DRAFT
Engineering Evaluation
ERM-West, Inc.
BioMarin Pharmaceutical Inc.
999 Third Street, San Rafael, CA 94901
New Plant #24305; Application #29685

Site Background

ERM-West, Inc. on behalf of BioMarin Pharmaceutical Inc. (BioMarin) has applied for an Authority to Construct and/or Permit to Operate for the following sources located at 999 Third Street in San Rafael:

S-1 Contaminated Soil Excavation Activities (Zone A, B, C, D1, D2, D3 and D4)

S-2 Three contaminated soil storage piles

A-1 Tenting Abatement System for Zone A: Four activated carbon containers, each container has at least 23,000 lb carbon and has three stacks (so a total of 12 stacks at the tent), Stack heights are 8.5 feet above ground-level.

This site is Pacific Gas & Electric (PG&E) Company's former San Rafael Manufactured Gas Plant (MGP) and specifically: Parcel 4 West. Parcel 4 West is the western side of the property known as Parcel 4, located at 999 Third Street, San Rafael, in Marin County. This site is located in the downtown commercial district of the City of San Rafael, CA. The proposed site is currently zoned for retail, office and residential mixed use. It is approximately 3 acres in size and contained three buildings. The surrounding neighborhood consists mostly of commercial land use with residential land use to the southwest. Saint Raphael Elementary School (1100 5th Avenue, San Rafael, CA 94901) is located within 1000 feet from the site.

PG&E previously owned Parcel 4 and conducted remediation in the eastern two-acre portion of Parcel 4 under Department Toxic Substances Control (DTSC) oversight. Air District permit was issued under Plant # 22853 and Application # 26510 on September 30, 2015. The remediation was completed and the Permit to Operate was cancelled on October 2, 2017.

Overview of Proposed Project

BioMarin purchased this property from PG&E and intends to remediate the remaining acre on the western side of the site in preparation for redevelopment of this site. The purpose of the remediation is to allow the land to be redeveloped for mixed, multi-family residential or other uses. Remediation activities will be conducted in a manner that minimizes the potential human health risks and environmental impacts. Remedial activities will involve the excavation of contaminated soil that will be loaded directly into trucks or placed briefly in stockpiles before being loaded onto trucks and hauled offsite. The excavation of the contaminated soils will result in emissions of organic compounds and particulate matter.

This current application, Application # 29685, is for excavation of areas which were previously located underneath buildings. The buildings have been demolished, and BioMarin intends to remediate these areas in fundamentally the same manner that PG&E remediated the other two acres of the site. BioMarin is proposing to remediate the western portion of Parcel 4 using the same remedy that was selected in PG&E Final Remedial Action Plan (RAP) approved by DTSC on November 20, 2012. An Explanation of Significant Differences was prepared to explain the expansion of the scope of the Final RAP.

ERM, a consultant for BioMarin, is planning to excavate and remove contaminated soil from the site. The total quantity of excavated soil will be about 33,000 tons. The soil will be excavated and generally placed

directly into trucks and transported offsite. There may be up to three stockpiles of contaminated soil at any one time on site and they, when inactive, will be covered with a layer of emission suppression Rusmar (or equivalent) foam, mulch, or overlaid with plastic sheeting. As soil is removed, there will be clean backfill material imported into the site, which will be used to backfill the pits formed from excavation. Most of the excavation will be conducted within an enclosed tent to minimize impacts to the surrounding community. The owner/operator will be following extensive mitigation and monitoring measures listed in the Final RAP and the Environmental Control and Monitoring Plan (ECMP) to minimize the emissions.

CEQA

In order to meet the California Environmental Quality Act (CEQA) requirements with respect to the proposed Parcel 4 West Remediation, an Addendum to the Former PG&E San Rafael MGP-RAP, Initial Study and Notice of Determination, dated November 16, 2012, was prepared and approved. ERM provided an addendum to the Initial Study and Notice of Determination for the proposed project. In early 2018, BioMarin demolished the three buildings on the western one-acre area of the parcel. BioMarin collected soil, soil vapor and groundwater samples that showed MGP related contamination beneath and around these former buildings. BioMarin proposed to excavate approximately 33,000 tons of contaminated soil, to transport the contaminated soil to permitted disposal facilities, and to backfill excavations with clean soil. DTSC will be overseeing this proposed remediation. DTSC proposed an Explanation of Significant Differences (ESD) to the 2012 RAP because soil excavation has already been used to remediate a substantial portion of the site.

As the lead agency under CEQA, DTSC determined that an Addendum to the previously approved Negative Declaration (State Clearinghouse No. 2012102020) is appropriate because the proposed project will not result in any significant impacts to the environment. DTSC has prepared an Addendum to the 2012 Negative Declaration to incorporate the soil excavation for the western one-acre area of the site. The CEQA Public Comment started on Wednesday 5/8/2019. This public comment period will close on 6/7/2019.

Excavation Activity Details

The actual excavation activity can be divided into four “zones” (A, B, C, and D) as shown on Figure 1.

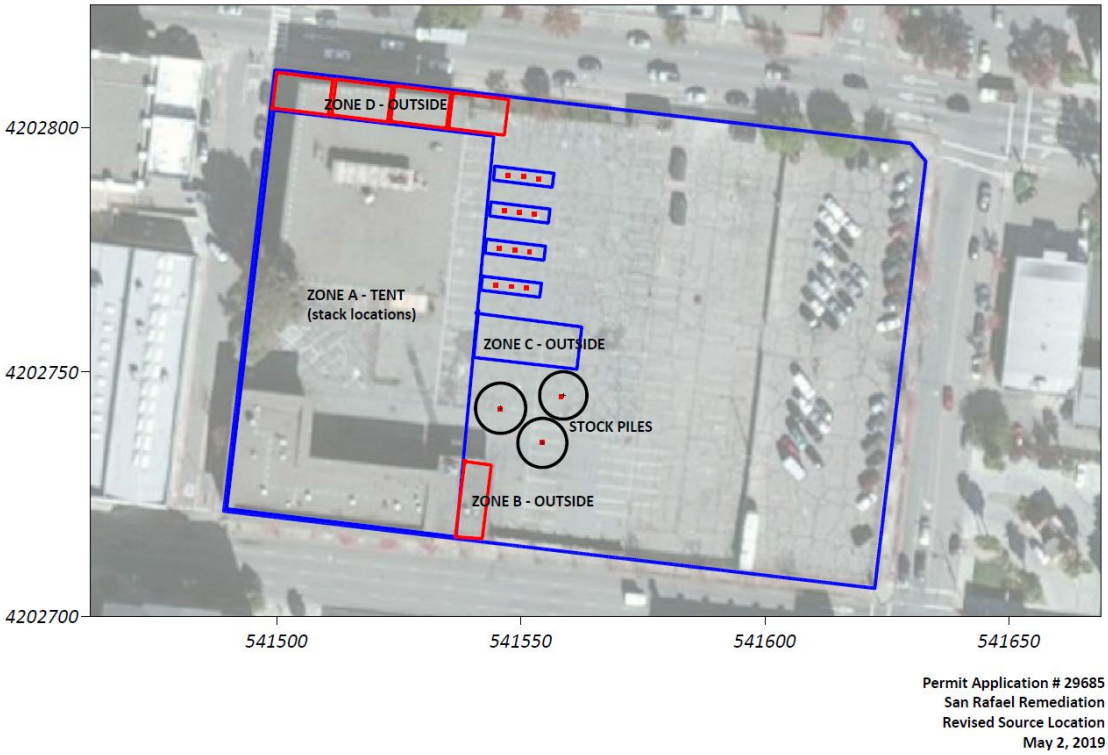
S-1 Contaminated Soil Excavation Activities (Zone A, B, C, D1, D2, D3 and D4)
S-2 Three contaminated soil storage piles
A-1 Tenting Abatement System for Zone A: Four activated carbon containers, each container has at least 23,000 lb carbon and has three stacks (so a total of 12 stacks at the tent), Stack heights are 8.5 feet above ground-level.

Excavation activities are planned to occur from 7 am to 5 pm on weekdays. The exact order of excavation of these sequences will be determined with the final project schedule. However, an average high of 250 tons (400 cubic yards) of contaminated soil will be excavated per day. A total of 33,000 tons (19,800 cubic yards) is anticipated to be excavated over the course of the project.

The District has reviewed the soil data for wells and borings at the proposed site. The following figure shows that the location of soil that will require burial due to volatile organic carbon (VOC) and/or total

petroleum hydrocarbon (TPH) concentrations exceeding 50 ppm by weight. Per District's Regulation 8-40, soil that has an organic content exceeding 50 ppm by weight is considered to be contaminated soil. Contaminated soil that is transported to locations within the Bay Area Air Quality Management District jurisdiction cannot be used as daily cover material and will require immediate burial. For the remaining soil that is not contaminated, it may be used as daily cover material at solid waste disposal sites that have been approved for such uses. The District reviewed and evaluated the soil data for daily cover and determinate that the acute impact at the solid waste disposal sites will be acceptable.

Figure 1 – ERM excavation activities



Emissions Calculations

The excavation will generate emissions of VOC, which may include both precursor organic compounds (POC) and non-precursor organic compounds (NPOC), particulate matter (PM10), and toxic air contaminants (TACs). There are three pathways for these pollutants to become airborne:

1. VOC, which may include TACs, will be emitted through the release of gases trapped in the soil pore space and through diffusion; and
2. Heavier organic compounds and metals will be emitted as fugitive dust.
3. Toxic PM emissions (toxic metals and PAHs) will be emitted from the stock piles

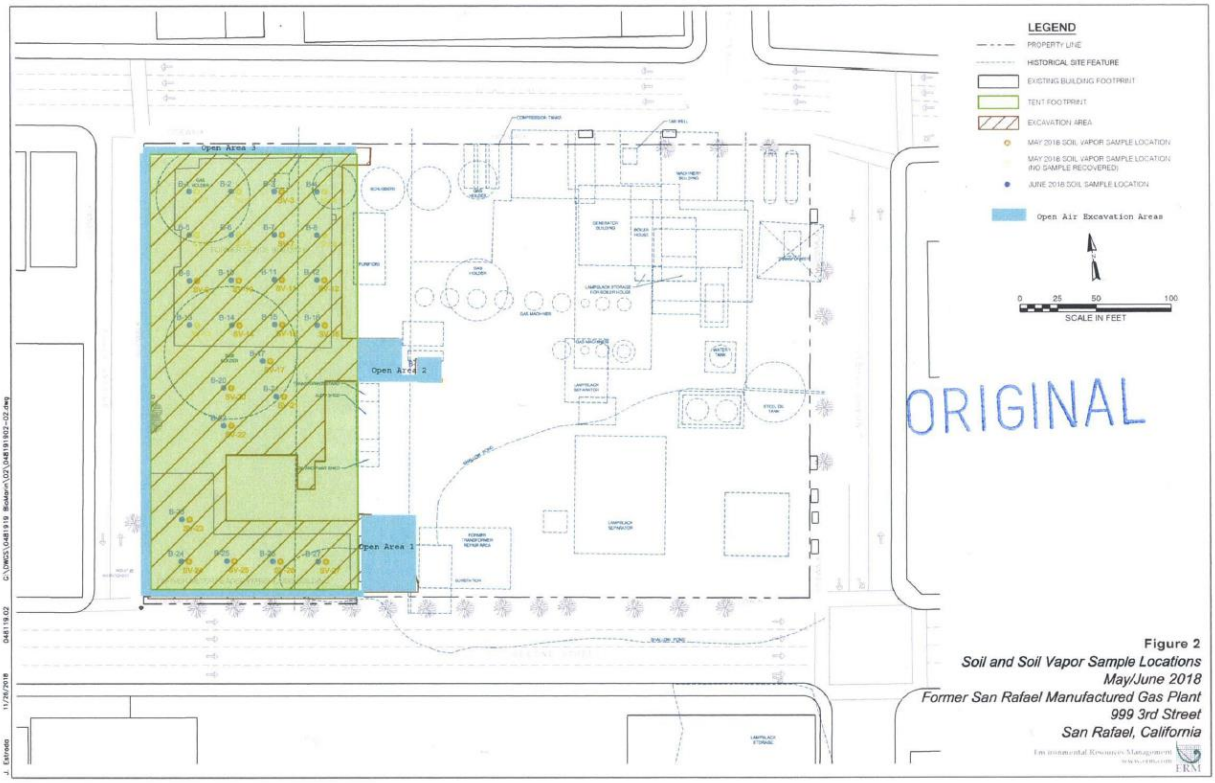
Hourly, daily, and annual emission estimates were determined for each zone. Emissions estimate details are in Appendix B. Emissions were based on excavating up to 250 tons of soil per day and up to 33,000 tons of soil for the total project.

The emissions are based on the sampling results within each designated zone. The emission calculations used the highest sampling results in each specific sampling location. Annual emissions were based on the highest sampling results within each zone. Maximum hourly emissions were based on the maximum of all sampling results within each zone.

The following table and figure summarizes which sampling locations were used in each of the identified zones. ERM confirmed in email, dated 5/2/2019.

Excavation - Zone A - Large Tent	Excavation - Zone B - Open Area South	Excavation - Zone C - Outside - East	Excavation - Zone D1 - Outside North 1	Excavation - Zone D2 - Outside North 2	Excavation - Zone D32 - Outside North 3	Excavation - Zone D4 - Outside North 4
5, 6, 7, 8, 9,10,11, 12,13, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28	28	18, 19	1	2	3	4

Figure 2 – Soil and Soil Vapor Sampling Locations



Excavation Procedures Details:

- Up to 33,000 tons of impacted soil (containing volatile organic compound (VOC), arsenic, benzene, copper, lead, mercury, nickel, PAHs (including naphthalene), and other toxic air contaminants)
- The overall duration of excavation activities is anticipated to range from 4 to 7 months, depending on weather and varying daily excavation rates.
- Remedial activities will be conducted 5 days a week for 10 hours a day, from 7 am to 5 pm on weekdays.
- Excavation to a depth of up to 12 feet within the tent footprint.
- Excavation in limited areas outside the tent footprint to a depth of up to 10 feet.
- Backfilling of excavated areas with up to 33,000 tons of clean fill
- Restoration of asphalt paving
- Mitigation control measures:
    - Minimizing the total area of soil exposed to atmosphere by placing a tent around as much of the excavated area as feasible (Zone A);
    - During excavation within the tent, keeping all exposed contaminated soil surfaces visibly moist by water spray, treatment with an approved vapor suppression – Rusmar Foam or

equivalent, or covering surfaces with Cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy duty plastic sheeting;
- Exposed soil surfaces in the excavation areas and stockpiles will be kept visibly moist, covered with plastic sheeting, Con-cover, and/or Rusmar foam;
- Limiting the pace of soil excavation to maximum of 30 truck trips per day;
- Loading excavated soils directly into haul trucks when possible to minimize the duration of onsite stockpiles;
- Keep drop heights to minimum while loading vehicles with soil;
- Covering contaminated soils with foam, Con-cover or plastic sheeting once loaded onto trucks;
- Cleaning trucks prior to leaving the site; and
- Stopping all earth movement outside the tents when dust control measures are not effective during high wind conditions.

The active excavation pit, recently excavated areas and areas over which trucks will travel are considered "active areas" from which the emissions will be generated.

S-2 Three Contaminated Soil Storage Piles are inactive areas and will be covered with foam and mulch. When soil is added or removed from the stockpiles, other excavation activities will not be occurring.

The following assumptions were used in the active and inactive areas to estimate air emissions:

Active Areas (S-1)	**Area (m^2)**	**Area (m^2)**
Excavation Pit		60.3
(a) Active Excavated Area	48.8	
(b) Recently Excavated Area)	11.5	
Trucks (within site)		27.9
Total Hourly Emitting Area (S-1)		**88.2**
Inactive Areas (Three Stockpiles S-2)		
Three stockpiles (each 101 m^2)	101.5	
Total Inactive Area (S-2)		**304.5**

Chromium

Chromium has been treated as trivalent chromium, not hexavalent chromium. There is no evidence indicating it would be hexavalent chromium.

Also, the total chromium detected in the soil at the site is within typical "background" levels for California soils, suggesting historical operations did not contribute to total chromium levels.

Cyanide

MGP-related cyanide is typically in the form of ferricyanide ($FE(CN)_6^{-3}$) which is a strongly-complexed cyanide inorganic salt of particulate. This form of cyanide does not readily volatilize into hydrogen

cyanide (*HCN*). Sample analysis was performed to measure HCN with EPA Method 9013/9016. All samples were non-detect for HCN. Therefore, cyanide is assessed as a particulate form.

Proposed configuration to reduce emissions

1. Tent will be used at Zone A. The tent will be under negative pressure and route vapors from the vent to activated carbon contained in minimum of four containers. Each carbon container will have at least 23,000 lbs of carbon and has three stacks (so a total of 12 stacks at the tent), and the stack height is 8.5 feet above ground-level.
2. 98% control of organics is assumed using the carbon containers (98% of the pore space and diffusion emissions).
3. No additional control for the fugitives is assumed. (Foam will be used in the tent. ERM is conservatively not accounting for foaming within the tents as appropriate.)
   Con-cover is a blend of polymers and a recycled fiber like newspaper. An equivalent cover is called FINN Waste Cover which is made from recycled paper and wood and contain polymers and other proprietary ingredients.
4. For the areas outside of the tents, ERM will use foaming in conjunction with Waste Cover and plastic sheeting so as to achieve 90% coverage.
5. Excavated soil will generally be placed directly on trucks and transported offsite. There are three contaminated soil stockpiles on site. Contaminated soil will be at these piles when a truck is not available to take excavated soil offsite. The stockpiles will be covered with Con-cover, a layer of emission suppressant foam or mulch, and will be overlaid with plastic sheeting. The sheeting will be removed when it is necessary to add or remove soil from the pile. (98% control efficiency was used to estimate air emissions at the stockpiles)

Figure 3 -- Picture of the Carbon Containers

Total Volatile Hydrocarbons (POC/NPOC) Emissions from S-1 and S-2

S-1 Contaminated Soil Excavation Activities (Zone A, B, C, D1, D2, D3 and D4)

S-2 Three contaminated soil storage piles

Table 1. Maximum Daily Emissions from S-1 and S-2

	Active Area Abated Emissions (lbs/day)							
	S-1							S-2
	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles
POC	3.41E+00	6.00E+01	4.49E-01	3.11E-03	3.38E-03	2.65E-02	8.30E-03	4.95E-01
NPOC	2.40E-02	2.45E-03	4.37E-01	2.45E-03	5.77E-03	9.45E-03	6.12E-03	6.54E-03
POC	6.39E+01							4.95E-01
NPOC	4.88E-01							6.54E-03

Maximum Daily POC and NPOC at S-1 = 63.9 + 0.49 = 64.4 lbs/day
Maximum Daily POC and NPOC at S-2 = 0.49 + 0.007 = 0.5 lbs/day

Table 2. Maximum Annual Emissions from S-1 and S-2

	Active Area Abated Emissions (lbs/year)

	S-1							S-2
	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles
POC	4.19E+02	1.80E+02	3.14E+00	9.33E-03	1.01E-02	7.96E-02	2.49E-02	1.72E+02
NPOC	2.95E+00	7.35E-03	3.06E+00	7.35E-03	1.73E-02	2.83E-02	1.84E-02	2.27E+00
POC	6.03E+02							1.72E+02
NPOC	6.09E+00							2.27E+00

Table 3. Maximum Daily Fugitive Metal Emissions from S-1 and S-2

	Active Area Abated Emissions (lbs/day)								
	S-1							S-2	
Chemical	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	Total Emissions
Arsenic	5.20E-08	7.44E-07	2.58E-06	5.01E-07	7.98E-07	5.41E-05	1.76E-06	2.76E-05	8.82E-05
Barium	3.78E-07	1.35E-05	3.81E-05	6.22E-06	3.65E-05	3.65E-05	3.11E-05	1.87E-05	1.81E-04
Beryllium	8.98E-10	6.49E-08	1.18E-07	5.28E-08	1.01E-07	8.93E-08	9.88E-08	4.56E-08	5.72E-07
Cadmium	7.09E-10	3.38E-08	1.01E-07	4.33E-08	4.46E-08	1.89E-07	4.33E-08	9.67E-08	5.52E-07
Chromium	1.65E-07	1.07E-05	6.66E-06	7.98E-06	8.79E-06	5.82E-06	5.28E-06	2.97E-06	4.84E-05
Copper	3.17E-07	3.11E-06	5.57E-06	2.03E-06	2.57E-06	5.55E-06	4.06E-06	2.83E-06	2.60E-05
Cyanide	1.42E-07	1.49E-07	6.25E-06	1.49E-07	1.62E-07	4.33E-06	2.16E-07	2.21E-06	1.36E-05
Lead	1.18E-07	1.27E-06	4.62E-06	7.58E-07	1.10E-06	1.35E-05	7.04E-06	6.91E-06	3.53E-05
Mercury	1.80E-09	4.74E-09	1.63E-06	2.71E-09	2.98E-09	7.71E-08	2.44E-08	3.94E-08	1.78E-06
Nickel	1.84E-07	1.22E-05	1.24E-05	3.52E-06	9.74E-06	4.74E-06	4.06E-06	2.42E-06	4.92E-05
Selenium	2.79E-09	2.71E-07	8.02E-07	3.25E-07	3.38E-07	3.11E-07	3.25E-07	1.59E-07	2.53E-06
Vanadium	6.14E-08	6.09E-06	9.38E-06	5.14E-06	5.41E-06	6.49E-06	6.77E-06	3.32E-06	4.27E-05
									4.90E-04

Table 4. Maximum Annual Fugitive Metal Emissions from S-1 and S-2

	Active Area Abated Emissions (lbs/yr)								
	S-1							S-2	
Chemical	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	Total Emissions
Arsenic	2.19E-06	7.83E-07	6.46E-06	5.23E-07	8.35E-07	5.66E-05	1.84E-06	4.04E-04	4.73E-04
Barium	1.59E-05	1.42E-05	9.51E-05	6.51E-06	3.82E-05	3.82E-05	3.25E-05	2.79E-03	3.03E-03
Beryllium	3.78E-08	6.84E-08	2.96E-07	5.52E-08	1.06E-07	9.34E-08	1.03E-07	6.72E-06	7.48E-06
Cadmium	2.98E-08	3.56E-08	2.51E-07	4.53E-08	4.67E-08	1.98E-07	4.53E-08	5.34E-06	5.99E-06
Chromium	6.96E-06	1.13E-05	1.66E-05	8.35E-06	9.20E-06	6.08E-06	5.52E-06	1.20E-03	1.26E-03
Copper	1.33E-05	3.28E-06	1.39E-05	2.12E-06	2.69E-06	5.80E-06	4.24E-06	2.25E-03	2.29E-03
Cyanide	5.96E-06	1.57E-07	1.56E-05	1.56E-07	1.70E-07	4.53E-06	2.26E-07	1.01E-03	1.04E-03
Lead	4.97E-06	1.34E-06	1.16E-05	7.92E-07	1.15E-06	1.41E-05	7.36E-06	8.52E-04	8.93E-04
Mercury	7.55E-08	4.99E-09	4.08E-06	2.83E-09	3.11E-09	8.06E-08	2.55E-08	1.50E-05	1.92E-05
Nickel	7.75E-06	1.28E-05	3.09E-05	3.68E-06	1.02E-05	4.95E-06	4.24E-06	1.33E-03	1.41E-03
Selenium	1.17E-07	2.85E-07	2.00E-06	3.40E-07	3.54E-07	3.25E-07	3.40E-07	2.17E-05	2.54E-05
Vanadium	2.58E-06	6.41E-06	2.34E-05	5.38E-06	5.66E-06	6.79E-06	7.07E-06	4.63E-04	5.20E-04
									1.10E-02

Emissions are based on the ERM proposed excavation procedures and configurations. ERM will also follow the RAP and ECMP to reduce the emissions. The District has reviewed the details and included them in the permit conditions.

Total Particulate Matter (PM) Emissions from S-1 and S-2

PM Emissions from Wind Erosion

PM = 0.036(1-V)(Um/Ut)^3(F(x)) [reference A]

Variable	Value	Units	Comments
V = fraction of contaminated area covered by vegetative cover	0	dimensionless	0 if bare soil
Um = mean annual windspeed (Inside)	0.14	m/s	((288/((129*288*52)ft3/80000ft3/min)/5280)*60)
Um = mean annual windspeed (outside)	4.69	m/s	default value from reference B (higher than all CA value
Ut = threshold wind speed at 7 m	11.32	m/s	default value from reference B
F(x) = function dependent on Um/Ut	0.194	dimensionless	default value from reference B
PM = PM emission factor for particulates generated from wind	1.198E-08	g/m2-hr	Inside
PM = PM emission factor for particulates generated from wind	4.967E-04	g/m2-hr	Outside

Sequence	Area (square feet)	Ew, g/hr	Ew, Emission factor	
			lb/hr	lb/day
Zone A - Main Tent	37,152	0.00004	0.00000009	0.00000219
Zone B - Outside Tent - South	912	0.04207	0.00009266	0.00222394
Zone C - Outside Tent - East	2,110	0.09735	0.00021443	0.00514630
Zone D1 - Outside Tent - North	906	0.04179	0.00009205	0.00220923
Zone D2 - Outside Tent - North	906	0.04179	0.00009205	0.00220923
Zone D3 - Outside Tent - North	906	0.04179	0.00009205	0.00220923
Zone D4 - Outside Tent - North	906	0.04179	0.00009205	0.00220923
Stockpiles	3,276	0.15117	0.00033297	0.00799121

Reference A — Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites, Equation 4-4, page 42

Reference B — Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (December 2002, OSWER 9355.4-24), Equation 4-5, page 4-18

PM Emissions from Excavation

PM = k(0.0032)(U/5)^1.3/(M/2)^1.4 [reference C: AP-42, Section 13.2.4]

Variable	Value	Units	Comments
k = particle size multiplier	0.74	dimensionless	assume particle size < 30 um
U = mean wind speed	0.30	mph	See Calculation in G7
U = mean wind speed	10.49	mph	based on default wind speed in Reference B
M = material moisture content	14	%	BAAQMD Request to use AP-42 Table 13.2.4-1
PMi = PM emission factor generated from excavation activities	4.063E-06	lbs/ton	Inside

PMo = PM emission factor generated from excavation activities	4.071E-04	lbs/ton	Outside

Total PM from excavation activities (Ee):

Ee = (PM)(excavated soil)(soil density)(1-C)

Total PM Emissions from stockpiling activities (Ees)

Ees = (PM)(excavated soil)(soil density)(1-C)(percentage being stockpiled)

Variable	Value	Unit	Comment
PM = PM emission factor generated from excavation activities	0.000004	lbs/ton	
excavated soil	400	cy/day	
soil density	1.66	ton/cy	
percentage being stockpiled	50%		Assume 50% of soil excavated is stockpiled
Eei = Total PM from excavation activities	0.0027	lbs/day	1 excavate/drop cycle - Assumes 10 hour day
	0.00027	lbs/hour	1 excavate/drop cycle
Eeo = Total PM from excavation activities	0.270	lbs/day	1 excavate/drop cycle - Assumes 10 hour day
	0.0270	lbs/hour	1 excavate/drop cycle
Ees = Total PM from stockpiling activities	0.135	lbs/day	1 excavate/drop cycle - Assumes 10 hour day
	0.0135	lbs/hour	1 excavate/drop cycle

Total PM Emissions from Vehicle Tracking

PM = (k(s/12)(S/30)^.5/(M/.5)^.2-C)(1-P/365) [Reference D: CalEEMod Construction Phase guidance, page 28]

Variable	Value	Unit	Comment
PM = PM emission factor from vehicle travel	0.424069199	lbs/VMT	AP-42 used equation for public roads and light duty vehicles,
k = particle size multiplier	1.8		6 for PM 30, 1.8 for PM 10 and 0.18 for PM 2.5, Reference E
s = silt content	13.5	%	use average silt content from AP-42
S = mean vehicle speed	5	mph	assume 5 mph
M = surface material moisture content	14	%	based on average moisture content of soil
C = emission factor for 1980's vehicle	0.00047	lbs/VMT	Ap-42 Table 13.2.2-4
P = number of days in a year with at least 0.01 in of rair	0	days/yr	per guidance, assume no precipitation for daily emissions

Reference E AP-42, Section 13.2.3

Ev = (PM)(VMT)(1-C)

Variable	Value	Unit	Comment
PM = emission factor	0.424069199	lbs/VMT	
VMT = vehicle miles traveled/day	2.65	VMT/day	Assume 35 trucks traveling 400 ft per day on site
C = control efficiency	0		accounted for at end
Ev = particulate matter from vehicles traveled	1.124	lbs/day	
Ev = particulate matter from vehicles traveled	0.112	lbs/hr	

Total PM Emissions = PM Emissions from wind erosion + PM Emissions from excavation + PM Emissions from Vehicle Tracking

		Unabated Emission factor (lbs/hr)	Unabated Emission factor (lbs/day)	Unabated Annual PM Emission (lbs/yr)	Abated Emission factor (lbs/hr)	Abated Emission factor (lbs/day)	Abated Annual PM Emission (lbs/yr)
Zone A - Main Tent		0.11227	1.126694	47.363	0.05613	0.563347	23.682
Zone B - Outside Tent - South		0.13906	1.395906	1.444	0.06953	0.697953	0.722
Zone C - Outsdie Tent		0.13918	1.398828	3.363	0.06959	0.699414	1.681
Zone D1 - Outside Tent - North	**S-1**	0.13906	1.395891	1.435	0.06953	0.697945	0.717
Zone D2 - Outside Tent - North		0.13906	1.395891	1.435	0.06953	0.697945	0.717
Zone D3 - Outside Tent - North		0.13906	1.395891	1.435	0.06953	0.697945	0.717
Zone D4 - Outside Tent - North		0.13906	1.395891	1.435	0.06953	0.697945	0.717
Stockpiles	**S-2**	0.01382	0.142832	7.836	0.00691	0.071416	3.918
Total				**65.746**			**32.873**

Table 5. Maximum Daily Particulate Matter (PM) Emissions from S-1 and S-2

Abated PM Emissions (lb/day)									
	S-1							S-2	Project
	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	
PM	0.564	0.722	0.700	0.717	0.717	0.717	0.717	0.084	
Total	**4.854**							**0.084**	**4.938**

Table 6. Maximum Annual Particulate Matter (PM) Emissions from S-1 and S-2

Abated PM Emissions (lb/year)									
	S-1							S-2	Project
	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	
PM	23.682	0.722	1.681	0.717	0.717	0.717	0.717	3.918	
Total	**28.953**							**3.918**	**32.871**

Plant Cumulative Increase

S-1 and S-2 located at "999 Third Street, San Rafael, CA 94901". There are no existing emissions at the plant.

Table 5 – Plant Cumulative Increase

Pollutants	Current Emissions [TPY]	New Emissions [TPY]	New Total Emissions [TPY]
POC	0.000	0.387	0.387
NOx	0.000	0.000	0.000
SO2	0.000	0.000	0.000

Pollutants	Current Emissions [TPY]	New Emissions [TPY]	New Total Emissions [TPY]
CO	0.000	0.000	0.000
PM10	0.000	0.016	0.016
NPOC	0.000	0.004	0.004

Health Risk Assessment

District's Regulation 2-5-216 Project:

2-5-216 **Project:** Any source, or group of sources, at a facility that: (a) is part of a proposed construction or modification, (b) is subject to the requirements of Regulation 2-1-301 or 302, and (c) emits one or more toxic air contaminants. All new or modified sources of TACs included in a single permit application will be considered as a project, except that a modified source that meets the requirements of Section 2-5-114 may be excluded from the project. *In addition, in order to discourage circumvention that might be achieved by breaking a project into smaller pieces and submitting more than one permit application over a period of time, a project shall include those new or modified sources of TACs at a facility that have been permitted within the three-year period immediately preceding the date a complete application is received, unless the applicant demonstrates to the satisfaction of the APCO that construction or modification of the sources included in the current application was neither (1) a reasonably foreseeable consequence of the previous project, nor (2) a critical element or integral part of the previous project.*

(Amended 1/6/10; 12/7/16)

PG&E conducted its soil remediation activities on the adjacent two-acre portion of the same site under District's Authority to Construct/Permit to Operate (Application #26510 and Plant #22583). The complete application #26510 was received on March 10, 2015 and the District received the of the current proposed remediation by BioMarin on December 28, 2018. Based on the project definition above, the Air District considers these remediation activities to be separate projects, because the first project was permitted more than three years before the second project.

The Health Risk Assessment (HRA) estimates the incremental health risks resulting from toxic air contaminant (TAC) emissions from the soil excavation project in open three storage piles, open excavation areas (Zone B, Zone C, Zone D1, D2, D3 and D4) and exhaust twelve stacks for tented excavation area at Zone A.

Health Risk Assessment (HRA) is required because Naphthalene emissions exceed the trigger level in District's Regulation 2, Rule 5, Table 2-5-1. Emissions details are in Table 8 below.

The HRA estimates the incremental health risks resulting from toxic air contaminants (TACs) emissions from the entire excavation activities, open excavation areas, exhaust stacks for tented excavation areas and open storage piles.

Although the duration of the proposed operation will be about 4-7 months, the project was conservatively evaluated assuming that the annual emission will continue to occur over a 9-year period. This is the shortest option available in Hot Spots Analysis and Reporting (HARP2) program.

For a 9-year exposure, the maximum residential impact occurs for the child receptor; thus, the residential cancer risk is calculated using the breathing rates and age sensitivity factors for a child. Assuming that the project emissions will occur at the same annual emission rate for 9 years, the maximum cancer risk is estimated to be 2.4 in a million, the maximum chronic hazard index is 0.02, and the maximum acute hazard index with the real time dust monitoring mitigation measure is less than 1.0. (Refer to the below Statement of Compliance section for a detail discussion of compliance with the acute hazard index.)
In accordance with Regulation 2, Rule 5, this project triggers TBACT, because the cancer risk will exceed 1 in a million. As discussed below, this project will comply with TBACT requirements. Projects that meet TBACT are subject to Regulation 2-5-302 project risk limits of 10 in a million cancer risk, 1.0 chronic hazard index, and 1.0 acute hazard index. This project will comply with these project risk limits.

Table 7 – Hourly POC and NPOC Emissions from S-1 and S-2 with the Acute Trigger Level

	Active Area Abated Emissions (lbs/hr)										
Chemical	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	Total Emissions	Acute Trigger Level	HRA Required (yes or no)
2-Butanone	1.46E-03	2.01E-04	3.40E-02	1.95E-04	2.15E-04	3.40E-04	3.12E-04	5.11E-04	3.72E-02	2.90E+01	no
Acenaphthene	2.13E-04	9.51E-07	4.58E-05	1.00E-06	1.10E-06	1.87E-05	1.00E-05	5.96E-05	3.50E-04		
Acenaphthylene	3.06E-03	9.44E-07	2.91E-05	6.88E-07	7.58E-07	2.45E-05	6.88E-06	9.72E-04	4.10E-03		
Acetone	2.40E-03	2.45E-04	4.37E-02	2.45E-04	5.77E-04	9.45E-04	6.12E-04	6.54E-04	4.94E-02		
Anthracene	4.99E-06	7.40E-09	1.41E-07	1.99E-09	2.19E-09	9.42E-08	1.99E-08	1.04E-05	1.56E-05		
Benzo(a) anthracene	5.40E-08	7.23E-11	3.06E-09	1.64E-11	1.81E-11	2.61E-09	5.28E-10	1.77E-07	2.37E-07		
Benzo(a) pyrene	1.56E-09	2.69E-12	9.49E-11	2.48E-13	2.73E-13	1.22E-10	2.20E-11	5.39E-09	7.20E-09		
Benzo(b)fluoranthene	1.42E-07	2.31E-10	8.57E-09	2.53E-11	2.79E-11	9.43E-09	1.67E-09	4.58E-07	6.20E-07		
Benzo(g,h,i)perylene	1.04E-02	4.28E-05	8.42E-04	3.82E-06	4.21E-06	2.14E-03	3.30E-04	1.97E-03	1.57E-02		
Benzo(k) fluoranthene	1.89E-10	5.61E-13	1.22E-11	1.50E-13	1.66E-13	1.12E-11	2.19E-12	6.54E-10	8.70E-10		
Carbon Disulfide	4.21E-04	5.77E-05	9.78E-03	5.61E-05	5.93E-05	6.25E-05	8.50E-05	1.46E-04	1.07E-02	1.40E+01	no
Chrysene	1.60E-09	1.73E-12	7.03E-11	3.19E-13	3.51E-13	8.11E-11	1.46E-11	5.53E-09	7.30E-09		
Dibenzo(a,h) anthracene	3.00E-10	2.14E-12	2.63E-11	5.74E-13	6.32E-13	2.82E-11	5.74E-12	1.03E-09	1.39E-09		
Fluoranthene	1.84E-06	9.50E-10	5.13E-08	1.12E-10	1.23E-10	8.93E-08	1.08E-08	5.52E-06	7.52E-06		
Fluorene	4.71E-04	6.00E+00	7.93E-06	1.87E-07	2.06E-07	3.49E-06	1.87E-06	2.40E-04	6.00E+00		
Indeno(1,2,3-cd) pyrene	4.05E-11	1.16E-13	2.97E-12	1.90E-14	2.10E-14	7.10E-12	1.13E-12	1.41E-10	1.93E-10		
Naphthalene	1.65E-03	2.83E-07	5.72E-05	3.06E-07	3.32E-07	4.88E-06	3.08E-06	4.11E-04	2.13E-03		
Phenanthrene	1.31E-04	4.24E-08	7.41E-07	5.21E-09	5.74E-09	2.65E-06	1.94E-07	2.19E-04	3.54E-04		
Pyrene	9.65E-07	5.13E-10	3.02E-08	5.94E-11	6.54E-11	4.93E-08	7.55E-09	3.00E-06	4.06E-06		
TPH-d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
TPH-g	3.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-02	3.68E-01		
TPH-mo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Benzene	4.02E-04	5.47E-05	9.95E-05	5.32E-05	5.62E-05	5.93E-05	8.05E-05	1.38E-04	9.43E-04	6.00E-02	no
Toluene*	1.49E-07	9.81E-09	2.29E-07	2.94E-08	2.94E-08	2.94E-08	2.94E-08	0.00E+00	5.06E-07	8.20E+01	no
Ethylbenzene*	1.87E-07	9.00E-09	9.81E-07	3.43E-08	3.43E-08	3.43E-08	3.43E-08	0.00E+00	1.31E-06		
m,p-Xylene*	1.77E-07	9.00E-09	2.94E-07	9.00E-09	9.00E-09	9.00E-09	9.00E-09	0.00E+00	5.17E-07	4.90E+01	no
o-Xylenes*	1.77E-07	9.00E-09	3.27E-07	9.00E-09	9.00E-09	9.00E-09	9.00E-09	0.00E+00	5.50E-07	4.90E+01	no
1,1-Dichloroethane*	1.68E-07	8.18E-09	1.31E-07	8.18E-09	8.18E-09	8.18E-09	8.18E-09	0.00E+00	3.40E-07		
Chloroform*	1.96E-07	9.81E-09	1.55E-07	9.81E-09	9.81E-09	9.81E-09	9.81E-09	0.00E+00	4.01E-07	3.30E-01	no
1,1,1-Trichloroethane*	2.15E-07	1.06E-08	1.72E-07	1.06E-08	1.06E-08	1.06E-08	1.06E-08	0.00E+00	4.40E-07	1.50E+02	no

Table 8 – Annual POC and NPOC Emissions from S-1 and S-2 with the Chronic Trigger Level

	Active Area Abated Emissions (lbs/yr)										
Chemical	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	Total Emissions	Chronic Trigger Level	HRA Required (yes or no)
2-Butanone	1.79E+00	6.03E-03	2.38E+00	5.86E-03	6.46E-03	1.02E-02	9.35E-03	1.77E+00	5.98E+00		
Acenaphthene	2.62E-01	2.85E-05	3.21E-03	3.01E-05	3.31E-05	5.60E-04	3.01E-04	2.07E-01	4.73E-01		
Acenaphthylene	3.76E+00	2.83E-05	2.04E-03	2.06E-05	2.27E-05	7.34E-04	2.06E-04	3.37E+00	7.14E+00		
Acetone	2.95E+00	7.35E-03	3.06E+00	7.35E-03	1.73E-02	2.83E-02	1.84E-02	2.27E+00	8.35E+00		
Anthracene	6.14E-03	2.22E-07	9.89E-06	5.96E-08	6.56E-08	2.83E-06	5.96E-07	3.60E-02	4.21E-02		
Benzo(a) anthracene	6.64E-05	2.17E-09	2.14E-07	4.92E-10	5.42E-10	7.84E-08	1.58E-08	6.13E-04	6.79E-04		
Benzo(a) pyrene	1.92E-06	8.08E-11	6.64E-09	7.45E-12	8.20E-12	3.65E-09	6.61E-10	1.87E-05	2.06E-05		
Benzo(b)fluoranthene	1.75E-04	6.94E-09	6.00E-07	7.59E-10	8.36E-10	2.83E-07	5.01E-08	1.59E-03	1.76E-03		
Benzo(g,h,i)perylene	1.27E+01	1.28E-03	5.89E-02	1.15E-04	1.26E-04	6.41E-02	9.91E-03	6.84E+00	1.97E+01		
Benzo(k) fluoranthene	2.33E-07	1.68E-11	8.57E-10	4.51E-12	4.97E-12	3.37E-10	6.58E-11	2.27E-06	2.50E-06		
Carbon Disulfide	5.18E-01	1.73E-03	6.85E-01	1.68E-03	1.78E-03	1.88E-03	2.55E-03	5.06E-01	1.72E+00	3.10E+04	no
Chrysene	1.97E-06	5.19E-11	4.92E-09	9.57E-12	1.05E-11	2.43E-09	4.38E-10	1.92E-05	2.12E-05		
Dibenzo(a,h) anthracene	3.69E-07	6.42E-11	1.84E-09	1.72E-11	1.90E-11	8.46E-10	1.72E-10	3.57E-06	3.95E-06		
Fluoranthene	2.27E-03	2.85E-08	3.59E-06	3.36E-09	3.70E-09	2.68E-06	3.25E-07	1.91E-02	2.14E-02		
Fluorene	5.79E-01	1.80E+02	5.55E-04	5.61E-06	6.18E-06	1.05E-04	5.61E-05	8.31E-01	1.81E+02		
Indeno(1,2,3-cd) pyrene	4.99E-08	3.49E-12	2.08E-10	5.71E-13	6.29E-13	2.13E-10	3.39E-11	4.88E-07	5.38E-07		
Naphthalene	2.03E+00	8.49E-06	4.01E-03	9.17E-06	9.96E-06	1.46E-04	9.23E-05	1.43E+00	3.47E+00	2.40E+00	YES
Phenanthrene	1.61E-01	1.27E-06	5.19E-05	1.56E-07	1.72E-07	7.94E-05	5.83E-06	7.59E-01	9.20E-01		
Pyrene	1.19E-03	1.54E-08	2.11E-06	1.78E-09	1.96E-09	1.48E-06	2.27E-07	1.04E-02	1.16E-02		
TPH-d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
TPH-g	3.97E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E+02	5.52E+02		
TPH-mo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Benzene	4.94E-01	1.64E-03	6.97E-03	1.60E-03	1.69E-03	1.78E-03	2.42E-03	4.79E-01	9.89E-01	2.90E+01	no
Toluene*	1.84E-04	2.94E-07	1.60E-05	8.83E-07	8.83E-07	8.83E-07	8.83E-07	0.00E+00	2.04E-04	1.20E+04	no
Ethylbenzene*	2.30E-04	2.70E-07	6.87E-05	1.03E-06	1.03E-06	1.03E-06	1.03E-06	0.00E+00	3.03E-04	3.30E+01	no
m,p-Xylene*	2.18E-04	2.70E-07	2.06E-05	2.70E-07	2.70E-07	2.70E-07	2.70E-07	0.00E+00	2.40E-04	2.70E+04	no
o-Xylenes*	2.18E-04	2.70E-07	2.29E-05	2.70E-07	2.70E-07	2.70E-07	2.70E-07	0.00E+00	2.42E-04	2.70E+04	no
1,1-Dichloroethane*	2.07E-04	2.45E-07	9.16E-06	2.45E-07	2.45E-07	2.45E-07	2.45E-07	0.00E+00	2.17E-04	5.00E+01	no
Chloroform*	2.41E-04	2.94E-07	1.09E-05	2.94E-07	2.94E-07	2.94E-07	2.94E-07	0.00E+00	2.54E-04	1.50E+01	no
1,1,1-Trichloroethane*	2.64E-04	3.19E-07	1.20E-05	3.19E-07	3.19E-07	3.19E-07	3.19E-07	0.00E+00	2.78E-04	3.90E+04	no

Table 9 – Hourly Fugitive Dust Metal Emissions from S-1 and S-2 with the Acute Trigger Level

	Active Area Abated Emissions (lbs/hr)									
Chemical	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	Total Emissions	Acute Trigger Level	HRA Required (yes or no)
Arsenic	5.20E-09	7.44E-08	2.58E-07	5.01E-08	7.98E-08	5.41E-06	1.76E-07	2.76E-06	8.82E-06	4.40E-04	no
Barium	3.78E-08	1.35E-06	3.81E-06	6.22E-07	3.65E-06	3.65E-06	3.11E-06	1.87E-06	1.81E-05		
Beryllium	8.98E-11	6.49E-09	1.18E-08	5.28E-09	1.01E-08	8.93E-09	9.88E-09	4.56E-09	5.72E-08		
Cadmium	7.09E-11	3.38E-09	1.01E-08	4.33E-09	4.46E-09	1.89E-08	4.33E-09	9.67E-09	5.52E-08		
Chromium	1.65E-08	1.07E-06	6.66E-07	7.98E-07	8.79E-07	5.82E-07	5.28E-07	2.97E-07	4.84E-06		
Copper	3.17E-08	3.11E-07	5.57E-07	2.03E-07	2.57E-07	5.55E-07	4.06E-07	2.83E-07	2.60E-06	2.20E-01	no
Cyanide	1.42E-08	1.49E-08	6.25E-07	1.49E-08	1.62E-08	4.33E-07	2.16E-08	2.21E-07	1.36E-06	7.50E-01	no
Lead	1.18E-08	1.27E-07	4.62E-07	7.58E-08	1.10E-07	1.35E-06	7.04E-07	6.91E-07	3.53E-06		
Mercury	1.80E-10	4.74E-10	1.63E-07	2.71E-10	2.98E-10	7.71E-09	2.44E-09	3.94E-09	1.78E-07	1.30E-03	no
Nickel	1.84E-08	1.22E-06	1.24E-06	3.52E-07	9.74E-07	4.74E-07	4.06E-07	2.42E-07	4.92E-06	3.10E-05	no
Selenium	2.79E-10	2.71E-08	8.02E-08	3.25E-08	3.38E-08	3.11E-08	3.25E-08	1.59E-08	2.53E-07		
Vanadium	6.14E-09	6.09E-07	9.38E-07	5.14E-07	5.41E-07	6.49E-07	6.77E-07	3.32E-07	4.27E-06	6.60E-02	no

Table 10 – Annual Fugitive Dust Metal Emissions from S-1 and S-2 with the Chronic Trigger Level

	Active Area Abated Emissions (lbs/yr)										
Chemical	Zone A	Zone B	Zone C	Zone D1	Zone D2	Zone D3	Zone D4	Storage Piles	Total Emissions	Chronic Trigger Level	HRA Required (yes or no)
Arsenic	2.19E-06	7.83E-07	6.46E-06	5.23E-07	8.35E-07	5.66E-05	1.84E-06	4.04E-04	4.73E-04	1.60E-03	no
Barium	1.59E-05	1.42E-05	9.51E-05	6.51E-06	3.82E-05	3.82E-05	3.25E-05	2.79E-03	3.03E-03		
Beryllium	3.78E-08	6.84E-08	2.96E-07	5.52E-08	1.06E-07	9.34E-08	1.03E-07	6.72E-06	7.48E-06	3.40E-02	no
Cadmium	2.98E-08	3.56E-08	2.51E-07	4.53E-08	4.67E-08	1.98E-07	4.53E-08	5.34E-06	5.99E-06	1.90E-02	no
Chromium	6.96E-06	1.13E-05	1.66E-05	8.35E-06	9.20E-06	6.08E-06	5.52E-06	1.20E-03	1.26E-03		
Copper	1.33E-05	3.28E-06	1.39E-05	2.12E-06	2.69E-06	5.80E-06	4.24E-06	2.25E-03	2.29E-03		
Cyanide	5.96E-06	1.57E-07	1.56E-05	1.56E-07	1.70E-07	4.53E-06	2.26E-07	1.01E-03	1.04E-03	3.50E+02	no
Lead	4.97E-06	1.34E-06	1.16E-05	7.92E-07	1.15E-06	1.41E-05	7.36E-06	8.52E-04	8.93E-04	2.90E-01	no
Mercury	7.55E-08	4.99E-09	4.08E-06	2.83E-09	3.11E-09	8.06E-08	2.55E-08	1.50E-05	1.92E-05	2.10E-01	no
Nickel	7.75E-06	1.28E-05	3.09E-05	3.68E-06	1.02E-05	4.95E-06	4.24E-06	1.33E-03	1.41E-03	3.10E-01	no
Selenium	1.17E-07	2.85E-07	2.00E-06	3.40E-07	3.54E-07	3.25E-07	3.40E-07	2.17E-05	2.54E-05	8.00E+00	no
Vanadium	2.58E-06	6.41E-06	2.34E-05	5.38E-06	5.66E-06	6.79E-06	7.07E-06	4.63E-04	5.20E-04		

Best Available Control Technology for Toxics (TBACT)

The owner/operator of soil excavation activities will be following extensive mitigation measures listed in the Final RAP and the ECMP approved by DTSC to minimize the emissions. The District considers these mitigation measures to be the best available control technology for toxics. The TBACT measures are as following:

- Most of the proposed excavation activities will be conducted inside tents. Tents will be abated with carbon units.
- Soil will be excavated and generally placed directly into trucks and transported offsite.
- Inactive stockpiles will be covered with a layer of emission suppression Rusmar Foam or equivalent, foam, mulch, cellulose cover (e.g. Con-cover or Waste Cover) or overlaid with heavy-duty plastic sheeting.
- During excavation within the tent, all exposed contaminated soil surfaces will be kept visibly moist by water spray, treated with an approved vapor suppression measure – Rusmar Foam or equivalent, or covered with cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emissions of organic compounds to the atmosphere.
- For the areas outside of the tents, ERM will use foaming in conjunction with Waste Cover and plastic sheeting so as to achieve 90% coverage.
- All the contaminated soils loaded into trucks or trailer for offsite disposal or treatment will be covered with an approved vapor suppression measure – Rusmar Foam or equivalent, or covered with cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emissions of organic compounds to the atmosphere.
- Appropriate decontamination of outer clothing will be required.
- Trucks will be cleaned off prior leaving the excavation site.

Statement of Compliance

Regulation 2, Rule 1 California Environmental Quality Act and Public Notice Requirements

California Environmental Quality Act (CEQA) Regulation 2-1-310
Except for projects which are considered ministerial per District's Regulation 2-1-311 or otherwise exempt per Regulation 2-1-312, all new sources that require a permit with BAAQMD must be reviewed in accordance with the California Environmental Quality Act (CEQA). CEQA requires a review of potential significant environmental impacts from proposed projects. An Initial Study/Negative Declaration was prepared as required by CEQA and approved by DTSC (as the lead agency). DTSC determined that an Addendum to the previously approved Negative Declaration (State Clearinghouse No. 2012102020) is appropriate because the proposed project will not result in any significant impacts to the environmental. DTSC has prepared an Addendum to the 2012 Negative Declaration to incorporate the soil excavation for the western one-acre area of the site. The CEQA Public Comment started on Wednesday 5/8/2019 and the public comment period will close on 6/7/2019. ERM-West will submit the CEQA and DTSC approval documents after the public comment period ends. We will review these documents before making final determination on the Air District permit.

Public Notification Regulation 2-1-412
This source is located within 1,000 feet of a school: Saint Raphael Elementary School (1100 5th Avenue, San Rafael, CA 94901). In accordance with Regulation 2-1-412, the Air District is required to prepare and distribute a public notice to the parents or guardians of children enrolled in any school within one-quarter mile of the source and to each address located within 1000 feet of the source. The Air District will receive comments on this project for 30 days after publication of the notice and will consider all comments before making a final decision on this project.

Regulation 2, Rule 2 New Source Review

Best Available Control Technology (BACT) Regulation 2-2-301
In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NOx, CO, SO2 or PM10.

Based on the emission calculation above, the owner/operator of S-1 is subject to BACT for POC emissions.

Best Available Control Technology (BACT)
The owner/operator of soil excavation activities will be following extensive mitigation measures listed in the Final Remedial Action Plan (RAP) and the Environmental Control and Monitoring Plan (ECMP) approved by DTSC to minimize the emissions. The Air District considers these measures to be the best available control technology for control of organic emissions from soil remediation projects. The BACT measures for POC are as following:

- Most of the proposed excavation activities will be conducted inside tents. Tents will be abated with carbon units.

- Soil will be excavated and generally placed directly into trucks and transported offsite.
- Inactive stockpiles will be covered with a layer of emission suppression Rusmar Foam or equivalent, foam, mulch, cellulose cover (e.g. Con-cover or Waste Cover) or overlaid with heavy-duty plastic sheeting.
- During excavation within the tent, all exposed contaminated soil surfaces will be kept visibly moist by water spray, treated with an approved vapor suppression measure – Rusmar Foam or equivalent, or covered with cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emissions of organic compounds to the atmosphere.
- For the areas outside of the tents, ERM will use foaming in conjunction with Waste Cover and plastic sheeting so as to achieve 90% coverage.
- All the contaminated soils loaded into trucks or trailer for offsite disposal or treatment will be covered with an approved vapor suppression measure – Rusmar Foam or equivalent, or covered with cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emissions of organic compounds to the atmosphere.

Offsets Regulation 2-2-302

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/year of POC or NOx per Regulation 2, Rule 2, Section 302. Based on the emission calculation above, offsets are not required for this project.

Regulation 2, Rule 5 New Source Review of Toxic Air Contaminants

Since TAC emissions for this project will exceed risk screen trigger levels, an HRA is required for this project pursuant to Regulation 2-5-401. The District conducted an HRA for this project in accordance with the BAAQMD HRA Guidelines. The following HRA tables show that these risk levels are considered acceptable. A detailed HRA report is attached.

TBACT:

Regulation 2-5-301 requires best available control technology for toxic air contaminants (TBACT) for each source that has a source risk of more than 1.0 in a million cancer risk or more than 0.2 chronic hazard index. The proposed excavation project is expected to meet TBACT. Please refer to TBACT discussion above.

Project Risks:

Regulation 2-5-302 limits project risks to 10.0 in a million cancer risk, 1.0 chronic hazard index, and 1.0 acute hazard index. The proposed project risks are all less than Regulation 2-5-302 project risk limits. Therefore, this project will comply with Regulation 2-5-302.

Table 11. Summary of HRA Results

Receptor	NAD 83 UTM Coordinates (meters)		Cancer Risk (in a million)	Chronic HI
	Easting (x)	Northing (y)		
Resident	541639.2	4,202,676	2.14	0.017
Worker	541579.2	4,202,686	0.33	0.023
Student (Saint Raphael Elementary School)	541545.4	4,203,055	0.015	0.31
Student (Parkside Children's Center)	541422.6	4,202,468	0.014	0.41

Maximum Acute Hazard Index	
NAD 83 UTM Coordinates: (541559.2, 4202826)	Acute Hazard Index
Max. Off-site	2.46

As discussed in ERM's ECMP, Section 2.3 Selected Dust Action Level and Section 3.1 Real-Time Dust Monitoring Program, the owner/operator will be taking hourly measurements upwind and downwind of the project using a handheld instrument that produces instantaneous measurements of PM10 concentrations. To ensure compliance with DTSC risk-based requirements and the California Ambient Air Quality Standard (CAAQS) for respirable dust (50 µg/m^3 of PM10, 24-hour average), ERM has selected and DTSC has approved a 1-hour based dust action level of 67.5 µg/m^3 of PM10. If the net project concentration measured by the 1-hour monitoring described above nears this dust action level, the owner/operator will implement additional dust-mitigation measures. Excavation may continue if airborne dust concentrations are reduced to an acceptable level. Excavation will cease if the dust action level is exceeded.

Although the HRA found a potential for an acute risk greater than 1.0 based on the worst-case emissions and air dispersion scenario in the model, the real-time monitoring for dust described above will also ensure that the acute risk is less than 1.0 during all soil remediation activities.

The total acute risk is 2.46 at NAD83 UTM: 541559, 4202826. The model run shows that Zone D3 is driving source with an acute hazard index (HI) of 1.83. The acute HI from Zone A was 0.0023, and the acute HI from all other zones was 0.6277. For Zone D3, Arsenic contributed 92.3% to the total acute HI of 1.83 and benzene contributed 7.5%. The distribution of acute impacts (arsenic, benzene, and other) from all zones, other than Zone A, are similar to the distribution of acute HI impacts for Zone D3. Overall, arsenic is contributing about 2.268 to the total acute HI, benzene is contributing 0.184, and Zone A emissions are contributing 0.002.

The HRA model run for acute impacts was based on the worst-case soil sampling data (Maximum Arsenic soil concentration: 400 mg/kg at Zone D3).

$$\frac{400\ mg\ Arsenic}{1\ kg\ soil} \times \frac{1\ kg\ soil}{1E+9\ \mu g\ soil} \times \frac{1000\ \mu g}{mg} = 4 \times 10^{-4}\ \frac{\mu g\ Arsenic}{\mu g\ soil}$$

At the Dust Action Level: 67.5 µg/m^3, soil excavation will stop, and additional mitigation measures will be implemented. For 67.5 µg/m^3, of PM10, the maximum arsenic concentration will be:

$$\frac{67.5\ \mu g\ soil}{1\ m3\ air} X\ \frac{4\ E-4\ \mu g\ Arsenic}{\mu g\ soil} = \frac{0.027\ \mu g\ Arsenic}{1\ m3\ air}$$

Thus, when excavation stops due to the real-time PM10 monitoring, the maximum potential concentration of arsenic in the air will be 0.027 µg/m^3. The acute reference exposure level (REL) for arsenic is 0.2 µg/m^3. Due to the real-time PM10 monitoring, the acute hazard quotient for arsenic will be:

Maximum Acute Non-Cancer Hazard Quotient = $\frac{Hourly\ Arsenic\ Concentration\ (\mu g/m3)}{Acute\ REL\ (\mu g/m3)} = \frac{0.027\ \mu g/m3}{0.2\ \mu g/m3}$ = 0.135 for As

As discussed above, benzene and Zone A emissions contributed an additional 0.186 to the total maximum acute HI. Adding the arsenic contribution based on real-time monitoring results in a total acute HI (0.186 + 0.135) = 0.32. This analysis demonstrates that the dust action level and real-time PM10 monitoring will ensure that the project acute HI will stay below an acute risk of 1.0. Therefore, implementation of the dust action level with real-time 1-hour monitoring will ensure compliance with Regulation 2-5-302.3.

Regulation 8-40 Organic Compounds – Aeration of Contamination Soil

Based on the information submitted, this operation is expected to be in compliance with Regulation 8-40, Aeration of Contaminated Soil, including procedures, monitoring and notification requirements.

Soil that contains less than 50 ppmw of volatile air contaminants is considered not contaminated per Regulation 8-40. It will be transported to landfills as daily coverage. This soil may contain toxic air contaminants that are not volatile.

As previously described, soil contains greater than 50 ppmw will be transported to a landfill that has approval to accept contaminated soil.

The proposed landfills include the following by waste type:

Non-Hazardous Waste

- Altamont Landfill in Livermore
- Kelly Canyon Landfill in Bay Point
- Forward Landfill in Manteca
- Potrero Hills Landfill in Suisun City
- Recology Hay Road Landfill in Vacaville
- Republic Services ECDC Landfill in East Carbon, Utah

Hazardous Waste

- Clean Harbors Environmental Services Buttonwillow Landfill facility in Buttonwillow
- Waste Management Kettleman Hills Landfill in Kettleman City
- Republic Services ECDC Landfill in East Carbon, Utah
- US Ecology's Beatty Landfill in Beatty, Nevada

Permit Conditions for Soil Excavation Project:

Please refer to the figures in the evaluation report for the different excavation zones, tent location and details.

Application No. 29685; Plant No. 24305; ERM-West, Inc. for S-1, S-2 and A-1

S-1 Contaminated Soil Excavation Activities (Zone A, B, C, D1, D2, D3 and D4)

S-2 Three contaminated soil storage piles

A-1 Tenting Abatement System for Zone A: Four activated carbon containers, each container has at least 23,000 lb carbon and has three stacks (so a total of 12 stacks at the tent), Stack heights are 8.5 feet above ground-level.

1. The owner/operator shall not excavate more than 250 tons per day (400 cubic yards per day) of contaminated soil at S-1 and shall not excavate more than 33,000 tons (19,800 cubic yards) total for the project.
   [Basis: Cumulative Increase, Regulation 2-5]

2. The owner/operator shall only excavate on weekdays from 7 am to 5 pm.
   [Basis: Cumulative Increase, Regulation 2-5]

3. The owner/operator shall use a 130 x 290 foot tent at Zone A of S-1.
   The owner/operator shall ensure the open excavation (un-tented) areas do not exceed the following dimensions at the identified zones of S-1:
   Zone B: 912 ft^2
   Zone C: 2110 ft^2
   Zone D1: 906 ft^2
   Zone D2: 906 ft^2
   Zone D3: 906 ft^2
   Zone D4: 906 ft^2
   Storage piles (S-2): 3276 ft^2
   [Basis: Cumulative Increase, Regulation 2-5]

4. The owner/operator shall abate Zone A of Source S-1 with A-1, containing at least four (23,000 lb minimum capacity) activated carbon vessels, when excavating soil within the Tent at Zone A. The owner/operator shall ensure that the tent is properly sealed during all Zone A operations.

The owner/operator shall implement all related mitigation measures detailed in the Environmental Control and Monitoring Plan (ECMP) dated on April 25, 2019, as approved by the California Department of Toxics Substances Control, and in the Air District Engineering Evaluation Report for Application # 29685.
[Basis: Cumulative Increase; Regulation 2-5]

5. The owner/operator shall maintain the A-1 stack height at least 8.5 feet above ground-level.
[Basis: Regulation 2-5]

6. All excavated contaminated soil in storage piles must be covered with cellulose cover or equivalent (e.g. Con-cover or Waster Cover) or heavy-duty plastic sheeting except for an active area not to exceed 6,000 square feet. The covering shall be in good conditions, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate. While the storage pile is active, the surface area not covered by plastic sheeting or other covering shall not exceed 6,000 square feet.
[Basis: Cumulative Increase. Regulation 2-5, Regulation 8-40-304]

7. All contaminated soil above grade shall be completely covered during periods of inactivity longer than one hour. The contaminated soil shall be covered with cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emission to the atmosphere. The covering shall be in good condition, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate.
[Basis: Regulation 8-40-305]

8. During excavation within the tent, all exposed contaminated soil surfaces above existing grade level shall be kept visibly moist by water spray, treated with an approved vapor suppressant – Rusmar Foam or equivalent, or covered with cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emissions of organic compounds to the atmosphere. The covering shall be in good conditions, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate.
[Basis: Regulation 8-40-306.1, Regulation 2-5]

9. When excavating outside of the tented areas, specified in Part 3, the owner/operator shall apply foam to control emissions when disturbing contaminated soil. Within one hour of active soil excavation or stockpile generation from soils excavated from areas outside the tent, the owner/operator shall apply one of the following to any remaining exposed contaminated soil:
   a. Cellulose cover or equivalent (e.g. Con-cover, Waste Cover, plastic sheeting)
   b. Clean soil upon completion of excavation (i.e. backfilling)

10. The owner/operate of S-1 shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the Air Pollution Control Officer on a daily basis at the following locations:
    a. At the inlet of each carbon container.
    b. At the three sample ports in the carbon bed of each container.

c. At the outlet of each carbon container prior to venting to the atmosphere.

When using an FID to monitor breakthrough, readings may be taken with and without a carbon filter tip fitted on the FID probe. Concentrations measured with the carbon filter tip in place shall be considered methane for the purposes of these permit conditions.

[Basis: Cumulative Increase, BACT/TBACT]

MONITORING AND CHANGING OUT THE CARBON BEDS (Permit Conditions 11-14)

11. The owner/operator shall record these daily monitoring readings in a monitoring log at the time they are taken. The monitoring results shall be used to estimate the frequency of carbon change-out necessary to maintain compliance with Part 12.
    [Basis: Cumulative Increase, BACT/TBACT]

12. The owner/operator shall change out each carbon container with unspent carbon upon breakthrough. Breakthrough defined as the detection of 10 ppmv or greater (measured as C1) at the sample port upstream and closest to the outlet.
    [Basis: Cumulative Increase, BACT/TBACT]

13. The owner/operator of this source shall maintain the following records for each month of operations of the source:
    a. The hours and times of operation.
    b. Each monitor reading or analysis result for the day of operation they are taken.
    c. The number of carbon beds removed from service.

    All measurements, records, and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least two years following the data the data is recorded.
    [Basis: Cumulative Increase, BACT/TBACT]

14. The owner/operator shall report in writing any non-compliance with Part 12 to the Director of the Compliance & Enforcement Division by the next business day after discovery. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well at the time of occurrence.
    [Basis: Cumulative Increase, BACT/TBACT]

TRUCKS (Permit Conditions 15-19)

15. All contaminated soils loaded into trucks or trailer for offsite disposal or treatment shall be covered with an approved vapor suppressant – Rusmar Foam or equivalent or cellulose cover or equivalent (e.g. Con-cover or Waste Cover) or continuous heavy-duty plastic sheeting to minimize emission of organic compounds to the atmosphere. The covering shall be in good condition, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate.
    [Basis: Regulation 8-40-306.2]

16. The owner/operator shall have no more than an average of 30 trucks per day to transport contaminated soil offsite.
    [Basis: Cumulative Increase, Regulation 2-5]

17. The owner/operator shall have no more than an average of 40 trucks per day to transport clean soil to site for backfilling.
    [Basis: Cumulative Increase, Regulation 2-5]

18. The owner/operator shall meet the following operational requirements to transport/handle contaminated soil:
    a. Earth-handling activities outside the tents shall be halted during high winds (sustained 15 mph or greater);
    b. On-site vehicles and equipment shall be limited to 15 mph;
    c. On-site vehicles and equipment shall be restricted to paved roads to the extent possible;
    d. Excavated soils shall be directly loaded onto trucks when possible; the duration of on-site soil stockpile shall be minimized;
    e. The exterior of the truck, trailer, and tires shall be cleaned-off prior to the truck leaving the site;
    f. Excavation activities shall be halted if any hourly net project dust level, measured pursuant to Part 25, equals or exceeds the Dust Action Level of 67.5 $\mu g/m^3$.
    g. Keep drop heights to minimum while loading vehicles with soil;
    h. No more than four trucks on site at a time; and
    i. Idling time for all equipment shall be minimized.
    [Basis: Cumulative Increase, Regulation 2-5, and Initial Study/Negative Declaration approved by DTSC]

19. The owner/operator shall allow the trucks to travel only on paved portions of the property or on “clean” soil that has been used as backfill after removing contaminated soil, to the extent possible.
    [Basis: Regulation 2-5 and Initial Study/Negative Declaration approved by DTSC]

20. The owner/operator shall ensure the clothing and shoes of onsite workers handling contaminated soil remain at the site when they exit the site unless appropriate decontamination of outer clothing is undertaken.
    [Basis: Cumulative Increase, Regulation 2-5]

21. The owner/operator shall ensure that excavated contaminated soil is not used as daily, intermediate, or final cover at any solid waste disposal site within the District.
    [Basis: Regulation 8-40-301]

22. The owner/operator shall backfill the excavated pit(s) with clean soil or other equivalent clean backfill materials.
    [Basis: Regulation 8-40-215]

23. The owner/operator shall provide a written report to the Compliance and Enforcement Division no later than 30 working days after excavation of the tented area and the un-tented areas are completed. The written verification shall include:
    a. Location of site at which excavation occurred.
    b. Quantity of soil excavated in tons and cubic yards.
    c. Procedures employed meet the requirements of Section 8-40-301 through 306.
    [Basis: Regulation 8-40-405, Cumulative Increase]

24. The weight and volume of excavated soil in tons and cubic yards shall be recorded in a monitoring log on a daily basis.
    [Basis: Regulation 1-523]

25. The owner/operator shall follow all the dust and VOC control measures, monitoring locations and procedures, action levels, corrective actions, and record keeping requirements specified in the Environmental Control and Monitoring Plan (ECMP) dated on April 25, 2019, as approved by the California Department of Toxics Substances Control. These requirements include:
    a. Hourly real-time dust monitoring during soil remediation activities.
    b. Hourly real-time VOC monitoring.
    c. Fence-line air monitoring.
    d. Real-time action levels for dust and VOC.
    [Basis: Cumulative Increase and Regulation 2-5]

26. The owner/operator shall transport the impacted soil that classified as non-RCRA Hazardous Waste, to the Clean Harbors Buttonwillow facility in Buttonwillow, CA or other Class I disposal facility approved by DTSC.
    [Basis: Initial Study/Negative Declaration approved by DTSC]

27. The owner/operator shall transport the contaminated soil to the Hay Road Landfill, Keller Canyon Landfill, Altamont Landfill, Forward Landfill or other landfills approved by DTSC. The owner/operator may transport the contaminated soil to Keller Canyon Landfill, Altamont Landfill, or Potrero Hills Landfill in the District jurisdiction only if landfills have District approval to accept contaminated soil.
    [Basis: Initial Study/Negative Declaration approved by DTSC, Regulation 8-40]

28. Any non-compliance with these conditions shall be reported in writing to the Compliance and Enforcement Division by the next business days after discovery. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence.
    [Basis: Regulation 1-441]

29. Upon final completion of the excavation project, the Permit Holder shall notify the Engineering Division within two weeks of completion of all remediation activities.
    [Basis: Regulation 1-441]

Recommendation

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct/Permit to Operate for the sources listed below. However, the proposed sources will be located within 1,000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412. After comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct/Permit to Operate for the following sources:

S-1 Contaminated Soil Excavation Activities (Zone A, B, C, D1, D2, D3 and D4)

S-2 Three contaminated soil storage piles

A-1 Tenting Abatement System for Zone A: Four activated carbon containers, each container has at least 23,000 lb carbon and has three stacks (so a total of 12 stacks at the tent), Stack heights are 8.5 feet above ground-level.

by_____date_____

Flora Chan
Senior Air Quality Engineer

Appendix A – Emission Calculations Methodology and Results

Introduction

Emissions of chemicals of potential concern (COPC) were estimated using the pore space and diffusion methodology outlined by the United States Environmental Protection Agency (USEPA) guidance *Estimation of Air Impacts for the Excavation of Contaminated Soils* (USEPA guidance 1992).

Per the USEPA guidance 1992, emissions from exposed surfaces during excavation are equal to the sum of emissions from the soil pore space and from diffusion. In addition, emissions from inactive contaminated storage piles were also estimated. However, these storage piles will be covered with vapor suppressant foam and mulch, in addition to an outer plastic tarp. Being inactive, significant emissions are expected only from diffusion. Also, while these storage piles will be generally inactive, when they are active, instead of material being excavated from the pit to the truck, material will be either excavated from the pit to the pile or from the pile to the truck. Thus, the emission estimates dealing with excavation from the pit to the truck will already cover the infrequent situations where the storage piles are active. Fugitive dust emissions were also calculated and then used to estimated particulate matter of 10 microns or smaller (PM10) and toxic emissions associated with the fugitive dust.

Assumptions

The emissions estimates provided are based on expected typical operations. The emission estimates are based on maximum results from soil gas and soil sampling data taken from the site. Figure 1 shows the excavation area divided into different zones.

In additional, the following assumptions were made during the analysis:

- Total Soil to be excavated is no more than 33,000 tons.
- A maximum of 250 tons of contaminated soil is excavated per day.
- Up to three stockpiles – with a diameter of 36 feet and a height of 7 feet for a surface area of about 101 m^2 each (1,100 square feet) – are used. Emissions from the stockpiles occur 24 hours per day.
- Excavation activities occur up to 10 hours per weekday.
- Air filled porosity (Ea) and total porosity are conservatively assumed to equal to 0.21 based on measured soil properties.
- Soil and air temperatures are approximately 25 degree Celsius.
- Moisture content is 14% - This moisture content is for clay/dirt mixtures at municipal soil waste landfills from AP-42 Table 13.2.4-1.

Pore Space and Diffusion Emission Approach Per USEPA Guidance

Emissions of soil pore space are estimated based on a modified version of Equation 3 from the USEPA guidance. The modification is made because actual contaminant concentration levels in the pore space are available and therefore do not need to be estimated:

$$ERps = \frac{Sps \times Ea \times Q \times ExC \times a \times b \times (1 - C)}{c}$$

Where:

ERps = emission rate from pore space, lbs/day
Sps = concentration of VOC in pore space, µg/L (based on soil gas test results)
Ea = air filled porosity, 0.21
Q = quantity of soil excavated, 250 tons/day (400 cubic yards/day)
ExC = soil-gas to atmosphere exchange rate, 0.33 (EPA default)
C = control efficiency
a = conversion factor, 28.32 L/cf
b = conversion factor, 27 cf/cy
c = conversion factor, 454E6 µg/lb

Emissions from diffusion are estimated bas on Equation 4 of the USEPA guidance:

$$ERDIFF = \frac{Csoil \times SA \times 10{,}000}{\frac{Ea}{Keq \times kg} + (\frac{\pi t}{De \times Keq})^{1/2}} \times \frac{T(1 - C)}{c}$$

Where:

ERDIFF = emission rate from diffusion, lbs/day
Csoil = concentration of contaminant in soil, g/cm^3 (Based on soil sample results)
SA = emitting surface area, 88m2
Ea = air filled porosity, 0.21
Keq = equilibrium coefficient
Kg = gas phase mass transfer coefficient, cm/s (default from USEPA guidance)
T = significant diffusion time, 60s (default form USEPA guidance
De = effective diffusivity @ 25 degree Celsius, cm^2/s
T = daily duration of excavation, 36,000 s/day
C = control efficiency
c = conversion factor, 454E6 µg/lb

The emitting surface area (SA) is initially calculated based on the assumption that a soil pit is formed. USEPA assumes the pit has default dimensions of 10m x 15m x 1m for a surface area of 150 m^2. USEPA derives this surface area assuming a default soil excavation of 150 m^3/hr; however, the soil excavation rate for this site is approximately 38.2 m^3/hr based on a daily excavation rate of 250 tons (400 cubic yards) and an excavation time of 8 hours/day. To obtain the emitting surface area specific to this site, the default dimensions of the pit described in the USEPA are proportioned based on the ratio between default soil excavation rate and the site-specific soil excavation rate. The surface area is then calculated based on the modified pit dimensions. The 88.2 m^2 value (60.3 m^2 from the pit and 27.9 m^2

from the truck area) is found to be consistent with the exposed emitting surface expected based on actual operations.

Per USEPA guidance, the diffusion equation assumes that the instantaneous emission rate at 60 seconds after soil is initially excavated is representative of the average emissions rate over the first 6 minutes. Furthermore, the USEPA assumption is that emissions after 6 minutes is minimal but that new soil will be disturbed with enough frequency that emissions occur continuously at the average rate during the first 6 minutes. So the equation inherently assumes that the emitting surface area of 88.2 m^2 is disturbed with enough frequency to support this assumption.

Effective diffusivity in air and equilibrium coefficients are specific to each contaminant and is calculated based on the Equation A-15 and A-16 listed in Appendix A of the USEPA guidance:

$$De = \frac{Da\ (Ea)^{3.33}}{(Et)^{3.33}}$$

Where:

De = effective diffusivity in air, cm2/s
Da = diffusivity of contaminant in air at 25 degree Celsius, cm^2/s
Ea = air filled porosity, 0.21
Et = total porosity, 0.26 (equals 1-measured density of soil/USEPA default particle density of 2.65 g/cm^3)

$$Keq = \frac{P \times MW \times Ea}{R \times T \times S\text{soil}}$$

Where:

Keq = equilibrium coefficient
P = vapor pressure at 25 degree Celsius, mm Hg
MW = molecular weight of contaminant, g/g-mol
Ea = air filled porosity, 0.21
R = universal gas constant, 62,361 mm Hg-cm^3/mol-K
T = temperature, 289K
Ssoil = concentration of contaminant in soil, g/cm^3

Contaminant specific vapor pressure and molecular weight (MW) are used in the equation above for all volatile organic compounds (VOCs) except total petroleum hydrocarbon (TPH). Instead, the USEPA recommended defaults of 35 mm HG and 100 g/g-mol are used for TPH. Also, the default of 0.0269 is used for TPH's De.

Active excavation will result in emissions from both pore space and diffusion. On the other hand, the emission from the inactive stock piles would be primarily from diffusion since the soil would not be disturbed in such a way to release gases in the pore space. There are no more than 3 stockpiles anticipated, each with a diameter of 36 feet and a height of 5 feet. However, for conservatism, the

maximum height of the piles is assumed to be 7 feet high. Assuming the pile forms in a shape of a cone, the total surface area per pile is 101 m^2 and a total of 304 m^2 for three piles. Emissions from the inactive piles are assumed to occur 24 hours a day.

There will be one tenting abatement systems when excavation at Zone A:
There will be a minimum of four activated carbons containers, each container has at least 23,000 lb carbon and has three stacks (so total of 12 stacks at the tent).

TAC, POC, and NPOC from Fugitive Dust

Emissions of toxic air contaminants (TAC), precursor organic compounds (POC), and non-precursor organic compounds (NPOC) from fugitive dust for each sequence were estimated by multiplying the average chemical concentration in the soil by the particulate matter (PM) emission factors specific to each sequence.

PM emissions are calculated for 2 categories of activities and are based on the listed reference:

1. PM emission from wind erosion (occurring 24 hours a day)
    - Rapid Assessment of Exposure to Particulate Emission from Surface Contamination Site, Equation 4-4, page 42 (USEPA 1985); and
    - Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, Equation 4-5, Page 4-18 (USEPA 2002)
2. PM emission from excavation (occurring 10 hours per day)

Key parameters used for these estimates are listed below:

- Moisture content (14%) was used. This moisture content is for clay/dirt mix at municipal soil waste landfills from AP-42 Table 13.2.4-1.
- 50% fugitive dust control for basic construction mitigation (BAAQMD 2012)
- PM emission factor for annual emissions from excavation activities are based on effective days of excavation based on an excavation rate of 250 tons per day (400 cubic yards per day) and a total of no more than 33,000 tons (19,800 cubic yards) of excavated soil.
- PM emission factor for annual emissions from wind erosion is conservatively based on total duration of each sequence.

Emissions of TAC are then based on the concentrations of chemicals in the soil and the PM emission factors. Hourly, daily, and annual emissions of TAC are estimated using the following equation:

$$TAC = S \times 10^{-6} \times EF$$

Where:

TAC = hourly, daily, or annual emission rate, lbs/hr, lbs/day, or lbs/yr
S = concentration of TAC in soil, mg/kg
EF = hourly, daily, or annual PM emission rate, lbs/hr, lbs/day, or lbs/yr

Vehicles will only be traveling on clean soil or paved surfaces without contaminated soil. Thus, the TAC levels in the PM emitted from vehicle tracking are treated as insignificant.

Appendix B – Emission Calculations Methodology and Results

The emission calculations for the proposed excavation project are presented in the following tables:

Total Hourly POC and NPOC Emissions from S-1 and S-2 – Table 1

Total Daily POC and NPOC Emission from S-1 and S-2 – Table 2

Total Annual POC and NPOC Emission from S-1 and S-2 – Table 3

Total Hourly Fugitive Dust Metal Emissions from S-1 and S-2 – Table 4

Total Daily Fugitive Dust Metal Emissions from S-1 and S-2 – Table 5

Total Annual Fugitive Dust Metal Emission from S-1 and S-2 – Table 6

Table 1 – Total Hourly POC and NPOC Emissions from S-1 and S-2

	Active Area Abated Emissions (lbs/hr)							
Chemical	**Zone A**	**Zone B**	**Zone C**	**Zone D1**	**Zone D2**	**Zone D3**	**Zone D4**	**Storage Piles**
2-Butanone	1.46E-03	2.01E-04	3.40E-02	1.95E-04	2.15E-04	3.40E-04	3.12E-04	5.11E-04
Acenaphthene	2.13E-04	9.51E-07	4.58E-05	1.00E-06	1.10E-06	1.87E-05	1.00E-05	5.96E-05
Acenaphthylene	3.06E-03	9.44E-07	2.91E-05	6.88E-07	7.58E-07	2.45E-05	6.88E-06	9.72E-04
Acetone	2.40E-03	2.45E-04	4.37E-02	2.45E-04	5.77E-04	9.45E-04	6.12E-04	6.54E-04
Anthracene	4.99E-06	7.40E-09	1.41E-07	1.99E-09	2.19E-09	9.42E-08	1.99E-08	1.04E-05
Benzo(a) anthracene	5.40E-08	7.23E-11	3.06E-09	1.64E-11	1.81E-11	2.61E-09	5.28E-10	1.77E-07
Benzo(a) pyrene	1.56E-09	2.69E-12	9.49E-11	2.48E-13	2.73E-13	1.22E-10	2.20E-11	5.39E-09
Benzo(b)fluoranthene	1.42E-07	2.31E-10	8.57E-09	2.53E-11	2.79E-11	9.43E-09	1.67E-09	4.58E-07
Benzo(g,h,i)perylene	1.04E-02	4.28E-05	8.42E-04	3.82E-06	4.21E-06	2.14E-03	3.30E-04	1.97E-03
Benzo(k) fluoranthene	1.89E-10	5.61E-13	1.22E-11	1.50E-13	1.66E-13	1.12E-11	2.19E-12	6.54E-10
Carbon Disulfide	4.21E-04	5.77E-05	9.78E-03	5.61E-05	5.93E-05	6.25E-05	8.50E-05	1.46E-04
Chrysene	1.60E-09	1.73E-12	7.03E-11	3.19E-13	3.51E-13	8.11E-11	1.46E-11	5.53E-09
Dibenzo(a,h) anthracene	3.00E-10	2.14E-12	2.63E-11	5.74E-13	6.32E-13	2.82E-11	5.74E-12	1.03E-09
Fluoranthene	1.84E-06	9.50E-10	5.13E-08	1.12E-10	1.23E-10	8.93E-08	1.08E-08	5.52E-06
Fluorene	4.71E-04	6.00E+00	7.93E-06	1.87E-07	2.06E-07	3.49E-06	1.87E-06	2.40E-04
Indeno(1,2,3-cd) pyrene	4.05E-11	1.16E-13	2.97E-12	1.90E-14	2.10E-14	7.10E-12	1.13E-12	1.41E-10
Naphthalene	1.65E-03	2.83E-07	5.72E-05	3.06E-07	3.32E-07	4.88E-06	3.08E-06	4.11E-04
Phenanthrene	1.31E-04	4.24E-08	7.41E-07	5.21E-09	5.74E-09	2.65E-06	1.94E-07	2.19E-04
Pyrene	9.65E-07	5.13E-10	3.02E-08	5.94E-11	6.54E-11	4.93E-08	7.55E-09	3.00E-06
TPH-d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-g	3.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-02
TPH-mo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.02E-04	5.47E-05	9.95E-05	5.32E-05	5.62E-05	5.93E-05	8.05E-05	1.38E-04
Toluene*	1.49E-07	9.81E-09	2.29E-07	2.94E-08	2.94E-08	2.94E-08	2.94E-08	0.00E+00
Ethylbenzene*	1.87E-07	9.00E-09	9.81E-07	3.43E-08	3.43E-08	3.43E-08	3.43E-08	0.00E+00
m,p-Xylene*	1.77E-07	9.00E-09	2.94E-07	9.00E-09	9.00E-09	9.00E-09	9.00E-09	0.00E+00
o-Xylenes*	1.77E-07	9.00E-09	3.27E-07	9.00E-09	9.00E-09	9.00E-09	9.00E-09	0.00E+00
1,1-Dichloroethane*	1.68E-07	8.18E-09	1.31E-07	8.18E-09	8.18E-09	8.18E-09	8.18E-09	0.00E+00
Chloroform*	1.96E-07	9.81E-09	1.55E-07	9.81E-09	9.81E-09	9.81E-09	9.81E-09	0.00E+00
1,1,1-Trichloroethane*	2.15E-07	1.06E-08	1.72E-07	1.06E-08	1.06E-08	1.06E-08	1.06E-08	0.00E+00
Total Volatile Hydrocarbons	**3.43E-01**	**6.00E+00**	**8.86E-02**	**5.56E-04**	**9.15E-04**	**3.60E-03**	**1.44E-03**	**5.01E-02**
POC	**3.41E-01**	**6.00E+00**	**4.49E-02**	**3.11E-04**	**3.38E-04**	**2.65E-03**	**8.30E-04**	**4.95E-02**
NPOC	**2.40E-03**	**2.45E-04**	**4.37E-02**	**2.45E-04**	**5.77E-04**	**9.45E-04**	**6.12E-04**	**6.54E-04**

Table 2 – Total Daily POC and NPOC Emission from S-1 and S-2

Chemical	Active Area Abated Emissions (lbs/day)							
	Zone A	**Zone B**	**Zone C**	**Zone D1**	**Zone D2**	**Zone D3**	**Zone D4**	**Storage Piles**
2-Butanone	1.46E-02	2.01E-03	3.40E-01	1.95E-03	2.15E-03	3.40E-03	3.12E-03	5.11E-03
Acenaphthene	2.13E-03	9.51E-06	4.58E-04	1.00E-05	1.10E-05	1.87E-04	1.00E-04	5.96E-04
Acenaphthylene	3.06E-02	9.44E-06	2.91E-04	6.88E-06	7.58E-06	2.45E-04	6.88E-05	9.72E-03
Acetone	2.40E-02	2.45E-03	4.37E-01	2.45E-03	5.77E-03	9.45E-03	6.12E-03	6.54E-03
Anthracene	4.99E-05	7.40E-08	1.41E-06	1.99E-08	2.19E-08	9.42E-07	1.99E-07	1.04E-04
Benzo(a) anthracene	5.40E-07	7.23E-10	3.06E-08	1.64E-10	1.81E-10	2.61E-08	5.28E-09	1.77E-06
Benzo(a) pyrene	1.56E-08	2.69E-11	9.49E-10	2.48E-12	2.73E-12	1.22E-09	2.20E-10	5.39E-08
Benzo(b)fluoranthene	1.42E-06	2.31E-09	8.57E-08	2.53E-10	2.79E-10	9.43E-08	1.67E-08	4.58E-06
Benzo(g,h,i)perylene	1.04E-01	4.28E-04	8.42E-03	3.82E-05	4.21E-05	2.14E-02	3.30E-03	1.97E-02
Benzo(k) fluoranthene	1.89E-09	5.61E-12	1.22E-10	1.50E-12	1.66E-12	1.12E-10	2.19E-11	6.54E-09
Carbon Disulfide	4.21E-03	5.77E-04	9.78E-02	5.61E-04	5.93E-04	6.25E-04	8.50E-04	1.46E-03
Chrysene	1.60E-08	1.73E-11	7.03E-10	3.19E-12	3.51E-12	8.11E-10	1.46E-10	5.53E-08
Dibenzo(a,h) anthracene	3.00E-09	2.14E-11	2.63E-10	5.74E-12	6.32E-12	2.82E-10	5.74E-11	1.03E-08
Fluoranthene	1.84E-05	9.50E-09	5.13E-07	1.12E-09	1.23E-09	8.93E-07	1.08E-07	5.52E-05
Fluorene	4.71E-03	6.00E+01	7.93E-05	1.87E-06	2.06E-06	3.49E-05	1.87E-05	2.40E-03
Indeno(1,2,3-cd) pyrene	4.05E-10	1.16E-12	2.97E-11	1.90E-13	2.10E-13	7.10E-11	1.13E-11	1.41E-09
Naphthalene	1.65E-02	2.83E-06	5.72E-04	3.06E-06	3.32E-06	4.88E-05	3.08E-05	4.11E-03
Phenanthrene	1.31E-03	4.24E-07	7.41E-06	5.21E-08	5.74E-08	2.65E-05	1.94E-06	2.19E-03
Pyrene	9.65E-06	5.13E-09	3.02E-07	5.94E-10	6.54E-10	4.93E-07	7.55E-08	3.00E-05
TPH-d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-g	3.23E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E-01
TPH-mo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.02E-03	5.47E-04	9.95E-04	5.32E-04	5.62E-04	5.93E-04	8.05E-04	1.38E-03
Toluene*	1.49E-06	9.81E-08	2.29E-06	2.94E-07	2.94E-07	2.94E-07	2.94E-07	0.00E+00
Ethylbenzene*	1.87E-06	9.00E-08	9.81E-06	3.43E-07	3.43E-07	3.43E-07	3.43E-07	0.00E+00
m,p-Xylene*	1.77E-06	9.00E-08	2.94E-06	9.00E-08	9.00E-08	9.00E-08	9.00E-08	0.00E+00
o-Xylenes*	1.77E-06	9.00E-08	3.27E-06	9.00E-08	9.00E-08	9.00E-08	9.00E-08	0.00E+00
1,1-Dichloroethane*	1.68E-06	8.18E-08	1.31E-06	8.18E-08	8.18E-08	8.18E-08	8.18E-08	0.00E+00
Chloroform*	1.96E-06	9.81E-08	1.55E-06	9.81E-08	9.81E-08	9.81E-08	9.81E-08	0.00E+00
1,1,1-Trichloroethane*	2.15E-06	1.06E-07	1.72E-06	1.06E-07	1.06E-07	1.06E-07	1.06E-07	0.00E+00
Total Volatile Hydrocarbons	**3.43E+00**	**6.00E+01**	**8.86E-01**	**5.56E-03**	**9.15E-03**	**3.60E-02**	**1.44E-02**	**5.01E-01**
POC	**3.41E+00**	**6.00E+01**	**4.49E-01**	**3.11E-03**	**3.38E-03**	**2.65E-02**	**8.30E-03**	**4.95E-01**
NPOC	**2.40E-02**	**2.45E-03**	**4.37E-01**	**2.45E-03**	**5.77E-03**	**9.45E-03**	**6.12E-03**	**6.54E-03**

Table 3 – Total Annual POC and NPOC Emission from S-1 and S-2

Chemical	Active Area Abated Emissions (lbs/yr)							
	Zone A	**Zone B**	**Zone C**	**Zone D1**	**Zone D2**	**Zone D3**	**Zone D4**	**Storage Piles**
2-Butanone	1.79E+00	6.03E-03	2.38E+00	5.86E-03	6.46E-03	1.02E-02	9.35E-03	1.77E+00
Acenaphthene	2.62E-01	2.85E-05	3.21E-03	3.01E-05	3.31E-05	5.60E-04	3.01E-04	2.07E-01
Acenaphthylene	3.76E+00	2.83E-05	2.04E-03	2.06E-05	2.27E-05	7.34E-04	2.06E-04	3.37E+00
Acetone	2.95E+00	7.35E-03	3.06E+00	7.35E-03	1.73E-02	2.83E-02	1.84E-02	2.27E+00
Anthracene	6.14E-03	2.22E-07	9.89E-06	5.96E-08	6.56E-08	2.83E-06	5.96E-07	3.60E-02
Benzo(a) anthracene	6.64E-05	2.17E-09	2.14E-07	4.92E-10	5.42E-10	7.84E-08	1.58E-08	6.13E-04
Benzo(a) pyrene	1.92E-06	8.08E-11	6.64E-09	7.45E-12	8.20E-12	3.65E-09	6.61E-10	1.87E-05
Benzo(b)fluoranthene	1.75E-04	6.94E-09	6.00E-07	7.59E-10	8.36E-10	2.83E-07	5.01E-08	1.59E-03
Benzo(g,h,i)perylene	1.27E+01	1.28E-03	5.89E-02	1.15E-04	1.26E-04	6.41E-02	9.91E-03	6.84E+00
Benzo(k) fluoranthene	2.33E-07	1.68E-11	8.57E-10	4.51E-12	4.97E-12	3.37E-10	6.58E-11	2.27E-06
Carbon Disulfide	5.18E-01	1.73E-03	6.85E-01	1.68E-03	1.78E-03	1.88E-03	2.55E-03	5.06E-01
Chrysene	1.97E-06	5.19E-11	4.92E-09	9.57E-12	1.05E-11	2.43E-09	4.38E-10	1.92E-05
Dibenzo(a,h) anthracene	3.69E-07	6.42E-11	1.84E-09	1.72E-11	1.90E-11	8.46E-10	1.72E-10	3.57E-06
Fluoranthene	2.27E-03	2.85E-08	3.59E-06	3.36E-09	3.70E-09	2.68E-06	3.25E-07	1.91E-02
Fluorene	5.79E-01	1.80E+02	5.55E-04	5.61E-06	6.18E-06	1.05E-04	5.61E-05	8.31E-01
Indeno(1,2,3-cd) pyrene	4.99E-08	3.49E-12	2.08E-10	5.71E-13	6.29E-13	2.13E-10	3.39E-11	4.88E-07
Naphthalene	2.03E+00	8.49E-06	4.01E-03	9.17E-06	9.96E-06	1.46E-04	9.23E-05	1.43E+00
Phenanthrene	1.61E-01	1.27E-06	5.19E-05	1.56E-07	1.72E-07	7.94E-05	5.83E-06	7.59E-01
Pyrene	1.19E-03	1.54E-08	2.11E-06	1.78E-09	1.96E-09	1.48E-06	2.27E-07	1.04E-02
TPH-d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-g	3.97E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E+02
TPH-mo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.94E-01	1.64E-03	6.97E-03	1.60E-03	1.69E-03	1.78E-03	2.42E-03	4.79E-01
Toluene*	1.84E-04	2.94E-07	1.60E-05	8.83E-07	8.83E-07	8.83E-07	8.83E-07	0.00E+00
Ethylbenzene*	2.30E-04	2.70E-07	6.87E-05	1.03E-06	1.03E-06	1.03E-06	1.03E-06	0.00E+00
m,p-Xylene*	2.18E-04	2.70E-07	2.06E-05	2.70E-07	2.70E-07	2.70E-07	2.70E-07	0.00E+00
o-Xylenes*	2.18E-04	2.70E-07	2.29E-05	2.70E-07	2.70E-07	2.70E-07	2.70E-07	0.00E+00
1,1-Dichloroethane*	2.07E-04	2.45E-07	9.16E-06	2.45E-07	2.45E-07	2.45E-07	2.45E-07	0.00E+00
Chloroform*	2.41E-04	2.94E-07	1.09E-05	2.94E-07	2.94E-07	2.94E-07	2.94E-07	0.00E+00
1,1,1-Trichloroethane*	2.64E-04	3.19E-07	1.20E-05	3.19E-07	3.19E-07	3.19E-07	3.19E-07	0.00E+00
Total Volatile Hydrocarbons	**4.22E+02**	**1.80E+02**	**6.20E+00**	**1.67E-02**	**2.74E-02**	**1.08E-01**	**4.33E-02**	**1.74E+02**
POC	**4.19E+02**	**1.80E+02**	**3.14E+00**	**9.33E-03**	**1.01E-02**	**7.96E-02**	**2.49E-02**	**1.72E+02**
NPOC	**2.95E+00**	**7.35E-03**	**3.06E+00**	**7.35E-03**	**1.73E-02**	**2.83E-02**	**1.84E-02**	**2.27E+00**

Table 4 – Total Hourly Fugitive Dust Metal Emissions from S-1 and S-2

Chemical	Active Area Abated Emissions (lbs/hr)							
	Zone A	**Zone B**	**Zone C**	**Zone D1**	**Zone D2**	**Zone D3**	**Zone D4**	**Storage Piles**
Arsenic	5.20E-09	7.44E-08	2.58E-07	5.01E-08	7.98E-08	5.41E-06	1.76E-07	2.76E-06
Barium	3.78E-08	1.35E-06	3.81E-06	6.22E-07	3.65E-06	3.65E-06	3.11E-06	1.87E-06
Beryllium	8.98E-11	6.49E-09	1.18E-08	5.28E-09	1.01E-08	8.93E-09	9.88E-09	4.56E-09
Cadmium	7.09E-11	3.38E-09	1.01E-08	4.33E-09	4.46E-09	1.89E-08	4.33E-09	9.67E-09
Chromium	1.65E-08	1.07E-06	6.66E-07	7.98E-07	8.79E-07	5.82E-07	5.28E-07	2.97E-07
Copper	3.17E-08	3.11E-07	5.57E-07	2.03E-07	2.57E-07	5.55E-07	4.06E-07	2.83E-07
Cyanide	1.42E-08	1.49E-08	6.25E-07	1.49E-08	1.62E-08	4.33E-07	2.16E-08	2.21E-07
Lead	1.18E-08	1.27E-07	4.62E-07	7.58E-08	1.10E-07	1.35E-06	7.04E-07	6.91E-07
Mercury	1.80E-10	4.74E-10	1.63E-07	2.71E-10	2.98E-10	7.71E-09	2.44E-09	3.94E-09
Nickel	1.84E-08	1.22E-06	1.24E-06	3.52E-07	9.74E-07	4.74E-07	4.06E-07	2.42E-07
Selenium	2.79E-10	2.71E-08	8.02E-08	3.25E-08	3.38E-08	3.11E-08	3.25E-08	1.59E-08
Vanadium	6.14E-09	6.09E-07	9.38E-07	5.14E-07	5.41E-07	6.49E-07	6.77E-07	3.32E-07

Table 5 – Total Daily Fugitive Dust Metal Emissions from S-1 and S-2

Chemical	**Active Area Abated Emissions (lbs/day)**							
	Zone A	**Zone B**	**Zone C**	**Zone D1**	**Zone D2**	**Zone D3**	**Zone D4**	**Storage Piles**
Arsenic	5.20E-08	7.44E-07	2.58E-06	5.01E-07	7.98E-07	5.41E-05	1.76E-06	2.76E-05
Barium	3.78E-07	1.35E-05	3.81E-05	6.22E-06	3.65E-05	3.65E-05	3.11E-05	1.87E-05
Beryllium	8.98E-10	6.49E-08	1.18E-07	5.28E-08	1.01E-07	8.93E-08	9.88E-08	4.56E-08
Cadmium	7.09E-10	3.38E-08	1.01E-07	4.33E-08	4.46E-08	1.89E-07	4.33E-08	9.67E-08
Chromium	1.65E-07	1.07E-05	6.66E-06	7.98E-06	8.79E-06	5.82E-06	5.28E-06	2.97E-06
Copper	3.17E-07	3.11E-06	5.57E-06	2.03E-06	2.57E-06	5.55E-06	4.06E-06	2.83E-06
Cyanide	1.42E-07	1.49E-07	6.25E-06	1.49E-07	1.62E-07	4.33E-06	2.16E-07	2.21E-06
Lead	1.18E-07	1.27E-06	4.62E-06	7.58E-07	1.10E-06	1.35E-05	7.04E-06	6.91E-06
Mercury	1.80E-09	4.74E-09	1.63E-06	2.71E-09	2.98E-09	7.71E-08	2.44E-08	3.94E-08
Nickel	1.84E-07	1.22E-05	1.24E-05	3.52E-06	9.74E-06	4.74E-06	4.06E-06	2.42E-06
Selenium	2.79E-09	2.71E-07	8.02E-07	3.25E-07	3.38E-07	3.11E-07	3.25E-07	1.59E-07
Vanadium	6.14E-08	6.09E-06	9.38E-06	5.14E-06	5.41E-06	6.49E-06	6.77E-06	3.32E-06

Table 6 – Total Annual Fugitive Dust Metal Emissions from S-1 and S-2

	Active Area Abated Emissions (lbs/yr)							
Chemical	**Zone A**	**Zone B**	**Zone C**	**Zone D1**	**Zone D2**	**Zone D3**	**Zone D4**	**Storage Piles**
Arsenic	2.19E-06	7.83E-07	6.46E-06	5.23E-07	8.35E-07	5.66E-05	1.84E-06	4.04E-04
Barium	1.59E-05	1.42E-05	9.51E-05	6.51E-06	3.82E-05	3.82E-05	3.25E-05	2.79E-03
Beryllium	3.78E-08	6.84E-08	2.96E-07	5.52E-08	1.06E-07	9.34E-08	1.03E-07	6.72E-06
Cadmium	2.98E-08	3.56E-08	2.51E-07	4.53E-08	4.67E-08	1.98E-07	4.53E-08	5.34E-06
Chromium	6.96E-06	1.13E-05	1.66E-05	8.35E-06	9.20E-06	6.08E-06	5.52E-06	1.20E-03
Copper	1.33E-05	3.28E-06	1.39E-05	2.12E-06	2.69E-06	5.80E-06	4.24E-06	2.25E-03
Cyanide	5.96E-06	1.57E-07	1.56E-05	1.56E-07	1.70E-07	4.53E-06	2.26E-07	1.01E-03
Lead	4.97E-06	1.34E-06	1.16E-05	7.92E-07	1.15E-06	1.41E-05	7.36E-06	8.52E-04
Mercury	7.55E-08	4.99E-09	4.08E-06	2.83E-09	3.11E-09	8.06E-08	2.55E-08	1.50E-05
Nickel	7.75E-06	1.28E-05	3.09E-05	3.68E-06	1.02E-05	4.95E-06	4.24E-06	1.33E-03
Selenium	1.17E-07	2.85E-07	2.00E-06	3.40E-07	3.54E-07	3.25E-07	3.40E-07	2.17E-05
Vanadium	2.58E-06	6.41E-06	2.34E-05	5.38E-06	5.66E-06	6.79E-06	7.07E-06	4.63E-04

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