	LEAD		
C9-C12AL	C9-C18AL	C9-C18 ALIPHATICS		
C9-C10AR	C19-C36AL	C19-C36 ALIPHATICS		
	C11-C22AR	C11-C22 AROMATICS		

SURFACE SOIL SAMPLE DESIGNATION WITH cPAHs, DETECTED EPH/VPH COMPOUNDS AND LEAD (mg/kg)
 cPAHs TOTAL CARCINOGENIC PAHs
 VPhtot TOTAL VOLATILE PETROLEUM HYDROCARBONS (SUM OF VPH FRACTIONS)
 C9-C12AL C9-C12 ALIPHATICS
 C9-C10AR C9-C10 AROMATICS

[---] TRACK PANS
 [---] VISUAL RECONNAISSANCE GRID WITH ALPHANUMERIC DESIGNATION
 [---] GRID SAMPLED
 [---] DENOTES BOUNDARY OF LIVINGSTON RAILYARD AND DOES NOT REPRESENT THE FACILITY BOUNDARY AS DEFINED UNDER MONTANA'S COMPREHENSIVE ENVIRONMENTAL CLEANUP AND RESPONSIBILITY ACT (CECRA).
 [---] DEQ-DEFINED EXPOSURE AREA

NOTE:

a) THE SECOND RESULT IS FOR A FIELD DUPLICATE SAMPLE.

BASEMAP SOURCE:
 HORIZONS, INC. RAPID CITY, SD (1989)

APPROXIMATE SCALE IN FEET

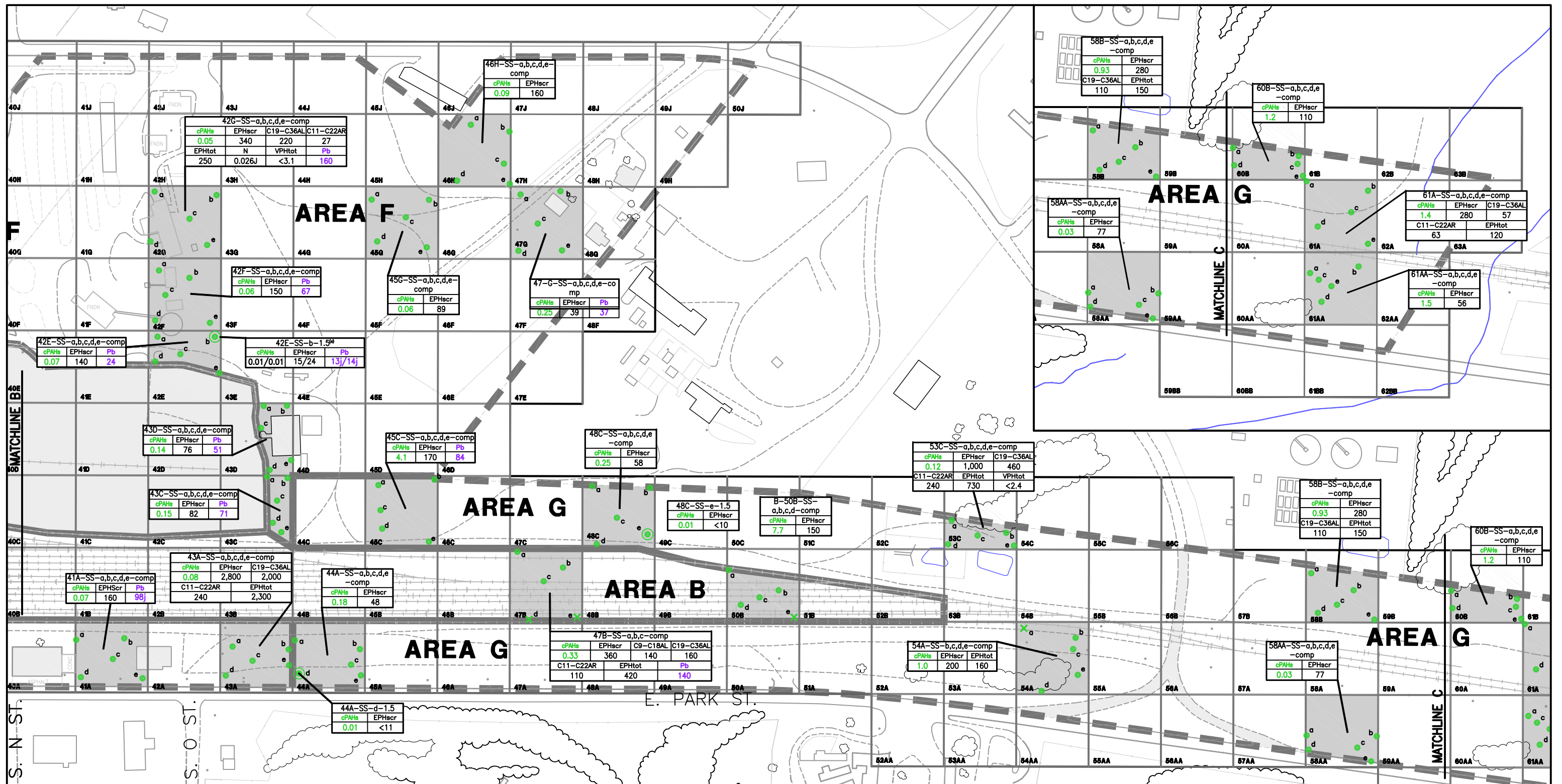
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BURLINGTON NORTHERN LIVINGSTON SHOP COMPLEX – LIVINGSTON, MT

GRID SURFACE SOIL SAMPLE ANALYTICAL RESULTS (2010)

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FIGURE 16B



LEGEND

9C-SS-a,b,c,d,e-comp		
cPAHs	EPHscr	C19-C36AL
0.19	210	120
C11-C22AR EPHtot Pb		
45	160	170

SURFACE SOIL SAMPLE DESIGNATION WITH cPAHs, DETECTED EPH/VPH COMPOUNDS AND LEAD (mg/kg)

cPAHs	TOTAL CARCINOGENIC PAHs	
VPHtot	TOTAL VOLATILE PETROLEUM HYDROCARBONS (SUM OF VPH FRACTIONS)	
C9-C12AL	C9-C12 ALIPHATICS	
C9-C10AR	C9-C10 AROMATICS	

EPHscr	EXTRACTABLE PETROLEUM HYDROCARBONS SCREEN	
EPHtot	TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS (SUM OF EPH FRACTIONS)	
C9-C18AL	C9-C18 ALIPHATICS	
C19-C36AL	C19-C36 ALIPHATICS	
C11-C22AR	C11-C22 AROMATICS	
Pb	LEAD	

NA NOT ANALYZED
 J ANALYTE DETECTED BELOW THE METHOD REPORTING LIMIT
 j ESTIMATED CONCENTRATION BASED ON DATA VALIDATION
 b NEAR-SURFACE SOIL SUB-SAMPLE LOCATION (2010)
 e 18-24 INCH DISCRETE SURFACE SOIL SAMPLE LOCATION (2010)
 e x BALLAST SUB-SAMPLE LOCATION (2010)

— VISUAL RECONNAISSANCE GRID WITH ALPHANUMERIC DESIGNATION
 — GRID SAMPLED
 — DENOTES BOUNDARY OF LIVINGSTON RAILYARD AND DOES NOT REPRESENT THE FACILITY BOUNDARY AS DEFINED UNDER MONTANA'S COMPREHENSIVE ENVIRONMENTAL CLEANUP AND RESPONSIBILITY ACT (CECRA).
 DEQ-DEFINED EXPOSURE AREA

— TRACK PANS

NOTE:
 a) THE SECOND RESULT IS FOR A FIELD DUPLICATE SAMPLE.

BASEMAP SOURCE:
 HORIZONS, INC. RAPID CITY, SD (1989)

APPROXIMATE SCALE IN FEET

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GRID SURFACE SOIL SAMPLE ANALYTICAL RESULTS (2010)

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 7/12 (Revision No. 2) **FIGURE 16C**