Analyzing Operational Greenhouse Gas Emissions

5.1. Greenhouse Gases (GHG)

Global Warming and Climate Change

Global Warming – An increase in GHG emissions leading to an increase in average global temperature.

Climate Change – A change in global or regional climate pattern possibly caused by global warming.

Unlike criteria air pollutants, greenhouse gasses (GHGs) are regional or even global pollutants. Whereas pollutants with localized air quality effects have relatively short atmospheric lifetimes (about one to several days), GHGs have long atmospheric lifetimes (one to a hundred years). GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Since GHGs trap heat radiating from Earth toward space, the surface of the Earth and the lower atmosphere warms up from the trapped heat with the average global temperature increased. This is called the "global warming" effect. The regional or global climate pattern would then be changed (called climate change) due to the changing of the average global temperature. Therefore, increases of GHG emissions would be associated with the global warming effect and ultimately result in climate change. Although the detailed regime between GHG emissions and climate change is not precisely verified, it is clear that the quantity of emissions is enormous and no single project alone would measurably contribute to a noticeable incremental change in the local, regional or global climate pattern.

The California Global Warming Solution Act of 2006 (Assembly Bill 32) defines six (6) gaseous compounds as GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HCFs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)[26]. In addition, California Senate Bill 605 defined three (3) short-lived climate pollutants (black carbon, fluorinated gases or F-gases, and methane) and requires CARB to establish statewide GHG emission inventories along with adopting rules and regulations to achieve the maximum, technological feasible, and cost-effective GHG emission reductions[27]. These are the current gaseous compounds considered by California to be associated with climate change.

Climate change is considered a global problem which could potentially impact the natural environment in California and the world in the following ways:

- ✓ Rising sea levels along the California coastline, particularly in San Francisco and the Sacramento–San Joaquin River Delta due to ocean thermal expansion and melting of glacial ice, which could cause flooding and saltwater intrusion in low-lying areas;
- ✓ Changing extreme-heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent;
- ✓ Increasing wildfire frequency and intensity;
- ✓ Decreasing snow pack and stream flow in the Sierra Nevada Mountain Range, decreasing winter recreation opportunities and summer water supplies;
- ✓ Increasing the severity of winter storms, causing higher peak stream flows and increased flooding;
- ✓ Changing growing season conditions that could affect California agriculture, causing variations in crop quality and yield; and

[26] California Assembly Bill 32 Overview. https://www.arb.ca.gov/cc/ab32/ab32.htm
[27] California Senate Bill 605. https://www.arb.ca.gov/cc/shortlived/meetings/11282016/appendixa.pdf

- ✓ Changing the distribution of plant and wildlife species due to changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects.

With the enactment of Senate Bill 97, California's lawmakers identified the need to analyze GHG emissions as a part of the CEQA review process. As part of the mandates in SB 97, effective on March 18, 2010[28], the Office of Planning and Research (OPR) amended the CEQA Guidelines to include the analysis and mitigation of GHG emissions. From the CEQA standpoint, GHG impacts from a land use project are inherently cumulative.

5.2. Assessing Operational Impacts from GHG Emissions

Operational GHG emissions are generated from activities associated with the activities in the project's operational phase. The project's operational GHG emissions are from combustion activities and would be considered as causing long-term cumulative climate change impacts since the impacts occur repeatedly in the project's lifetime. The amount of GHG emissions, along with the potential to cause substantial impacts depends on the type and level of operational activities proposed. Several sources of emissions should bel be considered when evaluating the operational emissions from a proposed project such as motor vehicle operation, fireplaces and wood burning appliances, water heaters and boilers, power generators, lawn maintenance equipment, and combustion processes operated by industrial facilities.

Motor vehicle operation, from land use development projects, are often referred to as an "indirect source" because of the GHG emissions from motor vehicle travel to and from a development's proposed location. Some of these projects include shopping centers, office buildings, and residential subdivisions. A developments' on-site activities are called "direct sources". Direct source projects also include projects such as refineries, power plants, or asphalt batch plants in which equipment and devices operate onsite.

In addition to indirect and direct source emissions, land use projects also generate "area source" emissions. GHG area sources include water and space heaters, fireplaces, wood burning appliances, and lawn maintenance equipment which involve fuel combustion processes. These sources individually emit a fairly small amount of GHGs, but cumulatively may represent a significant quantity of emissions. In addition to the similar sources with criteria pollutants, the project also needs to analyze the indirect GHG emissions from electricity usage, solid waste disposal, vegetation planting and/or removal, and water usage.

5.3. Determining Project Operational GHG Emissions

When estimating GHG emissions from a project's operational activities, each type of source/device should be identified with its specific activity information. Information required for calculating the GHG emissions are described below, with each requiring increasingly detailed information to produce more accurate results. If there are existing operational activities on site, the District recommends that the GHG emissions from the existing operation be quantified as the baseline condition and used to identify the net emissions between the existing and proposed operation on site.

The project specific information for calculating the operational emissions are listed but not limited to:

[28] California Governor's Office of Planning & Research. https://www.opr.ca.gov/s_ceqaandclimatechange.php

- Proposed project characteristics such as the location and land use setting,
- Proposed land use types and sizes,
- Project specific traffic study if available with the daily trip, traveling distance, or total VMT,
- Project related energy consuming data for electricity, natural gas, or propane usage,
- Project related area sources such as fireplaces /wood burning appliances, and lawn maintenance equipment,
- Project related direct sources/devices such as industrial processes, power generators, and boilers, and
- Assumption and emission rates applied for mobile source emissions, area source emissions, and direct/point source emissions calculation.

For the land use development projects, the District recommends using the latest version of CalEEMod to quantify operational GHG emissions. (Previous versions will not be accepted.) For the industrial related projects, the District recommends consulting with the District staff regarding the proposed industrial processes or device specialties prior to conducting the GHG emission estimation. All assumptions, modeling settings, modeling outputs, or special calculation methods for industrial projects should be provided in order for the District staff to review the project's operational GHG emission calculation.

5.4. Estimating Motor Vehicle Related GHG Emissions

Motor vehicles are a primary source of long-term operational emissions from residential, commercial, institutional, and industrial land uses. These land uses often do not emit substantial amounts of air pollutants directly, but may cause or attract motor vehicle trips that produce significant emissions. Motor vehicle emissions are calculated based on the project's daily trip rate for its land uses, the type of trips, traveling distance for each trip, the fleet mix, and emission rates. CalEEMod provides an user-friendly platform which incorporates the most recent vehicle emission factors from the EMFAC model developed by CARB along with trip generation factors published by the Institute of Transportation Engineers (ITE). The latest version of CalEEMod can be found at: www.caleemod.com. APPENDIX B summarizes the District's modeling recommendations for the project's CalEEMod analysis.

In addition to CalEEMod, motor vehicle emissions can also be calculated by using the EMFAC model directly when only the project's total VMT data is available for the analysis. The most recent EMFAC version is can be accessed online at www.arb.ca.gov/emfac/ . When special vehicle activities data is used, information on the vehicle classes, vehicle population, and traveling speeds should be provided as part of the District's CEQA review process. APPENDIX D presents the methods recommended by the District to calculate the project related motor vehicle emissions directly from the EMFAC model.

5.5. Non-Vehicular Emissions from Residential/Commercial Developments

Non-vehicular GHG emission sources associated with residential and commercial development include energy use to power lights, appliances, water heaters, space heating and cooling equipment, fuel combustion by lawnmowers, leaf blowers and other small utility equipment, residential wood burning, and other small sources. Collectively, these are referred to as "area sources" and are important from a cumulative standpoint even though they may appear insignificant when viewed individually. CalEEMod provides emission estimations from area sources based on land use types.

Please note that the default setting under CalEEMod "Hearths" emission module is used for wood burning devices and can result in substantial GHG emissions from wood burning devices

for a project. This setting should be carefully modified to be consist with the project's design whether the project includes wood burning devices. In addition, indirect GHG emissions from electricity energy use, water and space heating, solid waste disposal, vegetation planting and/or removal, and water usage should be analyzed as the part of total GHG emissions from a project.

5.6. Industrial Emission Source Projects

From an emissions standpoint, industrial facilities and operations are typically categorized as "point" or "aggregated point" sources. Point sources are stationary and generally refer to a site that has one or more emission sources at a facility within an identified location (e.g., power plant, refinery, etc.). Aggregated point sources can be stationary, a manufacture process, or mobile and are typically related, but individually small within the stationary facility operation however they may be significant as a group. This includes:

- Devices/equipment/processes along with proposed facilities whose emissions are small individually, but may be significant as a group (e.g., gasoline dispensing devices, kilns, heaters, etc.);
- Sources whose emissions emanate from a broad area (e.g., fugitive dust from storage piles and dirt roads, landfills, etc.); and,
- Mobile equipment used in industrial operations (e.g., air compressors, drill rigs, loaders, haul-trucks, etc.).

Please note that both industrial-related point and aggregated point sources are subject to the District's regulatory and/or control requirements. An "Authority to Construct" permit may be required from the District for the source/device. In addition, if the "direct" GHG emissions from an industrial project exceed 10,000 MT CO_2e/yr, the project would be subject to the CARB's Mandatory Greenhouse Gas Emission Reporting Regulation[29] and the Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation[30]. These are statewide regulations and compliance requirements are applied to industrial projects.

Furthermore, all GHG emission sources should be evaluated under CEQA including the stationary point, area and mobile sources if they are part of the proposed industrial project. While a specific piece of equipment or process may be covered by a District permit or statewide regulations it is not excluded from the CEQA evaluation process.

5.7. Significance Thresholds for Operational GHG Emissions

Table 5-1 shows the significance thresholds adopted by the District's Board of Directors on October 13, 2016, which are used to determine the significance and appropriate mitigation level for project-related operational GHG emissions (as shown in Table 2-3 and Table 2-4). Please note that the Bright-line threshold (10,000 MT CO_2e/yr) is applied to **both** the land use development projects and to the stationary projects. The Efficiency Matrix and De Minimis level

[29] https://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/mrr-regulation.htm
[30] https://www.arb.ca.gov/regact/2016/capandtrade16/capandtrade16.htm

(1,100 MT CO_2e/yr) are **only** applied to land use projects as they are not applicable for stationary (Industrial) projects and construction-only projects such as roadway, pipeline, or levee construction projects.

Table 5-1: PCAPCD Significance Thresholds for Project Operational GHG Emissions

Bright-Line Thresholds for Land Use and Stationary Project 10,000 MT CO_2e/yr			
Efficiency Matrix (for Land Use Project only)			
Residential		**Non-Residential**	
urban	**rural**	**urban**	**rural**
(MT CO_2e/capita)		(MT CO_2e/1,000 sf)	
4.5	**5.5**	**26.5**	**27.3**
De Minimis Level 1,100 MT CO_2e/yr			

The District suggests that the efficiency for residential projects (MT CO_2e/capita) can be calculated based on the default household size of 2.83 in CalEEMod or the specific value identified by the lead agency. The efficiency for non-residential projects is calculated based on its proposed floor footage and presented as MT CO_2e/1,000 square feet (s.f.). For a mixed-use type project, the District suggests that the lead agency decides which land use component (residential or non-residential) in its mixed-use proposal would be used to calculate the project's efficiency, either as MT CO2e per capita or per 1,000 s.f., in order to meet one of GHG efficiency matrix shown in Table 5-1.

Most of the long-term operational mitigation strategies suggested in this chapter focuses on methods to reduce vehicle trips along with travel distance, including site design standards that encourage pedestrian and bicycle-friendly transit-oriented development. In addition, the recommendations include design strategies for residential and commercial buildings that address energy conservation and other concepts that reduce the total project's GHG emissions. These recommendations are not all inclusive and are provided as examples among many possibilities.

5.8. Steps in Determining Significance of Operational Impacts from GHG

The following steps are recommended by the District on how to determine the significance of GHG emissions operational impacts.

Step 1: Emissions Quantification

The project's CEQA document should identify sources which would contribute to the project's operational GHG emissions. An analytical methodology should be identified to estimate the project's operational GHG emissions. The District recommends using the most current version of CalEEMod. (No previous versions will be accepted.) With the CalEEMod modeling default settings or the project specific operational activity information, CalEEMod can provide a quantitative analysis that estimates the project's related GHG emissions from its related operational activities.

- ✓ For more information and to download the software please go to: www.caleemod.com.
- ✓ APPENDIX B: PCAPCD Tips for Using CalEEMod

When a project proposes a conversion from its existing operation or involves District permitted devices, the lead agency should plan to consult with the District to identify a strategy related to the baseline conditions and how such conditions in the project description are described. Refer to Section 1.10 for further information on baseline conditions.

Step 2: Comparison of Unmitigated Operational GHG Emissions with the District's GHG Significance Thresholds

The total annual GHG emissions should be estimated from the project's operational activities which includes electricity and natural gas use, motor vehicle operation, water and waste water treatment, solid waste treatment, and stationary sources (if any). At this step, the project's total annual GHG emissions should consider all state and federal rules and regulations and should then be compared to the District's GHG operational significance thresholds.

1) Total GHG emissions are less than the De Minimis Level of 1,100 MT CO_2e/yr
   The project can be considered as less than cumulatively considerable since its contribution is relatively small compared to the cumulative GHG emissions in Placer County. No further GHG analysis will be required. However, the project will still be required to be in compliance with state and local regulations such as building codes and energy efficiency standards.

2) Total GHG emissions are between 1,100 MT CO_2e/yr (De Minimis Level) and 10,000 MT CO_2e/yr (Bright-line threshold)
   The project is required to conduct an efficiency analysis to further identify if its efficiency would meet one of conditions in Efficiency Matrix based on the proposed location and land use type. If the project cannot meet the associated efficiency condition, the lead agency should identify appropriate mitigation measures for the project. Please note that the Efficiency Matrix is only applied for land use projects with residential and/or commercial components. A stationary project or construction-only project such as roadway construction is not required to meet the efficiency condition.

3) Total GHG emissions exceed the Bright-line threshold of 10,000 MT CO_2e/yr
   The project's related GHG impacts are considered cumulatively considerable and all feasible mitigation measures should be identified to mitigate the project's related GHG emissions.

Step 3: Identification of Mitigation Measures and Emission Reductions

When the operational GHG emissions exceed the Bright-line thresholds or exceeds the Efficiency Matrix thresholds, a lead agency is responsible in identifying the necessary feasible mitigation measures for the operational GHG emissions, to reduce the project's related GHG impacts. Mitigation measures can be from 1) special features or designs included within the project description; 2) proposed measures within the CEQA-compliant environmental document; 3) identified measures from previously approved CEQA documents, and 4) regulatory measures as required by the District and local jurisdiction. APPENDIX A summarizes the District's rules and regulation applicable to the land use projects and APPENDIX F contains examples of feasible mitigation measures and a chart regarding the potential reduction of mitigation measures for GHG emissions. In addition, CAPCOA published the Quantifying Greenhouse Gas Mitigation Measures Report which provides a resource for local government in assessing emission reductions from GHG mitigation measures. For the project the District recommends identifying all feasible mitigation measures to the maximum extent.

- ✓ APPENDIX A: PCAPCD Rules and Regulations

- ✓ APPENDIX F: PCAPCD Recommended GHG Mitigation Measures and Reduction Chart
- ✓ CAPCOA Quantifying Greenhouse Gas Mitigation Measure Report

Please note that any commentments made within the project's design features that serve to mitigate impacts should be fully evaluated within the related impact analysis and mitigation discussion, to ensure that the feature does in fact mitigate the project's potential adverse impacts. In addition, it is at the lead agency discretion that the local jurisdiction's rules and regulatons are reflected within the project related emissions, either before or after mitigation, in the modeling analsyis for the project's operational GHG emissions impacts.

The District recommends that the proposed mitigation measures to reduce operational GHG emissions be as detailed as possible and should explicitly identify who is responsible for implementation, funding, monitoring, enforcement, and any required maintenance activities. In cases where the GHG emission reduction measures relate directly or indirectly to policies within a local jurisdiction's General or Community Plan, the District encourages discussion in the CEQA document on the relationship between the General Plan or Community Plan's policy and proposed reduction measures. If the land agency is planning to amend its General Plan or a Community Plan, CAPCOA has published the Model Policies for Greenhouse Gases in General Plans which can be a resource for local government to incorporate General Plan policies to reduce GHG emissions.

- ✓ CAPCOA Model Policies for Greenhouse Gases in General Plans

The District recommends that mitigation measures identified in the CEQA document be included as conditions of approval during the entitlement phase of project approval. In addition, any mitigation monitoring reporting plan (MMRP) should also be included as a condition of approval during the entitlement phase.

At the very least, the project's mitigated emissions after the mitigation implementation should be quantified and disclosed in its CEQA document.

Step 4: Impact Significance Determination

The project's CEQA document should determine its mitigated operational GHG emissions after mitigation implementation and compare the total mitigated GHG emissions with the applicable thresholds. If the implementation of mitigation measures, including on-site and off-site mitigation, reduces the operational GHG emissions to the level below thresholds, the project's related GHG emissions impacts would be reduced to a less than cumulatively considerable.

If the mitigated GHG emissions still exceed the bright-line threshold, the project would be considered to have a cumulative considerable contribution to global climate change impacts.

Figure 5-1 summarizes the steps recommended by the District in determining the potential significance of the operational GHG impacts.

Figure 5-1: Steps in Determining Potential Significance of GHG Operational Impacts

5.9. Options for Project's Operational GHG Impact Mitigation

When the operational related emissions exceeds an applicable significance threshold, lead agencies are responsible for identifying all feasible mitigation measures to reduce the project's operational GHG emissions. The GHG emission analysis should quantify the reduction of emissions associated with any proposed mitigation measure and include the information in project's CEQA document.

The project's mitigation measures can include special features or site designs, proposed measures within the CEQA-compliant environmental document, identified measures from previous approved CEQA documents, and measures as required by local rules and regulations. Emissions from motor vehicles that travel to and from residential, commercial, and industrial land uses can generally be mitigated by reducing vehicle activity through site design (e.g., transit oriented design, infill, mixed use, etc.), implementing transportation demand management measures, using clean fuels and vehicles, and/or off-site mitigation projects.

In addition, area source operational emissions from energy consumption from land uses can be mitigated by improving energy efficiencies, conservation measures and the use of alternative energy sources. The mitigation measures discussed in this section are intended for GHG emissions but will also benefit in reducing emissions of ROG, NO_x, and Diesel PM (DPM). The following categories best capture the types of mitigation measures that can reduce GHG emissions from project operational operations.

Site Design Mitigation Measures

Site design and project layout can be effective methods for mitigating GHG emissionimpacts from development. Land use development which incorporates urban infill, higher density, mixed use and walk-able, bike-able, and transit oriented designs can significantly reduce vehicle activity and associated air quality impacts. As early as possible in the scoping phase of a project, the District recommends that developers contact the District staff to discuss the project layout and design factors which can influence indirect source emissions and reduce mobile source emissions.

Energy Efficiency Mitigation Measures

Residential and commercial energy used for lighting, heating and cooling is a significant source of direct and indirect GHG emissions nationwide. Reducing site and building energy demand reduces emissions at the power plant source along with natural or propane gas combustion in homes and commercial buildings. Commercial and residential buildings' energy efficiency can be improved by orienting buildings to maximize indirect heating and cooling, enhancing the buildings' insulation beyond building code requirements, installing energy efficiency appliances, incorporating the on-site electrical generation such as solar panels, or applying energy from renewable sources such as electricity from wind mills or biomass energy facilities.

Transportation Demand Mitigation Measures

Vehicle emissions are often the largest continuing emissions source from a development's operational phase. Reducing the demand for single-occupancy vehicle trips is a simple, cost-effective means of reducing vehicle emissions. In addition, using cleaner fueled vehicles or retrofitting equipment with emission control devices can reduce the overall emissions without impacting operations. Currently clean fuel and vehicle technologies exist for both passenger and heavy-duty applications.

Neighborhood Electric Vehicle (NEV)

- ✓ Appendix F Recommended Mitigation Measures and Reduction Chart for GHGs

Off-Site Mitigation

The District prefers that land use projects implement all feasible on-site mitigation measures. It is understandable that many on-site mitigation measures may not be suitable for a land use project. If this occurs, off-site mitigation measures would be an option for the project if there are insufficient on-site feasible mitigation measures to mitigate the project's related air quality impacts. Therefore, it is important for the applicant, developer, lead agency, and the District to work closely together whenever off-site mitigation is considered for a project.

When off-site mitigation is an option used to mitigate the project's operational impacts, emission reductions achieved from off-site sources should be equal to the required emission reductions related to the land use project's on-site impacts. This can provide the proper nexus for GHG emission mitigation under CEQA. For example, excessive GHG emissions from a land use project's energy usage could be reduced by a project which will generate the same amount of GHG emission reductions by utilizing landfill gas to generate renewable electricity.

If an off-site mitigation measure is required for a land use project, that mitigation measure should explicitly identify the required GHG emission reduction and the implementation method. The District's Board of Directors adopted the Review of Land Use Projects under CEQA Policy in 2016 which outlines the principles on how the GHG off-site mitigation measures should be implemented, by the selected mitigation scenarios, to offset the land use project's related operational GHG emissions. The project applicant has two options to implement off-site mitigation measures for GHG emissions: 1) proposing their own offsite mitigation project, or 2) purchasing carbon credits from recognized carbon credit registries. Please note that there is no mitigation fee option for GHG off-site mitigation since there is no fee rate or cost-effectiveness factor established by a statewide incentive program.

- ✓ PCAPCD Review of Land Use Projects under CEQA Policy

The applicant can choose to implement an offsite mitigation project. Prior to implementation, the applicant should consult with the District and demonstrate that the project met all the conditions required by a selected carbon credit protocol approved by CAPCOA, CARB, or other similar entities determined acceptable by the District. If the applicant chooses to purchase carbon credits, the credits should be registered under the CAPCOA GHG Reduction Exchange Program, American Carbon Registry (ACR), Climate Action Reserve (CAR), or other similar carbon credit registry as determined acceptable by the District. The requirement will ensure that the proposed mitigation project or carbon credit purchase can result in an equivalent GHG reduction required by the offsite mitigation measure. In addition, the District encourages the applicant to consider generating or purchasing **local and California-only** carbon credits as the

preferred mechanism to implementing the GHG off-site mitigation measure which helps facilitate the State toward achieving the GHG emission reduction goal.

The following links are well-recognized entities that have approved carbon offset protocols and/or registered carbon credits which can be applied towards a land use project's GHG emission reductions.

- ✓ CAPCOA GHG Reduction Exchange Program (GHG Rx)
- ✓ CARB Compliance Offset Protocols
- ✓ American Carbon Registry
- ✓ Climate Action Registry

Please note that the District will not be involved with any carbon credit purchase agreements; the District is only assisting the lead agency with verification of the carbon credits to ensure that they are real, permanent, quantifiable, verifiable, enforceable, and additional.

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