Appendix E: Health Risk Assessment

RAP - FORMER KAST PROPERTY

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Appendix E: Health Risk Assessment

Provided by PCR Services Corporation

- Applicant's Proposed Remedy Calculation Files – Average Day
  - On-Site Construction Equipment Emissions
  - On-Site Road Emissions
  - VOC Emissions

- Emissions Inventory Files
  - Crystalline Silica Releases
  - Haul Road Diesel Particulate Emissions
  - HARP Unmitigated Emissions Input – Average Day

- Health Risk Assessment Files – Unmitigated
  - HARP Output Cancer Risk Summary
  - HARP Output Chronic Risk Summary
  - HARP Output Acute Risk Summary
  - Supplemental Health Risk Calculations

Applicant's Proposed Remedy Calculation Files – Average Day

- On-Site Construction Equipment Emissions
- On-Site Road Emissions
- VOC Emissions

VII. On-Site Construction Equipment Emissions

Summary: This section calculates the emissions of criteria pollutants from off-road equipment.

Emission Equation

Emission (Off-road Construction Equipment) = E x bhp-hr

Where:

E = size-specific emission factor (g/bhp-hr)

Source:

EMFAC2011

Assumptions	Value	Value	Units	Notes
Equipment Engine Tier		3	-	Refers to EPA emission standards (Tier 1-4) for Off-road equipment

Off-road Engine Emission Ratings

USEPA TABLE I - EPA Tier 1-3 Nonroad Diesel Engine Emission Standards (g/bhp-hr)

Engine Power		Tier	CO
(25 ≤ hp < 50)	50	1	4.9
(25 ≤ hp < 50)	50	2	4.9
(50 ≤ hp < 100)	100	1	-
(50 ≤ hp < 100)	100	2	3.7
(50 ≤ hp < 100)	100	3	3.7
(100 ≤ hp < 175)	175	1	-
(100 ≤ hp < 175)	175	2	3.7
(100 ≤ hp < 175)	175	3	3.7
(175 ≤ hp < 300)	300	1	8.5
(175 ≤ hp < 300)	300	2	2.6
(175 ≤ hp < 300)	300	3	2.6
(300 ≤ hp < 600)	600	1	8.5
(300 ≤ hp < 600)	600	2	2.6
(300 ≤ hp < 600)	600	3	2.6

Tiers 1, 2,3 &4 Off-Road Engine Emission Standards

HP Range	Tier	Nox	ROG	PM
75 - 99	1	6.9	1.19	0.552
100 - 174	1	6.9	0.82	0.304
175 - 299	1	6.9	1	0.4
300 - 600	1	6.9	1	0.4
75 - 99	2	5.32	0.28	0.3
100 - 174	2	4.655	0.245	0.22
175 - 299	2	4.655	0.245	0.15
300 - 600	2	4.56	0.24	0.15
75 - 99	3	3.325	0.175	0.3
100 - 174	3	2.85	0.15	0.22
175 - 299	3	2.85	0.15	0.15
300 - 600	3	2.85	0.15	0.15
75 - 99	4	2.5	0.14	0.015
100 - 174	4	2.5	0.14	0.015
175 - 299	4	1.5	0.14	0.015
300 - 600	4	1.5	0.14	0.015

Note: Based on SCAQMD Table II-B Tiers 1, 2,3 &4 Off-Road Engine Emission Standards

Table 3.3 OFFROAD Default Horsepower and Load Factors

OFFROAD Equipment Type	Horsepower	Load Factor
Aerial Lifts	63	0.31
Air Compressors	78	0.48
Bore/Drill Rigs	206	0.50
Cement and Mortar Mixers	9	0.56
Concrete/Industrial Saws	81	0.73
Cranes	226	0.29
Crawler Tractors	208	0.43
Crushing/Proc. Equipment	85	0.78
Dumpers/Tenders	16	0.38
Excavators	163	0.38
Forklifts	89	0.20
Generator Sets	84	0.74
Graders	175	0.41
Off-Highway Tractors	123	0.44
Off-Highway Trucks	400	0.38
Other Construction Equipment	172	0.42
Other General Industrial Equipment	88	0.34
Other Material Handling Equipment	167	0.40
Pavers	126	0.42
Paving Equipment	131	0.36
Plate Compactors	8	0.43
Pressure Washers	13	0.30
Pumps	84	0.74
Rollers	81	0.38
Rough Terrain Forklifts	100	0.40
Rubber Tired Dozers	255	0.40
Rubber Tired Loaders	200	0.36
Scrapers	362	0.48
Signal Boards	6	0.82
Skid Steer Loaders	65	0.37
Surfacing Equipment	254	0.30
Sweepers/Scrubbers	64	0.46
Tractors/Loaders/Backhoes	98	0.37
Trenchers	81	0.50
Welders	46	0.45

Notes:
1. Based on the weighted average horsepower (by equipment population) and load factors for the mode of the engine groupings in 2011 OFFROAD

Kast Air Emissions Calculations

Equipment List by Phase												Emissions Factors (g/bhp-hr)						
Phase	Phase Duration (days)	Hours per Day	Equipment	HP/Size	CalEEMod Category	Load Factor[1]	Output (bhp-hour)	Output (bhp-day)	Engine Size Class	Engine Size Class (CO)	Engine Tier	ROG	CO	NOx	CO2[2]	PM10	PM2.5	SOx[2]
Option 1																		
Demolition	119	8	Bobcat (Bobcat S510)	22	Tractors/ Loaders/ Backhoes	0.57	12.54	100.32	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Demolition	119	2	6000 Watt Generator	10	Generator Sets	0.74	7.4	14.8	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Demolition	119	2	Chain Saw	0.5	Concrete/ Industrial Saws	0.73	0.365	0.73	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Demolition	119	8	Water Pump	5	Pumps	0.74	3.7	29.6	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Excavation	889	8	18,000 lbs Excavator (Kubota KX80-4)	70	Excavator	0.38	26.6	212.8	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Excavation	889	8	Bobcat (Bobcat S510)	22	Tractors/ Loaders/ Backhoes	0.37	8.14	65.12	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Excavation	889	2	6000 Watt Generator	10	Generator Sets	0.74	7.4	14.8	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Excavation	889	8	Water Pump	5	Pumps	0.74	3.7	29.6	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
SVE Well Installation	59	4	Bobcat with Auger (Bobcat S510)	22	Tractors/ Loaders/ Backhoes	0.37	8.14	32.56	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
SVE Well Installation	59	1	6000 Watt Generator	10	Generator Sets	0.74	7.4	7.4	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Subslab Vent Installation	59	4	Bobcat with Auger (Bobcat S510)	22	Tractors/ Loaders/ Backhoes	0.37	8.14	32.56	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Subslab Vent Installation	59	1	6000 Watt Generator	10	Generator Sets	0.38	3.8	3.8	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Backfill and Compaction	415	8	Bobcat (Bobcat S510)	22	Tractors/ Loaders/ Backhoes	0.37	8.14	65.12	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Backfill and Compaction	593	4	Small Compactor (Wacker)	3	Plate compactors	0.43	1.29	5.16	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Backfill and Compaction	1256	4	Water Pump	5	Pumps	0.74	3.7	14.8	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050

Slurry Backfill	415	8	Concrete Pump	2	Pumps	0.74	1.48	11.84	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Site Restoration	593	1	6000 Watt Generator	10	Generator Sets	0.74	7.4	7.4	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Site Restoration	593	2	Concrete Pump	2	Pumps	0.74	1.48	2.96	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050

Kast Air Emissions Calculations

Street Trenching																		
Street Trenching/Pipe installation	180	8	Backhoe	100	Tractors/ Loaders/ Backhoes	0.57	57	456	100-174	100<hp<175	3	0.15	3.7	2.85	568.3	0.3	0.3	0.0050
Street Trenching/Pipe installation	180	8	Compressor	49	Generator Sets	0.74	36.26	290.08	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Street Trenching/Pipe installation	180	2	Generator	10	Generator Sets	0.74	7.4	14.8	75-99	50<hp<100	3	0.175	4.9	3.325	568.3	0.3	0.3	0.0050
Street Trenching/Pipe installation	180	1	Concrete Saw	48	Concrete/ Industrial Saws	0.73	35.04	35.04	175-299	175<hp<300	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050
Well Installation																		
Drilling and SVE Well Installation	63	8	Drill Rig	155	Bore/Drill Rigs	0.5	77.5	620	175-299	175<hp<300	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050
Street Paving																		
Street - Grinding	5	8	Cold Plane Grinding Machine	600	Scrapers	0.48	288	2304	300-600	300<hp<600	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050
Street - Grinding	5	8	Street Sweeper	200	Crawler Tractors	0.5	100	800	175-299	175<hp<300	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050
Street - Paving	10	8	Paving Machine	150	Other Construction Equipment	0.42	63	504	175-299	175<hp<300	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050
Street - Paving	10	8	Steam Roller	50	Rollers	0.38	19	152	175-299	175<hp<300	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050
Street - Paving	10	8	Street Sweeper	200	Crawler Tractors	0.5	100	800	175-299	175<hp<300	3	0.15	2.6	2.85	568.3	0.3	0.3	0.0050

1 - Load Factor obtained from CalEEMod Appendix D Defaults

2- Emission factors for CO2 and Sox were obtained from Table 3.4, Off-road Equipment Emission Factors, CalEEMod Appendix D Default Data Tables

Kast Air Emissions Calculations

Off-Road Emissions Calculations		Hourly Emissions (lb)						
Phase	Equipment	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1								
Demolition	Bobcat (Bobcat S510)	4.8E-03	1.4E-01	9.2E-02	1.6E+01	8.3E-03	8.3E-03	1.4E-04
Demolition	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Demolition	Chain Saw	1.4E-04	3.9E-03	2.7E-03	4.6E-01	2.4E-04	2.4E-04	4.0E-06
Demolition	Water Pump	1.4E-03	4.0E-02	2.7E-02	4.6E+00	2.4E-03	2.4E-03	4.1E-05
Excavation	18,000 lbs Excavator (Kubota KX80-4)	1.0E-02	2.9E-01	1.9E-01	3.3E+01	1.8E-02	1.8E-02	2.9E-04
Excavation	Bobcat (Bobcat S510)	3.1E-03	8.8E-02	6.0E-02	1.0E+01	5.4E-03	5.4E-03	9.0E-05
Excavation	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Excavation	Water Pump	1.4E-03	4.0E-02	2.7E-02	4.6E+00	2.4E-03	2.4E-03	4.1E-05
SVE Well Installation	Bobcat with Auger (Bobcat S510)	3.1E-03	8.8E-02	6.0E-02	1.0E+01	5.4E-03	5.4E-03	9.0E-05
SVE Well Installation	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Subslab Vent Installation	Bobcat with Auger (Bobcat S510)	3.1E-03	8.8E-02	6.0E-02	1.0E+01	5.4E-03	5.4E-03	9.0E-05
Subslab Vent Installation	6000 Watt Generator	1.5E-03	4.1E-02	2.8E-02	4.8E+00	2.5E-03	2.5E-03	4.2E-05
Backfill and Compaction	Bobcat (Bobcat S510)	3.1E-03	8.8E-02	6.0E-02	1.0E+01	5.4E-03	5.4E-03	9.0E-05

Backfill and Compaction	Small Compactor (Wacker)	5.0E-04	1.4E-02	9.5E-03	1.6E+00	8.5E-04	8.5E-04	1.4E-05
Backfill and Compaction	Water Pump	1.4E-03	4.0E-02	2.7E-02	4.6E+00	2.4E-03	2.4E-03	4.1E-05
Slurry Backfill	Concrete Pump	5.7E-04	1.6E-02	1.1E-02	1.9E+00	9.8E-04	9.8E-04	1.6E-05
Site Restoration	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Site Restoration	Concrete Pump	5.7E-04	1.6E-02	1.1E-02	1.9E+00	9.8E-04	9.8E-04	1.6E-05
Street Trenching								
Street Trenching/Pipe installation	Backhoe	1.9E-02	4.6E-01	3.6E-01	7.1E+01	3.8E-02	3.8E-02	6.3E-04
Street Trenching/Pipe installation	Compressor	1.4E-02	3.9E-01	2.7E-01	4.5E+01	2.4E-02	2.4E-02	4.0E-04
Street Trenching/Pipe installation	Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Street Trenching/Pipe installation	Concrete Saw	1.2E-02	2.0E-01	2.2E-01	4.4E+01	2.3E-02	2.3E-02	3.9E-04
Well Installation								
Drilling and SVE Well Installation	Drill Rig	2.6E-02	4.4E-01	4.9E-01	9.7E+01	5.1E-02	5.1E-02	8.5E-04
Street Paving								
Street - Grinding	Cold Plane Grinding Machine	9.5E-02	1.7E+00	1.8E+00	3.6E+02	1.9E-01	1.9E-01	3.2E-03
Street - Grinding	Street Sweeper	3.3E-02	5.7E-01	6.3E-01	1.3E+02	6.6E-02	6.6E-02	1.1E-03
Street - Paving	Paving Machine	2.1E-02	3.6E-01	4.0E-01	7.9E+01	4.2E-02	4.2E-02	6.9E-04
Street - Paving	Steam Roller	6.3E-03	1.1E-01	1.2E-01	2.4E+01	1.3E-02	1.3E-02	2.1E-04
Street - Paving	Street Sweeper	3.3E-02	5.7E-01	6.3E-01	1.3E+02	6.6E-02	6.6E-02	1.1E-03

Kast Air Emissions Calculations

Off-Road Emissions Calculations		Daily Emissions (lb)						
Phase	Equipment	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1								
Demolition	Bobcat (Bobcat S510)	3.9E-02	1.1E+00	7.4E-01	1.3E+02	6.6E-02	6.6E-02	1.1E-03
Demolition	6000 Watt Generator	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Demolition	Chain Saw	2.8E-04	7.9E-03	5.4E-03	9.1E-01	4.8E-04	4.8E-04	8.0E-06
Demolition	Water Pump	1.1E-02	3.2E-01	2.2E-01	3.7E+01	2.0E-02	2.0E-02	3.3E-04
Excavation	18,000 lbs Excavator (Kubota KX80-4)	8.2E-02	2.3E+00	1.6E+00	2.7E+02	1.4E-01	1.4E-01	2.3E-03
Excavation	Bobcat (Bobcat S510)	2.5E-02	7.0E-01	4.8E-01	8.2E+01	4.3E-02	4.3E-02	7.2E-04
Excavation	6000 Watt Generator	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Excavation	Water Pump	1.1E-02	3.2E-01	2.2E-01	3.7E+01	2.0E-02	2.0E-02	3.3E-04
SVE Well Installation	Bobcat with Auger (Bobcat S510)	1.3E-02	3.5E-01	2.4E-01	4.1E+01	2.2E-02	2.2E-02	3.6E-04
SVE Well Installation	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Subslab Vent Installation	Bobcat with Auger (Bobcat S510)	1.3E-02	3.5E-01	2.4E-01	4.1E+01	2.2E-02	2.2E-02	3.6E-04
Subslab Vent Installation	6000 Watt Generator	1.5E-03	4.1E-02	2.8E-02	4.8E+00	2.5E-03	2.5E-03	4.2E-05
Backfill and Compaction	Bobcat (Bobcat S510)	2.5E-02	7.0E-01	4.8E-01	8.2E+01	4.3E-02	4.3E-02	7.2E-04

Backfill and Compaction	Small Compactor (Wacker)	2.0E-03	5.6E-02	3.8E-02	6.5E+00	3.4E-03	3.4E-03	5.7E-05
Backfill and Compaction	Water Pump	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Slurry Backfill	Concrete Pump	4.6E-03	1.3E-01	8.7E-02	1.5E+01	7.8E-03	7.8E-03	1.3E-04
Site Restoration	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Site Restoration	Concrete Pump	1.1E-03	3.2E-02	2.2E-02	3.7E+00	2.0E-03	2.0E-03	3.3E-05
Street Trenching								
Street Trenching/Pipe installation	Backhoe	1.5E-01	3.7E+00	2.9E+00	5.7E+02	3.0E-01	3.0E-01	5.0E-03
Street Trenching/Pipe installation	Compressor	1.1E-01	3.1E+00	2.1E+00	3.6E+02	1.9E-01	1.9E-01	3.2E-03
Street Trenching/Pipe installation	Generator	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Street Trenching/Pipe installation	Concrete Saw	1.2E-02	2.0E-01	2.2E-01	4.4E+01	2.3E-02	2.3E-02	3.9E-04
Well Installation								
Drilling and SVE Well Installation	Drill Rig	2.1E-01	3.6E+00	3.9E+00	7.8E+02	4.1E-01	4.1E-01	6.8E-03
Street Paving								
Street - Grinding	Cold Plane Grinding Machine	7.6E-01	1.3E+01	1.4E+01	2.9E+03	1.5E+00	1.5E+00	2.5E-02
Street - Grinding	Street Sweeper	2.6E-01	4.6E+00	5.0E+00	1.0E+03	5.3E-01	5.3E-01	8.8E-03
Street - Paving	Paving Machine	1.7E-01	2.9E+00	3.2E+00	6.3E+02	3.3E-01	3.3E-01	5.6E-03
Street - Paving	Steam Roller	5.0E-02	8.7E-01	9.6E-01	1.9E+02	1.0E-01	1.0E-01	1.7E-03
Street - Paving	Street Sweeper	2.6E-01	4.6E+00	5.0E+00	1.0E+03	5.3E-01	5.3E-01	8.8E-03

Kast Air Emissions Calculations

Off-Road Emissions Calculations		8 Home Cluster Emissions (lb)						
Phase	Equipment	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1								
Demolition	Bobcat (Bobcat S510)	3.9E-02	1.1E+00	7.4E-01	1.3E+02	6.6E-02	6.6E-02	1.1E-03
Demolition	6000 Watt Generator	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Demolition	Chain Saw	2.8E-04	7.9E-03	5.4E-03	9.1E-01	4.8E-04	4.8E-04	8.0E-06
Demolition	Water Pump	1.1E-02	3.2E-01	2.2E-01	3.7E+01	2.0E-02	2.0E-02	3.3E-04
Excavation	18,000 lbs Excavator (Kubota KX80-4)	8.2E-02	2.3E+00	1.6E+00	2.7E+02	1.4E-01	1.4E-01	2.3E-03
Excavation	Bobcat (Bobcat S510)	2.5E-02	7.0E-01	4.8E-01	8.2E+01	4.3E-02	4.3E-02	7.2E-04
Excavation	6000 Watt Generator	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Excavation	Water Pump	1.1E-02	3.2E-01	2.2E-01	3.7E+01	2.0E-02	2.0E-02	3.3E-04
SVE Well Installation	Bobcat with Auger (Bobcat S510)	1.3E-02	3.5E-01	2.4E-01	4.1E+01	2.2E-02	2.2E-02	3.6E-04
SVE Well Installation	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Subslab Vent Installation	Bobcat with Auger (Bobcat S510)	1.3E-02	3.5E-01	2.4E-01	4.1E+01	2.2E-02	2.2E-02	3.6E-04
Subslab Vent Installation	6000 Watt Generator	1.5E-03	4.1E-02	2.8E-02	4.8E+00	2.5E-03	2.5E-03	4.2E-05
Backfill and Compaction	Bobcat (Bobcat S510)	2.5E-02	7.0E-01	4.8E-01	8.2E+01	4.3E-02	4.3E-02	7.2E-04
Backfill and Compaction	Small Compactor (Wacker)	2.0E-03	5.6E-02	3.8E-02	6.5E+00	3.4E-03	3.4E-03	5.7E-05
Backfill and Compaction	Water Pump	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Slurry Backfill	Concrete Pump	4.6E-03	1.3E-01	8.7E-02	1.5E+01	7.8E-03	7.8E-03	1.3E-04
Site Restoration	6000 Watt Generator	2.9E-03	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05

Site Restoration	Concrete Pump	1.1E-03	3.2E-02	2.2E-02	3.7E+00	2.0E-03	2.0E-03	3.3E-05
Street Trenching								
Street Trenching/Pipe installation	Backhoe	1.5E-01	3.7E+00	2.9E+00	5.7E+02	3.0E-01	3.0E-01	5.0E-03
Street Trenching/Pipe installation	Compressor	1.1E-01	3.1E+00	2.1E+00	3.6E+02	1.9E-01	1.9E-01	3.2E-03
Street Trenching/Pipe installation	Generator	5.7E-03	1.6E-01	1.1E-01	1.9E+01	9.8E-03	9.8E-03	1.6E-04
Street Trenching/Pipe installation	Concrete Saw	1.2E-02	2.0E-01	2.2E-01	4.4E+01	2.3E-02	2.3E-02	3.9E-04
Well Installation								
Drilling and SVE Well Installation	Drill Rig	2.1E-01	3.6E+00	3.9E+00	7.8E+02	4.1E-01	4.1E-01	6.8E-03
Street Paving								
Street - Grinding	Cold Plane Grinding Machine	7.6E-01	1.3E+01	1.4E+01	2.9E+03	1.5E+00	1.5E+00	2.5E-02
Street - Grinding	Street Sweeper	2.6E-01	4.6E+00	5.0E+00	1.0E+03	5.3E-01	5.3E-01	8.8E-03
Street - Paving	Paving Machine	1.7E-01	2.9E+00	3.2E+00	6.3E+02	3.3E-01	3.3E-01	5.6E-03
Street - Paving	Steam Roller	5.0E-02	8.7E-01	9.6E-01	1.9E+02	1.0E-01	1.0E-01	1.7E-03
Street - Paving	Street Sweeper	2.6E-01	4.6E+00	5.0E+00	1.0E+03	5.3E-01	5.3E-01	8.8E-03

Kast Air Emissions Calculations

Off-Road Emissions Calculations		Annual Emissions (lb)						
Phase	Equipment	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1								
Demolition	Bobcat (Bobcat S510)	4.6E+00	1.3E+02	8.7E+01	1.5E+04	7.9E+00	7.9E+00	1.3E-01
Demolition	6000 Watt Generator	6.8E-01	1.9E+01	1.3E+01	2.2E+03	1.2E+00	1.2E+00	1.9E-02
Demolition	Chain Saw	3.3E-02	9.3E-01	6.3E-01	1.1E+02	5.7E-02	5.7E-02	9.5E-04
Demolition	Water Pump	1.4E+00	3.8E+01	2.6E+01	4.4E+03	2.3E+00	2.3E+00	3.9E-02
Excavation	18,000 lbs Excavator (Kubota KX80-4)	7.3E+01	2.0E+03	1.4E+03	2.4E+05	1.3E+02	1.3E+02	2.1E+00
Excavation	Bobcat (Bobcat S510)	2.2E+01	6.3E+02	4.2E+02	7.3E+04	3.8E+01	3.8E+01	6.4E-01
Excavation	6000 Watt Generator	5.1E+00	1.4E+02	9.6E+01	1.6E+04	8.7E+00	8.7E+00	1.4E-01
Excavation	Water Pump	1.0E+01	2.8E+02	1.9E+02	3.3E+04	1.7E+01	1.7E+01	2.9E-01
SVE Well Installation	Bobcat with Auger (Bobcat S510)	7.4E-01	2.1E+01	1.4E+01	2.4E+03	1.3E+00	1.3E+00	2.1E-02
SVE Well Installation	6000 Watt Generator	1.7E-01	4.7E+00	3.2E+00	5.5E+02	2.9E-01	2.9E-01	4.8E-03
Subslab Vent Installation	Bobcat with Auger (Bobcat S510)	7.4E-01	2.1E+01	1.4E+01	2.4E+03	1.3E+00	1.3E+00	2.1E-02
Subslab Vent Installation	6000 Watt Generator	8.7E-02	2.4E+00	1.7E+00	2.8E+02	1.5E-01	1.5E-01	2.5E-03
Backfill and Compaction	Bobcat (Bobcat S510)	1.0E+01	2.9E+02	2.0E+02	3.4E+04	1.8E+01	1.8E+01	3.0E-01
Backfill and Compaction	Small Compactor (Wacker)	1.2E+00	3.3E+01	2.2E+01	3.8E+03	2.0E+00	2.0E+00	3.4E-02
Backfill and Compaction	Water Pump	7.2E+00	2.0E+02	1.4E+02	2.3E+04	1.2E+01	1.2E+01	2.0E-01
Slurry Backfill	Concrete Pump	7.2E+00	2.0E+02	1.4E+02	2.3E+04	1.2E+01	1.2E+01	2.0E-01
Site Restoration	6000 Watt Generator	1.7E+00	4.7E+01	3.2E+01	5.5E+03	2.9E+00	2.9E+00	4.8E-02

Site Restoration	Concrete Pump	6.8E-01	1.9E+01	1.3E+01	2.2E+03	1.2E+00	1.2E+00	1.9E-02
Street Trenching								
Street Trenching/Pipe installation	Backhoe	2.7E+01	6.7E+02	5.2E+02	1.0E+05	5.4E+01	5.4E+01	9.0E-01
Street Trenching/Pipe installation	Compressor	2.0E+01	5.6E+02	3.8E+02	6.5E+04	3.5E+01	3.5E+01	5.8E-01
Street Trenching/Pipe installation	Generator	1.0E+00	2.9E+01	2.0E+01	3.3E+03	1.8E+00	1.8E+00	2.9E-02
Street Trenching/Pipe installation	Concrete Saw	2.1E+00	3.6E+01	4.0E+01	7.9E+03	4.2E+00	4.2E+00	7.0E-02
Well Installation								
Drilling and SVE Well Installation	Drill Rig	1.3E+01	2.2E+02	2.5E+02	4.9E+04	2.6E+01	2.6E+01	4.3E-01
Street Paving								
Street - Grinding	Cold Plane Grinding Machine	3.8E+00	6.6E+01	7.2E+01	1.4E+04	7.6E+00	7.6E+00	1.3E-01
Street - Grinding	Street Sweeper	1.3E+00	2.3E+01	2.5E+01	5.0E+03	2.6E+00	2.6E+00	4.4E-02
Street - Paving	Paving Machine	1.7E+00	2.9E+01	3.2E+01	6.3E+03	3.3E+00	3.3E+00	5.6E-02
Street - Paving	Steam Roller	5.0E-01	8.7E+00	9.6E+00	1.9E+03	1.0E+00	1.0E+00	1.7E-02
Street - Paving	Street Sweeper	2.6E+00	4.6E+01	5.0E+01	1.0E+04	5.3E+00	5.3E+00	8.8E-02

Kast Air Emissions Calculations

Off-Road Emissions Calculations`				Hourly Emissions (lb)			
Phase	ROG	CO	Nox	CO2	PM10	PM2.5	Sox
Option 1							
Demolition	9.3E-03	2.6E-01	1.8E-01	3.0E+01	1.6E-02	1.6E-02	2.6E-04
Excavation	1.8E-02	5.0E-01	3.4E-01	5.7E+01	3.0E-02	3.0E-02	5.1E-04
SVE Well/Piping	6.0E-03	1.7E-01	1.1E-01	1.9E+01	1.0E-02	1.0E-02	1.7E-04
Subslab Vent Installation	4.6E-03	1.3E-01	8.8E-02	1.5E+01	7.9E-03	7.9E-03	1.3E-04
Backfill and Compaction	5.1E-03	1.4E-01	9.6E-02	1.6E+01	8.7E-03	8.7E-03	1.4E-04
Slurry Backfill	5.7E-04	1.6E-02	1.1E-02	1.9E+00	9.8E-04	9.8E-04	1.6E-05
Site Restoration	3.4E-03	9.6E-02	6.5E-02	1.1E+01	5.9E-03	5.9E-03	9.8E-05
Street Trenching							
Street Trenching/Pipe installation	4.7E-02	1.1E+00	9.0E-01	1.7E+02	9.0E-02	9.0E-02	1.5E-03
Well Installation							
Drilling and SVE Well Installation	2.6E-02	4.4E-01	4.9E-01	9.7E+01	5.1E-02	5.1E-02	8.5E-04
Street Paving							
Street - Grinding	1.3E-01	2.2E+00	2.4E+00	4.9E+02	2.6E-01	2.6E-01	4.3E-03
Street - Paving	6.0E-02	1.0E+00	1.1E+00	2.3E+02	1.2E-01	1.2E-01	2.0E-03

Off-Road Emissions Calculations				Daily Emissions (lb)			
Phase	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1							
Demolition	5.6E-02	1.6E+00	1.1E+00	1.8E+02	9.6E-02	9.6E-02	1.6E-03
Excavation	1.2E-01	3.5E+00	2.4E+00	4.0E+02	2.1E-01	2.1E-01	3.6E-03
SVE Well/Piping	1.5E-02	4.3E-01	2.9E-01	5.0E+01	2.6E-02	2.6E-02	4.4E-04
Subslab Vent Installation	1.4E-02	3.9E-01	2.7E-01	4.6E+01	2.4E-02	2.4E-02	4.0E-04
Backfill and Compaction	3.3E-02	9.2E-01	6.2E-01	1.1E+02	5.6E-02	5.6E-02	9.4E-04
Slurry Backfill	4.6E-03	1.3E-01	8.7E-02	1.5E+01	7.8E-03	7.8E-03	1.3E-04
Site Restoration	4.0E-03	1.1E-01	7.6E-02	1.3E+01	6.9E-03	6.9E-03	1.1E-04
Well Installation							
Drilling and SVE Well Installation	2.1E-01	3.6E+00	3.9E+00	7.8E+02	4.1E-01	4.1E-01	6.8E-03
Street Trenching							
Street Trenching/Pipe installation	2.8E-01	7.2E+00	5.3E+00	1.0E+03	5.3E-01	5.3E-01	8.8E-03
Street Paving							
Street - Grinding	1.0E+00	1.8E+01	2.0E+01	3.9E+03	2.1E+00	2.1E+00	3.4E-02
Street - Paving	4.8E-01	8.3E+00	9.1E+00	1.8E+03	9.6E-01	9.6E-01	1.6E-02

Kast Air Emissions Calculations

Off-Road Emissions Calculations			8 Home Cluster Emissions (lb)				
Phase	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1							
Demolition	5.6E-02	1.6E+00	1.1E+00	1.8E+02	9.6E-02	9.6E-02	1.6E-03
Excavation	1.2E-01	3.5E+00	2.4E+00	4.0E+02	2.1E-01	2.1E-01	3.6E-03
SVE Well/Piping	1.5E-02	4.3E-01	2.9E-01	5.0E+01	2.6E-02	2.6E-02	4.4E-04
Subslab Vent Installation	1.4E-02	3.9E-01	2.7E-01	4.6E+01	2.4E-02	2.4E-02	4.0E-04
Backfill and Compaction	3.3E-02	7.6E-01	5.2E-01	8.8E+01	4.6E-02	4.6E-02	7.7E-04
Slurry Backfill	4.6E-03	1.3E-01	8.7E-02	1.5E+01	7.8E-03	7.8E-03	1.3E-04
Site Restoration	4.0E-03	1.1E-01	7.6E-02	1.3E+01	6.9E-03	6.9E-03	1.1E-04
Well Installation							
Drilling and SVE Well Installation	2.1E-01	8.0E-02	5.4E-02	9.3E+00	4.9E-03	4.9E-03	8.2E-05
Street Trenching							
Street Trenching/Pipe installation	2.8E-01	7.2E+00	5.3E+00	1.0E+03	5.3E-01	5.3E-01	8.8E-03
Street Paving							
Street - Grinding	1.0E+00	1.8E+01	2.0E+01	3.9E+03	2.1E+00	2.1E+00	3.4E-02
Street - Paving	4.8E-01	8.3E+00	9.1E+00	1.8E+03	9.6E-01	9.6E-01	1.6E-02

Off-Road Emissions Calculations			Annual Emissions (lb)				
Phase	ROG	CO	NOx	CO2	PM10	PM2.5	SOx
Option 1							
Demolition	6.6E+00	1.9E+02	1.3E+02	2.2E+04	1.1E+01	1.1E+01	1.9E-01
Excavation	1.1E+02	3.1E+03	2.1E+03	3.6E+05	1.9E+02	1.9E+02	3.2E+00
SVE Well/Piping	9.1E-01	2.6E+01	1.7E+01	3.0E+03	1.6E+00	1.6E+00	2.6E-02
Subslab Vent Installation	8.3E-01	2.3E+01	1.6E+01	2.7E+03	1.4E+00	1.4E+00	2.4E-02
Backfill and Compaction	1.9E+01	5.3E+02	3.6E+02	6.1E+04	3.2E+01	3.2E+01	5.4E-01
Slurry Backfill	7.2E+00	2.0E+02	1.4E+02	2.3E+04	1.2E+01	1.2E+01	2.0E-01
Site Restoration	2.4E+00	6.6E+01	4.5E+01	7.7E+03	4.1E+00	4.1E+00	6.8E-02
Well Installation							
Drilling and SVE Well Installation	1.3E+01	2.2E+02	2.5E+02	4.9E+04	2.6E+01	2.6E+01	4.3E-01
Street Trenching							
Street Trenching/Pipe installation	5.0E+01	1.3E+03	9.6E+02	1.8E+05	9.5E+01	9.5E+01	1.6E+00
Street Paving							
Street - Grinding	5.1E+00	8.9E+01	9.8E+01	1.9E+04	1.0E+01	1.0E+01	1.7E-01
Street - Paving	4.8E+00	8.3E+01	9.1E+01	1.8E+04	9.6E+00	9.6E+00	1.6E-01

VIII. On-Site Road Emissions

Summary: This section calculates the emissions of criteria pollutants from on-site paved roads.

Emissions Factors

Running Emissions						g/mi					
Veh Class	Fuel	MdlYr	ROG	CO	NOx	CO2	PM10	PM2.5	SOx	Tire & Brake Wear PM10	Tire & Brake Wear PM2.5
LDA/LDT	All	All	6.4E-02	2.5E+00	2.8E-01	6.9E+02	3.0E-03	3.0E-04	7.0E-03	4.5E-02	1.8E-02
HHDT	DSL	All	7.8E-01	4.0E+00	1.4E+01	1.6E+03	8.0E-01	7.4E-01	1.7E-02	7.8E-02	3.1E-02
HHDT	DSL	2007	1.2E-01	8.6E-01	2.2E+00	1.6E+03	6.1E-02	5.6E-02	1.7E-02	5.9E-03	5.5E-03

Source: EMFAC 2011

Running Emissions						lbs/mi					
Veh Class	Fuel	MdlYr	ROG	CO	NOx	CO2	PM10	PM2.5	SOx	Tire & Brake Wear PM10	Tire & Brake Wear PM2.5
LDA/LDT	All	All	1.4E-04	5.5E-03	6.1E-04	1.5E+00	6.6E-06	6.6E-07	1.5E-05	9.9E-05	4.0E-05
HHDT	DSL	All	1.7E-03	8.8E-03	3.1E-02	3.6E+00	1.8E-03	1.6E-03	3.7E-05	1.7E-04	6.8E-05
HHDT	DSL	2007	2.7E-04	1.9E-03	4.8E-03	3.5E+00	1.4E-04	1.2E-04	3.7E-05	1.3E-05	1.2E-05

Source: EMFAC 2011

Heavy Truck Trip Data								SCAB			
Phase	Hourly Round Trips	Daily Round Trips	8 Home Cluster Round Trips	Annual Round Trips	Truck Type	Average Vehicle Weight (tons)	Trip length (SCAB)	Hourly VMT	Daily VMT	8 Home Cluster VMT	Annual VMT
Option 1											
Demo	1.05	8	134	991	Dump Truck	25	0.72	0.75	6	96	713

Green Waste	0.50	4	32	237	Dump Truck	25	0.72	0.36	3	23	171
Excavation	1.86	15	1,787	3,530	Dump Truck	25	0.72	1.34	11	1286	2541
SVE Well/Piping	0.1	1.1	8.5	63.2	Dump Truck	25	0.72	0.10	0.8	6	45
Subslab Vent	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill/Compact	1.99	16	1,529	3,776	Dump Truck	25	0.72	1.43	11	1101	2717
Slurry Backfill	0.64	5	287	1,214	Concrete Truck	25	0.72	0.46	4	206	874
Site Resto.	0.37	3	237	702	Concrete Truck	25	0.72	0.27	2	171	505
Street Trenching											
Demo	0.12	1	0	178	Dump Truck	25	0.72	0.09	0.7	0.00	128
Excavation	0.42	3	0	600	Dump Truck	25	0.72	0.30	2	0.00	432
Backfill	0.39	3	0	556	Dump Truck	25	0.72	0.28	2	0.00	400
Restoration	0.08	1	0	113	Concrete Truck	25	0.72	0.06	0.5	0.00	81
Pipe Delivery	0.13	1	0	180	Dump Truck	25	0.72	0.09	1	0.00	130
Well Installation											
Air Vac- Borehole Clearance	0.13	1	0	63	Air-Vac	25	0.72	0.09	1	0.00	45
Drilling and SVE Well Installation	0.13	1	0	63	Drill Rig	25	0.72	0.09	1	0.00	45
Waste Collection	0.25	2	0	126	Dump Truck	25	0.72	0.18	1	0.00	91
Street Paving											
Street Grinding	3	16	0	80	Dump Truck	25	0.72	1.92	12	0.00	58

Street Paving	1	8	0	80	Dump Truck	25	0.72	0.96	6	0.00	58
Visitor Trips											
Passenger Vehicle Trips	1.13	9	0	2,259	Passenger Vehicle	25	0.72	0.81	6	0	1626

Emissions Calculations

Hourly Truck Trip Emission Calculations (SCAB)					**lbs/hour**					
Phase	**Hourly VMT (SCAB)**	**ROG**	**CO**	**NOx**	**CO2**	**PM10**	**PM2.5**	**SOx**	**Tire & Brake Wear PM10**	**Tire & Brake Wear PM2.5**
Option 1										
Demo	0.75	2.0E-04	1.4E-03	3.6E-03	2.6E+00	1.0E-04	9.4E-05	2.8E-05	9.8E-06	9.0E-06
Green Waste	0.36	9.7E-05	6.8E-04	1.7E-03	1.3E+00	4.9E-05	4.5E-05	1.3E-05	4.7E-06	4.3E-06
Excavation	1.34	3.6E-04	2.5E-03	6.4E-03	4.7E+00	1.8E-04	1.7E-04	4.9E-05	1.8E-05	1.6E-05
SVE Well/Piping	0.10	2.6E-05	1.8E-04	4.6E-04	3.3E-01	1.3E-05	1.2E-05	3.5E-06	1.3E-06	1.2E-06
Subslab Vent	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Backfill/Compact	1.43	3.9E-04	2.7E-03	6.8E-03	5.0E+00	1.9E-04	1.8E-04	5.3E-05	1.9E-05	1.7E-05
Slurry Backfill	0.46	1.2E-04	8.8E-04	2.2E-03	1.6E+00	6.2E-05	5.7E-05	1.7E-05	6.0E-06	5.5E-06
Site Resto.	0.27	7.2E-05	5.1E-04	1.3E-03	9.3E-01	3.6E-05	3.3E-05	9.8E-06	3.5E-06	3.2E-06
Street Trenching										
Demo	0.09	2.4E-05	1.7E-04	4.2E-04	3.1E-01	1.2E-05	1.1E-05	3.3E-06	1.2E-06	1.1E-06
Excavation	0.30	8.1E-05	5.7E-04	1.4E-03	1.0E+00	4.1E-05	3.7E-05	1.1E-05	3.9E-06	3.6E-06
Backfill	0.28	7.5E-05	5.3E-04	1.3E-03	9.7E-01	3.8E-05	3.5E-05	1.0E-05	3.6E-06	3.3E-06
Restoration	0.06	1.5E-05	1.1E-04	2.7E-04	2.0E-01	7.6E-06	7.0E-06	2.1E-06	7.4E-07	6.8E-07
Pipe Delivery	0.09	2.4E-05	1.7E-04	4.3E-04	3.1E-01	1.2E-05	1.1E-05	3.3E-06	1.2E-06	1.1E-06
Well Installation										
Air Vac- Borehole Clearance	0.09	2.4E-05	1.7E-04	4.3E-04	3.1E-01	1.2E-05	1.1E-05	3.3E-06	1.2E-06	1.1E-06

Drilling and SVE Well Installation	0.09	2.4E-05	1.7E-04	4.3E-04	3.1E-01	1.2E-05	1.1E-05	3.3E-06	1.2E-06	1.1E-06
Waste Collection	0.18	4.9E-05	3.4E-04	8.5E-04	6.3E-01	2.4E-05	2.2E-05	6.6E-06	2.4E-06	2.2E-06
Street Paving										
Street Grinding	1.92	5.2E-04	3.7E-03	9.1E-03	6.7E+00	2.6E-04	2.4E-04	7.1E-05	2.5E-05	2.3E-05
Street Paving	0.96	2.6E-04	1.8E-03	4.6E-03	3.3E+00	1.3E-04	1.2E-04	3.5E-05	1.3E-05	1.2E-05
Visitor Trips										
Passenger Vehicle Trips	0.81	1.1E-04	4.5E-03	5.0E-04	1.2E+00	5.4E-06	5.4E-07	1.2E-05	8.0E-05	3.2E-05

Daily Truck Trip Emission Calculations (SCAB)					**lbs/day**					
Phase	**Daily VMT (SCAB)**	**ROG**	**CO**	**NOx**	**CO2**	**PM10**	**PM2.5**	**SOx**	**Tire & Brake Wear PM10**	**Tire & Brake Wear PM2.5**
Option 1										
Demo	6.0	1.6E-03	1.1E-02	2.9E-02	2.1E+01	8.1E-04	7.5E-04	2.2E-04	7.9E-05	7.2E-05
Green Waste	2.9	7.8E-04	5.5E-03	1.4E-02	1.0E+01	3.9E-04	3.6E-04	1.1E-04	3.8E-05	3.5E-05
Excavation	10.7	2.9E-03	2.0E-02	5.1E-02	3.7E+01	1.4E-03	1.3E-03	4.0E-04	1.4E-04	1.3E-04
SVE Well/Piping	0.8	2.1E-04	1.5E-03	3.6E-03	2.7E+00	1.0E-04	9.5E-05	2.8E-05	1.0E-05	9.2E-06
Subslab Vent	0.0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Backfill/Compact	11.5	3.1E-03	2.2E-02	5.4E-02	4.0E+01	1.5E-03	1.4E-03	4.2E-04	1.5E-04	1.4E-04
Slurry Backfill	3.7	1.0E-03	7.0E-03	1.8E-02	1.3E+01	5.0E-04	4.6E-04	1.4E-04	4.8E-05	4.4E-05
Site Resto.	2.1	5.8E-04	4.1E-03	1.0E-02	7.4E+00	2.9E-04	2.6E-04	7.9E-05	2.8E-05	2.6E-05
Street Trenching										
Demo	0.7	1.9E-04	1.4E-03	3.4E-03	2.5E+00	9.6E-05	8.8E-05	2.6E-05	9.3E-06	8.6E-06
Excavation	2.4	6.5E-04	4.6E-03	1.1E-02	8.3E+00	3.2E-04	3.0E-04	8.9E-05	3.1E-05	2.9E-05
Backfill	2.2	6.0E-04	4.2E-03	1.1E-02	7.7E+00	3.0E-04	2.8E-04	8.2E-05	2.9E-05	2.7E-05
Restoration	0.5	1.2E-04	8.6E-04	2.1E-03	1.6E+00	6.1E-05	5.6E-05	1.7E-05	5.9E-06	5.4E-06
Pipe Delivery	0.7	1.9E-04	1.4E-03	3.4E-03	2.5E+00	9.7E-05	8.9E-05	2.7E-05	9.4E-06	8.7E-06
Well Installation										
Air Vac- Borehole Clearance	0.7	1.9E-04	1.4E-03	3.4E-03	2.5E+00	9.7E-05	8.9E-05	2.7E-05	9.4E-06	8.7E-06

Drilling and SVE Well Installation	0.7	1.9E-04	1.4E-03	3.4E-03	2.5E+00	9.7E-05	8.9E-05	2.7E-05	9.4E-06	8.7E-06
Waste Collection	1.4	3.9E-04	2.7E-03	6.8E-03	5.0E+00	1.9E-04	1.8E-04	5.3E-05	1.9E-05	1.7E-05
Street Paving										
Street Grinding	11.5	3.1E-03	2.2E-02	5.5E-02	4.0E+01	1.6E-03	1.4E-03	4.2E-04	1.5E-04	1.4E-04
Street Paving	5.8	1.6E-03	1.1E-02	2.7E-02	2.0E+01	7.8E-04	7.2E-04	2.1E-04	7.5E-05	6.9E-05
Visitor Trips										
Passenger Vehicle Trips	6.5	9.1E-04	3.6E-02	4.0E-03	9.9E+00	4.3E-05	4.3E-06	1.0E-04	6.4E-04	2.6E-04

8 Home Cluster Truck Trip Emission Calculations (SCAB)					**lbs/8 Home Cluster**					
Phase	**8 Home Cluster VMT (SCAB)**	**ROG**	**CO**	**NOx**	**CO2**	**PM10**	**PM2.5**	**SOx**	**Tire & Brake Wear PM10**	**Tire & Brake Wear PM2.5**
Option 1										
Demo	96	2.6E-02	1.8E-01	4.6E-01	3.3E+02	1.3E-02	1.2E-02	3.6E-03	1.3E-03	1.2E-03
Green Waste	23	6.2E-03	4.4E-02	1.1E-01	8.0E+01	3.1E-03	2.9E-03	8.5E-04	3.0E-04	2.8E-04
Excavation	1286	3.5E-01	2.4E+00	6.1E+00	4.5E+03	1.7E-01	1.6E-01	4.7E-02	1.7E-02	1.5E-02
SVE Well/Piping	6	1.7E-03	1.2E-02	2.9E-02	2.1E+01	8.3E-04	7.6E-04	2.3E-04	8.0E-05	7.4E-05
Subslab Vent	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Backfill/Compact	1101	3.0E-01	2.1E+00	5.2E+00	3.8E+03	1.5E-01	1.4E-01	4.1E-02	1.4E-02	1.3E-02
Slurry Backfill	206	5.6E-02	3.9E-01	9.8E-01	7.2E+02	2.8E-02	2.6E-02	7.6E-03	2.7E-03	2.5E-03
Site Resto.	171	4.6E-02	3.2E-01	8.1E-01	5.9E+02	2.3E-02	2.1E-02	6.3E-03	2.2E-03	2.1E-03
Street Trenching										
Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Restoration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Delivery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well Installation										
Air Vac- Borehole Clearance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Drilling and SVE Well Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste Collection	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street Paving										
Street Grinding	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Visitor Trips										
Passenger Vehicle Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Annual Truck Trip Emission Calculations (SCAB)					**lbs/year**					
Phase	**Annual VMT (SCAB)**	**ROG**	**CO**	**NOx**	**CO2**	**PM10**	**PM2.5**	**SOx**	**Tire & Brake Wear PM10**	**Tire & Brake Wear PM2.5**
Option 1										
Demo	713	1.9E-01	1.4E+00	3.4E+00	2.5E+03	9.6E-02	8.9E-02	2.6E-02	9.3E-03	8.6E-03
Green Waste	171	4.6E-02	3.2E-01	8.1E-01	5.9E+02	2.3E-02	2.1E-02	6.3E-03	2.2E-03	2.1E-03
Excavation	2541	6.9E-01	4.8E+00	1.2E+01	8.8E+03	3.4E-01	3.2E-01	9.4E-02	3.3E-02	3.1E-02
SVE Well/Piping	45	1.2E-02	8.7E-02	2.2E-01	1.6E+02	6.1E-03	5.7E-03	1.7E-03	5.9E-04	5.5E-04
Subslab Vent	0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Backfill/Compact	2717	7.4E-01	5.2E+00	1.3E+01	9.4E+03	3.7E-01	3.4E-01	1.0E-01	3.6E-02	3.3E-02
Slurry Backfill	874	2.4E-01	1.7E+00	4.2E+00	3.0E+03	1.2E-01	1.1E-01	3.2E-02	1.1E-02	1.1E-02
Site Resto.	505	1.4E-01	9.6E-01	2.4E+00	1.8E+03	6.8E-02	6.3E-02	1.9E-02	6.6E-03	6.1E-03
Street Trenching										
Demo	128	3.5E-02	2.4E-01	6.1E-01	4.5E+02	1.7E-02	1.6E-02	4.7E-03	1.7E-03	1.5E-03
Excavation	432	1.2E-01	8.2E-01	2.1E+00	1.5E+03	5.8E-02	5.4E-02	1.6E-02	5.6E-03	5.2E-03
Backfill	400	1.1E-01	7.6E-01	1.9E+00	1.4E+03	5.4E-02	5.0E-02	1.5E-02	5.2E-03	4.8E-03
Restoration	81	2.2E-02	1.5E-01	3.9E-01	2.8E+02	1.1E-02	1.0E-02	3.0E-03	1.1E-03	9.8E-04
Pipe Delivery	130	3.5E-02	2.5E-01	6.2E-01	4.5E+02	1.8E-02	1.6E-02	4.8E-03	1.7E-03	1.6E-03
Well Installation										
Air Vac- Borehole Clearance	45	1.2E-02	8.6E-02	2.2E-01	1.6E+02	6.1E-03	5.6E-03	1.7E-03	5.9E-04	5.5E-04

Drilling and SVE Well Installation	45	1.2E-02	8.6E-02	2.2E-01	1.6E+02	6.1E-03	5.6E-03	1.7E-03	5.9E-04	5.5E-04
Waste Collection	91	2.5E-02	1.7E-01	4.3E-01	3.2E+02	1.2E-02	1.1E-02	3.3E-03	1.2E-03	1.1E-03
Street Paving										
Street Grinding	58	1.6E-02	1.1E-01	2.7E-01	2.0E+02	7.8E-03	7.2E-03	2.1E-03	7.5E-04	6.9E-04
Street Paving	58	1.6E-02	1.1E-01	2.7E-01	2.0E+02	7.8E-03	7.2E-03	2.1E-03	7.5E-04	6.9E-04
Visitor Trips										
Passenger Vehicle Trips	1626	2.3E-01	9.0E+00	1.0E+00	2.5E+03	1.1E-02	1.1E-03	2.5E-02	1.6E-01	6.5E-02

Misc Worker Trips

Worker Trip Emission Calculations (SCAB)							**lbs/hour**					
Phase	**Worker Round Trips per hour**	**Roundtrip Distance per Worker (mi)**	**VMT per Hour**	**ROG**	**CO**	**NOx**	**CO2**	**PM10**	**PM2.5**	**SOx**	**Tire & Brake Wear PM10**	**Tire & Brake Wear PM2.5**
Option 1	4	0.72	3	4.1E-04	1.6E-02	1.8E-03	4.4E+00	1.9E-05	1.9E-06	4.4E-05	2.9E-04	1.1E-04
Street Trenching	5.25	0.72	4	5.3E-04	2.1E-02	2.3E-03	5.8E+00	2.5E-05	2.5E-06	5.8E-05	3.7E-04	1.5E-04
Well Installation	5	0.72	4	5.0E-04	1.9E-02	2.2E-03	5.4E+00	2.3E-05	2.3E-06	5.4E-05	3.5E-04	1.4E-04
Street Paving												
Street Grinding	3	0.72	2	2.7E-04	1.1E-02	1.2E-03	2.9E+00	1.3E-05	1.3E-06	3.0E-05	1.9E-04	7.6E-05
Street Paving	3	0.72	2	2.7E-04	1.1E-02	1.2E-03	2.9E+00	1.3E-05	1.3E-06	3.0E-05	1.9E-04	7.6E-05

Worker Trip Emission Calculations (SCAB)							**lbs/day**					
Phase	**Worker Round Trips per day**	**Roundtrip Distance per Worker (mi)**	**VMT per Day**	**ROG**	**CO**	**NOx**	**CO2**	**PM10**	**PM2.5**	**SOx**	**Tire & Brake Wear PM10**	**Tire & Brake Wear PM2.5**
Option 1	32	0.72	23	3.2E-03	1.3E-01	1.4E-02	3.5E+01	1.5E-04	1.5E-05	3.6E-04	2.3E-03	9.1E-04
Street Trenching	42	0.72	30	4.3E-03	1.7E-01	1.9E-02	4.6E+01	2.0E-04	2.0E-05	4.7E-04	3.0E-03	1.2E-03
Well Installation	39	0.72	28	4.0E-03	1.6E-01	1.7E-02	4.3E+01	1.9E-04	1.9E-05	4.3E-04	2.8E-03	1.1E-03
Street Paving												

Street Grinding	16	0.72	12	1.6E-03	6.4E-02	7.1E-03	1.8E+01	7.6E-05	7.6E-06	1.8E-04	1.1E-03	4.6E-04
Street Paving	16	0.72	12	1.6E-03	6.4E-02	7.1E-03	1.8E+01	7.6E-05	7.6E-06	1.8E-04	1.1E-03	4.6E-04

Worker Trip Emission Calculations (SCAB) — **lbs/8 Home Cluster**

Phase	Worker Round Trips per day	Roundtrip Distance per Worker (mi)	VMT per Day	ROG	CO	NOx	CO2	PM10	PM2.5	SOx	Tire & Brake Wear PM10	Tire & Brake Wear PM2.5
Option 1	12,544	0.72	9028	1.3E+00	5.0E+01	5.5E+00	1.4E+04	6.0E-02	6.0E-03	1.4E-01	9.0E-01	3.6E-01
Street Trenching	0.00	0.00	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Well Installation	0.00	0.00	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Street Paving												
Street Grinding	0.00	0.00	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Street Paving	0.00	0.00	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Worker Trip Emission Calculations (SCAB) — **lbs/year**

Phase	Worker Round Trips per year	Roundtrip Distance per Worker (mi)	VMT per Year	ROG	CO	NOx	CO2	PM10	PM2.5	SOx	Tire & Brake Wear PM10	Tire & Brake Wear PM2.5
Option 1	8,032	0.72	5781	8.2E-01	3.2E+01	3.5E+00	8.8E+03	3.8E-02	3.8E-03	8.9E-02	5.7E-01	2.3E-01
Street Trenching	7,560	0.72	5441	7.7E-01	3.0E+01	3.3E+00	8.3E+03	3.6E-02	3.6E-03	8.4E-02	5.4E-01	2.2E-01
Well Installation	2,457	0.72	1768	2.5E-01	9.8E+00	1.1E+00	2.7E+03	1.2E-02	1.2E-03	2.7E-02	1.8E-01	7.0E-02
Street Paving												
Street Grinding	80	0.72	58	8.1E-03	3.2E-01	3.5E-02	8.8E+01	3.8E-04	3.8E-05	8.9E-04	5.7E-03	2.3E-03
Street Paving	160	0.72	115	1.6E-02	6.4E-01	7.1E-02	1.8E+02	7.6E-04	7.6E-05	1.8E-03	1.1E-02	4.6E-03

VIIII. On-Site Road - Reentrained Dust

Summary: This section calculates the emissions of re-entrained dust from on-site on road vehicles on paved roads.

$$E = [k(sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$$

Where:

E = size-specific emission factor (lb/VMT)

k = particle size multiplier

sL = road surface silt loading (g/m^2)

W = mean vehicle weight (tons)

P = averaging period (365 days)

N = number of "wet" days (>0.01 in of precipitation)

Source: AP-42 13.2.1-2, Equation (1). January 2011.

Correction:

P = number of wet days

N = number of days in period

Assumptions			
Parameter	**Value**	**Units**	**Reference**
Heavy Vehicle Weight (tons)	25	tons	Assumed
k (empirical constant) - PM10	0.0022	-	AP-42, Chapter 13.2.1, Table 13.2.1-1. PM10
k (empirical constant) -	0.00054	-	AP-42, Chapter 13.2.1, Table 13.2.1-1. PM2.5
sL (Haul Trucks)	0.02	g/m2	CARB Entrained Paved Road Dust. (1997) Silt loading for freeways:
sL (Worker Vehicles)	0.1	g/m2	CalEEMod Default for Worker trips (Assumes mix of freeway and surface street travel)
P (averaging period)	365	days	Days per year
N (wet days)	40	days	AP-42, Chapter 13.2.1, Figure 13.2.1-2. January
On-Site Heavy Truck Haul	0.72	miles	Measured distance from the furthest northern and southern homes in the community.
Employee/Worker Trip	0.72	miles	Measured distance from the furthest northern and southern homes in the community.
Paved Road Average Vehicle	2.4	tons	CalEEMod default average vehicle weight (tons)

Phase	Hourly Round Trips	Daily Round Trips	8 Home Cluster Round Trips	Annual Round Trips	Truck Type	Average Vehicle Weight (tons)	SCAB Round Trip length (SCAB)	Hourly VMT	Daily VMT	8 Home Cluster VMT	Annual VMT
Option 1											
Demo	1.0	8.4	133.8	991.1	Dump Truck	25	0.72	0.8	6.0	96.3	713.3
Green Waste	0.5	4.0	32.0	237.0	Dump Truck	25	0.72	0.4	2.9	23.0	170.6
Excavation	1.9	14.9	1787.5	3530.3	Dump Truck	25	0.72	1.3	10.7	1286.4	2540.7
SVE Well/Piping	0.1	1.1	8.5	63.2	Dump Truck	25	0.72	0.1	0.8	6.1	45.5
Subslab Vent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill/Compact	2.0	15.9	1529.4	3775.8	Dump Truck	25	0.72	1.4	11.5	1100.7	2717.4
Slurry Backfill	0.6	5.1	286.8	1213.8	Concrete Truck	25	0.72	0.5	3.7	206.4	873.6
Site Resto.	0.4	3.0	237.0	702.0	Concrete Truck	25	0.72	0.3	2.1	170.5	505.2
Street Trenching											
Demo	0.1	1.0	0.00	178.0	Dump Truck	25	0.72	0.1	0.7	0.00	128.1
Excavation	0.4	3.3	0.00	600.0	Dump Truck	25	0.72	0.3	2.4	0.00	431.8
Backfill	0.4	3.1	0.00	556.0	Dump Truck	25	0.72	0.3	2.2	0.00	400.2
Restoration	0.1	0.6	0.00	113.0	Concrete Truck	25	0.72	0.1	0.5	0.00	81.3
Pipe Delivery	0.1	1.0	0.00	180.0	Dump Truck	25	0.72	0.1	0.7	0.00	129.5
Well Installation											
Air Vac- Borehole Clearance	0.1	1.0	0.00	63.0	Air-Vac	25	0.72	0.1	0.7	0.00	45.3
Drilling and SVE Well Installation	0.1	1.0	0.00	63.0	Drill Rig	25	0.72	0.1	0.7	0.00	45.3

Waste Collection	0.3	2.0	0.00	126.0	Dump Truck	25	0.72	0.2	1.4	0.00	90.7
Street Paving											
Street Grinding	2.7	16.0	0.00	80.0	Dump Truck	25	0.72	1.9	11.5	0.00	57.6
Street Paving	1.3	8.0	0.00	80.0	Dump Truck	25	0.72	1.0	5.8	0.00	57.6

Emission Calculation

Hourly:

Phase	Hourly VMT (SCAB)	sL (g/M^2)	W (tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. Period	PM10 EF (lbs/mi.)	PM2.5 EF (lbs/mi.)	SCAB Pm10 Emissions	SCAB PM2.5 Emissions
Option 1											
Demo	0.8	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.56E-05	1.12E-05
Green Waste	0.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.18E-05	5.36E-06
Excavation	1.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	8.13E-05	1.99E-05
SVE Well/Piping	0.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.82E-06	1.43E-06
Subslab Vent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill/Compact	1.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	8.69E-05	2.13E-05
Slurry Backfill	0.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.79E-05	6.86E-06
Site Resto.	0.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.62E-05	3.97E-06
Street Trenching											
Demo	0.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.39E-06	1.32E-06
Excavation	0.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.82E-05	4.46E-06
Backfill	0.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.68E-05	4.14E-06
Restoration	0.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.42E-06	8.41E-07
Pipe Delivery	0.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.46E-06	1.34E-06
Well Installation											
Air Vac- Borehole Clearance	0.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.46E-06	1.34E-06
Drilling and SVE Well Installation	0.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.46E-06	1.34E-06
Waste Collection	0.2	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.09E-05	2.68E-06

Street Paving											
Street Grinding	1.9	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.16E-04	2.86E-05
Street Paving	1.0	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.82E-05	1.43E-05

Daily:

Phase	Daily VMT (SCAB)	sL (g/M^2)	W (tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. Period	PM10 EF (lbs/mi.)	PM2.5 EF (lbs/mi.)	SCAB Pm10 Emissions	SCAB PM2.5 Emissions
Option 1											
Demo	6.0	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.65E-04	8.96E-05
Green Waste	2.9	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.75E-04	4.28E-05
Excavation	10.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	6.50E-04	1.60E-04
SVE Well/Piping	0.8	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.65E-05	1.14E-05
Subslab Vent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill/Compact	11.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	6.95E-04	1.71E-04
Slurry Backfill	3.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.24E-04	5.49E-05
Site Resto.	2.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.29E-04	3.17E-05
Street Trenching											
Demo	0.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.32E-05	1.06E-05
Excavation	2.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.45E-04	3.57E-05
Backfill	2.2	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.35E-04	3.31E-05
Restoration	0.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.74E-05	6.72E-06
Pipe Delivery	0.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.36E-05	1.07E-05
Well Installation											
Air Vac- Borehole Clearance	0.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.36E-05	1.07E-05
Drilling and SVE Well Installation	0.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.36E-05	1.07E-05
Waste Collection	1.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	8.73E-05	2.14E-05
Street Paving											
Street Grinding	11.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	6.98E-04	1.71E-04
Street Paving	5.8	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.49E-04	8.57E-05

8 Home Cluster:

Phase	Annual VMT (SCAB)	sL (g/M^2)	W (tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. Period	PM10 EF (lbs/mi.)	PM2.5 EF (lbs/mi.)	SCAB Pm10 Emissions	SCAB PM2.5 Emissions
Option 1											
Demo	96.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.84E-03	1.43E-03
Green Waste	23.0	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.40E-03	3.43E-04
Excavation	1286.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	7.80E-02	1.91E-02
SVE Well/Piping	6.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.72E-04	9.14E-05
Subslab Vent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill/Compact	1100.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	6.67E-02	1.64E-02
Slurry Backfill	206.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.25E-02	3.07E-03
Site Resto.	170.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.03E-02	2.54E-03
Street Trenching											
Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Restoration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Delivery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well Installation											
Air Vac- Borehole Clearance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drilling and SVE Well Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste Collection	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street Paving											
Street Grinding	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Annual:

Phase	Annual VMT (SCAB)	sL (g/M^2)	W (tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. Period	PM10 EF (lbs/mi.)	PM2.5 EF (lbs/mi.)	SCAB Pm10 Emissions	SCAB PM2.5 Emissions
Option 1											
Demo	713.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.33E-02	1.06E-02
Green Waste	170.6	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.03E-02	2.54E-03
Excavation	2540.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.54E-01	3.78E-02
SVE Well/Piping	45.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.76E-03	6.77E-04
Subslab Vent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backfill/Compact	2717.4	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	1.65E-01	4.04E-02
Slurry Backfill	873.6	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.30E-02	1.30E-02
Site Resto.	505.2	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.06E-02	7.52E-03
Street Trenching											
Demo	128.1	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	7.77E-03	1.91E-03
Excavation	431.8	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.62E-02	6.43E-03
Backfill	400.2	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.43E-02	5.96E-03
Restoration	81.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	4.93E-03	1.21E-03
Pipe Delivery	129.5	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	7.86E-03	1.93E-03
Well Installation											
Air Vac- Borehole Clearance	45.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.75E-03	6.75E-04
Drilling and SVE Well Installation	45.3	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	2.75E-03	6.75E-04
Waste Collection	90.7	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	5.50E-03	1.35E-03
Street Paving											
Street Grinding	57.6	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.49E-03	8.57E-04
Street Paving	57.6	0.00054	25	0.0022	0.00054	40	365	6.06E-05	1.49E-05	3.49E-03	8.57E-04

Hourly Worker Trip Emissions:

Phase	Worker Trips per Hour	Round Trip per Worker (mile)	VMT per Hour	SL (g/m^2)	W (Tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. period	PM10 EF lbs/mi	PM2.5 EF lbs/mi	SCAB PM10 Emissions	SCAB PM2.5 Emissions
Option 1	4	0.72	3	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	4.28E-04	1.05E-04
Street Trenching	5	0.72	4	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	5.62E-04	1.38E-04
Well Installation	5	0.72	4	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	5.21E-04	1.28E-04
Street Paving													
Street Grinding	3	0.72	2	0.02	2.40	0.0022	0.00054	40	368	1.49E-04	3.65E-05	2.85E-04	7.00E-05
Street Paving	3	0.72	2	0.02	2.40	0.0022	0.00054	40	369	1.49E-04	3.65E-05	2.85E-04	7.00E-05

Daily Worker Trip Emissions:

Phase	Worker Trips per Day	Round Trip per Worker (mile)	VMT per Hour	SL (g/m^2)	W (Tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. period	PM10 EF lbs/mi	PM2.5 EF lbs/mi	SCAB PM10 Emissions	SCAB PM2.5 Emissions
Option 1	32	0.72	23	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	3.42E-03	8.40E-04
Street Trenching	42	0.72	30	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	4.49E-03	1.10E-03
Well Installation	39	0.72	28	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	4.17E-03	1.02E-03
Street Paving													
Street Grinding	16	0.72	12	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	1.71E-03	4.20E-04
Street Paving	16	0.72	12	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	1.71E-03	4.20E-04

8 Home Cluster Worker Trip Emissions:

Phase	Worker Trips per Day	Round Trip per Worker (mile)	VMT per Hour	SL (g/m^2)	W (Tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. period	PM10 EF lbs/mi	PM2.5 EF lbs/mi	SCAB PM10 Emissions	SCAB PM2.5 Emissions
Option 1	12544	0.72	9028	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	1.34E+00	3.29E-01
Street Trenching	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street Paving													
Street Grinding	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Annual Worker Trip Emissions:

Phase	Worker Trips per Year	Round Trip per Worker (mile)	VMT per Hour	SL (g/m^2)	W (Tons)	k (PM10)	k (PM2.5)	Wet Days	Avg. period	PM10 EF lbs/mi	PM2.5 EF lbs/mi	SCAB PM10 Emissions	SCAB PM2.5 Emissions
Option 1	8,032	0.72	5781	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	8.59E-01	2.11E-01
Street Trenching	7,560	0.72	5441	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	8.09E-01	1.98E-01
Well Installation	2,457	0.72	1768	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	2.63E-01	6.45E-02
Street Paving													
Street Grinding	80	0.72	58	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	8.56E-03	2.10E-03
Street Paving	160	0.72	115	0.02	2.40	0.0022	0.00054	40	365	1.49E-04	3.65E-05	1.71E-02	4.20E-03

V. VOC Emission Calculations

General Assumptions

Parameter	Value	Units	References
Hours per Day	8	hours	Hours of work 8am-4pm

Excavated Surface Volatilization Assumptions

Parameter	Value	Units	References
Layer Thickness	304.8	cm	10 feet of excavation
Stabilizer	91%	%	Apply stabilizer on inactive areas. Source: USEPA, Control of Air Emissions from Superfund Sites, (1992). Long-term VOC control efficiency ranges from 91 to 100%.
Work Days in year	251	days	

Excavated Surfaces VOC Emissions

Equation:

Active Area Emissions (lb/time) = tXVFXAs

None-Active Area Emissions (lb/time) = (1-MR)xtXVFXAs

Where:

MR = stabilized mitigation

t = time conversion factor (e.g. Hours/day, days/year)

VF = volatility factor output from EMSOFT model (mg/cm^2-day)

As = surface area of volatilization (cm^2)

Phase	Duration (days)	Hourly QTY Excavated (CY)	Daily QTY Excavated (CY)	Yearly QTY Excavated (CY)	Hourly Excavated/Disturbed Surface Area (cm^2)	Daily Previously Excavated/Disturbed Surface Area (cm^2)	Yearly Excavated/Disturbed Surface Area (cm^2)	Stabilized Mitigation (% Reduction)
Option 1 - Excavati	889	7	209	49,423	1.76E+04	5.23E+05	1.24E+08	91%
Street Trenching	180	6	45	8,100	1.41E+04	1.13E+05	2.03E+07	91%

Kast VOC Emissions Calculations

Volatilization Factor Calculations:

CAS #	Chemical	Chemical UCL Concentration (mg/kg)	Volatilization Factors					
			VF1day [1 day avg.] (mg/cm^2-day)	VF1day [workday] (lbs/cm^2-day)	VF1day [off-workday] (lbs/cm^2-day)	VF1hr [0.1 day avg.] (mg/cm^2-day)	VF1hr [workday] (lbs/cm^2-day)	VF1hr [off-workday] (lbs/cm^2-day)
Option 1 - Excavation								
100-41-4	Ethylbenzene	5.00E-01	8.72E-03	6.41E-09	2.88E-08	2.74E-02	2.01E-08	4.03E-08
106-46-7	1,4-Dichlorobenzene	5.90E-04	4.35E-06	3.20E-12	1.44E-11	1.36E-05	9.97E-12	1.99E-11
107-06-2	1,2-Dichloroethane	4.70E-04	8.52E-06	6.26E-12	2.82E-11	2.68E-05	1.97E-11	3.94E-11
108-67-8	1,3,5-Trimethylbenzene	1.90E-01	1.39E-03	1.02E-09	4.59E-09	4.32E-03	3.18E-09	6.35E-09
108-88-3	Toluene	1.20E-01	2.74E-03	2.01E-09	9.05E-09	8.61E-03	6.33E-09	1.27E-08
127-18-4	Tetrachloroethene	1.30E-02	4.34E-04	3.19E-10	1.44E-09	1.37E-03	1.01E-09	2.01E-09
129-00-0	Pyrene	1.00E+00	7.21E-06	5.29E-12	2.38E-11	8.66E-06	6.37E-12	1.27E-11
1330-20-7	Xylenes, Total	7.69E-01	1.29E-02	9.51E-09	4.28E-08	4.07E-02	2.99E-08	5.98E-08
156-59-2	cis-1,2-Dichloroethene	5.60E-04	1.50E-05	1.10E-11	4.96E-11	4.73E-05	3.47E-11	6.95E-11
71-43-2	Benzene	1.70E-01	5.09E-03	3.74E-09	1.68E-08	1.60E-02	1.18E-08	2.36E-08
74-83-9	Bromomethane	5.80E-03	2.12E-04	1.56E-10	7.01E-10	6.68E-04	4.91E-10	9.82E-10
75-01-4	Vinyl Chloride	2.41E-04	1.59E-05	1.17E-11	5.26E-11	5.03E-05	3.69E-11	7.39E-11
75-09-2	Methylene Chloride	3.20E-03	8.78E-05	6.45E-11	2.90E-10	2.76E-04	2.03E-10	4.06E-10
75-27-4	Bromodichloromethane	2.40E-04	2.40E-06	1.76E-12	7.92E-12	7.50E-06	5.51E-12	1.10E-11
75-65-0	tert-Butyl Alcohol (TBA)	4.80E-03	2.50E-05	1.84E-11	8.27E-11	7.75E-05	5.70E-11	1.14E-10
78-87-5	1,2-Dichloropropane	3.60E-04	7.84E-06	5.76E-12	2.59E-11	2.47E-05	1.81E-11	3.62E-11
79-01-6	Trichloroethene	7.40E-04	2.00E-05	1.47E-11	6.61E-11	6.29E-05	4.63E-11	9.25E-11
79-34-5	1,1,2,2-Tetrachloroethane	4.80E-04	2.97E-06	2.18E-12	9.83E-12	9.23E-06	6.79E-12	1.36E-11
90-12-0	1-Methylnaphthalene	2.60E+00	5.48E-03	4.02E-09	1.81E-08	1.05E-02	7.68E-09	1.54E-08
91-20-3	Naphthalene	1.50E+00	2.60E-03	1.91E-09	8.60E-09	8.22E-02	6.04E-08	1.21E-07
91-57-6	2-Methylnaphthalene	3.90E+00	5.48E-03	4.02E-09	1.81E-08	1.61E-02	1.18E-08	2.37E-08
95-63-6	1,2,4-Trimethylbenzene	7.80E-01	5.86E-03	4.31E-09	1.94E-08	1.83E-02	1.34E-08	2.69E-08
96-18-4	1,2,3-Trichloropropane	6.40E-04	6.21E-06	4.56E-12	2.05E-11	1.94E-05	1.43E-11	2.85E-11

Kast VOC Emissions Calculations

Street Trenching - Excavation

CAS #	Chemical	Chemical UCL Concentration (mg/kg)	Volatilization Factors					
			VF1day [1 day avg.] (mg/cm^2-day)	VF1day [workday] (lbs/cm^2-day)	VF1day [off-workday] (lbs/cm^2-day)	VF1hr [0.1 day avg.] (mg/cm^2-day)	VF1hr [workday] (lbs/cm^2-day)	VF1hr [off-workday] (lbs/cm^2-day)
100-41-4	Ethylbenzene	5.00E-01	8.72E-03	6.41E-09	2.88E-08	2.74E-02	2.01E-08	4.03E-08
106-46-7	1,4-Dichlorobenzene	5.90E-04	4.35E-06	3.20E-12	1.44E-11	1.36E-05	9.97E-12	1.99E-11
107-06-2	1,2-Dichloroethane	4.70E-04	8.52E-06	6.26E-12	2.82E-11	2.68E-05	1.97E-11	3.94E-11
108-67-8	1,3,5-Trimethylbenzene	1.90E-01	1.39E-03	1.02E-09	4.59E-09	4.32E-03	3.18E-09	6.35E-09
108-88-3	Toluene	1.20E-01	2.74E-03	2.01E-09	9.05E-09	8.61E-03	6.33E-09	1.27E-08
127-18-4	Tetrachloroethene	1.30E-02	4.34E-04	3.19E-10	1.44E-09	1.37E-03	1.01E-09	2.01E-09
129-00-0	Pyrene	1.00E+00	7.21E-06	5.29E-12	2.38E-11	8.66E-06	6.37E-12	1.27E-11
1330-20-7	Xylenes, Total	7.69E-01	1.29E-02	9.51E-09	4.28E-08	4.07E-02	2.99E-08	5.98E-08
156-59-2	cis-1,2-Dichloroethene	5.60E-04	1.50E-05	1.10E-11	4.96E-11	4.73E-05	3.47E-11	6.95E-11
71-43-2	Benzene	1.70E-01	5.09E-03	3.74E-09	1.68E-08	1.60E-02	1.18E-08	2.36E-08
74-83-9	Bromomethane	5.80E-03	2.12E-04	1.56E-10	7.01E-10	6.68E-04	4.91E-10	9.82E-10
75-01-4	Vinyl Chloride	2.41E-04	1.59E-05	1.17E-11	5.26E-11	5.03E-05	3.69E-11	7.39E-11
75-09-2	Methylene Chloride	3.20E-03	8.78E-05	6.45E-11	2.90E-10	2.76E-04	2.03E-10	4.06E-10
75-27-4	Bromodichloromethane	2.40E-04	2.40E-06	1.76E-12	7.92E-12	7.50E-06	5.51E-12	1.10E-11
75-65-0	tert-Butyl Alcohol (TBA)	4.80E-03	2.50E-05	1.84E-11	8.27E-11	7.75E-05	5.70E-11	1.14E-10
78-87-5	1,2-Dichloropropane	3.60E-04	7.84E-06	5.76E-12	2.59E-11	2.47E-05	1.81E-11	3.62E-11
79-01-6	Trichloroethene	7.40E-04	2.00E-05	1.47E-11	6.61E-11	6.29E-05	4.63E-11	9.25E-11
79-34-5	1,1,2,2-Tetrachloroethane	4.80E-04	2.97E-06	2.18E-12	9.83E-12	9.23E-06	6.79E-12	1.36E-11
90-12-0	1-Methylnaphthalene	2.60E+00	5.48E-03	4.02E-09	1.81E-08	1.05E-02	7.68E-09	1.54E-08
91-20-3	Naphthalene	1.50E+00	2.60E-03	1.91E-09	8.60E-09	8.22E-02	6.04E-08	1.21E-07
91-57-6	2-Methylnaphthalene	3.90E+00	5.48E-03	4.02E-09	1.81E-08	1.61E-02	1.18E-08	2.37E-08
95-63-6	1,2,4-Trimethylbenzene	7.80E-01	5.86E-03	4.31E-09	1.94E-08	1.83E-02	1.34E-08	2.69E-08
96-18-4	1,2,3-Trichloropropane	6.40E-04	6.21E-06	4.56E-12	2.05E-11	1.94E-05	1.43E-11	2.85E-11

Kast VOC Emissions Calculations

VOC Emission Calculations:

CAS #	Chemical	VOC Emission Rates								
		Active Area Emissions (lbs/hour)	Non-Active Area Emissions (lbs/hour)	Total Area Emissions (lbs/hour)	Active Area Emissions (lbs/day)	Non-Active Area Emissions (lbs/day)	Total Area Emissions (lbs/day)	Active Area Emissions (lbs/year)	Non-Active Area Emissions (lbs/year)	Total Area Emissions (lbs/year)
Option 1 - Excavation										
100-41-4	Ethylbenzene	3.54E-04	6.37E-05	4.17E-04	3.35E-03	1.36E-03	4.71E-03	1.99E+02	1.79E+01	2.17E+02
106-46-7	1,4-Dichlorobenzene	1.75E-07	3.15E-08	2.07E-07	1.67E-06	6.78E-07	2.35E-06	9.96E-02	8.96E-03	1.09E-01
107-06-2	1,2-Dichloroethane	3.46E-07	6.22E-08	4.08E-07	3.27E-06	1.33E-06	4.60E-06	1.95E-01	1.75E-02	2.12E-01
108-67-8	1,3,5-Trimethylbenzene	5.58E-05	1.00E-05	6.58E-05	5.33E-04	2.16E-04	7.49E-04	3.17E+01	2.86E+00	3.46E+01
108-88-3	Toluene	1.11E-04	2.00E-05	1.31E-04	1.05E-03	4.26E-04	1.48E-03	6.26E+01	5.63E+00	6.82E+01
127-18-4	Tetrachloroethene	1.77E-05	3.18E-06	2.08E-05	1.67E-04	6.76E-05	2.34E-04	9.93E+00	8.93E-01	1.08E+01
129-00-0	Pyrene	1.12E-07	2.01E-08	1.32E-07	2.77E-06	1.12E-06	3.89E-06	1.65E-01	1.48E-02	1.80E-01
1330-20-7	Xylenes, Total	5.25E-04	9.45E-05	6.19E-04	4.97E-03	2.01E-03	6.99E-03	2.96E+02	2.66E+01	3.23E+02
156-59-2	cis-1,2-Dichloroethene	6.10E-07	1.10E-07	7.20E-07	5.77E-06	2.34E-06	8.11E-06	3.43E-01	3.09E-02	3.74E-01
71-43-2	Benzene	2.07E-04	3.73E-05	2.44E-04	1.96E-03	7.93E-04	2.75E-03	1.16E+02	1.05E+01	1.27E+02
74-83-9	Bromomethane	8.62E-06	1.55E-06	1.02E-05	8.15E-05	3.30E-05	1.14E-04	4.85E+00	4.36E-01	5.28E+00
75-01-4	Vinyl Chloride	6.49E-07	1.17E-07	7.65E-07	6.12E-06	2.48E-06	8.60E-06	3.64E-01	3.28E-02	3.97E-01
75-09-2	Methylene Chloride	3.57E-06	6.42E-07	4.21E-06	3.37E-05	1.37E-05	4.74E-05	2.01E+00	1.81E-01	2.19E+00
75-27-4	Bromodichloromethane	9.67E-08	1.74E-08	1.14E-07	9.21E-07	3.73E-07	1.29E-06	5.48E-02	4.93E-03	5.97E-02
75-65-0	tert-Butyl Alcohol (TBA)	1.00E-06	1.80E-07	1.18E-06	9.62E-06	3.90E-06	1.35E-05	5.72E-01	5.15E-02	6.24E-01
78-87-5	1,2-Dichloropropane	3.18E-07	5.73E-08	3.76E-07	3.01E-06	1.22E-06	4.23E-06	1.79E-01	1.61E-02	1.95E-01
79-01-6	Trichloroethene	8.12E-07	1.46E-07	9.58E-07	7.68E-06	3.11E-06	1.08E-05	4.57E-01	4.11E-02	4.98E-01
79-34-5	1,1,2,2-Tetrachloroethane	1.19E-07	2.14E-08	1.41E-07	1.14E-06	4.63E-07	1.60E-06	6.79E-02	6.11E-03	7.41E-02
90-12-0	1-Methylnaphthalene	1.35E-04	2.43E-05	1.59E-04	2.11E-03	8.53E-04	2.96E-03	1.25E+02	1.13E+01	1.37E+02
91-20-3	Naphthalene	1.06E-03	1.91E-04	1.25E-03	9.99E-04	4.05E-04	1.40E-03	5.94E+01	5.35E+00	6.48E+01
91-57-6	2-Methylnaphthalene	2.08E-04	3.74E-05	2.45E-04	2.11E-03	8.53E-04	2.96E-03	1.25E+02	1.13E+01	1.37E+02
95-63-6	1,2,4-Trimethylbenzene	2.36E-04	4.25E-05	2.78E-04	2.25E-03	9.13E-04	3.17E-03	1.34E+02	1.21E+01	1.46E+02
96-18-4	1,2,3-Trichloropropane	2.50E-07	4.51E-08	2.96E-07	2.39E-06	9.66E-07	3.35E-06	1.42E-01	1.28E-02	1.55E-01

Kast VOC Emissions Calculations

Street Trenching - Excavation

CAS #	Chemical	VOC Emission Rates								
		Active Area Emissions (lbs/hour)	Non-Active Area Emissions (lbs/hour)	Total Area Emissions (lbs/hour)	Active Area Emissions (lbs/day)	Non-Active Area Emissions (lbs/day)	Total Area Emissions (lbs/day)	Active Area Emissions (lbs/year)	Non-Active Area Emissions (lbs/year)	Total Area Emissions (lbs/year)
100-41-4	Ethylbenzene	2.84E-04	5.12E-05	3.35E-04	7.23E-04	2.93E-04	1.02E-03	3.27E+01	2.94E+00	3.56E+01
106-46-7	1,4-Dichlorobenzene	1.41E-07	2.53E-08	1.66E-07	3.61E-07	1.46E-07	5.07E-07	1.63E-02	1.47E-03	1.78E-02
107-06-2	1,2-Dichloroethane	2.78E-07	5.00E-08	3.28E-07	7.07E-07	2.86E-07	9.93E-07	3.19E-02	2.87E-03	3.48E-02
108-67-8	1,3,5-Trimethylbenzene	4.48E-05	8.07E-06	5.29E-05	1.15E-04	4.66E-05	1.62E-04	5.20E+00	4.68E-01	5.67E+00
108-88-3	Toluene	8.93E-05	1.61E-05	1.05E-04	2.27E-04	9.19E-05	3.19E-04	1.03E+01	9.23E-01	1.12E+01
127-18-4	Tetrachloroethene	1.42E-05	2.55E-06	1.67E-05	3.60E-05	1.46E-05	5.06E-05	1.63E+00	1.46E-01	1.77E+00
129-00-0	Pyrene	8.98E-08	1.62E-08	1.06E-07	5.98E-07	2.42E-07	8.40E-07	2.70E-02	2.43E-03	2.94E-02
1330-20-7	Xylenes, Total	4.22E-04	7.59E-05	4.98E-04	1.07E-03	4.35E-04	1.51E-03	4.85E+01	4.37E+00	5.29E+01
156-59-2	cis-1,2-Dichloroethene	4.90E-07	8.83E-08	5.79E-07	1.25E-06	5.04E-07	1.75E-06	5.63E-02	5.06E-03	6.13E-02
71-43-2	Benzene	1.66E-04	2.99E-05	1.96E-04	4.22E-04	1.71E-04	5.94E-04	1.91E+01	1.72E+00	2.08E+01
74-83-9	Bromomethane	6.93E-06	1.25E-06	8.18E-06	1.76E-05	7.12E-06	2.47E-05	7.94E-01	7.15E-02	8.66E-01
75-01-4	Vinyl Chloride	5.21E-07	9.38E-08	6.15E-07	1.32E-06	5.35E-07	1.86E-06	5.97E-02	5.37E-03	6.50E-02
75-09-2	Methylene Chloride	2.87E-06	5.16E-07	3.38E-06	7.28E-06	2.95E-06	1.02E-05	3.29E-01	2.96E-02	3.59E-01
75-27-4	Bromodichloromethane	7.77E-08	1.40E-08	9.17E-08	1.99E-07	8.05E-08	2.79E-07	8.98E-03	8.08E-04	9.79E-03
75-65-0	tert-Butyl Alcohol (TBA)	8.04E-07	1.45E-07	9.48E-07	2.08E-06	8.41E-07	2.92E-06	9.38E-02	8.44E-03	1.02E-01
78-87-5	1,2-Dichloropropane	2.56E-07	4.60E-08	3.02E-07	6.50E-07	2.63E-07	9.13E-07	2.94E-02	2.64E-03	3.20E-02
79-01-6	Trichloroethene	6.53E-07	1.17E-07	7.70E-07	1.66E-06	6.71E-07	2.33E-06	7.49E-02	6.74E-03	8.16E-02
79-34-5	1,1,2,2-Tetrachloroethane	9.57E-08	1.72E-08	1.13E-07	2.46E-07	9.98E-08	3.46E-07	1.11E-02	1.00E-03	1.21E-02
90-12-0	1-Methylnaphthalene	1.08E-04	1.95E-05	1.28E-04	4.54E-04	1.84E-04	6.38E-04	2.05E+01	1.85E+00	2.24E+01
91-20-3	Naphthalene	8.53E-04	1.53E-04	1.01E-03	2.16E-04	8.73E-05	3.03E-04	9.74E+00	8.77E-01	1.06E+01
91-57-6	2-Methylnaphthalene	1.67E-04	3.01E-05	1.97E-04	4.54E-04	1.84E-04	6.38E-04	2.05E+01	1.85E+00	2.24E+01
95-63-6	1,2,4-Trimethylbenzene	1.90E-04	3.41E-05	2.24E-04	4.86E-04	1.97E-04	6.83E-04	2.20E+01	1.98E+00	2.40E+01
96-18-4	1,2,3-Trichloropropane	2.01E-07	3.62E-08	2.38E-07	5.15E-07	2.09E-07	7.23E-07	2.33E-02	2.09E-03	2.54E-02

Kast VOC Emissions Calculations

VI. Non-VOC Emissions

Dust Emissions:

Dust Sources	PM10 Emissions (lbs/hour)	PM2.5 Emissions (lbs/hour)	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/year	PM2.5 Emissions (lbs/year)
Option 1						
On-site haul road re-entrained dust	3.15E-02	3.15E-03	1.01E+00	1.01E-01	4.78E+02	4.78E+01
On-site excavation dust	4.98E-04	7.54E-05	1.48E-02	2.25E-03	3.51E+00	5.32E-01
On-site on road re-entrained dust	8.13E-05	1.99E-05	6.50E-04	1.60E-04	1.54E-01	3.78E-02
Street Trenching						
On-site excavation dust	4.00E-04	6.06E-05	3.20E-03	4.85E-04	5.76E-01	8.72E-02
On-site on road re-entrained dust	1.82E-05	4.46E-06	1.45E-04	3.57E-05	2.62E-02	6.43E-03

Kast VOC Emissions Calculations

Non-VOC COC Emission Calculations:

Chemical	Chemical UCL Concentration (mg/kg)	PM10 Emissions (lbs/hour)	PM2.5 Emissions (lbs/hour)	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/year)	PM2.5 Emissions (lbs/year)
Option 1 - On-site off road re-entrained dust							
2,4-Dinitrotoluene	6.30E-02	1.99E-09	1.99E-10	6.35E-08	6.35E-09	3.01E-05	3.01E-06
Antimony	2.90E-01	9.14E-09	9.14E-10	2.93E-07	2.93E-08	1.39E-04	1.39E-05
Arsenic	4.90E+00	1.54E-07	1.54E-08	4.94E-06	4.94E-07	2.34E-03	2.34E-04
BaP TEQ	1.70E-01	5.36E-09	5.36E-10	1.71E-07	1.71E-08	8.13E-05	8.13E-06
Benzo (a) Anthracene	2.10E-01	6.62E-09	6.62E-10	2.12E-07	2.12E-08	1.00E-04	1.00E-05
Benzo (a) Pyrene	1.20E-01	3.78E-09	3.78E-10	1.21E-07	1.21E-08	5.74E-05	5.74E-06
Benzo (b) Fluoranthene	5.80E-02	1.83E-09	1.83E-10	5.85E-08	5.85E-09	2.77E-05	2.77E-06
Benzo (k) Fluoranthene	1.30E-02	4.10E-10	4.10E-11	1.31E-08	1.31E-09	6.22E-06	6.22E-07
Bis(2-Ethylhexyl) Phthalate	1.50E-01	4.73E-09	4.73E-10	1.51E-07	1.51E-08	7.17E-05	7.17E-06
Cadmium	9.90E-02	3.12E-09	3.12E-10	9.99E-08	9.99E-09	4.73E-05	4.73E-06
Chromium, Hexavalent	1.30E-01	4.10E-09	4.10E-10	1.31E-07	1.31E-08	6.22E-05	6.22E-06
Chrysene	5.60E-01	1.77E-08	1.77E-09	5.65E-07	5.65E-08	2.68E-04	2.68E-05
Cobalt	8.10E+00	2.55E-07	2.55E-08	8.17E-06	8.17E-07	3.87E-03	3.87E-04
Copper	1.40E+01	4.41E-07	4.41E-08	1.41E-05	1.41E-06	6.69E-03	6.69E-04
Dibenz (a,h) Anthracene	8.90E-03	2.81E-10	2.81E-11	8.98E-09	8.98E-10	4.26E-06	4.26E-07
Indeno (1,2,3-c,d) Pyrene	1.70E-02	5.36E-10	5.36E-11	1.71E-08	1.71E-09	8.13E-06	8.13E-07
Lead	1.10E+01	3.47E-07	3.47E-08	1.11E-05	1.11E-06	5.26E-03	5.26E-04
Thallium	2.20E-01	6.93E-09	6.93E-10	2.22E-07	2.22E-08	1.05E-04	1.05E-05
TPH as Diesel	2.20E+03	6.93E-05	6.93E-06	2.22E-03	2.22E-04	1.05E+00	1.05E-01
TPH as Gasoline	1.30E+02	4.10E-06	4.10E-07	1.31E-04	1.31E-05	6.22E-02	6.22E-03
TPH as Motor Oil	3.00E+03	9.46E-05	9.46E-06	3.03E-03	3.03E-04	1.43E+00	1.43E-01
Vanadium	3.00E+01	9.46E-07	9.46E-08	3.03E-05	3.03E-06	1.43E-02	1.43E-03
Zinc	4.20E+01	1.32E-06	1.32E-07	4.24E-05	4.24E-06	2.01E-02	2.01E-03

Kast VOC Emissions Calculations

Chemical	Chemical UCL Concentration (mg/kg)	PM10 Emissions (lbs/hour)	PM2.5 Emissions (lbs/hour)	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/year)	PM2.5 Emissions (lbs/year)
Option 1 - On-site excavation dust							
2,4-Dinitrotoluene	6.30E-02	3.14E-11	4.75E-12	9.34E-10	1.41E-10	2.21E-07	3.35E-08
Antimony	2.90E-01	1.44E-10	2.19E-11	4.30E-09	6.51E-10	1.02E-06	1.54E-07
Arsenic	4.90E+00	2.44E-09	3.69E-10	7.27E-08	1.10E-08	1.72E-05	2.61E-06
BaP TEQ	1.70E-01	8.46E-11	1.28E-11	2.52E-09	3.82E-10	5.97E-07	9.05E-08
Benzo (a) Anthracene	2.10E-01	1.05E-10	1.58E-11	3.11E-09	4.72E-10	7.38E-07	1.12E-07
Benzo (a) Pyrene	1.20E-01	5.97E-11	9.04E-12	1.78E-09	2.69E-10	4.22E-07	6.39E-08
Benzo (b) Fluoranthene	5.80E-02	2.89E-11	4.37E-12	8.60E-10	1.30E-10	2.04E-07	3.09E-08
Benzo (k) Fluoranthene	1.30E-02	6.47E-12	9.80E-13	1.93E-10	2.92E-11	4.57E-08	6.92E-09
Bis(2-Ethylhexyl) Phthalate	1.50E-01	7.47E-11	1.13E-11	2.22E-09	3.37E-10	5.27E-07	7.98E-08
Cadmium	9.90E-02	4.93E-11	7.46E-12	1.47E-09	2.22E-10	3.48E-07	5.27E-08
Chromium, Hexavalent	1.30E-01	6.47E-11	9.80E-12	1.93E-09	2.92E-10	4.57E-07	6.92E-08
Chrysene	5.60E-01	2.79E-10	4.22E-11	8.30E-09	1.26E-09	1.97E-06	2.98E-07
Cobalt	8.10E+00	4.03E-09	6.10E-10	1.20E-07	1.82E-08	2.85E-05	4.31E-06
Copper	1.40E+01	6.97E-09	1.06E-09	2.08E-07	3.14E-08	4.92E-05	7.45E-06
Dibenz (a,h) Anthracene	8.90E-03	4.43E-12	6.71E-13	1.32E-10	2.00E-11	3.13E-08	4.74E-09
Indeno (1,2,3-c,d) Pyrene	1.70E-02	8.46E-12	1.28E-12	2.52E-10	3.82E-11	5.97E-08	9.05E-09
Lead	1.10E+01	5.47E-09	8.29E-10	1.63E-07	2.47E-08	3.87E-05	5.85E-06
Thallium	2.20E-01	1.09E-10	1.66E-11	3.26E-09	4.94E-10	7.73E-07	1.17E-07
TPH as Diesel	2.20E+03	1.09E-06	1.66E-07	3.26E-05	4.94E-06	7.73E-03	1.17E-03
TPH as Gasoline	1.30E+02	6.47E-08	9.80E-09	1.93E-06	2.92E-07	4.57E-04	6.92E-05
TPH as Motor Oil	3.00E+03	1.49E-06	2.26E-07	4.45E-05	6.74E-06	1.05E-02	1.60E-03
Vanadium	3.00E+01	1.49E-08	2.26E-09	4.45E-07	6.74E-08	1.05E-04	1.60E-05
Zinc	4.20E+01	2.09E-08	3.17E-09	6.23E-07	9.43E-08	1.48E-04	2.23E-05

Kast VOC Emissions Calculations

Chemical	Chemical UCL Concentration (mg/kg)	PM10 Emissions (lbs/hour)	PM2.5 Emissions (lbs/hour)	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/year)	PM2.5 Emissions (lbs/year)
Option 1 - On-site on road re-entrained dust							
2,4-Dinitrotoluene	6.30E-02	5.12E-12	1.26E-12	4.10E-11	1.01E-11	9.71E-09	2.38E-09
Antimony	2.90E-01	2.36E-11	5.78E-12	1.89E-10	4.63E-11	4.47E-08	1.10E-08
Arsenic	4.90E+00	3.98E-10	9.77E-11	3.19E-09	7.82E-10	7.55E-07	1.85E-07
BaP TEQ	1.70E-01	1.38E-11	3.39E-12	1.11E-10	2.71E-11	2.62E-08	6.43E-09
Benzo (a) Anthracene	2.10E-01	1.71E-11	4.19E-12	1.37E-10	3.35E-11	3.24E-08	7.94E-09
Benzo (a) Pyrene	1.20E-01	9.75E-12	2.39E-12	7.80E-11	1.91E-11	1.85E-08	4.54E-09
Benzo (b) Fluoranthene	5.80E-02	4.71E-12	1.16E-12	3.77E-11	9.25E-12	8.94E-09	2.19E-09
Benzo (k) Fluoranthene	1.30E-02	1.06E-12	2.59E-13	8.45E-12	2.07E-12	2.00E-09	4.92E-10
Bis(2-Ethylhexyl) Phthalate	1.50E-01	1.22E-11	2.99E-12	9.75E-11	2.39E-11	2.31E-08	5.67E-09
Cadmium	9.90E-02	8.04E-12	1.97E-12	6.44E-11	1.58E-11	1.53E-08	3.74E-09
Chromium, Hexavalent	1.30E-01	1.06E-11	2.59E-12	8.45E-11	2.07E-11	2.00E-08	4.92E-09
Chrysene	5.60E-01	4.55E-11	1.12E-11	3.64E-10	8.94E-11	8.63E-08	2.12E-08
Cobalt	8.10E+00	6.58E-10	1.62E-10	5.27E-09	1.29E-09	1.25E-06	3.06E-07
Copper	1.40E+01	1.14E-09	2.79E-10	9.10E-09	2.23E-09	2.16E-06	5.29E-07
Dibenz (a,h) Anthracene	8.90E-03	7.23E-13	1.78E-13	5.79E-12	1.42E-12	1.37E-09	3.37E-10
Indeno (1,2,3-c,d) Pyrene	1.70E-02	1.38E-12	3.39E-13	1.11E-11	2.71E-12	2.62E-09	6.43E-10
Lead	1.10E+01	8.94E-10	2.19E-10	7.15E-09	1.76E-09	1.69E-06	4.16E-07
Thallium	2.20E-01	1.79E-11	4.39E-12	1.43E-10	3.51E-11	3.39E-08	8.32E-09
TPH as Diesel	2.20E+03	1.79E-07	4.39E-08	1.43E-06	3.51E-07	3.39E-04	8.32E-05
TPH as Gasoline	1.30E+02	1.06E-08	2.59E-09	8.45E-08	2.07E-08	2.00E-05	4.92E-06
TPH as Motor Oil	3.00E+03	2.44E-07	5.98E-08	1.95E-06	4.79E-07	4.62E-04	1.13E-04
Vanadium	3.00E+01	2.44E-09	5.98E-10	1.95E-08	4.79E-09	4.62E-06	1.13E-06
Zinc	4.20E+01	3.41E-09	8.38E-10	2.73E-08	6.70E-09	6.47E-06	1.59E-06

Kast VOC Emissions Calculations

Chemical	Chemical UCL Concentration (mg/kg)	PM10 Emissions (lbs/hour)	PM2.5 Emissions (lbs/hour)	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/year)	PM2.5 Emissions (lbs/year)
Street Trenching - On-site excavation dust							
2,4-Dinitrotoluene	6.30E-02	2.52E-11	3.82E-12	2.02E-10	3.05E-11	3.63E-08	5.49E-09
Antimony	2.90E-01	1.16E-10	1.76E-11	9.28E-10	1.41E-10	1.67E-07	2.53E-08
Arsenic	4.90E+00	1.96E-09	2.97E-10	1.57E-08	2.37E-09	2.82E-06	4.27E-07
BaP TEQ	1.70E-01	6.80E-11	1.03E-11	5.44E-10	8.24E-11	9.79E-08	1.48E-08
Benzo (a) Anthracene	2.10E-01	8.40E-11	1.27E-11	6.72E-10	1.02E-10	1.21E-07	1.83E-08
Benzo (a) Pyrene	1.20E-01	4.80E-11	7.27E-12	3.84E-10	5.81E-11	6.91E-08	1.05E-08
Benzo (b) Fluoranthene	5.80E-02	2.32E-11	3.51E-12	1.86E-10	2.81E-11	3.34E-08	5.06E-09
Benzo (k) Fluoranthene	1.30E-02	5.20E-12	7.87E-13	4.16E-11	6.30E-12	7.49E-09	1.13E-09
Bis(2-Ethylhexyl) Phthalate	1.50E-01	6.00E-11	9.08E-12	4.80E-10	7.27E-11	8.64E-08	1.31E-08
Cadmium	9.90E-02	3.96E-11	6.00E-12	3.17E-10	4.80E-11	5.70E-08	8.63E-09
Chromium, Hexavalent	1.30E-01	5.20E-11	7.87E-12	4.16E-10	6.30E-11	7.49E-08	1.13E-08
Chrysene	5.60E-01	2.24E-10	3.39E-11	1.79E-09	2.71E-10	3.23E-07	4.88E-08
Cobalt	8.10E+00	3.24E-09	4.91E-10	2.59E-08	3.92E-09	4.67E-06	7.06E-07
Copper	1.40E+01	5.60E-09	8.48E-10	4.48E-08	6.78E-09	8.06E-06	1.22E-06
Dibenz (a,h) Anthracene	8.90E-03	3.56E-12	5.39E-13	2.85E-11	4.31E-12	5.13E-09	7.76E-10
Indeno (1,2,3-c,d) Pyrene	1.70E-02	6.80E-12	1.03E-12	5.44E-11	8.24E-12	9.79E-09	1.48E-09
Lead	1.10E+01	4.40E-09	6.66E-10	3.52E-08	5.33E-09	6.34E-06	9.59E-07
Thallium	2.20E-01	8.80E-11	1.33E-11	7.04E-10	1.07E-10	1.27E-07	1.92E-08
TPH as Diesel	2.20E+03	8.80E-07	1.33E-07	7.04E-06	1.07E-06	1.27E-03	1.92E-04
TPH as Gasoline	1.30E+02	5.20E-08	7.87E-09	4.16E-07	6.30E-08	7.49E-05	1.13E-05
TPH as Motor Oil	3.00E+03	1.20E-06	1.82E-07	9.60E-06	1.45E-06	1.73E-03	2.62E-04
Vanadium	3.00E+01	1.20E-08	1.82E-09	9.60E-08	1.45E-08	1.73E-05	2.62E-06
Zinc	4.20E+01	1.68E-08	2.54E-09	1.34E-07	2.03E-08	2.42E-05	3.66E-06

Kast VOC Emissions Calculations

Chemical	Chemical UCL Concentration (mg/kg)	PM10 Emissions (lbs/hour)	PM2.5 Emissions (lbs/hour)	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/year)	PM2.5 Emissions (lbs/year)
Street Trenching- On-site on road re-entrained dust							
2,4-Dinitrotoluene	6.30E-02	1.15E-12	2.81E-13	9.16E-12	2.25E-12	1.65E-09	4.05E-10
Antimony	2.90E-01	5.27E-12	1.29E-12	4.22E-11	1.04E-11	7.59E-09	1.86E-09
Arsenic	4.90E+00	8.91E-11	2.19E-11	7.13E-10	1.75E-10	1.28E-07	3.15E-08
BaP TEQ	1.70E-01	3.09E-12	7.59E-13	2.47E-11	6.07E-12	4.45E-09	1.09E-09
Benzo (a) Anthracene	2.10E-01	3.82E-12	9.37E-13	3.05E-11	7.50E-12	5.50E-09	1.35E-09
Benzo (a) Pyrene	1.20E-01	2.18E-12	5.36E-13	1.75E-11	4.28E-12	3.14E-09	7.71E-10
Benzo (b) Fluoranthene	5.80E-02	1.05E-12	2.59E-13	8.44E-12	2.07E-12	1.52E-09	3.73E-10
Benzo (k) Fluoranthene	1.30E-02	2.36E-13	5.80E-14	1.89E-12	4.64E-13	3.40E-10	8.36E-11
Bis(2-Ethylhexyl) Phthalate	1.50E-01	2.73E-12	6.69E-13	2.18E-11	5.36E-12	3.93E-09	9.64E-10
Cadmium	9.90E-02	1.80E-12	4.42E-13	1.44E-11	3.53E-12	2.59E-09	6.36E-10
Chromium, Hexavalent	1.30E-01	2.36E-12	5.80E-13	1.89E-11	4.64E-12	3.40E-09	8.36E-10
Chrysene	5.60E-01	1.02E-11	2.50E-12	8.15E-11	2.00E-11	1.47E-08	3.60E-09
Cobalt	8.10E+00	1.47E-10	3.62E-11	1.18E-09	2.89E-10	2.12E-07	5.21E-08
Copper	1.40E+01	2.55E-10	6.25E-11	2.04E-09	5.00E-10	3.67E-07	9.00E-08
Dibenz (a,h) Anthracene	8.90E-03	1.62E-13	3.97E-14	1.29E-12	3.18E-13	2.33E-10	5.72E-11
Indeno (1,2,3-c,d) Pyrene	1.70E-02	3.09E-13	7.59E-14	2.47E-12	6.07E-13	4.45E-10	1.09E-10
Lead	1.10E+01	2.00E-10	4.91E-11	1.60E-09	3.93E-10	2.88E-07	7.07E-08
Thallium	2.20E-01	4.00E-12	9.82E-13	3.20E-11	7.86E-12	5.76E-09	1.41E-09
TPH as Diesel	2.20E+03	4.00E-08	9.82E-09	3.20E-07	7.86E-08	5.76E-05	1.41E-05
TPH as Gasoline	1.30E+02	2.36E-09	5.80E-10	1.89E-08	4.64E-09	3.40E-06	8.36E-07
TPH as Motor Oil	3.00E+03	5.46E-08	1.34E-08	4.36E-07	1.07E-07	7.86E-05	1.93E-05
Vanadium	3.00E+01	5.46E-10	1.34E-10	4.36E-09	1.07E-09	7.86E-07	1.93E-07
Zinc	4.20E+01	7.64E-10	1.87E-10	6.11E-09	1.50E-09	1.10E-06	2.70E-07

Emissions Inventory Files

- Crystalline Silica Releases
- Haul Road Diesel Particulate Emissions
- HARP Unmitigated Emissions Input – Average Day

Kast Shell Emissions Inventory

Crystalline Silica Releases

Given

Concrete Breaking PM10 Emissions	97	lbs/yr
Concrete Breaking PM10 Emissions	1.98	lbs/yr-receptor

Assumption

Crystalline Silica Content in Concrete	28%

Calculation

Crystalline Silica Released by Year	27.16	lbs/yr
Crystalline Silica Released by Receptor	0.55	lbs/yr-receptor

Kast Shell Emissions Inventory

Haul Road - Diesel Particulate Emissions

Summary: This section calculates the emissions of criteria pollutants from off-site paved haul road.

Emissions Factors

Running Emissions							g/mi				
Veh Class	Fuel	MdlYr	ROG	CO	NOx	CO2	PM10	PM2.5	SOx	Tire & Brake Wear PM10	Tire & Brake Wear PM2.5
LDA/LDT	All	All	6.4E-02	2.5E+00	2.8E-01	6.9E+02	3.0E-03	3.0E-04	7.0E-03	4.5E-02	1.8E-02
HHDT	DSL	All	7.8E-01	4.0E+00	1.4E+01	1.6E+03	8.0E-01	7.4E-01	1.7E-02	7.8E-02	3.1E-02
HHDT	DSL	2007	1.2E-01	8.6E-01	2.2E+00	1.6E+03	6.1E-02	5.6E-02	1.7E-02	5.9E-03	5.5E-03

Source: EMFAC 2011

Running Emissions							lbs/mi				
Veh Class	Fuel	MdlYr	ROG	CO	NOx	CO2	PM10	PM2.5	SOx	Tire & Brake Wear PM10	Tire & Brake Wear PM2.5
LDA/LDT	All	All	1.4E-04	5.5E-03	6.1E-04	1.5E+00	6.6E-06	6.6E-07	1.5E-05	9.9E-05	4.0E-05
HHDT	DSL	All	1.7E-03	8.8E-03	3.1E-02	3.6E+00	1.8E-03	1.6E-03	3.7E-05	1.7E-04	6.8E-05
HHDT	DSL	2007	2.7E-04	1.9E-03	4.8E-03	3.5E+00	1.4E-04	1.2E-04	3.7E-05	1.3E-05	1.2E-05

Source: EMFAC 2011

Heavy Truck Trip Data												
Phase	Hourly Round Trips	Daily Round Trips	8 Home Cluster Round Trips	Annual Round Trips	Truck Type	Average Vehicle Weight (tons)	Round Trip length (miles)	Hourly VMT	Daily VMT	8 Home Cluster Round Trips	Annual VMT
Option 1											
Demo	1.0	8	134	991	Dump Truck	25	2	2	17	268	1,982

Green Waste	0.5	4.0	32.0	237.0	Dump Truck	25.0	2	1	8	64	474
Excavation	1.9	15	1,787	3,530	Dump Truck	25	2	4	30	3,575	7,061
SVE Well/Piping	0.1	1.1	8.5	63.2	Dump Truck	25	2	0	2	17	126
Subslab Vent	0.0	0	0	0	0.00	0.00	2	0.00	0.00	0.00	0.00
Backfill/Compact	2.0	16	1,529	3,776	Dump Truck	25	2	4	32	3,059	7,552
Slurry Backfill	0.6	5.1	286.8	1213.8	Concrete Truck	25	2	1	10	574	2,428
Site Resto.	0.4	3	237	702	Concrete Truck	25	2	1	6	474	1,404
Street Trenching											
Demo	0.1	1.0	0.00	178.0	Dump Truck	25	2	0	2	0	356
Excavation	0.4	3.3	0.00	600.0	Dump Truck	25	2	1	7	0	1,200
Slurry Backfill	0.4	3.1	0.00	556.0	Dump Truck	25	2	1	6	0	1,112
Restoration	0.1	0.6	0.00	113.0	Concrete Truck	25	2	0	1	0	226
Pipe Delivery	0.1	1.0	0.00	180.0	Dump Truck	25	2	0	2	0	360
Well Installation											
Air Vac- Borehole Clearance	0.1	1.0	0.00	63.0	Air-Vac	25	2	0	2	0	126
Drilling and SVE Well Installation	0.1	1.0	0.00	63.0	Drill Rig	25	2	0	2	0	126
Waste Collection	0.3	2.0	0.00	126.0	Dump Truck	25	2	1	4	0	252

Waste Transport to Offsite Disposal	0.1	1.0	0.00	60.4	Dump Truck	25	2	0	2	0	121
Street Paving											
Street Grinding	2.7	8.0	0.00	80.0	Dump Truck	25	2	5	16	0	160
Street Paving	1.3	16.0	0.00	80.0	Dump Truck	25	2	3	32	0	160

Emissions Calculations

Hourly Truck Trip Emission Calculations (SCAB)		**lbs/hour (SCAB)**
Phase	**Hourly VMT (SCAB)**	**PM10**
Option 1		
Demo	2.1	2.8E-04
Green Waste	1.0	1.4E-04
Excavation	3.7	5.0E-04
SVE Well/Piping	0.3	3.6E-05
Subslab Vent	0.00	0.0E+00
Backfill/Compact	4.0	5.4E-04
Slurry Backfill	1.3	1.7E-04
Site Resto.	0.7	1.0E-04
Street Trenching		
Demo	0.2	3.3E-05
Excavation	0.8	1.1E-04
Backfill	0.8	1.0E-04
Restoration	0.2	2.1E-05
Pipe Delivery	0.3	3.4E-05
Well Installation		
Air Vac- Borehole Clearance	0.3	3.4E-05
Drilling and SVE Well Installation	0.3	3.4E-05

Waste Collection	0.5	6.8E-05
Waste Transport to Offsite Disposal	0.2	3.2E-05
Street Paving		
Street Grinding	5.3	7.2E-04
Street Paving	2.7	3.6E-04
TOTAL		**3.32E-03**

Annual Truck Trip Emission Calculations (SCAB)		lbs/year (SCAB)
Phase	**Annual VMT (SCAB)**	**PM10**
Option 1		**2.84**
Demo	1,982	2.7E-01
Green Waste	474	6.4E-02
Excavation	7,061	9.5E-01
SVE Well/Piping	126	1.7E-02
Subslab Vent	0.00	0.0E+00
Backfill/Compact	7,552	1.0E+00
Slurry Backfill	2,428	3.3E-01
Site Resto.	1,404	1.9E-01
Street Trenching		**0.44**
Demo	356	4.8E-02
Excavation	1,200	1.6E-01
Backfill	1,112	1.5E-01
Restoration	226	3.1E-02
Pipe Delivery	360	4.9E-02
Well Installation		**0.08**
Air Vac- Borehole Clearance	126	1.7E-02
Drilling and SVE Well Installation	126	1.7E-02
Waste Collection	252	3.4E-02
Waste Transport to Offsite Disposal	121	1.6E-02
Street Paving		**0.04**
Street Grinding	160	2.2E-02
Street Paving	160	2.2E-02
TOTAL		**3.98**

Kast Shell Emissions Inventory

HARP Unmitigated Emissions Input - Average Day

Chem No.	CAS	Chem Name	Emissions by Receptor (lbs/year)	Sum of Hourly Emissions (lbs/hr)
1	96184	1,2,3-Trichloropropane	3.67E-03	5.33E-07
2	95636	1,2,4-Trimethylbenzene	3.47E+00	5.02E-04
3	78875	1,2-Dichloropropane	4.64E-03	6.77E-07
4	121142	2,4-Dinitrotoluene	5.20E-09	4.75E-12
5	91576	2-Methyl naphthalene	3.24E+00	4.42E-04
6	7440360	Antimony	3.14E-06	1.04E-08
7	7440382	Arsenic	5.31E-05	1.76E-07
8	56553	Benz[a]anthracene	2.28E-06	7.52E-09
9	71432	Benzene	3.02E+00	4.41E-04
10	50328	Benzo[a]pyrene	3.14E-06	1.04E-08
11	205992	Benzo[b]fluoranthene	6.28E-07	2.08E-09
12	207089	Benzo[k]fluoranthene	1.41E-07	4.66E-10
13	75274	Bromodichloromethane	1.42E-03	2.06E-07
14	7440439	Cadmium	1.07E-06	3.55E-09
15	18540299	Chromium, hexavalent (& compounds)	1.41E-06	4.66E-09
16	218019	Chrysene	6.07E-06	2.01E-08
17	7440484	Cobalt	8.78E-05	2.90E-07
18	7440508	Copper	1.52E-04	5.02E-07
19	117817	Di(2-ethylhexyl) phthalate	1.63E-06	5.37E-09
20	53703	Dibenz[a,h]anthracene	9.64E-08	3.19E-10
21	100414	Ethyl benzene	5.16E+00	7.53E-04
22	107062	Ethylene dichloride {EDC}	5.04E-03	7.35E-07
23	193395	Indeno[1,2,3-cd]pyrene	1.84E-07	6.09E-10
24	7439921	Lead	1.19E-04	3.94E-07
25	74839	Methyl bromide {Bromomethane}	1.25E-01	1.84E-05
26	75092	Methylene chloride {Dichloromethane}	5.20E-02	7.59E-06
27	91203	Naphthalene	1.54E+00	2.26E-03
28	106467	p-Dichlorobenzene	2.58E-03	3.73E-07
29	127184	Perchloroethylene {Tetrachloroethene}	2.57E-01	3.76E-05
30	129000	Pyrene	4.27E-03	2.38E-07
31	75650	tert-Butyl alcohol	1.48E-02	2.13E-06
32	7440280	Thallium	2.38E-06	7.88E-09
33	108883	Toluene	1.62E+00	2.36E-04
34	79016	Trichloroethylene	1.18E-02	1.73E-06
35	25551137	Trimethylbenzenes	8.21E-01	1.19E-04
36	7440622	Vanadium (fume or dust)	3.25E-04	1.07E-06
37	75014	Vinyl Chloride	9.43E-03	1.38E-06
38	1330207	Xylenes (mixed)	7.66E+00	1.12E-03
39	7440666	Zinc	4.55E-04	1.50E-06
40	1175	Silica, crystalline (respirable)	5.54E-01	
41	9901	DPM	1.63E+00	

Health Risk Assessment Files

- HARP Output Cancer Risk Summary
- HARP Output Chronic Risk Summary
- HARP Output Acute Risk Summary
- Supplemental Health Risk Calculations

Kast Shell HRA

HARP Cancer Risk Summary

No.	Receptor	Total Risk (in a million)
791	On-Site Residential	0.81
2017	Off-Site Residential	0.59
2051	Worker	0.09
2746	School	0.11

No.	Receptor	CAS	Chemical Name	% Contribution	Risk (in a million)
791	On-Site Residential	9901	Diesel engine exhaust, particulate matter (Diesel PM)	77%	0.62
		71432	Benzene	13%	0.10
		91203	Naphthalene	8%	0.06
2017	Off-Site Residential	9901	Diesel engine exhaust, particulate matter (Diesel PM)	77%	0.46
		71432	Benzene	13%	0.08
		91203	Naphthalene	8%	0.05
2051	Worker	9901	Diesel engine exhaust, particulate matter (Diesel PM)	77%	0.07
		71432	Benzene	13%	0.01
		91203	Naphthalene	8%	0.01
2746	School	9901	Diesel engine exhaust, particulate matter (Diesel PM)	85%	0.09
		71432	Benzene	9%	0.01
		91203	Naphthalene	5%	0.01

Kast Shell HRA

HARP Chronic Risk Summary

No.	Receptor	Max Chronic Risk
791	On-Site Residential	0.01
2017	Off-Site Residential	0.01
2051	Worker	0.01
2746	School	0.001

No.	Receptor	CAS	Chemical Name	Chronic Risk	% of Total
791	On-Site Residential	71432	Benzene	1.29E-02	100.00%
		18540299	Chromium, hexavalent (& compounds)	4.26E-09	0.00%
		9901	Diesel engine exhaust, particulate matter (Diesel PM)	0.00E+00	0.00%
2017	Off-Site Residential	71432	Benzene	9.42E-03	100.00%
		18540299	Chromium, hexavalent (& compounds)	3.12E-09	0.00%
		9901	Diesel engine exhaust, particulate matter (Diesel PM)	0.00E+00	0.00%
2051	Worker	9901	Benzene	9.69E-03	100.00%
		1175	Chromium, hexavalent (& compounds)	2.50E-09	0.00%
		91203	Diesel engine exhaust, particulate matter (Diesel PM)	0.00E+00	0.00%
2746	School	71432	Benzene	1.19E-03	100.00%
		18540299	Chromium, hexavalent (& compounds)	3.94E-10	0.00%
		9901	Diesel engine exhaust, particulate matter (Diesel PM)	0.00E+00	0.00%

Kast Shell HRA

HARP Acute Risk Summary

No.	Receptor	Source No.	Max. Acute Risk
639	On-Site Residential	25	0.01
1966	Off-Site Residential	47	0.01
2085	Worker	44	0.01
2746	School	40	0.001

No.	Receptor	Source No.	CAS	Chemical Name	Acute Risk	% of Total
639	On-Site Residential	25	71432	Benzene	5.31E-03	96.4%
			7440382	Arsenic	2.01E-04	3.6%
			1330207	Xylenes (mixed)	1.65E-05	0.3%
1966	Off-Site Residential	47	71432	Benzene	8.04E-03	96.4%
			7440382	Arsenic	3.04E-04	3.6%
			1330207	Xylenes (mixed)	2.50E-05	0.3%
2085	Worker	44	71432	Benzene	7.83E-03	96.3%
			7440382	Arsenic	2.96E-04	3.6%
			1330207	Xylenes (mixed)	2.44E-05	0.3%
2746	School	40	71432	Benzene	1.27E-03	96.2%
			7440382	Arsenic	4.81E-05	3.6%
			1330207	Xylenes (mixed)	3.96E-06	0.3%

Kast Shell HRA

Supplemental Health Risk Calculations

					Total Concentration (ug/m3)				Cancer Risk				Chronic Risk			
CAS	**Chemical Name**	**CPF (mg/kg-day)**	**RfC (ug/m^3)**	**Receptor -->**	791	2017	2051	2046	791	2017	2051	2046	791	2017	2051	2046
90-12-0	1-Methylnaphthalene	0	0		2.04E+00	1.49E+00	1.53E+00	2.38E-01								
156-59-2	cis-1,2-Dichloroethene	0	7.00E+00		5.58E-03	4.09E-03	4.20E-03	6.51E-04					7.97E-04	5.84E-04	6.00E-04	9.31E-05
NA	TPH as Diesel	0	3.00E+02		3.62E-02	2.66E-02	2.73E-02	4.23E-03					1.21E-04	8.85E-05	9.10E-05	1.41E-05
NA	TPH as Gasoline	0	7.00E+02		3.62E-02	2.66E-02	2.73E-02	4.23E-03					5.18E-05	3.79E-05	3.90E-05	6.05E-06
NA	TPH as Motor Oil	0	--		3.62E-02	2.66E-02	2.73E-02	4.23E-03								
Total	**Total/Max Risk**								**0**	**0**	**0**	**0**	**9.70E-04**	**7.11E-04**	**7.30E-04**	**1.13E-04**

Exposure factors used to calculate contaminant intake[a]

exposure frequency (days/year)	360
exposure duration (years)	5
daily breathing rate (L/kg BW-day)	393.0
average body weight (kg)	70
averaging time(cancer) (days)	25550
averaging time(noncancer) (days)	25550

[a] The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Page 5-16. Office of Environmental Health and Hazard Assessment. August 2003.
[b] Cancer Potency Factor. Please refer to List of Chemicals for source.
[c] Reference Concentration. Please refer to List of Chemicals for source.