SEVERN TRENT STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. SMC Radiological Sampling

Lot #: F4D100111

Larry Butlien

TRC Environmental Corp.
5 Waterside Crossing
Windsor, CT 06095

SEVERN TRENT LABORATORIES, INC.

Billy Tierney
Project Manager

May 3, 2004

Case Narrative
LOT NUMBER: **F4D100111**

This report contains the analytical results for the 24 samples received under chain of custody by STL St. Louis on April 9, 2004. These samples are associated with your SMC Radiological Sampling project.

All applicable quality control procedures met method-specified acceptance criteria except as noted on the following page.

This report is incomplete without the case narrative. All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Gross Alpha/Beta by EPA 900.0

The standard reporting limit was exceeded due to a reduction of sample size attributed to the sample's high residual mass. The analytical results are reported with the MDA achieved.
Affected Samples:
F4D100111 (3): SC12S
F4D100111 (4): SC32S

METHODS SUMMARY

F4D100111

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Gross Alpha/Beta by GFPC	EPA 900.0 MOD	EPA 900.0
Isotopic Uranium by Alpha Spectroscopy	EML A-01-R MOD	
Radium-226 by GFPC	EPA 903.0 MOD	
Radium-228 by GFPC	EPA 904 MOD	

References:

EML "ENVIRONMENTAL MEASUREMENTS LABORATORY PROCEDURES MANUAL" HASL-300 28TH EDITION, VOLUME I and II DEPARTMENT OF ENERGY

EPA "EASTERN ENVIRONMENTAL RADIATION FACILITY RADIOCHEMISTRY PROCEDURES MANUAL" US EPA EPA 520/5-84-006 AUGUST 1984

SAMPLE SUMMARY

F4D100111

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
GDX15	001	SC14S	04/06/04	17:25
GDX16	002	SC11S(R)	04/06/04	17:45
GDX17	003	SC12S	04/07/04	08:45
GDX18	004	SC32S	04/07/04	08:50
GDX19	005	W2(R)	04/06/04	18:00
GDX2A	006	A	04/07/04	11:00
GDX2C	007	SC13S	04/07/04	09:25
GDX2D	008	OBS-2A	04/07/04	14:30
GD1GE	009	SC14S-DISSOLVED	04/06/04	17:25
GD1GJ	010	SC11S(R)-DISSOLVED	04/06/04	17:45
GD1GM	011	SC12S-DISSOLVED	04/07/04	08:45
GD1GQ	012	SC32S-DISSOLVED	04/07/04	08:50
GD1GT	013	W2(R)-DISSOLVED	04/06/04	18:00
GD1G0	014	A-DISSOLVED	04/07/04	11:00
GD1G2	015	SC13S-DISSOLVED	04/07/04	09:25
GD1G5	016	OBS-2A-DISSOLVED	04/07/04	14:30
GD1HC	017	SC14S	04/06/04	17:25
GD1HE	018	SC11S(R)	04/06/04	17:45
GD1HG	019	SC12S	04/07/04	20:45
GD1HH	020	SC32S	04/07/04	20:50
GD1HK	021	W2(R)	04/06/04	18:00
GD1HN	022	A	04/07/04	11:00
GD1HR	023	SC13S	04/07/04	09:25
GD1HV	024	OBS-2A	04/07/04	14:30

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

TRC Environmental Corp.

Client Sample ID: SC14S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-001
Work Order: GDX15
Matrix: WATER

Date Collected: 04/06/04 1725
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	1.1	U	1.0	1.5	04/19/04	04/23/04	4110168	
Gross Beta	5.3		1.5	2.0	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.11	U	0.10	0.16	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.91	J	0.36	0.50	04/12/04	04/27/04	4103231	95

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
d results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC11S(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-002
Work Order: GDX16
Matrix: WATER

Date Collected: 04/06/04 1745
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.59	U	0.87	1.5	04/19/04	04/23/04	4110168	
Gross Beta	2.7	J	1.2	1.8	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.14	U	0.13	0.20	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	-0.14	U	0.27	0.49	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
d results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC12S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-003
Work Order: GDX17
Matrix: WATER

Date Collected: 04/07/04 0845
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	8.8	U	9.8	15	04/19/04	04/23/04	4110168	
Gross Beta	128		16	9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.52	J	0.18	0.18	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.42	U	0.31	0.49	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC32S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-004
Work Order: GDX18
Matrix: WATER

Date Collected: 04/07/04 0850
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L		900.0 MOD			
Gross Alpha	14	U	10	15	04/19/04	04/23/04	4110168	
Gross Beta	115		15	9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD			pCi/L		903.0 MOD			
Radium (226)	0.98	J	0.24	0.18	04/12/04	04/27/04	4103230	99
RA-228 BY GFPC EPA 904 MOD			pCi/L		904 MOD			
Radium 228	0.61	J	0.37	0.56	04/12/04	04/27/04	4103231	93

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: W2(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-005
Work Order: GDX19
Matrix: WATER

Date Collected: 04/06/04 1800
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	1.75	J	0.98	1.2	04/19/04	04/23/04	4110168	
Gross Beta	3.4	J	1.2	1.8	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.05	U	0.13	0.23	04/12/04	04/27/04	4103230	91
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.16	U	0.34	0.58	04/12/04	04/27/04	4103231	86

NOTE(S)

Data are incomplete without the case narrative.

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Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-006
Work Order: GDX2A
Matrix: WATER

Date Collected: 04/07/04 1100
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)		MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L		900.0 MOD			
Gross Alpha	0.7	U	1.1		2.0	04/19/04	04/23/04	4110168	
Gross Beta	1.9	J	1.2		1.9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L		903.0 MOD			
Radium (226)	0.1	U	0.10		0.16	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L		904 MOD			
Radium 228	-0.11	U	0.30		0.54	04/12/04	04/27/04	4103231	88

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC13S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-007
Work Order: GDX2C
Matrix: WATER

Date Collected: 04/07/04 0925
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	2.6	U	2.4	3.6	04/19/04	04/23/04	4110168	
Gross Beta	17.6		2.5	1.9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.30	J	0.17	0.21	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.39	U	0.27	0.41	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: OBS-2A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-008
Work Order: GDX2D
Matrix: WATER

Date Collected: 04/07/04 1430
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	4.0		1.2	1.0	04/19/04	04/23/04	4110168	
Gross Beta	3.4	J	1.2	1.7	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.95	J	0.26	0.20	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.58	J	0.33	0.50	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC14S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-009
Work Order: GD1GE
Matrix: WATER

Date Collected: 04/06/04 1725
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.41	U	0.84	1.5	04/22/04	04/25/04	4113251	
Gross Beta	7.3		1.4	1.3	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.33	J	0.15	0.16	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.89	J	0.32	0.42	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
d results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC11S(R)-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-010
Work Order: GD1GJ
Matrix: WATER

Date Collected: 04/06/04 1745
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L		900.0 MOD			
Gross Alpha	0.52	U	0.56	0.87	04/22/04	04/25/04	4113251	
Gross Beta	2.50	J	0.94	1.3	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD			pCi/L		903.0 MOD			
Radium (226)	0.17	U	0.13	0.20	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD			pCi/L		904 MOD			
Radium 228	0.24	U	0.36	0.60	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC12S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-011
Work Order: GD1GM
Matrix: WATER

Date Collected: 04/07/04 0845
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.91	U	0.97	1.5	04/22/04	04/25/04	4113251	
Gross Beta	14.0		2.1	1.5	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.82	J	0.24	0.22	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.58	U	0.41	0.65	04/13/04	04/28/04	4104301	98

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

ld results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC32S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-012
Work Order: GD1GQ
Matrix: WATER

Date Collected: 04/07/04 0850
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.29	U	0.85	1.5	04/22/04	04/25/04	4113251	
Gross Beta	15.3		2.3	1.6	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	1.09		0.26	0.19	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	1.24		0.43	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

d results are greater than the MDC

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: W2(R)-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-013
Work Order: GD1GT
Matrix: WATER

Date Collected: 04/06/04 1800
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.32	U	0.57	0.98	04/22/04	04/25/04	4113251	
Gross Beta	1.6	U	1.1	1.7	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.13	U	0.11	0.15	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.22	U	0.34	0.56	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
ld results are greater than the MDC

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: A-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-014
Work Order: GD1G0
Matrix: WATER

Date Collected: 04/07/04 1100
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.55	U	0.90	1.5	04/22/04	04/25/04	4113251	
Gross Beta	13.0		2.0	1.8	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.11	U	0.12	0.19	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.38	U	0.38	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
d results are greater than the MDC

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC13S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-015
Work Order: GD1G2
Matrix: WATER

Date Collected: 04/07/04 0925
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	-0.3	U	1.5	3.0	04/22/04	04/25/04	4113251	
Gross Beta	2.3	J	1.2	1.8	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.41	J	0.17	0.18	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.1	U	0.36	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: OBS-2A-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-016
Work Order: GD1G5
Matrix: WATER

Date Collected: 04/07/04 1430
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	2.08	J	0.83	0.86	04/22/04	04/25/04	4113251	
Gross Beta	3.0	J	1.2	1.8	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	1.23		0.28	0.19	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.68	J	0.39	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC14S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-017
Work Order: GD1HC
Matrix: SOLID

Date Collected: 04/06/04 1725
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.31	J	0.12	0.05	04/13/04	04/15/04	4104091	91

NOTE(S)

Data are incomplete without the case narrative.

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d results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC11S(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID:	F4D100111-018	Date Collected:	04/06/04 1745
Work Order:	GD1HE	Date Received:	04/09/04 0900
Matrix:	SOLID		

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.29	J	0.12	0.05	04/13/04	04/15/04	4104091	77

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC12S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID:	F4D100111-019	Date Collected:	04/07/04 2045
Work Order:	GD1HG	Date Received:	04/09/04 0900
Matrix:	SOLID		

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.43	J	0.14	0.06	04/13/04	04/15/04	4104091	98

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

d results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC32S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-020
Work Order: GD1HH
Matrix: SOLID

Date Collected: 04/07/04 2050
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.48	J	0.15	0.05	04/13/04	04/15/04	4104091	95

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: W2(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-021
Work Order: GD1HK
Matrix: SOLID

Date Collected: 04/06/04 1800
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.38	J	0.13	0.05	04/13/04	04/15/04	4104091	90

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

ld results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-022
Work Order: GD1HN
Matrix: SOLID

Date Collected: 04/07/04 1100
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.31	J	0.12	0.09	04/13/04	04/15/04	4104091	89

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
d results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC13S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-023
Work Order: GD1HR
Matrix: SOLID

Date Collected: 04/07/04 0925
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.24	J	0.11	0.07	04/13/04	04/16/04	4104091	93

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Qual results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: OBS-2A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-024
Work Order: GD1HV
Matrix: SOLID

Date Collected: 04/07/04 1430
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.32	J	0.13	0.07	04/13/04	04/16/04	4104091	89

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

METHOD BLANK REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: SOLID

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Lab Sample ID Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD			pCi/g	A-01-R MOD			F4D130000-091B	
Uranium 238	0.22	J	0.10	0.05	04/13/04	04/16/04	4104091	87

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only
Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

METHOD BLANK REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Lab Sample ID Batch #	Yld %
RA-226 BY EPA-903.0 MOD			pCi/L	903.0 MOD			F4D120000-230B	
Radium (226)	0.033	U	0.097	0.18	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD			pCi/L	904 MOD			F4D120000-231B	
Radium 228	0.28	U	0.27	0.43	04/12/04	04/27/04	4103231	99
RA-226 BY EPA-903.0 MOD			pCi/L	903.0 MOD			F4D130000-300B	
Radium (226)	0.03	U	0.11	0.21	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD			pCi/L	904 MOD			F4D130000-301B	
Radium 228	0.24	U	0.37	0.61	04/13/04	04/28/04	4104301	99
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			F4D190000-168B	
Gross Alpha	0.03	U	0.40	0.77	04/19/04	04/23/04	4110168	
Gross Beta	1.3	U	1.1	1.7	04/19/04	04/23/04	4110168	
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			F4D220000-251B	
Gross Alpha	-0.12	U	0.46	0.91	04/22/04	04/25/04	4113251	
Gross Beta	0.3	U	1.1	1.8	04/22/04	04/25/04	4113251	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only

Yld results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

Laboratory Control Sample Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Parameter	Spike Amount	Result	Total Uncert. (2 σ+/-)	MDC	% Yld	% Rec	Lab Sample ID / QC Control Limits
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D190000-168C
Gross Beta	95.5	89.4	9.4	1.7		94	(71 - 114)
	Batch #:	4110168		Analysis Date:	04/23/04		
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D190000-168C
Gross Alpha	51.4	43.8	5.2	0.8		85	(67 - 113)
	Batch #:	4110168		Analysis Date:	04/23/04		
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D220000-251C
Gross Beta	95.5	91.7	9.7	1.8		96	(71 - 114)
	Batch #:	4113251		Analysis Date:	04/25/04		
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D220000-251C
Gross Alpha	51.4	50.7	5.9	0.7		98	(67 - 113)
	Batch #:	4113251		Analysis Date:	04/25/04		

NOTE(S)

MDC is determined by instrument performance only
Calculations are performed before rounding to avoid round-off error in calculated results

Laboratory Control Sample/LCS Duplicate Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: SOLID

Parameter		Spike Amount	Result	Total Uncert. (2 σ+/-)	% Yld	% Rec	QC Control Limits	Precision	
Iso URANIUM (SHORT CT) DOE A-01-R MOD		pCi/g		A-01-R MOD				Lab Sample ID F4D130000-091C	
Uranium 234		19.6	16.5	2.6	87	84	(70 - 130)		
	Spk 2	19.6	18.8	3.0	82	96	(70 - 130)	13	%RPD
Uranium 238		19.6	18.9	2.9	87	96	(70 - 130)		
	Spk 2	19.6	16.4	2.7	82	84	(70 - 130)	14	%RPD

Batch #: 4104091 Analysis Date: 04/16/04

NOTE(S)

Calculations are performed before rounding to avoid round-off error in calculated results

Laboratory Control Sample/LCS Duplicate Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Parameter		Spike Amount	Result	Total Uncert. (2 σ+/-)	% Yld	% Rec	QC Control Limits	Precision	
RA-226 BY EPA-903.0 MOD			**pCi/L**	**903.0 MOD**				**Lab Sample ID F4D120000-230C**	
Radium (226)		11.3	9.5	1.1	100	84	(60 - 150)		
	Spk 2	11.3	10.3	1.2	100	92	(60 - 150)	8	%RPD
		Batch #:	4103230		Analysis Date:		04/27/04		
RA-228 BY GFPC EPA 904 MOD			**pCi/L**	**904 MOD**				**F4D120000-231C**	
Radium 228		6.24	5.28	0.83	91	85	(60 - 149)		
	Spk 2	6.24	4.84	0.76	98	78	(60 - 149)	9	%RPD
		Batch #:	4103231		Analysis Date:		04/27/04		
RA-226 BY EPA-903.0 MOD			**pCi/L**	**903.0 MOD**				**F4D130000-300C**	
Radium (226)		11.3	10.4	1.2	100	92	(60 - 150)		
	Spk 2	11.3	10	1.2	100	89	(60 - 150)	4	%RPD
		Batch #:	4104300		Analysis Date:		04/28/04		
RA-228 BY GFPC EPA 904 MOD			**pCi/L**	**904 MOD**				**F4D130000-301C**	
Radium 228		6.24	5.74	0.81	99	92	(60 - 149)		
	Spk 2	6.24	5.82	0.83	95	93	(60 - 149)	1	%RPD
		Batch #:	4104301		Analysis Date:		04/28/04		

NOTE(S)

Calculations are performed before rounding to avoid round-off error in calculated results

DUPLICATE EVALUATION REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Date Sampled: 04/05/04
Date Received: 04/06/04

Parameter	SAMPLE Result		Total Uncert. (2σ+/-)	% Yld	DUPLICATE Result		Total Uncert. (2σ+/-)	% Yld	QC Sample ID Precision	
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD				C4D060139-002	
Gross Alpha	2.8	J	1.3		2.2	J	1.1		24	%RPD
Gross Beta	5.8		1.4		3.9	J	1.2		39	%RPD
	Batch #:		4113251	(Sample)	4113251	(Duplicate)				
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD				F4D090319-001	
Gross Alpha	0.31	U	0.75		1.16	U	0.90		116	%RPD
Gross Beta	3.8	J	1.4		3.5	J	1.4		7	%RPD
	Batch #:		4110168	(Sample)	4110168	(Duplicate)				

NOTE(S)

ta are incomplete without the case narrative.
culations are performed before rounding to avoid round-off error in calculated results

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

MATRIX SPIKE REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot Id: F4D090319 Date Sampled: 04/08/04
Matrix: WATER Date Received: 04/09/04

Parameter	Spike Amount	Spike Result	Total Uncert. (2σ +/-)	Spike Yld.	Sample Result	Total Uncert. (2 σ +/-)	QC Sample ID %YLD	QC Sample ID %REC	QC Control Limits
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L		900.0 MOD			F4D090319-001	
Gross Beta	106	107	11		3.8	1.4		97	(50 - 150)
	Batch #:	4110168		Analysis Date:		04/23/04			
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L		900.0 MOD			F4D090319-001	
Gross Alpha	57.2	53.7	6.9		0.31	0.75		93	(50 - 150)
	Batch #:	4110168		Analysis Date:		04/23/04			

NOTE(S)

Data are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: C4D060139 Date Sampled: 04/05/04 1300
Matrix: WG Date Received: 04/06/04 1000

Parameter		Spike Amount	SPIKE Result	Total Uncert. (2 σ+/-)	Spike Yld	SAMPLE Result		Total Uncert. (2σ +/-)	QC Sample ID % Yld	%Rec	QC Control Limits
GROSS A/B BY GFPC EPA 900.0				pCi/L		900.0 MOD				C4D060139-002	
Gross Alpha		57.2	51.0	6.6		2.8	J	1.3		84	(50 - 150)
	Spk2	57.2	52.8	6.8		2.8	J	1.3		87	(50 - 150)
									Precision:	3	%RPD
		Batch #:	4113251		Analysis date:		04/25/04				
GROSS A/B BY GFPC EPA 900.0				pCi/L		900.0 MOD				C4D060139-002	
Gross Beta		106	126	13		5.8		1.4		113	(50 - 150)
	Spk2	106	124	13		5.8		1.4		112	(50 - 150)
									Precision:	1	%RPD
		Batch #:	4113251		Analysis date:		04/25/04				

NOTE(S)

[illegible] are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off error in calculated results

SEVERN TRENT STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. SMC Radiological Sampling

Lot #: F4D100111

Larry Butlien

TRC Environmental Corp.
5 Waterside Crossing
Windsor, CT 06095

SEVERN TRENT LABORATORIES, INC.

Billy Tierney
Project Manager

May 3, 2004

Case Narrative
LOT NUMBER: **F4D100111**

This report contains the analytical results for the 24 samples received under chain of custody by STL St. Louis on April 9, 2004. These samples are associated with your SMC Radiological Sampling project.

All applicable quality control procedures met method-specified acceptance criteria except as noted on the following page.

This report is incomplete without the case narrative. All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Gross Alpha/Beta by EPA 900.0

The standard reporting limit was exceeded due to a reduction of sample size attributed to the sample's high residual mass. The analytical results are reported with the MDA achieved.
Affected Samples:
F4D100111 (3): SC12S
F4D100111 (4): SC32S

METHODS SUMMARY

F4D100111

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Gross Alpha/Beta by GFPC	EPA 900.0 MOD	EPA 900.0
Isotopic Uranium by Alpha Spectroscopy	EML A-01-R MOD	
Radium-226 by GFPC	EPA 903.0 MOD	
Radium-228 by GFPC	EPA 904 MOD	

References:

EML "ENVIRONMENTAL MEASUREMENTS LABORATORY PROCEDURES MANUAL" HASL-300 28TH EDITION, VOLUME I and II DEPARTMENT OF ENERGY

EPA "EASTERN ENVIRONMENTAL RADIATION FACILITY RADIOCHEMISTRY PROCEDURES MANUAL" US EPA EPA 520/5-84-006 AUGUST 1984

SAMPLE SUMMARY

F4D100111

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
GDX15	001	SC14S	04/06/04	17:25
GDX16	002	SC11S(R)	04/06/04	17:45
GDX17	003	SC12S	04/07/04	08:45
GDX18	004	SC32S	04/07/04	08:50
GDX19	005	W2(R)	04/06/04	18:00
GDX2A	006	A	04/07/04	11:00
GDX2C	007	SC13S	04/07/04	09:25
GDX2D	008	OBS-2A	04/07/04	14:30
GD1GE	009	SC14S-DISSOLVED	04/06/04	17:25
GD1GJ	010	SC11S(R)-DISSOLVED	04/06/04	17:45
GD1GM	011	SC12S-DISSOLVED	04/07/04	08:45
GD1GQ	012	SC32S-DISSOLVED	04/07/04	08:50
GD1GT	013	W2(R)-DISSOLVED	04/06/04	18:00
GD1G0	014	A-DISSOLVED	04/07/04	11:00
GD1G2	015	SC13S-DISSOLVED	04/07/04	09:25
GD1G5	016	OBS-2A-DISSOLVED	04/07/04	14:30
GD1HC	017	SC14S	04/06/04	17:25
GD1HE	018	SC11S(R)	04/06/04	17:45
GD1HG	019	SC12S	04/07/04	20:45
GD1HH	020	SC32S	04/07/04	20:50
GD1HK	021	W2(R)	04/06/04	18:00
GD1HN	022	A	04/07/04	11:00
GD1HR	023	SC13S	04/07/04	09:25
GD1HV	024	OBS-2A	04/07/04	14:30

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

TRC Environmental Corp.

Client Sample ID: SC14S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-001
Work Order: GDX15
Matrix: WATER

Date Collected: 04/06/04 1725
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	1.1	U	1.0	1.5	04/19/04	04/23/04	4110168	
Gross Beta	5.3		1.5	2.0	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.11	U	0.10	0.16	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.91	J	0.36	0.50	04/12/04	04/27/04	4103231	95

NOTE(S)

Data are incomplete without the case narrative.

[illegible] is determined by instrument performance only.
[illegible] results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC11S(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-002
Work Order: GDX16
Matrix: WATER

Date Collected: 04/06/04 1745
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.59	U	0.87	1.5	04/19/04	04/23/04	4110168	
Gross Beta	2.7	J	1.2	1.8	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.14	U	0.13	0.20	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	-0.14	U	0.27	0.49	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC12S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-003
Work Order: GDX17
Matrix: WATER

Date Collected: 04/07/04 0845
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	8.8	U	9.8	15	04/19/04	04/23/04	4110168	
Gross Beta	128		16	9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.52	J	0.18	0.18	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.42	U	0.31	0.49	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
d results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC32S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-004
Work Order: GDX18
Matrix: WATER

Date Collected: 04/07/04 0850
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	14	U	10	15	04/19/04	04/23/04	4110168	
Gross Beta	**115**		15	9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.98	J	0.24	0.18	04/12/04	04/27/04	4103230	99
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.61	J	0.37	0.56	04/12/04	04/27/04	4103231	93

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: W2(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-005
Work Order: GDX19
Matrix: WATER

Date Collected: 04/06/04 1800
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	1.75	J	0.98	1.2	04/19/04	04/23/04	4110168	
Gross Beta	3.4	J	1.2	1.8	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.05	U	0.13	0.23	04/12/04	04/27/04	4103230	91
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.16	U	0.34	0.58	04/12/04	04/27/04	4103231	86

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
[illegible] results are greater than the MDC

[illegible] Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-006
Work Order: GDX2A
Matrix: WATER

Date Collected: 04/07/04 1100
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.7	U	1.1	2.0	04/19/04	04/23/04	4110168	
Gross Beta	**1.9**	J	1.2	1.9	**04/19/04**	**04/23/04**	**4110168**	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.1	U	0.10	0.16	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	-0.11	U	0.30	0.54	04/12/04	04/27/04	4103231	88

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC13S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-007
Work Order: GDX2C
Matrix: WATER

Date Collected: 04/07/04 0925
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)		MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L		900.0 MOD			
Gross Alpha	2.6	U	2.4		3.6	04/19/04	04/23/04	4110168	
Gross Beta	17.6		2.5		1.9	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L		903.0 MOD			
Radium (226)	0.30	J	0.17		0.21	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L		904 MOD			
Radium 228	0.39	U	0.27		0.41	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: OBS-2A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-008
Work Order: GDX2D
Matrix: WATER

Date Collected: 04/07/04 1430
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	4.0		1.2	1.0	04/19/04	04/23/04	4110168	
Gross Beta	3.4	J	1.2	1.7	04/19/04	04/23/04	4110168	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.95	J	0.26	0.20	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.58	J	0.33	0.50	04/12/04	04/27/04	4103231	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC14S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-009
Work Order: GD1GE
Matrix: WATER

Date Collected: 04/06/04 1725
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)		MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L		900.0 MOD			
Gross Alpha	0.41	U	0.84		1.5	04/22/04	04/25/04	4113251	
Gross Beta	7.3		1.4		1.3	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L		903.0 MOD			
Radium (226)	0.33	J	0.15		0.16	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L		904 MOD			
Radium 228	0.89	J	0.32		0.42	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

[illegible] is determined by instrument performance only.

[illegible] results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC11S(R)-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-010
Work Order: GD1GJ
Matrix: WATER

Date Collected: 04/06/04 1745
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.52	U	0.56	0.87	04/22/04	04/25/04	4113251	
Gross Beta	**2.50**	**J**	**0.94**	**1.3**	**04/22/04**	**04/25/04**	**4113251**	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.17	U	0.13	0.20	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.24	U	0.36	0.60	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC12S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-011
Work Order: GD1GM
Matrix: WATER

Date Collected: 04/07/04 0845
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)		MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L		900.0 MOD			
Gross Alpha	0.91	U	0.97		1.5	04/22/04	04/25/04	4113251	
Gross Beta	14.0		2.1		1.5	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L		903.0 MOD			
Radium (226)	0.82	J	0.24		0.22	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L		904 MOD			
Radium 228	0.58	U	0.41		0.65	04/13/04	04/28/04	4104301	98

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC32S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-012
Work Order: GD1GO
Matrix: WATER

Date Collected: 04/07/04 0850
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.29	U	0.85	1.5	04/22/04	04/25/04	4113251	
Gross Beta	**15.3**		**2.3**	**1.6**	**04/22/04**	**04/25/04**	**4113251**	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	**1.09**		**0.26**	**0.19**	**04/13/04**	**04/28/04**	**4104300**	**100**
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	**1.24**		**0.43**	**0.61**	**04/13/04**	**04/28/04**	**4104301**	**100**

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: W2(R)-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-013
Work Order: GD1GT
Matrix: WATER

Date Collected: 04/06/04 1800
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.32	U	0.57	0.98	04/22/04	04/25/04	4113251	
Gross Beta	1.6	U	1.1	1.7	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.13	U	0.11	0.15	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.22	U	0.34	0.56	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

results are greater than the MDC

Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: A-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-014
Work Order: GD1G0
Matrix: WATER

Date Collected: 04/07/04 1100
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	0.55	U	0.90	1.5	04/22/04	04/25/04	4113251	
Gross Beta	13.0		2.0	1.8	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.11	U	0.12	0.19	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.38	U	0.38	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: SC13S-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-015
Work Order: GD1G2
Matrix: WATER

Date Collected: 04/07/04 0925
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	-0.3	U	1.5	3.0	04/22/04	04/25/04	4113251	
Gross Beta	2.3	J	1.2	1.8	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	0.41	J	0.17	0.18	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.1	U	0.36	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

TRC Environmental Corp.

Client Sample ID: OBS-2A-DISSOLVED

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-016
Work Order: GD1G5
Matrix: WATER

Date Collected: 04/07/04 1430
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD			
Gross Alpha	2.08	J	0.83	0.86	04/22/04	04/25/04	4113251	
Gross Beta	3.0	J	1.2	1.8	04/22/04	04/25/04	4113251	
RA-226 BY EPA-903.0 MOD				pCi/L	903.0 MOD			
Radium (226)	1.23		0.28	0.19	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD				pCi/L	904 MOD			
Radium 228	0.68	J	0.39	0.61	04/13/04	04/28/04	4104301	100

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC14S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-017
Work Order: GD1HC
Matrix: SOLID

Date Collected: 04/06/04 1725
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.31	J	0.12	0.05	04/13/04	04/15/04	4104091	91

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC11S(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-018
Work Order: GD1HE
Matrix: SOLID

Date Collected: 04/06/04 1745
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.29	J	0.12	0.05	04/13/04	04/15/04	4104091	77

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC12S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-019
Work Order: GD1HG
Matrix: SOLID

Date Collected: 04/07/04 2045
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.43	J	0.14	0.06	04/13/04	04/15/04	4104091	98

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC32S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-020
Work Order: GD1HH
Matrix: SOLID

Date Collected: 04/07/04 2050
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.48	J	0.15	0.05	04/13/04	04/15/04	4104091	95

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: W2(R)

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-021
Work Order: GD1HK
Matrix: SOLID

Date Collected: 04/06/04 1800
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.38	J	0.13	0.05	04/13/04	04/15/04	4104091	90

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

results are greater than the MDC

Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-022
Work Order: GD1HN
Matrix: SOLID

Date Collected: 04/07/04 1100
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.31	J	0.12	0.09	04/13/04	04/15/04	4104091	89

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: SC13S

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F4D100111-023
Work Order: GD1HR
Matrix: SOLID

Date Collected: 04/07/04 0925
Date Received: 04/09/04 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.24	J	0.11	0.07	04/13/04	04/16/04	4104091	93

NOTE(S)

Data are incomplete without the case narrative.

is determined by instrument performance only.
results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

TRC Environmental Corp.

Client Sample ID: OBS-2A

Severn Trent Laboratories - Radiochemistry

Lab Sample ID:	F4D100111-024	Date Collected:	04/07/04 1430
Work Order:	GD1HV	Date Received:	04/09/04 0900
Matrix:	SOLID		

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD				pCi/sample	A-01-R MOD			
Uranium 238	0.32	J	0.13	0.07	04/13/04	04/16/04	4104091	89

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

METHOD BLANK REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: SOLID

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Lab Sample ID Batch #	Yld %
Iso URANIUM (SHORT CT) DOE A-01-R MOD			pCi/g	A-01-R MOD			F4D130000-091B	
Uranium 238	0.22	J	0.10	0.05	04/13/04	04/16/04	4104091	87

NOTE(S)

Data are incomplete without the case narrative.

[illegible] is determined using instrument performance only

[illegible] results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.

U Result is less than the sample detection limit.

METHOD BLANK REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Lab Sample ID Batch #	Yld %
RA-226 BY EPA-903.0 MOD			pCi/L	903.0 MOD			**F4D120000-230B**	
Radium (226)	0.033	U	0.097	0.18	04/12/04	04/27/04	4103230	100
RA-228 BY GFPC EPA 904 MOD			pCi/L	904 MOD			**F4D120000-231B**	
Radium 228	0.28	U	0.27	0.43	04/12/04	04/27/04	4103231	99
RA-226 BY EPA-903.0 MOD			pCi/L	903.0 MOD			**F4D130000-300B**	
Radium (226)	0.03	U	0.11	0.21	04/13/04	04/28/04	4104300	100
RA-228 BY GFPC EPA 904 MOD			pCi/L	904 MOD			**F4D130000-301B**	
Radium 228	0.24	U	0.37	0.61	04/13/04	04/28/04	4104301	99
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			**F4D190000-168B**	
Gross Alpha	0.03	U	0.40	0.77	04/19/04	04/23/04	4110168	
Gross Beta	1.3	U	1.1	1.7	04/19/04	04/23/04	4110168	
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			**F4D220000-251B**	
Gross Alpha	-0.12	U	0.46	0.91	04/22/04	04/25/04	4113251	
Gross Beta	0.3	U	1.1	1.8	04/22/04	04/25/04	4113251	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

Laboratory Control Sample Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Parameter	Spike Amount	Result	Total Uncert. (2 σ+/-)	MDC	% Yld	% Rec	Lab Sample ID / QC Control Limits
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D190000-168C
Gross Beta	95.5	89.4	9.4	1.7		94	(71 - 114)
	Batch #:	4110168		Analysis Date:	04/23/04		
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D190000-168C
Gross Alpha	51.4	43.8	5.2	0.8		85	(67 - 113)
	Batch #:	4110168		Analysis Date:	04/23/04		
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D220000-251C
Gross Beta	95.5	91.7	9.7	1.8		96	(71 - 114)
	Batch #:	4113251		Analysis Date:	04/25/04		
GROSS A/B BY GFPC EPA 900.0 MOD		pCi/L		900.0 MOD			F4D220000-251C
Gross Alpha	51.4	50.7	5.9	0.7		98	(67 - 113)
	Batch #:	4113251		Analysis Date:	04/25/04		

NOTE(S)

MDC is determined by instrument performance only
Calculations are performed before rounding to avoid round-off error in calculated results

Laboratory Control Sample/LCS Duplicate Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: SOLID

Parameter		Spike Amount	Result	Total Uncert. (2 σ+/-)	% Yld	% Rec	QC Control Limits	Precision	
Iso URANIUM (SHORT CT) DOE A-01-R MOD			pCi/g	A-01-R MOD				Lab Sample ID F4D130000-091C	
Uranium 234		19.6	16.5	2.6	87	84	(70 - 130)		
	Spk 2	19.6	18.8	3.0	82	96	(70 - 130)	13	%RPD
Uranium 238		19.6	18.9	2.9	87	96	(70 - 130)		
	Spk 2	19.6	16.4	2.7	82	84	(70 - 130)	14	%RPD
		Batch #:	4104091		Analysis Date:		04/16/04		

NOTE(S)

Calculations are performed before rounding to avoid round-off error in calculated results

Laboratory Control Sample/LCS Duplicate Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111
Matrix: WATER

Parameter		Spike Amount	Result	Total Uncert. (2 σ+/-)	% Yld	% Rec	QC Control Limits	Precision	Lab Sample ID
RA-226 BY EPA-903.0 MOD			pCi/L	903.0 MOD					**F4D120000-230C**
Radium (226)		11.3	9.5	1.1	100	84	(60 - 150)		
	Spk 2	11.3	10.3	1.2	100	92	(60 - 150)	8	%RPD
		Batch #:	4103230		Analysis Date:		04/27/04		
RA-228 BY GFPC EPA 904 MOD			pCi/L	904 MOD					**F4D120000-231C**
Radium 228		6.24	5.28	0.83	91	85	(60 - 149)		
	Spk 2	6.24	4.84	0.76	98	78	(60 - 149)	9	%RPD
		Batch #:	4103231		Analysis Date:		04/27/04		
RA-226 BY EPA-903.0 MOD			pCi/L	903.0 MOD					**F4D130000-300C**
Radium (226)		11.3	10.4	1.2	100	92	(60 - 150)		
	Spk 2	11.3	10	1.2	100	89	(60 - 150)	4	%RPD
		Batch #:	4104300		Analysis Date:		04/28/04		
RA-228 BY GFPC EPA 904 MOD			pCi/L	904 MOD					**F4D130000-301C**
Radium 228		6.24	5.74	0.81	99	92	(60 - 149)		
	Spk 2	6.24	5.82	0.83	95	93	(60 - 149)	1	%RPD
		Batch #:	4104301		Analysis Date:		04/28/04		

NOTE(S)

Calculations are performed before rounding to avoid round-off error in calculated results

DUPLICATE EVALUATION REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F4D100111 Date Sampled: 04/05/04
Matrix: WATER Date Received: 04/06/04

Parameter	SAMPLE Result		Total Uncert. (2σ+/-)	% Yld	DUPLICATE Result		Total Uncert. (2σ+/-)	% Yld	QC Sample ID Precision	
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD				C4D060139-002	
Gross Alpha	2.8	J	1.3		2.2	J	1.1		24	%RPD
Gross Beta	5.8		1.4		3.9	J	1.2		39	%RPD
	Batch #:		4113251	(Sample)	4113251	(Duplicate)				
GROSS A/B BY GFPC EPA 900.0 MOD				pCi/L	900.0 MOD				F4D090319-001	
Gross Alpha	0.31	U	0.75		1.16	U	0.90		116	%RPD
Gross Beta	3.8	J	1.4		3.5	J	1.4		7	%RPD
	Batch #:		4110168	(Sample)	4110168	(Duplicate)				

NOTE(S)

Data are incomplete without the case narrative.
Calculations are performed before rounding to avoid round-off error in calculated results

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

MATRIX SPIKE REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot Id: F4D090319 Date Sampled: 04/08/04
Matrix: WATER Date Received: 04/09/04

Parameter	Spike Amount	Spike Result	Total Uncert. (2σ +/-)	Spike Yld.	Sample Result	Total Uncert. (2σ +/-)	QC Sample ID %YLD	%REC	QC Control Limits
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			F4D090319-001		
Gross Beta	106	107	11		3.8	1.4		97	(50 - 150)
	Batch #:	4110168		Analysis Date:		04/23/04			
GROSS A/B BY GFPC EPA 900.0 MOD			pCi/L	900.0 MOD			F4D090319-001		
Gross Alpha	57.2	53.7	6.9		0.31	0.75		93	(50 - 150)
	Batch #:	4110168		Analysis Date:		04/23/04			

NOTE(S)

Data are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: C4D060139 Date Sampled: 04/05/04 1300
Matrix: WG Date Received: 04/06/04 1000

Parameter		Spike Amount	SPIKE Result	Total Uncert. (2 σ+/-)	Spike Yld	SAMPLE Result		Total Uncert. (2σ +/-)	QC Sample ID % Yld	%Rec	QC Control Limits
GROSS A/B BY GFPC EPA 900.0				pCi/L		900.0 MOD				C4D060139-002	
Gross Alpha		57.2	51.0	6.6		2.8	J	1.3		84	(50 - 150)
	Spk2	57.2	52.8	6.8		2.8	J	1.3		87	(50 - 150)
									Precision:	3	%RPD
		Batch #:	4113251		Analysis date:		04/25/04				
GROSS A/B BY GFPC EPA 900.0				pCi/L		900.0 MOD				C4D060139-002	
Gross Beta		106	126	13		5.8		1.4		113	(50 - 150)
	Spk2	106	124	13		5.8		1.4		112	(50 - 150)
									Precision:	1	%RPD
		Batch #:	4113251		Analysis date:		04/25/04				

NOTE (S)

Data are incomplete without the case narrative.

Calculations are performed before rounding to avoid round-off error in calculated results

June 9, 2005

Mr. David R. Smith
Shieldalloy Metallurgical Corporation
12 West Boulevard, PO Box 768
Newfield, NJ 08344

Re: Results of Ground Water Sampling (April 13, 2005)

Dear Mr. Smith:

Integrated Environmental Management, Inc. (IEM) is pleased to provide you with the Certificates of Analysis from a groundwater sampling round that took place on April 13, 2005. The samples were collected from four (4) on-site wells and from a well that belongs to the Borough of Newfield.[1]

The samples were collected by a representative of TRC, Inc., and forwarded, without preservative, to Outreach Laboratory in Broken Arrow, OK.[2] Attachment 1 contains the specifications for analysis of the samples. Attachment 2 contains the Certificates of Analysis. Table 1, below, is a summary of findings for an "unfiltered" aliquot:[3,4]

Table 1

Well ID	Radionuclide Concentration (picocuries per liter)*							
	Ra-226	Ra-228	Th-232	Th-230	Th-228	U-238	U-235	U-234
SC25S	< 0.454	16.9	<0.335	<0.751	<0.455	0.725	0.628	3.65
SC11S	<0.293	1.79	<0.336	<0.636	<0.366	3.03	<1.29	2.89
SC12S	<0.325	4.47	<0.246	<0.674	<0.227	<0.272	<0.154	0.427
SC13S	<0.418	7.64	<0.219	<0.606	<0.267	1.86	<0.498	2.57
*BN4-05***	*<1.00*	*5.54*	*0.144*	*<0.653*	*<0.405*	*<0.271*	*0.532*	*0.645*

* Statistically-significant results are shaded.
** Background (up-gradient and off of the Shieldalloy property) well

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[1] The Newfield well is up-gradient of the Shieldalloy Metallurgical Corporation (Shieldalloy) plant, and is thus representative of "background" groundwater.

[2] Outreach Laboratory is a NELAC-Certified laboratory for radioanalytical services.

[3] The gross alpha and gross beta results, which would typically be useful as screening values, are not reported in the tables in this letter since isotopic analyses were performed on all samples. They are, however, contained in the Certificates of Analysis.

[4] If an analytical result did not have statistical confidence (i.e., the result is lower than the minimum detectable concentration calculated for each analysis), a "<MDC" value is recorded in the tables instead.

Table 2 is a summary of findings for a "filtered" aliquot, the result of which can be compared to applicable drinking water standards:

Table 2

Well ID	Radionuclide Concentration (picocuries per liter)*							
	Ra-226	Ra-228	Th-232	Th-230	Th-228	U-238	U-235	U-234
SC25S	<0.352	1.18	<0.301	<0.811	<0.455	0.725	0.628	3.65
SC11S	<0.431	5.50	<0.256	<0.696	0.373	<1.77	<0.942	<1.91
SC12S	0.598	2.28	0.312	<0.648	<0.222	<0.483	<0.281	0.666
SC13S	<0.715	<0.532	<0.207	<0.587	<0.232	1.25	<0.220	1.14
*BN4-05***	*<0.459*	*6.39*	*0.310*	*<0.616*	*0.177*	*0.527*	*0.331*	*1.23*

* Statistically-significant results are shaded.
** Background (up-gradient and off of the Shieldalloy property) well

To interpret the Table 2 data, a comparison to the maximum contaminant levels (MCLs) for radionuclides promulgated by the U. S. Environmental Protection Agency in 40 CFR §141.66 may be helpful.[5] A specific MCL is given for Ra-226 and Ra-228, combined, in 40 CFR §141.66(b). For the remaining radionuclides shown in Table 2, 40 CFR §141.66(d)(2) limits the concentration to that which would deliver a radiation dose of four (4) millirem per year if ingested at the rate of two liters of water per day for 365 days as follows:

$$\frac{picocurie}{\ell} \times \frac{2\ \ell}{day} \times \frac{365\ day}{year} \times DCF\left(\frac{millirem}{picocurie}\right) < \frac{4\ millirem}{year}$$

where picocurie/l = the concentration of the radionuclide in question, and DCF = a dose conversion factor that translates ingestion intake into radiation dose. Using the ingestion dose conversion factors listed in the USEPA's Federal Guidance Report No. 11 for the calculations, the following table of MCLs results:[6]

Table 3

Maximum Contaminant Levels in Drinking Water (picocuries per liter)						
Ra-226 + Ra-228	Th-232	Th-230	Th-228	U-238	U-235	U-234
5	2	10	14	231	205	210

While MCL for the radium isotopes stands alone, the radiation dose limit of four (4) millirem per year is for all other radionuclides combined. Therefore, in order to determine compliance with the MCLs for the non-radium isotopes, the "unity rule", where the sum of the ratio of isotopes to its MCL must be less than one (1). In other words:

$$\frac{[Th\text{-}232]}{MCL_{Th\text{-}232}} + \frac{[Th\text{-}230]}{MCL_{Th\text{-}230}} + \frac{[Th\text{-}228]}{MCL_{Th\text{-}228}} + \frac{[U\text{-}238]}{MCL_{U\text{-}238}} + \frac{[U\text{-}235]}{MCL_{U\text{-}235}} + \frac{[U\text{-}234]}{MCL_{U\text{-}234}} < 1$$

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[5] Title 40, Code of Federal Regulations, Part 141, "National Primary Drinking Water Regulations".

[6] U. S. Environmental Protection Agency, EPA-520/1-88-020, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion: Federal Guidance Report No. 11", September, 1988.

Using the Table 2 results for the sample collected from the Borough of Newfield's well as an example:[7]

$$\frac{0.310}{2} + \frac{0.616}{10} + \frac{0.117}{14} + \frac{0.527}{231} + \frac{0.331}{205} + \frac{1.23}{210} = 0.23$$

Because the result is less than unity, the non-radium isotopes in that sample meet the USEPA's drinking water standard for those radionuclides. On the other hand, because the combined Ra-226 and Ra-228 result is slightly greater than five (5) picocuries per liter, the standard for radium cannot be met. However, it is important to note that demonstration of compliance with the drinking water standards for public water supplies is based upon an annual average radionuclide concentration (i.e., multiple analyses per year or one analysis of a composite sample collected over a period of one year), not on one sample collected at a single point in time.[8]

An important finding from this sampling campaign is that the radionuclide content of the groundwater under the Shieldalloy site cannot be distinguished from background. It is thus reasonable to conclude that the presence of licensed radioactive materials at the plant over all of these years is having no impact on the radiological quality of the groundwater.

Thank you for the opportunity of assisting you in completing this interesting assessment. If I can answer any questions or provide you with additional information on this or any other radiation-related matter, please don't hesitate to call me at (240) 631-8990. I look forward to speaking with you again soon.

Sincerely,

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

Carol D. Berger, CHP

Fil 94005.01

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[7] To ensure a level of conservatism in this evaluation, the minimum detectable concentrations shown in Table 2 are taken to be actual concentrations.

[8] See 40 CFR §141.26, "Monitoring Frequency and Compliance Requirements for Radionuclides in Community Water Systems".

ATTACHMENT 1
Laboratory Specifications

LABORATORY SPECIFICATIONS
March 30, 2005

1. **IEM**'s client will forward two (2) samples of ground water to the vendor. Sample volumes will be approximately one (1) liter. All samples will be accompanied by a chain-of-custody form that will reference this letter of specification.

2. A filtered (0.45 micrometer) and unfiltered fraction of each sample shall be analyzed for gross alpha activity, gross beta activity, radium isotopes, thorium isotopes and uranium isotopes. Analytical methods for the gross alpha/beta analyses shall be equal or technically equivalent to "Prescribed Procedures for Measurement of Drinking Water", No. EPA 900.0 (Gross alpha/beta). Analytical methods for the isotopic analyses shall be identical to those performed for the Kd determinations for Lab Number 20050135. The actual procedures followed shall be specified on the Certificate of Analysis.

3. The concentration of all alpha, beta, uranium, thorium and radium isotopes shall be reported in units of "picocuries per liter". Actual values, along with the error and the Minimum Detectable Activity (MDA), shall be reported. *Do not report "<MDA", "< [value]", "not detected", or any other censored value.*

4. Preliminary results, stamped or marked as "draft" or "preliminary" shall be sent to **IEM** for preliminary approval.

5. Once the preliminary results are approved, the final report shall be issued *without any changes to the approved draft*. All paper or electronic copies in your possession that are marked "draft" or "preliminary" shall be destroyed.

6. The vendor must commit to delivery of the draft analytical results within 20 business days after sample receipt.

7. Two copies of each Certificate of Analysis should be issued within five (5) business days after approval of the draft report, and should include a copy of the chain-of-custody form(s) and applicable Level I quality assurance data.

8. After authorization is given by **IEM**, sample residuals shall be disposed of by the vendor unless other arrangements have been made, in advance, with **IEM**.

ATTACHMENT 2
Certificates of Analysis

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

June 7, 2005

Carol Berger
Integrated Environmental Management, Inc.
8 Brooks Ave. Suite #205
Gaithersburg, MD 20877

CLIENT PROJECT NUMBER: 94005.01-02
OUTREACH LAB ID: 20050277

Dear Ms. Berger:

Please find enclosed the analytical report for your samples received in our laboratory on April 18, 2005 for the above captioned project. Five water samples were received in good condition and analyzed for Total and Dissolved Gross Alpha Beta, Radium 226, Radium 228, Isotopic Thorium and Isotopic Uranium with a standard 20 work-day turn. Preliminary results were faxed 5/23/05.

All Quality Control for the requested analyses is reported on the analytical report and is within method control limits with the exception of Radium 226 LCSD/MSD RPD and Thorium 230 MSD RPD. Results were in no way affected.

At your request, sample #5 was reanalyzed for Radium 228 producing similar results.

Unless notified otherwise, non-hazardous, non-radioactive samples will be disposed 30 days after the final report date. All others will be returned to you.

Thank you for choosing Outreach Laboratory and if you have any questions, please call us at 918-251-2515.

Laboratory Director

ACCREDITED IN ACCORDANCE WITH nelac
CERT. ID #OK001

ODEQ ID #9517
NRC ODEQ LIC. #27522-01

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.01-02
Lab Number:	20050277
Date Reported:	6/6/05
Date Received:	4/18/05
Page Number:	1 of 5

Analytical Report

Lab ID: 20050277-01
Client ID: SC25S
Date Sampled: 4/13/05 4:35:00 PM
Matrix: Water

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Gross Alpha	EPA 900/9310	1.75 +/- 0.785	pCi/l	0.590	4/21/05	4/25/05	RE
Gross Beta	EPA 900/9310	2.33 +/- 1.88	pCi/l	1.96	4/21/05	4/25/05	RE
Gross Alpha Filtered	EPA 900/9310	0.814 +/- 0.684	pCi/l	0.655	4/21/05	4/25/05	RE
Gross Beta Filtered	EPA 900/9310	2.31 +/- 2.05	pCi/l	2.16	4/21/05	4/25/05	RE
Ra-226	SM 7500 Ra (M)	0 +/- 0.198	pCi/l	0.454	4/20/05	5/3/05	SD
Ra-226 Filtered	SM 7500 Ra (M)	0.167 +/- 0.189	pCi/l	0.352	5/2/05	5/5/05	SD
Ra-228	EPA 904/9320	16.9 +/- 0.357	pCi/l	0.532	4/26/05	4/28/05	SD
Ra-228 Filtered	EPA 904/9320	1.18 +/- 0.321	pCi/l	0.532	4/26/05	4/28/05	SD
Th-232	LANL ER 200 M	0.128 +/- 0.221	pCi/l	0.335	5/2/05	5/12/05	SD
Th-232 Filtered	LANL ER 200 M	0.057 +/- 0.193	pCi/l	0.301	5/2/05	5/12/05	SD
Th-230	LANL ER 200 M	0.096 +/- 0.358	pCi/l	0.751	5/2/05	5/12/05	SD
Th-230 Filtered	LANL ER 200 M	0.351 +/- 0.410	pCi/l	0.811	5/2/05	5/12/05	SD
Th-228	LANL ER 200 M	0.117 +/- 0.285	pCi/l	0.455	5/2/05	5/12/05	SD
Th-228 Filtered	LANL ER 200 M	0.057 +/- 0.176	pCi/l	0.270	5/2/05	5/12/05	SD
U-238	ASTM D 3972	0.725 +/- 0.367	pCi/l	0.422	5/20/05	5/20/05	RE
U-238 Filtered	ASTM D 3972	1.44 +/- 1.16	pCi/l	1.37	5/20/05	5/20/05	RE
U-235	ASTM D 3972	0.628 +/- 0.295	pCi/l	0.093	5/20/05	5/20/05	RE
U-235 Filtered	ASTM D 3972	0.349 +/- 1.36	pCi/l	1.43	5/20/05	5/20/05	RE
U-234	ASTM D 3972	3.65 +/- 0.611	pCi/l	0.093	5/20/05	5/20/05	RE
U-234 Filtered	ASTM D 3972	1.44 +/- 1.80	pCi/l	1.17	5/20/05	5/20/05	RE

Lab ID: 20050277-02
Client ID: SC11S R
Date Sampled: 4/13/05 4:50:00 PM
Matrix: Water

Radiochemical Analyses

Gross Alpha	EPA 900/9310	5.81 +/- 1.81	pCi/l	1.68	4/21/05	4/25/05	RE
Gross Beta	EPA 900/9310	20.4 +/- 3.06	pCi/l	2.90	4/21/05	4/25/05	RE
Gross Alpha Filtered	EPA 900/9310	1.03 +/- 0.719	pCi/l	0.65	4/21/05	4/26/05	RE
Gross Beta Filtered	EPA 900/9310	6.66 +/- 2.27	pCi/l	2.29	4/21/05	4/26/05	RE
Ra-226	SM 7500 Ra (M)	0.234 +/- 0.175	pCi/l	0.293	4/20/05	5/3/05	SD

BDL = Below Detection Limit

reach
aboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.01-02
Lab Number:	20050277
Date Reported:	6/6/05
Date Received:	4/18/05
Page Number:	2 of 5

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Ra-226 Filtered	SM 7500 Ra (M)	0 +/- 0.158	pCi/l	0.431	5/2/05	5/6/05	SD
Ra-228	EPA 904/9320	1.79 +/- 0.305	pCi/l	0.532	4/29/05	5/2/05	SD
Ra-228 Filtered	EPA 904/9320	5.50 +/- 0.294	pCi/l	0.532	5/2/05	4/29/05	SD
Th-232	LANL ER 200 M	0.089 +/- 0.211	pCi/l	0.336	5/2/05	5/12/05	SD
Th-232 Filtered	LANL ER 200 M	0.217 +/- 0.206	pCi/l	0.256	5/2/05	5/12/05	SD
Th-230	LANL ER 200 M	0.010 +/- 0.281	pCi/l	0.636	5/2/05	5/12/05	SD
Th-230 Filtered	LANL ER 200 M	0.508 +/- 0.364	pCi/l	0.696	5/2/05	5/12/05	SD
Th-228	LANL ER 200 M	0 +/- 0.190	pCi/l	0.366	5/2/05	5/12/05	SD
Th-228 Filtered	LANL ER 200 M	0.373 +/- 0.192	pCi/l	0.085	5/2/05	5/12/05	SD
U-238	ASTM D 3972	3.03 +/- 0.197	pCi/l	2.14	5/20/05	5/20/05	RE
U-238 Filtered	ASTM D 3972	0 +/- 0.978	pCi/l	1.77	5/20/05	5/20/05	RE
U-235	ASTM D 3972	0.301 +/- 1.76	pCi/l	1.29	5/20/05	5/20/05	RE
U-235 Filtered	ASTM D 3972	0.206 +/- 0.907	pCi/l	0.942	5/20/05	5/20/05	RE
U-234	ASTM D 3972	2.89 +/- 3.19	pCi/l	2.04	5/20/05	5/20/05	RE
U-234 Filtered	ASTM D 3972	0.659 +/- 1.54	pCi/l	1.91	5/20/05	5/20/05	RE

Lab ID: 20050277-03
Client ID: SC12S
Date Sampled: 4/13/05 5:05:00 PM
Matrix: Water

Radiochemical Analyses

Gross Alpha	EPA 900/9310	7.65 +/- 2.05	pCi/l	1.41	4/21/05	4/25/05	RE
Gross Beta	EPA 900/9310	63.0 +/- 3.57	pCi/l	2.50	4/21/05	4/25/05	RE
Gross Alpha Filtered	EPA 900/9310	4.58 +/- 1.81	pCi/l	1.47	4/21/05	4/26/05	RE
Gross Beta Filtered	EPA 900/9310	61.4 +/- 3.38	pCi/l	2.23	4/21/05	4/26/05	RE
Ra-226	SM 7500 Ra (M)	0.222 +/- 0.185	pCi/l	0.325	4/20/05	5/3/05	SD
Ra-226 Filtered	SM 7500 Ra (M)	0.598 +/- 0.196	pCi/l	0.230	5/2/05	5/5/05	SD
Ra-228	EPA 904/9320	4.47 +/- 0.276	pCi/l	0.532	4/26/05	4/28/05	SD
Ra-228 Filtered	EPA 904/9320	2.28 +/- 0.271	pCi/l	0.532	4/26/05	4/28/05	SD
Th-232	LANL ER 200 M	0 +/- 0.131	pCi/l	0.246	5/2/05	5/11/05	SD
Th-232 Filtered	LANL ER 200 M	0.312 +/- 0.201	pCi/l	0.230	5/2/05	5/12/05	SD
Th-230	LANL ER 200 M	0.045 +/- 0.288	pCi/l	0.647	5/2/05	5/11/05	SD
Th-230 Filtered	LANL ER 200 M	0 +/- 0.250	pCi/l	0.648	5/2/05	5/12/05	SD
Th-228	LANL ER 200 M	0 +/- 0.150	pCi/l	0.277	5/2/05	5/11/05	SD
Th-228 Filtered	LANL ER 200 M	0.189 +/- 0.174	pCi/l	0.222	5/2/05	5/12/05	SD
U-238	ASTM D 3972	0.191 +/- 0.204	pCi/l	0.272	5/20/05	5/20/05	RE

BDL = Below Detection Limit

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.01-02
Lab Number:	20050277
Date Reported:	6/6/05
Date Received:	4/18/05
Page Number:	3 of 5

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
U-238 Filtered	ASTM D 3972	0.000 +/- 0.284	pCi/l	0.483	5/20/05	5/20/05	RE
U-235	ASTM D 3972	0.052 +/- 0.132	pCi/l	0.154	5/20/05	5/20/05	RE
U-235 Filtered	ASTM D 3972	0.190 +/- 0.225	pCi/l	0.281	5/20/05	5/20/05	RE
U-234	ASTM D 3972	0.427 +/- 0.237	pCi/l	0.240	5/20/05	5/20/05	RE
U-234 Filtered	ASTM D 3972	0.666 +/- 0.408	pCi/l	0.512	5/20/05	5/20/05	RE

Lab ID: 20050277-04
Client ID: SC13S
Date Sampled: 4/13/05 5:20:00 PM
Matrix: Water

Radiochemical Analyses

Gross Alpha	EPA 900/9310	8.54 +/- 2.02	pCi/l	1.37	4/21/05	4/25/05	RE
Gross Beta	EPA 900/9310	36.9 +/- 3.16	pCi/l	2.48	4/21/05	4/25/05	RE
Gross Alpha Filtered	EPA 900/9310	4.18 +/- 2.51	pCi/l	2.26	4/21/05	4/26/05	RE
Gross Beta Filtered	EPA 900/9310	37.6 +/- 3.50	pCi/l	2.91	4/21/05	4/26/05	RE
Ra-226	SM 7500 Ra (M)	0.141 +/- 0.215	pCi/l	0.418	4/20/05	5/4/05	SD
Ra-226 Filtered	SM 7500 Ra (M)	0 +/- 0.248	pCi/l	0.715	5/2/05	5/5/05	SD
Ra-228	EPA 904/9320	7.64 +/- 0.313	pCi/l	0.532	4/26/05	4/28/05	SD
Ra-228 Filtered	EPA 904/9320	ND +/- 0.254	pCi/l	0.532	4/26/05	4/28/05	SD
Th-232	LANL ER 200 M	0.139 +/- 0.159	pCi/l	0.219	5/2/05	5/12/05	SD
Th-232 Filtered	LANL ER 200 M	0.134 +/- 0.150	pCi/l	0.207	5/2/05	5/12/05	SD
Th-230	LANL ER 200 M	0 +/- 0.175	pCi/l	0.606	5/2/05	5/12/05	SD
Th-230 Filtered	LANL ER 200 M	0 +/- 0.195	pCi/l	0.587	5/2/05	5/12/05	SD
Th-228	LANL ER 200 M	0.095 +/- 0.175	pCi/l	0.267	5/2/05	5/12/05	SD
Th-228 Filtered	LANL ER 200 M	0 +/- 0.114	pCi/l	0.232	5/2/05	5/12/05	SD
U-238	ASTM D 3972	1.86 +/- 0.639	pCi/l	0.537	5/20/05	5/20/05	RE
U-238 Filtered	ASTM D 3972	1.25 +/- 0.357	pCi/l	0.263	5/20/05	5/20/05	RE
U-235	ASTM D 3972	0.006 +/- 0.305	pCi/l	0.498	5/20/05	5/20/05	RE
U-235 Filtered	ASTM D 3972	0.024 +/- 0.167	pCi/l	0.220	5/20/05	5/20/05	RE
U-234	ASTM D 3972	2.57 +/- 0.711	pCi/l	0.477	5/20/05	5/20/05	RE
U-234 Filtered	ASTM D 3972	1.14 +/- 0.374	pCi/l	0.362	5/20/05	5/20/05	RE

Lab ID: 20050277-05
Client ID: BoroNew 4-05
Date Sampled: 4/14/05 10:30:00 AM
Matrix: Water

BDL = Below Detection Limit

reach
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311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.01-02
Lab Number:	20050277
Date Reported:	6/6/05
Date Received:	4/18/05
Page Number:	4 of 5

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
		Radiochemical Analyses					
Gross Alpha	EPA 900/9310	4.90 +/- 1.06	pCi/l	0.695	4/21/05	4/25/05	RE
Gross Beta	EPA 900/9310	10.4 +/- 2.39	pCi/l	2.32	4/21/05	4/25/05	RE
Gross Alpha Filtered	EPA 900/9310	4.53 +/- 1.07	pCi/l	0.759	4/21/05	4/26/05	RE
Gross Beta Filtered	EPA 900/9310	8.40 +/- 2.24	pCi/l	2.19	4/21/05	4/26/05	RE
Ra-226	SM 7500 Ra (M)	0 +/- 0.386	pCi/l	1.00	4/20/05	5/4/05	SD
Ra-226 Filtered	SM 7500 Ra (M)	0.333 +/- 0.257	pCi/l	0.459	5/2/05	5/5/05	SD
Ra-228	EPA 904/9320	5.54 +/- 0.39	pCi/l	0.532	4/26/05	4/28/05	SD
Ra-228 Filtered	EPA 904/9320	6.39 +/- 0.286	pCi/l	0.532	4/26/05	4/28/05	SD
Th-232	LANL ER 200 M	0.144 +/- 0.133	pCi/l	0.141	5/2/05	5/12/05	SD
Th-232 Filtered	LANL ER 200 M	0.310 +/- 0.165	pCi/l	0.136	5/2/05	5/12/05	SD
Th-230	LANL ER 200 M	0.067 +/- 0.287	pCi/l	0.653	5/2/05	5/12/05	SD
Th-230 Filtered	LANL ER 200 M	0 +/- 0.248	pCi/l	0.616	5/2/05	5/12/05	SD
Th-228	LANL ER 200 M	0.195 +/- 0.268	pCi/l	0.405	5/2/05	5/12/05	SD
Th-228 Filtered	LANL ER 200 M	0.177 +/- 0.147	pCi/l	0.171	5/2/05	5/12/05	SD
U-238	ASTM D 3972	0.114 +/- 0.185	pCi/l	0.271	5/20/05	5/20/05	RE
U-238 Filtered	ASTM D 3972	0.527 +/- 0.265	pCi/l	0.239	5/20/05	5/20/05	RE
U-235	ASTM D 3972	0.532 +/- 0.185	pCi/l	0.124	5/20/05	5/20/05	RE
U-235 Filtered	ASTM D 3972	0.331 +/- 0.239	pCi/l	0.224	5/20/05	5/20/05	RE
U-234	ASTM D 3972	0.645 +/- 0.302	pCi/l	0.341	5/20/05	5/20/05	RE
U-234 Filtered	ASTM D 3972	1.23 +/- 0.371	pCi/l	0.239	5/20/05	5/20/05	RE

RE = Below Detection Limit

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.01-02
Lab Number:	20050277
Date Reported:	6/6/05
Date Received:	4/18/05
Page Number:	5 of 5

20050277 Report filtered and unfiltered results for all samples.

QC Report

Parameter	Blank	LCS %REC	LCSD %REC	LCSD RPD	DUP RPD	MS %REC	MSD %REC	MSD RPD	Date
Gross Alpha	1.7+/-0.7	100.0	109.0	8.3	NC	97.0	107.0	13.8	4/25/05
Gross Beta	2.7+/-2.8	102.0	100.0	2.1	NC	88.0	100.0	13.6	4/25/05
Ra-226	0+/-0.1	81.5	103.0	23.8	NC	96.2	71.0	30.1	5/11/05
Ra-226	0+/-0.1	89.7	93.1	3.8	NC	75.2	69.8	7.5	5/3/05
Ra-228	0.8+/-0.1	98.2	101.0	2.6	20.5	104.0	89.9	14.7	5/2/05
Ra-228 Filtered	0.8+/-0.1	98.2	101.0	2.6	20.5	104.0	89.9	14.7	4/29/05
Th-228	0+/-0.1	99.8	84.2	16.9	NC	108.0	91.0	18.7	5/11/05
Th-230	0+/-0.1	106.0	107.0	1.3	NC	133.0	97.7	32.3	5/11/05
Th-232	0.1+/-0	93.1	86.0	7.9	NC	90.0	91.7	0.1	5/11/05
U-234	0.7+/-1	86.2			NC	87.2			5/20/05
U-238	0.1+/-0	92.0			NC	95.8			5/20/05

Lab Approval:

BDL = Below Detection Limit

OUTREACH LABORATORY

311 North Aspen
Broken Arrow, OK 74012
Phone: (918) 251-2515
Fax: (918) 251-0008

CHAIN OF CUSTODY

Results To:
Company: Shieldalloy
Name: David Smith
Address: 35 SW Blvd
City: Newfield State: NJ Zip: 08344
Phone: _____ Fax #: _____

Bill To:
Company: IEM
Name: Carol Bergen
Address: _____
City: _____ State: _____ Zip: _____

ANALYSIS REQUESTED

PO #
PROJECT #: 94005.01-02
PROJECT NAME
REQUESTED TURNAROUND TIME (ADDITIONAL CHARGES MAY APPLY): Std-20 work
SAMPLER: TRC # Bore Newfield Site
Signature

PRESERVATIVE #: 1. HNO_3 pH<2 2. Ice <4°C 3. HCl pH<2 4. H_2SO_4 pH<2 5. NaOH pH>11

LAB SAMPLE ID	CLIENT SAMPLE ID	DATE SAMPLED	TIME SAMPLED	MATRIX	# CONTAINERS	CONTAINER SIZE / PLASTIC OR GLASS	PRESERVATIVE #	Gross Alpha/Beta	Iso Th	Iso U	Ra 224	Ra 228				REMARKS (I.E. FILTERED, UNFILTERED, GRAB, COMPOSITE)
1	SC255	4/13/05	1635	GW	1	4LP	~~0~~	✓	✓	✓	✓	✓				filtered & unfiltered results.
2	SC115(R)		1650	GW	1	4LP	~~0~~	✓	✓	✓	✓	✓				
3	SC125		1705	GW	1	4LP	~~0~~	✓	✓	✓	✓	✓				
4	SC135		1720	GW	1	4LP	~~0~~	✓	✓	✓	✓	✓				
5	Bore New 4-05	4/14/05	1230	GW	1	4LP	~~0~~	✓	✓	✓	✓	✓				

Do not preserve Filter it.

RELINQUISHED BY: David Smith DATE 4/14/05 TIME _____ RECEIVED BY: Michelle [illegible] DATE 4/18/05 TIME 15:00

RELINQUISHED BY: _____ DATE _____ TIME _____ RECEIVED BY: _____ DATE _____ TIME _____

My signature on this chain of custody form indicates that I am authorized by the above company to release samples for analysis. The company agrees to pay the entire balance upon receipt of sample. If it is understood and agreed that any balance carried over thirty (30) days is subject to a 1.5% per month (18% per annum) late charge. In the event of default, the company becomes liable for any reasonable attorney and/or collection fees and all related costs necessary to remit the entire balance to Outreach Technologies, Inc. (Outreach Laboratory).

SAMPLE DISPOSAL: All non-hazardous samples shall be [illegible]

FOR LABORATORY USE ONLY: 20050277

Sample Condition Upon Receipt: Good

Custody Seals Intact: Y N

Cooler Temperature: [illegible]

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

WAIVED

RECEIVED 9/10/07

CONFIDENTIAL/PRIVILED ATTORNEY/CLIENT/CONSULTANT WORK PRODUCT

August 29, 2007

Carol Berger
Integrated Environmental Management, Inc.
8 Brooks Ave #205
Gaithersburg, MD 20877

CLIENT PROJECT NAME: TRC 105106-000100-000000
OUTREACH LAB ID: 20070717

Dear Ms. Berger:

Please find enclosed the analytical report for your samples received in our laboratory on July 25, 2007 for the above captioned project. Thirteen liquid samples were received, samples W2 ® and IWC 1 were broken during shipment. Sample W2 ® had enough volume in unpreserved sample to split the sample before filtering. Twelve samples were analyzed for Gross Alpha/Beta within the 48 hour holding time, Uranium-Isotopic, Thorium-Isotopic, K-40 by ICP, Radium 226 and Radium 228. Per your chain of custody, five of the samples were also filtered for analysis. Per your chain of custody, if the Gross Alpha result was >5 pCi/l, the sample was reanalyzed for Gross Alpha/Beta.

All Quality Control for the requested analysis is reported on the analytical report. The method blank, laboratory control standard and matrix spike and spike duplicate were all within method control limits with the exception of the DUP RPD for Gross Beta. Your results were not affected in any way.

Unless notified otherwise, all non-hazardous, non-radioactive samples will be disposed 30 days after the report date.

Thank you for choosing Outreach Laboratory and if you have any questions, please call us at 918-251-2515.

Laboratory Director

ODEQ ID #9517
NRC ODEQ LIC. #27522-01

ACCREDITED IN ACCORDANCE WITH nelac

CERT. ID #OK001
See Certified
Parameter List

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oratory
11 North Aspen
roken Arrow, OK 74012
)18) 251-2515
AX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	1 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
b ID:	**20070717-01**						
ent ID:	**SC25S**						
te Sampled:	**7/24/07 7:35:00 AM**						
ıtrix:	**Liquid**						
		Radiochemical Analyses					
›ss Alpha	EPA 900/9310	2.15 +/- 1.22	pCi/l	0.922	7/25/07	8/23/07	SD
›ss Alpha (48 hour)	EPA 900/9310	6.52 +/- 1.75	pCi/l	0.922	7/25/07	7/25/07	SD
›ss Beta	EPA 900/9310	4.77 +/- 4.16	pCi/l	4.34	7/25/07	8/23/07	SD
›ss Beta (48 hour)	EPA 900/9310	8.81 +/- 4.28	pCi/l	4.34	7/25/07	7/25/07	SD
·226	SM 7500 Ra B (M)	0.164 +/- 0.147	pCi/l	0.272	8/15/07	8/19/07	SD
·228	EPA 904/9320	0.439 +/- 0.049	pCi/l	0.210	8/17/07	8/20/07	SD
·232	LANL ER 200 M	0.340 +/- 0.187	pCi/l	0.233	8/16/07	8/20/07	SD
·230	LANL ER 200 M	0.198 +/- 0.258	pCi/l	0.517	8/16/07	8/20/07	SD
·228	LANL ER 200 M	0.071 +/- 0.143	pCi/l	0.225	8/16/07	8/20/07	SD
›[illegible]	ASTM D 3972	0.117 +/- 0.294	pCi/l	0.459	8/16/07	8/21/07	SD
	ASTM D 3972	0.088 +/- 0.198	pCi/l	0.290	8/16/07	8/21/07	SD
·234	ASTM D 3972	1.06 +/- 0.492	pCi/l	0.526	8/16/07	8/21/07	SD
		Metals Analyses					
·10	EPA 6010B/200.7	2.28 +/- 1.98	pCi/l	0.383	8/7/07	8/17/07	RE
b ID:	**20070717-02**						
ent ID:	**SC14S**						
te Sampled:	**7/24/07 8:35:00 AM**						
ıtrix:	**Liquid**						
		Radiochemical Analyses					
›ss Alpha (48 hour)	EPA 900/9310	3.56 +/- 1.23	pCi/l	0.610	7/25/07	7/25/07	SD
›ss Beta (48 hour)	EPA 900/9310	6.17 +/- 2.93	pCi/l	2.87	7/25/07	7/25/07	SD
·226	SM 7500 Ra B (M)	0.202 +/- 0.157	pCi/l	0.284	8/15/07	8/19/07	SD
·228	EPA 904/9320	0.569 +/- 0.050	pCi/l	0.299	8/17/07	8/20/07	SD
·232	LANL ER 200 M	0.531 +/- 0.184	pCi/l	0.215	8/16/07	8/20/07	SD
·230	LANL ER 200 M	0.660 +/- 0.208	pCi/l	0.311	8/16/07	8/20/07	SD
·228	LANL ER 200 M	0 +/- 0.117	pCi/l	0.202	8/16/07	8/20/07	SD
·238	ASTM D 3972	0.079 +/- 0.285	pCi/l	0.463	8/16/07	8/21/07	SD
·235	ASTM D 3972	0.026 +/- 0.173	pCi/l	0.288	8/16/07	8/21/07	SD
·234	ASTM D 3972	0.361 +/- 0.309	pCi/l	0.389	8/16/07	8/21/07	SD
		Metals Analyses					
·10	EPA 6010B/200.7	3.5 +/- 3.04	pCi/l	0.383	8/7/07	8/17/07	RE

DL = Below Detection Limit

utreach
oratory
11 North Aspen
roken Arrow, OK 74012
918) 251-2515
AX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	2 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ab ID:	20070717-03						
lient ID:	SC11S ®						
ate Sampled:	7/24/07 9:15:00 AM						
atrix:	Liquid						
		Radiochemical Analyses					
oss Alpha (48 hour)	EPA 900/9310	2.62 +/- 1.46	pCi/l	1.18	7/25/07	7/25/07	SD
oss Alpha-Filtered(48 ur)	EPA 900/9310	0.894 +/- 1.03	pCi/l	0.943	7/25/07	7/25/07	SD
oss Beta (48 hour)	EPA 900/9310	0 +/- 3.62	pCi/l	4.03	7/25/07	7/25/07	SD
oss Beta-Filtered (48 hour)	EPA 900/9310	4.20 +/- 2.84	pCi/l	2.87	7/25/07	7/25/07	SD
a-226	SM 7500 Ra B (M)	0.189 +/- 0.208	pCi/l	0.395	8/15/07	8/19/07	SD
a-226-Filtered	SM 7500 Ra B (M)	-0.182 +/- 0.177	pCi/l	0.408	8/15/07	8/20/07	SD
a-228	EPA 904/9320	0.394 +/- 0.093	pCi/l	0.411	8/17/07	8/20/07	SD
a-228-Filtered	EPA 904/9320	0.250 +/- 0.048	pCi/l	0.200	8/17/07	8/21/07	SD
a-232	LANL ER 200 M	0.223 +/- 0.137	pCi/l	0.195	8/16/07	8/20/07	SD
-Filtered	LANL ER 200 M	0.143 +/- 0.154	pCi/l	0.245	8/16/07	8/20/07	SD
a-230	LANL ER 200 M	0.315 +/- 0.160	pCi/l	0.281	8/16/07	8/20/07	SD
a-230-Filtered	LANL ER 200 M	0.255 +/- 0.148	pCi/l	0.270	8/16/07	8/20/07	SD
a-228	LANL ER 200 M	0.202 +/- 0.114	pCi/l	0.151	8/16/07	8/20/07	SD
a-228-Filtered	LANL ER 200 M	0.157 +/- 0.121	pCi/l	0.180	8/16/07	8/20/07	SD
-238	ASTM D 3972	0.309 +/- 0.301	pCi/l	0.387	8/16/07	8/21/07	SD
-238-Filtered	ASTM D 3972	0.110 +/- 0.143	pCi/l	0.192	8/16/07	8/21/07	SD
-235	ASTM D 3972	0.456 +/- 0.330	pCi/l	0.380	8/16/07	8/21/07	SD
-235-Filtered	ASTM D 3972	0.181 +/- 0.160	pCi/l	0.186	8/16/07	8/21/07	SD
-234	ASTM D 3972	1.23 +/- 0.471	pCi/l	0.414	8/16/07	8/21/07	SD
-234-Filtered	ASTM D 3972	1.36 +/- 0.367	pCi/l	0.253	8/16/07	8/21/07	SD
		Metals Analyses					
-40	EPA 6010B/200.7	2.15 +/- 1.87	pCi/l	0.383	8/7/07	8/17/07	RE
-40-Filtered	EPA 6010B/200.7	2.2 +/- 1.91	pCi/l	0.341	8/8/07	8/17/07	RE
ab ID:	20070717-04						
lient ID:	SC12S						
ate Sampled:	7/24/07 10:05:00 AM						
atrix:	Liquid						
		Radiochemical Analyses					
ross Alpha	EPA 900/9310	11.0 +/- 3.85	pCi/l	1.93	7/25/07	8/23/07	SD
ross Alpha (48 hour)	EPA 900/9310	13.1 +/- 4.88	pCi/l	3.40	7/25/07	7/25/07	SD
Alpha-Filtered	EPA 900/9310	2.01 +/- 3.11	pCi/l	2.98	7/25/07	8/23/07	SD
ross Alpha-Filtered(48 ur)	EPA 900/9310	8.11 +/- 3.81	pCi/l	2.67	7/25/07	7/25/07	SD
ross Beta	EPA 900/9310	95 +/- 10.0	pCi/l	6.94	7/25/07	8/23/07	SD

BDL = Below Detection Limit

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11 North Aspen
roken Arrow, OK 74012
918) 251-2515
AX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	3 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
oss Beta (48 hour)	EPA 900/9310	112 +/- 11.1	pCi/l	7.90	7/25/07	7/25/07	SD
oss Beta-Filtered	EPA 900/9310	113 +/- 10.5	pCi/l	6.9	7/25/07	8/23/07	SD
oss Beta-Filtered (48 hour)	EPA 900/9310	115 +/- 12.6	pCi/l	10.2	7/25/07	7/25/07	SD
-226	SM 7500 Ra B (M)	1.53 +/- 0.256	pCi/l	0.257	8/15/07	8/19/07	SD
-226-Filtered	SM 7500 Ra B (M)	0.537 +/- 0.231	pCi/l	0.369	8/15/07	8/20/07	SD
-228	EPA 904/9320	2.62 +/- 0.120	pCi/l	0.533	8/17/07	8/20/07	SD
-228-Filtered	EPA 904/9320	1.04 +/- 0.051	pCi/l	0.225	8/17/07	8/21/07	SD
-232	LANL ER 200 M	0.666 +/- 0.140	pCi/l	0.115	8/16/07	8/20/07	SD
-232-Filtered	LANL ER 200 M	0.701 +/- 0.192	pCi/l	0.165	8/16/07	8/20/07	SD
-230	LANL ER 200 M	0.358 +/- 0.133	pCi/l	0.229	8/16/07	8/20/07	SD
-230-Filtered	LANL ER 200 M	0.563 +/- 0.202	pCi/l	0.309	8/16/07	8/20/07	SD
-228	LANL ER 200 M	0.743 +/- 0.148	pCi/l	0.122	8/16/07	8/20/07	SD
-228-Filtered	LANL ER 200 M	0.113 +/- 0.105	pCi/l	0.142	8/16/07	8/20/07	SD
238	ASTM D 3972	0.796 +/- 0.356	pCi/l	0.282	8/16/07	8/21/07	SD
23[illegible]tered	ASTM D 3972	0.489 +/- 0.401	pCi/l	0.387	8/16/07	8/21/07	SD
[illegible]	ASTM D 3972	0.239 +/- 0.233	pCi/l	0.273	8/16/07	8/21/07	SD
235-Filtered	ASTM D 3972	0.107 +/- 0.334	pCi/l	0.511	8/16/07	8/21/07	SD
234	ASTM D 3972	1.78 +/- 0.522	pCi/l	0.374	8/16/07	8/21/07	SD
234-Filtered	ASTM D 3972	1.04 +/- 0.602	pCi/l	0.609	8/16/07	8/21/07	SD
		Metals Analyses					
40	EPA 6010B/200.7	78.8 +/- 68.5	pCi/l	0.383	8/7/07	8/17/07	RE
40-Filtered	EPA 6010B/200.7	85 +/- 73.8	pCi/l	0.341	8/8/07	8/17/07	RE

b ID: 20070717-05
ient ID: SC12D
te Sampled: 7/24/07 10:35:00 AM
atrix: Liquid

		Radiochemical Analyses					
oss Alpha	EPA 900/9310	3.06 +/- 1.41	pCi/l	1.08	7/25/07	8/23/07	SD
oss Alpha (48 hour)	EPA 900/9310	7.39 +/- 1.76	pCi/l	0.929	7/25/07	7/25/07	SD
oss Alpha-Filtered(48 ur)	EPA 900/9310	4.69 +/- 1.57	pCi/l	1.07	7/25/07	7/25/07	SD
oss Beta	EPA 900/9310	1.13 +/- 3.71	pCi/l	3.98	7/25/07	8/23/07	SD
oss Beta (48 hour)	EPA 900/9310	8.33 +/- 3.05	pCi/l	2.91	7/25/07	7/25/07	SD
oss Beta-Filtered (48 hour)	EPA 900/9310	1.06 +/- 3.71	pCi/l	3.98	7/25/07	7/25/07	SD
-226	SM 7500 Ra B (M)	2.09 +/- 0.278	pCi/l	0.258	8/15/07	8/19/07	SD
-226-Filtered	SM 7500 Ra B (M)	2.74 +/- 0.306	pCi/l	0.238	8/15/07	8/20/07	SD
[illegible]	EPA 904/9320	0.668 +/- 0.049	pCi/l	0.210	8/17/07	8/20/07	SD
[illegible]-Filtered	EPA 904/9320	0.127 +/- 0.048	pCi/l	0.309	8/17/07	8/21/07	SD
-232	LANL ER 200 M	0.197 +/- 0.106	pCi/l	0.139	8/16/07	8/20/07	SD
-232-Filtered	LANL ER 200 M	0.213 +/- 0.115	pCi/l	0.155	8/16/07	8/21/07	SD

DL = Below Detection Limit

utreach
boratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	4 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
-230	LANL ER 200 M	0.300 +/- 0.143	pCi/l	0.256	8/16/07	8/20/07	SD
-230-Filtered	LANL ER 200 M	0.169 +/- 0.124	pCi/l	0.243	8/16/07	8/21/07	SD
-228	LANL ER 200 M	0.032 +/- 0.077	pCi/l	0.126	8/16/07	8/20/07	SD
-228-Filtered	LANL ER 200 M	0.137 +/- 0.090	pCi/l	0.123	8/16/07	8/21/07	SD
238	ASTM D 3972	0.126 +/- 0.175	pCi/l	0.249	8/16/07	8/21/07	SD
238-Filtered	ASTM D 3972	0.839 +/- 0.367	pCi/l	0.258	8/16/07	8/21/07	SD
235	ASTM D 3972	0.112 +/- 0.154	pCi/l	0.210	8/16/07	8/21/07	SD
235-Filtered	ASTM D 3972	0.331 +/- 0.264	pCi/l	0.279	8/16/07	8/21/07	SD
234	ASTM D 3972	0.393 +/- 0.248	pCi/l	0.286	8/16/07	8/21/07	SD
234-Filtered	ASTM D 3972	1.18 +/- 0.451	pCi/l	0.366	8/16/07	8/21/07	SD
		Metals Analyses					
40	EPA 6010B/200.7	1.2 +/- 1.04	pCi/l	0.383	8/7/07	8/17/07	RE
40-Filtered	EPA 6010B/200.7	1.36 +/- 1.18	pCi/l	0.341	8/8/07	8/17/07	RE

ab ID: 20070717-06
ID: SC32D
ite Sampled: 7/24/07 10:50:00 AM
atrix: Liquid

		Radiochemical Analyses					
oss Alpha	EPA 900/9310	5.52 +/- 1.63	pCi/l	1.02	7/25/07	8/23/07	SD
oss Alpha (48 hour)	EPA 900/9310	7.01 +/- 1.68	pCi/l	0.827	7/25/07	7/25/07	SD
oss Alpha-Filtered(48 ur)	EPA 900/9310	4.85 +/- 1.56	pCi/l	1.02	7/25/07	7/25/07	SD
oss Beta	EPA 900/9310	5.87 +/- 3.24	pCi/l	3.25	7/25/07	8/23/07	SD
oss Beta (48 hour)	EPA 900/9310	0.259 +/- 3.94	pCi/l	4.25	7/25/07	7/25/07	SD
oss Beta-Filtered (48 hour)	EPA 900/9310	1.58 +/- 3.07	pCi/l	3.25	7/25/07	7/25/07	SD
-226	SM 7500 Ra B (M)	3.36 +/- 0.461	pCi/l	0.489	8/15/07	8/19/07	SD
-226-Filtered	SM 7500 Ra B (M)	2.17 +/- 0.277	pCi/l	0.229	8/15/07	8/20/07	SD
-228	EPA 904/9320	0.843 +/- 0.054	pCi/l	0.353	8/17/07	8/20/07	SD
-228-Filtered	EPA 904/9320	0.86 +/- 0.096	pCi/l	0.400	8/17/07	8/21/07	SD
-232	LANL ER 200 M	0.061 +/- 0.146	pCi/l	0.234	8/16/07	8/20/07	SD
-232-Filtered	LANL ER 200 M	0.080 +/- 0.075	pCi/l	0.109	8/16/07	8/21/07	SD
-230	LANL ER 200 M	-0.038 +/- 0.192	pCi/l	0.404	8/16/07	8/20/07	SD
-230-Filtered	LANL ER 200 M	-0.110 +/- 0.089	pCi/l	0.238	8/16/07	8/21/07	SD
-228	LANL ER 200 M	0.196 +/- 0.155	pCi/l	0.211	8/16/07	8/20/07	SD
-228-Filtered	LANL ER 200 M	0.062 +/- 0.072	pCi/l	0.109	8/16/07	8/21/07	SD
238	ASTM D 3972	0.139 +/- 0.179	pCi/l	0.254	8/16/07	8/21/07	SD
-Filtered	ASTM D 3972	0.462 +/- 0.342	pCi/l	0.414	8/16/07	8/21/07	SD
	ASTM D 3972	0.187 +/- 0.178	pCi/l	0.227	8/16/07	8/21/07	SD
235-Filtered	ASTM D 3972	0.234 +/- 0.225	pCi/l	0.202	8/16/07	8/21/07	SD
234	ASTM D 3972	0.344 +/- 0.264	pCi/l	0.354	8/16/07	8/21/07	SD

BDL = Below Detection Limit

reach
oratory
11 North Aspen
roken Arrow, OK 74012
)18) 251-2515
AX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	5 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
234-Filtered	ASTM D 3972	1.86 +/- 0.529	pCi/l	0.338	8/16/07	8/21/07	SD
		Metals Analyses					
10	EPA 6010B/200.7	1.09 +/- 0.95	pCi/l	0.383	8/7/07	8/17/07	RE
10-Filtered	EPA 6010B/200.7	1.14 +/- 0.99	pCi/l	0.341	8/8/07	8/17/07	RE

b ID: 20070717-07
ent ID: W2®
te Sampled: 7/24/07 12:00:00 PM
trix: Liquid

		Radiochemical Analyses					
ss Alpha (48 hour)	EPA 900/9310	4.59 +/- 1.52	pCi/l	0.732	7/25/07	7/25/07	SD
ss Alpha-Filtered(48 ir)	EPA 900/9310	0.594 +/- 1.07	pCi/l	1.04	7/25/07	7/25/07	SD
ss Beta (48 hour)	EPA 900/9310	7.96 +/- 3.20	pCi/l	3.08	7/25/07	7/25/07	SD
ss Beta-Filtered (48 hour)	EPA 900/9310	8.93 +/- 3.14	pCi/l	2.97	7/25/07	7/25/07	SD
	SM 7500 Ra B (M)	0.813 +/- 0.431	pCi/l	0.724	8/15/07	8/19/07	SD
b-Filtered	SM 7500 Ra B (M)	0.119 +/- 0.122	pCi/l	0.228	8/15/07	8/20/07	SD
228	EPA 904/9320	1.05 +/- 0.098	pCi/l	0.546	8/17/07	8/20/07	SD
228-Filtered	EPA 904/9320	0 +/- 0.092	pCi/l	0.491	8/17/07	8/21/07	SD
232	LANL ER 200 M	0.539 +/- 0.210	pCi/l	0.140	8/16/07	8/20/07	SD
232-Filtered	LANL ER 200 M	0.239 +/- 0.110	pCi/l	0.126	8/16/07	8/21/07	SD
230	LANL ER 200 M	0.994 +/- 0.389	pCi/l	0.618	8/16/07	8/20/07	SD
230-Filtered	LANL ER 200 M	0.125 +/- 0.146	pCi/l	0.289	8/16/07	8/21/07	SD
228	LANL ER 200 M	0.265 +/- 0.213	pCi/l	0.281	8/16/07	8/20/07	SD
228-Filtered	LANL ER 200 M	0.122 +/- 0.087	pCi/l	0.112	8/16/07	8/21/07	SD
38	ASTM D 3972	0.905 +/- 0.571	pCi/l	0.639	8/16/07	8/21/07	SD
38-Filtered	ASTM D 3972	0.445 +/- 0.553	pCi/l	0.765	8/16/07	8/21/07	SD
35	ASTM D 3972	0.711 +/- 0.526	pCi/l	0.618	8/16/07	8/21/07	SD
35-Filtered	ASTM D 3972	0.322 +/- 0.413	pCi/l	0.479	8/16/07	8/21/07	SD
34	ASTM D 3972	1.26 +/- 0.621	pCi/l	0.608	8/16/07	8/21/07	SD
34-Filtered	ASTM D 3972	1.05 +/- 0.717	pCi/l	0.877	8/16/07	8/21/07	SD
		Metals Analyses					
0	EPA 6010B/200.7	8.32 +/- 7.23	pCi/l	0.383	8/7/07	8/17/07	RE
0-Filtered	EPA 6010B/200.7	9.31 +/- 8.09	pCi/l	0.341	8/8/07	8/17/07	RE

ID: 20070717-08
nt ID: SC22 S
ed: 7/24/07 12:30:00 PM
x: Liquid

		Radiochemical Analyses					
ss Alpha (48 hour)	EPA 900/9310	1.00 +/- 1.28	pCi/l	1.22	7/25/07	7/25/07	SD

DL = Below Detection Limit

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	6 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ross Beta (48 hour)	EPA 900/9310	1.56 +/- 3.83	pCi/l	4.08	7/25/07	7/25/07	SD
a-226	SM 7500 Ra B (M)	0.494 +/- 0.169	pCi/l	0.247	8/15/07	8/19/07	SD
a-228	EPA 904/9320	0.220 +/- 0.048	pCi/l	0.250	8/17/07	8/20/07	SD
h-232	LANL ER 200 M	0.715 +/- 0.187	pCi/l	0.162	8/16/07	8/20/07	SD
h-230	LANL ER 200 M	0.739 +/- 0.214	pCi/l	0.305	8/16/07	8/20/07	SD
h-228	LANL ER 200 M	0.150 +/- 0.101	pCi/l	0.121	8/16/07	8/20/07	SD
-238	ASTM D 3972	0.310 +/- 0.181	pCi/l	0.178	8/16/07	8/21/07	SD
-235	ASTM D 3972	0.165 +/- 0.131	pCi/l	0.131	8/16/07	8/21/07	SD
-234	ASTM D 3972	0.637 +/- 0.271	pCi/l	0.283	8/16/07	8/21/07	SD
		Metals Analyses					
-40	EPA 6010B/200.7	12.4 +/- 10.8	pCi/l	0.383	8/7/07	8/17/07	RE

ab ID: 20070717-10
lient ID: IWC 2
ate Sampled: 7/24/07 1:45:00 PM
x: Liquid

		Radiochemical Analyses					
ross Alpha (48 hour)	EPA 900/9310	1.46 +/- 2.25	pCi/l	2.18	7/25/07	7/25/07	SD
ross Beta (48 hour)	EPA 900/9310	13.3 +/- 4.31	pCi/l	4.10	7/25/07	7/25/07	SD
a-226	SM 7500 Ra B (M)	1.27 +/- 0.223	pCi/l	0.157	8/15/07	8/19/07	SD
a-228	EPA 904/9320	0.026 +/- 0.048	pCi/l	0.194	8/17/07	8/20/07	SD
h-232	LANL ER 200 M	0.521 +/- 0.151	pCi/l	0.139	8/16/07	8/21/07	SD
h-230	LANL ER 200 M	0.300 +/- 0.157	pCi/l	0.279	8/16/07	8/21/07	SD
h-228	LANL ER 200 M	0.186 +/- 0.097	pCi/l	0.104	8/16/07	8/21/07	SD
-238	ASTM D 3972	0.162 +/- 0.142	pCi/l	0.158	8/16/07	8/21/07	SD
-235	ASTM D 3972	0.120 +/- 0.101	pCi/l	0.058	8/16/07	8/21/07	SD
-234	ASTM D 3972	1.37 +/- 0.340	pCi/l	0.151	8/16/07	8/21/07	SD
		Metals Analyses					
-40	EPA 6010B/200.7	20.8 +/- 18.1	pCi/l	0.383	8/7/07	8/17/07	RE

ab ID: 20070717-11
lient ID: IWC 3
ate Sampled: 7/24/07 2:35:00 PM
latrix: Liquid

		Radiochemical Analyses					
ross Alpha	EPA 900/9310	3.16 +/- 1.36	pCi/l	0.965	7/25/07	8/23/07	SD
ross Alpha (48 hour)	EPA 900/9310	9.33 +/- 1.98	pCi/l	0.965	7/25/07	7/25/07	SD
Beta	EPA 900/9310	7.8 +/- 3.04	pCi/l	2.92	7/25/07	8/23/07	SD
ross Beta (48 hour)	EPA 900/9310	11.7 +/- 3.20	pCi/l	2.92	7/25/07	7/25/07	SD
a-226	SM 7500 Ra B (M)	0.205 +/- 0.112	pCi/l	0.182	8/15/07	8/19/07	SD
a-228	EPA 904/9320	1.86 +/- 0.056	pCi/l	0.168	8/17/07	8/20/07	SD

BDL = Below Detection Limit

11 North Aspen
roken Arrow, OK 74012
918) 251-2515
AX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	7 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
-232	LANL ER 200 M	0.350 +/- 0.140	pCi/l	0.148	8/16/07	8/20/07	SD
-230	LANL ER 200 M	0.575 +/- 0.199	pCi/l	0.307	8/16/07	8/20/07	SD
-228	LANL ER 200 M	0.299 +/- 0.127	pCi/l	0.131	8/16/07	8/20/07	SD
238	ASTM D 3972	0.269 +/- 0.173	pCi/l	0.174	8/16/07	8/21/07	SD
235	ASTM D 3972	0.131 +/- 0.124	pCi/l	0.135	8/16/07	8/21/07	SD
234	ASTM D 3972	0.628 +/- 0.244	pCi/l	0.185	8/16/07	8/21/07	SD
		Metals Analyses					
40	EPA 6010B/200.7	4.4 +/- 3.82	pCi/l	0.383	8/7/07	8/13/07	RE

b ID: 20070717-12
ient ID: SC20S
te Sampled: 7/24/07 3:25:00 PM
atrix: Liquid

		Radiochemical Analyses					
oss [illegible]ha (48 hour)	EPA 900/9310	1.23 +/- 1.39	pCi/l	1.31	7/25/07	7/25/07	SD
[illegible] (48 hour)	EPA 900/9310	7.33 +/- 3.42	pCi/l	3.38	7/25/07	7/25/07	SD
-226	SM 7500 Ra B (M)	-0.030 +/- 0.223	pCi/l	0.456	8/15/07	8/19/07	SD
-228	EPA 904/9320	0.292 +/- 0.047	pCi/l	0.260	8/17/07	8/21/07	SD
-232	LANL ER 200 M	0.311 +/- 0.129	pCi/l	0.123	8/16/07	8/20/07	SD
-230	LANL ER 200 M	0.056 +/- 0.168	pCi/l	0.376	8/16/07	8/20/07	SD
-228	LANL ER 200 M	0.272 +/- 0.123	pCi/l	0.123	8/16/07	8/20/07	SD
238	ASTM D 3972	0.197 +/- 0.280	pCi/l	0.410	8/16/07	8/21/07	SD
235	ASTM D 3972	0.289 +/- 0.231	pCi/l	0.246	8/16/07	8/21/07	SD
234	ASTM D 3972	0.967 +/- 0.394	pCi/l	0.354	8/16/07	8/21/07	SD
		Metals Analyses					
40	EPA 6010B/200.7	11 +/- 9.56	pCi/l	0.383	8/7/07	8/17/07	RE

b ID: 20070717-13
ient ID: SC20D
te Sampled: 7/24/07 3:25:00 PM
atrix: Liquid

		Radiochemical Analyses					
oss Alpha	EPA 900/9310	11.5 +/- 2.21	pCi/l	1.14	7/25/07	8/23/07	SD
oss Alpha (48 hour)	EPA 900/9310	24.8 +/- 3.05	pCi/l	1.14	7/25/07	7/25/07	SD
oss Beta	EPA 900/9310	11.7 +/- 3.46	pCi/l	3.24	7/25/07	8/23/07	SD
oss Beta (48 hour)	EPA 900/9310	18.9 +/- 3.71	pCi/l	3.24	7/25/07	7/25/07	SD
-22[illegible]	SM 7500 Ra B (M)	3.34 +/- 0.360	pCi/l	0.289	8/15/07	8/20/07	SD
[illegible]	EPA 904/9320	3.46 +/- 0.065	pCi/l	0.250	8/17/07	8/21/07	SD
-232	LANL ER 200 M	0.167 +/- 0.118	pCi/l	0.161	8/16/07	8/20/07	SD
-230	LANL ER 200 M	0.323 +/- 0.160	pCi/l	0.281	8/16/07	8/20/07	SD
-228	LANL ER 200 M	0.063 +/- 0.078	pCi/l	0.112	8/16/07	8/20/07	SD

DL = Below Detection Limit

Outreach
Laboratory
511 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070717
Date Reported:	8/24/07
Date Received:	7/25/07
Page Number:	8 of 8

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
238	ASTM D 3972	0.110 +/- 0.273	pCi/l	0.445	8/16/07	8/21/07	SD
235	ASTM D 3972	0.114 +/- 0.171	pCi/l	0.255	8/16/07	8/21/07	SD
234	ASTM D 3972	0.994 +/- 0.342	pCi/l	0.346	8/16/07	8/21/07	SD
		Metals Analyses					
40	EPA 6010B/200.7	1.97 +/- 1.71	pCi/l	0.383	8/7/07	8/17/07	RE

QC Report

rameter	Blank	LCS %REC	LCSD %REC	LCSD RPD	DUP RPD	MS %REC	MSD %REC	MSD RPD	Date
ss Alpha	0.857	89.8			4.4	98.1	99.3	1.1	7/25/07
ss Beta	1.87	113.0			64.1	111.0	121.0	8.3	7/25/07
10	0.392	70.0				128.0	125.0	1.4	8/17/07
	0.441	81.0				93.0	92.0	0.7	8/13/07
	0.056	118.0			NC	117.0	105.0	10.9	8/20/07
228	0.557	112.0			NC	106.0	106.0	0.2	8/21/07
228	0.025	100.0			NC	83.4	77.1	7.7	8/20/07
230	0.178	115.0			NC	101.0	95.5	5.1	8/20/07
232	0.079	105.0			NC	86.5	75.2	13.5	8/20/07
234	0.500	106.0			NC	106.0	110.0	3.7	8/21/07
238	0.185	117.0			NC	114.0	116.0	2.1	8/21/07

Lab Approval: _____

DL = Below Detection Limit

OUTREACH LABORATORY

Cooler

CHAIN OF CUSTODY

5 individual C[illegible]

311 North Aspen
Broken Arrow, OK 74012
Phone: (918) 251-2515
Fax: (918) 251-0008

Results To:
Company: T[illegible]
Name: Larry Butkovi
Address: 71 Griffin Rd North
City: Windsor State: CT Zip: 06095
Phone: 860-298-6225 Fax #: 860-298-6399

Bill To:
Company: IEM
Name: Carol Berger (240)-631-8990
Address: 8 Brooks Ave Suite 205
City: Gaithersburg State: MD Zip: 20877

ANALYSIS REQUESTED

PO #: Carol Berger (IEM) 94005.29
PROJECT #: (240)-631-8990 105166-000100-000000
PROJECT NAME: SMC
REQUESTED TURNAROUND TIME (ADDITIONAL CHARGES MAY APPLY): Standard
SAMPLER: Jeff Saunders
Signature

PRESERVATIVE #: 1. HNO_3 pH<2; 2. Ice <4°C; 3. HCl pH<2; 4. H_2SO_4 pH<2; 5. NaOH pH>11

LAB SAMPLE ID	CLIENT SAMPLE ID	DATE SAMPLED	TIME SAMPLED	MATRIX	# CONTAINERS	CONTAINER SIZE (PLASTIC OR GLASS)	PRESERVATIVE #	Gross Alpha/Beta (EPA 900.0) *	Isotopic Uranium	Isotopic Thorium	Isotopic Radium (Ra-226/Ra-228)	K-40 (ICP)				Notes / REMARKS to analysis (I.E. FILTERED, UNFILTERED, GRAB, COMPOSITE)
1	SC25S	7/24/07	0735	Aq	1	P	HNO_3	X	X	X	X	X				
2	SC14S		0835		1	P	HNO_3	X	X	X	X	X				
3	SC11S(R)		0915		2	P	HNO_3/Unp.	X	X	X	X	X			(1)→	Unpres. bottle to be analyzed as filtered fraction for all parameters
4	SC12S		1005		2	P	HNO_3/Unp.	X	X	X	X	X			(1)→	" "
5 (35)	~~SC32S~~ SC12D		1035		2	P	HNO_3/Unp.	X	X	X	X	X			(1)→	" "
6	SC32D		1050		2	P	HNO_3/Unp.	X	X	X	X	X			(1)→	" "
7	WZ(R)		1200		2	P	HNO_3/Unp.	X	X	X	X	X			(1)→	Unpres. bottle to be analyzed as filtered fraction for all parameters requested
8	SC22S		1230	1	2	P	HNO_3	X	X	X	X	X				
9	IWC1		1400		1	P	HNO_3	X	X	X	X	X				
10	IWC2		1345		1	P	HNO_3	X	X	X	X	X				
11	IWC3		1435		1	P	HNO_3	X	X	X	X	X				
12	SC20S	↓	1525	↓	1	P	HNO_3	X	X	X	X	X				
13	SC20D	7/24/07	1600	Aq	1	P	HNO_3	X	X	X	X	X				

RELINQUISHED BY: [signature] DATE 7/27/07 TIME 1845 RECEIVED BY: Via FedeX DATE 7/27/07 TIME 1845

RELINQUISHED BY: _____ DATE _____ TIME _____ RECEIVED BY: Lovina Fatt DATE 7/25/07 TIME 940

My signature on this chain of custody form indicates that I am authorized by the above company to release samples for analysis. The company agrees to pay the entire balance upon receipt of sample data and it is understood and agreed that any balance carried over thirty (30) days is subject to a 1.5% per month (18% per annum) late charge. In the event of default, the company becomes legally liable for any reasonable attorney and/or collection fees and all related costs necessary to remit the entire balance to Outreach Technologies, Inc. (Outreach Laboratory).

SAMPLE RETURN/DISPOSAL: All non-hazardous samples shall be disposed of 30 days after issue of final report. All others will be returned at client's expense.

FOR LABORATORY USE ONLY:
Sample Condition Upon Receipt: good
Custody Seals Intact: Y N
Cooler Temperature: 1.0°C

Outreach Laboratory
11 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

RECEIVED 9/10/07

~~CONFIDENTIAL/PRIVILED ATTORNEY/CLIENT/CONSULTANT WORK PRODUCT~~

August 29, 2007

Carol Berger
Integrated Environmental Management, Inc.
8 Brooks Ave #205
Gaithersburg, MD 20877

CLIENT PROJECT NAME: TRC 105106-000100-000000
OUTREACH LAB ID: 20070721

Dear Ms. Berger:

Please find enclosed the analytical report for your samples received in our laboratory on July 26, 2007 for the above captioned project. Four liquid samples were received in good condition and analyzed for Gross Alpha/Beta within 48 hour holding time, Uranium-Isotopic, Thorium-Isotopic, K-40 by ICP, Radium 226 and Radium 228. Per your chain of custody, if the Gross Alpha result was >5 pCi/l, the sample was reanalyzed for Gross Alpha/Beta.

All Quality Control for the requested analysis is reported on the analytical report. The method blank, laboratory control standard and matrix spike and spike duplicate were all within method control limits with the exception of the DUP RPD for Gross Beta. Your results were not affected in any way.

Unless notified otherwise, all non-hazardous, non-radioactive samples will be disposed 30 days after the report date.

Thank you for choosing Outreach Laboratory and if you have any questions, please call us at 918-251-2515.

Laboratory Director

ODEQ ID #9517
NRC ODEQ LIC. #27522-01

ACCREDITED IN ACCORDANCE WITH nelac

CERT. ID #OK001
See Certified
Parameter List

utreach
oratory
11 North Aspen
roken Arrow, OK 74012
)18) 251-2515
AX (918) 251-0008

Client:	IEM
Client Project:	105106-000100-000000
Lab Number:	20070721
Date Reported:	8/29/07
Date Received:	7/26/07
Page Number:	1 of 3

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ab ID:	**20070721-01**						
lient ID:	**NW-3**						
ate Sampled:	**7/25/07 7:15:00 AM**						
latrix:	**Liquid**						
		Radiochemical Analyses					
ross Alpha	EPA 900/9310	2.40 +/- 1.03	pCi/l	0.584	7/26/07	8/23/07	SD
ross Alpha (48 hour)	EPA 900/9310	5.81 +/- 1.67	pCi/l	1.03	7/25/07	7/26/07	SD
ross Beta	EPA 900/9310	4.82 +/- 2.86	pCi/l	2.86	7/26/07	8/23/07	SD
ross Beta (48 hour)	EPA 900/9310	5.55 +/- 3.23	pCi/l	3.25	7/25/07	7/26/07	SD
a-226	SM 7500 Ra B (M)	0.439 +/- 0.157	pCi/l	0.239	8/15/07	8/20/07	SD
a-228	EPA 904/9320	0.551 +/- 0.049	pCi/l	0.238	8/17/07	8/21/07	SD
)-232	LANL ER 200 M	0.443 +/- 0.171	pCi/l	0.178	8/16/07	8/21/07	SD
)-230	LANL ER 200 M	0.454 +/- 0.230	pCi/l	0.393	8/16/07	8/21/07	SD
)-228	LANL ER 200 M	0.011 +/- 0.093	pCi/l	0.158	8/16/07	8/21/07	SD
-238	ASTM D 3972	0.265 +/- 0.436	pCi/l	0.617	8/16/07	8/21/07	SD
[illegible]	ASTM D 3972	0.123 +/- 0.359	pCi/l	0.517	8/16/07	8/21/07	SD
-234	ASTM D 3972	1.13 +/- 0.660	pCi/l	0.713	8/16/07	8/21/07	SD
		Metals Analyses					
-40	EPA 6010B/200.7	1.12 +/- 0.97	pCi/l	0.383	8/7/07	8/17/07	RE
ıb ID:	**20070721-02**						
ient ID:	**NW-5**						
ıte Sampled:	**7/25/07 11:10:00 AM**						
atrix:	**Liquid**						
		Radiochemical Analyses					
oss Alpha	EPA 900/9310	3.17 +/- 1.46	pCi/l	1.12	7/26/07	8/23/07	SD
oss Alpha (48 hour)	EPA 900/9310	16.6 +/- 2.42	pCi/l	0.604	7/25/07	7/26/07	SD
oss Beta	EPA 900/9310	2.19 +/- 3.76	pCi/l	3.99	7/26/07	8/23/07	SD
oss Beta (48 hour)	EPA 900/9310	11.5 +/- 3.16	pCi/l	2.87	7/25/07	7/26/07	SD
-226	SM 7500 Ra B (M)	1.25 +/- 0.259	pCi/l	0.316	8/15/07	8/20/07	SD
-228	EPA 904/9320	1.34 +/- 0.058	pCi/l	0.186	8/17/07	8/22/07	SD
-232	LANL ER 200 M	0.444 +/- 0.196	pCi/l	0.212	8/16/07	8/21/07	SD
-230	LANL ER 200 M	0.581 +/- 0.266	pCi/l	0.418	8/16/07	8/21/07	SD
-228	LANL ER 200 M	0.257 +/- 0.159	pCi/l	0.188	8/16/07	8/21/07	SD
238	ASTM D 3972	0.009 +/- 0.177	pCi/l	0.309	8/16/07	8/21/07	SD
235	ASTM D 3972	0 +/- 0.105	pCi/l	0.194	8/16/07	8/21/07	SD
234	ASTM D 3972	0.302 +/- 0.215	pCi/l	0.260	8/16/07	8/21/07	SD
		Metals Analyses					
ɜo	EPA 6010B/200.7	2.1 +/- 1.82	pCi/l	0.383	8/7/07	8/17/07	RE

DL = Below Detection Limit

each
oratory
11 North Aspen
roken Arrow, OK 74012
)18) 251-2515
AX (918) 251-0008

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Client Project:	105106-000100-000000
Lab Number:	20070721
Date Reported:	8/29/07
Date Received:	7/26/07
Page Number:	2 of 3

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ab ID:	20070721-03						
lient ID:	SC26D						
ate Sampled:	7/25/07 8:30:00 AM						
atrix:	Liquid						
		Radiochemical Analyses					
oss Alpha (48 hour)	EPA 900/9310	1.89 +/- 1.30	pCi/l	1.07	7/25/07	7/26/07	SD
oss Beta (48 hour)	EPA 900/9310	4.88 +/- 2.96	pCi/l	2.96	7/25/07	7/26/07	SD
-226	SM 7500 Ra B (M)	0.186 +/- 0.15	pCi/l	0.262	8/15/07	8/20/07	SD
-228	EPA 904/9320	0.094 +/- 0.048	pCi/l	0.190	8/17/07	8/21/07	SD
-232	LANL ER 200 M	0.473 +/- 0.148	pCi/l	0.086	8/16/07	8/21/07	SD
-230	LANL ER 200 M	0.125 +/- 0.187	pCi/l	0.377	8/16/07	8/21/07	SD
-228	LANL ER 200 M	0.103 +/- 0.118	pCi/l	0.170	8/16/07	8/21/07	SD
238	ASTM D 3972	0.988 +/- 0.451	pCi/l	0.421	8/16/07	8/21/07	SD
235	ASTM D 3972	0.933 +/- 0.456	pCi/l	0.413	8/16/07	8/21/07	SD
234	ASTM D 3972	3.18 +/- 0.731	pCi/l	0.451	8/16/07	8/21/07	SD
		Metals Analyses					
[illegible]	EPA 6010B/200.7	8.31 +/- 7.22	pCi/l	0.383	8/7/07	8/17/07	RE
b ID:	20070721-04						
ent ID:	A						
te Sampled:	7/25/07 10:05:00 AM						
trix:	Liquid						
		Radiochemical Analyses					
oss Alpha (48 hour)	EPA 900/9310	0.53 +/- 1.69	pCi/l	1.71	7/25/07	7/26/07	SD
oss Beta (48 hour)	EPA 900/9310	0 +/- 7.83	pCi/l	8.54	7/25/07	7/26/07	SD
226	SM 7500 Ra B (M)	0.407 +/- 0.199	pCi/l	0.316	8/20/07	8/22/07	SD
228	EPA 904/9320	0.173 +/- 0.048	pCi/l	0.244	8/17/07	8/22/07	SD
232	LANL ER 200 M	0.139 +/- 0.068	pCi/l	0.062	8/18/07	8/20/07	SD
230	LANL ER 200 M	0.441 +/- 0.140	pCi/l	0.222	8/18/07	8/20/07	SD
228	LANL ER 200 M	0.026 +/- 0.051	pCi/l	0.080	8/18/07	8/20/07	SD
38	ASTM D 3972	0.106 +/- 0.160	pCi/l	0.238	8/16/07	8/21/07	SD
35	ASTM D 3972	0.144 +/- 0.120	pCi/l	0.119	8/16/07	8/21/07	SD
34	ASTM D 3972	0.77 +/- 0.261	pCi/l	0.196	8/16/07	8/21/07	SD
		Metals Analyses					
0	EPA 6010B/200.7	2.46 +/- 2.14	pCi/l	0.383	8/7/07	8/17/07	RE

L = Below Detection Limit

Outreach
Laboratory
11 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
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QC Report

Parameter	Blank	LCS %REC	LCSD %REC	LCSD RPD	DUP RPD	MS %REC	MSD %REC	MSD RPD	Date
Gross Alpha	0	108.0			7.4	99.9	102.0	2.0	7/26/07
Gross Beta	0	117.0			50.3	124.0	113.0	8.5	7/26/07
40	0.441	81.0				93.0	92.0	0.7	8/13/07
-226	0.026	105.0			8.7	96.6			8/22/07
-226	0.056	118.0			NC	117.0	105.0	10.9	8/20/07
-228	0.190	92.2			NC	95.8	103.0	7.7	8/22/07
-228	0.017	87.4			NC	90.2			8/20/07
-228	0.025	100.0			NC	83.4	77.1	7.7	8/20/07
-230	0.178	115.0			NC	101.0	95.5	5.1	8/20/07
-230	0.156	115.0			NC	112.0			8/20/07
-232	0.050	94.2			NC	102.0			8/20/07
-232	0.079	105.0			NC	86.5	75.2	13.5	8/20/07
234	0.500	106.0			NC	106.0	110.0	3.7	8/21/07
	0.154	105.0				97.0			8/21/07
	0.107	109.0				120.0			8/21/07
238	0.185	117.0			NC	114.0	116.0	2.1	8/21/07

Lab Approval: _____

BDL = Below Detection Limit

OUTREACH LABORATORY

311 North Aspen
Broken Arrow, OK 74012
Phone: (918) 251-2515
Fax: (918) 251-0008

CHAIN OF CUSTODY

Results To:
Company: [illegible]
Name: Larry Butler
Address: 71 Griffin Rd North
City: Windsor State: CT Zip: 06095
Phone: 860-298-6225 Fax #: 860-298-6399

Bill To:
Company: Integrated Environmental Management
Name: Carol Bergin (240)-631-8990
Address: 8 Brooks Ave. Suite 205
City: Gaithersburg State: MD Zip: 20877

ANALYSIS REQUESTED

PO #: 94005.29
PROJECT #: (TPL): 105104-000100-000000
PROJECT NAME: SMC
REQUESTED TURNAROUND TIME (ADDITIONAL CHARGES MAY APPLY): Standard
SAMPLER: Jeff Gaudes
Signature:

LAB SAMPLE ID	CLIENT SAMPLE ID	DATE SAMPLED	TIME SAMPLED	MATRIX	# CONTAINERS	CONTAINER SIZE (PLASTIC OR GLASS)	PRESERVATIVE # 1. HNO_3 pH<2 2. Ice <4°C 3. HCl pH<2 4. H_2SO_4 pH<2 5. NaOH pH>11	Gross Alpha/Beta (EPA 900.0)	Isotopic Uranium	Isotopic Thorium	Isotopic Radium (EPA-7.1/7.2)	K-40 (ICP)				REMARKS (I.E. FILTERED, UNFILTERED, GRAB, COMPOSITE)
	NW-3	7/25/07	0715	Aq	1	P	HNO_3	X	X	X	X	X				
	NW-5	↓	~~0735~~ 1110	↓	1	P	HNO_3	X	X	X	X	X				Note: [illegible] sample bottle leaked, this is a replacement
	SC26D	↓	0830	↓	1	P	HNO_3	X	X	X	X	X				
	A	7/25/07	1005	Aq	1	P	HNO_3	X	X	X	X	X				
																Fedex Tracking: 8614-3528-5574

Notes: * 48-hr. holding time for Gross Alpha/Beta (NJ Method)

RELINQUISHED BY: [signature] DATE 7/25/07 TIME 1835 RECEIVED BY: Via Fedex DATE 7/25/07 TIME 1630

RELINQUISHED BY: _____ DATE _____ TIME _____ RECEIVED BY: [signature] DATE 7/26/07 TIME 1040

My signature on this chain of custody form indicates that I am authorized by the above company to release samples for analysis. The company agrees to pay the entire balance upon receipt of sample data and it is understood and agreed that any balance carried over thirty (30) days is subject to a 1.5% per month (18% per annum) late charge. In the event of default, the company becomes legally liable for any reasonable attorney and/or collection fees and all related costs necessary to remit the entire balance to Outreach Technologies, Inc. (Outreach Laboratory).

SAMPLE RETURN/DISPOSAL: All non-hazardous samples shall be disposed of 30 days after issue of final report. All others will be returned at client's expense.

FOR LABORATORY USE ONLY:
Sample Condition Upon Receipt: 20090726 good
Custody Seals Intact: Y N
Cooler Temperature: 1.0°C

b. Observations and Findings

During the inspection period, the inspector discussed the desire to obtain groundwater samples from selected monitoring wells for independent analysis of radiological parameters. The purpose of obtaining analytical data from SMC groundwater monitoring wells was to determine current groundwater concentrations of various radiological parameters since there was limited information available, compare current measurements to available previous measurements, and provide staff from the NRC Office of Federal and State Materials and Environmental Management Programs (FSME) with data useful for their review of SMC's request for site decommissioning. NJDEP representatives had also expressed interest in obtaining aliquots of groundwater monitoring well water samples for their own independent analysis for radiological parameters. The inspector, FSME staff and NJDEP representatives identified fourteen wells for sampling. One additional well, SC13S was identified, but could not be sampled due to damage to the well. The licensee arranged for these wells to be sampled during SMC's routine quarterly sampling campaign in July 2007. SMC collects groundwater from numerous wells on the site and vicinity and analyzes for non-radiological parameters. In addition, NJDEP representatives coordinated the sampling of two Newfield Borough offsite potable water wells. These two wells are located approximately 2000 feet north (Newfield #3) and approximately 3000 feet northeast (Newfield #5) of the north site boundary fence. Because the general groundwater flow beneath the SMC site is generally northeast to southwest and these two wells are located up gradient of the site groundwater flow; these wells are not expected to be impacted by site operations.

The inspector reviewed the licensee's contractor's sampling and analysis plan and found it appropriately discussed sampling apparatus and sample containers, well purging prior to sampling, sample identification, and sample shipment and chain of custody. The inspector observed that the licensee's contractors followed the sampling plan.

Each of the three laboratories analyzed each of the samples to determine concentrations for the following radiological parameters: gross alpha activity, gross beta activity, potassium-40 (K-40), radium-226 (Ra-226), radium-228 (Ra-228), and isotopic uranium (uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238)). The licensee's contractor and ORISE also analyzed samples for isotopic thorium concentrations (thorium-228 (Th-228), thorium-230 (Th-230), and thorium-232 (Th-232)). Results were reported in units of picocuries per liter (pCi/l). NJDEP decommissioning criteria include a provision that groundwater comply with the NJ Groundwater Quality Standards, which for radionuclides, incorporate the drinking water standards of the U.S. Environmental Protection Agency (EPA) (40 CFR 141). Because of this provision, the NJDEP laboratory also reported the total uranium concentration for each sample in units of micrograms per liter (µg/l) so that the data could be compared to the EPA standard. Although ORISE and the licensee's contract laboratory did not report total uranium in units of µg/l, the inspector included total uranium concentrations in Table 1C in µg/l by applying a standard conversion factor to the uranium isotopic data.

In accordance with EPA regulations, gross alpha and gross beta analyses are used as screening methods to make initial determinations regarding compliance with radiological parameters for public drinking water supplies. The EPA regulations establish a maximum contaminant level (MCL) for gross alpha activity of 15 pCi/l (excluding the contribution from uranium and radon), 30 µg/l for total uranium, and 4 millirem (mrem)/year for gross beta activity (minus the contribution from naturally occurring K-40). If the gross alpha activity exceeds 5 pCi/l, specific Ra-226 and Ra-228 analyses are required. The EPA MCL for Ra-226 + Ra-228 is 5 pCi/l. A gross beta screening measurement is used to evaluate compliance with the gross beta MCL. If the gross beta activity does not exceed the screening criteria of 50 pCi/l (minus the contribution from naturally occurring K-40), no other analyses are required to determine compliance with the gross beta MCL.

Because one of the decay products of Ra-228 (Ra-224) has a short radioactive half-life (3.7 days) and can be a contributor to the radiation dose if present, NJDEP requires the gross alpha analysis to be performed within 48 hours of sample collection. Gross alpha analysis of water samples performed within 48 hours of collection will typically have a higher results than those analyzed beyond 48 hours of collection if Ra-224 is present.

The NRC considers the potential radiation dose from groundwater radioactivity concentrations in its decommissioning regulations, but does not have specific regulations regarding groundwater concentrations of radioactive nuclides. Because the NRC was comparing gross alpha results to previous data and was obtaining baseline data for other wells, the NRC laboratory was not requested to analyze the groundwater samples within 48 hours. Therefore, the NRC gross alpha and gross beta data are not directly comparable to the data from the NJDEP and contractor laboratories because of the different analytical techniques.

Sample results overall show generally good agreement between the laboratories, but specific comparisons at very low concentrations are difficult due to the statistical nature of radioactive decay, sample homogeneity, and laboratory techniques. Data from all three laboratories for gross beta activity for wells SC12S and IWC1 exceeded the gross beta screening value of 50 pCi/l, but K-40 analyses showed that the gross beta results exceeded 50 pCi/l due to the presence of naturally occurring K-40. The Ra-226 + Ra-228 results for well SC20D from all three laboratories were greater than the 5 pCi/l MCL. Although this is not an NRC compliance issue regarding current site operations, the results are being considered in the NRC's review of the SMC site decommissioning plan. All total uranium results were less than the EPA MCL.

Monitoring wells SC25S, SC14S, SC11SR, and W2R were sampled by the NRC in April 2004 and analyzed by ORISE. The ORISE data, transmitted in their letter report dated April 28, 2004, is incorporated in inspection report 04007102/2003001 as a separate enclosure. The gross alpha data from 2004 and from 2007 are not statistically different. The gross beta activity for well SC14S is higher than the 2004 result, but the 2007 value is well below the 50 pCi/l gross beta screening value.

c. Conclusions

The licensee and their environmental sampling and laboratory contractors, NJDEP, and Region I staff coordinated splitting groundwater monitoring well water samples during the routine groundwater sampling campaign in July 2007, and analyzed the samples for various radiological parameters. Gross beta concentrations from two wells exceeding the 50 pCi/l screening value were attributable to naturally occurring K-40. No elevated concentrations of total uranium were identified. The Ra-226 + Ra-228 concentration in one well, SC20D, exceeded the 5 pCi/l EPA MCL. Although this is not an NRC compliance issue regarding current site operations, the results are being considered in the NRC's review of the SMC site decommissioning plan.

V. Exit Meeting Summary

An exit meeting was held with the SMC RSO and Technical Director by telephone on November 29, 2007. The licensee acknowledged the inspector's observations. The inspector confirmed that proprietary and safeguards information were not included in this inspection report.

TABLE 1A

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Gross Alpha, Gross Beta, Ra-226, Ra-228, and K-40 Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory	Gross Alpha	Gross Beta	Ra-226	Ra-228	K-40
SC25S	Licensee	6.52 ± 1.75	8.81 ± 4.28	< 0.272	0.44 ± 0.05	2.28 ± 1.98
	NJDEP	0.76 ± 0.24	1.4 ± 0.28	< 0.91	< 2.0	< 9.6
	NRC	< 1.10	2.54 ± 0.97	< 0.20	< 0.88	(2)
SC14S	Licensee	3.56 ± 1.23	6.17 ± 2.93	< 0.284	0.57 ± 0.05	3.50 ± 3.04
	NJDEP	2.35 ± 0.34	5.86 ± 0.38	< 0.85	< 2.0	< 41
	NRC	1.17 ± 0.57	4.99 ± 0.91	< 0.16	< 0.78	(2)
SC11SR	Licensee	< 0.943	4.20 ± 2.84	< 0.408	0.25 ± 0.05	2.2 ± 1.91
	NJDEP	0.58 ± 0.18	3.09 ±0.31	< 0.95	< 2.0	<56
	NRC	< 0.55	1.77 ± 0.58	< 0.16	1.14 ± 0.61	(2)
SC12S	Licensee	8.11 ± 3.81	115 ± 13	0.54 ± 0.23	1.04 ± 0.05	85 ± 74
	NJDEP	3.72 ± 0.64	56.7 ± 1.0	< 1.0	< 2.3	71 ± 19
	NRC	< 4.4	99 ± 11	0.43 ± 0.13	1.48 ± 0.54	59 ± 66 (2)
SC12D	Licensee	4.69 ± 1.57	< 3.98	2.74 ± 0.31	< 0.309	1.36 ± 1.18
	NJDEP	6.01 ± 0.44	4.27 ± 0.33	1.81 ± 0.53	< 2.3	<11
	NRC	3.79 ± 0.60	2.79 ± 0.61	2.05 ± 0.28	2.28 ± 0.63	(2)
W2R	Licensee	< 1.04	8.93 ± 3.14	< 0.228	< 0.491	9.31 ± 8.09
	NJDEP	1.40 ± 0.33	7.50 ± 0.42	< 0.96	< 2.1	<42
	NRC	< 1.57	4.0 ± 1.5	<0.12	1.18 ± 0.47	(2)

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) NRC laboratory performed K-40 analysis only on samples with elevated gross beta activity
(3) No data, sample container broken during shipment to laboratory

TABLE 1A (continued)

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Gross Alpha, Gross Beta, Ra-226, Ra-228, and K-40 Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory	Gross Alpha ***	Gross Beta	Ra-226	Ra-228	K-40
SC22S	Licensee	< 1.22	< 4.08	0.49 ± 0.17	<0.250	12.4 ± 10.8
	NJDEP	1.17 ± 0.36	13.7 ± 0.55	< 0.93	< 1.9	<11
	NRC	< 1.9	9.9 ± 1.9	<0.14	1.09 ± 0.51	(2)
IWC1	Licensee	(3)	(3)	(3)	(3)	(3)
	NJDEP	9.3 ± 1.3	51.4 ± 1.4	< 0.78	< 1.6	85 ± 16
	NRC	3.7 ± 2.4	50.2 ± 6.1	0.16 ± 0.10	2.17 ± 0.55	56 ± 66 (2)
IWC2	Licensee	< 2.18	13.3 ± 4.31	1.27 ± 0.22	< 0.194	20.8 ± 18.1
	NJDEP	3.71 ± 0.92	18.7 ± 0.89	< 0.95	< 2.2	< 42
	NRC	< 4.3	6.9 ± 3.7	0.75 ± 0.15	1.72 ± 0.56	(2)
IWC3	Licensee	9.33 ± 1.98	11.7 ± 3.20	0.21 ± 0.11	1.86 ± 0.06	4.4 ± 3.82
	NJDEP	8.34 ± 0.63	8.98 ± 0.45	< 0.66	< 1.6	<15
	NRC	2.75 ± 0.69	6.80 ± 0.92	0.12 ± 0.07	3.53 ± 0.63	(2)
SC20S	Licensee	< 1.31	7.33 ± 3.42	< 0.456	2.92 ± 0.05	11 ± 9.6
	NJDEP	1.94 ± 0.51	13.3 ± 0.8	< 0.96	< 2.1	< 45
	NRC	< 1.8	8.3 ± 1.7	0.21 ± 0.08	1.70 ± 0.59	(2)
SC20D	Licensee	24.8 ± 3.1	18.9 ± 3.7	3.34 ± 0.36	3.46 ± 0.07	1.97 ± 1.71
	NJDEP	23.5 ± 1.0	17.9 ± 0.6	2.88 ± 0.47	5.4 ± 1.0	<11
	NRC	7.27 ± 0.89	8.6 ± 1.0	2.28 ± 0.24	6.03 ± 0.75	(2)

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) NRC laboratory performed K-40 analysis only on samples with elevated gross beta activity
(3) No data, sample container broken during shipment to laboratory

TABLE 1A (continued)

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Gross Alpha, Gross Beta, Ra-226, Ra-228, and K-40 Concentrations
Results in Units of picocuries/liter [1]

Sample Location	Analytical Laboratory	Gross Alpha	Gross Beta	Ra-226	Ra-228	K-40
SC26D	Licensee	1.89 ± 1.30	4.88 ± 2.96	<0.262	<0.190	8.31 ± 7.22
	NJDEP	0.75 ± 0.35	7.91 ± 0.39	< 0.98	< 2.2	11.8 ± 5.8
	NRC	1.92 ± 0.95	8.1 ± 1.4	<0.12	1.40 ± 0.53	(2)
A	Licensee	< 1.71	< 8.54	0.41 ± 0.20	<0.244	2.46 ± 2.14
	NJDEP	1.53 ± 0.37	7.20 ± 0.50	0.50 ± 0.18	< 0.71	< 43
	NRC	< 0.95	2.01 ± 0.95	0.13 ± 0.08	1.56 ± 0.61	(2)
Newfield #3	Licensee	5.81 ± 1.67	5.55 ± 3.23	0.44 ± 0.16	0.55 ± 0.05	1.12 ± 0.97
	NJDEP	5.24 ± 0.40	7.12 ± 0.35	0.90 ± 0.24	0.98 ± 0.48	< 13
	NRC	2.27 ± 0.70	4.9 ± 1.1	0.84 ± 0.15	1.89 ± 0.63	(2)
Newfield #5	Licensee	16.6 ± 2.42	11.5 ± 3.16	1.25 ± 0.26	1.34 ± 0.06	2.1 ± 1.82
	NJDEP	12.0 ± 0.6	11.1 ± 0.4	1.75 ± 0.24	2.43 ± 0.31	< 11
	NRC	2.54 ± 0.80	5.7 ± 1.2	0.91 ± 0.18	3.81 ± 0.68	(2)

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) NRC laboratory performed K-40 analysis only on samples with elevated gross beta activity
(3) No data, sample container broken during shipment to laboratory

TABLE 1B

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic Thorium Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory (2)	Th-228	Th-230	Th-232
SC25S	Licensee	< 0.23	< 0.52	0.34 ± 0.19
	NRC	< 1.06	1.03 ± 0.41	< 0.28
SC14S	Licensee	< 0.21	0.66 ± 0.21	0.53 ± 0.18
	NRC	< 0.31	1.13 ± 0.49	< 0.50
SC11SR	Licensee	< 0.18	< 0.27	< 0.25
	NRC	< 0.72	0.58 ± 0.37	< 0.35
SC12S	Licensee	< 0.15	0.56 ± 0.20	0.70 ± 0.19
	NRC	0.71 ± 0.43	0.71 ± 0.36	< 0.28
SC12D	Licensee	0.14 ± 0.09	< 0.25	0.21 ± 0.12
	NRC	< 0.76	0.92 ± 0.38	< 0.11
W2R	Licensee	0.12 ± 0.09	< 0.29	0.24 ± 0.11
	NRC	< 0.78	0.81 ± 0.37	< 0.28
SC22S	Licensee	0.15 ± 0.10	0.74 ± 0.21	0.72 ± 0.19
	NRC	< 0.68	1.12 ± 0.46	< 0.31
IWC1	Licensee	(3)	3)	(3)
	NRC	< 0.87	< 0.54	< 0.50
IWC2	Licensee	0.19 ± 0.10	0.30 ± 0.16	0.52 ± 0.15
	NRC	< 0.79	< 0.29	< 0.11

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) NJDEP laboratory did not perform isotopic thorium analyses
(3) No data, sample container broken during shipment to laboratory

Table 1B (continued)

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic Thorium Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory (2)	Th-228	Th-230	Th-232
IWC3	Licensee	0.30 ± 0.13	0.58 ± 0.20	0.35 ± 0.14
	NRC	1.25 ± 0.59	0.51 ± 0.34	< 0.35
SC20S	Licensee	0.27 ± 0.12	< 0.38	0.31 ± 0.13
	NRC	1.19 ± 0.58	1.11 ± 0.44	< 0.13
SC20D	Licensee	< 0.12	0.32 ± 0.16	0.17 ± 0.12
	NRC	1.15 ± 0.54	0.24 ± 0.19	< 0.49
SC26D	Licensee	< 0.17	< 0.38	0.47 ± 0.15
	NRC	0.96 ± 0.50	< 0.37	< 0.29
A	Licensee	< 0.08	0.44 ± 0.14	0.14 ± 0.07
	NRC	1.16 ± 0.55	< 0.39	< 0.34
Newfield #3	Licensee	< 0.16	0.45 ± 0.23	0.44 ± 0.17
	NRC	0.88 ± 0.49	0.31 ± 0.23	< 0.34
Newfield #5	Licensee	0.26 ± 0.16	0.58 ± 0.27	0.44 ± 0.20
	NRC	< 0.99	0.44 ± 0.29	< 0.46

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) NJDEP laboratory did not perform isotopic thorium analyses
(3) No data, sample container broken during shipment to laboratory

Table 1C
Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic and Total Uranium Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory	U-234	U-235	U-238	Total Uranium (2) (3)
SC25S	Licensee	1.06 ± 0.49	< 0.29	< 0.46	< 1.37
	NJDEP	< 0.21	< 0.12	< 0.17	< 0.49
	NRC	< 0.59	< 0.36	< 0.29	< 0.87
SC14S	Licensee	< 0.39	< 0.29	< 0.46	< 1.37
	NJDEP	< 0.19	< 0.11	< 0.15	< 0.44
	NRC	< 0.77	< 0.56	< 0.28	< 0.84
SC11SR	Licensee	1.36 ± 0.37	< 0.19	< 0.19	< 0.57
	NJDEP	< 0.19	< 0.11	< 0.15	< 0.45
	NRC	< 0.59	< 0.41	0.22 ± 0.20	0.65 ± 0.59
SC12S	Licensee	1.04 ± 0.60	< 0.51	0.49 ± 0.40	1.46 ± 1.19
	NJDEP	< 0.43	< 0.25	< 0.34	< 1.0
	NRC	0.25 ± 0.20	< 0.39	< 0.39	< 1.16
SC12D	Licensee	1.18 ± 0.45	0.33 ± 0.26	0.84 ± 0.37	2.50 ± 1.10
	NJDEP	< 0.18	< 0.11	< 0.15	< 0.44
	NRC	< 0.54	0.20 ± 0.20	0.16 ± 0.16	0.48 ± 0.48
W2R	Licensee	1.05 ± 0.72	< 0.48	< 0.77	< 2.29
	NJDEP	< 0.20	< 0.11	< 0.16	< 0.47
	NRC	< 0.72	< 0.61	<0.43	< 1.28

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) Total uranium concentration in units of micrograms/liter
(3) Total uranium concentration calculated by NRC staff from measured U-238 concentration and applying conversion factor of 0.3365 pCi/µg
(4) No data, sample container broken during shipment to laboratory

Table 1C (Continued)
Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic and Total Uranium Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory	U-234	U-235	U-238	Total Uranium (2) (3)
SC22S	Licensee	0.64 ± 0.27	0.17 ± 0.13	0.31 ± 0.18	0.92 ± 0.54
	NJDEP	< 0.036	< 0.020	< 0.028	< 0.084
	NRC	< 0.36	<0.14	< 0.36	< 1.07
IWC1	Licensee	(4)	(4)	(4)	(4)
	NJDEP	0.06 ± 0.01	< 0.034	0.05 ± 0.01	0.14 ± 0.03
	NRC	< 0.32	< 0.45	< 0.47	< 1.40
IWC2	Licensee	1.37 ± 0.34	0.12 ± 0.10	0.16 ± 0.14	0.48 ± 0.42
	NJDEP	< 0.29	<0.18	< 0.20	< 0.61
	NRC	< 0.28	< 0.14	< 0.40	< 1.19
IWC3	Licensee	0.63 ± 0.24	< 0.14	0.27 ± 0.17	0.80 ± 0.51
	NJDEP	< 0.051	< 0.032	< 0.036	< 0.11
	NRC	< 0.11	< 0.14	< 0.11	< 0.33
SC20S	Licensee	0.97 ± 0.39	0.29 ± 0.23	< 0.41	< 1.22
	NJDEP	< 0.052	< 0.032	< 0.036	< 0.11
	NRC	< 0.32	< 0.12	< 0.25	< 0.75
SC20D	Licensee	0.99 ± 0.34	< 0.26	< 0.45	< 1.34
	NJDEP	< 0.074	< 0.046	0.09 ± 0.02	0.27 ± 0.05
	NRC	< 0.27	< 0.41	< 0.39	< 1.16

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) Total uranium concentration in units of micrograms/liter
(3) Total uranium concentration calculated by NRC staff from measured U-238 concentration and applying conversion factor of 0.3365 pCi/µg
(4) No data, sample container broken during shipment to laboratory

Table 1C (Continued)
Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic and Total Uranium Concentrations
Results in Units of picocuries/liter (1)

Sample Location	Analytical Laboratory	U-234	U-235	U-238	Total Uranium (2) (3)
SC26D	Licensee	3.18 ± 0.73	0.93 ± 0.46	0.99 ± 0.45	2.94 ± 1.34
	NJDEP	0.14 ± 0.02	< 0.042	0.08 ± 0.02	0.23 ± 0.04
	NRC	< 0.39	< 0.13	<0.27	< 0.81
A	Licensee	0.77 ± 0.26	0.14 ± 0.12	<0.24	<0.72
	NJDEP	< 0.053	< 0.033	< 0.037	< 0.11
	NRC	< 0.32	< 0.13	< 0.26	<0.78
Newfield #3	Licensee	1.13 ± 0.66	< 0.52	< 0.62	< 1.85
	NJDEP	< 0.052	< 0.041	0.04 ± 0.01	0.11 ± 0.02
	NRC	< 0.52	< 0.50	< 0.40	< 1.19
Newfield #5	Licensee	0.30 ± 0.22	< 0.20	< 0.31	< 0.93
	NJDEP	< 0.058	0.046	0.039	< 0.12
	NRC	< 0.45	< 0.14	< 0.11	< 0.33

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
(2) Total uranium concentration in units of micrograms/liter
(3) Total uranium concentration calculated by NRC staff from measured U-238 concentration and applying conversion factor of 0.3365 pCi/µg
(4) No data, sample container broken during shipment to laboratory

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ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

October 8, 2007

Mr. Mark Roberts
U.S. Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, Pennsylvania 19406

SUBJECT: ANALYTICAL RESULTS FOR THIRTY-FOUR WATER SAMPLES ASSOCIATED WITH SHIELDALLOY METALLURGICAL COMPANY, SWEDESBORO, NEW JERSEY (INSPECTION REPORT #04007102/2006-001)[RFTA NO. 07-001]

Dear Mr. Roberts:

The Oak Ridge Institute for Science and Education (ORISE) received water samples from 17 different wells associated with the ShieldAlloy Metallurgical Company in Swedesboro, New Jersey. Each well had two 1 liter bottles associated with it. One bottle was used to analyze for gross alpha and gross beta using low background (LB) proportional counting, isotopic thorium and uranium using alpha spectroscopy, and radium-226 using alpha spectroscopy. The second bottle was used to analyze radium-228 via LB proportional counting. The water sample identifications are listed in Table 1. The LB results for gross alpha and gross beta are presented in Table 2, the radium-226 results are presented in Table 3, the radium-228 results are presented in Table 4, the thorium isotopic results are presented in Table 5, and the uranium isotopic results are presented in Table 6. The pertinent procedure references are provided in the tables.

ORISE's Quality Control (QC) requirements were met for these analyses. The QC files are available for your review upon request.

My contact information is listed below. You may also contact Wade Ivey at 865.576.9184 with any questions or comments.

Sincerely,

Dale Condra

Dale Condra, Manager
Laboratory

RDC/WPI:bf

Enclosures

c: T. Carter, NRC/FSME/DWMEP T-8F5
E. Knox-Davin, NRC/FSME/TWFN 8A23
File 1747
E. Abelquist, ORISE
S. Roberts, ORISE

Distribution approval and concurrence:	Initials
Technical Management Team Member	DMR
Quality Manager	GTP

P. O. Box 117
Oak Ridge, TN 37831

Voice: 865.241.3242 Fax: 865.241.3248 Email: Dale.Condra@orau.org

TABLE 1

SAMPLE IDENTIFICATIONS AND COLLECTION DATA SHIELDALLOY METALLURGICAL COMPANY SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Collection Date	Collection Time
1747W0001	NRC-1	07/24/2007	0730-1230[a]
1747W0002	NRC-1D[b]	07/24/2007	0730-1230
1747W0003	NRC-2	07/24/2007	0730-1230
1747W0004	NRC-2D	07/24/2007	0730-1230
1747W0005	NRC-3	07/24/2007	0730-1230
1747W0006	NRC-3D	07/24/2007	0730-1230
1747W0007	NRC-4	07/24/2007	0730-1230
1747W0008	NRC-4D	07/24/2007	0730-1230
1747W0009	NRC-5	07/24/2007	0730-1230
1747W0010	NRC-5D	07/24/2007	0730-1230
1747W0011	NRC-6	07/24/2007	0730-1230
1747W0012	NRC-6D	07/24/2007	0730-1230
1747W0013	NRC-7	07/24/2007	0730-1230
1747W0014	NRC-7D	07/24/2007	0730-1230
1747W0015	NRC-8	07/24/2007	0730-1230
1747W0016	NRC-8D	07/24/2007	0730-1230
1747W0017	NRC-9	07/24/2007	1400-1557
1747W0018	NRC-9D	07/24/2007	1400-1557
1747W0019	NRC-10	07/24/2007	1400-1557
1747W0020	NRC-10D	07/24/2007	1400-1557
1747W0021	NRC-11	07/24/2007	1400-1557
1747W0022	NRC-11D	07/24/2007	1400-1557
1747W0023	NRC-12	07/24/2007	1400-1557
1747W0024	NRC-12D	07/24/2007	1400-1557
1747W0025	NRC-13	07/24/2007	1400-1557
1747W0026	NRC-13D	07/24/2007	1400-1557

TABLE 1 (cont.)

SAMPLE IDENTIFICATIONS AND COLLECTION DATA SHIELDALLOY METALLURGICAL COMPANY SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Collection Date	Collection Time
1747W0027	NRC-14	07/25/2007	7:05
1747W0028	NRC-14D	07/25/2007	7:05
1747W0029	NRC-15	07/25/2007	7:25
1747W0030	NRC-15D	07/25/2007	7:25
1747W0031	NRC-16	07/25/2007	NDP[c]
1747W0032	NRC-17	07/25/2007	10:30
1747W0033	NRC-17D	07/25/2007	10:30
1747W0034	NRC-16D	07/25/2007	0830-0845

[a]A time range was given for samples labeled NRC-1 through NRC-13.
[b]The NRC sent two bottles of water from each well. ORISE added "D" to the sample ID for the second container for tracking purposes.
[c]No data provided.

TABLE 2

CONCENTRATIONS OF ALPHA AND BETA EMITTING RADIONUCLIDES IN WATER SAMPLES BY GROSS ALPHA AND GROSS BETA ANALYSIS AP1, REVISION 15 AND CP1, REVISION 15 SHIELDALLOY METALLURGICAL COMPANY SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L)	
		Gross Alpha	Gross Beta
1747W0001	NRC-1	0.72 ± 0.68[a] , 1.10[b]	2.54 ± 0.97 , 1.49
1747W0003	NRC-2	1.17 ± 0.57 , 0.79	4.99 ± 0.91 , 1.11
1747W0005	NRC-3	0.41 ± 0.34 , 0.55	1.77 ± 0.58 , 0.86
1747W0007	NRC-4	3.5 ± 2.7 , 4.4	99 ± 11 , 5
1747W0009	NRC-5	3.79 ± 0.60 , 0.45	2.79 ± 0.61 , 0.82
1747W0011	NRC-6	3.29 ± 0.56 , 0.45	2.79 ± 0.61 , 0.82
1747W0013	NRC-7	0.58 ± 0.90 , 1.57	4.0 ± 1.5 , 2.2
1747W0015	NRC-8	0.9 ± 1.1 , 1.9	9.9 ± 1.9 , 2.3
1747W0017	NRC-9	3.7 ± 2.4 , 3.6	50.2 ± 6.1 , 4.5
1747W0019	NRC-10	1.8 ± 2.5 , 4.3	6.9 ± 3.7 , 5.9
1747W0021	NRC-11	2.75 ± 0.69 , 0.73	6.80 ± 0.92 , 0.91
1747W0023	NRC-12	1.0 ± 1.1 , 1.8	8.3 ± 1.7 , 2.3
1747W0025	NRC-13	7.27 ± 0.89 , 0.52	8.6 ± 1.0 , 0.9
1747W0027	NRC-14	2.27 ± 0.70 , 0.81	4.9 ± 1.1 , 1.4
1747W0029	NRC-15	2.54 ± 0.80 , 0.93	5.7 ± 1.2 , 1.5
1747W0031	NRC-16	1.92 ± 0.95 , 1.32	8.1 ± 1.4 , 1.6
1747W0032	NRC-17	0.08 ± 0.50 , 0.95	2.01 ± 0.95 , 1.48

[a]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.
[b]MDCs are after the comma.

TABLE 3

CONCENTRATIONS OF RADIUM-226 IN WATER SAMPLES
AP7, REVISION 17 AND CP2, REVISION 12
SHIELDALLOY METALLURGICAL COMPANY
SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L)				
1747W0001	NRC-1	-0.06	±	0.09[a]	,	0.20[b]
1747W0003	NRC-2	0.03	±	0.09	,	0.16
1747W0005	NRC-3	0.00[c]	±	0.08	,	0.16
1747W0007	NRC-4	0.43	±	0.13	,	0.03
1747W0009	NRC-5	2.05	±	0.28	,	0.08
1747W0011	NRC-6	2.18	±	0.30	,	0.03
1747W0013	NRC-7	0.09	±	0.08	,	0.12
1747W0015	NRC-8	0.01	±	0.07	,	0.14
1747W0017	NRC-9	0.16	±	0.10	,	0.14
1747W0019	NRC-10	0.75	±	0.15	,	0.09
1747W0021	NRC-11	0.12	±	0.07	,	0.07
1747W0023	NRC-12	0.21	±	0.08	,	0.06
1747W0025	NRC-13	2.28	±	0.24	,	0.08
1747W0027	NRC-14	0.84	±	0.15	,	0.07
1747W0029	NRC-15	0.91	±	0.18	,	0.13
1747W0031	NRC-16	0.04	±	0.07	,	0.12
1747W0032	NRC-17	0.13	±	0.08	,	0.10

[a]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.
[b]MDCs are after the comma.
[c]Zero value is due to rounding.

TABLE 4

CONCENTRATIONS OF RADIUM-228 IN WATER SAMPLES
AP8, REVISION 3 AND CP1, REVISION 15
SHIELDALLOY METALLURGICAL COMPANY
SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L)				
1747W0002	NRC-1D	0.52	±	0.53[a]	,	0.88[b]
1747W0004	NRC-2D	0.45	±	0.47	,	0.78
1747W0006	NRC-3D	1.14	±	0.61	,	0.96
1747W0008	NRC-4D	1.48	±	0.54	,	0.79
1747W0010	NRC-5D	2.28	±	0.63	,	0.89
1747W0012	NRC-6D	4.55	±	0.74	,	0.89
1747W0014	NRC-7D	1.18	±	0.47	,	0.68
1747W0016	NRC-8D	1.09	±	0.51	,	0.76
1747W0018	NRC-9D	2.17	±	0.55	,	0.71
1747W0020	NRC-10D	1.72	±	0.56	,	0.78
1747W0022	NRC-11D	3.53	±	0.63	,	0.75
1747W0024	NRC-12D	1.70	±	0.59	,	0.86
1747W0026	NRC-13D	6.03	±	0.75	,	0.77
1747W0028	NRC-14D	1.89	±	0.63	,	0.90
1747W0030	NRC-15D	3.81	±	0.68	,	0.83
1747W0033	NRC-17D	1.56	±	0.61	,	0.91
1747W0034	NRC-16D	1.40	±	0.53	,	0.81

[a]Uncertainties represent the 95% confidence level, based on counting uncertainty.
[b]MDCs are after the comma.

TABLE 5

CONCENTRATIONS OF THORIUM RADIONUCLIDES
IN WATER SAMPLES
BY ALPHA SPECTROSCOPY AP11, REVISION 3 AND CP2, REVISION 12
SHIELDALLOY METALLURGICAL COMPANY
SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L)		
		Th-228	Th-230	Th-232
1747W0001	NRC-1	-0.11 ± 0.56[a] , 1.06[b]	1.03 ± 0.41 , 0.28	-0.04 ± 0.07 , 0.28
1747W0003	NRC-2	0.16 ± 0.20 , 0.31	1.13 ± 0.49 , 0.50	-0.12 ± 0.18 , 0.50
1747W0005	NRC-3	0.51 ± 0.46 , 0.72	0.58 ± 0.37 , 0.49	0.00[c] ± 0.15 , 0.35
1747W0007	NRC-4	0.71 ± 0.43 , 0.57	0.71 ± 0.36 , 0.36	-0.04 ± 0.07 , 0.28
1747W0009	NRC-5	0.57 ± 0.49 , 0.76	0.92 ± 0.38 , 0.12	0.11 ± 0.13 , 0.11
1747W0011	NRC-6	0.82 ± 0.46 , 0.59	1.40 ± 0.54 , 0.52	0.04 ± 0.13 , 0.30
1747W0013	NRC-7	0.26 ± 0.45 , 0.78	0.81 ± 0.37 , 0.28	0.00 ± 0.10 , 0.28
1747W0015	NRC-8	0.60 ± 0.46 , 0.68	1.12 ± 0.46 , 0.38	0.04 ± 0.14 , 0.31
1747W0017	NRC-9	0.65 ± 0.56 , 0.87	0.53 ± 0.39 , 0.54	-0.12 ± 0.18 , 0.50
1747W0019	NRC-10	0.42 ± 0.48 , 0.79	0.26 ± 0.23 , 0.29	0.08 ± 0.11 , 0.11
1747W0021	NRC-11	1.25 ± 0.59 , 0.67	0.51 ± 0.34 , 0.35	0.05 ± 0.16 , 0.35
1747W0023	NRC-12	1.19 ± 0.58 , 0.72	1.11 ± 0.44 , 0.13	0.04 ± 0.09 , 0.13
1747W0025	NRC-13	1.15 ± 0.54 , 0.64	0.24 ± 0.19 , 0.12	-0.12 ± 0.18 , 0.49
1747W0027	NRC-14	0.88 ± 0.49 , 0.59	0.31 ± 0.23 , 0.13	0.04 ± 0.15 , 0.34
1747W0029	NRC-15	0.39 ± 0.58 , 0.99	0.44 ± 0.29 , 0.15	0.05 ± 0.22 , 0.46
1747W0031	NRC-16	0.96 ± 0.50 , 0.62	0.35 ± 0.28 , 0.37	0.04 ± 0.13 , 0.29
1747W0032	NRC-17	1.16 ± 0.55 , 0.69	0.25 ± 0.25 , 0.39	0.00 ± 0.14 , 0.34

[a]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.
[b]MDCs are after the comma.
[c]Zero values are due to rounding.

TABLE 6

CONCENTRATIONS OF URANIUM RADIONUCLIDES IN WATER SAMPLES BY ALPHA SPECTROSCOPY AP11, REVISION 3 AND CP2, REVISION 12 SHIELDALLOY METALLURGICAL COMPANY SWEDESBORO, NEW JERSEY

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L)											
		U-234				U-235				U-238			
1747W0001	NRC-1	0.08	±	0.31[a]	, 0.59[b]	0.14	±	0.21	, 0.36	0.23	±	0.22	, 0.29
1747W0003	NRC-2	-0.40	±	0.32	, 0.77	-0.14	±	0.20	, 0.56	0.07	±	0.15	, 0.28
1747W0005	NRC-3	-0.04	±	0.26	, 0.59	-0.05	±	0.11	, 0.41	0.22	±	0.20	, 0.13
1747W0007	NRC-4	0.25	±	0.20	, 0.12	-0.05	±	0.10	, 0.39	0.12	±	0.22	, 0.39
1747W0009	NRC-5	-0.12	±	0.21	, 0.54	0.20	±	0.20	, 0.15	0.16	±	0.16	, 0.12
1747W0011	NRC-6	0.42	±	0.27	, 0.13	0.00[c]	±	0.15	, 0.40	0.59	±	0.34	, 0.32
1747W0013	NRC-7	-0.13	±	0.32	, 0.72	-0.17	±	0.19	, 0.61	0.00	±	0.18	, 0.43
1747W0015	NRC-8	0.04	±	0.17	, 0.36	0.05	±	0.09	, 0.14	0.04	±	0.17	, 0.36
1747W0017	NRC-9	0.10	±	0.17	, 0.32	0.00	±	0.20	, 0.45	-0.10	±	0.20	, 0.47
1747W0019	NRC-10	0.11	±	0.16	, 0.28	0.05	±	0.09	, 0.14	-0.04	±	0.16	, 0.40
1747W0021	NRC-11	0.11	±	0.13	, 0.11	0.05	±	0.09	, 0.14	0.04	±	0.08	, 0.11
1747W0023	NRC-12	0.20	±	0.21	, 0.32	0.12	±	0.14	, 0.12	0.10	±	0.15	, 0.25
1747W0025	NRC-13	0.14	±	0.17	, 0.27	-0.04	±	0.15	, 0.41	0.03	±	0.18	, 0.39
1747W0027	NRC-14	0.44	±	0.36	, 0.52	0.04	±	0.24	, 0.50	0.18	±	0.24	, 0.40
1747W0029	NRC-15	0.04	±	0.22	, 0.45	0.14	±	0.16	, 0.14	0.11	±	0.13	, 0.11
1747W0031	NRC-16	0.07	±	0.20	, 0.39	0.09	±	0.12	, 0.13	0.17	±	0.19	, 0.27
1747W0032	NRC-17	0.07	±	0.17	, 0.32	0.13	±	0.15	, 0.13	0.07	±	0.14	, 0.26

[a]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.
[b]MDCs are after the comma.
[c]Zero values are due to rounding.

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

November 26, 2007

Mr. Mark Roberts
U.S. Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, Pennsylvania 19406

SUBJECT: ADDENDUM TO ANALYTICAL RESULTS FOR THIRTY-FOUR WATER SAMPLES ASSOCIATED WITH SHIELDALLOY METALLURGICAL COMPANY, SWEDESBORO, NEW JERSEY DCN 1747-LR-002-0 (INSPECTION REPORT #04007102/2006-001)[RFTA NO. 07-001]

Dear Mr. Roberts:

The Oak Ridge Institute for Science and Education (ORISE) received water samples from 17 different wells associated with the ShieldAlloy Metallurgical Company in Swedesboro, New Jersey. The original results were submitted in a letter report dated October 8, 2007. After reviewing the results, you requested gamma counts on samples W0007 and W0017 to determine if potassium-40 (K-40) was present in the samples and the reason for the elevated gross beta concentrations when compared to the other samples. The samples were counted for four days by gamma spectroscopy (Procedure CP1, Revision 15). The K-40 concentration for W0007 was 59 ± 66 pCi/L compared to the gross beta concentration of 99 ± 11 pCi/L. The K-40 concentration for W0017 was 56 ± 66 pCi/L compared to the gross beta concentration of 50.2 ± 6.1 pCi/L.

ORISE's Quality Control (QC) requirements were met for these analyses. The QC files are available for your review upon request.

My contact information is listed below. You may also contact Wade Ivey at 865.576.9184 with any questions or comments.

Sincerely,

Dale Condra for

Dale Condra, Manager
Laboratory

RDC/WPI:km

c: T. Carter, NRC/FSME/DWMEP T-8F5
E. Knox-Davin, NRC/FSME/TWFN 8A23
File 1747
E. Abelquist, ORISE
S. Roberts, ORISE

Distribution approval and concurrence:	Initials
Technical Management Team Member	JJR
Quality Manager	CTP

P. O. Box 117
Oak Ridge, TN 37831

Voice: 865.241.3242 Fax: 865.241.3248 Email: Dale.Condra@orau.org

SHIELDALLOY METALURGICAL CO. (License No. SMB-743, Docket No. 04007102)

Table of NRC Sample Numbers (used in the ORISE Data Reports)

versus Well Locations

For July 23-24, 2007 Sampling Period

NRC Sample No.	SMC Well Location
NRC 1	SC25S
NRC 2	SC14S
NRC 3	SC11SR
NRC 4	SC12S
NRC 5	SC12D
NRC 6	Duplicate sample of SC12D
NRC 7	W2R
NRC 8	WC22S
NRC 9	IWC1
NRC 10	IWC2
NRC 11	IWC3
NRC 12	SC20S
NRC 13	SC20D
NRC 14	Newfield Well #3
NRC 15	Newfield Well #5
NRC 16	SC26A
NRC 17	A

All NRC samples were shipped as two, one-liter aliquots from each of the wells that had been sampled. For tracking purpose, ORISE designated the second one-liter sample from each well with a "D" on their data report, although both samples were taken from the same well. For example, samples NRC 1 and NRC 1D were both obtained from Well SC25S.

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

April 15, 2008

TRC Environmental
Jean Oliva
21 Griffin Rd North
Windsor, CT 06095

CLIENT PROJECT NUMBER: SMC-Newfield
OUTREACH LAB ID: 20080245

Dear Mrs. Jean Oliva:

Please find enclosed the analytical report for your sample received in our laboratory on March 20, 2008 for the above captioned project. Two liquid samples were received in good condition and analyzed for Radium-226 and Radium-228. Per your chain of custody, the samples were filtered prior to analysis. The attached results relate only to the samples submitted by your company.

All Quality Control for the requested analyses is reported on the analytical report. The method blank, laboratory control standard and matrix spikes and spike duplicates for all analyses were within method control limits with the exception of MSD RPD for Radium-226. Your results were in no way affected.

Parameters certified by NELAC meet all requirements of NELAC. A scope of Certified parameters is available upon request.

Unless notified otherwise, all non-hazardous, non-radioactive samples will be disposed 30 days after the report date. All others will be returned to you.

Thank you for choosing Outreach Laboratory and if you have any questions, please call us at 918-251-2515.

Laboratory Director

ODEQ ID #9517
NRC ODEQ LIC. #27522-01

ACCREDITED IN ACCORDANCE WITH
CERT. ID #OK001

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	TRC Environmental
Client Project:	SMC-Newfield
Lab Number:	20080245
Date Reported:	4/14/2008
Date Received:	3/21/08
Page Number:	1 of 1

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Lab ID:	**20080245-01**						
Client ID:	**SC20S**						
Date Sampled:	**3/18/2008 1:35:00 PM**						
Matrix:	**Liquid**						
	Radiochemical Analyses						
Radium-226	SM 7500 Ra B M	0.225 +/- 0.133	pCi/l	0.216	3/24/2008	4/2/2008	RE
Radium-228	EPA 904/9320	0.524 +/- 2.29	pCi/l	1.16	4/2/2008	4/11/2008	SD
Lab ID:	**20080245-02**						
Client ID:	**SC20D**						
Date Sampled:	**3/18/2008 2:35:00 PM**						
Matrix:	**Liquid**						
	Radiochemical Analyses						
Radium-226	SM 7500 Ra B M	3.02 +/- 0.344	pCi/l	0.272	3/24/2008	4/2/2008	RE
Radium-228	EPA 904/9320	3.09 +/- 0.76	pCi/l	0.367	4/2/2008	4/11/2008	SD

QC Report

Parameter	Blank	LCS %REC	LCSD %REC	LCSD RPD	DUP RPD	MS %REC	MSD %REC	MSD RPD	Date
Radium-226	0.0	77.9			0.8	83.8	114.0	30.2	4/2/2008
Radium-228	0	92.4			NC	75.3	82.5	9.1	4/11/2008

Lab Approval:

BDL = Below Detection Limit

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

October 9, 2008

Carol Berger
Integrated Environmental Management, Inc.
8 Brooks Ave #205
Gaithersburg, MD 20877

CLIENT PROJECT NAME: 94005.29.03
OUTREACH LAB ID: 20080585

Dear Ms. Berger:

Please find enclosed the analytical report for your samples received in our laboratory on July 11, 2008 for the above captioned project. Fourteen liquid samples were received in good condition and analyzed for Radium 226 and Radium 228, per your instructions. These samples were not filtered prior to analyzing.

All Quality Control for the requested analysis is reported on the analytical report and is within control limits.

Per your instructions, these samples will be disposed 30 days after the final report date.

Thank you for choosing Outreach Laboratory and if you have any questions, please call us at 918-251-2515.

Laboratory Director

ODEQ ID #9517
NRC ODEQ LIC. #27522-01

ACCREDITED IN ACCORDANCE WITH nelac

CERT. ID #OK001
See Certified
Parameter List

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.29.03
Lab Number:	20080595
Date Reported:	8/11/2008
Date Received:	7/11/08
Page Number:	1 of 4

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Lab ID:	20080595-01						
Client ID:	SC 25 S						
Date Sampled:	7/9/2008 8:30:00 AM						
Matrix:	Liquid						
		Radiochemical Analyses					
Radium-226	SM 7500 Ra B M	0.023 +/- 0.132	pCi/l	0.272	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	0 +/- 0.729	pCi/l	0.811	7/15/2008	8/6/2008	SD
Lab ID:	20080595-02						
Client ID:	W2 {R}						
Date Sampled:	7/9/2008 9:45:00 AM						
Matrix:	Liquid						
		Radiochemical Analyses					
Radium-226	SM 7500 Ra B M	0.082 +/- 0.100	pCi/l	0.189	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	0 +/- 0.602	pCi/l	0.657	7/15/2008	8/6/2008	SD
Lab ID:	20080595-03						
Client ID:	SC 14 S						
Date Sampled:	7/9/2008 10:15:00 AM						
Matrix:	Liquid						
		Radiochemical Analyses					
Radium-226	SM 7500 Ra B M	0.208 +/- 0.102	pCi/l	0.164	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	0 +/- 0.461	pCi/l	0.504	7/15/2008	8/6/2008	SD
Lab ID:	20080595-04						
Client ID:	SC 11 S {R}						
Date Sampled:	7/9/2008 11:20:00 AM						
Matrix:	Liquid						
		Radiochemical Analyses					
Radium-226	SM 7500 Ra B M	0.379 +/- 0.140	pCi/l	0.182	8/1/2008	8/6/2008	SD
Radium-228	EPA 904/9320	0 +/- 0.690	pCi/l	0.755	7/15/2008	8/6/2008	SD
Lab ID:	20080595-05						
Client ID:	SC 12 S						
Date Sampled:	7/9/2008 11:55:00 AM						
Matrix:	Liquid						
		Radiochemical Analyses					
Radium-226	SM 7500 Ra B M	0.154 +/- 0.077	pCi/l	0.107	8/1/2008	8/6/2008	SD
Radium-228	EPA 904/9320	0.211 +/- 0.668	pCi/l	0.719	7/15/2008	8/6/2008	SD

*NELAC Certified Parameter BDL = Below Detection Limit

treach
aboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.29.03
Lab Number:	20080595
Date Reported:	8/11/2008
Date Received:	7/11/08
Page Number:	2 of 4

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ıb ID:	20080595-06						
lient ID:	SC 12 D						
ıte Sampled:	7/9/2008 12:25:00 PM						
atrix:	Liquid						
		Radiochemical Analyses					
ıdium-226	SM 7500 Ra B M	2.24 +/- 0.408	pCi/l	0.340	8/1/2008	8/6/2008	SD
ıdium-228	EPA 904/9320	0.090 +/- 0.469	pCi/l	0.506	7/15/2008	8/8/2008	SD
ıb ID:	20080595-07						
lient ID:	SC 32 S						
ate Sampled:	7/9/2008 12:30:00 PM						
atrix:	Liquid						
		Radiochemical Analyses					
ıdium-226	SM 7500 Ra B M	0.401 +/- 0.207	pCi/l	0.310	8/1/2008	8/6/2008	SD
[illegible]28	EPA 904/9320	0.069 +/- 0.410	pCi/l	0.442	7/15/2008	8/6/2008	SD
ab ID:	20080595-08						
lient ID:	Newfield #5						
ate Sampled:	7/9/2008 1:15:00 PM						
atrix:	Liquid						
		Radiochemical Analyses					
adium-226	SM 7500 Ra B M	0.967 +/- 0.236	pCi/l	0.225	8/1/2008	8/6/2008	SD
adium-228	EPA 904/9320	3.55 +/- 0.503	pCi/l	0.459	7/15/2008	8/7/2008	SD
ab ID:	20080595-09						
lient ID:	Newfield #3						
ate Sampled:	7/9/2008 1:30:00 AM						
atrix:	Liquid						
		Radiochemical Analyses					
adium-226	SM 7500 Ra B M	0.431 +/- 0.127	pCi/l	0.136	8/1/2008	8/6/2008	SD
adium-228	EPA 904/9320	1.30 +/- 0.650	pCi/l	0.680	7/15/2008	8/7/2008	SD
ab ID:	20080595-10						
lient ID:	SC 13 S {R}						
ate Sampled:	7/9/2008 4:45:00 PM						
atrix:	Liquid						
		Radiochemical Analyses					
[illegible]-226	SM 7500 Ra B M	0.351 +/- 0.211	pCi/l	0.334	8/1/2008	8/5/2008	SD
adium-228	EPA 904/9320	0 +/- 0.747	pCi/l	0.821	7/15/2008	8/7/2008	SD

*NELAC Certified Parameter BDL = Below Detection Limit

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.29.03
Lab Number:	20080595
Date Reported:	8/11/2008
Date Received:	7/11/08
Page Number:	3 of 4

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Lab ID:	20080595-11						
Client ID:	OBS-2A						
Date Sampled:	7/9/2008 5:16:00 PM						
Matrix:	Liquid						
	Radiochemical Analyses						
Radium-226	SM 7500 Ra B M	0.646 +/- 0.144	pCi/l	0.121	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	1.46 +/- 0.632	pCi/l	0.663	7/15/2008	8/7/2008	SD
Lab ID:	20080595-12						
Client ID:	SC 20 S						
Date Sampled:	7/9/2008 6:35:00 PM						
Matrix:	Liquid						
	Radiochemical Analyses						
Radium-226	SM 7500 Ra B M	0.204 +/- 0.097	pCi/l	0.141	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	0.539 +/- 0.427	pCi/l	0.447	7/15/2008	8/7/2008	SD
Lab ID:	20080595-13						
Client ID:	SC 20 D						
Date Sampled:	7/9/2008 6:40:00 PM						
Matrix:	Liquid						
	Radiochemical Analyses						
Radium-226	SM 7500 Ra B M	4.59 +/- 0.485	pCi/l	0.253	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	2.20 +/- 0.527	pCi/l	0.527	7/15/2008	8/7/2008	SD
Lab ID:	20080595-14						
Client ID:	A						
Date Sampled:	7/10/2008 9:00:00 AM						
Matrix:	Liquid						
	Radiochemical Analyses						
Radium-226	SM 7500 Ra B M	0.485 +/- 0.217	pCi/l	0.291	8/1/2008	8/5/2008	SD
Radium-228	EPA 904/9320	0.752 +/- 0.454	pCi/l	0.474	7/15/2008	8/7/2008	SD

*NELAC Certified Parameter BDL = Below Detection Limit

Outreach Laboratory
311 North Aspen
Broken Arrow, OK 74012
(918) 251-2515
FAX (918) 251-0008

Client:	IEM
Client Project:	94005.29.03
Lab Number:	20080595
Date Reported:	8/11/2008
Date Received:	7/11/08
Page Number:	4 of 4

QC Report

rameter	Blank	LCS %REC	LCSD %REC	LCSD RPD	DUP RPD	MS %REC	MSD %REC	MSD RPD	Date
dium-226	0	120.0			NC	92.4	87.8	4.6	8/5/2008
dium-228	0	99.8			NC	113.0	128.0	12.9	8/7/2008
dium-228	0.586	103.0				110.0	95.0	15.1	8/6/2008

Lab Approval: _____

*NELAC Certified Parameter BDL = Below Detection Limit

OUTREACH LABORATORY

311 North Aspen
Broken Arrow, OK 74012
Phone: (918) 251-2515
Fax: (918) 251-0008
QA@outreachlab.com

CHAIN CUSTODY

Results To:
Company: TRC
Name: Larry Butler
Address: 21 Griffin Rd North
City: Windsor State: CT Zip: 06095
Phone: 860 298 6225 Fax #: 860 298 6399

Bill To:
Company: SAME
Name:
Address:
City: State: Zip:

ANALYSIS REQUESTED

PO #:
PROJECT #: 105106.000100.000000
PROJECT NAME: SMC
REQUESTED TURNAROUND TIME (ADDITIONAL CHARGES MAY APPLY):
SAMPLER: Signature Chris Carlson

LAB SAMPLE ID	CLIENT SAMPLE ID	DATE SAMPLED	TIME SAMPLED	MATRIX	# CONTAINERS	CONTAINER SIZE PLASTIC OR GLASS	PRESERVATIVE # (1. HNO_3 pH<2; 2. Ice <4°C; 3. HCl pH<2; 4. H_2SO_4 pH<2; 5. NaOH pH>11)	~~PA-226+PA-228~~ 8	See IEM Project	No. 97005.29.03	June 9, 2008					REMARKS (I.E. FILTERED, UNFILTERED, GRAB, COMPOSITE)
1	SC25S	7/9/08	0830	GW	1	1G/P	2	X								Custody Seals
2	W2(R)		0945	GW	1	1G/P	2	X								on coolers: 246
3	SC14S		1015	GW	1	1G/P	2	X								160
4	SC11S (R)		1120	GW	1	1G/P	2	X								244
5	SC12S		1155	GW	1	1G/P	2	X								245
6	SC12D		1225	GW	1	1G/P	2	X								242
7	SC32S		1230	GW	1	1G/P	2	X								
8	Newfield No 5		1315	GW	1	1G/P	2	X								
9	Newfield No 3		1330	GW	1	1G/P	2	X								
10	SC13S (R)		1645	GW	1	1G/P	2	X								
11	OBS-2A		1716	GW	1	1G/P	2	X								
12	SC-20S		1835	GW	1	1G/P	2	X								
13	SC-20D		1840	GW	1	1G/P	2	X								
14	A	7/10/08	0900	GW	1	1G/P	2	X								

RELINQUISHED BY: DATE 7/10/08 TIME 1125 RECEIVED BY: DATE 7/11/08 TIME 930

RELINQUISHED BY: DATE TIME RECEIVED BY: DATE TIME

My signature on this chain of custody form indicates that I am authorized by the above company to release samples for analysis. The company agrees to pay the entire balance upon receipt of sample data and it is understood and agreed that any balance carried over thirty (30) days is subject to a 1.5% per month (18% per annum) late charge. In the event of default, the company becomes legally liable for any reasonable attorney and/or collection fees and all related costs necessary to remit the entire balance to Outreach Technologies, Inc. (Outreach Laboratory).

SAMPLE RETURN/DISPOSAL: All non-hazardous samples shall be disposed of 30 days after issue of final report. All others will be [illegible]ed at client's expense.

FOR LABORATORY USE ONLY: 20080595
Sample Condition Upon Receipt: good
Custody Seals Intact: Y N
Cooler Temperature: NA

APPENDIX J - ECOLOGICAL DATA

APPENDIX J - ECOLOGICAL DATA

Table J-1 - List of Plant Species within Forested Uplands
Table J-2 – Potential Wildlife Species Receptors
Table J-3 - Macroinvertebrate Survey Results
New Jersey Natural Heritage Program Correspondence
U.S. Fish and Wildlife Program Correspondence
Endangered and Threatened Plant Species Survey Report (Amy S. Greene, Inc., 1994)

TABLE J-1
PLANT RECEPTOR SPECIES

Common Name	Scientific Name
Herbs	
Cattail	*Typha latifolia*
Giant Reed	*Phragmites australis*
Sensitive Fern	*Onoclea sensibilis*
Cinnamon Fern	*Osmunda cinnamomea*
Soft Rush	*Juncus effusus*
Japanese Knotweed	*Polygonum cuspidatum*
Sphagnum Moss	*Sphagnum spp.*
Poison Ivy	*Rhus radicans*
Jewel Weed	*Impatiens capensis*
Common Elder	*Sambucus canadensis*
Duckweed	*Lemna spp.*
Marsh Marigold	*Caltha palustris*
Goldenrod	*Salidago spp.*
Bracken Fern	*Pteridium aquilinum*
Crows Foot Club Moss	*Lycopodium*
Shrubs	
Swamp Magnolia	*Magnolia virginiana*
Sweet Pepperbush	*Clethra alnifolia*
Blueberry	*Vaccinium spp.*
Mountain Laurel	*Kalmia latifolia*
Greenbrier	*Smilax spp.*
Multiflora Rose	*Rosa multiflora*
Honeysuckle	*Lonicera spp.*
Bear Oak	*Quercus ilicifolia*
Holly	*Ilex opaca*
Staghorn Sumac	*Rhus typhina*
Trees	
Black Tupelo	*Nyssa sylvatica*
Red Maple	*Acer rubrum*
Atlantic Eastern Red Cedar	*Juniperus virginiana*
Atlantic White Cedar	*Chamaecyparis thyoides*
Willow	*Salix spp.*
White Oak	*Quercus alba*
Northern Red Oak	*Quercus rubra*
Pitch Pine	*Pinus rigida*

TABLE J-1
PLANT RECEPTOR SPECIES

Common Name	Scientific Name
Herbs	
Box Elder	*Acer negundo*
Black Cherry	*Prunus serotina*
Bigtooth Aspen	*Populus grandidentata*
Sassafras	*Sassafras albidum*
Flowering Dogwood	*Cornus florida*
Norway Maple	*Acer platanoides*
Black Locust	*Robinia pseudoacacia*

TABLE J-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
Amphibians								
Bufonidae	Fowler's Toad	*Bufo woodhousei fowleri*	I	Ground Ambusher	Water	X	X	X
Hylidae	Gray Treefrog	*Hyla versicolor*	I	Bark Ambusher	Water	X		X
	Northern Cricket Frog	*Acris crepitans*	I	Riparian Ambusher	Water	X		
	Northern Spring Peeper	*Pseudacris c. crucifer*	I	Riparian Ambusher	Water	X		X
Pelobatidae	Eastern Spadefoot	*Scaphiopus holbrookii*	I	Ground Ambusher	Water			X
Plethodontidae	Mud Salamander	*Pseudotriton montanus*	I	Water Gleaner	Water	X		
	Redback Salamander	*Plethodon c. cinereus*	I	Ground Gleaner	Terrestrial Subsurface			X
Ranidae	Bullfrog	*Rana catesbeiana*	C	Water Ambusher	Water	X		
	Green Frog	*Rana clamitans melanota*	I	Riparian Ambusher	Water	X		X
	Southern Leopard Frog	*Rana utricularia*	I	Riparian Ambusher	Water	X		
	Wood Frog	*Rana sylvatica*	I	Ground Ambusher	Water	X		X
Salamandridae	Red-spotted Newt	*Notophthalmus viridescens*	I	Water Gleaner	Water	X		X
Birds								
Accipitridae	Broad-winged Hawk	*Buteo platypterus*	C	Ground Pouncer	Tree-Branch		X	X
	Red-tailed Hawk	*Buteo jamaicensis*	C	Ground Pouncer	Tree-Branch		X	
Alcedinidae	Belted Kingfisher	*Ceryle alcyon*	P	Water Plunger	Riparian Subsurface	X		
Anatidae	Canada Goose	*Branta canadensis*	H	Ground Grazer	Riparian Ground	X	X	
	Mallard	*Anas platyrhynchos*	G	Water Forager	Riparian Ground	X		
	Wood Duck	*Aix sponsa*	G	Water Forager	Riparian Tree Cavity	X		
Apodidae	Chimney Swift	*Chaetura pelagica*	I	Air Screener	Buildings		X	
Ardeidae	Great Blue Heron	*Ardea herodias*	C	Water Ambusher	Riparian Twig-Branch	X		
	Green-backed Heron	*Butorides striatus*	C	Water Ambusher	Riparian Shrub	X		
Bombycillidae	Cedar Waxwing	*Bombycilla cedrorum*	F	Upper Canopy Gleaner	Tree-Twig		X	
Caprimulgidae	Common Nighthawk	*Chordeiles minor*	I	Air Screener	Buildings		X	
Charadriidae	Killdeer	*Charadrius vociferus*	I	Ground Gleaner	Ground-Herb		X	
Columbidae	Mourning Dove	*Zenaida macroura*	G	Ground Gleaner	Tree-Branch		X	X
	Rock Dove	*Columba livia*	O	Ground Gleaner	Buildings		X	
Corvidae	American Crow	*Corvus brachyrhynchos*	O	Ground Gleaner	Tree-Branch		X	

TABLE J-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
	Blue Jay	*Cyanocitta cristata*	O	Ground Gleaner	Tree-Branch			X
Cuculidae	Black-billed Cuckoo	*Coccyzus erythropthalmus*	I	Lower Canopy Gleaner	Tree-Branch			X
	Yellow-billed Cuckoo	*Coccyzus americanus*	I	Lower Canopy Gleaner	Tree-Branch			X
Falconidae	American Kestrel	*Falco sparverius*	C	Ground Pouncer	Tree Cavity-Crevice		X	
Fringillidae	American Goldfinch	*Carduelis tristis*	O	Ground Gleaner	Shrub		X	
	Blue Grosbeak	*Guiraca caerulea*	O	Ground Gleaner	Shrub	X		X
	Chipping Sparrow	*Spizella passerina*	O	Ground Gleaner	Shrub		X	X
	Field Sparrow	*Spizella pusilla*	O	Ground Gleaner	Ground-Herb		X	
	Indigo Bunting	*Passerina cyanea*	I	Lower Canopy Gleaner	Ground-Herb		X	X
	Northern Cardinal	*Cardinalis cardinalis*	O	Ground Gleaner	Shrub			X
	Song Sparrow	*Melospiza melodia*	O	Ground Gleaner	Ground-Herb	X	X	
	Swamp Sparrow	*Melospiza georgiana*	I	Ground Gleaner	Riparian Ground	X		
Hirundinidae	Barn Swallow	*Hirundo rustica*	I	Air Screener	Buildings		X	
	Tree Swallow	*Tachycineata bicolor*	I	Air Screener	Tree Cavity-Crevice	X	X	
Icteridae	Baltimore Oriole	*Icterus galbula*	O	Upper Canopy Gleaner	Tree-Twig			X
	Brown-headed Cowbird	*Molothrus ater*	O	Ground Gleaner	Nest Parasite	X	X	X
	Common Grackle	*Quiscalus quiscula*	O	Ground Gleaner	Tree-Branch	X	X	X
	Red-winged Blackbird	*Agelaius phoeniceus*	O	Ground Gleaner	Shrub	X	X	
Laridae	Herring Gull	*Larus argentatus*	C	Coastal Scavenger	Beach-Rock-Dune		X	
Mimidae	Brown Thrasher	*Toxostoma rufum*	O	Ground Gleaner	Shrub		X	
	Gray Catbird	*Dumetella carolinensis*	O	Ground Gleaner	Shrub	X	X	X
	Northern Mockingbird	*Mimus polyglottos*	O	Ground Gleaner	Shrub		X	
Paridae	Carolina Chickadee	*Parus carolinensis*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
	Tufted Titmouse	*Parus bicolor*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
Parulidae	American Redstart	*Setophaga ruticilla*	I	Lower Canopy Gleaner	Tree-Twig			X
	Black-and-White Warbler	*Mniotilta varia*	I	Bark Gleaner	Ground-Herb			X
	Common Yellowthroat	*Geothlypis trichas*	I	Lower Canopy Gleaner	Ground-Herb	X		X
	Prothonotary Warbler	*Protonotaria citrea*	I	Ground Gleaner	Tree Cavity-Crevice	X		X
	Yellow Warbler	*Dendroica petechia*	I	Lower Canopy Gleaner	Shrub	X		
Phasianidae	Northern Bobwhite	*Colinus virginianus*	O	Ground Gleaner	Ground-Herb		X	
Picidae	Downy Woodpecker	*Picoides pubescens*	I	Bark Gleaner	Tree Cavity-Crevice			X

TABLE J-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
	Northern Flicker	*Colaptes auratus*	I	Ground Gleaner	Tree Cavity-Crevice		X	X
Ploceidae	House Sparrow	*Passer domesticus*	G	Ground Gleaner	Buildings		X	
Scolopacidae	American Woodcock	*Scolopax minor*	I	Ground Prober	Ground-Herb		X	X
	Spotted Sandpiper	*Actitis macularia*	O	Riparian Gleaner	Ground-Herb	X		
Sittidae	White-breasted Nuthatch	*Sitta carolinensis*	I	Bark Gleaner	Tree Cavity-Crevice			X
Strigidae	Eastern Screech-Owl	*Otus asio*	C	Ground Pouncer	Tree Cavity-Crevice		X	
	Great Horned Owl	*Bubo virginianus*	C	Ground Pouncer	Tree-Branch		X	X
Sturnidae	European Starling	*Sturnus vulgaris*	O	Ground Gleaner	Buildings	X	X	
Sylviidae	Blue-gray Gnatcatcher	*Polioptila caerulea*	I	Upper Canopy Gleaner	Tree-Branch			X
Thraupidae	Scarlet Tanager	*Piranga olivacea*	I	Upper Canopy Gleaner	Tree-Twig			X
Trochilidae	Ruby-throated Hummingbird	*Archilochus colubris*	O	Floral Hover-Gleaner	Tree-Branch			X
Troglodytidae	Carolina Wren	*Thryothorus ludovicianus*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
	House Wren	*Troglodytes aedon*	I	Lower Canopy Gleaner	Tree Cavity-Crevice			X
Turdidae	American Robin	*Turdus migratorius*	O	Ground Gleaner	Tree-Branch	X	X	X
	Eastern Bluebird	*Sialia sialis*	O	Ground Gleaner	Tree Cavity-Crevice		X	
	Wood Thrush	*Hylocichla mustelina*	O	Ground Gleaner	Tree-Branch			X
Tyrannidae	Eastern Kingbird	*Tyrannus tyrannus*	I	Air Sallier	Tree-Twig	X	X	
	Eastern Phoebe	*Sayornis phoebe*	I	Air Sallier	Buildings	X	X	
	Eastern Wood-Pewee	*Contopus virens*	I	Air Sallier	Tree Branch			X
Tytonidae	Common Barn-Owl	*Tyto alba*	C	Ground Pouncer	Buildings		X	
Vireonidae	Red-eyed Vireo	*Vireo olivaceus*	I	Upper Canopy Gleaner	Tree-Twig			X
Mammals								
Canidae	Coyote	*Canis latrans*	O	Ground Forager	Terrestrial Subsurface			X
	Red Fox	*Vulpes vulpes*	O	Ground Forager	Terrestrial Subsurface		X	X
Cervidae	White-tailed Deer	*Odocoileus virginianus*	H	Ground Grazer	Ground-Herb		X	X
Cricetidae	Meadow Vole	*Microtus pennsylvanicus*	H	Ground Grazer	Terrestrial Subsurface		X	
	Muskrat	*Ondatra zibethicus*	H	Water Grazer	Riparian Subsurface	X		
	White-footed Mouse	*Peromyscus leucopus*	O	Ground Forager	Terrestrial Subsurface		X	X
	Woodland Vole	*Microtus pinetorum*	H	Ground Grazer	Terrestrial Subsurface			X
Didelphidae	Virginia Opossum	*Didelphis virginiana*	O	Ground Forager	Tree Cavity-Crevice	X	X	X

TABLE J-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
Leporidae	Eastern Cottontail	*Sylvilagus floridanus*	H	Ground Grazer	Ground-Herb		X	X
Muridae	House Mouse	*Mus musculus*	O	Ground Forager	Buildings		X	
	Norway Rat	*Rattus norvegicus*	O	Ground Forager	Terrestrial Subsurface		X	
Mustelidae	Ermine	*Mustela erminea*	C	Ground Pursuer	Ground-Herb			X
	Long-tailed Weasel	*Mustela frenata*	C	Ground Pursuer	Terrestrial Subsurface			X
	Striped Skunk	*Mephitis mephitis*	O	Ground Forager	Terrestrial Subsurface		X	X
Procyonidae	Raccoon	*Procyon lotor*	O	Ground Forager	Tree Cavity-Crevice	X	X	X
Sciuridae	Red Squirrel	*Tamiasciurus hudsonicus*	G	Upper Canopy Forager	Tree Cavity-Crevice			X
	Woodchuck	*Marmota monax*	H	Ground Grazer	Terrestrial Subsurface		X	
Soricidae	Masked Shrew	*Sorex cinereus*	I	Ground Gleaner	Terrestrial Subsurface		X	X
	N. Short-tailed Shrew	*Blarina brevicauda*	I	Ground Gleaner	Terrestrial Subsurface		X	X
Talpidae	Eastern Mole	*Scalopus aquaticus*	I	Ground Gleaner	Terrestrial Subsurface		X	
Vespertilionidae	Big Brown Bat	*Eptesicus fuscus*	I	Air Hawker	Buildings	X	X	
	Little Brown Bat	*Myotis lucifugus*	I	Air Hawker	Buildings	X	X	
	Red Bat	*Lasiurus borealis*	I	Air Hawker	Tree-Twig	X	X	X
Zapodidae	Meadow Jumping Mouse	*Zapus hudsonius*	O	Ground Forager	Ground-Herb		X	X
	Woodland Jumping Mouse	*Napaeozapus insignis*	O	Ground Forager	Ground-Herb			X
Reptiles								
Chelydridae	Snapping Turtle	*Chelydra serpentina*	O	Bottom Forager	Riparian Subsurface	X		
Colubridae	Black Rat Snake	*Elaphe o. obsoleta*	C	Ground Ambusher	Terrestrial Subsurface			X
	Eastern Garter Snake	*Thamnophia s. sirtalis*	C	Ground Ambusher	Terrestrial Subsurface	X	X	X
	Eastern Hognose Snake	*Heterodon platyrhinos*	C	Ground Ambusher	Terrestrial Subsurface		X	
	Eastern Kingsnake	*Lampropeltis getulus*	C	Ground Ambusher	Terrestrial Subsurface	X		X
	Eastern Milk Snake	*Lampropeltis t. triangulum*	C	Ground Ambusher	Terrestrial Subsurface		X	X
	Eastern Ribbon Snake	*Thamnophis s. sauritus*	C	Water Ambusher	Riparian Subsurface	X		
	Northern Black Racer	*Coluber c. constrictor*	C	Ground Ambusher	Terrestrial Subsurface		X	X
	Northern Brown Snake	*Storeria d. dekayi*	I	Ground Ambusher	Terrestrial Subsurface		X	X
	Northern Redbelly Snake	*Storeria o. occipitomaculata*	I	Ground Ambusher	Terrestrial Subsurface		X	X

TABLE J-2
POTENTIAL WILDLIFE SPECIES RECEPTORS
SMC FACILITY, NEWFIELD, NJ(1)

Family	Common Name	Scientific Name	Guild(2)	Forage Method	Breeding Substrate	Habitats Used		
						Pond/Stream	Grass	Forest
	Northern Ringneck Snake	*Diadophis punctatus edwardsi*	C	Ground Ambusher	Terrestrial Subsurface		X	X
	Northern Water Snake	*Nerodia s. sipedon*	C	Water Ambusher	Riparian Subsurface	X		X
	Rough Green Snake	*Opheodrys aestivus*	C	Ground Ambusher	Riparian Subsurface	X		X
Emydidae	Eastern Box Turtle	*Terrapene c. carolina*	O	Ground Forager	Terrestrial Subsurface		X	X
	Eastern Painted Turtle	*Chrysemys p. picta*	O	Bottom Forager	Terrestrial Subsurface	X		
	Red-bellied Turtle	*Chrysemys rubriventris*	O	Bottom Forager	Terrestrial Subsurface	X		
	Spotted Turtle	*Clemmys guttata*	O	Bottom Forager	Riparian Subsurface	X		
Kinosternidae	Musk Turtle	*Sternotherus odoratus*	C	Bottom Forager	Riparian Subsurface	X		
	Mud Turtle	*Kinosternon subrubrum*	O	Bottom Forager	Riparian Subsurface	X		
Scincidae	Five-lined Skink	*Eumeces fasciatus*	I	Ground Ambusher	Terrestrial Subsurface			X

(1) Includes resident and breeding amphibian, avian, mammalian, and reptilian species within the areas of aquatic habitat, grassland, and forest. Migratory and wintering species are also likely to use the area; however, these species would have a lesser potential for exposure to site contaminants than species inhabiting the site for extended periods.

(2) Guilds include:
C: Carnivore I: Insectivore P: Piscivore
H: Herbivore O: Omnivore G: Granivore
F: Frugivore (fruit-eating)

TABLE J-3

MACROBENTHIC SURVEY RESULTS

	Functional Group	Sample ID							
		SD-9A	SD-10	SD-14	SD-17	SD-19	SD-23	SD-30	SD-35
EPHEMEROPTERA									
Caenis	COLLECTOR	97	34	0	1	9	0	0	0
Baetis	COLLECTOR	0	0	0	19	4	0	0	1
Callibaetis	COLLECTOR	6	6	5	0	3	0	0	0
Siphlonurus	COLLECTOR	0	0	1	0	0	0	0	0
TOTAL		103	40	6	20	16	0	0	1
ODONATA									
Enallagma	PREDATOR	131	74	1	0	36	0	0	16
Tetragoneuria	PREDATOR	1	0	0	0	0	0	0	0
Calopteryx	PREDATOR	0	0	0	1	0	0	1	8
Argia	PREDATOR	0	0	0	3	0	0	0	0
Erythemis	PREDATOR	1	0	0	0	0	0	0	0
Aeshna	PREDATOR	4	0	0	0	0	0	0	0
Anax	PREDATOR	0	5	0	0	0	0	0	0
Pantala	PREDATOR	0	2	0	0	6	0	0	0
Tramea	PREDATOR	0	3	0	0	1	0	0	0
Libellula	PREDATOR	0	0	4	0	0	0	1	0
Neurocordulia	PREDATOR	0	0	0	0	0	0	0	1
Basiaeschna	PREDATOR	0	0	0	0	0	0	0	4
TOTAL		137	84	5	4	43	0	2	29
HEMIPTERA									
Ranatra	PREDATOR	1	0	0	0	0	0	0	0
Pelocoris	PREDATOR	0	4	0	0	1	0	1	0
Belostoma	PREDATOR	0	1	0	1	0	0	0	0
Buenoa	PREDATOR	0	1	0	0	0	0	0	0
Notonecta	PREDATOR	0	2	0	0	0	0	0	5
Rheumatobates	PREDATOR	0	1	0	0	0	0	0	0
Limnogonus	PREDATOR	0	0	1	0	1	0	6	6
Callecorixia	PREDATOR	0	0	0	1	0	0	0	0
TOTAL		1	9	1	2	2	0	7	11
MEGALOPTERA									
Sialis	PREDATOR	1	0	0	0	2	0	0	0
TOTAL		1	0	0	0	2	0	0	0
TRICHOPTERA									
Ptilostomis	SHREDDER	0	0	2	1	0	0	0	0
Cheumatopsyche	COLLECTOR	0	0	1	6	0	0	0	0
Oecitis	PREDATOR	0	0	1	0	0	0	0	0
Polycentropus	PREDATOR	0	0	0	0	0	0	0	2
Platycentropus	PREDATOR	0	0	0	0	0	0	0	1
Limnephilus	SHREDDER	0	0	0	0	0	0	0	4
TOTAL		0	0	4	7	0	0	0	7
LEPIDOPTERA									
Paraponynx	SHREDDER	0	0	0	0	0	0	0	1
TOTAL		0	0	0	0	0	0	0	1
COLEOPTERA									
Dineutus	PREDATOR	0	1	0	1	0	0	0	0
Peltodytes	PREDATOR	0	1	0	4	3	0	0	0
Laccophilus	PREDATOR	0	1	0	0	0	0	0	0
Agabus	PREDATOR	0	0	0	0	0	0	0	6
Elmidae(?)	SCRAPER	0	0	0	0	0	0	1	0

TABLE J-3

MACROBENTHIC SURVEY RESULTS

	Functional Group	Sample ID							
		SD-9A	SD-10	SD-14	SD-17	SD-19	SD-23	SD-30	SD-35
TOTAL		0	3	0	5	3	0	1	6
DIPTERA									
Chironomidae	COLLECTOR	93	186	48	19	46	0	5	14
Tipula	SHREDDER	0	0	0	0	0	0	1	0
Tabanus	PREDATOR	0	0	1	0	0	0	0	0
Bezzia	PREDATOR	0	0	1	0	0	0	0	0
Stratiomys	COLLECTOR	1	0	0	0	0	0	0	0
TOTAL		94	186	50	19	46	0	6	14
OLIGOCHAETA	COLLECTOR	2	4	1	2	1	0	24	15
MOLLUSCA									
Pisidium	FILTERER	0	0	0	0	0	113	15	15
Planorbidae	SCRAPER	0	0	0	0	0	0	0	1
Physidae	SCRAPER	31	37	2	0	3	184	1	5
TOTAL		31	37	2	0	3	297	16	21
CRUSTACEA									
Orconectes	COLLECTOR	0	0	0	3	0	0	0	0
Hyalella	COLLECTOR	17	20	0	1	0	0	62	0
Caecidotea	COLLECTOR	0	0	0	0	0	0	0	6
TOTAL		17	20	0	4	0	0	62	6
HIRUDINEA	PARASITE	0	1	0	0	0	1	2	0
HYDRACHNIDIA									
Rhyncholimnochares	PARASITE	5	0	0	1	3	0	0	0
Protzia	PARASITE	0	1	0	0	0	0	0	0
TOTAL		5	1	0	1	3	0	0	0

NA = Not Available

State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

Bradley M. Campbell
Commissioner

January 20, 2005

Jean Oliva
TRC Environmental Corporation
5 Waterside Crossing
Windsor, CT 06095-1563

Re: Shieldalloy Metallurgical Corporation, 12 West Boulevard, Newfield, NJ

Dear Ms. Oliva:

Thank you for your data request regarding rare species information for the above referenced project site in Newfield Borough and Vineland City, Gloucester and Cumberland Counties.

Searches of the Natural Heritage Database and the Landscape Project (Version 2) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
eastern box turtle	*Terrapene carolina*		Special Concern	G5	S5B

Neither the Natural Heritage Database nor the Landscape Project has records for any additional rare wildlife species or wildlife habitat within 1/4 mile of the referenced site.

We have also checked the Natural Heritage Database for occurrences of rare plant species or natural communities. The Natural Heritage Data Base does not have any records for rare plants or natural communities on or within 1/4 mile of the site.

Attached are lists of rare species and natural communities that have been documented from Gloucester and Cumberland Counties. If suitable habitat is present at the project site, these species have potential to be present.

Status and rank codes used in the tables and lists are defined in the attached EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, http://www.state.nj.us/dep/gis/imapnj/imapnj.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
Lawrence Niles
NHP File No. 05-3907551

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

LE	Taxa formally listed as endangered.
LT	Taxa formally listed as threatened.
PE	Taxa already proposed to be formally listed as endangered.
PT	Taxa already proposed to be formally listed as threatened.
C	Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
S/A	Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

D	Declining species-a species which has exhibited a continued decline in population numbers over the years.
E	Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
EX	Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state.
I	Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man.
INC	Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
T	Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
P	Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
S	Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
U	Undetermined species-a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a duel status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

E Native New Jersey plant species whose survival in the State or nation is in jeopardy.

REGIONAL STATUS CODES FOR PLANTS

LP Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.

EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

GLOBAL ELEMENT RANKS

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout it's range; with the number of occurrences in the range of 21 to 100.

G4 Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.

GH Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU Possibly in peril range-wide but status uncertain; more information needed.

GX Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? Species has not yet been ranked.

STATE ELEMENT RANKS

S1 Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

S4 Apparently secure in state, with many occurrences.

S5 Demonstrably secure in state and essentially ineradicable under present conditions.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).

SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.

SP Element has potential to occur in New Jersey, but no occurrences have been reported.

SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.

SRF Elements erroneously reported from New Jersey, but this error persists in the literature.

SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.

SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

B Refers to the breeding population of the element in the state.

N Refers to the non-breeding population of the element in the state.

T Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "G5T? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.

Q Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

.1 Elements documented from a single location.

Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

IDENTIFICATION CODES

These codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

Y Identification has been verified and is indicative of significant habitat.

BLANK Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.

? Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.

CUMBERLAND COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates						
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER		E		G5T5	S2
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5	S2B,S4N
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B,S2N
CALIDRIS CANUTUS	RED KNOT		T		G5	S3N
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5	S1B,S3N
CISTOTHORUS PLATENSIS	SEDGE WREN		E		G5	S1B
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4	S2
ELAPHE GUTTATA GUTTATA	CORN SNAKE		E		G5T5	S1
EUMECES FASCIATUS	FIVE-LINED SKINK		U		G5	S3
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B,S2N
HYLA ANDERSONII	PINE BARRENS TREEFROG		T		G4	S3
HYLA CHRYSOSCELIS	COPE'S GRAY TREEFROG		E		G5	S2
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5	S3B
LATERALLUS JAMAICENSIS	BLACK RAIL		T/T		G4	S2B
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
NOTROPIS CHALYBAEUS	IRONCOLOR SHINER				G4	S1S2
PANDION HALIAETUS	OSPREY		T/T		G5	S2B
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B,S4N
PITUOPHIS MELANOLEUCUS MELANOLEUCUS	NORTHERN PINE SNAKE		T		G4T4	S3
POOECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B
STRIX VARIA	BARRED OWL		T/T		G5	S3B
SYNAPTOMYS COOPERI	SOUTHERN BOG LEMMING		U		G5	S2
VIRGINIA VALERIAE VALERIAE	EASTERN SMOOTH EARTH SNAKE		U		G5T5	SU

CUMBERLAND COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
** Ecosystems						
BRACKISH TIDAL MARSH COMPLEX	BRACKISH TIDAL MARSH COMPLEX				G4	S2?
CAREX STRIATA VAR BREVIS HERBACEOUS VEGETATION	WALTER'S SEDGE COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G?	S1S3
COASTAL PLAIN INTERMITTENT POND	VERNAL POND				G3?	S2S3
FRESHWATER TIDAL MARSH COMPLEX	FRESHWATER TIDAL MARSH COMPLEX				G4?	S3?
PANICUM RIGIDULUM VAR PUBESCENS - DICHANTHELIUM SP / SPHAGNUM SPP HERBACEOUS VEGETATION	REDTOP PANICGRASS - ROSETTE GRASS / SPHAGNUM MOSS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2	S2
PANICUM VIRGATUM HERBACEOUS VEGETATION	SWITCHGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G?	S1?
RHEXIA VIRGINICA - PANICUM VERRUCOSUM HERBACEOUS VEGETATION	VIRGINIA MEADOW-BEAUTY - WARTY PANICGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2G3	S1S3
** Invertebrates						
ANAX LONGIPES	COMET DARNER				G5	S2S3
APAMEA APAMIFORMIS	A NOCTUID MOTH				G4	S2S4
APAMEA INEBRIATA	A NOCTUID MOTH				G3G4	S2S4
BOLORIA SELENE MYRINA	A SILVER-BORDERED FRITILLARY		T		G5T5	S2
CALLOPHRYS HENRICI	HENRY'S ELFIN				G5	S3S4
CALLOPHRYS HESSELI	HESSEL'S HAIRSTREAK				G3G4	S3S4
CALLOPHRYS IRUS	FROSTED ELFIN		T		G3	S2S3
CATOCALA CONSORS SORSCONI	THE CONSORT UNDERWING				G4T2T4	S1S3

CUMBERLAND COUNTY
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CATOCALA PRETIOSA PRETIOSA	PRECIOUS UNDERWING				G4T2T3	S2S3
CELITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4
CELITHEMIS VERNA	DOUBLE-RINGED PENNANT				G5	S2
CHLOROPTERYX TEPPERARIA	ANGLE WINGED EMERALD MOTH				G4	SU
CISTHENE KENTUCKIENSIS	KENTUCKY LICHEN MOTH				G4	SH
ENALLAGMA PICTUM	SCARLET BLUET				G3	S3
ENALLAGMA RECURVATUM	PINE BARRENS BLUET				G3	S3
EUSARCA FUNDARIA	A GEOMETRID MOTH				G4	S2S3
FARONTA RUBRIPENNIS	PINK STREAK				G3G4	S3
GOMPHUS APOMYIUS	BANNER CLUBTAIL				G4	S1
HEMARIS GRACILIS	GRACEFUL CLEARWING				G3G4	SU
HESPERIA ATTALUS SLOSSONAE	DOTTED SKIPPER				G3G4T3	S2S3
HESPERIA LEONARDUS	LEONARD'S SKIPPER				G4	S2
IDAEA OBFUSARIA	RIPPLED WAVE				G4G5	S2S4
IDAEA VIOLACEARIA	A GEOMETRID MOTH				G4	S1S3
LIBELLULA AURIPENNIS	GOLDEN-WINGED SKIMMER				G5	S1S2
LIBELLULA AXILENA	BAR-WINGED SKIMMER				G5	S3B,S2N
LIGUMIA NASUTA	EASTERN PONDMUSSEL		T		G4G5	S1
LITHOPHANE LEMMERI	LEMMER'S NOCTUID MOTH				G3G4	S2
LITHOPHANE LEPIDA ADIPEL	A NOCTUID MOTH				G4T4	S3S4
LYCAENA HYLLUS	BRONZE COPPER		E		G5	S2
MACROCHILO HYPOCRITALIS	A NOCTUID MOTH				G4	S3S4
MACROCHILO SANTERIVALIS	A NOCTUID MOTH				G3G4	S1S3
MACROCHILO SP 1	A NOCTUID MOTH				G3	S3
MEROPLEON TITAN	A NOCTUID MOTH				G2G4	S1
METARRANTHIS PILOSARIA	COASTAL BOG METARRANTHIS				G3G4	S3S4
METARRANTHIS SP 1	A GEOMETRID MOTH				G3	S2
PAPAIPEMA STENOCELIS	CHAIN FERN BORER MOTH				G4	S3
PROBLEMA BULENTA	RARE SKIPPER				G2G3	S2
SOMATOCHLORA PROVOCANS	TREETOP EMERALD				G4	S2S3

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SPEYERIA IDALIA	REGAL FRITILLARY				G3	SH
SYMPETRUM AMBIGUUM	BLUE-FACED MEADOWHAWK				G5	S2
TARACHIDIA SEMIFLAVA	HALF YELLOW MOTH				G4	S2S4
** Other types						
BALD EAGLE WINTERING SITE	BALD EAGLE WINTERING SITE				G?	S?
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?
PRIMEVAL FOREST	PRIMEVAL FOREST				G3?	S1
** Vascular plants						
AESCHYNOMENE VIRGINICA	SENSITIVE JOINT-VETCH	LT	E	LP	G2	S1
AGASTACHE SCROPHULARIIFOLIA	PURPLE GIANT-HYSSOP				G4	S2
ARETHUSA BULBOSA	DRAGON MOUTH				G4	S2
ARISTIDA VIRGATA	WAND-LIKE THREE-AWN GRASS				G5T4T5	S2
ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
ASCLEPIAS VARIEGATA	WHITE MILKWEED				G5	S2
ASTER CONCOLOR	EASTERN SILVERY ASTER			LP	G4?	S2
BIDENS BIDENTOIDES	ESTUARY BURR-MARIGOLD				G3	S2
BOLTONIA ASTEROIDES VAR ASTEROIDES	ASTER-LIKE BOLTONIA				G5T4T5	S2
CALYSTEGIA SPITHAMAEA	ERECT BINDWEED		E		G4G5T4T5	S1
CAREX BARRATTII	BARRATT'S SEDGE			LP	G4	S4
CAREX MITCHELLIANA	MITCHELL'S SEDGE				G3G4	S2
CAREX TYPHINA	CAT-TAIL SEDGE				G5	S3
CAREX UTRICULATA	BOTTLE-SHAPED SEDGE				G5	S2
CHENOPODIUM PRATERICOLA	NARROW-LEAF GOOSEFOOT				G5	S2
CHIONANTHUS VIRGINICUS	FRINGETREE				G5	S3
CLITORIA MARIANA	BUTTERFLY-PEA		E		G5	S1
COREOPSIS ROSEA	ROSE-COLOR COREOPSIS			LP	G3	S2

CUMBERLAND COUNTY
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CROTON WILLDENOWII	ELLIPTICAL RUSHFOIL			LP	G5	S2
CUSCUTA CORYLI	HAZEL DODDER				G5	S2
CUSCUTA POLYGONORUM	SMARTWEED DODDER				G5	S2
CYPERUS ENGELMANNII	ENGELMANN'S FLAT SEDGE				G4Q	S2
CYPERUS POLYSTACHYOS	COAST FLAT SEDGE		E		G5T5	S1
DESMODIUM LAEVIGATUM	SMOOTH TICK-TREFOIL				G5	S3
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL			LP	G4	S2
DESMODIUM VIRIDIFLORUM	VELVETY TICK-TREEFOIL				G5?	S2
DIOSCOREA VILLOSA VAR HIRTICAULIS	HAIRY-STEM WILD YAM				G4G5T3Q	S2
ELATINE AMERICANA	AMERICAN WATERWORT				G4	S2
ELATINE MINIMA	SMALL WATERWORT				G5	S2
ELEOCHARIS EQUISETOIDES	KNOTTED SPIKE-RUSH		E	LP	G4	S1
ELEOCHARIS MELANOCARPA	BLACK-FRUIT SPIKE-RUSH		E		G4	S1
ELEOCHARIS QUADRANGULATA	ANGLED SPIKE-RUSH				G4	S2
ELEOCHARIS TORTILIS	TWISTED SPIKE-RUSH		E		G5	S1
ERAGROSTIS HIRSUTA	STOUT LOVE GRASS				G5	S1.1
ERIOCAULON PARKERI	PARKER'S PIPEWORT				G3	S2
ERIOPHORUM TENELLUM	ROUGH COTTON-GRASS		E		G5	S1
EUPATORIUM AROMATICUM VAR AROMATICUM	SMALLER WHITE SNAKEROOT				G5T5	S1
EUPATORIUM CAPILLIFOLIUM	DOG-FENNEL THOROUGHWORT		E		G5	S1
EUPATORIUM RESINOSUM	PINE BARREN BONESET		E	LP	G3	S2
GALACTIA VOLUBILIS	DOWNY MILK-PEA		E		G5	SH
GENTIANA AUTUMNALIS	PINE BARREN GENTIAN			LP	G3	S3
GENTIANA VILLOSA	STRIPED GENTIAN				G4	SX.1
GNAPHALIUM HELLERI	SMALL EVERLASTING		E		G4G5T3?	SH
GRATIOLA VIRGINIANA	ROUND-FRUIT HEDGE-HYSSOP				G5	S2
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3
HYPERICUM ADPRESSUM	BARTON'S ST. JOHN'S-WORT		E		G2G3	S2

0 AUG 2004

CUMBERLAND COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
HYPERICUM GYMNANTHUM	CLASPING-LEAF ST. JOHN'S-WORT				G4	S1
JUNCUS CAESARIENSIS	NEW JERSEY RUSH		E	LP	G2	S2
LESPEDEZA STUEVEI	STUEVE'S DOWNY BUSH-CLOVER				G4?	S2
LOBELIA CANBYI	CANBY'S LOBELIA			LP	G4	S3
MALUS ANGUSTIFOLIA VAR PUBERULA	SPINY WILD CRABAPPLE				G5?T2T4	S2
MUHLENBERGIA TORREYANA	PINE BARREN SMOKE GRASS			LP	G3	S3
MYRIOPHYLLUM PINNATUM	CUTLEAF WATER-MILFOIL		E		G5	S1
MYRIOPHYLLUM VERTICILLATUM	WHORLED WATER-MILFOIL		E		G5	SH
NUPHAR MICROPHYLLUM	SMALL YELLOW POND-LILY		E		G5T4T5	SH
NYMPHOIDES CORDATA	FLOATINGHEART			LP	G5	S3
OBOLARIA VIRGINICA	VIRGINIA PENNYWORT				G5	S2
ONOSMODIUM VIRGINIANUM	VIRGINIA FALSE-GROMWELL		E		G4	S1
OPHIOGLOSSUM VULGATUM VAR PYCNOSTICHUM	SOUTHERN ADDER'S-TONGUE		E		G5	S1
PANICUM HEMITOMON	MAIDEN-CANE			LP	G5?	S2
PANICUM WRIGHTIANUM	WRIGHT'S PANIC GRASS				G4	S2
PASPALUM DISSECTUM	MUDBANK CROWN GRASS				G4?	S2
PENSTEMON LAEVIGATUS	SMOOTH BEARDTONGUE		E		G5	S1
PHORADENDRON LEUCARPUM	AMERICAN MISTLETOE			LP	G5	S2
PINUS SEROTINA	POND PINE				G5	S2
PINUS TAEDA	LOBLOLLY PINE				G5	S2
PLATANTHERA CILIARIS	YELLOW FRINGED ORCHID			LP	G5	S2
POLYGALA INCARNATA	PINK MILKWORT		E		G5	SH
POLYGALA MARIANA	MARYLAND MILKWORT			LP	G5	S2
POLYGALA POLYGAMA	RACEMED MILKWORT				G5	S2
POLYGONUM DENSIFLORUM	DENSE-FLOWER KNOTWEED		E		G5	S1
POTAMOGETON OAKESIANUS	OAKES' PONDWEED				G4	S2
PRENANTHES AUTUMNALIS	PINE BARREN RATTLESNAKE-ROOT			LP	G4G5	S2
PRUNUS ANGUSTIFOLIA	CHICKASAW PLUM		E		G5T4T5	S2

CUMBERLAND COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
PUCCINELLIA FASCICULATA	SALTMARSH ALKALI GRASS				G3G5	S2
QUERCUS LYRATA	OVERCUP OAK		E		G5	S1
QUERCUS NIGRA	WATER OAK		E		G5	S1
RHODODENDRON ATLANTICUM	DWARF AZALEA		E		G4G5	S1
RHYNCHOSPORA MICROCEPHALA	SMALL-HEAD BEAKED-RUSH		E		G5T5	S1
RHYNCHOSPORA NITENS	SHORT-BEAKED BALD-RUSH				G4?	S2
RHYNCHOSPORA PALLIDA	PALE BEAKED-RUSH				G3	S3
RUELLIA CAROLINIENSIS	CAROLINA PETUNIA		E		G5	SH
SAGITTARIA SUBULATA	AWL-LEAF ARROWHEAD				G4	S2
SCHIZAEA PUSILLA	CURLY GRASS FERN			LP	G3	S3
SCHOENOPLECTUS NOVAE-ANGLIAE	NEW ENGLAND BULRUSH				G5	S2
SCHWALBEA AMERICANA	CHAFFSEED	LE	E	LP	G2	S1
SCIRPUS MARITIMUS	SALTMARSH BULRUSH		E		G5	SH
SCLERIA MINOR	SLENDER NUT-RUSH			LP	G4	S4
SENECIO TOMENTOSUS	WOOLLY RAGWORT				G4G5	S2
SETARIA MAGNA	GIANT FOX-TAIL				G4G5	S2
SISYRINCHIUM FUSCATUM	SAND-PLAIN BLUE-EYED GRASS				G5?	S2
SPIRANTHES ODORATA	FRAGRANT LADIES'-TRESSES				G5	S2
SPOROBOLUS COMPOSITUS VAR COMPOSITUS	LONG-LEAF RUSH-GRASS				G5T5	S2
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2
STYLOSANTHES BIFLORA	PENCIL-FLOWER				G5	S3
TRICHOSTEMA SETACEUM	NARROW-LEAF BLUECURLS				G5	S2
UTRICULARIA PURPUREA	PURPLE BLADDERWORT			LP	G5	S3
VALERIANELLA RADIATA	BEAKED CORNSALAD		E		G5	S1
VERNONIA GLAUCA	BROAD-LEAF IRONWEED		E		G5	S1
VIOLA BRITTONIANA VAR BRITTONIANA	BRITTON'S COAST VIOLET				G4G5T4T5	S3

179 Records Processed

GLOUCESTER COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates						
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER		E		G5T5	S2
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5	S2B,S4N
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B,S2N
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2B
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B,S2N
HYLA ANDERSONII	PINE BARRENS TREEFROG		T		G4	S3
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
PANDION HALIAETUS	OSPREY		T/T		G5	S2B
PITUOPHIS MELANOLEUCUS MELANOLEUCUS	NORTHERN PINE SNAKE		T		G4T4	S3
PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5	S1B,S3N
POOECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
STRIX VARIA	BARRED OWL		T/T		G5	S3B
*** Ecosystems						
CLADIUM MARISCOIDES HERBACEOUS VEGETATION	TWIG-RUSH COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G3	S2

GLOUCESTER COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ELEOCHARIS (OLIVACEA, MICROCARPA, ROBBINSII) - XYRIS (DIFFORMIS VAR DIFFORMIS, SMALLIANA) HERBACEOUS VEGETATION	SPIKERUSH (SMALLFRUIT, BRIGHT GREEN, ROBBIN'S) - YELLOWEYED GRASS (BOG, SMALL'S) COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2	S2
FRESHWATER TIDAL MARSH COMPLEX	FRESHWATER TIDAL MARSH COMPLEX				G4?	S3?
RHEXIA VIRGINICA - PANICUM VERRUCOSUM HERBACEOUS VEGETATION	VIRGINIA MEADOW-BEAUTY - WARTY PANICGRASS COASTAL PLAIN INTERMITTENT POND HERBACEOUS VEGETATION				G2G3	S1S3
** Invertebrates						
ALASMIDONTA UNDULATA	TRIANGLE FLOATER		T		G4	S3
CATOCALA PRETIOSA PRETIOSA	PRECIOUS UNDERWING				G4T2T3	S2S3
CELITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4
ENALLAGMA PICTUM	SCARLET BLUET				G3	S3
FARONTA RUBRIPENNIS	PINK STREAK				G3G4	S3
GOMPHUS APOMYIUS	BANNER CLUBTAIL				G4	S1
ITAME SP. 1	BARRENS ITAME				G3	S3
LAMPSILIS CARIOSA	YELLOW LAMPMUSSEL		T		G3G4	S1
LAMPSILIS RADIATA	EASTERN LAMPMUSSEL		T		G5	S3
LEPTODEA OCHRACEA	TIDEWATER MUCKET		T		G4	S1
LIBELLULA AURIPENNIS	GOLDEN-WINGED SKIMMER				G5	S1S2
LIGUMIA NASUTA	EASTERN PONDMUSSEL		T		G4G5	S1
LITHOPHANE LEMMERI	LEMMER'S NOCTUID MOTH				G3G4	S2
MACROCHILO LOUISIANA	A NOCTUID MOTH				G4	S2S3
MACROCHILO SANTERIVALIS	A NOCTUID MOTH				G3G4	S1S3
MONOLEUCA SEMIFASCIA	A SLUG MOTH				G4G5	S2S3
NICROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	LE	E		G2G3	SH

GLOUCESTER COUNTY
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
PYRGUS WYANDOT	APPALACHIAN GRIZZLED SKIPPER		E		G2	SH
ZANCLOGNATHA SP 1	A NOCTUID MOTH				G3G4	S3
*** Other types						
BALD EAGLE WINTERING SITE	BALD EAGLE WINTERING SITE				G?	S?
*** Vascular plants						
AESCHYNOMENE VIRGINICA	SENSITIVE JOINT-VETCH	LT	E	LP	G2	S1
AGASTACHE NEPETOIDES	YELLOW GIANT-HYSSOP				G5	S2
ALOPECURUS CAROLINIANUS	TUFTED MEADOW-FOXTAIL				G5	S3S4
AMIANTHIUM MUSCITOXICUM	FLY POISON				G4G5	S2
ANEMONE CANADENSIS	CANADA ANEMONE				G5	SX
APLECTRUM HYEMALE	PUTTYROOT		E		G5	S1
ARISTIDA DICHOTOMA VAR CURTISSII	CURTISS' THREE-AWN GRASS				G5T5	S2
ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
ASCLEPIAS VARIEGATA	WHITE MILKWEED				G5	S2
ASCLEPIAS VERTICILLATA	WHORLED MILKWEED				G5	S2
ASIMINA TRILOBA	PAWPAW		E		G5	S1
ASTER CONCOLOR	EASTERN SILVERY ASTER			LP	G4?	S2
ASTER RADULA	LOW ROUGH ASTER		E		G5	S1
BIDENS BIDENTOIDES	ESTUARY BURR-MARIGOLD				G3	S2
BOUTELOUA CURTIPENDULA	SIDE-OATS GRAMA GRASS		E		G5T5	S1
CACALIA ATRIPLICIFOLIA	PALE INDIAN PLANTAIN		E		G4G5	S1
CALLITRICHE PALUSTRIS	MARSH WATER-STARWORT				G5	S2
CARDAMINE LONGII	LONG'S BITTERCRESS		E		G3	SH
CAREX BARRATTII	BARRATT'S SEDGE			LP	G4	S4
CAREX FRANKII	FRANK'S SEDGE				G5	S3
CAREX LIMOSA	MUD SEDGE		E		G5	S1
CAREX MITCHELLIANA	MITCHELL'S SEDGE				G3G4	S2

GLOUCESTER COUNTY
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CAREX POLYMORPHA	VARIABLE SEDGE		E		G3	S1
CAREX PRAIREA	PRAIRIE SEDGE				G5?	S2
CAREX UTRICULATA	BOTTLE-SHAPED SEDGE				G5	S2
CASTANEA PUMILA	CHINQUAPIN		E		G5	S1
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH				G5	S2
CORALLORHIZA WISTERIANA	SPRING CORALROOT				G5	SX
COREOPSIS ROSEA	ROSE-COLOR COREOPSIS			LP	G3	S2
CROTON WILLDENOWII	ELLIPTICAL RUSHFOIL			LP	G5	S2
CUPHEA VISCOSISSIMA	BLUE WAXWEED				G5?	S3
CYPERUS ENGELMANNII	ENGELMANN'S FLAT SEDGE				G4Q	S2
CYPERUS LANCASTRIENSIS	LANCASTER FLAT SEDGE		E		G5	S1
CYPERUS RETROFRACTUS	ROUGH FLATSEDGE		E		G5	SH
DALIBARDA REPENS	ROBIN-RUN-AWAY		E		G5	SH.1
DESMODIUM LAEVIGATUM	SMOOTH TICK-TREFOIL				G5	S3
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL			LP	G4	S2
DESMODIUM VIRIDIFLORUM	VELVETY TICK-TREEFOIL				G5?	S2
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER				G5	S2
DRABA REPTANS	CAROLINA WHITLOW-GRASS		E		G5	SH
ELEOCHARIS EQUISETOIDES	KNOTTED SPIKE-RUSH		E	LP	G4	S1
ELEOCHARIS TORTILIS	TWISTED SPIKE-RUSH		E		G5	S1
ELEPHANTOPUS CAROLINIANUS	CAROLINA ELEPHANT-FOOT		E		G5	SH
EPILOBIUM ANGUSTIFOLIUM SSP CIRCUMVAGUM	NARROW-LEAF FIREWEED				G5T5	S1
EPILOBIUM STRICTUM	DOWNY WILLOWHERB				G5?	S2
ERIOCAULON PARKERI	PARKER'S PIPEWORT				G3	S2
ERIOPHORUM GRACILE	SLENDER COTTON-GRASS		E		G5T?	SH
ERIOPHORUM TENELLUM	ROUGH COTTON-GRASS		E		G5	S1
EUPATORIUM RESINOSUM	PINE BARREN BONESET		E	LP	G3	S2
GLYCERIA LAXA	NORTHERN MANNA GRASS				G5	S1
GYMNOPOGON BREVIFOLIUS	SHORT-LEAF SKELETON GRASS		E		G5	S1

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3
HETERANTHERA MULTIFLORA	BOUQUET MUD-PLANTAIN				G4	S2
LESPEDEZA STUEVEI	STUEVE'S DOWNY BUSH-CLOVER				G4?	S2
LUDWIGIA LINEARIS	NARROW-LEAF PRIMROSE-WILLOW			LP	G5	S2
LUZULA ACUMINATA	HAIRY WOOD-RUSH		E		G5T4T5	S2
LYCOPODIELLA INUNDATA	NORTHERN BOG CLUB-MOSS				G5	S2
LYGODIUM PALMATUM	CLIMBING FERN			LP	G4	S2
LYSIMACHIA HYBRIDA	LOWLAND LOOSESTRIFE				G5	S3
MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH				G5	S2
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1
MICRANTHEMUM MICRANTHEMOIDES	NUTTALL'S MUDWORT		E		GH	SH
MUHLENBERGIA CAPILLARIS	LONG-AWN SMOKE GRASS		E		G5T?	S1
MUHLENBERGIA TORREYANA	PINE BARREN SMOKE GRASS			LP	G3	S3
NYMPHOIDES CORDATA	FLOATINGHEART			LP	G5	S3
OBOLARIA VIRGINICA	VIRGINIA PENNYWORT				G5	S2
ONOSMODIUM VIRGINIANUM	VIRGINIA FALSE-GROMWELL		E		G4	S1
PANICUM ACICULARE	BRISTLING PANIC GRASS		E		G4G5	S1
PASPALUM DISSECTUM	MUDBANK CROWN GRASS				G4?	S2
PENSTEMON LAEVIGATUS	SMOOTH BEARDTONGUE		E		G5	S1
PHASEOLUS POLYSTACHIOS VAR POLYSTACHIOS	WILD KIDNEY BEAN				G4T?	S2
PHLOX MACULATA VAR MACULATA	SPOTTED PHLOX				G5T?	S3
PHORADENDRON LEUCARPUM	AMERICAN MISTLETOE			LP	G5	S2
PINUS SEROTINA	POND PINE				G5	S2
PLATANTHERA CILIARIS	YELLOW FRINGED ORCHID			LP	G5	S2
POLYGALA INCARNATA	PINK MILKWORT		E		G5	SH
POLYGALA MARIANA	MARYLAND MILKWORT			LP	G5	S2
POLYGONUM HYDROPIPEROIDES VAR OPELOUSANUM	OPELOUSAS WATER-PEPPER				G5T?Q	S2
PRUNUS ANGUSTIFOLIA	CHICKASAW PLUM		E		G5T4T5	S2

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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
PUCCINELLIA FASCICULATA	SALTMARSH ALKALI GRASS				G3G5	S2
PYCNANTHEMUM TORREI	TORREY'S MOUNTAIN-MINT		E		G2	S1
QUERCUS IMBRICARIA	SHINGLE OAK		E		G5	S1.1
QUERCUS MUEHLENBERGII	YELLOW OAK				G5	S3
RANUNCULUS AMBIGENS	WATER-PLANTAIN SPEARWORT				G4	S2
RANUNCULUS LONGIROSTRIS	LONG-BEAK WATER BUTTERCUP				G5	S2
RHYNCHOSPORA GLOBULARIS	COARSE GRASS-LIKE BEAKED-RUSH		E		G5?	S1
RHYNCHOSPORA INUNDATA	SLENDER HORNED-RUSH			LP	G3G4	S2
RHYNCHOSPORA NITENS	SHORT-BEAKED BALD-RUSH				G4?	S2
RHYNCHOSPORA PALLIDA	PALE BEAKED-RUSH				G3	S3
RHYNCHOSPORA SCIRPOIDES	LONG-BEAK BALD-RUSH				G4	S2
ROTALA RAMOSIOR	TOOTHCUP				G5	S3
SAGITTARIA SUBULATA	AWL-LEAF ARROWHEAD				G4	S2
SCHEUCHZERIA PALUSTRIS	ARROW-GRASS		E		G5T5	SH
SCHIZAEA PUSILLA	CURLY GRASS FERN			LP	G3	S3
SCUTELLARIA NERVOSA	VEINED SKULLCAP				G5	S2
SISYRINCHIUM FUSCATUM	SAND-PLAIN BLUE-EYED GRASS				G5?	S2
SPHENOPHOLIS PENSYLVANICA	SWAMP OATS				G4	S2
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES		E		G4G5	S1
SPIRANTHES ODORATA	FRAGRANT LADIES'-TRESSES				G5	S2
SPOROBOLUS COMPOSITUS VAR COMPOSITUS	LONG-LEAF RUSH-GRASS				G5T5	S2
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2
STACHYS TENUIFOLIA	SMOOTH HEDGE-NETTLE				G5	S3
THASPIUM BARBINODE	HAIRY-JOINT MEADOW-PARSNIP				G5	SX
TIPULARIA DISCOLOR	CRANEFLY ORCHID				G4G5	S3
TRICHOSTEMA SETACEUM	NARROW-LEAF BLUECURLS				G5	S2
UTRICULARIA BIFLORA	TWO-FLOWER BLADDERWORT		E		G5	S1
UTRICULARIA GIBBA	HUMPED BLADDERWORT			LP	G5	S3
VALERIANELLA RADIATA	BEAKED CORNSALAD		E		G5	S1

GLOUCESTER COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
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NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E		G5	S1
VERNONIA GLAUCA	BROAD-LEAF IRONWEED		E		G5	S1
VULPIA ELLIOTEA	SQUIRREL-TAIL SIX-WEEKS GRASS		E		G5	SH

154 Records Processed

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Service
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609-646-9310
Fax: 609-646-0352
http://njfieldoffice.fws.gov

IN REPLY REFER TO:
ES-05-NE-010

JAN 3 1 2005

Jean M. Oliva, Senior Consulting Engineer
TRC
5 Waterside Crossing
Windsor, Connecticut 06095-1563
Fax number: (860) 298-6399

Reference: Threatened and endangered species review within the vicinity of the proposed Shieldalloy Metallurgical Corporation radio logical remedial action (TRC Project No. 26770-0100-00000), located within Newfield, Gloucester County New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

Except for an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed endangered or threatened flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. Therefore, no further consultation pursuant to Section 7 of the Endangered Species Act is required by the Service. This determination is based on the best available information. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered. Please be aware that this determination is valid for 90 days; therefore, if the project is not initiated within this time, the Service should be contacted prior to project implementation to verify the accuracy of this information. The Service will review current information to ensure that no federally listed threatened or endangered species will be adversely affected by the proposed project.

Enclosed is current information regarding federally listed and candidate species occurring in New Jersey. The Service encourages federal agencies and other planners to consider candidate species in project planning. The addresses of State agencies that may be contacted for current site-specific information regarding federal candidate and State-listed species are also enclosed.

Authorizing Supervisor: _____

Enclosures: Current summaries of federally listed and candidate species in New Jersey
Addresses for additional information on candidate and State-listed species

Sect 7 (es-NEeot7.fax) 11/24/03

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An ENDANGERED species is any species that is in danger of extinction throughout all or a significant portion of its range.

A THREATENED species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

	COMMON NAME	SCIENTIFIC NAME	STATUS
FISHES	Shortnose sturgeon	*Acipenser brevirostrum*	E
REPTILES	Bog turtle	*Clemmys muhlenbergii*	T
	Atlantic Ridley turtle	*Lepidochelys kempii*	E
	Green turtle	*Chelonia mydas*	T
	Hawksbill turtle	*Eretmochelys imbricata*	E
	Leatherback turtle	*Dermochelys coriacea*	E
	Loggerhead turtle	*Caretta caretta*	T
BIRDS	Bald eagle	*Haliaeetus leucocephalus*	T
	Piping plover	*Charadrius melodus*	T
	Roseate tern	*Sterna dougallii dougallii*	E
MAMMALS	Eastern cougar	*Felis concolor couguar*	E+
	Indiana bat	*Myotis sodalis*	E
	Gray wolf	*Canis lupus*	E+
	Delmarva fox squirrel	*Sciurus niger cinereus*	E+
	Blue whale*	*Balaenoptera musculus*	E
	Finback whale*	*Balaenoptera physalus*	E
	Humpback whale*	*Megaptera novaeangliae*	E
	Right whale*	*Balaena glacialis*	E
	Sei whale*	*Balaenoptera borealis*	E
	Sperm whale*	*Physeter macrocephalus*	E

	COMMON NAME	SCIENTIFIC NAME	STATUS
INVERTEBRATES	Dwarf wedgemussel	*Alasmidonta heterodon*	E
	Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	T
	Mitchell's satyr butterfly	*Neonympha m. mitchellii*	E+
	American burying beetle	*Nicrophorus americanus*	E+
PLANTS	Small whorled pogonia	*Isotria medeoloides*	T
	Swamp pink	*Helonias bullata*	T
	Knieskern's beaked rush	*Rhynchospora knieskernii*	T
	American chaff seed	*Schwalbea americana*	E
	Sensitive joint vetch	*Aeschynomene virginica*	T
	Seabeach amaranth	*Amaranthus pumilus*	T

STATUS			
E	endangered species	PE	proposed endangered
T	threatened species	PT	proposed threatened
+	presumed extirpated**		

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

** Current records indicate the species does not presently occur in New Jersey, although the species did occur in the State historically.

Note: for a complete listing of Endangered and Threatened Wildlife and Plants, refer to 50 CFR 17.11 and 17.12.

For further information, please contact:

U.S. Fish and Wildlife Service
New Jersey Field Office
927 N. Main Street, Building D
Pleasantville, New Jersey 08232
Phone: (609) 646-9310
Fax: (609) 646-0352

Revised 12/15/04

FEDERAL CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES are species that appear to warrant consideration for addition to the federal List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

SPECIES	SCIENTIFIC NAME
Bog asphodel	*Narthecium americanum*
Hirst's panicgrass	*Dichanthelium hirstii*

Note: For complete listings of taxa under review as candidate species, refer to Federal Register Vol. 69, No. 86, May 4, 2004 (Endangered and Threatened Wildlife and Plants; Review of Species that are Candidates or Proposed for Listing as Endangered or Threatened).

Revised June 2004

FEDERAL CANDIDATE AND STATE-LISTED SPECIES

Candidate species are species under consideration by the U.S. Fish and Wildlife Service (Service) for possible inclusion on the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to consider federal candidate species in project planning.

The New Jersey Natural Heritage Program maintains the most up-to-date information on federal candidate species and State-listed species in New Jersey and may be contacted at the following address:

Coordinator
Natural Heritage Program
Division of Parks and Forestry
P.O. Box 404
Trenton, New Jersey 08625
(609) 984-0097

Additionally, information on New Jersey's State-listed wildlife species may be obtained from the following office:

Dr. Larry Niles
Endangered and Nongame Species Program
Division of Fish and Wildlife
P.O. Box 400
Trenton, New Jersey 08625
(609) 292-9400

If information from either of the aforementioned sources reveals the presence of any federal candidate species within a project area, the Service should be contacted to ensure that these species are not adversely affected by project activities.

Revised 07/03

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.
18 COMMERCE STREET PLAZA • FLEMINGTON, NJ 08822
(908) 788-9676 • FAX (908) 788-6788
PA (610) 250-0773

June 14, 1994

Mr. Sean Hayden
TRC Environmental Corporation
5 Waterside Crossing
Windsor, CT 06095

Re: Endangered and Threatened Plant Species Survey
and Stressed Vegetation Survey
Shieldalloy Metallurgical Corporation Superfund Site
Newfield Borough, Gloucester County, NJ
City of Vineland, Cumberland County, NJ
ASGECI Project #1111

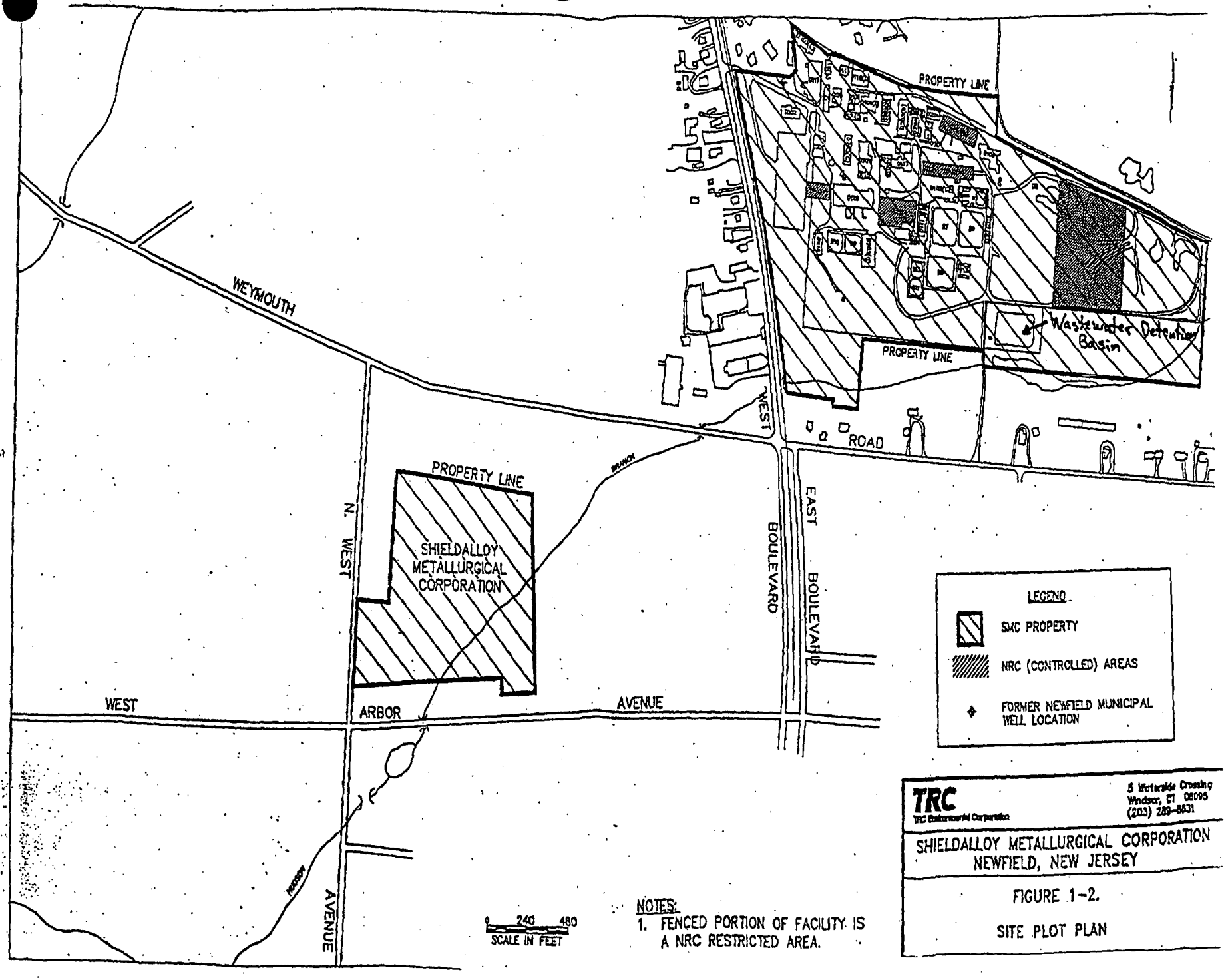
Dear Mr. Hayden:

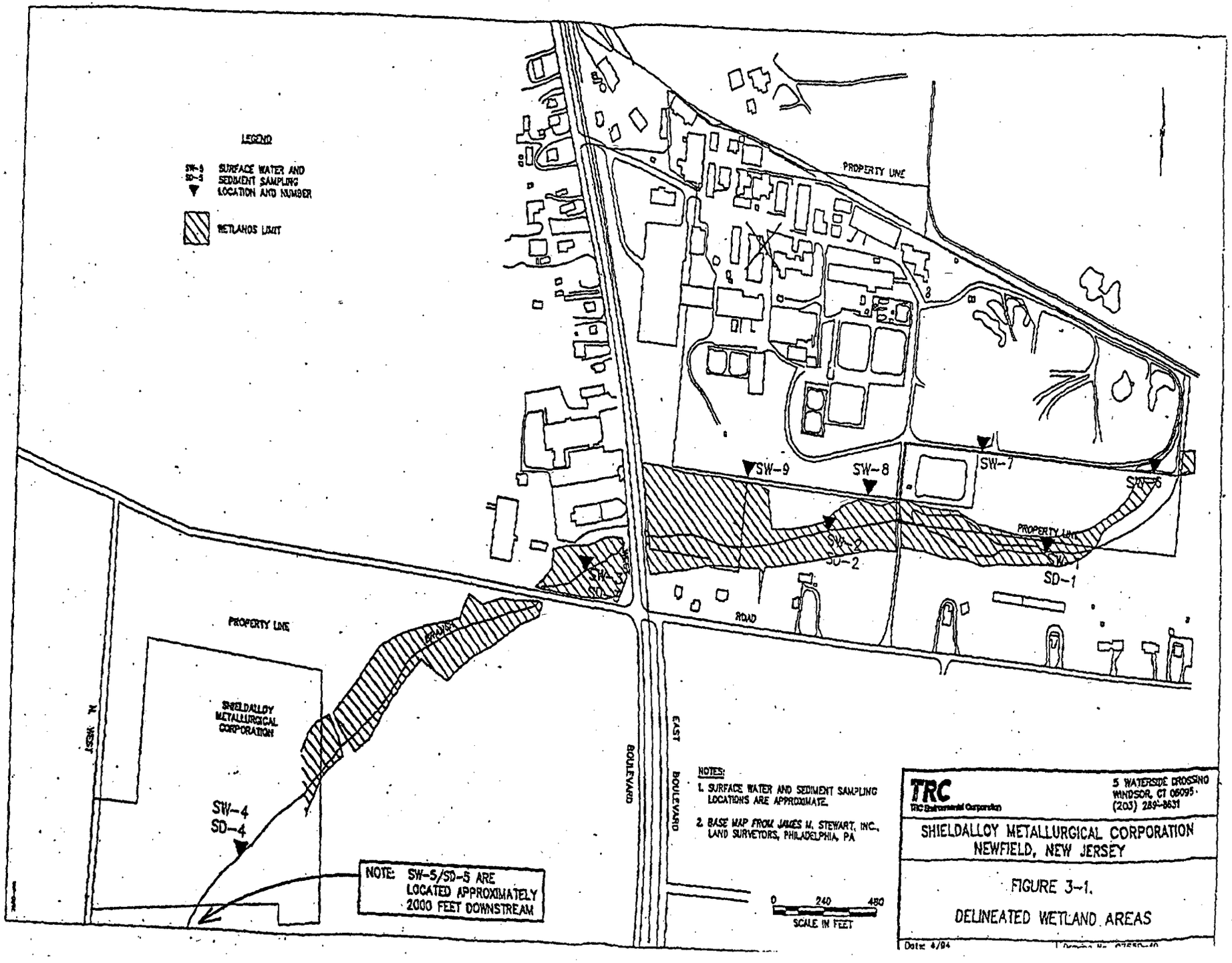
We are pleased to submit this Endangered and Threatened Plant Species Survey and Stressed Vegetation Survey Report for the above referenced site. The objective of these Surveys is to determine the presence or absence of the following species of concern: Barratt's sedge (*Carex barrattii*), pink tickseed (*Coreopsis rosea*), Pine Barren boneset (*Eupatorium resinosum*) and swamp pink (*Helonias bullata*) and analysis of the existence of stressed vegetation. Resumes of preparers of this report have been included.

The following summarizes the findings of the field investigation and review of existing information for the Shieldalloy Metallurgical Corporation Superfund Site located in Newfield Borough, Gloucester County, and the City of Vineland, Cumberland County, New Jersey. The field investigation was performed on June 6, 1994.

I. Introduction

The survey was conducted over approximately 100 acres, of which the manufacturing facility occupies approximately 60 acres. The northern property, containing the facility, is an irregularly shaped parcel located in Newfield Borough (Figure 1-2). The study area included adjacent wetlands in Newfield and Vineland that are primarily forested and associated with the Hudson Branch (Figure 3-1). The overall


WEYMOUTH
PROPERTY LINE
PROPERTY LINE
Wastewater Detention Basin
WEST
ROAD
PROPERTY LINE
SHIELDALLOY METALLURGICAL CORPORATION
N. WEST
BRANCH
BOULEVARD
EAST
BOULEVARD
WEST
ARBOR
AVENUE
HICKORY
AVENUE
LEGEND
SMC PROPERTY
NRC (CONTROLLED) AREAS
FORMER NEWFIELD MUNICIPAL WELL LOCATION
0 240 480
SCALE IN FEET
NOTES:
1. FENCED PORTION OF FACILITY IS A NRC RESTRICTED AREA.
TRC
TRC Environmental Corporation
5 Waterside Crossing
Windsor, CT 06095
(203) 289-8631
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE 1-2.
SITE PLOT PLAN


LEGEND
SW-9 SD-9 SURFACE WATER AND SEDIMENT SAMPLING LOCATION AND NUMBER
WETLANDS LIMIT
PROPERTY LINE
SW-9
SW-8
SW-7
SW-6
SW-2
SD-2
SW-1
SD-1
SW-3
SD-3
ROAD
PROPERTY LINE
SHIELDALLOY METALLURGICAL CORPORATION
SW-4
SD-4
NOTE: SW-5/SD-5 ARE LOCATED APPROXIMATELY 2000 FEET DOWNSTREAM
BOULEVARD
EAST BOULEVARD
NOTES:
1. SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS ARE APPROXIMATE.
2. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA
0 240 480
SCALE IN FEET
TRC
TRC Environmental Corporation
5 WATERSIDE CROSSING
WINDSOR, CT 06095
(203) 289-8631
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
FIGURE 3-1.
DELINEATED WETLAND AREAS
Date: 4/94

topography of the study area consisted of relatively flat to gently sloping terrain.

The study area is located in the Maurice River Watershed within the Delaware Bay Drainage Basin. The wetlands are drained by the Hudson Branch which is tributary to the Burnt Mill Branch of the Maurice River.

According to the State of New Jersey List of Endangered Plant Species and Plant Species of Concern (N.J.A.C. 7:5C-1.1 et seq.), the species of concern have been classified as follows:

- Barratt's sedge - rare (S3)
- pink tickseed - imperiled (S2)
- Pine Barren boneset - endangered (E)
- swamp pink - endangered (E)

Additionally, swamp pink is also classified as threatened according to the Federally Listed Endangered and Threatened Species in New Jersey (50 CFR 17.11 & 17.12, 1990).

Evaluations of the study area were made as to the suitability of existing habitat for these rare species. The stressed vegetation survey was conducted in order to visually identify evidence of the effects of potential contamination on plant species.

II. SAMPLING METHODOLOGY

A habitat evaluation was conducted over the Shield Metallurgy Corporation facility including adjacent wetlands associated with the Hudson Branch. In order to perform the biological survey for the species of concern and stressed vegetation survey, a meander survey was conducted to cover the entire study area. During the field investigation, special attention was given to areas with suitable habitat for the species of concern. The Britton and Brown (1970) plant identification key "An Illustrated Flora of the Northern United States and Canada" was used to determine plant species characteristics and to provide habitat information. Other sources to evaluate the habitat onsite included the use of published literature, site maps and topographic maps.

During the course of the investigation items including, but not limited to, chlorosis, stunted growth and abnormal physiological characteristics were used as criteria to evaluate evidence of stressed vegetation.

III. RESULTS OF STUDY

Our findings of the biological survey indicate that there were no occurrences of Barratt's sedge, pink tickseed, Pine Barren boneset and swamp pink within the study area.

The stressed vegetation survey conducted in conjunction with the biological survey indicated relatively normal growth over the study area, although the site has been subject to manmade disturbances in the past. These disturbances have led to invasive plant species becoming dominant in some portions of wetland and upland areas.

The forested wetlands onsite supported a dominant canopy layer of red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*) and black willow (*Salix nigra*). An often dense, understory growth included southern arrowwood (*Viburnum dentatum*), silky dogwood (*Cornus amomum*), highbush blueberry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*), elderberry (*Sambucus canadensis*) and greenbrier (*Smilax rotundifolia*). The herbaceous layer consisted of an abundance of cinnamon fern (*Osmunda cinnamomea*), tussock sedge (*Carex stricta*) and spotted jewelweed (*Impatiens capensis*). Scrub/shrub wetlands also observed onsite were generally overgrown with similar understory species including fetterbush (*Leucothoe racemosa*).

Emergent wetlands located on the facility site, within a wastewater detention pond, and associated with the Hudson Branch contained a dominance of spike rush (*Eleocharis* spp.), bog rush (*Juncus pelocarpus*), common rush, three square (*Scirpus americanus*), whitened sedge (*Carex albolutescens*), Canada rush (*Juncus canadensis*), slender rush (*Juncus tenuis*), common reedgrass (*Phragmites australis*), tussock sedge (*Carex stricta*), pointed broom sedge (*Carex scoparia*), sallow sedge (*Carex lurida*), larger water-starwort (*Callitriche heterophylla*) and spotted jewelweed.

Forested upland areas throughout the study area contained a dominant canopy layer of southern red oak (*Quercus falcata*), scarlet oak (*Quercus coccinea*), white oak (*Quercus alba*), red maple, black locust (*Robinia psuedoacacia*), mockernut (*Carya tomentosa*) and sand hickory (*Carya pallida*). The understory was supported by similar species in the sapling layer and the dominant vegetation in the shrub layer consisted of black huckleberry (*Gaylussacia baccata*), dangleberry (*Gaylussacia frondosa*), lowbush blueberry (*Vaccinium vacillans*), mountain laurel (*Kalmia latifolia*), sheep laurel (*Kalmia angustifolia*), multiflora

rose (*Rosa multiflora*), greenbrier (*Smilax rotundifolia*) and Japanese honeysuckle (*Lonicera Japonica*).

The forested areas in the study area appeared to be secondary growth, not mature, which have undergone disturbances in the past. Based on professional judgement, the trees appeared to be the proper height for their age. Other vegetation did not show signs of stunted growth or chlorosis.

The biological survey for Barratt's sedge revealed no findings of this rare species within the study area. Habitat requirements are open, undisturbed, emergent wetlands; not usually occurring in standing water. This habitat was not found due to the sites' disturbed nature. Barratt's sedge is commonly associated with Pineland swamps and bogs, blooming and fruiting from late April to July.

No species of pink tickseed were found over the study area. Pink tickseed habitat requirements are vernal ponds (i.e., shallow, isolated ponds not fed by a spring or stream) or open, emergent wetland areas which are ponded for most of the year and dry up in the summer. The biological survey for this species was conducted at a time of year when sufficient growth for identification may not be present. Pink tickseed flowers from July through late September. The only potential habitat identified within the study area was on the facility site within the wastewater detention basin (reference Figure 1-2). This area was observed to contain emergent wetland species and ponding. An additional site visit later in the growing season may be warranted in order to definitively assess the presence or absence of pink tickseed.

Pine Barren boneset was not identified within the study area limits. Habitat for this species of concern is open, undisturbed, emergent wetland communities and streamsides; located mostly in the Pine Barrens. Flowering of this species occurs from early July to October.

The biological survey for swamp pink was conducted at a time of the year when it would be in flower; the evergreen leaves, which grow in a basal rosette, are also readily identifiable. No swamp pink populations were found. The habitat type that supports swamp pink consists of deciduous, forested wetland communities and stands of Atlantic white cedar (*Chamaecyparis thyoides*). The forested wetland areas onsite would not provide habitat for swamp pink due to their disturbed nature and lack of Atlantic white cedar occurrences. Additionally, dense scrub/shrub wetland areas

provided inadequate sunlight and increased competition among plant species thereby creating poor habitat for swamp pink.

IV. Conclusion

In summary, habitats specific to the species of concern (Barratt's sedge, pink tickseed, Pine Barren boneset and swamp pink) were thoroughly searched and no specimens were identified as a result of our detailed biological survey. No suitable habitat was found onsite for Barratt's sedge, Pine Barren boneset and swamp pink. However, based on the field survey, the facility portion of the study area may contain potentially suitable habitat within the wastewater detention basin (emergent wetland) to support pink tickseed; although no individuals were identified during the site investigation.

No evidence of stressed vegetation within the wetland and upland communities was observed during the meander survey.

If you have any questions or comments concerning this submission please contact me.

Sincerely,
AMY S. GREENE ENVIRONMENTAL
CONSULTANTS, INC.

Thomas S. Brodde

Thomas S. Brodde
Project Manager

enc.

APPENDIX K - CULTURAL RESOURCE INFORMATION

APPENDIX K - CULTURAL RESOURCE INFORMATION

NJDEP State Historic Preservation Office Correspondence
NJDEP Comments on TRC 1995 Feasibility Study

Pam / Donna

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
DIVISION OF PARKS AND FORESTRY
HISTORIC PRESERVATION OFFICE
CN-404
TRENTON, N.J. 08625-0404
TEL: (609) 292-2023
FAX: (609) 984-0578

Robert C. Shinn, Jr.
Commissioner

HPO-A96-37

MEMORANDUM

TO: Bruce Venner, Chief
Bureau of Federal Case Management, NJ DEP

FROM: Dorothy Guzzo, Administrator, Historic Preservation Office,
Deputy State Historic Preservation Officer

DATE: January 5, 1995

RE: Gloucester County, Newfield Borough
Shieldalloy Metallurgical Superfund Site
Section 106 Consultation Comments

I am offering consultation comments on this proposed undertaking under Section 106 of the National Historic Preservation Act in response to your memorandum of October 24, 1995 requesting review of the following report:

The Cultural Resource Consulting Group
August 1995 Phase II Cultural Resources Study, Specialty Glass Corporation Melting Tank, Proposed Remediation of Shieldalloy Metallurgical Corporation Property

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published in the Federal Register 2 September 1986 (51 31115-31125), I am providing the following comments.

800.4 Identifying Historic Properties

I concur with the Phase II Cultural Resource Study's conclusion that the stack/melting tank is eligible for the National Register under Criteria C and D. The stack/melting tank is eligible under Criterion C as a well preserved, and rare, example of a glass stack/melting tank. The stack is eligible under Criterion D because of the information it may convey about New Jersey's historic glass industry given its rarity as a surviving glass melting stack.

800.5 Assessing Effects

The demolition of the stack will, of course, have an **adverse effect** on the stack/melting tank. Given the deteriorating condition of the stack, the high cost associated with stabilization of tall masonry stacks, and the groundwater pollution problems which are related to the metallurgical use of the stack since the 1950's, I see no feasible alternative to demolition of the stack.

Because the project will have an adverse effect on the stack, the Advisory Council on Historic Preservation must be notified of the adverse effect and sent the documentation listed under 800.8 (b) (copy attached). I have enclosed a draft Memorandum of Agreement (MOA) for the project for consideration. As mitigation for the demolition of the stack, the MOA calls for documentation of the stack to HABS/HAER Standards. The level of HABS/HAER documentation for a property is determined by the National Park Service (see the attached sheet). I suggest that a copy of the Phase II Cultural Resource Study be sent to the NPS to help in their determination of the appropriate level of documentation.

Should you have any questions, please contact Dan Saunders of my staff at (609) 984-0140.

Sincerely,

Dorothy P. Guzzo

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG/ds96226

c: Advisory Council On Historic Preservation
Joseph Gowers, EPA
John Vetter, EPA
Donna Gaffigan, NJDEP-BFCM
David R. Smith, SMC

DRAFT

MEMORANDUM OF AGREEMENT
AMONG
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF FEDERAL CASE MANAGEMENT, SHIELDALLOY METALLURGICAL CORPORATION
AND
THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER
SUBMITTED TO THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
PURSUANT TO 36 CFR 800.6(A)

WHEREAS, the Environmental Protection Agency (EPA) has determined that the remediation of the Shieldalloy Metallurgical Corporation (SMC) site will have an adverse effect on the Specialty Glass Corporation Melting Tank, a property which is eligible for listing on the National Register of Historic Places, and has consulted with the New Jersey State Historic Preservation Officer (SHPO) pursuant to the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (16 U.S.C> Part 470f0; and

WHEREAS, EPA has considered the alternatives to demolition of the Specialty Glass Corporation Melting Tank and concluded, in concurrence with the New Jersey SHPO, that there is no reasonable way to avoid the adverse effect of demolition of the Glass Melting Tank; and

WHEREAS, New Jersey Department of Environmental Protection, Bureau of Federal Case Management (NJDEP-BCA) and SMC, the owner of the site, have participated in the consultation and have been invited to concur in this Memorandum of Agreement,

NOW, THEREFORE, the EPA, NJDEP-BCA, the New Jersey SHPO, and SMC agree that the undertaking shall be implemented in accordance with the following stipulation in order to take into account the effect of the undertaking on historic properties.

Stipulations

EPA will ensure that the following measures are carried out:

1. The applicant shall contact the National Park Service (NPS), Northeast Field Office to determine what level and kind of HABS/HAER recordation is required for the Melting Tank. The applicant will complete all required recordation and secure NPS approval prior to initiating demolition of the Melting Tank. Copies of this documentation with original photographs will be provided to the Corps, the NJ SHPO, and Wheaton Village.

Execution of this Memorandum of agreement and implementation of its terms evidence that EPA has afforded the Council an opportunity to comment on the demolition of the Specialty Glass Corporation Melting tank, and that EPA taken into account the effect of the undertaking on historic properties.

DRAFT

ENVIRONMENTAL PROTECTION AGENCY

BY:_____DATE:_____

NEW JERSEY STATE HISTORIC PRESERVATION OFFICER

BY:_____DATE:_____

CONCUR:

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF FEDERAL CASE MANAGEMENT

BY:_____DATE:_____

SHIELDALLOY METTALURGICAL CORPORATION

BY:_____DATE:_____

ACCEPTED:

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY:_____DATE:_____

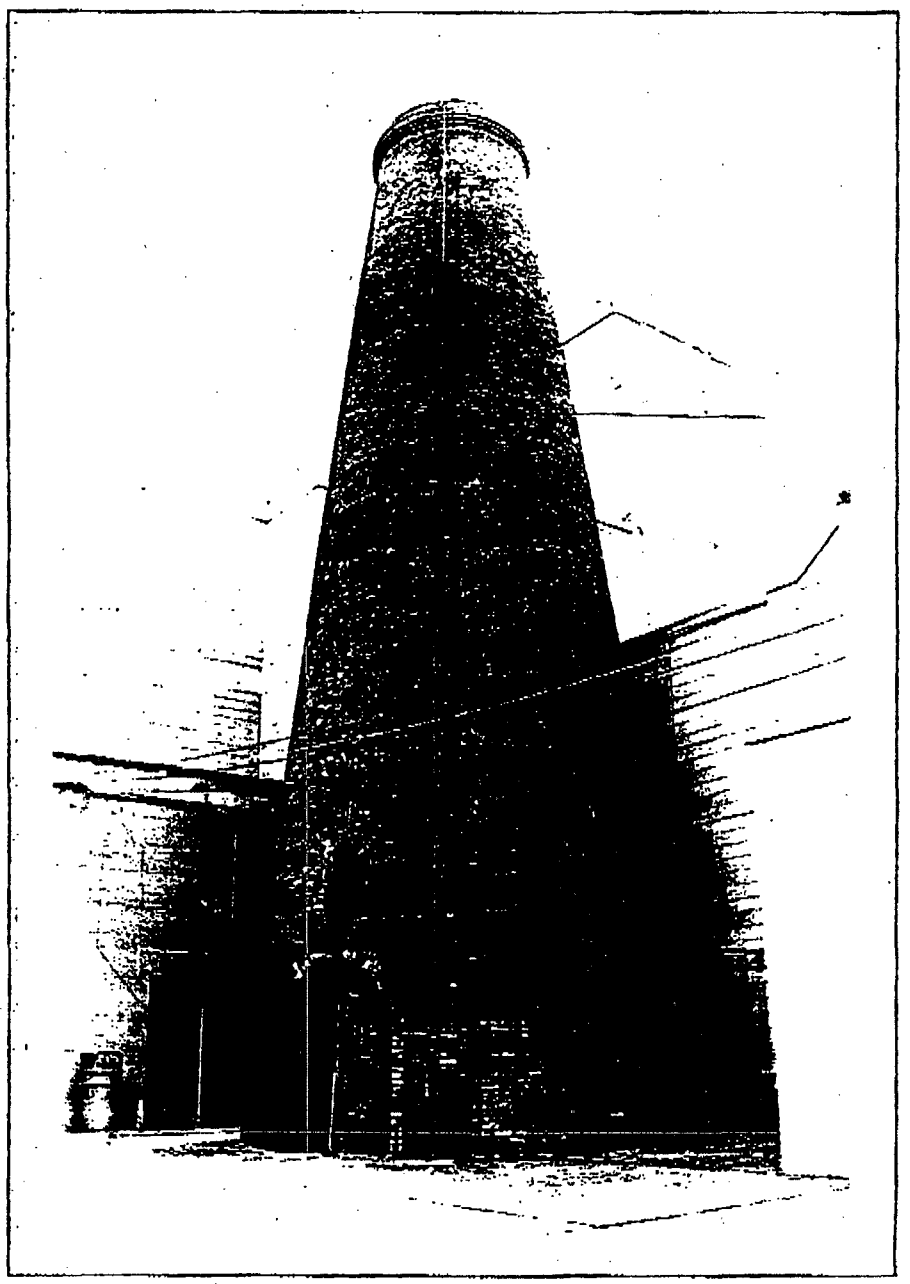


Illustration 13: Current condition of the glassworks stack (August 1995).

photographer: Richard Veit
date: August 1995
roll 3, neg. 9, exp. 21

Documentation required for consultation

(b) Finding of adverse effect. The required documentation is as follows:

(1) A description of the undertaking, including photographs, maps, and drawings, as necessary;

(2) A description of the efforts to identify historic properties;

(3) A description of the affected historic properties, using materials already compiled during the evaluation of significance, as appropriate; and

(4) A description of the undertaking's effects on historic properties.

Documentation required for submitting a signed MOA for Council review

(c) Memorandum of Agreement. When a memorandum is submitted for review in accordance with Section 800.6(a)(1), the documentation, in addition to that specified in Section 800.8(b), shall also include a description and evaluation of any proposed mitigation measures or alternatives that were considered to deal with the undertaking's effects and a summary of the views of the State Historic Preservation Officer and any interested persons.

Documentation required for requesting written Council comment, absent an MOA

(d) Requests for comment when there is no agreement. The purpose of this documentation is to provide the Council with sufficient information to make an independent review of the undertaking's effects on historic properties as the basis for informed and meaningful comments to the Agency Official. The required documentation is as follows:

(1) A description of the undertaking, with photographs, maps, and drawings, as necessary;

(2) A description of the efforts to identify historic properties;

(3) A description of the affected historic properties, with information on the significant characteristics of each property;

(4) A description of the effects of the undertaking on historic properties and the basis for the determinations;

(5) A description and evaluation of any alternatives or mitigation measures that the Agency Official proposes for dealing with the undertaking's effects;

(6) A description of any alternatives or mitigation measures that were considered but not chosen and the reasons for their rejection;

(7) Documentation of consultation with the State Historic Preservation Officer regarding the identification and evaluation of historic properties, assessment of effect, and any consideration of alternatives or mitigation measures;

(8) A description of the Agency Official's efforts to obtain and consider the views of affected local governments, Indian tribes, and other interested persons;

(9) The planning and approval schedule for the undertaking; and

United States Department of the Interior

NATIONAL PARK SERVICE
MID-ATLANTIC REGION
NATIONAL REGISTER PROGRAMS DIVISION
U.S. CUSTOM HOUSE, ROOM 251
2ND & CHESTNUT STREET
PHILADELPHIA, PA 19106

IN REPLY REFER TO:

Information Needed to Obtain a Level of Documentation for the Historic American Building Survey / Historic American Engineering Record (HABS/HAER)

To provide a level of documentation, the National Park Service (NPS) Regional Office requires concise information on the property's appearance and significance. Information on the condition of the property is only necessary when it can help determine whether there is original material that can still be documented; this is most often applicable to interiors of buildings. Lengthy reports or justifications of why the property must be demolished are not necessary; once the decision to document the property has been reached between the Federal Agency and the State Historic Preservation Office, the NPS's only role is to determine the level of documentation, which is based on the property's significance and complexity.

Please write to this office to request a level of HABS/HAER documentation for the property. Include with your request:

1. **A copy of the signed Memorandum of Agreement or other document requiring HABS/HAER documentation.** If some or all signatures are still pending, include correspondence from the State Historic Preservation Office indicating that HABS/HAER documentation will be required. Other correspondence on the project is generally not necessary, unless it provides other required information.

2. **The name, address/location of the property, and the county in which it is located.** If it is not located in a town or city, please identify the nearest town or city, (not a township) in the same State.

3. **Concise information on the history and appearance of the property.** This can usually be excerpted from existing documents (such as a survey report, National Register nomination, or correspondence from the State Historic Preservation Office) without doing additional work. Snapshots (not Polaroids) are usually necessary to convey the scale, and the amount of architectural or engineering detail, of the property. When there are no photographs of a building's interior, indicate how much original detailing, furnishings and/or equipment are inside; this will help us determine how much of the interior needs to be documented.

If you have questions about what to send, call the National Park Service at (215) 597-6484. You should receive a Schedule of Documentation, including guidelines for preparing the required documentation, within 30 days of our receipt of your request.

(November 1994)

State of New Jersey

Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

JUL 24 1996

Jean Oliva
Senior Consulting Engineer
TRC Environmental Corporation
5 Waterside Crossing
Windsor CT 06095

Dear Ms. Oliva:

Enclosed please find a disk containing NJDEP's comments on the Feasibility Study and Ecological Risk Assessment for the Shieldalloy Metallurgical Corporation site. The file is named FS&ERA.SMC.

If you have any questions, you may contact me at (609) 633-1394.

Sincerely,

Donna L. Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Federal Case Management

Enclosure

Draft Final
FEASIBILITY STUDY REPORT - VOLUME II
Soil Feasibility Study

1. General
NJDEP's Guidance Document for the Remediation of Contaminated Soils dated June 1994 contains information on capping as a remedial action. Of particular importance is the section on post-capping operation, maintenance and monitoring since such actions will be required after implementation of the remedy.

2. Risk Commission Report
TRC has elected to support its proposal to use a one in one hundred thousand (1×10^{-5}) cancer risk endpoint based on a draft report issued by the Environmental Risk Assessment and Risk Management Study Commission. This Commission was established in 1994 pursuant to a provision in HSRA. The NJDEP's cancer risk endpoint is currently 1×10^{-6}. The Commission's proposal to modify the cancer risk value for developing soil remediation standards is still only a draft recommendation. Until such time that a new risk level is promulgated by the New Jersey legislature, the Department will continue to require the 1×10^{-6} value.

3. Compliance Averaging, Section 2.1
It should be noted that although "guidance" has been developed for compliance averaging, the concept and the particular conditions for implementing compliance averaging have a regulatory basis and are contained in the *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-4.9(c)3i).

4. Compliance in Manufacturing Area - Dept 102, Section 2.1.1
Elevated chromium and hexavalent chromium contamination has been detected in the Department 102 area. Based on the minimum exceedances, TRC has proposed no further action. This is acceptable provided the existing containment (pavement) is properly maintained as part of the remedial action and the subsequent O&M phase.

5. Compliance in Manufacturing Area - RR Siding, Section 2.1.1
Elevated arsenic contamination has been detected in one sample collected in the Railroad Siding area. Based on the minimum exceedances, TRC has proposed no further action. This is acceptable provided the existing containment (pavement) is properly maintained as part of the remedial action and the subsequent O&M phase.

6. Compliance in Manufacturing Area - Beryllium, Section 2.1.1
a. The FS states that the compliance averaging ceiling for beryllium is 2 ppm. While this is true using the RDCSCC, SMC is utilizing the NRDCSCC values for the interior of the site (not off-

site). Since the health-based criteria for beryllium at non-residential sites is 0.7 ppm, the compliance averaging ceiling is 7 ppm. This adjusted many of the calculations for beryllium and thus reduced the total area of soil requiring remediation. This issue was discussed at a meeting held on May 19, 1996 between NJDEP and TRC. The agreements reached will be summarized in a letter from TRC, however, they must be reflected in the FS as well, unless superseded by the results of the bioavailability study discussed below.

b. There have been discussions with TRC/SMC regarding an Alternate Cleanup Standard (ACS) application for beryllium based on bioavailability. At NJDEP recommendation, SMC submitted a work plan on May 24, 1996 outlining how they proposed to determine site-specific bioavailability percentages. This data will assist the NJDEP in making a risk management decision based on the strength of evidence surrounding the beryllium contaminant levels at the site and the appropriateness of an ACS.

7. Compliance - Former Material Storage Area, Section 2.1.2
PCB contamination in excess of the NRDCSCC values has been discovered in the Former Material Storage Area. The FS Report must include this area of concern (AOC) as an area requiring remediation. Pre-design sampling can be employed to further define the limits of contamination.

8. Compliance - North/South Subsurface DDT Areas, Section 2.1.2
Due to the depth of the reported contamination and the inability to reconfirm the results, the DDT contamination in these two AOCs is either very limited or non-existent. Therefore, the existing soil "cap" is sufficient and SMC may consider no further action for these. However, the "presence" of these AOCs must be documented in the DER.

9. Compliance - On-Site Delineated Wetlands Area, Section 2.1.2
Elevated contaminant levels at RA-12 were compared to the SCC values in the FS Report. Since this area is within the delineated wetlands, it can be questioned whether these results should be compared to soil or sediment criteria. It is recommended that the results should be compared to both criteria. When compared to the SCC, there are exceedances for several inorganic parameters, therefore, the recommendation on page 2-12 with respect to no further action in this area is not acceptable. Further, this statement is inconsistent with Section 2.4.3 (page 2-43) which defers the remediation of this area to Volume III of the FS (Surface Water and Sediment) and is also inconsistent with Volume III, itself.

10. Compliance - Other Areas of Concern, Section 2.1.2
Due to the depth of the reported contamination and the inability to reconfirm the results, the beryllium contamination at SB-25 and SB-12 is either very limited or non-existent. Therefore, the existing soil "cap" is sufficient and SMC may consider no further action for these areas. However, the "presence" of these AOCs must be documented in the DER.

12. Compliance - Off-Site Delineated Wetlands Area, Section 2.1.5, p. 2-25

Elevated contaminant levels at RA-13 and RA-14, located on SMC's property boundary, were compared to the SCC values in the FS Report. Since this area is within the delineated wetlands, it can be questioned whether these results should be compared to soil or sediment criteria. It is recommended that the results should be compared to both criteria. Two issues are involved here, the on-site and the off-site areas adjacent to the site.

a. On-site - Based on the SCC, there are exceedances for several inorganic parameters. Therefore, the on-site portion of this area requires remediation, but is not discussed in the document. This is inconsistent with Volume III which show that remediation of this area is proposed.

b. Off-site - Based on the RDCSCC no further action is acceptable, but it may not be acceptable based on the sediment criteria and may be inconsistent with Volume III of the FS Report (see Figure 3-2 of Volume III).

13. Department 106, Section 2.1.1

There is no discussion regarding the Department 106 building and the level of contamination coating the building materials. As identified in NJDEP's letter dated November 3, 1995, SMC must discuss the need to remediate the building as a source of chromium contamination to soil and/or groundwater.

Alternative S-4-1 (Glass Stack), Section 4.2.7

a. There is concern about the proposal under recommended Soil Alternative S-4-1 to remediate potential chromium contaminated soil in the Department 101(b) Glass Stack Area. The Glass Stack was determined to be eligible for inclusion in the National Register of historic Places and is, therefore, subject to National Historic Preservation Act (NHPA) requirements. The proposal is to raze the stack and to excavate the soil in its footprint. The need for remedial action in this area seems to be based primarily upon the results of one soil sample (RA-64) collected from the tunnel adjacent to the stack. Additional soil samples should be collected from beneath the stack to show that the remedial action proposed is justified as discussed in the May 7 meeting.

b. It is indicated on page 4-16 that the cultural resource survey was submitted to the New Jersey State Historic Preservation Office (SHPO) with a request for determination of Historic American Building Survey (HABS) documentation required prior to the stack's demolition. It should be noted that the National Park Service (NPS) makes the determination of what level of documentation is required and whether HABS or Historic American Engineering Record (HAER) criteria are appropriate. Furthermore, it is the function of EPA to request a HABS/HAER determination from the NPS. The Soil FS shall be revised to reflect that the ARAR requirements with respect to the NHPA have not yet been completed.

14. Remedial Alternative Recommendation, Section 4.5

NJDEP partially concurs with TRC's recommendation for the remediation of soils at the SMC site. Alternative S-4-1 (Remediation of Chromium Source Areas and Landfill Containment with Institutional Controls) will adequately address soil contamination at the site. However, Option A (10^{-6} risk-based) is dictated by HSRA and must be employed instead of the recommended Option B (10^{-5} risk-based).

APPENDIX L - VISUAL RESOURCE SURVEY

APPENDIX L - VISUAL RESOURCE SURVEY

Details of Visual Site Analysis Process
Figure L-1 Projected Existing Viewshed Relative to Agricultural and Forested Areas
Figure L-2 Projected Proposed Action Viewshed Relative to Agricultural and Forested Areas
Photo Log
Photos - Existing Conditions
Figure L-3 Comparison of Rev. 1 Layout with Rev. 1b Layout

DETAILS OF VISUAL SITE ANALYSIS PROCESS

Geographic Information Systems (GIS) are proven tools in the evaluation of the relationship between land-use and development. TRC uses GIS methodologies to analytically evaluate potential visibility issues. These methods include viewshed analyses and photosimulations or renderings of proposed projects, as described in more detail below.

Viewshed Mapping - A viewshed analysis was completed to predict the existing visual impact of current conditions at theSMC facility as well as evaluate the potential visual impact of the decommissioning alternatives. The study area consisted of a 1.6-kilometer (1-mile) radius, using the center of the facility as the reference point. Base mapping and analytical data were acquired from the State of New Jersey GIS office. Site-specific existing and proposed topography was based on current facility survey data and information developed in support of the evaluation of the Decommissioning Plan alternatives. State-issued Digital Elevation grids (DEM 10M) were merged with the site-specific survey (0.3 meter or 1-foot resolution) to attain an accurate representation of the landscape. Once the elevation data were merged, vegetation coverage was processed as an impediment layer. The vegetation layer assigns a conservative vegetation height to areas containing vegetation cover exceeding 3 meters (10 feet) in height. Based on this information the visibility of the existing conditions is evaluated, as indicated in Figure L-1. For the alternatives undergoing analysis, the proposed elevation change is added and the visibility analysis is recomputed for the proposed conditions. The visibility analysis for the proposed action is presented in Figure L-2. The output mapping is used to determine potential visibility of the project from areas within the 1.6-kilometer (1-mile) radius. It is also used as a guide for the selection of potential visual vantage points for renderings.

Photosimulation Methodologies - Computer-assisted photo simulations create very accurate representations of what a proposed project will look like. The process uses sophisticated computer imaging technology to allow decision-makers to evaluate the visibility and visual effect of a proposed project from a number of locations. It is critical that the process used is rigorous and scientifically accurate. In general, computerized perspective views rely on three-dimensional engineering models of proposed structures in a geo-referenced real-world environment. The model positions the viewer at the approximate receptor point, and specifies a field of view equal to that of the lens used to capture the actual photograph upon which the

rendering is based. The computerized perspective views are then superimposed on the photographs to represent a visual depiction of the proposed changes at the facility.

The photosimulation process begins with the collection of photographic images in the field at selected visual vantage points, referred to as viewpoints. Because photographic simulations are typically presented from a variety of prominent views and at different distances, photographs are taken at a variety of viewpoints based on the information gathered during the viewshed analysis. Information noted in the field during the collection of photographic images includes global positioning system (GPS) coordinates for the photo location, the compass angle of the camera at each location, the focal length of the camera, the time of day and date of the photo, the general direction of the target view of concern (in this instance, the Storage Yard area), and the height of the camera. The GPS position measured in the field determines the exact location of the camera and the location of specific reference points in the foreground to ensure accurate camera alignment. The day and time information is used to adjust for sun angle in the simulations, allowing computer graphics specialists to simulate lighting conditions for different times of day or days of the year.

Simulating a proposed project initially involves the input of information about the project's "structures," such as the location and size of structures, as well as proposed changes to the landscape. For the proposed action (the LTC alternative), the model of the stabilized pile was created based on the pile's engineering dimensions, while the model of the off-site disposal with license termination (LT) alternative was based on the total removal of all licensed materials and the return of the Storage Yard area to natural site elevations. This information, along with the field-collected data, is entered and accurately plotted within an AutoCAD® environment. This ensures that the positioning data (two-dimensional or 2D) is based on representative geographic coordinates. Next, the 2D data is converted to three-dimensional (3D) data to account for the height information (i.e., camera locations, existing structures, existing topography, and proposed changes in topography). The 3D data is processed using a computer program called Studio VIZ® 4.0. At this point, the alignment of all known points (longitude, latitude and height) is confirmed. Next, the lighting is calculated by creating a "sun" for a specific time and day of year. This information is used to create highlights and shadows for each of the photo elements. Finally, once the lighting is created, the overall image is rendered. The resulting renderings are intended to show not only the form and scale of the proposed changes,

but also the texture and materials proposed in the design. The final image is checked to ensure its accuracy in terms of location, scale and perspective.

When simulated and actual photos are placed side-by-side, the positioning and visibility of the simulated elements are often nearly identical. Because of their accuracy, visual simulations developed using such methods are well-received and accepted by regulatory agencies as an appropriate way to evaluate visual impacts.

Agricultural Areas

Assumed Mixed Forest Approximate 35 Foot Stand

Existing viewshed of current site elevation obtained from site aerial survey 01-18-05 maximum elevation of existing pile 129.1 feet

Site Plan

1 Mile Site Radius

0 500 1,000 2,000 3,000 Feet

N

Source Data:
ProMaps, Moorestown, NJ, 2005;
New Jersey Department of Environmental Protection, 2005

Base Map:
New Jersey High Resolution Orthography, 2007

NEW JERSEY

TRC
21 Griffen Road North
Windsor, CT 06095
860-298-9692

SHIELDALLOY METALLURGICAL CORPORATION NEWFIELD, NEW JERSEY

PROJECTED EXISTING VIEWSHED RELATIVE TO AGRICULTURAL AND FORESTED AREAS

FIGURE L-1 | **JUNE 2009**

Abstract:

Visibility Analysis was produced using a bare earth Digital Elevation Model (DEM) with New Jersey Land Cover Data Set added to compensate for areas with vegetation. Site specific survey information for the proposed and existing footprints was utilized to adjust for elevation differences in this vicinity.

DEM Information: (10- by 10-m data spacing, elevations in decimeters) Elevation_resolution_ is 1 decimeter (0.1 meter). Elevation accuracy is 24,000 contour data, i.e. plus/minus half the contour interval.

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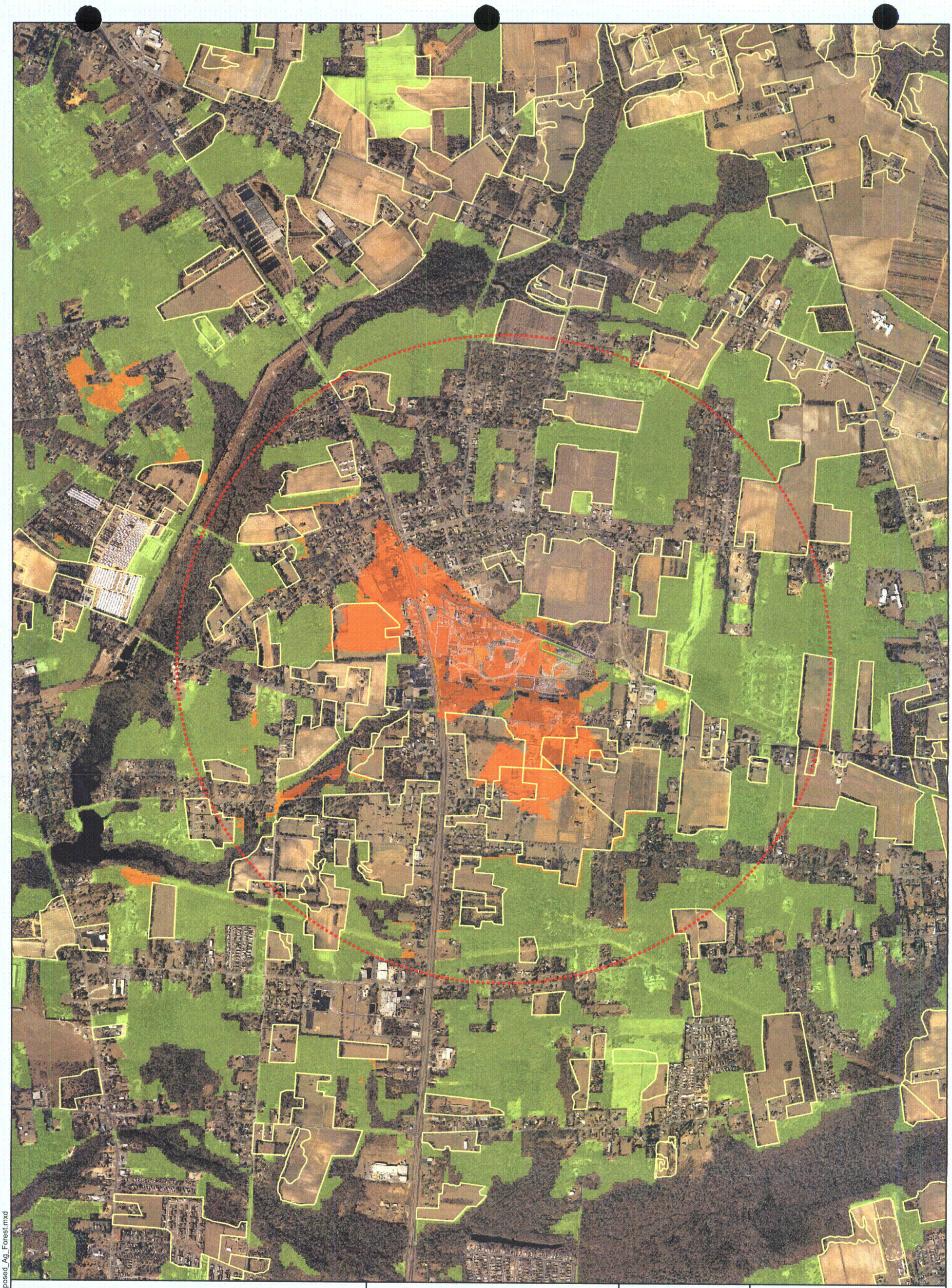


Capped Pile

Agricultural Areas

Assumed Mixed Forest
Approximate 25 Foot Stand

Potential incremental capped pile viewshed position and elevation acquired from Figure 1-1 Analysis assumed a capped pile height of 30'

Site Plan

1 Mile Site Radius

Abstract:

Visibility Analysis was produced using a bare earth Digital Elevation Model (DEM) with New Jersey Land Cover Data Set added to compensate for areas with vegetation. Site specific survey information for the proposed and existing footprints was utilized to adjust for elevation differences in this vicinity.

DEM Information: (10- by 10-m data spacing, elevations in decimeters) Elevation_resolution_ is 1 decimeter (0.1 meter). Elevation accuracy is 24,000 contour data, i.e. plus/minus half the contour interval.

0 500 1,000 2,000 3,000 Feet

N

Source Data:
ProMaps, Moorestown, NJ, 2005;
New Jersey Department of Environmental Protection, 2005

Base Map:
New Jersey High Resolution Orthography, 2007

NEW JERSEY

SITE LOCATION

TRC
21 Griffen Road North
Windsor, CT 06095
860-298-9692

SHIELDALLOY METALLURGICAL CORPORATION NEWFIELD, NEW JERSEY

PROJECTED PROPOSED ACTION VIEWSHED
RELATIVE TO AGRICULTURAL AND FORESTED AREAS

FIGURE L-2 | **JUNE 2009**

R:\Projects\GIS_2009\105106_ShieldAlloy\mxd\Viewshed_Proposed_Ag_Forest.mxd

PHOTO LOG NOTES

Photos were taken on March 14, 2005, looking towards the SMC facility, as indicated in the attached photo log. In some cases, upon completion of the initial photographic effort, it was determined that the direction in which the original photo was taken might capture the view towards the manufacturing portion of the facility, but would not necessarily completely capture the view in the direction of the Storage Yard. Therefore, on May 17, 2005, additional photos were taken from several of the viewpoints in a compass direction more reflective of the view towards the Storage Yard. These photos verified that the view of the Storage Yard from these locations would be blocked, mainly by existing vegetation.

Photo
Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
1	Shieldalloy on-site-directly west of the pile	39°32 539N 075° 01.100W	130°	~600 feet west	Industrial	5.2'	35mm (f.stop 16)
2	Shieldalloy on-site – southwest of pile	39°32 428N 075° 01.115W	75°	~650 feet southwest	Industrial	5.2'	35mm (f.stop 16) Digital
3	Shieldalloy on-site - near Water Treatment Bldg	39°32 447N 075° 01.241W	88°	~1300 feet west and looking West	Industrial	5.2'	Digital
4 (2 digital photos)	Shieldalloy on-site - near Water Treatment Bldg	39°32 446N 075° 01.250W	88°	~1320 feet west	Industrial	5.2'	35mm (f.stop 16) Digital
5	Shieldalloy on-site - Truck entry roadway	39°32 559N 075° 01.296W	113°	~1450 feet west	Industrial	5.2'	35mm (f.stop 16) Digital
6	Strawberry Ave-development site for Genco Homes	39°31 964N 075° 00.862W	338°	~2950 feet south	Residential	5.2'	35mm (f.stop 16)
7	West Blvd north of power line	39°31 741N 075° 01.371W	8°	~4650 feet southwest	Highway/ Residential	5.2'	35mm (f.stop 16) Digital
8 (2 digital	West Blvd near Arbor Avenue	39°32 118N 075° 01.343W	6°	~2400 feet southwest	Residential	5.2'	35mm (f.stop 16) Digital

Photo

Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
photos)							
9	Arbor Avenue and North West Avenue	39°32 070N 075° 01.903W	30°	~4800 feet southwest	Residential	5.2'	35mm (f.stop 16) Digital
10	North West Avenue north of Arbor Avenue intersection	39°32 162N 075° 01.894W	60°	~4600 feet southwest	Residential	5.5'	Digital only
11	Weymouth Road at Salem Avenue	39°32 461N 075° 02.213W	100°	~5100 feet west	Residential	5.2'	Digital only
12 (2 digital photos)	Catawba Avenue and West Blvd.	39°32 790N 075° 01.504W	146°	~3100 feet north west	Commercial	5.2'	35mm (f.stop 16) Digital
13	Church Street south of Catawba Avenue	39°32 818N 075° 01.334W	162°	~5100 feet north	Residential	5.2'	Digital only
14	Edgarton School at Madison/Catawba Ave	39°32 847N 075° 01.051W	182°	~1900 feet north	Institutional	5.2'	Digital only
15	Edgarton School parking lot on Catawba Ave	39°32 857N 075° 01.128W	191°	~2100 feet north	Institutional	5.2'	Digital only

Photo

Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
16	Rosemont Avenue and Fawn Drive	39°33 320N 075° 01.251W	172°	~5200 feet north	Residential	5.2'	Digital only
17	Woodlawn Avenue at Covey Lane	39°32 975N 075° 00.433W	193°	~3700 feet northeast	Residential	5.2'	Digital only
18 (3 -35 mm & Dig. Photos)	Gorgo Lane south of Newfield water tower	39°32 540N 075° 00.730W	228° to 280°	~1300 feet northeast	Residential/ Undeveloped	5.2'	35mm (f.stop 16) Digital
19	Grace Orthodox Church – Weymouth near West Blvd	39°32 317N 075° 01.320W	41°	~1600 feet southwest	Mixed Residential	5.2'	Digital
20 (3 digital photos)	Columbia Avenue at County Bridge	39°32 797N 075° 02.121W	128° to 159°	~5280 feet northwest	Residential	5.2'	Digital
21	Christ Community Church parking lot-Salem Avenue west of West Blvd.	39°32 662N 075° 01.620W	130°	~3300 feet northwest	Residential	5.2'	35mm (f.stop 16) Digital
22	Notre Dame School on Church Street south of Conwell	39°32 922N 075° 01.362W	160°	~3300 feet north-northwest	Institutional/ Residential	5.2'	Digital
23	46 West Blvd-Cabinet Source Store	39°32 539N 075° 01.416W	98°	~1980 feet west	Mixed Residential	5.2'	35mm (f.stop 16) Digital

Photo L

Shieldalloy Metallurgical Corporation, March 14, 2005

Photo #	Location	GPS Location	Compass heading	Distance of location from Storage Yard area	Land Use	Height of Camera	Focal Length for 35mm
24 (2 digital photos)	West Blvd and Sandy Drive	39°33 132N 075° 01.680W	140°	~5280 feet northwest	Residential	5.2'	Digital
25	Strawberry Avenue east of City Line Avenue	39°31 934N 075° 00.355W	295°	~3900 feet southeast	Residential	5.2'	35mm (f.stop 16)

Supplemental Photo Log

Shieldalloy Metallurgical Corporation, May 17, 2005

Supplemental Photo #	Location	Compass heading	Distance of location from Storage Yard area
15A	Edgarton School parking lot on Catawba Ave	165°	~2100 feet north
19A	Grace Orthodox Church – Weymouth near West Blvd	55°	~1600 feet southwest
20A	Columbia Avenue at County Bridge	120°	~5280 feet northwest
25A	Strawberry Avenue east of City Line Avenue	325°	~3900 feet southeast

Photo 1. View of northern portion of Storage Yard taken just west of the Storage Yard.

Photo 2. View of southern portion of Storage Yard taken from the unpaved SMC access road.

Photo 3. View toward the Storage Yard, taken near the SMC pond.

Photo 4. View toward the Storage Yard, taken near the SMC pond.

Photo 5. View toward the Storage Yard, from near the SMC administration building.

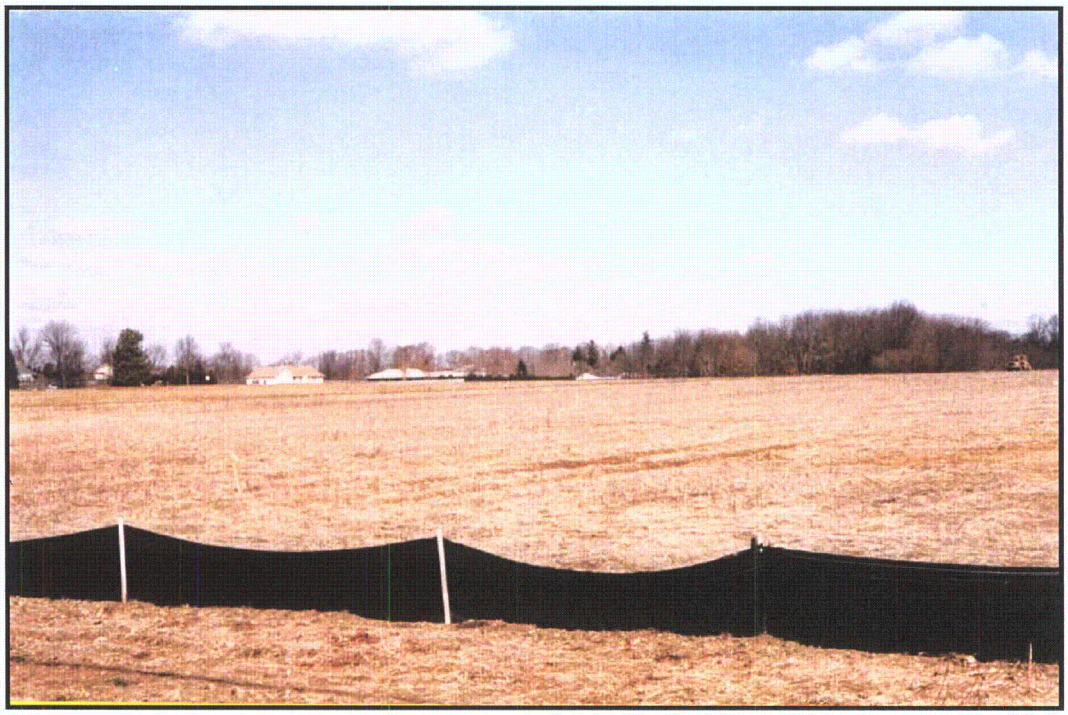


Photo 6. View toward the SMC site from Strawberry Ave- development site for Genco Homes.

Photo 7. View toward the SMC site from West Blvd north of power line.

Photo 8. View toward the SMC site from West Blvd near Arbor Avenue

Photo 9. View toward the SMC site from Arbor Avenue and North West Avenue

Photo 10. View toward the SMC site from North West Avenue north of Arbor Avenue intersection

Photo 11. View toward the SMC site from Weymouth Road at Salem Avenue

Photo 12. View toward the SMC site from Catawba Avenue and West Blvd.

Photo 13. View toward the SMC site from Church Street south of Catawba Avenue.

Photo 14. View toward the SMC site from Edgarton School at Madison/Catawba Ave

Photo 15. View toward the SMC site from Edgarton School parking lot on Catawba Ave.

Photo 16. View toward the SMC site from Rosemont Avenue and Fawn Drive.

Photo 17. View toward the SMC site from Woodlawn Avenue at Covey Lane

Photo 18. View toward the SMC site from Gorgo Lane south of Newfield water tower

Photo 19. View toward the SMC site from Grace Orthodox Church at Weymouth near West Blvd

Photo 20. View toward the SMC site from Columbia Avenue at County Bridge

Photo 21. View toward the SMC site from Christ Community on Church Salem Avenue.

Photo 22. View toward the SMC site from Notre Dame School on Church Street.

Photo 23. View toward the SMC site from 46 West Blvd- Cabinet Source Store.

Photo 24. View toward the SMC site from West Blvd and Sandy Drive.

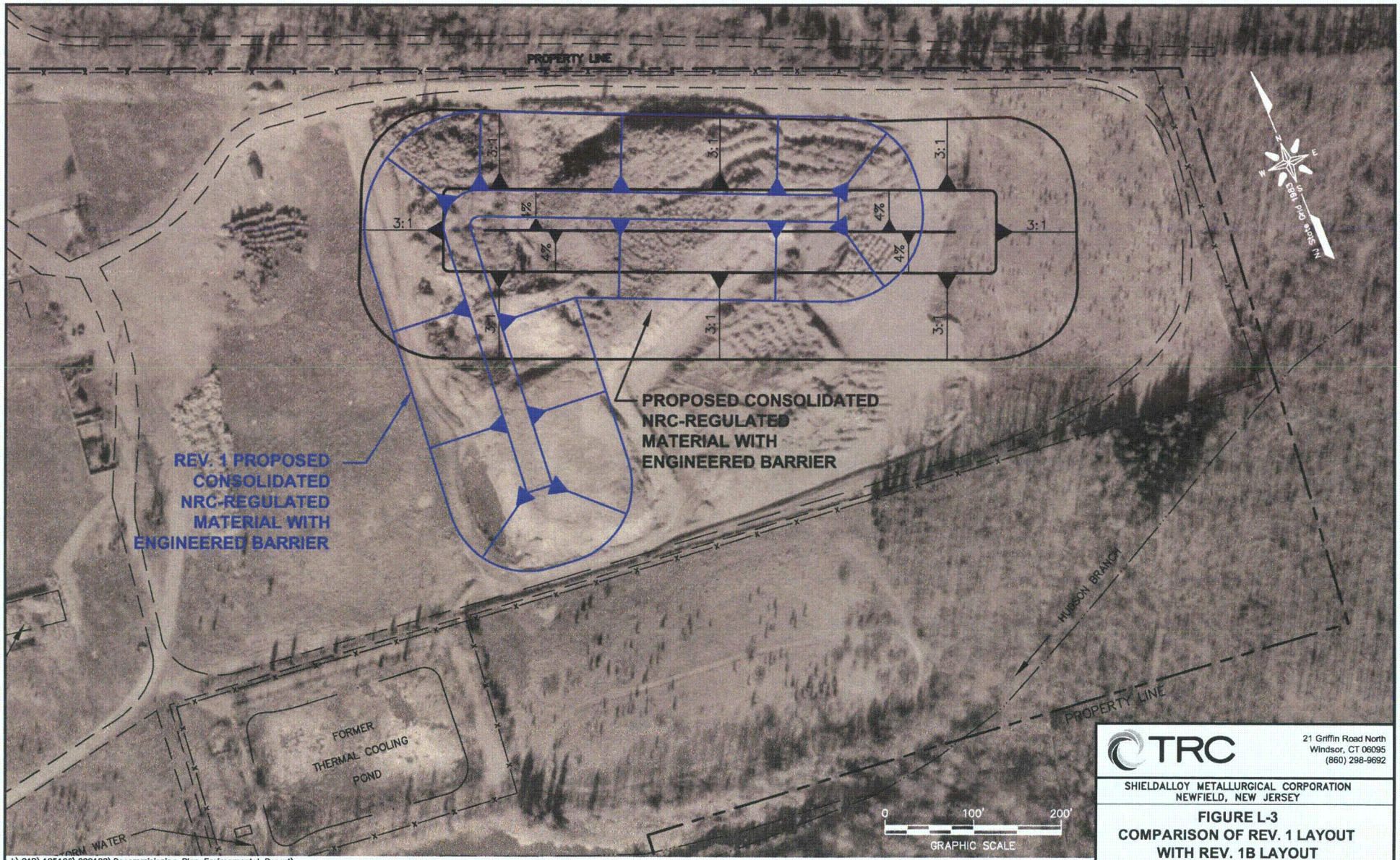
Photo 25. View toward the SMC site from Strawberry Avenue, east City Line Avenue.

Photo 15A. View toward Storage Yard at the SMC site from Edgarton School parking lot on Catawba Avenue.

Photo 19A. View toward Storage Yard at the SMC site from Grace Orthodox Church at Weymouth near West Blvd.

Photo 20A. View toward Storage Yard at the SMC site from Columbia Avenue at County Bridge.

Photo 25A. View toward Storage Yard at the SMC site from Strawberry Avenue east of City Line Avenue.



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TRC

21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE L-3
COMPARISON OF REV. 1 LAYOUT WITH REV. 1B LAYOUT

Date: 08/09 | Project No. 105106.000100.000000

APPENDIX M - SELECT SOCIOECONOMIC DATA

APPENDIX M - SELECT SOCIOECONOMIC DATA

Census Data

- Total Population – by State, County and Block
- Hispanic or Latino, and Not Hispanic or Latino, by Race – by State, County and Block Group
- Poverty Status in 1999 by Age – by State, County and Block Group
- Poverty Status in 1999 of Families by Family Type – by State, County and Block Group

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block 1000, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1001, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1002, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1003, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1017, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 1018, Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block 2007, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey
Total	8,414,350	146,438	254,673	6	0	78	45	0	2	50

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau

American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2008, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2009, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2010, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2011, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2012, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2019, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2020, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2021, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2022, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 2023, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey
Total	32	0	0	38	16	56	0	0	31	32

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2024, Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block 1006, Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block 1007, Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block 1006, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1007, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1008, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1012, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1013, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1014, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1015, Block Group 1, Census Tract 5018, Gloucester County, New Jersey
Total	112	202	0	92	62	35	15	13	64	0

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 1016, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1017, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1018, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1019, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1020, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1021, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1022, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 1023, Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block 2000, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2003, Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total	0	51	61	25	21	25	22	0	289	68

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2004, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2005, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2006, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2007, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2008, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2009, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2014, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2015, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2016, Block Group 2, Census Tract 5018, Gloucester County, New Jersey	Block 2017, Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total	51	35	0	0	0	8	17	32	39	25

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 2018, Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total	66

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, and definitions, see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total:	8,414,350	146,438	254,673	1,264	1,527	1,018	731	885
Hispanic or Latino	1,117,191	27,823	6,583	273	132	58	20	42
Not Hispanic or Latino:	7,297,159	118,615	248,090	991	1,395	960	711	843
Population of one race:	7,163,470	116,234	245,294	966	1,377	950	706	830
White alone	5,557,209	85,510	218,262	509	1,304	926	693	810
Black or African American alone	1,096,171	28,134	22,562	445	71	17	9	12
American Indian and Alaska Native alone	11,338	1,077	426	4	0	1	1	1
Asian alone	477,012	1,338	3,763	2	2	6	3	6
Native Hawaiian and Other Pacific Islander alone	2,175	39	60	1	0	0	0	0
Some other race alone	19,565	136	221	5	0	0	0	1
Population of two or more races:	133,689	2,381	2,796	25	18	10	5	13
Population of two races:	126,411	2,171	2,588	22	18	8	5	13
White; Black or African American	18,066	487	921	2	3	0	2	1
White; American Indian and Alaska Native	9,760	377	421	7	3	3	2	3
White; Asian	21,700	195	478	2	3	0	1	2
White; Native Hawaiian and Other Pacific Islander	1,008	16	40	0	0	0	0	0
White; Some other race	35,669	400	317	4	2	5	0	5
Black or African American; American Indian and Alaska Native	6,538	330	171	3	2	0	0	2
Black or African American; Asian	3,482	49	45	1	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander	1,307	35	12	0	0	0	0	0
Black or African American; Some other race	16,291	203	72	3	1	0	0	0
American Indian and Alaska Native; Asian	2,067	10	13	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	40	5	0	0	0	0	0	0
American Indian and Alaska Native; Some other race	455	30	5	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander	1,268	9	25	0	0	0	0	0
Asian; Some other race	8,513	19	63	0	0	0	0	0
Native Hawaiian and Other Pacific Islander; Some other race	247	6	5	0	4	0	0	0
Population of three races:	6,534	197	192	3	0	2	0	0
White; Black or African American; American Indian and Alaska Native	2,852	131	101	1	0	0	0	0

White; Black or African American; Asian	555	10	13	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	57	4	0	0	0	0	0	0
White; Black or African American; Some other race	837	17	30	0	0	0	0	0
White; American Indian and Alaska Native; Asian	235	1	3	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	35	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	144	8	15	0	0	2	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	286	2	3	0	0	0	0	0
White; Asian; Some other race	647	4	16	0	0	0	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	36	0	2	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian	138	5	2	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	45	1	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	187	6	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	78	3	2	2	0	0	0	0
Black or African American; Asian;Some other race	232	2	3	0	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	70	1	1	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	19	1	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	32	0	1	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	1	0	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	48	1	0	0	0	0	0	0
Population of four races:	535	9	14	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian	349	4	8	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	17	1	4	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	55	2	1	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	28	0	1	0	0	0	0	0
White; Black or African American; Asian; Some other race	30	0	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	5	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	16	2	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Some other race	4	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	1	0	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	11	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	5	0	0	0	0	0	0	0

Black or African American; American Indian and Alaska Native; Asian; Some other race	4	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	3	0	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	5	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0	0	0	0	0	0
Population of five races:	193	4	2	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	148	1	1	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	26	3	1	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	11	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	6	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0	0	0	0	0	0
Population of six races:	16	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	16	0	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P87. POVERTY STATUS IN 1999 BY AGE [17] - Universe: Population for whom poverty status is determined
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total:	8,232,588	135,350	249,843	755	1,492	1,002	721	889
Income in 1999 below poverty level:	699,668	20,367	15,395	92	56	26	61	44
Under 5 years	63,044	2,000	1,167	20	0	0	7	7
5 years	13,402	472	190	17	0	0	2	0
6 to 11 years	82,757	2,775	1,605	0	0	0	12	8
12 to 17 years	68,551	2,286	1,618	0	0	0	2	0
18 to 64 years	388,578	10,537	8,809	21	31	26	27	26
65 to 74 years	38,435	1,115	838	8	0	0	2	1
75 years and over	44,901	1,182	1,168	26	25	0	9	2
Income in 1999 at or above poverty level:	7,532,920	114,983	234,448	663	1,436	976	660	845
Under 5 years	486,798	6,667	14,993	22	90	31	34	46
5 years	103,544	1,445	3,059	0	48	0	13	11
6 to 11 years	644,822	10,376	21,829	39	111	67	62	66
12 to 17 years	592,171	10,396	21,631	111	60	74	57	62
18 to 64 years	4,724,939	70,598	146,407	410	934	680	386	552
65 to 74 years	531,283	8,276	15,034	42	94	63	53	50
75 years and over	449,363	7,225	11,495	39	99	61	55	58

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

U.S. Census Bureau
American FactFinder

P90. POVERTY STATUS IN 1999 OF FAMILIES BY FAMILY TYPE BY PRESENCE OF RELATED CHILDREN UNDER 18 YEARS BY AGE OF RELATED CHILDREN [41] - Universe: Families
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	New Jersey	Cumberland County, New Jersey	Gloucester County, New Jersey	Block Group 1, Census Tract 409.02, Cumberland County, New Jersey	Block Group 2, Census Tract 409.02, Cumberland County, New Jersey	Block Group 1, Census Tract 5017.03, Gloucester County, New Jersey	Block Group 1, Census Tract 5018, Gloucester County, New Jersey	Block Group 2, Census Tract 5018, Gloucester County, New Jersey
Total:	2,167,577	35,373	67,528	204	426	272	216	261
Income in 1999 below poverty level:	135,549	4,004	2,873	12	0	0	12	14
Married-couple family:	50,751	1,157	946	6	0	0	6	7
With related children under 18 years:	32,125	718	551	6	0	0	6	2
Under 5 years only	6,588	157	97	0	0	0	2	0
Under 5 years and 5 to 17 years	9,897	257	164	6	0	0	2	2
5 to 17 years only	15,640	304	290	0	0	0	2	0
No related children under 18 years	18,626	439	395	0	0	0	0	5
Other family:	84,798	2,847	1,927	6	0	0	6	7
Male householder, no wife present:	12,537	416	268	0	0	0	0	0
With related children under 18 years:	9,128	353	217	0	0	0	0	0
Under 5 years only	2,275	102	46	0	0	0	0	0
Under 5 years and 5 to 17 years	2,183	107	49	0	0	0	0	0
5 to 17 years only	4,670	144	122	0	0	0	0	0
No related children under 18 years	3,409	63	51	0	0	0	0	0
Female householder, no husband present:	72,261	2,431	1,659	6	0	0	6	7
With related children under 18 years:	62,646	2,155	1,472	6	0	0	6	7
Under 5 years only	10,266	391	263	0	0	0	0	2
Under 5 years and 5 to 17 years	17,521	661	340	0	0	0	0	2
5 to 17 years only	34,859	1,103	869	6	0	0	6	3
No related children under 18 years	9,615	276	187	0	0	0	0	0
Income in 1999 at or above poverty level:	2,032,028	31,369	64,655	192	426	272	204	247
Married-couple family:	1,617,865	22,993	53,061	120	362	230	167	210
With related children under 18 years:	803,675	10,959	27,617	81	153	83	59	95
Under 5 years only	165,127	1,744	4,760	0	26	17	3	11
Under 5 years and 5 to 17 years	166,268	2,238	5,430	26	48	0	17	16
5 to 17 years only	472,280	6,977	17,427	55	79	66	39	68
No related children under 18 years	814,190	12,034	25,444	39	209	147	108	115
Other family:	414,163	8,376	11,594	72	64	42	37	37

Male householder, no wife present:	113,465	2,247	3,181	20	8	0	9	13
With related children under 18 years:	53,687	1,392	1,892	5	0	0	8	10
Under 5 years only	12,813	373	337	0	0	0	4	3
Under 5 years and 5 to 17 years	7,667	206	215	0	0	0	3	0
5 to 17 years only	33,207	813	1,340	5	0	0	1	7
No related children under 18 years	59,778	855	1,289	15	8	0	1	3
Female householder, no husband present:	300,698	6,129	8,413	52	56	42	28	24
With related children under 18 years:	165,656	3,734	4,665	8	5	19	15	15
Under 5 years only	23,885	496	718	0	5	7	0	3
Under 5 years and 5 to 17 years	22,926	611	425	0	0	0	2	2
5 to 17 years only	118,845	2,627	3,522	8	0	12	13	10
No related children under 18 years	135,042	2,395	3,748	44	51	23	13	9

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

APPENDIX N – AIR MODELING INFORMATION

APPENDIX N – AIR MODELING INFORMATION

Air Quality Modeling Information
On-Site Stabilization and Long-Term Control (LTC) Alternative Spreadsheets (Tables N-1 through N-11)
Off-Site Disposal and License Termination (LT) Alternative Spreadsheets (Tables N-12 through N-25
Additional Alternatives Considered for ALARA Analysis (Tables N-26 through N-67)
Visual Effects Screening Analysis Output Sheet

APPENDIX N
AIR QUALITY MODELING INFORMATION

Project Emissions

For the two alternatives evaluated in the Environmental Report (ER) and the three additional alternatives considered in the ALARA analysis (Chapter 7 of the DP), air pollutant emissions will be generated from multiple operations and equipment. Combustion source emissions will be generated from engine exhaust systems, which, depending on the alternative being evaluated, have been assumed to include: tri-axle dump trucks, loader(s), dozer, dust control vehicle, rock crusher's engine, and/or locomotive engine. Fugitive emissions will be generated from material handling (storage piles, heavy equipment operation, drop emissions), wind erosion of exposed material surfaces, and vehicle travel on paved and unpaved roadways. Daily and annual emissions have been estimated for each alternative. The estimate of daily emissions conservatively represents a "worst-case" day of operations that includes the expected number of construction vehicles and fugitive emissions sources.

Of potential concern for this proposed project are nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) less than or equal to 10 micrometers in aerodynamic diameter (PM_{10}) and particulate matter less than or equal to 2.5 micrometers in aerodynamics ($PM_{2.5}$). National Ambient Air Quality Standards (NAAQS) have been established for PM_{10}, $PM_{2.5}$, SO_2, and NO_2.

Emission estimation methodologies for each of the alternatives are presented below.

On-Site Stabilization and Long-Term Control Alternative (LTC)

This alternative involves consolidating the radioactive materials within a section of the Storage Yard and constructing a multi-layer engineered barrier over the final consolidated pile. These calculations conservatively assume that areas from which stored materials are removed that are located outside of the footprint of the final consolidated pile will be covered with clean soil following material consolidation activities (associated materials are referred to herein as cover materials). To analyze emissions generated from this alternative, the following operational areas have been considered (see Figure 4-1, "Geometry of Emission Sources for the Proposed Decommissioning Alternatives Modeling"):

Area 1	Primary Controlled Area
	This area represents the existing Storage Yard and the materials contained therein.
Area 2	Engineered Barrier Area
	The area in which the materials from the existing Storage Yard area will be consolidated and covered by the Engineered Barrier.
Area 3	Engineered Barrier Staging Area
	Temporary storage area for materials brought on-site for the construction of the Engineered Barrier and associated drainage features.
Area 5	Roadways
	The area containing paved and unpaved roadways used to transport materials.

Another area represented in the air modeling, Area 4, the Staging Area, is used only for materials crushing and train loading for the LT alternative. Therefore, it is not considered under the LTC alternative.

Emissions for the various project steps that will occur during implementation of this alternative, from material relocation through the placement of soil cover materials, were estimated. Multiple spreadsheets were used to estimate emissions, as presented in the attached tables. The following is a summary of the emission estimation methodologies and emission factors presented in each of the tables:

Tables N-1a and N-1b: Air Emission Details

The operational assumptions that are common to multiple aspects of the various emission estimates are summarized on Tables N-1a and N-1b. Included in the operational assumptions are operational times and material amounts handled.

Table N-2: Material Description

The Storage Yard consists of several subpiles of different types of materials. This table presents the area, volume, mass, and physical characteristics of each subpile. The materials needed for the engineered barrier and soil cover are also listed in this table. Based on material composition, the material density, silt content, and moisture content have been estimated for each subpile. Each material was matched with a similar material found in the USEPA Compilation of Air Pollutant Emission Factors AP-42 Table 13.2.4-

1. This table also presents a weighted average of the materials' physical characteristics that is used in some of the emission estimation tables.

Table N-3: Material Handling – "Drop Emissions"

Fugitive PM_{10} and $PM_{2.5}$ "drop emissions" are created when a truck dumps material onto a pile or when material is loaded from a pile into a truck. The equation to estimate drop emissions is found in AP-42 Chapter 13.2.4, Aggregate Handling and Storage Piles. For this alternative, it is assumed that the drop emissions will occur when soil materials for the engineered barrier and soil cover are handled and when a loader moves material from an existing pile to the consolidated pile. The emission factor for piles includes the emissions from the material being placed into a pile. One of the variables used in the equation, mean wind speed, is from the table of "Normals, Means, and Extremes for Philadelphia PA (PHL)" from Local Climatological Data (ISSN 0198-4535) published by the National Climatic Data Center (NCDC). The pound per day emission estimate for each subpile assumes that every subpile has some material handling; therefore, the "Active 8-Hour Day" is a total of all the subpiles in each area.

Table N-4: Material Handling – Active/Inactive Pile Emissions

Fugitive PM_{10} and $PM_{2.5}$ emissions are generated once a pile is disturbed and becomes "active," which is when pile material is dumped, loaded or otherwise handled. Per AP-42 Chapter 13.2.4, once a pile is disturbed the fines may be disaggregated and released by wind events. There are also fugitive emissions generated when a disturbed pile is inactive due to wind erosion. As the undisturbed pile weathers, the potential for emissions is greatly reduced.

The emissions are estimated by using two emission factors published in the Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779), "Uncontrolled Particulate Emission Factors for Sand and Gravel Processing." One emission factor is for active storage piles during an active day. The active storage pile emission factor includes the following operations: loading (drop emissions), equipment traffic, and wind erosion. As there is no loading onto the storage piles being relocated, the emissions estimated using these factors will be conservative. The emission factor assumes that there is 8 to 10 hours of activity per 24 hours. The second emission factor is for a disturbed pile (recently active) that is inactive for the entire day. This emission factor represents wind erosion emissions. Both emission factors are for sand and gravel processing plants; the materials that are stored in Area 1, Area 2, and Area 3 are similar to the types of materials associated with such operations. The published emission factors are for PM_{10}. The $PM_{2.5}$ emission factor is developed from using a ratio of PM_{10} and $PM_{2.5}$ emissions factors for Drop Emissions.

The estimated daily emissions assume that only two subpiles have been disturbed and become active. The two piles are represented by one pile in the Primary Control Area and one pile in the Engineered Barrier Staging Area. Since the emission factor is based on the pile size, the daily emissions from the two largest subpiles (one from each area) are estimated (only the disturbed portion of the pile that will be removed and

consolidated within the footprint of the final pile is considered). For the purposes of modeling each hour of the day, the wind erosion portion of the active emission factor was extracted. Material handling is assumed to occur for 8 work hours each day and thus material handling emissions are calculated based on 8 hours per day. Wind erosion is assumed to occur 24 hours per day. The emission factor was then adjusted to represent the 8 hour portion of the day that is active and the 16 hour inactive portion of the day when only wind erosion is a source of emissions.

Table N-5: Heavy Equipment Operation

The emission factors used to estimate the fugitive PM_{10} and $PM_{2.5}$ emissions due to the operation of heavy equipment are from AP-42 Chapter 11.9 Western Surface Coal Mining. The heavy equipment assumed to be in use includes a dozer, loader and excavator. A dozer and loader are assumed to be used in Area 1 to consolidate the existing piles. The excavator and dozer are assumed to be used to shape the final pile and place the soil cap material. Dozer emissions are estimated using an equation for estimating emissions associated with the bulldozing of overburden. It is assumed that the emission rates for the loader and the excavator are the same as the dozer.

Table N-6: Unpaved Roadways – Access Road

The emission estimates for fugitive PM_{10} and $PM_{2.5}$ from the unpaved access road are based on emission factors from AP-42 Chapter 13.2.2 Unpaved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. The equation for unpaved surfaces at industrial sites is used for this project. The silt loading value is the weighted average of the materials' physical characteristics from Table N-2. These calculations assume the unpaved roads will be treated each month with a chemical dust suppressant (palliative), which is expected to reduce PM_{10} emissions by 80% per AP-42 Figure 13.2.2-5. The daily number of vehicles assumes that the deliveries for the engineered barrier soils and cover soils occur on the same days.

Table N-7: Paved Roadway Emissions

The emission estimates for fugitive PM_{10} and $PM_{2.5}$ from the paved road are based on AP-42 Chapter 13.2.1 Paved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. AP-42 Chapter 13.2.1 Equation 1 is used to estimate emissions from the paved roads and the silt loading is the value for iron and steel production as presented in AP-42 Table 13.2.1-3. The daily number of vehicles assumes that the deliveries for the engineered barrier soil materials and cover materials occur on the same days.

Table N-8: Exposed Ground Area Emissions

The emission factor for fugitive PM_{10} and $PM_{2.5}$ from the exposed ground area is presented in AP-42 Chapter 11.9.1, Table 11.9.4. Following USEPA guidance, the emission estimates assume that the wind erosion emissions from the exposed ground area will end during the revegetation period, 7 months after the start of material relocation. The emission factor is for PM_{30}, but the AP-42 table refers to Chapter 13.2.5, which has a particle distribution table for PM_{10} and $PM_{2.5}$ when wind speed is a factor.

Table N-9: Off-Road Diesel Engine Emissions

The emissions estimated and presented in this table are combustion emissions from off-road vehicle engines. Emission estimated include exhaust, brake and tire wear. Off-road vehicles have different emission factors than on-road vehicles because the manufacturers are subject to different emission standards for engine designs. The emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Non-Road Engine Modeling – Compression-Ignition, dated February 13, 1998, revised June 15, 1998. It is assumed that the engines were manufactured between 2003 and 2006 and are regulated by Tier 2 emission standards for PM and NO_x. Due to USEPA implementation of the Ultra-Low Sulfur Diesel Rule, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table N-10: On-Road Engine Emissions

The emissions estimated and presented in this table are combustion emissions from the on-road vehicle engines. Emission estimates include exhaust, brake, and tire wear. Emissions estimates are based on MOBILE6.2, a computerized model that provides emission estimates of present and future emissions from highway motor vehicles and is available through the EPA Office of Transportation and Air Quality. MOBILE6.2 allows the use of site-specific and fleet-specific parameters in order to develop emission estimates that best represent expected conditions and site location. Fleet vehicles that are less than 10 years old, utilize diesel fuel with 15 ppm sulfur content, and have an average speed of 10 miles per hour were modeled.

Table N-11: Emissions Summary

The emissions from each of the tables described above are summarized by area on this table.

Off-Site Disposal and License Termination Alternative (LT)

This alternative involves removing the radioactive materials from the facility by railcar, with some materials requiring crushing prior to off-site removal. It also conservatively assumes the placement of clean soil (cover material) over the Storage Yard after the materials have been removed. Under this alternative, active decommissioning measures will occur for eight hours

per day, five days per week, five months per year, over a two year period. To analyze emissions generated from this alternative, the following operational areas have been considered:

Area 1 Primary Control Area

This area represents the existing Storage Yard and the materials contained therein. The material to be transported off-site is located in the Storage Yard. The material will be removed and brought to the Staging Area.

Area 4 Staging Area

Material removed from the Primary Control Area will be brought to the Staging Area for temporary storage prior to train loading for shipment. A crusher will be utilized in this area to reduce the size of a portion of the material for shipment.

Area 5 Roadways

The area containing paved and unpaved roadways used to transport materials.

Area 2 (Engineered Barrier Area) and Area 3 (Engineered Barrier Staging Area), which are only applicable to the LTC alternative, are not considered for the LT alternative.

Emissions were estimated for the various project steps that are expected to occur during implementation of this alternative, from material relocation through transportation off site. Multiple spreadsheets were used to estimate emissions, as presented in the attached tables. The following is a summary of the emission estimation methodologies and emission factors presented in each of the tables:

Tables N-12a and N-12b: Air Emission Details

The operational assumptions that are common to multiple aspects of the various emission estimates are summarized on Tables N-12a and N-12b. Included in the operational assumptions are operational times and material amounts handled.

Table N-13: Material Description

This table presents the area, volume, mass, and physical characteristics of each subpile of material in the Storage Yard and cover materials. Based on material composition the density, silt content, and moisture content of each material was estimated. Each material was matched with a similar material found in AP-42 Table 13.2.4-1. This table also presents weighted average of the materials' physical characteristics that were used in some of the emission estimation tables.

Table N-14: Material Handling – "Drop Emissions"

Fugitive PM_{10} and $PM_{2.5}$ "drop emissions" are created when a truck dumps material onto a pile or when material is loaded from a pile into a truck. The equation to estimate drop emissions is found in AP-42 Chapter 13.2.4, Aggregate Handling and Storage Piles. For this alternative, it is assumed that the drop emissions will occur when cover materials are dumped on-site, when material is loaded onto a tri-axle truck for transfer to the Staging Area, and when the train is loaded with material. One of the variables used in the equation, mean wind speed, is from the table of "Normals, Means, and Extremes for Philadelphia PA (PHL)" from Local Climatological Data (ISSN 0198-4535) published by the NCDC.

Table N-15: Material Handling – Active/Inactive Pile Emissions

Fugitive PM_{10} and $PM_{2.5}$ emissions are generated once a pile is disturbed and becomes "active", which is when pile material is dumped, loaded, or otherwise handled. Per AP-42 Chapter 13.2.4, once a pile is disturbed, the fines may be disaggregated and released by wind events. There are also fugitive emissions generated when a disturbed pile is inactive due to wind erosion. As the undisturbed pile weathers, the potential for emissions is greatly reduced.

The emissions are estimated by using two emission factors published in the Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779), "Uncontrolled Particulate Emission Factors for Sand and Gravel Processing". One emission factor is for active storage piles during an active day. The active storage pile emission factor includes the following operations: loading (drop emissions), equipment traffic, and wind erosion. The "drop emission" for loading into the Staging Area pile is included in the active pile emission factor. The emission factor assumes that there is 8 to 10 hours of activity per 24 hours. The second emission factor is for a disturbed pile (recently active) that is inactive for the entire day. This emission factor represents wind erosion emissions. Both emission factors are for sand and gravel processing plants; the materials that are stored in Area 1 and Area 4 are similar to the types of materials associated with such operations. The published emission factors are for PM_{10}. The $PM_{2.5}$ emission factor is developed from using a ratio of PM_{10} and $PM_{2.5}$ emissions factors for Drop Emissions.

The estimated daily emissions assume that only two subpiles have been disturbed and become active. The two piles are represented by one pile in the Primary Control Area and one pile in the Staging Area. Since the emission factor is based on the pile size, the daily emissions from the two largest subpiles are estimated. For the purposes of modeling each hour of the day, the wind erosion portion of the active emission factor was extracted. Material handling is assumed to occur for 8 work hours each day and thus material handling emissions are calculated based on 8 hours per day. Wind erosion is assumed to occur 24 hours per day. The emission factor was then adjusted to represent the 8 hour portion of the day that is active and the 16 hour inactive portion of the day when only wind erosion is a source of emissions. Annual emissions assume that half the piles have been disturbed and removed during the first year and the remaining piles are disturbed and removed during the second year

Table N-16: Heavy Equipment Operation

The emission factors used to estimate the fugitive PM_{10} and $PM_{2.5}$emissions due to the operation of heavy equipment are from AP-42 Chapter 11.9 Western Surface Coal Mining. The heavy equipment assumed to be used includes a dozer and a loader. It is assumed that the loader and dozer will share time in Area 1 and Area 4. Dozer emissions are estimated using an equation for estimating emissions associated with the bulldozing of overburden materials. It is assumed that the emission rate for the loader is the same as the dozer.

Table N-17: Unpaved Roadways – Access Road

The emission estimates for fugitive PM_{10} and $PM_{2.5}$ from the access road are based on emission factors from AP-42 Chapter 13.2.2 Unpaved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. The equation for unpaved surfaces at industrial sites is used for this project. The silt loading value is the weighted average of the materials' physical characteristics from Table N-13. The calculations assume the unpaved roads will be treated each month with a chemical dust suppressant, which is expected to reduce PM_{10} emissions by 80%, per AP-42 Figure 13.2.2-5. The daily number of vehicles assumes that the material transfer and the cover material deliveries occur on the same days.

Table N-18: Paved Roadway Emissions

The emission estimates for fugitive PM_{10} and $PM_{2.5}$ from the paved road are based on AP-42 Chapter 13.2.1 Paved Roads. It is assumed that the vehicles using the road will be represented by heavy duty tri-axle trucks. AP-42 Chapter 13.2.1 Equation 1 is used to estimate emissions from the paved roads and the silt loading is the value for iron and steel production as presented in AP-42 Table 13.2.1-3.

Table N-19: Exposed Ground Area Emissions

The emission factor for fugitive PM_{10} and $PM_{2.5}$ from the exposed ground area is presented in AP-42 Chapter 11.9.1, Table 11.9.4. Following USEPA guidance, the emission estimates assume that re-vegetation (after the end of material relocation) will end the wind erosion emissions from the exposed ground area. Since this alternative will occur over a two-year period, the emission estimate assumes that more of the area is exposed every month and there are no exposed ground area emissions during the winter months. The emission factor is for PM_{30}, but the AP-42 table refers to AP-42 Chapter 13.2.5, which has a particle distribution table for PM_{10} and $PM_{2.5}$ when wind speed is a factor.

Table N-20: Off-Road Diesel Engine Emissions

The emissions estimated and presented in this table are combustion emissions from off-road vehicle engines. Emissions estimates include exhaust, brake and tire wear. Off-road vehicles have different emission factors than on-road vehicles because the manufacturers

are subject to different emission standards for engine designs. The emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Non-Road Engine Modeling – Compression-Ignition, dated February 13, 1998, revised June 15, 1998. It is assumed that the engines were manufactured between 2003 and 2006 and are regulated by Tier 2 emission standards for PM and NO_x. Due to USEPA implementation of the Ultra-Low Sulfur Diesel Rule, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table N-21: On-Road Engine Emissions

The emissions estimated and presented in this table are combustion emissions from the on-road vehicle engines. Emission estimates also include exhaust, brake and tire wear. Emissions estimates are based on MOBILE6.2, a computerized model that provides emission estimates of present and future emissions from highway motor vehicles and is available through the EPA Office of Transportation and Air Quality. MOBILE6.2 allows the use of site-specific and fleet-specific parameters in order to develop emission estimates that best represent expected conditions and site location. Fleet vehicles that are less than 10 years old, utilize diesel fuel with 15 ppm sulfur content, and have an average speed of 10 miles per hour were modeled.

Table N-22: Material Handling – Crushing Emissions

Fugitive PM_{10} and $PM_{2.5}$ emissions are created when mechanical crushing is employed for material size reduction. Only piles with large material will be processed in the crusher. The emission factor is from EPA's Factor Information Retrieval (FIRE) Data System version 6.25. The source classification code (SCC) for the process is 3-05-020-02, which is for stone quarrying – processing, secondary crushing (no emission factors were available for primary crushing). The emission factor is for a crusher that employs wet suppression technology as an emission control. The daily amount of material crushed and the estimated PM_{10} emissions are limited by the amount of material that can be loaded into a rail car. Annual emissions assume that half the material will be crushed in the first year and the other half crushed in the second year.

Table N-23: Crusher - Engine Emissions

The emissions estimated and presented in this table are combustion point source emissions from the diesel engine that powers the crusher. For the purpose of estimating emissions, it is assumed that the engine has a power rating of 300 HP. The emission factors used to estimate emissions are published in AP-42 Chapter 3.3, Table 3.3-1. Due to USEPA implementation of the Ultra-Low Sulfur Diesel Rule, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table N-24: Locomotive – Diesel Powered

The emissions estimated and presented in this table are combustion emissions from the diesel engine that powers the train. For the purpose of estimating emissions, it is assumed that the locomotive operates under "switch duty-cycle" as defined by USEPA and the engine has a power rating of 1,000 HP. The emission factors used to estimate emissions are published in USEPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines – Locomotives". Emissions are based on the assumption that the engines were manufactured from 2000 to 2004. Due to expected USEPA implementation of the Ultra-Low Sulfur Diesel Rule, it is assumed that the diesel fuel has a sulfur content of 15 parts per million.

Table N-25: Emissions Summary

The emissions from each of the tables described above are summarized by area on this table.

Three Additional Alternatives – Combining Off-Site Disposal and On-Site Stabilization

Three additional alternatives considered for the purposes of the ALARA analysis involve removing portions of the radioactive materials off site and on-site stabilization by consolidating remaining portions of radioactive material and covering the material with an engineered barrier. A summary of the three alternatives are as follows:

- Off-Site Disposal of Slag Only
- Off-Site Disposal of 50% of the Slag
- Off-Site Disposal of All Materials Except Slag

Under these three alternatives, it is assumed that active decommissioning measures will take two years and will occur for eight hours per day, five days per week. The on-site stabilization portion will occur during the first year for a seven-month period. The off-site disposal portion will occur during the second year for a five-month period. As in the other alternatives, the activities performed on the property have been broken into five operational areas so that the emissions generated can be analyzed. Although in the LTC and the LT alternatives not all the operational areas were active, in these three additional alternatives all five operational areas will be active for each alternative. The following are the five operational areas considered:

Area 1 Primary Control Area

This area is located in the existing Storage Yard and the consolidated material pile with the Engineered Barrier is located within this area. Some of the material to be transported off-site is located in the Storage Yard. The material will be removed and brought to the Staging Area.

Area 2 Engineered Barrier Area

The materials moved from the existing Storage Area will be consolidated into a final pile with the Engineered Barrier and will be located within Area 1.

Area 3 Engineered Barrier Staging Area

Materials needed to be brought on-site for the stabilization and long term control of the consolidated pile will be brought to an area prior to placement as the Engineered Barrier for the consolidated final pile. This area is referred to as the Engineered Barrier Staging Area and will be separate from the Engineered Barrier Area.

Area 4 Staging Area

Material removed from the Primary Control Area will be brought to the Staging Area for temporary storage prior to train loading for shipment. A crusher will be utilized in this area to reduce the size for a portion of the material for shipment.

Area 5 Roadways

The roadways are comprised of the paved and unpaved roads the construction vehicles associated with the project will utilize.

Emissions are estimated for the various project steps that are expected to occur during implementation of this alternative, from material relocation through transportation off-site. The same spreadsheets and methodologies used to estimate emissions for the LTC and LT alternatives are used to estimate emissions associated with these alternatives; therefore, descriptions of each of the emission spreadsheets are not provided. Emissions estimates are presented in the following tables for each of the three additional alternatives:

Off-Site Disposal of Slag Only

Tables N-26a and N-26b: Air Emission Details
Table N-27: Material Description
Table N-28: Material Handling – "Drop Emissions"

Table N-29: Material Handling – Active/Inactive Pile Emissions
Table N-30: Heavy Equipment Operation
Table N-31: Unpaved Roadways – Access Road
Table N-32: Paved Roadway Emissions
Table N-33: Exposed Ground Area Emissions
Table N-34: Off-Road Diesel Engine Emissions
Table N-35: On-Road Engine Emissions
Table N-36: Material Handling – Crushing Emissions
Table N-37: Crusher - Engine Emissions
Table N-38: Locomotive – Diesel Powered
Table N-39: Emissions Summary

Off-Site Disposal of 50% of the Slag

Tables N-40a and N-40b: Air Emission Details
Table N-41: Material Description
Table N-42: Material Handling – "Drop Emissions"
Table N-43: Material Handling – Active/Inactive Pile Emissions
Table N-44: Heavy Equipment Operation
Table N-45: Unpaved Roadways – Access Road
Table N-46: Paved Roadway Emissions
Table N-47: Exposed Ground Area Emissions
Table N-48: Off-Road Diesel Engine Emissions
Table N-49: On-Road Engine Emissions
Table N-50: Material Handling – Crushing Emissions
Table N-51: Crusher - Engine Emissions
Table N-52: Locomotive – Diesel Powered
Table N-53: Emissions Summary

Off-Site Disposal of All Materials Except Slag

Tables N-54a and N-54b: Air Emission Details
Table N-55: Material Description
Table N-56: Material Handling – "Drop Emissions"
Table N-57: Material Handling – Active/Inactive Pile Emissions
Table N-58: Heavy Equipment Operation
Table N-59: Unpaved Roadways – Access Road
Table N-60: Paved Roadway Emissions
Table N-61: Exposed Ground Area Emissions
Table N-62: Off-Road Diesel Engine Emissions
Table N-63: On-Road Engine Emissions
Table N-64: Material Handling – Crushing Emissions
Table N-65: Crusher - Engine Emissions
Table N-66: Locomotive – Diesel Powered
Table N-67: Emissions Summary

License Continuation Alternative (LC)

The LC Alternative involves leaving the existing storage piles in-place. Under this alternative, it is expected that the area would become largely naturally vegetated over the long term. Areas that do not support vegetation, such as large pieces of slag, have been exposed to the wind for some time and wind erodible particles have been removed. USEPA notes that erodible materials are removed from an undisturbed surface in a matter of minutes by wind, and as long as the surface remains undisturbed, it is no longer a source of particle emissions (USEPA, AP-42, Compilation of Air Pollution Emission Factors, Section 13.2.5). Piles containing finer material will tend to form a natural crust, and again the erodible materials from the crusted surface have already been removed. There would be no vehicles or construction equipment used under this scenario.

There will be no emissions of NO_x attributable to this alternative, since there will be no combustion sources or engines employed. Airborne particle emissions under the LC Alternative will be negligible. USEPA does not consider inactive exposed areas and storage piles within industrial facilities to be sources of particle emissions. Under the LC Alternative, the facility would have inconsequential impacts on air quality, since there would be virtually no emissions. Under this scenario, the air quality concentrations would be equal to the background concentrations.

Project Visibility Screening Modeling

The worst-case emission scenario (LT Alternative) was modeled using the EPA's visibility screening model, VISCREEN, to determine whether there would be any significant visibility impact on the nearest Prevention of Significant Deterioration (PSD) Class I area, the Brigantine National Wildlife Refuge. Modeling was performed in accordance with the Federal Land Manager's Air Quality Related Values Working Group (FLAG) Phase I Report (U.S. Forest Service, December 2000). The output of the VISCREEN model is attached and shows that the screening criteria for the maximum visual impacts are not exceeded either inside or outside the Class I area. Thus, since the other alternatives have lower emission rates, all of the remediation alternatives will comply with the visibility screening criteria.

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Table N-1a
Air Emission Details - Materials and Travel Distances

Common Truck Assumptions			
Yards per Load	(yards)	20	Given
Average Number of Wheels per Truck (10 unloaded, 14 loaded)	(wheels)	12	Given
Weight per Empty Truck	(tons)	15	Given
Average Weight of All Trucks	(tons)	32	Weighted Average Weight (material trucks & barrier/drainage trucks)
Engineered Barrier and Drainage Material			
Cover Soil, Total	(cubic yards)	15,184	CAD-based Estimate
Various Stone	(cubic yards)	16,092	CAD-based Estimate
Clay	(cubic yards)	20,725	CAD-based Estimate
Engineered Barrier/Drainage Material Total	(cubic yards)	52,000	
Amount of Cover Soil	(tons)	21,523	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Various Stone	(tons)	29,327	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Clay	(tons)	34,974	Cubic Yards x Pounds per Cubic Yard / 2,000
Engineered Barrier/Drainage Material Total	(tons)	85,824	
Number of Trucks Trips - Cover Soil	(truck trips)	759	Material Needed / Yards per Load
Number of Trucks Trips - Stone	(truck trips)	805	Material Needed / Yards per Load
Number of Trucks Trips - Clay	(truck trips)	1,036	Material Needed / Yards per Load
Cubic Yards of Engineered Barrier Material Delivered	(cubic yards)	52,000	Number of Trucks x Yards per Load
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Various Stone - Density	(pounds/cubic foot)	135	From Table 2
Various Stone - Density	(pounds/cubic yard)	3,645	Pounds per Cubic Foot x 27
Clay - Density	(pounds/cubic foot)	125	From Table 2
Clay - Density	(pounds/cubic yard)	3,375	Pounds per Cubic Foot x 27
Soil Material Loaded per Truck	(tons)	28	Yards per Load x Pounds per Cubic Yard
Soil Weight per Loaded Truck	(tons)	43	Load per Truck + Weight of Empty Truck
Average Weight of a Soil Material Truck	(tons)	29	Average of Empty Truck and Loaded Truck
Stone Material Loaded per Truck	(tons)	36	Yards per Load x Pounds per Cubic Yard
Stone Weight per Loaded Truck	(tons)	51	Load per Truck + Weight of Empty Truck
Average Weight of a Stone Material Truck	(tons)	33	Average of Empty Truck and Loaded Truck
Clay Material Loaded per Truck	(tons)	34	Yards per Load x Pounds per Cubic Yard
Clay Weight per Loaded Truck	(tons)	49	Load per Truck + Weight of Empty Truck
Average Weight of a Clay Material Truck	(tons)	32	Average of Empty Truck and Loaded Truck
Trucks per Project, All Engineered Barrier/Drainage Material	(trucks/project)	2,600	Assumes Engineered Barrier & Drainage Construction Operation = 120 Calendar Days (86 work days)
Trucks per Day, All Material	(trucks/day)	31.0	Trucks per Project / Time for Engineered Barrier/Final Grading (86 work days)
Soil Material for the Relocated Pile Areas			
Engineered Barrier Area Size	(square feet)	248,763	CAD-based Estimate
Storage Yard Area Not Covered by Engineered Barrier	(square feet)	158,100	Scaled Estimate
Number of Yards of Topsoil Needed	(cubic yards)	2,928	Estimated
Tons of Topsoil Needed	(tons)	4,150	Tons from Table 2
Number of Trucks	(trucks/project)	146	Cover Needed / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 Loads per Hour / 8 Hours Day
Yards per Day	(yards/day)	480	Yards per Load x Trucks per Day
Pounds per Cubic Foot	(pounds/cubic foot)	105	From Table 2
Ton per Project	(tons/project)	4,150	Pounds per Cubic Yard / Yards of Cover
Number of Days Needed	(days/project)	6	Number of Trucks / Yards per Load
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
On-Site Soil Consolidation			
Yards per Load	(yards/load)	20	Given
Material to be Moved	(cubic yards)	1,320	From Table 2
Material to be Moved	(tons)	1,871	From Table 2
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Number of Trucks from Piles to Engineered Barrier Area	(truck trips/project)	66	Cubic Yards / Yards per Load
Tons Material Loaded per Truck	(tons/truck)	28	Tons Material Moved / Number of Trucks
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
Travel Distances			
On-Site Material Transport			
Length of UNPAVED Roadway - to Engineered Barrier	(feet)	1,000	Weighted average length for various soil excavation areas
Cover & Engineered Barrier Material Transport			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Cover & Engineered Barrier Material
Length of PAVED Roadway	(feet)	1,650	Cover & Engineered Barrier Material
Soil Material for Relocated Pile Areas			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,600	Soil Material for Relocated Piles Areas
Length of PAVED Roadway	(feet)	1,650	Soil Material for Relocated Piles Areas
Off-Site Material Removal			
Length of UNPAVED Roadway - storage area to staging area	(feet)	1,100	Trip Length for Material Removed
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Trip Length for Cover Delivered
Length of PAVED Roadway	(feet)	1,650	Trip Length for Cover Delivered

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Table N-1b
Air Emission Details - Scheduling

Project Operational Times

			On-Site Stabil.
Working Hours			
	Days per Week	(days/week)	5
	Weeks per Year	(weeks/year)	30
	Hours per Day	(hours/day)	8
Project Duration			
	Total Years	(years)	1
	Total Months	(months)	7
	Months each Year	(months/year)	7

Task Durations			On-Site Stabil
	Time for Creating Consolidated Pile	(calendar days)	90
		(work days)	64
	Time for on-site soil consolidation	(work days)	3
	Time for Engineered Barrier	(calendar days)	90
		(work days)	64
	Final Grading for Drainage	(calendar days)	30
		(work days)	20
	Soil Cover for Non-Engineered Barrier Area	(calendar days)	13
		(work days)	9

Equipment Daily/Annual Operating Rates

Loader(s)	= Number of Equipment		2
	= Maximum Operating Hours per Day	(hours/day)	8
	= Maximum Operating Hours per Day FOR ALL	(hours/day)	16
	= Operating Hours per Year	(hours/year)	2412
Dozer	= Number of Equipment		2
	= Maximum Operating Hours per Day	(hours/day)	8
	= Maximum Operating Hours per Day FOR ALL	(hours/day)	16
	= Operating Hours per Year	(hours/year)	2412
Excavator	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	4
	= Maximum Operating Hours per Day FOR ALL	(hours/day)	4
	= Operating Hours per Year	(hours/year)	91
Dust Control Truck	= Maximum Trucks per Day	(truck/day)	1
	= Number of Trips per Month	(trucks/month)	22
	= Number of Trips for Project	(trip/project)	150

On-Site Stabilization and Long-Term Control

Table N-2
Material Description

Parcel #	Material Type	Volume (cubic yard)	Pile Size (acre)	Material Density (lbs/ft^3)	Material Density (g/cm^3)	Mass for Project (tons)	Percent of Pile To Be Moved (%)	Percent of Pile To Be Removed (%)	Percent of Pile To be Crushed (%)	Silt * (%)	Moisture* (%)	AP-42 Material* Match	Area Type
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.9	24,300	100	0	0	9.0	12.0	Cover	Primary Control Area
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	100	0	0	9.0	12.0	Cover	Primary Control Area
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.6	6,683	75	0	0	5.3	0.92	Slag	Primary Control Area
4	Slag	30,000	1.0	140	2.2	56,700	50	0	0	5.3	0.92	Slag	Primary Control Area
5A	Slag	2,600	0.2	140	2.2	4,914	25	0	0	5.3	0.92	Slag	Primary Control Area
5B	Demolition Concrete	2,400	0.3	120	1.9	3,888	25	0	0	3.9	2.10	Limestone Products	Primary Control Area
6	Hi-Ratio Slag	2,000	0.3	140	2.2	3,780	30	0	0	5.3	0.92	Slag	Primary Control Area
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.1	1,755	10	0	0	5.3	0.92	Slag	Primary Control Area
8	Baghouse Dust	13,000	0.9	100	1.6	17,550	100	0	0	13.0	7.0	Flue Dust	Primary Control Area
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.3	7,830	90	0	0	5.3	0.92	Slag	Primary Control Area
SC	On-Site Soil Consolidation	1,320	0.5	105	1.68	1,871	100	0	0	9.0	12.00	Cover	Primary Control Area
CVR1	Cover for moved pile areas	2,928	0.25	105	1.68	4,150	100	0	0	9.0	12.00	Cover	EB Staging Area
EB2	Cover Soil	15,184	0.25	105	1.68	21,523	100	0	0	9.0	12.00	Cover	EB Staging Area
EB4	Various Stone	16,092	0.25	135	2.2	29,327	100	0	0	2.6	7.40	Sand	EB Staging Area
EB5	Clay	20,725	0.25	125	2.0	34,974	100	0	0	6.0	10.00	Clay	EB Staging Area
Weighted Average	(includes engineered barrier material and cover material)			125	2.0					6.83	6.81		
	Unpaved Roadway												
	Total Volume & Mass of Material	130,248	cubic yards			220,662	tons						
	Controlled Materials:												
	Total =	75,320	cubic yards										
		130,688	tons										
	Amount Moved =	53,120	cubic yards										
		89,057	tons										

* Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1
EB = Engineered Barrier

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On-Site Stabilization and Long-Term Control

Table N-3
Material Handling - "Drop Emissions"

The "drop emission" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles, the drop emissions associated with each activity are included in the emission factor for those processes.

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13.2.4, November 2006

On-Site Soil Consolidation	3	days
Moving Storage Yard Materials	64	days
Placement of Barrier	64	days
Soil Cover for Non-Engineered Ar	9	days

Material Type	Parcel#	Pile & Material Type	Task	Area Type	Number of Working Days (days/project)	Material Amounts (tons/project)	Percent of Pile Moved (%)	Percent of Pile Removed (%)	Percent of Pile Crushed (%)	Material to be Handled (tons)	Material Amounts (tons/day)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M Material Moisture Content (%)	U Mean Wind Speed (mph)	E Calculated Emission Factor (lb/ton)	Calculated Emissions (lb/day)	Calculated Emissions (ton/project)
Loader Unloading	1	Excavated Soil Mixed with Slag	Moving Storage Yard Materials	Primary Control Area	64	24,300	100	0	0	24,300	380	PM10	0.35	12	8.7	1.9E-04	7.1E-02	2.3E-03
												PM2.5	0.053	12	8.7	2.8E-05	1.1E-02	3.4E-04
Loader Unloading	2	Excavated Soil from D111	Moving Storage Yard Materials	Primary Control Area	64	1,418	100	0	0	1,418	22	PM10	0.35	12	8.7	1.9E-04	4.1E-03	1.3E-04
												PM2.5	0.053	12	8.7	2.8E-05	6.3E-04	2.0E-05
Loader Unloading	3	Canal Slag (In & Out of Supersacs)	Moving Storage Yard Materials	Primary Control Area	64	6,683	75	0	0	5,012	78	PM10	0.35	0.92	8.7	6.8E-03	5.3E-01	1.7E-02
												PM2.5	0.053	0.92	8.7	1.0E-03	8.1E-02	2.6E-03
Loader Unloading	4	Slag	Moving Storage Yard Materials	Primary Control Area	64	56,700	50	0	0	28,350	443	PM10	0.35	0.92	8.7	6.8E-03	3.0E+00	9.7E-02
												PM2.5	0.053	0.92	8.7	1.0E-03	4.6E-01	1.5E-02
Loader Unloading	5A	Slag	Moving Storage Yard Materials	Primary Control Area	64	4,914	25	0	0	1,229	19	PM10	0.35	0.92	8.7	6.8E-03	1.3E-01	4.2E-03
												PM2.5	0.053	0.92	8.7	1.0E-03	2.0E-02	6.3E-04
Loader Unloading	5B	Demolition Concrete	Moving Storage Yard Materials	Primary Control Area	64	3,888	25	0	0	972	15	PM10	0.35	2.1	8.7	2.1E-03	3.3E-02	1.0E-03
												PM2.5	0.053	2.1	8.7	3.3E-04	4.9E-03	1.6E-04
Loader Unloading	6	Hi-Ratio Slag	Moving Storage Yard Materials	Primary Control Area	64	3,780	30	0	0	1,134	18	PM10	0.35	0.92	8.7	6.8E-03	1.2E-01	3.9E-03
												PM2.5	0.35	0.92	8.7	6.8E-03	1.2E-01	3.9E-03
Loader Unloading	7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Moving Storage Yard Materials	Primary Control Area	64	1,755	10	0	0	176	3	PM10	0.35	0.92	8.7	6.8E-03	1.9E-02	6.0E-04
												PM2.5	0.053	0.92	8.7	1.0E-03	2.8E-03	9.1E-05
Loader Unloading	8	Baghouse Dust	Moving Storage Yard Materials	Primary Control Area	64	17,550	100	0	0	17,550	274	PM10	0.35	7	8.7	4.0E-04	1.1E-01	3.5E-03
												PM2.5	0.053	7	8.7	6.0E-05	1.7E-02	5.3E-04
Loader Unloading	9	Baghouse Dust Mixed with Slag	Moving Storage Yard Materials	Primary Control Area	64	7,830	90	0	0	7,047	110	PM10	0.35	0.92	8.7	6.8E-03	7.5E-01	2.4E-02
												PM2.5	0.053	0.92	8.7	1.0E-03	1.1E-01	3.6E-03
Loader Unloading	SC	On-Site Soil Consolidation	On-Site Soil Consolidation	Primary Control Area	3	1,871	100	0	0	1,871	680	PM10	0.35	12	8.7	1.9E-04	1.3E-01	1.8E-04
												PM2.5	0.053	12	8.7	2.8E-05	1.9E-02	2.7E-05
Cover Placement	CVR1	Cover for moved pile areas	Soil Cover for Non-Engineered Area	EB Area	9	4,150	100	0	0	4,150	461	PM10	0.35	12	8.7	1.9E-04	8.8E-02	3.9E-04
												PM2.5	0.053	12	8.7	2.8E-05	1.3E-02	5.9E-05
EB Soil Placement	EB2	Cover Soil	Placement of Barrier	EB Area	64	21,523	100	0	0	21,523	336	PM10	0.35	12	8.7	1.9E-04	6.3E-02	2.0E-03
												PM2.5	0.053	12	8.7	2.8E-05	9.5E-03	3.1E-04
EB Stone Placement	EB4	Various Stone	Placement of Barrier	EB Area	64	29,327	100	0	0	29,327	458	PM10	0.35	7.4	8.7	3.7E-04	1.7E-01	5.4E-03
												PM2.5	0.053	7.4	8.7	5.6E-05	2.6E-02	8.2E-04
EB Clay Placement	EB5	Clay	Placement of Barrier	EB Area	64	34,974	100	0	0	34,974	546	PM10	0.35	10	8.7	2.4E-04	1.3E-01	4.2E-03
												PM2.5	0.053	10	8.7	3.7E-05	2.0E-02	6.4E-04

		Active 8 Hour Day (lbs/day)	Inactive Day (lbs/day)	March to Oct. (lbs/project)	Annual (ton/year)	March - Oct. (ton/project)
Primary Control Area	PM10	4.92	0.00	307	0.154	0.154
	PM2.5	0.85	0.00	53	0.027	0.027
EB Area	PM10	0.45	0.00	24.1	0.012	0.012
	PM2.5	0.068	0.00	3.64	0.0018	0.0018
EB Staging Area	PM10	0	0	0	0	0
	PM2.5	0	0	0	0	0

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13.2.4-1 and the mean wind speed (from May to Nov). is from Local Climatological Data (ISSN 0198-4538) Philadelphia, Pennsylvania.

EB = Engineered Barrier

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Table N-4
Material Handling - Active/Inactive Pile Emissions

The emission factor includes the emissions from loading material (drop emissions) into the pile, equipment traffic in the storage area, and wind erosion. Since it is difficult to determine when piles will be removed, the emissions assume all small piles are done on a Friday with an inactive weekend.

Parcel Number*	Material Type	Activity	Area Type	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Amount of pile to be Moved (%)	Amount of pile to be Moved (tons)	Annual Calendar Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/project)	Calculated Emissions (ton/project)	Fugitive Particulate Size (lb/acre/day)	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/project)	Calculated Emissions (ton/project)
1	Excavated Soil Mixed with Slag	Active	Primary Control Area	24,300	0.9	100	24,300	17	PM10	6.3	5.67	99	5.0E-02	PM2.5	0.95	0.86	1.5E+01	7.5E-03
		Inactive		24,300	0.9	100	24,300	5	PM10	1.7	1.53	7.6	3.8E-03	PM2.5	0.26	0.23	1.2E+00	5.8E-04
2	Excavated Soil from D111	Active	Primary Control Area	1,418	0.2	100	1,418	1	PM10	6.3	1.01	1.0	5.1E-04	PM2.5	0.95	0.15	1.6E-01	7.8E-05
		Inactive		1,418	0.2	100	1,418	2	PM10	1.7	0.27	0.5	2.7E-04	PM2.5	0.26	0.04	8.2E-02	4.1E-05
3	Canal Slag (In & Out of Supersacs)	Active	Primary Control	6,683	0.2	75	5,012	4	PM10	6.3	0.90	3.2	1.6E-03	PM2.5	0.95	0.14	4.9E-01	2.4E-04
		Inactive		6,683	0.2	75	5,012	2	PM10	1.7	0.24	0.48	2.4E-04	PM2.5	0.26	0.04	7.3E-02	3.7E-05
4	Slag	Active	Primary Control	56,700	1.0	50	28,350	20	PM10	6.3	3.26	67	3.3E-02	PM2.5	0.95	0.50	1.0E+01	5.1E-03
		Inactive		56,700	1.0	50	28,350	6	PM10	1.7	0.88	5.1	2.6E-03	PM2.5	0.26	0.13	7.8E-01	3.9E-04
5A	Slag	Active	Primary Control	4,914	0.2	25	1,229	1	PM10	6.3	0.32	0.28	1.4E-04	PM2.5	0.95	0.05	4.2E-02	2.1E-05
		Inactive		4,914	0.2	25	1,229	2	PM10	1.7	0.09	0.17	8.5E-05	PM2.5	0.26	0.01	2.6E-02	1.3E-05
5B	Demolition Concrete	Active	Primary Control	3,888	0.3	25	972	1	PM10	6.3	0.47	0.33	1.7E-04	PM2.5	0.95	0.07	5.0E-02	2.5E-05
		Inactive		3,888	0.3	25	972	2	PM10	1.7	0.13	0.26	1.3E-04	PM2.5	0.26	0.02	3.9E-02	1.9E-05
6	Hi-Ratio Slag	Active	Primary Control	3,780	0.3	30	1,134	1	PM10	6.3	0.60	0.49	2.5E-04	PM2.5	0.95	0.09	7.5E-02	3.7E-05
		Inactive		3,780	0.3	30	1,134	2	PM10	1.7	0.16	0.33	1.6E-04	PM2.5	0.26	0.02	4.9E-02	2.5E-05
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Active	Primary Control Area	1,755	0.3	10	176	0.13	PM10	6.3	0.17	0.021	1.1E-05	PM2.5	0.95	0.03	3.2E-03	1.6E-06
		Inactive		1,755	0.3	10	176	2	PM10	1.7	0.05	0.092	4.6E-05	PM2.5	0.26	0.01	1.4E-02	6.9E-06
8	Baghouse Dust	Active	Primary Control	17,550	0.9	100	17,550	13	PM10	6.3	5.66	74	3.7E-02	PM2.5	0.95	0.69	1.1E+01	5.6E-03
		Inactive		17,550	0.9	100	17,550	4	PM10	1.7	1.58	5.7	2.8E-03	PM2.5	0.26	0.24	8.6E-01	4.3E-04
9	Baghouse Dust Mixed with Slag	Active	Primary Control	7,830	0.4	90	7,047	5	PM10	6.3	2.49	13	6.3E-03	PM2.5	0.95	0.38	1.9E+00	9.6E-04
		Inactive		7,830	0.4	90	7,047	2	PM10	1.7	0.67	1.3	6.7E-04	PM2.5	0.26	0.10	2.0E-01	1.0E-04
SC	On-Site Soil Consolidation	Active	Primary Control	1,871	0.50	100	1,871	1	PM10	6.3	3.15	4.24	2.1E-03	PM2.5	0.95	0.48	6.4E-01	3.2E-04
		Inactive		1,871	0.50	100	1,871	2	PM10	1.7	0.85	1.7	8.5E-04	PM2.5	0.26	0.13	2.6E-01	1.3E-04
CVR1	Cover for moved pile areas	Active	EB Staging Area	4,150	0.25	100	4,150	9	PM10	6.3	1.58	14	7.1E-03	PM2.5	0.95	0.24	2.1E+00	1.1E-03
		Inactive		4,150	0.25	100	4,150	3	PM10	1.7	0.43	1.1	5.5E-04	PM2.5	0.26	0.06	1.7E-01	8.3E-05
EB2	Cover Soil	Active	EB Staging Area	21,523	0.25	100	21,523	15	PM10	6.3	1.58	24	1.2E-02	PM2.5	0.95	0.24	3.7E+00	1.8E-03
		Inactive		21,523	0.25	100	21,523	4	PM10	1.7	0.43	1.9	9.3E-04	PM2.5	0.26	0.06	2.8E-01	1.4E-04
EB4	Various Stone	Active	EB Staging Area	29,327	0.25	100	29,327	21	PM10	6.3	1.58	33	1.6E-02	PM2.5	0.95	0.24	5.0E+00	2.5E-03
		Inactive		29,327	0.25	100	29,327	6	PM10	1.7	0.43	2.5	1.3E-03	PM2.5	0.26	0.06	3.8E-01	1.9E-04
EB5	Clay	Active	EB Staging Area	34,974	0.25	100	34,974	25	PM10	6.3	1.58	39	2.0E-02	PM2.5	0.95	0.24	5.9E+00	3.0E-03
		Inactive		34,974	0.25	100	34,974	7	PM10	1.7	0.43	3.0	1.5E-03	PM2.5	0.26	0.06	4.6E-01	2.3E-04

Total Tons of Piles		
Primary Control Area	261,376	89,057
EB Area	0	0
EB Staging Area	179,947	89,974

	Annual PM10 (lbs/yr)	Annual PM10 (tons/yr)
Primary Control Area	265	265
EB Area	0	0
EB Staging Area	119	119

	Annual PM2.5 (lbs/yr)	Annual PM2.5 (tons/yr)
Primary Control Area	43.2	43.2
EB Area	0.0	0.0
EB Staging Area	18.0	18.0

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days.

	Max Active Day Total Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM10 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM10 (lbs/day)
Primary Control Area	6.91	1.58	5.66	1.05
EB Area	0	0	0	0
EB Staging Area	1.86	0.43	1.58	0.263

	Max Active Day Total Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM2.5 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM2.5 (lbs/day)
Primary Control Area	1.05	0.24	0.89	0.16
EB Area	0	0	0	0
EB Staging Area	0.28	0.06	0.24	0.043

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 13, Table 1 (page 779) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle:

1) loading of aggregate onto storage piles (batch or continuous drop operations),
2) equipment traffic in storage areas,
3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day, the remainder of the day wind erosion of the pile occurs.

Emission estimates for the EB piles (engineering barrier piles) are active everyday during the construction of the EB. Max Active Day is a weekday with one "worst case" pile is active for 8 hours and inactive of 16 hours for each area. Max Inactive Day is a weekend with one "worst case" pile is inactive for 24 hours. PM2.5 emissions are based on a ratio of the PM10 to PM2.5 emission factors for the drop emission factors in the Material Handling spreadsheet, also found in AP-42 Chapters 13.2.4 and 13-2.5.

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Table N-5

Heavy Equipment Operation

Emission Factor Equations

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling on the material. Some of these emissions estimates are double counted when the equipment is working with a pile.

Loader & Dozer Equation

$$PM10\ lbs/hr = 0.75\,(1.0(s)^{1.5}) / (M)^{1.4}$$

$$PM2.5\ lbs/hr = 0.105\,(5.7(s)^{1.2}) / (M)^{1.3}$$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 October 1998

Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Hours per Year (hours/year)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/year)	Calculated Emissions (ton/yr)	Calculated Emissions (ton/project)
Loaders	16	2,412	6.83	6.81		PM10	0.91	14.6	2,201	1.10	1.10
						PM2.5	0.50	7.9	1,196	0.60	0.60
Dozers	16	2,412	6.83	6.81		PM10	0.91	14.6	2,201	1.10	1.10
						PM2.5	0.50	7.9	1,196	0.60	0.60
Excavator	4	91	6.83	6.81		PM10	0.91	3.65	83	0.04	0.04
						PM2.5	0.50	1.98	45	0.02	0.02

	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	97	97	3
EB Area	33	33	20
EB Staging Area	21	21	0

	8 Hr Day PM10 (lbs/day)	Annual PM10 (lbs/year)	Annual PM10 (lbs/year)
Primary Controlled Area	29.2	2,834	2,834
EB Area	32.8	1,028	1028
EB Staging Area	32.8	623	623

	PM2.5 (lbs/day)	PM2.5 (lbs/year)	PM2.5 (lbs/year)
Primary Controlled Area	15.9	1,539	1,539
EB Area	17.8	558	558
EB Staging Area	17.8	338	338

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining

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On-Site Stabilization and Long-Term Control

Table N-6
Unpaved Roadways - Access Road

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated November, 2006

Equation (1a), $E = k(s/12)^a (W/3)^b$

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated DOES include particulate emissions from the engines.

Given Variables for Estimating Emissions

1.5 k = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
0.15 k = base emission factor for pounds of PM-2.5 particulate per vehicle mile traveled

6.00 s = road surface silt loading (silt content Iron and Steel Production)

32 W = average weight (tons) of vehicle traveling road

0.9 a = per Table 13.2.2-2. Constants for Equations 1a and 1b
0.45 b = per Table 13.2.2-2. Constants for Equations 1a and 1b

80% Percent of control, based on Fig. 13.2.2-5 for <10um, one month re-application, 0.18 gal/yd^2 petroleum resin

Roadway Type	Pollutant	Trip Length In and Out (feet)	Trucks per Day	Trucks per Project	Daily Vehicle Miles Traveled (miles/day)	Project Vehicle Miles Traveled (miles/project)	Uncontrolled E Emission Factor Equation 1a	Controlled E Emission Factor Equation 1a	Controlled Emissions Individual Daily (pounds)	Controlled Emissions Maximum Daily (pounds)	Controlled Emissions Individual Project (pounds)	Controlled Emissions Maximum Project (pounds)
On-Site Soil Consolidation	PM10	2,000	24	66	9.1	25	2.33	0.47	4.24		12	12
Cover & Engineered Barrier Material	PM10	2,400	31	2,600	14	1,182	2.33	0.47	6.57		552	552
Soil Material for Relocated Area	PM10	3,200	24	146	15	89	2.33	0.47	6.79	6.79	41	41
Dust Control Truck	PM10	3,200	1	150	0.6	91	2.33	0.47	0.28	0.28	42	42
On-Site Soil Consolidation	PM2.5	2,000	24	66	9.1	25	0.23	0.047	0.42		1.2	1.2
Cover & Engineered Barrier Material	PM2.5	2,400	31	2,600	14	1,182	0.23	0.047	0.66		55	55
Soil Material for Relocated Area	PM2.5	3,200	24	146	15	89	0.23	0.047	0.68	0.68	4.1	4.1
Dust Control Truck	PM2.5	3,200	1	150	0.6	91	0.23	0.047	0.028	0.028	4.2	4.2

TOTALS	Max. Daily (pounds)	Total Project (pounds)
PM10	7.07	647
PM2.5	0.71	64.7

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On-Site Stabilization and Long-Term Control

Table N-7
Paved Roadway Emissions

Predictive Emission Factor Equation from AP-42 5th Edition Chapter Section 13.2.1 Paved Roads, November 2006

Annual	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C]/453.592
Daily	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 - P/(4N))/453.592
Hourly	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 -1.2 P/N)/453.592

E =	particulate emission factor (pounds/mile traveled)	
k =	particulate size multiplier for particulate size range	
sL =	sL = road surface silt loading (grams per square meter for Iron & Steel Production))	
W =	average weight (tons) of the vehicles traveling the road	
C =	emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear	
P =	119	(number of wet days with at least 0.01" of precipitation)
N =	365	(number of days in the averaging period)
453.592	Conversion factor (1 pound = 453.592 grams)	

Truck Weight

Average Weight 32 tons

Roadway Types	% of Miles
Roadway with <500 vehicles/day	100%

Work Months

0 Winter Months (total of 5 per year)
7 Non-Winter Months (total of 7 per year)

Mileage Estimates

Cover and Engineered Barrier Material	1,650	Trip Length (feet) one way
Soil Material for Relocated Area	1,650	Trip Length (feet) one way
Water Truck	1,650	Trip Length (feet) one way

Total Number of Trucks

2,600 trucks/project	31 trucks/day
146 trucks/project	24 trucks/day
150 trucks/project	1 trucks/day

Roadway Type	sL Silt Loading Year (g/m^2)	W Average Vehicle Weight (tons)	Number of Miles Per Roadway Type Day	Project	Pollutant	k Base Multiplier (g/VMT)	C Wear & Tear Factor (g/VMT)	E Emission Factor Day Non-Winter (lbs/mile trvld)	Year Non-Winter Months (lbs/mile trvld)	Emissions Day Non-Winter (lb/day)	Year Non-Winter (lb/yr)	Year Non-Winter (ton/yr)
Cover and Engineered Barrier Material												
Roadway with <500 vehicles/day	5.82	32	19	1,625	PM10	7.3	0.2119	1.0E+00	1.1E+00	20.0	1,829	0.91
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	3.01	275	0.138
Soil Material for Relocated Area												
Roadway with <500 vehicles/day	5.82	32	15	91	PM10	7.3	0.2119	1.0E+00	1.1E+00	15.5	103	0.051
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	2.33	15	0.008
Water Truck												
Roadway with <500 vehicles/day	5.82	32	0.63	94	PM10	7.3	0.2119	1.0E+00	1.1E+00	0.65	106	0.053
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	0.10	16	0.008
								Totals	PM10	36.2	2,038	1.02
									PM2.5	5.44	307	0.15

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On-Site Stabilization and Long-Term Control

Table N-8
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area	Exposed Ground Area (sq ft)	Exposed Ground Area (acre)	Particulate Size	Emission Factor (ton/acre/year)	Emission Estimate Daily (lbs/day)	Hourly (lbs/hr)	Project (lbs/project)	Annual (lbs/year)
Exposed Ground Areas	Primary Control Area	248,763	5.71	TSP	0.38	11.89	0.495	2,532	2,532
Exposed Ground Areas	EB Area	158,100	3.63	TSP	0.38	7.56	0.315	1609	1,609

		Aerodynamic Particle Size Multiplier	Daily (lbs/day)	Hourly (lbs/hr)	Project (lbs/project)	Annual (lbs/year)
Primary Control Area	PM30	0.74	8.80	0.37	1,874	1,874
	PM10*	0.35	4.16	0.17	886	886
	PM2.5*	0.053	0.63	0.03	134	134
EB Area	PM30	0.74	5.59	0.23	1,191	1,191
	PM10*	0.35	2.65	0.11	563	563
	PM2.5*	0.053	0.40	0.02	85	85

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges or the surface is covered by rock, all disturbed areas are subject to wind erosion. This emission estimate assumes that the area will be become vegetated or will be covered with rock within 7 months of starting the material relocation/pile construction phase.

*The PM10 and PM2.5 emission factor has been adjusted from the PM30 emission factor, Section 13.2.5 (then to Section 13.2.4) which presents a distribution of particle sizes that are comparable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
silt range of 5.1 - 21 with a mean of 15
moisture range of 2.8 - 20 with a mean of 6.9
Physical properties of the sand/gravel:
silt range of 1.2 - 4.2 with a mean of 2.16 (site specific data)
sand moisture content, a mean of 7.4 (AP-42 Table 13.2.4-1)

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On-Site Stabilization and Long-Term Control

Table N-9
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the piles.

Loader
145 Estimated HP
16 Hours per Day
97 Days per Primary Control Area
33 Days per EB Area
21 Days per EB Staging Area
2412 Hours per Project
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

Dozer
132 Estimated HP
16 Hours per Day
97 Days per Primary Control Area
33 Days per EB Area
21 Days per EB Staging Area
2412 Hours per Project
7.08 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

Excavator
145 Estimated HP
4 Hours per Day
3 Days per Primary Control Area
20 Days per EB Area
0 Days per EB Staging Area
91 Hours per Project
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

Pollutant	Emission Factor Units	Loader			Dozer			Excavator			Totals	
		Emission Factor	pounds/day	pounds/year	Emission Factor	pounds/day	pounds/year	Emission Factor	pounds/day	pounds/year	pounds/day	pounds/year
PM	g/hp-hr	0.400	2.046	308	0.400	1.862	280.8	0.400	0.511	11.6	4.42	601
NOx	g/hp-hr	4.50	23.0	3,470	4.50	20.95	3,159	4.50	5.75	131	49.7	6,759
SOx	b/1,000 gals	0.213	0.026	3.91	0.213	0.024	3.64	0.213	0.0065	0.15	0.06	7.7

	Primary Control Area			EB Area			EB Staging Area		
	8 Hr Day (lbs/day)	Annual (lbs/year)	Project (lbs/year)	8 Hr Day (lbs/day)	Annual (lbs/year)	Project (lbs/year)	8 Hr Day (lbs/day)	Annual (lbs/year)	Project (lbs/year)
PM/PM10/PM2.5	4.42	379	379	4.42	138	138	4.42	83.4	83.4
NOx	49.7	4,268	4,268	49.7	1,553	1,553	49.7	938	938
SOx	0.057	4.86	4.86	0.057	1.77	1.77	0.057	1.07	1.07

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, excavator is a Caterpillar 22B with a 145 HP engine, and the dozer is a Caterpillar D5H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling – Compression-Ignition, dated February 13, 1998, revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

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EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes. The emissions estimates are the engine exhaust emissions. The emissions below are for two classes of heavy duty diesel vehicles.

Table N-10
On-Road Engine Emissions
EPA Model MOBILE 6.2

Maximum Miles per Day	
HDDV8A Miles per Day	36.6
HDDV8B Miles per Day	36.6
Miles per Year	
HDDV8A Miles per Year	1,598
HDDV8B Miles per Year	1,598
Idling	
Total hours of idling on site per day	1
Total hours of idling on site per year	160

Cover & Engineered Barrier Material	
Trucks per day	31
Trucks for project	2,600
Trucks per year	2600
Miles per truck	1.08
Soil Material for Relocated Pile Areas	
Trucks per day	24
Trucks for project	146
Trucks per year	146
Miles per truck	1.23

On-Site Soil Consolidation	
Trucks per day	24
Trucks for project	66
Trucks per year	66
Miles per truck	0.38
Dust Control Truck	
Trucks per day	1
Trucks for project	150
Trucks per year	150
Miles per truck	1.23

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)				HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)			
		grams/mile	grams/hour	max. pounds/day	pounds/year	grams/mile	grams/hour	max. pounds/day	pounds/year
PM10/PM2.5	10 mph average	0.254	NA	0.0205	0.89	0.25	NA	0.0204	0.89
	Idling	NA	1.0040	0.0022	0.35	NA	1.0040	0.0022	0.35
				0.0227	1.25			0.0226	1.24
SO2	10 mph average	0.0144	NA	1.2E-03	0.05	0.015	NA	1.2E-03	0.05
NOx	10 mph average	12.3	NA	0.991	43.2	13.9	NA	1.125	49.1

	PM10/PM2.5		SO2		NOx	
	max. pounds/day	pounds/year	max. pounds/day	pounds/year	max. pounds/day	pounds/year
Primary Control Area (33%)	0.0149	0.82	7.9E-04	0.0343	0.698	30.5
EB Area (0%)	0	0	0	0	0	0
EB Staging Area (33%)	0.0149	0.82	7.9E-04	0.0343	0.698	30.5
Roadways (33%)	0.0149	0.82	7.9E-04	0.0343	0.698	30.5

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less, it has been assumed that PM2.5 = PM10.

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On-Site Stabilization and Long-Term Control

Table N-11
Emissions Summary

Source	Area 1 - Primary Controlled Area				Area 2 - Engineered Barrier Area (EB Area)				Area 3 - Engineered Barrier Staging Area (EB Staging Area)				Area 5 - Roadways		
	PM-10 Emissions				PM-10 Emissions				PM-10 Emissions				PM-10 Emissions		
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	12 month lbs/year
Material Handling (Table 3)	4.92			307	x			24.1							
Active/Inactive Piles (Table 4)	5.86	1.05	1.58	285	0			0	1.58	0.283	0.43	119			
Heavy Equipment (Table 5)	x			2,834	32.8			1028	x			623			
Unpaved Roadways (Table 6)													7.07		647
Paved Roadways (Table 7)													36.2		2,036
Exposed Ground Area (Table 8)	1.39	2.77	4.16	886	0.88	1.76	2.65	563							
Off-Road Engines (Table 9)	x			379.4	4.42			138.1	x			83.4			
On-Road Engines (Table 10)	0.0149			0.82	0			0	0.0149			0.82	0.0149		0.82
TOTAL	12.2	3.83	5.7	4,693	38.1	1.763	2.65	1753	1.59	0.283	0.43	826	43.2		2,686

Source	Area 1 - Primary Controlled Area				Area 2 - Engineered Barrier Area (EB Area)				Area 3 - Engineered Barrier Staging Area (EB Staging Area)				Area 5 - Roadways		
	PM-2.5 Emissions				PM-2.5 Emissions				PM-2.5 Emissions				PM-2.5 Emissions		
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	12 month lbs/year
Material Handling (Table 3)	0.85			53.1	x			3.64							
Active/Inactive Piles (Table 4)	0.89	0.160	0.24	43.2	0			0	0.24	0.043	0.06	18.0			
Heavy Equipment (Table 5)	x			1,539	17.8			558.5	x			338			
Unpaved Roadways (Table 6)													0.71		64.7
Paved Roadways (Table 7)													5.44		307
Exposed Ground Area (Table 8)	0.21	0.42	0.63	134	0.13	0.27	0.40	85							
Off-Road Engines (Table 9)	x			379.4	4.420			138.06	x			83.4			
On-Road Engines (Table 10)	0.0149			0.82	0			0	0.0149			0.82	0.0149		0.82
TOTAL	2.0	0.6	0.87	2,150	22.4	0.267	0.40	785	0.25	0.043	0.06	441	6.16		372.1

Source	Area 1 - Primary Controlled Area			Area 2 - Engineered Barrier Area (EB Area)			Area 3 - Engineered Barrier Staging Area (EB Staging Area)			Area 5 - Roadways		
	SOx Emissions			SOx Emissions			SOx Emissions			SOx Emissions		
	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year
Off-Road Engines (Table 9)	x		4.86	5.7E-02		1.8E+00	x		1.07			
On-Road Engines (Table 10)	7.9E-04		3.4E-02	0		0	7.9E-04		0.0343	7.9E-04		3.4E-02
TOTAL	7.9E-04		4.893	5.7E-02		1.8E+00	7.9E-04		1.10	7.9E-04		3.4E-02

Source	Area 1 - Primary Controlled Area			Area 2 - Engineered Barrier Area (EB Area)			Area 3 - Engineered Barrier Staging Area (EB Staging Area)			Area 5 - Roadways		
	NOx Emissions			NOx Emissions			NOx Emissions			NOx Emissions		
	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year
Off-Road Engines (Table 9)	49.7		4,268	49.7		1,553	x		938			
On-Road Engines (Table 10)	0.698		30.5	0		0	0.698		30.5	0.698		30.5
TOTAL	50.4		4,298	49.7		1,553	0.698		968	0.698		30.5

The Material Handling daily emissions assume the activity only happens in the Primary Controlled Area, which is conservative because that the daily emissions are much greater for Material Handling in the Primary Controlled Area than the other areas. The "worse-case" day for the Heavy Equipment (including Off-Road Engines) happens when operating at the Engineered Barrier Area due to the use of an excavator in this area only. Although the activities for "worse-case" day at the Primary Controlled Area and the Engineered Barrier can not happen on the same day, to be conservative simultaneous operation has been assumed for the daily emission estimates. The "X" that appears is to avoid double counting of identical activities that can not occur at the same time in different areas.

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Off-Site Disposal and License Termination

Table N-12a
Air Emission Details -Materials and Travel Distances

Common Truck Assumptions			
	Yards per Load	(cubic yards)	20 Given
	Average Number of Wheels per Truck (10 unloaded, 14 loaded)	(wheels)	12 Given
	Weight per Empty Truck	(tons)	15 Given
	Average Weight of All Trucks	(tons)	42 Weighted Avg Weight (material trucks & barrier/drainage trucks)
Soil Material for the Removed Pile Areas			
	Cover Soil - Density	(pounds/cubic foot)	105 From Table 2
	Cover Soil - Density	(pounds/cubic yard)	2,835 Pounds per Cubic Foot x 27
	Total Storage Yard Area	(square feet)	310,687 CAD-based Estimate
	Depth of Cover	(feet)	1 Given
	Number of Yards of Topsoil Needed	(cubic yards)	11,507 Area x Depth / 27
	Tons of Topsoil Needed	(tons)	16,311 Tons from Table 2
	Number of Trucks	(trucks/project)	575 Cover Needed / Yards per Load
	Trucks per Day	(trucks/day)	24 Assume 3 Loads per Hour / 8 Hours Day
	Yards per Day	(yards/day)	480 Yards per Load x Trucks per Day
	Pounds per Cubic Foot	(pounds/cubic foot)	105 From Table 2
	Ton per Project	(tons/project)	16,311 Pounds per Cubic Yard / Yards of Cover
	Number of Days Needed	(days/project)	24 Number of Trucks / Yards per Load
	Weight per Loaded Truck	(tons)	43 Tons Material Moved + Ton per Empty Truck
	Average Weight of a Material Truck	(tons)	29 Average of Empty Truck and Loaded Material Truck
On-Site Soil Excavation			
	Yards per Load	(cubic yards/load)	20 Given
	Material to be Moved (assume cover amounts same)	(cubic yards)	1,320 From Table 2
	Material to be Moved (assume cover amounts same)	(tons)	1,871 From Table 2
	Trucks per Day	(trucks/day)	24 Assume 3 loads per Hour / 8 Hours Day
	Number of Trucks from Piles to Staging Area/Crusher	(truck trips/project)	66 Cubic Yards / Yards per Load
	Tons Material Loaded per Truck	(tons/truck)	28 Tons Material Moved / Number of Trucks
	Weight per Loaded Truck	(tons)	43 Tons Material Moved + Ton per Empty Truck
	Average Weight of a Material Truck	(tons)	29 Average of Empty Truck and Loaded Material Truck
Off-Site Material Removal			
	Cubic Yards of Material to be Removed	(cubic yards)	75,320 From Table 2
	Number of Truck Trips to Staging Area	(truck trips/project)	3,766 Cubic Yards / Yards per Load
	Trucks per Day	(trucks/day)	24 Assume 3 loads per Hour / 8 Hours Day
	Weight of Material Loaded per Truck	(tons)	35 Number of Truck Trips / Total Tons Material Removed
	Weight per Loaded Truck	(tons)	50 Tons Material Loaded per Truck + Tons per Empty Truck
	Average Weight of a Material Truck	(tons)	32 Average of an Empty Truck and a Loaded Material Truck
	Number of Train Cars		1,452 Tons of Material Removed / Capacity per Train Car
	Capacity per Train Car (tons)	(tons)	90 given
	Total Tons of Material Removed	(tons)	130,688 Tons from Table 2
	Train Cars per Year		726 Number of Train Cars / 2 (represents the two 5 month periods)
	Train Cars per Day (also Trucks to Staging Area)		6.9 Trains per Year / (Weeks per Year x Days per Week)
	Tons Loaded per Day	(tons)	622 Capacity per Train Car x Train Cars per Day
Travel Distances			
On-Site Material Transport			
	Length of UNPAVED Roadway - to Storage Area	(feet)	1,000 Weighted average length for various soil excavation areas
	Length of PAVED Roadway	(feet)	1650 Trip Length for Cover Delivered
Off-Site Material Removal			
	Length of UNPAVED Roadway - storage area to staging area	(feet)	1,100 Trip Length for Material Removed
	Length of UNPAVED Roadway - to paved roadway	(feet)	1,200 Trip Length for Cover Delivered
	Length of PAVED Roadway	(feet)	1,650 Trip Length for Cover Delivered

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Off-Site Disposal and License Termination

Table N-12b
Air Emission Details - Scheduling

Project Operational Times

			Off-Site Disposal
Working Hours			
	Days per Week	(days/week)	5 Assumed
	Weeks per Year	(weeks/year)	21 Assumed
	Hours per Day	(hours/day)	8 Assumed
Project Duration			
	Total Years	(years)	2
	Total Months	(months)	10 Given (see Project Schedule)
	Months each Year	(months/year)	5 Given (for 2 years)
	Total days per year	(calendar days)	147
		(work days)	105
	Soil Cover for Removed Piles	(work days)	210 Assumed
	Days to Remove Material from Storage Yard to Crusher/Train	(project work days)	210 Calculated
	Bring Crushed Material to Train	(project work days)	Calculated

Equipment Daily/Annual Operating Rates

Loader(s)	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	8 Assumed
	= Maximum Operating Hours per Day FOR ALL	(hours/day)	8
	= Operating Hours per Year	(hours/year)	840 Assumed
	= Operating Hours per Project	(hours/project)	1680 Assumed
Dozer	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	8 Assumed
	= Maximum Operating Hours per Day FOR ALL	(hours/day)	8
	= Operating Hours per Year	(hours/year)	840 Assumed
	= Operating Hours per Project	(hours/project)	1680
Dust Control Truck	= Maximum Trucks per Day	(truck/day)	1 Assumed
	= Number of Trips per Month	(trucks/month)	22 Assumed
	= Number of Trips per Year	(trucks/year)	105 Assumed
	= Number of Trips for Project	(trucks/project)	210 Assumed
Crusher	= Maximum Operating Hours per Day	(hours/day)	2 Assumed
	= Operating Hours per Year	(hours/year)	210 Assumed
	= Operating Hours per Project	(hours/project)	420 Assumed
Train	= Operating Hours per Day	(hours/day)	1 Assumed
	= Operating Hours per Year	(hours/year)	105 Assumed
	= Operating Hours per Project	(hours/project)	210 Assumed

Off-Site Disposal and License Termination

Table N-13
Material Description

Parcel #	Material Type	Volume (cubic yard)	Pile Size (acre)	Material Density (lbs/ft^3)	Material Density (g/cm^3)	Mass for Project (tons)	Percent of Pile To Be Moved (%)	Percent of Pile To Be Removed (%)	Percent of Pile To be Crushed (%)	Silt * (%)	Moisture* (%)	AP-42 Material* Match	Area Type
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.9	24,300	0	100	0	9.0	12.0	Cover	Primary Control Area
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	0	100	0	9.0	12.0	Cover	Primary Control Area
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.6	6,683	0	100	0	5.3	0.92	Slag	Primary Control Area
4	Slag	30,000	1.0	140	2.2	56,700	0	100	50	5.3	0.92	Slag	Primary Control Area
5A	Slag	2,600	0.2	140	2.2	4,914	0	100	50	5.3	0.92	Slag	Primary Control Area
5B	Demolition Concrete	2,400	0.3	120	1.9	3,888	0	100	50	3.9	2.10	Limestone Products	Primary Control Area
6	Hi-Ratio Slag	2,000	0.3	140	2.2	3,780	0	100	100	5.3	0.92	Slag	Primary Control Area
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.1	1,755	0	100	0	5.3	0.92	Slag	Primary Control Area
8	Baghouse Dust	13,000	0.9	100	1.6	17,550	0	100	0	13.0	7.0	Flue Dust	Primary Control Area
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.3	7,830	0	100	50	5.3	0.92	Slag	Primary Control Area
SC	On-Site Soil Consolidation	1,320	0.5	105	1.68	1,871	0	100	0	9.0	12.00	Cover	Primary Control Area
CVR1	Cover for moved pile areas	11,507	0.25	105	1.68	16,311	100	100	0	9.0	12.00	Cover	Staging Area
DP1	Staging Area Day Pile	75,320	0.1	129	2.06	130,688	0	100	0	7.1	4.1	Weighted Avg.	Staging Area
DP2	Crusher Day Pile	21,500	0.1	139	2.23	40,446	0	100	100	5.2	1.0	Weighted Avg.	Staging Area
Weighted Average				131	2.1					7.07	4.11		

Controlled Materials:
Total = 75,320 cubic yards
130,688 tons
Amount Removed = 75,320 cubic yards
(not including day piles) 130,688 tons
Amount Crushed = 21,500 cubic yards
(not including day piles) 40,446 tons

* Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1

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Off-Site Disposal and License Termination

Table N-14
Material Handling - "Drop Emissions"

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13.2.4, November 2006

Soil Cover for Moved Piles	210	days/project
Material Removal to Crusher	210	days/project
Material Removal (train loadir	210	days/project

The "drop emission" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles, the drop emissions associated with each activity are included in the emission factor for those processes. There are two drop points for each task -material removed to train, material directly to train, and cover material.

Material Type	Parcel#	Pile & Material Type	Task	Area Type	Number of Working Days (days/project)	Material Amounts (tons/project)	Percent of Pile Moved (%)	Percent of Pile Removed (%)	Percent of Pile Crushed (%)	Material to be Handled (tons)	Material Amounts (tons/day)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M *Material* Moisture Content (%)	U *Mean* Wind Speed (mph)	E *Calculated* Emission Factor (lb/ton)	*Calculated* Emissions (lb/day)	*Calculated* Emissions (ton/project)
Loader Unloading	1	Excavated Soil Mixed with Slag	Material Removal to Crusher or Train	Primary Control Area	210	24,300	0	100	0	24,300	116	PM10	0.35	12	8.7	1.9E-04	2.2E-02	2.3E-03
												PM2.5	0.053	12	8.7	2.8E-05	3.3E-03	3.4E-04
Loader Unloading	2	Excavated Soil from D111	Material Removal to Crusher or Train	Primary Control Area	210	1,418	0	100	0	1,418	7	PM10	0.35	12	8.7	1.9E-04	1.3E-03	1.3E-04
												PM2.5	0.053	12	8.7	2.8E-05	1.9E-04	2.0E-05
Loader Unloading	3	Canal Slag (In & Out of Supersacs)	Material Removal to Crusher or Train	Primary Control Area	210	6,683	0	100	0	6,683	32	PM10	0.35	0.92	8.7	6.8E-03	2.2E-01	2.3E-02
												PM2.5	0.053	0.92	8.7	1.0E-03	3.3E-02	3.5E-03
Loader Unloading	4	Slag	Material Removal to Crusher or Train	Primary Control Area	210	56,700	0	100	50	56,700	270	PM10	0.35	0.92	8.7	6.8E-03	1.8E+00	1.9E-01
												PM2.5	0.053	0.92	8.7	1.0E-03	2.8E-01	2.9E-02
Loader Unloading	5A	Slag	Material Removal to Crusher or Train	Primary Control Area	210	4,914	0	100	50	4,914	23	PM10	0.35	0.92	8.7	6.8E-03	1.6E-01	1.7E-02
												PM2.5	0.053	0.92	8.7	1.0E-03	2.4E-02	2.5E-03
Loader Unloading	5B	Demolition Concrete	Material Removal to Crusher or Train	Primary Control Area	210	3,888	0	100	50	3,888	19	PM10	0.35	2.1	8.7	2.1E-03	4.0E-02	4.2E-03
												PM2.5	0.053	2.1	8.7	3.3E-04	6.0E-03	6.3E-04
Loader Unloading	6	Hi-Ratio Slag	Material Removal to Crusher or Train	Primary Control Area	210	3,780	0	100	100	3,780	18	PM10	0.35	0.92	8.7	6.8E-03	1.2E-01	1.3E-02
												PM2.5	0.35	0.92	8.7	6.8E-03	1.2E-01	1.3E-02
Loader Unloading	7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Material Removal to Crusher or Train	Primary Control Area	210	1,755	0	100	0	1,755	8	PM10	0.35	0.92	8.7	6.8E-03	5.7E-02	6.0E-03
												PM2.5	0.053	0.92	8.7	1.0E-03	8.6E-03	9.1E-04
Loader Unloading	8	Baghouse Dust	Material Removal to Crusher or Train	Primary Control Area	210	17,550	0	100	0	17,550	84	PM10	0.35	7	8.7	4.0E-04	3.3E-02	3.5E-03
												PM2.5	0.053	7	8.7	6.0E-05	5.0E-03	5.3E-04
Loader Unloading	9	Baghouse Dust Mixed with Slag	Material Removal to Crusher or Train	Primary Control Area	210	7,830	0	100	50	7,830	37	PM10	0.35	0.92	8.7	6.8E-03	2.5E-01	2.7E-02
												PM2.5	0.053	0.92	8.7	1.0E-03	3.9E-02	4.0E-03
Loader Unloading	SC	On-Site Soil Consolidation	Material Removal to Crusher or Train	Primary Control Area	210	1,871	0	100	0	1,871	9	PM10	0.35	12	8.7	1.9E-04	1.7E-03	1.8E-04
												PM2.5	0.053	12	8.7	2.8E-05	2.5E-04	2.7E-05
Cover Placement	CVR1	Cover for moved pile areas	Soil Cover for Moved Piles	Staging Area	210	16,311	100	100	0	32,622	155	PM10	0.35	12	8.7	1.9E-04	2.9E-02	3.1E-03
												PM2.5	0.053	12	8.7	2.8E-05	4.4E-03	4.6E-04
Loader Unloading	DP1	Staging Area Day Pile	Material Removal to Crusher or Train	Staging Area	210	130,688	0	100	0	130,688	622	PM10	0.35	4.1	8.7	6.4E-04	5.2E-01	5.5E-02
												PM2.5	0.053	4.1	8.7	1.3E-04	7.9E-02	8.3E-03
Loader Unloading	DP2	Crusher Day Pile	Material Removal to Crusher or Train	Staging Area	210	40,446	0	100	100	40,446	193	PM10	0.35	0.98	8.7	6.3E-03	1.2E+00	1.3E-01
												PM2.5	0.053	0.98	8.7	9.5E-04	1.8E-01	1.9E-02

		Active 8 Hour Day (lbs/day)	Inactive Day (lbs/day)	Annual (lbs/project)	Annual (ton/year)	Annual (ton/project)
Primary Control Area	PM10	2.75	0.00	289	0.144	0.289
	PM2.5	0.52	0.00	54.7	0.027	0.055
Staging Area	PM10	1.76	0.00	185	0.092	0.185
	PM2.5	0.27	0.00	28.0	0.014	0.0280

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13.2.4-1 and the mean wind speed is from Local Climatological Data (ISSN 0198-4535) Philadelphia, Pennsylvania.

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Off-Site Disposal and License Termination

Table N-15
Material Handling - Active/Inactive Pile Emissions

The emission factor includes the emissions from loading material (drop emissions) into the pile, equipment traffic in the storage area, and wind erosion. Since it is difficult to determine which piles will be removed in the first year, the emissions assume all the piles will be removed in the first year and they are half the actual size. Also assumes all small piles are done on a Friday with an inactive weekend.

Parcel Number*	Material Type	Activity	Area Type	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Amount of pile to be Moved/Removed (%)	Amount of pile to be Moved/Removed (tons)	Annual Calendar Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/year)	Calculated Emissions (ton/year)	Fugitive Particulate Size (lb/acre/day)	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions (lbs/year)	Calculated Emissions (ton/year)
1	Excavated Soil Mixed with Slag	Active	Primary Control Area	24,300	0.9	100	24,300	20	PM10	6.3	5.67	111	6.5E-02	PM2.5	0.95	0.86	1.7E+01	8.4E-03
		Inactive		24,300	0.9	100	24,300	6	PM10	1.7	1.53	8.53	4.3E-03	PM2.5	0.26	0.23	1.3E+00	6.5E-04
2	Excavated Soil from D111	Active	Primary Control Area	1,418	0.2	100	1,418	1	PM10	6.3	1.01	1.1	5.7E-04	PM2.5	0.95	0.15	1.7E-01	8.7E-05
		Inactive		1,418	0.2	100	1,418	2	PM10	1.7	0.27	0.54	2.7E-04	PM2.5	0.26	0.04	8.2E-02	4.1E-05
3	Canal Slag (In & Out of Supersacs)	Active	Primary Control Area	6,683	0.2	100	6,683	5	PM10	6.3	1.20	6.4	3.2E-03	PM2.5	0.95	0.18	9.7E-01	4.9E-04
		Inactive		6,683	0.2	100	6,683	2	PM10	1.7	0.32	0.65	3.2E-04	PM2.5	0.26	0.05	9.8E-02	4.9E-05
4	Slag	Active	Primary Control Area	56,700	1.0	100	56,700	46	PM10	6.3	6.55	298	1.5E-01	PM2.5	0.95	0.99	4.5E+01	2.3E-02
		Inactive		56,700	1.0	100	56,700	13	PM10	1.7	1.77	23	1.2E-02	PM2.5	0.26	0.27	3.5E+00	1.7E-03
5A	Slag	Active	Primary Control Area	4,914	0.2	100	4,914	4	PM10	6.3	1.26	4.97	2.5E-03	PM2.5	0.95	0.19	7.5E-01	3.8E-04
		Inactive		4,914	0.2	100	4,914	2	PM10	1.7	0.34	0.68	3.4E-04	PM2.5	0.26	0.05	1.0E-01	5.1E-05
5B	Demolition Concrete	Active	Primary Control Area	3,888	0.3	100	3,888	3	PM10	6.3	1.89	5.90	3.0E-03	PM2.5	0.95	0.29	8.9E-01	4.5E-04
		Inactive		3,888	0.3	100	3,888	2	PM10	1.7	0.51	1.02	5.1E-04	PM2.5	0.26	0.08	1.5E-01	7.7E-05
6	Hi-Ratio Slag	Active	Primary Control Area	3,780	0.3	100	3,780	3	PM10	6.3	2.02	6.12	3.1E-03	PM2.5	0.95	0.31	9.3E-01	4.6E-04
		Inactive		3,780	0.3	100	3,780	2	PM10	1.7	0.54	1.09	5.4E-04	PM2.5	0.26	0.08	1.6E-01	8.2E-05
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Active	Primary Control Area	1,755	0.3	100	1,755	1	PM10	6.3	1.70	2.40	1.2E-03	PM2.5	0.95	0.26	3.6E-01	1.8E-04
		Inactive		1,755	0.3	100	1,755	2	PM10	1.7	0.46	0.92	4.6E-04	PM2.5	0.26	0.07	1.4E-01	6.9E-05
8	Baghouse Dust	Active	Primary Control Area	17,550	0.9	100	17,550	14	PM10	6.3	5.86	83	4.1E-02	PM2.5	0.95	0.89	1.3E+01	6.3E-03
		Inactive		17,550	0.9	100	17,550	4	PM10	1.7	1.58	6.37	3.2E-03	PM2.5	0.26	0.24	9.6E-01	4.8E-04
9	Baghouse Dust Mixed with Slag	Active	Primary Control Area	7,830	0.4	100	7,830	6	PM10	6.3	2.77	17.4	8.7E-03	PM2.5	0.95	0.42	2.6E+00	1.3E-03
		Inactive		7,830	0.4	100	7,830	2	PM10	1.7	0.75	1.50	7.5E-04	PM2.5	0.26	0.11	2.3E-01	1.1E-04
SC	On-Site Soil Consolidation	Active	Primary Control Area	1,871	0.50	100	1,871	2	PM10	6.3	3.15	4.74	2.4E-03	PM2.5	0.95	0.48	7.2E-01	3.6E-04
		Inactive		1,871	0.50	100	1,871	2	PM10	1.7	0.85	1.70	8.5E-04	PM2.5	0.26	0.13	2.6E-01	1.3E-04
CVR1	Cover for moved pile areas	Active	Staging Area	(daily max. for day pile) 1,000	0.25	100	1,000	105	PM10	6.3	1.58	166	8.3E-02	PM2.5	0.95	0.24	2.5E+01	1.3E-02
		Inactive		1,000	0.25	100	1,000	30	PM10	1.7	0.43	13	6.4E-03	PM2.5	0.26	0.06	1.9E+00	9.7E-04
DP1	Staging Area Day Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	100	500	105	PM10	6.3	0.63	66	3.3E-02	PM2.5	0.95	0.10	1.0E+01	5.0E-03
		Inactive		500	0.1	100	500	42	PM10	1.7	0.17	7.1	3.6E-03	PM2.5	0.26	0.03	1.1E+00	5.4E-04
DP2	Crusher Day Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	100	500	105	PM10	6.3	0.63	66	3.3E-02	PM2.5	0.95	0.10	1.0E+01	5.0E-03
		Inactive		500	0.1	100	500	42	PM10	1.7	0.17	7.1	3.6E-03	PM2.5	0.26	0.03	1.1E+00	5.4E-04

Total Tons of Piles		
Primary Control Area	130,688	130,688
Staging Area	2,000	2,000

	March to Oct. PM10 (lbs/yr)	Annual PM10 (lbs/yr)
Primary Control Area	567	567
Staging Area	325	325

	March to Oct. PM2.5 (lbs/yr)	Annual PM2.5 (lbs/yr)
Primary Control Area	66.9	66.9
Staging Area	49.2	49.2

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days.

	Max Active Day Total Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM10 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM10 (lbs/day)
Primary Control Area	7.73	1.77	6.55	1.18
Staging Area	1.86	0.43	1.58	0.283

	Max Active Day Total Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM2.5 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM2.5 (lbs/day)
Primary Control Area	1.17	0.27	0.99	0.178
Staging Area	0.28	0.06	0.24	0.043

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 16, Table 1 (page 779) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle:
1) loading of aggregate onto storage piles (batch or continuous drop operations),
2) equipment traffic in storage areas,
3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day, the remainder of the day wind erosion of the pile occurs.
Max Active Day is a weekday with one "worst case" pile is active for 6 hours and inactive of 16 hours for each area. Max Inactive Day is a weekend with one "worst case" pile is inactive for 24 hours. PM2.5 emissions are based on a ratio of the PM10 to PM2.5 emission factors for the drop emission factors in the Material Handling spreadsheet, also found in AP-42 Chapters 13.2.4 and 13.2.5.

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Off-Site Disposal and License Termination

Table N-16
Heavy Equipment Operation

Emission Factor Equations

Loader & Dozer Equation

$$PM10\ lbs/hr = 0.75\ (1.0(s)^{1.5}) / (M)^{1.4}$$

$$PM2.5\ lbs/hr = 0.105\ (5.7(s)^{1.2}) / (M)^{1.3}$$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 October 1998

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling of the material. Some of these emissions estimates are double counted when the equipment is working with a pile.

Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Based on (hours/year)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emissions (lb/day)	Calculated Emissions March to Oct. (lbs/year)	Calculated Emissions March to Oct. (ton/yr)	Calculated Emissions (ton/project)
Loader	8	840	7.07	4.11		PM10	1.95	15.6	1,638	0.82	1.64
						PM2.5	1.00	8.0	837	0.42	0.84
Dozer	8	840	7.07	4.11		PM10	1.95	15.6	1,638	0.82	1.64
						PM2.5	1.00	8.0	837	0.42	0.84

Amount time split for heavy equipment-

Primary Controlled Area	53	work days/year
Staging Area	53	work days/year

	8 Hr Day PM10 (lbs/day)	March to Oct. PM10 (lbs/year)	Annual PM10 (lbs/year)
Primary Controlled Area	15.6	1,638	1,638
Staging Area	15.6	1,638	1638

	PM2.5 (lbs/day)	PM2.5 (lbs/year)	PM2.5 (lbs/year)
Primary Controlled Area	8.0	837	837
Staging Area	8.0	837	837

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining.

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Table N-17
Unpaved Roadways - Access Road

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated November, 2006

Equation (1a), $E = k(s/12)^a (W/3)^b$

Given Variables for Estimating Emissions

1.5 k = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
0.15 k = base emission factor for pounds of PM-2.5 particulate per vehicle mile traveled
6.00 s = road surface silt loading (silt content Iron and Steel Production)
42 W = average weight (tons) of vehicle traveling road
0.9 a = per Table 13.2.2-2. Constants for Equations 1a and 1b
0.45 b = per Table 13.2.2-2. Constants for Equations 1a and 1b
80% Percent of control, based on Fig. 13.2.2-5 for <10um, one month re-application, 0.18 gal/yd^2 petroleum resin

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated DOES include particulate emissions from the engines.

Roadway Type	Pollutant	Trip Length In and Out (feet)	Trucks per Day	Trucks per Project	Daily Vehicle Miles Traveled (miles/day)	Project Vehicle Miles Traveled (miles/project)	Uncontrolled E Emission Factor Equation 1a	Controlled E Emission Factor Equation 1a	Controlled Emissions Individual Daily (pounds)	Controlled Emissions Maximum Daily (pounds)	Controlled Emissions Total Project (pounds)	Controlled Emissions Total Year (pounds)
On Site Material Excavation (cover)	PM10	2,000	24	66	9	25	2.63	0.53	4.79	4.79	13	6.58
Off Site Material Removal (cover)	PM10	2,400	24	575	11	262	2.63	0.53	5.74		138	68.9
Off Site Material Removal (staging area)	PM10	2,200	24	3,766	10	1,569	2.63	0.53	5.27	5.27	826	413
Dust Control Truck	PM10	3,300	1	210	0.6	131	2.63	0.53	0.33	0.33	69	34.6
On Site Material Excavation (cover)	PM2.5	2,000	24	66	9	25	0.26	0.053	0.48	0.48	1.3	0.66
Off Site Material Removal (cover)	PM2.5	2,400	24	575	11	262	0.26	0.053	0.57		13.8	6.89
Off Site Material Removal (staging area)	PM2.5	2,200	24	3,766	10	1,569	0.26	0.053	0.53	0.53	83	41.3
Dust Control Truck	PM2.5	3,300	1	210	0.6	131	0.26	0.053	0.033	0.033	6.9	3.46

TOTALS	Max. Daily (pounds)	Total Project (pounds)	Total Year (pounds)
PM10	10.4	1,046	523
PM2.5	1.04	105	52.3

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Off-Site Disposal and License Termination

Table N-18
Paved Roadway Emissions

Predictive Emission Factor Equation from AP-42 5th Edition Chapter Section 13.2.1 Paved Roads, November 2006

Annual	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C]/453.592
Daily	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 - P/(4N))/453.592
Hourly	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 -1.2 P/N)/453.592

E =	particulate emission factor (pounds/mile traveled)
k =	particulate size multiplier for particulate size range
sL =	sL = road surface silt loading (grams per square meter for Iron & Steel Production))
W =	average weight (tons) of the vehicles traveling the road
C =	emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear
P =	119 (number of wet days with at least 0.01" of precipitation)
N =	365 (number of days in the averaging period)
453.592	Conversion factor (1 pound = 453.592 grams)

Truck Weight

Average Weight 42 tons

Roadway Types	% of Miles
Roadway with <500 vehicles/day	100%

Work Months

0 Winter Months (total of 5 per year)
5 Non-Winter Months (total of 7 per year)

Mileage Estimates

On Site Material Excavation (cover)	1,650 Trip Length (feet) one way	66 trucks/project 24 trucks/day
Off Site Material Removal (cover)	1,650 Trip Length (feet) one way	575 trucks/project 24 trucks/day

Total Number of Trucks

Roadway Type	sL Silt Loading Year (g/m^2)	W Average Vehicle Weight (tons)	Number of Miles Per Roadway Type Day	Number of Miles Per Roadway Type Project	Pollutant	k Base Multiplier (g/VMT)	C Wear & Tear Factor (g/VMT)	E Emission Factor Day Non-Winter (lbs/mile trvld)	E Emission Factor Year Non-Winter Months (lbs/mile trvld)	Emissions Day Non-Winter (lb/day)	Emissions Year Non-Winter (ton/yr)
On Site Material Excavation (cover)											
Roadway with <500 vehicles/day	5.82	42	15	41	PM2.5	1.1	0.1617	2.3E-01	2.5E-01	3.49	2.6E-03
Roadway with <500 vehicles/day					PM10	7.3	0.2119	1.5E+00	1.7E+00	23.2	1.7E-02
Off Site Material Removal (cover)											
Roadway with <500 vehicles/day	5.82	42	15	360	PM2.5	1.1	0.1617	2.3E-01	2.5E-01	3.49	2.3E-02
Roadway with <500 vehicles/day					PM10	7.3	0.2119	1.5E+00	1.7E+00	23.2	1.5E-01
								Totals	PM10	46.3	1.7E-01
									PM2.5	6.97	2.5E-02

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Off-Site Disposal and License Termination

Table N-19
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area		Exposed Ground Area (sq ft)	Exposed Ground Area (acre)	Particulate Size	Emission Factor (ton/acre/year)	Daily (lbs/day)	Hourly (lbs/hr)	Monthly (lbs/month)	Emission Estimate Year 1 May - Nov (lbs/year)	Year 2 May - Oct (lbs/year)	Total Project (lbs/project)
Exposed Ground Areas	Primary Control Area	May - 1st year	31,058	0.71	TSP	0.38	1.48	0.062	46			
		June - 1st year	62,117	1.43	TSP	0.38	2.97	0.124	89			
		July - 1st year	93,175	2.14	TSP	0.38	4.45	0.186	138			
		Aug - 1st year	124,233	2.85	TSP	0.38	5.94	0.247	184			
		Sept - 1st year	155,291	3.57	TSP	0.38	7.42	0.309	223			
		(end operations) Oct - 1st year	155,291	3.57	TSP	0.38	7.42	0.309	230			
		Nov - 1st year	155,291	3.57	TSP	0.38	7.42	0.309	223			
										1,133		
		March - 2nd yea	155,291	3.57	TSP	0.38	7.42	0.309	230			
		April - 2nd year	155,291	3.57	TSP	0.38	7.42	0.309	223			
		(start operations) May - 2nd year	155,291	3.57	TSP	0.38	7.42	0.309	230			
		June - 2nd year	186,350	4.28	TSP	0.38	8.91	0.371	267			
		July - 2nd year	217,408	4.99	TSP	0.38	10.39	0.433	322			
		Aug - 2nd year	248,466	5.70	TSP	0.38	11.88	0.495	368			
		Sept - 2nd year	279,525	6.42	TSP	0.38	13.36	0.557	401			
		(end operations) Oct - 2nd year	310,583	7.13	TSP	0.38	14.85	0.619	460			
											2,502	3,634
		Total	310,583	7.13								
Exposed Ground Areas	Staging Area	Oct - 2nd	21,780	0.5	TSP	0.38	1.0	0.043	32.3		32.3	32.3

		Aerodynamic Particle Size Multiplier	Daily Maximum (lbs/day)	Hourly Maximum (lbs/hr)	Annual 1st year (lbs/year)	Annual 2nd year (lbs/year)	Total Project (lbs/project)
Primary Control Area	PM30	0.74	10.99	0.46	838	1,851	2,689
	PM10*	0.35	5.20	0.22	396	876	1,272
	PM2.5*	0.053	0.79	3.3E-02	60	133	193
Staging Area	PM30	0.74	0.77	3.2E-02	0	24	24
	PM10*	0.35	0.36	1.5E-02	0	11	11
	PM2.5*	0.053	5.5E-02	2.3E-03	0	1.7	1.7

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges or the surface is covered by rock, all disturbed areas are subject to wind erosion. This emission estimate assumes that the area will be become vegetated or will be covered with rock at the end of the second year.

*The PM10 and PM2.5 emission factor has been adjusted from the PM30 emission factor, Section 13.2.5 (then to Section 13.2.4) which presents a distribution of particle sizes that are comparable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
silt range of 5.1 - 21 with a mean of 15
moisture range of 2.8 - 20 with a mean of 6.9
Physical properties of the sand/gravel:
silt range of 1.2 - 4.2 with a mean of 2.16 (site specific data)
sand moisture content, a mean of 7.4 (AP-42 Table 13.2.4-1)

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Off-Site Disposal and License Termination

Table N-20
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the piles.

Loader
145 Estimated HP
8 Hours per Day
105 Days per Year
420 Hours/Year in Primary Control Area
420 Hours/Year in Staging Area
840 Hours per Year, Total
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

Dozer
132 Estimated HP
8 Hours per Day
105 Days per Year
420 Hours/Year in Primary Control Area
420 Hours/Year in Staging Area
840 Hours per Year, Total
7.08 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

Excavator
145 Estimated HP
0 Hours per Day
0 Days per Year
0 Hours/Year in Primary Control Area
0 Hours/Year in Staging Area
0 Hours per Year, Total
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

Pollutant	Area	Emission Factor Units	Loader			Dozer			Excavator			Totals	
			Emission Factor	pounds/day	pounds/year	Emission Factor	pounds/day	pounds/year	Emission Factor	pounds/day	pounds/year	pounds/day	pounds/year
PM	Primary Control Area	g/hp-hr	0.400	0.511	27	0.400	0.466	24.4	0.400	0	0	0.98	51.3
	Staging Area		0.400	0.511	27	0.400	0.466	24.4	0.400	0	0	0.98	51.3
NOx	Primary Control Area	g/hp-hr	4.50	5.8	302	4.50	5.24	275	4.50	0	0	11.0	577
	Staging Area		4.50	5.8	302	4.50	5.24	275	4.50	0	0	11.0	577
SOx	Primary Control Area	lb/1,000 gals	0.213	0.006	0.34	0.213	0.006	0.32	0.213	0	0	0.013	0.657
	Staging Area		0.213	0.006	0.34	0.213	0.006	0.32	0.213	0	0	0.013	0.657

	Primary Control Area		Staging Area		Roadways	
	8 Hr Day (lbs/day)	Annual (lbs/year)	8 Hr Day (lbs/day)	Annual (lbs/year)	8 Hr Day (lbs/day)	March to Oct. (lbs/year)
PM/PM10/PM2.5	0.977	51.3	0.977	51.3	0	0
NOx	11.0	577	11.0	577	0	0
SOx	0.013	0.66	0.013	0.66	0	0

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, excavator is a Caterpillar 22B with a 145 HP engine, and the dozer is a Caterpillar D6H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition, dated February 13, 1998 , revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

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Off-Site Disposal and License Termination

Table N-21
On-Road Engine Emissions
EPA Model MOBILE 6.2

EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes. The emissions estimates are the engine exhaust emissions. The emissions below are for two classes of heavy duty diesel vehicles.

Maximum Miles per Day	
HDDV8A Miles per Day	30.5
HDDV8B Miles per Day	30.5
Miles per Year	
HDDV8A Miles per Year	637
HDDV8B Miles per Year	637
Idling	
Total hours of idling on site per day	1
Total hours of idling on site per year	105

On Site Material Excavation (cover)	
Trucks per day	24
Trucks for project	66
Trucks per year	66
Miles per truck	1.00

Off Site Material Removal (staging area)	
Trucks per day	24
Trucks for project	3,766
Trucks per year	1,883
Miles per truck	0.42

Off Site Material Removal (cover)	
Trucks per day	24
Trucks for project	575
Trucks per year	288
Miles per truck	1.08

Dust Control Truck	
Trucks per day	1
Trucks for project	210
Trucks per year	105
Miles per truck	1.08

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)				HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)			
		grams/mile	grams/hour	max. pounds/day	pounds/year	grams/mile	grams/hour	max. pounds/day	pounds/year
PM10/PM2.5	10 mph average	0.254	NA	0.0171	0.36	0.25	NA	0.0170	0.35
	Idling	NA	1.0040	0.0022	0.23	NA	1.0040	0.0022	0.23
				0.0193	0.59			0.0192	0.59
SO2	10 mph average	0.0144	NA	9.7E-04	0.02	0.015	NA	1.0E-03	0.02
NOx	10 mph average	12.3	NA	0.826	17.2	13.9	NA	0.938	19.6

	PM10/PM2.5		SO2		NOx	
	max. pounds/day	pounds/year	max. pounds/day	pounds/year	max. pounds/day	pounds/year
Primary Control Area (25%)	0.0096	0.29	5.0E-04	0.0104	0.441	9.2
Staging Area (25%)	0.0096	0.29	5.0E-04	0.0104	0.441	9.2
Roadways (50%)	0.0192	0.59	9.9E-04	0.0207	0.882	18.4

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less, it has been assumed that PM2.5 = PM10.

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Off-Site Disposal and License Termination

Table N-22
Material Handling - Crushing Emissions

Maximum amount of material that can be crushed in one hour	300 ton/hour	
Operating hours per day of operations	2 hours/day	
Amount of material that can be crushed in one day	600 ton/day	8 hour/day, Daily rail car capacities = 245 tons per day
Days per year of operation	34 days/year	

Emission factor used to estimate emissions is for secondary crushing/screening (no factors for primary crushing are available). The emission estimate assumes wet suppression technology utilized to control emissions. It also assumes that half of each pile is crushed in the first year of operations and the other half in the next year.

Parcel Number	Material Type	Material Amounts (tons/hour)	Material Amounts (tons/day)	Material Amounts (tons/project)	Percentage To be Crushed (%)	Days Needed to Crush (days)	Crushed Material Amounts (tons/project)	Particulate Size	Uncontrolled Particulate Size Multiplier (lb/ton)	Controlled Particulate Size Multiplier (lb/ton)	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions Maximum (tons/year)	Controlled Emissions Maximum (tons/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
1	Excavated Soil Mixed with Slag	300	600	24,300	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
2	Excavated Soil from D111	300	600	1,418	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
3	Canal Slag (In & Out of	300	600	6,683	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
4	Slag	300	600	56,700	50	47	28,350	PM10	8.70E-03	7.40E-04	5.22	0.44	0.062	0.005	0.123	0.010
								PM2.5		5.00E-05		0.03		3.5E-04		7.1E-04
5A	Slag	300	600	4,914	50	4	2,457	PM10	8.70E-03	7.40E-04	5.22	0.44	0.005	0.000	0.011	0.001
								PM2.5		5.00E-05		0.03		3.1E-05		6.1E-05
5B	Demolition Concrete	300	600	3,888	50	3	1,944	PM10	8.70E-03	7.40E-04	5.22	0.44	0.004	0.000	0.008	0.001
								PM2.5		5.00E-05		0.03		2.4E-05		4.9E-05
6	Hi-Ratio Slag	300	600	3,780	100	6	3,780	PM10	8.70E-03	7.40E-04	5.22	0.44	8.2E-03	7.0E-04	0.016	0.001
								PM2.5		5.00E-05		0.03		4.7E-05		9.5E-05
9	Baghouse Dust Mixed with Slag	300	600	7,830	50	7	3,915	PM10	8.70E-03	7.40E-04	5.22	0.44	0.009	7.2E-04	0.017	0.001
								PM2.5		5.00E-05		0.03		4.9E-05		9.8E-05
CVR1	Cover for moved pile areas	300	600	16,311	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.0E+00	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
DP1	Staging Area Day Pile	300	600	130,688	0			Double counting								
DP2	Crusher Day Pile	300	600	40,446	100			Double counting								

	Total Days (days)	Total Material Crushed (tons)
Project	67	40,446
Year (50% of project)	34	20,223

	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions Maximum (tons/year)	Controlled Emissions Maximum (lbs/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
PM10 =	5.220	0.444	0.088	15.0	0.176	0.015
PM2.5 =		3.0E-02		1.0E+00		1.0E-03

Emission factors are from EPA's Factor Information Retrieval (FIRE) Data System 8.25. SCC for the crushing process is 3-05-020-02.

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Off-Site Disposal and License Termination

Table N-23
Crusher - Engine Emissions
Internal Combustion Engine, <600 HP

Potential Operating Hours (or permitted hours)	8,760	
Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Gallons per Hour	15.3	estimated
Fuel Input in MMBtu per Hour	2.100	estimated
BHP Rating	300	
Operating Hours		
Per Day	2	(See Table 11)
Days per Year	34	(See Table 11)
Per Year (5 months)	67	
Actual Fuel Usage (gals/year)	1,033	
Sulfur percentage content in fuel	0.0015	%, (15ppm)

These emission factors estimate particulate emissions from the engine. Particulate emissions from the crushing of material are not included; those emissions are addressed in Table K-22.

Pollutant	CAS#	Emission Factor Source	Emission Factor (lbs/MMBtu)	Actual Emissions (lb/hr)	(lb/day)	(lb/yr)	5 months (ton/yr)	Potential Emissions (lb/hr)	(ton/yr)
PM	na	1	0.31	0.651	1.30	43.9	0.022	0.651	2.85
PM10	na	1	0.31	0.651	1.30	43.9	0.022	0.651	2.85
PM2.5	na	1	0.31	0.651	1.30	43.9	0.022	0.651	2.85
SOx	na	1	1.52E-03	3.18E-03	6.36E-03	0.21	1.07E-04	3.18E-03	1.39E-02
NOx	na	1	4.41	9.261	18.5	624	0.31	9.261	40.6

Footnotes:

1 Emission factors are from EPA's AP-42 Table 3.3-1 dated November, 1996. The SCCs for this source are 2-02-001-01 for industrial size equipment and 2-03-001-01 for commercial/institutional size equipment. SOx emission factor is based on fuel sulfur content (AP-42 Table 3.4-1).

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Off-Site Disposal and License Termination

Table N-24
Locomotive - Diesel Powered

Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Fuel Input in MMBtu per Hour	7.000 estimated	Assumes that the locomotive operates only under "switch duty-cycle" as defined by the EPA.
Maximum hourly fuel use (gal/hr)	51 estimated	
BHP Rating	1000	
Operating Hours		
Hours per Day	1	
Hours per Year (5 months)	105	
Sulfur percentage content in fuel	0.0015 %, (15ppm)	

Pollutant	CAS#	Emission Factor Source	Emission Factors		Actual Emissions (lb/day)	(lb/yr)	5 months (ton/yr)
PM	na	1	0.54	g/bhp-hr	1.19	125	0.063
PM10	na	1	0.54	g/bhp-hr	1.19	125	0.063
PM2.5	na	1	0.54	g/bhp-hr	1.19	125	0.063
SOx	na	2	1.52E-03	lbs/MMBtu	1.1E-02	1.11	5.6E-04
NOx	na	1	11.00	g/bhp-hr	24.3	2,546	1.27

Emission factors are based on Tier I EPA emission limits for engines that were manufactured from 2000 to 2004. This assumes that if the engine was older than 2000 it would have been rebuilt and is required to comply with modern emission standards. The emission limits were published in the EPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines - Locomotives. Emissions include idling time and assumes that PM=PM10. The SOx emission factor is based on the sulfur content of the fuel and AP-42 Table 3.4-1.

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Off-Site Disposal and License Termination

Table N-25
Emissions Summary

Source	Area 1 - Primary Controlled Area				Area 4 - Staging Area				Area 5 - Roadways		
	PM-10 Emissions				PM-10 Emissions				PM-10 Emissions		
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	12 month lbs/year
Material Handling (Table 3)	2.75			289	1.76			185			
Active/Inactive Piles (Table 4)	6.55	1.18	1.77	587	1.58	0.283	0.43	325			
Heavy Equipment (Table 5)	15.6			1,638	15.6			1638			
Unpaved Roadways (Table 6)									10.4		523
Paved Roadways (Table 7)									46.3		337
Exposed Ground Area (Table 8)	1.73	3.46	5.20	876	0.12	0.24	0.36	11			
Off-Road Engines (Table 9)	0.977			51.3	0.977			51.30			
On-Road Engines (Table 10)	0.0096			0.29	0.0096			0.29	0.0192		0.59
Material Handling Crusher (Table 11)					0.44			15.0			
Crusher - Engine (Table 12)					1.30			43.9			
Train (Table 13)					1.19			125			
TOTAL	27.6	4.64	6.96	3,441	23.0	0.53	0.79	2,394	56.7		861

Source	Area 1 - Primary Controlled Area				Area 4 - Staging Area				Area 5 - Roadways		
	PM-2.5 Emissions				PM-2.5 Emissions				PM-2.5 Emissions		
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	12 month lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	12 month lbs/year
Material Handling (Table 3)	0.52			54.7	0.27			28.0			
Active/Inactive Piles (Table 4)	0.99	0.178	0.27	89	0.24	0.043	0.06	49.2			
Heavy Equipment (Table 5)	8.0			837	8.0			837			
Unpaved Roadways (Table 6)									1.04		52
Paved Roadways (Table 7)									6.97		51
Exposed Ground Area (Table 8)	0.26	0.52	0.79	133	0.02	0.04	0.06	1.7			
Off-Road Engines (Table 9)	0.977			51.3	0.977			51.30			
On-Road Engines (Table 10)	0.0096			0.29	0.0096			0.29	0.0192		0.59
Material Handling Crusher (Table 11)					0.030			1.01			
Crusher - Engine (Table 12)					1.30			43.9			
Train (Table 13)					1.19			125			
TOTAL	10.7	0.7	1.05	1,165	12.0	0.080	0.12	1138	8.03		103.6

Source	Area 1 - Primary Controlled Area				Area 4 - Staging Area				Area 5 - Roadways		
	SOx Emissions				SOx Emissions				SOx Emissions		
	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year
Off-Road Engines (Table 9)	0.013			0.66	0.013			0.657			
On-Road Engines (Table 10)	5.0E-04			0.0104	5.0E-04			0.0104	9.9E-04		0.0207
Material Handling Crusher (Table 11)											
Crusher - Engine (Table 12)					6.4E-03			0.21			
Train (Table 13)					1.1E-02			1.11			
TOTAL	0.0130			0.667	0.0300			2.00	9.9E-04		0.0207

Source	Area 1 - Primary Controlled Area				Area 4 - Staging Area				Area 5 - Roadways		
	NOx Emissions				NOx Emissions				NOx Emissions		
	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		12 month lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	12 month lbs/year
Off-Road Engines (Table 9)	11.0			577	11.0			577			
On-Road Engines (Table 10)	0.441			9.2	0.441			9.20	0.882		18.4
Material Handling Crusher (Table 11)											
Crusher - Engine (Table 12)					18.5			624			
Train (Table 13)					24.3			2,546			
TOTAL	11.4			586	54.2			3,757	0.882		18.4

The Material Handling emissions are from the activity of loading trucks in the Primary Controlled Area and unloading them in the Staging Area. Therefore, these daily emissions as a "worse case" assumption could happen at the same time. Heavy equipment operation (including Off-Road Engines) daily emissions assume that half the activity occurs in the Primary Controlled Area and half in the Staging Area.

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Off-Site Disposal of Slag Only
Table N-26a
Air Emission Details - Materials and Travel Distances

Common Truck Assumptions			
Yards per Load	(cubic yards)	20	Given
Average Number of Wheels per Truck (10 unloaded, 14 loaded)	(wheels)	12	Given
Weight per Empty Truck	(tons)	15	Given
Average Weight of All Trucks	(tons)	32	Weighted Average Weight (material trucks and barrier/drainage trucks)
Engineered Barrier and Drainage Material			
Cover Soil, Total	(cubic yards)	17,064	CAD-based Estimate
Various Stone	(cubic yards)	13,633	CAD-based Estimate
Clay	(cubic yards)	20,291	CAD-based Estimate
Engineered Barrier/Drainage Material Total	(cubic yards)	50,988	
Amount of Cover Soil	(tons)	24,188	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Various Stone	(tons)	24,847	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Clay	(tons)	34,242	Cubic Yards x Pounds per Cubic Yard / 2,000
Engineered Barrier/Drainage Material Total	(tons)	83,278	
Number of Trucks Trips - Cover Soil	(truck trips)	853	Material Needed / Yards per Load
Number of Trucks Trips - Stone	(truck trips)	682	Material Needed / Yards per Load
Number of Trucks Trips - Clay	(truck trips)	1,015	Material Needed / Yards per Load
Cubic Yards of Engineered Barrier Material Delivered	(cubic yards)	50,988	Number of Trucks x Yards per Load
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Various Stone - Density	(pounds/cubic foot)	135	From Table 2
Various Stone - Density	(pounds/cubic yard)	3,645	Pounds per Cubic Foot x 27
Clay - Density	(pounds/cubic foot)	125	From Table 2
Clay - Density	(pounds/cubic yard)	3,375	Pounds per Cubic Foot x 27
Soil Material Loaded per Truck	(tons)	28	Yards per Load x Pounds per Cubic Yard
Soil Weight per Loaded Truck	(tons)	43	Load per Truck + Weight of Empty Truck
Average Weight of a Soil Material Truck	(tons)	29	Average of Empty Truck and Loaded Truck
Stone Material Loaded per Truck	(tons)	36	Yards per Load x Pounds per Cubic Yard
Stone Weight per Loaded Truck	(tons)	51	Load per Truck + Weight of Empty Truck
Average Weight of a Stone Material Truck	(tons)	33	Average of Empty Truck and Loaded Truck
Clay Material Loaded per Truck	(tons)	34	Yards per Load x Pounds per Cubic Yard
Clay Weight per Loaded Truck	(tons)	49	Load per Truck + Weight of Empty Truck
Average Weight of a Clay Material Truck	(tons)	32	Average of Empty Truck and Loaded Truck
Trucks per Project, All Engineered Barrier/Drainage Material	(trucks/project)	2,549	Assumes Engineered Barrier & Drainage Construction Operation = 120 Calendar Days (86 work days
Trucks per Day, All Material	(trucks/day)	30.4	Trucks per Project / Time for Engineered Barrier/Final Grading (86 work days)
Soil Material for the Removed Pile Areas (Cover Non-EB Area)			
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Non-EB Storage Yard Area	(square feet)	158,100	CAD-based Estimate
EB Area	(square feet)	179,987	CAD-based Estimate
Total Disturbed Area for EB	(square feet)	242,224	CAD-based Estimate
Total Storage Yard Area	(square feet)	310,687	CAD-based Estimate
Depth of Cover	(feet)	1	Given
Number of Yards of Topsoil Needed	(cubic yards)	4,841	Area x Depth / 27
Tons of Topsoil Needed	(tons)	6,862	Tons from Table 2
Number of Trucks	(trucks/project)	242	Cover Needed / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 Loads per Hour / 8 Hours Day
Yards per Day	(yards/day)	480	Yards per Load x Trucks per Day
Pounds per Cubic Foot	(pounds/cubic foot)	105	From Table 2
Ton per Project	(tons/project)	6,862	Pounds per Cubic Yard / Yards of Cover
Number of Days Needed	(days/project)	10	Number of Trucks / Yards per Load
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
On-Site Soil Excavation			
Yards per Load	(cubic yards/load)	20	Given
Material to be Moved (assume cover amounts same)	(cubic yards)	1,320	From Table 2
Material to be Moved (assume cover amounts same)	(tons)	1,871	From Table 2
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Number of Trucks from Piles to Staging Area/Crusher	(truck trips/project)	66	Cubic Yards / Yards per Load
Tons Material Loaded per Truck	(tons/truck)	28	Tons Material Moved / Number of Trucks
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
Off-Site Material Removal (shipped to Train)			
Cubic Yards of Material to be Removed	(cubic yards)	38,920	From Table 2
Number of Truck Trips to Staging Area	(truck trips/project)	1,946	Cubic Yards / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Weight of Material Loaded per Truck	(tons)	36	Number of Truck Trips / Total Tons Material Removed
Weight per Loaded Truck	(tons)	53	Tons Material Loaded per Truck + Tons per Empty Truck
Average Weight of a Material Truck	(tons)	34	Average of an Empty Truck and a Loaded Material Truck
Number of Train Cars		822	Tons of Material Removed / Capacity per Train Car
Capacity per Train Car (tons)	(tons)	90	given
Total Tons of Material Removed	(tons)	73,948	Tons from Table 2
Train Cars per Year		411	Number of Train Cars / 2 (which represents the two 5 month periods)
Train Cars per Day (also Trucks to Staging Area)		3.9	Trains per Year / (Weeks per Year x Days per Week)
Tons Loaded per Day	(tons)	352	Capacity per Train Car x Train Cars per Day
Travel Distances			
On-Site Material Transport			
Length of UNPAVED Roadway - to Storage Area	(feet)	1,000	Weighted average length for various soil excavation areas
Length of PAVED Roadway	(feet)	1650	Trip Length for Cover Delivered
Cover & Engineered Barrier Material Transport			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Cover & Engineered Barrier Material
Length of PAVED Roadway	(feet)	1,650	Cover & Engineered Barrier Material
Soil Material for Relocated Pile Areas			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,600	Soil Material for Relocated Piles Areas
Length of PAVED Roadway	(feet)	1,650	Soil Material for Relocated Piles Areas
Off-Site Material Removal			
Length of UNPAVED Roadway - storage area to staging area	(feet)	1,100	Trip Length for Material Removed
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Trip Length for Cover Delivered
Length of PAVED Roadway	(feet)	1,650	Trip Length for Cover Delivered

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Off-Site Disposal of Slag Only
Table N-26b
Air Emission Details - Scheduling

Project Operational Times

Working Hours

Off-Site Disposal (2nd Year)		
Days per Week	(days/week)	5
Weeks per Year	(weeks/year)	21
Hours per Day	(hours/day)	8
Total days per year	(calendar days)	147
	(work days)	105
On-Site Stabilization (1st Year)		
Days per Week	(days/week)	5
Weeks per Year	(weeks/year)	30
Hours per Day	(hours/day)	8
Total days per year	(calendar days)	210
	(work days)	150

Project Duration

Total Years	(years)	2
Total Months	(months)	12
Off-Site Disposal (2nd Year)		
Months each Year - Off-Site Disposal	(months/year)	5
Days to Remove Material from Storage Yard to Crusher/Train	(project work days)	105
Soil Cover for Removed Piles	(project work days)	105
On-Site Stabilization (1st Year)		
Months each Year - On-Site Stabilization	(months/year)	7
Time for Creating Consolidated Pile	(calendar days)	90
	(work days)	64
Time for On-Site Soil Consolidation	(work days)	3
Time for Engineered Barrier	(calendar days)	90
	(work days)	64
Final Grading for Drainage	(calendar days)	30
	(work days)	20
Soil Cover for Non-Engineered Barrier Area	(calendar days)	13
	(work days)	9

Equipment Daily/Annual Operating Rates

	Off-Site Disposal (2nd Year)		
Loader(s)	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	8
	= Operating Hours per Year	(hours/year)	840
Dozer	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	8
	= Operating Hours per Year	(hours/year)	840
Crusher	= Maximum Operating Hours per Day	(hours/day)	2 from Table 11
	= Operating Days per Year	(days/year)	58 from Table 11
Train	= Operating Hours per Day	(hours/day)	1
	= Operating Hours per Year	(hours/year)	59 ratio of total materials & total materials removed
	On-Site Stabilization (1st Year)		
Loader(s)	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	8
	= Operating Hours per Year	(hours/year)	1200
Dozer	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	8
	= Operating Hours per Year	(hours/year)	1200
Excavator	= Number of Equipment		1
	= Maximum Operating Hours per Day	(hours/day)	4
	= Operating Hours per Year	(hours/year)	91
	Both Years		
Dust Control Truck	= Maximum Trucks per Day	(truck/day)	1
	= Number of Trips per Month	(trucks/month)	22
	= Number of Trips per Year - On-Site Stabilization	(trucks/year)	150
	= Number of Trips per Year - Off-Site Disposal	(trucks/year)	105

Off-Site Disposal of Slag Only

Table N-27
Material Description

Parcel #	Material Type	Volume (cubic yard)	Pile Size (acre)	Material Density (lbs/ft³)	Material Density (g/cm³)	Mass for Project (tons)	Percent of Pile To Be Moved to EB (%)	Percent of Pile To Be Removed (%)	Percent of Pile To be Crushed (%)	Silt * (%)	Moisture* (%)	AP-42 Material* Match	Area Type
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.9	24,300	100	0	0	9.0	12.0	Cover	Primary Control Area
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	100	0	0	9.0	12.0	Cover	Primary Control Area
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.6	6,683	0	100	0	5.3	0.92	Slag	Primary Control Area
4	Slag	30,000	1.0	140	2.2	56,700	0	100	50	5.3	0.92	Slag	Primary Control Area
5A	Slag	2,600	0.2	140	2.2	4,914	0	100	50	5.3	0.92	Slag	Primary Control Area
5B	Demolition Concrete	2,400	0.3	120	1.9	3,888	100	0	0	3.9	2.10	Limestone Products	Primary Control Area
6	Hi-Ratio Slag	2,000	0.3	140	2.2	3,780	0	100	100	5.3	0.92	Slag	Primary Control Area
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.1	1,755	100	0	0	5.3	0.92	Slag	Primary Control Area
8	Baghouse Dust	13,000	0.9	100	1.6	17,550	100	0	0	13.0	7.0	Flue Dust	Primary Control Area
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.3	7,830	100	0	0	5.3	0.92	Slag	Primary Control Area
SC	On-Site Soil Consolidation	1,320	0.5	105	1.7	1,871	100	100	0	9.0	12.00	Cover	Primary Control Area
CVR1	Cover for moved pile areas	4,841	0.25	105	1.7	6,862	100	100	0	9.0	12.00	Cover	EB Staging Area
EB2	Cover Soil	17,064	0.25	105	1.7	24,188	100	0	0	9.0	12.00	Cover	EB Staging Area
EB4	Various Stone	13,633	0.25	135	2.2	24,847	100	0	0	2.6	7.40	Sand	EB Staging Area
EB5	Clay	20,291	0.25	125	2.0	34,242	100	0	0	6.0	10.00	Clay	EB Staging Area
DP1	Staging Area Day Pile	38,920	0.1	141	2.25	73,948	0	100	0	12.5	7.3	Weighted Avg.	Staging Area
DP2	Crusher Day Pile	18,300	0.1	140	2.24	34,587	0	100	100	5.3	0.9	Weighted Avg.	Staging Area
Weighted Average				231	3.7					12.50	7.26		

Controlled Materials:
Total = 75,320 cubic yards
130,688 tons
Amount Removed = 38,920 cubic yards
(not including day piles) 73,948 tons
Amount Crushed = 18,300 cubic yards
(not including day piles) 34,587 tons

* Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1

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Table N-28
Material Handling - "Drop Emissions"

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13.2.4, November 2006

Schedule Estimates		Work Days
On-Site Stabilization, 2nd Year	On-Site Soil Consolidation	3
	Moving Storage Yard Materials	64 (two drop points)
	Placement of Barrier	64
	Soil Cover for Non-Engineered Area	9
License Termination, 1st Year	Soil Cover for Moved Piles	105
	Material Removal to Crusher/Train	105
	Material Removal (train loading)	105

The "drop emissions" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles, the drop emissions associated with each activity are included in the emission factor for those processes.

There are two drop points for each task -material removed to train, material directly to train, and cover material.

Material Type	Parcel#	Pile & Material Type	Task	Area Type (where emissions will occur)	Number of Working Days (days/project)	Material Amounts (tons/project)	Percent of Pile Moved (EB) (%)	Percent of Pile Removed (%)	Percent of Pile Crushed (%)	Material to be Handled (tons)	Material Amounts (tons/day)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M Material Moisture Content (%)	U Mean Wind Speed (mph)	E Calculated Emission Factor (lb/ton)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)	Calculated Emissions (ton/project)
Loader Unloading	1	Excavated Soil Mixed with Slag	Material Removal to Crusher/Train	Primary Control Area	105	24,300	0	0	0	0	0	PM10	0.35	12	8.7	1.9E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	12	8.7	2.8E-05	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	24,300	100	0	0	24,300	380	PM10	0.35	12	8.7	1.9E-04	7.1E-02	4.6E+00		4.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	1.1E-02	6.9E-01		6.9E-01
Loader Unloading	2	Excavated Soil from D111	Material Removal to Crusher/Train	Primary Control Area	105	1,418	0	0	0	0	0	PM10	0.35	12	8.7	1.9E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	12	8.7	2.8E-05	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	1,418	100	0	0	1,418	22	PM10	0.35	12	8.7	1.9E-04	4.1E-03	2.7E-01		2.7E-01
												PM2.5	0.053	12	8.7	2.8E-05	6.3E-04	4.0E-02		4.0E-02
Loader Unloading	3	Canal Slag (In & Out of	Material Removal to Crusher/Train	Primary Control Area	105	6,683	0	100	0	6,683	64	PM10	0.35	0.92	8.7	6.8E-03	4.3E-01		4.6E+01	4.6E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	6.6E-02		6.9E+00	6.9E+00
			Moving Storage Yard Materials	EB Area	64	6,683	0	100	0	6,683	104	PM10	0.35	0.92	8.7	6.8E-03	7.1E-01	4.8E+01		4.8E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	1.1E-01	6.9E+00		6.9E+00
Loader Unloading	4	Slag	Material Removal to Crusher/Train	Primary Control Area	105	56,700	0	100	50	56,700	540	PM10	0.35	0.92	8.7	6.8E-03	3.7E+00		3.9E+02	3.9E+02
												PM2.5	0.053	0.92	8.7	1.0E-03	5.6E-01		6.9E+01	6.9E+01
			Moving Storage Yard Materials	EB Area	64	56,700	0	100	50	56,700	886	PM10	0.35	0.92	8.7	6.8E-03	6.0E+00	3.9E+02		3.9E+02
												PM2.5	0.053	0.92	8.7	1.0E-03	9.2E-01	6.9E+01		6.9E+01
Loader Unloading	5A	Slag	Material Removal to Crusher/Train	Primary Control Area	105	4,914	0	100	50	4,914	47	PM10	0.35	0.92	8.7	6.8E-03	3.2E-01		3.4E+01	3.4E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	4.8E-02		5.1E+00	5.1E+00
			Moving Storage Yard Materials	EB Area	64	4,914	0	100	50	4,914	77	PM10	0.35	0.92	8.7	6.8E-03	5.2E-01	3.4E+01		3.4E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	7.9E-02	5.1E+00		5.1E+00
Loader Unloading	5B	Demolition Concrete	Material Removal to Crusher/Train	Primary Control Area	105	3,888	0	0	0	0	0	PM10	0.35	2.1	8.7	2.1E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	2.1	8.7	3.3E-04	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	3,888	100	0	0	3,888	61	PM10	0.35	2.1	8.7	2.1E-03	1.3E-01	8.4E+00		8.4E+00
												PM2.5	0.053	2.1	8.7	3.3E-04	2.0E-02	1.3E+00		1.3E+00
Loader Unloading	6	Hi-Ratio Slag	Material Removal to Crusher/Train	Primary Control Area	105	3,780	0	100	100	3,780	36	PM10	0.35	0.92	8.7	6.8E-03	2.5E-01		2.6E+01	2.6E+01
												PM2.5	0.35	0.92	8.7	6.8E-03	2.5E-01		2.6E+01	2.6E+01
			Moving Storage Yard Materials	EB Area	64	3,780	0	100	100	3,780	59	PM10	0.35	0.92	8.7	6.8E-03	4.0E-01	2.6E+01		2.6E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	6.1E-02	3.9E+00		3.9E+00
Loader Unloading	7	Hi-Ratio Slag & D111& D116	Material Removal to Crusher/Train	Primary Control Area	105	1,755	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	8.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	1,755	100	0	0	1,755	27	PM10	0.35	0.92	8.7	6.8E-03	1.9E-01	1.2E+01		1.2E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	2.8E-02	1.8E+00		1.8E+00
Loader Unloading	8	Baghouse Dust	Material Removal to Crusher/Train	Primary Control Area	105	17,550	0	0	0	0	0	PM10	0.35	7	8.7	4.0E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	7	8.7	6.0E-05	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	17,550	100	0	0	17,550	274	PM10	0.35	7	8.7	4.0E-04	1.1E-01	7.0E+00		7.0E+00
												PM2.5	0.053	7	8.7	6.0E-05	1.7E-02	1.1E+00		1.1E+00
Loader Unloading	9	Baghouse Dust Mixed with Slag	Material Removal to Crusher/Train	Primary Control Area	105	7,830	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	8.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	7,830	100	0	0	7,830	122	PM10	0.35	0.92	8.7	6.8E-03	8.3E-01	5.3E+01		5.3E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	1.3E-01	8.1E+00		8.1E+00
Loader Unloading	SC	On-Site Soil Consolidation	Material Removal to Crusher/Train	Primary Control Area	105	1,871	0	100	0	1,871	18	PM10	0.35	12	8.7	1.9E-04	3.3E-03		3.5E-01	3.5E-01
												PM2.5	0.053	12	8.7	2.8E-05	5.1E-04		5.3E-02	5.3E-02
			Moving Storage Yard Materials	EB Area	64	1,871	100	100	0	3,742	58	PM10	0.35	12	8.7	1.9E-04	1.1E-02	7.0E-01		7.0E-01
												PM2.5	0.053	12	8.7	2.8E-05	1.7E-03	1.1E-01		1.1E-01
Cover Placement	CVR1	Cover for moved pile areas	Soil Cover for Moved Piles	Primary Control Area	105	6,862	100	100	0	13,724	131	PM10	0.35	12	8.7	1.9E-04	2.4E-02		2.6E+00	2.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	3.7E-03		3.9E-01	3.9E-01
			Moving Storage Yard Materials	Primary Control Area	64	6,862	100	100	0	13,724	214	PM10	0.35	12	8.7	1.9E-04	4.0E-02	2.6E+00		2.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	6.1E-03	3.9E-01		3.9E-01
	EB2	Cover Soil	Placement of Barrier	EB Area	64	24,188	100	0	0	24,188	378	PM10	0.35	12	8.7	1.9E-04	7.1E-02	4.6E+00		4.5E+00
												PM2.5	0.053	12	8.7	2.8E-05	1.1E-02	6.9E-01		6.9E-01
	EB4	Various Stone	Placement of Barrier	EB Area	64	24,847	100	0	0	24,847	388	PM10	0.35	7.4	8.7	3.7E-04	1.4E-01	9.2E+00		9.2E+00
												PM2.5	0.053	7.4	8.7	5.6E-05	2.2E-02	1.4E+00		1.4E+00
	EB6	Clay	Placement of Barrier	EB Area	64	34,242	100	0	0	34,242	535	PM10	0.35	10	8.7	2.4E-04	1.3E-01	8.3E+00		8.3E+00
												PM2.5	0.053	10	8.7	3.7E-05	2.0E-02	1.3E+00		1.3E+00
Loader Unloading	DP1	Staging Area Day Pile	Material Removal to Crusher/Train	Staging Area	105	73,946	0	100	0	73,946	704	PM10	0.35	7.3	8.7	3.8E-04	2.7E-01		2.8E+01	2.8E+01
												PM2.5	0.053	7.3	8.7	5.7E-05	4.0E-02		4.2E+00	4.2E+00
Loader Unloading	DP2	Crusher Day Pile	Material Removal to Crusher/Train	Staging Area	105	34,587	0	100	100	34,587	329	PM10	0.35	0.92	8.7	6.8E-03	2.2E+00		2.4E+02	2.4E+02
												PM2.5	0.053	0.92	8.7	1.0E-03	3.4E-01		3.6E+01	3.6E+01

		Active 8 Hour Day (lbs/day)	Inactive Day (lbs/day)	1st Year Annual (lbs/year)	2nd Year Annual (lbs/year)	Total (ton/project)
Primary Control Area	PM10	4.75	0.00	2.67	495	497
	PM2.5	0.93	0.00	0.39	97	97
EB Area	PM10	9.4	0.00	600	0.0E+00	600
	PM2.5	1.42	0.00	91	0.0E+00	91
Staging Area	PM10	2.51	0.00	0.0E+00	264	264
	PM2.5	0.38	0.00	0.0E+00	40.0	40

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13.2.4-1 and the mean wind speed is from Local Climatological Data (ISSN 0198-4535) Philadelphia, Pennsylvania.

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Table N-29
Material Handling - Active/Inactive Pile Emissions

The emission factor includes the emissions from loading material (drop emissions) into the pile, equipment traffic in the storage area, and wind erosion. Since it is difficult to determine which piles will be removed in the first year, the emissions assume all the piles will be removed in the first year and they are half the actual size. Also assumes all small piles are done on a Friday with an inactive weekend.

Parcel Number	Material Type	Activity	Area Type	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Pile Amounts: Moved to EB (%)	Removed (%)	Crushed or Off-Site (%)	Total Removed (tons)	Annual Calendar Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)	Fugitive Particulate Size (lb/acre/day)	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)
1	Excavated Soil Mixed with Slag	Active	Primary Control Area	24,300	0.9	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		24,300	0.9	100	0	0	0	2	PM10	1.7	0.00	3.1E+00	-3.1E+00	PM2.5	0.26	0.00	4.6E-01	-4.6E-01
2	Excavated Soil from D111	Active	Primary Control Area	1,418	0.2	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		1,418	0.2	100	0	0	0	2	PM10	1.7	0.00	5.4E-01	-5.4E-01	PM2.5	0.26	0.00	8.2E-02	-8.2E-02
3	Canal Slag (In & Out of Supersack)	Active	Primary Control Area	6,683	0.2	0	100	0	6,683	9	PM10	6.3	1.20	0.0E+00	1.1E+01	PM2.5	0.95	0.18	0.0E+00	1.7E+00
		Inactive		6,683	0.2	0	100	0	6,683	3	PM10	1.7	0.32	0.0E+00	8.8E-01	PM2.5	0.26	0.05	0.0E+00	1.3E-01
4	Slag	Active	Primary Control Area	56,700	1.0	0	100	50	56,700	81	PM10	6.3	6.55	0.0E+00	5.3E+02	PM2.5	0.95	0.99	0.0E+00	8.0E+01
		Inactive		56,700	1.0	0	100	50	56,700	23	PM10	1.7	1.77	0.0E+00	4.1E+01	PM2.5	0.26	0.27	0.0E+00	6.2E+00
5A	Slag	Active	Primary Control Area	4,914	0.2	0	100	50	4,914	7	PM10	6.3	1.26	0.0E+00	8.8E+00	PM2.5	0.95	0.19	0.0E+00	1.3E+00
		Inactive		4,914	0.2	0	100	50	4,914	2	PM10	1.7	0.34	0.0E+00	6.8E-01	PM2.5	0.26	0.05	0.0E+00	1.0E-01
5B	Demolition Concrete	Active	Primary Control Area	3,868	0.3	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		3,868	0.3	100	0	0	0	2	PM10	1.7	0.00	1.0E+00	-1.0E+00	PM2.5	0.26	0.00	1.6E-01	-1.6E-01
6	Hi-Ratio Slag	Active	Primary Control Area	3,780	0.3	0	100	100	3,780	5	PM10	6.3	2.02	0.0E+00	1.1E+01	PM2.5	0.95	0.31	0.0E+00	1.6E+00
		Inactive		3,780	0.3	0	100	100	3,780	2	PM10	1.7	0.54	0.0E+00	1.1E+00	PM2.5	0.26	0.08	0.0E+00	1.6E-01
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	Active	Primary Control Area	1,755	0.3	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		1,755	0.3	100	0	0	0	2	PM10	1.7	0.00	9.2E-01	-9.2E-01	PM2.5	0.26	0.00	1.4E-01	-1.4E-01
8	Baghouse Dust	Active	Primary Control Area	17,550	0.9	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		17,550	0.9	100	0	0	0	2	PM10	1.7	0.00	3.2E+00	-3.2E+00	PM2.5	0.26	0.00	4.8E-01	-4.8E-01
9	Baghouse Dust Mixed with Slag	Active	Primary Control Area	7,630	0.4	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		7,630	0.4	100	0	0	0	2	PM10	1.7	0.00	1.5E+00	-1.5E+00	PM2.5	0.26	0.00	2.3E-01	-2.3E-01
SC	On-Site Soil Consolidation	Active	Primary Control Area	1,871	0.50	100	100	0	1,871	3	PM10	6.3	3.15	8.4E+00	0.0E+00	PM2.5	0.95	0.48	1.3E+00	0.0E+00
		Inactive		1,871	0.50	100	100	0	1,871	2	PM10	1.7	0.85	1.7E+00	0.0E+00	PM2.5	0.26	0.13	2.6E-01	0.0E+00
CVR1	Cover for moved pile areas	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	105	PM10	6.3	1.58	1.7E+02	0.0E+00	PM2.5	0.95	0.24	2.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	30	PM10	1.7	0.43	1.3E+01	0.0E+00	PM2.5	0.26	0.06	1.9E+00	0.0E+00
EB2	Cover Soil	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
EB4	Various Stone	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
EB5	Clay	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
DP1	Staging Area Day Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	0	100	0	500	105	PM10	6.3	0.63	0.0E+00	6.6E+01	PM2.5	0.95	0.10	0.0E+00	1.0E+01
		Inactive		500	0.1	0	100	0	500	42	PM10	1.7	0.17	0.0E+00	7.1E+00	PM2.5	0.26	0.03	0.0E+00	1.1E+00
DP2	Crusher Day Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	0	100	100	500	105	PM10	6.3	0.63	0.0E+00	6.6E+01	PM2.5	0.95	0.10	0.0E+00	1.0E+01
		Inactive		500	0.1	0	100	100	500	42	PM10	1.7	0.17	0.0E+00	7.1E+00	PM2.5	0.26	0.03	0.0E+00	1.1E+00

Total Tons of Piles		
Primary Control Area	130,658	73,948
Staging Area	1,000	1,000

	1st Year PM10 (lbs/yr)	2nd Year PM10 (lbs/yr)
Primary Control Area	20	592
Staging Area	0	147
EB Staging Area	504	0

	1st Year PM2.5 (lbs/yr)	2nd Year PM2.5 (lbs/yr)
Primary Control Area	3.1	89.5
Staging Area	0	22.2
EB Staging Area	76.3	0

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days.

	Max Active Day Total Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM10 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM10 (lbs/day)
Primary Control Area	7.73	1.77	6.55	1.18
Staging Area	0.74	0.17	0.63	0.11
EB Staging Area	1.86	0.43	1.58	0.28

	Max Active Day Total Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM2.5 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM2.5 (lbs/day)
Primary Control Area	1.17	0.27	0.99	0.178
Staging Area	0.11	0.026	0.10	0.017
EB Staging Area	0.28	0.064	0.24	0.043

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle:
1) loading of aggregate onto storage piles (batch or continuous drop operations),
2) equipment traffic in storage areas,
3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day, the remainder of the day wind erosion of the pile occurs.
Max Active Day is a weekday with one "worst case" pile is active for 8 hours and inactive fo 16 hours for each area. Max Inactive Day is a weekend with one "worst case" pile is inactive for 24 hours.
PM2.5 emissions are based on a ratio of the PM10 to PM2.5 emission factors for the drop emission factors in the Material Handling spreadsheet, also found in AP-42 Chapters 13.2.4 and 13.2.5.

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Table N-30

Heavy Equipment Operation

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling on the material. Some of these emissions estimates are double counted when the equipment is working with a pile.

Emission Factor Equations

Loader & Dozer Equation

PM10 lbs/hr $= 0.75\,(1.0(s)^{1.5}) / (M)^{1.4}$

PM2.5 lbs/hr $= 0.105\,(5.7(s)^{1.2}) / (M)^{1.3}$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 October 1998

	Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Based on (hours/year)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emissions (lb/day)
1st Year									
	Loader	8	1,200	12.50	7.26		PM10	2.06	16.5
							PM2.5	0.94	7.5
	Dozer	8	1,200	12.50	7.26		PM10	2.06	16.5
							PM2.5	0.94	7.5
	Excavator	4	91	12.50	7.26		PM10	2.06	8.3
							PM2.5	0.94	3.8
2nd Year									
	Loader	8	840	12.50	7.26		PM10	2.06	16.5
							PM2.5	0.94	7.5
	Dozer	8	840	12.50	7.26		PM10	2.06	16.5
							PM2.5	0.94	7.5
	Excavator			12.50	7.26		PM10		
							PM2.5		

1st Year	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	97	97	3
EB Area	33	33	20
EB Staging Area	21	21	
Staging Area			

	8 Hr Day PM10 (lbs/day)	1st Year PM10 (lbs/year)	2nd Year PM10 (lbs/year)
Primary Controlled Area	41.3	3,217	1,734
EB Area	41.3	1,245	0
EB Staging Area	33.0	705	0
Staging Area	33.0	0	1,734

2nd Year	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	53	53	
EB Area			
EB Staging Area			
Staging Area	53	53	

	PM2.5 (lbs/day)	PM2.5 (lbs/year)	PM2.5 (lbs/year)
Primary Controlled Area	18.8	1,467	791
EB Area	18.8	568	0
EB Staging Area	15.1	321	0
Staging Area	15.1	0	791

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining.

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Table N-31
Unpaved Roadways - Access Road

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated DOES include particulate emissions from the engines.

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated November, 2006

Equation (1a), $E = k (s/12)^a (W/3)^b$

Given Variables for Estimating Emissions

1.5 **k** = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
0.15 **k** = base emission factor for pounds of PM-2.5 particulate per vehicle mile traveled
6.00 **s** = road surface silt loading (silt content Iron and Steel Production)
32 **W** = average weight (tons) of vehicle traveling road
0.9 **a** = per Table 13.2.2-2. Constants for Equations 1a and 1b
0.45 **b** = per Table 13.2.2-2. Constants for Equations 1a and 1b
80% Percent of control, based on Fig. 13.2.2-5 for <10um, one month re-application, 0.18 gal/yd^2 petroleum resin

Roadway Type	Pollutant	Trip Length In and Out (feet)	Truck Trips per Day	Truck Trips per Project	Daily Vehicle Miles Traveled (miles/day)	1st Year Vehicle Miles Traveled (miles/project)	2nd Year Vehicle Miles Traveled (miles/project)	Uncontrolled E Emission Factor Equation 1a	Controlled E Emission Factor Equation 1a	Controlled Emissions Individual Daily (pounds)	Controlled Emissions Actual Max Daily (pounds)	Controlled Emissions 1st Year Annual (pounds)	Controlled Emissions 2nd Year Annual (pounds)
On Site Material Excavation	PM10	2,000	24	66	9.09	25.0		2.34	0.47	4.26	*4.26*	106	
Cover & Engineered Barrier Material Transport	PM10	2,400	30	2,549	13.8	1,159		2.34	0.47	6.46	*6.46*	7,486	
Off Site Material Removal (cover)	PM10	2,400	24	242	10.9		110	2.34	0.47	5.11	5.11		51.5
Off Site Material Removal (staging area)	PM10	2,200	24	1,946	10.0		811	2.34	0.47	4.68	4.68		380
Dust Control Truck (1st Year)	PM10	2,300	1	105	0.44	45.7		2.34	0.47	0.20	*0.20*	9.33	
Dust Control Truck (2nd Year)	PM10	2,300	1	150	0.44		65.3	2.34	0.47	0.20	0.20		30.6
On Site Material Excavation (cover)	PM2.5	2,000	24	66	9.09	25.0		0.23	0.047	0.43	*0.43*	11	
Cover & Engineered Barrier Material Transport	PM2.5	2,400	30	2,549	13.8	1,159		0.23	0.047	0.65	*0.65*	749	
Off Site Material Removal (cover)	PM2.5	2,400	24	242	10.9		110	0.23	0.047	0.51	0.51		5.2
Off Site Material Removal (staging area)	PM2.5	2,200	24	1,946	10.0		811	0.23	0.047	0.47	0.47		38
Dust Control Truck (1st Year)	PM2.5	2,300	1	105	0.44	45.7		0.23	0.047	0.020	*0.020*	0.93	
Dust Control Truck (2nd Year)	PM2.5	2,300	1	150	0.44		65.3	0.23	0.047	0.020	0.020		3.1

TOTALS	Daily (pounds)	1st year Year (pounds)	2nd Year Year (pounds)
PM10	10.9	7,601	462
PM2.5	1.09	760	46.2

"Daily" is a maximum sum of 1st and 2nd Year daily estimates

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Table N-32
Paved Roadway Emissions

Predictive Emission Factor Equation from AP-42 5th Edition Chapter Section 13.2.1 Paved Roads, November 2006

Annual E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C]/453.592
Daily E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 - P/(4N))/453.592
Hourly E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 -1.2 P/N)/453.592

E =	particulate emission factor (pounds/mile traveled)	
k =	particulate size multiplier for particulate size range	
sL =	sL = road surface silt loading (grams per square meter for Iron & Steel Production))	
W =	average weight (tons) of the vehicles traveling the road	
C =	emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear	
P =	119	(number of wet days with at least 0.01" of precipitation)
N =	365	(number of days in the averaging period)
453.592	*Conversion factor (1 pound = 453.592 grams)*	

Truck Weight
Average Weight 32 tons

Roadway Types	% of Miles
Roadway with <500 vehicles/day	100%

Work Months
0 Winter Months (total of 5 per year)
5 Non-Winter Months (total of 7 per year)

Mileage Estimates

On Site Material Excavation (cover)	1,650	Trip Length (feet) one way
Cover & Engineered Barrier Material Transport	1,650	Trip Length (feet) one way
Soil Material for Relocated Pile Areas	1,650	Trip Length (feet) one way
Off Site Material Removal (cover)	1,650	Trip Length (feet) one way
Dust Control Truck	1,650	Trip Length (feet) one way

Total Number of Trucks

		66 trucks/project	24 trucks/day
		2,549 trucks/project	30 trucks/day
		242 trucks/project	24 trucks/day
	1st Year	150 trucks/project	1 trucks/day
	2nd Year	105 trucks/project	

Roadway Type	sL Silt Loading Year (g/m^2)	W Average Vehicle Weight (tons)	Number of Miles Per Roadway Type: Day	Number of Miles Per Roadway Type: Project	Pollutant	k Base Multiplier (g/VMT)	C Wear & Tear Factor (g/VMT)	E Emission Factor: Day Non-Winter (lbs/mile trvld)	E Emission Factor: Year Non-Winter Months (lbs/mile trvld)	Emissions: Day Non-Winter (lb/day)	Emissions: 1st Year Non-Winter (lb/yr)	Emissions: 2nd Year Non-Winter (lb/yr)
On Site Material Excavation (cover)												
Roadway with <500 vehicles/day	5.8200	32.27	15	41	PM10	7.3	0.2119	1.0E+00	1.1E+00	*15.7*		46.89
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	*2.36*		7.05
Cover & Engineered Barrier Material Transport												
Roadway with <500 vehicles/day	5.82	32	18.97	1,593	PM10	7.3	0.2119	1.04	1.1E+00	19.8	1.8E+03	
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	2.98	2.7E+02	
Off Site Material Removal (cover)												
Roadway with <500 vehicles/day	5.82	32	15	151	PM10	7.3	0.2119	1.0E+00	1.1E+00	*15.7*		171.94
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	*2.36*		25.87
Dust Control Truck												
Roadway with <500 vehicles/day	5.82	32	1	94	PM10	7.3	0.2119	1.0E+00	1.1E+00	0.65	1.1E+02	
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	0.10	1.6E+01	
Roadway with <500 vehicles/day	5.82	32	1	66	PM10	7.3	0.2119	1.0E+00	1.1E+00	*0.65*		74.59
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.6E-01	1.7E-01	*0.10*		11.22
								Totals	PM10	32.0	1,918	293
									PM2.5	4.81	288	44.1

"Daily" is a maximum sum of 1st and 2nd Year daily estimates

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Table N-33
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area	Year of Operations	Total Calendar Days (day/year)	Exposed Ground Area (sq ft)	Exposed Ground Area (acre)	Particulate Size	Emission Factor (ton/acre/year)	Emission Estimates: Daily (lbs/day)	Emission Estimates: Year 1 (lbs/year)	Emission Estimates: Year 2 (lbs/year)	Emission Estimates: Total Project (lbs/project)
Exposed Ground Areas	Primary Control Area	1st year	210	310,687	7.13	TSP	0.38	14.85	3,119		3,119
Exposed Ground Areas	EB Area	2nd Year	147	242,224	7.13	TSP	0.38	14.85		2,182	2,182
Exposed Ground Areas	Staging Area	2nd Year	147	21,780	0.5	TSP	0.38	1.0		153	153

		Aerodynamic Particle Size Multiplier	Daily 24 hour (lbs/day)	Daily 8 Hour (lbs/day)	Daily 16 hour (lbs/day)	Annual 1st year (lbs/year)	Annual 2nd year (lbs/year)
Primary Control Area	PM30	0.74	10.99	3.66	7.33	2,308	
	PM10*	0.35	5.20	1.73	3.47	1,092	
	PM2.5*	0.053	0.79	0.26	0.52	165	
EB Area	PM30	0.74	10.99	3.66	7.32		1,615
	PM10*	0.35	5.20	1.73	3.46		764
	PM2.5*	0.053	0.79	0.26	0.52		116
Staging Area	PM30	0.74	0.77	0.26	0.51		113
	PM10*	0.35	0.36	0.12	0.24		53.6
	PM2.5*	0.053	5.5E-02	0.018	0.037		8.11

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges or the surface is covered by rock, all disturbed areas are subject to wind erosion. This emission estimate assumes that the area will be become vegetated or will be covered with rock at the end of the second year. It is assumed that the project will start in

*The PM10 and PM2.5 emission factor has been adjusted from the PM30 emission factor, Table 11.9-4 refers to Section 13.2.5 (then to Section 13.2.4) which presents a distribution of particle sizes that are comparable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
silt range of 5.1 - 21 with a mean of 15
moisture range of 2.8 - 20 with a mean of 6.9
Physical properties of the sand/gravel:
silt range of 1.2 - 4.2 with a mean of 2.16 (site specific data)
sand moisture content, a mean of 7.4 (AP-42 Table 13.2.4-1)

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slight rounding due to 150 vs 151 days

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Table N-34
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the piles.

Loader

145 Estimated HP
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
8 Hours per Day
97 Days/Year in Primary Control Area
33 Days/Year in EB Area
na Days/Year in Staging Area
21 Days/Year in EB Staging Area
1200 Hours per Year, Total

2nd Year: 105 days
8 Hours per Day
105 Days per Year
53 Days/Year in Primary Control Area
53 Days/Year in Staging Area
840 Hours per Year, Total

Dozer

132 Estimated HP
7.08 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
8 Hours per Day
97 Days/Year in Primary Control Area
33 Days/Year in EB Area
na Days/Year in Staging Area
21 Days/Year in EB Staging Area
1200 Hours per Year, Total

2nd Year: 105 days
8 Hours per Day
105 Days per Year
53 Days/Year in Primary Control Area
53 Days/Year in Staging Area
840 Hours per Year, Total

Excavator

145 Estimated HP
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
4 Hours per Day
3 Days/Year in Primary Control Area
20 Days/Year in EB Area
0 Days/Year in Staging Area
0 Days/Year in EB Staging Area
91 Hours per Year, Total

Pollutant	Area	Emission Factor Units	Loader				Dozer				Excavator				Totals		
			Emission Factor	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)	Emission Factor	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)	Emission Factor	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)
PM	Primary Control Area	g/hp-hr	0.400	1.023	98.9	53.7	0.400	0.931	90.1	48.9	0.400	0.511	1.41		2.47	190	103
	EB Area	g/hp-hr	0.400	1.023	33.5		0.400	0.931	30.5		0.400	0.511	10.2		2.47	74.1	
	Staging Area	g/hp-hr	0.400	1.023		53.7	0.400	0.931		48.9					1.95		103
	EB Staging Area	g/hp-hr	0.400	1.023	21.8		0.400	0.931	19.9						1.95	41.7	
NOx	Primary Control Area	g/hp-hr	4.50	5.8	556	302	4.50	10.48	1,013	550	4.50	5.75	15.8		22.0	1,585	852
	EB Area	g/hp-hr	4.50	5.8	188		4.50	10.48	343		4.50	5.75	115		22.0	646	
	Staging Area	g/hp-hr	4.50	5.8		302	4.50	10.48		550					16.2		852
	EB Staging Area	g/hp-hr	4.50	5.8	123		4.50	10.48	223						16.2	346	
SOx	Primary Control Area	lb/1,000 gals	0.213	0.013	1.25	0.68	0.213	0.012	1.166	0.63	0.213	0.27	0.75		0.30	3.2	1.31
	EB Area	lb/1,000 gals	0.213	0.013	0.424		0.213	0.012	0.394		0.213	0.27	5.4		0.30	6.3	
	Staging Area	lb/1,000 gals	0.213	0.013		0.68	0.213	0.012		0.63					0.025		1.31
	EB Staging Area	lb/1,000 gals	0.213	0.013	0.277		0.213	0.012	0.257						0.025	0.53	

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, excavator is a Caterpillar 22B with a 145 HP engine, and the dozer is a Caterpillar D5H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling – Compression-Ignition, dated February 13, 1998, revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

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Table N-35
On-Road Engine Emissions
EPA Model MOBILE 6.2

EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes. The emissions estimates are the engine exhaust emissions. The emissions below are for two classes of heavy duty diesel vehicles.

Maximum Miles per Day	
HDDV8A Miles per Day	52.0
HDDV8B Miles per Day	52.0
Miles per 1st Year	
HDDV8A Miles per Year	2,002
HDDV8B Miles per Year	2,002
Miles per 2nd Year	
HDDV8A Miles per Year	382
HDDV8B Miles per Year	382
Idling	
Total hours of idling on site per day	1
1st Year - Total hours of idling on site	150
2nd Year - Total hours of idling on site	105

Engineered Barrier and Drainage Material	
Trucks per day	40
Trucks for 1st Year	2,549
Trucks for 2nd Year	0
Miles per truck	1.08

On Site Material Excavation (cover)	
Trucks per day	24
Trucks for 1st Year	66
Trucks for 2nd Year	66
Miles per truck	1.00

Off Site Material Removal (cover)	
Trucks per day	24
Trucks for 1st Year	242
Trucks for 2nd Year	121
Miles per truck	1.08

Off Site Material Removal (staging area)	
Trucks per day	24
Trucks for 1st Year	1,946
Trucks for 2nd Year	973
Miles per truck	0.42

Dust Control Truck	
Trucks per day	1
Trucks for 1st Year	105
Trucks for 2nd Year	150
Miles per truck	1.08

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)					HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)				
		grams/mile	grams/hour	pounds/day	1st Year pounds/year	2nd Year pounds/year	grams/mile	grams/hour	pounds/day	1st Year pounds/year	2nd Year pounds/year
PM10/PM2.5	10 mph average	0.254	NA	0.0291	1.12	0.21	0.25	NA	0.0289	1.11	0.21
	Idling	NA	1.0040	0.0022	0.23	0.23	NA	1.0040	0.0022	0.33	0.23
				0.0313	1.35	0.45			0.0311	1.44	0.44
SO2	10 mph average	0.0144	NA	1.7E-03	0.06	0.01	0.015	NA	1.7E-03	0.07	0.01
NOx	10 mph average	12.3	NA	1.408	54.2	10.3	13.9	NA	1.598	61.47	11.7

	PM10/PM2.5			SO2			NOx		
	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year
Primary Control Area (see below)	0.0104	0.70	0.22	5.6E-04	3.3E-02	7.0E-03	0.501	28.91	5.52
EB Staging Area (see below)	0.0104	0.70		5.6E-04	3.3E-02		0.501	28.91	
Staging Area (see below)	0.0104		0.22	5.6E-04		7.0E-03	0.501		5.52
Roadways (50%)	0.0312	1.40	0.45	1.7E-03	6.5E-02	1.2E-02	1.503	57.8	11.0

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less, it has been assumed that PM2.5 = PM10. The emissions for non-roadway emissions are equally divided among each area.

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Off-Site Disposal of Slag Only

Table N-36
Material Handling - Crushing Emissions

Emission factor used to estimate emissions is for secondary crushing/screening (no factors for primary crushing are available). The emission estimate assumes wet suppression technology utilized to control emissions. It also assumes that half of each pile is crushed in the first year of operations and the other half in the next year.

Maxiumum amount of material that can be crushed in one hour	300 ton/hour	
Operating hours per day of operations	2 hours/day	
Amount of material that can be crushed in one day	600 ton/day	8 hour/day, Daily rail car capacities = 245 tons per day
Days per year of operation	58 days/year	

Parcel Number	Material Type	Material Amounts (tons/hour)	Material Amounts (tons/day)	Material Amounts (tons/project)	Percentage To be Crushed (%)	Days Needed to Crush (days)	Crushed Material Amounts (tons/project)	Particulate Size	Uncontrolled Particulate Size Multiplier (lb/ton)	Controlled Particulate Size Multiplier (lb/ton)	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions Maximum (tons/year)	Controlled Emissions Maximum (tons/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
1	Excavated Soil Mixed with Slag	300	600	24,300	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
2	Excavated Soil from D111	300	600	1,418	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
3	Canal Slag (In & Out of	300	600	6,683	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
4	Slag	300	600	56,700	50	47	28,350	PM10	8.70E-03	7.40E-04	5.22	0.44	0.123	0.010	0.123	0.010
								PM2.5		5.00E-05		0.03		7.1E-04		7.1E-04
5A	Slag	300	600	4,914	50	4	2,457	PM10	8.70E-03	7.40E-04	5.22	0.44	0.011	0.001	0.011	0.001
								PM2.5		5.00E-05		0.03		6.1E-05		6.1E-05
5B	Demolition Concrete	300	600	3,888	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
6	Hi-Ratio Slag	300	600	3,780	100	6	3,780	PM10	8.70E-03	7.40E-04	5.22	0.44	0.016	0.001	0.016	0.001
								PM2.5		5.00E-05		0.03		9.5E-05		9.5E-05
9	Baghouse Dust Mixed with Slag	300	600	7,830	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
CVR1	Cover for moved pile areas	300	600	6,862	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
DP1	Staging Area Day Pile	300	600	73,948	0			Double counting								
DP2	Crusher Day Pile	300	600	34,587	100			Double counting								

	Total Days (days)	Total Material Crushed (tons)
Project	58	34,587
2nd Year	58	34,587

	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions 2nd Year (tons/year)	Controlled Emissions 2nd Year (lbs/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
PM10 =	5.220	0.444	0.150	25.6	0.150	0.013
PM2.5 =		3.0E-02		1.73		8.6E-04

Emission factors are from EPA's Factor Information Retrieval (FIRE) Data System 6.25. SCC for the crushing process is 3-05-020-02.

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Table N-37
Crusher - Engine Emissions
Internal Combustion Engine, <600 HP

These emission factors estimate particulate emissions from the engine. Particulate emissions from the crushing of material are not included; those emissions are addressed in Table 11.

Potential Operating Hours (or permitted hours)	8,760	
Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Gallons per Hour	15.3	estimated
Fuel Input in MMBtu per Hour	2.100	estimated
BHP Rating	300	
Operating Hours		
Per Day	2	(See Table 11)
Days per Year	58	(See Table 11)
Per Year (5 months)	115	
Actual Fuel Usage (gals/year)	1,767	
Sulfur percentage content in fuel	0.0015	%, (15ppm)

Pollutant	CAS#	Emission Factor Source	Emission Factor (lbs/MMBtu)	Actual Emissions (lb/hr)	Actual Emissions (lb/day)	Actual Emissions (lb/yr)	Actual Emissions 2nd Year (ton/yr)	Potential Emissions (lb/hr)	Potential Emissions 2nd Year (ton/yr)
PM	na	1	0.31	0.651	1.30	75.1	0.038	0.651	2.85
PM10	na	1	0.31	0.651	1.30	75.1	0.038	0.651	2.85
PM2.5	na	1	0.31	0.651	1.30	75.1	0.038	0.651	2.85
SOx	na	1	1.52E-03	3.18E-03	6.36E-03	0.37	1.83E-04	3.18E-03	1.39E-02
NOx	na	1	4.41	9.261	18.5	1,068	0.53	9.261	40.6

Footnotes:

1 Emission factors are from EPA's AP-42 Table 3.3-1 dated November, 1996. The SCCs for this source are 2-02-001-01 for industrial size equipment and 2-03-001-01 for commercial/institutional size equipment. SOx emission factor is based on sulfur content and AP-42 Table 3.4-1.

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Table N-38
Locomotive - Diesel Powered

Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Fuel Input in MMBtu per Hour	7.000 estimated	Assumes that the locomotive operates only under "switch duty-cycle" as defined by the EPA.
Maximum hourly fuel use (gal/hr)	51 estimated	
BHP Rating	1000	
Operating Hours		
Hours per Day	1	
Hours per Year (5 months)	59	
Sulfur percentage content in fuel	0.0015 %, (15ppm)	

Pollutant	CAS#	Emission Factor Source	Emission Factors		Actual Emissions (lb/day)	2nd Year (lb/yr)	2nd Year (ton/yr)
PM	na	1	0.54	g/bhp-hr	1.19	71	0.035
PM10	na	1	0.54	g/bhp-hr	1.19	71	0.035
PM2.5	na	1	0.54	g/bhp-hr	1.19	71	0.035
SOx	na	2	1.52E-03	lbs/MMBtu	1.1E-02	0.63	3.2E-04
NOx	na	1	11.00	g/bhp-hr	24.3	1,441	0.72

Emission factors are based on Tier I EPA emission limits for engines that were manufactured from 2000 to 2004. This assumes that if the engine was older than 2000 it would have been rebuilt and is required to comply with modern emission standards. The emission limits were published in the EPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines - Locomotives. Emissions include idling time and assumes that PM=PM10. The SOx emissions are based on sulfur content of the fuel and AP-42 Table 3.4-1.

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Off-Site Disposal of Slag Only

Table N-39
Emissions Summary

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	PM-10 Emissions					PM-10 Emissions					PM-10 Emissions					PM-10 Emissions					PM-10 Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	1st Year lbs/year	2nd Year lbs/year
Material Handling (Table 3)	4.76			2.57	495	9.4			600	0.E+00						2.51			0.E+00	264				
Active/Inactive Piles (Table 4)	6.55	1.18	1.77	20	592						1.58	0.28	0.43	504	0.E+00	0.63	0.11	0.17	0.E+00	147				
Heavy Equipment (Table 5)	41.3			3,217	1,734	x			1,245	0.E+00	x			705	0.E+00	x			0.E+00	1734				
Unpaved Roadways (Table 6)																					10.9		7,601	462
Paved Roadways (Table 7)																					32.0		1,918	293
Exposed Ground Area (Table 8)	1.73	3.47	5.20	1,092	0.E+00	1.73	3.46	5.20	0.E+00	764						0.12	0.24	0.36	0.E+00	54				
Off-Road Engines (Table 9)	2.47			190	103	2.47			74.1	0.E+00	1.95			41.7	0.E+00	1.95			0.E+00	103				
On-Road Engines (Table 10)	0.0104			0.70	0.22						0.0104			0.70	0.E+00	0.0104			0.E+00	0.22	0.0312		1.40	0.45
Material Handling Crusher (Table 11)																0.44				25.6				
Crusher - Engine (Table 12)																1.30				75.1				
Train (Table 13)																1.19				71				
TOTAL	56.8	4.64	6.97	4,522	2,923	13.6	3.46	5.20	1,920	764	3.54	0.28	0.43	1,251	0	8.2	0.36	0.53	0	2,472	42.9		9,521	756

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	1st Year lbs/year	2nd Year lbs/year
Material Handling (Table 3)	0.93			0.39	97	1.42			91	0.E+00						0.36			0.E+00	40.0				
Active/Inactive Piles (Table 4)	0.99	0.178	0.27	3.1	89.6						0.24	0.043	0.064	78.3	0.E+00	0.10	0.017	0.026	0.E+00	22.2				
Heavy Equipment (Table 5)	18.8			1467	791	x			568	0.E+00	x			321	0.E+00	x			0.E+00	791				
Unpaved Roadways (Table 6)																					1.09		760	46.2
Paved Roadways (Table 7)																					4.81		288	44.1
Exposed Ground Area (Table 8)	0.26	0.52	0.79	165	0.E+00	0.26	0.52	0.79	0.E+00	116						0.016	0.037	0.055	0.E+00	8.11				
Off-Road Engines (Table 9)	2.47			190	103	2.47			74.1	0.E+00	1.95			41.7	0.E+00	1.95			0.E+00	103				
On-Road Engines (Table 10)	0.0104			0.70	0.22						0.0104			0.70	0.E+00	0.0104			0.E+00	0.22	0.0312		1.40	0.45
Material Handling Crusher (Table 11)																0.030				1.73				
Crusher - Engine (Table 12)																1.30				75.1				
Train (Table 13)																1.19				71				
TOTAL	23.5	0.70	1.05	1,827	1,080	4.15	0.52	0.79	733	116	2.20	0.043	0.064	440	0	5.0	0.054	0.08	0	1111	5.93		1,050	91

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	SOx Emissions					SOx Emissions					SOx Emissions					SOx Emissions					SOx Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	1st Year lbs/year	2nd Year lbs/year
Off-Road Engines (Table 9)	0.30			3.2	1.31	0.30			6	0.E+00	0.026			0.534	0.E+00	0.03			0.E+00	1.31				
On-Road Engines (Table 10)	5.6E-04			3.3E-02	7.0E-03						5.6E-04			3.3E-02	0E+00	5.6E-04			0.E+00	7.0E-03	1.7E-03		6.5E-02	1.2E-02
Material Handling Crusher (Table 11)																6.4E-03				0.37				
Crusher - Engine (Table 12)																1.1E-02				0.63				
Train (Table 13)																0.0426			0.E+00	2.32	1.7E-03		6.5E-02	0.0124
TOTAL	0.30			3.2	1.32	0.30			6	0.E+00	0.026			0.566	0.E+00									

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	NOx Emissions					NOx Emissions					NOx Emissions					NOx Emissions					NOx Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	1st Year lbs/year	2nd Year lbs/year
Off-Road Engines (Table 9)	22.0			1.585	852	21.98			645.9	0.E+00	16.23			346	0.E+00	16.2			0.E+00	852				
On-Road Engines (Table 10)	0.501			28.91	5.52						0.501			28.91	0.E+00	0.501			0.E+00	5.52	1.503		57.8	11.0
Material Handling Crusher (Table 11)																								
Crusher - Engine (Table 12)																18.5				1,068				
Train (Table 13)																24.3				1,441				
TOTAL	22.5			1,614	858	21.98			646	0.E+00	16.7			375	0.E+00	59.5			0.E+00	3,366	1.503		57.8	11.0

The Material Handling daily emissions assume the activity only happens in the Primary Controlled Area, which is conservative because that the daily emissions are much greater for Material Handling in the Primary Controlled Area than the other areas. The "worse-case" day for the Heavy Equipment (including Off-Road Engines) happens when operating at the Engineered Barrier Area due to the use of an excavator in this area only. Although the activities for "worse-case" day at the Primary Controlled Area and the Engineered Barrier can not happen on the same day, to be conservative simultaneous operation has been assumed for the daily emission estimates. The "X" that appears is to avoid double counting of identical activities that can not occur at the same time in different areas.

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Off-Site Disposal of 50% of Slag
Pile N-40a
Emission Details -Materials and Travel Distances

Common Truck Assumptions			
Yards per Load	(cubic yards)	20	Given
Average Number of Wheels per Truck (10 unloaded, 14 loaded)	(wheels)	12	Given
Weight per Empty Truck	(tons)	15	Given
Average Weight of All Trucks	(tons)	32	Weighted Average Weight (material trucks and barrier/drainage trucks)
Engineered Barrier and Drainage Material			
Cover Soil, Total	(cubic yards)	16,368	CAD-based Estimate
Various Stone	(cubic yards)	14,542	CAD-based Estimate
Clay	(cubic yards)	20,452	CAD-based Estimate
Engineered Barrier/Drainage Material Total	(cubic yards)	51,363	
Amount of Cover Soil	(tons)	23,202	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Various Stone	(tons)	26,504	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Clay	(tons)	34,512	Cubic Yards x Pounds per Cubic Yard / 2,000
Engineered Barrier/Drainage Material Total	(tons)	84,218	
Number of Trucks Trips - Cover Soil	(truck trips)	818	Material Needed / Yards per Load
Number of Trucks Trips - Stone	(truck trips)	727	Material Needed / Yards per Load
Number of Trucks Trips - Clay	(truck trips)	1,023	Material Needed / Yards per Load
Cubic Yards of Engineered Barrier Material Delivered	(cubic yards)	51,363	Number of Trucks x Yards per Load
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Various Stone - Density	(pounds/cubic foot)	135	From Table 2
Various Stone - Density	(pounds/cubic yard)	3,645	Pounds per Cubic Foot x 27
Clay - Density	(pounds/cubic foot)	125	From Table 2
Clay - Density	(pounds/cubic yard)	3,375	Pounds per Cubic Foot x 27
Soil Material Loaded per Truck	(tons)	28	Yards per Load x Pounds per Cubic Yard
Soil Weight per Loaded Truck	(tons)	43	Load per Truck + Weight of Empty Truck
Average Weight of a Soil Material Truck	(tons)	29	Average of Empty Truck and Loaded Truck
Stone Material Loaded per Truck	(tons)	36	Yards per Load x Pounds per Cubic Yard
Stone Weight per Loaded Truck	(tons)	51	Load per Truck + Weight of Empty Truck
Average Weight of a Stone Material Truck	(tons)	33	Average of Empty Truck and Loaded Truck
Clay Material Loaded per Truck	(tons)	34	Yards per Load x Pounds per Cubic Yard
Clay Weight per Loaded Truck	(tons)	49	Load per Truck + Weight of Empty Truck
Average Weight of a Clay Material Truck	(tons)	32	Average of Empty Truck and Loaded Truck
Trucks per Project, All Engineered Barrier/Drainage Material	(trucks/project)	2,568	Assumes Engineered Barrier & Drainage Construction Operation = 120 Calendar Days (86 work days)
Trucks per Day, All Material	(trucks/day)	30.6	Trucks per Project / Time for Engineered Barrier/Final Grading (86 work days)
Soil Material for the Removed Pile Areas (Cover Non-EB Area)			
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Non-EB Storage Yard Area	(square feet)	158,100	CAD-based Estimate
EB Area	(square feet)	179,987	CAD-based Estimate
Total Disturbed Area for EB	(square feet)	242,224	CAD-based Estimate
Total Storage Yard Area	(square feet)	310,687	CAD-based Estimate
Depth of Cover	(feet)	1	Given
Number of Yards of Topsoil Needed	(cubic yards)	4,841	Area x Depth / 27
Tons of Topsoil Needed	(tons)	6,862	Tons from Table 2
Number of Trucks	(trucks/project)	242	Cover Needed / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 Loads per Hour / 8 Hours Day
Yards per Day	(yards/day)	480	Yards per Load x Trucks per Day
Pounds per Cubic Foot	(pounds/cubic foot)	105	From Table 2
Ton per Project	(tons/project)	6,862	Pounds per Cubic Yard / Yards of Cover
Number of Days Needed	(days/project)	10	Number of Trucks / Yards per Load
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
On-Site Soil Excavation			
Yards per Load	(cubic yards/load)	20	Given
Material to be Moved (assume cover amounts same)	(cubic yards)	1,320	From Table 2
Material to be Moved (assume cover amounts same)	(tons)	1,871	From Table 2
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Number of Trucks from Piles to Staging Area/Crusher	(truck trips/project)	66	Cubic Yards / Yards per Load
Tons Material Loaded per Truck	(tons/truck)	28	Tons Material Moved / Number of Trucks
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
Off-Site Material Removal (shipped to Train)			
Cubic Yards of Material to be Removed	(cubic yards)	18,810	From Table 2
Number of Truck Trips to Staging Area	(truck trips/project)	941	Cubic Yards / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Weight of Material Loaded per Truck	(tons)	39	Number of Truck Trips / Total Tons Material Removed
Weight per Loaded Truck	(tons)	54	Tons Material Loaded per Truck + Tons per Empty Truck
Average Weight of a Material Truck	(tons)	34	Average of an Empty Truck and a Loaded Material Truck
Number of Train Cars		406	Tons of Material Removed / Capacity per Train Car
Capacity per Train Car (tons)	(tons)	90	given
Total Tons of Material Removed	(tons)	36,583	Tons from Table 2
Train Cars per Year		203	Number of Train Cars / 2 (which represents the two 5 month periods)
Train Cars per Day (also Trucks to Staging Area)		1.9	Trains per Year / (Weeks per Year x Days per Week)
Tons Loaded per Day	(tons)	174	Capacity per Train Car x Train Cars per Day
Travel Distances			
On-Site Material Transport			
Length of UNPAVED Roadway - to Storage Area	(feet)	1,000	Weighted average length for various soil excavation areas
Length of PAVED Roadway	(feet)	1650	Trip Length for Cover Delivered
Cover & Engineered Barrier Material Transport			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Cover & Engineered Barrier Material
Length of PAVED Roadway	(feet)	1,650	Cover & Engineered Barrier Material
Soil Material for Relocated Pile Areas			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,600	Soil Material for Relocated Piles Areas
Length of PAVED Roadway	(feet)	1,650	Soil Material for Relocated Piles Areas
Off-Site Material Removal			
Length of UNPAVED Roadway - storage area to staging area	(feet)	1,100	Trip Length for Material Removed
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Trip Length for Cover Delivered
Length of PAVED Roadway	(feet)	1,650	Trip Length for Cover Delivered

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Off-Site Disposal of 50% of Slag
Table N-40b
Air Emission Details - Scheduling

Project Operational Times

Working Hours

	Off-Site Disposal (2nd Year)		
	Days per Week	(days/week)	5
	Weeks per Year	(weeks/year)	21
	Hours per Day	(hours/day)	8
	Total days per year	(calendar days)	147
		(work days)	105
	On-Site Stabilization (1st Year)		
	Days per Week	(days/week)	5
	Weeks per Year	(weeks/year)	30
	Hours per Day	(hours/day)	8
	Total days per year	(calendar days)	210
		(work days)	150

Project Duration

Total Years	(years)	2
Total Months	(months)	12
Off-Site Disposal (2nd Year)		
Months each Year - Off-Site Disposal	(months/year)	5
Days to Remove Material from Storage Yard to Crusher/Train	(project work days)	105
Soil Cover for Removed Piles	(project work days)	105
On-Site Stabilization (1st Year)		
Months each Year - On-Site Stabilization	(months/year)	7
Time for Creating Consolidated Pile	(calendar days)	90
	(work days)	64
Time for On-Site Soil Consolidation	(work days)	3
Time for Engineered Barrier	(calendar days)	90
	(work days)	64
Final Grading for Drainage	(calendar days)	30
	(work days)	20
Soil Cover for Non-Engineered Barrier Area	(calendar days)	13
	(work days)	9

Equipment Daily/Annual Operating Rates

	Off-Site Disposal (2nd Year)			
Loader(s)	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	840	
Dozer	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	840	
Crusher	= Maximum Operating Hours per Day	(hours/day)	2	from Table 11
	= Operating Days per Year	(days/year)	25	from Table 11
Train	= Operating Hours per Day	(hours/day)	1	
	= Operating Hours per Year	(hours/year)	29	ratio of total material/shipped material
	On-Site Stabilization (1st Year)			
Loader(s)	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	1200	
Dozer	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	1200	
Excavator	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	4	
	= Operating Hours per Year	(hours/year)	91	
	Both Years			
Dust Control Truck	= Maximum Trucks per Day	(truck/day)	1	
	= Number of Trips per Month	(trucks/month)	22	
	= Number of Trips per Year - On-Site Stabilization	(trucks/year)	150	
	= Number of Trips per Year - Off-Site Disposal	(trucks/year)	105	

Off-Site Disposal of 50% of Slag

Table N-41
Material Description

Parcel #	Material Type	Volume (cubic yard)	Pile Size (acre)	Material Density (lbs/ft³)	Material Density (g/cm³)	Mass for Project (tons)	Percent of Pile To Be Moved to EB (%)	Percent of Pile To Be Removed (%)	Percent of Pile To be Crushed (%)	Silt * (%)	Moisture* (%)	AP-42 Material* Match	Area Type
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.9	24,300	100	0	0	9.0	12.0	Cover	Primary Control Area
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	100	0	0	9.0	12.0	Cover	Primary Control Area
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.6	6,683	0	100	0	5.3	0.92	Slag	Primary Control Area
4	Slag	30,000	1.0	140	2.2	56,700	47.3	52.7	26	5.3	0.92	Slag	Primary Control Area
5A	Slag	2,600	0.2	140	2.2	4,914	50	0	0	5.3	0.92	Slag	Primary Control Area
5B	Demolition Concrete	2,400	0.3	120	1.9	3,888	50	0	0	3.9	2.10	Limestone Products	Primary Control Area
6	Hi-Ratio Slag	2,000	0.3	140	2.2	3,780	0	0	0	5.3	0.92	Slag	Primary Control Area
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.1	1,755	100	0	0	5.3	0.92	Slag	Primary Control Area
8	Baghouse Dust	13,000	0.9	100	1.6	17,550	100	0	0	13.0	7.0	Flue Dust	Primary Control Area
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.3	7,830	50	0	0	5.3	0.92	Slag	Primary Control Area
SC	On-Site Soil Consolidation	1,320	0.5	105	1.7	1,871	100	0	0	9.0	12.00	Cover	Primary Control Area
CVR1	Cover for moved pile areas	4,841	0.25	105	1.7	6,862	100	100	0	9.0	12.00	Cover	EB Staging Area
EB2	Cover Soil	16,368	0.25	105	1.7	23,202	100	0	0	9.0	12.00	Cover	EB Staging Area
EB4	Various Stone	14,542	0.25	135	2.2	26,504	100	0	0	2.6	7.40	Sand	EB Staging Area
EB5	Clay	20,452	0.25	125	2.0	34,512	100	0	0	6.0	10.00	Clay	EB Staging Area
DP1	Staging Area Day Pile	18,810	0.1	144	2.31	36,563	0	100	0	25.3	14.7	Weighted Avg.	Staging Area
DP2	Crusher Day Pile	7,905	0.1	140	2.24	14,940	0	100	100	5.3	0.9	Weighted Avg.	Staging Area
Weighted Average				468	7.5					25.28	14.69		

Controlled Materials:
Total = 75,320 cubic yards
130,688 tons
Amount Removed = 18,810 cubic yards
(not including day piles) 36,563 tons
Amount Crushed = 7,905 cubic yards
(not including day piles) 14,940 tons

* Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1

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Off-Site Disposal of 50% of Slag

Table N-42
Material Handling - "Drop Emissions"

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13.2.4, November 2006

	Schedule Estimates	Work Days	
On-Site Stabilization, 2nd Year	On-Site Soil Consolidation	3	
	Moving Storage Yard Materials	64	(two drop points)
	Placement of Barrier	64	
	Soil Cover for Non-Engineered Area	9	
License Termination, 1st Year	Soil Cover for Moved Piles	105	
	Material Removal to Crusher/Train	105	
	Material Removal (train loading)	105	

The "drop emission" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles, the drop emissions associated with each activity are included in the emission factor for these processes.

There are two drop points for each task -material removed to train, material directly to train, and cover material

Material Type	Parcel#	Pile & Material Type	Task	Area Type (where emissions will occur)	Number of Working Days (days/project)	Material Amounts (tons/project)	Percent of Pile Moved (EB) (%)	Percent of Pile Removed (%)	Percent of Pile Crushed (%)	Material to be Handled (tons)	Material Amounts (tons/day)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M Material Moisture Content (%)	U Mean Wind Speed (mph)	E Calculated Emission Factor (lb/ton)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)	Calculated Emissions (ton/project)
Loader Unloading	1	Excavated Soil Mixed with Slag	Material Removal to Crusher/Train	Primary Control Area	105	24,300	0	0	0	0	0	PM10	0.35	12	6.7	1.9E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	12	6.7	2.8E-06	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	24,300	100	0	0	24,300	380	PM10	0.35	12	6.7	1.9E-04	7.1E-02	4.6E+00		4.6E+00
												PM2.5	0.053	12	6.7	2.8E-06	1.1E-02	6.9E-01		6.9E-01
Loader Unloading	2	Excavated Soil from D111	Material Removal to Crusher/Train	Primary Control Area	105	1,418	0	0	0	0	0	PM10	0.35	12	6.7	1.9E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	12	6.7	2.8E-06	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	1,418	100	0	0	1,418	22	PM10	0.35	12	6.7	1.9E-04	4.1E-03	2.7E-01		2.7E-01
												PM2.5	0.053	12	6.7	2.8E-06	6.3E-04	4.0E-02		4.0E-02
Loader Unloading	3	Canal Slag (In & Out of	Material Removal to Crusher/Train	Primary Control Area	105	6,663	0	100	0	6,663	64	PM10	0.35	0.92	6.7	6.8E-03	4.3E-01		4.6E+01	4.6E+01
												PM2.5	0.053	0.92	6.7	1.0E-03	6.6E-02		6.9E+00	6.9E+00
			Moving Storage Yard Materials	EB Area	64	6,663	0	100	0	6,663	104	PM10	0.35	0.92	6.7	6.8E-03	7.1E-01	4.6E+01		4.6E+01
												PM2.5	0.053	0.92	6.7	1.0E-03	1.1E-01	6.9E+00		6.9E+00
Loader Unloading	4	Slag	Material Removal to Crusher/Train	Primary Control Area	105	56,700	47.3	52.7	26.35	56,700	540	PM10	0.35	0.92	6.7	6.8E-03	3.7E+00		3.9E+02	3.9E+02
												PM2.5	0.053	0.92	6.7	1.0E-03	5.6E-01		5.9E+01	5.9E+01
			Moving Storage Yard Materials	EB Area	64	56,700	47.3	52.7	26.35	56,700	886	PM10	0.35	0.92	6.7	6.8E-03	6.0E+00	3.9E+02		3.9E+02
												PM2.5	0.053	0.92	6.7	1.0E-03	9.2E-01	5.9E+01		5.9E+01
Loader Unloading	6A	Slag	Material Removal to Crusher/Train	Primary Control Area	105	4,914	0	0	0	0	0	PM10	0.35	0.92	6.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	6.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	4,914	50	0	0	2,457	38	PM10	0.35	0.92	6.7	6.8E-03	2.6E-01	1.7E+01		1.7E+01
												PM2.5	0.053	0.92	6.7	1.0E-03	4.0E-02	2.5E+00		2.5E+00
Loader Unloading	6B	Demolition Concrete	Material Removal to Crusher/Train	Primary Control Area	105	3,888	0	0	0	0	0	PM10	0.35	2.1	6.7	2.1E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	2.1	6.7	3.3E-04	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	3,888	50	0	0	1,944	30	PM10	0.35	2.1	6.7	2.1E-03	6.5E-02	4.2E+00		4.2E+00
												PM2.5	0.053	2.1	6.7	3.3E-04	9.9E-03	6.3E-01		6.3E-01
Loader Unloading	6	Hi-Ratio Slag	Material Removal to Crusher/Train	Primary Control Area	105	3,780	0	0	0	0	0	PM10	0.35	0.92	6.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.35	0.92	6.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	3,780	0	0	0	0	0	PM10	0.35	0.92	6.7	6.8E-03	0.0E+00	0.0E+00		0.0E+00
												PM2.5	0.053	0.92	6.7	1.0E-03	0.0E+00	0.0E+00		0.0E+00
Loader Unloading	7	Hi-Ratio Slag & D111& D116	Material Removal to Crusher/Train	Primary Control Area	105	1,755	0	0	0	0	0	PM10	0.35	0.92	6.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	6.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	1,755	100	0	0	1,755	27	PM10	0.35	0.92	6.7	6.8E-03	1.8E-01	1.2E+01		1.2E+01
												PM2.5	0.053	0.92	6.7	1.0E-03	2.8E-02	1.8E+00		1.8E+00
Loader Unloading	8	Baghouse Dust	Material Removal to Crusher/Train	Primary Control Area	105	17,550	0	0	0	0	0	PM10	0.35	7	6.7	4.0E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	7	6.7	6.0E-06	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	17,550	100	0	0	17,550	274	PM10	0.35	7	6.7	4.0E-04	1.1E-01	7.0E+00		7.0E+00
												PM2.5	0.053	7	6.7	6.0E-06	1.7E-02	1.1E+00		1.1E+00
Loader Unloading	9	Baghouse Dust Mixed with Slag	Material Removal to Crusher/Train	Primary Control Area	105	7,830	0	0	0	0	0	PM10	0.35	0.92	6.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	6.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	7,830	50	0	0	3,915	61	PM10	0.35	0.92	6.7	6.8E-03	4.2E-01	2.7E+01		2.7E+01
												PM2.5	0.053	0.92	6.7	1.0E-03	6.3E-02	4.0E+00		4.0E+00
Loader Unloading	SC	On-Site Soil Consolidation	Material Removal to Crusher/Train	Primary Control Area	105	1,871	0	0	0	0	0	PM10	0.35	12	6.7	1.9E-04	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	12	6.7	2.8E-06	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	1,871	100	0	0	1,871	29	PM10	0.35	12	6.7	1.9E-04	5.5E-03	3.5E-01		3.5E-01
												PM2.5	0.053	12	6.7	2.8E-06	8.3E-04	5.3E-02		5.3E-02
Cover Placement	CVR1	Cover for moved pile areas	Soil Cover for Moved Piles	Primary Control Area	105	6,862	100	100	0	13,724	131	PM10	0.35	12	6.7	1.9E-04	2.4E-02		2.6E+00	2.6E+00
												PM2.5	0.053	12	6.7	2.8E-06	3.7E-03		3.9E-01	3.9E-01
			Moving Storage Yard Materials	Primary Control Area	64	6,862	100	100	0	13,724	214	PM10	0.35	12	6.7	1.9E-04	4.0E-02	2.6E+00		2.6E+00
												PM2.5	0.053	12	6.7	2.8E-06	6.1E-03	3.9E-01		3.9E-01
	EB2	Cover Soil	Placement of Barrier	EB Area	64	23,202	100	0	0	23,202	363	PM10	0.35	12	6.7	1.9E-04	6.8E-02	4.3E+00		4.3E+00
												PM2.5	0.053	12	6.7	2.8E-06	1.0E-02	6.6E-01		6.6E-01
	EB4	Various Stone	Placement of Barrier	EB Area	64	26,504	100	0	0	26,504	414	PM10	0.35	7.4	6.7	3.7E-04	1.5E-01	9.8E+00		9.8E+00
												PM2.5	0.053	7.4	6.7	5.6E-06	2.3E-02	1.5E+00		1.5E+00
	EB6	Clay	Placement of Barrier	EB Area	64	34,512	100	0	0	34,512	539	PM10	0.35	10	6.7	2.4E-04	1.3E-01	8.3E+00		8.3E+00
												PM2.5	0.053	10	6.7	3.7E-06	2.0E-02	1.3E+00		1.3E+00
Loader Unloading	DP1	Staging Area Day Pile	Material Removal to Crusher/Train	Staging Area	105	36,563	0	100	0	36,563	348	PM10	0.35	14.7	6.7	1.4E-04	4.9E-02		5.2E+00	5.2E+00
												PM2.5	0.053	14.7	6.7	2.1E-06	7.4E-03		7.8E-01	7.8E-01
Loader Unloading	DP2	Crusher Day Pile	Material Removal to Crusher/Train	Staging Area	105	14,940	0	100	100	14,940	142	PM10	0.35	0.92	6.7	6.8E-03	9.7E-01		1.0E+02	1.0E+02
												PM2.5	0.053	0.92	6.7	1.0E-03	1.5E-01		1.5E+01	1.5E+01

		Active 8 Hour Day (lbs/day)	Inactive Day (lbs/day)	1st Year Annual (lbs/year)	2nd Year Annual (lbs/year)	Total (ton/project)
Primary Control Area	PM10	4.18	0.00	2.87	435	438
	PM2.5	0.63	0.00	0.39	66	66
EB Area	PM10	8.2	0.00	527	0.0E+00	527
	PM2.5	1.25	0.00	80	0.0E+00	80
Staging Area	PM10	1.02	0.00	0.0E+00	107	107
	PM2.5	0.16	0.00	0.0E+00	16.2	16

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13.2.4-1 and the mean wind speed is from Local Climatological Data (ISSN 0196-4535) Philadelphia, Pennsylvania.

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Off-Site Dispos[illegible]% of Slag

Table N-43
Material Handling - Active/Inactive Pile Emissions

The em[illegible]r includes the emissions from loading material (drop emissions) into the pile, equipment traffic in the storage area, and wind erosion. Since it is difficult [illegible]e which piles will be removed in the first year, the emissions assume all the piles will be removed in the first year and they are half the actual size. Als[illegible]es all small piles are done on a Friday with an inctive weekend.

Parcel Number	Material Type	Activity	Area Type	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Pile Amounts: Moved to EB (%)	Removed (%)	Crushed or Off-Site (%)	Total Removed (tons)	Annual Calendar Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)	Fugitive Particulate Size (lb/acre/day)	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)
1	Excavated Soil Mixed with Slag	Active	Primary Control Area	24,300	0.9	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		24,300	0.9	100	0	0	0	2	PM10	1.7	0.00	3.1E+00	-3.1E+00	PM2.5	0.26	0.00	4.8E-01	-4.8E-01
2	Excavated Soil from D111	Active	Primary Control Area	1,416	0.2	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		1,416	0.2	100	0	0	0	2	PM10	1.7	0.00	5.4E-01	-5.4E-01	PM2.5	0.26	0.00	8.2E-02	-8.2E-02
3	Canal Slag (In & Out of Supersacs)	Active	Primary Control Area	6,683	0.2	0	100	0	6,683	19	PM10	6.3	1.20	0.0E+00	2.3E+01	PM2.5	0.95	0.18	0.0E+00	3.5E+00
		Inactive		6,683	0.2	0	100	0	6,683	5	PM10	1.7	0.32	0.0E+00	1.8E+00	PM2.5	0.26	0.06	0.0E+00	2.7E-01
4	Slag	Active	Primary Control Area	66,700	1.0	47	53	26	29,861	86	PM10	6.3	3.45	2.7E+02	3.0E+01	PM2.5	0.95	0.52	4.0E+01	4.6E+00
		Inactive		66,700	1.0	47	53	26	29,861	25	PM10	1.7	0.93	2.1E+01	2.3E+00	PM2.5	0.26	0.14	3.1E+00	3.5E-01
5A	Slag	Active	Primary Control Area	4,914	0.2	50	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		4,914	0.2	50	0	0	0	2	PM10	1.7	0.00	3.4E-01	-3.4E-01	PM2.5	0.26	0.00	5.1E-02	-5.1E-02
5B	Demolition Concrete	Active	Primary Control Area	3,888	0.3	50	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		3,888	0.3	50	0	0	0	2	PM10	1.7	0.00	5.1E-01	-5.1E-01	PM2.5	0.26	0.00	7.7E-02	-7.7E-02
6	Hi-Ratio Slag	Active	Primary Control Area	3,780	0.3	0	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		3,780	0.3	0	0	0	0	2	PM10	1.7	0.00	0.0E+00	0.0E+00	PM2.5	0.26	0.00	0.0E+00	0.0E+00
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D110 Polishing Compound Contaminated Equipment & Cleaning	Active	Primary Control Area	1,755	0.3	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		1,755	0.3	100	0	0	0	2	PM10	1.7	0.00	9.2E-01	-9.2E-01	PM2.5	0.26	0.00	1.4E-01	-1.4E-01
8	Baghouse Dust	Active	Primary Control Area	17,560	0.9	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		17,560	0.9	100	0	0	0	2	PM10	1.7	0.00	3.2E+00	-3.2E+00	PM2.5	0.26	0.00	4.8E-01	-4.8E-01
9	Baghouse Dust Mixed with Slag	Active	Primary Control Area	7,830	0.4	50	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		7,830	0.4	50	0	0	0	2	PM10	1.7	0.00	7.5E-01	-7.5E-01	PM2.5	0.26	0.00	1.1E-01	-1.1E-01
SC	On-Site Soil Consolidation	Active	Primary Control Area	1,871	0.50	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		1,871	0.50	100	0	0	0	2	PM10	1.7	0.00	1.7E+00	-1.7E+00	PM2.5	0.26	0.00	2.6E-01	-2.6E-01
CVR1	Cover for moved pile areas	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	105	PM10	6.3	1.58	1.7E+02	0.0E+00	PM2.5	0.95	0.24	2.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	30	PM10	1.7	0.43	1.3E+01	0.0E+00	PM2.5	0.26	0.06	1.9E+00	0.0E+00
EB2	Cover Soil	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
EB4	Various Stone	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
EB6	Clay	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
DP1	Staging Area Dry Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	0	100	0	500	105	PM10	6.3	0.63	0.0E+00	6.6E+01	PM2.5	0.95	0.10	0.0E+00	1.0E+01
		Inactive		500	0.1	0	100	0	500	42	PM10	1.7	0.17	0.0E+00	7.1E+00	PM2.5	0.26	0.03	0.0E+00	1.1E+00
DP2	Crusher Dry Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	0	100	100	500	105	PM10	6.3	0.63	0.0E+00	6.6E+01	PM2.5	0.95	0.10	0.0E+00	1.0E+01
		Inactive		500	0.1	0	100	100	500	42	PM10	1.7	0.17	0.0E+00	7.1E+00	PM2.5	0.26	0.03	0.0E+00	1.1E+00

Total Tons of Piles

Primary Control Area	130,688	36,583
Staging Area	1,000	1,000

	1st Year PM10 (lbs/yr)	2nd Year PM10 (lbs/yr)
Primary Control Area	297	48
Staging Area	0	147
EB Staging Area	504	0

	1st Year PM2.5 (lbs/yr)	2nd Year PM2.5 (lbs/yr)
Primary Control Area	45.0	7.0
Staging Area	0	22.2
EB Staging Area	76.3	0

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days.

	Max Active Day Total Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM10 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM10 (lbs/day)
Primary Control Area	4.07	0.93	3.45	0.62
Staging Area	0.74	0.17	0.63	0.11
EB Staging Area	1.86	0.43	1.58	0.28

	Max Active Day Total Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM2.5 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM2.5 (lbs/day)
Primary Control Area	0.62	0.14	0.52	0.094
Staging Area	0.11	0.026	0.10	0.017
EB Staging Area	0.28	0.064	0.24	0.043

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 13, Table 1 (page 770) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle

1) loading of aggregate onto storage piles (batch or continuous drop operations),

2) equipment traffic in storage areas,

3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day, the remainder of the day wind erosion of the pile occurs.

Max Active Day is a weekday with one "worst case" pile is active for 8 hours and inactive fo 16 hours for each area. Max Inactive Day is a weekend with one "worst case" pile is inactive for 24 hours.

PM2.5 emissions are based on a ratio of the PM10 to PM2.5 emission factors for the drop emission factors in the Material Handling spreadsheet, also found in AP-42 Chapters 13.2.4 and 13.2.5.

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Off-Site Disposal of 50% of Slag

Table N-44

Heavy Equipment Operation

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling on the material. Some of these emissions estimates are double counted when the equipment is working with a pile.

Emission Factor Equations

Loader & Dozer Equation

$$PM10\ lbs/hr = 0.75\ (1.0(s)^{1.5}) / (M)^{1.4}$$

$$PM2.5\ lbs/hr = 0.105\ (5.7(s)^{1.2}) / (M)^{1.3}$$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 October 1998

Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Based on (hours/year)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emissions (lb/day)
1st Year								
Loader	8	1,200	25.28	14.69		PM10	2.21	17.7
						PM2.5	0.88	7.0
Dozer	8	1,200	25.28	14.69		PM10	2.21	17.7
						PM2.5	0.88	7.0
Excavator	4	91	25.28	14.69		PM10	2.21	8.9
						PM2.5	0.88	3.5
2nd Year								
Loader	8	840	25.28	14.69		PM10	2.21	17.7
						PM2.5	0.88	7.0
Dozer	8	840	25.28	14.69		PM10	2.21	17.7
						PM2.5	0.88	7.0
Excavator			25.28	14.69		PM10		
						PM2.5		

1st Year	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	97	97	3
EB Area	33	33	20
EB Staging Area	21	21	
Staging Area			

	8 Hr Day PM10 (lbs/day)	1st Year PM10 (lbs/year)	2nd Year PM10 (lbs/year)
Primary Controlled Area	44.3	3,452	1,861
EB Area	44.3	1,336	0
EB Staging Area	35.4	756	0
Staging Area	35.4	0	1,861

2nd Year	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	53	53	
EB Area			
EB Staging Area			
Staging Area	53	53	

	PM2.5 (lbs/day)	PM2.5 (lbs/year)	PM2.5 (lbs/year)
Primary Controlled Area	17.5	1,367	737
EB Area	17.5	529	0
EB Staging Area	14.0	299	0
Staging Area	14.0	0	737

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining.

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Table N-45
Unpaved Roadways - Access Road

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated **DOES** include particulate emissions from the engines.

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated November, 2006

Equation (1a), $E = k(s/12)^a (W/3)^b$

Given Variables for Estimating Emissions

1.5 **k** = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
0.15 **k** = base emission factor for pounds of PM-2.5 particulate per vehicle mile traveled
6.00 **s** = road surface silt loading (silt content Iron and Steel Production)
32 **W** = average weight (tons) of vehicle traveling road
0.9 **a** = per Table 13.2.2-2. Constants for Equations 1a and 1b
0.45 **b** = per Table 13.2.2-2. Constants for Equations 1a and 1b
80% Percent of control, based on Fig. 13.2.2-5 for <10um, one month re-application, 0.18 gal/yd^2 petroleum resin

Roadway Type	Pollutant	Trip Length In and Out (feet)	Truck Trips per Day	Truck Trips per Project	Daily Vehicle Miles Traveled (miles/day)	1st Year Vehicle Miles Traveled (miles/project)	2nd Year Vehicle Miles Traveled (miles/project)	Uncontrolled E Emission Factor Equation 1a	Controlled E Emission Factor Equation 1a	Controlled Emissions Individual Daily (pounds)	Controlled Emissions Actual Max Daily (pounds)	Controlled Emissions 1st Year Annual (pounds)	Controlled Emissions 2nd Year Annual (pounds)
On Site Material Excavation	PM10	2,000	24	66	9.09	25.0		2.33	0.47	4.24	*4.24*	106	
Cover & Engineered Barrier Material Transport	PM10	2,400	31	2,568	13.9	1,167		2.33	0.47	6.48	*6.48*	7,563	
Off Site Material Removal (cover)	PM10	2,400	24	242	10.9		110	2.33	0.47	5.09	5.09		51.3
Off Site Material Removal (staging area)	PM10	2,200	24	941	10.0		392	2.33	0.47	4.66	4.66		183
Dust Control Truck (1st Year)	PM10	2,300	1	105	0.44	45.7		2.33	0.47	0.20	*0.20*	9.29	
Dust Control Truck (2nd Year)	PM10	2,300	1	150	0.44		65.3	2.33	0.47	0.20	0.20		30.5
On Site Material Excavation (cover)	PM2.5	2,000	24	66	9.09	25.0		0.23	0.047	0.42	*0.42*	11	
Cover & Engineered Barrier Material Transport	PM2.5	2,400	31	2,568	13.9	1,167		0.23	0.047	0.65	*0.65*	756	
Off Site Material Removal (cover)	PM2.5	2,400	24	242	10.9		110	0.23	0.047	0.51	0.51		5.1
Off Site Material Removal (staging area)	PM2.5	2,200	24	941	10.0		392	0.23	0.047	0.47	0.47		18
Dust Control Truck (1st Year)	PM2.5	2,300	1	105	0.44	45.7		0.23	0.047	0.020	*0.020*	0.93	
Dust Control Truck (2nd Year)	PM2.5	2,300	1	150	0.44		65.3	0.23	0.047	0.020	0.020		3.0

TOTALS	Daily (pounds)	1st year Year (pounds)	2nd Year Year (pounds)
PM10	10.9	7,679	264
PM2.5	1.09	768	26.4

"Daily" is a maximum sum of 1st and 2nd Year daily estimates

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Off-Site Disposal of 50% of Slag

Table N-46
Paved Roadway Emissions

Predictive Emission Factor Equation from AP-42 5th Edition Chapter Section 13.2.1 Paved Roads, November 2006

Annual	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C]/453.592
Daily	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 - P/(4N))/453.592
Hourly	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 -1.2 P/N)/453.592

E =	particulate emission factor (pounds/mile traveled)	
k =	particulate size multiplier for particulate size range	
sL =	sL = road surface silt loading (grams per square meter for Iron & Steel Production))	
W =	average weight (tons) of the vehicles traveling the road	
C =	emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear	
P =	119	(number of wet days with at least 0.01" of precipitation)
N =	365	(number of days in the averaging period)
453.592	Conversion factor (1 pound = 453.592 grams)	

Truck Weight

Average Weight 32 tons

Roadway Types	% of Miles
Roadway with <500 vehicles/day	100%

Work Months

0 Winter Months (total of 5 per year)
5 Non-Winter Months (total of 7 per year)

Mileage Estimates

On Site Material Excavation (cover)	1,650	Trip Length (feet) one way
Cover & Engineered Barrier Material Transport	1,650	Trip Length (feet) one way
Soil Material for Relocated Pile Areas	1,650	Trip Length (feet) one way
Off Site Material Removal (cover)	1,650	Trip Length (feet) one way
Dust Control Truck	1,650	Trip Length (feet) one way

Total Number of Trucks

	66	trucks/project	24 trucks/day
	2,568	trucks/project	31 trucks/day
	242	trucks/project	24 trucks/day
1st Year	150	trucks/project	1 trucks/day
2nd Year	105	trucks/project	

Roadway Type	sL Silt Loading Year (g/m^2)	W Average Vehicle Weight (tons)	Number of Miles Per Roadway Type Day	Project	Pollutant	k Base Multiplier (g/VMT)	C Wear & Tear Factor (g/VMT)	E Emission Factor Day Non-Winter (lbs/mile trvld)	Year Non-Winter Months (lbs/mile trvld)	Emissions Day Non-Winter (lb/day)	1st Year Non-Winter (lb/yr)	2nd Year Non-Winter (lb/yr)
On Site Material Excavation (cover)												
Roadway with <500 vehicles/day	5.8200	31.97	15	41	PM10	7.3	0.2119	1.0E+00	1.1E+00	*15.4*		46.22
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.7E-01	*2.32*		6.95
Cover & Engineered Barrier Material Transport												
Roadway with <500 vehicles/day	5.82	32	19.11	1,605	PM10	7.3	0.2119	1.03	1.1E+00	19.7	1.8E+03	
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.7E-01	2.96	2.7E+02	
Off Site Material Removal (cover)												
Roadway with <500 vehicles/day	5.82	32	15	151	PM10	7.3	0.2119	1.0E+00	1.1E+00	*15.4*		169.49
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.7E-01	*2.32*		25.50
Dust Control Truck												
Roadway with <500 vehicles/day	5.82	32	1	94	PM10	7.3	0.2119	1.0E+00	1.1E+00	0.64	1.1E+02	
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.7E-01	0.10	1.6E+01	
Roadway with <500 vehicles/day	5.82	32	1	66	PM10	7.3	0.2119	1.0E+00	1.1E+00	*0.64*		73.53
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.7E-01	*0.10*		11.06
								Totals	PM10	31.5	1,903	289
									PM2.5	4.74	286	43.5

"Daily" is a maximum sum of 1st and 2nd Year daily estimates

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Off-Site Disposal of 50% of Slag

Table N-47
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area	Year of Operations	Total Calendar Days (day/year)	Exposed Ground Area (sq ft)	Exposed Ground Area (acre)	Particulate Size	Emission Factor (ton/acre/year)	Emission Estimates: Daily (lbs/day)	Year 1 (lbs/year)	Year 2 (lbs/year)	Total Project (lbs/project)
Exposed Ground Areas	Primary Control Area	1st year	210	310,687	7.13	TSP	0.38	14.85	3,119		3,119
Exposed Ground Areas	EB Area	2nd Year	147	242,224	7.13	TSP	0.38	14.85		2,182	2,182
Exposed Ground Areas	Staging Area	2nd Year	147	21,780	0.5	TSP	0.38	1.0		153	153

		Aerodynamic Particle Size Multiplier	Daily 24 hour (lbs/day)	Daily 8 Hour (lbs/day)	Daily 16 hour (lbs/day)	Annual 1st year (lbs/year)	Annual 2nd year (lbs/year)
Primary Control Area	PM30	0.74	10.99	3.66	7.33	2,308	
	PM10*	0.35	5.20	1.73	3.47	1,092	
	PM2.5*	0.053	0.79	0.26	0.52	165	
EB Area	PM30	0.74	10.99	3.66	7.32		1,615
	PM10*	0.35	5.20	1.73	3.46		764
	PM2.5*	0.053	0.79	0.26	0.52		116
Staging Area	PM30	0.74	0.77	0.26	0.51		113
	PM10*	0.35	0.36	0.12	0.24		53.6
	PM2.5*	0.053	5.5E-02	0.018	0.037		8.11

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges or the surface is covered by rock, all disturbed areas are subject to wind erosion. This emission estimate assumes that the area will be become vegetated or will be covered with rock at the end of the second year. It is assumed that the project will start in

*The PM10 and PM2.5 emission factor has been adjusted from the PM30 emission factor, Table 11.9-4 refers to Section 13.2.5 (then to Section 13.2.4) which presents a distribution of particle sizes that are comparable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
silt range of 5.1 - 21 with a mean of 15
moisture range of 2.8 - 20 with a mean of 6.9
Physical properties of the sand/gravel:
silt range of 1.2 - 4.2 with a mean of 2.16 (site specific data)
sand moisture content, a mean of 7.4 (AP-42 Table 13.2.4-1)

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Off-Site Disposal of 50% of Slag

Table N-48
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the piles.

Loader

145 Estimated HP
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
8 Hours per Day
97 Days/Year in Primary Control Area
33 Days/Year in EB Area
na Days/Year in Staging Area
21 Days/Year in EB Staging Area
1200 Hours per Year, Total

2nd Year: 105 days
8 Hours per Day
105 Days per Year
53 Days/Year in Primary Control Area
53 Days/Year in Staging Area
840 Hours per Year, Total

Dozer

132 Estimated HP
7.08 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
8 Hours per Day
97 Days/Year in Primary Control Area
33 Days/Year in EB Area
na Days/Year in Staging Area
21 Days/Year in EB Staging Area
1200 Hours per Year, Total

2nd Year: 105 days
8 Hours per Day
105 Days per Year
53 Days/Year in Primary Control Area
53 Days/Year in Staging Area
840 Hours per Year, Total

Excavator

145 Estimated HP
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
4 Hours per Day
3 Days/Year in Primary Control Area
20 Days/Year in EB Area
0 Days/Year in Staging Area
0 Days/Year in EB Staging Area
91 Hours per Year, Total

Pollutant	Area	Emission Factor Units	Loader Emission Factor	Loader Daily (lbs/day)	Loader 1st Year (lbs/year)	Loader 2nd Year (lbs/year)	Dozer Emission Factor	Dozer Daily (lbs/day)	Dozer 1st Year (lbs/year)	Dozer 2nd Year (lbs/year)	Excavator Emission Factor	Excavator Daily (lbs/day)	Excavator 1st Year (lbs/year)	Excavator 2nd Year (lbs/year)	Totals Daily (lbs/day)	Totals 1st Year (lbs/year)	Totals 2nd Year (lbs/year)
PM	Primary Control Area	g/hp-hr	0.400	1.023	98.9	53.7	0.400	0.931	90.1	48.9	0.400	0.511	1.41		2.47	190	103
	EB Area	g/hp-hr	0.400	1.023	33.5		0.400	0.931	30.5		0.400	0.511	10.2		2.47	74.1	
	Staging Area	g/hp-hr	0.400	1.023		53.7	0.400	0.931		48.9					1.95		103
	EB Staging Area	g/hp-hr	0.400	1.023	21.8		0.400	0.931	19.9						1.95	41.7	
NOx	Primary Control Area	g/hp-hr	4.50	5.8	556	302	4.50	10.48	1,013	550	4.50	5.75	15.8		22.0	1,585	852
	EB Area	g/hp-hr	4.50	5.8	188		4.50	10.48	343		4.50	5.75	115		22.0	646	
	Staging Area	g/hp-hr	4.50	5.8		302	4.50	10.48		550					16.2		852
	EB Staging Area	g/hp-hr	4.50	5.8	123		4.50	10.48	223						16.2	346	
SOx	Primary Control Area	lb/1,000 gals	0.213	0.013	1.25	0.68	0.213	0.012	1.166	0.63	0.213	0.27	0.7		0.30	3.17	1.31
	EB Area	lb/1,000 gals	0.213	0.013	0.424		0.213	0.012	0.394		0.213	0.27	5.4		0.30	6.27	
	Staging Area	lb/1,000 gals	0.213	0.013		0.68	0.213	0.012		0.63					0.025		1.31
	EB Staging Area	lb/1,000 gals	0.213	0.013	0.277		0.213	0.012	0.257						0.025	0.53	

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, excavator is a Caterpillar 22B with a 145 HP engine, and the dozer is a Caterpillar D5H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition, dated February 13, 1998, revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

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Off-Site Disposal of 50% of Slag

Table N-49
On-Road Engine Emissions
EPA Model MOBILE 6.2

EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes. The emissions estimates are the engine exhaust emissions. The emissions below are for two classes of heavy duty diesel vehicles.

Maximum Miles per Day	
HDDV8A Miles per Day	52.2
HDDV8B Miles per Day	52.2
Miles per 1st Year	
HDDV8A Miles per Year	1,525
HDDV8B Miles per Year	1,525
Miles per 2nd Year	
HDDV8A Miles per Year	359
HDDV8B Miles per Year	359
Idling	
Total hours of idling on site per day	1
1st Year - Total hours of idling on site	150
2nd Year - Total hours of idling on site	105

Engineered Barrier and Drainage Material	
Trucks per day	40
Trucks for 1st Year	2,568
Trucks for 2nd Year	0
Miles per truck	1.08

On Site Material Excavation (cover)	
Trucks per day	24
Trucks for 1st Year	33
Trucks for 2nd Year	33
Miles per truck	1.00

Off Site Material Removal (cover)	
Trucks per day	24
Trucks for 1st Year	121
Trucks for 2nd Year	121
Miles per truck	1.08

Off Site Material Removal (staging area)	
Trucks per day	24
Trucks for 1st Year	0
Trucks for 2nd Year	941
Miles per truck	0.42

Dust Control Truck	
Trucks per day	1
Trucks for 1st Year	105
Trucks for 2nd Year	150
Miles per truck	1.08

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)					HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)				
		grams/mile	grams/hour	pounds/day	1st Year pounds/year	2nd Year pounds/year	grams/mile	grams/hour	pounds/day	1st Year pounds/year	2nd Year pounds/year
PM10/PM2.5	10 mph average	0.254	NA	0.0292	0.85	0.20	0.25	NA	0.0290	0.85	0.20
	Idling	NA	1.0040	0.0022	0.33	0.23	NA	1.0040	0.0022	0.33	0.23
				0.0314	1.18	0.43			0.0312	1.18	0.43
SO2	10 mph average	0.0144	NA	1.7E-03	0.05	0.01	0.015	NA	1.7E-03	0.05	0.01
NOx	10 mph average	12.3	NA	1.412	41.3	9.7	13.9	NA	1.603	46.8	11.0

	PM10/PM2.5			SO2			NOx		
	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year
Primary Control Area (see below)	0.0104	0.59	0.22	5.7E-04	2.5E-02	5.8E-03	0.503	22.02	5.18
EB Staging Area (see below)	0.0104	0.59		5.7E-04	2.5E-02		0.503	22.02	
Staging Area (see below)	0.0104		0.22	5.7E-04		5.8E-03	0.503		5.18
Roadways (50%)	0.0313	1.18	0.43	1.7E-03	5.0E-02	1.2E-02	1.508	44.0	10.4

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less, it has been assumed that PM2.5 = PM10. The emissions for non-roadway emissions are equally divided among each area.

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Off-Site Disposal of 50% of Slag

Table N-50
Material Handling - Crushing Emissions

Emission factor used to estimate emissions is for secondary crushing/screening (no factors for primary crushing are available). The emission estimate assumes wet suppression technology utilized to control emissions. It also assumes that half of each pile is crushed in the first year of operations and the other half in the next year.

Maxiumum amount of material that can be crushed in one hour	300 ton/hour	
Operating hours per day of operations	2 hours/day	
Amount of material that can be crushed in one day	600 ton/day	8 hour/day, Daily rail car capacities = 245 tons per day
Days per year of operation	25 days/year	

Parcel Number	Material Type	Material Amounts (tons/hour)	Material Amounts (tons/day)	Material Amounts (tons/project)	Percentage To be Crushed (%)	Days Needed to Crush (days)	Crushed Material Amounts (tons/project)	Particulate Size	Uncontrolled Particulate Size Multiplier (lb/ton)	Controlled Particulate Size Multiplier (lb/ton)	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions Maximum (tons/year)	Controlled Emissions Maximum (tons/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
1	Excavated Soil Mixed with Slag	300	600	24,300	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
2	Excavated Soil from D111	300	600	1,418	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
3	Canal Slag (In & Out of	300	600	6,683	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
4	Slag	300	600	56,700	26	25	14,940	PM10	8.70E-03	7.40E-04	5.22	0.44	0.065	0.006	0.065	0.006
								PM2.5		5.00E-05		0.03		3.7E-04		3.7E-04
5A	Slag	300	600	4,914	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
5B	Demolition Concrete	300	600	3,888	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
6	Hi-Ratio Slag	300	600	3,780	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
9	Baghouse Dust Mixed with Slag	300	600	7,830	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
CVR1	Cover for moved pile areas	300	600	6,862	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
DP1	Staging Area Day Pile	300	600	36,563	0			Double counting								
DP2	Crusher Day Pile	300	600	14,940	100			Double counting								

	Total Days (days)	Total Material Crushed (tons)
Project	25	14,940
2nd Year	25	14,940

	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions 2nd Year (tons/year)	Controlled Emissions 2nd Year (lbs/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
PM10 =	5.220	0.444	0.065	11.1	0.065	0.006
PM2.5 =		3.0E-02		0.75		3.7E-04

Emission factors are from EPA's Factor Information Retrieval (FIRE) Data System 6.25. SCC for the crushing process is 3-05-020-02.

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Off-Site Disposal of 50% of Slag

Table N-51
Crusher - Engine Emissions
Internal Combustion Engine, <600 HP

These emission factors estimate particulate emissions from the engine. Particulate emissions from the crushing of material are not included; those emissions are addressed in Table 11.

Potential Operating Hours (or permitted hours)	8,760	
Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Gallons per Hour	15.3	estimated
Fuel Input in MMBtu per Hour	2.100	estimated
BHP Rating	300	
Operating Hours		
Per Day	2	(See Table 11)
Days per Year	25	(See Table 11)
Per Year (5 months)	50	
Actual Fuel Usage (gals/year)	763	
Sulfur percentage content in fuel	0.0015	%, (15ppm)

Pollutant	CAS#	Emission Factor Source	Emission Factor (lbs/MMBtu)	Actual Emissions (lb/hr)	Actual Emissions (lb/day)	Actual Emissions (lb/yr)	Actual Emissions 2nd Year (ton/yr)	Potential Emissions (lb/hr)	Potential Emissions 2nd Year (ton/yr)
PM	na	1	0.31	0.651	1.30	32.4	0.016	0.651	2.85
PM10	na	1	0.31	0.651	1.30	32.4	0.016	0.651	2.85
PM2.5	na	1	0.31	0.651	1.30	32.4	0.016	0.651	2.85
SOx	na	1	1.52E-03	3.18E-03	6.36E-03	0.16	7.92E-05	3.18E-03	1.39E-02
NOx	na	1	4.41	9.261	18.5	461	0.23	9.261	40.6

Footnotes:
1 Emission factors are from EPA's AP-42 Table 3.3-1 dated November, 1996. The SCCs for this source are 2-02-001-01 for industrial size equipment and 2-03-001-01 for commercial/institutional size equipment. SOx emission factor is based on sulfur content and AP-42 Table 3.4-1.

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Off-Site Disposal of 50% of Slag

Table N-52
Locomotive - Diesel Powered

Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Fuel Input in MMBtu per Hour	7.000 estimated	Assumes that the locomotive operates only under "switch duty-cycle" as defined by the EPA.
Maximum hourly fuel use (gal/hr)	51 estimated	
BHP Rating	1000	
Operating Hours		
Hours per Day	1	
Hours per Year (5 months)	29	
Sulfur percentage content in fuel	0.0015 %, (15ppm)	

Pollutant	CAS#	Emission Factor Source	Emission Factors		Actual Emissions (lb/day)	2nd Year (lb/yr)	2nd Year (ton/yr)
PM	na	1	0.54	g/bhp-hr	1.19	35	0.017
PM10	na	1	0.54	g/bhp-hr	1.19	35	0.017
PM2.5	na	1	0.54	g/bhp-hr	1.19	35	0.017
SOx	na	2	1.52E-03	lbs/MMBtu	1.1E-02	0.31	1.6E-04
NOx	na	1	11.00	g/bhp-hr	24.3	712	0.36

Emission factors are based on Tier I EPA emission limits for engines that were manufactured from 2000 to 2004. This assumes that if the engine was older than 2000 it would have been rebuilt and is required to comply with modern emission standards. The emission limits were published in the EPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines - Locomotives. Emissions include idling time and assumes that PM=PM10. The SOx emissions are based on sulfur content of the fuel and AP-42 Table 3.4-1.

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Off-Site Disposal of 50% of Slag

Table N-53
Emissions Summary

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	PM-10 Emissions					PM-10 Emissions					PM-10 Emissions					PM-10 Emissions					PM-10 Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	1st Year lbs/year	2nd Year lbs/year
Material Handling (Table 3)	4.16			2.57	435	8.2			527	0.E+00						1.02			0.E+00	107				
Active/Inactive Piles (Table 4)	3.45	0.62	0.93	297	46						1.58	0.28	0.43	504	0.E+00	0.83	0.11	0.17	0.E+00	147				
Heavy Equipment (Table 5)	44.3			3,452	1,861	x			1,336	0.E+00	x			756	0.E+00	x			0.E+00	1861				
Unpaved Roadways (Table 6)																					10.9		7,679	264
Paved Roadways (Table 7)																					31.6		1,903	289
Exposed Ground Area (Table 8)	1.73	3.47	5.20	1,092	0.E+00	1.73	3.46	5.20	0.E+00	764						0.12	0.24	0.36	0.E+00	54				
Off-Road Engines (Table 9)	2.47			190	103	2.47			74.1	0.E+00	1.95			41.7	0.E+00	1.95			0.E+00	103				
On-Road Engines (Table 10)	0.0104			0.59	0.22						0.0104			0.59	0.E+00	0.0104			0.E+00	0.22	0.0313		1.16	0.43
Material Handling Crusher (Table 11)																0.44				11.1				
Crusher - Engine (Table 12)																1.30				32.4				
Train (Table 13)																1.19				35				
TOTAL	56.1	4.09	6.13	5,034	2,445	12.4	3.46	5.20	1,937	764	3.54	0.28	0.43	1,302	0	6.7	0.36	0.53	0	2,349	42.5		9,583	554

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	1st Year lbs/year	2nd Year lbs/year
Material Handling (Table 3)	0.63			0.39	66	1.26			80	0.E+00						0.15			0.E+00	16.2				
Active/Inactive Piles (Table 4)	0.52	0.094	0.14	45.0	7.0						0.24	0.043	0.064	76.3	0.E+00	0.10	0.017	0.026	0.E+00	22.2				
Heavy Equipment (Table 5)	17.5			1367	737	x			529	0.E+00	x			299.6	0.E+00	x			0.E+00	737				
Unpaved Roadways (Table 6)																					1.09		768	26.4
Paved Roadways (Table 7)																					4.74		286	43.5
Exposed Ground Area (Table 8)	0.26	0.52	0.79	165	0.E+00	0.26	0.52	0.79	0.E+00	116						0.018	0.037	0.055	0.E+00	8.11				
Off-Road Engines (Table 9)	2.47			190	103	2.47			74.1	0.E+00	1.95			41.7	0.E+00	1.95			0.E+00	103				
On-Road Engines (Table 10)	0.0104			0.59	0.22						0.0104			0.59	0.E+00	0.0104			0.E+00	0.22	0.0313		1.16	0.43
Material Handling Crusher (Table 11)																0.030				0.75				
Crusher - Engine (Table 12)																1.30				32.4				
Train (Table 13)																1.19				35				
TOTAL	21.4	0.62	0.93	1,769	913	3.97	0.52	0.79	683	116	2.20	0.043	0.064	418	0	4.8	0.054	0.08	0	955	5.86		1,065	70

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	SOx Emissions					SOx Emissions					SOx Emissions					SOx Emissions					SOx Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	1st Year lbs/year	2nd Year lbs/year
Off-Road Engines (Table 9)	0.30			3.2	1.31	0.30			6	0.E+00	0.026			0.534	0.E+00	0.03			0.E+00	1.31				
On-Road Engines (Table 10)	5.7E-04			2.5E-02	5.6E-03						5.7E-04			2.5E-02	0E+00	5.7E-04			0.E+00	5.6E-03	1.7E-03		5.0E-02	1.2E-02
Material Handling Crusher (Table 11)																6.4E-03				0.16				
Crusher - Engine (Table 12)																1.1E-02				0.31				
Train (Table 13)																0.0426			0.E+00	1.79	1.7E-03		5.0E-02	0.0117
TOTAL	0.30			3.2	1.32	0.30			6	0.E+00	0.026			0.559	0.E+00									

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	NOx Emissions					NOx Emissions					NOx Emissions					NOx Emissions					NOx Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	1st Year lbs/year	2nd Year lbs/year
Off-Road Engines (Table 9)	22.0			1,585	852	21.98			845.9	0.E+00	16.23			346	0.E+00	16.2			0.E+00	852				
On-Road Engines (Table 10)	0.503			22.02	5.18						0.503			22.02	0.E+00	0.503			0.E+00	5.18	1.508		44.0	10.4
Material Handling Crusher (Table 11)																18.5				461				
Crusher - Engine (Table 12)																24.3				712				
Train (Table 13)																59.5			0.E+00	2,031	1.508		44.0	10.4
TOTAL	22.5			1,607	857	21.98			846	0.E+00	16.7			368	0.E+00									

The Material Handling daily emissions assume the activity only happens in the Primary Controlled Area, which is conservative because that the daily emissions are much greater for Material Handling in the Primary Controlled Area than the other areas. The "worse-case" day for the Heavy Equipment (including Off-Road Engines) happens when operating at the Engineered Barrier Area due to the use of an excavator in this area only. Although the activities for "worse-case" day at the Primary Controlled Area and the Engineered Barrier can not happen on the same day, to be conservative simultaneous operation has been assumed for the daily emission estimates. The "X" that appears is to avoid double counting of identical activities that can not occur at the same time in different areas.

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Off Site Disposal of All Materials Except Slag
Table N-54a
Air Emission Details - Materials and Travel Distances

Common Truck Assumptions			
Yards per Load	(cubic yards)	20	Given
Average Number of Wheels per Truck (10 unloaded, 14 loaded)	(wheels)	12	Given
Weight per Empty Truck	(tons)	15	Given
Average Weight of All Trucks	(tons)	31	Weighted Average Weight (material trucks and barrier/drainage trucks)
Engineered Barrier and Drainage Material			
Cover Soil, Total	(cubic yards)	16,368	CAD-based Estimate
Various Stone	(cubic yards)	14,542	CAD-based Estimate
Clay	(cubic yards)	20,452	CAD-based Estimate
Engineered Barrier/Drainage Material Total	(cubic yards)	51,363	
Amount of Cover Soil	(tons)	23,202	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Various Stone	(tons)	26,504	Cubic Yards x Pounds per Cubic Yard / 2,000
Amount of Clay	(tons)	34,512	Cubic Yards x Pounds per Cubic Yard / 2,000
Engineered Barrier/Drainage Material Total	(tons)	84,218	
Number of Trucks Trips - Cover Soil	(truck trips)	818	Material Needed / Yards per Load
Number of Trucks Trips - Stone	(truck trips)	727	Material Needed / Yards per Load
Number of Trucks Trips - Clay	(truck trips)	1,023	Material Needed / Yards per Load
Cubic Yards of Engineered Barrier Material Delivered	(cubic yards)	51,363	Number of Trucks x Yards per Load
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Various Stone - Density	(pounds/cubic foot)	135	From Table 2
Various Stone - Density	(pounds/cubic yard)	3,645	Pounds per Cubic Foot x 27
Clay - Density	(pounds/cubic foot)	125	From Table 2
Clay - Density	(pounds/cubic yard)	3,375	Pounds per Cubic Foot x 27
Soil Material Loaded per Truck	(tons)	28	Yards per Load x Pounds per Cubic Yard
Soil Weight per Loaded Truck	(tons)	43	Load per Truck + Weight of Empty Truck
Average Weight of a Soil Material Truck	(tons)	29	Average of Empty Truck and Loaded Truck
Stone Material Loaded per Truck	(tons)	36	Yards per Load x Pounds per Cubic Yard
Stone Weight per Loaded Truck	(tons)	51	Load per Truck + Weight of Empty Truck
Average Weight of a Stone Material Truck	(tons)	33	Average of Empty Truck and Loaded Truck
Clay Material Loaded per Truck	(tons)	34	Yards per Load x Pounds per Cubic Yard
Clay Weight per Loaded Truck	(tons)	49	Load per Truck + Weight of Empty Truck
Average Weight of a Clay Material Truck	(tons)	32	Average of Empty Truck and Loaded Truck
Trucks per Project, All Engineered Barrier/Drainage Material	(trucks/project)	2,568	Assumes Engineered Barrier & Drainage Construction Operation = 120 Calendar Days (86 work days)
Trucks per Day, All Material	(trucks/day)	30.6	Trucks per Project / Time for Engineered Barrier/Final Grading (86 work days)
Soil Material for the Removed Pile Areas (Cover Non-EB Area)			
Cover Soil - Density	(pounds/cubic foot)	105	From Table 2
Cover Soil - Density	(pounds/cubic yard)	2,835	Pounds per Cubic Foot x 27
Non-EB Storage Yard Area	(square feet)	158,100	CAD-based Estimate
EB Area	(square feet)	179,987	CAD-based Estimate
Total Disturbed Area for EB	(square feet)	242,224	CAD-based Estimate
Total Storage Yard Area	(square feet)	310,887	CAD-based Estimate
Depth of Cover	(feet)	1	Given
Number of Yards of Topsoil Needed	(cubic yards)	4,841	Area x Depth / 27
Tons of Topsoil Needed	(tons)	6,862	Tons from Table 2
Number of Trucks	(trucks/project)	242	Cover Needed / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 Loads per Hour / 8 Hours Day
Yards per Day	(yards/day)	480	Yards per Load x Trucks per Day
Pounds per Cubic Foot	(pounds/cubic foot)	105	From Table 2
Ton per Project	(tons/project)	6,862	Pounds per Cubic Yard / Yards of Cover
Number of Days Needed	(days/project)	10	Number of Trucks / Yards per Load
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
On-Site Soil Excavation			
Yards per Load	(cubic yards/load)	20	Given
Material to be Moved (assume cover amounts same)	(cubic yards)	1,320	From Table 2
Material to be Moved (assume cover amounts same)	(tons)	1,871	From Table 2
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Number of Trucks from Piles to Staging Area/Crusher	(truck trips/project)	66	Cubic Yards / Yards per Load
Tons Material Loaded per Truck	(tons/truck)	28	Tons Material Moved / Number of Trucks
Weight per Loaded Truck	(tons)	43	Tons Material Moved + Ton per Empty Truck
Average Weight of a Material Truck	(tons)	29	Average of Empty Truck and Loaded Material Truck
Off-Site Material Removal (shipped to Train)			
Cubic Yards of Material to be Removed	(cubic yards)	37,720	From Table 2
Number of Truck Trips to Staging Area	(truck trips/project)	1,886	Cubic Yards / Yards per Load
Trucks per Day	(trucks/day)	24	Assume 3 loads per Hour / 8 Hours Day
Weight of Material Loaded per Truck	(tons)	31	Number of Truck Trips / Total Tons Material Removed
Weight per Loaded Truck	(tons)	46	Tons Material Loaded per Truck + Tons per Empty Truck
Average Weight of a Material Truck	(tons)	31	Average of an Empty Truck and a Loaded Material Truck
Number of Train Cars		651	Tons of Material Removed / Capacity per Train Car
Capacity per Train Car (tons)	(tons)	90	given
Total Tons of Material Removed	(tons)	58,612	Tons from Table 2
Train Cars per Year		326	Number of Train Cars / 2 (which represents the two 5 month periods)
Train Cars per Day (also Trucks to Staging Area)		3.1	Trains per Year / (Weeks per Year x Days per Week)
Tons Loaded per Day	(tons)	279	Capacity per Train Car x Train Cars per Day
Travel Distances			
On-Site Material Transport			
Length of UNPAVED Roadway - to Storage Area	(feet)	1,000	Weighted average length for various soil excavation areas
Length of PAVED Roadway	(feet)	1650	Trip Length for Cover Delivered
Cover & Engineered Barrier Material Transport			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Cover & Engineered Barrier Material
Length of PAVED Roadway	(feet)	1,650	Cover & Engineered Barrier Material
Soil Material for Relocated Pile Areas			
Length of UNPAVED Roadway - to paved roadway	(feet)	1,600	Soil Material for Relocated Piles Areas
Length of PAVED Roadway	(feet)	1,650	Soil Material for Relocated Piles Areas
Off-Site Material Removal			
Length of UNPAVED Roadway - storage area to staging area	(feet)	1,100	Trip Length for Material Removed
Length of UNPAVED Roadway - to paved roadway	(feet)	1,200	Trip Length for Cover Delivered
Length of PAVED Roadway	(feet)	1,650	Trip Length for Cover Delivered

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Off Site Disposal of All Materials Except Slag
Table N-54b
Air Emission Details - Scheduling

Project Operational Times

Working Hours

Off-Site Disposal (2nd Year)		
Days per Week	(days/week)	5
Weeks per Year	(weeks/year)	21
Hours per Day	(hours/day)	8
Total days per year	(calendar days)	147
	(work days)	105
On-Site Stabilization (1st Year)		
Days per Week	(days/week)	5
Weeks per Year	(weeks/year)	30
Hours per Day	(hours/day)	8
Total days per year	(calendar days)	210
	(work days)	150

Project Duration

Total Years	(years)	2
Total Months	(months)	12
Off-Site Disposal (2nd Year)		
Months each Year - Off-Site Disposal	(months/year)	5
Days to Remove Material from Storage Yard to Crusher/Train	(project work days)	105
Soil Cover for Removed Piles	(project work days)	105
On-Site Stabilization (1st Year)		
Months each Year - On-Site Stabilization	(months/year)	7
Time for Creating Consolidated Pile	(calendar days)	90
	(work days)	64
Time for On-Site Soil Consolidation	(work days)	3
Time for Engineered Barrier	(calendar days)	90
	(work days)	64
Final Grading for Drainage	(calendar days)	30
	(work days)	20
Soil Cover for Non-Engineered Barrier Area	(calendar days)	13
	(work days)	9

Equipment Daily/Annual Operating Rates

	Off-Site Disposal (2nd Year)			
Loader(s)	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	840	
Dozer	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	840	
Crusher	= Maximum Operating Hours per Day	(hours/day)	2	from Table 11
	= Operating Days per Year	(days/year)	10	from Table 11
Train	= Operating Hours per Day	(hours/day)	1	
	= Operating Hours per Year	(hours/year)	47	ratio of total material & material removed
	On-Site Stabilization (1st Year)			
Loader(s)	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	1200	
Dozer	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	8	
	= Operating Hours per Year	(hours/year)	1200	
Excavator	= Number of Equipment		1	
	= Maximum Operating Hours per Day	(hours/day)	4	
	= Operating Hours per Year	(hours/year)	91	
	Both Years			
Dust Control Truck	= *Maximum Trucks per Day*	(*truck/day*)	1	
	= Number of Trips per Month	(trucks/month)	22	
	= Number of Trips per Year - On-Site Stabilization	(trucks/year)	150	
	= Number of Trips per Year - Off-Site Disposal	(trucks/year)	105	

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Off Site Disposal of All Materials Except Slag

Table N-55
Material Description

Parcel #	Material Type	Volume (cubic yard)	Pile Size (acre)	Material Density (lbs/ft³)	Material Density (g/cm³)	Mass for Project (tons)	Percent of Pile To Be Moved to EB (%)	Percent of Pile To Be Removed (%)	Percent of Pile To be Crushed (%)	Silt * (%)	Moisture* (%)	AP-42 Material* Match	Area Type
1	Excavated Soil Mixed with Slag	15,000	0.9	120	1.9	24,300	0	100	0	9.0	12.0	Cover	Primary Control Area
2	Excavated Soil from D111	1,000	0.2	105	1.68	1,418	0	100	0	9.0	12.0	Cover	Primary Control Area
3	Canal Slag (In & Out of Supersacs)	3,000	0.2	165	2.6	6,683	100	0	0	5.3	0.92	Slag	Primary Control Area
4	Slag	30,000	1.0	140	2.2	56,700	50	0	0	5.3	0.92	Slag	Primary Control Area
5A	Slag	2,600	0.2	140	2.2	4,914	50	0	0	5.3	0.92	Slag	Primary Control Area
5B	Demolition Concrete	2,400	0.3	120	1.9	3,888	0	100	50	3.9	2.10	Limestone Products	Primary Control Area
6	Hi-Ratio Slag	2,000	0.3	140	2.2	3,780	0	0	0	5.3	0.92	Slag	Primary Control Area
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Cleaning	1,000	0.3	130	2.1	1,755	0	100	0	5.3	0.92	Slag	Primary Control Area
8	Baghouse Dust	13,000	0.9	100	1.6	17,550	0	100	0	13.0	7.0	Flue Dust	Primary Control Area
9	Baghouse Dust Mixed with Slag	4,000	0.4	145	2.3	7,830	0	100	50	5.3	0.92	Slag	Primary Control Area
SC	On-Site Soil Consolidation	1,320	0.5	105	1.7	1,871	0	100	0	9.0	12.00	Cover	Primary Control Area
CVR1	Cover for moved pile areas	4,841	0.25	105	1.7	6,862	100	100	0	9.0	12.00	Cover	EB Staging Area
EB2	Cover Soil	16,368	0.25	105	1.7	23,202	100	0	0	9.0	12.00	Cover	EB Staging Area
EB4	Various Stone	14,542	0.25	135	2.2	26,504	100	0	0	2.6	7.40	Sand	EB Staging Area
EB5	Clay	20,452	0.25	125	2.0	34,512	100	0	0	6.0	10.00	Clay	EB Staging Area
DP1	Staging Area Day Pile	37,720	0.1	115	1.84	58,612	0	100	0	15.8	9.2	Weighted Avg.	Staging Area
DP2	Crusher Day Pile	3,200	0.1	136	2.17	5,859	0	100	100	4.8	1.3	Weighted Avg.	Staging Area
Weighted Average				292	4.7					15.77	9.17		

Controlled Materials:
Total = 75,320 cubic yards
130,688 tons
Amount Removed = 37,720 cubic yards
(not including day piles) 58,612 tons
Amount Crushed = 3,200 cubic yards
(not including day piles) 5,859 tons

* Moisture and Silt percentages are from EPA's AP-42 Chapter 13.2.4, Table 13.2.4-1

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Off Site Disposal of All Materials Except Slag

Table N-56
Material Handling - "Drop Emissions"

$$E = k(0.0032) \times (U/5)^{1.3} / (M/2)^{1.4}$$

Emission factor equation from AP-42 5th Edition Section 13.2.4, November 2006

	Schedule Estimates	Work Days	
On-Site Stabilization, 2nd Year	On-Site Soil Consolidation	3	
	Moving Storage Yard Materials	64	(two drop points)
	Placement of Barrier	64	
	Soil Cover for Non-Engineered Area	9	
License Termination, 1st Year	Soil Cover for Moved Piles	105	
	Material Removal to Crusher/Train	105	
	Material Removal (train loading)	105	

The "drop emission" factor accounts for the batch dropping of material while loaded or unloaded. Although batch dropping occurs when material is loaded into piles, the drop emissions associated with each activity are included in the emission factor for those processes.

There are two drop points for each task - material removed to train, material directly to train, and cover material.

Material Type	Parcel#	Pile & Material Type	Task	Area Type (where emissions will occur)	Number of Working Days (days/project)	Material Amounts (tons/project)	Percent of Pile Moved (EB) (%)	Percent of Pile Removed (%)	Percent of Pile Crushed (%)	Material to be Handled (tons)	Material Amounts (tons/day)	Particulate Size	k Particulate Size Multiplier (dimensionless)	M Material Moisture Content (%)	U Mean Wind Speed (mph)	E Calculated Emission Factor (lb/ton)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)	Calculated Emissions (ton/project)
Loader Unloading	1	Excavated Soil Mixed with Slag	Material Removal to Crusher/Train	Primary Control Area	105	24,300	0	100	0	24,300	231	PM10	0.35	12	8.7	1.9E-04	4.3E-02		4.6E+00	4.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	6.6E-03		6.9E-01	6.9E-01
			Moving Storage Yard Materials	EB Area	64	24,300	0	100	0	24,300	380	PM10	0.35	12	8.7	1.9E-04	7.1E-02	4.6E+00		4.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	1.1E-02	6.9E-01		6.9E-01
Loader Unloading	2	Excavated Soil from O111	Material Removal to Crusher/Train	Primary Control Area	105	1,418	0	100	0	1,418	14	PM10	0.35	12	8.7	1.9E-04	2.6E-03		2.7E-01	2.7E-01
												PM2.5	0.053	12	8.7	2.8E-05	3.8E-04		4.0E-02	4.0E-02
			Moving Storage Yard Materials	EB Area	64	1,418	0	100	0	1,418	22	PM10	0.35	12	8.7	1.9E-04	4.1E-03	2.7E-01		2.7E-01
												PM2.5	0.053	12	8.7	2.8E-05	6.3E-04	4.0E-02		4.0E-02
Loader Unloading	3	Canal Slag (In & Out of	Material Removal to Crusher/Train	Primary Control Area	105	6,683	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	8.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	6,683	100	0	0	6,683	104	PM10	0.35	0.92	8.7	6.8E-03	7.1E-01	4.6E+01		4.6E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	1.1E-01	6.9E+00		6.9E+00
Loader Unloading	4	Slag	Material Removal to Crusher/Train	Primary Control Area	105	56,700	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	8.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	56,700	50	0	0	28,350	443	PM10	0.35	0.92	8.7	6.8E-03	3.0E+00	1.9E+02		1.9E+02
												PM2.5	0.053	0.92	8.7	1.0E-03	4.6E-01	2.9E+01		2.9E+01
Loader Unloading	5A	Slag	Material Removal to Crusher/Train	Primary Control Area	105	4,914	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.053	0.92	8.7	1.0E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	4,914	50	0	0	2,457	38	PM10	0.35	0.92	8.7	6.8E-03	2.6E-01	1.7E+01		1.7E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	4.0E-02	2.5E+00		2.5E+00
Loader Unloading	5B	Demolition Concrete	Material Removal to Crusher/Train	Primary Control Area	105	3,888	0	100	50	3,888	37	PM10	0.35	2.1	8.7	2.1E-03	8.0E-02		8.4E+00	8.4E+00
												PM2.5	0.053	2.1	8.7	3.3E-04	1.2E-02		1.3E+00	1.3E+00
			Moving Storage Yard Materials	EB Area	64	3,888	0	100	50	3,888	61	PM10	0.35	2.1	8.7	2.1E-03	1.3E-01	8.4E+00		8.4E+00
												PM2.5	0.053	2.1	8.7	3.3E-04	2.0E-02	1.3E+00		1.3E+00
Loader Unloading	6	Hi-Ratio Slag	Material Removal to Crusher/Train	Primary Control Area	105	3,780	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
												PM2.5	0.35	0.92	8.7	6.8E-03	0.0E+00		0.0E+00	0.0E+00
			Moving Storage Yard Materials	EB Area	64	3,780	0	0	0	0	0	PM10	0.35	0.92	8.7	6.8E-03	0.0E+00	0.0E+00		0.0E+00
												PM2.5	0.053	0.92	8.7	1.0E-03	0.0E+00	0.0E+00		0.0E+00
Loader Unloading	7	Hi-Ratio Slag & O111& D116	Material Removal to Crusher/Train	Primary Control Area	105	1,755	0	100	0	1,755	17	PM10	0.35	0.92	8.7	6.8E-03	1.1E-01		1.2E+01	1.2E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	1.7E-02		1.8E+00	1.8E+00
			Moving Storage Yard Materials	EB Area	64	1,755	0	100	0	1,755	27	PM10	0.35	0.92	8.7	6.8E-03	1.9E-01	1.2E+01		1.2E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	2.8E-02	1.8E+00		1.8E+00
Loader Unloading	8	Baghouse Dust	Material Removal to Crusher/Train	Primary Control Area	105	17,550	0	100	0	17,550	167	PM10	0.35	7	8.7	4.0E-04	6.7E-02		7.0E+00	7.0E+00
												PM2.5	0.053	7	8.7	6.0E-05	1.0E-02		1.1E+00	1.1E+00
			Moving Storage Yard Materials	EB Area	64	17,550	0	100	0	17,550	274	PM10	0.35	7	8.7	4.0E-04	1.1E-01	7.0E+00		7.0E+00
												PM2.5	0.053	7	8.7	6.0E-05	1.7E-02	1.1E+00		1.1E+00
Loader Unloading	9	Baghouse Dust Mixed with Slag	Material Removal to Crusher/Train	Primary Control Area	105	7,830	0	100	50	7,830	75	PM10	0.35	0.92	8.7	6.8E-03	5.1E-01		5.3E+01	5.3E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	7.7E-02		8.1E+00	8.1E+00
			Moving Storage Yard Materials	EB Area	64	7,830	0	100	50	7,830	122	PM10	0.35	0.92	8.7	6.8E-03	8.3E-01	5.3E+01		5.3E+01
												PM2.5	0.053	0.92	8.7	1.0E-03	1.3E-01	8.1E+00		8.1E+00
Loader Unloading	SC	On-Site Soil Consolidation	Material Removal to Crusher/Train	Primary Control Area	105	1,871	0	100	0	1,871	18	PM10	0.35	12	8.7	1.9E-04	3.3E-03		3.5E-01	3.5E-01
												PM2.5	0.053	12	8.7	2.8E-05	5.1E-04		5.3E-02	5.3E-02
			Moving Storage Yard Materials	EB Area	64	1,871	0	100	0	1,871	29	PM10	0.35	12	8.7	1.9E-04	5.5E-03	3.5E-01		3.5E-01
												PM2.5	0.053	12	8.7	2.8E-05	8.3E-04	5.3E-02		5.3E-02
Cover Placement	*CVR1*	*Cover for moved pile areas*	*Soil Cover for Moved Piles*	*Primary Control Area*	105	6,862	100	100	0	13,724	131	PM10	0.35	12	8.7	1.9E-04	2.4E-02		2.6E+00	2.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	3.7E-03		3.9E-01	3.9E-01
			Moving Storage Yard Materials	Primary Control Area	64	6,862	100	100	0	13,724	214	PM10	0.35	12	8.7	1.9E-04	4.0E-02	2.6E+00		2.6E+00
												PM2.5	0.053	12	8.7	2.8E-05	6.1E-03	3.9E-01		3.9E-01
	EB2	Cover Soil	Placement of Barrier	EB Area	64	23,202	100	0	0	23,202	363	PM10	0.35	12	8.7	1.9E-04	6.8E-02	4.3E+00		4.3E+00
												PM2.5	0.053	12	8.7	2.8E-05	1.0E-02	6.6E-01		6.6E-01
	EB4	Various Stone	Placement of Barrier	EB Area	64	26,504	100	0	0	26,504	414	PM10	0.35	7.4	8.7	3.7E-04	1.5E-01	9.8E+00		9.8E+00
												PM2.5	0.053	7.4	8.7	5.6E-05	2.3E-02	1.5E+00		1.5E+00
	EB5	Clay	Placement of Barrier	EB Area	64	34,512	100	0	0	34,512	539	PM10	0.35	10	8.7	2.4E-04	1.3E-01	8.3E+00		8.3E+00
												PM2.5	0.053	10	8.7	3.7E-05	2.0E-02	1.3E+00		1.3E+00
Loader Unloading	DP1	Staging Area Day Pile	Material Removal to Crusher/Train	Staging Area	105	58,612	0	100	0	58,612	558	PM10	0.35	9.2	8.7	2.7E-04	1.5E-01		1.6E+01	1.6E+01
												PM2.5	0.053	9.2	8.7	4.1E-05	2.3E-02		2.4E+00	2.4E+00
Loader Unloading	DP2	Crusher Day Pile	Material Removal to Crusher/Train	Staging Area	105	5,859	0	100	100	5,859	56	PM10	0.35	1.31	8.7	4.2E-03	2.3E-01		2.4E+01	2.4E+01
												PM2.5	0.053	1.31	8.7	6.3E-04	3.5E-02		3.7E+00	3.7E+00

		Active 8 Hour Day (lbs/day)	Inactive Day (lbs/day)	1st Year Annual lbs/year)	2nd Year Annual lbs/year)	Total (ton/project)
Primary Control Area	PM10	0.69	0.00	2.57	68	91
	PM2.5	0.13	0.00	0.39	13	14
EB Area	PM10	5.7	0.00	364	0.0E+00	364
	PM2.5	0.86	0.00	55	0.0E+00	55
Staging Area	PM10	0.38	0.00	0.0E+00	40	40
	PM2.5	0.06	0.00	0.0E+00	6.1	6

Estimates based on AP-42 Chapter 13.2.4 - Aggregate Handling and Storage Piles. Material moisture content are mean values of similar materials from AP-42 Table 13.2.4-1

d speed is from Local Climatological Data (ISSN 0198-4535) Philadelphia, Pennsylvania.

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Table N-57
Material Handling - Active/Inactive Pile Emissions

The emission factor includes the emissions from loading material (drop emissions) into the pile, equipment traffic in the storage area, and wind erosion. Since it is difficult to determine which piles will be removed in the first year, the emissions assume all the piles will be removed in the first year and they are half the actual size. Also assumes all small piles are done on a Friday with an inactive weekend.

Parcel Number	Material Type	Activity	Area Type	Estimated Pile Size (tons)	Estimated Pile Size (acre)	Pile Amounts: Moved to EB (%)	Removed (%)	Crushed or Off-Site (%)	Total Removed (tons)	Annual Calendar Days of Operation (days/yr)	Fugitive Particulate Size	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)	Fugitive Particulate Size (lb/acre/day)	Emission Factor (lb/acre/day)	Calculated Emissions (lb/day)	Calculated Emissions 1st Year (lbs/year)	Calculated Emissions 2nd Year (lbs/year)
1	Excavated Soil Mixed with Slag	Active	Primary Control Area	24,300	0.9	0	100	0	24,300	44	PM10	6.3	5.67	0.0E+00	2.5E+02	PM2.5	0.95	0.86	0.0E+00	3.7E+01
		Inactive		24,300	0.9	0	100	0	24,300	12	PM10	1.7	1.53	0.0E+00	1.9E+01	PM2.5	0.26	0.23	0.0E+00	2.9E+00
2	Excavated Soil from D111	Active	Primary Control Area	1,418	0.2	0	100	0	1,418	3	PM10	6.3	1.01	0.0E+00	2.6E+00	PM2.5	0.95	0.15	0.0E+00	3.9E-01
		Inactive		1,418	0.2	0	100	0	1,418	2	PM10	1.7	0.27	0.0E+00	5.4E-01	PM2.5	0.26	0.04	0.0E+00	8.2E-02
3	Canal Slag (In & Out of Supersacs)	Active	Primary Control Area	6,683	0.2	100	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		6,683	0.2	100	0	0	0	2	PM10	1.7	0.00	6.5E-01	-6.5E-01	PM2.5	0.26	0.00	9.8E-02	-9.8E-02
4	Slag	Active	Primary Control Area	56,700	1.0	50	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		56,700	1.0	50	0	0	0	2	PM10	1.7	0.00	1.8E+00	-1.8E+00	PM2.5	0.26	0.00	2.7E-01	-2.7E-01
5A	Slag	Active	Primary Control Area	4,914	0.2	50	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		4,914	0.2	50	0	0	0	2	PM10	1.7	0.00	3.4E-01	-3.4E-01	PM2.5	0.26	0.00	5.1E-02	-5.1E-02
5B	Demolition Concrete	Active	Primary Control Area	3,888	0.3	0	100	50	3,888	7	PM10	6.3	1.89	0.0E+00	1.3E+01	PM2.5	0.95	0.29	0.0E+00	2.0E+00
		Inactive		3,888	0.3	0	100	50	3,888	2	PM10	1.7	0.51	0.0E+00	1.0E+00	PM2.5	0.26	0.08	0.0E+00	1.5E-01
6	Hi-Ratio Slag	Active	Primary Control Area	3,780	0.3	0	0	0	0	0	PM10	6.3	0.00	0.0E+00	0.0E+00	PM2.5	0.95	0.00	0.0E+00	0.0E+00
		Inactive		3,780	0.3	0	0	0	0	2	PM10	1.7	0.00	0.0E+00	0.0E+00	PM2.5	0.26	0.00	0.0E+00	0.0E+00
7	Hi-Ratio Slag & D111 Flex Kleen Bags & D116 Polishing Compound Contaminated Equipment & Clearing	Active	Primary Control Area	1,755	0.3	0	100	0	1,755	3	PM10	6.3	1.70	0.0E+00	5.3E+00	PM2.5	0.95	0.26	0.0E+00	8.1E-01
		Inactive		1,755	0.3	0	100	0	1,755	2	PM10	1.7	0.46	0.0E+00	9.2E-01	PM2.5	0.26	0.07	0.0E+00	1.4E-01
8	Baghouse Dust	Active	Primary Control Area	17,550	0.9	0	100	0	17,550	31	PM10	6.3	5.86	0.0E+00	1.8E+02	PM2.5	0.95	0.89	0.0E+00	2.8E+01
		Inactive		17,550	0.9	0	100	0	17,550	9	PM10	1.7	1.58	0.0E+00	1.4E+01	PM2.5	0.26	0.24	0.0E+00	2.2E+00
9	Baghouse Dust Mixed with Slag	Active	Primary Control Area	7,830	0.4	0	100	50	7,830	14	PM10	6.3	2.77	0.0E+00	3.9E+01	PM2.5	0.95	0.42	0.0E+00	5.9E+00
		Inactive		7,830	0.4	0	100	50	7,830	4	PM10	1.7	0.75	0.0E+00	3.0E+00	PM2.5	0.26	0.11	0.0E+00	4.5E-01
SC	On-Site Soil Consolidation	Active	Primary Control Area	1,871	0.50	0	100	0	1,871	3	PM10	6.3	3.15	0.0E+00	1.1E+01	PM2.5	0.95	0.48	0.0E+00	1.6E+00
		Inactive		1,871	0.50	0	100	0	1,871	2	PM10	1.7	0.85	0.0E+00	1.7E+00	PM2.5	0.26	0.13	0.0E+00	2.6E-01
CVR1	Cover for moved pile areas	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	105	PM10	6.3	1.58	1.7E+02	0.0E+00	PM2.5	0.95	0.24	2.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	30	PM10	1.7	0.43	1.3E+01	0.0E+00	PM2.5	0.26	0.06	1.9E+00	0.0E+00
EB2	Cover Soil	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
EB4	Various Stone	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
EB5	Clay	Active	EB Staging Area	(daily max. for day pile) 1,000	0.25	100	100	0	1,000	64	PM10	6.3	1.58	1.0E+02	0.0E+00	PM2.5	0.95	0.24	1.5E+01	0.0E+00
		Inactive		1,000	0.25	100	100	0	1,000	18	PM10	1.7	0.43	7.8E+00	0.0E+00	PM2.5	0.26	0.06	1.2E+00	0.0E+00
DP1	Staging Area Day Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	0	100	0	500	105	PM10	6.3	0.63	0.0E+00	6.6E+01	PM2.5	0.95	0.10	0.0E+00	1.0E+01
		Inactive		500	0.1	0	100	0	500	42	PM10	1.7	0.17	0.0E+00	7.1E+00	PM2.5	0.26	0.03	0.0E+00	1.1E+00
DP2	Crusher Day Pile	Active	Staging Area	(daily max. for day pile) 500	0.1	0	100	100	500	105	PM10	6.3	0.63	0.0E+00	6.6E+01	PM2.5	0.95	0.10	0.0E+00	1.0E+01
		Inactive		500	0.1	0	100	100	500	42	PM10	1.7	0.17	0.0E+00	7.1E+00	PM2.5	0.26	0.03	0.0E+00	1.1E+00

Total Tons of Piles		
Primary Control Area	130,688	58,612
Staging Area	1,000	1,000

	1st Year PM10 (lbs/yr)	2nd Year PM10 (lbs/yr)
Primary Control Area	3	539
Staging Area	0	147
EB Staging Area	504	0

	1st Year PM2.5 (lbs/yr)	2nd Year PM2.5 (lbs/yr)
Primary Control Area	0.4	81.6
Staging Area	0	22.2
EB Staging Area	76.3	0

Only maximum emission days are modeled, so weekend emissions with no activity will not be maximum emission days.

	Max Active Day Total Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Inactive Day Worst Pile 24 Hr Day PM10 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM10 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM10 (lbs/day)
Primary Control Area	0.00	0.00	0.00	0.00
Staging Area	0.74	0.17	0.63	0.11
EB Staging Area	1.86	0.43	1.58	0.28

	Max Active Day Total Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Mak Inactive Day Worst Pile 24 Hr Day PM2.5 (lbs/day)	Max Active Day Active Hours Worst Pile 8 Hr Day PM2.5 (lbs/day)	Max Active Day Inactive Hours Worst Pile 16 Hr Day PM2.5 (lbs/day)
Primary Control Area	0.00	0.00	0.00	0.000
Staging Area	0.11	0.026	0.10	0.017
EB Staging Area	0.28	0.064	0.24	0.043

Emission factor is from Air Pollution Engineering Manual 1992 (AP-40), Chapter 15, Table 1 (page 779) - Uncontrolled Particulate Emission Factors for Sand and Gravel Processing. Emission factor represents the following steps in the storage cycle

1) loading of aggregate onto storage piles (batch or continuous drop operations),
2) equipment traffic in storage areas,
3) wind erosion of pile (batch or continuous drop operations). The emission factor assumes that the operation occurs during an 8 to 12 hours per day, the remainder of the day wind erosion of the pile occurs.

Max Active Day is a weekday with one "worst case" pile is active for 8 hours and inactive fo 16 hours for each area. Max Inactive Day is a weekend with one "worst case" pile is inactive for 24 hours.

PM2.5 emissions are based on a ratio of the PM10 to PM2.5 emission factors for the drop emission factors in the Material Handling spreadsheet, also found in AP-42 Chapters 13.2.4 and 13.2.5.

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Table N-58
Heavy Equipment Operation

The emission factor estimates emissions from the handling of material and the emissions from movement and traveling on the material. Some of these emissions estimates are double counted when the equipment is working with a pile.

Emission Factor Equations

Loader & Dozer Equation

$$PM10\ lbs/hr = 0.75\ (1.0(s)^{1.5}) / (M)^{1.4}$$

$$PM2.5\ lbs/hr = 0.105\ (5.7(s)^{1.2}) / (M)^{1.3}$$

Emission factor equations from AP-42 5th Edition Supplement E, Table 11.9.1 October 1998

	Heavy Equipment Type	Hours of Operation: Hours per Day (hours)	Hours of Operation: Based on (hours/year)	s Site Estimated Material Silt Content (%)	M AP-42 Material Moisture Content (%)	S Average Speed (mph)	Particulate Size	Calculated Emission Factor (lb/hour)	Calculated Emissions (lb/day)
1st Year									
	Loader	8	1,200	15.77	9.17		PM10	2.11	16.9
							PM2.5	0.92	7.4
	Dozer	8	1,200	15.77	9.17		PM10	2.11	16.9
							PM2.5	0.92	7.4
	Excavator	4	91	15.77	9.17		PM10	2.11	8.5
							PM2.5	0.92	3.7
2nd Year									
	Loader	8	840	15.77	9.17		PM10	2.11	16.9
							PM2.5	0.92	7.4
	Dozer	8	840	15.77	9.17		PM10	2.11	16.9
							PM2.5	0.92	7.4
	Excavator			15.77	9.17		PM10		
							PM2.5		

1st Year	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	97	97	3
EB Area	33	33	20
EB Staging Area	21	21	
Staging Area			

	8 Hr Day PM10 (lbs/day)	1st Year PM10 (lbs/year)	2nd Year PM10 (lbs/year)
Primary Controlled Area	42.3	3,292	1,775
EB Area	42.3	1,275	0
EB Staging Area	33.8	721	0
Staging Area	33.8	0	1,775

2nd Year	Loader Work Days	Dozer Work Days	Excavator Work Days
Primary Control Area	53	53	
EB Area			
EB Staging Area			
Staging Area	53	53	

	PM2.5 (lbs/day)	PM2.5 (lbs/year)	PM2.5 (lbs/year)
Primary Controlled Area	18.4	1,433	773
EB Area	18.4	555	0
EB Staging Area	14.7	314	0
Staging Area	14.7	0	773

Emissions are based on AP-42 Chapter 11.9 - Western Surface Coal Mining.

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Table N-59
Unpaved Roadways - Access Road

This equation is utilized to estimate emissions from the movement of vehicles on unpaved roadways. The particulate emissions estimated **DOES** include particulate emissions from the engines.

Predictive Emission Factor Equation 1a from AP-42 5th Edition Section 13.2.2
Industrial Site Unpaved Roads dated November, 2006

Equation (1a), $E = k(s/12)^a (W/3)^b$

Given Variables for Estimating Emissions

1.5 **k** = base emission factor for pounds of PM-10 particulate per vehicle mile traveled
0.15 **k** = base emission factor for pounds of PM-2.5 particulate per vehicle mile traveled
6.00 **s** = road surface silt loading (silt content Iron and Steel Production)
31 **W** = average weight (tons) of vehicle traveling road
0.9 **a** = per Table 13.2.2-2. Constants for Equations 1a and 1b
0.45 **b** = per Table 13.2.2-2. Constants for Equations 1a and 1b
80% Percent of control, based on Fig. 13.2.2-5 for <10um, one month re-application, 0.18 gal/yd^2 petroleum resin

Roadway Type	Pollutant	Trip Length In and Out (feet)	Truck Trips per Day	Truck Trips per Project	Daily Vehicle Miles Traveled (miles/day)	1st Year Vehicle Miles Traveled (miles/project)	2nd Year Vehicle Miles Traveled (miles/project)	Uncontrolled E Emission Factor Equation 1a	Controlled E Emission Factor Equation 1a	Controlled Emissions Individual Daily (pounds)	Controlled Emissions Actual Max Daily (pounds)	Controlled Emissions 1st Year Annual (pounds)	Controlled Emissions 2nd Year Annual (pounds)
On Site Material Excavation	PM10	2,000	24	66	9.09	25.0		2.30	0.46	4.18	*4.18*	104	
Cover & Engineered Barrier Material Transport	PM10	2,400	31	2,568	13.9	1,167		2.30	0.46	6.38	*6.38*	7,450	
Off Site Material Removal (cover)	PM10	2,400	24	242	10.9		110	2.30	0.46	5.01	5.01		50.5
Off Site Material Removal (staging area)	PM10	2,200	24	1,886	10.0		786	2.30	0.46	4.59	4.59		361
Dust Control Truck (1st Year)	PM10	2,300	1	105	0.44	45.7		2.30	0.46	0.20	*0.20*	9.15	
Dust Control Truck (2nd Year)	PM10	2,300	1	150	0.44		65.3	2.30	0.46	0.20	0.20		30.0
On Site Material Excavation (cover)	PM2.5	2,000	24	66	9.09	25.0		0.23	0.046	0.42	*0.42*	10	
Cover & Engineered Barrier Material Transport	PM2.5	2,400	31	2,568	13.9	1,167		0.23	0.046	0.64	*0.64*	745	
Off Site Material Removal (cover)	PM2.5	2,400	24	242	10.9		110	0.23	0.046	0.50	0.50		5.1
Off Site Material Removal (staging area)	PM2.5	2,200	24	1,886	10.0		786	0.23	0.046	0.46	0.46		36
Dust Control Truck (1st Year)	PM2.5	2,300	1	105	0.44	45.7		0.23	0.046	0.020	*0.020*	0.92	
Dust Control Truck (2nd Year)	PM2.5	2,300	1	150	0.44		65.3	0.23	0.046	0.020	0.020		3.0

TOTALS	Daily (pounds)	1st year Year (pounds)	2nd Year Year (pounds)
PM10	10.8	7,564	441
PM2.5	1.08	756	44.1

"Daily" is a maximum sum of 1st and 2nd Year daily estimates

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Table N-60
Paved Roadway Emissions

Predictive Emission Factor Equation from AP-42 5th Edition Chapter Section 13.2.1 Paved Roads, November 2006

Annual	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C]/453.592
Daily	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 - P/(4N))/453.592
Hourly	E = [(k (sL / 2) ^ 0.65) x (W / 3) ^ 1.5 - C] (1 -1.2 P/N)/453.592

E =	particulate emission factor (pounds/mile traveled)
k =	particulate size multiplier for particulate size range
sL =	sL = road surface silt loading (grams per square meter for Iron & Steel Production))
W =	average weight (tons) of the vehicles traveling the road
C =	emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear
P =	119 (number of wet days with at least 0.01" of precipitation)
N =	365 (number of days in the averaging period)
453.592	Conversion factor (1 pound = 453.592 grams)

Truck Weight

Average Weight 31 tons

Roadway Types	% of Miles
Roadway with <500 vehicles/day	100%

Work Months

0 Winter Months (total of 5 per year)
5 Non-Winter Months (total of 7 per year)

Mileage Estimates

On Site Material Excavation (cover)	1,650	Trip Length (feet) one way
Cover & Engineered Barrier Material Transport	1,650	Trip Length (feet) one way
Soil Material for Relocated Pile Areas	1,650	Trip Length (feet) one way
Off Site Material Removal (cover)	1,650	Trip Length (feet) one way
Dust Control Truck	1,650	Trip Length (feet) one way

Total Number of Trucks

	66 trucks/project	24 trucks/day
	2,568 trucks/project	31 trucks/day
	242 trucks/project	24 trucks/day
1st Year	150 trucks/project	1 trucks/day
2nd Year	105 trucks/project	

Roadway Type	sL Silt Loading Year (g/m^2)	W Average Vehicle Weight (tons)	Number of Miles Per Roadway Type Day	Project	Pollutant	k Base Multiplier (g/VMT)	C Wear & Tear Factor (g/VMT)	E Emission Factor Day Non-Winter (lbs/mile trvld)	Year Non-Winter Months (lbs/mile trvld)	Emissions Day Non-Winter (lb/day)	1st Year Non-Winter (lb/yr)	2nd Year Non-Winter (lb/yr)
On Site Material Excavation (cover)												
Roadway with <500 vehicles/day	5.8200	30.91	15	41	PM10	7.3	0.2119	9.8E-01	1.1E+00	*14.7*		43.95
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.6E-01	*2.21*		6.61
Cover & Engineered Barrier Material Transport												
Roadway with <500 vehicles/day	5.82	31	19.11	1,605	PM10	7.3	0.2119	0.98	1.1E+00	18.7	1.7E+03	
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.6E-01	2.81	2.6E+02	
Off Site Material Removal (cover)												
Roadway with <500 vehicles/day	5.82	31	15	151	PM10	7.3	0.2119	9.8E-01	1.1E+00	*14.7*		161.17
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.6E-01	*2.21*		24.24
Dust Control Truck												
Roadway with <500 vehicles/day	5.82	31	1	94	PM10	7.3	0.2119	9.8E-01	1.1E+00	0.61	1.0E+02	
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.6E-01	0.09	1.5E+01	
Roadway with <500 vehicles/day	5.82	31	1	66	PM10	7.3	0.2119	9.8E-01	1.1E+00	*0.61*		69.92
Roadway with <500 vehicles/day					PM2.5	1.1	0.1617	1.5E-01	1.6E-01	*0.09*		10.52
								Totals	PM10	30.0	1,810	275
									PM2.5	4.51	272	41.4

"Daily" is a maximum sum of 1st and 2nd Year daily estimates

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Table N-61
Exposed Ground Area Emissions

This table estimates the emissions due to wind erosion to an exposed ground area. Emissions will only occur when the exposed ground is not vegetated.

Material Type	Area	Year of Operations	Total Calendar Days (day/year)	Exposed Ground Area (sq ft)	Exposed Ground Area (acre)	Particulate Size	Emission Factor (ton/acre/year)	Emission Estimates: Daily (lbs/day)	Year 1 (lbs/year)	Year 2 (lbs/year)	Total Project (lbs/project)
Exposed Ground Areas	Primary Control Area	1st year	210	310,687	7.13	TSP	0.38	14.85	3,119		3,119
Exposed Ground Areas	EB Area	2nd Year	147	242,224	7.13	TSP	0.38	14.85		2,182	2,182
Exposed Ground Areas	Staging Area	2nd Year	147	21,780	0.5	TSP	0.38	1.0		153	153

		Aerodynamic Particle Size Multiplier	Daily 24 hour (lbs/day)	Daily 8 Hour (lbs/day)	Daily 16 hour (lbs/day)	Annual 1st year (lbs/year)	Annual 2nd year (lbs/year)
Primary Control Area	PM30	0.74	10.99	3.66	7.33	2,308	
	PM10*	0.35	5.20	1.73	3.47	1,092	
	PM2.5*	0.053	0.79	0.26	0.52	165	
EB Area	PM30	0.74	10.99	3.66	7.32		1,615
	PM10*	0.35	5.20	1.73	3.46		764
	PM2.5*	0.053	0.79	0.26	0.52		116
Staging Area	PM30	0.74	0.77	0.26	0.51		113
	PM10*	0.35	0.36	0.12	0.24		53.6
	PM2.5*	0.053	5.5E-02	0.018	0.037		8.11

Emission factor is from AP-42 Chapter 11.9.1, Table 11.9-4 - Uncontrolled Particulate Emission Factors for Open Dust Sources at Western Surface Coal Mines. Emission rate is an average for a year, typically emission rates decay sharply with time. From the time an area is disturbed until the new vegetation emerges or the surface is covered by rock, all disturbed areas are subject to wind erosion. This emission estimate assumes that the area will be become vegetated or will be covered with rock at the end of the second year. It is assumed that the project will start in

*The PM10 and PM2.5 emission factor has been adjusted from the PM30 emission factor, Table 11.9-4 refers to Section 13.2.5 (then to Section 13.2.4) which presents a distribution of particle sizes that are comparable for fugitive dust sources where wind speed is a factor.

Physical properties of the material used for development of the emission factor:
silt range of 5.1 - 21 with a mean of 15
moisture range of 2.8 - 20 with a mean of 6.9
Physical properties of the sand/gravel:
silt range of 1.2 - 4.2 with a mean of 2.16 (site specific data)
sand moisture content, a mean of 7.4 (AP-42 Table 13.2.4-1)

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Table N-62
Off-Road Diesel Engine Emissions

These estimates for the operation of heavy equipment only estimate the emissions from the engine of the equipment, which would emitted from the exhaust. A portion of the particulate emissions are double counted due to the testing methods when developing the emissions factors associated with the piles.

Loader

145 Estimated HP
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
8 Hours per Day
97 Days/Year in Primary Control Area
33 Days/Year in EB Area
na Days/Year in Staging Area
21 Days/Year in EB Staging Area
1200 Hours per Year, Total

2nd Year: 105 days
8 Hours per Day
105 Days per Year
53 Days/Year in Primary Control Area
53 Days/Year in Staging Area
840 Hours per Year, Total

Dozer

132 Estimated HP
7.08 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
8 Hours per Day
97 Days/Year in Primary Control Area
33 Days/Year in EB Area
na Days/Year in Staging Area
21 Days/Year in EB Staging Area
1200 Hours per Year, Total

2nd Year: 105 days
8 Hours per Day
105 Days per Year
53 Days/Year in Primary Control Area
53 Days/Year in Staging Area
840 Hours per Year, Total

Excavator

145 Estimated HP
7.61 Estimated Fuel Use (gal/hr based on 7.05 lbs/gal)
0.0015 % (15 ppm) Sulfur percentage content in fuel

1st Year: 150 days
4 Hours per Day
3 Days/Year in Primary Control Area
20 Days/Year in EB Area
0 Days/Year in Staging Area
0 Days/Year in EB Staging Area
91 Hours per Year, Total

Pollutant	Area	Emission Factor Units	Loader				Dozer				Excavator				Totals		
			Emission Factor	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)	Emission Factor	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)	Emission Factor	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)	Daily (lbs/day)	1st Year (lbs/year)	2nd Year (lbs/year)
PM	Primary Control Area	g/hp-hr	0.400	1.023	98.9	53.7	0.400	0.931	90.1	48.9	0.400	0.511	1.41		2.47	190	103
	EB Area	g/hp-hr	0.400	1.023	33.5		0.400	0.931	30.5		0.400	0.511	10.2		2.47	74.1	
	Staging Area	g/hp-hr	0.400	1.023		53.7	0.400	0.931		48.9					1.95		103
	EB Staging Area	g/hp-hr	0.400	1.023	21.8		0.400	0.931	19.9						1.95	41.7	
NOx	Primary Control Area	g/hp-hr	4.50	5.8	556	302	4.50	10.48	1,013	550	4.50	5.75	15.8		22.0	1,585	852
	EB Area	g/hp-hr	4.50	5.8	188		4.50	10.48	343		4.50	5.75	115		22.0	646	
	Staging Area	g/hp-hr	4.50	5.8		302	4.50	10.48		550					16.2		852
	EB Staging Area	g/hp-hr	4.50	5.8	123		4.50	10.48	223						16.2	346	
SOx	Primary Control Area	lb/1,000 gals	0.213	0.013	1.25	0.68	0.213	0.012	1.166	0.63	0.213	0.27	0.75		0.30	3.17	1.31
	EB Area	lb/1,000 gals	0.213	0.013	0.424		0.213	0.012	0.394		0.213	0.27	5.4		0.30	6.27	
	Staging Area	lb/1,000 gals	0.213	0.013		0.68	0.213	0.012		0.63					0.025		1.31
	EB Staging Area	lb/1,000 gals	0.213	0.013	0.277		0.213	0.012	0.257						0.025	0.53	

Assumptions: The payloader is a L60E Volvo with a 145 HP engine, excavator is a Caterpillar 22B with a 145 HP engine, and the dozer is a Caterpillar D5H 132 HP engine. Emission factors are from USEPA Report No. NR-009A Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition, dated February 13, 1998 , revised June 15, 1998. For the emission estimates of NOx and PM it is assumed that the equipment was manufactured between 2003 and 2006 which would be regulated under Tier 2 requirements. The SOx emissions are based on fuel sulfur content.

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Table N-63
On-Road Engine Emissions
EPA Model MOBILE 6.2

EPA Model MOBILE6.2 estimates emission rates for a variety of vehicle classes. The emissions estimates are the engine exhaust emissions. The emissions below are for two classes of heavy duty diesel vehicles.

Maximum Miles per Day	
HDDV8A Miles per Day	52.2
HDDV8B Miles per Day	52.2
Miles per 1st Year	
HDDV8A Miles per Year	2,000
HDDV8B Miles per Year	2,000
Miles per 2nd Year	
HDDV8A Miles per Year	376
HDDV8B Miles per Year	376
Idling	
Total hours of idling on site per day	1
1st Year - Total hours of idling on site	150
2nd Year - Total hours of idling on site	105

Engineered Barrier and Drainage Material	
Trucks per day	40
Trucks for 1st Year	2,568
Trucks for 2nd Year	0
Miles per truck	1.08

On Site Material Excavation (cover)	
Trucks per day	24
Trucks for 1st Year	66
Trucks for 2nd Year	66
Miles per truck	1.00

Off Site Material Removal (staging area)	
Trucks per day	24
Trucks for 1st Year	1,886
Trucks for 2nd Year	943
Miles per truck	0.42

Off Site Material Removal (cover)	
Trucks per day	24
Trucks for 1st Year	242
Trucks for 2nd Year	121
Miles per truck	1.08

Dust Control Truck	
Trucks per day	1
Trucks for 1st Year	105
Trucks for 2nd Year	150
Miles per truck	1.08

Pollutant	Operating Condition	HDDV8A (Heavy Duty Diesel Vehicle - >60,000 GVW)					HDDV8B (Heavy Duty Diesel Vehicle - 33,001 - 60,000 GVW)				
		grams/mile	grams/hour	pounds/day	1st Year pounds/year	2nd Year pounds/year	grams/mile	grams/hour	pounds/day	1st Year pounds/year	2nd Year pounds/year
PM10/PM2.5	10 mph average	0.254	NA	0.0292	1.12	0.21	0.25	NA	0.0290	1.11	0.21
	Idling	NA	1.0040	0.0022	0.33	0.23	NA	1.0040	0.0022	0.33	0.23
				0.0314	1.45	0.44			0.0312	1.44	0.44
SO2	10 mph average	0.0144	NA	1.7E-03	0.06	0.01	0.015	NA	1.7E-03	0.07	0.01
NOx	10 mph average	12.3	NA	1.412	54.1	10.2	13.9	NA	1.603	61.40	11.5

	PM10/PM2.5			SO2			NOx		
	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year	Daily lbs/day	1st Year lbs/year	2ndt Year lbs/year
Primary Control Area (see below)	0.0104	0.72	0.22	5.7E-04	3.3E-02	6.1E-03	0.503	28.88	5.43
EB Staging Area (see below)	0.0104	0.72		5.7E-04	3.3E-02		0.503	28.88	
Staging Area (see below)	0.0104		0.22	5.7E-04		6.1E-03	0.503		5.43
Roadways (50%)	0.0313	1.45	0.44	1.7E-03	6.5E-02	1.2E-02	1.508	57.8	10.9

Emissions estimates are based on EPA's MOBILE6.2 Mobile Source Emission Factor Model. The emission factors include 6.65 starts per day. All particulate matter is 10 micrometers or less, it has been assumed that PM2.5 = PM10. The emissions for non-roadway emissions are equally divided among each area.

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Table N-64
Material Handling - Crushing Emissions

Emission factor used to estimate emissions is for secondary crushing/screening (no factors for primary crushing are available). The emission estimate assumes wet suppression technology utilized to control emissions. It also assumes that half of each pile is crushed in the first year of operations and the other half in the next year.

Maxiumum amount of material that can be crushed in one hour	300 ton/hour	
Operating hours per day of operations	2 hours/day	
Amount of material that can be crushed in one day	600 ton/day	8 hour/day, Daily rail car capacities = 245 tons per day
Days per year of operation	10 days/year	

Parcel Number	Material Type	Material Amounts (tons/hour)	Material Amounts (tons/day)	Material Amounts (tons/project)	Percentage To be Crushed (%)	Days Needed to Crush (days)	Crushed Material Amounts (tons/project)	Particulate Size	Uncontrolled Particulate Size Multiplier (lb/ton)	Controlled Particulate Size Multiplier (lb/ton)	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions Maximum (tons/year)	Controlled Emissions Maximum (tons/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
1	Excavated Soil Mixed with Slag	300	600	24,300	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
2	Excavated Soil from D111	300	600	1,418	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
3	Canal Slag (In & Out of	300	600	6,683	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
4	Slag	300	600	56,700	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
5A	Slag	300	600	4,914	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
5B	Demolition Concrete	300	600	3,888	50	3	1,944	PM10	8.70E-03	7.40E-04	5.22	0.44	0.008	0.001	0.008	0.001
								PM2.5		5.00E-05		0.03		4.9E-05		4.9E-05
6	Hi-Ratio Slag	300	600	3,780	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
9	Baghouse Dust Mixed with Slag	300	600	7,830	50	7	3,915	PM10	8.70E-03	7.40E-04	5.22	0.44	0.017	0.001	0.017	0.001
								PM2.5		5.00E-05		0.03		9.8E-05		9.8E-05
CVR1	Cover for moved pile areas	300	600	6,862	0	0	0	PM10	8.70E-03	7.40E-04	0.00	0.00	0.000	0.000	0.000	0.000
								PM2.5		5.00E-05		0.00		0.0E+00		0.0E+00
DP1	Staging Area Day Pile	300	600	58,612	0			Double counting								
DP2	Crusher Day Pile	300	600	5,859	100			Double counting								

	Total Days (days)	Total Material Crushed (tons)
Project	10	5,859
2nd Year	10	5,859

	Uncontrolled Emissions (lb/day)	Controlled Emissions (lb/day)	Uncontrolled Emissions 2nd Year (tons/year)	Controlled Emissions 2nd Year (lbs/year)	Uncontrolled Emissions (tons/project)	Controlled Emissions (ton/project)
PM10 =	5.220	0.444	0.025	4.3	0.025	0.002
PM2.5 =		3.0E-02		0.29		1.5E-04

Emission factors are from EPA's Factor Information Retrieval (FIRE) Data System 6.25. SCC for the crushing process is 3-05-020-02.

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Off Site Disposal of All Materials Except Slag

Table N-65
Crusher - Engine Emissions
Internal Combustion Engine, <600 HP

Potential Operating Hours (or permitted hours)	8,760	
Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Gallons per Hour	15.3	estimated
Fuel Input in MMBtu per Hour	2.100	estimated
BHP Rating	300	
Operating Hours		
Per Day	2	(See Table 11)
Days per Year	10	(See Table 11)
Per Year (5 months)	20	
Actual Fuel Usage (gals/year)	299	
Sulfur percentage content in fuel	0.0015	%, (15ppm)

These emission factors estimate particulate emissions from the engine. Particulate emissions from the crushing of material are not included; those emissions are addressed in the table labeled Material Handling - Crushing Emissions

Pollutant	CAS#	Emission Factor Source	Emission Factor (lbs/MMBtu)	Actual Emissions (lb/hr)	Actual Emissions (lb/day)	Actual Emissions (lb/yr)	Actual Emissions 2nd Year (ton/yr)	Potential Emissions (lb/hr)	Potential Emissions 2nd Year (ton/yr)
PM	na	1	0.31	0.651	1.30	12.7	0.006	0.651	2.85
PM10	na	1	0.31	0.651	1.30	12.7	0.006	0.651	2.85
PM2.5	na	1	0.31	0.651	1.30	12.7	0.006	0.651	2.85
SOx	na	1	1.52E-03	3.18E-03	6.36E-03	0.06	3.11E-05	3.18E-03	1.39E-02
NOx	na	1	4.41	9.261	18.5	181	0.09	9.261	40.6

Footnotes:
1 Emission factors are from EPA's AP-42 Table 3.3-1 dated November, 1996. The SCCs for this source are 2-02-001-01 for industrial size equipment and 2-03-001-01 for commercial/institutional size equipment. SOx emission factor is based on sulfur content and AP-42 Table 3.4-1.

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Table N-66
Locomotive - Diesel Powered

Type Fuel	Diesel	
Fuel Higher Heating Value, (Btu/gal)	137,000	
Fuel Input in MMBtu per Hour	7.000 estimated	Assumes that the locomotive operates only under "switch duty-cycle" as defined by the EPA.
Maximum hourly fuel use (gal/hr)	51 estimated	
BHP Rating	1000	
Operating Hours		
Hours per Day	1	
Hours per Year (5 months)	47	
Sulfur percentage content in fuel	0.0015 %, (15ppm)	

Pollutant	CAS#	Emission Factor Source	Emission Factors		Actual Emissions (lb/day)	2nd Year (lb/yr)	2nd Year (ton/yr)
PM	na	1	0.54	g/bhp-hr	1.19	56	0.028
PM10	na	1	0.54	g/bhp-hr	1.19	56	0.028
PM2.5	na	1	0.54	g/bhp-hr	1.19	56	0.028
SOx	na	2	1.52E-03	lbs/MMBtu	1.1E-02	0.50	2.5E-04
NOx	na	1	11.00	g/bhp-hr	24.3	1,142	0.57

Emission factors are based on Tier I EPA emission limits for engines that were manufactured from 2000 to 2004. This assumes that if the engine was older than 2000 it would have been rebuilt and is required to comply with modern emission standards. The emission limits were published in the EPA's "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines - Locomotives. Emissions include idling time and assumes that PM=PM10. The SOx emissions are based on sulfur content of the fuel and AP-42 Table 3.4-1.

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Table N-67
Emissions Summary

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	PM-10 Emissions					PM-10 Emissions					PM-10 Emissions					PM-10 Emissions					PM-10 Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	1st Year lbs/year	2nd Year lbs/year
Material Handling (Table 3)	0.88			2.57	88	5.7			364	0.E+00						0.38			0.E+00	40				
Active/Inactive Piles (Table 4)	0.00	0.00	0.00	3	539						1.58	0.28	0.43	504	0.E+00	0.63	0.11	0.17	0.E+00	147				
Heavy Equipment (Table 5)	42.3			3,292	1,775	x			1,275	0.E+00	x			721	0.E+00	x			0.E+00	1775				
Unpaved Roadways (Table 6)																					10.8		7,564	441
Paved Roadways (Table 7)																					30.0		1,810	275
Exposed Ground Area (Table 8)	1.73	3.47	5.20	1,092	0.E+00	1.73	3.46	5.20	0.E+00	784						0.12	0.24	0.36	0.E+00	54				
Off-Road Engines (Table 9)	2.47			180	103	2.47			74.1	0.E+00	1.95			41.7	0.E+00	1.95			0.E+00	103				
On-Road Engines (Table 10)	0.0104			0.72	0.22						0.0104			0.72	0.E+00	0.0104			0.E+00	0.22	0.0313		1.45	0.44
Material Handling Crusher (Table 11)																0.44				4.3				
Crusher - Engine (Table 12)																1.30				12.7				
Train (Table 13)																1.19				56				
TOTAL	47.3	3.47	5.20	4,590	2,505	9.9	3.46	5.20	1,713	784	3.54	0.28	0.43	1,267	0	6.0	0.36	0.53	0	2,191	40.8		9,375	717

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions					PM-2.5 Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion	1st Year lbs/year	2nd Year lbs/year
Material Handling (Table 3)	0.13			0.39	13	0.88			55	0.E+00						0.06			0.E+00	6.1				
Active/Inactive Piles (Table 4)	0.00	0.000	0.00	0.4	81.6						0.24	0.043	0.064	76.3	0.E+00	0.10	0.017	0.026	0.E+00	22.2				
Heavy Equipment (Table 5)	18.4			1433	773	x			555	0.E+00	x			314	0.E+00	x			0.E+00	773				
Unpaved Roadways (Table 6)																					1.08		758	44.1
Paved Roadways (Table 7)																					4.51		272	41.4
Exposed Ground Area (Table 8)	0.26	0.52	0.78	165	0.E+00	0.26	0.52	0.78	0.E+00	118						0.018	0.037	0.055	0.E+00	8.11				
Off-Road Engines (Table 9)	2.47			180	103	2.47			74.1	0.E+00	1.95			41.7	0.E+00	1.95			0.E+00	103				
On-Road Engines (Table 10)	0.0104			0.72	0.22						0.0104			0.72	0.E+00	0.0104			0.E+00	0.22	0.0313		1.45	0.44
Material Handling Crusher (Table 11)																0.030				0.29				
Crusher - Engine (Table 12)																1.30				12.7				
Train (Table 13)																1.19				56				
TOTAL	21.3	0.52	0.79	1,781	971	3.59	0.52	0.79	684	118	2.20	0.043	0.064	433	0	4.7	0.054	0.08	0	981	5.61		1,030	88

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	SOx Emissions					SOx Emissions					SOx Emissions					SOx Emissions					SOx Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	1st Year lbs/year	2nd Year lbs/year
Off-Road Engines (Table 9)	0.30			3.2	1.31	0.30			6	0.E+00	0.025			0.534	0.E+00	0.03			0.E+00	1.31				
On-Road Engines (Table 10)	5.7E-04			3.3E-02	6.1E-03						5.7E-04			3.3E-02	0E+00	5.7E-04			0.E+00	6.1E-03	1.7E-03		6.5E-02	1.2E-02
Material Handling Crusher (Table 11)																8.4E-03				0.08				
Crusher - Engine (Table 12)																1.1E-02				0.50				
Train (Table 13)																0.0426			0.E+00	1.88	1.7E-03		6.5E-02	0.0122
TOTAL	0.30			3.2	1.32	0.30			6	0.E+00	0.026			0.568	0.E+00									

Source	Area 1 - Primary Controlled Area					Area 2 - Engineered Barrier Area					Area 3 - EB Staging Area					Area 4 - Staging Area					Area 5 - Roadways			
	NOx Emissions					NOx Emissions					NOx Emissions					NOx Emissions					NOx Emissions			
	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active Active Portion lbs/day 8 hours	Day-Active Inactive Portion lbs/day 16 hours	Day-Inactive lbs/day 24 hours	1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours		1st Year lbs/year	2nd Year lbs/year	Day-Active lbs/day 8 hours	Day-Active Inactive Portion 16 hours	1st Year lbs/year	2nd Year lbs/year
Off-Road Engines (Table 9)	22.0			1,565	852	21.98			645.9	0.E+00	18.23			346	0.E+00	18.2			0.E+00	852				
On-Road Engines (Table 10)	0.503			28.88	5.43						0.503			28.88	0.E+00	0.503			0.E+00	5.43	1.508		57.8	10.9
Material Handling Crusher (Table 11)																18.5				181				
Crusher - Engine (Table 12)																24.3				1,142				
Train (Table 13)																								
TOTAL	22.5			1,614	858	21.98			646	0.E+00	18.7			375	0.E+00	59.5			0.E+00	2,180	1.508		57.8	10.9

The Material Handling daily emissions assume the activity only happens in the Primary Controlled Area, which is conservative because that the daily emissions are much greater for Material Handling in the Primary Controlled Area than the other areas. The "worse-case" day for the Heavy Equipment (including Off-Road Engines) happens when operating at the Engineered Barrier Area due to the use of an excavator in this area only. Although the activities for "worse-case" day at the Primary Controlled Area and the Engineered Barrier can not happen on the same day, to be conservative simultaneous operation has been assumed for the daily emission estimates. The "X" that appears is to avoid double counting of identical activities that can not occur at the same time in different areas.

Visual Effects Screening Analysis for
Source: SMC
Class I Area: Brigantine

*** Level-1 Screening ***

Input Emissions for

Particulates	4.59	TON/YR
NOx (as NO2)	5.37	TON/YR
Primary NO2	.00	TON/YR
Soot	.00	TON/YR
Primary SO4	.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	186.30	km
Source-Observer Distance:	49.00	km
Min. Source-Class I Distance:	49.00	km
Max. Source-Class I Distance:	66.00	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	141.	66.0	28.	2.00	.067	.05	.001
SKY	140.	141.	66.0	28.	2.00	.017	.05	-.001
TERRAIN	10.	84.	49.0	84.	2.00	.147	.05	.001
TERRAIN	140.	84.	49.0	84.	2.00	.009	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.17	1.009	.05	.015
SKY	140.	0.	1.0	169.	2.00	.195	.05	-.007
TERRAIN	10.	0.	1.0	169.	2.00	1.354	.05	.013
TERRAIN	140.	0.	1.0	169.	2.00	.232	.05	.006

APPENDIX O – ENERGYSOLUTIONS CORRESPONDENCE

ENVIROCARE OF UTAH, LLC

SAFE AND SECURE

March 8, 2005

Mr. David Smith
Environmental Manager
Shieldalloy Metallurgical Corporation
Aluminum Products & Powders Division
14 West Boulevard
P.O. Box 768
Newfield, NJ 08344-0768

Re: Shieldalloy Material and Envirocare Prices/Practices

Dear Mr. Smith:

Recent discussions regarding the decommissioning plan for Shieldalloy Metallurgical Corporation (Shieldalloy) and the license application for Long-Term Control (LTC) have included some statements about Envirocare's disposal prices and waste management practices.

I would simply like to state for the record that any independent representation of disposal cost at Envirocare is unfounded as we have not priced the material. In order for Shieldalloy to accurately assert off-site disposal costs, we request the opportunity to discuss the material with you.

Also, there is no reason to be concerned about the possibility of waste material from a project such as Shieldalloy being returned. Envirocare meets or exceeds all applicable regulatory requirements and operates in a location that is remote from residences and surface water and is naturally suitable for low-level radioactive waste disposal.

In addition to disposing of low-level radioactive waste, Envirocare provides services such as waste packaging, transportation, and waste characterization. These services aid in ensuring that material is properly managed and secured once and for all.

If we could be of assistance with your project or if you have any questions, please contact me at (801) 649-2000.

Very truly yours,

Bryan A. Melchior
Director, Business Development

c: Ken Kalman, NRC
Trevor Anderson, EPA Region 2
Jill Lipoti, Ph.D., NJDEP

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ENVIROCARE OF UTAH, LLC

SAFE AND SECURE

October 26, 2005

Mr. David Smith, Environmental Manager
Shieldalloy Metallurgical Corporation
14 West Boulevard
P.O. Box 768
Newfield, New Jersey 08344-0768

Re: Off-Site Disposal Proposal

Dear Mr. Smith,

Following up our proposal, and given Shieldalloy's need for disclosure of pricing for the off-site disposal option, we have reconsidered our confidentiality requirements and would like to make our offer available to you and to anyone requesting the information. For nearly two decades, Envirocare has been a safe and compliant facility for the licensed disposal of millions of cubic feet annually. Envirocare has served various clients like Shieldalloy, and we can supply client references with similar circumstances. Cleanup projects of this scale are the cornerstone of our core business competency.

As discussed in our prior meetings, Envirocare proposes a turnkey solution to remove and transport your waste safely and efficiently by rail for disposal at our licensed facility. The work will be performed in accordance with Envirocare's strict Quality Assurance program along with our radiation protection procedures. As part of the project, Envirocare will refurbish existing railway and construct new railway with loading scales adjacent to the slag piles on Shielalloy property.

Materials will be excavated and loaded directly into railcars. To mitigate dust concerns, no on-site processing or sizing activities will be performed. Proven dust suppression techniques will be utilized along with environmental barriers protecting the public and the adjacent properties during the excavation and loading process. Once loaded, Envirocare will seal, manifest, and expeditiously ship the materials safely and compliantly to our licensed disposal facility in Clive, Utah.

Shieldalloy would pay $2,600,000 for startup cost, and $37,600 per railcar (average 100 tons) thereafter for all costs, including excavating, loading, transporting, and disposing. Shieldalloy must budget a minimum of $4 million per mobilization until the project is complete. These prices are fixed and assume that our agreement will be signed no later than early 2006 with the work beginning shortly thereafter.

To expedite the project, Envirocare would be willing to explore financing options should Shieldalloy provide acceptable collateral. In the event the proposed approach does not meet Shieldalloy's needs, Envirocare could design an alternative pricing structure facilitating shipments as funds are allocated.

We would like to thank Shieldalloy for its consideration of Envirocare on this project. Should you have additional questions, please do not hesitate to contact myself or Bryan Melchior.

Sincerely,

Al Rafati
Executive Vice President
Envirocare of Utah, LLC

cc: Bryan Melchior
Joe Diegal

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ENERGYSOLUTIONS

October 9, 2006

Mr. David Smith, Environmental Manager
Shieldalloy Metallurgical Corporation
14 West Boulevard
P.O. Box 768
Newfield, New Jersey 08344-0768

Re: Proposal for Site Cleanup and Off-Site Disposal

Dear Mr. Smith:

Energy*Solutions* has reviewed Shieldalloy Metallurgical Corporation's Decommissioning Plan (Revision 1a, dated June 30, 2006). Additionally, based on the inquiries of public agencies and the media, we wanted to renew our offer for the cleanup, transportation and offsite disposal services for Shieldalloy's radioactive slag, ash and soil material through **turnkey cleanup**.

Based on Sheildalloy's Decommissioning Plan, there are 81,000 tons of radioactive material requiring disposal. A total project cost can be calculated from Energy*Solutions*' proposal as follows:

Startup including refurbishing existing railway, installing additional Railway and adjacent loading scales, and other startup, mobilization activities	$ 2,600,000
Material cleanup and disposal: 81,000 tons @ $37,600 per railcar (ie. 810 railcars @ $37,600 ea.) included: project management, excavation, loading, transportation offsite disposal and an environmental protection barrier	$30,456,000
Total cost	$33,056,000

These are fixed costs for a turnkey, all-inclusive site cleanup with off-site disposal of material. If the actual volumes differ, the cost would be more or less, based on the actual amounts loaded. Energy*Solutions* remains willing to take responsibility for the site cleanup and would agree to offer Shieldalloy a financial plan to spread payments over several fiscal years based on an adequate financial guarantee.

Our proposal for offsite disposal would be prudent compared to cost underestimates in Shieldalloy's Decommissioning Plan for license continuation or long-term control for costs such as construction, monitoring and security. In the plan, these alternatives also lack provision for adequate financial surety for items such as remediation of contaminated groundwater, repairs from intruder damage, etc.

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801.649.2000 • Fax: 801.521.0453 • www.energysolutions.com

EXHIBIT A

ENERGYSOLUTIONS

Similar to our October 2005 letter and in light of inflated numbers being cited in publications to the public and the interest shown by residents and officials, this letter may be provided to interested parties requesting a clear understanding of cost.

EnergySolutions is anxious to assist Shieldalloy in completing this project. Should you have additional questions, please do not hesitate to contact me.

Very truly yours,

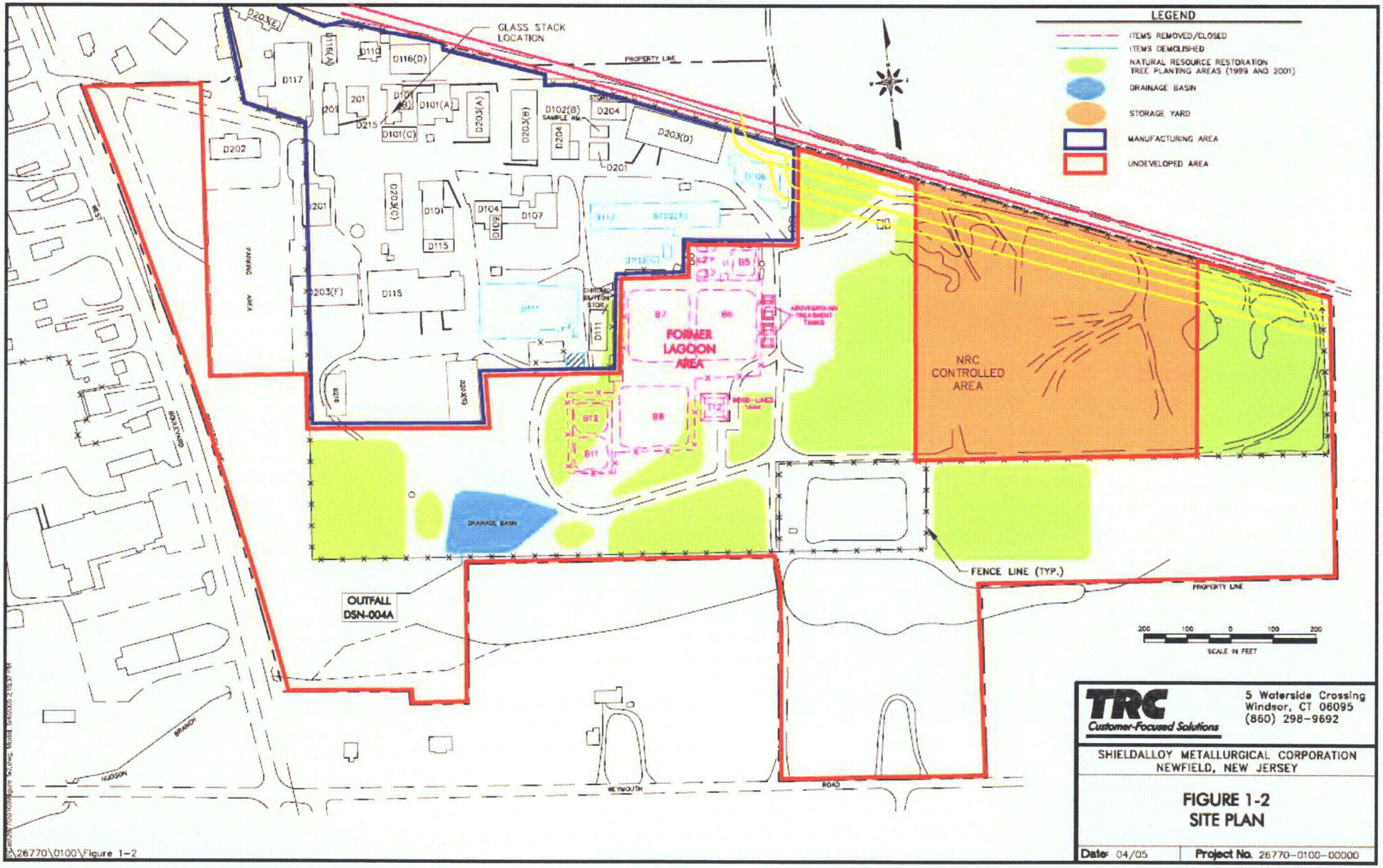
Al Rafati
President, Business Development

FGC/mab
Enclosure

cc: Eric Jackson, Shieldalloy Metallurgical Corporation

Rail Track

ENVIROCARE of Utah, Inc.



Jay

I believe, I had mentioned that SMC was working with Envirocare to obtain a proposal for the off-site desposal of our NRC licensable slag, baghouse dust, soils, and debris at their facility in Utah. They gave SMC (Joe Diegel and myself) a presentation on July 29th, of their preliminary proposal for doing this Turnkey project. They gave us a powerpoint presentation of their plan for this project which included a cost, timeframe for contracting and completion, transportation and upgrade of our railsiding. They indicated that the final quote and proposal was almost completed and should be ready within a week or two. Apparently they were expecting SMC to get back to them as to whether or not our Board of Directors was interested in moving ahead with the contract, before completing their final proposal. Whereas SMC was under the impression that we would have their final proposal in hand and present that to the SMC Board. Since we hadn't received we called to find out the status and ended up exchanging voice messages and finally Bryan Melchior left a message on September 8th about a confidentially agreement Envirocare wanted SMC to sign before completing their proposal. Previously there hadn't been any mention of this agreement but after recieving it I didn't feel SMC should sign it as it was written; so the e-mails below provide the exchnage that has taken place over this past week. We recieved another message from Al Rafati yesterday which I'm going to also forward on to you for your information. I'm asking you to do anything at this point but I want simply bring you up to speed regarding the current status of this matter.

I've copied this e-mail to Carol and Jim, as you have noticed for the same purpose - just to keep them aware of the status of the Envirocare proposal for off-site disposal.

Dave

-----Original Message-----
From: Smith, David
Sent: Monday, September 12, 2005 10:24 AM
To: 'Bryan Melchior'; Smith, David; Al Rafati
Cc: Tyson Creamer; Sherrie Halstrom; Diegel, Joe
Subject: RE: Confidentiality

Bryan

I'm not sure exactly where the SMC Board is with respect to deciding to go forward with the off-site disposal, but I believe that the $ 44 Million cost that was presented to Joe and myself at the end of July isn't possible at this time. If the cost had been more like one or two times the cost of the on-site option, then I think we wouldn't have been able to convince the Board to move the materials off site without any significant problem or delay. However that cost is more than an order of magnitude greater. That makes it hard to convince someone to buy into a project like that when the radiological risk of leaving the material on site is actually less than the risk associated with excavating, loading, removal and transportation. Therefore if you could provide us with as you put it "reliable numbers" that ENVIROCARE might not mind becoming public, I would appreciate it greatly. Understand, however, that with all that said, one of the reasons the Board has asked for the detailed proposal is to be sure we know the "real" number we would have to deal with. So really they are waiting to see that and have further discussions in light of capping and the potential legal fight with the NJDEP. I honestly cannot say it is either way yet.

Dave

-----Original Message-----
From: Bryan Melchior [mailto:bmelchior@envllc.com]
Sent: Friday, September 09, 2005 6:18 PM
To: dsmith@shieldalloy.com; Al Rafati
Cc: Tyson Creamer; Sherrie Halstrom; jdiegel@metallurg.com
Subject: RE: Confidentiality

David -

In all sincerity and respect, what is the intention of Shieldalloy? Given the budgetary number we supplied you, is Shieldalloy seriously considering offsite disposal? In the event you need reliable numbers from Envirocare in support of your long term possession only license application we can assist you given our relationship however, we'd prefer not to have our best pricing in the public arena. Additionally, there are ways to supply confidential pricing information to the NRC in support of authorization for offsite disposal without compromising confidentiality, and we can help with that.

We simply want to serve Shieldalloy in the most efficient manner possible. We are spending thousands of dollars and hundreds of man hours in preparation of a proposal but if you don't need it, we can give you reliable numbers that we might not mind becoming public. Thank you in advance for your understanding and I appreciate the opportunity of working with you.

Sincerely,
Bryan Melchior

Bryan Melchior

Envirocare of Utah, LLC

605 North 5600 West

Salt Lake City, UT 84116

(801) 649-2140 Office

(801) 413-5661 Fax

(801) 913-9050 Mobile

bmelchior@envllc.com

From: dsmith@shieldalloy.com [mailto:dsmith@shieldalloy.com]
Sent: Friday, September 09, 2005 3:42 PM
To: Bryan Melchior; dsmith@shieldalloy.com

Cc: Tyson Creamer; Sherrie Halstrom; jdiegel@metallurg.com
Subject: RE: Confidentiality

Bryan

I have read over the attached agreement. USNRC will want SMC to include the ENVIROCARE proposal into our Decommissioning Plan and this would be a breach of the agreement as I read it right now. I imagine that you probably have another version of the confidentiality agreement that would permit SMC to share your proposal with USNRC and include at least a summary of the cost and proposal into the decommissioning plan, which will become a public document as soon as we submit it NRC. If this is a correct assumption, please send me a copy of that version of the subject agreement for our review.

Thanks and have a nice weekend.

Dave

-----Original Message-----
From: Bryan Melchior [mailto:bmelchior@envllc.com]
Sent: Thursday, September 08, 2005 2:35 PM
To: dsmith@shieldalloy.com
Cc: Tyson Creamer; Sherrie Halstrom
Subject: Confidentiality

David,

Attached please find a copy of our confidentiality agreement addressed to you. I left you a message regarding this information. We are on track to deliver the proposal next Tuesday. Best Wishes, Bryan.

Bryan Melchior

Envirocare of Utah, LLC

605 North 5600 West

Salt Lake City, UT 84116

(801) 649-2140 Office

(801) 413-5661 Fax

(801) 913-9050 Mobile

bmelchior@envllc.com

ENERGYSOLUTIONS

September 24, 2008

Ms. Jacquelyn C. Gillings
Ecology and Environment, Inc.
368 Pleasant View Drive
Lancaster, NY 14086

Re: Update to Proposal for Site Cleanup and Off-Site Disposal – SMC

Ref: Proposal for Site Cleanup and Off-Site Disposal, Rafati to Smith, Oct 9, 2006

Dear Ms. Gillings,

Pursuant to Ecology and Environment Inc. (E&E) recent request on behalf of the Nuclear Regulatory Commission (NRC) for an updated and publicly available price letter for the radioactive slag, dirt, and ash (Subject Material) at the Shieldalloy Metallurgical Corporation (SMC) Site in Newfield, New Jersey, we are providing the following information for your consideration.

EnergySolutions has reviewed SMC's Decommissioning Plan (Revision 1a, dated June 30, 2006) and has determined the Subject Material is acceptable at EnergySolutions licensed low level radioactive waste disposal facility. Further, EnergySolutions possesses the infrastructure and experience necessary to complete remediation of the Subject Material in a safe, efficient, and economical manner on a turnkey basis.

EnergySolutions price and scope exhaustively includes all services necessary to perform the remediation, transportation, and disposition the Subject Material including but not limited to, establishing site security, use of EnergySolutions approved radioactive material handling procedures, NRC mobile license, any and all permits and fees including consultation with New Jersey officials and the public, all excavation, labor and health physics oversight, upgrading rail infrastructure, rail equipment, transportation, and disposal. That means the piles as they sit right now will be gone without any additional cost or third party contractor involvement.

Our safety and environmental stewardship record is second to none. EnergySolutions safely and efficiently manages over 500,000 tons of radioactive waste annually. Recently, EnergySolutions surpassed three million man hours without a lost time work incident. In order to protect the Newfield community, EnergySolutions will utilize an

EnergySolutions Inc.
423 West 300 South, Suite 200
Salt Lake City, Utah 84101
(801) 649-2000

environmental barrier at the site, will not crush or otherwise pulverize any of the Subject Material prior to transport, and will utilize lidded IP-1 gondola railcars for transportation purposes. A photo of the lidded railcars is attached hereto. Our environmental protection barrier will be constructed for temporary use during the project consistent with standard industrial practices in order to protect against airborne particle migration. After use, the barrier will be loaded into the railcars and shipped for disposal in the same manner as the Subject Material.

The current transportation route of choice takes the railcars from Newfield on a direct course West through Pennsylvania, to Chicago, and finally on to Clive, Utah. A map is attached for your easy reference. EnergySolutions average load out rate will be ten railcars per working day, five days per week, and ten hours per day with an average twenty-two full time employees. Railcars will depart SMC ten at a time and would likely travel all the way to Clive in the same manner. In the event the project proceeds uninterrupted with support from the various regulatory agencies our current operational plan indicates a start to finish duration of six to seven months. This plan includes installation of weigh scales, rail upgrades, mobilization, and demobilization. Unanticipated regulatory delays and/or force majeure events generally extend a project's duration by an amount of time equal to the event.

Based from information supplied to EnergySolutions by E&E, we understand two scenarios exist for calculating the total tonnage of Subject Material. Total tonnage ranges from 89,000 tons on the low end, to 130,000 tons on the high end. EnergySolutions price is offered such that once our mobilization fee is paid, the fixed costs are covered, and SMC may direct EnergySolutions to remediate any quantity of tonnage it deems appropriate.

A. One time mobilization fee $2,800,000.00

- The mobilization fee covers startup costs including refurbishing railway and installation of required infrastructure.

B. Subject Material cleanup, transportation, and disposal $39,605.00 per railcar

- Includes all aforementioned services necessary to achieve disposal

Note: Based from actual density measurements as performed by SMC at the request of EnergySolutions, the "as is" density of slag material is 110 pounds per cubic foot. The "as is" density of soil is assumed to be consistent because soil is largely commingled with slag. These considerations yield an in place mass of 79,000 tons on the low end and 99,000 tons on the high end which creates a material difference in the quantity of required railcars. The "as is" mass is the relevant measurement methodology because it

ENERGYSOLUTIONS

ultimately determines the required quantity of railcars. In this case, railcars will be weight limited rather than volume limited at 105 tons net waste weight per railcar.

In submitting pricing EnergySolutions assumes there have been no material changes to the infrastructure at the site since our letter dated October 9, 2006. Additionally, that the project would commence within one year from the date of this letter and the price of oil does not exceed $110.00 per barrel. As you are aware, the cost of remedial activities never goes down, it only goes up, as such we are willing to update our price as needed.

As mentioned above, our proposal exhaustively includes all activities necessary to achieve the end state criteria inclusive of our rigorous safety and environmental protection programs. We employ a robust interactive open book policy when dealing with the various regulatory agencies and the public. As always, our customer, in this case SMC, is a welcome source of input and generally acts in an oversight role. Customer oversight generally consists of a single project manager whom intermittently surveys operational progress and reviews a weekly project status report.

This letter may be provided to interested parties requesting a clear understanding of the cost. We appreciate the opportunity to be of service to SMC, E&E, and the NRC. In the event you have any questions or require further clarification please don't hesitate to contact me.

Sincerely,

Bryan Melchior
Vice President
EnergySolutions, Inc.

EnergySolutions Inc.
423 West 300 South, Suite 200
Salt Lake City, Utah 84101
(801) 649-2000

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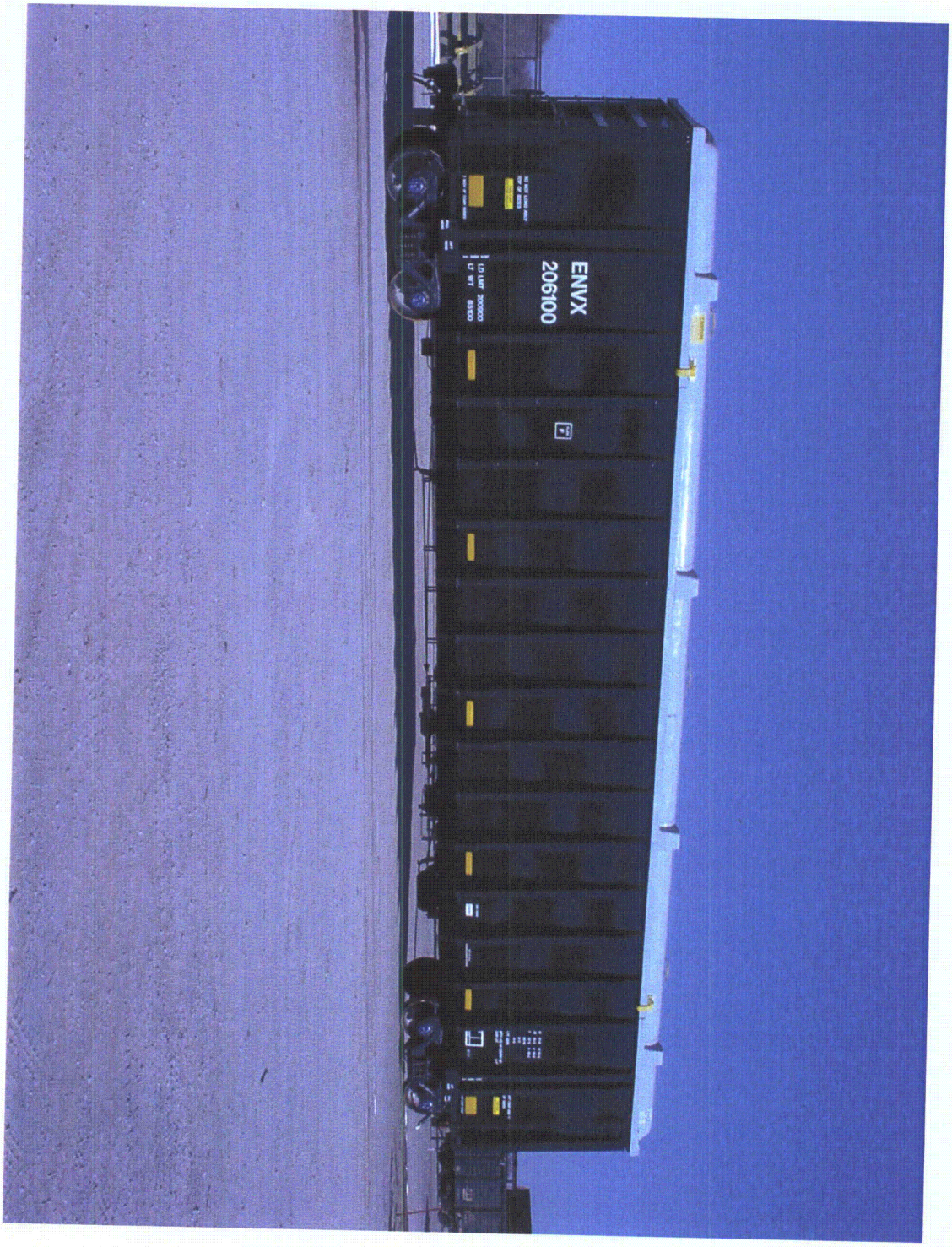
LIDDED GONDOLA RAILCAR



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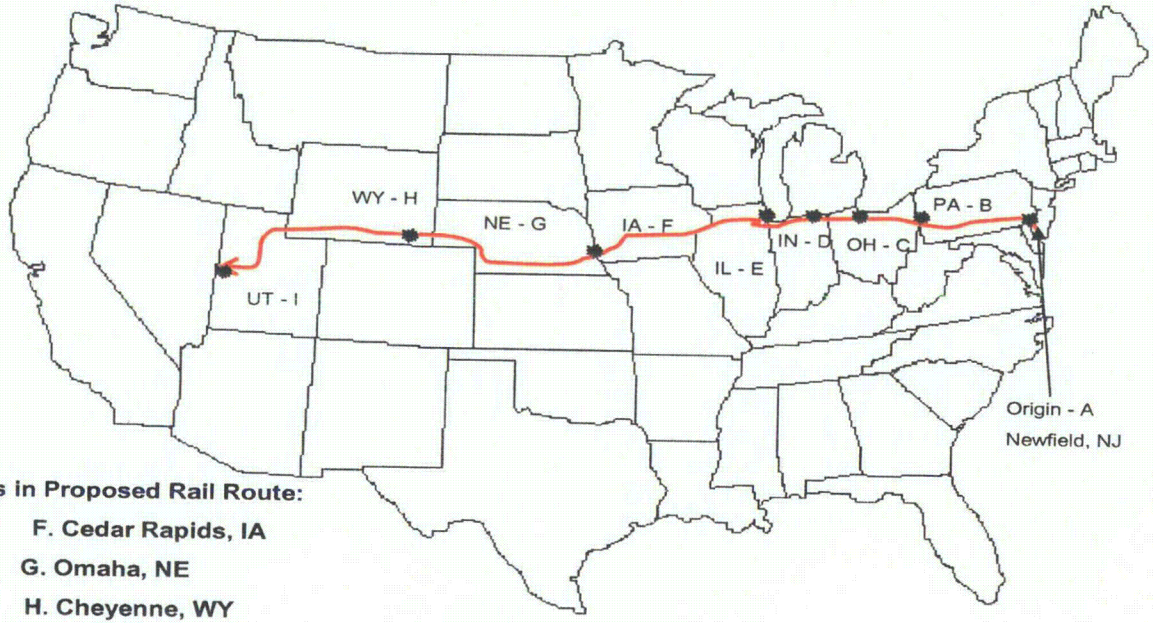
TRANSPORTATION ROUTE

SHIELD ALLOY – NEWFIELD, NJ

Gondola Railcar Shipments
Typical Rail Route



Major Communities in Proposed Rail Route:

A.	Newfield, NJ	F. Cedar Rapids, IA
B.	Conway, PA	G. Omaha, NE
C.	Willard, OH	H. Cheyenne, WY
D.	Elkhart, IN	I. Clive, UT
E.	Chicago, IL	

Energy*Solutions* Inc.
423 West 300 South, Suite 200
Salt Lake City, Utah 84101
(801) 649-2000