

**California Air Resources Board**

**Greenhouse Gas Quantification Methodology for the  
Strategic Growth Council  
Transformative Climate Communities Program**

**Greenhouse Gas Reduction Fund  
Fiscal Year 2016-17**



**FINAL  
August 14, 2017**

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# Preface

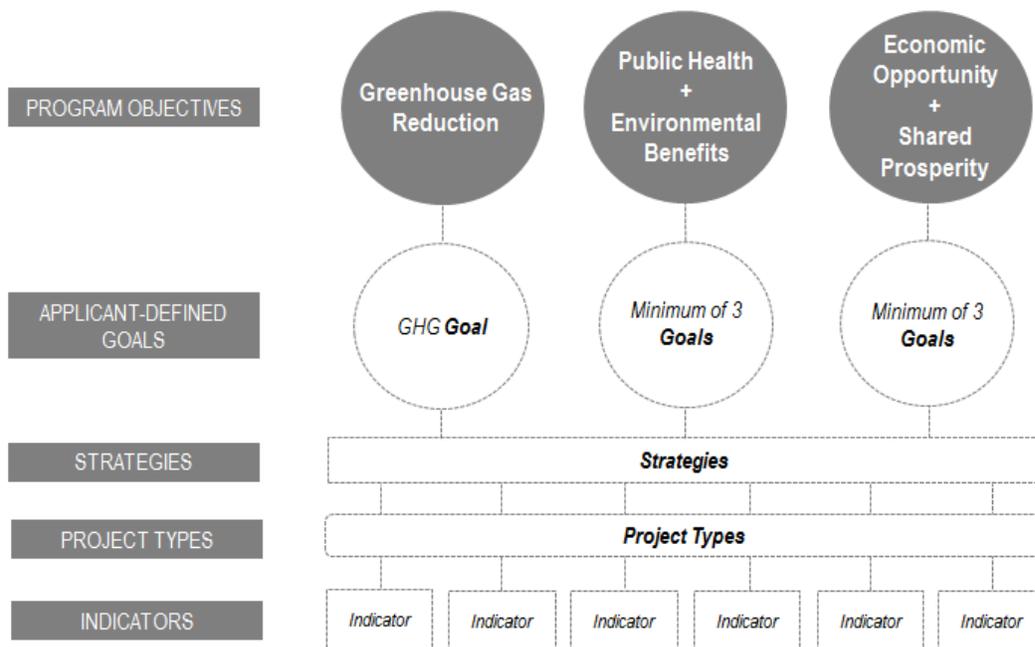
The Transformative Climate Communities (TCC) Program, administered by the Strategic Growth Council (SGC), was established by Assembly Bill (AB) 2722 (Burke, Chapter 371, Statutes of 2016) to “fund the development and implementation of neighborhood-level transformative climate community plans that include multiple, coordinated greenhouse gas emissions reduction projects that provide local economic, environmental, and health benefits to disadvantaged communities as described in Section 39711 of the Health and Safety Code.” (Pub. Resources Code § 75240.)

Based on the August 14<sup>th</sup> Draft Final TCC Program Guidelines, the TCC Program requires applicants to identify a project area that will be the focus of the TCC Proposal and deploy integrated climate strategies that combine greenhouse gas (GHG) reduction activities. TCC Proposals consists of five inter-related elements— Objectives, Goals, Strategies, Project Types, and Indicators.

The TCC Program Objectives reflect the TCC Program provisions outlined in AB 2722. Each TCC Proposal must identify Goals for each of the Program Objectives that align with community needs identified through the community engagement process.

Applicants must then identify a combination of Strategies known to reduce GHG emissions and promote public health, environmental and economic benefits, and develop Project Types that achieve the identified Goals. Lastly, applicants must track Indicators associated with each Project Type.

**Diagram I. TCC Program Framework**



## TCC Program Objectives

The TCC Proposals must address all three TCC Program Objectives:

1. Achieve Significant Reductions in Greenhouse Gas Emissions
2. Improve Public Health and Environmental Benefits
3. Expand Economic Opportunity and Shared Prosperity

## TCC Strategies

SGC developed a list of ten GHG emission reduction, public health, environmental, and economic benefit strategies for applicants to integrate into TCC project proposals in order to achieve the TCC Program Objectives and project Goals identified by the applicant.

### Strategies

1. Equitable Housing and Neighborhood Development
2. Transit Access and Mobility
3. Decarbonized Energy and Energy Efficiency
4. Water Efficiency
5. Material Management
6. Urban Greening and Green Infrastructure
7. Land Conservation and Restoration
8. Health and Well-Being
9. Workforce Development and Education
10. High Quality Job Creation and Local Economic Development

## TCC Project Types

TCC Strategies include multiple project types known to reduce greenhouse gas emissions and promote public health, environmental and economic benefits. For the TCC Program, project types fall into two categories:

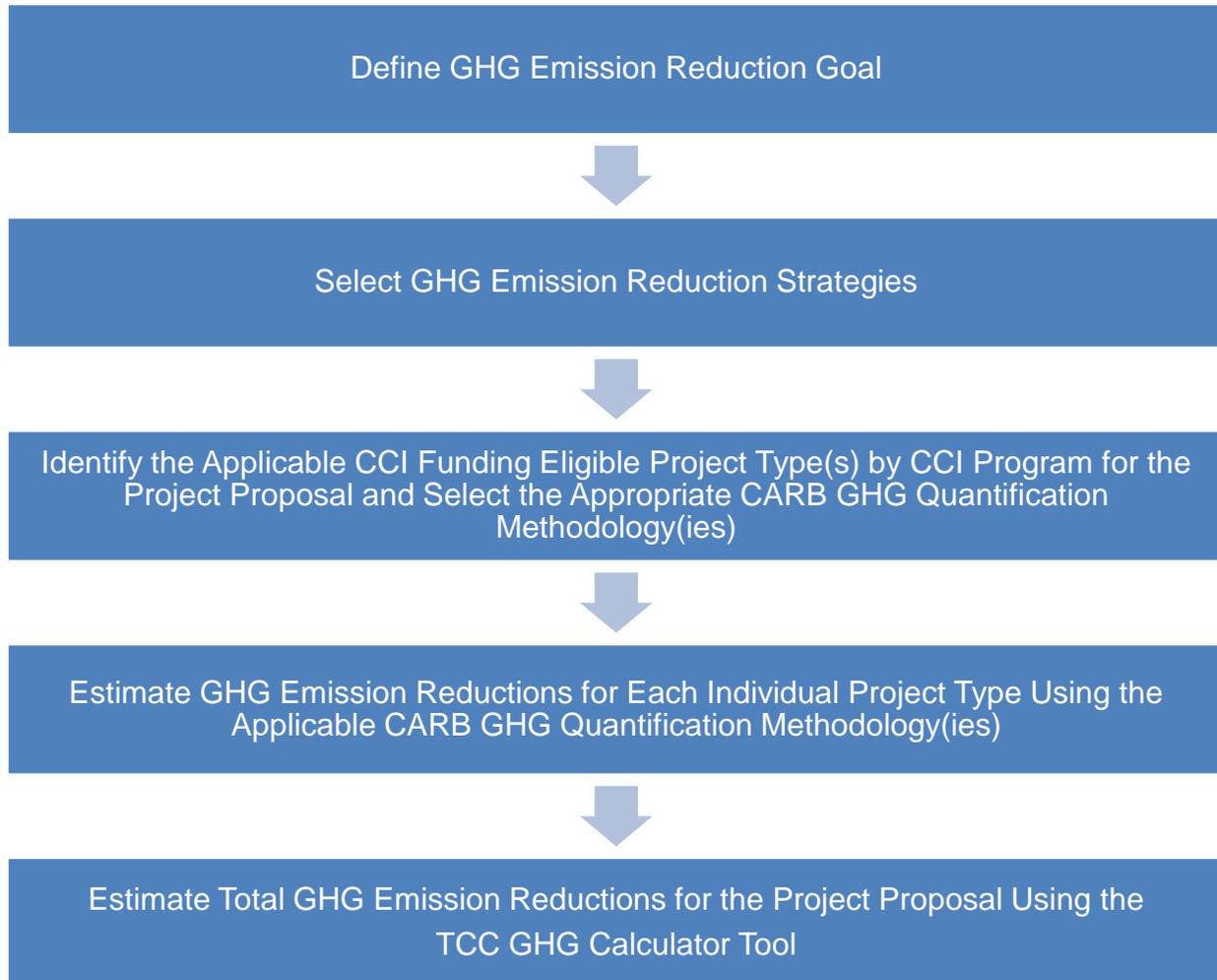
1. California Climate Investment (CCI) Funding Eligible: These are project types that are included in CCI programs and have CARB GHG quantification methodologies.
2. Leverage Funding Required: These project types are not included in CCI programs, and must be paid for with other funding sources.

Additional information on the TCC Program Objectives, Goals, Strategies, Project Types, and Indicators is available in the Draft Final TCC Program Guidelines, released August 14, 2017 at: <http://sgc.ca.gov/Grant-Programs/Transformative-Climate-Communities-Program.html>

## TCC GHG Quantification Methodology

For CCI Funding Eligible project types, CARB staff developed this Quantification Methodology and accompanying TCC GHG Calculator tool to provide methods for estimating GHG emission reductions for project proposals. Figure I below provides an overview of the TCC Program GHG Quantification Approach.

**Figure 1. TCC Program GHG Quantification Approach**



For quantification purposes, a list of CCI Funding Eligible project types by CCI program is provided in Table 1 of this Quantification Methodology. All of the corresponding CARB GHG quantification methodologies listed in Table 1 are available on the CARB Cap-and-Trade Auction Proceeds quantification materials webpage at: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification).

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## Section A. Introduction

The goal of California Climate Investments (CCI) is to reduce greenhouse gas (GHG) emissions and further the purposes of the Global Warming Solutions Act of 2006, known as Assembly Bill (AB) 32. The California Air Resources Board (CARB) is responsible for providing the quantification methodology to estimate the GHG emission reductions and other benefits from projects receiving monies from the Greenhouse Gas Reduction Fund (GGRF). CARB develops these methodologies based on the project types eligible for funding by each administering agency as reflected in the program Expenditure Records available at:

<https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/expenditurerecords.htm>.

CARB staff periodically review each quantification methodology to evaluate its effectiveness and update methodologies to make them more robust, user-friendly, and appropriate to the projects being quantified.

For the Strategic Growth Council (SGC) Transformative Climate Communities (TCC) Program, CARB staff developed this Quantification Methodology and accompanying TCC GHG Calculator tool to provide a method to aggregate estimated GHG emission reductions for project proposals using existing CARB quantification methodologies (Section B). This Quantification Methodology also provides instructions for documenting and supporting the GHG emission reduction estimate (Section C), and outlines the process for tracking and reporting GHG emission reductions and other benefits once a project is funded (Section D).

This methodology uses the latest final CARB GHG quantification methodologies developed for existing CCI programs and posted through June 5, 2017 on the CARB quantification webpage at: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification). These existing quantification methodologies are used to estimate carbon sequestration, GHG emission reductions, avoided GHG emissions, and GHG emissions associated with the implementation of TCC Program project proposals. Project proposals, at the time of full application, will report the combined total GHG emission reductions estimated using the applicable CARB quantification methodologies as well as the combined total GHG emission reductions per dollar of GGRF funds requested.

Applicants, with the assistance of a SGC-contracted technical assistance provider, must use this TCC Quantification Methodology, in conjunction with the accompanying TCC GHG Calculator tool, to estimate the total GHG emission reductions of the proposed project. The TCC GHG Calculator tool can be downloaded from: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification).

## TCC CCI Funding Eligible Project Types

SGC developed a list of CCI Funding Eligible project types by CCI program that meet the objectives of the TCC Program, and for which there are existing CARB GHG quantification methods to quantify GHG emission reductions. Other project types may be included in applications for funding under the TCC Program; however, each project requesting GGRF funding must include at least one eligible project type.

A complete list of TCC CCI Funding Eligible project types with existing CARB GHG quantification methods by CCI program is provided in Table 1. All of the corresponding CARB GHG quantification methodologies listed in Table 1 are available on CARB's quantification materials webpage at: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification). A summary table containing key input requirements for each CARB GHG quantification methodology is provided in Appendix B.

**NOTE:** If a project proposal includes a housing development, applicants must use the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17 to estimate GHG emission reductions. If there is no housing development, the applicant must use each applicable CARB GHG quantification methodology for each proposed project type, as identified in Table 1.

Many of the project types listed in Table 1 are quantifiable in multiple CARB GHG quantification methodologies. To avoid double-counting of GHG emission reduction estimates, applicants must not quantify estimates for project types multiple times when using separate CARB GHG quantification methodologies. SGC will review the quantified project types and verify that no double-counting of GHG emission reduction estimates occurred. Applicants are required to provide electronic documentation that is complete and sufficient to allow the calculations to be reviewed and replicated, as described in Section C of this Quantification Methodology.

**Table 1. CCI Funding Eligible Project Types by CCI Program**

CCI Program	Project Types	CARB GHG Quantification Methodology
Transit and Intercity Rail Capital	<ul style="list-style-type: none"> <li>• New/expanded transit service (e.g., rail (train), bus, ferry, shuttle and vanpool)</li> <li>• System and efficiency improvements that result in increased ridership</li> <li>• Cleaner vehicles/technology/fuels</li> <li>• Displaced fuel</li> </ul>	Transit and Intercity Rail Capital Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a>(PDF)</li> <li>• <a href="#">TIRCP GHG Emission Reduction Calculator for FY 2016-17</a> (.xlsm)</li> </ul>
Low Carbon Transit Operations	<ul style="list-style-type: none"> <li>• Transit vouchers</li> <li>• Network/fare integration</li> <li>• <i>See <a href="#">Transit and Intercity Rail Capital</a> for additional eligible project types</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>See <a href="#">Transit and Intercity Rail Capital Program</a> Quantification Methodology</i></li> </ul>
Active Transportation	<ul style="list-style-type: none"> <li>• New pedestrian facilities</li> <li>• New bike paths or lanes (Class I, Class II, or Class IV)</li> <li>• New or expanded bike share</li> </ul>	Active Transportation Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a> (PDF)</li> <li>• <a href="#">ATP GHG Emission Reduction Calculator for FY 2016-17</a> (.xlsm)</li> </ul>
Affordable Housing and Sustainable Communities	<ul style="list-style-type: none"> <li>• Affordable housing development</li> <li>• Housing related infrastructure</li> <li>• Sustainable rehabilitation of housing</li> <li>• Mixed use development</li> <li>• Transit subsidies for housing residence</li> <li>• New/expanded transit service (e.g., rail (train), bus, ferry, shuttle and vanpool)</li> </ul>	Affordable Housing and Sustainable Communities Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a> (PDF)</li> <li>• <a href="#">AHSC GHG Calculator for FY 2016-17</a> (.xlsm)</li> </ul>

**Table 1. (Continued) CCI Funding Eligible Project Types by CCI Program**

CCI Program	Project Types	CARB GHG Quantification Methodology
Sustainable Agricultural Lands Conservation	<ul style="list-style-type: none"> <li>• Agricultural conservation easements</li> <li>• Agricultural land conservation strategies and outcomes</li> </ul>	Sustainable Agricultural Lands Conservation Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a> (PDF)</li> </ul>
Low Carbon Transportation	<ul style="list-style-type: none"> <li>• Rebates for passenger zero-emission vehicles</li> <li>• Rebates for zero-emission public fleets</li> <li>• Car scrap and replace program for new or used hybrid, plug-in hybrid, or zero-emission vehicle replacements</li> <li>• Financing assistance for new or used zero-emission vehicles, plug-in hybrids, or hybrid and associated charging equipment</li> <li>• Advanced vehicle technology types for car sharing, vanpooling, ride-sharing and other mobility options in disadvantaged communities</li> <li>• Incentives to reduce the up-front cost of hybrid or zero-emission trucks and buses</li> <li>• Incentives for conventional engine trucks and buses to operate on renewable fuel</li> <li>• Rural school buses</li> <li>• Low NOx engine incentives</li> <li>• Agricultural worker vanpools</li> <li>• Zero-emission freight equipment</li> <li>• Zero-emission trucks</li> </ul>	Car Sharing and Mobility Options in Disadvantaged Communities Pilot Project: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a> (PDF)</li> </ul> Consumer-Based Heavy-Duty Projects: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a> (PDF)</li> </ul> Consumer-Based Light-Duty Projects: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17</a> (PDF)</li> </ul>

**Table 1. (Continued) CCI Funding Eligible Project Types by CCI Program**

CCI Program	Project Types	CARB GHG Quantification Methodology
Low-Income Weatherization	<ul style="list-style-type: none"> <li>• Single-family/small multi-family retrofits                             <ul style="list-style-type: none"> <li>○ Weatherization/energy efficiency</li> <li>○ Solar photovoltaic</li> </ul> </li> <li>• Large multi-family retrofits                             <ul style="list-style-type: none"> <li>○ Weatherization/energy efficiency</li> <li>○ Solar water heater</li> <li>○ Solar photovoltaic</li> </ul> </li> </ul>	<p>Low-Income Weatherization Program:</p> <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2015-16</a> (PDF)</li> </ul> <p>Low-Income Weatherization Program – Large Multi-Family:</p> <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2014-15</a> (PDF)</li> </ul>
Water-Energy Efficiency	<ul style="list-style-type: none"> <li>• Commercial/institutional water-energy efficiency                             <ul style="list-style-type: none"> <li>○ Dishwashers</li> <li>○ Clothes washers</li> <li>○ Ice machines</li> <li>○ Steam cookers</li> <li>○ Combination ovens</li> <li>○ Pre-rinse spray valves</li> <li>○ Faucets</li> <li>○ Showerheads</li> </ul> </li> <li>• Residential water-energy efficiency                             <ul style="list-style-type: none"> <li>○ Dishwashers</li> <li>○ Clothes washers</li> <li>○ Faucets</li> <li>○ Showerheads</li> </ul> </li> </ul>	<p>Water-Energy Grant Program:</p> <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2015-16</a> (PDF)</li> <li>• <a href="#">Water-Energy Grant Program GHG Calculator for FY 2015-16 Version 2</a> (.xlsm)</li> </ul>

**Table 1. (Continued) CCI Funding Eligible Project Types by CCI Program**

CCI Program	Project Types	CARB GHG Quantification Methodology
Urban and Community Forestry	<ul style="list-style-type: none"> <li>• Tree planting</li> <li>• Biomass utilization for wood products</li> <li>• Biomass utilization for electricity generation</li> </ul>	Urban and Community Forestry Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17 (PDF)</a></li> <li>• <a href="#">UCF GHG Calculator for FY 2016-17 Version 2 (.xlsx)</a></li> </ul>
Waste Diversion	<ul style="list-style-type: none"> <li>• Manufacturing value-added finished products using recycled fiber, plastic, and glass</li> <li>• Composting of organics</li> <li>• Standalone anaerobic digestion of organics producing biofuels or bioenergy</li> <li>• Co-digestion of organics at wastewater treatment plants producing biofuels or bioenergy</li> <li>• Food waste prevention</li> </ul>	Waste Diversion Grant and Loan Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2015-16 and FY 2016-17 (PDF)</a></li> <li>• <a href="#">Waste Diversion GHG Calculator for FY 2015-16 and FY 2016-17(.xlsx)</a></li> </ul>
Urban Greening	<ul style="list-style-type: none"> <li>• Tree planting that results in carbon sequestration or reduced building energy use</li> <li>• New pedestrian facilities</li> <li>• New bike paths or lanes (Class I, Class II, or Class IV)</li> </ul>	Urban Greening Grant Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17 (PDF)</a></li> <li>• <a href="#">Urban Greening GHG Emission Reduction Calculator for FY 2016-17(.xlsx)</a></li> </ul>

**NOTE:** Additional CCI programs with CARB GHG quantification methodologies not applicable to the TCC Program and not listed in Table 1 are High-Speed Rail, Low Carbon Transportation Advanced Technology Demonstration Projects, State Water Efficiency and Enhancement Program, Dairy Digester Research and Development Program, State Water Project Turbines, Wetland Restoration for Greenhouse Gas Reductions Grant Program, and Forest Health Program.

## Methodology Development

CARB, in consultation with SGC, developed this Quantification Methodology consistent with the guiding implementation principles of CCI, including ensuring transparency and accountability.<sup>i</sup> This Quantification Methodology was developed, through a public process, to be used to estimate the outcomes of proposed projects, inform project selection, and track results of funded projects. The implementing principles ensure that the methodology would:

- Apply at the project-level;
- Provide uniform methods to be applied statewide, and be accessible by all applicants;
- Use existing and proven tools and methods;
- Use project-level data, where available and appropriate; and
- Result in GHG emission reduction estimates that are conservative and supported by empirical literature.

CARB used existing CCI quantification methodologies that have been developed using peer-reviewed literature and tools and consulted with experts, as needed, to determine methods appropriate for the CCI Funding Eligible project types. CARB also consulted with SGC to determine the availability of inputs at the project-type-level. The methods were developed to provide estimates that are as accurate as possible with data readily available at the project level.

CARB and SGC released the Draft TCC GHG Quantification Methodology for FY 2016-17 and Draft TCC GHG Calculator tool for public comment in July 2017. This Final TCC GHG Quantification Methodology and accompanying TCC GHG Calculator tool for FY 2016-17 have been updated to address public comments, where appropriate, and for consistency with updates to the TCC Program Guidelines.

Applicants must use this Quantification Methodology, in conjunction with the accompanying TCC GHG Calculator tool, to estimate the GHG emission reductions of the proposed project. The TCC GHG Calculator tool can be downloaded from: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification).

## Program Assistance

SGC staff will review the quantification portions of the project proposal to ensure that the methods described in this document were properly applied to estimate the total GHG emission reductions for the proposed project. Applicants should use the following resources for additional questions and comments:

- Applicants are encouraged to check the frequently asked questions page regularly during the application process, which is at: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification).
- Applicants invited to submit a full application will be required to work with SGC-contracted technical assistance providers to estimate GHG emission reductions for all project types funded by GGRF and will be required to use a CARB GHG quantification methodology posted as of June 5, 2017.
- Questions on this document should be sent to [GGRFProgram@arb.ca.gov](mailto:GGRFProgram@arb.ca.gov).
- For more information on CARB's efforts to support implementation of GGRF investments, see: <https://www.arb.ca.gov/auctionproceeds>.
- Questions pertaining to the TCC Program should be sent to [tccpubliccomments@sgc.ca.gov](mailto:tccpubliccomments@sgc.ca.gov).

## Section B. GHG Quantification Methodology

### Overview

This Quantification Methodology uses existing CARB GHG quantification methodologies developed for other CCI programs to estimate carbon sequestration, GHG emission reductions, avoided GHG emissions, and GHG emissions associated with the implementation of TCC Program project proposals.

Applicants will follow the steps outlined in Figure 2 to estimate the total GHG emission reductions from the project proposal. Detailed instructions for each step are provided on subsequent pages. An example project showing how to use this Quantification Methodology and GHG Calculator tool is provided in Appendix A.

**Figure 2. Steps for Estimating Total GHG Emission Reductions**

**Step 1.** Identify the Applicable CCI Funding Eligible Project Type(s) by CCI Program for the Project Proposal and Select the Appropriate CARB GHG Quantification Methodology(ies)



**Step 2.** Estimate GHG Emission Reductions for Each Individual Project Type Using the Applicable CARB GHG Quantification Methodology(ies)



**Step 3.** Estimate Total GHG Emission Reductions for the Project Proposal Using the TCC GHG Calculator Tool

## **Step 1: Identify the Applicable CCI Funding Eligible Project Type(s) by CCI Program for the Project Proposal and Select the Appropriate CARB GHG Quantification Methodology(ies)**

For GHG quantification purposes, CARB staff has identified thirteen (13) appropriate quantification methodologies to use to estimate GHG emission reductions from CCI Funding Eligible project types by CCI program. Applicants must identify the relevant CCI program for each project type from Table 1. The CCI program identified for each project type will determine which existing CARB GHG quantification methodology (and accompanying GHG calculator tool, if applicable) must be used to estimate GHG emission reductions. The total GHG emission reductions across all project types by CCI program will be summed using the TCC GHG Calculator tool.

All of the CARB GHG quantification methodologies listed in Table 1 can be downloaded from: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification). A summary table containing key input requirements for each CARB GHG quantification methodology is provided in Appendix B.

**NOTE:** Applicants must incorporate at least one eligible project type and use at least one CARB GHG quantification methodology, as identified in Table 1, to quantify the total GHG emission reductions from the project proposal. Applicants should not include project types that have previously been awarded GGRF dollars unless the applicant can demonstrate that the project will achieve additional GHG emission reductions.

## Step 2: Estimate GHG Emission Reductions for Each Individual Project Type Using the Applicable CARB GHG Quantification Methodology(ies)

For each project type by CCI program, applicants will estimate GHG emission reductions using the appropriate CARB GHG quantification methodology (and accompanying GHG calculator tool, if applicable), as determined from Table 1. A summary table containing key input requirements for each CARB GHG quantification methodology is provided in Appendix B.

**NOTE:** If the TCC project proposal includes more than one individual project per project type, the applicant will need to estimate the GHG emission reductions from each individual project type separately. Most CARB quantification methodologies and accompanying GHG calculator tools allow for more than one individual project to be entered. However, if a proposed project includes more than one housing development, applicants **must** complete the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17 for each development separately. For example, if the proposed TCC project includes two different housing developments—one with 75% multi-family affordable housing and one 50% affordable senior housing—the applicant would need to complete the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17 twice, once per development.

### Step 3: Estimate Total GHG Emission Reductions for the Project Proposal Using the TCC GHG Calculator Tool

Applicants must use the TCC GHG Calculator tool to complete this step. The TCC GHG Calculator tool can be downloaded from [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification).

Users should begin with the **Read Me** tab, which contains instructions and prompts users to enter project information. Key terms are defined in the **Description** column. The **GHG Inputs** tab identifies inputs required by the user. Input and output fields are color coded:

- **Yellow** fields indicate a direct user input is required.
- **Green** fields indicate a selection from a drop-down box is required.
- **Gray** fields indicate output fields that are automatically populated based on user entries.

**NOTE:** Applicants must enter estimated GHG emission reductions and GGRF funding requested in the TCC GHG Calculator tool for each CCI program. If an existing CARB GHG quantification methodology was used to estimate GHG emission reductions for multiple project types under a single CCI program, applicants will enter the GHG emission reductions and GGRF funding requested as a single line item in the TCC GHG Calculator tool. However, if a proposed project includes more than one housing development, applicants **must** complete the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17 for each development and enter GHG emission reductions and GGRF funding requested for each development as separate line items in the TCC GHG Calculator tool.

Details of calculation methods for each project type by CCI program are provided within each respective CARB GHG quantification methodology.

The **GHG Summary** tab displays the estimated Total GHG Emission Reductions as well as the estimated Total GHG Emission Reductions per TCC GGRF dollar requested and per total GGRF dollar requested, as described below.

- **Total GHG Emission Reductions** is equal to the sum total of each of the GHG emission reductions calculated in Section B and are automatically summed in the TCC GHG Calculator tool in the **GHG Summary** tab.
- **Total GHG Emission reductions per Dollar of TCC GGRF Funds Requested** is calculated as:

$$\frac{\text{Total GHG Emission Reductions in Metric Tons of CO}_2\text{e}}{\text{TCC GGRF Funds Requested (\$)}}$$

Applicants should enter the TCC GGRF Funds Requested (\$) for all project features into the TCC GHG Calculator tool by CCI program. This amount is equal to the amount of GGRF dollars the applicant is requesting from SGC's TCC Program. The TCC GHG Calculator tool will provide the Total Project GHG Emission Reductions per TCC GGRF Dollar Requested.

- **Total Project GHG Emission Reductions per Dollar of GGRF Requested** is calculated as:

$$\frac{\text{Total Project GHG Emission Reductions in Metric Tons of CO}_2\text{e}}{\text{Total GGRF Funds Requested (\$)}}$$

Applicants should enter the Total GGRF Funds Requested (\$) into the TCC GHG Calculator tool for all project types. This amount is equal to the amount of GGRF dollars the applicant is requesting for the project from SGC's TCC Program, plus any additional GGRF dollars, other than SGC's TCC Program, that the project has or plans to apply for.

**NOTE:** Applicants should not include any GGRF dollars that have previously been awarded unless the project can demonstrate that the project will achieve additional GHG emission reductions.

For a list of GGRF funded programs, go to: [www.arb.ca.gov/cci-events](http://www.arb.ca.gov/cci-events). If no other GGRF funds are requested, this will be the same amount as the TCC Program GGRF Funds Requested. The TCC GHG Calculator tool will calculate the Total Project GHG Emission Reductions per GGRF Dollar Requested.

## Section C. Documentation

In addition to TCC Program application requirements, applicants for GGRF funding are required to document results from the use of this Quantification Methodology, including supporting materials to verify the accuracy of project-specific inputs.

Applicants are required to provide electronic documentation that is complete and sufficient to allow the calculations to be reviewed and replicated for the TCC GHG Calculator tool and all other CARB GHG quantification methodologies (and accompanying GHG calculator tools, as applicable) used to estimate GHG emission reductions. Paper copies of supporting materials must be available upon request by CARB or SGC staff.

The following checklist is provided as a guide to applicants; additional data and/or information may be necessary to support project-specific input assumptions. A summary table containing key input requirements for each CARB GHG quantification methodology is provided in Appendix B.

	<b>Documentation Description</b>	<b>Completed</b>
1.	Contact information for the person who can answer project specific questions from staff reviewers on the quantification calculations	
2.	Project description, including excerpts or specific references to the location in the main TCC Program application of the project information necessary to complete the applicable portions of the Quantification Methodology	
3.	Populated TCC GHG Calculator tool file (in .xls/.xlsm) with tabs applicable to the project populated (ensure that the Total Project GHG Emission Reductions, Total Project GHG Emission Reductions/TCC GGRF Funds Requested, and Total Project GHG Emission Reductions/Total GGRF Funds Requested fields in the summary tab contain calculated values)	
4.	If the Total GGRF Funds Requested are different than the TCC GGRF Funds Requested, identify the other GGRF program(s) where funding is sought, including the fiscal year of the application(s)	
5.	Any other information as necessary and appropriate to substantiate inputs (including any CARB GHG quantification methodology and accompanying GHG calculator tool and/or supporting worksheets used to estimate GHG emission reductions for all project types being quantified)	

## Section D. Reporting After Funding Award

Accountability and transparency are essential elements for all CCI projects. As described in CARB’s 2015 Funding Guidelines for Agencies that Administer California Climate Investments (2015 Funding Guidelines) and Funding Guidelines Supplement for FY 2016-17 Funds (Supplement), each administering agency is required to track and report on the benefits of the CCI funded under their program(s). Each project funded by the GGRF is expected to provide quantifiable net GHG benefit. The previous sections of this document provide the appropriate quantification methodologies and tools to use to estimate the net GHG benefit of a proposed project based on project types and assumptions of expected conditions and activity levels. This section explains the minimum reporting requirements for administering agencies and funding recipients during project implementation, termed Phase 1, and after a project is completed, termed Phase 2. Table 2 below shows the project phases and when reporting is required.

**Table 2. Quantification and Reporting By Project Phase**

	<b>Timeframe &amp; Reporting Frequency</b>	<b>Quantification Methods</b>
<b>Project Selection</b>	Period from solicitation to funding awards. Applicant submits application to SGC by due date in solicitation materials.	All applicants use methods in CARB’s GHG quantification methodology to estimate the net GHG benefit of the project.
<b>Phase 1</b>	Period from project award date through project completion date. SGC reports to CARB on an annual basis.	All awarded projects use methods in CARB’s GHG quantification methodology to update initial estimate of net GHG benefit, as needed, based on project changes.
<b>Phase 2</b>	Starts after Phase 1 is complete and a project becomes operational. SGC reports to CARB consistent with the 2015 Funding Guidelines.	GHG reduction estimates are updated and reported for a subset of awarded projects depending on project types funded.

Funding recipients have the obligation to provide, or provide access to, data and information on project outcomes to SGC. Applicants should familiarize themselves with the requirements below as well as those within the TCC Program solicitation materials (e.g., guidelines, applications, etc.), and grant agreement.

It is the responsibility of administering agencies to collect and compile project data from funding recipients, including the GHG emission reductions and information on benefits to disadvantaged communities.

Phase 1 reporting is required for all TCC Program projects. SGC will collect and submit data to CARB to satisfy Phase 1 reporting requirements. Projects must report any

changes that impact GHG emission reductions (i.e., assumptions or quantities) to SGC prior to project completion.

Phase 2 reporting is required for only a subset of TCC Program project types and is intended to document actual project benefits achieved after the project becomes operational. Phase 2 data collection and reporting will not be required for every TCC Program project or project type. SGC will be responsible for identifying the subset of individual projects that must complete Phase 2 reporting, identifying who will be responsible for collecting Phase 2 data, and for reporting the required information to CARB. CARB will work with SGC to address Phase 2 procedures, including but not limited to:

- The **timelines** for Phase 2 reporting, i.e., when does Phase 2 reporting begin, how long will Phase 2 reporting be needed.
- As applicable, **approaches for determining the subset of projects** that need Phase 2 reporting (i.e., how many **X** projects out of **Y** total projects are required to have Phase 2 reporting).
- **Methods for monitoring or measuring** the necessary data to quantify and document achieved GHG reductions and other select project benefits.
- **Data to be collected**, including data fields needed to support quantification of GHG emission benefits.
- Reporting requirements for transmitting the data to CARB or SGC for program transparency and use in reports.

Once the Phase 2 quantification method and data needs are determined, CARB will develop and post the final CARB approved Phase 2 methodology for use in Phase 2 reporting.

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<sup>i</sup> As described in Volume 1 of the California Air Resources Board. Funding Guidelines for Agencies Administering California Climate Investments (December 21, 2015) (2015 Funding Guidelines). [www.arb.ca.gov/cci-fundingguidelines](http://www.arb.ca.gov/cci-fundingguidelines)

## Appendix A. Example Project

### Introduction

The following example is a hypothetical project<sup>1</sup> to demonstrate how the TCC Program GHG Quantification Methodology for FY 2016-17 would be applied. This hypothetical project proposal does not provide examples of the supporting documentation that is required of actual project applicants.

### Overview of the project proposal

The project proposal will develop an area near a future High-Speed Rail (HSR) stop and is proposing the following **separate** developments:

1. Mixed-use development with a new bike path;
2. Senior housing development with new transit (local bus) service; and
3. Tree planting (not associated with either housing development).

The project proposal is located in Fresno County and has the following features:

1. Mixed-use development with a new bike path:
  - Transit-oriented development
  - First year of occupancy and bike path availability: 2019
  - 4-story rental development with 80 units; 75% are affordable
  - 3,000 square feet of commercial use
  - 2.0 acres (40 dwelling units per acre)
  - Traffic calming measures (roundabouts)
  - 1 parking space per dwelling unit
  - The distance to the nearest Central Business District (CBD) is 0.1 miles
  - Class I bike path in a non-university town
  - This bike path is 1.8 miles in length (one direction)
  - The bike path would be used 200 days per year
  - The road parallel to the bike path has an average daily traffic of 15,000.
  - There are five activity centers within ½ mile of the development
2. Senior housing development with new transit (local bus) service:
  - Integrated connectivity project
  - First year of occupancy and transit service: 2019
  - 1-story development with 90 units
  - 3.0 acres (30 dwelling units per acre)
  - The distance to the nearest CBD is 0.2 miles
  - \$2,500 in transit subsidies for each and every resident for three years
  - New local bus service funded by TCC GGRF funds for three years
  - Estimated ridership of 500 passengers per day on a daily service schedule
  - Consists of two hydrogen-powered buses with 2018 model year
  - The new bus service would run 40,000 miles per year (total for two buses)

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<sup>1</sup> The hypothetical project has not undergone verification of any TCC Program requirements; all assumptions about location, project type and features are for quantification methodology demonstration purposes only.

3. Tree planting (not associated with either housing development):
  - 100 one-year-old Chinese Pistache trees will be planted in 2019
  - The trees would be planted on the west side of conditioned (central air/heat pump) buildings, approximately 25 feet away
  - All buildings have natural gas heating equipment
  - All buildings were built post-1980 and are existing structures

The applicant requested a total of \$10,000,000 in TCC GGRF funds for the proposed project.

- \$4,800,000 for the mixed-use development and Class I bike path;
- \$5,000,000 for the senior housing development and new bus service; and
- \$200,000 for tree planting.

## Methods to apply

### **Step 1: Identify the Applicable CCI Funding Eligible Project Type(s) by CCI Program for the Project Proposal and Select the Appropriate CARB GHG Quantification Methodology(ies)**

Applicants must identify the relevant CCI program for each project type, as listed in Table 1. The CCI program identified will determine which existing CARB GHG quantification methodology (and accompanying GHG Calculator tool, if applicable) must be used to estimate GHG emission reductions. Table A-1 provides the appropriate CARB GHG quantification methodology to use for each of the project types in this example project proposal.

Since the proposed project includes two housing developments, the applicant will need to complete the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17 twice, once per development, to estimate GHG emission reductions. Since the Class I bike path and new bus service are associated with the mixed-use development and senior housing development, respectively, the applicant will also use the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17 to estimate GHG emission reductions for those projects.

**Table A-1. Example CCI Funding Eligible Project Types by CCI Program**

CCI Program	Project Types	CARB GHG Quantification Methodology
Affordable Housing and Sustainable Communities	<ul style="list-style-type: none"> <li>• Mixed-use development</li> <li>• New Class I bike paths*</li> </ul>	Affordable Housing and Sustainable Communities Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17 (PDF)</a></li> <li>• <a href="#">AHSC GHG Calculator for FY 2016-17 (.xlsm)</a></li> </ul>
Affordable Housing and Sustainable Communities	<ul style="list-style-type: none"> <li>• Senior housing development</li> <li>• New transit (local bus) service*</li> </ul>	Affordable Housing and Sustainable Communities Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17 (PDF)</a></li> <li>• <a href="#">AHSC GHG Calculator for FY 2016-17 (.xlsm)</a></li> </ul>
Urban Greening	<ul style="list-style-type: none"> <li>• Tree planting (not associated with either housing development)</li> </ul>	Urban Greening Grant Program: <ul style="list-style-type: none"> <li>• <a href="#">Quantification Methodology for FY 2016-17 (PDF)</a></li> <li>• <a href="#">Urban Greening GHG Emission Reduction Calculator for FY 2016-17(.xlsx)</a></li> </ul>

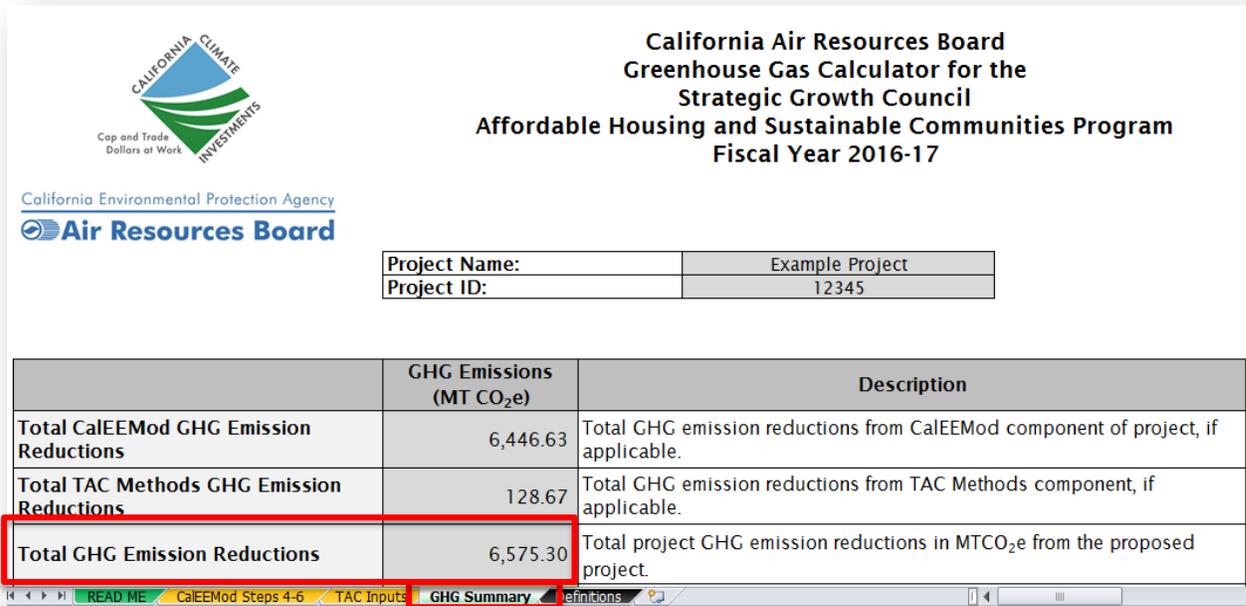
\*The new Class I bike path and new transit (local bus) service project types are associated with a housing development, and will therefore be quantified and entered into the TCC GHG Calculator tool under the Affordable Housing and Sustainable Communities Program using the Affordable Housing and Sustainable Communities Program Quantification Methodology for FY 2016-17.

## Step 2: Estimate GHG Emission Reductions for Each Individual Project Type Using the Applicable CARB GHG Quantification Methodology(ies)

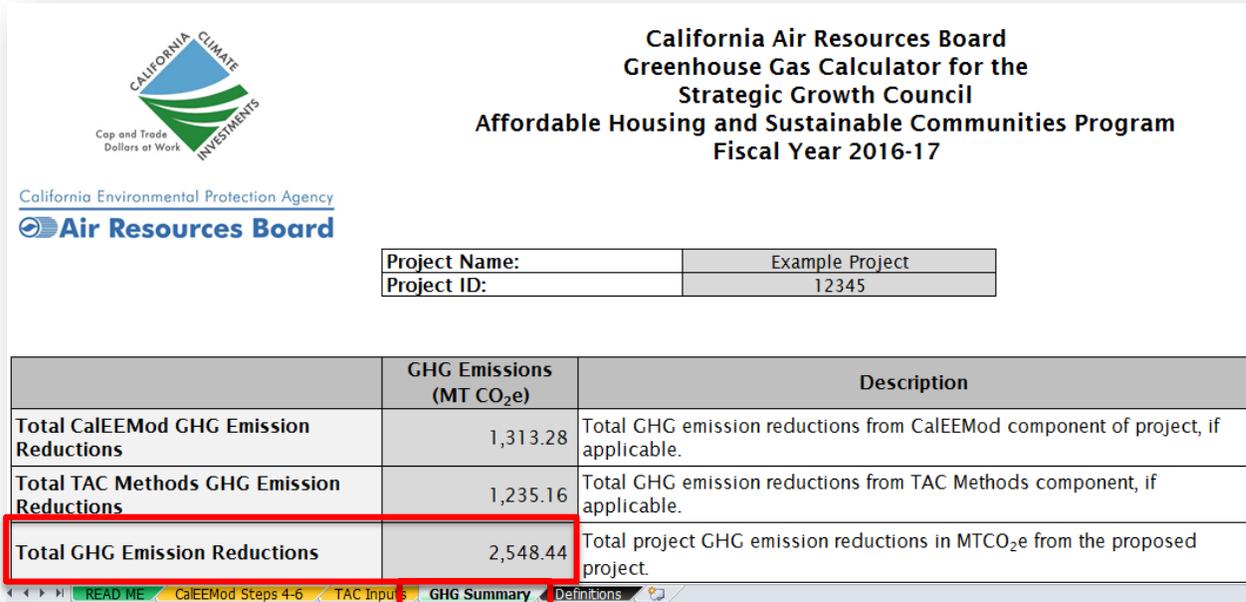
For each project type, applicants will estimate GHG emission reductions using the appropriate CARB GHG quantification methodology, as determined in Step 1. As shown in Table A-1, the Affordable Housing and Sustainable Communities Program Quantification Methodology and GHG Calculator tool for FY 2016-17 will be used to estimate GHG emission reductions associated with the mixed-use housing development with a new Class I bike path and the senior housing development with new transit (local bus) service. The Urban Greening Program Quantification Methodology and GHG Calculator tool for FY 2016-17 will be used to estimate GHG benefits associated with tree planting.

Screenshots of the GHG Summary tab from each applicable GHG Calculator tool are provided below for illustration purposes.

**Figure A-1. Results from the Mixed-use Development with New Bike Path Quantification**



**Figure A-2. Results from the Senior Housing Development with New Transit (Local Bus) Service Quantification**



**Figure A-3. Results from Tree Planting Quantification**



California Environmental Protection Agency  
**Air Resources Board**

**California Air Resources Board  
Calculator for the  
California Natural Resources Agency  
Urban Greening Grant Program  
Greenhouse Gas Reduction Quantification Methodology  
Fiscal Year 2016-2017**

<b>Project Name:</b>	Example Project
<b>Grant ID, if applicable:</b>	12345

**GHG Summary Worksheet**

GHG Benefit of Carbon Stored in Live Project Trees Estimated Using the CTCC (MT CO <sub>2</sub> e)	96.81
GHG Benefit of Carbon Stored in Live Project Trees Estimated Using i-Tree Streets (MT CO <sub>2</sub> e)	0.00
GHG Benefit from Energy Savings Estimated Using the CTCC (MT CO <sub>2</sub> e)	116.38
GHG Benefit from Energy Savings Estimated Using i-Tree Streets (MT CO <sub>2</sub> e)	0.00
Avoided GHG from Establishment of New Bicycle and Pedestrian Facilities (MT CO <sub>2</sub> e)	0.00
GHG Emissions from Project Implementation (MT CO <sub>2</sub> e)	10.66
<b>Net GHG Benefit (MT CO<sub>2</sub>e)</b>	<b>202.53</b>

New Bike-Ped Infrastructure | **GHG Summary** | ERFs & Sources

### Step 3: Estimate Total GHG Emission Reductions for the Project Proposal Using the TCC GHG Calculator Tool

Once each applicable CARB GHG quantification methodology and accompanying GHG Calculator tool (if applicable) are completed for all quantifiable CCI Funding Eligible project types, the applicant will enter the results into the TCC GHG Calculator tool, which will sum the GHG emission reductions across quantification methodologies to estimate the Total Project GHG Emission Reductions for the project proposal.

In the TCC GHG Calculator tool, the applicant will start by entering project information into the **Read Me** Tab.

<b>Project Name:</b>	TCC Example Project
<b>Contact Name:</b>	John Smith
<b>Contact Phone Number:</b>	916-555-1234
<b>Contact Email:</b>	<a href="mailto:jsmith@developer.org">jsmith@developer.org</a>
<b>Date Completed:</b>	1/1/2017

On the **GHG Inputs** tab, enter the GHG emission reductions and TCC GGRF funds requested by each CCI program from the appropriate CARB GHG quantification methodology.

CARB GHG Quantification Methodology	GHG Emission Reductions (MT CO <sub>2</sub> e)	TCC GGRF Funds Requested (\$)	GHG Emission Reductions/ TCC GGRF Funds Requested (\$)
Affordable Housing and Sustainable Communities Program	6575.30	\$ 4,800,000.00	0.001369854
Affordable Housing and Sustainable Communities Program	2548.44	\$ 5,000,000.00	0.000509688
Urban Greening Grant Program	202.53	\$ 200,000.00	0.00101265

On the **GHG Summary** tab, enter the total GGRF funds requested for the proposed project. The Total GHG Emission Reductions—as well as the estimated Total GHG Emission Reductions per TCC GGRF dollar requested and per total GGRF dollar requested—is automatically calculated in the TCC GHG Calculator tool.

	TOTALS	Description
Total GHG Emission Reductions	9,326.27	Total GHG Emission Reductions in MT CO <sub>2</sub> e from the project proposal.
TCC GGRF Funds Requested (\$)	\$ 10,000,000.00	TCC GGRF Funds Requested for the project proposal.
Total GHG Emission Reductions/ TCC GGRF Funds Requested (\$)	0.00093263	Total GHG Emission Reductions per TCC GGRF dollar requested.
<b>Total GGRF Funds Requested (\$)</b>	<b>\$ 10,000,000.00</b>	Total GGRF Funds Requested for the project proposal. If you are applying, have applied, or are planning to apply for additional GGRF funds for the project proposal, enter the combined funding request for all GGRF programs. If you are applying only to TCC for GGRF funding, re-enter the TCC GGRF Funds Requested in the "Total GGRF Funds Requested (\$)".
Total GHG Emission Reductions/ Total GGRF Funds Requested (\$)	0.00093263	Total GHG Emission Reductions per Total GGRF Funds Requested. This may be the same as the program-specific funding requested UNLESS the same project and phase will seek or has sought funding from other GGRF programs. Applicants must provide details in this case.

## Submit Documentation

To complete the quantification process, the applicant must submit an electronic copy of the TCC GHG Calculator tool (in .xls/.xlsm) and all of the required documentation as noted in Section C. Documentation includes any information necessary and appropriate to substantiate inputs (including any CARB GHG quantification methodology and accompanying GHG calculator tool and/or supporting worksheets used to estimate GHG emission reductions for all project types being quantified). For this example, in addition to the TCC GHG Calculator tool, the applicant would submit the following electronic copies:

- Two Affordable Housing and Sustainable Communities GHG Calculator tools for FY 2016-17
- One Urban and Community Forestry Program GHG Calculator tool for FY 2016-17
- Any other supporting documentation that is complete and sufficient to allow the calculations to be reviewed and replicated for the TCC GHG Calculator tool and all other CARB GHG calculator tools used to estimate GHG emission reductions

Save the file as instructed on the **Read Me** tab:

File name:	Example Project_TCC Calc
Save as type:	Excel Macro-Enabled Workbook

## Appendix B. CARB GHG Quantification Methodology Input Requirements

The following table summarizes the key input requirements for each CARB GHG quantification methodology, listed by CCI Program. Required inputs will vary based on project type chosen for quantification. Details on all required inputs are provided within each respective quantification methodology.

All of the CARB GHG quantification methodologies listed below are available on CARB's quantification materials webpage at: [www.arb.ca.gov/cci-quantification](http://www.arb.ca.gov/cci-quantification).

**Table B-1. General Input Requirements by CCI Program**

CCI Program	CARB GHG Quantification Methodology	General Input Requirements
Transit and Intercity Rail Capital	Transit and Intercity Rail Capital Program	<ul style="list-style-type: none"> <li>• Transit service type</li> <li>• First year of operation</li> <li>• Final year of operation</li> <li>• Days of operation</li> <li>• <b>Increase</b> in daily ridership</li> <li>• Vehicle miles traveled</li> </ul>
Low Carbon Transit Operations	<i>Transit and Intercity Rail Capital Program</i>	<ul style="list-style-type: none"> <li>• <i>See Transit and Intercity Rail Capital Program</i></li> </ul>
Active Transportation	Active Transportation Program	<ul style="list-style-type: none"> <li>• First year of operation</li> <li>• Final year of operation</li> <li>• Days of operation</li> <li>• Length of auto trip reduced</li> <li>• Average daily traffic</li> <li>• Number of trips</li> </ul>
Affordable Housing and Sustainable Communities	Affordable Housing and Sustainable Communities Program	<ul style="list-style-type: none"> <li>• Land use setting</li> <li>• Land use type/subtype</li> <li>• Transit service type</li> <li>• First year of operation</li> <li>• Final year of operation</li> <li>• Days of operation</li> <li>• <b>Increase</b> in daily ridership</li> <li>• Vehicle miles traveled</li> </ul>

**Table B-1. (Continued) General Input Requirements by CCI Program**

CCI Program	CARB GHG Quantification Methodology	General Input Requirements
Sustainable Agriculture Land Conservation	Sustainable Agriculture Land Conservation Program	<ul style="list-style-type: none"> <li>• Land use setting</li> <li>• Land use type/subtype</li> <li>• Year development rights extinguished</li> </ul>
Low Carbon Transportation	Car Sharing and Mobility Options in Disadvantaged Communities Pilot Project  Consumer-Based Heavy-Duty Projects  Consumer-Based Light-Duty Projects	<ul style="list-style-type: none"> <li>• Number of vehicles funded</li> <li>• Vehicle miles traveled</li> <li>• Project life</li> </ul>
Low-Income Weatherization	Low-Income Weatherization Program  Low-Income Weatherization Program – Large Multi-Family	<ul style="list-style-type: none"> <li>• Number of dwellings</li> <li>• Average effective useful life</li> <li>• Number of solar water heater systems</li> <li>• Solar photovoltaic capacity</li> </ul>
Water-Energy Efficiency	Water-Energy Grant Program	<ul style="list-style-type: none"> <li>• Number of units</li> <li>• Water heater fuel type</li> <li>• Operating days per year</li> <li>• Rated electricity consumption</li> <li>• Rated water consumption</li> <li>• Flow rate</li> <li>• Percentage of hot water used</li> <li>• Number of employees/guests</li> </ul>
Urban and Community Forestry	Urban and Community Forestry Program	<ul style="list-style-type: none"> <li>• Number of trees to be planted</li> <li>• Tree/site characteristics</li> <li>• Carbon stored in population</li> <li>• Annual electricity savings</li> <li>• Annual natural gas savings</li> </ul>

**Table B-1. (Continued) General Input Requirements by CCI Program**

CCI Program	CARB GHG Quantification Methodology	General Input Requirements
Waste Diversion	Waste Diversion Grant and Loan Program	<ul style="list-style-type: none"> <li>• Tonnage of newly diverted material of each feedstock</li> <li>• Tonnage of residual material/food waste/edible food</li> <li>• Size of facility</li> <li>• Type of equipment</li> <li>• Refrigerant charge size</li> <li>• Refrigerant type</li> </ul>
Urban Greening	Urban Greening Grant Program	<ul style="list-style-type: none"> <li>• Number of trees to be planted</li> <li>• Tree/site characteristics</li> <li>• Carbon stored in population</li> <li>• First year of operation</li> <li>• Final year of operation</li> <li>• Days of operation</li> <li>• Length of auto trip reduced</li> <li>• Average daily traffic</li> <li>• Number of trips</li> </ul>