Appendix H: Energy Assessment

Final

BALL ESTATES PROJECT

Energy Assessment Pursuant to Appendix F of the State CEQA Guidelines

Prepared for
Sean Marciniak
Miller Starr Regalia
1331 North California Boulevard, 5th Floor
Walnut Creek, CA 94596

February 2017

ESA

Final

BALL ESTATES PROJECT

Energy Assessment Pursuant to Appendix F of the State CEQA Guidelines

Prepared for
Sean Marciniak
Miller Starr Regalia
1331 North California Boulevard, 5th Floor
Walnut Creek, CA 94596

February 2017

626 Wilshire Boulevard
Suite 1100
Los Angeles, CA 90017
213.599.4300
www.esassoc.com

ESA

Irvine	Sacramento
Los Angeles	San Diego
Oakland	San Francisco
Orlando	Santa Monica
Pasadena	Seattle
Petaluma	Tampa
Portland	Woodland Hills

MSRG002AQ

OUR COMMITMENT TO SUSTAINABILITY | ESA helps a variety of public and private sector clients plan and prepare for climate change and emerging regulations that limit GHG emissions. ESA is a registered assessor with the California Climate Action Registry, a Climate Leader, and founding reporter for the Climate Registry. ESA is also a corporate member of the U.S. Green Building Council and the Business Council on Climate Change (BC3). Internally, ESA has adopted a Sustainability Vision and Policy Statement and a plan to reduce waste and energy within our operations. This document was produced using recycled paper.

TABLE OF CONTENTS

Report Title

Page

Executive Summary **ES-1**

1.0 Introduction **1**
- 1.1 Project Description 1
- 1.2 Environmental Setting 2
- 1.3 Regulatory Setting 2

2.0 Methodology **6**
- 2.1 Construction Energy 6
- 2.2 Operational Energy 7

3.0 Energy Assessment **8**
- 3.1 Threshold of Significance 8
- 3.2 Construction 9
- 3.3 Operations 12

4.0 Conclusion **17**

5.0 References **18**

Appendices

A. Project Construction and Operational Energy Calculation Worksheets A-1
B. Existing Office Operational Energy Calculation Worksheets B-1

List of Tables

Table 1 Estimated Project Construction Fuel Usage 10
Table 2 Estimated Project Operational Energy Usage 14

EXECUTIVE SUMMARY

Camille Avenue, LLC and Camille Ironwood Properties, LLC (the Applicants) propose to subdivide an existing approximately 61-acre site at 300 and 333 Camille Avenue in Alamo (project site) into 35 residential lots and predominately undeveloped parcels (project). In accordance with the requirements under the *California Environmental Quality Act (CEQA) Guidelines*, specifically Appendix F, Energy Conservation, this assessment provides an estimate of energy consumption for the project and the potential impacts from associated construction and operational activities. The assessment includes the categories and types of energy consumption resulting from the project, the calculation procedures used in the analysis, and any assumptions or limitations.

The northeastern approximately 20 acres would be divided into 35 residential lots ranging from approximately 20,000 square feet to approximately 52,662 square feet in area. This subdivision would allow for the construction of 35 new single-family custom homes and associated roads, utilities, and ancillary services and a 19 stall parking lot, serving as a 15,000 sf. access driveway and staging area to the East Bay Regional Park District (EBRPD) Madrone Trail. A restroom would be included in the staging area.

Construction of the project would utilize energy for necessary on-site building activities and to transport materials, soil, and debris to and from the site. Construction of the project would use approximately 12,940gallons of diesel and 1,615 gallons of gasoline on an annual average basis during the two and a half year construction timeframe. To put these numbers into perspective, the estimated annual average construction fuel usage would represent a very small fraction of the State's annual fuel usage (about 0.0004 percent of the statewide annual diesel consumption and 0.00001 percent of the statewide annual gasoline consumption). The project would comply with applicable construction regulations that affect energy demand, such as idling restrictions that would result in less fuel combustion and energy consumption and minimize the project's construction-related energy use. As a result, construction energy impacts would be considered **less than significant**.

Operational energy consumption would occur from building energy needs and from transportation fuels (e.g., diesel and gasoline) used for vehicles traveling to and from the site. The project would have a net electricity demand of approximately 27,280 kilowatt hours (kWh), which represents less than 0.00001 percent of the PG&E network sales for the 2015 year. The project would have a net natural gas demand of approximately 905,180 kilo British thermal units (kBtu) per year, which represents approximately 0.0005 percent of the PG&E network demand for the 2015 year. With respect to the net change in transportation fuel demand, vehicles traveling to and from the site would use approximately 17,686 gallons of gasoline and 109 gallons of diesel fuel in a year. Therefore, vehicles would represent about 0.0001 percent of the statewide gasoline

consumption and less than 0.00001 percent of the statewide diesel consumption. The amount of energy used would represent an insubstantial fraction of the region's available energy supply and capacity. The project would incorporate energy and water efficient designs consistent with energy efficiency standards in the applicable Title 24 Energy Efficiency Standards for Residential and Nonresidential Buildings and the Title 24 Building Energy Efficiency Standards, referred to as the California Green Building Standards (CALGreen) Code and include electric vehicle supply equipment (EVSE) for each dwelling unit to promote transportation energy efficiency. Because the project would implement energy efficient building standards and promote transportation energy efficiency, it would not result in the wasteful, inefficient, and unnecessary consumption of energy. In addition, as the project would be constructed to be solar-ready, the project would not preclude opportunities for improving overall fuel efficiency and future energy conservation. As a result, operational energy impacts would be considered **less than significant**.

1.0 Introduction

Appendix F of the State *CEQA Guidelines* states that, in order to ensure that energy implications are considered in project decisions, the potential energy implications of a project shall be considered in an EIR, to the extent relevant and applicable to the project. Appendix F further states that a project's energy consumption and proposed conservation measures may be addressed, as relevant and applicable, in the Project Description, Environmental Setting and Impact Analysis portions of a project's Environmental Impact Report (EIR), as well as through mitigation measures and alternatives.

In accordance with the intent of Appendix F of the State CEQA Guidelines, which requires an EIR to include a discussion of the potential energy impacts of a proposed project with an emphasis on avoiding of reducing inefficient, wasteful, and unnecessary consumption of energy, this assessment includes relevant information and analyses that address the energy implications of the project.

1.1 Project Description

Camille Avenue, LLC and Camille Ironwood Properties, LLC (the Applicants) propose to subdivide an existing approximately 61-acre site at 300 and 333 Camille Avenue in Alamo (project site) into 35 residential lots (result in a net increase of 33 dwelling units over existing conditions) and predominately undeveloped parcels (project). The project site is located in the Alamo area of Contra Costa County (County), west of Danville Boulevard. Entry to the project site is available from the western terminus of Camille Avenue (a public street) and the western terminus of Ironwood Place (a public street). Five legal parcels currently comprise the project site, all of which are owned by the Applicants.

The project would create 35 residential lots ranging in size from 20,000 to 52,662 square feet. The site's total size is approximately 61 acres, approximately 20 of which would be designated for the residential development. The residential area would allow space for associated roads, utilities, and ancillary services and a 19 stall parking lot, serving as a 15,000 sf. access driveway and staging area to the East Bay Regional Park District (EBRPD) Madrone Trail. A restroom would be included in the staging area. The remaining acreage would be devoted to four parcels (Parcels A-D) that would be maintained largely by the Homeowner's Association (HOA) and, if deemed appropriate, by a chosen land conservation organization such as the EBRPD. Parcels A-D are designated as follows:

- **Parcel A:** 1-acre area designated with a Scenic Easement and maintained by the HOA

- **Parcel B:** 34.7-acre open space maintained by the HOA or dedicated to an appropriate land conservation organization. (e.g. EBRPD)
- **Parcel C:** 3.9-acre, 100 foot wide strip buffer between the residential area and Parcel B open space.
- **Parcel D:** 0.52-acre staging area with 19 parking spaces and a restroom. The staging area would connect to the existing Madrone Trail.

All four proposed parcels would be protected from future development, with the exception of the staging facilities.

1.2 Environmental Setting

Electrical and gas services in the project area are provided by Pacific Gas & Electric Company (PG&E). PG&E obtains its energy supplies from power plants and natural gas fields in northern California, as well as from energy purchased outside its service area and delivered through high voltage transmission lines and pipelines. Power is generated from various sources, including fossil fuel, hydroelectric, nuclear, wind, and geothermal plants; and is fed into the electrical grid system serving Northern California.

PG&E updates all load forecasts for gas and electricity services every year. Load growth forecasts for this area are currently determined using load growth projection tools that use a number of sources of data including past peak loading, population, development characteristics, and temperature history information. If an update for the distribution area indicates that the load growth is different than forecasted, an expansion of the existing systems would be timed to match the faster or slower growth (Circlepoint, 2013).

The approximately 61-acre project site currently contains two residential buildings, a barn, horse pasture area, a 20,709-square-foot office building, two non-producing and abandoned walnut orchards, and adjacent open space. For the purposes of the CEQA analysis, the existing setting includes occupancy of the office building, which has varied over time. As discussed in the Section 3.0, *Project Description*, of the EIR, while the permitted capacity and documented actual occupancy of the building for CEQA baseline purposes is the entire 20,709 square feet, the consultant has selected as the appropriate baseline the 76 percent occupancy in effect in 2010 based on the flexible nature of the occupied building capacity and the likelihood based upon historical record, that the occupied capacity of the building will increase and decrease and the 76 percent estimate is based upon substantial evidence and presents a more accurate baseline.

1.3 Regulatory Setting

No federal or regional regulations are directly applicable to the analysis of energy resource impacts. As such, only State and local regulations pertinent to energy resource impacts are discussed below.

1.3.1 State

Title 24, Building Standards Code and CALGreen Code

The California Energy Commission (CEC) first adopted the Energy Efficiency Standards for Residential and Nonresidential Buildings (California Code of Regulations, Title 24, Part 6) in 1978 in response to a legislative mandate to reduce energy consumption in the state. These standards also have co-benefits of reducing building emissions of greenhouse gases and other pollutants as a result of reduced consumption of electricity, natural gas, and other fuels from residential and nonresidential buildings subject to the standard. The standards are updated periodically to allow for the consideration and inclusion of new energy efficiency technologies and methods.

The California Building Standards Commission (CBSC) adopted Part 11 of the Title 24 Building Energy Efficiency Standards, referred to as the California Green Building Standards (CALGreen) Code. The purpose of the CALGreen Code is 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 the following categories: (1) Planning and design; (2) Energy efficiency; (3) Water efficiency and conservation; (4) Material conservation and resource efficiency; and (5) Environmental air quality" (CBSC 2010). The CALGreen Code is not intended to substitute for or be identified as meeting the certification requirements of any green building program that is not established and adopted by the California Building Standards Commission. The CALGreen Code establishes mandatory measures for new residential and non-residential buildings. Such mandatory measures include energy efficiency, water conservation, material conservation, planning and design and overall environmental quality (CBSC 2010). The CALGreen Code was most recently updated in 2016 to include new mandatory measures for residential as well as nonresidential uses; the new measures took effect on January 1, 2017 (CBSC 2016). Although the CALGreen Code was adopted as part of the State's efforts to reduce GHG emissions, the standards have co-benefits of reducing energy consumption from residential and nonresidential buildings subject to the standard.

Renewables Portfolio Standard

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide 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, Governor Schwarzenegger signed Executive Order S-14-08, which expands the State's Renewables Portfolio Standard to 33 percent renewable power by 2020. Pursuant to Executive Order S-21-09, CARB was also preparing regulations to supplement the Renewables Portfolio Standard with a Renewable Energy Standard that will result in a total renewable energy requirement for utilities of 33 percent by 2020. But on April 12, 2011, Governor Jerry Brown signed SB X1-2 to increase California's Renewables Portfolio Standard to 33 percent by 2020. SB 350 (Chapter 547, Statues of 2015) further increased the Renewables

Portfolio Standard to 50 percent by 2030. The legislation also included interim targets of 40 percent by 2024 and 45 percent by 2027. SB 350 was signed into law on October 7, 2015.

California Air Resources Board On-Road and Off-Road Vehicle Regulations

In 2004, the California Air Resources Board (CARB) adopted an Airborne Toxic Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling in order to reduce public exposure to diesel particulate matter emissions (Title 13 California Code of Regulations [CCR] Section 2485). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure does not allow diesel-fueled commercial vehicles to idle for more than five minutes at any given location. While the goal of this measure is primarily to reduce public health impacts from diesel emissions, compliance with the regulation also results in energy savings in the form of reduced fuel consumption from unnecessary idling.

In addition to limiting exhaust from idling trucks, CARB also promulgated emission standards for off-road diesel construction equipment of greater than 25 horsepower (hp) such as bulldozers, loaders, backhoes and forklifts, as well as many other self-propelled off-road diesel vehicles. The In-Use Off-Road Diesel-Fueled Fleets regulation adopted by CARB on July 26, 2007 aims to reduce emissions by installation of diesel soot filters and encouraging the retirement, replacement, or repower of older, dirtier engines with newer emission controlled models (13 CCR Section 2449). The compliance schedule requires full implementation by 2023 in all equipment for large and medium fleets and by 2028 for small fleets.

California Assembly Bill No. 1493 (AB 1493, Pavley), (Chapter 200, Statutes of 2002)

In response to the transportation sector accounting for more than half of California's carbon dioxide (CO_2) emissions, Assembly Bill (AB) 1493 (Chapter 200, Statutes of 2002), authored by Assembly Member Fran Pavley and enacted on July 22, 2002, required CARB to set GHG emission standards for passenger vehicles, light duty trucks, and other vehicles whose primary use is non-commercial personal transportation manufactured in and after 2009. Referred to as the Pavley standards, implementation of AB 1493 was delayed due to litigation, but ultimately upheld by the Supreme Court. The standards established tailpipe GHG emissions standards for model year 2012 through 2016 light-duty vehicles under Phase I and model year 2017 through 2025 light-duty vehicles under Phase II. Although these standards were adopted as part of the State's efforts to reduce GHG emissions, the standards have co-benefits of reducing energy consumption from the transportation section by improving fuel economy and reducing fuel consumption as a means to reduce emissions.

The United States Environmental Protection Agency (USEPA) and United States Department of Transportation (USDOT) adopted federal equivalent standards for model year 2012 through 2016 light-duty vehicles and model year 2017 through 2025 light-duty vehicles. The federal standards are slightly different from the Pavley Phase I and Phase II standards, but the State of California

has agreed not to contest these standards, in part due to the fact that while the national standard would achieve slightly lower reductions in California, it would achieve greater reductions nationally and is stringent enough to meet state GHG emission reduction goals (CARB 2016). On November 15, 2012, CARB approved an amendment that allows manufacturers to comply with the national standards to meet state law.

1.3.2 Local

Contra Costa County General Plan

The Contra Costa County General Plan (General Plan) provides the fundamental basis for the County's land use and development policy, and addresses all aspects of development including public health, land use, community character, transportation, economics, housing, air quality, and other topics. The General Plan sets forth objectives, policies, standards, and programs for land use and new development for the Community as a whole. The Conservation Element of the General Plan contains the following goal related to energy conservation:

> Goal 8-L: Reduce energy use in the County to avoid risks of air pollution and energy shortages which prevent orderly development.

2.0
Methodology

2.1 Construction Energy

Construction of the project would require energy in the form of diesel and gasoline fuels through the use of heavy-duty construction equipment, such as excavators and forklifts, and through vehicle trips generated from worker trips and haul trucks traveling to and from the project site. Construction activities can vary substantially from day to day, depending on the the specific type of construction activity and the number of workers and vendors traveling to the site. The assessment of construction energy impacts considers these factors.

Energy use during construction is forecasted by assuming a conservative estimate of construction activities (i.e., maximum daily equipment usage levels). The project's construction fuel consumption is estimated based on information from the project's air quality and GHG analysis provided in the *Ball Estates Project Draft Air Quality and Greenhouse Gas Emissions Assessment* prepared by Illingworth and Rodkin in January 2016 and the project's *Traffic Impact Study* prepared in June 2016 by Abrams Associates Traffic Engineering, Inc. Pertinent information includes the number and type of construction equipment that would be used during project construction, the extent that various equipment are utilized in terms of equipment operating hours or miles driven, and the estimated duration of construction activities. Energy for construction haul truck and worker commuting trips are estimated based on the number of haul truck trips and workers for the various phases of construction and the associated vehicle miles traveled (VMT). Energy demand from construction of the staging area and parking were also included in the assessment, assuming the use of site preparation and paving heavy-duty construction equipment, and vendor and worker trips.

The construction equipment would likely be diesel-fueled (with the exception of construction worker commute vehicles, which would primarily be gasoline-fueled). For the purposes of this assessment, it is assumed heavy-duty construction equipment and haul trucks would be diesel-fueled, due to the speculative nature of specifying the amounts and types of non-diesel equipment that might be used, and the difficulties in calculating the energy which could be consumed by non-diesel equipment. This also represents a worst-case scenario intended to represent the maximum potential energy use during construction. The estimated fuel economy for heavy-duty construction equipment is based on fuel consumption factors from the CARB OFFROAD emissions model, which is a state-approved model for estimating emissions from off-road heavy-duty equipment. The estimated fuel economy for haul trucks and worker commute vehicles is based on fuel consumption factors from the CARB EMFAC emissions model, which is a state-approved model for estimating emissions on-road vehicles and trucks. Both OFFROAD and

EMFAC are incorporated into the California Emissions Estimator Model (CalEEMod), which is a state-approved emissions model used for the project's air quality and GHG emissions assessment. Therefore, this energy assessment is consistent with the modeling approach used for other environmental analyses in the EIR and consistent with general CEQA standards. In addition to the project's construction energy demand, the energy assessment also includes a discussion of the project's compliance with relevant energy-related regulatory measures that would minimize the amount of energy usage during construction. Detailed construction fuel consumption calculations are provided in Appendix A of this assessment.

As discussed in the Section 3.0, *Project Description*, of the EIR, for the purposes of preparing a conservative environmental analysis, construction of the project would last approximately 30 months, which includes infrastructure and the construction and operation of the homes. Subphases of construction would include demolition of the all existing on-site buildings and features, site clearing, grading, trenching, excavation, building construction, and building finishing activities. The project would require up to 125,000 square feet of building and pavement demolition, in addition to approximately 1,800 one-way trips of concrete trucks during the building construction phase, and 1,000 cubic yards of asphalt and concrete during the paving phase. Approximately 26,000 cubic yards of material would be excavated and balanced on the project site.

2.2 Operational Energy

Operation of the project would require energy in the form of electricity and natural gas for building heating, cooling, cooking, lighting, water demand and wastewater treatment, consumer electronics, and other energy needs, and transportation-fuels, primarily gasoline, for vehicles traveling to and from the site.

The energy usage required for project operations is estimated based on the net change in energy demand from the new buildings compared to the existing office use and two residential buildings and on information from the project's air quality and GHG analysis provided in the *Ball Estates Project Draft Air Quality and Greenhouse Gas Emissions Assessment* prepared by Illingworth and Rodkin in January 2016 and the project's *Traffic Impact Study* prepared in June 2016 by Abrams Associates Traffic Engineering, Inc. The energy usage takes into account compliance with the current building energy standards pursuant to the Title 24 Building Standards Code (2016). Energy for transportation is estimated based on the number of trips to and from the site and estimated VMT. The assessment also includes a discussion of the Project's compliance with relevant energy-related regulations and Project Design Features that would minimize the amount of energy usage during operations. Supplemental building energy use factors, waster demand factors, and vehicle trip lengths from CalEEMod are used to estimate building energy use and VMT.

3.0
Energy Assessment

3.1 Threshold of Significance

The potential for energy usage impacts is based on thresholds derived from Appendix F of the State *CEQA Guidelines*. Appendix F recommends the following considerations for evaluating energy impacts:

- 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 maybe discussed.
- The effects of the project on local and regional energy supplies and on requirements for additional capacity.
- The effects of the project on peak and base period demands for electricity and other forms of energy.
- The degree to which the project complies with existing energy standards.
- The effects of the project on energy resources.
- The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

In consideration of the above factors, the following threshold is utilized to determine if the project would result in potentially significant impacts on energy resources:

EN-1 Would the Project result in wasteful, inefficient, and unnecessary consumption of energy during project construction and operation, including transportation energy; result in energy demand substantially affecting local and regional energy supplies and capacity; or substantially conflict with existing energy standards?

3.2 Construction

3.2.1 Construction-Related Energy Consumption

For the purposes of this analysis, construction is conservatively assumed to occur over a 30-month period, which includes infrastructure and the construction and operation of the homes. However, the actual construction of the individual homes will be largely market-driven and may extend over a 10-year period. For the purposes of this analysis, a 30-month construction period results in a conservative analysis as the assumed annual energy demand would be higher.

Construction energy consumption would result primarily from transportation fuels (e.g., diesel and gasoline) used for haul trucks, heavy-duty construction equipment, and construction workers traveling to and from the site. This analysis provides the estimated maximum construction energy consumption for the purposes of evaluating the associated impacts on energy resources.

Off-road equipment associated with construction would include equipment such as backhoes, dozers, excavators, and rollers. Based on the number and type of equipment that would be used during cleanup activities, hour usage estimates, the duration of construction activities, and fuel consumption factors from the OFFROAD model, off-road equipment would use approximately 24,482 gallons of diesel fuel. Based on a construction duration of 30 months (i.e., two and a half years), the annual average estimated fuel usage for off-road equipment would be approximately 9,793 gallons of diesel fuel for off-road equipment.

Haul trucks would be used to haul material to and from the project site. Vendor trucks would be used to delivery supplies necessary for project construction. Based on the proposed development program and engineering estimates that form the basis of the construction-related impact analyses, it is estimated that a total of approximately 25,440 VMT for haul trucks and 11,826 VMT for vendor trucks would be required. Based on the CARB on-road vehicle emissions model, EMFAC2014, heavy-duty trucks operating in the San Francisco Bay Area Air Basin (SFBAAB) would have an estimated fuel economy of approximately 5.81 miles per gallon for haul trucks and 6.56 miles per gallon for vendor trucks (in order to provide a conservative assessment, this is modeled as calendar year 2017 fleet average trucks) (CARB 2014). Fuel consumption from truck idling was also included based on idling fuel consumption factors estimated from EMFAC2014 of approximately 1.66 gallons per hour for haul trucks and 1.62 gallons per hour for vendor trucks. Based on the information described above, construction of the project would use a total of approximately 7,867 gallons of diesel fuel for haul truck and vendor delivery trips and associated idling. On an annual average basis, haul trucks and vendor delivery trips associated with construction would use approximately 3,147 gallons of diesel fuel per year.

The number of construction workers that would be required would vary based on the phase of construction and activity taking place. The transportation fuel required by construction workers to travel to and from the project site would depend on the total number of worker trips estimated for the duration of construction activity. Based on the proposed development program and engineering estimates that form the basis of the construction-related impact analyses, it is estimated that a total of approximately 100,514 VMT would be required. According to the

EMFAC2014 model, passenger vehicles (light-duty automobiles and light-duty trucks) operating in the SFBAAB would have an average fuel economy of approximately 24.88 miles per gallon (in order to provide a conservative assessment, this is modeled as calendar year 2017 fleet average vehicles). Assuming construction worker automobiles have an average fuel economy consistent with the EMFAC2014 model, workers would use approximately 4,038 gallons of fuel (primarily gasoline) for construction worker trips. On an annual average basis, construction workers would use approximately 1,615 gallons of fuel (primarily gasoline) per year.

Based on fuel consumption data from the United States Energy Information Administration (USEIA), in 2015, California consumed a total of 342,523 thousand barrels of gasoline for transportation, which is equivalent to a total annual consumption of 14.4 billion gallons by the transportation sector (USEIA 2016a). For diesel, California consumed a total of 80,487 thousand barrels for transportation, which is equivalent to a total annual consumption of 3.4 billion gallons by the transportation sector (USEIA 2016b).

Based on the conservatively estimated fuel usage amounts presented above, construction of the project would use approximately 12,940 gallons of diesel and 1,615 gallons of gasoline on an annual average basis during the two and a half year construction timeframe, assuming worker automobiles are primarily gasoline fueled and heavy-duty construction equipment and trucks are primarily diesel-fueled. To put these numbers into perspective, the estimated annual average construction fuel usage would represent a very small fraction of the State's annual fuel usage (about 0.0004 percent of the statewide annual diesel consumption and 0.00001 percent of the statewide annual gasoline consumption). A comparison of the project's estimated fuel usage and the state's annual fuel usage is provided in **Table 1**.

Construction of the project is not expected to require substantial electricity usage. Electricity use during construction would be variable depending on lighting needs and the use of electric-powered equipment and would be temporary for the duration of construction activities. If electric-powered construction equipment or vehicles are used, they would replace the diesel- and gasoline-fueled equipment assumed in this assessment. Therefore, it is expected that construction electricity use would generally be considered as temporary and negligible and accounted for in the fuel estimates discussed above.

TABLE 1
ESTIMATED PROJECT CONSTRUCTION FUEL USAGE

Source	Gallons of Diesel Fuel Per Year	Gallons of Gasoline Fuel Per Year
Project Construction Assumed Duration: 30 Months (actual construction of the individual homes will be largely market-driven and may extend over a 10-year period)		
Ball Estates Proposed Project	12,940	1,615
State of California (Transportation Sector)	3,300,000,000	14,400,000,000
Percent of State (Transportation Sector)	0.0004%	0.00001%
Estimated Project Energy Savings from Construction Measures (Annual)	1,875	0

SOURCE: ESA, 2016

3.2.2 Construction Energy Impacts

As discussed in Section 1.3.1, CARB has adopted an ATCM to limit heavy-duty diesel motor vehicle idling in order to reduce public exposure to diesel particulate matter. This measure prohibits diesel-fueled commercial vehicles greater than 10,000 pounds from idling for more than five minutes at any given time (13 CCR Section 2485). The project would also be required to utilize construction contractors that demonstrate compliance with applicable CARB regulations governing the accelerated retrofitting, repowering, or replacement of heavy duty diesel equipment (13 CCR Section 2449). The regulation aims to reduce emissions by requiring the installation of diesel soot filters and encouraging the retirement, replacement, or repower of older, dirtier engines with newer emission-controlled models.

While intended to reduce construction criteria pollutant emissions, compliance with the above anti-idling and emissions regulation would also result in efficient use of construction-related energy and the minimization or elimination of wasteful and unnecessary consumption of energy. According to the CARB staff report that was prepared at the time the anti-idling ATCM was being proposed for adoption in late 2004/early 2005, the regulation was estimated to reduce non-essential idling and associated emissions of diesel particulate matter and nitrogen oxide (NO_X) emissions by 64 and 78 percent respectively in analysis year 2009 (CARB 2004). These reductions in emissions are directly attributable to overall reduced idling times and reduced idling fuel combustion as a result of compliance with the regulation, and the project's compliance would result in total energy savings of approximately 4,688 gallons of diesel fuel, assuming a fuel reduction equivalent to the percent reduction of particulate matter or NO_X as estimated by CARB (the lesser value [i.e., 64 percent] is used as a conservative assumption). The annual average energy savings would be approximately 1,875 gallons of diesel fuel per year during the construction period. Additional construction fuel savings would be expected from the In-Use Off-Road Diesel-Fueled Fleets regulation, although it is difficult to quantify since the regulation is based on a construction contractor's total fleet of equipment and does not regulate specific equipment that could be used for an individual project. A field testing program by an engine manufacturer that included a wide range of equipment types has shown that a Tier 4 off-road engine results in up to 10 percent lower fuel consumption than an equivalent Tier 3 off-road engine based on the overall results of the program (Cummins 2014). Another manufacturer has shown an 18 percent increase in fuel efficiency with a Tier 4 lift truck (i.e., forklift) as compared to the previous generation (MCF 2015). While some level of construction fuel savings would be expected from the In-Use Off-Road Diesel-Fueled Fleets regulation, estimates are not included in the energy savings calculations for the project since the underlying regulation applies to construction contractor's total fleet of equipment and not to specific equipment. The project's construction energy savings estimates from regulatory compliance are summarized in **Table 1**.

Based on the available data, construction would utilize energy for necessary on-site activities and to transport materials, soil, and debris to and from the site. It is reasonable to conclude that idling restrictions would result in less fuel combustion and energy consumption and minimize the

project's construction-related energy use. Therefore, construction of the project would not result in the wasteful and unnecessary consumption of energy.

According to the USEIA's International Energy Outlook 2016, the global supply of crude oil, other liquid hydrocarbons, and biofuels is expected to be adequate to meet the world's demand for liquid fuels through 2040 (USEIA 2016c). As of December 31, 2015, California had approximately 2,333 million barrels (approximately 98.0 trillion gallons) of crude oil left in the state's reserves (USEIA 2016d). Construction of the project would require temporary and short-term energy supplies and would not represent a substantial fraction of the available energy supply in terms of equipment and transportation fuels and would not substantially affect existing local and regional supply and capacity. Furthermore, construction of the project would use equipment that would be consistent with the energy standards applicable to construction equipment including limiting idling fuel consumption and using contractors that comply with applicable CARB regulatory standards that affect energy efficiency. Finally, because project construction will entail energy demands largely associated with equipment and transportation fuels, construction of the project would not increase demands on the electric power network during peak and base period demand periods. As a result, construction energy impacts would be considered **less than significant**.

3.3 Operations

3.3.1 Operational Energy Demand

Operational energy consumption would occur from building energy needs and from transportation fuels (e.g., diesel and gasoline) used for vehicles traveling to and from the site. This analysis provides the estimated maximum operational energy consumption for the purposes of evaluating the associated impacts on energy resources.

The daily operation of the project would generate demand for electricity, natural gas, and water supply, as well as generating wastewater requiring conveyance, treatment, and disposal off-site. Based on the proposed development program and engineering estimates that form the basis of the operational-related impact analyses, the project would have an electricity demand of approximately 289,280 kilowatt-hours (kWh), which is inclusive of electricity for water supply and wastewater treatment.

Based on the proposed development program and engineering estimates for the project, the project would have a natural gas demand of approximately 1,358,180 kilo British thermal units (kBtu) per year.

Operation of the project would result in transportation energy use. Transportation fuels, primarily gasoline and diesel, would be provided by local or regional suppliers and vendors. Vehicles would require a fraction of a percent of the total state's transportation fuel consumption. According to the EMFAC2014 model, the average fuel economy for passenger vehicles in the SFBAAB region at project buildout is predicted to be approximately 26.71 miles per gallon for gasoline and approximately 36.45 miles per gallon for diesel with gasoline vehicles accounting

for approximately 97.2 percent of the total VMT and diesel vehicles accounting for approximately 0.8 percent of the total VMT.[1] Electric vehicles are predicted to account for approximately 2.0 percent of the total VMT (for passenger vehicles). Based on the project's maximum estimated VMT of 773,600 miles per year, passenger vehicles would use approximately 28,150 gallons of gasoline and 174 gallons of diesel fuel in a year.

The existing office and two residential buildings (home and caretaker living quarters) would generate demand for electricity, natural gas, and water supply, as well as generating wastewater requiring conveyance, treatment, and disposal off-site. The estimated electricity and natural gas demand from the existing buildings, based on the 76 percent occupancy rate for the office, is estimated to be approximately 262,000kilowatt-hours (kWh) and 453,000 kilo British thermal units (kBtu) per year, based on the historical energy demand factors in CalEEMod, which correspond to the prior Title 24 (2005) standards. The estimated VMT from vehicles traveling to and from the existing office is approximately 287,582 VMT. This corresponds to fuel demand of approximately 10,464gallons of gasoline and 65 gallons of diesel fuel in a year. The net change in project operational energy demand is measured based on the removal of the existing office use. The approximate net change in project operational energy demand on an annual basis would be as follows:

- Electricity: 289,280 kWh – 262,000kWh = 27,280 kWh
- Natural Gas: 1,358,180 – 453,000 kBtu = 905,180 kBtu
- Transportation Fuel: 28,150 gal gasoline – 10,464 gal gasoline = 17,686 gal gasoline; 174 gal diesel – 65 gal diesel = 109 gal diesel.

To put the net change in electricity into perspective, the value is compared to the Pacific Gas and Electric (PG&E) network demand, which is the utility provider for the project region. In the 2015 year, PG&E had annual electric deliveries to customers of approximately 85,860 million kWh (PG&E 2016). The project would represent less than 0.00001 percent of the PG&E network sales for the 2015 year, which is a relatively very small fraction Furthermore, PG&E's infrastructure accounts for and accommodates an increase in energy demand and load growth. As discussed in Section 1.2, *Environmental Setting*, PG&E updates all load forecasts, including peak load forecasts, for gas and electricity services every year. If an increase or decrease in load growth is realized, an expansion of existing systems would be timed appropriately (Circlepoint, 2013). Therefore, electricity service and supply impacts from PG&E would not be expected.

To put the net change in natural gas into perspective, the value is compared to the PG&E network demand, which is the regional utility provider. In 2015, PG&E had natural gas sales of approximately 188,773 million cubic feet, equivalent to approximately 194,058 million kBtu (PG&E 2016). The project represents less than 0.00001 percent of the PG&E network demand for

1 Based on the California Air Resources Board on-road vehicle emissions model, EMFAC2014 (Modeling input: San Francisco Bay Area Air Basin; LDA, LDT1, LDT2; Annual; 2020). The modeling input values are considered generally representative of project buildout conditions for the region and representative of the majority of vehicles associated with project-related VMT.

the 2015 year, which is a very small fraction. For the same reasons as discussed above natural gas service and supply impacts from PG&E would not be expected due to their annual load growth planning.

With respect to transportation fuel demand, as discussed previously, in 2015, California consumed a total of 14.4 billion gallons of gasoline and 3.4 billion gallons of diesel in the transportation sector. Therefore, the net transportation fuel demand from project vehicles would represent about 0.0001 percent of the statewide gasoline consumption and less than 0.00001 percent of the statewide diesel consumption, which represents a very small fraction of the state's annual fuel usage.

A summary of the project's operational estimated energy usage and the state's annual energy usage is provided in **Table 2**.

TABLE 2
ESTIMATED PROJECT OPERATIONAL ENERGY USAGE

Source	Natural Gas Per Year (million kBtu)	Electricity Per Year (million kWh)	Gallons of Diesel Fuel Per Year	Gallons of Gasoline Fuel Per Year
Ball Estates Proposed Project	1.358	0.289	174	28,150
Existing Office, Home, and Caretaker Living Quarters	0.453	0262	65	10,464
Net Change	**0.905**	**0.027**	**109**	**17,686**
Pacific Gas & Electric (PG&E)	194,058	85,860	—	—
Percent of PG&E	<0.00001%	<0.00001%%	—	—
State of California (Transportation Sector)	—	—	3,300,000,000	14,400,000,000
Percent of State (Transportation Sector)	—	—	<0.00001%	0.0001%
Estimated Project Energy Savings from Operational Measures (Annual)	—	—	12 (destination accessibility)	572 (electric vehicle supply equipment) 1,886 (destination accessibility)

SOURCE: ESA, 2016

3.3.1 Operational Energy Impacts

The project would comply with or exceed the applicable provisions of the Title 24 standards and the CALGreen Code in effect at the time of building permit issuance. Examples of energy measures in the Title 24 standards and the CALGreen Code include energy efficiency metrics and performance standards for appliances, space-conditioning equipment (i.e., heating, ventilation and air conditioning [HVAC]), water heating systems, windows and doors, insulation, lighting, and roofing materials; indoor and outdoor water use efficiency and conservation performance metrics; and requirements to provide solar-ready buildings with a minimum solar zone area (solar zone is defined as a section of the roof designated and reserved for the future installation of a solar

electric or solar thermal system). According to the CEC, the latest version of the Title 24 (2016) standards, which took effect on January 1, 2017, uses approximately 28 percent less energy for residential lighting, heating, cooling, ventilation, and water heating compared to the prior Title 24 (2013) standards (CEC 2015).

As discussed previously discussed, for the purposes of this analysis, buildout of the project is conservatively assumed to occur over a 30-month period, which includes operation of the homes. However, the actual construction of the individual homes will be largely market-driven and may extend over a 10-year period. If the homes are built in future years, it is expected that compliance with future updates to the Title 24 standards would result in increased energy efficiency. The next iteration of the Title 24 standards are anticipated in 2019; however, estimated buildings energy reductions from these future standards are not yet known or available. The California Public Utilities Commission (CPUC) has also designed the Zero Net Energy (ZNE) Action Plan to make new residential and commercial construction in California zero net energy by 2030 in order to meet the state's GHG goals. The ZNE Action Plan's key milestones are achieved by improving and expanding Title 24 standards based on the future state of energy efficiency technologies and innovations, providing incentives, mandating carbon benchmarking and labeling, and developing performance data. However, it is not possible to accurately predict the increased level of energy efficiency associated with future updates to the Title 24 standards. Furthermore, Title 24 only regulates a portion of a buildings energy usage primarily related to lighting, heating, cooling, ventilation, and water heating; therefore, is it not possible to speculate how future Title 24 standards would reduce the overall energy profile of a building. As a result, the energy estimates provided above are considered conservative estimates, as they do not take into account anticipated energy reductions from future potentially applicable standards, which are not yet known or available. Nonetheless, the project would be built to achieve or exceed the energy efficiency metrics in the applicable Title 24 standards and the CALGreen Code in affect at the time of building permit issuance.

With respect to operational transportation-related fuel usage, the project would support statewide efforts to improve transportation energy efficiency and reduce wasteful or inefficient transportation energy consumption with respect to private automobiles. The project site is located to the east of the EBRPD-managed Madrone Trail, which commences at the existing terminus of Camille Avenue, and approximately a quarter-mile away from the Iron Horse Regional Trail. The project site would provide residents with convenient nearby access to these trails for recreational use. The project site would also provide residents with convenient access to other nearby uses including churches (Creekside Community Church approximately 0.6 miles to the north and San Ramon Valley United Methodist Church approximately 0.5 miles to the east), Rancho Romero Elementary School approximately 0.3 miles to the north, San Ramon Valley High School approximately 1 mile to the southeast, and Hap Magee Ranch Park approximately 0.5 miles to the northeast. Suburban commercial centers with retail, restaurant, office, and other commercial uses are located approximately 1 mile to the north in Alamo and approximately 1.5 miles to the southeast in Danville. As a result, the project would provide nearby access to a range of destinations. According to the California Air Pollution Control Officer's Association (CAPCOA) guidance document, *Quantifying Greenhouse Gas Mitigation Measures*, which provides emission reduction calculation formulas for transportation characteristics and measures, projects located in

an area with accessibility to destinations result in reductions in VMT. According to the CAPCOA guidance, factors that contribute to VMT reductions based on destination accessibility include the distance to a downtown or job center and expected VMT reductions range from approximately 6.7 percent to 20 percent, which higher reductions expected at central locations and lowest at peripheral ones (CAPCOA 2010). Thus, the project would be expected to result in transportation fuel savings of approximately 1,886 gallons of gasoline per year and 12 gallons of diesel per year or potentially more.

The project would also include the installation of electric vehicle supply equipment (EVSE) in garages, pursuant to the CALGreen Code. The project would include the installation of dedicated circuits to accommodate at least one electric vehicle per dwelling unit. Alternative-fueled, electric, and hybrid vehicles, to the extent these types of vehicles would be utilized by passengers, would reduce the project's consumption of gasoline and diesel; however, the effect may be minimal in the current vehicle market. According to the EMFAC2014 model, electric vehicles are predicted to account for 2.0 percent of passenger vehicle VMT in 2020 in the SFBAAB region. Based on the estimate above, this would translate to a fuel savings of up to approximately 572 gallons of fuel (primarily gasoline, assuming electric vehicles replace gasoline-fueled passenger vehicles) per year. Plug-in electric vehicles would generally obtain battery power from utilities, which as discussed in Section 1.3.1, are required to provide an increasing share of electricity from renewable sources (i.e., 33 percent by 2020 and 50 percent by 2030) under the State's Renewables Portfolio Standard. Therefore, while plug-in electric vehicles would replace traditional transportation fuels (i.e., gasoline) with utility provided electricity, the electricity would be provided by an increasing share of renewable sources resulting in an overall reduction in energy resource consumption.

The County's applicable General Plan Conservation Element goal calls for reducing energy use to avoid risks of air pollution and energy shortages. The project would be consistent with this goal by achieving or exceeding the energy efficiency metrics in the applicable Title 24 standards and the CALGreen Code and by supporting statewide efforts to improve transportation energy efficiency thereby reducing wasteful or inefficient energy consumption and associated air pollutant emissions.

Based on the available data, operation of the project would utilize energy for necessary building usage and transportation associated with vehicles traveling to and from the project site. The amount of energy used would represent an insubstantial fraction of the region's available energy supply and capacity. The project would incorporate energy and water efficient designs consistent with energy efficiency standards in the applicable Title 24 standards and the CALGreen Code and include EVSE to promote transportation energy efficiency. Because the project would implement energy efficient building standards and promote transportation energy efficiency, it would not result in the wasteful, inefficient, and unnecessary consumption of energy. In addition, as the project would be constructed to be solar-ready, the project would not preclude opportunities for improving overall fuel efficiency and future energy conservation. Furthermore, due to PG&E's load planning process, the relatively small energy demand from the project, including demand during peak times, would be expected to be accommodated within PG&E's projected and planned for capacity. As a result, operational energy impacts would be considered **less than significant**.

4.0 Conclusion

The project site is located in the Alamo area of Contra Costa County (County), west of Danville Boulevard. The property addresses are 300 and 333 Camille Avenue. The project would create 35residential lots (result in a net increase of 33 dwelling units over existing conditions) ranging in size from approximately 20,000 to 52,662 square feet. Construction of the project would utilize energy for necessary on-site building activities and to transport materials, soil, and debris to and from the site. Construction of the project would use approximately 12,940 gallons of diesel and 1,615 gallons of gasoline on an annual average basis during the two and a half year construction timeframe. To put these numbers into perspective, the estimated annual average construction fuel usage would represent a very small fraction of the State's annual fuel usage (about 0.0004 percent of the statewide annual diesel consumption and 0.00001 percent of the statewide annual gasoline consumption). The project would comply with applicable construction regulations that affect energy demand, such as idling restrictions that would result in less fuel combustion and energy consumption and minimize the project's construction-related energy use. As a result, construction energy impacts would be considered **less than significant**.

Operational energy consumption would occur from building energy needs and from transportation fuels (e.g., diesel and gasoline) used for vehicles traveling to and from the site. The project would have a net electricity demand of approximately 27,280kWh, which represents less than 0.00001 percent of the PG&E network sales for the 2015 year, which is a relatively very small fraction. The project would have a net natural gas demand of approximately 905,180 kBtu per year, which represents less than 0.00001 percent of the PG&E network demand for the 2015 year, which is a very small fraction. With respect to the net change in transportation fuel demand, vehicles traveling to and from the site would use approximately 17,686 gallons of gasoline and 109 gallons of diesel fuel in a year. Therefore, vehicles would represent about 0.0001 percent of the statewide gasoline consumption and less than 0.00001 percent of the statewide diesel consumption, which represents a very small fraction of the state's annual fuel usage. The amount of energy used would represent an insubstantial fraction of the region's available energy supply and capacity. The project would incorporate energy and water efficient designs consistent with energy efficiency standards in the applicable Title 24 standards and the CALGreen Code and include EVSE to promote transportation energy efficiency. Because the project would implement energy efficient building standards and promote transportation energy efficiency, it would not result in the wasteful, inefficient, and unnecessary consumption of energy. In addition, as the project would be constructed to be solar-ready, the project would not preclude opportunities for improving overall fuel efficiency and future energy conservation. As a result, operational energy impacts would be considered **less than significant**.

5.0 References

Abrams Associates Traffic Engineering, Inc., 2016. Traffic Impact Study, Ball Property, (2016).

California Building Standards Commission (CBSC), 2010. 2010 California Green Building Standards Code, (2010).

_____, 2016. CALGreen (Part 11 of Title 24), http://www.bsc.ca.gov/Home/CALGreen.aspx. Accessed December 2016.

California Air Pollution Control Officers Association (CAPCOA), 2010. *Quantifying Greenhouse Gas Mitigation Measures, A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010, http://capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf, accessed January 2017.

California Air Resources Board (CARB), 2004. *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling*, Appendix F, July 2004, https://www.arb.ca.gov/regact/idling/idling.htm, accessed November 2016.

_____, 2014. EMFAC2014, *Mobile Source Emissions Inventory*, http://www.arb.ca.gov/msei/categories.htm#emfac, accessed November 2016.

_____, 2016. Advanced Clean Cars Summary, http://www.arb.ca.gov/msprog/clean_cars/acc%20summary-final.pdf. Accessed September 2016.

California Energy Commission (CEC), 2015. Adoption Hearing, 2016 Building Energy Efficiency Standards, June 10, 2015. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2015-06-10_hearing/2015-06-10_Adoption_Hearing_Presentation.pdf. Accessed December 2016.

Cummins, 2014. *Cummins Tier-4-Final Field Test Showed 10% Lower Fuel Consumption*, March 5, 2014, http://www.cumminspacific.com/about/news/!content/2014/03/05/cummins-tier-4-final-field-test-program-exceeds-140-000-hours-gaining-valuable-experience-with-operators-on-site, accessed October 2016.

Illingworth and Rodkin, Inc., 2016. Ball Estates Project Draft Air Quality and Greenhouse Gas Emissions Assessment, (2016).

Mitsubishi Caterpillar Forklift America, Inc. (MCF), 2015. *Cat® Lift Trucks Introduces New Tier 4 Final Diesel Pneumatic Tire Lift Truck*, November 19, 2015. http://www.mcfa.com/mcfa/news/articles/cat/2015/Cat%20Lift%20Trucks%20Introduces%20New%20Tier%204%20Final%20Diesel%20Pneumatic%20Tire%20Lift%20Truck, accessed October 2016.

Pacific Gas & Electric (PG&E), 2016. 2015 Joint Annual Report to Shareholders. Accessed October 2016.

United States Energy Information Administration (USEIA), 2016a. "Table F3: Motor Gasoline Consumption, Price, and Expenditure Estimates, 2015" http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_mg.html&sid=CA, accessed December 2016.

_____, 2016b. "Table F7: Distillate Fuel Oil Consumption Estimates, 2015" http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_df.html&sid=CA, accessed December 2016.

_____, 2016c. International Energy Outlook 2016, http://www.eia.gov/outlooks/ieo/liquid_fuels.cfm, accessed January 2017.

_____, 2016d. California, Profile Data, https://www.eia.gov/state/data.cfm?sid=CA#ReservesSupply, accessed January 2017.

Appendix A

Project Construction and Operational Energy Calculation Worksheets

ESA

Ball Estates Project
Construction Energy Analysis

Annual Fuel Summary

24,482 gallons of diesel fuel for heavy-duty construction equipment
5,410 gallons of diesel fuel for haul trucks
2,457 gallons of diesel fuel for vendor trucks
4,038 gallons of fuel (primarily gasoline) for workers

32,349 Total Gallons Diesel
4,038 Total Gallons Gasoline

2.5 Estimated Project Construction Duration (years)

12,940 Annual Average Gallons Diesel
1,615 Annual Average Gallons Gasoline

	State Fuel Consumption (2014, gallons)	Percent of Annual Project Compared to State
Diesel	3,400,000,000	0.00038%
Gasoline	14,400,000,000	0.00001%

Estimated Fuel Savings from Project Regulatory Compliance and Mitigation Measures

Estimated Diesel Fuel Savings from Anti-Idling Regulation:
4,688 gallons diesel fuel savings (total)
1,875 gallons diesel fuel savings (annual)

State fuel consumption data:
United States Energy Information Administration (USEIA), "Table F3: Motor Gasoline Consumption, Price, and Expenditure Estimates, 2015," http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_mg.html&sid=CA, accessed December 2016; "Table F7: Distillate Fuel Oil Consumption Estimates, 2015," http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_df.html&sid=CA, accessed December 2016.

Ball Estates Project
Construction Energy Analysis

Off-Road Equipment

Equipment ≤ 50 hp		
pounds fuel/hp-hr (OFFROAD2011 model, ≤ 50 hp):	0.408	lb/hp-hr
diesel pounds/gallon (CARB density assumption):	7.07	lb/gal
diesel gallons/hp-hr:	0.0577	gal/hp-hr
Total hp-hr for equipment ≤ 50 hp:	1,197	hp-hr
Total diesel gallons:	69	gal
Equipment > 50 hp		
pounds fuel/hp-hr (OFFROAD2011 model, > 50 hp):	0.367	lb/hp-hr
diesel pounds/gallon (CARB density assumption):	7.07	lb/gal
diesel gallons/hp-hr:	0.0519	gal/hp-hr
Total hp-hr for equipment > 50 hp:	470,299	hp-hr
Total diesel gallons:	24,413	gal
Total diesel gallons (off-road equipment):	**24,482**	**gal**

Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
Proposed Project							
Phase 1: Demolition of Existing Resid	Excavators	1	4.7	160	0.38	12	3,429
Phase 1: Demolition of Existing Resid	Tractors/Loaders/Backhoes	1	8	264	0.38	12	9,631
Phase 2: Site Preparation	Excavators	1	8	160	0.38	10	4,864
Phase 2: Site Preparation	Other Construction Equipment	1	8	800	0.75	10	48,000
Phase 2: Site Preparation	Rubber Tired Dozers	1	4	140	0.4	10	2,240
Phase 3: Grading	Graders	1	7.1	150	0.41	45	19,649
Phase 3: Grading	Plate compactors	1	3.6	255	0.38	45	15,698
Phase 3: Grading	Rollers	1	3.6	130	0.38	45	8,003
Phase 3: Grading	Rubber Tired Dozers	1	3.6	140	0.44	45	9,979
Phase 3: Grading	Scrapers	2	7.1	394	0.48	45	120,848
Phase 3: Grading	Tractors/Loaders/Backhoes	1	3.6	264	0.36	45	15,396
Phase 3: Grading	Tractors/Loaders/Backhoes	1	3.6	97	0.36	45	5,657
Phase 4: Trenching	Excavators	1	5.3	160	0.38	30	9,667
Phase 4: Trenching	Plate compactors	2	6.7	120	0.5	30	24,120
Phase 4: Trenching	Tractors/Loaders/Backhoes	1	2.7	90	0.37	30	2,697
Phase 5: Paving	Pavers	1	1.8	174	0.36	35	3,946
Phase 5: Paving	Rollers	1	1.8	60	0.38	35	1,436
Phase 5: Paving	Rollers	1	1.8	50	0.38	35	1,197
Phase 5: Paving	Tractors/Loaders/Backhoes	1	1.8	97	0.37	35	2,261
Phase 6: Building Construction	Forklifts	1	8	89	0.2	395	56,248
Phase 6: Building Construction	Tractors/Loaders/Backhoes	2	0.1	90	0.37	395	2,631
Phase 7: Architectural Coating	Air Compressors	1	5	78	0.48	402	75,254
Staging Area	Excavators	1	8	160	0.38	5	2,432
Staging Area	Other Construction Equipment	1	8	800	0.75	5	24,000
Staging Area	Rubber Tired Dozers	1	4	140	0.4	5	1,120
Staging Area	Pavers	1	1.8	174	0.36	5	564
Staging Area	Rollers	1	1.8	60	0.38	5	205
Staging Area	Tractors/Loaders/Backhoes	1	1.8	97	0.37	5	323
							-
					Total hp-hr for equipment ≤ 50 hp:		1,197
					Total hp-hr for equipment > 50 hp:		470,299

Ball Estates Project
Construction Energy Analysis

On-Road Haul Trucks

EMFAC2014 Diesel Fuel Consumption Factor:[1]	0.1720	gallons/mile
Total Haul Truck VMT:	25,440	miles
Total VMT diesel gallons (on-road haul trucks):	**4,377**	
EMFAC2014 Diesel Fuel Consumption Factor:[2]	1.6569	gallons/hour
Total Haul Truck Idle-Hours per Year:	624	hours
Total Idling diesel gallons (on-road haul trucks):	**1,033**	
Total diesel gallons (on-road haul trucks):	**5,410**	gal

Estimated Fuel Savings from Anti-Idling Regulation (64 percent based on estimated CARB emissions reductions):[3]
2,871

1. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; T7 Single Construction; Annual; CY 2017; Aggregate MY; Aggregate Speed)
2. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; T7 Single Construction; Annual; CY 2017; Aggregate MY; 5 miles per hour converted to hourly rate)
3. Source: California Air Resources Board (CARB), 2004. Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Appendix F, July 2004, https://www.arb.ca.gov/regact/idling/idling.htm, accessed November 2016.

Phase	Days	Total One-Way Trips	Miles/Trip	VMT	Idle Hours
Proposed Project					
Phase 1: Demolition of Existing Residence	12	569	20	11,380	142
Phase 2: Site Preparation	10	-	-	-	-
Phase 3: Grading	45	-	-	-	-
Phase 4: Trenching	30	-	-	-	-
Phase 5: Paving	35	126	7.3	920	32
Phase 6: Building Construction	395	1,800	7.3	13,140	450
Phase 7: Architectural Coating	402	-	-	-	-
Staging Area	10	-	-	-	-
			Total Haul Truck VMT:	25,440	
			Total Idle-Hours:		624

Ball Estates Project
Construction Energy Analysis

On-Road Vendor Trucks

EMFAC2014 Diesel Fuel Consumption Factor:[1]	0.1524	gallons/mile
Total Vendor Truck VMT:	11,826	miles
Total VMT diesel gallons (on-road vendor trucks):	**1,803**	
EMFAC2014 Diesel Fuel Consumption Factor:[2]	1.6153	gallons/hour
Total Vendor Truck Idle-Hours per Year:	405	hours
Total Idling diesel gallons (on-road vendor trucks):	**654**	
Total diesel gallons (on-road vendor trucks):	**2,457**	gal

Estimated Fuel Savings from Anti-Idling Regulation (64 percent based on estimated CARB emissions reductions):[3] *1,817*

1. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; HHDT and MHDT; Annual; CY 2017; Aggregate MY; Aggregate Speed)
2. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; HHDT and MHDT; Annual; CY 2017; Aggregate MY; 5 miles per hour converted to hourly rate)
3. Source: California Air Resources Board (CARB), 2004. Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Appendix F, July 2004, https://www.arb.ca.gov/regact/idling/idling.htm, accessed November 2016.

Phase	Days	One-Way Trips/Day	Miles/Trip	VMT	Idle Hours
Proposed Project					
Phase 1: Demolition of Existing Residence	12	-	-	-	-
Phase 2: Site Preparation	10	-	-	-	-
Phase 3: Grading	45	-	-	-	-
Phase 4: Trenching	30	-	-	-	-
Phase 5: Paving	35	-	-	-	-
Phase 6: Building Construction	395	4	7.3	11,534	395
Phase 7: Architectural Coating	402	-	-	-	-
Staging Area	10	4	7.3	292	10
			Total Vendor Truck VMT:	11,826	
			Total Idle-Hours:		405

Ball Estates Project
Construction Energy Analysis

On-Road Workers (LDA, LDT1, LDT2)

EMFAC2014 Gasoline Fuel Consumption Factor:[1]	0.0402	gallons/mile
Total Worker VMT:	100,514	miles
Total VMT gasoline gallons (workers):	**4,038**	
Total VMT gasoline gallons with Savings (workers):	**4,038**	

1. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; LDA, LDT1, LDT2; CY 2017; Aggregate MY; Aggregate Speed)

Phase	Days	One-Way Trips/Day	Miles/Trip	VMT
Proposed Project				
Phase 1: Demolition of Existing Residence	12	5	12.4	744
Phase 2: Site Preparation	10	8	12.4	992
Phase 3: Grading	45	20	12.4	11,160
Phase 4: Trenching	30	10	12.4	3,720
Phase 5: Paving	35	10	12.4	4,340
Phase 6: Building Construction	395	13	12.4	63,674
Phase 7: Architectural Coating	402	3	12.4	14,954
Staging Area	10	8	12.4	930
			Total Worker VMT:	100,514

Ball Estates Project
Operational Energy Analysis

Energy and VMT Estimates

Total Energy and VMT Source	Natural Gas demand (million kBTU/yr)	Electricity demand (million kWh/yr)	Electricity demand from water demand (million kWh/yr)	Annual VMT
Ball Estates Project	1.358	0.275	0.015	773,603

Water Electricity Source	CalEEMod Indoor Water Use (Mgal/yr)	Outdoor Water Use (Mgal/yr)	Total Water Use (Mgal/yr)	Electricity Demand from water Demand (million kWh)
Ball Estates Project	1.824	1.350	3.174	0.015

CalEEMod Water Electricity Factors	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
Ball Estates Project	2117	111	1272	1911

Source: California Emissions Estimator Model (CalEEMod).

Ball Estates Project
Operational Energy Analysis

Fuel Usage from VMT

Annual VMT (Project Vehicles): 773,603 miles/year

Fuel Type:[1]	GAS	DSL	ELEC	
Percent:	97.2%	0.8%	2.0%	
Miles per Gallon Fuel:	26.71	36.45	-	
Annual VMT by Fuel Type :	751,992	6,328	15,283	miles/year
Annual Fuel Usage :	28,149	174	-	gal/year
Annual Fuel Savings from Electric Vehicles:[2]	-	-	572	gal/year (assumed to be gasoline)
Annual Fuel Savings from Destination Accessibility:[3]	1,886	12		

Notes:

1. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; LDA, LDT1, LDT2; Annual; 2020).
2. Assumes electric vehicles would replace traditional gasoline-fueled vehicles.
3. California Air Pollution Control Officer's Association, Quantifying Greenhouse Gas Mitigation Measures, August 2010, LUT-4, p. 167-170, August 2010. Assumes the minimum reduction value of 6.7 percent.

Ball Estates Project

Energy Assessment

Title 24 Energy Savings Adjustment

Nonresidential

% savings over Title 24 (2016)	% savings over Title 24 (2013)
0%	5.0%
5%	9.8%
10%	14.5%
15%	19.3%
20%	24.0%

Residential

% savings over Title 24 (2016)	% savings over Title 24 (2013)
0%	28.0%
5%	31.6%
10%	35.2%
15%	38.8%
20%	42.4%

Project Energy Use Factors Adjustment

Nonresidential % savings over Title 24 (2013) =	5.0%
Residential % savings over Title 24 (2013) =	28.0%

	T24 Electricity	NT24 Electricity	Lighting Electricity	T24 NG	NT24 NG
Title 24 (2013 - CalEEMod Default)					
Project Residential Land Uses					
Single-Family	246.52	6,680.41	1,608.84	50,264.25	2,615.00
Title 24 (2016)					
Project Residential Land Uses					
Single-Family	177.49	6,680.41	1,158.36	36,190.26	2,615.00

Sources:

California Emissions Estimator Model (CalEEMod), version 2016.3.1.

California Energy Commission, Adoption Hearing, 2016 Building Energy Efficiency Standards, June 10, 2015. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2015-06-10_hearing/2015-06-10_Adoption_Hearing_Presentation.pdf. Accessed December 2016.

Ball Estates Operations

Contra Costa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	35.00	Dwelling Unit	20.00	122,500.00	100

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	5			**Operational Year**	2019
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - .

Land Use - Total square feet calculated by assuming 3,500 sq feet/house x 35 houses

Vehicle Trips - ADT 9.57 per Traffic Impact Study, June 2016 (Abrams Associates).

Energy Use - CEC, Adoption Hearing, 2016 Building Energy Efficiency Standards, 6/10/15. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2015-06-10_hearing/2015-06-10_Adoption_Hearing_Presentation.pdf. Accessed Dec. 2016.

Area Mitigation -

Energy Mitigation -

Waste Mitigation -

Table Name	Column Name	Default Value	New Value
tblEnergyUse	LightingElect	1,608.84	1,158.36
tblEnergyUse	T24E	246.52	177.49
tblEnergyUse	T24NG	50,264.25	36,190.26
tblLandUse	BuildingSpaceSquareFeet	63,000.00	122,500.00
tblLandUse	LandUseSquareFeet	63,000.00	122,500.00
tblLandUse	LotAcreage	11.36	20.00
tblProjectCharacteristics	OperationalYear	2018	2019
tblVehicleTrips	ST_TR	9.91	9.57
tblVehicleTrips	SU_TR	8.62	9.57
tblVehicleTrips	WD_TR	9.52	9.57

4.0 Operational Detail - Mobile

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	334.95	334.95	334.95	773,603	773,603
Total	334.95	334.95	334.95	773,603	773,603

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Install Energy Efficient Appliances

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Single Family Housing	1.35818e+006	7.3200e-003	0.0626	0.0266	4.0000e-004		5.0600e-003	5.0600e-003		5.0600e-003	5.0600e-003	0.0000	72.4779	72.4779	1.3900e-003	1.3300e-003	72.9086
Total		**7.3200e-003**	**0.0626**	**0.0266**	**4.0000e-004**		**5.0600e-003**	**5.0600e-003**		**5.0600e-003**	**5.0600e-003**	**0.0000**	**72.4779**	**72.4779**	**1.3900e-003**	**1.3300e-003**	**72.9086**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Single Family Housing	1.35818e+006	7.3200e-003	0.0626	0.0266	4.0000e-004		5.0600e-003	5.0600e-003		5.0600e-003	5.0600e-003	0.0000	72.4779	72.4779	1.3900e-003	1.3300e-003	72.9086
Total		**7.3200e-003**	**0.0626**	**0.0266**	**4.0000e-004**		**5.0600e-003**	**5.0600e-003**		**5.0600e-003**	**5.0600e-003**	**0.0000**	**72.4779**	**72.4779**	**1.3900e-003**	**1.3300e-003**	**72.9086**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	280569	81.6208	3.6900e-003	7.6000e-004	81.9406
Total		**81.6208**	**3.6900e-003**	**7.6000e-004**	**81.9406**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	274685	79.9091	3.6100e-003	7.5000e-004	80.2222
Total		**79.9091**	**3.6100e-003**	**7.5000e-004**	**80.2222**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	2.28039 / 1.43764	5.7769	0.0745	1.8000e-003	8.1772
Total		**5.7769**	**0.0745**	**1.8000e-003**	**8.1772**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	1.82431 / 1.34994	4.8250	0.0596	1.4400e-003	6.7460
Total		**4.8250**	**0.0596**	**1.4400e-003**	**6.7460**

Appendix B

Existing Office Operational Energy Calculation Worksheets

ESA

Ball Estates Project - Existing Office
Operational Energy Analysis

Energy and VMT Estimates

Total Energy and VMT Source	Natural Gas demand (million kBTU/yr)	Electricity demand (million kWh/yr)	Electricity demand from water demand (million kWh/yr)	Annual VMT
Existing Office	0.372	0.229	0.021	243,376
Single Family Home	0.056	0.007	0.000	22,103
Caretaker Living Quarters	0.025	0.004	0.000	22,103
Total	**0.453**	**0.240**	**0.022**	**287,582**

Water Electricity Source	CalEEMod Indoor Water Use (Mgal/yr)	CalEEMod Outdoor Water Use (Mgal/yr)	Total Water Use (Mgal/yr)	Electricity Demand from water Demand (million kWh)
Existing Office	2.799	1.716	4.515	0.021
Single Family Home	0.065	0.041	0.106	0.0005
Caretaker Living Quarters	0.065	0.041	0.106	0.0005
Total	**2.929**	**1.798**	**4.727**	**0.022**

CalEEMod Water Electricity Factors	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
Existing Office	2117	111	1272	1911
Single Family Home	2117	111	1272	1911
Caretaker Living Quarters	2117	111	1272	1911
Total	2117	111	1272	1911

Source: California Emissions Estimator Model (CalEEMod).

Ball Estates Project - Existing Office
Operational Energy Analysis

Fuel Usage from VMT

Annual VMT (Project Vehicles): 287,582 miles/year

Fuel Type:[1]	GAS	DSL	ELEC	
Percent:	97.2%	0.8%	2.0%	
Miles per Gallon Fuel:	26.71	36.45	-	
Annual VMT by Fuel Type :	279,548	2,352	5,681	miles/year
Annual Fuel Usage :	10,464	65	-	gal/year

Notes:

1. California Air Resources Board, EMFAC2014 (San Francisco Bay Area Air Basin; LDA, LDT1, LDT2; Annual; 2020).

Ball Estates Existing Operational

Contra Costa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	15.75	1000sqft	0.36	15,751.00	0
Apartments Low Rise	1.00	Dwelling Unit	0.06	900.00	3
Single Family Housing	1.00	Dwelling Unit	0.32	8,000.00	3

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	5			**Operational Year**	2018
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Client given square footage based on Project Description.

Vehicle Trips - ADT 9.57 per Traffic Impact Study, June 2016 (Abrams Associates)
Based on data from the Traffic Impact Study: 130 trips per day / 15.571 ksf = 8.35 ADT per ksf (assumed for weekday trips).
Vehicle Emission Factors -

Vehicle Emission Factors -

Energy Use -

Table Name	Column Name	Default Value	New Value
tblEnergyUse	T24E	143.36	143.36
tblEnergyUse	T24E	321.72	321.72
tblEnergyUse	T24NG	22,210.61	22,210.61
tblEnergyUse	T24NG	49,807.87	49,807.87
tblLandUse	BuildingSpaceSquareFeet	1,000.00	900.00
tblLandUse	BuildingSpaceSquareFeet	1,800.00	8,000.00
tblLandUse	LandUseSquareFeet	1,000.00	900.00
tblLandUse	LandUseSquareFeet	1,800.00	8,000.00
tblVehicleTrips	ST_TR	7.16	9.57
tblVehicleTrips	ST_TR	9.91	9.57
tblVehicleTrips	SU_TR	6.07	9.57
tblVehicleTrips	SU_TR	8.62	9.57
tblVehicleTrips	WD_TR	6.59	9.57
tblVehicleTrips	WD_TR	11.03	8.35
tblVehicleTrips	WD_TR	9.52	9.57

4.0 Operational Detail - Mobile

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	9.57	9.57	9.57	22,103	22,103
General Office Building	131.52	38.75	16.54	243,376	243,376
Single Family Housing	9.57	9.57	9.57	22,103	22,103
Total	150.66	57.89	35.68	287,582	287,582

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Low Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4
Single Family Housing	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Office Building	0.571348	0.041302	0.187452	0.129481	0.019048	0.005152	0.010609	0.022861	0.001566	0.001884	0.005572	0.002772	0.000953
Apartments Low Rise	0.571348	0.041302	0.187452	0.129481	0.019048	0.005152	0.010609	0.022861	0.001566	0.001884	0.005572	0.002772	0.000953
Single Family Housing	0.571348	0.041302	0.187452	0.129481	0.019048	0.005152	0.010609	0.022861	0.001566	0.001884	0.005572	0.002772	0.000953

5.0 Energy Detail

Historical Energy Use: Y

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Low Rise	24963.3	1.3000e-004	1.1500e-003	4.9000e-004	1.0000e-005		9.0000e-005	9.0000e-005		9.0000e-005	9.0000e-005	0.0000	1.3321	1.3321	3.0000e-005	2.0000e-005	1.3401
General Office Building	371566	2.0000e-003	0.0182	0.0153	1.1000e-004		1.3800e-003	1.3800e-003		1.3800e-003	1.3800e-003	0.0000	19.8282	19.8282	3.8000e-004	3.6000e-004	19.9460
Single Family Housing	56000.8	3.0000e-004	2.5800e-003	1.1000e-003	2.0000e-005		2.1000e-004	2.1000e-004		2.1000e-004	2.1000e-004	0.0000	2.9884	2.9884	6.0000e-005	5.0000e-005	3.0062
Total		**2.4300e-003**	**0.0219**	**0.0169**	**1.4000e-004**		**1.6800e-003**	**1.6800e-003**		**1.6800e-003**	**1.6800e-003**	**0.0000**	**24.1487**	**24.1487**	**4.7000e-004**	**4.3000e-004**	**24.2922**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Low Rise	24963.3	1.3000e-004	1.1500e-003	4.9000e-004	1.0000e-005		9.0000e-005	9.0000e-005		9.0000e-005	9.0000e-005	0.0000	1.3321	1.3321	3.0000e-005	2.0000e-005	1.3401
General Office Building	371566	2.0000e-003	0.0182	0.0153	1.1000e-004		1.3800e-003	1.3800e-003		1.3800e-003	1.3800e-003	0.0000	19.8282	19.8282	3.8000e-004	3.6000e-004	19.9460
Single Family Housing	56000.8	3.0000e-004	2.5800e-003	1.1000e-003	2.0000e-005		2.1000e-004	2.1000e-004		2.1000e-004	2.1000e-004	0.0000	2.9884	2.9884	6.0000e-005	5.0000e-005	3.0062
Total		**2.4300e-003**	**0.0219**	**0.0169**	**1.4000e-004**		**1.6800e-003**	**1.6800e-003**		**1.6800e-003**	**1.6800e-003**	**0.0000**	**24.1487**	**24.1487**	**4.7000e-004**	**4.3000e-004**	**24.2922**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	3584.6	1.0428	5.0000e-005	1.0000e-005	1.0469
General Office Building	229335	66.7161	3.0200e-003	6.2000e-004	66.9775
Single Family Housing	7027	2.0442	9.0000e-005	2.0000e-005	2.0523
Total		**69.8031**	**3.1600e-003**	**6.5000e-004**	**70.0766**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	3584.6	1.0428	5.0000e-005	1.0000e-005	1.0469
General Office Building	229335	66.7161	3.0200e-003	6.2000e-004	66.9775
Single Family Housing	7027	2.0442	9.0000e-005	2.0000e-005	2.0523
Total		**69.8031**	**3.1600e-003**	**6.5000e-004**	**70.0766**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	7.3716	0.0958	2.3100e-003	10.4551
Unmitigated	7.3716	0.0958	2.3100e-003	10.4551

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	0.065154 / 0.0410754	0.1651	2.1300e-003	5.0000e-005	0.2336
General Office Building	2.79931 / 1.7157	7.0415	0.0915	2.2100e-003	9.9878
Single Family Housing	0.065154 / 0.0410754	0.1651	2.1300e-003	5.0000e-005	0.2336
Total		**7.3716**	**0.0958**	**2.3100e-003**	**10.4550**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	0.065154 / 0.0410754	0.1651	2.1300e-003	5.0000e-005	0.2336
General Office Building	2.79931 / 1.7157	7.0415	0.0915	2.2100e-003	9.9878
Single Family Housing	0.065154 / 0.0410754	0.1651	2.1300e-003	5.0000e-005	0.2336
Total		**7.3716**	**0.0958**	**2.3100e-003**	**10.4550**