LDC #: 20223D2b
SDG #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
Performance Quality Assurance/Evaluation Samples				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
Internal Standards				
Were internal standard area counts within -50% or +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds from the associated calibration standard?	✓			
Target Compound Identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
Compound Quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Tentatively Identified Compounds (TICs)				
Were the major ions (> 10 percent relative intensity) in the reference spectrum evaluated in sample spectrum?			✓	
Were relative intensities of the major ions within ± 20% between the sample and the reference spectra?			✓	
Did the raw data indicate that the laboratory performed a library search for all required peaks in the chromatograms (samples and blanks)?			✓	
System Performance				
System performance was found to be acceptable.	✓			
Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
Field Duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
Field Blanks				
Field blanks were identified in this SDG.		✓		
Target compounds were detected in the field blanks.			✓	

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

A. Phenol**	P. Bis(2-chloroethoxy)methane	EE. 2,6-Dinitrotoluene	TT. Pentachlorophenol**	III. Benzo(a)pyrene**
B. Bis (2-chloroethyl) ether	Q. 2,4-Dichlorophenol**	FF. 3-Nitroaniline	UU. Phenanthrene	JJJ. Indeno(1,2,3-cd)pyrene
C. 2-Chlorophenol	R. 1,2,4-Trichlorobenzene	GG. Acenaphthene**	VV. Anthracene	KKK. Dibenz(a,h)anthracene
D. 1,3-Dichlorobenzene	S. Naphthalene	HH. 2,4-Dinitrophenol*	WW. Carbazole	LLL. Benzo(g,h,i)perylene
E. 1,4-Dichlorobenzene**	T. 4-Chloroaniline	II. 4-Nitrophenol*	XX. Di-n-butylphthalate	MMM. Bis(2-Chloroisopropyl)ether
F. 1,2-Dichlorobenzene	U. Hexachlorobutadiene**	JJ. Dibenzofuran	YY. Fluoranthene**	NNN. Aniline
G. 2-Methylphenol	V. 4-Chloro-3-methylphenol**	KK. 2,4-Dinitrotoluene	ZZ. Pyrene	OOO. N-Nitrosodimethylamine
H. 2,2'-Oxybis(1-chloropropane)	W. 2-Methylnaphthalene	LL. Diethylphthalate	AAA. Butylbenzylphthalate	PPP. Benzoic Acid
I. 4-Methylphenol	X. Hexachlorocyclopentadiene*	MM. 4-Chlorophenyl-phenyl ether	BBB. 3,3'-Dichlorobenzidine	QQQ. Benzyl alcohol
J. N-Nitroso-di-n-propylamine*	Y. 2,4,6-Trichlorophenol**	NN. Fluorene	CCC. Benzo(a)anthracene	RRR. Pyridine
K. Hexachloroethane	Z. 2,4,5-Trichlorophenol	OO. 4-Nitroaniline	DDD. Chrysene	SSS. Benzidine
L. Nitrobenzene	AA. 2-Chloronaphthalene	PP. 4,6-Dinitro-2-methylphenol	EEE. Bis(2-ethylhexyl)phthalate	TTT.
M. Isophorone	BB. 2-Nitroaniline	QQ. N-Nitrosodiphenylamine (1)**	FFF. Di-n-octylphthalate**	UUU
N. 2-Nitrophenol**	CC. Dimethylphthalate	RR. 4-Bromophenyl-phenylether	GGG. Benzo(b)fluoranthene	VVV.
O. 2,4-Dimethylphenol	DD. Acenaphthylene	SS. Hexachlorobenzene	HHH. Benzo(k)fluoranthene	WWW.

Notes: * = System performance check compound (SPCC) for RRF; ** = Calibration check compound (CCC) for %RSD.

LDC #: 20223D26
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 11

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤25 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤25.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	12/4/08	PAH CCV1	GGG	26.9		SBLK1124BS1	J/UJ/A
	12/5/08	PAH CCV2	GGG	30.4		1, 3, 4, 6, 8,	J/UJ/A
			DDD	40.3		10, 12, 14,	
						16 → 20	
	12/12/08	PAH CCV2	CCC	28.9		2, 5, 7, 9, 11,	J/UJ/A
			GGG	24.6		13, 15	

CONCAL.2S

LDC #: 20223D2b
SDG #: all cases

VALIDATION FINDINGS WORKSHEET
Surrogate Recovery

Page: 1 of 1
Reviewer: F7
2nd Reviewer: 1

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were percent recoveries (%R) for surrogates within QC limits?
Y N N/A If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
Y N N/A If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Date	Sample ID	Surrogate	%R (Limits)	Qualifications
		1	TPH	155 (30-125)	no qual
				( )	
		16	FBP	44 (45-105)	↓
				( )	
		18	↓	43 (↓)	↓
				( )	
		~~6~~ 7	↓	40 (↓)	↓
				( )	
		~~14~~ 15	↓	42 (↓)	↓
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

* QC limits are advisory	QC Limits (Soil)	QC Limits (Water)		QC Limits (Soil)	QC Limits (Water)
S1 (NBZ) = Nitrobenzene-d5	23-120	35-114	S5 (2FP) = 2-Fluorophenol	25-121	21-100
S2 (FBP) = 2-Fluorobiphenyl	30-115	43-116	S6 (TBP) = 2,4,6-Tribromophenol	19-122	10-123
S3 (TPH) = Terphenyl-d14	18-137	33-141	S7 (2CP) = 2-Chlorophenol-d4	20-130*	33-110*
S4 (PHL) = Phenol-d5	24-113	10-94	S8 (DCB) = 1,2-Dichlorobenzene-d4	20-130*	16-110*

SUR.2S

LDC #: 20223D2b
SDG #: all cases

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

%R ~~RSD~~ no qualy parent 74x value ≥ 4x

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	1X	19 & 20	DD	120 (45-105)	169 (45-105)	32 (30)	14, 15	J/UJ/A
			VV	22 (55-105)	623 (55-105)	117 ( )		
			ccc *	0 (50-150)	184 (50-150)	120 ( )		
			GGG *	0 (45-115)	157 (45-115)	130 ( )	— — —	—
			HHH	0 (45-125)	673 (45-125)	107 ( )		J/UJ/A
			LLL	0 (40-125)	578 (40-125)	110 ( )		
			III *	0 (50-110)	1274 (50-110)	122 ( )		
			DDD *	0 (55-110)	1892 (55-110)	118 ( )		
			YY *	0 (55-115)	2975 (55-115)	135 ( )		
			JJJ	0 (40-120)	604 (40-120)	111 ( )		J/UJ/A
			UU *	0 (50-110)	2004 (50-110)	135 ( )		
			ZZ *	0 (45-125)	2199 (45-125)	131 ( )		
			~~GG~~	( )	372 (45-110)	95 (30)		
			KKK	( )	335 (40-125)	96 ( )		J/UJ/A
			NN	( )	384 (50-110)	99 ( )		J/UJ/A
			W	( )	161 (45-105)	44 ( )		J/UJ/A
			S	( )	197 (40-105)	56 ( )		J/UJ/A
			~~ZZ~~		2199	131		

	Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)		Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)
A.	Phenol	26-90%	≤ 35%	12-110%	≤ 42%	GG.	Acenaphthene	31-137%	≤ 19%	46-118%	≤ 31%
C.	2-Chlorophenol	25-102%	≤ 50%	27-123%	≤ 40%	II.	4-Nitrophenol	11-114%	≤ 50%	10-80%	≤ 50%
E.	1,4-Dichlorobenzene	28-104%	≤ 27%	36-97%	≤ 28%	KK.	2,4-Dinitrotoluene	28-89%	≤ 47%	24-96%	≤ 38%
J.	N-Nitroso-di-n-propylamine	41-126%	≤ 38%	41-116%	≤ 38%	TT.	Pentachlorophenol	17-109%	≤ 47%	9-103%	≤ 50%
R.	1,2,4-Trichlorobenzene	38-107%	≤ 23%	39-98%	≤ 28%	ZZ.	Pyrene	35-142%	≤ 36%	26-127%	≤ 31%
V.	4-Chloro-3-methylphenol	26-103%	≤ 33%	23-97%	≤ 42%						

LDC #: 20223DDb
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FZ
2nd Reviewer: A

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		SBLK1124BS1	GG	129 (45-110)	( )	( )	All + BLK	J/Pdet
			DD	130 (45-105)	( )	( )		
			VV	132 (55-105)	( )	( )		
			III	112 (50-110)	( )	( )		
			YY	117 (55-115)	( )	( )		
			NN	111 (50-110)	( )	( )		
			S	115 (40-105)	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 20223D2b
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Reviewer: PJ
2nd Reviewer: R

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

Y N N/A Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	compound ~~Sample ID~~	Finding	Associated Samples	Qualifications
		VV, CCC, GGG, HHH,	x'd cal range	1	J/A det
		LLL, III, DDD,			
		~~EEE~~, YY, ~~MM~~, JJJ,			
		~~WW~~, UU, ZZ			
		CCC, GGG, III,	↓	~~3~~ 4	↓
		DDD, YY, UU, ZZ	↓	↓	↓
		YY, ZZ	↓	6	↓
		CCC, GGG, DDD, YY,	↓	8	↓
		ZZ	↓	↓	↓
		VV, CCC, GGG, HHH,	↓	10	↓
		LLL, III, DDD, YY,	↓	↓	↓
		JJJ, UU, ZZ	↓	↓	↓

Comments: See sample calculation verification worksheet for recalculations

LDC #: 20223D2b
SDG #: [illegible]

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

Y N N/A Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	~~Sample ID~~ compd	Finding	Associated Samples	Qualifications
		YY, ZZ	x'd cal range	12	J/A det
		YY	↓	14	↓
		All detect	possible carry over from previous run (#1) per laboratory case narrative	3	J/A detect

Comments: See sample calculation verification worksheet for recalculations

COMQUA.2S

LDC #: 20223D26
SDG #: 0811280

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Reviewer: PI
2nd Reviewer: SL

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

Y N N/A Was the overall quality and usability of the data acceptable?

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		1, 10	VV, CCC, GGG, HHH, LLL, III, DDD, YY, JJJ, UU, ZZ		R/A
		2, 11	All except above		
		4	CCC, GGG, III, DDD, YY UU, ZZ		
		5	All except above		
		6, 12	YY, ZZ		
		7, 13	All except YY, ZZ		
		8	CCC, GGG, DDD, YY, ZZ		

Comments:

OVR.2S

LDC #: 20225D26
SDG #: 0811280

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Reviewer: PJ
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

Y N N/A Was the overall quality and usability of the data acceptable?

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		9	All except CCC, GGG DDD, YY, ZZ		R/A
		14	YY		
		15	All except YY		

Comments:

LDC#: 20223D2b
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: FT
2nd Reviewer: SC

METHOD: GC/MS PAH(EPA SW 846 Method 8270SIM)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (ug/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	6		8			
	Dilution: 1.0 Prep Date: 11/24/08_ Analysis date: 12/05/08		Dilution: 1.0 Prep Date: 11/24/08_ Analysis date: 12/05/08			
GG	43	5.8	100	5.7	2	-
VV	140	6.6	360	6.6	3	-
CCC	820	5.8	3000	5.7	4	-
GGG	870	5.8	2800	5.7	3	-
HHH	400	5.8	1400	5.7	4	-
LLL	400	5.8	1300	5.7	3	-
III	710	5.8	2300	5.7	3	-
DDD	1100	6.6	3900	6.6	4	-
KKK	70	5.8	360	5.7	5	D
YY	1600	6.6	3900	6.6	2	-
NN	33	6.6	100	6.6	3	-
JJJ	400	5.8	1300	5.7	3	-
W	6.8	5.7	13	5.6	2	-
S	5.7	5.4	13	5.3	2	-
UU	640	6.6	2400	6.6	4	-
ZZ	1200	5.8	3200	5.7	3	-

Compound	Concentration (Detection limit) (ug/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	7		9			
	Dilution: 5.0 Prep Date: 11/24/08_ Analysis date: 12/12/08		Dilution: 5.0 Prep Date: 11/24/08_ Analysis date: 12/12/08			
GG	32	29	79	29	2	-
VV	110	33	440	33	4	-

LDC#: 20223D2b
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: FT
2nd Reviewer: SC

METHOD: GC/MS PAH(EPA SW 846 Method 8270SIM)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (ug/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	7		9			
	Dilution: 5.0 Prep Date: 11/24/08 Analysis date: 12/12/08		Dilution: 5.0 Prep Date: 11/24/08 Analysis date: 12/12/08			
CCC	570	29	1700	29	3	-
GGG	640	29	1600	29	3	-
HHH	230	29	770	29	3	-
LLL	390	29	1000	29	3	-
III	600	29	1700	29	3	-
DDD	640	33	1900	33	3	-
YY	1200	29	3900	29	3	-
NN	24	33	96	33	4	-
JJJ	330	29	870	29	3	-
UU	580	33	2200	33	4	-
ZZ	1000	29	3100	29	3	-

Compound	Concentration (Detection limit) (ug/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	3		HCVWSS09030811			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/05/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/11/08			
VV	7.3U	7.3	3.0	6.5	2	-
CCC	17	6.4	15	6.2	1	-
GGG	16	6.4	25	6.2	2	-
HHH	11	6.4	7.3	6.4	1	-
LLL	6.4U	6.4	11	6.2	2	-
III	17	6.4	16	5.9	1	-
DDD	23	7.3	19	6.6	1	-

LDC#: 20223D2b
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: FT
2nd Reviewer: SC

METHOD: GC/MS PAH(EPA SW 846 Method 8270SIM)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (ug/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	3		HCVWSS09030811			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/05/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/11/08			
YY	34	7.3	41	6.8	1	-
JJJ	9.8	6.4	11	6.0	1	-
UU	11	7.3	18	6.8	2	-
ZZ	26	6.4	30	6.4	1	-

V:\FIELD DUPLICATES\20223D2b.wpd

LDC #: 20223D2b
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: F7
2nd Reviewer: A

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs,

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (0.5 std)	Recalculated RRF (0.5 std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL	9/15/08	~~Phenol~~ (1st internal standard) Acenaphthene	0.530	0.530	0.5271	0.5271	7.3	7.3
			~~Naphthalene~~ (2nd internal standard) Chrysene	1.177	1.177	1.2733	1.2733	11.0	11.0
			~~Fluorene (3rd internal standard)~~						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			~~Benzo(a)pyrene (6th internal standard)~~						
2	ICAL	12/10/08	~~Phenol~~ (1st internal standard) Acenaphthene	0.672	0.672	0.685728	0.685728	11.1	11.1
			~~Naphthalene~~ (2nd internal standard) Chrysene	per curve					
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			~~Benzo(a)pyrene (6th internal standard)~~						
3			Phenol (1st internal standard)						
			Naphthalene (2nd internal standard)						
			Fluorene (3rd internal standard)						
			Pentachlorophenol (4th internal standard)						
			Bis(2-ethylhexyl)phthalate (5th internal standard)						
			Benzo(a)pyrene (6th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC # 20223D2b
SDG# see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GCMS PAH 8270C sim

Parameter: Chrysene

Date	Column	Compound	X	Y	
12/10/2009	GCMS4	Chrysene	0.005	0.010	
			0.010	0.027	
			0.050	0.096	
			0.100	0.161	
			0.250	4.06E-001	
			0.500	7.73E-001	
			1.000	1.46E+000	
			5.000	8.029	
			10.000	14.926	

Regression Output:	Regression Output:	Reported	
Constant	0.00000		
Std Err of Y Est	0.18049		
R Squared	0.99879		0.99900
No. of Observations	9.00000		
Degrees of Freedom	8.00000		
X Coefficient(s)	1.515E+000	1.51637	
Std Err of Coef.	0.00		

LDC #: 2022 3D2b
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: A
2nd Reviewer: K

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	PAHCCV1	12/4/08	~~Phenol~~ (1st internal standard) Acenaphthene	0.527	0.612	0.612	16.0	16.0
			~~Naphthalene~~ (2nd internal standard) Chrysene	1.273	1.388	1.388	9.0	9.0
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					
2	PAH CCV2	12/5/08	~~Phenol~~ (1st internal standard)		0.611	0.611	15.8	15.8
			~~Naphthalene~~ (2nd internal standard)		1.786	1.786	40.3	40.3
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					
3	PAH CCV2	12/12/08	~~Phenol~~ (1st internal standard)	0.686	0.696	0.696	1.5	1.5
			~~Naphthalene~~ (2nd internal standard)	5.0	5.675	5.675	13.5	13.5
			Fluorene (3rd internal standard)					
			Pentachlorophenol (4th internal standard)					
			Bis(2-ethylhexyl)phthalate (5th internal standard)					
			Benzo(a)pyrene (6th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 20223122b
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: B
2nd reviewer: R

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270C)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl	~~52~~ 1.0	0.51892	52	52	0
Terphenyl-d14	~~155~~ 1.0	1.55263	155	155	0
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 20223D2b
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: A
2nd Reviewer: A

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = I MS - MSD I * 2/(MS + MSD) MS = Matrix spike percent recovery MSD = Matrix spike duplicate percent recovery

MS/MSD samples: 19 + 20

Compound	Spike Added (ug/kg)		Sample Concentration (ug/kg)	Spiked Sample Concentration (ug/kg)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol											
N-Nitroso-di-n-propylamine											
4-Chloro-3-methylphenol				138.7							
Acenaphthene	85.69	85.69	69.63	~~69.63~~	388.6	81	81	372	372	95	95
Pentachlorophenol											
Pyrene	↓	↓	776.8	555.3	2661	0	0	2199	2199	131	131

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 20223D26
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: A
2nd Reviewer: C

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration, SA = Spike added

RPD = I LCS - LCSD I * 2/(LCS + LCSD) LCS = Laboratory control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS/LCSD samples: SBLK1124BS1

Compound	Spike Added (ug/kg)		Spike Concentration (ug/kg)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol										
N-Nitroso-di-n-propylamine										
4-Chloro-3-methylphenol										
Acenaphthene	66.67	NA	85.98	NA	129	129				
Pentachlorophenol										
Pyrene	↓	↓	74.13	↓	111	111	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 20223D2b
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: [illegible]
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #1, Acenaphthene

Conc. = $\frac{(618328)(1.0)(1000)(\quad)(\quad)}{(171287)(0.5277)(15)(0.799)}$

= 570 ug/kg

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Hanna City AFS, RI/FS
Data Validation Reports
LDC# 20223

Arsenic

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 18, 2008

LDC Report Date: February 4, 2009

Matrix: Soil

Parameters: Arsenic

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811250

Sample Identification

HCCCSB0723010811
HCCCSB0745010811
HCCCSB0223010811
HCCCSB0245010811
HCCCSB0123010811
HCCCSB0145010811
HCCCSB0623010811
HCCCSB0623020811
HCCCSB0645010811

Introduction

This data review covers 9 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 6010B for Arsenic.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

All criteria for the initial calibration of each method were met.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No arsenic was found in the initial, continuing and preparation blanks.

No field blanks were identified in this SDG.

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VI. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

ICP-MS was not utilized in this SDG.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution was not performed for this SDG.

XI. Sample Result Verification

All sample result verifications were acceptable.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

Samples HCCCSB0623010811 and HCCCSB0623020811 were identified as field duplicates. No arsenic was detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCCSB0623010811		HCCCSB0623020811			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/3/08			
Arsenic	13.1	2.6U	9.4	2.5U	1	-

Hanna City AFS RI/FS
Arsenic - Data Qualification Summary - SDG 0811250

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Arsenic - Laboratory Blank Data Qualification Summary - SDG 0811250

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Arsenic - Field Blank Data Qualification Summary - SDG 0811250

No Sample Data Qualified in this SDG

LDC #: 20223B4
SDG #: 0811250
Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 2-4-09
Page: 1 of 1
Reviewer: MG
2nd Reviewer: ✓

METHOD: Arsenic (EPA SW 846 Method 6010B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-18-08
II.	Calibration	A	
III.	Blanks	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	N	client specified
VI.	Duplicate Sample Analysis	N	" "
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	not utilized
IX.	Furnace Atomic Absorption QC	N	" "
X.	ICP Serial Dilution	N	not performed
XI.	Sample Result Verification	A	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D = 7+8
XIV.	Field Blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: all soil

1	HCCCSB0723010811	11		21		31	
2	HCCCSB0745010811	12		22		32	
3	HCCCSB0223010811	13		23		33	
4	HCCCSB0245010811	14		24		34	
5	HCCCSB0123010811	15		25		35	
6	HCCCSB0145010811	16		26		36	
7	HCCCSB0623010811	17		27		37	
8	HCCCSB0623020811	18		28		38	
9	HCCCSB0645010811	19		29		39	
10	PBS	20		30		40	

Notes:

LDC #: 20223B4
SDG #: 0811250

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
V. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP Soil / Water.		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.			✓	
VI. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VII. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

LDC #: 20223B4
SDG #: 0811250

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
VIII. Internal Standards (EPA SW 846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field Duplicates				
Field duplicate pairs were identified in this SDG.	✓	✓		
Target analytes were detected in the field duplicates.	✓		✓	
XIII. Field Blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC#: 20223B4
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: SC

METHOD: Metals (EPA Method 6010B)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	7		8			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/3/08			
Arsenic	13.1	(2.6)	9.4	(2.5)	1	-

V:\FIELD DUPLICATES\FD_inorganic\20223B4.wpd

LDC #: 20223B4
SDG #: 0811250

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1406 ICV	ICP (Initial calibration)	As	1002.0	1000.0	100.2	100.2	Y
	GFAA (Initial calibration)						
	CVAA (Initial calibration)						
2125 CCV2	ICP (Continuing calibration)	As	931.82	1000.0	93.2	93.2	
	GFAA (Continuing calibration)						
	CVAA (Continuing calibration)						
	ICP/MS (Initial calibration)						
	ICP/MS (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results. ICV raw data found in SDG: 0811251 ("C")

LDC #: 20223B4
SDG #: 0811250

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1552 ICSAB-0	ICP Interference check	As	109.12 (µg/L)	100. (µg/L)	109.1	109.1	Y
2149 LCS	Laboratory control sample	As	47.16 (mg/kg)	50.0 (mg/kg)	94.3	94.4	↓
–	Matrix spike	–	(SSR-SR) –	–	–	–	–
–	Duplicate	–	–	–	–	–	–
–	ICP serial dilution	–	–	–	–	–	–

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 20223 B4
SDG #: 0811250

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, As were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)(%S)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(34.302\ \mu g/L)(0.200\ L)}{(1.00\ g)(0.780)} = 8.795\ \mu g/g \text{ or } mg/kg$$

Sample ID	Analyte	Reported Concentration (mg/kg)	Calculated Concentration (mg/kg)	Acceptable (Y/N)
1	As	8.8	8.8	Y

RECALC.4S2

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 18, 2008

LDC Report Date: February 26, 2009

Matrix: Soil

Parameters: Arsenic

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811251

Sample Identification

HCCBSB0923010811
HCCBSB0945010811
HCCBSB0623010811
HCCBSB0645010811
HCCBSB0423010811
HCCBSB0445010811
HCCBSB0445020811
HCCBSB0523010811
HCCBSB0545010811
HCCBSB0323010811
HCCBSB0345010811
HCCBSB0223010811
HCCBSB0245010811
HCCBSB0123010811
HCCBSB0145010811
HCCBSB0523010811
HCPSSB0545010811
HCPSSB0323010811
HCPSSB0345010811
HCPSSB0345020811
HCPSSB0623010811
HCPSSB0645010811
HCCBSB0945010811MS
HCCBSB0945010811MSD

Introduction

This data review covers 24 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 6010B for Arsenic.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

All criteria for the initial calibration of each method were met.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No arsenic was found in the initial, continuing and preparation blanks.

No field blanks were identified in this SDG.

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicate Sample Analysis

Duplicate sample analyses were reviewed for each matrix as applicable.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

ICP-MS was not utilized in this SDG.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution analysis was performed by the laboratory. The analysis criteria were met.

XI. Sample Result Verification

All sample result verifications were acceptable.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

Samples HCCBSB0445010811 and HCCBSB0445020811 and samples HCPSSB0345010811 and HCPSSB0345020811 were identified as field duplicates. No arsenic was detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCBSB0445010811		HCCBSB0445020811			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/4/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/4/08			
Arsenic	9.4	2.5U	11.7	2.6U	1	-

Analyte	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCPSSB0345010811		HCPSSB0345020811			
	Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08			
Arsenic	13.0	2.6U	7.3	2.5U	1	-

Samples HCCBSB0523010811 (primary) and HCCBSB0523030811 (QA split from CTL SDG 70393) and HCPSSB0645010811 (primary) and HCPSSB0645030811 (QA split from CTL SDG 70393) were compared. No arsenic were detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCBSB0523010811		HCCBSB0523030811			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/4/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/2/08			
Arsenic	7.6	2.5U	8.4	2.1U	1	-

Analyte	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCPSSB0645010811		HCPSSB0645030811			
	Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/2/08			
Arsenic	15.7	2.6U	23.1	2.2U	1	-

Hanna City AFS RI/FS
Arsenic - Data Qualification Summary - SDG 0811251

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Arsenic - Laboratory Blank Data Qualification Summary - SDG 0811251

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Arsenic - Field Blank Data Qualification Summary - SDG 0811251

No Sample Data Qualified in this SDG

LDC #: 20223C4
SDG #: 0811251
Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 2-4-09
Page: 1 of 1
Reviewer: MG
2nd Reviewer: ✓

METHOD: Arsenic (EPA SW 846 Method 6010B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-18-08
II.	Calibration	A	
III.	Blanks	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	A	MS/MSD
VI.	Duplicate Sample Analysis	N	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	not utilized
IX.	Furnace Atomic Absorption QC	N	" "
X.	ICP Serial Dilution	A	
XI.	Sample Result Verification	A	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D= 6+7, 19+20, 8+ HCCBSB0523030811 (G Labs SDG 70393)
XIV.	Field Blanks	N	22+ HCPSSB0645030811

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: all soil

1 1	HCCBSB0923010811	11 1	HCCBSB0345010811	21	HCCPSB0623010811 (PS)	31	
2 1	HCCBSB0945010811	12	HCCBSB0223010811	22	HCCPSB0645010811 (PS)	32	
3 1	HCCBSB0623010811	13	HCCBSB0245010811	23 1	HCCBSB0945010811MS	33	
4 1	HCCBSB0645010811	14	HCCBSB0123010811	24 1	HCCBSB0945010811MSD	34	
5 1	HCCBSB0423010811	15	HCCBSB0145010811	25 1	PBS1	35	
6 1	HCCBSB0445010811	16	HCCPSB0523010811 (B)	26 2	PBS2	36	
7 1	HCCBSB0445020811	17	HCCPSB0545010811 (PS)	27		37	
8 1	HCCBSB0523010811	18	HCCPSB0323010811 (PS)	28		38	
9 1	HCCBSB0545010811	19	HCCPSB0345010811 (PS)	29		39	
10 1	HCCBSB0323010811	20	HCCPSB0345020811 (PS)	30		40	

Notes:

LDC #: 20223C4
SDG #: 0811251

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
V. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VI. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VII. Graphite Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

LDC #: 20223C4
SDG #: 0811251

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
VIII. Internal Standards (EPA SW 846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field Duplicates				
Field duplicate pairs were identified in this SDG.	✓	~~✓~~		
Target analytes were detected in the field duplicates.	✓		~~✓~~	
XIII. Field Blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC#: 20223C4
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: SC

METHOD: Metals (EPA Method 6010B)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	6		7			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/4/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/4/08			
Arsenic	9.4	(2.5)	11.7	(2.6)	1	-

Compound	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	19		20			
	Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08			
Arsenic	13.0	(2.6)	7.3	(2.5)	2	-

Compound	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	8		HCCBSB0523030811			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/4/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/2/08			
Arsenic	7.6	(2.5)	8.4	(2.1)	1	-

Compound	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	22		HCPSSB0645030811			
	Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/2/08			
Arsenic	15.7	(2.6)	23.1	(2.2)	1	-

LDC #: 20223C4
SDG #: 081125I

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: ✓

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1406 ICV	ICP (Initial calibration)	As	1002.0	1000.0	100.2	100.2	Y
	GFAA (Initial calibration)						↓
	CVAA (Initial calibration)						↓
1603 CCV1	ICP (Continuing calibration)	As	997.80	1000.0	99.8	99.8	↓
	GFAA (Continuing calibration)						
	CVAA (Continuing calibration)						
	ICP/MS (Initial calibration)						
	ICP/MS (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.4SW

LDC #: 20223C4
SDG #: 0811251

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1552 ICSAB-0	ICP interference check	As	109.12 (µg/L)	100. (µg/L)	109.1	109.1	Y
1627 LCS2	Laboratory control sample	As	48.06 (mg/kg)	50.0 (mg/kg)	96.1	96.2	↓
0833 23	Matrix spike	As	(SSR-SR) 55.80 (mg/kg)	63.04 (mg/kg)	88.5	88.5	↓
0833/0839 23/24	Duplicate	As	66.93 (mg/kg)	72.13 (mg/kg)	7.5	7.5	↓
0836/0853 2	ICP serial dilution	As	43.313 (µg/L)	45.822 (µg/L)	5.8	5.8	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 20223C4
SDG #: 0811251

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for #2, As were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)(%S)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(43.313\ \mu g/L)(0.200\ L)}{(1.01\ g)(0.770)} = 11.139\ \mu g/g \text{ or } mg/kg$$

Sample ID	Analyte	Reported Concentration (mg/kg)	Calculated Concentration (mg/kg)	Acceptable (Y/N)
2	As	11.1	11.1	Y
12	As	7.0	7.0	
22	As	15.7	15.7	

RECALC.4S2

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 18, 2008

LDC Report Date: February 26, 2009

Matrix: Soil/Water

Parameters: Arsenic

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811280

Sample Identification

HCCASB0323010811
HCCASB0345010811
HCCASB0223010811
HCCASB0245010811
HCCASB0123010811
HCCASB0145010811
HCCASB0423010811
HCCASB0445010811
HCCASB0423020811
HCCASB0623010811
HCCASB0645010811
HCCASB0523010811
HCCASB0545010811
HCCASB0723010811
HCCASB0745010811
HCEB03020811
HCEB02020811
HCCASB0423010811MS
HCCASB0423010811MSD
HCCASB0623010811MS
HCCASB0623010811MSD

Introduction

This data review covers 19 soil samples and 2 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 6010B for Arsenic.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

All criteria for the initial calibration of each method were met.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No arsenic was found in the initial, continuing and preparation blanks.

Samples HCEB03020811 and HCEB02020811 were identified as equipment blanks. No arsenic was found in these blanks.

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicate Sample Analysis

Duplicate sample analyses were reviewed for each matrix as applicable.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

ICP-MS was not utilized in this SDG.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution analysis was performed by the laboratory. The analysis criteria were met.

XI. Sample Result Verification

All sample result verifications were acceptable.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

Samples HCCASB0423010811 and HCCASB0423020811 were identified as field duplicates. No arsenic was detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (mg/Kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCASB0423010811		HCCASB0423020811			
	Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08			
Arsenic	11.5	2.5U	15.2	2.6U	1	-

Hanna City AFS RI/FS
Arsenic - Data Qualification Summary - SDG 0811280

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Arsenic - Laboratory Blank Data Qualification Summary - SDG 0811280

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Arsenic - Field Blank Data Qualification Summary - SDG 0811280

No Sample Data Qualified in this SDG

LDC #: 20223D4

SDG #: 0811280

Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

Page: 1 of 1

Reviewer: MG

2nd Reviewer: ✓

METHOD: Arsenic (EPA SW 846 Method 6010B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-18-08
II.	Calibration	A	
III.	Blanks	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	A	MS/MSD
VI.	Duplicate Sample Analysis	N	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	not utilized
IX.	Furnace Atomic Absorption QC	N	" "
X.	ICP Serial Dilution	A	
XI.	Sample Result Verification	A	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D = 7 + 9
XIV.	Field Blanks	ND	EB = 16, 17

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	1	HCCASB0323010811	S	11	2	HCCASB0645010811	S	21	2	HCCASB0623010811MSD	S	31	
2	1	HCCASB0345010811		12	2	HCCASB0523010811		22	1	PBS1		32	
3	1	HCCASB0223010811		13	2	HCCASB0545010811		23	2	PBS2		33	
4	1	HCCASB0245010811		14	2	HCCASB0723010811		24	3	PBW		34	
5	1	HCCASB0123010811		15	2	HCCASB0745010811		25				35	
6	1	HCCASB0145010811		16	3	HCEB03020811	W	26				36	
7	1	HCCASB0423010811		17	3	HCEB02020811		27				37	
8	1	HCCASB0445010811		18	1	HCCASB0423010811MS	S	28				38	
9	1	HCCASB0423020811		19	1	HCCASB0423010811MSD		29				39	
10	2	HCCASB0623010811		20	2	HCCASB0623010811MS		30				40	

Notes:

LDC #: 20223D4
SDG #: 0811280

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
V. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VI. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VII. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

LDC #: 30223D4
SDG #: 0811280

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
VIII. Internal Standards (EPA SW-846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field Duplicates				
Field duplicate pairs were identified in this SDG.	✓	✓		
Target analytes were detected in the field duplicates.	✓		✓	
XIII. Field Blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC#: 20223D4
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: SC

METHOD: Metals (EPA Method 6010B)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/kg)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	7		9			
	Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08		Dilution: 1.0 Prep Date: 12/2/08 Analysis date: 12/3/08			
Arsenic	11.5	(2.5)	15.2	(2.6)	1	-

V:\FIELD DUPLICATES\FD_inorganic\20223D4.wpd

LDC #: 20223D4
SDG #: 0811280

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1406 ICV	ICP (Initial calibration)	As	1002.0	1000.0	100.2	100.2	Y
	GFAA (Initial calibration)						
	CVAA (Initial calibration)						
1742 CCV2	ICP (Continuing calibration)	As	971.79	1000.0	97.2	97.2	
	GFAA (Continuing calibration)						
	CVAA (Continuing calibration)						
	ICP/MS (Initial calibration)						
	ICP/MS (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 20223D4
SDG #: 0811280

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1552 ICSAB-0	ICP interference check	As	109.12 (µg/L)	100. (µg/L)	109.1	109.1	Y
1627 LCS1	Laboratory control sample	As	48.06 (mg/kg)	50.0 (mg/kg)	96.1	96.2	↓
1850 18	Matrix spike	As	(SSR-SR) 60.94 (mg/kg)	64.29 (mg/kg)	94.8	94.8	↓
1850/1857 18/19	Duplicate	As	72.48 (mg/kg)	68.89 (mg/kg)	5.1	5.1	↓
1844/1911 7	ICP serial dilution	As	45.759 (µg/L)	46.331 (µg/L)	1.2	1.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 20223D4
SDG #: 0811280

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for # 7, As were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(45.759\ \mu g/L)(0.200\ L)}{(1.03\ g)(0.770)} = 11.539\ \mu g/g \text{ or } mg/kg$$

Sample ID	Analyte	Reported Concentration (mg/kg)	Calculated Concentration (mg/kg)	Acceptable (Y/N)
7	As	11.5	11.5	Y
				↓
10	As	9.8	9.8	↓

RECALC.4S2

Hanna City AFS, RI/FS
Data Validation Reports
LDC# 20223

Metals

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 20, 2008

LDC Report Date: February 25, 2009

Matrix: Water

Parameters: Metals

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811299

Sample Identification

HCVWGW04010811
HCVWGW04020811
HCVWGW05010811
HCVWGW07010811
HCCAGW06010811
HCCBGW09010811
HCEB04020811F
HCEB05020811F
HCVWGW04010811F
HCVWGW04020811F
HCVWGW05010811F
HCVWGW07010811F
HCCAGW06010811F
HCCBGW09010811F
HCCBGW09010811MS
HCCBGW09010811MSD

Sample IDs ending in "F" were analyzed for dissolved metals

Introduction

This data review covers 16 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Methods 6010B and 7000 for Metals. The metals analyzed were Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

All criteria for the initial calibration of each method were met.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No metals contaminants were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Thallium	3.2 ug/L	HCVWGW04010811 HCVWGW04020811 HCVWGW07010811 HCCAGW06010811 HCCBGW09010811 HCEB04020811F HCEB05020811F HCVWGW04010811F HCVWGW05010811F HCVWGW07010811F HCCAGW06010811F HCCBGW09010811F

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

Samples HCEB04020811F and HCEB05020811F were identified as equipment blanks. No metals contaminants were found in these blanks with the following exceptions:

Equipment Blank ID	Sampling Date	Analyte	Concentration	Associated Samples
HCEB04020811F	11/20/08	Sodium Zinc	1240 ug/L 5.1 ug/L	HCVWGW04010811F HCVWGW04020811F HCVWGW05010811F HCVWGW07010811F HCCAGW06010811F HCCBGW09010811F
HCEB05020811F	11/20/08	Sodium Zinc	1260 ug/L 5.1 ug/L	HCVWGW04010811F HCVWGW04020811F HCVWGW05010811F HCVWGW07010811F HCCAGW06010811F HCCBGW09010811F

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
HCVWGW05010811F	Zinc	16.0 ug/L	16.0B ug/L
HCVWGW07010811F	Zinc	7.1 ug/L	7.1B ug/L

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
HCCBGW09010811MS/MSD (All samples in SDG 0811299)	Aluminum	-	125.8 (80-120)	-	J (all detects)	A

VI. Duplicate Sample Analysis

Duplicate sample analyses were reviewed for each matrix as applicable.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

ICP-MS was not utilized in this SDG.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution analysis was performed by the laboratory. The analysis criteria were met with the following exceptions:

Diluted Sample	Analyte	%D (Limits)	Associated Samples	Flag	A or P
HCCBGW09010811L	Calcium	43.9 (≤10)	All samples in SDG	J (all detects)	A

XI. Sample Result Verification

All sample result verifications were acceptable.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

Samples HCVWGW04010811 and HCVWGW04020811 and samples HCVWGW04010811F and HCVWGW04020811F were identified as field duplicates. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (ug/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCVWGW04010811		HCVWGW04020811			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08			
Aluminum	10600	200U	2530	200U	4	MD
Arsenic	3.0	5.0U	5.0U	5.0U	Not calculable	-
Barium	158	40U	133	40U	1	-
Calcium	96000	5000U	96000	5000U	1	-
Chromium	12.5	10.0U	2.2	10.0U	6	MD
Copper	6.3	10.0U	10.0U	10.0U	Not calculable	-
Iron	10000	100U	1990	100U	5	MD
Lead	3.7	3.0U	3.0U	3.0U	1	-
Magnesium	48600	5000U	48000	5000U	1	-
Manganese	409	15.0U	209	15.0U	2	-
Nickel	9.9	10.0U	10.0U	10.0U	Not calculable	-
Potassium	1870	5000U	5000U	5000U	Not calculable	-
Sodium	9770	5000U	9390	5000U	1	-
Vanadium	19.4	50.0U	5.4	50.0U	4	D
Zinc	24.8	20.0U	7.3	20.0U	3	-

Analyte	Concentration (Detection limit) (ug/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCVWGW04010811F		HCVWGW04020811F			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08			
Aluminum	222	200U	200U	200U	1	-
Barium	86.9	40.0U	78.7	40.0U	1	-
Calcium	94400	5000U	89600	5000U	1	-

Analyte	Concentration (Detection limit) (ug/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCVWGW04010811F		HCVWGW04020811F			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08			
Cobalt	15.0U	15.0U	5.8	15.0U	Not calculable	-
Iron	177	100U	100U	100U	2	-
Magnesium	47100	5000U	44500	5000U	1	-
Manganese	246	15.0U	143	15.0U	2	-
Sodium	9570	5000U	8780	5000U	1	-

Hanna City AFS RI/FS
Metals - Data Qualification Summary - SDG 0811299

SDG	Sample	Analyte	Flag	A or P	Reason
0811299	HCVWGW04010811 HCVWGW04020811 HCVWGW05010811 HCVWGW07010811 HCCAGW06010811 HCCBGW09010811 HCEB04020811F HCEB05020811F HCVWGW04010811F HCVWGW04020811F HCVWGW05010811F HCVWGW07010811F HCCAGW06010811F HCCBGW09010811F	Aluminum	J (all detects)	A	Matrix spike/Matrix spike duplicates (%R)
0811299	HCVWGW04010811 HCVWGW04020811 HCVWGW05010811 HCVWGW07010811 HCCAGW06010811 HCCBGW09010811 HCEB04020811F HCEB05020811F HCVWGW04010811F HCVWGW04020811F HCVWGW05010811F HCVWGW07010811F HCCAGW06010811F HCCBGW09010811F	Calcium	J (all detects)	A	ICP serial dilution (%D)

Hanna City AFS RI/FS
Metals - Laboratory Blank Data Qualification Summary - SDG 0811299

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Metals - Field Blank Data Qualification Summary - SDG 0811299

SDG	Sample	Analyte	Modified Final Concentration	A or P
0811299	HCVWGW05010811F	Zinc	16.0B ug/L	A
0811299	HCVWGW07010811F	Zinc	7.1B ug/L	A

LDC #: 20223E4

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

SDG #: 0811299

Page: 1 of 1

Laboratory: Empirical Laboratories, LLC

Reviewer: MG

2nd Reviewer: ✓

METHOD: Metals (EPA SW 846 Method 6010B/7000)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-20-08
II.	Calibration	A	
III.	Blanks	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	SW	MS/MSD
VI.	Duplicate Sample Analysis	N	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	not utilized
IX.	Furnace Atomic Absorption QC	N	" "
X.	ICP Serial Dilution	SW	
XI.	Sample Result Verification	A	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW	D = 1+2, 9+10
XIV.	Field Blanks	SW	EB = 7,8

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

all water

	1	HCVWGW04010811	11	HCVWGW05010811F	21		31	
	2	HCVWGW04020811	12	HCVWGW07010811F	22		32	
	3	HCVWGW05010811	13	HCCAGW06010811F	23		33	
	4	HCVWGW07010811	14	HCCBGW09010811F	24		34	
	5	HCCAGW06010811	15	HCCBGW09010811MS	25		35	
	6	HCCBGW09010811	16	HCCBGW09010811MSD	26		36	
MA ↓	7	HCEB04020811 F	17	PBW1	27		37	
	8	HCEB05020811 F	18	PBW2 (Hg)	28		38	
	9	HCVWGW04010811F	19		29		39	
	10	HCVWGW04020811F	20		30		40	

Notes: Equipment Blanks and samples appended with "F" were analyed for dissolved metals

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
V. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VI. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VII. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?	✓			
Were all percent differences (%Ds) < 10%?		✓		
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
VIII. Internal Standards (EPA-SW-846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓	✓		
Target analytes were detected in the field duplicates.	✓		✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: W

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→14	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
QC 15, 16	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP Trace	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻,

Comments: Mercury by CVAA if performed

LDC #: 20223E4
SDG #: 0211299

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Page: 1 of 1
Reviewer: MG
2nd Reviewer: ✓

METHOD: Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: µg/L Associated Samples: 1, 2, 4→9, 11→14 (all ND)

					Sample Identification									
Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Blank Action Limit	No samples were qualified									
Al														
Sb														
As														
Ba														
Be														
Cd														
Ca														
Cr														
Co														
Cu														
Fe														
Pb														
Mg														
Mn														
Hg														
Mo														
Ni														
K														
Se														
Ag														
Na														
Tl			3.2	16.00										
V														
Zn														
Sn														
B														

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

BLNKSMP.4SW

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method 6010B / 7000

(Y) N N/A Were field blanks identified in this SDG?
(Y) N N/A Were target analytes detected in the field blanks?

Qual: B

Blank units: mg/L Associated sample units: mg/L
Sampling date: 11-20-08 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / (Other) EB Associated Samples: ~~1→6~~ 9→14

Analyte	Blank ID	Blank ID	Action limit	Sample Identification								
	7	8		11	12							
Na	1240.	1260.	6300.									
Zn	5.1	5.1	25.50	16.0	7.1							

Blank units: Associated sample units:
Sampling date: Soil factor applied
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples:

Analyte	Blank ID	Blank Action Limit	Sample Identification									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [signature]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions ~~are identified~~ as "N/A".

(Y) N N/A — Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A — Were matrix spike percent recoveries (%R) within the control limits of ~~75-125~~ 80-120? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A — Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A — Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	15/16	water	Al		125.8 (80-120)		all	Jdets /A

Comments:

MSD.4S2

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
ICP Serial Dilution

Reviewer: MG
2nd Reviewer: [signature]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A — If analyte concentrations were > 50X the MDL (ICP) ,or >100X the MDL (ICP/MS), was a serial dilution analyzed?

Y (N) N/A — Were ICP serial dilution percent differences (%D) ≤10%?

Y (N) N/A — Is there evidence of negative interference? If yes, professional judgement will be used to qualify the data.

LEVEL IV ONLY:

(Y) N N/A — Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Diluted Sample ID	Matrix	Analyte	%D (Limits)	Associated Samples	Qualifications
1		6	water	Ca	43.9 (≤10)	all	J dets / A

Comments:

LDC#: 20223E4
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: SC

METHOD: Metals (EPA Method 6010B)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/~~kg~~ L) 1		2		Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08			
Aluminum	10600	(200)	2530	(200)	4	MD
Arsenic	3.0	(5.0)	5.0U	(5.0)	NC	-
Barium	158	(40)	133	(40)	1	-
Calcium	96000	(5000)	96000	(5000)	1	-
Chromium	12.5	(10.0)	2.2	(10.0)	6	MD
Copper	6.3	(10.0)	10.0U	(10.0)	NC	-
Iron	10000	(100)	1990	(100)	5	MD
Lead	3.7	(3.0)	3.0U	(3.0)	1	-
Magnesium	48600	(5000)	48000	(5000)	1	-
Manganese	409	(15.0)	209	(15.0)	2	-
Nickel	9.9	(10.0)	10.0U	(10.0)	NC	-
Potassium	1870	(5000)	5000U	(5000)	NC	-
Sodium	9770	(5000)	9390	(5000)	1	-
Vanadium	19.4	(50.0)	5.4	(50.0)	4	~~MD~~ D
Zinc	24.8	(20.0)	7.3	(20.0)	3	~~D~~

Compound	Concentration (Detection limit) (mg/~~kg~~ L) 9		10		Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08			
Aluminum	222	(200)	200U	(200)	1	-
Barium	86 9	(40.0)	78.7	(40.0)	1	-
Calcium	94400	(5000)	89600	(5000)	1	-
Cobalt	15.0U	(15.0)	5.8	(15.0)	NC	-

LDC#: 20223E4
SDG#: [illegible]

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: VG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/~~kg~~ L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	9		10			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 12/1/08			
Iron	177	(100)	100U	(100)	2	-
Magnesium	47100	(5000)	44500	(5000)	1	-
Manganese	246	(15.0)	143	(15.0)	2	-
Sodium	9570	(5000)	8780	(5000)	1	-

V:\FIELD DUPLICATES\FD_inorganic\20223E4.wpd

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1217 ICV	ICP (Initial calibration)	Cd	1081.5	1000.0	108.2	108.2	Y
	GFAA (Initial calibration)						
1319 ICV	CVAA (Initial calibration)	Hg	2.017	2.0	100.8	101.0	
1942 CCV3	ICP (Continuing calibration)	Ba	969.80	1000.0	97.0	97.0	
	GFAA (Continuing calibration)						
1425 CCV4	CVAA (Continuing calibration)	Hg	4.136	4.0	103.4	103.5	
	ICP/MS (Initial calibration)						
	ICP/MS (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.4SW

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1354 ICSAB-0	ICP Interference check	Cu	538.65 (µg/L)	500. (µg/L)	107.7	107.7	Y
1827 LCS	Laboratory control sample	Mn	510.32 (µg/L)	500.0 (µg/L)	102.1	102.1	↓
2037 15	Matrix spike	Se	(SSR-SR) 267.59 (µg/L)	250.00 (µg/L)	107.0	107.0	↓
2037 / 2044 15/16	Duplicate	Ag	246.99 (µg/L)	252.23 (µg/L)	2.1	2.1	↓
2031 / 2058 6	ICP serial dilution	Ca	61640. (µg/L)	88730. (µg/L)	43.9	43.9	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 20223E4
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for # 6, Al were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(3033.4\ \mu g/L)(0.050\ L)}{0.050\ L} = 3033.4\ \mu g/L$$

Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
6	Al	3030.	3030.	Y
	As	5.4	5.4	
	Ba	170.	170.	
	Ca	61600.	61600.	
	Cr	4.1	4.1	
	Fe	3510.	3510.	
	Mg	30700.	30700.	
	Mn	146.	146.	
	Na	75200.	75200.	
	V	6.0	6.0	
	Zn	11.1	11.1	
14	Ba	158.	158.	
	Ca	62500.	62500.	
	Fe	1220.	1220.	
	Mg	31100.	31100.	
	Mn	142.	142.	
	Na	76200.	76200.	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 20, 2008

LDC Report Date: February 5, 2009

Matrix: Water

Parameters: Metals

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811300

Sample Identification

HCPSGW05010811
HCPSGW04010811
HCPSGW04020811
HCPSGW02010811
HCPSGW03010811
HCCCGW06010811
HCPSGW04010811F
HCPSGW02010811F
HCCCGW06010811F
HCPSGW03010811MS
HCPSGW03010811MSD

Sample IDs ending in "F" were analyzed for dissolved metals

Introduction

This data review covers 11 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Methods 6010B and 7000 for Metals. The metals analyzed were Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

All criteria for the initial calibration of each method were met.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
12/2/08	CCV (23:52)	Magnesium	88.4 (90-110)	HCCCGW06010811 HCCCGW06010811F	J (all detects) UJ (all non-detects)	P

III. Blanks

Method blanks were reviewed for each matrix as applicable. No metals contaminants were found in the initial, continuing and preparation blanks.

No field blanks were identified in this SDG.

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VI. Duplicate Sample Analysis

Duplicate sample analyses were reviewed for each matrix as applicable.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

ICP-MS was not utilized in this SDG.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

X. ICP Serial Dilution

ICP serial dilution analysis was performed by the laboratory. The analysis criteria were met.

XI. Sample Result Verification

All sample result verifications were acceptable.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

Samples HCPSGW04010811 and HCPSGW04020811 were identified as field duplicates. No metals were detected in any of the samples.

Samples HCPSGW05010811 (primary) and HCPSGW05030811 (QA split from CTL SDG 70393) and samples HCCCGW06010811 (primary) and HCCCGW06030811 (QA split from CTL SDG 70393) were compared. No metals were detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (ug/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCCGW06010811		HCCCGW06030811			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/2/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/1/08			
Lead	3.0U	3.0U	2.5	10U	Not calculable	-

Although sample HCCCGW06010811 was analyzed for the total analyte list for metals, only lead results were compared. Due to laboratory oversight, the QA split sample HCCCGW06030811 was analyzed for lead only.

Hanna City AFS RI/FS
Metals - Data Qualification Summary - SDG 0811300

SDG	Sample	Analyte	Flag	A or P	Reason
0811300	HCCCGW06010811 HCCCGW06010811F	Magnesium	J (all detects) UJ (all non-detects)	P	Calibration (%R)

Hanna City AFS RI/FS
Metals - Laboratory Blank Data Qualification Summary - SDG 0811300

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Metals - Field Blank Data Qualification Summary - SDG 0811300

No Sample Data Qualified in this SDG

LDC #: 20223F4 **VALIDATION COMPLETENESS WORKSHEET** Date: 2-4-09
SDG #: 0811300 Level IV Page: 1 of 1
Laboratory: Empirical Laboratories, LLC Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6010B/7000)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-20-08
II.	Calibration	SW	
III.	Blanks	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	A	MS/MSD
VI.	Duplicate Sample Analysis	N	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	not utilized
IX.	Furnace Atomic Absorption QC	N	" "
X.	ICP Serial Dilution	A	
XI.	Sample Result Verification	A	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	SW ~~ND~~	D = 2+3*, 1+ HCPSGW05030811*
XIV.	Field Blanks	N	(@ Laboratories SDG 70393) 6+ HCCCGW06030811 ↓

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; *ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:
all water

1 1	HCPSGW05010811	11	HCPSGW03010811MSD	21		31	
2 1	HCPSGW04010811	12 1	PBW1	22		32	
3	HCPSGW04020811	13 2	PBW2	23		33	
4	HCPSGW02010811	14		24		34	
5	HCPSGW03010811	15		25		35	
6	HCCCGW06010811	16		26		36	
7 1	HCPSGW04010811F	17		27		37	
8	HCPSGW02010811F	18		28		38	
9	HCCCGW06010811F	19		29		39	
10	HCPSGW03010811MS	20		30		40	

Notes: Samples appended with "F" were analyed for dissolved metals

LDC #: 20223F4
SDG #: 0811300

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?		✓		
Were all initial calibration correlation coefficients > 0.995? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
V. Matrix Spike/Matrix Spike Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VI. Laboratory control samples				
Was an LCS anaytzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			
VII. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995?			✓	
Do all applicable analysies have duplicate injections? (Level IV only)			✓	
For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? (Level IV only)			✓	
Were analytical spike recoveries within the 85-115% QC limits?			✓	

LDC #: 20723F4
SDG #: 0811300

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
VIII. Internal Standards (EPA SW-846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall Assessment of Data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field Duplicates				
Field duplicate pairs were identified in this SDG.	✓	✓		
Target analytes were detected in the field duplicates.	✓	✓	✓	
XIII. Field Blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 20223F4
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: ✓

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→5, 7,8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, (Pb) Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
6, 9	↓	(Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn) Mo, B, Si, CN⁻, ___ ___
OC 10, 11	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, (Pb) Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP Trace	W	(Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn) Hg, (Ni, K, Se, Ag, Na, Tl, V, Zn) Mo, B, Si, CN⁻, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻,

Comments: (Mercury by CVAA if performed)

LDC #: 20223F4
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%) and cyanide (85-115%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?

Y N N/A Are all correlation coefficients ≥0.995?

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
1	12-2-08	CCV (23:52)	Mg	88.4 (90-110)	6,9	J/UJ/P

Comments:

CAL4SW

LDC#: 20223F4
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: SC

METHOD: Metals (EPA Method 6010B)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (ug/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	6		HCCCGW06030811			
	Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/2/08		Dilution: 1.0 Prep Date: 12/1/08 Analysis date: 12/1/08			
~~Arsenic~~ Lead	3.0U	(3.0)	2.5	(10)	NC	-

V:\FIELD DUPLICATES\FD_inorganic\20223F4.wpd

6 = TAL metals

~~8~~ split = lead only

LDC #: 20223F4
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: LA

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
1226 ICV	ICP (Initial calibration)	Ni	1018.4	1000.0	101.8	101.8	Y
	GFAA (Initial calibration)						
1319 ICV	CVAA (Initial calibration)	Hg	2.017	2.0	100.8	101.0	
2143 CCV2	ICP (Continuing calibration)	Zn	1015.5	1000.0	101.6	101.6	
	GFAA (Continuing calibration)						
1425 CCV2	CVAA (Continuing calibration)	Hg	4.136	4.0	103.4	103.5	
	ICP/MS (Initial calibration)						
	ICP/MS (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.4SW

LDC #: 20223F4
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1401 ICSAB-0	ICP Interference check	Cr	486.73 (µg/L)	500. (µg/L)	97.3	97.3	Y
2223 LCS2	Laboratory control sample	Be	54.519 (µg/L)	50.0 (µg/L)	109.0	109.0	↓
2257 10	Matrix spike	Pb	(SSR-SR) 252.50 (µg/L)	250.0 (µg/L)	101.0	101.0	↓
2257/2303 11	Duplicate	Pb	252.50 (µg/L)	249.70 (µg/L)	1.1	1.1	↓
2250/2317 5	ICP serial dilution	Pb	3.00 U (µg/L)	15.00 U (µg/L)	0	—	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 20223F4
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #6, Mg were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(38.002\ mg/L)(0.050\ L)(1000\ \mu g/mg)}{0.050\ L} = 38002.\ \mu g/L$$

Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
6	Al	6280.	6280.	Y
	As	4.2	4.2	
	Ba	108.	108.	
	Ca	68300.	68300.	
	Cr	8.5	8.5	
	Fe	4970.	4970.	
	Mg	38000.	38000.	
	Mn	198.	198.	
	MA ~~Hg~~	~~0.20~~	–	
	Ni	5.1	5.1	
	Na	31700.	31700.	
	V	11.1	11.1	
	Zn	12.9	12.9	

RECALC.4S2

Hanna City AFS, RI/FS
Data Validation Reports
LDC# 20223

pH

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 18, 2008

LDC Report Date: February 4, 2009

Matrix: Soil

Parameters: pH

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811250

Sample Identification

HCCCSB0123010811

Introduction

This data review covers one soil sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 9045B for pH.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blanks were not required by the method.

Field blanks were not required by the method.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VI. Laboratory Control Samples

Laboratory control samples were not required by the method.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags have been summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

Hanna City AFS RI/FS
pH - Data Qualification Summary - SDG 0811250

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
pH - Laboratory Blank Data Qualification Summary - SDG 0811250

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
pH - Field Blank Data Qualification Summary - SDG 0811250

No Sample Data Qualified in this SDG

LDC #: 20223B6

SDG #: 0811250

Laboratory: Emperical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: pH (EPA SW 846 Method 9045B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-18-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	N	
IV	Matrix Spike/Matrix Spike Duplicates	N	not required
V	Duplicates	N	client specified
VI.	Laboratory control samples	N	
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: soil

1	HCCCSB0123010811	11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 20223B6
SDG #: 0811250

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Inorganics (EPA Method 9045B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?			✓	
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?			✓	
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?		✓		
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.			✓	
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?		✓		
Was an LCS analyzed per extraction batch?		✓		
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?			✓	
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 20223B6
SDG #: 0811250

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?			✓	
Were detection limits < RL?			✓	
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 20223B6
SDG #: 0811250

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Inorganics, Method 9045B

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, pH reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

from raw data, pH = 6.62

#	Sample ID	Analyte	Reported Concentration (pH unit)	Calculated Concentration (pH unit)	Acceptable (Y/N)
1	1	pH	6.6	6.6	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 18, 2008

LDC Report Date: February 4, 2009

Matrix: Soil

Parameters: pH

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811251

Sample Identification

HCCBSB0123010811
HCCBSB0123020811

Introduction

This data review covers 2 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 9045B for pH.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blanks were not required by the method.

Field blanks were not required by the method.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VI. Laboratory Control Samples

Laboratory control samples were not required by the method.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags have been summarized at the end of this report if data has been qualified.

IX. Field Duplicates

Samples HCCBSB0123010811 and HCCBSB0123020811 were identified as field duplicates. No pH was detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (units)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCBSB0123010811		HCCBSB0123020811			
	Dilution: 1.0 Prep Date: 11/20/08 Analysis date: 11/20/08		Dilution: 1.0 Prep Date: 11/20/08 Analysis date: 11/20/08			
pH	6.7	NA	6.9	NA	1	-

Hanna City AFS RI/FS
pH - Data Qualification Summary - SDG 0811251

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
pH - Laboratory Blank Data Qualification Summary - SDG 0811251

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
pH - Field Blank Data Qualification Summary - SDG 0811251

No Sample Data Qualified in this SDG

LDC #: 20223C6

SDG #: 0811251

Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: pH (EPA SW 846 Method 9045B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-18-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	N	
IV	Matrix Spike/Matrix Spike Duplicates	N	not required
V	Duplicates	N	client specified
VI.	Laboratory control samples	N	
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	~~S~~N	D = 1+2
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:
all soil

1	HCCBSB0123010811	11		21		31	
2	HCCBSB0123020811	12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 20223C6
SDG #: 0811251

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Inorganics (EPA Method 9045B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?			✓	
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?			✓	
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?		✓		
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil Water.		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.			✓	
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?		✓		
Was an LCS analyzed per extraction batch?		✓		
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?			✓	
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 20223C6
SDG #: 0811251

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?			✓	
Were detection limits < RL?			✓	
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓	✗		
Target analytes were detected in the field duplicates.	✓		✗	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC#: 20223C6
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: SC

METHOD: pH (SM 9045B)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (units)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	1		2			
	Dilution: 1.0 Prep Date: 11/20/08 Analysis date:		Dilution: 1.0 Prep Date: 11/20/08 Analysis date:			
pH	6.7	NA	6.9	NA	1	-

V:\FIELD DUPLICATES\FD_inorganic\20223C6.wpd

LDC #: 20223C6
SDG #: 0811251

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Inorganics, Method 9045B

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, pH reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

from raw data: pH = 6.73

#	Sample ID	Analyte	Reported Concentration (pH unit)	Calculated Concentration (pH unit)	Acceptable (Y/N)
1	1	pH	6.7	6.7	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 18, 2008

LDC Report Date: February 4, 2009

Matrix: Soil

Parameters: pH

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811280

Sample Identification

HCCASB0123010811

Introduction

This data review covers one soil sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 9045B for pH.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blanks were not required by the method.

Field blanks were not required by the method.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VI. Laboratory Control Samples

Laboratory control samples were not required by the method.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags have been summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

Samples HCCASB0123010811 (primary) and HCCASB0123030811 (QA split from CTL SDG 70393) were compared. No pH was detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (units)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCCASB0123010811		HCCASB0123030811			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 11/24/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 11/24/08			
pH	7.2	NA	6.86	NA	1	-

Hanna City AFS RI/FS
pH - Data Qualification Summary - SDG 0811280

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
pH - Laboratory Blank Data Qualification Summary - SDG 0811280

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
pH - Field Blank Data Qualification Summary - SDG 0811280

No Sample Data Qualified in this SDG

LDC #: 20223D6

SDG #: 0811280

Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

Page: 1 of 1

Reviewer: MG

2nd Reviewer: ✓

METHOD: pH (EPA SW 846 Method 9045B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-18-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	N	
IV	Matrix Spike/Matrix Spike Duplicates	N	not required
V	Duplicates	N	client specified
VI.	Laboratory control samples	N	
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 1 + HCCASB0123030811 (CTL SDG 70393)
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: soil

1	HCCASB0123010811	11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 20223D6
SDG #: 0811280

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Inorganics (EPA Method 9045 B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?			✓	
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?			✓	
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?		✓		
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
IV. Matrix Spike/Matrix Spike Duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP Soil Water.		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.			✓	
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?		✓		
Was an LCS analyzed per extraction batch?		✓		
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?			✓	
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 20223D6
SDG #: 0811280

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?			✓	
Were detection limits < RL?			✓	
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓	✗		
Target analytes were detected in the field duplicates.	✓		✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC#: 20223D6
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: SC

METHOD: pH

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (units)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	1		HCCASB0123030811			
	Dilution: 1.0 Prep Date: 11/24/08 Analysis date:		Dilution: 1.0 Prep Date: 11/24/08 Analysis date:			
pH	7.2	NA	6.86	NA	1	-

V:\FIELD DUPLICATES\FD_inorganic\20223D6.wpd

LDC #: 20223D6
SDG #: 0811280

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method 9045B

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, pH reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

from raw data: pH = 7.22

#	Sample ID	Analyte	Reported Concentration (pH unit)	Calculated Concentration (pH unit)	Acceptable (Y/N)
1	1	pH	7.2	7.2	Y

Note:

Hanna City AFS, RI/FS
Data Validation Reports
LDC# 20223

Total Suspended Solids

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 20, 2008

LDC Report Date: February 5, 2009

Matrix: Water

Parameters: Total Suspended Solids

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811299

Sample Identification

HCVWGW04010811
HCVWGW04020811
HCVWGW05010811
HCVWGW07010811
HCCAGW06010811
HCVWGW04010811DUP

Introduction

This data review covers 6 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2540D for Total Suspended Solids.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No total suspended solids were found in the method blanks.

No field blanks were identified in this SDG.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags have been summarized at the end of this report if data has been qualified.

IX. Field Duplicates

Samples HCVWGW04010811 and HCVWGW04020811 were identified as field duplicates. No total suspended solids were detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (mg/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCVWGW04010811		HCVWGW04020811			
	Dilution: 10 Prep Date: 11/24/08 Analysis date: 11/24/08		Dilution: 7.0 Prep Date: 11/24/08 Analysis date: 11/24/08			
Total suspended solids	464	10U	456	7.0U	1	-

Hanna City AFS RI/FS
Total Suspended Solids - Data Qualification Summary - SDG 0811299

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Total Suspended Solids - Laboratory Blank Data Qualification Summary - SDG 0811299

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Total Suspended Solids - Field Blank Data Qualification Summary - SDG 0811299

No Sample Data Qualified in this SDG

LDC #: 20223E6

SDG #: 0811299

Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

Page: 1 of 1

Reviewer: MG

2nd Reviewer: ✓

METHOD: Total Suspended Solids (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-20-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A ~~N~~	
IV	Matrix Spike/Matrix Spike Duplicates	N	not required
V	Duplicates	A	DUP
VI.	Laboratory control samples	A ~~N~~	LCS
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 1+2
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: all water

1	HCVWGW04010811	11		21		31	
2	HCVWGW04020811	12		22		32	
3	HCVWGW05010811	13		23		33	
4	HCVWGW07010811	14		24		34	
5	HCCAGW06010811	15		25		35	
6	HCVWGW04010811DUP	16		26		36	
7	PBW	17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 20223E6
SDG #: 0811299

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: MG
2nd Reviewer: ✓

Method: Inorganics (EPA Method SM 2540D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?			✓	
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?			✓	
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			DUP only
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 20223E6
SDG #: 0811299

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓	✓		
Target analytes were detected in the field duplicates.	✓		✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC#: 20223E6
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: SC

METHOD: TSS (SM 2540D)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	1		2			
	Dilution: 10 Prep Date: 11/24/08 Analysis date:		Dilution: 7.0 Prep Date: 11/24/08 Analysis date:			
TSS	464	10	456	7.0	1	-

V:\FIELD DUPLICATES\FD_inorganic\20223E6.wpd

LDC #: 20223E6
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method SM 2540D

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	TSS	82.0 (mg/L)	96.6 (mg/L)	84.9	84.9	Y
–	Matrix spike sample	–	(SSR-SR) –	–	–	–	–
6	Duplicate sample	TSS	464.0 (mg/L)	456.0 (mg/L)	1.7	1.7	Y

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 20223E6
SDG #: 0811299

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method SM 2540D

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, TSS reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$\frac{(16.3195\,g - 16.2731\,g)(1000\ mg/g)}{0.100\,L} = 464.\ mg/L$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	1	TSS	464.	464.	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Hanna City AFS RI/FS

Collection Date: November 20, 2008

LDC Report Date: February 5, 2009

Matrix: Water

Parameters: Total Suspended Solids

Validation Level: Full Review

Laboratory: Empirical Laboratories, LLC

Sample Delivery Group (SDG): 0811300

Sample Identification

HCPSGW04010811
HCPSGW02010811
HCPSGW03010811

Introduction

This data review covers 3 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per Standard Method 2540D for Total Suspended Solids.

The review follows the U.S. Army Corps of Engineers (USACE) Louisville Quality System Manual Supplement (LQSMS), March 2007, and the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version (January 2006).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks results are summarized in Section III.

Field duplicates are summarized in Section IX.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The compound or analyte was found in an associated blank as well as in the sample.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No total suspended solids were found in the method blanks.

No field blanks were identified in this SDG.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

V. Duplicates

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

All sample result verifications were acceptable.

VIII. Overall Assessment of Data

Data flags have been summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

Samples HCPSGW02010811 (primary) and HCPSGW02030811 (QA split from CTL SDG 70393) were compared. No total suspended solids were detected in any of the samples with the following exceptions:

Analyte	Concentration (Detection limit) (mg/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	HCPSGW02010811		HCPSGW02030811			
	Dilution: 4.0 Prep Date: 11/24/08 Analysis date: 11/24/08		Dilution: 1.0 Prep Date: 11/24/08 Analysis date: 11/24/08			
Total suspended solids	8.4	4.0U	62	2.0U	7	MD

Hanna City AFS RI/FS
Total Suspended Solids - Data Qualification Summary - SDG 0811300

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Total Suspended Solids - Laboratory Blank Data Qualification Summary - SDG 0811300

No Sample Data Qualified in this SDG

Hanna City AFS RI/FS
Total Suspended Solids - Field Blank Data Qualification Summary - SDG 0811300

No Sample Data Qualified in this SDG

LDC #: 20223F6

SDG #: 0811300

Laboratory: Empirical Laboratories, LLC

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 2-4-09

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Total Suspended Solids (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-20-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A ✗	
IV	Matrix Spike/Matrix Spike Duplicates	N	not required
V	Duplicates	N	client specified
VI.	Laboratory control samples	A ✗	LCS
VII.	Sample result verification	A	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SN	D= 2+ HCPSGW02030811 (CTL SDG 70393)
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

all water

1	HCPSGW04010811	11		21		31	
2	HCPSGW02010811	12		22		32	
3	HCPSGW03010811	13		23		33	
4	PBW	14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 20223F6
SDG #: 0811300

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method SM2540D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?			✓	
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?			✓	
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.			✓	
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 20223F6
SDG #: 0811300

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC#: 20223F6
SDG#: see cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: SC

METHOD: TSS

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (Detection limit) (mg/L)				Difference Factor (X)	Disagreement /Major Disagreement (D/MD)
	2		HCPSGW02030811			
	Dilution: 4.0 Prep Date: 11/24/08 Analysis date:		Dilution: 1.0 Prep Date: 11/24/08 Analysis date:			
TSS	8.4	4.0	62	2.0	7	MD

V:\FIELD DUPLICATES\FD_inorganic\20223F6.wpd

LDC #: 20223F6
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method SM 2540D

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	TSS	82.0 (mg/L)	96.6 (mg/L)	84.9	84.9	Y
—	Matrix spike sample	—	(SSR-SR) —	—	—	—	—
—	Duplicate sample	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 20223F6
SDG #: 0811300

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Inorganics, Method SM 2540D

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, TSS reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$\frac{(17.3065g - 17.2984g)(1000\ mg/g)}{0.200\ L} = 40.5\ mg/L$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	1	TSS	40.5	40.5	Y

Note:

HANNAH CITY AIR FORCE STATION

DATA VALIDATION REPORT

United States Army Corps of Engineers
Louisville District
Louisville, KY

Prepared By:

LEE A. KNUPPEL AND ASSOCIATES, Inc.
7770 Cooper Road, Suite 7
Cincinnati, Ohio 45242

May 21, 2007

HANNAH CITY AIR FORCE STATION

DATA VALIDATION REPORT

Principal Chemist _____ _____

Kerry R. Nusekabel, B.S. Date
Q.A. Chemist

Senior Reviewer _____ _____

Lee A. Knuppel, B.S., M.S., P.E. Date
President

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Acronyms

BDL	Below Detection Limit
CCC	Calibration check compounds
CLP	Contract laboratory program
CRDL	Contract Required Detection Limit
CCV	Continuing calibration verification
COC	Chain of custody
%D	Percent difference
DCB	Decachlorobiphenyl
ICP	Inductively coupled plasma
IDL	Instrument detection limit
LCG	Louisville Chemistry Guideline
LCS	Laboratory Control Sample
MRL	Method Reporting Limit
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
QC	Quality Control
RF	Response factor
RPD	Relative percent difference
RSD	Relative standard deviation
SMF	Sporadic Marginal Failure
STL	Severn Trent Laboratories
SVOC	Semi-volatile organic compound
TCMX	Tetrachloro-m-xylene
TIC	Tentatively identified compound
USACE	United States Army Corps of Engineers
LKA	Lee A. Knuppel and Associates, Inc.
VOC	Volatile organic compound

1.0 BACKGROUND

1.1 DESCRIPTION OF HANNAH CITY AIR FORCE STATION, HANNAH CITY, IL

The property was formerly known as the Hanna City Air Force Station. The property, which is being investigated, is currently owned by the Illinois Department of Corrections (IDOC). The property has been used by the IDOC as a minimum security prison (the Hanna City Work Camp) but is currently not actively used by the IDOC. An interior parcel, containing the actual radar tower, is owned by the Federal Aviation Administration and used as a navigation facility. The property is located in Peoria County, Illinois; EPA Region 5; and Illinois Congressional District 18. The current address of the facility is 14617 Farmington Road, Hanna City, Illinois 61536. The property is located at N40°42'04", W89°51'47".

During the period from 1950 to 1961, the United States of America acquired a total of 89.56 acres of land interests for the former Hanna City Air Force Station from private landowners and local governments.

The Department of the Air Force (AF) continually operated this facility for radar tracking and navigation purposes from 1952 to 1968. The main facility improvements totaled 34 structures and included administration offices, classrooms, family housing, dormitories, recreation and equipment storage buildings, communication antenna, radar tower, warehouses, above-ground fuel storage, heating plant, fencing, and various other support buildings for utilities.

2.0 DESCRIPTION OF WORK PERFORMED

2.1 APPROACH AND METHODOLOGY

Lee A. Knuppel and Associates, Inc. (LKA) was contracted to perform data completeness and a data validation review of water and soil data for the Hannah City Air Force Station. The requirements for these tasks were specified in the Summary of Method Quality Objectives for SW-846, included in the Louisville Chemistry Guidelines (LCG), version 5, June 2002, published at http://www.lrl.usace.army.mil/ed/article.asp?id=196. The Summary of Method Quality Objectives of SW-846 (Tables 1-6) is included as Attachment 1. The Method Quality Objectives for PAH's based on the semivolatiles since the instrumentation is the same, so the Method Quality Objectives were slightly modified. The Method Quality Objectives for lead based on the ICP metals since the instrumentation is the same, so the Method Quality Objectives were slightly modified.

2.1.1 Data Validation

LKA identified approximately 10% (6 samples for volatiles, 4 samples for semivolatiles (polynuclear aromatic hydrocarbons (PAH's)), 2 samples for PCB's, 4 samples for TAL-metals, and 2 samples for lead) of the total number of samples collected for data validation. The samples validated were the original samples to meet the contract specifications of 10%. The selected samples were validated in accordance with the guidelines provided by the United States Army Corps of Engineers, Louisville District, and data validation qualifications were generated.

2.1.2 Data Completeness

All of the samples submitted by the USACE to LKA were reviewed for completeness. LKA used an Excel spreadsheet for collecting the data completeness information. The data completeness is provided in Attachment 3 and the Chain-of-Custodies pertaining to Hannah City Air Force Station can be located in Attachment 5.

During the usability evaluation, LKA found the following quality control concerns:

- Initial calibration curve (ICAL) had analytes with a RSD greater than 15 % but a correlation coefficient, r^2 >0.990.
- Initial calibration curve (ICAL) had analytes with a RSD greater than 30 % but a correlation coefficient, r^2 >0.990.
- Initial Calibration Verification (ICV) mid-level (2 nd Source) recoveries were outside the control limits.
- Continuing Calibration Verification (>30 % D with a positive bias).
- Continuing Calibration Verification (>20 % D with a positive bias).
- QC/MRL was outside the control limits.
- Internal standards were outside the control limits (-50 % - +100 %).
- Surrogates were outside their control limits.
- LCS recoveries were outside LCG limits
- Matrix spike (MS)/matrix spike duplicate (MSD) recoveries were outside the control limits.
- Relative Percent Difference (RPD) was outside the control limits.
- Serial Dilution (SD) was outside the control limits.
- Method, initial, or continuing calibration blanks had contamination present.

The summary of the usability findings and the reviewer comments are presented in Section 4 of this report.

3.0 DATA VALIDATION

3.1 DESCRIPTION OF QUALIFICATIONS

The data qualifications applied to the validated data were specified in the Summary of Method Quality Objectives for SW-846, see Attachment 1. The pertinent qualifications and their definitions are presented in Table 3.1. In addition to these primary validation qualifiers, LKA also included the amount of the analyte detected in the sample and the qualification code(s), (see Table 3.2).

Table 3.1 – List of Data Validation Qualifications

Qualifier	Definition
U	Undetected analyte
J	Estimated value
R	Rejected value
UJ	Estimated detection limit
B	Blank contamination

3.2 SUMMARY OF QUALIFICATIONS APPLIED

This section summarizes the types of qualifications assigned during data validation. The types of qualifications are discussed per analysis basis. A complete list of the qualifications applied to each of the samples validated is provided in Table 3.2.

3.2.1 Volatiles

LKA validated 6 samples from the April 2006, sampling event. Table 3.2 lists the qualifications applied to the data because of the data validation. There were ten types of deficiencies noted:

Other target analytes > 30 % RSD, r2> 0.990
Other target analytes > 15 % RSD, r2> 0.990
ICV outside control limits
QC/MRL outside control limits
CCV > 30 % D (positive bias)
CCV > 20 % D (positive bias)
ISTD outside control limits
LCS recoveries outside control limits
MS/MSD outside control limits

RPD outside control limits

The deficiencies are discussed separately in the following text to provide a short summary of the problems.

Other target analytes > 30 % RSD and r^2 > 0.990 (RSD)

The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analyte, so the correlation coefficient had to be ≥ 0.990. The following compound was > 30 % RSD and had r^2 > 0.990 in the SDG # 246011: chloromethane (31 %, r^2 = 0.998). The affected samples, VWGW03, and MBGW02, were qualified (J) for chloromethane. The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analyte, so the correlation coefficient had to be ≥ 0.990. The following compound was > 30 % RSD and had r^2 > 0.990 in the SDG # 246092: chloromethane (31 %, r^2 = 0.998). The affected sample, TFGW01, was qualified (J) for chloromethane.

Other target analytes > 15 % RSD and r^2 > 0.990 (ICC)

The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analytes, so the correlation coefficient had to be ≥ 0.990. The following compounds were > 15 % RSD and had r^2 > 0.990 in the SDG # 245903: acetone, (21 %, r^2 = 0.991), and 2-butanone, (17 %, r^2 = 0.991). The affected sample, VWSS01(0-0.5), was qualified (J) for acetone and 2-butanone. The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analytes, so the correlation coefficient had to be ≥ 0.990. The following compounds were > 15 % RSD and had r^2 > 0.990 in the SDG # 245931: acetone, (21 %, r^2 = 0.991), and 2-butanone, (17 %, r^2 = 0.991). The affected sample, CCSB02(4-5), was qualified (J) for acetone and 2-butanone. The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analytes, so the correlation coefficient had to be ≥ 0.990. The following compounds were > 15 % RSD and had r^2 > 0.990 in the SDG # 245967: acetone, (21 %, r^2 = 0.991), and 2-butanone, (17 %, r^2 = 0.991). The affected sample, PSSS02(0-0.5), was qualified (J) for acetone and 2-butanone. The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analytes, so the correlation coefficient had to be ≥ 0.990. The following compounds were > 15 % RSD and had r^2 > 0.990 in the SDG # 246011: vinyl chloride (29 %, r^2 = 0.999), bromomethane (25 %, r^2 = 1.000), and chloroethane (20 %, r^2 = 1.000). The affected samples, VWGW03, and MBGW02, were qualified (J) for vinyl chloride, bromomethane, and chloroethane. The initial calibration curve failed to meet the method requirement of ≤ 15 % RSD for the analytes, so the correlation coefficient had to be ≥ 0.990. The following compounds were > 15 % RSD and had r^2 > 0.990 in the SDG # 246092: vinyl chloride (29 %, r^2 = 0.999), bromomethane (25 %, r^2 = 1.000), and chloroethane (20 %, r^2 = 1.000). The affected sample, TFGW01, was qualified (J) for vinyl chloride, bromomethane, and chloroethane.

ICV outside control limits (ICV)

The initial calibration verification (ICV) was outside the control limits (80-120%) in SDG# 245903 for the following compounds: chloromethane (70 %), vinyl chloride (74%), 1,1-

dichloroethene (79%), trans-1,2-dichloroethene (77 %), and tetrachloroethene (79 %). The affected sample, VWSS01(0-0.5), was qualified (J) for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, and tetrachloroethene. The ICV was outside the control limits (80-120%) in SDG# 245931 for the following compounds: chloromethane (70 %), vinyl chloride (74%), 1,1-dichloroethene (79%), trans-1,2-dichloroethene (77 %), and tetrachloroethene (79 %). The affected sample, CCSB02(4-5), was qualified (J) for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, and tetrachloroethene. The ICV was outside the control limits (80-120%) in SDG# 245967 for the following compounds: chloromethane (70 %), vinyl chloride (74%), 1,1-dichloroethene (79%), trans-1,2-dichloroethene (77 %), and tetrachloroethene (79 %). The affected sample, PSSS02(0-0.5), was qualified (J) for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, and tetrachloroethene. The ICV was outside the control limits (80-120%) in SDG# 246011 for the following compounds: acetone (126 %). The affected samples, VWGW03, and MBGW02, were qualified (J) for acetone. The ICV was outside the control limits (80-120%) in SDG# 246092 for the following compounds: acetone (126 %). The affected sample, TFGW01, was qualified (J) for acetone.

QC/MRL outside control limits (MRL)

There were several analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: acetone (50 %, 38 %); 2-butanone (0 %); and trans-1,3-dichloropropene (65 %) in SDG #245903. The affected sample, VWSS01(0-0.5), was qualified (R) for acetone, and 2-butanone and (J) for trans-1,3-dichloropropene. There were a couple of analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: trans-1,3-dichloropropene (63 %, 64 %), and cis-1,3-dichloropropene (69 %) in SDG #245931. The affected sample, CCSB02(4-5), was qualified (J) for trans-1,3-dichloropropene, and cis-1,3-dichloropropene. There were many analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: acetone (52 %); trans-1,3-dichloropropene (67 %, 64 %); dibromochloromethane (68 %, 69 %); cis-1,3-dichloropropene (65 %); 4-methyl-2-pentanone (64 %); 2-hexanone (60 %); styrene (67 %); bromoform (69 %); in SDG #245967. The affected sample, PSSS02(0-0.5), was qualified (R) for acetone and (J) for trans-1,3-dichloropropene, dibromochloromethane, cis-1,3-dichloropropene, 4-methyl-2-pentanone, 2-hexanone, styrene, and bromoform. There were many analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: chloromethane (51 %, 56 %); acetone (170 %, 160 %); and 2-butanone (138 %, 133 %); in SDG #246011. The affected samples, VWGW03, and MBGW02, were qualified (R) for chloromethane and (J) for acetone and 2-butanone. There were many analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: chloromethane (43 %, 47 %); vinyl chloride (64 %, 64 %); and acetone (152 %, 150 %); in SDG #246092. The affected sample, TFGW01, was qualified (R) for chloromethane and (J) for vinyl chloride and acetone.

Continuing Calibration Verification > 30 % D (CCVP)

The other target analyte (a non-calibration check compound) was > 30 % D with a positive bias from the initial calibration. The following analyte was > 30 % D with a positive bias: acetone (47 % D) in SDG# 245967. The affected sample, PSSS02(0-0.5), was qualified (J) for acetone.

Continuing Calibration Verification > 20 % D, < 30 % D (CCV)

The other target analyte (a non-calibration check compound) was > 20 % D with a positive bias from the initial calibration. The following analyte was > 20 % D with a positive bias: carbon disulfide, (28 %) in SDG# 245903. The affected sample, VWSS01(0-0.5), was qualified (J) for carbon disulfide. The other target analyte (a non-calibration check compound) was > 20 % D with a positive bias from the initial calibration. The following analyte was > 20 % D with a positive bias: carbon disulfide, (28 %) in SDG# 245931. The affected sample, CCSB02(4-5), was qualified (J) for carbon disulfide. The other target analyte (a non-calibration check compound) was > 20 % D with a positive bias from the initial calibration. The following analyte was > 20 % D with a positive bias: carbon disulfide, (28 %) in SDG# 245967. The affected sample, PSSS02(0-0.5), was qualified (J) for carbon disulfide.

Internal Standard was outside control limits (ISTD)

The internal standards, chlorobenzene-d5 (475411, 520738-2082952), and 1,4-dichlorobenzene-d4 (141744, 197968-791872), were outside the control limits (-50 % - +100 %) in SDG# 245903. The affected sample, VWSS01(0-0.5), was qualified (J) for tetrachloroethene, 2-hexanone, dibromochloromethane, chlorobenzene, ethylbenzene, m,p-xylenes, o-xylene, styrene, bromoform, and 1,1,2,2-tetrachloroethane.

LCS was outside the control limits (LCS)

The LCS recoveries were outside the LCG limits (Appendix C) for one analyte in SDG# 245903. The analyte, which did not meet the LCG limits, was carbon disulfide (135 %, 64-123). The affected sample, VWSS01(0-0.5), was qualified (J) for carbon disulfide. The LCS recoveries were outside the LCG limits for two analytes in SDG# 245931. The analytes, which did not meet the LCG limits, were vinyl chloride (68 %, 75-134), and carbon disulfide, (124 %, 64-123). The affected sample, CCSB02(4-5), was qualified (J) for vinyl chloride, and carbon disulfide. The LCS recoveries were outside the LCG limits for an analyte in SDG# 245967. The analyte, which did not meet the LCG limits, was acetone (199 %, 50-150). The affected sample, PSSS02(0-0.5), was qualified (J) for acetone. The LCS recoveries were outside the LCG limits for an analyte in SDG# 246092. The analyte, which did not meet the LCG limits, was carbon disulfide (70 %, 74-123). The affected sample, TFGW01, was qualified (J) for carbon disulfide.

MS/MSD recoveries were outside the control limits (MS)

The MS/MSD recoveries were outside the control limits (70-130 %) for the analytes: acetone (419 %, 263 %); 2-butanone (196 %, 148 %); 4-methyl-2-pentanone (155 % MS); 2-hexanone (155 % MS) in SDG# 245903. The affected sample, VWSS01(0-0.5), was qualified (J) for acetone, 2-butanone, and 4-methyl-2-pentanone. The MS/MSD recoveries were outside the control limits (70-130 %) for the analytes: acetone (194 %); 2-butanone (133 %); chloromethane (69 % MSD); carbon disulfide (137 % MSD); and 4-methyl-2-pentanone (131 % MSD) in SDG# 245931. The affected sample, CCSB02(4-5), was qualified (J) for acetone, 2-butanone, chloromethane, and 4-methyl-2-pentanone.

RPD outside the control limits (RPD)

RPDs were outside the control limits in SDG# 245903 for an analyte. The analyte was: acetone (RPD=46, max. RPD=40). The affected sample, VWSS01(0-0.5), was qualified (J) for acetone. RPDs were outside the control limits in SDG# 245931 for an analyte. The analyte was: acetone (RPD=69, max. RPD=40). The affected sample, CCSB02(4-5), was qualified (J) for acetone.

Other Deficiencies not qualified

There was no other QC discrepancy in the volatile checklists (Attachment 2: A-2-1 – A-2-15). A brief summary is in Section 4.7.2, Volatiles.

3.2.2 Semivolatiles (PAH's)

LKA validated 4 samples from the April 2006, sampling event. Table 3.2 lists the qualifications applied to the data because of the data validation. There were four types of deficiencies noted:

QC/MRL outside control limits
CCV > 20 % D (positive bias)
MS/MSD outside control limits
Surrogate outside control limits

The deficiencies are discussed separately in the following text to provide a short summary of the problems.

QC/MRL outside control limits (MRL)

There was an analyte, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analyte was: fluoranthene (132 %); in SDG #245903. The affected sample, VWSS01(0-0.5), was qualified (J) for fluoranthene. There were several analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: fluoranthene (140 %, 142 %); fluorene (132 %);

phenanthrene (131 %); anthracene (144 %); and chrysene (133 %); in SDG #246011. The affected samples, VWGW03, and MBGW02, were qualified (J) for fluoranthene, fluorene, phenanthrene, anthracene, and chrysene.

Continuing Calibration Verification > 20 % D, < 30 % D (CCV)

The other target analyte (a non-calibration check compound) was > 20 % D with a positive bias from the initial calibration. The following analyte was > 20 % D with a positive bias: phenanthrene, (26 %) in SDG# 246011. The affected samples, VWGW03, and MBGW02, were qualified (J) for phenanthrene.

MS/MSD recoveries were outside the control limits (MS)

The MS/MSD recovery was outside the control limits (45-135 %) for the analytes: fluoranthene (24 %, 17 %); and pyrene (21 %, 22 %); in SDG# 245903. The affected sample, VWSS01(0-0.5), was qualified (J) for fluoranthene, and pyrene.

Surrogate recoveries were outside control limits (SURR)

The surrogate recoveries were outside the control limits (50-150 %). The surrogate, terphenyl-d14 (48 %), was outside the control limits in SDG# 246011 for sample, MBGW02. The affected sample, MBGW02, was qualified (J) for pyrene, benzo(a)anthracene, chrysene, and indeno(1,2,3-cd)pyrene.

Other Deficiencies not qualified

There was no other QC discrepancy in the semivolatile checklists (Attachment 2: A-2-16 – A-2-24). A brief summary is in Section 4.7.2, Semivolatiles.

3.2.3 PCB's

LKA validated 2 samples from the April 2006, sampling event. Table 3.2 lists the qualifications applied to the data because of the data validation. There was a deficiency noted:

Surrogate outside control limits

The deficiencies are discussed separately in the following text to provide a short summary of the problems.

Surrogate outside QC limits (SURR)

The surrogate, decachlorobiphenyl (DCB), was outside the control limits (50-150 %) in SDG # 246011. The affected sample, MBGW02, was qualified (J) for aroclor 1242, aroclor 1248, aroclor 1254, and aroclor 1260.

Other Deficiencies not qualified

There was no other QC discrepancy in the semivolatile checklists (Attachment 2: A-2-16 – A-2-24). A brief summary is in Section 4.7.2, PCB's.

3.2.4 TAL Metals-Total

LKA validated 4 samples from the April 2006, sampling event. Table 3.2 lists the qualifications applied to the data because of the data validation. There were six types of deficiencies noted:

Blank contamination (method, initial or continuing)
QC/MRL outside control limits
MS recoveries outside the control limits
Matrix effect confirmation
RPD outside the control limits
Serial Dilution outside the control limits

The deficiencies are discussed separately in the following text to provide a short summary of the problems.

Blank Contamination (method, initial or continuing) (B)

STL Laboratories had lead (0.00396 mg/L) present in the initial calibration blank for SDG# 246011 that was above one-half method-reporting limit. The affected sample, VWGW03, was qualified (B) for lead contamination. STL Laboratories had arsenic (0.006 mg/L) present in the continuing calibration blanks for SDG# 246011 that was above one-half method-reporting limit. The affected sample, VWGW03, was qualified (B) for arsenic contamination. STL Laboratories had lead (0.00396 mg/L), and vanadium (0.00279 mg/L) present in the initial calibration blank for SDG# 246092 that was above one-half method-reporting limit. The affected sample, CBGW01, was qualified (B) for lead and vanadium contamination. STL Laboratories had vanadium (0.0028 mg/L) present in the continuing calibration blanks for SDG# 246092 that was above one-half method-reporting limit. The affected sample, CBGW01, was qualified (B) for vanadium contamination.

QC/MRL outside control limits (MRL)

There were a few analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: calcium (147 %); iron (182 %); and manganese (131 %) in SDG #245903. The affected sample, VWSS01(0-0.5), was qualified (J) for calcium, iron, and manganese. There were a few analytes, which did not meet the control limits (70-130 %) for the MRL at the beginning, end, or both in the injection sequence. The analytes were: calcium (147 %); iron (182 %); and manganese (131 %) in SDG #245931. The affected sample, CCSB02(4-5), was qualified (J) for calcium, iron, and manganese.

MS recoveries outside control limits (MS)

The SDG# 245903 had a metal analyte outside the control limits (75-125 %) for spike recoveries for antimony (36 %). The affected sample, VWSS01(0-0.5), was qualified (J) for antimony. The SDG# 245931 had metal analytes outside the control limits (75-125 %) for spike recoveries for antimony (36 %), arsenic (55 %), lead (51 %), potassium (157 %), and thallium (74 %). The affected sample, CCSB02(4-5), was qualified (J) for antimony, arsenic, lead, potassium, and thallium.

Matrix Effect Confirmation (MSC)

The SDG# 245931 had metal analytes outside the control limits (75-125 %) in the matrix effect confirmation. The analytes were: cadmium (73 %), and zinc (73 %). The affected sample, CCSB02(4-5), was qualified (J) for cadmium, and zinc.

RPDs were above control limits (RPD)

RPD's calculated for the metal analytes were within the control limits (maximum RPD=20) except for manganese (RPD=30) in SDG# 245903. The affected sample, VWSS01(0-0.5), was qualified (J) for manganese. RPD's calculated for the metal analytes were within the control limits (maximum RPD=20) except for arsenic (RPD=48), cobalt (RPD=26), copper (RPD=26), and lead (RPD=40) in SDG# 245931. The affected sample, CCSB02(4-5), was qualified (J) for arsenic, cobalt, copper, and lead.

Serial Dilution (SD)

The serial dilution for cobalt (12 %), magnesium (11 %), manganese (12 %), and zinc (13 %) were outside the control limits (0-10 %) in SDG# 245903. The affected sample, VWSS01(0-0.5), was qualified (J) for cobalt, magnesium, manganese, and zinc. The serial dilution for calcium (12 %), chromium (11 %), iron (13 %), magnesium (11 %), manganese (14 %), and vanadium (11 %) were outside the control limits (0-10 %) in SDG# 245931. The affected sample, CCSB02(4-5), was qualified (J) for calcium, chromium, iron, magnesium, manganese, and vanadium. The serial dilution for cobalt (13 %), iron (12 %), and manganese (11 %), was outside the control limits (0-10 %) in SDG# 246011. The affected sample, VWGW03, was qualified (J) for cobalt, iron, and manganese.

Other Deficiencies not qualified

There were no other QC discrepancies in the metals and CVAA metals checklists (Attachment 2: A-2-29 – A-2-44) described in the following items: analyte contamination was present in the method, initial, or continuing blank; MS recoveries were outside the control limits, MSC recoveries were outside the control limits. The QC discrepancies are explained in the following three paragraphs with a brief summary in Section 4.7.2, TAL-Metals.

Analyte contamination was present in the method, initial, or continuing blank; the initial calibration blank detected vanadium contamination (0.00295 mg/L) in SDG#245903. When the contamination result was converted to solids, the amount was 0.33 mg/kg. Since the amount of vanadium in the sample was more than five times which was present in the initial calibration blank, the sample, VWSS01(0-0.5), was not qualified for vanadium contamination. The continuing calibration blanks detected aluminum (0.1204 mg/L), calcium (0.11137 mg/L), and magnesium (0.11881 mg/L) contamination in SDG# 245903. When the contamination results were converted to solids, the contamination amounts were 13.6 mg/kg, 12.6 mg/kg, and 13.5, respectively. Since the amounts of aluminum, calcium, and magnesium in the sample were more than five times which was present in the continuing calibration blanks, the sample, VWSS01(0-0.5), was not qualified for aluminum, calcium, and magnesium contamination. The initial calibration blank detected vanadium contamination (0.00295 mg/L) in SDG#245931. When the contamination result was converted to solids, the amount was 0.33 mg/kg. Since the amount of vanadium in the sample was more than five times which was present in the initial calibration blank, the sample, CCSB02(4-5), was not qualified for vanadium contamination. The continuing calibration blanks detected vanadium (0.00279 mg/L), aluminum (0.10913 mg/L), and magnesium (0.09277 mg/L) contamination in SDG# 245931. When the contamination results were converted to solids, the contamination amounts were 0.30 mg/kg, 11.7 mg/kg, and 9.97, respectively. Since the amounts of vanadium, aluminum, and magnesium in the sample were more than five times which was present in the continuing calibration blanks, the sample, CCSB02(4-5), was not qualified for vanadium, aluminum, and magnesium contamination. The initial calibration blank detected vanadium contamination (0.00279 mg/L) in SDG#246011. Since the amount of vanadium in the sample was more than five times which was present in the initial calibration blank, the sample, VWGW03, was not qualified for vanadium contamination. The continuing calibration blanks detected vanadium contamination (0.0027 mg/L, 0.0028) in SDG#246011. Since the amount of vanadium in the sample was more than five times which was present in the continuing calibration blanks, the sample, VWGW03, was not qualified for vanadium contamination. The method blank detected magnesium contamination (0.05269 mg/L) in SDG#246011. Since the amount of magnesium in the sample was more than five times which was present in the method blank, the sample, VWGW03, was not qualified for magnesium contamination. The continuing calibration blanks detected aluminum (0.10256 mg/L), and magnesium (0.08795 mg/L) in SDG#246092. Since the amounts of aluminum and magnesium in the sample was more than five times which was present in the continuing calibration blanks, the sample, CBGW01, was not qualified for aluminum, and magnesium contamination. The method blank detected magnesium (0.05269 mg/L) in SDG#246092. Since the amount of magnesium in the sample was more than five times which was present in the method blank, the sample, CBGW01, was not qualified for magnesium contamination.

MS recoveries were outside the control limits; the MS recoveries did not meet the control limits (75-125 %) for the analytes, aluminum (2049 %), iron (662%), lead (57 %), and manganese (-414 %) in SDG# 245903. The sample, VWSS01(0-0.5), was not qualified since the MS spike amounts were not four times or more than the sample's concentrations. The MS recoveries did not meet the control limits (75-125 %) for the analytes, aluminum (1976 %), calcium (228 %), iron (-1231 %), magnesium (208 %), and manganese (-44 %) in SDG# 245931. The sample, CCSB02(4-5), was not qualified since the MS spike amounts were not four times or more than the sample's

concentrations. The MS recoveries did not meet the control limits (75-125 %) for the analytes, aluminum (785 %), and iron (210 %), in SDG# 246011. The sample, VWGW03, was not qualified since the MS spike amounts were not four times or more than the sample's concentrations.

Matrix spike confirmation recoveries were outside the control limits; the MSC recoveries did not meet the control limits (75-125 %) for the analytes, aluminum (68 %), iron (-114 %), lead (74 %), and manganese (68 %) in SDG# 245903. The sample, VWSS01(0-0.5), was not qualified since the MS spike amounts were not four times or more than the sample's concentrations. The MSC recoveries did not meet the control limits (75-125 %) for the analytes, aluminum (65 %), calcium (65 %), iron (-109 %), magnesium (74 %), and manganese (70 %) in SDG# 245931. The sample, CCSB02(4-5), was not qualified since the MSC spike amounts were not four times or more than the sample's concentrations. The MSC recoveries did not meet the control limits (75-125 %) for the analytes, calcium (69 %), and iron (45 %), in SDG# 246011. The sample, VWGW03, was not qualified since the MSC spike amounts were not four times or more than the sample's concentrations.

3.2.5 Lead

LKA validated 2 samples from the April 2006, sampling event. Table 3.2 lists the qualifications applied to the data because of the data validation. There was a deficiency noted:

Blank contamination (method, initial or continuing)

The deficiencies are discussed separately in the following text to provide a short summary of the problems.

Blank Contamination (method, initial or continuing) (B)

STL Laboratories had lead present in the initial calibration blank for SDG# 246011 that was above one-half method-reporting limit. The affected sample, PSGW02, was qualified (B) for lead contamination.

Other Deficiencies not qualified

There was no other QC discrepancy in the lead checklists (Attachment 2: A-2-45 – A-2-48). A brief summary is in Section 4.7.2 Lead.

3.3 SUMMARY OF QUALIFICATIONS

Table 3.2 lists all qualifications assigned during data validation. The table is organized to list the laboratory batch, the field samples identification, the type of analysis, the analyte, amount in sample, qualification (Q), and qualification code(s). The codes used to indicate the reason for qualification are defined in Table 3.3

Table 3.2 – List of Data Validation Qualifications

Laboratory Batch	Field Sample	Analysis	Analyte	Amount in Sample (ug/L)	Q	Code(s)
246011	VWGW03	VOC	chloromethane	< 1.0	**R**	MRL, RSD
246011	VWGW03	VOC	vinyl chloride	< 1.0	UJ	ICC
246011	VWGW03	VOC	bromomethane	< 1.0	UJ	ICC
246011	VWGW03	VOC	chloroethane	< 1.0	UJ	ICC
246011	VWGW03	VOC	acetone	< 10	UJ	MRL, ICV
246011	VWGW03	VOC	2-butanone	< 10	UJ	MRL
246011	MBGW02	VOC	chloromethane	< 1.0	**R**	MRL, RSD
246011	MBGW02	VOC	vinyl chloride	< 1.0	UJ	ICC
246011	MBGW02	VOC	bromomethane	< 1.0	UJ	ICC
246011	MBGW02	VOC	chloroethane	< 1.0	UJ	ICC
246011	MBGW02	VOC	acetone	**5.5**	J	MRL, ICV
246011	MBGW02	VOC	2-butanone	< 10	UJ	MRL
246092	TFGW01	VOC	chloromethane	< 1.0	**R**	MRL, RSD
246092	TFGW01	VOC	vinyl chloride	< 1.0	UJ	ICC, MRL
246092	TFGW01	VOC	bromomethane	< 1.0	UJ	ICC
246092	TFGW01	VOC	chloroethane	< 1.0	UJ	ICC
246092	TFGW01	VOC	acetone	< 10	UJ	ICV, MRL
246092	TFGW01	VOC	carbon disulfide	< 2.0	UJ	ICV, MRL
246011	VWGW03	PAH	fluoranthene	< 1.1	UJ	MRL
246011	VWGW03	PAH	fluorene	< 1.1	UJ	MRL
246011	VWGW03	PAH	phenanthrene	< 1.1	UJ	MRL, CCV
246011	VWGW03	PAH	anthracene	< 1.1	UJ	MRL
246011	VWGW03	PAH	chrysene	< 0.54	UJ	MRL
246011	MBGW02	PAH	fluoranthene	< 1.1	UJ	MRL
246011	MBGW02	PAH	fluorene	< 1.1	UJ	MRL
246011	MBGW02	PAH	phenanthrene	< 1.1	UJ	MRL, CCV
246011	MBGW02	PAH	anthracene	< 1.1	UJ	MRL
246011	MBGW02	PAH	chrysene	< 0.54	UJ	MRL, SURR
246011	MBGW02	PAH	pyrene	< 1.1	UJ	SURR
246011	MBGW02	PAH	benzo(a)anthracene	< 0.14	UJ	SURR
246011	MBGW02	PAH	indeno(1,2,3-cd)pyrene	< 0.22	UJ	SURR
246011	MBGW02	PCB's	aroclor 1242	< 0.50	UJ	SURR
246011	MBGW02	PCB's	aroclor 1248	< 0.50	UJ	SURR
246011	MBGW02	PCB's	aroclor 1254	< 0.50	UJ	SURR
246011	MBGW02	PCB's	aroclor 1260	< 0.50	UJ	SURR

Laboratory Batch	Field Sample	Analysis	Analyte	Amount in Sample (mg/L)	Q	Code(s)
246011	VWGW03	METALS	lead	0.14	B	B
246011	VWGW03	METALS	arsenic	0.014	B	B

Q =Qualification; mg/kg =milligram-per-kilogram; UJ =Estimated detection limit; R =Rejected value; B =Blank contamination; J =Estimated value; ug/kg = microgram-per-kilogram; < =less than; VOC =Volatiles; PAH=Polynuclear Aromatic Hydrocarbons; PCB's Polychlorinated Biphenyls

Laboratory Batch	Field Sample	Analysis	Analyte	Amount in Sample (mg/L)	Q	Code(s)
246011	VWGW03	METALS	cobalt	**0.0099**	J	SD
246011	VWGW03	METALS	iron	**41**	J	SD
246011	VWGW03	METALS	manganese	**0.42**	J	SD
246092	CBGW01	METALS	lead	**0.0026**	B	B
246092	CBGW01	METALS	vanadium	**0.013**	B	B
246011	PSGW02	METALS	lead	**0.0036**	B	B

Laboratory Batch	Field Sample	Analysis	Analyte	Amount in Sample (ug/kg)	Q	Code(s)
245903	VWSS01(0-0.5)	VOC	acetone	**110**	**R**	MRL, ICC, MS, RPD
245903	VWSS01(0-0.5)	VOC	2-butanone	< 30	**R**	MRL, ICC, MS
245903	VWSS01(0-0.5)	VOC	chloromethane	< 7.5	UJ	ICV
245903	VWSS01(0-0.5)	VOC	vinyl chloride	< 7.5	UJ	ICV
245903	VWSS01(0-0.5)	VOC	1,1-dichloroethene	< 7.5	UJ	ICV
245903	VWSS01(0-0.5)	VOC	trans-1,2-dichloroethene	< 7.5	UJ	ICV
245903	VWSS01(0-0.5)	VOC	tetrachloroethene	< 7.5	UJ	ICV, ISTD
245903	VWSS01(0-0.5)	VOC	carbon disulfide	< 15	UJ	CCV, LCS
245903	VWSS01(0-0.5)	VOC	2-hexanone	< 30	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	dibromochloromethane	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	chlorobenzene	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	ethylbenzene	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	m,p-xylenes	< 15	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	o-xylene	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	styrene	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	bromoform	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	1,1,2,2-tetrachloroethane	< 7.5	UJ	ISTD
245903	VWSS01(0-0.5)	VOC	4-methyl-2-pentanone	< 30	UJ	MS
245931	CCSB02(4-5)	VOC	acetone	< 21	UJ	ICC, MS, RPD
245931	CCSB02(4-5)	VOC	2-butanone	< 21	UJ	ICC, MS
245931	CCSB02(4-5)	VOC	chloromethane	< 5.2	UJ	ICV, MS
245931	CCSB02(4-5)	VOC	vinyl chloride	< 5.2	UJ	ICV, LCS
245931	CCSB02(4-5)	VOC	1,1-dichloroethene	< 5.2	UJ	ICV
245931	CCSB02(4-5)	VOC	trans-1,2-dichloroethene	< 5.2	UJ	ICV
245931	CCSB02(4-5)	VOC	tetrachloroethene	< 5.2	UJ	ICV
245931	CCSB02(4-5)	VOC	carbon disulfide	< 10	UJ	CCV, LCS
245931	CCSB02(4-5)	VOC	trans-1,3-dichloropropene	< 5.2	UJ	MRL
245931	CCSB02(4-5)	VOC	cis-1,3-dichloropropene	< 5.2	UJ	MRL
245931	CCSB02(4-5)	VOC	4-methyl-2-pentanone	< 21	UJ	MS
245967	PSSS02(0-0.5)	VOC	acetone	**150**	**R**	MRL, ICC, CCVP, LCS
245967	PSSS02(0-0.5)	VOC	2-butanone	< 33	UJ	ICC, MS
245967	PSSS02(0-0.5)	VOC	chloromethane	< 8.2	UJ	ICV
245967	PSSS02(0-0.5)	VOC	vinyl chloride	< 8.2	UJ	ICV

Laboratory Batch	Field Sample	Analysis	Analyte	Amount in Sample (ug/kg)	Q	Code(s)
245967	PSSS02(0-0.5)	VOC	1,1-dichloroethene	< 8.2	UJ	ICV
245967	PSSS02(0-0.5)	VOC	trans-1,2-dichloroethene	< 8.2	UJ	ICV
245967	PSSS02(0-0.5)	VOC	tetrachloroethene	< 8.2	UJ	ICV
245967	PSSS02(0-0.5)	VOC	trans-1,3-dichloropropene	< 8.2	UJ	MRL
245967	PSSS02(0-0.5)	VOC	dibromochloromethane	< 8.2	UJ	MRL
245967	PSSS02(0-0.5)	VOC	cis-1,3-dichloropropene	< 8.2	UJ	MRL
245967	PSSS02(0-0.5)	VOC	4-methyl-2-pentanone	< 33	UJ	MRL
245967	PSSS02(0-0.5)	VOC	2-hexanone	< 33	UJ	MRL
245967	PSSS02(0-0.5)	VOC	styrene	< 8.2	UJ	MRL
245967	PSSS02(0-0.5)	VOC	bromoform	< 8.2	UJ	MRL
245967	PSSS02(0-0.5)	VOC	carbon disulfide	< 16	UJ	CCV
245903	VWSS01(0-0.5)	PAH	fluoranthene	**2500**	J	MRL, MS
245903	VWSS01(0-0.5)	PAH	pyrene	**2300**	J	MRL, MS

Laboratory Batch	Field Sample	Analysis	Analyte	Amount in Sample (mg/kg)	Q	Code(s)
245903	VWSS01(0-0.5)	METALS	calcium	**3300**	J	MRL
245903	VWSS01(0-0.5)	METALS	iron	**20000**	J	MRL
245903	VWSS01(0-0.5)	METALS	manganese	**470**	J	MRL, RPD, SD
245903	VWSS01(0-0.5)	METALS	antimony	< 2.3	UJ	MS
245903	VWSS01(0-0.5)	METALS	cobalt	**7.8**	J	SD
245903	VWSS01(0-0.5)	METALS	magnesium	**2900**	J	SD
245903	VWSS01(0-0.5)	METALS	zinc	**61**	J	SD
245931	CCSB02(4-5)	METALS	calcium	**2700**	J	MRL, SD
245931	CCSB02(4-5)	METALS	iron	**20000**	J	MRL, SD
245931	CCSB02(4-5)	METALS	manganese	**1000**	J	MRL, RPD, SD
245931	CCSB02(4-5)	METALS	antimony	**0.71**	J	MS
245931	CCSB02(4-5)	METALS	arsenic	**11**	J	MS, RPD
245931	CCSB02(4-5)	METALS	lead	**13**	J	MS, RPD
245931	CCSB02(4-5)	METALS	potassium	**610**	J	MS
245931	CCSB02(4-5)	METALS	thallium	< 2.7	UJ	MS
245931	CCSB02(4-5)	METALS	cadmium	< 0.21	UJ	MSC
245931	CCSB02(4-5)	METALS	zinc	**50**	J	MSC
245931	CCSB02(4-5)	METALS	cobalt	**11**	J	RPD
245931	CCSB02(4-5)	METALS	chromium	**14**	J	SD
245931	CCSB02(4-5)	METALS	magnesium	**2700**	J	SD
245931	CCSB02(4-5)	METALS	vanadium	**27**	J	SD

Table 3.3 lists the codes used in Table 3.2 to indicate the reason a sample result was qualified. The data qualification codes, the last column of Table 3.3, are defined in Section 2.

Table 3.3-Key to the Codes used in Table 3.2

Code	Description/Definition
RSD	The analytes had a RSD > 30 % and an $r^2 \geq 0.990$ in order for it to be qualified. The analytes were qualified (J).
ICC	The analytes had a RSD > 15 % and an $r^2 \geq 0.990$ in order for it to be qualified. The analytes were qualified (J).
ICV	ICV is an initial calibration verification using a second source. The analytes were outside the control limits. The analyte(s) were qualified (J).
MRL	Method reporting limit check was not within the control limits. The analyte(s) were qualified (J or R).
SURR	The surrogates were outside the control limits and the analytes, which corresponds to the surrogate, were qualified (J).
B	The method, initial, or continuing calibration blank was contaminated with a target analyte that was > ½ MRL. The analyte(s) were qualified (B).
CCVP	The continuing calibration verification had analyte(s) > 30 % D or drift from the initial calibration with a positive bias. The analyte(s) were qualified (J).
CCV	The continuing calibration verification had analyte(s) > 20 % D from the initial calibration with a positive bias. The analyte(s) were qualified (J).
ISTD	An internal standard(s) were outside the control limits (-50 % - +100 %). The associated analytes were qualified (J)
MS	Spike recoveries of one or several analytes were outside the control limits. The analyte(s) were qualified (J).
MSC	Matrix spike recoveries were outside the control limits. The post-digested spike is to confirmation matrix effect. The analyte(s) were qualified (J).
LCS	Laboratory control samples were outside the LCG limits for the particular analysis. The analyte(s) were qualified (J).
RPD	The difference between the MS/MSD or the sample/sample duplicate exceeded the control limits. The analytes were qualified (J).
SD	The serial dilution was not within the control limits. The analyte(s) were qualified (J).

3.4 IMPACT ON DATA QUALITY

The volatile samples had three analytes that was rejected: chloromethane, acetone, and 2-butanone. The results of the analytes were rejected because the analytes did not meet the control limit or sporadic marginal failure (SMF) limits for the method-reporting limits.

4.0 DATA REVIEW

LKA received sample results and data packages from the following laboratories for data review:

Severn Trent Laboratory, Chicago, IL

Severn Trent Laboratories (STL) provided the full data package by hardcopy. Based on the data completeness review, STL Laboratories provided full data packages and the packages were sufficient for data validation.

4.1 DESCRIPTION OF DATA COMPLETENESS REVIEW

Data completeness was evaluated with the guidelines provided by Louisville District, USACE, to LKA. The pertinent information on data completeness was tracked by LKA using an Excel spreadsheet (see attachment 3) and used Table 4.1 to report whether the laboratory had provided the required information.

During the data completeness task, LKA determined it was possible to provide additional information within the coding system, which relates to the compliance of the data to quality control specifications. For instance, if during the review a surrogate recovery was determined to be outside of the laboratory requirements, the deviation was noted. While this information does not provide an assessment of whether the usability of the data was impacted, it may provide some indication of the laboratory's compliance to the quality control requirements.

In cases where potential quality control issues were identified, the reviewer recorded a comment. The data reviewer's comments are provided in Section 4.7. The general and specific comments are on page 22.

4.2 DATA SUMMARY TABLES

4.2.1 SUMMARY OF LABORATORY COMPLETENESS

LKA reviewed 65 analyses for completeness, see Attachment 3. Numerical summaries of the assigned completeness codes for the reviewed analyses are provided in Table 4.1, see the following page. The following subsections also provide a more detailed description of the laboratories compliance with the completeness criteria.

Table 4.1 – Numerical Summary of Completeness

Completeness Requirement					
	Total # of items	Total # items not applicable to requirement	Total # items present but not associated with this requirement	Total # items missing in the data package	Total # items with Quality Control Deficiencies
Sample ID was cross listed to laboratory sample ID	65	0	0	0	0
Dilutions identified	1	64	0	0	0
Date of extraction and analysis identified were reported	23	0	42	0	0
Laboratory blanks were introduced at specified frequency	14	51	0	0	0
The surrogates were analyzed and reported and re-runs performed as needed.	45	0	20	0	0
The trip blanks and field blanks were reported	2	0	63	0	0
Laboratory completed and reported a "Cooler Receipt Form"?	5	0	0	0	0
The required matrix spike/matrix spike duplicates were performed	13	52	0	0	0
The laboratory control samples were reported	14	51	0	0	0

Cross Referenced Samples

The USACE requires that laboratories delivery a cross-reference between the laboratory sample identifications and the field sample identifications. This criterion was met for all of the samples as demonstrated in Table 4.1.

Dilutions

The USACE requires that the laboratories report the dilution factors applicable for each set of sample results. There was one dilution for all samples and analyses. The sample, MBSS01(0-0.5), was diluted by a factor of five for the PCB's analysis. The undiluted sample was not reported.

Date of Extraction and Analysis

The date of extraction and analysis must be clearly reported by the laboratory to permit easy assessment of holding time compliance. This requirement was met for all samples requiring extraction.

Laboratory Blanks

The USACE requires that the laboratory report the applicable blanks for each set of samples. The laboratory met this requirement. The metals' method blanks had contamination of magnesium. The analyte, magnesium, was not qualified since the sample's concentration was more than five times greater than amount detected in the method blank. However, the initial and continuing calibration blanks for metals had lead, arsenic, vanadium contamination. The corresponding samples were qualified appropriately. All other analyses were free of contamination.

Surrogates

Surrogates must be included as required by the methodology and the results must be reported. The laboratories met the completeness requirements for surrogates.

Field Blanks

There were two trip blanks and two field blanks in the coolers. The trip blank associated with samples, VWGW03, and MBGW02, detected methylene chloride (3.2 ug/L). The detected amount of methylene chloride in the trip blank had no impact on samples, VWGW03, and MBGW02, since methylene chloride was not detected in the sample. The trip blank associated with sample, TFGW01, was below detection limit (BDL) for all analytes. The field blank, FB-042106-1, associated with the volatile samples, VWGW03, and MBGW02, detected chloroform (0.51 ug/L), and acetone (4.6 ug/L). The sample, VWGW03, had no impact on the detected amounts of chloroform and acetone in the

field blank since the analytes were not detected in the sample. The detected amount of acetone in the field blank had impact on the sample, MBGW02, since acetone was detected in the sample (5.5 ug/L). The field blank, FB-042606-2, associated with the volatile sample, TFGW01, acetone (7.4 ug/L). The detected amount of acetone in the field blank had no impact on the sample, MBGW02, since acetone was not detected in the sample. The field blank, FB-042106-1, associated with the metals sample, VWGW03, detected barium (0.0033 mg/L), magnesium (0.016 mg/L), manganese (0.0006 mg/L), and potassium (0.22 mg/L). The detected amounts of barium, magnesium, manganese, and potassium in the field blank had little or no impact on the sample, VWGW03, since amounts detected in the sample was more than five times the amount detected in the field blank. The field blank, FB-042606-2, associated with the metals sample, CBGW01, detected aluminum (0.014 mg/L), barium (0.0019 mg/L), calcium (0.26 mg/L), iron (0.059 mg/L), magnesium (0.12 mg/L), manganese (0.00048 mg/L), potassium (0.22 mg/L), and zinc (0.0091 mg/L). The detected amounts of aluminum, barium, calcium, iron, magnesium, manganese, and potassium in the field blank had little or no impact on the sample, CBGW01, since amounts detected in the sample was more than five times the amount detected in the field blank. The detected amount of zinc in the field blank had impact on the sample, CBGW01, since amount detected in the sample (0.025 mg/L) was less than five times the amount detected in the field blank.

Target Analytes

A list of client specific target analytes was not provided to the data reviewer. Therefore, the reviewer used the target list of the methods used in the analysis.

Cooler Receipt Forms

The laboratories are required to report cooler receipt condition using forms. Severn Trent Laboratory (STL) used a dedicated cooler receipt form. The laboratory received 1 out of 9 sample coolers outside the 4^0 C ± 2^0 C temperature range. The cooler's temperature was: 1.1^0 C. The laboratory did not take any corrective action by contacting the client that the samples were received outside the temperature control limits. There would be little or no impact on the samples since the samples were received near zero degrees centigrade but the samples were not frozen.

Matrix Spike/Matrix Spike Duplicates

The laboratory performed matrix spikes on all the analyses. The frequency for the project matrix spike analyses is summarized in Table 4.2 – Summary of Samples and Quality Control Frequency. Additionally, the laboratory performed MS/MSD's on project samples. The number of project MS/MSD's were: four for volatiles, four for PAH's, two for PCB's, two for TAL-metals, and one for lead.

Laboratory Control Samples

Laboratory control samples were introduced at a frequency of at least one per laboratory batch.

4.3 SUMMARY OF FIELD QUALITY CONTROL SAMPLE COMPLETENESS

LKA also summarized the number of quality control samples introduced by either the field team or the laboratory. The results are presented in Table 4.2 (see the following page). The frequency requirement for the quality control samples was not provided to LKA as part of the data completeness task. However, the frequencies were recorded to facilitate later evaluation of the frequencies.

Table 4.2 – Summary of Samples and Quality Control Frequency

Analysis	Regular Samples	Method Blanks	Trip Blanks	Lab Duplicates	Field Duplicates	Matrix Spike /Matrix Spike Duplicate
Volatiles	6	5	2	0	0	4
PAH's	4	3	N/A	0	0	4
PCB's	2	2	N/A	0	0	2
Metals-TAL	4	2	N/A	2	0	2
Lead (Pb)	2	2	N/A	1	0	1

4.4 DEFICIENCIES IN DATA AND ANY FLAGGING CODES

The data completeness deficiencies are summarized in Section 4.2 of this report. The deficiency is the lack of laboratory duplicates.

4.5 SOURCE OF DEFICIENCIES

The most frequent data completeness deficiencies are summarized and discussed in Table 4.3.

Table 4.3 – Most Frequent Deficiencies

Deficiency	Incidents	Discussion
Lack of lab duplicates	3	There were three analyses which did not have a duplicate analyzed.

4.6 IMPACT ON QUALITY OF DATA

All results for the submitted samples were reported. The missing data impacts the ability of a data assessor to qualify the data. In the case of these samples, the data reviewer for data validation randomly selected 10 percent of the data. Missing data will not impact this data validation report and no qualifications were applied because of missing data.

4.7 DATA REVIEW COMMENTS

During the review of the completeness of the data packages, the reviewer made several observations that are relevant to the data quality. While these observations do not have the weight of data validation observations, they were determined to be relevant and helpful to understanding the data quality. Both general and analysis specific results are presented in the following subsections.

4.7.1 General Comments

The laboratory did not report the metal analytes in the appropriate units. LCG states on page 3 in the "Do Checklist" to report metals in ug/L.

4.7.2 Analysis Specific Comments

The following subsections summarize the data completeness reviewer's comments by analysis.

Volatiles

Surrogate Recovery Limits

The surrogate recovery limits used by STL Laboratories were the same throughout the project. The total number of samples analyzed was 40 soil samples. The individual surrogate recoveries for each of the 40 samples are in a worksheet and a graph in Attachment 4. The graph for the surrogate recoveries shows the control limits for the 40 samples but only three samples were validated. The remaining 37 samples were not validated but were used to produce a statistically acceptable control limits for the 40 samples. The graph for the surrogate recoveries shows the control limits for the 40 samples. All 40 samples evaluated were within the control limits (± 2 SD) for all three surrogates except for one sample in surrogate, 1,2-dichloroethane, one sample in surrogate, toluene-d8, and one sample in surrogate, 4-bromomofluorobenzene.

Calibration (Initial, verification, and continuing)

The laboratory did not provide a linear regression curve for the compounds above 15 % RSD for the initial calibration.(see Attachment 6) for the linear correlation coefficient for all analytes

whose RSD >15 % and the analytes which did not have RSD. The laboratory should report the RSD for all analytes before changing to a linear equation. The analyte, chloromethane, did meet the primary evaluation of the $r^2 > 0.990$ and the RSD were greater than 30 %. The analyte was qualified appropriately for the associated samples. There were five other analytes that did meet the primary evaluation of the $r^2 \geq 0.990$ and the RSD was greater than 15 %. The analytes were qualified appropriately.

The laboratory had one analyte above 30 % D for continuing calibration verifications. The analyte, acetone, was above > 30 % D with a positive bias in the continuing calibration verification. The analyte, carbon disulfide, was above > 20 % D with a positive bias in the continuing calibration verifications. The analytes were qualified appropriately.

The laboratory analyzed the initial calibration verifications after the initial calibration curves were within the control limits except for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, tetrachloroethene, and acetone. The analytes were qualified appropriately.

The laboratory analyzed the required method reporting limits and the QC/MRL were within the control limits except for acetone, 2-butanone, trans-1,3-dichloropropene, cis-1,3-dichloropropene, dibromochloromethane, 4-methyl-2-pentanone, 2-hexanone, styrene, bromoform, chloromethane, acetone, and 2-butanone. The analytes were qualified appropriately.

Surrogate, MS, and LCS recoveries

The surrogate recoveries were within the control limits for the samples. No qualifications were applied to the data.

The MS/MSDs were within the control limits except for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, chloromethane, and carbon disulfide. The analytes were qualified appropriately.

The RPDs were within the control limits except for acetone. The analyte was qualified appropriately.

The LCS recoveries were within the control limits except for carbon disulfide, vinyl chloride, and acetone. The analytes were qualified appropriately.

Sample analysis

The samples, VWSS01(0-0.5), CCSB02(4-5), PSSS02(0-0.5), VWGW03, MBGW02, and TFGW01, were analyzed within the recommend holding times. No qualifications were applied to the data.

There was no method blank, which had contamination that was greater than one-half the method-reporting limit. No qualifications were applied to the data.

The retention times (RRT), internal standard areas, and ions detected analyte spectrum were within the QC limits. No qualifications were applied to the data.

Semivolatiles (PAH's)

Surrogate Recovery Limits

The surrogate recovery limits used by STL Laboratories were the same throughout the project. The total number of samples analyzed was 24 soil samples. The individual surrogate recoveries for each of the 24 samples are in a worksheet and a graph in Attachment 4. The graph for the surrogate recoveries shows the control limits for the 24 samples but only two samples were validated. The remaining 22 samples were not validated but were used to produce a statistically acceptable control limits for the 24 samples. The graph for the surrogate recoveries shows the control limits for the 24 samples. All 24 samples evaluated were within the control limits (± 2 SD) for all three surrogates except for one sample in surrogate, nitrobenzene-d5, one sample in surrogate, 2-fluorobiphenyl, and three samples in surrogate, terphenyl-d14.

Calibration (Initial, verification, and continuing)

The analytes were within the < 15 %RSD for all analytes. No qualifications were applied to the data.

The laboratory analyzed the continuing calibration verifications. The continuing calibration verifications were within the control limits except for phenanthrene. The analyte was qualified appropriately.

The laboratory analyzed the initial calibration verifications after the initial calibration curves were within the control limits.

The laboratory analyzed the required method reporting limits and the QC/MRL were within the control limits except for fluoranthene, fluorene, phenanthrene, anthracene, and chrysene. The analytes were qualified appropriately.

Surrogate, MS, and LCS recoveries

The surrogate recoveries were within the control limits for the samples except for terphenyl-d14 for sample, MBGW02, in SDG# 246011. The sample was qualified appropriately.

The MS/MSDs were within the control limits except for fluoranthene, and pyrene. The analytes were qualified appropriately.

The RPDs were within the control limits. No qualifications were applied to the data.

The LCS recoveries were within the control limits. No qualifications were applied to the data.

Sample analysis

The samples, VWSS01(0-0.5), PSSS02(0-0.5), VWGW03, and MBGW02, were extracted and analyzed within the recommend holding times. No qualifications were applied to the data.

There was no method blank, which had contamination that was greater than one-half the method-reporting limit. No qualifications were applied to the data.

The retention times (RRT), internal standard areas, and ions detected analyte spectrum were within the QC limits. No qualifications were applied to the data.

PCB's

Surrogate Recovery Limits

The surrogate recovery limits were calculated for the surrogate; however, the number of samples evaluated was less than twenty samples. Twenty samples are a statistically acceptable number to provide acceptable limits for the surrogates. Attachment 4 shows the approximate recovery limits.

Calibration (Initial, verification, and continuing)

There were no discrepancies found in the initial calibration for PCB's. No qualifications were applied to the data.

The laboratory was within the control limits for the continuing calibration verifications. No qualifications applied to the data.

The laboratory was within the control limits for the required verifications after the initial calibration curves. No qualifications applied to the data.

The laboratory analyzed the required method reporting limits and the QC/MRL were within the control limits. No qualifications applied to the data.

Surrogate, MS, and LCS recoveries

The surrogate recoveries were within the control limits except for decachlorobiphenyl (DCB) for sample, MBGW02, in SDG#246011. The sample was qualified appropriately.

The MS/MSDs were within the control limits. No qualifications applied to the data.

The RPDs were within the control limits. No qualifications applied to the data.

Sample analysis

The samples, MBDD01(0-0.5), and MBGW02, were extracted and analyzed within the recommend holding times. No qualifications were applied to the data.

The method blanks were free of contamination. No qualifications applied to the data.

The retention times (RRT) were within the control limits and the column confirmation was within the control limits. No qualifications applied to the data.

TAL-Metals

Calibration (Initial, verification, and continuing)

There were no discrepancies found in the initial calibration for metals. No qualifications were applied to the data.

The continuing calibration verifications were within control limits. No qualifications were applied to the data.

The laboratory analyzed the required verifications after the initial calibration curves. The verifications were within control limits. No qualifications were applied to the data.

The laboratory analyzed the required method reporting limits and was within the control limits except for calcium, iron, and manganese. The analytes were qualified appropriately.

MS, and LCS recoveries

The MS recoveries were within the QC limits except for antimony, arsenic, lead, potassium, and thallium. The analytes were qualified appropriately.

The RPDs were within the control limits except for manganese, arsenic, cobalt, copper, and lead. The analytes were qualified appropriately.

The LCS recoveries were within the control limits. No qualifications were applied to the data.

Sample analysis

The samples, VWSS01(0-0.5), CCSB02(4-5), VWGW02, and CBGW01, were digested and analyzed within the recommend holding times. No qualifications were applied to the data.

There was no method blank contamination. However, there was contamination present in the initial calibration and continuing calibration blanks. The initial calibration and continuing calibration

blanks were contaminated with lead, arsenic, and vanadium. The analytes were qualified appropriately.

The serial dilution was within the control limits except for cobalt, magnesium, manganese, zinc, calcium, chromium, iron, magnesium, manganese, and vanadium. The analytes were qualified appropriately.

Lead-Pb

Calibration (Initial, verification, and continuing)

There were no discrepancies found in the initial calibration for lead. No qualifications were applied to the data.

The continuing calibration verifications were within the control limits. No qualifications were applied to the data.

The laboratory analyzed the required verifications after the initial calibration curves. The verifications were within the control limits. No qualifications were applied to the data.

The laboratory analyzed the required method reporting limits and was within the control limits. No qualifications were applied to the data.

MS, and LCS recoveries

The MS recoveries were within the control limits. No qualifications were applied to the data.

The RPDs were within the control limits. No qualifications were applied to the data.

The LCS recoveries were within the control limits. No qualifications were applied to the data.

Sample analysis

The samples, PSSS02(0-0.5), and PSGW02, were digested and analyzed within the recommend holding times. No qualifications were applied to the data.

There was no method blank contamination. However, there was contamination present in the initial calibration blank. The initial calibration blank was contaminated with lead. The analyte was qualified appropriately.

The serial dilution was within the control limits. No qualifications were applied to the data.

5.0 FINDING ON OVERALL QUALITY OF DATA

Based on the data review and validation, the percent completeness of usable laboratory data has been calculated using the following formula from LCG:

$$\% \text{ Usability} = \frac{[(\text{usable samples}) * (\text{total analytes})] - \text{unusable analytes} - [(\text{unusable samples}) * (\text{total analytes})]}{[(\text{total samples}) * (\text{total analytes})]}$$

The results of these analyses are reported in Table 5.1 (see page 34) and indicate that all of the data is usable for polynuclear aromatic hydrocarbons, PCB's, TAL-metals, and lead. Most of the data is usable for volatiles. It is our opinion that the quality of the data is acceptable.

Table 5.1 – Usable Laboratory Data

Analysis	Total Samples	Total No. Analytes	No. Individual Analytes Rejected	No. Samples Rejected	% Complete
Volatiles	6	204	6	0	97.1 %
PAH's	4	64	0	0	100 %
PCB's	2	14	0	0	100 %
Metals-TAL	4	230	0	0	100 %
Lead (Pb)	2	230	0	0	100 %

An example calculation is presented below.

$$\text{Volatiles} \quad \% \text{ Usability} = \frac{[(6) * (34)] - 6 - [(0 * 34)]}{[(6) * (34)]} = 97.1\%$$

ATTACHMENT 1

ENVIRONMENTAL DATA ASSURANCE GUIDELINE

Table 1
Summary of Method Quality Objectives for Method 8260 - Volatile Organic Compounds

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
BFB Tuning	Ion abundance relative to m/z 95 base peak	Every 12 hours	Method criteria	Correct problem and rerun	No flagging criteria – MUST RETUNE before analysis of samples. Reject all data.
Initial Calibration	Minimum five point curve.		Instrument Evaluation: SPCC: minimum RF values per method requirements CCCs: verify RSD ≤ 30% And All analytes: r ≥ 0.99, RSD ≤ 15%, $r^2 \geq 0.99$, mean RSD ≤ 15% with a maximum RSD ≤ 20%, for upto 5% for any non-contaminant of concern)	Correct problem and rerun. There should be no failures for an ICAL– correct and repeat is the corrective action otherwise it will be rejected.	Qualify with R when less than five std. were used. When RSD exceeds 15% or correlation is less than 0.99 -J/R. Manual integration is NOT acceptable for initial calibrations, except for the low level calibration concentrations (1st and 2nd point of the calibration curve). Refer to guideline in Section 5.0.
MDL Level Verification	MDL check (2XMDL)	Once per quarter per instrument used	Analytes detected	Correct problem and repeat.	Apply "R" to all non-detects.
MRL Level Verification	QC/MRL: Low-level check standard at MRL	At the beginning and end of every daily sequence, every 12 hours, or Shorter to bracket USACE samples	70-130% Sporadic Marginal Failure 60-140%	Correct problem and repeat. Or run MDL check to verify the non-detect	For results greater than the 130%, apply J to all positives. For a result <70% and >60%, apply J to all positives and UJ to all non-detects. For recovery <60%, apply J to all positives and R to all non-detects. If MDL check was run at end and acceptable do not reject data.

Notes: Sporadic Marginal Failure accumulation is allowed up to 5% of the target list for non-contaminants of concern before corrective action must be taken.

Table 1 (continued)
Summary of Method Quality Objectives for Method 8260 -Volatile Organic Compounds

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
Initial Calibration Verification (ICV)	Mid-level (2nd source) verification	After initial calibration	80-120% Sporadic Marginal Failure 60-140%	Correct problem and repeat.	For results greater than the 120%, apply J to all positives. For a result <80% and >60%, apply J to all positives and UJ to all non-detects. For recovery <60%, apply J to all positives and R to all non-detects.
CCV	Mid-level verification	At the beginning of every twelve hours	Instrument Evaluation: SPCC: minimum RF values per method requirements CCC: verify D ≤ 30% And D or mean D ≤ 20% with a max D for each target analyte ≤ 30% for upto 5% for any non-contaminants of concern. Internal Standards: Retention time ±30 seconds from retention time of the mid-point std. of the ICAL. EICP area within –50% to +100% of the ICAL mid-point std.	Correct the problem, reanalyze CCV, if problem continues repeat initial calibration	If mean %D > 20% and D > 30% then R. If mean %D ≤ 20% and D > 30% then J. For each target analyte, when D>20% with a negative bias -J/R. When D>30% with a positive bias –J positives only.
Internal Standards	Analytically spiked non-target compounds used to calculate the concentration of target compounds present	Every sample	Retention time ±30 seconds from retention time of the mid-point std. in the CCC for the sequence. EICP area within –50% to +100% of the CCC mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	For area counts between 10% and 50% or >150%, apply J/UJ. For areas <30%, reject all associated data.

Notes: Sporadic Marginal Failure accumulation is allowed up to 5% of the target list for non-contaminants of concern before corrective action must be taken.

Table 1 (continued)
Summary of Method Quality Objectives for Method 8260 -Volatile Organic Compounds

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
MB	Reagent Blank to assess method contamination	1 per sample batch	Analytes <1/2 MRL (up to 5% may exceed)	Reprep. And repeat for >5% exceedance	Apply B to all associated positives when less than 5X blank concentration and 10X for common lab contaminants (acetone, chloroform, and methylene chloride)
LCS	Interference-free matrix containing all target analytes	1 per sample batch	See limits in Appendix C	Correct problem and repeat.	When recovery is >UL flag positives with J. For recovery <LL, flag J/UJ. For a recovery LL and <30%, flag J/R.
MS	Sample matrix spiked with all target analytes prior to digestion	1 per sample batch	Only if [spike] > 4X[matrix] 70 – 130% Sporadic Marginal Failure 60-140%		No action is taken based on MS recovery alone, use professional judgment.
MSD	Use MD or MS	1 per sample batch	Only apply to results > MRL RPD ≤ 30% Sporadic Marginal Failure ≤ 40%		No action is taken based on duplicate results alone, use professional judgment.
Surrogates		Per sample	50%-150%	Rerun samples and/or re-extract when <10%.	When recovery is >UL flag positives with J. For recovery between 10% and the LL, flag J/UJ. For a surrogate recovery <10%, flag J/R.

Notes: Sporadic Marginal Failure accumulation is allowed up to 5% of the target list for non-contaminants of concern before corrective action must be taken.

Table 2
Summary of Method Quality Objectives for Method 8270 - Semivolatile Organic Compounds

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
DFTPP Tuning	Ion abundance relative to m/z 198 base peak	Every 12 hours	Method Criteria	Correct Problem and rerun	No flagging criteria – MUST RETUNE before analysis of samples Reject all data.
Initial Calibration	Minimum five point curve.		Instrument Evaluation: SPCC: minimum RF values per method requirements CCCs: RSD ≤ 30% AND All analytes: r ≥ 0.99, RSD ≤ 15%, $r^2 \geq 0.990$, or mean RSD ≤ 15% with a maximum RSD ≤ 20% for up to 5% of the non-contaminants of concern for the target list	Correct problem and rerun. There should be no failures for an ICAL – correct and repeat is the corrective action otherwise it will be rejected.	Qualify with R when less than five std. were used. When RSD exceeds 15% or correlation is less than 0.99-J/R. Manual integration is NOT acceptable for initial calibrations, except for the low level calibration concentrations (1st and 2nd point of the calibration curve). Refer to guideline in Section 5.0.
MDL Level Verification	MDL check (2XMDL no extraction)	Once per quarter per instrument used	Analytes detected	Correct problem and repeat.	Apply "R" to all non-detects.
MRL Level Verification	QC/MRL: Low-level check standard at MRL	At the beginning and end of every daily sequence, every 12 hours, or Shorter to bracket USACE samples	70-130% Sporadic Marginal Failure 50-150%	Correct problem and repeat. OR run MDL check to verify the non-detect	For results greater than the 130%, apply J to all positives. For a result <70% and >50%, apply J/UJ. For recovery <50%, apply J/R. If MDL check was run at end and acceptable do not reject data.

Notes: Sporadic Marginal Failure accumulation is allowed up to 5% of the target list for non-contaminants of concern before corrective action must be taken.

Table 2 (continued)
Summary of Method Quality Objectives for Method 8270 - Semivolatile Organic Compounds

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
Initial Calibration Verification (ICV)	Mid-level (2nd source) verification	After initial calibration	70-130% Sporadic Marginal Failure 50-150%	Correct problem and repeat.	For results greater than the 130%, apply J to all positives. For a result <70% and >50%, apply J/UJ. For recovery <50%, apply J/R.
CCV	Mid-level verification	Every twelve hours	Instrument Evaluation: SPCC: minimum RF values per method requirements CCC: verify D ≤ 20% And D or mean D ≤ 20% with a max D for each target analyte ≤ 30% for upto 5% for any non-contaminants of concern. Internal Standards: Retention time ±30 seconds from retention time of the mid-point std. of the ICAL. EICP area within –50% to +100% of the ICAL mid-point std.	Correct the problem, reanalyze CCV, if problem continues repeat initial calibration	If mean %D > 20% and D > 30% then R. If mean %D ≤ 20% and D > 30% then J. For each target analyte, when D>20% with a negative bias -J/R. when D>20% with a positive bias –J positives only.
Internal Standards	Analytically spiked non-target compounds used to calculate the concentration of target compounds present	Every sample	Retention time ±30 seconds from retention time of the mid-point std. in the CCC for the sequence. EICP area within –50% to +100% of the CCC mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	For area counts between 30% and 50% or >150%, apply J/UJ. For areas <30%, reject all associated data.

Notes: Sporadic Marginal Failure accumulation is allowed up to 5% of the target list for non-contaminants of concern before corrective action must be taken.

Table 2 (continued)
Summary of Method Quality Objectives for Method 8270 - Semivolatile Organic Compounds

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
MB	Reagent Blank to assess method contamination	1 per sample batch	Analytes <1/2 MRL (up to 5% may exceed)	Reprep and repeat for >5% exceedance	Apply B to all associated positives when less than 5X blank concentration and 10X for common lab contaminants (phthalates)
LCS	Interference-free matrix containing all target analytes	1 per sample batch	See limits in Appendix C	Correct problem and repeat.	When recovery is >UL flag positives with J. For recovery <LL flag J/UJ. For a recovery <LL and <30%, flag J/R.
MS	Sample matrix spiked with all target analytes prior to digestion	1 per sample batch	Only if [spike] > 4X[matrix] 45-135% Sporadic Marginal Failure 20-150%		No action is taken based on MS recovery alone, use professional judgment.
MSD	Use MD or MS	1 per sample batch	Only apply to results > MRL Water: RPD ≤ 40% Soil: RPD ≤ 50% SMF: ≤ 50%		No action is taken based on duplicate results alone, use professional judgment.
Surrogates		Per sample	50-150%	Rerun samples and/or re-extract when <10%.	When recovery is >UL, flag positives with J. For recovery between 10% and the LL, flag J/UJ. For surrogate recovery <10%, flag J/R.

Notes: Sporadic Marginal Failure accumulation is allowed up to 5% of the target list for non-contaminants of concern before corrective action must be taken.

Table 3
Summary of Method Quality Objectives for Method 8082 - PCBs

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
Initial Calibration (Aroclors 1016 & 1260)	Minimum five point curve.		$r \geq 0.99$, RSD $\leq 20\%$, $r^2 \geq 0.990$, mean RSD $\leq 20\%$	Correct problem and rerun.	Qualify with R when less than five std. Were used. When RSD exceeds 20% or correlation is less than 0.99 -J/R. Manual integration is NOT acceptable for initial calibrations, except for the low level calibration concentrations (1st and 2nd point of the calibration curve). Refer to guideline in Section 5.0.
MDL Level Verification	MDL check (2XMDL no extraction)	Once per quarter per instrument used	Analytes detected	Correct problem and repeat.	Apply "R" to all non-detects.
MRL Level Verification	QC/MRL: Low-level check standard at MRL	At the beginning and end of every daily sequence, every 12 hours, or Shorter to bracket USACE samples	70-130%	Correct problem and repeat. . Or run MDL check to verify the non-detect	For results >130%, apply J only. For a result marginally less than the LL (65-70%), apply J/UJ. For recovery more than marginally out (<65%), apply J/R. If MDL check was run at end and acceptable do not reject data.
Initial Calibration Verification (ICV)	Mid-level (2nd source) verification	After initial calibration	85-115%	Correct problem and repeat.	For results >115%, apply J only. For a result marginally less than the LL (80-85%), apply J/UJ. For recovery more than marginally out (<80%), apply J/R.
CCV	Mid-level verification	Every twelve hours	D or mean D $\leq 15\%$ with a maximum %D<20% for upto 5% of the calibrated peaks.	Correct problem and rerun.	For each target analyte, when the mean D>20% with a negative bias -J/R. when D>15% with a positive bias for any of the calibrated peaks for each arochlor–J positives only.

Table 3 (continued)
Summary of Method Quality Objectives for Method 8082 - PCBs

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
MB	Reagent Blank to assess method contamination	1 per sample batch	Analytes <1/2 MRL (up to 5% of the total list of analytes may exceed)	Reprep and repeat for >5% exceedance	Apply B to all associated positives when less than 5X blank concentration
LCS	Interference-free matrix containing all target analytes	1 per sample batch	See limits in Appendix C	Correct problem and repeat.	When recovery is >UL flag positives with J. For recovery <LL, flag J/UJ. For a recovery <LL and <30%, flag J/R.
MS	Sample matrix spiked with all target analytes prior to digestion	1 per sample batch	To consider [spike] > 4X[matrix] 50-150%		No action is taken based on MS recovery alone, use professional judgment.
MSD	Use MD or MS	1 per sample batch	Only apply to results > MRL Water: RPD ≤ 50% Soil: Lab QC Limits		No action is taken based on duplicate results alone, use professional judgment.
Surrogates			50-150%	Rerun samples and re-extract when <10%.	When recovery is >150% or between 10% and 50%, flag positives with J. For non-detect associated results where recovery is between 10% and 50%, flag UJ. For an analyte recovery <10%, flag R.
Target Analyte Confirmation	All positive results greater than the MRL.	Whenever a positive is detected on one column and confirmed on 2nd column.	RPD ≤ 40		Qualify with J when RPD>40 for positive results.

Table 7
Summary of Method Quality Objectives for Method 6010 - ICP Metals

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
Initial Calibration	3-stds and a blank	Daily	$R \geq 0.995$	Correct problem and repeat.	Apply R to all associated results when not performed daily. When correlation is less than 0.995 -J/R.
Instrument Precision	RSD 3 integration's (exposures)	Each calibration and calibration verification standard (ICV/CCV)	RSD<5%	Correct problem and repeat.	Apply R to all associated results.
MDL Level Verification	MDL check (2XMDL no digestion)	Once per quarter per instrument used	Analytes detected	Correct MDL and repeat.	Apply "R" to all non-detects.
MRL Level Verification	QC/MRL: Low-level check standard at MRL [Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)]	At the beginning and end of every daily sequence or shorter to bracket USACE samples	70-130%	Correct problem and repeat. Or run MDL check to verify the non-detect	For results greater than the UL, apply J to all positives. For a result marginally less than the LL (65-70%), apply J to all positives and UJ to all non-detects. For recovery more than marginally out (65%), apply J to all positives and R to all non-detects. If MDL check was run at end and acceptable do not reject data
Initial Calibration Verification (ICV)	Mid-level (2nd source) verification	After initial calibration	90-110%	Correct problem and repeat.	For results greater than the UL, apply J to all positives. For a result marginally less than the LL (85-90%), apply J to all positives and UJ to all non-detects. For recovery more than marginally out (<85%), apply J to all positives and R to all non-detects.
Initial Calibration Blank(ICB)	Interference-free matrix to assess analysis contamination	After initial calibration verification	Analytes <1/2 MRL (up to 5% may exceed)	Correct problem and repeat.	Apply U to all associated positives when less than 5X blank concentration

Table 7 (continued)
Summary of Method Quality Objectives for Method 6010 - ICP Metals

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
Interelement Check Standard (ICS)	ICS-A interferents only ICS-AB interferents and target analytes	Beginning of analytical sequence	ICSA: No detection of other elements: analytes <1/2 MRL (up to 5% may exceed) ICSAB: 80-120% for target analytes	Correct problem and repeat.	Only for samples with concentrations approximate to [ICS]. For recovery >120%, apply J to positives. For recovery in between 50-79%, apply J to positives and UJ to non-detects. For recovery <50%, apply R. For detections of other elements, use professional judgment.
Continuing Calibration Blank (CCB)	Interference-free matrix to assess analysis contamination	Every 10 samples and at end of analytical sequence	Analytes <1/2 MRL (up to 5% may exceed)	Correct problem and repeat.	Apply U to all associated positives when less than 5X blank concentration
Continuing Calibration Verification(CCV)	Mid-level verification	Every 10 samples and at end of analytical sequence	90-110%	Correct problem and repeat.	For results greater than the UL, apply J to all positives. For a result marginally less than the LL (85-90%), apply J to all positives and UJ to all non-detects. For recovery more than marginally out (<85%), apply J to all positives and R to all non-detects.
Method Blank (MB)	Reagent Blank to assess method contamination	1 per sample batch	Analytes <1/2 MRL (up to 5% may exceed)	Redigest and repeat.	Apply B to all associated positives when less than 5X blank concentration
Laboratory Control Sample (LCS)	Interference-free matrix containing all target analytes	1 per sample batch	See limits in Appendix C	Correct problem and repeat.	When recovery is >UL flag positives with J. For recovery <LL flag J/UJ. For a recovery <LL and <60%, flag J/R.

Table 7 (continued)
Summary of Method Quality Objectives for Method 6010, ICP Metals

Quality Control Element	Description of Element	Frequency of Implementation	Acceptance Criteria	Corrective Action	Flagging Criteria for Validator
Matrix Spike (MS) (pre-digested)	Sample matrix spiked with all of target analytes prior to digestion	1 per sample batch	To consider [spike] > 4X[matrix] Recovery=75-125%	See Section 7	For positive associated results where recovery is >125% or between 30-75%, flag with J. For non-detect associated results where recovery is between 30-74%, flag UJ. Associated with an analyte recovery <30%, flag non-detects R and positives J.
Matrix Duplicate (MD)	A USACE sample digested in duplicate	1 per sample batch	RPD ≤ 20		Flag all positives for the analytes out with a J in associated samples.
Post Digestion Spike	Sample digestate spiked with all of target analytes	As needed to confirm matrix effect	Recovery=75-125%	See Section 7	For positive associated results where recovery is >125% or between 30-75%, flag with J. For non-detect associated results where recovery is between 30-74%, flag UJ. All results associated with an analyte recovery <30%, flag R.
Serial Dilution (SD)	5X dilution analyzed to assess matrix effect	As needed to assess new and unusual matrices	Agreement between undiluted and diluted results within 10%	See Section 7	Flag associated positives with J.

ATTACHMENT 2

CHECKLISTS

Prepared by Kerry R. Nusekabel

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/18/06; SDG# 245903

Method: SW-8260B

Review Items	Yes	No	N/A
1) Is the BFB tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF value per the method requirements?	X		
c) Are the CCC compounds < 30% RSD?	X		
d) Are the other target analytes within < 15% RSD or have a r2 > 0.990?		X	
e) if "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maxium allowable RSD < 30%? If applicable, give a list of compounds whose RSD > 30 in the comments section.	X		
3) ICV: a) Mid-level (2nd source) Recovery = 80 - 120%?		X	
b) If "no" was answered for 3a, did the compounds outside the 80 - 120 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
c) QC/MRL: D < 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.		X	
e) MDL Check (2 X MDL)?	X		
4) CCV:a) Continuing Calibration verification was run at every 12 hours?	X		
b) Do the SPCC compounds meet the minimum RF values per the method requirements?	X		
c) Is the CCC compounds < 20% difference from the initial calibration?	X		
d) Are the other target analytes within < 20% difference from the initial calibration?		X	
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D < 30%? If applicable, give a list of compounds whose %D > 30% in the comments section.	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 245903)

Review Items	Yes	No	N/A
5) A Sample Analysis: a) were all samples analyzed within holding times?	X		
b) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
c) RRT of identified compounds within + 0.06 RRT units of RRT of standard component?	X		
d) Ions present in the standard spectra within abundance of > 10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?	X		
e) Are Internal Standard areas within QC limits (-50% or +100%)?		X	
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)		X	
7) MS/MSD: a) Is the percent recovery for MS/MSD within the limits (Water Recovery = 70 - 130%; Soil Recovery = 70-130%)?		X	
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (60 - 140%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.		X	
c) Are the RPDs within control limits? (max. RPD < 30; SMF limit: 40) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits for RPDs in the comments section.		X	
8) Surrogates: Are surrogate recoveries within the limits per sample ? (Criteria: 50 - 150%)	X		
9) Is the method blank <1/2 MRL for target analytes and it is analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 245903)

Comments on "No" response: **(2 d, e)** acetone, 21 %, r2 =0.991; 2-butanone, 17 %, r2 =0.991; qualify sample with a (J) for acetone and 2-butanone.

(3 a)chloromethane (70 %); vinyl chloride (74 %);1,1-dichloroethene(79%); trans-1,2-dichloroethene (77 %); tetrachloroethene(79%); qualify sample with (J) for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, and tetrachlroethene.

(3 c,d) acetone(55%, **38%**); 2-butanone(0%); trans-1,3-dichloropropene(65%); qualify sample with a (**R**) for 2-butanone and acetoneand (J) for trans-1,3-dichloropropene.

(4 d) carbon disulfide(28 %); qualify sample with (J) for carbon disulfide.

(5 e) chlorobenzene(475411,520738-2082952); 1,4-dichlorobenzene(141744,197968-791872); qualify sample with (J) for all analytes associated with the two ISTDs. No analytes were associated with 1,4-dichlorobenzene.

(6) carbon disulfide(135%, 64-123); qualify sample with (J) for carbon disulfide.

(7 a, b) acetone(419%, 263%); 2-butanone(196%, 148%); 4-methyl-2-pentanone(155% MS); 2-hexanone(155% MS); qualify sample with (J) for acetone, 2-butanone, 4-methyl-2-pentanone, and 2-hexanone.

(7 c) acetone(RPD=46); qualify sample with a (J) for acetone.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWSS01(0-0.5)	4/18/2006	4/19/2006	N/A	5/3/2005

(pg. 62, missing the reanalyze sample)

Method blank was free of contamination. (34 analytes)

MS/MSD was performed on project sample, VWSB01(4-5).

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/5/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/19/06; SDG# 245931

Method: SW-8260B

Review Items	Yes	No	N/A
1) Is the BFB tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF value per the method requirements?	X		
c) Are the CCC compounds < 30% RSD?	X		
d) Are the other target analytes within < 15% RSD or have a r2 > 0.990?		X	
e) if "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maxium allowable RSD < 30%? If applicable, give a list of compounds whose RSD > 30 in the comments section.	X		
3) ICV: a) Mid-level (2nd source) Recovery = 80 - 120%?		X	
b) If "no" was answered for 3a, did the compounds outside the 80 - 120 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
c) QC/MRL: D < 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
e) MDL Check (2 X MDL)?	X		
4) CCV:a) Continuing Calibration verification was run at every 12 hours?	X		
b) Do the SPCC compounds meet the minimum RF values per the method requirements?	X		
c) Is the CCC compounds < 20% difference from the initial calibration?	X		
d) Are the other target analytes within < 20% difference from the initial calibration?		X	
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D < 30%? If applicable, give a list of compounds whose %D > 30% in the comments section.	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 245931)

Review Items	Yes	No	N/A
5) A Sample Analysis: a) were all samples analyzed within holding times?	X		
b) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
c) RRT of identified compounds within + 0.06 RRT units of RRT of standard component?			X
d) Ions present in the standard spectra within abundance of > 10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?			X
e) Are Internal Standard areas within QC limits (-50% or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)		X	
7) MS/MSD: a) Is the percent recovery for MS/MSD within the limits (Water Recovery = 70 - 130%; Soil Recovery = 70-130%)?		X	
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (60 - 140%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.		X	
c) Are the RPDs within control limits? (max. RPD < 30; SMF limit: 40) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits for RPDs in the comments section.		X	
8) Surrogates: Are surrogate recoveries within the limits per sample ? (Criteria: 50 - 150%)	X		
9) Is the method blank <1/2 MRL for target analytes and it is analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 245931)

Comments on "No" response: **(2 d, e)** acetone, 21 %, r2 =0.991; 2-butanone, 17 %, r2 =0.991; qualify sample with a (J) for acetone and 2-butanone.

(3 a)chloromethane (70 %); vinyl chloride (74 %);1,1-dichloroethene(79%); trans-1,2-dichloroethene (77 %); tetrachloroethene(79%); qualify sample with (J) for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, and tetrachlroethene.

(3 c,d) trans-1,3-dichloropropene(63%,64%); cis-1,3-dichloropropene(69%); qualify sample with a (J) for trans-1,3-dichloropropene and cis-1,3-dichloropropene.

(4 d,e) carbon disulfide(28 %); qualify sample with (J) for carbon disulfide.

(6) vinyl chloride(68%,75-134); carbon disulfide(124%,64-123); qualify sample with (J) for vinyl chloride and carbon disulfide.

(7 a, b) acetone(194%); 2-butanone(133%); chloromethane(69% MSD); carbon disulfide(137%MSD); 4-methyl-2-pentanone(131%MSD); qualify sample with (J) for acetone, 2-butanone, chloromethane, carbon disulfide, and 4-methyl-2-pentanone.

(7 c) acetone(RPD=69); qualify sample with a (J) for acetone.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
CCSB02(4-5)	4/19/2006	4/20/2006	N/A	4/25/2006

(pg. 77)

Method blank was free of contamination. (34 analytes)

MS/MSD was performed on project sample, MBSB01(4-5).

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/13/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/20/06; SDG# 245967

Method: SW-8260B

Review Items	Yes	No	N/A
1) Is the BFB tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF value per the method requirements?	X		
c) Are the CCC compounds < 30% RSD?	X		
d) Are the other target analytes within < 15% RSD or have a r2 > 0.990?		X	
e) if "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maxium allowable RSD < 30%? If applicable, give a list of compounds whose RSD > 30 in the comments section.	X		
3) ICV: a) Mid-level (2nd source) Recovery = 80 - 120%?		X	
b) If "no" was answered for 3a, did the compounds outside the 80 - 120 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
c) QC/MRL: D < 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.		X	
e) MDL Check (2 X MDL)?	X		
4) CCV:a) Continuing Calibration verification was run at every 12 hours?	X		
b) Do the SPCC compounds meet the minimum RF values per the method requirements?	X		
c) Is the CCC compounds < 20% difference from the initial calibration?	X		
d) Are the other target analytes within < 20% difference from the initial calibration?		X	
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D < 30%? If applicable, give a list of compounds whose %D > 30% in the comments section.		X	

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 245967)

Review Items	Yes	No	N/A
5) A Sample Analysis: a) were all samples analyzed within holding times?	X		
b) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
c) RRT of identified compounds within + 0.06 RRT units of RRT of standard component?	X		
d) Ions present in the standard spectra within abundance of > 10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?	X		
e) Are Internal Standard areas within QC limits (-50% or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)		X	
7) MS/MSD: a) Is the percent recovery for MS/MSD within the limits (Water Recovery = 70 - 130%; Soil Recovery = 70-130%)?			X
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (60 - 140%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.			X
c) Are the RPDs within control limits? (max. RPD < 30; SMF limit: 40) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits for RPDs in the comments section.			X
8) Surrogates: Are surrogate recoveries within the limits per sample ? (Criteria: 50 - 150%)	X		
9) Is the method blank <1/2 MRL for target analytes and it is analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 245967)

Comments on "No" response: **(2 d, e)** acetone, 21 %, r2 =0.991; 2-butanone, 17 %, r2 =0.991; qualify sample with a (J) for acetone and 2-butanone.

(3 a)chloromethane (70 %); vinyl chloride (74 %);1,1-dichloroethene(79%); trans-1,2-dichloroethene (77 %); tetrachloroethene(79%); qualify sample with (J) for chloromethane, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, and tetrachlroethene.

(3 c,d) acetone(52%);trans-1,3-dichloropropene(67%,**64%**); dibromochloromethane(68%,**69%**); cis-1,3-dichloropropene(**65%**);4-methyl-2-pentanone(**64%**);2-hexanone(**60%**);styrene(**67%**);bromoform(**69%**);qualify sample with a ('**R**) for acetone and (J) for trans-1,3-dichloropropene, dibromochloromethane, cis-1,3-dichloropropene, 4-methyl-2-pentanone, 2-hexanone, styrene, and bromoform.

(4 d,e) acetone(47%); carbon disulfide(28 %); qualify sample with (J) for acetone and carbon disulfide.

(6) acetone(199%,50-150); qualify sample with (J) for acetone.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
PSSS02(0-0.5)	4/20/2006	4/21/2006	N/A	4/27/2006

(pg. 40)

Method blank was free of contamination. (34 analytes)
No MS/MSD was performed.

Validated/Reviewed by:
Kerry Nusekabel
Name: Kerry Nusekabel Date: 5/14/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/24/06; SDG# 246011

Method: SW-8260B

Review Items	Yes	No	N/A
1) Is the BFB tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF value per the method requirements?	X		
c) Are the CCC compounds < 30% RSD?	X		
d) Are the other target analytes within < 15% RSD or have a r2 > 0.990?		X	
e) if "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maxium allowable RSD < 30%? If applicable, give a list of compounds whose RSD > 30 in the comments section.		X	
3) ICV: a) Mid-level (2nd source) Recovery = 80 - 120%?		X	
b) If "no" was answered for 3a, did the compounds outside the 80 - 120 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
c) QC/MRL: D < 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.		X	
e) MDL Check (2 X MDL)?	X		
4) CCV:a) Continuing Calibration verification was run at every 12 hours?	X		
b) Do the SPCC compounds meet the minimum RF values per the method requirements?	X		
c) Is the CCC compounds < 20% difference from the initial calibration?	X		
d) Are the other target analytes within < 20% difference from the initial calibration?	X		
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D < 30%? If applicable, give a list of compounds whose %D > 30% in the comments section.			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 246011)

Review Items	Yes	No	N/A
5) A Sample Analysis: a) were all samples analyzed within holding times?	X		
b) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
c) RRT of identified compounds within + 0.06 RRT units of RRT of standard component?	X		
d) Ions present in the standard spectra within abundance of > 10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?	X		
e) Are Internal Standard areas within QC limits (-50% or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)	X		
7) MS/MSD: a) Is the percent recovery for MS/MSD within the limits (Water Recovery = 70 - 130%; Soil Recovery = 70-130%)?	X		
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (60 - 140%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.			X
c) Are the RPDs within control limits? (max. RPD < 30; SMF limit: 40) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits for RPDs in the comments section.	X		
8) Surrogates: Are surrogate recoveries within the limits per sample ? (Criteria: 50 - 150%)	X		
9) Is the method blank <1/2 MRL for target analytes and it is analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 246011)

Comments on "No" response: **(2 d, e)** chloromethane, 31 %, r2 =0.998; vinyl chloride, 29 %, r2 =0.999; bromomethane, 25%, r2 =1.000; chloroethane, 20 %, r2 =1.000; qualify samples with a (J) for chloromethane, vinyl chloride, bromomethane, and chloroethane.

(3 a,b)acetone (126%); acetone was not qualified since it met the SMF limits.

(3 c,d) chloromethane(51%,**56%**); acetone(170%,**160%**); 2-butanone(138%,**133%**); qualify samples with a (**R**) for chloromethane and (J) for acetone. 2-butanone was not qualify since it was within SMF limits.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWGW03	4/22/2006	4/25/2006	N/A	5/1/2006
MBGW02	4/24/2006	4/25/2006	N/A	5/1/2006

Method blank was free of contamination. (34 analytes)

MS/MSD was performed on project sample, MBGW01 and VWGW02.

FB-42106-1 detected chloroform, 0.51 ug/L (RL=1.0 ug/L); acetone, 4.6 ug/L (RL=10 ug/L)

TB-01 detected methylene chloride, 3.2 ug/L (RL=2.0 ug/L)

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/10/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/25/06; SDG# 246092

Method: SW-8260B

Review Items	Yes	No	N/A
1) Is the BFB tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF value per the method requirements?	X		
c) Are the CCC compounds < 30% RSD?	X		
d) Are the other target analytes within < 15% RSD or have a r2 > 0.990?		X	
e) if "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maxium allowable RSD < 30%? If applicable, give a list of compounds whose RSD > 30 in the comments section.		X	
3) ICV: a) Mid-level (2nd source) Recovery = 80 - 120%?		X	
b) If "no" was answered for 3a, did the compounds outside the 80 - 120 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
c) QC/MRL: D < 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (60-140%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.		X	
e) MDL Check (2 X MDL)?	X		
4) CCV:a) Continuing Calibration verification was run at every 12 hours?	X		
b) Do the SPCC compounds meet the minimum RF values per the method requirements?	X		
c) Is the CCC compounds < 20% difference from the initial calibration?	X		
d) Are the other target analytes within < 20% difference from the initial calibration?	X		
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D < 30%? If applicable, give a list of compounds whose %D > 30% in the comments section.			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 246092)

Review Items	Yes	No	N/A
5) A Sample Analysis: a) were all samples analyzed within holding times?	X		
b) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
c) RRT of identified compounds within + 0.06 RRT units of RRT of standard component?			X
d) Ions present in the standard spectra within abundance of > 10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?			X
e) Are Internal Standard areas within QC limits (-50% or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)		X	
7) MS/MSD: a) Is the percent recovery for MS/MSD within the limits (Water Recovery = 70 - 130%; Soil Recovery = 70-130%)?			X
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (60 - 140%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.			X
c) Are the RPDs within control limits? (max. RPD < 30; SMF limit: 40) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits for RPDs in the comments section.			X
8) Surrogates: Are surrogate recoveries within the limits per sample ? (Criteria: 50 - 150%)	X		
9) Is the method blank <1/2 MRL for target analytes and it is analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8260
Volatile Organic Compounds

Continued (SDG# 246092)

Comments on "No" response: **(2 d, e)** chloromethane, 31 %, r2 =0.998; vinyl chloride, 29 %, r2 =0.999; bromomethane, 25%, r2 =1.000; chloroethane, 20 %, r2 =1.000; qualify sample with a (J) for chloromethane, vinyl chloride, bromomethane, and chloroethane.
(3 a,b)acetone (126%); qualified sample with a (J) for acetone.
(3 c,d) chloromethane(43%,47**%**); vinyl chloride(64%,**64%**); acetone(152%,**150**%); qualify sample with a (**'R**) for chloromethane and (J) for acetone and vinyl chloride.
(6) carbon disulfide(70%, 74-123); qualify sample with (J) for carbon disulfide.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
TFGW01	4/25/2006	4/27/2006	N/A	5/4/2006

Method blank was free of contamination. (34 analytes)
No MS/MSD was performed.

FB-42606-2 detected acetone, 7.4 ug/L (RL=10 ug/L)
TB-02 Trip blk was BDL for all analytes.

Validated/Reviewed by:
Kerry Nusekabel
Name: Kerry Nusekabel Date: 5/10/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/18/06; SDG# 245903

Method: SW-8270B-Low Level PAH

Review Items	Yes	No	N/A
1) Is the DFTPP tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF values (>0.05) per the method requirements?	X		
c) Are the CCC compounds ≤ 30% RSD?	X		
d) Are the other target analytes within ≤15% RSD or have a $r^2 \geq 0.990$?	X		
e) If "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maximum allowable RSD ≤30%? If applicable, give a list of compounds whose RSD >30% in the comments section.			X
3) ICV: a) Mid-level (2nd source) Recovery = 70 - 130%?	X		
b) If "no" was answered for 3a, did the compound(s) outside the 70-130% recovery meet the sporadic marginal failure (50-150%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.			X
c) QC/MRL: D ≤ 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (50-150%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
e) MDL Check (2 X MDL)?	X		
4) CCV: a) Continuing calibration verification was run at every 12 hours?	X		
b) Does the SPCC compounds meet the minimum RF values (> 0.05) per the method requirements?	X		
c) Is the CCC compounds 20% difference from the initial calibration?	X		
d) Are the other target analytes within ≤20% difference from the initial calibration?	X		
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D ≤ 30%? If applicable, give a list of compounds whose %D >30 in the comments section.			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Continued (SDG# 245903)

Review Items	Yes	No	N/A
5) Sample Analysis: a) Were all samples extracted within holding times?	X		
b) Were all samples analyzed within holding times?	X		
c) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
d) RRT of identified compounds within ± 0.06 RRT units of standard compounds?	X		
e) Ions present in the standard spectra within abundance >10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?	X		
f) Are internal standard areas within QC limits (-50 or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)	X		
7) MS/MSD: a)Is the percent recovery for the MS/MSD within the limits (water recovery = 45-135%; soil recovery = 45-135%)?		X	
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (20-150%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.		X	
c) Are the RPDs within control limits? (water ≤40; soil ≤50) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits of RPDs in the comments section.	X		
8) Surrogates: Are surrogate recoveries within the limits (water recoveries: 50 - 150 % ; soil recoveries: 50 - 150 % ?	X		
9) Is the method blank free of contamination (≤ 1/2 MRL) and is it analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Continued (SDG# 245903)

Comments on "No" response: (**3 c**) fluoranthene (132%); qualify sample with a (J) for fluoranthene.
(**7 a,b**) fluoranthene(24%, 17%); pyrene(21%,22%) qualify sample with a (J) for fluoranthene. Pyrene-no qualification since it was within SMF limits.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWSS01(0-0.5)	4/18/2006	4/19/2006	4/21/2006	5/2/2006

(pg. 39)

Method blank free of contamination.
MS/MSD was performed on project sample, VWSB01(4-5)

Validated/Reviewed by:
Kerry Nusekabel
Name: Kerry Nusekabel Date: 5/6/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/20/06; SDG# 245967

Method: SW-8270B-Low Level PAH

Review Items	Yes	No	N/A
1) Is the DFTPP tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF values (>0.05) per the method requirements?	X		
c) Are the CCC compounds ≤ 30% RSD?	X		
d) Are the other target analytes within ≤15% RSD or have a $r^2 \geq 0.990$?	X		
e) If "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maximum allowable RSD ≤30%? If applicable, give a list of compounds whose RSD >30% in the comments section.			X
3) ICV: a) Mid-level (2nd source) Recovery = 70 - 130%?	X		
b) If "no" was answered for 3a, did the compound(s) outside the 70-130% recovery meet the sporadic marginal failure (50-150%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.			X
c) QC/MRL: D ≤ 30% ?	X		
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (50-150%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.			X
e) MDL Check (2 X MDL)?	X		
4) CCV: a) Continuing calibration verification was run at every 12 hours?	X		
b) Does the SPCC compounds meet the minimum RF values (> 0.05) per the method requirements?	X		
c) Is the CCC compounds 20% difference from the initial calibration?	X		
d) Are the other target analytes within ≤20% difference from the initial calibration?	X		
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D ≤ 30%? If applicable, give a list of compounds whose %D >30 in the comments section.			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Continued (SDG# 245967)

Review Items	Yes	No	N/A
5) Sample Analysis: a) Were all samples extracted within holding times?	X		
b) Were all samples analyzed within holding times?	X		
c) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
d) RRT of identified compounds within ± 0.06 RRT units of standard compounds?	X		
e) Ions present in the standard spectra within abundance >10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?	X		
f) Are internal standard areas within QC limits (-50 or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)	X		
7) MS/MSD: a)Is the percent recovery for the MS/MSD within the limits (water recovery = 45-135%; soil recovery = 45-135%)?	X		
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (20-150%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.			X
c) Are the RPDs within control limits? (water ≤40; soil ≤50) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits of RPDs in the comments section.	X		
8) Surrogates: Are surrogate recoveries within the limits (water recoveries: 50 - 150 % ; soil recoveries: 50 - 150 % ?	X		
9) Is the method blank free of contamination (≤ 1/2 MRL) and is it analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Continued (SDG# 245967)

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
PSSS02(0-0.5)	4/20/2006	4/21/2006	4/23/2006	5/3/2006

Method blank free of contamination.
MS/MSD was performed on project sample, PSSS02(0-0.5)

Validated/Reviewed by:
Kerry Nusekabel
Name: Kerry Nusekabel Date: 5/14/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/24/06; SDG# 246011

Method: SW-8270B-Low Level PAH

Review Items	Yes	No	N/A
1) Is the DFTPP tune performed every 12 hours and is the tuning criteria met?	X		
2) Initial Calibration: a) Does the curve consist of five calibration standards?	X		
b) Does the SPCC compounds meet the minimum RF values (>0.05) per the method requirements?	X		
c) Are the CCC compounds ≤ 30% RSD?	X		
d) Are the other target analytes within ≤15% RSD or have a $r^2 \geq 0.990$?	X		
e) If "no" was answered for 2d, did the compound(s) outside the primary evaluation meet the maximum allowable RSD ≤30%? If applicable, give a list of compounds whose RSD >30% in the comments section.			X
3) ICV: a) Mid-level (2nd source) Recovery = 70 - 130%?	X		
b) If "no" was answered for 3a, did the compound(s) outside the 70-130% recovery meet the sporadic marginal failure (50-150%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.			X
c) QC/MRL: D ≤ 30% ?		X	
d) If "no" was answered for 3c, did the compounds outside the 70 - 130 % recovery meet the sporadic marginal failure (50-150%)? Give the compound and its recovery if it is outside the sporadic marginal failure in the comments section.	X		
e) MDL Check (2 X MDL)?	X		
4) CCV: a) Continuing calibration verification was run at every 12 hours?	X		
b) Does the SPCC compounds meet the minimum RF values (> 0.05) per the method requirements?	X		
c) Is the CCC compounds 20% difference from the initial calibration?	X		
d) Are the other target analytes within ≤20% difference from the initial calibration?		X	
e) If "no" was answered for 4d, did the compound(s) outside the primary evaluation meet the maximum allowable D ≤ 30%? If applicable, give a list of compounds whose %D >30 in the comments section.	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Continued (SDG# 246011)

Review Items	Yes	No	N/A
5) Sample Analysis: a) Were all samples extracted within holding times?	X		
b) Were all samples analyzed within holding times?	X		
c) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
d) RRT of identified compounds within ± 0.06 RRT units of standard compounds?			X
e) Ions present in the standard spectra within abundance >10% of the base ion present in sample spectra? Do abundance agree to within 30% as compared to standard spectra? Was the mass-spectra visually reviewed and compared to the reference spectrum for all hits?			X
f) Are internal standard areas within QC limits (-50 or +100%)?	X		
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte)	X		
7) MS/MSD: a)Is the percent recovery for the MS/MSD within the limits (water recovery = 45-135%; soil recovery = 45-135%)?	X		
b) If "no" was answered for 7a, does the compound meet the sporadic marginal failure (20-150%)? If applicable, give the compound and its recovery if the compound was outside the sporadic marginal failure in the comments section.			X
c) Are the RPDs within control limits? (water ≤40; soil ≤50) If "no" was answered for 7c, give the compound and its RPD if it was above QC limits of RPDs in the comments section.	X		
8) Surrogates: Are surrogate recoveries within the limits (water recoveries: 50 - 150 % ; soil recoveries: 50 - 150 % ?		X	
9) Is the method blank free of contamination (≤ 1/2 MRL) and is it analyzed at the desired frequency?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8270
Polynuclear Aromatic Hydrocarbons

Continued (SDG# 246011)

Comments on "No" response: **(3 c,d)** fluoranthene(140%,142%); fluorene(**132%**); phenanthrene(**131%**);anthracene (**144%**); chrysene(**133%**); qualify samples with a (J) for fluoranthene, fluorene, phenanthrene, anthracene and chrysene.
(4 d) phenanthrene(26%); qualify samples with a (J) for phenanthrene.
(8) terphenyl-d14(48%); qualify sample,MBGW02, with a (J) for all analytes quantitiated with terphenyl.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWGW03	4/22/2006	4/25/2006	4/27/2006	5/4/2006
MBGW02	4/24/2006	4/25/2006	4/27/2006	5/4/2006

(pg. 42, 50)
Method blank free of contamination.
MS/MSD was performed on project samples, VWGW02, and MBGW01.
FB-42106-1 was BDL.

Validated/Reviewed by:
Kerry Nusekabel
Name: Kerry Nusekabel Date: 5/10/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8082
PCB's

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/19/06; SDG# 245931

Method: SW-8082

Review Items		Yes	No	N/A
1) Initial Calibration:	a) Does the curve consist of five Calibration standards?	X		
	b) Do Aroclors 1016 and 1260 meet the RSD ≤ 20% and r2 ≥ 0.990?	X		
2) ICV: a) Mid-level (2nd source) Recovery = 85-115%?		X		
b) QC/MRL: D ≤ 30%?		X		
c) MDL Check (2X MDL)?				X
3) CCV: a) Continuing Calibration verification was run at every 12 hours?		X		
b) Are all compounds within ± 15% drift from the initial calibration?		X		
4) Sample Analysis:	a) Were all samples extracted within holding times?	X		
	b) Were all samples analyzed within holding times?	X		
	c) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
	d) Are reported compounds within retention time windows?			X
	e) Are all hits confirmed on a second column?			X
	f) Is the target analyte confirmation within RDP ≤ 40%?			X
5) Method Blank: a)	Is the method blank run at the desired frequency?	X		
	b) Are the analytes < 1/2 method-reporting limit?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8082
PCB's
continued (SDG# 245931)

Review Items	Yes	No	N/A
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte.)	X		
7) MS/MSD: a) Is the percent recovery for the MS/MSD within the limits (Soil and Water recoveries: 50-150%)?	X		
b) Is the RPDs within control limits? (Water ≤ 50; Soil lab's QC limits) If "no" was answered for 7a, give the compound and its RPD if it was above QC limits for RPDs in the comments section.	X		
8) Surrogates: Are surrogate recoveries within the limites (Water and Soil recoveries = 50-150%) ?	X		

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
MBSS01(0-0.5)	4/19/2006	4/20/2006	4/21/2006	4/26/2006

Sample was diluted 5X. Lab did not reported undiluted sample.

MS/MSD was performed on project sample, MBSB01(4-5).

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/13/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8082
PCB's

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/24/06; SDG# 246011

Method: SW-8082

Review Items		Yes	No	N/A
1) Initial Calibration:	a) Does the curve consist of five Calibration standards?	X		
	b) Do Aroclors 1016 and 1260 meet the RSD $\leq$ 20% and r2 $\geq$ 0.990?	X		
2) ICV: a) Mid-level (2nd source) Recovery = 85-115%?		X		
b) QC/MRL: D $\leq$ 30%?		X		
c) MDL Check (2X MDL)?				X
3) CCV: a) Continuing Calibration verification was run at every 12 hours?		X		
b) Are all compounds within $\pm$ 15% drift from the initial calibration?		X		
4) Sample Analysis:	a) Were all samples extracted within holding times?	X		
	b) Were all samples analyzed within holding times?	X		
	c) Are all samples with concentrations > the highest standard used for the initial calibration diluted and reanalyzed?			X
	d) Are reported compounds within retention time windows?			X
	e) Are all hits confirmed on a second column?			X
	f) Is the target analyte confirmation within RDP $\leq$ 40%?			X
5) Method Blank: a)	Is the method blank run at the desired frequency?	X		
	b) Are the analytes < 1/2 method-reporting limit?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 8082
PCB's
continued (SDG# 246011)

Review Items	Yes	No	N/A
6) LCS: Is the percent recovery for the LCS within the limits (See Appendix C in LCG for the limits for each analyte.)	X		
7) MS/MSD: a) Is the percent recovery for the MS/MSD within the limits (Soil and Water recoveries: 50-150%)?	X		
b) Is the RPDs within control limits? (Water ≤ 50; Soil lab's QC limits) If "no" was answered for 7a, give the compound and its RPD if it was above QC limits for RPDs in the comments section.	X		
8) Surrogates: Are surrogate recoveries within the limites (Water and Soil recoveries = 50-150%) ?		X	

Comments on "No" response: (**8**) DCB 41%; qualify sample with a (J) for the last 4 aroclors.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
MBGW02	4/24/2006	4/25/2006	4/27/2006	5/3/2006

MS/MSD was performed on project sample, MBGW01.

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/10/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/18/06; SDG# 245903

Method: SW-6010

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank?	X		
2) Instrument Precision RSD 2 or 3 integration's (exposures) per each calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 90-110%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?		X	
5) Interelement Check Standard (ICS) a) ICS-An interferent only (QC limits: 80-120%) and at the beginning of the analytical sequence or ICS-B interferent and target analytes (QC limits: 80-120%) and at the beginning of the analytical sequence?	X		
6) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?		X	
7) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 90-110%	X		
c) Are the QC/MRL within the QC limits = 70-130%?		X	
8) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
9) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
10) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?		X	
b) Are all or a subset of target analytes within RPD ≤ 20 for the MD or MS?		X	
11) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?		X	

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Continued (SDG# 245903)

Review Items	Yes	No	N/A
12) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?	X		
b) Was the agreement between undiluted results and diluted < 10%?		X	
13) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response: **(4)** V, 0.00295 mg/L; qualify sample with a (B) if sample result < 5X the amount detected in the blk.

(6) Al 0.1204 mg/L; Ca 0.11137 mg/L; Mg 0.11881 mg/L; qualify sample with a (B) if sample result < 5X the amount detected in blk.

(7 c) Ca, 147%; Fe, 182%; Mn, 131%; qualify sample with a (J) for Ca, Fe, and Mn.

(10 a) Sb, 36 %; qualify sample with a (J) for Sb; Al, 2049%; Fe, 662%; Pb, 57%; Mn, -414%; spikes were not 4X or more the sample concentration. The sample duplicate and serial dilution will apply.

(10 b) Mn, 30 %; qualifiy sample with a (J) for Mn.

(11) Al, 68 %; Fe, -114%; Pb, 74%; Mn, 68%; spikes were not 4Xor more th sample concentration. No qualifications were applied to the data.

(12 b) Co, 12 %; Mg, 11%; Mn, 12%; Zn, 13%; qualify sample with a (J) for Co, Mg, Mn, and Zn.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWSS01(0-0.5)	4/18/2006	4/19/2006	4/20/2006	4/26/2006

MS and Dup samples were VWSB01(4-5)

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/7/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/19/06; SDG# 245931

Method: SW-6010

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank?	X		
2) Instrument Precision RSD 2 or 3 integration's (exposures) per each calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 90-110%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?		X	
5) Interelement Check Standard (ICS) a) ICS-An interferent only (QC limits: 80-120%) and at the beginning of the analytical sequence or ICS-B interferent and target analytes (QC limits: 80-120%) and at the beginning of the analytical sequence?	X		
6) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?		X	
7) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 90-110%	X		
c) Are the QC/MRL within the QC limits = 70-130%?		X	
8) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
9) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
10) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?		X	
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?		X	
11) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?		X	

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Continued (SDG# 245931)

Review Items	Yes	No	N/A
12) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?	X		
b) Was the agreement between undiluted results and diluted < 10%?		X	
13) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response: **(4)** V, 0.00295 mg/L; qualify sample with a (B) if sample result < 5X the amount detected in the blk.

(6) V, 0.00279 mg/L; Al, 0.10913; Mg, 0.09277 mg/L; qualify sample with a (B) if sample result < 5X the amount detected in blk.

(7 c) Ca, 147%; Fe, 182%; Mn, 131%; qualify sample with a (J) for Ca, Fe, and Mn.

(10 a) Sb, 36%; As, 55%; Pb, 51%;K, 157%; Tl74%; qualify sample with a (J) for Sb,As,Pb,K, and Tl; Al, 1976%; Ca,228%; Fe, (-1231%); Mg,208%; Mn, -44%; spikes were not 4X or more for sample concentration. The sample duplicate and serial dilution will apply.

(10 b) As,48%; Co,26%; Cu,26%; Pb,40%; qualifiy sample with a (J) for As, Co, Cu, and Pb.

(11) Cd,73%; Zn,73%; qualify sample with a (J) for Cd, and Zn. Al, 65%; Ca, 65%; Fe, -109%; Mg,74%; Mn, 70%; spikes were not 4Xor more th sample concentration. No qualifications were applied to the data for Al, Ca, Fe, Mg, and Mn..

(12 b) Ca,12%; Cr,11%; Fe,13%; Mg,11%; Mn,14%; V,11%; qualify sample with a (J) for Ca, Cr, Fe, Mg, Mn, and V.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
CCSB02(4-5)	4/19/2006	4/20/2006	4/20/2006	4/26/2006

MS and Dup samples were VWSB01(4-5)

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/14/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/22/06; SDG# 246011

Method: SW-6010

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank?	X		
2) Instrument Precision RSD 2 or 3 integration's (exposures) per each calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 90-110%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?		X	
5) Interelement Check Standard (ICS) a) ICS-An interferent only (QC limits: 80-120%) and at the beginning of the analytical sequence or ICS-B interferent and target analytes (QC limits: 80-120%) and at the beginning of the analytical sequence?	X		
6) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?		X	
7) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 90-110%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
8) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?		X	
9) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?			
10) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?		X	
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?	X		
11) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?		X	

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Continued (SDG# 246011)

Review Items	Yes	No	N/A
12) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?	X		
b) Was the agreement between undiluted results and diluted < 10%?		X	
13) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response: **(4)** Pb, 0.00396; V, 0.00279 mg/L; qualify sample with a (B) if sample results < 5X the amount detected in the blk. Qualify sample with (B) for lead.
(6) As, 0.006 mg/L; V, 0.0027; 0.0028 mg/L; qualify sample with a (B) if sample with a (B) if sample result < 5X the amount detected in blk.
(8) Mg, 0.05269 mg/L; qualify sample with a (B) if sample results < 5X the amount detected in the blk.
(10 a) Al (785 %) and Fe (210 %) were not spiked 4x the sample concentration. No qualifications were applied for the pre-digested spike.
(11) Ca (69 %) and Fe (45 %) were not spiked 4x the sample concentration. No qualifications were applied for the post-digested spike.
(12 b) Co, 13 %; Fe, 12%; Mn, 11%; qualify sample with a (J) for Co, Fe, and Mn.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWGW03	4/22/2006	4/25/2006	4/29/2006	5/1/2006

MS and Dup samples were performed on project sample, VWGW02.

Metals were reported in the wrong units (mg/L). The metals should have been reported in the ug/L.
FB-42106-1 detected Ba, 3.3ug/L; Mg, 16 ug/L; Mn, 0.6 ug/L; K, 220 ug/L.

Validated/Reviewed by:
Kerry Nusekabel
Name: Kerry Nusekabel Date: 5/12/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/25/06; SDG# 246092

Method: SW-6010

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank?	X		
2) Instrument Precision RSD 2 or 3 integration's (exposures) per each calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 90-110%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?			
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?		X	
5) Interelement Check Standard (ICS) a) ICS-An interferent only (QC limits: 80-120%) and at the beginning of the analytical sequence or ICS-B interferent and target analytes (QC limits: 80-120%) and at the beginning of the analytical sequence?	X		
6) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?		X	
7) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 90-110%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
8) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?		X	
9) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
10) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?			X
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?			X
11) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6010
ICP Metals

Continued (SDG# 246092)

Review Items	Yes	No	N/A
12) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?			X
b) Was the agreement between undiluted results and diluted < 10%?			X
13) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response: (**4**) Pb, 0.00396; V, 0.00279 mg/L; qualify sample with a (B) if sample results < 5X the amount detected in the blk.

(**6**) Al, 0.1103, 0.10256 mg/L; Mg, 0.09056, 0.08795 mg/L; As, 0.006 mg/L; V, 0.0027; 0.0028 mg/L; qualify sample with a (B) if sample with a (B) if sample result < 5X the amount detected in blk.

(**8**) Mg, 0.05269 mg/L; qualify sample with a (B) if sample results < 5X the amount detected in the blk.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
CBGW01	4/26/2006	4/27/2006	4/29/2006	5/2/2006

MS and Dup samples were not perfromed.

Metals were reported in the wrong units (mg/L). The metals should have been reported in the ug/L.

FB-042606-2 detected Al, 0.014 mg/L; Ba, 0.0019 mg/L; Ca, 0.26 mg/L; Fe, 0.059 mg/L; Mg, 0.12 mg/L; Mn, 0.00048 mg/L; K, 0.22 mg/L; and Zn, 0.0091 mg/L

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/10/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/18/06; SDG# 245903

Method: SW-7470/7471A

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank ($R \geq 0.995$)?	X		
2) Instrument Precision: 2 injections, RPD $\leq$ 10 calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 80-120%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?	X		
5) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?	X		
6) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 80-120%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
7) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
8) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
9) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?	X		
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?	X		
10) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Continued (SDG# 245903)

Review Items	Yes	No	N/A
11) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?			X
b) Was the agreement between undiluted results and diluted < 10%?			X
12) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWSS01(0-0.5)	4/18/2006	4/19/2006	4/25/2006	4/25/2006

MS and Dup samples were VWSB01(4-5)

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/6/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/19/06; SDG# 245931

Method: SW-7470/7471A

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank ($R \geq 0.995$)?	X		
2) Instrument Precision: 2 injections, RPD $\leq$ 10 calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 80-120%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?	X		
5) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?	X		
6) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 80-120%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
7) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
8) LCS; Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
9) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?	X		
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?	X		
10) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Continued (SDG# 245931)

Review Items	Yes	No	N/A
11) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?			X
b) Was the agreement between undiluted results and diluted < 10%?			X
12) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
CCSB02(4-5)	4/19/2006	4/20/2006	4/21/06	4/21/2006

MS and Dup samples were VWSB01(4-5)

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/14/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/22/06; SDG# 246011

Method: SW-7470/7471A

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank ($R \geq 0.995$)?	X		
2) Instrument Precision: 2 injections, RPD $\leq$ 10 calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 80-120%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?	X		
5) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?	X		
6) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 80-120%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
7) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
8) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
9) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?	X		
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?	X		
10) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Continued (SDG# 246011)

Review Items	Yes	No	N/A
11) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?			X
b) Was the agreement between undiluted results and diluted < 10%?			X
12) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
VWGW03	4/22/2006	4/25/2006	4/28/2006	4/28/2006

MS and Dup samples were performed on project sample, VWGW02.

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/12/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/25/06; SDG# 246092

Method: SW-7470/7471A

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank ($R \geq 0.995$)?	X		
2) Instrument Precision: 2 injections, RPD $\leq$ 10 calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 80-120%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?	X		
5) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?	X		
6) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 80-120%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
7) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
8) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
9) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?			X
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?			X
10) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 7470
CVAA Metals

Continued (SDG# 246092)

Review Items	Yes	No	N/A
11) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?			X
b) Was the agreement between undiluted results and diluted < 10%?			X
12) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
CBGW01	4/26/2006	4/27/2006	4/28/2006	4/28/2006

MS and Dup samples were not perfromed.

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/10/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6020
ICP Metals (Pb only)

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/20/06; SDG# 245967

Method: SW-6010

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank?	X		
2) Instrument Precision RSD 2 or 3 integration's (exposures) per each calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 90-110%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?	X		
5) Interelement Check Standard (ICS) a) ICS-An interferent only (QC limits: 80-120%) and at the beginning of the analytical sequence or ICS-B interferent and target analytes (QC limits: 80-120%) and at the beginning of the analytical sequence?	X		
6) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?	X		
7) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 90-110%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
8) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
9) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
10) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?			X
b) Are all or a subset of target analytes within RPD $\leq$ 20 for the MD or MS?			X
11) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?			X

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6020
ICP Metals (Pb only)

Continued (SDG# 245967)

Review Items	Yes	No	N/A
12) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?			X
b) Was the agreement between undiluted results and diluted < 10%?			X
13) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response:

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
PSSS02(0-0.5)	4/20/2006	4/21/2006	4/24/2006	4/26/2006

No MS and Dup samples were performed.

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/14/2007

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6020
ICP Metals (Pb only)

Project Name: USACE Hannah City Air Force Station

Batch Number(s): Samples collected 4/24/06; SDG# 246011

Method: SW-6010

Review Items	Yes	No	N/A
1) Initial Calibration: Does the curve consist of one calibration standard and a blank or three calibration standards and a blank?	X		
2) Instrument Precision RSD 2 or 3 integration's (exposures) per each calibration and calibration verification standards (ICV/CCV)?	X		
3) ICV: a) Mid-level (2nd source) verification QC limits: 90-110%?	X		
b) QC/MRL: Low-level check standard at MRL QC limits: 70-130%?	X		
c) MDL Check (2 X MDL)?	X		
4) Initial Calibration Blank (ICB) analytes <1/2 MRL except for Al, K, and Na?		X	
5) Interelement Check Standard (ICS) a) ICS-An interferent only (QC limits: 80-120%) and at the beginning of the analytical sequence or ICS-B interferent and target analytes (QC limits: 80-120%) and at the beginning of the analytical sequence?	X		
6) Continuing Calibration Blank (CCB) Are the analytes < 1/2 MRL?	X		
7) CCV: a) Continuing calibration verification was run every 10 samples and at the end of the sequence?	X		
b) Are the target analytes within the QC limits = 90-110%	X		
c) Are the QC/MRL within the QC limits = 70-130%?	X		
8) Method Blank: Are the analytes < 1/2 MRL and one per sample batch?	X		
9) LCS: Are the target analytes spiked in an interference-free matrix with a recovery 80-120% and one per sample batch?	X		
10) MS: a) Are the sample matrix spiked with all or a subset of target analytes (75-125 %) prior to digestion and one per sample batch?	X		
b) Are all or a subset of target analytes within RPD ≤ 20 for the MD or MS?	X		
11) Matrix Effect Confirmation: Is a post digested spike with all or a subset of target analytes and are the recoveries for the analytes with 75-125%?	X		

Lee A. Knuppel & Associates'
Lab Data Review Check List
Summary of Method Quality Objectives for Method 6020
ICP Metals (Pb only)

Continued (SDG# 246011)

Review Items	Yes	No	N/A
12) Serial Dilution: a When needed, was a serial dilution (1:4) performed to assess matrix effect?	X		
b) Was the agreement between undiluted results and diluted < 10%?	X		
13) Method of Standard Addition: When needed, was the method of quantitation performed for samples with suspected or confirmed matrix effect and have a R 0.995?			X

Comments on "No" response: (4) Pb, 0.00396 mg/L; qualify sample with a (B) if < 5X.

Holding Times:

	Date Collected	Date Rec'd	Date prep	Date analyzed
PSGW02	4/24/2006	4/25/2006	4/29/2006	5/2/2006

MS and Dup samples were project sample, PSGW01

Validated/Reviewed by:

Kerry Nusekabel

Name: Kerry Nusekabel Date: 5/10/2007

ATTACHMENT 3

DATA COMPLETENESS EXCEL SPREADSHEET

Prepared by Kerry R. Nusekabel

Hannah City Air Force Station
Data Completeness

Volatiles	spl	blk	dup	ms	lcs	dil	trip blk	eq blk	cooler receipt	Cooler receipt comments
VWSS01(0-0.5)	x	x		x	x				x	2 Coolers, within 4 C, contained 10 samples (245903)
CCSB02(4-5)	x	x		x	x				x	3 Coolers, within 4 C, contained 16 samples (245931)
PSSS02(0-0.5)	x	x			x				x	2 Coolers, within 4 C, contained 14 samples (245967)
VWGW03	x	x		x	x		x		x	4 Coolers, within 4 C, contained 16 samples (246011)
MBGW02	x			x						
TFGW01	x	x			x		x		x	1 Cooler, within 4 C, contained 7 samples (246092)
PAH's										
VWSS01(0-0.5)	x	x		x	x					
PSSS02(0-0.5)	x	x		x	x					
VWGW03	x	x		x	x					
MBGW02	x			x						
PCB's										
MBSS01(0-0.5)	x	x		x	x	x				
MBGW02	x	x		x	x					
Metals-TAL Total										
VWSS01(0-0.5)	x	x	x	x	x					
CCSB02(4-5)	x									
VWGW03	x	x	x	x	x					
CBGW01	x									
Lead										
PSSS02(0-0.5)	x	x			x					
PSGW02	x	x	x	x	x					
Total Analyses	18	14	3	13	14	1	2	0	5	
									65	

ATTACHMENT 4

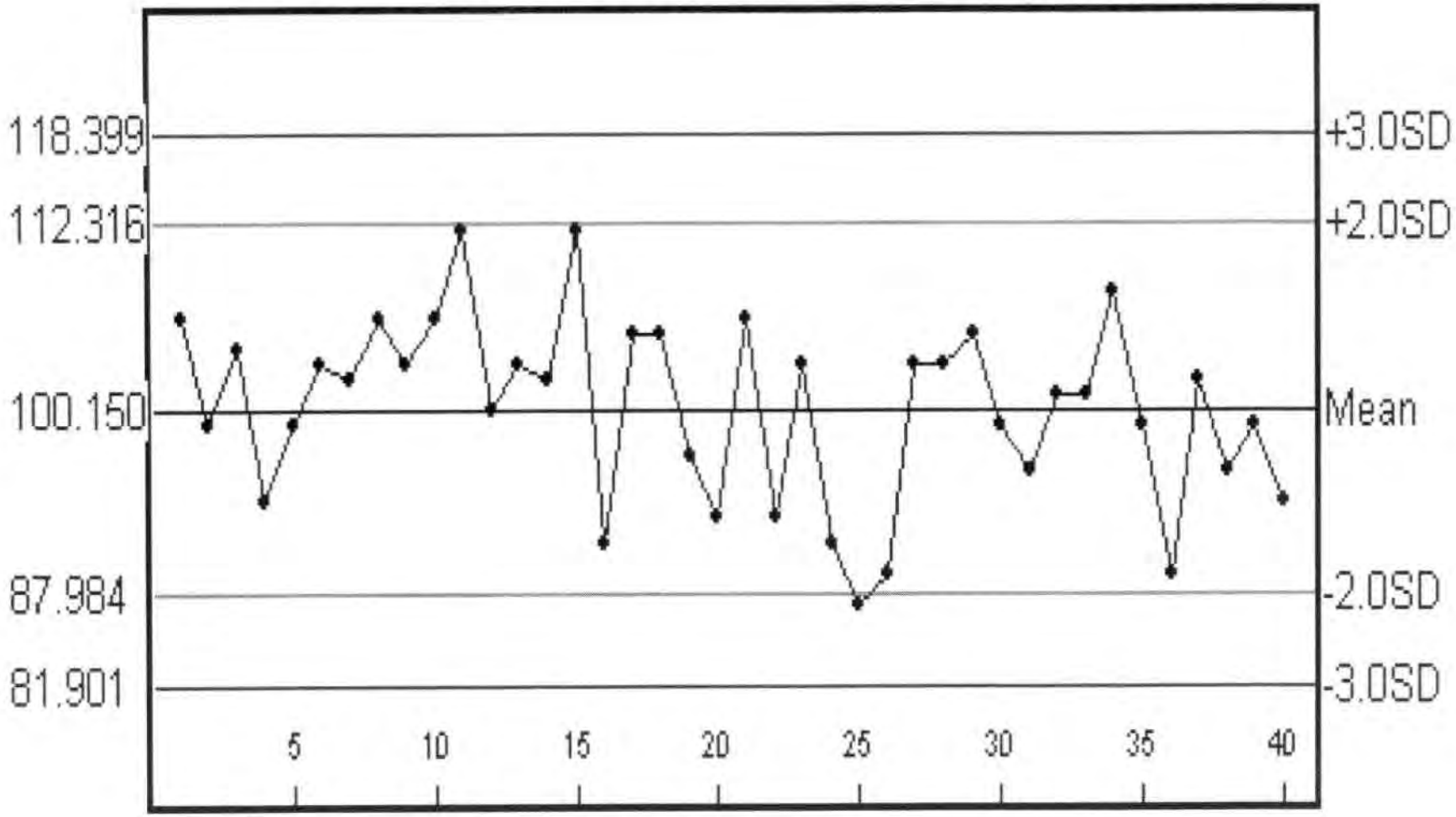
SURROGATE RECOVERY LIMITS

Prepared by Kerry R. Nusekabel

1,2-Dichloroethane-d4 (DCE) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
4/24/2006	CASS01(0-0.5)	106	
4/24/2006	CASS01(4-5)	99	
4/24/2006	CASS02(0-0.5)	104	
4/24/2006	CASS02(4-5)	94	
4/24/2006	VWSS01(0-0.5)	99	
4/24/2006	VWSS03(0-0.5)	103	
4/24/2006	VWSB01(4-5)	102	
4/24/2006	VWSB04(4-5)	106	
4/24/2006	VWSS02(0-0.5)	103	
4/24/2006	VWSS02(4-5)	106	
4/25/2006	CCSB01(0-0.5)	112	
4/25/2006	CCSB01(4-5)	100	
4/25/2006	CCSB03(0-0.5)	103	
4/25/2006	CCSB03(4-5)	102	
4/27/2006	CCSB02(0-0.5)	112	
4/25/2006	CCSB02(4-5)	91	
4/27/2006	MBSS01(0-0.5)	105	
4/27/2006	MBSS03(0-0.5)	105	
4/25/2006	MBSB01(4-5)	97	
4/25/2006	MBSB04(4-5)	93	
4/27/2006	MBSS02(0-0.5)	106	
4/25/2006	MBSB02(4-5)	93	
4/25/2006	PSSS01(0-0.5)	103	
4/25/2006	PSSS03(0-0.5)	91	
4/25/2006	PSSB01(4-5)	87	
4/25/2006	PSSB04(4-5)	89	
4/27/2006	PSSS02(0-0.5)	103	
4/27/2006	PSSS02(4-5)	103	
4/27/2006	TFSS01(0-0.5)	105	
4/27/2006	TFSB01(4-5)	99	
4/27/2006	TFSS02(0-0.5)	96	
4/27/2006	TFSB02(4-5)	101	
4/27/2006	MESS01(0-0.5)	101	
4/27/2006	MESB01(4-5)	108	
4/27/2006	CBSS01(0-0.5)	99	
4/27/2006	CBSS03(0-0.5)	89	
4/27/2006	CBSB01(4-5)	102	
4/27/2006	CBSB04(4-5)	96	
4/27/2006	CBSS02(0-0.5)	99	
4/27/2006	CBSB02(4-5)	94	

Hannah City Air Force Station
EPA Method 8260, 1,2-Dichloroethane-d4, 4/24 - 4/27/06

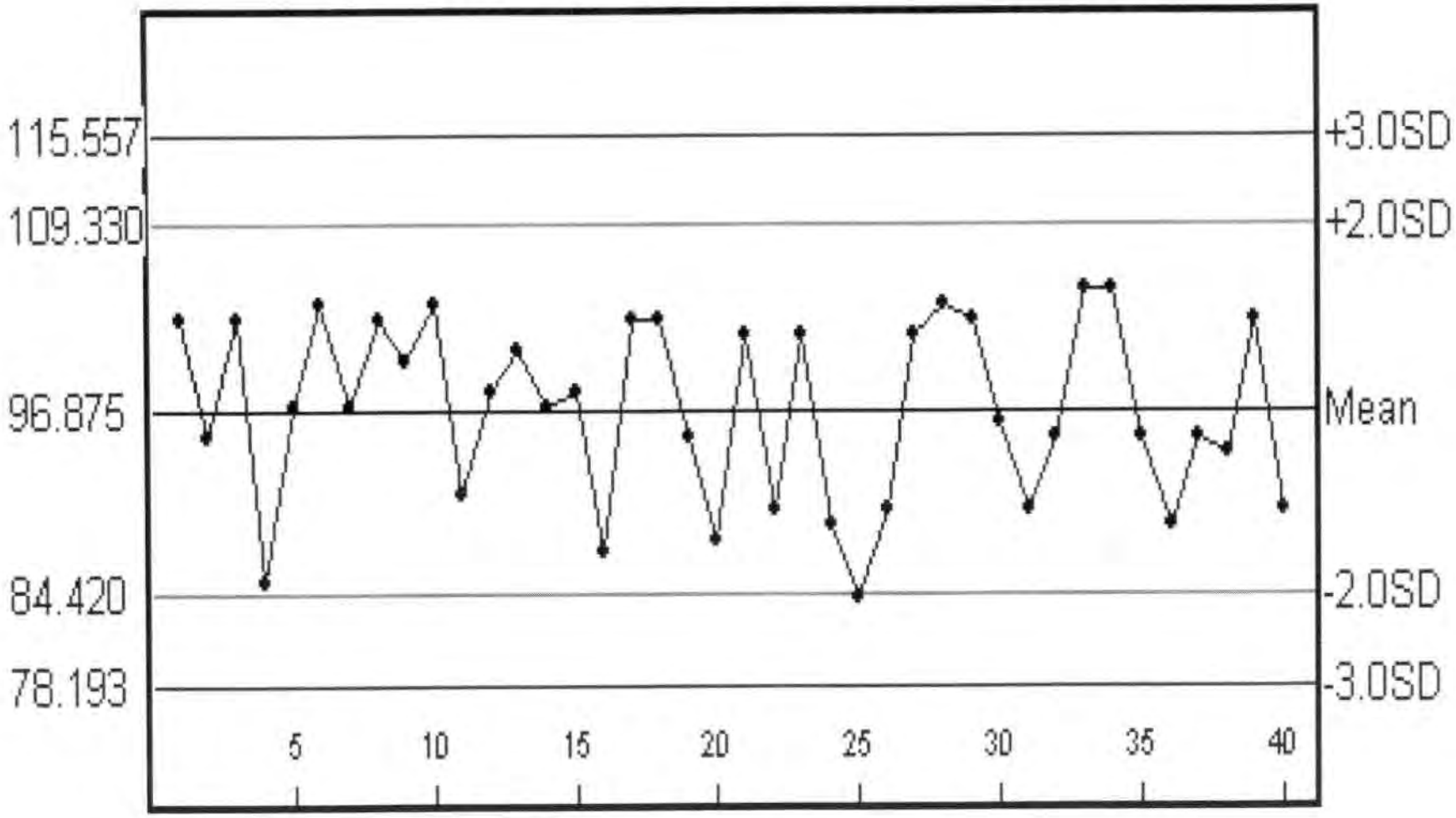


n= 40 Mean= 100.150 SD= 6.083 CV= 6.07% Min= 87.000 Max= 112.000

Toluene-d8 (TOL) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
4/24/2006	CASS01(0-0.5)	103	
4/24/2006	CASS01(4-5)	95	
4/24/2006	CASS02(0-0.5)	103	
4/24/2006	CASS02(4-5)	85	
4/24/2006	VWSS01(0-0.5)	97	
4/24/2006	VWSS03(0-0.5)	104	
4/24/2006	VWSB01(4-5)	97	
4/24/2006	VWSB04(4-5)	103	
4/24/2006	VWSS02(0-0.5)	100	
4/24/2006	VWSS02(4-5)	104	
4/25/2006	CCSB01(0-0.5)	91	
4/25/2006	CCSB01(4-5)	98	
4/25/2006	CCSB03(0-0.5)	101	
4/25/2006	CCSB03(4-5)	97	
4/27/2006	CCSB02(0-0.5)	98	
4/25/2006	CCSB02(4-5)	87	
4/27/2006	MBSS01(0-0.5)	103	
4/27/2006	MBSS03(0-0.5)	103	
4/25/2006	MBSB01(4-5)	95	
4/25/2006	MBSB04(4-5)	88	
4/27/2006	MBSS02(0-0.5)	102	
4/25/2006	MBSB02(4-5)	90	
4/25/2006	PSSS01(0-0.5)	102	
4/25/2006	PSSS03(0-0.5)	89	
4/25/2006	PSSB01(4-5)	84	
4/25/2006	PSSB04(4-5)	90	
4/27/2006	PSSS02(0-0.5)	102	
4/27/2006	PSSS02(4-5)	104	
4/27/2006	TFSS01(0-0.5)	103	
4/27/2006	TFSB01(4-5)	96	
4/27/2006	TFSS02(0-0.5)	90	
4/27/2006	TFSB02(4-5)	95	
4/27/2006	MESS01(0-0.5)	105	
4/27/2006	MESB01(4-5)	105	
4/27/2006	CBSS01(0-0.5)	95	
4/27/2006	CBSS03(0-0.5)	89	
4/27/2006	CBSB01(4-5)	95	
4/27/2006	CBSB04(4-5)	94	
4/27/2006	CBSS02(0-0.5)	103	
4/27/2006	CBSB02(4-5)	90	

Hannah City Air Force Station
EPA Method 8260, Toluene-d8, 4/24 - 4/27/06

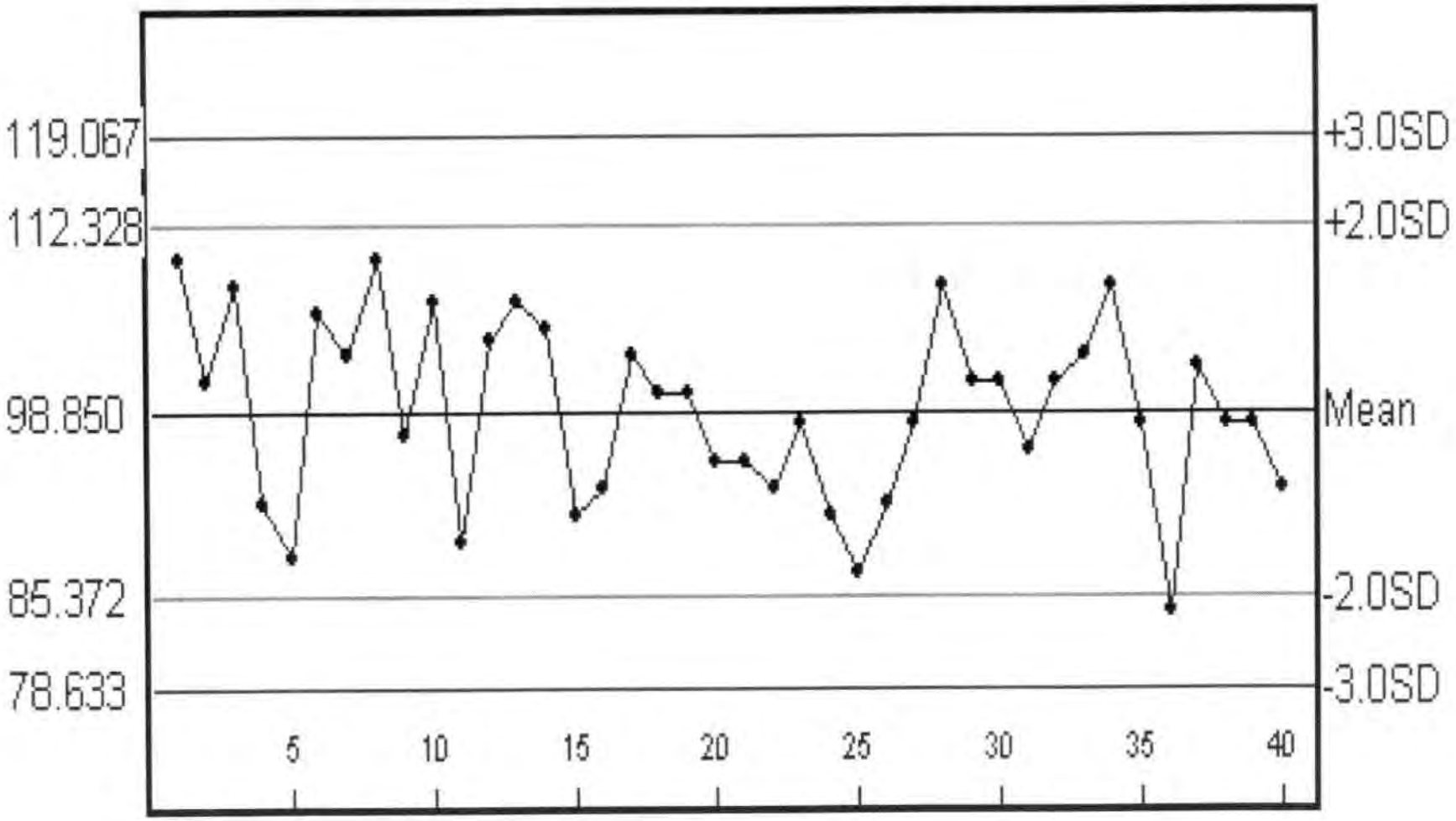


n= 40 Mean= 96.875 SD= 6.227 CV= 6.43% Min= 84.000 Max= 105.000

4-Bromofluorobenzene (BFB) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
4/24/2006	CASS01(0-0.5)	110	
4/24/2006	CASS01(4-5)	101	
4/24/2006	CASS02(0-0.5)	108	
4/24/2006	CASS02(4-5)	92	
4/24/2006	VWSS01(0-0.5)	88	
4/24/2006	VWSS03(0-0.5)	106	
4/24/2006	VWSB01(4-5)	103	
4/24/2006	VWSB04(4-5)	110	
4/24/2006	VWSS02(0-0.5)	97	
4/24/2006	VWSS02(4-5)	107	
4/25/2006	CCSB01(0-0.5)	89	
4/25/2006	CCSB01(4-5)	104	
4/25/2006	CCSB03(0-0.5)	107	
4/25/2006	CCSB03(4-5)	105	
4/27/2006	CCSB02(0-0.5)	91	
4/25/2006	CCSB02(4-5)	93	
4/27/2006	MBSS01(0-0.5)	103	
4/27/2006	MBSS03(0-0.5)	100	
4/25/2006	MBSB01(4-5)	100	
4/25/2006	MBSB04(4-5)	95	
4/27/2006	MBSS02(0-0.5)	95	
4/25/2006	MBSB02(4-5)	93	
4/25/2006	PSSS01(0-0.5)	98	
4/25/2006	PSSS03(0-0.5)	91	
4/25/2006	PSSB01(4-5)	87	
4/25/2006	PSSB04(4-5)	92	
4/27/2006	PSSS02(0-0.5)	98	
4/27/2006	PSSS02(4-5)	108	
4/27/2006	TFSS01(0-0.5)	101	
4/27/2006	TFSB01(4-5)	101	
4/27/2006	TFSS02(0-0.5)	96	
4/27/2006	TFSB02(4-5)	101	
4/27/2006	MESS01(0-0.5)	103	
4/27/2006	MESB01(4-5)	108	
4/27/2006	CBSS01(0-0.5)	98	
4/27/2006	CBSS03(0-0.5)	84	
4/27/2006	CBSB01(4-5)	102	
4/27/2006	CBSB04(4-5)	98	
4/27/2006	CBSS02(0-0.5)	98	
4/27/2006	CBSB02(4-5)	93	

Hannah City Air Force Station
EPA Method 8260, 4-Bromofluorobenzene, 4/24 - 4/27/06

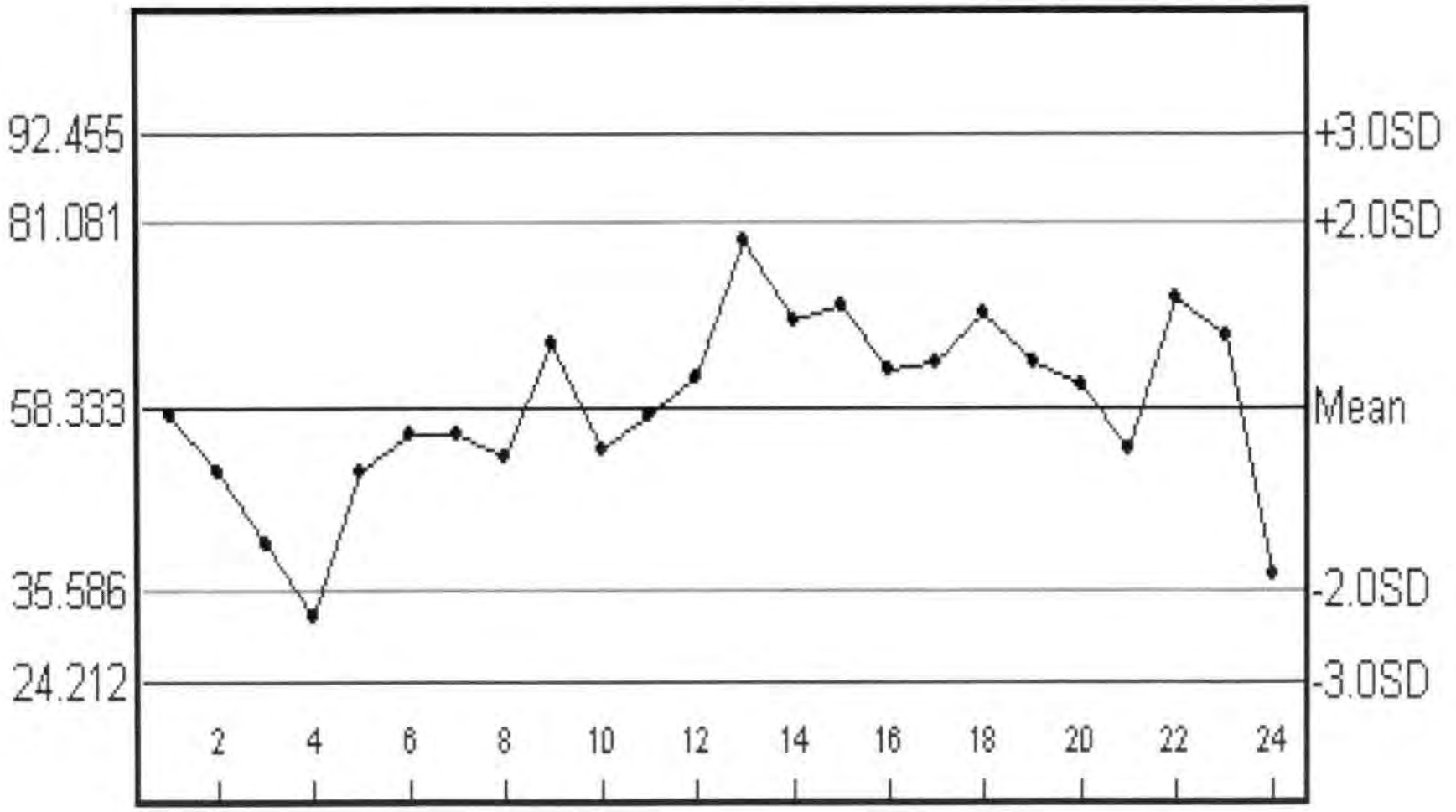


n= 40 Mean= 98.850 SD= 6.739 CV= 6.82% Min= 84.000 Max= 110.000

Nitrobenzene-d5 (NBZ) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
5/2/2006	VWSS01(0-0.5)	57	
5/2/2006	VWSS03(0-0.5)	50	
5/2/2006	VWSB01(4-5)	41	
5/2/2006	VWSB04(4-5)	32	
5/2/2006	VWSS02(0-0.5)	50	
5/2/2006	VWSS02(4-5)	55	
5/2/2006	MBSS01(0-0.5)	55	
5/2/2006	MBSS03(0-0.5)	52	
5/2/2006	MBSB01(4-5)	66	
5/2/2006	MBSB04(4-5)	53	
5/2/2006	MBSS02(0-0.5)	57	
5/2/2006	MBSB02(4-5)	62	
5/2/2006	PSSS01(0-0.5)	79	
5/2/2006	PSSS03(0-0.5)	69	
5/2/2006	PSSB01(4-5)	71	
5/2/2006	PSSB04(4-5)	63	
5/3/2006	PSSS02(0-0.5)	64	
5/3/2006	PSSS02(4-5)	70	
5/3/2006	TFSS01(0-0.5)	64	
5/3/2006	TFSB01(4-5)	61	
5/3/2006	TFSS02(0-0.5)	53	
5/3/2006	TFSB02(4-5)	72	
5/3/2006	MESS01(0-0.5)	67	
5/3/2006	MESB01(4-5)	37	

Hannah City Air Force Station
EPA Method 8270, Nitrobenzene-d5, 5/2 - 5/3/06

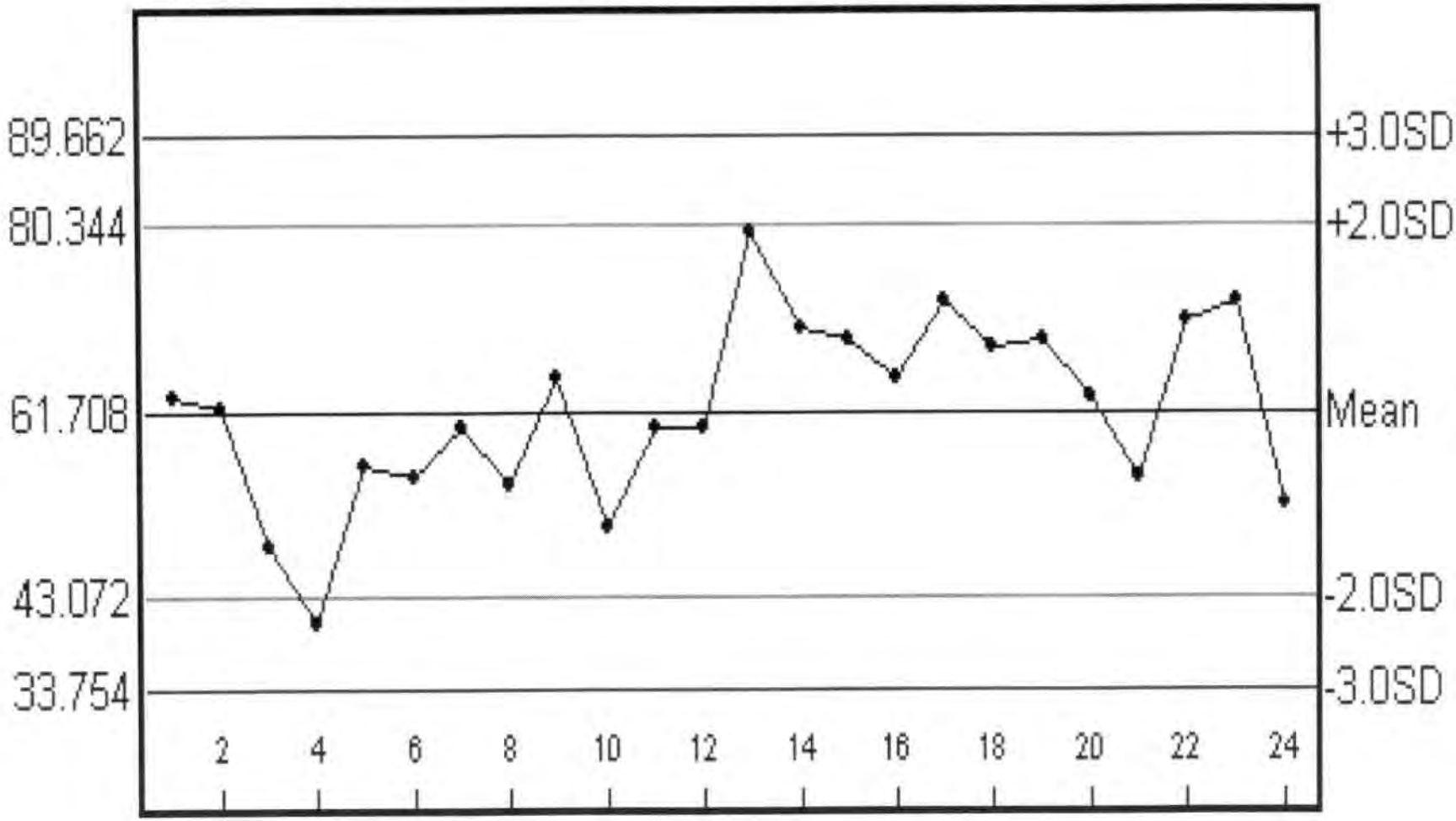


n= 24 Mean= 58.333 SD= 11.374 CV= 19.50% Min= 32.000 Max= 79.000

2-Fluorobiphenyl (FBP) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
5/2/2006	VWSS01(0-0.5)	63	
5/2/2006	VWSS03(0-0.5)	62	
5/2/2006	VWSB01(4-5)	48	
5/2/2006	VWSB04(4-5)	40	
5/2/2006	VWSS02(0-0.5)	56	
5/2/2006	VWSS02(4-5)	55	
5/2/2006	MBSS01(0-0.5)	60	
5/2/2006	MBSS03(0-0.5)	54	
5/2/2006	MBSB01(4-5)	65	
5/2/2006	MBSB04(4-5)	50	
5/2/2006	MBSS02(0-0.5)	60	
5/2/2006	MBSB02(4-5)	60	
5/2/2006	PSSS01(0-0.5)	80	
5/2/2006	PSSS03(0-0.5)	70	
5/2/2006	PSSB01(4-5)	69	
5/2/2006	PSSB04(4-5)	65	
5/3/2006	PSSS02(0-0.5)	73	
5/3/2006	PSSS02(4-5)	68	
5/3/2006	TFSS01(0-0.5)	69	
5/3/2006	TFSB01(4-5)	63	
5/3/2006	TFSS02(0-0.5)	55	
5/3/2006	TFSB02(4-5)	71	
5/3/2006	MESS01(0-0.5)	73	
5/3/2006	MESB01(4-5)	52	

Hannah City Air Force Station
EPA Method 8270, 2-Fluorobiphenyl, 5/2 - 5/3/06

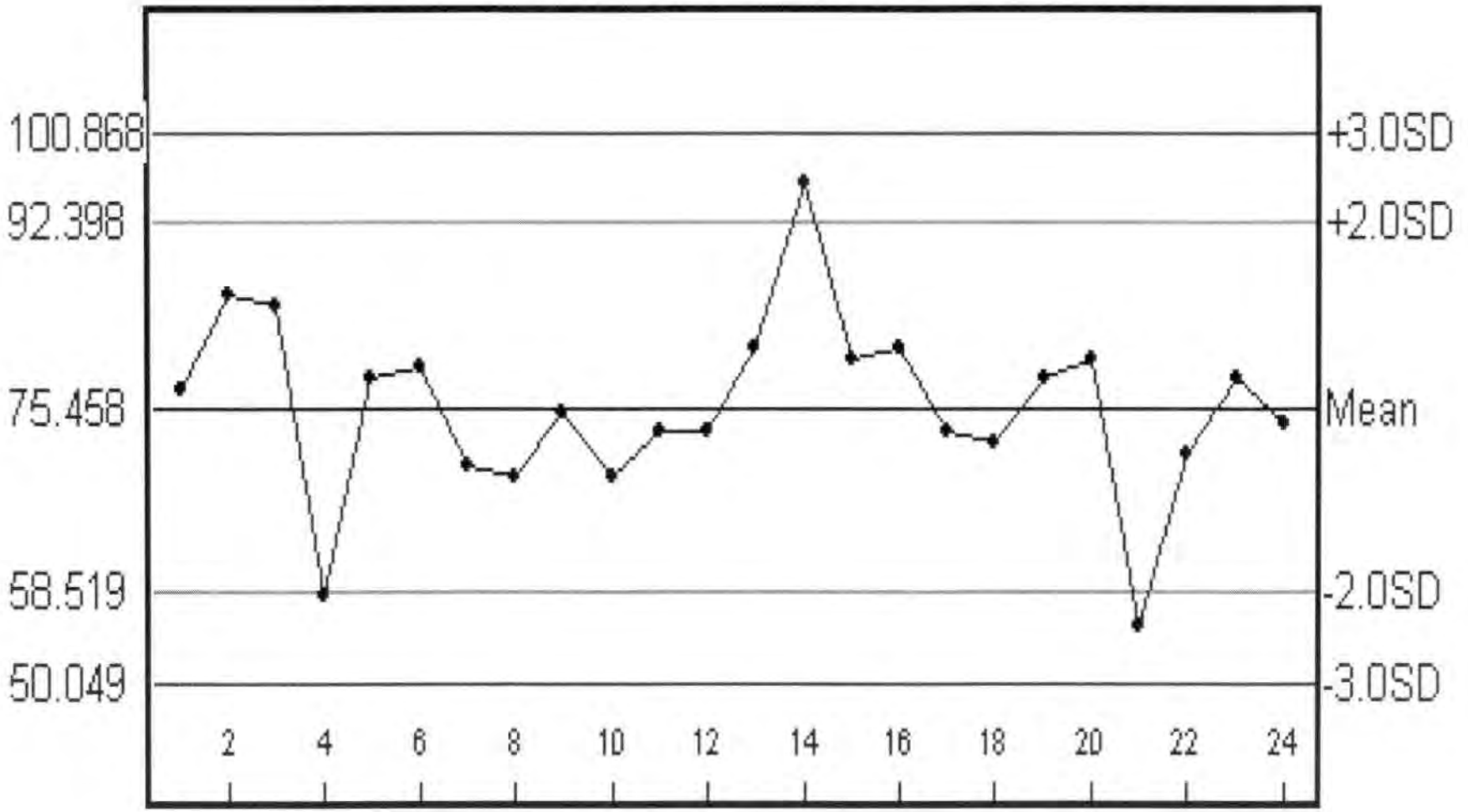


n= 24 Mean= 61.708 SD= 9.318 CV= 15.10% Min= 40.000 Max= 80.000

Terphenyl-d14 (TER) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
5/2/2006	VWSS01(0-0.5)	77	
5/2/2006	VWSS03(0-0.5)	86	
5/2/2006	VWSB01(4-5)	85	
5/2/2006	VWSB04(4-5)	58	
5/2/2006	VWSS02(0-0.5)	78	
5/2/2006	VWSS02(4-5)	79	
5/2/2006	MBSS01(0-0.5)	70	
5/2/2006	MBSS03(0-0.5)	69	
5/2/2006	MBSB01(4-5)	75	
5/2/2006	MBSB04(4-5)	69	
5/2/2006	MBSS02(0-0.5)	73	
5/2/2006	MBSB02(4-5)	73	
5/2/2006	PSSS01(0-0.5)	81	
5/2/2006	PSSS03(0-0.5)	96	
5/2/2006	PSSB01(4-5)	80	
5/2/2006	PSSB04(4-5)	81	
5/3/2006	PSSS02(0-0.5)	73	
5/3/2006	PSSS02(4-5)	72	
5/3/2006	TFSS01(0-0.5)	78	
5/3/2006	TFSB01(4-5)	80	
5/3/2006	TFSS02(0-0.5)	55	
5/3/2006	TFSB02(4-5)	71	
5/3/2006	MESS01(0-0.5)	78	
5/3/2006	MESB01(4-5)	74	

Hannah City Air Force Station
EPA Method 8270, Terphenyl-d14, 5/2 - 5/3/06

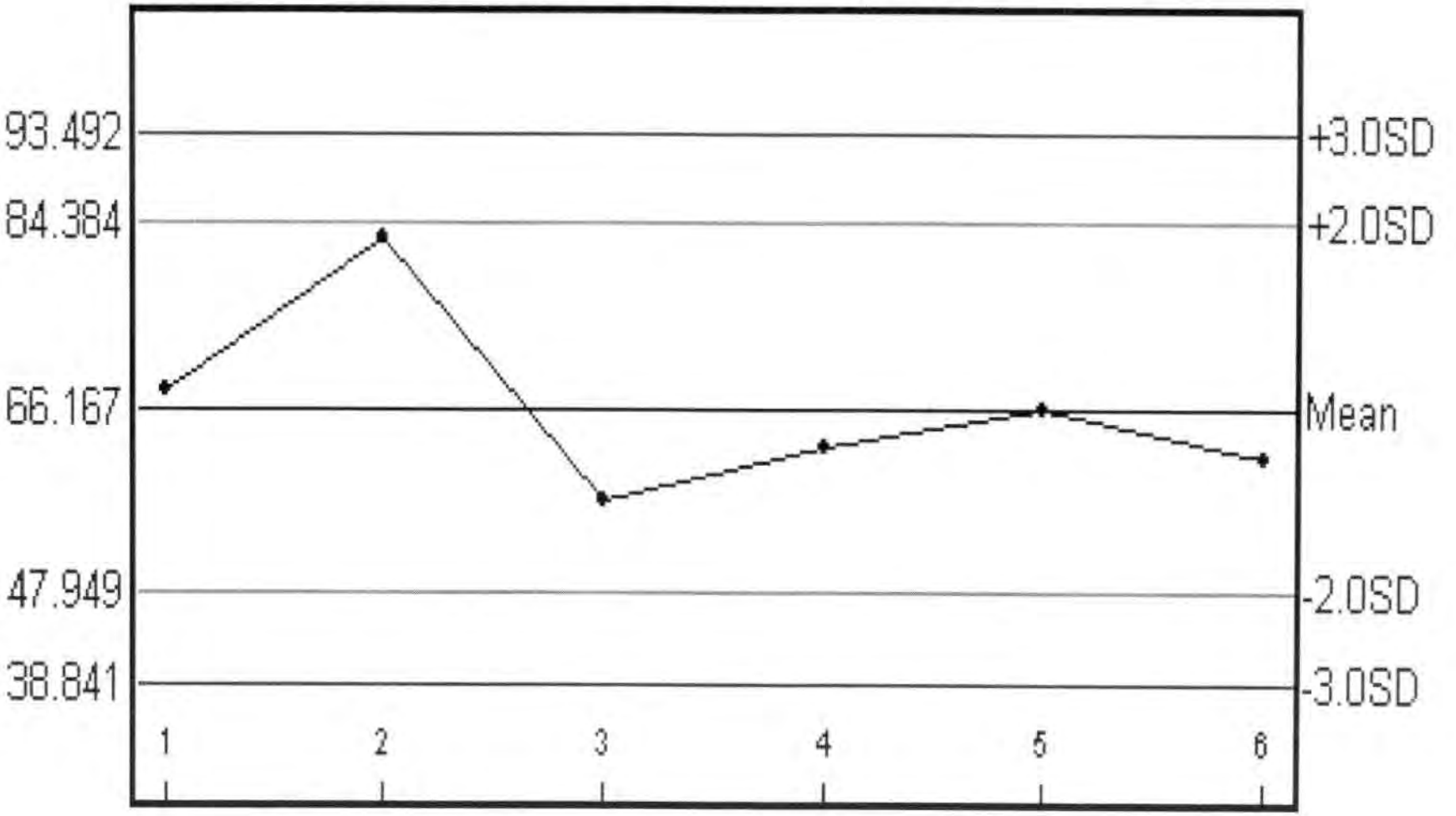


n= 24 Mean= 75.458 SD= 8.470 CV= 11.22% Min= 55.000 Max= 96.000

Tetrachloro-m-xylene (TCMX) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID	Result (%)	Comments
4/26/2006	MBSS01(0-0.5)	68	
4/26/2006	MBSS03(0-0.5)	83	
4/25/2006	MBSB01(4-5)	57	
4/25/2006	MBSB04(4-5)	62	
4/25/2006	MBSS02(0-0.5)	66	
4/25/2006	MBSB02(4-5)	61	

Hannah City Air Force Station
EPA Method 8082, Tetrachloro-m-xylene, 4/25 - 4/26/06

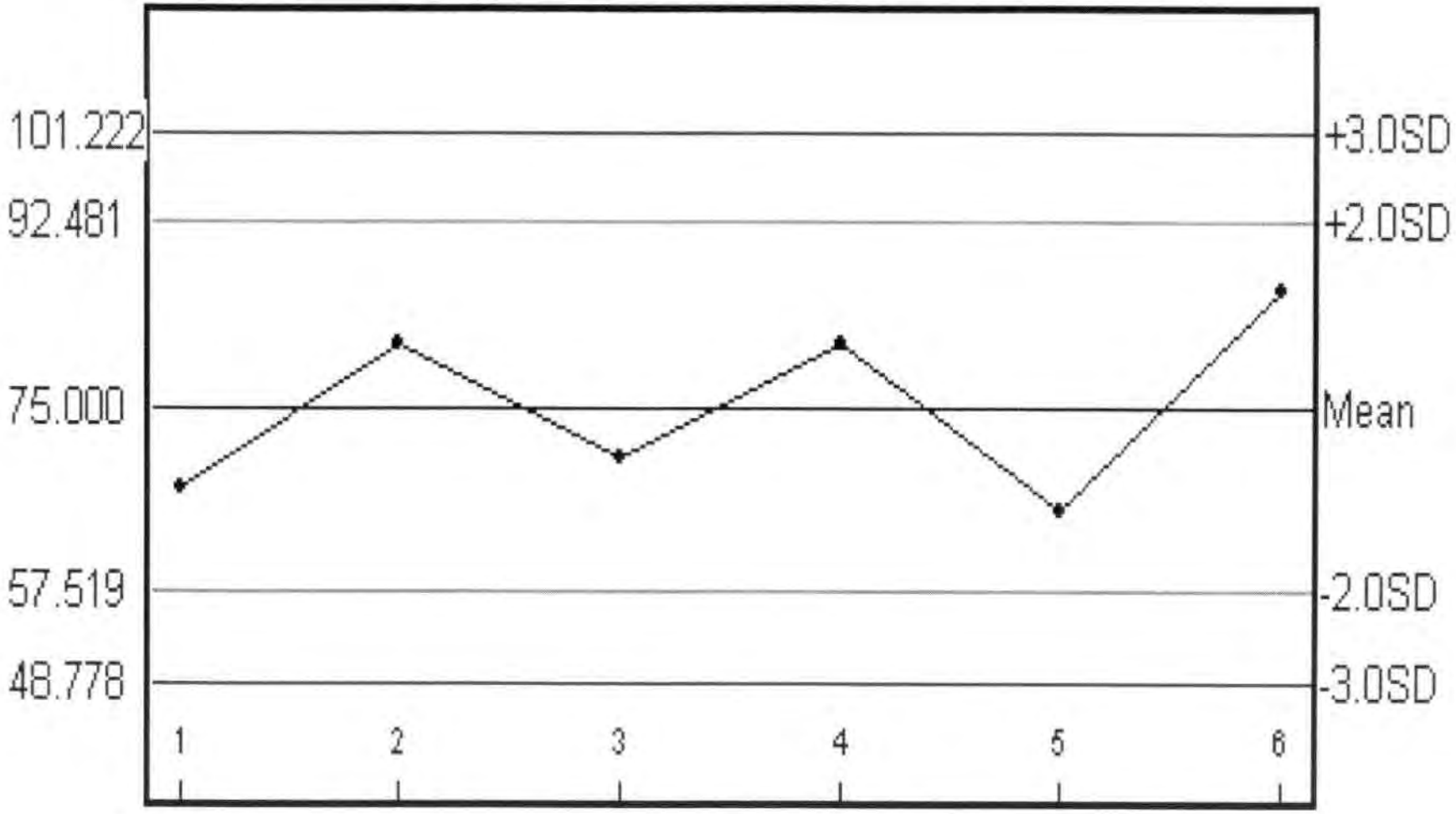


n= 6 Mean= 66.167 SD= 9.109 CV= 13.77% Min= 57.000 Max= 83.000

Decachlorobiphenyl (DCB) Surrogate Recoveries
Hannah City Air Force Station

Date Analyzed	Sample ID.	Result (%)	Comments
4/26/2006	MBSS01(0-0.5)	67	
4/26/2006	MBSS03(0-0.5)	81	
4/25/2006	MBSB01(4-5)	70	
4/25/2006	MBSB04(4-5)	81	
4/25/2006	MBSS02(0-0.5)	65	
4/25/2006	MBSB02(4-5)	86	

Hannah City Air Force Station
EPA Method 8082, DCB, 4/25 - 4/26/06



n= 6 Mean= 75.000 SD= 8.741 CV= 11.65% Min= 65.000 Max= 86.000

ATTACHMENT 5

CHAIN-OF-CUSTODIES (COC)

SEVERN TRENT **STL**

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: Joel Davis
Company: Tetra Tech EC
Address: 302 Research Drive
Norcross, GA
Phone: (770) 825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
P.O.#: Quote:

Shaded Areas For Internal Use Only 1 of

Lab Lot# 245903

Package Sealed	Samples Sealed
Yes No	Yes No
Received on Ice	**Samples Intact**
Yes No	Yes No

Temperature °C of Cooler 5.5, 2.6

Within Hold Time	Preserv. Indicated
Yes No	Yes No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No NA	Yes No NA

Sample Labels and COC Agree: Yes No COC not present

Sampler Name: Nelson Evans
Signature:
Project Name: Hanna City Air Force Station
Project Number:
Project Location: Hanna City, Illinois
Lab PM:
Date Required Hard Copy: __/__/__ Fax: __/__/__

Refrg #
/ Cont.
Volume
Preserv

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Sampling Time	Matrix	Comp/Grab	VOC	Metals	PAH	PCB	Additional Analyses / Remarks
1		CAS501(0-0.5)	4/18	1030	S		X	X		X	
2		CASB01 (4-5)	4/18	1125	S		X	X		X	
3		CAS502(0-0.5)	4/18	1150	S		X	X		X	
4		CASB02 (4-5)	4/18	1230	S		X	X		X	
5		VWS501 (0-0.5)	4/18	1455	S		X	X	X	X	
6		VWS503(0-0.5)	4/18	1500	S		X	X	X	X	
7		VWSB01 (4-5)	4/18	1520	S		X	X	X	X	
8		VWSB04(4-5)	4/18	1525	S		X	X	X	X	
7	X	VWSB01(4-5)	4/18	1525	S		X	X	X	X	
9		VWSB02(0-0.5)	4/18	1610	S		X	X	X	X	
10		VWSB02(4-5)	4/18	1645	S		X	X	X	X	

A-5-1

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
	Tetra Tech EC	4/18/06	1730		STL	4/19/06	1000
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater, SE = Sediment, W = Water, SOL = Solid, S = Soil, GRO = Grout/Solid, SL = Sludge, DL = Drum Liquid, MS = Miscellaneous, L = Leachate, OIL = Oil, WIPE = Wipe, A = Air, O = ____

Container Key
1 = Plastic, 2 = VOA Vial, 3 = Sterile Plastic, 4 = Amber Glass, 5 = Aluminum Glass, 6 = Other

Preservative Key
1 = HCl, Cool to 4°, 2 = H2SO4, Cool to 4°, 3 = HNO3, Cool to 4°, 4 = NaOH, Cool to 4°, 5 = NaOH/Zn, Cool to 4°, 6 = Cool to 4°, 7 = None

COMMENTS

Date Received
Courier: Fed Ex Hand Delivered
Bill of Lading

STL Chicago

STL Chicago is a part of Severn Trent Laboratories, Inc.

rpjacki | Job Sample Receipt Checklist Report | V2

Job Number.: 245903 Location.: 57222 Check List Number.: 1 Description.:
Customer Job ID.....: Job Check List Date.: 04/19/2006 Date of the Report..: 05/02/2006
Project Number.: 20006408 Project Description.: USACE Hannah City Project Manager.....: nsm
Customer.....: Tetra Tech EC, Inc. Contact.: Sharon Chittam

Questions ?	(Y/N)	Comments
Chain-of-Custody Present?.....	Y	
Were samples dropped off at or picked up by STL?..	N	
Custody seal on shipping container?.....	Y	
...If "yes", custody seal intact?.....	Y	
Custody seals on sample containers?.....	N	
...If "yes", custody seal intact?.....		
Samples iced?.....	Y	
Temperature of cooler acceptable? (4 deg C +/- 2).	Y	5.5,2.6
Samples received intact (good condition)?.....	Y	
Volatile samples acceptable? (no headspace).....		
Correct containers used?.....	Y	
Adequate sample volume provided?.....	Y	
Samples preserved correctly?.....	Y	
Samples received within holding-time?.....	Y	
Agreement between COC and sample labels?.....	Y	
Radioactivity at or below background levels?.....	Y	
A Sample Discrepancy Report (SDR) was needed?.....	N	
Residual Chlorine Check Required?		
If samples were shipped was there an air bill #?..	Y	
Sample Custodian Signature/Date.....	Y	

Page 1

KR 3/27/07

FedEx. US Airbill Express

FedEx Tracking Number 8568 0210 7095

0215

RECIPIENT: PEEL HERE

1 From This portion can be removed for Recipient's records

Date FedEx Tracking Number 856802107095

Sender's Name Phone 770 829-7100

Company TETRA TECH EC, INC

Address 302 RESEARCH DR TECH PK #200

City NORCROSS State GA ZIP 30092-2989

2 Your Internal Billing Reference

3 To

Recipient's Name Phone

Company

Recipient's Address

Address

City State ZIP

03291 99221

8568 0210 7095

245903

4a Express Package Service — Packages up to 150 lbs.

- [x] FedEx Priority Overnight
- [ ] FedEx Standard Overnight
- [ ] FedEx First Overnight
- [ ] FedEx 2Day
- [ ] FedEx Express Saver

4b Express Freight Service — Packages over 150 lbs.

- [ ] FedEx 1Day Freight*
- [ ] FedEx 2Day Freight
- [ ] FedEx 3Day Freight

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak*
- [ ] FedEx Box
- [ ] FedEx Tube
- [ ] Other

6 Special Handling

- [ ] SATURDAY Delivery
- [ ] HOLD Weekday at FedEx Location
- [ ] HOLD Saturday at FedEx Location

Does this shipment contain dangerous goods?

- [x] No
- [ ] Yes
- [ ] Dry Ice
- [ ] Cargo Aircraft Only

7 Payment Bill to:

- [x] Sender
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

Total Packages Total Weight Total Charges

8 NEW Residential Delivery Signature Options

- [ ] No Signature Required
- [ ] Direct Signature
- [ ] Indirect Signature

4/13-06

519

FedEx. US Airbill Express

FedEx Tracking Number 8568 0210 7100

0215

RECIPIENT: PEEL HERE

1 From This portion can be removed for Recipient's records

Date FedEx Tracking Number 856802107100

Sender's Name Phone 770 829-7100

Company TETRA TECH EC, INC

Address 302 RESEARCH DR TECH PK #200

City NORCROSS State GA ZIP 30092-2989

2 Your Internal Billing Reference

3 To

Recipient's Name Phone

Company

Recipient's Address

Address

City State ZIP

245903

3/27/07

STL Chicago

A-5-3

4a Express Package Service — Packages up to 150 lbs.

- [x] FedEx Priority Overnight
- [ ] FedEx Standard Overnight
- [ ] FedEx First Overnight
- [ ] FedEx 2Day
- [ ] FedEx Express Saver

4b Express Freight Service — Packages over 150 lbs.

- [ ] FedEx 1Day Freight*
- [ ] FedEx 2Day Freight
- [ ] FedEx 3Day Freight

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak*
- [ ] FedEx Box
- [ ] FedEx Tube
- [ ] Other

6 Special Handling

- [ ] SATURDAY Delivery
- [ ] HOLD Weekday at FedEx Location
- [ ] HOLD Saturday at FedEx Location

Does this shipment contain dangerous goods?

- [x] No
- [ ] Yes
- [ ] Dry Ice
- [ ] Cargo Aircraft Only

7 Payment Bill to:

- [x] Sender
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

Total Packages Total Weight Total Charges

8 NEW Residential Delivery Signature Options

- [ ] No Signature Required
- [ ] Direct Signature
- [ ] Indirect Signature

4/19-06

519

SEVERN TRENT **STL**

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: Joel Davis
Company: Tetra Tech EC
Address: 302 Research Drive
Norcross, GA 30092
Phone: 770-825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ___ of ___

Lab Lot# 245931

Package Sealed	Samples Sealed
Yes No	Yes No
Received on Ice	**Samples Intact**
Yes No	Yes No

Temperature °C of Cooler 3.2, 3.7, 2.9

Within Hold Time	Preserv. Indicated
Yes No	Yes No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No NA	Yes No NA

Sample Labels and COC Agree: Yes No COC not present

Sampler Name: Weldon Evans
Signature:
Project Name: Hanna City
Project Number:
Project Location: Hanna City, IL
Lab PM:
Date Required Hard Copy: ___/___/___ Fax: ___/___/___

Refrg #											
# / Cont.											
Volume											
Preserv											

Laboratory ID	MS-MSD	Client Sample ID	Sampling 2006 Date	Time	Matrix	Comp/Grab	VOC	Metals	PAH	PCB's	Ph						Additional Analyses / Remarks
1		CC SB01 (0-0.5)	4/19	840	S		X	X			X						
2		CC SB01 (4-5)	4/19	900	S		X	X			X						
1	X	CC SB01 (4-5)	4/19	900	S			X			X						
3		CC SB03 (0-0.5)	4/19	1000	S		X	X			X						
4		CC SB03 (4-5)	4/19	1020	S		X	X			X						
5		CC SS02 (0-0.5)	4/19	1110	S		X	X			X						
6		CC SB02 (4-5)	4/19	1140	S		X	X			X						
7		MB SS01 (0-0.5)	4/19	1350	S		X		X	X							
8		MB SS03 (0-0.5)	4/19	1355	S		X		X	X							
9		MB SB01 (4-5)	4/19	1410	S		X		X	X							
9	X	MB SB01 (4-5)	4/19	1410	S		X		X	X							Dbl volume
10		MB SB04 (4-5)	4/19	1415	S		X		X	X							

A-5-4

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
[signature]	Tetra Tech EC	4/19	1710	[signature]	STL	4/20/06	1015
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater; W = Water; S = Soil; SL = Sludge; MS = Miscellaneous; OL = Oil; A = Air; SE = Sediment; SO = Solid; DS = Drum Solid; DL = Drum Liquid; L = Leachate; WI = Wipe; O = ___

Container Key
1 Plastic; 2 VOA Vial; 3 Sterile Plastic; 4 Amber Glass; 5 Wide-mouth Glass; 6 Other ___

Preservative Key
1 HCL Cool to 4°; 2 H2SO4, Cool to 4°; 3 HNO3, Cool to 4°; 4 NaOH, Cool to 4°; 5 NaOH/Zn, Cool to 4°; 6 Cool to 4°; 7 None

COMMENTS

Date Received / /
Courier: FX
Hand Delivered
Bill of Lading

STL Chicago

SEVERN TRENT **STL**

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: Joel Davis
Company: Tetra Tech EC
Address: 302 Research Drive
Norcross, GA. 30092
Phone: 770-825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Lab Lot# 245934

Package Sealed	Samples Sealed
Yes No	Yes No
Received on Ice	**Samples Intact**
Yes No	Yes No

Temperature °C of Cooler: 3.2, 3.7, 2.9

Within Hold Time	Preserv. Indicated
Yes No	Yes No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No NA	Yes No NA

Sample Labels and COC Agree: Yes No COC not present

Sampler Name: Weldon Evans
Signature:
Project Name: Hanna City
Project Number:
Project Location: Hanna City, IL
Lab PM:
Date Required
Hard Copy: __/__/__
Fax: __/__/__

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Time	Matrix	Comp/Grab	VOC	PAH	PCB's	LEAD	Additional Analyses / Remarks
11		MBSS02 (0-0.5)	4/19	1500	S		X	X	X		
12		MBSB02 (4-5)	4/19	1515	S		X	X	X		
13		PSSS01 (0-0.5)	4/19	1550	S		X	X		X	
14		PSSS03 (0-0.5)	4/19	1555	S		X	X		X	
15		PSSB01 (4-5)	4/19	1605	S		X	X		X	
1	X	PSSB01 (4-5)	4/19	1605	S					X	
16		PSSB04 (4-5)	4/19	1610							added by OAT VOC, Pb, PAH per client.

A-5-5

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
	Tetra Tech EC	4/19	1710		STL	4/20/06	1015
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO = Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other

Preservative Key
1. HCL, Cool to 4°
2. H_2SO_4, Cool to 4°
3. HNO_3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received
Courier: Hand Delivered
Bill of Lading

STL Chicago is a part of Severn Trent Laboratories, Inc

rpjsckl Job Sample Receipt Checklist Report v2

Job Number.: 245931 Location.: 57222 Check List Number.: 1 Description.:
Customer Job ID.....: Job Check List Date.: 04/20/2006 Date of the Report..: 05/02/2006
Project Number.: 20006408 Project Description.: USACE Hannah City Project Manager ....: nsm
Customer.....: Tetra Tech EC, Inc. Contact.: Sharon Chittam

Questions ?	(Y/N)	Comments
Chain-of-Custody Present?.....	Y	
Were samples dropped off at or picked up by STL?..	N	
Custody seal on shipping container?.....	Y	
If "yes", custody seal intact?.....	Y	
Custody seals on sample containers?.....	N	
If "yes", custody seal intact?.....		
Samples iced?.....	Y	
Temperature of cooler acceptable? (4 deg C +/- 2).	Y	3.2,3.7,3.9
Samples received intact (good condition)?.....	Y	
Volatile samples acceptable? (no headspace).....		
Correct containers used?.....	Y	
Adequate sample volume provided?.....	Y	
Samples preserved correctly?.....	Y	
Samples received within holding-time?.....	Y	
Agreement between COC and sample labels?.....	Y	
Radioactivity at or below background levels?.....	Y	
A Sample Discrepancy Report (SDR) was needed?.....	N	
Residual Chlorine Check Required?		
If samples were shipped was there an air bill #?..	Y	
Sample Custodian Signature/Date.....	Y	

Page 1

KR 3/29/07

SEVERN TRENT STL

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: Joel Pauls
Company: TetraTech EC
Address: 302 Research Drive
Norcross, GA. 30092
Phone: 770-825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Lab Lot# 245967

Package Sealed	Samples Sealed
(Yes) No	Yes (No)
Received on Ice	**Samples Intact**
(Yes) No	(Yes) No

Temperature °C of Cooler: 3.7, 4, 3.9

Within Hold Time	Preserv. Indicated
(Yes) No	(Yes) No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No (NA)	Yes No (NA)

Sample Labels and COC Agree: (Yes) No COC not present

Sampler Name: Weldon Evans
Signature:
Project Name: Hanna City
Project Number:
Project Location: Hanna City, IL
Lab PM:
Date Required: Hard Copy: __/__/__ Fax: __/__/__

Additional Analyses / Remarks

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Sampling Time	Matrix	Comp/Grab	VOC	Lead	PAH	Metals	PG
1		PSS302 (0-0.5)	4/20	855	S		X	X	X		
2		PSSB02 (4-5)	4/20	905	S		X	X	X		
3		TFSS01 (0-0.5)	4/20	1000	S		X		X		
4		TFSB01 (4-5)	4/20	1030	S		X		X		
5		TFSS02 (0-0.5)	4/20	1120	S		X		X		
6		TFSB02 (4-5)	4/20	1130	S		X		X		
7		MESS01 (0-0.5)	4/20	1340	S		X		X		
8		MESB01 (4-5)	4/20	1405	S		X		X		
9		CBSS01 (0-0.5)	4/20	1450	S		X			X	X
10		CBSS03 (0-0.5)	4/20	1455	S		X			X	X
11		CBSB01 (4-5)	4/20	1500	S		X			X	X
12		CBSB04 (4-5)	4/20	1505	S		X			X	X

A-5-7

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
[signature]	TetraTech EC	4/20	1700	[signature]	STL	4/21/06	1055
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO = Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe
C = _____

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other _____

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received: / /
Courier: For Ex
Hand Delivered
Bill of Lading

STL Chicago

SEVERN TRENT STL

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: Joel Davis
Company: Tetra Tech EC
Address: 302 Research Drive
Norcross, GA 30092
Phone: (770) 825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Lab Lot# 245967

Package Sealed	Samples Sealed
Yes No	Yes No
Received on Ice	**Samples Intact**
Yes No	Yes No

Temperature °C of Cooler: 3.7, 4.1

Within Hold Time	Preserv. Indicated
Yes No	Yes No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No NA	Yes No NA

Sample Labels and COC Agree: Yes No COC not present

Sampler Name: Wendy Davis
Signature:
Project Name: Hanna City
Project Number:
Project Location: Hanna City, IL
Lab PM:
Date Required
Hard Copy: __/__/__
Fax: __/__/__

Refrg #												
# / Cont.												
Volume												
Preserv												

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Sampling Time	Matrix	Comp/Grab	VOC	Metals	PCB									Additional Analyses / Remarks
13		CBSS02(0-0.5)	4/20	1525	S		X	X	X									
14		CBSB02 (4-5)	4/20	1535	S		X	X	X									

A-5-8

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
[signature]	Tetra Tech EC	4/20	1700	[signature]	STL	4/21/06	1055
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO = Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe
O = ____

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other ____

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS:

Date Received / /
Courier: Fed Ex
Hand Delivered
Bill of Lading

STL Chicago

rpjsckl Job Sample Receipt Checklist Report v2

Job Number.: 245967 Location.: 57222 Check List Number.: 1 Description.:
Customer Job ID.....: Job Check List Date.: 04/21/2006 Date of the Report..: 05/02/2006
Project Number.: 20006408 Project Description.: USACE Hannah City Project Manager.....: nsm
Customer.....: Tetra Tech EC, Inc. Contact.: Sharon Chittam

Questions ?	(Y/N)	Comments
Chain-of-Custody Present?.....	Y	
Were samples dropped off at or picked up by STL?..	N	
Custody seal on shipping container?.....	Y	
...If "yes", custody seal intact?.....	Y	
Custody seals on sample containers?.....	N	
...If "yes", custody seal intact?.....		
Samples iced?.....	Y	
Temperature of cooler acceptable? (4 deg C +/- 2).	Y	3.7,4.1
Samples received intact (good condition)?.....	Y	
Volatile samples acceptable? (no headspace).....		
Correct containers used?.....	Y	
Adequate sample volume provided?.....	Y	
Samples preserved correctly?.....	Y	
Samples received within holding-time?.....	Y	
Agreement between COC and sample labels?.....	Y	
Radioactivity at or below background levels?.....	Y	
A Sample Discrepancy Report (SDR) was needed?.....	N	
Residual Chlorine Check Required?		
If samples were shipped was there an air bill #?..	Y	
Sample Custodian Signature/Date.....	Y	

Page 1

Kpa 4/6/07

55

100

FedEx. *US Airbill* Express

FedEx Tracking Number 8568 0210 7051

0215 **Recipient's Copy**

RECIPIENT: PEEL HERE

fedex.com 1800 GoFedEx 1800 463 3339

A-5-10

1 From This portion can be removed for Recipient's records

Date 4/ FedEx Tracking Number 856802107051

Sender's Name [illegible] Phone 770 825-7100

Company ULTRA TECH FC INC

Address 200 RESEARCH DR TECH PK 8200

City NORCROSS State GA ZIP 30092-2989

2 Your Internal Billing Reference

3 To

Recipient's Name Phone

Company

Recipient's Address

Address

City State ZIP

245467

0329199221

8568 0210 7051

4a Express Package Service *Packages up to 150 lbs.*

- [x] FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.* Saturday Delivery NOT available.
- [ ] FedEx 2Day — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Express Saver — Third business day.** Saturday Delivery NOT available.

FedEx Envelope rate not available. Minimum charge: One pound rate.

*To most locations.

4b Express Freight Service *Packages over 150 lbs.*

- [ ] FedEx 1Day Freight* — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

*Call for Confirmation. **To most locations.

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak* — includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak.
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other

*Declared value limit $500.

6 Special Handling — Include FedEx address in Section 3.

- [ ] SATURDAY Delivery — Not available for FedEx Standard Overnight, FedEx First Overnight, FedEx Express Saver, or FedEx 2Day Freight.
- [ ] HOLD Weekday at FedEx Location — Not available for FedEx First Overnight.
- [ ] HOLD Saturday at FedEx Location — Available ONLY for FedEx Priority Overnight and FedEx 2Day at select locations.

Does this shipment contain dangerous goods? One box must be checked.

- [ ] No
- [ ] Yes — As per attached Shipper's Declaration.
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry ice, 9, UN 1845 ____ x ____ kg

Dangerous goods including dry ice cannot be shipped in FedEx packaging.

- [ ] Cargo Aircraft Only

7 Payment Bill to: Enter FedEx Acct. No. or Credit Card No. below. Obtain Recip. Acct. No.

- [ ] Sender — Acct. No. or Section 1 will be billed.
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

Total Packages	Total Weight	Total Charges
2	7	

*Our liability is limited to $100 unless you declare a higher value. See the current FedEx Service Guide for details.

8 NEW Residential Delivery Signature Options (Ground or Express Home Delivery shipments only)

- [ ] No Signature Required — Package may be left without obtaining a signature for delivery.
- [ ] Direct Signature — Someone at recipient's address may sign for delivery. Fee applies.
- [ ] Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. Fee applies.

Rev. Date 11/06 Part #150120-000 ©1994-2006 FedEx PRINTED IN U.S.A. SAP

4-21-06

519

105

MOR 12

811 Chicago

SEVERN TRENT **STL**

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: Joel Pahls
Company: Tetra Tech EC
Address: 302 Research Drive
Norcross, GA 30092
Phone: 770-825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ___ of ___

Lab Lot# 246011

Package Sealed	Samples Sealed
(Yes) No	Yes (No)
Received on Ice	**Samples Intact**
(Yes) No	(Yes) No

Temperature °C of Cooler: (3.0) (3.2) (3.6) (2.8)

Within Hold Time	Preserv. Indicated
(Yes) No	(Yes) No NA
pH Check OK	**Res Cl_2 Check OK**
(Yes) No NA	Yes No (NA)

Sample Labels and COC Agree: (Yes) No COC not present

Sampler Name: Walton Evans
Signature:
Project Name: Hanna City
Project Number:
Project Location: Hanna City, IL
Lab PM:
Date Required — Hard Copy: ___/___/___ Fax: ___/___/___

Refrg #												
# / Cont.												
Volume												
Preserv												

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Sampling Time	Matrix	Comp/Grab	VOC	PCB	PAH	Metals	Lead						Additional Analyses / Remarks
A-5-11 1		FB-42106-1	4/21	845	W	G	X	X	X	X	X						
2		CAGW01	4/21	1130	W	G	X			X							
3		TB-01	4/21	1130	W	G											Trip Blank
4		CAGW02	4/21	1355	W	G	X			X							
5		VWGW01	4/21	1610	W	G	X			X							
6	X	VWGW02	4/22	920	W	G	X		X	X							Extra Sample
7		VWGW03	4/22	925	W	G	X		X	X							
8		CCGW01	4/22	1200	W	G	X			X							
9		CCGW03	4/22	1430	W	G	X			X							
10		CCGW02	4/24	935	W	G	X			X							
11	X	MBGW01	4/24	1040	W	G	X	X	X								Extra Sample
12		MBGW03	4/24	1050	W	G		X									

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
	Tetra Tech	4/24	1100		STL	4/25/06	1080
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Matrix Key
WW = Wastewater, W = Water, S = Soil, SL = Sludge, MS = Miscellaneous, O = Oil, A = Air, SE = Sediment, SO = Solid, DS = Drum Solid, DL = Drum Liquid, L = Leachate, WI = Wipe, O = ___

Container Key
1 Plastic, 2 VOA Vial, 3 Sterile Plastic, 4 Amber Glass, 5 Wide-mouth Glass, 6 Other ___

Preservative Key
1 HCL Cool to 4°, 2 H2SO4 Cool to 4°, 3 HNO3 Cool to 4°, 4 NaOH Cool to 4°, 5 NaOH/Zn Cool to 4°, 6 Cool to 4°, 7 None

COMMENTS

Date Received 4/25/06
Courier: Fed Ex Hand Delivered
Bill of Lading

SEVERN TRENT **STL**

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone 708-534-5200
Fax 708-534-5211

Report To:
Contact: Joel Davis
Company: Terra Tech EC
Address: 302 Research Drive
Norcross, GA. 30092
Phone: (770) 825-7134
Fax:
E-Mail:

Bill To:
Contact: Same
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Lab Lot# 246011

Package Sealed	Samples Sealed
Yes No	Yes No
Received on Ice	**Samples Intact**
Yes No	Yes No

Temperature °C of Cooler

Within Hold Time	Preserv. Indicated
Yes No	Yes No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No NA	Yes No NA

Sample Labels and COC Agree: Yes No COC not present

Sampler Name: Nelson Evans
Signature:
Project Name: Hawthorne City
Project Number:
Project Location: Hawthorne City, IL
Lab PM:
Date Required: Hard Copy: __/__/__ Fax: __/__/__

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Sampling Time	Matrix	Comp/Grab	VOC	PAH	PCB	LEAD	Additional Analyses / Remarks
13		MBGW02	4/24	1200	W	G	X	X	X		
14	X	PSGW01	4/24	1415	W	G	X	X		X	Extra Sample
15		PSGW03	4/24	1420	W	G				X	
16		PSGW02	4/24	1520	W	G	X	X		X	

A-5-12

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
	Terra Tech EC	4/24	1700		STL	4/25/06	1000
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Matrix Key
WW = Wastewater, W = Water, S = Soil, SL = Sludge, MS = Miscellaneous, OL = Oil, A = Air, SE = Sediment, SO = Solid, DS = Drum Solid, DL = Drum Liquid, L = Leachate, WI = Wipe, O = ____

Container Key
1 Plastic, 2 VOA Vial, 3 Sterile Plastic, 4 Amber Glass, 5 Widemouth Glass, 6 Other ____

Preservative Key
1 HCl, Cool to 4°, 2 H_2SO_4, Cool to 4°, 3 HNO_3, Cool to 4°, 4 NaOH, Cool to 4°, 5 NaOH/Zn, Cool to 4°, 6 Cool to 4°, 7 None

COMMENTS

Date Received 4/25/06
Courier: FedEx Hand Delivered
Bill of Lading see attach

STL Chicago is a part of Severn Trent Laboratories, Inc.

STL-0004 (0503)

rpjscki Job Sample Receipt Checklist Report v2

Job Number.: 246011 Location.: 57222 Check List Number.: 1 Description.:
Customer Job ID.....: Job Check List Date.: 04/25/2006 Date of the Report.: 05/11/2006
Project Number.: 20006408 Project Description.: USACE Hannah City Project Manager.....: nsm
Customer.....: Tetra Tech EC, Inc. Contact.: Sharon Chittam

Questions ?	(Y/N)	Comments
Chain-of-Custody Present?.....	Y	
Were samples dropped off at or picked up by STL?..	N	
Custody seal on shipping container?.....	Y	
...If "yes", custody seal intact?.....	Y	
Custody seals on sample containers?.....	N	
...If "yes", custody seal intact?.....		
Samples iced?.....	Y	
Temperature of cooler acceptable? (4 deg C +/- 2).	Y	3.0,3.2,3.6,2.8
Samples received intact (good condition)?.....	Y	
Volatile samples acceptable? (no headspace).....	Y	
Correct containers used?.....	Y	
Adequate sample volume provided?.....	Y	
Samples preserved correctly?.....	Y	
Samples received within holding-time?.....	Y	
Agreement between COC and sample labels?.....	Y	
Radioactivity at or below background levels?.....	Y	
A Sample Discrepancy Report (SDR) was needed?.....	N	
Residual Chlorine Check Required?		
If samples were shipped was there an air bill #?..	Y	
Sample Custodian Signature/Date.....	Y	

Page 1

KAC 3/20/10

54

100

FedEx Express *US Airbill*

FedEx Tracking Number 8568 0210 7040

Rev. 0215

1 From This portion can be removed for Recipient's records

Date 1/24/2012 FedEx Tracking Number 856802107040

Sender's Name Weldon Evans Phone 770 925-7100

Company TETRA TECH EC, INC

Address 302 RESEARCH DR TECH PK #200

City NORCROSS State GA ZIP 30092-2785

246011

2 Your Internal Billing Reference

3 To

Recipient's Name Charlie Wellington Phone 213-214-5500

Company CTC Chicago

Recipient's Address 2417 Bond street

Address

City Riverside, Park State IL ZIP 60426

0329199221

RECIPIENT: PEEL HERE

fedex.com 1.800.GoFedEx 1.800.463.3339

4a Express Package Service

[X] FedEx Priority Overnight

[ ] FedEx Standard O

[ ] FedEx 2Day

[ ] FedEx Express Sa

4b Express Freight Service

[ ] FedEx 1Day Freight*

[ ] FedEx 2Day Freig

5 Packaging

[ ] FedEx Envelope*

[ ] FedEx Pak*

6 Special Handling

[ ] SATURDAY Delivery

[ ] HOLD Weekday at FedEx Location

Does this shipment contain dangerous goods?

[X] No [ ] Yes [ ] Yes

7 Payment Bill to

[X] Sender [ ] Recipient [ ] Third Party

Total Packages 4

Total Weight 233

A-5-14

117 block 2d

SIL Chicago

SEVERN TRENT STL

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone 708-534-5200
Fax 708-534-5211

Report To:
Contact: JOEL DAVIS
Company: TETRA TECH EC
Address: 302 RESEARCH DRIVE
NORCROSS, GA. 30092
Phone: (770) 825-7134
Fax:
E-Mail:

Bill To:
Contact: SAME
Company:
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Lab Lot# 246092

Package Sealed	Samples Sealed
Yes No	Yes No
Received on Ice	**Samples Intact**
Yes No	Yes No

Temperature °C of Cooler 4.9

Within Hold Time	Preserv. Indicated
Yes No	Yes No NA
pH Check OK	**Res Cl_2 Check OK**
Yes No NA	Yes No NA

Sample Labels and COC Agree: Yes No COC not present

Sampler Name: WELDON EVANS
Signature:
Project Name: HANNA CITY
Project Number:
Project Location: HANNA City, IL
Lab PM:
Date Required — Hard Copy: __/__/__ Fax: __/__/__

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date (2006)	Sampling Time	Matrix	Comp/Grab	VOC	PAH	PCB	METALS	LEAD					Additional Analyses / Remarks
A-5-15 1		TFGW01	4/25	1110	W	G	X	X								
2		TFGW02	4/25	1245	W	G	X	X								
3		MEGW01	4/25	1600	W	G	X	X								
4		FB042606-2	4/26	845	W	G	X	X	X	X	X					
5		CBGW01	4/26	935	W	G	X			X						
6		CBGW02	4/26	1015	W	G	X			X						
7		TB-02	4/26	1030	W											Trip Blank

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
[signature]	TETRA TECH EC	4/26	1500	[signature]	STL	4/27/06	1000
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater, W = Water, S = Soil, SL = Sludge, MS = Miscellaneous, OL = Oil, A = Air, SE = Sediment, SO = Solid, DS = Drum Solid, DL = Drum Liquid, L = Leachate, WI = Wipe, O = ____

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other ____

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received 4/27/06
Courier: FedEx Hand Delivered
Bill of Lading see attach

STL Chicago is a part of Severn Trent Laboratories, Inc.

rpjsckl — Job Sample Receipt Checklist Report — V2

Job Number.: 246092 Location.: 57222 Check List Number.: 1 Description.:
Customer Job ID.....: Job Check List Date.: 04/27/2006 Date of the Report... 05/15/2006
Project Number.: 20006408 Project Description.: USACE Hannah City Project Manager..... nsm
Customer.....: Tetra Tech EC, Inc. Contact.: Sharon Chittam

Questions ?	(Y/N)	Comments
Chain-of-Custody Present?.....	Y	
Were samples dropped off at or picked up by STL?...	N	
Custody seal on shipping container?.....	Y	
...If "yes", custody seal intact?.....	Y	
Custody seals on sample containers?.....	N	
...If "yes", custody seal intact?.....		
Samples iced?.....	Y	
Temperature of cooler acceptable? (4 deg C +/- 2).	Y	4.9
Samples received intact (good condition)?.....	Y	
Volatile samples acceptable? (no headspace).....	Y	
Correct containers used?.....	Y	
Adequate sample volume provided?.....	Y	
Samples preserved correctly?.....	Y	
Samples received within holding-time?.....	Y	
Agreement between COC and sample labels?.....	Y	
Radioactivity at or below background levels?.....	Y	
A Sample Discrepancy Report (SDR) was needed?.....	N	
Residual Chlorine Check Required?		
If samples were shipped was there an air bill #?..	Y	
Sample Custodian Signature/Date.....	Y	

4/2/07

53

100

FedEx. Express *US Airbill*

FedEx Tracking Number 8568 0210 7030

Form 0215

1 From This portion can be removed for Recipient's records.

Date / / FedEx Tracking Number 856802107030

Sender's Name Phone

Company

Address

City State ZIP

RECIPIENT: PEEL HERE

fedex.com 1800 GoFedEx 1800 463 3339

2 Your Internal Billing Reference

246097

3 To

Recipient's Name Phone

Company

Recipient's Address

Address

City State ZIP

8568 0210 7030

4a Express Package Service *Packages up to 150 lbs.*

- FedEx Priority Overnight
- FedEx Standard Overnight
- FedEx First Overnight
- FedEx 2Day
- FedEx Express Saver

4b Express Freight Service *Packages over 150 lbs.*

- FedEx 1Day Freight*
- FedEx 2Day Freight
- FedEx 3Day Freight

5 Packaging

- FedEx Envelope*
- FedEx Pak*
- FedEx Box
- FedEx Tube
- Other

6 Special Handling

- SATURDAY Delivery
- HOLD Weekday at FedEx Location
- HOLD Saturday at FedEx Location

Does this shipment contain dangerous goods?

- No
- Yes
- Yes
- Dry Ice
- Cargo Aircraft Only

7 Payment *Bill to:*

- Sender
- Recipient
- Third Party
- Credit Card
- Cash/Check

Total Packages Total Weight 21 Total Charges

8 *NEW* Residential Delivery Signature Options

- No Signature Required
- Direct Signature
- Indirect Signature

519

A-5-17

Total Charges

ATTACHMENT 6

REVIEWER'S CALCULATIONS

Prepared by Kerry R. Nusekabel

Hannah City Air Force Station
Linear Regression

Sample(s):		acetone					
	Linear Regression					Rf	ISTD
VWSS01(0-0.5)							
	5	7668		Slope	Y-intercept	0.078512	976663
	20	27982		925.5254	7027.862	0.076708	911967
	50	50629				0.056307	899154
	100	98688	Corr. Coeff	0.991		0.05295	931898
	150	162421				0.054191	999065
	200	180680				0.047642	948109
					0.013153	0.061052	21.5441
					SD	Ave Rf	RSD
Sample(s):		2-butanone					
	Linear Regression					Rf	ISTD
VWSS01(0-0.5)							
	5	9673		Slope	Y-intercept	0.099041	976663
	20	49993		1768.913	5795.308	0.137047	911967
	50	83043				0.092357	899154
	100	177629	Corr. Coeff	0.991		0.095305	931898
	150	302462				0.100915	999065
	200	340651				0.089824	948109
					0.017454	0.102415	17.04282
					SD	Ave Rf	RSD
Sample(s):		acetone					
	Linear Regression					Rf	ISTD
CCSB02(4-5)							
	5	7668		Slope	Y-intercept	0.078512	976663
	20	27982		925.5254	7027.862	0.076708	911967
	50	50629				0.056307	899154
	100	98688	Corr. Coeff	0.991		0.05295	931898
	150	162421				0.054191	999065
	200	180680				0.047642	948109
					0.013153	0.061052	21.5441
					SD	Ave Rf	RSD

Hannah City Air Force Station
Linear Regression

Sample(s):			2-butanone					
	Linear Regression						Rf	ISTD
CCSB02(4-5)								
	5	9673		Slope	Y-intercept		0.099041	976663
	20	49993		1768.913	5795.308		0.137047	911967
	50	83043					0.092357	899154
	100	177629	Corr. Coeff	0.991			0.095305	931898
	150	302462					0.100915	999065
	200	340651					0.089824	948109
						0.017454	0.102415	17.04282
						SD	Ave Rf	RSD
Sample(s):			acetone					
	Linear Regression						Rf	ISTD
PSSS02(0-0.5)								
	5	7668		Slope	Y-intercept		0.078512	976663
	20	27982		925.5254	7027.862		0.076708	911967
	50	50629					0.056307	899154
	100	98688	Corr. Coeff	0.991			0.05295	931898
	150	162421					0.054191	999065
	200	180680					0.047642	948109
						0.013153	0.061052	21.5441
						SD	Ave Rf	RSD
Sample(s):			2-butanone					
	Linear Regression						Rf	ISTD
PSSS02(0-0.5)								
	5	9673		Slope	Y-intercept		0.099041	976663
	20	49993		1768.913	5795.308		0.137047	911967
	50	83043					0.092357	899154
	100	177629	Corr. Coeff	0.991			0.095305	931898
	150	302462					0.100915	999065
	200	340651					0.089824	948109
						0.017454	0.102415	17.04282
						SD	Ave Rf	RSD

Hannah City Air Force Station
Linear Regression

Sample(s):			chloromethane						
	Linear Regression							Rf	ISTD
MBGW02									
	0.5	N/A			Slope	Y-intercept		N/A	391005
	1	25957			12474.41	19958.67		1.643239	394906
	2.5	34788						0.863365	402935
	10	124212						0.801411	387479
	25	342983						0.900752	380774
	50	696561		Corr. Coeff	0.998			0.894566	389329
	75	979487						0.821451	397462
	100	1222730						0.776648	393592
							0.306012	0.957348	31.96459
							SD	Ave Rf	RSD
Sample(s):			vinyl chloride						
	Linear Regression							Rf	ISTD
MBGW02									
	0.5	N/A			Slope	Y-intercept		N/A	391005
	1	20835			10713.86	9977.916		1.318985	394906
	2.5	29398						0.729597	402935
	10	108160						0.697844	387479
	25	279681						0.734507	380774
	50	566166		Corr. Coeff	0.999			0.727105	389329
	75	827355						0.693865	397462
	100	1061352						0.674145	393592
							0.231431	0.796578	29.05319
							SD	Ave Rf	RSD

Sample(s):		bromomethane						
	Linear Regression						Rf	ISTD
MBGW02								
	0.5	N/A		Slope	Y-intercept		N/A	391005
	1	5607		3228.938	72.5504		0.354958	394906
	2.5	7600					0.188616	402935
	10	33115					0.213657	387479
	25	78109					0.205132	380774
	50	161791	Corr. Coeff	1.000			0.207782	389329
	75	240045					0.201315	397462
	100	325066					0.206474	393592
						0.057642	0.225419	25.57109
						SD	Ave Rf	RSD
Sample(s):		chloroethane						
	Linear Regression						Rf	ISTD
MBGW02								
	0.5	N/A		Slope	Y-intercept		N/A	391005
	1	6933		4278.933	1723.575		0.438902	394906
	2.5	11029					0.273717	402935
	10	45210					0.291693	387479
	25	104183					0.273608	380774
	50	219740	Corr. Coeff	1.000			0.282203	389329
	75	327280					0.274475	397462
	100	425189					0.27007	393592
						0.061388	0.300667	20.41733
						SD	Ave Rf	RSD

Sample(s):			chloromethane					
	Linear Regression						Rf	ISTD
TFGW01								
	0.5	N/A		Slope	Y-intercept		N/A	391005
	1	25957		12474.41	19958.67		1.643239	394906
	2.5	34788					0.863365	402935
	10	124212					0.801411	387479
	25	342983					0.900752	380774
	50	696561	Corr. Coeff	0.998			0.894566	389329
	75	979487					0.821451	397462
	100	1222730					0.776648	393592
						0.306012	0.957348	31.96459
						SD	Ave Rf	RSD
Sample(s):			vinyl chloride					
	Linear Regression						Rf	ISTD
TFGW01								
	0.5	N/A		Slope	Y-intercept		N/A	391005
	1	20835		10713.86	9977.916		1.318985	394906
	2.5	29398					0.729597	402935
	10	108160					0.697844	387479
	25	279681					0.734507	380774
	50	566166	Corr. Coeff	0.999			0.727105	389329
	75	827355					0.693865	397462
	100	1061352					0.674145	393592
						0.231431	0.796578	29.05319
						SD	Ave Rf	RSD

Hannah City Air Force Station
Linear Regression

Sample(s):			bromomethane					
	Linear Regression						Rf	ISTD
TFGW01								
	0.5	N/A		Slope	Y-intercept		N/A	391005
	1	5607		3228.938	72.5504		0.354958	394906
	2.5	7600					0.188616	402935
	10	33115					0.213657	387479
	25	78109					0.205132	380774
	50	161791	Corr. Coeff	1.000			0.207782	389329
	75	240045					0.201315	397462
	100	325066					0.206474	393592
						0.057642	0.225419	25.57109
						SD	Ave Rf	RSD
Sample(s):			chloroethane					
	Linear Regression						Rf	ISTD
TFGW01								
	0.5	N/A		Slope	Y-intercept		N/A	391005
	1	6933		4278.933	1723.575		0.438902	394906
	2.5	11029					0.273717	402935
	10	45210					0.291693	387479
	25	104183					0.273608	380774
	50	219740	Corr. Coeff	1.000			0.282203	389329
	75	327280					0.274475	397462
	100	425189					0.27007	393592
						0.061388	0.300667	20.41733
						SD	Ave Rf	RSD

ATTACHMENT 7

DATA QUALIFIERS

Prepared by Kerry R. Nusekabel

Volatiles	Water Samples	Units = ug/L	
Analyte	**VWGW03**	**MBGW02**	**TFGW01**
Chloromethane	< 1.0 **R**	**< 1.0 U**	**< 1.0 U**
Vinyl chloride	< 1.0 **UJ**	**< 1.0 U**	**< 1.0 U**
Bromomethane	< 1.0 **UJ**	**< 1.0 U**	**< 1.0 U**
Chloroethane	< 1.0 **UJ**	**< 1.0 U**	**< 1.0 U**
1,1-Dichloroethene	< 1.0 U	< 1.0 U	< 1.0 U
Carbon disulfide	< 2.0 U	< 2.0 U	< 2.0 **UJ**
Acetone	< 10 **UJ**	5.5 **J**	< 10 **UJ**
Methylene chloride	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,2-Dichloroethene	< 1.0 U	< 1.0 U	< 1.0 U
1,1-Dichloroethane	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,2-Dichloroethene	< 1.0 U	< 1.0 U	< 1.0 U
2-Butanone	< 10 **UJ**	< 10 **UJ**	< 10 U
Chloroform	< 1.0 U	< 1.0 U	< 1.0 U
1,1,1-Trichloroethane	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloroethane	< 1.0 U	< 1.0 U	< 1.0 U
Trichloroethene	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloropropane	< 1.0 U	< 1.0 U	< 1.0 U
Bromodichloromethane	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,3-Dichloropropene	< 1.0 U	< 1.0 U	< 1.0 U
4-Methyl-2-pentanone	< 10 U	< 10 U	< 10 U
Toluene	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,3-Dichloropropene	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2-Trichloroethane	< 1.0 U	< 1.0 U	< 1.0 U
Tetrachloroethane	< 1.0 U	< 1.0 U	< 1.0 U
2-Hexanone	< 10 U	< 10 U	< 10 U
Dibromochloromethane	< 1.0 U	< 1.0 U	< 1.0 U
Chlorobenzene	< 1.0 U	< 1.0 U	< 1.0 U
Ethylbenzene	< 1.0 U	< 1.0 U	< 1.0 U
m,p-Xylenes	< 2.0 U	< 2.0 U	< 2.0 U
o-Xylene	< 1.0 U	< 1.0 U	< 1.0 U
Styrene	< 1.0 U	< 1.0 U	< 1.0 U
Bromoform	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2,2-Tetrachloroethane	< 1.0 U	< 1.0 U	< 1.0 U

NR = Not reported
U = undetected analyte
J = Estimated value
R = Rejected value
UJ = Estimated detected value
B = Blank contamination
Bold indicates the qualifier

Volatiles (continued)	Soil Samples	Units = ug/kg	
Analyte	**VWSS01(0-0.5)**	**CCSB02(4-5)**	**PSSS02(0-0.5)**
Chloromethane	< 7.5 **UJ**	< 5.2 **UJ**	< 8.2 **UJ**
Vinyl chloride	< 7.5 **UJ**	< 5.2 **UJ**	< 8.2 **UJ**
Bromomethane	< 15 U	< 10 U	< 16 U
Chloroethane	< 7.5 U	< 5.2 U	< 8.2 U
1,1-Dichloroethene	< 7.5 **UJ**	< 5.2 **UJ**	< 8.2 **UJ**
Carbon disulfide	< 15 **UJ**	< 10 **UJ**	< 16 **UJ**
Acetone	110 **R**	< 21 **UJ**	150 **R**
Methylene chloride	< 15 U	< 10 U	< 16 U
trans-1,2-Dichloroethene	< 7.5 **UJ**	< 5.2 U	< 8.2 **UJ**
1,1-Dichloroethane	< 7.5 U	< 5.2 U	< 8.2 U
cis-1,2-Dichloroethene	< 7.5 U	< 5.2 U	< 8.2 U
2-Butanone	< 30 **R**	< 21 **UJ**	< 33 **UJ**
Chloroform	< 7.5 U	< 5.2 U	< 8.2 U
1,1,1-Trichloroethane	< 7.5 U	< 5.2 U	< 8.2 U
Benzene	< 7.5 U	< 5.2 U	< 8.2 U
1,2-Dichloroethane	< 7.5 U	< 5.2 U	< 8.2 U
Trichloroethene	< 7.5 U	< 5.2 U	< 8.2 U
1,2-Dichloropropane	< 7.5 U	< 5.2 U	< 8.2 U
Bromodichloromethane	< 7.5 U	< 5.2 U	< 8.2 U
cis-1,3-Dichloropropene	< 7.5 U	< 5.2 **UJ**	< 8.2 **UJ**
4-Methyl-2-pentanone	< 30 **UJ**	< 21 U	< 33 **UJ**
Toluene	< 7.5 U	< 5.2 U	< 8.2 U
trans-1,3-Dichloropropene	< 7.5 U	< 5.2 **UJ**	< 8.2 **UJ**
1,1,2-Trichloroethane	< 7.5 U	< 5.2 U	< 8.2 U
Tetrachloroethane	< 7.5 **UJ**	< 5.2 U	< 8.2 **UJ**
2-Hexanone	< 30 **UJ**	< 21 U	< 33 **UJ**
Dibromochloromethane	< 7.5 **UJ**	< 5.2 U	< 8.2 **UJ**
Chlorobenzene	< 7.5 **UJ**	< 5.2 U	< 8.2 U
Ethylbenzene	< 7.5 **UJ**	< 5.2 U	< 8.2 U
m,p-Xylenes	< 15 **UJ**	< 10 U	< 16 U
o-Xylene	< 7.5 **UJ**	< 5.2 U	< 8.2 U
Styrene	< 7.5 **UJ**	< 5.2 U	< 8.2 **UJ**
Bromoform	< 7.5 **UJ**	< 5.2 U	< 8.2 **UJ**
1,1,2,2-Tetrachloroethane	< 7.5 **UJ**	< 5.2 U	< 8.2 U

NR = Not reported
U = undetected analyte
J = Estimated value
R = Rejected value
UJ = Estimated detected value
B = Blank contamination
Bold indicates the qualifier

PAH's	Water Samples	Units = ug/L
Analyte	**VWGW03**	**MBGW02**
Naphthalene	< 1.1 U	< 1.1 U
Acenaphthylene	< 1.1 U	< 1.1 U
Acenaphthene	< 1.1 U	< 1.1 U
Fluorene	< 1.1 **UJ**	< 1.1 **UJ**
Phenanthrene	< 1.1 **UJ**	< 1.1 **UJ**
Anthracene	< 1.1 **UJ**	< 1.1 **UJ**
Fluoranthene	< 1.1 **UJ**	< 1.1 **UJ**
Pyrene	< 1.1 U	< 1.1 **UJ**
Benzo(a)anthracene	< 0.14 U	< 0.14 **UJ**
Chrysene	< 0.54 **UJ**	< 0.54 **UJ**
Benzo(b)fluoranthene	< 0.19 U	< 0.19 U
Benzo(k)fluoranthene	< 0.18 U	< 0.18 U
Benzo(a)pyrene	< 0.22 U	< 0.22 U
Indeno(1,2,3-cd)pyrene	< 0.22 U	< 0.22 **UJ**
Dibenz(a,h)anthracene	< 0.32 U	< 0.32 U
Benzo(g,h,i)perylene	< 1.1 U	< 1.1 U

PAH's	Soil Samples	Units = ug/kg
Analyte	**VWSS01(0-0.5)**	**PSSS02(0-0.5)**
Naphthalene	12 J	54
Acenaphthylene	< 41 U	< 41 U
Acenaphthene	170	11 J
Fluorene	130	11 J
Phenanthrene	2100	240
Anthracene	260	27 J
Fluoranthene	2500 **J**	350
Pyrene	2300 **J**	270
Benzo(a)anthracene	950	140
Chrysene	1200	210
Benzo(b)fluoranthene	1300	220
Benzo(k)fluoranthene	870	170
Benzo(a)pyrene	1100	200
Indeno(1,2,3-cd)pyrene	770	140
Dibenz(a,h)anthracene	290	53
Benzo(g,h,i)perylene	910	200

NR = Not reported
U = undetected analyte
J = Estimated value
R = Rejected value
UJ = Estimated detected value
B = Blank contamination
Bold indicates the qualifier

PCB's	Water Samples	Units = ug/L
Analyte	**MBGW02**	
Aroclor-1016	< 0.50 U	
Aroclor-1221	< 0.50 U	
Aroclor-1232	< 0.50 U	
Aroclor-1242	< 0.50 **UJ**	
Aroclor-1248	< 0.50 **UJ**	
Aroclor-1254	< 0.50 **UJ**	
Aroclor-1260	< 0.50 **UJ**	

PCB's	Soil Samples	Units = ug/kg
Analyte	**MBSS01(0-0.5)**	
Aroclor-1016	< 100 U	
Aroclor-1221	< 100 U	
Aroclor-1232	< 100 U	
Aroclor-1242	< 100 U	
Aroclor-1248	< 100 U	
Aroclor-1254	< 100 U	
Aroclor-1260	< 100 U	

NR = Not reported
U = undetected analyte
J = Estimated value
R = Rejected value
UJ = Estimated detected value
B = Blank contamination
Bold indicates the qualifier

TAL-Metals	Water Samples	Units = mg/L
Analyte	**VWGW03**	**CBGW01**
Aluminum	34	4.9
Antimony	0.002	< 0.0060 U
Arsenic	0.014 **B**	0.0023 B
Barium	0.45	0.14
Beryllium	0.0015	0.00022
Cadmium	< 0.0020 U	< 0.0020 U
Calcium	170	73
Chromium	0.050	0.0075 B
Cobalt	0.0099 **J**	0.0017 B
Copper	0.035	0.014
Iron	41 **J**	5.4
Lead	0.014 **B**	0.0026 **B**
Magnesium	100	37
Manganese	0.42 **J**	0.10
Mercury	< 0.00050 U	< 0.00050 U
Nickel	0.032	0.0065 B
Potassium	4.6	1.2
Selenium	< 0.015 U	0.0052 B
Silver	< 0.0050 U	< 0.0050 U
Sodium	44	34
Thallium	< 0.0020 U	< 0.0020 U
Vanadium	0.096	0.013 **B**
Zinc	0.078	0.025

NR = Not reported
U = undetected analyte
J = Estimated value
R = Rejected value
UJ = Estimated detected value
B = Blank contamination
Bold indicates the qualifier

TAL-Metals	Soil Samples	Units = mg/kg
Analyte	**VWSS01(0-0.5)**	**CCSB02(4-5)**
Aluminum	11000	9700
Antimony	< 2.3 **UJ**	0.71 **J**
Arsenic	8.7	11 **J**
Barium	150	170
Beryllium	0.59	0.58
Cadmium	< 0.23 U	< 0.21 **UJ**
Calcium	3300 **J**	2700 **J**
Chromium	17	14 **J**
Cobalt	7.8 **J**	11 **J**
Copper	20	21
Iron	20000 **J**	20000 **J**
Lead	17	13 **J**
Magnesium	2900 **J**	2700 **J**
Manganese	470 **J**	1000 **J**
Mercury	0.10	0.043
Nickel	22	39
Potassium	820	610 **J**
Selenium	< 1.7 U	0.64 B
Silver	< 0.57 U	< 0.54 U
Sodium	99	230
Thallium	< 2.8 U	< 2.7 **UJ**
Vanadium	27	27 **J**
Zinc	61 **J**	50 **J**

Pb-Lead	Water Samples	Units = ug/L
Analyte	**PSGW02**	
Lead	0.0036 **B**	

Pb-Lead	Soil Samples	Units = mg/kg
Analyte	**PSSS02(0-0.5)**	
Lead	26	

NR = Not reported
U = undetected analyte
J = Estimated value
R = Rejected value
UJ = Estimated detected value
B = Blank contamination
Bold indicates the qualifier

APPENDIX I

HUMAN HEALTH RISK ASSESSMENT EQUATIONS FOR ESTIMATING EXPOSURE AND RISK FROM MUTAGENIC CARCINOGENS USING AGE-DEPENDENT ADJUSTMENT FACTORS

APPENDIX J

PROUCL 4.0 AND EXPOSURE CALCULATION RESULTS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	F:\Hanna City Data\Data tables\HCCA EU PAH Surface.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics

Minimum	14
Maximum	3500
Mean	663.5
Median	120
SD	1189
Coefficient of Variation	1.792
Skewness	2.168

Log-transformed Statistics

Minimum of Log Data	2.639
Maximum of Log Data	8.161
Mean of log Data	5.103
SD of log Data	1.782

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.616
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1400

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1621
95% Modified-t UCL	1448

Assuming Lognormal Distribution

95% H-UCL	20577
95% Chebyshev (MVUE) UCL	2098
97.5% Chebyshev (MVUE) UCL	2756
99% Chebyshev (MVUE) UCL	4049

Gamma Distribution Test

k star (bias corrected)	0.381
Theta Star	1739
nu star	6.867
Approximate Chi Square Value (.05)	2.098
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.588
Anderson-Darling Test Statistic	0.717
Anderson-Darling 5% Critical Value	0.778
Kolmogorov-Smirnov Test Statistic	0.285
Kolmogorov-Smirnov 5% Critical Value	0.296

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1315
95% Jackknife UCL	1400
95% Standard Bootstrap UCL	1299
95% Bootstrap-t UCL	8836
95% Hall's Bootstrap UCL	5622
95% Percentile Bootstrap UCL	1379
95% BCA Bootstrap UCL	1617
95% Chebyshev(Mean, Sd) UCL	2391
97.5% Chebyshev(Mean, Sd) UCL	3139
99% Chebyshev(Mean, Sd) UCL	4607

Assuming Gamma Distribution

95% Approximate Gamma UCL	2172
95% Adjusted Gamma UCL	2869

Potential UCL to Use Use 95% Adjusted Gamma UCL 2869

Benzo(b)fluoranthene

General Statistics

Number of Valid Observations 9 Number of Distinct Observations 9

Raw Statistics

Minimum	25
Maximum	2800
Mean	635.1
Median	160
SD	982.7
Coefficient of Variation	1.547
Skewness	1.837

Log-transformed Statistics

Minimum of Log Data	3.219
Maximum of Log Data	7.937
Mean of log Data	5.393
SD of log Data	1.568

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.668
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1244

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1388
95% Modified-t UCL	1278

Assuming Lognormal Distribution

95% H-UCL	9685
95% Chebyshev (MVUE) UCL	1991
97.5% Chebyshev (MVUE) UCL	2594
99% Chebyshev (MVUE) UCL	3781

Gamma Distribution Test

k star (bias corrected)	0.464
Theta Star	1369
nu star	8.351
Approximate Chi Square Value (.05)	2.94
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	2.306
Anderson-Darling Test Statistic	0.589
Anderson-Darling 5% Critical Value	0.764
Kolmogorov-Smirnov Test Statistic	0.235
Kolmogorov-Smirnov 5% Critical Value	0.292

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1174
95% Jackknife UCL	1244
95% Standard Bootstrap UCL	1157
95% Bootstrap-t UCL	4693
95% Hall's Bootstrap UCL	4354
95% Percentile Bootstrap UCL	1205
95% BCA Bootstrap UCL	1344
95% Chebyshev(Mean, Sd) UCL	2063
97.5% Chebyshev(Mean, Sd) UCL	2681
99% Chebyshev(Mean, Sd) UCL	3894

Assuming Gamma Distribution

95% Approximate Gamma UCL	1804
95% Adjusted Gamma UCL	2300

Potential UCL to Use Use 95% Approximate Gamma UCL 1804

Benzo(k)fluoranthene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	7.4	Minimum of Log Data	2.001
Maximum	2000	Maximum of Log Data	7.601
Mean	372.6	Mean of log Data	4.437
Median	56	SD of log Data	1.858
SD	676.6		
Coefficient of Variation	1.816		
Skewness	2.206		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.618	Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	792	95% H-UCL	15829
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1221
95% Adjusted-CLT UCL	920.8	97.5% Chebyshev (MVUE) UCL	1607
95% Modified-t UCL	819.6	99% Chebyshev (MVUE) UCL	2366

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.366	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1019	
nu star	6.581	
Approximate Chi Square Value (.05)	1.943	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 743.6
Adjusted Chi Square Value	1.459	95% Jackknife UCL 792
		95% Standard Bootstrap UCL 724.3
Anderson-Darling Test Statistic	0.663	95% Bootstrap-t UCL 4079
Anderson-Darling 5% Critical Value	0.782	95% Hall's Bootstrap UCL 3265
Kolmogorov-Smirnov Test Statistic	0.265	95% Percentile Bootstrap UCL 761.2
Kolmogorov-Smirnov 5% Critical Value	0.296	95% BCA Bootstrap UCL 921.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1356
		97.5% Chebyshev(Mean, Sd) UCL 1781
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2617
95% Approximate Gamma UCL	1262	
95% Adjusted Gamma UCL	1681	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 1681

Benzo(a)pyrene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	13	Minimum of Log Data	2.565

Maximum	3000	Maximum of Log Data	8.006
Mean	619.9	Mean of log Data	4.985
Median	100	SD of log Data	1.834
SD	1076		
Coefficient of Variation	1.735		
Skewness	1.876		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.627
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1287
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	1449
95% Modified-t UCL	1324

Assuming Lognormal Distribution

95% H-UCL	24071
95% Chebyshev (MVUE) UCL	2031
97.5% Chebyshev (MVUE) UCL	2672
99% Chebyshev (MVUE) UCL	3931

Gamma Distribution Test

k star (bias corrected)	0.372
Theta Star	1665
nu star	6.703
Approximate Chi Square Value (.05)	2.009
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.513
Anderson-Darling Test Statistic	0.76
Anderson-Darling 5% Critical Value	0.78
Kolmogorov-Smirnov Test Statistic	0.289
Kolmogorov-Smirnov 5% Critical Value	0.296

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1210
95% Jackknife UCL	1287
95% Standard Bootstrap UCL	1167
95% Bootstrap-t UCL	8608
95% Hall's Bootstrap UCL	5754
95% Percentile Bootstrap UCL	1237
95% BCA Bootstrap UCL	1350
95% Chebyshev(Mean, Sd) UCL	2183
97.5% Chebyshev(Mean, Sd) UCL	2859
99% Chebyshev(Mean, Sd) UCL	4187

Assuming Gamma Distribution

95% Approximate Gamma UCL	2068
95% Adjusted Gamma UCL	2746

Potential UCL to Use

Use 95% Adjusted Gamma UCL 2746

Indeno(1,2,3-cd)pyrene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics

Minimum	12
Maximum	2300
Mean	472.7
Median	70
SD	834.7
Coefficient of Variation	1.766

Log-transformed Statistics

Minimum of Log Data	2.485
Maximum of Log Data	7.741
Mean of log Data	4.674
SD of log Data	1.809

Skewness 1.85

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.616
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	990.1

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1114
95% Modified-t UCL	1019

Assuming Lognormal Distribution

95% H-UCL	15434
95% Chebyshev (MVUE) UCL	1429
97.5% Chebyshev (MVUE) UCL	1878
99% Chebyshev (MVUE) UCL	2761

Gamma Distribution Test

k star (bias corrected)	0.366
Theta Star	1293
nu star	6.58
Approximate Chi Square Value (.05)	1.943
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.458
Anderson-Darling Test Statistic	0.927
Anderson-Darling 5% Critical Value	0.782
Kolmogorov-Smirnov Test Statistic	0.309
Kolmogorov-Smirnov 5% Critical Value	0.296

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1601
95% Adjusted Gamma UCL	2133

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	930.3
95% Jackknife UCL	990.1
95% Standard Bootstrap UCL	904.9
95% Bootstrap-t UCL	7879
95% Hall's Bootstrap UCL	5041
95% Percentile Bootstrap UCL	956.6
95% BCA Bootstrap UCL	1049
95% Chebyshev(Mean, Sd) UCL	1685
97.5% Chebyshev(Mean, Sd) UCL	2210
99% Chebyshev(Mean, Sd) UCL	3241

Potential UCL to Use

Use 99% Chebyshev (MVUE) UCL 2761

Recommended UCL exceeds the maximum observation

Dibenzo(a,h)anthracene

General Statistics

Number of Valid Observations	9
Number of Distinct Observations	8

Raw Statistics

Minimum	2.6
Maximum	690
Mean	162.3
Median	18
SD	288.3
Coefficient of Variation	1.777
Skewness	1.618

Log-transformed Statistics

Minimum of Log Data	0.956
Maximum of Log Data	6.537
Mean of log Data	3.38
SD of log Data	1.977

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.58
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.878
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	341

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	375.7
95% Modified-t UCL	349.6

Assuming Lognormal Distribution

95% H-UCL	10725
95% Chebyshev (MVUE) UCL	516.2
97.5% Chebyshev (MVUE) UCL	681.8
99% Chebyshev (MVUE) UCL	1007

Gamma Distribution Test

k star (bias corrected)	0.332
Theta Star	488.6
nu star	5.978
Approximate Chi Square Value (.05)	1.628
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.198
Anderson-Darling Test Statistic	1.044
Anderson-Darling 5% Critical Value	0.791
Kolmogorov-Smirnov Test Statistic	0.321
Kolmogorov-Smirnov 5% Critical Value	0.298

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	595.6
95% Adjusted Gamma UCL	809.9

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	320.3
95% Jackknife UCL	341
95% Standard Bootstrap UCL	310.4
95% Bootstrap-t UCL	3399
95% Hall's Bootstrap UCL	2620
95% Percentile Bootstrap UCL	310.5
95% BCA Bootstrap UCL	376
95% Chebyshev(Mean, Sd) UCL	581.1
97.5% Chebyshev(Mean, Sd) UCL	762.4
99% Chebyshev(Mean, Sd) UCL	1118

Potential UCL to Use Use 99% Chebyshev (MVUE) UCL 1007

Recommended UCL exceeds the maximum observation

General UCL Statistics for Full Data Sets

User Selected Options

From File	F:\Hanna City Data\Data tables\HCCB EU PAH Surface.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	120	Minimum of Log Data	4.787
Maximum	14000	Maximum of Log Data	9.547
Mean	1788	Mean of log Data	6.365
Median	420	SD of log Data	1.305
SD	4076		
Coefficient of Variation	2.279		
Skewness	3.243		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.438	Shapiro Wilk Test Statistic	0.89
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4015	95% H-UCL	6050
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3429
95% Adjusted-CLT UCL	5094	97.5% Chebyshev (MVUE) UCL	4391
95% Modified-t UCL	4216	99% Chebyshev (MVUE) UCL	6280

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.465	**Data appear Lognormal at 5% Significance Level**	
Theta Star	3845		
nu star	10.23		
Approximate Chi Square Value (.05)	4.088	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	3809
Adjusted Chi Square Value	3.478	95% Jackknife UCL	4015
		95% Standard Bootstrap UCL	3699
Anderson-Darling Test Statistic	1.371	95% Bootstrap-t UCL	21639
Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	13325
Kolmogorov-Smirnov Test Statistic	0.287	95% Percentile Bootstrap UCL	4154
Kolmogorov-Smirnov 5% Critical Value	0.268	95% BCA Bootstrap UCL	5414
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7145
		97.5% Chebyshev(Mean, Sd) UCL	9462
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	14015
95% Approximate Gamma UCL	4476		
95% Adjusted Gamma UCL	5262		

Potential UCL to Use		Use 95% Chebyshev (MVUE) UCL	3429

Benzo(b)fluoranthene

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		Log-transformed Statistics	
Minimum	96	Minimum of Log Data	4.564
Maximum	14000	Maximum of Log Data	9.547
Mean	1898	Mean of log Data	6.488
Median	560	SD of log Data	1.352
SD	4053		
Coefficient of Variation	2.135		
Skewness	3.204		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.462	Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4113	95% H-UCL	8026
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4178
95% Adjusted-CLT UCL	5170	97.5% Chebyshev (MVUE) UCL	5365
95% Modified-t UCL	4310	99% Chebyshev (MVUE) UCL	7697

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.486	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	3907		
nu star	10.69		
Approximate Chi Square Value (.05)	4.377	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	3908
Adjusted Chi Square Value	3.741	95% Jackknife UCL	4113
		95% Standard Bootstrap UCL	3809
Anderson-Darling Test Statistic	1.075	95% Bootstrap-t UCL	17957
Anderson-Darling 5% Critical Value	0.775	95% Hall's Bootstrap UCL	12159
Kolmogorov-Smirnov Test Statistic	0.253	95% Percentile Bootstrap UCL	4247
Kolmogorov-Smirnov 5% Critical Value	0.268	95% BCA Bootstrap UCL	5594
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7225
		97.5% Chebyshev(Mean, Sd) UCL	9530
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	14057
95% Approximate Gamma UCL	4636		
95% Adjusted Gamma UCL	5424		

Potential UCL to Use		
	Use 95% Approximate Gamma UCL	4636

Benzo(k)fluoranthene

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		Log-transformed Statistics	
Minimum	36	Minimum of Log Data	3.584
Maximum	7000	Maximum of Log Data	8.854
Mean	898	Mean of log Data	5.61
Median	220	SD of log Data	1.393
SD	2042		
Coefficient of Variation	2.274		
Skewness	3.215		

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.448
Shapiro Wilk Critical Value	0.85

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.85

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2014
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	2548
95% Modified-t UCL	2113

Assuming Lognormal Distribution

95% H-UCL	3846
95% Chebyshev (MVUE) UCL	1853
97.5% Chebyshev (MVUE) UCL	2385
99% Chebyshev (MVUE) UCL	3430

Gamma Distribution Test

k star (bias corrected)	0.445
Theta Star	2017
nu star	9.797
Approximate Chi Square Value (.05)	3.815
Adjusted Level of Significance	0.0278
Adjusted Chi Square Value	3.23
Anderson-Darling Test Statistic	1.266
Anderson-Darling 5% Critical Value	0.779
Kolmogorov-Smirnov Test Statistic	0.31
Kolmogorov-Smirnov 5% Critical Value	0.269

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	2306
95% Adjusted Gamma UCL	2723

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1911
95% Jackknife UCL	2014
95% Standard Bootstrap UCL	1855
95% Bootstrap-t UCL	11918
95% Hall's Bootstrap UCL	6549
95% Percentile Bootstrap UCL	2094
95% BCA Bootstrap UCL	2697
95% Chebyshev(Mean, Sd) UCL	3582
97.5% Chebyshev(Mean, Sd) UCL	4743
99% Chebyshev(Mean, Sd) UCL	7024

Potential UCL to Use

Use 95% Chebyshev (MVUE) UCL 1853

Benzo(a)pyrene

General Statistics

Number of Valid Observations	11
Number of Distinct Observations	11

Raw Statistics

Minimum	94
Maximum	11000
Mean	1471
Median	430
SD	3186
Coefficient of Variation	2.166
Skewness	3.221

Log-transformed Statistics

Minimum of Log Data	4.543
Maximum of Log Data	9.306
Mean of log Data	6.259
SD of log Data	1.286

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.451
Shapiro Wilk Critical Value	0.85

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.85

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3213
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	4049
95% Modified-t UCL	3368

Assuming Lognormal Distribution

95% H-UCL	5115
95% Chebyshev (MVUE) UCL	2993
97.5% Chebyshev (MVUE) UCL	3828
99% Chebyshev (MVUE) UCL	5469

Gamma Distribution Test

k star (bias corrected)	0.495
Theta Star	2973
nu star	10.89
Approximate Chi Square Value (.05)	4.505
Adjusted Level of Significance	0.0278
Adjusted Chi Square Value	3.858
Anderson-Darling Test Statistic	1.259
Anderson-Darling 5% Critical Value	0.774
Kolmogorov-Smirnov Test Statistic	0.302
Kolmogorov-Smirnov 5% Critical Value	0.267

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	3052
95% Jackknife UCL	3213
95% Standard Bootstrap UCL	3008
95% Bootstrap-t UCL	15358
95% Hall's Bootstrap UCL	9895
95% Percentile Bootstrap UCL	3346
95% BCA Bootstrap UCL	4300
95% Chebyshev(Mean, Sd) UCL	5659
97.5% Chebyshev(Mean, Sd) UCL	7471
99% Chebyshev(Mean, Sd) UCL	11031

Assuming Gamma Distribution

95% Approximate Gamma UCL	3556
95% Adjusted Gamma UCL	4153

Potential UCL to Use

Use 95% Chebyshev (MVUE) UCL 2993

Indeno(1,2,3-cd)pyrene

General Statistics

Number of Valid Observations	11
Number of Distinct Observations	10

Raw Statistics

Minimum	53
Maximum	6600
Mean	923.9
Median	300
SD	1903
Coefficient of Variation	2.06
Skewness	3.193

Log-transformed Statistics

Minimum of Log Data	3.97
Maximum of Log Data	8.795
Mean of log Data	5.843
SD of log Data	1.311

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.468
Shapiro Wilk Critical Value	0.85

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical Value	0.85

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1964

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2458
95% Modified-t UCL	2056

Assuming Lognormal Distribution

95% H-UCL	3661
95% Chebyshev (MVUE) UCL	2054
97.5% Chebyshev (MVUE) UCL	2631
99% Chebyshev (MVUE) UCL	3764

Gamma Distribution Test

k star (bias corrected)	0.514
Theta Star	1797
nu star	11.31
Approximate Chi Square Value (.05)	4.777
Adjusted Level of Significance	0.0278
Adjusted Chi Square Value	4.107
Anderson-Darling Test Statistic	1.101
Anderson-Darling 5% Critical Value	0.772

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1868
95% Jackknife UCL	1964
95% Standard Bootstrap UCL	1817
95% Bootstrap-t UCL	8069
95% Hall's Bootstrap UCL	5774

Kolmogorov-Smirnov Test Statistic	0.264	95% Percentile Bootstrap UCL	2044
Kolmogorov-Smirnov 5% Critical Value	0.267	95% BCA Bootstrap UCL	2665
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3425
		97.5% Chebyshev(Mean, Sd) UCL	4507
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	6633
95% Approximate Gamma UCL	2188		
95% Adjusted Gamma UCL	2545		
Potential UCL to Use		Use 95% Approximate Gamma UCL	2188

Dibenzo(a,h)anthracene

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	8.6	Minimum of Log Data	2.152
Maximum	2000	Maximum of Log Data	7.601
Mean	280.1	Mean of log Data	4.556
Median	85	SD of log Data	1.483
SD	576.4		
Coefficient of Variation	2.058		
Skewness	3.195		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.475	Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	595.1	95% H-UCL	1866
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	747.9
95% Adjusted-CLT UCL	744.8	97.5% Chebyshev (MVUE) UCL	967
95% Modified-t UCL	623	99% Chebyshev (MVUE) UCL	1398
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.48	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	583.9		
nu star	10.55		
Approximate Chi Square Value (.05)	4.29	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	566
Adjusted Chi Square Value	3.662	95% Jackknife UCL	595.1
		95% Standard Bootstrap UCL	549.7
Anderson-Darling Test Statistic	0.829	95% Bootstrap-t UCL	2133
Anderson-Darling 5% Critical Value	0.775	95% Hall's Bootstrap UCL	1794
Kolmogorov-Smirnov Test Statistic	0.248	95% Percentile Bootstrap UCL	622
Kolmogorov-Smirnov 5% Critical Value	0.268	95% BCA Bootstrap UCL	776.6
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1038
		97.5% Chebyshev(Mean, Sd) UCL	1365
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2009
95% Approximate Gamma UCL	689		
95% Adjusted Gamma UCL	807.1		
Potential UCL to Use		Use 95% Approximate Gamma UCL	689

General UCL Statistics for Full Data Sets

User Selected Options

From File	F:\Hanna City Data\Data tables\HCCC EU PAH Surface.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	28	Number of Distinct Observations	26

Raw Statistics

Minimum	92
Maximum	18000
Mean	2096
Median	335
SD	4361
Coefficient of Variation	2.08
Skewness	3.027

Log-transformed Statistics

Minimum of Log Data	4.522
Maximum of Log Data	9.798
Mean of log Data	6.37
SD of log Data	1.484

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.503
Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.924

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3500

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	3956
95% Modified-t UCL	3579

Assuming Lognormal Distribution

95% H-UCL	4267
95% Chebyshev (MVUE) UCL	4118
97.5% Chebyshev (MVUE) UCL	5195
99% Chebyshev (MVUE) UCL	7309

Gamma Distribution Test

k star (bias corrected)	0.468
Theta Star	4480
nu star	26.21
Approximate Chi Square Value (.05)	15.54
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	15.03
Anderson-Darling Test Statistic	2.407
Anderson-Darling 5% Critical Value	0.811
Kolmogorov-Smirnov Test Statistic	0.245
Kolmogorov-Smirnov 5% Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3536
95% Adjusted Gamma UCL	3655

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	3452
95% Jackknife UCL	3500
95% Standard Bootstrap UCL	3426
95% Bootstrap-t UCL	6143
95% Hall's Bootstrap UCL	9112
95% Percentile Bootstrap UCL	3471
95% BCA Bootstrap UCL	3951
95% Chebyshev(Mean, Sd) UCL	5689
97.5% Chebyshev(Mean, Sd) UCL	7243
99% Chebyshev(Mean, Sd) UCL	10296

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 10296

Chrysene

General Statistics

Number of Valid Observations 28

Number of Distinct Observations 25

Raw Statistics

Minimum	110
Maximum	21000
Mean	2344
Median	390
SD	4929
Coefficient of Variation	2.103
Skewness	3.168

Log-transformed Statistics

Minimum of Log Data	4.7
Maximum of Log Data	9.952
Mean of log Data	6.521
SD of log Data	1.455

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.49
Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.893
Shapiro Wilk Critical Value	0.924

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3930

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4472
95% Modified-t UCL	4023

Assuming Lognormal Distribution

95% H-UCL	4612
95% Chebyshev (MVUE) UCL	4536
97.5% Chebyshev (MVUE) UCL	5710
99% Chebyshev (MVUE) UCL	8016

Gamma Distribution Test

k star (bias corrected)	0.48
Theta Star	4881
nu star	26.89
Approximate Chi Square Value (.05)	16.06
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	15.55
Anderson-Darling Test Statistic	2.421
Anderson-Darling 5% Critical Value	0.809
Kolmogorov-Smirnov Test Statistic	0.235
Kolmogorov-Smirnov 5% Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3923
95% Adjusted Gamma UCL	4053

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	3876
95% Jackknife UCL	3930
95% Standard Bootstrap UCL	3847
95% Bootstrap-t UCL	7406
95% Hall's Bootstrap UCL	10909
95% Percentile Bootstrap UCL	4091
95% BCA Bootstrap UCL	4506
95% Chebyshev(Mean, Sd) UCL	6404
97.5% Chebyshev(Mean, Sd) UCL	8161
99% Chebyshev(Mean, Sd) UCL	11612

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 11612

Benzo(b)fluoranthene

General Statistics

Number of Valid Observations 28

Number of Distinct Observations 26

Raw Statistics

Minimum	140
Maximum	31000
Mean	2914
Median	550
SD	7031
Coefficient of Variation	2.412
Skewness	3.485

Log-transformed Statistics

Minimum of Log Data	4.942
Maximum of Log Data	10.34
Mean of log Data	6.693
SD of log Data	1.385

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.42
Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical Value	0.924

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	5177

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	6035
95% Modified-t UCL	5323

Assuming Lognormal Distribution

95% H-UCL	4639
95% Chebyshev (MVUE) UCL	4753
97.5% Chebyshev (MVUE) UCL	5953
99% Chebyshev (MVUE) UCL	8312

Gamma Distribution Test

k star (bias corrected)	0.466
Theta Star	6255
nu star	26.09
Approximate Chi Square Value (.05)	15.45
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	14.94
Anderson-Darling Test Statistic	2.981
Anderson-Darling 5% Critical Value	0.811
Kolmogorov-Smirnov Test Statistic	0.27
Kolmogorov-Smirnov 5% Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	4922
95% Adjusted Gamma UCL	5088

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	5100
95% Jackknife UCL	5177
95% Standard Bootstrap UCL	5006
95% Bootstrap-t UCL	14450
95% Hall's Bootstrap UCL	15586
95% Percentile Bootstrap UCL	5224
95% BCA Bootstrap UCL	6134
95% Chebyshev(Mean, Sd) UCL	8706
97.5% Chebyshev(Mean, Sd) UCL	11212
99% Chebyshev(Mean, Sd) UCL	16134

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 16134

Benzo(k)fluoranthene

General Statistics

Number of Valid Observations	28
Number of Distinct Observations	26

Raw Statistics

Minimum	41
Maximum	9600
Mean	1199
Median	215
SD	2446
Coefficient of Variation	2.04
Skewness	2.908

Log-transformed Statistics

Minimum of Log Data	3.714
Maximum of Log Data	9.17
Mean of log Data	5.817
SD of log Data	1.5

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.508
Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.924

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1986

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2231
95% Modified-t UCL	2028

Assuming Lognormal Distribution

95% H-UCL	2556
95% Chebyshev (MVUE) UCL	2440
97.5% Chebyshev (MVUE) UCL	3081
99% Chebyshev (MVUE) UCL	4340

Gamma Distribution Test

k star (bias corrected)	0.47
Theta Star	2553
nu star	26.3
Approximate Chi Square Value (.05)	15.61
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	15.1
Anderson-Darling Test Statistic	2.226
Anderson-Darling 5% Critical Value	0.81
Kolmogorov-Smirnov Test Statistic	0.232
Kolmogorov-Smirnov 5% Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	1959
95% Jackknife UCL	1986
95% Standard Bootstrap UCL	1938
95% Bootstrap-t UCL	3179
95% Hall's Bootstrap UCL	4679
95% Percentile Bootstrap UCL	2011
95% BCA Bootstrap UCL	2234
95% Chebyshev(Mean, Sd) UCL	3214
97.5% Chebyshev(Mean, Sd) UCL	4085
99% Chebyshev(Mean, Sd) UCL	5798

Assuming Gamma Distribution

95% Approximate Gamma UCL	2020
95% Adjusted Gamma UCL	2088

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 5798

Benzo(a)pyrene

General Statistics

Number of Valid Observations	28
Number of Distinct Observations	25

Raw Statistics

Minimum	80
Maximum	19000
Mean	2084
Median	390
SD	4527
Coefficient of Variation	2.172
Skewness	3.203

Log-transformed Statistics

Minimum of Log Data	4.382
Maximum of Log Data	9.852
Mean of log Data	6.38
SD of log Data	1.461

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.474
Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical Value	0.924

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3541

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4045
95% Modified-t UCL	3628

Assuming Lognormal Distribution

95% H-UCL	4069
95% Chebyshev (MVUE) UCL	3986
97.5% Chebyshev (MVUE) UCL	5020
99% Chebyshev (MVUE) UCL	7052

Gamma Distribution Test

k star (bias corrected)	0.473
Theta Star	4407
nu star	26.48
Approximate Chi Square Value (.05)	15.75
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	15.24
Anderson-Darling Test Statistic	2.297
Anderson-Darling 5% Critical Value	0.81

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	3491
95% Jackknife UCL	3541
95% Standard Bootstrap UCL	3481
95% Bootstrap-t UCL	7050
95% Hall's Bootstrap UCL	9686

Kolmogorov-Smirnov Test Statistic	0.246
Kolmogorov-Smirnov 5% Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3504
95% Adjusted Gamma UCL	3622

95% Percentile Bootstrap UCL	3599
95% BCA Bootstrap UCL	4102
95% Chebyshev(Mean, Sd) UCL	5813
97.5% Chebyshev(Mean, Sd) UCL	7427
99% Chebyshev(Mean, Sd) UCL	10596

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 10596

Indeno(1,2,3-cd)pyrene

General Statistics

Number of Valid Observations	28	Number of Distinct Observations	24

Raw Statistics		**Log-transformed Statistics**	
Minimum	56	Minimum of Log Data	4.025
Maximum	14000	Maximum of Log Data	9.547
Mean	1455	Mean of log Data	6.031
Median	285	SD of log Data	1.421
SD	3335		
Coefficient of Variation	2.293		
Skewness	3.346		

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.437
Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2528

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2917
95% Modified-t UCL	2594

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.923
Shapiro Wilk Critical Value	0.924

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	2608
95% Chebyshev (MVUE) UCL	2617
97.5% Chebyshev (MVUE) UCL	3287
99% Chebyshev (MVUE) UCL	4603

Gamma Distribution Test

k star (bias corrected)	0.476
Theta Star	3055
nu star	26.66
Approximate Chi Square Value (.05)	15.89
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	15.37
Anderson-Darling Test Statistic	2.437
Anderson-Darling 5% Critical Value	0.81
Kolmogorov-Smirnov Test Statistic	0.232
Kolmogorov-Smirnov 5% Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	2441
95% Adjusted Gamma UCL	2522

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	2491
95% Jackknife UCL	2528
95% Standard Bootstrap UCL	2459
95% Bootstrap-t UCL	6490
95% Hall's Bootstrap UCL	7482
95% Percentile Bootstrap UCL	2499
95% BCA Bootstrap UCL	3128
95% Chebyshev(Mean, Sd) UCL	4202
97.5% Chebyshev(Mean, Sd) UCL	5390
99% Chebyshev(Mean, Sd) UCL	7725

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 7725

Dibenzo(a,h)anthracene

General Statistics

Number of Valid Observations	28	Number of Distinct Observations	26

Raw Statistics		Log-transformed Statistics	
Minimum	15	Minimum of Log Data	2.708
Maximum	3600	Maximum of Log Data	8.189
Mean	458.4	Mean of log Data	4.848
Median	81.5	SD of log Data	1.538
SD	910.4		
Coefficient of Variation	1.986		
Skewness	2.847		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.525	Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical Value	0.924	Shapiro Wilk Critical Value	0.924
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	751.5	95% H-UCL	1068
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	993.1
95% Adjusted-CLT UCL	840.3	97.5% Chebyshev (MVUE) UCL	1257
95% Modified-t UCL	766.9	99% Chebyshev (MVUE) UCL	1776

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.467	Data appear Lognormal at 5% Significance Level
Theta Star	980.9	
nu star	26.17	
Approximate Chi Square Value (.05)	15.51	Nonparametric Statistics
Adjusted Level of Significance	0.0404	95% CLT UCL 741.4
Adjusted Chi Square Value	15	95% Jackknife UCL 751.5
		95% Standard Bootstrap UCL 731.8
Anderson-Darling Test Statistic	1.993	95% Bootstrap-t UCL 1211
Anderson-Darling 5% Critical Value	0.811	95% Hall's Bootstrap UCL 1816
Kolmogorov-Smirnov Test Statistic	0.233	95% Percentile Bootstrap UCL 761.8
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL 848.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1208
		97.5% Chebyshev(Mean, Sd) UCL 1533
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2170
95% Approximate Gamma UCL	773.5	
95% Adjusted Gamma UCL	799.6	

Potential UCL to Use	Use 95% Chebyshev (MVUE) UCL 993.1

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	F:\Hanna City Data\Data tables\HCME EU PAH Surface.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	34	Minimum of Log Data	3.526
Maximum	5800	Maximum of Log Data	8.666
Mean	1127	Mean of log Data	5.83
Median	485	SD of log Data	1.702
SD	1900		
Coefficient of Variation	1.686		
Skewness	2.32		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.637
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2304

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2692
95% Modified-t UCL	2386

Assuming Lognormal Distribution

95% H-UCL	28433
95% Chebyshev (MVUE) UCL	3818
97.5% Chebyshev (MVUE) UCL	5002
99% Chebyshev (MVUE) UCL	7327

Gamma Distribution Test

k star (bias corrected)	0.425
Theta Star	2651
nu star	7.651
Approximate Chi Square Value (.05)	2.534
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.958
Anderson-Darling Test Statistic	0.489
Anderson-Darling 5% Critical Value	0.769
Kolmogorov-Smirnov Test Statistic	0.252
Kolmogorov-Smirnov 5% Critical Value	0.294

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3401
95% Adjusted Gamma UCL	4403

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	2168
95% Jackknife UCL	2304
95% Standard Bootstrap UCL	2104
95% Bootstrap-t UCL	8111
95% Hall's Bootstrap UCL	7872
95% Percentile Bootstrap UCL	2212
95% BCA Bootstrap UCL	2721
95% Chebyshev(Mean, Sd) UCL	3887
97.5% Chebyshev(Mean, Sd) UCL	5081
99% Chebyshev(Mean, Sd) UCL	7427

Potential UCL to Use Use 95% Approximate Gamma UCL 3401

Benzo(b)fluoranthene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	70	Minimum of Log Data	4.248
Maximum	8600	Maximum of Log Data	9.06
Mean	1705	Mean of log Data	6.253
Median	680	SD of log Data	1.668
SD	2849		
Coefficient of Variation	1.671		
Skewness	2.226		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.642	Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	3470	95% H-UCL	36776
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5519
95% Adjusted-CLT UCL	4020	97.5% Chebyshev (MVUE) UCL	7222
95% Modified-t UCL	3588	99% Chebyshev (MVUE) UCL	10566

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.427	Data appear Gamma Distributed at 5% Significance Level
Theta Star	3990	
nu star	7.691	
Approximate Chi Square Value (.05)	2.557	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 3267
Adjusted Chi Square Value	1.977	95% Jackknife UCL 3470
		95% Standard Bootstrap UCL 3176
Anderson-Darling Test Statistic	0.565	95% Bootstrap-t UCL 12499
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL 12396
Kolmogorov-Smirnov Test Statistic	0.266	95% Percentile Bootstrap UCL 3257
Kolmogorov-Smirnov 5% Critical Value	0.294	95% BCA Bootstrap UCL 4080
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 5844
		97.5% Chebyshev(Mean, Sd) UCL 7635
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 11153
95% Approximate Gamma UCL	5127	
95% Adjusted Gamma UCL	6630	

Potential UCL to Use Use 95% Approximate Gamma UCL 5127

Benzo(k)fluoranthene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	22	Minimum of Log Data	3.091
Maximum	4500	Maximum of Log Data	8.412
Mean	751.4	Mean of log Data	5.3
Median	275	SD of log Data	1.708
SD	1452		
Coefficient of Variation	1.932		
Skewness	2.682		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.562	Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1651	95% H-UCL	17238
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2269
95% Adjusted-CLT UCL	2010	97.5% Chebyshev (MVUE) UCL	2973
95% Modified-t UCL	1724	99% Chebyshev (MVUE) UCL	4356

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.396	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	1897	
nu star	7.13	
Approximate Chi Square Value (.05)	2.242	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 1548
Adjusted Chi Square Value	1.71	95% Jackknife UCL 1651
		95% Standard Bootstrap UCL 1500
Anderson-Darling Test Statistic	0.646	95% Bootstrap-t UCL 7851
Anderson-Darling 5% Critical Value	0.774	95% Hall's Bootstrap UCL 6195
Kolmogorov-Smirnov Test Statistic	0.298	95% Percentile Bootstrap UCL 1687
Kolmogorov-Smirnov 5% Critical Value	0.295	95% BCA Bootstrap UCL 2190
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2861
		97.5% Chebyshev(Mean, Sd) UCL 3774
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 5567
95% Approximate Gamma UCL	2390	
95% Adjusted Gamma UCL	3134	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 3134

Benzo(a)pyrene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics

Minimum	43
Maximum	5900
Mean	1127
Median	470
SD	1922
Coefficient of Variation	1.705
Skewness	2.378

Log-transformed Statistics

Minimum of Log Data	3.761
Maximum of Log Data	8.683
Mean of log Data	5.848
SD of log Data	1.664

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.63
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.947
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2319

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2724
95% Modified-t UCL	2404

Assuming Lognormal Distribution

95% H-UCL	24007
95% Chebyshev (MVUE) UCL	3655
97.5% Chebyshev (MVUE) UCL	4781
99% Chebyshev (MVUE) UCL	6994

Gamma Distribution Test

k star (bias corrected)	0.429
Theta Star	2626
nu star	7.729
Approximate Chi Square Value (.05)	2.579
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.996
Anderson-Darling Test Statistic	0.515
Anderson-Darling 5% Critical Value	0.768
Kolmogorov-Smirnov Test Statistic	0.243
Kolmogorov-Smirnov 5% Critical Value	0.293

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	2181
95% Jackknife UCL	2319
95% Standard Bootstrap UCL	2137
95% Bootstrap-t UCL	8037
95% Hall's Bootstrap UCL	8230
95% Percentile Bootstrap UCL	2316
95% BCA Bootstrap UCL	2784
95% Chebyshev(Mean, Sd) UCL	3921
97.5% Chebyshev(Mean, Sd) UCL	5129
99% Chebyshev(Mean, Sd) UCL	7503

Assuming Gamma Distribution

95% Approximate Gamma UCL	3379
95% Adjusted Gamma UCL	4365

Potential UCL to Use

Use 95% Approximate Gamma UCL 3379

Indeno(1,2,3-cd)pyrene

General Statistics

Number of Valid Observations	9
Number of Distinct Observations	9

Raw Statistics

Minimum	34
Maximum	4200

Log-transformed Statistics

Minimum of Log Data	3.526
Maximum of Log Data	8.343

Mean	815.1	Mean of log Data	5.491
Median	325	SD of log Data	1.702
SD	1374		
Coefficient of Variation	1.685		
Skewness	2.324		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.642
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1666

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1947
95% Modified-t UCL	1726

Assuming Lognormal Distribution

95% H-UCL	20262
95% Chebyshev (MVUE) UCL	2720
97.5% Chebyshev (MVUE) UCL	3563
99% Chebyshev (MVUE) UCL	5220

Gamma Distribution Test

k star (bias corrected)	0.421
Theta Star	1935
nu star	7.581
Approximate Chi Square Value (.05)	2.495
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.924
Anderson-Darling Test Statistic	0.509
Anderson-Darling 5% Critical Value	0.769
Kolmogorov-Smirnov Test Statistic	0.2
Kolmogorov-Smirnov 5% Critical Value	0.294

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1568
95% Jackknife UCL	1666
95% Standard Bootstrap UCL	1550
95% Bootstrap-t UCL	5240
95% Hall's Bootstrap UCL	5308
95% Percentile Bootstrap UCL	1611
95% BCA Bootstrap UCL	1946
95% Chebyshev(Mean, Sd) UCL	2811
97.5% Chebyshev(Mean, Sd) UCL	3674
99% Chebyshev(Mean, Sd) UCL	5371

Assuming Gamma Distribution

95% Approximate Gamma UCL	2477
95% Adjusted Gamma UCL	3212

Potential UCL to Use

Use 95% Approximate Gamma UCL 2477

Dibenzo(a,h)anthracene

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics

Minimum	8.8
Maximum	1500
Mean	274.4
Median	82
SD	482.7
Coefficient of Variation	1.759

Log-transformed Statistics

Minimum of Log Data	2.175
Maximum of Log Data	7.313
Mean of log Data	4.297
SD of log Data	1.799

Skewness 2.519

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.621
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	573.6

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	683.4
95% Modified-t UCL	596.1

Assuming Lognormal Distribution

95% H-UCL	10054
95% Chebyshev (MVUE) UCL	964
97.5% Chebyshev (MVUE) UCL	1267
99% Chebyshev (MVUE) UCL	1862

Gamma Distribution Test

k star (bias corrected)	0.397
Theta Star	691.2
nu star	7.146
Approximate Chi Square Value (.05)	2.251
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	1.717
Anderson-Darling Test Statistic	0.479
Anderson-Darling 5% Critical Value	0.774
Kolmogorov-Smirnov Test Statistic	0.218
Kolmogorov-Smirnov 5% Critical Value	0.295

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	539.1
95% Jackknife UCL	573.6
95% Standard Bootstrap UCL	529.2
95% Bootstrap-t UCL	1329
95% Hall's Bootstrap UCL	1406
95% Percentile Bootstrap UCL	564
95% BCA Bootstrap UCL	688.4
95% Chebyshev(Mean, Sd) UCL	975.8
97.5% Chebyshev(Mean, Sd) UCL	1279
99% Chebyshev(Mean, Sd) UCL	1875

Assuming Gamma Distribution

95% Approximate Gamma UCL	871.2
95% Adjusted Gamma UCL	1142

Potential UCL to Use

Use 95% Adjusted Gamma UCL 1142

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	F:\Hanna City Data\Data tables\HCVW EU PAH Surface.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		Log-transformed Statistics	
Minimum	17	Minimum of Log Data	2.833
Maximum	8400	Maximum of Log Data	9.036
Mean	1463	Mean of log Data	5.907
Median	420	SD of log Data	1.83
SD	2660		
Coefficient of Variation	1.819		
Skewness	2.29		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.593	Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	2916	95% H-UCL	31002
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5165
95% Adjusted-CLT UCL	3374	97.5% Chebyshev (MVUE) UCL	6774
95% Modified-t UCL	3009	99% Chebyshev (MVUE) UCL	9934

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.399	Data appear Gamma Distributed at 5% Significance Level
Theta Star	3667	
nu star	8.775	
Approximate Chi Square Value (.05)	3.192	**Nonparametric Statistics**
Adjusted Level of Significance	0.0278	95% CLT UCL 2782
Adjusted Chi Square Value	2.667	95% Jackknife UCL 2916
		95% Standard Bootstrap UCL 2724
Anderson-Darling Test Statistic	0.667	95% Bootstrap-t UCL 12942
Anderson-Darling 5% Critical Value	0.788	95% Hall's Bootstrap UCL 9624
Kolmogorov-Smirnov Test Statistic	0.267	95% Percentile Bootstrap UCL 2882
Kolmogorov-Smirnov 5% Critical Value	0.27	95% BCA Bootstrap UCL 3079
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 4959
		97.5% Chebyshev(Mean, Sd) UCL 6472
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 9443
95% Approximate Gamma UCL	4021	
95% Adjusted Gamma UCL	4811	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 4811

Benzo(b)fluoranthene

General Statistics

Number of Valid Observations 11

Number of Distinct Observations 11

Raw Statistics

Minimum	16
Maximum	8800
Mean	1887
Median	620
SD	3128
Coefficient of Variation	1.657
Skewness	1.911

Log-transformed Statistics

Minimum of Log Data	2.773
Maximum of Log Data	9.083
Mean of log Data	6.298
SD of log Data	1.818

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.599
Shapiro Wilk Critical Value	0.85

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical Value	0.85

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3596

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4019
95% Modified-t UCL	3687

Assuming Lognormal Distribution

95% H-UCL	43257
95% Chebyshev (MVUE) UCL	7474
97.5% Chebyshev (MVUE) UCL	9797
99% Chebyshev (MVUE) UCL	14361

Gamma Distribution Test

k star (bias corrected)	0.431
Theta Star	4383
nu star	9.473
Approximate Chi Square Value (.05)	3.615
Adjusted Level of Significance	0.0278
Adjusted Chi Square Value	3.049
Anderson-Darling Test Statistic	0.724
Anderson-Darling 5% Critical Value	0.78
Kolmogorov-Smirnov Test Statistic	0.268
Kolmogorov-Smirnov 5% Critical Value	0.269

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	3438
95% Jackknife UCL	3596
95% Standard Bootstrap UCL	3364
95% Bootstrap-t UCL	14664
95% Hall's Bootstrap UCL	14681
95% Percentile Bootstrap UCL	3381
95% BCA Bootstrap UCL	3965
95% Chebyshev(Mean, Sd) UCL	5998
97.5% Chebyshev(Mean, Sd) UCL	7776
99% Chebyshev(Mean, Sd) UCL	11270

Assuming Gamma Distribution

95% Approximate Gamma UCL	4945
95% Adjusted Gamma UCL	5863

Potential UCL to Use

Use 95% Approximate Gamma UCL 4945

Benzo(k)fluoranthene

General Statistics

Number of Valid Observations 11

Number of Distinct Observations 9

Raw Statistics

Minimum	11
Maximum	4400
Mean	803.6
Median	200
SD	1364
Coefficient of Variation	1.697
Skewness	2.288

Log-transformed Statistics

Minimum of Log Data	2.398
Maximum of Log Data	8.389
Mean of log Data	5.401
SD of log Data	1.824

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.634
Shapiro Wilk Critical Value	0.85

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.969
Shapiro Wilk Critical Value	0.85

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1549

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1783
95% Modified-t UCL	1596

Assuming Lognormal Distribution

95% H-UCL	18141
95% Chebyshev (MVUE) UCL	3081
97.5% Chebyshev (MVUE) UCL	4039
99% Chebyshev (MVUE) UCL	5922

Gamma Distribution Test

k star (bias corrected)	0.42
Theta Star	1914
nu star	9.238
Approximate Chi Square Value (.05)	3.472
Adjusted Level of Significance	0.0278
Adjusted Chi Square Value	2.92
Anderson-Darling Test Statistic	0.483
Anderson-Darling 5% Critical Value	0.782
Kolmogorov-Smirnov Test Statistic	0.251
Kolmogorov-Smirnov 5% Critical Value	0.269

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1480
95% Jackknife UCL	1549
95% Standard Bootstrap UCL	1437
95% Bootstrap-t UCL	4137
95% Hall's Bootstrap UCL	4494
95% Percentile Bootstrap UCL	1492
95% BCA Bootstrap UCL	1796
95% Chebyshev(Mean, Sd) UCL	2596
97.5% Chebyshev(Mean, Sd) UCL	3372
99% Chebyshev(Mean, Sd) UCL	4895

Assuming Gamma Distribution

95% Approximate Gamma UCL	2139
95% Adjusted Gamma UCL	2543

Potential UCL to Use

Use 95% Adjusted Gamma UCL 2543

Benzo(a)pyrene

General Statistics

Number of Valid Observations	11
Number of Distinct Observations	11

Raw Statistics

Minimum	17
Maximum	7900
Mean	1396
Median	380
SD	2462
Coefficient of Variation	1.763
Skewness	2.333

Log-transformed Statistics

Minimum of Log Data	2.833
Maximum of Log Data	8.975
Mean of log Data	5.941
SD of log Data	1.809

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.606
Shapiro Wilk Critical Value	0.85

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.85

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2742

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	3175

Assuming Lognormal Distribution

95% H-UCL	29018
95% Chebyshev (MVUE) UCL	5150
97.5% Chebyshev (MVUE) UCL	6749

95% Modified-t UCL 2829

99% Chebyshev (MVUE) UCL 9890

Gamma Distribution Test

k star (bias corrected) 0.417
Theta Star 3348
nu star 9.174
Approximate Chi Square Value (.05) 3.433
Adjusted Level of Significance 0.0278
Adjusted Chi Square Value 2.884

Anderson-Darling Test Statistic 0.579
Anderson-Darling 5% Critical Value 0.783
Kolmogorov-Smirnov Test Statistic 0.235
Kolmogorov-Smirnov 5% Critical Value 0.269
Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 2617
95% Jackknife UCL 2742
95% Standard Bootstrap UCL 2558
95% Bootstrap-t UCL 10258
95% Hall's Bootstrap UCL 8839
95% Percentile Bootstrap UCL 2751
95% BCA Bootstrap UCL 3228
95% Chebyshev(Mean, Sd) UCL 4632
97.5% Chebyshev(Mean, Sd) UCL 6032
99% Chebyshev(Mean, Sd) UCL 8782

Assuming Gamma Distribution

95% Approximate Gamma UCL 3732
95% Adjusted Gamma UCL 4441

Potential UCL to Use

Use 95% Adjusted Gamma UCL 4441

Indeno(1,2,3-cd)pyrene

General Statistics

Number of Valid Observations 11
Number of Distinct Observations 10

Raw Statistics

Minimum 9.8
Maximum 4200
Mean 859.3
Median 260
SD 1358
Coefficient of Variation 1.58
Skewness 2.054

Log-transformed Statistics

Minimum of Log Data 2.282
Maximum of Log Data 8.343
Mean of log Data 5.618
SD of log Data 1.756

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.645
Shapiro Wilk Critical Value 0.85
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.964
Shapiro Wilk Critical Value 0.85
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1601

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 1804
95% Modified-t UCL 1644

Assuming Lognormal Distribution

95% H-UCL 16561
95% Chebyshev (MVUE) UCL 3408
97.5% Chebyshev (MVUE) UCL 4458
99% Chebyshev (MVUE) UCL 6520

Gamma Distribution Test

k star (bias corrected) 0.461
Theta Star 1865
nu star 10.14
Approximate Chi Square Value (.05) 4.027
Adjusted Level of Significance 0.0278
Adjusted Chi Square Value 3.422

Anderson-Darling Test Statistic 0.47

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 1533
95% Jackknife UCL 1601
95% Standard Bootstrap UCL 1512
95% Bootstrap-t UCL 4921

Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	5510
Kolmogorov-Smirnov Test Statistic	0.224	95% Percentile Bootstrap UCL	1551
Kolmogorov-Smirnov 5% Critical Value	0.268	95% BCA Bootstrap UCL	1650
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2644
		97.5% Chebyshev(Mean, Sd) UCL	3416
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4934
95% Approximate Gamma UCL	2163		
95% Adjusted Gamma UCL	2545		
Potential UCL to Use		Use 95% Approximate Gamma UCL	2163

Dibenzo(a,h)anthracene

General Statistics

Number of Valid Data	11	Number of Detected Data	10
Number of Distinct Detected Data	9	Number of Non-Detect Data	1
		Percent Non-Detects	9.09%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	11	Minimum Detected	2.398
Maximum Detected	2300	Maximum Detected	7.741
Mean of Detected	394.3	Mean of Detected	4.838
SD of Detected	701.8	SD of Detected	1.624
Minimum Non-Detect	6.4	Minimum Non-Detect	1.856
Maximum Non-Detect	6.4	Maximum Non-Detect	1.856

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.592	Shapiro Wilk Test Statistic	0.976
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	358.7	Mean	4.504
SD	676.1	SD	1.898
95% DL/2 (t) UCL	728.2	95% H-Stat (DL/2) UCL	5479
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	318.2	Mean in Log Scale	4.472
SD	687.6	SD in Log Scale	1.96
95% MLE (t) UCL	693.9	Mean in Original Scale	358.7
95% MLE (Tiku) UCL	667.6	SD in Original Scale	676.2
		95% Percentile Bootstrap UCL	736.8
		95% BCA Bootstrap UCL	902.5

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.451	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	873.7		
nu star	9.026		
A-D Test Statistic	0.48	Nonparametric Statistics	
5% A-D Critical Value	0.773	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.773	Mean	359.5
5% K-S Critical Value	0.28	SD	644.3
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	204.8

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1E-09
Maximum	2300
Mean	358.5
Median	68
SD	676.3
k star	0.218
Theta star	1647
Nu star	4.788
AppChi2	1.055
95% Gamma Approximate UCL	1626
95% Adjusted Gamma UCL	2140

Note: DL/2 is not a recommended method.

95% KM (t) UCL	730.6
95% KM (z) UCL	696.3
95% KM (jackknife) UCL	728.2
95% KM (bootstrap t) UCL	1951
95% KM (BCA) UCL	742.1
95% KM (Percentile Bootstrap) UCL	695.6
95% KM (Chebyshev) UCL	1252
97.5% KM (Chebyshev) UCL	1638
99% KM (Chebyshev) UCL	2397

Potential UCLs to Use

95% KM (Chebyshev) UCL	1252

General UCL Statistics for Full Data Sets

User Selected Options

From File	F:\Hanna City Data\Data tables\HCVW Subsurf PAH-0.5RL sub.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)pyrene

General Statistics

Number of Valid Observations	14	Number of Distinct Observations	14

Raw Statistics		Log-transformed Statistics	
Minimum	4.6	Minimum of Log Data	1.526
Maximum	560	Maximum of Log Data	6.328
Mean	50.41	Mean of log Data	2.525
Median	7.7	SD of log Data	1.231
SD	146.9		
Coefficient of Variation	2.914		
Skewness	3.722		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.337	Shapiro Wilk Test Statistic	0.697
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	119.9	95% H-UCL	79.15
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	63.43
95% Adjusted-CLT UCL	156.7	97.5% Chebyshev (MVUE) UCL	80.28
95% Modified-t UCL	126.4	99% Chebyshev (MVUE) UCL	113.4

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.41	Data do not follow a Discernable Distribution (0.05)
Theta Star	123	
nu star	11.47	
Approximate Chi Square Value (.05)	4.883	**Nonparametric Statistics**
Adjusted Level of Significance	0.0312	95% CLT UCL 115
Adjusted Chi Square Value	4.326	95% Jackknife UCL 119.9
		95% Standard Bootstrap UCL 114.1
Anderson-Darling Test Statistic	2.988	95% Bootstrap-t UCL 1409
Anderson-Darling 5% Critical Value	0.801	95% Hall's Bootstrap UCL 757.9
Kolmogorov-Smirnov Test Statistic	0.36	95% Percentile Bootstrap UCL 127.9
Kolmogorov-Smirnov 5% Critical Value	0.243	95% BCA Bootstrap UCL 170.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 221.5
		97.5% Chebyshev(Mean, Sd) UCL 295.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 441
95% Approximate Gamma UCL	118.5	
95% Adjusted Gamma UCL	133.7	

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL 441

General UCL Statistics for Full Data Sets

User Selected Options

From File	F:\Hanna City Data\Data tables\As in SubsurfSoil.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As_HCCA

General Statistics

Number of Valid Observations	17	Number of Distinct Observations	16

Raw Statistics		Log-transformed Statistics	
Minimum	8.8	Minimum of Log Data	2.175
Maximum	18	Maximum of Log Data	2.89
Mean	11.54	Mean of log Data	2.425
Median	11.6	SD of log Data	0.207
SD	2.519		
Coefficient of Variation	0.218		
Skewness	1.023		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.899	Shapiro Wilk Test Statistic	0.927
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.6	95% H-UCL	12.67
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.07
95% Adjusted-CLT UCL	12.71	97.5% Chebyshev (MVUE) UCL	15.17
95% Modified-t UCL	12.63	99% Chebyshev (MVUE) UCL	17.32

Gamma Distribution Test		Data Distribution
k star (bias corrected)	19.96	Data appear Normal at 5% Significance Level
Theta Star	0.578	
nu star	678.7	
Approximate Chi Square Value (.05)	619.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0346	95% CLT UCL 12.54
Adjusted Chi Square Value	613.3	95% Jackknife UCL 12.6
		95% Standard Bootstrap UCL 12.53
Anderson-Darling Test Statistic	0.474	95% Bootstrap-t UCL 12.82
Anderson-Darling 5% Critical Value	0.738	95% Hall's Bootstrap UCL 12.92
Kolmogorov-Smirnov Test Statistic	0.174	95% Percentile Bootstrap UCL 12.49
Kolmogorov-Smirnov 5% Critical Value	0.209	95% BCA Bootstrap UCL 12.66
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 14.2
		97.5% Chebyshev(Mean, Sd) UCL 15.35
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 17.62
95% Approximate Gamma UCL	12.65	
95% Adjusted Gamma UCL	12.77	

Potential UCL to Use		Use 95% Student's-t UCL	12.6

As_HCCB

General Statistics

Number of Valid Observations 17

Number of Distinct Observations 14

Raw Statistics

Minimum	3.9
Maximum	13.8
Mean	9.479
Median	9.5
SD	2.485
Coefficient of Variation	0.262
Skewness	-0.352

Log-transformed Statistics

Minimum of Log Data	1.361
Maximum of Log Data	2.625
Mean of log Data	2.211
SD of log Data	0.303

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical Value	0.892

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.892

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	10.53

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	10.42
95% Modified-t UCL	10.52

Assuming Lognormal Distribution

95% H-UCL	10.99
95% Chebyshev (MVUE) UCL	12.61
97.5% Chebyshev (MVUE) UCL	13.94
99% Chebyshev (MVUE) UCL	16.57

Gamma Distribution Test

k star (bias corrected)	10.85
Theta Star	0.874
nu star	368.8
Approximate Chi Square Value (.05)	325.3
Adjusted Level of Significance	0.0346
Adjusted Chi Square Value	321
Anderson-Darling Test Statistic	0.384
Anderson-Darling 5% Critical Value	0.739
Kolmogorov-Smirnov Test Statistic	0.137
Kolmogorov-Smirnov 5% Critical Value	0.209

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	10.75
95% Adjusted Gamma UCL	10.89

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	10.47
95% Jackknife UCL	10.53
95% Standard Bootstrap UCL	10.44
95% Bootstrap-t UCL	10.5
95% Hall's Bootstrap UCL	10.52
95% Percentile Bootstrap UCL	10.43
95% BCA Bootstrap UCL	10.29
95% Chebyshev(Mean, Sd) UCL	12.11
97.5% Chebyshev(Mean, Sd) UCL	13.24
99% Chebyshev(Mean, Sd) UCL	15.48

Potential UCL to Use

Use 95% Student's-t UCL 10.53

As_HCCC

General Statistics

Number of Valid Observations 17

Number of Distinct Observations 14

Raw Statistics

Minimum	7.4
Maximum	16.2
Mean	10.86
Median	10.7
SD	2.472
Coefficient of Variation	0.228
Skewness	0.61

Log-transformed Statistics

Minimum of Log Data	2.001
Maximum of Log Data	2.785
Mean of log Data	2.362
SD of log Data	0.225

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical Value	0.892

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.892

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	11.91

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	11.95
95% Modified-t UCL	11.93

Assuming Lognormal Distribution

95% H-UCL	12.04
95% Chebyshev (MVUE) UCL	13.46
97.5% Chebyshev (MVUE) UCL	14.59
99% Chebyshev (MVUE) UCL	16.8

Gamma Distribution Test

k star (bias corrected)	17.45
Theta Star	0.623
nu star	593.2
Approximate Chi Square Value (.05)	537.7
Adjusted Level of Significance	0.0346
Adjusted Chi Square Value	532.1
Anderson-Darling Test Statistic	0.388
Anderson-Darling 5% Critical Value	0.738
Kolmogorov-Smirnov Test Statistic	0.149
Kolmogorov-Smirnov 5% Critical Value	0.209

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	11.99
95% Adjusted Gamma UCL	12.11

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	11.85
95% Jackknife UCL	11.91
95% Standard Bootstrap UCL	11.84
95% Bootstrap-t UCL	12.03
95% Hall's Bootstrap UCL	12.1
95% Percentile Bootstrap UCL	11.81
95% BCA Bootstrap UCL	11.92
95% Chebyshev(Mean, Sd) UCL	13.48
97.5% Chebyshev(Mean, Sd) UCL	14.61
99% Chebyshev(Mean, Sd) UCL	16.83

Potential UCL to Use

Use 95% Student's-t UCL 11.91

Table J1.1 Chemical Daily Intake (CDI) from incidental ingestion of surface soil from Coal Area A Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Carcinogenic effects (6-16 years)**	**Carcinogenic effects (16-30 yrs)**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550

CALCULATIONS			Receptors											
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Chemicals of Potential Concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Medium: Surface Soil								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	2.9	4.10E-06	8.78E-07	2.81E-06	1.00E-06	3.67E-05	1.05E-06	2.10E-06	1.05E-05	1.05E-06	2.10E-06	5.61E-07	7.86E-07
Benzo(b)fluoranthene	205-99-2	1.8	2.58E-06	5.52E-07	1.77E-06	6.30E-07	2.31E-05	6.59E-07	1.32E-06	6.59E-06	6.59E-07	1.32E-06	3.53E-07	4.94E-07
Benzo(k)fluoranthene	207-08-9	1.7	2.40E-06	5.15E-07	1.64E-06	5.87E-07	2.15E-05	6.14E-07	1.23E-06	6.14E-06	6.14E-07	1.23E-06	3.29E-07	4.61E-07
Benzo(a)pyrene	50-32-8	2.7	3.92E-06	8.41E-07	2.69E-06	9.60E-07	3.51E-05	1.00E-06	2.01E-06	1.00E-05	1.00E-06	2.01E-06	5.37E-07	7.52E-07
Indeno(1,2,3-cd)pyrene	193-39-5	2.3	3.29E-06	7.04E-07	2.25E-06	8.04E-07	2.94E-05	8.40E-07	1.68E-06	8.40E-06	8.40E-07	1.68E-06	4.50E-07	6.30E-07
Dibenz(a,h)anthracene	53-70-3	0.7	9.86E-07	2.11E-07	6.75E-07	2.41E-07	8.82E-06	2.52E-07	5.04E-07	2.52E-06	2.52E-07	5.04E-07	1.35E-07	1.89E-07

CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration

Table J1.2 Dermal Absorption from surface soil at Coal Area A Exposure Unit

		Receptor											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2yrs**	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	2.80E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.07	0.2	0.2	0.07	0.07

Calculations				Receptor												
				Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult					
Chemicals of Potential Concern	**CAS No.**	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	
									0-2yrs	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**	
Benzo(a)anthracene	56-55-3	0.13	2.9	3.04E-06	6.51E-07	2.08E-06	7.43E-07	1.34E-05	3.81E-07	7.63E-07	4.30E-06	3.81E-07	7.63E-07	2.91E-07	4.08E-07	
Benzo(b)fluoranthene	205-99-2	0.13	1.8	1.91E-06	4.09E-07	1.31E-06	4.67E-07	8.40E-06	2.40E-07	4.80E-07	2.70E-06	2.40E-07	4.80E-07	1.83E-07	2.56E-07	
Benzo(k)fluoranthene	207-08-9	0.13	1.7	1.78E-06	3.81E-07	1.22E-06	4.35E-07	7.82E-06	2.24E-07	4.47E-07	2.52E-06	2.24E-07	4.47E-07	1.71E-07	2.39E-07	
Benzo(a)pyrene	50-32-8	0.13	2.7	2.91E-06	6.23E-07	1.99E-06	7.11E-07	1.28E-05	3.65E-07	7.30E-07	4.12E-06	3.65E-07	7.30E-07	2.79E-07	3.90E-07	
Indeno(1,2,3-cd)pyrene	193-39-5	0.13	2.3	2.43E-06	5.22E-07	1.67E-06	5.96E-07	1.07E-05	3.06E-07	6.12E-07	3.45E-06	3.06E-07	6.12E-07	2.33E-07	3.27E-07	
Dibenz(a,h)anthracene	53-70-3	0.13	0.7	7.30E-07	1.57E-07	5.00E-07	1.79E-07	3.21E-06	9.17E-08	1.83E-07	1.03E-06	9.17E-08	1.83E-07	7.00E-08	9.81E-08	

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004

DAD = Dermally Absorbed Dose

Table J1.3 Exposure Concentration from inhalation of dust from surface soil at Coal Area A Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Exposure Time (ET)	hrs/day	24	24	8	8	24	24	24	24	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Particulate emission factor (PEF)	m3/kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	613200	262800	613200	613200	613200	613200

			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Calculations															
Chemicals of potential concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**
Surface Soils								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	2.9	2.11E-09	4.52E-10	4.82E-10	1.72E-10	2.02E-09	5.78E-11	1.16E-10	2.02E-09	5.78E-11	1.16E-10	2.89E-10	4.05E-10
Benzo(b)fluoranthene	205-99-2	1.8	1.33E-09	2.84E-10	3.03E-10	1.08E-10	1.27E-09	3.63E-11	7.27E-11	1.27E-09	3.63E-11	7.27E-11	1.82E-10	2.54E-10
Benzo(k)fluoranthene	207-08-9	1.7	1.24E-09	2.65E-10	2.82E-10	1.01E-10	1.19E-09	3.39E-11	6.77E-11	1.19E-09	3.39E-11	6.77E-11	1.69E-10	2.37E-10
Benzo(a)pyrene	50-32-8	2.7	2.02E-09	4.33E-10	4.61E-10	1.65E-10	1.94E-09	5.53E-11	1.11E-10	1.94E-09	5.53E-11	1.11E-10	2.77E-10	3.87E-10
Indeno(1,2,3-cd)pyrene	193-39-5	2.3	1.69E-09	3.62E-10	3.86E-10	1.38E-10	1.62E-09	4.63E-11	9.27E-11	1.62E-09	4.63E-11	9.27E-11	2.32E-10	3.24E-10
Dibenz(a,h)anthracene	53-70-3	0.7	5.07E-10	1.09E-10	1.16E-10	4.14E-11	4.87E-10	1.39E-11	2.78E-11	4.87E-10	1.39E-11	2.78E-11	6.95E-11	9.73E-11

Cs: Soil or exposure point concentration; Inhalation EC: Inhalation Exposure Concentration

Table J1.4 Carcinogenic risks for Correctional Facility Inmate from exposure to surface soils at Coal Area A Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	2869	8.8E-07	7.3E-01	6.4E-07	4.5E-10	1.10E-01	5.0E-11	6.5E-07	7.3E-01	4.8E-07	1.1E-06
Benzo(b)fluoranthene	1804	5.5E-07	7.3E-01	4.0E-07	2.8E-10	1.1E-01	3.1E-11	4.1E-07	7.3E-01	3.0E-07	7.0E-07
Benzo(k)fluoranthene	1681	5.1E-07	7.3E-02	3.8E-08	2.6E-10	1.1E-01	2.9E-11	3.8E-07	7.3E-02	2.8E-08	6.5E-08
Benzo(a)pyrene	2746	8.4E-07	7.3E+00	6.1E-06	4.3E-10	1.1E+00	4.8E-10	6.2E-07	7.3E+00	4.5E-06	1.1E-05
Indeno(1,2,3-cd)pyrene	2300	7.0E-07	7.3E-01	5.1E-07	3.6E-10	1.1E-01	4.0E-11	5.2E-07	7.3E-01	3.8E-07	8.9E-07
Dibenz(a,h)anthracene	690	2.1E-07	7.3E+00	1.5E-06	1.1E-10	1.2E+00	1.3E-10	1.6E-07	7.3E+00	1.1E-06	2.7E-06
Pathway $ILCR_{total}$				**9.3E-06**			**7.6E-10**			**6.9E-06**	
$ILCR_{total}$ from surface soil											**1.6E-05**

Table J1.5 Carcinogenic risks for Correctional Facility Staff from exposure to surface soils at Coal Area A Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	2869	1.0E-06	7.3E-01	7.3E-07	1.7E-10	1.10E-01	1.9E-11	7.4E-07	7.3E-01	5.4E-07	1.3E-06
Benzo(b)fluoranthene	1804	6.3E-07	7.3E-01	4.6E-07	1.1E-10	1.1E-01	1.2E-11	4.7E-07	7.3E-01	3.4E-07	8.0E-07
Benzo(k)fluoranthene	1681	5.9E-07	7.3E-02	4.3E-08	1.0E-10	1.1E-01	1.1E-11	4.4E-07	7.3E-02	3.2E-08	7.5E-08
Benzo(a)pyrene	2746	9.6E-07	7.3E+00	7.0E-06	1.6E-10	1.1E+00	1.8E-10	7.1E-07	7.3E+00	5.2E-06	1.2E-05
Indeno(1,2,3-cd)pyrene	2300	8.0E-07	7.3E-01	5.9E-07	1.4E-10	1.1E-01	1.5E-11	6.0E-07	7.3E-01	4.3E-07	1.0E-06
Dibenz(a,h)anthracene	690	2.4E-07	7.3E+00	1.8E-06	4.1E-11	1.2E+00	5.0E-11	1.8E-07	7.3E+00	1.3E-06	3.1E-06
Pathway $ILCR_{total}$				**1.1E-05**			**2.9E-10**			**7.8E-06**	
$ILCR_{total}$ from surface soil											**1.8E-05**

Table J1.6 Carcinogenic risks for Resident Adult from exposure to surface soils at Coal Area A Exposure Unit

		Ingestion of Soil						Inhalation from Soil						Dermal Absorption from Soil						
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day) 0-2 yrs**	**Chemical Daily Intake (mg/kg-day) 2-6 yrs**	**Chemical Daily Intake (mg/kg-day) 6-16 yrs**	**Chemical Daily Intake (mg/kg-day) 16-30 yrs**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Carcinogen Inhalation EC (mg/m3) 6-16 yrs**	**Carcinogen Inhalation EC (mg/m3) 16-30 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day) 0-2 yrs**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Absorbed Dose (mg/kg-day) 6-16 yrs**	**Dermal Absorbed Dose (mg/kg-day) 16-30 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	2869	1.0E-06	2.1E-06	5.6E-07	7.9E-07	7.3E-01	3.3E-06	5.8E-11	1.2E-10	2.9E-10	4.0E-10	1.10E-01	2.4E-10	3.8E-07	7.6E-07	2.9E-07	4.1E-07	7.3E-01	1.3E-06	4.6E-06
Benzo(b)fluoranthene	1804	6.6E-07	1.3E-06	3.5E-07	4.9E-07	7.3E-01	2.1E-06	3.6E-11	7.3E-11	1.8E-10	2.5E-10	1.1E-01	1.5E-10	2.4E-07	4.8E-07	1.8E-07	2.6E-07	7.3E-01	8.5E-07	2.9E-06
Benzo(k)fluoranthene	1681	6.1E-07	1.2E-06	3.3E-07	4.6E-07	7.3E-02	1.9E-07	3.4E-11	6.8E-11	1.7E-10	2.4E-10	1.1E-01	1.4E-10	2.2E-07	4.5E-07	1.7E-07	2.4E-07	7.3E-02	7.9E-08	2.7E-07
Benzo(a)pyrene	2746	1.0E-06	2.0E-06	5.4E-07	7.5E-07	7.3E+00	3.1E-05	5.5E-11	1.1E-10	2.8E-10	3.9E-10	1.1E+00	2.3E-09	3.7E-07	7.3E-07	2.8E-07	3.9E-07	7.3E+00	1.3E-05	4.4E-05
Indeno(1,2,3-cd)pyrene	2300	8.4E-07	1.7E-06	4.5E-07	6.3E-07	7.3E-01	2.6E-06	4.6E-11	9.3E-11	2.3E-10	3.2E-10	1.1E-01	1.9E-10	3.1E-07	6.1E-07	2.3E-07	3.3E-07	7.3E-01	1.1E-06	3.7E-06
Dibenz(a,h)anthracene	690	2.5E-07	5.0E-07	1.4E-07	1.9E-07	7.3E+00	7.9E-06	1.4E-11	2.8E-11	7.0E-11	9.7E-11	1.2E+00	6.3E-10	9.2E-08	1.8E-07	7.0E-08	9.8E-08	7.3E+00	3.2E-06	1.1E-05
Pathway $ILCR_{total}$							**4.7E-05**						**3.7E-09**						**1.9E-05**	
$ILCR_{total}$ from surface soil																				**6.7E-05**

Table J1.7 Carcinogenic risks for Resident Child from exposure to surface soils at Coal Area A Exposure Unit

		Ingestion of Soil				Inhalation from Soil				Dermal Absorption from Soil				
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake; 0-2yrs (mg/kg-day)**	**Chemical Daily Intake; 2-6 yrs (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	2869	1.0E-06	2.1E-06	7.3E-01	2.3E-06	5.8E-11	1.2E-10	1.10E-01	1.0E-10	3.8E-07	7.6E-07	7.3E-01	8.4E-07	3.1E-06
Benzo(b)fluoranthene	1804	6.6E-07	1.3E-06	7.3E-01	1.4E-06	3.6E-11	7.3E-11	1.1E-01	6.4E-11	2.4E-07	4.8E-07	7.3E-01	5.3E-07	2.0E-06
Benzo(k)fluoranthene	1681	6.1E-07	1.2E-06	7.3E-02	1.3E-07	3.4E-11	6.8E-11	1.1E-01	6.0E-11	2.2E-07	4.5E-07	7.3E-02	4.9E-08	1.8E-07
Benzo(a)pyrene	2746	1.0E-06	2.0E-06	7.3E+00	2.2E-05	5.5E-11	1.1E-10	1.1E+00	9.7E-10	3.7E-07	7.3E-07	7.3E+00	8.0E-06	3.0E-05
Indeno(1,2,3-cd)pyrene	2300	8.4E-07	1.7E-06	7.3E-01	1.8E-06	4.6E-11	9.3E-11	1.1E-01	8.2E-11	3.1E-07	6.1E-07	7.3E-01	6.7E-07	2.5E-06
Dibenz(a,h)anthracene	690	2.5E-07	5.0E-07	7.3E+00	5.5E-06	1.4E-11	2.8E-11	1.2E+00	2.7E-10	9.2E-08	1.8E-07	7.3E+00	2.0E-06	7.5E-06
Pathway $ILCR_{total}$					**3.3E-05**				**1.5E-09**				**1.2E-05**	
$ILCR_{total}$ from surface soil														**4.5E-05**

Table J2.1 Chemical Daily Intake (CDI) from incidental ingestion of surface soil from Coal Area B Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Carcinogenic effects (6-16 years)**	**Carcinogenic effects (16-30 yrs)**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550

CALCULATIONS

			Receptors											
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Chemicals of Potential Concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Medium: Surface Soil								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	3.4	4.90E-06	1.05E-06	3.36E-06	1.20E-06	4.38E-05	1.25E-06	2.51E-06	1.25E-05	1.25E-06	2.51E-06	6.71E-07	9.39E-07
Benzo(b)fluoranthene	205-99-2	4.6	6.62E-06	1.42E-06	4.54E-06	1.62E-06	5.93E-05	1.69E-06	3.39E-06	1.69E-05	1.69E-06	3.39E-06	9.07E-07	1.27E-06
Benzo(k)fluoranthene	207-08-9	1.9	2.65E-06	5.67E-07	1.81E-06	6.48E-07	2.37E-05	6.77E-07	1.35E-06	6.77E-06	6.77E-07	1.35E-06	3.63E-07	5.08E-07
Benzo(a)pyrene	50-32-8	3.0	4.28E-06	9.16E-07	2.93E-06	1.05E-06	3.83E-05	1.09E-06	2.19E-06	1.09E-05	1.09E-06	2.19E-06	5.86E-07	8.20E-07
Indeno(1,2,3-cd)pyrene	193-39-5	2.2	3.13E-06	6.70E-07	2.14E-06	7.65E-07	2.80E-05	7.99E-07	1.60E-06	7.99E-06	7.99E-07	1.60E-06	4.28E-07	5.99E-07
Dibenz(a,h)anthracene	53-70-3	0.7	9.84E-07	2.11E-07	6.74E-07	2.41E-07	8.81E-06	2.52E-07	5.03E-07	2.52E-06	2.52E-07	5.03E-07	1.35E-07	1.89E-07

CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration

Table J2.2 Dermal Absorption from surface soil at Coal Area B Exposure Unit

		Receptor											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2yrs**	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	2.80E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.07	0.2	0.2	0.07	0.07

Calculations				Receptor												
				Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult					
Chemicals of Potential Concern	**CAS No.**	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**
									0-2yrs	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Benzo(a)anthracene	56-55-3	0.13	3.4	3.63E-06	7.78E-07	2.49E-06	8.88E-07	1.60E-05	4.56E-07	9.12E-07	5.14E-06	4.56E-07	9.12E-07	3.48E-07	4.87E-07
Benzo(b)fluoranthene	205-99-2	0.13	4.6	4.91E-06	1.05E-06	3.36E-06	1.20E-06	2.16E-05	6.16E-07	1.23E-06	6.95E-06	6.16E-07	1.23E-06	4.71E-07	6.59E-07
Benzo(k)fluoranthene	207-08-9	0.13	1.9	1.96E-06	4.20E-07	1.34E-06	4.80E-07	8.62E-06	2.46E-07	4.93E-07	2.78E-06	2.46E-07	4.93E-07	1.88E-07	2.63E-07
Benzo(a)pyrene	50-32-8	0.13	3.0	3.17E-06	6.79E-07	2.17E-06	7.75E-07	1.39E-05	3.98E-07	7.96E-07	4.49E-06	3.98E-07	7.96E-07	3.04E-07	4.25E-07
Indeno(1,2,3-cd)pyrene	193-39-5	0.13	2.2	2.32E-06	4.96E-07	1.59E-06	5.67E-07	1.02E-05	2.91E-07	5.82E-07	3.28E-06	2.91E-07	5.82E-07	2.22E-07	3.11E-07
Dibenz(a,h)anthracene	53-70-3	0.13	0.7	7.29E-07	1.56E-07	5.00E-07	1.78E-07	3.21E-06	9.16E-08	1.83E-07	1.03E-06	9.16E-08	1.83E-07	6.99E-08	9.79E-08

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004

DAD = Dermally Absorbed Dose

Table J2.3 Exposure Concentration from inhalation of dust from surface soil at Coal Area B Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Exposure Time (ET)	hrs/day	24	24	8	8	24	24	24	24	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Particulate emission factor (PEF)	m3/kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	613200	262800	613200	613200	613200	613200

			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Calculations															
Chemicals of potential concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**
								0-2 yrs	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	3.4	2.52E-09	5.40E-10	5.76E-10	2.06E-10	2.42E-09	6.91E-11	1.38E-10	2.42E-09	6.91E-11	1.38E-10	3.45E-10	4.84E-10
Benzo(b)fluoranthene	205-99-2	4.6	3.41E-09	7.30E-10	7.78E-10	2.78E-10	3.27E-09	9.34E-11	1.87E-10	3.27E-09	9.34E-11	1.87E-10	4.67E-10	6.54E-10
Benzo(k)fluoranthene	207-08-9	1.9	1.36E-09	2.92E-10	3.11E-10	1.11E-10	1.31E-09	3.73E-11	7.47E-11	1.31E-09	3.73E-11	7.47E-11	1.87E-10	2.61E-10
Benzo(a)pyrene	50-32-8	3.0	2.20E-09	4.72E-10	5.02E-10	1.79E-10	2.11E-09	6.03E-11	1.21E-10	2.11E-09	6.03E-11	1.21E-10	3.01E-10	4.22E-10
Indeno(1,2,3-cd)pyrene	193-39-5	2.2	1.61E-09	3.45E-10	3.67E-10	1.31E-10	1.54E-09	4.41E-11	8.82E-11	1.54E-09	4.41E-11	8.82E-11	2.20E-10	3.09E-10
Dibenz(a,h)anthracene	53-70-3	0.7	5.07E-10	1.09E-10	1.16E-10	4.13E-11	4.86E-10	1.39E-11	2.78E-11	4.86E-10	1.39E-11	2.78E-11	6.94E-11	9.72E-11

Cs: Soil or exposure point concentration; Inhalation EC: Inhalation Exposure Concentration

Table J2.4 Carcinogenic risks for Correctional Facility Inmate from exposure to surface soils at Coal Area B Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3429	1.0E-06	7.3E-01	7.7E-07	5.4E-10	1.10E-01	5.9E-11	7.8E-07	7.3E-01	5.7E-07	1.3E-06
Benzo(b)fluoranthene	4636	1.4E-06	7.3E-01	1.0E-06	7.3E-10	1.1E-01	8.0E-11	1.1E-06	7.3E-01	7.7E-07	1.8E-06
Benzo(k)fluoranthene	1853	5.7E-07	7.3E-02	4.1E-08	2.9E-10	1.1E-01	3.2E-11	4.2E-07	7.3E-02	3.1E-08	7.2E-08
Benzo(a)pyrene	2993	9.2E-07	7.3E+00	6.7E-06	4.7E-10	1.1E+00	5.2E-10	6.8E-07	7.3E+00	5.0E-06	1.2E-05
Indeno(1,2,3-cd)pyrene	2188	6.7E-07	7.3E-01	4.9E-07	3.4E-10	1.1E-01	3.8E-11	5.0E-07	7.3E-01	3.6E-07	8.5E-07
Dibenz(a,h)anthracene	689	2.1E-07	7.3E+00	1.5E-06	1.1E-10	1.2E+00	1.3E-10	1.6E-07	7.3E+00	1.1E-06	2.7E-06
Pathway $ILCR_{total}$				**1.1E-05**			**8.6E-10**			**7.8E-06**	
$ILCR_{total}$ from surface soil											**1.8E-05**

Table J2.5 Carcinogenic risks for Correctional Facility Staff from exposure to surface soils at Coal Area B Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3429	1.2E-06	7.3E-01	8.7E-07	2.1E-10	1.10E-01	2.3E-11	8.9E-07	7.3E-01	6.5E-07	1.5E-06
Benzo(b)fluoranthene	4636	1.6E-06	7.3E-01	1.2E-06	2.8E-10	1.1E-01	3.1E-11	1.2E-06	7.3E-01	8.8E-07	2.1E-06
Benzo(k)fluoranthene	1853	6.5E-07	7.3E-02	4.7E-08	1.1E-10	1.1E-01	1.2E-11	4.8E-07	7.3E-02	3.5E-08	8.2E-08
Benzo(a)pyrene	2993	1.0E-06	7.3E+00	7.6E-06	1.8E-10	1.1E+00	2.0E-10	7.8E-07	7.3E+00	5.7E-06	1.3E-05
Indeno(1,2,3-cd)pyrene	2188	7.6E-07	7.3E-01	5.6E-07	1.3E-10	1.1E-01	1.4E-11	5.7E-07	7.3E-01	4.1E-07	9.7E-07
Dibenz(a,h)anthracene	689	2.4E-07	7.3E+00	1.8E-06	4.1E-11	1.2E+00	5.0E-11	1.8E-07	7.3E+00	1.3E-06	3.1E-06
Pathway $ILCR_{total}$				**1.2E-05**			**3.3E-10**			**8.9E-06**	
$ILCR_{total}$ from surface soil											**2.1E-05**

Table J2.6 Carcinogenic risks for Resident Adult from exposure to surface soils at Coal Area B Exposure Unit

		Ingestion of Soil						Inhalation from Soil						Dermal Absorption from Soil						
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day) 0-2 yrs**	**Chemical Daily Intake (mg/kg-day) 2-6 yrs**	**Chemical Daily Intake (mg/kg-day) 6-16 yrs**	**Chemical Daily Intake (mg/kg-day) 16-30 yrs**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Carcinogen Inhalation EC (mg/m3) 6-16 yrs**	**Carcinogen Inhalation EC (mg/m3) 16-30 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day) 0-2 yrs**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Absorbed Dose (mg/kg-day) 6-16 yrs**	**Dermal Absorbed Dose (mg/kg-day) 16-30 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3429	1.3E-06	2.5E-06	6.7E-07	9.4E-07	7.3E-01	3.9E-06	6.9E-11	1.4E-10	3.5E-10	4.8E-10	1.10E-01	2.9E-10	4.6E-07	9.1E-07	3.5E-07	4.9E-07	7.3E-01	1.6E-06	5.5E-06
Benzo(b)fluoranthene	4636	1.7E-06	3.4E-06	9.1E-07	1.3E-06	7.3E-01	5.3E-06	9.3E-11	1.9E-10	4.7E-10	6.5E-10	1.1E-01	3.9E-10	6.2E-07	1.2E-06	4.7E-07	6.6E-07	7.3E-01	2.2E-06	7.5E-06
Benzo(k)fluoranthene	1853	6.8E-07	1.4E-06	3.6E-07	5.1E-07	7.3E-02	2.1E-07	3.7E-11	7.5E-11	1.9E-10	2.6E-10	1.1E-01	1.6E-10	2.5E-07	4.9E-07	1.9E-07	2.6E-07	7.3E-02	8.7E-08	3.0E-07
Benzo(a)pyrene	2993	1.1E-06	2.2E-06	5.9E-07	8.2E-07	7.3E+00	3.4E-05	6.0E-11	1.2E-10	3.0E-10	4.2E-10	1.1E+00	2.5E-09	4.0E-07	8.0E-07	3.0E-07	4.3E-07	7.3E+00	1.4E-05	4.8E-05
Indeno(1,2,3-cd)pyrene	2188	8.0E-07	1.6E-06	4.3E-07	6.0E-07	7.3E-01	2.5E-06	4.4E-11	8.8E-11	2.2E-10	3.1E-10	1.1E-01	1.8E-10	2.9E-07	5.8E-07	2.2E-07	3.1E-07	7.3E-01	1.0E-06	3.5E-06
Dibenz(a,h)anthracene	689	2.5E-07	5.0E-07	1.3E-07	1.9E-07	7.3E+00	7.9E-06	1.4E-11	2.8E-11	6.9E-11	9.7E-11	1.2E+00	6.3E-10	9.2E-08	1.8E-07	7.0E-08	9.8E-08	7.3E+00	3.2E-06	1.1E-05
Pathway $ILCR_{total}$							**5.4E-05**						**4.2E-09**						**2.2E-05**	
$ILCR_{total}$ from surface soil																				**7.6E-05**

Table J2.7 Carcinogenic risks for Resident Child from exposure to surface soils at Coal Area B Exposure Unit

		Ingestion of Soil				Inhalation from Soil				Dermal Absorption from Soil				
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake; 0-2yrs (mg/kg-day)**	**Chemical Daily Intake; 2-6 yrs (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3429	1.3E-06	2.5E-06	7.3E-01	2.7E-06	6.9E-11	1.4E-10	1.10E-01	1.2E-10	4.6E-07	9.1E-07	7.3E-01	1.0E-06	3.7E-06
Benzo(b)fluoranthene	4636	1.7E-06	3.4E-06	7.3E-01	3.7E-06	9.3E-11	1.9E-10	1.1E-01	1.6E-10	6.2E-07	1.2E-06	7.3E-01	1.4E-06	5.1E-06
Benzo(k)fluoranthene	1853	6.8E-07	1.4E-06	7.3E-02	1.5E-07	3.7E-11	7.5E-11	1.1E-01	6.6E-11	2.5E-07	4.9E-07	7.3E-02	5.4E-08	2.0E-07
Benzo(a)pyrene	2993	1.1E-06	2.2E-06	7.3E+00	2.4E-05	6.0E-11	1.2E-10	1.1E+00	1.1E-09	4.0E-07	8.0E-07	7.3E+00	8.7E-06	3.3E-05
Indeno(1,2,3-cd)pyrene	2188	8.0E-07	1.6E-06	7.3E-01	1.8E-06	4.4E-11	8.8E-11	1.1E-01	7.8E-11	2.9E-07	5.8E-07	7.3E-01	6.4E-07	2.4E-06
Dibenz(a,h)anthracene	689	2.5E-07	5.0E-07	7.3E+00	5.5E-06	1.4E-11	2.8E-11	1.2E+00	2.7E-10	9.2E-08	1.8E-07	7.3E+00	2.0E-06	7.5E-06
Pathway $ILCR_{total}$					**3.8E-05**				**1.8E-09**				**1.4E-05**	
$ILCR_{total}$ from surface soil														**5.2E-05**

Table J3.1 Chemical Daily Intake (CDI) from Incidental Ingestion of Surface Soil at Coal Area C Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Carcinogenic effects (6-16 years)**	**Carcinogenic effects (16-30 yrs)**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550

CALCULATIONS			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Chemicals of Potential Concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Medium: Surface Soil								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	10.3	1.47E-05	3.15E-06	1.01E-05	3.60E-06	1.32E-04	3.76E-06	7.52E-06	3.76E-05	3.76E-06	7.52E-06	2.01E-06	2.82E-06
Chrysene	218-01-9	11.6	1.66E-05	3.55E-06	1.14E-05	4.06E-06	1.48E-04	4.24E-06	8.48E-06	4.24E-05	4.24E-06	8.48E-06	2.27E-06	3.18E-06
Benzo(b)fluoranthene	205-99-2	16.1	2.30E-05	4.94E-06	1.58E-05	5.64E-06	2.06E-04	5.89E-06	1.18E-05	5.89E-05	5.89E-06	1.18E-05	3.16E-06	4.42E-06
Benzo(k)fluoranthene	207-08-9	5.8	8.28E-06	1.77E-06	5.67E-06	2.03E-06	7.41E-05	2.12E-06	4.24E-06	2.12E-05	2.12E-06	4.24E-06	1.13E-06	1.59E-06
Benzo(a)pyrene	50-32-8	10.6	1.51E-05	3.24E-06	1.04E-05	3.70E-06	1.35E-04	3.87E-06	7.74E-06	3.87E-05	3.87E-06	7.74E-06	2.07E-06	2.90E-06
Indeno(1,2,3-cd)pyrene	193-39-5	7.7	1.10E-05	2.36E-06	7.56E-06	2.70E-06	9.88E-05	2.82E-06	5.64E-06	2.82E-05	2.82E-06	5.64E-06	1.51E-06	2.12E-06
Dibenz(a,h)anthracene	53-70-3	1.0	1.42E-06	3.04E-07	9.72E-07	3.47E-07	1.27E-05	3.63E-07	7.26E-07	3.63E-06	3.63E-07	7.26E-07	1.94E-07	2.72E-07

CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration

Table J3.2 Dermal Absorption from Soil at Coal Area C Exposure Unit

		Receptor											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2yrs**	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	2.80E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.07	0.2	0.2	0.07	0.07

Calculations				Receptor												
				Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult					
Chemicals of Potential Concern	**CAS No.**	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**
									0-2yrs	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Benzo(a)anthracene	56-55-3	0.13	10.3	1.09E-05	2.34E-06	7.47E-06	2.67E-06	4.79E-05	1.37E-06	2.74E-06	1.54E-05	1.37E-06	2.74E-06	1.05E-06	1.46E-06
Chrysene	218-01-9	0.13	11.6	1.23E-05	2.63E-06	8.42E-06	3.01E-06	5.40E-05	1.54E-06	3.09E-06	1.74E-05	1.54E-06	3.09E-06	1.18E-06	1.65E-06
Benzo(b)fluoranthene	205-99-2	0.13	16.1	1.71E-05	3.66E-06	1.17E-05	4.18E-06	7.51E-05	2.15E-06	4.29E-06	2.42E-05	2.15E-06	4.29E-06	1.64E-06	2.29E-06
Benzo(k)fluoranthene	207-08-9	0.13	5.8	6.14E-06	1.32E-06	4.20E-06	1.50E-06	2.70E-05	7.71E-07	1.54E-06	8.69E-06	7.71E-07	1.54E-06	5.89E-07	8.24E-07
Benzo(a)pyrene	50-32-8	0.13	10.6	1.12E-05	2.40E-06	7.68E-06	2.74E-06	4.93E-05	1.41E-06	2.82E-06	1.59E-05	1.41E-06	2.82E-06	1.08E-06	1.51E-06
Indeno(1,2,3-cd)pyrene	193-39-5	0.13	7.7	8.18E-06	1.75E-06	5.60E-06	2.00E-06	3.60E-05	1.03E-06	2.05E-06	1.16E-05	1.03E-06	2.05E-06	7.84E-07	1.10E-06
Dibenz(a,h)anthracene	53-70-3	0.13	1.0	1.05E-06	2.25E-07	7.20E-07	2.57E-07	4.62E-06	1.32E-07	2.64E-07	1.49E-06	1.32E-07	2.64E-07	1.01E-07	1.41E-07

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004

DAD = Dermally Absorbed Dose

Table J3.3 Exposure Concentration from inhalation of dust from surface soil at Coal Area C Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Exposure Time (ET)	hrs/day	24	24	8	8	24	24	24	24	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Particulate emission factor (PEF)	m3/kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	613200	262800	613200	613200	613200	613200

			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Calculations															
Chemicals of potential concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**
Surface Soils								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	10.3	7.57E-09	1.62E-09	1.73E-09	6.17E-10	7.26E-09	2.07E-10	4.15E-10	7.26E-09	2.07E-10	4.15E-10	1.04E-09	1.45E-09
Chrysene	218-01-9	11.6	8.54E-09	1.83E-09	1.95E-09	6.96E-10	8.19E-09	2.34E-10	4.68E-10	8.19E-09	2.34E-10	4.68E-10	1.17E-09	1.64E-09
Benzo(b)fluoranthene	205-99-2	16.1	1.19E-08	2.54E-09	2.71E-09	9.67E-10	1.14E-08	3.25E-10	6.50E-10	1.14E-08	3.25E-10	6.50E-10	1.63E-09	2.28E-09
Benzo(k)fluoranthene	207-08-9	5.8	4.26E-09	9.14E-10	9.73E-10	3.48E-10	4.09E-09	1.17E-10	2.34E-10	4.09E-09	1.17E-10	2.34E-10	5.84E-10	8.18E-10
Benzo(a)pyrene	50-32-8	10.6	7.79E-09	1.67E-09	1.78E-09	6.35E-10	7.47E-09	2.13E-10	4.27E-10	7.47E-09	2.13E-10	4.27E-10	1.07E-09	1.49E-09
Indeno(1,2,3-cd)pyrene	193-39-5	7.7	5.68E-09	1.22E-09	1.30E-09	4.63E-10	5.45E-09	1.56E-10	3.11E-10	5.45E-09	1.56E-10	3.11E-10	7.78E-10	1.09E-09
Dibenz(a,h)anthracene	53-70-3	1.0	7.30E-10	1.56E-10	1.67E-10	5.95E-11	7.00E-10	2.00E-11	4.00E-11	7.00E-10	2.00E-11	4.00E-11	1.00E-10	1.40E-10

Cs: Soil or exposure point concentration; Inhalation EC: Inhalation Exposure Concentration

Table J3.4 Carcinogenic risks for Correctional Facility Inmate from exposure to surface soils at Coal Area C Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	10296	3.2E-06	7.3E-01	2.3E-06	1.6E-09	1.10E-01	1.8E-10	2.3E-06	7.3E-01	1.7E-06	4.0E-06
Chrysene	11612	3.6E-06	7.3E-03	2.6E-08	1.8E-09	1.10E-02	2.0E-11	2.6E-06	7.3E-03	1.9E-08	4.5E-08
Benzo(b)fluoranthene	16134	4.9E-06	7.3E-01	3.6E-06	2.5E-09	1.1E-01	2.8E-10	3.7E-06	7.3E-01	2.7E-06	6.3E-06
Benzo(k)fluoranthene	5798	1.8E-06	7.3E-02	1.3E-07	9.1E-10	1.1E-01	1.0E-10	1.3E-06	7.3E-02	9.6E-08	2.3E-07
Benzo(a)pyrene	10596	3.2E-06	7.3E+00	2.4E-05	1.7E-09	1.1E+00	1.8E-09	2.4E-06	7.3E+00	1.8E-05	4.1E-05
Indeno(1,2,3-cd)pyrene	7725	2.4E-06	7.3E-01	1.7E-06	1.2E-09	1.1E-01	1.3E-10	1.8E-06	7.3E-01	1.3E-06	3.0E-06
Dibenz(a,h)anthracene	993.1	3.0E-07	7.3E+00	2.2E-06	1.6E-10	1.2E+00	1.9E-10	2.3E-07	7.3E+00	1.6E-06	3.9E-06
Pathway $ILCR_{total}$				**3.4E-05**			**2.7E-09**			**2.5E-05**	
$ILCR_{total}$ from surface soil											**5.9E-05**

Table J3.5 Carcinogenic risks for Correctional Facility Staff from exposure to surface soils at Coal Area C Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	10296	3.6E-06	7.3E-01	2.6E-06	6.2E-10	1.10E-01	6.8E-11	2.7E-06	7.3E-01	1.9E-06	4.6E-06
Chrysene	11612	4.1E-06	7.3E-03	3.0E-08	7.0E-10	1.10E-02	7.7E-12	3.0E-06	7.3E-03	2.2E-08	5.2E-08
Benzo(b)fluoranthene	16134	5.6E-06	7.3E-01	4.1E-06	9.7E-10	1.1E-01	1.1E-10	4.2E-06	7.3E-01	3.0E-06	7.2E-06
Benzo(k)fluoranthene	5798	2.0E-06	7.3E-02	1.5E-07	3.5E-10	1.1E-01	3.8E-11	1.5E-06	7.3E-02	1.1E-07	2.6E-07
Benzo(a)pyrene	10596	3.7E-06	7.3E+00	2.7E-05	6.4E-10	1.1E+00	7.0E-10	2.7E-06	7.3E+00	2.0E-05	4.7E-05
Indeno(1,2,3-cd)pyrene	7725	2.7E-06	7.3E-01	2.0E-06	4.6E-10	1.1E-01	5.1E-11	2.0E-06	7.3E-01	1.5E-06	3.4E-06
Dibenz(a,h)anthracene	993.1	3.5E-07	7.3E+00	2.5E-06	6.0E-11	1.2E+00	7.1E-11	2.6E-07	7.3E+00	1.9E-06	4.4E-06
Pathway $ILCR_{total}$				**3.8E-05**			**1.0E-09**			**2.8E-05**	
$ILCR_{total}$ from surface soil											**6.7E-05**

Table J3.6 Carcinogenic risks for Resident Adult from exposure to surface soils at Coal Area C Exposure Unit

		Ingestion of Soil						Inhalation from Soil						Dermal Absorption from Soil						
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day) 0-2 yrs**	**Chemical Daily Intake (mg/kg-day) 2-6 yrs**	**Chemical Daily Intake (mg/kg-day) 6-16 yrs**	**Chemical Daily Intake (mg/kg-day) 16-30 yrs**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Carcinogen Inhalation EC (mg/m3) 6-16 yrs**	**Carcinogen Inhalation EC (mg/m3) 16-30 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day) 0-2 yrs**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Absorbed Dose (mg/kg-day) 6-16 yrs**	**Dermal Absorbed Dose (mg/kg-day) 16-30 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	10296	3.8E-06	7.5E-06	2.0E-06	2.8E-06	7.3E-01	1.2E-05	2.1E-10	4.1E-10	1.0E-09	1.5E-09	1.10E-01	8.7E-10	1.4E-06	2.7E-06	1.0E-06	1.5E-06	7.3E-01	4.8E-06	1.7E-05
Chrysene	11612	4.2E-06	8.5E-06	2.3E-06	3.2E-06	7.3E-03	1.3E-07	2.3E-10	4.7E-10	1.2E-09	1.6E-09	1.10E-02	9.8E-11	1.5E-06	3.1E-06	1.2E-06	1.7E-06	7.3E-03	5.4E-08	1.9E-07
Benzo(b)fluoranthene	16134	5.9E-06	1.2E-05	3.2E-06	4.4E-06	7.3E-01	1.8E-05	3.3E-10	6.5E-10	1.6E-09	2.3E-09	1.1E-01	1.4E-09	2.1E-06	4.3E-06	1.6E-06	2.3E-06	7.3E-01	7.6E-06	2.6E-05
Benzo(k)fluoranthene	5798	2.1E-06	4.2E-06	1.1E-06	1.6E-06	7.3E-02	6.6E-07	1.2E-10	2.3E-10	5.8E-10	8.2E-10	1.1E-01	4.9E-10	7.7E-07	1.5E-06	5.9E-07	8.2E-07	7.3E-02	2.7E-07	9.4E-07
Benzo(a)pyrene	10596	3.9E-06	7.7E-06	2.1E-06	2.9E-06	7.3E+00	1.2E-04	2.1E-10	4.3E-10	1.1E-09	1.5E-09	1.1E+00	8.9E-09	1.4E-06	2.8E-06	1.1E-06	1.5E-06	7.3E+00	5.0E-05	1.7E-04
Indeno(1,2,3-cd)pyrene	7725	2.8E-06	5.6E-06	1.5E-06	2.1E-06	7.3E-01	8.8E-06	1.6E-10	3.1E-10	7.8E-10	1.1E-09	1.1E-01	6.5E-10	1.0E-06	2.1E-06	7.8E-07	1.1E-06	7.3E-01	3.6E-06	1.2E-05
Dibenz(a,h)anthracene	993.1	3.6E-07	7.3E-07	1.9E-07	2.7E-07	7.3E+00	1.1E-05	2.0E-11	4.0E-11	1.0E-10	1.4E-10	1.2E+00	9.1E-10	1.3E-07	2.6E-07	1.0E-07	1.4E-07	7.3E+00	4.7E-06	1.6E-05
Pathway ILCR$_{total}$							**1.7E-04**						**1.3E-08**						**7.1E-05**	
ILCR$_{total}$ from surface soil																				**2.4E-04**

Table J3.7 Carcinogenic risks for Resident Child from exposure to surface soils at Coal Area C Exposure Unit

		Ingestion of Soil				Inhalation from Soil				Dermal Absorption from Soil				
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake; 0-2yrs (mg/kg-day)**	**Chemical Daily Intake; 2-6 yrs (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	10296	3.8E-06	7.5E-06	7.3E-01	8.2E-06	2.1E-10	4.1E-10	1.10E-01	3.7E-10	1.4E-06	2.7E-06	7.3E-01	3.0E-06	1.1E-05
Chrysene	11612	4.2E-06	8.5E-06	7.3E-03	9.3E-08	2.3E-10	4.7E-10	1.10E-02	4.1E-11	1.5E-06	3.1E-06	7.3E-03	3.4E-08	1.3E-07
Benzo(b)fluoranthene	16134	5.9E-06	1.2E-05	7.3E-01	1.3E-05	3.3E-10	6.5E-10	1.1E-01	5.7E-10	2.1E-06	4.3E-06	7.3E-01	4.7E-06	1.8E-05
Benzo(k)fluoranthene	5798	2.1E-06	4.2E-06	7.3E-02	4.6E-07	1.2E-10	2.3E-10	1.1E-01	2.1E-10	7.7E-07	1.5E-06	7.3E-02	1.7E-07	6.3E-07
Benzo(a)pyrene	10596	3.9E-06	7.7E-06	7.3E+00	8.5E-05	2.1E-10	4.3E-10	1.1E+00	3.8E-09	1.4E-06	2.8E-06	7.3E+00	3.1E-05	1.2E-04
Indeno(1,2,3-cd)pyrene	7725	2.8E-06	5.6E-06	7.3E-01	6.2E-06	1.6E-10	3.1E-10	1.1E-01	2.7E-10	1.0E-06	2.1E-06	7.3E-01	2.2E-06	8.4E-06
Dibenz(a,h)anthracene	993.1	3.6E-07	7.3E-07	7.3E+00	7.9E-06	2.0E-11	4.0E-11	1.2E+00	3.8E-10	1.3E-07	2.6E-07	7.3E+00	2.9E-06	1.1E-05
Pathway $ILCR_{total}$					**1.2E-04**				**5.6E-09**				**4.4E-05**	
$ILCR_{total}$ from surface soil														**1.6E-04**

Table J4.1 Chemical Daily Intake (CDI) from incidental ingestion of surface soil at Main Entrance Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Carcinogenic effects (6-16 years)**	**Carcinogenic effects (16-30 yrs)**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550

CALCULATIONS			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Chemicals of Potential Concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Medium: Surface Soil								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	3.4	4.86E-06	1.04E-06	3.33E-06	1.19E-06	4.35E-05	1.24E-06	2.48E-06	1.24E-05	1.24E-06	2.48E-06	6.66E-07	9.32E-07
Benzo(b)fluoranthene	205-99-2	5.1	7.32E-06	1.57E-06	5.02E-06	1.79E-06	6.56E-05	1.87E-06	3.75E-06	1.87E-05	1.87E-06	3.75E-06	1.00E-06	1.40E-06
Benzo(k)fluoranthene	207-08-9	3.1	4.48E-06	9.59E-07	3.07E-06	1.10E-06	4.01E-05	1.14E-06	2.29E-06	1.14E-05	1.14E-06	2.29E-06	6.13E-07	8.59E-07
Benzo(a)pyrene	50-32-8	3.4	4.83E-06	1.03E-06	3.31E-06	1.18E-06	4.32E-05	1.23E-06	2.47E-06	1.23E-05	1.23E-06	2.47E-06	6.61E-07	9.26E-07
Indeno(1,2,3-cd)pyrene	193-39-5	2.5	3.54E-06	7.58E-07	2.42E-06	8.66E-07	3.17E-05	9.05E-07	1.81E-06	9.05E-06	9.05E-07	1.81E-06	4.85E-07	6.79E-07
Dibenz(a,h)anthracene	53-70-3	1.1	1.63E-06	3.50E-07	1.12E-06	3.99E-07	1.46E-05	4.17E-07	8.34E-07	4.17E-06	4.17E-07	8.34E-07	2.23E-07	3.13E-07

CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration

Table J4.2 Dermal Absorption from surface soil at Main Entrance Exposure Unit

		Receptor											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2yrs**	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	2.80E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.07	0.2	0.2	0.07	0.07

Calculations				Receptor												
				Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult					
Chemicals of Potential Concern	**CAS No.**	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	
									0-2yrs	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**	
Benzo(a)anthracene	56-55-3	0.13	3.4	3.60E-06	7.71E-07	2.47E-06	8.81E-07	1.58E-05	4.52E-07	9.04E-07	5.10E-06	4.52E-07	9.04E-07	3.45E-07	4.83E-07	
Benzo(b)fluoranthene	205-99-2	0.13	5.1	5.43E-06	1.16E-06	3.72E-06	1.33E-06	2.39E-05	6.82E-07	1.36E-06	7.69E-06	6.82E-07	1.36E-06	5.20E-07	7.29E-07	
Benzo(k)fluoranthene	207-08-9	0.13	3.1	3.32E-06	7.11E-07	2.27E-06	8.12E-07	1.46E-05	4.17E-07	8.33E-07	4.70E-06	4.17E-07	8.33E-07	3.18E-07	4.45E-07	
Benzo(a)pyrene	50-32-8	0.13	3.4	3.58E-06	7.66E-07	2.45E-06	8.75E-07	1.57E-05	4.49E-07	8.99E-07	5.07E-06	4.49E-07	8.99E-07	3.43E-07	4.80E-07	
Indeno(1,2,3-cd)pyrene	193-39-5	0.13	2.5	2.62E-06	5.62E-07	1.80E-06	6.41E-07	1.15E-05	3.29E-07	6.59E-07	3.71E-06	3.29E-07	6.59E-07	2.51E-07	3.52E-07	
Dibenz(a,h)anthracene	53-70-3	0.13	1.1	1.21E-06	2.59E-07	8.28E-07	2.96E-07	5.31E-06	1.52E-07	3.04E-07	1.71E-06	1.52E-07	3.04E-07	1.16E-07	1.62E-07	

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004

DAD = Dermally Absorbed Dose

Table J4.3 Exposure Concentration from inhalation of dust from surface soil at Main Entrance Exposure Unit

		Receptors											
		Correctional Facility											
Exposure Parameters	**Units**	**Inmate**		**Correctional Facility Staff**		**Resident Child**			**Resident Adult**				
							0-2 yrs	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Exposure Time (ET)	hrs/day	24	24	8	8	24	24	24	24	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Particulate emission factor (PEF)	m3/kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	613200	262800	613200	613200	613200	613200

			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Calculations															
Chemicals of potential concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**
Surface Soils								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	3.4	2.50E-09	5.36E-10	5.71E-10	2.04E-10	2.40E-09	6.85E-11	1.37E-10	2.40E-09	6.85E-11	1.37E-10	3.43E-10	4.80E-10
Benzo(b)fluoranthene	205-99-2	5.1	3.77E-09	8.08E-10	8.61E-10	3.07E-10	3.61E-09	1.03E-10	2.07E-10	3.61E-09	1.03E-10	2.07E-10	5.16E-10	7.23E-10
Benzo(k)fluoranthene	207-08-9	3.1	2.30E-09	4.94E-10	5.26E-10	1.88E-10	2.21E-09	6.31E-11	1.26E-10	2.21E-09	6.31E-11	1.26E-10	3.16E-10	4.42E-10
Benzo(a)pyrene	50-32-8	3.4	2.48E-09	5.32E-10	5.67E-10	2.03E-10	2.38E-09	6.81E-11	1.36E-10	2.38E-09	6.81E-11	1.36E-10	3.40E-10	4.76E-10
Indeno(1,2,3-cd)pyrene	193-39-5	2.5	1.82E-09	3.90E-10	4.16E-10	1.49E-10	1.75E-09	4.99E-11	9.98E-11	1.75E-09	4.99E-11	9.98E-11	2.49E-10	3.49E-10
Dibenz(a,h)anthracene	53-70-3	1.1	8.40E-10	1.80E-10	1.92E-10	6.85E-11	8.05E-10	2.30E-11	4.60E-11	8.05E-10	2.30E-11	4.60E-11	1.15E-10	1.61E-10

Cs: Soil or exposure point concentration; Inhalation EC: Inhalation Exposure Concentration

Table J4.4 Carcinogenic risks for Correctional Facility Inmate from exposure to surface soils at Main Entrance Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3401	1.0E-06	7.3E-01	7.6E-07	5.4E-10	1.10E-01	5.9E-11	7.7E-07	7.3E-01	5.6E-07	1.3E-06
Benzo(b)fluoranthene	5127	1.6E-06	7.3E-01	1.1E-06	8.1E-10	1.1E-01	8.9E-11	1.2E-06	7.3E-01	8.5E-07	2.0E-06
Benzo(k)fluoranthene	3134	9.6E-07	7.3E-02	7.0E-08	4.9E-10	1.1E-01	5.4E-11	7.1E-07	7.3E-02	5.2E-08	1.2E-07
Benzo(a)pyrene	3379	1.0E-06	7.3E+00	7.6E-06	5.3E-10	1.1E+00	5.9E-10	7.7E-07	7.3E+00	5.6E-06	1.3E-05
Indeno(1,2,3-cd)pyrene	2477	7.6E-07	7.3E-01	5.5E-07	3.9E-10	1.1E-01	4.3E-11	5.6E-07	7.3E-01	4.1E-07	9.6E-07
Dibenz(a,h)anthracene	1142	3.5E-07	7.3E+00	2.6E-06	1.8E-10	1.2E+00	2.2E-10	2.6E-07	7.3E+00	1.9E-06	4.4E-06
Pathway $ILCR_{total}$				**1.3E-05**			**1.0E-09**			**9.4E-06**	
$ILCR_{total}$ from surface soil											**2.2E-05**

Table J4.5 Carcinogenic risks for Correctional Facility Staff from exposure to surface soils at Main Entrance Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3401	1.2E-06	7.3E-01	8.7E-07	2.0E-10	1.10E-01	2.2E-11	8.8E-07	7.3E-01	6.4E-07	1.5E-06
Benzo(b)fluoranthene	5127	1.8E-06	7.3E-01	1.3E-06	3.1E-10	1.1E-01	3.4E-11	1.3E-06	7.3E-01	9.7E-07	2.3E-06
Benzo(k)fluoranthene	3134	1.1E-06	7.3E-02	8.0E-08	1.9E-10	1.1E-01	2.1E-11	8.1E-07	7.3E-02	5.9E-08	1.4E-07
Benzo(a)pyrene	3379	1.2E-06	7.3E+00	8.6E-06	2.0E-10	1.1E+00	2.2E-10	8.7E-07	7.3E+00	6.4E-06	1.5E-05
Indeno(1,2,3-cd)pyrene	2477	8.7E-07	7.3E-01	6.3E-07	1.5E-10	1.1E-01	1.6E-11	6.4E-07	7.3E-01	4.7E-07	1.1E-06
Dibenz(a,h)anthracene	1142	4.0E-07	7.3E+00	2.9E-06	6.8E-11	1.2E+00	8.2E-11	3.0E-07	7.3E+00	2.2E-06	5.1E-06
Pathway $ILCR_{total}$				**1.4E-05**			**4.0E-10**			**1.1E-05**	
$ILCR_{total}$ from surface soil											**2.5E-05**

Table J4.6 Carcinogenic risks for Resident Adult from exposure to surface soils at Main Entrance Exposure Unit

		Ingestion of Soil						Inhalation from Soil						Dermal Absorption from Soil						
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day) 0-2 yrs**	**Chemical Daily Intake (mg/kg-day) 2-6 yrs**	**Chemical Daily Intake (mg/kg-day) 6-16 yrs**	**Chemical Daily Intake (mg/kg-day) 16-30 yrs**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Carcinogen Inhalation EC (mg/m3) 6-16 yrs**	**Carcinogen Inhalation EC (mg/m3) 16-30 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day) 0-2 yrs**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Absorbed Dose (mg/kg-day) 6-16 yrs**	**Dermal Absorbed Dose (mg/kg-day) 16-30 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3401	1.2E-06	2.5E-06	6.7E-07	9.3E-07	7.3E-01	3.9E-06	6.9E-11	1.4E-10	3.4E-10	4.8E-10	1.10E-01	2.9E-10	4.5E-07	9.0E-07	3.5E-07	4.8E-07	7.3E-01	1.6E-06	5.5E-06
Benzo(b)fluoranthene	5127	1.9E-06	3.7E-06	1.0E-06	1.4E-06	7.3E-01	5.9E-06	1.0E-10	2.1E-10	5.2E-10	7.2E-10	1.1E-01	4.3E-10	6.8E-07	1.4E-06	5.2E-07	7.3E-07	7.3E-01	2.4E-06	8.3E-06
Benzo(k)fluoranthene	3134	1.1E-06	2.3E-06	6.1E-07	8.6E-07	7.3E-02	3.6E-07	6.3E-11	1.3E-10	3.2E-10	4.4E-10	1.1E-01	2.6E-10	4.2E-07	8.3E-07	3.2E-07	4.5E-07	7.3E-02	1.5E-07	5.1E-07
Benzo(a)pyrene	3379	1.2E-06	2.5E-06	6.6E-07	9.3E-07	7.3E+00	3.9E-05	6.8E-11	1.4E-10	3.4E-10	4.8E-10	1.1E+00	2.8E-09	4.5E-07	9.0E-07	3.4E-07	4.8E-07	7.3E+00	1.6E-05	5.4E-05
Indeno(1,2,3-cd)pyrene	2477	9.0E-07	1.8E-06	4.8E-07	6.8E-07	7.3E-01	2.8E-06	5.0E-11	1.0E-10	2.5E-10	3.5E-10	1.1E-01	2.1E-10	3.3E-07	6.6E-07	2.5E-07	3.5E-07	7.3E-01	1.2E-06	4.0E-06
Dibenz(a,h)anthracene	1142	4.2E-07	8.3E-07	2.2E-07	3.1E-07	7.3E+00	1.3E-05	2.3E-11	4.6E-11	1.2E-10	1.6E-10	1.2E+00	1.0E-09	1.5E-07	3.0E-07	1.2E-07	1.6E-07	7.3E+00	5.4E-06	1.8E-05
Pathway $ILCR_{total}$							**6.5E-05**						**5.1E-09**						**2.7E-05**	
$ILCR_{total}$ from surface soil																				**9.1E-05**

Table J4.7 Carcinogenic risks for Resident Child from exposure to surface soils at Main Entrance Exposure Unit

		Ingestion of Soil				Inhalation from Soil				Dermal Absorption from Soil				
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake; 0-2yrs (mg/kg-day)**	**Chemical Daily Intake; 2-6 yrs (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	3401	1.2E-06	2.5E-06	7.3E-01	2.7E-06	6.9E-11	1.4E-10	1.10E-01	1.2E-10	4.5E-07	9.0E-07	7.3E-01	9.9E-07	3.7E-06
Benzo(b)fluoranthene	5127	1.9E-06	3.7E-06	7.3E-01	4.1E-06	1.0E-10	2.1E-10	1.1E-01	1.8E-10	6.8E-07	1.4E-06	7.3E-01	1.5E-06	5.6E-06
Benzo(k)fluoranthene	3134	1.1E-06	2.3E-06	7.3E-02	2.5E-07	6.3E-11	1.3E-10	1.1E-01	1.1E-10	4.2E-07	8.3E-07	7.3E-02	9.1E-08	3.4E-07
Benzo(a)pyrene	3379	1.2E-06	2.5E-06	7.3E+00	2.7E-05	6.8E-11	1.4E-10	1.1E+00	1.2E-09	4.5E-07	9.0E-07	7.3E+00	9.8E-06	3.7E-05
Indeno(1,2,3-cd)pyrene	2477	9.0E-07	1.8E-06	7.3E-01	2.0E-06	5.0E-11	1.0E-10	1.1E-01	8.8E-11	3.3E-07	6.6E-07	7.3E-01	7.2E-07	2.7E-06
Dibenz(a,h)anthracene	1142	4.2E-07	8.3E-07	7.3E+00	9.1E-06	2.3E-11	4.6E-11	1.2E+00	4.4E-10	1.5E-07	3.0E-07	7.3E+00	3.3E-06	1.2E-05
Pathway $ILCR_{total}$					**4.5E-05**				**2.1E-09**				**1.6E-05**	
$ILCR_{total}$ from surface soil														**6.2E-05**

Table J5.1 Chemical Daily Intake (CDI) from incidental ingestion of surface soil at Vehicle Wash Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Carcinogenic effects (6-16 years)**	**Carcinogenic effects (16-30 yrs)**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550

CALCULATIONS

			Receptors											
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Chemicals of Potential Concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Medium: Surface Soil								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	4.8	6.87E-06	1.47E-06	4.71E-06	1.68E-06	6.15E-05	1.76E-06	3.51E-06	1.76E-05	1.76E-06	3.51E-06	9.41E-07	1.32E-06
Benzo(b)fluoranthene	205-99-2	4.9	7.06E-06	1.51E-06	4.84E-06	1.73E-06	6.32E-05	1.81E-06	3.61E-06	1.81E-05	1.81E-06	3.61E-06	9.68E-07	1.35E-06
Benzo(k)fluoranthene	207-08-9	2.5	3.63E-06	7.78E-07	2.49E-06	8.89E-07	3.25E-05	9.29E-07	1.86E-06	9.29E-06	9.29E-07	1.86E-06	4.98E-07	6.97E-07
Benzo(a)pyrene	50-32-8	4.4	6.34E-06	1.36E-06	4.35E-06	1.55E-06	5.68E-05	1.62E-06	3.24E-06	1.62E-05	1.62E-06	3.24E-06	8.69E-07	1.22E-06
Indeno(1,2,3-cd)pyrene	193-39-5	2.2	3.09E-06	6.62E-07	2.12E-06	7.56E-07	2.77E-05	7.90E-07	1.58E-06	7.90E-06	7.90E-07	1.58E-06	4.23E-07	5.93E-07
Dibenz(a,h)anthracene	53-70-3	1.3	1.79E-06	3.83E-07	1.23E-06	4.38E-07	1.60E-05	4.57E-07	9.15E-07	4.57E-06	4.57E-07	9.15E-07	2.45E-07	3.43E-07

NA: Not Applicable; CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration

Table J5.2 Dermal Absorption from surface soil at Vehicle Wash Exposure Unit

		Receptor											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2yrs**	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	2.80E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.07	0.2	0.2	0.07	0.07

Calculations				Receptor												
				Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult					
Chemicals of Potential Concern	**CAS No.**	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**
									0-2yrs	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Benzo(a)anthracene	56-55-3	0.13	4.8	5.09E-06	1.09E-06	3.49E-06	1.25E-06	2.24E-05	6.40E-07	1.28E-06	7.21E-06	6.40E-07	1.28E-06	4.88E-07	6.84E-07
Benzo(b)fluoranthene	205-99-2	0.13	4.9	5.23E-06	1.12E-06	3.59E-06	1.28E-06	2.30E-05	6.58E-07	1.32E-06	7.41E-06	6.58E-07	1.32E-06	5.02E-07	7.03E-07
Benzo(k)fluoranthene	207-08-9	0.13	2.5	2.69E-06	5.77E-07	1.84E-06	6.58E-07	1.18E-05	3.38E-07	6.76E-07	3.81E-06	3.38E-07	6.76E-07	2.58E-07	3.61E-07
Benzo(a)pyrene	50-32-8	0.13	4.4	4.70E-06	1.01E-06	3.22E-06	1.15E-06	2.07E-05	5.91E-07	1.18E-06	6.66E-06	5.91E-07	1.18E-06	4.51E-07	6.31E-07
Indeno(1,2,3-cd)pyrene	193-39-5	0.13	2.2	2.29E-06	4.91E-07	1.57E-06	5.60E-07	1.01E-05	2.88E-07	5.75E-07	3.24E-06	2.88E-07	5.75E-07	2.20E-07	3.07E-07
Dibenz(a,h)anthracene	53-70-3	0.13	1.3	1.33E-06	2.84E-07	9.08E-07	3.24E-07	5.83E-06	1.66E-07	3.33E-07	1.88E-06	1.66E-07	3.33E-07	1.27E-07	1.78E-07

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004

DAD = Dermally Absorbed Dose

Table J5.3 Exposure Concentration from inhalation of dust from surface soil at Vehicle Wash Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Exposure Time (ET)	hrs/day	24	24	8	8	24	24	24	24	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Particulate emission factor (PEF)	m3/kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	613200	262800	613200	613200	613200	613200

			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Calculations															
Chemicals of potential concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**
Surface Soils								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	4.8	3.54E-09	7.58E-10	8.08E-10	2.88E-10	3.39E-09	9.69E-11	1.94E-10	3.39E-09	9.69E-11	1.94E-10	4.85E-10	6.78E-10
Benzo(b)fluoranthene	205-99-2	4.9	3.64E-09	7.79E-10	8.30E-10	2.96E-10	3.49E-09	9.96E-11	1.99E-10	3.49E-09	9.96E-11	1.99E-10	4.98E-10	6.97E-10
Benzo(k)fluoranthene	207-08-9	2.5	1.87E-09	4.01E-10	4.27E-10	1.52E-10	1.79E-09	5.12E-11	1.02E-10	1.79E-09	5.12E-11	1.02E-10	2.56E-10	3.59E-10
Benzo(a)pyrene	50-32-8	4.4	3.27E-09	7.00E-10	7.46E-10	2.66E-10	3.13E-09	8.95E-11	1.79E-10	3.13E-09	8.95E-11	1.79E-10	4.47E-10	6.26E-10
Indeno(1,2,3-cd)pyrene	193-39-5	2.2	1.59E-09	3.41E-10	3.63E-10	1.30E-10	1.53E-09	4.36E-11	8.71E-11	1.53E-09	4.36E-11	8.71E-11	2.18E-10	3.05E-10
Dibenz(a,h)anthracene	53-70-3	1.3	9.21E-10	1.97E-10	2.10E-10	7.51E-11	8.83E-10	2.52E-11	5.04E-11	8.83E-10	2.52E-11	5.04E-11	1.26E-10	1.77E-10

Cs: Soil or exposure point concentration; Inhalation EC: Inhalation Exposure Concentration

Table J5.4 Carcinogenic risks for Correctional Facility Inmate from exposure to surface soils at Vehicle Wash Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	4811	1.5E-06	7.3E-01	1.1E-06	7.6E-10	1.10E-01	8.3E-11	1.1E-06	7.3E-01	8.0E-07	1.9E-06
Benzo(b)fluoranthene	4945	1.5E-06	7.3E-01	1.1E-06	7.8E-10	1.1E-01	8.6E-11	1.1E-06	7.3E-01	8.2E-07	1.9E-06
Benzo(k)fluoranthene	2543	7.8E-07	7.3E-02	5.7E-08	4.0E-10	1.1E-01	4.4E-11	5.8E-07	7.3E-02	4.2E-08	9.9E-08
Benzo(a)pyrene	4441	1.4E-06	7.3E+00	9.9E-06	7.0E-10	1.1E+00	7.7E-10	1.0E-06	7.3E+00	7.4E-06	1.7E-05
Indeno(1,2,3-cd)pyrene	2163	6.6E-07	7.3E-01	4.8E-07	3.4E-10	1.1E-01	3.7E-11	4.9E-07	7.3E-01	3.6E-07	8.4E-07
Dibenz(a,h)anthracene	1252	3.8E-07	7.3E+00	2.8E-06	2.0E-10	1.2E+00	2.4E-10	2.8E-07	7.3E+00	2.1E-06	4.9E-06
Pathway $ILCR_{total}$				**1.5E-05**			**1.3E-09**			**1.1E-05**	
$ILCR_{total}$ from surface soil											**2.7E-05**

Table J5.5 Carcinogenic risks for Correctional Facility Staff from exposure to surface soils at Vehicle Wash Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	4811	1.7E-06	7.3E-01	1.2E-06	2.9E-10	1.10E-01	3.2E-11	1.2E-06	7.3E-01	9.1E-07	2.1E-06
Benzo(b)fluoranthene	4945	1.7E-06	7.3E-01	1.3E-06	3.0E-10	1.1E-01	3.3E-11	1.3E-06	7.3E-01	9.3E-07	2.2E-06
Benzo(k)fluoranthene	2543	8.9E-07	7.3E-02	6.5E-08	1.5E-10	1.1E-01	1.7E-11	6.6E-07	7.3E-02	4.8E-08	1.1E-07
Benzo(a)pyrene	4441	1.6E-06	7.3E+00	1.1E-05	2.7E-10	1.1E+00	2.9E-10	1.1E-06	7.3E+00	8.4E-06	2.0E-05
Indeno(1,2,3-cd)pyrene	2163	7.6E-07	7.3E-01	5.5E-07	1.3E-10	1.1E-01	1.4E-11	5.6E-07	7.3E-01	4.1E-07	9.6E-07
Dibenz(a,h)anthracene	1252	4.4E-07	7.3E+00	3.2E-06	7.5E-11	1.2E+00	9.0E-11	3.2E-07	7.3E+00	2.4E-06	5.6E-06
Pathway $ILCR_{total}$				**1.8E-05**			**4.8E-10**			**1.3E-05**	
$ILCR_{total}$ from surface soil											**3.1E-05**

Table J5.6 Carcinogenic risks for Resident Adult from exposure to surface soils at Vehicle Wash Exposure Unit

		Ingestion of Soil						Inhalation from Soil						Dermal Absorption from Soil						
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day) 0-2 yrs**	**Chemical Daily Intake (mg/kg-day) 2-6 yrs**	**Chemical Daily Intake (mg/kg-day) 6-16 yrs**	**Chemical Daily Intake (mg/kg-day) 16-30 yrs**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Carcinogen Inhalation EC (mg/m3) 6-16 yrs**	**Carcinogen Inhalation EC (mg/m3) 16-30 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day) 0-2 yrs**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Absorbed Dose (mg/kg-day) 6-16 yrs**	**Dermal Absorbed Dose (mg/kg-day) 16-30 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	4811	1.8E-06	3.5E-06	9.4E-07	1.3E-06	7.3E-01	5.5E-06	9.7E-11	1.9E-10	4.8E-10	6.8E-10	1.10E-01	4.1E-10	6.4E-07	1.3E-06	4.9E-07	6.8E-07	7.3E-01	2.3E-06	7.8E-06
Benzo(b)fluoranthene	4945	1.8E-06	3.6E-06	9.7E-07	1.4E-06	7.3E-01	5.7E-06	1.0E-10	2.0E-10	5.0E-10	7.0E-10	1.1E-01	4.2E-10	6.6E-07	1.3E-06	5.0E-07	7.0E-07	7.3E-01	2.3E-06	8.0E-06
Benzo(k)fluoranthene	2543	9.3E-07	1.9E-06	5.0E-07	7.0E-07	7.3E-02	2.9E-07	5.1E-11	1.0E-10	2.6E-10	3.6E-10	1.1E-01	2.1E-10	3.4E-07	6.8E-07	2.6E-07	3.6E-07	7.3E-02	1.2E-07	4.1E-07
Benzo(a)pyrene	4441	1.6E-06	3.2E-06	8.7E-07	1.2E-06	7.3E+00	5.1E-05	8.9E-11	1.8E-10	4.5E-10	6.3E-10	1.1E+00	3.7E-09	5.9E-07	1.2E-06	4.5E-07	6.3E-07	7.3E+00	2.1E-05	7.2E-05
Indeno(1,2,3-cd)pyrene	2163	7.9E-07	1.6E-06	4.2E-07	5.9E-07	7.3E-01	2.5E-06	4.4E-11	8.7E-11	2.2E-10	3.1E-10	1.1E-01	1.8E-10	2.9E-07	5.8E-07	2.2E-07	3.1E-07	7.3E-01	1.0E-06	3.5E-06
Dibenz(a,h)anthracene	1252	4.6E-07	9.1E-07	2.5E-07	3.4E-07	7.3E+00	1.4E-05	2.5E-11	5.0E-11	1.3E-10	1.8E-10	1.2E+00	1.2E-09	1.7E-07	3.3E-07	1.3E-07	1.8E-07	7.3E+00	5.9E-06	2.0E-05
Pathway $ILCR_{total}$							**7.9E-05**						**6.1E-09**						**3.2E-05**	
$ILCR_{total}$ from surface soil																				**1.1E-04**

Table J5.7 Carcinogenic risks for Resident Child from exposure to surface soils at Vehicle Wash Exposure Unit

		Ingestion of Soil				Inhalation from Soil				Dermal Absorption from Soil				
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake; 0-2yrs (mg/kg-day)**	**Chemical Daily Intake; 2-6 yrs (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	4811	1.8E-06	3.5E-06	7.3E-01	3.8E-06	9.7E-11	1.9E-10	1.10E-01	1.7E-10	6.4E-07	1.3E-06	7.3E-01	1.4E-06	5.2E-06
Benzo(b)fluoranthene	4945	1.8E-06	3.6E-06	7.3E-01	4.0E-06	1.0E-10	2.0E-10	1.1E-01	1.8E-10	6.6E-07	1.3E-06	7.3E-01	1.4E-06	5.4E-06
Benzo(k)fluoranthene	2543	9.3E-07	1.9E-06	7.3E-02	2.0E-07	5.1E-11	1.0E-10	1.1E-01	9.0E-11	3.4E-07	6.8E-07	7.3E-02	7.4E-08	2.8E-07
Benzo(a)pyrene	4441	1.6E-06	3.2E-06	7.3E+00	3.6E-05	8.9E-11	1.8E-10	1.1E+00	1.6E-09	5.9E-07	1.2E-06	7.3E+00	1.3E-05	4.8E-05
Indeno(1,2,3-cd)pyrene	2163	7.9E-07	1.6E-06	7.3E-01	1.7E-06	4.4E-11	8.7E-11	1.1E-01	7.7E-11	2.9E-07	5.8E-07	7.3E-01	6.3E-07	2.4E-06
Dibenz(a,h)anthracene	1252	4.6E-07	9.1E-07	7.3E+00	1.0E-05	2.5E-11	5.0E-11	1.2E+00	4.8E-10	1.7E-07	3.3E-07	7.3E+00	3.6E-06	1.4E-05
Pathway $ILCR_{total}$					**5.5E-05**				**2.6E-09**				**2.0E-05**	
$ILCR_{total}$ from surface soil														**7.5E-05**

Table J6.1 Chemical Daily Intake from incidental ingestion of subsurface soils at Coal Areas.
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Receptors							
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child		Resident Adult (a)	
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	6	30	30
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	10950	25550

CALCULATIONS

		Receptors							
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child		Resident Adult	
Exposure Unit	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Coal Area A EU	12.6	1.80E-05	3.86E-06	1.23E-05	4.40E-06	1.61E-04	1.38E-05	4.60E-05	1.97E-05
Coal Area B EU	10.5	1.50E-05	3.22E-06	1.03E-05	3.68E-06	1.35E-04	1.15E-05	3.85E-05	1.65E-05
Coal Area C EU	11.9	1.70E-05	3.65E-06	1.17E-05	4.16E-06	1.52E-04	1.31E-05	4.35E-05	1.86E-05

CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration
(a) CDI calculated assuming 6 years as a child and 24 years as an adult.

Table J6.2 Dermal Absorption from subsurface soil at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Receptor							
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child		Resident Adult	
Exposure Parameters	**Units**								
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	6	30	30
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	10950	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.07	0.07

Calculations			Receptor							
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child		Resident Adult (a)	
Exposure Unit	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**
Coal Area A EU	0.03	12.6	3.08E-06	6.60E-07	2.11E-06	7.53E-07	1.35E-05	1.16E-06	4.36E-06	1.87E-06
Coal Area B EU	0.03	10.5	2.57E-06	5.51E-07	1.76E-06	6.29E-07	1.13E-05	9.69E-07	3.64E-06	1.56E-06
Coal Area C EU	0.03	11.9	2.91E-06	6.23E-07	1.99E-06	7.12E-07	1.28E-05	1.10E-06	4.12E-06	1.77E-06

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004a
DAD = Dermally Absorbed Dose
(a) DAD calculated assuming 6 years as a child and 24 years as an adult.

Table J6.3 Exposure Concentration from inhalation of dust from subsurface soil at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Receptors							
		Correctional Facility							
Exposure Parameters	**Units**	**Inmate**		**Correctional Facility Staff**		**Resident Child**		**Resident Adult**	
Exposure time (ET)	hrs/day	24	24	8	8	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	6	30	30
Particulate emission factor (PEF)	cu.m./kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	262800	613200

		Correctional Facility							
Calculations		**Inmate**		**Correctional Facility Staff**		**Resident Child**		**Resident Adult**	
Exposure Unit	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Coal Area A EU	12.6	9.26E-09	1.99E-09	2.12E-09	7.55E-10	8.88E-09	7.61E-10	8.88E-09	3.81E-09
Coal Area B EU	10.5	7.74E-09	1.66E-09	1.77E-09	6.31E-10	7.42E-09	6.36E-10	7.42E-09	3.18E-09
Coal Area C EU	11.9	8.76E-09	1.88E-09	2.00E-09	7.14E-10	8.40E-09	7.20E-10	8.40E-09	3.60E-09

Cs: Soil or exposure point concentration; CDI: chemical daily intake; NA: Not applicable

Table J6.4 Carcinogenic risks for Correctional Facility Inmate from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Exposure Unit	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Total ILCR**
Coal Area A EU	12.6	3.9E-06	1.5E+00	5.8E-06	2.0E-09	4.3E+00	8.5E-09	6.6E-07	1.5E+00	9.9E-07	6.8E-06
Coal Area B EU	10.53	3.2E-06	1.5E+00	4.8E-06	1.7E-09	4.3E+00	7.1E-09	5.5E-07	1.5E+00	8.3E-07	5.7E-06
Coal Area C EU	11.91	3.6E-06	1.5E+00	5.5E-06	1.9E-09	4.3E+00	8.1E-09	6.2E-07	1.5E+00	9.4E-07	6.4E-06

Table J6.5 Carcinogenic risks for Correctional Facility Staff from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Total ILCR**
Coal Area A EU	12.6	4.4E-06	1.5E+00	6.6E-06	7.6E-10	4.3E+00	3.2E-09	7.5E-07	1.5E+00	1.1E-06	7.7E-06
Coal Area B EU	10.53	3.7E-06	1.5E+00	5.5E-06	6.3E-10	4.3E+00	2.7E-09	6.3E-07	1.5E+00	9.4E-07	6.5E-06
Coal Area C EU	11.91	4.2E-06	1.5E+00	6.2E-06	7.1E-10	4.3E+00	3.1E-09	7.1E-07	1.5E+00	1.1E-06	7.3E-06

Table J6.6 Carcinogenic risks for Resident Adult from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Total ILCR**
Coal Area A EU	12.6	2.0E-05	1.5E+00	3.0E-05	3.8E-09	4.3E+00	1.6E-08	1.9E-06	1.5E+00	2.8E-06	3.2E-05
Coal Area B EU	10.53	1.6E-05	1.5E+00	2.5E-05	3.2E-09	4.3E+00	1.4E-08	1.6E-06	1.5E+00	2.3E-06	2.7E-05
Coal Area C EU	11.91	1.9E-05	1.5E+00	2.8E-05	3.6E-09	4.3E+00	1.5E-08	1.8E-06	1.5E+00	2.6E-06	3.1E-05

Table J6.7 Carcinogenic risks for Resident Child from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Total ILCR**
Coal Area A EU	12.6	1.4E-05	1.5E+00	2.1E-05	7.6E-10	4.3E+00	3.3E-09	1.2E-06	1.5E+00	1.7E-06	2.2E-05
Coal Area B EU	10.53	1.2E-05	1.5E+00	1.7E-05	6.4E-10	4.3E+00	2.7E-09	9.7E-07	1.5E+00	1.5E-06	1.9E-05
Coal Area C EU	11.91	1.3E-05	1.5E+00	2.0E-05	7.2E-10	4.3E+00	3.1E-09	1.1E-06	1.5E+00	1.6E-06	2.1E-05

Table J6.8 Hazard quotients and indices for Correction Facility Inmate from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

	Ingestion of Subsurface Soil			Inhalation from Subsurface Soil			Dermal Absorption from Subsurface Soil			
Exposure Unit	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Carcinogen Inhalation EC (mg/m3)**	**Ref Conc (mg/m3)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dernal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Hazard Index**
Coal Area A EU	1.8E-05	3.0E-04	6.0E-02	9.3E-09	3.0E-05	3.1E-04	3.1E-06	3.0E-04	1.0E-02	7.1E-02
Coal Area B EU	1.5E-05	3.0E-04	5.0E-02	7.7E-09	3.0E-05	2.6E-04	2.6E-06	3.0E-04	8.6E-03	5.9E-02
Coal Area C EU	1.7E-05	3.0E-04	5.7E-02	8.8E-09	3.0E-05	2.9E-04	2.9E-06	3.0E-04	9.7E-03	6.7E-02

Table J6.9 Hazard quotients and indices for Correction Facility Staff from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

	Ingestion of Subsurface Soil			Inhalation from Subsurface Soil			Dermal Absorption from Subsurface Soil			
Exposure Unit	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Carcinogen Inhalation EC (mg/m3)**	**Ref Conc (mg/m3)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dernal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Hazard Index**
Coal Area A EU	1.2E-05	3.0E-04	4.1E-02	2.1E-09	3.0E-05	7.1E-05	2.1E-06	3.0E-04	7.0E-03	4.8E-02
Coal Area B EU	1.0E-05	3.0E-04	3.4E-02	1.8E-09	3.0E-05	5.9E-05	1.8E-06	3.0E-04	5.9E-03	4.0E-02
Coal Area C EU	1.2E-05	3.0E-04	3.9E-02	2.0E-09	3.0E-05	6.7E-05	2.0E-06	3.0E-04	6.6E-03	4.6E-02

Table J6.10 Hazard quotients and indices for Resident Adult from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

	Ingestion of Subsurface Soil			Inhalation from Subsurface Soil			Dermal Absorption from Subsurface Soil			
Exposure Unit	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Carcinogen Inhalation EC (mg/m3)**	**Ref Conc (mg/m3)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dernal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Hazard Index**
Coal Area A EU	4.6E-05	3.0E-04	1.5E-01	8.9E-09	3.0E-05	3.0E-04	4.4E-06	3.0E-04	1.5E-02	1.7E-01
Coal Area B EU	3.8E-05	3.0E-04	1.3E-01	7.4E-09	3.0E-05	2.5E-04	3.6E-06	3.0E-04	1.2E-02	1.4E-01
Coal Area C EU	4.4E-05	3.0E-04	1.5E-01	8.4E-09	3.0E-05	2.8E-04	4.1E-06	3.0E-04	1.4E-02	1.6E-01

Table J6.11 Hazard quotients and indices for Resident Child from exposure to subsurface soils at Coal Areas
(Arsenic is the only chemical of potential concern in subsurface soils.)

	Ingestion of Subsurface Soil			Inhalation from Subsurface Soil			Dermal Absorption from Subsurface Soil			
Exposure Unit	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Carcinogen Inhalation EC (mg/m3)**	**Ref Conc (mg/m3)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dernal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Hazard Index**
Coal Area A EU	1.6E-04	3.0E-04	5.4E-01	8.9E-09	3.0E-05	3.0E-04	1.4E-05	3.0E-04	4.5E-02	5.8E-01
Coal Area B EU	1.3E-04	3.0E-04	4.5E-01	7.4E-09	3.0E-05	2.5E-04	1.1E-05	3.0E-04	3.8E-02	4.9E-01
Coal Area C EU	1.5E-04	3.0E-04	5.1E-01	8.4E-09	3.0E-05	2.8E-04	1.3E-05	3.0E-04	4.3E-02	5.5E-01

Table J7.1 Chemical Daily Intake (CDI) from incidental ingestion of soil at Vehicle Wash Exposure Unit

		Receptors											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameter	**Units**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Non-carcinogenic effects**	**Carcinogenic effects (0-2 year)**	**Carcinogenic effects (2-6 years)**	**Carcinogenic effects (6-16 years)**	**Carcinogenic effects (16-30 yrs)**
Soil ingestion rate (IRs)	kg/day	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Fraction Ingested (FI)	unitless	1	1	1	1	1	1	1	1	1	1	1	1
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550

CALCULATIONS			Receptors												
			Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Chemicals of Potential Concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Medium: Surface Soil								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	0.04	5.40E-08	1.16E-08	3.70E-08	1.32E-08	4.83E-07	1.38E-08	2.76E-08	1.38E-07	1.38E-08	2.76E-08	7.39E-09	1.04E-08
Benzo(b)fluoranthene	205-99-2	0.05	7.51E-08	1.61E-08	5.14E-08	1.84E-08	6.72E-07	1.92E-08	3.84E-08	1.92E-07	1.92E-08	3.84E-08	1.03E-08	1.44E-08
Benzo(a)pyrene	50-32-8	0.44	6.30E-07	1.35E-07	4.32E-07	1.54E-07	5.64E-06	1.61E-07	3.22E-07	1.61E-06	1.61E-07	3.22E-07	8.63E-08	1.21E-07
Indeno(1,2,3-cd)pyrene	193-39-5	0.03	4.86E-08	1.04E-08	3.33E-08	1.19E-08	4.35E-07	1.24E-08	2.49E-08	1.24E-07	1.24E-08	2.49E-08	6.66E-09	9.32E-09
Dibenz(a,h)anthracene	53-70-3	0.02	2.22E-08	4.76E-09	1.52E-08	5.43E-09	1.99E-07	5.68E-09	1.14E-08	5.68E-08	5.68E-09	1.14E-08	3.04E-09	4.26E-09

CDI: Chemical Daily Intake; Cs: Soil or exposure point concentration

Table J7.2 Dermal Absorption from surface soil at Vehicle Wash Exposure Unit

		Receptor											
		Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult				
Exposure Parameters	**Units**						**0-2yrs**	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**
Event frequency (EV)	event/day	1	1	1	1	1	1	1	1	1	1	1	1
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Surface Area of Skin exposed (SA)	cm2	5.70E+03	5.70E+03	5.70E+03	5.70E+03	2.80E+03	2.80E+03	2.80E+03	5.70E+03	2.80E+03	2.80E+03	5.70E+03	5.70E+03
Body weight (BW)	kg	70	70	70	70	15	15	15	70	15	15	70	70
Averaging time (AT)	days	5475	25550	9125	25550	2190	25550	25550	10950	25550	25550	25550	25550
Soil to skin adherence factor (AF)	mg/cm2-event	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.07	0.2	0.2	0.07	0.07

Calculations				Receptor												
				Correctional Facility Inmate		Correctional Facility Staff		Resident Child			Resident Adult					
Chemicals of Potential Concern	**CAS No.**	**ABS (a)**	**Cs (mg/kg)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Non-carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	**Carcinogen DAD (mg/kg-day)**	
									0-2yrs	**2-6 yrs**		**0-2yrs**	**2-6 yrs**	**6-16**	**16-30**	
Benzo(a)anthracene	56-55-3	0.13	0.04	4.00E-08	8.57E-09	2.74E-08	9.78E-09	1.76E-07	5.02E-09	1.00E-08	5.66E-08	5.02E-09	1.00E-08	3.83E-09	5.37E-09	
Benzo(b)fluoranthene	205-99-2	0.13	0.05	5.56E-08	1.19E-08	3.81E-08	1.36E-08	2.45E-07	6.99E-09	1.40E-08	7.88E-08	6.99E-09	1.40E-08	5.34E-09	7.47E-09	
Benzo(a)pyrene	50-32-8	0.13	0.44	4.67E-07	1.00E-07	3.20E-07	1.14E-07	2.05E-06	5.86E-08	1.17E-07	6.61E-07	5.86E-08	1.17E-07	4.48E-08	6.27E-08	
Indeno(1,2,3-cd)pyrene	193-39-5	0.13	0.03	3.60E-08	7.72E-09	2.47E-08	8.81E-09	1.58E-07	4.52E-09	9.05E-09	5.10E-08	4.52E-09	9.05E-09	3.45E-09	4.83E-09	
Dibenz(a,h)anthracene	53-70-3	0.13	0.02	1.65E-08	3.53E-09	1.13E-08	4.02E-09	7.23E-08	2.07E-09	4.13E-09	2.33E-08	2.07E-09	4.13E-09	1.58E-09	2.21E-09	

a ABS (Dermal Absorption Factor) from Exhibit 3-4 in EPA 2004

DAD = Dermally Absorbed Dose

Table J7.3 Exposure Concentration from inhalation of dust from surface soil at Vehicle Wash Exposure Unit

		Receptors											
Exposure Parameters	**Units**	**Correctional Facility Inmate**		**Correctional Facility Staff**		**Resident Child**			**Resident Adult**				
							0-2 yrs	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Exposure Time (ET)	hrs/day	24	24	8	8	24	24	24	24	24	24	24	24
Exposure frequency (EF)	days/year	365	365	250	250	350	350	350	350	350	350	350	350
Exposure duration (ED)	years	15	15	25	25	6	2	4	30	2	4	10	14
Particulate emission factor (PEF)	m3/kg	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09	1.36E+09
Averaging time (AT)	hrs	131400	613200	219000	613200	52560	613200	613200	262800	613200	613200	613200	613200

			Receptors												
Calculations			**Correctional Facility Inmate**		**Correctional Facility Staff**		**Resident Child**			**Resident Adult**				
Chemicals of potential concern	**CAS No.**	**Cs (mg/kg)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Non-carcinogen Inhalation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**	**Carcinogen Inhallation EC (mg/m3)**
Surface Soils								**0-2 yrs**	**2-6 yrs**		**0-2 yrs**	**2-6 yrs**	**6-16 yrs**	**16-30 yrs**
Benzo(a)anthracene	56-55-3	0.04	2.78E-11	5.95E-12	6.34E-12	2.27E-12	2.66E-11	7.61E-13	1.52E-12	2.66E-11	7.61E-13	1.52E-12	3.81E-12	5.33E-12
Benzo(b)fluoranthene	205-99-2	0.05	3.87E-11	8.28E-12	8.83E-12	3.15E-12	3.71E-11	1.06E-12	2.12E-12	3.71E-11	1.06E-12	2.12E-12	5.30E-12	7.41E-12
Benzo(a)pyrene	50-32-8	0.44	3.24E-10	6.95E-11	7.40E-11	2.64E-11	3.11E-10	8.88E-12	1.78E-11	3.11E-10	8.88E-12	1.78E-11	4.44E-11	6.22E-11
Indeno(1,2,3-cd)pyrene	193-39-5	0.03	2.50E-11	5.36E-12	5.71E-12	2.04E-12	2.40E-11	6.85E-13	1.37E-12	2.40E-11	6.85E-13	1.37E-12	3.43E-12	4.80E-12
Dibenz(a,h)anthracene	53-70-3	0.02	1.14E-11	2.45E-12	2.61E-12	9.32E-13	1.10E-11	3.13E-13	6.26E-13	1.10E-11	3.13E-13	6.26E-13	1.57E-12	2.19E-12

Cs: Soil or exposure point concentration; Inhalation EC: Inhalation Exposure Concentration

Table J7.4 Carcinogenic risks for Correctional Facility Inmate from exposure to subsurface soils at Vehicle Wash Rack Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	37.78	1.2E-08	7.3E-01	8.4E-09	6.0E-12	1.10E-01	6.5E-13	8.6E-09	7.3E-01	6.3E-09	1.5E-08
Benzo(b)fluoranthene	52.57	1.6E-08	7.3E-01	1.2E-08	8.3E-12	1.1E-01	9.1E-13	1.2E-08	7.3E-01	8.7E-09	2.0E-08
Benzo(a)pyrene	441	1.4E-07	7.3E+00	9.9E-07	6.9E-11	1.1E+00	7.6E-11	1.0E-07	7.3E+00	7.3E-07	1.7E-06
Indeno(1,2,3-cd)pyrene	34.02	1.0E-08	7.3E-01	7.6E-09	5.4E-12	1.1E-01	5.9E-13	7.7E-09	7.3E-01	5.6E-09	1.3E-08
Dibenz(a,h)anthracene	15.54	4.8E-09	7.3E+00	3.5E-08	2.4E-12	1.2E+00	2.9E-12	3.5E-09	7.3E+00	2.6E-08	6.0E-08
Pathway $ILCR_{total}$				**1.0E-06**			**8.2E-11**			**7.8E-07**	
$ILCR_{total}$ from surface soil											**1.8E-06**

Table J7.5 Carcinogenic risks for Correctional Facility Staff from exposure to subsurface soils at Vehicle Wash Rack Exposure Unit

		Ingestion of Soil			Inhalation from Soil			Dermal Absorption from Soil			
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3)**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	37.78	1.3E-08	7.3E-01	9.6E-09	2.3E-12	1.10E-01	2.5E-13	9.8E-09	7.3E-01	7.1E-09	1.7E-08
Benzo(b)fluoranthene	52.57	1.8E-08	7.3E-01	1.3E-08	3.2E-12	1.1E-01	3.5E-13	1.4E-08	7.3E-01	9.9E-09	2.3E-08
Benzo(a)pyrene	441	1.5E-07	7.3E+00	1.1E-06	2.6E-11	1.1E+00	2.9E-11	1.1E-07	7.3E+00	8.3E-07	2.0E-06
Indeno(1,2,3-cd)pyrene	34.02	1.2E-08	7.3E-01	8.7E-09	2.0E-12	1.1E-01	2.2E-13	8.8E-09	7.3E-01	6.4E-09	1.5E-08
Dibenz(a,h)anthracene	15.54	5.4E-09	7.3E+00	4.0E-08	9.3E-13	1.2E+00	1.1E-12	4.0E-09	7.3E+00	2.9E-08	6.9E-08
Pathway $ILCR_{total}$				**1.2E-06**			**3.1E-11**			**8.9E-07**	
$ILCR_{total}$ from surface soil											**2.1E-06**

Table J7.6 Carcinogenic risks for Resident Adult from exposure to subsurface soils at Vehicle Wash Rack Exposure Unit

		Ingestion of Soil						Inhalation from Soil						Dermal Absorption from Soil						
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake (mg/kg-day) 0-2 yrs**	**Chemical Daily Intake (mg/kg-day) 2-6 yrs**	**Chemical Daily Intake (mg/kg-day) 6-16 yrs**	**Chemical Daily Intake (mg/kg-day) 16-30 yrs**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Carcinogen Inhalation EC (mg/m3) 6-16 yrs**	**Carcinogen Inhalation EC (mg/m3) 16-30 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day) 0-2 yrs**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Absorbed Dose (mg/kg-day) 6-16 yrs**	**Dermal Absorbed Dose (mg/kg-day) 16-30 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	37.78	1.4E-08	2.8E-08	7.4E-09	1.0E-08	7.3E-01	4.3E-08	7.6E-13	1.5E-12	3.8E-12	5.3E-12	1.10E-01	3.2E-12	5.0E-09	1.0E-08	3.8E-09	5.4E-09	7.3E-01	1.8E-08	6.1E-08
Benzo(b)fluoranthene	52.57	1.9E-08	3.8E-08	1.0E-08	1.4E-08	7.3E-01	6.0E-08	1.1E-12	2.1E-12	5.3E-12	7.4E-12	1.1E-01	4.4E-12	7.0E-09	1.4E-08	5.3E-09	7.5E-09	7.3E-01	2.5E-08	8.5E-08
Benzo(a)pyrene	441	1.6E-07	3.2E-07	8.6E-08	1.2E-07	7.3E+00	5.0E-06	8.9E-12	1.8E-11	4.4E-11	6.2E-11	1.1E+00	3.7E-10	5.9E-08	1.2E-07	4.5E-08	6.3E-08	7.3E+00	2.1E-06	7.1E-06
Indeno(1,2,3-cd)pyrene	34.02	1.2E-08	2.5E-08	6.7E-09	9.3E-09	7.3E-01	3.9E-08	6.9E-13	1.4E-12	3.4E-12	4.8E-12	1.1E-01	2.9E-12	4.5E-09	9.0E-09	3.5E-09	4.8E-09	7.3E-01	1.6E-08	5.5E-08
Dibenz(a,h)anthracene	15.54	5.7E-09	1.1E-08	3.0E-09	4.3E-09	7.3E+00	1.8E-07	3.1E-13	6.3E-13	1.6E-12	2.2E-12	1.2E+00	1.4E-11	2.1E-09	4.1E-09	1.6E-09	2.2E-09	7.3E+00	7.3E-08	2.5E-07
Pathway ILCR$_{total}$							**5.4E-06**						**4.0E-10**						**2.2E-06**	
ILCR$_{total}$ from surface soil																				**7.6E-06**

Table J7.7 Carcinogenic risks for Resident Child from exposure to subsurface soils at Vehicle Wash Rack Exposure Unit

		Ingestion of Soil				Inhalation from Soil				Dermal Absorption from Soil				
Chemical of Potential Concern	**Exposure Point Concentration (ug/kg)**	**Chemical Daily Intake; 0-2yrs (mg/kg-day)**	**Chemical Daily Intake; 2-6 yrs (mg/kg-day)**	**Oral Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Carcinogen Inhalation EC (mg/m3) 0-2 yrs**	**Carcinogen Inhalation EC (mg/m3) 2-6 yrs**	**Inhalation Unit Risk (mg/m3)$^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Absorbed Dose (mg/kg-day) 2-6 yrs**	**Dermal Slope Factor (mg/kg-day)$^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Benzo(a)anthracene	37.78	1.4E-08	2.8E-08	7.3E-01	3.0E-08	7.6E-13	1.5E-12	1.10E-01	1.3E-12	5.0E-09	1.0E-08	7.3E-01	1.1E-08	4.1E-08
Benzo(b)fluoranthene	52.57	1.9E-08	3.8E-08	7.3E-01	4.2E-08	1.1E-12	2.1E-12	1.1E-01	1.9E-12	7.0E-09	1.4E-08	7.3E-01	1.5E-08	5.7E-08
Benzo(a)pyrene	441	1.6E-07	3.2E-07	7.3E+00	3.5E-06	8.9E-12	1.8E-11	1.1E+00	1.6E-10	5.9E-08	1.2E-07	7.3E+00	1.3E-06	4.8E-06
Indeno(1,2,3-cd)pyrene	34.02	1.2E-08	2.5E-08	7.3E-01	2.7E-08	6.9E-13	1.4E-12	1.1E-01	1.2E-12	4.5E-09	9.0E-09	7.3E-01	9.9E-09	3.7E-08
Dibenz(a,h)anthracene	15.54	5.7E-09	1.1E-08	7.3E+00	1.2E-07	3.1E-13	6.3E-13	1.2E+00	6.0E-12	2.1E-09	4.1E-09	7.3E+00	4.5E-08	1.7E-07
Pathway $ILCR_{total}$					**3.8E-06**				**1.7E-10**				**1.4E-06**	
$ILCR_{total}$ from surface soil														**5.1E-06**

Table J8.1 Chemical Daily Intake from ingestion of groundwater at HCAFS

		Resident Child		Resident Adult	
Exposure Parameters	**Units**	**Non-carcinogen Effects**	**Carcinogen Effects**	**Non-carcinogen Effects**	**Carcinogen Effects**
Groundwater ingestion rate (IRw)	L/day	1	1	2	2
Exposure frequency (EF)	days/year	350	350	350	350
Exposure duration (ED)	years	6	6	30	30
Body weight (BW)	kg	15	15	70	70
Averaging time (AT)	days	2190	25550	10950	25550

			Resident Child		Resident Adult	
Chemical of Potential Concern	**CAS No.**	**C_w (mg/L)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Metals						
Aluminum	7429-90-5	52	3.32E+00	2.85E-01	1.42E+00	6.11E-01
Arsenic	7440-38-2	0.021	1.34E-03	1.15E-04	5.75E-04	2.47E-04
Iron	7439-89-6	64	4.09E+00	3.51E-01	1.75E+00	7.51E-01
Lead	7439-92-1	0.0969	6.19E-03	5.31E-04	2.65E-03	1.14E-03
Manganese	7439-96-5	1.81	1.16E-01	9.92E-03	4.96E-02	2.13E-02
Vanadium	7440-62-2	0.14	8.95E-03	7.67E-04	3.84E-03	1.64E-03

C_w: Exposure Point Concentration or concentration in groundwater; CDI: Chemical Daily Intake

Table 8.2 Dermal Absorption from groundwater at HCAFS

Exposure Parameters	Units	Resident Child		Resident Adult	
Event frequency (EV)	event/day	1	1	1	1
Event duration (t_event)	hr	0.58	0.58	1	1
Exposure frequency (EF)	days/year	350	350	350	350
Exposure duration (ED)	years	6	6	30	30
Surface Area of Skin exposed (SA)	cm2	6.60E+03	6.60E+03	1.80E+04	1.80E+04
Body weight (BW)	kg	15	15	70	70
Averaging time (AT)	days	2190	25550	10950	25550

Calculations				Resident Child			Resident Adult		
Chemical or Potential Concern	CAS No.	C_w (mg/L)	Kp (cm/hr) (a)	DA_{event} (mg/cm2-event)	Non-carcinogen DAD (mg/kg-day)	Carcinogen DAD (mg/kg-day)	DA_{event} (mg/cm2-event)	Non-carcinogen DAD (mg/kg-day)	Carcinogen DAD (mg/kg-day)
Metals									
Aluminum	7429-90-5	52	1.0E-03	3.0E-05	1.27E-02	1.09E-03	5.20E-05	1.28E-02	5.50E-03
Arsenic	7440-38-2	0.021	1.0E-03	1.2E-08	5.14E-06	4.40E-07	2.10E-08	5.18E-06	2.22E-06
Iron	7439-89-6	64	1.0E-03	3.7E-05	1.57E-02	1.34E-03	6.40E-05	1.58E-02	6.76E-03
Lead	7439-92-1	0.0969	1.0E-04	5.6E-09	2.37E-06	2.03E-07	9.69E-09	2.39E-06	1.02E-06
Manganese	7439-96-5	1.81	1.0E-03	1.0E-06	4.43E-04	3.80E-05	1.81E-06	4.46E-04	1.91E-04
Vanadium	7440-62-2	0.14	1.0E-03	8.1E-08	3.43E-05	2.94E-06	1.40E-07	3.45E-05	1.48E-05

DAevent = Dermal absorbed dose per event; DAD = Dermal absorbed Dose per day

a Kp (Permeability coefficients) from Exhibit 3-1 of EPA (2004a)

Table J8.3 Carcinogenic risks for Resident Adult from exposure to groundwater at HCAFS

			Ingestion of Groundwater			Dermal Absorption from Groundwater			
Chemical of Potential Concern		**C_w (mg/L)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor $(mg/kg\text{-}day)^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor $(mg/kg\text{-}day)^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Metals									
Aluminum	7429-90-5	52	6.1E-01	NC	NC	5.5E-03	NC	NC	NC
Arsenic	7440-38-2	0.021	2.5E-04	1.5E+00	3.7E-04	2.2E-06	1.5E+00	3.3E-06	3.7E-04
Iron	7439-89-6	64	7.5E-01	NA	NA	6.8E-03	NA	NA	NA
Lead	7439-92-1	0.0969	1.1E-03	8.5E-03	9.7E-06	1.0E-06	8.5E-03	8.7E-09	9.7E-06
Manganese	7439-96-5	1.81	2.1E-02	NC	NC	1.9E-04	NC	NC	NC
Vanadium	7440-62-2	0.14	1.6E-03	NA	NA	1.5E-05	NA	NA	NA
Pathway $ILCR_{total}$					**3.8E-04**			**3.3E-06**	
$ILCR_{total}$ from groundwater									**3.8E-04**

NA: Not available

NC: Non-carcinogen.

Table J8.4 Carcinogenic risks for Resident Child from exposure to groundwater at HCAFS

			Ingestion of Groundwater			Dermal Absorption from Groundwater			
Chemical of Potential Concern		**C_w (mg/L)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Slope Factor $(mg/kg\text{-}day)^{-1}$**	**ILCR**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Slope Factor $(mg/kg\text{-}day)^{-1}$**	**ILCR**	**Chemical-Specific ILCR**
Metals									
Aluminum	7429-90-5	52	2.8E-01	NC	NC	1.1E-03	NC	NC	NC
Arsenic	7440-38-2	0.021	1.2E-04	1.5E+00	1.7E-04	4.4E-07	1.5E+00	6.6E-07	1.7E-04
Iron	7439-89-6	64	3.5E-01	NA	NA	1.3E-03	NA	NA	NA
Lead	7439-92-1	0.0969	5.3E-04	8.5E-03	4.5E-06	2.0E-07	8.5E-03	1.7E-09	4.5E-06
Manganese	7439-96-5	1.81	9.9E-03	NC	NC	3.8E-05	NC	NC	NC
Vanadium	7440-62-2	0.14	7.7E-04	NA	NA	2.9E-06	NA	NA	NA
Pathway $ILCR_{total}$					**1.8E-04**			**6.6E-07**	
$ILCR_{total}$ from groundwater									**1.8E-04**

NA: Not available; "--": No value because the toxicity value required to calculate the ILCR was not available, or the chemical is outside the effective predictive domain

NC: Non-carcinogen.

Table J8.5 Hazard quotients and indices for Resident Adult from exposure to groundwater at HCAFS

			Ingestion of Groundwater			Dermal Absorption from Groundwater			
Chemical of Potential Concern		**C_w (mg/L)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Chemical Specific Hazard Index**
Metals									
Aluminum	7429-90-5	52	1.4E+00	1.0E+00	1.4E+00	1.3E-02	1.0E+00	1.3E-02	1.4E+00
Arsenic	7440-38-2	0.021	5.8E-04	3.0E-04	1.9E+00	5.2E-06	3.0E-04	1.7E-02	1.9E+00
Iron	7439-89-6	64	1.8E+00	7.0E-01	2.5E+00	1.6E-02	7.0E-01	2.3E-02	2.5E+00
Lead	7439-92-1	0.0969	2.7E-03	NA	NA	2.4E-06	NA	NA	NA
Manganese	7439-96-5	1.81	5.0E-02	4.6E-02	1.1E+00	4.5E-04	1.8E-03	2.4E-01	1.3E+00
Vanadium	7440-62-2	0.14	3.8E-03	5.0E-03	7.7E-01	3.5E-05	5.0E-03	6.9E-03	7.7E-01
Hazard Index for Pathway					**7.7E+00**			**3.0E-01**	
Total Hazard Index from Groundwater									**8.0E+00**

NA: Not available; "--": No value

Table J8.6 Hazard quotients and indices for Resident Child from exposure to groundwater at HCAFS

			Ingestion of Groundwater			Dermal Absorption from Groundwater			
Chemical of Potential Concern		**C_w (mg/L)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Chemical Specific Hazard Index**
Metals									
Aluminum	7429-90-5	52	3.3E+00	1.0E+00	3.3E+00	1.3E-02	1.0E+00	1.3E-02	3.3E+00
Arsenic	7440-38-2	0.021	1.3E-03	3.0E-04	4.5E+00	5.1E-06	3.0E-04	1.7E-02	4.5E+00
Iron	7439-89-6	64	4.1E+00	7.0E-01	5.8E+00	1.6E-02	7.0E-01	2.2E-02	5.9E+00
Lead	7439-92-1	0.0969	6.2E-03	NA	NA	2.4E-06	NA	NA	NA
Manganese	7439-96-5	1.81	1.2E-01	4.6E-02	2.5E+00	4.4E-04	1.8E-03	2.4E-01	2.8E+00
Vanadium	7440-62-2	0.14	8.9E-03	5.0E-03	1.8E+00	3.4E-05	5.0E-03	6.9E-03	1.8E+00
Hazard Index for Pathway					**1.8E+01**			**3.0E-01**	
Total Hazard Index from Groundwater									**1.8E+01**

NA: Not available; "--": No value

Table J9.1 Chemical Daily Intake from ingestion of filtered groundwater at HCAFS

		Resident Child		Resident Adult	
Exposure Parameters	**Units**	**Non-carcinogen Effects**	**Carcinogen Effects**	**Non-carcinogen Effects**	**Carcinogen Effects**
Groundwater ingestion rate (IRw)	L/day	1	1	2	2
Exposure frequency (EF)	days/year	350	350	350	350
Exposure duration (ED)	years	6	6	30	30
Body weight (BW)	kg	15	15	70	70
Averaging time (AT)	days	2190	25550	10950	25550

			Resident Child		Resident Adult	
Chemical of Potential Concern	**CAS No.**	**C_w (mg/L)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**	**Non-carcinogen CDI (mg/kg-day)**	**Carcinogen CDI (mg/kg-day)**
Metals						
Manganese	7439-96-5	0.49	3.13E-02	2.68E-03	1.34E-02	5.75E-03

C_w: Exposure Point Concentration or concentration in groundwater; CDI: Chemical Daily Intake

Table J9.2 Dermal Absorption from filtered groundwater at HCAFS

Exposure Parameters	Units	Resident Child		Resident Adult	
Event frequency (EV)	event/day	1	1	1	1
Event duration (t_event)	hr	0.58	0.58	1	1
Exposure frequency (EF)	days/year	350	350	350	350
Exposure duration (ED)	years	6	6	30	30
Surface Area of Skin exposed (SA)	cm2	6.60E+03	6.60E+03	1.80E+04	1.80E+04
Body weight (BW)	kg	15	15	70	70
Averaging time (AT)	days	2190	25550	10950	25550

Calculations				Resident Child			Resident Adult		
Chemical or Potential Concern	CAS No.	C_w (mg/L)	Kp (cm/hr) (a)	DA_{event} (mg/cm2-event)	Non-carcinogen DAD (mg/kg-day)	Carcinogen DAD (mg/kg-day)	DA_{event} (mg/cm2-event)	Non-carcinogen DAD (mg/kg-day)	Carcinogen DAD (mg/kg-day)
Metals									
Manganese	7439-96-5	0.49	1.0E-03	2.8E-07	1.20E-04	1.03E-05	4.90E-07	1.21E-04	5.18E-05

DAevent = Dermal absorbed dose per event; DAD = Dermal absorbed Dose per day

a Kp (Permeability coefficients) from Exhibit 3-1 of EPA (2004a)

b Outside of the Effective Prediction Domain (EPD) for Potts and Guy's equation for estimating Kp (EPA 2004a)

Table 9.3 Hazard quotients and indices for Resident Adult from exposure to filtered groundwater at HCAFS

			Ingestion of Groundwater			Dermal Absorption from Groundwater			
Chemical of Potential Concern		**C_w (mg/L)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Chemical Specific Hazard Index**
Metals									
Manganese	7439-96-5	0.49	1.3E-02	4.6E-02	2.9E-01	1.2E-04	1.8E-03	6.6E-02	3.6E-01
Hazard Index for Pathway					**2.9E-01**			**6.6E-02**	
Total Hazard Index from Groundwater									**3.6E-01**

NA: Not available; "--": No value

Highlighted values in Dermal Absorbed Dose column are chemicals outside the Effective Prediction Domain for Kp (EPA 2004a, OSWER Directive #9285.7-02EP).

Table 9.4 Hazard quotients and indices for Resident Child from exposure to filtered groundwater at HCAFS

			Ingestion of Groundwater			Dermal Absorption from Groundwater			
Chemical of Potential Concern		**C_w (mg/L)**	**Chemical Daily Intake (mg/kg-day)**	**Oral Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Dermal Absorbed Dose (mg/kg-day)**	**Dermal Reference Dose (mg/kg-day)**	**Hazard Quotient**	**Chemical Specific Hazard Index**
Metals									
Manganese	7439-96-5	0.49	3.1E-02	4.6E-02	6.8E-01	1.2E-04	1.8E-03	6.5E-02	7.5E-01
Hazard Index for Pathway					**6.8E-01**			**6.5E-02**	
Total Hazard Index from Groundwater									**7.5E-01**

NA: Not available; "--": No value

Highlighted values in Dermal Absorbed Dose column are chemicals outside the Effective Prediction Domain for Kp (EPA 2004a, OSWER Directive #9285.7-02EP).