Appendix ENE
Energy Supporting Information

DRAFT

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ENERGY TECHNICAL REPORT

OAKLAND WATERFRONT BALLPARK DISTRICT PROJECT

OAKLAND, CALIFORNIA

CONTENTS

TABLES

ACRONYMS AND ABBREVIATIONS

A's	Oakland Athletics
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ARB	California Air Resources Board
ATCM	Airborne Toxic Control Measure
BART	Bay Area Rapid Transit
BAU	"Business-As-Usual"
CalEEMod®	California Emissions Estimator Model
CalGreen	CalGreen Building Standards
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CNRA	California Natural Resources Agency
CO_2e	Carbon Dioxide Equivalent
Coliseum	Oakland-Alameda County Coliseum
CPUC	California Public Utilities Commission
DEIR	Draft Environmental Impact Report
DOORS	Diesel Off-Road Online Reporting System
DOT	Department of Transportation
EIR	Environmental Impact Report
EMFAC2017	Emissions Factors Model
EPA	Environmental Protection Agency
ESA	Environmental Science Associates
Estuary	Oakland-Alameda Estuary
EV	Electric Vehicle
GHG	Greenhouse Gas
GWh	Gigawatt Hours
Howard Terminal	Charles P. Howard Terminal
hp	horsepower

HVAC	Heating, Ventilation and Air Conditioning
I-880	Interstate 880
I-980	Interstate 980
ISTEA	Intermodal Surface Transportation Efficiency Act
kBTU	thousand British thermal units
LCFS	Low Carbon Fuel Standard
LEED	Leadership in Energy and Environmental Design
LOS	Level of Service
LPG	Liquefied Petroleum Gas
MLB	Major League Baseball
MMBtu	Million British Thermal Unit
MMT CO_2e	Million Metric Ton of Carbon Dioxide-Equivalent
mpg	Miles Per Gallon
MPO	Metropolitan Planning Organizations
MW	Megawatt
NFL	National Football League
NHTSA	National Highway Traffic Safety Administration
NOx	Nitrogen Oxide
OPP	Oakland Power Plant
OPR	Office of Planning and Research
PG&E	Pacific Gas & Electric
PM	Particulate Matter
PV	Photovoltaic
Ramboll	Ramboll US Corporation
RPS	Renewables Portfolio Standard
RTPs	Regional Transportation Plans
SB	Senate Bill
scf/yr	Standard cubic feet per year
SCS	Sustainable Communities Strategy
SmartWay	United States Environmental Protection Agency SmartWay
TDM	Transportation Demand Management
TDV	Time Dependent Valuation
TEA-21	Transportation Equity Act for the 21st Century

TMP	Transportation Management Plan
TRUs	Transportation Refrigeration Units
UPRR	Union Pacific Railroad
VDECS	Verified Diesel Emission Control Strategies
VMT	vehicle miles travelled

1. INTRODUCTION

At the request of Environmental Science Associates (ESA) on behalf of the City of Oakland, Ramboll US Corporation (Ramboll) conducted an analysis in support of the California Environmental Quality Act (CEQA) Draft Environmental Impact Report (DEIR) of energy use associated with the construction and operation of the proposed mixed-use Oakland Waterfront Ballpark District Project in Oakland, California (referred to hereafter as "the Project").

This report describes the scope and methodology for evaluation of energy use from construction and operation of the Project, as well as Project variants and alternatives. This analysis supports the Draft Environmental Impact Report's (DEIR) determination of potential impacts of the Project.

1.1 Project Description

1.1.1 Existing Conditions

The Athletics ("A's or Project sponsor"), a Major League Baseball (MLB) team, currently play at the Oakland-Alameda County Coliseum (Coliseum), located in the Coliseum Area Specific Plan area between East Oakland and the Oakland International Airport. The A's team headquarters is currently located at Jack London Square. The Coliseum also currently hosts non-A's events, including National Football League (NFL) football games and other special events (e.g. Motocross and Monster Jam exhibitions). Upon the departure of the A's from the Coliseum, a permanent reduction in A's-related emissions potential at the Coliseum is anticipated. All current operations at the Coliseum are included in the "Existing Conditions" presented in this analysis. The operations associated with MLB games only will be replaced by the Project; as such, the operations associated with MLB games only will be referred to as "A's Related Existing Conditions". For this analysis, the A's 30-year average annual attendance of 22,671 people was used for the A's Related Existing Condition calculations.

The Project location is the Charles P. Howard Terminal (Howard Terminal) and certain adjacent properties – together referred to as the "Project site" – located in the southwestern area of Oakland, California. Existing regional freeway access to the Project site exists via Interstate 880 (I-880) and Interstate 980 (I-980). Depicted in **Figure 1** of the **Air Quality, Greenhouse Gas, and Health Risk Assessment Technical Report (Air Quality Technical Report)**[1], the Project site is approximately nine miles northwest of the Oakland International Airport, approximately six miles northwest of the Oakland – Alameda County Coliseum, and approximately one mile from three stations on the regional Bay Area Rapid Transit (BART) system.

The Project site is located within the Seaport Area of the Port of Oakland, which includes the waterfront area generally bounded by the San Francisco-Oakland Bay Bridge to the northwest, I-880 to the east and northeast, and Howard Terminal on its easternmost extension. Within the Port of Oakland, the Project site sits along the north shore of the Inner Harbor of the Oakland-Alameda Estuary (Estuary). The Project site is located at 1 Market Street and is approximately 55 acres at the foot of Market Street. Figure 1 shows that the Project site is bound by the Estuary on the south; Jack London Square – an approximately 18-square-block, pedestrian-oriented mixed use and entertainment area to the east; the parallel Union Pacific railroad (UPRR) tracks and Embarcadero West roadway on the north;

[1] Ramboll. 2019. Air Quality, Greenhouse Gas, and Health Risk Analysis Technical Report. December.

and the heavy metal recycling center, Schnitzer Steel, and Port lands on the west. The Project site sits approximately one-half mile southwest of Downtown, across I-880. The north shore of the City of Alameda is directly south of the Project site, across the Estuary.

The site was used by the Port of Oakland as a shipping container terminal until 2014 and is currently used for truck parking, loaded and empty container storage and staging, and longshore training facilities. According to the Port of Oakland's revised memorandum on Howard Terminal Truck Relocation Assumptions,[2] for the purposes of this analysis it is conservatively assumed that prior to commencing Project construction all Port uses would be relocated to other off-Port locations in the region. Thus, no operational energy use credit is assumed from the existing Howard Terminal conditions associated with the Port of Oakland.

1.1.1.1 Proposed Project

The Project is a mixed-use Waterfront Ballpark District development with the following project elements:

- Demolish existing buildings on the Project site, except the existing Oakland Power Plant (OPP) (as discussed below in **Section 1.1.3** as a Project Variant) and the existing container cranes, which may be retained;
- Address any hazardous materials that may be present on the Project site;
- Construct:
  - A new privately funded, open-air, approximately 35,000-person capacity MLB park;
  - Up to 3,000 residential units of varying affordability and types
  - Approximately up to 1.77 million square feet of adjacent mixed-use development, including retail, commercial, and office uses;
  - A performance venue with a capacity of up to 3,500 individuals;
  - A 400-room hotel;
  - New and expanded utility infrastructure;
  - New signage and lighting; and
  - New parks and open spaces.
- Construct/provide improved access from the surrounding neighborhood and regional transportation networks; and
- Construct/provide new waterfront public access, enhanced water views, and on-site open space.

Additionally, the Project has committed to complying with Assembly Bill (AB) 734 regarding implementation of sustainability measures, developing a Leadership in Energy and Environmental Design (LEED) Gold ballpark, and ensuring no net additional Greenhouse Gas (GHG) emissions.

Project land uses are shown in **Table 1** of the **Air Quality Technical Report**.[3]

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[2] Port of Oakland. 2019. Memorandum – Howard Terminal Truck Relocation Assumptions – Revised. June 25. From Andrea Gardner (Port of Oakland) to Molly Maybrun (City of Oakland).

[3] Ramboll. 2019. Air Quality, Greenhouse Gas, and Health Risk Analysis Technical Report. December.

1.1.1.2 Ballpark Activity Assumptions

As shown in **Table 2** of the **Air Quality Technical Report,** the proposed ballpark at Howard Terminal will have a capacity of 35,000 attendees. Attendance estimates for MLB games, NFL games, and other events were provided by the Project sponsor, although these emissions are not included in the A's-Related Existing Conditions. For MLB games, an attendance of 35,000 attendees per game is used for the Project and an attendance of 22,671 attendees per game is used for the Existing Conditions.[4]

For the proposed ballpark, it was assumed that the A's game schedule would not shift substantially from current Coliseum activity, which typically includes 41 weekday evening, 14 weekday day, and 27 weekend games (for a total of approximately 2,870,000 average attendees annually). For other events, it was assumed that the ballpark would host an average of approximately nine concerts per year with a maximum of 35,000 attendees each, 100 corporate or community events per year with a maximum of 2,000 attendees each, 16 plaza events per year with a maximum of 4,000 attendees each, and 35 other events per year with a maximum of 7,500 attendees each (for a total of approximately 841,500 average attendees annually).

1.1.2 Maritime Reservation Scenario

The Maritime Reservation Scenario involves an alternative site plan for the Project that will be analyzed alongside the Project site plan described above. Under the Term Sheet between the Project sponsor and the Port of Oakland, the Port has the right to terminate the Project sponsor development rights to a portion of the Project site located generally within the southwestern corner of the site if the Port deemed that area necessary to accommodate the expansion of the turning basin that is used to turn large vessels within Oakland's Inner Harbor.

Under the Term Sheet, the Port of Oakland could, at any point within the next 10 years, choose to exercise its option and take back approximately 10 acres of the site from the Project sponsor. As a result, the Project site plan would be modified, and the proposed development would be denser, fitting the same development program (i.e., the ballpark and mix of other uses proposed) onto the smaller site, as shown in **Figure 10** of the **Air Quality Technical Report**.

The Port of Oakland has not designed or permitted an expanded turning basin and the impacts of the expansion, if it were proposed, are not considered in this Energy Technical Report. If the Port were to exercise its option and take back a portion of the Project site from the Project sponsor, the Port would analyze the potential impacts of expanding the turning basin at that time.

Changes to the Project site plan that would occur with the Maritime Reservation Scenario would occur within the area of the Project site that would be developed after Phase 1. The Maritime Reservation Scenario would distribute the Project's development program differently within the altered site configuration.

This Energy Technical Report will discuss the energy use of the Maritime Reservation Scenario compared to energy use identified for the Project. Additional details regarding the Maritime Reservation Scenario are discussed in **Section 3.4**.

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[4] Number of events, attendance, and population data provided by the Project sponsor. The 30-year annual average attendance per game was used for the Existing Conditions and A's Related Existing Conditions.

1.1.3 Project Variants

The Project may include one or more variants, which are Project elements that may or may not be proposed as part of the Project for particular reasons. The variants analyzed in this report include:

- Development of a portion of an existing OPP, removal of adjacent tank, and construction of a mixed-use building ("Peaker Power Plant"); and
- An aerial tram or gondola above Washington Street extending from downtown Oakland near 12th Street BART to Jack London Square ("Aerial Gondola").

This Energy Technical Report will discuss the energy use of the Project variants compared to the energy use identified for the Project.

1.1.4 Project Alternatives

In addition to the Project, this report also analyzes four alternatives to the Project, described below:

- **Alternative 1: No Project Alternative.** The No Project Alternative assumes that the Project is not constructed and that existing truck activity at Howard Terminal continues.
- **Alternative 2: The Off-Site (Coliseum Area) Alternative.** The Off-Site Alternative assumes that Howard Terminal would remain in its current use and the Oakland A's would construct a new ballpark and mixed-use development at the site of the Oakland Coliseum as envisioned in the City's adopted Coliseum Area Specific Plan. This Energy Technical Report does not provide any analyses for this alternative, as discussed further below.
- **Alternative 3: Reduced Project Alternative.** The Reduced Project Alternative assumes that the ballpark, hotel, and performance venue are constructed, as well as reduced square footage for the residential and commercial land uses.
- **Alternative 4: Grade Separation Alternative.** Under the Grade Separation Alternative, the Project would be constructed at the Project site and would be revised to include construction of a grade-separated crossing of the railroad tracks for vehicles accessing the site. This alternative would also construct a pedestrian and bicycle overcrossing. There are two potential locations for the grade-separated vehicular crossing, one at Market Street and one at Brush Street, as well as two possible designs for each location – an underpass or an overcrossing.

Energy use from Alternatives 1, 3, and 4 is included in **Section 3.6**. Alternative 2 is not included this analysis since impacts from the Coliseum were evaluated as part of the Coliseum Area Specific Plan Environmental Impact Report (EIR).

1.1.5 Project Phasing and Energy Use Sources

For the purposes of this analysis, the Project is conservatively assumed to be developed in two phases, though actual phasing may be in two or more phases or subphases. Phase 1 construction is set to begin in 2020 and has a target completion date of mid-2023. This phase will include the ballpark, up to 540 residential units, up to 250,000 square feet of office, up to 30,000 square feet of retail, an approximately 400-room hotel, and associated infrastructure, including parking garages. Phase 2 construction is estimated to begin in 2023 and be completed as early as 2027 and will include the remaining non-ballpark development (otherwise referred to as the Full Buildout plan). Project Phasing and Project Construction Schedule are presented in the **Air Quality Technical Report, Table 3**. Demolition and geotechnical work are assumed for purposes of this analysis to be completed across the entire site in 2020 and 2021. Once demolition and geotechnical work are complete, utilities and building construction will commence in the phased approach.

As the phasing of Project and Project Variant implementation is subject to change based on market conditions and other unanticipated factors, construction and operations could be extended beyond the anticipated buildout schedule. However, for the purposes of the CEQA analysis, it is assumed that the phasing schedule provided here represents an accelerated phasing schedule for the Project for the purposes of conservatively assessing daily maximum and annual average emissions impacts, and that construction would most likely not occur at a more rapid pace than is analyzed. As described further below, energy use factors are anticipated to be lower in later years with improved on-road vehicle efficiency; therefore, energy use would be lower if the schedule was extended.

1.2 Limits of Energy Analysis

This report evaluates the potential energy impacts of the Project with particular emphasis on avoiding or reducing inefficient, wasteful, or unnecessary consumption of energy. Existing conditions presented here are representative of 2018 operations. Estimates for the Project Full Buildout year of 2027 are also presented.

1.2.1 Existing Conditions Analysis

This document contains the evaluation of one scenario year to represent Existing Conditions. As mentioned above, the Project is compared to the A's Related Existing Conditions to determine the net impact of the Project. A more complete description of the Existing Conditions is provided in **Section 3.2**. The scenario year is 2018 for both the Existing Conditions and A's Related Existing Conditions. Existing Conditions are representative of the actual energy use for the existing Coliseum MLB, NFL, and other events uses and the A's headquarters use. A's Related Existing Conditions are representative of actual energy use for the MLB activity at the existing Coliseum as well as the A's headquarters use only.

1.2.2 Project Analysis

This document evaluates the energy consumption for complete buildout of the Project (including MLB uses, other events, and non-ballpark uses). Because California has adopted regulatory measures impacting energy consumption (i.e., GHG regulations) that take effect by 2027, the Project energy consumption quantities are based on these adopted 2027 regulatory measures (e.g., Renewables Portfolio Standard [RPS]) and emission factors (e.g., Emissions Factors Model [EMFAC2017] mobile factors), assuming the total operational activity from complete buildout and operation of the Project in 2027. The analysis is conservative because California revises its building energy standards (Title 24) on a periodic basis. California's building codes are published in their entirety every three years. The 2019 Title 24 code will take effect on January 1, 2020. Each subsequent building code has required more energy efficiency than the previous codes. Accordingly, this analysis is based on current codes and will result in an overestimate of actual energy usage in buildings.

2. ENERGY ENVIRONMENTAL AND REGULATORY OVERVIEW

2.1 General Setting

2.1.1 Energy Production and Distribution

Among the states, California ranks fourth in the nation in production of crude oil, 15th in production of natural gas, second in generation of hydroelectric power, and first as a producer of electricity from biomass, geothermal, and solar energy.[5] California's energy system provides approximately 10% of the natural gas to the state; approximately 90% of the state's natural gas is imported from Canada, the Southwest, and the Rocky Mountains region of the United States. Over half of the crude oil refined in California is from foreign countries, including Saudi Arabia, Ecuador, and Colombia. Additional crude oil is imported from Alaska. Over one-fourth of California's electricity is from out-of-state locations in the Pacific Northwest and the Southwest.[6]

2.1.1.1 Electricity and Natural Gas Supply

The production of electricity requires the combustion, consumption, or conversion of other energy resources, including water, wind, oil, natural gas, coal, solar, geothermal, and nuclear. Of the electricity that is generated within the state, 47% is generated by natural gas-fired power plants, 9% by nuclear power plants, 11% by hydroelectric, and a remaining 32% by renewables.[7]

Natural gas ultimately supplies the largest portion of California's electricity market; natural gas-fired power plants in California meet approximately 31% of the in-state electricity demand.[7] In addition to the generation of electricity, natural gas is also widely used for industrial, commercial, and residential heating. Most of the natural gas consumed in California comes from the Southwest, the Rocky Mountains, and Canada, while the remainder is produced in California. Although contractually California can receive natural gas from any producing region in North America, it can only take supplies from the three producing regions due to the current pipeline configuration.

For Alameda County, Pacific Gas & Electric (PG&E) is the primary supplier of electricity and natural gas to businesses and residents of the area. PG&E's service area extends from Eureka to Bakersfield (north to south), and from the Sierra Nevada to the Pacific Ocean (east to west). Electricity production facilities include natural gas-fired, coal-fired, nuclear, and hydroelectric plants. PG&E obtains its energy supplies from power plants and natural gas fields in northern California and from electricity and natural gas purchased outside its service area and delivered through high-voltage transmission lines of the power grid and through gas pipelines. Of the 2017 electric power mix delivered to retail customers, PG&E reported

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5 U.S. Energy Information Administration. 2018. California State Profile and Energy Estimates: Quick Facts. Available online at: http://www.eia.gov/state/?sid=CA. Accessed January 3, 2020.

6 U.S. Energy Information Administration. 2018. California State Profile and Energy Estimates: Profile Analysis. Available online at: https://www.eia.gov/state/analysis.cfm?sid=CA. Accessed January 3, 2020.

7 California Energy Commission. 2018. Total System Electric Generation. Available online at: https://www.energy.ca.gov/almanac/electricity_data/total_system_power.html. Accessed January 3, 2020. This sums to more than 100% due to rounding.

20% of electricity was generated by natural gas-fired power plants, 27% by nuclear power plants, 18% by large hydroelectric, and 33% by RPS-eligible renewables.[8]

Additionally, if it is available, the Project could purchase 100% zero-carbon electricity through the East Bay Community Energy[9] program.

2.1.1.2 Transportation Fuels Supply

Most petroleum fuel refined in California is for use in on-road motor vehicles and is refined within California to meet state-specific formulations required by the California Air Resources Board (CARB). The major categories of petroleum fuels are gasoline and diesel for passenger vehicles, transit, and rail vehicles; and fuel oil for industry and emergency electrical power generation. Other liquid fuels include kerosene, jet fuel, and residual fuel oil for marine vessels.

California's oil fields comprise the fourth-largest petroleum-producing area in the United States, behind federal offshore production, Texas, and North Dakota. Crude oil is moved from area to area within California through a network of pipelines that carry it from both onshore and offshore oil wells to the refineries that are located in the San Francisco Bay Area, the Los Angeles area, and the Central Valley. Currently, 16 petroleum refineries operate in California, processing approximately 2.0 million barrels per day of crude oil.[10]

Transportation fuel sources also includes electricity. Conventional gasoline and diesel vehicles consume gasoline or diesel fuel, whereas electric vehicles (EVs) consume electricity that can be sourced by fossil fuels or renewables. EVs, including battery-electric vehicles and plug-in hybrid electric vehicles, comprise a growing fraction of the passenger vehicles on the roads in California, and EV adoption is expected to increase over the upcoming decades due in part to improvements in battery technology and public initiatives and goals.

Other transportation fuel sources are alternative fuels, such as methanol and denatured ethanol (alcohol mixtures that contain no less than 70% alcohol), natural gas (compressed or liquefied), liquefied petroleum gas (LPG), hydrogen, and fuels derived from biological materials (i.e., biomass).

[8] PG&E. 2018. Corporate Responsibility and Sustainability Report. Available online at: http://www.pgecorp.com/corp_responsibility/reports/2018/assets/PGE_CRSR_2018.pdf, page 47. Accessed January 3, 2020.

[9] East Bay Community Energy (EBCE). Information available online: https://ebce.org/power-mix/. Accessed January 3, 2020.

[10] U.S. Energy Information Administration. 2019. California State Profile and Energy Estimates: Reserves and Supply. Available online at: http://www.eia.gov/state/data.cfm?sid=CA#ReservesSupply. Accessed January 3, 2020.

2.1.2 Energy Consumption

2.1.2.1 Electricity and Natural Gas Consumption

Californians consumed 255,350 gigawatt hours (GWh) of electricity in 2018, which is the most recent year for which data is available.[11,12] Of this total, Alameda County consumed 10,417 GWh[13] (4.1%).

Californians consumed 12,666 million therms of natural gas in 2018.[14,15] Of this total, Alameda County consumed 377 million therms of natural gas[16] (3.0%).

2.1.2.2 Transportation Sector Fuels Consumption

The transportation sector is a major end use of energy in California, accounting for approximately 40.3% of total statewide energy consumption in 2017.[17] In addition, energy is consumed in connection with construction and maintenance of transportation infrastructure, such as streets, highways, freeways, rail lines, and airport runways. California's 30 million vehicles consume more than 16 billion gallons of gasoline and more than 3 billion gallons of diesel each year, making California the second largest consumer of gasoline in the world.[18]

2.2 Regulatory Overview

2.2.1 Federal Programs

2.2.1.1 Energy Policy and Conservation Act

The Energy Policy and Conservation Act of 1975 was established in response to the oil crisis of 1973, which increased oil prices due to a shortage of reserves. The Act required that all vehicles sold in the U.S. meet certain fuel economy goals, known as the Corporate Average Fuel Economy standards. The National Highway Traffic Safety Administration (NHTSA) of the Department of Transportation (DOT) administers the Corporate Average Fuel Economy program, and the United States Environmental Protection Agency (EPA) provides the fuel economy data.

In April 2010, the EPA and NHTSA issued a Final Rulemaking establishing new federal fuel economy standards for model years 2012 to 2016 passenger cars and light-duty trucks. For

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[11] A watt hour is a unit of energy equivalent to one watt of power expended for one hour. For example, a typical light bulb is 60 watts, meaning that if it is left on for one hour, 60 watt hours have been used. One kilowatt equals 1,000 watts. The consumption of electrical energy by homes and businesses is usually measured in kilowatt hours (kWh). Some large businesses and institutions also use megawatt hours (MWh), where one MWh equals 1,000 kWh. One gigawatt equals one thousand (1,000) megawatts, or one million (1,000,000) kilowatts. The energy output of large power plants over long periods of time, or the energy consumption of jurisdictions, can be expressed in gigawatt hours (GWh).

[12] U.S. Energy Information Administration. 2019. California Electricity Profile 2018. Available online at: https://www.eia.gov/electricity/state/california/. Accessed January 3, 2020.

[13] California Energy Commission. 2018. Energy Consumption Data Management Service. Electricity Consumption by County. Available online at: http://www.ecdms.energy.ca.gov/elecbycounty.aspx. Accessed January 3, 2020.

[14] A British Thermal Unit (BTU) is the amount of energy needed to raise the temperature of one pound of water by one degree Fahrenheit. A kBTU is 1,000 BTUs. A MMBtu is 1,000,000 BTUs. A therm is 100,000 BTUs.

[15] California Energy Commission. 2018. Energy Consumption Data Management Service. Gas Consumption by County. Available online at: http://www.ecdms.energy.ca.gov/gasbycounty.aspx. Accessed January 3, 2020.

[16] California Energy Commission. 2018. Energy Consumption Data Management Service. Gas Consumption by County. Available online at: http://www.ecdms.energy.ca.gov/gasbycounty.aspx. Accessed January 3, 2020.

[17] U.S. Energy Information Administration. 2017. California State Profile and Energy Estimates: Consumption by Sector. Available online at: http://www.eia.gov/state/?sid=CA#tabs-2. Accessed January 3, 2020.

[18] California Energy Commission. 2016. Summary of California Vehicle and Transportation Energy. Available online at: http://www.energy.ca.gov/almanac/transportation_data/summary.html#vehicles. Accessed January 3, 2020.

model year 2012, the fuel economy standards for passenger cars, light trucks, and combined cars and trucks were 33.3 miles per gallon (mpg), 25.4 mpg, and 29.7 mpg, respectively.[19] These standards increase progressively up to 37.8 mpg, 28.8 mpg, and 34.1, respectively, for model year 2016. In subsequent rulemakings the agencies extended the national program of fuel economy standards to passenger vehicles and light-duty trucks of model years 2017-2025, culminating in fuel economy of 54.5 mpg by model year 2025,[20] as well as to medium- and heavy-duty vehicles of model years 2014-2018, including large pickup trucks and vans, semi-trucks, and all types and sizes of work trucks and buses.[21]

2.2.1.2 Energy Policy Act of 2005 and Energy Independence and Security Act of 2007

The Energy Policy Act of 2005 seeks to reduce reliance on non-renewable energy resources and provide incentives to reduce current demand on these resources. For example, under the Energy Policy Act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products. Because driving fuel-efficient vehicles and installing energy-efficient appliances can provide many benefits, such as lower energy bills, increased indoor comfort, and reduced air pollution, businesses are eligible for tax credits for buying hybrid vehicles, building energy-efficient buildings, and improving the energy efficiency of commercial buildings. Additionally, tax credits are given for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

The Energy Policy Act of 2005 also established the first renewable fuel volume mandate in the United States. The original Renewable Fuel Standard program required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012. Under the Energy Independence and Security Act of 2007, the Renewable Fuel Standard program was expanded to include diesel and to increase the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to 36 billion gallons by 2022.

2.2.1.3 American Recovery and Reinvestment Act

The American Recovery and Reinvestment Act of 2009 was passed in response to the economic crisis of the late 2000s, with the primary purpose of maintaining existing jobs and creating new jobs. Among the secondary objectives of the American Recovery and Reinvestment Act was investment in "green" energy programs, including funding the following through grants, loans, or other funding: private companies developing renewable energy technologies; local and state governments implementing energy efficiency and clean energy programs; research in renewable energy, biofuels, and carbon capture; and development of high efficiency or EVs.[22]

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[19] United States Environmental Protection Agency (EPA) and United States Department of Transportation (DOT). 2010. *Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*. Final Rule. 75 Fed. Reg. 25324-25728.

[20] United States Environmental Protection Agency (EPA) and United States Department of Transportation (DOT). 2012. *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*; Final Rule. 77 Fed. Reg. 62623.

[21] United States Environmental Protection Agency (EPA) and United States Department of Transportation (DOT). 2011. *Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles.* 76 Fed. Reg. 57106.

[22] American Recovery and Reinvestment Act of 2009. https://www.govinfo.gov/content/pkg/BILLS-111hr1enr/pdf/BILLS-111hr1enr.pdf. Accessed January 6, 2020.

2.2.1.4 Intermodal Surface Transportation Efficiency Act

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 promotes the development of inter-modal transportation systems to maximize mobility as well as address national and local interests in air quality and energy. The ISTEA contains factors that Metropolitan Planning Organizations (MPO), such as the Association of Bay Area Governments (ABAG), are to address in developing transportation plans and programs, including some energy-related factors. To meet the new Act requirements, MPO have adopted explicit policies defining the social, economic, energy, and environmental values that guide transportation decisions in their respective metropolitan areas. The planning process for specific projects would then address these policies. Another requirement of the ISTEA is to consider the consistency of transportation planning with federal, state, and local energy goals. Through this requirement, energy consumption is expected to be a decision criterion, along with cost and other values to determine the best transportation solution.

2.2.1.5 Transportation Equity Act for the 21st Century

The Transportation Equity Act for the 21st Century ("TEA-21") was signed into law in 1998 and builds upon the initiatives established in the ISTEA legislation discussed above. TEA-21 authorizes highway, highway safety, transit, and other efficient surface transportation programs. TEA-21 continues the program structure established for highways and transit under ISTEA, such as flexibility in the use of funds, emphasis on measures to improve the environment, and focus on a strong planning process as the foundation of good transportation decisions. TEA-21 also provides for investment in research and its application to maximize the performance of the transportation system through, for example, deployment of Intelligent Transportation Systems, to help improve operations and management of transportation systems and vehicle safety.

2.2.1.6 Mobile Source Regulations

Corporate Average Fuel Economy

The Corporate Average Fuel Economy standards seek to reduce energy consumption by increasing the fuel economy of passenger cars and light-duty trucks. Additional information on this regulation can be found in the **Air Quality Technical Report**.

EPA and NHTSA Joint Rulemaking for Vehicle Standards

As discussed above, in April 2010, the EPA and NHTSA issued a final rulemaking establishing new federal GHG and fuel economy standards for model years 2012 to 2016 passenger cars, light-duty trucks, and medium-duty passenger vehicles. In addition, on August 9, 2011, the EPA and NHTSA finalized regulations to reduce GHG emissions and improve fuel efficiency of medium- and heavy-duty vehicles, including large pickup trucks and vans, semi-trucks, and all types and sizes of work trucks and buses.

In August 2016, the EPA and NHTSA adopted the next phase (Phase 2) of the fuel economy and GHG standards for medium- and heavy-duty trucks, which apply to vehicles with model year 2018 and later.[23] In response to the EPA's adoption of the Phase 2 standards, California Air Resources Board (ARB) staff plan to bring a proposed California Phase 2 program before its Board in 2017.[24]

[23] EPA. Federal Register, Vol. 81, No. 206, Tuesday, October 25, 2016, Rules and Regulations. Available at: https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf. Accessed: January 3, 2020.

[24] CARB, CA Phase 2 GHG webpage: http://www.arb.ca.gov/msprog/onroad/caphase2ghg/caphase2ghg.htm. Accessed January 3, 2020.

Additional information on this regulation can be found in the **Air Quality Technical Report**.

2.2.2 State Programs

2.2.2.1 AB 32 (Statewide GHG Reductions)

The California Global Warming Solutions Act of 2006 ([AB 32) was signed into law in September 2006.[25] The law instructed ARB to develop and enforce regulations for the reporting and verification of state-wide GHG emissions. The bulk of GHG emissions in California are carbon dioxide that result from fossil fuel consumption. Therefore, a reduction in GHG emissions typically translates into reduced fuel and increased energy efficiency. The bill directed ARB to set a state-wide GHG emission limit based on 1990 levels, to be achieved by 2020. The bill set a timeline for adopting a scoping plan for achieving GHG reductions in a technologically and economically feasible manner.

The heart of the bill is the requirement that state-wide GHG emissions be reduced to 1990 levels by 2020. Based on ARB's calculation of 1990 baseline emissions levels, California must reduce GHG emissions by approximately 28.5% below "business-as-usual" (BAU) predictions for 2020 to achieve this goal.

In June 2011, ARB revised its "BAU" GHG emission estimate for 2020 in order to account for the recent economic downturn in its emission projections.[26] The estimate presented in the Scoping Plan (596 Million Metric Ton of Carbon Dioxide Equivalent [MMT CO2e]) was based on pre-recession, 2007 data from the Integrated Energy Policy Report. ARB has updated the projected "BAU" 2020 GHG emissions to 545 MMT CO_2e.

AB 32 requires ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions. In December 2008, ARB adopted its Climate Change Scoping Plan: A Framework for Change (Scoping Plan), which included the state's strategies for achieving AB 32's reduction targets. These strategies are implemented with additional rules and regulations pursuant to AB 32 such as Clean Cars, the low carbon fuel standard (LCFS), Title 24 building efficiency standards, and the RPS. These are discussed further below. Additional information on AB 32 can be found in the **Air Quality Technical Report**, and additional information about additional rules and regulations under the umbrella of AB 32 is below.

2.2.2.2 2008 California Energy Action Plan Update

The *2008 Energy Action Plan Update* provides a status update to the *2005 Energy Action Plan II,* which is the State of California's principal energy planning and policy document.[27] The plan continues the goals of the original *Energy Action Plan*, describes a coordinated implementation plan for state energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. First-priority actions to address California's increasing energy demands are energy efficiency, demand response (i.e., reduction of customer energy usage during peak periods in order to address system reliability and support the best use of energy infrastructure), and the use of renewable sources of power. If that these actions are unable

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[25] ARB. Assembly Bill 32 Overview. 2006a. http://www.arb.ca.gov/cc/ab32/ab32.htm. Accessed January 3, 2020.

[26] ARB. 2011. Supplement to the AB 32 Scoping Plan Functional Equivalent Document. http://www.arb.ca.gov/cc/scopingplan/document/Supplement_to_SP_FED.pdf. Accessed January 3, 2020.

[27] California Public Utilities Commission and California Energy Commission (CPUC & CEC). 2008. *2008 Update, Energy Action Plan*. Available online at: http://www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF. Accessed January 3, 2020.

to satisfy the increasing energy and capacity needs, the plan supports clean and efficient fossil-fired generation.

2.2.2.3 Title 24 Building Energy Efficiency Standards

The 2019 California Green Building Standards Code, as specified in Title 24, Part 11 of the California Code of Regulations (CCR), commonly referred to as CalGreen Building Standards (CalGreen), establishes voluntary and mandatory standards to improve public health, safety, and general welfare by enhancing the design and construction of buildings through the use of building concepts having a positive environmental impact and encouraging sustainable construction practices in five categories: planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. The provisions of this code apply to the planning, design, operation, construction, replacement, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such building structures throughout California. Examples of CalGreen provisions include reducing indoor water use, moisture sensing irrigation systems for landscaped areas, construction waste diversion goals, and energy system inspections. CalGreen is periodically amended; the most recent 2019 standards will become effective on January 1, 2020. Until that time, the 2016 standards remain in effect.

The Energy Efficiency Standards for Residential and Nonresidential Buildings, as specified in CCR Title 24, Part 6, were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods for building features such as space conditioning, water heating, lighting, and whole envelope. The 2005, 2008, and 2013 updates to the efficiency standards included provisions such as cool roofs on commercial buildings, increased use of skylights, and higher efficiency lighting, heating, ventilation and air conditioning (HVAC), and water heating systems. Additionally, some standards focused on larger energy saving concepts such as reducing loads at peak periods and seasons and improving the quality of such energy-saving installations. Past updates to the Title 24 standards have proved very effective in reducing building energy use, with the 2013 update estimated to reduce energy consumption in residential buildings by 25% and energy consumption in commercial buildings by 30%, relative to the 2008 standards.[28] The California Energy Commission (CEC) recently adopted another update in 2019, and these new standards become effective on January 1, 2020.[29] The 2019 updates include a requirement for solar photovoltaic (PV) systems for new homes, requirements for newly constructed healthcare facilities, additional high efficiency lighting requirements, high performance attic and walls, higher efficiency water and space heaters, and high efficiency air filters. Relative to the 2016 standards, the 2019 standards are expected to reduce high-

[28] CEC. 2012. Energy Commission Approves More Efficient Buildings for California's Future. Available online at: https://planning.lacity.org/eir/CrossroadsHwd/deir/files/references/C17.pdf. Accessed January 3, 2020.

[29] CEC. 2019. California's Energy Efficiency Standards for Residential and Nonresidential Buildings. Available online at: https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency. Accessed January 3, 2020.

rise residential and non-residential electricity consumption by approximately 10.7% and natural gas consumption by 1%.[30]

2.2.2.4 Senate Bill 32

Enacted in 2016, Senate Bill (SB) 32[31] codifies the 2030 GHG emissions reduction goal of Executive Order B-30-15 by requiring CARB to ensure that statewide GHG emissions are reduced to 40 percent below 1990 levels by 2030. Similar to AB 32, a reduction in GHG emissions typically corresponds with a reduction in energy usage as the bulk of GHGs result from the combustion of fossil fuel.

SB 32 was coupled with a companion bill: AB 197[32]. Designed to improve the transparency of CARB's regulatory and policy-oriented processes, AB 197 created the Joint Legislative Committee on Climate Change Policies, a committee with the responsibility to ascertain facts and make recommendations to the Legislature concerning statewide programs, policies and investments related to climate change. AB 197 also requires CARB to make certain GHG emissions inventory data publicly available on its web site; consider the social costs of GHG emissions when adopting rules and regulations designed to achieve GHG emission reductions; and, include specified information in all Scoping Plan updates for the emission reduction measures contained therein.

2.2.2.5 Senate Bill 100

Enacted in 2018, SB 100,[33] or The 100 Percent Clean Energy Act of 2018, increases the renewable energy and zero-carbon resources procurement target for retail electricity to 100 percent by 2045. The bill also revises the goals established by SB 350 to increase the renewable energy resource procurement target for retail electricity from 50 percent to 60 percent by 2030 and further establishes incremental goals of 33% by 2020, 44% by 2024, and 52% by 2027. SB 100 further directs the State Energy Resources Conservation and Development Commission, the California Public Utilities Commission (CPUC), and CARB to incorporate the 2045 target into all relevant planning and report on implementation every four years beginning on January 1, 2021.

2.2.2.6 Renewables Portfolio Standard

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to obtain at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In November 2008, then-Governor Schwarzenegger signed Executive Order S-14-08, which expands the state's Renewable Portfolio Standard to 33 percent renewable power by 2020. In September 2009, then-Governor Schwarzenegger continued California's commitment to the Renewable Portfolio Standard by signing Executive Order S-21-09, which directs the ARB under its AB 32 authority to enact regulations to help the state meet its Renewable Portfolio Standard goal of 33 percent renewable energy by 2020. In April 2011, Governor Brown signed SB 2X, which legislated the prior Executive

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30 CEC. 2019. 2019 Title 24 Impact Analysis. Available online at: https://ww2.energy.ca.gov/title24/2019standards/post_adoption/documents/2019_Impact_Analysis_Final_Report_2018-06-29.pdf. Accessed January 3, 2020.

31 Pavley. 2016. SB-32, Global Warming Solutions Act of 2006: emissions limit. Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32

32 Garcia. 2016. AB-197, State Air Resources Board: greenhouse gases: regulations. Available at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB197

33 De León, 2018. Senate Bill 100. The 100 Percent Clean Energy Act of 2018.

Order S-14-08 renewable standard. SB 350 further increases the RPS goals to 50 percent renewables by 2030.

In April 2015, Governor Brown issued Executive Order B-30-15, which established a GHG reduction target of 40 percent below 1990 levels by 2030. SB 350 (Chapter 547, Statutes of 2015) advanced these goals through two measures. First, the law increases the renewable power goal from 33 percent renewables by 2020 to 50 percent by 2030. Second, the law requires the CEC to establish annual targets to double energy efficiency in buildings by 2030. The law also requires the CPUC to direct electric utilities to establish annual efficiency targets and implement demand-reduction measures to achieve this goal. As described above, SB 100 sets more aggressive targets that supersede the earlier requirements.

2.2.2.7 Mobile Source Regulations

SB 743 (Updates to CEQA Guidelines)

Public Resources Code Section 21099(c)(1), as codified through enactment of SB 743, was enacted with the intent to change the focus of transportation analyses conducted under CEQA. SB 743 reflects a legislative policy to balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of GHG emissions. SB 743 requires the Office of Planning and Research (OPR) to establish "alternative metrics to the metrics used for traffic levels of service for transportation impacts outside transit priority areas."[34] Under SB 743, the new metrics- or significance criteria- must promote the reduction of GHG emissions, the development of multimodal transportation networks, and a diversity of land uses. SB 743 dictates that once the CEQA Guidelines are amended to include new thresholds, automobile delay, as described by level of service (LOS) or similar measures of vehicular capacity or congestion, shall no longer be considered a significant impact under CEQA in all locations in which the new thresholds are applied. The Legislature gave OPR the option of applying the new thresholds only to transit priority areas, or more broadly to areas throughout the State. OPR has proposed to apply the new thresholds throughout the State.

In December 2018, OPR issued its *Technical Advisory on Evaluating Transportation Impacts in CEQA.* The California Natural Resources Agency (CNRA) incorporated these updates in its December 2018 CEQA Guidelines Update Section 15064.3 and related revisions to Appendix G. Under the new Guidelines, the analysis of transportation impacts in the CEQA context shifts from a levels of service metric to a vehicle miles traveled (VMT) metric. In proposing the new approach, OPR noted the relationship between VMT and GHG emissions. Application of the new CEQA Guidelines is mandatory statewide when assessing CEQA transportation impacts starting July 1, 2020, although lead agencies may elect to opt-in immediately.

SB 375 (Land Use Planning)

SB 375, the Sustainable Communities and Climate Protection Act of 2008, supports the State's climate action goals to reduce GHG emissions through coordinated transportation and land use planning. SB 375 required ARB to establish GHG emission reduction targets (Regional Targets) for each metropolitan planning region. On September 23, 2010, ARB adopted Regional Targets applying to the years 2020 and 2035. In 2011, ARB adopted

[34] California Legislative Information. 2013. SB-743 Environmental quality: transit oriented infill projects, judicial review streamlining for environmental leadership development projects, and entertainment and sports center in the City of Sacramento. http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB743. Accessed January 3, 2020.

Regional Targets of 7% for 2020 and 15% for 2035 for the area under the jurisdiction of ABAG, which includes Stanford University.

SB 375 requires MPO including ABAG to incorporate a "sustainable communities strategy" (SCS) in their regional transportation plans (RTPs) that will achieve the GHG emission Reduction Targets set by ARB, primarily by reducing VMT from light-duty vehicles through development of more compact, complete, and efficient communities. ABAG prepared Plan Bay Area to fulfill this requirement.

The **Greenhouse Gas** chapter in the EIR document describes how the Project is consistent with Plan Bay Area and thus contributes to regional GHG reductions towards the ABAG's targets. In addition, the VMT Technical Report prepared by Fehr & Peers indicates that the proposed Project would generate VMT per worker and VMT per resident rates that are more than 15% below the regional averages. Reductions in GHG emissions and VMT directly translate to reductions in fossil fuel consumption.

Low Carbon Fuel Standard

The LCFS would reduce GHG emissions by reducing the carbon intensity of transportation fuels used in California by at least 10% by 2020. As of September 2018, ARB increased the LCFS to a 20% reduction by 2030. The requirements for this regulation are described in more detail in the **Greenhouse Gas** chapter in the EIR document.

Clean Cars

In January 2012, CARB approved the Advanced Clean Cars Program, which established an emissions control program for cars and light-duty trucks (such as SUVs, pickup trucks, and minivans) of model years 2017-2025. When the program is fully implemented, new vehicles would emit 75% less smog-forming pollutants than the average new car sold today, and GHG emissions would be reduced by nearly 35%. The requirements for this regulation are described in more detail in the **Greenhouse Gas** chapter in the EIR document.

Commercial Motor Vehicle Idling Regulation

On July 22, 2004, CARB initially adopted an Airborne Toxic Control Measure (ATCM) to limit idling of diesel-fueled commercial motor vehicles (idling ATCM) and subsequently amended it on October 20, 2005, October 19, 2009, and December 12, 2013. This ATCM is set forth in Title 13, (CCR), Section 2485, and requires, among other things, that drivers of diesel-fueled commercial motor vehicles with gross vehicle weight ratings greater than 10,000 pounds, including buses and sleeper berth equipped trucks, not idle the vehicle's primary diesel engine longer than five minutes at any location. This anti-idling regulation helps to reduce fuel consumption by reducing engine usage. The ATCM also requires owners and motor carriers that own or dispatch these vehicles to ensure compliance with the ATCM requirements. The regulation consists of new engine and in-use truck requirements and emission performance requirements for technologies used as alternatives to idling the truck's main engine. Under the new engine requirements, 2008 and newer model year heavy-duty diesel engines need to be equipped with a non-programmable engine shutdown system that automatically shuts down the engine after five minutes of idling or optionally meet a stringent oxides of nitrogen idling emission standard.

In-Use Off-Road Diesel Fueled Fleets Regulation

On May 16, 2008, CARB approved the In-Use Off-Road Diesel Fueled Fleets Regulation (Off-Road Regulation), which was later amended on December 31, 2009, July 16, 2010, and December 14, 2011. The overall purpose of the Off-Road Regulation is to reduce emissions of oxides of nitrogen (NOx) and particulate matter (PM) from off-road diesel vehicles operating within California. The regulation applies to all self-propelled off-road diesel vehicles 25 horsepower (hp) or greater used in California and most two-engine vehicles. The Off Road Regulation:

- Imposes limits on idling (i.e., fleets must limit unnecessary idling to 5 minutes), requires a written idling policy, and requires a disclosure when selling vehicles;
- Requires all vehicles to be reported to CARB (using the Diesel Off-Road Online Reporting System (DOORS) and labelled;
- Restricts the adding of older vehicles into fleets starting on January 1, 2014; and
- Requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing Verified Diesel Emission Control Strategies (VDECS; i.e., exhaust retrofits).

The anti-idling component of this Off-Road Regulation helps to reduce fuel consumption by reducing engine usage.

Tractor-Trailer Greenhouse Gas Regulation

CARB’s Tractor-Trailer GHG regulation reduces the energy consumption of large trucks. CARB developed this regulation to make heavy-duty tractors more fuel efficient. Fuel efficiency is improved by requiring the use of aerodynamic tractors and trailers that are also equipped with low rolling resistance tires. The tractors and trailers subject to this regulation must either use United States Environmental Protection Agency SmartWay (SmartWay) certified tractors and trailers, or retrofit their existing fleet with SmartWay verified technologies. The SmartWay certification process is part of their broader voluntary program called the SmartWay Transport Partnership Program. The regulation applies primarily to owners of 53-foot or longer box-type trailers, and owners of the heavy-duty tractors that pull them on California highways. These owners are responsible for replacing or retrofitting their affected vehicles with compliant aerodynamic technologies and low rolling resistance tires. All owners regardless of where their vehicle is registered must comply with the regulation when they operate their affected vehicles on California highways. Besides the owners of these vehicles, drivers, motor carriers, California-based brokers and California-based shippers that operate or use them also share in the responsibility for compliance with the regulation.

3. METHODOLOGY FOR DEVELOPMENT OF ENERGY PROJECTIONS

Table 1 lists the sources for which energy use estimates from the Project are quantified.

3.1 Project Construction Energy Use

The Project will be constructed in two or more development phases or subphases with full buildout expected to occur approximately seven or more years after project entitlements. This analysis conservatively assumes that there will be as few as two phases, that the complete build out would occur in as few as seven years and that the buildings constructed in each phase of the construction program (i.e., Phase 1 or Phase 2) would be occupied and fully operational as soon as construction of each phase is completed. This is conservative because occupancy and operation of each phase would likely ramp up over time, rather than upon completion of construction. The analysis also assumes that operational energy use from Phase 1 can overlap with construction energy use from Phase 2; this is conservative because it assumes only two phases, rather than several phases or subphases, which are conservatively estimated to be completed in approximately seven years.

The first phase of the construction program would commence after all existing uses have vacated. The preliminary construction schedule assumes that construction would start in 2020 and that it would take place on average for six days per week for the ballpark and five days per week for other land uses, with different equipment operating for different hours and different parts of the phase. See the **Air Quality Technical Report** for a summary of the expected construction phasing timeline, provided by the Project sponsor.

Initial construction activities affecting the full site area include demolition of the existing Howard Terminal buildings and parking lots, followed by geotechnical work. Construction activities related to Phase 1 land uses (the ballpark and initial mixed-use development) include grading, construction of a cut off wall,[35] site preparation, site utility upgrades, building construction, architectural coating, and paving. Construction activities related to Phase 2 land uses would include the same activities as Phase 1 for the remaining mixed-use development.

Energy use calculations associated with off-road construction equipment are based on the construction schedule, type and quantity of equipment and hours of operation for each piece of equipment based on Project-specific information provided by the Project sponsor for demolition, geotechnical work, grading and site preparation, cut off wall construction, utility upgrade installation, building construction, architectural coating, and paving. Fuel use from off-road construction equipment is estimated using consistent with EPA AP-42 diesel fuel. All off-road equipment is either diesel-fueled or electric based on Project-specific information. **Table 2** shows the anticipated fuel and electricity usage from off-road equipment. Unmitigated energy use assumes off-road engines are fleet-average, while mitigated energy use assumes off-road equipment is equipped with Tier 4 Final engines (with minor exceptions). Mitigated energy use also includes energy use from the construction of the Pedestrian Bike Overpass area of Phase 1

[35] The project may include a cutoff wall that will be constructed in the ground, directly below the perimeter of the ballpark. The cutoff will be constructed to reduce or eliminate the effects of groundwater on the baseball playing field under both current and future groundwater levels. An additional benefit may be to reduce or eliminate water proofing of portions of the stadium constructed below the groundwater level. The cutoff will be approximately 3 feet in cross-sectional width and comprise a mixture of native soil, bentonite clay, cement and water. The cutoff will extend approximately 60 to 70 feet below existing grade into the San Antonio Formation. The wall will be constructed to create a complete circle.

which is an Air Quality mitigation measure and is only constructed during the Mitigated scenario; this is the reason that Mitigated energy use is shown to be higher than Unmitigated energy use.

Passenger vehicles for construction workers are assumed to use gasoline. On-road construction vehicles such as vendors and trucks for demolition material, soil, and other material hauling are assumed to use diesel fuel. These fuel uses are calculated based on the number of trips and VMT along with fuel efficiency from EMFAC2017. Trip counts were provided by the Project sponsor for hauling, worker and vendor trips, and California Emissions Estimator Model (CalEEMod®) defaults are used for trip lengths for worker, vendor, and haul trips. **Table 3** shows the fuel efficiency derivations for the on-road vehicle types, while **Table 4** shows the anticipated fuel consumption from on-road construction vehicles.

Construction water trucks use indirect electricity to supply, treat, and distribute the water. **Table 5** shows the electricity required for construction water usage.

Total construction energy use is summarized in **Table 6**.

3.2 A's Related Existing Conditions Operational Energy Use

Detailed calculations of A's Related Existing Conditions operational energy uses are further explained below. These are calculated in order to estimate the net energy use of the Project (Project energy use minus A's Related Existing Conditions energy use).

3.2.1 Building Energy Use

Natural gas and electricity provide building energy for residential and commercial use. **Table 7** shows the annual and peak electricity and natural gas use for the Coliseum and A's Headquarters building.

Energy use for the A's Related Existing Conditions was based on a combination of historical data and the CalEEMod® defaults. For the existing Coliseum stadium, per-attendee electricity and natural gas use rates were estimated from the 2017 MLB season using PG&E electricity billing data, facility natural gas metering data, and 2017 MLB attendance. It is assumed that energy use in 2018 (the Existing Conditions year) is comparable to 2017. The per-attendee energy use rates were used to estimate total energy usage associated with events at the Coliseum in units of kilowatt-hours of electricity and thousand British thermal units (kBTU) of natural gas. For the A's headquarters at Jack London Square, electricity and natural gas use rates are calculated using CalEEMod® default energy consumption profile for a General Office Building (in climate zone 5). As the headquarters building was constructed prior to 2010, it is conservative for the A's Related Existing Conditions scenario to assume CalEEMod® default energy use rates for 2016 Title 24 Building Energy Efficiency Standards.

Additional information and tables regarding building electricity and natural gas usage estimates can be found in the **Air Quality Technical Report**.

3.2.2 Water Energy Use

Electricity is used to supply, treat, and distribute potable water and treat the resulting wastewater. Water consumption and wastewater generation were quantified as shown in the **Air Quality Technical Report, Table 31**. This electricity from water use is summarized in **Table 11**.

3.2.3 Mobile Energy Use

Fuel usage was estimated from on-road VMT by residents, spectators, event staff, employees, and visitors. Trip generation rates and total VMT for each land use for the existing conditions were provided by Fehr & Peers, as shown in the **Air Quality Technical Report, Table 23**. Fuel usage was estimated using an average mpg obtained from EMFAC2017 for the fleet mix corresponding to the vehicle category and fuel type (gasoline, diesel, compressed natural gas, or electricity).

Table 8 shows detailed mobile fuel consumption estimates for both Existing Conditions and A's Related Existing Conditions.

Additionally, this analysis accounts for energy use from Transportation Refrigeration Units (TRUs), which are cooling units installed on trucks carrying perishable goods, such as food. TRU energy use was calculated for this analysis to account for perishable goods delivery for the existing Coliseum. It was assumed that all TRUs would be diesel-powered. Energy use during travel time and during unloading were calculated using TRU assumptions discussed in the **Air Quality Technical Report, Table 40**. This energy use is summarized in **Table 11**.

Energy use from landscaping equipment was not included as it was assumed to be negligible relative to other Existing Conditions sources.

3.2.4 Stationary Source Energy Use

Diesel fuel usage is from diesel combustion resulting from their operation for testing and maintenance and for emergency operation. Under Existing Conditions, there are currently two emergency generators installed; however, energy use from these generators was conservatively not quantified or removed from the Project fuel use.

3.2.5 Summary of A's Related Existing Conditions Energy Consumption

Table 11 shows the total energy use for the A's Related Existing Conditions, including electricity, natural gas, diesel fuel, and gasoline.

3.3 Project Operational Energy Use

Detailed calculations of Project operational energy uses are further explained below.

3.3.1 Building Energy Use

Natural gas and electricity provide building energy for residential and commercial use. **Table 7** shows the annual and peak electricity and natural gas use for the ballpark and non-ballpark Project buildings.

Project annual energy use was based on a combination of historical data, Project-specific data from Meyers+ Engineers, and CalEEMod® defaults adjusted for 2019 Title 24. Natural gas consumption for the Project's Howard Terminal ballpark was quantified using the same methodology as for the existing Coliseum ballpark. For the purpose of this assessment, Ramboll assumes that natural gas use characteristics for Project are comparable to the Coliseum on a per-attendee basis. This is conservative as the new events uses are likely far more efficient for overall energy use than the existing Coliseum Stadium. Electricity use for the ballpark stadium was provided by Meyers+ Engineers. Energy use for the Project's retail, hotel, office, restaurant, performance venue, residential, and parking uses are calculated using CalEEMod® default energy consumption profiles, updated to reflect buildings constructed to 2019 Title 24 Building Energy Efficiency Standards as described in **Table 7**. Meyers+ Engineers provided estimates of peak electricity use and peak natural gas use for each land use subtype.

The Project will likely include additional energy conservation measures, which could include improved lighting, cooling, and water heating efficiencies, and solar hot water heating. These details are not known at this time and are conservatively excluded from the energy use estimates.

Additional information and tables regarding building electricity and natural gas usage estimates can be found in the **Air Quality Technical Report**.

3.3.2 Water Energy Use

Electricity is used to supply, treat, and distribute potable water and treat the resulting wastewater. Water consumption and wastewater generation were quantified as shown in the Air Quality Technical Report, Table 31. This electricity from water use is summarized in **Table 12**.

3.3.3 Mobile Energy Use

Fuel usage was estimated from on-road VMT by residents, spectators, event staff, employees, and visitors. Trip generation rates and total VMT for each land use for the Phase 1 Buildout and Full Project Buildout were provided by Fehr & Peers, as shown in the **Air Quality Technical Report, Table 23**. Fuel usage was estimated using an average mpg obtained from EMFAC2017 for the fleet mix corresponding to the vehicle category and fuel type (gasoline, diesel, compressed natural gas, or electricity).

Table 8 shows detailed vehicle fuel usage estimates for each scenario, including implementation of the Transportation Management Plan (TMP) and Transportation Demand Management (TDM) Plan measures. As shown in Table 8, mobile fuel usage is estimated to increase with Project Full Buildout due to the increase in annual VMT, despite improvements in vehicle fuel efficiency. Fehr & Peers also provided VMT without vehicle trip reduction (VTR) measures included in the TMP and TDM; energy use using the unreduced VMT was also calculated and are included in **Appendix D of the Air Quality Technical Report**.

Additionally, this analysis accounts for energy use from TRUs to account for perishable goods delivery to the Project, including the Howard Terminal ballpark. It was assumed that all TRUs would be diesel-powered. Energy use during travel time and during unloading were calculated using TRU assumptions discussed in the **Air Quality Technical Report, Table 40**. This energy use is summarized in **Table 12.**

Energy use from landscaping equipment was not included as it was assumed to be negligible relative to other Project sources. Additionally, energy use from idling Port trucks due to Project-caused traffic was also not included because it was assumed to be negligible. These are both discussed further in the **Air Quality Technical Report**.

Additionally, the TMP includes various strategies to reduce ballpark trips by 20 percent. One of those strategies provides that a transit hub be situated along 2nd Street to be used for shuttle bus stops from each of the three nearby Bart stations. Shuttle buses are assumed to operate for six hours a day on gamedays and for ballpark concert events only. Such service is an optional element of the TMP. For this reason, it is not known whether this service will be provided. Because such service is possible, shuttle bus energy use has been estimated, as shown in **Appendix E of the Air Quality Technical Report**. This energy use would be in addition to those discussed in this Section.

3.3.4 EV Charging Energy Use

Electricity used to charge additional EVs beyond the projected fleet-average due to the Project's commitment to including EV charging stations onsite is shown in Table 9. This assumes that all land uses at the Project will have EV chargers at 10% of total parking spaces. Battery EVs use electricity to drive their motors rather than that combustion of gasoline or diesel fuel. The gasoline and diesel displaced by the additional EVs is calculated in **Table 9**. The detailed derivation of the electricity usage VMT displacement estimates is shown in the **Air Quality Technical Report, Table 38**.

3.3.5 Stationary Source Energy Use

Diesel fuel usage from diesel combustion resulting from generator operation for testing and maintenance is included in this analysis. For the Full Buildout Project, 17 emergency generators are anticipated to be installed. Operation for routine maintenance and testing is conservatively assumed to be 50 hours per year for an unmitigated scenario, consistent with the maximum allowed testing time from the ATCM for Stationary Compression Ignition Engines (17 CCR 93115). Additionally, a mitigated scenario of 20 hours per year of operation for routine maintenance and testing was analyzed.

Fuel usage was estimated based on the fuel consumption rate based on generator size (provided by Meyers+ Engineers). **Table 10** provides details on fuel usage estimates from emergency generators. Additional details on fuel consumption rate and hours of operation can be found in the **Air Quality Technical Report, Table 36 and Table 37**.

3.3.6 Summary of Net Project Operational Energy Consumption

Table 11 summarizes A's Related Existing Conditions operational energy use by source and **Table 12** summarizes Phase 1 Buildout and Full Project Buildout operational energy use by source. **Table 13** presents the change in energy use between the A's Related Existing Conditions and Full Project Buildout.

3.3.7 Potential Mitigation Measures for Air Quality that Affect Energy Use

3.3.7.1 100% Zero-Carbon Electricity

As discussed above, if it is available, the Project could purchase 100% zero-carbon electricity through the East Bay Community Energy[36] program. This would not change the amount of electricity used by the Project but would affect the source of electricity.

3.3.7.2 On-Site Solar

The Project is also considering on-site solar PV energy on the rooftops of the non-ballpark buildings. For the purpose of the **Air Quality Technical Report**, it was assumed that 50% of the available rooftop space of all non-ballpark buildings could be utilized for rooftop solar PV panels. This estimate is specific to the Project based on conversations with the Project sponsor. Rooftop area was estimated from Project site plans. Annual electricity generated is calculated using the National Renewable Energy Laboratory's PVWatts®, version 6.[37] Input parameters are all defaults for Oakland, California, including a standard module type, fixed (roof mount) array type, system losses, tilt, and azimuth, as shown in **Table 47** of the **Air Quality Technical Report**. Again, this air quality mitigation measure would not change the amount of energy required by the Project but would change the source of electricity.

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[36] East Bay Community Energy (EBCE). Information available online: https://ebce.org/power-mix/. Accessed January 3, 2020.

[37] PVWatts. Available online at https://pvwatts.nrel.gov/pvwatts.php. Accessed January 3, 2020.

3.3.7.3 No Natural Gas for Residential Development

The Project could choose to include no natural gas in some or all residences in the non-ballpark development. Ramboll calculated the reduction in natural gas consumption for residential land uses by assuming that all natural gas use from the Project residential land use is replaced by zero-carbon electricity. Alternatively, natural gas use could also be replaced by grid electricity. This analysis assumes that the all-electric residences have an overall 40% higher kilowatt-hour usage compared to residential buildings with natural gas domestic hot water, space heating and appliances, as estimated by Meyers+ Engineers. The energy use is shown in **Table 14**.

3.3.7.4 Limited Natural Gas for Retail/Commercial Development

This potential air quality mitigation measure shows the change in energy use that would result from the replacement of natural gas consumption from space heating for non-ballpark non-residential land uses by zero-carbon electricity. Alternatively, natural gas consumption from space heating for non-residential land uses could instead be replaced by grid electricity. This analysis assumes that the all-electric commercial buildings have an overall 15% higher kilowatt-hour usage compared to commercial buildings with natural gas space heating, as estimated by Meyers+ Engineers. Energy use is shown in **Table 15** of the **Air Quality Technical Report.**

3.3.7.5 Additional EV Charging

Ten percent of parking spaces at the Project will be equipped with EV chargers, as described in the sections above. The Project sponsor could choose to add additional EV charging. For the purposes of this analysis, it is assumed that greater than 10 percent of parking spaces are serviced by Level 2 EV charging stations. Instead of increasing the percentage of charging-capable parking spaces uniformly, EV charging-capable parking spaces were increased in specific land uses which were charger-limited to maximize emissions reductions from EV charging.

Reductions are capped based on the maximum charging capacity and number of EV trips that are available for charging for each activity type. For certain activities, such as weeknight ballpark games in early years, the Project is charger-limited at 10% (e.g. there are more EV trips than there is available charger capacity during prime business or activity hours), while for other activities the Project is EV-limited at 10% (e.g. there is more than enough charger capacity to charge the number of EVs expected to visit the site based on the fleet mix that would achieve statewide targets). For the land uses that were charger-limited at 10%, the percent of EV chargers was increased, resulting in the following breakdown:

- Residential: 15% of spaces
- Office: 10% of spaces
- Restaurant: 20% of spaces
- Retail: 20% of spaces
- Hotel: 15% of spaces
- Ballpark: 35% of spaces

For Phase 1, this includes 27 additional parking spaces for residential units, no additional parking spaces for office land use, 8 additional parking spaces for retail and restaurant, 10 additional parking spaces for the hotel, and 0 parking spaces for the interim ballpark parking. For Full Buildout, this includes 150 additional parking spaces for residential units, no additional parking spaces for office land use, 70 additional parking spaces for retail and restaurant, 10 additional parking spaces for the hotel, and 500 additional parking spaces for the ballpark. The incremental increase in miles charged by Project chargers per year and CAP and GHG emissions reductions from this charging relative to conventional gasoline vehicles were calculated using the same methods and assumptions used for the Project, as discussed in **Section 2.4.10** of the **Air Quality Technical Report.** Energy use changes from additional EV charging are shown in **Table 9**.

3.4 Maritime Reservation Scenario Energy Use

As discussed above, the Maritime Reservation Scenario involves an alternative site plan for the Project that will be analyzed alongside the Project site plan described above. Under the Term Sheet between the Project sponsor and the Port of Oakland, the Port would have the right to terminate the Project sponsor's development rights to a portion of the Project site located generally within the southwestern corner of the site if the Port deemed that area necessary to accommodate the expansion of the turning basin that is used to turn large vessels within Oakland's Inner Harbor.

Under the Term Sheet, the Port of Oakland could, at any point within the next 10 years, choose to exercise its option and take back up to approximately 10 acres of the site from the Project sponsor, as shown in **Figure 10** of the **Air Quality Technical Report**. As a result, the Project site plan would be modified, and the proposed development would be denser, fitting the same development program (i.e. the ballpark and mix of other uses proposed) onto the smaller site.

The Port of Oakland has not proposed, designed, approved, or secured permitting for an expanded turning basin and the impacts of the expansion are not considered in this analysis. If the Port were to exercise its option and take back a portion of the Project site from the Project sponsor, the Port would analyze the potential impacts of expanding the turning basin as a separate project at that time.

Energy sources for the Maritime Reservation Scenario are identical to the sources shown in **Table 1** for the Project.

3.4.1 Maritime Reservation Scenario Construction Energy Use

Construction energy use for the Maritime Reservation Scenario was calculated by scaling the Project Phase 2 horizontal construction energy usage by the ratio of acreage of the Maritime Reservation Scenario to the Project. Vertical construction (building construction and architectural coating) energy use was not scaled since square footage for both the proposed Project and Maritime Reservation Scenario are the same. According to the Project Description, the only difference in acreage is in Phase 2 of construction; therefore, Phase 1 energy use for the Maritime Reservation Scenario are the same as the Project. The electricity usage for electric equipment and water consumption were conservatively assumed to be the same as the Project, and thus these values were not scaled for energy usage (similar to the assumption made for emissions in the **Air Quality Technical Report**, as discussed in **Section 6.2.1**). Total construction energy use is summarized in **Table 16**.

3.4.2 Maritime Reservation Scenario Operational Energy Use

The sources of operational energy use for the Maritime Reservation Scenario are the same as the Project energy use sources, as shown in **Table 1** and discussed further below.

Energy use for the A's Related Existing Conditions (which is used to calculate net energy use for the Maritime Reservation Scenario) was calculated using the same methods described in **Section 3.2.** No changes were made to the Howard Terminal Ballpark energy use for the Maritime Reservation Scenario relative to the Project. The sections below describe changes made to the non-ballpark land uses only for the Maritime Reservation Scenario.

3.4.2.1 Maritime Reservation Scenario Building and Water Energy Use

Building natural gas and electricity use (both annual and peak) for the Maritime Reservation Scenario is not expected to be different than the Project, since the overall square footage, land uses, and population are assumed to be the same. A summary of building energy use for Maritime Reservation Scenario is shown in Error! Reference source not found..

Water consumption and wastewater generation are also expected to be the same as the Project, as shown in Error! Reference source not found..

As was discussed for the Project, the Maritime Reservation Scenario will likely include additional energy conservation measures, which could include improved lighting, cooling, and water heating efficiencies, and solar hot water heating. These details are not known at this time and are conservatively excluded from the energy use estimates.

Additional information and tables regarding electricity and natural gas usage estimates can be found in the **Air Quality Technical Report**.

3.4.2.2 Maritime Reservation Scenario Mobile and EV Charger Energy Use

According to the Fehr & Peers, the transportation engineer, VMT for the Maritime Reservation Scenario will be the same as the Project since there is no change in square footage, land uses, or population. Therefore, energy use from mobile sources, EV chargers, and TRU operations will also be the same. This energy use is summarized in Error! Reference source not found..

3.4.2.3 Maritime Reservation Scenario Stationary Source Energy Use

As discussed above, emergency diesel generators combust diesel fuel. Diesel fuel usage quantified in this analysis accounts for diesel combustion used for testing and maintenance of the generators. For the Full Buildout Maritime Reservation Scenario, it is assumed that each of the non-ballpark buildings will have one emergency generator and the Howard Terminal ballpark will have one generator, for a total of 15 generators. Operation for routine maintenance and testing is conservatively assumed to be 50 hours per year for an unmitigated scenario, consistent with the maximum allowed testing time from the ATCM for Stationary Compression Ignition Engines (17 CCR 93115). Additionally, a mitigated scenario of 20 hours per year of operation for routine maintenance and testing was analyzed, as was done for the Project.

Fuel usage was estimated based on the fuel consumption rate based on generator size (provided by Meyers+ Engineers). **Table 17** provides details on fuel usage estimates from emergency generators. Additional details on fuel consumption rate and hours of operation can be found in the **Air Quality Technical Report, Table 79** and **Table 80**.

3.4.2.4 Summary of Maritime Reservation Scenario Operational EnergyConsumption

A summary of energy use from the Maritime Reservation Scenario is shown in Error! Reference source not found.. **Table 19** shows the net new Maritime Reservation Scenario energy use, which subtracts the A's Related Existing Conditions Energy Use from the Maritime Reservation Scenario Energy Use.

3.5 Project Variant Energy Sources

As discussed above, the Project may include one or more variants, which are Project elements that may or may not be proposed as part of the Project for particular reasons. Both variants are described briefly below. The location of the variants relative to the Project site is depicted in **Figure 12** of the **Air Quality Technical Report**.

The Peaker Power Plant Variant would implement the Project as well as the planned conversion of the existing OPP (now referred to as the "Peaker Plant") in the historic PG&E Station C facility from using jet fuel for peak power generation to a battery energy storage system.

The site of this variant is on the Project site, fronting Embarcadero West between Martin Luther King Way and Jefferson Street, and includes the associated fuel storage tank east of Jefferson Streets. The variant involves alterations to the existing power plant building, demolition of the existing fuel tank, and construction of a mixed-use building on the fuel tank parcel. This is a variant in this EIR because the Oakland A's do not control the site, although they have entered into an agreement with the Peaker Plant's owner, who believes that the increased energy demand associated with the Project will make conversion to battery storage economically feasible.

Additionally, the Aerial Gondola Variant includes the Project with the addition of a new aerial gondola above and along Washington Street, extending from 10th Street in downtown Oakland to Jack London Square. The gondola would be a mass transit option for people going to the Project site on a daily basis and for events. The gondola would transport people from downtown Oakland near the 12th Street BART Station and Oakland Convention Center to Jack London Square at the foot of Washington Street. The gondola is proposed to traverse over the skyway between the courthouse and police building at Washington and 6th Street, over the Nimitz Freeway / I-880, and over the railroad tracks. This variant could be implemented with the Project in Phase 1 (by opening day of the ballpark) or before Full Buildout.

3.5.1 Variant Construction Energy Use

Construction energy use for the variants was calculated using the same methodology as the Project. The construction equipment list for the Variants was provided by the Project sponsor. Diesel and electricity usage from off-road equipment for construction of the variants is shown in **Table 20**. **Table 21** shows the anticipated fuel consumption from on-road construction vehicles. **Table 22** shows the electricity required for construction water usage. Total construction energy use is summarized in **Table 32**.

3.5.2 Peaker Power Plant Variant Operational Energy Use

The Peaker Power Plant Variant will result in avoided energy use from the current jet fuel-powered electricity peaker plant that would be converted to battery storage. The battery storage would charge with electricity from the grid during non-peak hours and re-supply the grid with electricity during peak hours. The batteries that will be installed on-site have a round trip efficiency of 85%, based on communication with the Project sponsor, so approximately 15% of electricity pulled from the grid is lost.[38] The jet fuel energy reduction, peaker power plant avoided electricity generation, and electricity losses from batteries, as well as methods used for calculations, are shown in **Table 24.** Total operational energy use is summarized in **Table 28**.

While battery storage results in net zero electricity consumption, there are significant benefits to installing battery storage that are not explicitly quantified. Battery energy storage systems provide improvements to grid reliability by transferring otherwise curtailed electricity produced during off-peak times to peak times. This additionally promotes the transition to more renewably sourced electricity and eliminates the need for additional fossil fueled peaker plant operation.

3.5.3 Aerial Gondola Variant Operational Energy Use

The Aerial Gondola Variant will have three effects on energy use: 1) it will reduce fuel used by vehicles traveling to and from the Project site, since some visitors to the site will take the Aerial Gondola instead of a vehicle; 2) it will consume electricity for its own operation at each of the two proposed stations and one intermediate tower; and 3) it will consume diesel for the operation of emergency generators at each of the two proposed stations and one intermediate tower. The energy reduced from vehicles as well as the energy consumed by the Gondola are shown in **Table 25** and **Table 26**. Electricity use from the gondola and associated building loads was provided by SCJ Alliance on April 3, 2019. Total operational energy use is summarized in **Table 28**. Fuel usage for the emergency generators was estimated based on the fuel consumption rate based on generator size (provided by Meyers+ Engineers). **Table 17** provides details on fuel usage estimates from emergency generators. Additional details on fuel consumption rate and hours of operation can be found in the **Air Quality Technical Report, Table 107**.

3.6 Project Alternatives Energy Sources

3.6.1 Alternative 1: No Project Alternative

The No Project Alternative assumes that the Project is not constructed and that existing truck activity at Howard Terminal continues. Energy use from the No Project Alternative would consist of energy use from the A's Related Existing Conditions at the Coliseum, as quantified above, plus the energy use from the existing truck activity at Howard Terminal. This energy use has not been quantified.

3.6.2 Alternative 2: The Off-Site (Coliseum Area) Alternative

The Off-Site Alternative assumes that Howard Terminal would remain in its current use and the Oakland A's would construct a new ballpark and mixed-use development at the site of the Oakland Coliseum as envisioned in the City's adopted Coliseum Area Specific Plan. This Energy Technical Report does not provide any analyses for this alternative, since impacts from this alternative were already assessed as part of the Coliseum Area Specific Plan EIR.

3.6.3 Alternative 3: Reduced Project Alternative

The Reduced Project Alternative assumes that the ballpark, hotel, and performance venue are constructed in Phase 1 of the Project. In addition to these land uses, this alternative also assumes that residential and commercial land uses, including offices, retail, and restaurant spaces, as well as parking garages, will be constructed in both Phase 1 and Phase 2 with

[38] National Renewable Energy Laboratory (NREL). 2019. Cole, Wesley and Frazier, A. Will. June. Available online at: https://www.nrel.gov/docs/fy19osti/73222.pdf. Accessed February 2020.

reduced square footage relative to the Project. The reduced square footage analyzed for this alternative was a 77 percent reduction relative to the Project.

The Reduced Project Alternative will, by design, have lower energy use the Project, since it will involve the construction of less square footage and have a smaller population of residents and employees at Full Buildout than the Project. Therefore, while energy use was not explicitly calculated for the Reduced Project Alternative, the impact will be less than the Project impact.

3.6.4 Alternative 4: Grade Separation Alternative

3.6.4.1 Construction Energy Use

The Grade Separation Alternative involves the construction of an overpass and an underpass at either Brush Street or Market Street, as an addition to the Project. Construction energy use for the Grade Separation Alternative was calculated using the same methodology as the Project. Diesel and electricity usage from off-road equipment for construction of the Grade Separation Alternative is shown in **Table 29**. **Table 30** shows the anticipated fuel consumption from on-road construction vehicles. **Table 31** shows the electricity required for construction water usage.

Total construction energy use for the Grade Separation Alternative is summarized in **Table 32**. This energy use can be added to the Project energy use to see overall energy use of this alternative including the Project.

3.6.4.2 Grade Separation Alternative Operational Energy Use

According to Fehr & Peers, the Grade Separation Alternative is not expected to have a noticeable effect on transportation mode shifts or traffic volumes. All other operational energy sources (e.g., emergency generators, building energy use, etc.) would be unaffected. Therefore, the Grade Separation Alternative is not expected to have an effect on operational energy use, and it is assumed to be the same as the Project.

4. IMPACT ASSESSMENT AND MITIGATION MEASURES

4.1 Standards of Significance

CEQA Guidelines Appendix G (as amended December 28, 2018) includes two significance thresholds related to Energy as follows:

Would the project:

A. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

B. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

In addition, Part I of Appendix F of the CEQA Guidelines states as follows:

"The goal of conserving energy implies the wise and efficient use of energy. The means of achieving this goal include:

1. decreasing overall per capita energy consumption,
2. decreasing reliance on natural gas and oil, and
3. increasing reliance on renewable energy resources."

Appendix F states that an EIR should discuss the general energy impacts of a project, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy. The avoidance of inefficient, wasteful, and unnecessary consumption of energy will be the standard of significance used for this Project.

The City of Oakland has also established thresholds of significance[39] for CEQA impacts. The City's thresholds of significance for CEQA impacts listed under the topic of utilities include the following two thresholds relating to energy. Based on these thresholds, the Project would have a significant adverse impact related to energy if it would:

1. Violate applicable federal, state and local statutes and regulations relating to energy standards; or
2. Result in a determination by the energy provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the providers' existing commitments and require or result in construction of new energy facilities or expansion of existing facilities, construction of which could cause significant environmental effects.

These City thresholds of significance are addressed as part of the analysis of the two significance criteria identified above.

For purposes of this analysis, impacts to Energy Resources will be considered to be significant if the Project would result in the wasteful, inefficient or unnecessary consumption of energy resources, and conversely if the project would conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

[39] City of Oakland. 2016. CEQA Thresholds of Significance Guidelines. October 17.

4.2 Methodology

The methodology used to evaluate the significance of the Project's energy-related impacts is explained in the context of each impact, as discussed below.

4.3 Environmental Analysis

<u>Impact ER-1:</u> The Project Would Not Result in the Wasteful, Inefficient or Unnecessary Consumption of Fuel or Energy, and Conversely the Project Would Not Conflict With or Obstruct a State or Local Plan for Renewable Energy or Energy Efficiency (Less Than Significant)

4.3.1 Overview

The Project will be constructed in compliance with California's Building Energy Efficiency Standards; California's Green Building Standards; City of Oakland and/or AB 734 additional requirements; and will implement TDM strategies to reduce vehicle miles traveled and mobile fuel use. Overall, these programs will ensure that the Project reduces wasteful consumption of energy and does not obstruct any plans for renewable energy or energy efficiency.

4.3.2 Analysis of Factors Identified in CEQA Guidelines Appendix F

To determine whether a project would result in the wasteful, inefficient or unnecessary consumption of fuel or energy, and conversely whether the project would fail to incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation or other project features, Appendix F of the CEQA Guidelines identifies six categories of potential energy-related environmental impacts, and five categories of potential mitigation measures that may be incorporated into the project. Each impact and mitigation category identified in Appendix F is addressed below.

Based on the analysis of each of these factors, the potential for the Project to result in wasteful, inefficient or unnecessary consumption of fuel or energy, and conversely to fail to incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation or other project features is **Less Than Significant.**

4.3.2.1 Appendix F.II.C.1 Energy Requirements and Energy Use Efficiencies

In section II.C.1, CEQA Guidelines Appendix F states that environmental impacts may include:

The project's energy requirements and its energy use efficiencies by amount and fuel type for each stage of the project including construction, operation, maintenance and/or removal. If appropriate the energy intensiveness of materials may be discussed.

The inventories prepared for this evaluation include energy and fuel used for construction and operation of the Project. Energy intensiveness of materials is not addressed because the California Governor's OPR has stated that lifecycle analyses are not required under CEQA,[40] and in December 2009 the CNRA issued energy conservation guidelines for EIRs that make no reference to lifecycle emissions.[41] The CNRA explained that: (1) There exists no standard

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[40] California Natural Resources Agency, 2009. *Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97*, pp. 71-72. http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf. Accessed January 3, 2020.

[41] State CEQA Guidelines, Appendix F. These new guidelines were part of amendments issued pursuant to SB97. A copy of this document is available for public review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0903E.

regulatory definition for lifecycle emissions, and (2) Even if a standard definition for 'lifecycle' existed, the term might be interpreted to refer to emissions "beyond those that could be considered 'indirect effects'" as defined by CEQA Guidelines, and therefore, beyond what an EIR is required to estimate and mitigate.[42] This reasoning was reaffirmed in the November 2018 CEQA Guidelines Update.[43]

The Project requires energy in the forms of electricity, natural gas, and gasoline and diesel fuel. These energy use requirements are summarized in **Table 11** for existing conditions, **Table 12** for operational activities, and **Table 6** for construction activities. The change from the existing conditions to Full Buildout Project are shown in **Table 13.**

As shown in the tables noted above, operational electricity, natural gas, diesel, and gasoline requirements are projected to increase from the A's Related Existing Conditions to the Project due to the additional land uses included in the Project and not otherwise accounted for in the A's Related Existing Conditions (e.g., residences). However, the mobile fuel requirements will not increase as much as they would in the absence of the Project's TDM and TMP programs, EV initiatives, and increasing fuel efficiencies of vehicles. The electricity and natural gas consumption is a conservative estimate because the Project will also be required to achieve LEED Gold building design per AB734, which has not been incorporated quantitatively into this assessment. Additional water efficiency measures will further reduce electricity consumption. Due to its energy-efficient design and focus on reducing mobile fuel use, the resulting energy use from Project implementation is not wasteful or unnecessary.

4.3.2.2 Appendix F.II.C.2 Local and Regional Energy Supplies

In section II.C.2, CEQA Guidelines Appendix F states that environmental impacts may include:

The effects of the project on local and regional energy supplies and on requirements for additional capacity.

The Project will not have a substantial impact on the local or regional energy supplies or require additional capacity to be constructed. Through use of renewable energy, energy efficiency standards, and EV charging infrastructure, the Project will minimize impacts on the local and regional energy supply. The transition toward electric fuels for on-site vehicles will result in a small increase in calculated total electricity usage that will not significantly impact overall electricity infrastructure. This small increase may be offset by gains in energy efficiency at the Project that are not quantitatively addressed in the energy usage calculations as noted above.

As shown and discussed in **Section 3** above, the Project relies on electricity, natural gas, and gasoline and diesel consumption associated with mobile operations, emergency generator operations, and construction operations. Total energy use requirements for Existing Conditions and Project Full Buildout years are summarized in **Tables 6, 11**, and **12**.

[42] California Natural Resources Agency, 2009. *Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97*, p. 71. http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf. Accessed January 3, 2020.

[43] CNRA, 2018. Final Statement of Reasons For Regulatory Action
Amendments to the State CEQA Guidelines. Available at: http://resources.ca.gov/ceqa/docs/2018_CEQA_Final_Statement_of%20Reasons_111218.pdf, pg 41. Accessed January 3, 2020.

The Project site is supplied both electricity and natural gas through PG&E. PG&E has established contracts to ensure there is adequate electricity generation capacity to meet its current and future loads. In addition, the Project may include solar water heating and/or solar PVs that would generate renewable electricity and further reduce the burden on regional energy supplies. This extensive generation of new renewable energy would reduce the strain on electricity production by reducing the demand for electricity generation from the grid resources, particularly during peak times when energy demand is the highest and solar energy potential is also the highest.

To put the Project's energy use in context, in 2018, Californians consumed 255,350 GWh of electricity, of which Alameda County consumed 10,417 GWh.[44] CEC estimates that state-wide energy demand will increase to 320,375 GWh in 2025, an average annual growth rate of 1.32%.[45] The Project's anticipated increase in electricity usage from 6,685 megawatt-hours (MWh) for A's Related Existing Conditions to 64,107 MWh by 2027 Full Buildout reflects an increase of 57,421 MWh in electricity usage. This increase represents approximately 0.018% of the total 2018 state-wide electricity usage and 0.55% of Alameda County electricity usage. Therefore, the Project will not require additional generation capacity beyond more general state-wide expansion.

The Project's annual natural gas consumption is estimated to increase by 72,491 Million British Thermal Unit (MMBtu) from 3,178 MMBtu for A's Related Existing Conditions to 75,669 MMBtu at Full Buildout. Alameda County natural gas demand was approximately 37,700,000 MMBtu in 2018.[46] The Project's increase in natural gas consumption accounts for just 0.0033% of the projected statewide annual consumption and 0.19% of the projected countywide consumption.

Although natural gas is the most common electricity source in California, 90% of the state's natural gas is imported from the Rocky Mountain region, the Southwest, and Canadian basins.[47] The United States produces 20 trillion standard cubic feet per year (scf/yr) and had 340 trillion scf of proven reserves in 2014.[48] The Project's natural gas consumption is not substantial in comparison to the national natural gas reserves and comprises a tiny portion of annual national natural gas production.

Gasoline and diesel are provided by California's transportation fuels supplier network, as the majority of gasoline and diesel fuels are used for transportation to and from the Project.

Based on the very small increases in overall energy demand, the Project will not have a substantial impact on the local or regional energy supplies or require additional capacity to be constructed.

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[44] California Energy Commission. 2018. Energy Consumption Data Management Service. Electricity Consumption by County. Available online at: http://www.ecdms.energy.ca.gov/elecbycounty.aspx. Accessed January 3, 2020.

[45] California Energy Commission. 2018. California Energy Demand 2018-2030 Revised Forecast. Available online at: https://efiling.energy.ca.gov/getdocument.aspx?tn=223244. Accessed January 3, 2020.

[46] California Energy Commission . 2018. Gas Consumption by County. Available online at: http://www.ecdms.energy.ca.gov/gasbycounty.aspx. Accessed January 3, 2020.

[47] U.S. Energy Information Administration. 2018. California State Profile and Energy Estimates: Profile Analysis. Available online at: https://www.eia.gov/state/analysis.cfm?sid=CA. Accessed January 3, 2020.

[48] California Energy Commission. 2015. Draft Staff Report: 2015 Natural Gas Outlook. Available online at: http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-03/TN206501_20151103T100153_Draft_Staff_Report_2015_Natural_Gas_Outlook.pdf. Accessed January 3, 2020.

4.3.2.3 Appendix F.II.C.3 Peak and Base Period Demands

In section II.C.3, CEQA Guidelines Appendix F states that environmental impacts may include:

The effects of the project on peak and base period demands for electricity and other forms of energy.

The Project will not have a substantial impact on the peak and base period demands for electricity or other forms of energy. The Project's base energy consumption compared to regional and statewide energy consumption is discussed above in section 4.3.2.2. Further details and reasoning on the peak demand are described below.

In 2016, California's peak grid demand was 46,193 megawatts (MW). On the same day, PG&E reached a maximum demand of 23,752 MW.[49] In 2018, California's peak grid demand increased to 46,427 MW.[50] In comparison, the Project's maximum demand is expected to 21.1 MW. This number was derived by conservatively summing the peak demand for all individual land use subtypes, although the peak is unlikely to occur at the same time for all land uses.[51] This also conservatively excludes the benefits of LEED Gold design and improvements in demand response due to the Title 24 energy standards, which would further reduce peak demand. Overall, the Project peak demand represents less than 0.09% of PG&E's peak demand and will therefore have a relatively negligible effect on state-wide peak demands.

4.3.2.4 Appendix F.II.C.4 Existing Energy Standards

In section II.C.4, CEQA Guidelines Appendix F states that environmental impacts may include:

The degree to which the project complies with existing energy standards.

The Project complies with existing energy standards. During implementation of the Project, the Project will continue to adhere to State standards designed to minimize use of fuel in construction vehicles, ensure that buildings employ strict energy efficiency techniques, and operate comprehensive TDM programs, as described further below.

Construction Vehicles and Electricity Usage

Project construction requires use of on-road trucks for soil hauling and deliveries, and off-road equipment such as excavators, cranes, forklifts, and pavers. The Project would comply with state and local requirements designed to minimize idling and associated emissions, which also minimizes use of fuel. Specifically, idling of commercial vehicles and off-road equipment would be limited to five minutes in accordance with the Commercial Motor Vehicle Idling Regulation and the Off-Road Regulation, and the trucks used would be compliant with the requirements of the Tractor-Trailer GHG Regulation.

Building Efficiency

The Project's anticipated electricity and natural gas use in buildings is shown in the sections above. New building construction is subject to California's Title 24, as discussed in **Section**

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[49] California ISO. 2017. 2016-2017 Transmission Plan. Available online at: http://www.caiso.com/Documents/Board-Approved_2016-2017TransmissionPlan.pdf. Accessed January 3, 2020.

[50] California ISO. 2018. California ISO Peak Load History 1998 through 2018. Available online at: https://www.caiso.com/Documents/CaliforniaISOPeakLoadHistory.pdf. Accessed January 16, 2020.

[51] Meyers+ Engineers. 2019. Howard Terminal Electric Load. Email to Noah Rosen, Oakland Athletics. July 16.

2.2.2.3 above. California's Title 24 reduces energy use in residential and commercial buildings through progressive updates to both the Green Building Standards Code (Title 24, Part 11) and the Energy Efficiency Standards (Title 24, Part 6). Provisions added over the years include consideration and possible incorporation of new energy efficiency technologies and methods for building features such as space conditioning, water heating, lighting, and whole envelope, as well as construction waste diversion goals. Additionally, some standards focus on larger energy saving concepts such as reducing loads at peak periods and seasons, improving the quality of energy-saving installations, and performing energy system inspections. Past updates to the Title 24 standards have proven very effective in reducing building energy use, with the 2013 update to the energy efficiency standards estimated to reduce energy consumption in residential buildings by 25% and energy consumption in commercial buildings by 30%, relative to the 2008 standards.[52] The 2019 standards are expected to further reduce high-rise residential and non-residential electricity consumption by approximately 10.7% and natural gas consumption by 1%.[53].

As the Project phasing schedule anticipates build out between 2023 and 2027, further reductions can be anticipated from future Title 24 code cycles. Additionally, the Project will go beyond Title 24 requirements in construction and operation of new buildings by achieving the LEED Gold standard. This energy benefit of this commitment has conservatively not been quantified.

Transportation

Vehicle use at the Project has been reduced pursuant to the AB 734 requirements, through TDM and TMP programs. VMT has a direct correlation to fuel usage. Many regulatory requirements reduce mobile fuel use and VMT, and the Project will comply with or exceed all requirements. For example, SB 743 requires projects to evaluate VMT relative to existing regional averages rather than evaluating LOS for CEQA significance and allows streamlining for projects in high quality transit areas. SB 375, the Sustainable Communities & Climate Protection Program, requires MPOs to develop SCS to reduce per capita VMT. The ARB has prepared a white paper that identifies how VMT reductions consistent with SB 743 and SB 375 relate to statewide climate goals.[54] The Project focuses housing and job growth within existing urbanized areas near transit and thus fulfills one of the key aspects of the SCS.[55] The Project also helps fulfill the Governor's Zero Emission Vehicle Action Plan (Executive Order B-48-18) by promoting the adoption of EVs. The vehicles that travel to and from the Project will be registered at the Department of Motor Vehicles consistent with the overall regional fleet and therefore will comply with vehicle efficiency standards.

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[52] CEC. 2012. Energy Commission Approves More Efficient Buildings for California's Future. Available online at: https://energyarchive.ca.gov/releases/2012_releases/2012-05-31_energy_commission_approves_more_efficient_buildings_nr.html. Accessed January 3, 2020.

[53] CEC. 2019. 2019 Title 24 Impact Analysis. Available online at: https://ww2.energy.ca.gov/title24/2019standards/post_adoption/documents/2019_Impact_Analysis_Final_Report_2018-06-29.pdf. Accessed January 3, 2020.

[54] ARB. 2019. CARB 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals. Available at: https://ww2.arb.ca.gov/resources/documents/carb-2017-scoping-plan-identified-vmt-reductions-and-relationship-state-climate. Accessed January 3, 2020.

[55] ARB. 2019. What are Sustainable Communities Strategies. Available at: https://ww2.arb.ca.gov/our-workprogramssustainable-communities-program/what-are-sustainable-communities-strategies. Accessed January 3, 2020.

4.3.2.5 Appendix F.II.C.5 Energy Resources

In section II.C.5, CEQA Guidelines Appendix F states that environmental impacts may include:

The effects of the project on energy resources.

The Project's use of energy will not have a substantial effect on statewide or regional energy resources. The Project's energy use is discussed in **Section 3** above, including electricity, natural gas, and gasoline and diesel consumption associated with mobile operations, emergency generator operations, and construction operations. The change in energy use requirements from the A's Related Existing Conditions to Full Buildout Project years is summarized in **Table 13**. Programs and measures relevant to energy resources are discussed in detail in **Sections 4.3.2.2** and **4.3.2.3**.

4.3.2.6 Appendix F.II.C.6 Transportation Energy Use

In section II.C.6, CEQA Guidelines Appendix F states that environmental impacts may include:

The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

The Project uses efficient transportation alternatives to reduce its transportation energy use requirements, as described further below.

The Project's transportation energy use is discussed in **Section 3** above and gasoline and diesel quantities for all inventory scenarios, including the A's Related Existing Conditions and Project are presented in **Tables 6, 11**, and **12**. The quantification of VMT associated with Project operations, which feeds into total transportation energy use quantified, is discussed in detail in the **Air Quality Technical Report**.

The Project includes reductions in VMT from TMP and TDM Plan measures, which result in an approximately 20% reduction in gasoline, diesel, natural gas, and electricity usage at Full Buildout. Additional displacement of gasoline or diesel fuel will occur due to the Project's commitment to installing additional EV charging stations.

The Project's EV charging stations will reduce fuel use and GHG emissions by assisting Californians in the shift from fossil-fueled vehicles to EVs, while the fossil fuels needed to produce electricity for charging continues to decrease. As shown in **Table 39** of the **Air Quality Technical Report**, by 2027 a conventional passenger vehicle is expected to emit 256 grams of Carbon Dioxide Equivalent (CO_2e) per mile, while the indirect electricity emissions for an EV are 24 grams of CO_2e per mile. By 2027, for every mile that is driven in an EV rather than in a gasoline or diesel car, GHG emissions are thus reduced by 90%, and corresponding fuel use decreases. This is based on the emissions from diesel or gasoline cars using EMFAC2017 in 2027, compared with electricity needed to charge the EV based on an electricity grid that achieves 52% RPS in 2027.

4.3.2.7 Appendix F.II.D.1 Energy Reduction Measures

In section II.D.1, CEQA Guidelines Appendix F states that mitigation measures (including those already incorporated into the project) may include:

Potential measures to reduce wasteful, inefficient and unnecessary consumption of energy during construction, operation, maintenance and/or removal. The discussion should explain *why certain measures were incorporated in the project and why other measures were dismissed.*

The Project implements a number of programs to reduce the consumption of energy. Buildings will achieve LEED Gold standards, will comply with increasingly stringent Title 24 Building Energy Efficiency and Green Building standards, and will comply with Oakland's Standard Conditions of Approval. Mobile fuel use is reduced through an extensive TDM/TMP program. Mobile fuel is also displaced through use of EV charging stations. Solid waste energy use is reduced through diversion, recycling, and composting programs. The Project may include additional energy reduction or fuel displacement features, such as the incorporation of on-site solar generation, and water and waste reduction measures. These measures have not been quantitatively incorporated in the Project due to uncertainties about their scope and feasibility at this time.

4.3.2.8 Appendix F.II.D.2 Siting, Orientation, and Design

In section II.D.2, CEQA Guidelines Appendix F states that mitigation measures (including those already incorporated into the project) may include:

The potential of siting, orientation, and design to minimize energy consumption, including transportation energy, increase water conservation and reduce solid waste.

A number of Project initiatives and programs, as well as general features of the location itself, utilize siting, orientation, or design elements to minimize energy consumption, as discussed further below.

Transportation (Siting)

The Project is well positioned to take advantage of the many public transit options in the Bay Area, located approximately one mile from three nearby BART stations. In general, development near transit rich areas is good for reducing energy use and GHGs from a project. According to the California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures document (2010),[56] "[l]ocating a project with high density near transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT."

Building Energy Efficiency (Siting, Orientation)

The Project's high-performance design and construction of new buildings to achieve both LEED Gold and stringent Title 24 building energy requirements will allow for increased energy efficiency and opportunities for on-site renewables generation. Title 24 performance-based compliance requires building energy modeling through computer software that calculates energy use and reductions by incorporating building orientation and climate data; it penalizes buildings that are oriented in a way that will increase energy consumption, as such buildings would be required to achieve additional energy efficiency features to reach the target energy design ratings. Therefore, the Project is incentivized to site and orient its buildings in a way that maximizes energy efficiency.

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[56] California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures. August. Available online at: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf. Accessed January 3, 2020.

4.3.2.9 Appendix F.II.D.3 Reducing Peak Energy Demand

In section II.D.3, CEQA Guidelines Appendix F states that mitigation measures (including those already incorporated into the project) may include:

The potential for reducing peak energy demand.

The Project's energy mitigation measures and project features will help reduce peak energy demand throughout the Project life. LEED Gold and Title 24 Building Energy Efficiency Standards include measures that encourage load-shifting and demand-response. Title 24 energy use performance standards are based on the time dependent valuation (TDV) of energy, which uses the value of the electricity or natural gas used at every hour of the year to incentivize load shifting off of the peak. In addition, the mixed-use nature of the Project site naturally allows for a balanced energy load, as not all uses will be occupied at the same time of day.

4.3.2.10 Appendix F.II.D.4 Alternative Fuels

In section II.D.4, CEQA Guidelines Appendix F states that mitigation measures (including those already incorporated into the project) may include:

Alternative fuels (particularly renewable ones) or energy systems.

The Project has pursued the use of alternative fuels or energy systems for heating, cooling, electricity, and transportation, as discussed below.

The Project has committed to providing on-site EV charging stations to support the expanded use of EVs. The Project's EV charging stations will reduce fuel use and GHG emissions by assisting Californians in the shift from fossil-fueled vehicles to EVs, while the fossil fuels needed to produce electricity for charging continues to decrease. Additional details regarding the number and type of EV chargers to be installed by the Project are shown in the **Air Quality Technical Report**.

4.3.2.11 Appendix F.II.D.5 Recycling Efforts

In section II.D.5, CEQA Guidelines Appendix F states that mitigation measures (including those already incorporated into the project) may include:

Energy conservation which could result from recycling efforts.

California has a statewide goal of 75% waste diversion by 2020, while the City of Oakland Zero Waste goal reduces emissions from waste by 89 percent between 2005 and 2020.[57] The City of Oakland administers a Recycling and Solid Waste Program. For multifamily homes, this includes compost service provided by Waste Management, which provides compost service to businesses and residences. California Waste Solutions provides recycling service for residences, while commercial recycling is an open market with other potential providers.[58] The Project will comply with these goals by implementing waste diversion policies and infrastructure.

4.3.2.12 Summary

In summary, based on the analysis of each of the factors identified in CEQA Guidelines Appendix F, the potential for the Project to result in wasteful, inefficient or unnecessary

[57] City of Oakland. Zero Waste. Available at: http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/IDR/o/ZW/index.htm. Accessed January 3, 2020.

[58] Oakland Recycles. Zero Waste Services. Available at: https://www.oaklandrecycles.com/. Accessed January 3, 2020..

consumption of fuel or energy, and conversely to fail to incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation or other project features is **Less Than Significant.**

TABLES

Table 1
Energy Use Sources for the Project
Oakland Waterfront Ballpark District Project
Oakland, California

Type	Source	Description
Construction	Off-Road Equipment	Diesel fuel and electricity use of off-road equipment
	On-Road Mobile Sources	Diesel hauling and vendor vehicle fuel use, and gasoline worker vehicle fuel use
	Water	Electricity use for water supply, distribution, and treatment
Operations	Building Energy Use	Electricity and natural gas used in buildings
	On-Road Mobile Sources	Diesel, gasoline, electricity, and natural gas fuel used for vehicles
	Water	Electricity use for water supply, distribution, and treatment
	TRU Operation	Diesel fuel used by Transportation Refrigeration Units
	Standby Emergency Generators	Diesel fuel used by generators

Table 2
Project Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Equipment Type[1]	CalEEMod® Equipment Type	Fuel	Number	HP	kW	Load Factor[2]	Equipment Start Date	Equipment End Date	Number Days	Hours per Day	Utilizations for Duration	Equipment Tier[3]	Fuel Usage[4] (gal diesel)	Electricity Usage[5] (kWh)
Phase 1	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	--	0.73	9/1/2020	11/9/2020	50	8	50%	Tier 4 Final	604	--
		Excavators	Excavators	Diesel	6	158	--	0.38	9/1/2020	11/9/2020	50	8	80%	Tier 4 Final	5,918	--
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	--	0.37	9/1/2020	11/9/2020	50	8	100%	Tier 4 Final	1,461	--
		Crushing / Proc. Equipment	Crushing/Proc. Equipment	Diesel	1	85	--	0.78	9/1/2020	11/9/2020	50	8	75%	Tier 4 Final	1,016	--
Phase 2	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	--	0.73	11/10/2020	1/18/2021	50	8	50%	Tier 4 Final	604	--
		Excavators	Excavators	Diesel	6	158	--	0.38	11/10/2020	1/18/2021	50	8	80%	Tier 4 Final	5,918	--
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	--	0.37	11/10/2020	1/18/2021	50	8	100%	Tier 4 Final	1,461	--
		Crushing / Proc. Equipment	Crushing/Proc. Equipment	Diesel	1	85	--	0.78	11/10/2020	1/18/2021	50	8	75%	Tier 4 Final	1,016	--
Offsite Improvements: Grids 1-19[3,6]	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	--	0.73	--	--	23	8	100%	Tier 4 Final	556	--
		Excavators	Excavators	Diesel	1	158	--	0.38	--	--	130	8	100%	Tier 4 Final	3,206	--
		Tractors/Loaders/Dump Truck	Tractors/Loaders/Backhoes	Diesel	2	97	--	0.37	--	--	130	8	33%	Tier 4 Final	1,253	--
	Construct Curb, Gutter, Sidewalk, Ramps	Road Compactor	Plate Compactors	Diesel	1	100	--	0.43	--	--	31	8	50%	Tier 4 Final	272	--
		Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	--	0.73	--	--	31	8	50%	Tier 4 Final	375	--
		Concrete Truck	Off-Highway Trucks	Diesel	2	300	--	0.38	--	--	31	8	100%	Tier 4 Final	2,903	--
	New / Modified Traffic Signal	Crane	Cranes	Diesel	1	175	--	0.29	--	--	25	8	100%	Tier 4 Final	515	--
		Hole trencher	Trenchers	Diesel	1	175	--	0.50	--	--	49	8	100%	Tier 4 Final	1,761	--
		Excavators	Excavators	Diesel	1	158	--	0.38	--	--	97	8	50%	Tier 4 Final	1,196	--
		Concrete Truck	Off-Highway Trucks	Diesel	1	300	--	0.38	--	--	49	8	50%	Tier 4 Final	1,147	--
	Street Lighting	Crane	Cranes	Diesel	1	175	--	0.29	--	--	23	8	100%	Tier 4 Final	474	--
		Hole trencher	Trenchers	Diesel	1	175	--	0.50	--	--	46	8	100%	Tier 4 Final	1,653	--
		Excavators	Excavators	Diesel	1	158	--	0.38	--	--	120	8	100%	Tier 4 Final	2,959	--
		Concrete Truck	Off-Highway Trucks	Diesel	1	300	--	0.38	--	--	24	8	50%	Tier 4 Final	562	--
	Paving	Road Compactor	Plate Compactors	Diesel	1	100	--	0.43	--	--	117	8	50%	Tier 4 Final	1,028	--
		Tractors/Loaders/Dump Truck	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	--	--	117	8	75%	Tier 4 Final	1,282	--
	Striping	Construction Vehicle	Off-Highway Trucks	Diesel	1	100	--	0.38	--	--	104	8	100%	Tier 4 Final	1,623	--
DDC	Geotechnical Work	Excavators	Excavators	Diesel	2	158	--	0.38	11/10/2020	4/15/2021	113	8	90%	Tier 4 Final	5,016	--
		Dozer	Rubber Tired Loaders	Diesel	1	215	--	0.36	11/10/2020	4/15/2021	113	8	33%	Tier 4 Final	1,185	--
		Cranes	Cranes	Diesel	4	226	--	0.29	11/10/2020	4/15/2021	113	8	90%	Tier 3	10,824	--
		Water Trucks	Off-Highway Trucks	Diesel	3	402	--	0.38	11/10/2020	4/15/2021	113	8	75%	Tier 4 Final	15,952	--
		Generators	Generator Sets	Diesel	2	84	--	0.74	11/10/2020	4/15/2021	113	8	70%	Tier 4 Final	4,019	--
DPC	Geotechnical Work	Excavators	Excavators	Diesel	2	158	--	0.38	11/10/2020	4/15/2021	113	8	90%	Tier 4 Final	5,016	--
		Dozer	Rubber Tired Loaders	Diesel	1	215	--	0.36	11/10/2020	4/15/2021	113	8	33%	Tier 4 Final	1,185	--
		Cranes	Cranes	Diesel	4	226	--	0.29	11/10/2020	4/15/2021	113	8	90%	Tier 3	10,824	--
		Water Trucks	Off-Highway Trucks	Diesel	2	402	--	0.38	11/10/2020	4/15/2021	113	8	75%	Tier 4 Final	10,635	--
		Generators	Generator Sets	Diesel	1	84	--	0.74	11/10/2020	4/15/2021	113	8	70%	Tier 4 Final	2,009	--
Phase 1	Cut Off Wall	Drill	Bore/Drill Rigs	Diesel	2	433	--	0.50	1/2/2021	3/2/2021	44	8	90%	Tier 4 Final	7,042	--
		Gradall Type Forklifts	Forklifts	Diesel	2	111	--	0.20	1/2/2021	3/2/2021	44	8	90%	Tier 4 Final	722	--
		Manlift	Aerial Lifts	Diesel	2	58	--	0.31	1/2/2021	3/2/2021	44	8	75%	Tier 4 Final	482	--
		Cranes	Cranes	Diesel	2	286	--	0.29	1/2/2021	3/2/2021	44	8	90%	Tier 4 Final	2,667	--
		Excavators	Excavators	Diesel	2	189	--	0.38	1/2/2021	3/2/2021	44	8	75%	Tier 4 Final	1,947	--
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	2	90	--	0.36	1/2/2021	3/2/2021	44	8	70%	Tier 4 Final	820	--
	Grading and Site Preparation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	20	97	--	0.37	3/5/2021	5/23/2021	56	8	90%	Tier 4 Final	14,725	--
		Scrapers/Blades/Rollers	Scrapers	Diesel	10	500	--	0.48	3/5/2021	5/23/2021	56	8	90%	Tier 4 Final	49,680	--
		Water Trucks	Off-Highway Trucks	Diesel	5	402	--	0.38	3/5/2021	5/23/2021	56	8	75%	Tier 4 Final	13,176	--
		Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	5/24/2021	11/23/2021	132	8	100%	Tier 4 Final	8,282	--
		Generators	Generator Sets	Diesel	3	84	--	0.74	3/5/2021	4/11/2021	26	8	70%	Tier 4 Final	1,387	--
	Grading and Site Preparation Remediation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	--	0.37	4/1/2021	5/15/2021	32	8	100%	Tier 4 Final	935	--
		Scrapers/Blades/Rollers	Scrapers	Diesel	3	500	--	0.48	4/1/2021	5/15/2021	32	8	100%	Tier 4 Final	9,463	--
		Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	4/1/2021	5/15/2021	32	8	75%	Tier 4 Final	1,506	--
	Crane Removal Demolition[3]	Cranes	Cranes	Diesel	2	226	--	0.29	6/22/2021	12/8/2021	122	8	75%	Tier 4 Final	4,869	--
		Excavators	Excavators	Diesel	4	158	--	0.38	6/22/2021	12/8/2021	122	8	75%	Tier 4 Final	9,025	--
	Site Utilities	Excavators	Excavators	Diesel	4	162	--	0.38	11/24/2021	4/28/2022	112	8	95%	Tier 4 Final	10,761	--
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	11/24/2021	4/28/2022	112	8	100%	Tier 4 Final	1,636	--
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	2	199	--	0.36	11/24/2021	4/28/2022	112	8	100%	Tier 4 Final	6,591	--
		Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	11/24/2021	4/28/2022	112	8	75%	Tier 4 Final	5,270	--
		Pile Driving Rigs	Bore/Drill Rigs	Diesel	4	206	--	0.50	4/12/2021	6/1/2021	44	8	100%	Tier 4 Final	7,445	--
		Gradall-type Forklifts	Forklifts	Diesel	4	93	--	0.20	4/12/2021	6/1/2021	44	8	100%	Tier 4 Final	1,345	--
		Concrete Boom Pumps	Other Construction Equipment	Diesel	2	480	--	0.42	4/12/2021	8/19/2022	425	8	15%	Tier 4 Final	10,389	--

Table 2
Project Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Equipment Type[1]	CalEEMod® Equipment Type	Fuel	Number	HP	kW	Load Factor[2]	Equipment Start Date	Equipment End Date	Number Days	Hours per Day	Utilizations for Duration	Equipment Tier[3]	Fuel Usage[4] (gal diesel)	Electricity Usage[5] (kWh)
Phase 1	Ballpark Building Construction	Bobcat	Rubber Tired Loaders	Diesel	2	71	--	0.36	4/12/2021	4/19/2022	320	8	90%	Tier 4 Final	6,047	--
		Small Excavator	Excavators	Diesel	2	404	--	0.38	4/12/2021	10/12/2021	158	8	90%	Tier 4 Final	17,932	--
		Large Excavator	Excavators	Diesel	2	523	--	0.38	4/12/2021	10/12/2021	158	8	90%	Tier 4 Final	23,214	--
		Crawler Cranes	Cranes	Diesel	4	530	--	0.29	10/12/2021	7/12/2022	235	8	95%	Tier 4 Final	55,724	--
		Mobile Cranes	Cranes	Diesel	4	530	--	0.29	4/1/2022	1/1/2023	236	8	85%	Tier 4 Final	50,071	--
		Gradall-type Forklifts	Forklifts	Diesel	6	93	--	0.20	4/12/2021	4/1/2023	618	8	100%	Tier 4 Final	28,326	--
		Cutting/chopping saws	Other Construction Equipment	Electric	15	--	5.0	0.42	4/12/2021	4/1/2023	618	8	100%	--	--	154,030
		Air Compressors	Air Compressors	Electric	4	--	7	0.48	4/1/2021	1/1/2023	549	8	75%	--	--	47,162
		Drywall stud impact guns	Other Construction Equipment	Electric	25	--	1.0	0.42	4/1/2022	2/1/2023	263	8	100%	--	--	21,850
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	--	0.42	10/1/2022	3/1/2023	130	8	20%	Tier 4 Final	2,119	--
		Bobcat	Rubber Tired Loaders	Diesel	2	71	--	0.36	10/1/2022	3/1/2023	130	8	90%	Tier 4 Final	2,456	--
		Small Excavator	Excavators	Diesel	2	404	--	0.38	10/1/2022	3/1/2023	130	8	90%	Tier 4 Final	14,754	--
		Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	4/29/2022	4/19/2023	305	8	90%	Tier 4 Final	17,222	--
		Generators	Generator Sets	Diesel	6	84	--	0.74	4/12/2021	4/19/2023	633	8	70%	Tier 4 Final	67,536	--
Phase 1	Mixed Use Building Construction	Pile Driving Rigs	Bore/Drill Rigs	Diesel	2	206	--	0.50	11/24/2021	6/1/2022	136	8	100%	Tier 4 Final	11,507	--
		Gradall-type Forklifts	Forklifts	Diesel	2	93	--	0.20	11/24/2021	6/1/2022	136	8	100%	Tier 4 Final	2,078	--
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	--	0.42	1/1/2022	9/28/2022	193	8	50%	Tier 4 Final	7,863	--
		Bobcat	Rubber Tired Loaders	Diesel	2	71	--	0.36	1/1/2022	9/28/2022	193	8	50%	Tier 4 Final	2,026	--
		Small Excavator	Excavators	Diesel	2	404	--	0.38	1/1/2022	5/11/2022	93	8	50%	Tier 4 Final	5,864	--
		Large Excavator	Excavators	Diesel	2	523	--	0.38	1/1/2022	5/10/2023	353	8	50%	Tier 4 Final	28,814	--
		Tower Cranes	Cranes	Electric	2	--	179	0.29	12/1/2021	2/1/2023	306	8	100%	--	--	252,486
		Mobile Cranes	Cranes	Diesel	2	530	--	0.29	5/1/2022	12/1/2023	415	8	75%	Tier 4 Final	38,845	--
		Gradall-type Forklifts	Forklifts	Diesel	6	93	--	0.20	11/24/2021	12/1/2023	528	8	75%	Tier 4 Final	18,151	--
		Cutting/chopping saws	Other Construction Equipment	Electric	15	--	5.0	0.42	11/24/2021	12/1/2023	528	8	75%	--	--	98,699
		Air Compressors	Air Compressors	Diesel	2	125	--	0.48	11/24/2021	12/1/2023	528	8	75%	Tier 4 Final	19,420	--
		Air Compressors	Air Compressors	Electric	2	--	7	0.48	11/24/2021	12/1/2023	528	8	75%	--	--	22,679
		Tile cutting saws	Other Construction Equipment	Electric	10	--	5.0	0.42	10/1/2022	12/1/2023	305	8	50%	--	--	25,339
		Drywall stud impact guns	Other Construction Equipment	Electric	25	--	1.0	0.42	9/1/2022	12/1/2023	327	8	50%	--	--	13,584
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	--	0.42	1/1/2023	12/1/2023	240	8	50%	Tier 4 Final	9,778	--
		Bobcat	Rubber Tired Loaders	Diesel	2	71	--	0.36	1/1/2023	12/1/2023	240	8	50%	Tier 4 Final	2,519	--
		Small Excavator	Excavators	Diesel	2	404	--	0.38	1/1/2023	12/1/2023	240	8	50%	Tier 4 Final	15,133	--
		Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	4/20/2023	12/1/2023	162	8	100%	Tier 4 Final	10,164	--
		Generators	Generator Sets	Diesel	6	84	--	0.74	4/20/2023	12/1/2023	162	8	70%	Tier 4 Final	17,284	--
	Architectural Coating	Air Compressors	Air Compressors	Diesel	3	125	--	0.48	2/15/2022	12/1/2023	469	8	100%	Tier 4 Final	34,500	--
		Air Compressors	Air Compressors	Electric	3	--	7	0.48	2/15/2022	12/1/2023	469	8	100%	--	--	40,289
	Paving	Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	7/1/2022	9/30/2022	66	8	100%	Tier 4 Final	4,141	--
		Pavers	Pavers	Diesel	2	130	--	0.42	7/1/2022	9/30/2022	66	8	75%	Tier 4 Final	2,185	--
		Paving Equipment	Paving Equipment	Diesel	2	132	--	0.36	7/1/2022	9/30/2022	66	8	75%	Tier 4 Final	1,896	--
		Rollers	Rollers	Diesel	2	80	--	0.38	7/1/2022	9/30/2022	66	8	75%	Tier 4 Final	1,214	--
	Pedestrian Bike Overpass Grading and Site Preparation[3]	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	7/14/2022	9/7/2022	40	8	100%	Tier 4 Final	584	--
		Scrapers/Blades/Rollers	Scrapers	Diesel	1	500	--	0.48	7/14/2022	9/7/2022	40	8	80%	Tier 4 Final	3,154	--
		Water Trucks	Off-highway trucks	Diesel	1	402	--	0.38	7/14/2022	9/7/2022	40	8	80%	Tier 4 Final	2,008	--
		Generators	Generator Sets	Diesel	1	84	--	0.74	7/14/2022	9/7/2022	40	8	80%	Tier 4 Final	813	--
	Pedestrian Bike Overpass Site Utilities[3]	Excavators	Excavators	Diesel	2	162	--	0.38	7/14/2022	9/7/2022	40	8	75%	Tier 4 Final	1,517	--
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	7/14/2022	9/7/2022	40	8	75%	Tier 4 Final	438	--
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	1	199	--	0.36	7/14/2022	9/7/2022	40	8	75%	Tier 4 Final	883	--
		Water Trucks	Off-highway trucks	Diesel	1	402	--	0.38	7/14/2022	9/7/2022	40	8	75%	Tier 4 Final	1,882	--
	Pedestrian Bike Overpass Tower Construction[3]	Pile Driving Rigs	Bore/Drill Rigs	Diesel	1	206	--	0.50	9/8/2022	3/22/2023	140	8	15%	Tier 4 Final	888	--
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	--	0.42	9/8/2022	3/22/2023	140	8	10%	Tier 4 Final	1,141	--
		Bobcat	Rubber Tired Loaders	Diesel	1	71	--	0.36	9/8/2022	3/22/2023	140	8	25%	Tier 4 Final	367	--
		Small Excavator	Excavators	Diesel	1	404	--	0.38	9/8/2022	3/22/2023	140	8	35%	Tier 4 Final	3,090	--
		Mobile Cranes	Cranes	Diesel	1	530	--	0.29	9/8/2022	3/22/2023	140	8	30%	Tier 4 Final	2,621	--
		Gradall-type Forklifts	Forklifts	Diesel	1	93	--	0.20	9/8/2022	3/22/2023	140	8	50%	Tier 4 Final	535	--
		Cutting/chopping saws	Other Construction Equipment	Electric	1	--	5.0	0.42	9/8/2022	3/22/2023	140	8	3%	Tier 4 Final	--	58
	Pedestrian Bike Overpass Sitework[3]	Water Trucks	Off-highway trucks	Diesel	1	402	--	0.38	3/23/2023	5/17/2023	40	8	75%	Tier 4 Final	1,882	--
		Pavers	Pavers	Diesel	1	130	--	0.42	3/23/2023	5/17/2023	40	8	13%	Tier 4 Final	110	--
		Paving Equipment	Paving Equipment	Diesel	1	132	--	0.36	3/23/2023	5/17/2023	40	8	13%	Tier 4 Final	96	--
		Rollers	Rollers	Diesel	1	80	--	0.38	3/23/2023	5/17/2023	40	8	13%	Tier 4 Final	61	--

Table 2
Project Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Equipment Type[1]	CalEEMod® Equipment Type	Fuel	Number	HP	kW	Load Factor[2]	Equipment Start Date	Equipment End Date	Number Days	Hours per Day	Utilizations for Duration	Equipment Tier[3]	Fuel Usage[4] (gal diesel)	Electricity Usage[5] (kWh)
Phase 2	Grading and Site Preparation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	20	97	--	0.37	12/4/2023	2/15/2024	54	8	100%	Tier 4 Final	15,776	--
		Scrapers/Blades/Rollers	Scrapers	Diesel	20	500	--	0.48	12/4/2023	2/15/2024	54	8	90%	Tier 4 Final	95,811	--
		Water Trucks	Off-Highway Trucks	Diesel	10	402	--	0.38	12/4/2023	2/15/2024	54	8	75%	Tier 4 Final	25,410	--
		Water Trucks	Off-Highway Trucks	Diesel	2	402	--	0.38	2/16/2024	8/19/2024	132	8	100%	Tier 4 Final	16,563	--
		Generators	Generator Sets	Diesel	6	84	--	0.74	12/4/2023	8/19/2024	186	8	70%	Tier 4 Final	19,845	--
	Grading and Site Preparation Remediation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	--	0.37	1/1/2024	2/15/2024	34	8	100%	Tier 4 Final	993	--
		Scrapers/Blades/Rollers	Scrapers	Diesel	3	500	--	0.48	1/1/2024	2/15/2024	34	8	100%	Tier 4 Final	10,054	--
		Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	1/1/2024	2/15/2024	34	8	75%	Tier 4 Final	1,600	--
	Site Utilities	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	8/20/2024	2/5/2025	122	8	100%	Tier 4 Final	1,782	--
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	2	199	--	0.36	8/20/2024	2/5/2025	122	8	100%	Tier 4 Final	7,179	--
		Water Trucks	Off-Highway Trucks	Diesel	2	402	--	0.38	8/20/2024	2/5/2025	122	8	100%	Tier 4 Final	15,309	--
		Generators	Generator Sets	Diesel	6	84	--	0.74	8/20/2024	2/5/2025	122	8	70%	Tier 4 Final	13,016	--
Phase 2	Mixed Use Building Construction	Pile Driving Rigs	Bore/Drill Rigs	Diesel	2	206	--	0.50	8/20/24	8/20/25	262	8	90%	Tier 4 Final	19,950	--
		Gradall-type Forklifts	Forklifts	Diesel	2	93	--	0.20	8/20/24	8/20/25	262	8	100%	Tier 4 Final	4,003	--
		Concrete Boom Pumps	Other Construction Equipment	Diesel	4	480	--	0.42	8/20/2024	8/20/2025	262	8	40%	Tier 4 Final	34,159	--
		Bobcat	Rubber Tired Loaders	Diesel	4	71	--	0.36	8/20/2024	5/1/2025	183	8	100%	Tier 4 Final	7,684	--
		Small Excavator	Excavators	Diesel	4	404	--	0.38	8/20/2024	5/1/2025	183	8	100%	Tier 4 Final	46,155	--
		Large Excavator	Excavators	Diesel	4	523	--	0.38	8/20/2024	4/1/2025	161	8	100%	Tier 4 Final	52,567	--
		Tower Cranes	Cranes	Electric	8	--	179	0.29	5/1/2025	11/1/2026	392	8	100%	--	--	1,293,786
		Mobile Cranes	Cranes	Diesel	8	530	--	0.29	11/1/2025	6/1/2027	412	8	100%	Tier 4 Final	205,674	--
		Gradall-type Forklifts	Forklifts	Diesel	15	93	--	0.20	8/20/2024	8/1/2027	769	8	100%	Tier 4 Final	88,119	--
		Cutting/chopping saws	Other Construction Equipment	Electric	45	--	5.0	0.42	4/1/2025	8/1/2027	609	8	100%	--	--	455,361
		Air Compressors	Air Compressors	Diesel	5	125	--	0.48	10/1/2025	8/1/2027	478	8	75%	Tier 4 Final	43,952	--
		Air Compressors	Air Compressors	Electric	5	--	7	0.48	10/1/2025	8/1/2027	478	8	75%	--	--	51,328
		Tile cutting saws	Other Construction Equipment	Electric	35	--	5.0	0.42	4/1/2025	8/1/2027	609	8	100%	--	--	354,170
		Drywall stud impact guns	Other Construction Equipment	Electric	75	--	1.0	0.42	4/1/2025	8/1/2027	609	8	100%	--	--	151,787
		Concrete Boom Pumps	Other Construction Equipment	Diesel	3	480	--	0.42	8/1/2026	8/1/2027	260	8	40%	Tier 4 Final	25,423	--
		Bobcat	Rubber Tired Loaders	Diesel	6	71	--	0.36	8/1/2026	8/1/2027	260	8	100%	Tier 4 Final	16,377	--
		Small Excavator	Excavators	Diesel	6	404	--	0.38	8/1/2026	8/1/2027	260	8	80%	Tier 4 Final	78,690	--
		Water Trucks	Off-Highway Trucks	Diesel	2	402	--	0.38	2/6/2025	7/1/2027	626	8	75%	Tier 4 Final	58,913	--
		Generators	Generator Sets	Diesel	6	84	--	0.74	2/6/2025	9/1/2027	670	8	70%	Tier 4 Final	71,484	--
	Paving	Water Trucks	Off-Highway Trucks	Diesel	1	402	--	0.38	7/1/2025	1/2/2026	134	8	100%	Tier 4 Final	8,407	--
		Pavers	Pavers	Diesel	2	130	--	0.42	7/1/2025	1/2/2026	134	8	75%	Tier 4 Final	4,436	--
		Paving Equipment	Paving Equipment	Diesel	2	132	--	0.36	7/1/2025	1/2/2026	134	8	75%	Tier 4 Final	3,850	--
		Rollers	Rollers	Diesel	2	80	--	0.38	7/1/2025	1/2/2026	134	8	75%	Tier 4 Final	2,466	--
	Architectural Coating	Air Compressors	Air Compressors	Diesel	3	125	--	0.48	6/20/2025	9/1/2027	574	8	75%	Tier 4 Final	31,668	--
		Air Compressors	Air Compressors	Electric	3	--	7.457	0.48	6/20/2025	9/1/2027	574	8	75%	--	--	36,982
														Unmitigated Total[3]	**1,800,927**	**3,019,533**
														Mitigated Total[3]	**1,845,763**	**3,019,591**

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Table 2
Project Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Notes:

1. Construction equipment list was provided by the Project sponsor.
2. Equipment load factors were estimated from the Air Resource Board's OFFROAD database.
3. Mitigated tier assumed to be Tier 4 Final engines, except where shown above. The unmitigated tier is Fleet-Average tier. Dashes indicate there is no applicable tier due to the equipment being electric. Engine tier, however, does not affect fuel usage or electricity usage, thus the usage indicated applies to both the mitigated and unmitigated scenarios with the exception of the Offsite Improvements phase and the Pedestrian Bike Overpass area of Phase 1 which are mitigation measures and are only constructed during the mitigated scenario.
4. Fuel use from off-road construction equipment is estimated using diesel fuel data from USEPA AP-42 Table 3.4.1, which cites an average brake-specific fuel consumption (BSFC) of 7,000 BTU/hp-hr, a heating value of 19,300 BTU/lb, and density of 7.1 lb/gal. Fuel use was calculated with the following equation:

   Fuel Usage = Σ(N * HP * LF * Hr * U * F)

   N: number of Equipment Pieces
   HP: equipment horsepower (OFFROAD2011)
   LF: Load Factor
   Factor: 0.051084 gal/hp-hr
   U: Utilization
5. Electricity Usage was calculated using the following equation:

   Electricity Usage = Σ(N * kW * LF * Hr * U)

   N: number of Equipment Pieces
   kW: equipment kilowatt usage
   LF: Load Factor
   U: Utilization
6. Equipment start and end dates vary by grid for Offsite Construction. All emissions would occur during between 2/1/2021 and 9/21/2021.

Abbreviations:

BTU - British thermal units	hr - hour
CalEEMod® - California Emissions Estimator Model	kW - kilowatt
DDC - deep dynamic compaction	kWh - kilowatt hour
DPC - direct power compaction	lb - pounds
gal - gallons	USEPA - United States Environmental Protection Agency
HP - horsepower	

Table 3
Fuel Efficiency Derivation for On-Road Construction Equipment
Oakland Waterfront Ballpark District Project
Oakland, California

Year	Fuel Consumption (gallons/day)[1]					VMT (miles/day)[1]					Fuel Efficiency (gallon/mile)[2]					Fuel Efficiency by Category (miles/gallon)		
	HHDT	MHDT	LDA	LDT1	LDT2	HHDT	MHDT	LDA	LDT1	LDT2	HHDT	MHDT	LDA	LDT1	LDT2	Hauling	Vendor	Worker
2020	287,389	94,647	769,421	89,786	326,410	1,814,493	875,069	23,167,103	2,333,620	7,698,626	0.16	0.11	0.033	0.038	0.042	6.3	7.5	27
2021	290,621	95,772	759,166	88,604	316,494	1,864,846	902,897	23,456,819	2,359,125	7,710,663	0.16	0.11	0.032	0.038	0.041	6.4	7.6	28
2022	291,016	95,741	746,130	87,118	306,213	1,912,091	929,284	23,671,850	2,377,619	7,709,520	0.15	0.10	0.032	0.037	0.040	6.6	7.8	29
2023	283,301	94,926	732,997	85,693	296,508	1,958,773	955,808	23,901,996	2,399,722	7,721,211	0.14	0.10	0.031	0.036	0.038	6.9	8.2	30
2024	286,667	96,285	718,698	84,195	287,002	2,010,827	983,937	24,107,385	2,421,121	7,734,914	0.14	0.10	0.030	0.035	0.037	7.0	8.3	30
2025	287,799	97,132	703,472	82,579	277,663	2,056,804	1,008,403	24,294,766	2,440,869	7,750,599	0.14	0.10	0.029	0.034	0.036	7.1	8.5	31
2026	288,164	97,733	688,485	80,971	268,902	2,101,400	1,030,748	24,432,457	2,455,459	7,757,704	0.14	0.095	0.028	0.033	0.035	7.3	8.6	32
2027	288,146	98,320	676,553	79,691	261,631	2,149,504	1,054,730	24,625,081	2,475,572	7,786,877	0.13	0.093	0.027	0.032	0.034	7.5	8.8	33

Notes:
1. Fuel consumption and VMT from EMFAC2017 online database for Alameda County. HHDT and MHDT are assumed to be diesel. LDA, LDT1 and LDT2 are assumed to be gasoline.
2. Fuel efficiency calculated based off of EMFAC data: [Fuel Consumption]/ [VMT]
3. Consistent with CalEEMod®, Hauling assumes 100% HHDT, Vendor assumes 50% HHDT and 50% MHDT, and Worker assumes 50% LDA, 25% LDT1, and 25% LDT2 vehicles.

Abbreviations:
CalEEMod® - California Emissions Estimator Model
EMFAC2017 - California Air Resources Board EMission FACtor model
LDA - light duty auto
LDT - light duty truck
MHDT - medium-heavy duty truck
HHDT - heavy-heavy duty truck
VMT - vehicle miles traveled

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Table 4
Project On-Road Construction Vehicle Fuel Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Year	One-Way Trips Per Phase[1]			Annual VMT (mi/yr)[1]			Fuel Consumption (gallons)[2]		
			Worker	Vendor	Hauling	Worker	Vendor	Hauling	Worker (Gasoline)	Vendor (Diesel)	Hauling (Diesel)
DDC Area	Geotechnical Work	2020	1,520	380	0	16,416	2,774	0	605	370	0
		2021	3,000	750	0	32,400	5,475	0	1,161	717	0
DPC Area	Geotechnical Work	2020	1,520	380	0	16,416	2,774	0	605	370	0
		2021	3,000	750	0	32,400	5,475	0	1,161	717	0
Offsite Improvements: Grids 1-19	Demolition	2021	1,520	0	0	16,416	0	0	588	0	0
	Construct Curb, Gutter, Sidewalk, Ramps	2021	3,070	0	5,418	33,156	0	108,360	1,188	0	16,887
	New / Modified Traffic Signal	2021	4,850	0	677	52,380	0	13,536	1,877	0	2,109
	Street Lighting	2021	2,400	0	1,199	25,920	0	23,976	929	0	3,736
	Paving	2021	585	0	0	6,318	0	0	226	0	0
	Striping	2021	312	0	0	3,370	0	0	121	0	0
Phase 1 Ballpark and Initial Mixed Use Development	Demolition	2020	2,000	0	54	21,600	0	1,080	795	0	171
	Cut Off Wall	2021	2,200	0	1,245	23,760	0	27,423	851	0	4,274
	Grading and Site Preparation	2021	9,400	0	26,217	101,520	0	524,326	3,638	0	81,712
	Grading and Site Preparation Remediation	2021	480	0	18,000	5,184	0	589,500	186	0	91,869
	Crane Removal Demolition	2021	3,660	0	0	39,528	0	0	1,416	0	0
	Site Utilities	2021	2,240	560	0	24,192	4,088	0	867	535	0
		2022	6,720	1,680	0	72,576	12,264	0	2,529	1,565	0
	Ballpark Building Construction	2021	279,210	43,584	0	3,015,468	318,163	0	108,054	41,666	0
		2022	384,990	60,096	0	4,157,892	438,701	0	144,902	55,984	0
		2023	114,390	17,856	0	1,235,412	130,349	0	41,833	15,899	0
	Mixed Use Building Construction	2021	16,800	2,688	0	181,440	19,622	0	6,502	2,570	0
		2022	156,000	24,960	0	1,684,800	182,208	0	58,715	23,252	0
		2023	144,000	23,040	0	1,555,200	168,192	0	52,661	20,515	0
	Architectural Coating	2022	167,628	0	0	1,810,382	0	0	63,091	0	0
		2023	175,680	0	0	1,897,344	0	0	64,246	0	0
	Paving	2022	1,980	0	0	21,384	0	0	745	0	0
	Pedestrian Bike Overpass Grading and Site Preparation[3]	2022	2,000	0	358	21,600	0	7,160	753	0	1,090
	Pedestrian Bike Overpass Site Utilities[3]	2022	1,200	160	80	12,960	1,168	1,600	452	149	244
	Pedestrian Bike Overpass Tower Construction[3]	2022	6,560	1,312	0	70,848	9,578	0	2,469	1,222	0
		2023	4,640	928	0	50,112	6,774	0	1,697	826	0
	Pedestrian Bike Overpass Sitework[3]	2023	1,600	480	80	17,280	3,504	1,600	585	427	231
Phase 2 Mixed Use Development	Demolition	2020	2,280	0	41	24,624	0	820	907	0	130
		2021	720	0	13	7,776	0	260	279	0	41
	Grading and Site Preparation	2023	1,600	0	0	17,280	0	0	585	0	0
		2024	13,280	0	15,673	143,424	0	313,440	4,715	0	44,685
	Grading and Site Preparation Remediation	2024	510	0	18,000	5,508	0	589,500	181	0	84,040
	Site Utilities	2024	11,520	1,536	0	124,416	11,213	0	4,090	1,348	0
		2025	3,120	416	0	33,696	3,037	0	1,075	359	0
	Mixed Use Building Construction	2024	76,800	39,552	0	829,440	288,730	0	27,269	34,708	0
		2025	208,800	107,532	0	2,255,040	784,984	0	71,918	92,725	0
		2026	208,800	107,532	0	2,255,040	784,984	0	69,905	91,037	0
		2027	139,200	71,688	0	1,503,360	523,322	0	45,378	59,468	0
	Paving	2025	3,960	0	0	42,768	0	0	1,364	0	0
		2026	30	0	0	324	0	0	10	0	0
	Architectural Coating	2025	55,600	0	0	600,480	0	0	19,150	0	0
		2026	104,400	0	0	1,127,520	0	0	34,952	0	0
		2027	69,600	0	0	751,680	0	0	22,689	0	0
								Unmitigated Total[3]	**859,030**	**443,804**	**306,921**
								Mitigated Total[3]	**869,915**	**446,429**	**331,219**

Notes

1. Total miles based on trip generation provided by Project sponsor and CalEEMod® default trip distance by trip type.
2. Fuel usage based on VMT data and fuel efficiency values calculated in Table 3. It is assumed that worker vehicles use gasoline while vendor and hauling vehicles use diesel.
3. Onroad fuel usage does not vary between the unmitigated and mitigated scenario with the exception of fuel usage for the Pedestrian Bike Overpass area within Phase 1 and the Offsite Improvements Phase, which are only constructed during the mitigated scenario.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
DDC - deep dynamic compaction
DPC - direct power compaction
mi - mile
yr - year
VMT - vehicle miles traveled

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Table 5
Electricity Required for Project Construction Water Usage
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Year	Number of Work Days	Average Acreage Needing Water[1] (acres)	Water Usage[1] (gal/acre/ day)	Number of Water Trucks	Utilization (%)	Total Water Usage (million gal)	Outdoor Water Electric Intensity Factor[2] (kWh/million gal)	Electricity Usage (MWh)
DDC	Geotechnical Work	2020	38	37	8,000	3	75%	11	3,500	39
		2021	75	37	8,000	3	75%	22		77
DPC	Geotechnical Work	2020	38	9	8,000	2	75%	2.8		10
		2021	75	9	8,000	2	75%	5.6		20
Phase 1	Grading and Site Preparation	2021	56	31	8,000	5	75%	14		49
		2021	132	31	8,000	1	100%	33		116
	Grading and Site Preparation Remediation	2021	32	31	8,000	1	75%	8		28
	Site Utilities	2021	28	31	4,000	1	75%	3.5		12.3
		2022	84	31	4,000	1	75%	10.5		37
	Ballpark Building Construction	2022	176	14	4,000	1	90%	9.7		34
		2023	78	14	4000	1	90%	4.3		15
	Mixed Use Building Construction	2023	162	18	4,000	1	100%	11		40
	Paving	2022	65	31	4,000	1	100%	8.1		29
	Pedestrian Bike Overpass Grading and Site Preparation[3]	2022	40	1.2	8,000	1	80%	0.39		1.4
	Pedestrian Bike Overpass Site Utilities[3]	2022	40	1.2	4,000	1	75%	0.19		0.68
	Pedestrian Bike Overpass Sitework[3]	2023	40	1.2	4,000	1	75%	0.19		0.68
Phase 2	Grading and Site Preparation	2023	20	17	8,000	10	75%	3		9
		2024	34	17	8,000	10	75%	5		16
		2024	132	17	8,000	2	100%	18		61
	Grading and Site Preparation Remediation	2024	34	17	8,000	1	75%	5		16
	Site Utilities	2024	96	17	4,000	2	100%	6		22
		2025	26	17	4,000	2	100%	1.7		6
	Mixed Use Building Construction	2025	235	17	4,000	2	75%	16		55
		2026	261	17	4,000	2	75%	17		61
		2027	130	17	4,000	2	75%	9		30
	Paving	2025	132	17	4,000	1	100%	8.8		31
		2026	2	17	4,000	1	100%	0.13		0.46
									Unmitigated Total	**813**
									Mitigated Total	**816**

Notes:

1. Acreage is the acreage of the phase area. Water usage assumed to be 8,000 gal/acre/day for Grading and Site Preparation and 4,000 gal/acre/day for all other subphases based on Project sponsor estimations.
2. Electric intensity factors were taken from Table 9.2 in Appendix D of the CalEEMod User's Guide as the sum of supply water, treat water and distribute water electric intensity factors. Since the water use reported here is only for fugitive dust control, indoor water use-related emissions and wastewater treatment-related emissions are not estimated here.
3. Water usage does not vary between the unmitigated and mitigated scenario with the exception of water usage for the Pedestrian Bike Overpass area of Phase 1 which is only constructed during the mitigated scenario.

Abbreviations:

gal - Gallons
kWh - kilowatt-hours
MWh - megawatt-hours
DDC - deep dynamic compaction
DPC - direct power compaction

References:

CalEEMod User's Guide (Available online at: http://www.aqmd.gov/caleemod/user's-guide)
PG&E, Pacific Gas and Electric - Gas and power company for California (https://www.pge.com/)

Table 6
Summary of Project Construction Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source		Units	Unmitigated Project Construction Usage[1]	Mitigated Project Construction Usage[1]
Electricity	Water Consumption[2]	kWh	812,894	815,619
	Off-Road Construction Equipment[3]	kWh	3,019,533	3,019,591
	Electricity Total	**kWh**	**3,832,427**	**3,835,210**
Diesel	On-Road Construction Trips[4]	gallons	750,725	777,648
	Off-Road Construction Equipment[3]	gallons	1,800,927	1,845,763
	Diesel Total	**gallons**	**2,551,652**	**2,623,410**
Gasoline	On-Road Construction Trips[4]	gallons	859,030	869,915
	Gasoline Total	**gallons**	**859,030**	**869,915**

Notes:

1. The energy usage for the unmitigated and mitigated scenarios differs due to the Pedestrian Bike Overpass area of Phase 1 and the Offsite Improvements Phase being constructed only during the mitigated scenario.
2. Construction water use based on project-specific estimate provided by Project sponsor. See Table 5 for more details on the methodology.
3. Off-road equipment electricity use based on hours of operation for electric equipment. Off-road diesel fuel usage based on a fuel usage rate of 0.051 gallons of diesel per horsepower (hp)-hour, consistent with diesel conversion factors given in USEPA AP-42 Table 3.4.1. See Table 2 for more details on the methodology.
4. On-road mobile source fuel use based on vehicle miles traveled (VMT) for all years of construction and fleet-average fuel consumption in gallons per mile from EMFAC2017 for CY 2020 through 2027 in Alameda County. See Table 4 for more details on the methodology.

Abbreviations:

CY - calendar year
EMFAC2017 - California Air Resources Board EMission FACtor model
hp - horsepower
kWh - kilowatt-hour
USEPA - United States Environmental Protection Agency
VMT - vehicle miles traveled

References:

USEPA. 1996. AP 42. Compilation of Air Pollutant Emission Factors, Volume 1. Fifth Edition. Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines. Available online at: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf. Accessed March 2019.

Table 7
Annual and Peak Building Energy Usage for Existing and Project Operations
Oakland Waterfront Ballpark District Project
Oakland, California

A's Related Existing Operational [1,2]

Land Use	CalEEMod Venue Subtype	Annual Electricity Use (MWh/yr)	Annual Natural Gas Use (MMBTU/yr)
Coliseum Ballpark (A's Games)		5,877	2,401
A's Headquarters	General Office Building	499	773

Phase 1 Buildout Conditions [2,3,4]

Land Use	CalEEMod Venue Subtype	Annual Electricity Use (MWh/yr)	Peak Electricity Use (kW)	Annual Natural Gas Use (MMBTU/yr)	Peak Natural Gas Use (cfh)
Howard Terminal Ballpark	--	9,855	4,500	4,794	43,000
Office	General Office Building	2,915	0,950	4,787	2,083
Retail	Regional Shopping Center	292	180	137	2,222
Residential	High Rise Apartment	2,212	675	4,681	65,160
Performance Venue	Arena	0	0.0	0	0
Hotel	Hotel	2,128	840	10,141	9,100
Parking Garages	Enclosed Parking Garage with Elevators	1,954	96	0	0
Ballpark Parking	Enclosed Parking Garage with Elevators	0	0	0	0

Full Project [2,3,4]

Land Use	CalEEMod Venue Subtype	Annual Electricity Use (MWh/yr)	Peak Electricity Use (kW)	Annual Natural Gas Use (MMBTU/yr)	Peak Natural Gas Use (cfh)
Howard Terminal Ballpark	--	9,855	4,500	4,794	43,000
Office	General Office Building	17,487	5,700	28,720	12,500
Retail	Regional Shopping Center	2624	1,620	1231	20,000
Residential	High Rise Apartment	12,291	3,750	26,008	362,000
Performance Venue	Arena	356	1,000	1,229	2,000
Hotel	Hotel	2,128	840	10,141	9,100
Parking Garages	Enclosed Parking Garage with Elevators	10,874	534	0	0
Ballpark Parking	Enclosed Parking Garage with Elevators	3,152		0	

Notes:

1. Annual electricity and natural gas use rates for the Coliseum Ballpark were calculated based on historical energy use rates per attendee and actual attendance data for 2017 for MLB games (3.2 kWh/attendee/year and 1.3 kBtu/attendee/year). PG&E invoices for the MLB season (March through September) are provided in the Appendix. A's headquarters energy use rate is based on CalEEMod® version 2016.3.2 defaults for Climate Zone 5. These calculations are shown in more detail in Air Quality Technical Report, Table 20.
2. The electricity and natural gas usages are specific to the operation of the Project; however, these values are not expected to change for the Maritime Reservation Scenario.
3. As described in Air Quality Technical Report, Table 20, annual electricity use for the Howard Terminal Ballpark was provided by Meyers+ on 4/29/2019. Natural gas use for the ballpark assumes the same per attendee use rate from the Coliseum historical data. Annual electricity and natural gas use for all ancillary land uses are based on CalEEMod® defaults for Climate Zone 5, which account for 2016 Title 24. For the Phase 1 and Full Project Buildout scenarios, Title 24 electricity and lighting electricity use rates were reduced by 10.7% and Title 24 natural gas use rates were reduced by 1.0%, per the California Energy Commission (CEC) 2019 Title 24 Impact Analysis.
4. Peak electricity and natural gas use rates were provided by Meyers+ Engineers on 7/16/2019 and 3/6/2019, respectively. Phase 1 Buildout peak energy use was scaled based on Full Buildout energy use.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
cfh - cubic feet per hour
kW - kilowatt
kWh - kilowatt hour
MWh - megawatt hour
MMBTU - million British Thermal Units
PG&E - Pacific Gas & Electric
yr - year

References:

CalEEMod Version 2016.3.2. Available Online at: http://www.caleemod.com

CEC 2019 Title 24 Impact Analysis. Available online at:
https://www.energy.ca.gov/title24/2019standards/post_adoption/documents/

Table 8
Project Mobile Fuel Consumption
Oakland Waterfront Ballpark District Project
Oakland, California

Scenario	Land Use and Scenario			Fleet Type	Annual VMT (mi/yr)[1]	Percent Gasoline Vehicle Miles[2]	Gasoline Miles per Gallon[3]	Percent Diesel Vehicle Miles[2]	Diesel Miles per Gallon[3]	Percent Natural Gas Vehicle Miles[2]	Natural Gas Miles per DEG[3]	Percent Electric Vehicle Miles[2]	Electric kWh per Mile[3]	Fuel Consumption[4]			
														(gallons of gasoline)	(gallons of diesel)	(DEG of CNG)	(kWh)
Existing Conditions	Ballpark Stadium	A's Games	Weekday Evening	Passenger	9,534,127	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	368,363	2,528	--	38,894
			Weekday Day	Passenger	3,418,787	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	132,089	906	--	13,947
			Weekend	Passenger	7,083,068	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	273,663	1,878	--	28,895
		Other Events		Passenger	1,092,000	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	42,191	290	--	4,455
		NFL Games		Passenger	4,455,000	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	172,124	1,181	--	18,174
		A's Games Deliveries		Bus	1,796	25.3%	4.6	67.9%	6.4	6.0%	3.9	0.8%	0.30	98	191	28	4
				Truck	20,951	37.3%	7.4	62.7%	10.7	--	--	0.0%	0.30	1,058	1,228	--	0
		Event Deliveries		Truck	511	37.3%	7.4	62.7%	10.7	--	--	0.0%	0.30	26	30	--	0
		NFL Deliveries		Truck	2,300	37.3%	7.4	62.7%	10.7	--	--	0.0%	0.30	116	135	--	0
		Arena Management		Passenger	178,875	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	6,911	47	--	730
	A's Headquarters	Sports Team Management		Passenger	425,358	97.7%	25.3	1.0%	35.9	--	--	1.4%	0.30	16,434	113	--	1,735
	Existing Conditions[5]			--	**26,212,773**	--	--	--	--	--	--	--	--	**1,013,073**	**8,526**	**28**	**106,835**
	A's Related Existing Conditions			**--**	**20,662,962**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**798,616**	**6,891**	**28**	**84,206**
Phase 1 Buildout	Ballpark Stadium	A's Games	Weekday Evening	Passenger	11,890,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	393,725	3,486	--	70,785
			Weekday Day	Passenger	4,074,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	134,906	1,195	--	24,254
			Weekend	Passenger	8,721,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	288,787	2,557	--	51,919
		Other Events	Concerts	Passenger	2,286,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	75,699	670	--	13,609
			Other	Passenger	2,030,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	67,221	595	--	12,085
			Corporate/Community	Passenger	1,400,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	46,360	410	--	8,335
			Plaza	Passenger	432,000	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	14,305	127	--	2,572
		A's Games Deliveries		Bus	1,796	20.1%	4.8	70.0%	6.8	9.1%	4.1	0.8%	0.25	75	184	40	3
				Truck	20,951	32.3%	7.7	67.7%	12.0	--	--	0.0%	0.25	882	1,181	--	0
		Event Deliveries		Truck	40,880	32.3%	7.7	67.7%	12.0	--	--	0.0%	0.25	1,721	2,305	--	0
		Arena Management		Passenger	90,502	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	2,997	27	--	539
	A's Headquarters	Sports Team Management		Passenger	425,358	96.5%	29.1	1.2%	39.7	--	--	2.4%	0.25	14,085	125	--	2,532
	Residential			All	5,131,200	88.7%	27.5	9.1%	9.3	0.07%	3.0	2.1%	0.25	165,199	50,447	1,163	27,567
	Office			All	5,698,800	88.7%	27.5	9.1%	9.3	0.07%	3.0	2.1%	0.25	183,473	56,028	1,292	30,617
	Retail			All	5,067,600	88.7%	27.5	9.1%	9.3	0.07%	3.0	2.1%	0.25	163,151	49,822	1,149	27,226
	Restaurant			All	2,752,800	88.7%	27.5	9.1%	9.3	0.07%	3.0	2.1%	0.25	88,626	27,064	624	14,789
	Hotel			All	8,698,800	88.7%	27.5	9.1%	9.3	0.07%	3.0	2.1%	0.25	280,057	85,522	1,972	46,734
	Performance Venue		Attendees	Passenger	--	--	--	--	--	--	--	--	--	--	--	--	--
			Deliveries	Truck	--	--	--	--	--	--	--	--	--	--	--	--	--
				Bus	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total			**--**	**58,761,687**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1,921,269**	**281,745**	**6,240**	**333,567**

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Table 8
Project Mobile Fuel Consumption
Oakland Waterfront Ballpark District Project
Oakland, California

Scenario	Land Use and Scenario			Fleet Type	Annual VMT (mi/yr)[1]	Percent Gasoline Vehicle Miles[2]	Gasoline Miles per Gallon[3]	Percent Diesel Vehicle Miles[2]	Diesel Miles per Gallon[3]	Percent Natural Gas Vehicle Miles[2]	Natural Gas Miles per DEG[3]	Percent Electric Vehicle Miles[2]	Electric kWh per Mile[3]	Fuel Consumption[4] (gallons of gasoline)	Fuel Consumption[4] (gallons of diesel)	Fuel Consumption[4] (DEG of CNG)	Fuel Consumption[4] (kWh)
Full Project Buildout	Ballpark Stadium	A's Games	Weekday Evening	Passenger	11,890,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	345,003	3,375	--	106,074
			Weekday Day	Passenger	4,074,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	118,212	1,156	--	36,345
			Weekend	Passenger	8,721,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	253,050	2,475	--	77,803
		Other Events	Concerts	Passenger	2,286,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	66,331	649	--	20,394
			Other	Passenger	2,030,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	58,903	576	--	18,110
			Corporate/Community	Passenger	1,400,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	40,623	397	--	12,490
			Plaza	Passenger	432,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	12,535	123	--	3,854
		A's Games Deliveries		Bus	1,796	17.6%	5.1	69.5%	7.2	12.90%	4.1	0.0%	0.25	61	172	56	0
				Truck	20,951	29.7%	8.1	70.3%	12.8	--	--	0.0%	0.25	769	1,150	--	0
		Event Deliveries		Truck	40,880	29.7%	8.1	70.3%	12.8	--	--	0.0%	0.25	1,500	2,244	--	0
		Arena Management		Passenger	90,502	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	2,626	26	--	807
	A's Headquarters	Sports Team Management		Passenger	425,358	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	12,342	121	--	3,795
	Residential			All	26,255,300	87.1%	31.0	9.6%	10.0	0.08%	3.1	3.2%	0.25	738,749	252,522	6,843	210,366
	Office			All	25,953,300	87.1%	31.0	9.6%	10.0	0.08%	3.1	3.2%	0.25	730,252	249,617	6,765	207,946
	Retail			All	20,434,100	87.1%	31.0	9.6%	10.0	0.08%	3.1	3.2%	0.25	574,957	196,534	5,326	163,725
	Restaurant			All	23,810,900	87.1%	31.0	9.6%	10.0	0.08%	3.1	3.2%	0.25	669,971	229,012	6,206	190,781
	Hotel			All	8,698,800	87.1%	31.0	9.6%	10.0	0.08%	3.1	3.2%	0.25	244,759	83,664	2,267	69,698
	Performance Venue		Attendees	Passenger	2,830,000	95.2%	32.8	1.2%	43.8	--	--	3.6%	0.25	82,116	803	--	25,247
			Deliveries	Truck	4,380	29.7%	8.1	70.3%	12.8	--	--	0.0%	0.25	161	240	--	0
				Bus	4,380	17.6%	5.1	69.5%	7.2	12.90%	4.1	0.0%	0.25	150	420	138	0
	Total			**--**	**139,403,647**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3,953,070**	**1,025,277**	**27,602**	**1,147,435**

Notes:

1. Trip generation rate and total vehicle miles traveled (VMT) for each land use were provided by Fehr & Peers, and assume that all trips are primary trips. See Air Quality Technical Report Table 23. Ballpark trips account for attendees and event-day staff. For Existing Conditions, the trip generation rate and VMT for A's Games provided by Fehr & Peers assume 35,000 attendees per game. These values were scaled down to reflect the actual existing attendance of 22,671 attendees per game.
2. Percentage of gasoline, diesel, natural gas, or electric vehicle miles calculated by taking the ratio of vehicle miles driven by a specific fuel-type vehicle over total miles for that vehicle classification (for all fuel types) in EMFAC.
3. Miles per gallon calculated from the fuel consumption and vehicle miles travelled using EMFAC2017 for calendar years 2018, 2023, and 2027 for the Baseline, Phase 1 Buildout, and Full Project Buildout, respectively. Electric vehicle fuel economy is consistent with the current range of fuel efficiencies of electric cars from US Department of Energy, Fuel Economy Guide.
4. The mobile fuel consumption values are specific to the operation of the Project; however, these values are not expected to change for the Maritime Reservation Scenario.
5. The Existing Conditions emissions incorporate all emissions at the Coliseum Stadium, including those from NFL or other event uses.

Abbreviations:

CNG - compressed natural gas | gal - gallon | mi - mile
DEG - diesel equivalent gallons | kWh - kilowatt-hour | yr - year

References:

US Department of Energy (DOE), Fuel Economy Guide. Electric. Available at: https://www.fueleconomy.gov/feg/PowerSearch.do?action=noform&path=1&year1=1984&year2=2019&vtype=Electric. Accessed May 2019.

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Table 9
Project Mobile Fuel Use Reductions and Electricity Use due to EV Charging Stations
Oakland Waterfront Ballpark District Project
Oakland, California

Reductions in Gasoline and Diesel Miles from 10% Project Electric Vehicle Charging Stations

Scenario	Phase	Fleet Type	Annual Electric VMT (mi/yr)[1]	Percent Replacing Gasoline Vehicle Miles[2]	Electric Miles Replacing Gasoline Vehicle Miles	Percent Replacing Diesel Vehicle Miles[2]	Electric Miles Replacing Diesel Vehicle Miles
Reference	Phase 1 Buildout	Passenger	0	98.8%	0	1.2%	0
		All	755,083	88.7%	669,627	9.1%	68,721
	Full Project Buildout	Passenger	1,802,455	98.7%	1,779,233	1.3%	23,222
		All	6,186,459	87.1%	5,389,569	9.6%	593,541
CTF	Phase 1 Buildout	Passenger	0	98.8%	0	1.2%	0
		All	768,892	88.7%	681,873	9.1%	69,978
	Full Project Buildout	Passenger	1,863,616	98.7%	1,839,605	1.3%	24,010
		All	7,063,509	87.1%	6,153,644	9.6%	677,687

Reductions in Gasoline and Diesel Fuel Use from 10% Project Electric Vehicle Charging Stations

Phase	Fleet Type	Total Electric Miles Replacing Gasoline Vehicle Miles[3]	Gasoline Miles per Gallon[4]	Total Electric Miles Replacing Diesel Vehicle Miles	Diesel Miles per Gallon[4]	Fuel Reduction	
						(gallons of gasoline)	(gallons of diesel)
Phase 1 Buildout	Passenger	0	29	0	40	0	0
	All	12,246	28	1,257	9.3	-445	-136
Full Project Buildout	Passenger	60,372	33	788	44	-1,840	-18
	All	764,075	31	84,146	10	-24,678	-8,435

Electricity Use from Electric Vehicle Charging Stations

Phase	Fleet Type	Electricity Use from EV Chargers (kWh/yr)[5,6,7]
Phase 1 Buildout	Passenger	0
	All	3,452
Full Project Buildout	Passenger	15,290
	All	219,262

Reductions in Gasoline and Diesel Miles from Additional Project Electric Vehicle Charging Stations[7]

Scenario	Phase	Fleet Type	Annual Additional Electric VMT (mi/yr)[9]	Percent Replacing Gasoline Vehicle Miles[2]	Electric Miles Replacing Gasoline Vehicle Miles	Percent Replacing Diesel Vehicle Miles[2]	Electric Miles Replacing Diesel Vehicle Miles
CTF (10%)	Phase 1 Buildout	Passenger	0	98.8%	0	1.2%	0
		All	768,892	88.7%	681,873	9.1%	69,978
	Full Project Buildout	Passenger	1,863,616	98.7%	1,839,605	1.3%	24,010
		All	7,063,509	87.1%	6,153,644	9.6%	677,687
CTF (> 10%)	Phase 1 Buildout	Passenger	0	98.8%	0	1.2%	0
		All	768,892	88.7%	681,873	9.1%	69,978
	Full Project Buildout	Passenger	2,400,149	98.7%	2,369,226	1.3%	30,923
		All	7,236,985	87.1%	6,304,775	9.6%	694,331

Reductions in Gasoline and Diesel Fuel Use from Additional Project Electric Vehicle Charging Stations

Phase	Fleet Type	Total Electric Miles Replacing Gasoline Vehicle Miles[3]	Gasoline Miles per Gallon[4]	Total Electric Miles Replacing Diesel Vehicle Miles	Diesel Miles per Gallon[4]	Fuel Reduction	
						(gallons of gasoline)	(gallons of diesel)
Phase 1 Buildout	Passenger	0	29	0	40	0	0
	All	0	28	0	9.3	0	0
Full Project Buildout	Passenger	529,621	33	6,913	44	-16,144	-158
	All	151,131	31	16,644	10	-4,881	-1,668

Table 9
Project Mobile Fuel Use Reductions and Electricity Use due to EV Charging Stations
Oakland Waterfront Ballpark District Project
Oakland, California

Electricity Use from Additional Electric Vehicle Charging Stations

Phase	Fleet Type	Electricity Use from Additional EV Chargers (kWh/yr)[5,6,7]
Phase 1 Buildout	Passenger	0
	All	0
Full Project Buildout	Passenger	134,133
	All	43,369

Notes:

1. VMT due to electric vehicle chargers is from the Air Quality Technical Report, Table 38.
2. Percentage of gasoline or diesel miles is estimated from EMFAC for the Passenger and All fleet mixes. This has been adjusted to remove electric vehicles that were already accounted for. Natural gas vehicles were conservatively not included, as these are not expected to be replaced by electric vehicles.
3. For EV Charging, the total eVMT is calculated as the difference between the eVMT charged by Project chargers from the Reference scenario and the CTF scenario. For Additional EV Charging, the total eVMT is calculated as the difference between the eVMT charged by Project chargers from the CTF (10%) scenario and the CTF (> 10%) scenario.
4. Miles per gallon are calculated from the fuel consumption and vehicle miles travelled using EMFAC2017, as shown in Table 8, Project Mobile Fuel Consumption.
5. Electricity Use is from the Air Quality Technical Report, Table 39.
6. The EV charging indirect electricity emission factor assumes an EV fuel economy of 0.25 kWh/mi, according to the US Department of Energy.
7. The electricity use from EV chargers is specific to the operation of the Project; however, these values are not expected to change for the Maritime Reservation Scenario.
8. The Additional EV Charging Stations calculation assumes that higher than 10 percent of parking spaces are serviced by Level 2 (208/240V 40-amp) EV charging stations. For this purpose, it was assumed that EV chargers would be installed in 15% of residential, 10% of office, 20% of restaurant/retail, 15% of hotel, and 35% of ballpark parking spaces (not including interim ballpark parking). These are summarized in the Air Quality Technical Report, Table 50.
9. The miles charged by additional chargers represent the additional miles charged as a result of the additional EV charging-capable parking spaces. The miles charged assuming greater than 10% of parking spaces have EV charging is shown in the Air Quality Technical Report, Table 50. The miles charged assuming 10% of parking spaces have EV charging is shown in the Air Quality Technical Report, Table 39. These values represent the difference between these two estimates.

Abbreviations:

EV - electric vehicle
gal - gallon
kWh - kilowatt-hours
mi - mile
yr - year

Table 10
Project Generator Fuel Consumption
Oakland Waterfront Ballpark District Project
Oakland, California

Project Mitigated Generators

Scenario[1]	Generator Hours of Operation [2] (hrs)	Average Horsepower (hp)	Fuel Consumption[3] (gallons of diesel)
Project Phase 1 Buildout	140	872	6,234
Project Full Buildout	340	931	16,167

Notes:

1. The table shows generator fuel consumption for an annual operation of 20 hours/year, which represents the mitigated case in the Air Quality Technical Report.
2. Total annual hours of operation and average horsepower from Air Quality Technical Report Table 37.
3. Consistent with USEPA AP-42 diesel fuel data in Table 3.4.1, which cites an average brake-specific fuel consumption (BSFC) of 7,000 BTU/hp-hr, a heating value of 19,300 BTU/lb, and density of 7.1 lb/gal.

Abbreviations:

BTU - British Thermal Units
gal - gallon
hp - horsepower
hrs - hours
lb - pound

Table 11
Summary of A's Related Existing Operational Energy Resources Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source		A's Related Existing Operational Usage[1,2]
Electricity		
Building[3]	MWh/year	6,376
Water[4]	MWh/year	225
Mobile[5]	MWh/year	84
Total Electricity	**MWh/year**	**6,685**
Natural Gas		
Building[3]	kBtu/year	3,174,285
Mobile[6]	kBtu/year	3,566
Total Natural Gas	**kBtu/year**	**3,177,851**
Diesel		
Mobile[7]	gallons/year	6,891
TRU Operation[8]	gallons/year	260
Total Diesel	**gallons/year**	**7,151**
Gasoline		
Mobile[7]	gallons/year	798,616
Total Gasoline	**gallons/year**	**798,616**

Notes:

1. Values specific to NFL and Other Events are not included in the A's Related Existing total in order to conservatively estimate net new emissions attributable to the Project.
2. A's Related Existing operational energy use will remain the same when analyzing both the Project and the Maritime Reservation Scenario.
3. Electricity and natural gas usage from building energy are shown with more detail in Table 7, Annual and Peak Energy Usage for Existing and Project Operations.
4. Electricity from water sources is determined based on water emissions and energy emission factors, as shown in Air Quality Technical Report Table 31, Water Usage and Wastewater Emissions from Existing Conditions and Project Operations, and Table 21, Energy Usage Emission Factors.
5. Electricity demand based on VMT from EMFAC2017 and estimated electric vehicle fuel economy (in kWh per mile) assuming 30 kWh/100 miles for A's Related Existing Conditions and 25 kWh/100 miles for Phase 1 and Full Buildout. This is consistent with the current range of fuel efficiencies of electric cars from US Department of Energy.
6. EMFAC2017 include compressed natural gas (CNG) in terms of diesel gallon equivalents (DGE). This is converted into Btu per the US Department of Energy Alternative Fuel Data Center conversion: 1 DGE of CNG = 128,488 Btu.
7. Mobile source fuel use calculated based on vehicle miles traveled (VMT), as shown in Table 8, Mobile Energy, and the fleet-average fuel consumption (in gallons per mile) from EMFAC2017 for 2018.
8. Diesel usage from TRU operation is based on TRU emissions showin in the Air Quality Technical Report, Table 40.

Table 11
Summary of A's Related Existing Operational Energy Resources Use
Oakland Waterfront Ballpark District Project
Oakland, California

Abbreviations:

AQTR - Air Quality Technical Report
CNG - compressed natural gas
DGE - diesel gallon equivalent
DOE - United States Department of Energy
EMFAC2017 - California Air Resources Board EMission FACtor model
kBTU - thousand British Thermal Unit
kWh - kilowatt-hour
MWh - mega-watt hour
TRU - transportation refrigeration unit
VMT - vehicle miles traveled

References:

DOE. 2017. Fuel Economy Guide, Model Year 2017. Electric Vehicles. Available online at: http://www.fueleconomy.gov/feg/printGuides.shtml. Accessed May 2019.

DOE. 2017. Alternative Fuels Data Center, Gasoline and Diesel Gallon Equivalency Methodology, Compressed Natural Gas. Available online at: https://afdc.energy.gov/fuels/equivalency_methodology.html. Accessed May 2019.

Table 12
Summary of Project Operational Energy Resources Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source[1]		**Phase 1 Operational Usage**	**Full Buildout Operational Usage**
Electricity			
Building[2]	MWh/year	19,356	58,767
Water[3]	MWh/year	1,270	3,957
Mobile[4]	MWh/year	334	1,147
EV Charging[5]	MWh/year	3	235
Total Electricity	**MWh/year**	**20,963**	**64,107**
Natural Gas			
Building[2]	kBTU/year	24,539,193	72,122,326
Mobile[4,6]	kBTU/year	801,762	3,546,469
Total Natural Gas	**kBTU/year**	**25,340,955**	**75,668,795**
Diesel			
Mobile[4]	gallons/year	281,745	1,025,277
EV Charging[5]	gallons/year	-136	-8,453
TRU Operation[7]	gallons/year	288	319
Generators[8]	gallons/year	6,234	16,167
Total Diesel	**gallons/year**	**288,131**	**1,033,310**
Gasoline			
Mobile[4]	gallons/year	1,921,269	3,953,070
EV Charging[5]	gallons/year	-445	-26,518
Total Gasoline	**gallons/year**	**1,920,825**	**3,926,552**

Notes:

1. The sources of energy resource use correspond to those resulting from the air quality mitigation measures detailed in the Air Quality Technical Report. These reductions include EV charging and annual generator operation of 20 hours/year. This inventory does not include the energy usage associated with the additional EV charging.
2. Electricity and natural gas usage for building energy are shown with more detail in Table 7, Annual and Peak Building Energy Usage for Existing and Project Operations.
3. Electricity from water sources is determined based on water emissions and energy emission factors, as shown in Air Quality Technical Report Table 31, Water Usage and Wastewater Emissions from Existing Conditions and Project Operations, and Table 21, Energy Usage Emission Factors.
4. Mobile source fuel use calculated based on vehicle miles traveled (VMT) and the fleet-average fuel consumption (in gallons per mile) from EMFAC2017 for 2023 and 2027 for the Phase 1 and Full Buildout, respectively, as shown in Table 8, Mobile Energy. Project VMT reflects implementation of Transportation Management Plan (TMP) and Transportation Demand Management (TDM) Plan measures.
5. Electricity demand based on VMT from EMFAC2017 and estimated electric vehicle fuel economy (in kWh per mile) assuming 30 kWh/100 miles for baseline and 25 kWh/100 miles for Phase 1 and Full Buildout. As part of the Project design, the Project will provide EV chargers for at least 10% of its parking spaces. Electricity used to charge additional EVs beyond the projected EMFAC2017 fleet average due to the Project's commitments is shown in Table 9, EV Fuel. The fuel economy is consistent with the current range of fuel efficiencies of electric cars from US Department of Energy.
6. EMFAC2017 include compressed natural gas (CNG) in terms of diesel gallon equivalents (DEG). This is converted into Btu per the US Department of Energy Alternative Fuel Data Center conversion: 1 DGE of CNG = 128,488 Btu.
7. Diesel usage from TRU operation is based on TRU emissions showin in the Air Quality Technical Report, Table 40.
8. Diesel usage from generators is based on generator hours of operation and average horsepower for mitigated generators, as shown in Table 10, Project Generator Fuel Consumption.

Table 12
Summary of Project Operational Energy Resources Use
Oakland Waterfront Ballpark District Project
Oakland, California

Abbreviations:

AQTR - Air Quality Technical Report
CNG - compressed natural gas
DGE - diesel gallon equivalent
DOE - United States Department of Energy
EMFAC2017 - California Air Resources Board EMission FACtor model
EV - electric vehicle
kBTU - thousand British Thermal Unit
kWh - kilowatt-hour
MWh - mega-watt hour
TRU - transportation refrigeration unit
VMT - vehicle miles traveled

References:

DOE. 2017. Fuel Economy Guide, Model Year 2017. Electric Vehicles. Available online at: http://www.fueleconomy.gov/feg/printGuides.shtml. Accessed May 2019.

USEPA. 1996. AP 42. Compilation of Air Pollutant Emission Factors, Volume 1. Fifth Edition. Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines. Available online at: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf. Accessed May 2019.

DOE. 2017. Alternative Fuels Data Center, Gasoline and Diesel Gallon Equivalency Methodology, Compressed Natural Gas. Available online at: https://afdc.energy.gov/fuels/equivalency_methodology.html. Accessed May 2019.

Table 13
Change in Energy Consumption from Existing Conditions to Project
Oakland Waterfront Ballpark District Project
Oakland, California

Source		A's Related Existing Conditions[1]	Full Buildout Operational Usage[1]	Change from Existing to Full Buildout
Electricity				
Building	MWh/year	6,376	58,767	52,391
Water	MWh/year	225	3,957	3,733
Mobile	MWh/year	84	1,147	1,063
EV Chargers	MWh/year	0	235	235
Total Electricity	**MWh/year**	**6,685**	**64,107**	**57,421**
Natural Gas				
Building	kBTU/year	3,174,285	72,122,326	68,948,041
Mobile	kBTU/year	3,566	3,546,469	3,542,903
Total Natural Gas	**kBTU/year**	**3,177,851**	**75,668,795**	**72,490,944**
Diesel				
Mobile	gallons/year	6,891	1,025,277	1,018,386
EV Chargers	gallons/year	0	-8,453	-8,453
Generators	gallons/year	0	16,167	16,167
TRU Operation	gallons/year	260	319	59
Total Diesel	**gallons/year**	**7,151**	**1,033,310**	**1,026,159**
Gasoline				
Mobile	gallons/year	798,616	3,953,070	3,154,454
EV Chargers	gallons/year	0	-26,518	-26,518
Total Gasoline	**gallons/year**	**798,616**	**3,926,552**	**3,127,936**

Notes:

1. Values are from Table 11, A's Related Existing Operational Energy Resources Use, and Table 12, Project Operational Energy Resources Use, and values specific to NFL and Other Events are not included in the A's Related Existing Conditions total in order to conservatively estimate net new emissions attributable to the Project.

Abbreviations

CalEEMod® - California Emissions Estimator Model
CY - calendar year
DOE - United States Department of Energy
EMFAC2017 - California Air Resources Board EMission FACtor model
hp - horsepower
kBTU - thousand British Thermal Unit
kWh - kilowatt-hour
USEPA - United States Environmental Protection Agency
VMT - vehicle miles traveled

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Table 14
Energy Use Reductions from Replacing Residential Natural Gas with Zero-Carbon Electricity
Oakland Waterfront Ballpark District Project
Oakland, California

Additional Electricity Use from Replacing Natural Gas if Using Grid Electricity Rather Than Zero-Carbon Electricity

Scenario	Electricity Use That Replaces Natural Gas Use[1] (kWh/yr)
Phase 1 Buildout	885
Full Project Buildout	4,916

Notes:

1. Assumes a 40% increase in residential electricity use, based on engineering estimates from Meyers+ Engineers.

Abbreviations:

kWh - kilowatt hour

yr - year

Table 15
Energy Use Reductions from Replacing Non-Residential Natural Gas Space Heating with Zero-Carbon Electricity
Oakland Waterfront Ballpark District Project
Oakland, California

Proportion of Natural Gas Use by Commercial End Use in PG&E

End Use	Annual Natural Gas Use[1]	Units
Heating	24,852	10,000 therms
Cooling	401	
Water Heating	16,668	
Cooking	11,176	
Miscellaneous	474	
Process	2,907	
Segment Total	**56,478**	
Percent of Annual Natural Gas Use from Heating Loads	44%	%

Energy Use Reductions for Phase 1 Buildout and Full Project Buildout

Scenario	Non-Residential Natural Gas Use from Retail and Office[2]	Non-Residential Natural Gas Use from Space Heating[3]
	(MMBTU/yr)	
Phase 1 Buildout	4,924	2,166
Full Project Buildout	29,952	13,180

Additional Electricity Use from Replacing Natural Gas if Using Grid Electricity Rather Than Zero-Carbon Electricity

Scenario	Non-Residential Electricity Use from Space Heating[4]
	(MWh/yr)
Phase 1 Buildout	991
Full Project Buildout	6,296

Notes:

1. Commercial End Use Survey data from http://capabilities.itron.com/CeusWeb/Chart.aspx for PG&E, all commercial buildings, natural gas use. Accessed: April 2019.
2. This calculation shows the reduction in natural gas consumption from space heating for retail and office land uses. If replaced by zero-carbon electricity, this is the total reduction. If replaced by grid electricity, additional electricity will be added as shown in the bottom table. Natural gas use is from Table 12.
3. Assumes the proportion of natural gas use from space heating for the Project is consistent with the overall PG&E inventory.
4. According to communication with Meyers+ Engineers, it is assumed that about 15-30% of non-residential electricity usage should be added to account for heating, depending on specific land use. For this analysis, the retail assumed 40% and the office assumed 30% of electricity would be added for heating electrically.

Abbreviations:

MMBTU - million British Thermal Units
MWh - megawatt-hour
PG&E - Pacific Gas & Electric
yr - year

References:

Commercial End Use Survey data from http://capabilities.itron.com/CeusWeb/Chart.aspx for PGE, all commercial buildings, natural gas use. Accessed: April 2019.

Table 16
Maritime Reservation Scenario Construction Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Scaling Factor[1]	Project Construction Energy Usage[2]					Maritime Reservation Scenario Construction Energy Usage				
			Off-Road		On-Road		Water Use	Off-Road		On-Road[3]		Water Use[4]
			Diesel (gal)	Electricity (kWh)	Diesel (gal)	Gasoline (gal)	Electricity (MWh)	Diesel[3] (gal)	Electricity[4] (kWh)	Diesel (gal)	Gasoline (gal)	Electricity (MWh)
DDC Area	Geotechnical Work	1	36,996	0	1,087	1,766	117	36,996	0	1,087	1,766	117
DPC Area	Geotechnical Work	1	29,669	0	1,087	1,766	29	29,669	0	1,087	1,766	29
Offsite improvements: Grids 1-19	Demolition	1	5,015	0	0	588	0	5,015	0	0	588	0
	Construct Curb, Gutter, Sidewalk, Ramps	1	3,550	0	16,887	1,188	0	3,550	0	16,887	1,188	0
	New / Modified Traffic Signal	1	4,619	0	2,109	1,877	0	4,619	0	2,109	1,877	0
	Street Lighting	1	5,648	0	3,736	929	0	5,648	0	3,736	929	0
	Paving	1	2,310	0	0	226	0	2,310	0	0	226	0
	Striping	1	1,623	0	0	121	0	1,623	0	0	121	0
Phase 1	Demolition	1	8,999	0	171	795	0	8,999	0	171	795	0
	Grading and Site Preparation	1	87,249	0	81,712	3,638	165	87,249	0	81,712	3,638	165
	Grading and Site Preparation Remediation	1	11,903	0	91,869	186	28	11,903	0	91,869	186	28
	Crane Removal Demolition	1	13,895	0	0	1,416	0	13,895	0	0	1,416	0
	Site Utilities	1	24,258	0	2,100	3,396	49	24,258	0	2,100	3,396	49
	Cut Off Wall	1	13,680	0	4,274	851	0	13,680	0	4,274	851	0
	Ballpark Building Construction	1	304,581	223,042	113,548	294,789	49	304,581	223,042	113,548	294,789	49
	Mixed Use Building Construction	1	189,445	412,787	46,337	117,878	40	189,445	412,787	46,337	117,878	40
	Architectural Coating	1	34,500	40,289	0	127,338	0	34,500	40,289	0	127,338	0
	Paving	1	9,437	0	0	745	29	9,437	0	0	745	29
	Pedestrian Bike Overpass Grading and Site Preparation[6]	1	6,559	0	1,090	753	1.4	6,559	0	1,090	753	1.4
	Pedestrian Bike Overpass Site Utilities[6]	1	4,720	0	393	452	0.68	4,720	0	393	452	0.68
	Pedestrian Bike Overpass Tower Construction[6]	1	8,642	58	2,049	4,166	0	8,642	58	2,049	4,166	0
	Pedestrian Bike Overpass Sitework[6]	1	2,150	0	659	585	0.68	2,150	0	659	585	0.68
Phase 2	Demolition	0.67	8,999	0	170	1,185	0	5,996	0	114	790	0
	Grading and Site Preparation	0.67	173,406	0	44,685	5,300	86	115,532	0	29,771	3,531	86
	Grading and Site Preparation Remediation	0.67	12,647	0	84,040	181	16	8,426	0	55,992	121	16
	Site Utilities	0.67	37,287	0	1,707	5,165	28	24,842	0	1,137	3,441	28
	Mixed Use Building Construction[5]	1	753,149	2,306,432	277,939	214,469	145	753,149	2,306,432	277,939	214,469	145
	Paving	0.67	19,159	0	0	1,374	31	12,765	0	0	915	31
	Architectural Coating[5]	1	31,668	36,982	0	76,792	0	31,668	36,982	0	76,792	0
							Unmitigated Total[6]	**1,716,991**	**3,019,533**	**707,137**	**854,623**	**813**
							Mitigated Total[6]	**1,761,826**	**3,019,591**	**734,060**	**865,507**	**816**

Notes:

1. Changes to the Project site plan that would occur with the Maritime Reservation Scenario would occur within the area of the Project site that would be developed after Phase 1. Therefore, only subphases that occur after construction of Phase 1 would have a reduced area, as indicated by the scaling factor. The scaling factor was determined by dividing the Maritime Reservation Scenario area by the Project area.
2. See Tables 2-6 for Project construction energy usage methodology.
3. Off-road equipment diesel use and on-road vehicle diesel and gasoline use calculated by multiplying the corresponding Project values by the scaling factor.
4. Electricity usage for electric off-road equipment and for construction water consumption are not scaled from the Project for Maritime Reservation Scenario emissions calculations, and thus these values are not scaled for energy usage calculations either.
5. Mixed Use Building Construction and Architectural Coating subphases were not scaled because the Maritime Reservation Scenario square footage is the same as the Project.
6. The energy usage for the unmitigated and mitigated scenarios differs due to the Pedestrian Bike Overpass area of Phase 1 and the Offsite Improvements Phase being constructed only during the mitigated scenario.

Abbreviations:

DDC - deep dynamic compaction
DPC - direct power compaction
gal - gallons
kWh - kilowatt-hours
MWh - megawatt-hours

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Table 17
Summary of Maritime Reservation Scenario Operational Energy Resources Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source		Phase 1 Operational Usage	Full Buildout Operational Usage
Electricity			
Building[1]	MWh/year	19,356	58,767
Water[2]	MWh/year	1,270	3,957
Mobile[3,4]	MWh/year	334	1,147
EV Chargers[4]	MWh/year	3	235
Total Electricity	**MWh/year**	**20,963**	**64,107**
Natural Gas			
Building[1]	kBTU/year	24,539,193	72,122,326
Mobile[5]	kBTU/year	801,762	3,546,469
Total Natural Gas	**kBTU/year**	**25,340,955**	**75,668,795**
Diesel			
Mobile[3]	gallons/year	281,745	1,025,277
EV Charging[4]	gallons/year	-136	-8,453
TRU Operation[6]	gallons/year	288	319
Generators[7]	gallons/year	6,234	15,276
Total Diesel	**gallons/year**	**288,131**	**1,032,419**
Gasoline			
Mobile[3]	gallons/year	1,921,269	3,953,070
EV Charging[4]	gallons/year	-445	-26,518
Total Gasoline	**gallons/year**	**1,920,825**	**3,926,552**

Notes:

1. Electricity and natural gas usage for the Maritime Resrvation Scenario is not expected to change from the electricity and natural gas usage for the Project, which is shown with more detail in Table 7, Annual and Peak Energy Usage for Existing and Project Operations.
2. Water usage for the Maritime Reservation Scenario is not expected to change from the water usage for the Project, which is based on water emissions and energy emission factors shown in the Air Quality Technical Report, Table 31 and Table 21, respectively.
3. Mobile source fuel use for the Maritime Reservation Scenario is not expected to change from the mobile source fuel use for the Project, which is calculated based on vehicle miles traveled (VMT) and the fleet-average fuel consumption (in gallons per mile) from EMFAC2017 for 2023 and 2027 for the Phase 1 and Full Buildout, respectively, as shown in Air Quality Technical Report, Table 23. Project VMT reflects implementation of Transportation Management Plan (TMP) and Transportation Demand Management (TDM) Plan measures.
4. Mobile electricity demand for the Maritime Reservation Scenario is not expected to change from the mobile electricity demand for the Project, which is based on VMT from EMFAC2017 and estimated electric vehicle fuel economy (in kWh per mile) assuming 30 kWh/100 miles for baseline and 25 kWh/100 miles for Phase 1 and Full Buildout. Electricity used to charge additional EVs beyond the projected EMFAC2017 fleet average due to the Project's commitments is derived in Air Quality Technical Report, Table 39. The fuel economy is consistent with the current range of fuel efficiencies of electric cars from US Department of Energy.
5. EMFAC2017 include compressed natural gas (CNG) in terms of diesel gallon equivalents (DEG). This is converted into Btu per the US Department of Energy Alternative Fuel Data Center conversion: 1 DGE of CNG = 128,488 Btu. Available at: https://afdc.energy.gov/fuels/equivalency_methodology.html
6. Diesel usage from TRU operation for the Maritime Reservation Scenario is not expected to change from the diesel usage from TRU operation for the Project, which is based on TRU emissions showin in the Air Quality Technical Report, Table 40.

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Table 17
Summary of Maritime Reservation Scenario Operational Energy Resources Use
Oakland Waterfront Ballpark District Project
Oakland, California

Notes, Continued:

7. Maritime Reservation Scenario diesel usage from generators in the is based on generator hours of operation and average horsepower for mitigated generators, as shown in Table 18.

Abbreviations:

Btu - British Thermal Unit
CNG - compressed natural gas
DEG - diesel gallon equivalents
EV - electric vehicles
kBTU - thousand British Thermal Units
kWh - kilowatt-hour
MWh - megawatt-hour
TDM - Transportation Demand Management
TMP - Transportation Management Plan
TRU - transportation refrigeration unit
VMT - vehicle miles traveled

References:

DOE. 2017. Fuel Economy Guide, Model Year 2017. Electric Vehicles. Available online at: http://www.fueleconomy.gov/feg/printGuides.shtml. Accessed May 2019.

USEPA. 1996. AP 42. Compilation of Air Pollutant Emission Factors, Volume 1. Fifth Edition. Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines. Available online at: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf. Accessed May 2019.

DOE. 2017. Alternative Fuels Data Center, Gasoline and Diesel Gallon Equivalency Methodology, Compressed Natural Gas. Available online at: https://afdc.energy.gov/fuels/equivalency_methodology.html. Accessed May 2019.

Table 18
Generator Fuel Consumption for the Maritime Reservation Scenario
Oakland Waterfront Ballpark District Project
Oakland, California

Maritime Reservation Scenario Mitigated Generators

Scenario[1]	Generator Hours of Operation [2] (hrs)	Average Horsepower (hp)	Fuel Consumption[3] (gallons of diesel)
Phase 1 Buildout	140	872	6,234
Full Buildout	300	997	15,276

Notes:

1. Mitigated generator fuel consumption is presented for an annual operation of 20 hours/year.
2. Total annual hours of operation and average horsepower for the Maritime Reservation Scenario, found in the Air Quality Technical Report Table 76, Unmitigated Generator Emissions from Maritime Reservation Scenario, and Table 77, Mitigated Generator Emissions from Maritime Reservation Scenario.
3. Consistent with USEPA AP-42 diesel fuel data in Table 3.4.1, which cites an average brake-specific fuel consumption (BSFC) of 7,000 BTU/hp-hr, a heating value of 19,300 BTU/lb, and density of 7.1 lb/gal.

Abbreviations:

BTU - British Thermal Units
gal - gallon
hp - horsepower
hrs - hours
lb - pound

Table 19
Change in Energy Consumption from Existing Conditions to Maritime Reservation Scenario
Oakland Waterfront Ballpark District Project
Oakland, California

Source		A's Related Existing Conditions[1]	Full Buildout Operational Usage, Maritime Reservation Scenario[1]	Change from Existing to Maritime Reservation Scenario
Electricity				
Building	MWh/year	6,376	58,767	52,391
Water	MWh/year	225	3,957	3,733
Mobile	MWh/year	84	1,147	1,063
EV Chargers	MWh/year	0	235	235
Total Electricity	**MWh/year**	**6,685**	**64,107**	**57,421**
Natural Gas				
Building	kBTU/year	3,174,285	72,122,326	68,948,041
Mobile	kBTU/year	3,566	3,546,469	3,542,903
Total Natural Gas	**kBTU/year**	**3,177,851**	**75,668,795**	**72,490,944**
Diesel				
Mobile	gallons/year	6,891	1,025,277	1,018,386
EV Chargers	gallons/year	0	-8,453	-8,453
Generators	gallons/year	0	15,276	15,276
TRU Operation	gallons/year	260	319	59
Total Diesel	**gallons/year**	**7,151**	**1,032,419**	**1,025,269**
Gasoline				
Mobile	gallons/year	798,616	3,953,070	3,154,454
EV Chargers	gallons/year	0	-26,518	-26,518
Total Gasoline	**gallons/year**	**798,616**	**3,926,552**	**3,127,936**

Notes:

1. Values are from Table 11, A's Related Existing Operational Energy Resource Use, and Table 17, Maritime Reservation Scenario Operational Energy Resource Use, and values specific to NFL and Other Events are not included in the A's Related Existing Conditions total in order to conservatively estimate net new emissions attributable to the Project.

Abbreviations

Btu - British Thermal Unit
CNG - compressed natural gas
DEG - diesel gallon equivalents
EV - electric vehicles
kBTU - thousand British Thermal Units
kWh - kilowatt-hour
MWh - megawatt-hour
TDM - Transportation Demand Management
TMP - Transportation Management Plan
TRU - transportation refrigeration unit
VMT - vehicle miles traveled

Table 20
Variant Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Equipment Type[1]	CalEEMod® Equipment Type	Fuel	Number	HP	kW	Load Factor	Equipment Start Date	Equipment End Date	Number Days	Hours per Day	Utilizations for Duration	Equipment Tier[2]	Fuel Usage[3] (gal diesel)	Electricity Usage[4] (kWh)
Peaker Power Plant	Building Renovation	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	--	0.73	2/24/2022	2/28/2023	264	8	10%	Tier 4 Final	638	--
		Gradall-type Forklifts	Forklifts	Diesel	2	93	--	0.20	2/24/2022	2/28/2023	264	8	80%	Tier 4 Final	3,227	--
		Air Compressors	Air Compressors	Electric	1	--	7.5	0.48	2/24/2022	2/28/2023	264	8	30%	--	--	2,268
		Drywall stud impact guns	Other Construction Equipment	Electric	2	--	1.0	0.42	2/24/2022	2/28/2023	264	8	35%	--	--	614
		Bobcat	Rubber Tired Loaders	Diesel	1	71	--	0.36	2/24/2022	2/28/2023	264	8	40%	Tier 4 Final	1,109	--
		Cranes	Cranes	Diesel	1	226	--	0.29	2/24/2022	2/28/2023	264	8	50%	Tier 4 Final	3,512	--
														Total	**8,486**	**2,882**
Aerial Gondola	Grading and Site Preparation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	876	--
		Scrapers/Blades/Rollers	Scrapers	Diesel	1	500	--	0.48	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	5,914	--
		Water Trucks	Off-highway trucks	Diesel	1	402	--	0.38	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	3,764	--
		Generators	Generator Sets	Diesel	1	84	--	0.74	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	1,524	--
		Excavators	Excavators	Diesel	2	162	--	0.38	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	3,034	--
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	--	0.37	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	876	--
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	1	199	--	0.36	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	1,765	--
		Water Trucks	Off-highway trucks	Diesel	1	402	--	0.38	9/2/2021	12/22/2021	80	8	75%	Tier 4 Final	3,764	--
	Foundations and Structure	Pile Driving Rigs	Bore/Drill Rigs	Diesel	2	206	--	0.50	12/23/2021	6/10/2022	122	8	33%	Tier 4 Final	3,406	--
		Concrete Boom Pumps	Off-highway trucks	Diesel	2	480	--	0.38	12/23/2021	6/10/2022	122	8	75%	Tier 4 Final	13,709	--
		Bobcat	Rubber Tired Loaders	Diesel	2	71	--	0.36	12/23/2021	6/10/2022	122	8	85%	Tier 4 Final	2,177	--
		Small Excavator	Excavators	Diesel	2	404	--	0.38	12/23/2021	6/10/2022	122	8	25%	Tier 4 Final	3,846	--
		Large Excavator	Excavators	Diesel	2	523	--	0.38	12/23/2021	6/10/2022	122	8	25%	Tier 4 Final	4,979	--
		Crawler Cranes	Cranes	Diesel	2	530	--	0.29	12/23/2021	6/10/2022	122	8	50%	Tier 4 Final	7,613	--
		Gradall-type Forklifts	Forklifts	Diesel	2	93	--	0.20	12/23/2021	6/10/2022	122	8	50%	Tier 4 Final	932	--
		Cutting/chopping saws	Other Construction Equipment	Electric	2	--	5.0	0.42	12/23/2021	6/10/2022	122	8	100%	--	--	4,054
	Architectural Finish/Escalators	Air Compressors	Air Compressors	Diesel	2	125	--	0.48	6/13/2022	10/28/2022	100	8	85%	Tier 4 Final	4,168	--
		Air Compressors	Air Compressors	Electric	2	--	7.5	0.48	6/13/2022	10/28/2022	100	8	85%	--	--	4,868
	Cabling and Equipment	Cranes	Cranes	Diesel	1	226	--	0.29	10/31/2022	3/31/2023	110	8	75%	Tier 4 Final	2,195	--
		Crawler Cranes	Cranes	Diesel	2	530	--	0.29	10/31/2022	3/31/2023	110	8	75%	Tier 4 Final	10,296	--
		Mobile Cranes	Cranes	Diesel	2	530	--	0.29	10/31/2022	3/31/2023	110	8	75%	Tier 4 Final	10,296	--
		Gradall-type Forklifts	Forklifts	Diesel	2	93	--	0.20	10/31/2022	3/31/2023	110	8	50%	Tier 4 Final	840	--
														Total	**85,979**	**8,922**
Tank Structure/Parcel	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	2	81	--	0.73	7/1/2021	9/1/2021	45	8	50%	Tier 4 Final	1,087	--
		Excavators	Excavators	Diesel	2	158	--	0.38	7/1/2021	9/1/2021	45	8	80%	Tier 4 Final	1,775	--
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	--	0.37	7/1/2021	9/1/2021	45	8	100%	Tier 4 Final	1,315	--
	Grading and Site Preparation	Scrapers/Blades/Rollers	Scrapers	Diesel	2	500	--	0.48	11/15/2021	11/25/2021	9	8	90%	Tier 4 Final	1,597	--
														Total	**5,774**	**0**

Notes:

1. Construction equipment list was provided by the Project sponsor.
2. This analysis assumes Tier 4 Final engines for all Variant construction. Dashes indicate there is no applicable tier for electric equipment. Equipment tier does not affect fuel usage, thus usage would remain the same regardless of assumed tier.
3. Fuel use from off-road construction equipment is estimated using consistent with USEPA AP-42 diesel fuel data in Table 3.4.1, which cites an average brake-specific fuel consumption (BSFC) of 7,000 BTU/hp-hr, a heating value of 19,300 BTU/lb, and density of 7.1 lb/gal. Fuel use was calculated with the following equation:

   Fuel Usage = Σ(N * HP * LF * Hr * U * F)

   N: number of Equipment Pieces
   HP: equipment horsepower (OFFROAD2011)
   LF: Load Factor
   Factor: 0.051084 gal/hp-hr
   U: Utilization

4. Electricity Usage was calculated using the following equation:

   Electricity Usage = Σ(N * kW * LF * Hr * U)

   N: number of Equipment Pieces
   kW: equipment kilowatt usage
   LF: Load Factor
   U: Utilization

Abbreviations:

BTU - British thermal units	kW - kilowatt
gal - gallons	kWh - kilowatt hour
HP - horsepower	lb - pounds
hr - hour	USEPA - United States Environmental Protection Agency

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Table 21
Variant On-Road Construction Vehicle Fuel Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Year	One-Way Trips Per Phase			Annual VMT (mi/yr)[1]			Fuel Consumption (gallons)[2]		
			Worker	Vendor	Hauling	Worker	Vendor	Hauling	Worker (Gasoline)	Vendor (Diesel)	Hauling (Diesel)
Peaker Power Plant	Building Renovation	2022	22,200	4,440	0	239,760	32,412	0	8,356	4,136	0
		2023	4,200	840	0	45,360	6,132	0	1,536	748	0
								Total	**9,892**	**4,884**	**0**
Aerial Gondola	Grading and Site Preparation	2021	1,920	0	50	20,736	0	1,000	743	0	156
	Foundations and Structure	2021	252	0	0	2,722	0	0	98	0	0
		2022	4,140	0	0	44,712	0	0	1,558	0	0
	Architectural Finish/Escalators	2022	8,000	0	0	86,400	0	0	3,011	0	0
	Cabling and Equipment	2022	2,250	0	0	24,300	0	0	847	0	0
		2023	3,250	390	0	35,100	2,847	0	1,189	347	0
								Total	**7,445**	**347**	**156**
Tank Structure/Parcel	Demolition	2021	675	675	400	7,290	4,928	8,000	261	645	1,247
	Grading and Site Preparation	2021	45	45	0	486	329	0	17	43	0
								Total	**279**	**688**	**1,247**

Notes
1. Total miles based on trip generation provided and CalEEMod® default trip distance by trip type.
2. Fuel usage based on VMT data and fuel efficiency values calculated in Table 3. It is assumed that worker vehicles use gasoline while vendor and hauling vehicles use diesel.

Abbreviations:
CalEEMod® - California Emissions Estimator Model
VMT - vehicle miles traveled
mi - mile
yr - year

Table 22
Electricity Required for Variant Construction Water Usage
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Phase	Construction Subphase	Year	Number of Work Days	Average Acreage Needing Water[1]	Water Usage[1]	Number of Water Trucks	Utilization	Total Water Usage	Outdoor Water Electric Intensity Factor[2]	Electricity Usage
				(acres)	(gal/acre/ day)		(%)	(million gal)	(kWh/million gal)	(MWh)
Aerial Gondola	Grading and Site Preparation	2021	80	7.2	8,000	2.0	0.75	4.6	3,500	16
									Total	**16**

Notes:

1. Acreage is the acreage of the phase area. Water usage is assumed to be similar to the Project with 8,000 gal/acre/day for Grading and Site Preparation.
2. Electric intensity factors were taken from Table 9.2 in Appendix D of the CalEEMod User's Guide as the sum of supply water, treat water and distribute water electric intensity factors. Since the water use reported here is only for fugitive dust control, indoor water use-related emissions and wastewater treatment-related emissions are not estimated here.

Abbreviations:

gal - gallons
kWh - kilowatt-hours
MWh - megawatt-hours

References:

CalEEMod User's Guide (Available online at: http://www.aqmd.gov/caleemod/user's-guide)
PG&E, Pacific Gas and Electric - Gas and power company for California (https://www.pge.com/)

Table 23
Summary of Variant Construction Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source		Units	Peaker Power Plant	Aerial Gondola	Tank Structure/Parcel
Electricity	Water Consumption[1]	kWh	--	16	--
	Off-Road Construction Equipment[2]	kWh	2,882	8,922	--
	Electricity Total	**kWh**	**2,882**	**8,938**	**--**
Diesel	On-Road Construction Trips[3]	gallons	4,884	503	1,935
	Off-Road Construction Equipment[2]	gallons	8,486	85,979	5,774
	Diesel Total	**gallons**	**13,370**	**86,482**	**7,709**
Gasoline	On-Road Construction Trips[3]	gallons	9,892	7,445	279
	Gasoline Total	**gallons**	**9,892**	**7,445**	**279**

Notes:

1. Construction water use based on project-specific estimate provided by Project sponsor. See Table 22 for more details on the methodology.
2. Off-road equipment electricity use based on hours of operation for electric equipment. Off-road diesel fuel usage based on a fuel usage rate of 0.051 gallons of diesel per horsepower (hp)-hour, consistent with diesel conversion factors given in USEPA AP-42 Table 3.4.1. See Table 20 for more details on the methodology.
3. On-road mobile source fuel use based on vehicle miles traveled (VMT) for all years of construction and fleet-average fuel consumption in gallons per mile from EMFAC2017 for CY 2020 through 2027 in Alameda County. See Table 21 for more details on the methodology.

Abbreviations:

CY - calendar year
EMFAC2017 - California Air Resources Board EMission FACtor model
hp - horsepower
kWh - kilowatt-hour
USEPA - United States Environmental Protection Agency
VMT - vehicle miles traveled

References:

USEPA. 1996. AP 42. Compilation of Air Pollutant Emission Factors, Volume 1. Fifth Edition. Chapter 3.4, Large Stationary Diesel and

Table 24
Operational Energy Use for Peaker Power Plant Variant
Oakland Waterfront Ballpark District Project
Oakland, California

Heat Content of Jet Fuel[1]

0.135	MMBtu/gal

Historical Power Generation of Oakland Power Plant (2010-2018)

Year	Electricity Fuel Consumption (MMBTU)[2]	Net Electricity Generation (MWh)	Jet Fuel Consumption (gal)
2010	147,254	10,746	1,090,770
2011	85,493	6,144	633,281
2012	164,195	11,966	1,216,259
2013	40,744	2,996	301,807
2014	109,277	7,404	809,459
2015	330,211	22,938	2,446,007
2016	83,245	5,625	616,630
2017	29,287	2,009	216,941
2018	65,556	3,852	485,600
Average		**8,187**	**868,528**

Estimated Electricity Storage from On-Site Batteries Replacing the Peaker Plant

Input	Units
90	MW battery capacity[3]
4	hours of maximum storage per day[3]
40%	Annual Average Renewable Curtailment[4]
85%	Round Trip Efficiency[5]
7,953	MWh/yr Battery Electricity Loss[5]

Notes:

[1] The heat content of jet fuel is based on data from US EPA (2018), "Emission Factors for Greenhouse Gas Inventories".

[2] Data from Form EIA-923 detailed data for 2010-2018 for Dynegy Oakland Power Plant.

[3] Battery energy storage system specifications are provided by the Project sponsor.

[4] The annual average charge rate of the battery energy storage system is calculated based on the monthly curtailment of solar and wind renewable power sources from May 2014 through August 2019, as reported by the California Independent System Operator (CAISO 2019). The battery energy storage system is assumed to be fully charged using solar and wind power that would have otherwise been curtailed during peak curtailment months and proportionally lower charge rates during other months of the year. This is a conservative estimate as it is based on historical curtailment. As California increases solar and wind generation capacity, the battery energy storage system could potentially be fully charged even in the historically low-curtailment months.

[5] The battery round-trip efficiency is the fraction of energy put into the storage that can be retrieved, and is a combination of the charge efficiency and discharge efficiency of the storage bank. More details available at the National Renewable Energy Laboratory (NREL).

Abbreviations:

CAISO - California Independent System Operator
gal - gallon
MMBtu - million British Thermal Units
MW - megawatt
MWh - megawatt hours
USEPA - United States Environmental Protection Agency
yr - year

References:

US EPA. 2018. Emission Factors for Greenhouse Gas Inventories. Available at: https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

Form EIA-923. 2010-2018. Available at: https://www.eia.gov/electricity/data/eia923/

California Independent System Operator (CAISO 2019). Available at: http://www.caiso.com/informed/Pages/ManagingOversupply.aspx (Accessed: September 2019)

National Renewable Energy Laboratory (NREL). 2019. Cole, Wesley and Frazier, A. Will. June. Available online at: https://www.nrel.gov/docs/fy19osti/73222.pdf. Accessed February 2020.

Table 25
Operational Mobile Fuel Consumption Reduction for Aerial Gondola Variant
Oakland Waterfront Ballpark District Project
Oakland, California

Aerial Gondola Mobile Energy Reduction[1,2]

Land Use and Scenario			Fleet Type	Aerial Gondola VTR (%)	Annual Trip Reduction (trips /year)	Annual VMT Reduction (mi /year)	Percent Gasoline Vehicle Miles	Gasoline Miles per Gallon	Percent Diesel Vehicle Miles	Diesel Miles per Gallon	Percent Natural Gas Vehicle Miles	Natural Gas Miles per DEG	Percent Electric Vehicle Miles	Electric kWh per Mile	Fuel Consumption Reduction			
															Gasoline (gal)	Diesel (gal)	CNG (DEG)	Electricity (kWh)
Ballpark Stadium	A's Games	Weekday Evening	Passenger	3%	-31,857	-436,441	95%	33	1.2%	44	--	--	3.6%	0.25	-12,664	-124	--	-3,894
		Weekday Day	Passenger	3%	-11,088	-151,906	95%	33	1.2%	44	--	--	3.6%	0.25	-4,408	-43	--	-1,355
		Weekend	Passenger	2%	-14,634	-212,193	95%	33	1.2%	44	--	--	3.6%	0.25	-6,157	-60	--	-1,893
	Other Events[3]	Concerts	Passenger	3%	-7,236	-85,385	95%	33	1.2%	44	--	--	3.6%	0.25	-2,478	-24	--	-762
		Other	Passenger	3%	-6,300	-74,340	95%	33	1.2%	44	--	--	3.6%	0.25	-2,157	-21	--	-663
		Corporate/Community	Passenger	3%	-4,500	-53,100	95%	33	1.2%	44	--	--	3.6%	0.25	-1,541	-15	--	-474
		Plaza	Passenger	3%	-1,392	-16,426	95%	33	1.2%	44	--	--	3.6%	0.25	-477	-4.7	--	-147
	A's Games Deliveries		Bus	0%	0	0	18%	5.1	70%	7.2	13%	4.1	0%	0.25	0	0	0	0
			Truck	0%	0	0	30%	8.1	70%	13	--	--	0%	0.25	0	0	--	0
	Event Deliveries		Truck	0%	0	0	30%	8.1	70%	13	--	--	0%	0.25	0	0	--	0
	Arena Management		Passenger	13%	-1238	-11,765	95%	33	1.2%	44	--	--	3.6%	0.25	-341	-3.3	--	-105
Sports Team Management			Passenger	13%	-5,821	-55,297	95%	33	1.2%	44	--	--	3.6%	0.25	-1,604	-16	--	-493
Residential			All	13%	-284,037	-3,408,444	87%	31	10%	10	0.082%	3.1	3.2%	0.25	-95,904	-32,782	-888	-27,310
Office			All	13%	-280,878	-3,370,536	87%	31	10%	10	0.082%	3.1	3.2%	0.25	-94,837	-32,418	-879	-27,006
Retail			All	13%	-220,974	-2,651,688	87%	31	10%	10	0.082%	3.1	3.2%	0.25	-74,611	-25,504	-691	-21,246
Restaurant			All	13%	-257,556	-3,090,672	87%	31	10%	10	0.082%	3.1	3.2%	0.25	-86,963	-29,726	-806	-24,763
Hotel			All	13%	-94,237	-1,130,844	87%	31	10%	10	0.082%	3.1	3.2%	0.25	-31,819	-10,876	-295	-9,061
Performance Venue		Attendees	Passenger	13%	-31,200	-374,400	95%	33	1.2%	44	--	--	3.6%	0.25	-10,864	-106	--	-3,340
		Deliveries	Truck	0%	0	0	30%	8.1	70%	13	--	--	0%	0.25	0	0	--	0
			Bus	0%	0	0	18%	5.1	70%	7.2	13%	4.1	0%	0.25	0	0	0	0
					Total Reduction	**-15,123,436**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-426,824**	**-131,723**	**-3,558**	**-122,511**

Notes:

1. See Air Quality Technical Report Table 105, Summary of Mobile Emissions Reductions from Gondola Variant, and Energy Technical Report Table 8, Project Mobile Fuel Consumption, for more details.
2. Aerial Gondola Vehicle trip rates were provided by Fehr & Peers.
3. Corporate/Community, plaza, and other activities at ballpark are assumed to have the same VTR % as "Other Events" Concerts.

Abbreviations:

CNG - compressed natural gas
DEG - diesel equivalent gallon
kWh - kilowatt hour
mi - mile
VMT - vehicle miles traveled
VTR - vehicle trip rate

Table 26
Operational Electricity Consumption for Aerial Gondola Variant
Oakland Waterfront Ballpark District Project
Oakland, California

Gondola Station	Annual Electricity Use (kWh)[1]
Jack London Station	3,387,500
10th St. Station	1,456,250
Tower 3rd St. Station	43,050
Total	4,886,800

Aerial Gondola Energy Use[2]

Electricity Use Rate (kWh/yr)	Annual Electricity Use (MWh/yr)
4,886,800	4,887

Notes:

1. Electricity use from the gondola and associated building loads was provided by SCJ Alliance on 4/3/2019.
2. See Air Quality Technical Report Table 103, Summary of Emissions from Aerial Gondola Energy Usage, for more details.

Abbreviations:

kWh - kilowatt hour
MWh - mega watt hour
yr - year

References:

SCJ Alliance. 2019. Technical Memorandum: Oakland Gondola Electric Service. April 3.

Table 27
Variant Generator Fuel Consumption
Oakland Waterfront Ballpark District Project
Oakland, California

Variant Mitigated Generators

Variant	Location	Generator Hours of Operation[1] (hrs)	Average Horsepower (hp)	Fuel Consumption[2] (gallons of diesel)
Aerial Gondola	Jack London Square Tower	50	2,012	5,138
	Convention Center Station	50	1,006	2,569
	Tower	50	201	514
Peaker Power Plant	Fuel Tank Parcel	20	335	343

Notes:

1. Operation for routine maintenance and testing for the Aerial Gondola generators is conservatively assumed to be 50 hours per year, the maximum allowable by the Airborne Toxics Control Measure (ATCM) for Stationary Compression Ignition Engines (17 CCR 93115). Operation for routine maintenance and testing for the Fuel Tank Parcel generator is assumed to be 50 hours per year in the unmitigated scenario, and 20 hours per year in the mitigated scenario.
2. Consistent with USEPA AP-42 diesel fuel data in Table 3.4.1, which cites an average brake-specific fuel consumption (BSFC) of 7,000 BTU/hp-hr, a heating value of 19,300 BTU/lb, and density of 7.1 lb/gal.

Abbreviations:

BTU - British Thermal Units
gal - gallon
hp - horsepower
hrs - hours
lb - pound

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Table 28
Summary of Variant Operational Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source		Net Variant Operational Energy Consumption
Electricity		
Aerial Gondola Electricity Usage[1]	MWh/year	4,887
Aerial Gondola Mobile Electricity Reduction[2]	MWh/year	-123
Peaker Power Plant Electricty Generation Avoided[3]	MWh/year	8,187
Peaker Plant Replacement Battery Losses	MWh/year	7,953
Aerial Gondola Total Electricity Usage	**MWh/year**	**4,764**
Peaker Power Plant Total Electricity Generation Avoided[3]	**MWh/year**	**16,140**
Natural Gas		
Aerial Gondola Mobile Natural Gas Reduction[2]	kBTU/year	-457,205
Aerial Gondola Total Natural Gas Reduction	**kBTU/year**	**-457,205**
Diesel		
Peaker Power Plant Mitigated Generator[4]	gallons/year	343
Aerial Gondola Mitigated Generators[4]	gallons/year	8,221
Aerial Gondola Mobile Diesel Reduction[2]	gallons/year	-131,723
Aerial Gondola Total Diesel Reduction	**gallons/year**	**-123,160**
Gasoline		
Aerial Gondola Mobile Gasoline Reduction[2]	gallons/year	-426,824
Aerial Gondola Total Gasoline Reduction	**gallons/year**	**-426,824**
Jet Fuel		
Peaker Power Plant Average Jet Fuel Reduction[3]	gallons/year	-868,528
Peaker Power Plant Total Jet Fuel Reduction	**gallons/year**	**-868,528**

Notes:

1. See Table 26 for more detail on Aerial Gondola electricity use. This is the electricity that must be produced in order to operate the gondolas and associated building loads.
2. See Table 25 for more detail on Aerial Gondola mobile electricity reduction. The gondolas will replace VMT otherwise created by automobiles and trucks, resulting in a reduction in electricity, natural gas, diesel, and gasoline usage.

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Table 28
Summary of Variant Operational Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Notes, Continued:

3. See Table 24 for more detail on Peaker Power Plant electricity and jet fuel consumption reductions. The removal of the Peaker Power Plant will result in a reduction of jet fuel consumption and avoided electricity generation. The positive contribution to electricity consumption represents avoided electricity production by decommissioning the Plant. Additionally, although the Peaker Power Plant variant involves the on-site installation of Battery Storage Systems, the batteries will consume the equivalent amount of electricity during non-peak hours as it supplies to the grid during peak hours. Therefore, the contribution to net variant electricity consumption nets to zero. While the battery storage neither contributes nor reduces electricity consumption, battery storage systems increase grid reliability, promote the transition to more renewably sourced electricity, and eliminate the need for additional fossil fueled peaker plant operation. None of these benefits are explicitly quantified above.

4. See Table 27 for more detail on Peaker Power Plant and Aerial Gondola generator fuel usage.

Abbreviations:

MWh - megawatt hour
kBTU - thousand British Thermal Unit
VMT - vehicle miles traveled

Table 29
Grade Separation Alternative Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Equipment Type[1]	CalEEMod® Equipment Type	Fuel	Number	HP	Load Factor[2]	Equipment Start Date	Equipment End Date	Number of Days	Hours per Day	Utilizations for Duration	Equipment Tier[3]	Fuel Usage[4] (gal diesel)
Overcrossing	Site Utilities	Excavators	Excavators	Diesel	4	162	0.38	1/1/2021	10/1/2021	196	8	95%	Tier 4 Final	18,831
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	1/1/2021	10/1/2021	196	8	100%	Tier 4 Final	5,726
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	2	199	0.36	1/1/2021	10/1/2021	196	8	100%	Tier 4 Final	11,534
		Generators	Generator Sets	Diesel	2	84	0.74	1/1/2021	10/1/2021	196	8	70%	Tier 4 Final	6,971
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	1/1/2021	10/1/2021	196	8	100%	Tier 4 Final	12,297
	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	10/1/2021	10/31/2021	21	8	25%	Tier 4 Final	127
		Excavators	Excavators	Diesel	1	158	0.38	10/1/2021	10/31/2021	21	8	100%	Tier 4 Final	518
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	10/1/2021	10/31/2021	21	8	100%	Tier 4 Final	614
		Crushing / Proc. Equipment	Crushing/Proc. Equipment	Diesel	1	85	0.78	10/1/2021	10/31/2021	21	8	75%	Tier 4 Final	427
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	10/1/2021	10/31/2021	21	8	75%	Tier 4 Final	988
	Geotechnical Work	Excavators	Excavators	Diesel	2	158	0.38	11/1/2021	3/1/2022	87	8	20%	Tier 4 Final	858
		Dozer	Rubber Tired Loaders	Diesel	1	215	0.36	11/1/2021	3/1/2022	87	8	10%	Tier 4 Final	277
		Cranes	Cranes	Diesel	2	226	0.29	11/1/2021	3/1/2022	87	8	90%	Tier 3	4,167
		Drill	Bore/Drill Rigs	Diesel	2	433	0.50	11/1/2021	3/1/2022	87	8	90%	Tier 4 Final	13,925
		Generators	Generator Sets	Diesel	2	84	0.74	11/1/2021	3/1/2022	87	8	70%	Tier 4 Final	3,094
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	11/1/2021	3/1/2022	87	8	75%	Tier 4 Final	4,094
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	0.42	11/1/2021	3/1/2022	87	8	20%	Tier 4 Final	1,418
	Abutement	Excavators	Excavators	Diesel	2	158	0.38	3/1/2022	6/1/2022	67	8	20%	Tier 4 Final	661
		Dozer	Rubber Tired Loaders	Diesel	1	215	0.36	3/1/2022	6/1/2022	67	8	10%	Tier 4 Final	213
		Cranes	Cranes	Diesel	2	226	0.29	3/1/2022	6/1/2022	67	8	80%	Tier 3	2,852
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	3/1/2022	6/1/2022	67	8	80%	Tier 4 Final	1,566
		Generators	Generator Sets	Diesel	4	84	0.74	3/1/2022	6/1/2022	67	8	70%	Tier 4 Final	4,766
		Gradall Type Forklifts	Forklifts	Diesel	4	111	0.20	3/1/2022	6/1/2022	67	8	100%	Tier 4 Final	2,444
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	0.42	3/1/2022	6/1/2022	67	8	20%	Tier 4 Final	1,092
	Grading and Site Preparation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	6/1/2022	10/1/2022	88	8	100%	Tier 4 Final	2,571
		Scrapers/Blades/Rollers	Scrapers	Diesel	2	500	0.48	6/1/2022	10/1/2022	88	8	10%	Tier 4 Final	1,735
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	6/1/2022	10/1/2022	88	8	75%	Tier 4 Final	4,141
		Generators	Generator Sets	Diesel	2	84	0.74	6/1/2022	10/1/2022	88	8	70%	Tier 4 Final	3,130
		Excavators	Excavators	Diesel	2	158	0.38	6/1/2022	10/1/2022	88	8	60%	Tier 4 Final	2,604
		Pavers	Pavers	Diesel	2	130	0.42	6/1/2022	10/1/2022	88	8	20%	Tier 4 Final	777
		Paving Equipment	Paving Equipment	Diesel	2	132	0.36	6/1/2022	10/1/2022	88	8	20%	Tier 4 Final	674
		Rollers	Rollers	Diesel	2	80	0.38	6/1/2022	10/1/2022	88	8	20%	Tier 4 Final	432
	Structural Work	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	3	97	0.37	6/1/2022	6/1/2023	262	8	80%	Tier 4 Final	9,185
		Generators	Generator Sets	Diesel	6	84	0.74	6/1/2022	6/1/2023	262	8	100%	Tier 4 Final	39,933
		Gradall Type Forklifts	Forklifts	Diesel	4	111	0.20	6/1/2022	6/1/2023	262	8	80%	Tier 4 Final	7,644
		Cranes	Cranes	Diesel	3	226	0.29	6/1/2022	6/1/2023	262	8	90%	Tier 3	18,823
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	0.42	6/1/2022	6/1/2023	262	8	15%	Tier 4 Final	3,202
													Total	**194,309**

Table 29
Grade Separation Alternative Off-Road Construction Equipment Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Equipment Type[1]	CalEEMod® Equipment Type	Fuel	Number	HP	Load Factor[2]	Equipment Start Date	Equipment End Date	Number of Days	Hours per Day	Utilizations for Duration	Equipment Tier[3]	Fuel Usage[4] (gal diesel)
Undercrossing	Site Utilities	Excavators	Excavators	Diesel	4	162	0.38	1/1/2021	1/1/2022	261	8	95%	Tier 4 Final	25,076
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	0.37	1/1/2021	1/1/2022	261	8	100%	Tier 4 Final	3,813
		Rubber Tired Loaders	Rubber Tired Loaders	Diesel	2	199	0.36	1/1/2021	1/1/2022	261	8	100%	Tier 4 Final	15,359
		Generators	Generator Sets	Diesel	2	84	0.74	1/1/2021	1/1/2022	261	8	70%	Tier 4 Final	9,282
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	1/1/2021	1/1/2022	261	8	75%	Tier 4 Final	12,281
	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	1/1/2022	2/1/2022	22	8	25%	Tier 4 Final	133
		Excavators	Excavators	Diesel	1	158	0.38	1/1/2022	2/1/2022	22	8	100%	Tier 4 Final	543
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	1/1/2022	2/1/2022	22	8	100%	Tier 4 Final	643
		Crushing / Proc. Equipment	Crushing/Proc. Equipment	Diesel	1	85	0.78	1/1/2022	2/1/2022	22	8	75%	Tier 4 Final	447
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	1/1/2022	2/1/2022	22	8	100%	Tier 4 Final	1,380
	Construct Shoofly	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	0.73	9/1/2021	1/1/2022	88	8	25%	Tier 4 Final	532
		Excavators	Excavators	Diesel	2	158	0.38	9/1/2021	1/1/2022	88	8	100%	Tier 4 Final	4,340
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	9/1/2021	1/1/2022	88	8	100%	Tier 4 Final	2,571
		Gradall Type Forklifts	Forklifts	Diesel	2	111	0.20	9/1/2021	1/1/2022	88	8	100%	Tier 4 Final	1,605
		Rollers	Rollers	Diesel	1	80	0.38	9/1/2021	1/1/2022	88	8	30%	Tier 4 Final	324
	Geotechnical Work (Bridges)	Excavators	Excavators	Diesel	2	158	0.38	1/1/2022	4/1/2022	65	8	20%	Tier 4 Final	641
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	1/1/2022	4/1/2022	65	8	100%	Tier 4 Final	1,899
		Cranes	Cranes	Diesel	2	226	0.29	1/1/2022	4/1/2022	65	8	90%	Tier 3	3,113
		Drill	Bore/Drill Rigs	Diesel	2	433	0.50	1/1/2022	4/1/2022	65	8	90%	Tier 4 Final	10,404
		Generators	Generator Sets	Diesel	2	84	0.74	1/1/2022	4/1/2022	65	8	70%	Tier 4 Final	2,312
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	0.42	1/1/2022	4/1/2022	65	8	15%	Tier 4 Final	794
	Build Road & Vehicular Bridges	Cranes	Cranes	Diesel	4	226	0.29	4/1/2022	1/1/2023	196	8	100%	Tier 3	20,861
		Generators	Generator Sets	Diesel	4	84	0.74	4/1/2022	1/1/2023	196	8	100%	Tier 4 Final	19,916
		Gradall Type Forklifts	Forklifts	Diesel	2	111	0.20	4/1/2022	1/1/2023	196	8	75%	Tier 4 Final	2,681
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	4/1/2022	1/1/2023	196	8	80%	Tier 4 Final	4,581
		Water Trucks	Off-Highway Trucks	Diesel	2	402	0.38	4/1/2022	1/1/2023	196	8	80%	Tier 4 Final	19,675
	Excavate and Shore	Excavators	Excavators	Diesel	4	158	0.38	1/1/2023	3/1/2024	305	8	70%	Tier 4 Final	21,059
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	1/1/2023	3/1/2024	305	8	80%	Tier 4 Final	7,129
		Cranes	Cranes	Diesel	4	226	0.29	1/1/2023	3/1/2024	305	8	80%	Tier 3	25,970
		Drill	Bore/Drill Rigs	Diesel	2	433	0.50	1/1/2023	3/1/2024	305	8	20%	Tier 4 Final	10,848
		Generators	Generator Sets	Diesel	4	84	0.74	1/1/2023	3/1/2024	305	8	70%	Tier 4 Final	21,694
		Concrete Boom Pumps	Other Construction Equipment	Diesel	1	480	0.42	1/1/2023	3/1/2024	305	8	15%	Tier 4 Final	3,728
	Grading and Site Preparation	Pavers	Pavers	Diesel	2	130	0.42	3/1/2024	5/1/2024	44	8	50%	Tier 4 Final	971
		Paving Equipment	Paving Equipment	Diesel	2	132	0.36	3/1/2024	5/1/2024	44	8	50%	Tier 4 Final	843
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	3/1/2024	5/1/2024	44	8	75%	Tier 4 Final	2,070
		Rollers	Rollers	Diesel	2	80	0.38	3/1/2024	5/1/2024	44	8	50%	Tier 4 Final	540
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	3/1/2024	5/1/2024	44	8	100%	Tier 4 Final	1,285
	Demolish Shoofly	Excavators	Excavators	Diesel	1	158	0.38	1/1/2023	2/1/2023	23	8	100%	Tier 4 Final	567
		Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	0.37	1/1/2023	2/1/2023	23	8	100%	Tier 4 Final	672
		Water Trucks	Off-Highway Trucks	Diesel	1	402	0.38	1/1/2023	2/1/2023	23	8	100%	Tier 4 Final	1,443
													Total	**264,025**

Notes:

1. Construction equipment list, number, horsepower, start date, end date, hours per day, utilization, and tier provided by the Project sponsor. The Grade Separation Alternative will involve construction of a single overcrossing or a single undercrossing at either Brush Street or Market Street. The off-road equipment list is assumed to be the same for both Brush Street and Market Street options.
2. Load factors were estimated from the Air Resource Board's OFFROAD database.
3. Mitigated tier assumed to be Tier 4 Final engines, except where shown above. The unmitigated tier is Fleet-Average tier. Engine tier does not affect fuel usage or electricity usage, thus the usage indicated applies to both the mitigated and unmitigated scenarios.
4. Fuel use from off-road construction equipment is estimated using consistent with USEPA AP-42 diesel fuel data in Table 3.4.1, which cites an average brake-specific fuel consumption (BSFC) of 7,000 BTU/hp-hr, a heating value of 19,300 BTU/lb, and density of 7.1 lb/gal. Fuel use was calculated with the following equation:

Fuel Usage = Σ(N * HP * LF * Hr * U * F)

N: number of Equipment Pieces
HP: equipment horsepower (OFFROAD2011)
LF: Load Factor
Factor: 0.051084 gal/hp-hr
U: Utilization

Abbreviations:

BTU - British thermal units
gal - gallons
HP - horsepower
hr - hour
lb - pounds
USEPA - United States Environmental Protection Agency

Table 30
Grade Separation Alternative On-Road Construction Vehicle Fuel Use
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area	Construction Activity	Year	One-Way Trips Per Phase			Annual VMT (mi/yr)[1]			Fuel Consumption (gallons)		
			Worker	Vendor	Hauling	Worker	Vendor	Hauling	Worker (Gasoline)	Vendor (Diesel)	Hauling (Diesel)
Brush Street - Overcrossing	Site Utilities	2021	5,880	1,960	0	63,504	14,308	--	2,276	1,874	--
	Demolition	2021	336	420	0	3,629	3,066	--	130	402	--
	Geotechnical Work	2021	1,350	450	0	14,580	3,285	--	522	430	--
		2022	1,260	420	0	13,608	3,066	--	474	391	--
	Abutement	2022	2,680	1,005	0	28,944	7,337	--	1,009	936	--
	Grading and Site Preparation	2022	1,760	440	0	19,008	3,212	--	662	410	--
	Structural Work	2022	9,180	1,530	0	99,144	11,169	--	3,455	1,425	--
		2023	6,540	1,090	0	70,632	7,957	--	2,392	971	--
								Total	**10,920**	**6,839**	**--**
Brush Street - Undercrossing	Site Utilities	2021	7,830	2,610	0	84,564	19,053	--	3,030	2,495	--
	Demolition	2022	352	440	0	3,802	3,212	--	132	410	--
	Construct Shoofly	2021	2,112	440	0	22,810	3,212	--	817	421	--
	Geotechnical Work (Bridges)	2022	1,950	650	0	21,060	4,745	--	734	606	--
	Build Road & Vehicular Bridges	2022	9,800	3,920	0	105,840	28,616	--	3,689	3,652	--
	Excavate and Shore	2023	13,000	3,900	11,252	140,400	28,470	225,040	4,754	3,473	32,548
		2024	2250	675	1,948	24,300	4,928	38,960	799	592	5,554
	Grading and Site Preparation	2024	880	220	0	9,504	1,606	--	312	193	--
	Demolish Shoofly	2023	414	0	0	4,471	--	--	151	--	--
								Total	**14,419**	**11,841**	**38,102**
Market Street - Overcrossing	Site Utilities	2021	5,880	1,960	0	63,504	14,308	--	2,276	1,874	--
	Demolition	2021	336	420	0	3,629	3,066	--	130	402	--
	Geotechnical Work	2021	1,350	450	0	14,580	3,285	--	522	430	--
	Geotechnical Work	2022	1,260	420	0	13,608	3,066	--	474	391	--
	Abutement	2022	2,680	1,005	0	28,944	7,337	--	1,009	936	--
	Grading and Site Preparation	2022	1,760	440	0	19,008	3,212	--	662	410	--
	Structural Work	2022	9,180	1,530	0	99,144	11,169	--	3,455	1,425	--
	Structural Work	2023	6,540	1,090	0	70,632	7,957	--	2,392	971	--
								Total	**10,920**	**6,839**	**--**
Market Street - Undercrossing	Site Utilities	2021	7,830	2,610	0	84,564	19,053	--	3,030	2,495	--
	Demolition	2022	352	440	0	3,802	3,212	--	132	410	--
	Construct Shoofly	2021	2,112	440	0	22,810	3,212	--	817	421	--
	Geotechnical Work (Bridges)	2022	1,950	650	0	21,060	4,745	--	734	606	--
	Build Road & Vehicular Bridges	2022	9,800	3,920	0	105,840	28,616	--	3,689	3,652	--
	Excavate and Shore	2023	13,000	3,900	10,230	140,400	28,470	204,600	4,754	3,473	29,592
		2024	2,250	675	1,770	24,300	4,928	35,400	799	592	5,047
	Grading and Site Preparation	2024	880	220	0	9,504	1,606	--	312	193	--
	Demolish Shoofly	2023	414	0	0	4,471	--	--	151	--	--
								Total	**14,419**	**11,841**	**34,638**

Notes

1. Total miles based on trip generation provided by Fehr & Peers and CalEEMod® default trip distance by trip type.
2. Fuel usage based on VMT data and fuel efficiency values calculated in Table 3. It is assumed that worker vehicles use gasoline while vendor and hauling vehicles use diesel.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
VMT - vehicle miles traveled
mi - mile
yr - year

Table 31
Electricity Required for Grade Separation Alternative Construction Water Usage
Oakland Waterfront Ballpark District Project
Oakland, California

Construction Area		Construction Subphase	Year	Number of Work Days	Average Acreage Needing Water[1]	Water Usage	Number of Water Trucks	Utilization	Total Water Usage	Outdoor Water Electric Intensity Factor[2]	Electricity Usage
					(acres)	(gal/acre/ day)		(%)	(million gal)	(kWh/million gal)	(MWh)
Brush Street	Overpass	Site Utilities	2,021	196	1.4	4,000	1.0	1.0	1.1	3,500	3.9
		Demolition	2,021	21	1.4	4,000	1.0	0.75	0.12		0.41
		Geotechnical Work	2,021	45	1.4	4,000	1.0	0.75	0.25		0.89
			2,022	42	1.4	4,000	1.0	0.75	0.24		0.83
		Grading and Site Preparation	2,022	88	1.4	8,000	1.0	0.75	1.0		3.5
										Total	**9.5**
	Underpass	Site Utilities	2,021	261	1.4	4,000	1.0	0.75	1.5	3,500	5.1
		Demolition	2,022	22	1.4	4,000	1.0	1.0	0.12		0.43
		Build Road & Vehicular Bridges	2,022	196	1.4	4,000	2.0	0.80	1.1		3.9
		Grading and Site Preparation	2,024	44	1.4	8,000	1.0	0.75	0.50		1.7
		Demolish Shoofly	2,023	23	1.4	4,000	1.0	1.0	0.13		0.45
										Total	**12**
Market Street	Overpass	Site Utilities	2,021	196	1.4	4,000	1.0	1.0	1.1	3,500	3.8
		Demolition	2,021	21	1.4	4,000	1.0	0.75	0.12		0.40
		Geotechnical Work	2,021	45	1.4	4,000	1.0	0.75	0.25		0.87
			2,022	42	1.4	4,000	1.0	0.75	0.23		0.81
		Grading and Site Preparation	2,022	88	1.4	8,000	1.0	0.75	1.0		3.4
										Total	**9.2**
	Underpass	Site Utilities	2,021	261	1.4	4,000	1.0	0.75	1.4	3,500	5.0
		Demolition	2,022	22	1.4	4,000	1.0	1.0	0.12		0.42
		Build Road & Vehicular Bridges	2,022	196	1.4	4,000	2.0	0.80	1.1		3.8
		Grading and Site Preparation	2,024	44	1.4	8,000	1.0	0.75	0.48		1.7
		Demolish Shoofly	2,023	23	1.4	4,000	1.0	1.0	0.13		0.44
										Total	**11**

Notes:

1. Acreage is the acreage of the construction area. Daily water usage per acre assumed to be similar to the Project with 8,000 gal/acre/day for Grading and Site Preparation and 4,000 gal/acre/day for all other subphases.
2. Electric intensity factors were taken from Table 9.2 in Appendix D of the CalEEMod User's Guide as the sum of supply water, treat water and distribute water electric intensity factors. Since the water use reported here is only for fugitive dust control, indoor water use-related emissions and wastewater treatment-related emissions are not estimated here.

Abbreviations:

CO_2e - Carbon dioxide-e MWh - megawatt-hours
gal - Gallons lbs - pounds
GHG - Greenhouse gases MT - Metric Tons
kWh - kilowatt-hours

References:

CalEEMod User's Guide (Available online at: http://www.aqmd.gov/caleemod/user's-guide)
PG&E, Pacific Gas and Electric - Gas and power company for California (https://www.pge.com/)

Table 32
Summary of Grade Separation Alternative Construction Energy Use
Oakland Waterfront Ballpark District Project
Oakland, California

Source		Units	Grade Separation Alternative Construction Usage[4]			
			Brush Overcrossing	Brush Undercrossing	Market Overcrossing	Market Undercrossing
Electricity	Water Consumption[1]	kWh	9,465	11,634	9,244	11,363
	Off-Road Construction Equipment[2]	kWh	--	--	--	--
	Electricity Total	**kWh**	**9,465**	**11,634**	**9,244**	**11,363**
Diesel	On-Road Construction Trips[3]	gallons	6,839	49,943	6,839	46,479
	Off-Road Construction Equipment[2]	gallons	194,309	264,025	194,309	264,025
	Diesel Total	**gallons**	**201,148**	**313,968**	**201,148**	**310,504**
Gasoline	On-Road Construction Trips[3]	gallons	10,920	14,419	10,920	14,419
	Gasoline Total	**gallons**	**10,920**	**14,419**	**10,920**	**14,419**

Notes:

1. Construction water use estimated using similar assumptions as Project water usage. See Table 31 for more details on the methodology.
2. Off-road equipment electricity use based on hours of operation for electric equipment. Off-road diesel fuel usage based on a fuel usage rate of 0.051 gallons of diesel per horsepower (hp)-hour, consistent with diesel conversion factors given in USEPA AP-42 Table 3.4.1. See Table 29 for more details on the methodology.
3. On-road mobile source fuel use based on vehicle miles traveled (VMT) for all years of construction and fleet-average fuel consumption in gallons per mile from EMFAC2017 for CY 2020 through 2027 in Alameda County. See Table 30 for more details on the methodology.
4. The Grade Separation Alternative will involve construction of a single overpass or single underpass at either Brush Street or Market Street.

Abbreviations:

CY - calendar year
EMFAC2017 - California Air Resources Board EMission FACtor model
hp - horsepower
kWh - kilowatt-hour
USEPA - United States Environmental Protection Agency
VMT - vehicle miles traveled

References:

USEPA. 1996. AP 42. Compilation of Air Pollutant Emission Factors, Volume 1. Fifth Edition. Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines. Available online at: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf. Accessed March 2019.