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APPENDIX A

Air Quality Data

Appendix AQ1
Emissions Support Data

Table AQ1-1 Emissions Estimates for Emergency Standby Generators

Use Area: Data Center Bldg (IT Power)

Engine Mfg:	**CAT**	# of Units:	26	Max # of Engines Tested per Day:	10	# Redundant Engines:	2
Model #:	**D3516E**			*(engines are not tested concurrently)*		Emer Ops Engines:	24
Fuel:	ULSD	**Engine Data**					
Fuel S, %wt:	0.0015	Fuel wt, lb/gal:	7.05	Btu/gal:	137000	Lbs S/1000 gal:	0.10575
Lbs SO2/1000 gal:	0.2115	EPA Tier:	2	Control System:	SCR + DPF to Meet T4	Turbocharged:	Yes
Aftercooled:	Yes						

Engine Data													*METRIC UNITs*			NOx
	BHP	**kWe**	**Load %**	**RPM**	**Fuel, gph**	**Stk Ht, ft**	**Stk Diam, in**	**Stk Temp, F**	**mmbtu/hr**	**Stk Flow, ACFM**	**Stack Vel, f/s**	**Stk Diam, m**	**Stk Temp, Kelvins**	**Stk Vel, m/s**	**lb/hr**
	4043	2750	100	1800	192.9	100	20	896	26.43	22050	168.4496	0.5080	753.15	51.3434	13.593
	3030	2062.5	75	1800	147.3	100	20	846.3	-	17829	136.2035	0.5080	725.54	41.5148	10.187
	2100	1375	50	1800	107.5	100	20	838.4	-	14068	107.4716	0.5080	721.15	32.7573	7.060
	1713	1100	40	1800	90	100	20	832.3	-	12161	92.9032	0.5080	717.76	28.3169	5.759

Stack Exit Area (sq.ft) = 2.181662

Scenarios	**Emissions Factor Scenarios (all values in g/bhp-hr)** NOx	CO	VOC	SO2	PM10	PM2.5	**CO2e** lb/mmbtu
Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052
Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU adjusted EFs, 100% Load	1.53	2.6	0.14	0.005	0.02	0.02	
0.25 hr Uncontrolled, Tier 2 Stds Efs, 100% Load, w/DPF	4.6						
0.75 hr Controlled, T4 Efs, 100% Load, w/DPF	0.5						

	Controlled Emissions Factor Scenarios (all values in g/bhp-hr) NOx	CO	VOC	SO2	PM10	PM2.5	**CO2e** lb/mmbtu
Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load	0.500	2.6	0.14	0.005	0.02	0.02	163.052
Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU adjusted EFs, 100% Load	1.53	2.6	0.14	0.005	0.02	0.02	163.052

Scenario 1: **Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load**

Redundant engines do NOT operate during emergency operations.

Max Hourly Runtime: 1
Max Daily Runtime: 24
Max Annual Runtime: 100

	Single Engine NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	4.457	23.175	1.248	0.045	0.178	0.178	na
lbs/day	106.960	556.192	29.949	1.070	4.278	4.278	na
TPY	0.223	1.159	0.062	0.002	0.009	0.009	215.5

	24 Engines NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	106.96	556.19	29.95	1.07	4.28	4.28	na
lbs/day	2567.04	13348.61	718.77	25.67	102.68	102.68	na
TPY	5.35	27.81	1.50	0.05	0.21	0.21	5170.83

Scenario 2: **Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU adjusted EFs, 100% Load**

Max Hourly Runtime: 1
Max Daily Runtime: 1
Max Annual Runtime: 50

	Single Engine NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	13.593	23.175	1.248	0.045	0.178	0.178	na
lbs/day	13.593	23.175	1.248	0.045	0.178	0.178	na
TPY	0.340	0.579	0.031	0.001	0.004	0.004	107.7

	10 Engines NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	13.593	23.175	1.248	0.045	0.178	0.178	na
lbs/day	135.928	231.747	12.479	0.446	1.783	1.783	na

	All Engines NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
TPY	8.84	15.06	0.81	0.03	0.12	0.12	2800.87

BAAQMD 150 Hrs/Yr Emissions Totals, TPY:	NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
	14.183	42.873	2.309	0.082	0.330	0.330	7971.7

Table AQ1-2 Emissions Estimates for Emergency Standby Generators

Use Area: Data Center Bldg (Aux Power)

Engine Mfg:	**CAT**	# of Units:	1	Max # of Engines Tested per Day:	1	# Redundant Engines:	0
Model #:	**C32**			*(engines are not tested concurrently)*		Emer Ops Engines:	1
Fuel:	ULSD	**Engine Data**					

														METRIC UNITs		NOx
Fuel S, %wt:	0.0015	**BHP**	**kWe**	**Load %**	**RPM**	**Fuel, gph**	**Stk Ht, ft**	**Stk Diam, in**	**Stk Temp, F**	**mmbtu/hr**	**Stk Flow, ACFM**	**Stack Vel, f/s**	**Stk Diam, m**	**Stk Temp, Kelvins**	**Stk Vel, m/s**	**lb/hr**
Fuel wt, lb/gal:	7.05	1483	1000	100	1800	71.5	100	8	892.5	9.80	8115.3	387.4769	0.2032	751.21	118.1029	4.986
Btu/gal:	137000	1124	750	75	1800	56	100	8	822.2	-	6858.4	327.4643	0.2032	712.15	99.8111	3.779
Lbs S/1000 gal:	0.10575	772	500	50	1800	38.1	100	8	769.5	-	4815.2	229.9088	0.2032	682.87	70.0762	2.596
Lbs SO2/1000 gal:	0.2115	635.0000	400	40	1800	31.4	100	8	733.5	-	4039.9	192.8909	0.2032	662.87	58.7932	2.135
EPA Tier:	2															
Control System:	SCR + DPF to Meet T4															
Turbocharged:	Yes															
Aftercooled:	Yes															

Stack Exit Area (sq.ft) = 0.349066

	Emissions Factor Scenarios (all values in g/bhp-hr)						**CO2e**
Scenarios	**NOx**	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**lb/mmbtu**
Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052
Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU Adjusted EFs, 100% Load	1.53	2.6	0.14	0.005	0.02	0.02	163.052
0.25 hr Uncontrolled, Tier 2 Stds Efs, 100% Load, w/DPF	4.6						163.052
0.75 hr Controlled, T4 Efs, 100% Load, w/DPF	0.5						163.052

	Controlled Emissions Factor Scenarios (all values in g/bhp-hr)						**CO2e**
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**lb/mmbtu**
Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load	0.500	2.600	0.140	0.005	0.020	0.020	163.052
Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU Adjusted EFs, 100% Load	1.53	2.600	0.140	0.005	0.020	0.020	163.052

Scenario 1: **Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load**

Max Hourly Runtime: 1
Max Daily Runtime: 24
Max Annual Runtime: 100

	Single Engine						
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	1.635	8.501	0.458	0.016	0.065	0.065	na
lbs/day	39.234	204.015	10.985	0.392	1.569	1.569	na
TPY	0.082	0.425	0.023	0.001	0.003	0.003	79.9
	All Engines						
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	1.63	8.50	0.46	0.02	0.07	0.07	na
lbs/day	39.23	204.02	10.99	0.39	1.57	1.57	na
TPY	0.08	0.43	0.02	0.001	0.003	0.003	79.86

Scenario 2: **Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU Adjusted EFs, 100% Load**

Max Hourly Runtime: 1
Max Daily Runtime: 1
Max Annual Runtime: 50

	Single Engine						
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	4.986	8.501	0.458	0.016	0.065	0.065	na
lbs/day	4.986	8.501	0.458	0.016	0.065	0.065	na
TPY	0.125	0.213	0.011	0.0004	0.002	0.002	39.9
	1 Engine						
	NOx	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
lbs/hr	4.986	8.501	0.458	0.016	0.065	0.065	na
lbs/day	4.986	8.501	0.458	0.016	0.065	0.065	na
	All Engines						
TPY	0.12	0.21	0.01	0.000	0.002	0.002	39.93

BAAQMD 150 Hrs/Yr Emissions Totals, TPY:	**NOx**	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
	0.206	0.638	0.034	0.001	0.005	0.005	119.8

Table AQ1-3 Emissions Estimates for Emergency Standby Generators

Use Area: Ski Lodge Bldg

Engine Mfg:	**CAT**	# of Units:	1	Max # of Engines Tested per Day:	1	# Redundant Engines: 0
Model #:	**3512C**			*(engines are not tested concurrently)*		Emer Ops Engines: 1
Fuel:	ULSD	**Engine Data**				
Fuel S, %wt:	0.0015					
Fuel wt, lb/gal:	7.05					
Btu/gal:	137000					
Lbs S/1000 gal:	0.10575					
Lbs SO2/1000 gal:	0.2115					
EPA Tier:	2					
Control System:	SCR + DPF to Meet T4					
Turbocharged:	Yes					
Aftercooled:	Yes					

BHP	**kWe**	**Load %**	**RPM**	**Fuel, gph**	**Stk Ht, ft**	**Stk Diam, in**	**Stk Temp, F**	**mmbtu/hr**	**Stk Flow, ACFM**	**Stack Vel, f/s**	***METRIC UNITs*** **Stk Diam, m**	**Stk Temp, Kelvins**	**Stk Vel, m/s**	**NOx lb/hr**
2400	1750	100	1800	109.4	36	16	820.4	14.99	12943.5	154.5017	0.4064	711.15	47.0921	8.069
1799	1200	75	1800	86.1	36	16	819.4	-	10575.9	126.2405	0.4064	710.59	38.4781	6.048
1237	800	50	1800	63.8	36	16	813.5	-	8410	100.3870	0.4064	707.32	30.598	4.159
1012	640	40	1800	54.6	36	16	805.6	-	7410.8	88.4599	0.4064	702.93	26.9626	3.402

Stack Exit Area (sq.ft) = 1.396263

Scenarios	**Emissions Factor Scenarios (all values in g/bhp-hr)** NOx	CO	VOC	SO2	PM10	PM2.5	**CO2e lb/mmbtu**
Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load	0.5	2.6	0.14	0.005	0.02	0.02	163.052
Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU Adjusted EFs, 100% Load	1.53	2.6	0.14	0.005	0.02	0.02	163.052
0.25 hr Uncontrolled, Tier 2 Stds Efs, 100% Load, w/DPF	4.6						163.052
0.75 hr Controlled, T4 Efs, 100% Load, w/DPF	0.5						163.052

	Controlled Emissions Factor Scenarios (all values in g/bhp-hr) NOx	CO	VOC	SO2	PM10	PM2.5	**CO2e lb/mmbtu**
Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load	0.500	2.600	0.140	0.005	0.020	0.020	163.052
Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU Adjusted EFs, 100% Load	1.53	2.600	0.140	0.005	0.020	0.020	163.052

Scenario 1: **Emergency Ops, 100 hrs/yr, Tier 4 Controlled EFs, 100% Load**

Max Hourly Runtime: 1
Max Daily Runtime: 24
Max Annual Runtime: 100

	Single Engine NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	2.646	13.757	0.741	0.026	0.106	0.106	na
lbs/day	63.493	330.166	17.778	0.635	2.540	2.540	na
TPY	0.132	0.688	0.037	0.001	0.005	0.005	122.2

	All Engines NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	2.65	13.76	0.74	0.03	0.11	0.11	na
lbs/day	63.49	330.17	17.78	0.63	2.54	2.54	na
TPY	0.13	0.69	0.04	0.001	0.005	0.005	122.19

Scenario 2: **Maint/Readiness Testing, 50 hrs/yr, T2/T4 SU Adjusted EFs, 100% Load**

Max Hourly Runtime: 1
Max Daily Runtime: 1
Max Annual Runtime: 50

	Single Engine NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	8.069	13.757	0.741	0.026	0.106	0.106	na
lbs/day	8.069	13.757	0.741	0.026	0.106	0.106	na
TPY	0.202	0.344	0.019	0.0007	0.003	0.003	61.1

	1 Engine NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
lbs/hr	8.069	13.757	0.741	0.026	0.106	0.106	na
lbs/day	8.069	13.757	0.741	0.026	0.106	0.106	na

	All Engines NOx	CO	VOC	SO2	PM10	PM2.5	CO2e
TPY	0.20	0.34	0.02	0.001	0.003	0.003	61.09

BAAQMD 150 Hrs/Yr Emissions Totals, TPY:	**NOx**	**CO**	**VOC**	**SO2**	**PM10**	**PM2.5**	**CO2e**
	0.334	1.032	0.056	0.002	0.008	0.008	183.3

Table AQ1-4 Fixed Roof Tank Emissions Estimates

Ref: AP-42, Section 7.1, 11/2006
Tanks converted from rectangular to horizontal cylindrical for purposes of these calculations.
indicates input

Standing Storage Losses			***Comments***	**Note**
Type of organic liquid:	#2 ULS Diesel		~11000 gal tanks for Cat D3516E engines	
Vapor molecular weight:	Mw	130	AP-42	
Vapor density, lbs/ft3:	Vd	0.00015243		
Liquid density, lbs/gal	Dl	7.1	AP-42	
TVP, psia @ 60F	Vp	0.0065	AP-42 (consistent with Ta below)	
~ Tank diameter, ft.	D	9		
~ Tank height or length, ft.	H	23		
~ Tank capacity, gals	Tc	11000		
Avg vapor space height, ft.	Hv	2	annual avg value based on use versus tank refills	
Vapor space volume, ft3	Vv	127.23		
~Total tank volume, ft3	Tv	1470	Based on actual tank dimensions	
Avg Annual Temp, F	Ta	56.6	API Bulletin 2517, for SFO Airport	
Avg diurnal temp change, F	Tc	13.1	Avg max minus avg min.	
Paint factor	Pf	0.05	AP-42, Table 7.1-6, solar absorbance value	1
Product factor	Pd	1	Crude = 0.75, all others = 1	
Turnover factor	Kn	1	If turnover <36/year, the factor = 1. If >36 then calculate Kn. Per AP-42.	
Annual throughput, gals/yr	At	20820		
Vapor space expansion factor	Ke	0.04	AP-42, default value	
Vapor saturation factor	Ks	0.9993		
# of similar tanks		14	1 tank per double stack + 2 tanks for non-stacked units	2
Standing Loss	**Ls**	**0.28**	**lbs/yr (breathing and standing losses)**	
Working Losses				
Vapor molecular weight:	Mw	130		
Vapor pressure, psia @ 70F	Vp	0.0065		
Throughput, bbl/yr	Q	495.7		
Turnover factor	Kn	1		
Working loss product factor	Kp	1		
Working Loss	**Lw**	**0.42**	**lbs/yr (tank filling and withdrawal losses)**	
	Ls+Lw	**0.70**		
Engineering Uncertainty Factor		1.2		
Uncontrolled Total Tank Losses		**0.84**	**lbs/yr each tank**	
		11.79	**lbs/yr all tanks**	
Control System ?	No	0	control fraction	
System type, etc.	NA, no controls are required on #2 fuel oil storage tanks or delivery systems			3
Controlled Total Tank Losses		**0.84**	**lbs/yr each tank**	
		11.79	**lbs/yr all tanks**	
		0.006	**TPY all tanks**	

Note 1 - paint factor reduced due to tanks being inside the bldg on the ground floor not subject to ambient sunlight exposure.
Note 2 - based on Applicant supplied data
Note 3 - consult agency regulations for permitting requirements

Air Toxics Emissions - Source: SJVUAPCD AB2588 Air Toxics Profiles (Profile 23 Diesel Fuel Storage)

Toxic Pollutant	EF, lb/lb VOC	Emissions, lbs/yr (all tanks)	lbs/hr
Benzene	0.00088	0.0104	1.18447E-06
Toluene	0.00482	0.0568	6.48765E-06
Xylenes	0.0042	0.0495	5.65314E-06

Table AQ1-5 Fixed Roof Tank Emissions Estimates

Ref: AP-42, Section 7.1, 11/2006
Tanks converted from rectangular to horizontal cylindrical for purposes of these calculations.
indicates input

Standing Storage Losses			***Comments***	**Note**
Type of organic liquid:	#2 ULS Diesel		~5000 gal tank for Cat 3512C engine	
Vapor molecular weight:	Mw	130	AP-42	
Vapor density, lbs/ft3:	Vd	0.00015243		
Liquid density, lbs/gal	Dl	7.1	AP-42	
TVP, psia @ 60F	Vp	0.0065	AP-42 (consistent with Ta below)	
~ Tank diameter, ft.	D	8		
~ Tank height or length, ft.	H	13.5		
~ Tank capacity, gals	Tc	5000		
Avg vapor space height, ft.	Hv	2	annual avg value based on use versus tank refills	
Vapor space volume, ft3	Vv	100.53		
~Total tank volume, ft3	Tv	668	Based on actual tank dimensions	
Avg Annual Temp, F	Ta	56.6	API Bulletin 2517, for SFO Airport	
Avg diurnal temp change, F	Tc	13.1	Avg max minus avg min.	
Paint factor	Pf	0.05	AP-42, Table 7.1-6, solar absorbance value	1
Product factor	Pd	1	Crude = 0.75, all others = 1	
Turnover factor	Kn	1	If turnover <36/year, the factor = 1. If >36 then calculate Kn. Per AP-42.	
Annual throughput, gals/yr	At	6090		
Vapor space expansion factor	Ke	0.04	AP-42, default value	
Vapor saturation factor	Ks	0.9993		
# of similar tanks		1	1 tank only	2
Standing Loss	**Ls**	**0.22**	**lbs/yr (breathing and standing losses)**	
Working Losses				
Vapor molecular weight:	Mw	130		
Vapor pressure, psia @ 70F	Vp	0.0065		
Throughput, bbl/yr	Q	145.0		
Turnover factor	Kn	1		
Working loss product factor	Kp	1		
Working Loss	**Lw**	**0.12**	**lbs/yr (tank filling and withdrawal losses)**	
	Ls+Lw	**0.35**		
Engineering Uncertainty Factor		1.2		
Uncontrolled Total Tank Losses		**0.42**	**lbs/yr each tank**	
		0.42	**lbs/yr all tanks**	
Control System ?	No	0	control fraction	
System type, etc.	NA, no controls are required on #2 fuel oil storage tanks or delivery systems			3
Controlled Total Tank Losses		**0.42**	**lbs/yr each tank**	
		0.42	**lbs/yr all tanks**	
		0.000	**TPY all tanks**	

Note 1 - paint factor reduced due to tanks being inside the bldg on the ground floor not subject to ambient sunlight exposure.
Note 2 - based on Applicant supplied data
Note 3 - consult agency regulations for permitting requirements

Air Toxics Emissions - Source: SJVUAPCD AB2588 Air Toxics Profiles (Profile 23 Diesel Fuel Storage)

Toxic Pollutant	EF, lb/lb VOC	Emissions, lbs/yr (all tanks)	lbs/hr
Benzene	0.00088	0.0004	4.17212E-08
Toluene	0.00482	0.0020	2.28518E-07
Xylenes	0.0042	0.0017	1.99124E-07

Table AQ1-6 Fixed Roof Tank Emissions Estimates

Ref: AP-42, Section 7.1, 11/2006
Tanks converted from rectangular to horizontal cylindrical for purposes of these calculations.
indicates input

Standing Storage Losses			***Comments***	**Note**
Type of organic liquid:	#2 ULS Diesel		~3400 gal tank for Cat C32 engine	
Vapor molecular weight:	Mw	130	AP-42	
Vapor density, lbs/ft3:	Vd	0.00015243		
Liquid density, lbs/gal	Dl	7.1	AP-42	
TVP, psia @ 60F	Vp	0.0065	AP-42 (consistent with Ta below)	
~ Tank diameter, ft.	D	6		
~ Tank height or length, ft.	H	17		
~ Tank capacity, gals	Tc	3400		
Avg vapor space height, ft.	Hv	2	annual avg value based on use versus tank refills	
Vapor space volume, ft3	Vv	56.55		
~Total tank volume, ft3	Tv	454	Based on actual tank dimensions	
Avg Annual Temp, F	Ta	56.6	API Bulletin 2517, for SFO Airport	
Avg diurnal temp change, F	Tc	13.1	Avg max minus avg min.	
Paint factor	Pf	0.05	AP-42, Table 7.1-6, solar absorbance value	1
Product factor	Pd	1	Crude = 0.75, all others = 1	
Turnover factor	Kn	1	If turnover <36/year, the factor = 1. If >36 then calculate Kn. Per AP-42.	
Annual throughput, gals/yr	At	3575		
Vapor space expansion factor	Ke	0.04	AP-42, default value	
Vapor saturation factor	Ks	0.9993		
# of similar tanks		1	1 tank only	2
Standing Loss	**Ls**	**0.13**	**lbs/yr (breathing and standing losses)**	
Working Losses				
Vapor molecular weight:	Mw	130		
Vapor pressure, psia @ 70F	Vp	0.0065		
Throughput, bbl/yr	Q	85.1		
Turnover factor	Kn	1		
Working loss product factor	Kp	1		
Working Loss	**Lw**	**0.07**	**lbs/yr (tank filling and withdrawal losses)**	
	Ls+Lw	**0.20**		
Engineering Uncertainty Factor		1.2		
Uncontrolled Total Tank Losses		**0.24**	**lbs/yr each tank**	
		0.24	**lbs/yr all tanks**	
Control System ?	No	0	control fraction	
System type, etc.	NA, no controls are required on #2 fuel oil storage tanks or delivery systems			3
Controlled Total Tank Losses		**0.24**	**lbs/yr each tank**	
		0.24	**lbs/yr all tanks**	
		0.000	**TPY all tanks**	

Note 1 - paint factor reduced due to tanks being inside the bldg on the ground floor not subject to ambient sunlight exposure.
Note 2 - based on Applicant supplied data
Note 3 - consult agency regulations for permitting requirements

Air Toxics Emissions - Source: SJVUAPCD AB2588 Air Toxics Profiles (Profile 23 Diesel Fuel Storage)

Toxic Pollutant	EF, lb/lb VOC	Emissions, lbs/yr (all tanks)	lbs/hr
Benzene	0.00088	0.0002	2.38304E-08
Toluene	0.00482	0.0011	1.30526E-07
Xylenes	0.0042	0.0010	1.13736E-07

Table AQ1-7 Small Fixed Roof Tank Emissions Estimates

Ref: AP-42, Section 7.1, 11/2006 and 6/2020.

indicates input

Standing Storage Losses			***Comments***	**Note**
Type of organic liquid:	#2 ULS Diesel		500 gal Day Tanks	
Vapor molecular weight:	Mw	130	AP-42	
Vapor density, lbs/ft3:	Vd	0.00015243		
Liquid density, lbs/gal	Dl	7.1	AP-42	
TVP, psia @ 60F	Vp	0.0065	AP-42 (consistent with Ta below)	
~ Tank diameter, ft.	D	3.75	equivalent dimemnsion for 4000 gals	
~ Tank height or length, ft.	H	6	equivalent dimemnsion for 4000 gals	
~ Tank capacity, gals	Tc	500		
Avg vapor space height, ft.	Hv	1	annual avg value based on use versus tank refills	
Vapor space volume, ft3	Vv	11.04		
Total tank volume, ft3	Tv	67	Based on actual tank dimensions	
Avg Annual Temp, F	Ta	56.6	NWS-NOAA Climate Summary	
Avg diurnal temp change, F	Tc	13.1	Avg max minus avg min.	
Paint factor	Pf	0.17	AP-42, Table 7.1-6, solar absorbance value	1
Product factor	Pd	1	Crude = 0.75, all others = 1	
Turnover factor	Kn	0.881	If turnover <36/year, the factor = 1. If >36 then calculate Kn. Per AP-42.	
Annual throughput, gals/yr	At	3575		
Vapor space expansion factor	Ke	0.04	AP-42, default value	
Vapor saturation factor	Ks	0.9997		
# of similar tanks		12	1 day tank per engine double stack	2
Standing Loss	**Ls**	**0.02**	**lbs/yr (breathing and standing losses)**	

Working Losses			
Vapor molecular weight:	Mw	130	
Vapor pressure, psia @ 70F	Vp	0.0065	
Throughput, bbl/yr	Q	85.1	
Turnover factor	Kn	0.881	
Working loss product factor	Kp	1	
Working Loss	**Lw**	**0.06**	**lbs/yr (tank filling and withdrawal losses)**
	Ls+Lw	**0.09**	
Engineering Uncertainty Factor		1.2	
Uncontrolled Total Tank Losses		**0.11**	**lbs/yr each tank**
		1.27	**lbs/yr all tanks**
Control System ?	No	0	control fraction
System type, etc.	NA, no controls are required on #2 fuel oil storage tanks or delivery systems		3
Controlled Total Tank Losses		**0.11**	**lbs/yr each tank**
		1.27	**lbs/yr all tanks**
		6.332E-04	**TPY all tanks**

Note 1 - paint factor for new tanks, painted white, etc.

Note 2 - for conservativeness, annual thruput based on M&R testing of 50 hrs/yr

Note 3 - consult agency reguations for permitting requirements

Air Toxics Emissions - Source: SJVUAPCD AB2588 Air Toxics Profiles (Profile 23 Diesel Fuel Storage)

Toxic Pollutant	**EF, lb/lb VOC**	**Emissions, lbs/yr (all tanks)**	**Emissions, TPY**	**lbs/hr**
Benzene	0.00088	0.0011	5.57173E-06	1.27E-07
Toluene	0.00482	0.0061	3.05179E-05	6.97E-07
Xylenes	0.0042	0.0053	2.65923E-05	6.07E-07

Appendix AQ2
Engine Specifications

PERFORMANCE DATA [LF3213]

FEBRUARY 04, 2022

For Help Desk Phone Numbers Click here

Help

Perf No: EM5402 **Change Level:** 00

General | Heat Rejection | Emissions | Regulatory | Altitude Derate | Cross Reference | Perf Param Ref

View PDF

SALES MODEL:	3516E	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
MACHINE SALES MODEL:		**HERTZ:**	60
ENGINE POWER (BKW):	3,015.0	**FAN POWER (KW):**	120.0
GEN POWER WITH FAN (EKW):	2,750.0	**ASPIRATION:**	TA
COMPRESSION RATIO:	14.7	**AFTERCOOLER TYPE:**	ATAAC
RATING LEVEL:	MISSION CRITICAL STANDBY	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
PUMP QUANTITY:	1	**INLET MANIFOLD AIR TEMP (C):**	50
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (C):**	104
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	ADEM5	**TURBO QUANTITY:**	4
ELECTRONICS TYPE:	ADEM5	**TURBOCHARGER MODEL:**	GTB6051N-44T-1.25
IGNITION TYPE:	CI	**CERTIFICATION YEAR:**	2017
INJECTOR TYPE:	EUI	**CRANKCASE BLOWBY RATE (M3/HR):**	114.4
FUEL INJECTOR:	3920221	**FUEL RATE (RATED RPM) NO LOAD (L/HR):**	59.0
UNIT INJECTOR TIMING (MM):	64.34	**PISTON SPD @ RATED ENG SPD (M/SEC):**	12.9
REF EXH STACK DIAMETER (MM):	305		
MAX OPERATING ALTITUDE (M):	750		

INDUSTRY	SUB INDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data Top

Note(s)

THE INLET MANIFOLD AIR TEMP LISTED IN THE HEADER, AND IN THE GENERAL PERFORMANCE DATA, IS THE AVERAGE INLET MANIFOLD TEMP FRONT TO REAR ON THE ENGINE.

THIS STANDBY RATING IS FOR A STANDBY ONLY ENGINE ARRANGEMENT. RERATING THE ENGINE TO A STANDARD PRIME OR CONTINUOUS RATING IS NOT PERMITTED.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BKW	KPA	G/BKW-HR	G/BKW-HR	L/HR	L/HR	G/EKW-HR	G/EKW-HR
2,750.0	100	3,015	2,574	205.9	202.0	730.2	716.3	225.7	221.4
2,475.0	90	2,725	2,327	203.4	199.6	652.2	639.8	224.0	219.7
2,200.0	80	2,436	2,080	205.5	201.6	588.9	577.6	227.5	223.2
2,062.5	75	2,291	1,956	206.9	202.9	557.6	547.0	229.8	225.4
1,925.0	70	2,146	1,833	208.6	204.6	526.7	516.7	232.6	228.1
1,650.0	60	1,857	1,585	213.6	209.5	466.5	457.6	240.3	235.8
1,375.0	50	1,567	1,338	220.6	216.4	406.8	399.0	251.5	246.7
1,100.0	40	1,278	1,091	226.8	222.5	341.0	334.5	263.5	258.4
825.0	30	988	844	233.9	229.4	272.0	266.8	280.2	274.9
687.5	25	844	720	239.8	235.2	238.0	233.5	294.3	288.7
550.0	20	699	597	249.1	244.3	204.8	200.9	316.5	310.5
275.0	10	409	350	283.9	278.5	136.8	134.2	422.8	414.7

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BKW	KPA	DEG C	DEG C	KPA	DEG C	KPA	DEG C
2,750.0	100	3,015	303.0	49.4	675.1	235.2	480.0	323	240.7
2,475.0	90	2,725	269.7	38.9	636.4	207.5	458.4	289	220.3
2,200.0	80	2,436	242.8	37.0	618.6	185.0	453.4	261	205.0
2,062.5	75	2,291	228.9	36.3	611.0	173.8	452.4	246	197.5
1,925.0	70	2,146	214.9	35.7	603.6	162.7	451.5	231	190.0
1,650.0	60	1,857	186.9	34.4	589.6	141.7	449.6	201	174.8
1,375.0	50	1,567	158.5	32.8	575.4	121.6	448.0	172	158.1
1,100.0	40	1,278	123.5	32.2	555.6	96.9	444.6	135	135.0
825.0	30	988	85.9	31.2	523.5	71.7	432.9	96	108.7
687.5	25	844	68.9	30.7	501.6	60.3	422.1	78	96.4
550.0	20	699	53.9	30.3	473.4	50.5	405.6	62	85.0
275.0	10	409	27.1	29.2	379.4	32.9	335.8	34	62.4

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	ENGINE OUTLET DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)
EKW	%	BKW	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
2,750.0	100	3,015	236.0	624.5	16,605.3	17,225.4	226.5	207.3
2,475.0	90	2,725	222.4	570.2	15,643.9	16,198.3	212.9	195.6
2,200.0	80	2,436	208.1	527.0	14,574.7	15,074.3	198.1	182.4
2,062.5	75	2,291	200.1	504.8	13,991.3	14,464.7	190.0	175.1
1,925.0	70	2,146	192.1	482.7	13,400.4	13,847.9	182.0	167.8
1,650.0	60	1,857	176.5	440.8	12,280.3	12,676.5	166.6	154.0
1,375.0	50	1,567	160.8	398.3	11,136.5	11,482.2	150.9	139.8
1,100.0	40	1,278	141.0	344.3	9,674.1	9,964.0	131.0	121.7
825.0	30	988	117.6	280.2	8,015.0	8,246.2	108.4	100.9
687.5	25	844	106.7	249.6	7,261.3	7,463.8	98.0	91.4
550.0	20	699	97.2	221.5	6,601.9	6,776.2	89.1	83.3

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	ENGINE OUTLET DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)
275.0	10	409	80.0	162.6	5,414.9	5,531.2	73.0	68.9

Heat Rejection Data Top

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXH RECOVERY TO 177C	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BKW	KW	KW	KW	KW	KW	KW	KW	KW	KW
2,750.0	100	3,015	894	160	2,849	1,547	393	941	3,015	7,376	7,857
2,475.0	90	2,725	821	146	2,489	1,345	351	834	2,725	6,588	7,018
2,200.0	80	2,436	761	140	2,278	1,227	317	719	2,436	5,948	6,337
2,062.5	75	2,291	730	138	2,176	1,173	300	663	2,291	5,632	6,000

Emissions Data Top

Units Filter All Units

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER PERCENT LOAD		EKW BKW %	2,750.0 3,015 100	2,062.5 2,291 75	1,375.0 1,567 50	687.5 844 25	275.0 409 10
TOTAL NOX (AS NO2)		G/HR	20,001	12,263	6,348	3,506	3,883
TOTAL CO		G/HR	2,776	1,017	711	1,134	1,123
TOTAL HC		G/HR	305	285	264	243	189
TOTAL CO2		KG/HR	1,954	1,489	1,082	626	359
PART MATTER		G/HR	206.9	114.2	111.5	119.5	82.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,319.2	1,872.1	1,335.4	1,271.3	2,728.6
TOTAL CO	(CORR 5% O2)	MG/NM3	321.4	155.3	149.5	421.2	689.5
TOTAL HC	(CORR 5% O2)	MG/NM3	30.7	37.7	48.2	77.4	97.9
PART MATTER	(CORR 5% O2)	MG/NM3	20.0	14.8	20.1	37.3	44.3
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	860.6	694.7	495.5	471.7	1,012.5
TOTAL CO	(CORR 15% O2)	MG/NM3	119.3	57.6	55.5	156.3	255.9
TOTAL HC	(CORR 15% O2)	MG/NM3	11.4	14.0	17.9	28.7	36.3
PART MATTER	(CORR 15% O2)	MG/NM3	7.4	5.5	7.5	13.8	16.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,130	912	650	619	1,329
TOTAL CO	(CORR 5% O2)	PPM	257	124	120	337	552
TOTAL HC	(CORR 5% O2)	PPM	57	70	90	144	183
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	419	338	241	230	493
TOTAL CO	(CORR 15% O2)	PPM	95	46	44	125	205
TOTAL HC	(CORR 15% O2)	PPM	21	26	33	54	68
TOTAL NOX (AS NO2)		G/HP-HR	5.00	4.03	3.04	3.11	7.09
TOTAL CO		G/HP-HR	0.69	0.33	0.34	1.01	2.05
TOTAL HC		G/HP-HR	0.08	0.09	0.13	0.22	0.34
PART MATTER		G/HP-HR	0.05	0.04	0.05	0.11	0.15
TOTAL NOX (AS NO2)		G/KW-HR	6.80	5.47	4.13	4.23	9.65
TOTAL CO		G/KW-HR	0.94	0.45	0.46	1.37	2.79
TOTAL HC		G/KW-HR	0.10	0.13	0.17	0.29	0.47
PART MATTER		G/KW-HR	0.07	0.05	0.07	0.14	0.20
TOTAL NOX (AS NO2)		LB/HR	44.09	27.03	13.99	7.73	8.56
TOTAL CO		LB/HR	6.12	2.24	1.57	2.50	2.48
TOTAL HC		LB/HR	0.67	0.63	0.58	0.54	0.42
TOTAL CO2		LB/HR	4,307	3,282	2,386	1,381	792
PART MATTER		LB/HR	0.46	0.25	0.25	0.26	0.18
OXYGEN IN EXH		%	9.7	10.7	11.5	12.4	14.4
DRY SMOKE OPACITY		%	2.7	1.8	2.1	3.0	2.3
BOSCH SMOKE NUMBER			0.98	0.58	0.70	1.07	0.75

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER PERCENT LOAD		EKW BKW %	2,750.0 3,015 100	2,062.5 2,291 75	1,375.0 1,567 50	687.5 844 25	275.0 409 10
TOTAL NOX (AS NO2)		G/HR	24,002	14,715	7,618	4,207	4,659
TOTAL CO		G/HR	4,637	1,698	1,187	1,894	1,876
TOTAL HC		G/HR	405	379	352	324	251
PART MATTER		G/HR	289.7	159.8	156.1	167.3	115.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,783.0	2,246.6	1,602.5	1,525.6	3,274.4
TOTAL CO	(CORR 5% O2)	MG/NM3	536.7	259.4	249.6	703.4	1,151.5
TOTAL HC	(CORR 5% O2)	MG/NM3	40.8	50.1	64.1	102.9	130.2
PART MATTER	(CORR 5% O2)	MG/NM3	28.1	20.7	28.2	52.2	62.0
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	1,032.7	833.6	594.6	566.1	1,215.0
TOTAL CO	(CORR 15% O2)	MG/NM3	199.2	96.3	92.6	261.0	427.3
TOTAL HC	(CORR 15% O2)	MG/NM3	15.1	18.6	23.8	38.2	48.3
PART MATTER	(CORR 15% O2)	MG/NM3	10.4	7.7	10.5	19.4	23.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,356	1,094	781	743	1,595
TOTAL CO	(CORR 5% O2)	PPM	429	208	200	563	921
TOTAL HC	(CORR 5% O2)	PPM	76	94	120	192	243
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	503	406	290	276	592
TOTAL CO	(CORR 15% O2)	PPM	159	77	74	209	342
TOTAL HC	(CORR 15% O2)	PPM	28	35	44	71	90
TOTAL NOX (AS NO2)		G/HP-HR	6.00	4.83	3.65	3.73	8.51
TOTAL CO		G/HP-HR	1.16	0.56	0.57	1.68	3.43
TOTAL HC		G/HP-HR	0.10	0.12	0.17	0.29	0.46
PART MATTER		G/HP-HR	0.07	0.05	0.07	0.15	0.21
TOTAL NOX (AS NO2)		G/KW-HR	8.16	6.57	4.96	5.08	11.57
TOTAL CO		G/KW-HR	1.58	0.76	0.77	2.28	4.66
TOTAL HC		G/KW-HR	0.14	0.17	0.23	0.39	0.62
PART MATTER		G/KW-HR	0.10	0.07	0.10	0.20	0.29
TOTAL NOX (AS NO2)		LB/HR	52.91	32.44	16.79	9.27	10.27
TOTAL CO		LB/HR	10.22	3.74	2.62	4.17	4.13
TOTAL HC		LB/HR	0.89	0.84	0.78	0.71	0.55
PART MATTER		LB/HR	0.64	0.35	0.34	0.37	0.25

Regulatory Information Top

EPA EMERGENCY STATIONARY	2011 - ----	

GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.

Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR

EPA EMERGENCY STATIONARY		2011 - ----		
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data Top

Note(s)

THE TEMPERATURES LISTED IN THE CHART ARE AMBIENT TEMPERATURES. THE FOLLOWING DERATE CHART WAS CALCULATED ASSUMING A 5 DEG C RISE IN AIR TEMPERATURE BETWEEN AMBIENT AND THE TURBOCHARGER INLET.

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BKW)

AMBIENT OPERATING TEMP (C)	0	5	10	15	20	25	30	35	40	45	50	55	60	NORMAL
ALTITUDE (M)														
0	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	2,976	3,015
250	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	2,996	2,930	3,015
500	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	2,961	2,880	2,781	3,015
750	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	2,994	2,929	2,842	2,749	2,695	3,015
1,000	2,880	2,879	2,878	2,877	2,876	2,871	2,809	2,720	2,616	2,548	2,546	2,545	2,543	2,877
1,250	2,815	2,814	2,813	2,812	2,811	2,802	2,737	2,646	2,553	2,489	2,488	2,486	2,484	2,811
1,500	2,750	2,748	2,747	2,746	2,745	2,733	2,666	2,579	2,494	2,432	2,430	2,428	2,426	2,745
1,750	2,685	2,683	2,682	2,680	2,679	2,665	2,598	2,521	2,435	2,365	2,363	2,361	2,360	2,680
2,000	2,612	2,611	2,609	2,608	2,606	2,592	2,533	2,454	2,353	2,269	2,268	2,265	2,263	2,608
2,250	2,540	2,538	2,537	2,535	2,534	2,517	2,456	2,360	2,237	2,157	2,155	2,153	2,151	2,537
2,500	2,468	2,466	2,465	2,464	2,462	2,443	2,364	2,246	2,123	2,051	2,049	2,047	2,045	2,465
2,750	2,384	2,383	2,381	2,380	2,379	2,347	2,253	2,133	2,019	1,954	1,953	1,951	1,949	2,382
3,000	2,288	2,286	2,285	2,284	2,282	2,246	2,150	2,035	1,926	1,865	1,864	1,862	1,860	2,286
3,250	2,221	2,220	2,219	2,218	2,216	2,176	2,080	1,969	1,861	1,804	1,802	1,801	1,799	2,220
3,500	2,157	2,155	2,154	2,153	2,152	2,107	2,017	1,904	1,800	1,770	1,769	1,768	1,766	2,156
3,750	2,096	2,095	2,094	2,093	2,092	2,047	1,955	1,839	1,766	1,738	1,737	1,736	1,735	2,096
4,000	2,041	2,040	2,039	2,038	2,037	1,987	1,893	1,795	1,731	1,704	1,703	1,703	1,702	2,041
4,250	1,971	1,970	1,969	1,968	1,967	1,914	1,820	1,751	1,684	1,658	1,657	1,656	1,656	1,971
4,500	1,879	1,879	1,878	1,877	1,877	1,825	1,768	1,691	1,613	1,582	1,582	1,581	1,581	1,880

Cross Reference Top

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
5644208	LL2333	5898066	PG266	-	JD700379	

Performance Parameter Reference Top

Parameters Reference: DM9600 - 14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS: Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

WET & DRY EXHAUST/EMISSIONS DESCRIPTION: Wet - Total exhaust flow or concentration of total exhaust flow Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded

EMISSIONS DEFINITIONS: Emissions : DM1176

EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702
Sound Pressure : TM7080

Date Released : 10/27/21

PERFORMANCE DATA[EM1788]

July 13, 2023

Performance Number: EM1788 **Change Level: 02**

SALES MODEL:	3512C	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
MACHINE SALES MODEL:		**HERTZ:**	60
ENGINE POWER (BHP):	2,360	**FAN POWER (HP):**	114.0
GEN POWER WITH FAN (EKW):	1,600.0	**ASPIRATION:**	TA
COMPRESSION RATIO:	14.7	**AFTERCOOLER TYPE:**	ATAAC
RATING LEVEL:	PRIME	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
PUMP QUANTITY:	1	**INLET MANIFOLD AIR TEMP (F):**	122
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (F):**	210.2
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	ADEM3	**TURBO QUANTITY:**	4
ELECTRONICS TYPE:	ADEM3	**TURBOCHARGER MODEL:**	GTB5518BN-52T-1.12
CAMSHAFT TYPE:	STANDARD	**CERTIFICATION YEAR:**	2016
IGNITION TYPE:	CI	**CRANKCASE BLOWBY RATE (FT3/HR):**	2,358.8
INJECTOR TYPE:	EUI	**FUEL RATE (RATED RPM) NO LOAD (GAL/HR):**	8.3
FUEL INJECTOR:	3920221	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,539.4
UNIT INJECTOR TIMING (IN):	64.34		
REF EXH STACK DIAMETER (IN):	10		
MAX OPERATING ALTITUDE (FT):	2,789		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET

General Performance Data

RATING IS AVAILABLE THROUGH DESIGN TO ORDER (DTO) WITH AN APPROVED SPECIAL RATING REQUEST. RATING DEFINITION: PRIME POWER OUTPUT AVAILABLE WITH VARYING LOAD FOR THE DURATION OF AN EMERGENCY OUTAGE. AVERAGE POWER OUTPUT IS 45 - 85% OF THE PRIME POWER RATING. TYPICAL OPERATION IS 200 HOURS PER YEAR, WITH A MAXIMUM EXPECTED USAGE OF 500 HOURS A YEAR. TYPICAL PEAK DEMAND IS 100% OF PRIME RATED EKW WITH 10% OVERLOAD CAPABILITY FOR EMERGENCY USE FOR A MAXIMUM OF 1 HOUR IN 12. OVERLOAD OPERATION CANNOT EXCEED 25 HOURS PER YEAR. TYPICAL APPLICATIONS INCLUDE BUT ARE NOT LIMITED TO: DATA CENTER, HEALTHCARE.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)
EKW	%	BHP	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR
1,760.0	110	2,584	318	0.334	0.328	121.8	119.5
1,600.0	100	2,360	291	0.329	0.322	109.4	107.3
1,440.0	90	2,136	263	0.332	0.326	100.0	98.1
1,280.0	80	1,911	235	0.337	0.330	90.7	89.0
1,200.0	75	1,799	221	0.340	0.333	86.1	84.5
1,120.0	70	1,686	208	0.343	0.336	81.5	79.9
960.0	60	1,462	180	0.352	0.345	72.5	71.1
800.0	50	1,237	152	0.366	0.359	63.8	62.6
640.0	40	1,012	125	0.382	0.375	54.6	53.5
480.0	30	788	97	0.401	0.394	44.6	43.7
400.0	25	676	83	0.410	0.402	39.0	38.3
320.0	20	563	69	0.419	0.411	33.3	32.7
160.0	10	339	42	0.467	0.458	22.3	21.9

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
1,760.0	110	2,584	77.0	121.0	1,175.8	59.3	848.4	82	431.4
1,600.0	100	2,360	68.4	114.3	1,119.4	51.5	820.4	73	388.3
1,440.0	90	2,136	61.9	111.6	1,095.1	46.3	811.3	66	365.8
1,280.0	80	1,911	54.8	111.8	1,085.8	40.9	816.6	59	346.7
1,200.0	75	1,799	50.9	111.2	1,080.1	38.1	819.4	55	335.8
1,120.0	70	1,686	47.2	108.3	1,068.4	35.5	817.6	51	321.9
960.0	60	1,462	40.6	104.5	1,046.5	30.9	814.7	44	295.7
800.0	50	1,237	34.7	103.1	1,026.1	26.8	813.5	38	269.7
640.0	40	1,012	27.7	101.8	993.4	22.1	805.6	30	236.0
480.0	30	788	20.1	101.3	945.6	17.1	788.8	22	204.3
400.0	25	676	16.0	99.4	895.6	14.6	753.7	18	185.6
320.0	20	563	12.0	97.1	827.6	12.0	703.4	14	166.2
160.0	10	339	6.1	92.9	636.6	8.2	569.1	8	130.1

General Performance Data (Continued)

PERFORMANCE DATA[EM1788]

July 13, 2023

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
1,760.0	110	2,584	5,708.5	14,298.4	24,662.6	25,527.3	5,374.6	4,942.3
1,600.0	100	2,360	5,365.1	12,943.5	22,818.8	23,594.8	4,971.4	4,580.6
1,440.0	90	2,136	5,047.9	12,019.6	21,384.8	22,093.1	4,649.8	4,290.3
1,280.0	80	1,911	4,612.0	11,078.3	19,636.5	20,280.2	4,267.8	3,942.3
1,200.0	75	1,799	4,384.2	10,575.9	18,701.8	19,312.4	4,065.4	3,757.5
1,120.0	70	1,686	4,199.0	10,092.5	17,867.4	18,444.7	3,885.0	3,593.3
960.0	60	1,462	3,872.1	9,222.7	16,392.6	16,906.7	3,558.3	3,297.0
800.0	50	1,237	3,557.6	8,410.0	14,978.0	15,430.9	3,247.8	3,015.2
640.0	40	1,012	3,182.9	7,410.8	13,285.9	13,673.1	2,879.7	2,677.5
480.0	30	788	2,725.0	6,273.0	11,415.7	11,731.8	2,470.4	2,303.7
400.0	25	676	2,492.6	5,564.3	10,466.9	10,744.4	2,254.7	2,107.0
320.0	20	563	2,258.2	4,837.2	9,509.9	9,746.7	2,044.9	1,916.4
160.0	10	339	1,944.2	3,649.8	8,128.3	8,285.9	1,744.3	1,653.6

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
1,760.0	110	2,584	33,967	7,341	99,767	53,671	14,105	31,452	109,585	264,829	282,110
1,600.0	100	2,360	32,243	6,802	88,304	46,689	12,668	25,895	100,092	237,840	253,359
1,440.0	90	2,136	30,057	6,587	81,865	42,801	11,580	22,356	90,566	217,408	231,595
1,280.0	80	1,911	27,002	6,484	76,728	39,743	10,510	18,926	81,040	197,323	210,199
1,200.0	75	1,799	25,598	6,422	73,884	38,074	9,973	17,238	76,277	187,237	199,455
1,120.0	70	1,686	24,788	6,308	70,277	36,208	9,435	15,647	71,514	177,146	188,704
960.0	60	1,462	22,990	6,099	63,830	32,943	8,393	12,867	61,989	157,583	167,865
800.0	50	1,237	21,377	5,936	57,638	29,952	7,394	10,237	52,463	138,815	147,873
640.0	40	1,012	20,852	5,758	49,609	26,048	6,318	7,178	42,937	118,624	126,364
480.0	30	788	17,896	5,332	41,802	21,469	5,161	4,700	33,411	96,892	103,215
400.0	25	676	17,053	5,018	36,012	18,024	4,518	3,611	28,648	84,829	90,364
320.0	20	563	16,307	4,673	29,628	14,237	3,858	2,649	23,886	72,430	77,156
160.0	10	339	13,712	3,892	18,473	7,393	2,584	1,200	14,359	48,505	51,670

Sound Data

SOUND PRESSURE DATA FOR THIS RATING CAN BE FOUND IN PERFORMANCE NUMBER - DM8779.

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:1.5 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	118.0	109.0	123.0	119.0	111.0
1,600.0	100	2,360	117.0	108.0	122.0	118.0	110.0
1,440.0	90	2,136	116.0	107.0	121.0	117.0	109.0
1,280.0	80	1,911	115.0	106.0	120.0	116.0	108.0
1,200.0	75	1,799	115.0	105.0	120.0	116.0	108.0
1,120.0	70	1,686	114.0	105.0	119.0	115.0	107.0
960.0	60	1,462	113.0	103.0	118.0	114.0	106.0
800.0	50	1,237	112.0	102.0	117.0	113.0	105.0
640.0	40	1,012	110.0	101.0	115.0	111.0	103.0
480.0	30	788	109.0	99.0	114.0	110.0	102.0
400.0	25	676	108.0	98.0	113.0	109.0	101.0
320.0	20	563	107.0	97.0	112.0	108.0	100.0
160.0	10	339	105.0	95.0	110.0	106.0	98.0

PERFORMANCE DATA[EM1788]

July 13, 2023

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:1.5 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	110.0	111.0	111.0	109.0
1,600.0	100	2,360	109.0	110.0	110.0	108.0
1,440.0	90	2,136	108.0	109.0	109.0	107.0
1,280.0	80	1,911	107.0	108.0	108.0	106.0
1,200.0	75	1,799	106.0	108.0	107.0	105.0
1,120.0	70	1,686	106.0	107.0	107.0	105.0
960.0	60	1,462	105.0	106.0	106.0	104.0
800.0	50	1,237	103.0	105.0	104.0	102.0
640.0	40	1,012	102.0	103.0	103.0	101.0
480.0	30	788	100.0	102.0	101.0	99.0
400.0	25	676	99.0	101.0	101.0	99.0
320.0	20	563	99.0	100.0	100.0	98.0
160.0	10	339	96.0	98.0	97.0	96.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	105.0	96.0	113.0	107.0	99.0
1,600.0	100	2,360	104.0	95.0	112.0	106.0	98.0
1,440.0	90	2,136	103.0	94.0	111.0	105.0	97.0
1,280.0	80	1,911	102.0	93.0	110.0	104.0	96.0
1,200.0	75	1,799	101.0	93.0	109.0	104.0	95.0
1,120.0	70	1,686	101.0	92.0	109.0	103.0	94.0
960.0	60	1,462	100.0	91.0	108.0	102.0	93.0
800.0	50	1,237	98.0	90.0	106.0	101.0	92.0
640.0	40	1,012	97.0	88.0	105.0	99.0	91.0
480.0	30	788	95.0	87.0	103.0	98.0	89.0
400.0	25	676	95.0	86.0	103.0	97.0	88.0
320.0	20	563	94.0	85.0	102.0	96.0	87.0
160.0	10	339	91.0	83.0	99.0	94.0	85.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	97.0	98.0	97.0	95.0
1,600.0	100	2,360	96.0	97.0	97.0	94.0
1,440.0	90	2,136	95.0	96.0	96.0	93.0
1,280.0	80	1,911	94.0	95.0	94.0	92.0
1,200.0	75	1,799	93.0	94.0	94.0	91.0
1,120.0	70	1,686	93.0	94.0	93.0	91.0
960.0	60	1,462	92.0	92.0	92.0	89.0
800.0	50	1,237	90.0	91.0	91.0	88.0
640.0	40	1,012	89.0	90.0	90.0	87.0
480.0	30	788	87.0	88.0	88.0	85.0
400.0	25	676	87.0	87.0	87.0	84.0
320.0	20	563	86.0	86.0	86.0	83.0
160.0	10	339	83.0	84.0	84.0	81.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	98.0	90.0	106.0	101.0	92.0
1,600.0	100	2,360	97.0	89.0	105.0	100.0	91.0
1,440.0	90	2,136	96.0	88.0	104.0	99.0	90.0
1,280.0	80	1,911	95.0	87.0	103.0	98.0	89.0
1,200.0	75	1,799	95.0	86.0	103.0	97.0	88.0
1,120.0	70	1,686	94.0	86.0	102.0	96.0	88.0

960.0	60	1,462	93.0	84.0	101.0	95.0	87.0
800.0	50	1,237	92.0	83.0	100.0	94.0	85.0
640.0	40	1,012	90.0	82.0	98.0	93.0	84.0
480.0	30	788	89.0	80.0	97.0	91.0	82.0
400.0	25	676	88.0	79.0	96.0	90.0	82.0
320.0	20	563	87.0	78.0	95.0	89.0	81.0
160.0	10	339	85.0	76.0	93.0	87.0	78.0

EXHAUST:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	90.0	91.0	91.0	88.0
1,600.0	100	2,360	89.0	90.0	90.0	87.0
1,440.0	90	2,136	88.0	89.0	89.0	86.0
1,280.0	80	1,911	87.0	88.0	88.0	85.0
1,200.0	75	1,799	87.0	87.0	87.0	85.0
1,120.0	70	1,686	86.0	87.0	87.0	84.0
960.0	60	1,462	85.0	86.0	86.0	83.0
800.0	50	1,237	84.0	84.0	84.0	82.0
640.0	40	1,012	82.0	83.0	83.0	80.0
480.0	30	788	81.0	81.0	81.0	79.0
400.0	25	676	80.0	81.0	80.0	78.0
320.0	20	563	79.0	80.0	80.0	77.0
160.0	10	339	77.0	78.0	77.0	75.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:1 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	104.0	91.0	99.0	100.0	98.0
1,600.0	100	2,360	104.0	91.0	99.0	100.0	98.0
1,440.0	90	2,136	104.0	91.0	99.0	100.0	98.0
1,280.0	80	1,911	104.0	91.0	99.0	100.0	98.0
1,200.0	75	1,799	104.0	91.0	99.0	100.0	98.0
1,120.0	70	1,686	104.0	91.0	99.0	100.0	98.0
960.0	60	1,462	104.0	91.0	99.0	100.0	98.0
800.0	50	1,237	104.0	91.0	99.0	100.0	98.0
640.0	40	1,012	104.0	91.0	99.0	100.0	98.0
480.0	30	788	104.0	91.0	99.0	100.0	98.0
400.0	25	676	104.0	91.0	99.0	100.0	98.0
320.0	20	563	104.0	91.0	99.0	100.0	98.0
160.0	10	339	104.0	91.0	99.0	100.0	98.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:1 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	99.0	100.0	98.0	102.0
1,600.0	100	2,360	99.0	100.0	98.0	102.0
1,440.0	90	2,136	99.0	100.0	98.0	102.0
1,280.0	80	1,911	99.0	100.0	98.0	102.0
1,200.0	75	1,799	99.0	100.0	98.0	102.0
1,120.0	70	1,686	99.0	100.0	98.0	102.0
960.0	60	1,462	99.0	100.0	98.0	102.0
800.0	50	1,237	99.0	100.0	98.0	102.0
640.0	40	1,012	99.0	100.0	98.0	102.0
480.0	30	788	99.0	100.0	98.0	102.0
400.0	25	676	99.0	100.0	98.0	102.0
320.0	20	563	99.0	100.0	98.0	102.0
160.0	10	339	99.0	100.0	98.0	102.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:7 METER

PERFORMANCE DATA[EM1788]

July 13, 2023

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	92.0	80.0	87.0	88.0	86.0
1,600.0	100	2,360	92.0	80.0	87.0	88.0	86.0
1,440.0	90	2,136	92.0	80.0	87.0	88.0	86.0
1,280.0	80	1,911	92.0	80.0	87.0	88.0	86.0
1,200.0	75	1,799	92.0	80.0	87.0	88.0	86.0
1,120.0	70	1,686	92.0	80.0	87.0	88.0	86.0
960.0	60	1,462	92.0	80.0	87.0	88.0	86.0
800.0	50	1,237	92.0	80.0	87.0	88.0	86.0
640.0	40	1,012	92.0	80.0	87.0	88.0	86.0
480.0	30	788	92.0	80.0	87.0	88.0	86.0
400.0	25	676	92.0	80.0	87.0	88.0	86.0
320.0	20	563	92.0	80.0	87.0	88.0	86.0
160.0	10	339	92.0	80.0	87.0	88.0	86.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:7 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	87.0	88.0	86.0	90.0
1,600.0	100	2,360	87.0	88.0	86.0	90.0
1,440.0	90	2,136	87.0	88.0	86.0	90.0
1,280.0	80	1,911	87.0	88.0	86.0	90.0
1,200.0	75	1,799	87.0	88.0	86.0	90.0
1,120.0	70	1,686	87.0	88.0	86.0	90.0
960.0	60	1,462	87.0	88.0	86.0	90.0
800.0	50	1,237	87.0	88.0	86.0	90.0
640.0	40	1,012	87.0	88.0	86.0	90.0
480.0	30	788	87.0	88.0	86.0	90.0
400.0	25	676	87.0	88.0	86.0	90.0
320.0	20	563	87.0	88.0	86.0	90.0
160.0	10	339	87.0	88.0	86.0	90.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	63 HZ	125 HZ	250 HZ	500 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	87.0	74.0	81.0	82.0	80.0
1,600.0	100	2,360	87.0	74.0	81.0	82.0	80.0
1,440.0	90	2,136	87.0	74.0	81.0	82.0	80.0
1,280.0	80	1,911	87.0	74.0	81.0	82.0	80.0
1,200.0	75	1,799	87.0	74.0	81.0	82.0	80.0
1,120.0	70	1,686	87.0	74.0	81.0	82.0	80.0
960.0	60	1,462	87.0	74.0	81.0	82.0	80.0
800.0	50	1,237	87.0	74.0	81.0	82.0	80.0
640.0	40	1,012	87.0	74.0	81.0	82.0	80.0
480.0	30	788	87.0	74.0	81.0	82.0	80.0
400.0	25	676	87.0	74.0	81.0	82.0	80.0
320.0	20	563	87.0	74.0	81.0	82.0	80.0
160.0	10	339	87.0	74.0	81.0	82.0	80.0

MECHANICAL:SOUND PRESSURE(OBCF) DISTANCE:15 METER

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	2000 HZ	4000 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)
1,760.0	110	2,584	81.0	83.0	80.0	84.0
1,600.0	100	2,360	81.0	83.0	80.0	84.0
1,440.0	90	2,136	81.0	83.0	80.0	84.0
1,280.0	80	1,911	81.0	83.0	80.0	84.0
1,200.0	75	1,799	81.0	83.0	80.0	84.0
1,120.0	70	1,686	81.0	83.0	80.0	84.0
960.0	60	1,462	81.0	83.0	80.0	84.0
800.0	50	1,237	81.0	83.0	80.0	84.0
640.0	40	1,012	81.0	83.0	80.0	84.0
480.0	30	788	81.0	83.0	80.0	84.0

400.0	25	676	81.0	83.0	80.0	84.0
320.0	20	563	81.0	83.0	80.0	84.0
160.0	10	339	81.0	83.0	80.0	84.0

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN		**EKW**	**1,760.0**	**1,600.0**	**1,200.0**	**800.0**	**400.0**	**160.0**
PERCENT LOAD		**%**	**110**	**100**	**75**	**50**	**25**	**10**
ENGINE POWER		**BHP**	**2,584**	**2,360**	**1,799**	**1,237**	**676**	**339**
TOTAL NOX (AS NO2)		G/HR	13,263	11,589	7,549	3,869	1,827	1,711
TOTAL CO		G/HR	1,339	1,451	1,404	1,013	815	946
TOTAL HC		G/HR	305	281	243	232	243	295
TOTAL CO2		KG/HR	1,283	1,169	906	666	405	233
PART MATTER		G/HR	133.8	132.9	140.3	143.5	83.4	75.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,390.8	2,307.7	1,912.1	1,341.9	1,040.9	1,844.0
TOTAL CO	(CORR 5% O2)	MG/NM3	242.2	293.7	354.1	356.2	464.0	1,013.5
TOTAL HC	(CORR 5% O2)	MG/NM3	47.7	47.8	53.7	69.5	119.0	272.7
PART MATTER	(CORR 5% O2)	MG/NM3	20.3	21.9	30.9	41.4	40.0	71.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,165	1,124	931	654	507	898
TOTAL CO	(CORR 5% O2)	PPM	194	235	283	285	371	811
TOTAL HC	(CORR 5% O2)	PPM	89	89	100	130	222	509
TOTAL NOX (AS NO2)		G/HP-HR	5.15	4.92	4.20	3.13	2.71	5.05
TOTAL CO		G/HP-HR	0.52	0.62	0.78	0.82	1.21	2.79
TOTAL HC		G/HP-HR	0.12	0.12	0.14	0.19	0.36	0.87
PART MATTER		G/HP-HR	0.05	0.06	0.08	0.12	0.12	0.22
TOTAL NOX (AS NO2)		LB/HR	29.24	25.55	16.64	8.53	4.03	3.77
TOTAL CO		LB/HR	2.95	3.20	3.10	2.23	1.80	2.08
TOTAL HC		LB/HR	0.67	0.62	0.54	0.51	0.53	0.65
TOTAL CO2		LB/HR	2,829	2,578	1,998	1,467	893	514
PART MATTER		LB/HR	0.30	0.29	0.31	0.32	0.18	0.17
OXYGEN IN EXH		%	10.0	10.3	10.9	11.6	12.9	15.2
DRY SMOKE OPACITY		%	2.1	2.4	3.0	3.6	2.8	3.0
BOSCH SMOKE NUMBER			0.73	0.84	1.10	1.32	1.04	1.11

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN		**EKW**	**1,760.0**	**1,600.0**	**1,200.0**	**800.0**	**400.0**	**160.0**
PERCENT LOAD		**%**	**110**	**100**	**75**	**50**	**25**	**10**
ENGINE POWER		**BHP**	**2,584**	**2,360**	**1,799**	**1,237**	**676**	**339**
TOTAL NOX (AS NO2)		G/HR	15,916	13,907	9,059	4,642	2,193	2,053
TOTAL CO		G/HR	2,411	2,612	2,528	1,823	1,466	1,702
TOTAL HC		G/HR	406	374	323	308	323	392
PART MATTER		G/HR	187.3	186.0	196.4	200.9	116.7	105.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,869.0	2,769.3	2,294.5	1,610.3	1,249.1	2,212.8
TOTAL CO	(CORR 5% O2)	MG/NM3	436.0	528.6	637.4	641.2	835.1	1,824.3
TOTAL HC	(CORR 5% O2)	MG/NM3	63.4	63.6	71.4	92.5	158.3	362.7
PART MATTER	(CORR 5% O2)	MG/NM3	28.4	30.6	43.3	58.0	55.9	100.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,397	1,349	1,118	784	608	1,078
TOTAL CO	(CORR 5% O2)	PPM	349	423	510	513	668	1,459
TOTAL HC	(CORR 5% O2)	PPM	118	119	133	173	296	677
TOTAL NOX (AS NO2)		G/HP-HR	6.18	5.91	5.04	3.76	3.25	6.06
TOTAL CO		G/HP-HR	0.94	1.11	1.41	1.48	2.17	5.03
TOTAL HC		G/HP-HR	0.16	0.16	0.18	0.25	0.48	1.16

PART MATTER	G/HP-HR	0.07	0.08	0.11	0.16	0.17	0.31
TOTAL NOX (AS NO2)	LB/HR	35.09	30.66	19.97	10.23	4.83	4.53
TOTAL CO	LB/HR	5.31	5.76	5.57	4.02	3.23	3.75
TOTAL HC	LB/HR	0.89	0.83	0.71	0.68	0.71	0.87
PART MATTER	LB/HR	0.41	0.41	0.43	0.44	0.26	0.23

Regulatory Information

EPA EMERGENCY STATIONARY		2011 - ----		
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,338	2,360
1,000	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,332	2,293	2,255	2,360
2,000	2,360	2,360	2,360	2,360	2,360	2,360	2,360	2,329	2,288	2,249	2,210	2,174	2,360
3,000	2,343	2,343	2,343	2,343	2,343	2,328	2,286	2,245	2,205	2,167	2,131	2,095	2,343
4,000	2,262	2,262	2,262	2,262	2,262	2,243	2,203	2,163	2,125	2,089	2,053	2,019	2,262
5,000	2,184	2,184	2,184	2,184	2,184	2,161	2,122	2,084	2,047	2,012	1,978	1,746	2,184
6,000	2,110	2,110	2,110	2,110	2,110	2,081	2,044	2,007	1,972	1,935	1,676	1,463	2,110
7,000	2,038	2,038	2,038	2,038	2,038	2,004	1,968	1,933	1,770	1,581	1,369	1,204	2,038
8,000	1,969	1,969	1,969	1,969	1,966	1,929	1,894	1,676	1,487	1,274	1,133	1,015	1,969
9,000	1,902	1,902	1,902	1,902	1,891	1,794	1,605	1,392	1,204	1,086	968	897	1,902
10,000	1,838	1,838	1,838	1,838	1,699	1,510	1,298	1,156	1,038	920	850	779	1,838
11,000	1,776	1,776	1,776	1,605	1,416	1,227	1,086	991	897	826	755	708	1,776
12,000	1,717	1,717	1,534	1,322	1,156	1,038	944	850	779	732	684	661	1,628
13,000	1,628	1,416	1,227	1,109	991	897	826	755	708	684	637	614	1,416
14,000	1,322	1,180	1,062	944	873	779	732	708	661	637	590		1,204
15,000	1,109	991	897	826	755	708	684	637	614	590			1,086

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4577183	LL8480	4994641	PG041	LS	RRL00001	
4577183	LL8480	5157730	PG041	-	LYP00001	

Supplementary Data

Type	Classification	Performance Number
SOUND	SOUND PRESSURE	DM8779

Performance Parameter Reference

Parameters Reference:DM9600-14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.
C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%
TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.
REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.
MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE
Location for air temperature measurement air cleaner inlet at stabilized operating conditions.
REFERENCE EXHAUST STACK DIAMETER
The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.
REFERENCE FUEL
DIESEL
Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).

GAS
Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.
ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD
Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.
ALTITUDE CAPABILITY
Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.
EMISSION CYCLE LIMITS:
Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.
WET & DRY EXHAUST/EMISSIONS DESCRIPTION:
Wet - Total exhaust flow or concentration of total exhaust flow
Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded
EMISSIONS DEFINITIONS:
Emissions : DM1176
EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets
test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 10/27/21

PERFORMANCE DATA[DM9933]

September 13, 2021

Performance Number: DM9933 **Change Level: 04**

SALES MODEL:	C32	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
ENGINE POWER (BHP):	1,474	**HERTZ:**	60
GEN POWER WITH FAN (EKW):	1,000.0	**FAN POWER (HP):**	56.3
COMPRESSION RATIO:	15.0	**ASPIRATION:**	TA
RATING LEVEL:	STANDBY	**AFTERCOOLER TYPE:**	ATAAC
PUMP QUANTITY:	1	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
FUEL TYPE:	DIESEL	**INLET MANIFOLD AIR TEMP (F):**	120
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (F):**	210.2
GOVERNOR TYPE:	ADEM4	**TURBO CONFIGURATION:**	PARALLEL
ELECTRONICS TYPE:	ADEM4	**TURBO QUANTITY:**	2
IGNITION TYPE:	CI	**TURBOCHARGER MODEL:**	GTB45518BS-52T-1.37
INJECTOR TYPE:	EUI	**CERTIFICATION YEAR:**	2007
REF EXH STACK DIAMETER (IN):	8	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	1,913.4
MAX OPERATING ALTITUDE (FT):	997		

INDUSTRY	SUBINDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET

General Performance Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR
1,000.0	100	1,483	333	0.342	71.5
900.0	90	1,338	301	0.341	64.2
800.0	80	1,195	268	0.348	58.7
750.0	75	1,124	252	0.353	56.0
700.0	70	1,053	237	0.354	52.6
600.0	60	912	205	0.353	45.4
500.0	50	772	173	0.350	38.1
400.0	40	635	143	0.351	31.4
300.0	30	496	111	0.357	25.0
250.0	25	426	96	0.363	21.8
200.0	20	355	80	0.373	18.7
100.0	10	209	47	0.424	12.5

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
1,000.0	100	1,483	70.8	118.8	1,214.1	58.6	892.5	76	424.5
900.0	90	1,338	64.3	111.4	1,153.5	52.2	856.8	70	392.7
800.0	80	1,195	60.6	106.7	1,117.9	48.8	833.4	66	375.9
750.0	75	1,124	58.4	104.2	1,102.3	47.0	822.2	63	366.1
700.0	70	1,053	54.2	100.0	1,080.1	43.6	811.1	59	345.5
600.0	60	912	44.3	90.6	1,028.7	35.7	789.8	49	304.7
500.0	50	772	33.5	81.3	968.0	27.4	769.5	37	264.3
400.0	40	635	24.3	74.9	899.7	20.8	733.5	27	224.9
300.0	30	496	16.1	70.5	816.3	15.3	679.6	19	185.5
250.0	25	426	12.3	69.0	768.2	12.9	646.0	15	165.6
200.0	20	355	8.9	67.9	713.3	10.7	605.3	11	147.2
100.0	10	209	4.5	67.5	572.6	7.8	491.3	6	123.0

General Performance Data (Continued)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
1,000.0	100	1,483	3,105.2	8,115.3	13,517.7	14,024.8	2,950.9	2,698.6
900.0	90	1,338	2,944.7	7,443.4	12,775.8	13,231.6	2,780.0	2,550.6
800.0	80	1,195	2,860.8	7,069.3	12,380.1	12,796.7	2,687.9	2,475.7

750.0	75	1,124	2,799.4	6,858.4	12,094.1	12,491.0	2,630.6	2,427.3
700.0	70	1,053	2,654.6	6,439.5	11,425.3	11,795.7	2,491.4	2,301.6
600.0	60	912	2,369.9	5,618.4	10,126.3	10,445.3	2,210.8	2,046.3
500.0	50	772	2,090.3	4,815.2	8,871.8	9,141.4	1,926.2	1,786.0
400.0	40	635	1,819.3	4,039.9	7,654.2	7,876.2	1,664.7	1,547.4
300.0	30	496	1,549.9	3,272.7	6,487.7	6,664.2	1,412.4	1,317.4
250.0	25	426	1,414.6	2,888.8	5,920.9	6,075.3	1,284.6	1,200.7
200.0	20	355	1,292.4	2,528.2	5,413.4	5,545.9	1,167.2	1,094.3
100.0	10	209	1,149.4	1,989.9	4,805.1	4,893.7	1,028.8	975.8

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
1,000.0	100	1,483	20,153	7,292	58,664	32,275	8,277	16,551	62,887	155,406	165,547
900.0	90	1,338	18,470	6,522	52,678	28,324	7,440	14,394	56,743	139,692	148,807
800.0	80	1,195	16,970	5,949	49,043	26,036	6,799	13,345	50,677	127,654	135,984
750.0	75	1,124	16,223	6,124	47,027	24,781	6,486	12,683	47,666	121,777	129,723
700.0	70	1,053	15,326	6,876	43,772	22,824	6,093	11,231	44,653	114,394	121,858
600.0	60	912	13,529	6,786	37,588	19,231	5,263	8,681	38,675	98,811	105,259
500.0	50	772	11,822	5,357	31,812	16,013	4,411	6,504	32,735	82,825	88,230
400.0	40	635	10,869	4,421	25,935	12,562	3,637	4,598	26,908	68,277	72,732
300.0	30	496	9,934	3,738	20,129	9,084	2,892	2,986	21,049	54,294	57,837
250.0	25	426	9,352	3,463	17,322	7,412	2,525	2,290	18,081	47,414	50,508
200.0	20	355	8,620	3,178	14,651	5,809	2,162	1,718	15,065	40,584	43,232
100.0	10	209	6,683	2,334	9,950	2,795	1,444	1,067	8,853	27,118	28,888

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN		EKW	1,000.0	750.0	500.0	250.0	100.0
PERCENT LOAD		%	100	75	50	25	10
ENGINE POWER		BHP	1,483	1,124	772	426	209
TOTAL NOX (AS NO2)		G/HR	7,256	4,250	2,777	1,877	1,108
TOTAL CO		G/HR	192	123	265	435	672
TOTAL HC		G/HR	19	55	53	40	80
TOTAL CO2		KG/HR	726	568	384	219	125
PART MATTER		G/HR	26.9	19.9	34.3	53.7	43.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,346.5	1,746.8	1,683.5	2,004.0	1,999.0
TOTAL CO	(CORR 5% O2)	MG/NM3	62.1	49.6	159.5	470.0	1,358.8
TOTAL HC	(CORR 5% O2)	MG/NM3	5.4	19.7	27.7	36.7	147.6
PART MATTER	(CORR 5% O2)	MG/NM3	7.3	6.9	17.8	53.8	69.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,143	851	820	976	974
TOTAL CO	(CORR 5% O2)	PPM	50	40	128	376	1,087
TOTAL HC	(CORR 5% O2)	PPM	10	37	52	68	275
TOTAL NOX (AS NO2)		G/HP-HR	4.93	3.81	3.61	4.41	5.32
TOTAL CO		G/HP-HR	0.13	0.11	0.34	1.02	3.22
TOTAL HC		G/HP-HR	0.01	0.05	0.07	0.09	0.38
PART MATTER		G/HP-HR	0.02	0.02	0.04	0.13	0.21
TOTAL NOX (AS NO2)		LB/HR	16.00	9.37	6.12	4.14	2.44
TOTAL CO		LB/HR	0.42	0.27	0.58	0.96	1.48
TOTAL HC		LB/HR	0.04	0.12	0.12	0.09	0.18
TOTAL CO2		LB/HR	1,600	1,252	847	484	275
PART MATTER		LB/HR	0.06	0.04	0.08	0.12	0.09
OXYGEN IN EXH		%	10.0	11.4	12.2	13.4	15.7
DRY SMOKE OPACITY		%	0.7	0.7	1.3	3.0	2.2
BOSCH SMOKE NUMBER			0.18	0.16	0.57	1.30	1.00

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN		EKW	1,000.0	750.0	500.0	250.0	100.0
PERCENT LOAD		%	100	75	50	25	10
ENGINE POWER		BHP	1,483	1,124	772	426	209
TOTAL NOX (AS NO2)		G/HR	8,780	5,143	3,360	2,272	1,341
TOTAL CO		G/HR	359	231	495	813	1,256
TOTAL HC		G/HR	36	104	100	76	151
PART MATTER		G/HR	52.5	38.7	66.9	104.7	83.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,839.3	2,113.6	2,037.0	2,424.8	2,418.8
TOTAL CO	(CORR 5% O2)	MG/NM3	116.2	92.7	298.2	879.0	2,541.0
TOTAL HC	(CORR 5% O2)	MG/NM3	10.2	37.3	52.3	69.3	278.9
PART MATTER	(CORR 5% O2)	MG/NM3	14.2	13.4	34.8	104.9	135.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,383	1,030	992	1,181	1,178
TOTAL CO	(CORR 5% O2)	PPM	93	74	239	703	2,033
TOTAL HC	(CORR 5% O2)	PPM	19	70	98	129	521
TOTAL NOX (AS NO2)		G/HP-HR	5.97	4.60	4.37	5.34	6.43
TOTAL CO		G/HP-HR	0.24	0.21	0.64	1.91	6.03
TOTAL HC		G/HP-HR	0.02	0.09	0.13	0.18	0.73
PART MATTER		G/HP-HR	0.04	0.03	0.09	0.25	0.40
TOTAL NOX (AS NO2)		LB/HR	19.36	11.34	7.41	5.01	2.96
TOTAL CO		LB/HR	0.79	0.51	1.09	1.79	2.77
TOTAL HC		LB/HR	0.08	0.23	0.22	0.17	0.33
PART MATTER		LB/HR	0.12	0.09	0.15	0.23	0.18

Regulatory Information

EPA TIER 2		2006 - 2010		
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 89 SUBPART D AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	NON-ROAD	TIER 2	CO: 3.5 NOx + HC: 6.4 PM: 0.20

EPA EMERGENCY STATIONARY		2011 - ----		
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	50	60	70	80	90	100	110	120	130	NORMAL
ALTITUDE (FT)										
0	1,474	1,474	1,474	1,474	1,474	1,468	1,442	1,417	1,393	1,474
1,000	1,474	1,474	1,474	1,466	1,439	1,413	1,388	1,364	1,341	1,474
2,000	1,474	1,465	1,438	1,411	1,385	1,360	1,336	1,314	1,291	1,434
3,000	1,438	1,410	1,383	1,358	1,333	1,309	1,286	1,264	1,242	1,389
4,000	1,383	1,356	1,331	1,306	1,282	1,259	1,237	1,216	1,195	1,345
5,000	1,330	1,304	1,280	1,256	1,233	1,211	1,190	1,169	1,149	1,302
6,000	1,278	1,254	1,230	1,207	1,185	1,164	1,144	1,124	1,105	1,260
7,000	1,228	1,205	1,182	1,160	1,139	1,119	1,099	1,080	1,062	1,220
8,000	1,180	1,157	1,135	1,114	1,094	1,074	1,056	1,037	1,020	1,180
9,000	1,133	1,111	1,090	1,070	1,050	1,032	1,014	996	979	1,141
10,000	1,087	1,066	1,046	1,027	1,008	990	973	956	940	1,103
11,000	1,043	1,023	1,004	985	967	950	933	917	902	1,066

12,000	1,001	981	963	945	928	911	895	880	865	1,029
13,000	959	941	923	906	889	874	858	843	829	994
14,000	919	901	884	868	852	837	822	808	794	959
15,000	880	863	847	831	816	802	788	774	761	926

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
0K8987	PP6050	2537557	GS277	-	SYC00001	
0K7838	GG0346	3208618	GS490	-	JDB00001	
0K8987	PP6050	3249750	GS277	-	SYC00001	
0K8987	PP6050	3367659	GS471	-	PRH00001	
0K8987	PP6050	3801431	GS471	-	PRH00001	
0K8987	PP6050	4391323	GS471	-	PRH03719	
0K8987	PP6050	4447558	GS471	-	PRH00001	
0K8987	PP6050	4447562	GS471	-	PRH00001	
0K8987	PP6050	5233431	GS471	-	PRH00001	
0K8987	PP6050	5612763	GS471	DK	PRH00001	
0K8987	PP6050	6034725	PG457	-	PRH00001	

Performance Parameter Reference

Parameters Reference:DM9600-12

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.
C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%
TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.
REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other

engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on TM2001.

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE

TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.

Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS:

Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

EMISSIONS DEFINITIONS:

Emissions : DM1176

EMISSION CYCLE DEFINITIONS

1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets
test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS:

PERFORMANCE DATA[DM9933]

Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 07/10/19

Application & Performance Warranty Data

Project Information

Site Location:	Bay Area, CA
Project Name:	Stack SVY03A
Application:	Standby Power
Number Of Engines:	1
Operating Hours per Year:	100

Engine Specifications

Engine Manufacturer:	Caterpillar
Model Number:	3516E
Rated Speed:	1800 RPM
Type of Fuel:	Ultra-Low Sulfur Diesel (ULSD)
Type of Lube Oil:	1 wt% sulfated ash or less
Lube Oil Consumption:	0.1 % Fuel Consumption
Number of Exhaust Manifolds:	1

Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO_x	CO	NMHC	NMNEHC	PM_{10}	O_2	H_2O
%		*bhp*	*acfm (cfm)*	*° F*	*gal/hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*%*	*%*
100	Rated	4,043	22,051.6	897	191.8	6	1.16	0.14	0.1	0.07	9.4	10

Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	*g/bhp-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	
NO_x	6	2.67	496	966	8.046	17.74	0.5	0.22	41	81	0.671	1.48	91.7%
CO	1.16	0.52	157	307	1.556	3.43	2.6	1.16	353	688	3.487	7.69	
NMHC	0.14	0.06	33	65	0.188	0.41	0.14	0.06	33	65	0.188	0.41	
PM_{10}	0.07	0.03	22	43	0.094	0.21	0.02	0.01	7	14	0.03	0.07	68.6%

System Specifications

DOC/SCR/DPF System Specifications (M3X-72-63-26PF-J-R4, ACIS-3, Commissioning & Startup, FACINS-M3-72-63)

SCR Catalyst Space Velocity:	11,234 1/hr
Sound Attenuation:	25-30 dBA insertion loss
Reactant:	Urea
Percent Concentration:	32.5%
Design Exhaust Flow Rate:	22,052 acfm (cfm)
Design Exhaust Temperature[1]:	897° F
Exhaust Temperature Limits:	572° F – 977° F
Minimum Regeneration Temperature[2]:	500° F
SCR Catalyst Volume:	45 ft^3
System Dosing Capacity:	60 L/hr
System Pressure Loss:	18.0 inH_2O (Clean)
Total Catalyst Volume:	45 ft^3
Estimated Reactant Consumption:	13.5 gal/hr (51 L/hr) / Per Engine

Standard ecoCUBE® Performance for CAT 3516E, 3MW

SCR + DPF

Flow Rate (kg/hr)	Temperature (F)	Loads	NOx Reduction	CO Reduction	VOC Reduction	**PM Reduction
4,545	672	10%	90%	60%	20%	>85%
7,144	915	25%	94%	80%	50%	>85%
15,244	974	50%	90%	80%	50%	>85%
19,422	917	75%	93%	80%	50%	>85%
22,803	901	100%	93%	80%	50%	>85%

**The DPF will provide an 85% PM reduction. Please note that if the level of PM that will result post-DPF for a given load point is less than 0.018 g/bhp-hr, the measurement will likely be within the error bars of EPA Method 5/202 (i.e. Method 5/202 will have difficulty accurately measuring this amount of PM as it is so low). As a result, measurements should be taken as per ISO method 8178-4 or 40 CFR 1065

*** Ammonia Slip will be <10 ppmvd @ 15% O2**

Standard ecoCUBE® Performance for CAT C32, 1MW

SCR + DPF

Flow Rate (kg/hr)	Temperature (F)	Loads	NOx Reduction	CO Reduction	VOC Reduction	**PM Reduction
1,990	491	10%	[2] 79%	50%		>85%
2,889	646	25%	92%	80%	50%	>85%
4,815	770	50%	92%	80%	50%	>85%
6,858	822	75%	92%	80%	50%	>85%
8,115	893	100%	90%	80%	50%	>85%

**The DPF will provide an 85% PM reduction. Please note that if the level of PM that will result post-DPF for a given load point is less than 0.018 g/bhp-hr, the measurement will likely be within the error bars of EPA Method 5/202 (i.e. Method 5/202 will have difficulty accurately measuring this amount of PM as it is so low). As a result, measurements should be taken as per ISO method 8178-4 or 40 CFR 1065

*** Ammonia Slip will be <10 ppmvd @ 15% O2**

[2] Insulation is required between the ecoCUBE and engine. Please note that the above values assume less then 10 degF of heat loss between engine turbo and ecoCUBE® SCR catalyst

Application & Performance Warranty Data

Project Information

Site Location:	California
Project Name:	Bay Area
Application:	Standby Power
Number Of Engines:	1
Operating Hours per Year:	100

Engine Specifications

Engine Manufacturer:	Caterpillar
Model Number:	3512C
Rated Speed:	1800 RPM
Generator Power:	1600 ekW
Type of Fuel:	Ultra-Low Sulfur Diesel (ULSD)
Type of Lube Oil:	1 wt% sulfated ash or less
Lube Oil Consumption:	0.1 % Fuel Consumption
Number of Exhaust Manifolds:	1

Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO_x	CO	NMNEHC	PM_{10}	O_2	H_2O
%		*bhp*	*acfm (cfm)*	*° F*		*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*%*	*%*
100	Rated	2,400	12,943.5	820.4		5.91	1.11	0.16	0.08	10	10

Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	*g/bhp-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	
NO_x*	5.91	1.56	492	908	7.925	17.47	0.5	0.13	42	77	0.671	1.48	91.5%
CO	1.11	0.29	152	280	1.489	3.28	2.6	0.69	355	656	3.487	7.69	
NMNEHC**	0.16	0.04	38	71	0.215	0.47	0.14	0.04	33	62	0.188	0.41	12.5%
PM_{10}	0.08	0.02	26	47	0.107	0.24	0.02	0.01	7	13	0.03	0.07	72.5%

* MW referenced as NO_2

** MW referenced as CH_4. Propane in the exhaust shall not exceed 15% by volume of the NMHC compounds in the exhaust, excluding aldehydes. The 15% (vol.) shall be established on a wet basis, reported on a methane molecular weight basis. The measurement of exhaust NMHC composition shall be based upon EPA method 320 (FTIR), and shall exclude formaldehyde.

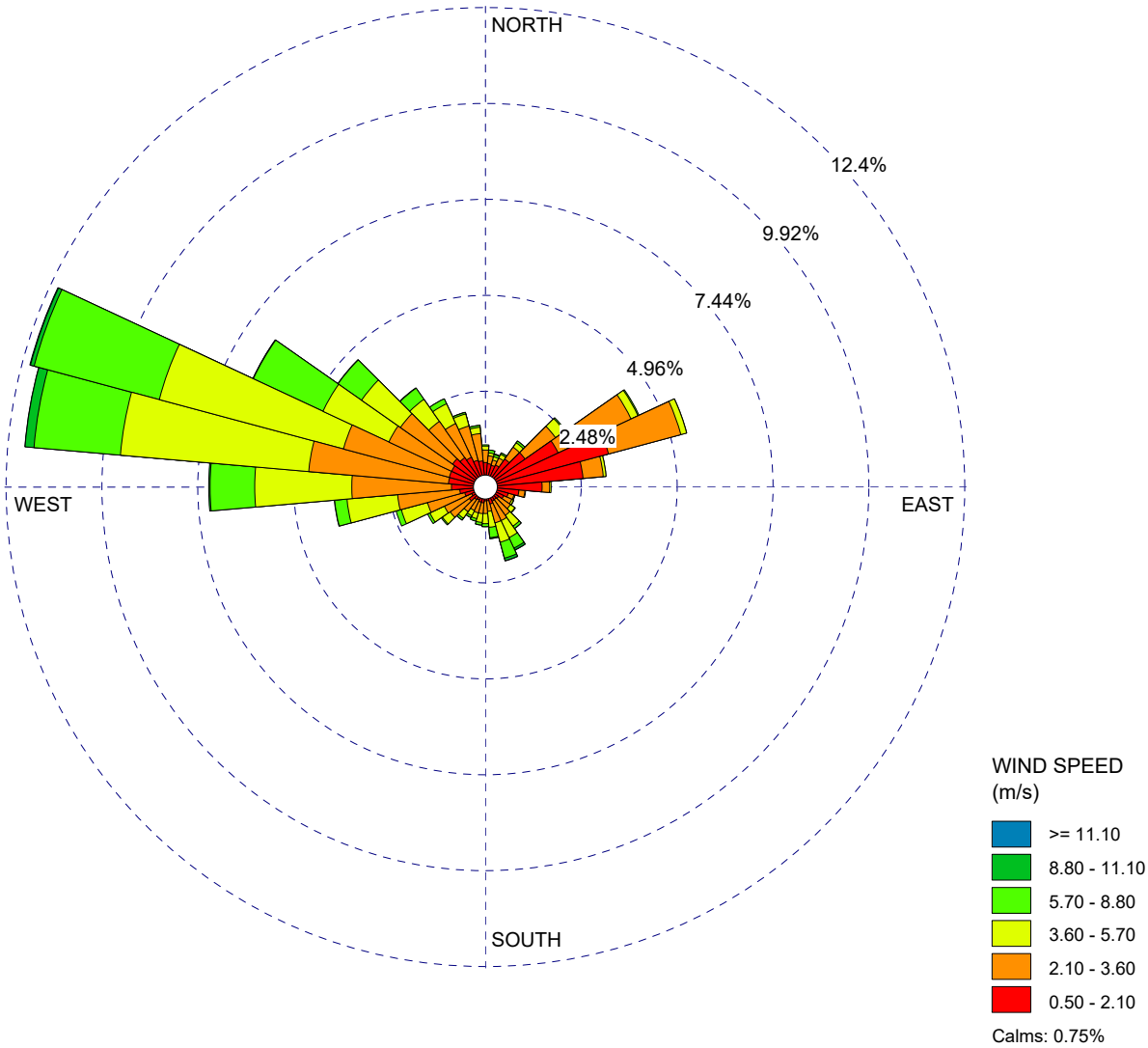
Appendix AQ3
Modeling Support Data

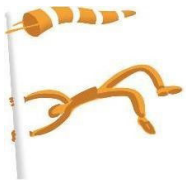
WIND ROSE PLOT:

Figure AQ3-1
SVY03A Data Center

DISPLAY:

Wind Speed
Direction (blowing from)



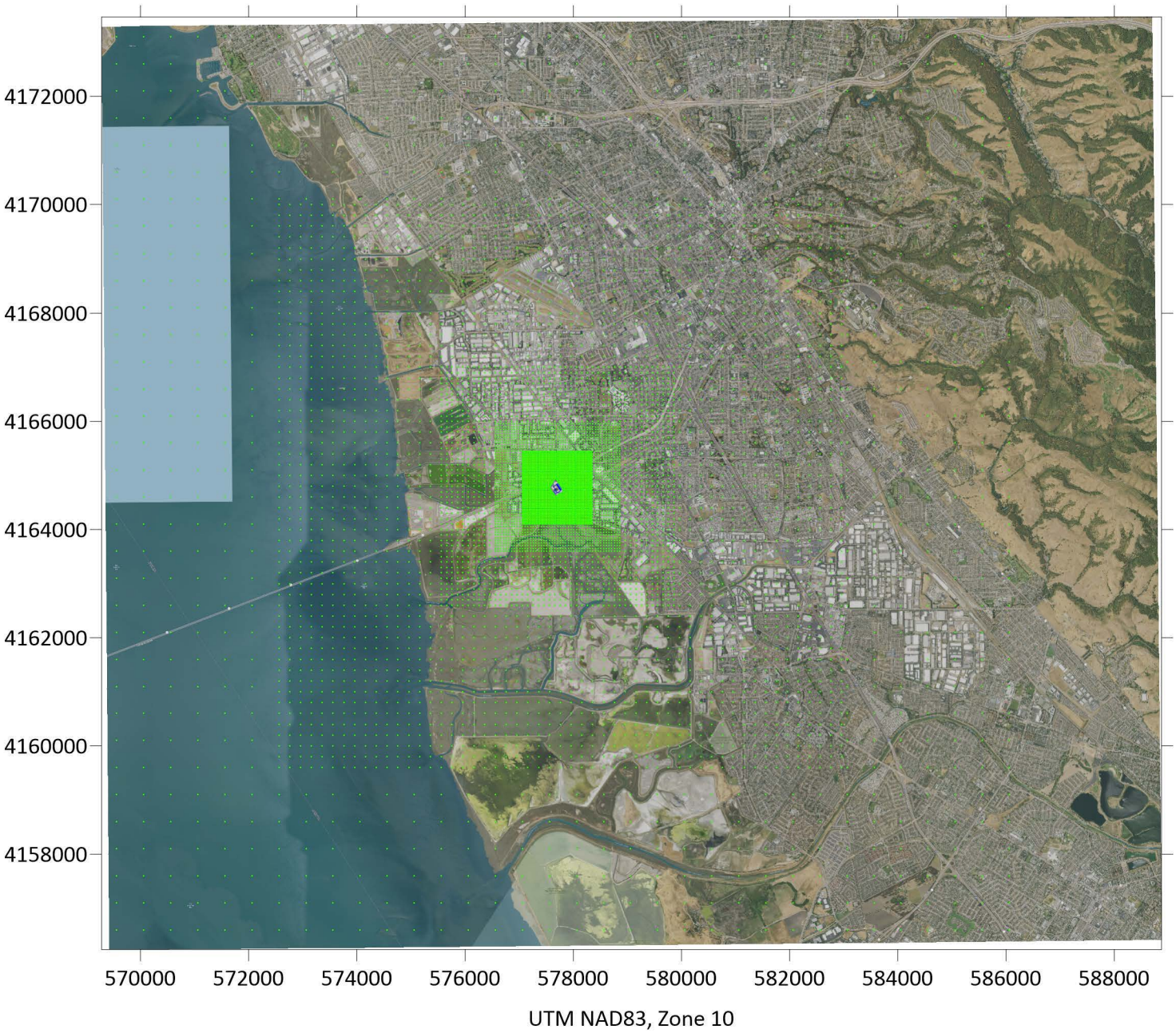
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Hayward Executive Airport 2013-2017	**Start Date: 1/1/2013 - 00:00** **End Date: 1/1/2018 - 23:59**	**Atmospheric Dynamics, Inc.**	
		MODELER:	
	CALM WINDS: **0.75%**	TOTAL COUNT: **43504 hrs.**	
	AVG. WIND SPEED: **3.33 m/s**	DATE: **9/1/2023**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure AQ3-2
Building Heights/Stack Locations

Hayward Data Center
Fence in Green
Fenceline Receptors in Blue
Buildings in Magenta
Stacks in Red

Figure AQ3-3
Receptor Grids



Appendix AQ4
Construction Emissions

Table AQ4-1 Air Quality Construction Support Data

Project Name:		**Hayward Data Center/BGF**						**CalEEMod Input Data**
	See Equipment Type TAB for type, horsepower and load factor							
	Switch Yard Station	**25800**	**sq.ft.**				**11.1**	**Project Site area (acres) or approx. 484110 sq.ft.**
	Storm Water Basin Areas (3)	**18100**	**sq.ft.**					
	Loading Dock	**0**	**sq.ft.**	**included in Bldg sq.ft.**				**Employees and Operational Year**
	ACB Bldg.	**2,936**	**sq.ft.**					**Ops Employees □45 Ops Yr: 2027**
	Ski Lodge Bldg.	**14,500**	**sq.ft.**					
	Substation	**25,300**	**sq.ft.**	**0**	**spaces**			**Other: Approx const period is 81 weeks, 20.25 months**
	S□Y03 Data Center Bldg (3 story bldg)	**318,700**	**sq.ft.**	**55**	**spaces**			**Ops □isitors/day: S□Y03 □4**
	Construction Days and Hours (Monday-Friday)	**7:00**	**am to**	**5:00**	**pm**			**Ops Site deliveries per day: S□Y03 □3**
	The work day period is 10 hours, but union labor requires breaks at lunch, etc. There will also be equipment downtime for maintenance, refueling, etc. This will result in an potential actual work (equipment use) period of □8.5 hrs/day.							
Quantity	**Phase Descriptions**	**HP**	**Load Factor**	**Work Period Hours/day**	**EQ Use Days**	**EQ Use Hours per day**	**Phase Hours**	**Comments**
	Main Site Construction							
	Demolition (9 Bldgs and all auxiliaries)	**Start Date:**	**5/14/2024**	**Total phase days:**	**45**	**Each**	**Total**	**Demolition □olume**
		End Date:	**7/15/2024**			**Piece**	**All Pieces**	Square footage of buildings to be demolished =~ 168,000
3	Excavators	158	0.38	8.5	35	6.6	694	FEMA calc volume = 30703 cu.yds.
2	Loaders	97	0.37	8.5	40	7.6	604	Per Contra Costa County data: 1 cu.yd = 0.2085 tons
1	Rubber-Tired Dozers	247	0.4	8.5	40	7.6	302	Total tons of debris = 6402 @ 10 tons per avg haul = 640 trips
1	Tractors/Loaders/Backhoes	97	0.37	8.5	35	6.6	231	(std 10-wheeler dump truck)
1	Water Truck	350	0.38	8.5	42	7.9	333	Asphalt Removal, cu.yds. = ~ 3090 at 1.98 tons/cu.yd. = 6118 tons
	Haul Trucks (emissions computed under VMT hauling)					0.0	0	Avg haul rate is 10 tons = 612 trips
	Site Preparation/Grading	**Start Date:**	**6/18/2024**	**Total phase days:**	**65**			
		End Date:	**9/16/2024**					**Soil Hauling □olume**
2	Excavator	158	0.38	8.5	45	5.9	530	Cut volume = **6,000** cubic yards?
1	Loaders	97	0.37	8.5	40	5.2	209	Fill volume = **9600** cubic yards?
1	Rubber-Tired Dozers	247	0.4	8.5	30	3.9	118	Import volume =**3600** cubic yards?
1	Grader	187	0.41	8.5	40	5.2	209	at 10 cu.yd. per truck = 360 haul loads to the site
1	Scraper	367	0.48	8.5	20	2.6	52	(std 10-wheeler dump truck)
1	Backhoe	97	0.37	8.5	25	3.3	82	Data source: Applicant
1	Water Truck	350	0.38	8.5	60	7.8	471	(cut/fill is unbalanced)
	Haul Trucks (emissions computed under VMT hauling)					0.0	0	
	Site Utilities/Foundations/etc.	**Start Date:**	**8/16/2024**	**Total phase days:**	**44**			
		End Date:	**10/16/2024**					
2	Excavators	158	0.38	8.5	30	5.8	348	
1	Loader	97	0.37	8.5	25	4.8	121	
1	Backhoe	97	0.37	8.5	30	5.8	174	
2	Skid Steer Loader	65	0.37	8.5	20	3.9	155	
2	Misc Equipment	172	0.42	8.5	20	3.9	155	
1	Water Truck	350	0.38	8.5	40	7.7	309	
	Haul Trucks (emissions computed under VMT hauling)					0.0	0	

	Building Construction	**Start Date:**	**8/30/2024**	**Total phase days:**	**365**			
	(including Recycled Water linear construction)	**End Date:**	**1/22/2026**					
1	Cranes	231	0.29	8.5	90	2.1	189	**Concrete Required 9600 cu.yds.**
3	Building Hoist	231	0.29	8.5	100	2.3	699	Assumed 8 cu.yd. per delivery =~1200 delivery trips to site
2	Grader	187	0.41	8.5	25	0.6	29	(a portion of this concrete may be delivered during the site utilities/foundation phase)
5	Misc. Equipment	172	0.42	8.5	40	0.9	186	
1	Water Truck	350	0.38	8.5	200	4.7	932	
	Haul Trucks (emissions computed under VMT hauling)					0.0	0	
	Architectural Coating	**Start Date:**	**8/15/2025**	**Total phase days:**	**44**			
		End Date:	**10/15/2025**					
2	Air Compressors	78	0.48	8.5	40	7.7	618	
1	Aerial Lift	63	0.31	8.5	40	7.7	309	
1	Forklift	89	0.2	8.5	40	7.7	309	
	Paving and LS	**Start Date:**	**7/9/2025**	**Total phase days:**	**70**			
		Start Date:	**10/15/2025**					
1	Excavator	158	0.38	8.5	15	1.8	27	**Asphalt Required for Paving 1860 cubic yards**
1	Loader	97	0.37	8.5	35	4.3	149	12 cu.yd. per truck = 155 haul loads to the site
1	Backhoe	97	0.37	8.5	20	2.4	97	(std single trailer bottom dump asphalt delivery truck)
2	Skid Steer Loader	65	0.37	8.5	40	4.9	194	
1	Paver	132	0.42	8.5	30	3.6	219	
2	Roller/Compactor	80	0.38	8.5	35	4.3	0	
	Haul Trucks (emissions computed under VMT hauling)					0.0	0	
	Underground Offsite Linears (none proposed)	**Start Date:**		**Total phase days:**	**0**			
	(See Separate CalEEMod Evaluation)	**End Date:**						
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
	Aboveground Offsite Linears (none proposed)	**Start Date:**		**Total phase days:**	**0**			
	(See Separate CalEEMod Evaluation)	**End Date:**						
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	
0		0	0	0	0	#DIV/0!	#DIV/0!	

See equipment HP and Load Factors in "Equipment Types" worksheet tab.							
Construction notes: "Not all equipment in each phase will be onsite simultaneously, i.e., equipment will be scheduled on site as needed."							**Other Misc Data for CalEEMod Input (Final Buildout Ops)**
1. Equipment types by phase supplied by Applicant.							1. IT + Bldg Power Needs at buildout (see Project Description)
Construction phase periods supplied by Applicant.							2. Reclaimed water used on site = No
2. Equipment run hours per day calculated or derived from CalEEMod, SCAQMD Const Survey, App E-1, 2020,							3. Potable water use for bldg employees ~6400 gals/yr/employee =~ 288,000 gal/yr
or CalEEMod Tables 3.2, App D, 2020.							increased to 300,000 gal/yr for conservative calculations.
3. Watering for fugitive dust control at a minimum of 2 times per day							CBECS (2012), Table W1, EIA.gov
4. Construction period onsite speed will be limited to <=15 mph							4. Waste generation rates ~ 1.15 ton/yr/employee ~= 52 tons/yr (CalEEMod default)
5. Demo debris calc per FEMA Debris Estimating Guide, FEMA 329, Sept 2010		Haul distance to WM-Davis St Transfer Station =10.2 mi					Cal-Recycle from City of LA (2006) shows 1.37 ton/yr/employee = 61.7 tons/yr
Contra Costa County demo data used to adjust FEMA values to tons.		Haul distance to WM Altamont Landfill =32 mi					5. OPs round trips/day: Employees = 45, Visitors = 4, Deliveries = 3
6. Delivery hauls away from the site include: demo debris + demo asphalt = 1252		Haul distance to Vasco Landfill = 27.5 mi					Estimated total round trips/day = 45+4+3 = 52
7. Delivery hauls to the site for cut/fill (for site prep/grading) = 360			Avg Debris haul = 23 miles				Bldg sq.ft. =~336136 = 336.136 per 1000 sq.ft.
Delivery hauls to the site for concrete (bldg construction) = 1200							52 RT / 336.136 = 0.155 RT/1000 sq.ft.
Delivery hauls to the site (paving) = 155							6. Ops phase will be serviced by only paved roads.
8. Construction materials deliveries to the site will average 4 per day for the period starting							7. Outdoor water use for landscaping per FEMP/USDOE-PNNL-19498, July 2010
8/30/24 to 12/31/25 for a total of ~340 work days which = 1360							Annual irrigation factor for SF region is 12.24 gal/sqft/yr, with system efficiency of 85%
9. Haul data in items 6, 7, and 8 are assumed to be round trips (conservative).							Landscape area estimate = 106,500 sq.ft.(per const drawing A051)
10. Approx 22 month construction manpower scaled from 15 month schedule as follows:							Annual outdoor water use estimate = 1,533,600 gal/yr
15 month schedule - peak manpower month = 410, average manpower month = 218							
22 month schedule - peak manpower month = 282, average manpower month = 150							
484 work days based on above phase schedule, 484 x 150 = 72600 RTs per const period							
Phase Worker RT breakdown:							
	Demolition - 7% = 5082						
	Site Prep - 3% = 2178						
	Utilities/Foundations - 10% = 7260						
	Bldg Construction - 74% = 53724						
	Paving/Landscaping - 3% = 2178						
	Architectural coating - 3% = 2178						

Typical Equipment Type & Load Factors			
OFFROAD Equipment Type	**Horsepower**	**Onsite Load Factor**	**Added or Revised**
Aerial/Boom Lifts	63	0.31	
Air Compressors	78	0.48	
Bore/Drill Rigs	221	0.5	
Cement and Mortar Mixers	9	0.56	
Concrete/Industrial Saws	81	0.73	
Cranes	231	0.29	
Crawler Tractors	212	0.43	
Crushing/Proc. Equipment	85	0.78	
Dumpers/Tenders	16	0.38	
Excavators	158	0.38	
Forklifts	89	0.2	
Generator Sets	84	0.74	
Graders	187	0.41	
Water Truck (9000 gal)	350	0.38	7/15/2023
12 yd Cement Truck	370	0.38	7/15/2023
12 yd Dump Truck	350	0.38	7/15/2023
Tractor Trailer Truck	450	0.4	7/15/2023
24 yd Transfer (doubles)	450	0.4	7/15/2023
Flat Bed Truck/Trailer	505	0.4	7/15/2023
Misc Haul Trucks	350	0.4	7/15/2023
Off-Highway Tractors	124	0.44	
Off-Highway Trucks	350	0.38	7/15/2023
Other Construction Equipment	172	0.42	
Other General Industrial Equipment	88	0.34	

				Other Material Handling Equipment	168	0.4		
				Pavers	132	0.42		
				Paving Equipment	130	0.36		
				Plate Compactors	8	0.43		
				Pressure Washers	13	0.3		
				Pumps	84	0.74		
				Rollers/Compactors	80	0.38		
				Rough Terrain Forklifts	100	0.4		
				Rubber Tired Dozers	247	0.4		
				Rubber Tired Loaders	203	0.36		
				Scrapers	367	0.48		
				Signal Boards	6	0.82		
				Skid Steer Loaders	65	0.37		
				Surfacing Equipment	263	0.3		
				Sweepers/Scrubbers	64	0.46		
				Tractors/Loaders/Backhoes	97	0.37		
				Trenchers	78	0.5		
				Welders	46	0.45		

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Hayward DC/BGF

Alameda County, Annual

Table AQ4-2

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	336.14	1000sqft	11.30	336,140.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	63
Climate Zone	5			**Operational Year**	2027
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Project data from Applicant

Land Use - Building data from Applicant (current estimate).

Construction Phase - Applicant supplied construction schedule.

Off-road Equipment - Applicant data.

Off-road Equipment - Applicant data.

Off-road Equipment - Applicant data.

Off-road Equipment - Applicant data.

Off-road Equipment - Applicant data.

Off-road Equipment - Applicant data.

Trips and VMT - Applicant data: Avg workers/day = 150, Max workers/day =218. Used 150 as conservative avg for the Bldg construction period.

On-road Fugitive Dust - Best estimate.

Demolition - Claculated from FEMA and Contra Costa County resources.

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Grading - Applicant data.

Architectural Coating - Calculated per CalEEMod, App A, Section 4.7.

Vehicle Trips - Based on employee count + visitors and deliveries per day = 52 divided by 336.14 (1000 sqft).

Road Dust - No unpaved roads will be used during operation of the facility.

Area Coating - Revised estimates per App A, Section 4.7.

Energy Use - Emissions from electricty generation for normal operations will be apportioned to the supplying utility, i.e., PG&E.

Water And Wastewater - Calculated by Applicant (see Construction Support Table)

Solid Waste - Calculated by Applicant.

Construction Off-road Equipment Mitigation - Applicant data.

Fleet Mix - Defaults used.

Woodstoves - N/A

Consumer Products - Defaults used.

Landscape Equipment - Defaults used.

Operational Off-Road Equipment - N/A

Stationary Sources - Emergency Generators and Fire Pumps - N/A

Stationary Sources - Emergency Generators and Fire Pumps EF - N/A

Stationary Sources - Process Boilers - N/A

Stationary Sources - Process Boilers EF - N/A

Stationary Sources - User Defined - N/A

Land Use Change - Defaults used.

Sequestration - Defaults used.

Mobile Land Use Mitigation - N/A

Mobile Commute Mitigation - N/A

Area Mitigation - Use of BAAQMD low VOC coatings.

Energy Mitigation - N/A

Water Mitigation - Low flow faucets and toilets per Bldg Codes. Landscaping irrigation system per Codes.

Waste Mitigation - N/A

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	168,070.00	221,850.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	504,210.00	672,272.00
tblAreaCoating	Area_Nonresidential_Exterior	168070	221850
tblAreaCoating	Area_Nonresidential_Interior	504210	450422
tblAreaMitigation	UseLowVOCPaintParkingCheck	False	True
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	20.00	44.00
tblConstructionPhase	NumDays	300.00	365.00
tblConstructionPhase	NumDays	20.00	45.00
tblConstructionPhase	NumDays	20.00	72.00
tblConstructionPhase	NumDays	10.00	65.00
tblGrading	AcresOfGrading	58.09	11.30
tblGrading	MaterialExported	0.00	6,000.00
tblGrading	MaterialImported	0.00	9,600.00
tblGrading	MeanVehicleSpeed	7.10	5.00
tblLandUse	LotAcreage	7.72	11.30
tblOffRoadEquipment	HorsePower	130.00	132.00
tblOffRoadEquipment	HorsePower	63.00	231.00
tblOffRoadEquipment	HorsePower	402.00	350.00
tblOffRoadEquipment	HorsePower	402.00	350.00
tblOffRoadEquipment	HorsePower	402.00	350.00
tblOffRoadEquipment	HorsePower	402.00	350.00
tblOffRoadEquipment	HorsePower	203.00	97.00
tblOffRoadEquipment	LoadFactor	0.38	0.40
tblOffRoadEquipment	LoadFactor	0.42	0.40
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	7.70
tblOffRoadEquipment	UsageHours	7.00	2.10
tblOffRoadEquipment	UsageHours	8.00	6.60
tblOffRoadEquipment	UsageHours	8.00	3.60
tblOffRoadEquipment	UsageHours	8.00	4.30
tblOffRoadEquipment	UsageHours	8.00	7.60
tblOffRoadEquipment	UsageHours	8.00	3.90
tblOffRoadEquipment	UsageHours	8.00	5.20
tblOffRoadEquipment	UsageHours	8.00	3.30
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOnRoadDust	AverageVehicleWeight	2.40	25.00
tblOnRoadDust	AverageVehicleWeight	2.40	25.00
tblRoadDust	MaterialMoistureContent	0.5	0
tblRoadDust	MaterialSiltContent	4.3	0
tblRoadDust	MeanVehicleSpeed	40	0
tblSolidWaste	SolidWasteGenerationRate	312.61	0.18
tblTripsAndVMT	HaulingTripLength	20.00	23.00
tblTripsAndVMT	HaulingTripNumber	1,238.00	1,252.00
tblTripsAndVMT	HaulingTripNumber	1,200.00	360.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblTripsAndVMT	HaulingTripNumber	0.00	2,560.00
tblTripsAndVMT	HaulingTripNumber	0.00	155.00
tblTripsAndVMT	VendorTripNumber	55.00	7.00
tblTripsAndVMT	WorkerTripNumber	20.00	113.00
tblTripsAndVMT	WorkerTripNumber	20.00	34.00
tblTripsAndVMT	WorkerTripNumber	23.00	165.00
tblTripsAndVMT	WorkerTripNumber	108.00	147.00
tblTripsAndVMT	WorkerTripNumber	20.00	31.00
tblTripsAndVMT	WorkerTripNumber	22.00	50.00
tblVehicleTrips	ST_TR	2.21	0.16
tblVehicleTrips	SU_TR	0.70	0.16
tblVehicleTrips	WD_TR	9.74	0.16
tblWater	IndoorWaterUseRate	59,743,422.05	300,000.00
tblWater	OutdoorWaterUseRate	36,616,936.10	1,533,600.00

2.0 Emissions Summary

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2024	0.1886	1.5343	1.7893	4.9700e-003	0.7244	0.0603	0.7846	0.1966	0.0555	0.2521						455.5327
2025	2.4802	1.0318	1.4794	4.4000e-003	0.1920	0.0375	0.2295	0.0514	0.0348	0.0862						408.1971
2026	7.0400e-003	0.0463	0.0607	2.2000e-004	0.0106	1.6000e-003	0.0122	2.8400e-003	1.4700e-003	4.3100e-003						20.2243
Maximum	**2.4802**	**1.5343**	**1.7893**	**4.9700e-003**	**0.7244**	**0.0603**	**0.7846**	**0.1966**	**0.0555**	**0.2521**						**455.5327**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2024	0.0774	0.3916	2.2418	4.9700e-003	0.5961	7.3900e-003	0.6035	0.1564	7.2800e-003	0.1637						455.5323
2025	2.4107	0.3870	1.8109	4.4000e-003	0.1920	5.8900e-003	0.1979	0.0514	5.7700e-003	0.0571						408.1968
2026	3.9700e-003	0.0168	0.0786	2.2000e-004	0.0106	2.9000e-004	0.0109	2.8400e-003	2.8000e-004	3.1200e-003						20.2243
Maximum	**2.4107**	**0.3916**	**2.2418**	**4.9700e-003**	**0.5961**	**7.3900e-003**	**0.6035**	**0.1564**	**7.2800e-003**	**0.1637**						**455.5323**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**6.87**	**69.56**	**-24.09**	**0.00**	**13.84**	**86.34**	**20.86**	**16.03**	**85.47**	**34.63**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**5-14-2024**	**8-13-2024**	0.9018	0.2263
2	**8-14-2024**	**11-13-2024**	0.6932	0.1944
3	**11-14-2024**	**2-13-2025**	0.2362	0.0899
4	**2-14-2025**	**5-13-2025**	0.2138	0.0842
5	**5-14-2025**	**8-13-2025**	0.2893	0.1165
6	**8-14-2025**	**11-13-2025**	2.8006	2.5237
7	**11-14-2025**	**2-13-2026**	0.1692	0.0673
		Highest	2.8006	2.5237

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.4946	3.0000e-005	3.0800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005						6.4000e-003
Energy	0.0347	0.3155	0.2651	1.8900e-003		0.0240	0.0240		0.0240	0.0240						723.7065
Mobile	0.0196	0.0249	0.1864	4.1000e-004	0.0474	3.0000e-004	0.0477	0.0127	2.8000e-004	0.0130						40.1549
Waste						0.0000	0.0000		0.0000	0.0000						0.0905
Water						0.0000	0.0000		0.0000	0.0000						1.0616
Total	**1.5489**	**0.3405**	**0.4545**	**2.3000e-003**	**0.0474**	**0.0243**	**0.0717**	**0.0127**	**0.0243**	**0.0370**						**765.0198**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.4946	3.0000e-005	3.0800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005						6.4000e-003
Energy	0.0347	0.3155	0.2651	1.8900e-003		0.0240	0.0240		0.0240	0.0240						723.7065
Mobile	0.0196	0.0249	0.1864	4.1000e-004	0.0474	3.0000e-004	0.0477	0.0127	2.8000e-004	0.0130						40.1549
Waste						0.0000	0.0000		0.0000	0.0000						0.0905
Water						0.0000	0.0000		0.0000	0.0000						0.9618
Total	**1.5489**	**0.3405**	**0.4545**	**2.3000e-003**	**0.0474**	**0.0243**	**0.0717**	**0.0127**	**0.0243**	**0.0370**						**764.9200**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**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**	**0.00**	**0.00**	**0.01**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	5/14/2024	7/15/2024	5	45	Demolition
2	Site Preparation	Site Preparation	6/18/2024	9/16/2024	5	65	Site Prep and Grading
3	Site Utilities and Foundations	Trenching	8/16/2024	10/16/2024	5	44	Site Utilities and Foundations

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4	Building Construction	Building Construction	8/30/2024	1/22/2026	5	365	Building Erection
5	Paving and Landscaping	Paving	7/9/2025	10/16/2025	5	72	Paving and Landscaping
6	Architectural Coating	Architectural Coating	8/15/2025	10/15/2025	5	44	Interior/Exterior Painting

Acres of Grading (Site Preparation Phase): 11.3

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 672,272; Non-Residential Outdoor: 221,850; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Demolition	Excavators	3	6.60	158	0.38
Demolition	Off-Highway Trucks	1	7.90	350	0.40
Demolition	Rubber Tired Dozers	1	7.60	247	0.40
Demolition	Rubber Tired Loaders	1	7.60	97	0.36
Demolition	Tractors/Loaders/Backhoes	2	6.60	97	0.37
Site Preparation	Excavators	2	5.90	158	0.38
Site Preparation	Graders	1	5.20	187	0.41
Site Preparation	Off-Highway Trucks	1	7.80	350	0.38
Site Preparation	Rubber Tired Dozers	1	3.90	247	0.40
Site Preparation	Scrapers	1	2.60	367	0.48
Site Preparation	Tractors/Loaders/Backhoes	1	5.20	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	3.30	97	0.37
Site Utilities and Foundations	Excavators	2	5.80	158	0.38
Site Utilities and Foundations	Graders	0	8.00	187	0.41
Site Utilities and Foundations	Off-Highway Trucks	1	7.70	350	0.38
Site Utilities and Foundations	Other Construction Equipment	2	3.90	172	0.40

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Site Utilities and Foundations	Rubber Tired Dozers	0	8.00	247	0.40
Site Utilities and Foundations	Scrapers	0	8.00	367	0.48
Site Utilities and Foundations	Skid Steer Loaders	2	3.90	65	0.37
Site Utilities and Foundations	Tractors/Loaders/Backhoes	1	5.80	97	0.37
Site Utilities and Foundations	Tractors/Loaders/Backhoes	1	4.80	97	0.37
Building Construction	Aerial Lifts	2	2.30	231	0.31
Building Construction	Cranes	1	2.10	231	0.29
Building Construction	Forklifts	0	8.00	89	0.20
Building Construction	Generator Sets	0	8.00	84	0.74
Building Construction	Graders	2	0.60	187	0.41
Building Construction	Off-Highway Trucks	1	4.70	350	0.38
Building Construction	Other Construction Equipment	5	0.90	172	0.42
Building Construction	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Building Construction	Welders	0	1.00	46	0.45
Paving and Landscaping	Excavators	1	1.80	158	0.38
Paving and Landscaping	Pavers	1	3.60	132	0.42
Paving and Landscaping	Paving Equipment	0	8.00	132	0.36
Paving and Landscaping	Rollers	2	4.30	80	0.38
Paving and Landscaping	Skid Steer Loaders	2	4.90	65	0.37
Paving and Landscaping	Tractors/Loaders/Backhoes	1	4.30	97	0.37
Paving and Landscaping	Tractors/Loaders/Backhoes	1	2.40	97	0.37
Architectural Coating	Aerial Lifts	1	7.70	63	0.31
Architectural Coating	Air Compressors	2	7.70	78	0.48
Architectural Coating	Forklifts	1	7.70	89	0.20

Trips and VMT

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	8	113.00	0.00	1,252.00	10.80	7.30	23.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	8	34.00	0.00	360.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Utilities and Foundations	9	165.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	11	147.00	7.00	2,560.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving and Landscaping	8	31.00	0.00	155.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	4	50.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1340	0.0000	0.1340	0.0203	0.0000	0.0203						0.0000
Off-Road	0.0456	0.3960	0.4484	9.2000e-004		0.0185	0.0185		0.0170	0.0170						81.3513
Total	**0.0456**	**0.3960**	**0.4484**	**9.2000e-004**	**0.1340**	**0.0185**	**0.1525**	**0.0203**	**0.0170**	**0.0373**						**81.3513**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Demolition - 2024

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3900e-003	0.0934	0.0202	4.2000e-004	0.1025	8.1000e-004	0.1033	0.0255	7.8000e-004	0.0263						43.0620
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	6.2200e-003	4.0700e-003	0.0530	1.7000e-004	0.1923	1.0000e-004	0.1924	0.0476	9.0000e-005	0.0477						15.5908
Total	**7.6100e-003**	**0.0974**	**0.0731**	**5.9000e-004**	**0.2949**	**9.1000e-004**	**0.2958**	**0.0731**	**8.7000e-004**	**0.0740**						**58.6528**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0603	0.0000	0.0603	9.1300e-003	0.0000	9.1300e-003						0.0000
Off-Road	0.0113	0.0488	0.5565	9.2000e-004		1.5000e-003	1.5000e-003		1.5000e-003	1.5000e-003						81.3512
Total	**0.0113**	**0.0488**	**0.5565**	**9.2000e-004**	**0.0603**	**1.5000e-003**	**0.0618**	**9.1300e-003**	**1.5000e-003**	**0.0106**						**81.3512**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Demolition - 2024

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3900e-003	0.0934	0.0202	4.2000e-004	0.1025	8.1000e-004	0.1033	0.0255	7.8000e-004	0.0263						43.0620
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	6.2200e-003	4.0700e-003	0.0530	1.7000e-004	0.1923	1.0000e-004	0.1924	0.0476	9.0000e-005	0.0477						15.5908
Total	**7.6100e-003**	**0.0974**	**0.0731**	**5.9000e-004**	**0.2949**	**9.1000e-004**	**0.2958**	**0.0731**	**8.7000e-004**	**0.0740**						**58.6528**

3.3 Site Preparation - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0993	0.0000	0.0993	0.0529	0.0000	0.0529						0.0000
Off-Road	0.0539	0.4911	0.4710	1.1600e-003		0.0201	0.0201		0.0185	0.0185						102.3124
Total	**0.0539**	**0.4911**	**0.4710**	**1.1600e-003**	**0.0993**	**0.0201**	**0.1193**	**0.0529**	**0.0185**	**0.0713**						**102.3124**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Site Preparation - 2024

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.7000e-004	0.0238	5.3900e-003	1.1000e-004	0.0256	2.0000e-004	0.0258	6.3800e-003	1.9000e-004	6.5800e-003						10.8271
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	2.7000e-003	1.7700e-003	0.0230	7.0000e-005	0.0836	4.0000e-005	0.0836	0.0207	4.0000e-005	0.0207						6.7760
Total	**3.0700e-003**	**0.0255**	**0.0284**	**1.8000e-004**	**0.1092**	**2.4000e-004**	**0.1095**	**0.0271**	**2.3000e-004**	**0.0273**						**17.6030**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0447	0.0000	0.0447	0.0238	0.0000	0.0238						0.0000
Off-Road	0.0142	0.0613	0.6280	1.1600e-003		1.8900e-003	1.8900e-003		1.8900e-003	1.8900e-003						102.3122
Total	**0.0142**	**0.0613**	**0.6280**	**1.1600e-003**	**0.0447**	**1.8900e-003**	**0.0466**	**0.0238**	**1.8900e-003**	**0.0257**						**102.3122**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Site Preparation - 2024

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.7000e-004	0.0238	5.3900e-003	1.1000e-004	0.0256	2.0000e-004	0.0258	6.3800e-003	1.9000e-004	6.5800e-003						10.8271
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	2.7000e-003	1.7700e-003	0.0230	7.0000e-005	0.0836	4.0000e-005	0.0836	0.0207	4.0000e-005	0.0207						6.7760
Total	**3.0700e-003**	**0.0255**	**0.0284**	**1.8000e-004**	**0.1092**	**2.4000e-004**	**0.1095**	**0.0271**	**2.3000e-004**	**0.0273**						**17.6030**

3.4 Site Utilities and Foundations - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0272	0.2316	0.3409	6.7000e-004		0.0103	0.0103		9.4800e-003	9.4800e-003						59.3367
Total	**0.0272**	**0.2316**	**0.3409**	**6.7000e-004**		**0.0103**	**0.0103**		**9.4800e-003**	**9.4800e-003**						**59.3367**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Site Utilities and Foundations - 2024

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	8.8700e-003	5.8200e-003	0.0756	2.4000e-004	0.0287	1.4000e-004	0.0288	7.6400e-003	1.3000e-004	7.7700e-003						22.2595
Total	**8.8700e-003**	**5.8200e-003**	**0.0756**	**2.4000e-004**	**0.0287**	**1.4000e-004**	**0.0288**	**7.6400e-003**	**1.3000e-004**	**7.7700e-003**						**22.2595**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	8.7700e-003	0.0582	0.4325	6.7000e-004		1.1000e-003	1.1000e-003		1.1000e-003	1.1000e-003						59.3366
Total	**8.7700e-003**	**0.0582**	**0.4325**	**6.7000e-004**		**1.1000e-003**	**1.1000e-003**		**1.1000e-003**	**1.1000e-003**						**59.3366**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Site Utilities and Foundations - 2024

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	8.8700e-003	5.8200e-003	0.0756	2.4000e-004	0.0287	1.4000e-004	0.0288	7.6400e-003	1.3000e-004	7.7700e-003						22.2595
Total	**8.8700e-003**	**5.8200e-003**	**0.0756**	**2.4000e-004**	**0.0287**	**1.4000e-004**	**0.0288**	**7.6400e-003**	**1.3000e-004**	**7.7700e-003**						**22.2595**

3.5 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0256	0.2223	0.2039	5.6000e-004		9.3700e-003	9.3700e-003		8.6200e-003	8.6200e-003						49.6621
Total	**0.0256**	**0.2223**	**0.2039**	**5.6000e-004**		**9.3700e-003**	**9.3700e-003**		**8.6200e-003**	**8.6200e-003**						**49.6621**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Building Construction - 2024

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.4000e-004	0.0407	9.2400e-003	1.8000e-004	5.2300e-003	3.5000e-004	5.5800e-003	1.4400e-003	3.3000e-004	1.7700e-003						18.5625
Vendor	3.0000e-004	0.0135	4.0000e-003	6.0000e-005	2.0200e-003	8.0000e-005	2.1100e-003	5.9000e-004	8.0000e-005	6.6000e-004						6.1301
Worker	0.0158	0.0104	0.1347	4.2000e-004	0.0511	2.5000e-004	0.0514	0.0136	2.3000e-004	0.0138						39.6624
Total	**0.0168**	**0.0646**	**0.1479**	**6.6000e-004**	**0.0584**	**6.8000e-004**	**0.0591**	**0.0156**	**6.4000e-004**	**0.0163**						**64.3550**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.8800e-003	0.0298	0.2997	5.6000e-004		9.2000e-004	9.2000e-004		9.2000e-004	9.2000e-004						49.6620
Total	**6.8800e-003**	**0.0298**	**0.2997**	**5.6000e-004**		**9.2000e-004**	**9.2000e-004**		**9.2000e-004**	**9.2000e-004**						**49.6620**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Building Construction - 2024

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.4000e-004	0.0407	9.2400e-003	1.8000e-004	5.2300e-003	3.5000e-004	5.5800e-003	1.4400e-003	3.3000e-004	1.7700e-003						18.5625
Vendor	3.0000e-004	0.0135	4.0000e-003	6.0000e-005	2.0200e-003	8.0000e-005	2.1100e-003	5.9000e-004	8.0000e-005	6.6000e-004						6.1301
Worker	0.0158	0.0104	0.1347	4.2000e-004	0.0511	2.5000e-004	0.0514	0.0136	2.3000e-004	0.0138						39.6624
Total	**0.0168**	**0.0646**	**0.1479**	**6.6000e-004**	**0.0584**	**6.8000e-004**	**0.0591**	**0.0156**	**6.4000e-004**	**0.0163**						**64.3550**

3.5 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0706	0.5702	0.5967	1.6600e-003		0.0241	0.0241		0.0222	0.0222						147.2733
Total	**0.0706**	**0.5702**	**0.5967**	**1.6600e-003**		**0.0241**	**0.0241**		**0.0222**	**0.0222**						**147.2733**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Building Construction - 2025

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8800e-003	0.1204	0.0275	5.3000e-004	0.0155	1.0300e-003	0.0165	4.2700e-003	9.9000e-004	5.2600e-003						54.0449
Vendor	8.8000e-004	0.0401	0.0117	1.8000e-004	6.0000e-003	2.4000e-004	6.2400e-003	1.7400e-003	2.3000e-004	1.9700e-003						17.8577
Worker	0.0440	0.0277	0.3751	1.2000e-003	0.1517	7.2000e-004	0.1524	0.0404	6.6000e-004	0.0410						114.7774
Total	**0.0468**	**0.1882**	**0.4142**	**1.9100e-003**	**0.1732**	**1.9900e-003**	**0.1752**	**0.0464**	**1.8800e-003**	**0.0482**						**186.6800**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0204	0.0885	0.8890	1.6600e-003		2.7200e-003	2.7200e-003		2.7200e-003	2.7200e-003						147.2731
Total	**0.0204**	**0.0885**	**0.8890**	**1.6600e-003**		**2.7200e-003**	**2.7200e-003**		**2.7200e-003**	**2.7200e-003**						**147.2731**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Building Construction - 2025

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8800e-003	0.1204	0.0275	5.3000e-004	0.0155	1.0300e-003	0.0165	4.2700e-003	9.9000e-004	5.2600e-003						54.0449
Vendor	8.8000e-004	0.0401	0.0117	1.8000e-004	6.0000e-003	2.4000e-004	6.2400e-003	1.7400e-003	2.3000e-004	1.9700e-003						17.8577
Worker	0.0440	0.0277	0.3751	1.2000e-003	0.1517	7.2000e-004	0.1524	0.0404	6.6000e-004	0.0410						114.7774
Total	**0.0468**	**0.1882**	**0.4142**	**1.9100e-003**	**0.1732**	**1.9900e-003**	**0.1752**	**0.0464**	**1.8800e-003**	**0.0482**						**186.6800**

3.5 Building Construction - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.3300e-003	0.0350	0.0366	1.0000e-004		1.4800e-003	1.4800e-003		1.3600e-003	1.3600e-003						9.0283
Total	**4.3300e-003**	**0.0350**	**0.0366**	**1.0000e-004**		**1.4800e-003**	**1.4800e-003**		**1.3600e-003**	**1.3600e-003**						**9.0283**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Building Construction - 2026

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.1000e-004	7.3400e-003	1.6800e-003	3.0000e-005	9.5000e-004	6.0000e-005	1.0100e-003	2.6000e-004	6.0000e-005	3.2000e-004						3.2484
Vendor	5.0000e-005	2.4500e-003	7.1000e-004	1.0000e-005	3.7000e-004	1.0000e-005	3.8000e-004	1.1000e-004	1.0000e-005	1.2000e-004						1.0747
Worker	2.5500e-003	1.5500e-003	0.0217	7.0000e-005	9.3000e-003	4.0000e-005	9.3400e-003	2.4700e-003	4.0000e-005	2.5100e-003						6.8730
Total	**2.7100e-003**	**0.0113**	**0.0241**	**1.1000e-004**	**0.0106**	**1.1000e-004**	**0.0107**	**2.8400e-003**	**1.1000e-004**	**2.9500e-003**						**11.1961**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.2500e-003	5.4200e-003	0.0545	1.0000e-004		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004						9.0282
Total	**1.2500e-003**	**5.4200e-003**	**0.0545**	**1.0000e-004**		**1.7000e-004**	**1.7000e-004**		**1.7000e-004**	**1.7000e-004**						**9.0282**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Building Construction - 2026

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.1000e-004	7.3400e-003	1.6800e-003	3.0000e-005	9.5000e-004	6.0000e-005	1.0100e-003	2.6000e-004	6.0000e-005	3.2000e-004						3.2484
Vendor	5.0000e-005	2.4500e-003	7.1000e-004	1.0000e-005	3.7000e-004	1.0000e-005	3.8000e-004	1.1000e-004	1.0000e-005	1.2000e-004						1.0747
Worker	2.5500e-003	1.5500e-003	0.0217	7.0000e-005	9.3000e-003	4.0000e-005	9.3400e-003	2.4700e-003	4.0000e-005	2.5100e-003						6.8730
Total	**2.7100e-003**	**0.0113**	**0.0241**	**1.1000e-004**	**0.0106**	**1.1000e-004**	**0.0107**	**2.8400e-003**	**1.1000e-004**	**2.9500e-003**						**11.1961**

3.6 Paving and Landscaping - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0161	0.1670	0.2736	4.1000e-004		7.2000e-003	7.2000e-003		6.6300e-003	6.6300e-003						35.9563
Paving	0.0000					0.0000	0.0000		0.0000	0.0000						0.0000
Total	**0.0161**	**0.1670**	**0.2736**	**4.1000e-004**		**7.2000e-003**	**7.2000e-003**		**6.6300e-003**	**6.6300e-003**						**35.9563**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Paving and Landscaping - 2025

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.6000e-004	0.0102	2.3200e-003	4.0000e-005	1.3100e-003	9.0000e-005	1.4000e-003	3.6000e-004	8.0000e-005	4.5000e-004						4.5761
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	2.5600e-003	1.6100e-003	0.0218	7.0000e-005	8.8200e-003	4.0000e-005	8.8700e-003	2.3500e-003	4.0000e-005	2.3900e-003						6.6772
Total	**2.7200e-003**	**0.0118**	**0.0241**	**1.1000e-004**	**0.0101**	**1.3000e-004**	**0.0103**	**2.7100e-003**	**1.2000e-004**	**2.8400e-003**						**11.2533**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.1000e-003	0.0680	0.3069	4.1000e-004		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004						35.9563
Paving	0.0000					0.0000	0.0000		0.0000	0.0000						0.0000
Total	**6.1000e-003**	**0.0680**	**0.3069**	**4.1000e-004**		**6.6000e-004**	**6.6000e-004**		**6.6000e-004**	**6.6000e-004**						**35.9563**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Paving and Landscaping - 2025

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.6000e-004	0.0102	2.3200e-003	4.0000e-005	1.3100e-003	9.0000e-005	1.4000e-003	3.6000e-004	8.0000e-005	4.5000e-004						4.5761
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	2.5600e-003	1.6100e-003	0.0218	7.0000e-005	8.8200e-003	4.0000e-005	8.8700e-003	2.3500e-003	4.0000e-005	2.3900e-003						6.6772
Total	**2.7200e-003**	**0.0118**	**0.0241**	**1.1000e-004**	**0.0101**	**1.3000e-004**	**0.0103**	**2.7100e-003**	**1.2000e-004**	**2.8400e-003**						**11.2533**

3.7 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.3292					0.0000	0.0000		0.0000	0.0000						0.0000
Off-Road	0.0122	0.0930	0.1493	2.4000e-004		4.0200e-003	4.0200e-003		3.9400e-003	3.9400e-003						20.4528
Total	**2.3414**	**0.0930**	**0.1493**	**2.4000e-004**		**4.0200e-003**	**4.0200e-003**		**3.9400e-003**	**3.9400e-003**						**20.4528**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.7 Architectural Coating - 2025

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	2.5200e-003	1.5900e-003	0.0215	7.0000e-005	8.7000e-003	4.0000e-005	8.7400e-003	2.3100e-003	4.0000e-005	2.3500e-003						6.5815
Total	**2.5200e-003**	**1.5900e-003**	**0.0215**	**7.0000e-005**	**8.7000e-003**	**4.0000e-005**	**8.7400e-003**	**2.3100e-003**	**4.0000e-005**	**2.3500e-003**						**6.5815**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.3292					0.0000	0.0000		0.0000	0.0000						0.0000
Off-Road	2.9500e-003	0.0290	0.1551	2.4000e-004		3.4000e-004	3.4000e-004		3.4000e-004	3.4000e-004						20.4528
Total	**2.3322**	**0.0290**	**0.1551**	**2.4000e-004**		**3.4000e-004**	**3.4000e-004**		**3.4000e-004**	**3.4000e-004**						**20.4528**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.7 Architectural Coating - 2025

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	2.5200e-003	1.5900e-003	0.0215	7.0000e-005	8.7000e-003	4.0000e-005	8.7400e-003	2.3100e-003	4.0000e-005	2.3500e-003						6.5815
Total	**2.5200e-003**	**1.5900e-003**	**0.0215**	**7.0000e-005**	**8.7000e-003**	**4.0000e-005**	**8.7400e-003**	**2.3100e-003**	**4.0000e-005**	**2.3500e-003**						**6.5815**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0196	0.0249	0.1864	4.1000e-004	0.0474	3.0000e-004	0.0477	0.0127	2.8000e-004	0.0130						40.1549
Unmitigated	0.0196	0.0249	0.1864	4.1000e-004	0.0474	3.0000e-004	0.0477	0.0127	2.8000e-004	0.0130						40.1549

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Office Building	53.78	53.78	53.78	128,527	128,527
Total	53.78	53.78	53.78	128,527	128,527

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Office Building	0.572127	0.056462	0.177932	0.111691	0.020543	0.005283	0.014601	0.013006	0.000784	0.000540	0.024304	0.000352	0.002374

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000						378.1580
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000						378.1580
NaturalGas Mitigated	0.0347	0.3155	0.2651	1.8900e-003		0.0240	0.0240		0.0240	0.0240						345.5485
NaturalGas Unmitigated	0.0347	0.3155	0.2651	1.8900e-003		0.0240	0.0240		0.0240	0.0240						345.5485

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Office Building	6.43708e+006	0.0347	0.3155	0.2651	1.8900e-003		0.0240	0.0240		0.0240	0.0240						345.5485
Total		**0.0347**	**0.3155**	**0.2651**	**1.8900e-003**		**0.0240**	**0.0240**		**0.0240**	**0.0240**						**345.5485**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Office Building	6.43708e+006	0.0347	0.3155	0.2651	1.8900e-003		0.0240	0.0240		0.0240	0.0240						345.5485
Total		**0.0347**	**0.3155**	**0.2651**	**1.8900e-003**		**0.0240**	**0.0240**		**0.0240**	**0.0240**						**345.5485**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	4.04713e +006				378.1580
Total					**378.1580**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	4.04713e +006				378.1580
Total					**378.1580**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Non-Residential Interior

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Use Low VOC Paint - Non-Residential Exterior

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.4946	3.0000e-005	3.0800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005						6.4000e-003
Unmitigated	1.4946	3.0000e-005	3.0800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005						6.4000e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1815					0.0000	0.0000		0.0000	0.0000						0.0000
Consumer Products	1.3128					0.0000	0.0000		0.0000	0.0000						0.0000
Landscaping	2.8000e-004	3.0000e-005	3.0800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005						6.4000e-003
Total	**1.4946**	**3.0000e-005**	**3.0800e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**						**6.4000e-003**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1815					0.0000	0.0000		0.0000	0.0000						0.0000
Consumer Products	1.3128					0.0000	0.0000		0.0000	0.0000						0.0000
Landscaping	2.8000e-004	3.0000e-005	3.0800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005						6.4000e-003
Total	**1.4946**	**3.0000e-005**	**3.0800e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**						**6.4000e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Toilet

Use Water Efficient Irrigation System

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated				0.9618
Unmitigated				1.0616

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Office Building	0.3 / 1.5336				1.0616
Total					**1.0616**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Office Building	0.26292 / 1.44005				0.9618
Total					**0.9618**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated				0.0905
Unmitigated				0.0905

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Office Building	0.18				0.0905
Total					**0.0905**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Office Building	0.18				0.0905
Total					**0.0905**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Figure AQ4-1
Construction Point and Area Source Locations

Hayward Data Center
Fence in Green
Areapoly Source in Blue
Construction Stacks in Red

Appendix AQ5
Risk Assessment Support Data

Table AQ5-1 Sensitive Receptors and Distances from Site

(all sites and coordinates from Google Earth unless otherwise noted) Image Date: 7/8/2022

Hayward Data Center

Receptor ID	Direction	Name	UTM Em	UTM Nm	Distance from Generator Yard meters	feet	miles
Site (Generator Yard)			**577642.50**	**4164820.00**	na	na	
Residence			579048.00	4164616.00	1420.2	4659.5	0.88
Residence			579008.00	4164661.00	1374.7	4510.3	0.85
Residence			578967.00	4164708.00	1329.2	4361.0	0.83
Residence			578929.00	4164744.00	1288.7	4228.2	0.80
Residence			578877.00	4164797.00	1234.7	4050.9	0.77
Residence			578822.00	4164854.00	1180.0	3871.4	0.73
Residence			578786.00	4164892.00	1145.8	3759.1	0.71
Residence			578732.00	4164950.00	1097.2	3599.8	0.68
Residence			578686.00	4164999.00	1058.7	3473.6	0.66
Residence			578640.00	4165177.00	1059.5	3475.9	0.66
Residence			578620.00	4165252.00	1068.7	3506.2	0.66
Residence			578607.00	4165328.00	1090.1	3576.5	0.68
Residence			578572.00	4165352.00	1071.0	3513.7	0.67
Residence			578522.00	4165439.00	1075.5	3528.5	0.67
Residence/Elder Care		Best Care Provider	578495.00	4165491.00	1084.9	3559.4	0.67
Residence			578599.00	4165536.00	1194.8	3919.9	0.74
Residence			578490.00	4165608.00	1157.2	3796.7	0.72
School		Eden Gardens ES	578636.00	4165807.00	1400.4	4594.6	0.87
School		Momtessori Childrens House	579149.00	4165986.00	1905.0	6250.1	1.18
School		Gansberger School	579484.00	4166025.00	2200.7	7220.2	1.37
School		Southgate ES	579889.00	4166077.00	2574.3	8445.7	1.60
School		Eldridge ES	580514.00	4164490.00	2890.4	9482.9	1.80
Residence/Elder Care		Best Friends Care	579239.00	4165688.00	1817.2	5962.0	1.13
Pre-School		Sunny Day Preschool	579097.00	4165651.00	1675.2	5495.9	1.04
School/ROP		Eden Area ROP	579398.00	4166013.00	2122.5	6963.6	1.32
Hospital		Medical Center	579630.00	4166246.00	2446.1	8025.4	1.52
School		MLK MS	580103.00	4165714.00	2617.9	8588.8	1.63
Hospital		St. Rose Hospital	580477.00	4165496.00	2914.0	9560.4	1.81
Hospital		Stantec Health Care	580357.00	4165404.00	2776.6	9109.6	1.73
School		Palma Ceia ES	580653.00	4164912.00	3011.9	9881.6	1.87

Table AQ5-2

CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m³)$^{-1}$	Inhalation[d] Cancer Potency Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
ACETALDEHYDE	75-07-0	4.7E+02	12/08	3.0E+02	12/08	1.4E+02	12/08			2.7E-06	1.0E-02	4/99 [5/93]			1
ACETAMIDE	60-35-5									2.0E-05	7.0E-02	4/99			1
ACROLEIN	107-02-8	2.5E+00	12/08	7.0E-01	12/08	3.5E-01	12/08								1
ACRYLAMIDE	79-06-1									1.3E-03	4.5E+00	4/99 [7/90]			1
ACRYLIC ACID	79-10-7	6.0E+03	4/99												1
ACRYLONITRILE	107-13-1					5.0E+00	12/01			2.9E-04	1.0E+00	4/99 [1/91]			1
ALLYL CHLORIDE	107-05-1									6.0E-06	2.1E-02	4/99			1
2-AMINOANTHRAQUINONE	117-79-3									9.4E-06	3.3E-02	4/99			1
AMMONIA	7664-41-7	3.2E+03	4/99			2.0E+02	2/00								1
ANILINE	62-53-3									1.6E-06	5.7E-03	4/99			1
Aniline hydrochloride	*142-04-1*									*1.6E-06*	*5.7E-03*	*4/99 [8/22]*			*1*
ARSENIC AND COMPOUNDS (INORGANIC)[TAC] [Including but not limited to: arsenic (inorganic oxides)]	7440-38-2 1016 [1015]	2.0E-01	12/08	1.5E-02	12/08	1.5E-02	12/08	3.5E-06	12/08	3.3E-03 TAC	1.2E+01	7/90	1.5E+00	10/00	1
Arsenic acid	*7778-39-4*	*2.0E-01*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*3.5E-06*	*12/08 [8/22]*	*3.3E-03 TAC*	*1.2E+01*	*7/90 [8/22]*	*1.5E+00*	*10/00 [8/22]*	*0.5278*
Arsenic pentoxide	*1303-28-2*	*2.0E-01*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*3.5E-06*	*12/08 [8/22]*	*3.3E-03 TAC*	*1.2E+01*	*7/90 [8/22]*	*1.5E+00*	*10/00 [8/22]*	*0.6519*
Arsenic trioxide	*1327-53-3*	*2.0E-01*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*3.5E-06*	*12/08 [8/22]*	*3.3E-03 TAC*	*1.2E+01*	*7/90 [8/22]*	*1.5E+00*	*10/00 [8/22]*	*0.7574*
ARSINE	7784-42-1	2.0E-01	12/08	1.5E-02	12/08	1.5E-02	12/08								1
Calcium arsenate	*7778-44-1*	*2.0E-01*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*3.5E-06*	*12/08 [8/22]*	*3.3E-03 TAC*	*1.2E+01*	*7/90 [8/22]*	*1.5E+00*	*10/00 [8/22]*	*0.3766*
Gallium arsenide	*1303-00-0*	*2.0E-01*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*1.5E-02*	*12/08 [8/22]*	*3.5E-06*	*12/08 [8/22]*	*3.3E-03 TAC*	*1.2E+01*	*7/90 [8/22]*	*1.5E+00*	*10/00 [8/22]*	*0.518*
ASBESTOS[TAC, f]	1332-21-4									1.9E-04 TACf	2.2E+02	3/86			333.33
Actinolite	*77536-66-4*									*1.9E-04 TACf*	*2.2E+02*	*3/86 [8/22]*			*333.33*
Amosite	*12172-73-5*									*1.9E-04 TACf*	*2.2E+02*	*3/86 [8/22]*			*333.33*
Anthophyllite	*77536-67-5*									*1.9E-04 TACf*	*2.2E+02*	*3/86 [8/22]*			*333.33*
Chrysotile	*12001-29-5*									*1.9E-04 TACf*	*2.2E+02*	*3/86 [8/22]*			*333.33*
Crocidolite	*12001-28-4*									*1.9E-04 TACf*	*2.2E+02*	*3/86 [8/22]*			*333.33*
Tremolite	*77536-68-6*									*1.9E-04 TACf*	*2.2E+02*	*3/86 [8/22]*			*333.33*

Table last updated: August 4, 2023

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk $(\mu g/m^3)^{-1}$	Inhalation[d] Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
BENZENE[TAC]	71-43-2	2.7E+01	6/14	3.0E+00	6/14	3.0E+00	6/14			2.9E-05[TAC]	1.0E-01	1/85			1
BENZIDINE (AND ITS SALTS) *values also apply to:*	92-87-5									1.4E-01	5.0E+02	4/99 [1/91]			1
Benzidine based dyes	*1020*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
C.I. Direct Blue 218 [PAH-Derivative/Related, POM]	*28407-37-6*									*1.4E-01*	*5.0E+02*	*4/99 [8/22]*			*1*
3,3'-Dimethylbenzidine dihydrochloride	*612-82-8*									*1.4E-01*	*5.0E+02*	*4/99 [8/22]*			*1*
Direct Black 38	*1937-37-7*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
Direct Blue 6	*2602-46-2*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
Direct Brown 95 (technical grade)	*16071-86-6*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
BENZYL CHLORIDE	100-44-7	2.4E+02	4/99							4.9E-05	1.7E-01	4/99			1
BERYLLIUM AND COMPOUNDS	7440-41-7 [1021]					7.0E-03	12/01	2.0E-03	12/01	2.4E-03	8.4E+00	4/99 [7/90]			1
Beryllium sulfate	*13510-49-1*					*7.0E-03*	*12/01 [8/22]*	*2.0E-03*	*12/01 [8/22]*	*2.4E-03*	*8.4E+00*	*4/99 [8/22]*			*0.0857*
Beryllium sulfate (tetrahydrate)	*7787-56-6*					*7.0E-03*	*12/01 [8/22]*	*2.0E-03*	*12/01 [8/22]*	*2.4E-03*	*8.4E+00*	*4/99 [8/22]*			*0.0508*
Beryllium oxide	*1304-56-9*					*7.0E-03*	*12/01 [8/22]*	*2.0E-03*	*12/01 [8/22]*	*2.4E-03*	*8.4E+00*	*4/99 [8/22]*			*0.36*
BIS(2-CHLOROETHYL)ETHER (Dichloroethyl ether)	111-44-4									7.1E-04	2.5E+00	4/99			1
BIS(CHLOROMETHYL)ETHER	542-88-1									1.3E-02	4.6E+01	4/99 [1/91]			1
BROMINE AND COMPOUNDS	7726-95-6 [1040]														1
Bromate	*15541-45-4*									*1.4E-04*	*4.9E-01*	*4/99 [8/22]*			*0.6247*
POTASSIUM BROMATE	7758-01-2									1.4E-04	4.9E-01	4/99 [10/93]			1
1-BROMOPROPANE	106-94-5	3.3E+03	4/23	3.4E+00	4/23	1.7E+00	4/23			3.7E-6	1.3E-2	12/22			1
1,3-BUTADIENE[TAC]	106-99-0	6.6E+02	7/13	9.0E+00	7/13	2.0E+00	7/13			1.7E-04 TAC	6.0E-01	7/92			1
CADMIUM AND COMPOUNDS[TAC]	7440-43-9 [1045]					2.0E-02	1/01	5.0E-04	10/00	4.2E-03 TAC	1.5E+01	1/87			1
Cadmium chloride	*10108-64-2*					*2.0E-02*	*1/01 [8/22]*	*5.0E-04*	*10/00 [8/22]*	*4.2E-03 TAC*	*1.5E+01*	*1/87 [8/22]*			*0.6132*
Cadmium succinate	*141-00-4*					*2.0E-02*	*1/01 [8/22]*	*5.0E-04*	*10/00 [8/22]*	*4.2E-03 TAC*	*1.5E+01*	*1/87 [8/22]*			*0.4921*

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m³)⁻¹	Inhalation[d] Cancer Potency Factor (mg/kg-d)⁻¹	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date[c] Value Reviewed [Added]	M[e] W A F
CAPROLACTAM	105-60-2	5.0E+01	10/13	7.0E+00	10/13	2.2E+00	10/13								1
CARBON DISULFIDE	75-15-0	6.2E+03	4/99			8.0E+02	5/02								1
CARBON MONOXIDE	630-08-0	2.3E+04	4/99												1
CARBON TETRACHLORIDE[TAC] (Tetrachloromethane)	56-23-5	1.9E+03	4/99			4.0E+01	1/01			4.2E-05 TAC	1.5E-01	9/87			1
CARBONYL SULFIDE	463-58-1	6.6E+02	2/17	1.0E+01	2/17	1.0E+01	2/17								1
CHLORINATED PARAFFINS	108171-26-2									2.5E-05	8.9E-02	4/99			1
CHLORINE	7782-50-5	2.1E+02	4/99			2.0E-01	2/00								1
CHLORINE DIOXIDE	10049-04-4					6.0E-01	1/01								1
4-CHLORO-O-PHENYLENEDIAMINE	95-83-0									4.6E-06	1.6E-02	4/99			1
CHLOROBENZENE	108-90-7					1.0E+03	1/01								1
CHLOROFORM[TAC]	67-66-3	1.5E+02	4/99			3.0E+02	4/00			5.3E-06 TAC	1.9E-02	12/90			1
Chlorophenols	*1060*														*1*
PENTACHLOROPHENOL	87-86-5									5.1E-06	1.8E-02	4/99			1
2,4,6-TRICHLOROPHENOL	88-06-2									2.0E-05	7.0E-02	4/99 [1/91]			1
CHLOROPICRIN	76-06-2	2.9E+01	4/99			4.0E-01	12/01								1
p-CHLORO-o-TOLUIDINE	95-69-2									7.7E-05	2.7E-01	4/99			1
1-CHLORO-4-(TRIFLUOROMETHYL)BENZENE {PCBTF}	98-56-6									8.6E-06	3.0E-02	8/20 [8/22]			1
CHROMIUM (III)	16065-83-1	4.8E-01	8/22	1.2E-01	8/22	6.0E-02	8/22								1
CHROMIUM 6+[TAC] *values also apply to:*[g]	18540-29-9					2.0E-01	1/01	2.0E-02	10/00	1.5E-01 TAC	5.1E+02	1/86	5.0E-01	*1/14*	1
Barium chromate	*10294-40-3*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	*5.0E-01*	*1/14*	*0.2053*
t-Butyl chromate(VI)	*1189-85-1*					*2.0E-01*	*1/01 [8/22]*	*2.0E-02*	*10/00 [8/22]*	*1.5E-01 TAC*	*5.1E+02*	*1/86 [8/22]*	*5.0E-01*	*1/14 [8/22]*	*0.2258*
Calcium chromate	*13765-19-0*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	*5.0E-01*	*1/14*	*0.3332*
Lead chromate	*7758-97-6*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	*5.0E-01*	*1/14*	*0.1609*
Sodium dichromate	*10588-01-9*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	*5.0E-01*	*1/14*	*0.397*
Strontium chromate	*7789-06-2*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	*5.0E-01*	*1/14*	*0.2554*
CHROMIUM TRIOXIDE (as chromic acid mist)	1333-82-0					2.0E-03	1/01	2.0E-02	10/00	1.5E-01 TAC	5.1E+02	1/86	5.0E-01	*1/14*	0.52
COBALT	7440-48-4									7.7E-3	2.7E+01	10/20			1
Cobalt compounds, insoluble, including but not limited to:	1216									7.7E-3	2.7E+01	10/20 [8/22]			1

Table last updated: August 4, 2023

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m^3)$^{-1}$	Inhalation[d] Cancer Potency Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
COBALT CARBONATE	513-79-1									7.7E-3	2.7E+01	10/20 [8/22]			0.4955
COBALT CARBONYL	10210-68-1									7.7E-3	2.7E+01	10/20 [8/22]			0.3448
COBALT HYDROXIDE	21041-93-0									7.7E-3	2.7E+01	10/20 [8/22]			0.6341
COBALT OXALATE	814-89-1									7.7E-3	2.7E+01	10/20 [8/22]			0.3957
COBALT [II] OXIDE	1307-96-6									7.7E-3	2.7E+01	10/20 [8/22]			0.7865
COBALT [III] OXIDE	1308-06-1									7.7E-3	2.7E+01	10/20 [8/22]			0.7342
COBALT SULFIDE	1317-42-6									7.7E-3	2.7E+01	10/20 [8/22]			0.6481
Cobalt sulfate and other soluble cobalt compounds, including but not limited to:	1217									1.0E-02	3.5E+01	8/23 [8/22]			1
COBALT ACETATE (TETRAHYDRATE)	71-48-7									1.0E-02	3.5E+01	8/23 [8/22]			0.3331
COBALT CHLORIDE (HEXAHYDRATE)	7646-79-9									1.0E-02	3.5E+01	8/23 [8/22]			0.4539
COBALT HYDROCARBONYL	16842-03-8									1.0E-02	3.5E+01	8/23 [8/22]			0.3428
COBALT NITRATE (HEXAHYDRATE)	10141-05-6									1.0E-02	3.5E+01	8/23 [8/22]			0.3221
COBALT OCTOATE	136-52-7									1.0E-02	3.5E+01	8/23 [8/22]			0.1708
COBALT SULFATE	10124-43-3									1.0E-02	3.5E+01	8/23 [8/22]			0.3804
COBALT SULFATE (HEPTAHYDRATE)	10026-24-1									1.0E-02	3.5E+01	8/23 [8/22]			0.3804
COPPER AND COMPOUNDS [Including but not limited to: copper fume (as copper)]	7440-50-8 [1067]	1.0E+02	4/99												1
p-CRESIDINE	120-71-8									4.3E-05	1.5E-01	4/99			1
CRESOLS (mixtures of)	1319-77-3					6.0E+02	1/01								1
m-CRESOL	108-39-4					6.0E+02	1/01								1
o-CRESOL	95-48-7					6.0E+02	1/01								1
p-CRESOL	106-44-5					6.0E+02	1/01								1
CUPFERRON	135-20-6									6.3E-05	2.2E-01	4/99			1
Cyanide Compounds (inorganic)	*57-12-5 1073*	*3.4E+02*	*4/99*			*9.0E+00*	*4/00*								*1*
Calcium cyanide	*592-01-8*	*3.4E+02*	*4/99 [8/22]*			*9.0E+00*	*4/00 [8/22]*								*1*

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		Acute Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk $(\mu g/m^3)^{-1}$	Inhalation[d] Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
HYDROGEN CYANIDE (Hydrocyanic acid)	74-90-8 *341972-31-4* *191234-22-7*	3.4E+02	4/99			9.0E+00	4/00								1
Potassium cyanide	*151-50-8*	*3.4E+02*	*4/99 [8/22]*			*9.0E+00*	*4/00 [8/22]*								*1*
Sodium cyanide	*143-33-9*	*3.4E+02*	*4/99 [8/22]*			*9.0E+00*	*4/00 [8/22]*								*1*
2,4-DIAMINOANISOLE	615-05-4									6.6E-06	2.3E-02	4/99			1
2,4-DIAMINOTOLUENE	95-80-7									1.1E-03	4.0E+00	4/99			1
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	96-12-8									2.0E-03	7.0E+00	4/99 [1/92]			1
p-DICHLOROBENZENE	106-46-7					8.0E+02	1/01			1.1E-05	4.0E-02	4/99 [1/91]			1
3,3-DICHLOROBENZIDINE	91-94-1									3.4E-04	1.2E+00	4/99 [1/91]			1
1,1,-DICHLOROETHANE (Ethylidene dichloride)	75-34-3									1.6E-06	5.7E-03	4/99			1
1,1-DICHLOROETHYLENE … (see Vinylidene Chloride)															
DI(2-ETHYLHEXYL)PHTHALATE (DEHP)	117-81-7									2.4E-06	8.4E-03	4/99 [1/92]	8.4E-03	10/00	1
DIESEL EXHAUST … (see Particulate Emissions from Diesel-Fueled Engines)															
DIETHANOLAMINE	111-42-2					3.0E+00	12/01								
p-DIMETHYLAMINOAZOBENZENE	60-11-7									1.3E-03	4.6E+00	4/99			1
N,N-DIMETHYL FORMAMIDE	68-12-2					8.0E+01	1/01								1
2,4-DINITROTOLUENE	121-14-2									8.9E-05	3.1E-01	4/99			1
2,4-Dinitrotoluene, sulfurized	*1326-41-6*									*8.9E-05*	*3.1E-01*	*4/99 [8/22]*			*1*
1,4-DIOXANE[i] (1,4-Diethylene dioxide)	123-91-1	3.0E+03	4/99			3.0E+03	4/00			7.7E-06	2.7E-02	4/99 [1/91]			1
EPICHLOROHYDRIN (1-Chloro-2,3-epoxypropane)	106-89-8	1.3E+03	4/99			3.0E+00	1/01			2.3E-05	8.0E-02	4/99 [1/92]			1
1,2-EPOXYBUTANE	106-88-7					2.0E+01	1/01								1
ETHYL BENZENE	100-41-4					2.0E+03	2/00			2.5E-06	8.7E-3	11/07			1
ETHYL CHLORIDE (Chloroethane)	75-00-3					3.0E+04	4/00								1
ETHYLENE DIBROMIDE[TAC] (1,2-Dibromoethane)	106-93-4					8.0E-01	12/01			7.1E-05 TAC	2.5E-01	7/85			1
ETHYLENE DICHLORIDE[TAC] (1,2-Dichloroethane)	107-06-2					4.0E+02	1/01			2.1E-05 TAC	7.2E-02	9/85			1
ETHYLENE GLYCOL	107-21-1					4.0E+02	4/00								1
ETHYLENE GLYCOL BUTYL ETHER … (see Glycol ethers)															

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ETHYLENE OXIDE[TAC] (1,2-Epoxyethane)	75-21-8					3.0E+01	1/01			8.8E-05 TAC	3.1E-01	11/87			1
ETHYLENE THIOUREA	96-45-7									1.3E-05	4.5E-02	4/99			1
Fluorides and compounds	1101	*2.4E+02*	*4/99*			1.3E+01	8/03	4.0E-02	8/03						*1*
HYDROGEN FLUORIDE (Hydrofluoric acid)	7664-39-3	2.4E+02	4/99			1.4E+01	8/03	4.0E-02	8/03						1
Modified hydrogen fluoride {MHF}	*1141*	*2.4E+02*	*4/99 [8/22]*			*1.4E+01*	*8/03 [8/22]*	*4.0E-02*	*8/03 [8/22]*						*1*
Selenium hexafluoride	*7783-79-1*	*2.4E+02*	*4/99 [8/22]*			*1.4E+01*	*8/03 [8/22]*	*4.0E-02*	*8/03 [8/22]*						*0.5908*
Sodium aluminum fluoride	*15096-52-3*					*1.4E+01*	*8/03 [8/22]*	*4.0E-02*	*8/03 [8/22]*						*0.5429*
Sodium fluoride	*7681-49-4*					*1.4E+01*	*8/03 [8/22]*	*4.0E-02*	*8/03 [8/22]*						*0.4525*
FORMALDEHYDE[TAC]	50-00-0	5.5E+01	12/08	9.0E+00	12/08	9.0E+00	12/08			6.0E-06 TAC	2.1E-02	3/92			1
GLUTARALDEHYDE	111-30-8					8.0E-02	1/01								1
GLYCOL ETHERS	1115														1
ETHYLENE GLYCOL BUTYL ETHER – EGBE	111-76-2	4.7E+03	5/18	1.64E+02	5/18	8.2E+01	5/18								1
ETHYLENE GLYCOL ETHYL ETHER – EGEE	110-80-5	3.7E+02	4/99[1/92]			7.0E+01	2/00								1
ETHYLENE GLYCOL ETHYL ETHER ACETATE – EGEEA	111-15-9	1.4E+02	4/99			3.0E+02	2/00								1
ETHYLENE GLYCOL METHYL ETHER – EGME	109-86-4	9.3E+01	4/99			6.0E+01	2/00								1
ETHYLENE GLYCOL METHYL ETHER ACETATE – EGMEA	110-49-6					9.0E+01	2/00								1
HEXACHLOROBENZENE	118-74-1									5.1E-04	1.8E+00	4/99 [1/91]			1
HEXACHLOROCYCLOHEXANES (mixed or technical grade)	608-73-1									1.1E-03	4.0E+00	4/99 [1/91]	4.0E+00	10/00 [1/92]	1
alpha-HEXACHLOROCYCLOHEXANE	319-84-6									1.1E-03	4.0E+00	4/99 [1/91]	4.0E+00	10/00 [1/92]	1
beta-HEXACHLOROCYCLOHEXANE	319-85-7									1.1E-03	4.0E+00	4/99 [1/91]	4.0E+00	10/00 [1/92]	1
gamma-HEXACHLOROCYCLOHEXANE (Lindane)	58-89-9									3.1E-04	1.1E+00	4/99	1.1E+00	10/00	1

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1,6-HEXAMETHYLENE DIISOCYANATE (monomer)[n]	822-06-0	0.3	9/19	0.06	9/19	0.03	9/19								1
n-HEXANE	110-54-3					7.0E+03	4/00								1
HYDRAZINE	302-01-2					2.0E-01	1/01			4.9E-03	1.7E+01	4/99 [7/90]			1
HYDROCHLORIC ACID (Hydrogen chloride)	7647-01-0	2.1E+03	4/99			9.0E+00	2/00								1
HYDROGEN BROMIDE … (see Bromine & Compounds)															
HYDROGEN CYANIDE … (see Cyanide & Compounds)															
HYDROGEN FLUORIDE … (see Fluorides & Compounds)															
HYDROGEN SELENIDE … (see Selenium & Compounds)															
HYDROGEN SULFIDE	7783-06-4	4.2E+01	4/99[7/90]			1.0E+01	4/00								1
ISOPHORONE	78-59-1					2.0E+03	12/01								
ISOPROPYL ALCOHOL (Isopropanol)	67-63-0	3.2E+03	4/99			7.0E+03	2/00								1
LEAD AND COMPOUNDS[TAC, h] (inorganic) *values also apply to:*	7439-92-1 1128 [1130]									1.2E-05 TAC	4.2E-02	4/97	8.5E-03	10/00	1
Lead acetate	*301-04-2*									*1.2E-05 TAC*	*4.2E-02*	*4/97*	*8.5E-03*	*10/00*	*0.637*
Lead phosphate	*7446-27-7*									*1.2E-05 TAC*	*4.2E-02*	*4/97*	*8.5E-03*	*10/00*	*0.7659*
Lead subacetate	*1335-32-6*									*1.2E-05 TAC*	*4.2E-02*	*4/97*	*8.5E-03*	*10/00*	*0.7696*
LINDANE ... (see gamma-Hexachlorocyclohexane)															
MALEIC ANHYDRIDE	108-31-6					7.0E-01	12/01								1
MANGANESE AND COMPOUNDS	7439-96-5 [1132]			1.7E-01	12/08	9.0E-02	12/08								1
Manganese cyclopentadienyl tricarbonyl	*12079-65-1*			*1.7E-01*	*12/08 [8/22]*	*9.0E-02*	*12/08 [8/22]*								*0.2694*
2-Methylcyclopentadienyl manganese tricarbonyl	*12108-13-3*			*1.7E-01*	*12/08 [8/22]*	*9.0E-02*	*12/08 [8/22]*								*0.2521*
MERCURY AND COMPOUNDS (INORGANIC)	7439-97-6 [1133]	6.0E-01	12/08	6.0E-02	12/08	3.0E-02	12/08	1.6E-04	12/08						1
Mercuric chloride	*7487-94-7*	*6.0E-01*	*12/08*	*6.0E-02*	*12/08*	*3.0E-02*	*12/08*	*1.6E-04*	*12/08*						*1*
METHANOL	67-56-1	2.8E+04	4/99			4.0E+03	4/00								1
METHYL BROMIDE (Bromomethane)	74-83-9	3.9E+03	4/99			5.0E+00	2/00								1
METHYL tertiary-BUTYL ETHER	1634-04-4					8.0E+03	2/00			2.6E-07	1.8E-03	11/99			1

Table last updated: August 4, 2023

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m³)$^{-1}$	Inhalation[d] Cancer Potency Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
METHYL CHLOROFORM (1,1,1-Trichloroethane)	71-55-6	6.8E+04	4/99			1.0E+03	2/00								1
METHYL ETHYL KETONE (2-Butanone)	78-93-3	1.3E+04	4/99												1
METHYL ISOCYANATE	624-83-9					1.0E+00	12/01								1
4,4'-METHYLENE BIS (2-CHLOROANILINE) (MOCA)	101-14-4									4.3E-04	1.5E+00	4/99			1
METHYLENE CHLORIDE[TAC] (Dichloromethane)	75-09-2	1.4E+04	4/99			4.0E+02	2/00			1.0E-06 TAC	3.5E-03	7/89			1
4,4'-METHYLENE DIANILINE (AND ITS DICHLORIDE)	101-77-9					2.0E+01	12/01			4.6E-04	1.6E+00	4/99	1.6E+00	10/00	1
METHYLENE DIPHENYL DIISOCYANATE	101-68-8	1.2E+01	3/16	1.6E-01	3/16	8.0E-02	3/16								1
MICHLER'S KETONE (4,4'-Bis(dimethylamino)benzophenone)	90-94-8									2.5E-04	8.6E-01	4/99			1
N-NITROSODI-n-BUTYLAMINE	924-16-3									3.1E-03	1.1E+01	4/99 [1/92]			1
N-NITROSODI-n-PROPYLAMINE	621-64-7									2.0E-03	7.0E+00	4/99 [1/91]			1
N-NITROSODIETHYLAMINE	55-18-5									1.0E-02	3.6E+01	4/99 [1/91]			1
N-NITROSODIMETHYLAMINE	62-75-9									4.6E-03	1.6E+01	4/99 [1/91]			1
N-NITROSODIPHENYLAMINE	86-30-6									2.6E-06	9.0E-03	4/99			1
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6									6.3E-03	2.2E+01	4/99 [7/90]			1
N-NITROSOMORPHOLINE	59-89-2									1.9E-03	6.7E+00	4/99 [7/92]			1
N-NITROSOPIPERIDINE	100-75-4									2.7E-03	9.4E+00	4/99 [7/92]			1
N-NITROSOPYRROLIDINE	930-55-2									6.0E-04	2.1E+00	4/99 [7/90]			1
NAPHTHALENE ... (see Polycyclic aromatic hydrocarbons)															
NICKEL AND COMPOUNDS[TAC] *values also apply to:*	7440-02-0 [1145]	2.0E-01	3/12	6.0E-02	3/12	1.4E-02	3/12	1.1E-02	3/12	2.6E-04 TAC	9.1E-01	8/91			1
Nickel acetate	*373-02-4*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.3321*
Nickel carbonate	*3333-67-3*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.4945*
Nickel carbonyl	*13463-39-3*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.3438*
Nickel chloride	*7718-54-9*	*2.0E-01*	*3/12 [8/22]*	*6.0E-02*	*3/12 [8/22]*	*1.4E-02*	*3/12 [8/22]*	*1.1E-02*	*3/12 [8/22]*	*2.6E-04 TAC*	*9.1E-01*	*8/91 [8/22]*			*0.4529*

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m³)$^{-1}$	Inhalation[d] Cancer Potency Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
Nickel hydroxide	*12054-48-7*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04* TAC	*9.1E-01*	*8/91*			*0.6332*
Nickel nitrate {Nickel (II) nitrate}	*13138-45-9*	*2.0E-01*	*3/12 [8/22]*	*6.0E-02*	*3/12 [8/22]*	*1.4E-02*	*3/12 [8/22]*	*1.1E-02*	*3/12 [8/22]*	*2.6E-04* TAC	*9.1E-01*	*8/91 [8/22]*			*0.3213*
Nickelocene	*1271-28-9*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04* TAC	*9.1E-01*	*8/91*			*0.4937*
NICKEL OXIDE	1313-99-1	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	2.0E-02	3/12	*1.1E-02*	*3/12*	*2.6E-04* TAC	*9.1E-01*	*8/91*			0.7859
Nickel refinery dust from the pyrometallurgical process	*1146*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04* TAC	*9.1E-01*	*8/91*			*1*
Nickel subsulfide	*12035-72-2*	*2.0E-01*	*3/12*	*6.0E-02*	*3/12*	*1.4E-02*	*3/12*	*1.1E-02*	*3/12*	*2.6E-04* TAC	*9.1E-01*	*8/91*			*0.2443*
Nickel sulfate	*7786-81-4*	*2.0E-01*	*3/12 [8/22]*	*6.0E-02*	*3/12 [8/22]*	*1.4E-02*	*3/12 [8/22]*	*1.1E-02*	*3/12 [8/22]*	*2.6E-04* TAC	*9.1E-01*	*8/91 [8/22]*			*0.3794*
NITRIC ACID	7697-37-2	8.6E+01	4/99												1
NITROGEN DIOXIDE	10102-44-0	4.7E+02	4/99[1/92]												1
p-NITROSODIPHENYLAMINE	156-10-5									6.3E-06	2.2E-02	4/99			1
OZONE	10028-15-6	1.8E+02	4/99[1/92]												1
PARTICULATE EMISSIONS FROM DIESEL-FUELED ENGINES[TAC, i]	9901					5.0E+00 TAC	8/98			3.0E-04 TAC	1.1E+00	8/98			1
PENTACHLOROPHENOL ... (see Chlorophenols)															
PERCHLOROETHYLENE[TAC] (Tetrachloroethylene)	127-18-4	2.0E+04	4/99			3.5E+01 TAC	10/91			6.1E-06 TAC	2.1E-02	10/91			1
PHENOL	108-95-2	5.8E+03	4/99			2.0E+02	4/00								1
PHOSGENE	75-44-5	4.0E+00	4/99												1
PHOSPHINE	7803-51-2					8.0E-01	9/02								1
PHOSPHORIC ACID	7664-38-2					7.0E+00	2/00								1
PHTHALIC ANHYDRIDE	85-44-9					2.0E+01	1/01								1
PCB (POLYCHLORINATED BIPHENYLS) (unspeciated mixture) [j]	1336-36-3									2.0E-05 [lowest risk] 1.1E-04 [low risk] 5.7E-04 [high risk]	7.0E-02 [lowest risk] 4.0E-01 [low risk] 2.0E+00 [high risk]	4/99	7.0E-02 [lowest risk] 4.0E-01 [low risk] 2.0E+00 [high risk]	10/00	1
PCB (POLYCHLORINATED BIPHENYLS (speciated)[k]															
3,3',4,4'-TETRACHLOROBIPHENYL (PCB 77)	32598-13-3					4.0E-01	8/03	1.0E-04	8/03	3.8E-03	1.3E+01	8/03	1.3E+01	8/03	1
3,4,4',5-TETRACHLOROBIPHENYL (PCB 81)	70362-50-4					1.3E-01	1/11	3.3E-05	1/11	1.1E-02	3.9E+01	1/11	3.9E+01	1/11	1

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m^3)$^{-1}$	Inhalation[d] Cancer Potency Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
2,3,3',4,4'-PENTACHLOROBIPHENYL (PCB 105)	32598-14-4					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3,4,4',5-PENTACHLOROBIPHENYL (PCB 114)	74472-37-0					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3',4,4',5-PENTACHLOROBIPHENYL (PCB 118)	31508-00-6					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3',4,4',5'-PENTACHLOROBIPHENYL (PCB 123)	65510-44-3					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
3,3',4,4',5-PENTACHLOROBIPHENYL (PCB 126)	57465-28-8					4.0E-04	8/03	1.0E-07	8/03	3.8E+00	1.3E+04	8/03	1.3E+04	8/03	1
2,3,3',4,4',5-HEXACHLOROBIPHENYL (PCB 156)	38380-08-4					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3,3',4,4',5'-HEXACHLOROBIPHENYL (PCB 157)	69782-90-7					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3',4,4',5,5'-HEXACHLOROBIPHENYL (PCB 167)	52663-72-6					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
3,3',4,4',5,5'-HEXACHLOROBIPHENYL (PCB 169)	32774-16-6					1.3E-03	1/11	3.3E-07	1/11	1.1E+00	3.9E+03	1/11	3.9E+03	1/11	1
2,3,3',4,4',5,5'-HEPTACHLOROBIPHENYL (PCB 189)	39635-31-9					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
POLYCHLORINATED DIBENZO-*P*-DIOXINS (PCDD) (Treated as 2,3,7,8-TCDD for HRA)[TAC, k]	1085 1086					4.0E-05	2/00	1.0E-08	10/00	3.8E+01 TAC	1.3E+05	8/86	1.3E+05 TAC	8/86	1
2,3,7,8-TETRACHLORODIBENZO-*P*-DIOXIN[TAC]	1746-01-6					4.0E-05	2/00	1.0E-08	10/00	3.8E+01 TAC	1.3E+05	8/86	1.3E+05 TAC	8/86	1
1,2,3,7,8-PENTACHLORODIBENZO-*P*-DIOXIN	40321-76-4					4.0E-05	8/03	1.0E-08	8/03	3.8E+01	1.3E+05	8/03	1.3E+05	8/03	1
1,2,3,4,7,8-HEXACHLORODIBENZO-*P*-DIOXIN	39227-28-6					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,6,7,8-HEXACHLORODIBENZO-*P*-DIOXIN	57653-85-7					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,7,8,9-HEXACHLORODIBENZO-*P*-DIOXIN	19408-74-3					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk $(\mu g/m^3)^{-1}$	Inhalation[d] Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-*P*-DIOXIN	35822-46-9					4.0E-03	2/00	1.0E-06	10/00	3.8E-01	1.3E+03	4/99	1.3E+03	10/00	1
1,2,3,4,6,7,8,9-OCTACHLORODIBENZO-*P*-DIOXIN	3268-87-9					1.3E-01	1/11	3.3E-05	1/11	1.1E-02	3.9E+01	1/11	3.9E+01	1/11	1
POLYCHLORINATED DIBENZOFURANS (PCDF)[TAC, k] (Treated as 2,3,7,8-TCDD for HRA)	1080					4.0E-05	2/00	1.0E-08	10/00	3.8E+01 TAC	1.3E+05	8/86	1.3E+05 TAC	8/86	1
2,3,7,8-TETRACHLORODIBENZOFURAN	5120-73-19					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6					1.3E-03	1/11	3.3E-07	1/11	1.1E+00	3.9E +03	1/11	3.9E +03	1/11	1
2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4					1.3E-04	1/11	3.3E-08	1/11	1.1E+01	3.9E +04	1/11	3.9E +04	1/11	1
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4					4.0E-03	2/00	1.0E-06	10/00	3.8E-01	1.3E+03	4/99	1.3E+03	10/00	1
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7					4.0E-03	2/00	1.0E-06	10/00	3.8E-01	1.3E+03	4/99	1.3E+03	10/00	1
1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	39001-02-0					1.3E-01	1/11	3.3E-05	1/11	1.1E-02	3.9E +01	1/11	3.9E +01	1/11	1
POLYCYCLIC AROMATIC HYDROCARBON (PAH)[l] [Treated as B(a)P for HRA][l]	1150 1151									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
BENZ(A)ANTHRACENE[l]	56-55-3									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
BENZO(A)PYRENE[l]	50-32-8									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
BENZO(B)FLUORANTHENE[l]	205-99-2									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
BENZO(J)FLUORANTHENE[l]	205-82-3									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
BENZO(K)FLUORANTHENE[l]	207-08-9									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
CHRYSENE[l]	218-01-9									1.1E-05	3.9E-02	4/99 [4/94]	1.2E-01	10/00 [4/94]	1

Table last updated: August 4, 2023

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	8-Hour Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	Chronic Inhalation (µg/m^3)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk (µg/m^3)$^{-1}$	Inhalation[d] Cancer Potency Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)$^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
DIBENZ(A,H)ACRIDINE[l]	226-36-8									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
DIBENZ(A,H)ANTHRACENE[l]	53-70-3									1.2E-03	4.1E+00	4/99 [4/94]	4.1E+00	10/00 [4/94]	1
DIBENZ(A,J)ACRIDINE[l]	224-42-0									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
DIBENZO(A,E)PYRENE[l]	192-65-4									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
DIBENZO(A,H)PYRENE[l]	189-64-0									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
DIBENZO(A,I)PYRENE[l]	189-55-9									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
DIBENZO(A,L)PYRENE[l]	191-30-0									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
7H-DIBENZO(C,G)CARBAZOLE[l]	194-59-2									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
7,12-DIMETHYLBENZ(A)ANTHRACENE[l]	57-97-6									7.1E-02	2.5E+02	4/99 [4/94]	2.5E+02	10/00 [4/94]	1
1,6-DINITROPYRENE[l]	42397-64-8									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
1,8-DINITROPYRENE[l]	42397-65-9									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
INDENO(1,2,3-C,D)PYRENE[l]	193-39-5									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
3-METHYLCHOLANTHRENE[l]	56-49-5									6.3E-03	2.2E+01	4/99 [4/94]	2.2E+01	10/00 [4/94]	1
5-METHYLCHRYSENE[l]	3697-24-3									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
NAPHTHALENE	91-20-3					9.0E+00	4/00			3.4E-05	1.2E-01	8/04			1
5-NITROACENAPHTHENE[l]	602-87-9									3.7E-05	1.3E-01	4/99 [4/94]	1.3E-01	10/00 [4/94]	1
6-NITROCHRYSENE[l]	7496-02-8									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
2-NITROFLUORENE[l]	607-57-8									1.1E-05	3.9E-02	4/99 [4/94]	1.2E-01	10/00 [4/94]	1
1-NITROPYRENE[l]	5522-43-0									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
4-NITROPYRENE[l]	57835-92-4									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
POLYMERIC (OLIGO) HEXAMETHYLENE-1,6-DIISOCYANATE (HDI)	1221	4.5E+00	9/19 [8/22]	8.0E-01	9/19 [8/22]	4.0E-01	9/19 [8/22]								1
BIURET	108-19-0	4.5E+00	9/19 [8/22]	8.0E-01	9/19 [8/22]	4.0E-01	9/19 [8/22]								1

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk $(\mu g/m^3)^{-1}$	Inhalation[d] Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
DIISOCYANURATE	1226	4.5E+00	9/19 [8/22]	8.0E-01	9/19 [8/22]	4.0E-01	9/19 [8/22]								1
HDI PREPOLYMER	1227	4.5E+00	9/19 [8/22]	8.0E-01	9/19 [8/22]	4.0E-01	9/19 [8/22]								1
ISOCYANURATE	1228	4.5E+00	9/19 [8/22]	8.0E-01	9/19 [8/22]	4.0E-01	9/19 [8/22]								1
URETDIONE (HDI) {URETIDONE}	23501-81-7	4.5E+00	9/19 [8/22]	8.0E-01	9/19 [8/22]	4.0E-01	9/19 [8/22]								1
POTASSIUM BROMATE.... ... (see Bromine & Compounds)															1
1,3-PROPANE SULTONE	1120-71-4									6.9E-04	2.4E+00	4/99			1
PROPYLENE (PROPENE)	115-07-1					3.0E+03	4/00								1
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2					7.0E+03	2/00								1
PROPYLENE OXIDE	75-56-9	3.1E+03	4/99			3.0E+01	2/00			3.7E-06	1.3E-02	4/99 [7/90]			1
SELENIUM AND COMPOUNDS[m]	7782-49-2 [1170]					2.0E+01	12/01	5.0E-03	12/01						1
HYDROGEN SELENIDE	7783-07-5	5.0E+00	4/99												1
Selenium sulfide	*7446-34-6*					*2.0E+01*	*12/01*	*5.0E-03*	*12/01*						*1*
Selenium hexafluoride see Fluorides and Compounds															
SILICA [CRYSTALLINE, RESPIRABLE]	1175					3.0E+00	2/05								1
Silica, crystalline (respirable), in the form of cristobalite	*14464-46-1*					*3.0E+00*	*2/05 [8/22]*								*1*
Silica, crystalline (respirable), in the form of quartz	*14808-60-7*					*3.0E+00*	*2/05 [8/22]*								*1*
SODIUM HYDROXIDE	1310-73-2	8.0E+00	4/99												1
STYRENE	100-42-5	2.1E+04	4/99			9.0E+02	4/00								1
SULFATES	9960	1.2E+02	4/99												1
SULFUR DIOXIDE	7446-09-5	6.6E+02	4/99 [1/92]												1
SULFURIC ACID	7664-93-9	1.2E+02	4/99			1.0E+00	12/01								1
SULFUR TRIOXIDE	*7446-71-9*	*1.2E+02*	*4/99*			*1.0E+00*	*12/01*								*1*
OLEUM	8014-95-7	1.2E+02	4/99												1
TERTIARY-BUTYL-ACETATE (TBAc)	540-88-5									1.3E-06	4.7E-03	8/18	5.0E-03	8/18	1
1,1,2,2-TETRACHLOROETHANE	79-34-5									5.8E-05	2.0E-01	4/99			1
TETRACHLOROPHENOLS ... (see Chlorophenols)															
2,4,5-TRICHLOROPHENOL ... (see Chlorophenols)															
2,4,6-TRICHLOROPHENOL ... (see Chlorophenols)															
THIOACETAMIDE	62-55-5									1.7E-03	6.1E+00	4/99			1

Table last updated: August 4, 2023

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Substance	Chemical[b] Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date[c] Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date[c] Value Reviewed [Added]	Inhalation[d] Unit Risk $(\mu g/m^3)^{-1}$	Inhalation[d] Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date[c] Value Reviewed [Added]	M[e] W A F
TOLUENE	108-88-3	5.0E+03	8/20	8.3E+02	8/20	4.2E+02	8/20								1
Toluene diisocyantates	*26471-62-5*	*2.0E+00*	*3/16*	*1.5E-02*	*3/16*	*8.0E-03*	*3/16*			*1.1E-05*	*3.9E-02*	*4/99*			*1*
TOLUENE-2,4-DIISOCYANATE	584-84-9	*2.0E+00*	3/16	1.5E-02	3/16	8.0E-03	3/16			1.1E-05	3.9E-02	4/99			1
TOLUENE-2,6-DIISOCYANATE	91-08-7	*2.0E+00*	3/16	1.5E-02	3/16	8.0E-03	3/16			1.1E-05	3.9E-02	4/99			1
1,1,2-TRICHLOROETHANE (Vinyl trichloride)	79-00-5									1.6E-05	5.7E-02	4/99			1
TRICHLOROETHYLENE[TAC]	79-01-6					6.0E+02	4/00			2.0E-06 TAC	7.0E-03	10/90			1
TRIETHYLAMINE	121-44-8	2.8E+03	4/99			2.0E+02	9/02								1
URETHANE (Ethyl carbamate)	51-79-6									2.9E-04	1.0E+00	4/99 [7/90]			1
Vanadium Compounds	*N/A*														*1*
Vanadium (fume or dust)	*7440-62-2*	*3.0E+01*	*4/99*												*1*
VANADIUM PENTOXIDE	1314-62-1	3.0E+01	4/99												1
VINYL ACETATE	108-05-4					2.0E+02	12/01								1
VINYL CHLORIDE[TAC] (Chloroethylene)	75-01-4	1.8E+05	4/99							7.8E-05 TAC	2.7E-01	12/90			1
VINYLIDENE CHLORIDE (1,1-Dichloroethylene)	75-35-4					7.0E+01	1/01								1
XYLENES (mixed isomers)	1330-20-7	2.2E+04	4/99			7.0E+02	4/00								1
m-XYLENE	108-38-3	2.2E+04	4/99			7.0E+02	4/00								1
o-XYLENE	95-47-6	2.2E+04	4/99			7.0E+02	4/00								1
p-XYLENE	106-42-3	2.2E+04	4/99			7.0E+02	4/00								1

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

Purpose:	The purpose of this reference table is to provide a quick list of all health values that have been approved by the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) for use in facility health risk assessments conducted for the AB 2588 Air Toxics "Hot Spots" Program. The OEHHA has developed and adopted new risk assessment guidelines that update and replace the California Air Pollution Control Officers Association's (CAPCOA) *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, October 1993*. The OEHHA has adopted three technical support documents for these guidelines, which can be found on their website (http://www.oehha.ca.gov/air/hot_spots/index.html). This table lists the OEHHA adopted inhalation and oral cancer slope factors, noncancer acute Reference Exposure Levels (RELs), and inhalation and oral noncancer chronic RELs. OEHHA is still in the process of adopting new health values. Therefore, new health values will periodically be added to, or deleted from, this table. Users of this table are advised to monitor the OEHHA website (*www.oehha.ca.gov*) for any updates to the health values. May 2008 update: The Air Resources Board adopted amendments to the AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation (Title 17, California Code of Regulations, Section 93300.5) on November 16, 2006. The amendments became effective on September 26, 2007, after approval from the Office of Administrative Law. Under the new amendments, the substances previously listed in Appendix A-I *(Substances for Which Emissions Must Be Quantified*) and Appendix F (*Criteria For Inputs For Risk Assessment Using Screening Air Dispersion Modeling*) of the ARB's *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) (July 1997)* have been removed from this table. September 2022 update: The Air Resources Board adopted amendments to the AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation (Title 17, California Code of Regulations, Section 93300.5) on November 19, 2020. The amendments became effective on March 21, 2022, after approval from the Office of Administrative Law. Under the new amendments a number of pollutants were added to Appendix A-1: *Substances for Which Emissions Must be Quantified*. OEHHA was consulted to determine which existing health values may be applied to these new pollutants. OEHHA applied health values to 61 pollutants. OEHHA also helped determine the appropriate MWAF, if applicable. NOTE ON REPORTING UNDER HOT SPOTS PROGRAM: New chemicals that are reported by a facility due to being covered by one of the chemical "functional group" definitions, which are shown at the end of EICG Appendix A-I (i.e., the functional groups related to isocyanates, halogenated PAHs, and certain types of per/poly fluorinated compounds), should be discussed with CARB and/or OEHHA to determine whether an OEHHA health value may apply to them.
a	The *italic* font used in this table is designed to clarify applicability of OEHHA adopted health effects values to individual or grouped substances listed in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines*, Appendix A-I list of *"Substances for Which Emissions Must Be Quantified"*.
b	Chemical Abstract Service Number (CAS): For chemical groupings and mixtures where a CAS number is not applicable, the 4-digit code used in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) Report* is listed. The 4-digit codes enclosed in brackets [ ] are codes that have been phased out, but may still appear on previously reported Hot Spots emissions. For information on the origin and use of the 4-digit code, see the EICG report. (https://ww2.arb.ca.gov/our-work/programs/ab-2588-air-toxics-hot-spots/hot-spots-inventory-guidelines)

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c Date Value Reviewed [Added]: These columns list the date that the health value was last reviewed by OEHHA, and/or the Scientific Review Panel, and/or approved for use in the AB 2588 Air Toxics "Hot Spots" Program

- If the health value is unchanged since it was first approved for use in the Hot Spots Program, then the date that the value was first approved for use by CAPCOA is listed within the brackets [ ].
- April 1999 is listed for the cancer potency values and noncancer acute RELs, which have been adopted by the OEHHA as part of the AB 2588 Hot Spot Risk Assessment Guidelines.
- February 2000, April 2000, January 2001, and December 2001 are listed for the first set of 22, the second set of 16, the third set of 22, and the fourth set of 12 noncancer chronic RELs, respectively. The chronic REL for carbon disulfide was adopted in May 2002. Chronic RELs for phosphine and triethylamine were adopted in September 2002. Chronic RELs for fluorides including hydrogen fluoride were adopted August 2003. Chronic REL for silica [crystalline respirable] was adopted February 2005.
- October 2000 is listed for the oral chronic RELs and oral cancer slope factors.
- Cancer potency value adopted for naphthalene in August 2004. The inhalation and oral cancer potency values for ethyl benzene were adopted in November 2007.
- For the substances identified as Toxic Air Contaminants, the Air Resources Board hearing date is listed. The dates for acetaldehyde, benzo[a]pyrene, and methyl tertiary-butyl ether represent the dates the values were approved by the Scientific Review Panel.
- On December 19, 2008, OEHHA adopted new acute, 8-hour, and chronic RELs for acetaldehyde, acrolein, arsenic, formaldehyde, manganese, and mercury. The most current health values can be found at: http://www.oehha.ca.gov/air/allrels.html.

Note: 1. We present the new oral RELs only in milligrams per kilogram-day (mg/kg-d), although OEHHA has presented them in other tables in either micrograms per kilogram-day (μg/kg-d) or milligrams per kilogram-day.

2. All acute RELs use a 1-hour averaging period (OEHHA, 2008). RELs which were developed using earlier guidelines and specified a different averaging time are unchanged in concentration value, but now refer to the 1-hour averaging period. As of August 1, 2013, the affected chemicals are: benzene, carbon disulfide, carbon tetrachloride, chloroform, ethylene glycol monoethyl ether, ethylene glycol monoethyl ether acetate, and ethylene glycol monomethyl ether: These may be replaced by updated RELs following the OEHHA (2008) guidelines in due course.

3. At OEHHA's direction, the chronic oral REL for arsenic does not apply to arsine because arsine is a gas and not particle associated.

- OEHHA's adoption of the World Health Organization's 2005 Toxicity Equivalency Factors for polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), and dioxin-like polychlorinated biphenyls (PCBs) occurred in January 2011. See Appendix C of OEHHA's *Air Toxics Hot Spots Program Technical Support Document for Cancer Potencies* at https://oehha.ca.gov/air/crnr/technical-support-document-cancer-potency-factors-2009 for more information.
- On March 23, 2012, OEHHA adopted revised acute, 8-hour and chronic RELs for nickel and nickel compounds. The values of the RELs are listed in the table at: http://www.oehha.ca.gov/air/chronic_rels/032312CREL.html.
- On July 29, 2013, OEHHA adopted an acute and 8-hour REL, and a revised chronic REL for 1,3-butadiene. The REL values and summary can be found online at: http://www.oehha.ca.gov/air/hot_spots/index.html.
- On October 18, 2013, the following changes were made to the Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values:
  - OEHHA adopted acute, 8-hour, and chronic RELs for caprolactam. The REL values and summary can be found at: https://oehha.ca.gov/media/downloads/crnr/caprolactam2013.pdf.
  - Changes have been made to target organs to the following substances with no change to health factors: Chloroform, Diethanolamine, Fluorides and Hydrogen Fluoride, Methylene Chloride, Styrene, Xylenes. The "date added" in this table reflects the date of the health factor only.
- On June 27, 2014, OEHHA adopted a new 8-hour REL and revised acute and chronic RELs for benzene. The REL values and summary can be found at: http://www.oehha.ca.gov/air/chronic_rels/BenzeneJune2014.html.
- On March 28, 2016, OEHHA adopted new and revised RELs for toluene diisocyanate (TDI) and methylene diphenyl diisocyanate (MDI). The REL values and summaries can be found at: http://www.oehha.ca.gov/air/chronic_rels/032816TDI_MDI_RELs.html. On March 30, 2016, the name of MDI was changed from methylene diphenyl isocyanate to a more accurate name: methylene diphenyl diisocyanate.
- On September 8, 2016, OEHHA adopted an updated inhalation cancer unit risk factor (URF) for perchloroethylene (PCE or tetrachloroethylene). The updated URF and summary can be found at: http://oehha.ca.gov/air/crnr/notice-adoption-inhalation-cancer-unit-risk-factor-perchloroethylene.

Table 1
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	• On February 21, 2017, OEHHA adopted new acute, 8-hour, and chronic inhalation RELs for carbonyl sulfide. The REL values and summary can be found at: http://oehha.ca.gov/air/crnr/notice-adoption-reference-exposure-levels-carbonyl-sulfide. • On May 4, 2018, OEHHA adopted new 8-hour and chronic inhalation REL, and a revised acute REL for ethylene glycol butyl ether. The REL values and summary can be found at: https://oehha.ca.gov/air/chemicals/ethylene-glycol-monobutyl-ether. • On August 16, 2018, OEHHA adopted an inhalation URF, inhalation cancer potency factor, and oral cancer potency factor for tertiary-butyl acetate (TBAc). Although OEHHA has adopted an oral cancer potency value for tertiary-butyl acetate, its chemical/biological properties do not fit the multipathway scheme. Therefore, non-inhalation pathway risks calculated from this value will be zero because the transfer factors are set to zero. Please contact OEHHA for more information. The values can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-cancer-inhalation-unit-risk-and-slope-factors-and-cancer-oral-slope-factor • On September 6, 2019, OEHHA adopted new RELs for hexamethylene diisocyanate. The REL values and summary can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-reference-exposure-levels-hexamethylene-diisocyanate. • On August 20, 2020, OEHHA adopted new and revised RELs for toluene. The REL values and summary can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-reference-exposure-levels-toluene. • On October 2, 2020, OEHHA adopted a new inhalation URF for cobalt. The updated URF and summary can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-cancer-inhalation-unit-risk-factors-cobalt-and-cobalt-compounds • On August 31, 2022, OEHHA adopted new RELs for trivalent chromium (CrIII). The REL values and summary can be found at: https://oehha.ca.gov/air/document/chromium-trivalent-inorganic-water-soluble-compounds-reference-exposure-levels-rels. • August 2022 [8/22] is listed to reflect the new pollutants that were added to Appendix A-1: Substances for Which Emissions Must be Quantified in the 2022 Emission Inventory Criteria Guidelines (https://ww2.arb.ca.gov/our-work/programs/ab-2588-air-toxics-hot-spots/hot-spots-inventory-guidelines). OEHHA was consulted to determine which existing health values may be applied to these new pollutants. Health values were added for 61 pollutants on August 31, 2022. OEHHA was also consulted on the appropriate MWAF, if applicable. • Selenium hexafluoride (7783-79-1): The health values for fluorides were applied to selenium hexafluoride. Selenium also has a set of health values; however, the Hot Spots Analysis and Reporting Program (HARP) software can only apply one set of health values for each pollutant. To account for the additional toxicity of selenium, the MWAF default is 1. • On December 9, 2022, OEHHA adopted a new inhalation cancer unit risk factor (URF) for 1-bromopropane. The URF and summary can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-cancer-inhalation-unit-risk-and-slope-factors-1-bromopropane. • On April 28, 2023, OEHHA adopted new RELs for 1-bromopropane. The REL values and summary can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-reference-exposure-levels-1-bromopropane. • On August 4, 2023, OEHHA adopted a revised cancer URF for cobalt sulfate heptahydrate and water-soluble cobalt compounds. The updated URF and summary can be found at: https://oehha.ca.gov/air/crnr/notice-adoption-revised-cancer-inhalation-unit-risk-factors-cobalt-sulfate-heptahydrate-and
d	Inhalation cancer potency factor: The "unit risk factor" has been replaced in the new risk assessment algorithms by a factor called the "inhalation cancer potency factor". Inhalation cancer potency factors are expressed as units of inverse dose [i.e., $(mg/kg\text{-}day)^{-1}$]. They were derived from unit risk factors [units = $(ug/m^3)^{-1}$] by assuming that a receptor weighs 70 kilograms and breathes 20 cubic meters of air per day. The inhalation potency factor is used to calculate a potential inhalation cancer risk using the new risk assessment algorithms defined in the OEHHA, *Air Toxics Hot Spots Program; Technical Support Document for Exposure Assessment and Stochastic Analysis (August 2012)*. (https://oehha.ca.gov/media/downloads/crnr/exposureassessment2012tsd.pdf)
e	Molecular Weight Adjustment Factor: For most of the Hot Spots toxic metals, the OEHHA cancer potency factors and noncancer RELs apply to the weight of the toxic metal atom contained in the overall compound. Some of the Hot Spots compounds contain various elements along with the toxic metal atom (e.g., "Nickel hydroxide", CAS number 12054-48-7, has a formula of H2NiO2). Therefore, an adjustment to the reported pounds of the overall compound is needed before applying the OEHHA cancer potency factor and noncancer RELs for "Nickel and compounds" to such a compound. This ensures that the cancer potency factor and noncancer RELs are applied only to the fraction of the overall weight of the emissions that are associated with health effects of the metal. In other cases, the Hot Spots metals are already reported as the metal atom equivalent (e.g., CAS 7440-02-0, "Nickel"), and these cases do not use any further molecular weight adjustment. (Refer to Note [7] in Appendix A, List of Substances in the EICG Report for further information on how the emissions of various Hot Spots metal compounds are reported.) The appropriate molecular weight adjustment factors (MWAF) to be used along with the OEHHA cancer potency factors and noncancer RELs for Hot Spots metals can be found in the MWAF column of this table. So, for example, assume that 100 pounds of "Nickel hydroxide" emissions are reported under CAS number 12054-48-7. To get the Nickel atom equivalent of these emissions, multiply by the listed MWAF (0.6332) for Nickel hydroxide: • 100 pounds x 0.6332 = 63.32 pounds of Nickel atom equivalent. This step should be completed prior to applying the OEHHA cancer potency factor and noncancer RELs for "Nickel and compounds" in a calculation for a prioritization score or risk assessment calculation. (Note -The HARP software automatically applies the appropriate MWAF for each Hot Spots chemical (by CAS number), so the emissions should not be manually adjusted when using HARP. Therefore, if using HARP, you would use 100 pounds for Nickel hydroxide and HARP will make the MWAF adjustment for you. If not using HARP, you would use 63.32 pounds.) For more information on MWAF please refer to Section 4.2.1.1.1 of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for the Preparation of Risk Assessments* (Guidance Manual) (February 2015). Note: The value listed in the MWAF column for Asbestos is not a molecular weight adjustment. This is a conversion factor for adjusting mass and fibers or structures. See Appendix C of OEHHA's Guidance Manual (February 2015) for more information on Asbestos reporting and risk assessment information or see the EICG report for reporting guidance. Also see the Asbestos footnote (designated by the letter f).
TAC	Toxic Air Contaminant: The Air Resources Board has identified this substance as a Toxic Air Contaminant. (https://ww2.arb.ca.gov/resources/documents/carb-identified-toxic-air-contaminants)

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

f	Asbestos: The units for the Inhalation Cancer Potency factor for asbestos are (100 PCM fibers/m^3)$^{-1}$. A conversion factor of 100 fibers/0.003 µg can be multiplied by a receptor concentration of asbestos expressed in µg/m^3. Unless other information necessary to estimate the concentration (fibers/m^3) of asbestos at receptors of interest is available. A unit risk factor of 1.9 E 10^{-4} (µg/m^3)$^{-1}$ and an inhalation cancer potency factor of 2.2 E 10^{+2} (mg/kg BW * day)$^{-1}$ are available. For more information on asbestos quantity conversion factors, see Appendix F of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part II; Technical Support Document for Cancer Potency Factors (May 2009)* (*https://oehha.ca.gov/air/crnr/technical-support-document-cancer-potency-factors-2009*), and Appendix C of OEHHA's Guidance Manual (February 2015) (https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0).
g	Chromium 6 (Hexavalent Chromium): In July 2011, OEHHA developed the oral cancer slope factor for chromium 6+ and compounds for the California Public Health Goal in drinking water. As of February 2014, OEHHA states it should also be used for the Hot Spots program.
h	Lead, Inorganic: Inorganic Lead was identified by the Air Resources Board as a Toxic Air Contaminant in April 1997. Since information on noncancer health effects show no identified threshold, no Reference Exposure Level has been developed. The document, *Risk Management Guidelines for New, Modified, and Existing Sources of Lead, March 2001*, has been developed by ARB and OEHHA staff for assessing noncancer health impacts from sources of lead (https://ww2.arb.ca.gov/sites/default/files/classic/toxics/lead/mainandappend.pdf?_ga=2.97130777.765928880.1615842085-992278915.1615253163). See Appendix F of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (2003)* for an overview of how to evaluate noncancer impacts from exposure to lead using these risk management guidelines (https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf).
i	Particulate Emissions from Diesel-Fueled Engines: The inhalation cancer potency factor was derived from whole diesel exhaust and should be used only for impacts from the inhalation pathway (based on diesel PM measurements). The inhalation impacts from speciated emissions from diesel-fueled engines are already accounted for in the inhalation cancer potency factor. However, at the discretion of the risk assessor, speciated emissions from diesel-fueled engines may be used to estimate acute noncancer health impacts or the contribution to cancer risk or chronic noncancer health impacts for the non-inhalation exposure pathway. See Appendix D of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (2003) for more information. The noncancer chronic REL for diesel exhaust is based on assumptions of contributions of diesel PM to ambient PM. It should be used with diesel PM measurement.
j	Cancer Potency Factors (CPFs) for unspeciated mixtures of Polychlorinated Biphenyls: High Risk: For use in cases where congeners with more than four chlorines comprise more than one-half percent of total polychlorinated biphenyls. Use as default CPF for Tier 1 assessments. Low Risk: This number would not ordinarily be used in the Hot Spots program. Lowest Risk: For use in cases where congeners with more than four chlorines comprise less than one-half percent of total polychlorinated biphenyls. As of February 2014, there is no approved method that can be used to assess the noncancer hazard of an unspeciated PCB mixture. Persons preparing HRAs for the Hot Spots Program should consult with OEHHA and the local Air Pollution Control or Air Quality Management District if an assessment of the noncancer hazard for unspeciated PCB mixtures is needed.
k	Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (also referred to as chlorinated dioxins and dibenzofurans) and dioxin-like PCB congeners: The OEHHA has adopted the World Health Organization 2005 (WHO-05) Toxicity Equivalency Factor scheme for evaluating the risk due to exposure to samples containing mixtures of polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) and a number of dioxin-like PCB congeners. See Appendix A of OEHHA's *Technical Support Document for Describing Available Cancer Potency Factors* for more information about the scheme. See Appendix C (revised January 20, 2011) of OEHHA's Technical Support Document: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Exposures (2009) online at http://oehha.ca.gov/air/hot_spots/tsd052909.html for more information about the scheme. The two numbers (i.e., 1085 and 1086) in the column listing Chemical Abstracts Numbers are used for reporting and risk assessment purposes. Be sure to input emissions under the proper code when using the HARP software. ID code 1085 has no health values associated with it in the HARP software; therefore, no health impacts will be calculated when using ID 1085. See the Emissions Inventory Criteria and Guidelines for more information on reporting emissions.
l	Polycyclic Aromatic Hydrocarbons (PAHs): These substances are PAH or PAH-derivatives that have OEHHA-developed Potency Equivalency Factors (PEFs) which were approved by the Scientific Review Panel in April 1994 (see ARB document entitled *Benzo[a]pyrene as a Toxic Air Contaminant*). PAH inhalation slope factors listed here have been adjusted by the PEFs. See OEHHA's Technical Support Document: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Exposures (2009) for more information about the scheme. Section 8.2.3 and Appendix G of OEHHA's *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (2003)* also contains information on PAHs. The two numbers (i.e., 1150 and 1151) in the column listing Chemical Abstracts Numbers are used for reporting and risk assessment purposes. Be sure to input emissions under the proper code when using the HARP software. ID code 1150 has no health values associated with it in the HARP software; therefore, no health impacts will be calculated when using ID 1150. See the Emissions Inventory Criteria and Guidelines for more information on reporting emissions.
m	SELENIUM AND COMPOUNDS: In February 2014, an oral REL was added to the consolidated table. The REL was adopted in December 2001 but could not be used by the Hot Spots Program (or HARP software) until transfer factors for the oral and dermal routes were adopted. Transfer factors were included in the OEHHA's *Technical Support Document for Exposure Assessment and Stochastic Analysis* (August 2012) and were added to the HARP software in March 2015.
n	1,6-HEXAMETHYLENE DIISOCYANATE (HDI): On September 19, 2019, acute, 8-hour, and chronic RELs were added to the table and HARP for the HDI (monomer). OEHHA adopted these RELs and others for HDI polyisocyanates on September 6, 2019. The Acute, 8-hour, and chronic RELs for HDI polyisocyanates were added to the consolidated table and HARP on August 31, 2022.

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES[a]

N/A Not Applicable.

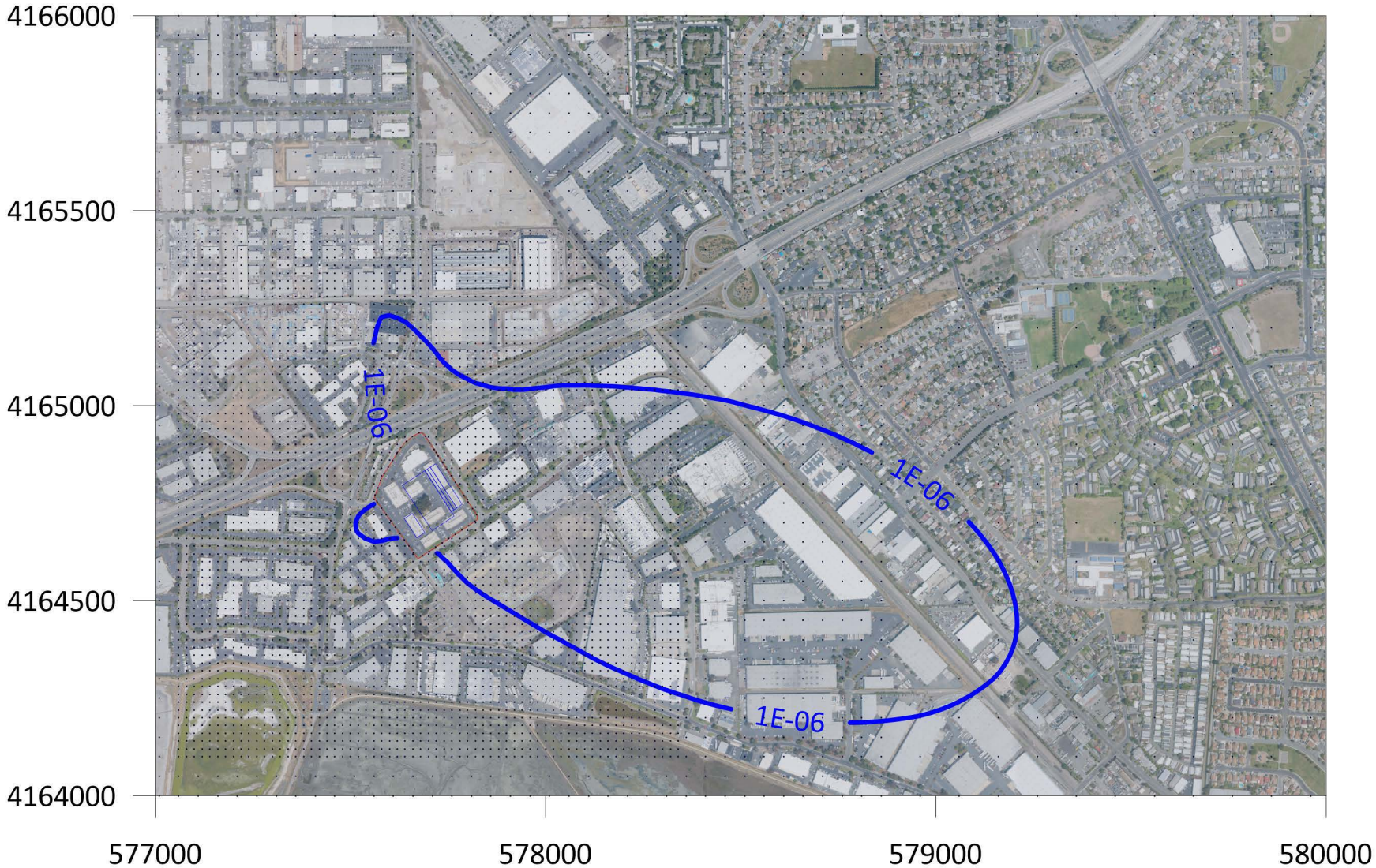
Other Changes:

- 10/18/2010, removed CHLORODIFLUOROMETHANE, which should have been removed in May 2008.

February 2014:

- Removed applicability of oleum to the sulfuric acid chronic inhalation REL because oleum represents only an acute health hazard.
- Removed “METHYL MERCURY (see Mercury & Compounds)” entry because methyl mercury has different chemical properties, potency, and toxicity compared to elemental mercury and mercury salts, and it is not emitted directly from any California facilities.
- September 1, 2017, changed the “1101 Fluorides” entry back to “1101 Fluorides and compounds” to keep the consistency with the Emission Inventory Guidelines. The substance name for CAS# 1101 was changed from “Fluorides and compounds” as in 2002 to “Fluorides” in 2003 without footnotes about the change.

Figure AQ5-1
Cancer Risk Isopleth



APPENDIX B

Biological Resources Constraints

MEMORANDUM

TO:	Desiree Dei Rossi, David J. Powers and Associates	**FROM:**	Bianca Clarke, WRA, Inc.
DATE:	August 10, 2023		
SUBJECT:	SVY03A Data Center Campus Project		

1 PURPOSE AND PROJECT DESCRIPTION

The purpose of this report is to provide an analysis of biological resources at the SVY03A Data Center Campus Project (Project) in the city of Hayward, Alameda County, California. The proposed project includes two new data center buildings, a security building, an on-site substation, backup generators, a PG&E switching station, and existing infrastructure improvements. This report will address the questions in the California Environmental Quality Act (CEQA) Environmental Checklist (Appendix G of the CEQA Guidelines) and will be suitable for use for CEQA documentation.

2 EXISITING CONDITIONS

The approximately 12-acre Project Area is situated within a heavily urbanized area and is surrounded on all sides by industrial and commercial uses. The Project Area consists of Assessor's Parcel Numbers (APNs) 461-0085-016-00; 461-0085-052-01. It consists of an industrial complex bounded by Investment Boulevard, Production Avenue, Eden Landing Road, and a parking lot. The Project Area is mostly paved with ornamental landscaping throughout.

3 METHODS

This evaluation is based on a review of literature and database sources as well as a site visit completed by WRA, Inc. (WRA) on June 22, 2023. Prior to the site visit, WRA biologists reviewed literature resources and performed database searches to assess the potential for sensitive land cover types (e.g., wetlands) and special-status species (e.g., endangered plants), including:

- Contemporary aerial photographs (Google Earth 2023)
- Historical aerial photographs (NETR 2023)
- National Wetlands Inventory (USFWS 2023a)
- California Natural Diversity Database (CNDDB; CDFW 2023)
- California Native Plant Society Rare Plant Inventory (CNPS 2023a)
- Consortium of California Herbaria 2 (CCH2 2023)
- USFWS Information Planning and Consultation database (USFWS; IPaC 2023b)
- eBird Online Database (eBird 2023)
- California Bird Species of Special Concern in California (Shuford and Gardali 2008)
- California Amphibian and Reptile Species of Special Concern (Thomson et al. 2016)
- A Field Guide to Western Reptiles and Amphibians (Stebbins 2003)

- A Manual of California Vegetation, Online Edition (CNPS 2023b)
- California Natural Community List (CDFW 2023)
- Database searches for Redwood Point, San Leandro, Hayward, and Newark 7.5-minute quadrangles.

On June 22, 2023, WRA conducted a field assessment of the Project Area to observe conditions for the presence of sensitive land cover types, potentially jurisdictional areas, and the potential to support habitat for special status plant and wildlife species. .

4 RESULTS

4.1 Land Cover Types

WRA observed one land cover type within the Project Area: developed/ornamental. The land cover map is included in Attachment A.

Developed/Ornamental
Developed/Ornamental areas comprise the entirety of the Project Area and consist of buildings, paved and concrete areas, landscaped areas, bare dirt, and gravel areas typical of developed industrial land uses. Common ornamental plants included coast redwood (*Sequoia sempervirens*), deer grass (*Muhlenbergia rigens*), and mexican bush sage (*Salvia leucantha*). This land cover type is not considered sensitive by the California Department of Fish and Wildlife (CDFW).


Typical view of the roadways surrounding the Project Area.


Parking lot from the Project site in the developed industrial park.

4.2 Special-status Species

4.2.1 Special-status Plant Species

Based upon a review of the resource databases listed in Section 4.0, 32 special-status plant species have been documented in the vicinity of the Project Area. All are unlikely or have no potential to occur within the Project Area due to a lack of suitable conditions (e.g., edaphic (soil) conditions, topography, unique pH, associated natural communities, low levels of disturbance). Additionally, no special-status plant species were observed within the Project Area on June 22,

2023. The list of the CNDDB and IPaC special-status plant species database output is included in Attachment B and the plant species observed during the June 22, 2023 site visit are included in Attachment C.

Plant Species that are federally listed but have no potential to occur within the Project Area include: robust spineflower (*Chorizanthe robusta* var. *robusta*; FE[1]), Santa Cruz tarplant (*Holocarpha macradenia*; FT, SE), Contra Costa goldfields (*Lasthenia conjugens*; FE), Suaeda californica (*California seablite*; FE).

4.2.2 Special-status Wildlife Species

Based upon a review of the resource databases listed in Section 3.0, 43 special-status wildlife species have been documented in the vicinity of the Project Area. All are unlikely or have no potential to occur within the Project Area based on a lack of habitat features (e.g., salt marsh, rivers, grassland, sandy beaches or alkaline flats, and the presence of specific host plants). However, non-status bird species protected by the Migratory Bird Treaty Act (MBTA) and by California Fish and Game Codes (CFGC), have the potential to nest in vegetation or on structures within or adjacent to the Project Area.

Wildlife species that are federally listed but have no potential to occur within the Project Area, and of which there is no critical habitat for include: green sturgeon (*Acipenser medirostris* pop. 1; FT), California tiger salamander (*Ambystoma californiense* pop. 1; FT), western snowy plover (*Charadrius nivosus nivosus*), monarch (*Danaus plexippus plexippus* pop. 1; FC), Alameda whipsnake (*Masticophis lateralis euryxanthus*; FT, ST), steelhead (*Oncorhynchus mykiss irideus*; FT), California clapper rail (Rallus longirostris obsoletus; FE), California Ridgway's rail (*Rallus obsoletus obsoletus*; FE, SE), foothill yellow-legged frog (*Rana boylii*; FPT, SE), California red-legged frog (*Rana draytonii*; FT), salt-marsh harvest mouse (*Reithrodontomys raviventris*; FE, SE), longfin smelt (*Spirinchus thaleichthys*; FC, SE), and California least tern (*Sternula antillarum browni*; FE, SE). The list of the CNDDB and IPaC special-status wildlife species database output is included in Attachment B.

5 RECOMMENDATIONS

5.1 Special Status Species

5.1.1 Special Status Species

A total of 32 special-status plant species and 42 special-status wildlife species have been documented within the vicinity of the Project Area. Of these species, all are unlikely or have no potential to occur.
Non-status nesting birds protected by the MBTA have the potential to nest in the ornamental trees within the Project Area. Pre-construction nesting bird surveys are recommended during the nesting bird season (February 15- September 1) prior to any vegetation removal.

[1] FE: Federal Endangered, FT: Federal Threatened, FC: Federal Candidate, FPT: Federal Proposed Threatened, SE: State Endangered, ST: State Threatened

5.1.2 Sensitive Natural Communities

No sensitive natural communities occur within the Project Area. The Project Area is comprised of ruderal/grassland and developed/ornamental. No recommendations are required.

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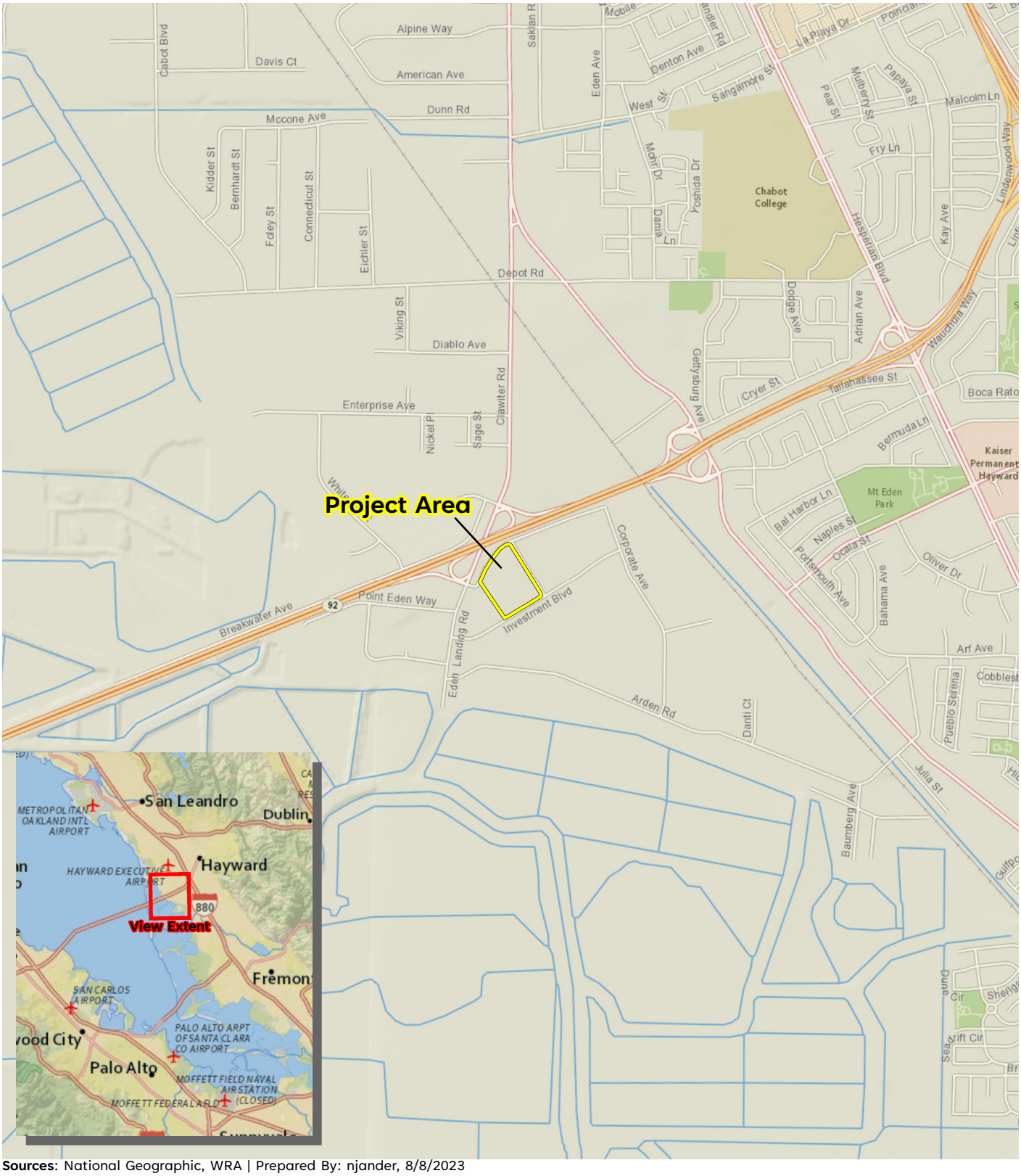
Attachment A. Figures



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Sources: National Geographic, WRA | Prepared By: njander, 8/8/2023

Figure 1. Project Area Location

SVY03A Data Center Campus Project
Hayward, California

0 0.25 0.5 Miles

N

wra Environmental Consultants

Path: L:\Acad 2000 Files\320000\320464\GIS\ArcMap\320464Base.aprx Layout Name: Fig2_Land Cover Types

Sources: USDA NAIP Imagery 2022, WRA | Prepared By: njander, 8/8/2023

Figure 2. Land Cover Types

SVY03A Data Center Campus Project
Hayward, California

0 50 100 Feet

N

wra Environmental Consultants

Attachment B. CNDDB and IPaC Special-status Species Output

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Newark (3712251) OR Redwood Point (3712252) OR San Leandro (3712262) OR Hayward (3712261))
 AND Taxonomic Group IS (Ferns OR Gymnosperms OR Monocots OR Dicots OR Lichens OR Bryophytes)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Amsinckia lunaris bent-flowered fiddleneck	PDBOR01070	None	None	G3	S3	1B.2
Astragalus tener var. tener alkali milk-vetch	PDFAB0F8R1	None	None	G2T1	S1	1B.2
Balsamorhiza macrolepis big-scale balsamroot	PDAST11061	None	None	G2	S2	1B.2
Centromadia parryi ssp. congdonii Congdon's tarplant	PDAST4R0P1	None	None	G3T2	S2	1B.1
Chloropyron maritimum ssp. palustre Point Reyes salty bird's-beak	PDSCR0J0C3	None	None	G4?T2	S2	1B.2
Chorizanthe robusta var. robusta robust spineflower	PDPGN040Q2	Endangered	None	G2T1	S1	1B.1
Eryngium aristulatum var. hooveri Hoover's button-celery	PDAPI0Z043	None	None	G5T1	S1	1B.1
Eryngium jepsonii Jepson's coyote-thistle	PDAPI0Z130	None	None	G2	S2	1B.2
Extriplex joaquinana San Joaquin spearscale	PDCHE041F3	None	None	G2	S2	1B.2
Fritillaria liliacea fragrant fritillary	PMLIL0V0C0	None	None	G2	S2	1B.2
Gilia millefoliata dark-eyed gilia	PDPLM04130	None	None	G2	S2	1B.2
Helianthella castanea Diablo helianthella	PDAST4M020	None	None	G2	S2	1B.2
Hoita strobilina Loma Prieta hoita	PDFAB5Z030	None	None	G2?	S2?	1B.1
Holocarpha macradenia Santa Cruz tarplant	PDAST4X020	Threatened	Endangered	G1	S1	1B.1
Horkelia cuneata var. sericea Kellogg's horkelia	PDROS0W043	None	None	G4T1?	S1?	1B.1
Lasthenia conjugens Contra Costa goldfields	PDAST5L040	Endangered	None	G1	S1	1B.1
Monolopia gracilens woodland woollythreads	PDAST6G010	None	None	G3	S3	1B.2
Plagiobothrys glaber hairless popcornflower	PDBOR0V0B0	None	None	GX	SX	1A

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Polygonum marinense Marin knotweed	PDPGN0L1C0	None	None	G2Q	S2	3.1
Sanicula maritima adobe sanicle	PDAPI1Z0D0	None	Rare	G2	S2	1B.1
Senecio aphanactis chaparral ragwort	PDAST8H060	None	None	G3	S2	2B.2
Spergularia macrotheca var. longistyla long-styled sand-spurrey	PDCAR0W062	None	None	G5T2	S2	1B.2
Streptanthus albidus ssp. peramoenus most beautiful jewelflower	PDBRA2G012	None	None	G2T2	S2	1B.2
Stuckenia filiformis ssp. alpina northern slender pondweed	PMPOT03091	None	None	G5T5	S2S3	2B.2
Suaeda californica California seablite	PDCHE0P020	Endangered	None	G1	S1	1B.1
Trifolium hydrophilum saline clover	PDFAB400R5	None	None	G2	S2	1B.2

Record Count: 26

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Newark (3712251) OR Redwood Point (3712252) OR San Leandro (3712262) OR Hayward (3712261))
 AND Taxonomic Group IS (Fish OR Amphibians OR Reptiles OR Birds OR Mammals OR Mollusks OR Arachnids OR Crustaceans OR Insects)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
Accipiter striatus sharp-shinned hawk	ABNKC12020	None	None	G5	S4	WL
Acipenser medirostris pop. 1 green sturgeon - southern DPS	AFCAA01031	Threatened	None	G2T1	S1	
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Threatened	G1G2	S2	SSC
Ambystoma californiense pop. 1 California tiger salamander - central California DPS	AAAAA01181	Threatened	Threatened	G2G3T3	S3	WL
Antrozous pallidus pallid bat	AMACC10010	None	None	G4	S3	SSC
Aquila chrysaetos golden eagle	ABNKC22010	None	None	G5	S3	FP
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Asio flammeus short-eared owl	ABNSB13040	None	None	G5	S3	SSC
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Bombus crotchii Crotch bumble bee	IIHYM24480	None	Candidate Endangered	G2	S2	
Bombus occidentalis western bumble bee	IIHYM24252	None	Candidate Endangered	G3	S1	
Charadrius nivosus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S3	SSC
Circus hudsonius northern harrier	ABNKC11011	None	None	G5	S3	SSC
Coturnicops noveboracensis yellow rail	ABNME01010	None	None	G4	S1S2	SSC
Danaus plexippus plexippus pop. 1 monarch - California overwintering population	IILEPP2012	Candidate	None	G4T1T2Q	S2	
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Eumops perotis californicus western mastiff bat	AMACD02011	None	None	G4G5T4	S3S4	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Geothlypis trichas sinuosa saltmarsh common yellowthroat	ABPBX1201A	None	None	G5T3	S3	SSC
Gonidea angulata western ridged mussel	IMBIV19010	None	None	G3	S2	
Lasiurus cinereus hoary bat	AMACC05032	None	None	G3G4	S4	
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3T1	S2	FP
Masticophis lateralis euryxanthus Alameda whipsnake	ARADB21031	Threatened	Threatened	G4T2	S2	
Melospiza melodia pusillula Alameda song sparrow	ABPBXA301S	None	None	G5T2T3	S2S3	SSC
Microcina lumi Lum's micro-blind harvestman	ILARA47050	None	None	G1	S1	
Nannopterum auritum double-crested cormorant	ABNFD01020	None	None	G5	S4	WL
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	AMAFF08082	None	None	G5T2T3	S2S3	SSC
Nycticorax nycticorax black-crowned night heron	ABNGA11010	None	None	G5	S4	
Oncorhynchus mykiss irideus pop. 8 steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T3Q	S3	
Pomatiopsis californica Pacific walker	IMGASJ9020	None	None	G1	S1	
Rallus obsoletus obsoletus California Ridgway's rail	ABNME05011	Endangered	Endangered	G3T1	S2	FP
Rana boylii pop. 4 foothill yellow-legged frog - central coast DPS	AAABH01054	Proposed Threatened	Endangered	G3T2	S2	
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Reithrodontomys raviventris salt-marsh harvest mouse	AMAFF02040	Endangered	Endangered	G1G2	S3	FP
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S3	
Rynchops niger black skimmer	ABNNM14010	None	None	G5	S2	SSC
Scapanus latimanus parvus Alameda Island mole	AMABB02031	None	None	G5T1Q	SH	SSC
Setophaga petechia yellow warbler	ABPBX03010	None	None	G5	S3S4	SSC
Sorex vagrans halicoetes salt-marsh wandering shrew	AMABA01071	None	None	G5T1	S1	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Spirinchus thaleichthys	AFCHB03010	Candidate	Threatened	G5	S1	
longfin smelt						
Sternula antillarum browni	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
California least tern						
Tryonia imitator	IMGASJ7040	None	None	G2	S2	
mimic tryonia (=California brackishwater snail)						

Record Count: 42

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Alameda County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building

2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse Reithrodontomys raviventris Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/613	Endangered

Birds

NAME	STATUS
California Clapper Rail Rallus longirostris obsoletus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern Sterna antillarum browni Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Western Snowy Plover Charadrius nivosus nivosus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened

Reptiles

NAME	STATUS
Alameda Whipsnake (=striped Racer) Masticophis lateralis euryxanthus Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5524	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened
California Tiger Salamander Ambystoma californiense There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/2076	Threatened
Foothill Yellow-legged Frog Rana boylii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5133	Proposed Threatened

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp Branchinecta lynchi Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
California Seablite Suaeda californica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6310	Endangered

Santa Cruz Tarplant Holocarpha macradenia Threatened

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.
https://ecos.fws.gov/ecp/species/6832

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

Additional information can be found using the following links:

- Eagle Managment https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list,click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be

present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 1 to Aug 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence

at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

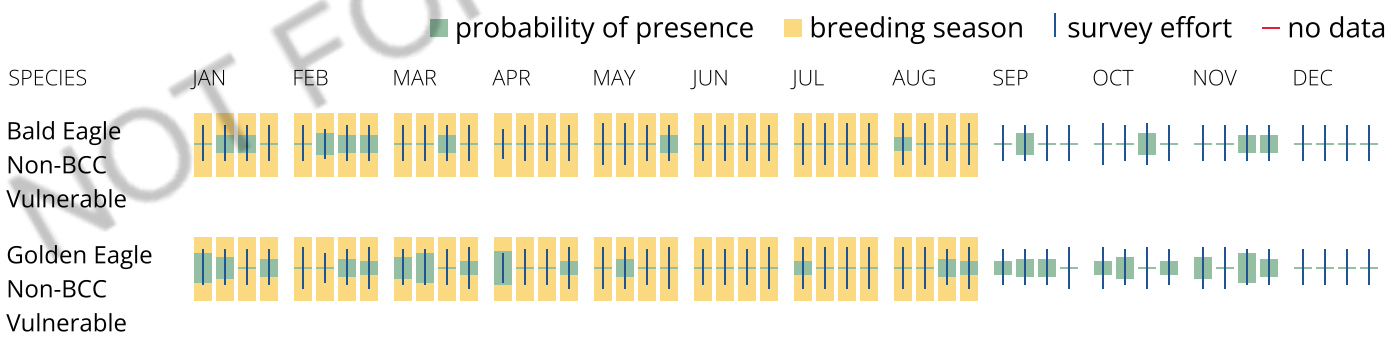
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 1 to Aug 31
Belding's Savannah Sparrow Passerculus sandwichensis beldingi This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8	Breeds Apr 1 to Aug 15
Black Oystercatcher Haematopus bachmani This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31

Black Skimmer Rynchops niger — Breeds May 20 to Sep 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5234

Black Swift Cypseloides niger — Breeds Jun 15 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8878

Black Tern Chlidonias niger — Breeds May 15 to Aug 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3093

Black Turnstone Arenaria melanocephala — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Bullock's Oriole Icterus bullockii — Breeds Mar 21 to Jul 25

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

California Gull Larus californicus — Breeds Mar 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

California Thrasher Toxostoma redivivum — Breeds Jan 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Clark's Grebe Aechmophorus clarkii — Breeds Jun 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Gull-billed Tern Gelochelidon nilotica — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9501

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Marbled Godwit Limosa fedoa — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Tricolored Blackbird Agelaius tricolor — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Western Grebe aechmophorus occidentalis — Breeds Jun 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/6743

Willet Tringa semipalmata — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of

presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

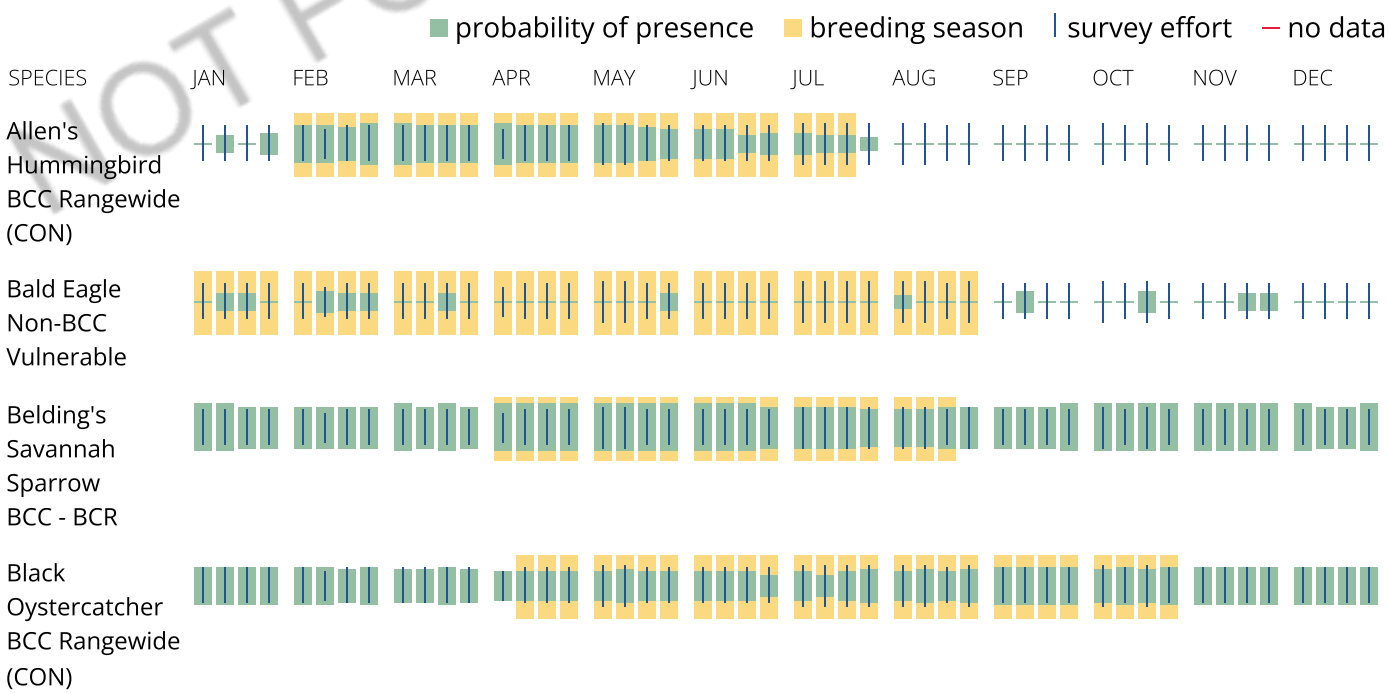
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Black Skimmer BCC Rangewide (CON)

Black Swift BCC Rangewide (CON)

Black Tern BCC Rangewide (CON)

Black Turnstone BCC Rangewide (CON)

Bullock's Oriole BCC - BCR

California Gull BCC Rangewide (CON)

California Thrasher BCC Rangewide (CON)

Clark's Grebe BCC Rangewide (CON)

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Common Yellowthroat BCC - BCR

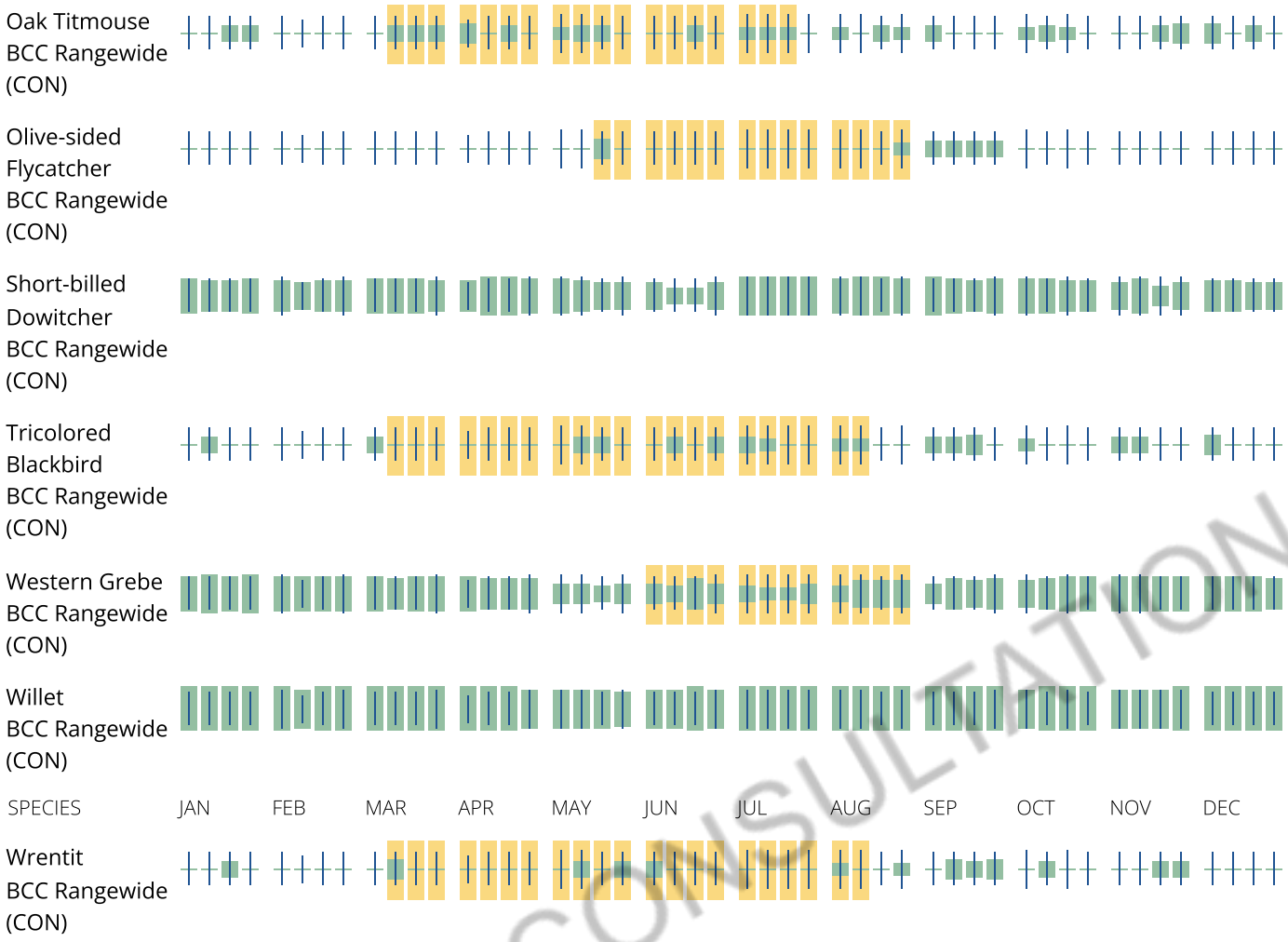
Golden Eagle Non-BCC Vulnerable

Gull-billed Tern BCC Rangewide (CON)

Lawrence's Goldfinch BCC Rangewide (CON)

Marbled Godwit BCC Rangewide (CON)

Nuttall's Woodpecker BCC - BCR



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location did not intersect any wetlands mapped by NWI.

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Attachment C. Observed Plant Species

Attachment C. Plant Species Observed within the Project Area on June 22, 2023

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	CAL-IPC Status[2]
Buxus sp.	Boxwood	non-native	shrub	-	-
Eucalyptus globulus	Blue gum	non-native (invasive)	tree	-	Limited
Fraxinus velutina 'Modesto'	Modesto ash	non-native	tree	-	-
Lagerstroemia indica	Crape myrtle	non-native	tree, shrub	-	-
Muhlenbergia rigens	Deergrass	native	perennial grass	-	-
Nerium oleander	Oleander	non-native	tree	-	-
Prunus cerasifera	Cherry plum	non-native (invasive)	tree	-	Limited
Pyrus calleryana	Callery pear	non-native (invasive)	tree	-	Watch
Salvia leucantha	Mexican bush sage	non-native	perennial herb	-	-
Sequoia sempervirens	Coast redwood	native	tree	-	-

Note: All species identified using the *Jepson eFlora* [Jepson Flora Project (eds.) 2023]; nomenclature follows *Jepson eFlora* [Jepson Flora Project (eds.) 2023] or Rare Plant Inventory (CNPS 2023). Sp.: "species", intended to indicate that the observer was confident in the identity of the genus but uncertain which species.

[1] **California Native Plant Society. 2023. Rare Plant Inventory (online edition, v9.5). Sacramento, California. Online at: http://rareplants.cnps.org/; most recently accessed: June 2023.**

FE:	Federal Endangered
FT:	Federal Threatened
SE:	State Endangered
ST:	State Threatened
SR:	State Rare
Rank 1A:	Plants presumed extinct in California
Rank 1B:	Plants rare, threatened, or endangered in California and elsewhere
Rank 2:	Plants rare, threatened, or endangered in California, but more common elsewhere
Rank 3:	Plants about which we need more information – a review list
Rank 4:	Plants of limited distribution – a watch list

[2] **California Invasive Plant Council. 2023. California Invasive Plant Inventory Database. California Invasive Plant Council, Berkeley, CA. Online at: http://www.cal-ipc.org/paf/; most recently accessed: June 2023.**

High:	Severe ecological impacts; high rates of dispersal and establishment; most are widely distributed ecologically.
Moderate:	Substantial and apparent ecological impacts; moderate-high rates of dispersal, establishment dependent on disturbance; limited-moderate distribution ecologically
Limited:	Minor or not well documented ecological impacts; low-moderate rate of invasiveness; limited distribution ecologically
Watch:	These species have been assessed as posing a high risk of becoming invasive in the future in California.