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# **OAK KNOLL MIXED USE PROJECT**

## **GREENHOUSE GAS REDUCTION PLAN**

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## ACRONYMS AND ABBREVIATIONS

ARB:	[California] Air Resources Board
BAAQMD:	Bay Area Quality Management District
BAU:	business as usual
Caltrans:	California Department of Transportation
CAPCOA:	California Air Pollution Control Officers Association
CEQA:	California Environmental Quality Act
CH <sub>4</sub> :	methane
CHTS:	California Household Travel Survey
CO <sub>2</sub> :	Carbon Dioxide
CO <sub>2</sub> e:	Carbon Dioxide Equivalent
CPUC:	California Public Utilities Commission
DEIR:	Draft Environmental Impact Report
EBMUD:	East Bay Municipal Utility District
ECAP:	Energy and Climate Action Plan
EIR:	Environmental Impact Report
ESA:	Environmental Science Associates
GGRP:	Greenhouse Gas Reduction Plan
GHG:	Greenhouse Gas
MT:	metric ton
MT/yr:	metric ton per year
N <sub>2</sub> O:	nitrous oxide
NMCO:	Naval Medical Center Oakland
PG&E:	Pacific Gas and Electric Company
SCA:	Standard Condition of Approval
SP:	service population
TDM:	Transportation Demand Management
VMT:	vehicle miles traveled

# 1. INTRODUCTION

The City of Oakland, California, requires a greenhouse gas (GHG) Reduction Plan (GGRP) for the Oak Knoll Mixed Use Project (“Oak Knoll Project”), as a standard condition of approval (SCA). The Oak Knoll Project is pursuing environmental entitlements under the California Environmental Quality Act (CEQA), with the City of Oakland as the lead agency. Under SCA GHG-1, the City of Oakland requires a GGRP that requires the Oak Knoll Project to increase energy efficiency and reduce GHG emissions below at least one of the Bay Area Quality Management District’s (BAAQMD’s) CEQA Thresholds of Significance and 36% below a 2005 “Business as Usual” (BAU) scenario, as defined in the City’s Energy and Climate Action Plan (ECAP).

## 1.1 Project Description and Overview

The Oak Knoll Project site consists of approximately 165 acres of the 183-acre former Oak Knoll Naval Medical Center Oakland (NMCO) property, approximately 15 acres of an adjacent property (known as the “Hardenstine parcel”), and approximately 8 acres of City-owned property, for a site with a total size of approximately 188 acres. The Project site is bounded by Mountain Boulevard/Interstate 580 (I-580) to the west, Keller Avenue to the north and east, and Sequoyah Road to the south.

The Project site consists of former U.S. Navy land, previously the location of a medical facility, as well as the adjacent, undeveloped Hardenstine parcel. The NMCO facility was decommissioned in 1996, medical and related facilities were subsequently demolished, and the site has been largely unoccupied since that time. For this reason, no existing conditions are considered in this analysis.

The Oak Knoll Project would create a mixed-use development consisting of residential neighborhoods, commercial development, and open space and recreational facilities. Table 1 shows the breakdown of proposed land uses, consistent with that used in the DEIR.

<b>Table 1. Project Land Uses</b>			
<b>Land Use</b>	<b>Size</b>	<b>Units</b>	<b>Population</b>
Townhouse	572	Dwelling Units	1,368
Single Family Home	363	Dwelling Units	868
Community Center	4,000	SF	4
Supermarket and Other Commercial Retail	66,000	SF	138
Health Club	10,000	SF	20
Restaurant (Sit down)	6,000	SF	18
Parks/Open Space	83	acres	0

The Project is anticipated to be fully built and occupied in the year 2024, with a service population (SP) of 2,416.

## 1.2 SCA GHG-1

The City of Oakland applies *SCA GHG-1: Greenhouse Gas (GHG) Reduction Plan* to all projects which result in a net increase in GHG emissions. This GGRP is responsive to the requirements of SCA GHG-1, namely that the “project applicant shall retain a qualified air quality consultant to develop a Greenhouse Gas (GHG) Reduction Plan for City review and approval.” The basic requirements of SCA GHG-1 are stated below, in text from SCA GHG-1:

The goal of the GHG Reduction Plan shall be to increase energy efficiency and reduce GHG emissions to below at least one of the Bay Area Quality Management District’s (BAAQMD’s) CEQA Thresholds of Significance (1,100 metric tons of CO<sub>2</sub>e per year or 4.6 metric tons of CO<sub>2</sub>e per year per service population) AND to reduce GHG emissions by 36 percent below the project’s “adjusted” baseline GHG emissions (as explained below) to help achieve the City’s goal of reducing GHG emissions. The GHG Reduction Plan shall include, at a minimum, (a) a detailed GHG emissions inventory for the project under a “business-as-usual” scenario with no consideration of project design features, or other energy efficiencies, (b) an “adjusted” baseline GHG emissions inventory for the project, taking into consideration energy efficiencies included as part of the project (including the City’s Standard Conditions of Approval, proposed mitigation measures, project design features, and other City requirements), (c) a comprehensive set of quantified additional GHG reduction measures available to further reduce GHG emissions beyond the adjusted GHG emissions, and (d) requirements for ongoing monitoring and reporting to demonstrate that the additional GHG reduction measures are being implemented.

The GGRP shall be implemented beginning with Project construction, for instance construction of physical GHG reduction measures incorporated into the design of the Project. During and after construction, the applicant is committed to ongoing monitoring and reporting to ensure that GHG reduction measures are being implemented.

The GHG Reduction Plan shall be considered fully attained when project emissions are less than either of the two potentially applicable numeric BAAQMD CEQA Thresholds AND GHG emissions are 36 percent below the project’s “adjusted” baseline GHG emissions, as confirmed by the City through an established monitoring program. Monitoring and reporting activities will continue as directed by SCA GHG-1.

As part of this GHG Reduction Plan, Ramboll Environ prepared a detailed GHG emissions inventory for the project under a 2005 “business-as-usual” scenario (hereafter called the “2005 BAU Project”) with no consideration of regulatory standards adopted thereafter designed to reduce GHG emissions or other energy efficiencies. This 2005 BAU Project inventory is compared to an “adjusted” baseline GHG emissions inventory for the Project (hereafter called the “Project scenario”), taking into consideration energy efficiencies included as part of the Project (including the City’s Standard Conditions of Approval, proposed mitigation measures, project design features, other City requirements, and federal, state and other local regulatory standards enacted since 2005). GHG emission sources associated with the Project include both on-site and off-site sources. On-site sources include off-road mobile equipment (loaders, tractors, etc.) during construction, on-road vehicles, and area sources such as hearths. Off-site sources include on-road vehicles and emissions from solid waste disposal. GHG emissions from purchased electricity, including for the supply, distribution, and treatment of water, are off-site sources. A summary of this analysis is provided in Table 3.

## 2. SUMMARY OF GHG EMISSIONS

Emissions representing two operational years were considered: 2005 and 2024. The year 2005 is the baseline year because the City of Oakland's GHG reduction goal is based on existing GHG emissions in the year 2005. The year 2024 is the year when construction of the project is anticipated to be complete, so this case is called the "Full Buildout" year.

The inventories for each year were based on information from the Project Description, information provided by the Project Sponsor to Environmental Science Associates (ESA) for the Draft Environmental Impact Report (DEIR), as well as information from the Project traffic consultant. Ramboll Environ prepared a detailed GHG emissions inventory for the project under a 2005 BAU scenario with no consideration of project design features or other energy efficiencies. ESA prepared the "adjusted" baseline GHG emissions inventory for the project, taking into consideration energy efficiencies included as part of the project (including proposed mitigation measures, project design features, and other City requirements). Details on the emissions inventories are provided below for the existing conditions, Project construction, and the proposed Project.

### 2.1 Summary of Existing Conditions GHG Emissions

As noted above, although there were existing historical uses at the site of the NMCO, at the time of the Notice of Preparation of the Project EIR, only minimal existing uses were active. To conservatively overestimate Project impacts, no GHG inventory of existing sources was subtracted from the Project GHG inventory (i.e., a "zero baseline").

### 2.2 Proposed One-time Project GHG Emissions

#### 2.2.1 Summary of Construction GHG Emissions

As reported in the analysis performed by ESA for the DEIR for the Project, total construction emissions are 17,872 metric tons (MT) of carbon dioxide equivalents (CO<sub>2</sub>e) over the three phases of construction. There may be a construction scenario with lower total GHG emissions, but the higher estimate is used here to be conservative. For inclusion in the ongoing GHG emissions inventory, this amount is annualized over the anticipated 40-year life of the Project, to an amount of 447 MT CO<sub>2</sub>e per year. ESA used the California Emission Estimator Model version 2013.2.2 (CalEEMod®) to estimate construction emissions for the Project. The California Air Pollution Control Officers Association (CAPCOA) in collaboration with Ramboll Environ (as ENVIRON International Corporation) developed CalEEMod® for use in developing emission inventories suitable for CEQA analyses.

#### 2.2.2 Summary of Land-Use Change and Vegetation GHG Emissions

The Project is responsible for the one-time change in land use from grassland over the former building pads at the NMCO to developed residential landscapes. The Project will also plant 910 net new trees, of mixed hardwood. These two combined changes result in a net one-time GHG benefit of 441 MT CO<sub>2</sub>e. As with the construction GHG emissions, these are annualized over the 40-year life of the project, as a credit of 11 MT CO<sub>2</sub>e/year.

### 2.3 Proposed Ongoing Project GHG Emissions

Two analyses were prepared for proposed Project emissions, to reflect the Full Buildout Project and 2005 BAU scenarios. The use of 2005 BAU Project to represent the Project without adjustment for statewide and Project design GHG reduction measures is consistent with the emissions reductions goal described in SCA GHG-1. The Project emissions scenario

represents the Project as it must be constructed. Accordingly, it includes all local, state, and federal measures expected to be implemented by 2024, including the SCAs.

### **2.3.1 Methodology for Project Emissions Inventories**

The Project operations were analyzed for the years 2005 and 2024, at full buildout. ESA's analysis of Project GHG emissions uses CalEEMod® version 2013.2.2. Consistent with the methodology in the Oakland ECAP, Ramboll Environ analyzed the 2005 BAU Project as if it was operating in 2005, and consistent with CalEEMod® version 2013.2.2.

The GHG inventories are divided by source category to cover

1. Area Sources
2. Purchased electricity use not related to water usage
3. Natural gas use
4. Water usage, including purchased electricity use
5. Waste
6. Mobile Sources.

Each source category is discussed separately below.

#### **2.3.1.1 Area Sources**

The proposed Project includes area sources such as architectural coatings, consumer products use, hearths, and landscaping equipment. CalEEMod® does not consider architectural coatings and consumer products to be sources of GHG.

Hearth emissions for the 2024 Project were calculated with CalEEMod®. BAAQMD Rule 6-3-306 does not allow wood stoves in new building construction after November 1, 2016, so the percentage of dwelling units with wood stoves was assumed to be zero. The CalEEMod® default count of dwelling units with wood stoves was assumed to instead have natural gas fireplaces.

Hearth emissions for the 2005 BAU Project were calculated consistent with CalEEMod® methods, assuming the default mix of wood and natural gas hearths. Although BAAQMD Rule 6-3-306 does not allow wood stoves in new building construction after November 1, 2016, the 2005 BAU Project does not reflect the implementation of this new rule, as the new rule is not considered business as usual for 2005 activity levels. The count of hearths and the operation of hearths from CalEEMod® were used with the emission factors in Table D5.2 of Appendix D of the CalEEMod® User's Guide to estimate hearth emissions.

The Project land uses will employ gasoline and diesel landscaping equipment. Emissions from lawn and garden equipment are estimated using CalEEMod®. CalEEMod®'s emissions estimates are based on emission factors for the landscaping equipment from the California Air Resources Board (ARB) OFFROAD2011 model.

#### **2.3.1.2 Purchased Electricity Not Related to Water Use**

The Oak Knoll Project includes operational emissions associated with purchased electricity for lighting, heating, household electronics, electric vehicle charging, and other uses not associated with water supply, treatment, and distribution. CalEEMod® estimates emissions based on the type and size of land uses associated with the Project, as shown in Table 1. ESA adjusted the building envelope electricity usage for the 2024 Project to account for the

2016 Title 24 building energy efficiency standards, which will be in effect at the commencement of Project construction. The more stringent measures proposed for the 2019 Title 24 building energy efficiency standards are not included by ESA as the 2019 Title 24 building energy efficiency standards have not yet been adopted.

For estimating GHG emissions from electricity use for the 2024 Project, the Pacific Gas and Electric Company (PG&E) CO<sub>2</sub> intensity factor for 2020 was used in place of the default energy intensity in CalEEMod®.<sup>1</sup> This electricity emission factor for GHG is used for 2024, as PG&E has not published an estimated emission factor for 2024. The 2005 BAU Project uses the CalEEMod® emission factor for CO<sub>2</sub> intensity in 2005, not the anticipated 2020 emission factor. This use of the historical emission factor for the 2005 case is consistent with the Oakland ECAP. In addition to the difference in CO<sub>2</sub> intensity between the 2005 BAU Project and Project inventories, the 2005 BAU Project inventory does not account for increases in building energy efficiency from the Title 24 building energy efficiency standards.

### **2.3.1.3 Natural Gas**

The Oak Knoll Project includes operational emissions associated with on-site natural gas combustion. ESA estimated emissions using CalEEMod® based on the type and size of land uses associated with the Project, as shown in Table 1. ESA adjusted the building envelope natural gas usage for the Project to account for the 2016 Title 24 building energy efficiency standards, which will be in effect at the commencement of Project construction. The 2005 BAU Project inventory does not account for increases in building energy efficiency from the post-2005 Title 24 building energy efficiency standards. Like the 2024 Project case, the emission factors used to estimate 2005 BAU emissions from natural gas combustion are from Table D8.2 of the CalEEMod® User's Guide. The CH<sub>4</sub> (methane) and N<sub>2</sub>O (nitrous oxide) emission factors used are from CalEEMod®. The global warming potentials for CH<sub>4</sub> and N<sub>2</sub>O are 21 and 310, respectively, consistent with CalEEMod®.

### **2.3.1.4 Water Use, Including Purchased Electricity**

Electricity is required to supply, treat, and distribute water and wastewater, and as such water use is a source of GHG emissions. The water use estimate of 207,000 gallons per day for the Project is from East Bay Municipal Utility District (EBMUD). As with GHG emissions from purchased electricity not related to water use, ESA used the PG&E CO<sub>2</sub>e intensity factor for 2020 in place of the default energy intensity in CalEEMod® for the 2024 Project. This electricity emission factor for GHG is used for 2024, as PG&E has not published an estimated emission factor for 2024. As described in Section 2.3.1.2, the CalEEMod® emission factor for 2005 CO<sub>2</sub> intensity is used for water-related purchased electricity emissions from the 2005 BAU Project. The water demand is the same for 2005 as for the 2024 Project.

### **2.3.1.5 Waste**

Waste generated by the Oak Knoll project will result in GHG emissions, which ESA estimated using CalEEMod®. The Oakland ECAP accounts for the City of Oakland Zero Waste goal, which reduces GHG emissions from waste by 89% between 2005 and 2020.

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<sup>1</sup> Pacific Gas and Electric Company (PG&E). Greenhouse Gas Emission Factors: Guidance for PG&E Customers. April. Available online at:  
[http://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge\\_ghg\\_emission\\_factor\\_info\\_sheet.pdf](http://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf).



### **2.3.1.6 Mobile Sources**

The Project would generate vehicle trips from residents traveling to and from the site and non-residents traveling to and from the site for work or commercial purposes. ESA relied on the trip generation data in the transportation impact analysis prepared by Fehr & Peers to estimate 2024 Project emissions using CalEEMod®. The 2005 BAU Project mobile source GHG emissions rely on the same trip generation data and 2005 mobile fleet emission factors, consistent with the methods of the ECAP analysis. The emission factors for 2005 and 2024 are taken from EMFAC2014. The trip generation rates and trip lengths are identical in the 2005 BAU and 2024 Project inventories.

The calculation of vehicle miles traveled (VMT) for both the 2005 BAU and 2024 Project relies on the trip generation data in the transportation impact analysis prepared by Fehr & Peers. Trip generation rates are consistent with those presented in the Transportation and Circulation chapter of the DEIR. The trip generation data accounts for a mode-split trip rate reduction of 3.1%, which quantifies the shift in mode split from vehicles to other modes of transportation, including walking, biking and transit. The estimated VMT use the trip generation rates from the Transportation and Circulation chapter of the DEIR described above and primary trip lengths from the 2012 California Household Travel Survey (CHTS), conducted by the California Department of Transportation (Caltrans). Table GGRP-3 of Appendix A shows the weighted-average trip length for the Project.

The GHG emissions associated with on-road mobile sources include running and starting exhaust emissions. Starting and evaporative emissions are associated with the number of starts or time between vehicle uses and the assumptions used in determining these values are described below. Project traffic emission factors are from EMFAC2014 for the vehicle fleet mix in Alameda County. The EMFAC2014 model is a newer on-road emissions model than the EMFAC2011 model incorporated in the CalEEMod® model. The emission factors taken from EMFAC2014 represent 2005 for the 2005 BAU case, including the 2005 fleet mix, and 2024 for the 2020 Project case, including the 2024 fleet mix. Alameda County fleet emissions reported by the EMFAC2014 model for running emissions were converted to units of grams of pollutant emitted per VMT using the daily VMT in the County. Alameda County fleet emissions reported by EMFAC2014 for idling and starting emissions were converted to units of grams of pollutant emitted per trip for idling and starting emissions.

## **2.4 Current State and Local Requirements that Reduce GHG Emissions**

### **2.4.1 State and Local Requirements Other Than the Transportation Demand Management (TDM)**

The following state programs and existing City requirements will reduce GHG emissions from the 2005 BAU scenario:

- The Project Transportation Demand Management (TDM) program will reduce VMT by 10%, which reduces on-road mobile source emissions
- The Pavley Act and ACC programs reduce on-road vehicle fleet emissions
- The City of Oakland’s Zero Waste goal will reduce GHG emissions from waste by 89%
- The Renewable Portfolio Standard will reduce GHG from electricity generation
- The BAAQMD Rule 6-3 eliminates wood-fired hearths in new homes, thereby reducing GHG emissions per hearth

- Increased penetration of electric vehicles will reduce GHG emissions from on-road mobile sources, even without assuming mandated changes to charging infrastructure
- Increased residential and nonresidential building energy efficiency due to 2016 and 2019 Title 24 standards (in compliance with SCA GHG-2)

These requirements, as well as the TDM, are considered as part of the Project scenario. The TDM, due to its large impact on GHG emissions, is discussed separately below.

#### **2.4.2 TDM**

As required by SCA TRA4, the Project will implement a TDM program to reduce VMT by 10%. The VMT reduction will have a direct effect on running exhaust emissions from on-road vehicles.

#### **2.4.3 Phasing**

The Project will be constructed in three phases, with operations commencing in sequence for the same three phases. Table 2 shows the operational GHG emissions as estimated by ESA for each of the three phases of construction individually as well as at Full Buildout of the Project. The emissions for each phase are specific to its first year of operation, which is expected to be the highest-emitting year due to the planned improvements to the on-road vehicle fleet. Table 2 shows the emissions of Phase I in its first operational year, 2022, and the emissions of Phase II in its first operational year, 2023. Phase-specific land-use inputs match the phase and project description and incorporate data from traffic consultants.

As shown in Table 2, only Phase I operations are not below the efficiency threshold of 4.6 (MT CO<sub>2e</sub> per service population per year (MT CO<sub>2e</sub>/SP/year). Although Phase II alone is below the efficiency threshold of 4.6 MT CO<sub>2e</sub>/SP/year, the combined operation of Phases I and II has an efficiency above 4.6 MT CO<sub>2e</sub>/SP/year, which would require temporary offsets or mitigation. Each year, emissions for Phase I and Phase II will reduce, so the Full Buildout emissions for 2024 are lower than the sum of the 2022 Phase I and 2023 Phase II emissions shown in Table 2. At Full Buildout, however, the entire project achieves emissions of 4.5 MT CO<sub>2e</sub>/SP/year, which is below the efficiency threshold of significance.

In the time period between the completion of Phase I construction and Full Buildout, the Project Sponsor will mitigate GHG emissions from partial-Project operation to below the efficiency threshold of 4.6 MT CO<sub>2e</sub>/SP/year. The Project Sponsor may purchase sufficient carbon offsets (2,098 MT per year [MT/yr] of Phase I operations) from 2022 until Full Buildout to reduce the Phase I and cumulative phasing exceedances below the efficiency threshold. Although the exceedance decreases during the years between Phase I and Full Buildout, this plan assumes that the project applicant would continue to purchase the same number of offset credits as would be needed during Phase I. Because this is a temporary exceedance, which no longer exists at Full Buildout, the purchase of carbon offsets is an appropriate way to address the exceedance. To the extent that Project design features minimize GHG, those features may sufficiently reduce operational GHG emissions per service population during Phase I and Phase I plus Phase II such that no additional mitigation is required. If the project applicant chooses to install Project design features that minimize GHGs, the Project applicant would provide the City with an updated report of the Project's operational emissions by phase and would be required to mitigate any remaining exceedance.

<b>Table 2. Operational Emissions by Phase</b>				
	<b>Project Phase</b>			
	<b>I, Operational Year 2022</b>	<b>II, Operational Year 2023</b>	<b>III, Operational Year 2024</b>	<b>Full Buildout, Operational Year 2024</b>
<b>Project Description</b>				
Housing Units	332	263	340	935
Commercial Development (square feet)	86,000	0	0	86,000
Service Population	975	629	813	2,416
<b>GHG Emissions by Source (MT CO<sub>2</sub>e)</b>				
Total operational emissions <sup>a</sup>	6,353	2,543	1,879	10,371
Annualized construction <sup>b</sup>	241	143	63	447
Annualized net vegetation	-11	0	0	-11
<b>TOTAL ANNUAL GHG EMISSIONS</b>	<b>6,586, in 2022</b>	<b>2,686, in 2023</b>	<b>1,942, in 2024</b>	<b>10,807, in 2024</b>
Mass Emissions Threshold of 1,100 MT CO <sub>2</sub> e Exceeded?	Yes	Yes	Yes	Yes
Emissions per Service Population per Year	6.8	4.3	2.4	4.5
Efficiency Threshold of 4.6 MT CO <sub>2</sub> e Exceeded?	Yes	No	No	No
Offsets required (MT/year)	2,098	0	0	0
Offsets required for cumulative phases (MT/year)	2,098	Less than 2,098	0	0
<b>Notes</b>				
<sup>a</sup> Incorporates TDM Program (SCA TRA-4) and applicable requirements for green building measures (SCA GHG-2).				
<sup>b</sup> Incorporates on-site crushing scenario for Phase 1 construction and construction-related air pollutant controls (SCA AIR-1)				
Source: ESA 2016				

#### 2.4.4 Comparison of 2005 BAU and 2024 Project Emissions Inventories

Table 3 shows the 2005 BAU Project and 2024 Project GHG inventories, with a column showing the percent reduction in emissions from the 2005 BAU Project inventory by source category.

Emissions from area sources (hearths and landscaping), decrease by 18% from the 2005 BAU Project scenario due to the replacement of wood-fired hearths with natural gas fireplaces, as required by BAAQMD Rule 6-3.

Emissions related to purchased electricity and natural gas decrease by 43%, due to the combined impacts of increased building energy efficiency and reductions in the carbon intensity of electricity provided by PG&E. These reductions are from the Title 24 building energy efficiency standards and the state Renewables Portfolio Standard.

Emissions related to water use, which are from wastewater treatment and the purchased electricity used to supply, distribute and treat the water, are reduced by 54%, due to the state Renewables Portfolio Standard lowering the carbon intensity of purchased electricity between the 2005 BAU Project and 2024 Project scenarios.

Between the 2005 BAU Project and 2024 Project scenarios, emissions from waste are reduced as Oakland implements measures to meet its Zero Waste goal by 2020. This is an 88% reduction in GHG emissions from waste.

On-road mobile source emissions decrease by 32% between the 2005 BAU Project scenario and the 2024 Project scenario. The fleet average emission factors from EMFAC2014 show that the vehicle fleet is more efficient by 2024.

<b>Table 3: Summary of Full Buildout 2005 BAU Project and 2024 Project Greenhouse Gas Emissions (MT/yr CO<sub>2</sub>e)</b>			
<b>Source Category</b>	<b>GHG Emissions for 2005 BAU Project, Full Buildout (MT CO<sub>2</sub>e)</b>	<b>GHG Emissions for 2024 Project, Full Buildout (MT CO<sub>2</sub>e)</b>	<b>Percent Reduction from 2005 BAU Project</b>
Hearths and Landscaping	105	86	18%
Purchased Electricity – non-water related	2,344	2,557	43%
Natural Gas	2,106		
Water Use	221	101	54%
Waste Disposed	528	61	88%
On-Road Exhaust	11,175	7,566	32%
Annualized Construction	447	447	0%
Annualized Net Vegetation Emissions	-11	-11	0%
<b>Total</b>	<b>16,913</b>	<b>10,807</b>	<b>36.1%</b>

Table 3 shows that the Project achieves a 36.1% reduction from the 2005 BAU Project scenario.

#### **2.4.5 GHG Emissions Per Service Population**

In addition to the total project emissions, Ramboll Environ also calculated the GHG efficiency of the Project on a per-service population basis. The service population is from Chapter 4 of the DEIR. At full buildout, the Project population is 2,416 residents and employees and annual GHG emissions are 10,807 MT CO<sub>2</sub>e/year. The Project GHG emissions on a per-service population basis are 4.5 MT CO<sub>2</sub>e/SP/year.

SCA GHG-1 requires the GGRP to both reduce GHG emissions per service population to below 4.6 MT CO<sub>2</sub>e/SP/year and to at least 36% below the 2005 BAU emissions. As shown in Section 2.4.4, the Project emissions are below the 4.6 MT CO<sub>2</sub>e/SP/year threshold and 36% below the 2005 BAU emissions. Accordingly, no reduction measures are required by SCA GHG-1.

### 3. SUMMARY

This GHG Reduction Plan demonstrates the Oak Knoll Project can meet the goals of SCA GHG-1. Specifically, the goals met by this GGRP are to increase energy efficiency and reduce GHG emissions to below the applicable BAAQMD CEQA Threshold of Significance pertaining to an efficiency metric based on the Project's total population, and to reduce GHG emissions by 36 percent below 2005 BAU Project GHG emissions. After construction of Phase I, to ensure the partially constructed Project meets the applicable BAAQMD CEQA Threshold of Significance, this Plan requires the Project sponsor to purchase carbon offsets or otherwise reduce GHG emissions from Phase I from the year Phase I becomes operational to the year Phase III becomes operational to meet SCA GHG-1 requirements. At full buildout, the Project meets both the BAAQMD's CEQA Threshold pertaining to an efficiency metric based on the Project's total population and has a 36 percent reduction from 2005 BAU Project GHG emissions.

## **APPENDIX A**

### **SUPPORTING CALCULATIONS**

**Table GGRP-1**  
**Land Use Summary, Full Buildout**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

<b>Project Land Use</b>	<b>CalEEMod Land Use Subtype<sup>1</sup></b>	<b>Size</b>	<b>Units</b>	<b>Population<sup>2</sup></b>
Townhomes	Condo/Townhouse	572	Units	1,368
Single Family Detached	Single Family Home	363	Units	868
Community Center	Commercial- Government (Civic Center)	4,000	SF	4
Retail (Gross Leasable)	Retail - Supermarket	66,000	SF	138
Community Center Related Commercial	Recreational - Health Club	10,000	SF	20
Retail (Gross Leasable)	Recreational - High Turnover Restaurant	6,000	SF	18
Parking Lot	Parking Lot	87,210	SF	0
Parking	Parking	26	acres	0
Open Space	Open Space	83	acres	0

**Notes:**

1. Land uses shown are CalEEMod Land Use Subtypes and are matched based on the DEIR Project Description.
2. Residential and Commercial Population is from the Population and Housing Chapter of the DEIR.



**Table GGRP-2**  
**Trip Generation Rates**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

<b>Trip Generation Land Use Type<sup>1</sup></b>	<b>Size</b>	<b>Units</b>	<b>ITE Code</b>	<b>Weekday Trip Generation (Trips/Day-Size Unit)</b>	<b>Daily Trips with Mode Split Adjustment and Internalization Trip Capture Factor Applied<sup>2</sup> (Trips/Day)</b>
Condo/Townhouse	572	Units	230	5.81	2,928
Single Family Housing	363	Units	210	9.52	3,052
Regional Shopping Center	82	1000sf	820	42.70	5,270
Internal Trips	--	--	--	--	1,110
<b>Oak Knoll Total Project Trips</b>					<b>12,360</b>

**Notes:**

1. Land Use Type aggregation from Fehr & Peers traffic study.
2. Trip rates from Fehr & Peers traffic study and include
  - a Mode Split Adjustment Factor of 3.1%, applied to all land uses
  - an Internalization Trip Capture Factor from the ITE Trip Generation Handbook

**Table GGRP-3  
Trip Lengths  
Oak Knoll Mixed Use Project  
Greenhouse Gas Reduction Plan  
Oakland, California**

<b>Trip Generation Land Use Type<sup>1</sup></b>	<b>Home- Work Trip Length<sup>2</sup></b>	<b>Home- Shop Trip Length<sup>2</sup></b>	<b>Home- Other Trip Length<sup>2</sup></b>	<b>Home- Work Trip %</b>	<b>Home- Shop Trip %</b>	<b>Home- Other Trip %</b>	<b>Commerci al- Commerci al Trip Length</b>	<b>Commerci al-Work Trip Length</b>	<b>Commerci al- NonWork Trip Length</b>	<b>Commerci al- Commerci al Trip %</b>	<b>Commerci al-Work Trip %</b>	<b>Commerci al- NonWork Trip %</b>	<b>Primary Trip<sup>2</sup> %</b>	<b>Diverted Trip<sup>2</sup> %</b>	<b>Pass-By Trip<sup>2</sup> %</b>	<b>Average Primary Trip Length<sup>3</sup> (miles)</b>	<b>Average Overall Trip Length<sup>3</sup> (miles)</b>
Condo/Townhouse	11	6.5	6.5	0.261	0.291	0.448	6.5	11	5.7	0	0	0	1	0	0	7.7	7.7
Single Family Housing	11	6.5	6.5	0.261	0.291	0.448	6.5	11	5.7	0	0	0	1	0	0	7.7	7.7
Regional Shopping Center	11	6.5	6.5	0	0	0	6.5	11	5.7	0.647	0.163	0.19	0.54	0.35	0.11	7.1	4.5
Internal Trips	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5

**Notes:**

1. Land Use Type aggregation from Fehr & Peers traffic study.
2. Trip length and trip type data from CalEEMod with adjustments by Fehr & Peers for each land use.
3. Internal Trip length from Fehr & Peers.

**Table GGRP-4  
Hearth Population, 2005 BAU  
Oak Knoll Mixed Use Project  
Greenhouse Gas Reduction Plan  
Oakland, California**

**Woodstoves Population Inputs in CalEEMod<sup>1</sup>**

	<b>Conventional %</b>	<b>Catalytic %</b>	<b>Non-Catalytic %</b>	<b>Pellet %</b>	<b>Wood Mass Fireplace (lb/year)</b>
<b>Multifamily Homes</b>	0	0.5	0.5	0	954.8
<b>Single Family Homes</b>	0	3.5	3.5	0	1,355.2

**Fireplace Population Inputs in CalEEMod<sup>1</sup>**

	<b>Wood Hearth %</b>	<b>Natural Gas %</b>	<b>Propane %</b>	<b>No Hearth %</b>	<b>Wood Mass Fireplace (lb/year)</b>
<b>Multifamily Homes</b>	14	55	0	31	92.4
<b>Single Family Homes</b>	45	55	0	0	215.6

**Notes:**

1. From Table 5.1 of CalEEMod User's Guide Appendix D.

**Table GGRP-5  
Hearth Emissions, 2005 BAU  
Oak Knoll Mixed Use Community Plan Project  
Greenhouse Gas Reduction Plan  
Oakland, California**

**Project Data**

<b>Housing Type</b>	<b>Project Dwelling Units</b>	<b>Count of Catalytic Woodstoves</b>	<b>Count of Non-Catalytic Woodstoves</b>	<b>Count of Wood Hearths</b>	<b>Count of Natural Gas Hearths</b>	<b>Count of Propane Hearths</b>	<b>Count of No Hearth</b>
Multi-Family Home	572	2.86	2.86	80.08	314.6	0	177.32
Single-Family Home	363	12.71	12.705	163.35	199.65	0	0

**Woodstoves Operation Inputs in CalEEMod<sup>1</sup>**

<b>Housing Type</b>	<b>Hours/day Woodstove</b>	<b>Day/year Woodstove</b>
Multi-Family Home	8.5	11
Single-Family Home	8.5	26

**Notes:**

1. From Table 5.1 of CalEEMod User's Guide Appendix D.

**Fireplace Operation Inputs in CalEEMod<sup>1</sup>**

<b>Housing Type</b>	<b>Hours/day Fireplace</b>	<b>Day/year Fireplace</b>	<b>MMBTU/hr-fireplace</b>
Single-Family Home	3.5	6.3	0.06
Multi-Family Home	3.5	4.3	0.06

**Notes:**

1. From Table 5.1 of CalEEMod User's Guide Appendix D.

**Table GGRP-5  
Hearth Emissions, 2005 BAU  
Oak Knoll Mixed Use Community Plan Project  
Greenhouse Gas Reduction Plan  
Oakland, California**

**Table D5.2 Hearth Emission Factors from CalEEMod User's Guide Appendix D, filtered for relevant hearth types**

<b>Emission Factor by Pollutant<sup>1</sup> (lb/MMBTU)</b>				
<b>Hearth Type</b>	<b>CO2_BIO</b>	<b>CO2_NBIO</b>	<b>CH4</b>	<b>N2O</b>
Natural Gas <sup>2</sup>	0	117.6470588	0.002254902	0.002156863
Propane	0	136.6120219	0.002185792	0.009836066
No Fireplace	0	0	0	0

<b>Emission Factor by Pollutant<sup>1</sup> (lb/ton dry wood burned)</b>				
<b>Hearth Type</b>	<b>CO2_BIO</b>	<b>CO2_NBIO</b>	<b>CH4</b>	<b>N2O</b>
Woodstoves Catalytic	2,952	0	11.6	0
Woodstoves Noncatal	2,952	0	16	0
Wood Fireplace	3,400	0	0	0.3

**Notes:**

1. From Table 5.2 of CalEEMod User's Guide Appendix D.

**Table GGRP-5  
Hearth Emissions, 2005 BAU  
Oak Knoll Mixed Use Community Plan Project  
Greenhouse Gas Reduction Plan  
Oakland, California**

**Project Emissions**

		<b>Project Emissions by Hearth Type (lb/year)</b>			
<b>Housing Type</b>	<b>Hearth Type</b>	<b>CO2_BIO</b>	<b>CO2_NBIO</b>	<b>CH4</b>	<b>N2O</b>
Single-Family Home	Natural Gas	0	31,075	1	1
	Woodstoves Cata	25,413	0	100	0
	Woodstoves Non	25,413	0	138	0
	Wood Fireplace	59,871	0	0	5
Multi-Family Home	Natural Gas	0	33,311	1	1
	Woodstoves Cata	4,031	0	16	0
	Woodstoves Non	4,031	0	22	0
	Wood Fireplace	12,579	0	0	1

**CO<sub>2</sub>e emissions:**                      92.5                      MT CO<sub>2</sub>e/year

1 metric ton =                      1.102 short tons

Global Warming Potentials (IPCC 1995)

CH4 Global Warming Potential                      21

N2O Global Warming Potential                      310

**References:**

California Emissions Estimator Model (CalEEMod). Available online at <http://www.caleemod.com/>

Intergovernmental Panel on Climate Change (IPCC). 1995. Second Assessment Report. Available at [http://www.ipcc.ch/ipccreports/sar/wg\\_1/ipcc\\_sar\\_wg\\_1\\_full\\_report.pdf](http://www.ipcc.ch/ipccreports/sar/wg_1/ipcc_sar_wg_1_full_report.pdf)

**Table GGRP-6**  
**CalEEMod Output File with Landscaping Emissions**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

CalEEMod Version: CalEEMod.2013.2.2

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**Oak Knoll Mixed Use Project**  
**Alameda County, Annual**

**1.0 Project Characteristics**

**1.1 Land Usage**

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Government (Civic Center)	4.00	1000sqft	0.09	4,000.00	0
Other Asphalt Surfaces	26.00	Acre	26.00	1,132,560.00	0
Parking Lot	87.21	1000sqft	2.00	87,210.00	0
City Park	83.00	Acre	83.00	3,615,480.00	0
Health Club	10.00	1000sqft	0.23	10,000.00	0
High Turnover (Sit Down Restaurant)	6.00	1000sqft	0.14	6,000.00	0
Condo/Townhouse	572.00	Dwelling Unit	35.75	572,000.00	1209
Single Family Housing	363.00	Dwelling Unit	117.86	653,400.00	872
Supermarket	66.00	1000sqft	1.52	66,000.00	0

**1.2 Other Project Characteristics**

<b>Urbanization</b>	Urban	<b>Wind Speed (m/s)</b>	2.2	<b>Precipitation Freq (Days)</b>	63
<b>Climate Zone</b>	5			<b>Operational Year</b>	2014
<b>Utility Company</b>	Pacific Gas & Electric Company				
<b>CO2 Intensity (lb/MW hr)</b>	290	<b>CH4 Intensity (lb/MW hr)</b>	0.029	<b>N2O Intensity (lb/MW hr)</b>	0.006

### 1.3 User Entered Comments & Non-Default Data

Project Characteristics - 2020 carbon intensity from PG&E. This run is for Landscaping only.

Land Use - Population from DEIR

Construction Phase - This run is for Landscaping only.

Vehicle Trips - This run is for Landscaping only.

Vehicle Emission Factors - This run is for Landscaping only.

Vehicle Emission Factors -

Vehicle Emission Factors -

Woodstoves - This run is for Landscaping only.

Landscape Equipment - This run is for Landscaping only.

Energy Use - This run is for Landscaping only.

Water And Wastewater - This run is for Landscaping only.

Solid Waste - This run is for Landscaping only.0

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	300.00	0.00
tblConstructionPhase	PhaseEndDate	12/30/2016	12/31/2016
tblEnergyUse	LightingElect	1,001.10	0.00
tblEnergyUse	LightingElect	4.07	0.00
tblEnergyUse	LightingElect	3.43	0.00
tblEnergyUse	LightingElect	6.01	0.00
tblEnergyUse	LightingElect	0.88	0.00
tblEnergyUse	LightingElect	1,608.84	0.00
tblEnergyUse	LightingElect	8.31	0.00
tblEnergyUse	NT24E	3,125.85	0.00
tblEnergyUse	NT24E	4.80	0.00
tblEnergyUse	NT24E	3.36	0.00
tblEnergyUse	NT24E	20.97	0.00
tblEnergyUse	NT24E	5,096.44	0.00
tblEnergyUse	NT24E	27.24	0.00
tblEnergyUse	NT24NG	2,951.00	0.00



tblEnergyUse	NT24NG	1.01	0.00
tblEnergyUse	NT24NG	6.90	0.00
tblEnergyUse	NT24NG	128.02	0.00
tblEnergyUse	NT24NG	6,192.92	0.00
tblEnergyUse	NT24NG	12.69	0.00
tblEnergyUse	T24E	135.74	0.00
tblEnergyUse	T24E	5.01	0.00
tblEnergyUse	T24E	1.48	0.00
tblEnergyUse	T24E	3.26	0.00
tblEnergyUse	T24E	248.69	0.00
tblEnergyUse	T24E	3.32	0.00
tblEnergyUse	T24NG	21,338.24	0.00
tblEnergyUse	T24NG	19.28	0.00
tblEnergyUse	T24NG	18.78	0.00
tblEnergyUse	T24NG	41.99	0.00
tblEnergyUse	T24NG	44,827.08	0.00
tblEnergyUse	T24NG	25.82	0.00
tblFireplaces	FireplaceDayYear	4.29	0.00
tblFireplaces	FireplaceDayYear	6.29	0.00
tblFireplaces	FireplaceWoodMass	92.40	0.00
tblFireplaces	FireplaceWoodMass	215.60	0.00
tblFireplaces	NumberGas	314.60	0.00
tblFireplaces	NumberGas	199.65	0.00
tblFireplaces	NumberWood	80.08	0.00
tblFireplaces	NumberWood	163.35	0.00
tblLandUse	Population	1,636.00	1,209.00
tblLandUse	Population	1,038.00	872.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblSolidWaste	SolidWasteGenerationRate	7.14	0.00
tblSolidWaste	SolidWasteGenerationRate	263.12	0.00
tblSolidWaste	SolidWasteGenerationRate	2.90	0.00

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tblSolidWaste	SolidWasteGenerationRate	57.00	0.00
tblSolidWaste	SolidWasteGenerationRate	71.40	0.00
tblSolidWaste	SolidWasteGenerationRate	366.24	0.00
tblSolidWaste	SolidWasteGenerationRate	372.24	0.00
tblVehicleTrips	ST_TR	1.59	0.00
tblVehicleTrips	ST_TR	7.16	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	158.37	0.00
tblVehicleTrips	ST_TR	10.08	0.00
tblVehicleTrips	ST_TR	177.59	0.00
tblVehicleTrips	SU_TR	1.59	0.00
tblVehicleTrips	SU_TR	6.07	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	131.84	0.00
tblVehicleTrips	SU_TR	8.77	0.00
tblVehicleTrips	SU_TR	166.44	0.00
tblVehicleTrips	WD_TR	1.59	0.00
tblVehicleTrips	WD_TR	6.59	0.00
tblVehicleTrips	WD_TR	27.92	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	127.15	0.00
tblVehicleTrips	WD_TR	9.57	0.00
tblVehicleTrips	WD_TR	102.24	0.00
tblWater	IndoorWaterUseRate	37,268,102.66	0.00
tblWater	IndoorWaterUseRate	794,638.74	0.00
tblWater	IndoorWaterUseRate	591,431.44	0.00
tblWater	IndoorWaterUseRate	1,821,202.27	0.00
tblWater	IndoorWaterUseRate	23,650,911.30	0.00
tblWater	IndoorWaterUseRate	8,135,702.18	0.00
tblWater	OutdoorWaterUseRate	98,892,952.02	0.00
tblWater	OutdoorWaterUseRate	20,486,409.20	0.00

tblWater	OutdoorWaterUseRate	487,036.65	0.00
tblWater	OutdoorWaterUseRate	362,490.24	0.00
tblWater	OutdoorWaterUseRate	116,246.95	0.00
tblWater	OutdoorWaterUseRate	14,910,357.12	0.00
tblWater	OutdoorWaterUseRate	251,619.66	0.00
tblWoodstoves	WoodstoveDayYear	10.82	0.00
tblWoodstoves	WoodstoveDayYear	26.24	0.00
tblWoodstoves	WoodstoveWoodMass	954.80	0.00
tblWoodstoves	WoodstoveWoodMass	1,355.20	0.00

## 2.0 Emissions Summary

	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
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

## 2.2 Overall Operational Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	27.6226	0.0843	7.1148	3.7000e-004		0.0378	0.0378		0.0378	0.0378	0.0000	11.3455	11.3455	0.0121	0.0000	11.5997
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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<b>Total</b>	<b>27.6226</b>	<b>0.0843</b>	<b>7.1148</b>	<b>3.7000e-004</b>	<b>0.0000</b>	<b>0.0378</b>	<b>0.0378</b>	<b>0.0000</b>	<b>0.0378</b>	<b>0.0378</b>	<b>0.0000</b>	<b>11.3455</b>	<b>11.3455</b>	<b>0.0121</b>	<b>0.0000</b>	<b>11.5997</b>
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**Mitigated Operational**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	27.6226	0.0843	7.1148	3.7000e-004		0.0378	0.0378		0.0378	0.0378	0.0000	11.3455	11.3455	0.0121	0.0000	11.5997
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Total</b>	<b>27.6226</b>	<b>0.0843</b>	<b>7.1148</b>	<b>3.7000e-004</b>	<b>0.0000</b>	<b>0.0378</b>	<b>0.0378</b>	<b>0.0000</b>	<b>0.0378</b>	<b>0.0378</b>	<b>0.0000</b>	<b>11.3455</b>	<b>11.3455</b>	<b>0.0121</b>	<b>0.0000</b>	<b>11.5997</b>

	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
<b>Percent Reduction</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

**3.0 Construction Detail**

**Construction Phase**

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	12/31/2016	5	0	

**Acres of Grading (Site Preparation Phase): 0**

**Acres of Grading (Grading Phase): 0**

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

**OffRoad Equipment**

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	162	0.38
Demolition	Rubber Tired Dozers	2	8.00	255	0.40

**Trips and VMT**

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

**3.1 Mitigation Measures Construction**

**4.0 Operational Detail - Mobile**

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**4.1 Mitigation Measures Mobile**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

## 4.2 Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated	Mitigated
	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
Condo/Townhouse	0.00	0.00	0.00		
Government (Civic Center)	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		
High Turnover (Sit Down Restaurant)	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
Single Family Housing	0.00	0.00	0.00		
Supermarket	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

## 4.3 Trip Type Information

Land Use	Miles			Trip %			Trip Purpose %		
	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
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6
Condo/Townhouse	12.40	4.30	5.40	26.10	29.10	44.80	86	11	3
Government (Civic Center)	9.50	7.30	7.30	75.00	20.00	5.00	50	34	16
Health Club	9.50	7.30	7.30	16.90	64.10	19.00	52	39	9
High Turnover (Sit Down Restaurant)	9.50	7.30	7.30	8.50	72.50	19.00	37	20	43
Other Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Single Family Housing	12.40	4.30	5.40	26.10	29.10	44.80	86	11	3
Supermarket	9.50	7.30	7.30	6.50	74.50	19.00	34	30	36

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.542757	0.062006	0.168650	0.114572	0.031552	0.004717	0.018583	0.044562	0.001747	0.003723	0.005493	0.000211	0.001428

## 5.0 Energy Detail

### 4.4 Fleet Mix

Historical Energy Use: N

### 5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

## 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					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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Supermarket	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>		<b>0.0000</b>	<b>0.0000</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

**Mitigated**

	Natural Gas 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					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Supermarket	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>		<b>0.0000</b>	<b>0.0000</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

**5.3 Energy by Land Use - Electricity**

**Unmitigated**

	Electricity Use	Total CO2	CH4	N2O	CO2e
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Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0	0.0000	0.0000	0.0000	0.0000
Health Club	0	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Supermarket	0	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

**Mitigated**

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0	0.0000	0.0000	0.0000	0.0000
Health Club	0	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000

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Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Supermarket	0	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

## 6.0 Area Detail

### 6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	27.6226	0.0843	7.1148	3.7000e-004		0.0378	0.0378		0.0378	0.0378	0.0000	11.3455	11.3455	0.0121	0.0000	11.5997
Unmitigated	27.6226	0.0843	7.1148	3.7000e-004		0.0378	0.0378		0.0378	0.0378	0.0000	11.3455	11.3455	0.0121	0.0000	11.5997

### 6.2 Area by SubCategory

#### Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.3846					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	24.0057					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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Landscaping	0.2322	0.0843	7.1148	3.7000e-004		0.0378	0.0378		0.0378	0.0378	0.0000	11.3455	11.3455	0.0121	0.0000	11.5997
<b>Total</b>	<b>27.6226</b>	<b>0.0843</b>	<b>7.1148</b>	<b>3.7000e-004</b>		<b>0.0378</b>	<b>0.0378</b>		<b>0.0378</b>	<b>0.0378</b>	<b>0.0000</b>	<b>11.3455</b>	<b>11.3455</b>	<b>0.0121</b>	<b>0.0000</b>	<b>11.5997</b>

**Mitigated**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.3846						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	24.0057						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.2322	0.0843	7.1148	3.7000e-004			0.0378	0.0378		0.0378	0.0378	0.0000	11.3455	11.3455	0.0121	0.0000
<b>Total</b>	<b>27.6226</b>	<b>0.0843</b>	<b>7.1148</b>	<b>3.7000e-004</b>			<b>0.0378</b>	<b>0.0378</b>		<b>0.0378</b>	<b>0.0378</b>	<b>0.0000</b>	<b>11.3455</b>	<b>11.3455</b>	<b>0.0121</b>	<b>0.0000</b>

**7.0 Water Detail**

**7.1 Mitigation Measures Water**

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Unmitigated	0.0000	0.0000	0.0000	0.0000
Mitigated	0.0000	0.0000	0.0000	0.0000

## 7.2 Water by Land Use

### Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0 / 0	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0 / 0	0.0000	0.0000	0.0000	0.0000
Health Club	0 / 0	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0 / 0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0 / 0	0.0000	0.0000	0.0000	0.0000
Supermarket	0 / 0	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

### Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0 / 0	0.0000	0.0000	0.0000	0.0000

Government (Civic Center)	0 / 0	0.0000	0.0000	0.0000	0.0000
Health Club	0 / 0	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0 / 0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0 / 0	0.0000	0.0000	0.0000	0.0000
Supermarket	0 / 0	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

## 8.0 Waste Detail

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### 8.1 Mitigation Measures Waste

#### Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

### 8.2 Waste by Land Use

#### Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0	0.0000	0.0000	0.0000	0.0000
Health Club	0	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Supermarket	0	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

**Mitigated**

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Condo/Townhouse	0	0.0000	0.0000	0.0000	0.0000
Government (Civic Center)	0	0.0000	0.0000	0.0000	0.0000
Health Club	0	0.0000	0.0000	0.0000	0.0000
High Turnover (Sit Down Restaurant)	0	0.0000	0.0000	0.0000	0.0000

Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Supermarket	0	0.0000	0.0000	0.0000	0.0000
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

## 9.0 Operational Offroad

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

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**Table GGRP-7**  
**Energy Use Emission Factors for Greenhouse Gases**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

Greenhouse Gas	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e	Units
<b>Global Warming Potential<sup>1</sup></b>	1	21	310	-	-
<b>2005 Electricity Use Emission Factor<sup>2</sup></b>	641 2.9E-01	0.029 1.3E-05	0.00617 2.8E-06	643.52 0.29	lb/MWh MT/MWh
<b>2020 Electricity Use Emission Factor<sup>3</sup></b>	290 1.3E-01	0.029 1.3E-05	0.00617 2.8E-06	292.52 0.13	lb/MWh MT/MWh
<b>Natural Gas Use Emission Factor<sup>4</sup></b>	117.6471 5.3E-03	0.0023 1.0E-07	0.0022 9.8E-08	118.36 0.0054	lb/MMBTU MT/therm

**Note:**

1. Global Warming Potentials from IPCC 1995 consistent with CalEEMod version 2013.2.2.
2. From CalEEMod version 2013.2.2.
3. Electricity Use CO<sub>2</sub> emission factor from PG&E 2013. The 2020 PG&E emission factor is used for operating year 2024. CH<sub>4</sub> and N<sub>2</sub>O emission factors from CalEEMod.
4. Natural Gas Use emission factors from Table 8.2 of CalEEMod User's Guide Appendix D.

1 ton= 2000 pounds  
1 short ton = 1.10231 tons  
1 MMBTU = 10 therms

**References:**

California Emissions Estimator Model (CalEEMod). Available online at <http://www.caleemod.com/>

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Pacific Gas and Electric Company (PG&E). 2013. Greenhouse Gas Emission Factors: Guidance for PG&E Customers.  
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**Table GGRP-8**  
**Energy Usage for 2005 BAU Operations**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

CalEEMod Land Use Type	CalEEMod Land Use Subtype	Size	Electricity Use Rate <sup>1</sup> (kWh/unit-yr)	Annual Electricity Use (MWh/yr)	Natural Gas Use Rate <sup>2</sup> (kBtu/unit-yr)	Annual Natural Gas Use (therm/yr)
Condo/Townhouse	Condo/Townhouse	572 DU	4,296	2,457	25,895	148,121
Single Family Home	Single Family Home	363 DU	7,027	2,551	56,001	203,283
Commercial	Government (Civic Center)	4,000 SF	15	58	24	944
Retail	Supermarket	66,000 SF	40	2,610	41	26,974
Recreational	Health Club	10,000 SF	9	87	27	2,696
Recreational	High Turnover (Sit Down Restaurant)	6,000 SF	31	185	171	10,253
Parking Lot	Parking Lot	87,210 SF	1	76	0	0
Parking	Parking	26 acres	0	0	0	0
City Park	City Park	83 acres	0	0	0	0
Electrical Vehicle Charging			-	2	-	-
<b>Project Subtotal</b>		-	-	<b>8,025</b>	-	<b>392,271</b>

**Notes:**

1. Electricity Use Rate is the sum of Title 24 and non-Title 24 electricity uses plus Lighting electricity use.
2. Natural Gas Use Rate is the sum of Title 24 and non-Title 24 natural gas uses.

**Table GGRP-9**  
**Energy Use Emissions, 2005 BAU Operational**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

<b>CalEEMod Land Use Type</b>	<b>CalEEMod Land Use Subtype</b>	<b>CO<sub>2</sub>e (MT CO<sub>2</sub>e/yr)</b>
Condo/Townhouse	Condo/Townhouse	1,513
Single Family Home	Single Family Home	1,836
Commercial	Government (Civic Center)	22
Retail	Supermarket	907
Recreational	Health Club	40
Recreational	High Turnover (Sit Down Restaurant)	109
Parking Lot	Parking Lot	22
Parking	Parking	0
City Park	City Park	0
Electric Vehicle Charging		1
<b>Project Subtotal</b>		<b>4,450</b>

**Table GGRP-10**  
**Water Usage and Electricity Intensity**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

**Water Usage**

**Project Total:** 207,000 gallons/day  
76 million gallons/year

**Notes:**

1. Water usage from East Bay Municipal Utilities District

**Water Electricity Intensity**

<b>County</b>	<b>Electricity to Supply Water (kWh/million gal)</b>	<b>Electricity to Treat Water (kWh/million gal)</b>	<b>Electricity to Distribute Water (kWh/million gal)</b>
Alameda	2,117	111	1,272

**Notes:**

1. Water Electricity Intensity from Table 9.2 of Appendix D of the CalEEMod User's Guide.

**Table GGRP-11**  
**Wastewater Treatment Types and Electricity Intensity**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

**Wastewater Electricity Intensity**

County	Electricity to Treat Wastewater (kWh/million gal)
Alameda	1,911

Water Electricity Intensity from Table 9.2 of Appendix D of the CalEEMod User's Guide.

**Wastewater Treatment Types**

County	Septic Tank	Aerobic	Anaerobic, Facultative Lagoons	Anaerobic, Combustion of Gas	Anaerobic, Cogeneration of Gas
Alameda	10.33%	87.46%	2.21%	100%	0%

Water Treatment Types from Table 9.3 of Appendix D of the CalEEMod User's Guide.

**Wastewater Treatment Direct Emission Factors**

Wastewater Treatment Type	CO <sub>2</sub> Biogenic, ton/gal	CO <sub>2</sub> Non-Biogenic, ton/gal	CH <sub>4</sub> , ton/gal	N <sub>2</sub> O, ton/gal
Septic	0	0	2.50E-07	8.48E-10
Aerobic	3.90E-07	0	1.34E-09	8.48E-10
Anaerobic Facultative	3.90E-07	0	4.02E-07	8.48E-10
Digester Burn	0	0	0	0
Digester Cogen	0	0	0	0

Wastewater Treatment Direct Emission Factors from Table 9.4 of Appendix D of the CalEEMod User's Guide.

**Table GGRP-12**  
**Water Use GHG Emissions, 2005 BAU**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

<b>Electricity Indirect Emissions (MT CO<sub>2</sub>e/year)</b>	<b>Septic Tank Direct Emissions (MT CO<sub>2</sub>e/year)</b>	<b>Aerobic Direct Emissions (MT CO<sub>2</sub>e/year)</b>	<b>Facultative Lagoon Direct Emissions (MT CO<sub>2</sub>e/year)</b>
119	42	44	15
<b>Total: 221</b>			

**Table GGRP-13**  
**Solid Waste Generation**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

**Solid Waste Generation Rates<sup>1</sup>**

CalEEMod Land Use Type	CalEEMod Land Use Subtype	Size Metric	Solid Waste Generation Rate, ton/size/year
Condo/Townhouse	Condo/Townhouse	DU	0.46
Single Family Home	Single Family Home	Resident	0.42
Commercial	Government (Civic Center)	1000sqft	5.70
Retail	Supermarket	1000sqft	5.64
Recreational	Health Club	1000sqft	5.70
Recreational	High Turnover (Sit Down Restaurant)	1000sqft	11.90
Parking Lot	Parking Lot	1000sqft	0
Parking	Parking	acres	0
City Park	City Park	acres	0.09

**Notes:**

1. Solid Waste Generation Rates from Table 10.1 of Appendix D of the CalEEMod User's Guide.

**Solid Waste Generation - Project Operation**

CalEEMod Land Use Type	CalEEMod Land Use Subtype	Area (DU or 1000 sq ft or acre)	Solid Waste Generation Rate, ton/year
Condo/Townhouse	Condo/Townhouse	572 DU	263
Single Family Home	Single Family Home	872 Residents	366
Commercial	Government (Civic Center)	4 KSF	23
Retail	Supermarket	66 KSF	372
Recreational	Health Club	10 KSF	57
Recreational	High Turnover (Sit Down Restaurant)	6 KSF	71
Parking Lot	Parking Lot	87 KSF	0
Parking	Parking	26 acres	0
City Park	City Park	83 acres	7
<b>Project Total</b>		-	<b>1,160</b>

**Table GGRP-14**  
**Solid Waste GHG Emissions Baseline and Project Operations**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

**Solid Waste Landfill Gas Treatment Types**

County	Landfill, No Gas Capture	Landfill, Capture Gas Flare	Landfill Gas Capture Efficiency	Landfill Gas Control Efficiency
Alameda	6%	94%	75%	98%

Solid Waste Landfill Gas Treatment Types from Appendices A and D, Table 10.2, to CalEEMod User's Guide

**Solid Waste Landfill Gas (LFG) Emission Factors**

Description	CO <sub>2</sub> Emissions (ton/ton waste)	CH <sub>4</sub> Emissions (ton/ton waste)
No LFG Collection	1.43E-01	4.26E-02
LFG Collection and Combustion	2.29E-01	1.14E-02

Solid Waste Landfill Gas Emission Factors from Table 10.2 of CalEEMod User's Guide Appendix D.

**Solid Waste GHG Emissions - Project Operation**

CalEEMod Land Use Type	CalEEMod Land Use Subtype	CO <sub>2</sub> (MT/year)	CH <sub>4</sub> (MT/year)	CO <sub>2</sub> e (MT/year)
Condo/Townhouse	Condo/Townhouse	53	3.2	120
Single Family Home	Single Family Home	74	4.4	167
Commercial	Government (Civic Center)	4.6	0.27	10.4
Retail	Supermarket	75.6	4.47	169.3
Recreational	Health Club	12	0.7	26
Recreational	High Turnover (Sit Down Restaurant)	14.5	0.86	32
Parking Lot	Parking Lot	0	0	0
Parking	Parking	0	0	0
City Park	City Park	1	0.1	3
<b>Project Total by GHG, without Zero Waste Goal</b>		<b>235</b>	<b>14</b>	<b>528</b>

**Table GGRP-15**  
**Operational Mobile Emissions, 2005 BAU**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

<b>Daily One-way Vehicle Trips<sup>1</sup></b>	<b>Weighted Trip Length<sup>2</sup> (mile/trip)</b>	<b>Miles/Day</b>	<b>Emissions, Total<sup>3</sup> (MT CO<sub>2</sub>e/year)</b>
12,360	5.7	69,924	11,175

**Notes:**

1. Trip rates from Fehr & Peers traffic study.
2. Trip length weighted by trip length for each external land use and relative contribution to trip generation of external and internal trips.
3. Emissions include gasoline and diesel vehicle types only.  
Emissions from electric vehicle charging are in Table GGRP-23.



**Table GGRP-16**  
**Onroad Fleet Mix, 2005 BAU**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

Fleet Mix, 2005					
Vehicle Type	Total Vehicles	Percentage of Fleet Mix	% by Fuel Type		
			Gas	DSL	ELEC
LDA	645,402	58%	57.2%	0.3%	0.0%
LDT1	85,166	8%	7.6%	0.0%	0.0%
LDT2	177,825	16%	15.9%	0.0%	0.0%
LHD1	30,543	3%	2.0%	0.8%	0.0%
LHD2	4,807	0%	0.2%	0.2%	0.0%
MCY	23,657	2%	2.1%	0.0%	0.0%
MDV	122,377	11%	10.9%	0.0%	0.0%
MH	6,374	1%	0.5%	0.0%	0.0%
OBUS	876	0%	0.0%	0.0%	0.0%
SBUS	280	0%	0.0%	0.0%	0.0%
T6	13,563	1%	0.3%	0.9%	0.0%
T7	9,264	1%	0.0%	0.8%	0.0%
UBUS	1,347	0%	0.0%	0.1%	0.0%

**Notes:**

1. Fleet mixes calculated based on EMFAC2014 projections for Alameda County.

**Abbreviations:**

EMFAC2014: California Air Resources Board Emission FACTor model.

**Table GGRP-17**  
**Mobile Emission Factors, 2005 BAU**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

Year	Fuel	CO <sub>2</sub>	CO <sub>2</sub>
		[g/mile]	[g/trip]
2005	Total	423.2655	81.7196
2005	Diesel	37.5738	0.1226
2005	Gas	385.6917	81.5971
2005	Electric	0.0000	0.0000

**Notes:**

1. Emission factors from EMFAC2014. The g/trip emission factors were calculated by converting the g/vehicle/day emission factor in EMFAC using the following equation:

$$\text{g/trip} = (\text{g/vehicle/day}) * (\text{vehicle population/vehicle trip count})$$

**Abbreviations:**

EMFAC2014: California Air Resources Board EMISSION FACTOR model.

**Table GGRP-18**  
**Vegetation-Change Emissions**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

<b>Number of Net New Trees<sup>1</sup></b>	<b>Units</b>	<b>Broad Species Class</b>	<b>Annual CO<sub>2</sub> accumulation per tree (MT CO<sub>2</sub>/tree/year)<sup>2</sup></b>	<b>Project GHG Sequestration<sup>3</sup> (MT CO<sub>2</sub>e)</b>
909	Trees	Mixed Hardwood	-0.0367	-667
<b>Number of Net New Acres<sup>1</sup></b>	<b>Units</b>	<b>Vegetation Land Use Subtype</b>	<b>Annual CO<sub>2</sub> accumulation per acre (MT CO<sub>2</sub>/acre/year)<sup>2</sup></b>	<b>Project GHG Loss due to Land Use Change (MT CO<sub>2</sub>e)</b>
-52.40	Acres	Grassland	-4.31	226
<b>Total, Trees and Acres Covered</b>				-441
<b>Annualized Net Vegetation Emissions (over 40 years)</b>				-11

**Notes:**

1. Number of net new trees from Project Sponsor.
2. From CalEEMod User's Guide Appendix A.
3. Trees are assumed to have a growing period of 20 years.

**Table GGRP-19**  
**Public Street Lighting GHG Emissions**  
**Oak Knoll Mixed Use Project**  
**Greenhouse Gas Reduction Plan**  
**Oakland, California**

	<b>2005 BAU</b>	<b>Project</b>
<b>Parameter</b>	High Pressure Sodium (HPS) lights	Light Emitting Diode (LED) lights
Watts/hour/light <sup>1</sup>	138.32	69.21
Number of lights <sup>2</sup>	230	230
Hours/day	11.5	11.5
MWh/day	0.37	0.18
Emission Factor <sup>3</sup> (lb CO <sub>2</sub> /MWh)	641	290
lb of CO <sub>2</sub> /year	85,598	19,377
<b>MT CO<sub>2</sub> /yr</b>	<b>39</b>	<b>9</b>

**Notes:**

1. Assumes a 138.32 W HPS Type II full cut off light bulb is replaced with a 50% more efficient LED light bulb of 69.21. Light bulb comparison was obtained from the base case and LED D in LED Street Lighting Study prepared for the U.S. Department of Energy. Available at: [http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway\\_sf-streetlighting.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_sf-streetlighting.pdf). Accessed: February 2016.
2. Based on length of street in Project.
3. CO<sub>2</sub>e intensity factor for Pacific Gas and Electric accounts for CO<sub>2</sub> emissions rates under the 2020 33% Renewable Portfolio Standard in the Project scenario.

**Abbreviations:**

Wh - watt hour  
MWh - megawatt hour  
lb - pound  
CO<sub>2</sub> - carbon dioxide  
MT - metric tonne