D.4

CALCULATION METHODOLOGY FOR GREENHOUSE GAS EMISSIONS

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Calculation Methodology for GHG

D2.1 Stationary Source Combustion

D2.1.1 Description

Stationary combustion includes the following sources operated at the project location.

Category Assumptions:

- Cargo handling equipment (CHE) and construction equipment within terminal boundaries.[1]

The fuel used for this equipment will be diesel liquefied propane gas (LPG), or liquefied natural gas (LNG).

Diesel and LPG emission factors for CO_2 were provided directly by the OFFROAD2007 emission factor program in units of grams per horsepower-hour (g/hp-hr). Diesel and LPG CH_4 emission factors were derived from the total organic gas (TOG) OFFROAD2007 emission rates per CARB's staff direction. Emission factors from the California Climate Action Registry's *General Reporting Protocol* (GRP) were used for N_2O and LNG CO_2. Originally in units of kilograms GHG per gallon fuel (kg/gal), the N_2O and CO_2 emission factors were converted to units of g/hp-hr to simplify the emission calculations. This conversion used default values of brake-specific fuel consumption (BSFC) by equipment horsepower category, from OFFROAD2007, and a fuel density value from the GRP. The emission factor conversion from kg/gal to g/hp-hr is shown in Table XX-7.

D2.1.2 Equations

D2.1.2.1 Mass Emissions Estimates

General Equation:

Total Emissions = *Emission Factor (g GHG/hp-hr)*

1 Although most CHE sources are mobile, they are classified as stationary for the purposes of GHG reporting because they remain onsite.

× *Work Produced (hp-hr)*
× *0.000001 (metric tons per gram)*

Example:

Given: Equipment power output of 140,000 hp-hr per year

Total Emissions CO_2 = 568.3 (g CO2 /hp-hr) [from Table XX-7]
× 140,000 (hp-hr/year)
× 0.000001 (metric tons per gram)
Total Emissions CO_2 = 79.6 metric tons

D2.1.2.2 Converting Mass Estimates to Carbon Dioxide Equivalent (CO2e)

General Equation:

Metric Tons of CO_2e = Metric Tons of GHG × GWP
Global warming potentials (GWPs) are listed in Table XX-1.

Example:

Given: GHG Emission Rate = 0.014 metric tons of CH4;
GWP = 21 (from Table XX-1)
Metric Tons of CO_2e = Metric Tons of GHG × GWP
Metric Tons of CO_2e = 0.014 Metric Tons of Methane × 21
Metric Tons of CO_2e = 0.29

D2.1.3 Data Requirements—Cargo Handling and Construction Equipment

Fuel Usage:

Propane _____ gallons[2]
Diesel _____ gallons

OR

Propane _____ hp-hr
Diesel _____ hp-hr

2 Often, offroad equipment usage is provided in hp-hr rather than gallons of fuel consumed.In this case, the gallons of fuel consumed must be derived from the hp-hr by using a brake-specific fuel consumption (BSFC) value (in lb fuel per bhp-hr), which depends on the type of equipment.Offroad 2007 provides typical BSFC values by equipment horsepower category.

D2.1.4 Emission Factors

OFFROAD2007 for Diesel and LPG CO_2 emission factors (g/hp-hr)

Table XX-2 for original CH_4 and N_2O and LNG CO_2 emission factors (kg/gal)

Table XX-7 for converted CH_4 and N_2O and LNG CO_2 emission factors (g/hp-hr)

D2.2 Mobile Source Combustion

D2.2.1 Description

This source category includes mobile sources that travel both on- and off-site.

Category Assumptions:

- Primarily consists of trucks, worker commute vehicles, ships, and tugboats.

The fuel used will be diesel/distillate/residual fuel, gasoline, or liquefied natural gas (LNG).

For diesel trucks, CO_2 emission factors in units of grams per mile (g/mi) were obtained directly from the EMFAC2007 emission factor program. Emission factors from the GRP (g/mi) were used for CH_4 and N_2O. For LNG trucks, emission factors from the GRP (kg/gal) were used for CO2 and (g/mi) for N_2O and CH_4. GRP CO2 emission factor, originally in units of kg/gal, were converted to units of g/hp-hr to simplify the emission calculations. This conversion used a manufacturer-provided BSFC value and a fuel density value from the GRP.

For worker commute vehicles, CO_2 emissions were obtained from URBEMIS. Details and assumptions regarding the URBEMIS parameters are discussed in Section 3.2.4.4. The CO_2 emission factor, originally in units of kg/gal, was converted to units of g/mi by using average fuel economy data by model year category from the U.S. Department of Transportation, *Summary of Fuel Economy Performance* (October 2006).The total miles traveled were calculated using the CO_2 emission factor in terms of g/mi and the CO_2 yearly emissions from URBEMIS. The CH_4 and N_2O emission factors were obtained from the GRP in units of g/mi. The vehicle years with the most conservative CH_4 and N_2O emission factors were used.

For main and auxiliary engines on ships and tugboats, CO_2 emission factors in units of grams per kilowatt-hour (g/kWh) were obtained directly from Entec (2002) Tables 2.8, 2.9, and 2.10. Emission factors from the GRP (kg/gal) were used for CH_4 and N_2O. These emission factors were converted to units of g/kWh to simplify the emission calculations. This conversion used specific fuel consumption (SFC) values provided by Entec (2002) and fuel density values from the GRP. Emissions from ship boilers were calculated using emission factors from the GRP.

D2.2.2 Equations

D2.2.2.1 Mass Emissions Estimates

General Equations:

GHGs of Source Category CO_2, CH_4, N_2O

Total Emissions = *Emission Factor (g GHG/hp-hr)*
× *Work Produced (hp-hr)*
× *0.000001 (metric tons per gram)*

OR

Total Emissions = *Emission Factor (g GHG/kWh)*
× *Power Output (kWh)*
× *0.000001 (metric tons per gram)*

OR

Total Emissions = *Emission Factor (g GHG/mile)*
× *Vehicle-Miles Traveled (VMT) (miles)*
× *0.000001 (metric tons per gram)*

Example:

Given: 1,000 truck trips and an average trip length of 20 miles.
Total VMT = 1,000 trips x 20 miles/trip = 20,000 mi

Total Emissions N_2O = *0.05 (g/mile) [from Table XX-4]*
× *20,000 miles*
× *0.000001 (metric tons per gram)*
Total Emissions N_2O = *0.001 metric tons*

D2.2.3 Data Requirements—Trucks and Worker Commute Vehicles

Miles traveled by fuel type:

LNG	_____ miles
Propane	_____ miles
Diesel	_____ miles
Gasoline	_____ miles

Fleet Est. Average miles per gallon by Fuel type

LNG _____ miles/gallon
Propane _____ miles/gallon
Diesel _____ miles/gallon
Gasoline _____ miles/gallon

(Note: EMFAC2007 output tables provide estimates of mpg)

D2.2.4 Data Requirements—Ships and Tugboats

Main and Auxiliary Engines:

Residual Fuel _____ kWh engine output
Distillate Fuel _____ kWh engine output

Boilers:

Residual Fuel _____ gal fuel
Distillate Fuel _____ gal fuel

D2.2.5 Emission Factors

See Attachment 2:

Table D4-2. GHG Emission Factors for Liquid Fuels.

Table D4-3. GHG Indirect Emission Factors for Electricity Generation.

Table D4-4. CH4 and N2O Emission Factors for On-Road Mobile Sources.

Table D4-5. Derivation of GHG Emission Factors for Marine Vessels—Main & Auxiliary Engines.

Table D4-6. Derivation of GHG Emission Factors for Marine Vessels—Boilers.

Table D4-7. Derivation of GHG Emission Factors for Off-Road Equipment.

D2.3 Electricity Usage

D2.3.1 Description

Electrical usage directly related to terminal operations.

Category Summary:

- Includes alternative maritime power (AMP) usage during ship hoteling, and on-terminal electricity consumption for lighting, electric gantry cranes, etc.

Assumes on-grid consumption

Emission factors for electricity usage were obtained from the GRP.

D2.3.2 Equations

D2.3.3 Mass Emissions Estimates

General Equation:

GHGs of Source Category CO_2, CH_4, N_2O

Total Emissions = *Emission Factor (lbs GHG/Megawatt-hour [MWh])*
× *Electricity Used (kWh)*
× *0.001 MWh per kWh*
÷ *2,204.62 lbs/metric ton*

Example:

Given: Electricity Usage = 1,000,000 kWh

Total Emissions CO_2 = *804.54 (lbs CO_2 /MWh) [from Table XX-3]*
× *1,000,000 kWh*
× *0.001 MWh per kWh*
÷ *2,204.62 lbs/metric ton*
Total Emissions CO_2 = *364.9 metric tons*

D2.3.4 Data Requirements—Electricity Usage

Electricity Usage _____ kilowatt- hours (kWh)

D2.3.5 Emission Factors

Table D4-3 for emission factors

Attachment 1
Global Warming Potentials

Table D4-1. Global Warming Potentials

Greenhouse Gas	*GWP (SAR, 1996)*
CO_2	1
CH_4	21
N_2O	310
Source: U.S. Environmental Protection Agency, U.S. Greenhouse Gas Emissions and Sinks: 1990–2000 (April 2002). Note: This information is found in Table III.6.1 of the CCAR protocol.	

Attachment 2
Emission Factors

Table D4-2. GHG Emission Factors for Liquid Fuels

Fuel	*Fuel Density*	*Emission Factor*		
		CO_2	CH_4	N_2O
Propane (LPG)	4.24 lb/gal [a]	5.67 kg/gal	0.000091 kg/gal	0.00041 kg/gal
CA Low Sulfur Diesel	7.46 bbl/metric ton	9.96 kg/gal	0.0014 kg/gal	0.0001 kg/gal
Non-CA Diesel/ Diesel No. 2	7.46 bbl/metric ton	10.05 kg/gal	0.0014 kg/gal	0.0001 kg/gal
Liquefied Natural Gas (LNG)	11.6 bbl/metric ton	4.37 kg/gal	0.0059 kg/MMBtu	0.0001 kg/MMBtu
Distillate Fuel Oil [#1, 2, 4, Diesel]	7.46 bbl/metric ton	10.15 kg/gal	0.0014 kg/gal	0.0001 kg/gal
Residual Fuel Oil [#5, 6]	6.66 bbl/metric ton	11.79 kg/gal	0.0015 kg/gal	0.0001 kg/gal
CA Reformulated Gasoline	8.53 bbl/metric ton	8.55 kg/gal	(see Table XX-4)	(see Table XX-4)

Source: California Climate Action Registry, *General Reporting Protocol* v2.2, March 2007. Tables C.3, C.5, and C.6 (unless otherwise noted).

[a] Source: *AP-42* Appendix A (January 1995).

Table D4-3. GHG Indirect Emission Factors for Electricity Generation

Region	*Emission Factor (lb/MWh)*		
	CO_2	CH_4	N_2O
Los Angeles	804.54	0.0067	0.0037

Source: US EPA and DOE-EIA, as cited in California Climate Action Registry, General Reporting Protocol—Reporting Entity-Wide Greenhouse Gas Emissions. Tables C.1 and C.2. Version 2.2. Los Angeles, CA. March 2007.

Table D4-4. CH4 and N2O Emission Factors for On-Road Mobile Sources

Vehicle Type/Model Years	*Emission Factor (g/mile)*	
	CH_4	N_2O
Passenger Cars—Gasoline		
Model Year 1966–1972	0.22	0.02
Model Year 1973–1974	0.19	0.02
Model Year 1975–1979	0.11	0.05
Model Year 1980–1983	0.07	0.08
Model Year 1984–1991	0.06	0.08
Model Year 1992	0.06	0.07
Model Year 1993	0.05	0.05
Model Year 1994–1999	0.05	0.04
Model Year 2000–present	0.04	0.04
Light Duty Trucks—Gasoline		
Model Year 1966–1972	0.22	0.02
Model Year 1973–1974	0.23	0.02
Model Year 1975–1979	0.14	0.07
Model Year 1980–1983	0.12	0.13
Model Year 1984–1991	0.11	0.14
Model Year 1992	0.09	0.11
Model Year 1993	0.07	0.08
Model Year 1994–1999	0.06	0.06
Model Year 2000-present	0.05	0.06
Heavy Duty Trucks		
Model Year 1966–1982 (Diesel)	0.10	0.05
Model Year 1983–1995 (Diesel)	0.08	0.05
Model Year 1996–present (Diesel)	0.06	0.05
CNG, LNG (all model years)	3.48	0.05
Source: California Climate Action Registry, General Reporting Protocol v2.2, March 2007. Table C.4.		

Table D4-5. Derivation of GHG Emission Factors for Marine Vessels—Main & Auxiliary Engines

Source	*Engine Type**	*Fuel*	*GHG Emission Factors (g/kWh)*		
			CO_2	*CH_4*	*N_2O*
Ships—At Sea	Main	Residual	683	0.004	0.031
Ships—Maneuvering	Main	Residual	683	0.004	0.031
Ships—At Sea	Main	Distillate	683	0.004	0.031
Ships—Maneuvering	Main	Distillate	683	0.004	0.031
Ships—All Operations	Main—Gas Turbine	Residual	970	0.002	0.08
Ships—All Operations	Main—Steam	Residual	970	0.002	0.08
Ships	Auxiliary	Residual	683	0.004	0.031
Ships	Auxiliary	Distillate	683	0.004	0.031
Tugs	Main	Distillate / MGO**	683	0.004	0.031
Tugs	Auxiliary	Distillate / MGO	683	0.004	0.031

* Diesel reciprocating engines unless otherwise noted. On diesel-electric vessels there is no differentiation between main propulsion and auxiliary engines; all power is provided by the same engines.

** MGO = marine gas oil.

Source: Cooper, David, and Tomas Gustafsson. *Methodology for Calculating Emissions from Ships: 1. Update of Emission Factors.* Swedish Environmental Protection Agency, Swedish Methodology for Environmental Data. Norrsköping, Sweden. 2004. http://www.smed.se. This is the same source as used by Starcrest Consulting for the Port of Los Angeles emissions inventory.

Table D4-6. Derivation of GHG Emission Factors for Marine Vessels—Boilers

Source	*Engine Type*	*Fuel*	*GHG Emission Factors (g/kWh)*		
			CO_2	*CH_4*	*N_2O*
Ships	Boiler	Distillate	970	0.002	0.08
Ships	Boiler	Residual	970	0.002	0.08

Source: Cooper, David, and Tomas Gustafsson. *Methodology for Calculating Emissions from Ships: 1. Update of Emission Factors*. Swedish Environmental Protection Agency, Swedish Methodology for Environmental Data. Norrsköping, Sweden. 2004. http://www.smed.se. This is the same source as used by Starcrest Consulting for the Port of Los Angeles emissions inventory.

Table D4-7. Derivation of GHG Emission Factors for Off-Road Equipment

Engine Size (hp)	*BSFC (lb/hp-hr)* [a]	*Diesel Fuel Density (barrels/metric ton)* [b]	*LNG / LPG Fuel Density (barrels/metric ton)*	*Converted Emission Factors (g/hp-hr)*		
				Diesel N_2O	*LNG CO_2*	*LPG N_2O*
26–50	0.54	7.46	11.6	7.67E-03	521.49	0.01
51–120	0.49	7.46	11.6	6.96E-03	473.20	0.01
121–175	0.47	7.46	11.6	6.68E-03	453.89	0.01
176–250	0.47	7.46	11.6	6.68E-03	453.89	0.01

[a] Source: Off-road 2007 data file "Equip.csv".

[b] Source: CCAR General Reporting Protocol v. 2.2.

Attachment 3
GHG Descriptions

Water vapor is the most abundant, important, and variable greenhouse gas in the atmosphere. It is not considered a pollutant; in the atmosphere it maintains a climate necessary for life. The main source of water vapor is evaporation from the oceans (approximately 85%). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves. Water vapor is not one of the six GHGs identified by the World Resources Institute (WRI) as a man-made contributor to global climate change.

Carbon dioxide (CO_2) is an odorless, colorless natural greenhouse gas. Natural sources include the following: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic (human caused) sources of carbon dioxide are from burning coal, oil, natural gas, and wood. Concentrations are currently around 370 ppm; some say that concentrations may increase to 540 ppm by 2100 as a direct result of anthropogenic sources (IPCC 2001). Some predict that this will result in an average global temperature rise of at least 2° Celsius (IPPCC 2001).

Methane (CH_4) is a flammable gas and is the main component of natural gas. When one molecule of methane is burned in the presence of oxygen, one molecule of carbon dioxide and two molecules of water are released. There are no health effects from methane. A natural source of methane is from the anaerobic decay of organic matter. Geological deposits known as natural gas fields contain methane, which is extracted for fuel. Other sources are from landfills, fermentation of manure, and cattle.

Nitrous oxide (N_2O), also known as laughing gas, is a colorless greenhouse gas. Higher concentrations can cause dizziness, euphoria, and sometimes slight hallucinations. Nitrous oxide is produced by microbial processes in soil and water, including those reactions which occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. It is used in rocket engines, as an aerosol spray propellant, and in race cars.

Ozone is a greenhouse gas; however, unlike the other greenhouse gases, ozone in the troposphere is relatively short-lived and therefore is not global in nature. According to CARB, it is difficult to make an accurate determination of the contribution of ozone precursors (NOx and VOCs) to global warming (CARB 2004b). Ozone is not one of the six GHGs identified by the World Resources Institute (WRI) as a man-made contributor to global climate change.

Aerosols are particles emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light. Cloud formation can also be affected by aerosols. Sulfate aerosols are emitted when fuel with sulfur in it is burned. Black

carbon (or soot) is emitted during bio mass burning incomplete combustion of fossil fuels. Particulate matter regulation has been lowering aerosol concentrations in the United States; however, global concentrations are likely increasing. Aerosols are not one of the six GHGs identified by the World Resources Institute (WRI) as a man-made contributor to global climate change.

Source: AEP, 2007.

Attachment 4
GHG Emission Calculations

Table D4-8. Construction GHG Emissions by Project Element and Project Alternative

Project Construction Element	*Proposed Project* *Total Project Emissions 2009–2014 (MT)*				*Alternative 1* *Total Project Emissions 2009–2014 (MT)*				*Alternative 2* *Total Project Emissions 2009–2014 (MT)*				*Alternative 3* *Total Project Emissions 2009–2014 (MT)*				*Alternative 4* *Total Project Emissions 2009–2014 (MT)*				*Alternative 5* *Total Project Emissions 2009–2014 (MT)*			
	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e
Catalina Express Terminal	388	0	0	390	388	0	0	390	388	0	0	390	388	0	0	390	388	0	0	390	—	—	—	—
Cruise Ship Terminal Berth 91–93	—	—	—	—	988	0	0	994	—	—	—	—	—	—	—	—	988	0	0	994	988	0	0	994
Cruise Ship Parking Facilities	1,565	0	0	1,575	1,565	0	0	1,575	1,565	0	0	1,575	1,565	0	0	1,575	783	0	0	787	783	0	0	787
North Harbor	4,214	1	0	4,239	4,214	1	0	4,239	4,214	1	0	4,239	4,214	1	0	4,239	—	—	—	—	—	—	—	—
Maritime Office Building—Crowley	235	0	0	236	235	0	0	236	235	0	0	236	235	0	0	236	—	—	—	—	—	—	—	—
Maritime Office Building—Millennium	235	0	0	236	235	0	0	236	235	0	0	236	235	0	0	236	—	—	—	—	—	—	—	—
Maritime Office Building—Lane Victory	235	0	0	236	235	0	0	236	235	0	0	236	235	0	0	236	235	0	0	236	—	—	—	—
Downtown Harbor	1,887	0	0	1,898	1,887	0	0	1,898	1,887	0	0	1,898	1,887	0	0	1,898	1,887	0	0	1,898	—	—	—	—
7th Street Harbor	1,320	0	0	1,328	1,320	0	0	1,328	1,320	0	0	1,328	1,320	0	0	1,328	1,320	0	0	1,328	—	—	—	—
7th Street Pier	1,160	0	0	1,167	1,160	0	0	1,167	1,160	0	0	1,167	1,160	0	0	1,167	1,160	0	0	1,167	—	—	—	—
Downtown Square	168	0	0	169	168	0	0	169	168	0	0	169	168	0	0	169	168	0	0	169	168	0	0	169
Downtown Water Feature	118	0	0	119	118	0	0	119	118	0	0	119	118	0	0	119	118	0	0	119	118	0	0	119
John S. Gibson Park	174	0	0	175	174	0	0	175	174	0	0	175	174	0	0	175	174	0	0	175	174	0	0	175
Ralph J. Scott Fireboat Museum	372	0	0	374	372	0	0	374	372	0	0	374	372	0	0	374	372	0	0	374	—	—	—	—

Project Construction Element	Proposed Project Total Project Emissions 2009–2014 (MT)				Alternative 1 Total Project Emissions 2009–2014 (MT)				Alternative 2 Total Project Emissions 2009–2014 (MT)				Alternative 3 Total Project Emissions 2009–2014 (MT)				Alternative 4 Total Project Emissions 2009–2014 (MT)				Alternative 5 Total Project Emissions 2009–2014 (MT)			
	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e
Maritime Museum Renovation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Maritime Office Building—L.A. Maritime Institute	253	0	0	254	253	0	0	254	253	0	0	254	253	0	0	254	253	0	0	254	—	—	—	—
Maritime Office Building	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ports O' Call Promenade—Phase 1	2,189	0	0	2,202	2,189	0	0	2,202	2,189	0	0	2,202	2,189	0	0	2,202	2,189	0	0	2,202	—	—	—	—
Ports O' Call Promenade—Phase 2	2,386	0	0	2,401	2,386	0	0	2,401	2,386	0	0	2,401	2,386	0	0	2,401	2,386	0	0	2,401	—	—	—	—
Ports O' Call Promenade—Phase 3	2,195	0	0	2,208	2,195	0	0	2,208	2,195	0	0	2,208	2,195	0	0	2,208	2,195	0	0	2,208	—	—	—	—
Southern Pacific Railyard Demolition	282	0	0	284	282	0	0	284	282	0	0	284	282	0	0	284	282	0	0	284	282	0	0	284
Fisherman's Park	723	0	0	727	723	0	0	727	723	0	0	727	723	0	0	727	723	0	0	727	723	0	0	727
Ports O' Call Redevelopment without restaurant	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ports O' Call Redevelopment Phase 1	2,164	0	0	2,177	2,164	0	0	2,177	2,164	0	0	2,177	1,082	0	0	1,089	2,164	0	0	2,177	2,164	0	0	2,177
Ports O' Call Redevelopment Phase 2	3,326	0	0	3,346	3,326	0	0	3,346	3,326	0	0	3,346	1,663	0	0	1,673	3,326	0	0	3,346	3,326	0	0	3,346
Ports O' Call Redevelopment with Restaurant	590	0	0	593	590	0	0	593	590	0	0	593	590	0	0	593	590	0	0	593	590	0	0	593

Project Construction Element	Proposed Project Total Project Emissions 2009–2014 (MT)				Alternative 1 Total Project Emissions 2009–2014 (MT)				Alternative 2 Total Project Emissions 2009–2014 (MT)				Alternative 3 Total Project Emissions 2009–2014 (MT)				Alternative 4 Total Project Emissions 2009–2014 (MT)				Alternative 5 Total Project Emissions 2009–2014 (MT)			
	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e
Ports O' Call Redevelopment Phase 3	1,702	0	0	1,712	1,702	0	0	1,712	1,702	0	0	1,712	851	0	0	856	1,702	0	0	1,712	1,702	0	0	1,712
Red Car Maintenance Facility	615	0	0	619	615	0	0	619	615	0	0	619	615	0	0	619	615	0	0	619	615	0	0	619
Westway Terminal Demolition	857	0	0	862	857	0	0	862	857	0	0	862	857	0	0	862	857	0	0	862	857	0	0	862
City Dock No. 1 Promenade	2,449	0	0	2,464	2,449	0	0	2,464	2,449	0	0	2,464	2,449	0	0	2,464	2,449	0	0	2,464	2,449	0	0	2,464
Outer Harbor Cruise Ship Terminal—Berth 45–50	7,391	1	0	7,435	4,434	1	0	4,461	8,173	1	0	8,223	4,434	1	0	4,461	—	—	—	—	—	—	—	—
Outer Harbor Park and Promenade	1,091	0	0	1,097	1,091	0	0	1,097	1,091	0	0	1,097	1,091	0	0	1,097	1,091	0	0	1,097	1,091	0	0	1,097
San Pedro Park	1,112	0	0	1,118	1,112	0	0	1,118	1,112	0	0	1,118	1,112	0	0	1,118	1,112	0	0	1,118	1,112	0	0	1,118
Salinas De San Pedro/Youth Camp Promenade	2,577	0	0	2,592	2,577	0	0	2,592	2,577	0	0	2,592	2,577	0	0	2,592	2,577	0	0	2,592	2,577	0	0	2,592
Sampson Way Roadway Improvements	886	0	0	892	886	0	0	892	886	0	0	892	886	0	0	892	886	0	0	892	886	0	0	892
Red Car Line Extension Sampson Way to 22nd St.	988	0	0	994	988	0	0	994	988	0	0	994	988	0	0	994	988	0	0	994	988	0	0	994
Red Car Line Extension 22nd St. to Cabrillo Beach	1,064	0	0	1,071	1,064	0	0	1,071	1,064	0	0	1,071	1,064	0	0	1,071	1,064	0	0	1,071	1,064	0	0	1,071
Red Car Line Extension Outer Harbor	589	0	0	593	589	0	0	593	589	0	0	593	589	0	0	593	589	0	0	593	589	0	0	593
Red Car Line Extension City Dock No. 1	602	0	0	605	602	0	0	605	602	0	0	605	602	0	0	605	602	0	0	605	602	0	0	605

Project Construction Element	*Proposed Project* *Total Project Emissions 2009–2014 (MT)*				*Alternative 1* *Total Project Emissions 2009–2014 (MT)*				*Alternative 2* *Total Project Emissions 2009–2014 (MT)*				*Alternative 3* *Total Project Emissions 2009–2014 (MT)*				*Alternative 4* *Total Project Emissions 2009–2014 (MT)*				*Alternative 5* *Total Project Emissions 2009–2014 (MT)*			
	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e
Berth 240 Fueling Station	225	0	0	226	225	0	0	226	225	0	0	226	225	0	0	226	225	0	0	226	—	—	—	—
Total Project Emissions	**48,324**	**7**	**0**	**48,617**	**46,356**	**7**	**0**	**46,637**	**49,107**	**7**	**0**	**49,405**	**41,772**	**6**	**0**	**42,026**	**36,455**	**5**	**0**	**36,676**	**23,846**	**3**	**0**	**23,991**

Table D4-9. Derivation of GHG Emissions for Marine Vessels—2006 Baseline

Average Emissions (lb/2006 yr)			*Greenhouse Gases (lb/2006 yr)*		
Spacial Allocation	*Power Type*	*Activity (kWh/yr)*	*CO_2*	*CH_4*	*N_2O*
State Boundary to SCAB Boundary	Diesel Engines	1,301,284	1,959,418	11	89
SCAB Boundary to Fairway—Northbound	Diesel Engines	400,395	602,898	4	27
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—
Total State Boundary to Fairway—Northbound		*1,701,679*	*2,562,316*	*15*	*116*
State Boundary to SCAB Boundary	Diesel Engines	17,903,251	26,957,951	158	1,224
SCAB Boundary to Fairway—Southbound	Diesel Engines	16,908,626	25,460,287	149	1,156
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—
Total State Boundary to Fairway—Southbound		*34,811,878*	*52,418,237*	*307*	*2,379*
Fairway—Northbound	Diesel Engines	359,203	540,872	3	25
Fairway—Northbound	Boiler	—	—	—	—
Total Fairway—Northbound		*359,203*	*540,872*	*3*	*25*
Fairway—Southbound	Diesel Engines	6,056,739	9,119,978	53	414
Fairway—Southbound	Boiler	—	—	—	—
Total Fairway—Southbound		*6,056,739*	*9,119,978*	*53*	*414*
Precautionary Zone—Northbound	Diesel Engines	103,837	156,354	1	7
Precautionary Zone—Northbound	Boiler	13,445	20,244	0	1
Total Precautionary Zone—Northbound		*117,282*	*176,598*	*1*	*8*
Precautionary Zone—Southbound	Diesel Engines	3,932,545	5,921,458	35	269
Precautionary Zone—Southbound	Boiler	509,176	766,695	4	35
Total Precautionary Zone—Southbound		*4,441,721*	*6,688,153*	*39*	*304*
Outer Harbor Zone2 (vessels bound to inner harbor berths)[(2)]	Diesel Engines	1,334,914	2,010,057	12	91
Outer Harbor Zone2 (vessels bound to inner harbor berths)[(2)]	Boiler	203,596	306,566	2	14
Total Outer Harbor Zone2		*1,538,510*	*2,316,623*	*14*	*105*
Inner Harbor Zone (maneuvering through main channel: inner harbor to inner harbor	Diesel Engines	1,553,355	2,338,975	14	106

Average Emissions (lb/2006 yr)			*Greenhouse Gases (lb/2006 yr)*		
Spacial Allocation	*Power Type*	*Activity (kWh/yr)*	*CO_2*	*CH_4*	*N_2O*
berths):					
Inner Harbor Zone (maneuvering through main channel: inner harbor to inner harbor berths):	Boiler	236,911	356,731	2	16
Total Inner Harbor Zone		*1,790,266*	*2,695,706*	*16*	*122*
Total Transit (Sea + Fairway + All Zones)	All	*50,817,277*	*76,518,483*	*448*	*3,473*
Hoteling	Diesel Engines	20,971,561	31,578,080	185	1,433
Hoteling	Boiler	4,442,087	6,688,705	39	304
Total Hoteling		*25,413,648*	*38,266,785*	*224*	*1,737*
Annual Total (lb/yr)		76,230,925	114,785,268	672	5,210
Annual Total (ton/yr)			57,393	0.3	2.6
Sum of Baseline OGV + Berth 87 Total GHGs (lb/yr)					
Total Transit (Sea + Fairway + All Zones)			77,148,836	452	3,502
Total Hoteling			38,495,753	225	1,750
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor. Activity and emission factors obtained from linked file.					

Table D4-10a. Baseline GHG Emissions—Berth 87 (Vessel Type 1: General Cargo)

Average Emissions (lb/2006 yr)			*Greenhouse Gases (lb/2006 yr)*		
Spacial Allocation	*Power Type*	*Activity (kWh/yr)*	*CO_2*	*CH_4*	*N_2O*
State Boundary to SCAB Boundary	Main Engine	43,378	65,316	0.4	3.0
State Boundary to SCAB Boundary	Auxiliary Engine	2,660	4,005	0.0	0.2
State Boundary to SCAB Boundary	Boiler	—	—	—	—
Sea/Fairway	Main Engine	13,347	20,097	0.1	0.9
Sea/Fairway	Auxiliary Engine	818	1,232	0.0	0.1
Sea/Fairway	Boiler	—	—	—	—
Total Sea/Fairway		*60,203*	*90,651*	*1*	*4*
Fairway	Main Engine	10,626	16,000	0.1	0.7
Fairway	Auxiliary Engine	652	981	0.0	0.0
Fairway	Boiler	—	—	—	—

Average Emissions (lb/2006 yr)			*Greenhouse Gases (lb/2006 yr)*		
Spacial Allocation	*Power Type*	*Activity (kWh/yr)*	*CO_2*	*CH_4*	*N_2O*
Fairway		*11,277*	*16,981*	*0*	*1*
Precautionary Zone	Main Engine	4,613	6,946	0.0	0.3
Precautionary Zone	Auxiliary Engine	403	606	0.0	0.0
Precautionary Zone	Boiler	141	302	0.0	0.0
Total Precautionary Zone		*5,157*	*7,855*	*0*	*0*
Harbor Zone (vessels bound to Berth 87)	Main Engine	110	166	0.0	0.0
Harbor Zone (vessels bound to Berth 87)	Auxiliary Engine	352	529	0.0	0.0
Harbor Zone (vessels bound to Berth 87)	Boiler	47	100	0.0	0.0
Harbor Zone (vessels bound to Berth 87)		*508*	*795*	*0*	*0*
Total Transit (Sea + Fairway + All Zones)	*All*	*77,145*	*116,281*	*1*	*5*
Hoteling	Main Engine	—	—	—	—
Hoteling	Auxiliary Engine	19,223	28,946	0.2	1.3
Hoteling	Boiler	5,215	11,153	0.0	0.9
Total Hoteling		*24,439*	*40,098*	*0*	*2*
Annual Total (lb/yr)		101,584	156,379	0.9	7.5
Annual Total (ton/yr)		**50.8**	**78.2**	**0.0004**	**0.0038**
Emissions = Engine Power * Load Factor * Emission Factor * Time VSRP (12 knots): 59% compliance to 20 nm Average hourly emissions are based on residual fuel with 2.7% sulfur content.					

Table D4-10b. Baseline GHG Emissions—Berth 87 (Vessel Type 2: Bulk Carrier)

Average Emissions (lb/2006 yr)			*Greenhouse Gases (lb/2006 yr)*		
Spacial Allocation	*Power Type*	*Activity (kWh/yr)*	*CO_2*	*CH_4*	*N_2O*
State Boundary to SCAB Boundary	Main Engine	184,768	278,215	1.6	12.6
State Boundary to SCAB Boundary	Auxiliary Engine	17,896	26,948	0.2	1.2
State Boundary to SCAB Boundary	Boiler	—	—	—	—
Sea/Fairway	Main Engine	56,852	85,605	0.5	3.9

Average Emissions (lb/2006 yr)			*Greenhouse Gases (lb/2006 yr)*		
Spacial Allocation	*Power Type*	*Activity (kWh/yr)*	*CO_2*	*CH_4*	*N_2O*
Sea/Fairway	Auxiliary Engine	5,507	8,292	0.0	0.4
Sea/Fairway	Boiler	—	—	—	—
Total Sea/Fairway		*265,022*	*399,059*	*2*	*18*
Fairway	Main Engine	45,260	68,151	0.4	3.1
Fairway	Auxiliary Engine	4,384	6,601	0.0	0.3
Fairway	Boiler	—	—	—	—
Fairway		*49,644*	*74,752*	*0*	*3*
Precautionary Zone	Main Engine	20,313	30,586	0.2	1.4
Precautionary Zone	Auxiliary Engine	2,584	3,891	0.0	0.2
Precautionary Zone	Boiler	581	1,243	0.0	0.1
Total Precautionary Zone		*23,478*	*35,720*	*0*	*2*
Harbor Zone (vessels bound to Berth 87)	Main Engine	485	730	0.0	0.0
Harbor Zone (vessels bound to Berth 87)	Auxiliary Engine	2,257	3,399	0.0	0.2
Harbor Zone (vessels bound to Berth 87)	Boiler	192	410	0.0	0.0
Harbor Zone (vessels bound to Berth 87)		*2,934*	*4,539*	*0*	*0*
Total Transit (Sea + Fairway + All Zones)	*All*	*341,079*	*514,071*	*3*	*23*
Hoteling	Main Engine	—	—	—	—
Hoteling	Auxiliary Engine	81,282	122,391	0.7	5.6
Hoteling	Boiler	31,087	66,479	0.1	5.5
Total Hoteling		*112,369*	*188,870*	*1*	*11*
Annual Total (lb/yr)		453,448	702,941	3.9	34.4
Annual Total (ton/yr)		**226.7**	**351.5**	**0.0019**	**0.0172**

Emissions = Engine Power * Load Factor * Emission Factor * Time

VSRP (12 knots): 59% compliance to 20 nm

Average hourly emissions are based on residual fuel with 2.7% sulfur content.

Table D4-11. Derivation of GHG Emissions for Marine Vessels—Proposed Project Unmitigated

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*							
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
State Boundary to SCAB Boundary	Diesel Engines	2,074,469	3,123,647	18	142	2,120,740	3,193,319	19	145	2,174,722	3,274,604	19	149	2,213,281	3,274,604	19	149	1,989,640	3,274,604	19	149
SCAB Boundary to Fairway—Northbound	Diesel Engines	638,298	961,122	6	44	652,535	982,560	6	45	669,145	1,007,570	6	46	681,010	1,025,435	6	47	612,197	921,820	5	42
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,712,767*	*4,084,769*	*24*	*185*	*2,773,275*	*4,175,879*	*24*	*190*	*2,843,868*	*4,282,174*	*25*	*194*	*2,894,291*	*4,300,039*	*25*	*195*	*2,601,836*	*4,196,424*	*25*	*190*
State Boundary to SCAB Boundary	Diesel Engines	28,540,842	42,975,579	252	1,951	29,177,440	43,934,142	257	1,994	29,920,139	45,052,466	264	2,045	30,450,638	45,851,268	269	2,081	27,373,744	41,218,213	241	1,871
SCAB Boundary to Fairway—Southbound	Diesel Engines	26,955,239	40,588,047	238	1,842	27,556,471	41,493,357	243	1,883	28,257,909	42,549,551	249	1,931	28,758,936	43,303,976	254	1,965	25,852,980	38,928,313	228	1,767
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*55,496,081*	*83,563,626*	*489*	*3,793*	*56,733,912*	*85,427,499*	*500*	*3,877*	*58,178,048*	*87,602,017*	*513*	*3,976*	*59,209,573*	*89,155,244*	*522*	*4,047*	*53,226,724*	*80,146,526*	*469*	*3,638*
Fairway—Northbound	Diesel Engines	473,223	712,559	4	32	483,778	728,452	4	33	496,092	746,995	4	34	504,888	760,239	4	35	453,872	683,421	4	31
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*473,223*	*712,559*	*4*	*32*	*483,778*	*728,452*	*4*	*33*	*496,092*	*746,995*	*4*	*34*	*504,888*	*760,239*	*4*	*35*	*453,872*	*683,421*	*4*	*31*
Fairway—Southbound	Diesel Engines	7,979,303	12,014,894	70	545	8,157,280	12,282,884	72	557	8,364,920	12,595,539	74	572	8,157,280	12,282,884	72	557	7,653,012	11,523,579	67	523
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,979,303*	*12,014,894*	*70*	*545*	*8,157,280*	*12,282,884*	*72*	*557*	*8,364,920*	*12,595,539*	*74*	*572*	*8,157,280*	*12,282,884*	*72*	*557*	*7,653,012*	*11,523,579*	*67*	*523*
Precautionary Zone—Northbound	Diesel Engines	141,464	213,010	1	10	144,619	217,761	1	10	148,300	223,304	1	10	150,930	227,264	1	10	135,679	204,300	1	9
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	10,242	15,422	0	1	10,424	15,696	0	1	9,770	14,711	0	1
Total Precautionary Zone—Northbound		*151,234*	*227,721*	*1*	*10*	*154,607*	*232,801*	*1*	*11*	*158,543*	*238,727*	*1*	*11*	*161,354*	*242,959*	*1*	*11*	*145,449*	*219,011*	*1*	*10*
Precautionary Zone—Southbound	Diesel Engines	5,357,550	8,067,169	47	366	5,477,049	8,247,106	48	374	5,616,465	8,457,033	50	384	5,716,048	8,606,980	50	391	5,138,468	7,737,285	45	351
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	387,892	584,072	3	27	394,770	594,427	3	27	354,880	534,363	3	24
Total Precautionary Zone—Southbound		*5,727,561*	*8,624,316*	*51*	*391*	*5,855,313*	*8,816,680*	*52*	*400*	*6,004,357*	*9,041,104*	*53*	*410*	*6,110,817*	*9,201,408*	*54*	*418*	*5,493,348*	*8,271,649*	*48*	*375*

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*							
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	651,535	981,054	6	45	668,120	1,006,026	6	46	679,966	1,023,863	6	46	—	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	60,500	91,098	1	4	62,040	93,417	1	4	63,140	95,074	1	4	—	—	—	—
Total Outer Harbor Zone1		—	—	—	—	*712,035*	*1,072,152*	*6*	*49*	*730,160*	*1,099,443*	*6*	*50*	*743,106*	*1,118,937*	*7*	*51*	—	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,593,299	2,399,122	14	109	814,419	1,226,317	7	56	835,150	1,257,532	7	57	849,957	1,279,829	7	58	1,528,146	2,301,017	13	104
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	75,625	113,873	1	5	77,550	116,771	1	5	78,925	118,842	1	5	141,900	213,667	1	10
Total Outer Harbor Zone2		*1,741,249*	*2,621,899*	*15*	*119*	*890,044*	*1,340,190*	*8*	*61*	*912,700*	*1,374,304*	*8*	*62*	*928,882*	*1,398,671*	*8*	*63*	*1,670,046*	*2,514,684*	*15*	*114*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,854,021	2,791,706	16	127	947,687	1,426,987	8	65	971,810	1,463,310	9	66	989,041	1,489,256	9	68	1,778,206	2,677,547	16	122
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	88,000	132,507	1	6	90,240	135,880	1	6	91,840	138,289	1	6	165,120	248,631	1	11
Total Inner Harbor Zone		*2,026,181*	*3,050,937*	*18*	*138*	*1,035,687*	*1,559,494*	*9*	*71*	*1,062,050*	*1,599,190*	*9*	*73*	*1,080,881*	*1,627,544*	*10*	*74*	*1,943,326*	*2,926,177*	*17*	*133*
Total Transit (Sea + Fairway + All Zones)	All	*76,307,599*	*114,900,721*	*673*	*5,215*	*76,795,931*	*115,636,030*	*677*	*5,248*	*78,750,737*	*118,579,493*	*694*	*5,382*	*79,791,073*	*120,087,926*	*703*	*5,451*	*73,187,614*	*110,481,470*	*647*	*5,015*
Hoteling	Diesel Engines	23,805,596	35,845,449	210	1,627	24,336,576	36,644,976	215	1,663	24,956,052	37,577,757	220	1,706	25,398,536	38,244,029	224	1,736	22,832,133	34,379,650	201	1,560
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,384,000	5,095,483	30	231	3,444,000	5,185,828	30	235	3,096,000	4,661,824	27	212
Total Hoteling		*27,033,596*	*40,706,033*	*238*	*1,848*	*27,636,576*	*41,613,975*	*244*	*1,889*	*28,340,052*	*42,673,240*	*250*	*1,937*	*28,842,536*	*43,429,857*	*254*	*1,971*	*25,928,133*	*39,041,474*	*229*	*1,772*
Annual Total (lb/yr)		103,341,195	155,606,754	911	7,063	104,432,507	157,250,005	921	7,137	107,090,789	161,252,733	944	7,319	108,633,608	163,517,783	958	7,422	99,115,747	149,522,944	876	6,787
Annual Total (ton/yr)			77,803	0.5	3.5		78,625	0.5	3.6		80,626	0.5	3.7		81,759	0.5	3.7		74,761	0.4	3.4
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																					

Table D4-12. Derivation of GHG Emissions for Marine Vessels—Alternative 1 Unmitigated

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines	2,074,469	3,123,647	18	142	2,120,740	3,193,319	19	145	2,120,740	3,193,319	19	145	2,120,740	3,193,319	19	145
SCAB Boundary to Fairway—Northbound	Diesel Engines	638,298	961,122	6	44	652,535	982,560	6	45	652,535	982,560	6	45	652,535	982,560	6	45
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,712,767*	*4,084,769*	*24*	*185*	*2,773,275*	*4,175,879*	*24*	*190*	*2,773,275*	*4,175,879*	*24*	*190*	*2,773,275*	*4,175,879*	*24*	*190*
State Boundary to SCAB Boundary	Diesel Engines	28,540,842	42,975,579	252	1,951	29,177,440	43,934,142	257	1,994	29,177,440	43,934,142	257	1,994	29,177,440	43,934,142	257	1,994
SCAB Boundary to Fairway—Southbound	Diesel Engines	26,955,239	40,588,047	238	1,842	27,556,471	41,493,357	243	1,883	27,556,471	41,493,357	243	1,883	27,556,471	41,493,357	243	1,883
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*55,496,081*	*83,563,626*	*489*	*3,793*	*56,733,912*	*85,427,499*	*500*	*3,877*	*56,733,912*	*85,427,499*	*500*	*3,877*	*56,733,912*	*85,427,499*	*500*	*3,877*
Fairway—Northbound	Diesel Engines	473,223	712,559	4	32	483,778	728,452	4	33	483,778	728,452	4	33	483,778	728,452	4	33
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*473,223*	*712,559*	*4*	*32*	*483,778*	*728,452*	*4*	*33*	*483,778*	*728,452*	*4*	*33*	*483,778*	*728,452*	*4*	*33*
Fairway—Southbound	Diesel Engines	7,979,303	12,014,894	70	545	8,157,280	12,282,884	72	557	8,157,280	12,282,884	72	557	8,157,280	12,282,884	72	557
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,979,303*	*12,014,894*	*70*	*545*	*8,157,280*	*12,282,884*	*72*	*557*	*8,157,280*	*12,282,884*	*72*	*557*	*8,157,280*	*12,282,884*	*72*	*557*
Precautionary Zone—Northbound	Diesel Engines	141,464	213,010	1	10	144,619	217,761	1	10	144,619	217,761	1	10	144,619	217,761	1	10
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	9,988	15,039	0	1	9,988	15,039	0	1
Total Precautionary Zone—Northbound		*151,234*	*227,721*	*1*	*10*	*154,607*	*232,801*	*1*	*11*	*154,607*	*232,801*	*1*	*11*	*154,607*	*232,801*	*1*	*11*
Precautionary Zone—Southbound	Diesel Engines	5,357,550	8,067,169	47	366	5,477,049	8,247,106	48	374	5,477,049	8,247,106	48	374	5,477,049	8,247,106	48	374
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	378,264	569,573	3	26	378,264	569,573	3	26
Total Precautionary Zone—Southbound		*5,727,561*	*8,624,316*	*51*	*391*	*5,855,313*	*8,816,680*	*52*	*400*	*5,855,313*	*8,816,680*	*52*	*400*	*5,855,313*	*8,816,680*	*52*	*400*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	434,357	654,036	4	30	434,357	654,036	4	30	434,357	654,036	4	30
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	40,333	60,732	0	3	40,333	60,732	0	3	40,333	60,732	0	3
Total Outer Harbor Zone1		—	—	—	—	*474,690*	*714,768*	*4*	*32*	*474,690*	*714,768*	*4*	*32*	*474,690*	*714,768*	*4*	*32*
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,593,299	2,399,122	14	109	1,085,892	1,635,089	10	74	1,085,892	1,635,089	10	74	1,085,892	1,635,089	10	74

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	100,833	151,831	1	7	100,833	151,831	1	7	100,833	151,831	1	7
Total Outer Harbor Zone2		*1,741,249*	*2,621,899*	*15*	*119*	*1,186,725*	*1,786,920*	*10*	*81*	*1,186,725*	*1,786,920*	*10*	*81*	*1,186,725*	*1,786,920*	*10*	*81*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,854,021	2,791,706	16	127	1,263,583	1,902,650	11	86	1,263,583	1,902,650	11	86	1,263,583	1,902,650	11	86
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	117,333	176,676	1	8	117,333	176,676	1	8	117,333	176,676	1	8
Total Inner Harbor Zone		*2,026,181*	*3,050,937*	*18*	*138*	*1,380,917*	*2,079,325*	*12*	*94*	*1,380,917*	*2,079,325*	*12*	*94*	*1,380,917*	*2,079,325*	*12*	*94*
Total Transit (Sea + Fairway + All Zones)	All	*76,307,599*	*114,900,721*	*673*	*5,215*	*77,200,497*	*116,245,208*	*681*	*5,276*	*77,200,497*	*116,245,208*	*681*	*5,276*	*77,200,497*	*116,245,208*	*681*	*5,276*
Hoteling	Diesel Engines	23,805,596	35,845,449	210	1,627	24,336,576	36,644,976	215	1,663	24,336,576	36,644,976	215	1,663	24,336,576	36,644,976	215	1,663
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226
Total Hoteling		*27,033,596*	*40,706,033*	*238*	*1,848*	*27,636,576*	*41,613,975*	*244*	*1,889*	*27,636,576*	*41,613,975*	*244*	*1,889*	*27,636,576*	*41,613,975*	*244*	*1,889*
Annual Total (lb/yr)		103,341,195	155,606,754	911	7,063	104,837,073	157,859,182	925	7,165	104,837,073	157,859,182	925	7,165	104,837,073	157,859,182	925	7,165
Annual Total (ton/yr)			77,803	0.5	3.5		78,930	0.5	3.6		78,930	0.5	3.6		78,930	0.5	3.6
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																	

Table D4-13. Derivation of GHG Emissions for Marine Vessels—Alternative 2 Unmitigated

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
State Boundary to SCAB Boundary	Diesel Engines	2,074,469	3,123,647	18	142	2,120,740	3,193,319	19	145	2,174,722	3,274,604	19	149	2,213,281	3,332,664	20	151
SCAB Boundary to Fairway—Northbound	Diesel Engines	638,298	961,122	6	44	652,535	982,560	6	45	669,145	1,007,570	6	46	681,010	1,025,435	6	47
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,712,767*	*4,084,769*	*24*	*185*	*2,773,275*	*4,175,879*	*24*	*190*	*2,843,868*	*4,282,174*	*25*	*194*	*2,894,291*	*4,358,099*	*26*	*198*
State Boundary to SCAB Boundary	Diesel Engines	28,540,842	42,975,579	252	1,951	29,177,440	43,934,142	257	1,994	29,920,139	45,052,466	264	2,045	30,450,638	45,851,268	269	2,081
SCAB Boundary to Fairway—Southbound	Diesel Engines	26,955,239	40,588,047	238	1,842	27,556,471	41,493,357	243	1,883	28,257,909	42,549,551	249	1,931	28,758,936	43,303,976	254	1,965
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*55,496,081*	*83,563,626*	*489*	*3,793*	*56,733,912*	*85,427,499*	*500*	*3,877*	*58,178,048*	*87,602,017*	*513*	*3,976*	*59,209,573*	*89,155,244*	*522*	*4,047*
Fairway—Northbound	Diesel Engines	473,223	712,559	4	32	483,778	728,452	4	33	496,092	746,995	4	34	504,888	760,239	4	35
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
Total in Fairway—Northbound		*473,223*	*712,559*	*4*	*32*	*483,778*	*728,452*	*4*	*33*	*496,092*	*746,995*	*4*	*34*	*504,888*	*760,239*	*4*	*35*
Fairway—Southbound	Diesel Engines	7,979,303	12,014,894	70	545	8,157,280	12,282,884	72	557	8,364,920	12,595,539	74	572	8,157,280	12,282,884	72	557
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,979,303*	*12,014,894*	*70*	*545*	*8,157,280*	*12,282,884*	*72*	*557*	*8,364,920*	*12,595,539*	*74*	*572*	*8,157,280*	*12,282,884*	*72*	*557*
Precautionary Zone—Northbound	Diesel Engines	141,464	213,010	1	10	144,619	217,761	1	10	148,300	223,304	1	10	150,930	227,264	1	10
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	10,242	15,422	0	1	10,424	15,696	0	1
Total Precautionary Zone—Northbound		*151,234*	*227,721*	*1*	*10*	*154,607*	*232,801*	*1*	*11*	*158,543*	*238,727*	*1*	*11*	*161,354*	*242,959*	*1*	*11*
Precautionary Zone—Southbound	Diesel Engines	5,357,550	8,067,169	47	366	5,477,049	8,247,106	48	374	5,616,465	8,457,033	50	384	5,716,048	8,606,980	50	391
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	387,892	584,072	3	27	394,770	594,427	3	27
Total Precautionary Zone—Southbound		*5,727,561*	*8,624,316*	*51*	*391*	*5,855,313*	*8,816,680*	*52*	*400*	*6,004,357*	*9,041,104*	*53*	*410*	*6,110,817*	*9,201,408*	*54*	*418*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	651,535	981,054	6	45	668,120	1,006,026	6	46	679,966	1,023,863	6	46
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	60,500	91,098	1	4	62,040	93,417	1	4	63,140	95,074	1	4
Total Outer Harbor Zone1		—	—	—	—	*712,035*	*1,072,152*	*6*	*49*	*730,160*	*1,099,443*	*6*	*50*	*743,106*	*1,118,937*	*7*	*51*
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,593,299	2,399,122	14	109	814,419	1,226,317	7	56	835,150	1,257,532	7	57	849,957	1,279,829	7	58
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	75,625	113,873	1	5	77,550	116,771	1	5	78,925	118,842	1	5
Total Outer Harbor Zone2		*1,741,249*	*2,621,899*	*15*	*119*	*890,044*	*1,340,190*	*8*	*61*	*912,700*	*1,374,304*	*8*	*62*	*928,882*	*1,398,671*	*8*	*63*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,854,021	2,791,706	16	127	947,687	1,426,987	8	65	971,810	1,463,310	9	66	989,041	1,489,256	9	68
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	88,000	132,507	1	6	90,240	135,880	1	6	91,840	138,289	1	6
Total Inner Harbor Zone		*2,026,181*	*3,050,937*	*18*	*138*	*1,035,687*	*1,559,494*	*9*	*71*	*1,062,050*	*1,599,190*	*9*	*73*	*1,080,881*	*1,627,544*	*10*	*74*
Total Transit (Sea + Fairway + All Zones)	All	*76,307,599*	*114,900,721*	*673*	*5,215*	*76,795,931*	*115,636,030*	*677*	*5,248*	*78,750,737*	*118,579,493*	*694*	*5,382*	*79,791,073*	*120,145,986*	*704*	*5,453*
Hoteling	Diesel Engines	23,805,596	35,845,449	210	1,627	24,336,576	36,644,976	215	1,663	24,956,052	37,577,757	220	1,706	25,398,536	38,244,029	224	1,736
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,384,000	5,095,483	30	231	3,444,000	5,185,828	30	235
Total Hoteling		*27,033,596*	*40,706,033*	*238*	*1,848*	*27,636,576*	*41,613,975*	*244*	*1,889*	*28,340,052*	*42,673,240*	*250*	*1,937*	*28,842,536*	*43,429,857*	*254*	*1,971*
Annual Total (lb/yr)		103,341,195	155,606,754	911	7,063	104,432,507	157,250,005	921	7,137	107,090,789	161,252,733	944	7,319	108,633,608	163,575,843	958	7,424
Annual Total (ton/yr)			77,803	0.5	3.5		78,625	0.5	3.6		80,626	0.5	3.7		81,788	0.5	3.7
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																	

Table D4-14. Derivation of GHG Emissions for Marine Vessels—Alternative 3 Unmitigated

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines	2,074,469	3,123,647	18	142	2,120,740	3,193,319	19	145	2,120,740	3,193,319	19	145	2,120,740	3,193,319	19	145
SCAB Boundary to Fairway—Northbound	Diesel Engines	638,298	961,122	6	44	652,535	982,560	6	45	652,535	982,560	6	45	652,535	982,560	6	45
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,712,767*	*4,084,769*	*24*	*185*	*2,773,275*	*4,175,879*	*24*	*190*	*2,773,275*	*4,175,879*	*24*	*190*	*2,773,275*	*4,175,879*	*24*	*190*
State Boundary to SCAB Boundary	Diesel Engines	28,540,842	42,975,579	252	1,951	29,177,440	43,934,142	257	1,994	29,177,440	43,934,142	257	1,994	29,177,440	43,934,142	257	1,994
SCAB Boundary to Fairway—Southbound	Diesel Engines	26,955,239	40,588,047	238	1,842	27,556,471	41,493,357	243	1,883	27,556,471	41,493,357	243	1,883	27,556,471	41,493,357	243	1,883
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*55,496,081*	*83,563,626*	*489*	*3,793*	*56,733,912*	*85,427,499*	*500*	*3,877*	*56,733,912*	*85,427,499*	*500*	*3,877*	*56,733,912*	*85,427,499*	*500*	*3,877*
Fairway—Northbound	Diesel Engines	473,223	712,559	4	32	483,778	728,452	4	33	483,778	728,452	4	33	483,778	728,452	4	33
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*473,223*	*712,559*	*4*	*32*	*483,778*	*728,452*	*4*	*33*	*483,778*	*728,452*	*4*	*33*	*483,778*	*728,452*	*4*	*33*
Fairway—Southbound	Diesel Engines	7,979,303	12,014,894	70	545	8,157,280	12,282,884	72	557	8,157,280	12,282,884	72	557	8,157,280	12,282,884	72	557
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,979,303*	*12,014,894*	*70*	*545*	*8,157,280*	*12,282,884*	*72*	*557*	*8,157,280*	*12,282,884*	*72*	*557*	*8,157,280*	*12,282,884*	*72*	*557*
Precautionary Zone—Northbound	Diesel Engines	141,464	213,010	1	10	144,619	217,761	1	10	144,619	217,761	1	10	144,619	217,761	1	10
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	9,988	15,039	0	1	9,988	15,039	0	1
Total Precautionary Zone—Northbound		*151,234*	*227,721*	*1*	*10*	*154,607*	*232,801*	*1*	*11*	*154,607*	*232,801*	*1*	*11*	*154,607*	*232,801*	*1*	*11*
Precautionary Zone—Southbound	Diesel Engines	5,357,550	8,067,169	47	366	5,477,049	8,247,106	48	374	5,477,049	8,247,106	48	374	5,477,049	8,247,106	48	374
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	378,264	569,573	3	26	378,264	569,573	3	26
Total Precautionary Zone—Southbound		*5,727,561*	*8,624,316*	*51*	*391*	*5,855,313*	*8,816,680*	*52*	*400*	*5,855,313*	*8,816,680*	*52*	*400*	*5,855,313*	*8,816,680*	*52*	*400*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	434,357	654,036	4	30	434,357	654,036	4	30	434,357	654,036	4	30
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	40,333	60,732	0	3	40,333	60,732	0	3	40,333	60,732	0	3
Total Outer Harbor Zone1		—	—	—	—	*474,690*	*714,768*	*4*	*32*	*474,690*	*714,768*	*4*	*32*	*474,690*	*714,768*	*4*	*32*
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,593,299	2,399,122	14	109	1,085,892	1,635,089	10	74	1,085,892	1,635,089	10	74	1,085,892	1,635,089	10	74

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	100,833	151,831	1	7	100,833	151,831	1	7	100,833	151,831	1	7
Total Outer Harbor Zone2		*1,741,249*	*2,621,899*	*15*	*119*	*1,186,725*	*1,786,920*	*10*	*81*	*1,186,725*	*1,786,920*	*10*	*81*	*1,186,725*	*1,786,920*	*10*	*81*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,854,021	2,791,706	16	127	1,263,583	1,902,650	11	86	1,263,583	1,902,650	11	86	1,263,583	1,902,650	11	86
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	117,333	176,676	1	8	117,333	176,676	1	8	117,333	176,676	1	8
Total Inner Harbor Zone		*2,026,181*	*3,050,937*	*18*	*138*	*1,380,917*	*2,079,325*	*12*	*94*	*1,380,917*	*2,079,325*	*12*	*94*	*1,380,917*	*2,079,325*	*12*	*94*
Total Transit (Sea + Fairway + All Zones)	All	*76,307,599*	*114,900,721*	*673*	*5,215*	*77,200,497*	*116,245,208*	*681*	*5,276*	*77,200,497*	*116,245,208*	*681*	*5,276*	*77,200,497*	*116,245,208*	*681*	*5,276*
Hoteling	Diesel Engines	23,805,596	35,845,449	210	1,627	24,336,576	36,644,976	215	1,663	24,336,576	36,644,976	215	1,663	24,336,576	36,644,976	215	1,663
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226
Total Hoteling		*27,033,596*	*40,706,033*	*238*	*1,848*	*27,636,576*	*41,613,975*	*244*	*1,889*	*27,636,576*	*41,613,975*	*244*	*1,889*	*27,636,576*	*41,613,975*	*244*	*1,889*
Annual Total (lb/yr)		103,341,195	155,606,754	911	7,063	104,837,073	157,859,182	925	7,165	104,837,073	157,859,182	925	7,165	104,837,073	157,859,182	925	7,165
Annual Total (ton/yr)			77,803	0.5	3.5		78,930	0.5	3.6		78,930	0.5	3.6		78,930	0.5	3.6
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																	

Table D4-15. Derivation of GHG Emissions for Marine Vessels—Alternative 4 Unmitigated

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines	1,921,704	2,893,619	17	131	1,964,567	2,958,161	17	134	1,964,567	2,958,161	17	134	1,964,567	2,958,161	17	134
SCAB Boundary to Fairway—Northbound	Diesel Engines	591,293	890,344	5	40	604,482	910,203	5	41	604,482	910,203	5	41	604,482	910,203	5	41
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,512,997*	*3,783,964*	*22*	*172*	*2,569,049*	*3,868,365*	*23*	*176*	*2,569,049*	*3,868,365*	*23*	*176*	*2,569,049*	*3,868,365*	*23*	*176*
State Boundary to SCAB Boundary	Diesel Engines	26,439,074	39,810,828	233	1,807	27,028,794	40,698,802	238	1,847	27,028,794	40,698,802	238	1,847	27,028,794	40,698,802	238	1,847
SCAB Boundary to Fairway—Southbound	Diesel Engines	24,970,237	37,599,115	220	1,707	25,527,194	38,437,757	225	1,745	25,527,194	38,437,757	225	1,745	25,527,194	38,437,757	225	1,745
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*51,409,311*	*77,409,943*	*453*	*3,513*	*52,555,987*	*79,136,559*	*463*	*3,592*	*52,555,987*	*79,136,559*	*463*	*3,592*	*52,555,987*	*79,136,559*	*463*	*3,592*
Fairway—Northbound	Diesel Engines	443,061	667,142	4	30	452,943	682,022	4	31	452,943	682,022	4	31	452,943	682,022	4	31

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*443,061*	*667,142*	*4*	*30*	*452,943*	*682,022*	*4*	*31*	*452,943*	*682,022*	*4*	*31*	*452,943*	*682,022*	*4*	*31*
Fairway—Southbound	Diesel Engines	7,470,723	11,249,095	66	511	7,637,356	11,500,004	67	522	7,637,356	11,500,004	67	522	7,637,356	11,500,004	67	522
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,470,723*	*11,249,095*	*66*	*511*	*7,637,356*	*11,500,004*	*67*	*522*	*7,637,356*	*11,500,004*	*67*	*522*	*7,637,356*	*11,500,004*	*67*	*522*
Precautionary Zone—Northbound	Diesel Engines	132,966	200,214	1	9	135,931	204,680	1	9	135,931	204,680	1	9	135,931	204,680	1	9
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	9,988	15,039	0	1	9,988	15,039	0	1
Total Precautionary Zone—Northbound		*142,736*	*214,925*	*1*	*10*	*145,919*	*219,719*	*1*	*10*	*145,919*	*219,719*	*1*	*10*	*145,919*	*219,719*	*1*	*10*
Precautionary Zone—Southbound	Diesel Engines	5,035,706	7,582,551	44	344	5,148,026	7,751,678	45	352	5,148,026	7,751,678	45	352	5,148,026	7,751,678	45	352
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	378,264	569,573	3	26	378,264	569,573	3	26
Total Precautionary Zone—Southbound		*5,405,717*	*8,139,697*	*48*	*369*	*5,526,290*	*8,321,251*	*49*	*378*	*5,526,290*	*8,321,251*	*49*	*378*	*5,526,290*	*8,321,251*	*49*	*378*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Outer Harbor Zone1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,518,611	2,286,659	13	104	1,552,483	2,337,662	14	106	1,552,483	2,337,662	14	106	1,552,483	2,337,662	14	106
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	151,250	227,746	1	10	151,250	227,746	1	10	151,250	227,746	1	10
Total Outer Harbor Zone2		*1,666,561*	*2,509,436*	*15*	*114*	*1,703,733*	*2,565,408*	*15*	*116*	*1,703,733*	*2,565,408*	*15*	*116*	*1,703,733*	*2,565,408*	*15*	*116*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,767,110	2,660,839	16	121	1,806,526	2,720,189	16	123	1,806,526	2,720,189	16	123	1,806,526	2,720,189	16	123
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	176,000	265,013	2	12	176,000	265,013	2	12	176,000	265,013	2	12
Total Inner Harbor Zone		*1,939,270*	*2,920,071*	*17*	*133*	*1,982,526*	*2,985,202*	*17*	*135*	*1,982,526*	*2,985,202*	*17*	*135*	*1,982,526*	*2,985,202*	*17*	*135*
Total Transit (Sea + Fairway + All Zones)	All	*70,990,375*	*106,894,272*	*626*	*4,852*	*72,573,804*	*109,278,531*	*640*	*4,960*	*72,573,804*	*109,278,531*	*640*	*4,960*	*72,573,804*	*109,278,531*	*640*	*4,960*
Hoteling	Diesel Engines	22,820,152	34,361,610	201	1,560	23,329,152	35,128,040	206	1,594	23,329,152	35,128,040	206	1,594	23,329,152	35,128,040	206	1,594
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226
Total Hoteling		*26,048,152*	*39,222,194*	*230*	*1,780*	*26,629,152*	*40,097,039*	*235*	*1,820*	*26,629,152*	*40,097,039*	*235*	*1,820*	*26,629,152*	*40,097,039*	*235*	*1,820*
Annual Total (lb/yr)		97,038,527	146,116,466	856	6,632	99,202,956	149,375,570	875	6,780	99,202,956	149,375,570	875	6,780	99,202,956	149,375,570	875	6,780
Annual Total (ton/yr)			73,058	0.4	3.3		74,688	0.4	3.4		74,688	0.4	3.4		74,688	0.4	3.4

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																	

Table D4-16. Derivation of GHG Emissions for Marine Vessels—Alternative 5 Unmitigated

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines	1,921,704	2,893,619	17	131	1,964,567	2,958,161	17	134	1,964,567	2,958,161	17	134	1,964,567	2,958,161	17	134
SCAB Boundary to Fairway—Northbound	Diesel Engines	591,293	890,344	5	40	604,482	910,203	5	41	604,482	910,203	5	41	604,482	910,203	5	41
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,512,997*	*3,783,964*	*22*	*172*	*2,569,049*	*3,868,365*	*23*	*176*	*2,569,049*	*3,868,365*	*23*	*176*	*2,569,049*	*3,868,365*	*23*	*176*
State Boundary to SCAB Boundary	Diesel Engines	26,439,074	39,810,828	233	1,807	27,028,794	40,698,802	238	1,847	27,028,794	40,698,802	238	1,847	27,028,794	40,698,802	238	1,847
SCAB Boundary to Fairway—Southbound	Diesel Engines	24,970,237	37,599,115	220	1,707	25,527,194	38,437,757	225	1,745	25,527,194	38,437,757	225	1,745	25,527,194	38,437,757	225	1,745
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*51,409,311*	*77,409,943*	*453*	*3,513*	*52,555,987*	*79,136,559*	*463*	*3,592*	*52,555,987*	*79,136,559*	*463*	*3,592*	*52,555,987*	*79,136,559*	*463*	*3,592*
Fairway—Northbound	Diesel Engines	443,061	667,142	4	30	452,943	682,022	4	31	452,943	682,022	4	31	452,943	682,022	4	31
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*443,061*	*667,142*	*4*	*30*	*452,943*	*682,022*	*4*	*31*	*452,943*	*682,022*	*4*	*31*	*452,943*	*682,022*	*4*	*31*
Fairway—Southbound	Diesel Engines	7,470,723	11,249,095	66	511	7,637,356	11,500,004	67	522	7,637,356	11,500,004	67	522	7,637,356	11,500,004	67	522
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,470,723*	*11,249,095*	*66*	*511*	*7,637,356*	*11,500,004*	*67*	*522*	*7,637,356*	*11,500,004*	*67*	*522*	*7,637,356*	*11,500,004*	*67*	*522*
Precautionary Zone—Northbound	Diesel Engines	132,966	200,214	1	9	135,931	204,680	1	9	135,931	204,680	1	9	135,931	204,680	1	9
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	9,988	15,039	0	1	9,988	15,039	0	1
Total Precautionary Zone—Northbound		*142,736*	*214,925*	*1*	*10*	*145,919*	*219,719*	*1*	*10*	*145,919*	*219,719*	*1*	*10*	*145,919*	*219,719*	*1*	*10*
Precautionary Zone—Southbound	Diesel Engines	5,035,706	7,582,551	44	344	5,148,026	7,751,678	45	352	5,148,026	7,751,678	45	352	5,148,026	7,751,678	45	352
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	378,264	569,573	3	26	378,264	569,573	3	26
Total Precautionary Zone—Southbound		*5,405,717*	*8,139,697*	*48*	*369*	*5,526,290*	*8,321,251*	*49*	*378*	*5,526,290*	*8,321,251*	*49*	*378*	*5,526,290*	*8,321,251*	*49*	*378*
Outer Harbor Zone1 (vessels bound to outer	Diesel	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
harbor berths)[5]	Engines																
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Outer Harbor Zone1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,518,611	2,286,659	13	104	1,552,483	2,337,662	14	106	1,552,483	2,337,662	14	106	1,552,483	2,337,662	14	106
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	151,250	227,746	1	10	151,250	227,746	1	10	151,250	227,746	1	10
Total Outer Harbor Zone2		*1,666,561*	*2,509,436*	*15*	*114*	*1,703,733*	*2,565,408*	*15*	*116*	*1,703,733*	*2,565,408*	*15*	*116*	*1,703,733*	*2,565,408*	*15*	*116*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,767,110	2,660,839	16	121	1,806,526	2,720,189	16	123	1,806,526	2,720,189	16	123	1,806,526	2,720,189	16	123
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	176,000	265,013	2	12	176,000	265,013	2	12	176,000	265,013	2	12
Total Inner Harbor Zone		*1,939,270*	*2,920,071*	*17*	*133*	*1,982,526*	*2,985,202*	*17*	*135*	*1,982,526*	*2,985,202*	*17*	*135*	*1,982,526*	*2,985,202*	*17*	*135*
Total Transit (Sea + Fairway + All Zones)	All	*70,990,375*	*106,894,272*	*626*	*4,852*	*72,573,804*	*109,278,531*	*640*	*4,960*	*72,573,804*	*109,278,531*	*640*	*4,960*	*72,573,804*	*109,278,531*	*640*	*4,960*
Hoteling	Diesel Engines	22,820,152	34,361,610	201	1,560	23,329,152	35,128,040	206	1,594	23,329,152	35,128,040	206	1,594	23,329,152	35,128,040	206	1,594
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226
Total Hoteling		*26,048,152*	*39,222,194*	*230*	*1,780*	*26,629,152*	*40,097,039*	*235*	*1,820*	*26,629,152*	*40,097,039*	*235*	*1,820*	*26,629,152*	*40,097,039*	*235*	*1,820*
Annual Total (lb/yr)		97,038,527	146,116,466	856	6,632	99,202,956	149,375,570	875	6,780	99,202,956	149,375,570	875	6,780	99,202,956	149,375,570	875	6,780
Annual Total (ton/yr)			73,058	0.4	3.3		74,688	0.4	3.4		74,688	0.4	3.4		74,688	0.4	3.4
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																	

Table D4-17. Derivation of GHG Emissions for Marine Vessels—Alternative 6

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines	1,921,704	2,893,619	17	131	1,964,567	2,958,161	17	134	1,964,567	2,958,161	17	134	1,964,567	2,958,161	17	134
SCAB Boundary to Fairway—Northbound	Diesel Engines	591,293	890,344	5	40	604,482	910,203	5	41	604,482	910,203	5	41	604,482	910,203	5	41
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*2,512,997*	*3,783,964*	*22*	*172*	*2,569,049*	*3,868,365*	*23*	*176*	*2,569,049*	*3,868,365*	*23*	*176*	*2,569,049*	*3,868,365*	*23*	*176*
State Boundary to SCAB Boundary	Diesel Engines	26,439,074	39,810,828	233	1,807	27,028,794	40,698,802	238	1,847	27,028,794	40,698,802	238	1,847	27,028,794	40,698,802	238	1,847
SCAB Boundary to Fairway—Southbound	Diesel	24,970,237	37,599,115	220	1,707	25,527,194	38,437,757	225	1,745	25,527,194	38,437,757	225	1,745	25,527,194	38,437,757	225	1,745

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
	Engines																
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*51,409,311*	*77,409,943*	*453*	*3,513*	*52,555,987*	*79,136,559*	*463*	*3,592*	*52,555,987*	*79,136,559*	*463*	*3,592*	*52,555,987*	*79,136,559*	*463*	*3,592*
Fairway—Northbound	Diesel Engines	443,061	667,142	4	30	452,943	682,022	4	31	452,943	682,022	4	31	452,943	682,022	4	31
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*443,061*	*667,142*	*4*	*30*	*452,943*	*682,022*	*4*	*31*	*452,943*	*682,022*	*4*	*31*	*452,943*	*682,022*	*4*	*31*
Fairway—Southbound	Diesel Engines	7,470,723	11,249,095	66	511	7,637,356	11,500,004	67	522	7,637,356	11,500,004	67	522	7,637,356	11,500,004	67	522
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*7,470,723*	*11,249,095*	*66*	*511*	*7,637,356*	*11,500,004*	*67*	*522*	*7,637,356*	*11,500,004*	*67*	*522*	*7,637,356*	*11,500,004*	*67*	*522*
Precautionary Zone—Northbound	Diesel Engines	132,966	200,214	1	9	135,931	204,680	1	9	135,931	204,680	1	9	135,931	204,680	1	9
Precautionary Zone—Northbound	Boiler	9,770	14,711	0	1	9,988	15,039	0	1	9,988	15,039	0	1	9,988	15,039	0	1
Total Precautionary Zone—Northbound		*142,736*	*214,925*	*1*	*10*	*145,919*	*219,719*	*1*	*10*	*145,919*	*219,719*	*1*	*10*	*145,919*	*219,719*	*1*	*10*
Precautionary Zone—Southbound	Diesel Engines	5,035,706	7,582,551	44	344	5,148,026	7,751,678	45	352	5,148,026	7,751,678	45	352	5,148,026	7,751,678	45	352
Precautionary Zone—Southbound	Boiler	370,011	557,146	3	25	378,264	569,573	3	26	378,264	569,573	3	26	378,264	569,573	3	26
Total Precautionary Zone—Southbound		*5,405,717*	*8,139,697*	*48*	*369*	*5,526,290*	*8,321,251*	*49*	*378*	*5,526,290*	*8,321,251*	*49*	*378*	*5,526,290*	*8,321,251*	*49*	*378*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Outer Harbor Zone1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,518,611	2,286,659	13	104	1,552,483	2,337,662	14	106	1,552,483	2,337,662	14	106	1,552,483	2,337,662	14	106
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	147,950	222,777	1	10	151,250	227,746	1	10	151,250	227,746	1	10	151,250	227,746	1	10
Total Outer Harbor Zone2		*1,666,561*	*2,509,436*	*15*	*114*	*1,703,733*	*2,565,408*	*15*	*116*	*1,703,733*	*2,565,408*	*15*	*116*	*1,703,733*	*2,565,408*	*15*	*116*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,767,110	2,660,839	16	121	1,806,526	2,720,189	16	123	1,806,526	2,720,189	16	123	1,806,526	2,720,189	16	123
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	172,160	259,231	2	12	176,000	265,013	2	12	176,000	265,013	2	12	176,000	265,013	2	12
Total Inner Harbor Zone		*1,939,270*	*2,920,071*	*17*	*133*	*1,982,526*	*2,985,202*	*17*	*135*	*1,982,526*	*2,985,202*	*17*	*135*	*1,982,526*	*2,985,202*	*17*	*135*
Total Transit (Sea + Fairway + All Zones)	All	*70,990,375*	*106,894,272*	*626*	*4,852*	*72,573,804*	*109,278,531*	*640*	*4,960*	*72,573,804*	*109,278,531*	*640*	*4,960*	*72,573,804*	*109,278,531*	*640*	*4,960*
Hoteling	Diesel Engines	22,820,152	34,361,610	201	1,560	23,329,152	35,128,040	206	1,594	23,329,152	35,128,040	206	1,594	23,329,152	35,128,040	206	1,594

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Hoteling	Boiler	3,228,000	4,860,584	28	221	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226	3,300,000	4,968,999	29	226
Total Hoteling		*26,048,152*	*39,222,194*	*230*	*1,780*	*26,629,152*	*40,097,039*	*235*	*1,820*	*26,629,152*	*40,097,039*	*235*	*1,820*	*26,629,152*	*40,097,039*	*235*	*1,820*
Annual Total (lb/yr)		97,038,527	146,116,466	856	6,632	99,202,956	149,375,570	875	6,780	99,202,956	149,375,570	875	6,780	99,202,956	149,375,570	875	6,780
Annual Total (ton/yr)			73,058	0.4	3.3		74,688	0.4	3.4		74,688	0.4	3.4		74,688	0.4	3.4
Emissions = (Engine Power * Load Factor * Time * 2 (1-Way) Trips * Vessels per Year = Activity) * Emission Factor.																	

Table D4-18. Derivation of GHG Emissions for Marine Vessels—Proposed Project with Mitigation

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines		3,123,647	18	142		3,193,319	19	145		3,274,604	19	149		3,274,604	19	149
SCAB Boundary to Fairway—Northbound	Diesel Engines	450,708	678,657	4	31	350,943	678,657	4	31	359,876	678,657	4	31	366,256	678,657	4	31
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*450,708*	*3,802,304*	*22*	*173*	*350,943*	*3,871,977*	*23*	*176*	*359,876*	*3,953,261*	*23*	*179*	*366,256*	*3,953,261*	*23*	*179*
State Boundary to SCAB Boundary	Diesel Engines		42,975,579	252	1,951		43,934,142	257	1,994		45,052,466	264	2,045		45,851,268	269	2,081
SCAB Boundary to Fairway—Southbound	Diesel Engines	19,033,349	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301	15,197,493	28,659,604	168	1,301	15,466,952	28,659,604	168	1,301
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*19,033,349*	*71,635,183*	*420*	*3,251*	*14,820,250*	*72,593,746*	*425*	*3,295*	*15,197,493*	*73,712,070*	*432*	*3,346*	*15,466,952*	*74,510,872*	*436*	*3,382*
Fairway—Northbound	Diesel Engines	296,969	447,164	3	20	420,360	447,164	3	20	431,060	447,164	3	20	438,703	447,164	3	20
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*296,969*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*	*431,060*	*447,164*	*3*	*20*	*438,703*	*447,164*	*3*	*20*
Fairway—Southbound	Diesel Engines	5,007,383	7,539,904	44	342	7,087,946	7,539,904	44	342	7,268,366	7,539,904	44	342	7,397,238	7,539,904	44	342
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*5,007,383*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*	*7,268,366*	*7,539,904*	*44*	*342*	*7,397,238*	*7,539,904*	*44*	*342*
Precautionary Zone—Northbound	Diesel Engines	102,168	153,841	1	7	144,619	153,841	1	7	148,300	153,841	1	7	150,930	153,841	1	7
Precautionary Zone—Northbound	Boiler	7,056	10,625	0	0	9,988	10,625	0	0	10,242	10,625	0	0	10,424	10,625	0	0
Total Precautionary Zone—Northbound		*109,224*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*	*158,543*	*164,465*	*1*	*7*	*161,354*	*164,465*	*1*	*7*
Precautionary Zone—Southbound	Diesel Engines	3,869,342	5,826,289	34	264	5,477,049	5,826,289	34	264	5,616,465	5,826,289	34	264	5,716,048	5,826,289	34	264
Precautionary Zone—Southbound	Boiler	267,230	402,383	2	18	378,264	402,383	2	18	387,892	402,383	2	18	394,770	402,383	2	18
Total Precautionary Zone—Southbound		*4,136,571*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*	*6,004,357*	*6,228,673*	*36*	*283*	*6,110,817*	*6,228,673*	*36*	*283*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	651,535	—	—	—	668,120	—	—	—	679,966	—	—	—
Outer Harbor Zone1 (vessels bound to outer	Boiler	—	—	—	—	60,500	—	—	—	62,040	—	—	—	63,140	—	—	—

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
harbor berths)[5]																	
Total Outer Harbor Zone1		—	—	—	—	*712,035*	—	—	—	*730,160*	—	—	—	*743,106*	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,150,716	1,732,699	10	79	814,419	1,732,699	10	79	835,150	1,732,699	10	79	849,957	1,732,699	10	79
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	106,853	160,894	1	7	75,625	160,894	1	7	77,550	160,894	1	7	78,925	160,894	1	7
Total Outer Harbor Zone2		*1,257,569*	*1,893,594*	*11*	*86*	*890,044*	*1,893,594*	*11*	*86*	*912,700*	*1,893,594*	*11*	*86*	*928,882*	*1,893,594*	*11*	*86*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,339,015	2,016,232	12	92	947,687	2,016,232	12	92	971,810	2,016,232	12	92	989,041	2,016,232	12	92
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	124,338	187,223	1	8	88,000	187,223	1	8	90,240	187,223	1	8	91,840	187,223	1	8
Total Inner Harbor Zone		*1,463,353*	*2,203,454*	*13*	*100*	*1,035,687*	*2,203,454*	*13*	*100*	*1,062,050*	*2,203,454*	*13*	*100*	*1,080,881*	*2,203,454*	*13*	*100*
Total Transit (Sea + Fairway + All Zones)	All	*31,755,128*	*93,914,741*	*550*	*4,263*	*31,327,185*	*94,942,976*	*556*	*4,309*	*32,124,604*	*96,142,584*	*563*	*4,364*	*32,694,189*	*96,941,387*	*568*	*4,400*
Hoteling (with AMP applied)	Diesel Engines	12,464,875	18,769,075	110	852	4,593,529	18,769,075	110	852	4,710,455	18,769,075	110	852	4,793,974	18,769,075	110	852
Hoteling	Boiler	2,331,333	3,510,422	21	159	3,300,000	3,510,422	21	159	3,384,000	3,510,422	21	159	3,444,000	3,510,422	21	159
Total Hoteling		*14,796,208*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*	*8,094,455*	*22,279,497*	*130*	*1,011*	*8,237,974*	*22,279,497*	*130*	*1,011*
Annual Total OGVs (lb/yr)		46,551,336	116,194,238	680	5,274	39,220,713	117,222,474	687	5,320	40,219,059	118,422,082	694	5,375	40,932,163	119,220,884	698	5,411
Annual Total OGVs (ton/yr)			58,097	0.3	2.6		58,611	0.3	2.7		59,211	0.3	2.7		59,610	0.3	2.7
AMP hoteling eff. emis. reduction (%)	Diesel Engines hoteling only	28%				73%				73%				73%			
AMP activity (kWh/yr) & emissions (lb/yr)	Electric Power Generation	4,728,056	8,386,186	70	39	12,632,204	22,405,830	187	103	12,953,751	22,976,160	191	106	13,183,427	23,383,539	195	108
Annual Total OGVs+AMP (lb/yr)			124,580,424	750	5,312		139,628,303	873	5,424		141,398,242	885	5,481		142,604,423	893	5,519
Annual Total OGVs+AMP (ton/yr)			62,290	0.4	2.7		69,814	0.4	2.7		70,699	0.4	2.7		71,302	0.4	2.8

Activity (kWh/yr) = Average Engine Power * Load Factor$_{(VSR\ corrected)}$ * Fuel Corrected Emission Factor * Time$_{(VSR\ corrected)}$ * 2 $_{(1\text{-}Way)}$ Trips * Vessels per Year

Underway Emissions = Activity * Emission Factor. Activity and emission factors obtained from linked file.

Hoteling Emissions (lb/yr) = Emissions (lb/yr) for 1-way trip * (100%—AMP effective reduction %) * Vessels per Year

Electric Power Generation Emissions (lb/yr) = Hoteling Activity Foregone with AMP (kWh/yr) * Power Plant Emission Factor

Table D4-19. Derivation of GHG Emissions for Marine Vessels—Alternative 1 Mitigated

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines		3,123,647	18	142		3,193,319	19	145		3,193,319	19	145		3,193,319	19	145
SCAB Boundary to Fairway—Northbound	Diesel Engines	450,708	678,657	4	31	350,943	678,657	4	31	350,943	678,657	4	31	350,943	678,657	4	31

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*450,708*	*3,802,304*	*22*	*173*	*350,943*	*3,871,977*	*23*	*176*	*350,943*	*3,871,977*	*23*	*176*	*350,943*	*3,871,977*	*23*	*176*
State Boundary to SCAB Boundary	Diesel Engines		42,975,579	252	1,951		43,934,142	257	1,994		43,934,142	257	1,994		43,934,142	257	1,994
SCAB Boundary to Fairway—Southbound	Diesel Engines	19,033,349	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*19,033,349*	*71,635,183*	*420*	*3,251*	*14,820,250*	*72,593,746*	*425*	*3,295*	*14,820,250*	*72,593,746*	*425*	*3,295*	*14,820,250*	*72,593,746*	*425*	*3,295*
Fairway—Northbound	Diesel Engines	296,969	447,164	3	20	420,360	447,164	3	20	420,360	447,164	3	20	420,360	447,164	3	20
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*296,969*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*
Fairway—Southbound	Diesel Engines	5,007,383	7,539,904	44	342	7,087,946	7,539,904	44	342	7,087,946	7,539,904	44	342	7,087,946	7,539,904	44	342
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*5,007,383*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*
Precautionary Zone—Northbound	Diesel Engines	102,168	153,841	1	7	144,619	153,841	1	7	144,619	153,841	1	7	144,619	153,841	1	7
Precautionary Zone—Northbound	Boiler	7,056	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0
Total Precautionary Zone—Northbound		*109,224*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*
Precautionary Zone—Southbound	Diesel Engines	3,869,342	5,826,289	34	264	5,477,049	5,826,289	34	264	5,477,049	5,826,289	34	264	5,477,049	5,826,289	34	264
Precautionary Zone—Southbound	Boiler	267,230	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18
Total Precautionary Zone—Southbound		*4,136,571*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	434,357	—	—	—	434,357	—	—	—	434,357	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	40,333	—	—	—	40,333	—	—	—	40,333	—	—	—
Total Outer Harbor Zone1		—	—	—	—	*474,690*	—	—	—	*474,690*	—	—	—	*474,690*	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,150,716	1,732,699	10	79	1,085,892	1,732,699	10	79	1,085,892	1,732,699	10	79	1,085,892	1,732,699	10	79
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	106,853	160,894	1	7	100,833	160,894	1	7	100,833	160,894	1	7	100,833	160,894	1	7
Total Outer Harbor Zone2		*1,257,569*	*1,893,594*	*11*	*86*	*1,186,725*	*1,893,594*	*11*	*86*	*1,186,725*	*1,893,594*	*11*	*86*	*1,186,725*	*1,893,594*	*11*	*86*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,339,015	2,016,232	12	92	1,263,583	2,016,232	12	92	1,263,583	2,016,232	12	92	1,263,583	2,016,232	12	92
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	124,338	187,223	1	8	117,333	187,223	1	8	117,333	187,223	1	8	117,333	187,223	1	8
Total Inner Harbor Zone		*1,463,353*	*2,203,454*	*13*	*100*	*1,380,917*	*2,203,454*	*13*	*100*	*1,380,917*	*2,203,454*	*13*	*100*	*1,380,917*	*2,203,454*	*13*	*100*
Total Transit (Sea + Fairway + All Zones)	All	*31,755,128*	*93,914,741*	*550*	*4,263*	*31,731,750*	*94,942,976*	*556*	*4,309*	*31,731,750*	*94,942,976*	*556*	*4,309*	*31,731,750*	*94,942,976*	*556*	*4,309*
Hoteling (with AMP applied)	Diesel Engines	12,464,875	18,769,075	110	852	4,593,529	18,769,075	110	852	4,593,529	18,769,075	110	852	4,593,529	18,769,075	110	852

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
Hoteling	Boiler	2,331,333	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159
Total Hoteling		*14,796,208*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*
Annual Total OGVs (lb/yr)		46,551,336	116,194,238	680	5,274	39,625,279	117,222,474	687	5,320	39,625,279	117,222,474	687	5,320	39,625,279	117,222,474	687	5,320
Annual Total OGVs (ton/yr)			58,097	0.3	2.6		58,611	0.3	2.7		58,611	0.3	2.7		58,611	0.3	2.7
AMP hoteling eff. emis. reduction (%)	Diesel Engines hoteling only	28%				73%				73%				73%			
AMP activity (kWh/yr) & emissions (lb/yr)	Electric Power Generation	4,728,056	8,386,186	70	39	12,632,204	22,405,830	187	103	12,632,204	22,405,830	187	103	12,632,204	22,405,830	187	103
Annual Total OGVs+AMP (lb/yr)			124,580,424	750	5,312		139,628,303	873	5,424		139,628,303	873	5,424		139,628,303	873	5,424
Annual Total OGVs+AMP (ton/yr)			62,290	0.4	2.7		69,814	0.4	2.7		69,814	0.4	2.7		69,814	0.4	2.7

Activity (kWh/yr) = Average Engine Power * Load Factor$_{(VSR\ corrected)}$ * Fuel Corrected Emission Factor * Time$_{(VSR\ corrected)}$ * 2 $_{(1\text{-}Way)}$ Trips * Vessels per Year

Underway Emissions = Activity * Emission Factor. Activity and emission factors obtained from linked file.

Hoteling Emissions (lb/yr) = Emissions (lb/yr) for 1-way trip * (100%—AMP effective reduction %) * Vessels per Year

Electric Power Generation Emissions (lb/yr) = Hoteling Activity Foregone with AMP (kWh/yr) * Power Plant Emission Factor

Table D4-20. Derivation of GHG Emissions for Marine Vessels—Alternative 2 Mitigated

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
State Boundary to SCAB Boundary	Diesel Engines		3,123,647	18	142		3,193,319	19	145		3,274,604	19	149		3,332,664	20	151
SCAB Boundary to Fairway—Northbound	Diesel Engines	450,708	678,657	4	31	350,943	678,657	4	31	359,876	678,657	4	31	366,256	678,657	4	31
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*450,708*	*3,802,304*	*22*	*173*	*350,943*	*3,871,977*	*23*	*176*	*359,876*	*3,953,261*	*23*	*179*	*366,256*	*4,011,322*	*23*	*182*
State Boundary to SCAB Boundary	Diesel Engines		42,975,579	252	1,951		43,934,142	257	1,994		45,052,466	264	2,045		45,851,268	269	2,081
SCAB Boundary to Fairway—Southbound	Diesel Engines	19,033,349	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301	15,197,493	28,659,604	168	1,301	15,466,952	28,659,604	168	1,301
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*19,033,349*	*71,635,183*	*420*	*3,251*	*14,820,250*	*72,593,746*	*425*	*3,295*	*15,197,493*	*73,712,070*	*432*	*3,346*	*15,466,952*	*74,510,872*	*436*	*3,382*
Fairway—Northbound	Diesel Engines	296,969	447,164	3	20	420,360	447,164	3	20	431,060	447,164	3	20	438,703	447,164	3	20
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*296,969*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*	*431,060*	*447,164*	*3*	*20*	*438,703*	*447,164*	*3*	*20*
Fairway—Southbound	Diesel Engines	5,007,383	7,539,904	44	342	7,087,946	7,539,904	44	342	7,268,366	7,539,904	44	342	7,397,238	7,539,904	44	342
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Total in Fairway—Southbound		*5,007,383*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*	*7,268,366*	*7,539,904*	*44*	*342*	*7,397,238*	*7,539,904*	*44*	*342*
Precautionary Zone—Northbound	Diesel Engines	102,168	153,841	1	7	144,619	153,841	1	7	148,300	153,841	1	7	150,930	153,841	1	7
Precautionary Zone—Northbound	Boiler	7,056	10,625	0	0	9,988	10,625	0	0	10,242	10,625	0	0	10,424	10,625	0	0
Total Precautionary Zone—Northbound		*109,224*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*	*158,543*	*164,465*	*1*	*7*	*161,354*	*164,465*	*1*	*7*
Precautionary Zone—Southbound	Diesel Engines	3,869,342	5,826,289	34	264	5,477,049	5,826,289	34	264	5,616,465	5,826,289	34	264	5,716,048	5,826,289	34	264
Precautionary Zone—Southbound	Boiler	267,230	402,383	2	18	378,264	402,383	2	18	387,892	402,383	2	18	394,770	402,383	2	18
Total Precautionary Zone—Southbound		*4,136,571*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*	*6,004,357*	*6,228,673*	*36*	*283*	*6,110,817*	*6,228,673*	*36*	*283*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	651,535	—	—	—	668,120	—	—	—	679,966	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	60,500	—	—	—	62,040	—	—	—	63,140	—	—	—
Total Outer Harbor Zone1		—	—	—	—	*712,035*	—	—	—	*730,160*	—	—	—	*743,106*	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,150,716	1,732,699	10	79	814,419	1,732,699	10	79	835,150	1,732,699	10	79	849,957	1,732,699	10	79
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	106,853	160,894	1	7	75,625	160,894	1	7	77,550	160,894	1	7	78,925	160,894	1	7
Total Outer Harbor Zone2		*1,257,569*	*1,893,594*	*11*	*86*	*890,044*	*1,893,594*	*11*	*86*	*912,700*	*1,893,594*	*11*	*86*	*928,882*	*1,893,594*	*11*	*86*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,339,015	2,016,232	12	92	947,687	2,016,232	12	92	971,810	2,016,232	12	92	989,041	2,016,232	12	92
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	124,338	187,223	1	8	88,000	187,223	1	8	90,240	187,223	1	8	91,840	187,223	1	8
Total Inner Harbor Zone		*1,463,353*	*2,203,454*	*13*	*100*	*1,035,687*	*2,203,454*	*13*	*100*	*1,062,050*	*2,203,454*	*13*	*100*	*1,080,881*	*2,203,454*	*13*	*100*
Total Transit (Sea + Fairway + All Zones)	All	*31,755,128*	*93,914,741*	*550*	*4,263*	*31,327,185*	*94,942,976*	*556*	*4,309*	*32,124,604*	*96,142,584*	*563*	*4,364*	*32,694,189*	*96,999,447*	*568*	*4,403*
Hoteling (with AMP applied)	Diesel Engines	12,464,875	18,769,075	110	852	4,593,529	18,769,075	110	852	4,710,455	18,769,075	110	852	4,793,974	18,769,075	110	852
Hoteling	Boiler	2,331,333	3,510,422	21	159	3,300,000	3,510,422	21	159	3,384,000	3,510,422	21	159	3,444,000	3,510,422	21	159
Total Hoteling		*14,796,208*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*	*8,094,455*	*22,279,497*	*130*	*1,011*	*8,237,974*	*22,279,497*	*130*	*1,011*
Annual Total OGVs (lb/yr)		46,551,336	116,194,238	680	5,274	39,220,713	117,222,474	687	5,320	40,219,059	118,422,082	694	5,375	40,932,163	119,278,945	699	5,414
Annual Total OGVs (ton/yr)			58,097	0.3	2.6		58,611	0.3	2.7		59,211	0.3	2.7		59,639	0.3	2.7
AMP hoteling eff. emis. reduction (%)	Diesel Engines hoteling only	28%				73%				73%				73%			
AMP activity (kWh/yr) & emissions (lb/yr)	Electric Power Generation	4,728,056	8,386,186	70	39	12,632,204	22,405,830	187	103	12,953,751	22,976,160	191	106	13,183,427	23,383,539	195	108
Annual Total OGVs+AMP (lb/yr)			124,580,424	750	5,312		139,628,303	873	5,424		141,398,242	885	5,481		142,662,483	893	5,521
Annual Total OGVs+AMP (ton/yr)			62,290	0.4	2.7		69,814	0.4	2.7		70,699	0.4	2.7		71,331	0.4	2.8

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Activity (kWh/yr) = Average Engine Power * Load Factor$_{(VSR\ corrected)}$ * Fuel Corrected Emission Factor * Time$_{(VSR\ corrected)}$ * 2 $_{(1\text{-}Way)}$ Trips * Vessels per Year																	
Underway Emissions = Activity * Emission Factor. Activity and emission factors obtained from linked file.																	
Hoteling Emissions (lb/yr) = Emissions (lb/yr) for 1-way trip * (100%—AMP effective reduction %) * Vessels per Year																	
Electric Power Generation Emissions (lb/yr) = Hoteling Activity Foregone with AMP (kWh/yr) * Power Plant Emission Factor																	

Table D4-21. Derivation of GHG Emissions for Marine Vessels—Alternative 3 Mitigated

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines		3,123,647	18	142		3,193,319	19	145		3,193,319	19	145		3,193,319	19	145
SCAB Boundary to Fairway—Northbound	Diesel Engines	450,708	678,657	4	31	350,943	678,657	4	31	350,943	678,657	4	31	350,943	678,657	4	31
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*450,708*	*3,802,304*	*22*	*173*	*350,943*	*3,871,977*	*23*	*176*	*350,943*	*3,871,977*	*23*	*176*	*350,943*	*3,871,977*	*23*	*176*
State Boundary to SCAB Boundary	Diesel Engines		42,975,579	252	1,951		43,934,142	257	1,994		43,934,142	257	1,994		43,934,142	257	1,994
SCAB Boundary to Fairway—Southbound	Diesel Engines	19,033,349	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301	14,820,250	28,659,604	168	1,301
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*19,033,349*	*71,635,183*	*420*	*3,251*	*14,820,250*	*72,593,746*	*425*	*3,295*	*14,820,250*	*72,593,746*	*425*	*3,295*	*14,820,250*	*72,593,746*	*425*	*3,295*
Fairway—Northbound	Diesel Engines	296,969	447,164	3	20	420,360	447,164	3	20	420,360	447,164	3	20	420,360	447,164	3	20
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*296,969*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*	*420,360*	*447,164*	*3*	*20*
Fairway—Southbound	Diesel Engines	5,007,383	7,539,904	44	342	7,087,946	7,539,904	44	342	7,087,946	7,539,904	44	342	7,087,946	7,539,904	44	342
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*5,007,383*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*	*7,087,946*	*7,539,904*	*44*	*342*
Precautionary Zone—Northbound	Diesel Engines	102,168	153,841	1	7	144,619	153,841	1	7	144,619	153,841	1	7	144,619	153,841	1	7
Precautionary Zone—Northbound	Boiler	7,056	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0
Total Precautionary Zone—Northbound		*109,224*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*	*154,607*	*164,465*	*1*	*7*
Precautionary Zone—Southbound	Diesel Engines	3,869,342	5,826,289	34	264	5,477,049	5,826,289	34	264	5,477,049	5,826,289	34	264	5,477,049	5,826,289	34	264
Precautionary Zone—Southbound	Boiler	267,230	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18
Total Precautionary Zone—Southbound		*4,136,571*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*	*5,855,313*	*6,228,673*	*36*	*283*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[(5)]	Diesel Engines	—	—	—	—	434,357	—	—	—	434,357	—	—	—	434,357	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[(5)]	Boiler	—	—	—	—	40,333	—	—	—	40,333	—	—	—	40,333	—	—	—

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Total Outer Harbor Zone1		—	—	—	—	*474,690*	—	—	—	*474,690*	—	—	—	*474,690*	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,150,716	1,732,699	10	79	1,085,892	1,732,699	10	79	1,085,892	1,732,699	10	79	1,085,892	1,732,699	10	79
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	106,853	160,894	1	7	100,833	160,894	1	7	100,833	160,894	1	7	100,833	160,894	1	7
Total Outer Harbor Zone2		*1,257,569*	*1,893,594*	*11*	*86*	*1,186,725*	*1,893,594*	*11*	*86*	*1,186,725*	*1,893,594*	*11*	*86*	*1,186,725*	*1,893,594*	*11*	*86*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,339,015	2,016,232	12	92	1,263,583	2,016,232	12	92	1,263,583	2,016,232	12	92	1,263,583	2,016,232	12	92
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	124,338	187,223	1	8	117,333	187,223	1	8	117,333	187,223	1	8	117,333	187,223	1	8
Total Inner Harbor Zone		*1,463,353*	*2,203,454*	*13*	*100*	*1,380,917*	*2,203,454*	*13*	*100*	*1,380,917*	*2,203,454*	*13*	*100*	*1,380,917*	*2,203,454*	*13*	*100*
Total Transit (Sea + Fairway + All Zones)	All	*31,755,128*	*93,914,741*	*550*	*4,263*	*31,731,750*	*94,942,976*	*556*	*4,309*	*31,731,750*	*94,942,976*	*556*	*4,309*	*31,731,750*	*94,942,976*	*556*	*4,309*
Hoteling (with AMP applied)	Diesel Engines	12,464,875	18,769,075	110	852	4,593,529	18,769,075	110	852	4,593,529	18,769,075	110	852	4,593,529	18,769,075	110	852
Hoteling	Boiler	2,331,333	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159
Total Hoteling		*14,796,208*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*	*7,893,529*	*22,279,497*	*130*	*1,011*
Annual Total OGVs (lb/yr)		46,551,336	116,194,238	680	5,274	39,625,279	117,222,474	687	5,320	39,625,279	117,222,474	687	5,320	39,625,279	117,222,474	687	5,320
Annual Total OGVs (ton/yr)			58,097	0.3	2.6		58,611	0.3	2.7		58,611	0.3	2.7		58,611	0.3	2.7
AMP hoteling eff. emis. reduction (%)	Diesel Engines hoteling only	28%				73%				73%				73%			
AMP activity (kWh/yr) & emissions (lb/yr)	Electric Power Generation	4,728,056	8,386,186	70	39	12,632,204	22,405,830	187	103	12,632,204	22,405,830	187	103	12,632,204	22,405,830	187	103
Annual Total OGVs+AMP (lb/yr)			124,580,424	750	5,312		139,628,303	873	5,424		139,628,303	873	5,424		139,628,303	873	5,424
Annual Total OGVs+AMP (ton/yr)			62,290	0.4	2.7		69,814	0.4	2.7		69,814	0.4	2.7		69,814	0.4	2.7

Activity (kWh/yr) = Average Engine Power * Load Factor$_{(VSR\ corrected)}$ * Fuel Corrected Emission Factor * Time$_{(VSR\ corrected)}$ * 2 $_{(1\text{-}Way)}$ Trips * Vessels per Year

Underway Emissions = Activity * Emission Factor. Activity and emission factors obtained from linked file.

Hoteling Emissions (lb/yr) = Emissions (lb/yr) for 1-way trip * (100%—AMP effective reduction %) * Vessels per Year

Electric Power Generation Emissions (lb/yr) = Hoteling Activity Foregone with AMP (kWh/yr) * Power Plant Emission Factor

Table D4-22. Derivation of GHG Emissions for Marine Vessels—Alternative 4 Mitigated

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines		2,893,619	17	131		2,958,161	17	134		2,958,161	17	134		2,958,161	17	134

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
SCAB Boundary to Fairway—Northbound	Diesel Engines	418,215	629,730	4	29	329,860	629,730	4	29	329,860	629,730	4	29	329,860	629,730	4	29
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*418,215*	*3,523,350*	*21*	*160*	*329,860*	*3,587,891*	*21*	*163*	*329,860*	*3,587,891*	*21*	*163*	*329,860*	*3,587,891*	*21*	*163*
State Boundary to SCAB Boundary	Diesel Engines		39,810,828	233	1,807		40,698,802	238	1,847		40,698,802	238	1,847		40,698,802	238	1,847
SCAB Boundary to Fairway—Southbound	Diesel Engines	17,661,155	26,593,413	156	1,207	13,929,954	26,593,413	156	1,207	13,929,954	26,593,413	156	1,207	13,929,954	26,593,413	156	1,207
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*17,661,155*	*66,404,241*	*389*	*3,014*	*13,929,954*	*67,292,215*	*394*	*3,054*	*13,929,954*	*67,292,215*	*394*	*3,054*	*13,929,954*	*67,292,215*	*394*	*3,054*
Fairway—Northbound	Diesel Engines	279,129	420,301	2	19	395,107	420,301	2	19	395,107	420,301	2	19	395,107	420,301	2	19
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*279,129*	*420,301*	*2*	*19*	*395,107*	*420,301*	*2*	*19*	*395,107*	*420,301*	*2*	*19*	*395,107*	*420,301*	*2*	*19*
Fairway—Southbound	Diesel Engines	4,706,575	7,086,959	42	322	6,662,152	7,086,959	42	322	6,662,152	7,086,959	42	322	6,662,152	7,086,959	42	322
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*4,706,575*	*7,086,959*	*42*	*322*	*6,662,152*	*7,086,959*	*42*	*322*	*6,662,152*	*7,086,959*	*42*	*322*	*6,662,152*	*7,086,959*	*42*	*322*
Precautionary Zone—Northbound	Diesel Engines	96,031	144,599	1	7	135,931	144,599	1	7	135,931	144,599	1	7	135,931	144,599	1	7
Precautionary Zone—Northbound	Boiler	7,056	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0
Total Precautionary Zone—Northbound		*103,087*	*155,224*	*1*	*7*	*145,919*	*155,224*	*1*	*7*	*145,919*	*155,224*	*1*	*7*	*145,919*	*155,224*	*1*	*7*
Precautionary Zone—Southbound	Diesel Engines	3,636,899	5,476,287	32	249	5,148,026	5,476,287	32	249	5,148,026	5,476,287	32	249	5,148,026	5,476,287	32	249
Precautionary Zone—Southbound	Boiler	267,230	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18
Total Precautionary Zone—Southbound		*3,904,129*	*5,878,670*	*34*	*267*	*5,526,290*	*5,878,670*	*34*	*267*	*5,526,290*	*5,878,670*	*34*	*267*	*5,526,290*	*5,878,670*	*34*	*267*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Outer Harbor Zone1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,096,774	1,651,476	10	75	1,552,483	1,651,476	10	75	1,552,483	1,651,476	10	75	1,552,483	1,651,476	10	75
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	106,853	160,894	1	7	151,250	160,894	1	7	151,250	160,894	1	7	151,250	160,894	1	7
Total Outer Harbor Zone2		*1,203,627*	*1,812,370*	*11*	*82*	*1,703,733*	*1,812,370*	*11*	*82*	*1,703,733*	*1,812,370*	*11*	*82*	*1,703,733*	*1,812,370*	*11*	*82*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,276,246	1,921,717	11	87	1,806,526	1,921,717	11	87	1,806,526	1,921,717	11	87	1,806,526	1,921,717	11	87
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	124,338	187,223	1	8	176,000	187,223	1	8	176,000	187,223	1	8	176,000	187,223	1	8
Total Inner Harbor Zone		*1,400,584*	*2,108,940*	*12*	*96*	*1,982,526*	*2,108,940*	*12*	*96*	*1,982,526*	*2,108,940*	*12*	*96*	*1,982,526*	*2,108,940*	*12*	*96*
Total Transit (Sea + Fairway + All Zones)	All	*29,676,501*	*87,390,054*	*512*	*3,966*	*30,675,542*	*88,342,570*	*517*	*4,010*	*30,675,542*	*88,342,570*	*517*	*4,010*	*30,675,542*	*88,342,570*	*517*	*4,010*

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Hoteling (with AMP applied)	Diesel Engines	11,948,885	17,992,121	105	817	6,221,107	17,992,121	105	817	6,221,107	17,992,121	105	817	6,221,107	17,992,121	105	817
Hoteling	Boiler	2,331,333	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159
Total Hoteling		*14,280,219*	*21,502,543*	*126*	*976*	*9,521,107*	*21,502,543*	*126*	*976*	*9,521,107*	*21,502,543*	*126*	*976*	*9,521,107*	*21,502,543*	*126*	*976*
Annual Total OGVs (lb/yr)		43,956,720	108,892,597	638	4,942	40,196,649	109,845,113	643	4,986	40,196,649	109,845,113	643	4,986	40,196,649	109,845,113	643	4,986
Annual Total OGVs (ton/yr)			54,446	0.3	2.5		54,923	0.3	2.5		54,923	0.3	2.5		54,923	0.3	2.5
AMP hoteling eff. emis. reduction (%)	Diesel Engines hoteling only	28%				73%				73%				73%			
AMP activity (kWh/yr) & emissions (lb/yr)	Electric Power Generation	4,532,336	8,039,036	67	37	17,108,045	30,344,660	253	140	17,108,045	30,344,660	253	140	17,108,045	30,344,660	253	140
Annual Total OGVs+AMP (lb/yr)			116,931,633	705	4,979		140,189,773	896	5,125		140,189,773	896	5,125		140,189,773	896	5,125
Annual Total OGVs+AMP (ton/yr)			58,466	0.4	2.5		70,095	0.4	2.6		70,095	0.4	2.6		70,095	0.4	2.6

Activity (kWh/yr) = Average Engine Power * Load Factor$_{(VSR\ corrected)}$ * Fuel Corrected Emission Factor * Time$_{(VSR\ corrected)}$ * 2 $_{(1\text{-}Way)}$ Trips * Vessels per Year

Underway Emissions = Activity * Emission Factor. Activity and emission factors obtained from linked file.

Hoteling Emissions (lb/yr) = Emissions (lb/yr) for 1-way trip * (100%—AMP effective reduction %) * Vessels per Year

Electric Power Generation Emissions (lb/yr) = Hoteling Activity Foregone with AMP (kWh/yr) * Power Plant Emission Factor

Table D4-23. Derivation of GHG Emissions for Marine Vessels—Alternative 5 Mitigated

Spacial Allocation	Power Type	Year: 2011				Year: 2015				Year: 2022				Year: 2037			
		Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)			Activity (kWh/yr)	Greenhouse Gases (lb/yr)		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
State Boundary to SCAB Boundary	Diesel Engines		2,893,619	17	131		2,958,161	17	134		2,958,161	17	134		2,958,161	17	134
SCAB Boundary to Fairway—Northbound	Diesel Engines	418,215	629,730	4	29	329,860	629,730	4	29	329,860	629,730	4	29	329,860	629,730	4	29
SCAB Boundary to Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Northbound		*418,215*	*3,523,350*	*21*	*160*	*329,860*	*3,587,891*	*21*	*163*	*329,860*	*3,587,891*	*21*	*163*	*329,860*	*3,587,891*	*21*	*163*
State Boundary to SCAB Boundary	Diesel Engines		39,810,828	233	1,807		40,698,802	238	1,847		40,698,802	238	1,847		40,698,802	238	1,847
SCAB Boundary to Fairway—Southbound	Diesel Engines	17,661,155	26,593,413	156	1,207	13,929,954	26,593,413	156	1,207	13,929,954	26,593,413	156	1,207	13,929,954	26,593,413	156	1,207
SCAB Boundary to Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total State Boundary to Fairway—Southbound		*17,661,155*	*66,404,241*	*389*	*3,014*	*13,929,954*	*67,292,215*	*394*	*3,054*	*13,929,954*	*67,292,215*	*394*	*3,054*	*13,929,954*	*67,292,215*	*394*	*3,054*
Fairway—Northbound	Diesel Engines	279,129	420,301	2	19	395,107	420,301	2	19	395,107	420,301	2	19	395,107	420,301	2	19
Fairway—Northbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Northbound		*279,129*	*420,301*	*2*	*19*	*395,107*	*420,301*	*2*	*19*	*395,107*	*420,301*	*2*	*19*	*395,107*	*420,301*	*2*	*19*
Fairway—Southbound	Diesel Engines	4,706,575	7,086,959	42	322	6,662,152	7,086,959	42	322	6,662,152	7,086,959	42	322	6,662,152	7,086,959	42	322

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*		*CO_2*	*CH_4*	*N_2O*
Fairway—Southbound	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total in Fairway—Southbound		*4,706,575*	*7,086,959*	*42*	*322*	*6,662,152*	*7,086,959*	*42*	*322*	*6,662,152*	*7,086,959*	*42*	*322*	*6,662,152*	*7,086,959*	*42*	*322*
Precautionary Zone—Northbound	Diesel Engines	96,031	144,599	1	7	135,931	144,599	1	7	135,931	144,599	1	7	135,931	144,599	1	7
Precautionary Zone—Northbound	Boiler	7,056	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0	9,988	10,625	0	0
Total Precautionary Zone—Northbound		*103,087*	*155,224*	*1*	*7*	*145,919*	*155,224*	*1*	*7*	*145,919*	*155,224*	*1*	*7*	*145,919*	*155,224*	*1*	*7*
Precautionary Zone—Southbound	Diesel Engines	3,636,899	5,476,287	32	249	5,148,026	5,476,287	32	249	5,148,026	5,476,287	32	249	5,148,026	5,476,287	32	249
Precautionary Zone—Southbound	Boiler	267,230	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18	378,264	402,383	2	18
Total Precautionary Zone—Southbound		*3,904,129*	*5,878,670*	*34*	*267*	*5,526,290*	*5,878,670*	*34*	*267*	*5,526,290*	*5,878,670*	*34*	*267*	*5,526,290*	*5,878,670*	*34*	*267*
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Diesel Engines	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone1 (vessels bound to outer harbor berths)[5]	Boiler	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Outer Harbor Zone1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Diesel Engines	1,096,774	1,651,476	10	75	1,552,483	1,651,476	10	75	1,552,483	1,651,476	10	75	1,552,483	1,651,476	10	75
Outer Harbor Zone2 (vessels bound to inner harbor berths)[2]	Boiler	106,853	160,894	1	7	151,250	160,894	1	7	151,250	160,894	1	7	151,250	160,894	1	7
Total Outer Harbor Zone2		*1,203,627*	*1,812,370*	*11*	*82*	*1,703,733*	*1,812,370*	*11*	*82*	*1,703,733*	*1,812,370*	*11*	*82*	*1,703,733*	*1,812,370*	*11*	*82*
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Diesel Engines	1,276,246	1,921,717	11	87	1,806,526	1,921,717	11	87	1,806,526	1,921,717	11	87	1,806,526	1,921,717	11	87
Inner Harbor Zone (maneuvering through main channel:inner harbor to inner harbor berths)	Boiler	124,338	187,223	1	8	176,000	187,223	1	8	176,000	187,223	1	8	176,000	187,223	1	8
Total Inner Harbor Zone		*1,400,584*	*2,108,940*	*12*	*96*	*1,982,526*	*2,108,940*	*12*	*96*	*1,982,526*	*2,108,940*	*12*	*96*	*1,982,526*	*2,108,940*	*12*	*96*
Total Transit (Sea + Fairway + All Zones)	All	*29,676,501*	*87,390,054*	*512*	*3,966*	*30,675,542*	*88,342,570*	*517*	*4,010*	*30,675,542*	*88,342,570*	*517*	*4,010*	*30,675,542*	*88,342,570*	*517*	*4,010*
Hoteling (with AMP applied)	Diesel Engines	11,948,885	17,992,121	105	817	6,221,107	17,992,121	105	817	6,221,107	17,992,121	105	817	6,221,107	17,992,121	105	817
Hoteling	Boiler	2,331,333	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159	3,300,000	3,510,422	21	159
Total Hoteling		*14,280,219*	*21,502,543*	*126*	*976*	*9,521,107*	*21,502,543*	*126*	*976*	*9,521,107*	*21,502,543*	*126*	*976*	*9,521,107*	*21,502,543*	*126*	*976*
Annual Total OGVs (lb/yr)		43,956,720	108,892,597	638	4,942	40,196,649	109,845,113	643	4,986	40,196,649	109,845,113	643	4,986	40,196,649	109,845,113	643	4,986
Annual Total OGVs (ton/yr)			54,446	0.3	2.5		54,923	0.3	2.5		54,923	0.3	2.5		54,923	0.3	2.5
AMP hoteling eff. emis. reduction (%)	Diesel Engines hoteling only	28%				73%				73%				73%			
AMP activity (kWh/yr) & emissions (lb/yr)	Electric Power Generation	4,532,336	8,039,036	67	37	17,108,045	30,344,660	253	140	17,108,045	30,344,660	253	140	17,108,045	30,344,660	253	140
Annual Total OGVs+AMP (lb/yr)			116,931,633	705	4,979		140,189,773	896	5,125		140,189,773	896	5,125		140,189,773	896	5,125

Spacial Allocation	*Power Type*	*Year: 2011*				*Year: 2015*				*Year: 2022*				*Year: 2037*			
		Activity (kWh/yr)	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*			*Activity (kWh/yr)*	*Greenhouse Gases (lb/yr)*		
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Annual Total OGVs+AMP (ton/yr)			58,466	0.4	2.5		70,095	0.4	2.6		70,095	0.4	2.6		70,095	0.4	2.6

Activity (kWh/yr) = Average Engine Power * Load Factor$_{(VSR\ corrected)}$ * Fuel Corrected Emission Factor * Time$_{(VSR\ corrected)}$ * 2 $_{(1\text{-}Way)}$ Trips * Vessels per Year

Underway Emissions = Activity * Emission Factor. Activity and emission factors obtained from linked file.

Hoteling Emissions (lb/yr) = Emissions (lb/yr) for 1-way trip * (100%—AMP effective reduction %) * Vessels per Year

Electric Power Generation Emissions (lb/yr) = Hoteling Activity Foregone with AMP (kWh/yr) * Power Plant Emission Factor

Table D4-24. GHG Emissions for Harbor Craft—Proposed Project and Alternatives 1–5 (Unmitigated and Mitigated)

Harbor Craft Unmitigated GHG Emissions						
	Harbor Craft GHG Emissions Annual (lb/yr)					
Vessel Operations	CO_2	CH_4	N_2O			
Assist Tugs Transit 2009–2013	10,970,495	64	498			
Assist Tugs Hotelling 2009–2013	648,864	4	29			
Assist Tugs Transit 2013–2014	5,485,247	32	249			
Assist Tugs Hotelling 2013–2014	648,864	4	29			
Assist Tugs Transit 2014–2015	5,485,247	32	249			
Assist Tugs Hotelling 2014–2015	648,864	4	29			
Assist Tugs Transit 2015–2018	5,485,247	32	249			
Assist Tugs Hotelling 2015–2018	648,864	4	29			
Assist Tugs Transit 2018–2020	5,485,247	32	249			
Assist Tugs Hotelling 2018–2020	648,864	4	29			
Assist Tugs Transit 2020–2037	5,485,247	32	249			
Assist Tugs Hotelling 2020–2037	648,864	4	29			
Ferry Vessels 2009	18,701,131	110	849			
Ferry Vessels 2010–2014	18,701,131	110	849			
Ferry Vessels 2015–2029	18,701,131	110	849			
Ferry Vessels 2030–2037	18,701,131	110	849			
Commercial Fishing 2010–2014	5,558,910	33	252			
Commercial Fishing 2015–2029	5,558,910	33	252			
Commercial Fishing 2030+	5,558,910	33	252			
Crew Boats 2010–2014	934,172	5	42			
Crew Boats 2015–2029	934,172	5	42			
Crew Boats 2030+	934,172	5	42			
Excursion 2010–2014	16,747,176	98	760			
Excursion 2015–2029	16,747,176	98	760			
Excursion 2030–2037	16,747,176	98	760			
Government Boats 2010–2014	2,813,803	16	128			
Government Boats 2015–2029	2,813,803	16	128			
Government Boats 2030+	2,813,803	16	128	**Assist Tug AMP Elec. Generation (lb/yr)**		
Totals by Year						
Total 2009–2013	56,374,551	330	2,559	NA	NA	NA

Harbor Craft Unmitigated GHG Emissions						
	Harbor Craft GHG Emissions Annual (lb/yr)					
Vessel Operations	*CO_2*	*CH_4*	*N_2O*			
Total 2013–2014	50,889,304	298	2,310	NA	NA	NA
Total 2015	50,889,304	298	2,310	NA	NA	NA
Total 2015–2018	50,889,304	298	2,310	NA	NA	NA
Total 2018–2020	50,889,304	298	2,310	NA	NA	NA
Total 2020–2037	49,955,132	293	2,267	NA	NA	NA

Harbor Craft Mitigated GHG Emissions			
	Harbor Craft GHG Emissions Annual (lb/yr)		
Vessel Operations	*CO_2*	*CH_4*	*N_2O*
Assist Tugs Transit 2009	10,970,495	64	498
Assist Tugs Hotelling 2009	648,864	4	29
Assist Tugs Transit 2010–2012	10,969,294	64	498
Assist Tugs Hotelling 2010–2012	691,214	4	31
Assist Tugs Transit 2013–2014	5,484,647	32	249
Assist Tugs Hotelling 2013–2014	302,406	2	14
Assist Tugs Transit 2014–2015	5,484,647	32	249
Assist Tugs Hotelling 2014–2015	30,241	0	1
Assist Tugs Transit 2015–2018	5,484,647	32	249
Assist Tugs Hotelling 2015–2018	30,241	0	1
Assist Tugs Transit 2018–2020	5,484,647	32	249
Assist Tugs Hotelling 2018–2020	30,241	0	1
Assist Tugs Transit 2020–2037	5,484,647	32	249
Assist Tugs Hotelling 2020–2037	30,241	0	1
Ferry Vessels 2009	13,872,470	81	630
Ferry Vessels 2010–2014	13,872,470	81	630
Ferry Vessels 2015–2029	13,872,470	81	630
Ferry Vessels 2030–2037	13,872,470	81	630
Commercial Fishing 2010–2014	5,558,910	33	252
Commercial Fishing 2015–2029	5,558,910	33	252
Commercial Fishing 2030+	5,558,910	33	252
Crew Boats 2010–2014	934,172	5	42
Crew Boats 2015–2029	934,172	5	42
Crew Boats 2030+	934,172	5	42

Harbor Craft Mitigated GHG Emissions						
	Harbor Craft GHG Emissions Annual (lb/yr)					
Vessel Operations	*CO_2*	*CH_4*	*N_2O*			
Excursion 2010–2014	16,747,176	98	760			
Excursion 2015–2029	16,747,176	98	760			
Excursion 2030–2037	16,747,176	98	760	Hbr. Craft AMP Elec. Generation Emis. (lb/yr)		
Government Boats 2010–2014	2,813,803	16	128	AMP applies to assist tug hoteling only.		
Government Boats 2015–2029	2,813,803	16	128	Engine-hrs/yr replaced by AMP, starting in		
Government Boats 2030+	2,813,803	16	128	2014 =	2,920	
Totals by Year						
Total 2009	51,545,890	302	2,340	NA	NA	NA
Total 2010–2012	51,587,040	302	2,341	NA	NA	NA
Total 2013–2014	45,713,585	268	2,075	NA	NA	NA
Total 2014–2015	45,441,419	266	2,062	2,349,257	20	11
Total 2015–2018	45,441,419	266	2,062	2,349,257	20	11
Total 2018–2020	45,441,419	266	2,062	2,349,257	20	11
Total 2020–2037	45,441,419	266	2,062	2,349,257	20	11

Table D4-25. GHG Emissions for Harbor Craft—Alternative 6

	Harbor Craft GHG Emissions Annual (lb/yr)		
Vessel Operations	*CO_2*	*CH_4*	*N_2O*
Assist Tugs Transit 2010–2014	10,969,294	64	498
Assist Tugs Hotelling 2010–2014	691,214	4	31
Assist Tugs Transit 2014–2015	10,969,294	64	498
Assist Tugs Hotelling 2014–2015	691,214	4	31
Assist Tugs Transit 2015–2018	10,969,294	64	498
Assist Tugs Hotelling 2015–2018	691,214	4	31
Assist Tugs Transit 2018–2020	10,969,294	64	498
Assist Tugs Hotelling 2018–2020	691,214	4	31
Assist Tugs Transit 2020–2037	10,969,294	64	498
Assist Tugs Hotelling 2020–2037	691,214	4	31
Ferry Vessels 2010–2014	18,708,115	110	849
Ferry Vessels 2015–2029	18,708,115	110	849

Ferry Vessels 2030–2037	18,708,115	110	849
Commercial Fishing 2010–2014	7,389,779	33	252
Commercial Fishing 2015–2029	5,558,910	33	252
Commercial Fishing 2030+	5,558,910	33	252
Crew Boats 2010–2014	934,172	5	42
Crew Boats 2015–2029	934,172	5	42
Crew Boats 2030+	934,172	5	42
Excursion 2010–2014	16,747,176	98	760
Excursion 2015–2029	16,747,176	98	760
Excursion 2030–2037	16,747,176	98	760
Government Boats 2010–2014	2,813,803	16	128
Government Boats 2015–2029	2,813,803	16	128
Government Boats 2030+	2,813,803	16	128
Total	*194,419,937*	*1,128*	*8,741*
Total 2010–2014	58,253,553	330	2,561
Total 2015	56,422,684	330	2,561
Total 2015–2018	56,422,684	330	2,561
Total 2018–2020	56,422,684	330	2,561
Total 2020–2037	55,488,512	325	2,519

Table D4-26. GHG Emissions for Commercial Land Uses/Activities

Land Uses/Activities (sq ft)	*CEQA Baseline (2006)*	*Proposed Project (2015)*	*Proposed Project (2037)*	*Alt. 1 (2015)*	*Alt. 1 (2037)*	*Alt. 2 (2015)*	*Alt. 2 (2037)*	*Alt. 3 (2015) (Reduced Project)*	*Alt. 3 (2037) (Reduced Project)*	*Alt. 4 (2015)*	*Alt. 4 (2037)*	*Alt. 5 (2015) (No Federal Action/ NEPA Baseline)*	*Alt. 5 (2037) (No Federal Action/ NEPA Baseline)*	*Alt. 6 (2015) (No Project)*	*Alt. 6 (2037) (No Project)*
Catalina Terminal	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642	38,642
Crowley Marine Tugs	4,225	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	0	0	0	0	0	0
Cruise Ship Terminals	248,140	448,140	448,140	253,250	253,250	448,140	448,140	348,140	348,140	153,250	153,250	153,250	153,250	248,140	248,140
Millenium Tugs	0	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	0	0	0	0	0	0
Ports O'Call	150,000	375,000	375,000	375,000	375,000	375,000	375,000	187,500	187,500	375,000	375,000	375,000	375,000	375,000	375,000
Jankovich & Sons	10,197	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mikes Marine	1,548	1,548	1,548	0	0	1,548	1,548	1,548	1,548	0	0	1,548	1,548	0	0
Red Car Maintenance	10,000	17,600	17,600	17,600	17,600	17,600	17,600	17,600	17,600	17,600	17,600	17,600	17,600	0	0
Westways	11,853	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipal Warehouse No. 1	504,000	504,000	504,000	474,000	474,000	504,000	504,000	504,000	504,000	504,000	504,000	504,000	504,000	504,000	504,000
Warehouse #9	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	0	0
Warehouse #10	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	87,500	0	0
LA Maritime Institute	3,400	4,225	4,225	4,225	4,225	4,225	4,225	4,225	4,225	4,225	4,225	5,500	5,500	5,500	5,500
Ralph J. Scott Historic Fireboat	0	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	0	0
SS Lane Victory	2,400	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Red Car Museum	0	0	0	12,400	12,400	0	0	10,000	10,000	10,000	10,000	0	0	0	0
Surface Parking	2,800,000	3,124,454	3,124,454	2,999,823	2,999,823	3,109,419	3,109,419	2,407,859	2,407,859	3,311,795	3,311,795	3,308,236	3,308,236	2,800,000	2,800,000
Total Sq Ft	3,941,905	4,711,109	4,711,109	4,372,440	4,372,440	4,696,074	4,696,074	3,717,014	3,717,014	4,592,012	4,592,012	4,581,276	4,581,276	3,981,282	3,981,282
Projected Electricity Demand KW hours/year (Commercial)**	57,946,004	69,253,302	69,253,302	64,274,868	64,274,868	69,032,288	69,032,288	54,640,106	54,640,106	67,502,576	67,502,576	67,344,757	67,344,757	58,524,845	58,524,845

** Based on 14.7 kwh/yr/sq ft for all land uses, from figure 134 of the California Energy Commission's California Energy Demand 2008–2018 Staff Revised Forecast Report.

Table D4-27. GHG Emissions for Waterfront Red Car Line Electricity Usage

Calculation Description	*Existing 2006 Baseline*			*Future with Proposed Project and Alts. 1–5*				*Total for Pr.Pr. & Alts. 1–5*	*Notes*
	Existing Red Car		*Existing Shuttle Bus*	*South System Spine**	*Ext. 1 (Replaces Shuttle Bus)*	*Ext. 2 (Outer Harbor)*	*Ext. 3 (Whse#1/ Museum)*		
Start location	Cruise Ship Terminal, Swinford St.		22nd and Miner Sts.	Cruise Ship Terminal, Swinford St.	22nd and Miner Sts.	22nd and Miner Sts.	22nd and Miner Sts.		
End location	22nd & Miner Sts.		Cabrillo Aquarium	22nd & Miner Sts.	Cabrillo Aquarium	Cruise Term. (Foot of Miner St.)	Warehouse No.1 (on City Dock No.1)		
Segment distance (mi)	1.5		2	1.5	2	0.75	0.6		Excludes non-revenue distances.
Operating Schedule	10am-6pm, Fri-Mon + cruises			All routes: 8am-8pm Mon-Thu, 8am-12mid. Fri-Sun					Ref. for existing hours: railwaypreservation.com/FAQ.html. Future hr/yr are weighted 4 days @ 12 hr/day + 3 days @ 16 hr/day.
Oper. Hours/day	8		8	All routes: 12 Mon-Thu, 16 Fri-Sun					
Oper. Days/yr	240		240	363	363	363	363		
Oper. Hours/yr	1,920		1,920	4,978	4,978	4,978	4,978		
Headway (min)	20		20	6.67	20	20	20		
Round trips/hr	3.0		3.0	9.0	3.0	3.0	3.0		
Round trips/yr	5,760		5,760	44,805	14,935	14,935	14,935		
VMT and KWh	Existing/ Calc.	2006 PoLA Reported	Existing/ Calc.	Projected	Projected	Projected	Projected	Projected	
VMT/yr	17,280	15,500	23,040	134,414	59,739	22,402	17,922	234,477	
Red Car KWh/yr	69,120	62,000	n.a.	537,655	238,958	89,609	71,687	937,909	
Red Car MWh/yr	69	62	n.a.	538	239	90	72	938	

Energy Intensity Assumption for KWh Calculation			
Calc. from PoLA reported 2006 data above	4.00	KWh/VMT	Appears reasonable based on LRT performance relationships shown in Caltrans, *Energy and Transportation Systems*, FHWA/CA/TL-83/08, 1983, Fig. E-1.

* "South System Spine" is same segment as existing line. Future VMT on this segment includes trips bound for extensions. For SPW EIR, calculations include SPW project area only and do not include travel north of Swinford St. Cruise Ship Terminal or to downtown San Pedro.

GHG Emissions Summary (Mt/yr)

Alternative	*CO_2*	*CH_4*	*N_2O*	*Notes*
2006 Baseline (Alt. 6)	25	0.0002	0.0001	Shuttle bus emissions assumed to be included in motor vehicles analysis, not here.
Prop. Proj. & Alts. 1–5	342	0.0029	0.0016	

Notes:

Total GHG emissions values in this tab are passed to final report tables.

Shuttle bus applies to CEQA Baseline and Alt. 6 only.

Shuttle bus GHG emissions are assumed to be included in [JSA's data used in] the vehicle GHG emissions analysis, and are not calculated separately here.

All 3 Red Car Line extensions assumed to apply to all alternatives except 6 (No Project).

Existing Red Car operational data are PoLA reported 2006. Existing Shuttle Bus operational data are assumed such that bus meets each Red Car trip (bus assumed same headway as Red Car).

Future Red Car operations for all alts. assume Recommended System Operating Concept per *Waterfront Red Car Line Expansion Feasibility Study, Draft Final Report*, PoLA, 11/26/07, sec. 6.3. Also *Draft System Operating Scenarios Evaluation Report, Waterfront Red Car Line Expansion Feasibility Study*. PoLA, July 2007 (DraftSystemOperatingScenariosEvaluationReport.pdf), sec. 2.6 for operating days/yr.

Table D4-28. GHG Emissions for Terminal Equipment Electrification

Unmitigated Emissions	*CEQA Baseline (w/Berth 87): 2006 Alt. 6 (No-Build)—Unmit.: 2011–2037*			
Year	*Activity*	*CO_2*	*CH_4*	*N_2O*
2006	1,218,050	0.0	0.0	0.0
2011	994,850	0.0	0.0	0.0
2015	994,850	0.0	0.0	0.0
2022	994,850	0.0	0.0	0.0
2037	994,850	0.0	0.0	0.0

Unmitigated Emissions	*Proposed Project—Unmit.*				*Alt. 1—Unmit.*				*Alt. 2—Unmit.*				*Alt. 3—Unmit.*				*Alt. 4—Unmit.*				*Alt. 5—Unmit.*			
Year	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*
2006	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2011	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0
2015	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0

2022	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0
2037	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0	–	0.0	0.0	0.0

Mitigated Emissions	*Proposed Project—Mit.*				*Alt. 1—Mit.*				*Alt. 2—Mit.*				*Alt. 3—Mit.*				*Alt. 4—Mit.*				*Alt. 5—Mit.*			
Year	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*	*Activity*	*CO_2*	*CH_4*	*N_2O*
2006	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2011	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	994,850	271	0.002	0.001	994,850	271	0.002	0.001
2015	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	994,850	271	0.002	0.001	994,850	271	0.002	0.001
2022	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	994,850	271	0.002	0.001	994,850	271	0.002	0.001
2037	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	1,250,950	340	0.003	0.002	994,850	271	0.002	0.001	994,850	271	0.002	0.001	994,850	271	0.002	0.001
Activity indicates energy usage by equipment that has been electrified. Activity units are *hp-hr/yr*. Emissions units are *metric tons per year*.																								

Table D4-29. GHG Emissions for On-Road Vehicles

Alternative and Year	*VMT/year*	*Emissions (metric tons/year)*		
		CO_2	CH_4	N_2O
Existing				
2006	61,510,234	29,681	5.62	5.74
No Project				
2011	34,664,134	16,661	3.06	3.38
2015	61,951,479	32,054	4.06	4.65
2022	66,255,019	34,261	3.50	4.22
2037	73,427,587	37,870	3.88	4.67
Proposed Project				
2015	130,869,593	67,755	8.57	9.81
2022	138,492,359	71,663	7.32	8.81
2037	157,332,754	81,202	8.31	10.01
Alternative 1				
2015	118,052,549	61,188	7.73	8.85
2022	123,808,909	64,135	6.54	7.88
2037	138,027,352	71,310	7.29	8.78
Alternative 2				
2015	130,356,834	67,490	8.54	9.78
2022	137,905,556	71,360	7.28	8.77
2037	156,562,965	80,806	8.27	9.96
Alternative 3				
2015	91,573,616	57,615	6.00	6.87
2022	97,329,977	61,205	5.14	6.19
2037	111,548,420	69,967	5.89	7.10
Alternative 4				
2015	115,486,084	60,440	7.57	8.66
2022	122,255,502	63,278	6.46	7.78
2037	129,029,515	66,613	6.82	8.21
Alternative 5				
2015	115,526,384	59,826	7.57	8.66
2022	121,068,755	62,665	6.39	7.70
2037	127,842,768	66,001	6.75	8.13